



Welcome to National Semiconductor's Summer 2000 Edition of the **Linear/Mixed-Signal Designer's Guide!**  
Included in this guide are:

- Alphanumeric index
- Product selection trees
- Product selection guides
- Package descriptions
- CD-ROM with complete datasheets, a pdf version of this guide, and other valuable information

Updated information on each of the products listed in this guide plus new products can be found on the web at: <http://www.national.com>, where you can find the data you need as well order samples, get an evaluation board, find out which distributors have stock and order parts on-line. Test out your designs with online simulation tools, too!

Some of the topics you will find at our site:

- Search engine for parts, application notes and other information
- Design Engineer Product Information
  - Packaging information and technical support
  - Product trees, datasheets, application notes
  - Parametric selection guides, system diagrams, models and software
  - Design communities and featured product sites
  - Technical support
- Events and Seminars
- Purchasing Information
  - Order samples and purchase product and evaluation boards on-line
  - Pricing and distributor inventory searches
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# ALPHANUMERIC INDEX

## *Section 1*

# ALPHANUMERIC INDEX

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ADC0803	4-2	4-3	8-bit $\mu$ P Compatible A/D Converter
ADC08031	4-2	4-3	8-bit High Speed Serial I/O A/D Converter with Multiplexer Options, Voltage Ref. and Track/Hold Function
ADC08034	4-2	4-3	8-bit High Speed Serial I/O A/D Converter with Multiplexer Options, Voltage Ref. and Track/Hold Function
ADC08038	4-2	4-3	8-bit High Speed Serial I/O A/D Converter with Multiplexer Options, Voltage Ref. and Track/Hold Function
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ADC08061	4-2	4-3	500 ns A/D Converter with S/H Function and Input Multiplexer
ADC08062	4-2	4-3	500 ns A/D Converter with S/H Function and Input Multiplexer
ADC0808	4-2	4-3	8-bit $\mu$ P Compatible A/D Converter with 8-channel Multiplexer
ADC0809	4-2	4-3	8-bit $\mu$ P Compatible A/D Converter with 8-channel Multiplexer
ADC08131	4-2	4-3	8-bit High Speed Serial I/O A/D Converter with Multiplexer Options, Voltage Ref. and Track/Hold Function
ADC08134	4-2	4-3	8-bit High Speed Serial I/O A/D Converter with Multiplexer Options, Voltage Reference and Track/Hold Function
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ADC10061	4-2	4-4	10-bit 600ns A/D Converter with Input Multiplexer and Sample/Hold

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ADC10664	4-2	4-4	10-bit 360ns A/D Converter with Input Multiplexer and Sample/Hold
ADC10731	4-2	4-4	10-bit Plus Sign Serial I/O A/D Converter with Mux, Sample/Hold and Reference
ADC10732	4-2	4-4	10-bit Plus Sign Serial I/O A/D Converter with Mux, Sample/Hold and Reference
ADC10734	4-2	4-4	10-bit Plus Sign Serial I/O A/D Converter with Mux, Sample/Hold and Reference
ADC10738	4-2	4-4	10-bit Plus Sign Serial I/O A/D Converter with Mux, Sample/Hold and Reference
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ADC1175	4-6	4-7	8-bit, 20MHz, 60mW, A/D Converter
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ADC12032	4-2	4-5	Self-Calibrating 12-bit Plus Sign Serial I/O A/D Converter with MUX and Sample/Hold
ADC12034	4-2	4-5	Self-Calibrating 12-bit Plus Sign Serial I/O A/D Converter with MUX and Sample/Hold
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ADC12132	4-2	4-5	Self-Calibrating 12-bit Plus Sign Serial I/O A/D Converter with MUX and Sample/Hold
ADC12138	4-2	4-5	Self-Calibrating 12-bit Plus Sign Serial I/O A/D Converter with MUX and Sample/Hold
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ADC12L034	4-2	4-5	3.3V Self-Calibrating 12-bit Plus Sign Serial I/O A/D Converter with MUX and Sample/Hold
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COP884CL	12-3	12-6,7	8-Bit Microcontroller
COP884CS	12-3	12-6,7	8-Bit Microcontroller with UART and One Multi-Function Timer
COP884EK	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 8k Memory, Comparator, and Single-slope A/D Capability
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COP888CS	12-3	12-6,7	8-Bit Microcontroller with UART and One Multi-Function Timer
COP888EB	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 8k Memory, CAN Interface, 8-Bit A/D, and USART
COP888EK	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 8k Memory, Comparator, and Single-slope A/D Capability
COP888FH	12-3	12-8,9	8-Bit ROM Based Microcontrollers with 12k Memory, Comparators, USART and Hardware Multiply/Divide
COP888GD	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 16k Memory and 8-Channel A/D
COP888GW	12-3	12-10,11	8-Bit Microcontroller with Pulse Train Generators and Capture Modules
COP889EB	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 8k Memory, CAN Interface, 8-Bit A/D, and USART
COP8ACC5	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 4k Memory and High Resolution A/D
COP8ACC7	12-3	12-10,11	8-Bit OTP Microcontroller with 16k Memory and High Resolution A/D
COP8SAA5	12-3	12-4,5	8-Bit ROM Based Microcontroller with 1k Memory, Power On Reset and Very Small Packaging
COP8SAA7	12-3	12-4,5	8-Bit One-Time Programmable (OTP) Microcontroller with 1k Memory, Power On Reset and Very Small Packaging
COP8SAB5	12-3	12-4,5,6,7	8-Bit ROM Based Microcontroller with 2k Memory, Power On Reset and Very Small Packaging
COP8SAB7	12-3	12-4,5,6,7	8-Bit One-Time Programmable (OTP) Microcontroller with 2k Memory, Power On Reset and Very Small Packaging
COP8SAC5	12-3	12-6,7	8-Bit ROM Based Microcontroller with 4k Memory, Power On Reset and Very Small Packaging
COP8SAC7	12-3	12-6,7	8-Bit One-Time Programmable (OTP) Microcontroller with 4k Memory, Power On Reset and Very Small Packaging

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COP8SGE7	12-3	12-6,7,8,9	8-Bit ROM OTP Microcontrollers with 8k Memory, Two Comparators and USART
COP8SGG5	12-3	12-8,9	8-Bit ROM Based Microcontrollers with 16k Memory, Two Comparators and USART
COP8SGH5	12-3	12-8,9	8-Bit ROM Based Microcontrollers with 20k Memory, Two Comparators and USART
COP8SGK5	12-3	12-8,9	8-Bit ROM Based Microcontrollers with 24k Memory, Two Comparators and USART
COP8SGR5	12-3	12-8,9	8-Bit ROM Based Microcontrollers with 32k Memory, Two Comparators and USART
COP8SGR7	12-3	12-8,9	8-Bit ROM OTP Microcontrollers with 32k Memory, Two Comparators and USART
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COP920C	12-3	12-4,5	8-Bit Microcontroller
COP922C	12-3	12-4,5	8-Bit Microcontroller
COP940C	12-3	12-4,5	8-Bit Microcontroller
COP940CJ	12-3	12-4,5	8-Bit ROM Based Microcontroller with 2k Memory, Comparator and Brown Out Detector
COP942C	12-3	12-4,5	8-Bit Microcontroller
COP942CJ	12-3	12-4,5	8-Bit ROM Based Microcontroller with 2k Memory, Comparator and Brown Out Detector
COP980C	12-3	12-4,5	8-Bit Microcontroller
COP981C	12-3	12-4,5	8-Bit Microcontroller
COP982C	12-3	12-4,5	8-Bit Microcontroller
COP984CF	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 4k Memory and A/D Converter
COP984CL	12-3	12-6,7	8-Bit Microcontroller
COP984CS	12-3	12-6,7	8-Bit Microcontroller with UART and One Multi-Function Timer
COP984EK	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 8k Memory, Comparator, and Single-slope A/D Capability
COP988CF	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 4k Memory and A/D Converter
COP988CL	12-3	12-6,7	8-Bit Microcontroller
COP988CS	12-3	12-6,7	8-Bit Microcontroller with UART and One Multi-Function Timer
COP988EK	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 8k Memory, Comparator, and Single-slope A/D Capability
COP988FH	12-3	12-8,9	8-Bit ROM Based Microcontrollers with 12k Memory, Comparators, USART and Hardware Multiply/Divide
COP988GD	12-3	12-10,11	8-Bit ROM Based Microcontrollers with 16k Memory and 8-Channel A/D
DAC0800	4-8	4-8	8-bit Digital-to-Analog Converter
DAC0802	4-8	4-8	8-bit Digital-to-Analog Converter
DAC0808	4-8	4-8	8-bit Digital-to-Analog Converter
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DS14185	5-2, 5-15	5-17	EIA/TIA-232 3 Driver x 5 Receiver
DS14196	5-2, 5-15	5-17	EIA/TIA-232 5 Driver x 3 Receiver
DS1487	5-14	5-18	Low Power RS-485 1/4 Unit Load Multipoint Transceiver
DS1488	5-15	5-17	Quad Line Driver
DS1489	5-15	5-17	Quad Line Receiver
DS14C232	5-15	5-17	+5V TIA/EIA-232 Dual Driver and Receiver
DS14C238	5-2, 5-15	5-17	Single Supply TIA/EIA - 232 4x4 Driver/Receiver
DS14C241	5-2, 5-15	5-17	Single Supply TIA/EIA - 232 4x5 Driver/Receiver
DS14C335	5-2, 5-15	5-17	+3.3V Supply TIA/EIA - 232 3X5 Driver/Receiver
DS14C88	5-15	5-17	Quad CMOS Line Driver
DS14C89	5-15	5-17	Quad CMOS Receiver
DS1603		5-17	TRI-STATE Dual Receiver
DS1691	5-13	5-17, 5-18, 13-2	RS-422/RS-423 Line Driver with TRI-STATE Outputs
DS1692		5-17	TRI-STATE Differential Line Driver
DS16F95	5-14	5-18, 13-2, 13-9	EIA-485/EIA-422A Differential Bus Transceiver
DS1776		5-17, 13-2	Pi-Bus Transceiver
DS26C31	5-13	5-18, 13-2, 13-9	CMOS Quad TRI STATE Differential Line Driver
DS26C32	5-13	5-18, 13-2, 13-9	CMOS Quad Differential Line Receiver
DS26LS31	5-13	5-18, 13-2, 13-9	Quad High Speed Differential Line Driver
DS26LS32	5-13	5-18, 13-2, 13-9	Quad Differential Line Receiver
DS26LS33	5-13	5-18	Quad Differential Line Receiver
DS26LV31	5-13	5-18, 13-2	3V Enhanced CMOS Quad Differential Line Driver
DS26LV32	5-13	5-17, 13-2	3V Enhanced CMOS Quad Differential Line Receiver
DS26LV32		5-18	3V Enhanced CMOS Quad Differential Line Receiver
DS26S10		5-17	Quad Bus Transceiver
DS3486	5-13	5-18	Quad RS-422/RS-423 Line Receiver
DS3487	5-13	5-18	Quad TRI-STATE Line Driver
DS34C86	5-13	5-18	Quad CMOS Differential Line Receiver
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DS36277	5-2, 5-14	5-18	Dominant Mode Multipoint Transceiver
DS3650		5-17	Quad Differential Line Receiver
DS3651		5-17	Quad High Speed MOS Sense Amplifier
DS3662		5-17	Quad High Speed Trapezoidal Bus Transceiver
DS3691	5-13	5-17, 5-18	RS-422/RS-423 Line Driver with TRI-STATE Outputs
DS3695	5-14	5-18	Multipoint RS-485/RS-422 Transceiver
DS36950	5-2, 5-14	5-18	Quad Differential Bus Transceiver
DS36954	5-2, 5-14	5-18	Quad Differential Bus Transceiver
DS3696	5-14	5-18	Multipoint RS485/RS422 Transceiver
DS3697	5-14	5-18	Multipoint RS-485/RS-422 Repeater
DS36C200	5-3	5-11, 5-17	Dual High Speed Bi-Directional Differential Transceiver
DS36C278	5-14	5-18	Low Power Multipoint TIA/EIA-485 Transceiver
DS36C279	5-14	5-18	Low Power TIA/EIA-485 Transceiver with Sleep Mode
DS36C280	5-14	5-18	Slew Rate Controlled CMOS TIA/EIA-485 Transceiver
DS36F95	5-14	5-18	EIA-485/EIA-422A Differential Bus Transceiver
DS3862		5-17	Octal High Speed Trapezoidal Bus Transceiver
DS3883		5-17	BTL 9-bit Data Transceiver
DS3884		5-17	BTL Handshake Transceiver
DS3886		5-17	BTL 9-bit Latching Data Transceiver
DS3893		5-17	BTL TurboTransceiver
DS3896		5-17	BTL Trapezoidal Transceiver
DS3897		5-17	BTL Trapezoidal Transceiver
DS38C86		5-17	CMOS BTL 9-bit Latching Data Transceiver
DS481	5-14	5-18	Low Power RS-485/RS-422 Multipoint Transceiver with Sleep Mode
DS485	5-14	5-18	Low-Power RS-485/RS-422 Multipoint Transceiver
DS75107		5-17	Dual Line Receiver
DS75110		5-17	Dual Line Driver
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DS7830		5-17	Dual Differential Line Driver
DS7831		5-17, 13-2	Dual TRI-STATE Line Driver
DS78C120		5-18, 13-3	Dual CMOS Compatible Differential Line Receiver
DS78C20		5-18, 13-3	Dual CMOS Compatible Differential Line Receiver
DS78LS120		5-18	Dual Differential Line Receiver (Noise-Filtering and Fail-Safe)
DS8641		5-17	Quad Unified Bus Transceiver
DS8820		5-17	Dual Line Receiver
DS8832		5-17	Dual TRI-STATE Line Driver
DS8838		5-17	Quad Unified Bus Transceiver
DS88C20		5-18	Dual CMOS Compatible Differential Line Receiver
DS8921	5-13	5-18	Differential Line Driver and Receiver Pair
DS8922	5-13	5-18	TRI-STATE RS-422 Dual Differential Line Driver and Receiver Pair
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DS8925	5-2	5-18	Local Talk Dual Driver/Triple Receiver
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DS90C031	5-3	5-11, 13-2, 13-9	LVDS Quad CMOS Differential Line Driver
DS90C032	5-3	5-11, 13-2, 13-9	LVDS Quad CMOS Differential Line Receiver
DS90C363	5-5	5-10	+3.3V Programmable LVDS Transmitter 18-bit Flat Panel Display (FPD) Link - 65MHz
DS90C365	5-5	5-10	+3.3V Programmable LVDS Transmitter 18-bit Flat Panel Display (FPD) Link - 85MHz
DS90C383	5-5	5-10	+3.3V Programmable LVDS Transmitter 24-bit Flat Panel Display (FPD) Link - 65MHz
DS90C385	5-5	5-10	+3.3V Programmable LVDS Transmitter 24-bit Flat Panel Display (FPD) Link - 85MHz
DS90C387	5-7	5-10	+3V LDI Transmitter 24-bit Dual Pixel Flat Panel Display (FPD) Link-SVGA to UXGA
DS90C401	5-3	5-11	Dual Low Voltage Differential Signaling (LVDS) Driver
DS90C402	5-3	5-11	Dual Low Voltage Differential Signaling (LVDS) Receiver
DS90CF363	5-5	5-10	+3.3V LVDS Transmitter 18-bit Flat Panel Display (FPD) Link - 65MHz
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DS90CF561	5-4	5-10	LVDS Transmitter 18-bit Color Flat Panel Display (FPD) Link - 40MHz
DS90CF562	5-6	5-10	LVDS Receiver 18-bit Color Flat Panel Display (FPD) Link - 40MHz
DS90CF563	5-4	5-10	LVDS Transmitter 18-bit Color Flat Panel Display (FPD) Link - 65MHz
DS90CF564	5-6	5-10	LVDS Receiver 18-bit Color Flat Panel Display (FPD) Link - 65MHz
DS90CF581	5-4	5-10	LVDS Transmitter 24-bit Color Flat Panel Display (FPD) Link
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DS90CP22	5-3	5-9	+3V 2x2 LVDS Cross Point Switch - 800Mbps
DS90CR211	5-8	5-12	5V Rising Edge Data Strobe LVDS 21-bit Channel Link Transmitter - 40MHz
DS90CR212	5-8	5-12	5V Rising Edge Data Strobe LVDS 21-bit Channel Link Receiver - 40MHz
DS90CR213	5-8	5-12	5V Rising Edge Data Strobe LVDS 21-bit Channel Link Transmitter - 66MHz
DS90CR214	5-8	5-12	5V Rising Edge Data Strobe LVDS 21-bit Channel Link Receiver - 66MHz
DS90CR215	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 21-bit Channel Link Transmitter - 66MHz
DS90CR216	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 21-bit Channel Link Receiver - 66MHz
DS90CR217	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 21-bit Channel Link Transmitter - 85MHz
DS90CR218	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 21-bit Channel Link Receiver - 85MHz
DS90CR281	5-8	5-12	5V Rising Edge Data Strobe LVDS 28-bit Channel Link Transmitter - 40MHz
DS90CR282	5-8	5-12	5V Rising Edge Data Strobe LVDS 28-bit Channel Link Receiver - 40MHz
DS90CR283	5-8	5-12	5V Rising Edge Data Strobe LVDS 28-bit Channel Link Transmitter - 66MHz
DS90CR284	5-8	5-12	5V Rising Edge Data Strobe LVDS 28-bit Channel Link Receiver - 66MHz
DS90CR285	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 28-bit Channel - 66MHz
DS90CR286	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 28-bit Channel - 66MHz
DS90CR287	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 28-bit Channel Link Transmitter - 85MHz
DS90CR288	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 28-bit Channel Link Receiver - 85MHz
DS90CR483	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 48-bit Channel Link Transmitter - 112MHz
DS90CR484	5-8	5-12	+3.3V Rising Edge Data Strobe LVDS 48-bit Channel Link Receiver - 112MHz
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DS90CR584	5-6	5-10	LVDS Receiver 24-bit Color Flat Panel Display (FPD) Link - 65MHz
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DS90LV018	5-3	5-11	3V LVDS Single CMOS Differential Line Receiver
DS90LV019	5-3	5-11	3.3V or 5V LVDS Driver/Receiver
DS90LV027	5-3	5-11	3V LVDS Dual CMOS Differential Transmitter
DS90LV028	5-3	5-11	3V LVDS Dual CMOS Differential Line Receiver
DS90LV031	5-3	5-11	3V LVDS Quad CMOS Differential Line Driver
DS90LV032	5-3	5-11	3V LVDS Quad CMOS Differential Line Receiver
DS90LV047	5-3	5-11	3V LVDS Quad CMOS Differential Line Driver
DS90LV048	5-3	5-11	3V LVDS Quad CMOS Differential Line Receiver
DS92CK16	5-3	5-9	3V 1:6 LVDS to TTL Clock Distribution
DS92LV010	5-3	5-9	Bus LVDS 3.3/5.0V Single Transceiver
DS92LV1021		5-9	16MHz - 40MHz 10-bit Serializer
DS92LV1023		5-9	40MHz - 66MHz 10-bit Serializer
DS92LV1210		5-9	16MHz - 40MHz 10-bit Deserializer
DS92LV1212		5-9	16-40MHz 10-bit Bus LVDS Random Lock Deserializer with Embedded Clock Recovery
DS92LV1224		5-9	40MHz - 66MHz 10 bit Random Lock Deserializer with Embedded Clock Recovery
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DS96172	5-14	5-18	RS-485/RS-422 Quad Differential Line Driver
DS96173	5-14	5-18	RS-485/RS-422 Quad Differential Line Receiver
DS96174	5-14	5-18	RS-485/RS-422 Quad Differential Line Driver
DS96175	5-14	5-18	RS-485/RS-422 Quad Differential Line Receiver
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DS96177	5-14	5-18	RS-485/RS-422 Differential Bus Repeater
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DS9636		5-17	RS-423 Dual Programmable Slew Rate Line Driver
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DS96F174	5-14	5-18, 13-3	EIA-485/EIA-422 Quad Differential Driver
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LM108	2-17, 2-18	2-19, 13-6	Operational Amplifier
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LM1085	10-4	10-14, 10-15	3A Low Dropout Positive Regulator
LM1086	10-4	10-14, 10-15	1.5A Low Dropout Positive Regulator
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LM12458	4-2	4-5	Military 12-bit Data Acquisition System
LM129	9-2	9-3, 13-4	Precision Reference
LM12H458	4-2	4-5, 13-4, 13-6	12-bit Plus Sign Data Acquisition System with Self-Calibration
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LM2631	10-2	10-5	Synchronous Step-Down Voltage Regulator
LM2635	10-2	10-5	5-bit Programmable Synchronous Buck Regulator Controller
LM2636	10-2	10-5	5-bit Programmable Synchronous Buck Regulator Controller
LM2637	10-2	10-5	Motherboard Power Supply Solution with a 5-bit Programmable Switching Controller and Two Linear Regulator Controllers
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LM2686	10-3	10-9	Regulated Switched-Capacitor Converter
LM2687	10-3	10-9	Regulated Switched-Capacitor Inverter
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LM2902	2-9, 2-10, 2-11, 2-12	2-15	Low Power Quad Operational Amplifier
LM2903	2-23, 2-24	2-25	Low Power Low Offset Voltage Dual Comparator
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LM2930	10-4	10-12, 10-13	3-Terminal Positive Regulator
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LM2937	10-4	10-12, 10-13	500mA Low Dropout Regulator
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LM2941	10-4	10-14, 10-15, 13-5	1A Low Dropout Adjustable Regulator
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LM3351	10-3	10-4	Switched-Capacitor Voltage Converter
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LM337	10-4	10-17	3-Terminal Adjustable Negative Regulator (High Voltage)
LM338	10-4	10-16	5A Adjustable Regulator
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LM3813	7-2	7-3	Current Gauge IC with Ultra Low Loss Sense Element and PWM Output, for Low-Side Sensing
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LM4543	3-10	3-10	AC '97 Codec with Stereo and National 3D Sound
LM4545	3-10	3-10	AC '97 Codec with Stereo Headphone Amplifier and National 3D Sound
LM4546	3-10	3-10	AC '97 Rev 2 Codec with Sample Rate Conversion and National 3D Sound
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LM4663	3-4	3-5	2W Stereo Class D Audio Power Amplifier with Stereo Headphone Amplifier
LM4700	3-4, 6-2	3-6	Overture 30 Watt Audio Power Amplifier with Mute and Standby Modes
LM4701	3-4	3-6	Overture 30 Watt Audio Power Amplifier with Mute and Standby Modes
LM4752	3-4	3-6	Stereo 11 Watt Audio Power Amplifier
LM4755	3-4	3-6	Stereo 11 Watt Audio Power Amplifier with Mute
LM4765	3-4	3-6	Overture Audio Power Amplifier Series Dual 30-Watt Audio Power Amplifier with Mute and Standby Modes
LM4766	3-4	3-6	2 X40 Watt Stereo Audio Amplifier with Standby and Mute Control
LM4808	3-4	3-5	Dual 150mW Headphone Amplifier
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LM4834	3-4, 3-9	3-5, 3-9	Boomer 1.75 Watt Audio Power Amplifier with DC Volume Control and Microphone Preamp
LM4835	3-4	3-5	Stereo 2W Audio Power Amplifier with DC Volume Control and Selectable Gain
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LM4861	3-4, 11-2	3-5	1 Watt Audio Power Amplifier with Shutdown Mode
LM4862	3-4, 11-2	3-5	675mW Audio Power Amplifier with Shutdown Mode
LM4863	3-4	3-5	Dual 2.2 Watt Audio Amplifier Plus Stereo Headphone Function
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LM4871	3-4	3-5	1.1 Watt Audio Power Amplifier with Shutdown Mode
LM4872	3-4	3-5	1 Watt Audio Power Amplifier in micro SMD Package
LM4873	3-4	3-5	Dual 2.1 Watt Audio Amplifier Plus Stereo Headphone Function
LM4876	3-4	3-5	1.1 Watt Audio Power Amplifier with Logic-Low Shutdown
LM4877	3-4	3-5	1 Watt Audio Power Amplifier in micro SMD Package with Logic-Low Shutdown
LM4880	3-4	3-5	Dual 200mW Audio Power Amplifier with Shutdown Mode
LM4881	3-4	3-5	Boomer Dual 200mW Headphone Amplifier with Shutdown Mode
LM4882	3-4	3-5	Boomer Audio Power Amplifier Series 250mW Audio Power Amplifier with Shutdown Mode
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LM555			Timer
LM56	8-3, 11-2	8-4	Dual Output Low Power Thermostat
LM60	8-2, 11-2	8-4	2.7V SOT-23 Temperature Sensor
LM61	8-2	8-4	2.7V, SOT-23 or TO-92 Temperature Sensor
LM611	2-9, 2-10, 2-11, 2-12	2-16	Operational Amplifier and Adjustable Reference
LM6118	2-17, 2-18	2-20	Fast Settling Dual Operational Amplifier
LM6121		2-22, 13-5	High Speed Buffer
LM6125		2-22	High Speed Buffer with Fault Alarm
LM613	2-24	2-16, 2-25	Dual Operational Amplifier, Dual Comparator and Adjustable Reference
LM6132	2-9, 2-10, 2-11, 2-12, 11-2	2-14	Dual, Low Power 10MHz Rail-to-Rail I/O Operational Amplifier
LM6134	2-9, 2-10, 2-11, 2-12, 11-2	2-15	Quad, Low Power 10MHz Rail-to-Rail I/O Operational Amplifier
LM614	2-11	2-16	Quad Operational Amplifier and Adjustable Reference
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LM6218	2-17, 2-18	2-20	Fast Settling Dual Operational Amplifier
LM6221		2-22	High Speed Buffer
LM628	6-2	6-3	Precision Motion Controller
LM629	6-2	6-3	Precision Motion Controller
LM6321	2-2, 2-3	2-6, 2-7, 2-22	High Speed Buffer
LM6361	2-2	2-6, 2-7	High Speed Operational Amplifier
LM6364		2-6, 2-7	High Speed Operational Amplifier
LM6365		2-6, 2-7	High Speed Operational Amplifier
LM6511	2-23, 2-24	2-25	180ns 3V Comparator
LM66	8-3	8-4	Dual Output Low Power Thermostat
LM675		2-16	Power Operational Amplifier
LM70	8-3	8-5	10-bit + Sign SPI/MICROWIRE Temperature Sensor
LM709	2-17, 2-18	2-19	Operational Amplifier
LM7121	2-3	2-6, 2-7	175MHz Tiny Low Power Voltage Feedback Amplifier
LM7131	2-2, 11-2	2-6, 2-7	Tiny High Speed Single Supply Operational Amplifier
LM7171	2-2, 2-3	2-6, 2-7, 13-5, 13-7	Very High Speed, High Output Current, Voltage Feedback Amplifier
LM723		10-16, 13-7	Voltage Regulator
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LM741	2-17, 2-18	2-19	Operational Amplifier
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LM76	8-3	8-4	±1°C 12-bit +Sign Digital Temperature Sensor and Thermal Window Comparator with Two-Wire Interface
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LM79Mxx	10-4	10-17	Voltage Regulator
LM79xx	10-4	10-17	Series 3-Terminal Negative Regulator
LM80	8-3	8-5	Serial Interface ACPI Compatible Microprocessor System Hardware Monitor
LM809	7-2	7-3	Power-On Reset
LM81	8-3	8-5	Microprocessor System Hardware Monitor
LM810	7-2	7-3	Power-On Reset
LM82	8-3	8-5	Remote Diode and Local Digital Temperature Sensor with Two-Wire Interface
LM8261	2-9, 2-10, 2-11, 2-12, 3-7, 11-2	2-13, 3-8	RRIO, High Output Current & Unlimited Cap Load Op Amp in SOT23-5
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LM83	8-3	8-5	3 Diode Input ACPI Compatible Digital Temperature Sensor with Two-Wire Interface
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LM84	8-3	8-5	Diode Input Digital Temperature Sensor with Two-Wire Interface
LM87	8-3	8-5	Serial Interface System Hardware Monitor with Remote Diode Temperature Sensing
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LMC6001	2-9, 2-10, 2-11, 2-12	2-13	Ultra Ultra-Low Input Current Amplifier
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LMC6041	2-9, 2-10, 2-11, 2-12	2-13	CMOS Single Micropower Operational Amplifier
LMC6042	2-9, 2-10, 2-11, 2-12	2-14	CMOS Dual Micropower Operational Amplifier
LMC6044	2-9, 2-10, 2-11, 2-12	2-15	CMOS Quad Micropower Operational Amplifier
LMC6061	2-9, 2-10, 2-11, 2-12	2-13, 13-5	Precision CMOS Single Micropower Operational Amplifier
LMC6062	2-9, 2-10, 2-11, 2-12	2-14, 13-5, 13-7	Precision CMOS Dual Micropower Operational Amplifier
LMC6064	2-9, 2-10, 2-11, 2-12	2-15, 13-5	Precision CMOS Quad Micropower Operational Amplifier
LMC6081	2-9, 2-10, 2-11, 2-12	2-13	Precision CMOS Single Operational Amplifier
LMC6082	2-9, 2-10, 2-11, 2-12	2-14	Precision CMOS Dual Operational Amplifier
LMC6084	2-9, 2-10, 2-11, 2-12	2-15	Precision CMOS Quad Operational Amplifier
LMC6442	2-9, 2-10, 2-11, 2-12	2-14	Dual Micropower Rail-to-Rail Output Single Supply Operational Amplifier
LMC6462	2-9, 2-10, 2-11, 2-12	2-14, 13-5	Micropower Dual Rail To Rail I/O CMOS Operational Amplifier
LMC6464	2-9, 2-10, 2-11, 2-12	2-15, 13-5	CMOS Dual Rail-to-Rail Input and Output Operational Amplifier
LMC6482	2-9, 2-10, 2-11, 2-12, 11-2	2-14, 13-5	CMOS Dual Rail-to-Rail Input and Output Operational Amplifier
LMC6484	2-9, 2-10, 2-11, 2-12, 11-2	2-15, 13-5	CMOS Quad Rail to Rail Input and Output Operational Amplifier
LMC6492	2-9, 2-10, 2-11, 2-12	2-14	Dual CMOS Rail-to-Rail Input and Output Operational Amplifier
LMC6494	2-9, 2-10, 2-11, 2-12	2-15	Quad CMOS Rail-to-Rail Input and Output Operational Amplifier
LMC6572	2-9, 2-10, 2-11, 2-12, 11-2	2-14	Dual Low Voltage (2.7V to 3V) Operational Amplifier
LMC6574	2-9, 2-10, 2-11, 12-2	2-15	Quad Low Voltage (2.7V to 3V) Operational Amplifier
LMC660	2-9, 2-10, 2-11, 2-12	2-15	CMOS Quad Operational Amplifier
LMC662	2-9, 2-10, 2-11, 2-12	2-14	Dual CMOS Operational Amplifier
LMC6762	2-23, 2-24	2-25	Dual Micro-Power Rail-to-Rail Input and Output CMOS Comparator with Push-Pull Output
LMC6772	2-23, 2-24	2-25	Dual Micro-Power Rail-to-Rail Input CMOS Comparator with Open Drain Output
LMC6953	7-2	7-3	PCI Local Bus Power Supervisor
LMC7101	2-9, 2-10, 2-11, 2-12, 11-2	2-13	Tiny Low Power Operational Amplifier with Rail-to-Rail Input and Output
LMC7111	2-9, 2-10, 2-11, 2-12, 11-2	2-13	Tiny CMOS Comparator with Rail-to-Rail Input
LMC7211	2-23, 2-24, 11-2	2-25	Tiny CMOS Comparator with Rail-to-Rail Input
LMC7215	2-23, 2-24, 11-2	2-25	Micro-Power, Rail-to-Rail CMOS Comparators with Open-Drain/Push-Pull Outputs and TinyPak Package
LMC7221	2-23, 2-24	2-25	Tiny CMOS Comparator with Rail-to-Rail Input and Open Drain Output
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LMC7660	10-3		Switched-Capacitor Voltage Converter
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Part Number	Decision Tree Page #	Selection Guide Page #	Descriptor
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LMD18201	6-2	6-3	3A, 55V H-Bridge
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LMF100	4-10	4-10	High Performance Dual Switched Capacitor Filter
LMV101		2-16	Fixed Gain Amplifiers/w built-in feedback R's, Fixed gain of -1
LMV102		2-16	Fixed Gain Amplifiers/w built-in feedback R's, Fixed gain of -2
LMV105		2-16	Fixed Gain Amplifiers/w built-in feedback R's, Fixed gain of -5
LMV110		2-16	Fixed Gain Amplifiers/w built-in feedback R's, Fixed gain of -10
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LMV324	2-9, 2-10, 2-11, 2-12	2-15	General Purpose, Low Voltage, Rail-to-Rail Output Operational Amplifier
LMV331	2-23, 2-24	2-25	Single General Purpose, Low Voltage, TinyPack Comparator
LMV339	2-23, 2-24	2-25	Quad General Purpose, Low Voltage, TinyPack Comparator
LMV358	2-9, 2-10, 2-11, 2-12	2-14	General Purpose, Low Voltage, Rail-to-Rail Output Operational Amplifier
LMV393	2-23, 2-24	2-25	Dual General Purpose, Low Voltage, TinyPack Comparator
LMV431	9-2	9-3	Low Voltage, Micropower, Adjustable Shunt Reference
LMV710	2-9, 2-10, 2-11, 2-12	2-13	Low Power, RRIO Operational Amplifiers with High Output Current Drive
LMV711	2-9, 2-10, 2-11, 2-12	2-13	Low Power, RRIO Operational Amplifiers with High Output Current Drive with Shutdown
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LMV7219	2-23, 2-24	2-25	Dual 10MHz, Low Noise, Low Voltage, and Low Power Operational Amplifier
LMV722	2-9, 2-10, 2-11, 2-12, 3-7	2-14, 3-8	7 nsec, 2.7V to 5V Comparator with Rail-to Rail Output
LMV751	2-9, 2-10, 2-11, 2-12, 3-7	2-13, 3-8	Low Noise, Low Vos, Single CMOS Op Amp
LMV821	2-9, 2-10, 2-11, 2-12	2-13	5MHz, Low Voltage, Low Power, RRO, 5MHz Operational Amplifier
LMV822	2-9, 2-10, 2-11, 2-12	2-14	Low Voltage, Low Power, RRO, 5MHz Operational Amplifier
LMV824	2-9, 2-10, 2-11, 2-12	2-15	Low Voltage, Low Power, RRO, 5MHz Operational Amplifier
LMV921	2-9, 2-10, 2-11, 2-12, 11-2	2-13	1.8V, 1MHz, Single Low Power Operational Amplifiers with Rail-To-Rail Input and Output
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LMV924	2-9, 2-10, 2-11, 2-12	2-15	1.8V, 1MHz, Quad Low Power Operational Amplifiers with Rail-To-Rail Input and Output
LMX1600		11-4, 11-5	2.0GHz/500MHz PLLatinum Low Cost Dual Frequency Synthesizer
LMX1601		11-4, 11-5	1.1GHz/500MHz PLLatinum Low Cost Dual Frequency Synthesizer
LMX1602		11-4, 11-5	1.1GHz/1.1GHz PLLatinum Low Cost Dual Frequency Synthesizer
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# ALPHANUMERIC INDEX

Part Number	Decision Tree Page #	Selection Guide Page #	Descriptor
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LMX2315	11-2	11-4, 11-5, 13-7	PLLatinum 1.2GHz Frequency Synthesizer for RF Personal Communications
LMX2316	11-2	11-4, 11-5	1.2GHz PLLatinum Low Power Frequency Synthesizer for RF Personal Communications
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LMX2325	11-2	11-4, 11-5, 13-7	PLLatinum 2.5GHz Frequency Synthesizer for RF Personal Communications
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LMX2330	11-2	11-4, 11-5	PLLatinum Dual Frequency Synthesizer for RF Personal Communications
LMX2331	11-2	11-4, 11-5	PLLatinum Dual Frequency Synthesizer for RF Personal Communications
LMX2332	11-2	11-4, 11-5	(1.2GHz/0.51GHz) PLLatinum Dual Frequency Synthesizer for RF Personal Comm
LMX2335	11-2	11-4, 11-5	PLLatinum 1.1GHz Dual Frequency Synthesizer for RF Personal Communications
LMX2336	11-2	11-4, 11-5	PLLatinum 1.1GHz Dual Frequency Synthesizer for RF Personal Communications
LMX2337	11-2	11-4, 11-5	PLLatinum 1.1GHz Dual Frequency Synthesizer for RF Personal Communications
LMX2350		11-4, 11-5	2.5GHz/550MHz PLLatinum Fractional N RF / Integer N IF Dual Low Power Frequency Synthesizer
LMX2352		11-4, 11-5	1.2GHz/550MHz PLLatinum Fractional N RF / Integer N IF Dual Low Power Frequency Synthesizer
LMX3161	11-2	11-3	Single Chip DECT RF Transceiver
LMX3162	11-2	11-3	Single Chip Radio Transceiver
LMX5080	11-2	11-4, 11-5	PLLatinum 2.7 GHz Low Power Dual Modulus Prescaler for RF Personal Communications
LP2902	2-9, 2-10, 2-11, 2-12	2-15	Micropower Quad Operational Amplifier
LP2950	10-4, 11-2	10-10, 10-11	Series of Adjustable Micropower Voltage Regulator
LP2951	10-4, 11-2	10-10, 10-11, 13-5, 13-7	Series of Adjustable Micropower Voltage Regulator
LP2952	10-4, 11-2	10-12, 10-13	Adjustable Micropower Low-Dropout Voltage Regulator
LP2953	10-4, 11-2	10-12, 10-13, 13-5, 13-7	Adjustable Micropower Low-Dropout Voltage Regulator
LP2954	10-4	10-12, 10-13	5V Micropower Low-Dropout Voltage Regulator
LP2956	10-4, 11-2	10-12, 10-13, 13-5, 13-7	Dual Micropower Low-Dropout Voltage Regulator
LP2957	10-4	10-12, 10-13	5V Low-Dropout Regulator for $\mu$ P Application
LP2960	10-4, 11-2	10-12, 10-13	Adjustable Micropower 0.5A Low-Dropout Regulator
LP2966	10-4	10-12, 10-13	Dual 150mA Ultra Low-Dropout Regulator
LP2975	10-4	10-14, 10-15	MOSFET LDO Driver/Controller
LP2980	10-4, 11-2	10-10, 10-11	Micropower SOT, 50mA Ultra Low-Dropout Regulator
LP2981	10-4, 11-2	10-10, 10-11	Micropower SOT, 100mA Ultra Low-Dropout Regulator
LP2982	10-4, 11-2	10-10, 10-11	Micropower SOT, 50mA Ultra Low-Dropout Regulator
LP2985	10-4	10-12, 10-13	Micropower SOT, 150mA Low-Noise Ultra Low-Dropout Regulator



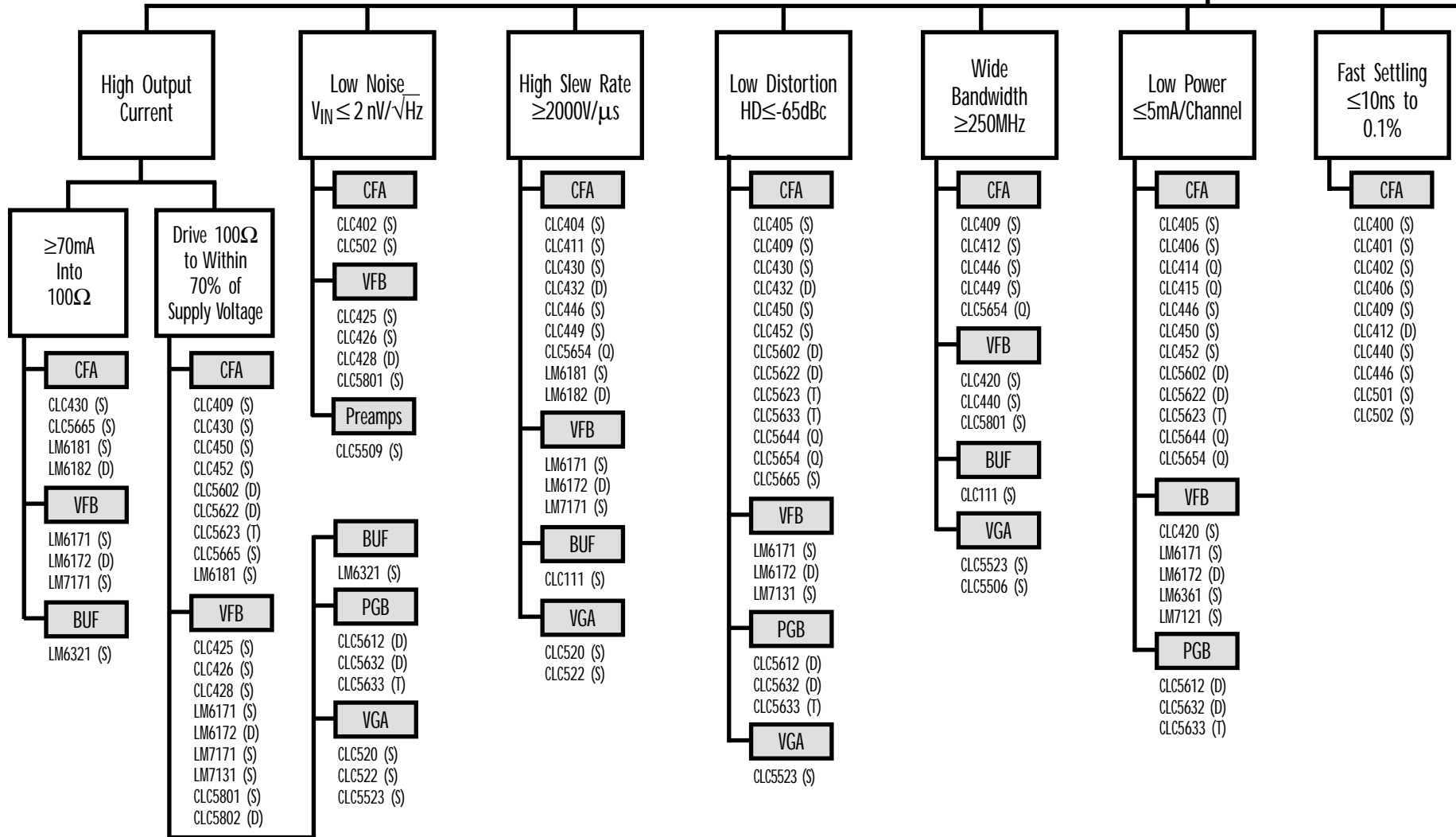
Part Number	Decision Tree Page #	Selection Guide Page #	Descriptor
LP2986	10-4, 11-2	10-12, 10-13	Micropower, 200mA Ultra Low-Dropout Fixed or Adjustable Voltage Regulator
LP2987	10-4, 11-2	10-12, 10-13	Micropower, 200mA Ultra Low-Dropout Voltage Regulator with Programmable Power-On Reset Delay
LP2988	10-4, 11-2	10-12, 10-13	Micropower, 200mA Ultra Low-Dropout Low Noise Voltage Regulator with Programmable Power-On Reset Delay
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LP324	2-9, 2-10, 2-11, 2-12	2-15	Micropower Quad Operational Amplifier
LP339	2-23, 2-24	2-25	Ultra-Low Power Quad Comparator
LP3470	7-2	7-3	Tiny Power On Reset Circuit
LP3961	10-4	10-14, 10-15	800mA Low Dropout Positive Regulator
LP3962	10-4	10-14, 10-15	1.5A Low Dropout Positive Regulator
LP3963	10-4	10-14, 10-15	3A Low Dropout Positive Regulator
LP3964	10-4	10-14, 10-15	800mA Low Dropout Positive Regulator
LP3965	10-4	10-14, 10-15	1.5A Low Dropout Positive Regulator
LP3966	10-4	10-14, 10-15	3A Low Dropout Positive Regulator
LPC660	2-9, 2-10, 2-11, 2-12	2-15	Low Power CMOS Operational Amplifier
LPC661	2-9, 2-10, 2-11, 2-12	2-13	Low Power CMOS Operational Amplifier
LPC662	2-9, 2-10, 2-11, 2-12	2-14	Low Power CMOS Dual Operational Amplifier
LPV321	2-9, 2-10, 2-11, 2-12, 11-2	2-13	Single Low Voltage, Micropower, Rail-to-Rail Output Operational Amplifiers
LPV324	2-9, 2-10, 2-11, 2-12	2-15	Quad Low Voltage, Micropower, Rail-to-Rail Output Operational Amplifiers
LPV358	2-9, 2-10, 2-11, 2-12	2-14	Dual Low Voltage, Micropower, Rail-to-Rail Output Operational Amplifiers
MAX660	10-3		Switched-Capacitor Voltage Converter
MF10	4-10	4-10	Universal Monolithic Dual Switched Capacitor Filter
MF4	4-10	4-10	4th Order Switched Capacitor Butterworth Lowpass Filter
SC14401	12-2		DECT Baseband Processor
SC14420	12-2		Two Line DECT Baseband Processor
TL082	2-17, 2-18	2-20	Wide Bandwidth Dual JFET Input Operational Amplifier



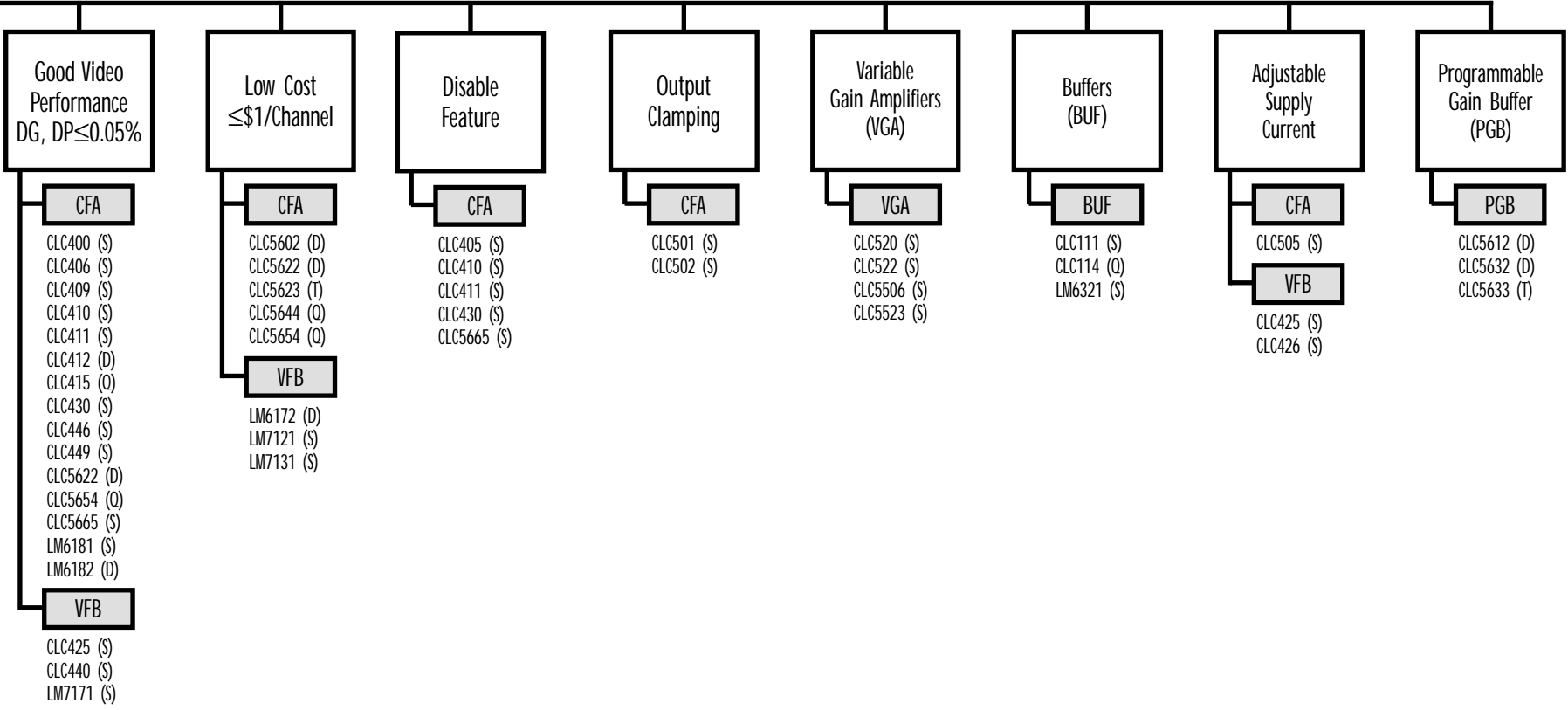
# AMPLIFIERS/BUFFERS/COMPARATORS

## *Section 2*

## High-Performance High-Speed Amplifiers



# (Op Amps, Buffers, VGAs, PGBs, Preamps)



(S) Single    CFA Current Feedback Op Amp  
 (D) Dual      VFB Voltage Feedback Op Amp  
 (T) Triple    BUF Buffer  
 (Q) Quad      PGB Programmable Gain Buffer  
                  VGA Variable Gain Amplifier

# AMPLIFIERS/BUFFERS/COMPARATORS

## HIGH-PERFORMANCE HIGH-SPEED AMPLIFIERS

≤5mA Low Power	Part Number	Single/ Dual Trip/Quad	Features	Mode	SSBW MHz	A <sub>v</sub> V/V <sup>1</sup>	2nd/3rd HD into R <sub>L</sub> = 100Ω	Slew Rate V/μs	I <sub>cc</sub> mA/ch	NTSC Diff G/P %/deg	I <sub>OUT</sub> mA	Settling Time (2V step) ns to %
	CLC111	S	Closed Loop Buffer	BUF	800	1	-62/-62 at 20MHz	3500	10.5	0.15/0.04	60	16 to 0.1
√	CLC114	Q	Closed Loop Buffer	BUF	200	1	-50/-58 at 20MHz	450	3	0.08/0.1	25	20 to 0.01
	CLC400	S	Optimized for Low Gain	CFB	200	2	-60/-60 at 20MHz	700	15	0.03/0.01	70	12 to 0.05
	CLC401	S	Optimized for High Gain	CFB	150	20	-45/-60 at 20MHz	1200	15	NA	70	10 to 0.1
	CLC404	S	Wideband, High SR	CFB	175	6	-53/-60 at 20MHz	2600	11	0.07/0.03	70	10 to 0.2
√	CLC405	S	Disable Feature	CFB	110	2	-72/-70 at 1MHz	350	3.5	0.01/0.25	60	18 to 0.05
√	CLC406	S	Wideband, Low-Power	CFB	160	6	-46/-50 at 20MHz	1500	5	0.02/0.02	70	12 to 0.05
	CLC409	S	Very Wideband, Low Distortion	CFB	350	2	-49/-59 at 60MHz	1200	13.5	0.03/0.01	70	8 to 0.1
	CLC410	S	Fast Settling with Disable Feature	CFB	200	2	-60/-60 at 20MHz	700	16	0.01/0.01	70	12 to 0.05
	CLC411	S	High-Speed with Disable Feature	CFB	200	2	-48/-52 at 20MHz	2300	11	0.02/0.03	70	15 to 0.1
	CLC412	D	Wideband Video	CFB	250	2	-46/-50 at 20MHz	1300	5.1	0.02/0.02	70	12 to 0.05
√	CLC414	Q	Low-Power	CFB	90	6	-47/-55 at 5MHz	1000	2.5	0.1/0.12	70	16 to 0.1
√	CLC415	Q	Wideband	CFB	160	6	-44/-54 at 20MHz	1500	5	0.03/0.03	70	12 to 0.1
√	CLC420	S	High-Speed	VFB	300	1	-50/-53 at 20MHz	1100	4	NA	70	18 to 0.01
	CLC425	S	Adjustable Supply Current, Ultra Low Noise, Wideband	VFB	95	20	-53/-75 at 10MHz	350	15	0.014/0.01	90	22 to 0.2
	CLC426	S	Adjustable Supply Current, Low Noise, Wideband	VFB	130	2	-62/-68 at 10MHz	400	11	NA	80	16 to 0.05
	CLC428	D	Low Noise	VFB	160	1	-62/-72 at 10MHz	500	11	NA	80	16 to 0.1
	CLC430	S	GP with Disable Feature	CFB	75	2	-89/-92 at 1MHz	2000	11	0.03/0.05	85	35 to 0.05
	CLC432	D	Wideband	CFB	62	2	-65/-75 at 1MHz	2000	7.1	0.12/0.12	60	70 to 0.05
	CLC440	S	High-Speed, Low-Power	VFB	750	1	-64/-70 at 5MHz	1500	7	0.015/0.025	90	10 to 0.05

### Temperature Range Codes

C = Commercial (0°C to +70°C)

I = Industrial (-40°C to +85°C)

M = Military (-55°C to +125°C)

All values are typical at room temperature unless otherwise specified.

### Package Codes

LMyyyy (4 digit P/N)

CLCxxxx (4 digit P/N) CLCxxx (3 digit P/N)

M = Plastic SOIC

E = Plastic SOIC

N = Plastic DIP

P = Plastic DIP

M5 = 5-Pin SOT-23

M5 = 5-Pin SOT-23

WG = Ceramic SOIC

J = Ceramic DIP (Military)

WG = Ceramic SOIC

### Eval Board

DIP

SOIC

DIP

SOIC

A = CLC730013 CLC730027

G = CLC730028

B = CLC730038 CLC730036

H = CLC730035 CLC730039

C = CLC730012 CLC730045

I = CLC730029 CLC730033

D = CLC730023

J = CLC730065 CLC730066

E = CLC730024 CLC730031

K = CLC730075 CLC730074

F = CLC730055 CLC730060

S = CLC730068 (5-Pin SOT-23)

### Mode

CFB = Current Feedback

VFB = Voltage Feedback

BUF = Closed Loop Buffer

PGB = Programmable Gain Buffer

### Notes

1 Closed Loop Gain used to specify most parameters.

2 Spec. Supply Range is the range of total supply voltage where operation is possible but parameters are not necessarily guaranteed. Refer to datasheets for more details.

3 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

## HIGH-PERFORMANCE HIGH-SPEED AMPLIFIERS

≤5mA Low Power	Part Number	Single/ Dual Trip/Quad	V <sub>OS</sub> mV Typ/Temp Limit	Spec. <sup>2</sup> Supply Range (V)	Noise Voltage (nV/√Hz)	i <sub>nn</sub> (pA/√Hz)	i <sub>ni</sub> (pA/√Hz)	Temp Range	Package	Eval Board	SPICE Model	Price <sup>3</sup>
√	CLC111	S	2/17	±3 to 13	4.0	1.6	–	I, M	E, P, J	C	Y	\$2.11
	CLC114	Q	0.5/8.2	±5	3.9	0.9	–	I, M	E, P, J	D	N	\$7.30
	CLC400	S	2/9	±5	2.6	3.2	14.2	I, M	E, P, J	A	Y	\$3.43
	CLC401	S	3/11	±5	2.4	2.6	17.0	I, M	E, P, J	A	Y	\$3.65
	CLC404	S	2.10	±5	3.2	2.2	12.3	I, M	E, P, M5, J	A,S	Y	\$2.61
√	CLC405	S	1/8	±5	5.0	3.0	12.0	I, M	P, E, J	A	Y	\$1.55
√	CLC406	S	2/12	±5	2.7	2.1	11.0	I, M	P, E, M5, J	A,S	Y	\$2.44
	CLC409	S	0.5/9.5	±5	2.2	3.2	14.3	I, M	P, E, M5, J	A,S	Y	\$3.36
	CLC410	S	2/9	±5	2.4	2.5	13.5	I, M	E, P, J	A	Y	\$2.90
	CLC411	S	2/14	±10 to ±15	2.5	6.3	12.9	I, M	E, P, J	A	Y	\$3.65
	CLC412	D	2/12	±5	3.0	2.0	12.0	I, M	E, P, J	B	Y	\$3.22
√	CLC414	Q	2/14	±5	4.2	1.3	9.8	I, M	WG, E, P, J	E	Y	\$6.00
√	CLC415	Q	2/10	±5	3.0	2.0	11.5	I, M	E, P, J	E	Y	\$6.85
√	CLC420	S	5/1.8	±5	4.2	2.0	2.0	I, M	WG, E, P, J	A	Y	\$2.85
	CLC425	S	0.1/1	±5	1.05	1.6	1.6	I, M	WG, E, P, M5, J	A,S	Y	\$3.23
	CLC426	S	1/2.8	±5	1.60	2.0	2.0	I, M	WG, E, P, J	A	Y	\$3.26
	CLC428	D	1/3.5	±5	2.0	2.0	2.0	I, M	E, P, J	B	Y	\$4.26
	CLC430	S	1/10	±5 to ±15	3.0	3.2	15.0	I, M	WG, E, P, J	A	Y	\$1.59
	CLC432	D	3/7	±5 to ±15	3.3	2.0	13.0	I, M	E, P, J	B	Y	\$2.29
	CLC440	S	1/4	±2.5 to ±6	3.5	2.5	2.5	I, M	E, P, J	F	Y	\$4.08

### Temperature Range Codes

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### Package Codes

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CLCxxxx (4 digit P/N)    CLCxxx (3 digit P/N)

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E = Plastic SOIC

N = Plastic DIP

P = Plastic DIP

M5 = 5-Pin SOT-23

M5 = 5-Pin SOT-23

WG = Ceramic SOIC

J = Ceramic DIP (Military)

WG = Ceramic SOIC

### Eval Board

DIP

SOIC

DIP

SOIC

A = CLC730013    CLC730027    G = CLC730028

B = CLC730038    CLC730036    H = CLC730035    CLC730039

C = CLC730012    CLC730045    I = CLC730029    CLC730033

D = CLC730023    J = CLC730065    CLC730066

E = CLC730024    CLC730031    K = CLC730075    CLC730074

F = CLC730055    CLC730060    S = CLC730068 (5-Pin SOT-23)

### Mode

CFB = Current Feedback

VFB = Voltage Feedback

BUF = Closed Loop Buffer

PGB = Programmable Gain Buffer

### Notes

1 Closed Loop Gain used to specify most parameters.

2 Spec. Supply Range is the range of total supply voltage where operation is possible but parameters are not necessarily guaranteed. Refer to datasheets for more details.

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# AMPLIFIERS/BUFFERS/COMPARATORS

## HIGH-PERFORMANCE HIGH-SPEED AMPLIFIERS

≤5mA Low Power	Part Number	Single/ Dual Trip/Quad	Features	Mode	SSBW MHz	A <sub>v</sub> V/V <sup>1</sup>	2nd/3rd HD into R <sub>L</sub> = 100Ω	Slew Rate V/μs	I <sub>CC</sub> mA/ch	NTSC Diff G/P %/deg	I <sub>OUT</sub> mA	Settling Time (2V step) ns to %
√	CLC446	S	Wideband, Low-Power	CFB	400	2	-54/-50 at 50MHz	2000	4.8	0.02/0.03	48	9 to 0.1
	CLC449	S	Ultra Wideband	CFB	1100	2	-44/-62 at 50MHz	2500	12	0.03/0.02	90	11 to 0.1
√	CLC450	S	Low-Power, High Output Current	CFB	135	2	-86/-65 at 1MHz	370	1.6	0.03/0.3	130	15 to 0.05
√	CLC452	S	Low-Power, High Output Current	CFB	160	2	-77/-72 at 1MHz	540	3.2	0.05/0.08	130	20 to 0.05
	CLC501	S	High-Speed, Output Clamping, High Gain	CFB	75	32	-45/-60 at 20MHz	1200	18	NA	70	12 to 0.05
	CLC502	S	Fast Settling, Output Clamping	CFB	150	2	-50/-60 at 20MHz	800	17	0.01/0.05	55	25 to 0.0025
√	CLC505	S	High-Speed, Adjustable Supply Current	CFB	50	6	-50/-65 at 5MHz	800	1	0.04/0.06	45	35 to 0.1
√	CLC5602	D	Video Amp, High Output	CFB	135	2	-86/-85 at 1MHz	300	1.6	0.06/0.02	130	15 to 0.05
√	CLC5612	D	High Output	PGB	90	2	-74/-86 at 1MHz	290	1.6	0.15/0.02	130	17 to 0.05
√	CLC5622	D	Video Amp, High Output, High Capacity Load	CFB	160	2	-95/-95 at 1MHz	370	3.2	0.05/0.03	130	18 to 0.05
√	CLC5623	T	Video Amp, High Output, High Capacity Load	CFB	148	2	-78/-94 at 1MHz	370	3.2	0.06/0.06	130	18 to 0.05
√	CLC5632	D	High Output	PGB	130	2	-82/-69 at 1MHz	410	3.2	0.08/0.02	130	17 to 0.05
√	CLC5633	T	High Output	PGB	130	2	-73/-92 at 1MHz	410	3.2	0.03/0.06	130	20 to 0.05
√	CLC5644	Q	Low-Power, Low Cost	CFB	125	2	-72/-79 at 5MHz	1000	2.5	0.04/0.07	70	16 to 0.1
√	CLC5654	Q	High-Speed, Low Cost	CFB	350	2	-71/-82 at 5MHz	2000	5	0.03/0.03	70	12 to 0.1
	CLC5665	S	Disable Feature	CFB	90	1	-89/-92 at 1MHz	1800	11	0.05/0.05	85	35 to 0.05
	CLC5801	S	High-Speed, Low Noise	VFB	420	10	-53/-78 at 10MHz	300	16	NA	80	18 to 0.2
	CLC5802	D	Dual, Low Noise	VFB	140	1	-69/-66 at 5MHz	450	11	NA	70	16 to 0.1
√	LM6171	S	High-Speed, Low-Power, Low Distortion	VFB	160	1	-72/-70 at 1MHz	3600	2.5	0.03/0.5	100	48 to 0.1
√	LM6172	D	High-Speed, Low-Power, Low Distortion	VFB	160	1	-72/-70 at 1MHz	3000	2.3	0.28/0.6	100	65 to 0.1
	LM6181	S	100MHz, 100mA	CFB	160	2	-50/-55 at 10MHz	2000	7.5	0.05/0.04	100	50 to 0.1
	LM6182	D	100MHz, 100mA	CFB	100	2	-50/-55 at 10MHz	2000	7.5	0.05/0.04	100	50 to 0.1
	LM6321	S	High-Speed, High Output	BUF	50	1	NA	800	15	NA	300	NA
√	LM6361	S	High-Speed, Wide Supply Range	VFB	50	1	NA	300	5	0.1/0.1	65	120 to 0.1
√	LM6364	S	High-Speed, A <sub>v</sub> > +5	VFB	35	5	NA	300	5	NA	65	100 to 0.1
√	LM6365	S	High-Speed, A <sub>v</sub> > +25	VFB	25	25	NA	300	5	NA	65	80 to 0.1
√	LM7121	S	Low-Power, High-Speed	VFB	235	1	NA	1300	5	0.3/0.65	40	74 to 0.1
	LM7131	S	Low-Voltage, High-Speed, Single Supply	VFB	90	1	-74/-94 at 1MHz	130	7.5	0.25/1.0	65	NA
	LM7171	S	High-Speed, High Output Current, A <sub>v</sub> > +2	VFB	220	2	-75/-55 at 5MHz	4100	6.5	0.01/0.02	100	42 to 0.1

### Temperature Range Codes

C = Commercial (0°C to +70°C)

I = Industrial (-40°C to +85°C)

M = Military (-55°C to +125°C)

All values are typical at room temperature unless otherwise specified.

### Package Codes

LMyyyy (4 digit P/N)

CLCxxxx (4 digit P/N) CLCxxx (3 digit P/N)

M = Plastic SOIC

E = Plastic SOIC

N = Plastic DIP

P = Plastic DIP

M5 = 5-Pin SOT-23

M5 = 5-Pin SOT-23

WG = Ceramic SOIC

J = Ceramic DIP (Military)

WG = Ceramic SOIC

### Eval Board

DIP

SOIC

DIP

SOIC

A = CLC730013 CLC730027 G = CLC730028

B = CLC730038 CLC730036 H = CLC730035 CLC730039

C = CLC730012 CLC730045 I = CLC730029 CLC730033

D = CLC730023 J = CLC730065 CLC730066

E = CLC730024 CLC730031 K = CLC730075 CLC730074

F = CLC730055 CLC730060 S = CLC730068 (5-Pin SOT-23)

### Mode

CFB = Current Feedback

VFB = Voltage Feedback

BUF = Closed Loop Buffer

PGB = Programmable Gain Buffer

### Notes

1 Closed Loop Gain used to specify most parameters.

2 Spec. Supply Range is the range of total supply voltage where operation is possible but parameters are not necessarily guaranteed. Refer to datasheets for more details.

3 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.



## HIGH-PERFORMANCE HIGH-SPEED AMPLIFIERS

≤5mA Low Power	Part Number	Single/ Dual Trip/Quad	V <sub>OS</sub> mV Typ/Temp Limit	Spec. <sup>2</sup> Supply Range (V)	Noise Voltage (nV/√Hz)	i <sub>nn</sub> (pA/√Hz)	i <sub>ni</sub> (pA/√Hz)	Temp Range	Package	Eval Board	SPICE Model	Price <sup>3</sup>
√	CLC446	S	2/11	±5	3.8	2.0	16.0	I, M	E, P, J	F	N	\$1.80
	CLC449	S	3/9	±5	2.2	3.0	15.0	I, M	E, P, J	F	Y	\$3.22
√	CLC450	S	2/8	+5 to ±5	3.0	6.9	8.5	I	E, P, M5	A,S	N	\$1.20
√	CLC452	S	1/8	+5 to ±5	2.8	7.5	10.5	I, M	E, P, M5, J	A,S	N	\$1.24
	CLC501	S	1.5/5	±5	2.4	8.4	10.2	I, M	WG, E, P, J	A	Y	\$5.90
	CLC502	S	0.5/2.8	±5	2.0	18.0	22.0	I, M	E, P, J	A	Y	\$3.20
√	CLC505	S	13/14.5	±5	5.2	1.3	9.0	I, M	P, E, J	A	Y	\$3.37
√	CLC5602	D	2/8	+5 to ±5	3.4	6.3	8.7	I	M, N	B	N	\$1.83
√	CLC5612	D	3/35	+5 to ±5	3.4	6.3	8.7	I	M, N	B	N	\$1.83
√	CLC5622	D	1/8	+5 to ±5	3.4	6.3	8.7	I	M, N	B	N	\$1.88
√	CLC5623	T	1/8	+5 to ±5	4.9	6.6	11.1	I	M, N	K	N	\$2.42
√	CLC5632	D	7/35	+5 to ±5	3.4	6.3	8.7	I	M, N	B	N	\$1.88
√	CLC5633	T	7/35	+5 to ±5	4.9	6.6	11.1	I	M, N	K	N	\$2.42
√	CLC5644	Q	2.5/15	±5	4.5	1.5	10.0	I	M, N	E	N	\$3.23
√	CLC5654	Q	2.5/11	±5	3.3	2.5	12	I	M, N	E	N	\$2.98
	CLC5665	S	1/10	±5 to ±15	3.0	3.2	15	I	M, N	A	Y	\$1.14
	CLC5801	S	0.1/1	±5	2.0	1.8	1.8	I	M, M5	A, S	Y	\$2.05
	CLC5802	D	1/3.5	±5	4.0	2.0	2.0	I	M	B	Y	\$2.25
√	LM6171	S	1.5/5	±5 to ±15	12	1.0	1.0	I	M, N	—	Y	\$1.29
√	LM6172	D	0.4/4	±5 to ±15	12	1.0	1.0	I, M	WG, M, N, J	—	Y	\$1.60
	LM6181	S	2/4	±5 to ±15	4	3	16	I	M, N	—	Y	\$1.49
	LM6182	D	2/4	±5 to ±15	4	3	16	I	M, N	—	N	\$2.49
	LM6321	S	15/50	±5 to ±15	na	na	na	C, I	M, N	—	N	\$2.56
√	LM6361	S	5/10	±5 to ±15	15	1.5	1.5	C, I	M, N	—	Y	\$1.16
√	LM6364	S	2/11	+4.75 to ±16	8	1.5	1.5	C	M, N	—	Y	\$1.44
√	LM6365	S	1/4	+4.75 to ±16	5	1.5	1.5	C	M, N	—	Y	\$1.51
√	LM7121	S	0.9/15	+5 to ±15	17	1.9	1.9	I	M, N, M5	—	Y	\$0.99
	LM7131	S	0.02/4	+2.7 to ±5	17	1.9	1.9	C	M, N, M5	—	Y	\$0.93
	LM7171	S	0.2/4	±5.5 to ±15	14	1.8	1.8	I, M	M,N, WG, J	—	Y	\$1.29

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### Package Codes

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J = Ceramic DIP (Military)

WG = Ceramic SOIC

### Eval Board

DIP

SOIC

DIP

SOIC

A = CLC730013

CLC730027

G = CLC730028

B = CLC730038

CLC730036

H = CLC730035

CLC730039

C = CLC730012

CLC730045

I = CLC730029

CLC730033

D = CLC730023

J = CLC730065

CLC730066

E = CLC730024

CLC730031

K = CLC730075

CLC730074

F = CLC730055

CLC730060

S = CLC730068 (5-Pin SOT-23)

### Mode

CFB = Current Feedback

VFB = Voltage Feedback

BUF = Closed Loop Buffer

PGB = Programmable Gain Buffer

### Notes

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3 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# AMPLIFIERS/BUFFERS/COMPARATORS

## MULTIPLEXER PRODUCTS

Device	Channels	Switching Speed (ns)	Crosstalk Rejection (dB) <sup>1</sup>	Settling Time to 0.01 (ns)	2nd Harmonic Distortion <sup>2</sup> HD2 (dBc)	3rd Harmonic Distortion <sup>2</sup> HD3 (dBc)	SSBW (MHz)	Supply Voltage V <sub>S</sub> (V)	Supply Current I <sub>S</sub> (mA)	Digital Interface	Temp Range	Pkg	Eval Board	SPICE Model	Price <sup>3</sup>
CLC532	2:1	5	80	17	80	86	190	±5	23	CMOS/TTL/ECL	I, M	J, E, P	G	Y	\$2.38
CLC533	4:1	6	80	17	80	86	180	±5	28	CMOS/TTL/ECL	I, M	J, E, P	H	N	\$5.20

## VARIABLE GAIN AMPLIFIER PRODUCTS<sup>4</sup>

Device	Single/Dual/Trip/Quad	Signal Channel BW (MHz)	Control Channel BW (MHz)	Gain Adjust Range (dB)	Slew Rate SR (V/μS)	Supply Voltage V <sub>S</sub> (V)	Supply Current I <sub>S</sub> (mA)	Common Mode Input Range CMIR (V)	Temp Range	Pkg	Eval Board	SPICE Model	Comments	Price <sup>3</sup>
CLC520	S	160	100	40	2000	±5	28	±2.2	I, M	E, P, J	I	Y	Gain Linear in dB	\$4.98
CLC522	S	165	165	40	2000	±5	46	±2.2	I, M	J, E, P	I	Y	Linear Gain Control (V/V)	\$4.09
CLC5523	S	250	95	80	1800	±5	13.5	±3.8	I	N, M	J	N	Gain Linear in dB	\$3.91

## OTHER PRODUCTS

Device	Description	BW (MHz)	Supply Voltage V <sub>S</sub> (V)	Supply Current I <sub>S</sub> (mA)	Temp Range	Pkg	Eval Board	SPICE Model	Price <sup>3</sup>
CLC5509 <sup>5</sup>	0.65nV/√Hz Preamp	33	±5	9	C	M	T <sup>5</sup>	N	\$2.27
CLC5506 <sup>5</sup>	0.25dB Step IF Amplifier	600	5	80	I	M	U <sup>5</sup>	N	\$4.95

### Temperature Range Codes

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 All values are typical at room temperature unless otherwise specified.

### Package Codes

**LMyyyy (4 digit P/N)**  
**CLCxxxx (4 digit P/N)**  
 M = Plastic SOIC  
 N = Plastic DIP  
 M5 = 5-Pin SOT-23  
 J = Ceramic DIP (Military)

**CLCxxx (3 digit P/N)**  
 E = Plastic SOIC  
 P = Plastic DIP  
 M5 = 5-Pin SOT-23  
 J = Ceramic DIP (Military)

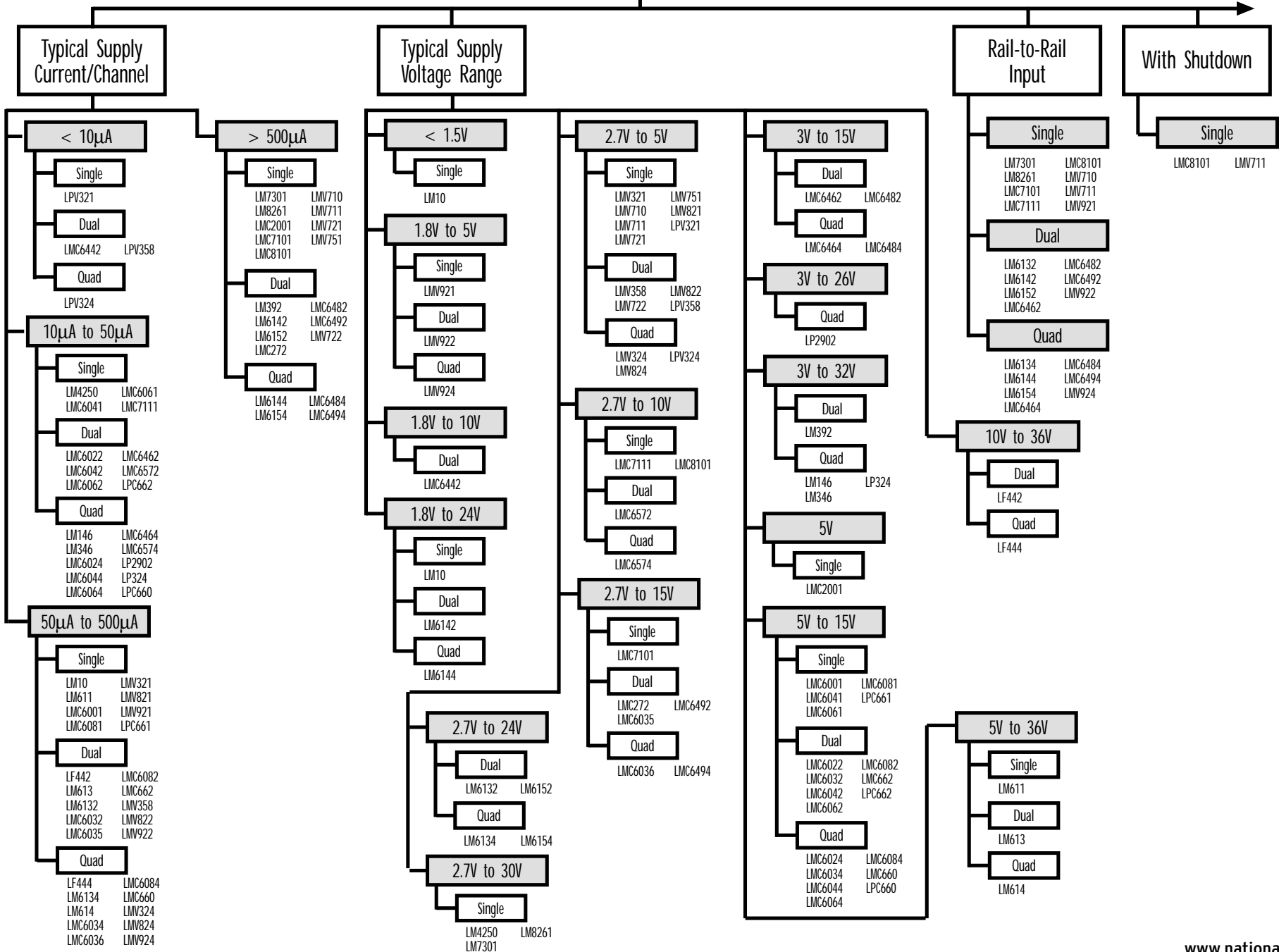
### Eval Board

DIP	SOIC	DIP	SOIC
A = CLC730013	CLC730027	G = CLC730028	
B = CLC730038	CLC730036	H = CLC730035	CLC730039
C = CLC730012	CLC730045	I = CLC730029	CLC730033
D = CLC730023		J = CLC730065	CLC730066
E = CLC730024	CLC730031	K = CLC730075	CLC730074
F = CLC730055	CLC730060	S = CLC730068 (5-Pin SOT-23)	
		T =	CLC730101
		U =	CLC730102

### Notes

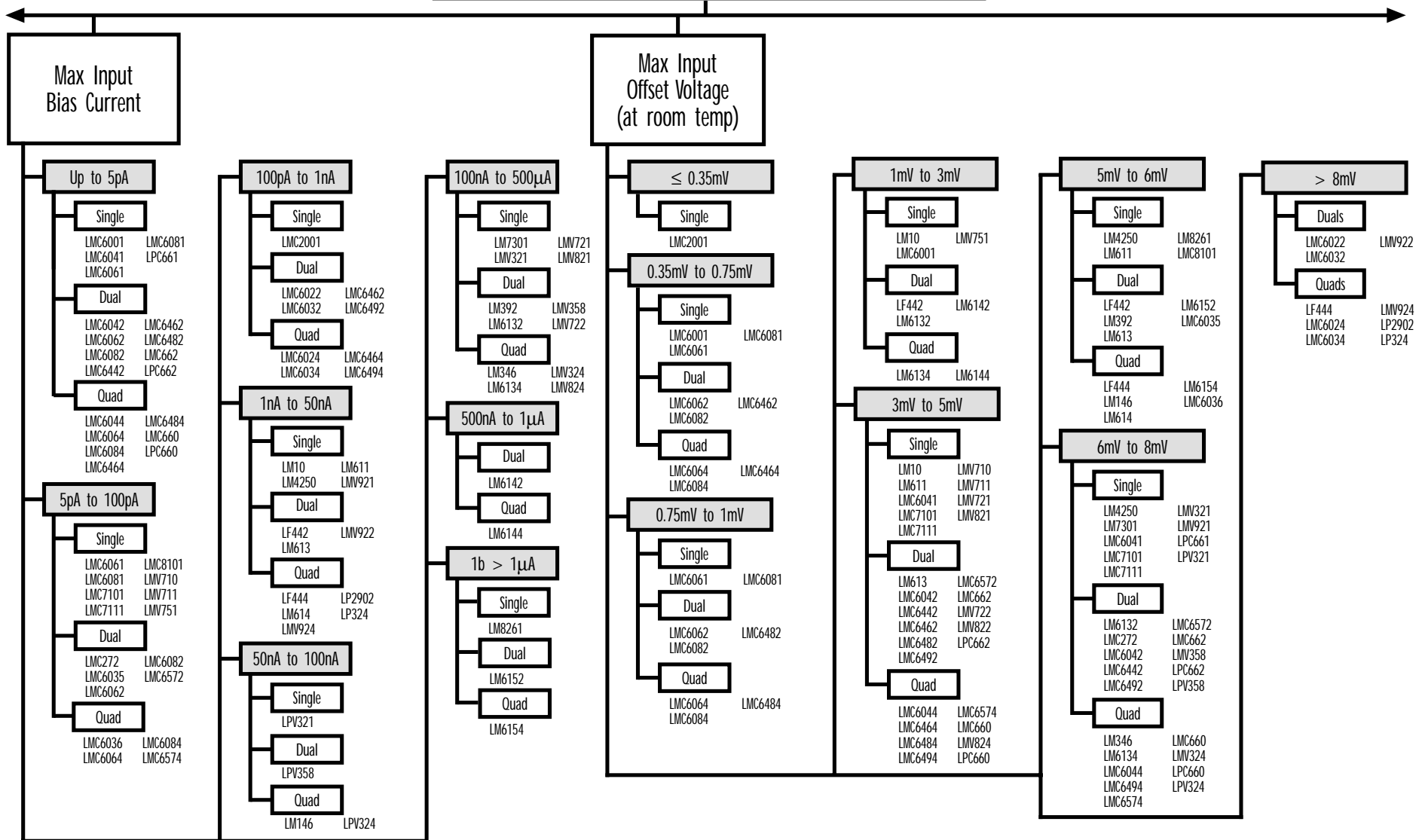
- Crosstalk tested @ 10MHz, 2Vpp
- Harmonic Distortion @ 5MHz, 2Vpp
- 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.
- A<sub>VMAX</sub> = 10
- Populated Evaluation Boards available xxxxxxPCASM

# Low-Power Op Amps

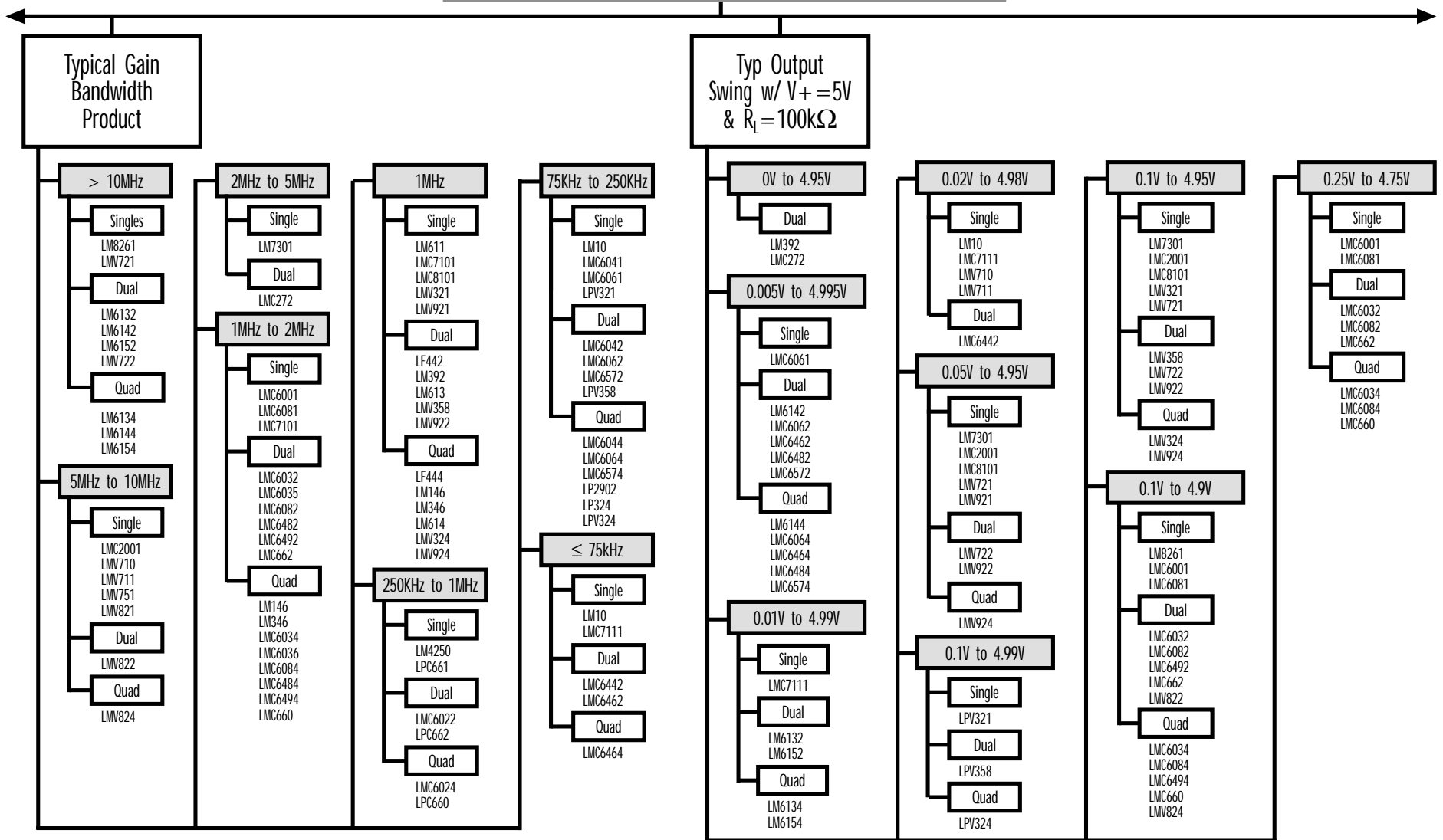


# AMPLIFIERS/BUFFERS/COMPARATORS

## Low-Power Op Amps

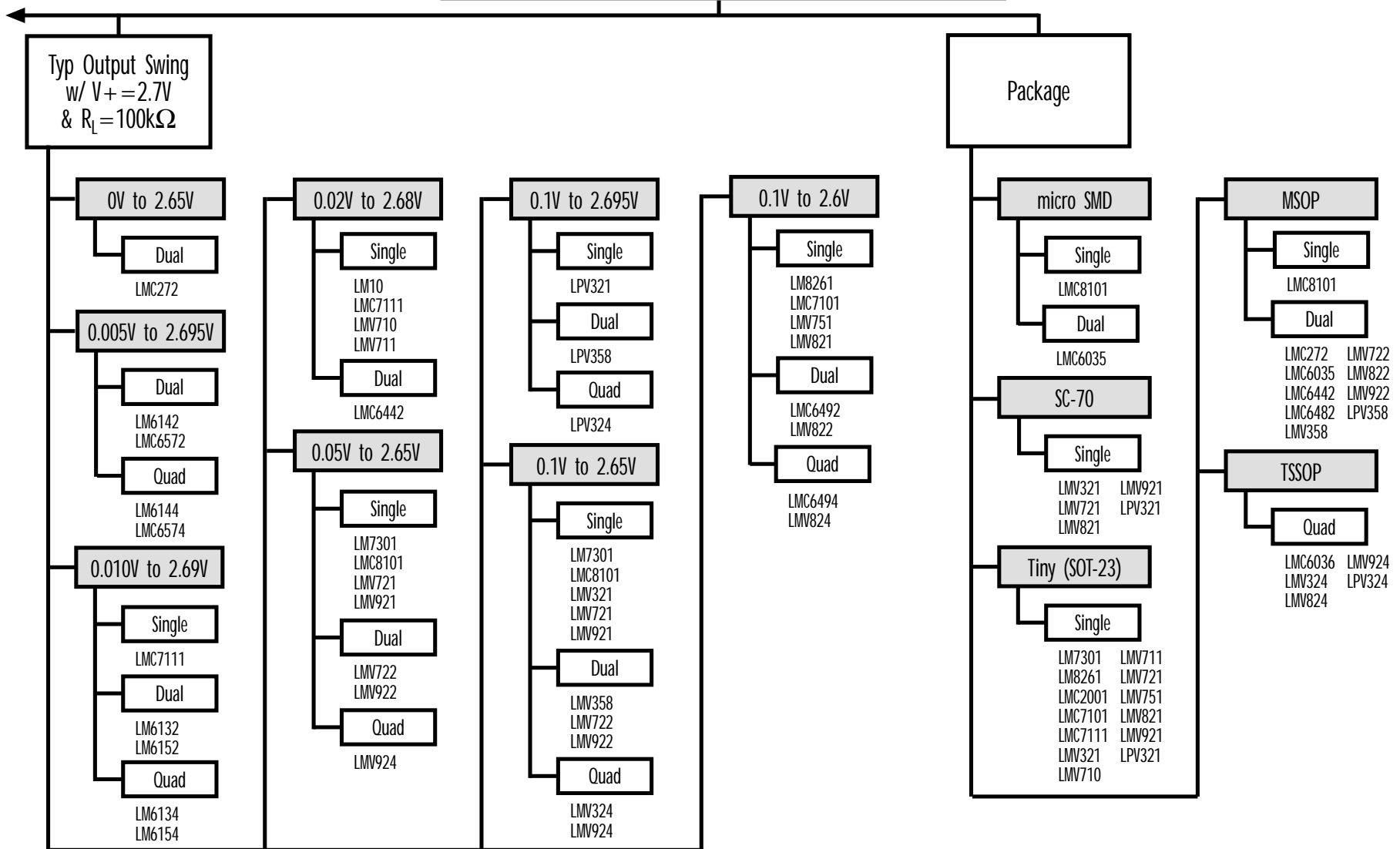


# Low-Power Op Amps



# AMPLIFIERS/BUFFERS/COMPARATORS

## Low-Power Op Amps



# SINGLE-LOW POWER OPERATIONAL AMPLIFIERS

## ORDERING GUIDE

Part Number	I <sub>s</sub> typ	V <sub>OS</sub> (mV) Max	I <sub>B</sub> Typ	CMVR (V) Min	Out Swing (V) Typ with R <sub>L</sub> = 100K	GBW (MHz) Typ	Supply Voltage	Operating Temp	Packages	Price†
LM10	270 μA, 280 μA, 300 μA	2, 4	10 nA, 12 nA	0V to 4.2V	0.02V to 4.98V	0.05, 0.09	1.1V to 7V, 1.1V to 45V	C,I,M	H08,M14,N08	\$1.30
LM4250	10 μA	5, 6	20 nA	1.5V to 3.5V	0.9V to 4.1V	0.25	2V to 36V	C,M	H08,J08,M08,N08	\$0.67
LM7301	600 μA	6	90 nA	0V to 5V	0.07V to 4.93V **	4	2.2V to 30V	I	M08,M5	\$0.78
LM8261	970 μA	5	1.18 μA	-0.3V to 5.3V	0.086V to 4.87V **	24	2.5V to 30V	I	M5	\$1.00
LMC2001	750 μA	0.04	3 pA	0V to 3.5V	0.03V to 4.975V **	6	4.75V to 5.25V	C	M5	\$1.05
LMC6001	450 μA	0.35, 1	25 fA, 100 fA, 1000 fA	-0.1V to 3.1V	0.1V to 4.87V *	1.3	5V to 15V	I	N08	\$1.59
LMC6041	14 μA	3, 6	2 fA	-0.1V to 2.7V	0.004V to 4.987V	0.075	5V to 15V	I	M08,N08	\$0.69
LMC6061	20 μA	0.35, 0.8	10 fA	-0.1V to 2.7V	0.005V to 4.995V	0.1	5V to 15V	I,M	J08,M08,N08,Wafer	\$0.51
LMC6081	450 μA	0.35, 0.8	10 fA	-0.1V to 2.7V	0.1V to 4.87V *	1.3	5V to 15V	I	M08,N08	\$1.20
LMC7101	500 μA	3, 7	1000 fA	-0.2V to 5.3V	0.1V to 4.9V *	1.1	2.7V to 15V	I	M5	\$0.43
LMC7111	25 μA	3, 7	100 fA	-0.2V to 5.2V	0.01V to 4.99V	0.05	2.7V to 11V	I	M5,N08	\$0.46
LMC8101	700 μA	5	1000 fA	-0.2V to 5.2V	0.025V to 4.975V **	1	2.7V to 10V	I	BP08,MM08	\$0.43
LMV321	130 μA	7	15 nA	0V to 4V	0.01V to 4.935V **	1	2.7V to 5V	I	M5,M7	\$0.26
LMV710	1.17 mA	3	4 pA	0V to 5.2V	0.01V to 4.98V **	5	2.7V to 5V	I	M5	\$0.56
LMV711	1.17 mA	3	4 pA	0V to 5.2V	0.01V to 4.98V **	5	2.7V to 5V	I	M6	\$0.60
LMV721	1.03 mA	3	260 nA	-0.3V to 4.1V	0.046V to 4.962V *	10	2.2V to 5V	I	M5,M7	\$0.59
LMV751	600 μA	1	1.5 pA	0V to 3.6V	0.086V to 4.89V **	5	2.7V to 5V	I	M5	\$0.65
LMV821	300 μA	3.5	40 nA	-0.2V to 4.2V	0.1V to 4.9V *	5.6	2.7V to 5V	I	M5,M7	\$0.37
LMV921	160 μA	6	12 nA	-0.2V to 5.2V	0.035V to 4.965V *	1	1.5V to 5V	I	M5,M7	\$0.44
LPC661	55 μA	6	2 fA	-0.1V to 2.7V	0.004V to 4.987V	0.35	5V to 15V	I	M08	\$0.62
LPV321	9 μA	7	1.5 nA	-0.2V to 4V	0.09V to 4.9965V	0.152	1.5V to 5V	I	M5,M7	\$0.31

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5V

### Footnotes

\* Typical Output Swing with R<sub>L</sub> = 2K

\*\* Typical Output Swing with R<sub>L</sub> = 10K

Note 1: 1995 Operational Amplifiers Databook

† Suggested 1000 piece price, lowest grade, lowest cost package.

**Package Code Key**  
(Letter = Pkg Type,  
Number = # of Pins)

BP = micro SMD  
E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
M6 = SOT23-6  
M7 = SC70-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

### Temperature Ranges

C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C

# AMPLIFIERS/BUFFERS/COMPARATORS

## DUAL-LOW POWER OPERATIONAL AMPLIFIERS

### ORDERING GUIDE

Part Number	I <sub>s</sub> typ	V <sub>OS</sub> (mV) Max	I <sub>B</sub> Typ	CMVR (V) Min	Out Swing (V) Typ with R <sub>L</sub> = 100K	GBW (MHz) Typ	Supply Voltage	Operating Temp	Packages	Price†
LF442	300 μA, 400 μA	1, 5	10 pA	4V to 6V***	2V to 8V***	1	10V to 36V, 10V to 44V	C, M	H08, N08	\$0.55
LM392	1000 μA	5	50 nA	0V to 3V	0V to 3.5V	1	3V to 32V	C	M08, N08	\$0.55
LM6132	720 μA	2, 6	110 nA	0V to 5V	0.007V to 4.992V	10	2.7V to 24V	I	M08, N08	\$1.32
LM6142	1.3 mA	1, 2.5	180 nA	0V to 5V	0.005V to 4.995V	17	1.8V to 24V	I, M	J08, M08, N08	\$2.10
LM6152	2.8 mA	2, 5	500 nA	0V to 5V	0.006V to 4.992V	75	2.7V to 24V	C	M08, N08	\$1.82
LMC272	2 mA	7	1000 fA	-0.3V to 4.2V	0V to 4.94V **	2	2.7V to 15V	C	M08, MM08, N08	\$0.36
LMC6022	86 μA	9	40 fA	-0.1V to 2.7V	0.004V to 4.987V	0.35	5V to 15V	I	M08	\$0.58
LMC6032	760 μA	9	40 fA	-0.1V to 2.7V	0.1V to 4.87V *	1.4	5V to 15V	I	M08, N08	\$0.36
LMC6035	800 μA	5	20 fA	-0.2V to 4.2V	0.07V to 4.92V *	1.4	2V to 15V	I	BP08, M08, MM08	\$0.50
LMC6042	20 μA	3, 6	2 fA	-0.1V to 2.7V	0.004V to 4.987V	0.1	5V to 15V	I	M08, N08	\$0.87
LMC6062	32 μA	0.35, 0.8	10 fA	-0.1V to 2.7V	0.005V to 4.995V	0.1	5V to 15V	I, M	J08, M08, N08	\$0.91
LMC6082	900 μA	0.35, 0.8	10 fA	0.1V to 2.7V	0.1V to 4.87V *	1.3	5V to 15V	I	M08, N08	\$1.10
LMC6442	1.9 μA	3, 7	5 fA	-0.2V to 3.85V	0.022V to 4.99V	0.01	1.8V to 11V	I	M08, MM08, N08	\$1.19
LMC6462	40 μA	0.5, 3	150 fA	-0.1V to 5.25V	0.005V to 4.995V	0.05	3V to 15V	I, M	J08, M08, N08	\$1.01
LMC6482	1000 μA	0.75, 3	20 fA	-0.25V to 5.25V	0.005V to 4.995V *	1.5	3V to 15V	I, M	J08, M08, MM08, N08, Wafer	\$0.72
LMC6492	1000 μA	3, 6	150 fA	-0.25V to 5.25V	0.1V to 4.9V *	1.5	2.5V to 15V	A	M08, N08	\$0.89
LMC6572	76 μA	3, 7	20 fA	-0.05V to 4V	0.005V to 4.995V *	0.22	2.7V to 10V	I	M08, N08	\$0.58
LMC662	760 μA	3, 6	2 fA	-0.1V to 2.7V	0.1V to 4.87V *	1.4	5V to 15V	C, I	M08, N08, Wafer	\$0.72
LMV358	210 μA	7	15 nA	0V to 4V	0.01V to 4.935V **	1	2.7V to 5V	I	M08, MM08	\$0.26
LMV722	1.8 mA	3	260 nA	-0.3V to 4.1V	0.046V to 4.962V *	10	2.2V to 5V	I	M08, MM08	\$0.76
LMV822	500 μA	3.5	40 nA	-0.2V to 4.2V	0.1V to 4.9V *	5.6	2.7V to 5V	I	M08, MM08	\$0.44
LMV922	400 μA	8	12 nA	-0.2V to 5.2V	0.035V to 4.965V *	1	1.5V to 5V	I	M08, MM08	\$0.53
LPC662	86 μA	3, 6	2 fA	-0.1V to 2.7V	0.004V to 4.987V	0.35	5V to 15V	I	M08	\$0.87
LPV358	14 μA	7	1.5 nA	-0.2V to 4V	0.09V to 4.9965V	0.152	2.7V to 5V	I	M08, MM08	\$0.33

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5V

#### Footnotes

\* Typical Output Swing with R<sub>L</sub> = 2K

\*\* Typical Output Swing with R<sub>L</sub> = 10K

\*\*\* V<sub>S</sub> = 10V

Note 1: 1995 Operational Amplifiers Databook

† Suggested 1000 piece price, lowest grade, lowest cost package.

#### Package Code Key (Letter = Pkg Type, Number = # of Pins)

BP = micro SMD  
E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
M6 = SOT23-6  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

#### Temperature Ranges

C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C



# QUAD-LOW POWER OPERATIONAL AMPLIFIERS

## ORDERING GUIDE

Part Number	I <sub>s</sub> typ	V <sub>os</sub> (mV) Max	I <sub>B</sub> Typ	CMVR (V) Min	Opt Swing (V) Typ with R <sub>L</sub> = 100K	GBW (MHz) Typ	Supply Voltage	Operating Temp	Packages	Price†
LF444	600 μA	5, 10	10 pA	4V to 6V***	2V to 8V***	1	10V to 36V, 10V to 44V	C,M	D14,M14,N14,Wafer	\$0.70
LM146	140 μA	5	50 nA	1.5V to 3.5V	1V to 4V	1.2	3V to 44V	M	J16	\$4.90
LM346	140 μA	6	50 nA	1.5V to 3.5V	1V to 4V	1.2	3V to 36V	C	M16,N16	\$0.67
LM6134	1.44 mA	2, 6	110 nA	0V to 5V	0.007V to 4.992V	10	2.7V to 24V	I	M14,N14	\$1.58
LM6144	2.6 mA	1, 2.5	180 nA	0V to 5V	0.005V to 4.995V	17	1.8V to 24V	I	M14,N14	\$2.80
LM6154	5.6 mA	5	500 nA	0V to 5V	0.006V to 4.992V	75	2.7V to 24V	C	M14,N14	\$3.26
LMC6024	160 μA	9	40 fA	-0.1V to 2.7V	0.004V to 4.987V	0.35	5V to 15V	I	M14	\$0.72
LMC6034	1.52 mA	9	40 fA	-0.1V to 2.7V	0.1V to 4.87V *	1.4	5V to 15V	I	M14	\$0.36
LMC6036	1.6 mA	5	20 fA	-0.2V to 4.2V	0.07V to 4.92V *	1.4	2V to 15V	I	M14,MT14	\$0.72
LMC6044	40 μA	3, 6	2 fA	-0.1V to 2.7V	0.004V to 4.987V	0.1	5V to 15V	I	M14,N14,Wafer	\$1.08
LMC6064	64 μA, 80 μA	0.35, 0.8	10 fA	-0.1V to 2.7V	0.005V to 4.995V	0.1	5V to 15V	I,M	J14,M14,N14	\$1.59
LMC6084	1.8 mA	0.35, 0.8	10 fA	0.1V to 2.7V	0.1V to 4.87V *	1.3	5V to 15V	I	M14,N14	\$1.55
LMC6464	80 μA	0.5, 3	150 fA	-0.1V to 5.25V	0.005V to 4.995V	0.05	3V to 15V	I,M	J14,M14,N14,WG14	\$1.73
LMC6484	2 mA	0.75, 3	20 fA	-0.25V to 5.25V	0.005V to 4.995V *	1.5	3V to 15V	I,M	J14,M14,N14,WG14	\$1.40
LMC6494	2 mA	3, 6	150 fA	-0.25V to 5.25V	0.1V to 4.9V *	1.5	2.5V to 15V	A	M14,N14	\$1.59
LMC6574	152 μA	3, 7	20 fA	-0.05V to 4V	0.005V to 4.995V *	0.22	2.7V to 10V	I	M14,N14	\$1.20
LMC660	1.52 mA	3, 6	2 fA	-0.1V to 2.7V	0.1V to 4.87V *	1.4	5V to 15V	C,I	M14,N14	\$0.65
LMV324	410 μA	7	15 nA	0V to 4V	0.01V to 4.935V **	1	2.7V to 5V	I	M14,MT14	\$0.29
LMV824	1000 μA	3.5	40 nA	-0.2V to 4.2V	0.1V to 4.9V *	5.6	2.7V to 5V	I	M14,MT14	\$0.51
LMV924	752 μA	8	12 nA	-0.2V to 5.2V	0.035V to 4.965V *	1	1.5V to 5V	I	M14,MT14	\$0.63
LP2902	85 μA	10	2 nA	0V to 3.5V	0.7V to 3.6V	0.1	3V to 26V	I	M14,N14	\$0.67
LP324	85 μA	9	2 nA	0V to 3.5V	0.7V to 3.6V	0.1	3V to 32V	C	M14,N14	\$0.43
LPC660	160 μA	3, 6	2 fA	-0.1V to 2.7V	0.004V to 4.987V	0.35	5V to 15V	I	M14	\$1.20
LPV324	30 μA	7	1.5 nA	-0.2V to 4V	0.09V to 4.9965V	0.152	2.7V to 5V	I	M14,MT14	\$0.36

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5V

### Footnotes

\* Typical Output Swing with R<sub>L</sub> = 2k

\*\* Typical Output Swing with R<sub>L</sub> = 10k

\*\*\* V<sub>S</sub> = 10V

† 1,000 pc. suggested resale, FOB Santa Clara, California  
Price may vary by package or grade.

### Package Code Key

(Letter = Pkg Type,  
Number = # of Pins)

E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

### Temperature Ranges

C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C

# AMPLIFIERS/BUFFERS/COMPARATORS

## SPECIAL FUNCTION OPERATIONAL AMPLIFIERS

### ORDERING GUIDE

Part Number	V <sub>OS</sub> (mV) Max	I <sub>B</sub> (nA) Max	GBW (MHz) Typ	Slew Rate (V/μs) Typ	Supply Current (mA) Max	Supply Voltage		Pkg.	Operating Temp Ranges	Special Note	Price†
						Min (V)	Max (V)				
CLC5509	15	50-200 Ω Z <sub>IN</sub>	33		11	8	11	M08	I	0.58nV/Hz Preamp plus Buffer	\$2.50
LM12	15	150	0.7	0.7	9	15	80	K4	C	80W Operational Amplifier	\$16.80
LM359		15μA	30	30	60	5	22	M14, N14	C	Dual High Speed Programmable "Norton" Amplifier	\$1.47
LM392	5	250	1	1		4	36	M08, N08	C	Low Power Op Amp with Voltage Comparator	\$0.60
LM611	3.5, 5	20	0.8	0.7	350μA	4	36	J08, M14	C, I, M	Single Op Amp with Adjustable Referencer	\$0.80
LM613	2.5, 5	10, 25	0.8	0.7	1mA	4	36	J16, M16	I, M	Dual Op Amp, Dual Comparator and Adjustable Reference	\$1.30
LM614	5	10	0.8	0.7	500μA	4	36	M16, Wafer	C, I	Quad Op Amp with Adjustable Reference	\$1.17
LM675	10	2μA	5.5	5.5	8	12	60	T5	C	3 Amp Power Op Amp	\$3.00
LM3046			120					M14	C	Five Transistor Array	\$0.47
LM194/394	0.1, 0.2		200					K06	I, M	Supermatch Transistor Pair	\$2.11
LMV101			1.6	1	0.25	2.7	5	M5, M7	C	LMV321 Type/w built-in Feedback R's, Fixed Gain of -1	\$0.32
LMV102			1.8	1	0.25	2.7	5	M5, M7	C	LMV321 Type/w built-in Feedback R's, Fixed Gain of -2	\$0.32
LMV105			0.8	1	0.25	2.7	5	M5, M7	C	LMV321 Type/w built-in Feedback R's, Fixed Gain of -5	\$0.32
LMV110			0.2	1	0.25	2.7	5	M5, M7	C	LMV321 Type/w built-in Feedback R's, Fixed Gain of -10	\$0.32
LMV11			1	1	0.25	2.7	5	M5, M7	C	LMV321 type/w built-in 1/2 divider R's on "+" input	\$0.32

Specs at T<sub>A</sub> = 25°C

#### Footnotes

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or

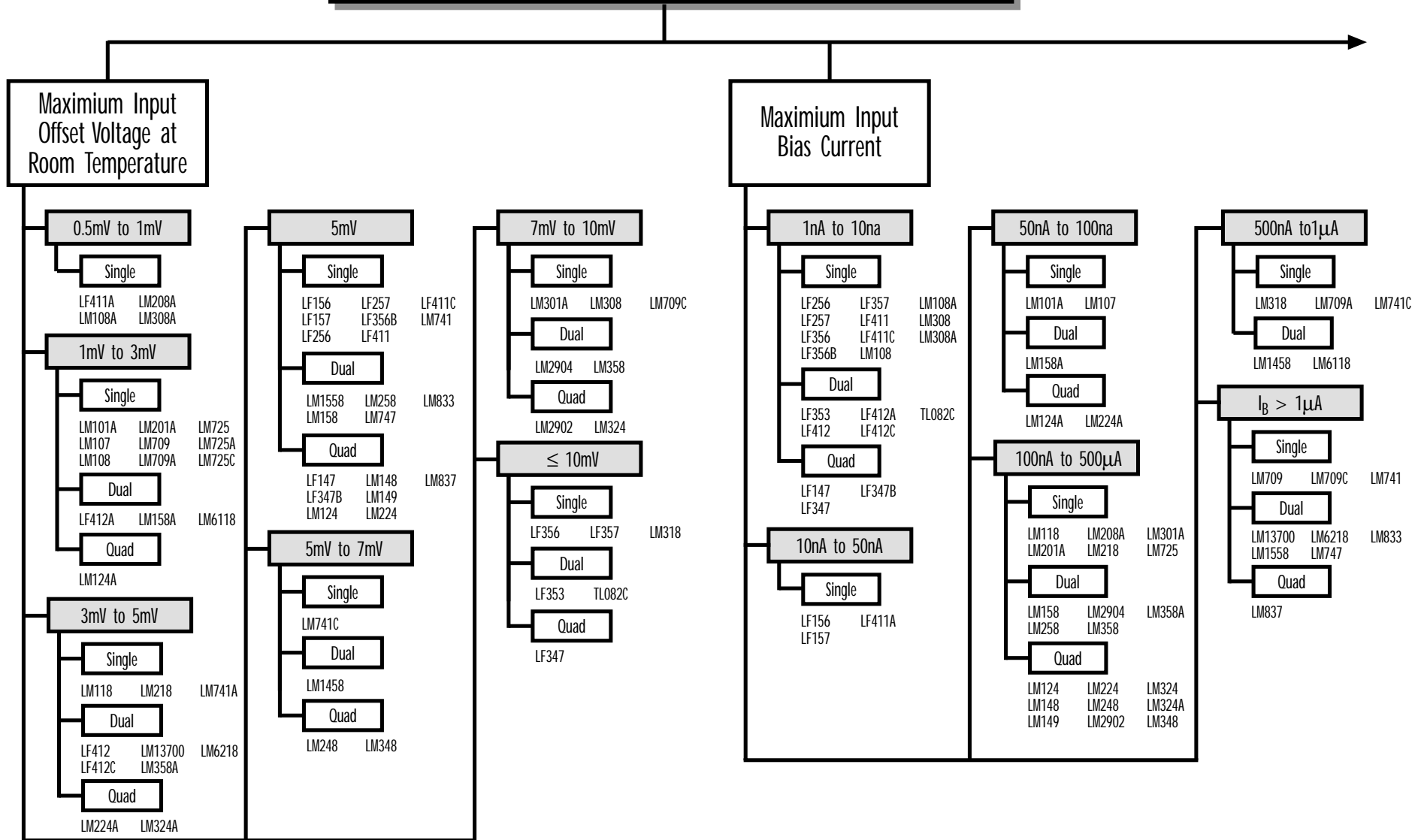
#### Package Code Key (Letter = Pkg Type, Number = # of Pins)

E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

#### Temperature Ranges

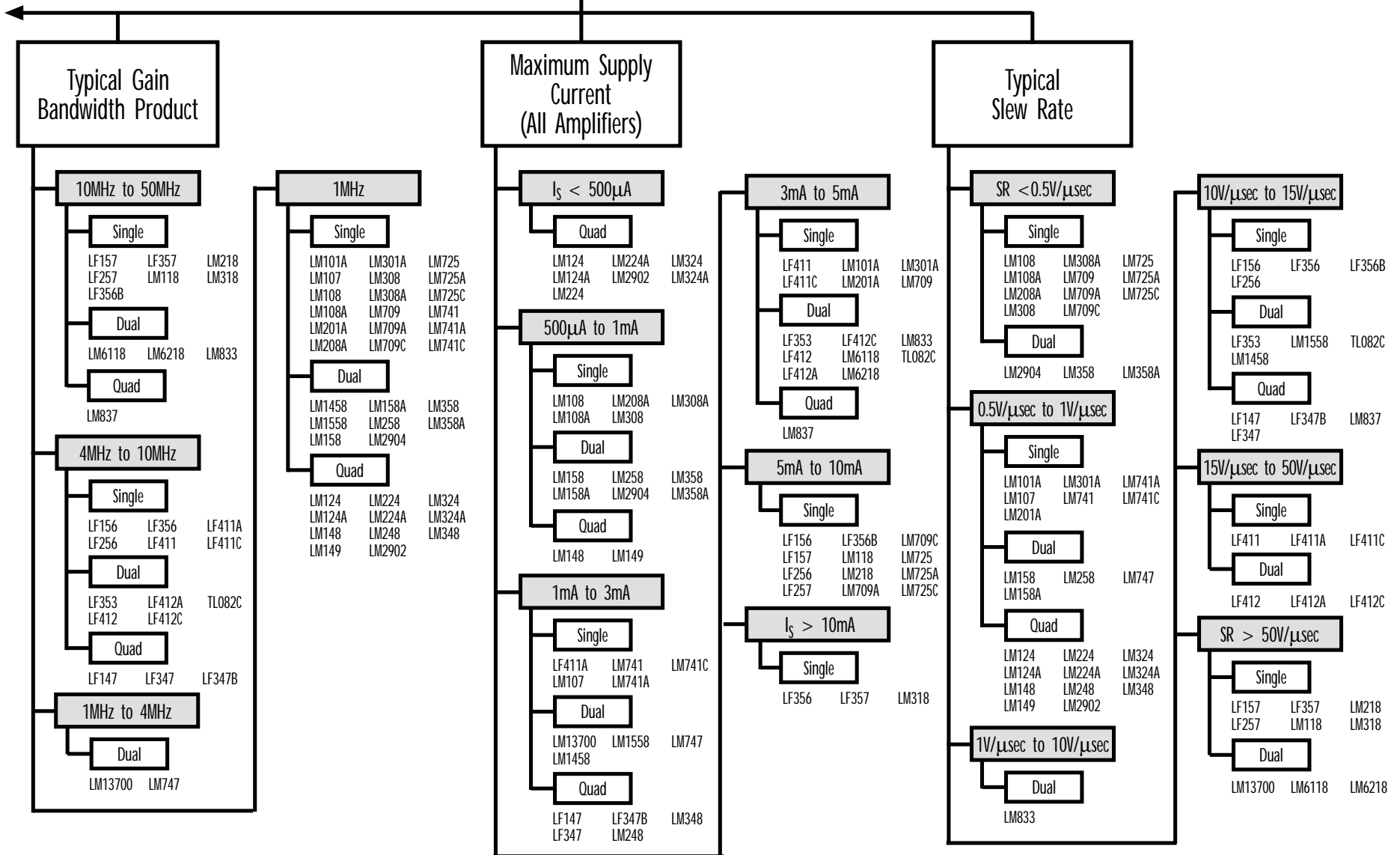
C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C

# General Purpose Operational Amplifiers



# AMPLIFIERS/BUFFERS/COMPARATORS

## General Purpose Operational Amplifiers



# SINGLE – GENERAL PURPOSE OPERATIONAL AMPLIFIERS

## ORDERING GUIDE

Part Number	V <sub>OS</sub> Max (mV)	I <sub>B</sub> Typ	GBW (MHz) Typ	Slew Rate (V/μS)	I <sub>S</sub> Max (mA)	Supply Voltage	Operating Temp	Packages	Price†
LF156	5	30 pA	5	12	5 mA	10V to 44V	M	H08,Wafer	\$2.30
LF157	5	30 pA	20	50	5 mA	10V to 44V	M	H08	\$2.72
LF256	5	30 pA	5	12	5 mA	10V to 44V	I	H08	\$2.24
LF257	5	30 pA	20	50	5 mA	10V to 44V	I	H08	\$2.15
LF356	5, 10	30 pA	5, 12	12	5 mA	10V to 36V,10V to 44V	C	H08,M08,N08	\$0.62
LF357	10	30 pA	20	50	5 mA	10V to 36V	C	H08	\$1.07
LF411	0.5, 5	10 pA	4	15	1.8 mA	10V to 36V,10V to 44V	C,M	H08,N08,Wafer	\$0.61
LM101A	2	30 nA	1	0.5	1.8 mA	10V to 44V	M	H08,J08,W10	\$1.37
LM107	2	30 nA	1	0.5	1.2 mA	10V to 44V	M	H08,Wafer	\$1.98
LM108	2	800 pA	1	0.25	300 μA	4V to 40V	M	Die,H08,J08,J14,Wafer	\$1.67
LM108A	0.5	800 pA	1	0.3	300 μA	4V to 40V	M	H08,J08,J14,W10,WG10	\$2.37
LM118	4	120 nA	15	70	4.5 mA	10V to 40V	M	H08,J08,J14	\$3.34
LM201A	2	30 nA	1	0.5	1.8 mA	10V to 44V	I	H08	\$1.34
LM208A	0.5	800 pA	1	0.3	300 μA	4V to 40V	I	H08	\$2.15
LM218	4	120 nA	15	70	4.5 mA	10V to 40V	I	H08	\$3.65
LM301A	7.5	70 nA	1	0.5	1.8 mA	10V to 36V	C	H08,N08,Wafer	\$0.42
LM308	7.5	1.5 nA	1	0.3	300 μA	4V to 36V	C	H08	\$0.84
LM308A	0.5	1.5 nA	1	0.3	300 μA	4V to 36V	C	H08	\$1.15
LM318	10	150 nA	15	70	4.5 mA	10V to 40V	C	H08,M08,N08,Wafer	\$0.58
LM709	2, 7.5	100 nA, 200 nA, 300 nA	1	0.25	2.5 mA, 2.6 mA	18V to 36V	C,M	H08	\$1.24
LM725	1, 2.5	42 nA	1	0.2	1000 μA	6V to 44V	C,M	H08,N08,Wafer	\$1.17
LM741	3, 5, 6	30 nA, 80 nA	1	0.5	1.7 mA	10V to 36V,10V to 44V	C,M	Die,H08,H10,J08,N08,W10,Wafer,WG10	\$0.25

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5V

### Footnotes

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

### Package Code Key (Letter = Pkg Type, Number = # of Pins)

BP = micro SMD  
E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

### Temperature Ranges

C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C

# AMPLIFIERS/BUFFERS/COMPARATORS

## DUAL – GENERAL PURPOSE OPERATIONAL AMPLIFIERS

### ORDERING GUIDE

Part Number	V <sub>OS</sub> Max (mV)	I <sub>B</sub> Typ	GBW (MHz) Typ	Slew Rate (V/μS)	I <sub>S</sub> Max (mA)	Supply Voltage	Operating Temp	Packages	Price†
LF353	10	50 pA	4	13	3.6 mA	10V to 36V	C	M08,N08	\$0.23
LF412	1, 3	50 pA	4	15	3.6 mA	10V to 36V,10V to 44V	C	H08,H08,J08,N08,Wafer	\$0.80
LM13700	4	400 nA	2	50	2.6 mA	10V to 36V	C	M16,N16	\$0.55
LM1458	6	200 nA	1	10	3 mA	6V to 36V	C	H08,M08,N08,Wafer	\$0.19
LM1558	5	200 nA	1	10	3 mA	6V to 44V	M	H08,J08,Wafer	\$1.55
LM158	2, 5	20 nA, 45 nA	1	0.5	500 μA	3V to 32V	M	H08,J08,WG10	\$1.38
LM258	5	45 nA	1	0.5	500 μA	3V to 32V	I	H08	\$1.20
LM2904	7	45 nA	1	0.1	500 μA	3V to 26V	I	M08,N08,Wafer	\$0.19
LM358	3, 7	45 nA	1	0.1	500 μA	3V to 32V	C	BP08,H08,M08,N08,Wafer	\$0.15
LM6118	1	200 nA	17	75	5.5 mA	10V to 42V	M	J08	\$18.70
LM6218	3	200 nA	17	75	5.5 mA	10V to 42V	I	M14,N08	\$3.85
LM747	5	80 nA	1.5	0.5	3.4 mA	10V to 44V	M	H08,H10,J14,Wafer	\$1.37
LM833	5	500 nA	15	7	5 mA	10V to 36V	I	M08,MM08,N08	\$0.32
TL082	15	400 pA	4	13	3.5 mA	10V to 36V	C	M08,N08	\$0.23

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5V

#### Footnotes

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

#### Package Code Key (Letter = Pkg Type, Number = # of Pins)

BP = micro SMD  
E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

#### Temperature Ranges

C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C

## QUAD – GENERAL PURPOSE OPERATIONAL AMPLIFIERS

### ORDERING GUIDE

Part Number	V <sub>OS</sub> Max (mV)	I <sub>B</sub> Typ	GBW (MHz) Typ	Slew Rate (V/μS)	I <sub>S</sub> Max (mA)	Supply Voltage	Operating Temp	Packages	Price†
LF147	5	50 pA	4	13	7.2 mA	10V to 44V	M	J14	\$3.39
LF347	5, 10	50 pA	4	13	7.2 mA	10V to 36V	C	M14,N14,Wafer	\$0.60
LM124	2, 5	20 nA, 45 nA	1	0.5	720 μA	3V to 32V	M	E20,J14,W14,Wafer,WG14	\$1.13
LM148	5	30 nA	0.9	0.5	2.4 mA	10V to 44V	M	E20,J14,Wafer	\$1.12
LM149	5	30 nA	0.9	0.5	2.4 mA	10V to 44V	M	J14	\$4.27
LM224	3, 5	40 nA, 45 nA	1	0.5	720 μA	3V to 32V	I	J14	\$0.97
LM248	6	30 nA	1	0.5	2.4 mA	10V to 36V	I	J14	\$1.15
LM2902	7	45 nA	1	0.5	720 μA	3V to 26V	I	M14,N14	\$0.20
LM324	3, 7	45 nA	1	0.5	720 μA	3V to 32V	C	Die,J14,M14,MT14,N14,Wafer	\$0.19
LM348	6	30 nA	1	0.5	2.4 mA	10V to 36V	C	M14,N14,Wafer	\$0.39
LM837	5	500 nA	25	10	10 mA	10V to 36V	I	M14,N14	\$0.60

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5V

#### Footnotes

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

#### Package Code Key (Letter = Pkg Type, Number = # of Pins)

E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

#### Temperature Ranges

C = 0 to 70°C  
I = -40 to 85°C  
M = -55 to 125°C  
E = -40 to 125°C

# AMPLIFIERS/BUFFERS/COMPARATORS

## BUFFERS

### ORDERING GUIDE

Part Number	Key Features	Slew Rate (V/ $\mu$ Sec) typ	Bandwidth -3dB (MHz) typ	Gain (Av) typ	Output (V, mA)	Full Power BW (MHz @ $V_{PP}$ , $R_L$ )	Packages	Operating Temperature Ranges	Price†
CLC110	Wideband Closed Loop Buffer	800	730	0.97	$\pm 4$ , 70	90 @ 5, 100 $\Omega$	J8	M	\$20.70
CLC111	Ultra-High Slew Rate Closed Loop Buffer	3500	800	0.996	$\pm 3.9$ , 60	450 @ 4, 100 $\Omega$	M8	I	\$2.11
CLC114	Quad Closed Loop Buffer	450	200	0.97	$\pm 4$ , 60	95 @ 2, 100 $\Omega$	E20,J14,M14	I, M	\$7.30
CLC115	Quad Wideband Closed Loop Buffer	2700	700	0.97	$\pm 4$ , 60	270 @ 4, 100 $\Omega$	J14	M	\$47.20
CLC5612	Dual, High Output, Programmable Gain Buffer	290	90	1,2,-1	$\pm 4$ , 130	62 @ 2, 100 $\Omega$	M8, N8	I	\$1.83
CLC5632	Dual, High Output, Programmable Gain Buffer	410	130	1,2,-1	$\pm 4$ , 130	90 @ 2, 100 $\Omega$	M8, N8	I	\$1.88
CLC5633	Triple, High Output, Programmable Gain Buffer	410	130	1,2,-1	$\pm 4$ , 130	97 @ 2, 100 $\Omega$	M14, N14	I	\$2.42
LM6121/6221/6321	High Speed 50 $\Omega$ Drive	800	50	0.99	$\pm 12$ , $\pm 300$	7 @ 27, 50 $\Omega$	H8, N8, M14	C, I, M	\$2.56
LM6125	High Speed 50 $\Omega$ Drive with Shutdown and Thermal Error Flag	800	50	0.99	$\pm 12$ , $\pm 300$	7 @ 27, 50 $\Omega$	H08	M	\$11.30

Specs at  $T_A = 25^\circ\text{C}$

† 1,000 pc. suggested resale, FOB Santa Clara California, USA. Price may vary by package.

**Package Code Key**  
(Letter = Pkg Type,  
Number = # of Pins)

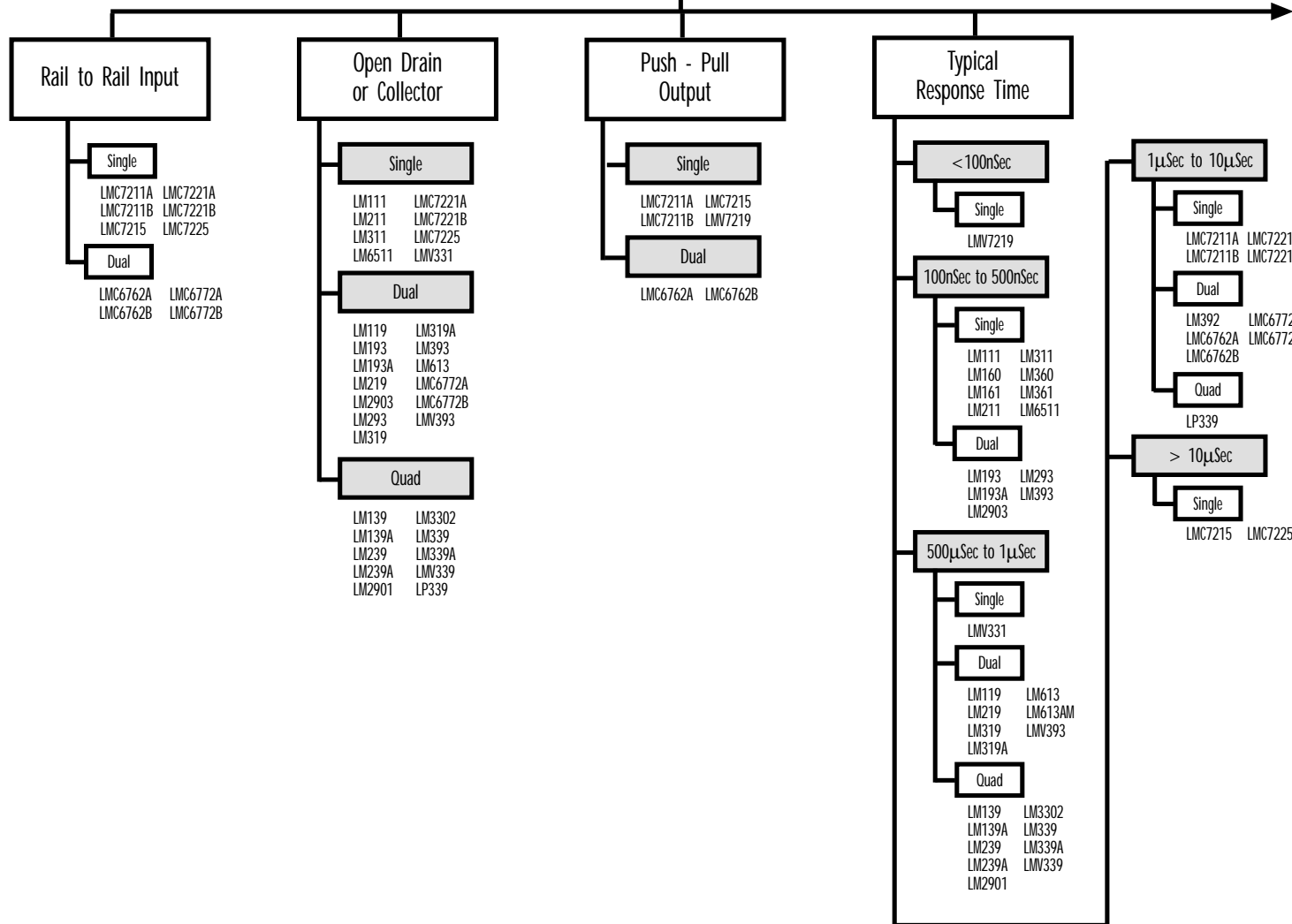
BP = micro SMD  
E = LCC  
H/G = Metal Can  
J/D = Ceramic Dual-In-Line  
K = Metal Can (TO-3)  
M = SOIC  
MT = TSSOP  
MM = MSOP  
M3 = SOT23-3  
M5 = SOT23-5  
N = Plastic Dual-In-Line (PDIP)  
T = TO-220  
V = PLCC  
W = Flatpak  
WG = Ceramic SOIC  
Z = TO-92

**Temperature Ranges**

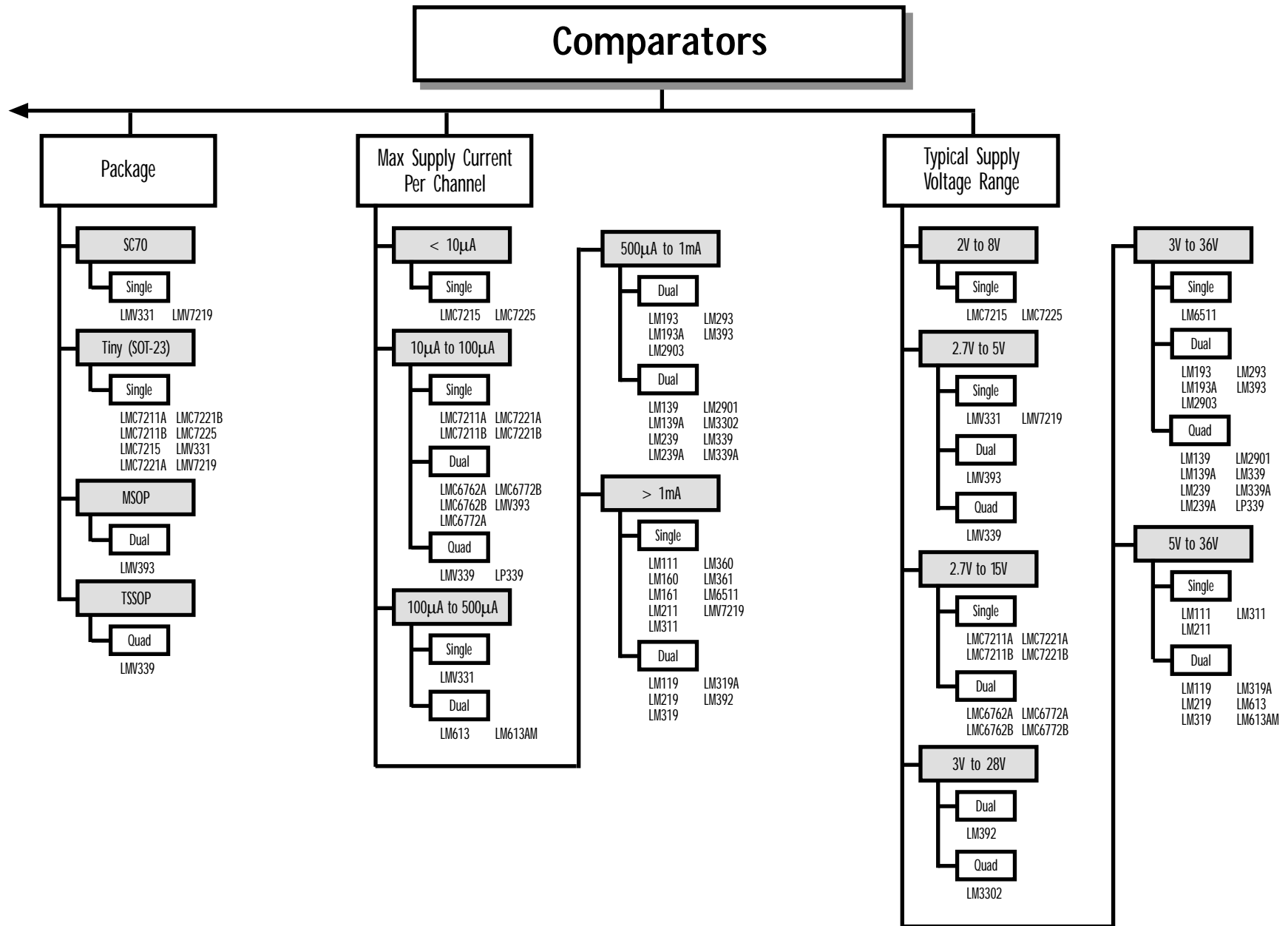
C = 0 to 70 $^\circ\text{C}$   
I = -40 to 85 $^\circ\text{C}$   
M = -55 to 125 $^\circ\text{C}$   
E = -40 to 125 $^\circ\text{C}$



# Comparators



# AMPLIFIERS/BUFFERS/COMPARATORS



# VOLTAGE COMPARATORS

## ORDERING GUIDE

Part Number	Number of Channels	Output Type	Response Time (nSec) Typ	V <sub>OS</sub> Max (mV)	I <sub>S</sub> Max (mA)	I <sub>B</sub> Typ (nA)	Supply Voltage	Packages	Operating Temp	Price†
LM111	1	OC	200	3	6	60 nA	5V to 36V	Die,E20,H08,J08,J14,W10	M	\$1.82
LM119	2	OC	800	4	11	150 nA	5V to 36V	E20,H10,J14,W10	M	\$2.53
LM139	4	OC	500	2, 5	2	25 nA	3V to 36V	Die,E20,J14,W14,WG14	M	\$1.02
LM160	1	Diff	130	2	32	5 μA	9V to 16V	H08	M	\$13.70
LM161	1	Diff	140	1	20	5 μA	11V to 32V	H10	M	\$8.40
LM193	2	OC	400	2, 5	1	25 nA	3V to 36V	H08,J08	M	\$2.00
LM211	1	OC	200	3	6	60 nA	5V to 36V	H08	I	\$1.85
LM219	2	OC	800	4	11	150 nA	5V to 36V	J14	I	\$3.10
LM239	4	OC	500	2, 5	2	25 nA	3V to 36V	J14	I	\$0.89
LM2901	4	OC	500	7	2	25 nA	3V to 36V	M14,N14	I	\$0.20
LM2903	2	OC	400	7	1	25 nA	3V to 36V	M08,N08	I	\$0.19
LM293	2	OC	400	5	1	25 nA	3V to 36V	H08	I	\$2.68
LM311	1	OC	200	7.5	7.5	100 nA	5V to 36V	H08,M08,N08	C	\$0.22
LM319	2	OC	800	1, 8	12.5	150 nA, 250 nA	5V to 36V	H10,M14,N14	C	\$0.53
LM3302	4	OC	500	20	2	25 nA	3V to 28V	N14	I	\$0.26
LM339	4	OC	500	2, 5	2	25 nA	3V to 36V	J14,M14,N14	C	\$0.19
LM360	1	Diff	130	2	32	5 μA	9V to 16V	H08,M08,N08	C	\$2.06
LM361	1	Diff	140	1	20	10 μA	11V to 32V	H10,M14,N14	C	\$1.30
LM392	2	OC	1500	5	2	50 nA	3V to 32V	M08,N08	C	\$0.55
LM393	2	OC	400	5	1	25 nA	3V to 36V	H08,M08,N08	C	\$0.17
LM613	2	OC	750	3.5, 5	0.47	10 nA, 25 nA	4V to 36V	J16,M16	I,M	\$1.30
LM6511	1	OC	180	5	3.5	38 nA	2.7V to 36V	M08	I	\$1.19
LMC6762	2	PP	4000	5, 15	0.02	40 fA	2.7V to 15V	M08,N08	I	\$1.05
LMC6772	2	OC	4000	5, 15	0.02	40 fA	2.7V to 15V	M08,N08	I	\$1.05
LMC7211	1	PP	4000	5, 15	0.012	40 fA	2.7V to 15V	M08,M5	I	\$0.50
LMC7215	1	PP	24000	6	0.001	5 fA	2V to 8V	M08,M5	I	\$0.65
LMC7221	1	OC	4000	5, 15	0.014	40 fA	2.7V to 15V	M08,M5	I	\$0.55
LMC7225	1	OC	24000	6	0.001	5 fA	2V to 8V	M08,M5	I	\$0.65
LMV331	1	OC	600	7	0.12	25 nA	2.7V to 5V	M5,M7	I	\$0.26
LMV339	4	OC	600	7	0.3	25 nA	2.7V to 5V	M14,MT14	I	\$0.29
LMV393	2	OC	600	7	0.1	25 nA	2.7V to 5V	M08,MM08	I	\$0.26
LMV7219	1	PP	7	6	1.8	500 nA	2.5V to 5V	M5,M7	I	\$1.10
LP339	4	OC	8000	5	0.1	2.5 nA	2V to 36V	M14,N14	C	\$0.43

Specs at T<sub>A</sub> = 25°C & V<sub>S</sub> = +5

### Footnotes

OC = Open Collector or Drain

PP = Active "Push-Pull"

Diff = Differential Output

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

### Package Code Key (Letter = Pkg Type, Number = # of Pins)

BP = micro SMD

E = LCC

H/G = Metal Can

J/D = Ceramic Dual-In-Line

K = Metal Can (TO-3)

M = SOIC

MT = TSSOP

MM = MSOP

M3 = SOT23-3

M5 = SOT23-5

M7 = SC70-5

N = Plastic Dual-In-Line (PDIP)

T = TO-220

V = PLCC

W = Flatpak

WG = Ceramic SOIC

Z = TO-92

### Temperature Ranges

C = 0 to 70°C

I = -40 to 85°C

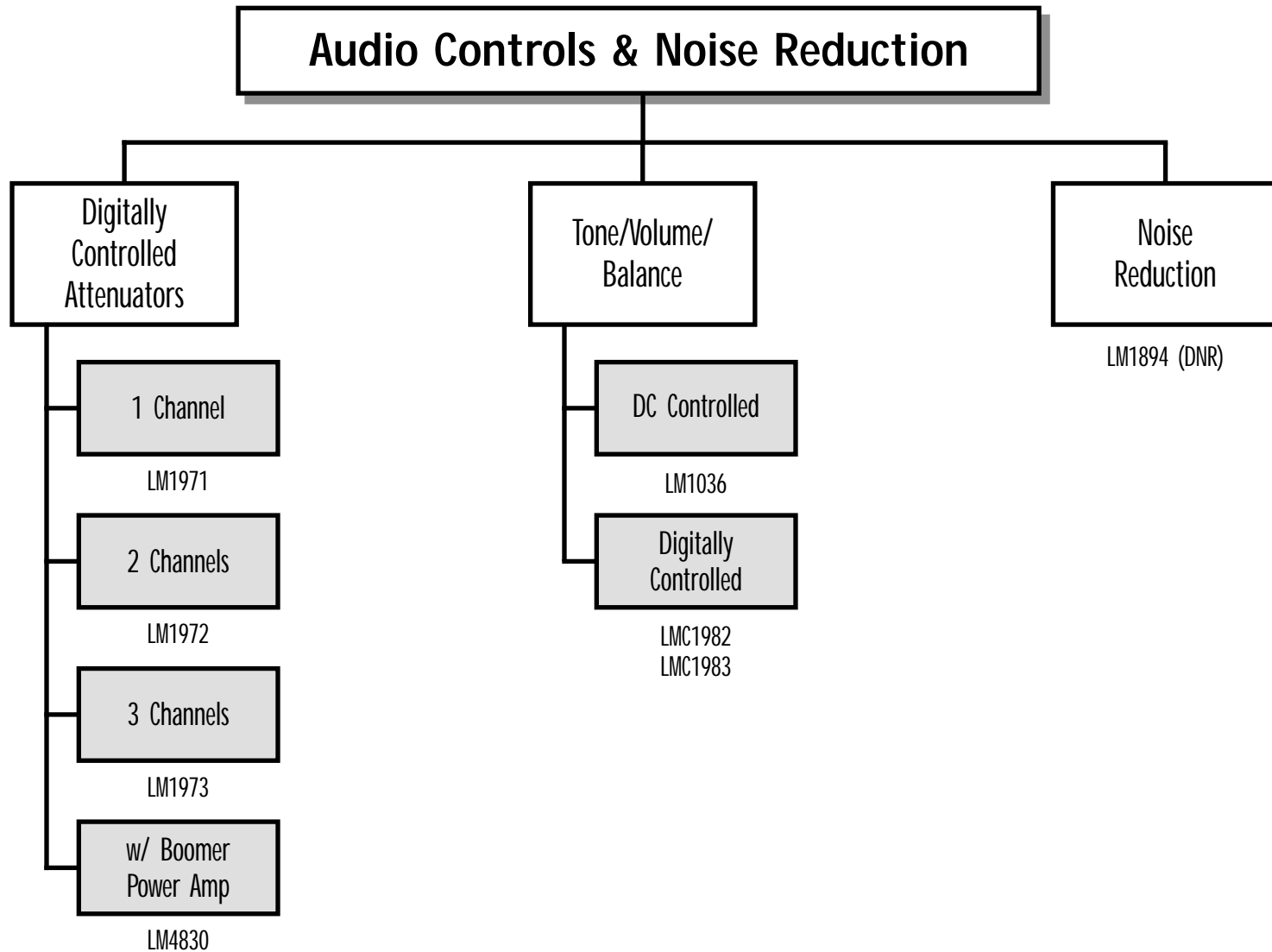
M = -55 to 125°C

E = -40 to 125°C



**AUDIO**

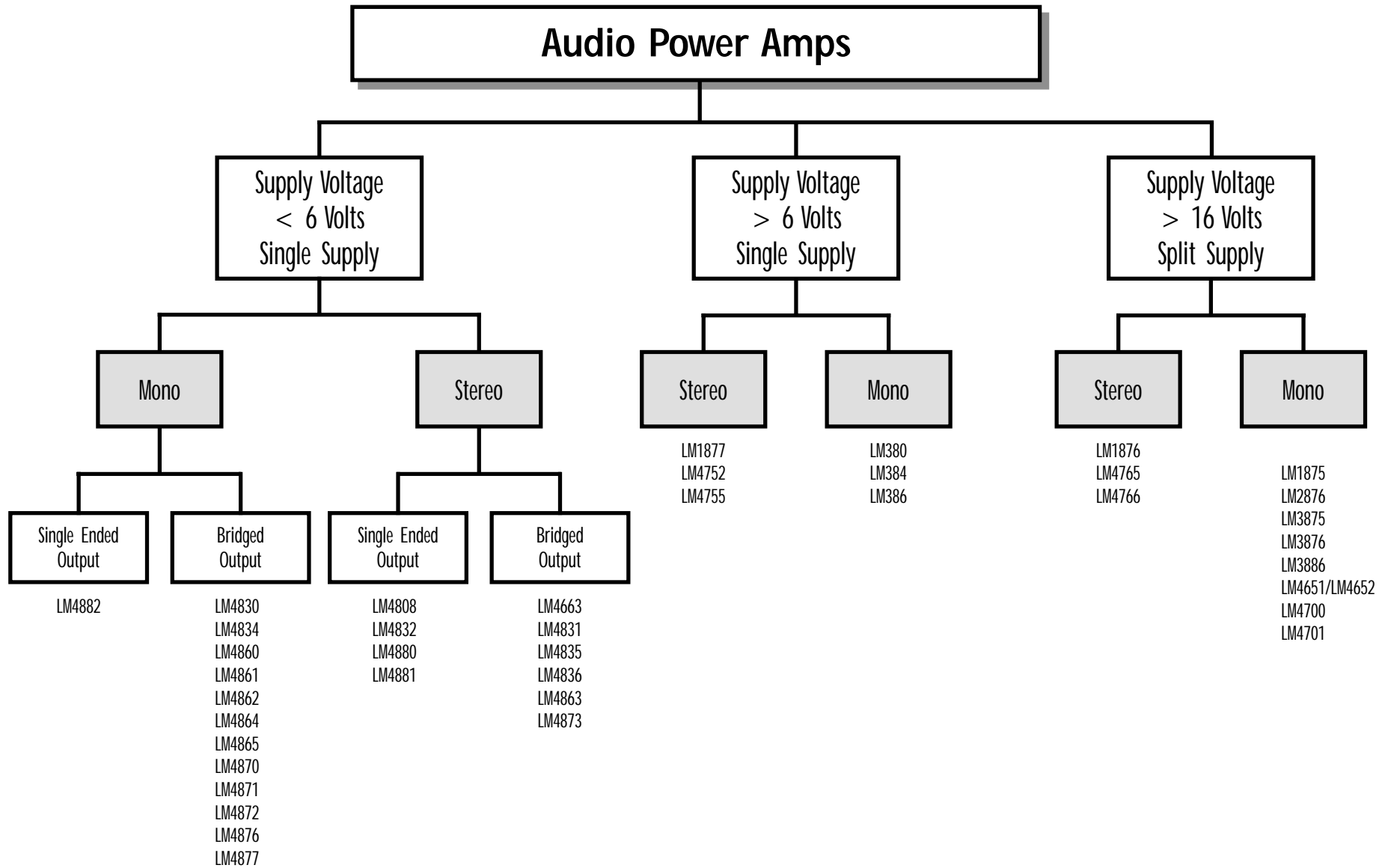
*Section 3*



## AUDIO CONTROLS

Part Number	Description	Audio Channels	Supply Range	SNR (Typ)	THD (Typ)	Separation Typ)	Package (Pin)	Comm. Interface	Price <sup>1</sup>
LM1036	Dual DC Operated Tone/ Volume Balance Circuit	2	9V-16V	80dB	.05%	75dB	Dip(20), SO(20)	DC Control	\$1.10
LM1971	Single Channel Audio Attenuator	1	4.5V-12V	115dB	.001%	NA	Dip(8), SO(8)	Serial	\$2.25
LM1972	2 Channel Digitally Controlled Audio Attenuator	2	4.5V-12V	120dB	.0008%	110dB	Dip(20), SO(20)	Serial	\$2.20
LM1973	3 Channel Digitally Controlled Audio Attenuator	3	4.5V-12V	120dB	.0008%	110dB	Dip(20), SO(20)	Serial	\$2.28
LMC1982	Digitally-Controlled Stereo Tone/Volume/Balance Control	4	6V-12V	95dB	.008%	80dB	Dip(28), PLCC(28)	Serial	\$3.75
LMC1983	Digitally-Controlled Stereo Tone/Volume/Balance Control	6	6V-12V	95dB	.008%	80dB	Dip(28), PLCC(28)	Serial	\$3.75

<sup>1</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.





AUDIO POWER AMPS

User Supply Voltage	Part Number	Power [THD ≤ 1% (Typ)] <sup>1</sup>			Power [THD ≤ 10% (Typ)] <sup>1</sup>			Typical THD Ratings	THD Measurement Conditions	Supply Range (V)	Single/Dual	Package (Pin Count)	Price <sup>4</sup>
		4 Ω	8 Ω	16 Ω	4 Ω	8 Ω	16 Ω						
3V & 5V	LM4663	2.1W	NA	NA	NA	NA	NA	0.20%	Po=1W @ V <sub>S</sub> =5V	4.5V to 5.5V	Dual	TSSOP(24)	\$3.30
	LM4808	NA	NA	105mW	NA	NA	160mW	0.05%	Po=3.5V <sub>pp</sub> @ V <sub>S</sub> =5V	2.0V to 5.5V	Dual	SOP(8) MSOP(8)	\$0.55
	LM4830	1.5W	1.15W	0.6W	2W	1.4W	0.85W	0.20%	Po=1W @ V <sub>S</sub> =5V	2.7V to 5.5V	Single	SO(24) Dip(24)	\$2.65
	LM4831	1.5W	1.1W	NA	1.9W	1.4W	NA	0.50%	Po=1W @ V <sub>S</sub> =5V	2.7V to 5.5V	Dual	TQFP(44)	\$3.75
	LM4832	0.33W	0.25W	NA	0.42W	0.33W	NA	0.15%	Po=0.22W @ V <sub>S</sub> =5V	4.5V to 5.5V	Dual	SSOP(28) DIP(28)	\$2.99
	LM4834	1.75W	1.1W	0.65W	2.2W	1.5W	0.85W	0.3%	Po=1W @ V <sub>S</sub> =5V	4.5V to 5.5V	Single/Dual	SSOP(28)	\$2.25
	LM4835	2.0W	1.1W	NA	NA	1.5W	NA	0.30%	Po=1W @ V <sub>S</sub> =5V	2.7V to 5.5V	Dual	TSSOP(28) TSSOP EXP PAD(28)	\$2.50
	LM4836	2.0W	NA	NA	NA	1.5W	NA	0.30%	Po=1W @ V <sub>S</sub> =5V	2.7V to 5.5V	Dual	TSSOP(28) TSSOP EXP PAD(28)	\$2.65
	LM4860	1.55W	1.15W	0.6W	1.9W	1.45W	0.85W	0.72%	Po=1W @ V <sub>S</sub> =5V	2.7V to 5.5V	Single	SO(16)	\$1.20
	LM4861	1.55W	1.15W	0.6W	1.9W	1.45W	0.85W	0.72%	Po=1W @ V <sub>S</sub> =5V	2.0V to 5.5V	Single	SO(8)	\$1.20
	LM4862	0.52W	0.68W	0.53W	0.69W	0.83W	0.66W	0.50%	Po=.4W @ V <sub>S</sub> =5V	2.7V to 5.5V	Single	SO(8) Dip(8)	\$0.89
	LM4863	2.2W	1.1W	0.6W	2.7W	1.5W	0.85W	0.45%	Po=.5W @ V <sub>S</sub> =5V	2.0V to 5.5V	Dual	SO(16) <sup>2</sup> Dip(16) <sup>2</sup> TSSOP(20) <sup>2</sup> TSSOPe(20)	\$2.00
	LM4864	NA	0.675W	0.55W	NA	0.84W	0.68W	0.7%	Po=.3W @ V <sub>S</sub> =5V	2.7V to 5.5V	Single	MSOP(8) <sup>2</sup> SO(8) Dip(8)	\$0.83
	LM4865	NA	750mW	NA	NA	1.0W	NA	0.60%	Po=300mW @ V <sub>S</sub> =5V	2.7V to 5.5V	Single	SOP(8) MSOP(8)	\$0.70
	LM4870	1.7W	1.18W	0.65W	2.15W	1.5W	0.85W	0.25%	Po=1W @ V <sub>S</sub> =5V	2.0V to 5.5V	Single	SO(16)	\$1.00
	LM4871	1.7W	1.18W	0.65W	2.15W	1.5W	0.85W	0.25%	Po=1W @ V <sub>S</sub> =5V	2.0V to 5.5V	Single	SO(8) Dip(8)	\$1.00
	LM4872	NA	1W	NA	NA	NA	NA	0.10%	Po=250mW @ V <sub>S</sub> =5V	2.0V to 5.5V	Single	micro SMD(8)	\$0.65
	LM4873	2.1W	1.1W	0.65W	2.6W	1.5W	0.85W	0.3%	Po=2W @ V <sub>S</sub> =5V	2.0V to 5.5V	Dual	TSSOP(20) <sup>2</sup> TSSOPe(20) <sup>2</sup> TSSOPe(28)	\$2.00
	LM4876	NA	1.1W	NA	NA	1.5W	NA	0.25%	Po=1W <sub>RMS</sub> @ 5V	2.0V to 5.5V	Single	SOP(8)	\$0.97
	LM4877	NA	1W	NA	NA	NA	NA	0.10%	Po=1W <sub>RMS</sub> @ 5V	2.0V to 5.5V	Single	micro SMD(8)	\$0.70
LM4880	0.34W	0.27W	0.17W	0.43W	0.33W	0.2W	0.03%	Po=.2W @ V <sub>S</sub> =5V	2.7V to 5.5V	Dual	SO(8) Dip(8)	\$0.76	
LM4881	NA	0.25W	0.15W	NA	0.3W	0.2W	0.04%	Po=.2W @ V <sub>S</sub> =5V	2.7V to 5.5V	Dual	MSOP(8) SO(8) Dip(8)	\$0.67	
LM4882	0.38W	0.27W	0.17W	0.43W	0.33W	0.2W	0.03%	Po=.2W @ V <sub>S</sub> =5V	2.4V to 5.5V	Single	MSOP(8) SO(8)	\$0.60	
V <sub>S</sub> =6V	LM386	0.25W	0.25W	0.15W	0.32W	0.3W	0.2W	0.25%	Po=.125W @ V <sub>S</sub> =6V	4V to 18V	Single	SO(8) Dip(8) MSOP(8)	\$0.19
12V	LM380	1.5W	1.0W	NA	2.25W	1.5W	NA	0.50%	Po=4W @ V <sub>S</sub> =22V	10V to 22V	Single	Dip(14) Dip(8)	\$0.50
	LM384	NA	NA	NA	1.75W	NA	NA	0.25%	Po=4W @ V <sub>S</sub> =22V	12V to 26V	Single	Dip(14)	\$0.88
	LM386	0.25W	0.6W	0.6W	0.35W	0.8W	0.95W	0.25%	Po=.125W @ V <sub>S</sub> =6V	4V to 18V	Single	SO(8) Dip(8) MSOP(8)	\$0.19
	LM1877	1.5W	1.0W	0.55W	1.75W	1.3W	0.75W	0.06%	Po=1W @ V <sub>S</sub> =14V	6V to 24V	Dual	Dip(14) SO(14)	\$0.80

<sup>1</sup> Power Specified as Continuous RMS

<sup>2</sup> The package doesn't support the fullpower rating. See Datasheet.

<sup>3</sup> Isolated packages available

<sup>4</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

User Supply Voltage	Part Number	Power [THD ≤ 1% (Typ)] <sup>1</sup>			Power [THD ≤ 10% (Typ)] <sup>1</sup>			Typical THD Ratings	THD Measurement Conditions	Supply Range (V)	Single/Dual	Package (Pin Count)	Price <sup>4</sup>
		4 Ω	8 Ω	16 Ω	4 Ω	8 Ω	16 Ω						
14V	LM380	2.5W	1.75W	NA	3.25W	2.25W	NA	0.20%	Po=4W @ V <sub>S</sub> =22V	10V to 22V	Single	Dip(14) Dip(8)	\$0.50
	LM384	NA	NA	NA	3.25W	NA	NA	0.25%	Po=4W @ V <sub>S</sub> =22V	12V to 26V	Single	Dip(14)	\$0.88
V <sub>S</sub> =16V	LM386	NA	0.6W	1.0W	NA	0.8W	1.6W	0.25%	Po=.125W @ V <sub>S</sub> =6V	4V to 18V	Single	SO(8) Dip(8)	\$0.19
	LM1877	2.0W	1.3W	0.85W	2.5W	1.75W	1.0W	0.06%	Po=1W @ V <sub>S</sub> =14V	6V to 24V	Dual	Dip(14) SO(14)	\$0.80
<b>20V &amp; Above</b>													
V <sub>S</sub> =±22V	LM1876	23W	20W	11W	29W	26W	14W	0.08%	Po=15W @ V <sub>S</sub> =±20V	20V to 54V	Dual	TO-220(15) <sup>3</sup>	\$1.80
V <sub>S</sub> =20V	LM1877	2.0W	2.0W	NA	2.5W	3.0W	NA	0.06%	Po=1W @ V <sub>S</sub> =14V	6V to 24V	Dual	Dip(14) SO(14)	\$0.80
V <sub>S</sub> =22V	LM380	NA	4.0W	2.5W	NA	5W	3.25W	0.20%	Po=4W @ V <sub>S</sub> =22V	10V to 22V	Single	Dip(14) Dip(8)	\$0.50
V <sub>S</sub> =26V	LM384	NA	5.5W	NA	2.5W	7W	5W	0.25%	Po=4W @ V <sub>S</sub> =22V	12V to 26V	Single	Dip(14)	\$0.88
V <sub>S</sub> =±25V	LM1875	20W	20W	NA	25W	30W	NA	0.02%	Po=20W @ V <sub>S</sub> =±25V	16V to 60V	Single	TO-220(5)	\$1.29
V <sub>S</sub> =±30V	LM2876	25W	40W	22W	35W	50W	26W	0.06%	Po=25W @ V <sub>S</sub> =±30V	20V to 60V	Single	TO-220(11) <sup>3</sup>	\$1.81
V <sub>S</sub> =±35V	LM3875	45W (V <sub>S</sub> =±25V)	56W	30W	56W (V <sub>S</sub> =±25V)	70W	39W	0.06%	Po=40W @ V <sub>S</sub> =±35V	20V to 84V	Single	TO-220(11) <sup>3</sup>	\$2.40
V <sub>S</sub> =±35V	LM3876	45W (V <sub>S</sub> =±25V)	56W	30W	56W (V <sub>S</sub> =±25V)	70W	39W	0.06%	Po=40W @ V <sub>S</sub> =±35V	20V to 84V	Single	TO-220(11) <sup>3</sup>	\$2.20
V <sub>S</sub> =±35V	LM3886	68W (V <sub>S</sub> =±28V)	63W	33W	87W (V <sub>S</sub> =±28V)	78W	41W	0.03%	Po=60W @ V <sub>S</sub> =±28V	20V to 84V	Single	TO-220(11) <sup>3</sup>	\$2.45
V <sub>S</sub> =±20V	LM4651/LM4652	135W	75W	NA	170W	90W	NA	0.30%	Po=10W @ V <sub>S</sub> =±20V	±11V to ±21V	Single/Single	DIP(24)/TO-220(15)	\$4.65/\$4.25
V <sub>S</sub> =±28V	LM4700	23W	34W	19W	29W	42W	24W	0.08%	Po=30W @ V <sub>S</sub> =28V	20V to 64V	Single	TO-220(11) <sup>3</sup>	\$1.80
V <sub>S</sub> =±28V	LM4701	23W	34W	19W	29W	42W	24W	0.08%	Po=30W @ V <sub>S</sub> =28V	20V to 64V	Single	TO-220(9)	\$1.90
V <sub>S</sub> =24V	LM4752	8W	4.8W	3W	11W	7W	4W	0.05%	Po=4.5W @ V <sub>S</sub> =24V	10V to 32V	Dual	TO220(7)	\$1.90
V <sub>S</sub> =24V	LM4755	8W	4.8W	3W	11W	7W	4W	0.05%	Po=4.5W @ V <sub>S</sub> =24V	10V to 32V	Dual	TO220(9)	\$1.90
V <sub>S</sub> =±28V	LM4765	24W	32W	18W	28W	40W	22W	0.08%	Po=30W @ V <sub>S</sub> =±28V	20V to 64V	Dual	TO220(15)	\$2.00
V <sub>S</sub> =±30V	LM4766	26W	42W	23W	37W	53W	28W	0.06%	Po=25W @ V <sub>S</sub> =±30V	20V to 60V	Dual	TO220(15)	\$2.10

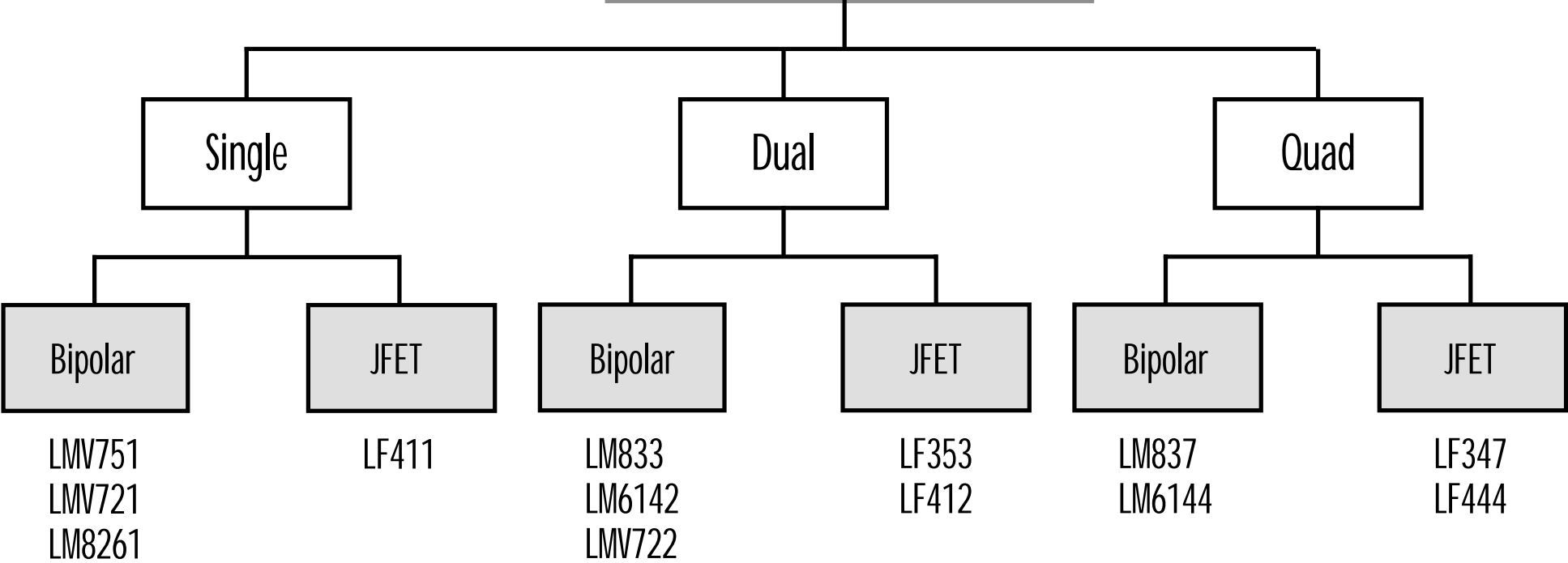
<sup>1</sup> Power Specified as Continuous RMS

<sup>2</sup> The package doesn't support the fullpower rating. See Datasheet.

<sup>3</sup> Isolated packages available

<sup>4</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# Audio Op Amps



# AUDIO

## AUDIO OP AMPS

Part Number	Description	Input Ref. Noise Voltage	THD	Slew Rate	GBW	PSRR	Supply Range	Package (Pin)	Price <sup>1</sup>
LM833	Dual Audio Amplifier	4.5nV/√Hz	0.002%	7V/μs	15MHz	100dB	±18V	SO(8), Dip(8)	\$0.32
LM837	Quad Audio Amplifier	4.5nV/√Hz	0.0015%	10V/μs	25MHz	100dB	±18V	SO(14), Dip(14)	\$0.80
LF347	Quad Wide Bandwidth JFET	20nV/√Hz	0.02%	13V/μs	4MHz	100dB	±18V	Dip(14), SO(14)	\$0.60
LF353	Dual LF351	16nV/√Hz	0.02%	13V/μs	4MHz	100dB	±18V	SO(14), Dip(14)	\$0.32
LF411	Single Low Offset, Low Drift JFET	25nV/√Hz	0.02%	15V/μs	3MHz	100dB	±18V	Dip(8), CAN(8)-Mil, CERDIP(8)	\$0.61
LF412	Dual LF411	25nV/√Hz	0.02%	15V/μs	3MHz	100dB	±18V	Dip(8), CAN(8)-Mil, CERDIP(8)	\$0.80
LF444	Low Power JFET Quad	35nV/√Hz	0.02%	1V/μs	1MHz	100dB	±18V	Dip(14), SO(14), CERDIP(14)	\$0.70
LM6142	High-Speed Low Power Dual	16nV/√Hz	0.03%	15V/μs	10MHz	87dB	1.8V to 24V	Dip(8), SO(8), CERDIP(8)	\$2.10
LM6144	High-Speed Low Power Quad	16nV/√Hz	0.03%	15V/μs	10MHz	87dB	1.8V to 24V	Dip(14), SO(14), CERDIP(8)	\$3.26
LMV751	Low Noise Low Offset Single	6.5nV/√Hz	n/a	2.3V/μs	5MHz	107dB	2.7V to 5V	SOT23(5)	\$0.65
LMV721	10MHz Low Noise Low Voltage	8.5nV/√Hz	n/a	5.3V/μs	10MHz	90dB	2.2V to 5.5V	SOT23(5), SC70(5)	\$0.59
LMV722	10MHz Low Noise Low Voltage	8.5nV/√Hz	n/a	5.3V/μs	10MHz	90dB	2.2V to 5.5V	MSOP(8), SOIC(8)	\$0.76
LM8261	Single RRIO High Current High Capacitive Load	15nV/√Hz	0.05%	15V/μs	24MHz	104dB	2.5V to 30V	SOT23(5)	\$1.00

<sup>1</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# Integrated Audio Systems

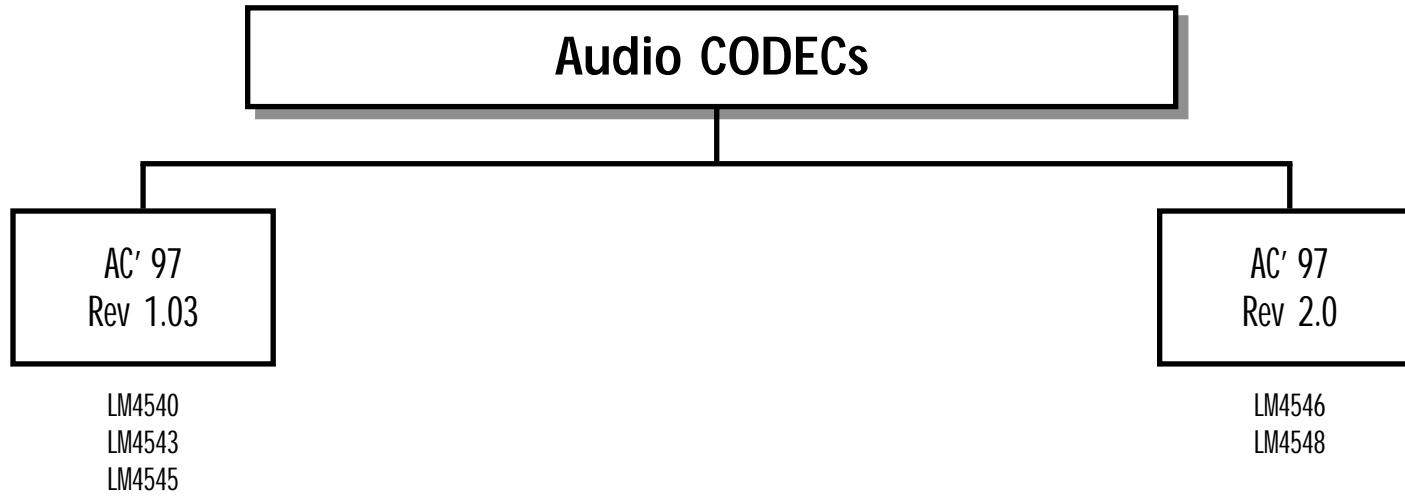
LM4830  
LM4831  
LM4832  
LM4834

## INTEGRATED AUDIO SYSTEM

Part Number	Applications	Features	Audio Channels	Supply Range	Package (Pin)	Control/Interface	Price <sup>1</sup>
LM4830	Two-way Audio Amplification System w/Volume Control	Volume Control (Parallel), Mono Boomer Power Amp, Headphone Driver, Microphone Pre-amp, Low Power Shutdown Mode	2 Microphone Inputs, 1 Output	2.7V to 5.5V	SO(24), DIP(24)	Parallel	\$2.65
LM4831	Desktop Audio Systems	Stereo 1.1W Boomer Power Amp, Headphone Amp and Line Out, 3 Stereo Input Mixing, Microphone Amp, Low Power Shutdown Mode	3 Stereo Input, Microphone In and Out, Stereo Line Out, Stereo BTL or SEL Power Amp	2.7V to 5.5V	TQFP(44)	Parallel	\$3.75
LM4832	Integrated Multimedia Audio System	Tone & Volume Controls, Stereo Boomer Power Amp, Microphone Pre-amp, 3D Sound Mode, Low Power Shutdown Mode	Stereo Input, Stereo Power Amp, 2 Microphone Inputs, 1 Microphone Output	4.5V to 5.5V	SO(28), DIP(28)	I <sup>2</sup> C	\$2.99
LM4834	PC Audio System	DC Volume Control, Stereo Headphone Driver, Stereo Line Out, Mono Boomer Power Amp, Mic Pre-amp, Low Power Shutdown Mode	Stereo Line Input & Output, 1 Mic Input & Output, 1 BTL Power Amp, Stereo Headphone Out	4.5V to 5.5V	SSOP(28)	DC	\$2.25

<sup>1</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# AUDIO



## AUDIO CODECs

Part Number	AC '97 Rev	3.3V, 5V Digital	SRC	EAPD	Headphone Amp	5.1 Channels Support	2nd Line Out	Video In	Secondary Line Volume Control	Aux In	Multiple CODEC	Analog 3D	Price <sup>1</sup>
LM4540	1.03	√										√	\$3.50
LM4543	1.03	√						√		√		√	\$4.00
LM4545	1.03	√			√		√	√	√	√		√	\$4.50
LM4546	2.0	√	√									√	\$4.00
LM4548	2.0	√	√				√	√	√	√	√	√	\$4.50

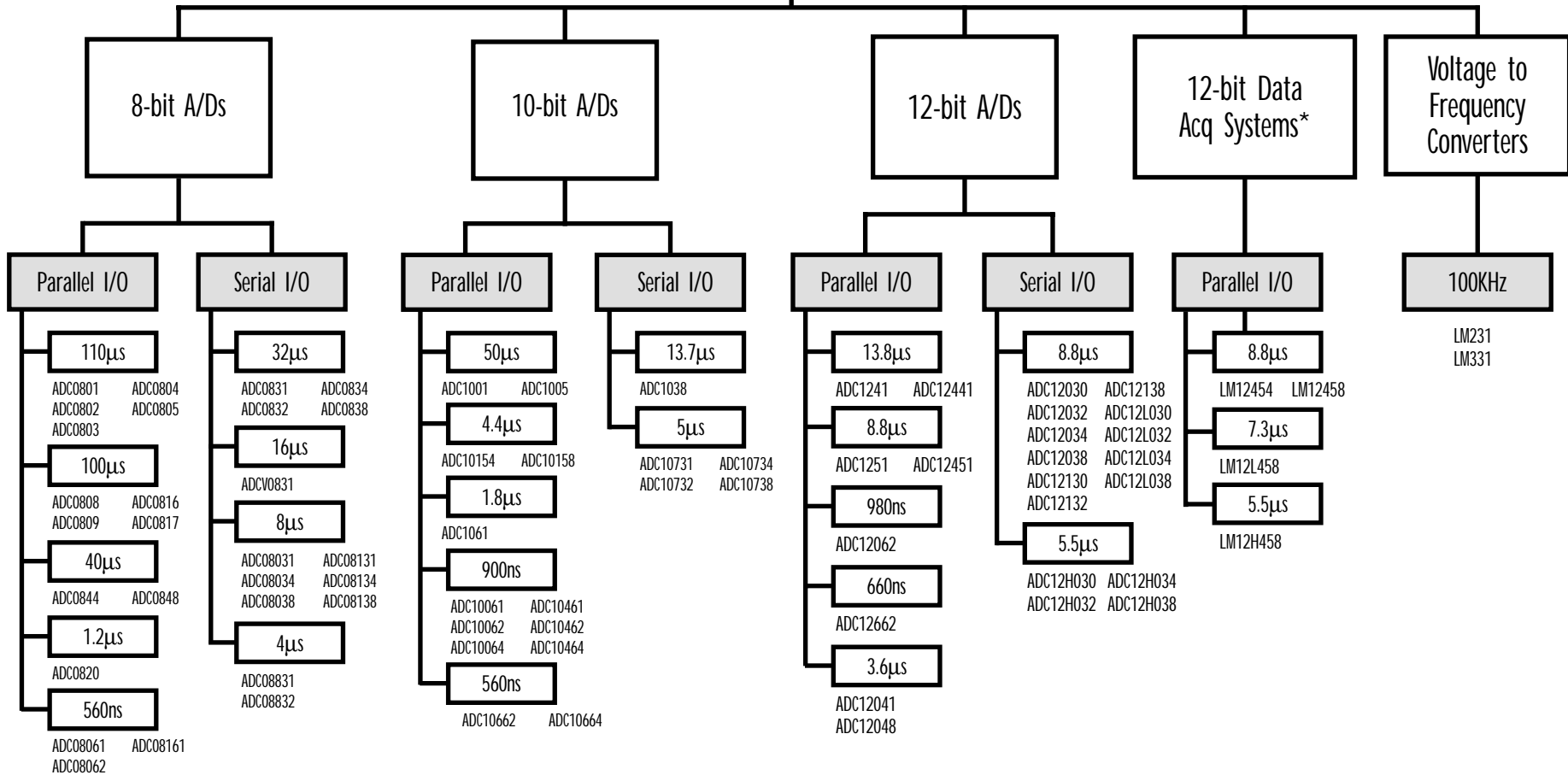
<sup>1</sup>1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
Price may vary by package or grade.

# DATA CONVERSION

*Section 4*

# DATA CONVERSION

## General Purpose/Industrial Analog-to-Digital Converters



\* Products classified as Data Acquisition Systems are configurable to execute multiple conversions without microprocessor intervention. Typically they include on-board FIFO for result storage and sequencing capabilities not found on conventional A/D Converters.



## GENERAL PURPOSE/INDUSTRIAL ANALOG-TO-DIGITAL CONVERTERS

Part Number	I/O Type	Resolution (bits)	Conv. Time (max)	Accuracy (max)	# Mux Inputs	S/H	On-Board Reference	Supply Voltage	Temp Range	Power (max)	Pkg.	Comments	Price <sup>1</sup>
<b>8 - B I T</b>													
ADC0801	Parallel	8	110µs	±1/4 LSB	1	N	N	+5V	C	9mW	N	Differential Input	\$5.85
ADC0802	Parallel	8	110µs	±1/2 LSB	1	N	N	+5V	C	9mW	N, WM	Differential Input	\$3.18
ADC0803	Parallel	8	110µs	±1/2 LSB	1	N	N	+5V	C	9mW	N	Differential Input	\$2.50
ADC0804	Parallel	8	110µs	±1 LSB	1	N	N	+5V	C	12.5mW	N, WM	Differential Input	\$1.35
ADC0805	Parallel	8	110µs	±1 LSB	1	N	N	+5V	C	9mW	N	Ratiometric Operation	\$2.12
ADC0808	Parallel	8	100µs	±1/2 LSB	8	N	N	+5V	C	15mW	N, V		\$2.70
ADC0809	Parallel	8	100µs	±1 LSB	8	N	N	+5V	C	15mW	N, V		\$2.39
ADC0816	Parallel	8	100µs	±1/2 LSB	16	N	N	+5V	C	15mW	N		\$7.50
ADC0817	Parallel	8	100µs	±1 LSB	16	N	N	+5V	C	15mW	N		\$4.61
ADC0844B	Parallel	8	40µs	±1/2 LSB	4	N	N	+5V	C	13mW	J		\$7.75
ADC0844C	Parallel	8	40µs	±1 LSB	4	N	N	+5V	C	13mW	J, N		\$2.13
ADC0848B	Parallel	8	40µs	±1/2 LSB	8	N	N	+5V	C	13mW	N, V		\$3.06
ADC0848C	Parallel	8	40µs	±1 LSB	8	N	N	+5V	C	13mW	N, V		\$2.34
ADC0831C	Serial	8	32µs	±1 LSB	1	N	N	+5V	C	15mW	N, WM		\$1.22
ADC0832C	Serial	8	32µs	±1 LSB	2	N	N	+5V	C, I	32mW	N, WM		\$1.41
ADC0834C	Serial	8	32µs	±1 LSB	4	N	N	+5V	C,	15mW	WM		\$1.62
ADC0834BC	Serial	8	32µs	±1/2 LSB	4	N	N	+5V	C,	15mW	N		\$1.87
ADC0838B	Serial	8	32µs	±1/2 LSB	8	N	N	+5V	C	15mW	V		\$2.58
ADC0838C	Serial	8	32µs	±1 LSB	8	N	N	+5V	C, I	15mW	N, WM		\$1.40
ADC08031C	Serial	8	8µs	±1 LSB	1	Y	Y	+5V	C, I	20mW	N, M		\$2.63
ADC08034C	Serial	8	8µs	±1 LSB	4	Y	Y	+5V	I	20mW	WM		\$2.78
ADC08038C	Serial	8	8µs	±1 LSB	8	Y	Y	+5V	I	20mW	N, M		\$3.26
ADC08131C	Serial	8	8µs	±1 LSB	1	Y	Y	+5V	I	20mW	M	Guaranteed Reference O/P	\$3.00
ADC08134C	Serial	8	8µs	±1 LSB	4	Y	Y	+5V	I	20mW	N, M	Guaranteed Reference O/P	\$3.26
ADC08138C	Serial	8	8µs	±1 LSB	8	Y	Y	+5V	I	20mW	N, M	Guaranteed Reference O/P	\$3.62
ADC0820B	Parallel	8	1.2µs	±1/2 LSB	1	N	Y	+5V	C	75mW	N, WM, V		\$3.03
ADC0820C	Parallel	8	1.2µs	±1 LSB	1	N	Y	+5V	C	75mW	N, WM		\$1.60
ADC08061B	Parallel	8	560ns	±1/2 LSB	1	N	Y	+5V	I	100mW	N, M	High speed upgrade for ADC0820	\$7.55
ADC08061C	Parallel	8	560ns	±1 LSB	1	N	Y	+5V	I	100mW	N, M	High speed upgrade for ADC0820	\$4.41
ADC08062B	Parallel	8	560ns	±1/2 LSB	2	N	Y	+5V	I	100mW	N, M		\$11.80
ADC08062C	Parallel	8	560ns	±1 LSB	2	N	Y	+5V	I	100mW	N, M		\$7.80
ADC08161B	Parallel	8	560ns	±1/2 LSB	1	N	Y	+5V	I	100mW	N, M	ADC08061 with on-board reference	\$8.30
ADC08161C	Parallel	8	560ns	±1 LSB	1	N	Y	+5V	I	100mW	N, M	ADC08061 with on-board reference	\$4.67
ADC08831	Serial	8	4µs	±1 LSB	1	Y	N	+5V	I	5.5mW	MM, WM	2MHz clock frequency	\$0.95
ADC08832	Serial	8	4µs	±1 LSB	2	Y	N	+5V	I	6.5mW	MM, WM	2MHz clock frequency	\$0.95
ADCV0831	Serial	8	16µs	±1.5 LSB	1	Y	N	2.7V to +5V	C	720µW	M6	10nA shutdown supply current	\$1.22

**Package Codes:**

H = Metal Can	M, MS, MSA = SSOP	V = PLCC
J = Cerdip	M6 = SOT-23	VF = PQFP
M = Small Outline	N = Plastic Dip	WM = Small Outline

**Temperatures:**

C = 0°C to +70°C  
 I = -25°C to +85°C or -40°C to +85°C  
 M = -55°C to +125°C

**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
 Price may vary by package or grade.

# DATA CONVERSION

## GENERAL PURPOSE/INDUSTRIAL ANALOG-TO-DIGITAL CONVERTERS

Part Number	I/O Type	Resolution (bits)	Conv. Time (max)	Accuracy (max)	# Mux Inputs	S/H	On-Board Ref.	Supply Volt.	Temp Range	Power (max)	Pkg.	Comments	Price <sup>1</sup>
<b>10 - B I T</b>													
ADC1001	Byte-Wide	10	200 $\mu$ s	$\pm 2$ LSB	1	N	N	+5V	C, I	25mW	J		\$11.90
ADC1005B	Byte-wide	10	50 $\mu$ s	$\pm 1/2$ LSB	1	N	N	+5V	C	15mW	J		\$19.40
ADC1005C	Byte-wide	10	50 $\mu$ s	$\pm 1$ LSB	1	N	N	+5V	C	15mW	J		\$8.25
ADC1038	Serial	10	13.7 $\mu$ s	$\pm 1$ LSB	8	N	Y	+5V	I	15mW	WM		\$3.42
ADC10731	Serial	10 + sign	5 $\mu$ s	$\pm 1$ LSB	1	Y	Y	+5V	I	37mW	N, M	Software power-down to 18 $\mu$ W	\$3.89
ADC10732	Serial	10 + sign	5 $\mu$ s	$\pm 1$ LSB	2	Y	Y	+5V	I	37mW	N, M	Software power-down to 18 $\mu$ W	\$5.15
ADC10734	Serial	10 + sign	5 $\mu$ s	$\pm 1$ LSB	4	Y	Y	+5V	I	37mW	N, M	Software power-down to 18 $\mu$ W	\$4.87
ADC10738	Serial	10 + sign	5 $\mu$ s	$\pm 1$ LSB	8	Y	Y	+5V	I	37mW	N, M	Software power-down to 18 $\mu$ W	\$4.37
ADC10154	Byte-wide	10 + sign	4.4 $\mu$ s	$\pm 1$ LSB	4	Y	Y	+5V, $\pm 5V$	I	33mW	N, M		\$6.75
ADC10158	Byte-wide	10 + sign	4.4 $\mu$ s	$\pm 1$ LSB	8	Y	Y	+5V, $\pm 5V$	I	33mW	N, M		\$7.10
ADC1061	Parallel	10	1.8 $\mu$ s	$\pm 2$ LSB	1	N	Y	+5V	I	235mW	N, M		\$5.65
ADC10061C	Parallel	10	900ns	$\pm 1.5$ LSB	1	N	Y	+5V	I	235mW	N, M	1MS/s throughput	\$6.15
ADC10062C	Parallel	10	900ns	$\pm 1.5$ LSB	2	N	Y	+5V	I	235mW	N, M	1MS/s throughput	\$6.45
ADC10064C	Parallel	10	900ns	$\pm 1.5$ LSB	2	N	Y	+5V	I	235mW	N, M	1MS/s throughput	\$6.80
ADC10461	Parallel	10	900ns	$\pm 1$ LSB	1	N	Y	+5V	I	235mW	N, M	AC tested version of ADC10061	\$6.05
ADC10462	Parallel	10	900ns	$\pm 1$ LSB	2	N	Y	+5V	I	235mW	N, M	AC tested version of ADC10062	\$6.30
ADC10464	Parallel	10	900ns	$\pm 1$ LSB	4	N	Y	+5V	I	235mW	N, M	AC tested version of ADC10064	\$6.35
ADC10662	Parallel	10	466ns	$\pm 1.5$ LSB	2	N	Y	+5V	I	235mW	N, M	AC Tested, 2MS/s throughput	\$11.40
ADC10664	Parallel	10	466ns	$\pm 1.5$ LSB	4	N	Y	+5V	I	235mW	N, M	AC Tested, 2MS/s throughput	\$11.70

**Package Codes:** M = Small Outline V = PLCC  
H = Metal Can MS = SSOP VF = PQFP  
J = Cerdip N = Plastic Dip WM = Small Outline

**Temperatures:** C = 0°C to +70°C  
I = -25°C to +85°C or -40°C to +85°C  
M = -55°C to +125°C

**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
Price may vary by package or grade.

**GENERAL PURPOSE/INDUSTRIAL ANALOG-TO-DIGITAL CONVERTERS**

Part Number	I/O Type	Resolution (bits)	Conv. Time (max)	Accuracy (max)	# Mux Inputs	S/H	On-Board Ref.	Supply Volt.	Temp Range	Power (max)	Pkg.	Comments	Price <sup>1</sup>
<b>12 - B I T</b>													
ADC1241	Parallel	12 + sign	13.8μs	±1 LSB	1	N	Y	+5V, ±5V	I	70mW	J	Self Calibrating	\$7.65
ADC12441	Parallel	12 + sign	13.8μs	±1 LSB	1	N	Y	+5V, ±5V	I	70mW	J	AC Tested	\$7.25
ADC12030	Serial	12 + sign	8.8μs	±1 LSB	2	N	Y	+5V	I	33mW	N, M	Software power-down to 100μW	\$5.30
ADC12032	Serial	12 + sign	8.8μs	±1 LSB	2	N	Y	+5V	I	33mW	N, M	Software power-down to 100μW	\$4.68
ADC12034	Serial	12 + sign	8.8μs	±1 LSB	4	N	Y	+5V	I	33mW	N, M	Software power-down to 100μW	\$4.90
ADC12038	Serial	12 + sign	8.8μs	±1 LSB	8	N	Y	+5V	I	33mW	N, M	Software power-down to 100μW	\$5.15
ADC12038EVAL	Serial	12 + sign	8.8μs		8		N	+5V				Evaluation Kit	\$150.00
ADC12130	Serial	12 + sign	8.8μs	±2 LSB	2	N	Y	3.3V/+5V	I	33mW	N, M	Software power-down to 100μW	\$3.30
ADC12132	Serial	12 + sign	8.8μs	±2 LSB	2	N	Y	3.3V/+5V	I	33mW	MS	Software power-down to 100μW	\$3.40
ADC12138	Serial	12 + sign	8.8μs	±2 LSB	8	N	Y	3.3V/+5V	I	33mW	N, M, MS	Software power-down to 100μW	\$3.59
ADC12L030	Serial	12 + sign	8.8μs	±1 LSB	2	N	Y	+5V	I	15mW	N, M	Software power-down to 40μW	\$4.68
ADC12L032	Serial	12 + sign	8.8μs	±1 LSB	2	N	Y	+5V	I	15mW	N, M	3V Guaranteed Operation	\$4.68
ADC12L034	Serial	12 + sign	8.8μs	±1 LSB	4	N	Y	+5V	I	15mW	N, M	3V Guaranteed Operation	\$4.90
ADC12L038	Serial	12 + sign	8.8μs	±1 LSB	8	N	Y	+5V	I	15mW	N, M	3V Guaranteed Operation	\$5.15
ADC12451	Byte-wide	12 + sign	7.7μs	±1 LSB	1	N	Y	+5V, ±5V	I	113mW	J	AC Tested	\$9.00
ADC1251	Byte-wide	12 + sign	7.7μs	±1 LSB	1	N	Y	+5V, ±5V	I	113mW	J	Self Calibrating	\$9.00
ADC12H030	Serial	12 + sign	5.5μs	±1 LSB	2	N	Y	+5V	I	36mW	N, M	Software power-down to 100μW	\$5.50
ADC12H032	Serial	12 + sign	5.5μs	±1 LSB	2	N	Y	+5V	I	36mW	N, M	Software power-down to 100μW	\$5.50
ADC12H034	Serial	12 + sign	5.5μs	±1 LSB	4	N	Y	+5V	I	36mW	N, M	Software power-down to 100μW	\$6.60
ADC12H038	Serial	12 + sign	5.5μs	±1 LSB	8	N	Y	+5V	I	36mW	N, M	Software power-down to 100μW	\$6.10
ADC12041	Parallel	12 + sign	3.6μs	±1 LSB	1	Y	N	+5V	I	33mW	MS, V	Self Calibrating	\$6.75
ADC12048	Parallel	12 + sign	3.6μs	±1 LSB	8	Y	N	+5V	I	34mW	VF, V	Self Calibrating	\$7.25
LM12048EVAL	Parallel	12 + sign	3.6μs	±1 LSB	8	Y	Y	+5V				Evaluation Kit	
ADC12062B	Parallel	12	980ns	±1 LSB	2	N	Y	+5V	I	75mW	V, VF		\$25.90
ADC12062EVAL	Parallel	12	980ns		2		N	+5V				Evaluation Kit	\$148.00
ADC12062C	Parallel	12	980ns	±11/2 LSB	2	N	Y	+5V	I	75mW	V, VF		\$5.50
ADC12662	Parallel	12	660ns	±11/2 LSB	2	N	Y	+5V	I	200mW	V, VF		\$6.50
LM12454	Parallel	12 + sign	8.8μs	±1 LSB	4	Y	Y	+5V	I	30mW	V	On-board Timer, FIFO, and Sequencer	\$13.10
LM12458	Parallel	12 + sign	8.8μs	±1 LSB	8	Y	Y	+5V	I, M	30mW	V, VF, EL	On-board Timer, FIFO, and Sequencer	\$13.10
LM12458EVAL	Parallel	12 + sign	5.5μs		4.8		Y	+5V			V, VF	Evaluation Kit	\$148.00
LM12L458	Parallel	12 + sign	7.3μs	±1 LSB	8	Y	Y	+3.3V	I	15mW	V	Self Calibrating	\$14.90
LM12H458	Parallel	12 + sign	5.5μs	±1 LSB	8	Y	Y	+5V	I	34mW	V, VF, EL	Self Calibrating	\$15.50
LM231	Frequency	V-F	N/A	0.01%	1	N	N/A	+5V to +40V	I	30mW	N	V to F Converter, 100kHz Max	\$3.44
LM331	Frequency	V-F	N/A	0.01%	1	N	N/A	+5V to +40V	I	30mW	N	V to F Converter, 100kHz Max	\$1.51
LM331A	Frequency	V-F	N/A	0.01%	1	N	Y	+5V to +40V	I	30mW	N	V to F Converter, 100kHz Max	\$3.61

**Package Codes:**

EL = Cerquad      M = Small Outline      V = PLCC  
H = Metal Can      MS = SSOP              VF = PQFP  
J = Cerdip          N = Plastic Dip        WM = Small Outline

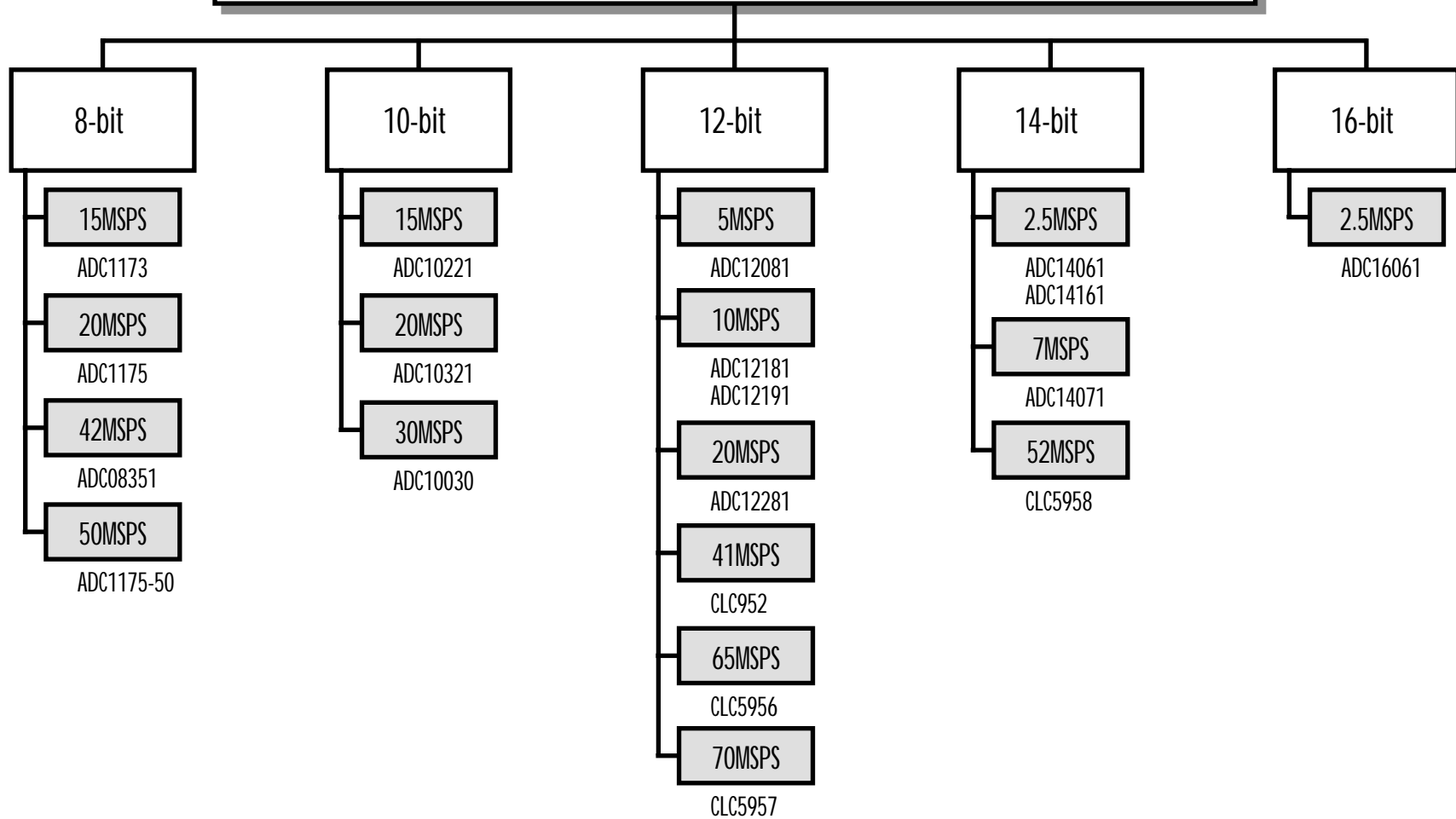
**Temperatures:**

C = 0°C to +70°C  
I = -25°C to +85°C or -40°C to +85°C  
M = -55°C to +125°C

**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.

Price may vary by package or grade.

## High-Speed Analog-to-Digital Converters



## HIGH-SPEED ANALOG-TO-DIGITAL CONVERTERS

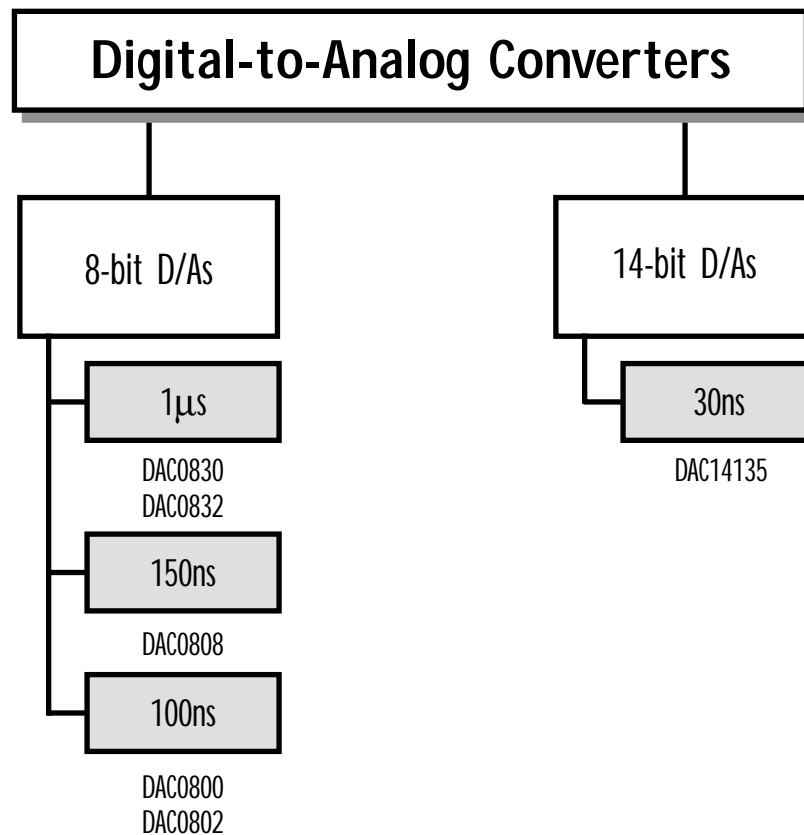
Part Number	Supply	Power	V <sub>in</sub>	Resolution Bits	Speed MSPS	Static Perf.			Dynamic Characteristics					Board	Package	Price <sup>1</sup>
						INL	DNL	ENOB	SINAD	SNR	THD	SFDR				
ADC08351	3V	40mW	2V <sub>pp</sub>	8-Bit	42MSPS	±0.7	±0.6	7.2 Bits	45dB	45dB	-51dB	54dB	No	WM, LQA	\$2.05	
ADC1173	3V	33mW	2V <sub>pp</sub>	8-Bit	15MSPS	±0.5	±0.4	7.6 Bits	46dB	48dB	-54dB	51dB	Yes	MS, JM	\$2.20	
ADC1175	5V	60mW	2V <sub>pp</sub>	8-Bit	20MSPS	±0.5	±0.35	7.2 Bits	45dB	45dB	-52dB	48dB	Yes	MS, JM	\$2.60	
ADC1175-50	5V	125mW	2V <sub>pp</sub>	8-Bit	50MSPS	±0.8	±0.7	7.2 Bits	45dB	45dB	-54dB	56dB	Yes	MS, JM, LQA	\$3.95	
ADC10030	5V	125mW	2V <sub>pp</sub>	10-Bit	30MSPS	±0.45	±0.4	9.9 Bits	60dB	60dB	-72dB	73dB	Yes	VF	\$4.50	
ADC10221	5V	98mW	2V <sub>pp</sub>	10-Bit	15MSPS	±0.45	±0.35	9.6 Bits	60dB	60dB	-70dB	72dB	Yes	VF	\$2.40	
ADC10321	5V	98mW	2V <sub>pp</sub>	10-Bit	20MSPS	±1.0	±0.5	9.2 Bits	57dB	56dB	-56dB	62dB	Yes	VF	\$2.80	
ADC12081	5V	105mW	2V <sub>pp</sub>	12-Bit	5MSPS	±0.6	±0.35	10.9 Bits	67.6dB	68dB	-79dB	79dB	Yes	VF	\$6.00	
ADC12181	5V	235mW	2V <sub>pp</sub>	12-Bit	10MSPS	±0.7	±0.4	10.4 Bits	64.5dB	65dB	-74dB	73dB	Yes	VF	\$9.00	
ADC12191	5V	235mW	2V <sub>pp</sub>	12-Bit	10MSPS	±0.7	±0.4	10 Bits	62dB	63dB	-72dB	71dB	Yes	VF	\$5.60	
ADC12281	5V	443mW	2V <sub>pp</sub>	12-Bit	20MSPS	±1.0	±0.4	10.5 Bits	65dB	65.5dB	-76dB	75dB	Yes	VF	\$13.00	
CLC952	+5V/-5V	660mW	1V <sub>pp</sub>	12-Bit	41MSPS	±3	±1.4	10.2 Bits	63.2dB	64dB	-70dB	67dB	Yes	MS	\$25.40	
CLC956	5V	615mW	2V <sub>pp</sub>	12-Bit	65MSPS	±1.7	±0.65	10.5 Bits	65.5dB	66dB	-71dB	70dB	Yes	MS	\$18.50	
CLC957	5V	640mW	2V <sub>pp</sub>	12-Bit	70MSPS	±1.5	±0.65	10.5 Bits	65.5dB	67dB	-71dB	74dB	Yes	MS	\$19.90	
ADC14061	5V	390mW	2V <sub>pp</sub> (Diff)	14-Bit	2.5MSPS	±0.75	±0.3	12.8 Bits	79dB	80dB	-88dB	90dB	Yes	VF	\$20.00	
ADC14161	5V	390mW	2V <sub>pp</sub> (Diff)	14-Bit	2.5MSPS	±0.75	±0.3	12.8 Bits	79dB	80dB	-88dB	90dB	Yes	VF	\$21.00	
ADC14071	5V	380mW	2V <sub>pp</sub> (Diff)	14-Bit	7MSPS	±2.1	±1.0	12.7 Bits	78dB	80dB	-83dB	86dB	Yes	VF	\$23.00	
CLC958	5V	1330mW	2V <sub>pp</sub>	14-Bit	52MSPS	±1.5	±0.3	11.2 Bits	69dB	70dB	-83dB	90dB	Yes	C	\$35.00	
ADC16061	5V	390mW	2V <sub>pp</sub> (Diff)	16-Bit	2.5MSPS	±3	±1.0	12.8 Bits	79dB	80dB	-88dB	92dB	Yes	VF	\$30.00	

**Temperatures:** C = 0°C to +70°C  
 I = -25°C to +85°C or -40°C to +85°C  
 M = -55°C to +125°C

**Package Codes:**  
 C = CSP  
 JM = Small Outline Type II  
 LQA = LLP  
 MS = SSOP  
 VF = PQFP  
 WM = Small Outline

**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
 Price may vary by package or grade.

# DATA CONVERSION



## DIGITAL-TO-ANALOG CONVERTERS

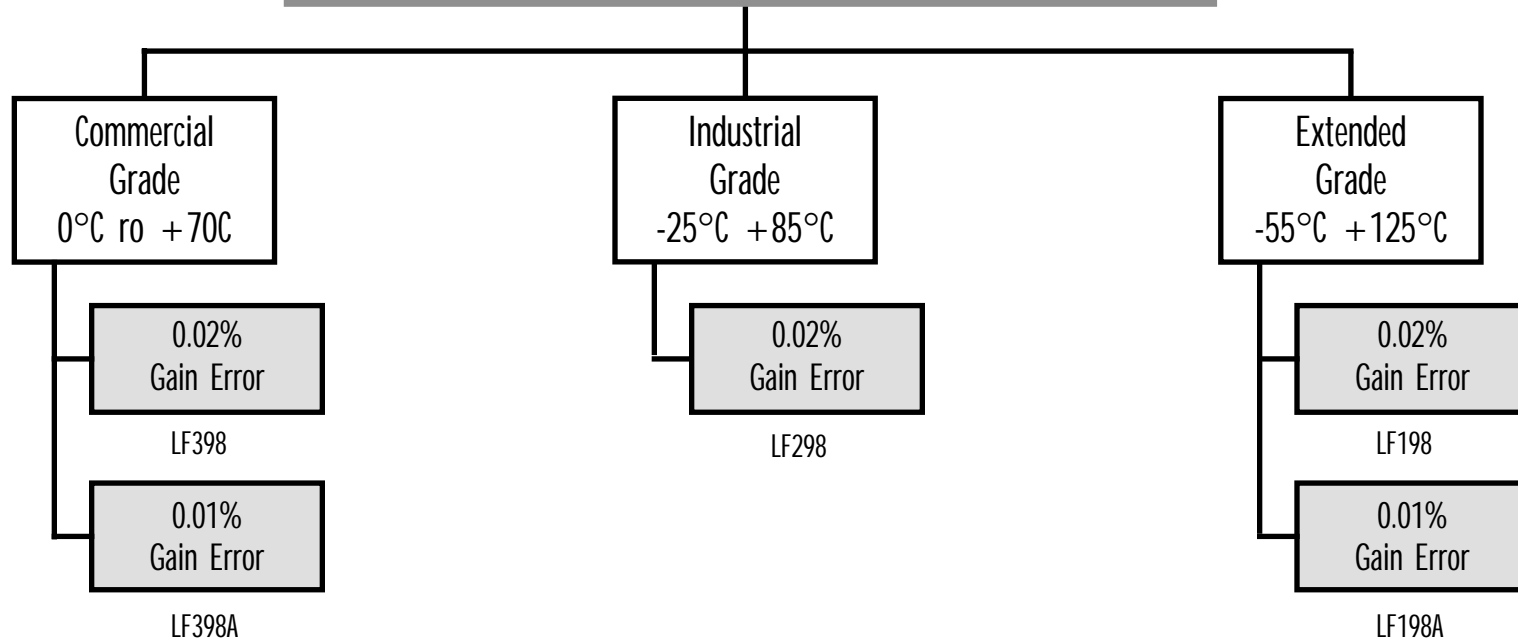
Part Number	Resolution (bits)	Linearity % (max)	Settling Time (max)	Voltage Supply	Temp Range	Packages	Comments	Price <sup>1</sup>
DAC0800	8	0.19	100ns	±5 to ±15V	C	N, M	High Speed Multiplying	\$0.69
DAC0802	8	0.1	100ns	±5 to ±15V	C	N, M	High Speed Multiplying	\$1.34
DAC0808	8	0.19	150ns	±5 to ±15V	C	N, M	Multiplying	\$0.81
DAC0830	8	0.05	1µs	+5 to +15V	C	N	4-Quadrant Multiplying	\$2.99
DAC0832	8	0.2	1µs	+5 to +15V	C	N, WM, V	4-Quadrant Multiplying	\$1.39
DAC14135	14	0.01 (typ)	30ns (typ)	+3.3 to +5V	I	MS	High Speed, Wide Dynamic Range	\$9.75

**Package Codes:**  
 H = Metal Can  
 J = Cerdip  
 M = Small Outline  
 MS = SSOP  
 N = Plastic Dip  
 V = PLCC  
 VF = PQFP  
 WM = Small Outline

**Temperatures:**  
 C = 0°C to +70°C  
 I = -25°C to +85°C or -40°C to +85°C  
 M = -55°C to +125°C

**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
 Price may vary by package or grade.

# Sample-and-Hold Amplifiers



## SAMPLE-AND-HOLD AMPLIFIERS

Part Number	Input Offset Voltage (max)	Gain Error (max)	Hold Step (max)	PSRR (min)	Temp Range	Packages	Comments	Price <sup>1</sup>
LF198	5mV	0.02%	2.0mV	80dB	M	H		\$7.15
LF198A	5mV	0.01%	1.0mV	90dB	M	H	High Accuracy	\$8.65
LF298	5mV	0.02%	2.0mV	80dB	I	H, M		\$3.19
LF398	10mV	0.02%	2.5mV	80dB	C	H, M, N		\$1.23
LF398A	10mV	0.01%	1.0mV	90dB	C	H	High Accuracy	\$4.20

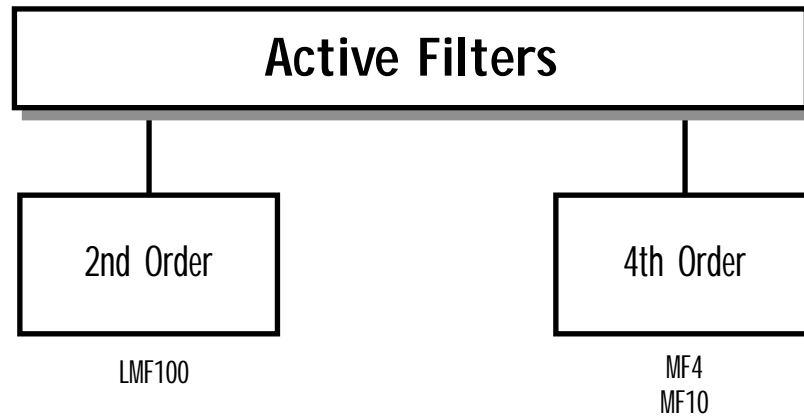
**Package Codes:**

- H = Metal Can
- M = Small Outline
- N = Plastic Dip

**Temperatures:** C = 0°C to +70°C  
 I = -25°C to +85°C  
 M = -55°C to +125°C

**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
 Price may vary by package or grade.

# DATA CONVERSION



## ACTIVE FILTERS

Part Number	Supply Voltage Range	Type	Function	Packages	Max Order	Temp Range	Max Freq. Accuracy	Freq. Range	Comments	Price <sup>1</sup>
MF4	4 to 15V	Lowpass	Butterworth	N	4th	C	±0.6%	0.1 to 20kHz		\$0.77
MF10	4 to 15V	Universal	Universal	N, WM	4th	C	±0.6%	0.1 to 30kHz	Dual	\$1.65
LMF100	4 to 15V	Universal	Universal	N, WM	2nd	C, I	±0.6%	0.1 to 100kHz	Dual High Performance	\$2.67

### Package Codes:

WM = Small Outline (wide)  
N = Plastic Dip

Temperatures: C = 0°C to +70°C  
I = -25°C to +85°C

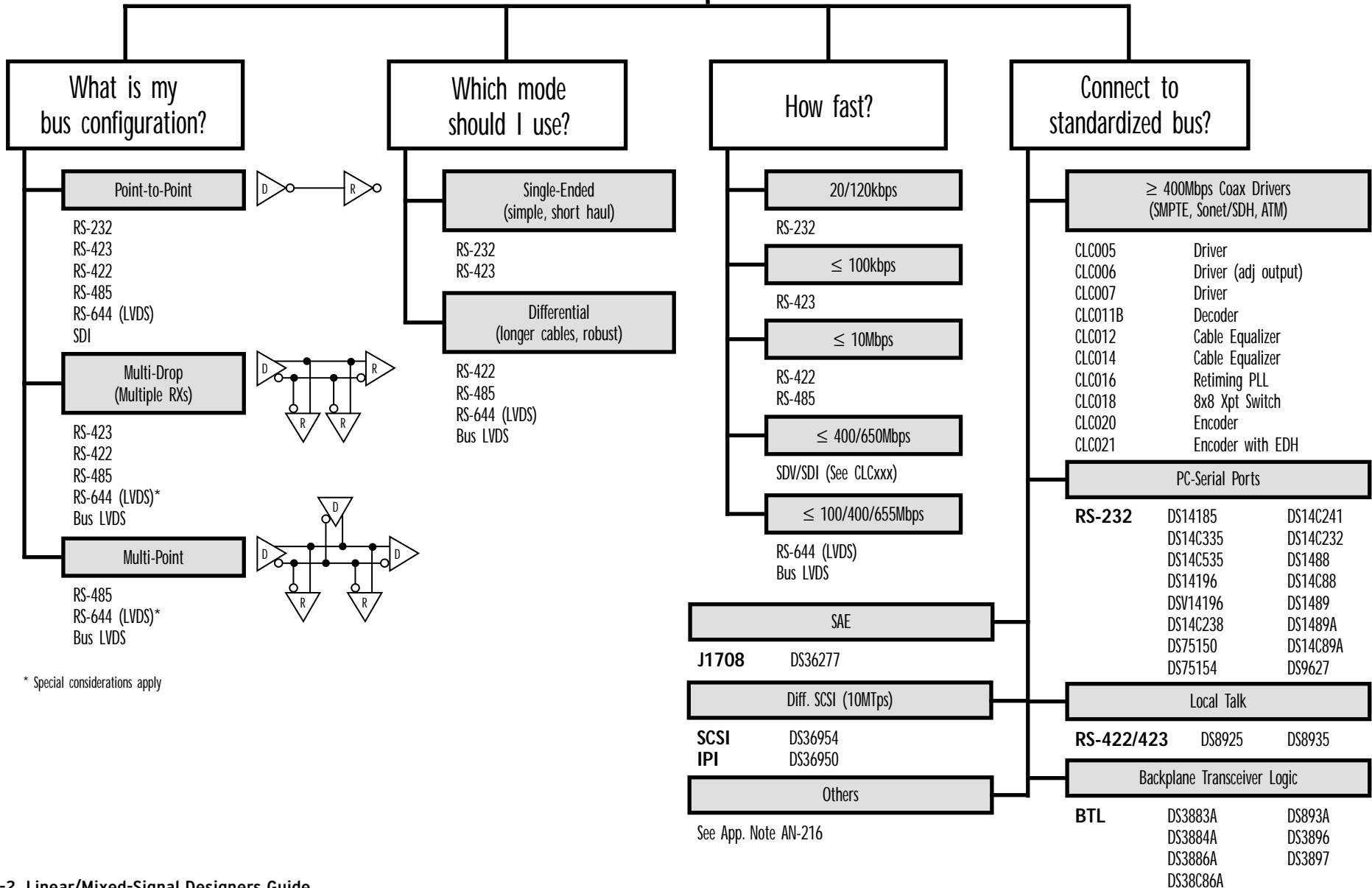
**Note 1:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
Price may vary by package or grade.



# INTERFACE

## *Section 5*

## How to Select the Best Recommended Standard



# How to Select the Best LVDS Product for Your Application

What is My Power Supply Voltage?

Serializers

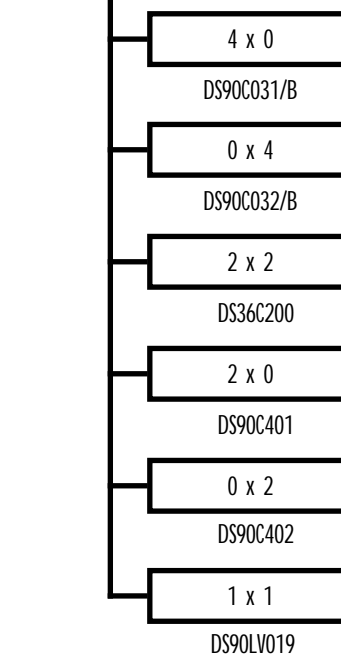
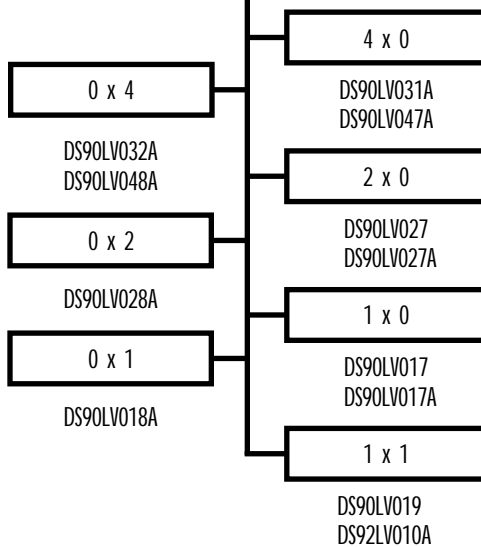
See LVDS Channel Link  
and Bus LVDS

3.3V

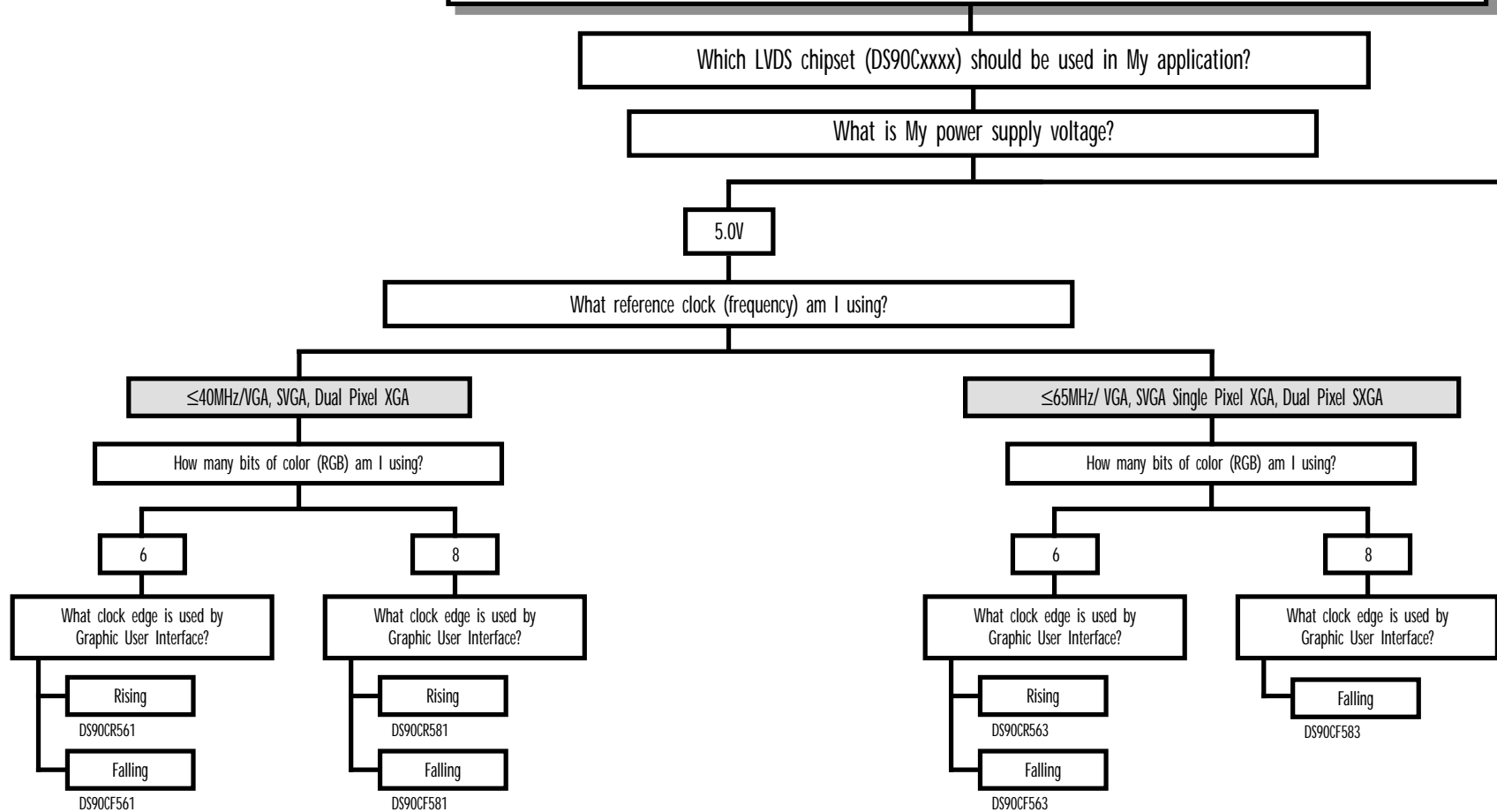
5.0V

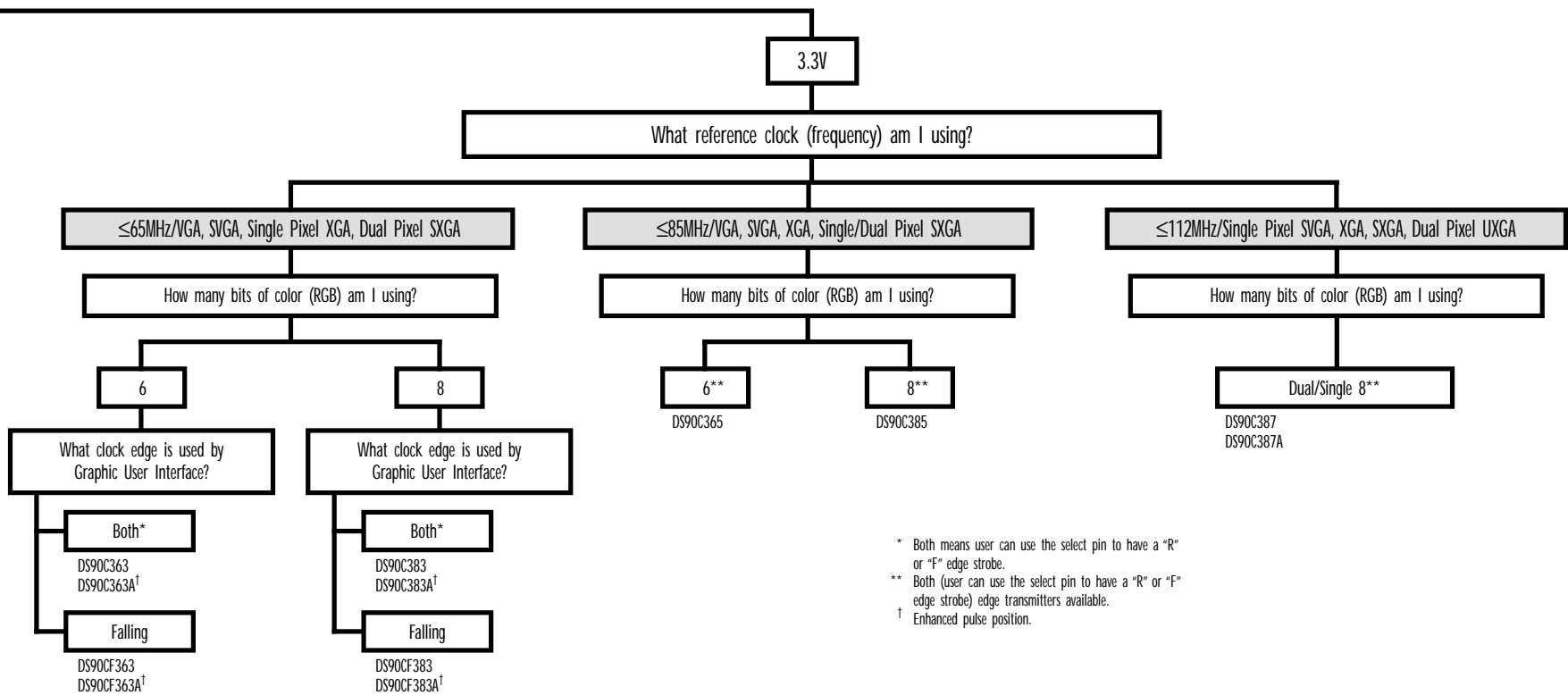
How many Dr/Rx do I need?

How many Dr/Rx do I need?



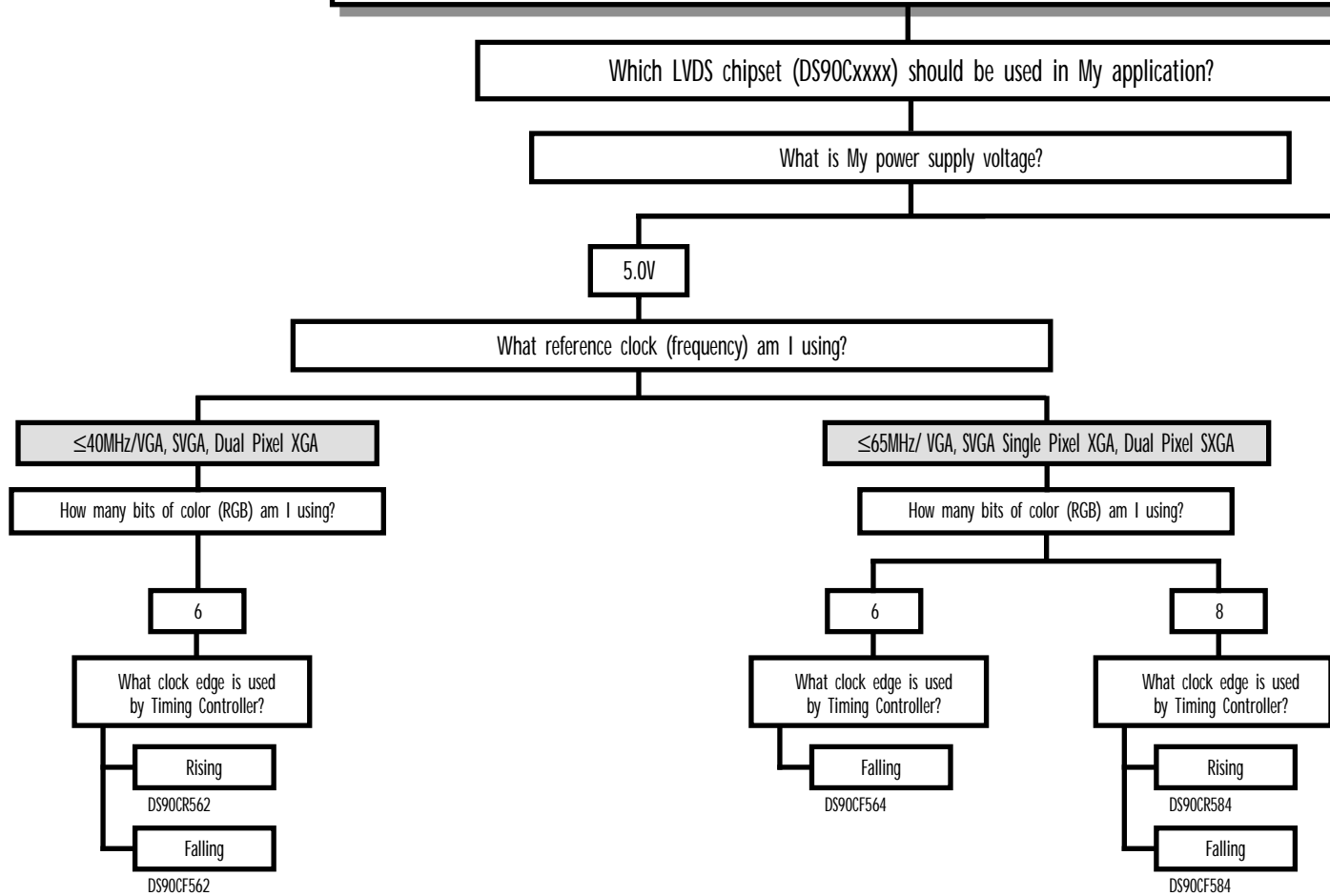
## How to Select the Best Flat Panel Display Link Transmitter Product for Your Application

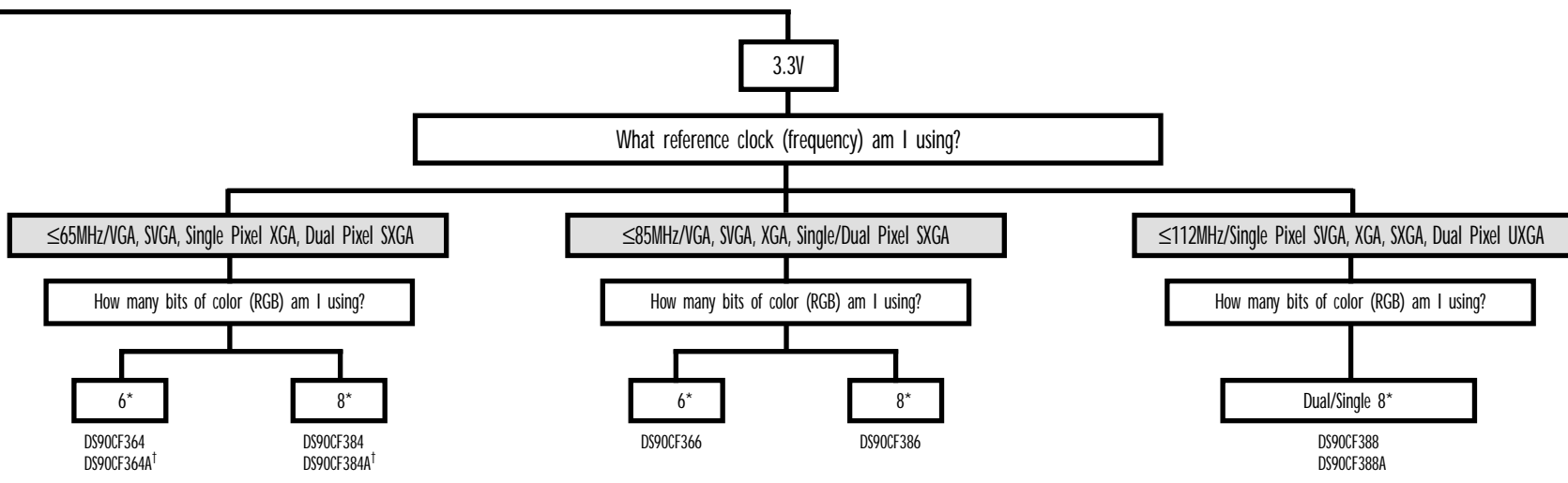




\* Both means user can use the select pin to have a "R" or "F" edge strobe.  
 \*\* Both (user can use the select pin to have a "R" or "F" edge strobe) edge transmitters available.  
 † Enhanced pulse position.

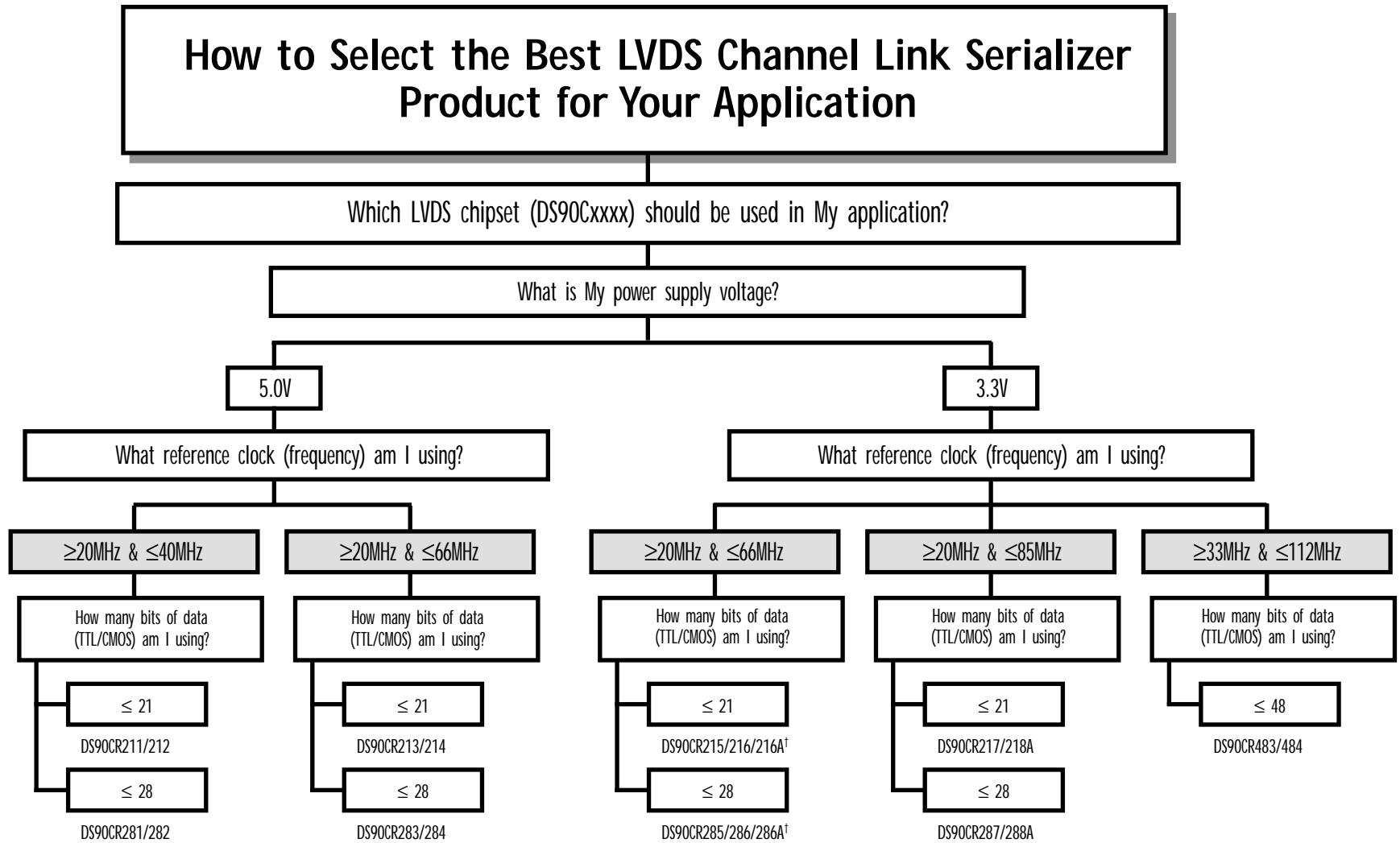
## How to Select the Best Flat Panel Display Link Receiver Product for Your Application





\* Only 3V falling edge receivers are available.  
† Enhanced receiver output specification (set and hold times).

# INTERFACE



Note: See Bus LVDS for 10-to-1 Serializers

<sup>†</sup> Enhanced receiver output specification (set and hold times)



## SERIAL DIGITAL INTERFACE\* (SDI)

Order Number	Description	Temp Range	Speed	Features	# Leads/Package	Price <sup>2</sup>
CLC005AJE	Single Cable Driver	Ind	Up to 622Mbps	ITU-T G.703-Compliant Outputs	8 SOIC	\$5.00
CLC006AJE	Single Cable Driver	Ind	Up to 400Mbps	Adjustable Amplitude Outputs	8 SOIC	\$4.50
CLC007AJE	Single Cable Driver with Dual Complementary Outputs	Ind	Up to 400Mbps	Complementary Output Pair	8 SOIC	\$4.00
CLC011ACQ	Serial Digital Video Decoder	Com	Up to 300Mbps	Data Decoding and Deserializing	28 PLCC	\$7.81
CLC011BCQ	Serial Digital Video Decoder	Com	Up to 360Mbps	Data Decoding and Deserializing	28 PLCC	\$6.75
CLC012AJE	Adaptive Cable Equalizer	Ind	50 to 622Mbps	ITU-T G.703-Compliant Recovery	14 SOIC	\$12.60
CLC014AJE	Adaptive Cable Equalizer	Ind	50 to 650Mbps	SMPTE 259M Serial Recovery	14 SOIC	\$11.50
CLC016ACQ	Data Retiming PLL & Clock Recovery	Com	40 to 400Mbps	Automatic Rate Selection	28 PLCC	\$17.40
CLC016AJQ	Data Retiming PLL & Clock Recovery	Ind	40 to 400Mbps	Automatic Rate Selection	28 PLCC	\$18.70
CLC018AJVQ	8 x 8 Digital Crosspoint Switch	Ind	Up to 1.4Gbps	Non-Blocking, Expandable	64 PQFP	\$17.00
◆ CLC020ACQ	Serial Digital Video Encoder	Com	Up to 400Mbps	Data Encoding and Serialization	28 PLCC	\$27.50
◆ CLC021VGZ-3.3	Serial Digital Video Encoder with EDH	Com	Up to 400Mbps	Data Encoding, Serialization and EDH		\$27.50

◆ Denotes NEW Product

\* High-Speed Non-LVDS Interface Devices

Note 2: 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

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## BUS LVDS

Order Number	Description	Number of Drivers	Number of Receivers	Temp Range (°C)	Supply Voltage (V)	Speed	Features	# Leads/Package	Price <sup>1</sup>
DS92LV010ATM	Single Bus LVDS Transceiver	1	1	Ind	3.3/5V	155Mbps/Channel	3.3V or 5V Operation	8 SOIC	\$2.33
DS92LV222ATM	Bus LVDS Repeater/Mux	2	2	Ind	3.3V	200Mbps/Channel	Repeater, Mux, or 1:2 Clock Driver Modes	16 SOIC	\$3.16
DS92LV1021TMSA	10:1 Serializer w/Embedded Clock	1	0	Ind	3.3V	400Mbps @ 40MHz CLK	400Mbps Data Payload Over Single Pair	28 SSOP	\$8.64
DS92LV1210TMSA	1:10 Deserializer w/Clock Recovery	0	1	Ind	3.3V	400Mbps @ 40MHz CLK	400Mbps Data Payload Over Single Pair	28 SSOP	\$8.64
◆ DS92LV1023TMSA	10:1 Serializer w/Embedded Clock	1	0	Ind	3.3V	600Mbps @ 66MHz CLK	660Mbps Data Payload Over Single Pair	28 SSOP	\$7.95
◆ DS92LV1224TMSA	10:1 Deserializer w/Clock Recovery	0	1	Ind	3.3V	600Mbps @ 66MHz CLK	660Mbps Data Payload Over Single Pair	28 SSOP	\$7.95
◆ DS90CP22M-8	2x2 LVDS Crosspoint Switch	2	2	Com	3.3V	800Mbps Per Channel	800Mbps Per Channel Crosspoint Switch	16 SOIC	\$8.75
◆ DS92CK16TMTc	1:6 Clock Distribution	1	6	Ind	3.3V	to 125MHz	LVDS in/Bus LVDS out 1:6 Clock Distribution	24 TSSOP	\$5.00

◆ Denotes NEW Product

Note 1: 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# INTERFACE

## LVDS FLAT PANEL DISPLAY INTERFACE (FPD-LINK & LDI)

Order Number	Color Bits	Type	Supply Voltage	Max Clock Frequency	Display Type	Clock Edge Strobe	# Leads/Package	Price <sup>2</sup>
DS90CF561MTD	18-bit	Transmitter	5	40MHz	SVGA	Falling	48 TSSOP	\$5.00
DS90CR561MTD	18-bit	Transmitter	5	40MHz	SVGA	Rising	48 TSSOP	\$5.06
DS90CF562MTD	18-bit	Receiver	5	40MHz	SVGA	Falling	48 TSSOP	\$5.00
DS90CR562MTD	18-bit	Receiver	5	40MHz	SVGA	Rising	48 TSSOP	\$5.06
DS90CF581MTD	24-bit	Transmitter	5	40MHz	SVGA	Falling	56 TSSOP	\$6.25
DS90CR581MTD	24-bit	Transmitter	5	40MHz	SVGA	Rising	56 TSSOP	\$6.25
DS90CF563MTD	18-bit	Transmitter	5	65MHz	XGA	Falling	48 TSSOP	\$5.00
DS90CF564MTD	18-bit	Receiver	5	65MHz	XGA	Falling	48 TSSOP	\$5.00
DS90CF583MTD	24-bit	Transmitter	5	65MHz	XGA	Falling	56 TSSOP	\$5.25
DS90CR583MTD	24-bit	Transmitter	5	65MHz	XGA	Rising	56 TSSOP	\$6.35
DS90CF584MTD	24-bit	Receiver	5	65MHz	XGA	Falling	56 TSSOP	\$5.25
DS90CR584MTD	24-bit	Receiver	5	65MHz	XGA	Rising	56 TSSOP	\$6.35
DS90C363MTD/AMTD††	18-bit	Transmitter	3.3	65MHz	XGA	Programmable	48 TSSOP	\$4.00
DS90CF363MTD/AMTD††	18-bit	Transmitter	3.3	65MHz	XGA	Falling	48 TSSOP	\$4.00
DS90CF364MTD/AMTD†	18-bit	Receiver	3.3	65MHz	XGA	Falling	48 TSSOP	\$4.00
DS90C383MTD/AMTD††	24-bit	Transmitter	3.3	65MHz	XGA	Programmable	56 TSSOP	\$4.25
DS90CF383MTD/AMTD††	24-bit	Transmitter	3.3	65MHz	XGA	Falling	56 TSSOP	\$4.25
DS90CF384MTD/AMTD†	24-bit	Receiver	3.3	65MHz	XGA	Falling	56 TSSOP	\$4.25
DS90C365MTD	18-bit	Transmitter	3.3	85MHz	SXGA	Programmable	48 TSSOP	\$4.00
DS90CF366MTD	18-bit	Receiver	3.3	85MHz	SXGA	Falling	48 TSSOP	\$4.00
DS90C385MTD	24-bit	Transmitter	3.3	85MHz	SXGA	Programmable	56 TSSOP	\$4.75
DS90CF386MTD	24-bit	Receiver	3.3	85MHz	SXGA	Falling	56 TSSOP	\$4.25
◆ DS90C387VJD	48-bit	Transmitter	3.3	112MHz	SXGA/UXGA+	Programmable	100 TQFP	\$6.50
◆ DS90CF388VJD	48-bit	Receiver	3.3	112MHz	SXGA/UXGA+	Falling	100 TQFP	\$6.50
◆ DS90C387AVJD	48-bit	Transmitter	3.3	112MHz	SXGA/UXGA+	Falling	100 TQFP	\$6.50
◆ DS90CF388AVJD	48-bit	Receiver	3.3	112MHz	SXGA/UXGA+	Falling	100 TQFP	\$6.50

◆ Denotes NEW Product

† Enhanced receiver output specifications (set and hold times)

†† Enhanced pulse position

**Note 2:** 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
Pricemay vary by package or grade.

## LVDS LINE DRIVERS AND RECEIVERS

Order Number	# of Drivers	# of Receivers	Power Supply (V)	Max Icc (mA)	TRI-STATE® Outputs	High Impedance Bus Pins	Temp Range (°C)	Data Rate	Driver Max tpd (ns)	Driver Max Pulse Skew (ns)	Receiver Max tpd (ns)	Receiver Max Pulse Skew (ns)	# Leads/Package	Comments	Price <sup>1</sup>
DS90C031E-QML	4	0	5	7	Yes	No	Mil	>100Mbps	5.0	3.0	—	—	20 LCC	Military-883	\$28.80
DS90C031TM	4	0	5	3	Yes	No	Ind	>155Mbps	3.5	0.9	—	—	16 SOIC		\$1.95
DS90C032E-QML	0	4	5	11	Yes	No	Mil	>100Mbps	—	—	8.0	3.0	20 LCC	Military-883	\$28.80
DS90C032TM	0	4	5	10	Yes	No	Ind	>155Mbps	—	—	6.0	1.2	16 SOIC		\$1.95
DS90C401M	2	0	5	3	No	No	Ind	>155Mbps	3.5	0.9	—	—	8 SOIC		\$1.20
DS90C402M	0	2	5	10	No	No	Ind	>155Mbps	—	—	6.0	1.2	8 SOIC		\$1.20
DS90LV017M	1	0	3.3	4	No	Yes	Com	>155Mbps	6.0	1.9	—	—	8 SOIC		\$0.74
◆ DS90LV017ATM	1	0	3.3	4	No	Yes	Ind	>600Mbps	1.5	—	—	—	8 SOIC		\$0.78
DS90LV018ATM	0	1	3.3	9	No	Yes	Ind	>400Mbps	—	—	2.5	0.4	8 SOIC		\$0.64
DS90LV019TM	1	1	3.3/5	20/48	Yes	Yes	Ind	>100Mbps	7.0/6.0	1.0/1.0	9.0/8.0	1.5/1.6	14 SOIC	3.3V or 5V V <sub>CC</sub>	\$1.48
DS90LV027M	2	0	3.3	4	No	Yes	Com	>155Mbps	6.0	1.9	—	—	8 SOIC		\$1.35
◆ DS90LV027ATM	2	0	3.3	4	No	Yes	Ind	>600Mbps	1.5	—	—	—	8 SOIC		\$1.75
DS90LV028ATM	0	2	3.3	9	No	Yes	Ind	>400Mbps	—	—	2.5	0.4	8 SOIC		\$1.21
DS90LV031ATM	4	0	3.3	8	Yes	Yes	Ind	>400Mbps	2.0	0.4	—	—	16 SOIC		\$2.05
DS90LV032ATM	0	4	3.3	15	Yes	Yes	Ind	>400Mbps	—	—	3.3	0.35	16 SOIC		\$2.05
DS90LV047ATM	4	0	3.3	8	Yes	Yes	Ind	>400Mbps	1.7	0.4	—	—	16 SOIC	Flow through pin out	\$2.05
◆ DS90LV047ATMTC	4	0	3.3	8	Yes	Yes	Ind	>400Mbps	1.7	0.4	—	—	16 TSSOP	Flow through pin out	\$2.05
DS90LV048ATM	0	4	3.3	15	Yes	Yes	Ind	>400Mbps	—	—	2.7	0.4	16 SOIC	Flow through pin out	\$2.05
◆ DS90LV048ATMTC	0	4	3.3	15	Yes	Yes	Ind	>400Mbps	—	—	2.7	0.4	16 TSSOP	Flow through pin out	\$2.05
DS36C200M	2	2	5	7	Yes	Yes	Com	>100Mbps	5.5	2.2	9.0	3.0	14 SOIC	1394 Link	\$1.16

◆ Denotes NEW Product

Note 1: 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# INTERFACE

## LVDS CHANNEL-LINK SERIALIZERS AND DESERIALIZERS

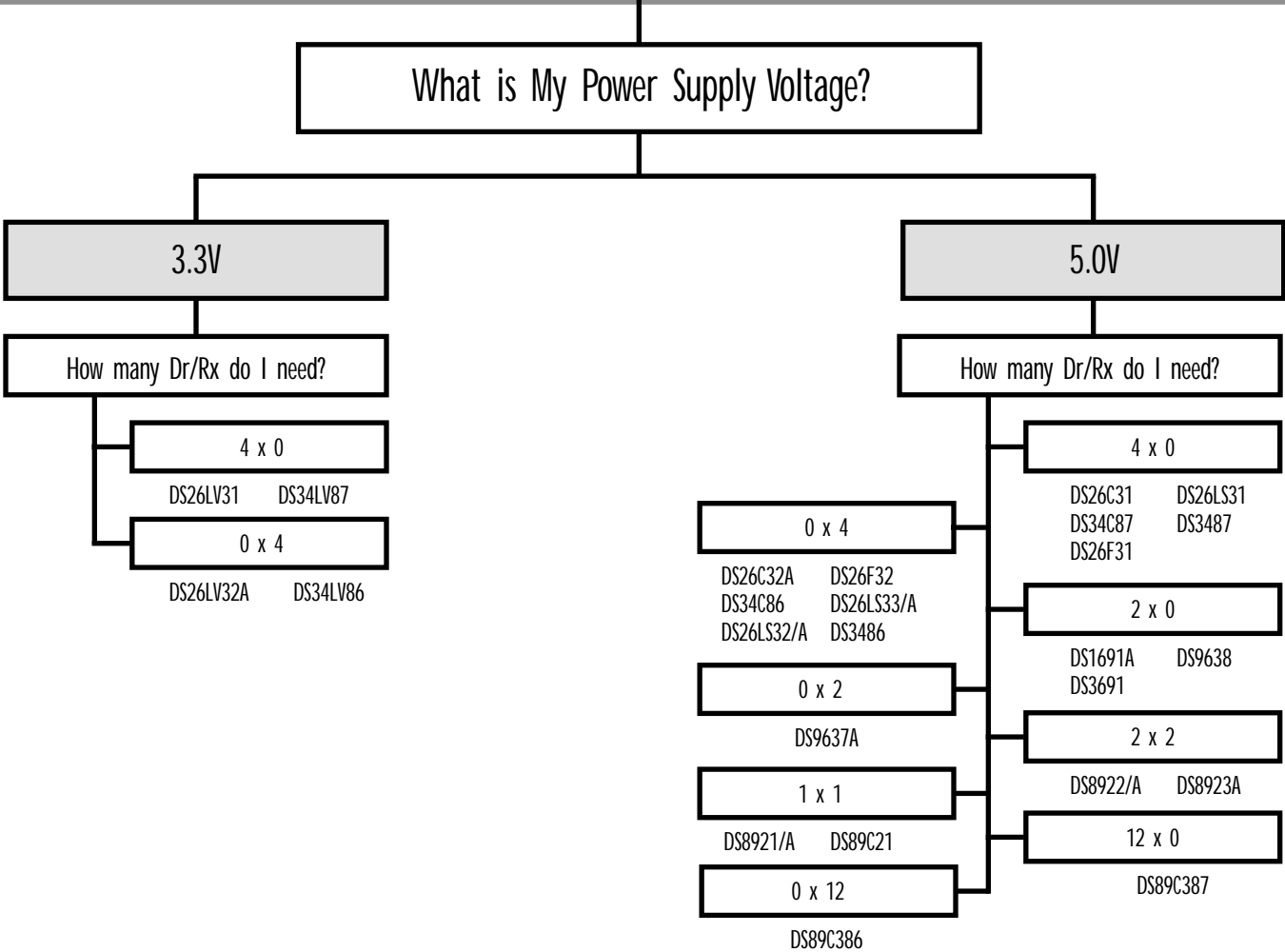
Order Number	Transmitter/ Receiver	TTL Bus Width	Mux/Demux Ratio	Power Supply (V)	Max ICC (mA)	Clock Frequency	Max Throughput	# Leads/ Package	Eval Board Order #	Price <sup>1</sup>
DS90CR211MTD	Transmitter	21	21:3	5	53	20-40MHz	840Mbps	48 TSSOP	CLINK5V28BT-66	\$5.15
DS90CR212MTD	Receiver	21	3:21	5	80	20-40MHz	840Mbps	48 TSSOP	CLINK5V28BT-66	\$5.15
DS90CR213MTD	Transmitter	21	21:3	5	84	20-66MHz	1.38Gbps	48 TSSOP	CLINK5V28BT-66	\$6.05
DS90CR214MTD	Receiver	21	3:21	5	140	20-66MHz	1.38Gbps	48 TSSOP	CLINK5V28BT-66	\$6.05
DS90CR215MTD	Transmitter	21	21:3	3.3	55	20-66MHz	1.38Gbps	48 TSSOP	CLINK3V28BT-66	\$3.70
DS90CR216MTD	Receiver	21	3:21	3.3	105	20-66MHz	1.38Gbps	48 TSSOP	CLINK3V28BT-66	\$3.70
DS90CR216AMTD †	Receiver	21	3:21	3.3	—	20-66MHz	1.38Gbps	48 TSSOP	CLINK3V28BT-66	\$3.70
◆ DS90CR217MTD	Transmitter	21	21:3	3.3	—	20-85MHz	1.78Gbps	48 TSSOP	CLINK3V28BT-66	\$6.10
◆ DS90CR218AMTD	Receiver	21	3:21	3.3	—	20-85MHz	1.78Gbps	48 TSSOP	CLINK3V28BT-66	\$6.10
DS90CR281MTD	Transmitter	28	28:4	5	53	20-40MHz	1.12Gbps	56 TSSOP	CLINK5V28BT-66	\$5.75
DS90CR282MTD	Receiver	28	4:28	5	80	20-40MHz	1.12Gbps	56 TSSOP	CLINK5V28BT-66	\$5.75
DS90CR283MTD	Transmitter	28	28:4	5	84	20-66MHz	1.84Gbps	56 TSSOP	CLINK5V28BT-66	\$6.70
DS90CR284MTD	Receiver	28	4:28	5	140	20-66MHz	1.84Gbps	56 TSSOP	CLINK5V28BT-66	\$6.70
DS90CR285MTD	Transmitter	28	28:4	3.3	55	20-66MHz	1.84Gbps	56 TSSOP	CLINK3V28BT-66	\$3.70
DS90CR286MTD	Receiver	28	4:28	3.3	105	20-66MHz	1.84Gbps	56 TSSOP	CLINK3V28BT-66	\$3.70
DS90CR286AMTD †	Receiver	28	4:28	3.3	—	20-66MHz	1.84Gbps	56 TSSOP	CLINK3V28BT-66	\$3.70
◆ DS90CR287MTD	Transmitter	28	28:4	3.3	—	20-85MHz	2.38Gbps	56 TSSOP	CLINK3V28BT-85	\$7.10
◆ DS90CR288AMTD	Receiver	28	4:28	3.3	—	20-85MHz	2.38Gbps	56 TSSOP	CLINK3V28BT-85	\$7.10
◆ DS90CR483VJD	Transmitter	48	48:8	3.3	—	33-112MHz	5.37Gbps	100 TQFP	CLINK3V48BT-112	\$11.00
◆ DS90CR484VJD	Receiver	48	8:48	3.3	—	33-112MHz	5.37Gbps	100 TQFP	CLINK3V48BT-112	\$11.00

◆ Denotes NEW Product

† Enhanced receiver output specifications (set and hold times)

Note 1: 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# How to Select the Best RS-422 Product for Your Application



## How to Select the Best RS-485 Product for Your Application

What type of device do I need?

Standard Line Dr, Rx and Xcvr

Low Power CMOS Xcvr

Special Xcvr

How many Dr/Rx do I need?

What features do I need?

What features do I need?

1 x 1

1 x 1

1 x 1

4 x 4

1 x 1

DS3695  
DS3695A (SOIC)  
DS36F95  
DS75176B  
DS96176  
DS16F95

DS481 (Sleep Mode)  
DS1487 (1/4 UL, 128 nodes)  
DS485 (CMOS)  
DS36C278 (1/2, 1/4 UL)  
DS36C279 (Sleep Mode)  
DS36C280 (Slew Rate Control)

DS36276 (Failsafe)  
DS36277 (SAE 1708 App)  
DS3696/A (TS Pin)  
DS3697 (Repeater)  
DS96177 (Repeater)

DS36950  
DS36954

4 x 0

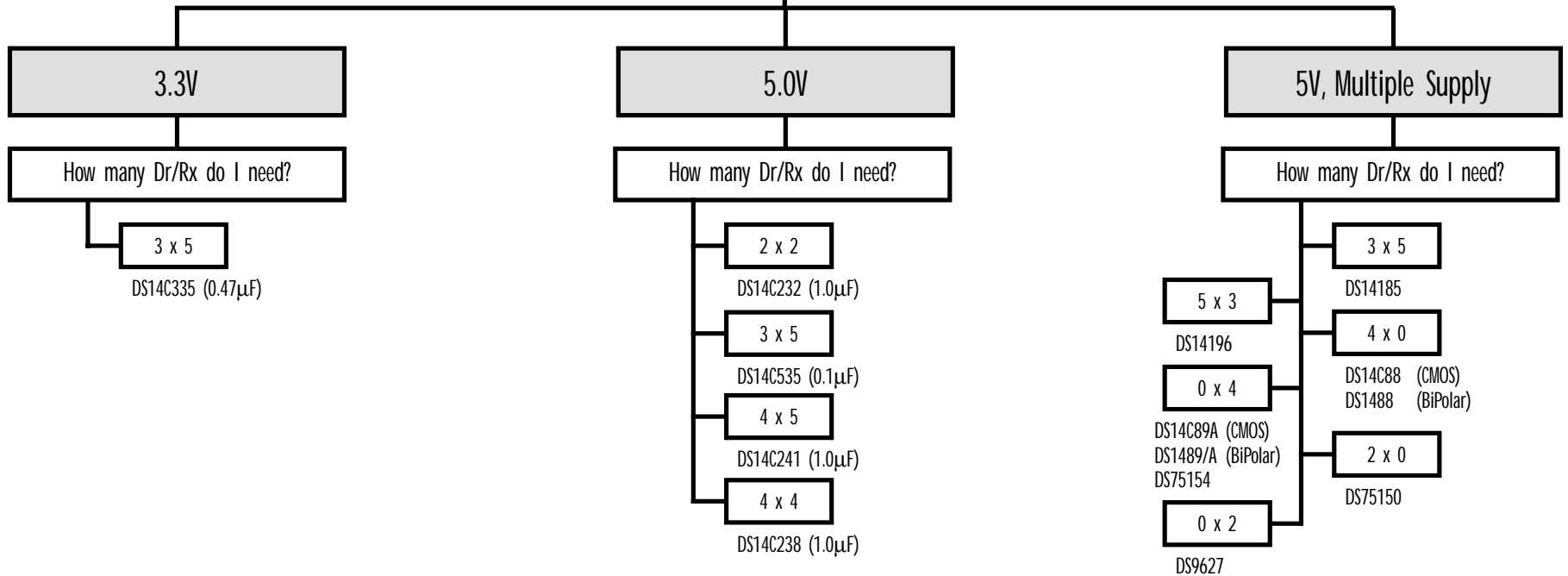
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DS96172  
DS96174  
DS96F172  
DS96F174

DS96173  
DS96175  
DS96F173  
DS96F175

# How to Select the Best RS-232 Product for Your Application

What is My Power Supply Voltage?



# INTERFACE

## DATA TRANSMISSION STANDARDS

Specifications		TIA/EIA-232-F	TIA/EIA-423-B	TIA/EIA-422-B	TIA/EIA-485-A	TIA/EIA-644 (LVDS)
Mode of Operation		Single-Ended	Single-Ended	Differential	Differential	Differential
Number of Drivers and Receivers Allowed on One Line		1 Driver, 1 Receiver	1 Driver, 10 Receivers	1 Driver, 10 Receivers	32 Unit Loads	1 Driver, 1 Receiver
Maximum Cable Length		~ 50 feet (2500pF)	4000 feet	4000 feet	4000 feet	~ <20M
Maximum Data Rate		20kb/s	100kb/s	10Mb/s	10Mb/s	655Mbps
Driver Output Maximum Voltage		±25V	±6V	-0.25V to +6V	-7V to +12V	±450mV
Driver Output Signal Level	Loaded	±5V to ±15V	±3.6V	±2V	±1.5V	±250mV
	Unloaded	±25V	±6V	±10V	±6V	—
Driver Load Impedance		3kΩ to 7kΩ	≥450Ω	100Ω typ	54Ω	100Ω
Maximum Driver Output Current (High Impedance State)	Power On	—	—	—	±100μA	—
	Power Off	6.6mA (±2V)	±100μA	±100μA	±100μA	—
Slew Rate		30V/μs max	Controls Provided	—	—	—
Receiver Input Voltage Range		±15V	±12V	-10V to +10V	-7V to +12V	GND to +2.4V
Receiver Input Sensitivity		±3V	±200mV	±200mV	±200mV	±100mV
Receiver Input Resistance		3kΩ to 7kΩ	4kΩ min	4kΩ min	12kΩ min	High Z

Tx = Transmitter/Driver  
Rx = Receiver

### Temp Range:

Commercial (Com) = 0°C to 70°C  
Industrial (Ind) = -40°C to 85°C  
Military (Mil) = -55°C to 125°C  
Military (Mil 883) = -55°C to 125°C

### Package Types:

J = Ceramic Dip    MTD = TSSOP    VJD = TOFP  
E = LCC            N = Molded DIP    VF = PQFP  
M = SOIC            V = PLCC            W = Ceramic Flatpack  
MSA = SSOP        VB = PQFP            WG = Ceramic SOIC  
MEA = SSOP        VEH = TOFP            WM = Wide SOIC



**TIA/EIA-232 (RS-232)**

Part Number	Description	Tx	Rx	Temp Range	Mil 883	Package Type	# Leads	Price <sup>2</sup>
DS1488	Quad Line Driver	4	0	Com		M, N	14	\$0.19
DS14C88	Quad CMOS Line Driver	4	0	Com		M, N	14	\$0.48
DS75150	Dual Line Driver	2	0	Com		M	8	\$0.53
DS1489	Quad Line Receiver	0	4	Com		M, N	14	\$0.19
DS1489A	Quad Line Receiver	0	4	Com		M, N	14	\$0.20
DS14C89A	Quad CMOS Line Receiver	0	4	Com		M, N	14	\$0.40
DS75154	Quad Line Receiver	0	4	Com		M	16	\$0.67
DS9627M	Dual Line Receiver	0	2	Mil	√	J	16	\$22.60
DS14C232C	Low Power 5V Powered EIA-232 Dual Driver/Receiver	2	2	Com		M, N	16	\$0.77
DS14C232T	Low Power 5V Powered EIA-232 Dual Driver/Receiver	2	2	Ind		M	16	\$0.94
DS14C238	Single Supply EIA-232 4X4 Driver/Receiver	4	4	Com		WM	24	\$2.87
DS14C241	Single Supply EIA-232 4X5 Driver/Receiver	4	5	Com		WM	28	\$3.08
DS14C335	+3.3V Supply TIA/EIA-232 3x5 Driver/Receiver	3	5	Com		MSA	28	\$2.64
DS14C535	+5V Supply EIA/TIA-232 3X5 Driver/Receiver	3	5	Com		MSA	28	\$3.27
DS14185	+5V Supply EIA/TIA-232 3X5 Driver/Receiver	3	5	Com		WM	20	\$0.46
DS14196	+5V Supply EIA/TIA-232 5X3 Driver/Receiver	5	3	Com		WM	20	\$0.69

**TIA/EIA-423 (RS-423)**

Part Number	Description	Tx	Rx	Temp Range	Mil 883	Package Type	# Leads	Price <sup>2</sup>
DS9636A	Dual Programmable Slew Rate Line Driver	2	0	Mil	√	J	8	\$8.00
DS1691A	Quad TRI-STATE Line Driver	4	0	Mil	√	J	16	\$6.05
DS3691	Quad TRI-STATE Line Driver	4	0	Com		M, N	16	\$1.70

**SPECIAL INTERFACE**

Part Number	Description	Tx	Rx	Temp Range	Mil 883	Package Type	# Leads	Price <sup>2</sup>
DS36C200	Dual High Speed Bi-Directional/Differential Transceiver	2	2	Com		M	14	\$1.16

Tx = Transmitter/Driver  
Rx = Receiver

Temp Range:  
Commercial (Com) = 0°C to 70°C  
Industrial (Ind) = -40°C to 85°C  
Military (Mil) = -55°C to 125°C  
Military (Mil 883) = -55°C to 125°C

Package Types:  
J = Ceramic Dip  
E = LCC  
M = SOIC  
MSA = SSOP  
MEA = SSOP  
MTD = TSSOP  
N = Molded DIP  
V = PLCC  
VB = PQFP  
VEH = TQFP  
VJD = TQFP  
VF = PQFP  
W = Ceramic Flatpack  
WG = Ceramic SOIC  
WM = Wide SOIC

<sup>2</sup> Price:  
1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

**GENERAL PURPOSE**

Part Number	Description	Tx	Rx	Temp Range	Mil 883	Package Type	# Leads	Price <sup>2</sup>
DS75110A	Dual Line Driver	2	0	Com		M, N	14	\$0.45
DS7830	Dual Differential Line Driver	2	0	Mil	√	J, W	14	\$4.80
DS7831	Dual TRI-STATE Line Driver	2	0	Mil	√	J	16	\$20.50
DS8832	Dual TRI-STATE Line Driver	2	0	Com		N	16	\$1.21
DS1603	TRI-STATE Dual Line Receiver	0	2	Mil	√	J	16	\$14.60
DS75107	Dual Line Receiver	0	2	Com		M, N	14	\$0.40
DS7820	Dual Line Receiver	0	2	Mil	√	J	14	\$6.15
DS7820A	Dual Line Receiver	0	2	Mil	√	J	14	\$8.65
DS8820A	Dual Line Receiver	0	2	Com		N	14	\$0.83
DS9622M	Dual Line Receiver	0	2	Mil	√	J, E	14/20	\$7.45
DS3650	Quad Differential Line Receiver	0	4	Com		M, N	16	\$1.60
DS3651	Quad High Speed MOS Sense Amplifier	0	4	Com		N	16	\$1.71
DS8641	Quad Unified Bus Transceiver	4	4	Com		N	16	\$1.20
DS8838	Quad Unified Bus Transceiver	4	4	Com		M, N	16	\$1.10
DS26S10	Quad Bus Transceiver	4	4	Com		N	16	\$1.07
DS75160A	IEEE-488 GPIB Transceiver	8	8	Com		N	20	\$1.08
DS75161A	IEEE-488 GPIB Transceiver	8	8	Com		N	20	\$1.08
DS1776	Pi-Bus Transceiver	8	8	Mil	√	E	28	\$66.00
DS3662	Quad High Speed Trapezoidal Bus Transceiver	4	4	Com		N, WM	16	\$2.14
DS3862	Octal High Speed Trapezoidal Bus Transceiver	8	8	Com		N, WM	20	\$4.50

**BTL**

Part Number	Description	Tx	Rx	Temp Range	Package Type	# Leads	Price <sup>2</sup>
DS3883A	BTL 9-Bit Data Transceiver	9	9	Com	VF	44	\$7.65
DS3884A	BTL Handshake Transceiver	6	6	Com	VF	44	\$9.65
DS3886A	BTL 9-Bit Latching Data Transceiver	9	9	Com	VF	44	\$7.45
DS38C86A	CMOS BTL 9-Bit Latching Data Transceiver	9	9	Com	VB	48	\$8.20
DS3893A	BTL Turbo Transceiver	4	4	Com	V	20	\$3.82
DS3896	BTL Trapezoidal Transceiver	8	8	Com	M, N	20	\$4.49
DS3897	BTL Trapezoidal Transceiver	4	4	Com	M, N	20	\$3.83

# INTERFACE

## TIA/EIA-485 (RS-485)

Part Number	Description	Tx	Rx	Temp Range	Mil 883	Package Type	# Leads	Price <sup>2</sup>
DS96172C	Quad Differential Line Driver	4	0	Com		N	16	\$1.25
DS96F172C	Quad Differential Line Driver	4	0	Com		N	16	\$2.50
DS96F172M	Quad Differential Line Driver	4	0	Mil	✓	J	16	\$12.70
DS96F172M	Quad Differential Line Driver	4	0	Mil	✓	E	16/20	\$30.00
DS96174C	Quad Differential Line Driver	4	0	Com		N	16	\$1.15
DS96F174C	Quad Differential Line Driver	4	0	Com		J, N	16	\$2.30
DS96F174M	Quad Differential Line Driver	4	0	Mil	✓	J, W, E	16/20	\$10.70
DS96173C	Quad Differential Line Receiver	0	4	Com		N	16	\$1.25
DS96F173C	Quad Differential Line Receiver	0	4	Com		J	16	\$3.65
DS96F173M	Quad Differential Line Receiver	0	4	Mil	✓	J, W, E	16/20	\$6.80
DS96175C	Quad Differential Line Receiver	0	4	Com		N	16	\$1.15
DS96F175C	Quad Differential Line Receiver	0	4	Com		J	16	\$3.38
DS96F175M	Quad Differential Line Receiver	0	4	Mil	✓	J, W, E	16/20	\$6.80
DS16F95	Differential Bus Transceiver	1	1	Mil	✓	J	8	\$31.10
DS16F95	Differential Bus Transceiver	1	1	Mil	✓	WG, E	8/10/20	\$35.40
DS3695	Multipoint Transceiver	1	1	Com		N	8	\$0.75
DS3695A	Multipoint Transceiver	1	1	Com		M	8	\$1.22
DS3695AT	Multipoint Transceiver	1	1	Ind		M	8	\$1.22
DS3695T	Multipoint Transceiver	1	1	Ind		N	8	\$0.75
DS36C278	Low Power Multipoint Transceiver	1	1	Com		M, N	8	\$1.25
DS36C278T	Low Power Multipoint Transceiver	1	1	Ind		M, N	8	\$1.25
DS36C279	Low Power Multipoint Transceiver/Sleep Mode	1	1	Com		M, N	8	\$1.25
DS36C279T	Low Power Multipoint Transceiver/Sleep Mode	1	1	Ind		M, N	8	\$1.40
DS36C280	Low Power Multipoint Transceiver/Slew Rate Control	1	1	Com		M, N	8	\$1.25
DS36C280T	Low Power Multipoint Transceiver/Slew Rate Control	1	1	Ind		M, N	8	\$1.25
DS36F95	Differential Bus Transceiver	1	1	Com		J, M	8	\$2.10
DS3696	Multipoint Transceiver	1	1	Com		N	8	\$1.22
DS3696A	Multipoint Transceiver	1	1	Com		M	8	\$1.58
DS3697	Multipoint Repeater	1	1	Com		N	8	\$1.72
DS36276	FAILSAFE Multipoint Transceiver	1	1	Com		M	8	\$1.40
DS36277T	Dominant Mode Multipoint Transceiver	1	1	Ind		M, N	8	\$1.40
DS75176B	Multipoint Transceiver	1	1	Com		M, N	8	\$0.39
DS75176BT	Multipoint Transceiver	1	1	Ind		M, N	8	\$0.50
DS96176C	Differential Bus Transceiver	1	1	Com		N	8	\$1.15
DS96177C	Differential Bus Repeater	1	1	Com		N	8	\$1.10
DS36950	Quad Differential Bus Transceiver	4	4	Com		V	20	\$7.00
DS36954	Quad Differential Bus Transceiver	4	4	Com		M, V	20	\$5.70
DS481	Low Power Multipoint Transceiver/Sleep Mode	1	1	Com		M, N	8	\$0.86
DS481T	Low Power Multipoint Transceiver/Sleep Mode	1	1	Ind		M, N	8	\$0.93
DS485	Low Power Multipoint Transceiver	1	1	Com		M, N	8	\$0.93
DS485T	Low Power Multipoint Transceiver	1	1	Ind		M, N	8	\$0.93
DS1487	Low Power 1/4 Unit Load Multipoint Transceiver	1	1	Com		M, N	8	\$1.25

Tx = Transmitter/Driver  
Rx = Receiver

### Temp Range:

Commercial (Com) = 0°C to 70°C  
Industrial (Ind) = -40°C to 85°C

Military (Mil) = -55°C to 125°C  
Military (Mil 883) = -55°C to 125°C

## TIA/EIA-422 DRIVERS (RS-422) TIA/EIA-422/423 RECEIVERS (RS-422/423)

Part Number	Description	Tx	Rx	Temp Range	Mil 883	Package Type	# Leads	Price <sup>2</sup>
DS26C31T	Quad CMOS TRI-STATE Differential Line Driver	4	0	Ind		M, N	16	\$0.57
DS26C31M	Quad CMOS TRI-STATE Differential Line Driver	4	0	Mil	✓	J, W, E, WG	16/20	\$9.75
DS26LS31C	Quad High Speed Differential Line Driver	4	0	Com		M, N	16	\$0.43
DS26LS31M	Quad High Speed Differential Line Driver	4	0	Mil	✓	J, W, E	16/20	\$6.00
DS26LV31T	3V Enhanced CMOS Quad Differential Line Driver	4	0	Ind		M, N	16	\$1.00
DS3487	Quad TRI-STATE Line Driver	4	0	Com		M, N	16	\$0.40
DS34C87T	Quad CMOS TRI-STATE Differential Line Driver	4	0	Ind		M, N	16	\$0.81
DS34LV87T	3V Enhanced CMOS Quad Differential Line Driver	4	0	Ind		M, N	16	\$1.12
DS1691A	Dual TRI-STATE Line Driver	2	0	Mil	✓	J	16	\$6.05
DS3691	Dual TRI-STATE Line Driver	2	0	Com		M, N	16	\$1.70
DS89C387T	12 Channel CMOS Differential Line Driver	12	0	Ind		MEA	48	\$6.10
DS9638C	Dual High Speed Differential Line Driver	2	0	Com		M, N	8	\$0.95
DS9638M	Dual High Speed Differential Line Driver	2	0	Mil	✓	J	8	\$10.70
DS26C32AT	Quad CMOS Differential Line Receiver	0	4	Ind		M, N	16	\$0.52
DS26C32AM	Quad CMOS Differential Line Receiver	0	4	Mil	✓	J, E, WG	16/20	\$9.75
DS26LS32AC	Quad Differential Line Receiver	0	4	Com		M, N	16	\$0.43
DS26LS32C	Quad Differential Line Receiver	0	4	Com		M, N	16	\$0.43
DS26LS32M	Quad Differential Line Receiver	0	4	Mil	✓	J, W, E	16/20	\$6.00
DS26LS33M	Quad Differential Line Receiver	0	4	Mil	✓	J	16	\$6.00
DS3486	Quad Differential Line Receiver	0	4	Com		M, N	16	\$0.40
DS34C86T	Quad CMOS Differential Line Receiver	0	4	Ind		M, N	16	\$0.86
DS34LV86T	3V Enhanced CMOS Quad Differential Line Receiver	0	4	Ind		M, N	16	\$1.12
DS78C20	Dual CMOS Compatible Differential Line Receiver	0	2	Mil	✓	J	14	\$15.30
DS78C120	Dual CMOS Compatible Differential Line Receiver	0	2	Mil	✓	J	16	\$17.80
DS78LS120	Dual Differential Line Receiver	0	2	Mil	✓	J, W	16	\$6.95
DS88C20	Dual CMOS Compatible Differential Line Receiver	0	2	Com		N	14	\$2.65
DS89C386T	12 Channel CMOS Differential Line Receiver	0	12	Ind		MEA	48	\$6.10
DS9637AC	Dual Differential Line Receiver	0	2	Com		M, N	8	\$0.83
DS9637AM	Dual Differential Line Receiver	0	2	Mil	✓	J	8	\$9.25
DS8921	Differential Line Driver and Receiver Pair	1	1	Com		M, N	8	\$0.63
DS8921A	Differential Line Driver and Receiver Pair	1	1	Com		M, N	8	\$0.69
DS8921AT	Differential Line Driver and Receiver Pair	1	1	Ind		M	8	\$0.90
DS89C21T	Differential CMOS Line Driver and Receiver Pair	1	1	Ind		M	8	\$1.50
DS8922	Dual TRI-STATE Differential Line Driver/Receiver Pairs	2	2	Com		M, N	16	\$0.85
DS8922A	Dual TRI-STATE Differential Line Driver/Receiver Pairs	2	2	Com		M, N	16	\$0.90
DS8923A	Dual TRI-STATE Differential Line Driver/Receiver Pairs	2	2	Com		M, N	16	\$0.95
DS8925	Local Talk™ 2X3 Driver/Receiver	2	3	Com		M	16	\$1.34
DS8935	Local Talk™ 2X3 Driver/Receiver	2	3	Com		WM	20	\$1.55

### Package Types:

J = Ceramic Dip  
E = LCC  
M = SOIC  
MSA = SSOP  
MEA = SSOP

MTD = TSSOP  
N = Molded DIP  
V = PLCC  
VB = PQFP  
VEH = TOFP

VJD = TOFP  
VF = PQFP  
W = Ceramic Flatpack  
WG = Ceramic SOIC  
WM = Wide SOIC

### 2 Price:

1,000 pc. suggested resale,  
FOB Santa Clara, California,  
USA. Price may vary by pack-  
age or grade.

## LVDS APPLICATION NOTES

	AN#	Title
LVDS		LVDS Owner's Manual & Design Guide <sup>1</sup>
	AN-971	An Overview of LVDS Technology
	AN-977	LVDS Signal Quality: Jitter Measurements Using Eye Pattern
	AN-1035	PCB Design Guidelines for LVDS Technology
	AN-1040	Bit Error Rate (BER) Testing Data
	AN-1060	EDN Article Reprint (1/97)
	AN-1088	LVDS Signal Quality: Cable Drive Measurement Using Eye Patterns
	AN-1108	Channel Link PCB and Interconnect Design-in Guidelines
	AN-1110	LVDS Quad Dynamic Icc vs. Frequency
	AN-1115	DS92LV010A Bus LVDS
	Channel & FPD Links	AN-1032
AN-1041		Channel Link Introduction
AN-1045		FPD Rising/Falling Edge Clocking and Bit Mapping
AN-1056		FPD STN Panel Applications
AN-1059		Skew and Jitter
AN-1084		Parallel Application of High Speed Link
AN-1085		FPD Link PCB and Interconnect Design-in Guidelines
AN-1109	Multi-Drop Channel-Link Operation	
General	AN-806	Data Transmission Lines and Their Characteristics
	AN-807	Reflections: Computations & Waveforms
	AN-808	Long Transmission Lines & Data Signal Quality
	AN-905	Transmission Line Rapidesigner Operations <sup>2</sup>
	AN-912	Common Data Transmission Parameters & Their Definitions
	AN-916	A Practical Guide To Cable Selection
	AN-1111	An Introduction to IBIS (I/O Buffer Information Specification) Modeling

<sup>1</sup>The LVDS Owner's Manual & Design Guide literature number is Lit# 550062

<sup>2</sup>The literature number for the Transmission Line Rapidesigner is Lit# 633200-001 (metric) or 633201-001 (English units).  
(The accompanying application note, AN-905, is also available separately as Lit# 100905-001)

## ANSI/TIA/EIA-644 (LVDS) SPECIFICATIONS

Parameter	Description	Min	Max	Units
V <sub>OD</sub>	Differential Output Voltage	247	454	mV
V <sub>OS</sub>	Offset Voltage	1.125	1.375	V
ΔV <sub>OD</sub>	Change in V <sub>OD</sub>		50	mV
ΔV <sub>OS</sub>	Change in V <sub>OS</sub>		50	mV
I <sub>SC</sub>	Short Circuit Current		24	mA
t <sub>r</sub> /t <sub>f</sub>	Output Rise/Fall Times (≥200Mbps)	0.26	1.5	ns
	Output Rise/Fall Times (<200Mbps)		30% of t <sub>UI</sub> <sup>3</sup>	
I <sub>IN</sub>	Input Current		20	μA
V <sub>TH</sub>	Threshold Voltage		100	mV
V <sub>IN</sub>	Input Voltage Range	0	2.4	V

<sup>3</sup> t<sub>UI</sub> is unit interval (i.e. waveform period).

## TECHNOLOGY COMPARISON

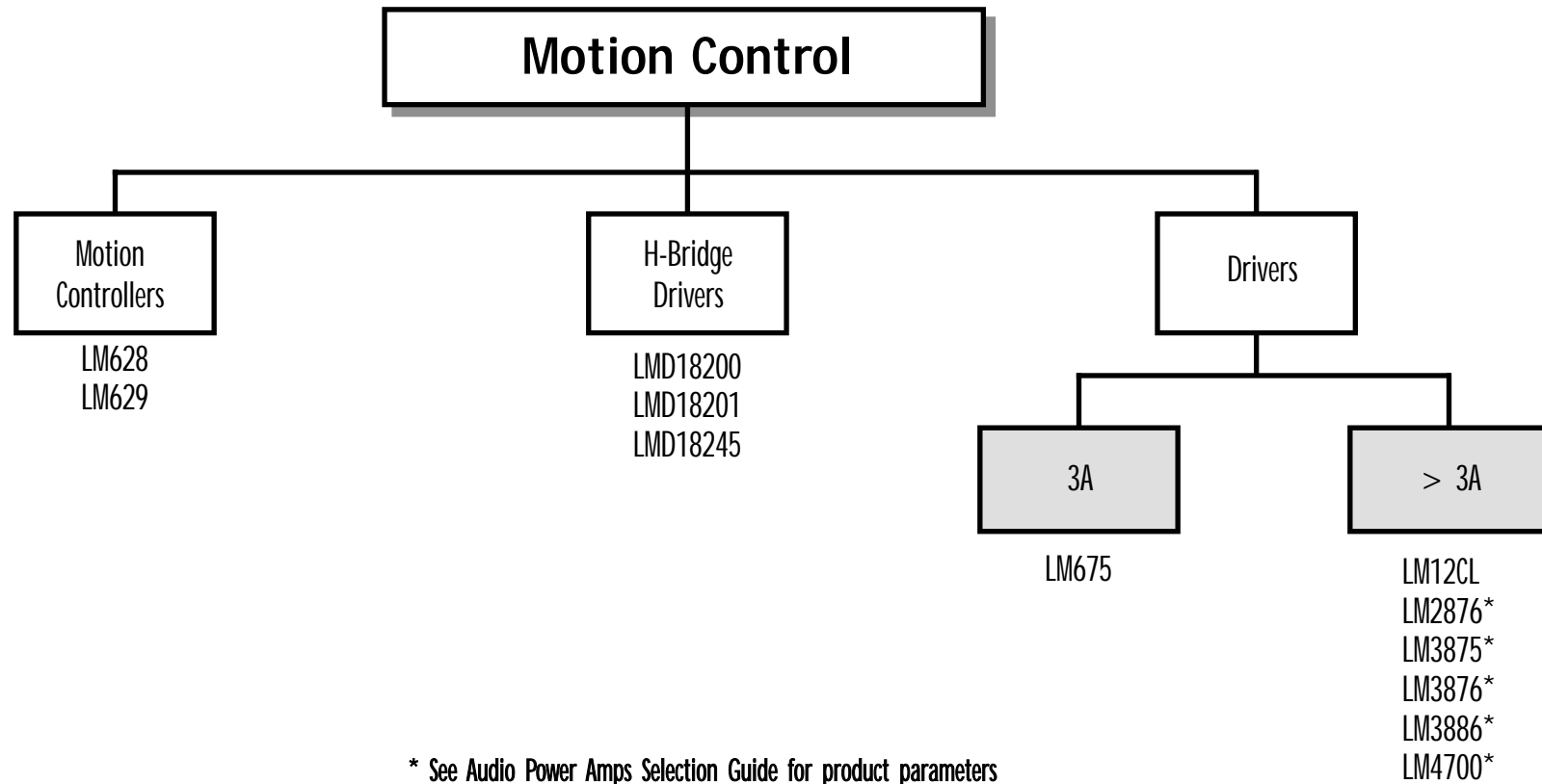
Parameter	LVDS	PECL	RS-422	TTL/CMOS
Output Voltage Swing	±350mV	±800mV	±2-5V	±2.4-5.5V
Receiver Threshold	±100mV	±200mV	±200mV	1.2/1.5V
Max Speed	>400Mbps	>400Mbps	<30Mbps	<150Mbps
I <sub>CC</sub> @ 155Mbps	<10mA	87mA	18mA	75mA
Noise/EMI	Low	Low	High	High
Chip Cost	Low	Medium	Low	Low



# MOTION CONTROL

## *Section 6*

# MOTION CONTROL



\* See Audio Power Amps Selection Guide for product parameters

## MOTOR DRIVE CIRCUITS—BRIDGES

Part Number	Description	Output Current (A)	Max Input Voltage (V)	Operating Temp (T <sub>J</sub> )	Package	Price <sup>1</sup>
LMD18200	DMOS H-Bridge with Internal Current Sense	3	55	-40°C to +125°C	11-Lead TO-220	\$7.75
LMD18200-2D	Mil-Std 883. Dual DMOS H-Bridge	3	55	-55°C to +125°C	24-Lead Ceramic Dip	\$98.00
LMD18201	DMOS H-Bridge	3	55	-40°C to +125°C	11-Lead TO-220	\$7.20
LMD18245	DMOS H-Bridge with Digital or Analog Control	3	55	-40°C to +125°C	15-Lead TO-220	\$9.35
LM675	Monolithic Power Op-Amp	3	60	0°C to +70°C	5-Lead TO-220	\$3.00
LM12CL	Monolithic Power Op-Amp	10	60	0°C to +70°C	4-Lead TO-3	\$14.30

## PRECISION MOTION CONTROL PROCESSORS

Part Number	Features	Max Clock Speed (MHz)	Operating Temp (T <sub>A</sub> )	Package	Price <sup>1</sup>
LM628	32-Bit Position, Velocity, and Acceleration Registers; Position and Velocity Modes; 16-Bit PID Filter with Programmable Coefficients; 8- or 12-Bit DAC Output Data; Quadrature Incremental Encoder Interface; 8-Bit Asynchronous Host Interface	6 or 8	-40°C to +85°C	28-Lead DIP	\$19.00
LM629	Same Features as LM628, but with 8-Bit. PWM Sign/Magnitude Output Data	6 or 8	-40°C to +85°C	28-Lead DIP	\$19.00

Note 1: 1,000 piece suggested resale price. FOB Santa Clara, California, USA Price may vary with package option.

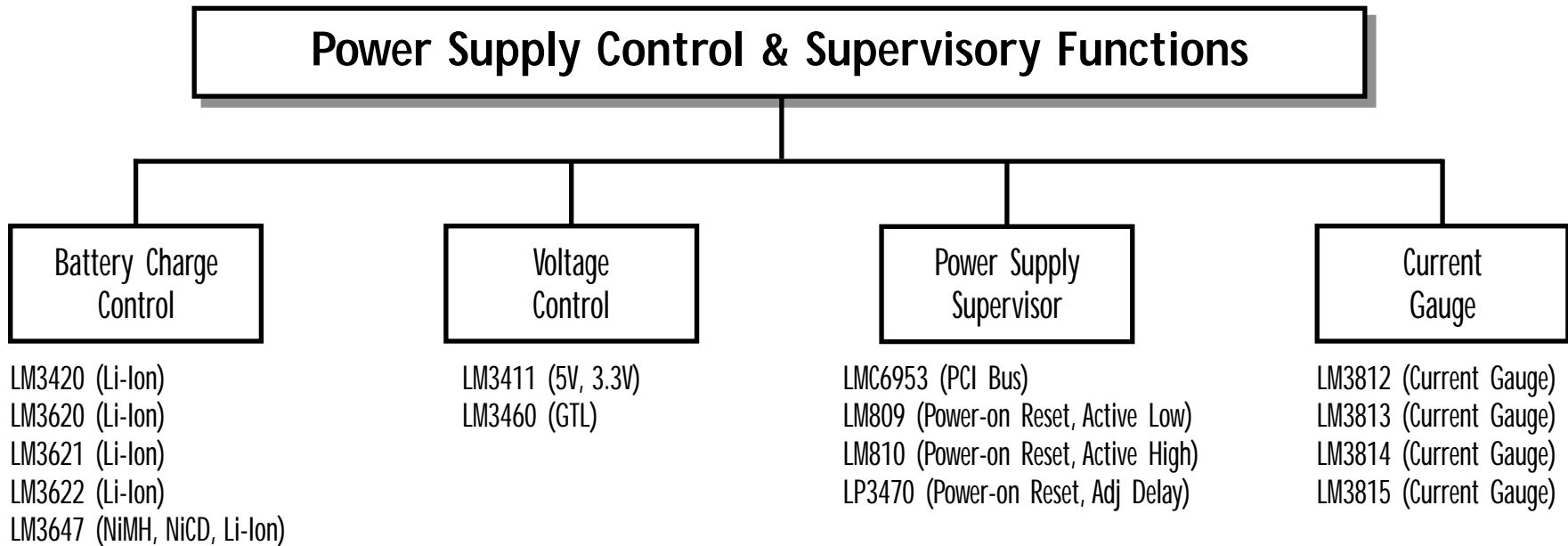




**BATTERY CHARGE, POWER SUPPLY  
CONTROL & SUPERVISORY FUNCTIONS**

*Section 7*

# BATTERY CHARGE, POWER SUPPLY CONTROL & SUPERVISORY FUNCTIONS



## BATTERY CHARGE CONTROL PRODUCTS

Part Number	Function	Input Range (V)	Function	Features	Pkg <sup>1</sup>	Operating Temp Range <sup>2</sup>	Price <sup>6</sup>
LM3420	Charge control for 1, 2, 3, 4, or 5 Li-Ion cells	4.2, 8.2, 8.4, 12.6, 16.8	Current for control of charger (20mA to 15mA)	1% & 0.5% tolerances.	M5	I	\$0.90
LM3620	Charge control for 1 or 2 Li-Ion cells	4 to 30	Current for control of charger (up to 15mA)	1.2% tolerance. Selectable battery type (coke vs graphite anode).	M5	C	\$0.75
LM3621	Full-function charge controller for 1 Li-Ion cell	3.0 to 5.5	Analog control of constant-current constant-voltage charger	0.5% tolerance. Selectable battery type (coke vs graphite anode). 5 charge modes plus fault detection.	M16	C	\$1.57
LM3622	Charge control for 1 or 2 Li-Ion cells	4.5 to 20	Analog control of CVCC charger	0.7% & 1.2% tolerance. Low voltage battery detection. Coke & graphite versions available.	M8	I	\$0.95
LM3647	High precision, fast charger for 2-8 NiMH, NiCd cells or 1-4 Li-Ion cells	1.0 to 20	Li-Ion: Constant-current constant-voltage charge NiMH, NiCd: -ΔV charge termination	Selectable battery type. 4 charge stages plus fault detection	M20	I <sup>3</sup>	\$2.84

## VOLTAGE CONTROL PRODUCTS

Part Number	Function	Input Range (V)	Output	Features	Pkg <sup>1</sup>	Operating Temp Range <sup>2</sup>	Price <sup>6</sup>
LM3411	Power supply feedback control	3.3, 5	Current for control of regulator (20mA to 15mA)	1% & 0.5% tolerances. Custom voltages available (3V to 17V).	M5, N8	I	\$0.52
LM3460	GTL, GTLp Bus voltage control	1.2, 1.5	Current for control of regulator (20mA to 15mA)	1% tolerance.	M5	I	\$0.83

## CURRENT GAUGE PRODUCTS

Part Number	Function	Input Range	Output	Features	Pkg <sup>1</sup>	Operating Temp Range <sup>2</sup>	Price <sup>6</sup>
LM3812-1.0	High-Side Current Gauge	up to 1A	PWM with duty cycle proportional to input current	Sampling interval of 50ms for 4% tolerance.	M8	I	\$1.52
LM3812-7.0	High-Side Current Gauge	up to 7A (10A peak)	PWM with duty cycle proportional to input current	Sampling interval of 50ms for 6% tolerance.	M8	I	\$1.52
LM3813-1.0	Low-Side Current Gauge	up to 1A	PWM with duty cycle proportional to input current	Sampling interval of 50ms for 4% tolerance.	M8	I	\$1.52
LM3813-7.0	Low-Side Current Gauge	up to 7A (10A peak)	PWM with duty cycle proportional to input current	Sampling interval of 50ms for 6% tolerance.	M8	I	\$1.52
LM3814-1.0	High-Side Current Gauge	up to 1A	PWM with duty cycle proportional to input current	Sampling interval of 6ms for 5.5% tolerance.	M8	I	\$1.52
LM3814-7.0	High-Side Current Gauge	up to 7A (10A peak)	PWM with duty cycle proportional to input current	Sampling interval of 6ms for 8.5% tolerance.	M8	I	\$1.52
LM3815-1.0	Low-Side Current Gauge	up to 1A	PWM with duty cycle proportional to input current	Sampling interval of 6ms for 5.5% tolerance.	M8	I	\$1.52
LM3815-7.0	Low-Side Current Gauge	up to 7A (10A peak)	PWM with duty cycle proportional to input current	Sampling interval of 6ms for 8.5% tolerance.	M8	I	\$1.52

## POWER SUPPLY SUPERVISOR PRODUCTS

Part Number	Function	Reset Threshold(s)	Output	Features	Pkg <sup>1</sup>	Operating Temp Range <sup>2</sup>	Price <sup>6</sup>
LMC6953	PCI Local Bus Supervisor	(1.5-6, 3.3, and 5V)	Active low reset flag	Triple voltage monitor with adjustable delay	M8	C	\$1.48
LM809	Power-on Reset	2.63, 2.93, 3.08, 4.00, 4.38, 4.63V	Active low reset flag	Fixed 240ms delay	M3	I <sup>4</sup>	\$0.40
LM810	Power-on Reset	2.63, 2.93, 3.08, 4.00, 4.38, 4.63V	Active high reset flag	Fixed 240ms delay	M3	I <sup>4</sup>	\$0.40
LP3470	Power-on Reset	2.63, 2.93, 3.08, 4.00, 4.38, 4.63V	Active low reset flag	Adjustable delay	M5	I <sup>3</sup> , C <sup>5</sup>	\$0.53

1 Package designation includes number of pins:

N = plastic dual-in-line M3 = 3 Lead SOT-23  
M = plastic surface-mount M5 = 5 Lead SOT-23

2 Industrial temperature range, I, denotes a junction temperature range of -40°C to +125°C.  
Commercial temperature range, C, denotes a junction temperature range of 0°C to +70°C.

3 Temperature range is -40°C to +85°C.

4 Temperature range is -40°C to +105°C

5 Temperature range is -20°C to +85°C.

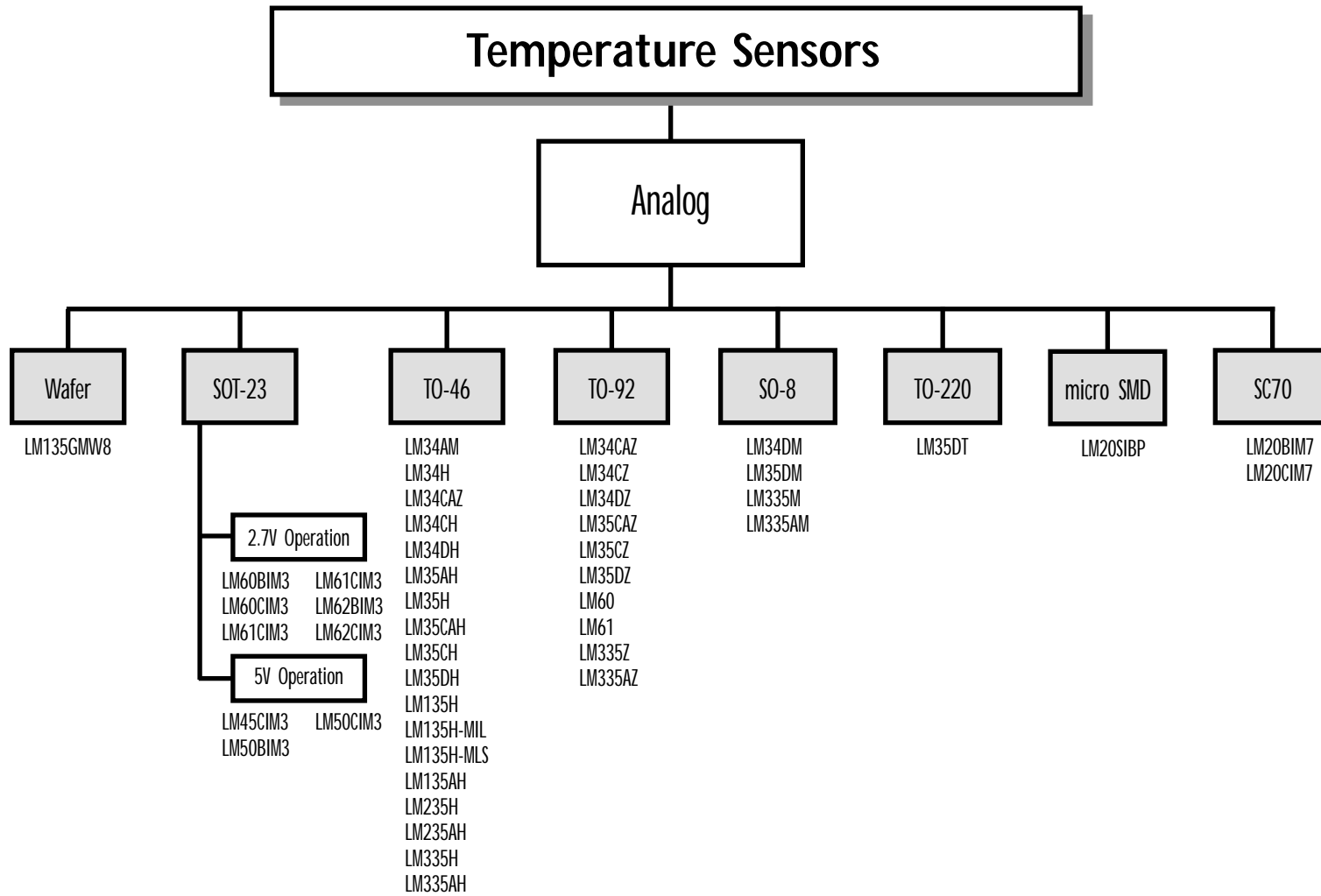
6 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
Price may vary by package or grade.



# TEMPERATURE SENSORS

## *Section 8*

# TEMPERATURE SENSORS





# TEMPERATURE SENSORS

## TEMPERATURE SENSOR PRODUCTS

Part Number	Product Description	Operating Temp. Range	Accuracy * (Tmin to Tmax)	Sensor Gain (Tmin to Tmax)	Supply Voltage Range	Quiescent Current (Tmin to Tmax)	Packages	Price **
LM20B	<b>2.4V micro SMD or SC70 Precision Temperature Sensors</b>	-55°C to +130°C	±2.5°C	-11.7mV/°C	+2.4V to +5.5V	10µA	SC70	\$0.50
LM20C		-55°C to +130°C	±5.0°C	-11.7mV/°C	+2.4V to +5.5V	10µA	SC70	\$0.40
LM20S		-40°C to +125°C	±3.5°C	-11.7mV/°C	+2.4V to +5.5V	10µA	micro SMD	\$0.45
LM34A	<b>Precision Fahrenheit Temperature Sensors</b> Output voltage linearity proportional to Fahrenheit temperature. Complement to LM35 family.	-50°F to +300°F	±2.0°F	10mV/°F	+5V to +30V	163µA	TO-46	\$10.70
LM34		-50°F to +300°F	±3.0°F	10mV/°F	+5V to +30V	181µA	TO-46	\$9.20
LM34CA		-40°F to +230°F	±3.0°F	10mV/°F	+5V to +30V	142µA	TO-46, TO-92	\$4.00
LM34C		-40°F to +230°F	±3.0°F	10mV/°F	+5V to +30V	159µA	TO-46, TO-92	\$3.10
LM34D		-32°F to +212°F	±4.0°F	10mV/°F	+5V to +30V	159µA	TO-46, TO-92, SO-8	\$0.90
LM35A	<b>Precision Celsius Temperature Sensors</b> Output voltage linearity proportional to Celsius temperature. Complement to LM34 family.	-55°C to +150°C	±1.0°C	10mV/°C	+4V to +30V	133µA	TO-46	\$11.40
LM35		-55°C to +150°C	±1.5°C	10mV/°C	+4V to +30V	161µA	TO-46	\$8.75
LM35CA		-40°C to +110°C	±1.5°C	10mV/°C	+4V to +30V	116µA	TO-46, TO-92	\$3.80
LM35C		-40°C to +110°C	±2.0°C	10mV/°C	+4V to +30V	141µA	TO-46, TO-92	\$3.00
LM35D		0°C to +100°C	±2.0°C	10mV/°C	+4V to +30V	141µA	TO-46, TO-92, SO-8, TO-220	\$0.86
LM45B	<b>SOT-23 Precision Celsius Temperature Sensors</b>	-40°C to +125°C	±3.0°C (-20 to +100°C)	10mV/°C	+4V to +10V	160µA	SOT-23	\$0.74
LM45C		-40°C to +125°C	±4.0°C (-20 to +100°C)	10mV/°C	+4V to +10V	160µA	SOT-23	\$0.40
LM50B	<b>SOT-23 Precision Celsius Temperature Sensors</b> Negative temperature output available from single supply.	-40°C to +125°C	+3.0°C, -3.5°C (-25 to +100°C)	10mV/°C	+4.5V to +10V	180µA	SOT-23	\$0.74
LM50C		-40°C to +125°C	±4.0°C	10mV/°C	+4.5V to +10V	180µA	SOT-23	\$0.40
LM56B	<b>Low Power Thermostats</b> Digital output temperature sensor.	-40°C to +125°C	±3.0°C	6.2mV/°C	+2.7V to +10V	230µA	SO-8, MSOP-8	\$1.00
LM56C		-40°C to +125°C	±3.0°C	6.2mV/°C	+2.7V to +10V	230µA	SO-8	\$0.75
LM66C-RLSKB††		-40°C to +85°C	±3.0°C (+73°C, +82°C)	6.2mV/°C	+2.7V to +10V	230µA	SO-8	†††
LM60B	<b>2.7V, SOT-23 Temperature Sensors</b> Negative temperature output available from single supply.	-25°C to +125°C	±3.0°C	6.25mV/°C	+2.7V to +10V	125µA	SOT-23	\$0.80
LM60C		-40°C to +125°C	±4.0°C	6.25mV/°C	+2.7V to +10V	125µA	SOT-23	\$0.46
LM61B		-25°C to +85°C	±3.0°C	10mV/°C	+2.7V to +10V	155µA	SOT-23	\$0.80
LM61C		-30°C to +100°C	±4.0°C	10mV/°C	+2.7V to +10V	155µA	SOT-23	\$0.46
LM62B		0°C to +90°C	+2.5°C, -2.0°C	15.6mV/°C	+2.7V to +10V	165µA	SOT-23	\$0.80
LM62C		0°C to +90°C	+4.0°C, -3.0°C	15.6mV/°C	+2.7V to +10V	165µA	SOT-23	\$0.46
LM75-3	<b>I<sup>2</sup>C Digital Temperature Sensors and Thermal Watchdogs</b>	-55°C to +125°C	±3.0°C	0.5°C/LSB	+3.0V to +3.6V	1mA	SO-8, MSOP-8	\$1.05
LM75-5		-55°C to +125°C	±3.0°C	0.5°C/LSB	+4.5V to +5.5V	1mA	SO-8, MSOP-8	\$1.05
LM76(CNM)-3		-55°C to +150°C	±1.0°C (+70 to +100°C)	0.0625°C/LSB	+3.0V to +3.6V	500µA	SO-8	\$1.30
LM76(CHM)-5		-55°C to +150°C	±1.0°C (-10 to +45°C)	0.0625°C/LSB	+4.5V to +5.5V	450µA	SO-8	\$1.30
LM77-3		-55°C to +150°C	±1.5°C (-10°C to +65°C)	0.5°C/LSB	+3.0V to +3.6V	0.5mA	SO-8	\$0.90
LM77-5		-55°C to +150°C	±1.5°C (-10°C to +65°C)	0.5°C/LSB	+4.5V to +5.5V	0.5mA	SO-8	\$0.90

\* Accuracy is guaranteed over Tmin to Tmax and is guaranteed at 25°C.

\*\* 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

† Does not include quantization error.

†† Thermostat values are preset internally.

††† Contact National sales reps for availability and pricing.



TEMPERATURE SENSOR PRODUCTS

Part Number	Product Description	Operating Temp. Range	Accuracy * (Tmin to Tmax)	Sensor Gain (Tmin to Tmax)	Supply Voltage Range	Quiescent Current (Tmin to Tmax)	Packages	Price **
LM80	<b>Microprocessor System Hardware Monitors</b>	-25°C to +125°C	±3.0°C	0.5°C/LSB	+2.8V to +5.75V	1.5mA	TSSOP-24	\$3.00
LM81		-40°C to +125°C	±3.0°C	0.5°C/LSB	+2.8V to +3.8V	0.9mA	TSSOP-24	\$1.90
LM87		-40°C to +125°C	±3.0°C (+60°C to +100°C)†	1°C/LSB	+2.8V to +3.8V	2.0mA	TSSOP-24	\$2.80
LM135A	<b>Two-Terminal Shunt Kelvin Temperature Sensors</b> The LM135, 235, 335 family operate as 2-terminal zener diodes with breakdown voltage linearity proportional to Kelvin temperature. Military screening available for LM135.	-55°C to +150°C	±2.7°C	10mV/°K	N/A	400µA to 5mA	TO-46	\$8.55
LM135		-55°C to +150°C	±5.0°C	10mV/°K	N/A	400µA to 5mA	TO-46	\$3.93
LM235A		-40°C to +125°C	±2.7°C	10mV/°K	N/A	400µA to 5mA	TO-46	\$7.10
LM235		-40°C to +125°C	±2.5°C	10mV/°K	N/A	400µA to 5mA	TO-46	\$2.70
LM335A		-40°C to +100°C	±5.0°C	10mV/°K	N/A	400µA to 5mA	TO-46, TO-92, SO-8	\$3.40
LM335	-40°C to +100°C	±9.0°C	10mV/°K	N/A	400µA to 5mA	TO-46, TO-92, SO-8	\$1.14	
LM70-3	<b>SPI/MICROWIRE Temperature Sensors</b>	-55°C to +150°C	+1.5, -2.0	0.25°C/LSB	+2.65V to +3.6V	490µA	MSOP-8, LLP-8	\$0.77
LM70-5		-55°C to +150°C	+1.5, -2.0	0.25°C/LSB	+4.5V to +5.5V	490µA	MSOP-8, LLP-8	\$0.77
LM74-3		-55°C to +150°C	±1.25°C (-10 to +65°C)	0.0625°C/LSB	+3.0V to +3.6V	520µA	SO-8, micro SMD	\$0.85
LM74-5		-55°C to +150°C	±1.25°C (-10 to +65°C)	0.0625°C/LSB	+4.5V to +5.5V	520µA	SO-8, micro SMD	\$0.85
LM82	<b>Remote Diode Temperature Sensors</b>	0°C to +125°C	±3.0°C (+25 to +100°C)	1°C/LSB	+3.0V to +3.6V	0.8mA	QSOP-16	\$1.95
LM83		0°C to +125°C	±3.0°C (+25°C to +100°C)	1°C/LSB	+3.0V to +3.6V	0.8mA	QSOP-16	\$2.60
LM84		0°C to +125°C	±3.0°C (+60°C to +100°C)†	1°C/LSB	+3.0V to +3.6V	1.0mA	QSOP-16	\$1.80
LM92	<b>±0.33°C Accurate, 12-Bit + Sign Temperature Sensor and Thermal Window Comparator with 2-Wire Interface</b>	-55°C to +150°C	±0.33°C (+30°C) ±0.5°C (+10°C to +50°C)	0.0625°C/LSB	+2.7V to +5.5V	0.625mA	SO-8	\$2.05

\* Accuracy is guaranteed over Tmin to Tmax and is guaranteed at 25°C.

\*\* 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

† Does not include quantization error.

‡ Thermostat values are preset internally.

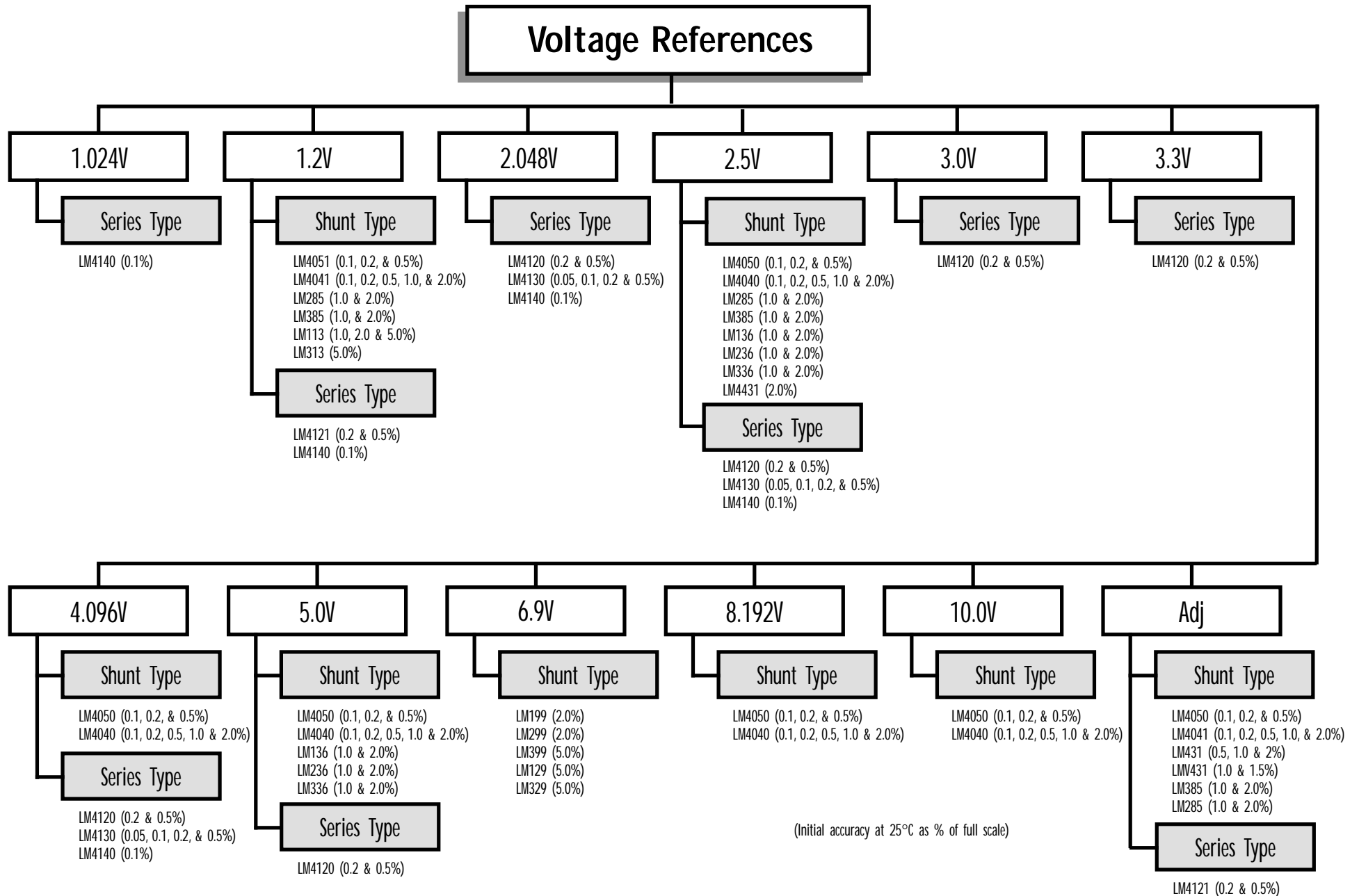
‡‡‡ Contact National sales reps for availability and pricing.



## VOLTAGE REFERENCES

### *Section 9*

# VOLTAGE REFERENCE



## SHUNT TYPE VOLTAGE REFERENCES

Part Number	Reference Voltage (V <sub>R</sub> )	Initial Accuracy (% FS max), T=25°C	TEMPCO (ppm/°C) max	Operating Temp Range ***	Operating Current Range	Package	Notes	Price <sup>1</sup>
LM4050	2.5, 4.1†, 5, 8.2†, 10	±0.1, ±0.2, ±0.5	50	Ind, Ext	60µA to 15mA	SOT-23		\$0.75
LM4051	1.2†, Adj	±0.1, ±0.2, ±0.5	50	Ind	60µA to 15mA	SOT-23	1.225V to 10V Adjustable	\$0.75
LM4040	2.5, 4.1†, 5, 8.2†, 10	±0.1, ±0.2, ±0.5, ±1.0, ±2.0	100, 150	Ind, Ext	60µA to 15mA	SOT-23, TO-92	±1% & ±2% accuracy parts have TEMPCO's of 150 ppm/°C	\$0.34
LM4041	1.2†, Adj	±0.1, ±0.2, ±0.5, ±1.0, ±2.0	100, 150	Ind, Ext	60µA to 12mA	SOT-23, TO-92	1.225V to 10V Adjustable. TEMPCO same as LM4040	\$0.32
LM185	1.2†, 2.5, Adj	±1.0, ±2.0	30, 50	Mil	10µA to 20mA	TO-46, LCC	Adjustable from 1.24 to 5.3V	\$5.00
LM285	1.2†, 2.5, Adj	±1.0, ±2.0	30, 50	Ind	10µA to 20mA	SO-8, TO-46, TO-92	Adjustable from 1.24 to 5.3V	\$0.58
LM385	1.2†, 2.5, Adj	±1.0, ±2.0	30, 50	Com	10µA to 20mA	SOT-23, SO-8, TO-92	Adjustable from 1.24 to 5.3V	\$0.35
LM113	1.2†	±1.0, ±2.0, ±5.0	100††	Mil	500µA to 20mA	TO-46	1.22V	\$6.80
LM313	1.2†	±5.0	100††	Com	500µA to 20mA	TO-46	1.22V	\$4.05
LM431	Adj	±0.5, ±1.0, ±2.0	50††	Com, Ind	1.0mA to 100mA	micro SMD, SOT-23, SO-8, TO-92	Adjustable from 2.5 to 36V	\$0.15
LMV431	Adj	±1.0, ±1.5	130	Com, Ind	55µA to 20mA	SOT-23, TO-92	Adjustable from 1.24 to 30V (Low voltage version of LM431)	\$0.31
LM4431	2.5	±2.0	30††	Com	100µA to 15mA	SOT-23		\$0.36
LM136	2.5, 5	±1.0, ±2.0	40	Mil	400-600µA to 10mA	TO-46	Trimmable reference voltage and temperature drift	\$2.19
LM336	2.5, 5	±2.0, ±5.0**	34	Com	400-600µA to 10mA	SO-8, TO-92	Trimmable reference voltage and temperature drift	\$0.57
LM199	6.95	±2.0	0.5	Mil	500µA to 10mA	TO-46		\$24.10
LM299	6.95	±2.0	1	Ind	500µA to 10mA	TO-46	Operating Temperature range: -25 to 85°C	\$8.30
LM399	6.95	±5.0	1, 2	Com	500µA to 10mA	TO-46		\$1.98
LM129	6.95	±3.0**	10*, 20, 50	Mil	600µA to 15mA	TO-46		\$3.55
LM329	6.95	±5.0	10, 20*, 50, 100	Com	600µA to 15mA	TO-92, TO46	LM329D has a tempco of 100 ppm/°C	\$0.36
LM236	2.5, 5	±1.0, +2.0	34	Ind	400-600µA to 10mA	TO-46	Trimmable reference voltage and temperature drift	\$4.35

## SERIES TYPE VOLTAGE REFERENCES

Part Number	Reference Voltage (V <sub>R</sub> )	Initial Accuracy (% FS max), T=25°C	TEMPCO (ppm/°C) max	Operating Temp Range ***	Quiescent Current (max)	Output Current (max)	Dropout Voltage (max 25°C)	Package	Notes	Price <sup>1</sup>
LM4120	1.8, 2.0†, 2.5, 3.0, 3.3, 4.1†, 5.0	±0.2, ±0.5	50	Ind	250µA	±5mA	0.21V @ 5mA	SOT-23	Part has an enable pin	\$0.85
LM4121	1.2†, Adj	±0.2, ±0.5	50	Ind	250µA	±5mA	0.21V @ 5mA	SOT-23	Part has an enable pin	\$0.85
LM4130	2.0†, 2.5, 4.1†	±0.05, ±0.1, ±0.2, ±0.5	10, 20, 30	Ind	75µA	20mA	0.275V @ 10mA	SOT-23		\$1.35
LM4140	1.0†, 1.2†, 2.0†, 2.5, 4.1† Custom:0.5V to 4.5V	±0.1	(3), 6, 10	Com	320µA	8mA	0.235V @ 8mA	SO-8	Part has an enable pin	\$2.40

† Consult datasheet for precise V<sub>R</sub>  
†† Typical value

\* Other TEMPCO's available, lowest are shown  
\*\* Initial Accuracy better than value indicated  
\*\*\* Com. = 0 to 70°C Ind. = -40 to 85°C,  
Ext. = -40 to 125°C Mil. = -55 to 125°C.

Note 1: 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

Refer to specific datasheets for exact specifications, available options, and ordering information.  
Some combinations of reference voltage, initial accuracy and package are not available.

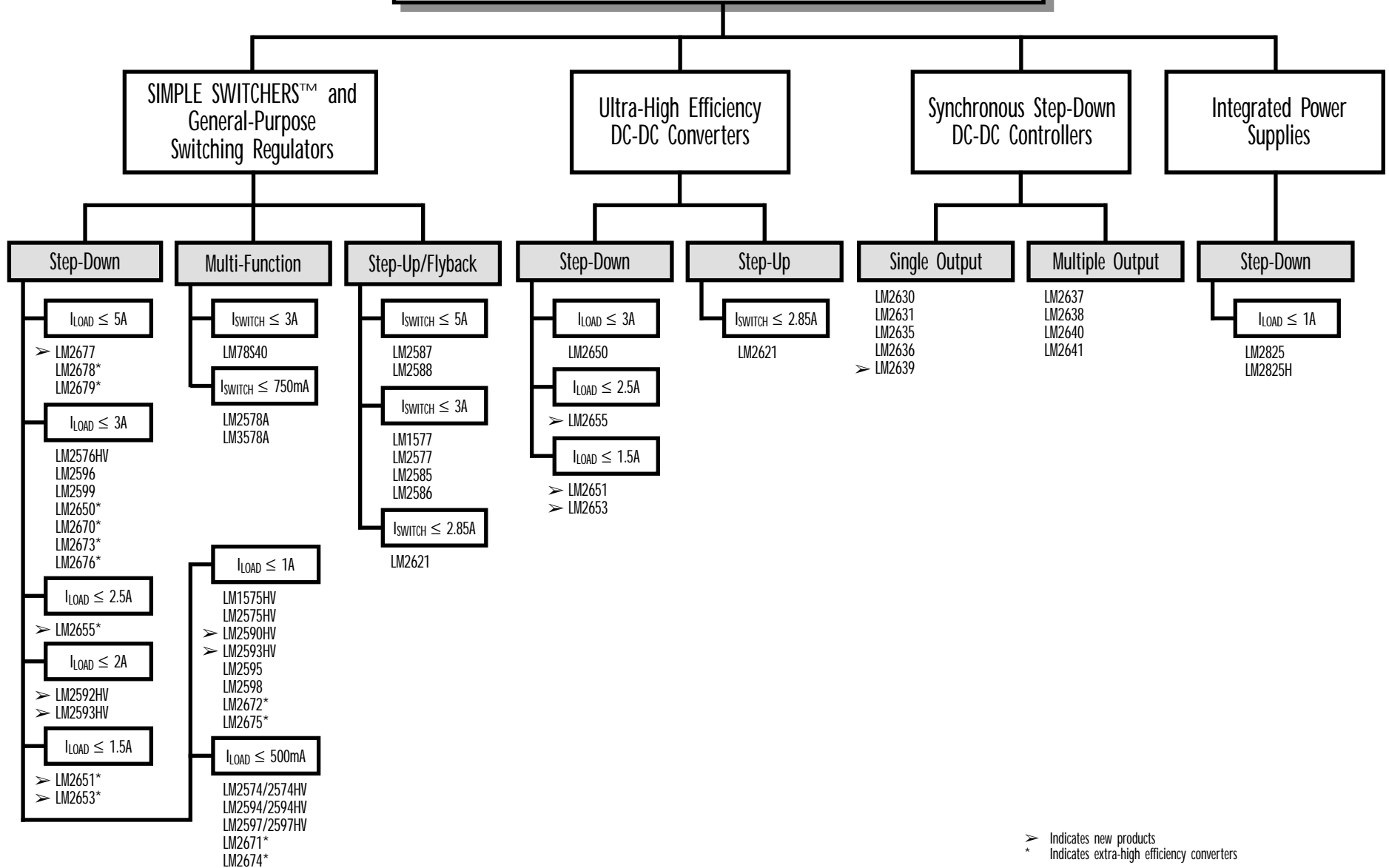


# VOLTAGE REGULATORS/CONVERTERS

## *Section 10*

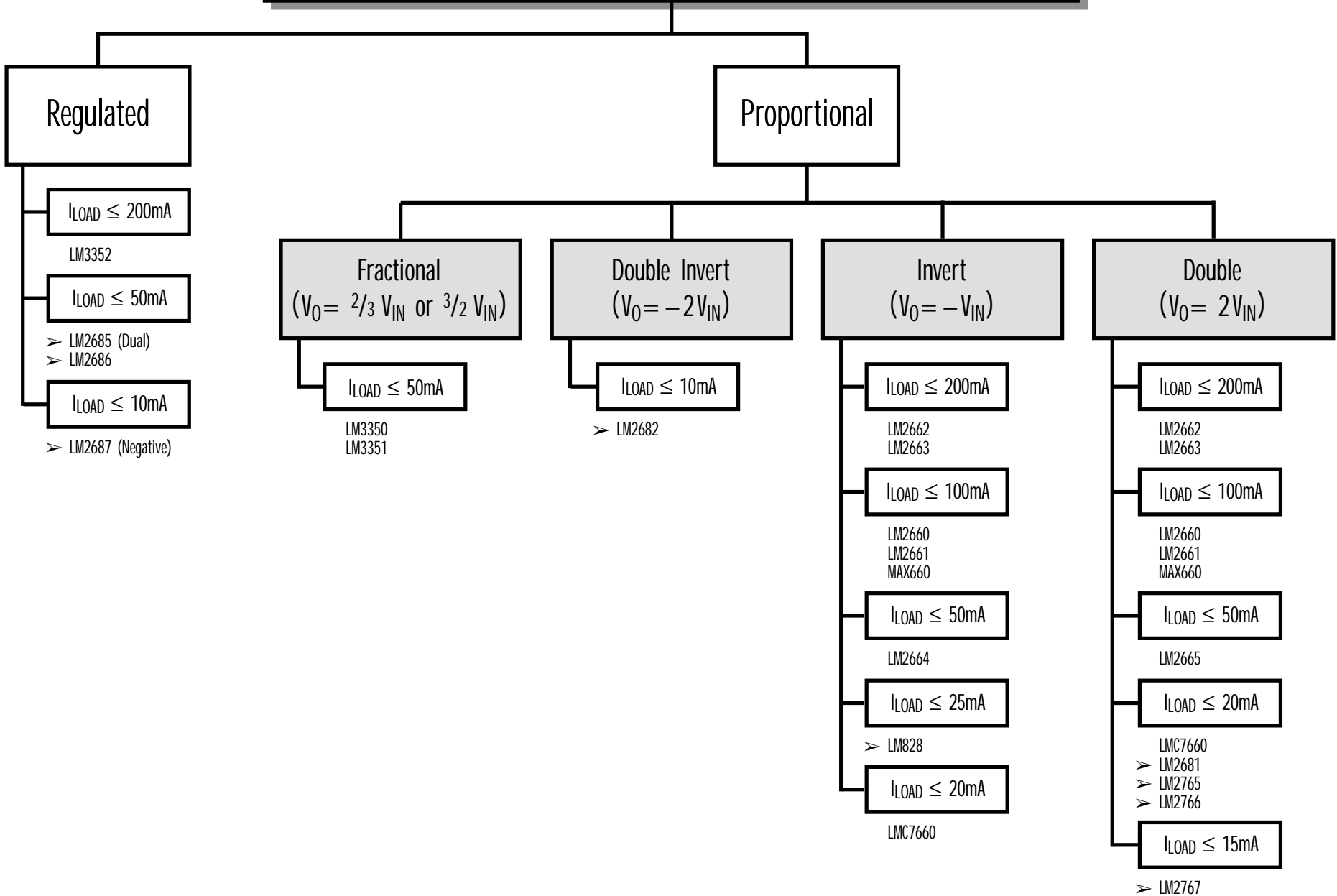
# VOLTAGE REGULATORS/CONVERTERS

## Switching Regulators



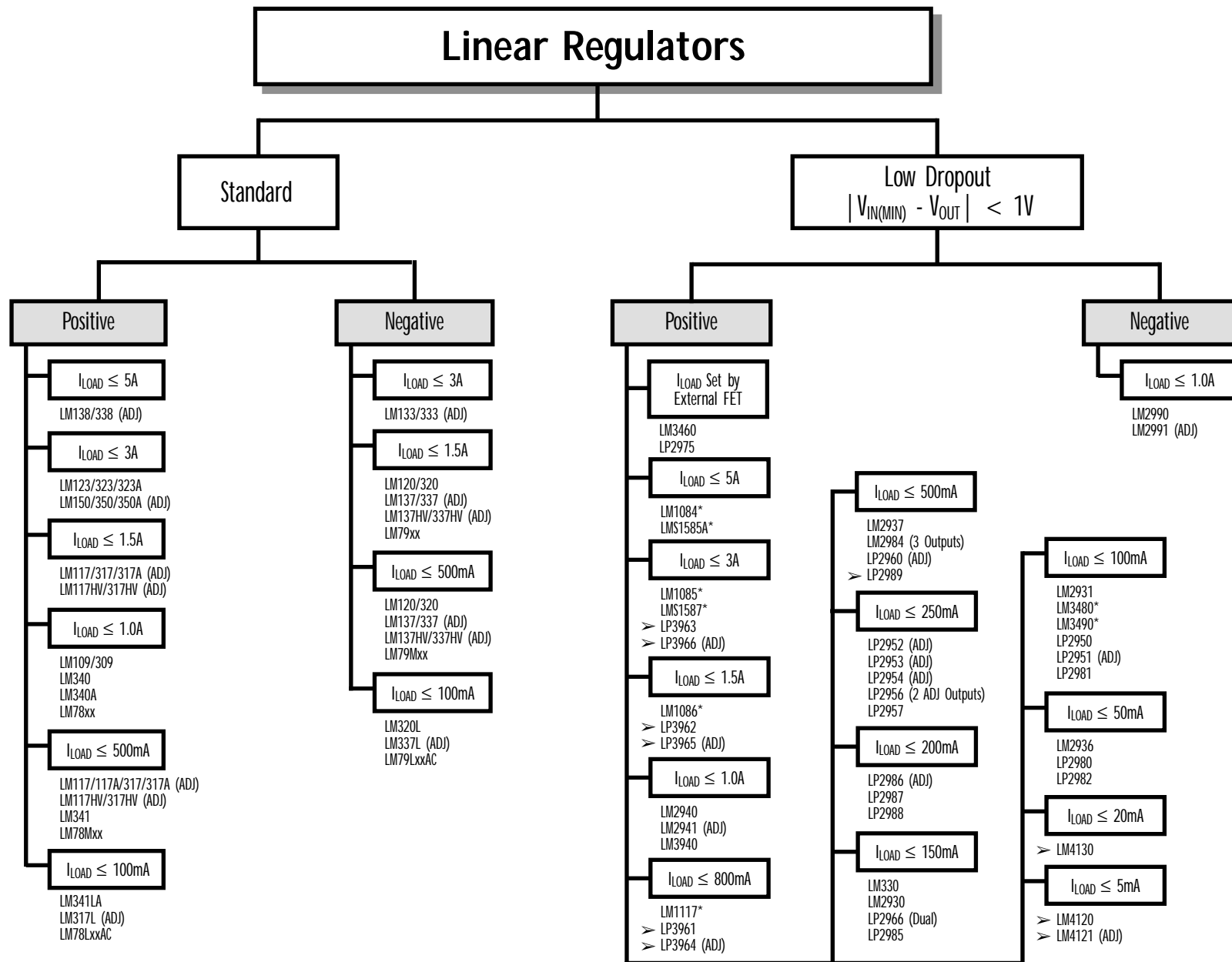


# Switched Capacitor Converters and Regulators



➤ Indicates New Products

# VOLTAGE REGULATORS/CONVERTERS



> Indicates new products  
\* Indicates dropout voltage  $\leq 1.15V - 1.5V$

## SWITCHING REGULATORS FOR COMPUTING VOLTAGE CONVERSION

Part Number	# of Reg. Volt.	Linear Regulator Output (V) <sup>1</sup>	Switch. Regulator Output Adj. Range (V)	Initial Output Accur. <sup>2</sup>	5-Bit DAC	Switching Regulator Output Current	Input Voltage		Switch. Freq. (kHz)	Features <sup>3</sup>							Applications	Pkg.	Price <sup>5</sup>
							Min	Max		Clock Sync	OVP	UVP	PGOOD	OCP	SS	S/D or EN			
<b>SYNCHRONOUS STEP-DOWN DC-DC CONTROLLERS</b>																			
LM2630	1		1.8 to 6	2.5%		controller	4.5	30	200-400	✓		✓	✓	✓	✓	✓	CPU V <sub>CORE</sub>	TSSOP-20	\$2.50
LM2631	1		1.5 to 6	2.5%		controller	4.5	30	200-400	✓	✓	✓	✓	✓	✓	✓	CPU V <sub>CORE</sub>	TSSOP-20	\$2.50
LM2635	1		1.8 to 3.5	2%	✓	controller	4.5	5.5	50-1000		✓		✓	✓	✓	✓	CPU V <sub>CORE</sub> , V <sub>I/O</sub>	SO-20	\$1.60
LM2636	1		1.3 to 3.5	1.5%	✓	controller	4.5	5.5	50-1000		✓		✓	✓	✓	✓	CPU V <sub>CORE</sub> , V <sub>I/O</sub> ; V <sub>GTL</sub> ; V <sub>AGP</sub>	SO-20	\$1.60
LM2637	3	1.5V, 2.5V	1.3 to 3.5	1.5%	✓	controller	4.75	5.25	50-1000		✓	✓	✓	✓	✓	✓	CPU V <sub>CORE</sub> , V <sub>I/O</sub> ; V <sub>GTL</sub> ; V <sub>CLK</sub> ; V <sub>AGP</sub>	SO-24	\$2.10
LM2638	3	1.25V, 1.5V	1.3 to 3.5	1.5%	✓	controller	4.75	5.25	50-1000		✓	✓	✓	✓	✓	✓	CPU V <sub>CORE</sub> , V <sub>I/O</sub> ; V <sub>GTL</sub> ; V <sub>CLK</sub> ; V <sub>AGP</sub> ; V <sub>STDBY</sub> 2.5V, 3.3V	SO-24	\$2.10
LM2639	1		1.3 to 3.5	1.5%	✓	Multi-phase controller	4.75	5.25	8000	✓		✓	✓	✓	✓	✓	CPU V <sub>CORE</sub>	SO-24	\$2.88
LM2640	3	5	2.2 to 6	2%		controller	5.5	30	200	✓	✓	✓		✓	✓	✓	Main V3.3, V5; V <sub>STDBY</sub> 5V	TSSOP-28	\$3.50
LM2641	3	5	2.2 to 6	2%		controller	5.5	30	300	✓	✓	✓		✓	✓	✓	Main V3.3, V5; V <sub>STDBY</sub> 5V	TSSOP-28	\$3.50
<b>ULTRA-HIGH EFFICIENCY DC-DC CONVERSION</b>																			
LM2621	1		1.2 to 14	3%		1A <sup>4</sup>	0.65	22	1000					✓		✓	PC Card Supply, TFT/LCD Bias Supply	MSOP-8	\$1.89
LM2650	1		1.5 to 16	5%		3A	4.5	18	90-300					✓	✓	✓	Main V3.3, V5; V <sub>GTL</sub> ; V <sub>AGP</sub>	SO-24	\$3.50
LM2651	1		1.2 to 13, or fixed 1.8, 2.5, 3.3V	2% Adj 3% Fixed		1.5A	4	14	300			✓		✓	✓	✓	PDA/Peripheral Main Supply	TSSOP-16	\$3.15
LM2653	1		1.5 to 5	3%		1.5A	4	14	300		✓	✓	✓	✓	✓	✓	PDA/Peripheral Main Supply	TSSOP-16	\$3.15
LM2655	1		1.2 to 13, or fixed 3.3V	2.3% Adj 3.5% Fixed		2.5A	4	14	300		✓	✓		✓	✓	✓	PDA/Peripheral Main Supply	TSSOP-16	\$3.10

## INTEGRATED POWER SUPPLIES

Part Number	V <sub>IN</sub>	V <sub>OUT</sub>	I <sub>OUT</sub>	Application	Package	Price <sup>5</sup>
LM2825-3.3	4.75V to 40V	3.3V	1A	Buck	24-Pin Molded DIP	\$10.50
LM2825-5.0	7V to 40V	5.0V	1A	Buck	24-Pin Molded DIP	\$9.65
LM2825-12	15V to 40V	12V	0.75A	Buck	24-Pin Molded DIP	\$10.50
LM2825-ADJ	4.5V to 40V	1.23V to 8V	1A	Buck	24-Pin Molded DIP	\$10.50
LM2825H-ADJ	9V to 40V	7V to 15V	0.55A	Buck	24-Pin Molded DIP	\$10.50

Note 1 For LM2637 and LM2638, output voltages of linear controllers default to the fixed values shown but are also adjustable.

Note 2 Accuracy of switching controller over temperature.

Note 3 Available features include these:

**Clock Sync.:** Ability to synchronize switching frequency to external source  
**PGOOD:** Output flag indicates when the output voltage is within 10% of nominal

**OCP:** Output overcurrent protection  
**OVP:** Output overvoltage protection  
**SS:** Soft-start  
**S/D or EN:** Shutdown or Enable control  
**UVP:** Output undervoltage protection

Note 4 LM2621 is a boost converter with a 2.85A (typ) switch. Maximum load current is up to 1A in most applications, but it is limited at lower input voltages. Consult datasheet for further information.

Note 5 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# VOLTAGE REGULATORS/CONVERTERS

## SIMPLE SWITCHER® POWER CONVERTER FAMILY

Part Number	Output Voltage	Tolerance	Min	Max	Temp Range <sup>2</sup>	Switching Frequency (kHz)	Converter Efficiency	Soft Start	Shutdown	Power Good Flag	Clock Sync	Adj Current Limit	Package <sup>3</sup>	Price <sup>4</sup>
<b>BUCK CONVERTERS</b>														
<b>500mA Output Current</b>														
LM2671	3.3V, 5V, 12V, Adj <sup>1</sup>	±1.5%	8V	40V	Ind	260-400	94%	√	√		√		M, N	\$1.68
LM2674	3.3V, 5V, 12V, Adj <sup>1</sup>	±1.5%	8V	40V	Ind	260	94%		√				M, N	\$1.40
LM2594	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Ind	150	88%		√				M, N	\$1.42
LM2594HV	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	60V	Ind	150	88%		√				M, N	\$1.95
LM2597	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Ind	150	88%	√	√	√			M, N	\$1.68
LM2597HV	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	60V	Ind	150	88%	√	√	√			M, N	\$2.08
LM2574HV	3.3V, 5V, 12V, 15V, Adj <sup>1</sup>	±4%	4.75V	60V	Ind	52	80%		√				M, N	\$1.95
<b>1.0A Output Current</b>														
LM2672	3.3V, 5V, 12V, Adj <sup>1</sup>	±1.5%	8V	40V	Ind	260-400	94%	√	√		√		M, N	\$2.59
LM2675	3.3V, 5V, 12V, Adj <sup>1</sup>	±1.5%	8V	40V	Ind	260	94%		√				M, N	\$2.25
LM2590HV	3.3V, 5V, Adj <sup>1</sup>	±4%	4.5V	60V	Ind	150	90%	√	√				S, T	Call
LM2591HV	3.3V, 5V, Adj <sup>1</sup>	±4%	4.5V	60V	Ind	150	90%		√				S, T	Call
LM2595	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Ind	150	90%		√				S, T	\$1.68
LM2595 Mil	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Mil	150	90%		√				J	\$13.90
LM2598	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Ind	150	90%	√	√	√			S, T	\$1.93
LM1575	3.3V, 5V, 12V, 15V, Adj <sup>1</sup>	±4%	4.75V	40V	Mil	52	85%		√				K	\$9.35
LM1575HV	5V, 12V, 15V, Adj <sup>1</sup>	±4%	4.75V	60V	Mil	52	85%		√				K	\$28.00
LM2575HV	3.3V, 5V, 12V, 15V, Adj <sup>1</sup>	±4%	4.75V	60V	Ind	52	85%		√				M, N, S, T	\$2.15
<b>1.5A Output Current</b>														
LM2651	1.8V, 2.5V, 3.3V, Adj <sup>1</sup>	±3%	4V	14V	Ind	300	97%	√	√				MTC	\$3.15
LM2653	Adj (1.5V to 5V)	±2%	4V	14V	Ind	300	97%	√	√	√			MTC	\$3.15

### Notes:

All switching converters have Current Limiting and Thermal Shutdown features.

<sup>1</sup> Typically 1.23V to (V<sub>IN</sub> max - 3V).

<sup>2</sup> Under Temp Range the letters indicate temperature range.  
 Ind = Industrial Temperature range of -40°C to +125°C  
 Mil = Military Temperature range of -55°C to +150°C.

<sup>3</sup> Under Package, the letter identifies the type of package.

K = Metal Can (TO-3)  
 M = Small Outline Molded Package (Surface Mount)  
 MM = Mini SO-8  
 MTC = TSSOP  
 N = Molded Dual-In-Line Package  
 S = TO-263 (Power Surface Mount)  
 T = TO-220 (Power Through Hole)  
 J = Aluminum Nitride Ceramic Dual In-Line Package

<sup>4</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
 Price may vary by package or grade.

**SIMPLE SWITCHER® POWER CONVERTER FAMILY**

Part Number	Output Voltage	Tolerance	Min	Max	Temp Range <sup>2</sup>	Switching Frequency (kHz)	Converter Efficiency	Soft Start	Shutdown	Power Good Flag	Clock Sync	Adj Current Limit	Package <sup>3</sup>	Price <sup>4</sup>
<b>2.0A Output Current</b>														
LM2592HV	3.3V, 5V, Adj <sup>1</sup>	±4%	4.5V	60V	Ind	150	90%		√				S, T	Call
LM2593HV	3.3V, 5V, Adj <sup>1</sup>	±4%	4.5V	60V	Ind	150	90%	√	√				S, T	Call
<b>2.5A Output Current</b>														
LM2655	3.3V, Adj <sup>1</sup>	±3%	4V	14V	Ind	300	96%	√	√				MTC	\$3.10
<b>3.0A Output Current</b>														
LM2650	Adj <sup>1</sup>	±4%	4.5V	18V	Ind	90-300	95%	√	√				M	\$3.50
LM2670	3.3V, 5V, 12V, Adj <sup>1</sup>	±2%	8V	40V	Ind	260-400	94%		√		√		S, T	\$3.19
LM2673	3.3V, 5V, 12V, Adj <sup>1</sup>	±2%	8V	40V	Ind	260	94%	√				√	S, T	\$3.19
LM2676	3.3V, 5V, 12V, Adj <sup>1</sup>	±2%	8V	40V	Ind	260	94%		√				S, T	\$2.92
LM2596	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Ind	150	90%		√				S, T	\$1.98
LM2599	3.3V, 5V, 12V, Adj <sup>1</sup>	±4%	4.5V	40V	Ind	150	90%	√	√	√			S, T	\$2.64
LM2576HV	3.3V, 5V, 12V, 15V, Adj <sup>1</sup>	±4%	6V	60V	Ind	52	85%		√				S, T	\$2.98
<b>5.0A Output Current</b>														
LM2677	3.3V, 5V, 12V, Adj <sup>1</sup>	±2%	8V	40V	Ind	260	94%		√		√		S, T	\$3.69
LM2678	3.3V, 5V, 12V, Adj <sup>1</sup>	±2%	8V	40V	Ind	260	92%		√				S, T	\$3.49
LM2679	3.3V, 5V, 12V, Adj <sup>1</sup>	±2%	8V	40V	Ind	260	92%	√				√	S, T	\$3.69
<b>BOOST/FLYBACK CONVERTERS</b>														
<b>2.85A Switch Current</b>														
LM2621	Adj	±3%	1.2V	14V	Ind	2000	90%		√				MM	\$1.89
<b>3.0A Switch Current</b>														
LM2585	3.3V, 5V, 12V, Adj	±4%	4V	40V	Ind	100	90%	√					S, T	\$3.17
LM2586	3.3V, 5V, 12V, Adj	±4%	4V	40V	Ind	100-200	90%	√	√		√		S, T	\$3.27
LM1577	12V, 15V, Adj	±5%	3.5V	40V	Mil	52	80%	√					K	\$29.00
LM2577	12V, 15V, Adj	±5%	3.5V	40V	Ind	52	80%	√					M, N, S, T	\$3.12
<b>5.0A Switch Current</b>														
LM2587	3.3V, 5V, 12V, Adj	±4%	4V	40V	Ind	100	90%	√					S, T	\$4.17
LM2588	3.3V, 5V, 12V, Adj	±4%	4V	40V	Ind	100-200	90%	√	√		√		S, T	\$4.27

**Notes:**  
All switching converters have Current Limiting and Thermal Shutdown features.

<sup>1</sup> Typically 1.23V to (V<sub>IN</sub> max - 3V).

<sup>2</sup> Under Temp Range the letters indicate temperature range.  
Ind = Industrial Temperature range of -40°C to +125°C  
Mil = Military Temperature range of -55°C to +150°C.

<sup>3</sup> Under Package, the letter identifies the type of package.

- K = Metal Can (TO-3)
- M = Small Outline Molded Package (Surface Mount)
- MM = Mini SO-8
- MTC = TSSOP
- N = Molded Dual-In-Line Package
- S = TO-263 (Power Surface Mount)
- T = TO-220 (Power Through Hole)
- J = Aluminum Nitride Ceramic Dual In-Line Package

<sup>4</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA.  
Price may vary by package or grade.



PROPORTIONAL SWITCHED CAPACITOR CONVERTERS

Part Number	Function	Output Impedance (ohms)	Output Current (mA)	Input Range (V)	Oscillator Frequency (kHz)	Capacitor Value (μF)	Quiescent Current (μA)	Shutdown	Frequency Control Input	Frequency Sync.	Package	Price <sup>1</sup>
LM2660	-( $V_{IN}$ ) or 2 ( $V_{IN}$ )	6.5	100	1.5 to 5.5	10/80	150 (x2)	120/400		√	√	MSOP-8/SO-8	\$1.08
LM2661	-( $V_{IN}$ ) or 2 ( $V_{IN}$ )	6.5	100	1.5 to 5.5	80	150 (x2)	1000	√		√	MSOP-8/SO-8	\$1.08
LM2662	-( $V_{IN}$ ) or 2 ( $V_{IN}$ )	3.5	200	1.5 to 5.5	20/150	47 (x2)	300/1300		√	√	SO-8	\$1.53
LM2663	-( $V_{IN}$ ) or 2 ( $V_{IN}$ )	3.5	200	1.5 to 5.5	150	47 (x2)	1300	√		√	SO-8	\$1.53
LM2664	-( $V_{IN}$ )	12	40	1.8 to 5.5	160	3.3 (x2)	220	√			SOT23-6	\$0.67
LM2665	2 ( $V_{IN}$ )	12	40	1.8 to 5.5	160	3.3 (x2)	550	√			SOT23-6	\$0.67
LM2681	2 ( $V_{IN}$ )	15	20	2.5 to 5.5	160	3.3 (x2)	550				SOT23-6	\$0.55
LM2682	-2 ( $V_{IN}$ )	90	10	2.0 to 5.5	6	3.3 (x3)	150				MSOP-8/SO-8	\$1.05
LM2765	2 ( $V_{IN}$ )	20	20	1.8 to 5.5	50	3.3 (x2)	130	√			SOT23-6	\$0.75
LM2766	2 ( $V_{IN}$ )	20	20	1.8 to 5.5	200	1 (x2)	350	√			SOT23-6	\$0.75
LM2767	2 ( $V_{IN}$ )	20	15	1.8 to 5.5	11	10 (x2)	40				SOT23-5	\$0.75
LM828	-2 ( $V_{IN}$ )	20	25	1.8 to 5.5	12	10 (x2)	40				SOT23-5	\$0.65
LM3350	3/2 ( $V_{IN}$ ) or 2/3 ( $V_{IN}$ )	4.2/1.8	50	1.5 to 5.5	1600	0.33 (x4)	3750	√			MSOP-8	\$0.88
LM3351	3/2 ( $V_{IN}$ ) or 2/3 ( $V_{IN}$ )	4.2/1.8	50	1.5 to 5.5	400	1 (x4)	1110	√			MSOP-8	\$0.88

REGULATED SWITCHED CAPACITOR CONVERTERS

Part Number	Output Voltage	Output Current (mA)	Input Range (V)	Oscillator Frequency (kHz)	Capacitor Value (μF)	Quiescent Current (μA)	Shutdown	Package	Price <sup>1</sup>
LM3352	2.5V, 3.0V, or 3.3V	200	2.5 to 5.5	1000	0.33 (x3)	330	√	TSSOP-16	\$2.28
LM2685	5V and -5V	50	2.85 to 6.5	130	2.2 (x4), 4.7	800	√	TSSOP-14	\$1.38
LM2686	5V	50	2.85 to 6.5	130	2.2 (x2), 4.7	450	√	TSSOP-14	\$1.36
LM2687	Adj (-1.5V to -5.2V)	10	2.7 to 5.5	100	1 (x3), 4.7	500	√	MSOP-8	\$0.80

<sup>1</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

# VOLTAGE REGULATORS/CONVERTERS

## LOW DROPOUT REGULATOR PRODUCTS

Output Current	Device	V <sub>OUT</sub> Accuracy <sup>1</sup>	Output Voltage (V)							Dropout Voltage V (max) <sup>2</sup>	Quiescent Current mA (max) <sup>3</sup>	Max. Input Voltage	Reverse Polarity Protection (V)	Transient Protection (V)
			1.8	2.5	3.0	3.3	5	ADJ	Other Available Voltages					
5mA	LM4120A	0.2%			√	√	√		1.8, 2.048, 2.5, 4.096	0.21	0.25	14	—	—
	LM4121A	0.2%						1.22 to 10	1.25	0.55F	0.25	12	—	—
	LM4120	0.5%			√	√	√		1.8, 2.048, 2.5, 4.096	0.21	0.25	14	—	—
	LM4121	0.5%						1.22 to 10	1.25	0.55F	0.25	12	—	—
20mA	LM4130A	0.05%		√					2.048, 4.096	0.275	0.075	6	—	—
	LM4130C	0.1%		√					2.048, 4.096	0.275	0.075	6	—	—
	LM4130B	0.2%		√					2.048, 4.096	0.275	0.075	6	—	—
	LM4130D	0.4%		√					2.048, 4.096	0.275	0.075	6	—	—
	LM4130E	0.5%		√					2.048, 4.096	0.275	0.075	6	—	—
50mA	LP2980A	0.5%	√	√	√	√	√		1.5, 2.6, 2.7, 2.8, 2.9, 3.1, 3.2, 3.5, 3.6, 3.8, 4.0, 4.5, 4.7	0.15	0.095	16 ††	—	—
	LP2980	1%	√	√	√	√	√		1.5, 2.6, 2.7, 2.8, 2.9, 3.1, 3.2, 3.5, 3.6, 3.8, 4.0, 4.5, 4.7	0.15	0.095	16	—	—
	LP2982A	1%		√	√	√	√		2.6, 2.75, 2.8, 3.6, 3.8, 4.0, 4.5, 4.7, 5.3	0.15	0.095	16	—	—
	LP2982	1.5%		√	√	√	√		2.6, 2.75, 2.8, 3.6, 3.8, 4.0, 4.5, 4.7, 5.3	0.15	0.095	16	—	—
	LM2936	3%F					√			0.4	0.015	40	-15	+60*/-50
100mA	LP2981A	0.75%		√	√	√	√		2.7, 2.8, 2.9, 3.1, 3.2, 3.6, 3.8, 4.0, 4.7	0.25	0.095	16	—	—
	LP2950AC	0.5%			√	√	√			0.45	0.12	30	—	—
	LP2951AC	0.5%			√	√	√	1.24 to 29 <sup>#</sup>		0.45	0.12	30	—	—
	LP2950C	1%			√	√	√			0.45	0.12	30	—	—
	LP2951**	1%					√	1.24 to 29 <sup>#</sup>		0.45	0.12	30	—	—
	LP2951C	1%			√	√	√	1.24 to 29 <sup>#</sup>		0.45	0.12	30	—	—
	LP2981	1.25%		√	√	√	√		2.7, 2.8, 2.9, 3.1, 3.2, 3.6, 3.8, 4.0, 4.7	0.25	0.095	16	—	—
	LM2931A	4%					√			0.6	1.0	26	-15	+60*/-50
	LM3480	4%				√	√		12, 15	1.1	4T	30	—	—
	LM3490	4%				√	√		12, 15	1.1	4T	30	—	—
LM2931	5%					√			0.6	1.0	26	-15	+60*/-50	
LM2931C	5%						3 to 24		0.6	1.0	26	-15	+60*/-50	



## LOW DROPOUT REGULATOR PRODUCTS

Output Current	Device	Shutdown Control	Error Flag	Power-On Reset	Additional Features	Operating Temp Range <sup>4</sup>	Package Availability <sup>5</sup>	Price <sup>6</sup>
5mA	LM4120A	✓			Low temperature coefficient, 50ppm/°C	Ind-Y	M5	\$1.00
	LM4121A	✓			Low temperature coefficient, 50ppm/°C	Ind-Y	M5	\$1.00
	LM4120	✓			Low temperature coefficient, 50ppm/°C	Ind-Y	M5	\$0.85
	LM4121	✓			Low temperature coefficient, 50ppm/°C	Ind-Y	M5	\$0.85
20mA	LM4130A				Low temperature coefficient, 10ppm/°C	Ind-Y	M5	\$3.50
	LM4130C				Low temperature coefficient, 20ppm/°C	Ind-Y	M5	\$2.00
	LM4130B				Low temperature coefficient, 10ppm/°C	Ind-Y	M5	\$2.40
	LM4130D				Low temperature coefficient, 20ppm/°C	Ind-Y	M5	\$1.52
	LM4130E				Low temperature coefficient, 30ppm/°C	Ind-Y	M5	\$1.35
50mA	LP2980A	✓				Ind	BP, M5	\$0.50
	LP2980	✓				Ind	BP, M5	\$0.45
	LP2982A	✓			Low-noise	Ind	BP, M5	\$0.52
	LP2982	✓			Low-noise	Ind	BP, M5	\$0.50
	LM2936					Ind	M, Z	\$1.10
100mA	LP2981A	✓				Ind	BP, M5	\$0.58
	LP2950AC					Ind	Z	\$0.55
	LP2951AC	✓	✓			Ind	N, M	\$0.69
	LP2950C					Ind	Z	\$0.50
	LP2951**	✓	✓			Mil	E, H, J, WG	\$8.30
	LP2951C	✓	✓			Ind	N, M, MM	\$0.63
	LP2981	✓				Ind	BP, M5	\$0.52
	LM2931A					Ind	M, S, T, Z	\$0.39
LM3480					Ind	M3	\$0.34	
LM3490	✓				Ind	M5	\$0.36	
LM2931					Ind	BP, M, S, T, Z	\$0.38	
LM2931C	✓				Ind	M, S, T	\$0.38	

### Notes

- "F" denotes accuracy for full temperature range; otherwise, accuracy is at 25°C.
- Dropout voltage is given for full load. "F" denotes value for full temperature range, and "T" denotes typical value; otherwise, values are maximum at 25°C.
- Quiescent current is given for minimum load. "F" denotes value for full temperature range, and "T" denotes typical value; otherwise, values are maximum at 25°C.
- Military temperature range ("Mil") denotes junction temperature range of -55°C to +150°C, unless marked as "X" for products having an upper operating limit of 125°C.  
  
Industrial temperature range ("Ind") denotes junction temperature range of -40 to +125°C, unless marked as "X" for products having a lower operating limit of 0°C or "Y" for products with an upper limit of 85°C.
- Under Package Availability, the letter identifies the type of package.  
BP = micro SMD  
DT = TO252 D-Pak  
E = Leadless Ceramic Chip Carrier  
H = Metal Can (TO-99)  
J = Ceramic Dual-In-Line Package  
K = Metal Can (TO-3)  
S = TO-263 (Power Surface Mount)  
N = Molded Dual-In-Line Package  
M = Small Outline Molded Package (Surface Mount)  
M3 = SOT23-3 (3 Lead SOT23 Package)  
M5 = SOT23-5 (5 Lead SOT23 Package)  
MM = Mini 8-Lead Surface-Mount Package  
MP = SOT223  
T = TO-220  
WG = Ceramic SOIC  
Z = TO-92

6 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

### Other Notes

- \* Positive transient protection value also indicates the regulator's load dump capability.
- \*\* Available in indicated package only as a military specified device.
- †† 20V version available upon request.
- # Denotes products with fixed output voltages that also provide adjustment control of the output voltage.

# VOLTAGE REGULATORS/CONVERTERS

## LOW DROPOUT REGULATOR PRODUCTS

Output Current	Device	V <sub>OUT</sub> Accuracy <sup>1</sup>	Output Voltage (V)							Dropout Voltage V (max) <sup>2</sup>	Quiescent Current mA (max) <sup>3</sup>	Max. Input Voltage	Reverse Polarity Protection (V)	Transient Protection (V)	
			1.8	2.5	3.0	3.3	5	ADJ	Other Available Voltages						
150mA	LP2966	1%	√	√	√	√	√			2.8, 3.6	0.195	0.45	7	—	—
	LP2985A	1%	√	√	√	√	√			2.7, 2.8, 2.9, 3.1, 3.2, 3.5, 3.6, 3.8, 4.0, 4.7, 4.8	0.35	0.095	16	—	—
	LP2985	1.5%	√	√	√	√	√			2.7, 2.8, 2.9, 3.1, 3.2, 3.5, 3.6, 3.8, 4.0, 4.7, 4.8	0.35	0.095	16	—	—
	LM330	4%						√			0.6	7	26	-12	+50/-30
	LM2930	6%						√		8	0.6	7	26	-6	+40*/-12
200mA	LP2986A	0.5%			√	√	√		1.24 to 15.5 <sup>#</sup>		0.23	0.12	16	—	—
	LP2987A	0.5%		√	√	√	√			2.8, 3.2, 3.8	0.23	0.12	16	—	—
	LP2988A	0.5%		√	√	√	√			2.8, 3.2, 3.8	0.23	0.12	16	—	—
	LP2986	1%			√	√	√		1.24 to 15.5 <sup>#</sup>		0.23	0.12	16	—	—
	LP2987	1%		√	√	√	√			2.8, 3.2, 3.8	0.23	0.12	16	—	—
	LP2988	1%		√	√	√	√			2.8, 3.2, 3.8	0.23	0.12	16	—	—
250mA	LP2952A	0.5%				√	√		1.23 to 29 <sup>#</sup>		0.6	0.17	30	-20	—
	LP2953A	0.5%				√	√		1.24 to 29 <sup>#</sup>		0.6	0.17	30	-20	—
	LP2953AM**	0.5%					√		1.24 to 29 <sup>#</sup>		0.6	0.17	30	-20	—
	LP2954A	0.5%					√		1.24 to 29 <sup>#</sup>		0.6	0.15	30	-20	—
	LP2956A**	0.5%					√		1.24 to 29 <sup>#</sup>		0.6	0.25	30	-20	—
	LP2956A	0.5%					√		1.24 to 29 <sup>#</sup>		0.6	0.25	30	-20	—
	LP2957A	0.5%					√				0.6	0.20	30	-20	—
	LP2952	1%				√	√		1.24 to 29 <sup>#</sup>		0.6	0.17	30	-20	—
	LP2953	1%				√	√		1.24 to 29 <sup>#</sup>		0.6	0.17	30	-20	—
	LP2954	1%					√		1.24 to 29 <sup>#</sup>		0.6	0.15	30	-20	—
	LP2956	1%					√		1.24 to 29 <sup>#</sup>		0.6	0.25	30	-20	—
	LP2957	1%					√				0.6	0.20	30	-20	—
	500mA	LP2989A	0.75%		√	√	√	√				0.425	0.175	16	—
LP2989		1.25%		√	√	√	√				0.425	0.175	16	—	—
LP2960A		0.8%		√	√				1.24 to 29 <sup>#</sup>		0.6	0.6	30	-20	—
LP2960		1.5%		√	√				1.24 to 29 <sup>#</sup>		0.6	0.6	30	-20	—
LP2984		3%			√(3)						0.8	100	26	-15	+60*/-35
LP2937		3%		√	√		√			8, 10, 12, 15	1.0F	10	26	-15	+60*/-50

## LOW DROPOUT REGULATOR PRODUCTS

Output Current	Device	Shutdown Control	Error Flag	Power-On Reset	Additional Features	Operating Temp Range <sup>4</sup>	Package Availability <sup>5</sup>	Price <sup>6</sup>
150mA	LP2966	√	√		Two independent outputs	Ind	MM	\$0.79
	LP2985A	√			Low-noise, ceramic output cap.	Ind	BP, M5	\$0.52
	LP2985	√			Low-noise, ceramic output cap.	Ind	BP, M5	\$0.50
	LM330					Ind-x	T	\$0.54
	LM2930					Ind	S, T	\$0.50
200mA	LP2986A	√	√			Ind	M, MM	\$0.80
	LP2987A	√	√	√		Ind	M, MM	\$0.80
	LP2988A	√	√	√	Low-noise	Ind	M, MM	\$0.83
	LP2986	√	√			Ind	M, MM	\$0.75
	LP2987	√	√	√		Ind	M, MM	\$0.75
	LP2988	√	√	√	Low-noise	Ind	M, MM	\$0.81
	LP2988	√	√			Ind	M, MM	\$0.81
250mA	LP2952A	√	√			Ind	N, M	\$1.70
	LP2953A	√	√		Aux. Comparator	Ind	N, M	\$2.05
	LP2953AM**	√	√		Aux. Comparator	Mil-x	J, WG	\$10.40
	LP2954A	√	√		Shutdown, error flag, & ADJ output on M package only	Ind	M, S, T	\$2.08
	LP2956A**	√	√		Aux. Comparator, Aux. 75 mA output	Mil	J	\$14.50
	LP2956A	√	√		Aux. Comparator, Aux. 75 mA output	Ind	N, M	\$2.20
	LP2957A	√	√			Ind	S, T	\$1.90
	LP2952	√	√			Ind	N, M	\$1.00
	LP2953	√	√		Aux. Comparator	Ind	N, M	\$1.13
	LP2954	√	√		Shutdown, error flag, & ADJ output on M package only	Ind	M, S, T	\$0.96
	LP2956	√	√		Aux. Comparator, Aux. 75mA output	Ind	N, M	\$1.53
LP2957	√	√			Ind	S, T	\$1.47	
500mA	LP2989A	√	√		Low Noise; Sense Pin	Ind	M, MM	\$0.96
	LP2989	√	√		Low Noise; Sense Pin	Ind	M, MM	\$0.91
	LP2960A	√	√		Aux. Comparator	Ind	N, M	\$1.95
	LP2960	√	√		Aux. Comparator	Ind	N, M	\$1.17
	LP2984	√		√	Three 5V Outputs, $\mu$ A Watchdog®	Ind	T	\$3.10
	LP2937					Ind	MP, S, T	\$0.70

### Notes

- "F" denotes accuracy for full temperature range; otherwise, accuracy is at 25°C.
- Dropout voltage is given for full load. "F" denotes value for full temperature range, and "T" denotes typical value; otherwise, values are maximum at 25°C.
- Quiescent current is given for minimum load. "F" denotes value for full temperature range, and "T" denotes typical value; otherwise, values are maximum at 25°C.
- Military temperature range ("Mil") denotes junction temperature range of -55°C to +150°C, unless marked as "X" for products having an upper operating limit of 125°C.  
  
Industrial temperature range ("Ind") denotes junction temperature range of -40 to +125°C, unless marked as "X" for products having a lower operating limit of 0°C or "Y" for products with an upper limit of 85°C.

- Under Package Availability, the letter identifies the type of package.

BP = micro SMD  
 DT = TO252 D-Pak  
 E = Leadless Ceramic Chip Carrier  
 H = Metal Can (TO-99)  
 J = Ceramic Dual-In-Line Package  
 K = Metal Can (TO-3)  
 S = TO-263 (Power Surface Mount)  
 N = Molded Dual-In-Line Package  
 M = Small Outline Molded Package (Surface Mount)  
 M3 = SOT23-3 (3 Lead SOT23 Package)  
 M5 = SOT23-5 (5 Lead SOT23 Package)  
 MM = Mini 8-Lead Surface-Mount Package  
 MP = SOT223  
 T = TO-220  
 WG = Ceramic SOIC  
 Z = TO-92

- 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

### Other Notes

- \* Positive transient protection value also indicates the regulator's load dump capability.
- \*\* Available in indicated package only as a military specified device.
- †† 20V version available upon request.
- # Denotes products with fixed output voltages that also provide adjustment control of the output voltage.

# VOLTAGE REGULATORS/CONVERTERS

## LOW DROPOUT REGULATOR PRODUCTS

Output Current	Device	V <sub>OUT</sub> Accuracy <sup>1</sup>	Output Voltage (V)							Dropout Voltage V (max) <sup>2</sup>	Quiescent Current mA (max) <sup>3</sup>	Max. Input Voltage	Reverse Polarity Protection (V)	Transient Protection (V)	
			1.8	2.5	3.0	3.3	5	ADJ	Other Available Voltages						
800mA	LM1117	1%	√	√		√	√		1.25 to 13.8	2.85, 4.1	1.3F	10	20	—	—
	LP3961	1.5%	√	√		√	√				0.3	9	7	—	—
	LP3964	1.5%	√	√		√	√		1.22 to 5.1		0.3	9	7	—	—
1A	LM2990**	2%								-5, -5.2, -12, -15	1.0T	5	-26	—	—
	LM2990	2%								-5, -5.2, -12, -15	1.0T	5	-26	—	—
	LM2991**	2%							-2 to -25		1.0T	5	-26	—	—
	LM2991	2%							-2 to -25		1.0T	5	-26	—	—
	LM2940**	3%					√			8, 12, 15	0.7	15	26	-15	+60*/-50
	LM2940	3%					√			8, 9, 10, 12	0.8	15	26	-15	+60*/-50
	LM2940C	3%					√			9, 12, 15	0.8	15	26	-15	+45/-45
	LM2941**	3%							5 to 20		0.8	15	26	-15	+60*/-50
	LM2941	3%							5 to 20		0.8	15	26	-15	+60*/-50
	LM2941C	3%							5 to 20		0.8	15	26	-15	+45/-45
	LM3940**	3%				√					0.8	15	7.5	—	—
	LM3940	3%				√					0.8	15	7.5	—	—
	1.5A	LM1086	1%		√		√	√		1.25 to 23.5	2.85	1.5F	10	30	—
LP3962		1.5%	√	√		√	√				0.45	9	7	—	—
LP3965		1.5%	√	√		√	√		1.22 to 5.1		0.45	9	7	—	—
3A	LM1085	1%				√	√		1.25 to 23.5	12	1.5F	10	30	—	—
	LMS1587	1%				√			1.25 to 11.7	1.5	1.3F	13	13	—	—
	LP3963	1.5%	√	√		√	√				1.0	9	7	—	—
	LP3966	1.5%	√	√		√	√		1.22 to 5.1		1.0	9	7	—	—
5A	LM1084	1%				√	√		1.25 to 23.5	12	1.5F	10	30	—	—
	LMS1585A	1%				√			1.25 to 11.7	1.5	1.3F	13	13	—	—
Controller	LP2975A	1.5%				√	√		1.24 to 24 <sup>#</sup>	12	—	0.24	24	—	—
	LP2975	2.5%				√	√		1.24 to 24 <sup>#</sup>	12	—	0.24	24	—	—
	LM3460	2.5%								1.2, 1.5	—	0.125	—	—	—

## LOW DROPOUT REGULATOR PRODUCTS

Output Current	Device	Shutdown Control	Error Flag	Power-On Reset	Additional Features	Operating Temp Range <sup>4</sup>	Package Availability <sup>5</sup>	Price <sup>6</sup>
800mA	LM1117					Ind	DT, S	\$0.45
	LP3961	√	√			Ind	MP, S, T	\$1.01
	LP3964	√			Sense Pin on Fixed-output Devices	Ind	MP, S, T	\$1.01
1A	LM2990**					Mil	J, WG	\$7.65
	LM2990					Ind	S, T	\$1.25
	LM2991**	√				Mil	J, WG	\$7.65
	LM2991	√				Ind	S, T	\$1.25
	LM2940**					Mil-x	J, WG	\$7.65
	LM2940					Ind	MP, S, T	\$0.81
	LM2940C					Ind	S, T	\$0.86
	LM2941**	√				Mil	J, WG	\$7.65
	LM2941	√				Ind	S, T	\$1.98
	LM2941C	√				Ind	S, T	\$0.92
	LM3940**					Mil	J, WG	\$9.00
LM3940					Ind	MP, S, T	\$0.75	
1.5A	LM1086					Ind	S, T	\$0.54
	LP3962	√	√			Ind	MP, S, T	\$1.21
	LP3965	√			Sense Pin on Fixed-output Devices	Ind	MP, S, T	\$1.21
3A	LM1085					Ind	S, T	\$0.81
	LMS1587					Ind-x, Ind	S, T	\$1.10
	LP3963	√	√			Ind	S, T	\$1.74
	LP3966	√			Sense Pin on Fixed-output Devices	Ind	S, T	\$1.74
5A	LM1084					Ind	S, T	\$1.00
	LMS1585A					Ind-x, Ind	S, T	\$1.35
Controller	LP2975A	√			User-selected dropout voltage	Ind	MM	\$0.83
	LP2975	√			User-selected dropout voltage	Ind	MM	\$0.75
	LM3460				User-selected dropout voltage	Ind	M5	\$0.83

### Notes

- "F" denotes accuracy for full temperature range; otherwise, accuracy is at 25°C.
  - Dropout voltage is given for full load. "F" denotes value for full temperature range, and "T" denotes typical value; otherwise, values are maximum at 25°C.
  - Quiescent current is given for minimum load. "F" denotes value for full temperature range, and "T" denotes typical value; otherwise, values are maximum at 25°C.
  - Military temperature range ("Mil") denotes junction temperature range of -55°C to +150°C, unless marked as "X" for products having an upper operating limit of 125°C.  
Industrial temperature range ("Ind") denotes junction temperature range of -40 to +125°C, unless marked as "X" for products having a lower operating limit of 0°C or "Y" for products with an upper limit of 85°C.
  - Under Package Availability, the letter identifies the type of package.  
BP = micro SMD  
DT = TO252 D-Pak  
E = Leadless Ceramic Chip Carrier  
H = Metal Can (TO-99)  
J = Ceramic Dual-In-Line Package  
K = Metal Can (TO-3)  
S = TO-263 (Power Surface Mount)  
N = Molded Dual-In-Line Package  
M = Small Outline Molded Package (Surface Mount)  
M3 = SOT23-3 (3 Lead SOT23 Package)  
M5 = SOT23-5 (5 Lead SOT23 Package)  
MM = Mini 8-Lead Surface-Mount Package  
MP = SOT223  
T = TO-220  
WG = Ceramic SOIC  
Z = TO-92
- 6 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

### Other Notes

- \* Positive transient protection value also indicates the regulator's load dump capability.
- \*\* Available in indicated package only as a military specified device.
- †† 20V version available upon request.
- # Denotes products with fixed output voltages that also provide adjustment control of the output voltage.

# VOLTAGE REGULATORS/CONVERTERS

## POSITIVE REGULATORS

Output Current (A)	Device	Output Voltage (V)	Quiescent Current or Min Load (mA) <sup>1</sup>	Max Input Voltage (V)	Max Load Regulation %	Operating Temp Range <sup>2</sup>	Package Availability <sup>3</sup>	Additional Features	Price <sup>4</sup>
100mA	LM317L	Adj. (1.2 to 37)	5	40	1.5	Industrial	M, Z		\$0.23
	LM325	15	3	30	0.07	Commercial	H	Dual ± Tracking Outputs	\$4.32
	LM340LA	5, 12, 15	4.5	3.5	0.7	Commercial	H, Z	Dual ± Tracking Outputs	
	LM78Lxx	5, 6.2, 8.2, 9, 12, 15	5	35	1	Ext Commercial	BP, M, Z		\$0.17
200mA	LM109	5	10	35	1	Military	H		\$5.50
	LM309	5	10	35	1	Ext Commercial	H		\$2.07
500mA	LM341	5, 12, 15	10	35	2	Industrial	T		\$0.39
	LM78MXX	5, 12, 15	10	35	2	Industrial	H, T, DT		\$0.39
	LM117A	Adj. (1.2 to 37)	5	40	0.3	Military	H		\$4.86
	LM317A	Adj. (1.2 to 37)	10	40	0.5	Industrial	H		\$2.80
	LM317	Adj. (1.2 to 37)	10	40	0.5	Ext Commercial	H, DT		\$0.39
	LM117HV	Adj. (1.2 to 57)	12	60	0.5	Military	H		\$14.70
	LM317HV	Adj. (1.2 to 57)	12	60	0.3	Ext Commercial	H		\$4.00
1A	LM109K	5	10	35	1	Military	K		\$7.00
	LM78xx	5, 8, 12, 15	8	35	1	Ext Commercial	T		
	LM309K	5	10	35	1	Ext Commercial	K		\$2.47
	LM317	Adj. (1.2 to 37)	10	40	0.5	Ext Commercial	MP		\$0.41
	LM317A	Adj. (1.2 to 37)	10	40	0.5	Ext Commercial	MP		\$0.57
	LM340	5, 12, 15	8	35	1	Commercial	K, S, T, MP		\$0.31
	LM340A	5	6	35	0.3	Commercial	T		\$0.80
1.5A	LM117	Adj. (1.2 to 37)	10	35	0.3	Military	K, WG		\$5.40
	LM317A	Adj. (1.2 to 37)	10	35	0.5	Ext Commercial	T		\$0.80
	LM317	Adj. (1.2 to 37)	10	35	0.5	Ext Commercial	K, S, T		\$0.43
	LM117HV	Adj. (1.2 to 57)	12	60	0.3	Military	K		\$12.20
	LM317HV	Adj. (1.2 to 57)	12	60	0.5	Ext Commercial	K, T		\$1.14
3A	LM123	5	20	20	1	Military	K		\$9.55
	LM323A	5	20	20	2	Industrial	K		\$4.91
	LM323	5	20	20	2	Ext Commercial	K		\$4.00
	LM150	Adj. (1.2 to 33)	5	35	0.3	Military	K		\$8.70
	LM350A	Adj. (1.2 to 33)	10	35	0.3	Industrial	K, T		\$1.90
	LM350	Adj. (1.2 to 33)	10	35	0.5	Ext Commercial	K, T		\$1.65
5A	LM138	Adj. (1.2 to 32)	5	40	0.3	Military	K		\$18.20
	LM338	Adj. (1.2 to 32)	10	40	0.5	Ext Commercial	K, T		\$1.08
I <sub>max</sub> Set By	LM105	Adj. (4.5 to 40)	2	50	0.05	Military	H	45mA Output w/o Pass	\$2.40
	External	LM305A	Adj. (4.5 to 40)	2	50	0.2	Commercial	H	45mA Output w/o Pass
Pass	LM305	Adj. (4.5 to 30)	2	40	0.2	Commercial	H	45mA Output w/o Pass	\$0.80
Element	LM723	Adj. (2 to 37)	4	40	0.2	Military	H, J	Low Noise, High Quality Reference	\$2.47
	LM723C	Adj. (2 to 37)	4	40	0.3	Commercial	H, N	Low Noise, High Quality Reference	\$0.36

<sup>1</sup> Max quiescent current for fixed or minimum load for adjustables

<sup>2</sup> Operating temp range:  
 Commercial = 0°C to +70°C  
 Ext Commercial = 0°C to +125°C  
 Industrial = -40°C to +125°C  
 Military = -55°C to +150°C

<sup>3</sup> Under Package Availability, the letter identifies the type of package.

BP = micro SMD  
 E = Leadless Ceramic Chip Carrier  
 H = Metal Can (TO-99)  
 J = Ceramic Dual-In-Line Package  
 K = Metal Can (TO-3)  
 N = Molded Dual-In-Line Package  
 M = SOIC  
 M5 = SOT23-5 (5 Lead SOT23)  
 MM = Mini 8-Lead Surface-Mount  
 MP = SOT223 (3 Lead Surface Mount)  
 S = TO-263 (Power Surface Mount)  
 T = TO-220  
 WG = Ceramic SOIC  
 Z = TO-92

<sup>4</sup> 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

Output Current (A)	Device	Output Voltage (V)	Quiescent Current or Min Load (mA) <sup>1</sup>	Max Input Voltage (V)	Max Load Regulation %	Operating Temp Range <sup>2</sup>	Package Availability <sup>3</sup>	Additional Features	Price <sup>4</sup>
100mA	LM325	-15	5	-30	0.06	Commercial	H	Dual ± Tracking Output	\$4.32
	LM337L	Adj. (-1.2 to -37)	5	-40	1.5	Industrial	M, Z		\$0.58
	LM320L	-5, -12, -15	6	-35	1	Commercial	Z		\$0.17
	LM79Lxx	-5, -12, -15	6	-35	1	Ext Commercial	M, Z		\$0.17
500mA	LM137	Adj. (-1.2 to -37)	5	-40	1	Military	H		\$8.75
	LM337	Adj. (-1.2 to -37)	10	-40	1.5	Ext Commercial	H		\$3.14
	LM137HV	Adj. (-1.2 to -47)	5	-50	1	Military	H		\$14.70
	LM337HV	Adj. (-1.2 to -47)	10	-50	1.5	Ext Commercial	H		\$5.15
	LM79Mxx	-5, -12, -15	3	-35*	2	Ext Commercial	T		\$0.39
1A	LM337	Adj. (-1.2 to -37)	10	-40	1.5	Ext Commercial	MP		\$0.44
1.5A	LM120	-5, -12, -15	2	-35*	1	Military	K		\$6.25
	LM320	-5, -12, -15	3	-35*	1	Ext Commercial	T		\$0.77
	LM79xx	-5, -12, -15	3	-35*	1	Ext Commercial	T		\$0.39
	LM137	Adj. (-1.2 to -37)	5	-40	1	Military	K		\$8.75
	LM337	Adj. (-1.2 to -37)	10	-40	1.5	Ext Commercial	K, T		\$0.68
	LM137HV	Adj. (-1.2 to -47)	5	-50	1	Military	K		\$14.70
3A	LM337HV	Adj. (-1.2 to -47)	10	-50	1.5	Ext Commercial	K		\$6.50
	LM133	Adj. (-1.2 to -32)	5	-35	0.5	Military	K		\$26.70
	LM333	Adj. (-1.2 to -32)	5	-35	1	Industrial	K		\$5.15

1 Max quiescent current for fixed or minimum load for adjustables

2 Operating temp range:  
 Commercial = 0°C to +70°C  
 Ext Commercial = 0°C to +125°C  
 Industrial = -40°C to +125°C  
 Military = -55°C to +150°C

\* Maximum input voltage is -25V for -5V version

3 Under Package Availability, the letter identifies the type of package.

E = Leadless Ceramic Chip Carrier	N = Molded Dual-In-Line Package	MP = SOT223 (3 Lead Surface Mount)
H = Metal Can (TO-99)	M = SOIC	S = TO-263 (Power Surface Mount)
J = Ceramic Dual-In-Line Package	M5 = SOT23-5 (5 Lead SOT23)	T = TO-220
K = Metal Can (TO-3)	MM = Mini 8-Lead Surface-Mount	WG = Ceramic SOIC
		Z = TO-92

4 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

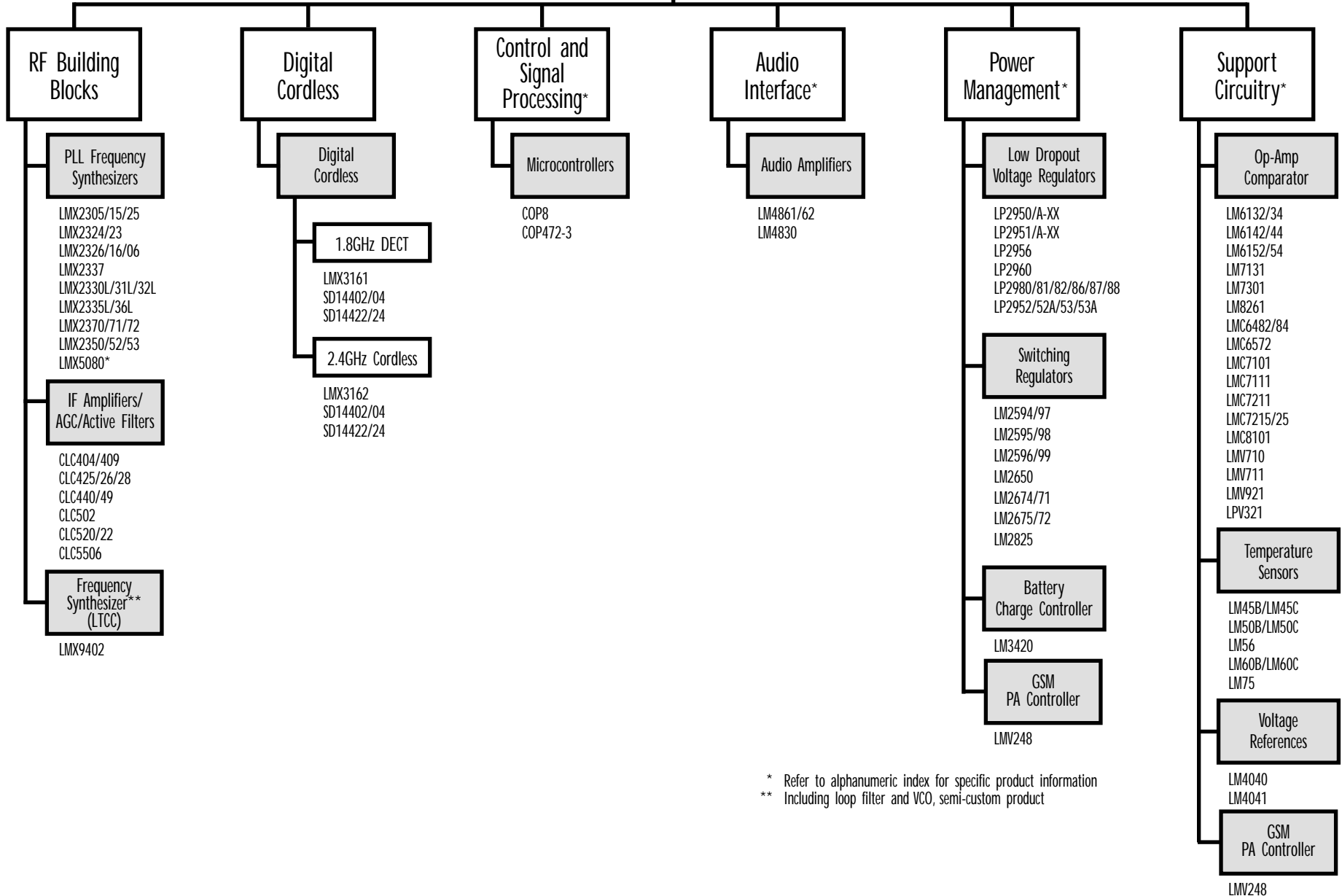




**WIRELESS**

*Section 11*

## Wireless Communications



\* Refer to alphanumeric index for specific product information  
 \*\* Including loop filter and VCO, semi-custom product

Part Number	Description	Features	
<b>LMX3161</b>	1.8 GHz, Single Chip, Radio Transceiver	<ul style="list-style-type: none"> <li>• Single Chip solution for DECT RF Transceiver</li> <li>• RF sensitivity to -93dBm and RSSI sensitivity to -100dBm</li> <li>• Two regulated voltage outputs for discrete amplifiers</li> <li>• High gain (85dB) intermediate frequency strip</li> </ul>	<ul style="list-style-type: none"> <li>• Allows unregulated 3.0V-5.5V supply voltage</li> <li>• Power-down mode for increased current savings</li> <li>• System noise figure 6.5dB (typ)</li> <li>• 48-pin PQFP surface mount plastic package</li> </ul>
<b>LMX3162</b>	2.4 GHz, Single Chip, Radio Transceiver	<ul style="list-style-type: none"> <li>• Single Chip Transceiver solution 2.4GHz applications (Bluetooth, Home RF 802.11b, 2.4GHz US DCT)</li> <li>• System RF sensitivity to -93dBm and RSSI sensitivity to -100dBm</li> <li>• Two regulated voltage outputs for discrete amplifiers</li> <li>• High gain (85dB) intermediate frequency strip</li> </ul>	<ul style="list-style-type: none"> <li>• Allows unregulated 3.0V-5.5V supply voltage</li> <li>• Power-down mode for increased current savings</li> <li>• System noise figure 6.5dB (typ)</li> <li>• 48-pin PQFP surface mount plastic package</li> </ul>

Part Number	Type	RF Input	Prescalers	Active I <sub>CC</sub> (typ @ 3V)	Powerdown I <sub>CC</sub> (typ @ 3V)	V <sub>CC</sub> Range	Operating Temp Range	FastLock™
<b>SINGLE PLLS (INTEGER)</b>								
LMX2305	Military Grade	550 MHz	64/65 or 128/129	4.0mA	30µA	2.6 to 5.5V	-40 to +105°C	No
LMX2315	Military Grade	1.2 GHz	64/65 or 128/129	6.0mA	30µA	2.6 to 5.5V	-55 to +105°C	No
LMX2325	Military Grade	2.5 GHz	32/33 or 64/65	11.0mA	30µA	2.6 to 5.5V	-55 to +90°C	No
LMX2324	Low Power Single	2.0 GHz	32/33	3.5mA	10µA	2.7 to 5.5V	-40 to +85°C	No
LMX2323TM	Low Power Single	2.0 GHz	32/33	3.5mA	10µA	2.7 to 5.5V	-40 to +85°C	No
LMX2306	Low Power Single	550 MHz	8/9	1.2mA	1µA	2.3 to 5.5V	-40 to +85°C	Yes
LMX2316	Low Power Single	1.2 GHz	32/33	2.0mA	1µA	2.3 to 5.5V	-40 to +85°C	Yes
LMX2326	Low Power Single	2.8 GHz	32/33	3.5mA	1µA	2.3 to 5.5V	-40 to +85°C	Yes
<b>DUAL PLLS (INTEGER)</b>								
LMX1600	RF/IF Dual	2.0 GHz (Main PLL), 500 MHz (Aux PLL)	32/33 (Main PLL), 8/9 (Aux PLL)	5mA	1µA	2.7 to 3.6V	-40 to +85°C	No
LMX1601	RF/IF Dual	1.1 GHz (Main PLL), 500 MHz (Aux PLL)	16/17 (Main PLL), 8/9 (Aux PLL)	4mA	1µA	2.7 to 3.6V	-40 to +85°C	No
LMX1602	RF/RF Dual	1.1 GHz (Main PLL), 1.1 GHz (Aux PLL)	16/17 (Main PLL), 8/9 (Aux PLL)	5mA	1µA	2.7 to 3.6V	-40 to +85°C	No
LMX2337	RF/RF Dual	550 MHz (Main PLL), 550 MHz (Aux PLL)	64/65 or 128/129 (Main PLL), 64/65 or 128/129 (Aux PLL)	9mA	1µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2330L	Low Power RF/IF Dual	2.5 GHz (Main PLL), 510 MHz (Aux PLL)	32/33 or 64/65 (Main PLL), 8/9 or 16/17 (Aux PLL)	5mA	1µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2331L	Low Power RF/IF Dual	2.0 GHz (Main PLL), 510 MHz (Aux PLL)	64/65 or 128/129 (Main PLL), 8/9 or 16/17 (Aux PLL)	4mA	1µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2332L	Low Power RF/IF Dual	1.2 GHz (Main PLL), 510 MHz (Aux PLL)	64/65 or 128/129 (Main PLL), 8/9 or 16/17 (Aux PLL)	3mA	1µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2335L	Low Power RF/RF Dual	1.1 GHz (Main PLL), 1.1 GHz (Aux PLL)	64/65 or 128/129 (Main PLL), 64/65 or 128/129 (Aux PLL)	4mA	1µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2336L	Low Power RF/RF Dual	2.0 GHz (Main PLL), 1.1 GHz (Aux PLL)	64/65 or 128/129 (Main PLL), 64/65 or 128/129 (Aux PLL)	5mA	1µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2370	Low Power RF/RF Dual	2.5 GHz (Main PLL), 1.2 GHz (Aux PLL)	16/17 or 32/33 (Main PLL), 8/9 or 16/17 (Aux PLL)	6mA	15µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2371	Low Power RF/RF Dual	2.0 GHz (Main PLL), 1.2 GHz (Aux PLL)	16/17 or 32/33 (Main PLL), 8/9 or 16/17 (Aux PLL)	5mA	15µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2372	Low Power RF/RF Dual	1.2 GHz (Main PLL), 1.2 GHz (Main PLL)	8/9 or 16/17 (Main and Aux PLLs)	4mA	15µA	2.7 to 5.5V	-40 to +85°C	Yes
<b>FRACTIONAL-N PLLS</b>								
LMX2350	RF/IF Dual Fractional N	2.5 GHz (Main PLL), 550 MHz (Aux PLL)	32/33 or 16/17 (Main PLL), 8/9 (Aux PLL)	7mA	5µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2352	RF/IF Dual Fractional N	1.2 GHz (Main PLL), 550 MHz (Aux PLL)	8/9 or 16/17 (Main PLL), 8/9 (Aux PLL)	5.5mA	5µA	2.7 to 5.5V	-40 to +85°C	Yes
LMX2353	RF Single	2.5 GHz	32/33 or 16/17	4.5mA	5µA	2.7 to 5.5V	-40 to +85°C	Yes
<b>PRESCALER</b>								
LMX5080	Dual Mode Prescaler	2.7 GHz	128/130 or 256/258 or 512/514	7mA		2.7 to 5.5V	-40 to +85°C	N/A

\* Die options available on some parts. Contact us at Die@nsc.com for more information.

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.

PLLATINUM™ FAMILY OF PLLS

Part Number	Type	Typical Applications	Package*	Order Number (add "X" suffix for Tape/Reel)	Price†
<b>SINGLE PLLS (INTEGER)</b>					
LMX2305	Military Grade	Satellite Transceivers, IF Local Oscillators	Ceramic SOIC 20	LMX2305WG-QML	\$63.50
LMX2315	Military Grade	Satellite Transceivers, IF Local Oscillators	Ceramic SOIC 20	LMX2315WG-QML	\$115.00
LMX2325	Military Grade	Satellite Transceivers, IF Local Oscillators	Ceramic SOIC 20	LMX2325WG-QML	\$135.00
LMX2324	Low Power Single	DECT, PHS, PDC, GPS, GSM, PCS1900, DCS1900	TSSOP 16/CSP 16	LMX2324TM/LMX2324SLB	\$1.75
LMX2323	Low Power Single	Basestations (LMX2324 + lock detect)	TSSOP 16	LMX2323TM	\$2.25
LMX2306	Low Power Single	IF Local Oscillators, Paggers	TSSOP 16/CSP 16	LMX2306TM/LMX2306SLB	\$2.30
LMX2316	Low Power Single	Analog/Digital Cellular and Cordless	TSSOP 16/CSP 16	LMX2316TM/LMX2316SLB	\$2.50
LMX2326	Low Power Single	DECT, PHS, PDC, GPS, PCS1900, DCS1800, WLAN	TSSOP 16/CSP 16	LMX2326TM/LMX2326SLB	\$2.95
<b>DUAL PLLS (INTEGER)</b>					
LMX1600	RF/IF Dual	PDC, PHS	TSSOP 16/CSP 16	LMX1600TM/LMX1600SLB	\$1.85
LMX1601	RF/IF Dual	PDC, PHS, AMPS, NAMPS, Cordless Phones, ISM (902-928)	TSSOP 16/CSP 16	LMX1601TM/LMX1601SLB	\$1.70
LMX1602	RF/RF Dual	PDC, PHS, AMPS, NAMPS, Cordless Phones, ISM (902-928)	TSSOP 16/CSP 16	LMX1602TM/LMX1602SLB	\$1.85
LMX2337	RF/RF Dual	Cordless Phones	SO 16/TSSOP 16	LMX2337TM/LMX2337TM	\$2.65
LMX2330L	Low Power RF/IF Dual	WLAN, DCS1800, PCS1900, ISM (2.4-2.45)	TSSOP 20/CSP 24	LMX2330LTM/LMX2330LSLB	\$3.70
LMX2331L	Low Power RF/IF Dual	PHS, PDC, DECT, DCS1800, PCS1900	TSSOP 20/CSP 24	LMX2331LTM/LMX2331LSLB	\$2.15
LMX2332L	Low Power RF/IF Dual	GSM, IS-136, IS-95, ISM (902-928)	TSSOP 20/CSP 24	LMX2332LTM/LMX2332LSLB	\$2.04
LMX2335L	Low Power RF/RF Dual	AMPS, NAMPS, 900MHz Cordless	SO 16/TSSOP 16/CSP16	LMX2335LM/LMX2335LTM/LMX2335LSLB	\$2.72
LMX2336L	Low Power RF/RF Dual	Dual Band PCS/DCS Phones, CATV	TSSOP 20/CSP 24	LMX2336LTM/LMX2336LSLB	\$3.50
LMX2370	Low Power RF/RF Dual	IS-95, DCS1800 PCS1900, ISM (2.4GHz), CATV, W-CDMA	TSSOP 20/CSP 24	LMX2370TM/LMX2370SLB	\$3.95
LMX2371	Low Power RF/RF Dual	PDC, PHS, DCS1800, PCS1900, CATV, IS-95, IS-136	TSSOP 20/CSP 24	LMX2371TM/LMX2371SLB	\$2.76
LMX2372	Low Power RF/RF Dual	GSM, IS-136, IS-95, ISM (902-928 MHz)	TSSOP 20/CSP 24	LMX2372TM/LMX2372SLB	\$2.42
<b>FRACTIONAL-N PLLS</b>					
LMX2350	RF/IF Dual Fractional N	Dual Band PCS/PCN Phones, TDMA Systems, CATV	TSSOP 24/CSP 24	LMX2350TM/LMX2350SLB	\$4.20
LMX2352	RF/IF Dual Fractional N	Dual Band PCS/PCN Phones, TDMA Systems, CATV	TSSOP 24/CSP 24	LMX2352TM/LMX2350SLB	\$4.00
LMX2353	RF Single Fractional N	Dual Band PCS/PCN Phones, TDMA Systems, CATV	TSSOP 16/CSP 16	LMX2353TM/LMX2353SLB	\$2.88
<b>PRESCALER</b>					
LMX5080	Dual Mode Prescaler	WLAN, ISM (2.4-2.45 GHz), CATV	SO 8	LMX5080M	\$2.50

\* Die options available on some parts. Contact us at Die@nsc.com for more information.

† 1,000 pc. suggested resale, FOB Santa Clara, California, USA. Price may vary by package or grade.



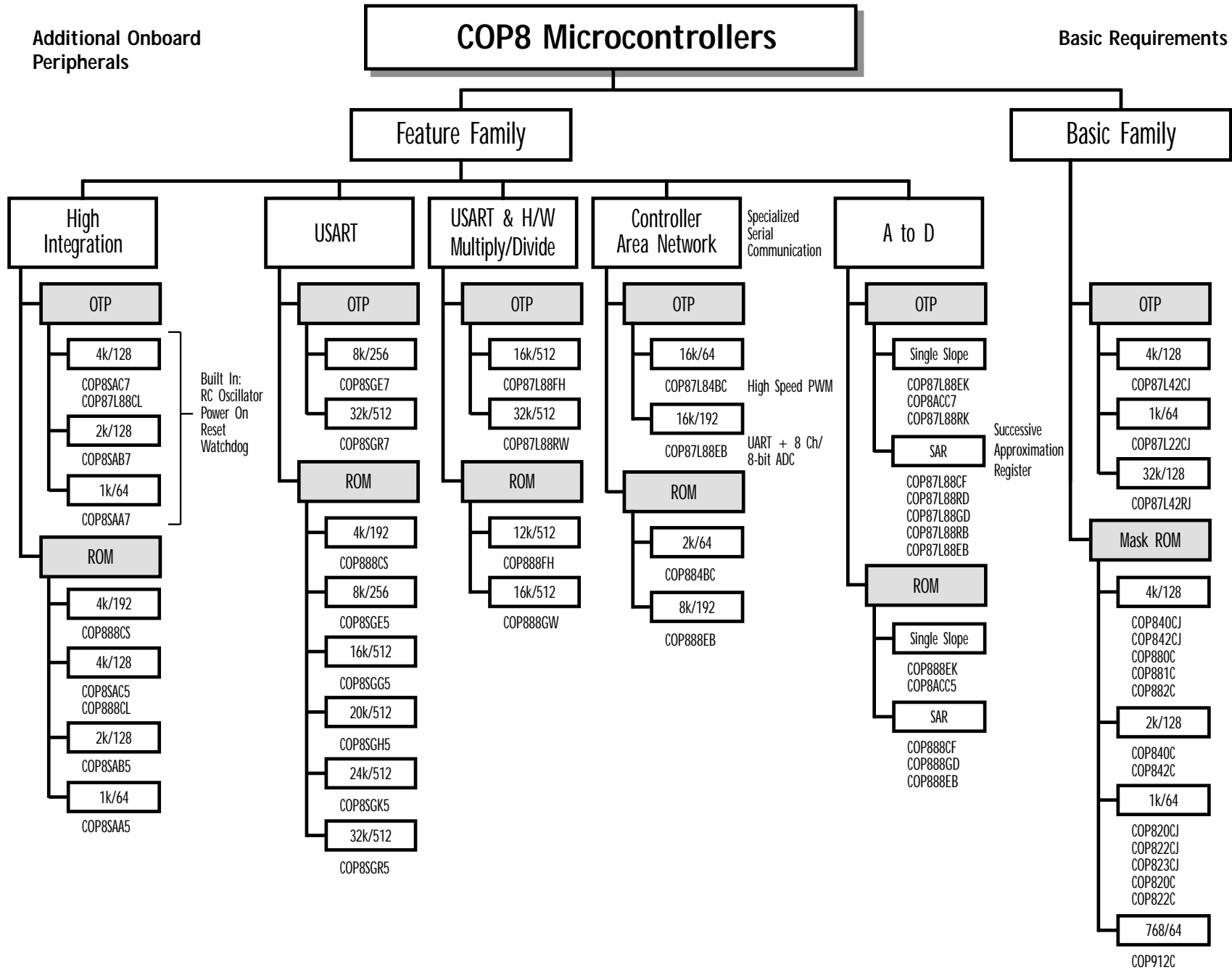
# **MICROCONTROLLERS**

## *Section 12*





# MICROCONTROLLERS



# MICROCONTROLLERS

## COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Memory			I/O		Packaging					Power Management			Timers										
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Windowed EPROM	Instruction Cycle	ROM/EPROM	RAM	EPROM	Total	High Sink Current (10 - 15 mA)	Pins	DIP	SO	PLCC	POPP	Chip Scale	HALT	IDLE	Brown-Out	Normal <sup>3</sup>	High Speed <sup>4</sup>	Modulator	PWM Outputs <sup>5</sup>	Pulse Train Generator	Capture	Idle Timer	
Part Number						µs	Bytes			Pins	Qty																	
COP-	COP-	COP-	COP-	COP-																								
912C				87L42CJ		2	768/4K	64/128		16	0	20	√	√				√				1		1				
920C	820C		620C	87L20CJ		1	1K	64		24	4	28	√	√				√				1		1				
922C	822C		622C	87L22CJ 87L42CJ		1	1K 1K/4K	64 64/128		16	0	20	√	√				√				1		1				
940C	840C		640C	87L40CJ		1	2K/4K	128		24	4	28	√	√				√				1		1				
942C	842C		642C	87L42CJ		1	2K/4K	128		16	0	20	√	√				√				1		1				
980C	880C		680C			1	4K	128		36/40		40/44	√		√			√				1		1				
981C	881C		681C	87L40CJ		1	4K	128		24		28	√	√				√				1		1				
982C	882C		682C	87L42CJ		1	4K	128		16		20	√	√				√				1		1				
	820CJ			87L20CJ 87L40RJ		1	1K 1K/32K	64 64/128		24	8	28	√	√				√		√		1		1	2			
	822CJ			87L22CJ 87L42CJ 87L42RJ		1	1K 1K/4K 1K/32K	64 64/128 64/128		16	4	20	√	√				√		√		1		1	2			
	823CJ					1	1K	64		12	4	16		√				√		√		1		1	2			
940CJ	840CJ			87L40CJ 87L40RJ		1	4K 4K/32K	128		24	8	28	√	√				√		√		1		1	2			
942CJ	842CJ			87L42CJ 87L42RJ		1	4K 4K/32K	128		16	4	20	√	√				√		√		1		1	2			
8SAA516M9	8SAA516M8	8SAA516M7		8SAA716M		1	1K	64		12	4	16		√				√	√			1		1				√
8SAA516N9	8SAA516N8	8SAA516N7		8SAA716N		1	1K	64		12	4	16	√					√	√			1		1				√
8SAA520M9	8SAA520M8	8SAA520M7		8SAA720M		1	1K	64		16	4	20		√				√	√			1		1				√
8SAA520N9	8SAA520N8	8SAA520N7		8SAA720N		1	1K	64		16	4	20	√					√	√			1		1				√
8SAA528M9	8SAA528M8	8SAA528M7		8SAA728M		1	1K	64		24	8	28		√				√	√			1		1				√
8SAA528N9	8SAA528N8	8SAA528N7		8SAA728N		1	1K	64		24	8	28	√					√	√			1		1				√
8SAA5SLB9	8SAA5SLB8			8SAA7SLB		1	1K	64		24	8	28					√	√	√			1		1				√
8SAB520M9	8SAB520M8	8SAB520M7		8SAB720M		1	2K	128		16	4	20		√				√	√			1		1				√

1. Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.

2. While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.

3. 16-bit, clocked at tC. Can be s/w configured as:

1) PWM, 2) Input Capture, 3) External Event Counter Input.

4. 8- or 16-bit, clocked at CKI (100nSec max.)

5. Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.

6. One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

7. Patented EMI reducing circuitry on-chip.

8. Reference to User's Manual.

9. 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.

## COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Additional Features											Core Family <sup>8</sup>	Additional Remarks	Price <sup>9</sup>	
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Multi-Input Wake-up	Interrupts <sup>6</sup>	Comparators	A/D Converter	H/W Multiply/Divide	USART	Controller Area Network (CAN)	MICROWIRE/ PLUS <sup>5</sup>	WATCHDOG <sup>7</sup>	Clock Monitor	Power-On Reset				Reduced EMI <sup>7</sup>
Part Number																			
COP-	COP-	COP-	COP-	COP-															
912C				87L42CJ		3						√					Basic	Lowest Price	\$0.65
920C	820C		620C	87L20CJ		3						√					Basic		\$1.30
922C	822C		622C	87L22CJ 87L42CJ		3						√					Basic		\$1.05
940C	840C		640C	87L40CJ		3						√					Basic		\$1.40
942C	842C		642C	87L42CJ		3						√					Basic		\$1.15
980C	880C		680C			3						√					Basic		\$1.90
981C	881C		681C	87L40CJ		3						√					Basic		\$1.78
982C	882C		682C	87L42CJ		3						√					Basic		\$1.70
	820CJ			87L20CJ 87L40RJ	8	3	1					√	√		√		Basic		\$1.50
	822CJ			87L22CJ 87L42CJ 87L42RJ	8	3	1					√	√		√		Basic		\$1.30
	823CJ				8	3	1					√	√		√		Basic		\$1.22
940CJ	840CJ			87L40CJ 87L40RJ	8	3	1					√	√		√	√	Basic		\$1.92
942CJ	842CJ			87L42CJ 87L42RJ	8	3	1					√	√		√	√	Basic		\$1.62
8SAA516M9	8SAA516M8	8SAA516M7		8SAA716M	4	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$0.73
8SAA516N9	8SAA516N8	8SAA516N7		8SAA716N	4	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$0.73
8SAA520M9	8SAA520M8	8SAA520M7		8SAA720M	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$0.83
8SAA520N9	8SAA520N8	8SAA520N7		8SAA720N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$0.82
8SAA528M9	8SAA528M8	8SAA528M7		8SAA728M	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.18
8SAA528N9	8SAA528N8	8SAA528N7		8SAA728N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.20
8SAA5SLB9	8SAA5SLB8			8SAA5SLB	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.10
8SAB520M9	8SAB520M8	8SAB520M7		8SAB720M	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.22

1. Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.

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3. 16-bit, clocked at tC. Can be s/w configured as:

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5. Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.

6. One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

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8. Reference to User's Manual.

9. 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.

# MICROCONTROLLERS

## COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Memory				I/O		Packaging					Power Management			Timers									
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military <sup>1</sup> -55°C to +125°C	One Time Programmable <sup>2</sup>	Windowed EPROM	Instruction Cycle	ROM/EPROM	RAM	EPROM	Total	High Sink Current (10 - 15 mA)	Pins	DIP	SO	PLCC	POPP	Chip Scale	HALT	IDLE	Brown-Out	Normal <sup>3</sup>	High Speed <sup>4</sup>	Modulator	PWM Outputs <sup>5</sup>	Pulse Train Generator	Capture	Idle Timer	
Part Number					µs	Bytes				Pins	Qty																	
COP-	COP-	COP-	COP-	COP-																								
8SAB520N9	8SAB520N8	8SAB520N7		8SAB720N	1	2K	128			16	4	20	√					√	√		1			1			√	
8SAB528M9	8SAB528M8	8SAB528M7		8SAB728M	1	2K	128			24	8	28		√				√	√		1			1			√	
8SAB528N9	8SAB528N8	8SAB528N7		8SAB728N	1	2K	128			24	8	28	√					√	√		1			1			√	
8SAB5SLB9	8SAB5SLB8			8SAB7SLB	1	2K	128			24	8	28					√	√	√		1			1			√	
8SAC520M9	8SAC520M8	8SAC520M7		8SAC720M	1	4K	128			16	4	20		√				√	√		1			1			√	
8SAC520N9	8SAC520N8	8SAC520N7		8SAC720N	√	1	4K	128		16	4	20	√					√	√		1			1			√	
8SAC528M9	8SAC528M8	8SAC528M7		8SAC728M	1	4K	128			24	8	28		√				√	√		1			1			√	
8SAC528N9	8SAC528N8	8SAC528N7		8SAC728N	√	1	4K	128		24	8	28	√					√	√		1			1			√	
8SAC5SLB9	8SAC5SLB8			8SAC7SLB	1	4K	128			24	8	28					√	√	√		1			1			√	
8SAC540N9	8SAC540N8	8SAC540N7		8SAC740N	√	1	4K	128		36	8	40	√					√	√		1			1			√	
8SAC544V9	8SAC544V8	8SAC544V7		8SAC744V	√	1	4K	128		40	8	44			√			√	√		1			1			√	
8SAC5VEJ9	8SAC5VEJ8	8SAC5VEJ7		8SAC7VEJ	1	4K	128			40	8	44				√		√	√		1			1			√	
984CL	884CL		684CL	87L84CL	1	4K/16K	128			24	4	28	√	√				√	√		2			2			√	
988CL	888CL		688CL	87L88CL	1	4K/16K	128			34/40	8	40/44	√		√			√	√		2			2			√	
	8SEC516M8				1	4K	128	128		12		16		√				√	√		1			1			√	
	8SEC520M8				1	4K	128	128		16		20		√				√	√		1			1			√	
984CS	884CS		684CS	8SGE728M 8SGR728M	1	4K/8K 4K/32K	192/256 192/512			24	4	28		√				√	√		1			1			√	
984CS	884CS		684CS	8SGE728N 8SGR728N	√	1	4K/8K 4K/32K	192/256 192/512		24	4	28	√					√	√		1			1			√	
988CS	888CS		688CS	8SGE740N 8SGR740N	√	1	4K/8K 4K/32K	192/256 192/512		36	8	40	√					√	√		1			1			√	
988CS	888CS		688CS	8SGE744V 8SGR744V	√	1	4K/8K 4K/32K	192/256 192/512		40	8	44			√			√	√		1			1			√	
8SGE528M9	8SGE528M8	8SGE528M7		8SGE728M	1	8K	256			24	4	28		√				√	√		3			3			√	
8SGE528N9	8SGE528N8	8SGE528N7		8SGE728N	1	8K	256			24	4	28	√					√	√		3			3			√	
8SGE540N9	8SGE540N8	8SGE540N7		8SGE740N	1	8K	256			36	8	40	√					√	√		3			3			√	

- Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.
- While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.
- 16-bit, clocked at tC. Can be s/w configured as:  
1) PWM, 2) Input Capture, 3) External Event Counter Input.

- 8- or 16-bit, clocked at CKI (100nSec max.)
- Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.
- One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

- Patented EMI reducing circuitry on-chip.
- Reference to User's Manual.
- 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.

# COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Additional Features											Core Family <sup>8</sup>	Additional Remarks	Price <sup>9</sup>	
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Multi-Input Wake-up	Interrupts <sup>6</sup>	Comparators	A/D Converter	H/W Multiply/Divide	USART	Controller Area Network (CAN)	MICROWIRE/ PLUS <sup>5(a)</sup>	WATCHDOG <sup>5(b)</sup>	Clock Monitor	Power-On Reset				Reduced EMI <sup>7</sup>
Part Number																			
COP-	COP-	COP-	COP-	COP-															
8SAB520N9	8SAB520N8	8SAB520N7		8SAB720N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.22
8SAB528M9	8SAB528M8	8SAB528M7		8SAB728M	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.33
8SAB528N9	8SAB528N8	8SAB528N7		8SAB728N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.37
8SAB5SLB9	8SAB5SLB8			8SAB7SLB	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.15
8SAC520M9	8SAC520M8	8SAC520M7		8SAC720M	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.38
8SAC520N9	8SAC520N8	8SAC520N7		8SAC720N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.40
8SAC528M9	8SAC528M8	8SAC528M7		8SAC728M	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.53
8SAC528N9	8SAC528N8	8SAC528N7		8SAC728N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.55
8SAC5SLB9	8SAC5SLB8			8SAC7SLB	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.25
8SAC540N9	8SAC540N8	8SAC540N7		8SAC740N	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.78
8SAC544V9	8SAC544V8	8SAC544V7		8SAC744V	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$1.72
8SAC5VEJ9	8SAC5VEJ8	8SAC5VEJ7		8SAC7VEJ	8	7						√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.12
984CL	884CL		684CL	87L84CL	8	9						√	√	√			Feature		\$2.24
988CL	888CL		688CL	87L88CL	8	9						√	√	√			Feature		\$2.45
	8SEC516M8				4	9						√	√	√		√	Feature		\$1.77
	8SEC520M8				8	9						√	√	√		√	Feature		\$1.81
984CS	884CS		684CS	8SGE728M 8SGR728M	8	9	1			√		√	√	√			Feature		\$2.29
984CS	884CS		684CS	8SGE728N 8SGR728N	8	9	1			√		√	√	√			Feature		\$2.29
988CS	888CS		688CS	8SGE740N 8SGR740N	8	9	1			√		√	√	√			Feature		\$2.50
988CS	888CS		688CS	8SGE744V 8SGR744V	8	9	1			√		√	√	√			Feature		\$2.50
8SGE528M9	8SGE528M8	8SGE528M7		8SGE728M	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.62
8SGE528N9	8SGE528N8	8SGE528N7		8SGE728N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.62
8SGE540N9	8SGE540N8	8SGE540N7		8SGE740N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.77

1. Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.

2. While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.

3. 16-bit, clocked at tC. Can be s/w configured as:

1) PWM, 2) Input Capture, 3) External Event Counter Input.

4. 8- or 16-bit, clocked at CKI (100nSec max.)

5. Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.

6. One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

7. Patented EMI reducing circuitry on-chip.

8. Reference to User's Manual.

9. 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.

# MICROCONTROLLERS

## COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Memory				I/O		Packaging					Power Management			Timers									
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Windowed EPROM	Instruction Cycle	ROM/EPROM	RAM	EPROM	Total	High Sink Current (10 - 15 mA)	Pins	DIP	SO	PLCC	POPP	Chip Scale	HALT	IDLE	Brown-Out	Normal <sup>3</sup>	High Speed <sup>4</sup>	Modulator	PWM Outputs <sup>5</sup>	Pulse Train Generator	Capture	Idle Timer	
Part Number					µs	Bytes				Pins	Qty																	
COP-	COP-	COP-	COP-	COP-																								
8SGE544V9	8SGE544V8	8SGE544V7		8SGE744V	1	8K	256			40	8	44			√			√	√		3			3			√	
8SGE5VEJ9	8SGE5VEJ8	8SGE5VEJ7		8SGR728M	1	8K	256			40	8	44				√		√	√		3			3			√	
8SGG528M9	8SGG528M8	8SGG528M7		8SGR728N	√	16K/32K	512			24	4	28		√				√	√		3			3			√	
8SGG528N9	8SGG528N8	8SGG528N7		8SGR740N	√	16K/32K	512			24	4	28	√					√	√		3			3			√	
8SGG540N9	8SGG540N8	8SGG540N7		8SGR740N	√	16K/32K	512			36	8	40	√					√	√		3			3			√	
8SGG544V9	8SGG544V8	8SGG544V7		8SGR744V	√	16K/32K	512			40	8	44			√			√	√		3			3			√	
8SGG5VEJ9	8SGG5VEJ8	8SGG5VEJ7		8SGR7VEJ	1	16K/32K	512			40	8	44				√		√	√		3			3			√	
8SGH528M9	8SGH528M8	8SGH528M7		8SGR728M	1	20K/32K	512			24	4	28		√				√	√		3			3			√	
8SGH528N9	8SGH528N8	8SGH528N7		8SGR728N	√	1	20K/32K	512		24	4	28	√					√	√		3			3			√	
8SGH540N9	8SGH540N8	8SGH540N7		8SGR740N	√	1	20K/32K	512		36	8	40	√					√	√		3			3			√	
8SGH544V9	8SGH544V8	8SGH544V7		8SGR744V	√	1	20K/32K	512		40	8	44			√			√	√		3			3			√	
8SGH5VEJ9	8SGH5VEJ8	8SGH5VEJ7		8SGR7VEJ	1	20K/32K	512			40	8	44				√		√	√		3			3			√	
8SGK528M9	8SGK528M8	8SGK528M7		8SGR728M	1	24K/32K	512			24	4	28		√				√	√		3			3			√	
8SGK528N9	8SGK528N8	8SGK528N7		8SGR728N	√	1	24K/32K	512		24	4	28	√					√	√		3			3			√	
8SGK540N9	8SGK540N8	8SGK540N7		8SGR740N	√	1	24K/32K	512		36	8	40	√					√	√		3			3			√	
8SGK544V9	8SGK544V8	8SGK544V7		8SGR744V	√	1	24K/32K	512		40	8	44			√			√	√		3			3			√	
8SGK5VEJ9	8SGK5VEJ8	8SGK5VEJ7		8SGR7VEJ	1	24K/32K	512			40	8	44				√		√	√		3			3			√	
8SGR528M9	8SGR528M8	8SGR528M7		8SGR728M	1	32K	512			24	4	28		√				√	√		3			3			√	
8SGR528N9	8SGR528N8	8SGR528N7		8SGR728N	√	1	32K	512		24	4	28	√					√	√		3			3			√	
8SGR540N9	8SGR540N8	8SGR540N7		8SGR740N	√	1	32K	512		36	8	40	√					√	√		3			3			√	
8SGR544V9	8SGR544V8	8SGR544V7		8SGR744V	√	1	32K	512		40	8	44			√			√	√		3			3			√	
8SGR5VEJ9	8SGR5VEJ8	8SGR5VEJ7		8SGR7VEJ	1	32K	512			40	8	44				√		√	√		3			3			√	
988FH	888FH		688FH	87L88FH	1	12K/16K	512			36/40	8	40/44	√		√			√	√		3			3			√	
	884BC		684BC	87L84BC	1	2K/16K	64			19	4	28		√				√	√		1	1		3			√	

- Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.
- While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.
- 16-bit, clocked at tC. Can be s/w configured as:  
1) PWM, 2) Input Capture, 3) External Event Counter Input.
- 8- or 16-bit, clocked at CKI (100nSec max.)
- Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.
- One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.
- Patented EMI reducing circuitry on-chip.
- Reference to User's Manual.
- 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.

# COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Additional Features											Core Family <sup>8</sup>	Additional Remarks	Price <sup>9</sup>	
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Multi-Input Wake-up	Interrupts <sup>6</sup>	Comparators	A/D Converter	H/W Multiply/Divide	USART	Controller Area Network (CAN)	MICROWIRE/ PLUS <sup>5</sup>	WATCHDOG <sup>5</sup>	Clock Monitor	Power-On Reset				Reduced EMI <sup>7</sup>
Part Number																			
COP-	COP-	COP-	COP-	COP-															
8SGE544V9	8SGE544V8	8SGE544V7		8SGE744V	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.72
8SGE5VEJ9	8SGE5VEJ8	8SGE5VEJ7		8SGE7VEJ	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$4.00
8SGG528M9	8SGG528M8	8SGG528M7		8SGR728M	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.86
8SGG528N9	8SGG528N8	8SGG528N7		8SGR728N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.86
8SGG540N9	8SGG540N8	8SGG540N7		8SGR740N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.92
8SGG544V9	8SGG544V8	8SGG544V7		8SGR744V	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$2.99
8SGG5VEJ9	8SGG5VEJ8	8SGG5VEJ7		8SGR7VEJ	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.60
8SGH528M9	8SGH528M8	8SGH528M7		8SGR728M	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.19
8SGH528N9	8SGH528N8	8SGH528N7		8SGR728N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.19
8SGH540N9	8SGH540N8	8SGH540N7		8SGR740N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.29
8SGH544V9	8SGH544V8	8SGH544V7		8SGR744V	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.47
8SGH5VEJ9	8SGH5VEJ8	8SGH5VEJ7		8SGR7VEJ	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$4.20
8SGK528M9	8SGK528M8	8SGK528M7		8SGR728M	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.34
8SGK528N9	8SGK528N8	8SGK528N7		8SGR728N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.34
8SGK540N9	8SGK540N8	8SGK540N7		8SGR740N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.41
8SGK544V9	8SGK544V8	8SGK544V7		8SGR744V	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.54
8SGK5VEJ9	8SGK5VEJ8	8SGK5VEJ7		8SGR7VEJ	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$4.28
8SGR528M9	8SGR528M8	8SGR528M7		8SGR728M	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.41
8SGR528N9	8SGR528N8	8SGR528N7		8SGR728N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.41
8SGR540N9	8SGR540N8	8SGR540N7		8SGR740N	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.54
8SGR544V9	8SGR544V8	8SGR544V7		8SGR744V	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$3.68
8SGR5VEJ9	8SGR5VEJ8	8SGR5VEJ7		8SGR7VEJ	8	13	2			√		√	√	√	√	√	Feature	On-Chip RC Oscillator	\$4.55
988FH	888FH		688FH	87L88FH	8	13	2		√	√		√	√	√	√	√	Feature		\$3.85
	884BC		684BC	87L84BC	7	11	2				√				√	√	Feature		\$2.95

1. Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.  
 2. While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.  
 3. 16-bit, clocked at tC. Can be s/w configured as:  
 1) PWM, 2) Input Capture, 3) External Event Counter Input.

4. 8- or 16-bit, clocked at CKI (100nSec max.)  
 5. Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.  
 6. One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

7. Patented EMI reducing circuitry on-chip.  
 8. Reference to User's Manual.  
 9. 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.

# MICROCONTROLLERS

## COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Memory			I/O	Packaging					Power Management			Timers											
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Windowed EPROM	Instruction Cycle	ROM/EPROM	RAM	EPROM	Total	High Sink Current (10 - 15 mA)	Pins	DIP	SO	PLCC	POPP	Chip Scale	HALT	IDLE	Brown-Out	Normal <sup>3</sup>	High Speed <sup>4</sup>	Modulator	PWM Outputs <sup>5</sup>	Pulse Train Generator	Capture	Idle Timer	
Part Number						µs	Bytes			Pins	Qty																	
COP-	COP-	COP-	COP-	COP-																								
	885BC		685BC			1	2K	64		11	20			√				√	√		1			3				√
	888EB	688EB		87L88EB 87L88RB		1	8K/16K 8K/32K	192		34	4	44			√			√	√		2			2				√
	889EB			87L89EB 87L89RB		1	8K/16K 8K/32K	192		58	8	68			√			√	√		2			2				√
984CF	884CF			87L84CF		1	4K/16K	128		22	4	28	√	√				√	√		2			2				√
988CF	888CF			87L88CF		1	4K/16K	128		34/38	8	40/44	√		√			√	√		2			2				√
988GD	888GD		688GD	87L88RD		1	16K/32K	256		40	8	44			√	√		√	√		3			3				√
8ACC520M9	8ACC520M8		8ACC520M6	8ACC720M		1	4K/16K	128		16	3	20			√			√	√		1			1				√
8ACC528M9	8ACC528M8		8ACC528M6	8ACC728M		1	4K/16K	128		24	4	28			√			√	√		1			1				√
8ACC528N9	8ACC528N8		8ACC528N6	8ACC728N		1	4K/16K	128		24	4	28	√					√	√		1			1				√
984EK	884EK		684EK	87L84EK 87L84RK		1	8K/16K 8K/32K	256		24	4	28	√	√				√	√		3			3				√
988EK	888EK		688EK	87L88EK 87L88RK		1	8K/16K 8K/32K	256		36/40	8	40/44	√		√			√	√		3			3				√
	888GW			87L88RW		1	16K/32K	512		53	8	68			√			√	√		2			2	4	2		√

- Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.
- While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.
- 16-bit, clocked at tC. Can be s/w configured as:  
1) PWM, 2) Input Capture, 3) External Event Counter Input.

- 8- or 16-bit, clocked at CKI (100nSec max.)
- Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.
- One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

- Patented EMI reducing circuitry on-chip.
- Reference to User's Manual.
- 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.



## COP8 SELECTION GUIDE

NOTE: All device numbers are prefixed by COP

Mask ROM				OTP	Additional Features											Core Family <sup>8</sup>	Additional Remarks	Price <sup>9</sup>	
Commercial <sup>1</sup> 0°C to +70°C	Industrial -40°C to +85°C	Automotive -40°C to +125°C	Military -55°C to +125°C	One Time Programmable <sup>2</sup>	Multi-Input Wake-up	Interrupts <sup>6</sup>	Comparators	A/D Converter	H/W Multiply/Divide	USART	Controller Area Network (CAN)	MICROWIRE/ PLUS <sup>5a</sup>	WATCHDOG <sup>5b</sup>	Clock Monitor	Power-On Reset				Reduced EMI <sup>7</sup>
Part Number																			
COP-	COP-	COP-	COP-	COP-															
	885BC		685BC		3	11	1				√	√			√	√	Feature		\$2.50
	888EB	688EB		87L88EB 87L88RB	11	14		√		√	√	√	√	√		√	Feature	Successive Approximation A/D (4 Channel, 8-bit)	\$5.40
	889EB			87L89EB 87L89RB	15	14		√		√	√	√	√	√		√	Feature	Successive Approximation A/D (8 Channel, 8-bit)	\$5.95
984CF	884CF			87L84CF	8	9		√				√	√	√			Feature	Successive Approximation A/D (2 Channel, 8-bit)	\$2.50
	888CF			87L88CF	8/6	9		√				√	√	√			Feature	Successive Approximation A/D (6/8 Channel, 8-bit)	\$2.71
988GD	888GD		688GD	87L88RD	8	11		√				√	√	√		√	Feature	Successive Approximation A/D (8 Channel, 8-bit)	\$3.89
8ACC520M9	8ACC520M8		8ACC520M6	8ACC720M	8	8	1	√				√	√	√		√	Feature	Single Slope A/D (4 Channel, 16-bit)	\$2.15
8ACC528M9	8ACC528M8		8ACC528M6	8ACC728M	8	8	1	√				√	√	√		√	Feature	Single Slope A/D (6 Channel, 16-bit)	\$2.40
8ACC528N9	8ACC528N8		8ACC528N6	8ACC728N	8	8	1	√				√	√	√		√	Feature	Single Slope A/D (6 Channel, 16-bit)	\$2.40
984EK	884EK		684EK	87L84EK 87L84RK	8	11	1	√				√	√	√		√	Feature	Single Slope A/D (3 Channel, 16-bit)	\$3.29
988EK	888EK		688EK	87L88EK 87L88RK	8	11	1	√				√	√	√		√	Feature	Single Slope A/D (6 Channel, 16-bit)	\$3.50
	888GW			87L88RW	8	13			√	√		√	√	√		√	Feature		\$6.30

1. Two versions available, "C" shown - 2.3 to 4.0V operation, "CH" for 4.0 to 6.0V operation.
2. While OTP's/windowed devices are functionally identical to masked ROM devices, electrical specifications and options may differ. Check sales office for specific availability.
3. 16-bit, clocked at tC. Can be s/w configured as:  
1) PWM, 2) Input Capture, 3) External Event Counter Input.

4. 8- or 16-bit, clocked at CKI (100nSec max.)
5. Pulse Width Modulation, 8/16 bits, 1µSec or 100nSec (max) resolution.
6. One (dedicated) external interrupt on basic family devices, 9 external interrupts (1 dedicated, 8 configurable) on feature family devices.

7. Patented EMI reducing circuitry on-chip.
8. Reference to User's Manual.
9. 10,000 pc. suggested resale for masked ROM product, FOB Santa Clara, CA. Price may vary with package or grade.



**ENHANCED SOLUTIONS** (FORMERLY MIL-AERO)

*Section 13*

# ENHANCED SOLUTIONS

As one of the largest suppliers of IC products for high reliability applications, we've provided analog and mixed-signal engineering for the Military/Aerospace market for more than 30 years. Our expertise in system design and integration is creating innovative solutions for space, radar, communication, and other applications. For fast, effective product design, development, and delivery, National provides knowledge in systems integration and design, as well as organizational and partnership strategies – whether the product you need comes off-the-shelf or is customized for your environment and application. For a complete listing of Military/Aerospace parts and services, visit us on the web at: [enhancedsolutions.national.com](http://enhancedsolutions.national.com)

National Part Number	SMD/JAN Drawing Number	Function
CLC110AJ-QML	5962-8997501PA	WB Closed Loop Monolithic Buffer Amp
CLC114AE-QML	5962-9233901M2A	Low Power Quad Buffer
CLC114AJ-QML	5962-9233901MCA	Low Power Quad Buffer
CLC400AE-QML	5962-89970012A	General Purpose WB Op Amp
CLC400AJ-QML	5962-8997001PA	General Purpose WB Op Amp
CLC401AJ-QML	5962-8997301PA	General Purpose HG Op Amp
CLC402AJ-QML	5962-9203301MPA	Fast Settling Op Amp
CLC404AJ-QML	5962-9099401MPA	Large Signal WB Op Amp
CLC406AJ-QML	5962-9200401MPA	Video Op Amp
CLC409AE-QML	5962-9203401M2A	Low Distortion Op Amp
CLC409AJ-QML	5962-9203401MPA	Low Distortion Op Amp
CLC410AJ-QML	5962-9060001PA	WB Op Amp
CLC411AJ-QML	5962-9456601MPA	High Speed Video Op Amp
CLC412AE-QML	5962-9471901M2A	Low Crosstalk WB Op Amp
CLC412AJ-QML	5962-9471901MPA	Low Crosstalk WB Op Amp
CLC414AE-QML	5962-9169301M2A	General Purpose Quad Op Amp
CLC414AJ-QML	5962-9169301MCA	General Purpose Quad Op Amp
CLC415AJ-QML	5962-9305501MCA	General Purpose Quad Op Amp
CLC420AE-QML	5962-9175801M2A	WB Low Power Op Amp
CLC420AJ-QML	5962-9175801MPA	WB Low Power Op Amp
CLC420BE-QML	5962-9175802M2A	WB Low Power Op Amp
CLC420BJ-QML	5962-9175802MPA	WB Low Power Op Amp
CLC425AJ-QML	5962-9325901MPA	Low Noise Op Amp
CLC426AJ-QML	5962-9459701MPA	Low Noise Unity Gain Op Amp
CLC428AJ-QML	5962-9470801MPA	Dual Low Noise Op Amp
CLC430AE-QML	5962-9203001M2A	Video Op Amp
CLC430AJ-QML	5962-9203001MPA	Video Op Amp
CLC431AE-QML	5962-9472501M2A	Dual Video Op Amp
CLC431AJ-QML	5962-9472501MCA	Dual Video Op Amp
CLC432AJ-QML	5962-9472502MPA	Dual Video Op Amp
CLC440AJ-QML	5962-9751801MPA	WB Low Power Op Amp
CLC446AJ-QML	5962-9751901MPA	WB Low Power Op Amp
CLC449AJ-QML	5962-9752001MPA	WB Op Amp
CLC452AJ-QML	5962-9752101MPA	High Output Low Power Line Driver
CLC501AJ-QML	5962-8997401PA	High Gain Op Amp

## SMD/JAN DRAWINGS BY PART NUMBER

National Part Number	SMD/JAN Drawing Number	Function
CLC502AE-QML	5962-9174301M2A	Clamping Op Amp
CLC502AJ-QML	5962-9174301MPA	Clamping Op Amp
CLC505AJ-QML	5962-9099301MPA	High Speed Op Amp
CLC520AJ-QML	5962-9169401MCA	WB AGC Op Amp
CLC522AE-QML	5962-9451701M2A	WB Variable Gain Op Amp
CLC522AJ-QML	5962-9451701MCA	WB Variable Gain Op Amp
CLC532AE-QML	5962-9203501M2A	Wide Range Multiplexer
CLC532AJ-QML	5962-9203501MCA	Wide Range Multiplexer
DS1691AJ-SMD	5962-8672101EA	Single Line Driver
DS16F95E/883	5962-89615012A	High Speed Single Transceiver
DS16F95J-QMLV	5962-8961501VPA	High Speed Single Transceiver
DS16F95J/883	5962-8961501PA	High Speed Single Transceiver
DS16F95W-SMD	5962-8961501HA	High Speed Single Transceiver
DS16F95WG/883	5962-8961501QXA	High Speed Single Transceiver
DS1776E/883	5962-9231701M3A	Pi-Bus Transceiver
DS26C31ME/883	5962-9163901M2A	Quad Line Driver
DS26C31MJ/883	5962-9163901MEA	Quad Line Driver
DS26C31MW/883	5962-9163901MFA	Quad Line Driver
DS26C31MWG/883	5962-9163901MXA	Quad Line Driver
DS26C32AME/883	5962-9164001M2A	Quad Line Receiver
DS26C32AMJ/883	5962-9164001MEA	Quad Line Receiver
DS26C32AMW/883	5962-9164001MFA	Quad Line Receiver
DS26C32AMWG/883	5962-9164001MXA	Quad Line Receiver
DS26LS31ME-SMD	5962-7802301Q2A	Quad Line Driver
DS26LS31MJ-QMLV	5962-7802301VEA	Quad Line Driver
DS26LS31MJ-SMD	5962-7802301MEA	Quad Line Driver
DS26LS31MW-QMLV	5962-7802301VFA	Quad Line Driver
DS26LS31MW-SMD	5962-7802301MFA	Quad Line Driver
DS26LS32ME/883	5962-7802006Q2A	Quad Line Receiver
DS26LS32MJ/883	5962-7802006QEA	Quad Line Receiver
DS26LS32MW/883	5962-7802006QFA	Quad Line Receiver
DS26LV31W-QML	5962-9858401QFA +	Quad Vow Voltage Line Driver
DS26LV32AW-QML	5962-9858501QFA +	Quad Low Voltage Line Receiver
DS7831J-SMD	8004101EA	Dual Differential Line Driver
DS7831W-SMD	8004101FA	Dual Differential Line Driver

National Part Number	SMD/JAN Drawing Number	Function
DS78C120J/883	5962-8963001EA	Dual Line Receiver
DS78C20J/883	5962-9321101MCA	Dual Line Receiver
DS90C031E-QML	5962-9583301Q2A	Quad LVDS Line Driver
DS90C031W-QML	5962-9583301QFA	Quad LVDS Line Driver
DS90C032E-QML	5962-9583401Q2A	Quad LVDS Line Receiver
DS90C032W-QML	5962-9583401QFA	Quad LVDS Line Receiver
DS9622ME/883	5962-87522012A	Dual Line Receiver
DS9622MJ/883	5962-8752201CA	Dual Line Receiver
DS9627MJ/883	5962-8978701MEA	Dual Line Receiver
DS9636AJ/883	5962-8752301PA	Dual Line Driver
DS9637AMJ/883	5962-8752401PA	Dual Line Receiver
DS9638J/883	5962-8754601PA	Dual Line Driver
DS96F172ME/883	5962-9076501M2A	Quad Line Driver
DS96F172MJ-QMLV	5962-9076501VEA	Quad Line Driver
DS96F172MJ/883	5962-9076501MEA	Quad Line Driver
DS96F173ME/883	5962-9076602M2A	Quad Line Receiver
DS96F173MJ-QMLV	5962-9076602VEA	Quad Line Receiver
DS96F173MJ/883	5962-9076602MEA	Quad Line Receiver
DS96F173MW/883	5962-9076602MFA	Quad Line Receiver
DS96F174ME/883	5962-9076502M2A	Quad Line Driver
DS96F174MJ-QMLV	5962-9076502VEA	Quad Line Driver
DS96F174MJ/883	5962-9076502MEA	Quad Line Driver
DS96F174MW/883	5962-9076502MFA	Quad Line Driver
DS96F175ME/883	5962-9076601M2A	Quad Line Receiver
DS96F175MJ-QMLV	5962-9076601VEA	Quad Line Receiver
DS96F175MJ/883	5962-9076601MEA	Quad Line Receiver
DS96F175MW/883	5962-9076601MFA	Quad Line Receiver
JL101ABCA	JM38510/10103BCA	General Purpose Op Amp
JL101ABGA	JM38510/10103BGA	General Purpose Op Amp
JL101ABHA	JM38510/10103BHA	General Purpose Op Amp
JL101ABPA	JM38510/10103BPA	General Purpose Op Amp
JL101ASGA	JM38510/10103SGA	General Purpose Op Amp
JL101ASHA	JM38510/10103SHA	General Purpose Op Amp
JL101ASPA	JM38510/10103SPA	General Purpose Op Amp
JL108ABCA	JM38510/10104BCA	Precision Op Amp
JL108ABGA	JM38510/10104BGA	Precision Op Amp
JL108ABHA	JM38510/10104BHA	Precision Op Amp

National Part Number	SMD/JAN Drawing Number	Function
JL108ABPA	JM38510/10104BPA	Precision Op Amp
JL108ASCA	JM38510/10104SCA	Precision Op Amp
JL108ASGA	JM38510/10104SGA	Precision Op Amp
JL108ASHA	JM38510/10104SHA	Precision Op Amp
JL108ASPA	JM38510/10104SPA	Precision Op Amp
JL109BXA	JM38510/10701BXA	Voltage Regulator
JL109BYA	JM38510/10701BYA	Voltage Regulator
JL109SXA	JM38510/10701SXA	Voltage Regulator
JL111BCA	JM38510/10304BCA	Voltage Comparator
JL111BGA	JM38510/10304BGA	Voltage Comparator
JL111BHA	JM38510/10304BHA	Voltage Comparator
JL111BPA	JM38510/10304BPA	Voltage Comparator
JL111SGA	JM38510/10304SGA	Voltage Comparator
JL111SHA	JM38510/10304SHA	Voltage Comparator
JL111SPA	JM38510/10304SPA	Voltage Comparator
JL117BXA	JM38510/11703BXA	Adjustable Regulator
JL117BYA	JM38510/11704BYA	Adjustable Regulator
JL117SXA	JM38510/11703SXA	Adjustable Regulator
JL117SYA	JM38510/11704SYA	Adjustable Regulator
JL118BCA	JM38510/10107BCA	Fast Op Amp
JL118BGA	JM38510/10107BGA	Fast Op Amp
JL118BHA	JM38510/10107BHA	Fast Op Amp
JL118BPA	JM38510/10107BPA	Fast Op Amp
JL118SGA	JM38510/10107SGA	Fast Op Amp
JL118SHA	JM38510/10107SHA	Fast Op Amp
JL118SPA	JM38510/10107SPA	Fast Op Amp
JL119BCA	JM38510/10306BCA	High Speed Dual Comparator
JL119BIA	JM38510/10306BIA	High Speed Dual Comparator
JL120-12BXA	JM38510/11502BXA	Voltage Regulator
JL120-12BYA	JM38510/11506BYA	Voltage Regulator
JL120-15BXA	JM38510/11503BXA	Voltage Regulator
JL120-15BYA	JM38510/11507BYA	Voltage Regulator
JL120-15SXA	JM38510/11503SXA	Voltage Regulator
JL120-5BXA	JM38510/11501BXA	Voltage Regulator
JL120-5BYA	JM38510/11505BYA	Voltage Regulator
JL120-5SXA	JM38510/11501SXA	Voltage Regulator
JL120-5SYA	JM38510/11505SYA	Voltage Regulator

National Part Number	SMD/JAN Drawing Number	Function
JL124ABCA	JM38510/11006BCA	Low Power Quad Op Amp
JL124ABDA	JM38510/11006BDA	Low Power Quad Op Amp
JL124ASCA	JM38510/11006SCA	Low Power Quad Op Amp
JL124ASDA	JM38510/11006SDA	Low Power Quad Op Amp
JL124BCA	JM38510/11005BCA	Low Power Quad Op Amp
JL124BDA	JM38510/11005BDA	Low Power Quad Op Amp
JL124SCA	JM38510/11005SCA	Low Power Quad Op Amp
JL124SDA	JM38510/11005SDA	Low Power Quad Op Amp
JL137BXA	JM38510/11803BXA	Adjustable Regulator
JL137BYA	JM38510/11804BYA	Adjustable Regulator
JL137SXA	JM38510/11803SXA	Adjustable Regulator
JL137SYA	JM38510/11804SYA	Adjustable Regulator
JL139BCA	JM38510/11201BCA	Quad Comparator
JL139BDA	JM38510/11201BDA	Quad Comparator
JL139SCA	JM38510/11201SCA	Quad Comparator
JL139SDA	JM38510/11201SDA	Quad Comparator
JL140-12BXA	JM38510/10703BXA	Voltage Regulator
JL140-12BYA	JM38510/10707BYA	Voltage Regulator
JL140-12SXA	JM38510/10703SXA	Voltage Regulator
JL140-12SYA	JM38510/10707SYA	Voltage Regulator
JL140-15BXA	JM38510/10704BXA	Voltage Regulator
JL140-15BYA	JM38510/10708BYA	Voltage Regulator
JL140-15SYA +	JM38510/10708SYA	Voltage Regulator
JL140-24BYA	JM38510/10709BYA	Voltage Regulator
JL140-5BXA	JM38510/10702BXA	Voltage Regulator
JL140-5BYA	JM38510/10706BYA	Voltage Regulator
JL140-5SXA	JM38510/10702SXA	Voltage Regulator
JL140-5SYA	JM38510/10706SYA	Voltage Regulator
JL147BCA	JM38510/11906BCA	Wide BW Quad JFET Op Amp
JL148BCA	JM38510/11001BCA	Quad Op Amp
JL148BDA	JM38510/11001BDA	Quad Op Amp
JL148SCA	JM38510/11001SCA	Quad Op Amp
JL148SDA	JM38510/11001SDA	Quad Op Amp
JL1558BGA	JM38510/10108BGA	Dual Op Amp
JL155BGA	JM38510/11401BGA	JFET Input Op Amp
JL156BGA	JM38510/11402BGA	JFET Input Op Amp
JL156SGA	JM38510/11402SGA	JFET Input Op Amp

# ENHANCED SOLUTIONS

National Part Number	SMD/JAN Drawing Number	Function
JL193BGA	JM38510/11202BGA	Dual Comparator
JL193BPA	JM38510/11202BPA	Dual Comparator
JL198BGA	JM38510/12501BGA	Monolithic Sample And Hold
JL198SGA	JM38510/12501SGA	Monolithic Sample And Hold
JL2951BPA	5962-3870501BPA	LDO Regulator
JL2951S2A	5962-3870501S2A	LDO Regulator
JL2951SPA	5962-3870501SPA	LDO Regulator
JL411BPA	JM38510/11904BPA	JFET Input Op Amp
JL412BGA	JM38510/11905BGA	JFET Input Dual Op Amp
JL412BPA	JM38510/11905BPA	JFET Input Dual Op Amp
JL555BGA	JM38510/10901BGA	Timer
JL555BPA	JM38510/10901BPA	Timer
JL555SGA	JM38510/10901SGA	Timer
JL555SPA	JM38510/10901SPA	Timer
JL723BIA	JM38510/10201BIA	Precision Voltage Regulator
JL723SCA	JM38510/10201SCA	Precision Voltage Regulator
JL723SIA	JM38510/10201SIA	Precision Voltage Regulator
JL741BCA	JM38510/10101BCA	Op Amp
JL741BGA	JM38510/10101BGA	Op Amp
JL741BHA	JM38510/10101BHA	Op Amp
JL741BPA	JM38510/10101BPA	Op Amp
JL741SGA	JM38510/10101SGA	Op Amp
JL741SPA	JM38510/10101SPA	Op Amp
JL747BCA	JM38510/10102BCA	Dual Op Amp
JL747BDA	JM38510/10102BDA	Dual Op Amp
JL747BIA	JM38510/10102BIA	Dual Op Amp
JL747SCA	JM38510/10102SCA	Dual Op Amp
JL747SIA	JM38510/10102SIA	Dual Op Amp
LF147J-SMD	8102306CA	Wide BW Quad JFET Op Amp
LF412MJ-SMD	5962-9676001QPA	JFET Input Dual Op Amp
LM105H/883	5962-8958801GA	Adjustable Voltage Regulator
LM107H/883	5962-8958901GA	General Purpose Op Amp
LM108AHRQML	5962R9863702QGA +	Precision Op Amp
LM108AHRQMLV	5962R9863702VGA +	Precision Op Amp
LM108AJ-BRQML	5962R9863702QPA +	Precision Op Amp

National Part Number	SMD/JAN Drawing Number	Function
LM108AJ-BRQMLV	5962R9863702VPA +	Precision Op Amp
LM108AJRQML	5962R9863702QCA +	Precision Op Amp
LM108AJRQMLV	5962R9863702VCA +	Precision Op Amp
LM108AWGROML	5962R9863702OZA +	Precision Op Amp
LM108AWGROMLV	5962R9863702VZA +	Precision Op Amp
LM108AWROML	5962R9863702OHA +	Precision Op Amp
LM108AWROMLV	5962R9863702VHA +	Precision Op Amp
LM10H/883	5962-8760401GA	Op Amp/Voltage Reference
LM113-1H-QMLV	5962-9684302VXA	Reference Diode
LM113-1H-SMD	5962-8671102XA	Reference Diode
LM113H-QMLV	5962-9684301VXA	Reference Diode
LM113H-SMD	5962-8671101XA	Reference Diode
LM119E-SMD	86014012A	High Speed Dual Comparator
LM119H-QMLV	5962-9679801VIA	High Speed Dual Comparator
LM119H-SMD	86014011A	High Speed Dual Comparator
LM119J-QMLV	5962-9679801VCA	High Speed Dual Comparator
LM119J-SMD	8601401CA	High Speed Dual Comparator
LM119W-QMLV	5962-9679801VHA	High Speed Dual Comparator
LM119W-SMD	8601401HA	High Speed Dual Comparator
LM119WG-SMD	8601401XA	High Speed Dual Comparator
LM124AE/883	77043022A	Low Power Quad Op Amp
LM124AJ/883	7704302CA	Low Power Quad Op Amp
LM124AJRQML	5962R9950401QCA +	Low Power Quad Op Amp
LM124AJRQMLV	5962R9950401VCA +	Low Power Quad Op Amp
LM124AWG/883	7704302XA	Low Power Quad Op Amp
LM124AWGROML	5962R9950401OZA +	Low Power Quad Op Amp
LM124AWGROMLV	5962R9950401VZA +	Low Power Quad Op Amp
LM124AWROML	5962R9950401ODA +	Low Power Quad Op Amp
LM124AWROMLV	5962R9950401VDA +	Low Power Quad Op Amp
LM124E/883	77043012A	Low Power Quad Op Amp
LM124J/883	7704301CA	Low Power Quad Op Amp
LM124WG/883	7704301XA	Low Power Quad Op Amp
LM129AH-SMD	5962-8992101XA	Precision Voltage Reference
LM12H458MWG/883	5962-9319502OZA	12 Bit Data Acquisition System
LM136AH-5.0-SMD	8418002XA	Reference Diode

## SMD/JAN DRAWINGS BY PART NUMBER

National Part Number	SMD/JAN Drawing Number	Function
LM137H-SMD	7703403XA	Adjustable Regulator
LM137HVH-SMD	7703404XA	Adjustable Regulator
LM137HVK-SMD	7703404YA	Adjustable Regulator
LM137K-SMD	7703403YA	Adjustable Regulator
LM139AE-SMD	5962-87739012A	Quad Comparator
LM139AJ-QMLV	5962-9673801VCA	Quad Comparator
LM139AJ-SMD	5962-8773901CA	Quad Comparator
LM139AJRQML	5962R9673801QCA +	Quad Comparator
LM139AJRQMLV	5962R9673801VCA +	Quad Comparator
LM139AW-QMLV	5962-9673801VDA	Quad Comparator
LM139AW-SMD	5962-8773901DA	Quad Comparator
LM139AWG-QMLV	5962-9673801VXA	Quad Comparator
LM139AWG-SMD	5962-8773901XA	Quad Comparator
LM139AWGROML	5962R9673801QXA +	Quad Comparator
LM139AWGROMLV	5962R9673801VXA +	Quad Comparator
LM139AWROML	5962R9673801QDA +	Quad Comparator
LM139AWROMLV	5962R9673801VDA +	Quad Comparator
LM150K/883	5962-8767501XA	Adjustable Power Regulator
LM1575HVK12-QML	5962-9167302QXA	Switching Regulator
LM1575HVK5-QML	5962-9167202QXA	Switching Regulator
LM1575HVKAD-QML	5962-9167102QXA	Switching Regulator
LM1575J-12-QML	5962-9167301QEA	Switching Regulator
LM1575J-15-QML	5962-9167401QEA	Switching Regulator
LM1575J-5.0-QML	5962-9167201QEA	Switching Regulator
LM1575J-ADJ-QML	5962-9167101MEA	Switching Regulator
LM1575K-5.0-QML	5962-9167201MXA	Switching Regulator
LM1575K-ADJ-QML	5962-9167101MXA	Switching Regulator
LM1577K-ADJ/883	5962-9216601MXA	Switching Regulator
LM158AH-QMLV	5962-8771002VGA	Low Power Dual Op Amp
LM158AH-SMD	5962-8771002GA	Low Power Dual Op Amp
LM158AJ-QMLV	5962-8771002VPA	Low Power Dual Op Amp
LM158AJ/883	5962-8771002PA	Low Power Dual Op Amp
LM158H-SMD	5962-8771001GA	Low Power Dual Op Amp
LM158J/883	5962-8771001PA	Low Power Dual Op Amp
LM160H/883	5962-8767401GA	High Speed Differential Comparator

SMD/JAN DRAWINGS BY PART NUMBER

National Part Number	SMD/JAN Drawing Number	Function
LM185BYH-SMD	5962-9091401MXA	Adjustable Voltage Reference
LM185BYH1.2-SMD	5962-8759405XA	Adjustable Voltage Reference
LM185BYH2.5-SMD	5962-8759406XA	Adjustable Voltage Reference
LM185E-1.2/883	5962-87594012A	Adjustable Voltage Reference
LM185H-1.2-SMD	5962-8759401XA	Adjustable Voltage Reference
LM185H-2.5-SMD	5962-8759402XA	Adjustable Voltage Reference
LM193AH-QMLV	5962-9452602VGA	Dual Comparator
LM193AH/883	5962-9452602MGA	Dual Comparator
LM193AJ-QMLV	5962-9452602VPA	Dual Comparator
LM193AJ/883	5962-9452602MPA	Dual Comparator
LM194H/883	5962-8777701XA	Super Mach Pair Op Amp
LM195H/883	5962-8777801XA	Power Transistor
LM195K/883	5962-8777801YA	Power Transistor
LM199AH-SMD	5962-8856101XA	Precision Voltage Reference
LM2595J-12-QML	5962-9650201QEA	Switching Regulator
LM2595J-3.3-QML	5962-9687901QEA	Switching Regulator
LM2595J-5.0-QML	5962-9650301QEA	Switching Regulator
LM2595J-ADJ-QML	5962-9650401QEA	Switching Regulator
LM2940J-12/883	5962-9088401QEA	LDO Regulator
LM2940J-15/883	5962-9088501QEA	LDO Regulator
LM2940J-5.0/883	5962-8958701EA	LDO Regulator
LM2940J-8.0/883	5962-9088301QEA	LDO Regulator
LM2940WG5.0/883	5962-898701XA +	LDO Regulator
LM2941J/883	5962-9166701QEA	Adjustable LDO Regulator
LM2990J-12-QML	5962-9571001QEA	LDO Regulator
LM2990J-15-QML	5962-9570901QEA	LDO Regulator
LM2990J-5.0-QML	5962-9571101QEA	LDO Regulator
LM2991J-QML	5962-9650501QEA	Adjustable LDO Regulator
LM2991J-QMLV	5962-9650501VEA	Adjustable LDO Regulator
LM2991WG-QML	5962-9650501QXA	Adjustable LDO Regulator
LM3940J-3.3-QML	5962-9688401QEA	LDO Regulator
LM3940WG3.3-QML	5962-9688401QXA	LDO Regulator
LM6121H/883	5962-9081201MGA	VIP Buffer
LM6121J/883	5962-9081201MPA	VIP Buffer
LM6125H/883	5962-9081501MGA	VIP Buffer
LM613AMJ/883	5962-9300301MEA	Super Block
LM6142AMJ-QML	5962-9550301QPA	VIP Voltage Feedback Dual Op Amp

National Part Number	SMD/JAN Drawing Number	Function
LM6161E/883	5962-89621012A	VIP Op Amp
LM6161J-QMLV	5962-8962101VPA +	VIP Op Amp
LM6161J/883	5962-8962101PA	VIP Op Amp
LM6161W-SMD	5962-8962101HA	VIP Op Amp
LM6161WG-QMLV	5962-8962101VXA +	VIP Op Amp
LM6161WG/883	5962-8962101XA	VIP Op Amp
LM6162J-QMLV	5962-9216501VPA	VIP Op Amp
LM6162J/883	5962-9216501MPA	VIP Op Amp
LM6162WG-QMLV	5962-9216501VXA	VIP Op Amp
LM6162WG/883	5962-9216501MXA	VIP Op Amp
LM6164J-QMLV	5962-8962401VPA	VIP Op Amp
LM6164J/883	5962-8962401PA	VIP Op Amp
LM6164W-SMD	5962-8962401HA	VIP Op Amp
LM6164WG-QMLV	5962-8962401VXA	VIP Op Amp
LM6164WG/883	5962-8962401XA	VIP Op Amp
LM6165J-QMLV	5962-8962501VPA	VIP Op Amp
LM6165J/883	5962-8962501PA	VIP Op Amp
LM6165WG-QMLV	5962-8962501VXA	VIP Op Amp
LM6165WG/883	5962-8962501XA	VIP Op Amp
LM6172AMJ-QML	5962-9560401QPA	VIP Voltage Feedback Dual Op Amp
LM7171AMJ-QML	5962-9553601QPA	VIP Voltage Feedback Op Amp
LM7171AMJ-QMLV	5962-9553601VPA	VIP Voltage Feedback Op Amp
LM7171AMW-QML	5962-9553601QHA	VIP Voltage Feedback Op Amp
LM7171AMWG-QML	5962-9553601QXA	VIP Voltage Feedback Op Amp
LM7171AMWG-QMLV	5962-9553601VXA	VIP Voltage Feedback Op Amp
LM725H/883	5962-9552901MGA	Instrumentation Op Amp
LM78540J/883	5962-8876101EA	Switching Regulator
LMC555J/883	5962-8950305PA	CMOS Timer
LMC6061AMJ/883	5962-9460401MPA	CMOS Op Amp
LMC6062AMJ/883	5962-9209403MPA	CMOS Dual Op Amp
LMC6064AMJ/883	5962-9209303MCA	CMOS Quad Op Amp
LMC6462AMJ-QML	5962-9560301QPA	CMOS Dual Op Amp
LMC6464AMJ-QML	5962-9560302QCA	CMOS Quad Op Amp
LMC6464AMWG-QML	5962-9560302QXA	CMOS Quad Op Amp
LMC6482AMJ/883	5962-9453401MPA	CMOS Dual Op Amp
LMC6484AMJ/883	5962-9453402MCA	CMOS Quad Op Amp
LMC6484AMWG/883	5962-9453402QXA	CMOS Quad Op Amp

National Part Number	SMD/JAN Drawing Number	Function
LMD18200-2D/883	5962-9232501MXA	Dual H-Bridge
LP2951E/883	5962-3870501M2A	Adjustable LDO Regulator
LP2951H/883	5962-3870501MGA	Adjustable LDO Regulator
LP2951J/883	5962-3870501MPA	Adjustable LDO Regulator
LP2951WG/883	5962-3870501MXA	Adjustable LDO Regulator
LP2953AMJ-QMLV	5962-9233601VEA	Adjustable LDO Regulator
LP2953AMJ/883	5962-9233601MEA	Adjustable LDO Regulator
LP2953AMWG-QMLV	5962-9233601VXA	Adjustable LDO Regulator
LP2953AMWG/883	5962-9233601QXA	Adjustable LDO Regulator
LP2956AMJ-QML	5962-9554701QEA	Adjustable LDO Regulator

# ENHANCED SOLUTIONS

## LINEAR PRODUCTS – RADIATION TEST RESULTS

Total Ionizing Dose Results			Single Event Latchup		
Part Number	Total Dose to Pre-Rad Limit (krad)	Functional Level (krad)	SEL	LET (MeV/mg/cm <sup>2</sup> )	Process Technology
LF156	10	> 15			Bi-FET
LM35AH	100	> 100			Bipolar-SiCr
LM101	80 - 100	> 100			Bipolar
LM105	100	> 100			Bipolar
LM107	> 100	> 100			Bipolar
LM108	80 - 100	> 100			Bipolar
LM109	20 - 50	> 50			Bipolar
LM111	< 10	> 20			Bipolar
LM113	100	> 100			Bipolar
LM117H	20 - 30	> 100	No	>110	Bipolar
LM117K	30 - 40	> 100	No	>110	Bipolar
LM118	50	> 200			Bipolar
LM119	10 - 20	> 100	No	>100	Bipolar
LM120-12(H)	> 100	> 100	No	>110	Bipolar
LM120-12(K)	> 100	> 100	No	>110	Bipolar
LM120-15(H)	> 100	> 100			Bipolar
LM120-15(K)	> 100	> 100			Bipolar
LM124	> 100	> 125	No	>90	Bipolar
LM124A	25 - 30	> 100			Bipolar
LM12H458MEL	5	< 10			CMOS
LM135	> 50	> 50			Bipolar
LM136AH-2.5	100	> 100	No	>110	Bipolar
LM136AH-5.0	30	>100			Bipolar
LM137(H)	20 - 30	50			Bipolar
LM137(K)	20 - 30	50			Bipolar
LM139	50 - 80	> 100	No	>80	Bipolar
LM140-5(H)	20	> 100			Bipolar

- Notes:
1. Linear products have been irradiated to High Dose rates as required by MIL-STD-883D, Method 1019.4. "Worst-case" conditions for Linear products are derived through Low Dose Rate testing.
  2. Using pre-radiation limits provides small additional margin for Linear products that are used in space environments tested at high dose rate.
  3. Parts qualified to RHA Level R are guaranteed to meet their post rad specifications after 100 krad(Si) total dose. Rad levels for all other products are typical and are not guaranteed.



LINEAR PRODUCTS – RADIATION TEST RESULTS

Total Ionizing Dose Results			Single Event Latchup		
Device	Total Dose to Pre-Rad Limit (krad)	Functional Level (krad)	SEL	LET (MeV/mg/cm <sup>2</sup> )	Process Technology
LM140-121(H)	20	> 50			Bipolar
LM140-12(K)	20	> 50			Bipolar
LM140-15(H)	> 20	> 50			Bipolar
LM140-15(K)	> 20	> 50			Bipolar
LM148	> 20	> 20			Bipolar
LM158	12 - 50	> 50	No		Bipolar
LM158A	12 - 50	> 50	No		Bipolar
LM185	< 10	> 10			Bipolar
LM193	< 20	> 100	No	>110	Bipolar
LM193A	< 20	> 100	No	>110	Bipolar
LM555	> 25	> 25			Bipolar
LM723	> 100	> 100			Bipolar
LM1575J-5.0	30	> 50			Bipolar
LM1575J-ADJ	30	> 50			Bipolar
LM6142AMJ	10	< 100			VIP III
LM6161	50	200			VIP I
LM6172	> 100	> 300			VIP III
LM7171	> 100	> 200			VIP III
LM2595J-5.0	100	> 100			Bipolar
LM2595J-ADJ	100	> 100			Bipolar
LM2991J	10	< 30			Bipolar
LMC6062	5	10			CMOS
LMX2305	25	50	No	>84	BiCMOS
LMX2315	25	50	No	>84	BiCMOS
LMX2325	25	50	No	>84	BiCMOS
LP2951	> 75	> 100	No	>90	Bipolar
LP2953	> 30	> 75			Bipolar
LP2956	30	< 50			Bipolar

- Notes:
1. Linear products have been irradiated to High Dose rates as required by MIL-STD-883D, Method 1019.4. "Worst-case" conditions for Linear products are derived through Low Dose Rate testing.
  2. Using pre-radiation limits provides small additional margin for Linear products that are used in space environments tested at high dose rate.
  3. Parts qualified to RHA Level R are guaranteed to meet their post rad specifications after 100 krads(Si) total dose. Rad levels for all other products are typical and are not guaranteed.

# ENHANCED SOLUTIONS

## HIGH-PERFORMANCE OP AMPS - RADIATION TEST RESULTS

Neutron Irradiation (Neutron/cm <sup>2</sup> )	Total Dose	Dose Rate	Result Summary	Product within Process	
<b>CBIC-U (39x39 Mil Die Size) Process Type/Base Chip Technology</b>					
1x10 <sup>12</sup>	30, 100, 300	50 rads/sec	Slight change in DC operating point	CLC109 CLC110	CLC111
Not Available	10, 30, 50, 100	570 rads (Si)/min	No degradation of gain; slight degradation of bandwidth at initial radiation exposure	CLC400* CLC401* CLC406 CLC412	CLC425 CLC522 CLC532
<b>CBIC-U (54x54 Mil Die Size) Process Type/Base Chip Technology</b>					
Not Available	10,000	155 rads/sec	Slight change in DC operating point; no degradation in AC characteristics	CLC400* CLC401*	CLC402
Not Available	10, 30, 100, 300	140 rads (Si)/sec	Negligible degradation to 1000 krads specification; should meet specification to 3000 krads	CLC404 CLC409	CLC410
1.85x10 <sup>14</sup>	None	None	Little change in the small signal frequency response over a wide gain range	CLC420 CLC422	
Not Available	5, 10, 15, 20, 25	500 rads/hour	No degradation of gain; slight degradation of bandwidth at initial radiation exposure	CLC501* CLC502	CLC505
6x10 <sup>11</sup>	30, 60, 100, 150, 200	50 rads/sec	Change in DC bias characteristics; no AC testing performed	CLC520*	
1x10 <sup>12</sup>	30, 100, 300	50 rads/sec	Slight change in DC operating point		
<b>CBIC-U (76x65 Mil Die Size) Process Type/Base Chip Technology</b>					
Not Available	30, 100, 300			CLC411 CLC414	CLC415* CLC533
<b>CBIC-V2 (44x44 Mil Die Size) Process Type/Base Chip Technology</b>					
Report Available	10,000			CLC440 CLC446 Generic CBIC-V*	CLC449
<b>CBIC-R (56x68 Mil Die Size) Process Type/Base Chip Technology</b>					
Report Available	10,000	155 rads/sec	Change in outset voltage and bias current; moderate change in transimpedance.	CLC430	

\*Tested  
 Note: Parts available to RHA are guaranteed to meet their post rad specifications after 100krad (si) total dose.  
 Rad levels for all other products are typical and are not guaranteed.

## LVDS (LOW VOLTAGE DIFFERENTIAL SIGNALLING) PRODUCTS - RADIATION TEST RESULTS

Product	Parameter	3 krad(Si)	10 krad(Si)	30 krad(Si)	50 krad(Si)	100 krad(Si)	300 krad(Si)	+25°C Anneal	Single Event Effects
									Heavy Ion Test Results Latchup (SEL [MeV/(mg/cm <sup>2</sup> )])
DS16F95	All Parameters	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Not available	>120
DS26C31	All Parameters	Meets Pre-Rad	Meets Pre-Rad	–	–	–	–	Not available	>120
DS26C32	All Parameters	Meets Pre-Rad	Meets Pre-Rad	–	–	–	–	Not available	>120
DS26LS31	All Parameters	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Not available	>120
DS26LS32	All Parameters	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Meets Pre-Rad	Not available	>120
DS90C031	I <sub>CCZ</sub>	10mA	10mA	13mA	13mA		Not available	Not available	
	D <sub>VOS</sub>	± 25mV	± 25mV	± 35mV	± 35mV		Not available	Not available	
	D <sub>VOD</sub>	± 35mV	± 35mV	± 45mV	± 45mV		Not available	Not available	
	I <sub>OZL</sub>	10µA	10µA	25µA	25µA		Not available	Not available	
	I <sub>OZH</sub>	10µA	10µA	25µA	25µA		Not available	Not available	
DS90C032	I <sub>CCHO1</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCHO2</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCHO3</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCL02</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCL03</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCZ01</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCZ02</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCZ03</sub>	11mA	11mA	25mA	25mA		25mA		
	I <sub>CCZ04</sub>	11mA	11mA	25mA	25mA		25mA		
I <sub>CCZ05</sub>	11mA	11mA	25mA	25mA		25mA			



## PACKAGE DESCRIPTIONS

*Section 14*

# PACKAGE DESCRIPTIONS



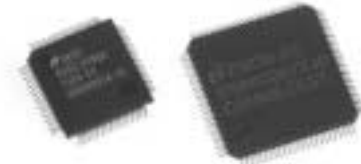
**Molded Plastic Leaded Chip Carrier  
(PLCC)**

Product Suffix: **V**  
SDI Product Suffix: **Q**



**Molded Plastic Quad Flat Package  
(PQFP)**

Product Suffix: **VBG, VCC, VCE, VEF, VF, VH, VHG,  
VE, VJ, VJG, VJQ, VLJ, VNG, VOL, VUL, VUW**



**Molded Plastic Thin Quad Flat Package  
(TQFP)**

Product Suffix: **VEH, VJD, VF, VH**



**Leadless Leadframe Package  
(LLP)**

Product Suffix: **LQ, LQA**



**Chip Scale Packaging  
(CSP)**

Product Suffix: **SLB**



**micro SMD**  
Product Suffix: **IBP**

Package photos are actual size. Please see web site at <http://www.national.com/packaging/> for specifications. Many National products are available in wafer, die, and known good die form. Please go to [www.national.com/kgd](http://www.national.com/kgd) for more information.



**SC70**  
Product Suffix: M7



**Miniature Molded Small Outline Package  
(MSOP, Mini SO)**  
Product Suffix: MM



**Molded Small Outline Package  
(SOT-23)**  
Product Suffix: M3, M5, M6



**Molded Small Outline Package  
(SOT-223)**  
Product Suffix: MP



**Molded Thin Shrink Small Outline Package  
(TSSOP)**  
Product Suffix: MTA, MTD, MTC, MT, MTE



**Molded Small Outline Package  
(SO, SOT)**  
Product Suffix: M, WM  
SDI Product Suffix: E



**Molded Shrink Small Outline Package  
(SSOP)**  
Product Suffix: MSA, MEA, MS

# PACKAGE DESCRIPTIONS



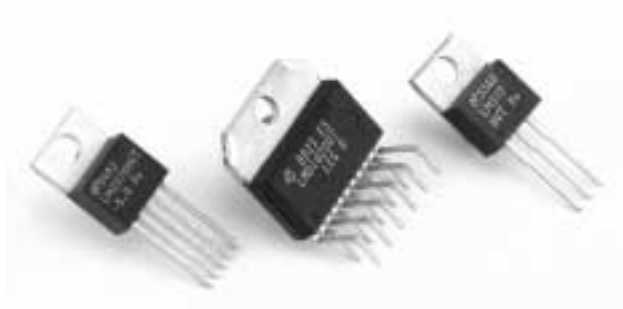
**3-Lead Metal Can Package  
TO46**  
Product Suffix: H



**Molded TO-92**  
Product Suffix: Z



**Molded TO-220 Isolated Tab**  
Product Suffix: TF



**Molded TO-220**  
Product Suffix: T,TA



**Molded D-Pak  
(TO-252)**  
Product Suffix: DT



**Molded Power Surface Mount  
(TO-263)**  
Product Suffix: S,TS



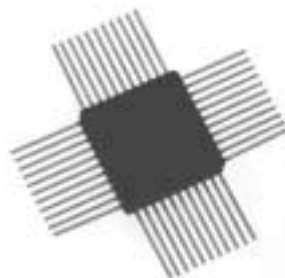
**Molded Dual-in-Line Package  
(DIP)**  
Product Suffix: N

Package photos are actual size. Please see web site at <http://www.national.com/packaging/> for specifications. Many National products are available in wafer, die, and known good die form. Please go to [www.national.com/kgd](http://www.national.com/kgd) for more information.

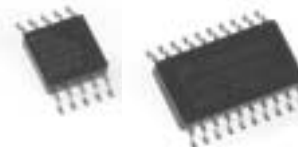




**Ceramic Flatpack**  
Product Suffix: **W**



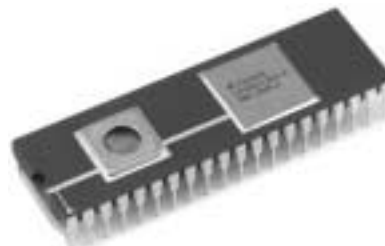
**Ceramic Quad Flatpack**  
Product Suffix: **W**



**Ceramic Small Outline Integrated Circuit (Gullwing) (Ceramic SOIC)**  
Product Suffix: **WG**



**Ceramic Dual-in-Line Package (CerDIP)**  
Product Suffix: **J**



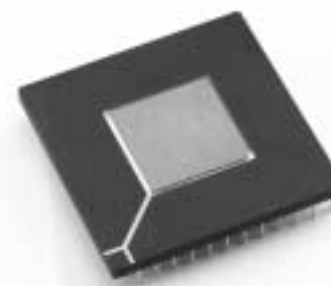
**Ceramic Sidebrazed Dual-in-Line Package**  
Product Suffix: **D**



**Ceramic Quad Flatpack (Gullwing)**  
Product Suffix: **WG**



**Ceramic Quad Flatpack J-bend**  
Product Suffix: **EL**



**Ceramic Pin Grid Array (PGA)**  
Product Suffix: **U**




# TRADEMARK INFORMATION

*Section 15*

# TRADEMARK INFORMATION

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