

October 9, 2007

## CMOS Dual Peripheral Drivers

QP1631 – AND

QP1632 – NAND

QP1633 – OR

QP1634 – NOR

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## General Description

The QP163x series of dual peripheral drivers are designed to be a universal set of interface components for CMOS circuits.

Each circuit has CMOS compatible inputs with thresholds that track as a function of VCC (approximately 1/2 VCC). The inputs are PNPs providing the high impedance necessary for interfacing with CMOS.

Outputs have high voltage capability; minimum breakdown voltage is 56V at 250 uA.

The outputs are Darlington connected transistors. This allows high current operation (300 mA max) at low internal VCC current levels since base drive for the output transistor is obtained from the load in proportion to the required loading conditions. This is essential in order to minimize loading on the CMOS logic supply.

Typical VCC = 5V power is 28 mW with both outputs ON.

VCC operating range is 4.5V to 15V.

The circuit also features output transistor protection, if the VCC supply is lost, by forcing the output into the high impedance OFF state with the same breakdown levels as when VCC was applied.

Pin-outs are the same as the respective logic functions found in the popular series of circuits; DS75451, DS75461. This feature allows direct conversion of present systems to the MM74C CMOS family and DS163x series circuits with great power savings.

The QP163x series is also TTL compatible at VCC = 5V.

The device type(s) features:

- CMOS compatible inputs
- High impedance inputs; PNP's
- High output voltage breakdown 56V min
- High output current capability 300 mA max
- Same pin-outs and logic functions as DS75451 and DS75461 series circuits
- Low VCC power dissipation (~28 mW both outputs "ON" at 5V)

The device/family is constructed using High Voltage Bi-Polar processing.

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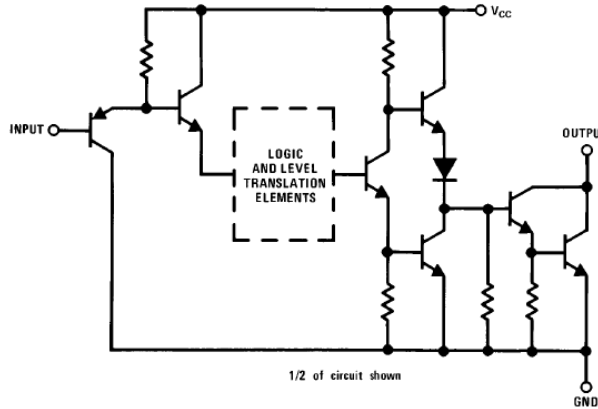
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## Block Diagrams -(Dual-In-Line and Metal Can Packages)

QP163x

Equivalent Circuit



Pin #	Function	Pin #	Function
Pin 1	A1 – Input	Pin 5	X2 – Ouput
Pin 2	B1 – Input	Pin 6	A2 – Input
Pin 3	X1 – Output	Pin 7	B2 – Input
Pin 4	Ground	Pin 8	Vcc

## Test Table

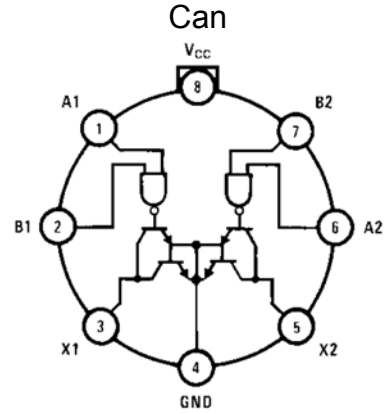
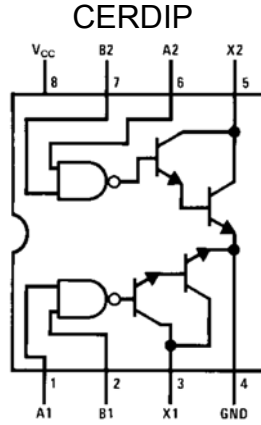
Device	Input Under Test	Other Input	Output	
			Apply	Measure
QP1631	$V_{IH}$ $V_{IL}$	$V_{IH}$ $V_{CC}$	$V_{OH}$ $I_{OL}$	$I_{OH}$ $V_{OL}$
QP1632	$V_{IH}$ $V_{IL}$	$V_{IH}$ $V_{CC}$	$I_{OL}$ $V_{OH}$	$V_{OL}$ $I_{OH}$
QP1633	$V_{IH}$ $V_{IL}$	GND $V_{IL}$	$V_{OH}$ $I_{OL}$	$I_{OH}$ $V_{OL}$
QP1634	$V_{IH}$ $V_{IL}$	GND $V_{IL}$	$I_{OL}$ $V_{OH}$	$V_{OL}$ $I_{OH}$

## Truth Table

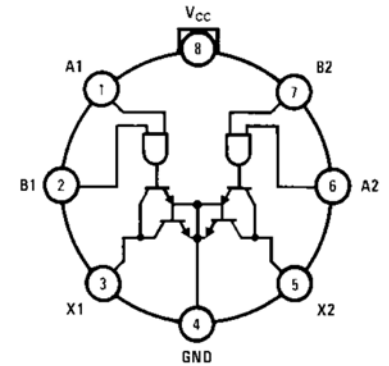
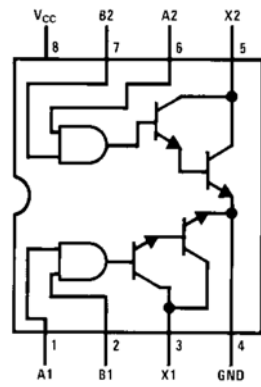
Input		Out			
A	B	1631	1632	1633	1634
0	0	0	1	0	1
0	1	0	1	1	0
1	0	0	1	1	0
1	1	1	0	1	0

# Connection Diagrams

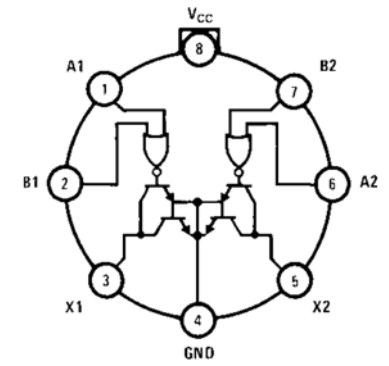
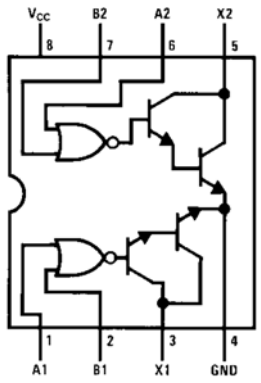
QP1631



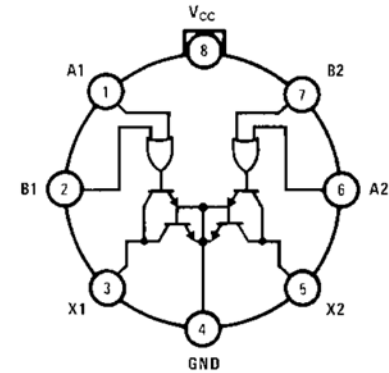
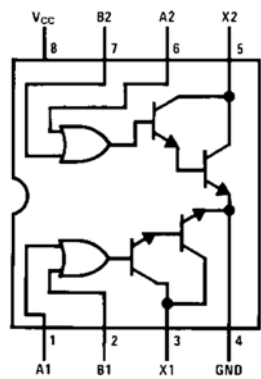
QP1632



QP1633



QP1634



**Absolute Maximum Ratings**

Stresses above the AMR may cause permanent damage, extended operation at AMR may degrade performance and affect reliability

Condition		Units	Notes
Power Supply and Input Voltage	-0.5 to +16.0	Volts DC	
Voltage at Inputs	- 0.3 to V <sub>CC</sub> +0.3	Volts DC	
Output Voltage	56	Volts	
Storage Temperature Range	-65 to +150	°C	
Lead Temperature (soldering, 10 seconds)	+260	°C	
Junction Temperature (T <sub>J</sub> )	+175	°C	
Maximum Power Dissipation Hermetic DIP	1133	mW	/1
Maximum Power Dissipation Hermetic CAN	787	mW	/2

**Recommended Operating Conditions**

Condition		Units	Notes
Supply Voltage Range (V <sub>CC</sub> )	4.5 to 15	Volts DC	
Operating Range (T <sub>c</sub> )	-55C to +125	°C	/1 /2

/1 – Derate 7.6 mW/°C above 25°C  
 /2 – Derate 5.2 mW/°C above 25°C

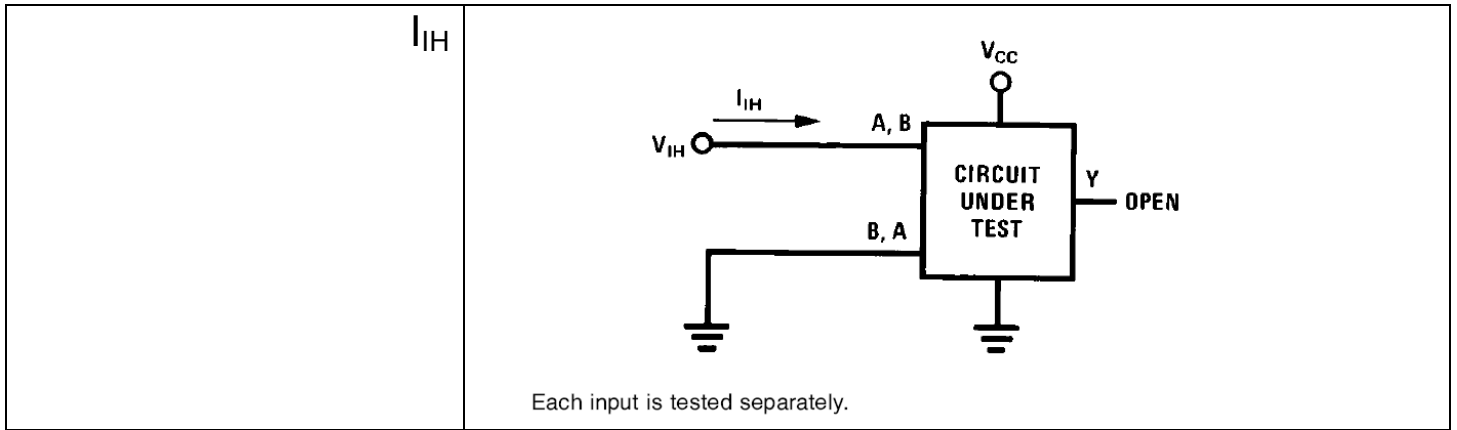
**TABLE I – ELECTRICAL PERFORMANCE CHARACTERISTICS**

Test	Symbol	Conditions -55°C ≤ T <sub>A</sub> ≤ +125°C Unless Otherwise Specified	Min	Max	Unit
Input High Voltage	V <sub>IH</sub>	V <sub>CC</sub> = 5V	3.5		V
		V <sub>CC</sub> = 10V	8.0		V
		V <sub>CC</sub> = 15V	12.5		V
Input Low Voltage	V <sub>IL</sub>	V <sub>CC</sub> = 5V		1.5	V
		V <sub>CC</sub> = 10V		2.0	V
		V <sub>CC</sub> = 15V		2.5	V
Input Low Current	I <sub>IL</sub>	V <sub>CC</sub> = 5V, V <sub>IN</sub> = 0.4V		-115.5	µA
		V <sub>CC</sub> = 15V, V <sub>IN</sub> = 0.4V		-360	µA
Output High Voltage	V <sub>OH</sub>	V <sub>CC</sub> = 15V, I <sub>OH</sub> = 250µA	56		V
Output Low Voltage	V <sub>OL</sub>	V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = 100mA		1.1	V
		V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = 300mA		1.4	V

**TABLE I – ELECTRICAL PERFORMANCE CHARACTERISTICS**

Test	Symbol	Conditions -55°C ≤ TA ≤ +125°C Unless Otherwise Specified	Min	Max	Unit
Power Supply Current V <sub>IH</sub> =V <sub>CC</sub> , V <sub>IL</sub> =GND	I <sub>CCL</sub>				
	QP1631	V <sub>CC</sub> = 5V, V <sub>out</sub> = Low		11	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = Low		20	mA
	QP1632	V <sub>CC</sub> = 5V, V <sub>out</sub> = Low		12	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = Low		23	mA
	QP1633	V <sub>CC</sub> = 5V, V <sub>out</sub> = Low		12	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = Low		23	mA
	QP1634	V <sub>CC</sub> = 5V, V <sub>out</sub> = Low		12	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = Low		23	mA
	I <sub>CCH</sub>				
	QP1631	V <sub>CC</sub> = 5V, V <sub>out</sub> = High		3	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = High		10	mA
	QP1632	V <sub>CC</sub> = 5V, V <sub>out</sub> = High		3.5	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = High		14	mA
	QP1633	V <sub>CC</sub> = 5V, V <sub>out</sub> = High		4	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = High		15	mA
	QP1634	V <sub>CC</sub> = 5V, V <sub>out</sub> = High		5	mA
		V <sub>CC</sub> = 15V, V <sub>out</sub> = High		18	mA
Propagation Delay, Input to Output	QP1631				
	t <sub>PDL</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.50	us
	t <sub>PDL</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.88	us
	t <sub>PDH</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.20	us
	t <sub>PDH</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.50	us

Propagation Delay, Input to Output	QP1632				
	t <sub>PDL</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.20	us
	t <sub>PDL</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.55	us
	t <sub>PDH</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.20	us
	t <sub>PDH</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	1.50	us
	QP1633				
	t <sub>PDL</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	2.00	us
	t <sub>PDL</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	2.00	us
	t <sub>PDH</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.001	0.75	us
	t <sub>PDH</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.001	0.75	us
	QP1634				
	t <sub>PDL</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	2.00	us
	t <sub>PDL</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.01	2.00	us
	t <sub>PDH</sub> 25°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.001	0.75	us
	t <sub>PDH</sub> -55°C, 125°C	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pf R <sub>L</sub> =50Ω V <sub>out</sub> =10V	0.001	0.75	us

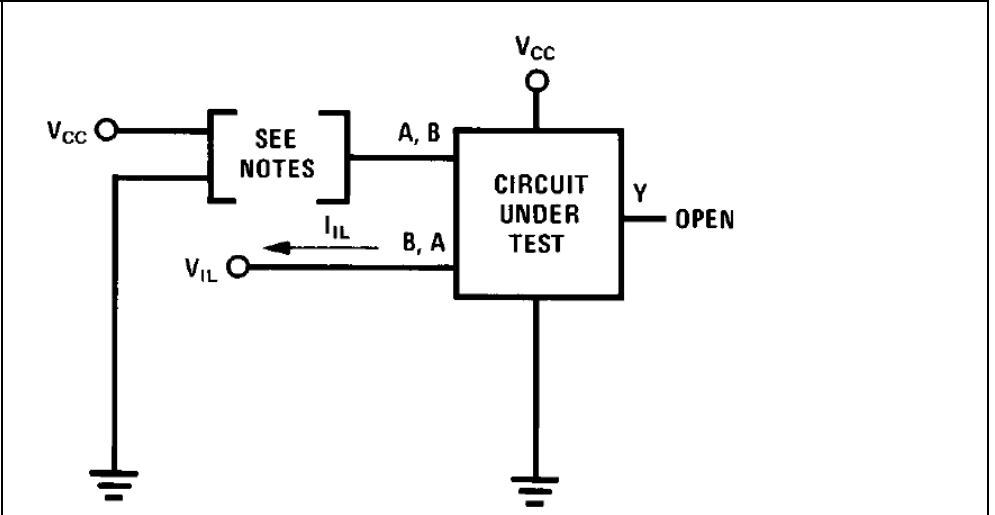


$I_{IL}$

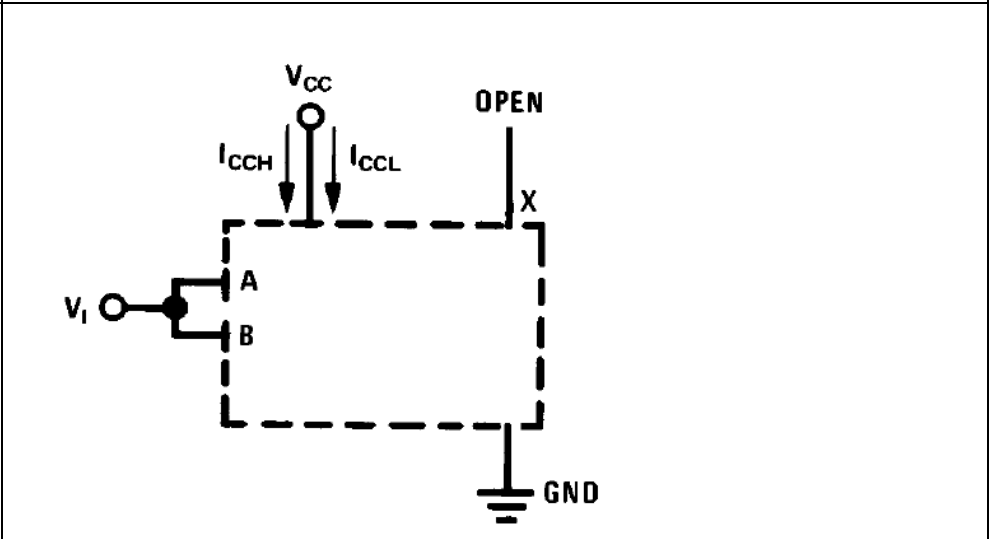
**Notes:**  
 Each input tested separately

QP1631/32 Input not under Test at  $V_{CC}$ .

QP1633/34 Input not under test at GND.



$I_{CC}$  for AND/NAND



**Ordering Information**

Part Number	Package (Mil-Std-1835)	Generic
5962-8863101GA	G – MACY1-X8 – 8 Lead Can	QP1631
5962-8863101PA	P – GDIP1-T8 or CDIP2-T8	QP1631
5962-9052201GA	G – MACY1-X8 – 8 Lead Can	QP1632
5962-9052201PA	P – GDIP1-T8 or CDIP2-T8	QP1632
QP1633/GA	G – MACY1-X8 – 8 Lead Can	QP1633
QP1633/PA	P – GDIP1-T8 or CDIP2-T8	QP1633
5962-8982101GA	G – MACY1-X8 – 8 Lead Can	QP1634
5962-8982101PA	P – GDIP1-T8 or CDIP2-T8	QP1634

QP Semiconductor supports Source Control Drawing (SCD), and custom package development for this product family.

**Notes:**

Package outline information and specifications are defined by Mil-Std-1835 package dimension requirements.

“-MIL” products manufactured by QP Semiconductor are compliant to the assembly, burn-in, test and quality conformance requirements of Test Methods 5004 & 5005 of Mil-Std-883 for Class B devices. This datasheet defines the electrical test requirements for the device(s).

The listed drawings, Mil-PRF-38535, Mil-Std-883 and Mil-Std-1835 are available online at <http://www.dsccl.dla.mil/>

Additional information is available at our website <http://www.qpsemi.com>