National Semiconductor

MICROCIRCUIT DATA SHEET

MN54LCX16244-X REV 0A0

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Low Voltage 16-Bit Buffer/Line Driver With 5V Tolerant Inputs and Outputs

General Description

The LCX16244 contains sixteen non-inverting buffers with TRI-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus oriented transmitter/receiver. The device is nibble controlled. Each nibble has separate TRI-STATE control inputs which can be shorted together for full 16-bit operation. The device is designed for low voltage (3.3V) Vcc applications with capability of interfacing to a 5V signal environment.

The LCX16244 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Industry Part Number

54LCX16244

NS Part Numbers

54LCX16244W-QML

Prime Die

LCX16244

Controlling Document

5962-99505

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- 5V tolerant inputs and outputs
- Power down high impedance inputs and outputs
- Supports live insertion / withdrawl
- Latch-up immunity to 500 mA

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage (Vcc)	
	-0.5V to +7.0V
DC Input Diode Current (Iik)	
Vi < GND	-50 mA
DC Input Voltage (Vi)	
	-0.5V to 7.0V
DC Output Diode Current (Iok)	
Vo < GND	-50 mA
Vo > Vcc	+50 mA
DC Output Voltage (Vo)	
Output in High or Low State (Note 2)	-0.5V to Vcc +0.5V
Output in TRI-STATE	-0.5V to 7.0V
DC Output Source or Sink Current (Io)	
	±50 mA
DC Vcc or Ground Current (Icc or Ignd)	
	±100 mA
Storage Temperature (Tstg)	
	-65C to +150C
Junction Temperature (Tj)	
	175 C

Note 1: Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
Note 2: The DC output current (Io) absolute maximum rating must be observed.

Recommended Operating Conditions

Supply Voltage (Vcc)	
Operating	2.0V to 3.6V
Data Retention	1.5V to 3.6V
Input Voltage (Vi)	
	0V to 5.5V
Output Voltage (Vo)	
High or low state	0V to Vcc
Tri-State	0V to 5.5V
Operating Temperature	
Free Air Ambient	-55C to +125C
Input Edge Rate (Delta t / Delta V)	
Vin = 0.8V to 2.0V, Vcc = 3.0 V	0 ns/V to 10 ns/V
Output Current (Ioh / Iol)	
Vcc = 3.0V to 3.6V	±24mA
Vcc = 2.7V	±12mA
Minimum high-level input voltage (Vih)	
Vcc = 2.7V to 3.6V	2.0V
Maximum low-level input voltage (Vil)	
Vcc = 2.7V to 3.6V	0.8V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC 2.7V to 3.6V, Temp. Range: -55C to 125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High Level Input Current	VCC=3.6V, VM=5.5V	1, 2	INPUTS		5.0	uA	1, 2, 3
IIL	Low Level Input Current	VCC=3.6V, VM=0.0V	1, 2	INPUTS		-5.0	uA	1, 2, 3
VOL	Low level output voltage	VCC=2.7V, VIL=0.8V, VIH=2.0V, IOL=100.0uA	1, 2	OUTPUTS		0.20	V	1, 2, 3
		VCC=3.6V, VIL=0.8V, VIH=2.0V, IOL=100.0uA	1, 2	OUTPUTS		0.20	V	1, 2, 3
		VCC=2.7V, VIL=0.8V, VIH=2.0V, IOL=12.0mA	1, 2	OUTPUTS		0.40	V	1, 2, 3
		VCC=3.0V, VIL=0.8V, VIH=2.0V, IOL=24.0mA	1, 2	OUTPUTS		0.55	V	1, 2, 3
VOH	High Level Output Voltage	VCC=2.7V, VIH=2.0V, VIL=0.8V, IOH=-100.0uA	1, 2	OUTPUTS	2.5		V	1, 2, 3
		VCC=3.6V, VIH=2.0V, VIL=0.8V, IOH=-100.0uA	1, 2	OUTPUTS	3.4		V	1, 2, 3
		VCC=2.7V, VIH=2.0V, VIL=0.8V, IOH=-12.0mA	1, 2	OUTPUTS	2.2		V	1, 2, 3
		VCC=3.0V, VIH=2.0V, VIL=0.8V, IOH=-12mA	1, 2	OUTPUTS	2.4		V	1, 2, 3
		VCC=3.0V, VIH=2.0V, VIL=0.8V, IOH=-24.0mA	1, 2	OUTPUTS	2.2		V	1, 2, 3
IOZH	Maximum TRI-STATE Leakage Current	VCC=2.7V, VM=5.5V, VINL=0.0V, VINH=2.7V, VIH=2.0V	1, 2	OUTPUTS		5.0	uA	1, 2, 3
		VCC=3.6V, VM=5.5V, VINL=0.0V, VINH=3.6V, VIH=2.0V	1, 2	OUTPUTS		5.0	uA	1, 2, 3
IOZL	Maximum TRI-STATE Leakage Current	VCC=2.7V, VM=0.0V, VINH=2.7V, VINL=0.0V, VIH=2.0V	1, 2	OUTPUTS		-5.0	uA	1, 2, 3
		VCC=3.6V, VM=0.0V, VINH=3.6V, VINL=0.0V, VIH=2.0V	1, 2	OUTPUTS		-5.0	uA	1, 2, 3
ICCF	Quiescent Supply Current Functional	VCC=3.6V, VINH=3.6V, VINL=0.0V	1, 2	VCC		20.0	uA	1, 2, 3
ICCL	Quiescent Supply Current Outputs Low	VCC=3.6V, VINH=3.6V, VINL=0.0V	1, 2	VCC		20.0	uA	1, 2, 3
ICCH	Quiescent Supply Current Outputs High	VCC=3.6V, VINH=3.6V, VINL=0.0V	1, 2	VCC		20.0	uA	1, 2, 3
ICCZ	Quiescent Supply Current Outputs Tri-state	VCC=3.6V, VINH=3.6V, VINL=0.0V	1, 2	VCC		20.0	uA	1, 2, 3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC 2.7V to 3.6V, Temp. Range: -55C to 125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCZR	Quiescent Supply Current Outputs Tri-state	VCC=2.7V, force 5.5V all inputs and outputs	1, 2	VCC	-20.0	20.0	uA	1, 2, 3
		VCC=3.6V, force 5.5V all inputs and outputs	1, 2	VCC	-20.0	20.0	uA	1, 2, 3
ICCT	Supply Current per Input (TTL levels)	VCC=3.6V, VINT=VCC-0.6V, VINL=0.0V	1, 2	VCC		0.5	mA	1, 2, 3
		VCC=2.7V, VINT=VCC-0.6V, VINL=0.0V	1, 2	VCC		0.5	mA	1, 2, 3
IOFF	Power-Off Leakage Current	VCC=0.0V, VM=5.5V, VINL=0.0V	1, 2	INPUTS/ OUTPUTS		10.0	uA	1, 2, 3
VIKL	Clamp Diode Voltage	VCC=3.0V, IM=-18mA, VINL=0.0V, VINH=3.0V	1, 2	INPUTS		-1.2	V	1, 2, 3
VOLP	Quiet Output Maximum Dynamic VOL	VCC=3.3V, LOAD 50pF / 500 OHMS, VINH=2.7V, VINL=0.0V	5	OUTPUTS		1200	mV	4
VOLV	Quiet Output Minimum Dynamic VOL	VCC=3.3V, LOAD 50pF / 500 OHMS, VINH=2.7V, VINL=0.0V	5	OUTPUTS		-1100	mV	4
VOHP	Quiet Output Maximum Dynamic VOH	VCC=3.3V, LOAD 50pF / 500 OHMS, VINH=2.7V, VINL=0.0V	5	OUTPUTS		900	mV	4
VOHV	Quiet Output Minimum Dynamic VOH	VCC=3.3V, LOAD 50pF / 500 OHMS, VINH=2.7V, VINL=0.0V	5	OUTPUTS		-1300	mV	4
Cin	Input Capacitance	VCC = Open	5	INPUTS		10	pF	4
Cout	Output Capacitance	VCC=3.3V, VINL=0.0V, VINH=3.3V, outputs=tristate	5	Outputs		12	pF	4
Cpd	Power Dissipation Capacitance per Buffer	VCC=3.3V, VINL=0.0V, VINH=3.3V, f=10MHz, outputs=unloaded	5	VCC		40	pF	4

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pF, RL=500 OHMS, TR/TF=2.5ns, Vin=0V to 2.7V, VM(input)=1.5V, VM(output)=1.5V, Temp. range -55C to +125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH	Propagation Delay	VCC=2.7V	3, 4	In to On	1.0	6.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	In to On	0.5	5.5	ns	9, 10, 11
tpHL	Propagation Delay	VCC=2.7V	3, 4	In to On	1.0	6.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	In to On	0.5	5.5	ns	9, 10, 11
tpZL	Output Enable Time	VCC=2.7V	3, 4	$\overline{OE}$n to On	1.0	7.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	$\overline{OE}$n to On	0.5	6.5	ns	9, 10, 11
tpZH	Output Enable Time	VCC=2.7V	3, 4	$\overline{OE}$n to On	1.0	7.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	$\overline{OE}$n to On	0.5	6.5	ns	9, 10, 11
tpHZ	Output Disable Time	VCC=2.7V,VM(output)=VOH-0.3V	3, 4	$\overline{OE}$n to On	1.0	6.0	ns	9, 10, 11
		VCC=3.0V to 3.6V,VM(output)=VOH-0.3V	3, 4	$\overline{OE}$n to On	1.0	6.0	ns	9, 10, 11
tpLZ	Output Disable Time	VCC=2.7V,VM(output)=VOL+0.3V	3, 4	$\overline{OE}$n to On	1.0	6.0	ns	9, 10, 11
		VCC=3.0V to 3.6V,VM(output)=VOL+0.3V	3, 4	$\overline{OE}$n to On	1.0	6.0	ns	9, 10, 11
tOSHL	Output to Output Skew	VCC=2.7V to 3.6V	5	OUTPUT		1.0	ns	9, 10, 11
tOSLH	Output to Output Skew	VCC=2.7V to 3.6V	5	OUTPUT		1.0	ns	9, 10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C, +125C, & -55C TEMPERATURE, SUBGROUPS 1, 2, 3, 7, & 8.
Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C, +125C, & -55C TEMPERATURE, SUBGROUPS A1, 2, 3, 7, & 8.
Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C, +125C, & -55C TEMPERATURE, SUBGROUPS A9, 10, & 11.
Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C, +125C, & -55C TEMPERATURE, SUBGROUPS A9, 10, & 11.
Note 5: GUARANTEED BUT NOT TESTED. (DESIGN CHARACTERIZATION DATA)

Revision History

Rev	ECN #	Rel Date	Originator	Changes
0A0	M0003195	08/05/99	Linda Collins	Initial MDS Release