National Semiconductor

MICROCIRCUIT DATA SHEET

MN54LCX245-X REV 0A0

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Low Voltage Octal Bidirectional Transceiver With 5V Tolerant Inputs and Outputs

General Description

The LCX245 contains eight non-inverting bidirectional buffers with Tri-State outputs and is intended for bus oriented applications. The device is designed for low voltage (3.3V) Vcc applications with capability of interfacing to a 5V signal environment. The T/R input determines the direction of data flow through the device. The $\overline{OE}$ input disables both the A and B ports by placing them in a high impedance state.

The LCX245 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Industry Part Number

54LCX245

NS Part Numbers

54LCX245E-QML*
54LCX245J-QML**
54LCX245W-QML***

Prime Die

LCX245

Controlling Document

5962-97543

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

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

Features

- 5V tolerant inputs and outputs
- Power down high impedance inputs and outputs
- Supports live insertion / withdrawl
- Standard Military Drawing (SMD)
  - LCX245: 5962-9754302Q2A*, QRA**, QSA***

(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)	±200 mA
Storage Temperature (Tstg)	-65 C to +150 C
Junction Temperature (Tj)	
CDIP	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	2.7V 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	-55 C to +125 C
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 2.7 V 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	$\overline{OE}$, T/$\overline{R}$		5.0	uA	1, 2, 3
IIL	Low Level Input Current	VCC=3.6V, VM=0.0V	1, 2	$\overline{OE}$, T/$\overline{R}$		-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	OUTPUT		.20	V	1, 2, 3
		VCC=3.6V, VIL=0.8V, VIH=2.0V, IOL=100.0uA	1, 2	OUTPUT		.20	V	1, 2, 3
		VCC=2.7V, VIL=0.8V, VIH=2.0V, IOL=12.0mA	1, 2	OUTPUT		.40	V	1, 2, 3
		VCC=3.0V, VIL=0.8V, VIH=2.0V, IOL=24.0mA	1, 2	OUTPUT		.55	V	1, 2, 3
VOH	High Level Output Voltage	VCC=2.7V, VIH=2.0V, VIL=0.8V, IOH=-100.0uA	1, 2	OUTPUT	2.5		V	1, 2, 3
		VCC=3.6V, VIH=2.0V, VIL=0.8V, IOH=-100.0uA	1, 2	OUTPUT	3.4		V	1, 2, 3
		VCC=2.7V, VIH=2.0V, VIL=0.8V, IOH=-12.0mA	1, 2	OUTPUT	2.2		V	1, 2, 3
		VCC=3.0V, VIH=2.0V, VIL=0.8V, IOH=-12mA	1, 2	OUTPUT	2.4		V	1, 2, 3
		VCC=3.0V, VIH=2.0V, VIL=0.8V, IOH=-24.0mA	1, 2	OUTPUT	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	OUTPUT		5.0	uA	1, 2, 3
		VCC=3.6V, VM=5.5V, VINL=0.0V, VINH=3.6V, VIH=2.0V	1, 2	OUTPUT		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	OUTPUT		-5.0	uA	1, 2, 3
		VCC=3.6V, VM=0.0V, VINH=3.6V, VINL=0.0V, VIH=2.0V	1, 2	OUTPUT		-5.0	uA	1, 2, 3
ICCF	Quiescent Supply Current	VCC=3.6V, VINH=3.6V, VINL=0.0V	1, 2	VCC		10.0	uA	1, 2, 3
ICCZR	Supply Current Outputs Tri-State	VCC=3.6V, force 5.5V on all inputs and outputs	1, 2	VCC	-10.0	10.0	uA	1, 2, 3
		VCC=2.7V, force 5.5V on all inputs and outputs	1, 2	VCC	-10.0	10.0	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

Electrical Characteristics

DC PARAMETERS(Continued)

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

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IOFF	Power-Off Leakage Current	VCC=0.0V, VM=5.5V, VINL=0.0V	1, 2	INPUTS/ OUTPUTS		100.0	uA	1, 2, 3
VIKL	Clamp Diode Voltage	VCC=3.0V, IM=-18mA, VINL=0.0V, VINH=3.0V	1, 2	$\overline{OE}$, T/R		-1.2	V	1, 2, 3
VOLP	Quiet Output Maximum Dynamic VOL	VCC=3.0V, LOAD 50pF / 500 OHMS	5	OUTPUT		1.0	V	4
VOLV	Quiet Output Minimum Dynamic VOL	VCC=3.0V, LOAD 50pF / 500 OHMS	5	OUTPUT		-0.8	V	4
VOHP	Quiet Output Maximum Dynamic VOH	VCC=3.0V, LOAD 50pF / 500 OHMS	5	OUTPUT		0.7	V	4
VOHV	Quiet Output Minimum Dynamic VOH	VCC=3.0V, LOAD 50pF / 500 OHMS	5	OUTPUT		-1.1	V	4
CIN	Input Capacitance	VCC=Gnd	5	$\overline{OE}$, T/R		12	pF	4
CIO	Input/Output Capacitance	VCC=3.3V	5	I/O		12	pF	4
CPD	Power Dissipation Capacitance	VCC=3.3V, VIN=0.0V to VCC, F = 10 MHz	5	VCC		50	pF	4

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, 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	An/Bn or Bn/An	1.5	9.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	An/Bn or Bn/An	1.5	8.0	ns	9, 10, 11
tpHL	Propagation Delay	VCC=2.7V	3, 4	An/Bn or Bn/An	1.5	9.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	An/Bn or Bn/An	1.5	8.0	ns	9, 10, 11
tpZL	Output Enable Time	VCC=2.7V	3, 4	$\overline{OE}$ to An or Bn	1.5	11.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	$\overline{OE}$ to An or Bn	1.5	10.0	ns	9, 10, 11
tpZH	Output Enable Time	VCC=2.7V	3, 4	$\overline{OE}$ to An or Bn	1.5	11.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	$\overline{OE}$ to An or Bn	1.5	10.0	ns	9, 10, 11
tpHZ	Output Disable Time	VCC=2.7V	3, 4	$\overline{OE}$ to An or Bn	1.5	9.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	$\overline{OE}$ to An or Bn	1.5	8.0	ns	9, 10, 11
tpLZ	Output Disable Time	VCC=2.7V	3, 4	$\overline{OE}$ to An or Bn	1.5	9.0	ns	9, 10, 11
		VCC=3.0V to 3.6V	3, 4	$\overline{OE}$ to An or Bn	1.5	8.0	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.

(Continued)

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	M0002892	03/09/99	Linda Collins	Initial MDS Release

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Global Electronic Components Distributor

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Texas Instruments:

TCAN332DR MSP430F2112TRHBT OPA643P MSP430F47127IPZ PCM56U TPA6203A1DRBR TPS51125ARGER MSP430F5172IRSBT BQ24314DSGR UA9637ACPS OPT3101RHFR TPS7A8018DRBR MSP430F5131IDA MSP430G2403IPW28 OPA2541BM SN74GTL2006PWR TLC085CDR TPS92200D2DDCR SN74LVCZ240APW TPS71710DCKR MSP430G2332IN20 ADS8344E CC2520RHDR DS90C383MTDX/NOPB LMV358MMX/NOPB MSP430F2001TRSAT UCC27210DR TLV990-28PFB ISO124U/1K SN75LV4735DBLE