

Low-Voltage CMOS 16-Bit Transceiver

With 5 V-Tolerant Inputs and Outputs
(3-State, Non-Inverting)

MC74LCX16245

The MC74LCX16245 is a high performance, non-inverting 16-bit transceiver operating from a 1.65 to 5.5 V supply. The device is byte controlled. Each byte has separate Output Enable inputs which can be tied together for full 16-bit operation. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5 V allows MC74LCX16245 inputs to be safely driven from 5.0 V devices. The MC74LCX16245 is suitable for memory address driving and all TTL level bus oriented transceiver applications.

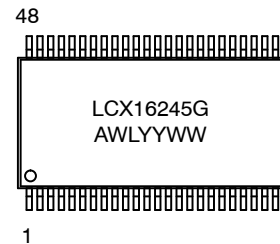
The 4.5 ns maximum propagation delays support high performance applications. Current drive capability is 24 mA at $V_{CC} = 3.0$ V for both A and B ports. The Transmit/Receive (T/Rn) inputs determine the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B to A ports. The Output Enable inputs ($\overline{OE_n}$), when HIGH, disable both A and B ports by placing them in a HIGH Z condition.

Features

- Designed for 1.65 to 5.5 V V_{CC} Operation
- 4.5 ns Maximum t_{pd}
- 5.0 V Tolerant – Interface Capability With 5.0 V TTL Logic
- Supports Live Insertion and Withdrawal
- I_{OFF} Specification Guarantees High Impedance When $V_{CC} = 0$ V
- LVTTL Compatible
- LVC MOS Compatible
- 24 mA Balanced Output Sink and Source Capability at $V_{CC} = 3$ V
- Near Zero Static Supply Current in All Three Logic States (20 μ A)
Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 100 mA
- ESD Performance:
 - ♦ Human Body Model >2000 V
- These Devices are Pb-Free and are RoHS Compliant



MARKING DIAGRAM



A	= Assembly Location
WL	= Wafer Lot
YY	= Year
WW	= Work Week
G	= Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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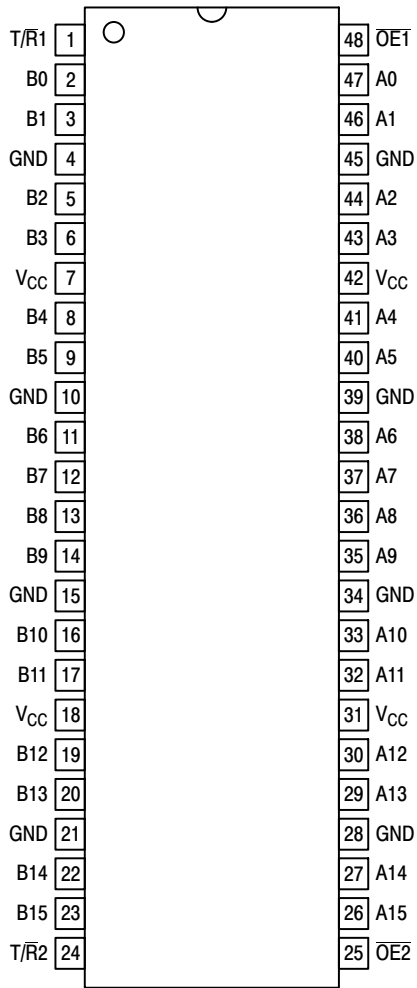


Figure 1. Pinout: 48-Lead (Top View)

Table 1. PIN NAMES

Pins	Function
$\overline{OE}n$	Output Enable Inputs
T/R $\overline{n}$	Transmit/Receive Inputs
A0 – A15	Side A Inputs or 3-State Outputs
B0 – B15	Side B Inputs or 3-State Outputs

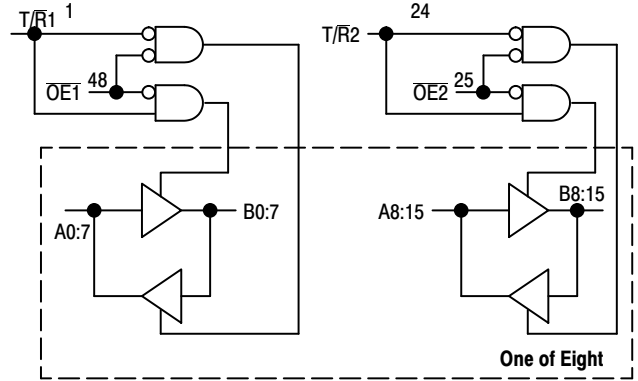


Figure 2. Logic Diagram

TRUTH TABLE

Inputs		Outputs	Inputs		Outputs
OE1	T/R1		OE2	T/R2	
L	L	Bus B0:7 Data to Bus A0:7	L	L	Bus B8:15 Data to Bus A8:15
L	H	Bus A0:7 Data to Bus B0:7	L	H	Bus A8:15 Data to Bus B8:15
H	X	High Z State on A0:7, B0:7	H	X	High Z State on A8:15, B8:15

H = High Voltage Level

L = Low Voltage Level

Z = High Impedance State

X = High or Low Voltage Level and Transitions Are Acceptable; for I_{CC} reasons, DO NOT FLOAT Inputs

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MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	–0.5 to +6.5	V
V_{IN}	DC Input Voltage (Note 1)	–0.5 to +6.5	V
V_{OUT}	DC Output Voltage (Note 1) Active-Mode (High or Low State) Tri-State Mode Power-Down Mode ($V_{CC} = 0$ V)	–0.5 to $V_{CC} + 0.5$ –0.5 to +6.5 –0.5 to +6.5	V
I_{IK}	DC Input Diode Current $V_{IN} < GND$	–50	mA
I_{OK}	DC Output Diode Current $V_{OUT} < GND$	–50	mA
I_O	DC Output Source/Sink Current	±50	mA
I_{CC}	DC Supply Current per Supply Pin	±100	mA
I_{GND}	DC Supply Current per Ground Pin	±100	mA
T_{STG}	Storage Temperature Range	–65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 secs	260	°C
T_J	Junction Temperature Under Bias	+150	°C
θ_{JA}	Thermal Resistance (Note 2)	71	°C/W
P_D	Power Dissipation in Still Air	1765	mW
MSL	Moisture Sensitivity	Level 1	–
F_R	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	–
V_{ESD}	ESD Withstand Voltage (Note 3) Human Body Model Charged Device Model	>2000 N/A	V

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. I_O absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
3. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage Operating Data Retention Only	1.65 1.5	2.5, 3.3 2.5, 3.3	5.5 5.5	V
V_{IN}	Digital Input Voltage	0	–	5.5	V
V_{OUT}	Output Voltage Active Mode (High or Low State) Tri-State Mode Power Down Mode ($V_{CC} = 0$ V)	0 0 0	– – –	V_{CC} 5.5 5.5	V
T_A	Operating Free-Air Temperature	–40	–	+125	°C
t_r, t_f	Input Rise or Fall Rate $V_{CC} = 1.65$ V to 1.95 V $V_{CC} = 2.3$ V to 2.7 V V_{IN} from 0.8 V to 2.0 V, $V_{CC} = 3.0$ V $V_{CC} = 4.5$ V to 5.5 V	0 0 0 0	– – – –	20 20 10 5	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

4. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = -40 °C to +85 °C		T _A = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65 to 1.95	0.65 x V _{CC}	–	0.65 x V _{CC}	–	V
			2.3 to 2.7	1.7	–	1.7	–	
			2.7 to 3.6	2.0	–	2.0	–	
			4.5 to 5.5	0.7 x V _{CC}	–	0.7 x V _{CC}	–	
V _{IL}	Low-Level Input Voltage		1.65 to 1.95	–	0.35 x V _{CC}	–	0.35 x V _{CC}	V
			2.3 to 2.7	–	0.7	–	0.7	
			2.7 to 3.6	–	0.8	–	0.8	
			4.5 to 5.5	–	0.3 x V _{CC}	–	0.3 x V _{CC}	
V _{OH}	High-Level Output Voltage	V _I = V _{IH} or V _{IL}	1.65 to 5.5	V _{CC} – 0.1	–	V _{CC} – 0.1	–	V
		I _{OH} = –100 μA	1.65	1.2	–	1.2	–	
		I _{OH} = –4 mA	2.3	1.8	–	1.8	–	
		I _{OH} = –8 mA	2.7	2.2	–	2.2	–	
		I _{OH} = –12 mA	3.0	2.4	–	2.4	–	
		I _{OH} = –16 mA	3.0	2.2	–	2.2	–	
		I _{OH} = –24 mA	4.5	3.8	–	3.8	–	
		I _{OH} = –32 mA						
V _{OL}	Low-Level Output Voltage	V _I = V _{IH} or V _{IL}	1.65 to 5.5	–	0.1	–	0.1	V
		I _{OH} = –100 μA	1.65	–	0.45	–	0.45	
		I _{OH} = –4 mA	2.3	–	0.6	–	0.6	
		I _{OH} = –8 mA	2.7	–	0.4	–	0.4	
		I _{OH} = –12 mA	3.0	–	0.4	–	0.4	
		I _{OH} = –16 mA	3.0	–	0.55	–	0.55	
		I _{OH} = –24 mA	4.5	–	0.6	–	0.6	
		I _{OH} = –32 mA						
I _I	Input Leakage Current	V _I = 0 to 5.5 V	3.6	–	±5.0	–	±5.0	μA
I _{OZ}	3-State Output Leakage Current	V _I = V _{IH} or V _{IL} , V _O = 0 V to 5.5 V	3.6	–	±5.0	–	±5.0	μA
I _{OFF}	Power Off Leakage Current	V _I = 5.5 V or V _O = 5.5 V	0	–	10	–	10	μA
I _{CC}	Quiescent Supply Current	V _I = 5.5 V or GND	3.6	–	10	–	10	μA
ΔI _{CC}	Increase in I _{CC} per Input	V _{IH} = V _{CC} – 0.6 V	2.3 to 3.6	–	500	–	500	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	V _{CC} (V)	T _A = -40 °C to +85 °C		T _A = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay, D to O	See Figures 3 and 4	1.65 to 1.95	–	8.5	–	8.5	ns
			2.3 to 2.7	–	5.4	–	5.4	
			2.7	–	5.2	–	5.2	
			3.0 to 3.6	–	4.5	–	4.5	
			4.5 to 5.5	–	4.0	–	4.0	
t _{PZH} , t _{PZL}	Output Enable Time, OE to O	See Figures 3 and 4	1.65 to 1.95	–	10.5	–	10.5	ns
			2.3 to 2.7	–	8.5	–	8.5	
			2.7	–	7.2	–	7.2	
			3.0 to 3.6	–	6.5	–	6.5	
			4.5 to 5.5	–	5.5	–	5.5	
t _{PHZ} , t _{PLZ}	Output Disable Time, OE to O	See Figures 3 and 4	1.65 to 1.95	–	9.7	–	9.7	ns
			2.3 to 2.7	–	7.7	–	7.7	
			2.7	–	6.9	–	6.9	
			3.0 to 3.6	–	6.4	–	6.4	
			4.5 to 5.5	–	5.4	–	5.4	
t _{OSSL} , t _{OSLH}	Output to Output Skew, (Note 5)		1.65 to 1.95	–	–	–	–	ns
			2.3 to 2.7	–	–	–	–	
			2.7	–	–	–	–	
			3.0 to 3.6	–	1.0	–	1.0	
			4.5 to 5.5	–	–	–	–	

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption: $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

DYNAMIC SWITCHING CHARACTERISTICS

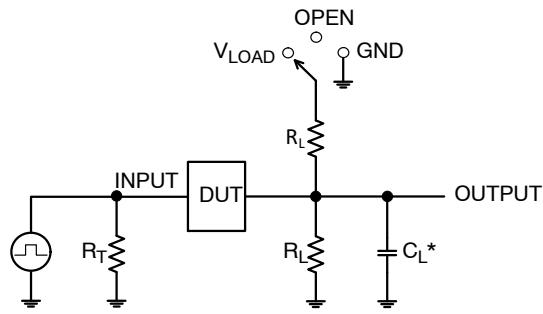
Symbol	Characteristic	Condition	T _A = +25 °C			Units
			Min	Typ	Max	
V _{OLP}	Dynamic LOW Peak Voltage (Note 6)	V _{CC} = 3.3 V, C _L = 50 pF, V _{IH} = 3.3 V, V _{IL} = 0 V		0.8		V
		V _{CC} = 2.5 V, C _L = 30 pF, V _{IH} = 2.5 V, V _{IL} = 0 V		0.6		V
V _{OLV}	Dynamic LOW Valley Voltage (Note 6)	V _{CC} = 3.3 V, C _L = 50 pF, V _{IH} = 3.3 V, V _{IL} = 0 V		–0.8		V
		V _{CC} = 2.5 V, C _L = 30 pF, V _{IH} = 2.5 V, V _{IL} = 0 V		–0.6		V

6. Number of outputs defined as “n”. Measured with “n-1” outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
C _{IN}	Input Capacitance	V _{CC} = 3.3 V, V _I = 0 V or V _{CC}	7	pF
C _{I/O}	Input/Output Capacitance	V _{CC} = 3.3 V, V _I = 0 V or V _{CC}	8	pF
C _{PD}	Power Dissipation Capacitance	10 MHz, V _{CC} = 3.3 V, V _I = 0 V or V _{CC}	20	pF

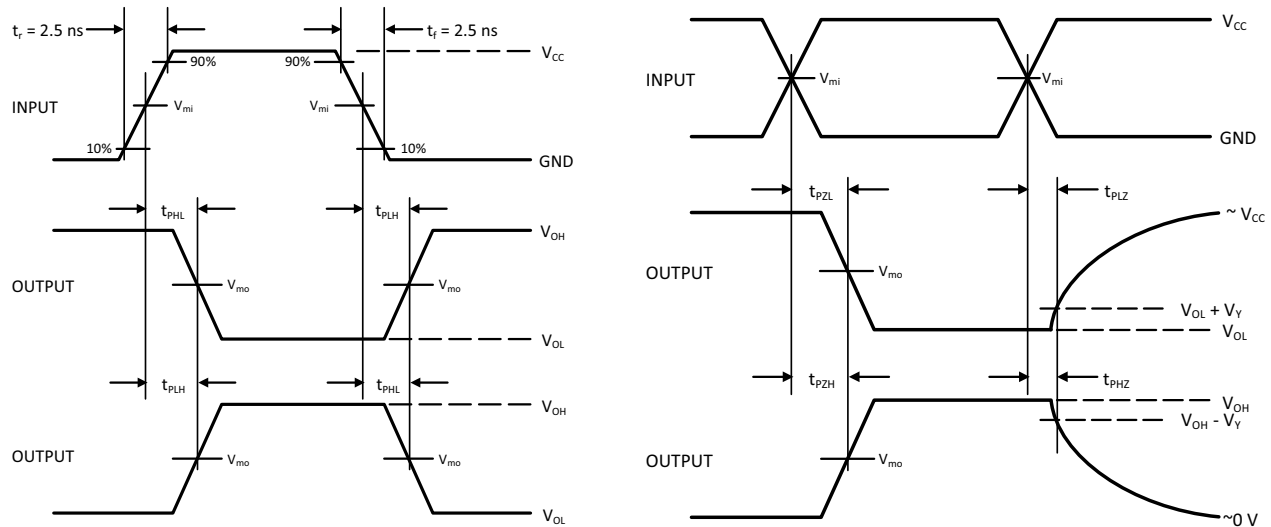
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C_L includes probe and jig capacitance
 R_T is Z_{OUT} of pulse generator (typically 50 Ω)
 $f = 1$ MHz

Test	Switch Position
t_{PLH} / t_{PHL}	Open
t_{PLZ} / t_{PZL}	V_{LOAD}
t_{PHZ} / t_{PZH}	GND

Figure 3. Test Circuit



V_{CC} , V	R_L , Ω	C_L , pF	V_{LOAD}	V_{mi} , V	V_{m0} , V	V_Y , V
1.65 to 1.95	500	30	$2 \times V_{CC}$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	500	30	$2 \times V_{CC}$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.7	500	50	6 V	1.5	$V_{CC}/2$	0.3
3.0 to 3.6	500	50	6 V	1.5	$V_{CC}/2$	0.3
4.5 to 4.5	500	50	$2 \times V_{CC}$	$V_{CC}/2$	$V_{CC}/2$	0.3

Figure 4. Switching Waveforms

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCX16245DTR2G	TSSOP-48*	2500 / Tape & Reel

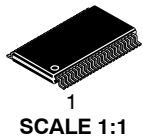
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

REVISION HISTORY

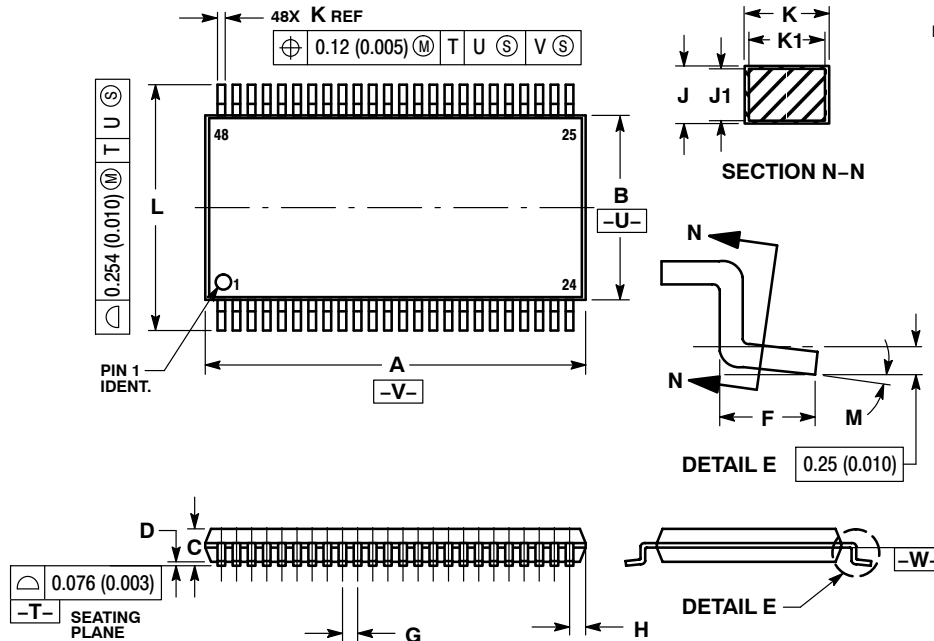
Revision	Description of Changes	Date
11	Update formatting, revive from obsolete, replace five page 1 values, delete one bullet and edit another, replace all tables on pages 3 and 4, edit AC table values, replace figures 3 and 4	7/8/2025

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



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CASE 1201
ISSUE B

DATE 06 JUL 2010

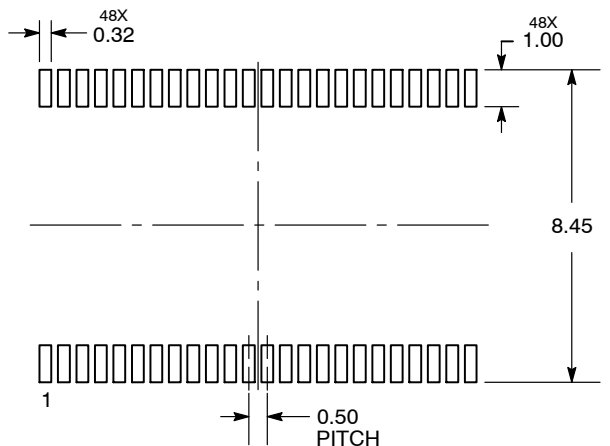


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.40	12.60	0.488	0.496
B	6.00	6.20	0.236	0.244
C	---	1.10	---	0.043
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.50 BSC		0.0197 BSC	
H	0.37	---	0.015	---
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.17	0.27	0.007	0.011
K1	0.17	0.23	0.007	0.009
L	7.95	8.25	0.313	0.325
M	0 °	8 °	0 °	8 °

**RECOMMENDED
 SOLDERING FOOTPRINT***



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**GENERIC
 MARKING DIAGRAM***



XXXXX = Specific Device Code
 A = Assembly Location
 WL = Wafer Lot
 YY = Year
 WW = Work Week
 G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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