

MC74LCX245

Low-Voltage CMOS Octal Transceiver

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

The MC74LCX245 is a high performance, non-inverting octal transceiver operating from a 2.0 to 5.5 V supply. 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 MC74LCX245 inputs to be safely driven from 5 V devices if V_{CC} is less than 5.0 V. The MC74LCX245 is suitable for memory address driving and all TTL level bus oriented transceiver applications.

Current drive capability is 24 mA at both A and B ports. The Transmit/Receive (T/\bar{R}) input determines the direction of data flow through the bi-directional 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 input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

Features

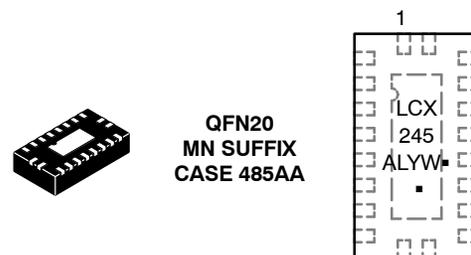
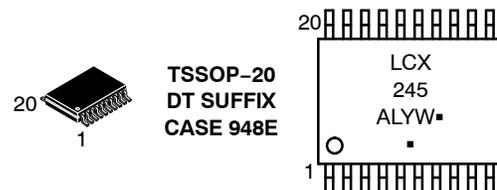
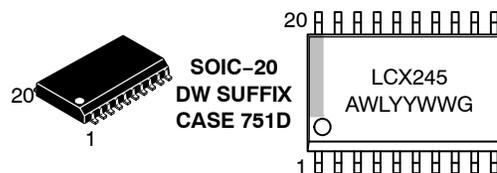
- Designed for 2.0 to 5.5 V V_{CC} Operation
- 5 V Tolerant – Interface Capability With 5 V TTL Logic
- Supports Live Insertion and Withdrawal
- I_{OFF} Specification Guarantees High Impedance When $V_{CC} = 0$ V
- LVTTL Compatible
- LVC MOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (10 μ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance: Human Body Model >2000 V
Machine Model >200 V
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



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MARKING DIAGRAMS



A = Assembly Location
L, WL = Wafer Lot
Y, YY = Year
W, WW = Work Week
G or ▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

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

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

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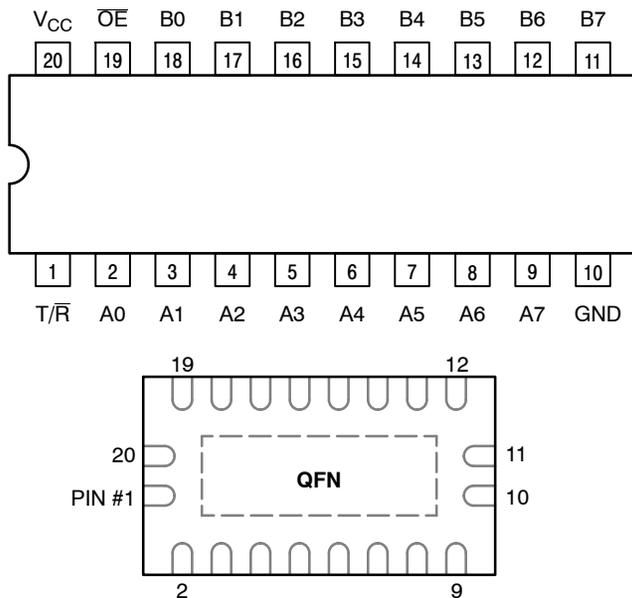


Figure 1. Pinout (Top View)

PIN NAMES

PINS	FUNCTION
\overline{OE}	Output Enable Input
T/R	Transmit/Receive Input
A0–A7	Side A 3–State Inputs or 3–State Outputs
B0–B7	Side B 3–State Inputs or 3–State Outputs

TRUTH TABLE

INPUTS		OPERATING MODE Non-Inverting
\overline{OE}	T/R	
L	L	B Data to A Bus
L	H	A Data to B Bus
H	X	Z

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

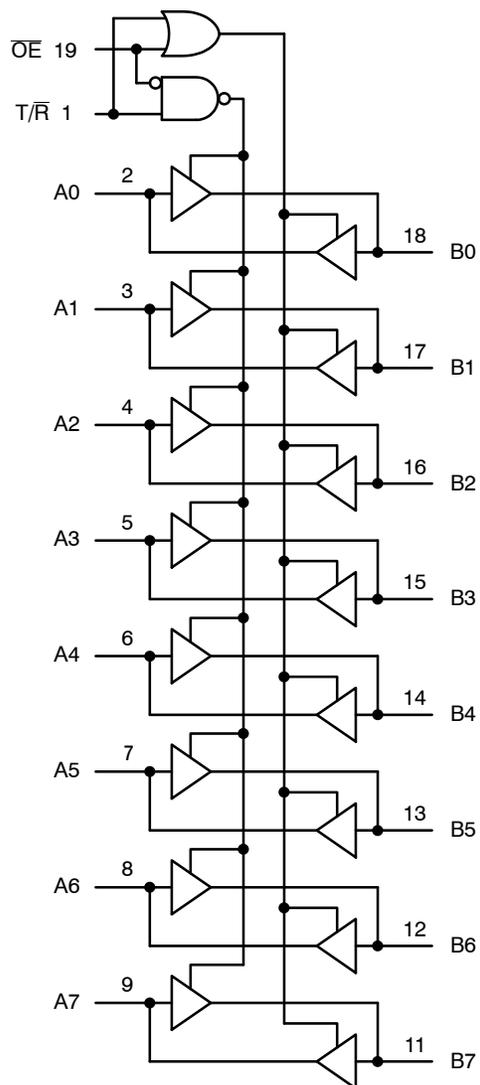


Figure 2. Logic Diagram

MC74LCX245

MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Unit
V _{CC}	DC Supply Voltage	-0.5 to +7.0		V
V _I	DC Input Voltage	-0.5 ≤ V _I ≤ +7.0		V
V _O	DC Output Voltage	-0.5 ≤ V _O ≤ +7.0	Output in 3-State	V
		-0.5 ≤ V _O ≤ V _{CC} + 0.5	Output in HIGH or LOW State (Note 1)	V
I _{IK}	DC Input Diode Current	-50	V _I < GND	mA
I _{OK}	DC Output Diode Current	-50	V _O < GND	mA
		+50	V _O > V _{CC}	mA
I _O	DC Output Source/Sink Current	±50		mA
I _{CC}	DC Supply Current Per Supply Pin	±100		mA
I _{GND}	DC Ground Current Per Ground Pin	±100		mA
T _{STG}	Storage Temperature Range	-65 to +150		°C
MSL	Moisture Sensitivity		Level 1	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V _{CC}	Supply Voltage	Operating	2.0	2.5, 3.3	5.5	V
		Data Retention Only	1.5	2.5, 3.3	5.5	
V _I	Input Voltage	0		5.5	V	
V _O	Output Voltage (HIGH or LOW State) (3-State)	0		V _{CC}	V	
		0		5.5		
I _{OH}	HIGH Level Output Current	V _{CC} = 3.0 V - 3.6 V		- 24	mA	
		V _{CC} = 2.7 V - 3.0 V		- 12		
		V _{CC} = 2.3 V - 2.7 V		- 8		
I _{OL}	LOW Level Output Current	V _{CC} = 3.0 V - 3.6 V		+ 24	mA	
		V _{CC} = 2.7 V - 3.0 V		+ 12		
		V _{CC} = 2.3 V - 2.7 V		+ 8		
T _A	Operating Free-Air Temperature	-55		+125	°C	
Δt/ΔV	Input Transition Rise or Fall Rate, V _{IN} from 0.8 V to 2.0 V, V _{CC} = 3.0 V	0		10	ns/V	

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DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	T _A = -55°C to +125°C		Unit
			Min	Max	
V _{IH}	HIGH Level Input Voltage (Note 2)	2.3 V ≤ V _{CC} ≤ 2.7 V	1.7		V
		2.7 V ≤ V _{CC} ≤ 3.6 V	2.0		
V _{IL}	LOW Level Input Voltage (Note 2)	2.3 V ≤ V _{CC} ≤ 2.7 V		0.7	V
		2.7 V ≤ V _{CC} ≤ 3.6 V		0.8	
V _{OH}	HIGH Level Output Voltage	2.3 V ≤ V _{CC} ≤ 3.6 V; I _{OL} = 100 μA	V _{CC} - 0.2		V
		V _{CC} = 2.3 V; I _{OH} = -8 mA	1.8		
		V _{CC} = 2.7 V; I _{OH} = -12 mA	2.2		
		V _{CC} = 3.0 V; I _{OH} = -18 mA	2.4		
		V _{CC} = 3.0 V; I _{OH} = -24 mA	2.2		
V _{OL}	LOW Level Output Voltage	2.3 V ≤ V _{CC} ≤ 3.6 V; I _{OL} = 100 μA		0.2	V
		V _{CC} = 2.3 V; I _{OL} = 8 mA		0.6	
		V _{CC} = 2.7 V; I _{OL} = 12 mA		0.4	
		V _{CC} = 3.0 V; I _{OL} = 16 mA		0.4	
		V _{CC} = 3.0 V; I _{OL} = 24 mA		0.55	
I _{OZ}	3-State Output Current	V _{CC} = 3.6 V, V _{IN} = V _{IH} or V _{IL} , V _{OUT} = 0 to 5.5 V		±5	μA
I _{OFF}	Power Off Leakage Current	V _{CC} = 0, V _{IN} = 5.5 V or V _{OUT} = 5.5 V		10	μA
I _{IN}	Input Leakage Current	V _{CC} = 3.6 V, V _{IN} = 5.5 V or GND		±5	μA
I _{CC}	Quiescent Supply Current	V _{CC} = 3.6 V, V _{IN} = 5.5 V or GND		10	μA
ΔI _{CC}	Increase in I _{CC} per Input	2.3 ≤ V _{CC} ≤ 3.6 V; V _{IH} = V _{CC} - 0.6 V		500	μA

2. These values of V_I are used to test DC electrical characteristics only.

AC CHARACTERISTICS t_R = t_F = 2.5 ns; R_L = 500 Ω

Symbol	Parameter	Waveform	Limits								Unit
			T _A = -55°C to +125°C								
			V _{CC} = 3.3 V ± 0.3V		V _{CC} = 2.7 V		V _{CC} = 2.5 V ± 0.2V		V _{CC} = 5.0 V		
			C _L = 50 pF		C _L = 50 pF		C _L = 30 pF		C _L = 50 pF		
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation Delay Input to Output	1	1.5 7.0	1.5 7.0	1.5 8.0	1.5 8.0	1.5 8.4	1.5 8.4	1.5 5.0	1.5 5.0	ns
t _{PZH} t _{PZL}	Output Enable Time to High and Low Level	2	1.5 8.5	1.5 8.5	1.5 9.5	1.5 9.5	1.5 10.5	1.5 10.5	1.5 7.0	1.5 7.0	ns
t _{PHZ} t _{PLZ}	Output Disable Time From High and Low Level	2	1.5 7.5	1.5 7.5	1.5 8.5	1.5 8.5	1.5 9.0	1.5 9.0	1.5 6.0	1.5 6.0	ns
t _{OSHL} t _{OSLH}	Output-to-Output Skew (Note 3)		1.0 1.0		1.0 1.0		1.0 1.0		1.0 1.0		ns

3. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

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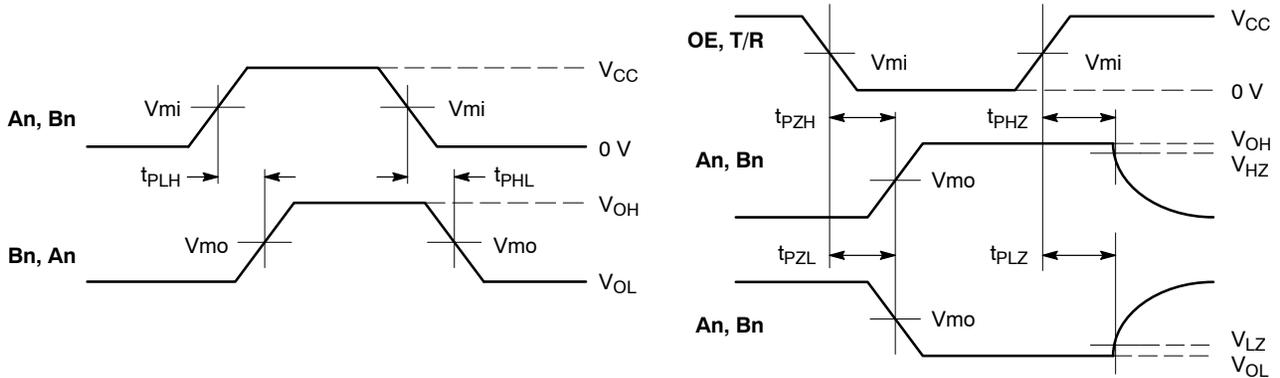
DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	T _A = +25°C			Unit
			Min	Typ	Max	
V _{OLP}	Dynamic LOW Peak Voltage (Note 4)	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 4)	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

4. 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	Unit
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}	25	pF



WAVEFORM 1 – PROPAGATION DELAYS

t_R = t_F = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

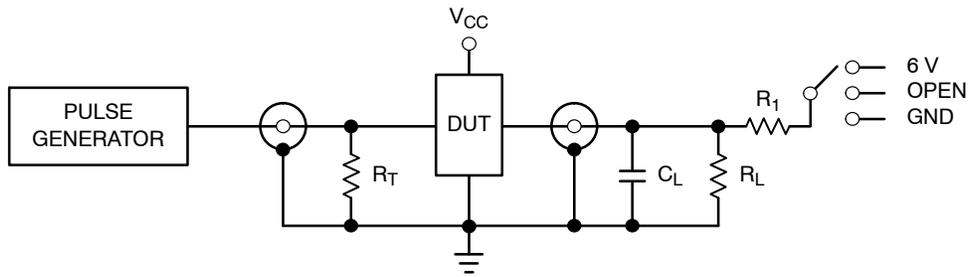
WAVEFORM 2 – OUTPUT ENABLE AND DISABLE TIMES

t_R = t_F = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

Figure 3. AC Waveforms

Symbol	V _{CC}			
	3.3 V ± 0.3 V	2.7 V	2.5 V ± 0.2 V	5.0 V
V _{mi}	1.5 V	1.5 V	V _{CC} /2	V _{CC} /2
V _{mo}	1.5 V	1.5 V	V _{CC} /2	V _{CC} /2
V _{HZ}	V _{OL} + 0.3 V	V _{OL} + 0.3 V	V _{OL} + 0.15 V	V _{OL} + 0.15 V
V _{LZ}	V _{OH} - 0.3 V	V _{OH} - 0.3 V	V _{OH} - 0.15 V	V _{OH} - 0.15 V

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TEST	SWITCH
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	6 V at $V_{CC} = 3.3 \pm 0.3$ V 6 V at $V_{CC} = 2.5 \pm 0.2$ V
Open Collector/Drain t_{PLH} and t_{PHL}	6 V
t_{PZH} , t_{PHZ}	GND

$C_L = 50$ pF at $V_{CC} = 3.3 \pm 0.3$ V or equivalent (includes jig and probe capacitance)

$C_L = 30$ pF at $V_{CC} = 2.5 \pm 0.2$ V or equivalent (includes jig and probe capacitance)

$R_L = R_1 = 500 \Omega$ or equivalent

$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 4. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCX245DWR2G	SOIC-20 (Pb-Free)	1000 Tape & Reel
MC74LCX245DWG	SOIC-20 (Pb-Free)	38 Units / Rail
MC74LCX245DTG	TSSOP-20 (Pb-Free)	75 Units / Rail
MC74LCX245DTR2G	TSSOP-20 (Pb-Free)	2500 Tape & Reel
NLV74LCX245DTR2G*	TSSOP-20 (Pb-Free)	2500 Tape & Reel
MC74LCX245MNTWG	QFN20 (Pb-Free)	3000 Tape & Reel

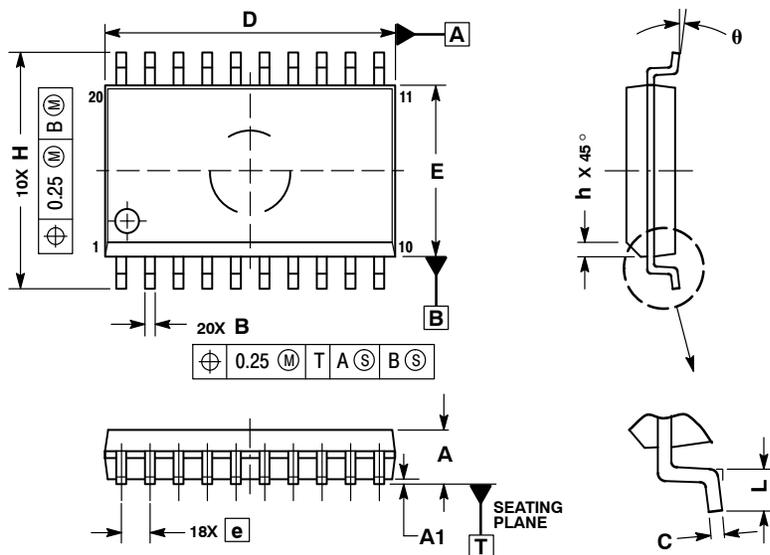
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

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PACKAGE DIMENSIONS

SOIC-20
DW SUFFIX
CASE 751D-05
ISSUE G



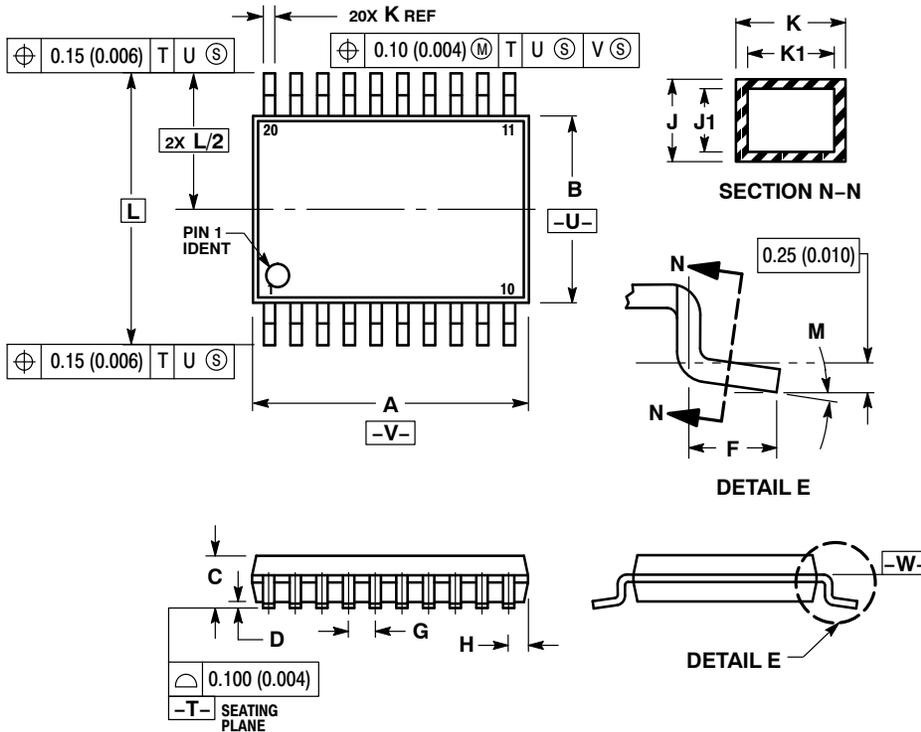
- NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
theta	0°	7°

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PACKAGE DIMENSIONS

TSSOP-20
CASE 948E-02
ISSUE C

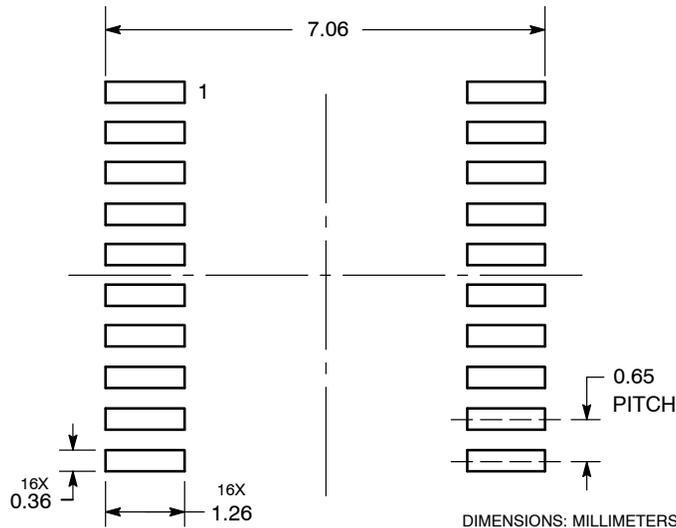


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 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.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

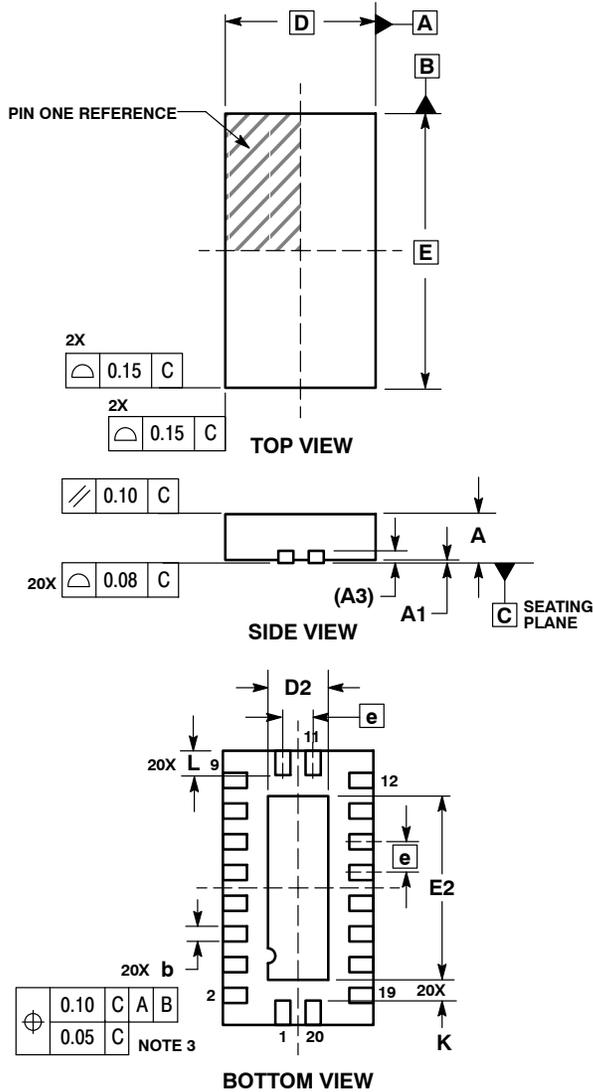
SOLDERING FOOTPRINT



MC74LCX245

PACKAGE DIMENSIONS

QFN20, 2.5x4.5 MM
CASE 485AA
ISSUE B



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.20	0.30
D	2.50 BSC	
D2	0.85	1.15
E	4.50 BSC	
E2	2.85	3.15
e	0.50 BSC	
K	0.20	---
L	0.35	0.45

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