

Low-Voltage CMOS Octal Transceiver

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

MC74LCX245

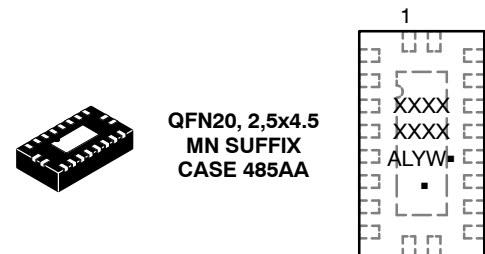
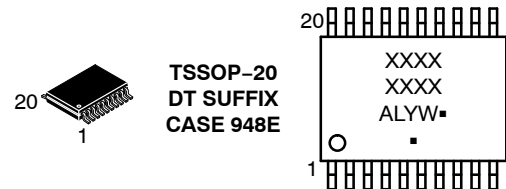
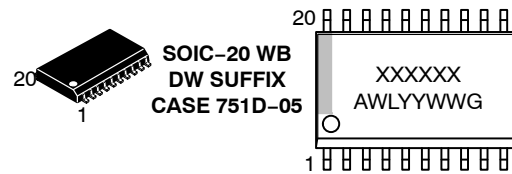
The MC74LCX245 is a high performance, non-inverting octal transceiver operating from a 1.65 to 5.5 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5 V 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 at $V_{CC} = 3.0$ V. The Transmit/Receive (T/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 1.65 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 at $V_{CC} = 3.0$ V
- Near Zero Static Supply Current in All Three Logic States (10 μ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 100 mA
- ESD Performance: Human Body Model > 2000 V
- Q Suffix 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

MARKING DIAGRAMS



XXXXXXXX = Specific Device Code
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 7 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 7.

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

MC74LCX245

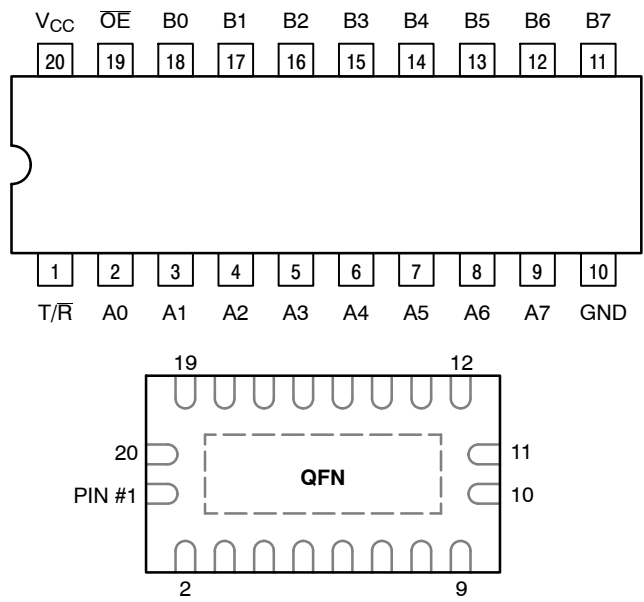


Figure 1. Pinout (Top View)

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

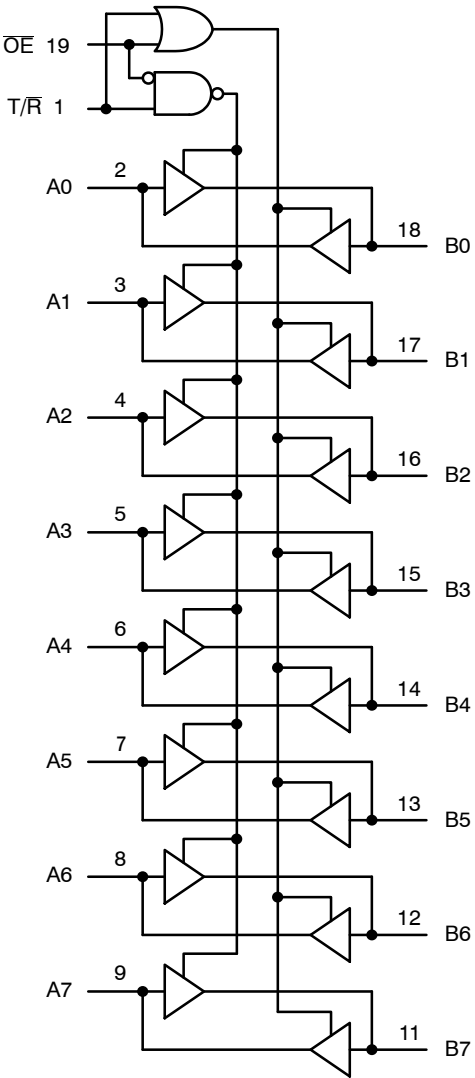


Figure 2. Logic Diagram

MC74LCX245

MAXIMUM RATINGS

Symbol	Parameter	Condition	Value	Unit
V_{CC}	DC Supply Voltage		-0.5 to +6.5	V
V_I	DC Input Voltage (Note 1)		-0.5 to +6.5	V
V_O	DC Output Voltage (Note 1)	Active-Mode (High or Low State)	-0.5 to $V_{CC} + 0.5$	V
		Tri-State Mode	-0.5 to +6.5	
		Power-Down Mode ($V_{CC} = 0$ V)	-0.5 to +6.5	
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} or I_{GND}	DC Supply Current per Supply Pin or 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)	SOIC-20W	96	°C/W
		WQFN20	99	
		QFN20	111	
		TSSOP-20	150	
P_D	Power Dissipation in Still Air	SOIC-20W	1302	mW
		WQFN20	1256	
		QFN20	1127	
		TSSOP-20	833	
MSL	Moisture Sensitivity	SOIC-20W	Level 3	-
		All other packages	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	>2000	V
		Charged Device Model	N/A	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- I_O absolute maximum rating must be observed.
- 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.
- HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD20-A115A (Machine Model) be discontinued.

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RECOMMENDED OPERATING CONDITIONS (Note 4)

Symbol	Parameter		Min	Typ	Max	Unit
V _{CC}	Supply Voltage	Operating	1.65	2.5, 3.3	5.5	V
		Data Retention Only	1.5	2.5, 3.3	5.5	
V _I	Digital Input Voltage		0	–	5.5	V
V _O	Output Voltage	Active-Mode (High or Low State)	0	–	V _{CC}	V
		Tri-State Mode	0	–	5.5	
		Power-Down Mode (V _{CC} = 0 V)	0	–	5.5	
T _A	Operating Free-Air Temperature		–55		+125	°C
t _r , t _f	Input Rise or Fall Rate	V _{CC} = 1.65 V to 1.95 V	0	–	20	ns/V
		V _{CC} = 2.3 V to 2.7 V	0	–	20	
		V _{IN} from 0.8 V to 2.0 V, V _{CC} = 3.0 V	0	–	10	
		V _{CC} = 4.5 V to 5.5 V	0	–	5	

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.

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 × V _{CC}		0.65 × 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 × V _{CC}		0.7 × V _{CC}		
V _{IL}	Low-Level Input Voltage		1.65 to 1.95		0.35 × V _{CC}		0.35 × 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 × V _{CC}		0.3 × V _{CC}	
V _{OH}	High-Level Output Voltage	V _I = V _{IH} or V _{IL}						V
		I _{OH} = –100 μA	1.65 to 5.5	V _{CC} – 0.1	–	V _{CC} – 0.1	–	
		I _{OH} = –4 mA	1.65	1.2	–	1.2	–	
		I _{OH} = –8 mA	2.3	1.8	–	1.8	–	
		I _{OH} = –12 mA	2.7	2.2	–	2.2	–	
		I _{OH} = –16 mA	3.0	2.4	–	2.4	–	
		I _{OH} = –24 mA	3.0	2.2	–	2.2	–	
		I _{OH} = –32 mA	4.5	3.8	–	3.8	–	
V _{OL}	Low-Level Output Voltage	V _I = V _{IH} or V _{IL}						V
		I _{OL} = 100 μA	1.65 to 5.5	–	0.1	–	0.1	
		I _{OL} = 4 mA	1.65	–	0.45	–	0.45	
		I _{OL} = 8 mA	2.3	–	0.6	–	0.6	
		I _{OL} = 12 mA	2.7	–	0.4	–	0.4	
		I _{OL} = 16 mA	3.0	–	0.4	–	0.4	
		I _{OL} = 24 mA	3.0	–	0.55	–	0.55	
		I _{OL} = 32 mA	4.5	–	0.6	–	0.6	
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

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DC ELECTRICAL CHARACTERISTICS (continued)

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	
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

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	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	–	10.3	–	10.3	ns
			2.3 to 2.7	–	8.4	–	8.4	
			2.7	–	8.0	–	8.0	
			3.0 to 3.6	–	7.0	–	7.0	
			4.5 to 5.5	–	5.0	–	5.0	
t _{PZH} , t _{PZL}	Output Enable Time, $\overline{OE}$ to O	See Figures 3 and 4	1.65 to 1.95	–	13.0	–	13.0	ns
			2.3 to 2.7	–	10.5	–	10.5	
			2.7	–	9.5	–	9.5	
			3.0 to 3.6	–	8.5	–	8.5	
			4.5 to 5.5	–	7.0	–	7.0	
t _{PHZ} , t _{PLZ}	Output Disable Time, $\overline{OE}$ to O	See Figures 3 and 4	1.65 to 1.95	–	11.0	–	11.0	ns
			2.3 to 2.7	–	9.0	–	9.0	
			2.7	–	8.5	–	8.5	
			3.0 to 3.6	–	7.5	–	7.5	
			4.5 to 5.5	–	6.0	–	6.0	
t _{OSHL} , t _{OSLH}	Output to Output Skew (Note 5)		1.65 to 1.95	–	–	–	–	ns
			2.3 to 2.7	–	1.0	–	1.0	
			2.7	–	1.0	–	1.0	
			3.0 to 3.6	–	1.0	–	1.0	
			5.0	–	1.0	–	1.0	

5. 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.

MC74LCX245

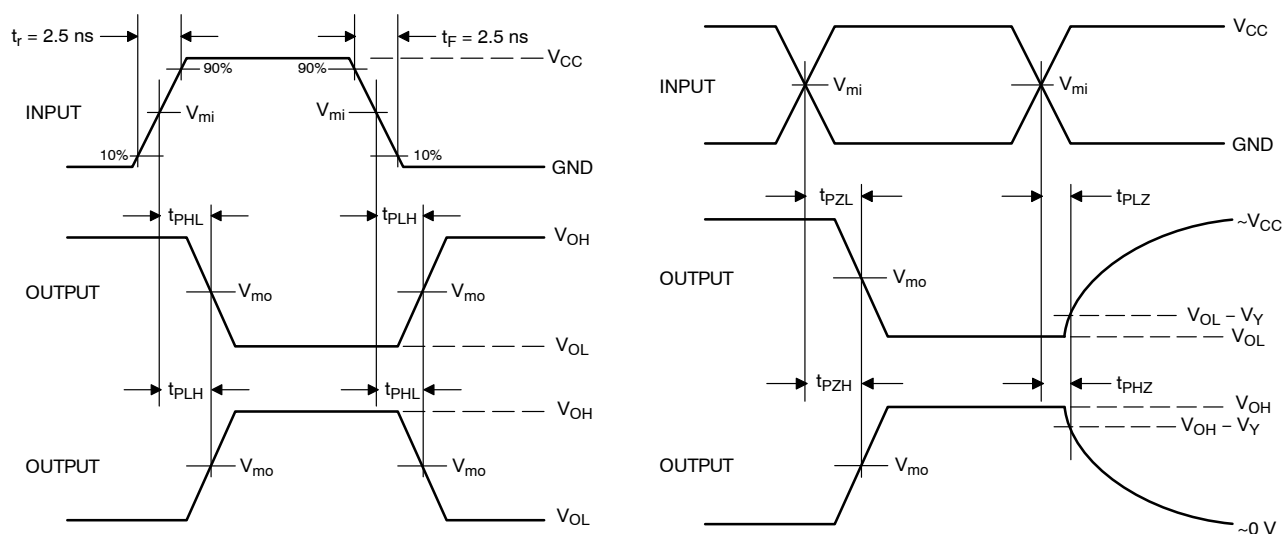
DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	$T_A = +25^\circ\text{C}$			Unit
			Min	Typ	Max	
V_{OLP}	Dynamic LOW Peak Voltage (Note 6)	$V_{CC} = 3.3\text{ V}, C_L = 50\text{ pF}, V_{IH} = 3.3\text{ V}, V_{IL} = 0\text{ V}$ $V_{CC} = 2.5\text{ V}, C_L = 30\text{ pF}, V_{IH} = 2.5\text{ V}, V_{IL} = 0\text{ V}$		0.8 0.6		V V
V_{OLV}	Dynamic LOW Valley Voltage (Note 6)	$V_{CC} = 3.3\text{ V}, C_L = 50\text{ pF}, V_{IH} = 3.3\text{ V}, V_{IL} = 0\text{ V}$ $V_{CC} = 2.5\text{ V}, C_L = 30\text{ pF}, V_{IH} = 2.5\text{ V}, V_{IL} = 0\text{ V}$		-0.8 -0.6		V 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

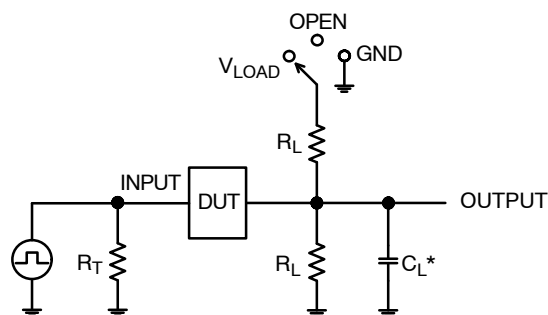
Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	$V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or } V_{CC}$	7	pF
$C_{I/O}$	Input/Output Capacitance	$V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or } V_{CC}$	8	pF
C_{PD}	Power Dissipation Capacitance	10 MHz, $V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or } V_{CC}$	25	pF



V_{CC}, V	R_L, Ω	C_L, pF	V_{LOAD}	V_{mi}, V	V_{mo}, 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 3. Switching Waveforms

MC74LCX245



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 4. Test Circuit

ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
MC74LCX245DWG	LCX245	SOIC-20 WB	38 Units / Rail
MC74LCX245DWR2G	LCX245	SOIC-20 WB	1000 / Tape & Reel
MC74LCX245DTG	LCX 245	TSSOP-20	75 Units / Rail
MC74LCX245DTR2G	LCX 245	TSSOP-20	2500 / Tape & Reel
MC74LCX245DTR2G-Q*	LCX 245	TSSOP-20	2500 / Tape & Reel
MC74LCX245MNTWG	LCX 245	QFN20, 2.5x4.5	3000 / Tape & Reel (4mm pitch carrier tape)

DISCONTINUED (Note 7)

NLV74LCX245DTR2G*	LCX 245	TSSOP-20 (Pb-Free)	2500 Tape & Reel
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[†]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](#).

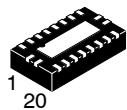
*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

7. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

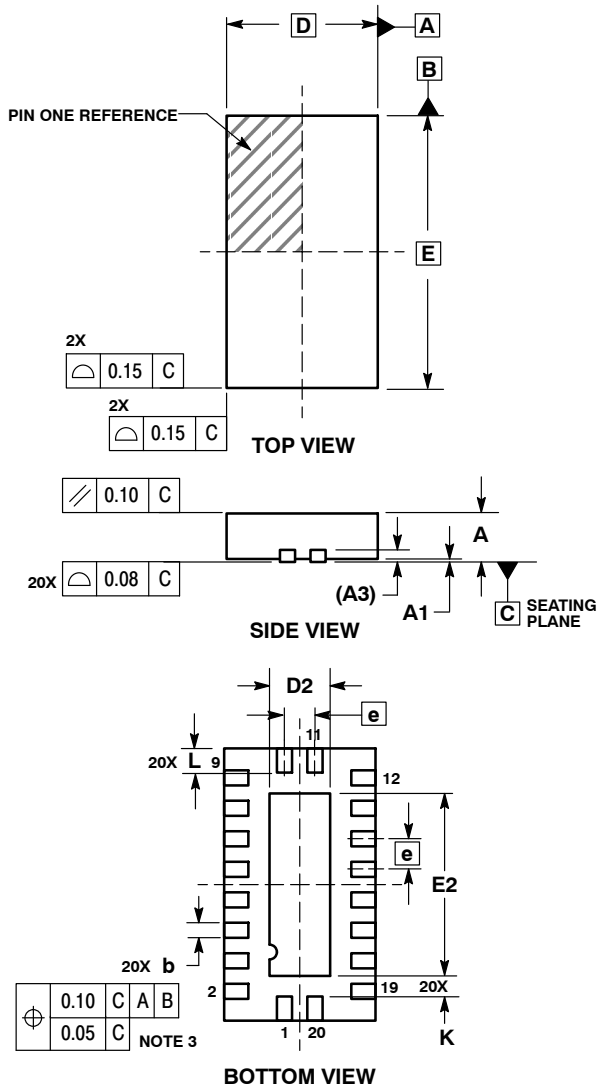
ON Semiconductor®



SCALE 2:1

QFN20, 2.5x4.5 MM
CASE 485AA-01
ISSUE B

DATE 30 APR 2010

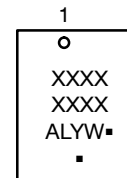


NOTES:

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

GENERIC MARKING DIAGRAM*



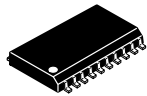
XXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*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.

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DESCRIPTION:	QFN20. 2.5X4.5 MM	PAGE 1 OF 1

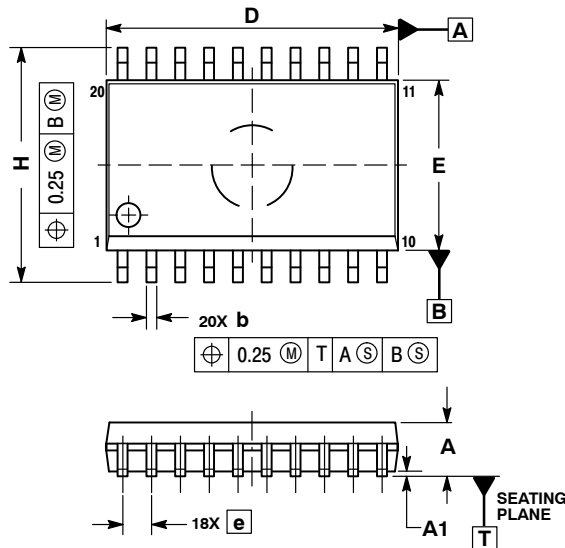
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SCALE 1:1

SOIC-20 WB
CASE 751D-05
ISSUE H

DATE 22 APR 2015

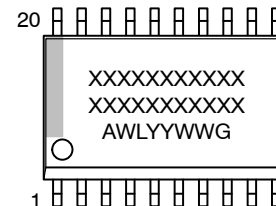


NOTES:

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.

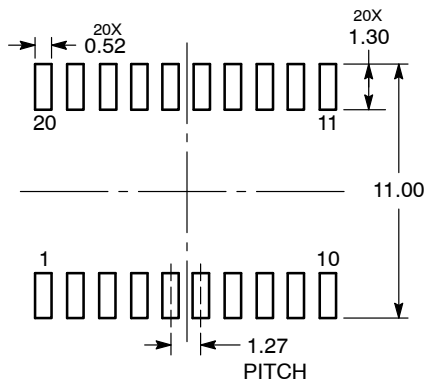
DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
b	0.35	0.49
c	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

GENERIC
MARKING DIAGRAM*



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

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.

*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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DESCRIPTION:	SOIC-20 WB	PAGE 1 OF 1

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Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

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