

Low-Voltage CMOS Octal Transceiver

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

MC74LCX245

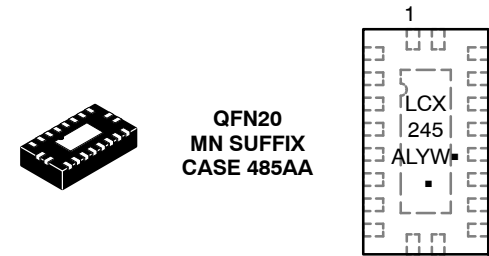
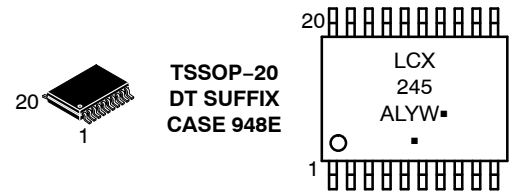
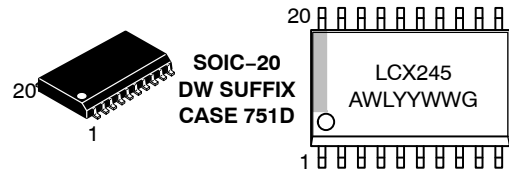
The MC74LCX245 is a high performance, non-inverting octal transceiver operating from a 2.0 to 5.5 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5 V 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/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
- LVTTTL Compatible
- LVCMOS 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

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.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

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

MC74LCX245

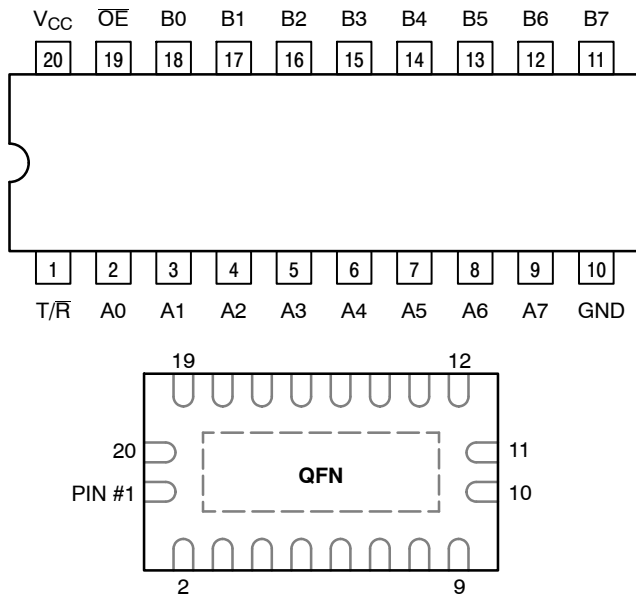


Figure 1. Pinout (Top View)

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

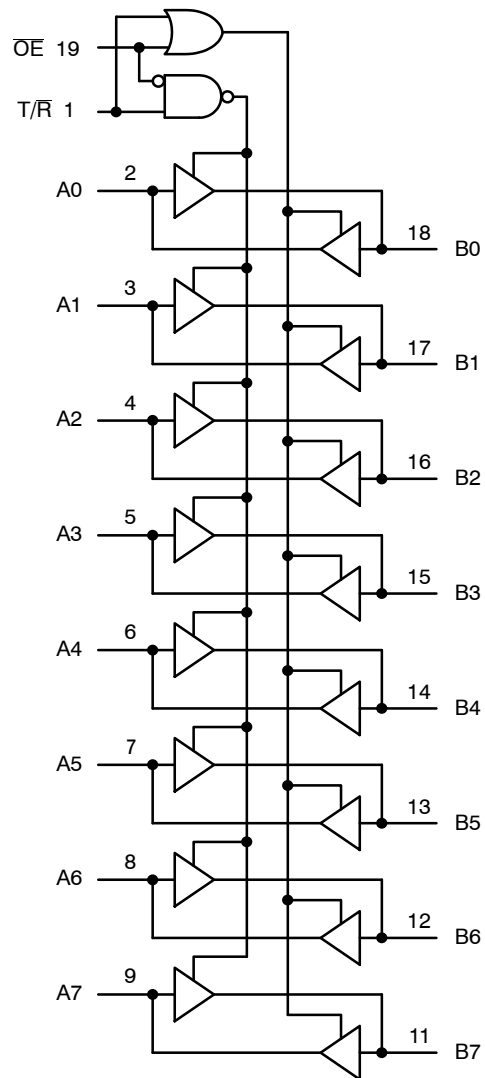


Figure 2. Logic Diagram

MC74LCX245

MAXIMUM RATINGS

| Symbol | Parameter | 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 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.

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 | |

MC74LCX245

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 | |
| 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 | 1.0 1.0 | |

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.

MC74LCX245

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 V _{CC} = 2.5 V, C _L = 30 pF, V _{IH} = 2.5 V, V _{IL} = 0 V | | 0.8 | | 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 V _{CC} = 2.5 V, C _L = 30 pF, V _{IH} = 2.5 V, V _{IL} = 0 V | | -0.8 | | 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 |

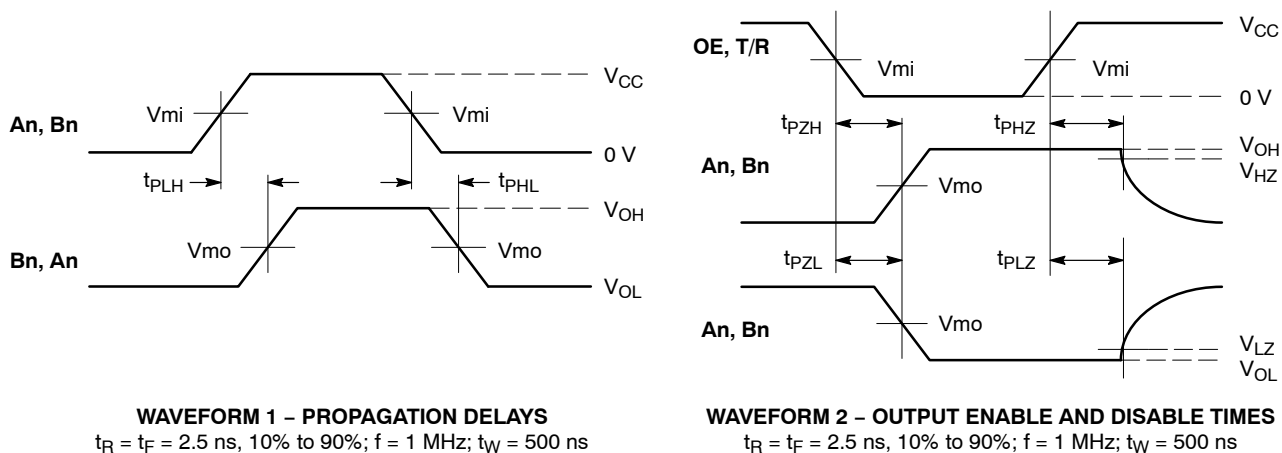
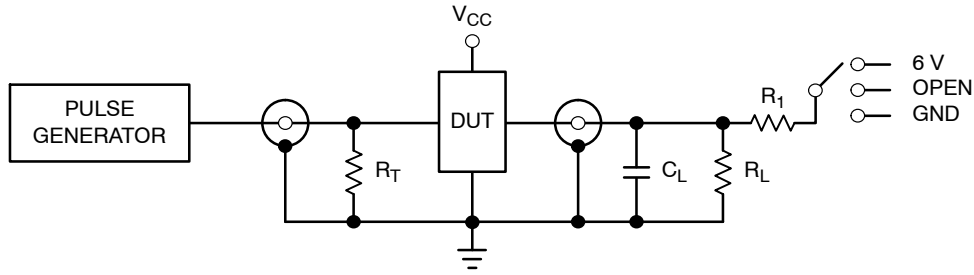


Figure 3. AC Waveforms

| 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 |

MC74LCX245



| 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 |
| MC74LCX245MNTWG | QFN20 (Pb-Free) | 3000 Tape & Reel (4mm pitch carrier tape) |

DISCONTINUED (Note 5)

| | | |
|-------------------|-----------------------|------------------|
| NLV74LCX245DTR2G* | TSSOP-20 (Pb-Free) | 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.

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

5. **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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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



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° |

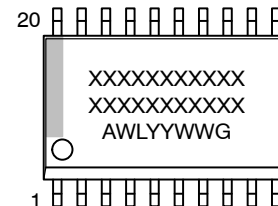
RECOMMENDED
SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

GENERIC
MARKING DIAGRAM*



- XXXXXX = 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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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



TSSOP-20 WB
CASE 948E
ISSUE D

DATE 17 FEB 2016

SCALE 2:1



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



GENERIC MARKING DIAGRAM*



- 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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