

Dual 2-to-4 Decoder/ Demultiplexer

MC74LVX139

The MC74LVX139 is an advanced high speed CMOS 2-to-4 decoder/demultiplexer fabricated with silicon gate CMOS technology.

When the device is enabled ($\overline{E} = \text{low}$), it can be used for gating or as a data input for demultiplexing operations. When the enable input is held high, all four outputs are fixed high, independent of other inputs.

The inputs tolerate voltages up to 5.5 V, allowing the interface of 5.0 V systems to 3.0 V systems.

Features

- High Speed: $t_{PD} = 6.0 \text{ ns}$ (Typ) at $V_{CC} = 3.3 \text{ V}$
- Low Power Dissipation: $I_{CC} = 4 \mu\text{A}$ (Max) at $T_A = 25^\circ\text{C}$
- High Noise Immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2 V to 3.6 V Operating Range
- Low Noise: $V_{OLP} = 0.5 \text{ V}$ (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 100 mA
- Chip Complexity: 100 FETs or 25 Equivalent Gates
- ESD Performance:
Human Body Model > 2000 V
- These Devices are Pb-Free and are RoHS Compliant

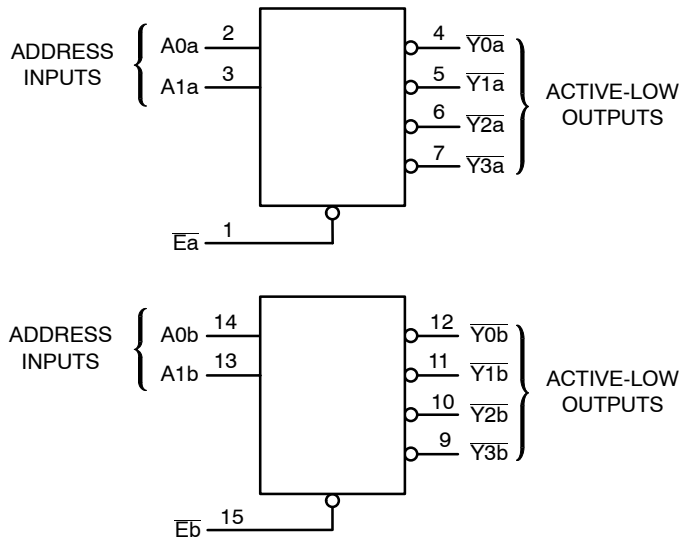
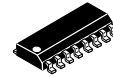


Figure 1. Logic Diagram

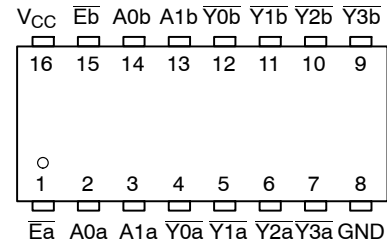


SOIC-16
D SUFFIX
CASE 751B

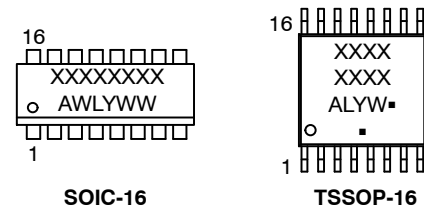


TSSOP-16
DT SUFFIX
CASE 948F

PIN ASSIGNMENT



MARKING DIAGRAM



XXXXXX = Specific Device Code
 A = Assembly Location
 WL, L = Wafer Lot
 Y = Year
 WW, W = Work Week
 G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

| Inputs | | | Outputs | | | |
|--------|----|----|---------|----|----|----|
| E | A1 | A0 | Y0 | Y1 | Y2 | Y3 |
| H | X | X | H | H | H | H |
| L | L | L | L | H | H | H |
| L | L | H | H | L | H | H |
| L | H | L | H | H | L | H |
| L | H | H | H | H | H | L |

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

MC74LVX139

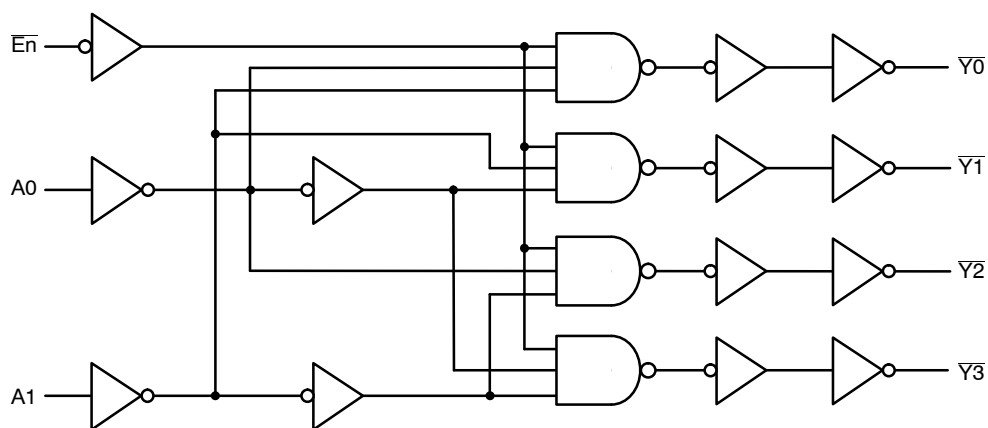


Figure 2. Expanded Logic Diagram
(1/2 of Device)

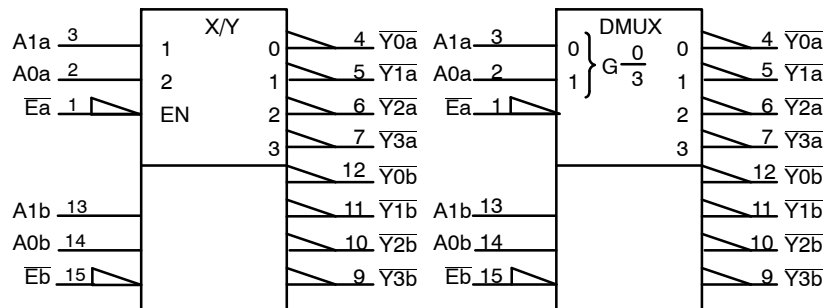


Figure 3. IEC Logic Diagram

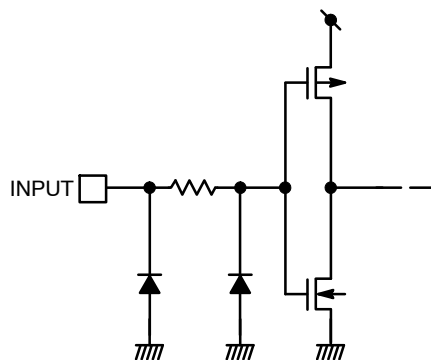


Figure 4. Input Equivalent Circuit

MC74LVX139

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit | |
|------------------|---|--|----------------------|-----|
| V _{CC} | DC Supply Voltage | −0.5 to +6.5 | V | |
| V _{IN} | DC Input Voltage | −0.5 to +6.5 | V | |
| V _{OUT} | DC Output Voltage | −0.5 to V _{CC} +0.5 | V | |
| I _{IN} | DC Input Current, per Pin | ±20 | mA | |
| I _{OUT} | DC Output Current, Per Pin | ±25 | mA | |
| I _{CC} | DC Supply Current, V _{CC} and GND Pins | ±75 | mA | |
| I _{IK} | Input Clamp Current | −20 | mA | |
| I _{OK} | Output Clamp Current | ±20 | 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 1) | SOIC-16 | °C/W | |
| | | TSSOP-16 | | 159 |
| P _D | Power Dissipation in Still Air at 25 °C | SOIC-16 | mW | |
| | | TSSOP-16 | | 787 |
| 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 2) | Human Body Model Charged Device Model | 2000 N/A | V |

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. 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.
2. 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 | Characteristics | Min | Max | Unit |
|---------------------------------|---|-----|-----------------|------|
| V _{CC} | DC Supply Voltage | 2.0 | 3.6 | V |
| V _{IN} | DC Input Voltage | 0 | 5.5 | V |
| V _{OUT} | DC Output Voltage Output in 3-State High or Low State | 0 | V _{CC} | V |
| T _A | Operating Temperature Range, all Package Types | −40 | 85 | °C |
| t _r , t _f | Input Rise or Fall Time V _{CC} = 5.0 V ± 0.5 V | 0 | 100 | 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.

MC74LVX139

DC CHARACTERISTICS (Voltages Referenced to GND)

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25 °C | | | -40 °C ≤ T _A ≤ 85 °C | | Unit |
|-----------------|--|---|------------------------|--|-------------------|--|--|--|------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | Minimum High-Level Input Voltage | | 2.0 3.0 3.6 | 0.75 V _{CC} 0.7 V _{CC} 0.7 V _{CC} | – – – | – – – | 0.75 V _{CC} 0.7 V _{CC} 0.7 V _{CC} | – – – | V |
| V _{IL} | Maximum Low-Level Input Voltage | | 2.0 3.0 3.6 | – – – | – – – | 0.25 V _{CC} 0.3 V _{CC} 0.3 V _{CC} | – – – | 0.25 V _{CC} 0.3 V _{CC} 0.3 V _{CC} | V |
| V _{OH} | High-Level Output Voltage | I _{OH} = –50 μA I _{OH} = –50 μA I _{OH} = –4 mA | 2.0 3.0 3.0 | 1.9 2.9 2.58 | 2.0 3.0 3.0 | – – – | 1.9 2.9 2.48 | – – – | V |
| V _{OL} | Low-Level Output Voltage | I _{OL} = 50 μA I _{OH} = 50 μA I _{OH} = 4 mA | 2.0 3.0 3.0 | – – – | 0.0 | 0.1 0.1 0.36 | – – – | 0.1 0.1 0.44 | V |
| I _{IN} | Input Leakage Current | V _{IN} = 5.5 V or GND | 0 to 3.6 | – | – | ±0.1 | – | ±1.0 | μA |
| I _{CC} | Maximum Quiescent Supply Current (per package) | V _{IN} = V _{CC} or GND | 3.6 | 1.0 | 1.0 | 2.0 | – | – | 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.

AC ELECTRICAL CHARACTERISTICS Input t_r = t_f = 3.0 ns

| Symbol | Parameter | Test Conditions | T _A = 25 °C | | | -40 °C ≤ T _A ≤ 85 °C | | Unit |
|--|-----------------------------------|--|------------------------|-------------|--------------|---------------------------------|--------------|------|
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, A to Y | V _{CC} = 2.7 V C _L = 15 pF C _L = 50 pF | – – | 8.5 11.0 | 15.0 16.5 | 1.0 1.0 | 17.8 18.0 | ns |
| | | V _{CC} = 3.3 V ± 0.3 V C _L = 15 pF C _L = 50 pF | – – | 6.0 8.5 | 10.0 13.0 | 1.0 1.0 | 12.0 15.0 | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, E to Y | V _{CC} = 2.7 V C _L = 15 pF C _L = 50 pF | – – | 8.0 10.0 | 13.0 16.5 | 1.0 1.0 | 15.5 18.0 | ns |
| | | V _{CC} = 3.3 V ± 0.3 V C _L = 15 pF C _L = 50 pF | – – | 5.5 7.5 | 8.2 13.0 | 1.0 1.0 | 10.0 15.0 | |
| C _{IN} | Maximum Input Capacitance | | – | 4 | 10 | – | 10 | pF |

| C _{PD} | Power Dissipation Capacitance (Note 3) | Typical @ 25 °C, V _{CC} = 3.3 V | pF |
|-----------------|--|--|----|
| | | 26 | |

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

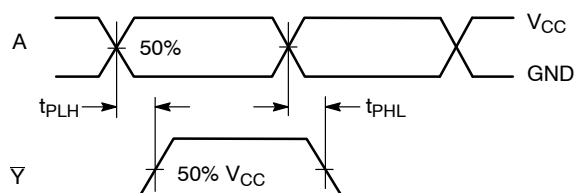


Figure 5. Switching Waveform

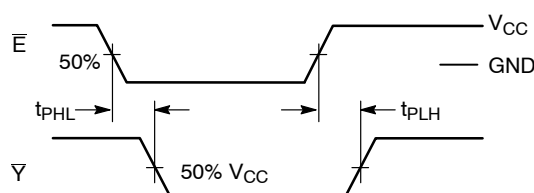
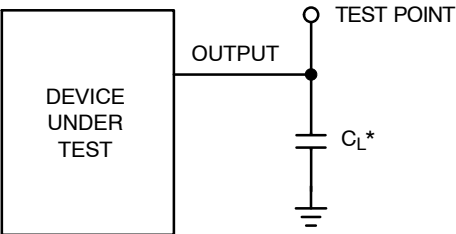


Figure 6. Switching Waveform

MC74LVX139



* Includes all probe and jig capacitance

Figure 7. Test Circuit

ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] |
|-----------------|------------|----------|-----------------------|
| MC74LVX139DTR2G | LVX 139 | TSSOP-16 | 2500 / Tape & Reel |
| MC74LVX239DR2G | LVX139G | SOIC-16 | 2500 / Tape & Reel |

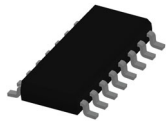
[†] For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

MC74LVX139

REVISION HISTORY

| Revision | Description of Changes | Date |
|----------|---|------------|
| 6 | Modified voltage ratings from 7.0 V to 6.5 V. | 07/09/2025 |

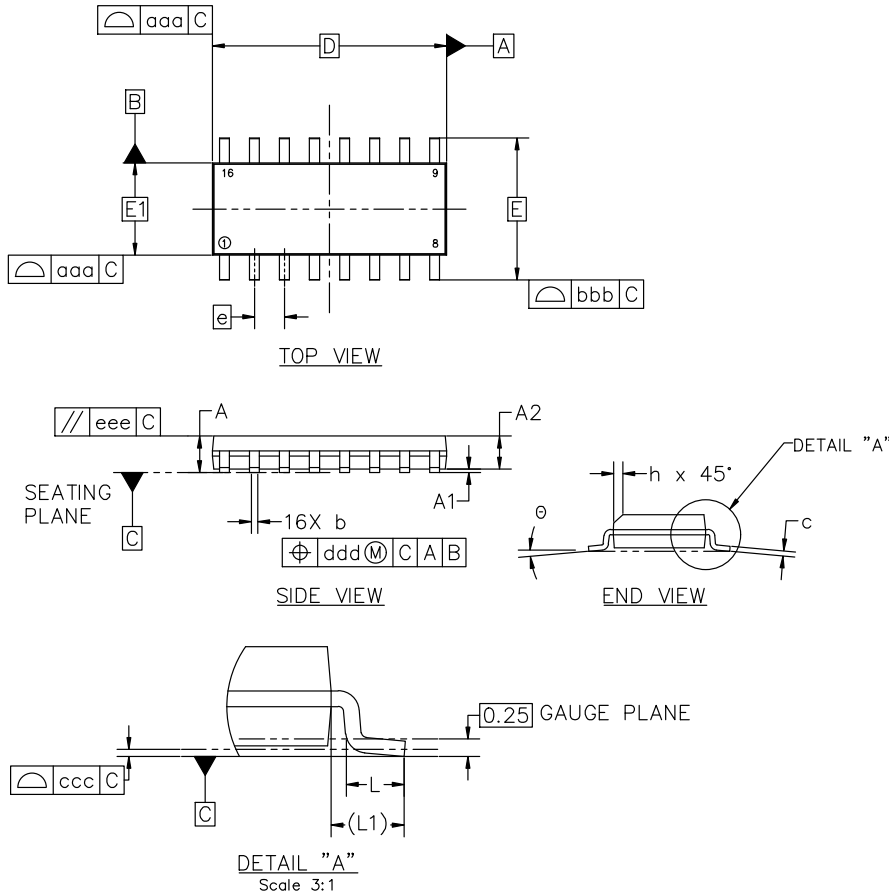
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.


SOIC-16 9.90x3.90x1.37 1.27P
CASE 751B
ISSUE M

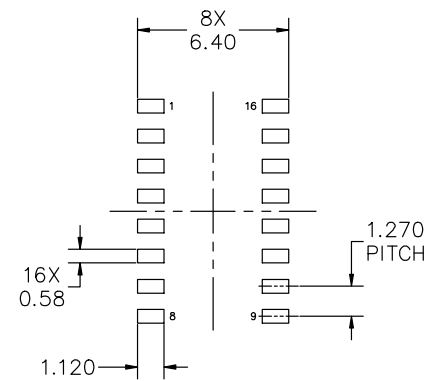
DATE 18 OCT 2024

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.



| MILLIMETERS | | | |
|--------------------------------|----------|------|------|
| DIM | MIN | NOM | MAX |
| A | 1.35 | 1.55 | 1.75 |
| A1 | 0.10 | 0.18 | 0.25 |
| A2 | 1.25 | 1.37 | 1.50 |
| b | 0.35 | 0.42 | 0.49 |
| c | 0.19 | 0.22 | 0.25 |
| D | 9.90 BSC | | |
| E | 6.00 BSC | | |
| E1 | 3.90 BSC | | |
| e | 1.27 BSC | | |
| h | 0.25 | --- | 0.50 |
| L | 0.40 | 0.83 | 1.25 |
| L1 | 1.05 REF | | |
| θ | 0° | --- | 7° |
| TOLERANCE OF FORM AND POSITION | | | |
| aaa | 0.10 | | |
| bbb | 0.20 | | |
| ccc | 0.10 | | |
| ddd | 0.25 | | |
| eee | 0.10 | | |



*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE onsemi SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D

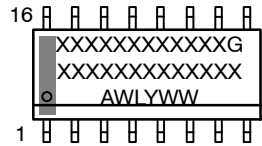
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SOIC-16 9.90x3.90x1.37 1.27P
CASE 751B
ISSUE M

DATE 18 OCT 2024

GENERIC
MARKING DIAGRAM*

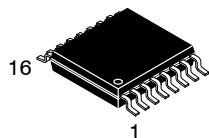


XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

*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.

| | | | |
|---|---|---|---|
| STYLE 1: PIN 1. COLLECTOR 2. BASE 3. EMITTER 4. NO CONNECTION 5. EMITTER 6. BASE 7. COLLECTOR 8. COLLECTOR 9. BASE 10. EMITTER 11. NO CONNECTION 12. EMITTER 13. BASE 14. COLLECTOR 15. EMITTER 16. COLLECTOR | STYLE 2: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION 4. CATHODE 5. CATHODE 6. NO CONNECTION 7. ANODE 8. CATHODE 9. CATHODE 10. ANODE 11. NO CONNECTION 12. CATHODE 13. CATHODE 14. NO CONNECTION 15. ANODE 16. CATHODE | STYLE 3: PIN 1. COLLECTOR, DYE #1 2. BASE, #1 3. EMITTER, #1 4. COLLECTOR, #1 5. COLLECTOR, #2 6. BASE, #2 7. EMITTER, #2 8. COLLECTOR, #2 9. COLLECTOR, #3 10. BASE, #3 11. EMITTER, #3 12. COLLECTOR, #3 13. COLLECTOR, #4 14. BASE, #4 15. EMITTER, #4 16. COLLECTOR, #4 | STYLE 4: PIN 1. COLLECTOR, DYE #1 2. COLLECTOR, #1 3. COLLECTOR, #2 4. COLLECTOR, #2 5. COLLECTOR, #3 6. COLLECTOR, #3 7. COLLECTOR, #4 8. COLLECTOR, #4 9. BASE, #4 10. EMITTER, #4 11. BASE, #3 12. EMITTER, #3 13. BASE, #2 14. EMITTER, #2 15. BASE, #1 16. EMITTER, #1 |
| STYLE 5: PIN 1. DRAIN, DYE #1 2. DRAIN, #1 3. DRAIN, #2 4. DRAIN, #2 5. DRAIN, #3 6. DRAIN, #3 7. DRAIN, #4 8. DRAIN, #4 9. GATE, #4 10. SOURCE, #4 11. GATE, #3 12. SOURCE, #3 13. GATE, #2 14. SOURCE, #2 15. GATE, #1 16. SOURCE, #1 | STYLE 6: PIN 1. CATHODE 2. CATHODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE 7. CATHODE 8. CATHODE 9. ANODE 10. ANODE 11. ANODE 12. ANODE 13. ANODE 14. ANODE 15. ANODE 16. ANODE | STYLE 7: PIN 1. SOURCE N-CH 2. COMMON DRAIN (OUTPUT) 3. COMMON DRAIN (OUTPUT) 4. GATE P-CH 5. COMMON DRAIN (OUTPUT) 6. COMMON DRAIN (OUTPUT) 7. COMMON DRAIN (OUTPUT) 8. SOURCE P-CH 9. SOURCE P-CH 10. COMMON DRAIN (OUTPUT) 11. COMMON DRAIN (OUTPUT) 12. COMMON DRAIN (OUTPUT) 13. GATE N-CH 14. COMMON DRAIN (OUTPUT) 15. COMMON DRAIN (OUTPUT) 16. SOURCE N-CH | |

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TSSOP-16 WB
CASE 948F
ISSUE B

DATE 19 OCT 2006

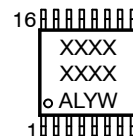

NOTES:

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 | 4.90 | 5.10 | 0.193 | 0.200 |
| 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 | 0.18 | 0.28 | 0.007 | 0.011 |
| 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° |

**RECOMMENDED
SOLDERING FOOTPRINT***


*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***


XXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
G or ■ = 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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