

Hex 3-State Noninverting Buffer with Common Enables

High-Performance Silicon-Gate CMOS

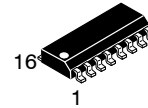
MC74HC365A, MC74HCT365A

The MC74HC365A/MC74HCT365A is identical in pinout to the LS365. The MC74HC365A inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs. The MC74HCT365A inputs are compatible with LSTTL outputs.

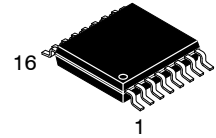
This device is a high-speed hex buffer with 3-state outputs and two common active-low Output Enables. When either of the enables is high, the buffer outputs are placed into high-impedance states. The HC365A, HCT365A has noninverting outputs.

Features

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2.0 to 6.0 V (HC), 4.5 to 5.5 V (HCT)
- Low Input Current: 1.0 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 90 FETs or 22.5 Equivalent Gates
- -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



SOIC-16
D SUFFIX
CASE 751B

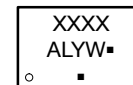
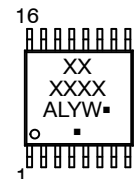
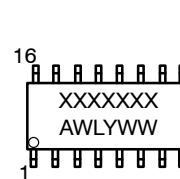


TSSOP-16
DT SUFFIX
CASE 948F



QFN16
MN SUFFIX
CASE 485AW

MARKING DIAGRAMS



- A = Assembly Location
 WL, L = Wafer Lot
 YY, Y = Year
 WW, W = Work Week
 G or ■ = Pb-Free Package
 (Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

MC74HC365A, MC74HCT365A

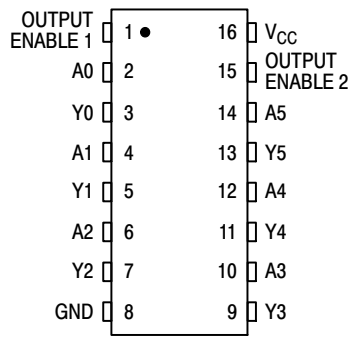


Figure 1. Pin Assignment

FUNCTION TABLE

Inputs			Output
Enable 1	Enable 2	A	Y
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

X = don't care

Z = high impedance

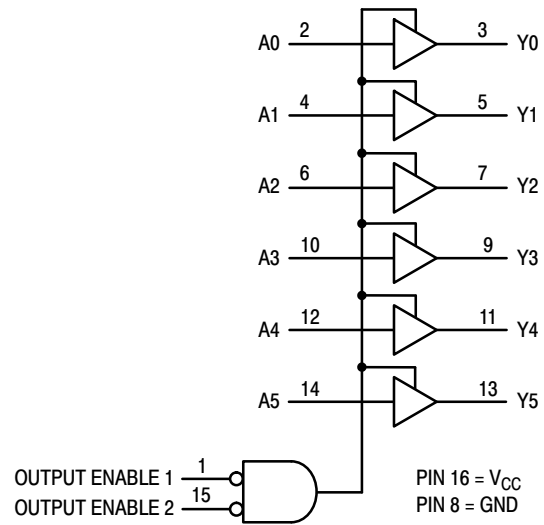


Figure 2. Logic Diagram

MC74HC365A, MC74HCT365A

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 V _{CC} + 0.5	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	±50	mA
I _{IK}	Input Clamp Current (V _{IN} < 0 or V _{IN} > V _{CC})	±20	mA
I _{OK}	Output Clamp Current (V _{OUT} < 0 or V _{OUT} > V _{CC})	±20	mA
T _{STG}	Storage Temperature	−65 to +150	°C
T _L	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T _J	Junction Temperature Under Bias	±150	°C
θ _{JA}	Thermal Resistance (Note 1)	SOIC−16 QFN16 TSSOP−16	126 118 159
P _D	Power Dissipation in Still Air at 25°C	SOIC−16 QFN16 TSSOP−16	995 1062 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

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	Parameter	Min	Max	Unit
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MC74HC

V_{CC}	DC Supply Voltage	2.0	6.0	V
V_{IN}, V_{OUT}	DC Input, Output Voltage (Note 3)	0	V_{CC}	V
T_A	Operating Free-Air Temperature	-55	+125	°C
t_r, t_f	Input Rise or Fall Time	$V_{CC} = 2.0$ V $V_{CC} = 3.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	0 1000 600 500 400	ns

MC74HCT

V_{CC}	DC Supply Voltage	4.5	5.5	V
V_{IN}, V_{OUT}	DC Input, Output Voltage (Note 3)	0	V_{CC}	V
T_A	Operating Free-Air Temperature	-55	+125	°C
t_r, t_f	Input Rise or Fall Time	0	500	ns

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.

3. 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.

MC74HC365A, MC74HCT365A

DC ELECTRICAL CHARACTERISTICS (MC74HC365A)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				–55 to 25°C	≤ 85°C	≤ 125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{out} = V _{CC} – 0.1 V I _{out} ≤ 20 μA	2.0 3.0 4.5 6.0	1.5 2.1 3.15 4.2	1.5 2.1 3.15 4.2	1.5 2.1 3.15 4.2	V
V _{IL}	Maximum Low-Level Input Voltage	V _{out} = 0.1 V I _{out} ≤ 20 μA	2.0 3.0 4.5 6.0	0.50 0.90 1.35 1.80	0.50 0.90 1.35 1.80	0.50 0.90 1.35 1.80	V
V _{OH}	Minimum High-Level Output Voltage	V _{in} = V _{IH} I _{out} ≤ 20 μA	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
		V _{in} = V _{IH} I _{out} ≤ 3.6 mA I _{out} ≤ 6.0 mA I _{out} ≤ 7.8 mA	3.0 4.5 6.0	2.48 3.98 5.48	2.34 3.84 5.34	2.20 3.70 5.20	
V _{OL}	Maximum Low-Level Output Voltage	V _{in} = V _{IL} I _{out} ≤ 20 μA	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
		V _{in} = V _{IL} I _{out} ≤ 3.6 mA I _{out} ≤ 6.0 mA I _{out} ≤ 7.8 mA	3.0 4.5 6.0	0.26 0.26 0.26	0.33 0.33 0.33	0.40 0.40 0.40	
I _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	6.0	±0.1	±1.0	±1.0	μA
I _{OZ}	Maximum Three-State Leakage Current	Output in High-Impedance State V _{in} = V _{IL} or V _{IH} V _{out} = V _{CC} or GND	6.0	±0.5	±5.0	±10	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{in} = V _{CC} or GND I _{out} = 0 μA	6.0	4	40	160	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.

MC74HC365A, MC74HCT365A

AC ELECTRICAL CHARACTERISTICS (MC74HC365A)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			–55 to 25°C	≤ 85°C	≤ 125°C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A to Output Y (Figures 3 and 4)	2.0 3.0 4.5 6.0	120 60 24 20	150 75 30 26	180 90 36 31	ns
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Output Enable to Output Y (Figures 3 and 4)	2.0 3.0 4.5 6.0	220 110 44 37	275 140 55 47	330 170 66 56	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to Output Y (Figures 3 and 4)	2.0 3.0 4.5 6.0	220 110 44 37	275 140 55 47	330 170 66 56	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 3 and 4)	2.0 3.0 4.5 6.0	60 22 12 10	75 28 15 13	90 34 18 15	ns
C _{in}	Maximum Input Capacitance	–	10	10	10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High-Impedance State)	–	15	15	15	pF

C _{PD}	Power Dissipation Capacitance (Per Buffer)*	Typical @ 25°C, V _{CC} = 5.0 V	pF
		60	

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.

*Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.

MC74HC365A, MC74HCT365A

DC ELECTRICAL CHARACTERISTICS (MC74HCT365A)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				–55 to 25°C	≤ 85°C	≤ 125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{out} = V _{CC} – 0.1 V I _{out} ≤ 20 μA	4.5 to 5.5	2.0	2.0	2.0	V
V _{IL}	Maximum Low-Level Input Voltage	V _{out} = 0.1 V I _{out} ≤ 20 μA	4.5 to 5.5	0.8	0.8	0.8	V
V _{OH}	Minimum High-Level Output Voltage	V _{in} = V _{IH} I _{out} ≤ 20 μA	4.5	4.4	4.4	4.4	V
		V _{in} = V _{IH} I _{out} ≤ 6.0 mA	4.5	3.98	3.84	3.70	
V _{OL}	Maximum Low-Level Output Voltage	V _{in} = V _{IL} I _{out} ≤ 20 μA	4.5	0.1	0.1	0.1	V
		V _{in} = V _{IL} I _{out} ≤ 6.0 mA	4.5	0.26	0.33	0.40	
I _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	4.5	±0.1	±1.0	±1.0	μA
I _{OZ}	Maximum Three-State Leakage Current	Output in High-Impedance State V _{in} = V _{IL} or V _{IH} V _{out} = V _{CC} or GND	4.5	±0.5	±5.0	±10	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{in} = V _{CC} or GND I _{out} = 0 μA	4.5	4	40	160	μA

ΔI _{CC}	Additional Quiescent Supply Current	V _{in} = 2.4 V, Any One Input V _{in} = V _{CC} or GND, Other Inputs I _{out} = 0 μA	5.5	≥ –55°C	25 to 125°C	mA
				2.9	2.4	

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 (MC74HCT365A)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			–55 to 25°C	≤ 85°C	≤ 125°C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A to Output Y (Figures 3 and 4)	4.5	24	30	36	ns
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Output Enable to Output Y (Figures 3 and 4)	4.5	44	55	66	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to Output Y (Figures 3 and 4)	4.5	44	55	66	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 3 and 4)	4.5	12	15	18	ns
C _{in}	Maximum Input Capacitance	–	10	10	10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High-Impedance State)	–	15	15	15	pF

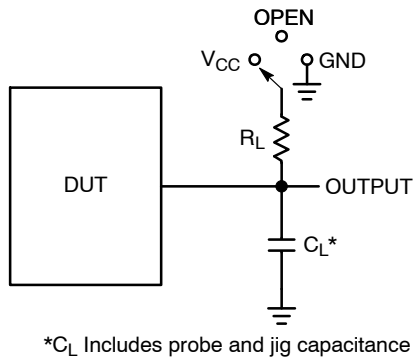
C _{PD}	Power Dissipation Capacitance (Per Buffer)*	Typical @ 25°C, V _{CC} = 5.0 V			pF
		60			

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.

*Used to determine the no-load dynamic power consumption: P_D = C_{PD} V_{CC}²f + I_{CC} V_{CC}.

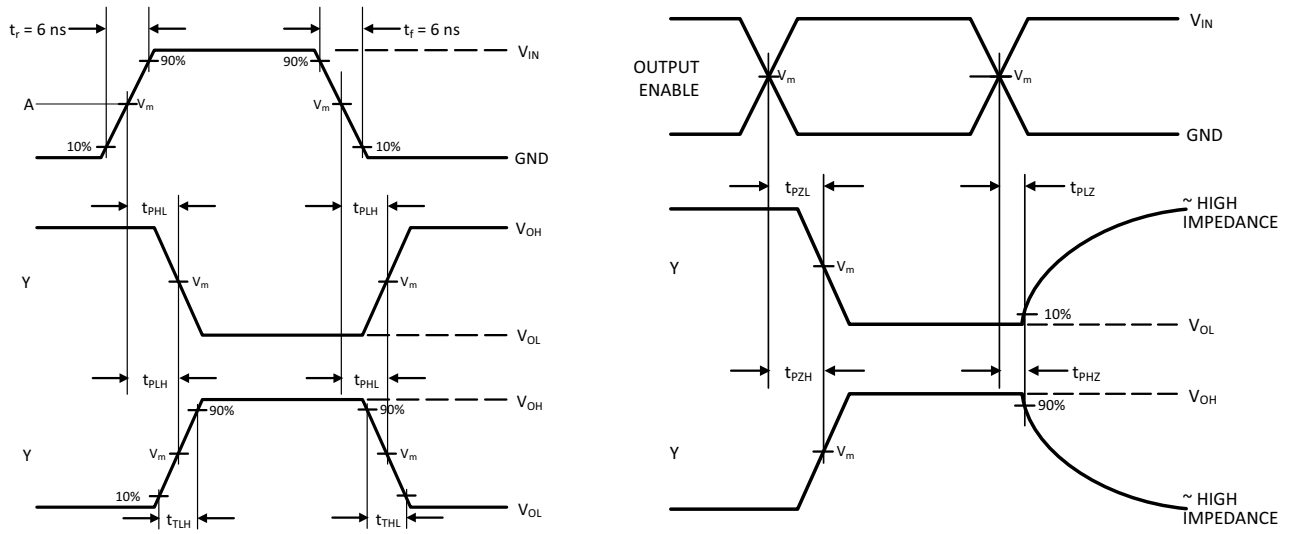
SWITCHING WAVEFORMS

MC74HC365A, MC74HCT365A



Test	Switch Position	C _L	R _L
t _{PLH} / t _{PHL}	Open	50 pF	1 kΩ
t _{PLZ} / t _{PZL}	V _{CC}		
t _{PHZ} / t _{PZH}	GND		

Figure 3. Test Circuit



Device	V _{IN} , V	V _m , V
MC74HC365A	V _{CC}	50% x V _{CC}
MC74HCT365A	3 V	1.3 V

Figure 4. Switching Waveforms

MC74HC365A, MC74HCT365A

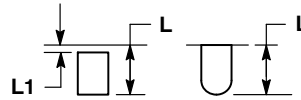
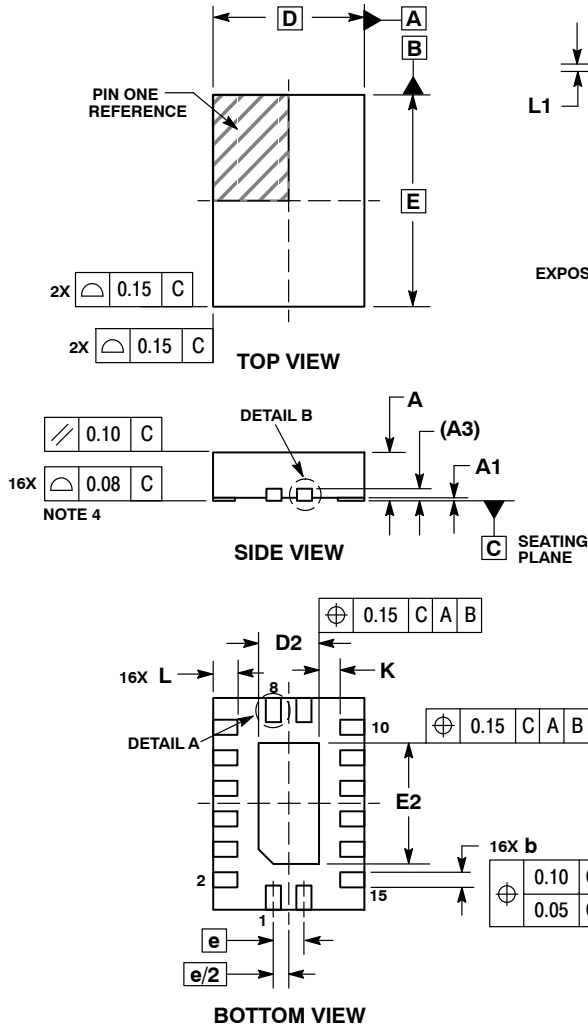
PACKAGE DIMENSIONS



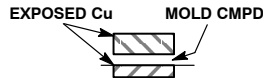
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QFN16, 2.5x3.5, 0.5P
CASE 485AW
ISSUE O

DATE 11 DEC 2008



DETAIL A
ALTERNATE TERMINAL
CONSTRUCTIONS



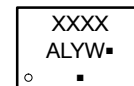
DETAIL B
ALTERNATE
CONSTRUCTIONS

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 0.15 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	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	3.50	BSC
E2	1.85	2.15
e	0.50	BSC
K	0.20	---
L	0.35	0.45
L1	---	0.15

GENERIC MARKING DIAGRAM*

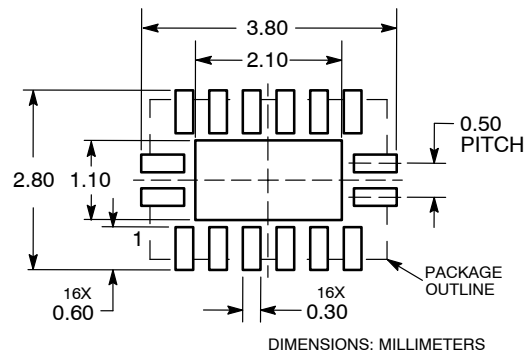


- XXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb-Free Package

(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. Some products may not follow the Generic Marking.

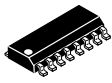
RECOMMENDED SOLDERING FOOTPRINT*



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

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



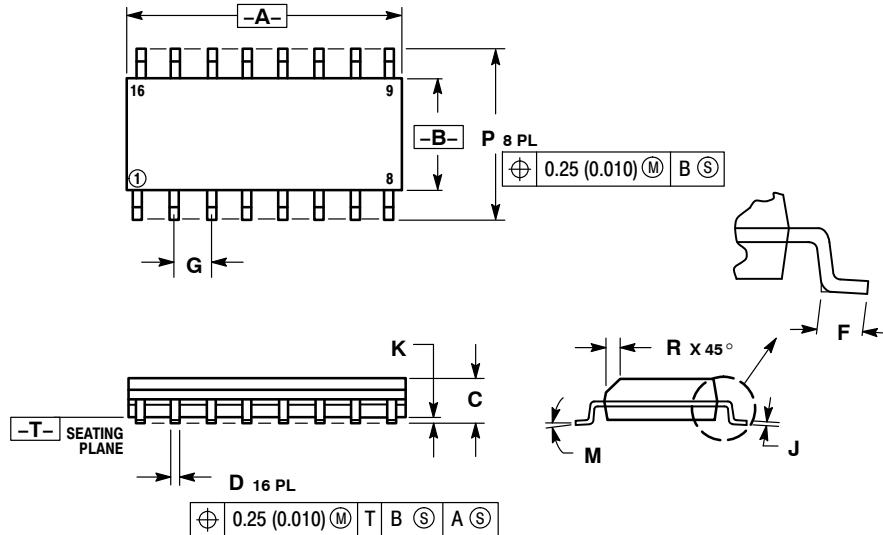
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SOIC-16

CASE 751B-05

ISSUE K

DATE 29 DEC 2006



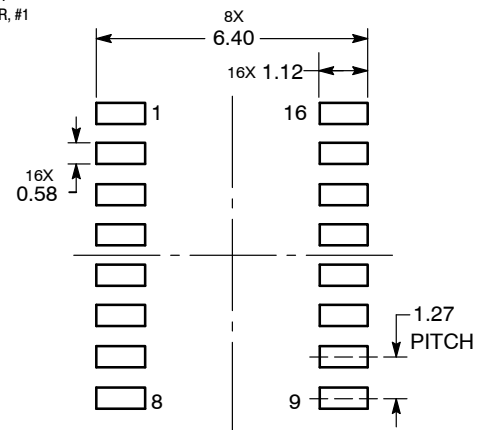
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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

RECOMMENDED SOLDERING FOOTPRINT*



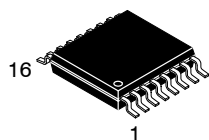
DIMENSIONS: MILLIMETERS

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

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DESCRIPTION:	SOIC-16	PAGE 1 OF 1

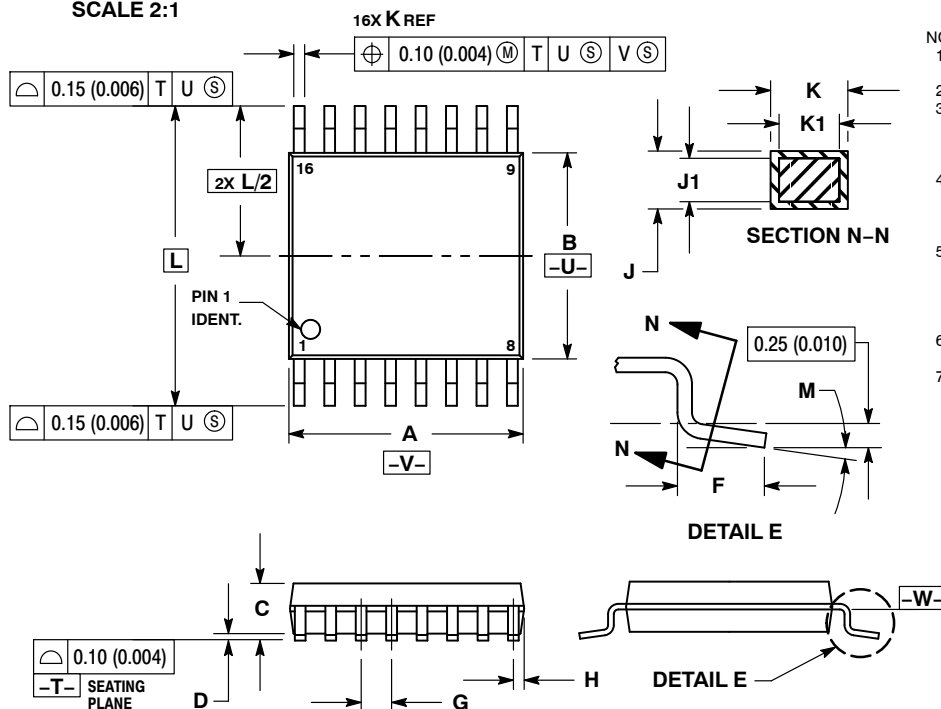
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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



TSSOP-16 WB
CASE 948F
ISSUE B

DATE 19 OCT 2006

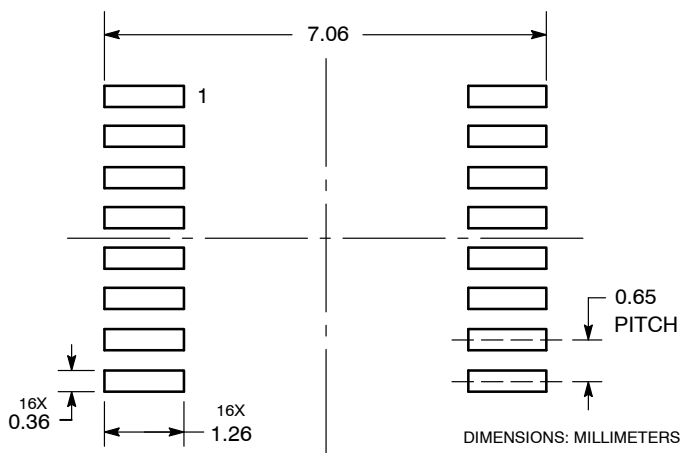


NOTES:

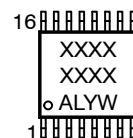
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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*



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.

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

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