8-Input Data Selector/ Multiplexer with 3-State Outputs

High−Performance Silicon−Gate CMOS

MC74HC251A

The MC54/74HC251 is identical in pinout to the LS251. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

This device selects one of the eight binary Data Inputs, as determined by the Address Inputs. The Output Enable pin must be a low level for the selected data to appear at the outputs. If Output Enable is high, both the Y and the $\overline{Y}$ outputs are in the high−impedance state. This 3−state feature allows the HC251 to be used in bus−oriented systems.

The HC251 is similar in function to the HC251 which does not have 3−state outputs.

Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μA
- High Noise Immunity Characteristic of CMOS Devices
- 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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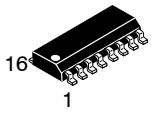
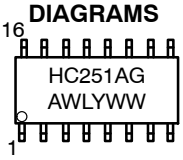
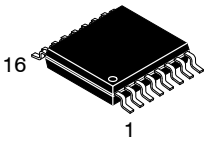
MARKING DIAGRAMS

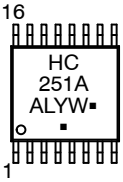


SOIC−16
D SUFFIX
CASE 751B





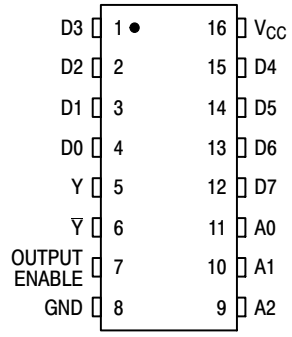
TSSOP−16
DT SUFFIX
CASE 948F



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)

PIN ASSIGNMENT



ORDERING INFORMATION

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

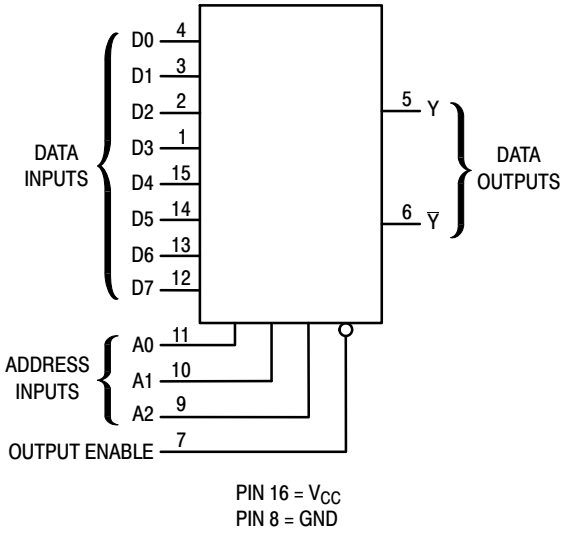


Figure 1. Logic Diagram

FUNCTION TABLE

Inputs				Outputs	
A2	A1	A0	Output Enabled	Y	$\overline{Y}$
X	X	X	H	Z	$\overline{Z}$
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

Z = high impedance
D0, D1, …, D7 = the level of the respective D input.

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	−0.5 to + 7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	−1.5 to V_{CC} + 1.5	V
V_{out}	DC Output Voltage (Referenced to GND)	−0.5 to V_{CC} + 0.5	V
I_{in}	DC Input Current, per Pin	±25	mA
I_{out}	DC Output Current, per Pin	±50	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	±75	mA
P_D	Power Dissipation in Still Air SOIC Package TSSOP Package	500 TBD	mW
T_{stg}	Storage Temperature	−65 to + 150	°C

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.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high−impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND ≤ (V_{in} or V_{out}) ≤ V_{CC}.

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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)		2.0	6.0	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Referenced to GND)		0	V_{CC}	V
T_A	Operating Temperature, All Package Types		−55	+125	°C
t_r, t_f	Input Rise and Fall Time (Figure 2)	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	0 0 0	1000 500 400	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.

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

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} = 0.1 V or V_{CC} − 0.1 V $\|I_{out}\| \leq 20$ μA	2.0 4.5 6.0	1.5 3.15 4.2	1.5 3.15 4.2	1.5 3.15 4.2	V
V_{IL}	Maximum Low−Level Input Voltage	V_{out} = 0.1 V or V_{CC} − 0.1 V $\|I_{out}\| \leq 20$ μA	2.0 4.5 6.0	0.3 0.9 1.2	0.3 0.9 1.2	0.3 0.9 1.2	V
V_{OH}	Minimum High−Level Output Voltage	V_{in} = V_{IH} or V_{IL} $\|I_{out}\| \leq 20$ 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} or V_{IL} $\|I_{out}\| \leq 4.0$ mA $\|I_{out}\| \leq 5.2$ mA	4.5 6.0	3.98 5.48	3.84 5.34	3.70 5.20	
V_{OL}	Maximum Low−Level Output Voltage	V_{in} = V_{IH} or V_{IL} $\|I_{out}\| \leq 20$ 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_{IH} or V_{IL} $\|I_{out}\| \leq 4.0$ mA $\|I_{out}\| \leq 5.2$ mA	4.5 6.0	0.26 0.26	0.33 0.33	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	8	80	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.

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input $t_r = t_f$ = 6 ns)

Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			− 55 to 25°C	≤ 85°C	≤ 125°C	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Input D to Output Y or $\overline{Y}$ (Figures 2, 3 and 6)	2.0 4.5 6.0	185 37 31	230 46 39	280 56 48	ns
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Input A to Output Y or $\overline{Y}$ (Figures 3 and 6)	2.0 4.5 6.0	205 41 35	255 51 43	310 62 53	ns
t_{PLZ}, t_{PHZ}	Maximum Propagation Delay, Output Enable to Output Y (Figures 5 and 7)	2.0 4.5 6.0	195 39 33	245 49 42	295 59 50	ns
t_{PZL}, t_{PZH}	Maximum Propagation Delay, Output Enable to Output Y (Figures 5 and 7)	2.0 4.5 6.0	145 29 25	180 36 31	220 44 38	ns
t_{PLZ}, t_{PHZ}	Maximum Propagation Delay, Output Enable to Output $\overline{Y}$ (Figures 5 and 7)	2.0 4.5 6.0	220 44 37	275 55 47	330 66 56	ns
t_{PZL}, t_{PZH}	Maximum Propagation Delay, Output Enable to Output $\overline{Y}$ (Figures 5 and 7)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t_{TLH}, t_{THL}	Maximum Output Transition Time, Any Output (Figures 2 and 6)	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	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

		Typical @ 25°C, V_{CC} = 5.0 V	
C_{PD}	Power Dissipation Capacitance (Per Package)	36	pF

PIN DESCRIPTIONS

INPUTS

D0, D1, …, D7 (Pins 4, 3, 2, 1, 15, 14, 13, 12)

Data inputs. Data on one of these eight binary inputs may be selected to appear on the output.

CONTROL INPUTS

A0, A1, A2 (Pins 11, 10, 9)

Address inputs. The data on these pins are the binary address of the selected input (see the Function Table).

Output Enable (Pin 7)

Output Enable. This input pin must be at a low level for the selected data to appear at the outputs. If the Output Enable pin is high, both the Y and $\overline{Y}$ outputs are taken to the high−impedance state.

OUTPUTS

Y, $\overline{Y}$ (Pins 5, 6)

Data outputs. The selected data is presented at these pins in both true (Y output) and complemented ($\overline{Y}$ output) forms.

SWITCHING WAVEFORMS

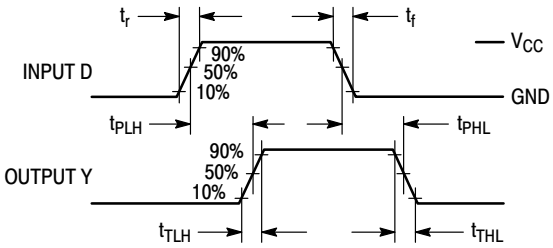


Figure 2.

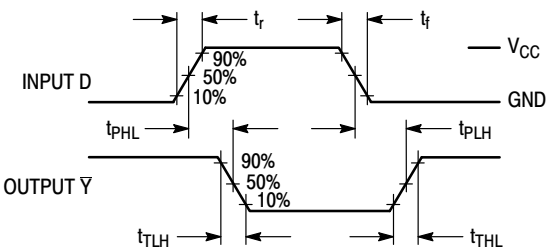


Figure 3.

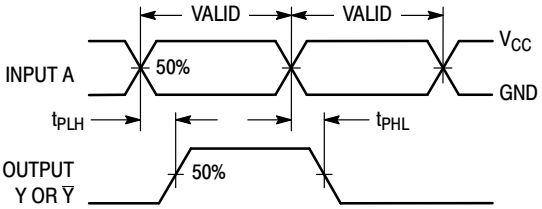


Figure 4.

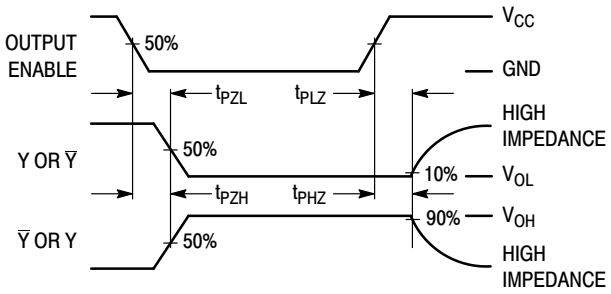
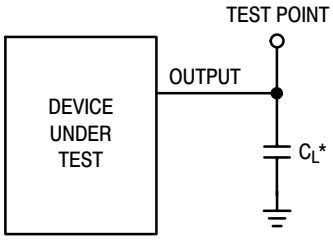


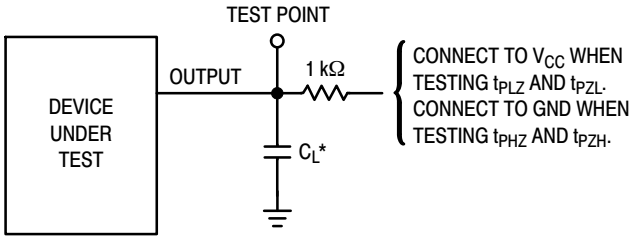
Figure 5.

TEST CIRCUITS



*Includes all probe and jig capacitance

Figure 6.



*Includes all probe and jig capacitance

Figure 7.

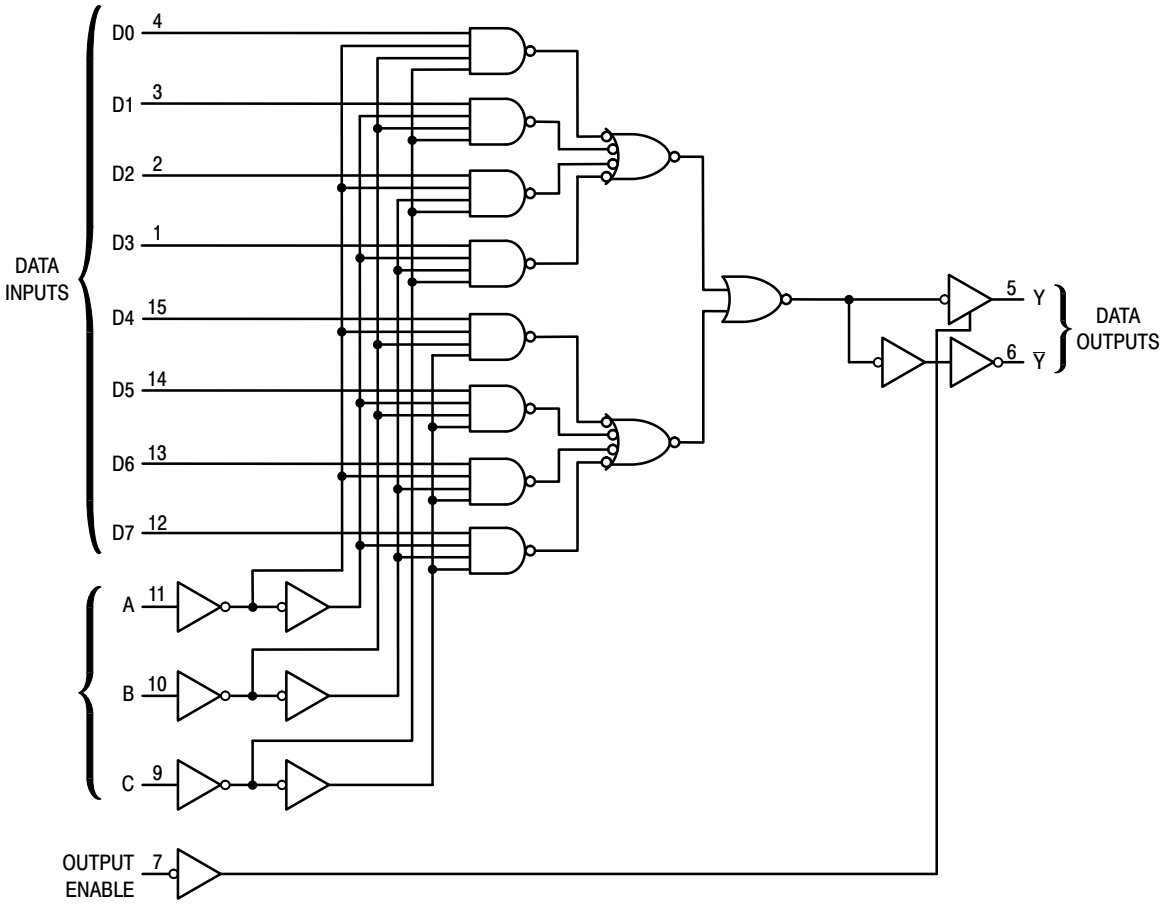


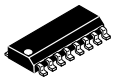
Figure 8. Expanded Logic Diagram

ORDERING INFORMATION

Device	Package	Shipping†
MC74HC251ADG	SOIC−16 (Pb−Free)	48 Units / Rail
MC74HC251ADR2G		2500 Tape & Reel
NLV74HC251ADR2G*		2500 Tape & Reel
MC74HC251ADTG	TSSOP−16 (Pb−Free)	96 Units / Rail
MC74HC251ADTR2G		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.

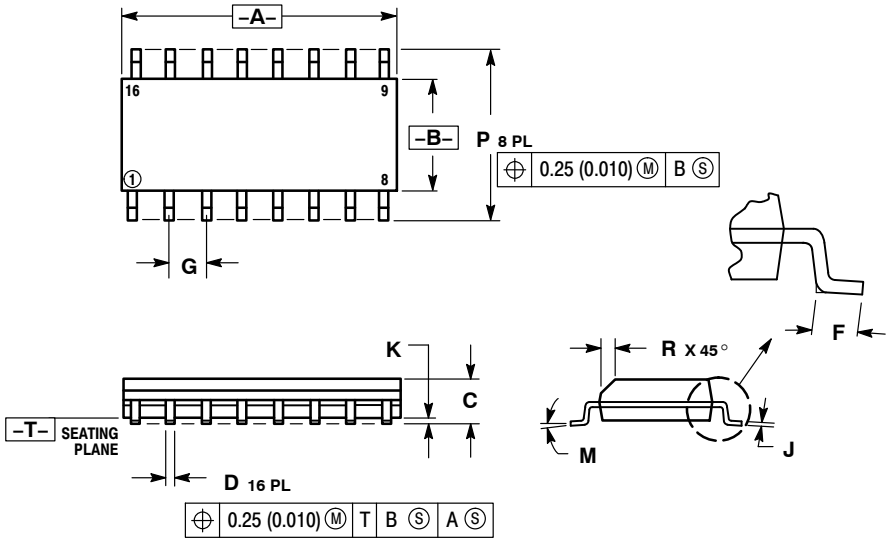
*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.



SCALE 1:1

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.

	MILLIMETERS		INCHES	
DIM	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:
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

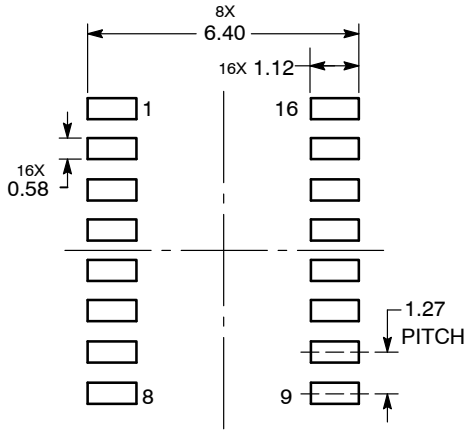
STYLE 4:
PIN 1. COLLECTOR, DYE #1
2. COLLECTOR, #1
3. COLLECTOR, #2
4. COLLECTOR, #2
5. COLLECTOR, #3
6. COLLECTOR, #3
7. COLLECTOR, #4
8. COLLECTOR, #4
9. BASE, #4
10. EMITTER, #4
11. BASE, #3
12. EMITTER, #3
13. BASE, #2
14. EMITTER, #2
15. BASE, #1
16. EMITTER, #1

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

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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DESCRIPTION:	SOIC–16	PAGE 1 OF 1

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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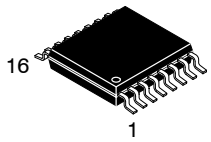
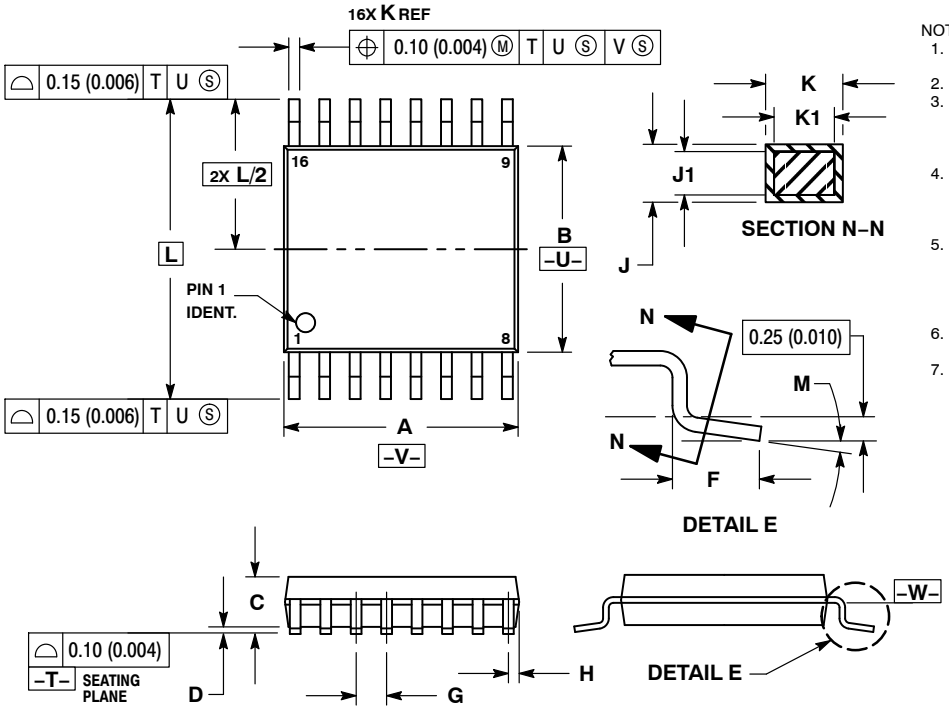


SCALE 2:1

TSSOP−16
CASE 948F−01
ISSUE B

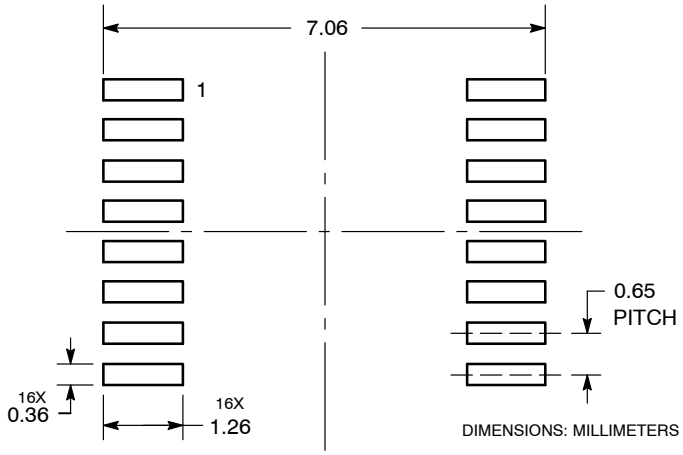
DATE 19 OCT 2006



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−.

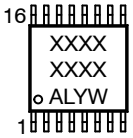
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	−−−	1.20	−−−	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0 °	8 °	0 °	8 °

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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.

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