MC74HC4851A, MC74HC4852A

Analog Multiplexers/ Demultiplexers with Injection Current Effect Control

Automotive Customized

These devices are pin compatible to standard HC405x and MC1405xB analog mux/demux devices, but feature injection current effect control. This makes them especially suited for usage in automotive applications where voltages in excess of normal logic voltage are common.

The injection current effect control allows signals at disabled analog input channels to exceed the supply voltage range without affecting the signal of the enabled analog channel. This eliminates the need for external diode/ resistor networks typically used to keep the analog channel signals within the supply voltage range.

The devices utilize low power silicon gate CMOS technology. The Channel Select and Enable inputs are compatible with standard CMOS outputs.

Features

- Injection Current Cross−Coupling Less than 1mV/mA (See Figure 9)
- Pin Compatible to HC405X and MC1405XB Devices
- Power Supply Range (V_{CC} − GND) = 2.0 to 6.0 V
- In Compliance With the Requirements of JEDEC Standard No. 7A
- Chip Complexity: 154 FETs or 36 Equivalent Gates
- Pb−Free Packages are Available*

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

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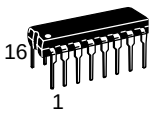
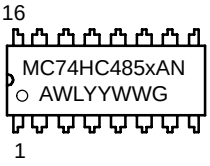
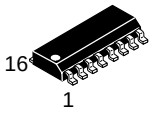
MARKING DIAGRAMS

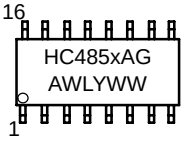


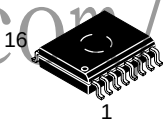
PDIP−16
N SUFFIX
CASE 648



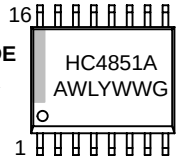


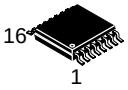
SOIC−16
D SUFFIX
CASE 751B



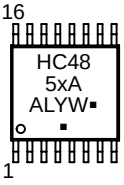


SOIC−16 WIDE
DW SUFFIX
CASE 751G





TSSOP−16
DT SUFFIX
CASE 948F



x = 1 or 2
A = Assembly Location
L, WL = Wafer Lot
Y, YY = Year
W, WW = Work Week
G = Pb−Free Package
▪ = 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 11 of this data sheet.

Publication Order Number:
MC74HC4851A/D

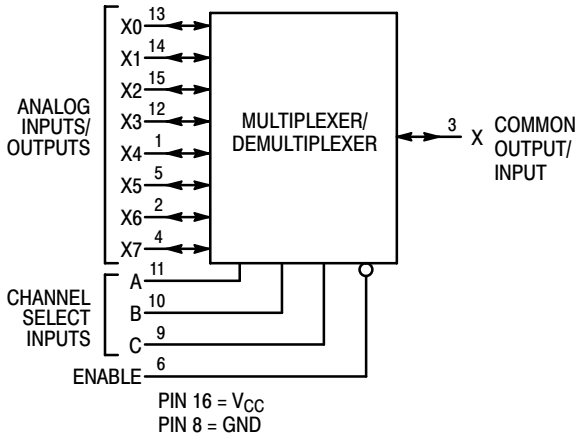


Figure 1. MC74HC4851A Logic Diagram
Single−Pole, 8−Position Plus Common Off

FUNCTION TABLE − MC74HC4851A

Control Inputs				
	Select			
Enable	C	B	A	ON Channels
L	L	L	L	X0
L	L	L	H	X1
L	L	H	L	X2
L	L	H	H	X3
L	H	L	L	X4
L	H	L	H	X5
L	H	H	L	X6
L	H	H	H	X7
H	X	X	X	NONE

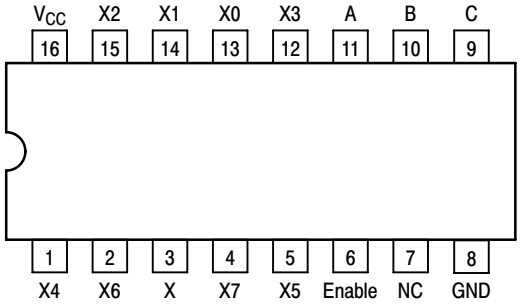


Figure 2. MC74HC4851A 16−Lead Pinout (Top View)

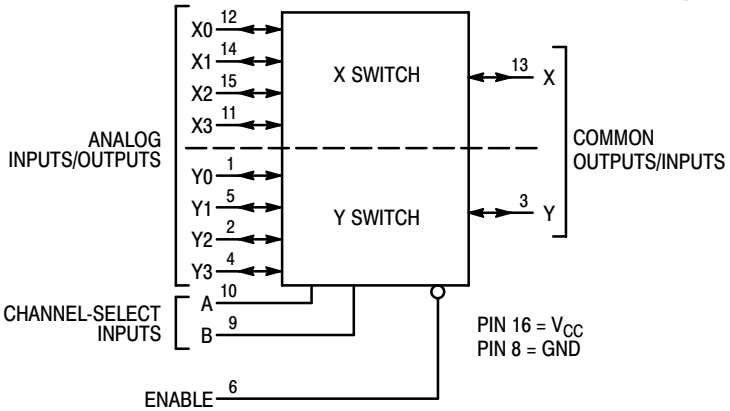


Figure 3. MC74HC4852A Logic Diagram
Double−Pole, 4−Position Plus Common Off

FUNCTION TABLE − MC74HC4852A

Control Inputs				
	Select			
Enable	B	A	ON Channels	
L	L	L	Y0	X0
L	L	H	Y1	X1
L	H	L	Y2	X2
L	H	H	Y3	X3
H	X	X	NONE	

X = Don't Care

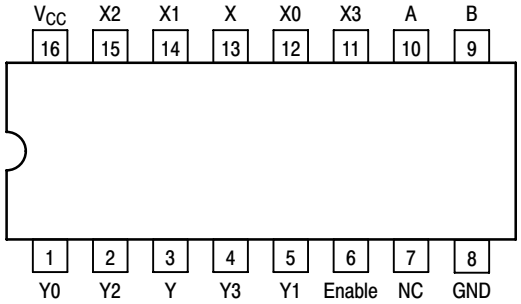


Figure 4. MC74HC4852A 16−Lead Pinout (Top View)

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	Positive DC Supply Voltage	(Referenced to GND)	–0.5 to + 7.0	V
V_{in}	DC Input Voltage (Any Pin)	(Referenced to GND)	–0.5 to V_{CC} + 0.5	V
I	DC Current, Into or Out of Any Pin		± 25	mA
P_D	Power Dissipation in Still Air,	Plastic DIP† SOIC Package† TSSOP Package†	750 500 450	mW
T_{stg}	Storage Temperature Range		–65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds Plastic DIP, SOIC or TSSOP Package		260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

†Derating — Plastic DIP: – 10 mW/°C from 65° to 125°C
SOIC Package: – 7 mW/°C from 65° to 125°C
TSSOP Package: − 6.1 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the ON Semiconductor High−Speed CMOS Data Book (DL129/D).

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}	Positive DC Supply Voltage	(Referenced to GND)	2.0	6.0	V
V_{in}	DC Input Voltage (Any Pin)	(Referenced to GND)	GND	V_{CC}	V
V_{IO}*	Static or Dynamic Voltage Across Switch		0.0	1.2	V
T_A	Operating Temperature Range, All Package Types		– 55	+ 125	°C
t_r, t_f	Input Rise/Fall Time (Channel Select or Enable Inputs)	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	0 0 0	1000 500 400	ns

*For voltage drops across switch greater than 1.2 V (switch on), excessive V_{CC} current may be drawn; i.e., the current out of the switch may contain both V_{CC} and switch input components. The reliability of the device will be unaffected unless the Maximum Ratings are exceeded.

DC CHARACTERISTICS — Digital Section (Voltages Referenced to GND) V_{EE} = GND, Except Where Noted

Symbol	Parameter	Condition	V_{CC} V	Guaranteed Limit			Unit
				−55 to 25°C	≤85°C	≤125°C	
V_{IH}	Minimum High−Level Input Voltage, Channel−Select or Enable Inputs	R_{on} = Per Spec	2.0 3.0 4.5 6.0	1.50 2.10 3.15 4.20	1.50 2.10 3.15 4.20	1.50 2.10 3.15 4.20	V
V_{IL}	Maximum Low−Level Input Voltage, Channel−Select or Enable Inputs	R_{on} = Per Spec	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
I_{in}	Maximum Input Leakage Current on Digital Pins (Enable/A/B/C)	V_{in} = V_{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I_{CC}	Maximum Quiescent Supply Current (per Package)	$V_{in(digital)}$ = V_{CC} or GND $V_{in(analog)}$ = GND	6.0	2	20	40	μA

NOTE: Information on typical parametric values can be found in Chapter 2 of the ON Semiconductor High−Speed CMOS Data Book (DL129/D).

DC CHARACTERISTICS — Analog Section

Symbol	Parameter	Condition	V_{CC}	Guaranteed Limit			Unit
				−55 to 25°C	≤85°C	≤125°C	
R_{on}	Maximum “ON” Resistance	V_{in} = V_{IL} or V_{IH};V_{IS} = V_{CC} to GND; I_S ≤ 2.0 mA	2.0 3.0 4.5 6.0	1700 1100 550 400	1750 1200 650 500	1800 1300 750 600	Ω
ΔR_{on}	Delta “ON” Resistance	V_{in} = V_{IL} or V_{IH}; V_{IS} = V_{CC}/2 I_S ≤ 2.0 mA	2.0 3.0 4.5 6.0	300 160 80 60	400 200 100 80	500 240 120 100	Ω
I_{off}	Maximum Off−Channel Leakage Current, Any One Channel Common Channel	V_{in} = V_{CC} or GND	6.0	±0.1 ±0.1	±0.1 ±0.1	±0.1 ±0.1	μA
I_{on}	Maximum On−Channel Leakage Channel−to−Channel	V_{in} = V_{CC} or GND	6.0	±0.1	±0.1	±0.1	μA

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

Symbol	Parameter	V_{CC}	−55 to 25°C	≤85°C	≤125°C	Unit
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Analog Input to Analog Output	2.0 3.0 4.5 6.0	160 80 40 30	180 90 45 35	200 100 50 40	ns
t_{PHL}, $t_{PHZ,PZH}$ t_{PLH}, $t_{PLZ,PZL}$	Maximum Propagation Delay, Enable or Channel−Select to Analog Output	2.0 3.0 4.5 6.0	260 160 80 60	280 180 90 70	300 200 100 80	ns
C_{in}	Maximum Input Capacitance Digital Pins (All Switches Off) Any Single Analog Pin (All Switches Off) Common Analog Pin		10 35 130	10 35 130	10 35 130	pF
C_{PD}	Power Dissipation Capacitance Typical	5.0	20			pF

INJECTION CURRENT COUPLING SPECIFICATIONS (V_{CC} = 5V, T_A = −55°C to +125°C)

Symbol	Parameter	Condition	Typ	Max	Unit
$V\Delta_{out}$	Maximum Shift of Output Voltage of Enabled Analog Channel	I_{in}* ≤ 1 mA, R_S ≤ 3,9 kΩ I_{in}* ≤ 10 mA, R_S ≤ 3,9 kΩ I_{in}* ≤ 1 mA, R_S ≤ 20 kΩ I_{in}* ≤ 10 mA, R_S ≤ 20 kΩ	0.1 1.0 0.5 5.0	1.0 5.0 2.0 20	mV

* I_{in} = Total current injected into all disabled channels.

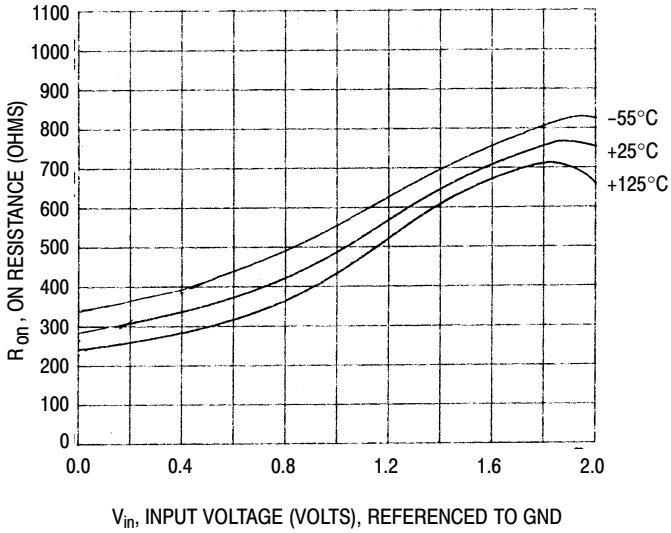


Figure 5. Typical On Resistance V_{CC} = 2V

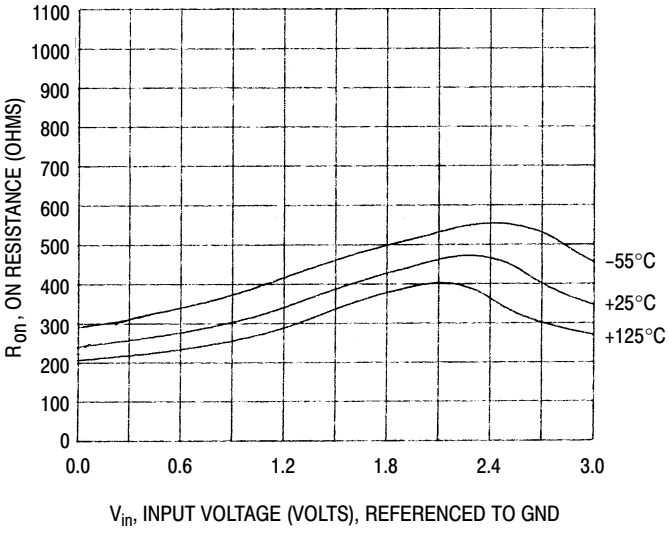


Figure 6. Typical On Resistance V_{CC} = 3V

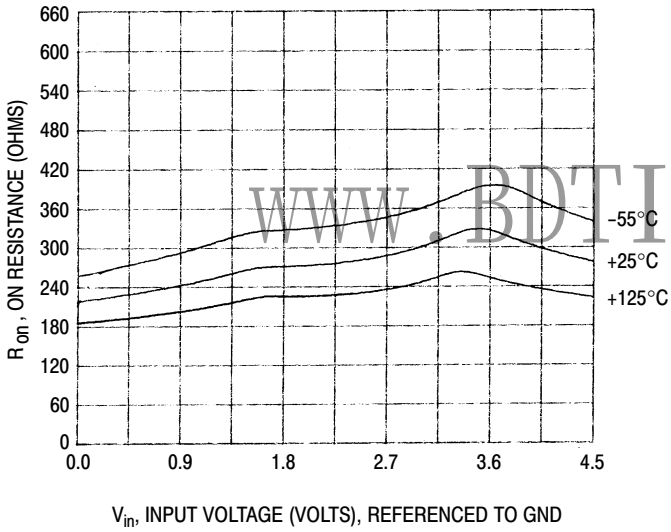


Figure 7. Typical On Resistance V_{CC} = 4.5V

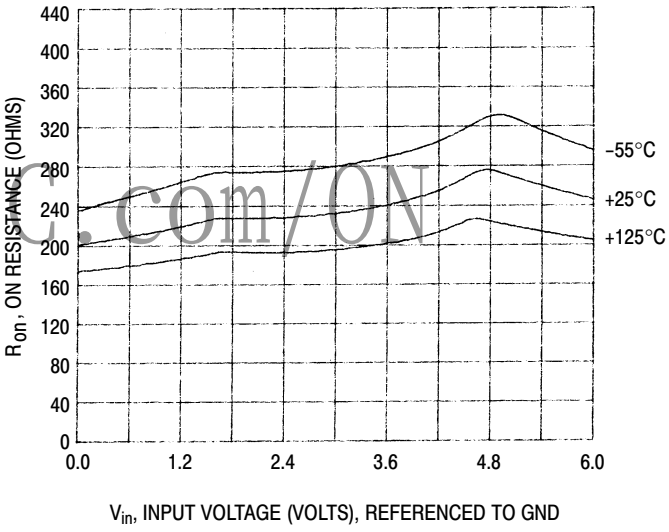


Figure 8. Typical On Resistance V_{CC} = 6V

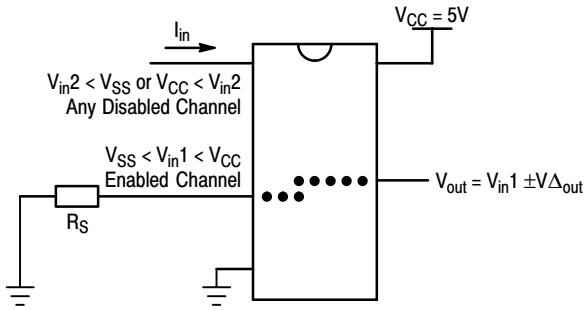


Figure 9. Injection Current Coupling Specification

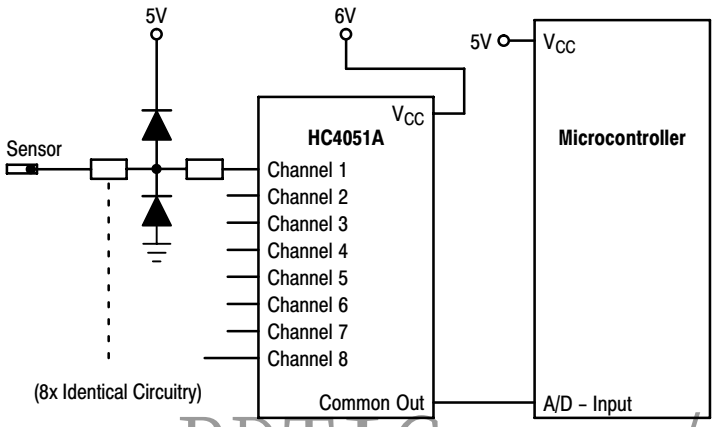


Figure 10. Actual Technology
Requires 32 passive components and one extra 6V regulator
to suppress injection current into a standard HC4051 multiplexer

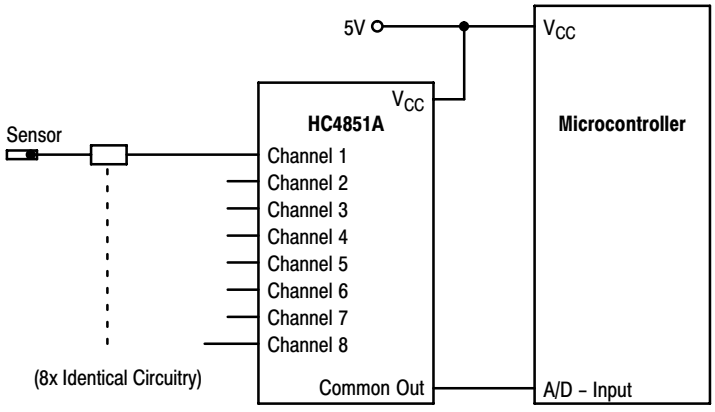


Figure 11. MC74HC4851A Solution
Solution by applying the HC4851A multiplexer

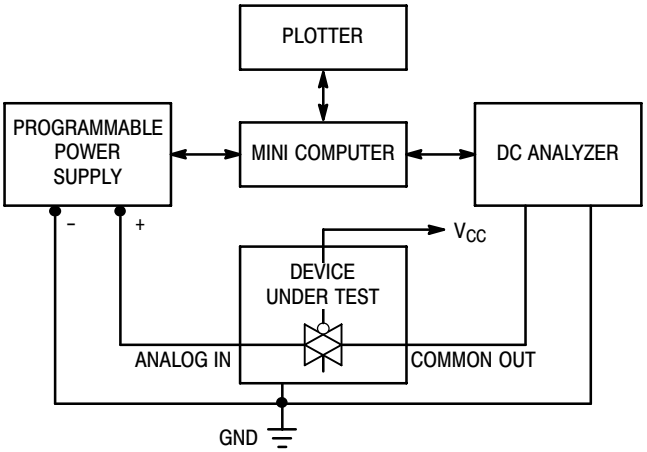


Figure 12. On Resistance Test Set–Up

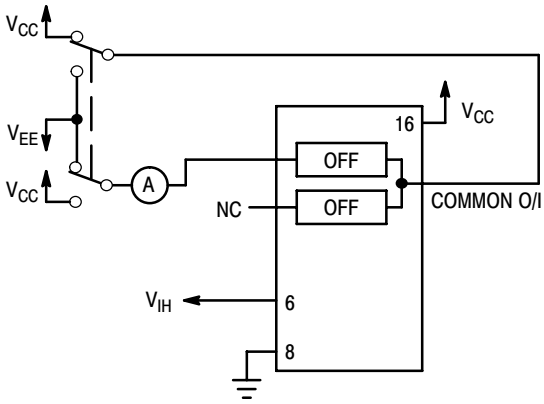


Figure 13. Maximum Off Channel Leakage Current, Any One Channel, Test Set–Up

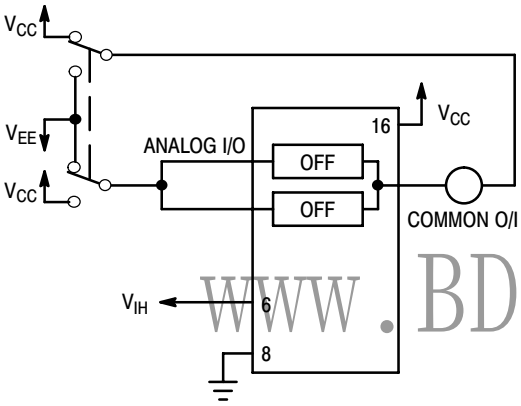


Figure 14. Maximum Off Channel Leakage Current, Common Channel, Test Set–Up

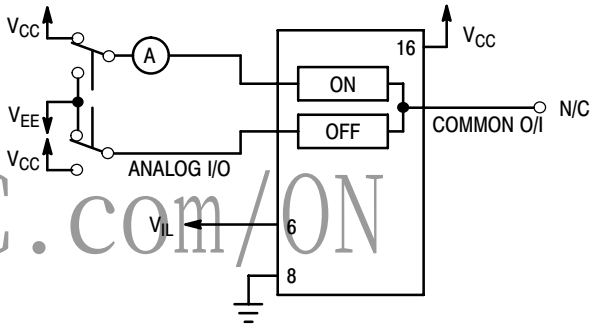


Figure 15. Maximum On Channel Leakage Current, Channel to Channel, Test Set–Up

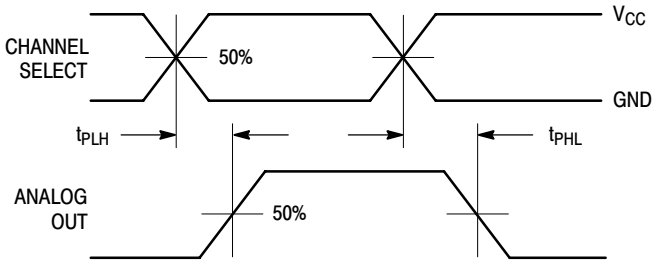
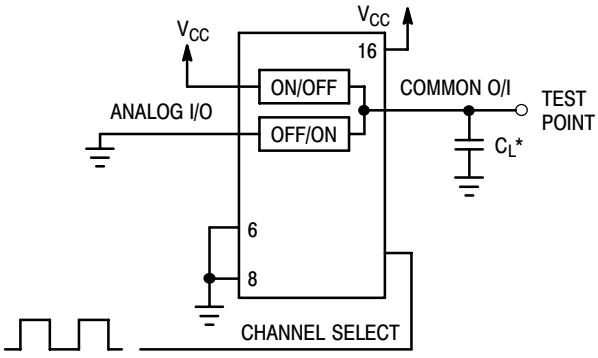


Figure 16. Propagation Delays, Channel Select to Analog Out



*Includes all probe and jig capacitance

Figure 17. Propagation Delay, Test Set–Up Channel Select to Analog Out

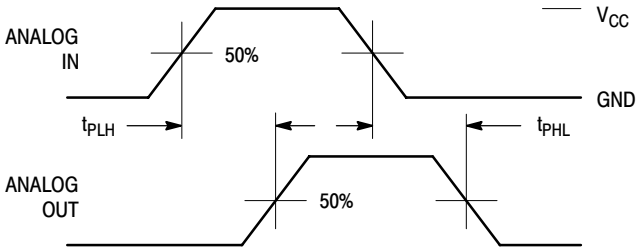
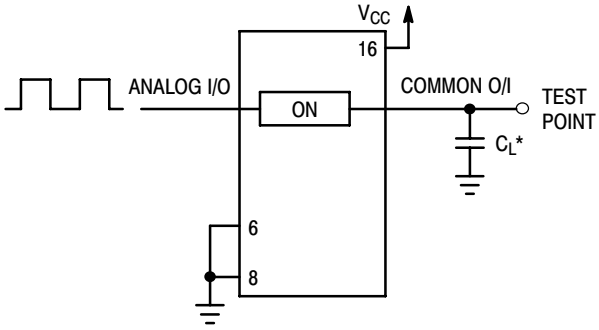


Figure 18. Propagation Delays, Analog In to Analog Out



*Includes all probe and jig capacitance

Figure 19. Propagation Delay, Test Set−Up Analog In to Analog Out

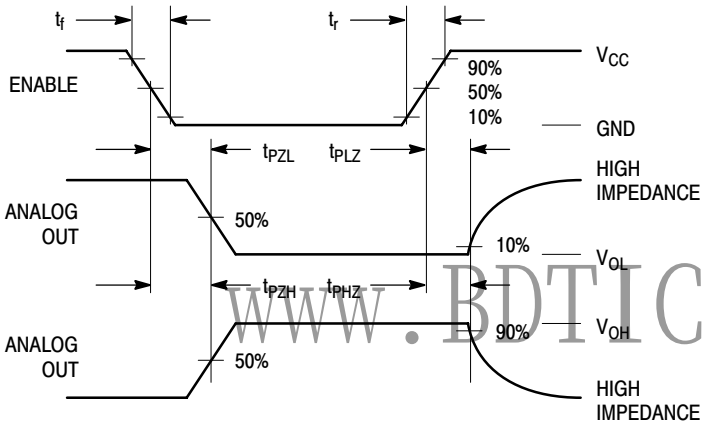


Figure 20. Propagation Delays, Enable to Analog Out

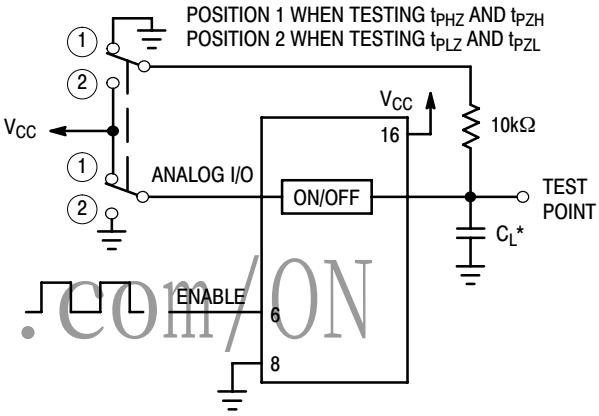


Figure 21. Propagation Delay, Test Set−Up Enable to Analog Out

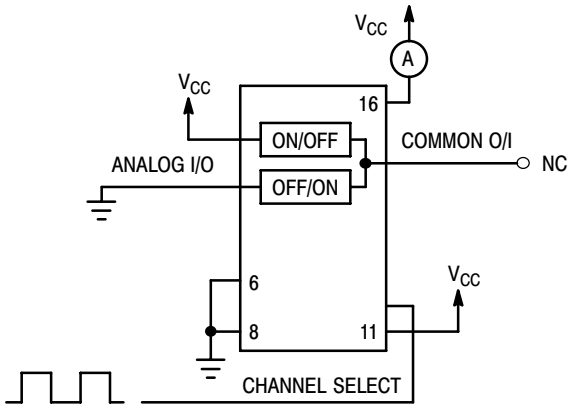


Figure 22. Power Dissipation Capacitance, Test Set−Up

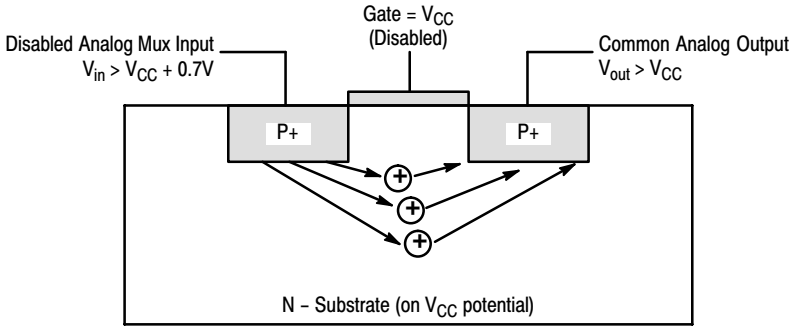


Figure 23. Diagram of Bipolar Coupling Mechanism
Appears if V_{in} exceeds V_{CC}, driving injection current into the substrate

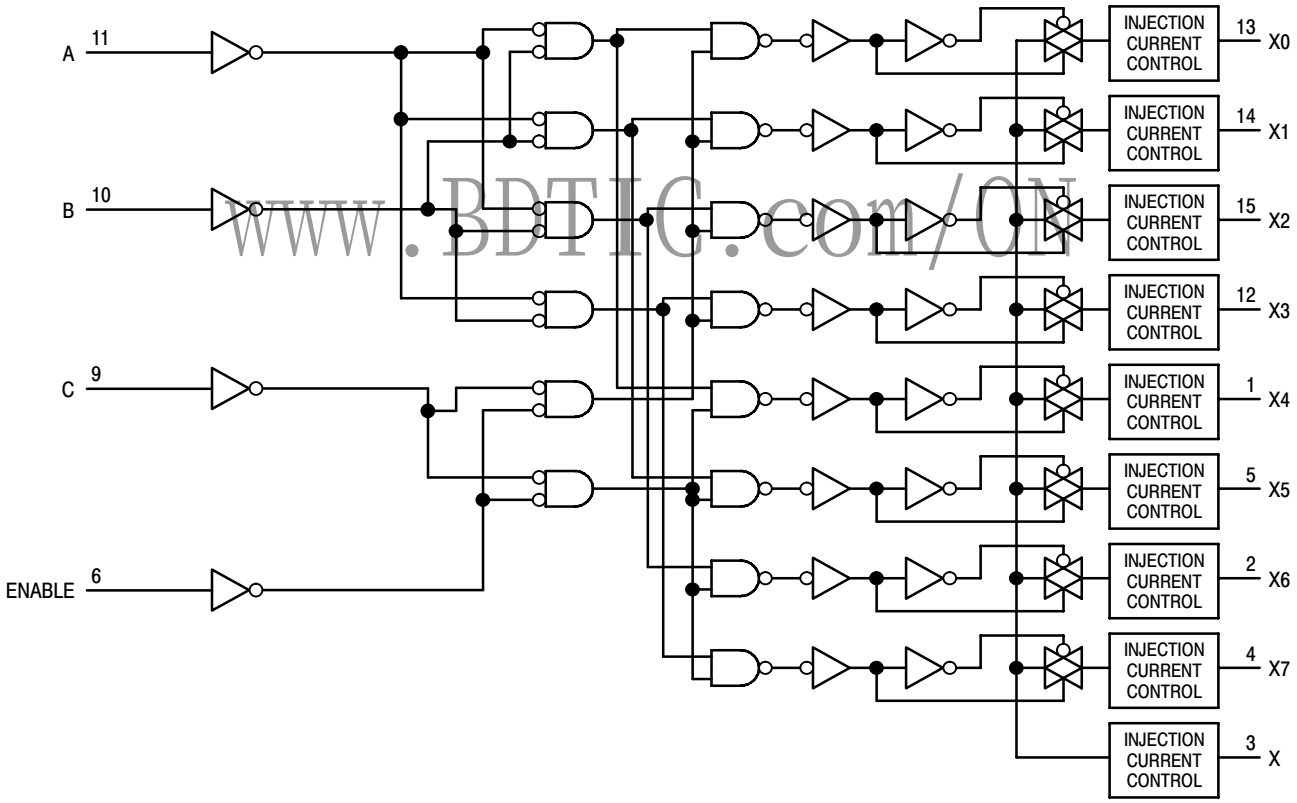


Figure 24. Function Diagram, HC4851A

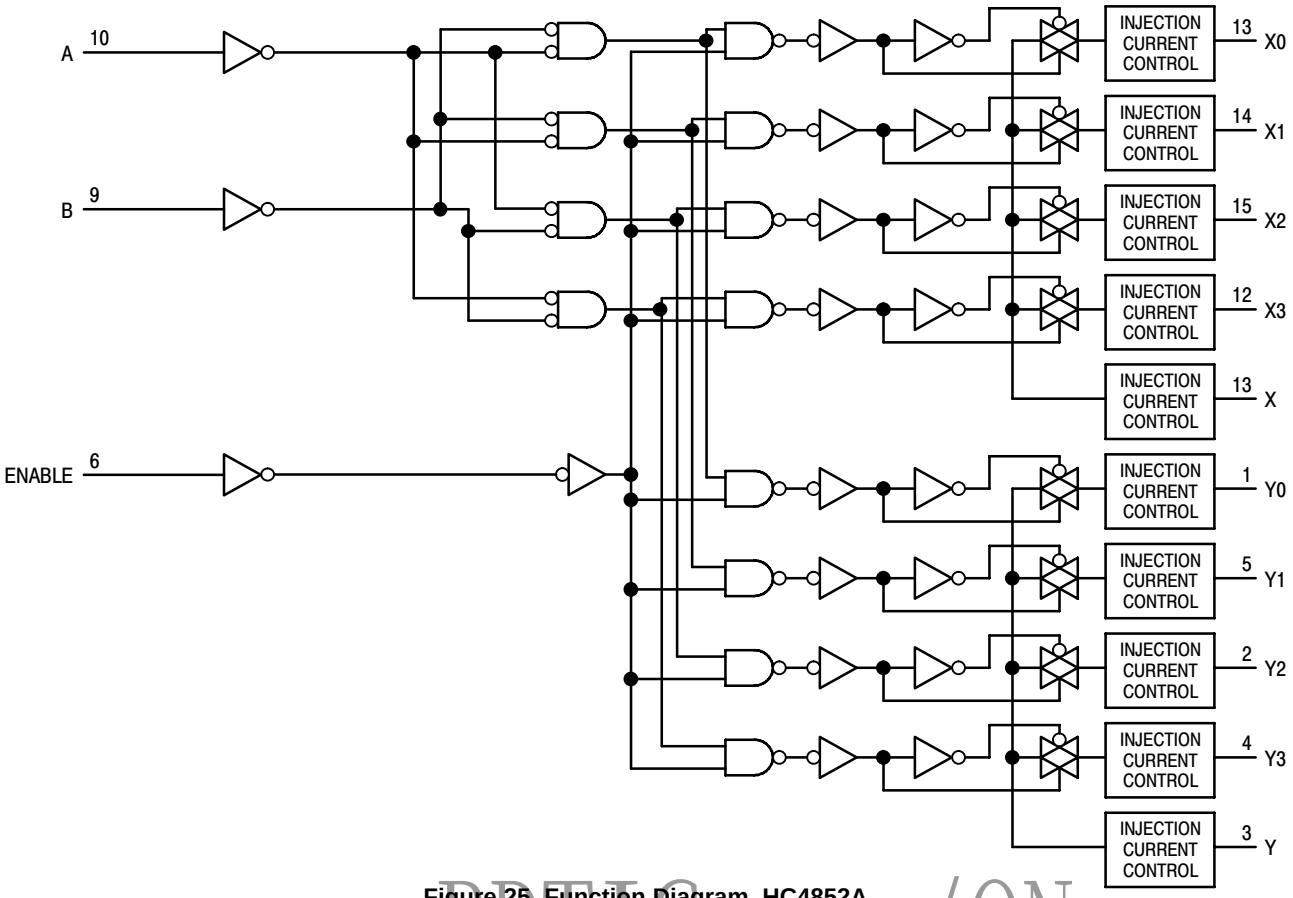


Figure 25. Function Diagram, HC4852A

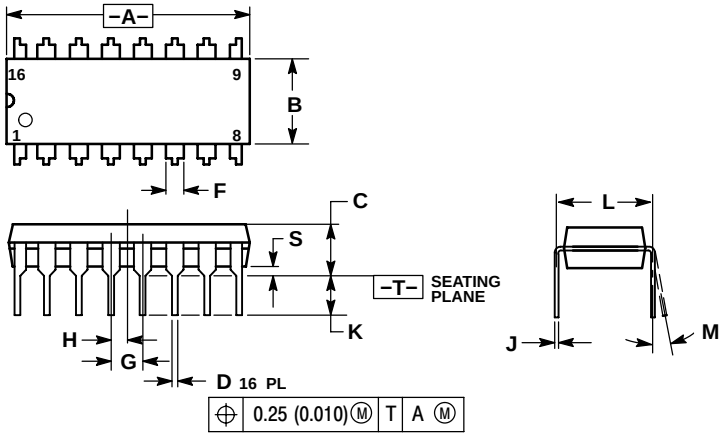
ORDERING INFORMATION

Device	Package	Shipping†
MC74HC4851AN	PDIP−16	500 Units / Box
MC74HC4851ANG	PDIP−16 (Pb−Free)	500 Units / Box
MC74HC4851AD	SOIC−16	48 Units / Rail
MC74HC4851ADG	SOIC−16 (Pb−Free)	48 Units / Rail
MC74HC4851ADR2	SOIC−16	2500 Units / Tape & Reel
MC74HC4851ADR2G	SOIC−16 (Pb−Free)	2500 Units / Tape & Reel
MC74HC4851ADTR2	TSSOP−16*	2500 Units / Tape & Reel
MC74HC4851ADTR2G	TSSOP−16*	2500 Units / Tape & Reel
MC74HC4851ADW	SOIC−16 WIDE	48 Units / Rail
MC74HC4851ADWG	SOIC−16 WIDE (Pb−Free)	48 Units / Rail
MC74HC4851ADWR2	SOIC−16 WIDE	1000 Units / Tape & Reel
MC74HC4851ADWR2G	SOIC−16 WIDE (Pb−Free)	1000 Units / Tape & Reel
MC74HC4852AN	PDIP−16	500 Units / Box
MC74HC4852ANG	PDIP−16 (Pb−Free)	500 Units / Box
MC74HC4852AD	SOIC−16	48 Units / Rail
MC74HC4852ADG	SOIC−16 (Pb−Free)	48 Units / Rail
MC74HC4852ADR2	SOIC−16	2500 Units / Tape & Reel
MC74HC4852ADR2G	SOIC−16 (Pb−Free)	2500 Units / Tape & Reel
MC74HC4852ADTR2	TSSOP−16*	2500 Units / Tape & Reel
MC74HC4852ADTR2G	TSSOP−16*	2500 Units / 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.
*This package is inherently Pb−Free.

PACKAGE DIMENSIONS

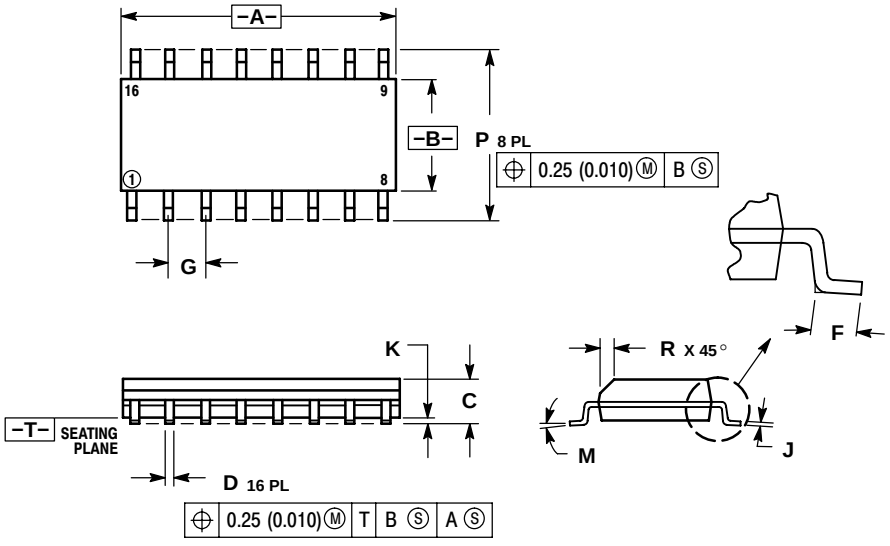
PDIP−16
N SUFFIX
CASE 648−08
ISSUE T



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0 °	10 °	0 °	10 °
S	0.020	0.040	0.51	1.01

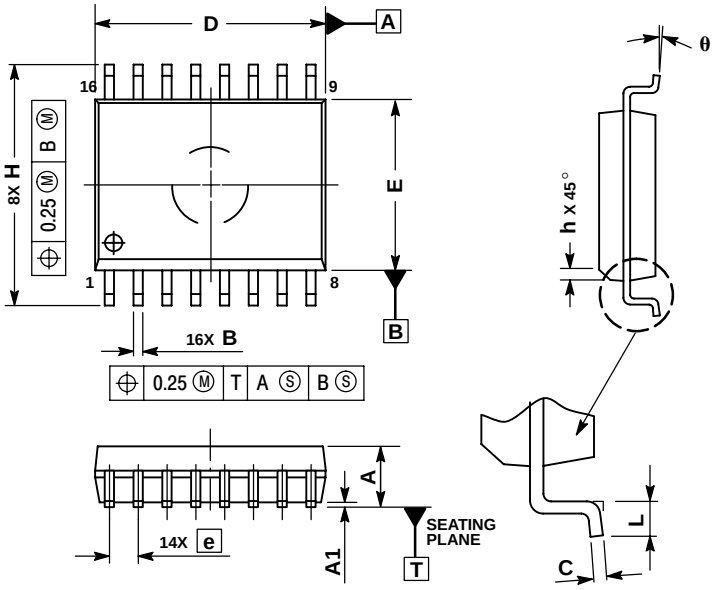
SOIC−16
D SUFFIX
CASE 751B−05
ISSUE J



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

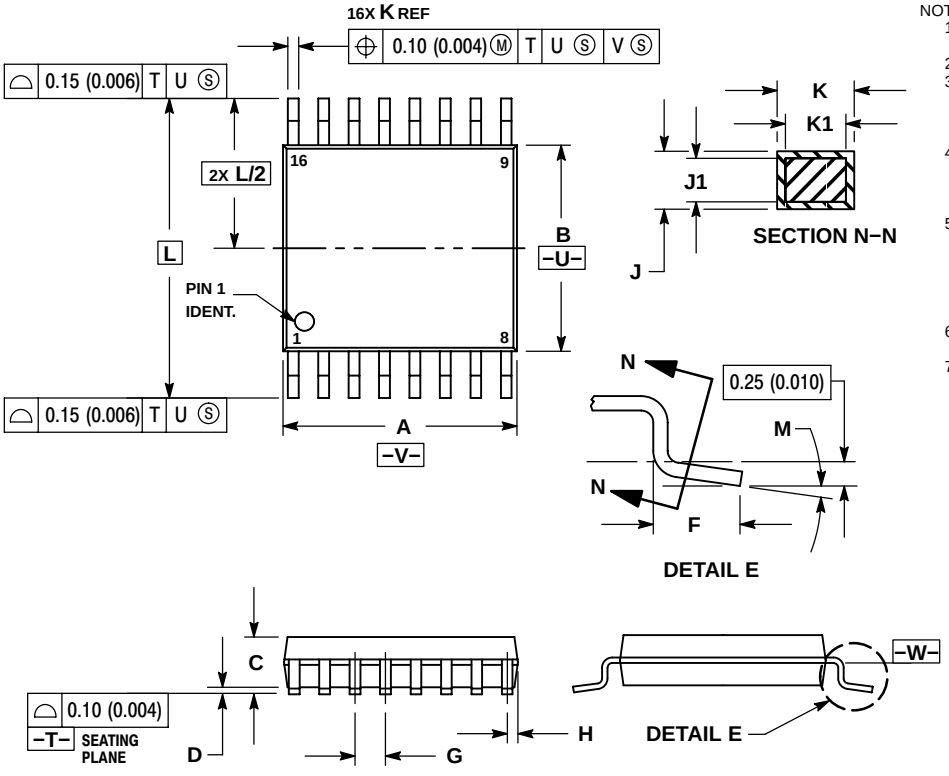
SOIC−16 WIDE
DW SUFFIX
CASE 751G−03
ISSUE C



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INLCUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	10.15	10.45
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
q	0 °	7 °

TSSOP−16
DT SUFFIX
CASE 948F−01
ISSUE A



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 °

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