3.3V Differential LVPECL/LVDS/CML to LVTTL/LVCMOS Translator

The MC100EPT21 is a Differential LVPECL/LVDS/CML to LVTTL/LVCMOS translator. Because LVPECL (Positive ECL), LVDS, and positive CML input levels and LVTTL/LVCMOS output levels are used, only +3.3 V and ground are required. The small outline 8–lead SOIC package makes the EPT21 ideal for applications which require the translation of a clock or data signal.

The V_{BB} output allows this EPT21 to be cap coupled in either single–ended or differential input mode. When single–ended cap coupled, V_{BB} output is tied to the \overline{D} input and D is driven for a non–inverting buffer, or V_{BB} output is tied to the D input and \overline{D} is driven for an inverting buffer. When cap coupled differentially, V_{BB} output is connected through a resistor to each input pin. If used, the V_{BB} pin should be bypassed to V_{CC} via a 0.01 μF capacitor. For additional information see AND8020/D. For a single–ended direct connection use an external voltage reference source such as a resistor divider. Do not use V_{BB} for a single–ended direct connection or port to another device.

Features

- 1.4 ns Typical Propagation Delay
- Maximum Frequency > 275 MHz Typical
- LVPECL/LVDS/CML Inputs, LVTTL/LVCMOS Outputs
- 24 mA TTL outputs
- Operating Range: $V_{CC} = 3.0 \text{ V}$ to 3.6 V with GND = 0 V
- The 100 Series Contains Temperature Compensation
- V_{BB} Output
- These Devices are Pb-Free and are RoHS Compliant



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MARKING DIAGRAMS*



SO-8 D SUFFIX CASE 751





TSSOP-8 DT SUFFIX CASE 948R





DFN8 MN SUFFIX CASE 506AA



A = Assembly Location

L = Wafer Lot

Y = Year

W = Work Week

M = Date Code

■ = Pb-Free Package

(Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

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

1

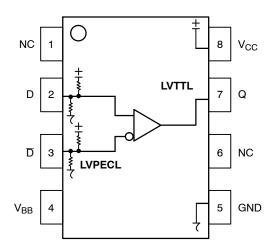


Figure 1. Logic Diagram and 8-Lead Pinout (Top View)

Table 1. PIN DESCRIPTION

PIN	FUNCTION
Q	LVTTL/LVCMOS Output
D*, D *	Differential LVPECL/LVDS/CML Input
V _{CC}	Positive Supply
V_{BB}	Output Reference Voltage
GND	Ground
NC	No Connect
EP	(DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

^{*} Pin will default to 1/2 of V_{CC} when left open.

Table 2. ATTRIBUTES

Characteristic	Value				
Internal Input Pulldown Resistor	D	50 kΩ			
Internal Input Pulldown Resistor	D	50 kΩ			
Internal Input Pullup Resistor	D, \overline{D}	50 kΩ			
ESD Protection	Human Body Model Machine Model Charged Device Model	> 1.5 kV > 100 V > 2 kV			
Moisture Sensitivity, Indefinite Time Ou	Level 1 Level 3 Level 1				
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in			
Transistor Count		81 Devices			
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test					

^{1.} For additional information, see Application Note AND8003/D.

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V _{CC}	PECL Power Supply	GND = 0 V		3.8	V
V _{IN}	PECL Input Voltage	GND = 0 V	$V_I \leq V_{CC}$	0 to 3.8	V
I _{BB}	V _{BB} Sink/Source			± 0.5	mA
T _A	Operating Temperature Range			-40 to +85	°C
T _{stg}	Storage Temperature Range			-65 to +150	°C
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	SO-8 SO-8	190 130	°C/W °C/W
$\theta_{\sf JC}$	Thermal Resistance (Junction-to-Case)	Standard Board	SO-8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
$\theta_{\sf JC}$	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °C/W
T _{sol}	Wave Solder Pb Pb-Free	< 2 to 3 sec @ 248°C <2 to 3 sec @ 260°C		265 265	°C
$\theta_{\sf JC}$	Thermal Resistance (Junction-to-Case)	(Note 2)	DFN8	35 to 40	°C/W

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.

Table 4. PECL INPUT DC CHARACTERISTICS V_{CC} = 3.3 V, GND = 0.0 V (Note 3)

			-40°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
V _{IH}	Input HIGH Voltage (Single-Ended)	2075		2420	2075		2420	2075		2420	mV
V _{IL}	Input LOW Voltage (Single-Ended)	1355		1675	1355		1675	1355		1675	mV
V_{BB}	Output Voltage Reference	1775	1875	1975	1775	1875	1975	1775	1875	1975	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 4)	1.2		3.3	1.2		3.3	1.2		3.3	V
I _{IH}	Input HIGH Current			150			150			150	μΑ
I _{IL}	Input LOW Current	-150			-150			-150			μΑ

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

^{2.} JEDEC standard multilayer board - 2S2P (2 signal, 2 power)

^{3.} Input parameters vary 1:1 with V_{CC}.

V_{IHCMR} min varies 1:1 with GND, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.

Table 5. LVTTL/LVCMOS OUTPUT DC CHARACTERISTICS $V_{CC} = 3.3 \text{ V}$, GND = 0.0 V, $T_A = -40 ^{\circ}\text{C}$ to 85 $^{\circ}\text{C}$

Symbol	Characteristic	Condition	Min	Тур	Max	Unit
V _{OH}	Output HIGH Voltage	$I_{OH} = -3.0 \text{ mA}$	2.4			V
V _{OL}	Output LOW Voltage	I _{OL} = 24 mA			0.5	V
I _{CCH}	Power Supply Current	Outputs set to HIGH	5	17	25	mA
I _{CCL}	Power Supply Current	Outputs set to LOW	8	21	30	mA
los	Output Short Circuit Current		-130		-80	mA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

Table 6. AC CHARACTERISTICS V_{CC} = 3.0 V to 3.6 V, GND = 0.0 V (Note 5)

			-40°C		25°C		85°C					
Symbol	Characteristic		Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
f _{max}	Maximum Frequency (Figure 2)		275	350		275	350		275	350		MHz
t _{PLH} , t _{PHL}	Propagation Delay to Output Differential		800 1200	1400 1400	2050 1800	800 1200	1400 1400	2250 1800	900 1100	1600 1300	2950 1900	ps
t _{SKEW}	Duty Cycle Skew (Note 6)		45	50	55	45	50	55	45	50	55	%
t _{SKPP}	Part-to-Part Skew (Note 6)				500			500			500	ps
t _{JITTER}	Random Clock Jitter (RMS)			3.5	5		3.5	5		3.5	5	ps
V _{PP}	Input Voltage Swing (Differential Configuration)		150	800	1200	150	800	1200	150	800	1200	mV
t _r t _f	Output Rise/Fall Times (0.8V - 2.0V)	Q, Q	250	600	900	250	600	900	250	600	900	ps

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

- 5. Measured with a 750 mV 50% duty-cycle clock source. R_L = 500 Ω to GND and C_L = 20 pF to GND. Refer to Figure 3.
- 6. Skews are measured between outputs under identical transitions. Duty cycle skew is measured between differential outputs using the deviations of the sum Tpw- and Tpw+.

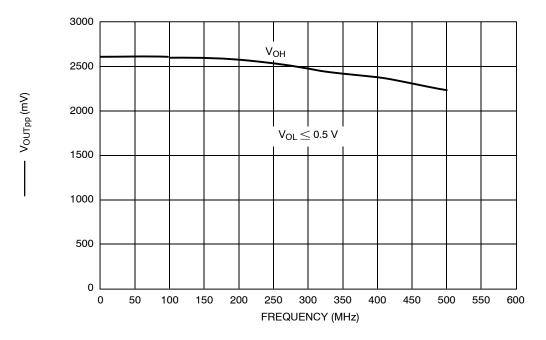


Figure 2. F_{max}

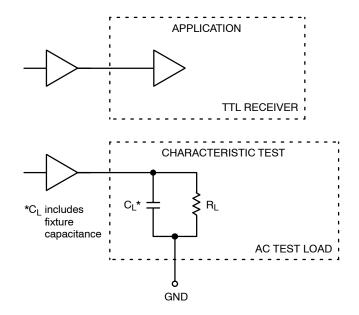


Figure 3. TTL Output Loading Used For Device Evaluation

ORDERING INFORMATION

Device	Package	Shipping [†]
MC100EPT21DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC100EPT21DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC100EPT21DTG	TSSOP-8 (Pb-Free)	100 Units / Rail
MC100EPT21DTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel
MC100EPT21MNR4G	DFN8 (Pb-Free)	1000 / 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.

Resource Reference of Application Notes

AN1405/D – ECL Clock Distribution Techniques

AN1406/D – Designing with PECL (ECL at +5.0 V)

AN1503/D – ECLinPS $^{\text{\tiny{M}}}$ I/O SPiCE Modeling Kit

AN1504/D - Metastability and the ECLinPS Family

AN1568/D - Interfacing Between LVDS and ECL

AN1672/D - The ECL Translator Guide

AND8001/D - Odd Number Counters Design

AND8002/D - Marking and Date Codes

AND8020/D - Termination of ECL Logic Devices

AND8066/D - Interfacing with ECLinPS

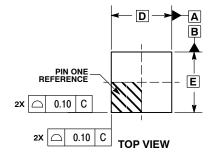
AND8090/D - AC Characteristics of ECL Devices





DFN8 2x2, 0.5P CASE 506AA ISSUE F

DATE 04 MAY 2016



DETAIL B

(A3)

SIDE VIEW

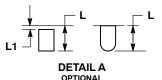
SEATING PLANE

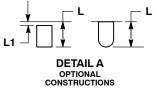
C

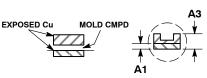
0.10 С

80.0 С

NOTE 4







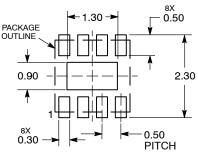


NOTES

- DIMENSIONING AND TOLERANCING PER
- ASME Y14.5M, 1994 . CONTROLLING DIMENSION: MILLIMETERS. DIMENSION & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
 4. COPLANARITY APPLIES TO THE EXPOSED
- PAD AS WELL AS THE TERMINALS.

	MILLIMETERS				
DIM	MIN	MAX			
Α	0.80	1.00			
A1	0.00	0.05			
А3	0.20	REF			
b	0.20	0.30			
D	2.00	BSC			
D2	1.10	1.30			
Е	2.00	BSC			
E2	0.70	0.90			
е	0.50 BSC				
K	0.30 REF				
Ĺ	0.25	0.35			
L1		0.10			

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

DETAIL A ←D2 → 0.10 CAB е С 0.05 NOTE 3 **BOTTOM VIEW**

GENERIC MARKING DIAGRAM*



XX = Specific Device Code

= Date Code

= Pb-Free Device

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

DOCUMENT NUMBER:	98AON18658D	Electronic versions are uncontrolled except when accessed directly from the Document Rep Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.			
DESCRIPTION:	DFN8. 2.0X2.0. 0.5MM PITO	CH	PAGE 1 OF 1		

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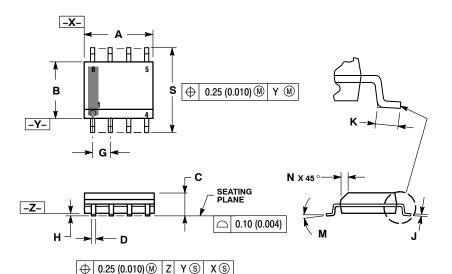
^{*}This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.





SOIC-8 NB CASE 751-07 **ISSUE AK**

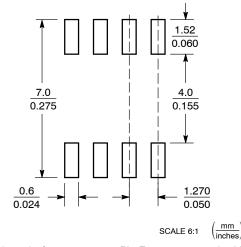
DATE 16 FEB 2011



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
- ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: MILLIMETER.
- DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE
- 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.
- 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

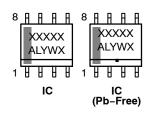
	MILLIN	IETERS	INCHES		
DIM	MIN	MAX	MIN	MAX	
Α	4.80	5.00	0.189	0.197	
В	3.80	4.00	0.150	0.157	
C	1.35	1.75	0.053	0.069	
D	0.33	0.51	0.013	0.020	
G	1.27	7 BSC	0.050 BSC		
Н	0.10	0.25	0.004	0.010	
J	0.19	0.25	0.007	0.010	
K	0.40	1.27	0.016	0.050	
М	0 °	8 °	0 °	8 °	
N	0.25	0.50	0.010	0.020	
S	5.80	6.20	0.228	0.244	

SOLDERING FOOTPRINT*



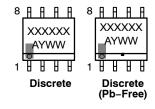
^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code = Assembly Location = Wafer Lot = Year = Work Week W

= Pb-Free Package



XXXXXX = Specific Device Code = Assembly Location Α

= Year ww = Work Week = 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.

STYLES ON PAGE 2

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SOIC-8 NB CASE 751-07 ISSUE AK

DATE 16 FEB 2011

			D/ (I E TO I ED E
STYLE 1: PIN 1. EMITTER 2. COLLECTOR 3. COLLECTOR 4. EMITTER 5. EMITTER 6. BASE 7. BASE 8. EMITTER STYLE 5:	STYLE 2: PIN 1. COLLECTOR, DIE, #1 2. COLLECTOR, #1 3. COLLECTOR, #2 4. COLLECTOR, #2 5. BASE, #2 6. EMITTER, #2 7. BASE, #1 8. EMITTER, #1 STYLE 6:	STYLE 3: PIN 1. DRAIN, DIE #1 2. DRAIN, #1 3. DRAIN, #2 4. DRAIN, #2 5. GATE, #2 6. SOURCE, #2 7. GATE, #1 8. SOURCE, #1 STYLE 7:	
PIN 1. DRAIN 2. DRAIN 3. DRAIN 4. DRAIN 5. GATE 6. GATE 7. SOURCE 8. SOURCE	PIN 1. SOURCE 2. DRAIN 3. DRAIN 4. SOURCE 5. SOURCE 6. GATE 7. GATE 8. SOURCE	STYLE 7: PIN 1. INPUT 2. EXTERNAL BYPASS 3. THIRD STAGE SOURCE 4. GROUND 5. DRAIN 6. GATE 3 7. SECOND STAGE Vd 8. FIRST STAGE Vd	PIN 1. COLLECTOR, DIE #1 2. BASE, #1 3. BASE, #2 4. COLLECTOR, #2 5. COLLECTOR, #2 6. EMITTER, #2 7. EMITTER, #1 8. COLLECTOR, #1
STYLE 9: PIN 1. EMITTER, COMMON 2. COLLECTOR, DIE #1 3. COLLECTOR, DIE #2 4. EMITTER, COMMON 5. EMITTER, COMMON 6. BASE, DIE #2 7. BASE, DIE #1 8. EMITTER, COMMON	STYLE 10: PIN 1. GROUND 2. BIAS 1 3. OUTPUT 4. GROUND 5. GROUND 6. BIAS 2 7. INPUT 8. GROUND	STYLE 11: PIN 1. SOURCE 1 2. GATE 1 3. SOURCE 2 4. GATE 2 5. DRAIN 2 6. DRAIN 2 7. DRAIN 1 8. DRAIN 1	STYLE 12: PIN 1. SOURCE 2. SOURCE 3. SOURCE 4. GATE 5. DRAIN 6. DRAIN 7. DRAIN 8. DRAIN
STYLE 13: PIN 1. N.C. 2. SOURCE 3. SOURCE 4. GATE 5. DRAIN 6. DRAIN 7. DRAIN 8. DRAIN	STYLE 14: PIN 1. N-SOURCE 2. N-GATE 3. P-SOURCE 4. P-GATE 5. P-DRAIN 6. P-DRAIN 7. N-DRAIN 8. N-DRAIN	7. DHAIN 1 8. DRAIN 1 STYLE 15: PIN 1. ANODE 1 2. ANODE 1 3. ANODE 1 4. ANODE 1 5. CATHODE, COMMON 6. CATHODE, COMMON 7. CATHODE, COMMON 8. CATHODE, COMMON	STYLE 16: PIN 1. EMITTER, DIE #1 2. BASE, DIE #1 3. EMITTER, DIE #2 4. BASE, DIE #2 5. COLLECTOR, DIE #2 6. COLLECTOR, DIE #2 7. COLLECTOR, DIE #1 8. COLLECTOR, DIE #1
STYLE 17: PIN 1. VCC 2. V2OUT 3. V1OUT 4. TXE 5. RXE 6. VEE 7. GND 8. ACC	STYLE 18: PIN 1. ANODE 2. ANODE 3. SOURCE 4. GATE 5. DRAIN 6. DRAIN 7. CATHODE 8. CATHODE	STYLE 19: PIN 1. SOURCE 1 2. GATE 1 3. SOURCE 2 4. GATE 2 5. DRAIN 2 6. MIRROR 2 7. DRAIN 1 8. MIRROR 1	STYLE 20: PIN 1. SOURCE (N) 2. GATE (N) 3. SOURCE (P) 4. GATE (P) 5. DRAIN 6. DRAIN 7. DRAIN 8. DRAIN
STYLE 21: PIN 1. CATHODE 1 2. CATHODE 2 3. CATHODE 3 4. CATHODE 4 5. CATHODE 5 6. COMMON ANODE 7. COMMON ANODE 8. CATHODE 6	STYLE 22: PIN 1. I/O LINE 1 2. COMMON CATHODE/VCC 3. COMMON CATHODE/VCC 4. I/O LINE 3 5. COMMON ANODE/GND 6. I/O LINE 4 7. I/O LINE 5 8. COMMON ANODE/GND	STYLE 23: PIN 1. LINE 1 IN 2. COMMON ANODE/GND 3. COMMON ANODE/GND 4. LINE 2 IN 5. LINE 2 OUT 6. COMMON ANODE/GND 7. COMMON ANODE/GND 8. LINE 1 OUT	STYLE 24: PIN 1. BASE 2. EMITTER 3. COLLECTOR/ANODE 4. COLLECTOR/ANODE 5. CATHODE 6. CATHODE 7. COLLECTOR/ANODE 8. COLLECTOR/ANODE
STYLE 25: PIN 1. VIN 2. N/C 3. REXT 4. GND 5. IOUT 6. IOUT 7. IOUT 8. IOUT	STYLE 26: PIN 1. GND 2. dv/dt 3. ENABLE 4. ILIMIT 5. SOURCE 6. SOURCE 7. SOURCE 8. VCC	STYLE 27: PIN 1. ILIMIT 2. OVLO 3. UVLO 4. INPUT+ 5. SOURCE 6. SOURCE 7. SOURCE 8. DRAIN	STYLE 28: PIN 1. SW_TO_GND 2. DASIC_OFF 3. DASIC_SW_DET 4. GND 5. V_MON 6. VBULK 7. VBULK 8. VIN
STYLE 29: PIN 1. BASE, DIE #1 2. EMITTER, #1 3. BASE, #2 4. EMITTER, #2 5. COLLECTOR, #2 6. COLLECTOR, #2 7. COLLECTOR, #1 8. COLLECTOR, #1	STYLE 30: PIN 1. DRAIN 1 2. DRAIN 1 3. GATE 2 4. SOURCE 2 5. SOURCE 1/DRAIN 2 6. SOURCE 1/DRAIN 2 7. SOURCE 1/DRAIN 2 8. GATE 1		

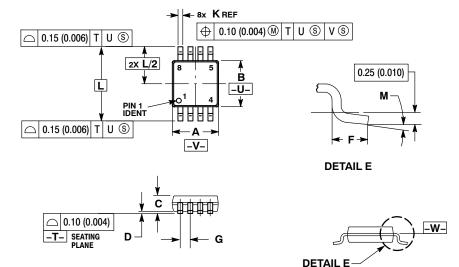
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TSSOP 8 CASE 948R-02 ISSUE A

DATE 04/07/2000



- 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. TERMINAL NUMBERS ARE SHOWN FOR
- REFERENCE ONLY.
 6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α	2.90	3.10	0.114	0.122
В	2.90	3.10	0.114	0.122
С	0.80	1.10	0.031	0.043
D	0.05	0.15	0.002	0.006
F	0.40	0.70	0.016	0.028
G	0.65 BSC		0.026 BSC	
K	0.25	0.40	0.010	0.016
L	4.90 BSC		0.193 BSC	
M	٥°	6 °	٥°	6°

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