

MC10EP01, MC100EP01

3.3V / 5V ECL 4-Input OR/NOR

The MC10EP01 is a 4-input OR/NOR gate. The device is functionally equivalent to the EL01 device, LVEL01, and E101 (a quad version). With AC performance much faster than the LVEL01 device, the EP01 is ideal for applications requiring the fastest AC performance available.

The 100 Series contains temperature compensation.

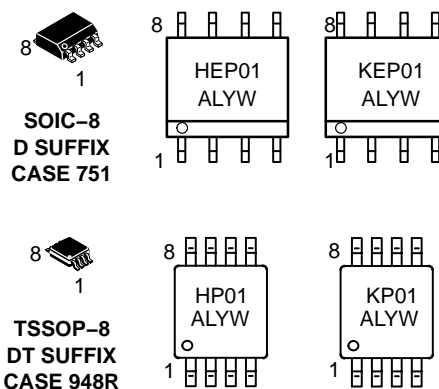
- 230 ps Typical Propagation Delay
- Maximum Frequency > 3 GHz Typical
- PECL Mode Operating Range:
 $V_{CC} = 3.0\text{ V}$ to 5.5 V with $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:
 $V_{CC} = 0\text{ V}$ with $V_{EE} = -3.0\text{ V}$ to -5.5 V
- Open Input Default State
- Pb-Free Package is Available



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MARKING DIAGRAMS*



H	= MC10
K	= MC100
A	= Assembly Location
L	= Wafer Lot
Y	= Year
W	= Work Week

*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 7 of this data sheet.

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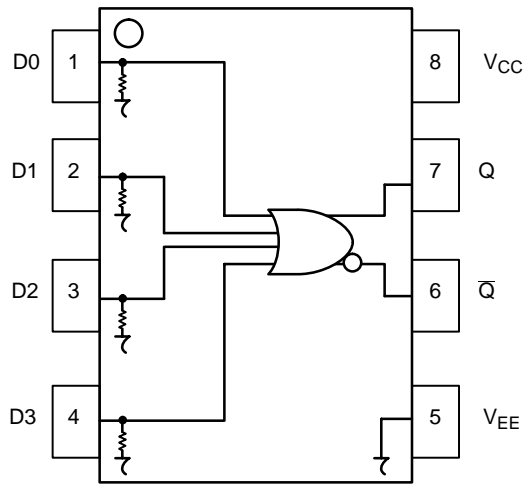


Figure 1. 8-Lead Pinout (Top View) and Logic Diagram

Table 1. PIN DESCRIPTION

Pin	Function
D0 – D3	ECL Data Inputs
Q, \bar{Q}	ECL Data Outputs
V _{CC}	Positive Supply
V _{EE}	Negative Supply

Table 2. TRUTH TABLE

D0*	D1*	D2*	D3*	Q	\bar{Q}
L	L	L	L	L	H
H	X	X	X	H	L
X	H	X	X	H	L
X	X	H	X	H	L
X	X	X	H	H	L
H	H	H	H	H	L

*Pins will default LOW when left open.

Table 3. ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	75 k Ω
Internal Input Pullup Resistor	N/A
ESD Protection	Human Body Model Machine Model Charged Device Model
	> 4 kV > 200 V > 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Level 1
Flammability Rating	Oxygen Index: 28 to 34
	UL 94 V-0 @ 0.125 in
Transistor Count	115
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

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

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Table 4. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Mode Power Supply	$V_{EE} = 0\text{ V}$		6	V
V_{EE}	NECL Mode Power Supply	$V_{CC} = 0\text{ V}$		-6	V
V_I	PECL Mode Input Voltage	$V_{EE} = 0\text{ V}$	$V_I \leq V_{CC}$	6	V
	NECL Mode Input Voltage	$V_{CC} = 0\text{ V}$	$V_I \geq V_{EE}$	-6	V
I_{out}	Output Current	Continuous Surge		50	mA
				100	mA
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	SOIC-8	190	°C/W
		500 lfpm	SOIC-8	130	°C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm	TSSOP-8	185	°C/W
		500 lfpm	TSSOP-8	140	°C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44	°C/W
T_{sol}	Wave Solder	< 2 to 3 sec @ 248°C		265	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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Table 5. 10EP DC CHARACTERISTICS, PECL $V_{CC} = 3.3\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 2)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	20	24	31	20	24	31	20	24	31	mA
V_{OH}	Output HIGH Voltage (Note 3)	2165	2290	2415	2230	2355	2480	2290	2415	2540	mV
V_{OL}	Output LOW Voltage (Note 3)	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	2090		2415	2155		2480	2215		2540	mV
V_{IL}	Input LOW Voltage (Single-Ended)	1365		1690	1430		1755	1490		1815	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

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 lfm. 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. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.3 V to -2.2 V.

3. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

Table 6. 10EP DC CHARACTERISTICS, PECL $V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 4)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	20	24	31	20	24	31	20	24	31	mA
V_{OH}	Output HIGH Voltage (Note 5)	3865	3990	4115	3930	4055	4180	3990	4115	4240	mV
V_{OL}	Output LOW Voltage (Note 5)	3065	3190	3315	3130	3255	3380	3190	3315	3440	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	3790		4115	3855		4180	3915		4240	mV
V_{IL}	Input LOW Voltage (Single-Ended)	3065		3390	3130		3455	3190		3515	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

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 lfm. 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.

4. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +2.0 V to -0.5 V.

5. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

Table 7. 10EP DC CHARACTERISTICS, NECL $V_{CC} = 0\text{ V}$; $V_{EE} = -5.5\text{ V}$ to -3.0 V (Note 6)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	20	24	31	20	24	31	20	24	31	mA
V_{OH}	Output HIGH Voltage (Note 7)	-1135	-1010	-885	-1070	-945	-820	-1010	-885	-760	mV
V_{OL}	Output LOW Voltage (Note 7)	-1935	-1810	-1685	-1870	-1745	-1620	-1810	-1685	-1560	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	-1210		-885	-1145		-820	-1085		-760	mV
V_{IL}	Input LOW Voltage (Single-Ended)	-1935		-1610	-1870		-1545	-1810		-1485	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

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 lfm. 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.

6. Input and output parameters vary 1:1 with V_{CC} .

7. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

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Table 8. 100EP DC CHARACTERISTICS, PECL $V_{CC} = 3.3\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 8)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	15	24	32	17	26	36	19	28	38	mA
V_{OH}	Output HIGH Voltage (Note 9)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
V_{OL}	Output LOW Voltage (Note 9)	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV
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
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

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 lfm. 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.

8. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.3 V to -2.2 V.

9. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

Table 9. 100EP DC CHARACTERISTICS, PECL $V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 10)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	15	24	32	17	26	36	19	28	38	mA
V_{OH}	Output HIGH Voltage (Note 11)	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV
V_{OL}	Output LOW Voltage (Note 11)	3055	3180	3305	3055	3180	3305	3055	3180	3305	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	3775		4120	3775		4120	3775		4120	mV
V_{IL}	Input LOW Voltage (Single-Ended)	3055		3375	3055		3375	3055		3375	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

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 lfm. 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.

10. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +2.0 V to -0.5 V.

11. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

Table 10. 100EP DC CHARACTERISTICS, NECL $V_{CC} = 0\text{ V}$; $V_{EE} = -5.5\text{ V}$ to -3.0 V (Note 12)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	15	24	32	17	26	36	19	28	38	mA
V_{OH}	Output HIGH Voltage (Note 13)	-1145	-1020	-895	-1145	-1020	-895	-1145	-1020	-895	mV
V_{OL}	Output LOW Voltage (Note 13)	-1945	-1820	-1695	-1945	-1820	-1695	-1945	-1820	-1695	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	-1225		-880	-1225		-880	-1225		-880	mV
V_{IL}	Input LOW Voltage (Single-Ended)	-1945		-1625	-1945		-1625	-1945		-1625	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

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 lfm. 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.

12. Input and output parameters vary 1:1 with V_{CC} .

13. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

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Table 11. AC CHARACTERISTICS $V_{CC} = 3.0\text{ V to }5.5\text{ V}$; $V_{EE} = 0\text{ V or }V_{CC} = 0\text{ V}$; $V_{EE} = -3.0\text{ V to }-5.5\text{ V}$ (Note 14)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{\max}	Maximum Frequency (See Figure 2. F_{\max}/JITTER)		> 3			> 3			> 3		GHz
t_{PLH} , t_{PHL}	Propagation Delay D to Q, \bar{Q}	150	260	330	150	270	330	200	300	350	ps
t_{JITTER}	Cycle-to-Cycle Jitter (See Figure 2. F_{\max}/JITTER)		0.2	< 1		0.2	< 1		0.2	< 1	ps
t_r , t_f	Output Rise/Fall Times (20% – 80%) Q, \bar{Q}	50	120	170	60	130	180	70	150	200	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 lfm. 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.

14. Measured using a 750 mV source, 50% duty cycle clock source. All loading with $50\ \Omega$ to $V_{CC} - 2.0\text{ V}$.

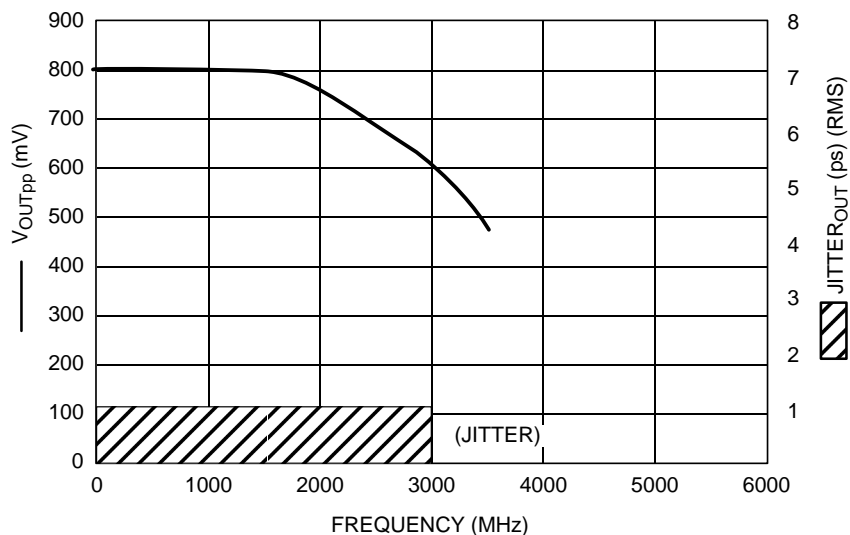


Figure 2. F_{\max}/Jitter

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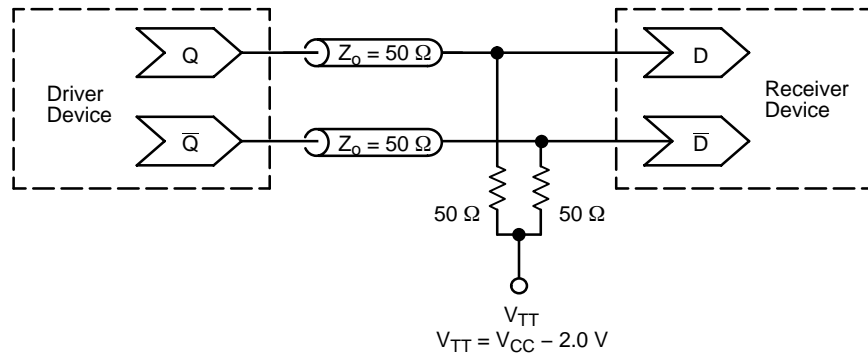


Figure 3. Typical Termination for Output Driver and Device Evaluation
 (See Application Note AND8020/D – Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping [†]
MC10EP01D	SOIC–8	98 Units / Rail
MC10EP01DG	SOIC–8 (Pb–Free)	98 Units / Rail
MC10EP01DR2	SOIC–8	2500 / Tape & Reel
MC10EP01DT	TSSOP–8	100 Units / Rail
MC10EP01DTR2	TSSOP–8	2500 / Tape & Reel
MC100EP01D	SOIC–8	98 Units / Rail
MC100EP01DR2	SOIC–8	2500 / Tape & Reel
MC100EP01DT	TSSOP–8	100 Units / Rail
MC100EP01DTR2	TSSOP–8	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.

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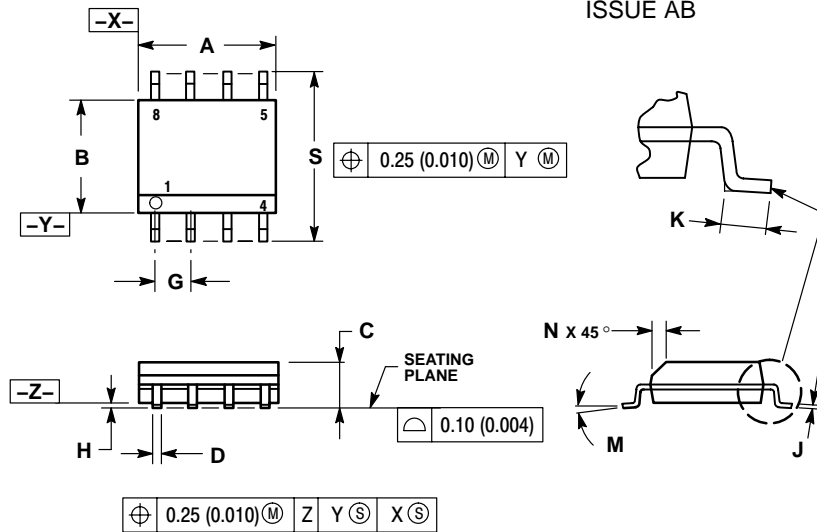
Resource Reference of Application Notes

- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1642/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

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PACKAGE DIMENSIONS

SOIC-8 NB D SUFFIX PLASTIC SOIC PACKAGE CASE 751-07 ISSUE AB

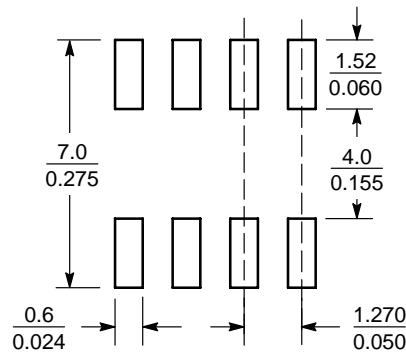


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION 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.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	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 BSC		0.050 BSC	
H	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
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOLDERING FOOTPRINT*



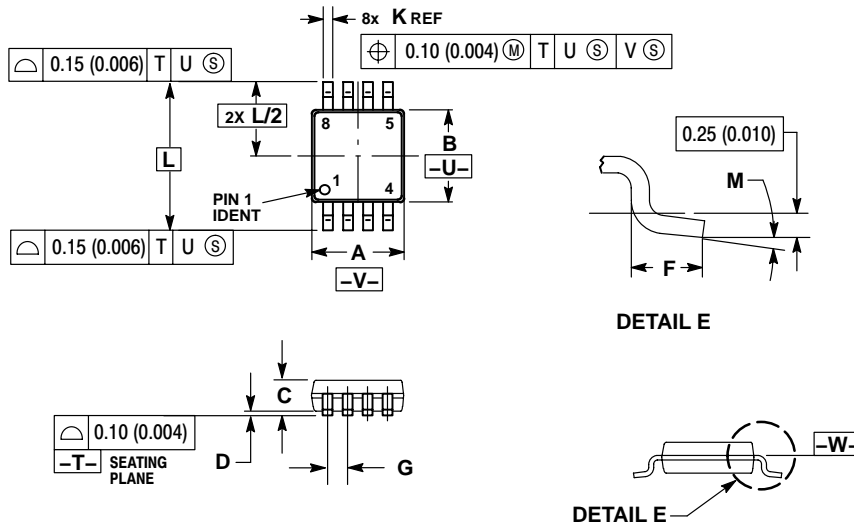
SCALE 6:1 ($\frac{\text{mm}}{\text{inches}}$)

*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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PACKAGE DIMENSIONS


TSSOP-8 DT SUFFIX PLASTIC TSSOP PACKAGE CASE 948R-02 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. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	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	0°	6°	0°	6°

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