

# MC10EP58, MC100EP58

## 3.3V / 5V ECL 2:1 Multiplexer

### Description

The MC10/100EP58 is a 2:1 multiplexer. The device is pin and functionally equivalent to the EL58 and LVEL58 devices.

The 100 Series contains temperature compensation.

### Features

- 310 ps Typical Propagation Delay
- Maximum Frequency > 3 GHz Typical
- PECL Mode Operating Range:  $V_{CC} = 3.0\text{ V}$  to  $5.5\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -3.0\text{ V}$  to  $-5.5\text{ V}$
- Open Input Default State
- Q Output Will Default LOW with Inputs Open or at  $V_{EE}$
- Pb-Free Packages are Available



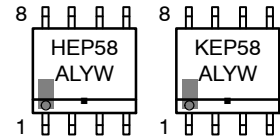
**ON Semiconductor®**

<http://onsemi.com>

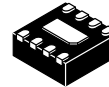
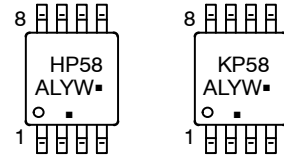
### MARKING DIAGRAMS\*



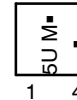
**SOIC-8  
D SUFFIX  
CASE 751**



**TSSOP-8  
DT SUFFIX  
CASE 948R**



**DFN8  
MN SUFFIX  
CASE 506AA**



H = MC10	A = Assembly Location
K = MC100	L = Wafer Lot
5U = MC10	Y = Year
3P = MC100	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 8 of this data sheet.

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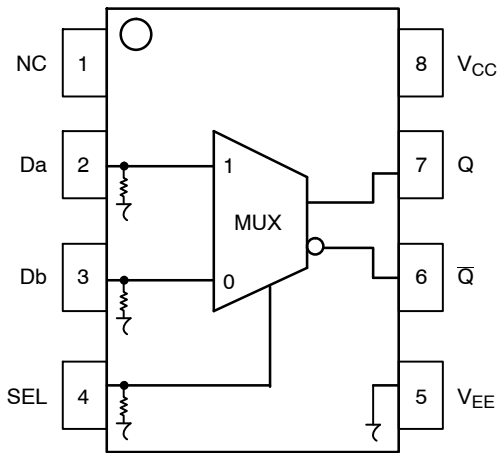


Figure 1. 8-Lead Pinout (Top View) and Logic Diagram

Table 1. PIN DESCRIPTION

PIN	FUNCTION
Da*, Db*	ECL Data Inputs
SEL*	ECL Select Inputs
Q, Q̄	ECL Data Outputs
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply
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.

\* Pins will default LOW when left open.

Table 2. TRUTH TABLE

SEL	Data
H	a
L	b

Table 3. ATTRIBUTES

Characteristics	Value	
Internal Input Pulldown Resistor	75 kΩ	
Internal Input Pullup Resistor	N/A	
ESD Protection	Human Body Model	> 4 kV
	Machine Model	> 200 V
	Charged Device Model	> 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Pb Pkg	Pb-Free Pkg
	SOIC-8	Level 1
	TSSOP-8	Level 1
	DFN8	Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in
Transistor Count	41 Devices	
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 <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		6	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		-6	V
V <sub>I</sub>	PECL Mode Input Voltage NECL Mode Input Voltage	V <sub>EE</sub> = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub>	6	V
		V <sub>CC</sub> = 0 V	V <sub>I</sub> ≥ V <sub>EE</sub>	-6	V
I <sub>out</sub>	Output Current	Continuous Surge		50	mA
				100	mA
I <sub>BB</sub>	V <sub>BB</sub> Sink/Source			± 0.5	mA
T <sub>A</sub>	Operating Temperature Range			-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm	8 SOIC	190	°C/W
		500 lfpm	8 SOIC	130	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	8 SOIC	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	8 TSSOP	185	°C/W
			8 TSSOP	140	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	8 TSSOP	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	DFN8	129	°C/W
			DFN8	84	°C/W
T <sub>sol</sub>	Wave Solder  Pb Pb-Free	<2 to 3 sec @ 248°C <2 to 3 sec @ 260°C		265 265	°C
θ <sub>JC</sub>	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.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

**Table 5. 10EP DC CHARACTERISTICS, PECL V<sub>CC</sub> = 3.3 V, V<sub>EE</sub> = 0 V (Note 3)**

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current	20	28	37	20	30	39	22	31	40	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 4)	2165	2290	2415	2230	2355	2480	2290	2415	2540	mV
V <sub>OL</sub>	Output LOW Voltage (Note 4)	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV
V <sub>IH</sub>	Input HIGH Voltage (Single-Ended)	2090		2415	2155		2480	2215		2540	mV
V <sub>IL</sub>	Input LOW Voltage (Single-Ended)	1365		1690	1460		1755	1490		1815	mV
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	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 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.

3. Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary +0.3 V to -2.2 V.

4. All loading with 50 Ω to V<sub>CC</sub> - 2.0 V.

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**Table 6. 10EP DC CHARACTERISTICS, PECL**  $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 5)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current	20	28	37	20	30	39	22	31	40	mA
$V_{OH}$	Output HIGH Voltage (Note 6)	3865	3990	4115	3930	4055	4180	3990	4115	4240	mV
$V_{OL}$	Output LOW Voltage (Note 6)	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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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

6. All loading with 50  $\Omega$  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  $-3.0\text{ V}$  (Note 7)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current	20	28	37	20	30	39	22	31	40	mA
$V_{OH}$	Output HIGH Voltage (Note 8)	-1135	-1010	-885	-1070	-945	-820	-1010	-885	-760	mV
$V_{OL}$	Output LOW Voltage (Note 8)	-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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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.

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

8. All loading with 50  $\Omega$  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 9)**

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current	20	28	37	20	31	39	25	33	42	mA
$V_{OH}$	Output HIGH Voltage (Note 10)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
$V_{OL}$	Output LOW Voltage (Note 10)	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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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.

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

10. All loading with 50  $\Omega$  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 11)**

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current	20	28	37	20	31	39	25	33	42	mA
$V_{OH}$	Output HIGH Voltage (Note 12)	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV
$V_{OL}$	Output LOW Voltage (Note 12)	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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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.

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

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

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**Table 10. 100EP DC CHARACTERISTICS, NECL**  $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -5.5\text{ V to } -3.0\text{ V}$  (Note 13)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current	20	28	37	20	31	39	25	33	42	mA
$V_{OH}$	Output HIGH Voltage (Note 14)	-1145	-1020	-895	-1145	-1020	-895	-1145	-1020	-895	mV
$V_{OL}$	Output LOW Voltage (Note 14)	-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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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.

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

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

**Table 11. AC CHARACTERISTICS**  $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V to } -5.5\text{ V}$  or  $V_{CC} = 3.0\text{ V to } 5.5\text{ V}$ ;  $V_{EE} = 0\text{ V}$  (Note 15)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\text{max}}$	Maximum Frequency (See Figure 2. $F_{\text{max}}/\text{JITTER}$ )		> 3			> 3			> 3		GHz
$t_{\text{PLH}}$ , $t_{\text{PHL}}$	Propagation Delay to Output Differential D to $Q, \bar{Q}$ SEL to $Q, \bar{Q}$	200	280	380	210	310	410	220	340	420	ps
$t_{\text{JITTER}}$	Cycle-to-Cycle Jitter (See Figure 2. $F_{\text{max}}/\text{JITTER}$ )		0.2	< 2		0.2	< 2		0.2	< 2	ps
$V_{\text{PP}}$	Input Voltage Swing (Differential Configuration)	150	800	1200	150	800	1200	150	800	1200	mV
$t_r$ , $t_f$	Output Rise/Fall Times (20% – 80%) Q, $\bar{Q}$	70	120	170	80	130	180	100	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.

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

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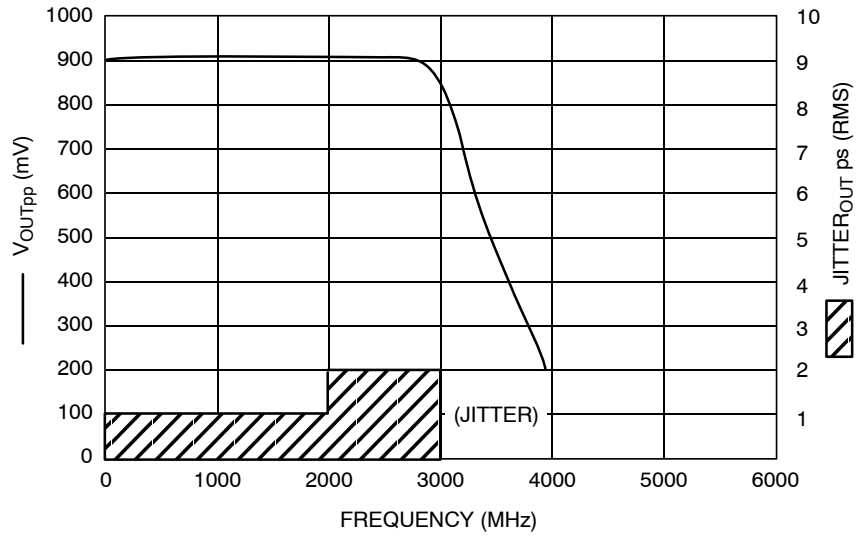


Figure 2.  $F_{max}/Jitter$

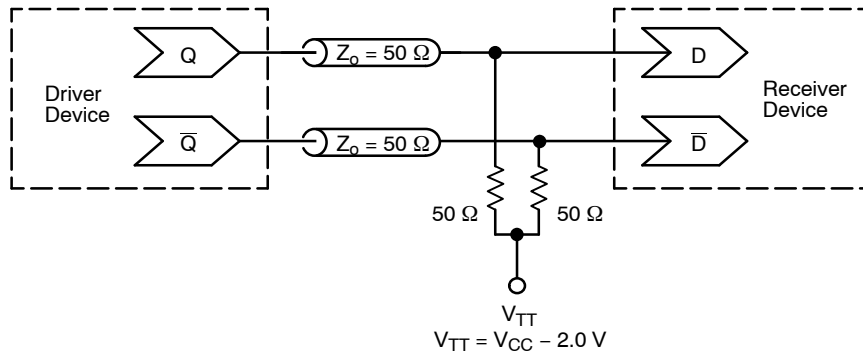


Figure 3. Typical Termination for Output Driver and Device Evaluation  
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

## MC10EP58, MC100EP58

### ORDERING INFORMATION

Device	Package	Shipping†
MC10EP58D	SOIC-8	98 Units / Rail
MC10EP58DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC10EP58DR2	SOIC-8	2500 / Tape & Reel
MC10EP58DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC10EP58DT	TSSOP-8	100 Units / Rail
MC10EP58DTG	TSSOP-8 (Pb-Free)	100 Units / Rail
MC10EP58DTR2	TSSOP-8	2500 / Tape & Reel
MC10EP58DTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel
MC10EP58MNR4	DFN8	1000 / Tape & Reel
MC10EP58MNR4G	DFN8 (Pb-Free)	1000 / Tape & Reel
MC100EP58D	SOIC-8	98 Units / Rail
MC100EP58DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC100EP58DR2	SOIC-8	2500 / Tape & Reel
MC100EP58DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC100EP58DT	TSSOP-8	100 Units / Rail
MC100EP58DTG	TSSOP-8 (Pb-Free)	100 Units / Rail
MC100EP58DTR2	TSSOP-8	2500 / Tape & Reel
MC100EP58DTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel
MC100EP58MNR4	DFN8	1000 / Tape & Reel
MC100EP58MNR4G	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

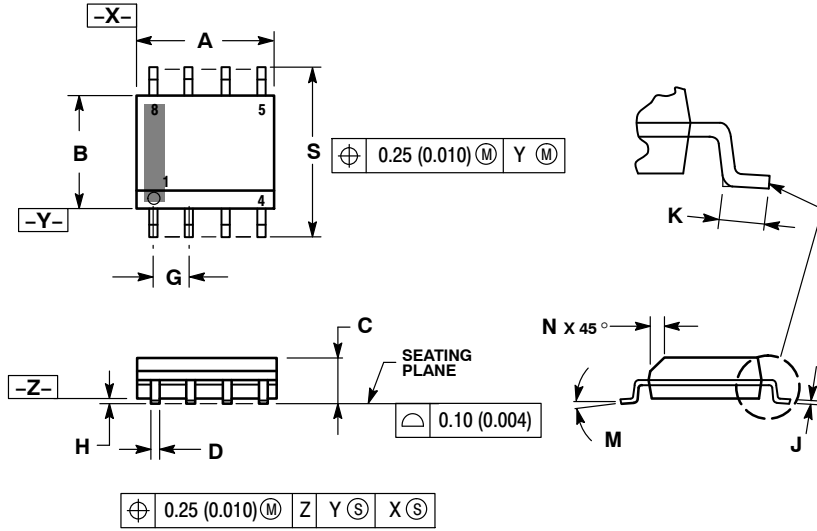
- AN1405/D** - ECL Clock Distribution Techniques
- AN1406/D** - Designing with PECL (ECL at +5.0 V)
- AN1503/D** - ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** - Metastability and the ECLinPS Family
- AN1568/D** - Interfacing Between LVDS and ECL
- AN1672/D** - The ECL Translator Guide
- AND8001/D** - 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



# MC10EP58, MC100EP58

## PACKAGE DIMENSIONS

SOIC-8 NB  
CASE 751-07  
ISSUE AH

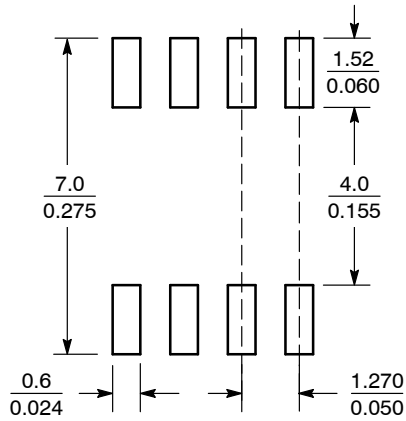


NOTES:

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\*



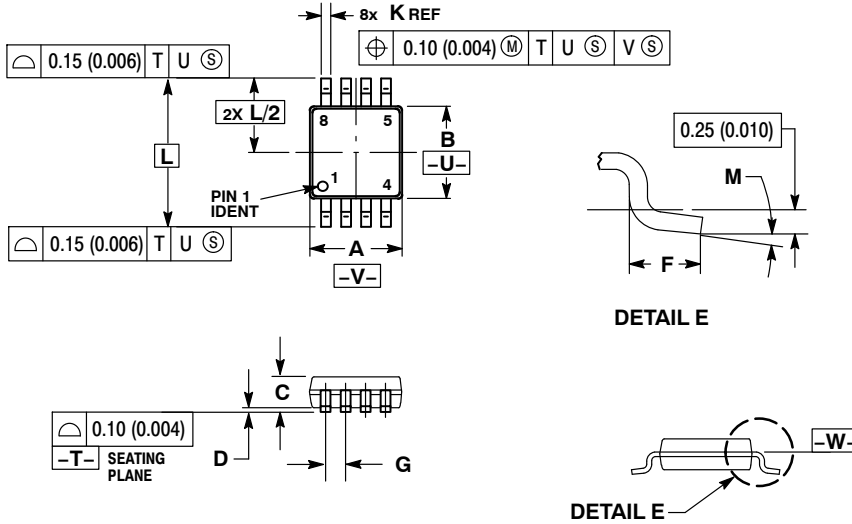
SCALE 6:1 (mm/inches)

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

# MC10EP58, MC100EP58

## PACKAGE DIMENSIONS

TSSOP-8  
DT SUFFIX  
PLASTIC TSSOP PACKAGE  
CASE 948R-02  
ISSUE A



### NOTES:

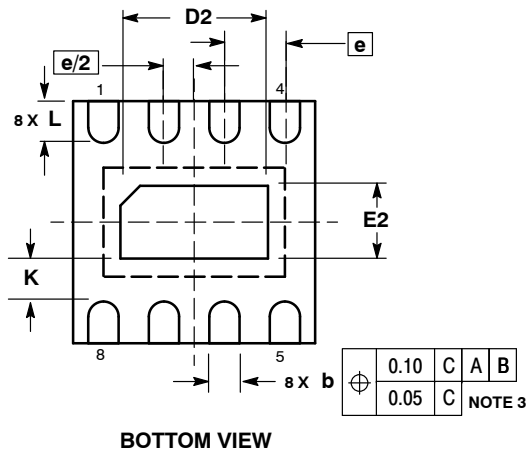
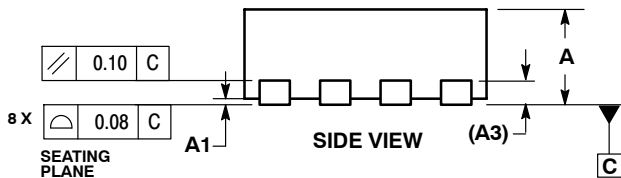
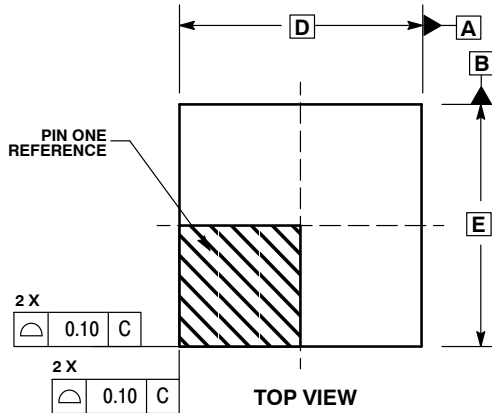
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL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

# MC10EP58, MC100EP58

## PACKAGE DIMENSIONS

DFN8  
CASE 506AA-01  
ISSUE D



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20	REF
b	0.20	0.30
D	2.00 BSC	
D2	1.10	1.30
E	2.00 BSC	
E2	0.70	0.90
e	0.50 BSC	
K	0.20	---
L	0.25	0.35

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