MC10EP16

Differential Receiver

The MC10EP16 is a differential receiver. The device is functionally equivalent to the EL16 and LVEL16 devices with higher performance capabilities. With output transition times significantly faster than the EL16 and LVEL16, the EP16 is ideally suited for interfacing with high frequency sources.

The EP16 provides a V_{BB} output for either single-ended use or as a DC bias for AC coupling to the device within the package. The V_{BB} pin should be used only as a bias for the EP16 as its current sink/source capability is limited. Whenever used, the V_{BB} pin should be bypassed to ground via a 0.01μf capacitor.

- 160ps Propagation Delay
- High Bandwidth to 3 GHz Typical
- PECL mode: 3.0V to 5.5V V_{CC} with V_{EE} = 0V
- ECL mode: 0V V_{CC} with V_{EE} = –3.0V to –5.5V
- Internal Input Resistors: Pulldown on D, Pulldown and Pullup on $\overline{D}$
- Q Output will default LOW with inputs open or at V_{EE}
- ESD Protection: 4KV HBM, 200V MM
- V_{BB} Output
- New Differential Input Common Mode Range
- Moisture Sensitivity Level 1, Indefinite Time Out of Drypack. For Additional Information, See Application Note AND8003/D
- Flammability Rating: UL–94 code V–0 @ 1/8", Oxygen Index 28 to 34
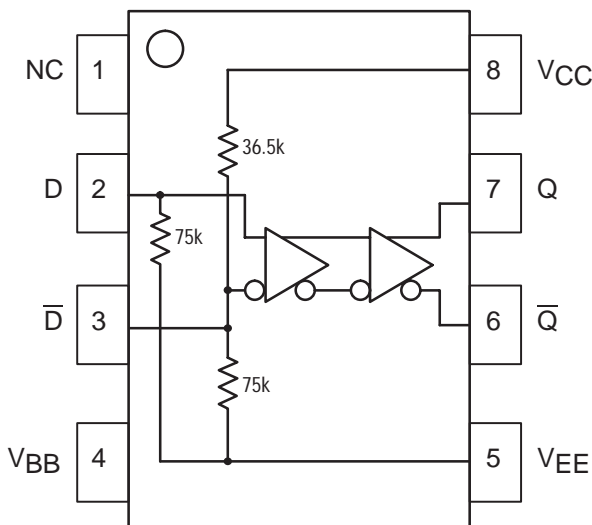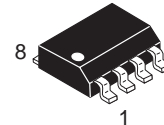- Transistor Count: 167 devices

SO–8
D SUFFIX
CASE 751

MARKING DIAGRAM

HEP16
ALYW
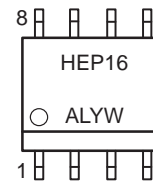
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week

*For additional information, see Application Note AND8002/D

PIN DESCRIPTION	
PIN	**FUNCTION**
D, $\overline{D}$	ECL Data Inputs
Q, $\overline{Q}$	ECL Data Outputs
V_{BB}	Ref. Voltage Output

ORDERING INFORMATION

Device	Package	Shipping
MC10EP16D	SOIC	98 Units/Rail
MC10EP16DR2	SOIC	2500 Tape & Reel

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

MAXIMUM RATINGS*

Symbol	Parameter		Value	Unit
V_{EE}	Power Supply (V_{CC} = 0V)		−6.0 to 0	VDC
V_{CC}	Power Supply (V_{EE} = 0V)		6.0 to 0	VDC
V_I	Input Voltage (V_{CC} = 0V, V_I not more negative than V_{EE})		−6.0 to 0	VDC
V_I	Input Voltage (V_{EE} = 0V, V_I not more positive than V_{CC})		6.0 to 0	VDC
I_{out}	Output Current	Continuous Surge	50 100	mA
I_{BB}	V_{BB} Sink/Source Current†		± 0.5	mA
T_A	Operating Temperature Range		−40 to +85	°C
T_{stg}	Storage Temperature		−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction–to–Ambient)	Still Air 500lfpm	190 130	°C/W
θ_{JC}	Thermal Resistance (Junction–to–Case)		41 to 44 ± 5%	°C/W
T_{sol}	Solder Temperature (<2 to 3 Seconds: 245°C desired)		265	°C

* Maximum Ratings are those values beyond which damage to the device may occur.

† Use for inputs of same package only.

DC CHARACTERISTICS, ECL/LVECL (V_{CC} = 0V; V_{EE} = −5.5V to −3.0V) (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 (Note 1.)	20	24	31	20	24	31	20	24	32	mA
V_{OH}	Output HIGH Voltage (Note 2.)	−1135	−1060	−885	−1070	−945	−820	−1010	−885	−760	mV
V_{OL}	Output LOW Voltage (Note 2.)	−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
V_{BB}	Output Voltage Reference	−1510	−1410	−1310	−1445	−1345	−1245	−1385	−1285	−1185	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 3.)	V_{EE}+2.0		0.0	V_{EE}+2.0		0.0	V_{EE}+2.0		0.0	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current D $\overline{D}$	0.5 −150			0.5 −150			0.5 −150			μA

NOTE: 10EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500lfpm is maintained.

1. V_{CC} = 0V, V_{EE} = V_{EEmin} to V_{EEmax}, all other pins floating.
2. All loading with 50 ohms to V_{CC}−2.0 volts.
3. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.
4. Input and output parameters vary 1:1 with V_{CC}.

DC CHARACTERISTICS, LVPECL (V_{CC} = 3.3V $\pm$ 0.3V, V_{EE} = 0V) (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 (Note 5.)	20	24	31	20	24	31	20	24	32	mA
V_{OH}	Output HIGH Voltage (Note 6.)	2165	2240	2415	2230	2355	2480	2290	2415	2540	mV
V_{OL}	Output LOW Voltage (Note 6.)	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
V_{BB}	Output Voltage Reference	1790	1890	1990	1855	1955	2055	1915	2015	2115	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 7.)	2.0		3.3	2.0		3.3	2.0		3.3	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current D $\overline{D}$	0.5 −150			0.5 −150			0.5 −150			μA

NOTE: 10EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500lfpm is maintained.

5. V_{CC} = 3.0V, V_{EE} = 0V, all other pins floating.
6. All loading with 50 ohms to V_{CC}–2.0 volts.
7. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.
8. Input and output parameters vary 1:1 with V_{CC}.

DC CHARACTERISTICS, PECL (V_{CC} = 5.0V $\pm$ 0.5V, V_{EE} = 0V) (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 (Note 9.)	20	24	31	20	24	31	20	24	32	mA
V_{OH}	Output HIGH Voltage (Note 10.)	3865	3940	4115	3930	4055	4180	3990	4115	4240	mV
V_{OL}	Output LOW Voltage (Note 10.)	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
V_{BB}	Output Voltage Reference	3490	3590	3690	3555	3655	3755	3615	3715	3815	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 11.)	2.0		5.0	2.0		5.0	2.0		5.0	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current D $\overline{D}$	0.5 −150			0.5 −150			0.5 −150			μA

NOTE: 10EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500lfpm is maintained.

9. V_{CC} = 5.0V, V_{EE} = 0V, all other pins floating.
10. All loading with 50 ohms to V_{CC}–2.0 volts.
11. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.
12. Input and output parameters vary 1:1 with V_{CC}.

MC10EP16

AC CHARACTERISTICS (V_{CC} = 0V; V_{EE} = −3.0V to −5.5V) or (V_{CC} = 3.0V to 5.5V; V_{EE} = 0V)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Toggle Frequency (Note 13.)		3.0			3.0			3.0		GHz
t_{PLH}, t_{PHL}	Propagation Delay to Output Differential	100	160	240	100	160	240	120	190	280	ps
t_{SKEW}	Duty Cycle Skew (Note 14.)		5.0			5.0	20		5.0	20	ps
t_{JITTER}	Cycle–to–Cycle Jitter		TBD			TBD			TBD		ps
V_{PP}	Input Voltage Swing (Diff.)	150	800	1200	150	800	1200	150	800	1200	mV
t_r t_f	Output Rise/Fall Times Q (20% − 80%)	70	120	170	80	130	180	100	150	200	ps

13. F_{max} guaranteed for functionality only. V_{OL} and V_{OH} levels are guaranteed at DC only.
14. Skew is measured between outputs under identical transitions. Duty cycle skew is defined only for differential operation when the delays are measured from the cross point of the inputs to the cross point of the outputs.

PACKAGE DIMENSIONS

SO–8
D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751–06
ISSUE T
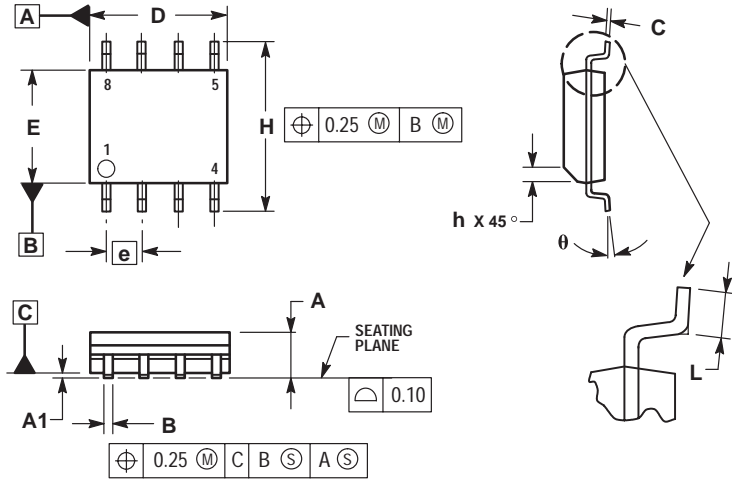
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETER.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
θ	0 °	7 °

⊕ 0.25 Ⓜ B Ⓜ

⊕ 0.25 Ⓜ C B Ⓢ A Ⓢ

◯ 0.10

SEATING PLANE

h X 45 °

Notes

<u>Notes</u>