

# MC10EP57

## 4:1 Differential Multiplexer

The MC10EP57 is a fully differential 4:1 multiplexer. By leaving the SEL1 line open (pulled LOW via the input pulldown resistors) the device can also be used as a differential 2:1 multiplexer with SEL0 input selecting between D0 and D1. The fully differential architecture of the EP57 makes it ideal for use in low skew applications such as clock distribution.

The SEL1 is the most significant select line. The binary number applied to the select inputs will select the same numbered data input (i.e., 00 selects D0).

Multiple  $V_{BB}$  outputs are provided for single-ended or AC coupled interfaces. In these scenarios, the  $V_{BB}$  output should be connected to the data bar inputs and bypassed via a 0.01 $\mu$ F capacitor to ground. Note that the  $V_{BB}$  output can source/sink up to 0.5mA of current without upsetting the voltage level. All  $V_{CC}$  and  $V_{EE}$  pins must be externally connected to power supply to guarantee proper operation

- 350ps Typical Propagation Delays
- Typical Frequency 3.0GHz
- 20-Lead TSSOP Package
- 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,  $\bar{D}$
- Q Output will default LOW with inputs open or at  $V_{EE}$
- ESD Protection: >2KV HBM, >100V MM
- $V_{BB}$  Outputs
- New Differential Input Common Mode Range
- Moisture Sensitivity Level 1, Indefinite Time Out of Drypack.  
For Additional Information, See Application Note AND8003/D
- Useful as Either 4:1 or 2:1 Multiplexer
- Flammability Rating: UL-94 code V-0 @ 1/8",  
Oxygen Index 28 to 34
- Transistor Count = 584 devices

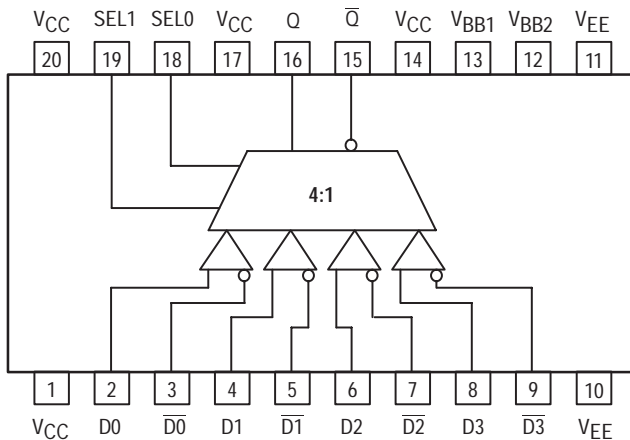
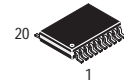


Figure 1. 20-Lead TSSOP (Top View) and Logic Diagram



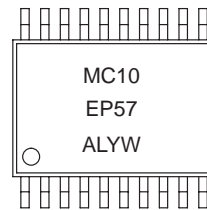
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TSSOP-20  
DT SUFFIX  
CASE 948E

### MARKING DIAGRAM



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

\*For additional information, see Application Note AND8002/D

PIN DESCRIPTION	
PIN	FUNCTION
D0-3, $\bar{D}0-3$	ECL Diff. Data Inputs
SEL0, 1	ECL Mux Select Inputs
$V_{BB1}$ , $V_{BB2}$	ECL Reference Output Voltage
Q, $\bar{Q}$	ECL Data Outputs
$V_{CC}$	Positive Supply
$V_{EE}$	Negative, 0 Supply

FUNCTION TABLE		
SEL1	SEL0	DATA OUT
L	L	D0, $\bar{D}0$
L	H	D1, $\bar{D}1$
H	L	D2, $\bar{D}2$
H	H	D3, $\bar{D}3$

ORDERING INFORMATION		
Device	Package	Shipping
MC10EP57DT	TSSOP	75 Units/Rail
MC10EP57DTR2	TSSOP	2500 Tape & Reel

# MC10EP57

## 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
$\theta_{JA}$	Thermal Resistance (Junction-to-Ambient) Still Air 500lfpm	140 100	°C/W
$\theta_{JC}$	Thermal Resistance (Junction-to-Case)	23 to 41 ±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.)	40	52	65	40	52	65	40	52	65	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.)	-1995	-1810	-1685	-1995	-1745	-1620	-1995	-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	-1550	-1450	-1350	-1500	-1400	-1300	-1450	-1350	-1250	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 SEL, $\overline{D}$ $\overline{D}$	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  $V_{CC}$ .

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## 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	
IEE	Power Supply Current (Note 5.)	40	52	65	40	52	65	40	52	65	mA
VOH	Output HIGH Voltage (Note 6.)	2165	2240	2415	2230	2355	2480	2290	2415	2540	mV
VOL	Output LOW Voltage (Note 6.)	1305	1490	1615	1305	1555	1680	1305	1615	1740	mV
VIH	Input HIGH Voltage Single Ended	2090		2415	2155		2480	2215		2540	mV
VIL	Input LOW Voltage Single Ended	1365		1690	1430		1755	1490		1815	mV
VBB	Output Voltage Reference	1750	1850	1950	1800	1900	2000	1850	1950	2050	mV
VIHCMR	Input HIGH Voltage Common Mode Range (Note 7.)	2.0		3.3	2.0		3.3	2.0		3.3	V
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current  SEL, D 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.  $V_{CC} = 3.3V$ ,  $V_{EE} = 0V$ , 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	
IEE	Power Supply Current (Note 9.)	40	52	65	40	52	65	40	52	65	mA
VOH	Output HIGH Voltage (Note 10.)	3865	3940	4115	3930	4055	4180	3990	4115	4240	mV
VOL	Output LOW Voltage (Note 10.)	3005	3190	3315	3005	3255	3380	3005	3315	3440	mV
VIH	Input HIGH Voltage Single Ended	3790		4115	3855		4180	3915		4240	mV
VIL	Input LOW Voltage Single Ended	3065		3390	3130		3455	3190		3515	mV
VBB	Output Voltage Reference	3450	3550	3650	3500	3600	3700	3550	3650	3750	mV
VIHCMR	Input HIGH Voltage Common Mode Range (Note 11.)	2.0		5.0	2.0		5.0	2.0		5.0	V
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current  SEL, D 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  $V_{CC}$ .

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## 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					GHz
$t_{PLH}$ , $t_{PHL}$	Propagation Delay to Output Differential D→Q, $\bar{Q}$ COM_SEL, SEL→Q, $\bar{Q}$	250 300	350 400	450 500	275 320	375 420	475 520	320 320	420 450	520 575	ps
$t_{SKEW}$	Within-Device Skew (Note 14.) Duty Cycle Skew (Note 15.)			100			100			100	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 (20% – 80%) Q, $\bar{Q}$	70	120	170	70	140	200	70	150	220	ps

13.  $F_{max}$  guaranteed for functionality only.

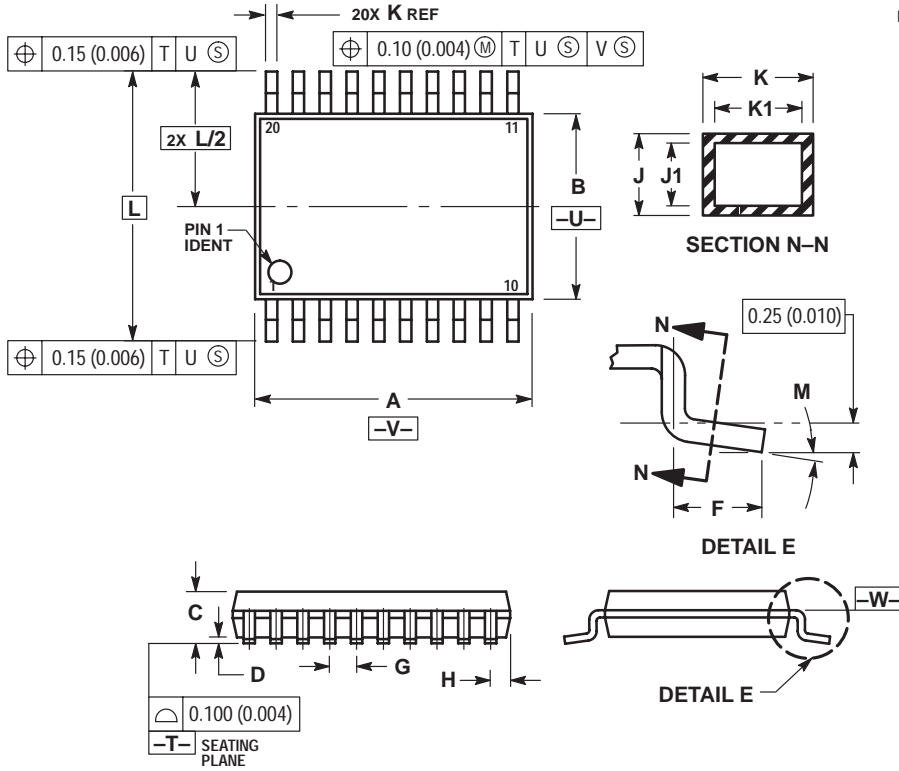
14. Within-Device Skew is defined as identical transitions on similar paths through a device.

15. 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.

# MC10EP57

## PACKAGE DIMENSIONS

TSSOP-20  
DT SUFFIX  
20 PIN PLASTIC TSSOP PACKAGE  
CASE 948E-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. 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-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
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	0.27	0.37	0.011	0.015
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°

**Notes**

**Notes**

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