MC10EP57, MC100EP57

3.3V / 5V ECL 4:1 Differential Multiplexer

http://onsemi.com

Description

The MC10/100EP57 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.

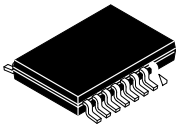
The SEL1 is the most significant select line. The binary number applied to the select inputs will select the same numbered data input (i.e., 00 selects D0).

Multiple V_{BB} outputs are provided. The V_{BB} pin, an internally generated voltage supply, is available to this device only. For single−ended input conditions, the unused differential input is connected to V_{BB} as a switching reference voltage. V_{BB} may also rebias AC coupled inputs. When used, decouple V_{BB} and V_{CC} via a 0.01 μF capacitor and limit current sourcing or sinking to 0.5 mA. When not used, V_{BB} should be left open.

The 100 Series contains temperature compensation.

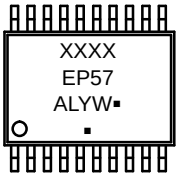
Features

- 375 ps Typical Propagation Delays
- Maximum Frequency > 2 GHz Typical
- PECL Mode Operating Range:
  V_{CC} = 3.0 V to 5.5 V with V_{EE} = 0 V
- NECL Mode Operating Range:
  V_{CC} = 0 V with V_{EE} = −3.0 V to −5.5 V
- Open Input Default State
- Safety Clamp on Inputs
- Q Output will default LOW with inputs open or at V_{EE}
- V_{BB} Outputs
- Useful as Either 4:1 or 2:1 Multiplexer
- These Devices are Pb−Free and are RoHS Compliant

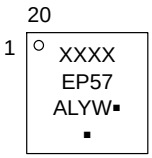


TSSOP−20
DT SUFFIX
CASE 948E

MARKING DIAGRAM*



QFN−20
MN SUFFIX
CASE 485E



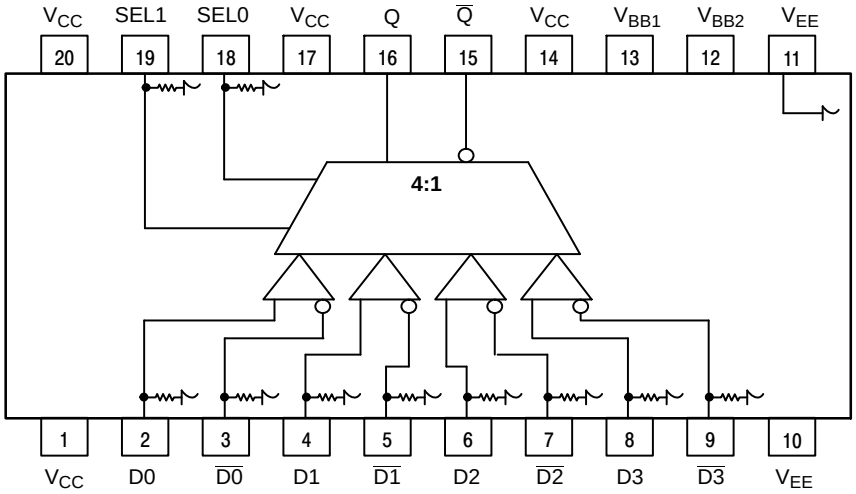
xxx	= MC10 or 100
A	= Assembly Location
L	= Wafer Lot
Y	= Year
W	= Work Week
▪	= Pb−Free Package

(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.



Warning: All V_{CC} and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. 20−Lead Package (Top View) **and Logic Diagram**

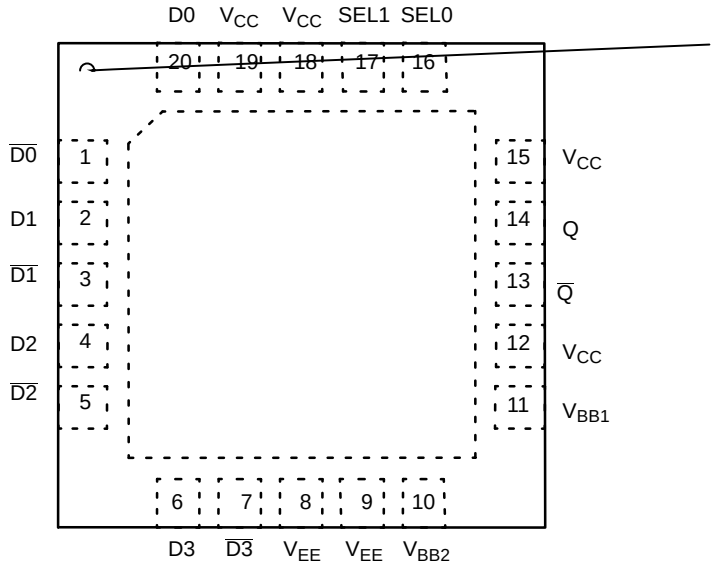


Figure 1. QFN−20 Pinout (Top View)

Table 3. ATTRIBUTES

Characteristics		Value	
Internal Input Pulldown Resistor		75 kΩ	
Internal Input Pullup Resistor		N/A	
ESD Protection	Human Body Model Machine Model Charged Device Model	> 4 kV > 100 V > 2 kV	
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)		Pb Pkg	Pb−Free Pkg
	TSSOP−20 QFN−20	Level 1 N/A	Level 3 Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
Transistor Count		584 Devices	
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test			

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

Table 4. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Mode Power Supply	V_{EE} = 0 V		6	V
V_{EE}	NECL Mode Power Supply	V_{CC} = 0 V		−6	V
V_I	PECL Mode Input Voltage NECL Mode Input Voltage	V_{EE} = 0 V V_{CC} = 0 V	$V_I \le V_{CC}$ $V_I \ge V_{EE}$	6 −6	V V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
T_A	Operating Temperature Range			−40 to +85	°C
T_{stg}	Storage Temperature Range				

Table 5. 10EP DC CHARACTERISTICS, PECL V_{CC} = 3.3 V, V_{EE} = 0 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	40	52	65	40	52	65	40	52	65	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 V										

Table 7. 10EP DC CHARACTERISTICS, NECL V_{CC} = 0 V, V_{EE} = −5.5 V to −3.0 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	40	52	65	40	52	65	40	52	65	mA
VOH	Output HIGH Voltage (Note 9)	−1135	−1010	−885	−1070	−945	−820	−1010	−885	−760	mV
V_{OL}	Output LOW Voltage (Note 9)	−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	−1465	−1310	−1445	−1400	−1245	−1385	−1340	−1185	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 10)	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	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.

8. Input and output parameters vary 1:1 with V_{CC}.
9. All loading with 50 Ω to V_{CC} − 2.0 V.
10. V_{IHCMR} min varies 1:1 with V_{EE}, 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 8. 100EP DC CHARACTERISTICS, PECL V_{CC} = 3.3 V, V_{EE} = 0 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	40	52	65	40	52	65	40	52	65	mA
V_{OH}	Output HIGH Voltage (Note 12)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
V_{OL}	Output LOW Voltage (Note 12)	1305	1480	1605	1305	1480	1605	1305	1480	1605	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	2075		2420	2075		2420	2075		2420	mV
V_{IL}	Input LOW Voltage (Single−Ended)	1305		1675	1305		1675	1305		1675	mV
V_{BB}	Output Voltage Reference	1775	1875	1975	1775	1875	1975	1775	1875	1975	mV

Table 9. 100EP DC CHARACTERISTICS, PECL V_{CC} = 5.0 V, V_{EE} = 0 V (Note 14)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current	40	52	65	40	52	65	40	52	65	mA
V_{OH}	Output HIGH Voltage (Note 15)	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV
V_{OL}	Output LOW Voltage (Note 15)	3005	3180	3305	3005	3180	3305	3005	3180	3305	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	3775		4120	3775		4120	3775		4120	mV
V_{IL}	Input LOW Voltage (Single−Ended)	3005		3375	3005		3375	3005		3375	mV
V_{BB}	Output Voltage Reference	3475	3575	3675	3475	3575	3675	3475	3575	3675	

Table 11. AC CHARACTERISTICS V_{CC} = 0 V; V_{EE} = −3.0 V to −5.5 V or V_{CC} = 3.0 V to 5.5 V; V_{EE} = 0 V (Note 20)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Frequency (Figure 2)		> 3			> 3			> 3		GHz
t_{PLH}, t_{PHL}	Propagation Delay to Output Differential										ps
	D to Q, $\overline{Q}$	250	350	450	275	375	475	320	420	520	
	COM_SEL, SEL to Q, $\overline{Q}$	300	400	500	320	420	520	320	450	575	
t_{SKEW}	Device to Device Skew (Note 21)			200			200			200	ps
t_{JITTER}	CLOCK Random Jitter (RMS)										ps
	@ ≤ 0.5 GHz		0.122	0.3		0.140	0.3		0.172	0.3	
	@ ≤ 1.0 GHz		0.110	0.3		0.135	0.3		0.151	0.3	
	@ ≤ 1.5 GHz		0.112	0.3		0.132	0.3		0.152	0.3	
	@ ≤ 2.0 GHz		0.128	0.3		0.139	0.3		0.163	0.3	
	@ ≤ 2.5 GHz		0.114	0.3		0.129	0.3		0.177	0.3	
	@ ≤ 3.0 GHz		0.116	0.3		0.152	0.3		0.305	1.0	
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 Q, $\overline{Q}$ (20% − 80%)	70	120	170	70	140	200	70	150	220	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.

20. Measured using a 750 mV source, 50% duty cycle clock source. All loading with 50 Ω to V_{CC} − 2.0 V.
21. 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.

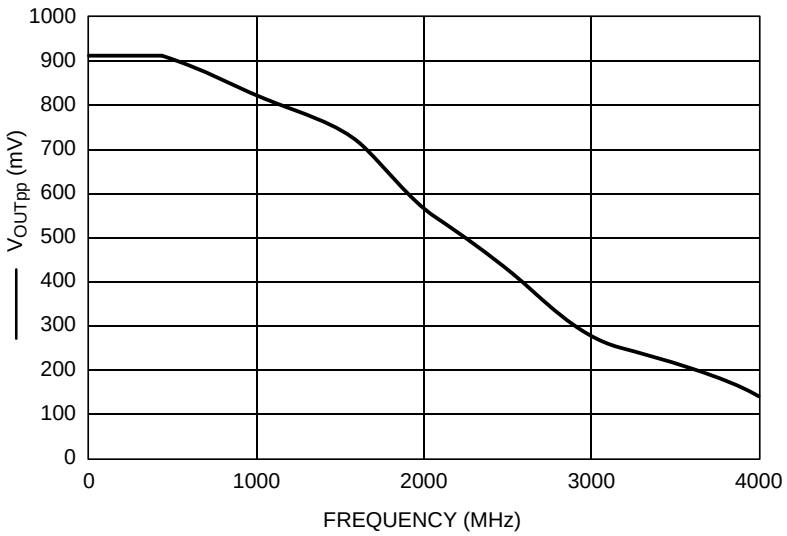


Figure 2. F_{max}

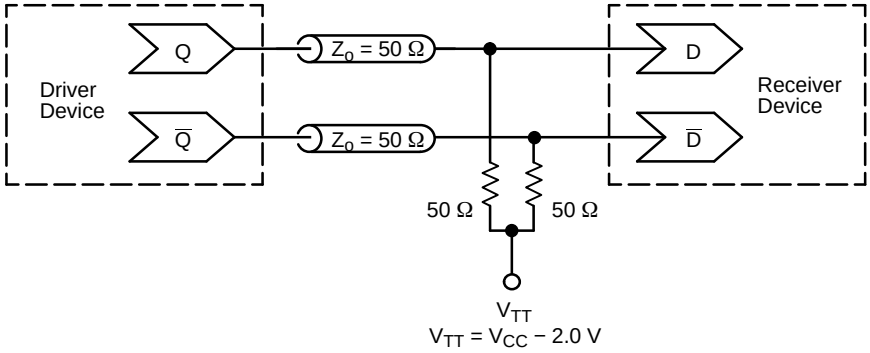


Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D − Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping†
MC10EP57DTG	TSSOP−20 (Pb−Free)	75 Units / Rail
MC10EP57DTR2G	TSSOP−20 (Pb−Free)	2500 / Tape & Reel
MC10EP57MNG	QFN−20 (Pb−Free)	92 Units / Rail
MC10EP57MNTXG	QFN−20 (Pb−Free)	3000 / Tape & Reel
MC100EP57DTG	TSSOP−20 (Pb−Free)	75 Units / Rail
MC100EP57DTR2G	TSSOP−20 (Pb−Free)	2500 / Tape & Reel
MC100EP57MNG	QFN−20 (Pb−Free)	92 Units / Rail
MC100EP57MNTXG	QFN−20 (Pb−Free)	3000 / 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

TSSOP−20 WB