5.0 V ECL 1:2 Differential Fanout Buffer

The MC10EL/100EL11 is a differential 1:2 fanout buffer. The device is functionally similar to the E111 device but with higher performance capabilities. The within-device skew and propagation delay is significantly improved over the E111.

The differential inputs of the EL11 employ clamping circuitry to maintain stability under open input conditions. If the inputs are left open (pulled to V_{EE}) the Q outputs will go LOW.

The 100 Series contains temperature compensation.

Features

- 265 ps Propagation Delay
- 5 ps Skew Between Outputs
- PECL Mode Operating Range: $V_{CC} = 4.2$ V to 5.7 with $V_{EE} = 0$ V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = -4.2 V to -5.7 V
- Internal Input Pulldown Resistors
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

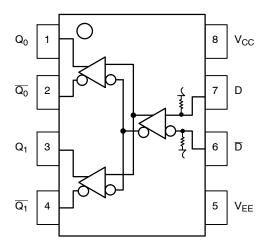
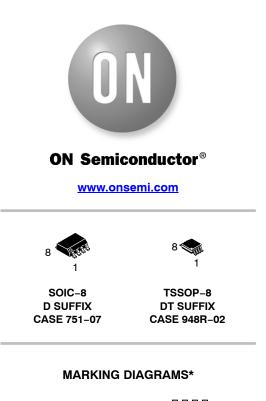
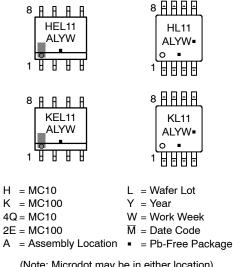


Figure 1. Logic Diagram and Pinout Assignment

Table 1. PIN DESCRIPTION

PIN	FUNCTION
D, D	ECL Data Inputs
Q0, <u>Q0;</u> Q1, <u>Q1</u>	ECL Data Outputs
V _{CC}	Positive Supply
V _{EE}	Negative Supply





(Note: Microdot may be in either location) *For additional marking information, refer to Application Note <u>AND8002/D</u>.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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Table 2. ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	75 KΩ
Internal Input Pullup Resistor	N/A
ESD Protection Human Body Model Machine Model	> 1 KV > 100 V
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Pb-Free Pkg
SOIC-8 TSSOP-8	Level 1 Level 3
Flammability Rating Oxygen Index: 28 to 34	UL 94 V–0 @ 0.125 in
Transistor Count	44
Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

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

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V _{CC}	PECL Mode Power Supply	V _{EE} = 0 V		8	V
V_{EE}	NECL Mode Power Supply	$V_{CC} = 0 V$		-8	V
VI	PECL Mode Input Voltage NECL Mode Input Voltage	V _{EE} = 0 V V _{CC} = 0 V	$\begin{array}{l} V_I \leq V_{CC} \\ V_I \geq V_{EE} \end{array}$	6 -6	V
I _{out}	Output Current	Continuous Surge		50 100	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 500 lfpm	SOIC-8	190 130	°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 500 lfpm	TSSOP-8	185 140	°C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44 ± 5%	°C/W
T _{sol}	Wave Solder (Pb-Free)	<2 to 3 sec @ 260°C		265	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected. 1. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

Table 4. 10EL SERIES PECL DC CHARACTERISTICS (V_{CC} = 5.0 V; V_{EE} = 0.0 V (Note 1))

			-40°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
I _{EE}	Power Supply Current		26	31		26	31		26	31	mA
V _{OH}	Output HIGH Voltage (Note 2)	3920	4010	4110	4020	4105	4190	4090	4185	4280	mV
V _{OL}	Output LOW Voltage (Note 2)	3050	3200	3350	3050	3210	3370	3050	3227	3405	mV
V _{IH}	Input HIGH Voltage (Single-Ended)	3770		4110	3870		4190	3940		4280	mV
V _{IL}	Input LOW Voltage (Single-Ended)	3050		3500	3050		3520	3050		3555	mV
VIHCMR	Input HIGH Voltage Common Mode Range (Differential) (Note 3)	2.5		4.6	2.5		4.6	2.5		4.6	V
I _{IH}	Input HIGH Current			150			150			150	μA
Ι _{ΙL}	Input LOW Current	0.5			0.5			0.3			μΑ

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.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.25 V / –0.5 V.

Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V. 2.

3. VIHCMR min varies 1:1 with VEE, VIHCMR max varies 1:1 with VCC. The VIHCMR range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between VPPmin and 1 V.

Table 5. 10EL SERIES NECL DC CHARACTERISTICS (V_{CC} = 0.0 V; V_{EE} = -5.0 V (Note 1))

			-40°C		25°C		85°C				
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
I _{EE}	Power Supply Current		26	31		26	31		26	31	mA
V _{OH}	Output HIGH Voltage (Note 2)	-1080	-990	-890	-980	-895	-810	-910	-815	-720	mV
V _{OL}	Output LOW Voltage (Note 2)	-1950	-1800	-1650	-1950	-1790	-1630	-1950	-1773	-1595	mV
V _{IH}	Input HIGH Voltage (Single-Ended)	-1230		-890	-1130		-810	-1060		-720	mV
VIL	Input LOW Voltage (Single-Ended)	-1950		-1500	-1950		-1480	-1950		-1445	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3)	-2.5		-0.4	-2.5		-0.4	-2.5		-0.4	V
I _{IH}	Input HIGH Current			150			150			150	μA
۱ _{IL}	Input LOW Current	0.5			0.5			0.3			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.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.25 V / -0.5 V. 2. Outputs are terminated through a 50 Ω resistor to V_{CC} - 2.0 V.

3. VIHCMR min varies 1:1 with VEE, VIHCMR max varies 1:1 with VCC. The VIHCMR range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between VPPmin and 1 V.

Table 6. 100EL SERIES PECL DC CHARACTERISTICS (V_{CC} = 5.0 V; V_{EE} = 0.0 V (Note 1))

			−40°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
I _{EE}	Power Supply Current		26	31		26	31		30	36	mA
V _{OH}	Output HIGH Voltage (Note 2)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
V _{OL}	Output LOW Voltage (Note 2)	3170	3305	3445	3190	3295	3380	3190	3295	3380	mV
V _{IH}	Input HIGH Voltage (Single-Ended)	3835		4120	3835		4120	3835		4120	mV
V _{IL}	Input LOW Voltage (Single-Ended)	3190		3525	3190		3525	3190		3525	mV
VIHCMR	Input HIGH Voltage Common Mode Range (Differential) (Note 3)	2.5		4.6	2.5		4.6	2.5		4.6	V
I _{IH}	Input HIGH Current			150			150			150	μA
Ι _{ΙL}	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.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.8 V / -0.5 V.

2. Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V.

3. 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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{PP}min and 1 V.

Table 7. 100EL SERIES NECL DC CHARACTERISTICS ($V_{CC} = 0.0 \text{ V}$; $V_{EE} = -5.0 \text{ V}$ (Note 1))

			–40°C		25°C		85°C				
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
I _{EE}	Power Supply Current		26	31		26	31		30	36	mA
V _{OH}	Output HIGH Voltage (Note 2)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
V _{OL}	Output LOW Voltage (Note 2)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV
VIH	Input HIGH Voltage (Single-Ended)	-1165		-880	-1165		-880	-1165		-880	mV
VIL	Input LOW Voltage (Single-Ended)	-1810		-1475	-1810		-1475	-1810		-1475	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3)	-2.5		-0.4	-2.5		-0.4	-2.5		-0.4	V
I _{IH}	Input HIGH Current			150			150			150	μA
IIL	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.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.8 V / -0.5 V.

2. Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V.

 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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{PP}min and 1 V.

			-40°C		25°C		85°C				
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
fmax	Maximum Toggle Frequency					1.5					GHz
t _{PLH} t _{PHL}	Propagation Delay to Output	135	260	385	190	265	340	215	29*0	365	ps
t _{SKEW}	Within-Device Skew (Note 2) Duty Cycle Skew (Note 3)		5			5	20		5	20	ps
t JITTER	Random Clock Jitter (RMS)					0.6					ps
V _{PP}	Input Swing (Note 4)	150		1000	150		1000	150		1000	mV
t _r t _f	Output Rise/Fall Times Q (20% – 80%)	100	225	350	100	225	350	100	225	350	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.

1. 10 Series: V_{EE} can vary +0.25 V / –0.5 V.

100 Series: $\overline{V_{EE}}$ can vary +0.8 V / -0.5 V.

2. Within-device skew defined as identical transitions on similar paths through a device.

3. Duty cycle skew is the difference between a t_{PLH} and t_{PHL} propagation delay through a device.

4. V_{PP}(min) is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈ 40.

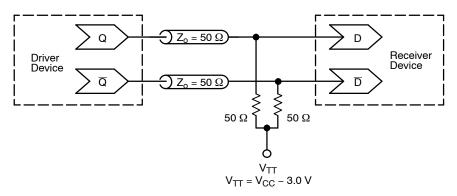


Figure 2. Typical Termination for Output Driver and Device Evaluation (See Application Note <u>AND8020/D</u> – Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping [†]				
MC10EL11DG	SOIC-8 (Pb-Free)	98 Units / Rail				
MC10EL11DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel				
MC10EL11DTG	TSSOP-8 (Pb-Free)	100 Units / Rail				
MC100EL11DG	SOIC-8 (Pb-Free)	98 Units / Rail				
MC100EL11DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel				
MC100EL11DTG	TSSOP-8 (Pb-Free)	100 Units / Rail				
MC100EL11DTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel				

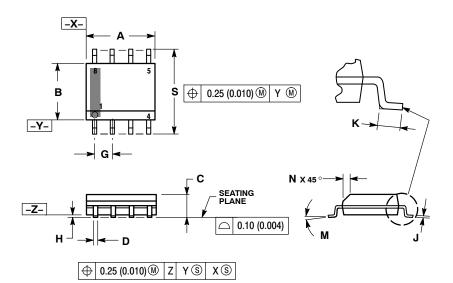
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, <u>BRD8011/D</u>.

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

PACKAGE DIMENSIONS

SOIC-8 NB CASE 751-07 **ISSUE AK**

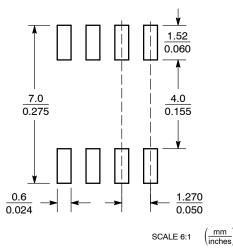


NOTES:

- 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 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE 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.
- STANDARD IS 751-07.

	MILLIN	IETERS	INC	HES		
DIM	MIN	MAX	MIN	MAX		
Α	4.80	5.00	0.189	0.197		
В	3.80	4.00	0.150	0.157		
С	1.35	1.75	0.053	0.069		
D	0.33	0.51	0.013	0.020		
G	1.27	7 BSC	0.050 BSC			
Н	0.10	0.25	0.004	0.010		
ſ	0.19	0.25	0.007	0.010		
К	0.40	1.27	0.016	0.050		
М	0 °	8 °	0 °	8 °		
Ν	0.25	0.50	0.010	0.020		
S	5.80	6.20	0.228	0.244		

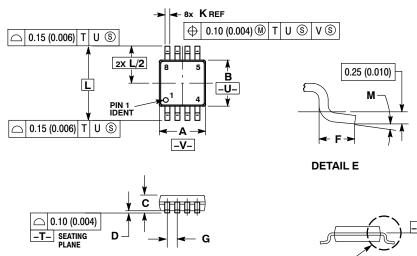
SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

TSSOP-8 CASE 948R-02 ISSUE A



DETAIL E	
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NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: MILLIMETER.
- CONTROLLING DIMENSION: MILLIMETER.
 DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH. OR GATE BURRS SHALL NOT EXCEED 0.15 (0.069) EED EIDE
- OLOBÓ PER SIDE.
 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.
 DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α	2.90	3.10	0.114	0.122
В	2.90	3.10	0.114	0.122
С	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	
Κ	0.25	0.40	0.010	0.016
L	4.90 BSC		0.193 BSC	
M	0°	6 °	0°	6 °

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