

MC100LVEL16

3.3V ECL Differential Receiver

The MC100LVEL16 is a differential receiver. The device is functionally equivalent to the EL16 device, operating from a 3.3 V supply. The LVEL16 exhibits a wider V_{IHCMR} range than its EL16 counterpart. With output transition times and propagation delays comparable to the EL16 the LVEL16 is ideally suited for interfacing with high frequency sources at 3.3 V supplies.

Under open input conditions, the Q input will be pulled down to V_{EE} and the \bar{Q} input will be biased to $V_{CC}/2$. This condition will force the Q output low.

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.

- 300 ps Propagation Delay
- High Bandwidth Output Transitions
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: $V_{CC} = 3.0 \text{ V}$ to 3.8 V with $V_{EE} = 0 \text{ V}$
- NECL Mode Operating Range: $V_{CC} = 0 \text{ V}$ with $V_{EE} = -3.0 \text{ V}$ to -3.8 V
- Internal Input Pulldown Resistors on D, Pullup and Pulldown Resistors on \bar{D}
- Q Output will Default LOW with Inputs Open or at V_{EE}

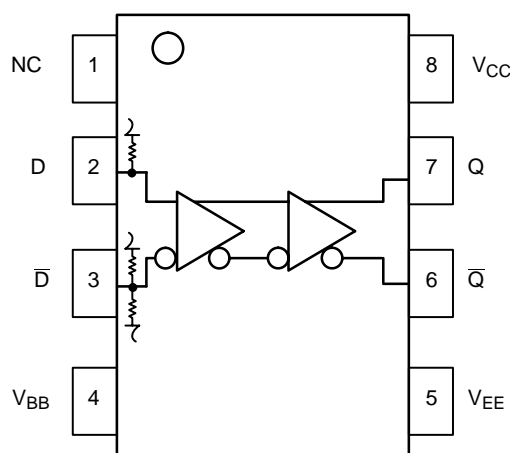


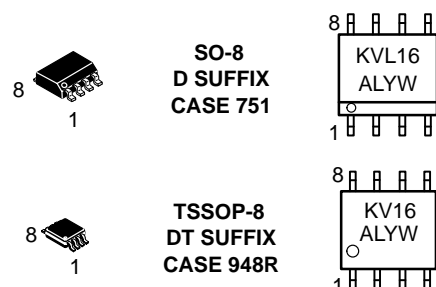
Figure 1. Logic Diagram and Pinout Assignment



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MARKING DIAGRAMS*



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

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

Device	Package	Shipping†
MC100LVEL16D	SO-8	98 Units / Rail
MC100LVEL16DR2	SO-8	2500 Tape & Reel
MC100LVEL16DT	TSSOP-8	98 Units / Rail
MC100LVEL16DTR2	TSSOP-8	2500 Tape & Reel

†For additional tape and reel information, refer to Brochure BRD8011/D.

PIN DESCRIPTION

PIN	FUNCTION
D, \bar{D}	ECL Data Inputs
Q, \bar{Q}	ECL Data Outputs
V_{BB}	Reference Voltage Output
V_{CC}	Positive Supply
V_{EE}	Negative Supply
NC	No Connect

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ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	75 k Ω
Internal Input Pullup Resistor	75 k Ω
ESD Protection	Human Body Model Machine Model Charged Device Model
	> 4 kV > 400 V > 2 kV
Moisture Sensitivity (Note 1)	Level 1
Flammability Rating	Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in
Transistor Count	79
Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

1. Refer to Application Note AND8003/D for additional information.

MAXIMUM RATINGS (Note 2)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V _{CC}	PECL Mode Power Supply	V _{EE} = 0 V		8 to 0	V
V _{EE}	NECL Mode Power Supply	V _{CC} = 0 V		-8 to 0	V
V _I	PECL Mode Input Voltage NECL Mode Input Voltage	V _{EE} = 0 V V _{CC} = 0 V	V _I ≤ V _{CC} V _I ≥ V _{EE}	6 to 0 -6 to 0	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			-65 to +150	°C
θ _{JA}	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	SO-8 SO-8	190 130	°C/W °C/W
θ _{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	SO-8	41 to 44 ± 5%	°C/W
θ _{JA}	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
θ _{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44 ± 5%	°C/W
T _{sol}	Wave Solder	<2 to 3 sec @ 248°C		265	°C

2. Maximum Ratings are those values beyond which device damage may occur.

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LVPECL DC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$; $V_{EE} = 0.0\text{ V}$ (Note 3)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current		17	23		17	23		18	24	mA
V_{OH}	Output HIGH Voltage (Note 4)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
V_{OL}	Output LOW Voltage (Note 4)	1470	1605	1745	1490	1595	1680	1490	1595	1680	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	2135		2420	2135		2420	2135		2420	mV
V_{IL}	Input LOW Voltage (Single-Ended)	1490		1825	1490		1825	1490		1825	mV
V_{BB}	Output Voltage Reference	1.92		2.04	1.92		2.04	1.92		2.04	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 5) $V_{pp} < 500\text{ mV}$ $V_{pp} \geq 500\text{ mV}$	1.2		2.9	1.1		2.9	1.1		2.9	V
		1.5		2.9	1.4		2.9	1.4		2.9	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	D	0.5		0.5			0.5			μA
		D	-600		-600			-600			μA

NOTE: Devices 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 air flow greater than 500 lfm is maintained.

3. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $\pm 0.3\text{ V}$.

4. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2\text{ V}$.

5. V_{IHCMR} min varies 1:1 with V_{EE} , 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_{ppmin} and 1 V .

LVNECL DC CHARACTERISTICS $V_{CC} = 0.0\text{ V}$; $V_{EE} = -3.3\text{ V}$ (Note 6)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current		17	23		17	23		18	24	mA
V_{OH}	Output HIGH Voltage (Note 7)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
V_{OL}	Output LOW Voltage (Note 7)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	-1 165		-880	-1 165		-880	-1 165		-880	mV
V_{IL}	Input LOW Voltage (Single-Ended)	-1810		-1475	-1810		-1475	-1810		-1475	mV
V_{BB}	Output Voltage Reference	-1.38		-1.26	-1.38		-1.26	-1.38		-1.26	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 8) $V_{pp} < 500\text{ mV}$ $V_{pp} \geq 500\text{ mV}$	-2.1		-0.4	-2.2		-0.4	-2.2		-0.4	V
		-1.8		-0.4	-1.9		-0.4	-1.9		-0.4	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	D	0.5		0.5			0.5			μA
		D	-600		-600			-600			μA

NOTE: Devices 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 air flow greater than 500 lfm is maintained.

6. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $\pm 0.3\text{ V}$.

7. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2\text{ V}$.

8. V_{IHCMR} min varies 1:1 with V_{EE} , 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_{ppmin} and 1 V .

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AC CHARACTERISTICS $V_{CC}= 3.3\text{ V}$; $V_{EE}= 0.0\text{ V}$ or $V_{CC}= 0.0\text{ V}$; $V_{EE}= -3.3\text{ V}$ (Note 9)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{\max}	Maximum Toggle Frequency		1.75			1.75			1.75		GHz
t_{PLH} t_{PHL}	Propagation Delay to Output Differential Single-Ended	150 100	275 275	400 450	225 175	300 300	375 425	240 190	315 315	390 440	ps
t_{SKEW}	Duty Cycle Skew (Differential) (Note 10)		5	30		5	20		5	20	ps
t_{JITTER}	Random Clock Jitter (RMS)		0.7			0.7			0.7		ps
V_{PP}	Input Swing (Note 11)	150		1000	150		1000	150		1000	mV
t_r t_f	Output Rise/Fall Times Q (20% - 80%)	120	220	320	120	220	320	120	220	320	ps

9. V_{EE} can vary $\pm 0.3\text{ V}$.

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

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

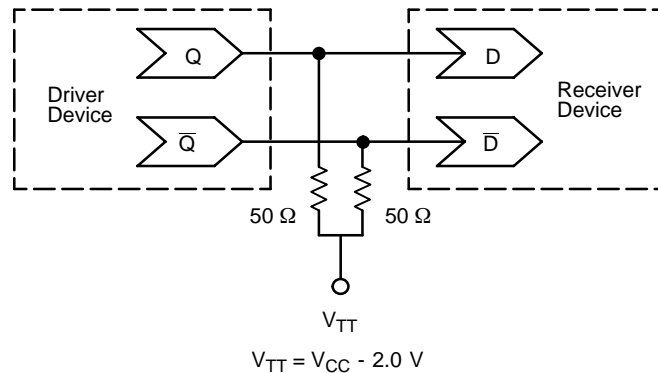


Figure 2. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020 - Termination of ECL Logic Devices.)

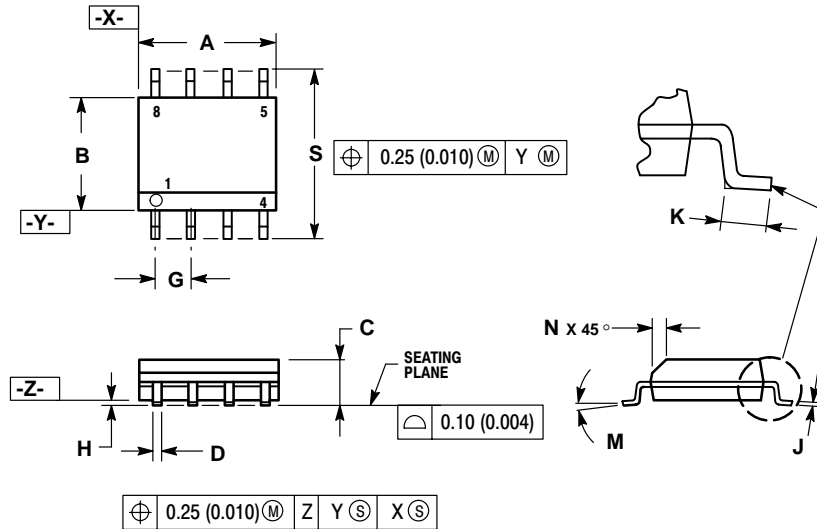
Resource Reference of Application Notes

- AN1404** - ECLinPS Circuit Performance at Non-Standard V_{IH} Levels
- AN1405** - ECL Clock Distribution Techniques
- AN1406** - Designing with PECL (ECL at +5.0 V)
- AN1503** - ECLinPS I/O SPICE Modeling Kit
- AN1504** - Metastability and the ECLinPS Family
- AN1560** - Low Voltage ECLinPS SPICE Modeling Kit
- AN1568** - Interfacing Between LVDS and ECL
- AN1596** - ECLinPS Lite Translator ELT Family SPICE I/O Model Kit
- AN1650** - Using Wire-OR Ties in ECLinPS Designs
- AN1672** - The ECL Translator Guide
- AND8001** - Odd Number Counters Design
- AND8002** - Marking and Date Codes
- AND8020** - Termination of ECL Logic Devices
- AND8090** - AC Characteristics of ECL Devices

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PACKAGE DIMENSIONS

SO-8 D SUFFIX PLASTIC SOIC PACKAGE CASE 751-07 ISSUE AA



NOTES:

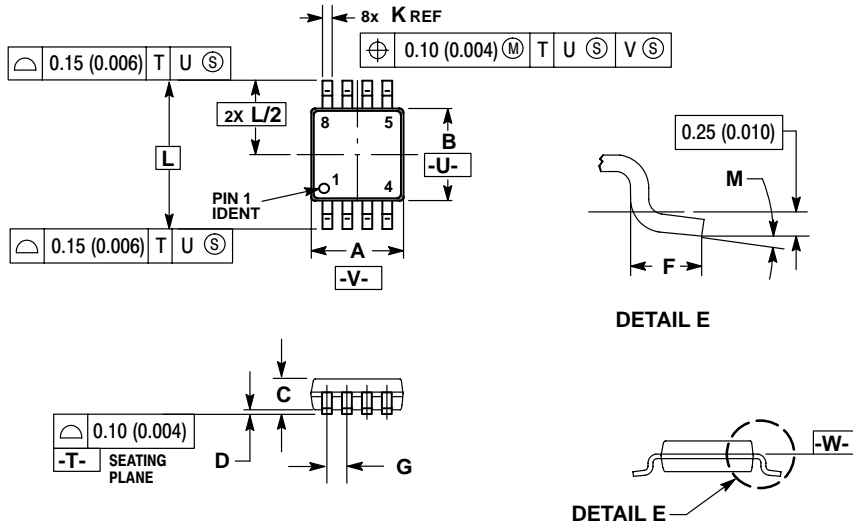
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL 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

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PACKAGE DIMENSIONS

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



- NOTES:
1. DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
 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. 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°

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