

# MC10EL89

## 5V ECL Coaxial Cable Driver

The MC10EL89 is a differential fanout gate specifically designed to drive coaxial cables. The device is especially useful in Digital Video Broadcasting applications; for this application, since the system is polarity free, each output can be used as an independent driver. The driver boasts a gain of approximately 40 and produces output swings twice as large as a standard ECL output. When driving a coaxial cable, proper termination is required at both ends of the line to minimize signal loss. The 1.6 V output swings allow for termination at both ends of the cable, while maintaining the required 800 mV swing at the receiving end of the cable. Because of the larger output swings, the device cannot be terminated into the standard -2.0 V. All of the DC parameters are tested with a 50  $\Omega$  to -3.0 V load. The driver accepts a standard differential ECL input and can run off of the Digital Video Broadcast standard -5.0 V supply.

- 375 ps Propagation Delay
- 1.6 V Output Swings
- PECL Mode Operating Range:  $V_{CC} = 4.2$  V to 5.7 V 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

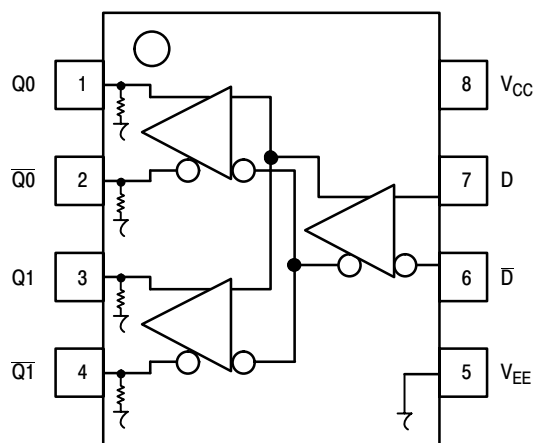


Figure 1. Logic Diagram and Pinout Assignment

### PIN DESCRIPTION

PIN	Function
D, $\bar{D}$	ECL Data Inputs
Q0, $\bar{Q0}$ ; Q1, $\bar{Q1}$	ECL Data Outputs (1.6 V <sub>pp</sub> )
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply



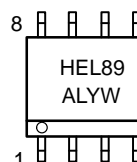
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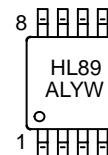
### MARKING DIAGRAMS\*



SO-8  
D SUFFIX  
CASE 751



TSSOP-8  
DT SUFFIX  
CASE 948R



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†
MC10EL89D	SO-8	98 Units / Rail
MC10EL89DR2	SO-8	2500 Tape & Reel
MC10EL89DT	TSSOP-8	100 Units / Rail
MC10EL89DTR2	TSSOP-8	2500 Tape & Reel

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

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## ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	50 K $\Omega$
Internal Input Pullup Resistor	N/A
ESD Protection Human Body Model Machine Model	> 2 KV > 100 V
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Level 1
Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in
Transistor Count	31
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

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

## MAXIMUM RATINGS (Note 2)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		8	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		-8	V
V <sub>I</sub>	PECL Mode Input Voltage NECL Mode Input Voltage	V <sub>EE</sub> = 0 V V <sub>CC</sub> = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub> V <sub>I</sub> ≥ V <sub>EE</sub>	6 -6	V V
I <sub>out</sub>	Output Current	Continuous Surge		50 100	mA mA
T <sub>A</sub>	Operating Temperature Range			-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	SO-8 SO-8	190 130	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SO-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44 ± 5%	°C/W
T <sub>sol</sub>	Wave Solder	<2 to 3 sec @ 248°C		265	°C

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

## 10EL SERIES PECL DC CHARACTERISTICS V<sub>CC</sub> = 5.0 V; V<sub>EE</sub> = 0.0 V (Note 3)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current		23	28		23	28		23	28	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 4)	3.77	3.90	4.02	3.87	3.98	4.10	3.94	4.04	4.19	V
V <sub>OL</sub>	Output LOW Voltage (Note 4)	2.10	2.28	2.42	2.00	2.30	2.44	1.95	2.33	2.49	V
V <sub>IH</sub>	Input HIGH Voltage (Single-Ended)	3770		4110	3870		4190	3940		4280	mV
V <sub>IL</sub>	Input LOW Voltage (Single-Ended)	3050		3500	3050		3520	3050		3555	mV
V <sub>IHCMR</sub>	Input HIGH Voltage Common Mode Range (Differential) (Note 5)	2.5		4.6	2.5		4.6	2.5		4.6	V
I <sub>IH</sub>	Input HIGH Current		70	150		50	150		40	150	μA
I <sub>IL</sub>	Input LOW Current	0.5	50		0.5	30		0.3	25		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 lpm is maintained.

3. Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary +0.25 V / -0.5 V.

4. Outputs are terminated through a 50 ohm resistor to V<sub>CC</sub> -3 volts.

5. V<sub>IHCMR</sub> min varies 1:1 with V<sub>EE</sub>. V<sub>IHCMR</sub> max varies 1:1 with V<sub>CC</sub>. The V<sub>IHCMR</sub> 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<sub>ppmin</sub> and 1 V.

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## 10EL SERIES NECL DC CHARACTERISTICS $V_{CC} = 0.0\text{ V}$ ; $V_{EE} = -5.0\text{ V}$ (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		23	28		23	28		23	28	mA
$V_{OH}$	Output HIGH Voltage (Note 7)	-1.23	-1.10	-0.98	-1.13	-1.02	-0.90	-1.06	-0.96	-0.81	V
$V_{OL}$	Output LOW Voltage (Note 7)	-2.90	-2.72	-2.58	-3.00	-2.70	-2.56	-3.05	-2.67	-2.51	V
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1230		-890	-1130		-810	-1060		-720	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1950		-1500	-1950		-1480	-1950		-1445	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential) (Note 8)	-2.5		-0.4	-2.5		-0.4	-2.5		-0.4	V
$I_{IH}$	Input HIGH Current		70	150		50	150		20	150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5	50		0.5	30		0.3	25		$\mu\text{A}$

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 +0.25 V / -0.5 V.

7. Outputs are terminated through a 50 ohm resistor to  $V_{CC}$  -3 volts.

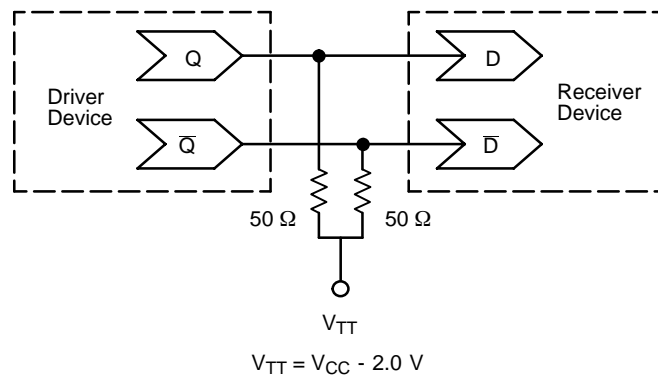
8.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and 1 V.

## AC CHARACTERISTICS $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0.0\text{ V}$ or $V_{CC} = 0.0\text{ V}$ ; $V_{EE} = -5.0\text{ V}$ (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					1.5					Gb/s
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output	200	340	480	260	350	440	310	400	490	ps
$t_{SKEW}$	Within-Device Skew		5	20		5	20		5	20	ps
$t_{JITTER}$	Random Clock Jitter (RMS)		5			5			5		ps
$V_{PP}$	Input Swing (Note 10)					400					mV
$t_r$ $t_f$	Output Rise/Fall Times Q (20% - 80%)	205	330	455	205	330	455	205	330	455	ps

9.  $V_{EE}$  can vary +0.25 V / -0.5 V.

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



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

## MC10EL89

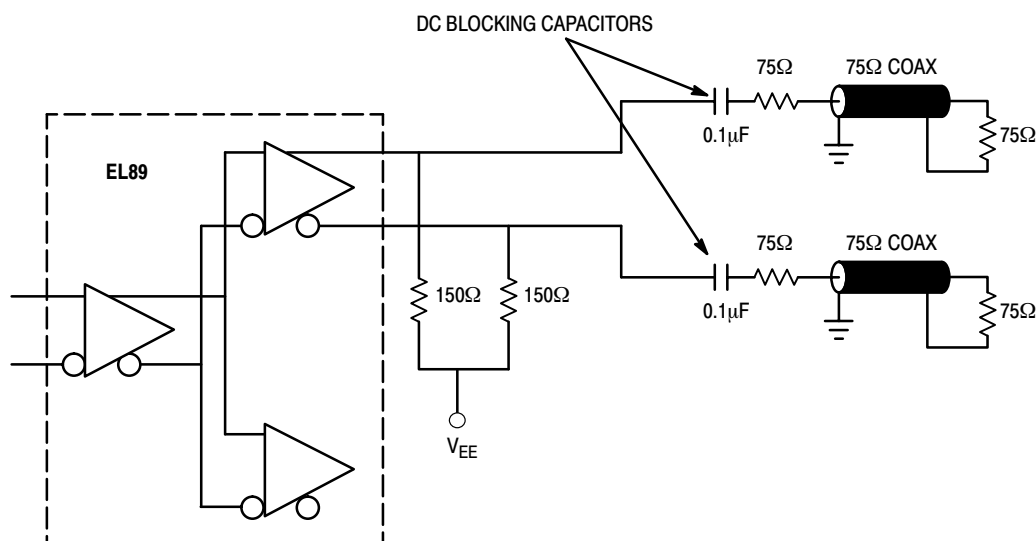


Figure 3. EL89 CATV Termination Configuration

### Resource Reference of Application Notes

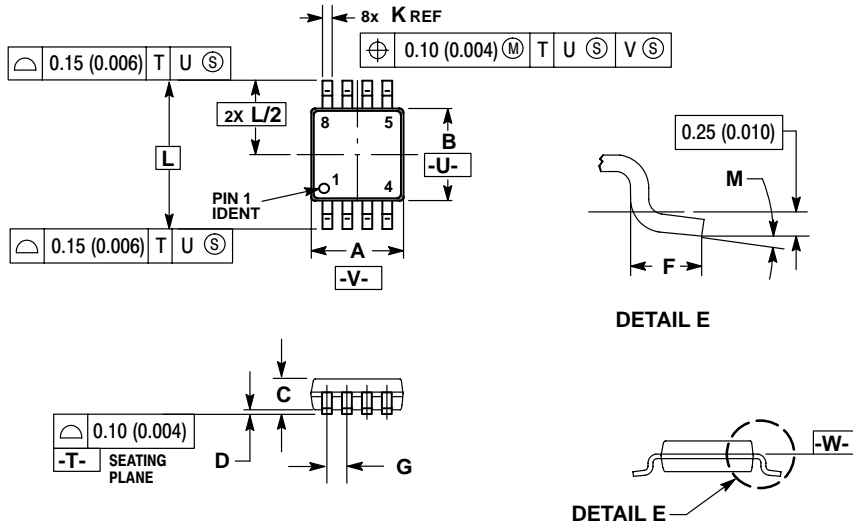
- AN1404** - ECLinPS Circuit Performance at Non-Standard  $V_{IH}$  Levels
- AN1405** - ECL Clock Distribution Techniques
- AN1406** - Designing With PECL (ECL at +5.0 V)
- AN1503** - ECLinPS I/O SPICE Modeling Kit
- AN1504** - Metastability and the ECLinPS Family
- AN1560** - Low Voltage ECLinPS SPICE 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



# MC10EL89


## 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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