

# MC10EL89

## 5 V ECL Coaxial Cable Driver

### Description

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.

### Features

- 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
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

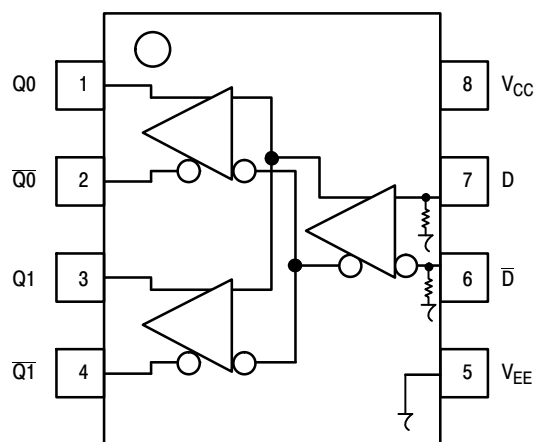


Figure 1. Logic Diagram and Pinout Assignment



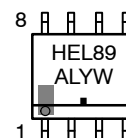
ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)



SOIC-8 NB  
D SUFFIX  
CASE 751-07

### MARKING DIAGRAMS\*



A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

Device	Package	Shipping†
MC10EL89DG	SOIC-8 (Pb-Free)	98 Units/Tube
MC10EL89DR2G	SOIC-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, [BRD8011/D](#).

# MC10EL89

**Table 1. 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

**Table 2. 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](#).

**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
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
I <sub>out</sub>	Output Current	Continuous Surge		50 100	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	SOIC-8	190 130	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-8	41 to 44	°C/W
T <sub>sol</sub>	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)

# MC10EL89

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

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 2)	3.77	3.90	4.02	3.87	3.98	4.10	3.94	4.04	4.19	V
$V_{OL}$	Output LOW Voltage (Note 2)	2.10	2.28	2.42	2.00	2.30	2.44	1.95	2.33	2.49	V
$V_{IH}$	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
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)	2.5		4.6	2.5		4.6	2.5		4.6	V
$I_{IH}$	Input HIGH Current		70	150		50	150		40	150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5	50		0.5	30		0.3	25		$\mu\text{A}$

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 lfm. 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  $+0.25 \text{ V} / -0.5 \text{ V}$ .
2. Outputs are terminated through a  $50 \Omega$  resistor to  $V_{CC} - 3.0 \text{ V}$ .
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  $V_{ppmin}$  and  $1 \text{ V}$ .

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

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 2)	-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 2)	-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 Configuration) (Note 3)	-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: 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 lfm. 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  $+0.25 \text{ V} / -0.5 \text{ V}$ .
2. Outputs are terminated through a  $50 \Omega$  resistor to  $V_{CC} - 3.0 \text{ V}$ .
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  $V_{ppmin}$  and  $1 \text{ V}$ .

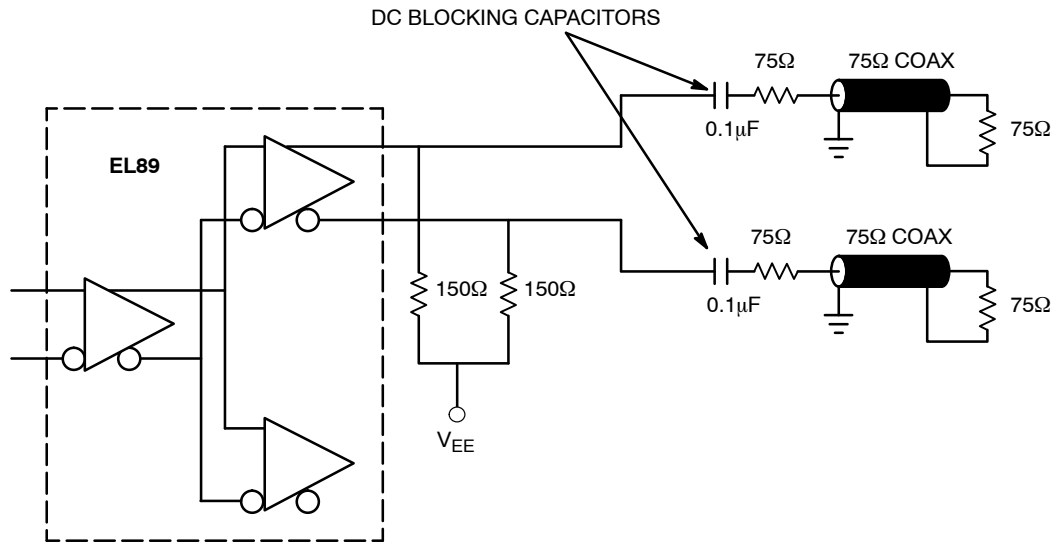
# MC10EL89

**Table 6. 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 1))

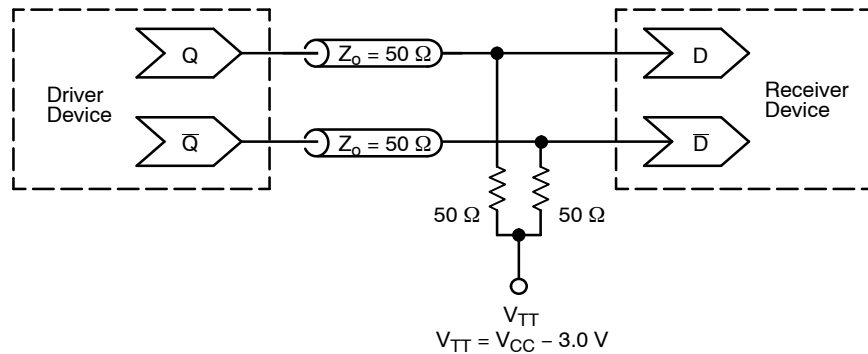
Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Toggle Frequency					1.5					Gb/s
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output	200	340	480	260	350	440	310	400	490	ps
$t_{SKEW}$	Within-Device Skew		5	20		5	20		5	20	ps
$t_{JITTER}$	Random Clock Jitter (RMS)		5			5			5		ps
$V_{PP}$	Input Swing (Note 2)	150			150	400		150			mV
$t_r$ $t_f$	Output Rise/Fall Times Q (20% – 80%)	205	330	455	205	330	455	205	330	455	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 lfm. 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.

- $V_{EE}$  can vary  $+0.25\text{ V}$  /  $-0.5\text{ V}$ .
- $V_{PP(\min)}$  is the minimum input swing for which AC parameters are guaranteed. The device has a DC gain of  $\approx 40$ .



**Figure 2. EL89 CATV Termination Configuration**



**Figure 3. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note [AND8020/D](#) – Termination of ECL Logic Devices.)

## MC10EL89

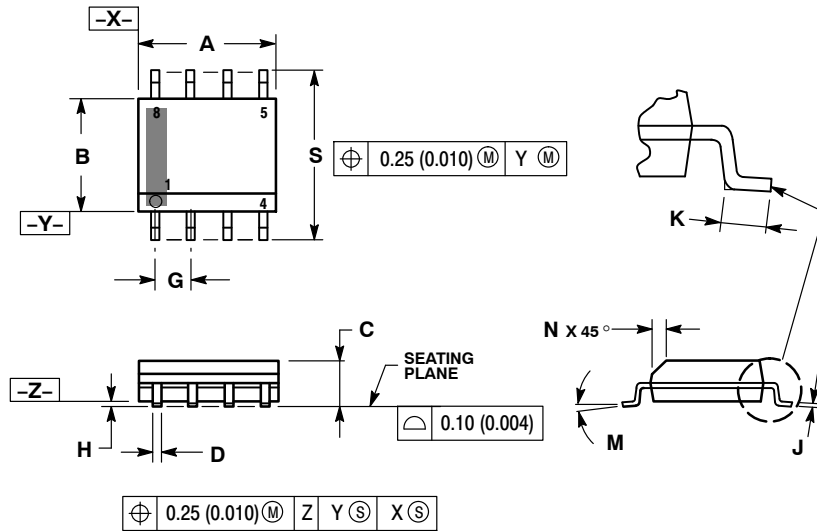
### Resource Reference of Application Notes

- 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

# MC10EL89

## PACKAGE DIMENSIONS

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

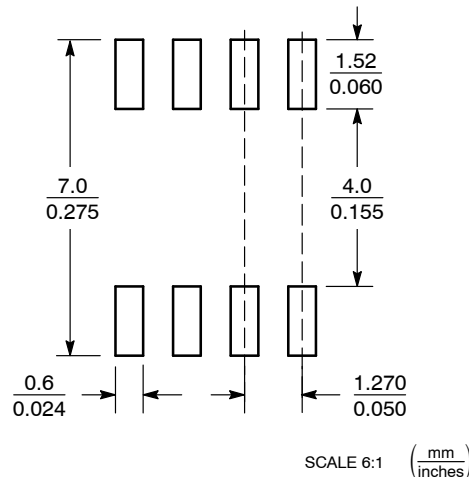


#### NOTES:

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

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, [SOLDDRM/D](#).

ECLinPS is a registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marketing.pdf](http://www.onsemi.com/site/pdf/Patent-Marketing.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
 19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
 Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
 Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
 Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
 USA/Canada  
 Europe, Middle East and Africa Technical Support:  
 Phone: 421 33 790 2910  
 Japan Customer Focus Center  
 Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative