

# MC10EP89

## Coaxial Cable Driver

The MC10EP89 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 produces swings 70% larger than 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 (5V) and 1.4V (3.3V) swing allow for termination at both ends of the cable, while maintaining a 800mV (5V) and 700mV (3.3V) swing at the receiving end of the cable. Because of the larger output swings, the device cannot be terminated into the standard  $V_{CC}-2.0V$ . All of the DC parameters are tested with a  $50\Omega$  to  $V_{CC}-3.0V$  load. The driver accepts a standard differential ECL input and can run off of the digital video broadcast standard  $-5.0V$  supply.

The MC10EP89 meets ANSI/SMPTE standard 292M–Bit Serial Digital Interface for High Definition Television Systems 8.1.3 and 8.1.5 requirements.

- 310ps Typical Propagation Delay
- 3.0 GHz Typical Toggle Frequency
- 1.6V (5V) and 1.4V (3.3V) Swing
- PECL mode: 3.0V to 5.5V  $V_{CC}$  with  $V_{EE} = 0V$
- ECL mode: 0V  $V_{CC}$  with  $V_{EE} = -3.0V$  to  $-5.5V$
- Internal Input Resistors: Pulldown on D, Pulldown and Pullup on  $\overline{D}$
- Q Output will default LOW with inputs open or at  $V_{EE}$
- ESD Protection: >4KV HBM, >200V MM
- New Differential Input Common Mode Range
- Moisture Sensitivity Level 1, Indefinite Time Out of Drypack
- Flammability Rating: UL–94 code V–0 @ 1/8", Oxygen Index 28 to 34
- Transistor Count = 152 devices

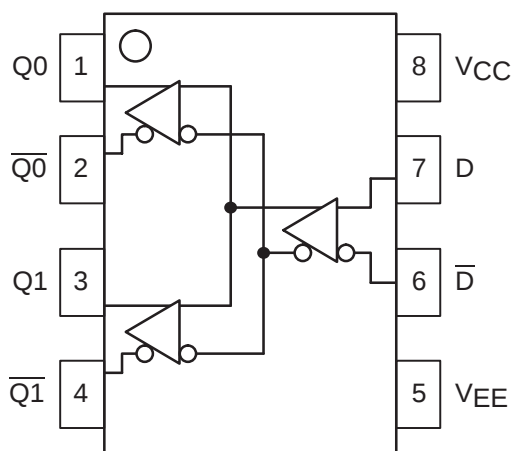


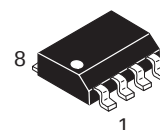
Figure 1. 8-Lead Pinout (Top View) and Logic Diagram



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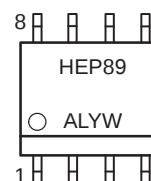
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SO-8  
D SUFFIX  
CASE 751

### MARKING DIAGRAM



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

\*For additional information, see Application Note AND8002/D

### PIN DESCRIPTION

| PIN                                       | FUNCTION           |
|-------------------------------------------|--------------------|
| D, $\overline{D}$                         | ECL Data Inputs    |
| Q0, Q1, $\overline{Q0}$ , $\overline{Q1}$ | ECL Data Outputs   |
| $V_{CC}$                                  | Positive Supply    |
| $V_{EE}$                                  | Negative, 0 Supply |

### ORDERING INFORMATION

| Device      | Package | Shipping         |
|-------------|---------|------------------|
| MC10EP89D   | SOIC    | 98 Units/Rail    |
| MC10EP89DR2 | SOIC    | 2500 Tape & Reel |

# MC10EP89

## MAXIMUM RATINGS\*

| Symbol        | Parameter                                                               | Value             | Unit |
|---------------|-------------------------------------------------------------------------|-------------------|------|
| $V_{EE}$      | Power Supply ( $V_{CC} = 0V$ )                                          | -6.0 to 0         | VDC  |
| $V_{CC}$      | Power Supply ( $V_{EE} = 0V$ )                                          | 6.0 to 0          | VDC  |
| $V_I$         | Input Voltage ( $V_{CC} = 0V$ , $V_I$ not more negative than $V_{EE}$ ) | -6.0 to 0         | VDC  |
| $V_I$         | Input Voltage ( $V_{EE} = 0V$ , $V_I$ not more positive than $V_{CC}$ ) | 6.0 to 0          | VDC  |
| $I_{out}$     | Output Current<br>Continuous<br>Surge                                   | 50<br>100         | mA   |
| $T_A$         | Operating Temperature Range                                             | -40 to +85        | °C   |
| $T_{stg}$     | Storage Temperature                                                     | -65 to +150       | °C   |
| $\theta_{JA}$ | Thermal Resistance (Junction-to-Ambient)<br>Still Air<br>500lfpm        | 190<br>130        | °C/W |
| $\theta_{JC}$ | Thermal Resistance (Junction-to-Case)                                   | 41 to 44 $\pm$ 5% | °C/W |
| $T_{sol}$     | Solder Temperature (<2 to 3 Seconds: 245°C desired)                     | 265               | °C   |

\* Maximum Ratings are those values beyond which damage to the device may occur.

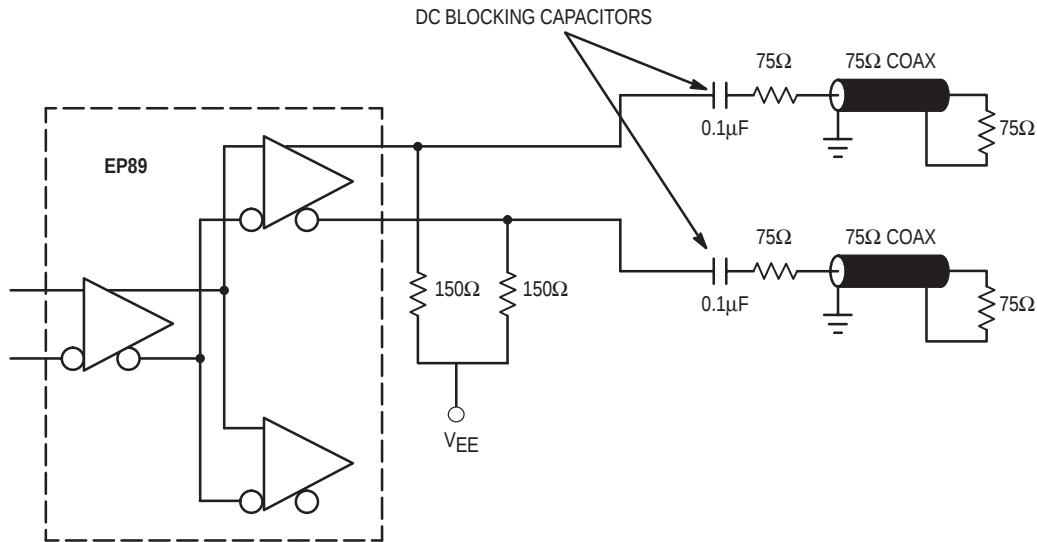


Figure 2. EP89 Termination Configuration

# MC10EP89

## DC CHARACTERISTICS, ECL/LVECL ( $V_{CC} = 0V$ ; $V_{EE} = -3.3 \pm 0.01V$ ) (Note 4.)

| Symbol          | Characteristic                                    | -40°C       |       |       | 25°C        |       |       | 85°C        |       |       | Unit |
|-----------------|---------------------------------------------------|-------------|-------|-------|-------------|-------|-------|-------------|-------|-------|------|
|                 |                                                   | Min         | Typ   | Max   | Min         | Typ   | Max   | Min         | Typ   | Max   |      |
| IEE             | Power Supply Current<br>(Note 1.)                 | 22          | 28    | 34    | 24          | 32    | 38    | 28          | 34    | 40    | mA   |
| VOH             | Output HIGH Voltage<br>(Note 2.)                  | -1220       | -1120 | -1020 | -1150       | -1050 | -950  | -1075       | -975  | -875  | mV   |
| VOL             | Output LOW Voltage<br>(Note 2.)                   | -2680       | -2580 | -2480 | -2670       | -2570 | -2470 | -2630       | -2530 | -2430 | mV   |
| VIH             | Input HIGH Voltage<br>Single Ended                | -1230       |       | -890  | -1130       |       | -810  | -1060       |       | -720  | mV   |
| VIL             | Input LOW Voltage<br>Single Ended                 | -1950       |       | -1500 | -1950       |       | -1480 | -1950       |       | -1445 | mV   |
| VIHCMR          | Input HIGH Voltage Common Mode<br>Range (Note 3.) | -1.3        |       | 0.0   | -1.3        |       | 0.0   | -1.3        |       | 0.0   | V    |
| I <sub>IH</sub> | Input HIGH Current                                |             |       | 150   |             |       | 150   |             |       | 150   | μA   |
| I <sub>IL</sub> | Input LOW Current $\frac{D}{\bar{D}}$             | 0.5<br>-150 |       |       | 0.5<br>-150 |       |       | 0.5<br>-150 |       |       | μA   |

NOTE: 10EP circuits 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 airflow greater than 500lfpm is maintained.

1.  $V_{CC} = 0V$ ,  $V_{EE} = -3.3V$ , all other pins floating.
2. All loading with 50 ohms to  $V_{CC}$ -3.0 volts.
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , max varies 1:1 with  $V_{CC}$ .
4. Input and output parameters vary 1:1 with  $V_{CC}$ .

## DC CHARACTERISTICS, ECL/LVECL ( $V_{CC} = 0V$ ; $V_{EE} = -5.2 \pm 0.01V$ ) (Note 8.)

| Symbol          | Characteristic                                    | -40°C       |       |       | 25°C        |       |       | 85°C        |       |       | Unit |
|-----------------|---------------------------------------------------|-------------|-------|-------|-------------|-------|-------|-------------|-------|-------|------|
|                 |                                                   | Min         | Typ   | Max   | Min         | Typ   | Max   | Min         | Typ   | Max   |      |
| IEE             | Power Supply Current<br>(Note 5.)                 | 25          | 32    | 39    | 28          | 35    | 42    | 31          | 38    | 45    | mA   |
| VOH             | Output HIGH Voltage<br>(Note 6.)                  | -1220       | -1120 | -1020 | -1150       | -1050 | -950  | -1075       | -975  | -875  | mV   |
| VOL             | Output LOW Voltage<br>(Note 6.)                   | -2950       | -2800 | -2650 | -2950       | -2850 | -2650 | -2950       | -2800 | -2650 | mV   |
| VIH             | Input HIGH Voltage<br>Single Ended                | -1230       |       | -890  | -1130       |       | -810  | -1060       |       | -720  | mV   |
| VIL             | Input LOW Voltage<br>Single Ended                 | -1950       |       | -1500 | -1950       |       | -1480 | -1950       |       | -1445 | mV   |
| VIHCMR          | Input HIGH Voltage Common Mode<br>Range (Note 7.) | -3.2        |       | 0.0   | -3.2        |       | 0.0   | -3.2        |       | 0.0   | V    |
| I <sub>IH</sub> | Input HIGH Current                                |             |       | 150   |             |       | 150   |             |       | 150   | μA   |
| I <sub>IL</sub> | Input LOW Current $\frac{D}{\bar{D}}$             | 0.5<br>-150 |       |       | 0.5<br>-150 |       |       | 0.5<br>-150 |       |       | μA   |

NOTE: 10EP circuits 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 airflow greater than 500lfpm is maintained.

5.  $V_{CC} = 0V$ ,  $V_{EE} = -5.2V$ , all other pins floating.
6. All loading with 50 ohms to  $V_{CC}$ -3.0 volts.
7.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , max varies 1:1 with  $V_{CC}$ .
8. Input and output parameters vary 1:1 with  $V_{CC}$ .

# MC10EP89

## DC CHARACTERISTICS, LVPECL ( $V_{CC} = 3.3V \pm 0.01V$ , $V_{EE} = 0V$ ) (Note 12.)

| Symbol          | Characteristic                                     | -40°C       |      |      | 25°C        |      |      | 85°C        |      |      | Unit |
|-----------------|----------------------------------------------------|-------------|------|------|-------------|------|------|-------------|------|------|------|
|                 |                                                    | Min         | Typ  | Max  | Min         | Typ  | Max  | Min         | Typ  | Max  |      |
| IEE             | Power Supply Current<br>(Note 9.)                  | 22          | 28   | 34   | 24          | 32   | 38   | 28          | 34   | 40   | mA   |
| VOH             | Output HIGH Voltage<br>(Note 10.)                  | 2080        | 2180 | 2280 | 2150        | 2250 | 2350 | 2225        | 2325 | 2425 | mV   |
| VOL             | Output LOW Voltage<br>(Note 10.)                   | 620         | 720  | 820  | 630         | 730  | 830  | 670         | 770  | 870  | mV   |
| VIH             | Input HIGH Voltage<br>Single Ended                 | 2070        |      | 2410 | 2170        |      | 2490 | 2240        |      | 2580 | mV   |
| VIL             | Input LOW Voltage<br>Single Ended                  | 1350        |      | 1800 | 1350        |      | 1820 | 1350        |      | 1855 | mV   |
| VIHCMR          | Input HIGH Voltage Common Mode<br>Range (Note 11.) | 2.0         |      | 3.3  | 2.0         |      | 3.3  | 2.0         |      | 3.3  | V    |
| I <sub>IH</sub> | Input HIGH Current                                 |             |      | 150  |             |      | 150  |             |      | 150  | μA   |
| I <sub>IL</sub> | Input LOW Current $\frac{D}{\bar{D}}$              | 0.5<br>-150 |      |      | 0.5<br>-150 |      |      | 0.5<br>-150 |      |      | μA   |

NOTE: 10EP circuits 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 airflow greater than 500lfpm is maintained.

9.  $V_{CC} = 3.3V$ ,  $V_{EE} = 0V$ , all other pins floating.

10. All loading with 50 ohms to  $V_{CC}$ -3.0 volts.

11.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , max varies 1:1 with  $V_{CC}$ .

12. Input and output parameters vary 1:1 with  $V_{CC}$ .

## DC CHARACTERISTICS, PECL ( $V_{CC} = 5.0V \pm 0.5V$ , $V_{EE} = 0V$ ) (Note 16.)

| Symbol          | Characteristic                                     | -40°C       |      |      | 25°C        |      |      | 85°C        |      |      | Unit |
|-----------------|----------------------------------------------------|-------------|------|------|-------------|------|------|-------------|------|------|------|
|                 |                                                    | Min         | Typ  | Max  | Min         | Typ  | Max  | Min         | Typ  | Max  |      |
| IEE             | Power Supply Current<br>(Note 13.)                 | 27          | 34   | 41   | 30          | 37   | 44   | 32          | 39   | 46   | mA   |
| VOH             | Output HIGH Voltage<br>(Note 14.)                  | 3780        | 3880 | 3980 | 3850        | 3950 | 4050 | 3925        | 4025 | 4125 | mV   |
| VOL             | Output LOW Voltage<br>(Note 14.)                   | 2075        | 2225 | 2375 | 2060        | 2210 | 2360 | 2090        | 2240 | 2390 | mV   |
| VIH             | Input HIGH Voltage<br>Single Ended                 | 3770        |      | 4110 | 3870        |      | 4190 | 3940        |      | 4280 | mV   |
| VIL             | Input LOW Voltage<br>Single Ended                  | 3050        |      | 3500 | 3050        |      | 3520 | 3050        |      | 3555 | mV   |
| VIHCMR          | Input HIGH Voltage Common Mode<br>Range (Note 15.) | 2.0         |      | 5.0  | 2.0         |      | 5.0  | 2.0         |      | 5.0  | V    |
| I <sub>IH</sub> | Input HIGH Current                                 |             |      | 150  |             |      | 150  |             |      | 150  | μA   |
| I <sub>IL</sub> | Input LOW Current $\frac{D}{\bar{D}}$              | 0.5<br>-150 |      |      | 0.5<br>-150 |      |      | 0.5<br>-150 |      |      | μA   |

NOTE: 10EP circuits 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 airflow greater than 500lfpm is maintained.

13.  $V_{CC} = 5.0V$ ,  $V_{EE} = 0V$ , all other pins floating.

14. All loading with 50 ohms to  $V_{CC}$ -3.0 volts.

15.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , max varies 1:1 with  $V_{CC}$ .

16. Input and output parameters vary 1:1 with  $V_{CC}$ .

## MC10EP89

### AC CHARACTERISTICS ( $V_{CC} = 0V$ ; $V_{EE} = -3.0V$ to $-5.5V$ ) or ( $V_{CC} = 3.0V$ to $5.5V$ ; $V_{EE} = 0V$ )

| Symbol                   | Characteristic                           | -40°C |     |      | 25°C |     |      | 85°C |     |      | Unit |
|--------------------------|------------------------------------------|-------|-----|------|------|-----|------|------|-----|------|------|
|                          |                                          | Min   | Typ | Max  | Min  | Typ | Max  | Min  | Typ | Max  |      |
| $f_{max}$                | Maximum Toggle Frequency (Note 17.)      |       |     |      |      | 3.0 |      |      |     |      | GHz  |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay to Output Differential | 200   | 280 | 380  | 220  | 310 | 400  | 250  | 330 | 420  | ps   |
| $t_{SKEW}$               | Duty Cycle Skew (Note 18.)               |       | 5.0 | 20   |      | 5.0 | 20   |      | 5.0 | 20   | ps   |
| $t_{JITTER}$             | Cycle-to-Cycle Jitter                    |       | TBD |      |      | TBD |      |      | TBD |      | ps   |
| $V_{PP}$                 | Input Voltage Swing (Diff.) (Note 19.)   | 150   | 800 | 1200 | 150  | 800 | 1200 | 150  | 800 | 1200 | mV   |
| $t_r$<br>$t_f$           | Output Rise/Fall Times (20% – 80%) Q     | 120   | 230 | 380  | 130  | 250 | 410  | 150  | 270 | 430  | ps   |

17.  $F_{max}$  guaranteed for functionality only.

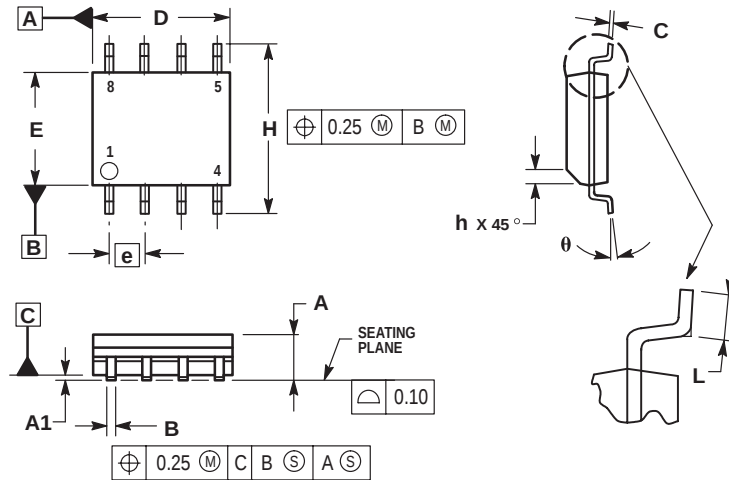
18. Skew is measured between outputs under identical transitions. Duty cycle skew is defined only for differential operation when the delays are measured from the cross point of the inputs to the cross point of the outputs.

19.  $V_{IL}$  must not go below  $V_{CC} - 3V$ .

# MC10EP89

## PACKAGE DIMENSIONS

SO-8  
D SUFFIX  
PLASTIC SOIC PACKAGE  
CASE 751-06  
ISSUE T



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETER.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM      | MILLIMETERS |      |
|----------|-------------|------|
|          | MIN         | MAX  |
| A        | 1.35        | 1.75 |
| A1       | 0.10        | 0.25 |
| B        | 0.35        | 0.49 |
| C        | 0.19        | 0.25 |
| D        | 4.80        | 5.00 |
| E        | 3.80        | 4.00 |
| e        | 1.27 BSC    |      |
| H        | 5.80        | 6.20 |
| h        | 0.25        | 0.50 |
| L        | 0.40        | 1.25 |
| $\theta$ | 0°          | 7°   |

## Notes

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