



## 5V/3.3V 3GHz COAXIAL CABLE DRIVER

ECL Pro™  
SY10EP89V

### FEATURES

- 3.3V and 5V power supply options
- 3.0GHz typical toggle frequency
- 310ps typical propagation delay
- 1.6V (5V) and 1.4V (3.3V) swing
- Internal input resistors: pulldown on D, pulldown and pullup on /D
- New differential input common mode range
- Available in 8-pin MSOP and SOIC packages

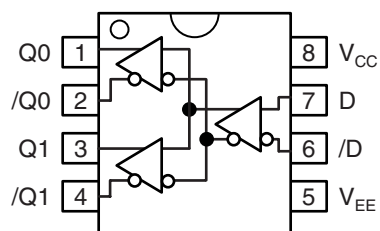
### DESCRIPTION

The SY10EP89V 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, while maintaining a 800mV (5V) or 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.

### PIN NAMES

| Pin              | Function         |
|------------------|------------------|
| D, /D            | ECL Data Inputs  |
| Q0, Q1, /Q0, /Q1 | ECL Data Outputs |
| $V_{CC}$         | Positive Supply  |
| $V_{EE}$         | Negative Supply  |

## PACKAGE/ORDERING INFORMATION



**8-Pin SOIC (Z8-1)**  
**8-Pin MSOP (K8-1)**

Ordering Information<sup>(1)</sup>

| Part Number                     | Package Type | Operating Range | Package Marking                        | Lead Finish    |
|---------------------------------|--------------|-----------------|----------------------------------------|----------------|
| SY10EP89VZC                     | Z8-1         | Commercial      | HEP89V                                 | Sn-Pb          |
| SY10EP89VZCTR <sup>(2)</sup>    | Z8-1         | Commercial      | HEP89V                                 | Sn-Pb          |
| SY10EP89VKC                     | K8-1         | Commercial      | HP89                                   | Sn-Pb          |
| SY10EP89VKCTR <sup>(2)</sup>    | K8-1         | Commercial      | HP89                                   | Sn-Pb          |
| SY10EP89VZI                     | Z8-1         | Industrial      | HEP89V                                 | Sn-Pb          |
| SY10EP89VZITR <sup>(2)</sup>    | Z8-1         | Industrial      | HEP89V                                 | Sn-Pb          |
| SY10EP89VKI                     | K8-1         | Industrial      | HP89                                   | Sn-Pb          |
| SY10EP89VKITR <sup>(2)</sup>    | K8-1         | Industrial      | HP89                                   | Sn-Pb          |
| SY10EP89VZG <sup>(3)</sup>      | Z8-1         | Industrial      | HEP89V with Pb-Free bar line indicator | NiPdAu Pb-Free |
| SY10EP89VZGTR <sup>(2, 3)</sup> | Z8-1         | Industrial      | HEP89V with Pb-Free bar line indicator | NiPdAu Pb-Free |
| SY10EP89VKG <sup>(3)</sup>      | K8-1         | Industrial      | HP89 with Pb-Free bar line indicator   | NiPdAu Pb-Free |
| SY10EP89VKGTR <sup>(2, 3)</sup> | K8-1         | Industrial      | HP89 with Pb-Free bar line indicator   | NiPdAu Pb-Free |

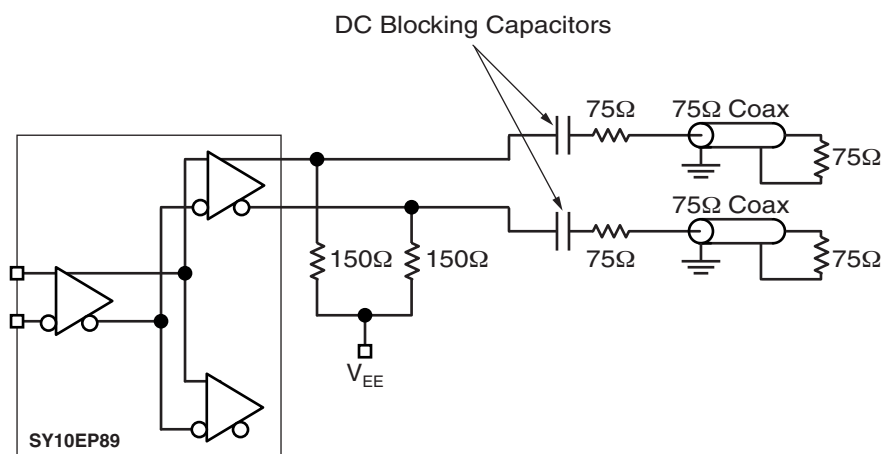
**Notes:**

1. Contact factory for die availability. Dice are guaranteed at  $T_A = 25^\circ\text{C}$ , DC Electricals only.
2. Tape and Reel.
3. Pb-Free package is recommended for new designs.

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

| Symbol            | Rating                                                                                                                                                   | Value                    | Unit         |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|
| $V_{CC} - V_{EE}$ | Power Supply Voltage                                                                                                                                     | 6V                       | V            |
| $V_{IN}$          | Input Voltage ( $V_{CC} = 0V$ , $V_{IN}$ not more negative than $V_{EE}$ )<br>Input Voltage ( $V_{EE} = 0V$ , $V_{IN}$ not more positive than $V_{CC}$ ) | -6.0 to 0<br>+6.0 to 0   | V<br>V       |
| $I_{OUT}$         | Output Current<br>-Continuous<br>-Surge                                                                                                                  | 50<br>100                | mA           |
| $T_A$             | Operating Temperature Range                                                                                                                              | -40 to +85               | °C           |
| $T_{LEAD}$        | Lead Temperature (Soldering, 20 sec.)                                                                                                                    | +260                     | °C           |
| $T_{store}$       | Storage Temperature Range                                                                                                                                | -65 to +150              | °C           |
| $\theta_{JA}$     | Package Thermal Resistance (Junction-to-Ambient)<br>-Still-Air (SOIC)<br>-500lfpm (SOIC)<br>-Still-Air (MSOP)<br>-500lfpm (MSOP)                         | 160<br>109<br>206<br>155 | °C/W<br>°C/W |
| $\theta_{JC}$     | Package Thermal Resistance (Junction-to-Case)<br>(SOIC)<br>(MSOP)                                                                                        | 39<br>39                 | °C/W         |

**Note 1.** Permanent Device Damage May Occur If Absolute Maximum Ratings Are Exceeded. This Is A Stress Rating Only And Functional Operation Is Not Implied At Conditions Other Than Those Detailed In The Operational Sections Of This Data Sheet. Exposure To Absolute Maximum Rating Conditions For Extended Periods May Affect Device Reliability.



**Figure 1. EP89V Termination Configuration**

**5.0V PECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 5.0V$ ;  $V_{EE} = 0V^{(2)}$ .

| Symbol      | Parameter                                           | $T_A = -40^\circ C$ |             |          | $T_A = +25^\circ C$ |        |          | $T_A = +85^\circ C$ |        |          | Unit    |
|-------------|-----------------------------------------------------|---------------------|-------------|----------|---------------------|--------|----------|---------------------|--------|----------|---------|
|             |                                                     | Min.                | Typ.        | Max.     | Min.                | Typ.   | Max.     | Min.                | Typ.   | Max.     |         |
| $I_{EE}$    | Power Supply Current                                | 27                  | 34          | 45       | 30                  | 37     | 45       | 32                  | 39     | 50       | mA      |
| $V_{OH}$    | Output HIGH Voltage <sup>(3)</sup>                  | 3780                | 3880        | 3980     | 3850                | 3950   | 4050     | 3925                | 4025   | 4125     | mV      |
| $V_{OL}$    | Output LOW Voltage <sup>(3)</sup>                   | 2075                | 2225        | 2375     | 2060                | 2210   | 2360     | 2090                | 2240   | 2390     | 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      |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range <sup>(4)</sup> | $V_{EE} + 2.0$      |             | $V_{CC}$ | $V_{EE} + 2.0$      |        | $V_{CC}$ | $V_{EE} + 2.0$      |        | $V_{CC}$ | V       |
| $I_{IH}$    | Input HIGH Current                                  | —                   | —           | 150      | —                   | —      | 150      | —                   | —      | 150      | $\mu A$ |
| $I_{IL}$    | Input LOW Current                                   | D<br>/D             | 0.5<br>-150 | —<br>—   | 0.5<br>-150         | —<br>— | —<br>—   | 0.5<br>-150         | —<br>— | —<br>—   | $\mu A$ |

**Note 1.** 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 traverse airflow greater than 500lfpm is maintained.

**Note 2.** Input and output parameters vary 1:1 with  $V_{CC}$ .

**Note 3.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 4.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**3.3V LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 3.3V$ ,  $V_{EE} = 0V^{(2)}$ .

| Symbol      | Parameter                                                   | $T_A = -40^\circ C$ |             |          | $T_A = +25^\circ C$ |        |          | $T_A = +85^\circ C$ |        |          | Unit    |
|-------------|-------------------------------------------------------------|---------------------|-------------|----------|---------------------|--------|----------|---------------------|--------|----------|---------|
|             |                                                             | Min.                | Typ.        | Max.     | Min.                | Typ.   | Max.     | Min.                | Typ.   | Max.     |         |
| $I_{EE}$    | Power Supply Current                                        | 22                  | 28          | 34       | 24                  | 32     | 38       | 28                  | 34     | 40       | mA      |
| $V_{OH}$    | Output HIGH Voltage <sup>(3)</sup>                          | 2080                | 2180        | 2280     | 2150                | 2250   | 2350     | 2225                | 2325   | 2425     | mV      |
| $V_{OL}$    | Output LOW Voltage <sup>(3)</sup>                           | 620                 | 720         | 820      | 630                 | 730    | 830      | 670                 | 770    | 870      | mV      |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                           | 2070                | —           | 2410     | 2170                | —      | 2490     | 2240                | —      | 2580     | mV      |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                            | 1350                | —           | 1800     | 1350                | —      | 1820     | 1350                | —      | 1855     | mV      |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Diff.) <sup>(4)</sup> | $V_{EE} + 2.0$      |             | $V_{CC}$ | $V_{EE} + 2.0$      |        | $V_{CC}$ | $V_{EE} + 2.0$      |        | $V_{CC}$ | V       |
| $I_{IH}$    | Input HIGH Current                                          | —                   | —           | 150      | —                   | —      | 150      | —                   | —      | 150      | $\mu A$ |
| $I_{IL}$    | Input LOW Current                                           | D<br>/D             | 0.5<br>-150 | —<br>—   | 0.5<br>-150         | —<br>— | —<br>—   | 0.5<br>-150         | —<br>— | —<br>—   | $\mu A$ |

**Note 1.** 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 traverse airflow greater than 500lfpm is maintained.

**Note 2.** Input and output parameters vary 1:1 with  $V_{CC}$ .

**Note 3.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 4.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**LVECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 0V$ ,  $V_{EE} = -3.3V$ .

| Symbol      | Parameter                                                   | $T_A = -40^\circ C$ |          |        | $T_A = +25^\circ C$ |        |        | $T_A = +85^\circ C$ |        |        | Unit    |
|-------------|-------------------------------------------------------------|---------------------|----------|--------|---------------------|--------|--------|---------------------|--------|--------|---------|
|             |                                                             | Min.                | Typ.     | Max.   | Min.                | Typ.   | Max.   | Min.                | Typ.   | Max.   |         |
| $I_{EE}$    | Power Supply Current                                        | 22                  | 28       | 34     | 24                  | 32     | 38     | 28                  | 34     | 40     | mA      |
| $V_{OH}$    | Output HIGH Voltage <sup>(2)</sup>                          | -1220               | -1120    | -1020  | -1150               | -1050  | -950   | -1075               | -975   | -875   | mV      |
| $V_{OL}$    | Output LOW Voltage <sup>(2)</sup>                           | -2680               | -2580    | -2480  | -2670               | -2570  | -2470  | -2630               | -2530  | -2430  | mV      |
| $V_{IH}$    | 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 (Diff.) <sup>(3)</sup> | $V_{EE} + 2.0$      |          | 0.0    | $V_{EE} + 2.0$      |        | 0.0    | $V_{EE} + 2.0$      |        | 0.0    | V       |
| $I_{IH}$    | Input HIGH Current                                          | —                   | —        | 150    | —                   | —      | 150    | —                   | —      | 150    | $\mu A$ |
| $I_{IL}$    | Input LOW Current                                           | D<br>/D             | 0.5<br>— | —<br>— | 0.5<br>—            | —<br>— | —<br>— | 0.5<br>—            | —<br>— | —<br>— | $\mu A$ |

**Note 1.** 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 traverse airflow greater than 500lfpm is maintained.

**Note 2.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 3.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**ECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 0V$ ;  $V_{EE} = -5.2V$ .

| Symbol      | Parameter                                           | $T_A = -40^\circ C$ |          |        | $T_A = +25^\circ C$ |        |        | $T_A = +85^\circ C$ |        |        | Unit    |
|-------------|-----------------------------------------------------|---------------------|----------|--------|---------------------|--------|--------|---------------------|--------|--------|---------|
|             |                                                     | Min.                | Typ.     | Max.   | Min.                | Typ.   | Max.   | Min.                | Typ.   | Max.   |         |
| $I_{EE}$    | Power Supply Current                                | 27                  | 32       | 41     | 30                  | 37     | 44     | 32                  | 39     | 50     | mA      |
| $V_{OH}$    | Output HIGH Voltage <sup>(2)</sup>                  | -1220               | -1120    | -1020  | -1150               | -1050  | -950   | -1075               | -975   | -875   | mV      |
| $V_{OL}$    | Output LOW Voltage <sup>(2)</sup>                   | -2950               | -2800    | -2650  | -2950               | -2850  | -2650  | -2950               | -2800  | -2650  | mV      |
| $V_{IH}$    | 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 <sup>(3)</sup> | $V_{EE} + 2.0$      |          | 0      | $V_{EE} + 2.0$      |        | 0      | $V_{EE} + 2.0$      |        | 0      | V       |
| $I_{IH}$    | Input HIGH Current                                  | —                   | —        | 150    | —                   | —      | 150    | —                   | —      | 150    | $\mu A$ |
| $I_{IL}$    | Input LOW Current                                   | D<br>/D             | 0.5<br>— | —<br>— | 0.5<br>—            | —<br>— | —<br>— | 0.5<br>—            | —<br>— | —<br>— | $\mu A$ |

**Note 1.** 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 traverse airflow greater than 500lfpm is maintained.

**Note 2.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 3.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**AC ELECTRICAL CHARACTERISTICS**

$V_{CC} = 0V$ ,  $V_{EE} = -3.0V$  to  $-5.5V$ ;  $V_{CC} = 3.0V$  to  $5.5V$ ,  $V_{EE} = 0V$ <sup>(1)</sup>.

| Symbol                 | Parameter                                                        | $T_A = -40^{\circ}C$ |          |           | $T_A = +25^{\circ}C$ |        |           | $T_A = +85^{\circ}C$ |        |           | Unit |
|------------------------|------------------------------------------------------------------|----------------------|----------|-----------|----------------------|--------|-----------|----------------------|--------|-----------|------|
|                        |                                                                  | Min.                 | Typ.     | Max.      | Min.                 | Typ.   | Max.      | Min.                 | Typ.   | Max.      |      |
| $f_{MAX}$              | Maximum Toggle Frequency <sup>(2)</sup>                          | 3                    | —        | —         | 3                    | —      | —         | 3                    | —      | —         | GHz  |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay to Output Differential                         | 200                  | —        | 380       | 220                  | 310    | 400       | 250                  | —      | 420       | ps   |
| $t_{SKEW}$             | Within Device Skew <sup>(3)</sup> Q, /Q<br>Device-to-Device Skew | —<br>—               | 5.0<br>— | 20<br>120 | —<br>—               | 5<br>— | 20<br>120 | —<br>—               | —<br>— | 20<br>120 | ps   |
| $t_{JITTER}$           | Cycle-to-Cycle Jitter                                            | —                    | 0.5      | < 1.0     | —                    | 0.5    | < 1.0     | —                    | 0.5    | < 1.0     | ps   |
| $V_{PP}$               | Input Voltage Swing <sup>(4)</sup><br>(Differential)             | 150                  | 800      | 1200      | 150                  | 800    | 1200      | 150                  | —      | 1200      | mV   |
| $t_r$<br>$t_f$         | Output Rise/Fall Times Q, /Q<br>(20% to 80%)                     | 120                  | —        | 350       | 130                  | 250    | 350       | 150                  | —      | 350       | ps   |

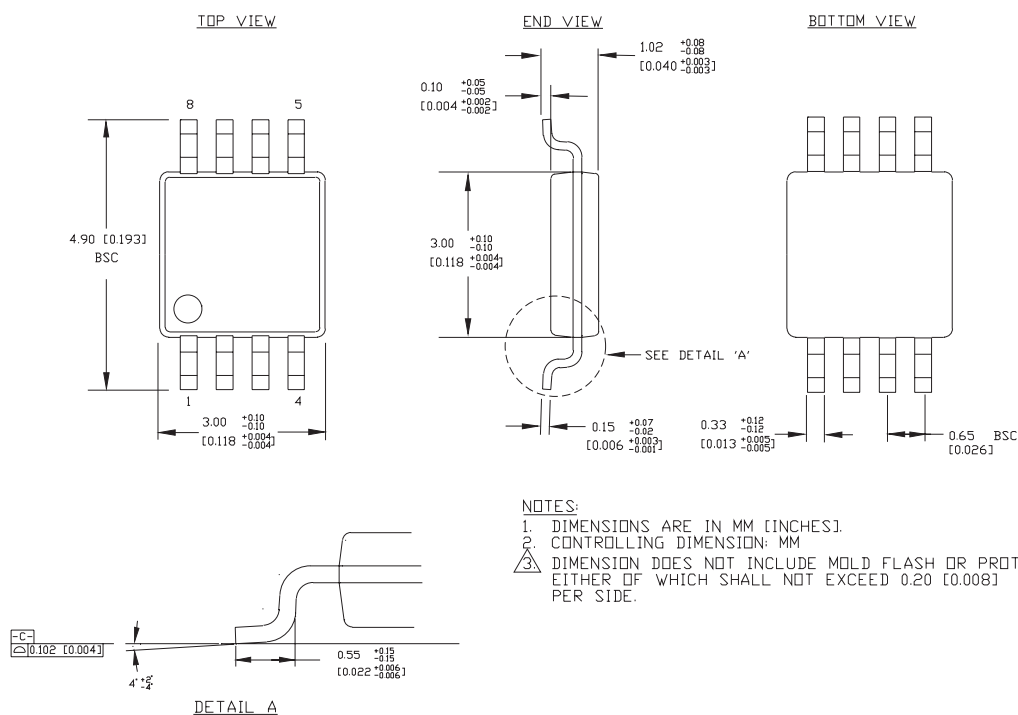
**Note 1.** Measured using a 750mV source, 50% duty cycle clock source. All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 2.**  $f_{MAX}$  guaranteed for functionality only.  $V_{OL}$  and  $V_{OH}$  levels are guaranteed at DC only.

**Note 3.** 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.

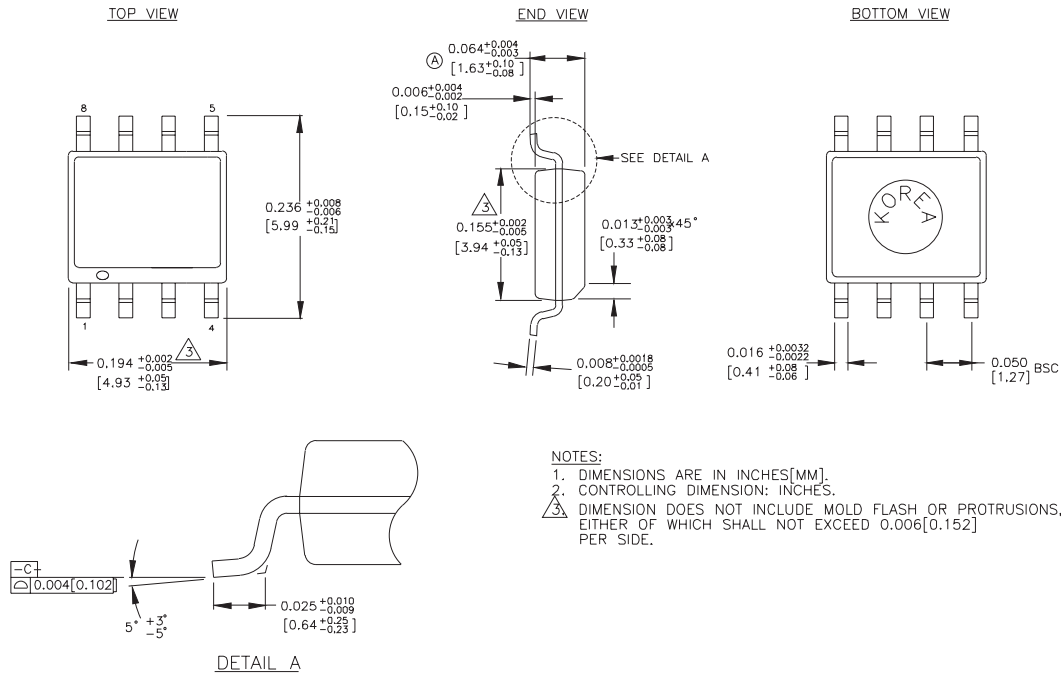
**Note 4.**  $V_{IL}$  must not go below  $V_{CC} - 3.0V$ .

## 8-PIN MSOP (K8-1)



Rev. 01

## 8-PIN PLASTIC SOIC (Z8-1)



Rev. 03

**MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA**TEL + 1 (408) 944-0800 FAX + 1 (408) 474-1000 WEB <http://www.micrel.com>

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