

## FEATURES

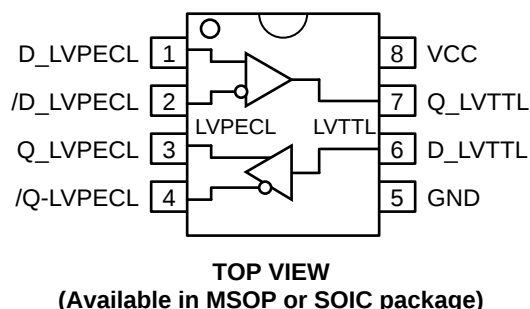
- 3.3V  $\pm 10\%$  power supply
- Guaranteed AC parameters over temperature:  
 $f_{\text{MAX}} > 275\text{MHz}$  (LVTTTL)
- $< 2\text{ns}$  LVPECL-to-LVTTTL propagation delay
- $< 600\text{ps}$  LVTTTL-to-LVPECL propagation delay
- Internal  $75\text{k}\Omega$  input pull-down resistors
- Industrial temperature range:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Available in 8-pin MSOP and SOIC packages

## DESCRIPTION

The SY10/100EPT28L is a differential LVPECL-to-LVTTTL translator and a LVTTTL-to-differential LVPECL translator in a single package. Because LVPECL (Positive ECL) levels are used, only +3.3V and ground are required. The small outline 8-pin package and the dual translation design of the EPT28L makes it ideal for applications which are sending and receiving signals across a backplane.

The 100K series includes temperature compensation. Thus, logic levels are constant over temperature.

## PIN CONFIGURATION/BLOCK DIAGRAM



## PIN NAMES

| Pin                   | Function                                                                           |
|-----------------------|------------------------------------------------------------------------------------|
| D_LVTTTL              | Low Voltage TTL Input                                                              |
| Q_LVTTTL              | Low Voltage TTL Output                                                             |
| D_LVPECL<br>/D_LVPECL | Low Voltage Differential PECL Inputs<br>with $75\text{k}\Omega$ internal pull-down |
| Q_LVPECL<br>/Q_LVPECL | Low Voltage Differential PECL Outputs                                              |
| V <sub>CC</sub>       | 3.3V Positive Supply                                                               |
| GND                   | Ground                                                                             |

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

| Symbol             | Rating                                                                                                                           | Value                    | Unit         |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|
| V <sub>CC</sub>    | Power Supply Voltage                                                                                                             | –0.5 to +3.8             | V            |
| V <sub>I</sub>     | Input Voltage                                                                                                                    | 0 to V <sub>CC</sub>     | V            |
| I <sub>OUT</sub>   | LVPECL Output Current<br>–Continuous<br>–Surge                                                                                   | 50<br>100                | mV           |
| T <sub>A</sub>     | Operating Temperature Range                                                                                                      | –40 to +85               | °C           |
| T <sub>store</sub> | Storage Temperature Range                                                                                                        | –65 to +150              | °C           |
| θ <sub>JA</sub>    | 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 |
| θ <sub>JC</sub>    | 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.

**DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

| Symbol          | Parameter            | T <sub>A</sub> = –40°C |      |      | T <sub>A</sub> = +25°C |      |      | T <sub>A</sub> = +85°C |      |      | Unit | Condition |
|-----------------|----------------------|------------------------|------|------|------------------------|------|------|------------------------|------|------|------|-----------|
|                 |                      | Min.                   | Typ. | Max. | Min.                   | Typ. | Max. | Min.                   | Typ. | Max. |      |           |
| V <sub>CC</sub> | Power Supply Voltage | 3.0                    | 3.3  | 3.6  | 3.0                    | 3.3  | 3.6  | 3.0                    | 3.3  | 3.6  | V    |           |
| I <sub>CC</sub> | Power Supply Current | —                      | 20   | 40   | —                      | 22   | 40   | —                      | 25   | 40   | mA   |           |

**NOTE:**

1. 10/100KEPT 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.

**LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**V<sub>CC</sub> = 3.3V ±10%

| Symbol          | Parameter                          |                 | T <sub>A</sub> = –40°C |              |              | T <sub>A</sub> = +25°C |              |              | T <sub>A</sub> = +85°C |              |              | Unit     | Condition               |
|-----------------|------------------------------------|-----------------|------------------------|--------------|--------------|------------------------|--------------|--------------|------------------------|--------------|--------------|----------|-------------------------|
|                 |                                    |                 | Min.                   | Typ.         | Max.         | Min.                   | Typ.         | Max.         | Min.                   | Typ.         | Max.         |          |                         |
| V <sub>OH</sub> | Output HIGH <sup>(2)</sup> Voltage | 10EPT<br>100EPT | 2165<br>2155           | 2290<br>2280 | 2415<br>2405 | 2230<br>2155           | 2355<br>2280 | 2480<br>2405 | 2290<br>2155           | 2415<br>2280 | 2540<br>2405 | mV       |                         |
| V <sub>OL</sub> | Output LOW <sup>(2)</sup> Voltage  | 10EPT<br>100EPT | 1365<br>1355           | 1490<br>1480 | 1615<br>1605 | 1430<br>1355           | 1555<br>1480 | 1680<br>1605 | 1490<br>1355           | 1615<br>1480 | 1740<br>1605 | mV       |                         |
| V <sub>IH</sub> | Input HIGH <sup>(2)</sup> Voltage  | 10EPT<br>100EPT | 2090<br>2075           | —<br>—       | 2415<br>2420 | 2155<br>2075           | —<br>—       | 2480<br>2420 | 2215<br>2075           | —<br>—       | 2540<br>2420 | mV       |                         |
| V <sub>IL</sub> | Input LOW <sup>(2)</sup> Voltage   | 10EPT<br>100EPT | 1365<br>1355           | —<br>—       | 1690<br>1675 | 1430<br>1355           | —<br>—       | 1755<br>1675 | 1490<br>1355           | —<br>—       | 1815<br>1675 | mV       |                         |
| I <sub>IH</sub> | Input HIGH Current                 |                 | —                      | —            | 150          | —                      | —            | 150          | —                      | —            | 150          | μA       | V <sub>IN</sub> = 3.46V |
| I <sub>IL</sub> | Input LOW Current /D, D            |                 | 0.5                    | —            | 0.5          | —                      | —            | 0.5          | —                      | —            | 0.5          | μA       |                         |
| C <sub>IN</sub> | Input Capacitance (SOIC)<br>(MSOP) |                 | —<br>—                 | —<br>—       | —<br>—       | —<br>—                 | 0.75<br>1.1  | —<br>—       | —<br>—                 | —<br>—       | —<br>—       | pF<br>pF |                         |

**NOTES:**

1. 10/100KEPT 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.
2. Input and output parameters vary 1:1 with V<sub>CC</sub>.

**LVTTTL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 3.3V \pm 10\%$ 

| Symbol        | Parameter                           | $T_A = -40^\circ\text{C}$ |      |      | $T_A = +25^\circ\text{C}$ |      |      | $T_A = +85^\circ\text{C}$ |      |      | Unit          | Condition               |
|---------------|-------------------------------------|---------------------------|------|------|---------------------------|------|------|---------------------------|------|------|---------------|-------------------------|
|               |                                     | Min.                      | Typ. | Max. | Min.                      | Typ. | Max. | Min.                      | Typ. | Max. |               |                         |
| $V_{OH}$      | Output HIGH Voltage                 | 2.0                       | —    | —    | 2.0                       | —    | —    | 2.0                       | —    | —    | V             | $I_{OH} = -3\text{mA}$  |
| $V_{OL}$      | Output LOW Voltage                  | —                         | —    | 0.5  | —                         | —    | 0.5  | —                         | —    | 0.5  | V             | $I_{OH} = -24\text{mA}$ |
| $V_{IH}$      | Input HIGH Voltage                  | 2.0                       | —    | —    | 2.0                       | —    | —    | 2.0                       | —    | —    | V             |                         |
| $V_{IL}$      | Input LOW Voltage                   | —                         | —    | 0.8  | —                         | —    | 0.8  | —                         | —    | 0.8  | V             |                         |
| $V_{IK}$      | Input Clamp Voltage                 | —                         | —    | -1.2 | —                         | —    | -1.2 | —                         | —    | -1.2 | V             | $I_{IK} = -18\text{mA}$ |
| $I_{IH}$      | Input HIGH Current                  | —                         | —    | 20   | —                         | —    | 20   | —                         | —    | 20   | $\mu\text{A}$ | $V_{IN} = 2.7\text{V}$  |
|               |                                     | —                         | —    | 100  | —                         | —    | 100  | —                         | —    | 100  | $\mu\text{A}$ | $V_{IN} = V_{CC}$       |
| $I_{IL}$      | Input LOW Current                   | —                         | —    | -0.2 | —                         | —    | -0.2 | —                         | —    | -0.2 | $\mu\text{A}$ | $V_{IN} = 0.5\text{V}$  |
| $I_{OUT(SC)}$ | LVTTTL Output Short-Circuit Current | -275                      | —    | -80  | -275                      | —    | -80  | -275                      | —    | -80  | mA            | $V_{OUT} = 0\text{V}$   |
| $C_{IN}$      | Input Capacitance (SOIC)<br>(MSOP)  | —                         | —    | —    | —                         | 0.75 | —    | —                         | —    | —    | pF            |                         |
|               |                                     | —                         | —    | —    | —                         | 1.1  | —    | —                         | —    | —    | pF            |                         |

**NOTE:**

- 10/100KEPT 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.

**AC ELECTRICAL CHARACTERISTICS** $V_{CC} = +3.3V \pm 10\%$ 

| Symbol                 | Parameter                                                   | $T_A = -40^\circ\text{C}$ |          |          | $T_A = +25^\circ\text{C}$ |          |          | $T_A = +85^\circ\text{C}$ |          |          | Unit       | Condition                     |
|------------------------|-------------------------------------------------------------|---------------------------|----------|----------|---------------------------|----------|----------|---------------------------|----------|----------|------------|-------------------------------|
|                        |                                                             | Min.                      | Typ.     | Max.     | Min.                      | Typ.     | Max.     | Min.                      | Typ.     | Max.     |            |                               |
| $f_{MAX}$              | Maximum Frequency<br>LVPECL<br>LVTTTL                       | 700<br>275                | —<br>350 | —<br>—   | 700<br>275                | —<br>350 | —<br>—   | 700<br>275                | —<br>350 | —<br>—   | MHz<br>MHz | Output<br>Toggle<br>Frequency |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>$D\_LVPECL \rightarrow Q\_LVTTTL$      | 1.5                       | —        | 2.5      | 1.5                       | —        | 2.5      | 1.5                       | —        | 2.5      | ns         | $C_L = 20\text{pF}$           |
|                        | $Q\_LVTTTL \rightarrow D\_LVPECL$                           | 100                       | 400      | 600      | 100                       | 400      | 600      | 100                       | 400      | 600      | ps         | $50\Omega$ to $V_{CC}-2.0$    |
| $V_{CMR}$              | LVPECL<br>Common Mode Range                                 | 1.2                       | —        | $V_{CC}$ | 1.2                       | —        | $V_{CC}$ | 1.2                       | —        | $V_{CC}$ | V          |                               |
| $V_{PP}$               | LVPECL Input Voltage Swing<br>(Single-Ended) <sup>(1)</sup> | 100                       | —        | —        | 100                       | —        | —        | 100                       | —        | —        | mV         |                               |
| $t_r, t_f$             | LVPECL Output Rise/Fall Times<br>(20% to 80%)               | 200                       | —        | 500      | 200                       | —        | 500      | 200                       | —        | 500      | ns         | $50\Omega$ to $V_{CC}-2.0$    |
|                        | LVTTTL Output Rise/Fall Times<br>(10% to 90%)               | 0.5                       | —        | 1.0      | 0.5                       | —        | 1.0      | 0.5                       | —        | 1.0      | ns         | $C_L = 20\text{pF}$           |
| $t_{DC}$               | Duty Cycle                                                  | 45                        | 50       | 55       | 45                        | 50       | 55       | 45                        | 50       | 55       | %          |                               |
| $t_{JITTER}$           | Cycle-to-Cycle Jitter (rms)                                 | —                         | 0.2      | < 1      | —                         | 0.2      | < 1      | —                         | 0.2      | < 1      | ps         | RMS                           |

**NOTE:**

1.  $V_{PP}$  (Min) is the minimum input swing for which AC parameters are guaranteed.

## TERMINATION RECOMMENDATIONS

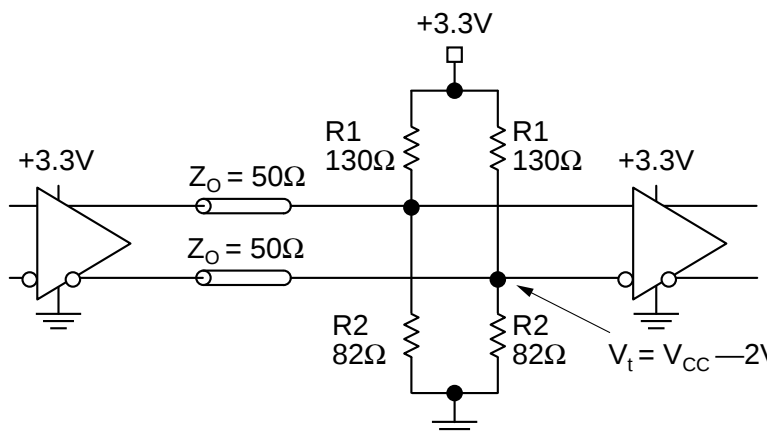


Figure 1. LVPECL Parallel Termination-Thevenin Equivalent

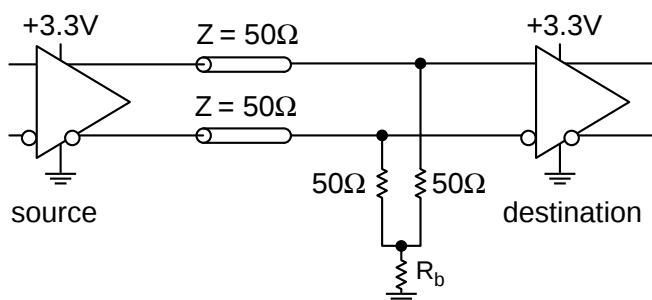


Figure 2. LVPECL Three-Resistor "Y-Termination"

**Notes:**

1. Power-saving alternative to 4-resistor, Thevenin termination.
2. Place termination resistors as close to destination inputs as possible.
3.  $R_b$  resistor sets the DC bias voltage, equal to  $V_t$ . For 3.3V supply,  $R_b$  value is between 46Ω to 50Ω.

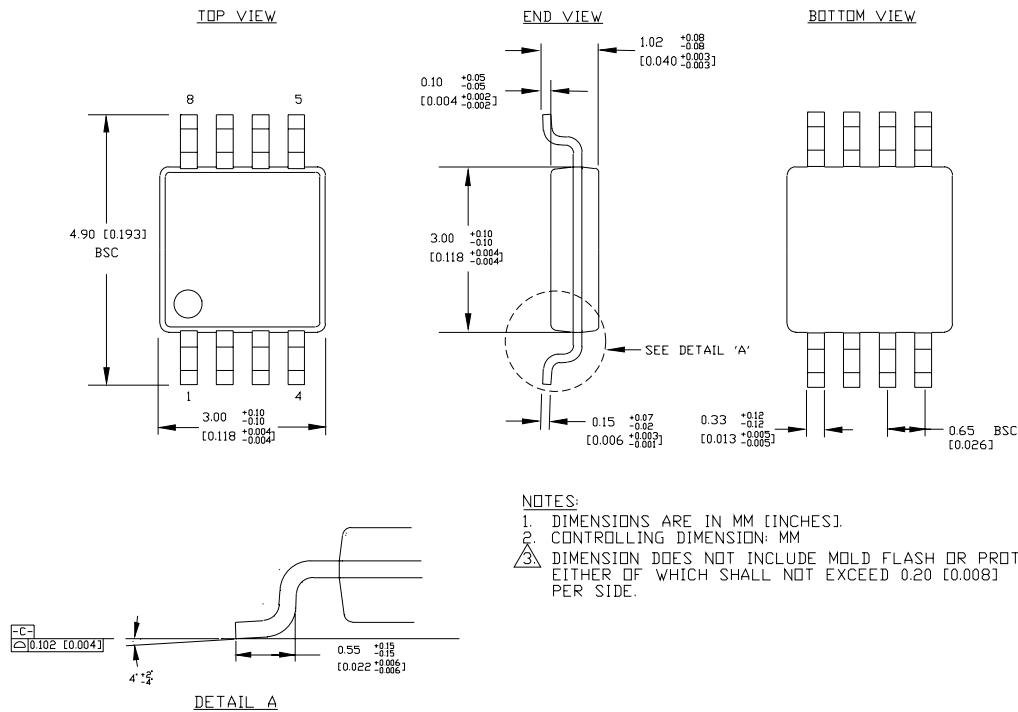
## PRODUCT ORDERING CODE

| Ordering Code    | Package Type | Operating Range | Package Marking |
|------------------|--------------|-----------------|-----------------|
| SY10EPT28LZI     | Z8-1         | Industrial      | HEP28           |
| SY10EPT28LZITR*  | Z8-1         | Industrial      | HEP28           |
| SY100EPT28LZI    | Z8-1         | Industrial      | XEP28           |
| SY100EPT28LZITR* | Z8-1         | Industrial      | XEP28           |

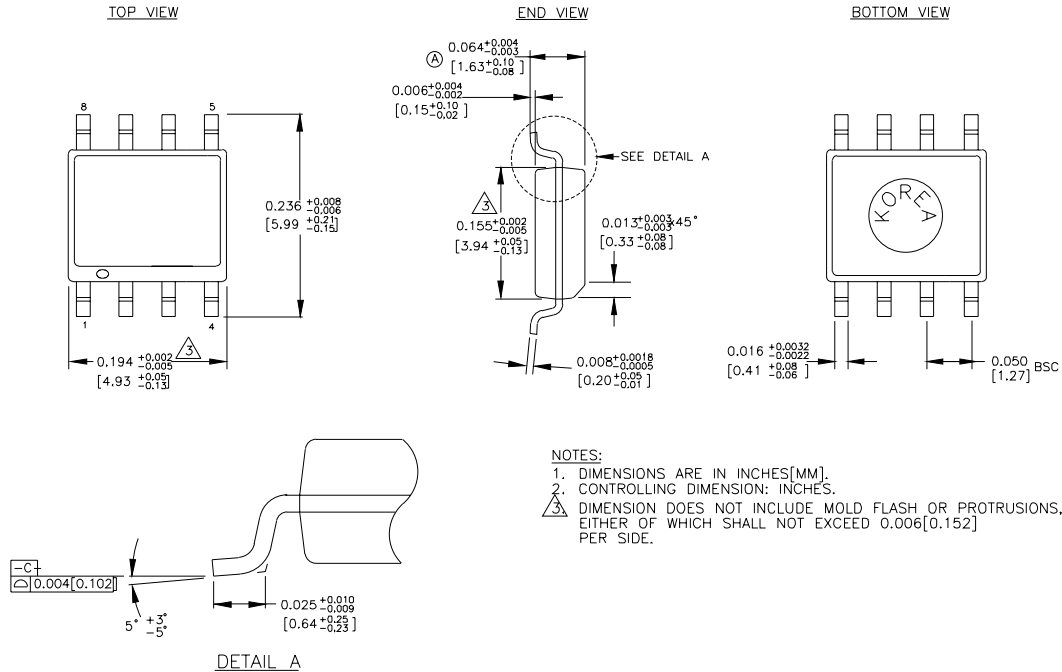
| Ordering Code    | Package Type | Operating Range | Package Marking |
|------------------|--------------|-----------------|-----------------|
| SY10EPT28LKI     | K8-1         | Industrial      | HP28            |
| SY10EPT28LKITR*  | K8-1         | Industrial      | HP28            |
| SY100EPT28LKI    | K8-1         | Industrial      | XP28            |
| SY100EPT28LKITR* | K8-1         | Industrial      | XP28            |

\*Tape and Reel

## 8 LEAD MSOP (K8-1)



Rev. 01

**8 LEAD SOIC .150" WIDE (Z8-1)**

Rev. 03

**MICREL-SYNERGY 3250 SCOTT BOULEVARD SANTA CLARA CA 95054 USA**TEL + 1 (408) 980-9191 FAX + 1 (408) 914-7878 WEB <http://www.micrel.com>

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