



**3V LVTTTL-TO-DIFFERENTIAL LVPECL  
AND DIFFERENTIAL LVPECL-TO-LVTTTL  
TRANSLATOR**

**ECL Pro™  
SY10EPT28L  
SY100EPT28L**

**FEATURES**

- 3.3V ±10% power supply
- Guaranteed AC parameters over temperature:  
f<sub>MAX</sub> > 275MHz (LVTTTL)
- < 2ns LVPECL-to-LVTTTL propagation delay
- < 600ps LVTTTL-to-LVPECL propagation delay
- Internal 75kΩ input pull-down resistors
- Industrial temperature range: -40°C to +85°C
- Available in 8-pin MSOP and SOIC packages



**ECL Pro™**

**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.

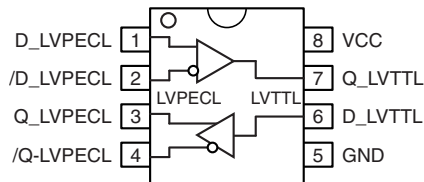
Data sheets and support documentation can be found on Micrel's web site at [www.micrel.com](http://www.micrel.com).

[www.DataSheet4U.com](http://www.DataSheet4U.com)

**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 75kΩ internal pull-down |
| Q_LVPECL<br>/Q_LVPECL | Low Voltage Differential PECL Outputs                                |
| V <sub>CC</sub>       | 3.3V Positive Supply   |
| GND                   | Ground   |

**PACKAGE/ORDERING INFORMATION**



**TOP VIEW**  
(Available in MSOP or SOIC package)

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

| Part Number                       | Package Type | Operating Range | Package Marking                       | Lead Finish    |
|-----------------------------------|--------------|-----------------|---------------------------------------|----------------|
| SY10EPT28LZI                      | Z8-1         | Industrial      | HEP28                                 | Sn-Pb          |
| SY10EPT28LZITR <sup>(2)</sup>     | Z8-1         | Industrial      | HEP28                                 | Sn-Pb          |
| SY100EPT28LZI                     | Z8-1         | Industrial      | XEP28                                 | Sn-Pb          |
| SY100EPT28LZITR <sup>(2)</sup>    | Z8-1         | Industrial      | XEP28                                 | Sn-Pb          |
| SY10EPT28LKI                      | K8-1         | Industrial      | HP28                                  | Sn-Pb          |
| SY10EPT28LKITR <sup>(2)</sup>     | K8-1         | Industrial      | HP28                                  | Sn-Pb          |
| SY100EPT28LKI                     | K8-1         | Industrial      | XP28                                  | Sn-Pb          |
| SY100EPT28LKITR <sup>(2)</sup>    | K8-1         | Industrial      | XP28                                  | Sn-Pb          |
| SY10EPT28LZG <sup>(3)</sup>       | Z8-1         | Industrial      | HEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY10EPT28LZGTR <sup>(2, 3)</sup>  | Z8-1         | Industrial      | HEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY100EPT28LZG <sup>(3)</sup>      | Z8-1         | Industrial      | XEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY100EPT28LZGTR <sup>(2, 3)</sup> | Z8-1         | Industrial      | XEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY10EPT28LKG <sup>(3)</sup>       | K8-1         | Industrial      | HP28 with Pb-Free bar-line indicator  | NiPdAu Pb-Free |
| SY10EPT28LKGTR <sup>(2, 3)</sup>  | K8-1         | Industrial      | HP28 with Pb-Free bar-line indicator  | NiPdAu Pb-Free |
| SY100EPT28LKG <sup>(3)</sup>      | K8-1         | Industrial      | XP28 with Pb-Free bar-line indicator  | NiPdAu Pb-Free |
| SY100EPT28LKGTR <sup>(2, 3)</sup> | K8-1         | Industrial      | XP28 with Pb-Free bar-line indicator  | NiPdAu Pb-Free |

**Notes:**

1. Contact factory for die availability. Dice are guaranteed at T<sub>A</sub> = 25°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 <sub>CC</sub>    | Power Supply Voltage                                | -0.5 to +3.8         | V    |      |
| V <sub>IN</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>LEAD</sub>  | Lead Temperature (Soldering, 20sec.)                | +260                 | °C   |      |
| T <sub>store</sub> | Storage Temperature Range                           | -65 to +150          | °C   |      |
| θ <sub>JA</sub>    | Package Thermal Resistance<br>(Junction-to-Ambient) | -Still-Air (SOIC)    | 160  | °C/W |
|                    |   | -500lfpm (SOIC)      | 109  |      |
|                    |   | -Still-Air (MSOP)    | 206  | °C/W |
|                    |   | -500lfpm (MSOP)      | 155  |      |
| θ <sub>JC</sub>    | Package Thermal Resistance<br>(Junction-to-Case)    | (SOIC)               | 39   | °C/W |
|                    |   | (MSOP)               | 39   |      |

**DC ELECTRICAL CHARACTERISTICS<sup>(2)</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   |           |

**LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(2)</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 Voltage                | 10EPT  | 2165                   | 2290 | 2415 | 2230                   | 2355 | 2480 | 2290                   | 2415 | 2540 | mV   | Note 3                  |
|                 |                                    | 100EPT | 2155                   | 2280 | 2405 | 2155                   | 2280 | 2405 | 2155                   | 2280 | 2405 |      |                         |
| V <sub>OL</sub> | Output LOW Voltage                 | 10EPT  | 1365                   | 1490 | 1615 | 1430                   | 1555 | 1680 | 1490                   | 1615 | 1740 | mV   | Note 3                  |
|                 |                                    | 100EPT | 1355                   | 1480 | 1605 | 1355                   | 1480 | 1605 | 1355                   | 1480 | 1605 |      |                         |
| V <sub>IH</sub> | Input HIGH Voltage                 | 10EPT  | 2090                   | —    | 2415 | 2155                   | —    | 2480 | 2215                   | —    | 2540 | mV   | Note 3                  |
|                 |                                    | 100EPT | 2075                   | —    | 2420 | 2075                   | —    | 2420 | 2075                   | —    | 2420 |      |                         |
| V <sub>IL</sub> | Input LOW Voltage                  | 10EPT  | 1365                   | —    | 1690 | 1430                   | —    | 1755 | 1490                   | —    | 1815 | mV   | Note 3                  |
|                 |                                    | 100EPT | 1355                   | —    | 1675 | 1355                   | —    | 1675 | 1355                   | —    | 1675 |      |                         |
| 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) |        | —                      | —    | —    | —                      | 0.75 | —    | —                      | —    | —    | pF   |                         |
|                 |                                    |        | —                      | —    | —    | —                      | 1.1  | —    | —                      | —    | —    | pF   |                         |

**Notes:**

- 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.
- 10/100EPT circuits are designed to meet the DC specifications shown in the above tables 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.
- Input and output parameters vary 1:1 with V<sub>CC</sub>.

**LVTTTL DC ELECTRICAL CHARACTERISTICS<sup>(4)</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 Voltage                 | 2.0                    | —    | —    | 2.0                    | —    | —    | 2.0                    | —    | —    | V    | I <sub>OH</sub> = -3mA            |
| V <sub>OL</sub>      | Output LOW Voltage                  | —                      | —    | 0.5  | —                      | —    | 0.5  | —                      | —    | 0.5  | V    | I <sub>OH</sub> = -24mA           |
| V <sub>IH</sub>      | Input HIGH Voltage                  | 2.0                    | —    | —    | 2.0                    | —    | —    | 2.0                    | —    | —    | V    |                                   |
| V <sub>IL</sub>      | Input LOW Voltage                   | —                      | —    | 0.8  | —                      | —    | 0.8  | —                      | —    | 0.8  | V    |                                   |
| V <sub>IK</sub>      | Input Clamp Voltage                 | —                      | —    | -1.2 | —                      | —    | -1.2 | —                      | —    | -1.2 | V    | I <sub>IK</sub> = -18mA           |
| I <sub>IH</sub>      | Input HIGH Current                  | —                      | —    | 20   | —                      | —    | 20   | —                      | —    | 20   | μA   | V <sub>IN</sub> = 2.7V            |
|                      |                                     | —                      | —    | 100  | —                      | —    | 100  | —                      | —    | 100  | μA   | V <sub>IN</sub> = V <sub>CC</sub> |
| I <sub>IL</sub>      | Input LOW Current                   | —                      | —    | -0.2 | —                      | —    | -0.2 | —                      | —    | -0.2 | μA   | V <sub>IN</sub> = 0.5V            |
| I <sub>OUT(SC)</sub> | LVTTTL Output Short-Circuit Current | -275                   | —    | -80  | -275                   | —    | -80  | -275                   | —    | -80  | mA   | V <sub>OUT</sub> = 0V             |
| C <sub>IN</sub>      | Input Capacitance (SOIC)<br>(MSOP)  | —                      | —    | —    | —                      | 0.75 | —    | —                      | —    | —    | pF   |                                   |
|                      |                                     | —                      | —    | —    | —                      | 1.1  | —    | —                      | —    | —    | pF   |                                   |

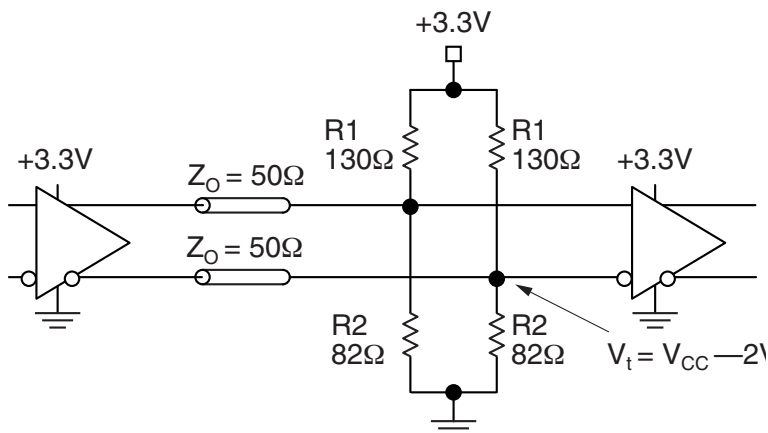
**AC ELECTRICAL CHARACTERISTICS<sup>(4)</sup>**

V<sub>CC</sub> = +3.3V ±10%

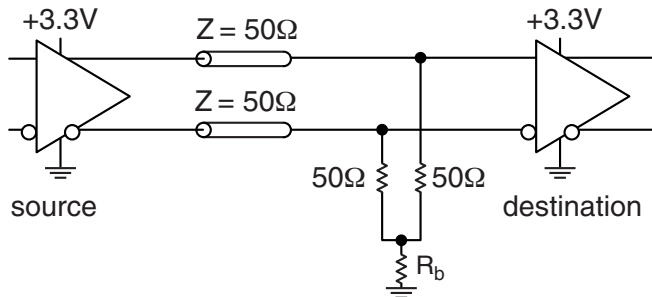
| Symbol                               | Parameter                                     | T <sub>A</sub> = -40°C |      |                 | T <sub>A</sub> = +25°C |      |                 | T <sub>A</sub> = +85°C |      |                 | Unit | Condition                   |
|--------------------------------------|---|------------------------|------|-----------------|------------------------|------|-----------------|------------------------|------|-----------------|------|-----------------------------|
|                                      |   | Min.                   | Typ. | Max.            | Min.                   | Typ. | Max.            | Min.                   | Typ. | Max.            |      |                             |
| f <sub>MAX</sub>                     | Maximum Frequency<br>LVPECL<br>LVTTTL         | 700                    | —    | —               | 700                    | —    | —               | 700                    | —    | —               | MHz  | Output Toggle Frequency     |
|                                      |   | 275                    | 350  | —               | 275                    | 350  | —               | 275                    | 350  | —               | MHz  |                             |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>D_LVPECL → Q_LVTTTL      | 1.5                    | —    | 2.5             | 1.5                    | —    | 2.5             | 1.5                    | —    | 2.5             | ns   | C <sub>L</sub> = 20pF       |
|                                      | Q_LVTTTL → D_LVPECL                           | 100                    | 400  | 600             | 100                    | 400  | 600             | 100                    | 400  | 600             | ps   | 50Ω to V <sub>CC</sub> -2.0 |
| V <sub>CMR</sub>                     | LVPECL<br>Common Mode Range                   | 1.2                    | —    | V <sub>CC</sub> | 1.2                    | —    | V <sub>CC</sub> | 1.2                    | —    | V <sub>CC</sub> | V    |                             |
| V <sub>PP</sub>                      | LVPECL Input Voltage Swing<br>(Single-Ended)  | 100                    | —    | —               | 100                    | —    | —               | 100                    | —    | —               | mV   | <b>Note 5</b>               |
| t <sub>r</sub> , t <sub>f</sub>      | LVPECL Output Rise/Fall Times<br>(20% to 80%) | 200                    | —    | 500             | 200                    | —    | 500             | 200                    | —    | 500             | ns   | 50Ω to V <sub>CC</sub> -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 <sub>L</sub> = 20pF       |
| t <sub>DC</sub>                      | Duty Cycle                                    | 45                     | 50   | 55              | 45                     | 50   | 55              | 45                     | 50   | 55              | %    |                             |
| t <sub>JITTER</sub>                  | Cycle-to-Cycle Jitter (rms)                   | —                      | 0.2  | < 1             | —                      | 0.2  | < 1             | —                      | 0.2  | < 1             | ps   | RMS                         |

- 10/100KEPT circuits are designed to meet the DC specifications shown in the above tables 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.
- V<sub>PP</sub> (min) is the minimum input swing for which AC parameters are guaranteed.

**TERMINATION RECOMMENDATIONS**



**Figure 1. LVPECL Parallel Termination-Thevenin Equivalent**

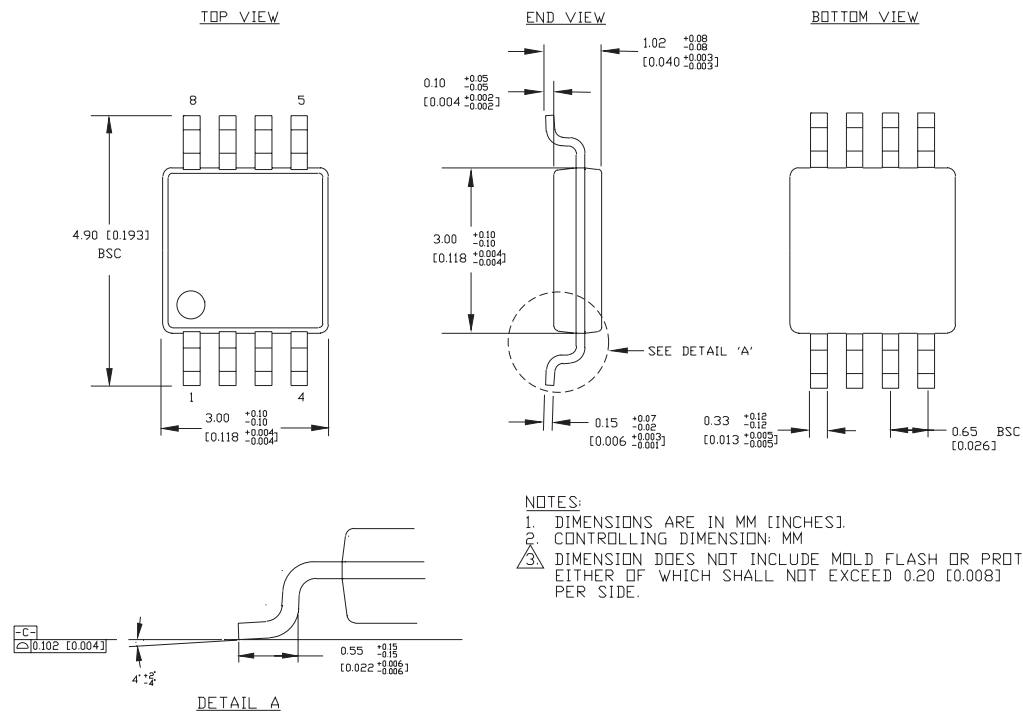


**Figure 2. LVPECL Three-Resistor "Y-Termination"**

**Notes:**

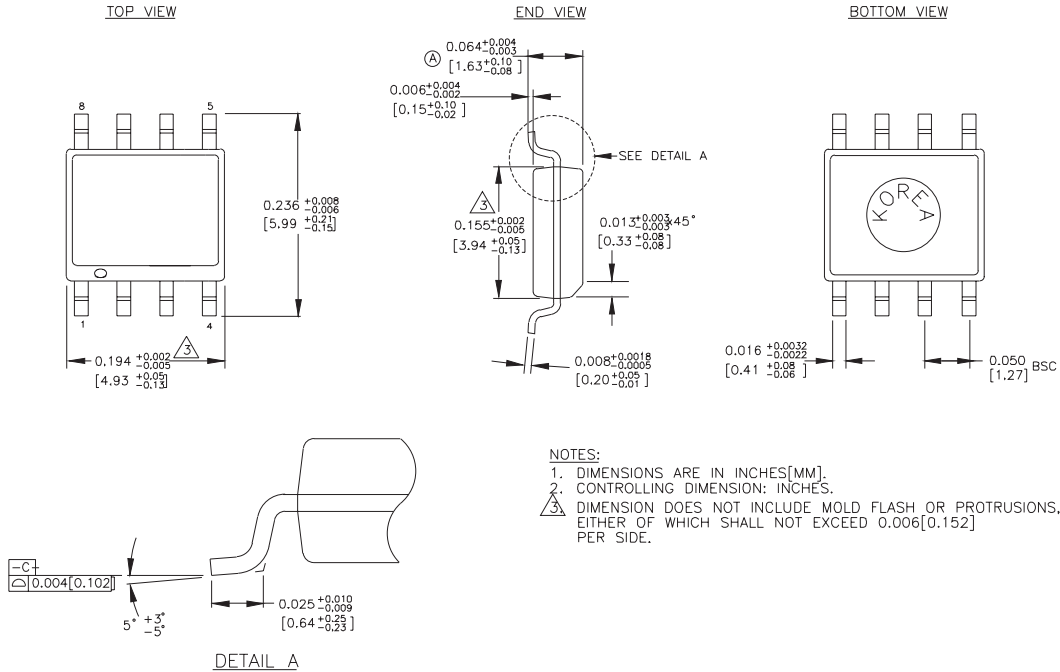
1. Power-saving alternative to 4-resistor, Thevenin termination.
2. Place termination resistors as close to destination inputs as possible.
3.  $R_b$  resistor sets the DC bias voltage, equal to  $V_t$ . For 3.3V supply,  $R_b$  value is between 46Ω to 50Ω.

**8-PIN MSOP (K8-1)**



Rev. 01

**8-PIN SOIC .150" WIDE (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>

The information furnished by Micrel in this datasheet is believed to be accurate and reliable. However, no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is at Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2005 Micrel, Incorporated.