



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:
 $f_{MAX} > 275\text{MHz}$ (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.

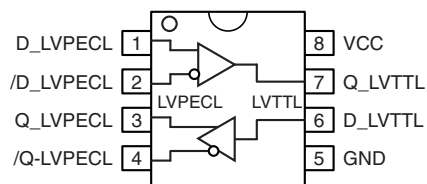
The 100k series includes temperature compensation. Thus, logic levels are constant over temperature.

Data sheets and support documentation can be found on Micrel's web site at www.micrel.com.

PIN NAMES

| Pin | Function |
|-----------------------|--|
| D_LVTTTL | Low Voltage TTL Input |
| Q_LVTTTL | Low Voltage TTL Output |
| D_LVPECL /D_LVPECL | Low Voltage Differential PECL Inputs with 75kΩ internal pull-down |
| Q_LVPECL /Q_LVPECL | Low Voltage Differential PECL Outputs |
| V _{CC} | 3.3V Positive Supply |
| GND | Ground |

PACKAGE/ORDERING INFORMATION



TOP VIEW
(Available in MSOP
or SOIC package)

Ordering Information⁽¹⁾

| Part Number | Package Type | Operating Range | Package Marking | Lead Finish |
|-----------------------------------|--------------|-----------------|---------------------------------------|----------------|
| SY10EPT28LZI | Z8-1 | Industrial | HEP28 | Sn-Pb |
| SY10EPT28LZITR ⁽²⁾ | Z8-1 | Industrial | HEP28 | Sn-Pb |
| SY100EPT28LZI | Z8-1 | Industrial | XEP28 | Sn-Pb |
| SY100EPT28LZITR ⁽²⁾ | Z8-1 | Industrial | XEP28 | Sn-Pb |
| SY10EPT28LKI | K8-1 | Industrial | HP28 | Sn-Pb |
| SY10EPT28LKITR ⁽²⁾ | K8-1 | Industrial | HP28 | Sn-Pb |
| SY100EPT28LKI | K8-1 | Industrial | XP28 | Sn-Pb |
| SY100EPT28LKITR ⁽²⁾ | K8-1 | Industrial | XP28 | Sn-Pb |
| SY10EPT28LZG ⁽³⁾ | Z8-1 | Industrial | HEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY10EPT28LZGTR ^(2, 3) | Z8-1 | Industrial | HEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY100EPT28LZG ⁽³⁾ | Z8-1 | Industrial | XEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY100EPT28LZGTR ^(2, 3) | Z8-1 | Industrial | XEP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY10EPT28LKG ⁽³⁾ | K8-1 | Industrial | HP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY10EPT28LKGTR ^(2, 3) | K8-1 | Industrial | HP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY100EPT28LKG ⁽³⁾ | K8-1 | Industrial | XP28 with Pb-Free bar-line indicator | NiPdAu Pb-Free |
| SY100EPT28LKGTR ^(2, 3) | 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_A = 25°C, DC Electricals only.
2. Tape and Reel.
3. Pb-Free package is recommended for new designs.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Rating | Value | Unit |
|--------------------|--|--------------------------|--------------|
| V _{CC} | Power Supply Voltage | -0.5 to +3.8 | V |
| V _{IN} | Input Voltage | 0 to V _{CC} | V |
| I _{OUT} | LVPECL Output Current -Continuous -Surge | 50 100 | mV |
| T _A | Operating Temperature Range | -40 to +85 | °C |
| T _{LEAD} | Lead Temperature (Soldering, 20sec.) | +260 | °C |
| T _{store} | Storage Temperature Range | -65 to +150 | °C |
| θ _{JA} | Package Thermal Resistance (Junction-to-Ambient) -Still-Air (SOIC) -500lfpm (SOIC) -Still-Air (MSOP) -500lfpm (MSOP) | 160 109 206 155 | °C/W °C/W |
| θ _{JC} | Package Thermal Resistance (Junction-to-Case) (SOIC) (MSOP) | 39 39 | °C/W |

DC ELECTRICAL CHARACTERISTICS⁽²⁾

| Symbol | Parameter | T _A = -40°C | | | T _A = +25°C | | | T _A = +85°C | | | Unit | Condition |
|-----------------|----------------------|------------------------|------|------|------------------------|------|------|------------------------|------|------|------|-----------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | | |
| V _{CC} | Power Supply Voltage | 3.0 | 3.3 | 3.6 | 3.0 | 3.3 | 3.6 | 3.0 | 3.3 | 3.6 | V | |
| I _{CC} | Power Supply Current | — | 20 | 40 | — | 22 | 40 | — | 25 | 40 | mA | |

LVPECL DC ELECTRICAL CHARACTERISTICS⁽²⁾

V_{CC} = 3.3V ±10%

| Symbol | Parameter | | T _A = -40°C | | | T _A = +25°C | | | T _A = +85°C | | | Unit | Condition |
|-----------------|------------------------------------|-----------------|------------------------|--------------|--------------|------------------------|--------------|--------------|------------------------|--------------|--------------|----------|-------------------------|
| | | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | | |
| V _{OH} | Output HIGH Voltage | 10EPT 100EPT | 2165 2155 | 2290 2280 | 2415 2405 | 2230 2155 | 2355 2280 | 2480 2405 | 2290 2155 | 2415 2280 | 2540 2405 | mV | Note 3 |
| V _{OL} | Output LOW Voltage | 10EPT 100EPT | 1365 1355 | 1490 1480 | 1615 1605 | 1430 1355 | 1555 1480 | 1680 1605 | 1490 1355 | 1615 1480 | 1740 1605 | mV | Note 3 |
| V _{IH} | Input HIGH Voltage | 10EPT 100EPT | 2090 2075 | — — | 2415 2420 | 2155 2075 | — — | 2480 2420 | 2215 2075 | — — | 2540 2420 | mV | Note 3 |
| V _{IL} | Input LOW Voltage | 10EPT 100EPT | 1365 1355 | — — | 1690 1675 | 1430 1355 | — — | 1755 1675 | 1490 1355 | — — | 1815 1675 | mV | Note 3 |
| I _{IH} | Input HIGH Current | | — | — | 150 | — | — | 150 | — | — | 150 | μA | V _{IN} = 3.46V |
| I _{IL} | Input LOW Current /D, D | | 0.5 | — | 0.5 | — | — | 0.5 | — | — | 0.5 | μA | |
| C _{IN} | Input Capacitance (SOIC) (MSOP) | | — — | — — | — — | — — | 0.75 1.1 | — — | — — | — — | — — | pF 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_{CC}.

LVTTTL DC ELECTRICAL CHARACTERISTICS⁽⁴⁾

V_{CC} = 3.3V ±10%

| Symbol | Parameter | T _A = -40°C | | | T _A = +25°C | | | T _A = +85°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} = -3mA |
| V _{OL} | Output LOW Voltage | — | — | 0.5 | — | — | 0.5 | — | — | 0.5 | V | I _{OH} = -24mA |
| 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} = -18mA |
| I _{IH} | Input HIGH Current | — | — | 20 | — | — | 20 | — | — | 20 | μA | V _{IN} = 2.7V |
| | | — | — | 100 | — | — | 100 | — | — | 100 | μA | V _{IN} = V _{CC} |
| I _{IL} | Input LOW Current | — | — | -0.2 | — | — | -0.2 | — | — | -0.2 | μA | V _{IN} = 0.5V |
| I _{OUT(SC)} | LVTTTL Output Short-Circuit Current | -275 | — | -80 | -275 | — | -80 | -275 | — | -80 | mA | V _{OUT} = 0V |
| C _{IN} | Input Capacitance (SOIC) (MSOP) | — | — | — | — | 0.75 | — | — | — | — | pF | |
| | | — | — | — | — | 1.1 | — | — | — | — | pF | |

AC ELECTRICAL CHARACTERISTICS⁽⁴⁾

V_{CC} = +3.3V ±10%

| Symbol | Parameter | T _A = -40°C | | | T _A = +25°C | | | T _A = +85°C | | | Unit | Condition |
|--------------------------------------|---|------------------------|------|-----------------|------------------------|------|-----------------|------------------------|------|-----------------|------|-----------------------------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | | |
| f _{MAX} | Maximum Frequency LVPECL LVTTTL | 700 | — | — | 700 | — | — | 700 | — | — | MHz | Output Toggle Frequency |
| | | 275 | 350 | — | 275 | 350 | — | 275 | 350 | — | MHz | |
| t _{PLH} t _{PHL} | Propagation Delay D_LVPECL → Q_LVTTTL | 1.5 | — | 2.5 | 1.5 | — | 2.5 | 1.5 | — | 2.5 | ns | C _L = 20pF |
| | Q_LVTTTL → D_LVPECL | 100 | 400 | 600 | 100 | 400 | 600 | 100 | 400 | 600 | ps | 50Ω to V _{CC} -2.0 |
| V _{CMR} | LVPECL Common Mode Range | 1.2 | — | V _{CC} | 1.2 | — | V _{CC} | 1.2 | — | V _{CC} | V | |
| V _{PP} | LVPECL Input Voltage Swing (Single-Ended) | 100 | — | — | 100 | — | — | 100 | — | — | mV | Note 5 |
| t _r , t _f | LVPECL Output Rise/Fall Times (20% to 80%) | 200 | — | 500 | 200 | — | 500 | 200 | — | 500 | ns | 50Ω to V _{CC} -2.0 |
| | LVTTTL Output Rise/Fall Times (10% to 90%) | 0.5 | — | 1.0 | 0.5 | — | 1.0 | 0.5 | — | 1.0 | ns | C _L = 20pF |
| 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 |

- 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_{PP} (min) is the minimum input swing for which AC parameters are guaranteed.

TERMINATION RECOMMENDATIONS

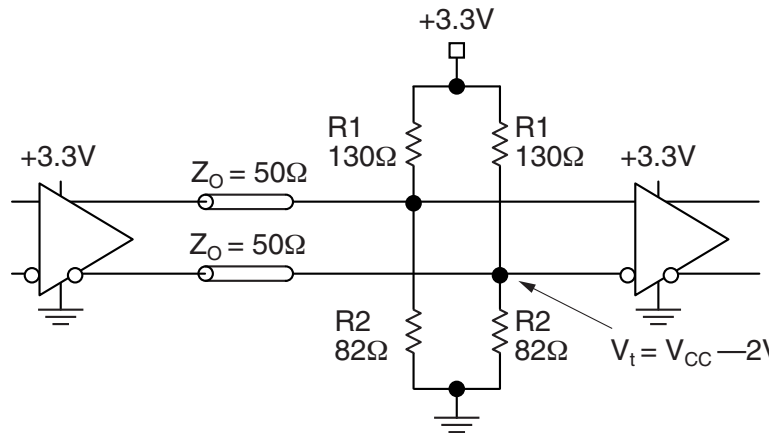


Figure 1. LVPECL Parallel Termination–Thevenin Equivalent

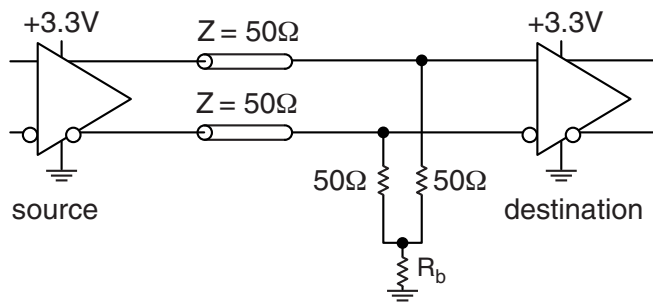
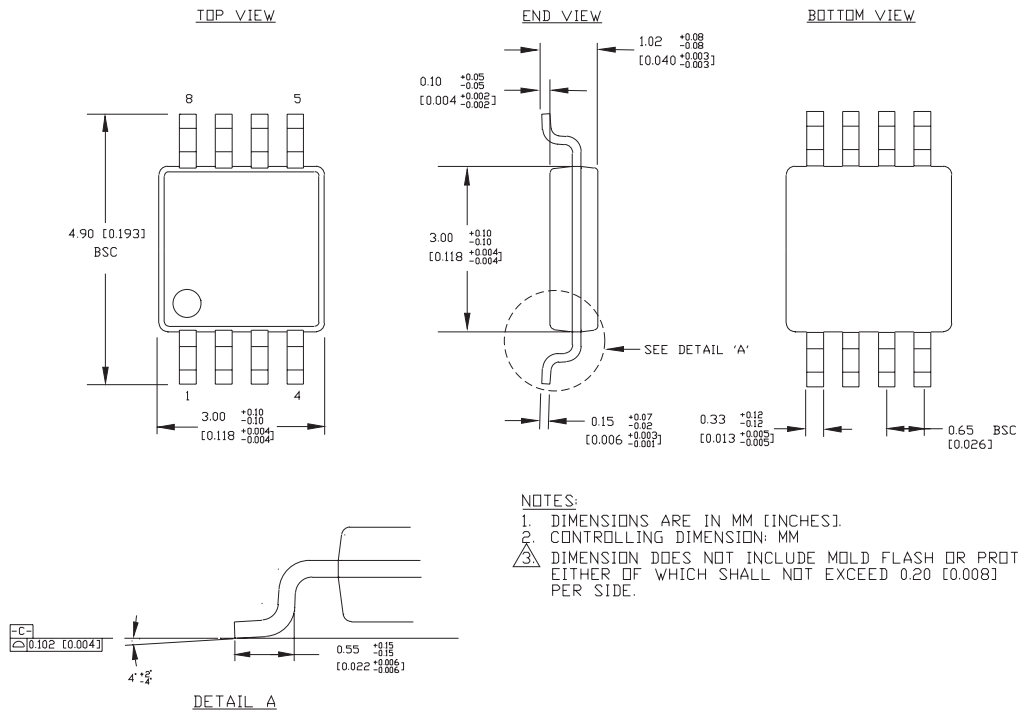


Figure 2. LVPECL Three-Resistor ‘Y-Termination’

Notes:

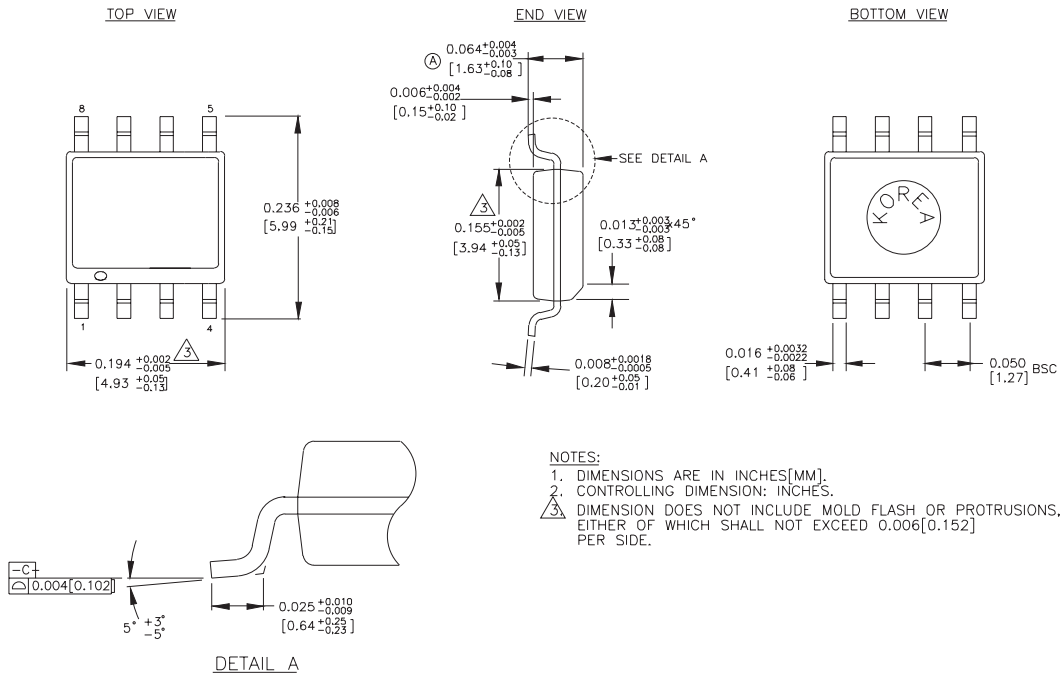
1. Power-saving alternative to 4-resistor, Thevenin termination.
2. Place termination resistors as close to destination inputs as possible.
3. R_b resistor sets the DC bias voltage, equal to V_t . For 3.3V supply, R_b value is between 46Ω to 50Ω.

8-PIN MSOP (K8-1)



Rev.01

8-PIN SOIC .150" WIDE (Z8-1)



Rev. 03

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