

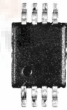


**3V LVTTTL-TO-DIFFERENTIAL LVPECL  
AND DIFFERENTIAL LVPECL-TO-LVTTTL  
TRANSLATOR**

**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.

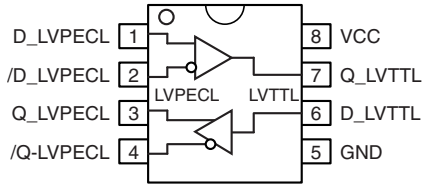
Data sheets and support documentation can be found on Micrel's web site at [www.micrel.com](http://www.micrel.com).

**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 <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 -Continuous -Surge	50 100	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 (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 (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) (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(4)

$V_{CC} = 3.3V \pm 10\%$

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) (MSOP)	—	—	—	—	0.75	—	—	—	—	pF	
		—	—	—	—	1.1	—	—	—	—	pF	

### AC ELECTRICAL CHARACTERISTICS(4)

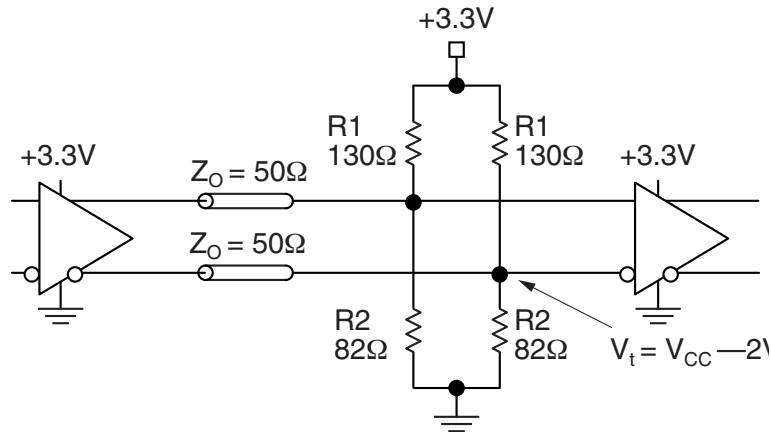
$V_{CC} = +3.3V \pm 10\%$

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 LVPECL LVTTTL	700	—	—	700	—	—	700	—	—	MHz	Output Toggle Frequency
		275	350	—	275	350	—	275	350	—	MHz	
$t_{PLH}$ $t_{PHL}$	Propagation Delay 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 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	<b>Note 5</b>
$t_r, t_f$	LVPECL Output Rise/Fall Times (20% to 80%)	200	—	500	200	—	500	200	—	500	ns	$50\Omega$ 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	$C_L = 20\text{pF}$
$t_{DC}$	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

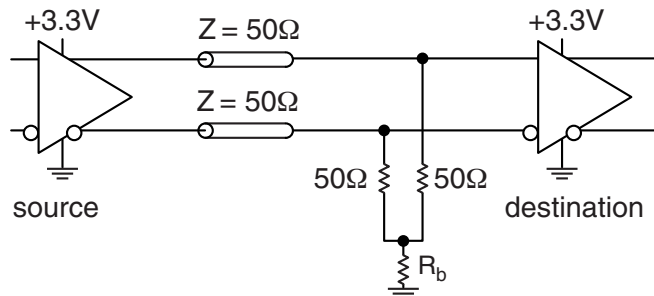
4. 10/100KEPT circuits are designed to meet the DC specifications shown in the above tables after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.

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

**TERMINATION RECOMMENDATIONS**



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

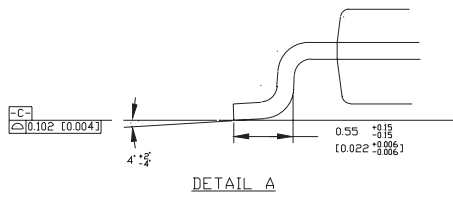
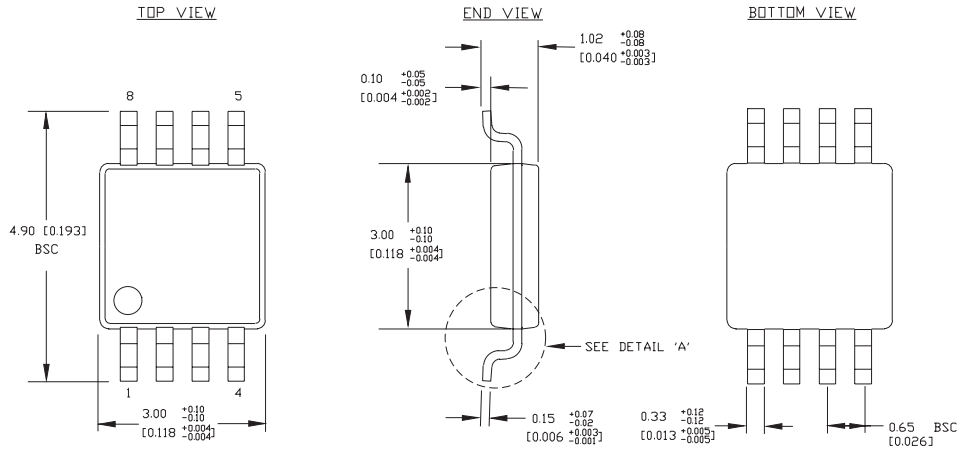


**Figure 2. LVPECL Three-Resistor ‘Y-Termination’**

**Notes:**

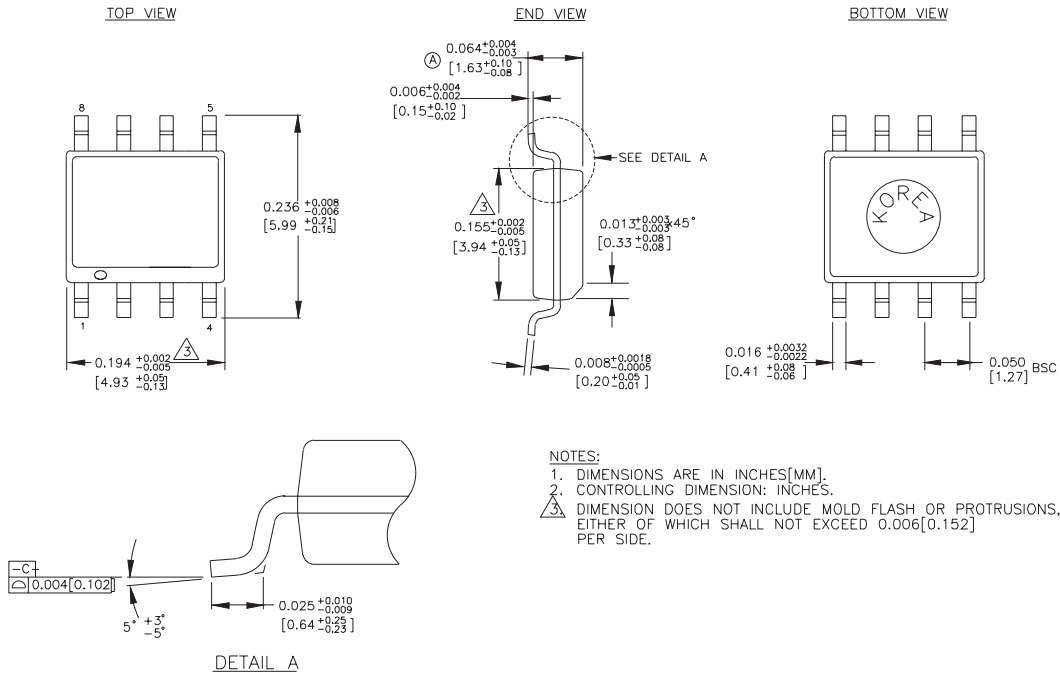
1. Power-saving alternative to 4-resistor, Thevenin termination.
2. Place termination resistors as close to destination inputs as possible.
3.  $R_b$  resistor sets the DC bias voltage, equal to  $V_t$ . For 3.3V supply,  $R_b$  value is between 46Ω to 50Ω.

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



- NOTES:**
1. DIMENSIONS ARE IN MM [INCHES].
  2. CONTROLLING DIMENSION: MM
  3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.20 [0.008] PER SIDE.

**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.