



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

**ECL Pro™
SY10EPT28L
SY100EPT28L**

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°C to $+85^{\circ}\text{C}$
- 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.

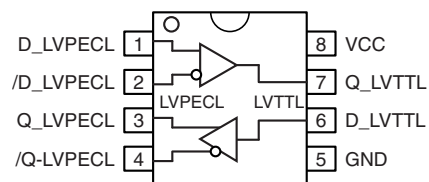
The 100k series includes temperature compensation. Thus, logic levels are constant over temperature.

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 $75\text{k}\Omega$ 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 $T_A = 25^\circ\text{C}$, 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⁾ $V_{CC} = 3.3V \pm 10\%$

Symbol	Parameter	$T_A = -40^\circ C$			$T_A = +25^\circ C$			$T_A = +85^\circ C$			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⁾ $V_{CC} = +3.3V \pm 10\%$

Symbol	Parameter	$T_A = -40^\circ C$			$T_A = +25^\circ C$			$T_A = +85^\circ C$			Unit	Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
f_{MAX}	Maximum Frequency LVPECL LVTTTL	700 275	— 350	— —	700 275	— 350	— —	700 275	— 350	— —	MHz MHz	Output Toggle Frequency
t_{PLH} t_{PHL}	Propagation Delay $D_LVPECL \rightarrow Q_LVTTTL$	1.5	—	2.5	1.5	—	2.5	1.5	—	2.5	ns	$C_L = 20pF$
	$Q_LVTTTL \rightarrow D_LVPECL$	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

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

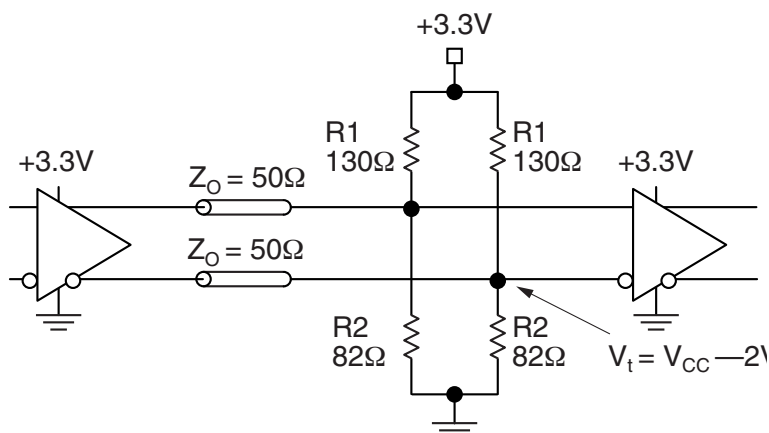


Figure 1. LVPECL Parallel Termination–Thevenin Equivalent

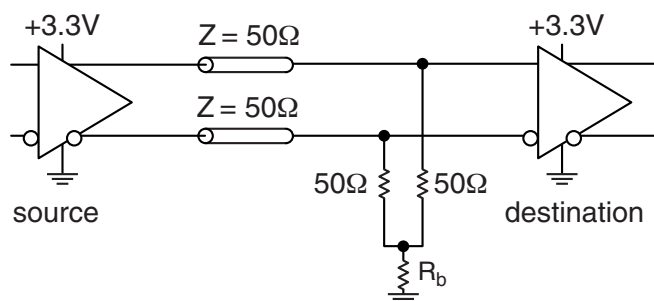
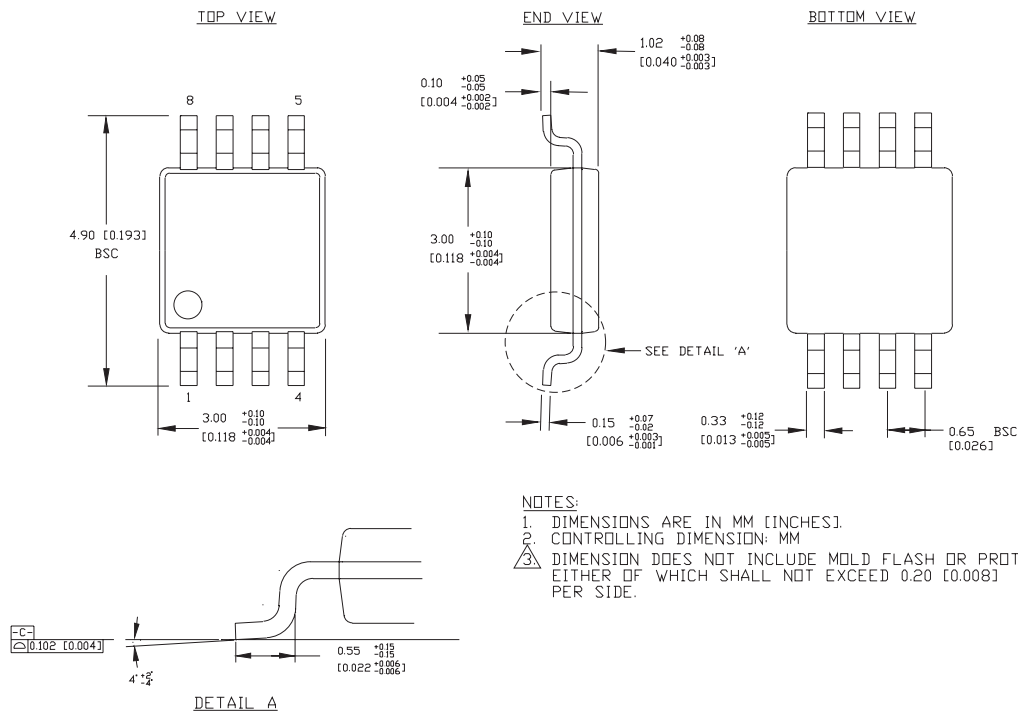


Figure 2. LVPECL Three-Resistor “Y-Termination”

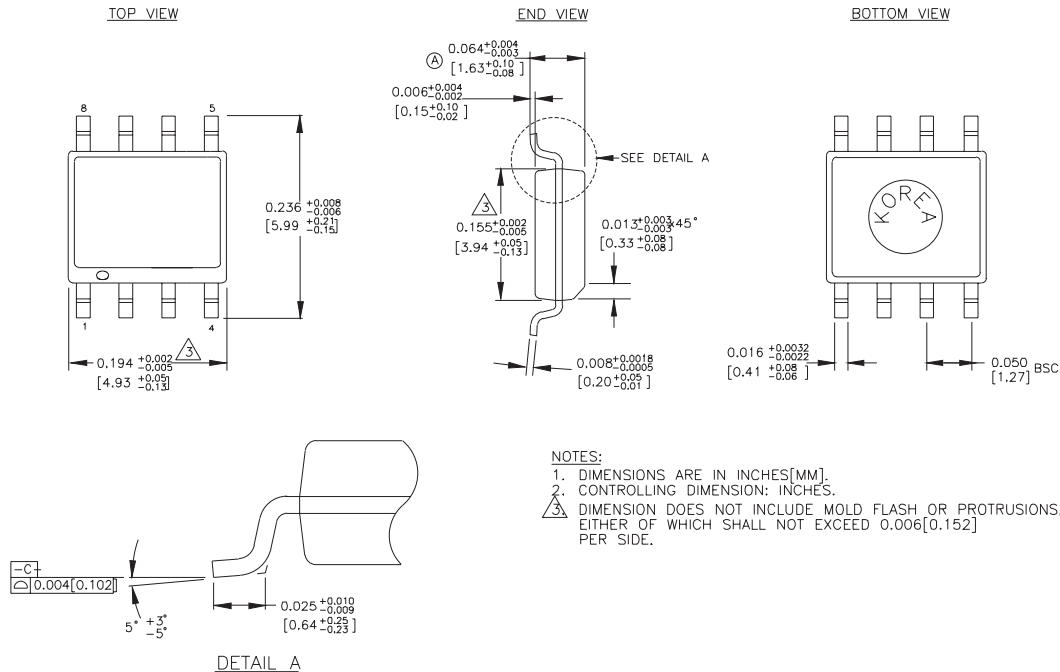
Notes:

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)



Rev. 01

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

Rev. 03

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