MICREL ®

3V LVTTL-TO-DIFFERENTIAL LVPECL AND DIFFERENTIAL LVPECL-TO-LVTTL TRANSLATOR

ECL Pro™
SY10EPT28L
SY100EPT28L

FEATURES

- **3.3V ±10% power supply**
- **Guaranteed AC parameters over temperature:**
  f_{MAX} > 275MHz (LVTTL)
- **< 2ns LVPECL-to-LVTTL propagation delay**
- **< 600ps LVTTL-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-LVTTL translator and a LVTTL-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.
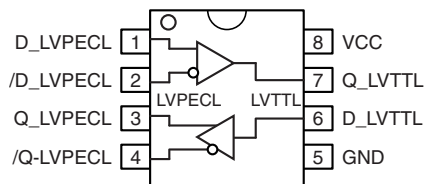
The 100k series includes temperature compensation. Thus, logic levels are constant over temperature.

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

PIN NAMES

Pin	Function
D_LVTTL	Low Voltage TTL Input
Q_LVTTL	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

ECL Pro is a trademark of Micrel, Inc.

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	50	mV
		−Surge	100	
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)	160	°C/W
		−500lfpm (SOIC)	109	
		−Still-Air (MSOP)	206	°C/W
		−500lfpm (MSOP)	155	
θ_{JC}	Package Thermal Resistance (Junction-to-Case)	(SOIC)	39	°C/W
		(MSOP)	39	

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]

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

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	2165	2290	2415	2230	2355	2480	2290	2415	2540	mV	**Note 3**
		100EPT	2155	2280	2405	2155	2280	2405	2155	2280	2405		
V_{OL}	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_{IH}	Input HIGH Voltage	10EPT	2090	—	2415	2155	—	2480	2215	—	2540	mV	**Note 3**
		100EPT	2075	—	2420	2075	—	2420	2075	—	2420		
V_{IL}	Input LOW Voltage	10EPT	1365	—	1690	1430	—	1755	1490	—	1815	mV	**Note 3**
		100EPT	1355	—	1675	1355	—	1675	1355	—	1675		
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)		—	—	—	—	0.75	—	—	—	—	pF	
	(MSOP)		—	—	—	—	1.1	—	—	—	—	pF	

Notes:

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 ratlng conditions for extended periods may affect device reliability.

2. 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.

3. Input and output parameters vary 1:1 with V_{CC}.

LVTTL DC ELECTRICAL CHARACTERISTICS[4]

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

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	$V_{IN} = 0.5V$
$I_{OUT(SC)}$	LVTTL Output Short-Circuit Current	−275	—	−80	−275	—	−80	−275	—	−80	mA	$V_{OUT} = 0V$
C_{IN}	Input Capacitance (SOIC)	—		—	—	0.75	—	—		—	pF	
	(MSOP)	—		—	—	1.1	—	—		—	pF	

AC ELECTRICAL CHARACTERISTICS[4]

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

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 LVTTL	700 275	— 350	— —	700 275	— 350	— —	700 275	— 350	— —	MHz MHz	Output Toggle Frequency
t_{PLH} t_{PHL}	Propagation Delay D_LVPECL → Q_LVTTL	1.5	—	2.5	1.5	—	2.5	1.5	—	2.5	ns	$C_L = 20pF$
	Q_LVTTL → 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
	LVTTL 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.
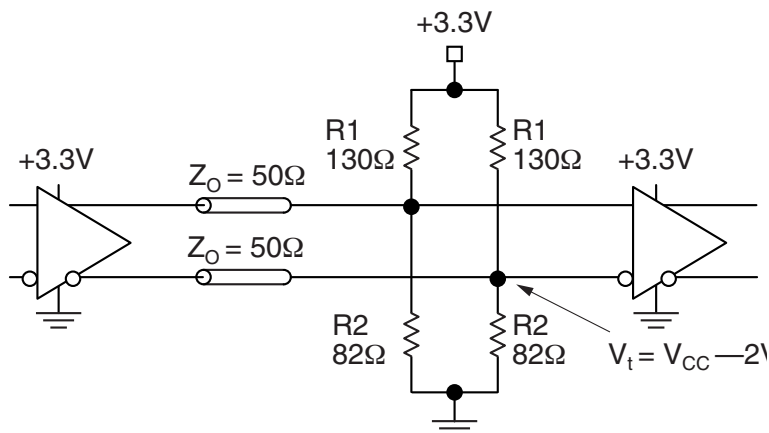
TERMINATION RECOMMENDATIONS

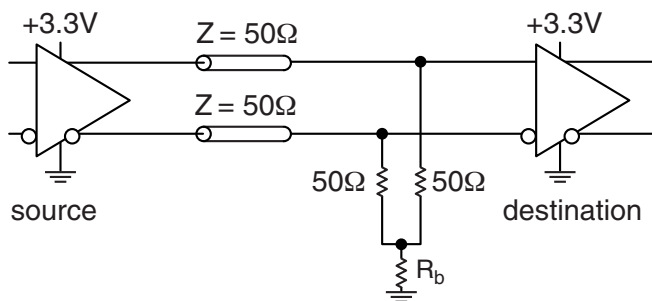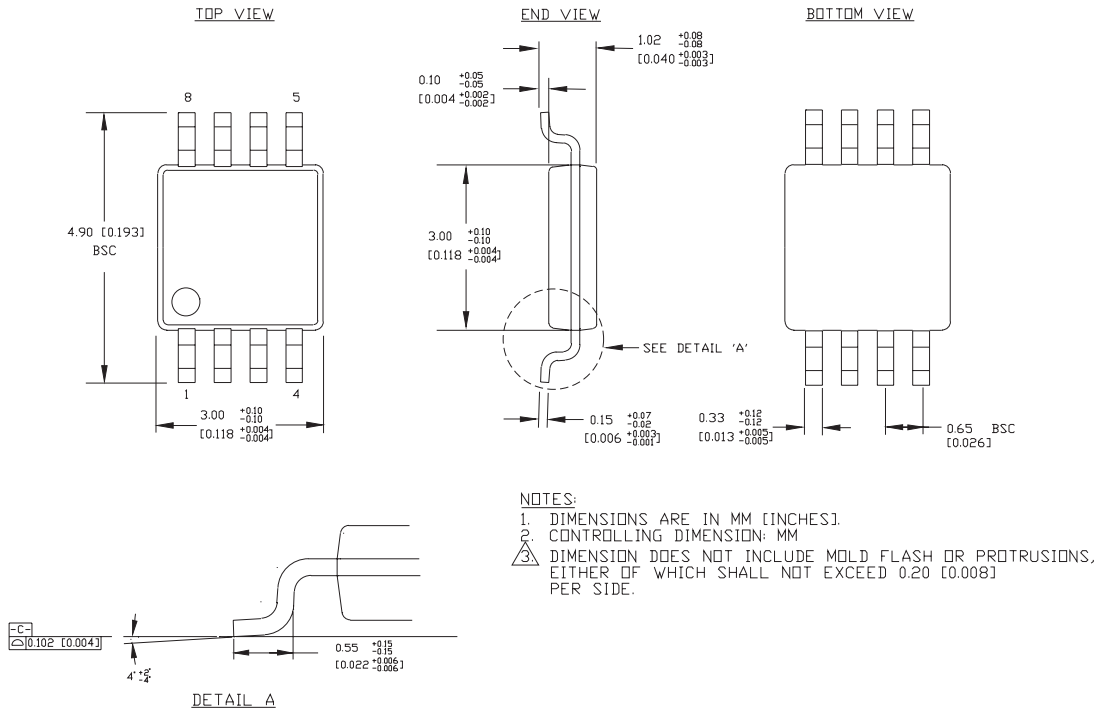**Figure 1. LVPECL Parallel Termination–Thevenin Equivalent**

Figure 2. LVPECL Three-Resistor "Y–Termination"
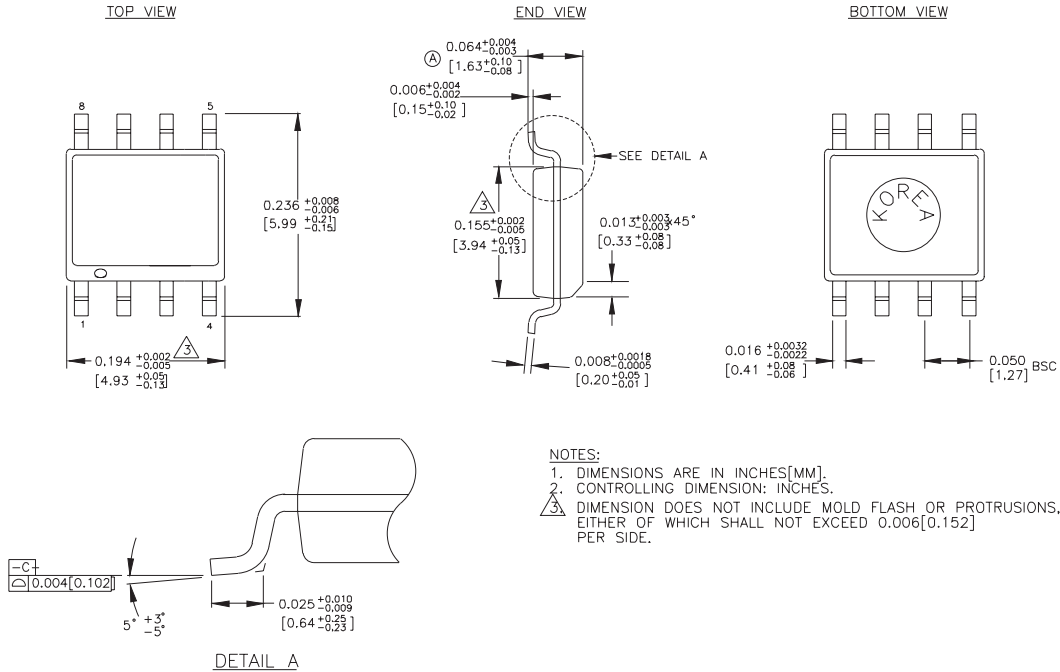
Notes:

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)

TOP VIEW

8   5

4.90 [0.193]
BSC

1   4

3.00 $^{+0.10}_{-0.10}$
[0.118 $^{+0.004}_{-0.004}$]

END VIEW

1.02 $^{+0.08}_{-0.08}$
[0.040 $^{+0.003}_{-0.003}$]

0.10 $^{+0.05}_{-0.05}$
[0.004 $^{+0.002}_{-0.002}$]

3.00 $^{+0.10}_{-0.10}$
[0.118 $^{+0.004}_{-0.004}$]

SEE DETAIL 'A'

0.15 $^{+0.07}_{-0.02}$
[0.006 $^{+0.003}_{-0.001}$]

0.33 $^{+0.12}_{-0.12}$
[0.013 $^{+0.005}_{-0.005}$]

BOTTOM VIEW

0.65   BSC
[0.026]

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.

-C-
0.102 [0.004]

4° $^{+4}_{-4}$

0.55 $^{+0.15}_{-0.15}$
[0.022 $^{+0.006}_{-0.006}$]

DETAIL A

Rev. 01

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

TOP VIEW

END VIEW

BOTTOM VIEW

KOREA

NOTES:
1. DIMENSIONS ARE IN INCHES[MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.006[0.152] PER SIDE.

DETAIL A

Rev. 03

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.

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MAX34405BEZT+ NLSX3014MUTAG NVT4556BUKZ NLSV4T244EMUTAG NLSX5011MUTCG NLV9306USG
NLVSX4014MUTAG MAX34405BEZT+T NLSV4T3144MUTAG NSV12200LT1G NLVSX4373MUTAG NB3U23CMNTAG
MAX3371ELT+T MAX3008EUP+T NLVPCA9306AMUTCG NLSX3013BFCT1G MAX9378EUA+T NLV7WBD3125USG
NLV14504BDTG NLSX3012DMR2G NLSX5012DR2G MAX3391EEUD+T MAX3379EETD+ PI4ULS3V4857GEAEX
MAX3391EEBC+T MAX14842ATE+T 74AVCH1T45FZ4-7 CLVC16T245MDGGREP HEF4104BT TC74LCX16245(EL,F)
MC10H124FNG CAVCB164245MDGGREP 7WBD383USG NVT2001GM,115 CLVC8T245MRHLTEP 74LVC1G175GS,132
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