Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

2.5V/3.3V/5V 1:2 DIFFERENTIAL PECL/LVPECL/ECL FANOUT BUFFER

ECL Pro™
SY10EP11U
SY100EP11U

FEATURES

- 2.5V, 3.3V and 5V power supply options
- Guaranteed AC parameters over temperature:
  - f_{MAX} > 3.0GHz
  - < 20ps output-to-output skew
  - < 200ps t_r / t_f
  - < 300ps propagation delay
- Wide temperature range: –40°C to +85°C
- Available in 8-pin (3mm) MSOP and SOIC packages

ECL Pro™

DESCRIPTION

The SY10/100EP11U is a precision, high-speed 1:2 differential fanout buffer. Having within-device skews and output transition times significantly improved over the EL11V, the EP11U is ideally suited for those applications which require the ultimate in AC performance.

The differential inputs of the EP11U employ clamping circuitry to maintain stability under open input conditions. If the inputs are left open, the Q outputs will go LOW.

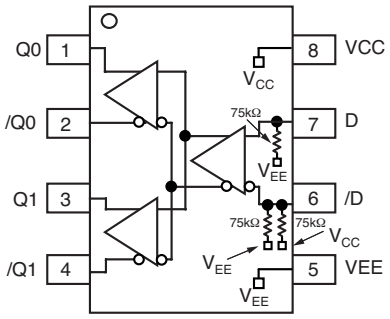
CROSS REFERENCE TABLE

Micrel Semiconductor	ON Semiconductor
SY10EP11UZI/KI	MC10EP11D/DT
SY10EP11UZI/KI	MC10LVEP11D/DT
SY100EP11UZI/KI	MC100EP11D/DT
SY100EP11UZI/KI	MC100LVEP11D/DT

PIN NAMES

Pin	Function
D	PECL, LVPECL, ECL, LVECL Clock or Data Input: Internal 75kΩ pulldown resistor. If left floating, pin defaults LOW, Q_{OUT} goes LOW.
/D	PECL, LVPECL, ECL, LVECL complementary Clock or Data Input: Internal 75kΩ pull-up and down resistors. If left open, default is V_{CC}/2. When the input is not used, it can be left open.
Q0, /Q0 Q1, /Q1	PECL, LVPECL, ECL, LVECL Outputs: Terminates to V_{CC} –2V.
V_{CC}	Positive Power Supply: Bypass with 0.1μF//0.01μF low ESR capacitors.
V_{EE}	Negative Power Supply: For PECL operation, connect to GND.

PACKAGE/ORDERING INFORMATION



8-pin MSOP and SOIC Packages

Ordering Information[1]

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY10EP11UKC	K8-1	Commercial	HP11	Sn-Pb
SY10EP11UKCTR[2]	K8-1	Commercial	HP11	Sn-Pb
SY100EP11UKC	K8-1	Commercial	XP11	Sn-Pb
SY100EP11UKCTR[2]	K8-1	Commercial	XP11	Sn-Pb
SY10EP11UZC	Z8-1	Commercial	HEP11U	Sn-Pb
SY10EP11UZCTR[2]	Z8-1	Commercial	HEP11U	Sn-Pb
SY100EP11UZC	Z8-1	Commercial	XEP11U	Sn-Pb
SY100EP11UZCTR[2]	Z8-1	Commercial	XEP11U	Sn-Pb
SY10EP11UKI	K8-1	Industrial	HP11	Sn-Pb
SY10EP11UKITR[2]	K8-1	Industrial	HP11	Sn-Pb
SY100EP11UKI	K8-1	Industrial	XP11	Sn-Pb
SY100EP11UKITR[2]	K8-1	Industrial	XP11	Sn-Pb
SY10EP11UZI	Z8-1	Industrial	HEP11U	Sn-Pb
SY10EP11UZITR[2]	Z8-1	Industrial	HEP11U	Sn-Pb
SY100EP11UZI	Z8-1	Industrial	XEP11U	Sn-Pb
SY100EP11UZITR[2]	Z8-1	Industrial	XEP11U	Sn-Pb
SY10EP11UKG[3]	K8-1	Industrial	HP11 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY10EP11UKGTR[2, 3]	K8-1	Industrial	HP11 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY100EP11UKG[3]	K8-1	Industrial	XP11 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY100EP11UKGTR[2, 3]	K8-1	Industrial	XP11 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY10EP11UZG[3]	Z8-1	Industrial	HEP11U with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY10EP11UZGTR[2, 3]	Z8-1	Industrial	HEP11U with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY100EP11UZG[3]	Z8-1	Industrial	XEP11U with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY100EP11UZGTR[2, 3]	Z8-1	Industrial	XEP11U with Pb-Free bar-line indicator	Pb-Free NiPdAu

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
$V_{CC} - V_{EE}$	Power Supply Voltage			6V	V
V_{IN}	Input Voltage (V_{CC} = 0V, V_{IN} not more negative than V_{EE}) Input Voltage (V_{EE} = 0V, V_{IN} not more positive than V_{CC})			–6.0 to 0 +6.0 to 0	V V
I_{OUT}	Output Current	–Continuous –Surge		50 100	mA
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 –500lfpm	(SOIC) (SOIC)	160 109	°C/W
		–Still-Air –500lfpm	(MSOP) (MSOP)	206 155	°C/W
θ_{JC}	Package Thermal Resistance (Junction-to-Case)		(SOIC) (MSOP)	39 39	°C/W

Note:

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.

DC ELECTRICAL CHARACTERISTICS[1]

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										V	
	(PECL)	4.5	5.0	5.5	4.5	5.0	5.5	4.5	5.0	5.5		
	(LVPECL)	2.37	—	3.8	2.37	—	3.8	2.37	—	3.8		
	(ECL)	–5.5	–5.0	–4.5	–5.5	–5.0	–4.5	–5.5	–5.0	–4.5		
	(LVECL)	–3.8	–3.3	–2.37	–3.8	–3.3	–2.37	–3.8	–3.3	–2.37		
I_{EE}	Power Supply Current											
	SY10EP11U	—	—	37	—	25	39	—	—	40	mA	
	SY100EP11U	—	—	44	—	30	44	—	—	44	mA	
I_{IH}	Input HIGH Current	—	—	150	—	—	150	—	—	150	μA	$V_{IN} = V_{IH}$
I_{IL}	Input LOW Current D	0.5	—	—	0.5	—	—	0.5	—	—	μA	$V_{IN} = V_{IL}$
	/D	–150	—	—	–150	—	—	–150	—	—	μA	$V_{IN} = V_{IL}$
C_{IN}	Input Capacitance (MSOP)	—	—	—	—	1.0	—	—	—	—	pF	
	(SOIC)	—	—	—	—	1.35	—	—	—	—	pF	

Note:

1. 10/100KEP circuits are designed to meet the DC specifications shown in the above table 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.

(10KEP) LVPECL DC ELECTRICAL CHARACTERISTICS[1]

V_{CC} = 2.5V ±5%, V_{EE} = 0V.

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_{OL}	Output LOW Voltage	565	690	815	630	755	880	690	815	940	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[2] Common Mode Range	1.2	—	V_{CC}	1.2	—	V_{CC}	1.2	—	V_{CC}	V	

(10KEP) LVPECL DC ELECTRICAL CHARACTERISTICS[1]

V_{CC} = 3.3V ±10%, V_{EE} = 0V.

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_{IL}	Input LOW Voltage (Single-Ended)	1365	—	1690	1430	—	1755	1490	—	1815	mV	
V_{IH}	Input HIGH Voltage (Single-Ended)	2090	—	2415	2155	—	2480	2215	—	2540	mV	
V_{OL}	Output LOW Voltage	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	2165	2290	2415	2230	2355	2480	2290	2415	2540	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[2] Common Mode Range	1.2	—	V_{CC}	1.2	—	V_{CC}	1.2	—	V_{CC}	V	

(10KEP) PECL DC ELECTRICAL CHARACTERISTICS[1]

V_{CC} = 5.0V ±10%, V_{EE} = 0V.

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_{IL}	Input LOW Voltage (Single-Ended)	3065	—	3390	3130	—	3455	3190	—	3515	mV	
V_{IH}	Input HIGH Voltage (Single-Ended)	3790	—	4115	3855	—	4180	3915	—	4240	mV	
V_{OL}	Outuput LOW Voltage	3065	3190	3315	3130	3255	3380	3190	3315	3440	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	3865	3990	4115	3930	4055	4180	3990	4115	4240	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[2] Common Mode Range	1.2	—	V_{CC}	1.2	—	V_{CC}	1.2	—	V_{CC}	V	

No tes:

1. 10KEP circuits are designed to meet the DC specifications shown in the above table 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 are at V_{CC} = 2.5V. They vary 1:1 with V_{CC}.
2. The V_{IHCMR} range is referenced to the most positive side of the differential input signal. See “Input Waveform” section. Single-ended input CLK pin operation is limited to $V_{CC} \geq 3.0V$ in PECL mode.

(10KEP) ECL/LVECL DC ELECTRICAL CHARACTERISTICS[3]

V_{CC} = 0V, V_{EE} = –5.5V to –2.375V.

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_{IL}	Input LOW Voltage (Single-Ended)	–1935	—	–1610	–1870	—	–1545	–1810	—	–1485	mV	
V_{IH}	Input HIGH Voltage (Single-Ended)	–1210	—	–885	–1145	—	–820	–1085	—	–760	mV	
V_{OL}	Outuput LOW Voltage	–1935	–1810	–1685	–1870	–1745	–1620	–1810	–1685	–1560	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	–1135	–1010	–885	–1070	–945	–820	–1010	–885	–760	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[4] Common Mode Range	V_{EE} +1.2		0.0	V_{EE} +1.2		0.0	V_{EE} +1.2		0.0	V	

(100KEP) LVPECL DC ELECTRICAL CHARACTERISTICS[3]

V_{CC} = 2.5V ±5%.

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_{OL}	Outuput LOW Voltage	555	680	805	555	680	805	555	680	805	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[4] Common Mode Range	1.2	—	V_{CC}	1.2	—	V_{CC}	1.2	—	V_{CC}	V	

(100KEP) LVPECL DC ELECTRICAL CHARACTERISTICS[3]

V_{CC} = 3.3V ±10%, V_{EE} = 0V.

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_{IL}	Input LOW Voltage (Single-Ended)	1355	—	1675	1355	—	1675	1355	—	1675	mV	
V_{IH}	Input HIGH Voltage (Single-Ended)	2075	—	2420	2075	—	2420	2075	—	2420	mV	
V_{OL}	Output LOW Voltage	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[4] Common Mode Range	1.2	—	V_{CC}	1.2	—	V_{CC}	1.2	—	V_{CC}	V	

Notes:

3. 10KEP circuits are designed to meet the DC specifications shown in the above table 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.
4. The V_{IHCMR} range is referenced to the most positive side of the differential input signal. See “Input Waveform” section. Single-ended input CLK pin operation is limited to $V_{EE} \leq$ –3.0V in ECL/LVECL mode.

(100KEP) PECL DC ELECTRICAL CHARACTERISTICS[5]

V_{CC} = 5.0V ±10%, V_{EE} = 0V.

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_{IL}	Input LOW Voltage (Single-Ended)	3055	—	3375	3055	—	3375	3055	—	3375	mV	
V_{IH}	Input HIGH Voltage (Single-Ended)	3775	—	4120	3775	—	4120	3775	—	4120	mV	
V_{OL}	Outuput LOW Voltage	3055	3180	3305	3055	3180	3305	3055	3180	3305	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[6] Common Mode Range	2.0	—	V_{CC}	2.0	—	V_{CC}	2.0	—	V_{CC}	V	

Notes:

5. 100KEP circuits are designed to meet the DC specifications shown in the above table 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 are at V_{CC} = 5.0V. They vary 1:1 with V_{CC}.
6. The V_{IHCMR} range is referenced to the most positive side of the differential input signal. See “Input Waveform” section. Single-ended input CLK pin operation is limited to $V_{CC} \geq 3.0V$ in PECL mode.

(100KEP) ECL/LVECL DC ELECTRICAL CHARACTERISTICS[7]

V_{CC} = 0V, V_{EE} = –5.5V to –2.375V.

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_{IL}	Input LOW Voltage (Single-Ended)	–1945	—	–1625	–1945	—	–1625	–1945	—	–1625	mV	
V_{IH}	Input HIGH Voltage (Single-Ended)	–1225	—	–880	–1225	—	–880	–1225	—	–880	mV	
V_{OL}	Outuput LOW Voltage	–1945	–1820	–1695	–1945	–1820	–1695	–1945	–1820	–1695	mV	50Ω to V_{CC}–2V
V_{OH}	Output HIGH Voltage	–1145	–1020	–895	–1145	–1020	–895	–1145	–1020	–895	mV	50Ω to V_{CC}–2V
V_{IHCMR}	Input HIGH Voltage[8] Common Mode Range	V_{EE} +1.2		0.0	V_{EE} +1.2		0.0	V_{EE} +1.2		0.0	V	

Notes:

7. 100KEP circuits are designed to meet the DC specifications shown in the above table 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.
8. The V_{IHCMR} range is referenced to the most positive side of the differential input signal. See “Input Waveform” section. Single-ended input CLK pin operation is limited to $V_{EE} \leq –3.0V$ in ECL/LVECL mode.

AC ELECTRICAL CHARACTERISTICS

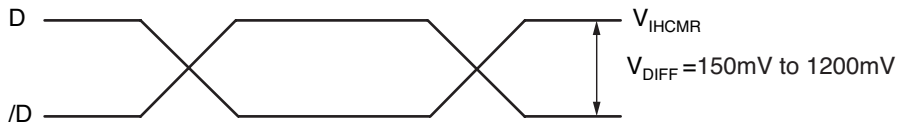
V_{CC} = 0V; V_{EE} = –5.5V to –2.375V or V_{CC} = 2.375V to 5.5V, V_{EE} = 0V.

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}	Max. Toggle Frequency(9)	3	—	—	3	—	—	3	—	—	GHz	
t_{PLH} t_{PHL}	Propagation Delay (Differential) D to Q, /Q D to Q, /Q	 140 170	 200 230	 250 300	 160 180	 220 240	 270 310	 180 210	 240 270	 300 360	 ps ps	 V_{CC} = 3.3/5V V_{CC} = 2.5V
t_{SKEW}	Within-Device Skew(10) Q, /Q	—	5	20	—	5	20	—	5	20	ps	
	Part-to-Part Skew(10)	— —	— —	130 110	— —	— —	130 110	— —	— —	150 120	ps ps	V_{CC} = 3.3/5V V_{CC} = 2.5V
t_{JITTER}	Cycle-to-Cycle Jitter (RMS)	—	0.2	< 1	—	0.2	< 1	—	0.2	< 1	ps_{RMS}	
V_{DIFF}	Input Swing(11)	150	800	1200	150	800	1200	150	800	1200	mV	
t_r, t_f	Output Rise/Fall Time (20% to 80%)	70	110	170	80	120	180	100	140	200	ps	

Notes:

9. Measured with 750mV input signal, 50% duty cycle. All loading with a 50Ω to V_{CC} –2.0V.
10. Skew is measured between outputs under identical transitions. Duty cycle skew is defined only for differential operation when the delays are measured from the cross point of the inputs to the cross point of the outputs.
11. See “Input Waveform.”

INPUT WAVEFORM



TERMINATION RECOMMENDATIONS

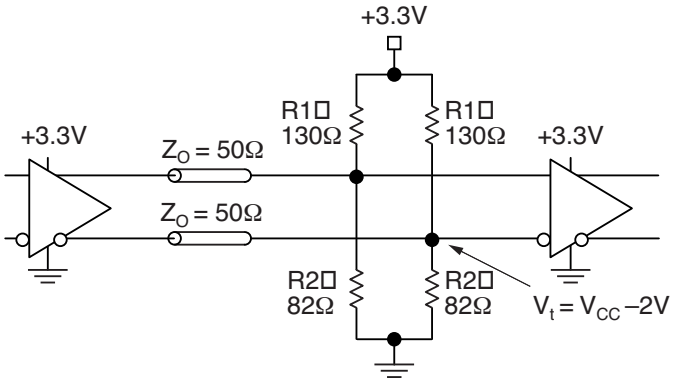


Figure 1. Parallel Termination–Thevenin Equivalent

Notes:

1. For +2.5V systems: R1 = 250Ω, R2 = 62.5Ω.
2. For +5.0V systems: R1 = 82Ω.

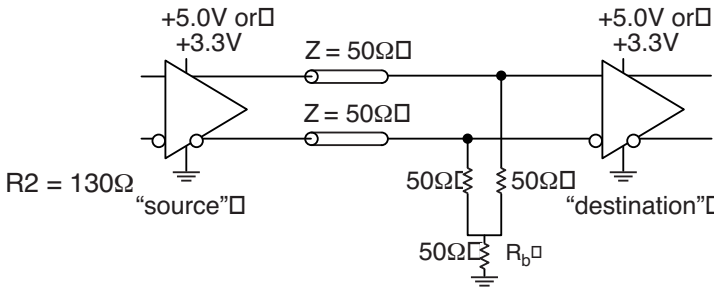
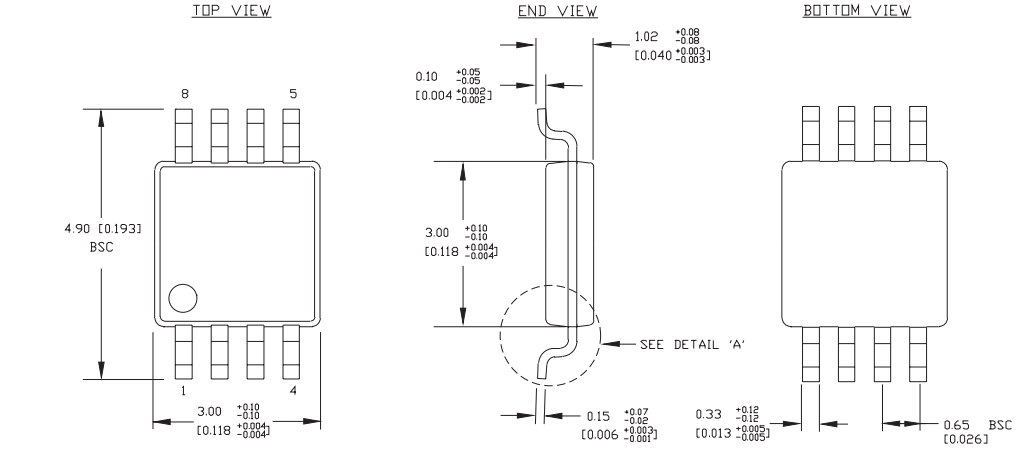


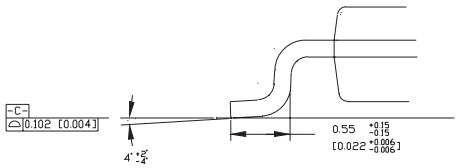
Figure 2. Three-Resistor "Y–Termination"

Notes:

1. Power-saving alternative to 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 systems R_b = 46Ω to 50Ω. For +5V systems, R_b = 110Ω.

8-PIN MSOP (K8-1)

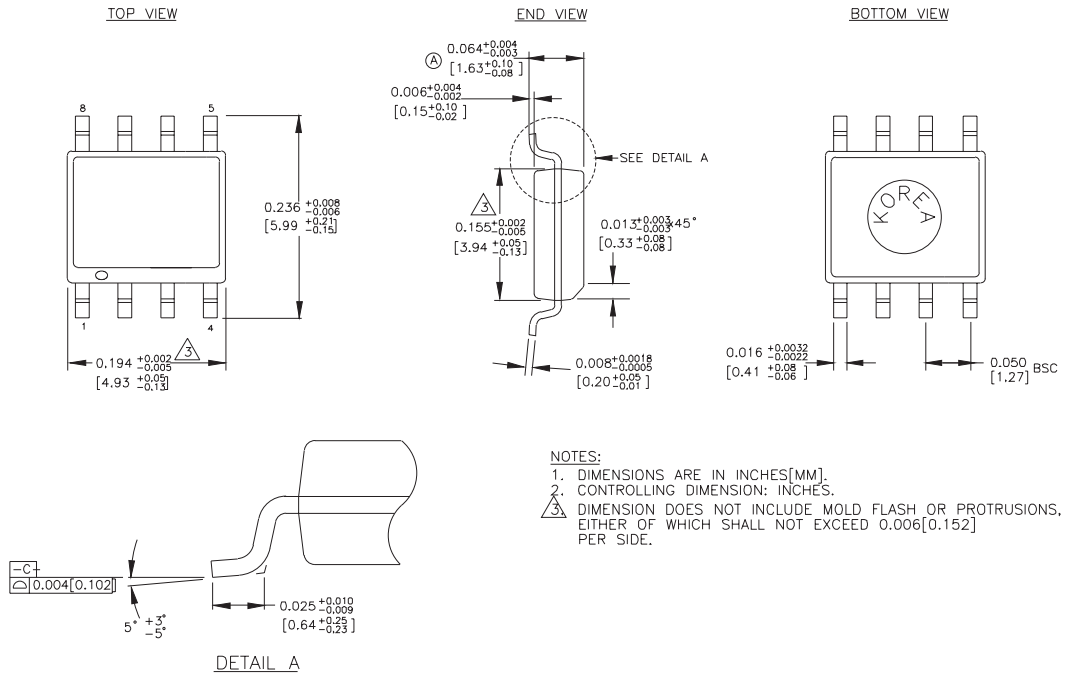




NOTES:
1. DIMENSIONS ARE IN MM [INCHES].
2. CONTROLLING DIMENSION: MM
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.20 [0.008] PER SIDE.

Rev. 01

8-PIN SOIC (Z8-1)



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.

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