



SY54011R

Low Voltage 1.2V/1.8V CML 1:2 Fanout
Buffer, 3.2Gbps, 3.2GHz

General Description

The SY54011R is a fully differential, low voltage 1.2V/1.8V CML 1:2 fanout buffer. It is optimized to provide two identical output copies with less than 15ps of skew and less than 10ps_{pp} total jitter. The SY54011R can process clock signals as fast as 3.2GHz or data patterns up to 3.2Gbps.

The differential input includes Micrel's unique, 3-pin input termination architecture that interfaces to LVPECL, LVDS or CML differential signals, (AC- or DC-coupled from a 2.5V driver) as small as 100mV (200mV_{PP}) without any level-shifting or termination resistor networks in the signal path. For AC-coupled input interface applications, an integrated voltage reference (V_{REF-AC}) is provided to bias the VT pin. The outputs are CML, with extremely fast rise/fall times guaranteed to be less than 95ps.

The SY54011R operates from a 2.5V $\pm 5\%$ core supply and a 1.8V or 1.2V $\pm 5\%$ output supply and is guaranteed over the full industrial temperature range (-40°C to $+85^{\circ}\text{C}$). The SY54011R is part of Micrel's high-speed, Precision Edge[®] product line.

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



Precision Edge[®]

Features

- 1.2V/1.8V CML 1:2 fanout buffer
- Guaranteed AC performance over temperature and voltage:
 - DC-to- > 3.2Gbps throughput
 - <300ps propagation delay (IN-to-Q)
 - <15ps within-device skew
 - <95ps rise/fall times
- Ultra-low jitter design
 - <1ps_{RMS} random jitter
- High-speed CML outputs
- 2.5V $\pm 5\%$, 1.8/1.2V $\pm 5\%$ power supply operation
- Industrial temperature range: -40°C to $+85^{\circ}\text{C}$
- Available in 16-pin (3mm x 3mm) MLF[®] package

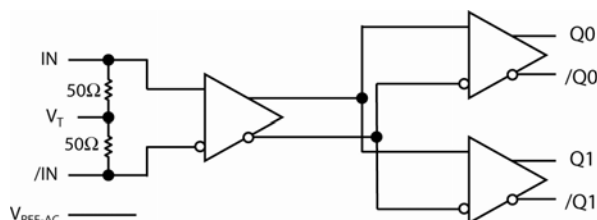
Applications

- Data Distribution: OC-48, OC-48+FEC
- SONET clock and data distribution
- Fibre Channel clock and data distribution
- Gigabit Ethernet clock and data distribution

Markets

- Storage
- ATE
- Test and measurement
- Enterprise networking equipment
- High-end servers
- Access
- Metro area network equipment

Functional Block Diagram



Precision Edge is a registered trademark of Micrel, Inc.
MLF and MicroLeadFrame are registered trademarks of Amkor Technology.

Micrel Inc. • 2180 Fortune Drive • San Jose, CA 95131 • USA • tel +1 (408) 944-0800 • fax + 1 (408) 474-1000 • <http://www.micrel.com>

June 2010

M9999-061110-A
hbwhelp@micrel.com or (408) 955-1690

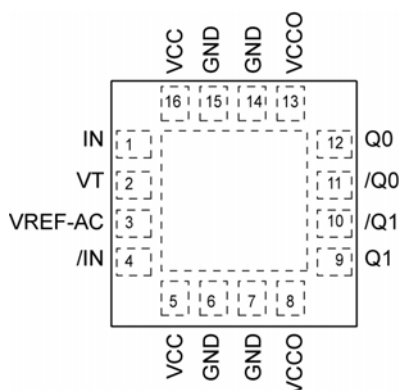
Ordering Information⁽¹⁾

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY54011RMG	MLF-16	Industrial	011R with Pb-Free bar-line indicator	NiPdAu Pb-Free
SY54011RMGTR ⁽²⁾	MLF-16	Industrial	011R 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.

Pin Configuration



16-Pin MLF[®] (MLF-16)

Pin Description

Pin Number	Pin Name	Pin Function
1, 4	IN, /IN	Differential Input: This input pair is the differential signal input to the device. Input accepts differential signals as small as 100mV (200mV _{PP}). Each input pin internally terminates with 50Ω to the VT pin.
2	VT	Input Termination Center-Tap: Each side of the differential input pair terminates to VT pin. This pin provides a center-tap to a termination network for maximum interface flexibility. See "Interface Applications" subsection.
3	VREF-AC	Reference Voltage: This output biases to $V_{CC}-1.15\text{V}$. It is used for AC-coupling inputs IN and /IN. Connect VREF-AC directly to the VT pin. Bypass with 0.1μF low ESR capacitor to VCC. Maximum sink/source current is ±0.5mA. See "Input Interface Applications" subsection.
5, 16	VCC	Positive Power Supply: Bypass with 0.1μF//0.01μF low ESR capacitors as close to the VCC pins as possible. Supplies input and core circuitry.
8, 13	VCCO	Output Supply: Bypass with 0.1μF//0.01μF low ESR capacitors as close to the VCCO pins as possible. Supplies the output buffers.
6, 7, 14, 15	GND, Exposed pad	Ground: Exposed pad must be connected to a ground plane that is the same potential as the ground pins.
10, 9 11, 12	/Q1, Q1 /Q0, Q0	CML Differential Output Pairs: Differential buffered copies of the input signal. The output swing is typically 390mV. See "Interface Applications" subsection for termination information.

Absolute Maximum Ratings⁽¹⁾

Supply Voltage (V_{CC})	–0.5V to +3.0V
Supply Voltage (V_{CCO})	–0.5V to +2.7V
$V_{CC} - V_{CCO}$	<1.8V
$V_{CCO} - V_{CC}$	<0.5V
Input Voltage (V_{IN})	–0.5V to V_{CC}
CML Output Voltage (V_{OUT})	0.6V to $V_{CCO}+0.5V$
Current (V_T)	
Source or sink current on V_T pin	±100mA
Input Current	
Source or sink current on (IN, /IN)	±50mA
Current (V_{REF-AC})	
Source or sink current on V_{REF-AC} ⁽⁴⁾	±0.5mA
Maximum operating Junction Temperature	125°C
Lead Temperature (soldering, 20sec.)	260°C
Storage Temperature (T_s)	–65°C to +150°C

Operating Ratings⁽²⁾

Supply Voltage (V_{CC})	2.375V to 2.625V
(V_{CCO})	1.14V to 1.9V
Ambient Temperature (T_A)	–40°C to +85°C
Package Thermal Resistance ⁽³⁾	
MLF [®]	
Still-air (θ_{JA})	75°C/W
Junction-to-board (ψ_{JB})	33°C/W

DC Electrical Characteristics⁽⁵⁾

$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, unless otherwise stated.

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{CC}	Power Supply Voltage Range	V_{CC}	2.375	2.5	2.625	V
		V_{CCO}	1.14	1.2	1.26	V
		V_{CCO}	1.7	1.8	1.9	V
I_{CC}	Power Supply Current	Max. V_{CC}		15	22	mA
I_{CCO}	Power Supply Current	No Load. V_{CCO}		32	42	mA
R_{IN}	Input Resistance (IN-to- V_T , /IN-to- V_T)		45	50	55	Ω
R_{DIFF_IN}	Differential Input Resistance (IN-to-/IN)		90	100	110	Ω
V_{IH}	Input HIGH Voltage (IN, /IN)	IN, /IN	1.2		V_{CC}	V
V_{IL}	Input LOW Voltage (IN, /IN)	V_{IL} with V_{IH} of 1.2V	0.2		$V_{IH}-0.1$	V
V_{IH}	Input HIGH Voltage (IN, /IN)	IN, /IN	1.14		V_{CC}	V
V_{IL}	Input LOW Voltage (IN, /IN)	V_{IL} with V_{IH} of 1.14V, (1.2V-5%)	0.66		$V_{IH}-0.1$	V
V_{IN}	Input Voltage Swing (IN, /IN)	see Figure 3a	0.1		1.0	V
V_{DIFF_IN}	Differential Input Voltage Swing (IN - /IN)	see Figure 3b	0.2		2.0	V
V_{REF-AC}	Output Reference Voltage		$V_{CC}-1.3$	$V_{CC}-1.15$	$V_{CC}-1.0$	V
V_{T_IN}	Voltage from Input to V_T				1.28	V

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 ratings conditions for extended periods may affect device reliability.
2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
3. Package thermal resistance assumes exposed pad is soldered (or equivalent) to the device's most negative potential on the PCB. ψ_{JB} and θ_{JA} values are determined for a 4-layer board in still-air number, unless otherwise stated.
4. Due to the limited drive capability, use for input of the same package only.
5. The circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established.

CML Outputs DC Electrical Characteristics⁽⁶⁾

$V_{CCO} = 1.14V$ to $1.26V$ $R_L = 50\Omega$ to V_{CCO} ,

$V_{CCO} = 1.7V$ to $1.9V$, $R_L = 50\Omega$ to V_{CCO} or 100Ω across the outputs,

$V_{CC} = 2.375V$ to $2.625V$. $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise stated.

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{OH}	Output HIGH Voltage	$R_L = 50\Omega$ to V_{CCO}	$V_{CCO}-0.020$	$V_{CCO}-0.010$	V_{CCO}	V
V_{OUT}	Output Voltage Swing	See Figure 3a	300	390	475	mV
V_{DIFF_OUT}	Differential Output Voltage Swing	See Figure 3b	600	780	950	mV
R_{OUT}	Output Source Impedance		45	50	55	Ω

Note:

6. The circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established

AC Electrical Characteristics

$V_{CCO} = 1.14V$ to $1.26V$ $R_L = 50\Omega$ to V_{CCO} ,

$V_{CCO} = 1.7V$ to $1.9V$, $R_L = 50\Omega$ to V_{CCO} or 100Ω across the outputs,

$V_{CC} = 2.375V$ to $2.625V$. $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise stated.

Symbol	Parameter	Condition	Min	Typ	Max	Units
f_{MAX}	Maximum Frequency	NRZ Data	3.2			Gbps
		$V_{OUT} > 200mV$ Clock	3.2			GHz
t_{PD}	Propagation Delay IN-to-Q	Figure 1a	150	205	300	ps
t_{Skew}	Within Device Skew	Note 7		3	15	ps
	Part-to-Part Skew	Note 8			75	ps
t_{Jitter}	Random Jitter				1	ps _{RMS}
t_R t_F	Output Rise/Fall Times (20% to 80%)	At full output swing.	30	60	95	ps
	Duty Cycle	Differential I/O	47		53	%

Notes:

7. Within device skew is measured between two different outputs under identical input transitions.
8. Part-to-part skew is defined for two parts with identical power supply voltages at the same temperature and no skew at the edges at the respective inputs.

Interface Applications

For Input Interface Applications see Figures 4a-f and for CML Output Termination see Figures 5a-d.

CML Output Termination with VCCO 1.2V

For VCCO of 1.2V, Figure 5a, terminate the output with 50 Ω -to-1.2V, DC-coupled, not 100 Ω differentially across the outputs.

If AC-coupling is used, Figure 5d, terminate into 50 Ω -to-1.2V before the coupling capacitor and then connect to a high value resistor to a reference voltage.

Do not AC couple with internally terminated receiver. For example, 50 Ω ANY-IN input. AC-coupling will offset the output voltage by 200mV and this offset voltage will be too low for proper driver operation.

Any unused output pair needs to be terminated when VCCO is 1.2V, do not leave floating.

CML Output Termination with VCCO 1.8V

For VCCO of 1.8V, Figure 5a and Figure b, terminate with either 50 Ω -to-1.8V or 100 Ω differentially across the outputs. AC- or DC-coupling is fine.

Input AC Coupling

The SY54011R input can accept AC coupling from any driver. Tie VT to VREF-AC and bypass with a 0.1 μ F capacitor as shown in Figures 4c and 4d.

Timing Diagrams

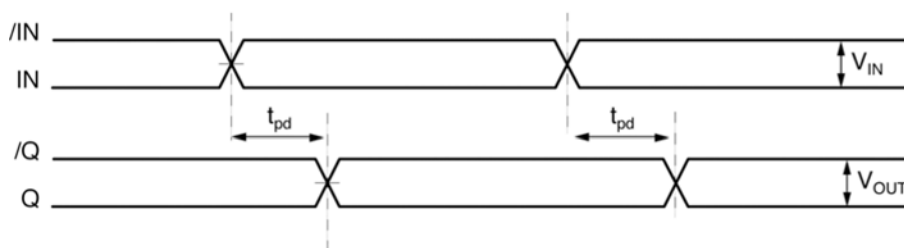
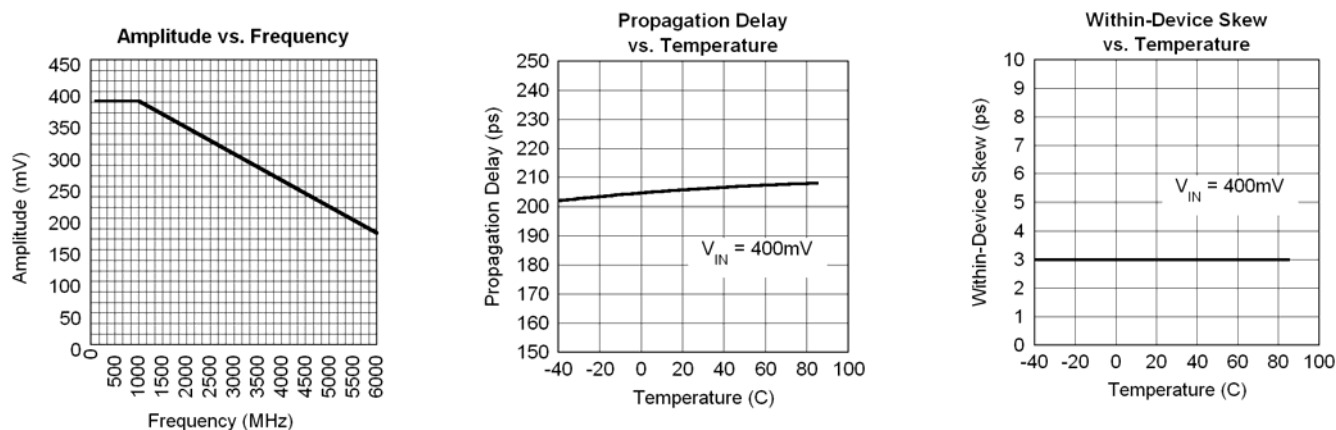


Figure 1a. Propagation Delay

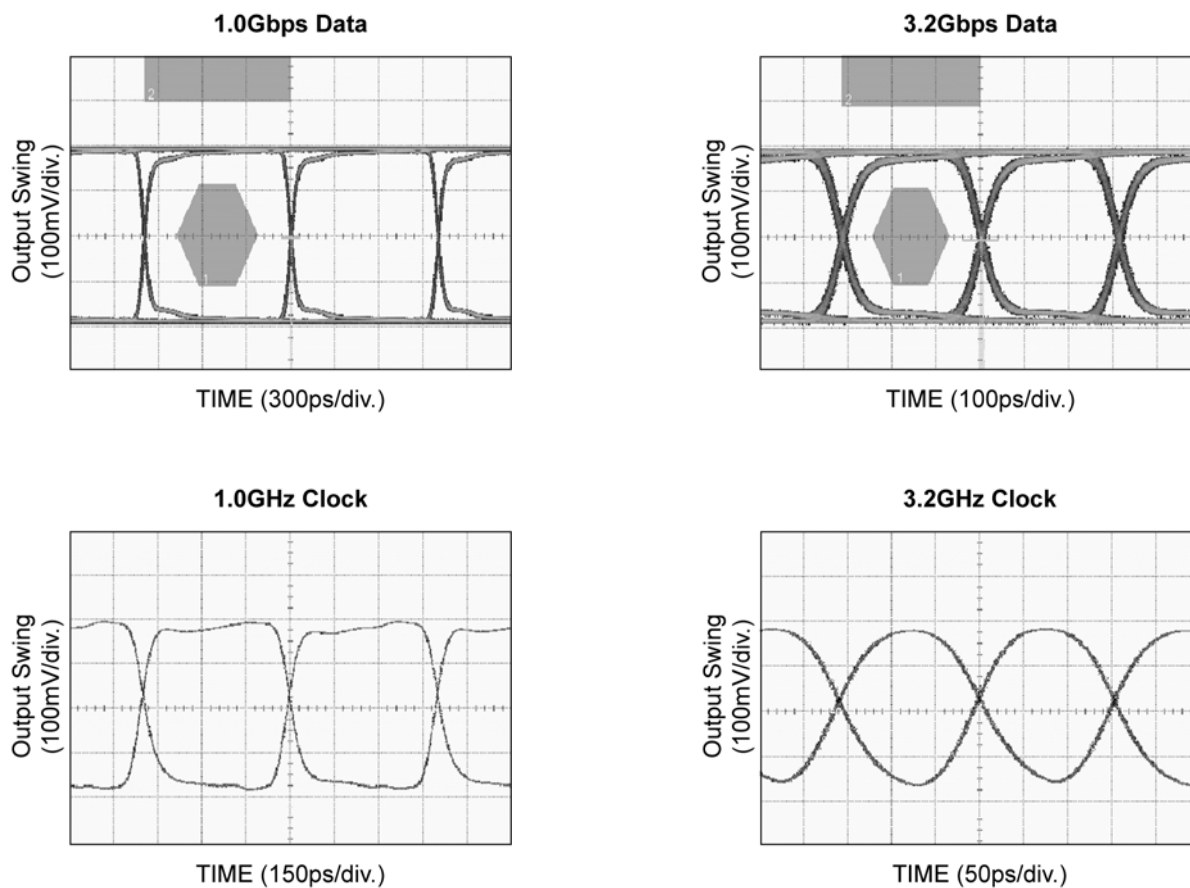
Typical Characteristics

$V_{CC} = 2.5V$, $V_{CCO} = 1.2V$, $GND = 0V$, $V_{IN} = 100mV$; $R_L = 50\Omega$ to $1.2V$; $T_A = 25^\circ C$, unless otherwise stated.



Functional Characteristics

$V_{CC} = 2.5V$, $V_{CCO} = 1.2V$, $GND = 0V$, $V_{IN} = 100mV$; $R_L = 50\Omega$ to $1.2V$, Data Pattern: $2^{23}-1$; $T_A = 25^\circ C$, unless otherwise stated.



Input and Output Stage

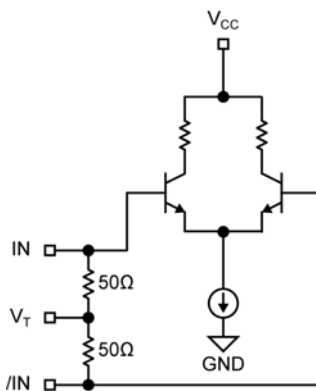


Figure 2a. Simplified Differential Input Buffer

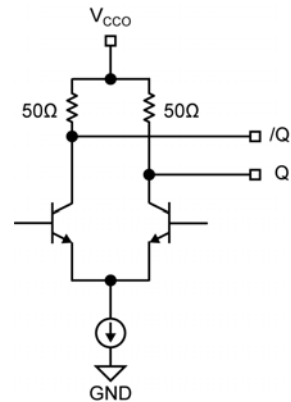


Figure 2b. Simplified CML Output Buffer

Single-Ended and Differential Swings

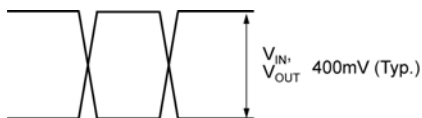


Figure 3a. Single-Ended Swing

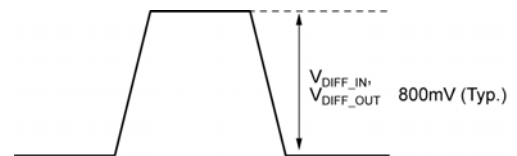


Figure 3b. Differential Swing

Input Interface Applications

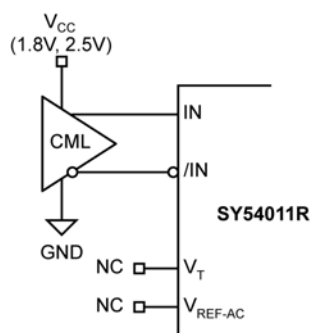


Figure 4a. CML Interface
(DC-Coupled, 1.8V, 2.5V)

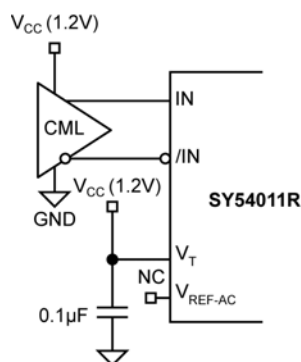


Figure 4b. CML Interface
(DC-Coupled, 1.2V)

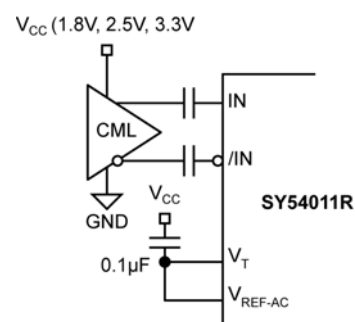


Figure 4c. CML Interface
(AC-Coupled)

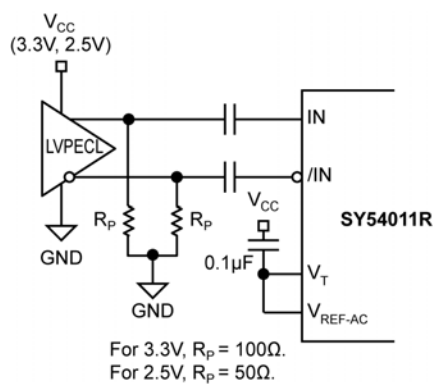


Figure 4d. LVPECL Interface
(AC-Coupled)

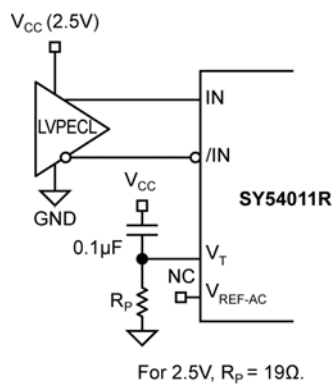


Figure 4e. LVPECL Interface
(DC-Coupled)

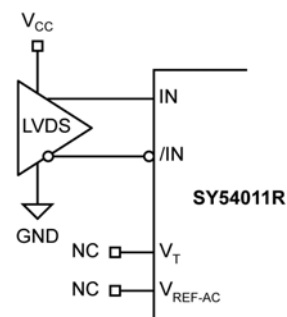


Figure 4f. LVDS Interface

CML Output Termination

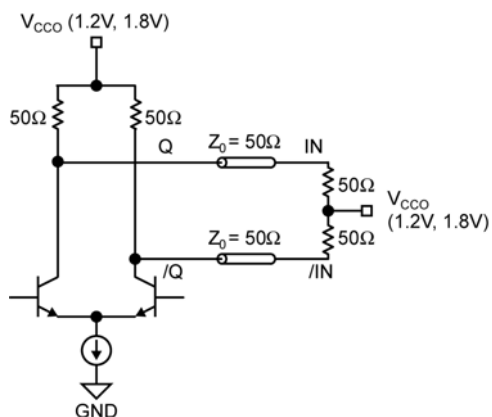


Figure 5a. 1.2V or 1.8V CML DC-Coupled Termination

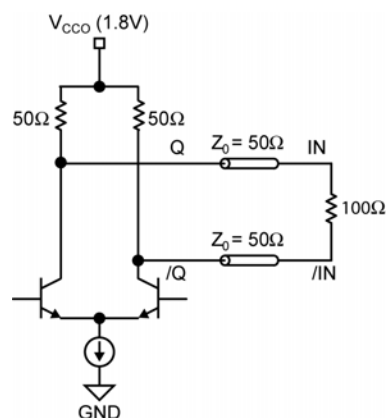


Figure 5b. 1.8V CML DC-Coupled Termination

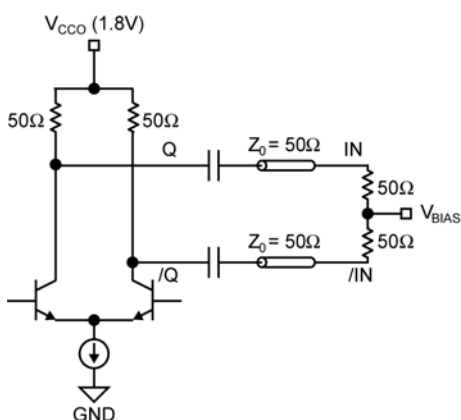


Figure 5c. CML AC-Coupled Termination
(Vcco 1.8V only)

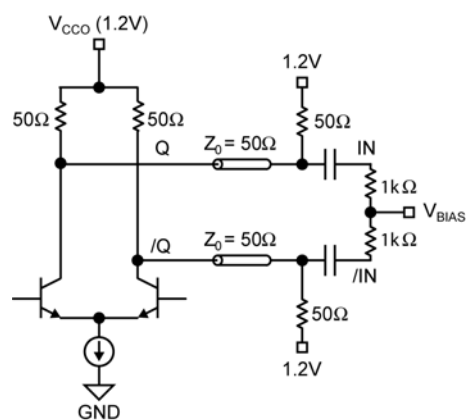
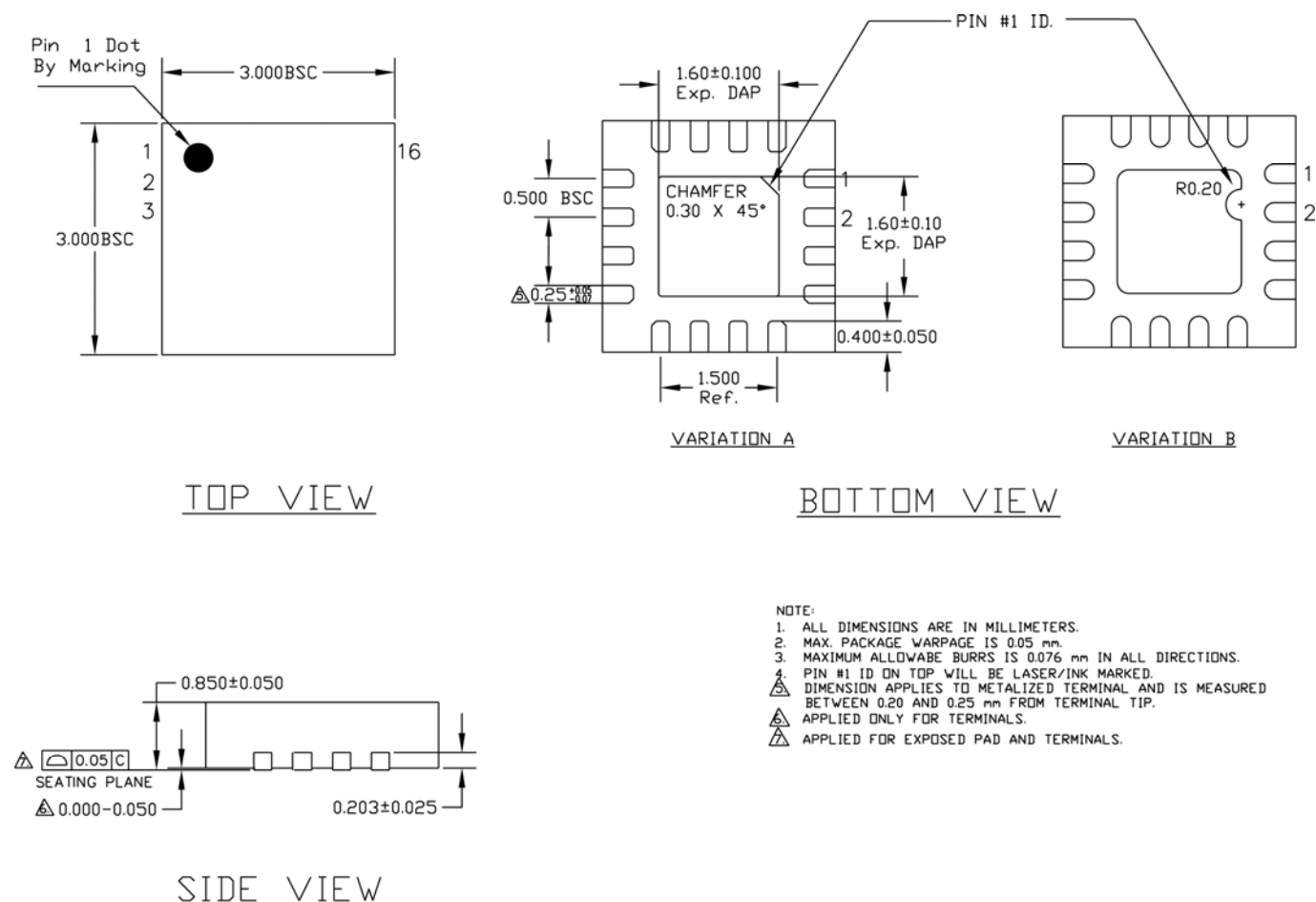


Figure 5d. CML AC-Coupled Termination
(Vcco 1.2V only)

Related Product and Support Documents

Part Number	Function	Datasheet Link
HBW Solutions	New Products and Termination Application Notes	http://www.micrel.com/page.do?page=/product-info/as/HBWsolutions.shtml

Package Information



16-Pin MLF® (3mm x3mm) (MLF-16)

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 data sheet 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 a Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2008 Micrel, Incorporated.



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331