SY89311U

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

Precision Edge®

General Description

The SY89311U is a precision, high-speed 1:2 differential fanout buffer. Having within-device skews and output transition times significantly improved over the EL11V, the SY89311U is ideally suited for those applications which require the ultimate in AC performance in a small package.

The differential inputs of the SY89311U employ clamping circuitry to maintain stability under open input conditions. If the inputs are left open, the Q outputs will be LOW.

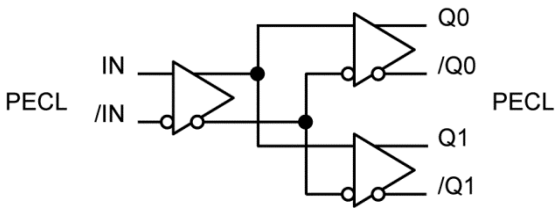
The differential inputs can accept 10/100K ECL/PECL signals (external termination required) and the outputs are 100K ECL/PECL compatible.

Datasheets and support documentation are available on Micrel's web site at: www.micrel.com.

Features

- 2.5V, 3.3V and 5V power supply
- Guaranteed AC parameters over temperature:
  - f_{MAX} > 3.0GHz
  - <20ps output-to-output skew
  - <200ps t_r / t_f
  - <300ps propagation delay
  - 51fs$_{(RMS)}$ phase jitter (typical)
- 100K compatible I/O
- Wide temperature range: –40°C to +85°C
- Available in ultra-small 8-pin MLF®
  (2mm x 2mm) package

Block Diagram



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*Micro*LeadFrame and MLF are registered trademarks of Amkor Technology, Inc.

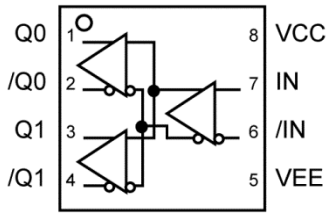
Ordering Information

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY89311UMITR	MLF-8	Industrial	311	Sn-Pb
SY89311UMGT[1]	MLF-8	Industrial	311 with Pb-Free bar-line indicator	Pb-Free NiPdAu

Note:

1. Other voltages are available. Contact Micrel for details.

Pin Configuration



8-Pin MLF®
Ultra-Small Outline (2mm x 2mm)

Pin Description

Pin Number	Pin Name	Type	Pin Function
1, 2, 3, 4	Q0, /Q0, Q1, /Q1	100K Output	Differential PECL/ECL Outputs: Default to LOW if IN inputs are left open. Q1, /Q1 See “Output Interface Applications” section for recommendations on terminations. Unused output pairs may be left floating without any impact on skew or jitter.
5	VEE, Exposed Pad	Negative Power Supply	Negative Power Supply: V_{EE} and exposed pad must be tied to most negative supply. For PECL/LVPECL connect to ground.
6	/IN	100K Input	Differential PECL/ECL Input: Internal 75kΩ pull-up and pull-down resistors. If left floating, pin defaults to $V_{CC}/2$. When not used, this input can be left open. See “Input Interface Applications” section for single-ended inputs.
7	IN	100K Input	Differential PECL/ECL Input: Internal 75kΩ pull-down resistor. If left open, pin defaults LOW. Q output will be LOW. Accepts differential 10K and 100K ECL/PECL. See “Input Interface Applications” section for single-ended inputs.
2	5	Positive Power Supply	Positive Power Supply: Bypass with 0.1µF//0.01µF low ESR capacitors

Absolute Maximum Ratings[Error! Reference source not found.]

Supply Voltage (V_{CC}) ..... -0.5V to +6.0V
Input Voltage (V_{IN}) ..... -0.5 to V_{CC}
LVPECL Output Current (I_{OUT})
  Continuous 50mA
  Surge 100mA
Input Current
  Source or sink current on IN, /IN ..... ±50mA
Lead Temperature (soldering, 20 sec.) ..... +260°C
Storage Temperature (T_S) ..... -65°C to +150°C

Operating Ratings[Error! Reference source not found.]

Supply Voltage $|V_{CC}-V_{EE}|$ ..... +2.375V to +2.625V
  ..... +3.0V to +3.6V
  ..... +4.5V to +5.5V
Ambient Temperature (T_A) ..... –40°C to +85°C
Package Thermal Resistance, Note 3
MLF™ (θ_{JA})
  Still-Air ..... 93°C/W
  500lfpm ..... 87°C/W
MLF™ (θ_{JB})
  Junction-to-Board ..... 60°C/W

DC Electrical Characteristics[3]

T_A = –40°C to +85°C

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{CC}	Power Supply Voltage	LVPECL	2.375	2.5	2.625	V
		LVPECL	3.0	3.3	3.6	V
		PECL	4.5	5.0	5.5	V
		ECL	-5.5	-5.0	-4.5	V
		LVECL	-3.6	-3.3	-3.0	V
		LVECL	-2.625	-2.5	-2.375	V
I_{EE}	Power Supply Current	Max. V_{CC}, no load		30	44	mA
I_{IH}	Input HIGH Current	$V_{IN} = V_{IH}$			150	µA
I_{IL}	Input Low Current IN	$V_{IN} = V_{IL}$	0.5			µA
	/IN	$V_{IN} = V_{IL}$	-150			µA
C_{IN}	Input Capacitance			1.0		pF

(100K) ECL/LVECL DC Electrical Characteristics

V_{CC} = +2.5V ±5% or +3.3V ±10% or +5.0V ±10% and V_{EE} = 0V; V_{CC} = 0V and V_{EE} = –2.5V ±5% or –3.3V ±10% or –5.0V ±10%; R_L = 50Ω to V_{CC}–2V; T_A = –40°C to +85°C, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{OH}	Output HIGH Voltage		V_{CC} –1.145		V_{CC} –0.895	V
V_{OL}	Output LOW Voltage		V_{CC} –1.945		V_{CC} –1.695	V
V_{IH}	Input HIGH Voltage		V_{CC} –1.225		V_{CC} –0.88	V
V_{IL}	Input LOW Voltage		V_{CC} –1.945		V_{CC} –1.625	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range	Note 6	V_{EE} +1.2		V_{CC}	V
I_{IH}	Input HIGH Current	$V_{IN} = V_{IH}$			150	µA
I_{IL}	Input LOW Current (IN)	$V_{IN} = V_{IL}$	0.5			µA
	Input LOW Current (/IN)	$V_{IN} = V_{IL}$	-150			µA

Notes:

2. 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.
3. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
4. Package Thermal Resistance values assume exposed pad is soldered (or equivalent) to the device's most negative potential on the PCB.
5. This circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established.
6. V_{IHCMR} (min) varies 1:1 with V_{EE}, (max) varies 1:1 with V_{CC}.

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AC Electrical Characteristics[7]

V_{CC} = +2.5V ±5% or +3.3V ±10% or +5.0V ±10% and V_{EE} = 0V; V_{CC} = 0V and V_{EE} = –2.5V ±5% or –3.3V ±10% or –5.0V ±10%; R_L = 50Ω to V_{CC}–2V; T_A = –40°C to +85°C, unless otherwise noted.

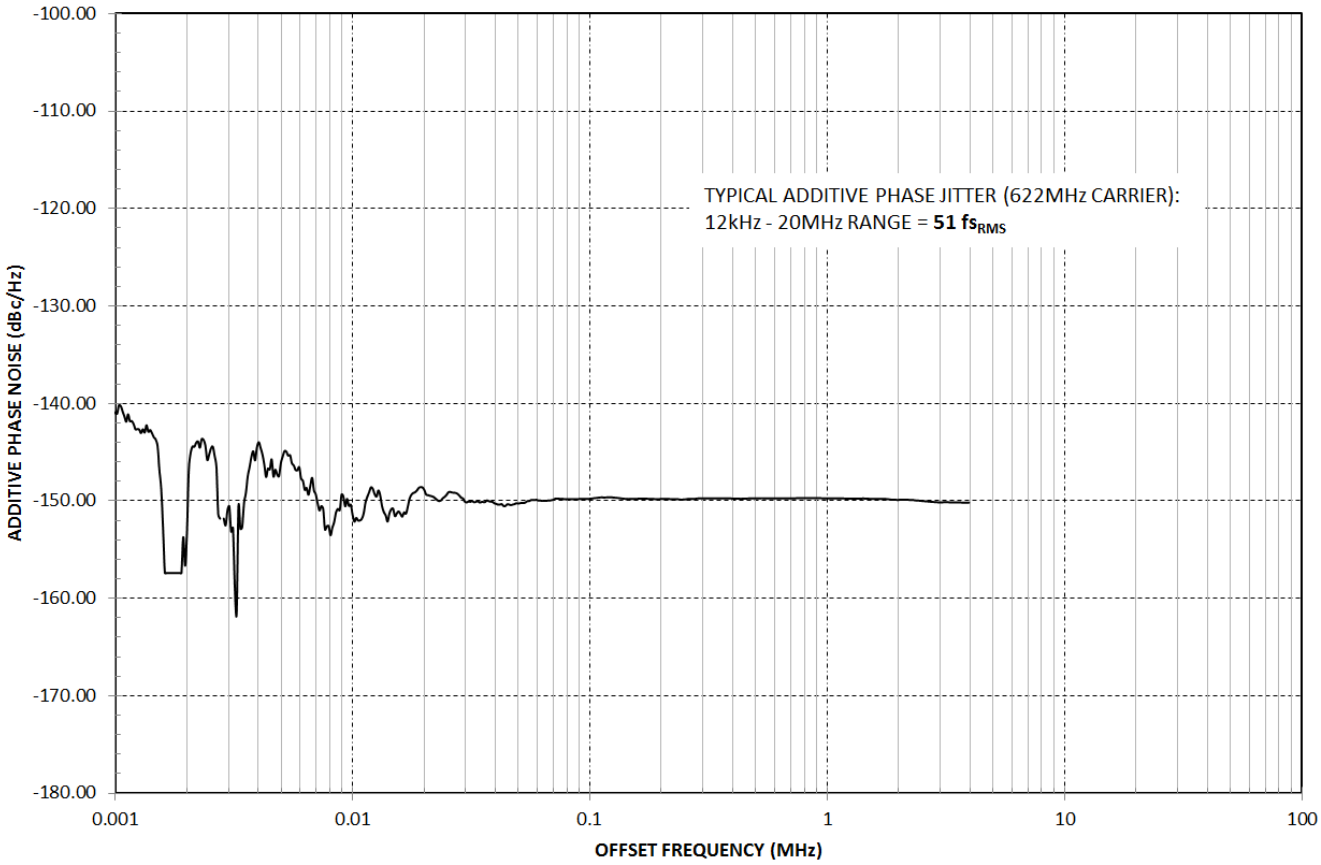
Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
f_{MAX}	Maximum Toggle Frequency		3			GHz
t_{pd}	Propagation Delay (Differential)					
	IN to Q, /Q	V_{CC} = 3.3V/5V	140	220	300	ps
	IN to Q, /Q	V_{CC} = 2.5V	170	240	360	ps
t_{SKEW}	Within-Device Skew Q, /Q	Note 8		5	20	ps
	Part-to-Part Skew	V_{CC} = 3.3V/5V, Note 8			150	ps
		V_{CC} = 2.5V, Note 8			120	ps
t_{JITTER}	Cycle-to-Cycle Jitter (rms)				1	$ps_{(rms)}$
	Additive Phase Jitter	622MHz over 12kHz-20MHz		51		$fs_{(rms)}$
V_{DIFF}	Input Swing	Note 9	150	800	1200	mV
t_r, t_f	Output Rise/Fall Time (20% to 80%)		70	120	200	ps

Notes:

7. Measured with 750mV input signal, 50% duty cycle. V_{DIFF_OUT} is ≥ 400mV.
8. 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.
9. See “Input Waveform”.

Additive Phase Noise Plot

V_{CC} = +3.3V, GND = 0, R_L = 50Ω to V_{CC}–2V, T_A = 25°C



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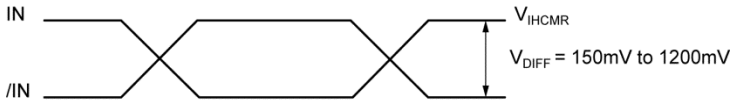
Input Waveform



Input Interface Applications

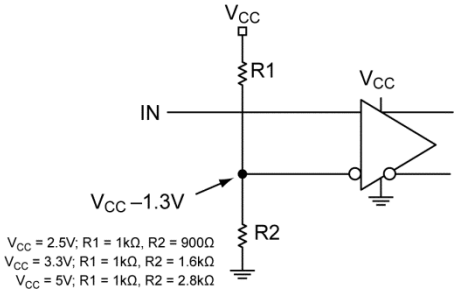


Figure 1. Single-Ended Input (Terminating unused Input)

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LVPECL Output Interface Applications

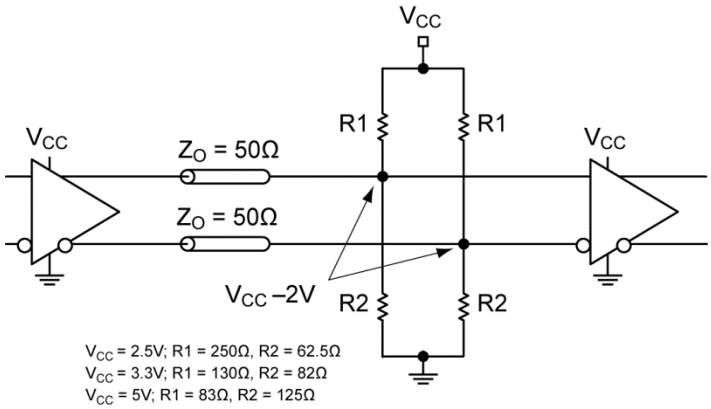


Figure 2. Parallel Thevenin-Equivalent Termination

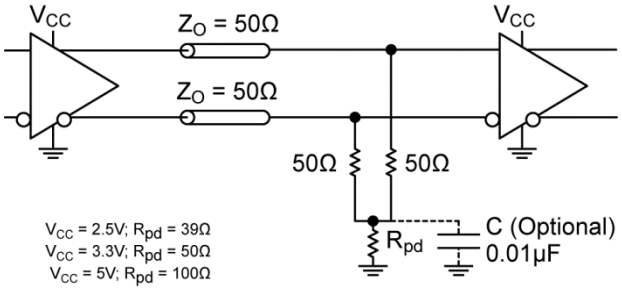


Figure 3. Three Resistor "Y Termination"

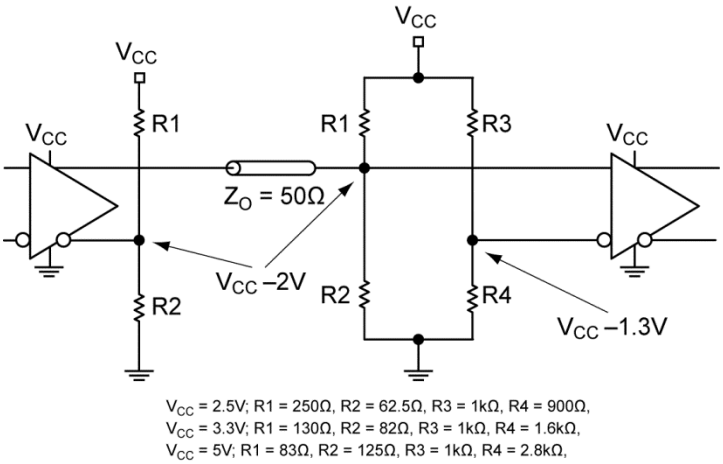
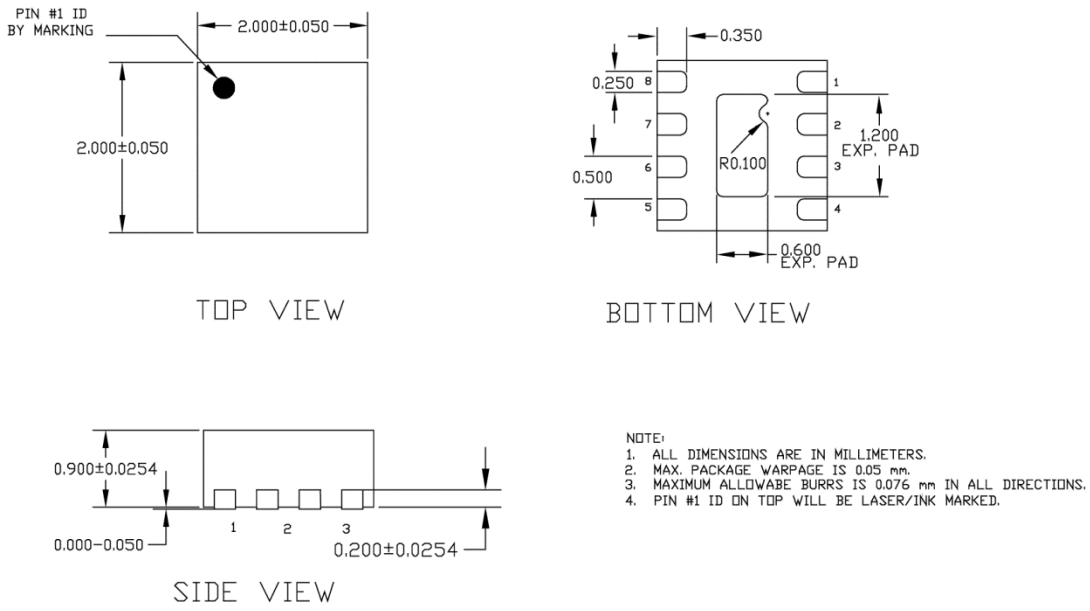
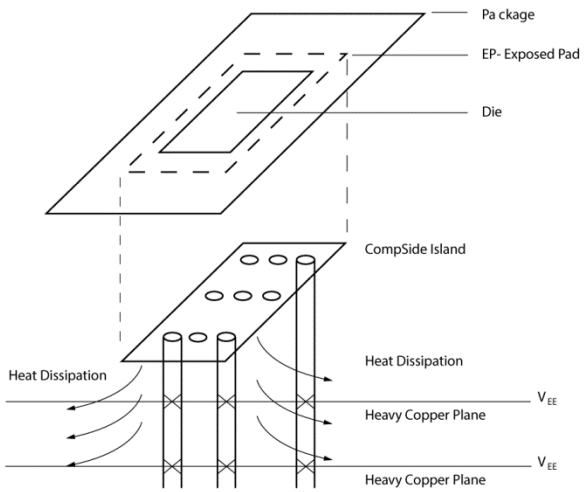


Figure 4. Termination Unused I/O

Package Information[10]





PCB Thermal Consideration for 8-Pin MLF® Package

Package Notes:

1. Package meets Level 2 qualification.
2. All parts are dry-packaged before shipment.
3. Exposed pads must be soldered to a ground for proper thermal management.

8-Lead MLF (MLF-8)

Note:

10. Package information is correct as of the publication date. For updates and most current information, go to www.micrel.com.

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Revision History

Date	Change Description/Edits by:	Rev.
8/4/10	Added new paragraph to disclaimer in boiler plate. Per Colin Sturt. M.Galvan	14
1/16/13	Complete rework	15

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