

### FEATURES

- 3.3V and 5V power supply options
- 250ps propagation delay
- Very high voltage gain
- Ideal for Pulse Amplifier and Limiting Amplifier applications
- Data synchronous Enable/Disable (/EN) on  $Q_{HG}$  and  $/Q_{HG}$  provides for complete glitchless gating of the outputs
- Ideal for gating timing signals
- Complete solution for high quality, high frequency crystal oscillator applications
- Available in an ultra-small 8-pin (2mm × 2mm) MLF™ package

### APPLICATIONS

- Oscillator modules

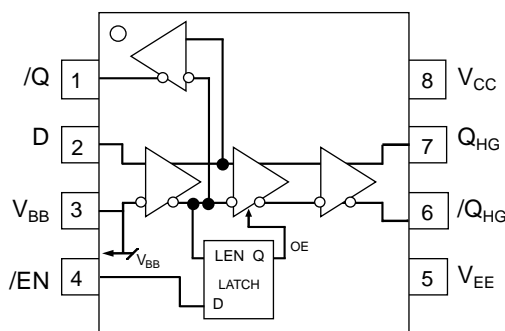
### DESCRIPTION

The SY89250V is a differential PECL/ECL receiver/buffer in a space saving (2mm × 2mm) MLF™ package. The device is functionally equivalent to the SY100EL16VC, but features a 70% smaller footprint. It provides a  $V_{BB}$  output for either single-ended application or as a DC bias for AC-coupling to the device.

The SY89250V provides an /EN input which is synchronized with the data input (D) signal in a way that provides glitchless gating of the  $Q_{HG}$  and  $/Q_{HG}$  outputs. When the /EN signal is LOW, the input is passed to the outputs and the data output equals the data input. When the data input is HIGH and the /EN goes HIGH, it will force the  $Q_{HG}$  LOW and the  $/Q_{HG}$  HIGH on the next negative transition of the data input. If the data input is LOW when the /EN goes HIGH, the next data transition to a HIGH is ignored and  $Q_{HG}$  remains LOW and  $/Q_{HG}$  remains HIGH. The next positive transition of the data input is not passed on to the data outputs under these conditions. The  $Q_{HG}$  and  $/Q_{HG}$  outputs remain in their disabled state as long as the /EN input is held HIGH. The /EN input has no influence on the /Q output and the data input is passed on (inverted) to this output whether /EN is HIGH or LOW. This configuration is ideal for crystal oscillator applications, where the oscillator can be free running and gated on and off synchronously without adding extra counts to the output.

All support documentation can be found on Micrel's web site at [www.micrel.com](http://www.micrel.com).

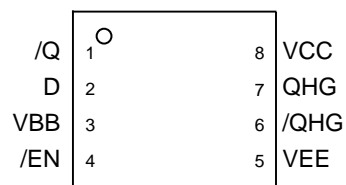
### BLOCK DIAGRAM



### FUNCTIONAL CROSS REFERENCE

Micrel Part Number	PECL/ECL	Functional Cross
SY89250V	100k	SY100EL16VC

## PACKAGE/ORDERING INFORMATION



**8-Pin MLF™  
(Ultra-Small Outline)**

Ordering Information<sup>(1)</sup>

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY89250VMI	MLF-8	Industrial	250	Sn-Pb
SY89250VMITR <sup>(2)</sup>	MLF-8	Industrial	250	Sn-Pb
SY89250VMG	MLF-8	Industrial	250 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY89250VMGTR <sup>(2)</sup>	MLF-8	Industrial	250 with Pb-Free bar-line indicator	Pb-Free NiPdAu

**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 DESCRIPTION

Pin Number	Pin Name	Type	Pin Function
1	/Q	100k	Single-Ended PECL/ECL Feedback Output.
2	D	100k	Single-Ended PECL/ECL Input: The signal input includes an internal 75k $\Omega$ pull-down ECL Input resistor. If input is left open, Q output will default to LOW. See "Input Interface Applications" section for single-ended inputs.
3	VBB	Reference Output Voltage	Bias Voltage: $V_{CC} - 1.3\text{V}$ . Used as reference voltage when AC-coupling to the D input. Max sink/source is $\pm 0.5\text{mA}$ .
4	/EN	Enable Input	/EN Input which is synchronized with data input (D) signal in a way that provides glitchless gating of $Q_{HG}$ and $/Q_{HG}$ outputs. Includes internal 75k $\Omega$ pull-down resistor. Default is LOW
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, 7	/QHG, QHG	100k ECL Output	Differential PECL/ECL Output: Defaults to LOW if D inputs left open. See "Output Interface Applications" section for recommendations on terminations.
8	VCC	Positive Power Supply	Positive Power Supply: Bypass with 0.1 $\mu\text{F}$ /0.01 $\mu\text{F}$ low ESR capacitors.

## TRUTH TABLE

/EN	$Q_{HG}$ Output
0	Data
1	Logic Low

**Absolute Maximum Ratings<sup>(1)</sup>**

Power Supply Voltage ( $V_{CC}$ ) ..... -0.5V to +6.0V  
 ECL Input Voltage ( $V_{IN}$ ) ..... 0V to  $V_{CC} + 0.5V$   
 Voltage Applied to Output at HIGH State  
 ( $V_{OUT}$ ) ..... -0.5V to  $V_{CC}$   
 Current Applied to Output at LOW State  
 ( $I_{OUT}$ ) ..... Twice the rated  $I_{OL}$  mA  
 Lead Temperature (soldering, 20 sec.) ..... 260°C  
 Storage Temperature ( $T_S$ ) ..... -65°C to +150°C

**Operating Ratings<sup>(2)</sup>**

Power Supply Voltage  $|V_{CC} - V_{EE}|$  .... 3.3V  $\pm 10\%$  or 5V  $\pm 10\%$   
 Ambient Temperature ( $T_A$ ) ..... -40°C to +85°C  
 Package Thermal Resistance,<sup>(3)</sup>  
 MLF™ ( $\theta_{JA}$ ) .....  
 Still-Air ..... 93°C/W  
 MLF™ ( $\psi_{JB}$ ), ..... 60°C/W

**DC ELECTRICAL CHARACTERISTICS**

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

Symbol	Parameter	Condition	Min	Typ	Max	Units
$V_{EE}$	Power Supply	$ V_{CC} - V_{EE} $ $ V_{CC} - V_{EE} $	3.0 4.5	3.3 5.0	3.6 5.5	V V
$I_{EE}$	Power Supply Current				46	mA
$I_{IH}$	Input HIGH Current				150	$\mu\text{A}$
$V_{BB}$	Output Reference Voltage		$V_{CC} - 1.38$	$V_{CC} - 1.32$	$V_{CC} - 1.26$	V

**DC ELECTRICAL CHARACTERISTICS**

$V_{CC} = +3.3V \pm 10\%$  or  $+5V \pm 10\%$  and  $V_{EE} = 0V$ ;  $V_{CC} = 0V$  and  $V_{EE} = -3.3V \pm 10\%$  or  $-5V \pm 10\%$ ;  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ; unless otherwise stated.

Symbol	Parameter	Condition	Min	Typ	Max	Units
$V_{OH}$	Output HIGH Voltage	Note 4	$V_{CC} - 1.085$		$V_{CC} - 0.880$	V
$V_{OL}$	Output LOW Voltage	Note 4	$V_{CC} - 1.830$		$V_{CC} - 1.555$	V
$V_{IH}$	Input HIGH Voltage		$V_{CC} - 1.165$		$V_{CC} - 0.880$	V
$V_{IL}$	Input LOW Voltage		$V_{CC} - 1.810$		$V_{CC} - 1.475$	V
$V_{BB}$	Output Reference Voltage		$V_{CC} - 1.38$		$V_{CC} - 1.26$	V
$V_{PP}$	Minimum Input Swing		150			mV
$I_{IH}$	Input HIGH Current				150	$\mu\text{A}$
$I_{IL}$	Input LOW Current		0.5			$\mu\text{A}$

**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 RATING 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 devices most negative potential on the PCB.
4. Output loaded with 50 $\Omega$  to  $V_{CC} - 2V$ .

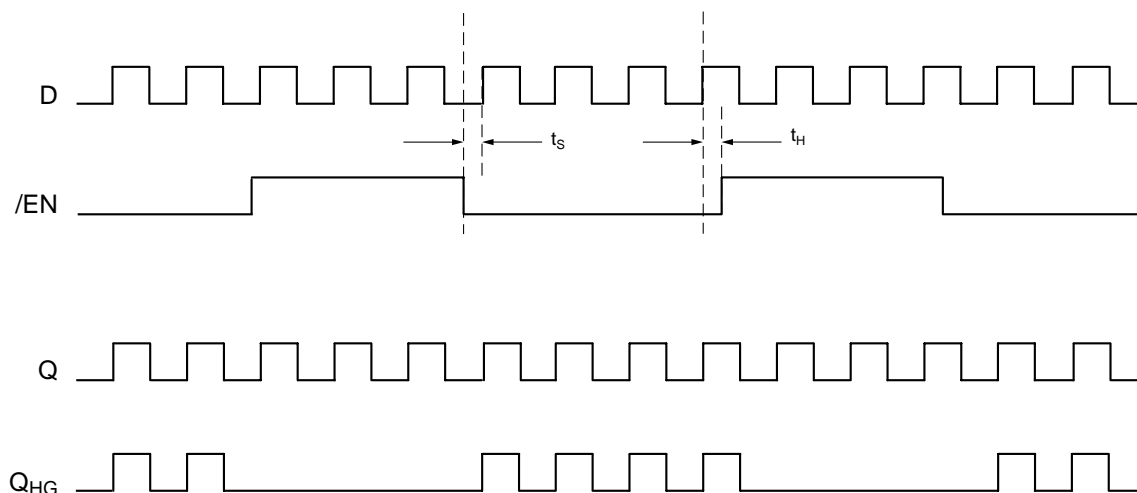
**AC ELECTRICAL CHARACTERISTICS**

$V_{EE} = V_{EE(min)}$  to  $V_{EE(max)}$ ;  $V_{CC} = GND$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ ; unless otherwise stated.

Symbol	Parameter	Condition	Min	Typ	Max	Units
$t_{pd}$	Propagation Delay to: Q, /Q Output	D (Diff)			380	ps
		D (SE)			430	ps
	QHG, /QHG Output	D (Diff)			730	ps
		D (SE)			780	ps
$t_s$	Set-Up Time	/EN		150		ps
$t_H$	Hold Time	/EN		150		ps
$t_{SKEW}$	Duty Cycle Skew	(Diff)	Note 5	5	20	ps
$V_{PP}$	Minimum Input Swing	/EN	Note 6	150		mV
$V_{CMR}$	Common Mode Range	/EN	Note 7	-1.3	-0.4	V
$t_r, t_f$	Output Q Rise/Fall Times (20% to 80%)	At full output swing	100	225	350	ps

**Notes:**

- Duty cycle skew is the difference between a  $t_{pd}$  propagation delay through a device.
- Minimum input swing for which AC parameters are guaranteed. The device has a DC gain of  $\approx 40$  to Q, /Q outputs and a DC gain of  $\approx 200$  or higher to /Q<sub>HG</sub>, Q<sub>HG</sub> outputs.
- The CMR range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP(min)}$  and 1V. The lower end of the CMR range varies 1:1 with  $V_{EE}$ . The numbers in the spec table assume a nominal  $V_{EE} = -3.3V$ . Note for PECL operation, the  $V_{CMR(min)}$  will be fixed at  $3.3V - |V_{CMR(min)}|$ .

**TIMING DIAGRAM**

## OUTPUT INTERFACE APPLICATIONS

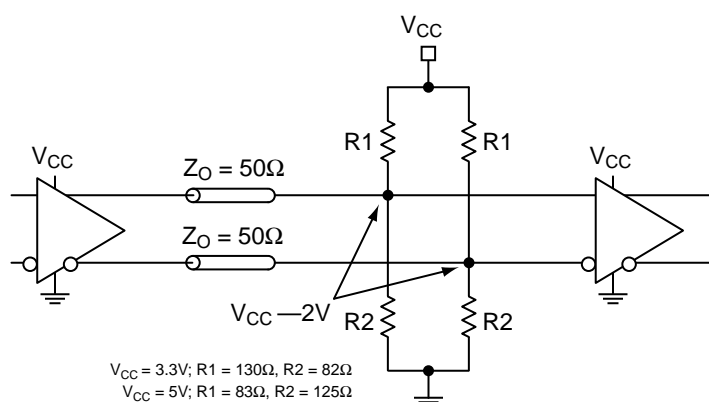


Figure 1a. Parallel Thevenin-Equivalent Termination

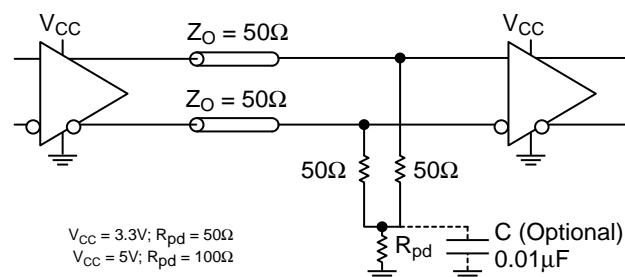


Figure 1b. Three Resistor "Y Termination"

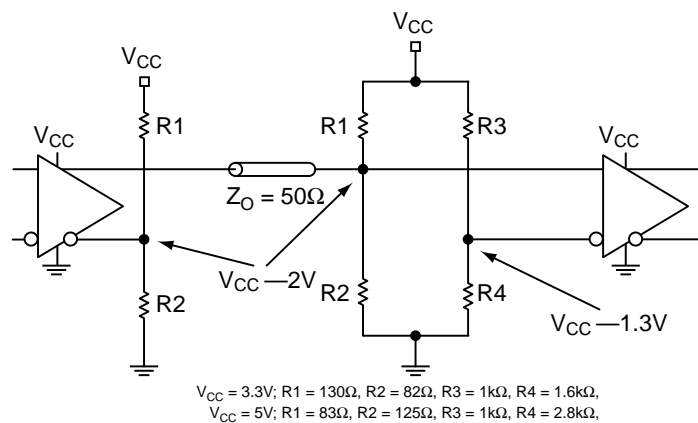
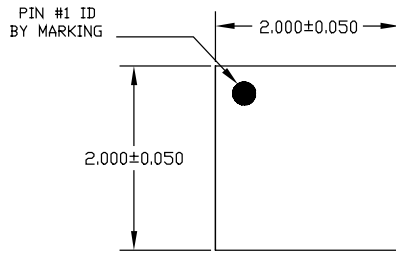


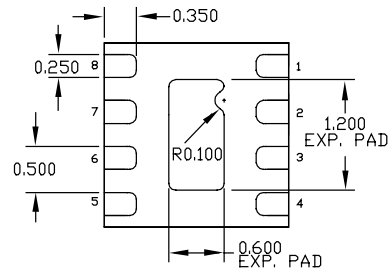
Figure 1c. Terminating Unused I/O

## RELATED PRODUCT AND SUPPORT DOCUMENTATION

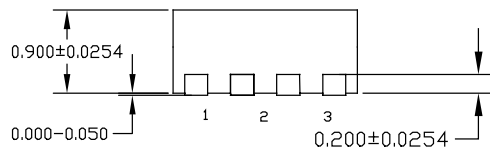
Part Number	Function	Data Sheet Link
SY89306/316V	3.3V/5V 2.5GHz PECL/ECL Differential Receiver/Buffer	<a href="http://www.micrel.com/product-info/products/sy89306-316v.shtml">www.micrel.com/product-info/products/sy89306-316v.shtml</a>
SY89206/216V	3.3V/5V 1GHz PECL/ECL Differential Receiver/Buffer	<a href="http://www.micrel.com/product-info/products/sy89206-216v.shtml">www.micrel.com/product-info/products/sy89206-216v.shtml</a>
HBW Solutions	New Products and Applications	<a href="http://www.micrel.com/product-info/products/solutions.shtml">www.micrel.com/product-info/products/solutions.shtml</a>

**8 LEAD ULTRA-SMALL EPAD-MicroLeadFrame™ (MLF-8)**

TOP VIEW



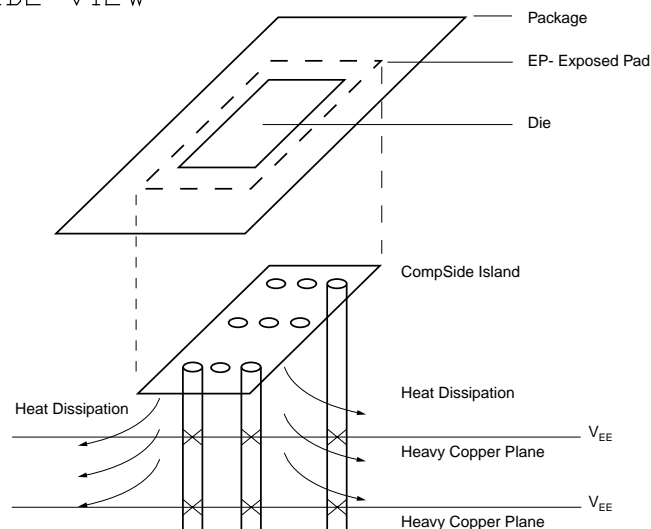
BOTTOM VIEW



SIDE VIEW

## NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. MAX. PACKAGE WARPAGE IS 0.05 mm.
3. MAXIMUM ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.
4. PIN #1 ID ON TOP WILL BE LASER/INK MARKED.

**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.

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