



**3.3V/5V 1GHz
DIFFERENTIAL PECL/ECL
RECEIVER/BUFFER**

**Precision Edge®
SY89206/216V**

FEATURES

- $f_{MAX} > 1.0\text{GHz}$
- 3.3V and 5V power supply options
- 250ps propagation delay
- High bandwidth output transitions
- Internal 75k Ω input pull-down resistors
- SY89206V: 100k PECL/ECL compatible
- SY89216V: 10k PECL/ECL compatible
- Industrial temperature range: -40°C to $+85^{\circ}\text{C}$
- Available in an ultra-small 8-pin (2mm x 2mm) MLF™ package



Precision Edge®

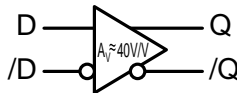
DESCRIPTION

The SY89206V and SY89216V are differential PECL/ECL receiver/buffers in a space-saving (2mm x 2mm) MLF™ package. The devices are functionally equivalent to the SY10/100EL16V, but feature a 70% smaller footprint.

The SY89206/216V provide a V_{BB} output for either single-ended use or as a DC bias for AC-coupling to the device. The V_{BB} pin should be used only as a bias for the SY89206/16V as its current sink/source capability is limited. Whenever used, the V_{BB} pin should be bypassed with a 0.01 μF capacitor to V_{CC} .

Under open input conditions (pulled to V_{EE}), internal input clamps will force the Q output LOW.

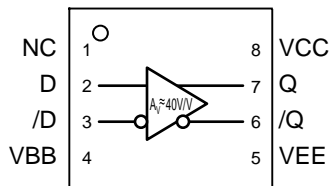
BLOCK DIAGRAM



FUNCTIONAL CROSS REFERENCE

| Micrel Part Number | PECL/ECL | Functional Cross |
|--------------------|----------|------------------|
| SY89206V | 100k | SY100EL16V |
| SY89216V | 10k | SY10EL16V |

PACKAGE/ORDERING INFORMATION



**8-Pin MLF™
Ultra-Small Outline**

Ordering Information⁽¹⁾

| Part Number | Package Type | Operating Range | Package Marking | Lead Finish |
|-----------------------------|--------------|-----------------|-------------------------------------|----------------|
| SY89206VMITR ⁽²⁾ | MLF-8 | Industrial | 206 | Sn-Pb |
| SY89216VMITR ⁽²⁾ | MLF-8 | Industrial | 216 | Sn-Pb |
| SY89206VMGTR ⁽²⁾ | MLF-8 | Industrial | 206 with Pb-Free bar-line indicator | Pb-Free NiPdAu |
| SY89216VMGTR ⁽²⁾ | MLF-8 | Industrial | 216 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.

PIN DESCRIPTION

SY89206V

| Pin Number | Pin Name | Type | Pin Function |
|------------|--------------------|--------------------------|--|
| 2, 3 | D, /D | 100k ECL Input | Differential PECL/ECL Input: The signal inputs include internal 75kΩ pull-down resistors. If inputs are left open, Q output will default to LOW. See "Input Interface Applications" section for single-ended inputs. |
| 7, 6 | Q, /Q | 100k ECL Output | Differential PECL/ECL Output: Q 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 0.1μF//0.01μF low ESR capacitors. |
| 5 | VEE Exposed Pad | Negative Power Supply | Negative Power Supply: VEE and exposed pad must be tied to most negative supply. For PECL/LVPECL connect to ground. |
| 4 | VBB | Reference Voltage Output | Bias Voltage: V _{CC} -1.3V. Used as reference voltage when AC coupling to the D, /D inputs. Max sink/source is ±0.5mA. |
| 1 | NC | | No connection. |

SY89216V

| Pin Number | Pin Name | Type | Pin Function |
|------------|--------------------|--------------------------|--|
| 2, 3 | D, /D | 10k ECL Input | Differential PECL/ECL Input: The signal inputs include internal 75kΩ pull-down resistors. If inputs are left open, Q output will default to LOW. See "Input Interface Applications" section for single-ended inputs. |
| 7, 6 | Q, /Q | 10k ECL Output | Differential PECL/ECL Output: Q 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 0.1μF//0.01μF low ESR capacitors. |
| 5 | VEE Exposed Pad | Negative Power Supply | Negative Power Supply: VEE and exposed pad must be tied to most negative supply. For PECL/LVPECL connect to ground. |
| 4 | VBB | Reference Voltage Output | Bias Voltage: V _{CC} -1.3V. Used as reference voltage when AC coupling to the D, /D inputs. Max sink/source is ±0.5mA. |
| 1 | NC | | No connection. |

Absolute Maximum Ratings(Note 1)

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, 10 sec.) 220°C
 Storage Temperature (T_S) -65°C to +150°C

Operating Ratings(Note 2)

Power Supply Voltage $|V_{CC} - V_{EE}|$.. 3.3V ±10% or 5V ±10%
 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™ (ψ_{JB}), 60°C/W

DC ELECTRICAL CHARACTERISTICS

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

| Symbol | Parameter | Condition | Min | Typ | Max | Units |
|----------|--------------------------|---------------------|-------|-----|-------|---------------|
| V_{EE} | Power Supply | $ V_{CC} - V_{EE} $ | 3.0 | 3.3 | 3.6 | V |
| | | $ V_{CC} - V_{EE} $ | 4.5 | 5.0 | 5.5 | V |
| I_{EE} | Power Supply Current | SY89206V | | 21 | 26 | mA |
| | | SY89216V | | 18 | 22 | mA |
| I_{IH} | Input HIGH Current | | | | 150 | μA |
| V_{BB} | Output Reference Voltage | SY89206V | -1.38 | | -1.26 | V |
| | | SY89216V | -1.43 | | -1.19 | V |

SY89206V (100K ECL) 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 noted.

| Symbol | Parameter | Condition | Min | Typ | Max | Units |
|----------|---------------------|------------------|------------------|-----|------------------|---------------|
| V_{OH} | Output HIGH Voltage | Note 4, 5 | $V_{CC} - 1.085$ | — | $V_{CC} - 0.880$ | V |
| V_{OL} | Output LOW Voltage | Note 4, 5 | $V_{CC} - 1.830$ | — | $V_{CC} - 1.555$ | 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_{PP} | Minimum Input Swing | | 150 | — | — | mV |
| I_{IH} | Input HIGH Current | | — | — | 150 | μA |
| I_{IL} | Input LOW Current | | 0.5 | — | — | μA |

SY89216V (10K ECL) 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 $-5V \pm 10\%$; $T_A = -40^\circ C$ to $+85^\circ C$ unless otherwise noted.

| Symbol | Parameter | Condition | Min | Typ | Max | Units |
|----------|---------------------|----------------------------|----------------|-----|----------------|---------|
| V_{OH} | Output HIGH Voltage | Note 4 , Input Card | $V_{CC}-1.080$ | — | $V_{CC}-0.720$ | V |
| V_{OL} | Output LOW Voltage | Note 4 , Input Card | $V_{CC}-1.950$ | — | $V_{CC}-1.595$ | V |
| V_{IH} | Input HIGH Voltage | | $V_{CC}-1.230$ | — | $V_{CC}-0.720$ | V |
| V_{IL} | Input LOW Voltage | | $V_{CC}-1.950$ | — | $V_{CC}-1.445$ | V |
| V_{PP} | Minimum Input Swing | | 150 | — | — | mV |
| I_{IH} | Input HIGH Current | | — | — | 150 | μA |
| I_{IL} | Input LOW Current | | 0.5 | — | — | μA |

AC 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 $-5V \pm 10\%$; $T_A = -40^\circ C$ to $+85^\circ C$ unless otherwise noted.

| Symbol | Parameter | Condition | Min | Typ | Max | Units |
|------------|--|---|--------------|-----|--------------|-------|
| f_{MAX} | Maximum Frequency | $V_{OUT} \geq 400mV$ | 1.0 | | | GHz |
| t_{PLH} | Propagation Delay | D (Differential) | 125 | 280 | 375 | ns |
| t_{PHL} | | D (Single ended) | 75 | 280 | 425 | ns |
| t_{SKEW} | Duty Cycle Skew | Note 6 , EL/6V no space – $40^\circ C$ | | 5 | 20 | ps |
| V_{PP} | Minimum Input Swing | Note 7 | 150 | | | mV |
| V_{CMR} | Common Mode Range | Note 8 | $V_{CC}-1.3$ | | $V_{CC}-0.4$ | V |
| t_r, t_f | Output Rise/Fall Times (20% to 80%) | | 100 | 225 | 350 | ps |

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 RATING conditions for extended periods may affect device reliability.

Note 2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.

Note 3. Package Thermal Resistance assumes exposed pad is soldered (or equivalent) to the device's most negative potential on the PCB.

Note 4. Output loaded with 50Ω to $V_{CC}-2V$.

Note 5. $V_{IN} = V_{IL}$ (min) or V_{IH} (max)

Note 6. Duty cycle skew is the difference between a t_{PLH} and t_{PHL} propagation delay through a device.

Note 7. Minimum input swing for which AC parameters are guaranteed. The device has a DC gain of $\approx 40V/V$.

Note 8. 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 specification table assume a nominal $V_{EE} = -3.3V$. Note for PECL operation, the V_{CMR} (min) will be fixed at $3.3V - |V_{CMR}(\text{min})|$.

INPUT INTERFACE APPLICATIONS

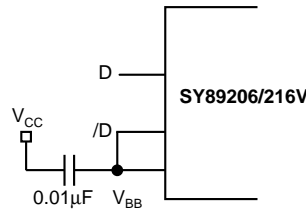


Figure 1. Single-Ended LVPECL Input (Terminating Unused Input)

OUTPUT INTERFACE APPLICATIONS

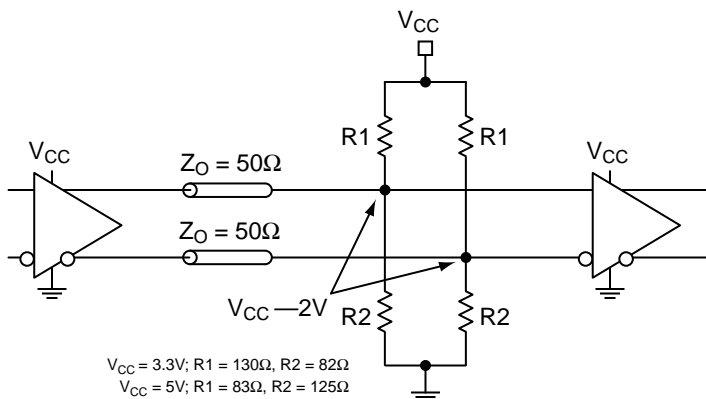


Figure 2a. Parallel Thevenin-Equivalent Termination

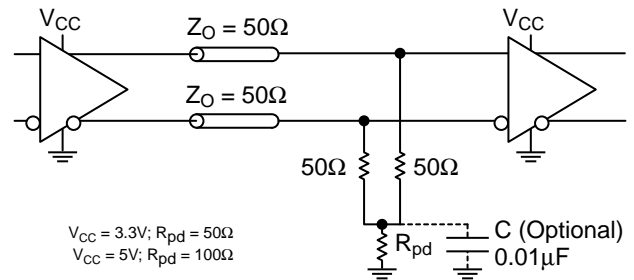


Figure 2b. Three Resistor "Y Termination"

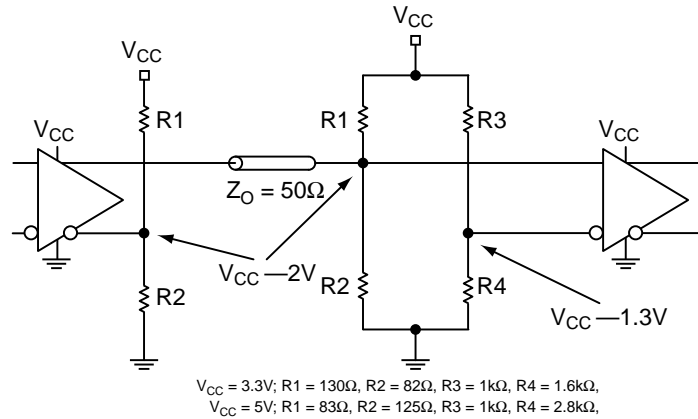
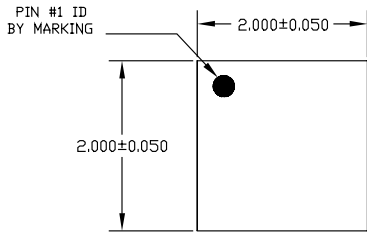


Figure 2c. Terminating Unused I/O

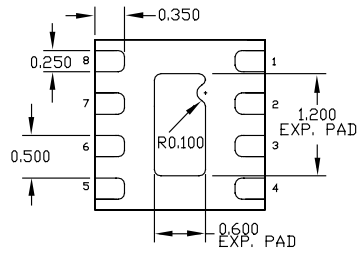
RELATED PRODUCT AND SUPPORT DOCUMENTATION

| Part Number | Function | Data Sheet Link |
|---------------|--|--|
| SY89306/316V | 3.3V/5V 2.5GHz PECL/ECL Differential Receiver/Buffer | www.micrel.com/product-info/products/sy89306-316v.shtml |
| SY89223L | 3.3V Dual Differential LVPECL-to-LVTTL Translator | www.micrel.com/product-info/products/sy89223l.shtml |
| HBW Solutions | New Products and Applications | www.micrel.com/product-info/products/solutions.shtml |

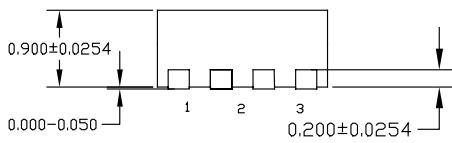
8 LEAD ULTRA-SMALL EPAD-MicroLeadFrame™ (MLF-8)



TOP VIEW

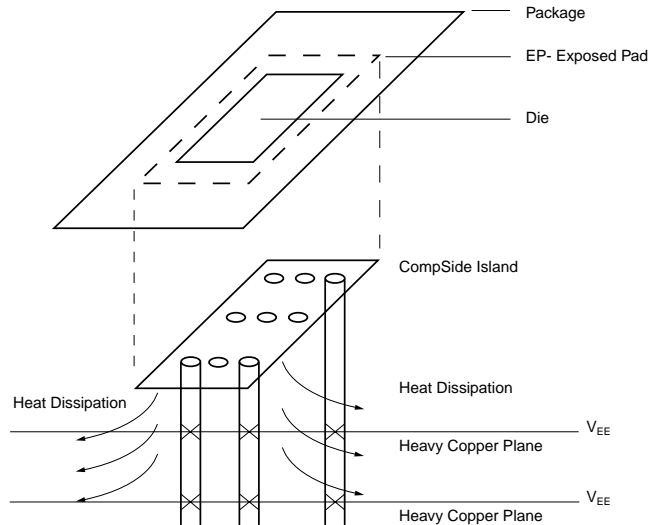


BOTTOM VIEW



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:

- Note 1.** Package meets level two qualification.
- Note 2.** All parts are dry-packed before shipment.
- Note 3.** Exposed pads must be soldered to the most negative supply plane, equivalent to V_{EE} , for proper thermal management.

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