



SY89312V

3.3V/5V, 4GHz PECL/ECL
÷2 Clock Generator

Precision Edge®



Precision Edge®

General Description

The SY89312V is an integrated ÷2 divider with differential clock inputs. It is functionally equivalent to the SY100EP32V but in an ultra-small 8-pin QFN package that features a 70% smaller footprint.

The V_{BB} pin, an internally generated voltage supply, is available for this device only. For single-ended input conditions, the unused differential input is connected to V_{BB} as a switching reference voltage. V_{BB} can also bias AC-coupled inputs. When used, decouple V_{BB} and V_{CC} via a 0.01 μ F capacitor and limit current sourcing or sinking to 0.5mA. When not in use, V_{BB} should be left open.

The reset pin is asynchronous and is asserted when it is high. Upon power-up, the internal flip-flops will be in a random state; the reset allows for the synchronous use of multiple SY89312Vs in a system.

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

Features

- Guaranteed AC performance over temperature and voltage:
- >4GHz f_{MAX} input
- <160ps t_r/t_f
- <440ps t_{pd}
- 3.3V and 5V power supply operation
- 100k ECL/PECL-compatible I/O
- Internal 75K Ω input pull-down resistors
- Wide operating temperature range: -40°C to +85°C
- Available in ultra-small 8-pin 2mm x 2mm QFN package

Truth Table⁽¹⁾

| CLK | /CLK | RESET | Q | /Q |
|-----------------|-----------------|-------|---|----|
| X | X | H | L | H |
| $\bar{\square}$ | $\bar{\square}$ | L | F | F |

Note:

1. F = Divide by 2 function.

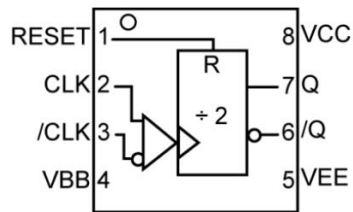
Ordering Information

| Part Number | Package Type | Operating Range | Package Marking | Lead Finish |
|-----------------------------|---------------------|-----------------|-------------------------------------|----------------|
| SY89312VMGTR ⁽²⁾ | 8-pin 2mm x 2mm QFN | Industrial | 312 with Pb-Free Bar Line Indicator | Pb-Free NiPdAu |

Note:

2. Pb-Free package is recommended for new designs.

Pin Configuration



8-Pin 2mm x 2mm QFN

Pin Description

| Pin Number | Pin Name | Type | Pin Function |
|------------|-----------|--------------------------|--|
| 2, 3 | CLK, /CLK | 100K ECL/PECL Input | Differential PECL/ECL Input: Internal 75k Ω pull-down resistor. If left open, pin defaults LOW (see Input Interface Applications section for single-ended inputs). |
| 7, 6 | Q, /Q | 100K ECL/PECL Output | Differential PECL/ECL Output: Output CLK input divided by 2 (see Output Interface Applications section for recommendations on terminations). |
| 8 | VCC | Positive Power Supply | Positive Power Supply: Bypass with 0.1 μ F low ESR capacitor. |
| 5 | VEE, ePad | Negative Power Supply | Negative Power Supply: VEE and exposed pad (ePad) must be tied to most negative supply. For PECL/LVPECL connect to ground. |
| 4 | VBB | Reference Voltage Output | Bias Reference Voltage: VCC-1.4V. Used as reference voltage for single-ended inputs or AC-coupling to the CLK, /CLK inputs. Maximum sink/source is \pm 0.5mA (see Input Interface Applications section). |
| 1 | Reset | 100k ECL/PECL Input | Single-Ended Input: PECL/ECL asynchronous reset. |

Absolute Maximum Ratings⁽³⁾

| | |
|---|-------------------|
| Supply Voltage ($ V_{CC} - V_{EE} $) | +6.0V |
| Input Voltage (V_{IN}) | -0.5V to V_{CC} |
| LVPECL Output Current (I_{OUT}) | |
| Continuous | 50mA |
| Surge | 100mA |
| Current (V_{BB}) | |
| Source or Sink on V_{BB} ⁽⁶⁾ | ± 1.5 mA |
| Lead Temperature (soldering, 20s) | 260°C |
| Storage Temperature (T_s) | -65°C to +150°C |

Operating Ratings⁽⁴⁾

| | |
|---|----------------|
| Supply Voltage ($ V_{CC} - V_{EE} $) | +3.0 to +3.6V |
| Ambient Temperature (T_A) | -40°C to +85°C |
| Package Thermal Resistance ⁽⁵⁾ | |
| QFN (θ_{JA}) | |
| Still Air | 93°C/W |
| 500lfpm | 87°C/W |
| QFN (ψ_{JB}) | |
| Junction-to-Board | 56°C/W |

PECL/ECL (100K) 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 $-5V \pm 10\%$; $R_L = 50\Omega$ to $V_{CC} - 2V$;
 $T_A = -40^\circ C$ to $+85^\circ C$ unless otherwise stated.

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Units |
|-------------|---|----------------------------|------------------|------------------|------------------|---------|
| I_{EE} | Power Supply Current | Maximum V_{CC} , no load | — | 30 | 42 | mA |
| 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 ⁽⁷⁾ | | $V_{EE} + 2.0$ | — | V_{CC} | V |
| V_{BB} | Bias Voltage | | $V_{CC} - 1.525$ | $V_{CC} - 1.425$ | $V_{CC} - 1.325$ | V |
| I_{IH} | Input HIGH Current | | — | — | 150 | μA |
| I_{IL} | Input LOW Current CLK | | 0.5 | — | — | μA |
| | Input LOW Current /CLK | | -150 | — | — | |

Notes:

- 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.
- The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
- Package thermal resistance assumes exposed pad is soldered (or equivalent) to the devices most negative potential on the PCB.
- Due to the limited drive capability use for input of the same package only.
- V_{IHCMR} (minimum) varies 1:1 with V_{EE} , (maximum) varies 1:1 with V_{CC} .

AC Electrical Characteristics⁽⁸⁾

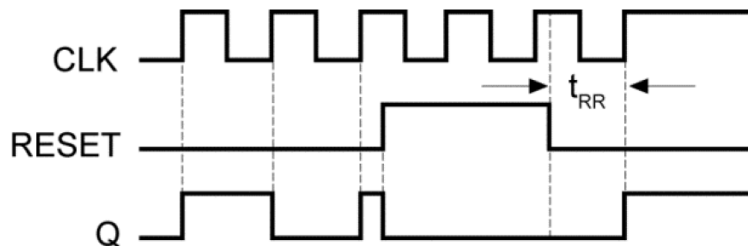
PECL: $V_{CC} = +3.3V \pm 10\%$ or $+5V \pm 10\%$ and $V_{EE} = GND$; ECL: $V_{EE} = -3.3V \pm 10\%$ or $-5V \pm 10\%$ and $V_{CC} = GND$; $R_L = 50\Omega$ to $V_{CC} - 2V$; $T_A = -40^\circ C$ to $+85^\circ C$ unless otherwise stated.

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Units |
|--------------|--|-----------|------|------|------|-------|
| f_{MAX} | Maximum Input Frequency | | 4 | — | — | GHz |
| t_{pd} | Propagation Delay to Output Differential RESET, CLK → Q, /Q | | 250 | 275 | 440 | ps |
| t_{RR} | Set/Reset Recovery | | 200 | 100 | — | ps |
| t_{PW} | Minimum Pulse Width RESET | | 550 | 200 | — | ps |
| t_{JITTER} | Cycle-to-Cycle RMS Jitter | | — | — | 1 | psRMS |
| V_{PP} | Input Voltage Swing (Differential) | | 150 | 800 | 1200 | mV |
| t_r, t_f | Output Rise/Fall Times Q, /Q (20% to 80%) | | 50 | 100 | 160 | ps |

Note:

8. Measured using a 750mV source, 50% duty cycle clock source

Timing Diagram



Input Interface Applications

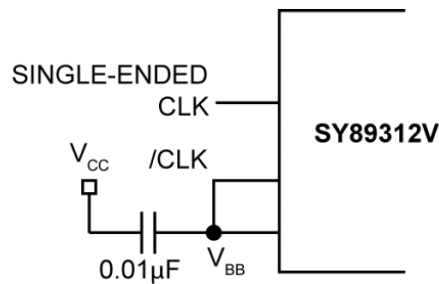


Figure 1. Single-Ended LVPECL Input (Terminating Unused Input)

LVPECL Output Interface Applications

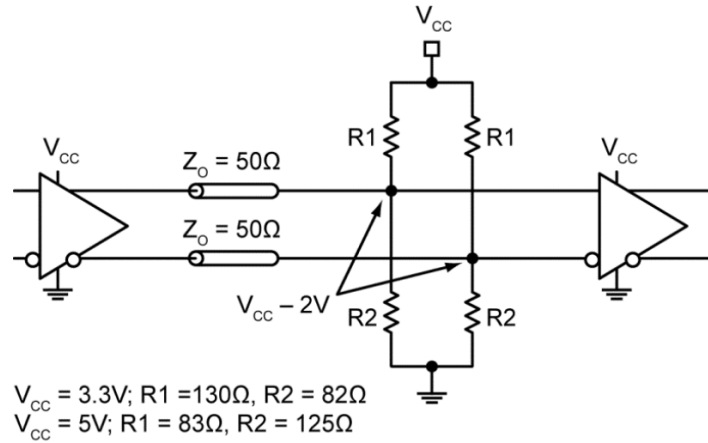


Figure 2. Parallel Thevenin-Equivalent Termination

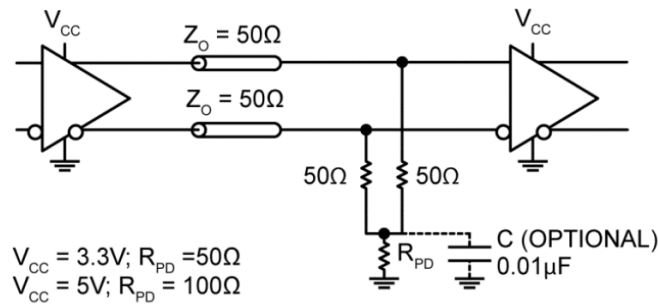


Figure 3. Three Resistor "Y Termination"

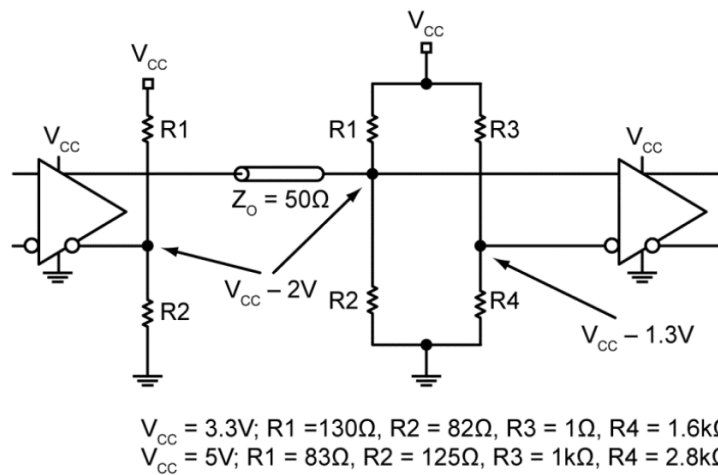
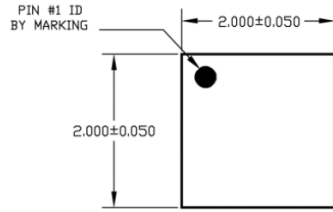
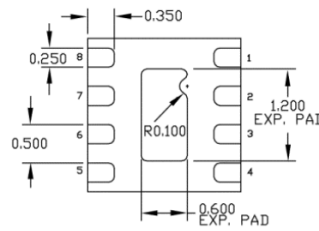


Figure 4. Terminating Unused I/O

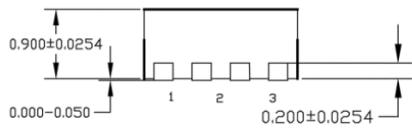
Package Information (9, 10, 11, 12)



TOP VIEW

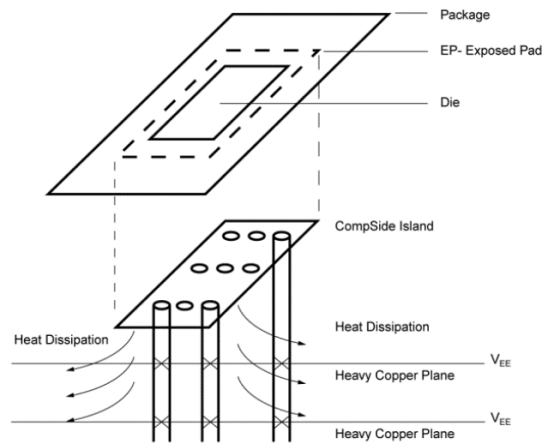


BOTTOM VIEW



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.



8-Pin 2mm x 2mm QFN Package

Note:

9. Package information is correct as of the publication date. For updates and most current information, go to www.micrel.com.
10. Package meets Level 1 qualifications.
11. All parts are dry packaged before shipment.
12. Exposed pads must be soldered to the most negative plane, equivalent to device V_{BB} , for proper thermal management.

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