



# SY10EL34/L SY100EL34/L

5V/3.3V  $\div 2$ ,  $\div 4$ ,  $\div 8$  Clock Generation Chip

Precision Edge<sup>®</sup>

## General Description

The SY10/100EL34/L are low-skew  $\div 2$ ,  $\div 4$ ,  $\div 8$  clock generation chips designed explicitly for low-skew clock generation applications. The internal dividers are synchronous to each other; therefore, the common output edges are all precisely aligned. The devices can be driven by either a differential or single-ended ECL or, if positive power supplies are used, PECL input signal. In addition, by using the  $V_{BB}$  output, a sinusoidal source can be AC-coupled into the device. If a single-ended input is to be used, the  $V_{BB}$  output should be connected to the  $\overline{CLK}$  input and bypassed to ground via a  $0.01\mu F$  capacitor. The  $V_{BB}$  output is designed to act as the switching reference for the input of the EL34/L under single-ended input conditions. As a result, this pin can only source/ sink up to 0.5mA of current.

The common enable ( $\overline{EN}$ ) is synchronous so that the internal dividers will only be enabled/disabled when the internal clock is already in the LOW state. This avoids any chance of generating a runt clock pulse on the internal clock when the device is enabled/disabled as can happen with an asynchronous control. An internal runt pulse could lead to losing synchronization between the internal divider stages. The internal enable flip-flop is clocked on the falling edge of the divider stages. The internal enable flip-flop is clocked on the falling edge of the input clock; therefore, all associated specification limits are referenced to the negative edge of the clock input.

Upon start-up, the internal flip-flops will attain a random state; the master reset (MR) input allows for the synchronization of the internal dividers, as well as for multiple EL34/Ls in a system.

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



Precision Edge<sup>®</sup>

## Features

- 3.3V and 5V power supply options
- 50ps output-to-output skew
- Synchronous enable/disable
- Master Reset for synchronization
- Internal  $75K\Omega$  input pull-down resistors
- Available in 16-pin SOIC package

## Pin Description

| Pin Name        | Pin Function                   |
|-----------------|--------------------------------|
| CLK             | Differential clock inputs.     |
| $\overline{EN}$ | Synchronous enable.            |
| MR              | Master reset.                  |
| $V_{BB}$        | Reference output.              |
| $Q_0$           | Differential $\div 2$ outputs. |
| $Q_1$           | Differential $\div 4$ outputs. |
| $Q_2$           | Differential $\div 8$ outputs. |

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December 2011

M9999-120611-I  
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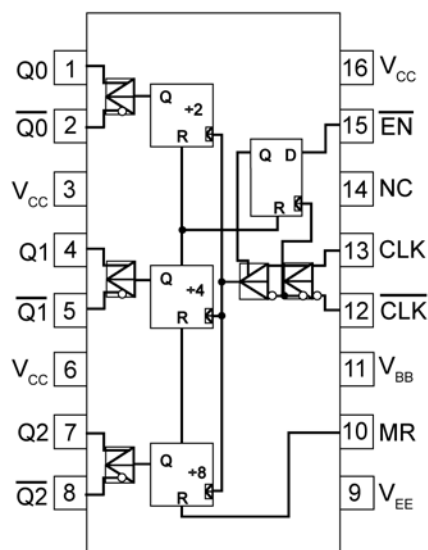
## Ordering Information

| Part Number                   | Package Type | Operating Range | Package Marking                                 | Lead Finish    |
|-------------------------------|--------------|-----------------|-------------------------------------------------|----------------|
| SY10EL34LZG                   | Z16-2        | Industrial      | SY10EL34LZG with<br>Pb-Free Bar Line Indicator  | Pb-Free NiPdAu |
| SY10EL34LZGTR <sup>(2)</sup>  | Z16-2        | Industrial      | SY10EL34LZG with<br>Pb-Free Bar Line Indicator  | Pb-Free NiPdAu |
| SY100EL34LZG                  | Z16-2        | Industrial      | SY100EL34LZG with<br>Pb-Free Bar Line Indicator | Pb-Free NiPdAu |
| SY100EL34LZGTR <sup>(2)</sup> | Z16-2        | Industrial      | SY100EL34LZG with<br>Pb-Free Bar Line Indicator | Pb-Free NiPdAu |
| SY10EL34ZG                    | Z16-2        | Industrial      | SY10EL34ZG with<br>Pb-Free Bar Line Indicator   | Pb-Free NiPdAu |
| SY10EL34ZGTR <sup>(2)</sup>   | Z16-2        | Industrial      | SY10EL34ZG with<br>Pb-Free Bar Line Indicator   | Pb-Free NiPdAu |
| SY100EL34ZG                   | Z16-2        | Industrial      | SY100EL34ZG with<br>Pb-Free Bar Line Indicator  | Pb-Free NiPdAu |
| SY100EL34ZGTR <sup>(2)</sup>  | Z16-2        | Industrial      | SY100EL34ZG with<br>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 Configuration



16-Pin Narrow SOIC (Z16-2)

**DC Electrical Characteristics<sup>(1)</sup>** $V_{EE} = V_{EE}$  (minimum) to  $V_{EE}$  (maximum);  $V_{CC} = \text{GND}$ .

| Symbol                                      | Parameter                | Min.  | Typ. | Max.  | Units         |
|---------------------------------------------|--------------------------|-------|------|-------|---------------|
| <b><math>T_A = -40^\circ\text{C}</math></b> |                          |       |      |       |               |
| $I_{EE}$                                    | Power Supply Current     |       |      |       |               |
|                                             | 10EL                     | –     | –    | 49    | mA            |
|                                             | 100EL                    | –     | –    | 49    |               |
| $V_{BB}$                                    | Output Reference Voltage |       |      |       | V             |
|                                             | 10EL                     | –1.43 |      | –1.30 |               |
|                                             | 100EL                    | –1.38 |      | –1.26 |               |
| $I_{IH}$                                    | Input High Current       | –     | –    | 150   | $\mu\text{A}$ |
| <b><math>T_A = 0^\circ\text{C}</math></b>   |                          |       |      |       |               |
| $I_{EE}$                                    | Power Supply Current     |       |      |       |               |
|                                             | 10EL                     | –     | –    | 49    | mA            |
|                                             | 100EL                    | –     | –    | 49    |               |
| $V_{BB}$                                    | Output Reference Voltage |       |      |       | V             |
|                                             | 10EL                     | –1.38 |      | –1.27 |               |
|                                             | 100EL                    | –1.38 |      | –1.26 |               |
| $I_{IH}$                                    | Input High Current       | –     | –    | 150   | $\mu\text{A}$ |
| <b><math>T_A = +25^\circ\text{C}</math></b> |                          |       |      |       |               |
| $I_{EE}$                                    | Power Supply Current     |       |      |       |               |
|                                             | 10EL                     | –     | –    | 49    | mA            |
|                                             | 100EL                    | –     | –    | 49    |               |
| $V_{BB}$                                    | Output Reference Voltage |       |      |       | V             |
|                                             | 10EL                     | –1.35 |      | –1.25 |               |
|                                             | 100EL                    | –1.38 |      | –1.26 |               |
| $I_{IH}$                                    | Input High Current       | –     | –    | 150   | $\mu\text{A}$ |
| <b><math>T_A = +85^\circ\text{C}</math></b> |                          |       |      |       |               |
| $I_{EE}$                                    | Power Supply Current     |       |      |       |               |
|                                             | 10EL                     | –     | –    | 49    | mA            |
|                                             | 100EL                    | –     | –    | 54    |               |
| $V_{BB}$                                    | Output Reference Voltage |       |      |       | V             |
|                                             | 10EL                     | –1.31 |      | –1.19 |               |
|                                             | 100EL                    | –1.38 |      | –1.26 |               |
| $I_{IH}$                                    | Input High Current       | –     | –    | 150   | $\mu\text{A}$ |

**Note:**

- Parametric values specified at:
  - 5V Power Supply Range:
    - 100EL34 Series: –4.2V to –5.5V
    - 10EL34 Series: –4.75V to –5.5V
  - 3V Power Supply Range:
    - 10/100EL34L Series: –3.0V to –3.8V

**AC Electrical Characteristics<sup>(1)</sup>** $V_{EE} = V_{EE}$  (minimum) to  $V_{EE}$  (maximum);  $V_{CC} = \text{GND}$ .

| Symbol                                      | Parameter                                | Min. | Typ. | Max. | Units |
|---------------------------------------------|------------------------------------------|------|------|------|-------|
| <b><math>T_A = -40^\circ\text{C}</math></b> |                                          |      |      |      |       |
| $t_{PD}$                                    | Propagation Delay to Output<br>CLK<br>MR | 960  | 1100 | 1200 | ps    |
|                                             |                                          | 650  | 800  | 1010 |       |
| $t_{SKEW}$                                  | Within-Device Skew <sup>(2)</sup>        | –    | –    | 50   | ps    |
| $t_S$                                       | Set-Up Time ( $\overline{EN}$ )          | 400  | –    | –    | ps    |
| $t_H$                                       | Hold Time ( $\overline{EN}$ )            | 200  | –    | –    | ps    |
| $V_{PP}$                                    | Minimum Input Swing <sup>(3)</sup>       | 250  | –    | –    | mV    |
| $V_{CMR}$                                   | Common-Mode Range <sup>(4)</sup>         | –1.3 | –    | –0.4 | V     |
| $t_r$<br>$t_f$                              | Output Rise/Fall Times<br>Q (20% – 80%)  | 275  | 400  | 525  | ps    |
| <b><math>T_A = 0^\circ\text{C}</math></b>   |                                          |      |      |      |       |
| $t_{PD}$                                    | Propagation Delay to Output<br>CLK<br>MR | 960  | 1100 | 1200 | ps    |
|                                             |                                          | 650  | 800  | 1010 |       |
| $t_{SKEW}$                                  | Within-Device Skew <sup>(2)</sup>        | –    | –    | 50   | ps    |
| $t_S$                                       | Set-Up Time ( $\overline{EN}$ )          | 400  | –    | –    | ps    |
| $t_H$                                       | Hold Time ( $\overline{EN}$ )            | 200  | –    | –    | ps    |
| $V_{PP}$                                    | Minimum Input Swing <sup>(3)</sup>       | 250  | –    | –    | mV    |
| $V_{CMR}$                                   | Common-Mode Range <sup>(4)</sup>         | –1.4 | –    | –0.4 | V     |
| $t_r$<br>$t_f$                              | Output Rise/Fall Times<br>Q (20% – 80%)  | 275  | 400  | 525  | ps    |
| <b><math>T_A = +25^\circ\text{C}</math></b> |                                          |      |      |      |       |
| $t_{PD}$                                    | Propagation Delay to Output<br>CLK<br>MR | 960  | 1100 | 1200 | ps    |
|                                             |                                          | 650  | 800  | 1010 |       |
| $t_{SKEW}$                                  | Within-Device Skew <sup>(2)</sup>        | –    | –    | 50   | ps    |
| $t_S$                                       | Set-Up Time ( $\overline{EN}$ )          | 400  | –    | –    | ps    |
| $t_H$                                       | Hold Time ( $\overline{EN}$ )            | 200  | –    | –    | ps    |
| $V_{PP}$                                    | Minimum Input Swing <sup>(3)</sup>       | 250  | –    | –    | mV    |
| $V_{CMR}$                                   | Common-Mode Range <sup>(4)</sup>         | –1.4 | –    | –0.4 | V     |
| $t_r$<br>$t_f$                              | Output Rise/Fall Times<br>Q (20% – 80%)  | 275  | 400  | 525  | ps    |

**AC Electrical Characteristics<sup>(1)</sup> (Continued)** $V_{EE} = V_{EE}$  (minimum) to  $V_{EE}$  (maximum);  $V_{CC} = \text{GND}$ .

| Symbol                    | Parameter                                | Min. | Typ. | Max. | Units |
|---------------------------|------------------------------------------|------|------|------|-------|
| $T_A = +85^\circ\text{C}$ |                                          |      |      |      |       |
| $t_{PD}$                  | Propagation Delay to Output<br>CLK<br>MR | 960  | 1100 | 1200 | ps    |
|                           |                                          | 650  | 800  | 1010 |       |
| $t_{SKEW}$                | Within-Device Skew                       | –    | –    | 50   | ps    |
| $t_S$                     | Set-Up Time ( $\overline{\text{EN}}$ )   | 400  | –    | –    | ps    |
| $t_H$                     | Hold Time ( $\overline{\text{EN}}$ )     | 200  | –    | –    | ps    |
| $V_{PP}$                  | Minimum Input Swing <sup>(3)</sup>       | 250  | –    | –    | mV    |
| $V_{CMR}$                 | Common-Mode Range <sup>(4)</sup>         | –1.4 | –    | –0.4 | V     |
| $t_r$<br>$t_f$            | Output Rise/Fall Times<br>Q (20% – 80%)  | 275  | 400  | 525  | ps    |

**Notes:**

- Parametric values specified at:
  - 5V Power Supply Range:  
100EL34 Series: –4.2V to –5.5V  
10EL34 Series: –4.75V to –5.5V
  - 3V Power Supply Range:  
10/100EL34L Series: –3.0V to –3.8V
- Skew is measured between outputs under identical transitions.
- Minimum input swing for which AC parameters are guaranteed. The device will function reliably with differential inputs down to 100mV.
- 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  $V_{PP}$  minimum and 1V. The lower end of the CMR range varies 1:1 with  $V_{EE}$ . The numbers in the specification table assume a nominal  $V_{EE} = -3.3\text{V}$ . Note for PECL operation, the  $V_{CMR(MIN)}$  will be fixed at  $3.3\text{V} - I_{VCMR(MIN)}$ .

**Truth Table**

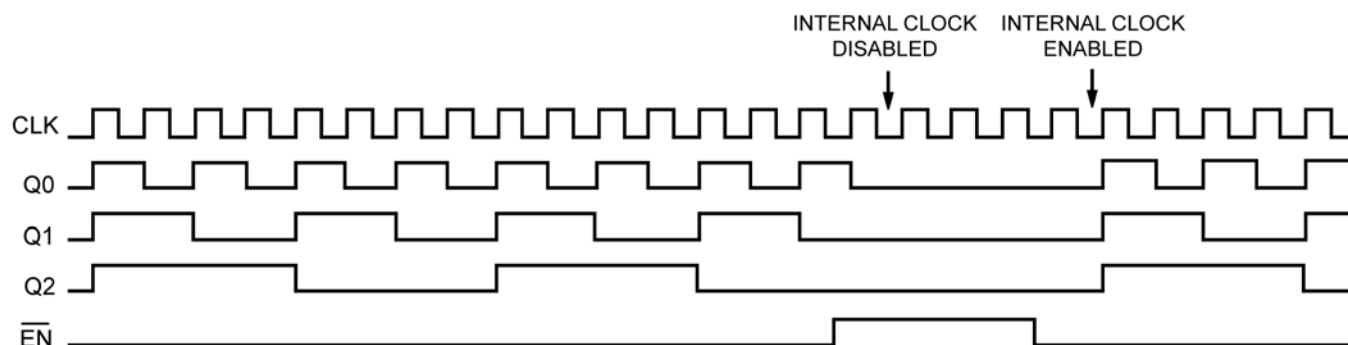
| CLK | $\overline{\text{EN}}$ | MR | Function        |
|-----|------------------------|----|-----------------|
| Z   | L                      | L  | Divide          |
| ZZ  | H                      | L  | Hold $Q_{0-2}$  |
| X   | X                      | H  | Reset $Q_{0-2}$ |

**Notes:**

Z = LOW-to-HIGH transition

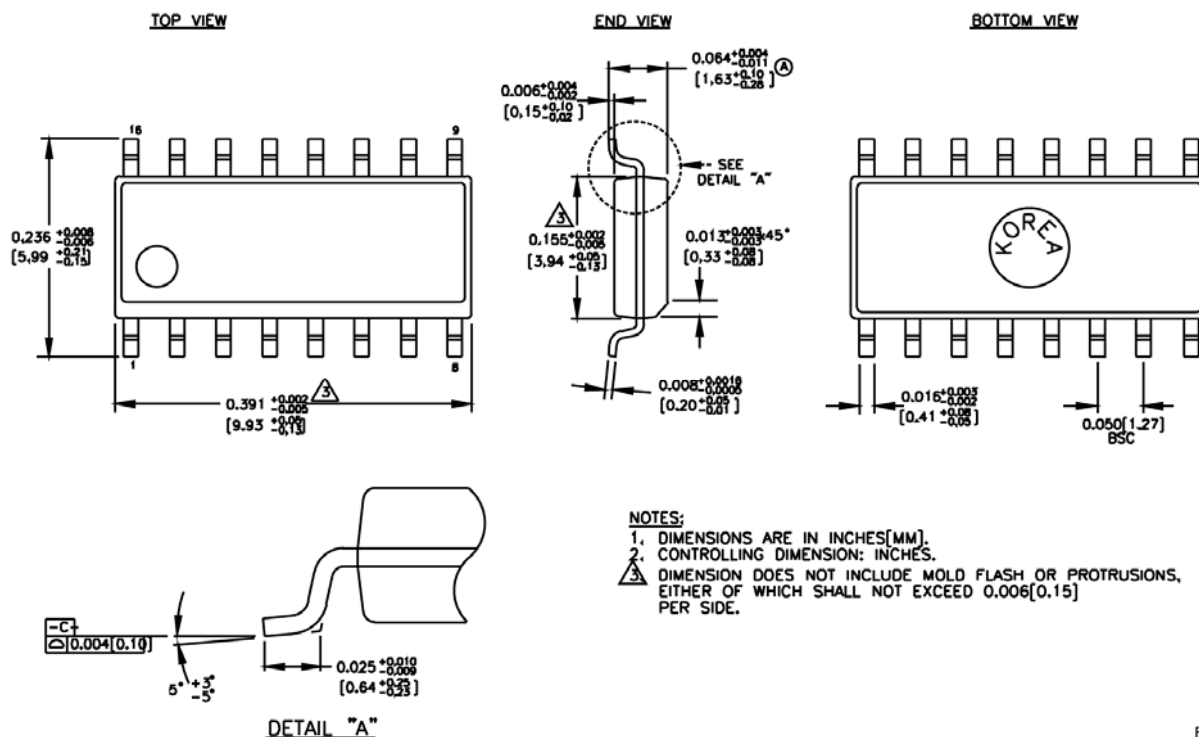
ZZ = HIGH-to-LOW transition

## Timing Diagram



The  $\overline{\text{EN}}$  signal will freeze the internal clocks to the flip-flops on the first falling edge of CLK after its assertion. The internal dividers will maintain their state during the internal clock freeze and will return to clocking once the internal clocks are unfrozen. The outputs will transition to their next states in the same manner, time and relationship as they would have had the  $\overline{\text{EN}}$  signal not been asserted.

## Package Information



Rev. 02

16-Pin .150" Wide SOIC (Z16-2)

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