



**2.5V/3.3V/5V 1:5 LVPECL/PECL/  
ECL/HSTL 2GHz CLOCK DRIVER  
WITH 2:1 DIFFERENTIAL INPUT MUX**

**Precision Edge®  
SY100EP14U**

## FEATURES

- **Guaranteed AC parameters over temp/voltage:**
  - > 2GHz  $f_{MAX}$
  - < 25ps within-device skew
  - < 275ps tr/TF time
  - < 525ps prop delay
- **2:1 Differential MUX input**
- **Flexible supply voltage: 2.5V/3.3V/5V**
- **Wide operating temperature range: -40°C to +85°C**
- **$V_{BB}$  reference for single-ended or AC-coupled PECL inputs**
- **100K ECL compatible outputs**
- **Inputs accept PECL/LVPECL/ECL/HSTL logic**
- **75k $\Omega$  internal input pull-down resistors**
- **Available in a 20-Pin TSSOP package**



**ECL Pro™**

## DESCRIPTION

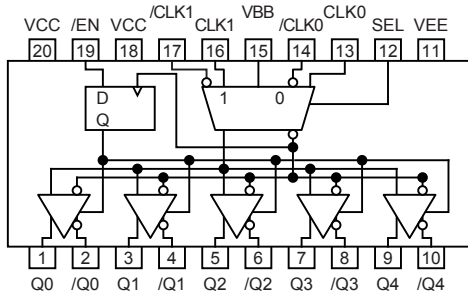
The SY100EP14U is a high-speed, 2GHz differential PECL/ECL 1:5 fanout buffer optimized for ultra-low skew applications. Within device skew is guaranteed to be less than 25ps over temperature and supply voltage. The wide supply voltage operation allows this fanout buffer to operate in 2.5V, 3.3V, and 5V systems. A  $V_{BB}$  reference is included for single-supply or AC-coupled PECL/ECL input applications, thus eliminating resistor networks. When interfacing to a single-ended or AC-coupled PECL/ECL input signal, connect the  $V_{BB}$  pin to the unused /CLK pin, and bypass the pin to  $V_{CC}$  through a 0.01 $\mu$ F capacitor.

The SY100EP14U features a 2:1 input MUX, making it an ideal solution for redundant clock switchover applications. If only one input pair is used, the other pair may be left floating. In addition, this device includes a synchronous enable pin that forces the outputs into a fixed logic state. Enable or disable state is initiated only after the outputs are in a LOW state, thus eliminating the possibility of a "runt" clock pulse.

The SY100EP14U I/O are fully differential and 100K ECL compatible. Differential 10K ECL logic can interface directly into the SY100EP14U inputs.

The SY100EP14U is part of Micrel's high-speed clock synchronization family. For applications that require a different I/O combination, consult the Micrel website at [www.micrel.com](http://www.micrel.com), and choose from a comprehensive product line of high-speed, low-skew fanout buffers, translators, and clock generators.

**PACKAGE/ORDERING INFORMATION**



**20-Pin TSSOP**

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

| Part Number                       | Package Type | Operating Range | Package Marking                        |
|-----------------------------------|--------------|-----------------|--|
| SY100EP14UK4C                     | K4-20-1      | Commercial      | XEP14U                                 |
| SY100EP14UK4CTR <sup>(2)</sup>    | K4-20-1      | Commercial      | XEP14U                                 |
| SY100EP14UK4I                     | K4-20-1      | Industrial      | XEP14U                                 |
| SY100EP14UK4ITR <sup>(2)</sup>    | K4-20-1      | Industrial      | XEP14U                                 |
| SY100EP14UK4G <sup>(3)</sup>      | K4-20-1      | Industrial      | XEP14U with Pb-Free bar line indicator |
| SY100EP14UK4GTR <sup>(2, 3)</sup> | K4-20-1      | Industrial      | XEP14U with Pb-Free bar line indicator |

**Notes:**

1. Contact factory for die availability. Dice are guaranteed at T<sub>A</sub> = 25°C, DC Electricals only.
2. Tape and Reel.
3. Pb-Free package is recommended for new designs.

**PIN DESCRIPTION**

| Pin                        | Function  |
|----------------------------|---|
| CLK0, /CLK0<br>CLK1, /CLK1 | PECL, LVPECL, ECL, LVECL, HSTL Clock or Data Inputs.<br>Internal 75kΩ pull-down resistors on CLK0, CLK1, and internal 75kΩ pull-up and 75kΩ pull-down resistors or /CLK0, /CLK1. For single-ended applications, connect signal into CLK0 and/or CLK1 inputs. /CLK0, /CLK1 default condition is $V_{CC}/2$ when left floating. CLK0, CLK1 default condition is LOW when left floating. |
| Q0 to Q4<br>/Q0 to /Q4     | LVPECL, PECL, ECL Differential Outputs: Terminate with 50Ω to $V_{CC}-2V$ . For single-ended applications, terminate the unused output with 50Ω to $V_{CC}-2V$  |
| /EN                        | LVPECL, PECL, ECL compatible synchronous enable: When /EN goes HIGH, the $Q_{OUT}$ will go LOW and / $Q_{OUT}$ will go HIGH on the next LOW input clock transition. Includes a 75kΩ pull-down. Default state is LOW when left floating. The internal latch is clocked on the falling edge of the input clock (CLK0, CLK1)   |
| SEL                        | LVPECL, PECL, ECL compatible 2:1 Mux input signal select: When SEL is LOW, CLK0 input pair is selected. When SEL is HIGH, CLK1 input pair is selected. Includes a 75kΩ pull-down. Default state is LOW and CLK0 is selected.  |
| $V_{BB}$                   | Output Reference Voltage: Equal to $V_{CC}-1.7V$ (approx.), and used for single-ended input signals or AC-coupled applications. For single-ended PECL, LVPECL applications, bypass with a 0.01μF to $V_{CC}$ . For single-ended LVTTTL inputs, bypass to GND. Max. sink/source current is 0.5mA.  |
| $V_{CC}$                   | Positive Power Supply: Bypass with 0.1μF//0.01μF low ESR capacitors.  |
| $V_{EE}$                   | Negative Power Supply: LVPECL, PECL applications, connect to GND.   |

**TRUTH TABLE<sup>(1)</sup>**

| CLK0 | CLK1 | CLK_SEL | /EN | Q  |
|------|------|---------|-----|----|
| L    | X    | L       | L   | L  |
| H    | X    | L       | L   | H  |
| X    | L    | H       | L   | L  |
| X    | H    | H       | L   | H  |
| X    | X    | X       | H   | L* |

**Note 1.** On next negative transition of CLK0 or CLK1.

**FUNCTION TABLE**

| CLK_SEL | Active Input |
|---------|--------------|
| 0       | CLK0, /CLK0  |
| 1       | CLK1, /CLK1  |

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

| Symbol            | Rating   | Value                  | Unit |
|-------------------|--|------------------------|------|
| $V_{CC} - V_{EE}$ | Power Supply Voltage   | 6.0                    | V    |
| $V_{IN}$          | Input Voltage ( $V_{CC} = 0V$ , $V_{IN}$ not more negative than $V_{EE}$ )<br>Input Voltage ( $V_{EE} = 0V$ , $V_{IN}$ not more positive than $V_{CC}$ ) | -6.0 to 0<br>+6.0 to 0 | V    |
| $I_{OUT}$         | Output Current<br>-Continuous<br>-Surge  | 50<br>100              | mA   |
| $I_{BB}$          | $V_{BB}$ Sink/Source Current <sup>(2)</sup>  | ±0.5                   | mA   |
| $T_{LEAD}$        | Lead Temperature (soldering, 20sec.)   | +260                   | °C   |
| $T_A$             | Operating Temperature Range  | -40 to +85             | °C   |
| $T_{store}$       | Storage Temperature Range  | -65 to +150            | °C   |
| ESD               | Mil Std. 883 Human Body Model, All Pins  | >1.5k                  | V    |
| $\theta_{JA}$     | Package Thermal Resistance (Junction-to-Ambient)<br>-Still-Air (single-layer PCB)<br>-Still-Air (multi-layer PCB)<br>-500lfpm (multi-layer PCB)          | 115<br>75<br>65        | °C/W |
| $\theta_{JC}$     | Package Thermal Resistance (Junction-to-Case)  | 21                     | °C/W |

**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.** Due to the limited drive capability, use for inputs of same package only.

**DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

| Symbol   | Parameter                 | $T_A = -40^\circ C$ |      |       | $T_A = +25^\circ C$ |      |       | $T_A = +85^\circ C$ |      |       | Unit | Condition         |                   |
|----------|---------------------------|---------------------|------|-------|---------------------|------|-------|---------------------|------|-------|------|-------------------|-------------------|
|          |                           | Min.                | Typ. | Max.  | Min.                | Typ. | Max.  | Min.                | Typ. | Max.  |      |                   |                   |
| $V_{CC}$ | Power Supply Voltage      |                     |      |       |                     |      |       |                     |      |       | V    |                   |                   |
|          | (PECL)                    | 4.5                 | 5.0  | 5.5   | 4.5                 | 5.0  | 5.5   | 4.5                 | 5.0  | 5.5   |      |                   |                   |
|          | (LVPECL)                  | 2.37                | 3.3  | 3.8   | 2.37                | 3.3  | 3.8   | 2.37                | 3.3  | 3.8   |      |                   |                   |
|          | (ECL)                     | -4.5                | -5.0 | -5.5  | -4.5                | -5.0 | -5.5  | -4.5                | -5.0 | -5.5  |      |                   |                   |
|          | (LVECL)                   | -3.8                | -3.3 | -2.37 | -3.8                | -3.3 | -2.37 | -3.8                | -3.3 | -2.37 |      |                   |                   |
| $I_{CC}$ | Power Supply Current      | —                   | —    | 75    | —                   | 68   | 78    | —                   | —    | 82    | mA   |                   |                   |
| $I_{IH}$ | Input HIGH Current        | —                   | —    | 150   | —                   | —    | 150   | —                   | —    | 150   | µA   | $V_{IN} = V_{IH}$ |                   |
| $I_{IL}$ | Input LOW Current         | D                   | 0.5  | —     | —                   | 0.5  | —     | —                   | 0.5  | —     | —    | µA                | $V_{IN} = V_{IL}$ |
|          |                           | /D                  | -150 | —     | —                   | -150 | —     | —                   | -150 | —     | —    | µA                | $V_{IN} = V_{IL}$ |
| $C_{IN}$ | Input Capacitance (TSSOP) | —                   | —    | —     | —                   | 0.75 | —     | —                   | —    | —     | pF   |                   |                   |

**Note 1.** 100KEP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.

**(100KEP) LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = 2.5V \pm 5\%$ ,  $V_{EE} = 0V$

| Symbol      | Parameter  | $T_A = -40^\circ C$ |      |          | $T_A = +25^\circ C$ |      |          | $T_A = +85^\circ C$ |      |          | Unit | Condition                 |
|-------------|--|---------------------|------|----------|---------------------|------|----------|---------------------|------|----------|------|---------------------------|
|             |  | Min.                | Typ. | Max.     | Min.                | Typ. | Max.     | Min.                | Typ. | Max.     |      |                           |
| $V_{IL}$    | Input LOW Voltage <sup>(2)</sup><br>(Single-ended)     | 555                 | —    | 875      | 555                 | —    | 875      | 555                 | —    | 875      | mV   |                           |
| $V_{IH}$    | Input HIGH Voltage <sup>(2)</sup><br>(Single-ended)    | 1335                | —    | 1620     | 1335                | —    | 1620     | 1335                | —    | 1620     | mV   |                           |
| $V_{OL}$    | Output LOW Voltage                                     | 555                 | 680  | 805      | 555                 | 680  | 805      | 555                 | 680  | 805      | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{OH}$    | Output HIGH Voltage                                    | 1355                | 1480 | 1605     | 1355                | 1480 | 1605     | 1355                | 1480 | 1605     | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{IHCMR}$ | Input HIGH Voltage<br>Common Mode Range <sup>(3)</sup> | 1.2                 | —    | $V_{CC}$ | 1.2                 | —    | $V_{CC}$ | 1.2                 | —    | $V_{CC}$ | V    |                           |

**Note 1.** 100KEP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained. Input and output varies 1:1 with  $V_{CC}$ .

**Note 2.**  $V_{BB}$  reference is not functional for  $V_{CC} < 3.0V$ . External  $V_{BB}$  equivalent is required.

**Note 3.**  $V_{IHCMR}$  (min) varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  (Max) varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(100KEP) LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{EE} = 0V$

| Symbol      | Parameter  | $T_A = -40^\circ C$ |      |          | $T_A = +25^\circ C$ |      |          | $T_A = +85^\circ C$ |      |          | Unit | Condition                 |
|-------------|--|---------------------|------|----------|---------------------|------|----------|---------------------|------|----------|------|---------------------------|
|             |  | Min.                | Typ. | Max.     | Min.                | Typ. | Max.     | Min.                | Typ. | Max.     |      |                           |
| $V_{IL}$    | Input LOW Voltage<br>(Single-Ended)                    | 1355                | —    | 1675     | 1355                | —    | 1675     | 1355                | —    | 1675     | mV   |                           |
| $V_{IH}$    | Input HIGH Voltage<br>(Single-Ended)                   | 2075                | —    | 2420     | 2075                | —    | 2420     | 2075                | —    | 2420     | mV   |                           |
| $V_{OL}$    | Output LOW Voltage                                     | 1355                | 1480 | 1605     | 1355                | 1480 | 1605     | 1355                | 1480 | 1605     | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{OH}$    | Output HIGH Voltage                                    | 2155                | 2280 | 2405     | 2155                | 2280 | 2405     | 2155                | 2280 | 2405     | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{BB}$    | Reference Voltage <sup>(2)</sup>                       | 1775                | 1875 | 1975     | 1775                | 1875 | 1975     | 1775                | 1875 | 1975     | mV   | $V_{CC} = 3.3V$           |
| $V_{IHCMR}$ | Input HIGH Voltage<br>Common Mode Range <sup>(3)</sup> | 1.2                 | —    | $V_{CC}$ | 1.2                 | —    | $V_{CC}$ | 1.2                 | —    | $V_{CC}$ | V    |                           |

**Note 1.** 100KEP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained. Input and output varies 1:1 with  $V_{CC}$ .

**Note 2.** Single-ended input operation is limited  $V_{CC} \geq 3.0V$  in LVPECL mode.  $V_{BB}$  reference varies 1:1 with  $V_{CC}$ .

**Note 3.**  $V_{IHCMR}$  (min) varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  (Max) varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(100KEP) PECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 5.0V \pm 10\%$ ,  $V_{EE} = 0V$ 

| Symbol      | Parameter   | $T_A = -40^\circ\text{C}$ |      |          | $T_A = +25^\circ\text{C}$ |      |          | $T_A = +85^\circ\text{C}$ |      |          | Unit | Condition                 |
|-------------|---|---------------------------|------|----------|---------------------------|------|----------|---------------------------|------|----------|------|---------------------------|
|             |   | Min.                      | Typ. | Max.     | Min.                      | Typ. | Max.     | Min.                      | Typ. | Max.     |      |                           |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                    | 3055                      | —    | 3375     | 3055                      | —    | 3375     | 3055                      | —    | 3375     | mV   |                           |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                   | 3775                      | —    | 4120     | 3775                      | —    | 4120     | 3775                      | —    | 4120     | mV   |                           |
| $V_{OL}$    | Output LOW Voltage                                  | 3055                      | 3180 | 3305     | 3055                      | 3180 | 3305     | 3055                      | 3180 | 3305     | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{OH}$    | Output HIGH Voltage                                 | 3855                      | 3980 | 4105     | 3855                      | 3980 | 4105     | 3855                      | 3980 | 4105     | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{BB}$    | Output Voltage Reference <sup>(2)</sup>             | 3475                      | 3575 | 3675     | 3475                      | 3575 | 3675     | 3475                      | 3575 | 3675     | mV   | $V_{CC} = +5.0V$          |
| $V_{IHCMR}$ | Input HIGH Voltage <sup>(3)</sup> Common Mode Range | 2.0                       | —    | $V_{CC}$ | 2.0                       | —    | $V_{CC}$ | 2.0                       | —    | $V_{CC}$ | V    |                           |

**Note 1.** 100KEP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained. Input and output parameters are at  $V_{CC} = 5.0V$ . They vary 1:1 with  $V_{CC}$ .

**Note 2.**  $V_{BB}$  reference varies 1:1 with  $V_{CC}$ .

**Note 3.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Single-ended input CLK pin operation is limited to  $V_{CC} \geq 3.0V$  in PECL mode.

**(100KEP) LVECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{EE} = -2.37V$  to  $-3.8V$ ;  $V_{CC} = 0V$ 

| Symbol      | Parameter   | $T_A = -40^\circ\text{C}$ |       |       | $T_A = +25^\circ\text{C}$ |       |       | $T_A = +85^\circ\text{C}$ |       |       | Unit | Condition                 |
|-------------|---|---------------------------|-------|-------|---------------------------|-------|-------|---------------------------|-------|-------|------|---------------------------|
|             |   | Min.                      | Typ.  | Max.  | Min.                      | Typ.  | Max.  | Min.                      | Typ.  | Max.  |      |                           |
| $V_{IL}$    | Input LOW Voltage (Single-ended)                    | -1945                     | —     | -1625 | -1945                     | —     | -1625 | -1945                     | —     | -1625 | mV   |                           |
| $V_{IH}$    | Input HIGH Voltage (Single-ended)                   | -1165                     | —     | -880  | -1165                     | —     | -880  | -1165                     | —     | -880  | mV   |                           |
| $V_{OL}$    | Output LOW Voltage                                  | -1945                     | -1820 | -1695 | -1945                     | -1820 | -1695 | -1945                     | -1820 | -1695 | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{OH}$    | Output HIGH Voltage                                 | -1145                     | -1020 | -0895 | -1145                     | -1020 | -0895 | -1145                     | -1020 | -0895 | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{BB}$    | Output Reference Voltage <sup>(2)</sup>             | -1525                     | -1425 | -1325 | -1525                     | -1425 | -1325 | -1525                     | -1425 | -1325 | mV   |                           |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range <sup>(3)</sup> | $V_{EE} + 1.2$            |       | 0.0   | $V_{EE} + 1.2$            |       | 0.0   | $V_{EE} + 1.2$            |       | 0.0   | V    |                           |

**Note 1.** 100KEP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained. Input and output parameters vary 1:1 with  $V_{CC}$ .

**Note 2.** Single-ended input operation is limited  $V_{EE} \leq -3.0V$  in ECL/LVECL mode.  $V_{BB}$  reference varies 1:1 with  $V_{CC}$ .

**Note 3.**  $V_{IHCMR}$  (min) varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  (max) varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(100K) ECL/LVECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 0V$ ,  $V_{EE} = -5.5V$  to  $-3.0V$ 

| Symbol      | Parameter   | $T_A = -40^\circ C$ |       |       | $T_A = +25^\circ C$ |       |       | $T_A = +85^\circ C$ |       |       | Unit | Condition                 |
|-------------|---|---------------------|-------|-------|---------------------|-------|-------|---------------------|-------|-------|------|---------------------------|
|             |   | Min.                | Typ.  | Max.  | Min.                | Typ.  | Max.  | Min.                | Typ.  | Max.  |      |                           |
| $V_{IL}$    | Input LOW Voltage                                   | -1945               | —     | -1625 | -1945               | —     | -1625 | -1945               | —     | -1625 | mV   |                           |
| $V_{IH}$    | Input HIGH Voltage                                  | -1225               | —     | -880  | -1225               | —     | -880  | -1225               | —     | -880  | mV   |                           |
| $V_{OL}$    | Output LOW Voltage <sup>(2)</sup>                   | -1945               | -1820 | -1695 | -1945               | -1820 | -1695 | -1945               | -1820 | -1695 | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{OH}$    | Output HIGH Voltage <sup>(2)</sup>                  | -1145               | -1020 | -895  | -1145               | -1020 | -895  | -1145               | -1020 | -895  | mV   | $50\Omega$ to $V_{CC}-2V$ |
| $V_{BB}$    | Output Reference Voltage <sup>(3)</sup>             | -1525               | -1425 | -1325 | -1525               | -1425 | -1325 | -1525               | -1425 | -1325 | mV   |                           |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range <sup>(4)</sup> | $V_{EE} + 1.2$      |       | 0.0   | $V_{EE} + 1.2$      |       | 0.0   | $V_{EE} + 1.2$      |       | 0.0   | V    |                           |

**Note 1.** 10EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained. Input and output parameters vary 1:1 with  $V_{CC}$ .

**Note 2.** All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .

**Note 3.** Single-ended input operation is limited  $V_{EE} \leq -3.0V$  in ECL/LVECL mode.  $V_{BB}$  reference varies 1:1 with  $V_{CC}$ .

**Note 4.**  $V_{IHCMR}$  (min) varies 1:1 with  $V_{EE}$ , (max) varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  is referenced to the most positive side of the differential input signal.

**HSTL INPUT DC ELECTRICAL CHARACTERISTICS** $V_{CC} = 2.37V$  to  $3.8V$ ;  $V_{EE} = 0V$ 

| Symbol   | Parameter               | $T_A = -40^\circ C$ |      |      | $T_A = +25^\circ C$ |      |      | $T_A = +85^\circ C$ |      |      | Unit |
|----------|-------------------------|---------------------|------|------|---------------------|------|------|---------------------|------|------|------|
|          |                         | Min.                | Typ. | Max. | Min.                | Typ. | Max. | Min.                | Typ. | Max. |      |
| $V_{IH}$ | Input HIGH Voltage      | 1200                | —    | —    | 1200                | —    | —    | 1200                | —    | —    | mV   |
| $V_{IL}$ | Input LOW Voltage       | —                   | —    | 400  | —                   | —    | 400  | —                   | —    | 400  | mV   |
| $V_X$    | Input Crossover Voltage | 680                 | —    | 900  | 680                 | —    | 900  | 680                 | —    | 900  | mV   |

**AC ELECTRICAL CHARACTERISTICS**

LVPECL:  $V_{CC} = 2.37V$  to  $2.625V$ ,  $V_{EE} = 0V$ ; PECL:  $V_{CC} = 4.50V$  to  $5.50V$ ,  $V_{EE} = 0V$ ;  
 ECL:  $V_{EE} = -4.50V$  to  $-5.5V$ ,  $V_{CC} = 0V$ ; LVECL:  $V_{EE} = -2.37V$  to  $-3.8V$ ,  $V_{CC} = 0V$

| Symbol                 | Parameter   | $T_A = -40^\circ C$ |      |      | $T_A = +25^\circ C$ |      |      | $T_A = +85^\circ C$ |      |      | Unit |
|------------------------|---|---------------------|------|------|---------------------|------|------|---------------------|------|------|------|
|                        |   | Min.                | Typ. | Max. | Min.                | Typ. | Max. | Min.                | Typ. | Max. |      |
| $f_{MAX}$              | Maximum Frequency <sup>(1)</sup>  | 2                   | —    | —    | 2                   | —    | —    | 2                   | —    | —    | GHz  |
| $t_{PLH}$<br>$t_{PHL}$ | PECL/ECL ( $V_{CC} = 5V$ )<br>Propagation Delay to Output<br>IN (Differential)                  | 250                 | 330  | 400  | 250                 | 330  | 450  | 250                 | 330  | 600  | ps   |
|                        | IN (Single-Ended)   | —                   | —    | —    | —                   | 355  | —    | —                   | —    | —    | ps   |
|                        | LVPECL/LVECL ( $V_{CC} = 2.37V$ to $3.8V$ )<br>Propagation Delay to Output<br>IN (Differential) | 275                 | 350  | 425  | 275                 | 350  | 475  | 275                 | 350  | 525  | ps   |
|                        | IN (Single-Ended)   | —                   | —    | —    | —                   | 375  | —    | —                   | —    | —    | ps   |
| $t_{SKEW}^{(2)}$       | PECL/ECL ( $V_{CC} = 5V$ )<br>Within-Device Skew (Diff.)  | —                   | 25   | 35   | —                   | 30   | 45   | —                   | 40   | 50   | ps   |
|                        | Part-to-Part Skew (Diff.)   | —                   | 100  | 125  | —                   | 150  | 175  | —                   | 175  | 200  | ps   |
|                        | LVPECL/LVECL ( $V_{CC} = 2.37V$ to $3.8V$ )<br>Within-Device Skew (Diff.)                       | —                   | 10   | 25   | —                   | 15   | 25   | —                   | 15   | 25   | ps   |
|                        | Part-to-Part Skew (Diff.)   | —                   | 100  | 125  | —                   | 150  | 175  | —                   | 200  | 225  | ps   |
| $t_S$                  | Set-Up Time <sup>(3)</sup> /EN to CLK   | 100                 | 50   | —    | 100                 | 50   | —    | 100                 | 50   | —    | ps   |
| $t_H$                  | Hold Time <sup>(3)</sup> /EN to CLK   | 200                 | 140  | —    | 200                 | 140  | —    | 200                 | 140  | —    | ps   |
| $V_{PP}$               | Minimum Input Swing   | 150                 | 800  | 1200 | 150                 | 800  | 1200 | 150                 | 800  | 1200 | mV   |
| $t_r, t_f$             | PECL/ECL Output Rise/Fall Times<br>(20% to 80%)   | 100                 | 180  | 240  | 105                 | 180  | 270  | 110                 | 225  | 300  | ps   |
|                        | LVPECL/LVECL ( $V_{CC} = 2.37V$ to $3.8V$ )   | 90                  | 130  | 225  | 95                  | 130  | 250  | 100                 | 150  | 275  | ps   |

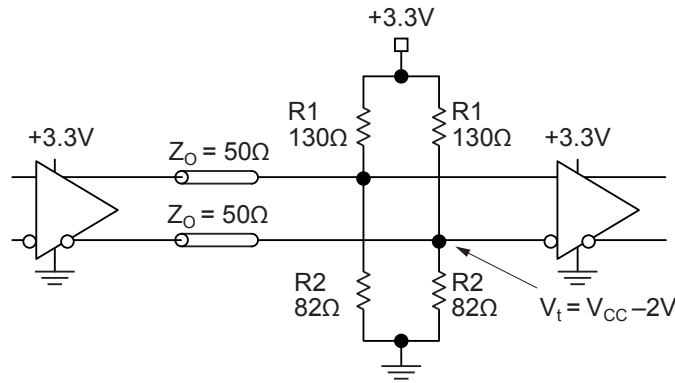
**Note 1.**  $f_{MAX}$  is defined as the maximum toggle frequency. Measured with 750mV input signal, 50% duty cycle, all loading with 50W to  $V_{CC}-2V$ .

**Note 2.** Skew is measured between outputs under identical transitions.

**Note 3.** Set-up and hold times apply to synchronous applications that intend to enable/disable before then ext clock cycle. For asynchronous applications, set-up and hold time does not apply.



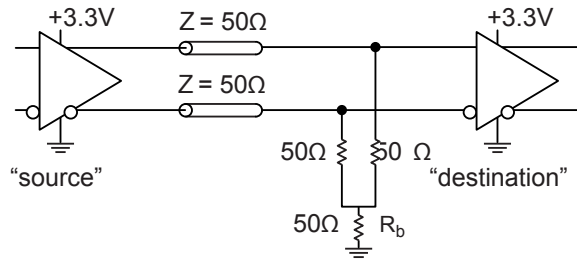
**TERMINATION RECOMMENDATIONS**



**Figure 1. Parallel Termination–Thevenin Equivalent**

**Note 1.** For +2.5V systems: R1 = 250Ω, R2 = 62.5Ω

**Note 2.** For +5.0V systems: R1 = 82Ω, R2 = 130Ω

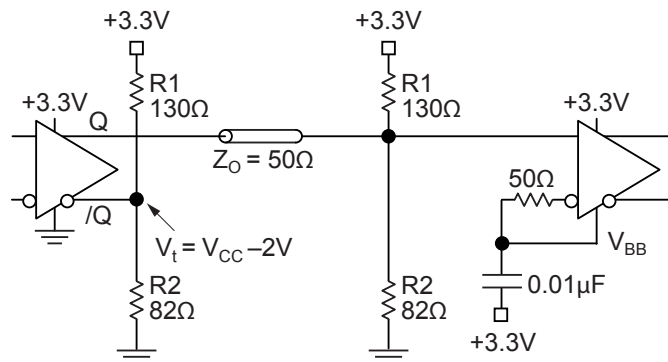


**Figure 2. Three-Resistor “Y-Termination”**

**Note 1.** Power-saving alternative to Thevenin termination.

**Note 2.** Place termination resistors as close to destination inputs as possible.

**Note 3.** R<sub>b</sub> resistor sets the DC bias voltage, equal to V<sub>t</sub>. For +3.3V systems R<sub>b</sub> = 46Ω to 50Ω. For +5V systems, R<sub>b</sub> = 110Ω.



**Figure 3. Terminating Unused I/O**

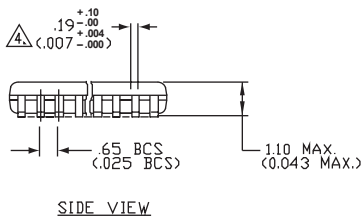
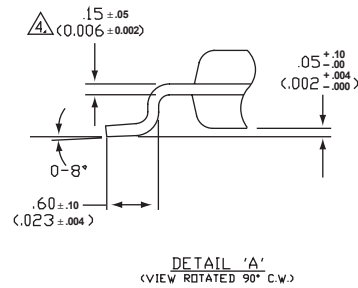
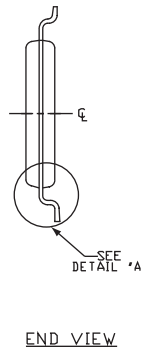
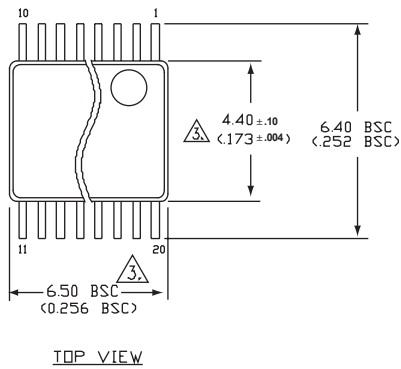
**Note 1.** Unused output (/Q) must be terminated to balance the output.

**Note 2.** Micrel's differential I/O logic devices include a V<sub>BB</sub> reference pin .

**Note 3.** Connect unused input through 50Ω to V<sub>BB</sub>. Bypass with a 0.01μF capacitor to V<sub>CC</sub>, not GND.

**Note 4.** For +2.5V systems: R1 = 250Ω, R2 = 62.5Ω.

**20-PIN TSSOP (K4-20-1)**



- NOTES:
1. DIMENSIONS ARE IN MM [INCHES].
  2. CONTROLLING DIMENSION: MM
  3. DIMENSION DOES NOT INCLUDE MOLD FLASH OF 0.254 [0.010] MAX.
  4. THIS DIMENSION INCLUDES LEAD FINISH.

Rev.01

**Package Notes:**

**Note 1.** Package meets Level 1 moisture sensitivity.

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