



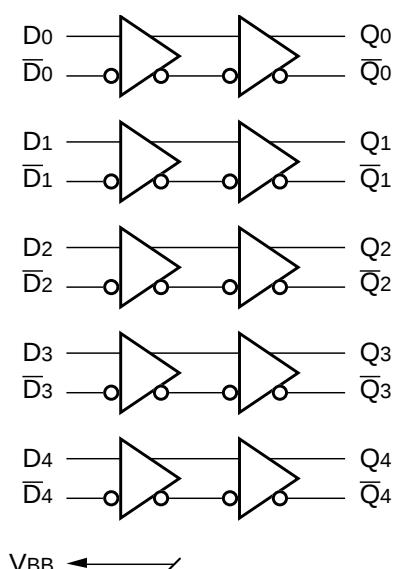
# QUINT LVPECL-TO-PECL OR PECL-TO-LVPECL TRANSLATOR

SY100E417

## FEATURES

- 3.3V and 5V power supplies required
- Also, supports LVPECL-to-PECL translation
- 500ps propagation delays
- Fully differential design
- Differential line receiver capability
- Available in 28-pin PLCC package

## BLOCK DIAGRAM



## DESCRIPTION

The SY100E417 is a quint LVPECL-to-PECL translator. It can also be used as a quint PECL-to-LVPECL translator. The device receives standard PECL signals and translates them to differential LVPECL output signals (or vice versa).

The SY100E417 can also be used as a differential line receiver for PECL-to-PECL or LVPECL-to-LVPECL signals. However, please note that for the latter we will need two different power supplies. Please refer to Function Table for more details.

A VBB output is provided for interfacing single ended input signals. If a single ended input is to be used, the VBB output should be connected to the  $\bar{D}_n$  input and the active signal will drive the  $D_n$  input. When used, the VBB should be bypassed to Vcc via a 0.01 $\mu$ F capacitor. The VBB is designed to act as a switching reference for the SY100E417 under single ended input conditions. As a result, the pin can only source/sink 0.5mA of current.

To accomplish the PECL-to-LVPECL level translation, the SY100E417 requires three power rails. The Vcc and Vcc\_VBB supply is to be connected to the standard PECL supply, the 3.3V supply is to be connected to the Vcco supply, and GND is connected to the system ground plane. Both the Vcc and Vcco should be bypassed to ground with a 0.01 $\mu$ F capacitor.

To accomplish the LVPECL-to-PECL level translation, the SY100E417 requires three power rails as well. The 5.0V supply is connected to the Vcc and Vcco pins, 3.3V supply is connected to the Vcc\_VBB pin and GND is connected to the system ground plane. Vcc\_VBB is used to provide a proper VBB output level if a single ended input is used. Vcc\_VBB = 3.3V is only required for single-ended LVPECL input. For differential LVPECL input, Vcc\_VBB can be either 3.3V or 5.0V.

Under open input conditions, the  $D_n$  input will be biased at a Vcc/2 voltage level and the  $\bar{D}_n$  input will be pulled to GND. This condition will force the "Qn" output low, ensuring stability.

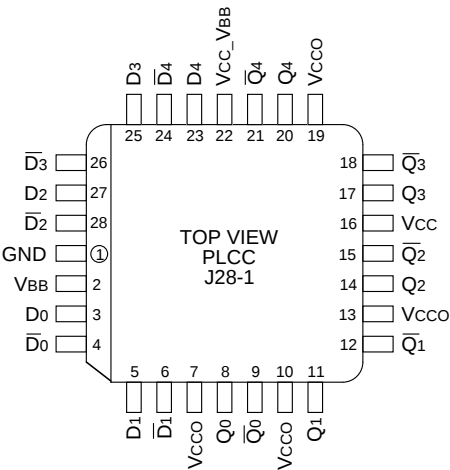
## PIN NAMES

| Pin     | Function                   |
|---------|----------------------------|
| $D_n$   | PECL / LVPECL Inputs       |
| $Q_n$   | PECL / LVPECL Outputs      |
| VBB     | Reference Voltage Output   |
| Vcco    | Vcc for Outputs            |
| Vcc_VBB | Vcc for VBB Output         |
| GND     | Common Ground Rail         |
| Vcc     | Vcc for Internal Circuitry |

## FUNCTION TABLE

| Function         | Vcc  | Vcco | Vcc_VBB |
|------------------|------|------|---------|
| PECL-to-LVPECL   | 5.0V | 3.3V | 5.0V    |
| LVPECL-to-PECL   | 5.0V | 5.0V | 3.3V    |
| PECL-to-PECL     | 5.0V | 5.0V | 5.0V    |
| LVPECL-to-LVPECL | 5.0V | 3.3V | 3.3V    |

PACKAGE/ORDERING INFORMATION



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

| Part Number                     | Package Type | Operating Range | Package Marking                             | Lead Finish |
|---------------------------------|--------------|-----------------|---------------------------------------------|-------------|
| SY100E417JI                     | J28-1        | Industrial      | SY100E417JI                                 | Sn-Pb       |
| SY100E417JITR <sup>(2)</sup>    | J28-1        | Industrial      | SY100E417JI                                 | Sn-Pb       |
| SY100E417JC                     | J28-1        | Commercial      | SY100E417JC                                 | Sn-Pb       |
| SY100E417JCTR <sup>(2)</sup>    | J28-1        | Commercial      | SY100E417JC                                 | Sn-Pb       |
| SY100E417JY <sup>(3)</sup>      | J28-1        | Industrial      | SY100E417JY with Pb-Free bar-line indicator | Matte-Sn    |
| SY100E417JYTR <sup>(2, 3)</sup> | J28-1        | Industrial      | SY100E417JY with Pb-Free bar-line indicator | Matte-Sn    |

- 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.

## PECL INPUT DC ELECTRICAL CHARACTERISTICS

VCC\_VBB = VCC = +4.5V to +5.5V

| Symbol | Parameter                         | TA = -40°C  |        |        | TA = 0°C    |        |        | TA = +25°C  |        |        | TA = +85°C  |        |        | Unit |
|--------|-----------------------------------|-------------|--------|--------|-------------|--------|--------|-------------|--------|--------|-------------|--------|--------|------|
|        |                                   | Min.        | Typ.   | Max.   | Min.        | Typ.   | Max.   | Min.        | Typ.   | Max.   | Min.        | Typ.   | Max.   |      |
| VCC    | Power Supply Voltage              | 4.5         | —      | 5.5    | 4.5         | —      | 5.5    | 4.5         | —      | 5.5    | 4.5         | —      | 5.5    | V    |
| VIH    | Input HIGH Voltage <sup>(1)</sup> | 3.835       | —      | 4.120  | 3.835       | —      | 4.120  | 3.835       | —      | 4.120  | 3.835       | —      | 4.120  | V    |
| VIL    | Input LOW Voltage <sup>(1)</sup>  | 3.190       | —      | 3.515  | 3.190       | —      | 3.525  | 3.190       | —      | 3.525  | 3.190       | —      | 3.525  | V    |
| VPP    | Minimum Peak-to-Peak Input        | 150         | —      | —      | 150         | —      | —      | 150         | —      | —      | 150         | —      | —      | mV   |
| IIH    | Input HIGH Current                | —           | —      | 150    | —           | —      | 150    | —           | —      | 150    | —           | —      | 150    | μA   |
| IIL    | Input LOW Current $\frac{Dn}{Dn}$ | 0.5<br>-600 | —<br>— | —<br>— | 0.5<br>-600 | —<br>— | —<br>— | 0.5<br>-600 | —<br>— | —<br>— | 0.5<br>-600 | —<br>— | —<br>— | μA   |
| VBB    | Output Reference <sup>(1)</sup>   | 3.620       | —      | 3.740  | 3.620       | —      | 3.740  | 3.620       | —      | 3.740  | 3.620       | —      | 3.740  | V    |
| ICC    | Power Supply Current              | —           | —      | 20     | —           | —      | 20     | —           | 14     | 20     | —           | —      | 20     | mA   |

### Note:

1. These levels are for VCC\_VBB = 5.0V. Level specifications will vary 1:1 with VCC\_VBB.

## LVPECL OUTPUT DC ELECTRICAL CHARACTERISTICS

VCC = +4.5V to +5.5V; VCCO = +3.0V to 3.8V

| Symbol | Parameter                          | TA = -40°C |      |       | TA = 0°C |      |       | TA = +25°C |       |       | TA = +85°C |      |       | Unit |
|--------|------------------------------------|------------|------|-------|----------|------|-------|------------|-------|-------|------------|------|-------|------|
|        |                                    | Min.       | Typ. | Max.  | Min.     | Typ. | Max.  | Min.       | Typ.  | Max.  | Min.       | Typ. | Max.  |      |
| VCCO   | Power Supply Voltage               | 3.0        | —    | 3.8   | 3.0      | —    | 3.8   | 3.0        | 3.3   | 3.8   | 3.0        | —    | 3.8   | V    |
| VOH    | Output HIGH Voltage <sup>(1)</sup> | 2.215      | —    | 2.420 | 2.275    | —    | 2.420 | 2.275      | 2.350 | 2.420 | 2.275      | —    | 2.420 | V    |
| VOL    | Output LOW Voltage <sup>(1)</sup>  | 1.470      | —    | 1.745 | 1.490    | —    | 1.680 | 1.490      | 1.600 | 1.680 | 1.490      | —    | 1.680 | V    |
| ICCO   | Power Supply Current               | —          | —    | 35    | —        | —    | 35    | —          | 23    | 35    | —          | —    | 37    | mA   |

### Note:

1. These levels are for VCCO = 3.3V. Level specifications will vary 1:1 with VCCO.

## LVPECL INPUT DC ELECTRICAL CHARACTERISTICS

VCC\_VBB = +3.0V to +3.8V<sup>(1)</sup>; VCC = +4.5V to +5.5V

| Symbol | Parameter                         | TA = -40°C  |        |        | TA = 0°C    |        |        | TA = +25°C  |        |        | TA = +85°C  |        |        | Unit |
|--------|-----------------------------------|-------------|--------|--------|-------------|--------|--------|-------------|--------|--------|-------------|--------|--------|------|
|        |                                   | Min.        | Typ.   | Max.   | Min.        | Typ.   | Max.   | Min.        | Typ.   | Max.   | Min.        | Typ.   | Max.   |      |
| VCC    | Power Supply Voltage              | 4.5         | —      | 5.5    | 4.5         | —      | 5.5    | 4.5         | —      | 5.5    | 4.5         | —      | 5.5    | V    |
| VIH    | Input HIGH Voltage <sup>(2)</sup> | 2.135       | —      | 2.420  | 2.135       | —      | 2.420  | 2.135       | —      | 2.420  | 2.135       | —      | 2.420  | V    |
| VIL    | Input LOW Voltage <sup>(2)</sup>  | 1.490       | —      | 1.825  | 1.490       | —      | 1.825  | 1.490       | —      | 1.825  | 1.490       | —      | 1.825  | V    |
| VPP    | Minimum Peak-to-Peak Input        | 150         | —      | —      | 150         | —      | —      | 150         | —      | —      | 150         | —      | —      | mV   |
| IIH    | Input HIGH Current                | —           | —      | 150    | —           | —      | 150    | —           | —      | 150    | —           | —      | 150    | μA   |
| IIL    | Input LOW Current $\frac{Dn}{Dn}$ | 0.5<br>-600 | —<br>— | —<br>— | 0.5<br>-600 | —<br>— | —<br>— | 0.5<br>-600 | —<br>— | —<br>— | 0.5<br>-600 | —<br>— | —<br>— | μA   |
| VBB    | Output Reference <sup>(2)</sup>   | 1.92        | —      | 2.04   | 1.92        | —      | 2.04   | 1.92        | —      | 2.04   | 1.92        | —      | 2.04   | V    |
| ICC    | Power Supply Current              | —           | —      | 20     | —           | —      | 20     | —           | 14     | 20     | —           | —      | 20     | mA   |

### Notes:

- VCC\_VBB = 3.3V is only required for single-ended LVPECL input. For differential LVPECL input, VCC\_VBB can be either 3.3V or 5V.
- These levels are for VCC\_VBB = 3.3V. Level specifications will vary 1:1 with VCC\_VBB.

## PECL OUTPUT DC ELECTRICAL CHARACTERISTICS

VCC = VCCO = +4.5V to +5.5V

| Symbol | Parameter                          | TA = -40°C |      |       | TA = 0°C |      |       | TA = +25°C |      |       | TA = +85°C |      |       | Unit |
|--------|------------------------------------|------------|------|-------|----------|------|-------|------------|------|-------|------------|------|-------|------|
|        |                                    | Min.       | Typ. | Max.  | Min.     | Typ. | Max.  | Min.       | Typ. | Max.  | Min.       | Typ. | Max.  |      |
| VCCO   | Power Supply Voltage               | 4.5        | —    | 5.5   | 4.5      | —    | 5.5   | 4.5        | —    | 5.5   | 4.5        | —    | 5.5   | V    |
| VOH    | Output HIGH Voltage <sup>(1)</sup> | 3.915      | —    | 4.120 | 3.975    | —    | 4.120 | 3.975      | —    | 4.120 | 3.975      | —    | 4.120 | V    |
| VOL    | Output LOW Voltage <sup>(1)</sup>  | 3.170      | —    | 3.445 | 3.190    | —    | 3.380 | 3.190      | —    | 3.380 | 3.190      | —    | 3.380 | V    |
| ICCO   | Power Supply Current               | —          | —    | 35    | —        | —    | 35    | —          | 23   | 35    | —          | —    | 37    | mA   |

### Notes:

1. These levels are for VCCO = 5.0V. Level specifications will vary 1:1 with VCCO.

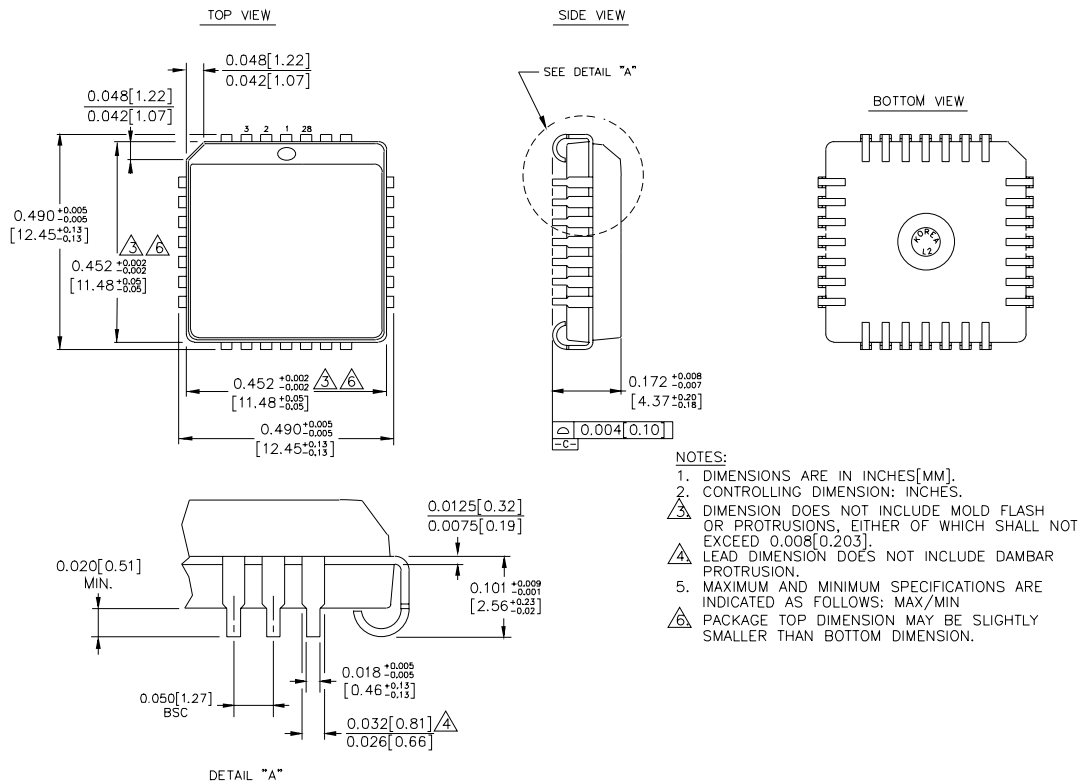
## AC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>

| Symbol   | Parameter                                 | TA = -40°C |            |            | TA = 0°C   |            |            | TA = +25°C |            |            | TA = +85°C |            |            | Unit |
|----------|-------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|
|          |                                           | Min.       | Typ.       | Max.       | Min.       | Typ.       | Max.       | Min.       | Typ.       | Max.       | Min.       | Typ.       | Max.       |      |
| tPD      | Propagation Delay<br>D to Q<br>Diff. S.E. | 410<br>380 | 510<br>530 | 610<br>680 | 410<br>380 | 510<br>530 | 610<br>680 | 410<br>380 | 510<br>530 | 610<br>680 | 410<br>380 | 510<br>530 | 610<br>680 | ps   |
| tskew    | Within-Device Skew                        | —          | —          | —          | —          | —          | —          | —          | —          | —          | —          | —          | —          | ps   |
|          | Output-to-Output <sup>(2)</sup>           | —          | 20         | 100        | —          | 20         | 100        | —          | 20         | 100        | —          | 20         | 100        |      |
|          | Part-to-Part (Diff.) <sup>(2)</sup>       | —          | 20         | 200        | —          | 20         | 200        | —          | 20         | 200        | —          | 20         | 200        |      |
|          | Duty Cycle (Diff.) <sup>(3)</sup>         | —          | 25         | —          | —          | 25         | —          | —          | 25         | —          | —          | 25         | —          |      |
| VPP      | Minimum Input Swing <sup>(4)</sup>        | 150        | —          | —          | 150        | —          | —          | 150        | —          | —          | 150        | —          | —          | mV   |
| VCMR     | Common Mode Range <sup>(5)</sup>          | —          | —          | —          | —          | —          | —          | —          | —          | —          | —          | —          | —          | V    |
|          | VPP < 500mV                               | 1.3        | —          | VCC-0.2    | 1.2        | —          | VCC-0.2    | 1.2        | —          | VCC-0.2    | 1.2        | —          | VCC-0.2    |      |
|          | VPP ≥ 500mV                               | 1.5        | —          | VCC-0.2    | 1.4        | —          | VCC-0.2    | 1.4        | —          | VCC-0.2    | 1.4        | —          | VCC-0.2    |      |
| tr<br>tf | Output Rise/Fall Times Q<br>(20% to 80%)  | 320        | —          | 580        | 320        | —          | 580        | 320        | —          | 580        | 320        | —          | 580        | ps   |

### Notes:

1. Power supply requirements applies as indicated in the DC electrical characteristics tables.
2. Skew is measured between outputs under identical transitions.
3. Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device Common Mode Range.
4. Minimum input swing for which AC parameters are guaranteed. The device has a DC gain of ~40.
5. 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 VPP min. and 1V.

## 28-PIN PLCC (J28-1)



Rev. 03

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