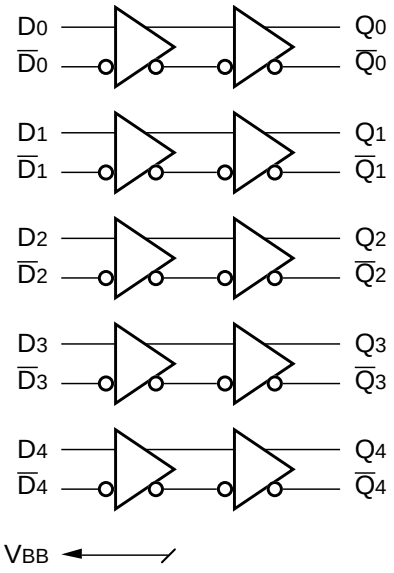
# QUINT LVPECL-TO-PECL OR PECL-TO-LVPECL TRANSLATOR

**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




## 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 |

## 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.

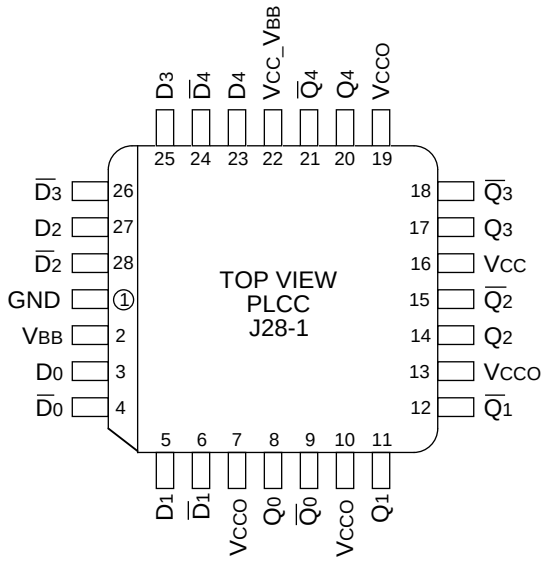
A $V_{BB}$ output is provided for interfacing single ended input signals. If a single ended input is to be used, the $V_{BB}$ output should be connected to the $\overline{D}n$ input and the active signal will drive the Dn input. When used, the $V_{BB}$ should be bypassed to $V_{CC}$ via a 0.01µF capacitor. The $V_{BB}$ 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 $V_{CC}$ and $V_{CC\_VBB}$ supply is to be connected to the standard PECL supply, the 3.3V supply is to be connected to the $V_{CCO}$ supply, and GND is connected to the system ground plane. Both the $V_{CC}$ and $V_{CCO}$ should be bypassed to ground with a 0.01µF 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 $V_{CC}$ and $V_{CCO}$ pins, 3.3V supply is connected to the $V_{CC\_VBB}$ pin and GND is connected to the system ground plane. $V_{CC\_VBB}$ is used to provide a proper $V_{BB}$ output level if a single ended input is used. $V_{CC\_VBB}$ = 3.3V is only required for single-ended LVPECL input. For differential LVPECL input, $V_{CC\_VBB}$ can be either 3.3V or 5.0V.

Under open input conditions, the Dn input will be biased at a $V_{CC}/2$ voltage level and the $\overline{D}n$ input will be pulled to GND. This condition will force the "Qn" output low, ensuring stability.

## PIN CONFIGURATION




## PIN NAMES

| Pin | Function |
|---|---|
| Dn | PECL / LVPECL Inputs |
| $Q_n$ | PECL / LVPECL Outputs |
| $V_{BB}$ | Reference Voltage Output |
| $V_{CCO}$ | $V_{CC}$ for Outputs |
| $V_{CC}\_V_{BB}$ | $V_{CC}$ for $V_{BB}$ Output |
| GND | Common Ground Rail |
| $V_{CC}$ | $V_{CC}$ for Internal Circuitry |

## PECL INPUT DC ELECTRICAL CHARACTERISTICS

$V_{CC}\_V_{BB} = V_{CC}$ = +4.5V to +5.5V

| Symbol | Parameter | $T_A$ = –40°C | | | $T_A$ = 0°C | | | $T_A$ = +25°C | | | $T_A$ = +85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| $V_{CC}$ | Power Supply Voltage | 4.5 | — | 5.5 | 4.5 | — | 5.5 | 4.5 | — | 5.5 | 4.5 | — | 5.5 | V |
| $V_{IH}$ | Input HIGH Voltage(1) | 3.835 | — | 4.120 | 3.835 | — | 4.120 | 3.835 | — | 4.120 | 3.835 | — | 4.120 | V |
| $V_{IL}$ | Input LOW Voltage(1) | 3.190 | — | 3.515 | 3.190 | — | 3.525 | 3.190 | — | 3.525 | 3.190 | — | 3.525 | V |
| $V_{PP}$ | Minimum Peak-to-Peak Input | 150 | — | — | 150 | — | — | 150 | — | — | 150 | — | — | mV |
| $I_{IH}$ | Input HIGH Current | — | — | 150 | — | — | 150 | — | — | 150 | — | — | 150 | µA |
| $I_{IL}$ | Input LOW Current Dn<br>$\overline{Dn}$ | 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 |
| $V_{BB}$ | Output Reference(1) | 3.620 | — | 3.740 | 3.620 | — | 3.740 | 3.620 | — | 3.740 | 3.620 | — | 3.740 | V |
| $I_{CC}$ | Power Supply Current | — | — | 20 | — | — | 20 | — | 14 | 20 | — | — | 20 | mA |

**NOTE:**

1. These levels are for $V_{CC}\_V_{BB}$ = 5.0V. Level specifications will vary 1:1 with $V_{CC}\_V_{BB}$.

## LVPECL OUTPUT DC ELECTRICAL CHARACTERISTICS

$V_{CC}$ = +4.5V to +5.5V; $V_{CCO}$ = +3.0V to 3.8V

| | | $T_A$ = –40°C | | | $T_A$ = 0°C | | | $T_A$ = +25°C | | | $T_A$ = +85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Parameter** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** | **Unit** |
| $V_{CCO}$ | Power Supply Voltage | 3.0 | — | 3.8 | 3.0 | — | 3.8 | 3.0 | 3.3 | 3.8 | 3.0 | — | 3.8 | V |
| $V_{OH}$ | Output HIGH Voltage(1) | 2.215 | — | 2.420 | 2.275 | — | 2.420 | 2.275 | 2.350 | 2.420 | 2.275 | — | 2.420 | V |
| $V_{OL}$ | Output LOW Voltage(1) | 1.470 | — | 1.745 | 1.490 | — | 1.680 | 1.490 | 1.600 | 1.680 | 1.490 | — | 1.680 | V |
| $I_{CCO}$ | Power Supply Current | — | — | 35 | — | — | 35 | — | 23 | 35 | — | — | 37 | mA |

**NOTE:**

1. These levels are for $V_{CCO}$ = 3.3V. Level specifications will vary 1:1 with $V_{CCO}$.

## LVPECL INPUT DC ELECTRICAL CHARACTERISTICS

$V_{CC\_VBB}$ = +3.0V to +3.8V(1); $V_{CC}$ = +4.5V to +5.5V

| | | $T_A$ = –40°C | | | $T_A$ = 0°C | | | $T_A$ = +25°C | | | $T_A$ = +85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Parameter** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** | **Unit** |
| $V_{CC}$ | Power Supply Voltage | 4.5 | — | 5.5 | 4.5 | — | 5.5 | 4.5 | — | 5.5 | 4.5 | — | 5.5 | V |
| $V_{IH}$ | Input HIGH Voltage(2) | 2.135 | — | 2.420 | 2.135 | — | 2.420 | 2.135 | — | 2.420 | 2.135 | — | 2.420 | V |
| $V_{IL}$ | Input LOW Voltage(2) | 1.490 | — | 1.825 | 1.490 | — | 1.825 | 1.490 | — | 1.825 | 1.490 | — | 1.825 | V |
| $V_{PP}$ | Minimum Peak-to-Peak Input | 150 | — | — | 150 | — | — | 150 | — | — | 150 | — | — | mV |
| $I_{IH}$ | Input HIGH Current | — | — | 150 | — | — | 150 | — | — | 150 | — | — | 150 | µA |
| $I_{IL}$ | Input LOW Current Dn<br>$\overline{Dn}$ | 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 |
| $V_{BB}$ | Output Reference(2) | 1.92 | — | 2.04 | 1.92 | — | 2.04 | 1.92 | — | 2.04 | 1.92 | — | 2.04 | V |
| $I_{CC}$ | Power Supply Current | — | — | 20 | — | — | 20 | — | 14 | 20 | — | — | 20 | mA |

**NOTES:**

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

## PECL OUTPUT DC ELECTRICAL CHARACTERISTICS

VCC = VCCO = +4.5V to +5.5V

| Symbol | Parameter | $T_A$ = –40°C | | | $T_A$ = 0°C | | | $T_A$ = +25°C | | | $T_A$ = +85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| $V_{CCO}$ | Power Supply Voltage | 4.5 | — | 5.5 | 4.5 | — | 5.5 | 4.5 | — | 5.5 | 4.5 | — | 5.5 | V |
| $V_{OH}$ | Output HIGH Voltage(1) | 3.915 | — | 4.120 | 3.975 | — | 4.120 | 3.975 | — | 4.120 | 3.975 | — | 4.120 | V |
| $V_{OL}$ | Output LOW Voltage(1) | 3.170 | — | 3.445 | 3.190 | — | 3.380 | 3.190 | — | 3.380 | 3.190 | — | 3.380 | V |
| $I_{CCO}$ | Power Supply Current | — | — | 35 | — | — | 35 | — | 23 | 35 | — | — | 37 | mA |

**NOTES:**

1. These levels are for $V_{CCO}$ = 5.0V. Level specifications will vary 1:1 with $V_{CCO}$.

## AC ELECTRICAL CHARACTERISTICS(1)

| Symbol | Parameter | $T_A$ = –40°C | | | $T_A$ = 0°C | | | $T_A$ = +25°C | | | $T_A$ = +85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay Diff.<br>D to Q 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 |
| $t_{skew}$ | Within-Device Skew<br>Output-to-Output(2)<br>Part-to-Part (Diff.)(2)<br>Duty Cycle (Diff.)(3) | <br>—<br>—<br>— | <br>20<br>20<br>25 | <br>100<br>200<br>— | <br>—<br>—<br>— | <br>20<br>20<br>25 | <br>100<br>200<br>— | <br>—<br>—<br>— | <br>20<br>20<br>25 | <br>100<br>200<br>— | <br>—<br>—<br>— | <br>20<br>20<br>25 | <br>100<br>200<br>— | ps |
| $V_{PP}$ | Minimum Input Swing(4) | 150 | — | — | 150 | — | — | 150 | — | — | 150 | — | — | mV |
| $V_{CMR}$ | Common Mode Range(5)<br>$V_{PP}$ < 500mV<br>$V_{PP}$ ≥ 500mV | <br>1.3<br>1.5 | <br>—<br>— | <br>$V_{CC}$–0.2<br>$V_{CC}$–0.2 | <br>1.2<br>1.4 | <br>—<br>— | <br>$V_{CC}$–0.2<br>$V_{CC}$–0.2 | <br>1.2<br>1.4 | <br>—<br>— | <br>$V_{CC}$–0.2<br>$V_{CC}$–0.2 | <br>1.2<br>1.4 | <br>—<br>— | <br>$V_{CC}$–0.2<br>$V_{CC}$–0.2 | V |
| $t_r$<br>$t_f$ | Output Rise/Fall Times Q<br>(20% to 80%) | 320 | — | 580 | 320 | — | 580 | 320 | — | 580 | 320 | — | 580 | ps |

**NOTES:**

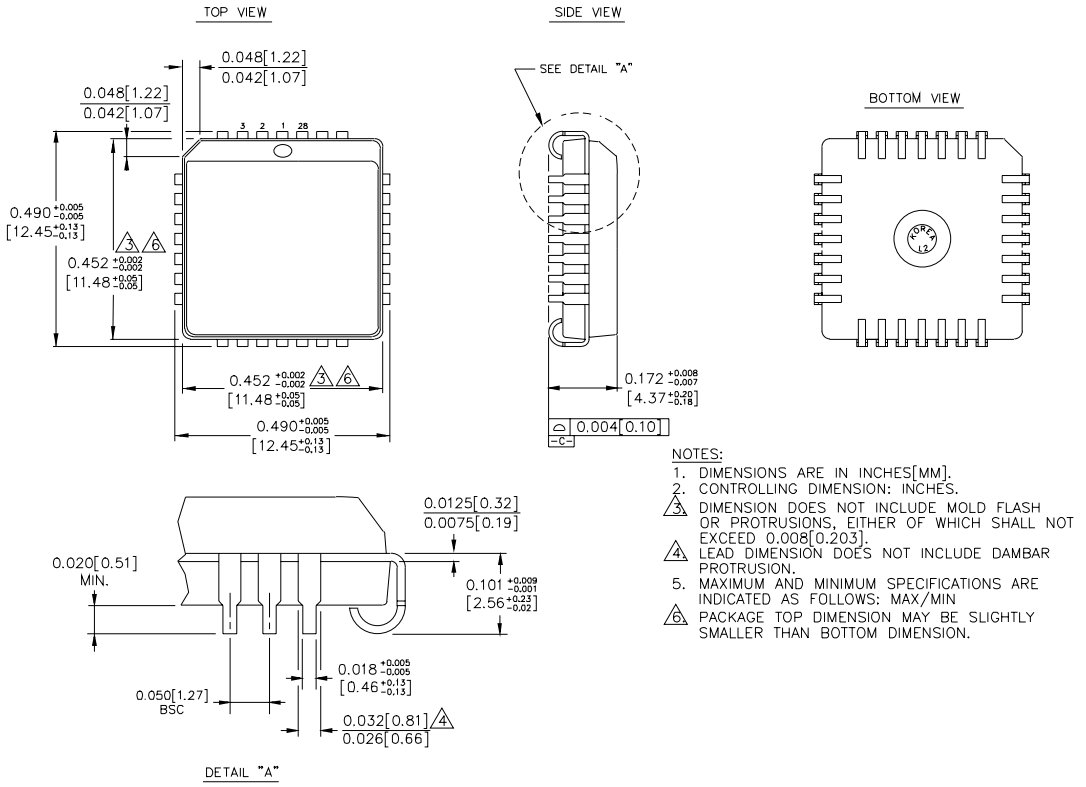
1. Power supply requirements applies as indicated in the DC electrical characteristics tables.
2. Skew is measured between outputs under identical transitions.
3. Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device Common Mode Range.
4. Minimum input swing for 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 $V_{PP}$ min. and 1V.

## PRODUCT ORDERING CODE

| Ordering Code | Package Type | Operating Range |
|---|---|---|
| SY100E417JC | J28-1 | Commercial |
| SY100E417JCTR | J28-1 | Commercial |

| Ordering Code | Package Type | Operating Range |
|---|---|---|
| SY100E417JI | J28-1 | Industrial |
| SY100E417JITR | J28-1 | Industrial |

## 28 LEAD PLCC (J28-1)




NOTES:
1. DIMENSIONS ARE IN INCHES[MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.008[0.203].
4. LEAD DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION.
5. MAXIMUM AND MINIMUM SPECIFICATIONS ARE INDICATED AS FOLLOWS: MAX/MIN
6. PACKAGE TOP DIMENSION MAY BE SLIGHTLY SMALLER THAN BOTTOM DIMENSION.

Rev. 03

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