## Preliminary Information

October 4, 1999

This document contains information on a new product. The parametric information, although not fully characterized, is the result of testing initial devices.

## Features

- 100 ps Part-to-Part Skew
- 35 ps Output-to-Output Skew
- Differential Design
- VBB Output
- Low Voltage VEE Range of –2.375 to –3.8V for ECL
- Low Voltage VCC Range of +2.375 to +3.8V for PECL and HSTL
- 75 KΩ Input Pulldown Resistors
- ECL/PECL Outputs

## Description

The SK10EP111 is a low skew 1-to-10 diffferential driver, designed with clock distribution in mind. It accepts two clock sources into an input multiplexer. The ECL/PECL input signals can be either differential or single-ended if the VBB output is used. HSTL inputs can be used when the EP111 is operating under PECL conditions. The selected signal is fanned out to 10 identical differential outputs.

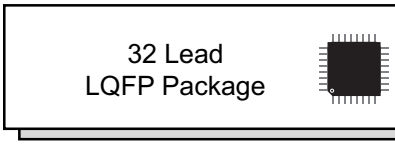
The SK10EP111 is specifically designed, modeled, and produced with low skew as the key goal. Optimal design and layout serve to minimize gate-to-gate skew within a device, and characterization is used to determine process control limits that ensure consistent tpd distributions from lot to lot. The net result is a dependable, guaranteed low skew device.

To ensure that the tight skew specification is met, it is necessary that both sides of the differential output are terminated into 50Ω, even if only one side is being used. In most applications, all ten differential pairs will be used and therefore terminated. In the case where fewer than ten pairs are used, it is necessary to terminate at least the output pairs on the same package side as the pair(s) being used on that side in order to maintain minimum skew. Failure to do this will result in small degradations of propagation delay (on the order of 10–20 ps) of the output(s) being used which, while not being catastrophic to most designs, will mean a loss of skew margin.

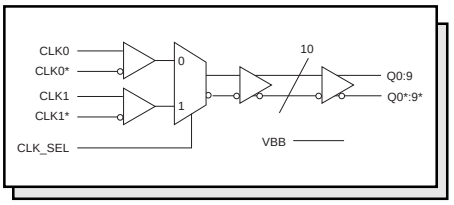
The SK10EP111, as with most other ECL devices, can be operated from a positive VCC supply in PECL mode. This allows the EP111 to be used for high performance clock distribution in +3.3V or +2.5V systems. Designers can take advantage of the EP111's performance to distribute low skew clocks across the backplane or the board. In a PECL environment, series or Thevenin line terminations are typically used as they require no additional power supplies.

Low-Voltage 1:10
Differential ECL/PECL/HSTL
Clock Driver

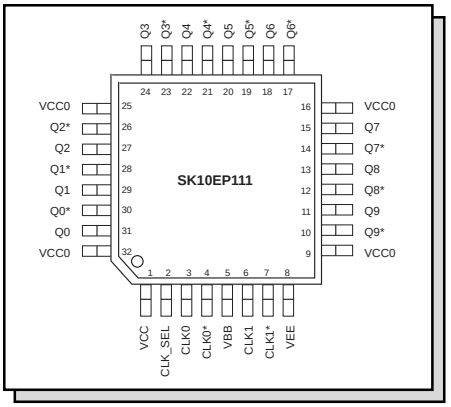
32 Lead
LQFP Package



## Logic Symbol




## Pinout




## Pin Names

| Pin | Function |
|---|---|
| CLK0, CLK0* | Differential ECL/PECL Input Pair |
| CLK1, CKL1* | Differential HSTL Input Pair |
| Q0:9, Q0*:9* | Differential PECL Outputs |
| CLK_SEL | Active Clock Select Input |
| VBB | VBB Output |

## Function

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

## ECL DC Characteristics

| Symbol | Characteristic | -40°C | | | 0°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $V_{OH}$ | Output HIGH Voltage | -1135 | | -890 | -1080 | | -840 | -1020 | | -810 | -910 | | -720 | mV |
| $V_{OL}$ | Output LOW Voltage | -1950 | | -1650 | -1950 | | -1630 | -1950 | | -1630 | -1950 | | -1595 | mV |
| $V_{IH}$ | Input HIGH Voltage | -1230 | | -890 | -1170 | | -840 | -1130 | | -810 | -1060 | | -720 | mV |
| $V_{IL}$ | Input LOW Voltage | -1950 | | -1500 | -1950 | | -1480 | -1950 | | -1480 | -1950 | | -1445 | mV |
| $V_{BB}$ | Output Reference Voltage | -1.43 | | -1.30 | -1.38 | | -1.27 | -1.35 | | -1.25 | -1.31 | | -1.19 | V |
| $V_{EE}$ | Power Supply Voltage | -2.375 | | -3.8 | -2.375 | | -3.8 | -2.375 | | -3.8 | -2.375 | | -3.8 | V |
| $I_{IH}$ | Input HIGH Current | | | 150 | | | 150 | | | 150 | | | 150 | µA |
| $I_{EE}$ | Power Supply Current VEE = -2.375 to -3.8V | | 80 | 108 | | 80 | 108 | | 80 | 108 | | 80 | 108 | mA |
| $V_{CMR}$ | Common Mode Range | VEE + 1.7 | | VCC - 0.3 | VEE + 1.7 | | VCC - 0.3 | VEE + 1.7 | | VCC - 0.3 | VEE + 1.7 | | VCC - 0.3 | V |
| $V_{PP}$ | Minimum Input Swing | 500 | | | 500 | | | 500 | | | 500 | | | mV |

## HSTL DC Characteristics

| Symbol | Characteristic | -40°C | | | 0°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $V_{CMR}$ | Common Mode Range | VEE + 0.9 | | VCC - 1.1 | VEE + 0.9 | | VCC - 1.1 | VEE + 0.9 | | VCC - 1.1 | VEE + 0.9 | | VCC - 1.1 | V |
| $V_{PP}$ | Minimum Input Swing | 500 | | | 500 | | | 500 | | | 500 | | | mV |

## PECL DC Characteristics

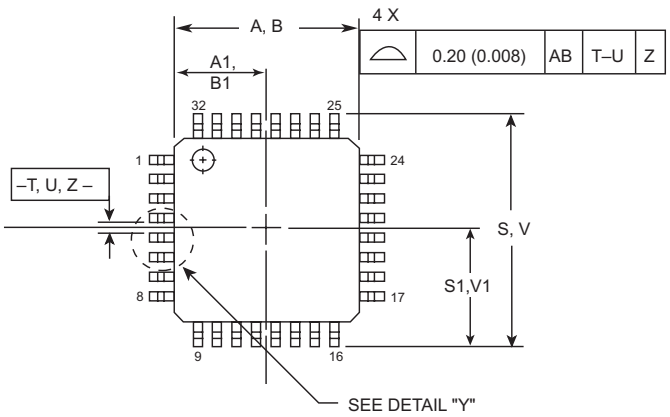
| Symbol | Characteristic | -40°C | | | 0°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $V_{OH}$ | Output HIGH Voltage (Note 1) | 2165 | | 3210 | 2220 | | 2420 | 2280 | | 2490 | 2390 | | 2580 | mV |
| $V_{OL}$ | Output LOW Voltage (Note 1) | 1350 | | 1650 | 1350 | | 1670 | 1350 | | 1670 | 1350 | | 1705 | mV |
| $V_{IH}$ | Input HIGH Voltage (Note 1) | 2670 | | 2410 | 2130 | | 2460 | 2170 | | 2410 | 2240 | | 2580 | mV |
| $V_{IL}$ | Input LOW Voltage (Note 1) | 1350 | | 1800 | 1350 | | 1820 | 1350 | | 1820 | 1350 | | 1855 | mV |
| $V_{BB}$ | Output Reference Voltage (Note 1) | 1.87 | | 2.00 | 1.92 | | 2.03 | 1.95 | | 2.05 | 1.99 | | 2.11 | V |
| $V_{EE}$ | Power Supply Voltage | 2.375 | | 3.8 | 2.375 | | 3.8 | 2.375 | | 3.8 | 2.375 | | 3.8 | V |
| $I_{IH}$ | Input HIGH Current | | | 150 | | | 150 | | | 150 | | | 150 | µA |
| $I_{EE}$ | Power Supply Current VCC = +2.375 to +3.8V | | 80 | 108 | | 80 | 108 | | 80 | 108 | | 80 | 108 | mA |
| $V_{CMR}$ | Common Mode Range | VEE + 1.7 | | VCC - 0.3 | VEE + 1.7 | | VCC - 0.3 | VEE + 1.7 | | VCC - 0.3 | VEE + 1.7 | | VCC - 0.3 | V |
| $V_{PP}$ | Minimum Input Swing | 500 | | | 500 | | | 500 | | | 500 | | | mV |

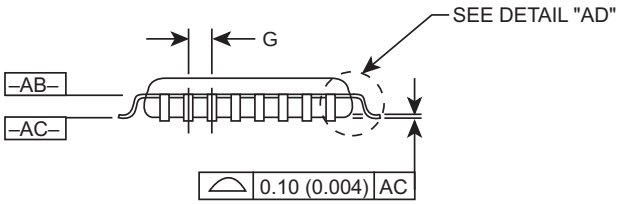
Note 1: These values are for $V_{CC}$ = 3.3V. Level Specifications will vary 1:1 with $V_{CC}$.

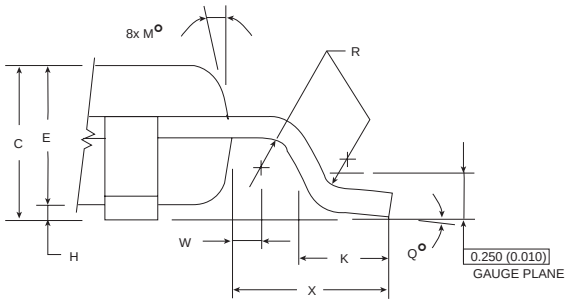
## AC Characteristics ($V_{EE}$ = –2.375V to –3.8V; $V_{CC}$ = $V_{CC0}$ = GND)

| Symbol | Characteristic | -40°C | | | 0°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $t_{PLH}$ | ECL/PECL Prop<br>Delay to Output | 310<br>390 | 380<br>420 | 450<br>440 | 350<br>405 | 415<br>440 | 475<br>460 | 375<br>430 | 445<br>460 | 510<br>490 | 480<br>460 | 575<br>490 | 680<br>520 | ps<br>ps |
| $t_{PHL}$ | HSTL Prop<br>Delay to Output | 340<br>550 | 415<br>580 | 485<br>600 | 380<br>585 | 450<br>620 | 510<br>640 | 410<br>610 | 480<br>640 | 545<br>670 | 520<br>640 | 615<br>670 | 720<br>700 | ps<br>ps |
| $t_{skew}$ | Within-Device Skew | | 15 | 30 | | 15 | 30 | | 15 | 30 | | 15 | 30 | ps |
| | Part-to-Part Skew | | 100 | 145 | | 100 | 130 | | 100 | 135 | | 100 | 150 | ps |
| $f_{max}$ | Max Input Frequency | | 1500 | | | 1500 | | | 1500 | | | 1500 | | MHz |
| $t_r$, $t_f$ | Output Rise/Fall Time | 200 | | 600 | 200 | | 600 | 200 | | 600 | 200 | | 600 | ps |

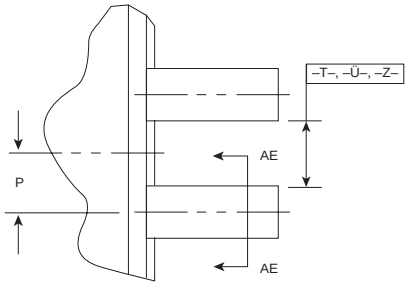
## Package Information



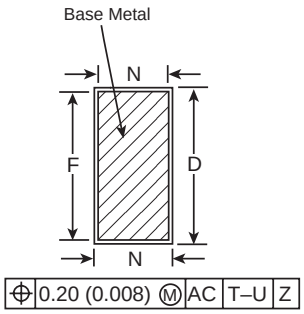




**DETAIL AD**




**DETAIL Y**




**SECTION AE**

NOTES:

1. Dimensioning and tolerancing per ANSI Y14.5M, 1982.
2. Controlling Dimension: Millimeter
3. Datum Plane –AB– is located at bottom of lead and is coincident with the lead where the lead exits the plastic body at the bottom of the parting line.
4. Datums –T–, –U–, and –Z– to be determined at Datum Plane –AB–.
5. Dimensions S and V to be determined at Seating Plane –AC–.
6. Dimensions A and B do not include mold protrusion. Allowable protrusion is 0.250 (0.010) per side. Dimensions A and B do not include mold mismatch and are determined at Datum Plane –AB–.
7. Dimension D does not include Dambar protrusion. Dambar protrusion shall not cause the D dimension to exceed 0.520 (0.020).
8. Minimum solder plate thickness shall be 0.0075 (0.0003).
9. Exact shape of each corner may vary from depiction.

| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 7.000 BSC | | 0.276 BSC | |
| A1 | 3.500 BSC | | 0.138 BSC | |
| B | 7.000 BSC | | 0.276 BSC | |
| B1 | 3.500 BSC | | 0.138 BSC | |
| C | 1.400 | 1.600 | 0.055 | 0.063 |
| D | 0.300 | 0.450 | 0.012 | 0.018 |
| E | 1.350 | 1.450 | 0.053 | 0.057 |
| F | 0.300 | 0.400 | 0.012 | 0.016 |
| G | 0.800 BSC | | 0.031 BSC | |
| H | 0.050 | 0.150 | 0.002 | 0.006 |
| J | 0.090 | 0.200 | 0.004 | 0.008 |
| K | 0.500 | 0.700 | 0.020 | 0.028 |
| M | 12° REF | | 12° REF | |
| N | 0.090 | 0.160 | 0.004 | 0.006 |
| P | 0.400 BSC | | 0.016 BSC | |
| Q | 1° | 5° | 1° | 5° |
| R | 0.150 | 0.250 | 0.006 | 0.010 |
| S | 9.000 BSC | | 0.354 BSC | |
| S1 | 4.500 BSC | | 0.177 BSC | |
| V | 9.000 BSC | | 0.354 BSC | |
| V1 | 4.500 BSC | | 0.177 BSC | |
| W | 0.200 REF | | 0.008 REF | |
| X | 1.000 REF | | 0.039 REF | |