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To order additional Reference Guides,
e-mail **sales@semtech.com** and refer to:
**Part Number: ECL-PRG-0702**

# Test and Measurement
## *ECL CLOCK AND LOGIC*

**Semtech's strategy in ECL Clock and Logic Products** centers around three product families - the first two represent industry standard ECL products; Eclipse, Eclipse Light, and Eclipse Plus. The third, the Clockwise family, consists of proprietary ECL clock distribution products. Features common to these product families include excellent performance in low jitter, minimum pin-to-pin and part-to-part skew, low power, and high-reaching frequencies. Semtech's Eclipse, Eclipse Light, and Eclipse Plus products offer two key advantages over the competition's offerings; improved ESD protection and a single part with guaranteed performance over the full range of power supply voltages (3.3V to 5V). Semtech's Clockwise products offer additional features such as on-chip input and output termination, level translation, and performance up to 3GHz.

**SEMTECH**

PRODUCT REFERENCE GUIDE **2002**

## ECL Logic

| PART NUMBER | PART DESCRIPTION | OPERATING VOLTAGE | FEATURES | PACKAGE |
|---|---|---|---|---|
| SK100E016PJ | 8-bit synchronous binary up counter | +4.2V to +5.5V | 700MHz minimum count frequency; 1000ps CLK to Q, TC*; internal TC* feedback (gated); fully synchronous counting and TC* generation asynchronous master reset | 28-pin PLCC |
| SK10E116PJ & SK100E116PJ | Quint differential line receiver | +4.2V to +5.5V | Low skew; guaranteed skew spec; differential design; $V_{BB}$ output; enable input; 400ps maximum propagation delay | 28-pin PLCC |
| SK10E131PJ & SK100E131PJ | 4-bit D flip-flop | +4.2V to +5.5V | 1100MHz minimum toggle frequency; individual and common clocks; individual resets (asynchronous); paired sets (asynchronous) | 28-pin PLCC |
| SK100E142PJ | 9-bit shift register | +4.2V to +5.5V | 700MHz minimum shift frequency; 9-bit for byte-parity applications; asynchronous master reset; dual clocks | 28-pin PLCC |
| SK100E151PJ | 6-bit D register | +4.2V to +5.5V | 1100MHz toggle frequency; asynchronous master reset; dual clocks | 28-pin PLCC |
| SK10E445PJ & SK100E445PJ | 4-bit serial/parallel converter | +4.2V to +5.5V | On-chip ÷4 and ÷8 clocks; 2.0Gb/s data rate capability; differential clock & serial inputs; asynchronous data synchronization; mode select to expand to 8-bits | 28-pin PLCC |

## ClockWise™ Clock Distribution

| PART NUMBER | PART DESCRIPTION | OPERATING VOLTAGE | FEATURES | PACKAGE |
|---|---|---|---|---|
| SK10EL32W & SK100EL32W | ÷2 divider | -5.5V to -3.0V or +3.0V to +5.5V | 405ps propogation delay; 3GHz toggle frequency | 8-pin SOIC |
| SK100EL33W | ÷4 divider | -5.5V to -3.0V or +3.0V to +5.5V | 560ps propagation delay; 4.0GHz toggle frequency; $V_{BB}$ output | 8-pin SOIC |
| SK100EL34WD | ÷2, ÷4, ÷8 clock generation chip | -5.5V to -3.0V or +3.0V to +5.5V | 50ps output-to-output skew; synchronous enable/disable; master reset for synchronization | 16-pin SOIC |
| SK100EL38WD | ÷2, ÷4/6 clock generation chip | -5.5V to -3.0V or +3.0V to +5.5V | 50ps output-to-output skew; master reset for synchronization | 20-pin SOIC |
| SK100EL39WD | ÷2/4, ÷4/6 clock generation chip | -5.5V to -3.0V or +3.0V to +5.5V | 50ps output-to-output skew; synchronous enable/disable; master reset for synchronization | 20-pin SOIC |
| SK10E111PJ & SK100E111PJ | 1:9 differential clock driver | +4.2V to +5.5V | $V_{BB}$ output; enable input | 28-pin PLCC |
| SK100EP111LF | Low voltage 1:10 differential LVECL/LVPECL/HSTL clock driver | +2.375V to +3.8V | 50ps part-to-part skew; 20ps output-to-output skew; $V_{BB}$ output | 32-pin LQFP |
| SK2200LF | LVPECL/HSTL to HSTL 1:9 high speed transceiver logic bus clock driver | +3.135V to +3.465V or +1.6V to +2.0V | 200ps part-to-part skew; 50ps output-to-output skew; low voltage HSTL output buffer; 500MHz maximum clock frequency | 32-pin LQFP |
| SK100LVE111PJ | 1:9 differential LVECL/LVPECL clock driver | +3.0V to +3.8V or -3.0V to -3.8V | 200ps part-to-part skew; internal 50ps output-to-output skew; $V_{BB}$ output | 28-pin PLCC |
| SK100LVE111EPJ | 1:9 differential LVECL/LVPECL clock driver w/enable input | +3.0V to +3.8V or -3.0V to -3.8V | 200ps part-to-part skew; 50ps output-to-output skew; $V_{BB}$ output; enable input | 28-pin PLCC |
| SK100EL14WD | 1:5 clock distribution chip | +3.0V to +5.5V or -3.0V to -5.5V | Maximum 50ps output-to-output skew; $V_{BB}$ output; synchronous enable/disable; multiplexed clock input; 75KW internal input pulldown resistors; new differential input common mode range | 20-pin SOIC |
| SK100EL15WD | 1:4 clock distribution chip | +3.0V to +5.5V or -3.0V to -5.5V | 50ps output-to-output skew; synchronous enable/disable; multiplexed clock input | 16-pin SOIC |
| SK12429 | High frequency PLL clock synthesizer | +3.0V to +5.5V | 25 to 400MHz differential PECL outputs; ±25ps peak-to-peak output jitter; fully integrated phase locked loop; minimal frequency overshoot; synthesized architecture; serial 3-wire interface; parallel interface for power-up; quartz crystal interface | 28-pin PLCC |

Complete datasheet specifications and more information about Semtech and its products can be found at www.semtech.com

## ClockWise™ LVDS Family

| PART NUMBER | PART DESCRIPTION | OPERATING VOLTAGE | FEATURES | PACKAGE |
|---|---|---|---|---|
| SK1303ATF | Differential LVDS receiver/driver | +3.0V to +5.5V | >800MHz toggle frequency, 100Ω on-chip input termination | 8-pin SOIC<br>8-pin MSOP |
| SK2111ATF | 1 to 10 differential LVDS clock driver | +3.0V to +3.6V | Part-to-part skew 100ps (maximum), output channel-to-channel skew 35ps (maximum) | 32-pin LQFP |

## ClockWise™ Clock Distribution: SK15xx Clock/Data Family  *1:5 Signal Distribution, 3GHz, Synch/Asynch Operation, 32-Pin TQFP Package*

**LOGIC FAMILY**

| PART NUMBER | OUTPUT | OPERATING VOLTAGE | OUTPUT CONFIGURATION |
|---|---|---|---|
| SK1500ATF | ECL/PECL | +3.0V to +5.5V | Open emitter |
| SK1501ATF | Double swing/TTL | +4.2V to +5.5V | Open emitter |
| SK1502ATF | ECL/PECL | +3.0V to +5.5V | 50Ω double termination |
| SK1503ATF | ECL/PECL | +3.0V to +5.5V | Internal current sink (double termination) |
| SK1504ATF | ECL/PECL | +3.0V to +5.5V | 50Ω source termination |

**OPEN COLLECTOR LOGIC FAMILY**

| PART NUMBER | OUTPUT CURRENT | OPERATING VOLTAGE | OUTPUT CONFIGURATION |
|---|---|---|---|
| SK1599ATF | 12mA | +3.0V to +5.5V | Open collector |

**LOGIC/TRANSLATION FAMILY**

| PART NUMBER | TRANSLATION | OPERATING VOLTAGE | OUTPUT CONFIGURATION |
|---|---|---|---|
| SK1525ATF | Anything to PECL | +6.0V to +7.2V | Open emitter |
| SK1526ATF | Anything to ECL | +6.0V to +7.2V | Open emitter |
| SK1527ATF | Anything to PECL | +6.0V to +7.2V | 50Ω double termination |
| SK1528ATF | Anything to ECL | +6.0V to +7.2V | 50Ω double termination |
| SK1529ATF | Anything to PECL | +6.0V to +7.2V | 50Ω source termination |
| SK1530ATF | Anything to ECL | +6.0V to +7.2V | 50Ω source termination |

## ClockWise™ Clock Distribution: SK19xx Clock/Data Family  *1:9 Signal Distribution, 3GHz, Synch/Asynch Operation, 32-Pin TQFP Package*

**LOGIC FAMILY**

| PART NUMBER | OUTPUT | OPERATING VOLTAGE | OUTPUT CONFIGURATION |
|---|---|---|---|
| SK1900ATF | ECL/PECL | +3.0V to +5.5V | Open emitter |
| SK1901ATF | Double swing/TTL | +4.2V to +5.5V | Open emitter |
| SK1902ATF | ECL/PECL | +3.0V to +5.5V | 50Ω double termination |
| SK1903ATF | ECL/PECL | +3.0V to +5.5V | Internal current sink (double termination) |
| SK1904ATF | ECL/PECL | +3.0V to +5.5V | 50Ω source termination |

**OPEN COLLECTOR LOGIC FAMILY**

| PART NUMBER | OUTPUT CURRENT | OPERATING VOLTAGE | OUTPUT CONFIGURATION |
|---|---|---|---|
| SK1999ATF | 12mA | +3.0V to +5.5V | Open collector |

**LOGIC/TRANSLATION FAMILY**

| PART NUMBER | TRANSLATION | OPERATING VOLTAGE | OUTPUT CONFIGURATION |
|---|---|---|---|
| SK1925ATF | Anything to PECL | +6.0V to +7.2V | Open emitter |
| SK1926ATF | Anything to ECL | +6.0V to +7.2V | Open emitter |
| SK1927ATF | Anything to PECL | +6.0V to +7.2V | 50Ω double termination |
| SK1928ATF | Anything to ECL | +6.0V to +7.2V | 50Ω double termination |
| SK1929ATF | Anything to PECL | +6.0V to +7.2V | 50Ω source termination |
| SK1930ATF | Anything to ECL | +6.0V to +7.2V | 50Ω source termination |

## ClockWise™ Clock Distribution: SK44xx Clock/Data Family  *Quad Buffer Receiver, 3GHz, Synch/Asynch Operation, 32-Pin TQFP Package*
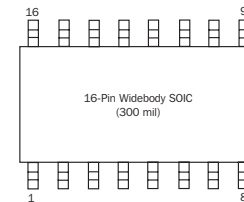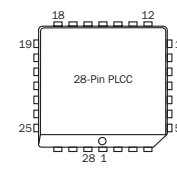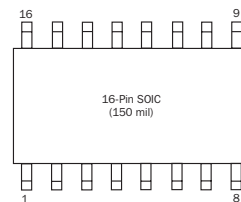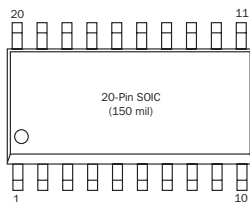
**LOGIC FAMILY**

| PART NUMBER | OUTPUT SWING | OPERATING VOLTAGE | INPUT TERMINATION | OUTPUT CONFIGURATION |
|---|---|---|---|---|
| SK4400ATF | ECL/PECL | +3.0V to +5.5V | Open | Open emitter |
| SK4401ATF | Double swing/TTL | +4.2V to +5.5V | Open | Open emitter |
| SK4404ATF | ECL/PECL | +3.0V to +5.5V | Open | 50Ω output |
| SK4410ATF | ECL/PECL | +3.0V to +5.5V | 100Ω | Open emitter |
| SK4411ATF | Double swing/TTL | +3.0V to +5.5V | 100Ω | Open emitter |
| SK4414ATF | ECL/PECL | +3.0V to +5.5V | 100Ω | 50Ω output |

**LOGIC/TRANSLATION FAMILY**

| PART NUMBER | TRANSLATION | OPERATING VOLTAGE | INPUT TERMINATION | OUTPUT CONFIGURATION |
|---|---|---|---|---|
| SK4425ATF | Anything to PECL | +6.0V to +7.2V | Open | Open emitter |
| SK4426ATF | Anything to ECL | +6.0V to +7.2V | Open | Open emitter |
| SK4429ATF | Anything to PECL | +6.0V to +7.2V | Open | 50Ω output |
| SK4430ATF | Anything to ECL | +6.0V to +7.2V | Open | 50Ω output |
| SK4435ATF | Anything to PECL | +6.0V to +7.2V | 100Ω | Open emitter |
| SK4436ATF | Anything to ECL | +6.0V to +7.2V | 100Ω | Open emitter |
| SK4439ATF | Anything to PECL | +6.0V to +7.2V | 100Ω | 50Ω output |
| SK4440ATF | Anything to ECL | +6.0V to +7.2V | 100Ω | 50Ω output |

## ECL Lite

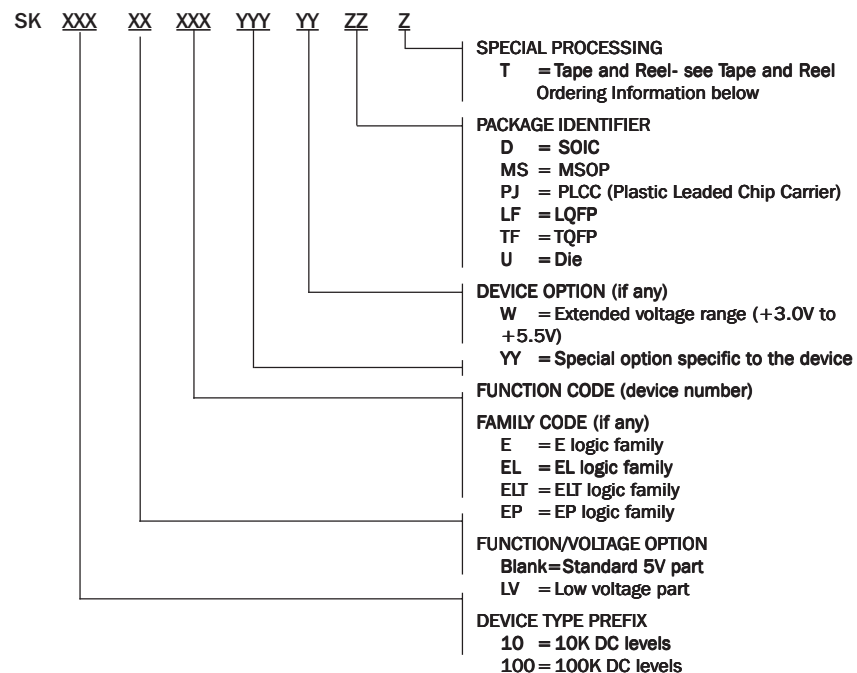| PART NUMBER | PART DESCRIPTION | OPERATING VOLTAGE | FEATURES | PACKAGE |
|---|---|---|---|---|
| SK10EL31WD & SK100EL31WD | D flip-flop with set and reset | +3.0V to +5.5V | 350ps propagation delay; 2.9GHz toggle frequency | 8-pin SOIC |
| SK10EL52WD & SK100EL52WD | Differential data and clock D flip-flop | +3.0V to +5.5V | 365ps propagation delay; 2.0GHz toggle frequency | 8-pin SOIC |
| SK10EL11WD/MS & SK100EL11WD/MS | 1:2 differential fanout buffer | +3.0V to +5.5V | 330ps propagation delay; 5ps skew between outputs | 8-pin SOIC/ MSOP |
| SK100EL56WD | Dual 2:1 differential multiplexer | +3.0V to +5.5V | 500ps propagation delay; $V_{BB}$ output | 20-pin SOIC |
| SK100EL57WD | 4:1 differential multiplexer | +3.0V to +5.5V | 420ps propagation delay; useful as either a 4:1 or 2:1 multiplexer; $V_{BB}$ output | 16-pin SOIC |
| SK100EL58WD | 2:1 multiplexer | +3.0V to +5.5V | 450ps typical propagation delay | 8-pin SOIC |
| SK10EL16BD/MS & SK100EL16BD/MS | Differential receiver with monitoring output | +3.0V to +5.5V | 300ps propagation delay; single-ended mounting output | 8-pin SOIC/ MSOP |
| SK10EL16WD/MS & SK100EL16WD/MS | Differential receiver | +3.0V to +5.5V | 300ps propagation delay | 8-pin SOIC/ MSOP |
| SK10EL16VD/MS & SK100EL16VD/MS | Differential receiver with variable output swing | +3.0V to +5.5V | 300ps propagation delay; VCTRL input to control the amplitude of the differential outputs | 8-pin SOIC |
| SK100EL17WD | Quad differential receiver | +3.0V to +5.5V | 325ps typical propagation delay | 20-pin SOIC |
| SK100EL16YD/MS | High gain differential receiver with variable output swing | +3.0V to +5.5V | 400ps propagation delay; VCTRL input to control the amplitude of the differential high gain outputs | 8-pin SOIC/ MSOP |
| SK10EL16XWAD/MS & SK100EL16XWAD/MS | High gain differential receiver | +3.0V to +5.5V | 300ps propagation delay; high gain outputs: pin-to-pin compatible with SK101100EL16W | 8-pin SOIC/ MSOP |
| SK10EL16XWBD/MS & SK100EL16XWBD/MS | High gain differential receiver with monitoring output | +3.0V to +5.5V | 300ps propagation delay; pin-to-pin compatible with SK10/100EL16B with the exception of differential high gain outputs; single-ended monitoring output | 8-pin SOIC/ MSOP |
| SK10EL16XWCD/MS & SK100EL16XWCD/MS | High gain differential receiver | +3.0V to +5.5V | 300ps propagation delay; D* input internally connected to $V_{BB}$; enable-input; single-ended monitoring output | 8-pin SOIC/ MSOP |
| SK10EL16XWDMS & SK100EL16XWDMS | High gain differential receiver | +3.0V to +5.5V | 300ps propagation delay; differential monitor outputs and high gain outputs; enable-input pin | 10-pin MSOP |
| SK10EL16XWED/MS & SK100EL16XWED/MS | High gain differential receiver | +3.0V to +5.5V | 300ps propagation delay; differential monitor outputs and high gain outputs | 8-pin SOIC/ MSOP |
| SK10EL16XWFD/MS & SK100EL16XWFD/MS | High gain differential receiver | +3.0V to +5.5V | 300ps propagation delay; enable option; single ended monitor output; differential high gain outputs | 8-pin SOIC/ MSOP |
| SK10EL16XWGD/MS & SK100EL16XWGD/MS | High gain differential receiver with variable output swing | +3.0V to +5.5V | 300ps propagation delay; differential high gain outputs; VCTRL input controls amplitude of QHG and QHG outputs | 8-pin SOIC/ MSOP |



32-Pin TQFP (5mm x 5mm)

32-Pin LQFP (7mm x 7mm)

20-Pin SOIC (150 mil)

16-Pin SOIC (150 mil)

28-Pin PLCC

16-Pin Widebody SOIC (300 mil)
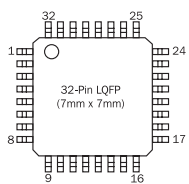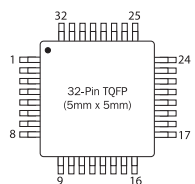
## Translators

| PART NUMBER | OPERATING VOLTAGE +3.0V to +5.5V | OPERATING VOLTAGE -3.0V to -5.5V | TRANSLATION FROM | TRANSLATION TO ECL | LVECL | PECL | LVPECL | TTL | LVTTL | CMOS | LVCMOS | LVDS | CML | PACKAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SK100EL90W | ■ | ■ | ECL | | | ■ | ■ | | | | | | | SOIC-8 |
| SK100ELT25W | ■ | ■ | ECL | | | | | ■ | | ■ | | | | SOIC-8 |
| SK100EL90W | ■ | ■ | LVECL | | | ■ | ■ | | | | | | | SOIC-20 |
| SK100ELT25W | ■ | ■ | LVECL | | | | | | ■ | | ■ | | | SOIC-8 |
| SK100EL91W | ■ | ■ | PECL | ■ | ■ | | | | | | | | | SOIC-20 |
| SK100ELT21W | ■ | | PECL | | | | | ■ | | ■ | | | | SOIC-8 |
| SK100ELT23W | ■ | | PECL | | | | | ■ | | ■ | | | | SOIC-8 |
| SK1300 | ■ | | PECL | | | | | | | | | ■ | | MSOP-8, SOIC-8 |
| SK1302 | ■ | | PECL | | | | | | | | | | ■ | MSOP-10 |
| SK100EL91W | ■ | ■ | LVPECL | ■ | ■ | | | | | | | | | SOIC-20 |
| SK100ELT21W | ■ | | LVPECL | | | | | | ■ | | ■ | | | SOIC-8 |
| SK100ELT23W | ■ | | LVPECL | | | | | | ■ | | ■ | | | SOIC-8 |
| SK1300 | ■ | | LVPECL | | | | | | | | | ■ | | MSOP-8, SOIC-8 |
| SK1302 | ■ | | LVPECL | | | | | | | | | | ■ | MSOP-10 |
| SK100ELT20W | ■ | | TTL | | | ■ | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT22W | ■ | | TTL | | | ■ | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT24W | ■ | ■ | TTL | ■ | | | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT20W | ■ | | LVTTL | | | | ■ | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT22W | ■ | | LVTTL | | | | ■ | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT24W | ■ | ■ | LVTTL | | ■ | | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT20W | ■ | | CMOS | | | ■ | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT22W | ■ | | CMOS | | | ■ | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT24W | ■ | ■ | CMOS | ■ | | | | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT20W | ■ | | LVCMOS | | | | ■ | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT22W | ■ | | LVCMOS | | | | ■ | | | | | | | MSOP-8, SOIC-8 |
| SK100ELT24W | ■ | ■ | LVCMOS | | ■ | | | | | | | | | MSOP-8, SOIC-8 |
| SK1301 | ■ | | LVDS | | | ■ | ■ | | | | | | | MSOP-8, SOIC-8 |



8-Pin SOIC (150 mil)



10-Pin MSOP (3mm x 3mm)



8-Pin MSOP (3mm x 3mm)
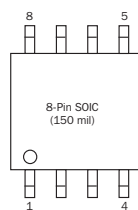
## Part Identification Information

SK  XXX  XX  XXX  YYY  YY  ZZ  Z

**SPECIAL PROCESSING**
T = Tape and Reel- see Tape and Reel Ordering Information below

**PACKAGE IDENTIFIER**
D = SOIC
MS = MSOP
PJ = PLCC (Plastic Leaded Chip Carrier)
LF = LQFP
TF = TQFP
U = Die

**DEVICE OPTION (if any)**
W = Extended voltage range (+3.0V to +5.5V)
YY = Special option specific to the device

**FUNCTION CODE (device number)**

**FAMILY CODE (if any)**
E = E logic family
EL = EL logic family
ELT = ELT logic family
EP = EP logic family

**FUNCTION/VOLTAGE OPTION**
Blank = Standard 5V part
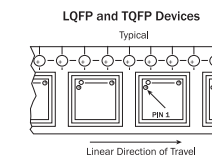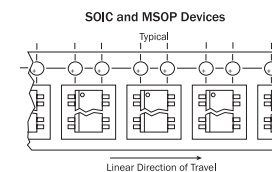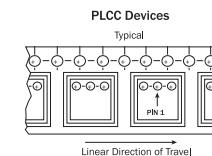LV = Low voltage part

**DEVICE TYPE PREFIX**
10 = 10K DC levels
100 = 100K DC levels

## Tape and Reel Information

Semtech's tape and reel packaging fully conforms to the latest EIA-481-1A and EIA-481-2A specifications. The antistatic embossed tape provides a secure cavity sealed with a peel-back tape.

| Device Type | Tape Width (mm) | Maximum (Device/Reel) | Reel Size (Inch) | Maximum (Device/Tube) |
|---|---|---|---|---|
| PLCC-28 | 24 | 750 | 13 | 38 |
| SOIC-8 | 12 | 2,500 | 13 | 98 |
| SOIC-16 | 16 | 2,500 | 13 | 49 |
| SOIC-20 | 24 | 1,000 | 13 | 38 |
| MSOP-8 | 12 | 2,500 | 13 | 50 |
| MSOP-10 | 12 | 2,500 | 13 | 50 |
| LQFP-32 (7 x 7mm) | 16 | 1,000 | 13 | 250 (tray) |
| TQFP-32 (7 x 7mm) | 16 | 1,000 | 13 | 250 (tray) |
| TQFP-32 (5 x 5mm) | 16 | 1,000 | 13 | 360 (tray) |

Ordering Information:
To order devices which are to be delivered in tape and reel, add the suffix T to the device number being ordered.

PLCC Devices
Typical



Linear Direction of Travel

SOIC and MSOP Devices
Typical



Linear Direction of Travel

LQFP and TQFP Devices
Typical



Linear Direction of Travel

All Viewed from Tape Side