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## Low Power, 1.62V to 3.63V, 10MHz to 40MHz, 1:6 Oscillator Fanout Buffer

### FEATURES

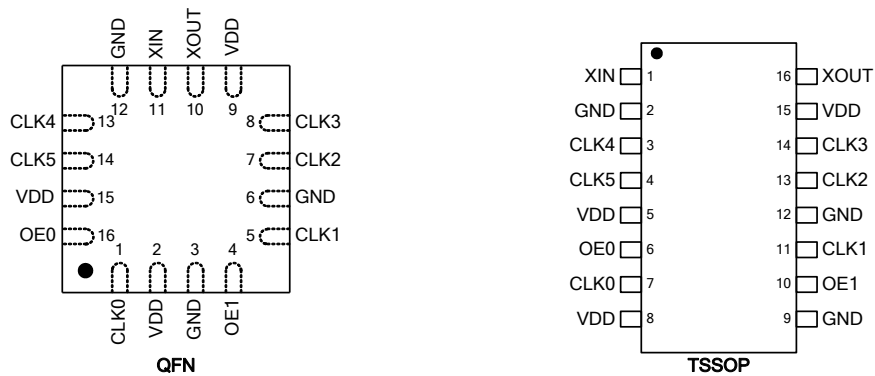
- Advanced Oscillator Design for Wide Frequency Coverage
- 6 LVCMOS Outputs with 2 Output Enable Pins
- 8mA Output Drive Strength
- Input/Output Frequency:
  - Fundamental Crystal: 10MHz to 40MHz
- Very Low Jitter and Phase Noise
- Low Current Consumption
- Single 1.62V to 3.63V Power Supply
- Available in QFN-16L and TSSOP-16L GREEN/RoHS Compliant Packages

### DESCRIPTION

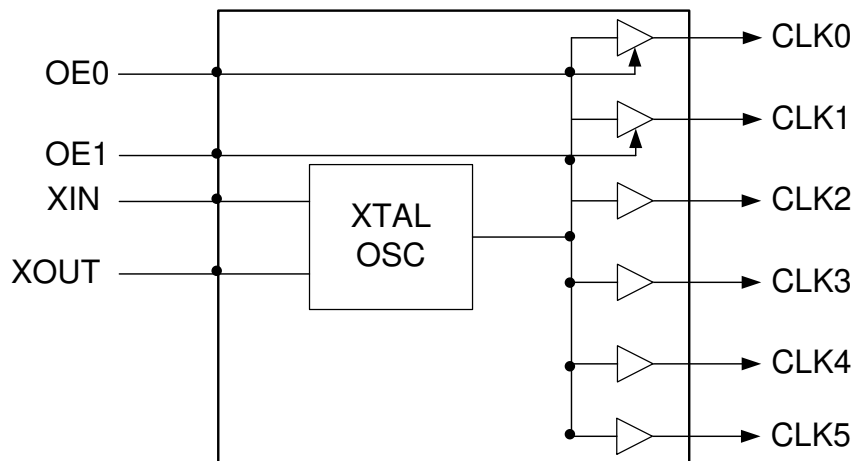
The PL135-67 is an advanced oscillator fanout buffer design for high performance, low-power, small form-factor applications. The PL135-67 accepts a fundamental input crystal of 10MHz to 40MHz and produces six outputs of the same frequency, two with their own Output Enable functions.

Offered in a small 3 x 3mm QFN or TSSOP package, the PL135-67 offers the best phase noise and jitter performance and lowest power consumption of any comparable IC.

### PACKAGE PIN CONFIGURATION



### BLOCK DIAGRAM



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**Low Power, 1.62V to 3.63V, 10MHz to 40MHz, 1:6 Oscillator Fanout Buffer**
**PACKAGE PIN ASSIGNMENT**

| Name | Package Pin # |             | Type | Description  |
|------|---------------|-------------|------|--|
|      | QFN-16L       | (T)SSOP-16L |      |  |
| CLK0 | 1             | 7           | O    | Output clock   |
| VDD  | 2, 9, 15      | 5, 8, 15    | P    | V <sub>DD</sub> connection   |
| GND  | 3, 6, 12      | 2, 9, 12    | P    | GND connection   |
| OE1  | 4             | 6           | I*   | Output enable (OE) input for CLK1. Internal pull-up. Pull low to tri-state CLK1. |
| CLK1 | 5             | 11          | O    | Output clock   |
| CLK2 | 7             | 13          | O    | Output clock   |
| CLK3 | 8             | 14          | O    | Output clock   |
| XOUT | 10            | 16          | O    | Crystal output. Do not connect when using reference clock.                       |
| XIN  | 11            | 1           | I    | Crystal input  |
| CLK4 | 13            | 3           | O    | Output clock   |
| CLK5 | 14            | 4           | O    | Output clock   |
| OE0  | 14            | 4           | I*   | Output enable (OE) input for CLK0. Internal pull-up. Pull low to tri-state CLK0. |

\* **Note:** These pins include an internal 60kΩ pull up.

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### LAYOUT RECOMMENDATIONS

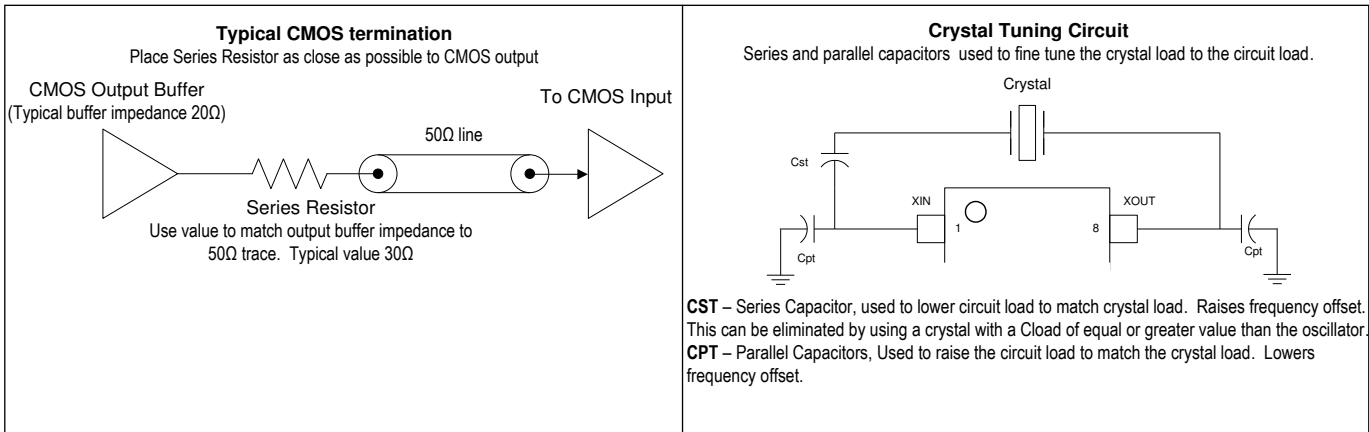
The following guidelines are to assist you with a performance optimized PCB design:

#### Signal Integrity and Termination Considerations

- Keep traces short!
- Trace = Inductor. With a capacitive load this equals ringing!
- Long trace = Transmission Line. Without proper termination this will cause reflections (looks like ringing).
- Design long traces as “striplines” or “microstrips” with defined impedance.
- Match trace at one side to avoid reflections bouncing back and forth.

#### Decoupling and Power Supply Considerations

- Place decoupling capacitors as close as possible to the  $V_{DD}$  pin(s) to limit noise from the power supply
- Multiple  $V_{DD}$  pins should be decoupled separately for best performance.
- Addition of a ferrite bead in series with  $V_{DD}$  can help prevent noise from other board sources
- Value of decoupling capacitor is frequency dependant. Typical value to use is  $0.1\mu F$ .



### ELECTRICAL SPECIFICATIONS

#### ABSOLUTE MAXIMUM RATINGS

| PARAMETERS                     | SYMBOL   | MIN. | MAX.         | UNITS |
|--------------------------------|----------|------|--------------|-------|
| Supply Voltage Range           | $V_{DD}$ | -0.5 | 4.6          | V     |
| Input Voltage Range            | $V_I$    | -0.5 | $V_{DD}+0.5$ | V     |
| Output Voltage Range           | $V_O$    | -0.5 | $V_{DD}+0.5$ | V     |
| Storage Temperature            | $T_S$    | -65  | 150          | °C    |
| Ambient Operating Temperature* |          | -40  | 85           | °C    |

Exposure of the device under conditions beyond the limits specified by Maximum Ratings for extended periods may cause permanent damage to the device and affect product reliability. These conditions represent a stress rating only, and functional operations of the device at these or any other conditions above the operational limits noted in this specification is not implied. \*Operating temperature is guaranteed by design. Parts are tested to commercial grade only.

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**AC SPECIFICATIONS**

| PARAMETERS              | CONDITIONS                                | MIN. | TYP. | MAX. | UNITS |
|-------------------------|---|------|------|------|-------|
| Crystal Input Frequency | Fundamental Crystal                       | 10   |      | 40   | MHz   |
| Settling Time           | At power-up ( $V_{DD} \geq 1.62V$ )       |      |      | 2    | ms    |
| Output Enable Time      | OE Function; $T_a=25^\circ C$ , 10pF Load |      |      | 10   | ns    |
| $V_{DD}$ Sensitivity    | Frequency vs. $V_{DD}$ , $\pm 10\%$       | -2   |      | 2    | ppm   |
| Output Rise Time        | 15pF Load, 10/90% $V_{DD}$ , 3.3V         |      | 2    | 4    | ns    |
| Output Fall Time        | 15pF Load, 90/10% $V_{DD}$ , 3.3V         |      | 2    | 4    | ns    |
| Output to Output Skew   | Under all conditions                      |      |      | 1    | ns    |
| Duty Cycle              | Under all conditions                      | 45   | 50   | 55   | %     |

**DC SPECIFICATIONS**

| PARAMETERS              | SYMBOL    | CONDITIONS                        | MIN  | TYP | MAX  | UNITS |
|-------------------------|-----------|-----------------------------------|------|-----|------|-------|
| Supply Current, Dynamic | $I_{DD}$  | $V_{DD} = 3.3V$ , 25MHz, No Load  |      | 7.1 |      | mA    |
|                         |           | $V_{DD} = 2.5V$ , 25MHz, No Load  |      | 4.8 |      | mA    |
|                         |           | $V_{DD} = 1.8V$ , 25MHz, No Load  |      | 3.4 |      | mA    |
| Operating Voltage       | $V_{DD}$  |                                   | 1.62 |     | 3.63 | V     |
| Output Low Voltage      | $V_{OL}$  | $I_{OL} = +4mA$ , 3.3V            |      |     | 0.4  | V     |
| Output High Voltage     | $V_{OH}$  | $I_{OH} = -4mA$ , 3.3V            | 2.4  |     |      | V     |
| Output Current          | $I_{OSD}$ | $V_{OL} = 0.4V$ , $V_{OH} = 2.4V$ | 8    |     |      | mA    |

**CRYSTAL SPECIFICATIONS**

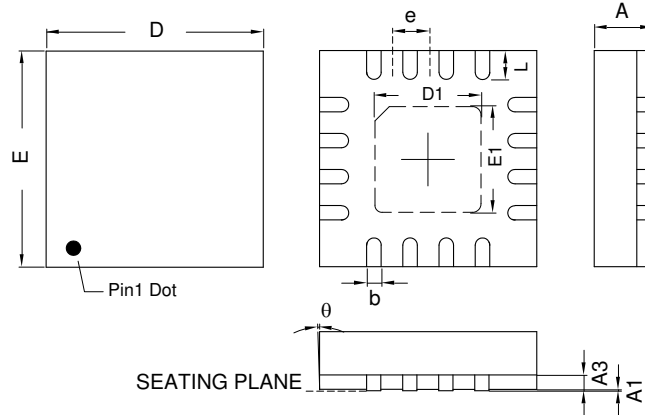
| PARAMETERS                              |                   | SYMBOL        | MIN. | TYP. | MAX. | UNITS    |
|---|-------------------|---------------|------|------|------|----------|
| Fundamental Crystal Resonator Frequency |                   | $F_{XIN}$     | 10   |      | 40   | MHz      |
| Crystal Loading Rating                  |                   | $C_{L(xtal)}$ |      | 15   |      | pF       |
| Operating Drive Level                   |                   |               |      | 0.1  | 2    | mW       |
| Metal Can Crystal                       | Shunt Capacitance | $C_0$         |      |      | 5.5  | pF       |
|   | ESR Max           | ESR           |      |      | 40   | $\Omega$ |
| Small SMD Crystal                       | Shunt Capacitance | $C_0$         |      |      | 2.5  | pF       |
|   | ESR Max           | ESR           |      |      | 60   | $\Omega$ |

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### PACKAGE DRAWINGS (GREEN PACKAGE COMPLIANT)

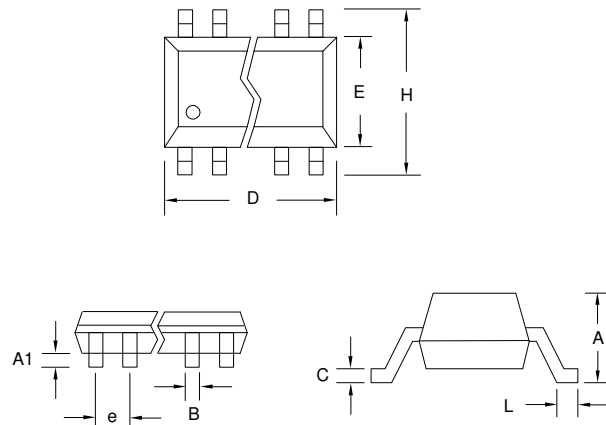
#### QFN 16L

| Symbol | Dimension in MM |      |
|--------|-----------------|------|
|        | Min.            | Max. |
| A      | 0.07            | 0.8  |
| A1     | 0.05            | 0.05 |
| A3     | 0.20            |      |
| b      | 0.18            | 0.30 |
| D      | 3.00 BSC        |      |
| E      | 3.00 BSC        |      |
| D1     | --              | 1.70 |
| E1     | --              | 1.70 |
| L      | 0.30            | 0.50 |
| e      | 0.50 BSC        |      |



#### TSSOP 16L

| Symbol | Dimension in MM |      |
|--------|-----------------|------|
|        | Min.            | Max. |
| A      | -               | 1.20 |
| A1     | 0.05            | 0.15 |
| b      | 0.19            | 0.30 |
| C      | 0.09            | 0.20 |
| D      | 4.90            | 5.10 |
| E      | 4.30            | 4.50 |
| H      | 6.20            | 6.60 |
| L      | 0.45            | 0.75 |
| e      | 0.635 BSC       |      |



## Low Power, 1.62V to 3.63V, 10MHz to 40MHz, 1:6 Oscillator Fanout Buffer

### ORDERING INFORMATION (GREEN PACKAGE COMPLIANT)

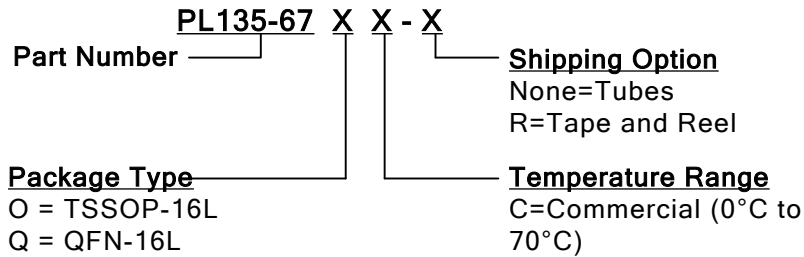
*For part ordering, please contact our Sales Department:*

2180 Fortune Drive, San Jose, CA 95131, USA

Tel: (408) 944-0800 Fax: (408) 474-1000

#### PART NUMBER

The order number for this device is a combination of the following:  
Part number, Package type and Operating temperature range



| Part Number/Order Number | Marking           | Package Option               |
|--------------------------|-------------------|------------------------------|
| PL135-67OC               | P135-67<br>OC     | 16-Pin TSSOP (Tube)          |
| PL135-67OC-R             | LLLLL             | 16-Pin TSSOP (Tape and Reel) |
| PL135-67QC-R             | P135<br>67<br>LLL | 16-Pin QFN (Tape and Reel)   |

\*Note: LLL designates lot number

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