



PL135-27

Low Power, 1.62V to 3.63V, 10MHz to 40MHz, 1:2 Oscillator Fanout Buffer

Revision 2.0

General Description

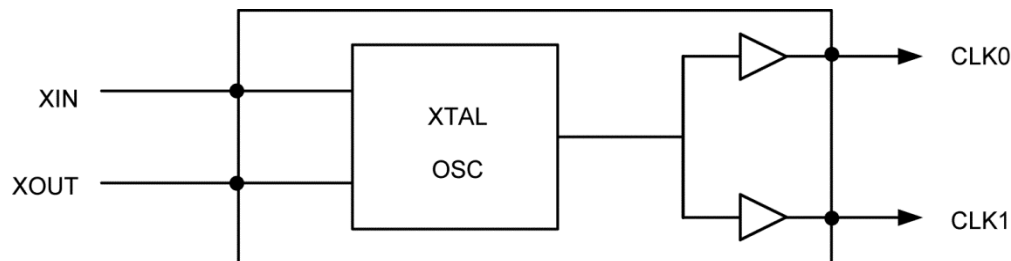
The PL135-27 is an advanced oscillator fanout buffer design for high performance, low-power, small form-factor applications. The PL135-27 accepts a fundamental crystal input of 10MHz to 40MHz and produces two LVCMOS outputs of the same frequency. The PL135-27 is designed to fit in a small 2mm × 1.3mm DFN package and offers the best phase noise, jitter performance and lowest power consumption of any comparable IC.

Datasheets and support documentation are available on Micrel's web site at: www.micrel.com.

Features

- Advanced oscillator design for wide frequency coverage
- Two LVCMOS outputs
- 8mA output drive strength
- Input/output frequency: 10MHz to 40MHz fundamental crystal
- Very low jitter and phase noise
- Low current consumption
- Single 1.62V to 3.63V power supply
- Available in 2.0mm × 1.3mm DFN-6L, GREEN/RoHS-compliant package

Block Diagram



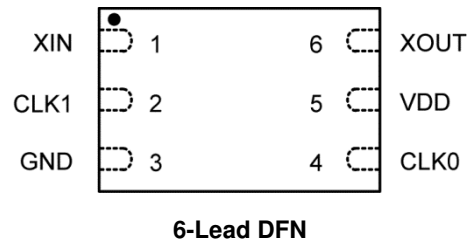
Ordering Information

| Part Number | Ambient Temperature Range | Marking ⁽¹⁾ | Package |
|--------------|---------------------------|------------------------|-------------------------|
| PL135-27GC-R | 0°C to +70°C | J27 | 6-Pin 2.0mm × 1.3mm DFN |
| PL135-27GI-R | -40°C to +85°C | LLL | |

Note:

1. LLL designates lot number.

Pin Configuration



Pin Description

| Pin Number DFN-6L | Pin Name | Type | Pin Description |
|----------------------|----------|------|----------------------------|
| 1 | XIN | I | Crystal input |
| 2 | CLK1 | O | Clock output |
| 3 | GND | P | GND connection |
| 4 | CLK0 | O | Clock output |
| 5 | VDD | P | V _{DD} connection |
| 6 | XOUT | O | Crystal output |

Absolute Maximum Ratings⁽²⁾

Supply Voltage (V_{DD}) -0.5V to +4.6V
 Output Voltage (V_{OUT}) -0.5V to $V_{DD}+0.5V$
 Storage Temperature (T_S) -65°C to +150°C

Operating Ratings⁽³⁾

Supply Voltage (V_{DD}) +1.62V to +3.63V
 Ambient Temperature (T_A) -40°C to +85°C

AC Electrical Characteristics

$V_{DD} = 1.8V \pm 10\%$, $2.5V \pm 10\%$ or $3.3V \pm 10\%$; $C_L = 15pF$; $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise noted

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Units |
|--------------|-------------------------|-------------------------------------|------|------|------|-------|
| F_X | Crystal Input Frequency | Fundamental crystal | 10 | | 40 | MHz |
| t_{SETTLE} | Settling Time | At Power-Up ($V_{DD} \geq 1.62V$) | | | 2 | ms |
| dF/dV_{DD} | V_{DD} Sensitivity | Frequency vs. V_{DD} , $\pm 10\%$ | -0.5 | | 0.5 | ppm |
| t_R | Output Rise Time | 10/90% V_{DD} , $V_{DD}=3.3V$ | | 2 | 3 | ns |
| t_F | Output Fall Time | 90/10% V_{DD} , $V_{DD}=3.3V$ | | 2 | 3 | ns |
| t_{SKEW} | Output to Output Skew | | | | 500 | ps |
| D-C | Duty Cycle | | 45 | 50 | 55 | % |

Notes:

- Exceeding the absolute maximum ratings may damage the device.
- The device is not guaranteed to function outside its operating ratings.

DC Electrical Characteristics

$V_{DD} = 1.8V \pm 10\%$, $2.5V \pm 10\%$ or $3.3V \pm 10\%$; $C_L = 15pF$; $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise noted

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Units |
|-----------|-------------------------|-----------------------------------|------|------|------|-------|
| I_{DD} | Supply Current, Dynamic | $V_{DD} = 3.3V$, 25MHz, No Load | | 1.6 | | mA |
| | | $V_{DD} = 2.5V$, 25MHz, No Load | | 1.2 | | mA |
| | | $V_{DD} = 1.8V$, 25MHz, No Load | | 0.9 | | mA |
| V_{DD} | Operating Voltage | | 1.62 | | 3.63 | V |
| V_{OL} | Output Low Voltage | $I_{OL} = +4mA$, 3.3V | | | 0.4 | V |
| V_{OH} | Output High Voltage | $I_{OH} = -4mA$, 3.3V | 2.4 | | | V |
| I_{OSD} | Output Current | $V_{OL} = 0.4V$, $V_{OH} = 2.4V$ | 8 | | | mA |

Crystal Specifications

$V_{DD} = 1.8V \pm 10\%$, $2.5V \pm 10\%$ or $3.3V \pm 10\%$; $C_L = 15pF$; $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise noted

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Units |
|---------------|-----------------------------------------|------------------|------|------|------|----------|
| F_{XIN} | Fundamental Crystal Resonator Frequency | | 10 | | 40 | MHz |
| $C_{L(xtal)}$ | Crystal Loading Rating | | | 12 | | pF |
| P_D | Operating Drive Level | | | 0.1 | 2 | mW |
| C_0 | Shunt Capacitance | | | | 5.5 | pF |
| ESR | Effective Series Resistance | $C_0 \leq 5.5pF$ | | | 40 | Ω |
| | | $C_0 \leq 2.5pF$ | | | 60 | Ω |

Layout Recommendations

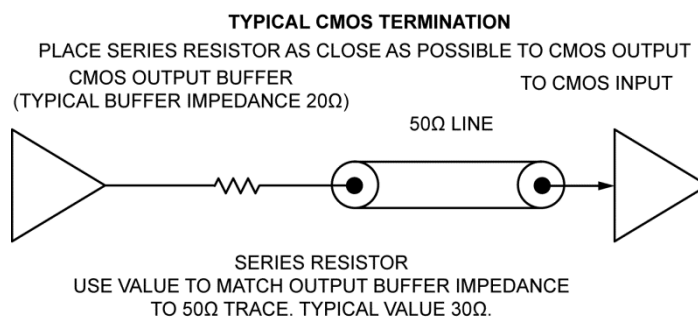
The following guidelines are to assist you with a performance optimized PCB design:

Signal Integrity and Termination Considerations

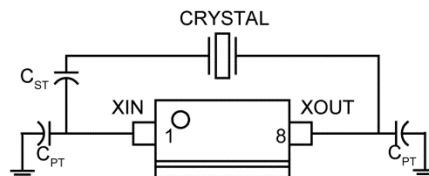
- Keep traces short.
- Trace = Inductor. With a capacitive load this equals ringing.
- Long trace = Transmission Line. Without proper termination this will cause reflections (looks like ringing).
- Design long traces as “striplines” or “microstrips” with defined impedance.
- Match trace at one side to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

Decoupling and Power Supply Considerations

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



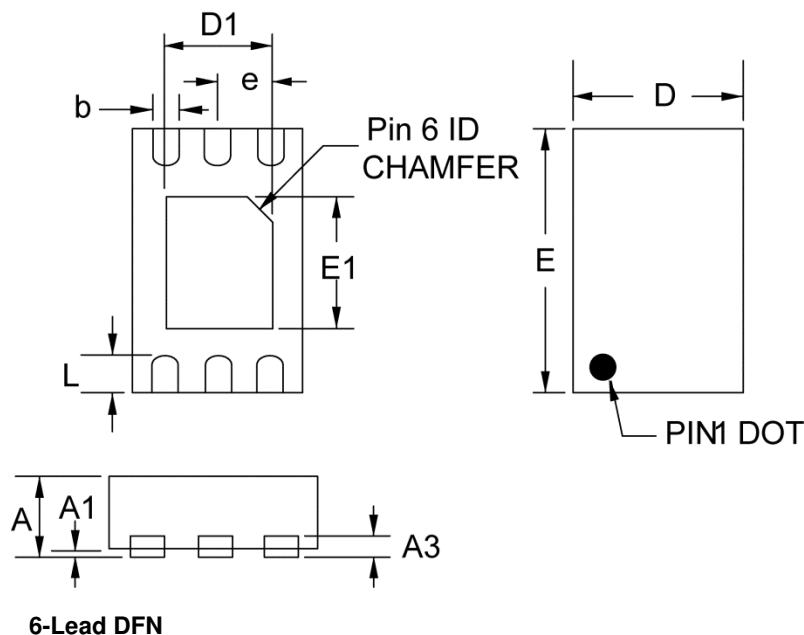
CRYSTAL TUNING CIRCUIT
SERIES AND PARALLEL CAPACITORS USED TO FINE TUNE THE CRYSTAL LOAD TO THE CIRCUIT LOAD



CST – SERIES CAPACITOR, USED TO LOWER CIRCUIT LOAD TO MATCH CRYSTAL LOAD. RAISES FREQUENCY OFFSET. THIS CAN BE ELIMINATED BY USING A CRYSTAL WITH A CLOAD OF EQUAL OR GREATER VALUE THAN THE OSCILLATOR.
CPT – PARALLEL CAPACITORS, USED TO RAISE THE CIRCUIT LOAD TO MATCH THE CRYSTAL LOAD. LOWERS FREQUENCY OFFSET.

Package Information⁽⁴⁾

| Symbol | Dimension in MM | |
|--------|-----------------|-------|
| | Min. | Max. |
| A | 0.45 | 0.60 |
| A1 | 0.00 | 0.05 |
| A3 | 0.152 | 0.152 |
| b | 0.15 | 0.25 |
| e | 0.40BSC | |
| D | 1.25 | 1.35 |
| E | 1.95 | 2.05 |
| D1 | 0.75 | 0.85 |
| E1 | 0.95 | 1.05 |
| L | 0.20 | 0.30 |



Note:

4. Package information is correct as of the publication date. For updates and most current information, go to www.micrel.com.

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA
 TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB <http://www.micrel.com>

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