PL135-27

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

Revision 2.0

General Description

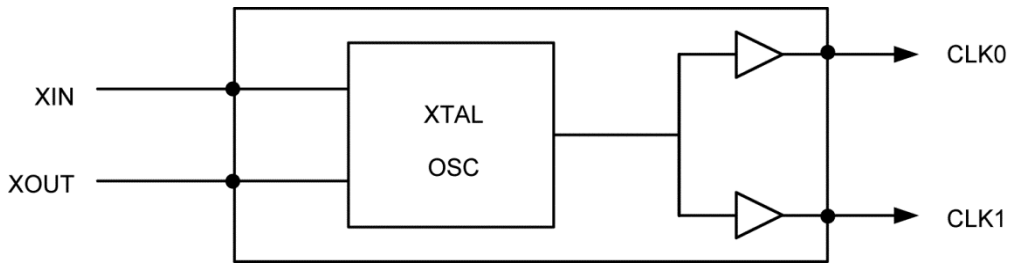
The PL135-27 is an advanced oscillator fanout buffer design for high performance, low-power, small form-factor applications. The PL135-27 accepts a fundamental crystal input of 10MHz to 40MHz and produces two LVCMOS outputs of the same frequency. The PL135-27 is designed to fit in a small 2mm × 1.3mm 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



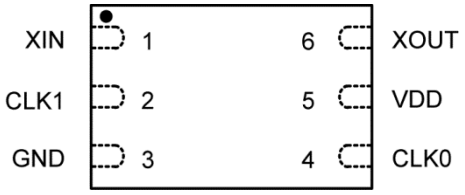
Ordering Information

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

Note:

1. LLL designates lot number.

Pin Configuration



6-Lead DFN

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

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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 ±10%, 2.5V ±10% or 3.3V ±10%; C_L = 15pF; T_A = -40°C to +85°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}, ±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:

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

DC Electrical Characteristics

V_{DD} = 1.8V ±10%, 2.5V ±10% or 3.3V ±10%; C_L = 15pF; T_A = -40°C to +85°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 ±10%, 2.5V ±10% or 3.3V ±10%; C_L = 15pF; T_A = -40°C to +85°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
C0	Shunt Capacitance				5.5	pF
ESR	Effective Series Resistance	C0 ≤ 5.5pF			40	Ω
		C0 ≤ 2.5pF			60	Ω

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Layout Recommendations

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

Signal Integrity and Termination Considerations

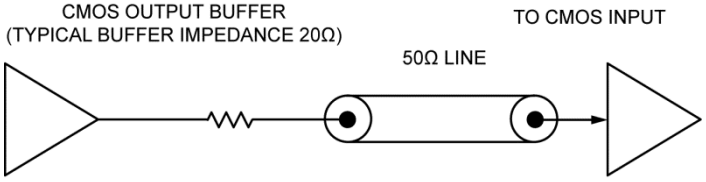
- Keep traces short.
- Trace = Inductor. With a capacitive load this equals ringing.
- Long trace = Transmission Line. Without proper termination this will cause reflections (looks like ringing).
- Design long traces as “striplines” or “microstrips” with defined impedance.
- Match trace at one side to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

Decoupling and Power Supply Considerations

- Place decoupling capacitors as close as possible to the 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 0.1µF.

TYPICAL CMOS TERMINATION

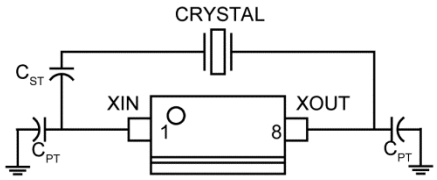
PLACE SERIES RESISTOR AS CLOSE AS POSSIBLE TO CMOS OUTPUT



SERIES RESISTOR
USE VALUE TO MATCH OUTPUT BUFFER IMPEDANCE
TO 50Ω TRACE. TYPICAL VALUE 30Ω.

CRYSTAL TUNING CIRCUIT

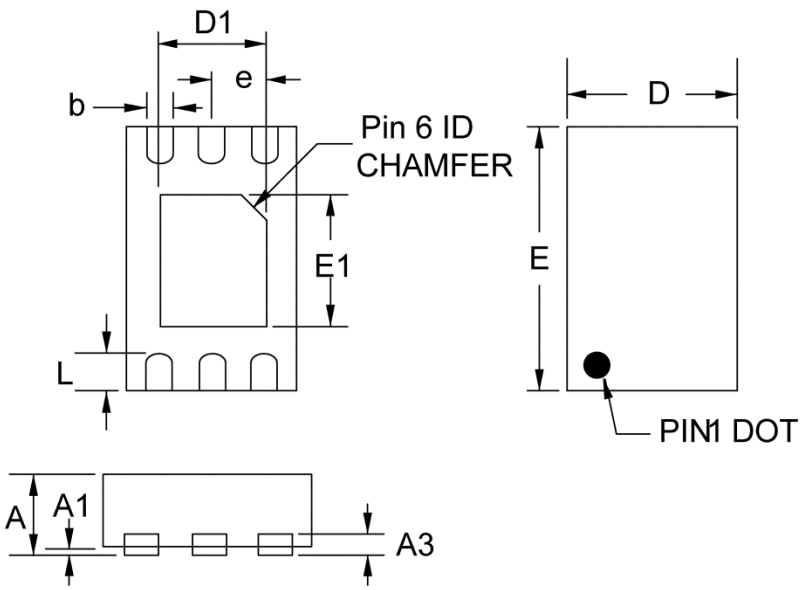
SERIES AND PARALLEL CAPACITORS USED TO FINE TUNE THE CRYSTAL LOAD TO THE CIRCUIT LOAD



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



6-Lead DFN

Note:

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

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