

**3.0–13.5 GHz Low Power UltraCMOS®
Divide-by-4 Prescaler
Radiation Tolerant for Space
Applications**

Features

- High-frequency operation: up to 13.5 GHz
- Fixed divide ratio of 4
- Low-power operation: 16 mA typical @ 2.6V
- Small package: 8-lead CFP
- Available as DIE

Product Description

The PE9309 is a high-performance dynamic UltraCMOS® prescaler with a fixed divide ratio of 4. Its operating frequency range is 3.0 GHz to 13.5 GHz. The PE9309 operates on a single supply with a frequency-selecting bias resistor and draws only 16 mA. It is packaged in a small 8-lead CFP and is also available in die form for hybrid application.

The PE9309 is manufactured on Peregrine’s UltraCMOS process, a patented variation of silicon-on-insulator (SOI) technology on a sapphire substrate, offering the performance of GaAs with the economy and integration of conventional CMOS.

Figure 2. Package Type
8-lead CFP

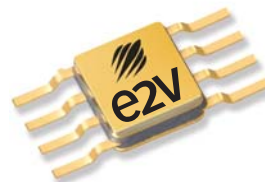


Figure 1. Functional Schematic Diagram

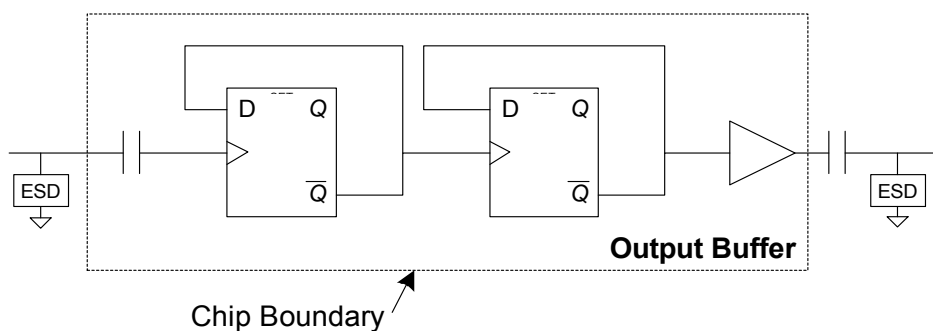


Table 1. Electrical Specifications ($Z_S = Z_L = 50\Omega$) $-40\text{ }^\circ\text{C} \leq T_A \leq +85\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Condition	Min	Typ	Max	Unit
Frequency		3.0		13.5	GHz
Output power, P_{OUT}	$0.75\text{ GHz} \leq F_{OUT} \leq 3.375\text{ GHz}$	0			dBm
Input power, P_{IN}	$3.0\text{ GHz} \leq F_{IN} < 13.5\text{ GHz}$	0		7	dBm

Figure 3. Pin Configuration (Top View)

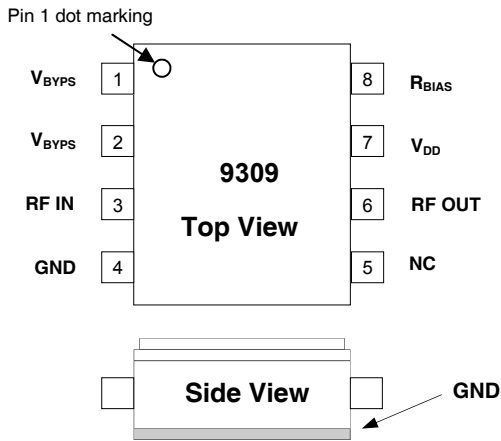


Table 2. Pin Descriptions

Pin #	Pin Name	Description
1	V _{BYP} S	Prescaler supply bypass
2	V _{BYP} S	Prescaler supply bypass
3	IN	RF input
4	GND	Ground
5	NC	Not connected
6	OUT	RF output
7	V _{DD}	Supply voltage
8	R _{BIAS}	Frequency-selecting bias resistor
GND	GND	Bottom of the package is ground. Connecting the bottom of the package to ground is required

Table 3. Operating Ranges

Parameter	Min	Typ	Max	Unit
Supply voltage, V _{DD}	2.45	2.6	2.75	V
Supply current, I _{DD}	6		23	mA

Table 4. Absolute Maximum Ratings

Symbol	Parameter/Condition	Min	Max	Unit
V _{DD}	DC supply voltage		3.0	V
T _{ST}	Storage temperature range	-65	+150	°C
T _{OP}	Operating temperature range	-40	+85	°C
Θ _{JC}	Theta JC		57	°C/W
T _J	Junction temperature maximum		+125	°C
V _{ESD}	ESD voltage (Human Body Model)		250	V
P _{IN_MAX}	Maximum input power		14	dBm

Exceeding absolute maximum ratings may cause permanent damage. Operation should be restricted to the limits in the Operating Ranges table. Operation between operating range maximum and absolute maximum for extended periods may reduce reliability.

Electrostatic Discharge (ESD) Precautions

When handling this UltraCMOS device, observe the same precautions that you would use with other ESD-sensitive devices. Although this device contains circuitry to protect it from damage due to ESD, precautions should be taken to avoid exceeding the specified rating.

Latch-Up Immunity

Unlike conventional CMOS devices, UltraCMOS devices are immune to latch-up.

ELDRS

UltraCMOS devices do not include bipolar minority carrier elements, and therefore do not exhibit enhanced low dose rate sensitivity.

Device Functional Considerations

The PE9309 divides a 3.0 GHz to 13.5 GHz input signal by four, producing a 750 MHz to 3.375 GHz output signal. In order for the prescaler to work properly, several conditions need to be adhered to. It is crucial that pins 1, 2 and 7 be supplied with bypass capacitors to ground. In addition, the output signal (pin 6) needs to be ac coupled via an external capacitor as shown in the test circuit in *Figure 5*.

The input frequency range is selected by the value of R_{BIAS} according to *Figure 4*.

The ground pattern on the board should be made as wide as possible to minimize ground impedance.

The bottom of the package is the primary ground connection and it needs to be soldered to the PCB ground.

Figure 4. Frequency vs R_{BIAS}

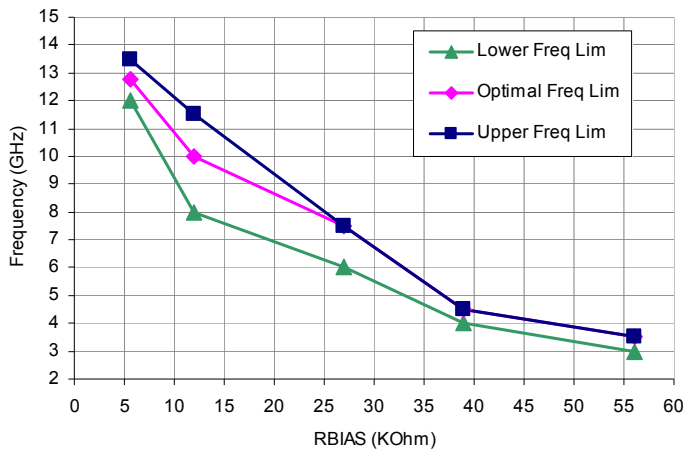


Figure 5. Test Circuit Block Diagram

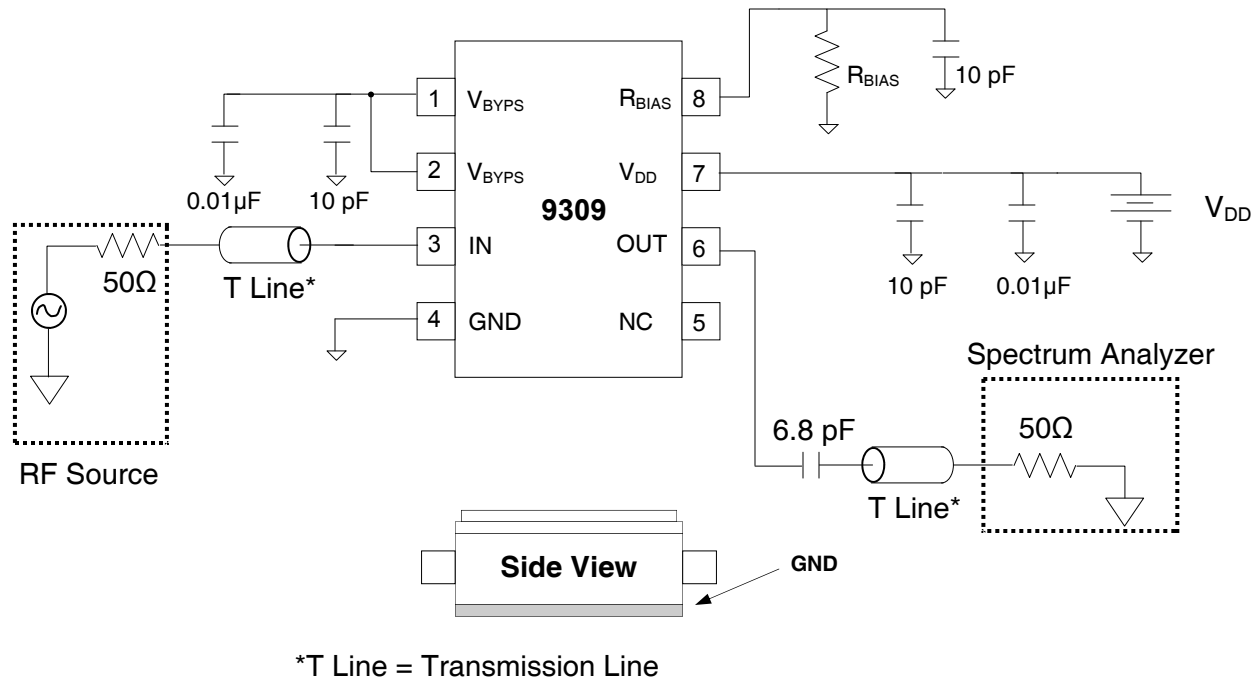


Figure 6. High Frequency System Application

The wideband frequency of operation of the PE9309 makes it an ideal part for use in a DBS down converter system.

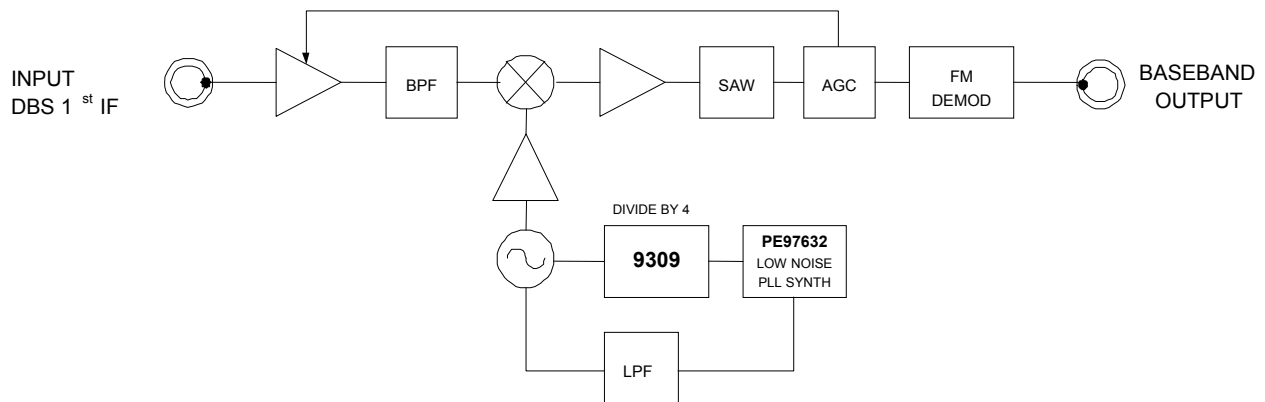
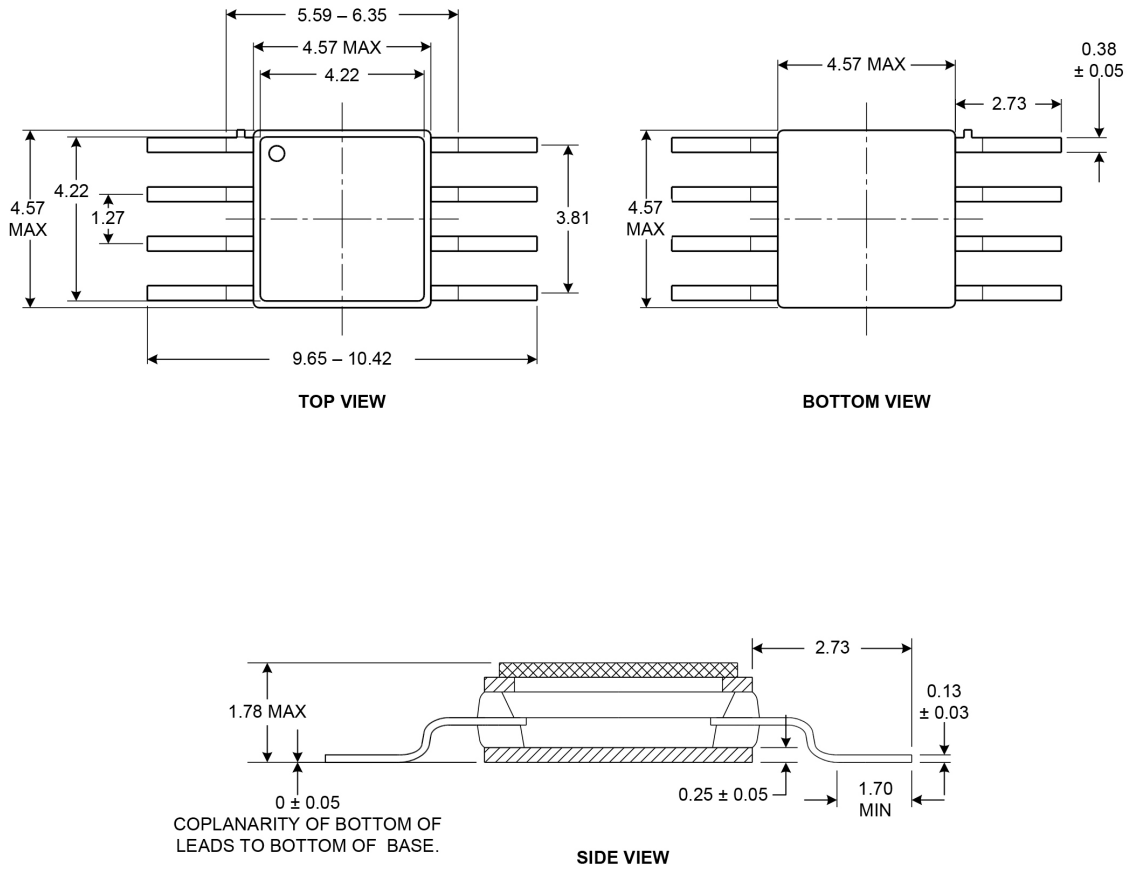


Figure 9. Package Drawing (dimensions are in millimeters)
8-lead CFP

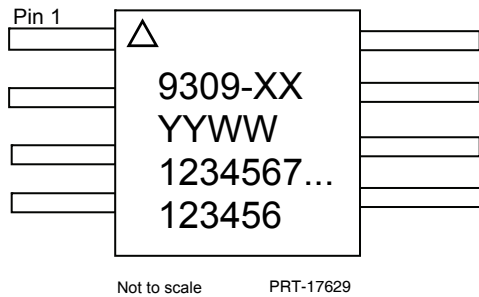
Note: Bottom of the package is ground. Connecting the bottom of the package to ground is required.



DIMS IN MM.
ALL TOLERANCES ARE +/- 0.127
UNLESS OTHERWISE STATED.
NOT TO SCALE

Rev. 97 170809
IIGNALB

Figure 10. Top Marking Specifications



- Line 1: Pin 1 indicator Δ No e2v or Peregrine logos present
- Line 2: Part number (XX will be specified by the purchase order)
- Line 3: Date code (last two digits of the year and work week)
- Line 4: Waferlot # (as many characters as room allows)
- Line 5: DOP # (e2v internal / 5 digits / optional, as room allows)
- Line 6: Serial # (5 digits minimum)

Note: There is **NO** backside symbolization on any of the Peregrine products.

Table 5. Ordering Information

Order Code	Description	Package	Shipping Method
9309-01*	PE9309-08CFPJ-B Engineering samples	8-lead CFP	50 / Tray
9309-11	PE9309-08CFPJ-B Production units	8-lead CFP	50 / Tray
9309-00	PE9309 Evaluation kit	Evaluation kit	1 / Box

Note: * The 9309-01 devices are engineering sample (ES) prototype units intended for use as initial evaluation units for customers of the PE9309-11 flight units. The PE9309-01 device provides the same functionality and footprint as the PE9309-11 space qualified device, and intended for engineering evaluation only. They are tested at +25 °C only and processed to a non-compliant flow (e.g. no burn-in, non-hermetic, etc). These units are non-hermetic and are not suitable for qualification, production, radiation testing or flight use.

Sales Contact and Information

Contact Information:
e2v - <http://www.teledyne-e2v.com> - inquiries@e2v-us.com

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Preliminary Specification: The datasheet contains preliminary data. Additional data may be added at a later date. Peregrine reserves the right to change specifications at any time without notice in order to supply the best possible product.
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