PE3503

3.5 GHz Low Power CMOS Divide-by-8 Prescaler

Product Description

The PE3503 is a high performance monolithic CMOS prescaler with a fixed divide ratio of 8. Its operating frequency range is 1.5 GHz to 3.5 GHz. The PE3503 operates on a nominal 3 V supply and draws only 12 mA. It is packaged in a small 8-lead MSOP and is ideal for microwave PLL synthesis solutions.

The PE3503 is manufactured in Peregrine's patented Ultra Thin Silicon (UTSi©) CMOS process, offering the performance of GaAs with the economy and integration of conventional CMOS.

Features

- High-frequency operation: 1.5 GHz to 3.5 GHz
- Fixed divide ratio of 8
- Low-power operation: 12 mA typical @ 3 V across frequency
- Small package: 8-lead MSOP
- Low Cost
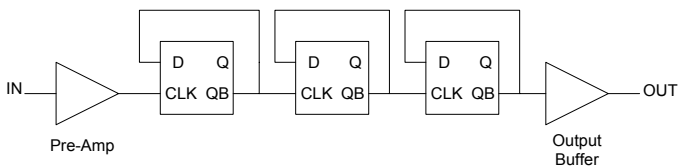
Figure 1. Functional Schematic Diagram
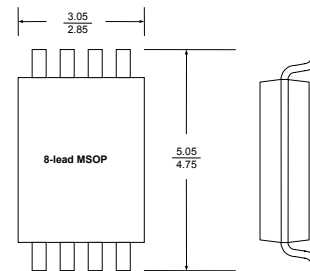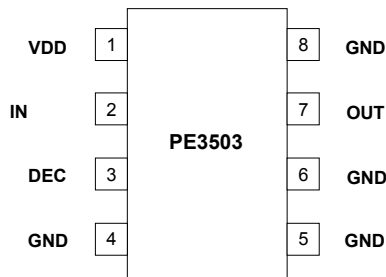

Figure 2. Package Drawing

Table 1. Electrical Specifications ($Z_S = Z_L = 50\ \Omega$)

V_{DD} = 3.0 V, -40° C < T_A < 85° C, unless otherwise specified

Parameter	Minimum	Typical	Maximum	Units
Supply Voltage	2.85	3.0	3.15	V
Supply Current		12	17	mA
Frequency Range (F_{IN})	1.5		3.5	GHz
Input Power (P_{IN})	-10		+5	dBm
Output Power	-5			dBm

Figure 3. Pin Configuration

VDD	1		8	GND
IN	2	PE3503	7	OUT
DEC	3		6	GND
GND	4		5	GND

Table 2. Pin Descriptions

Pin No.	Pin Name	Description
1	VDD	Power supply pin. Bypassing is required.
2	IN	Input signal pin. Should be coupled with a capacitor (eg 15pF)
3	DEC	Power supply decoupling pin. Place a capacitor as close as possible and connect directly to the ground plane (eg 10 nF and 10 pF).
4	GND	Ground pin. Ground pattern on the board should be as wide as possible to reduce ground impedance.
5	GND	Ground pin.
6	GND	Ground pin.
7	OUT	Divided frequency output pin. This pin should be coupled with a capacitor (eg 100 pF).
8	GND	Ground pin.

Table 3. Absolute Maximum Ratings

Symbol	Parameter/Conditions	Min	Max	Units
VDD	Supply voltage		4.0	V
T_{ST}	Storage temperature range	-65	150	°C
T_{OP}	Operating temperature range	-40	85	°C
VESD	ESD voltage (Human Body Model)		250	V
P_{INMAX}	Maximum input power		10	dBm

Electrostatic Discharge (ESD) Precautions

When handling this UTSi 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 rating specified in Table 3.

Latch-Up Avoidance

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

Device Functional Considerations

The PE3503 takes an input signal frequency from 1.5 GHz to 3.5 GHz and produces an output signal frequency one-eighth that of the supplied input. In order for the prescaler to work properly, several conditions need to be adhered to. It is crucial that pin 3 be supplied with a bypass capacitor to ground. In addition, the input and output signals (pins 2 & 7, respectively) need to be AC coupled via an external capacitor as shown in the test circuit in Figure 7.

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

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Typical Performance Data

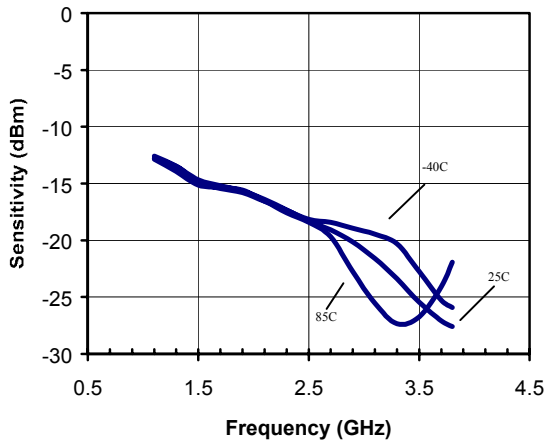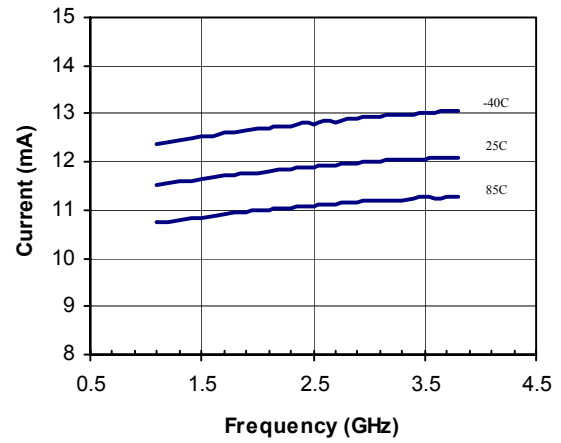### Figure 4. Input Sensitivity

Figure 5. Device Current
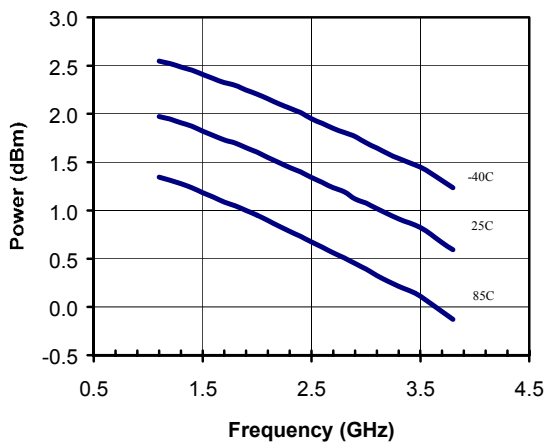

Figure 6. Output Power
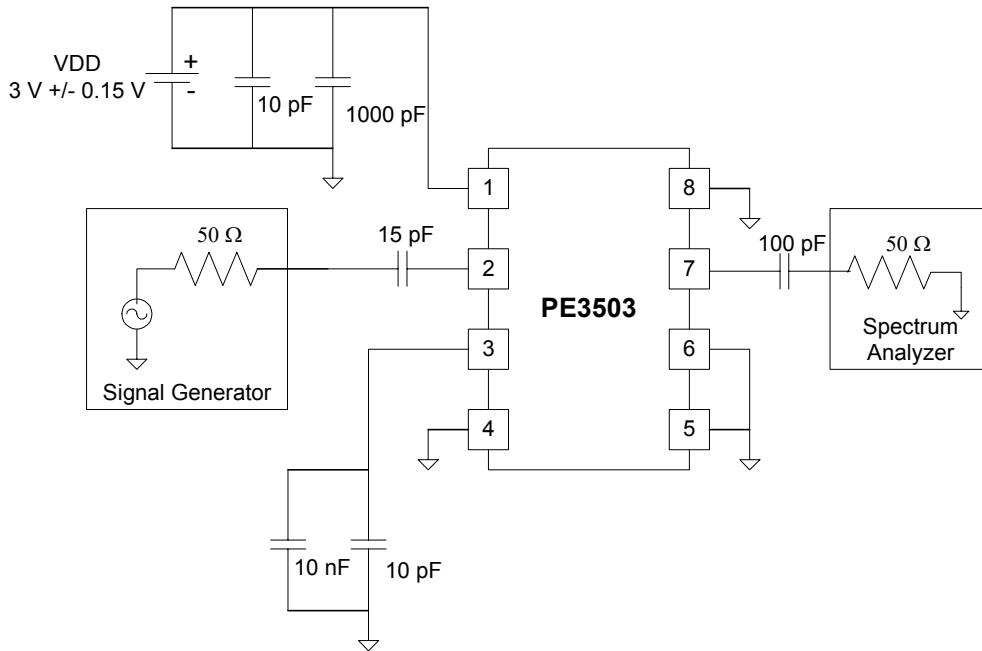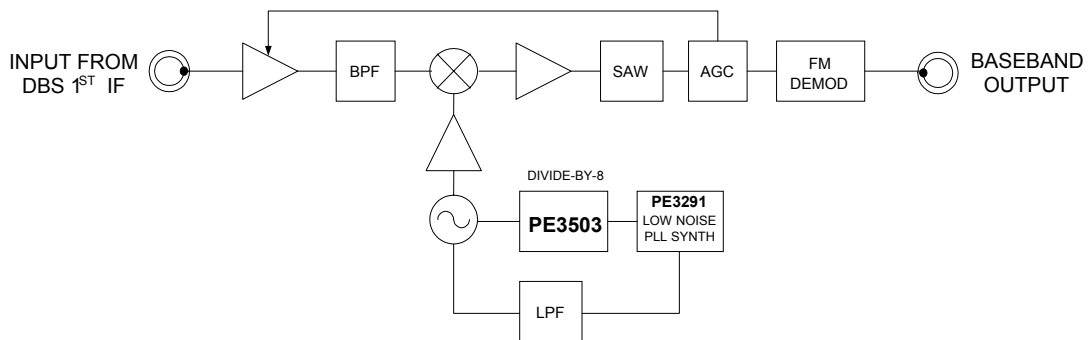
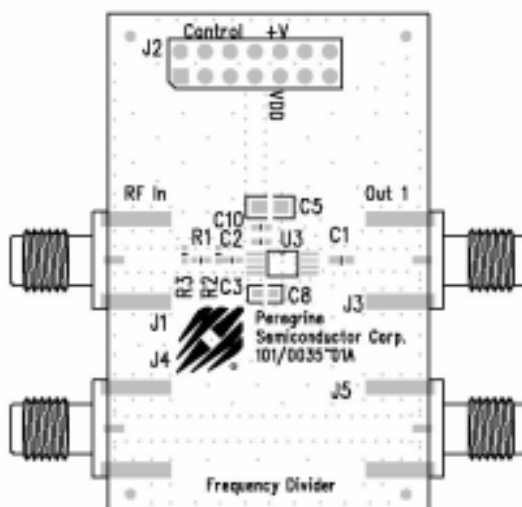## Figure 7. Test Circuit Block Diagram

Figure 8. High Frequency System Application

The wideband frequency of operation of the PE3503 makes it an ideal part for use in a DBS downconverter system.

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Evaluation Board Description

The PE3503 evaluation board is depicted below in Figure 9. The input is driven into the RF In port while the divided output is taken at Out 1. Both input and output contain footprints for AC coupling capacitors (C3 and C1 respectively). The power supply connection is provided near the top of the evaluation board (J2) with the lower pin as the supply and the upper pin as ground. In addition C2, C5, and C10 are placeholders for power supply decoupling capacitors. Placeholders C4, C6, and C8 are needed for required bypass capacitors. Note: C4 and C6 are located on the underside of the evaluation board.

Figure 9. PE3503 Evaluation Board

Evaluation Board Test Setup

The PE3503 can be tested on the evaluation board using the test setup shown in the Test Circuit Block Diagram. In the test setup, it is essential that the power supply is properly decoupled and bypass capacitors are used for pin 3. In addition, the input and output need to be AC coupled.

Testing

Test measurements were made using the test setup depicted above. With a nominal supply of 2.85 volts, the input signal generator was swept from 1500 MHz to 3500 MHz with the input power set at –10 dBm. The output power was measured with a power meter.

Applications Support

If you have a problem with your evaluation kit or if you have applications questions call (858) 455-0660 and ask for applications support. You may also contact us by fax or e-mail:

Fax: (858) 455-0770
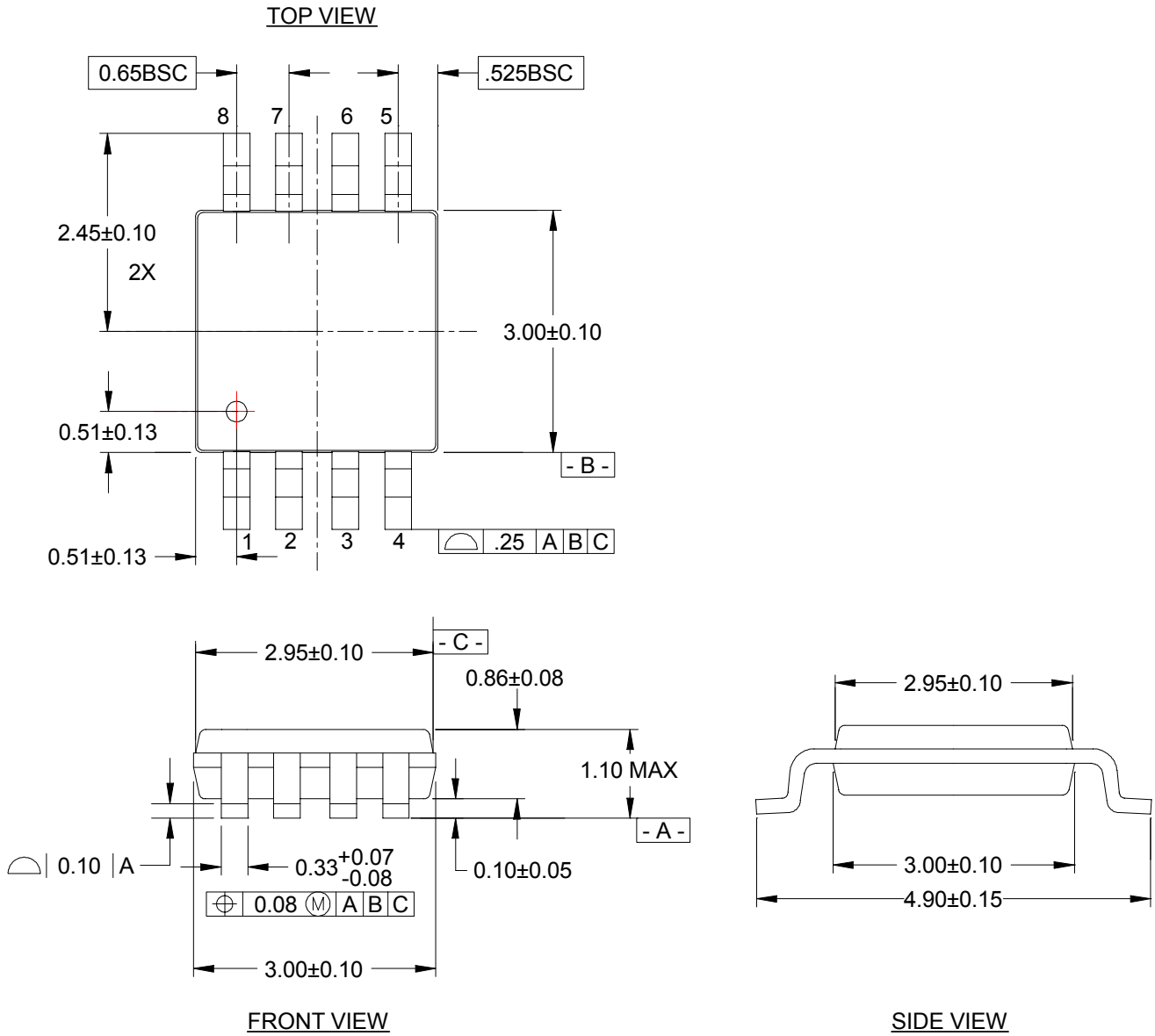**E-Mail:** help@peregrine-semi.com

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Figure 10. Package Drawing

8-lead MSOP

TOP VIEW

FRONT VIEW

SIDE VIEW

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Table 4. Ordering Information

Order Code	Part Marking	Description	Package	Shipping Method
3503-21	3503		8-lead MSOP	50 pcs. / Tube
3503-22	3503		8-lead MSOP	2000 pcs. / T&R
3503-00	PE3503-EK		Evaluation Board	1 / Box

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For a list of representatives in your area, please refer to our Web site at: ***http://www.peregrine-semi.com***

Data Sheet Identification

Advance Information

The product is in a formative or design stage. The data sheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The data sheet 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.

Product Specification

The data sheet contains final data. In the event Peregrine decides to change the specifications, Peregrine will notify customers of the intended changes by issuing a PCN (Product Change Notice).