

PE3501

Product Description

The PE3501 is a high-performance monolithic CMOS prescaler with a fixed divide ratio of 2. Its operating frequency range is 1.5 GHz to 3.5 GHz. The PE3501 operates on a nominal 3 V supply and draws only 12 mA. It is packaged in a small 8-lead TSSOP and is ideal for microwave PLL synthesis solutions.

The PE3501 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.

3.5 GHz Low Power CMOS Divide-by-2 Prescaler

Features

- High-frequency operation: 1.5 GHz to 3.5 GHz
- Fixed divide ratio of 2
- Low-power operation: 12 mA typical @ 3 V across frequency
- Small package: 8-lead TSSOP
- Low Cost

Figure 1. Functional Schematic Diagram

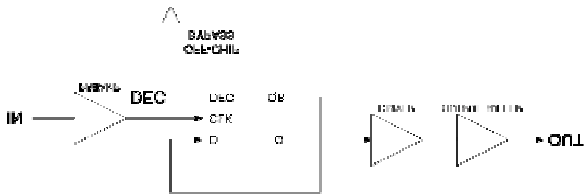


Figure 2. Package Drawing

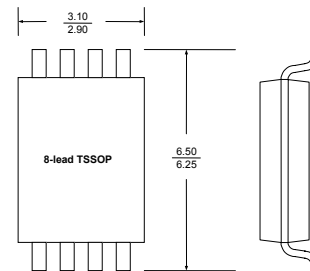
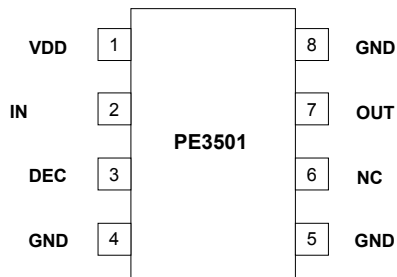


Table 1. Electrical Specifications ($Z_S = Z_L = 50 \Omega$)

$V_{DD} = 3.0 \text{ V}$, $-40^\circ \text{ C} < T_A < 85^\circ \text{ C}$, unless otherwise specified

Parameter	Conditions	Minimum	Typical	Maximum	Units
Supply Voltage		2.85	3.0	3.15	V
Supply Current			12	14	mA
Input Frequency (F_{IN})	$P_{IN} = -5 \text{ dBm min.}$	1.5		3.5	GHz
Input Power (P_{IN})	$F_{IN} = 1.5 \text{ TO } 2.0 \text{ GHz}$	-12		+5	dBm
	$F_{IN} = 2.0 \text{ TO } 2.7 \text{ GHz}$	-15		+5	dBm
	$F_{IN} = 2.7 \text{ TO } 3.5 \text{ GHz}$	-5		+5	dBm
Output Power		-10			dBm

Figure 3. Pin Configuration

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.
4	GND	Ground pin. Ground pattern on the board should be as wide as possible to reduce ground impedance.
5	GND	Ground pin.
6	NC	No Connection. This pin should be left open.
7	OUT	Divided frequency output pin. This pin should be coupled with a capacitor (eg 47 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

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 PE3501 takes an input signal frequency from 1.5 GHz to 3.5 GHz and produces an output signal frequency half 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.

Figure 4. Test Circuit Block Diagram

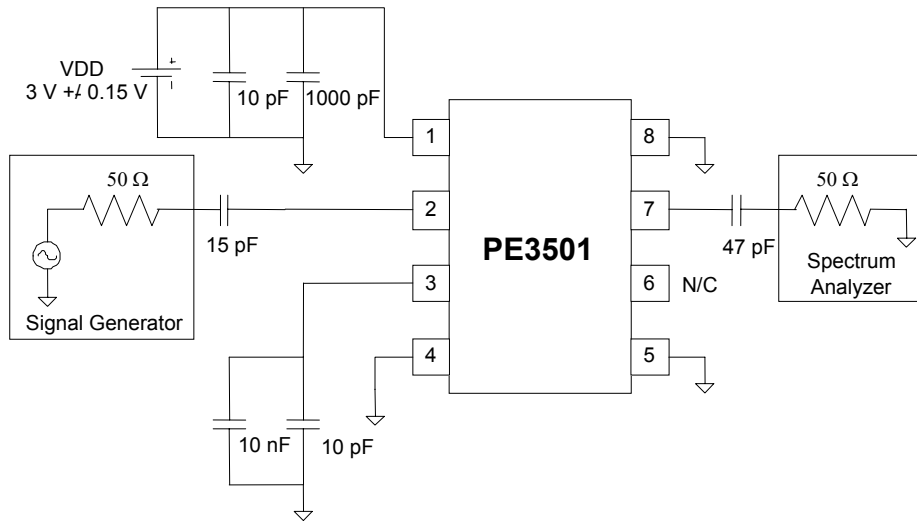
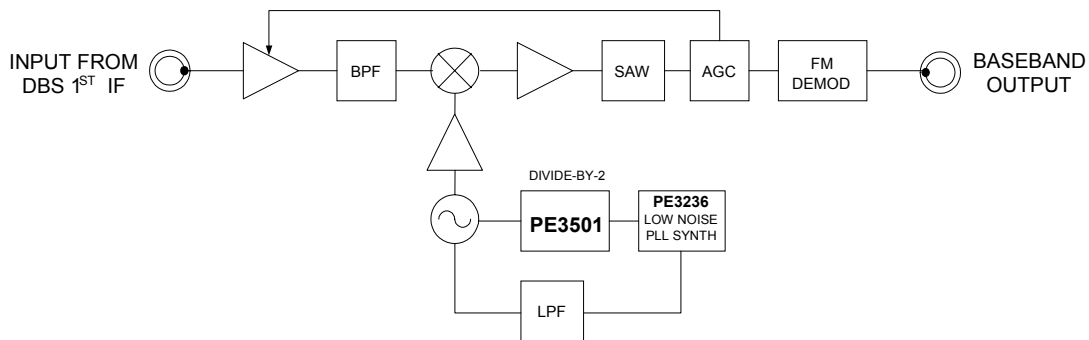


Figure 5. High Frequency System Application

The wideband frequency of operation of the PE3501 makes it an ideal part for use in a DBS downconverter system.



Typical Performance Data @ +25 °C

Figure 6. Typical Input Sensitivity

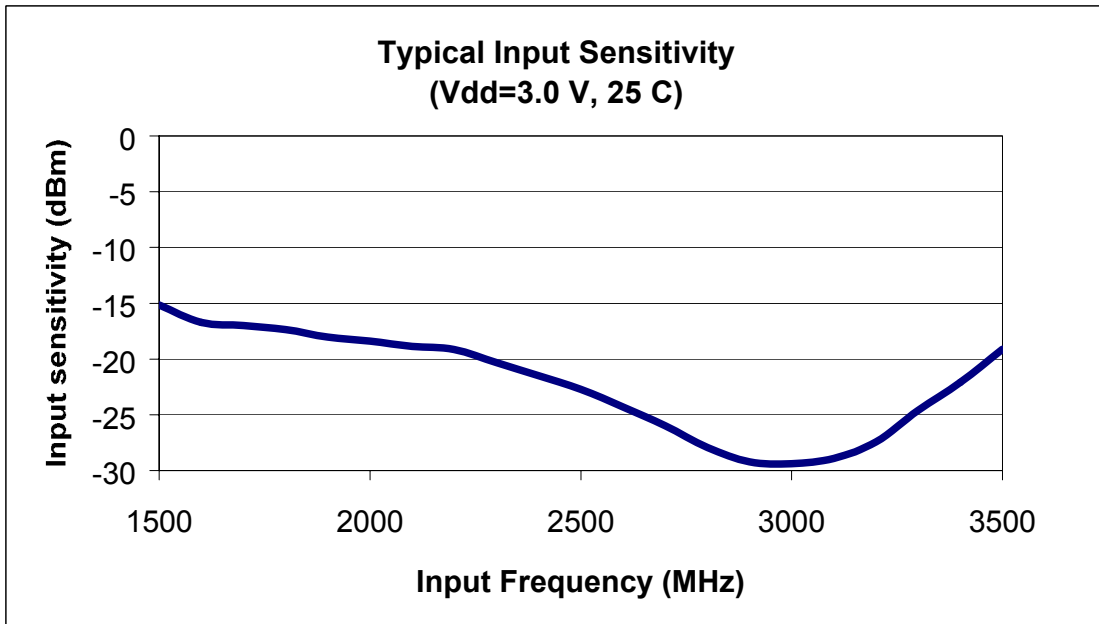
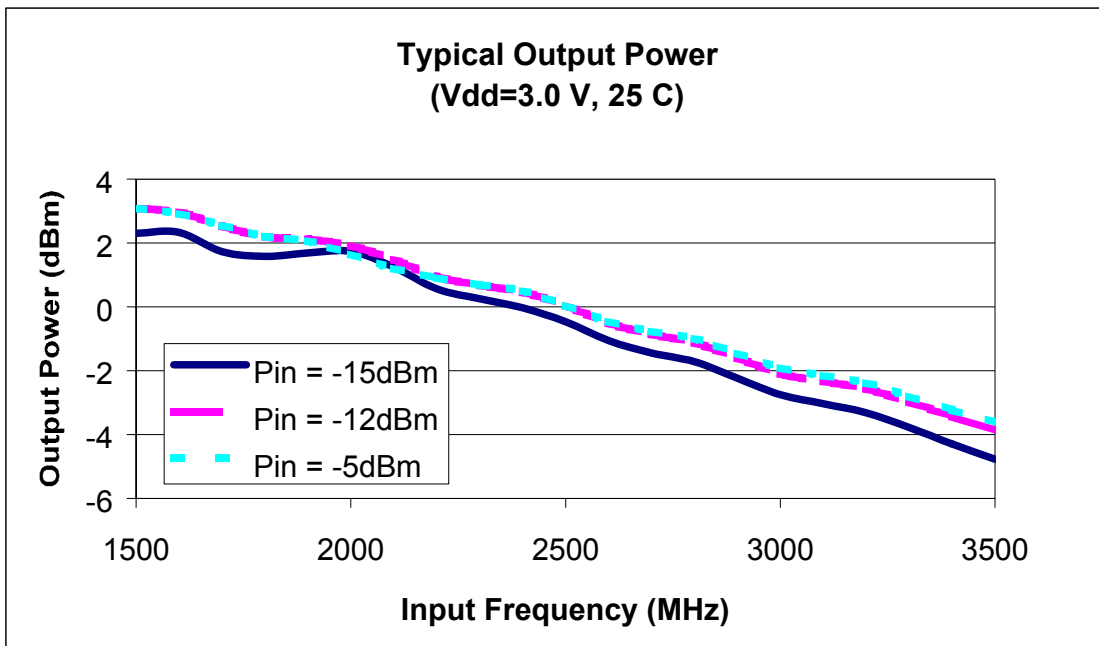


Figure 7. Typical Output Power



Typical Performance Data @ +25 °C

Table 4. S11

Input Frequency (GHz)	S11 Magnitude	S11 Angle (deg)
1.5	0.816	-23.738
1.6	0.802	-24.910
1.7	0.804	-24.748
1.8	0.824	-26.894
1.9	0.824	-29.343
2.0	0.822	-31.118
2.1	0.821	-33.050
2.2	0.817	-35.060
2.3	0.815	-36.939
2.4	0.813	-39.006
2.5	0.806	-41.149
2.6	0.799	-43.534
2.7	0.790	-46.256
2.8	0.778	-48.921
2.9	0.764	-52.132
3.0	0.744	-55.091
3.1	0.725	-58.411
3.2	0.702	-62.405
3.3	0.678	-66.439
3.4	0.652	-70.959
3.5	0.627	-76.275

Table 5. S22

Output Frequency (GHz)	S22 Magnitude	S22 Angle (deg)
0.75	0.309	9.866
0.80	0.310	2.634
0.85	0.309	5.011
0.90	0.309	4.704
0.95	0.324	3.422
1.00	0.331	2.487
1.05	0.333	1.268
1.10	0.336	0.252
1.15	0.336	-1.149
1.20	0.353	-1.979
1.25	0.342	-2.921
1.30	0.343	-3.891
1.35	0.342	1.641
1.40	0.347	-5.165
1.45	0.367	-3.504
1.50	0.362	-7.175
1.55	0.360	-7.217
1.60	0.362	-9.751
1.65	0.370	-10.785
1.70	0.372	-11.949
1.75	0.375	-13.645

Figure 8. S11 vs. Input Frequency (VDD = 3 V)

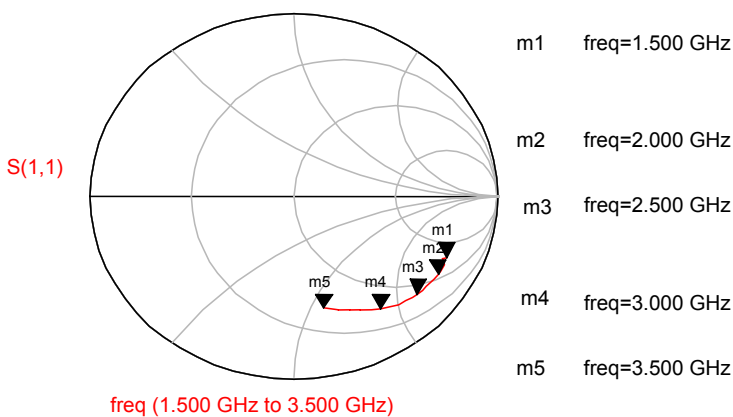


Figure 9. S22 vs. Output Frequency (VDD = 3 V)

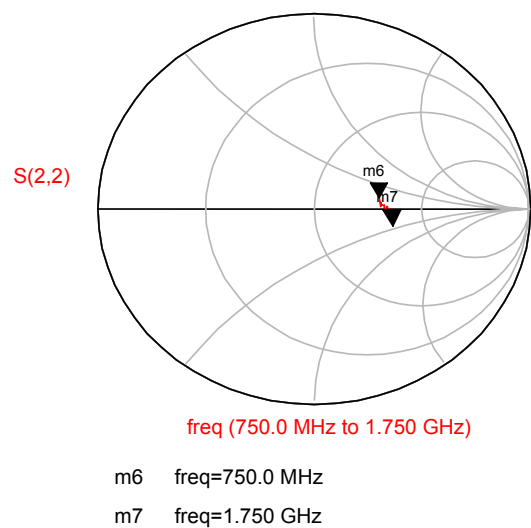


Figure 10. Package Drawing

8-Lead TSSOP

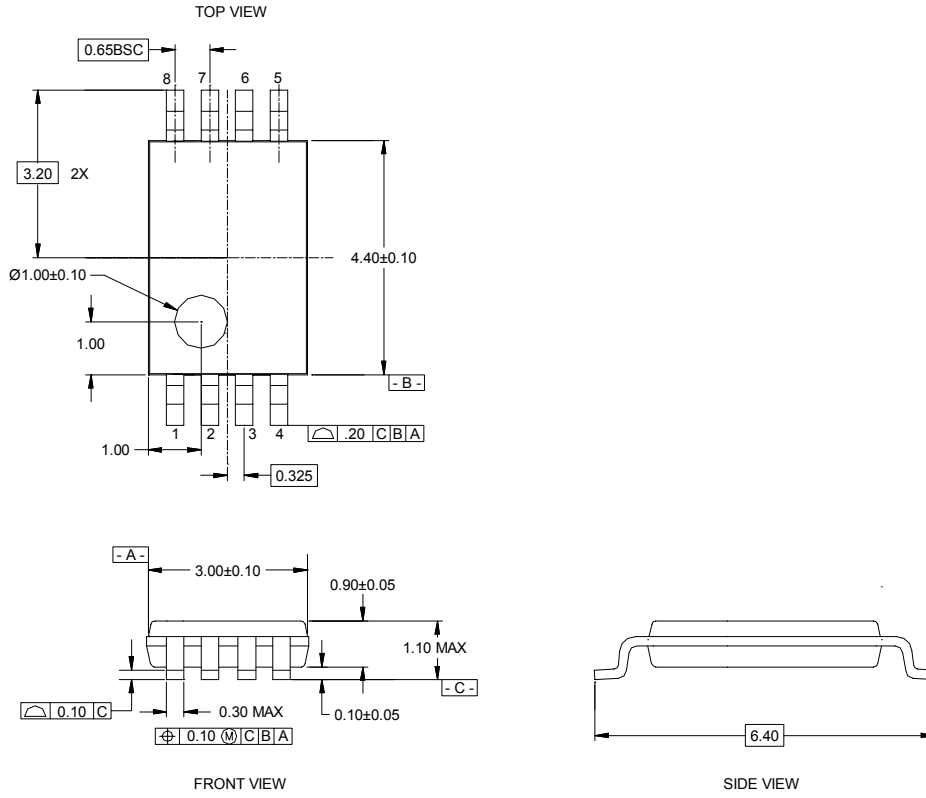


Table 6. Ordering Information

Order Code	Part Marking	Description	Package	Shipping Method
3501-21	PE3501		8-lead TSSOP	100 pcs. / Tube
3501-22	PE3501		8-lead TSSOP	2000 pcs. / T&R
3501-00	PE3501-EK		Evaluation Board	1 / Box

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Data Sheet Identification

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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.

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