

# PE4122

**UltraCMOS™ High Linearity Quad MOSFET Mixer For PCS & 3G BTS**

### Features

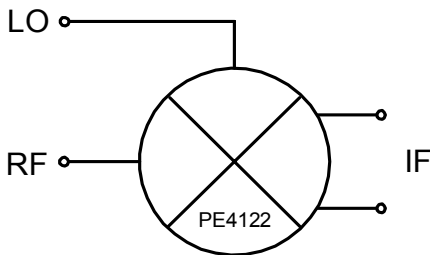
- Integrated, single-ended RF & LO interfaces
- High linearity: IIP3 >+ 30 dBm, 1.8 - 2.0 GHz (+17 dBm LO)
- Low-conversion loss: 7.4 dB (+17 dBm LO)
- High isolation: typical LO-IF at 38 dB, LO-RF at 34 dB
- Designed for low-side LO injection

### Product Description

The PE4122 is a high linearity, passive Quad MOSFET Mixer for PCS & 3G Base Station Receivers, exhibiting high dynamic range performance over a broad LO drive range up to +20 dBm. This mixer integrates passive matching networks to provide single-ended interfaces for the RF and LO ports, eliminating the need for external RF baluns or matching networks. The PE4122 is optimized for frequency down-conversion using low-side LO injection for PCS & 3G Base Station applications, and is also suitable for use in up-conversion applications.

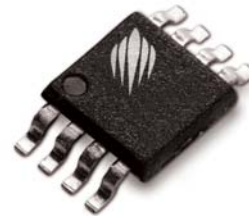
The PE4122 is manufactured on Peregrine's UltraCMOS™ process, a patented variation of silicon-on-insulator (SOI) technology on a sapphire substrate, offering the performance of GaAs with the economy and integration of conventional CMOS.

**Figure 1. Functional Diagram**



**Figure 2. Package Type**

8-lead TSSOP



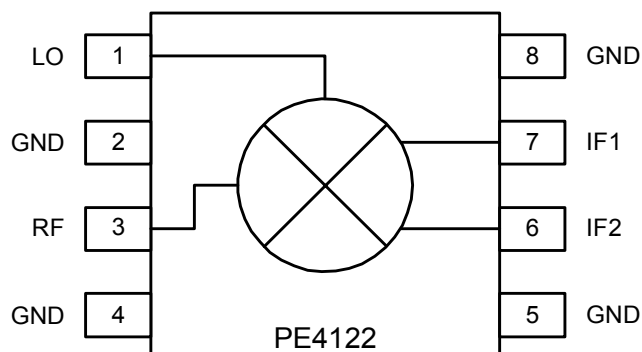
**Table 1. AC and DC Electrical Specifications @ +25 °C (Z<sub>S</sub> = Z<sub>L</sub> = 50 Ω)**

Parameter	Minimum	Typical	Maximum	Units
Frequency Range:				
LO	1540	--	1740	MHz
RF	1800	--	2000	MHz
IF <sup>1</sup>	--	260	--	MHz
Conversion Loss <sup>2</sup>		7.4	7.8	dB
Isolation:				
LO-RF	28	34		dB
LO-IF	34	38		dB
Input IP3				
1.8 GHz	28	30		dBm
1.9 GHz	31	33		dBm
2.0 GHz	28	30		dBm
Input 1 dB Compression		20		dBm

Notes: 1. An IF frequency of 260 MHz is a nominal frequency. The IF frequency can be specified by the user as long as the RF and LO frequencies are within the specified maximum and minimum.

2. Conversion Loss includes loss of IF transformer (M/A COM ETK4-2T, nominal loss 0.7dB at 260 MHz).

\*Test conditions unless otherwise noted: LO = 260 MHz, LO input drive = 17 dBm, RF input drive = 0 dBm.

**Figure 3. Pin Configuration (Top View)**

**Table 2. Pin Descriptions**

Pin No.	Pin Name	Description
1	LO	LO Input
2	GND	Ground connection for Mixer. Traces should be physically short and connect immediately to ground plane for best performance.
3	RF	RF Input
4	GND	Ground.
5	GND	Ground.
6	IF2	IF differential output
7	IF1	IF differential output
8	GND	Ground.

**Table 3. Absolute Maximum Ratings**

Symbol	Parameter/Conditions	Min	Max	Units
$T_{ST}$	Storage temperature range	-65	150	°C
$T_{OP}$	Operating temperature range	-40	85	°C
$P_{LO}$	LO input power		20	dBm
$P_{RF}$	RF input power		16	dBm
$V_{ESD}$	ESD Sensitive Device		250	V

Absolute Maximum Ratings are those values listed in the above table. Exceeding these values may cause permanent device damage. Functional operation should be restricted to the limits in the DC Electrical Specifications table. Exposure to absolute maximum ratings for extended periods may affect device reliability.

### Electrostatic Discharge (ESD) Precautions

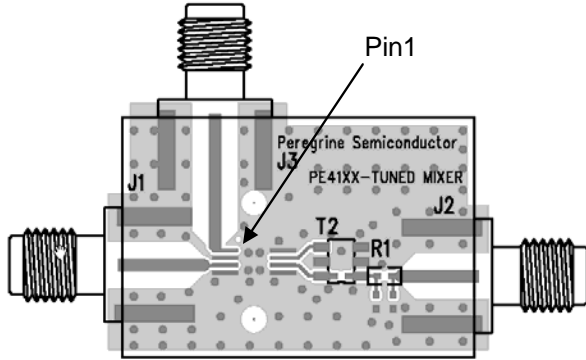
When handling this UltraCMOS™ device, observe the same precautions that you would use with other ESD-sensitive devices. Although this device contains circuitry to protect it from damage due to ESD, precautions should be taken to avoid exceeding the rating specified.

### Latch-Up Avoidance

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

**Evaluation Kit**

**Figure 4. Evaluation Board Layout**  
Peregrine Specification 101/0054



**Table 4. Bill of Materials**

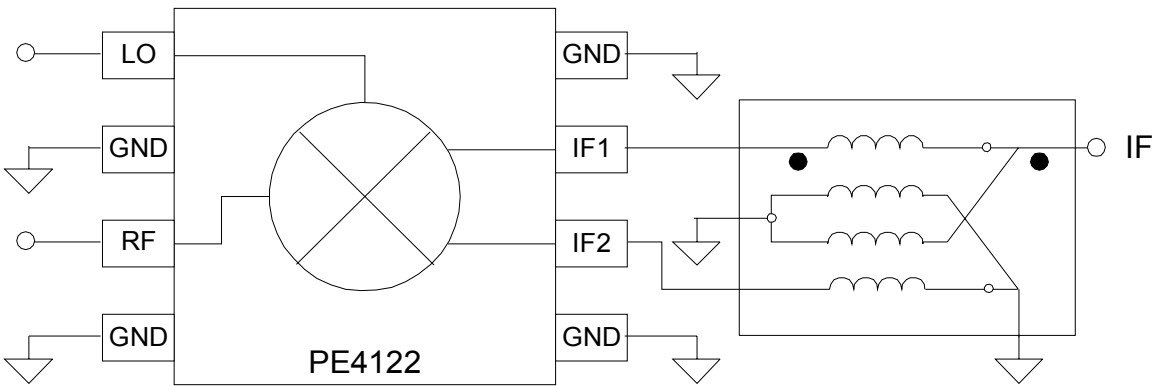
Reference	Value / Description
T2	M/A Com ETK4-2T
U1 (Not Labeled)	PE4122 Mixer
R1	0 Ω
J1, J2, J3	SMA Connector

**Applications Support**

If you have a problem with your evaluation kit or if you have applications questions, please contact applications support:

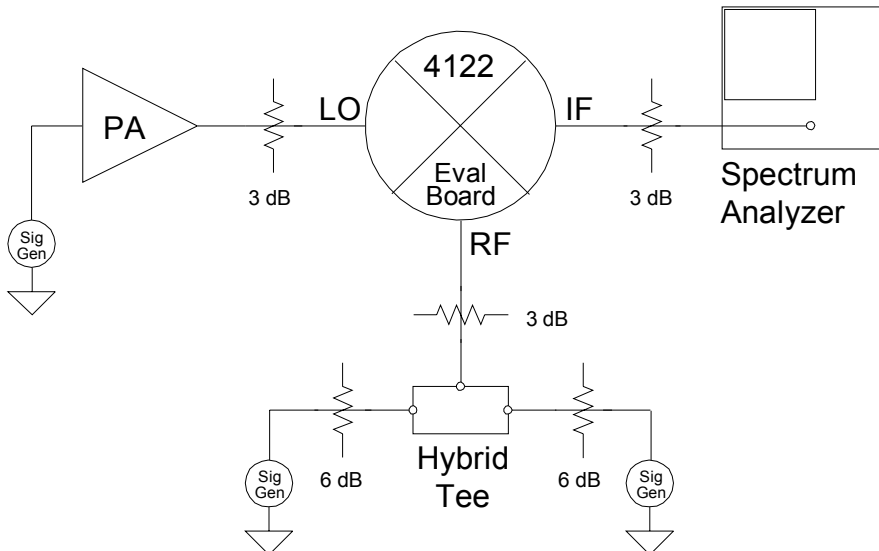
E-Mail: [help@psemi.com](mailto:help@psemi.com) (fastest response)  
Phone: (858) 731-9400

**Figure 5. Evaluation Board Schematic Diagram**



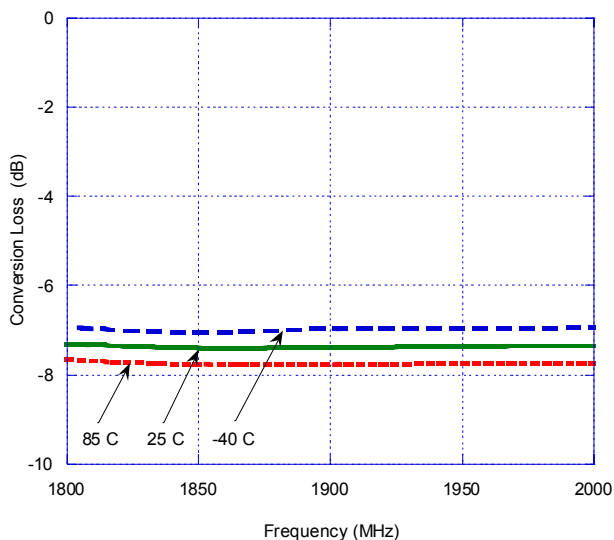
T2 M/A-Com E-Series RF 4:1 Transformer 2.0 – 1000 MHz ETK4-2T

**Figure 6. Evaluation Board Testing Block Diagram, 2-Tone Setup**

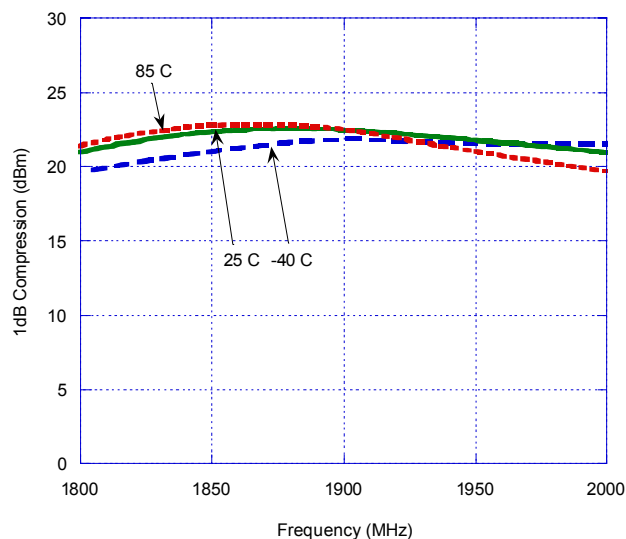


**Typical Performance Data (LO=17 dBm, RF=0 dBm, IF=260 MHz)**

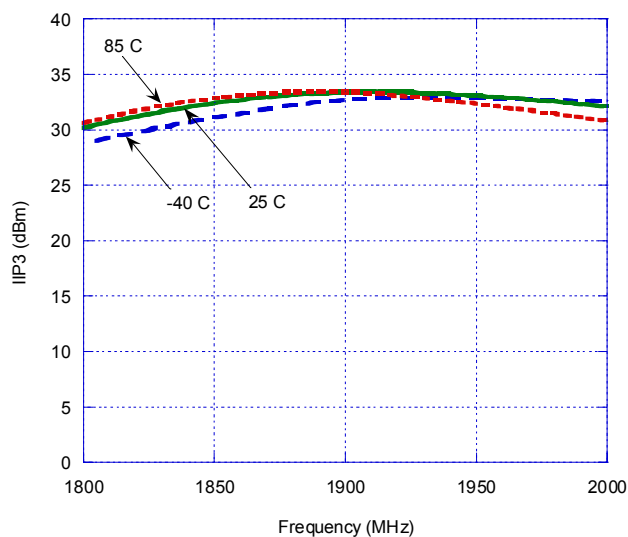
**Figure 7. Conversion Loss vs. Frequency**



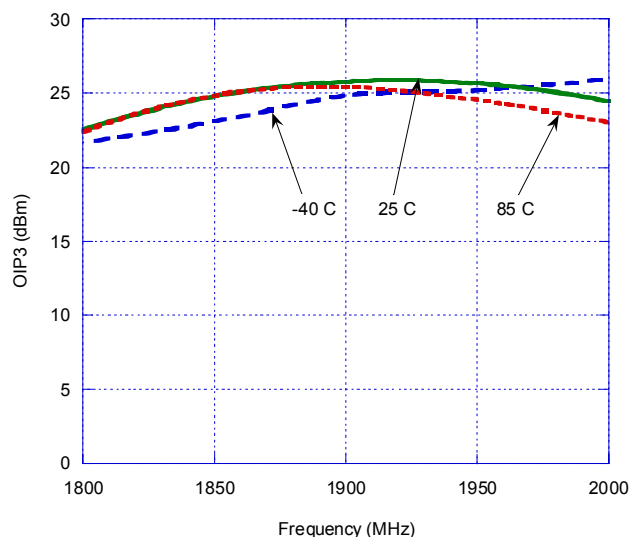
**Figure 8. Input 1dB Compression vs. Frequency**



**Figure 9. Input IP3 vs. Frequency**



**Figure 10. Output IP3 vs. Frequency**



Typical Performance Data (LO=17 dBm, RF=0 dBm, IF=260 MHz)

Figure 11. LO-IF Isolation vs. Temperature

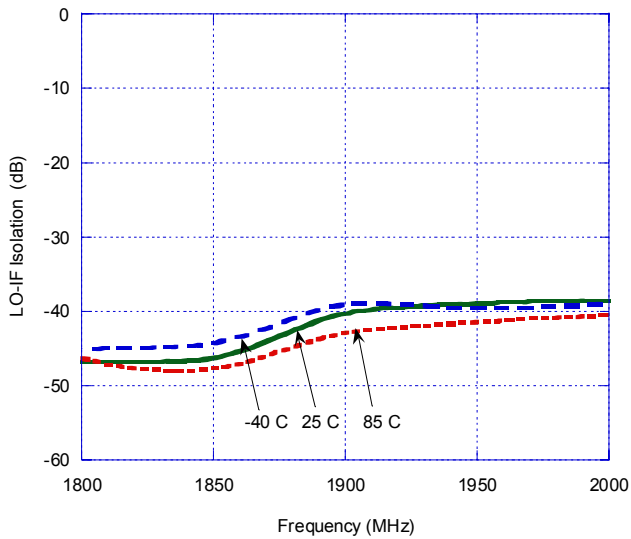


Figure 12. LO-RF Isolation vs. Temperature

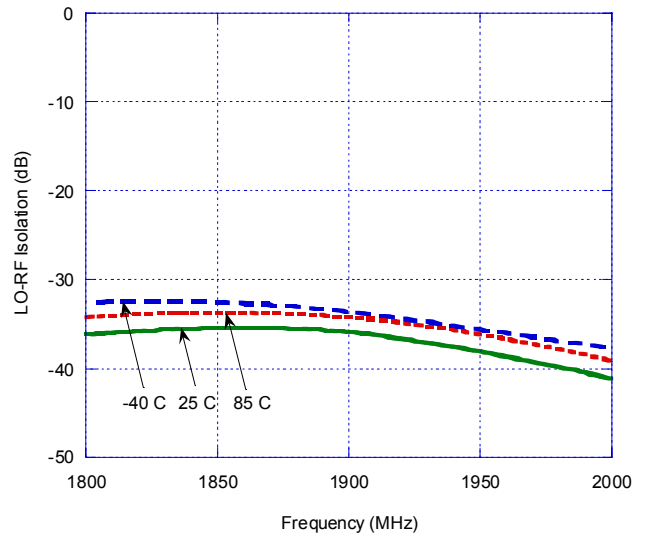


Figure 13. LO Port Return Loss @ 25°C

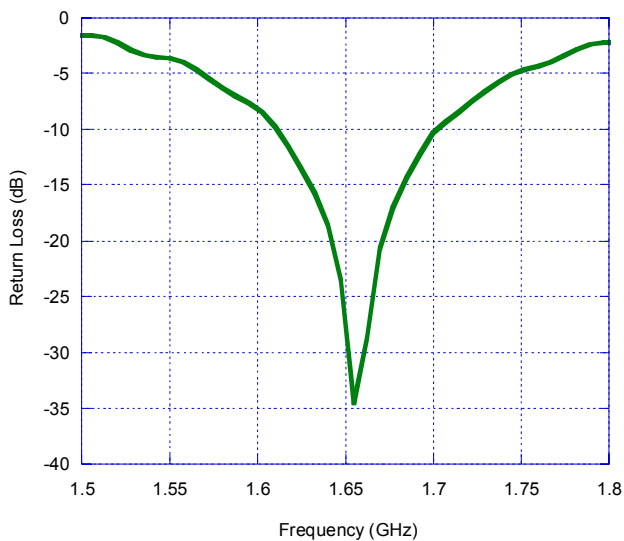
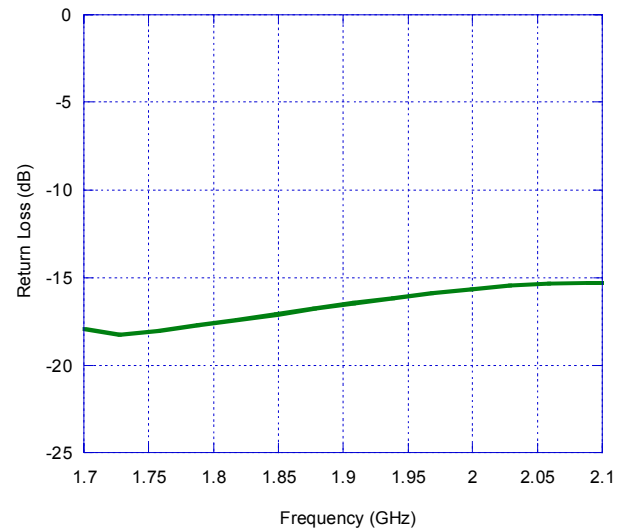


Figure 14. RF Port Return Loss @ 25°C



Typical Performance Data @ +25 °C (RF=0 dBm, IF=260 MHz)

Figure 15. Conversion Loss across LO Power

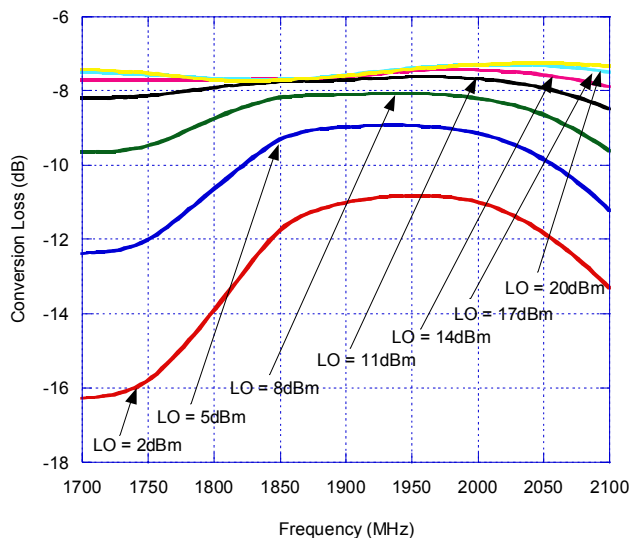


Figure 16. Input IP3 across LO Power

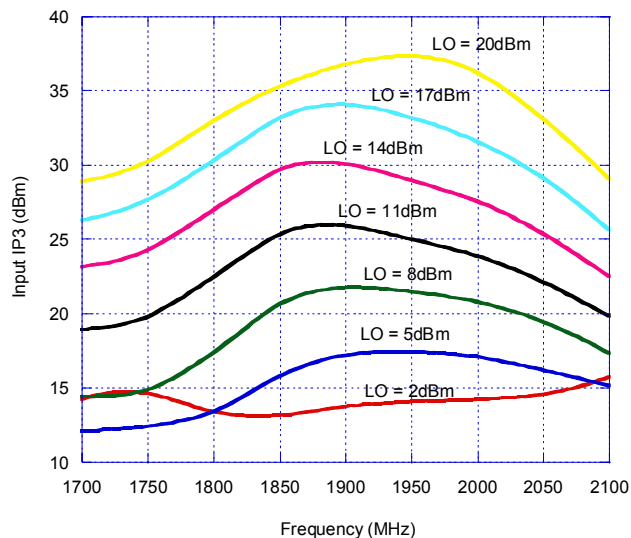


Table 5. Spurious Response

mF <sub>RF</sub>	mF <sub>RF</sub> + nF <sub>LO</sub>				
	nF <sub>LO</sub>				
	0	1	2	3	4
0	---	-33.09	-6.83	-11.49	-8.86
1	-27.64	-5.01	-39.91	-34.08	-58.33
2	-49.53	-50.27	-58.81	-70.85	-81.69
3	-82.93	-83.92	-88.39	-93.79	-86.81
4	>110	>110	>110	>110	>110

Normalized to dB below P<sub>IF</sub>  
(RF=1900 MHz @ 0 dBm, LO = 1640 MHz @ 17 dBm)

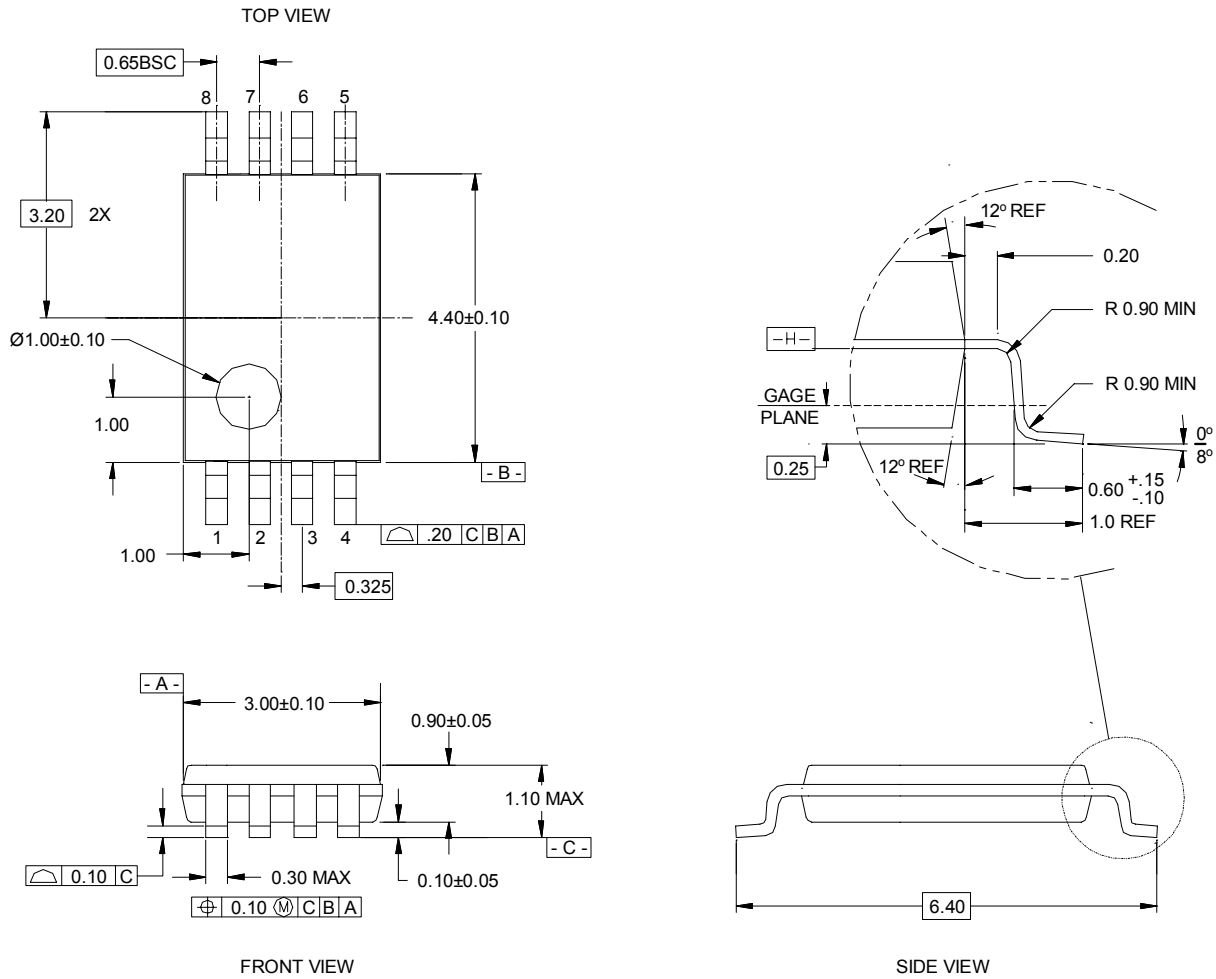
Table 6. Spurious Response

mF <sub>RF</sub>	mF <sub>RF</sub> - nF <sub>LO</sub>				
	nF <sub>LO</sub>				
	0	1	2	3	4
0	---	-33.09	-6.83	-11.49	-8.86
1	-27.64	0.00	-28.79	-18.38	-33.83
2	-49.53	-62.22	-53.59	-69.13	-65.66
3	-82.93	-75.81	-72.79	-73.00	-71.97
4	>110	>110	>110	-95.65	-93.44

Normalized to dB below P<sub>IF</sub>  
(RF=1900 MHz @ 0 dBm, LO = 1640 MHz @ 17 dBm)

**Figure 17. Package Drawing**

8-lead TSSOP



**Table 7. Ordering Information**

Order Code	Part Marking	Description	Package	Shipping Method
4122-21	4122	PE4122-08TSSOP-100A	8-lead TSSOP	100 units / Tube
4122-22	4122	PE4122-08TSSOP-2000C	8-lead TSSOP	2000 units / T&R
4122-00	4122-EK	PE4122-08TSSOP-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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