PEREGRINE SEMICONDUCTOR

PRODUCT SPECIFICATION

PE4135

High Linearity Quad MOSFET Mixer for GSM800 & Cellular BTS

Features

- Integrated, single-ended RF & LO interfaces
- High linearity: Typical IIP3 at 32dBm 820 – 920 MHz (+17 dBm LO)
- Low conversion loss: 6.8 dB (+17 dBm LO)
- High isolation: Typical LO-IF at 42 dB, LO-RF at 32 dB
- Packaged in a 6-lead 3x3mm MLPM

Product Description

The PE4135 is a high linearity, passive Quad MOSFET Mixer for GSM800 & Cellular Base Station Receivers, exhibiting high dynamic range performance over a broad LO drive range of 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 PE4135 is optimized for frequency down-conversion using low-side LO injection for GSM800 & Cellular Base Station application, and is also suitable for up-conversion applications.

The PE4135 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.

Figure 1. Functional Schematic Diagram

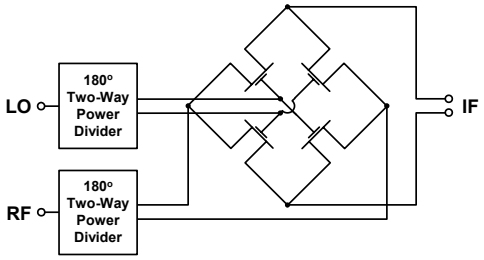


Figure 2. Package Type

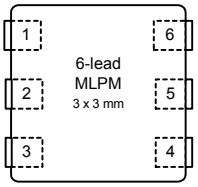


Table 1. Electrical Specifications @ +25°C

Parameter	Minimum	Typical	Maximum	Units
Frequency Range:				
LO	750	--	850	MHz
RF	820	--	920	MHz
IF*	--	70	--	MHz
Conversion Loss**		6.8	7.3	dB
Isolation:				
LO-RF	30	32		dB
LO-IF	40	42		dB
Input IP3	29	32		dBm
Input 1 dB Compression		21		dBm

**An IF frequency of 70 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.*

***Conversion Loss includes loss of IF transformer (M/A COM ETC1-1-13, nominal loss 0.7 dB at 70 MHz).*

Test conditions unless otherwise noted: IF = 70 MHz, LO input drive = 17 dBm, RF input drive = 3 dBm.

Figure 3. Pin Configuration

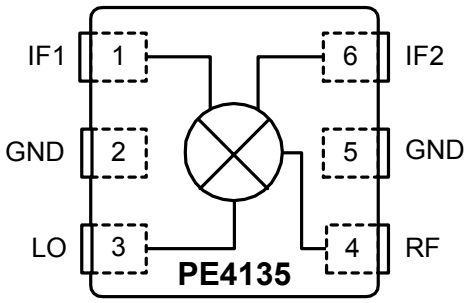


Table 2. Pin Descriptions

Pin No.	Pin Name	Description
1	IF1	IF differential output.
2	GND	Ground connections for Mixer. Traces should be physically short and connect immediately to ground plane for best performance. The exposed solder pad must also be soldered to the ground plane for best performance.
3	LO	LO Input.
4	RF	RF Input.
5	GND	Ground connections for Mixer. Traces should be physically short and connect immediately to ground plane for best performance. The exposed solder pad must also be soldered to the ground plane for best performance.
6	IF2	IF differential output.

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		12	dBm
V_{ESD}	ESD Sensitive Device		250	V

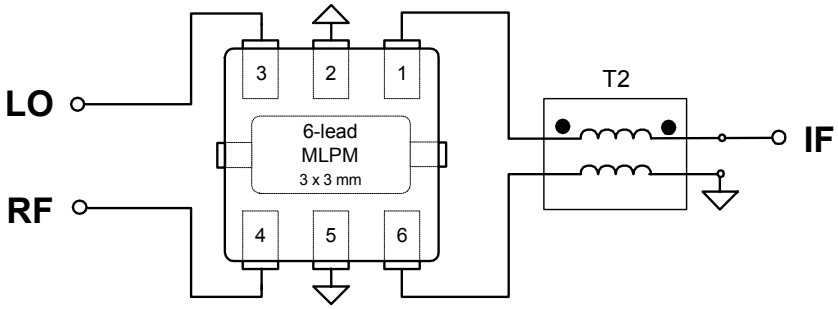
Electrostatic Discharge (ESD) Precautions

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.

Latch-Up Avoidance

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

Figure 4. Evaluation Board Schematic Diagram



T2, M/A-Com E-Series RF 1:1 Transformer, 4.5 – 3000 MHz, ETC1-1-13

Figure 5. Evaluation Board Layout

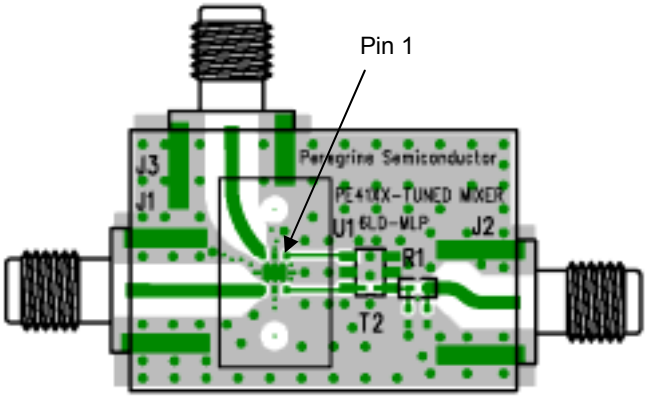
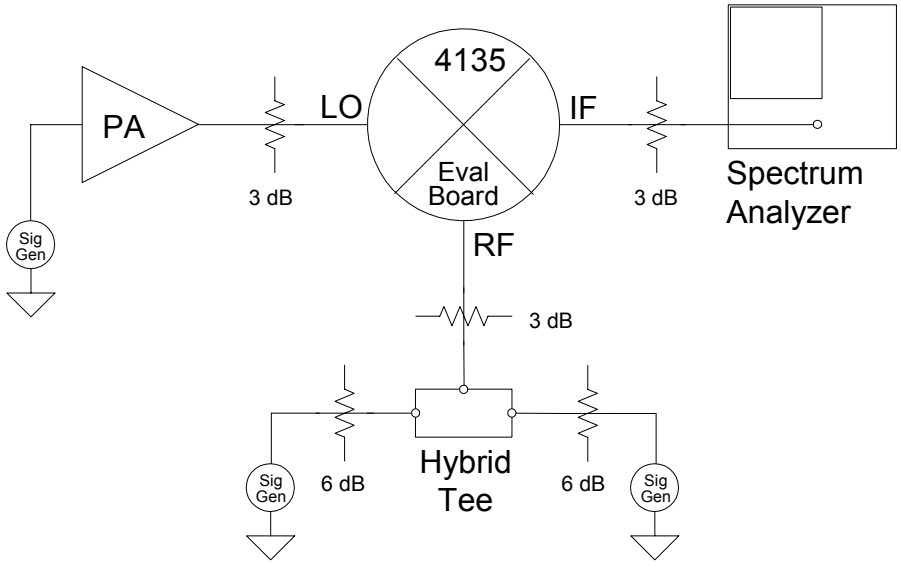


Table 4. Bill of Materials

Reference	Value / Description
T2	M/A Com ETK1-1-13
R1	0Ω
U1	PE4135 MLP Mixer
J1, J2, J3	SMA Connector

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



Typical Performance Data (LO=17 dBm, RF=3 dBm, IF=70 MHz)

Figure 7. Conversion Loss

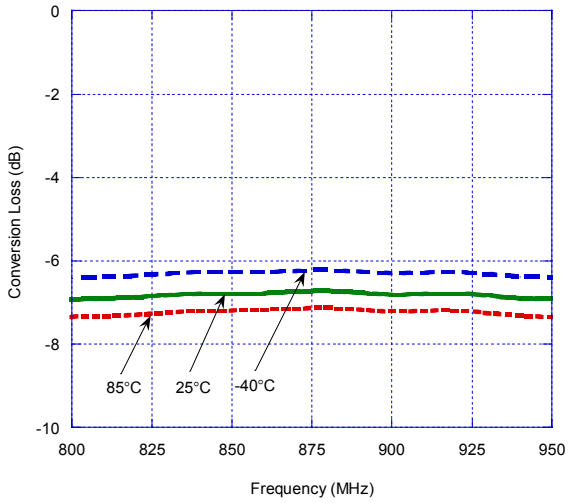


Figure 8. Input 1dB Compression

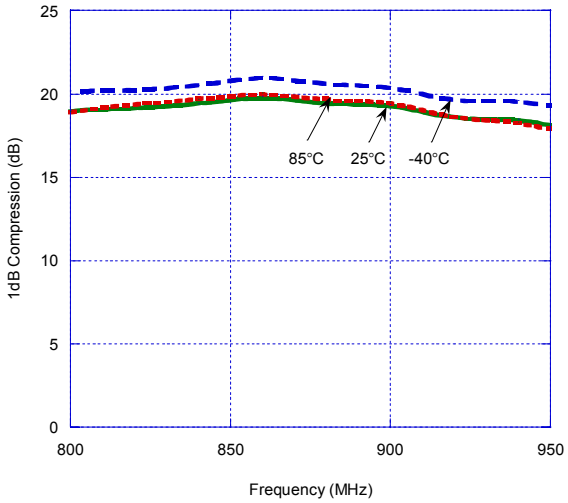


Figure 9. Input IP3 @ -40 °C to 85 °C

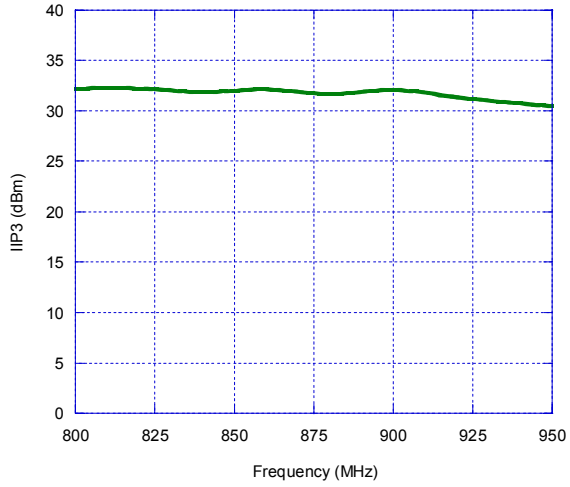
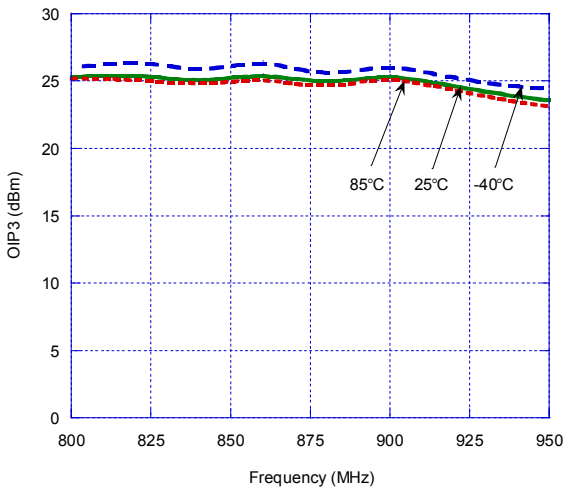


Figure 10. Output IP3



Typical Performance Data (LO=17 dBm, RF=3 dBm, IF=70 MHz)

Figure 11. LO-IF Isolation

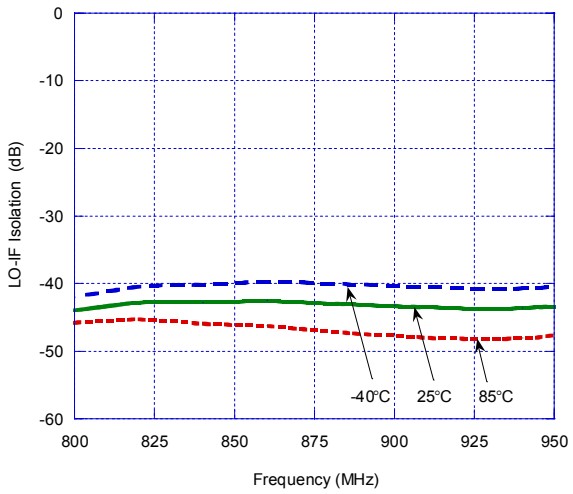


Figure 12. LO-RF Isolation

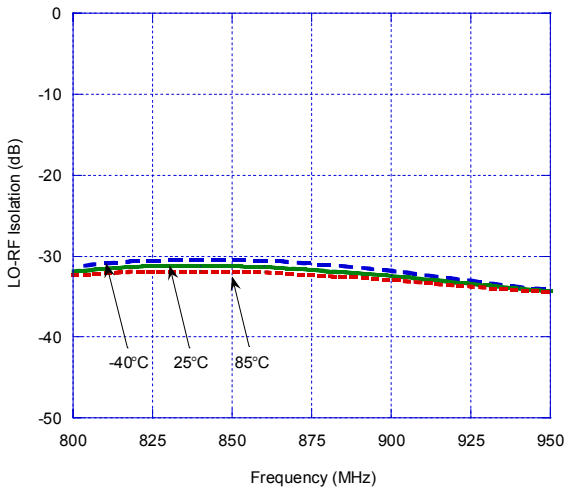


Figure 13. LO Port Return Loss @ 25°C

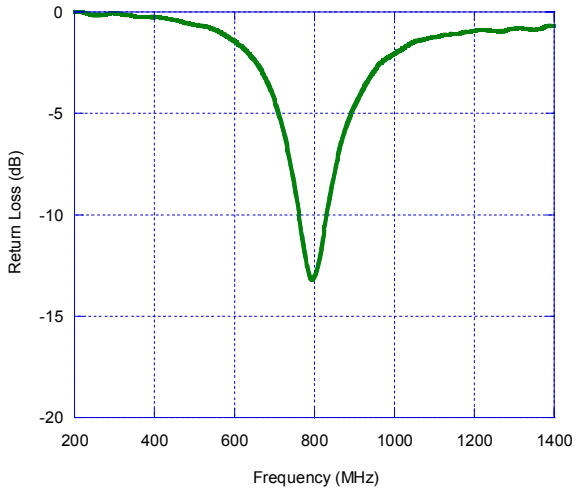
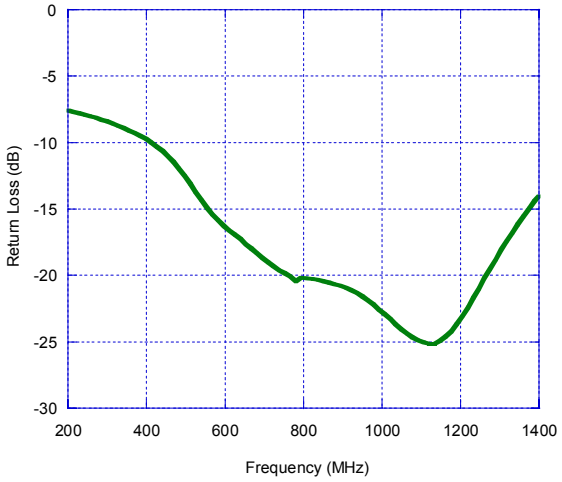


Figure 14. RF Port Return Loss @ 25°C



Typical Performance Data (LO=17 dBm, RF=3 dBm, IF=70 MHz)

Figure 15. Input IP3 Across LO Power

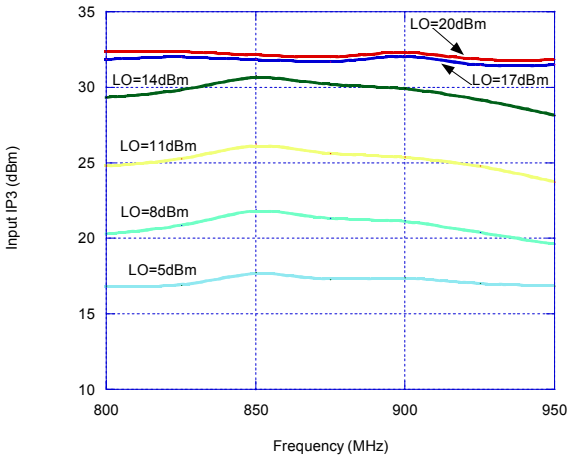


Figure 16. Conversion Loss Across LO Power

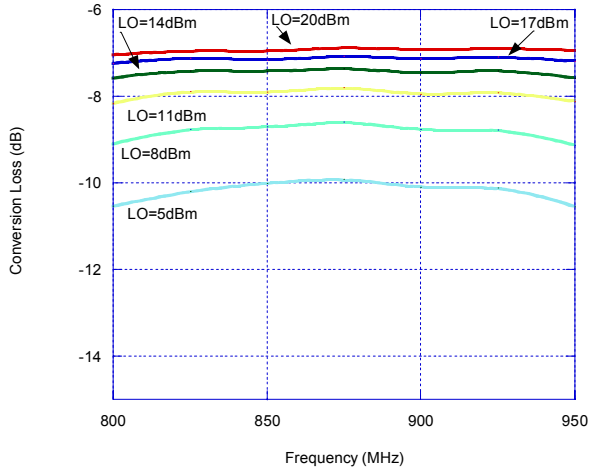


Table 5. Spurious Response

Spurious Response				
	mRF+nLO			
	nLO			
mRF	1	2	3	4
1	1	29	20	32
2	50	46	58	50
3	69	81	70	77
4	88	85	83	>90

Normalized to dB below PIF

(RF=870Mhz @ 3dBm, LO=940MHz @ 17dBm)

Table 6. Spurious Response

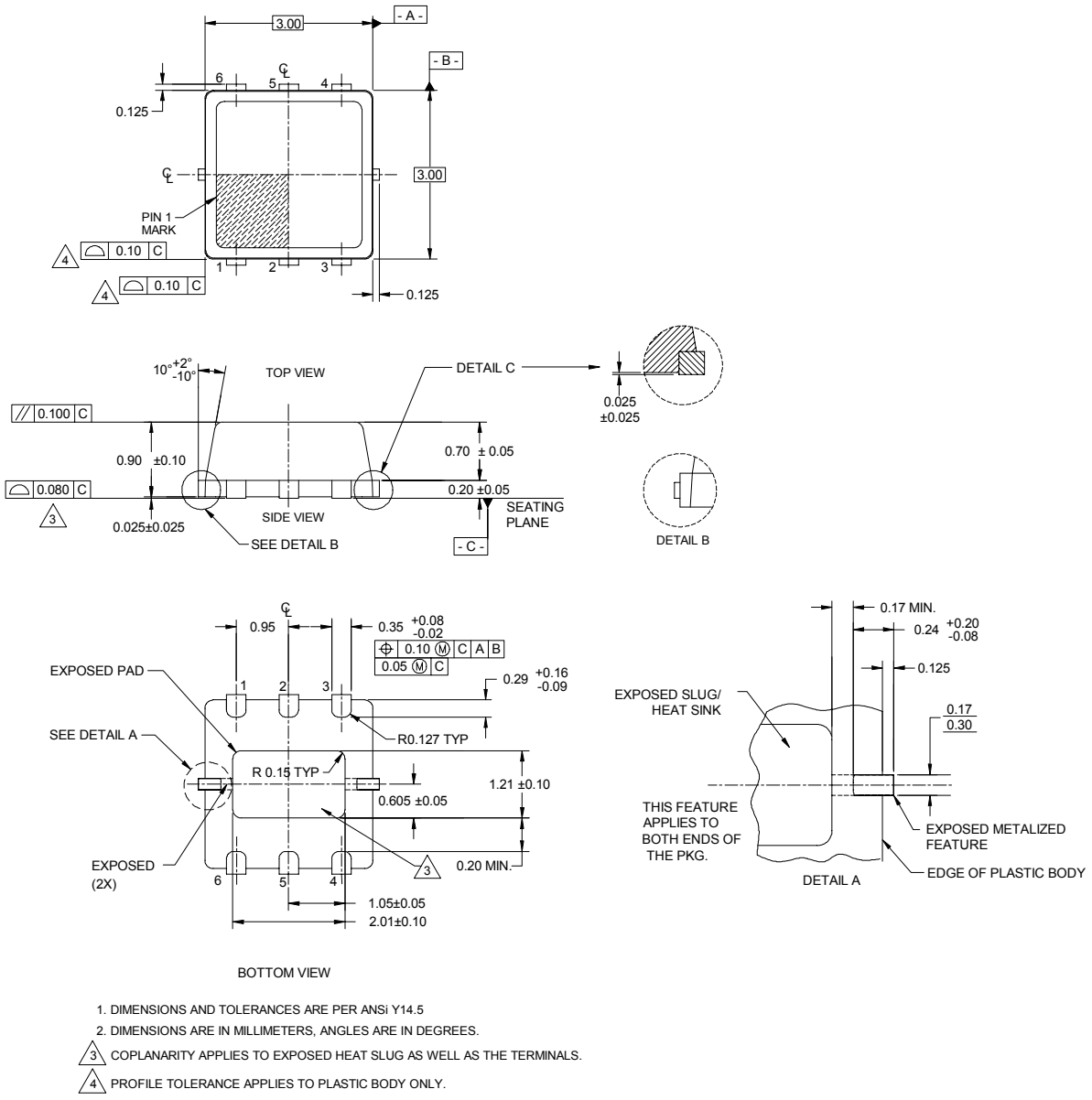
Spurious Response				
	mRF+nLO			
	nLO			
mRF	1	2	3	4
1	0	27	12	35
2	47	53	47	50
3	66	66	62	67
4	86	83	>90	>90

Normalized to dB below PIF

(RF=870Mhz @ 3dBm, LO=940MHz @ 17dBm)

Figure 17. Package Drawing

6-lead MLPM



1. DIMENSIONS AND TOLERANCES ARE PER ANSi Y14.5
2. DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.
3. COPLANARITY APPLIES TO EXPOSED HEAT SLUG AS WELL AS THE TERMINALS.
4. PROFILE TOLERANCE APPLIES TO PLASTIC BODY ONLY.

Table 7. Ordering Information

Order Code	Part Marking	Description	Package	Shipping Method
4135-01	4135	PE4135-06MLP3x3-12800F	6-lead 3x3 MLPM	12800 units / Canister
4135-02	4135	PE4135-06MLP3x3-3000C	6-lead 3x3 MLPM	3000 units / T&R
4135-00	4135-EK	PE4135-06MLP3x3-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).

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Peregrine products are protected under one or more of the following U.S. patents: 6,090,648; 6,057,555; 5,973,382; 5,973,363; 5,930,638; 5,920,233; 5,895,957; 5,883,396; 5,864,162; 5,863,823; 5,861,336; 5,663,570; 5,610,790; 5,600,169; 5,596,205; 5,572,040; 5,492,857; 5,416,043. Other patents are pending.