

# PE4134

**High Linearity Quad MOSFET Mixer  
for PCS & 3G BTS**

## Features

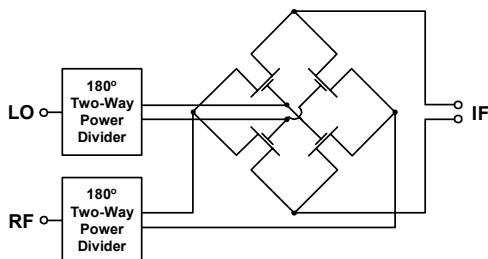
- Integrated, single-ended RF & LO interfaces
- High linearity: IIP3 >+31 dBm, 1.9 GHz (+17 dBm LO)
- Low-conversion loss: 7.4 dB (+17 dBm LO)
- High isolation: Typical LO-IF at 33 dB, LO-RF at 31 dB
- Optimized for low-side LO injection
- Packaged in a 6-lead 3x3 mm DFN

## Product Description

The PE4134 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 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 PE4134 is optimized for frequency down-conversion using low-side LO injection for PCS & 3G Base Station applications, and is also suitable for up-conversion applications.

The PE4134 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**

6-lead 3x3 mm DFN



**Table 1. AC and DC Electrical Specifications @ +25 °C**

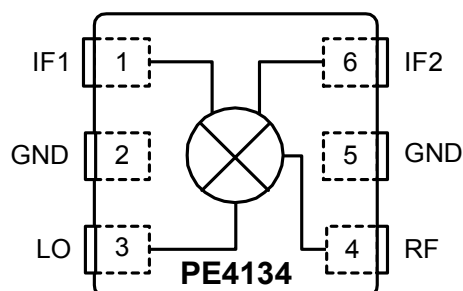
| Parameter                    | Minimum | Typical | Maximum | Units |
|------------------------------|---------|---------|---------|-------|
| Frequency Range:             |         |         |         |       |
| LO                           | 1540    | --      | 1740    | MHz   |
| RF                           | 1800    | --      | 2000    | MHz   |
| IF <sup>1</sup>              | --      | 260     | --      | MHz   |
| Conversion Loss <sup>2</sup> |         | 7.4     | 8.0     | dB    |
| Isolation:                   |         |         |         |       |
| LO-RF                        | 27      | 31      |         | dB    |
| LO-IF                        | 27      | 33      |         | dB    |
| Input IP3                    |         |         |         |       |
| 1.8 GHz                      | 26      | 29      |         | dBm   |
| 1.9 GHz                      | 31      | 33      |         | dBm   |
| 2.0 GHz                      | 28      | 31      |         | dBm   |
| Input 1 dB Compression       |         | 22      |         | 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 0.7 dB at 260 MHz).

\*Test conditions unless otherwise noted: IF = 260 MHz, LO input drive = 17 dBm, RF input drive = 3 dBm.

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



**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     |

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

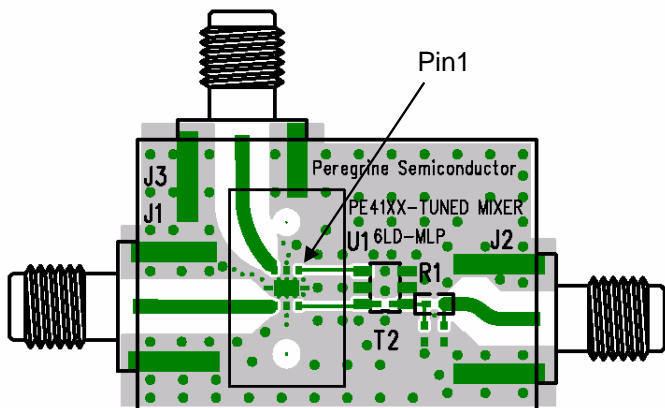


Table 4. Bill of Materials

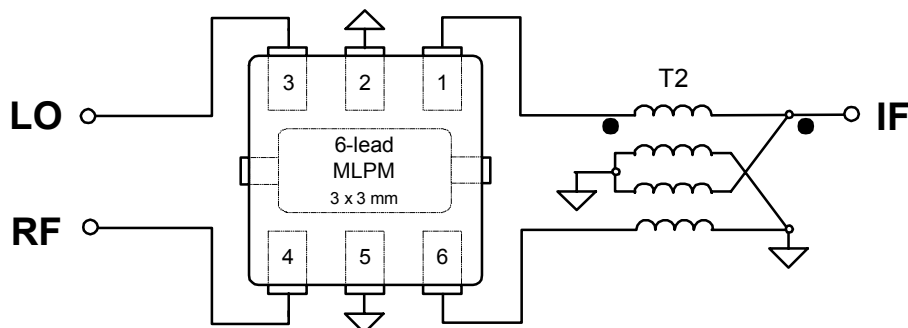
| Reference  | Value / Description |
|------------|---------------------|
| T2         | M/A Com ETK4-2T     |
| R1         | 0 $\Omega$          |
| U1         | PE4134 MLP Mixer    |
| J1, J2, J3 | SMA Connector       |

## Applications Support

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

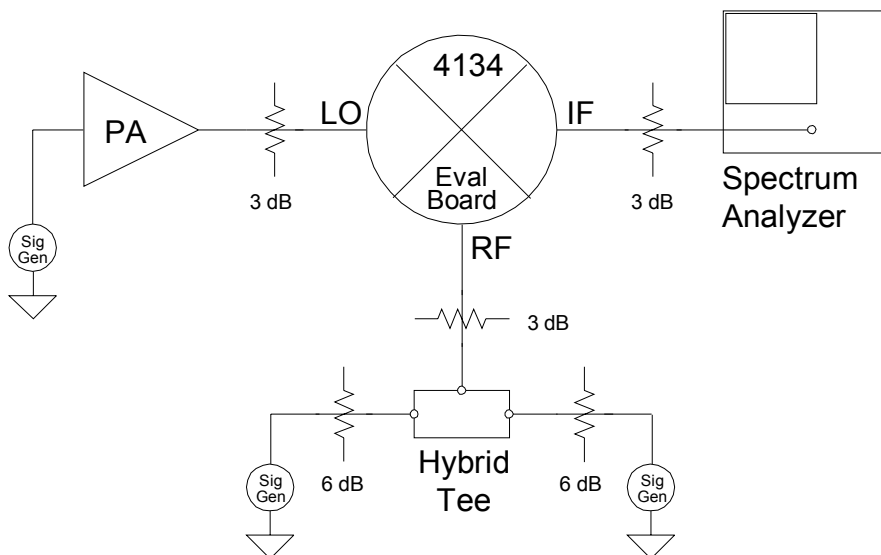
E-Mail: [help@psemi.com](mailto:help@psemi.com) (fastest response)  
Phone: (858) 731-9400

Figure 5. Evaluation Board Schematic Diagram



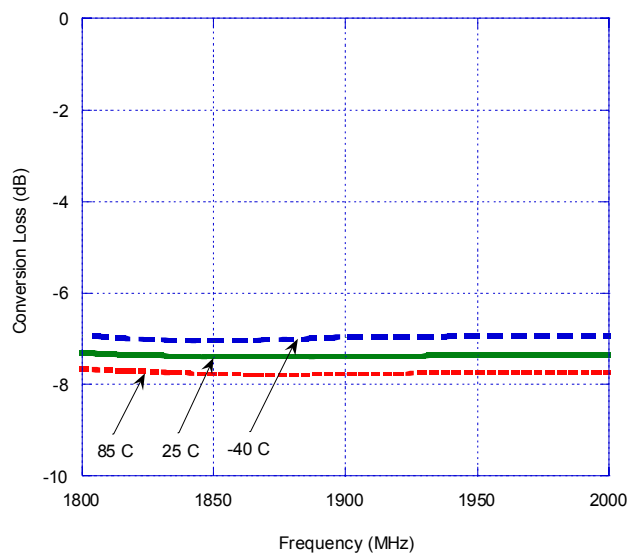
T2, M/A-Com E-Series RF 4:1 Transformer, 2.0 – 1000 MHz, ETK4-2T

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

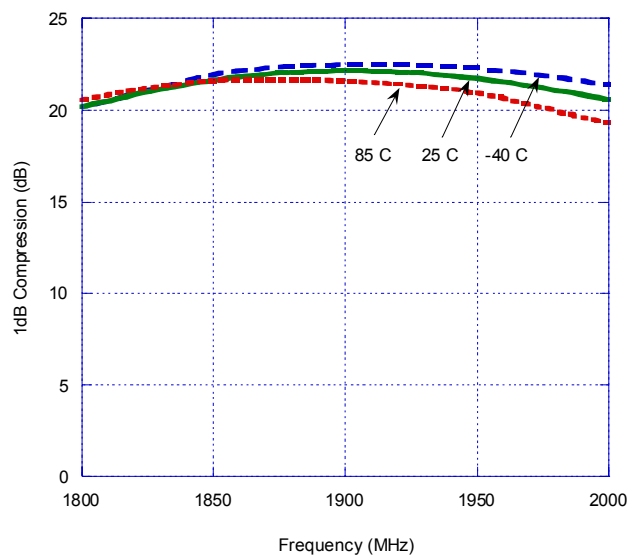


Typical Performance Data (LO=17 dBm, RF=3 dBm, IF=260 MHz)

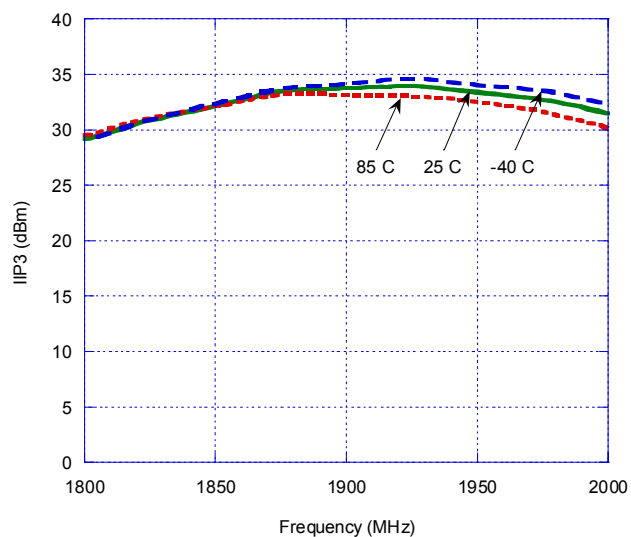
**Figure 7. Conversion Loss**



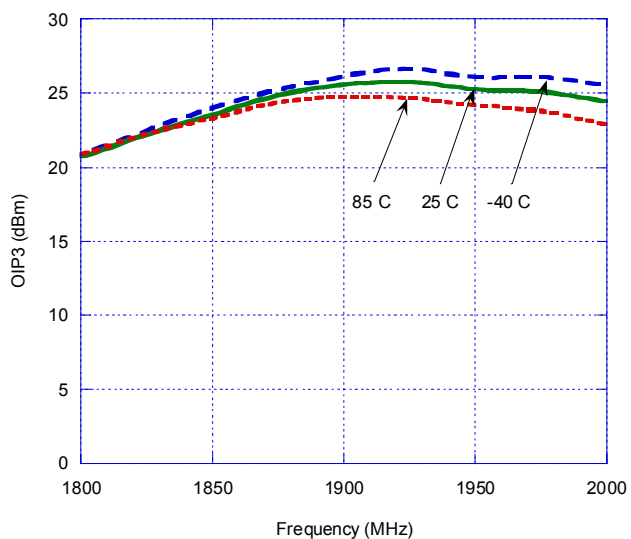
**Figure 8. Input 1dB Compression**



**Figure 9. Input IP3**

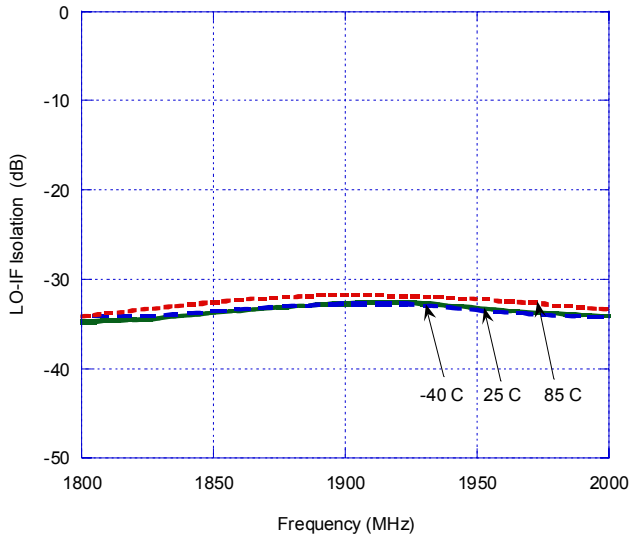


**Figure 10. Output IP3**

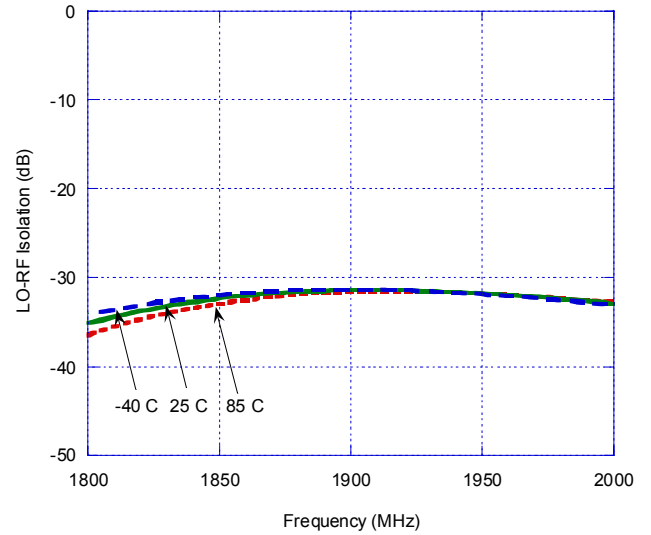


**Typical Performance Data (LO=17 dBm, RF=3 dBm, IF=260 MHz)**

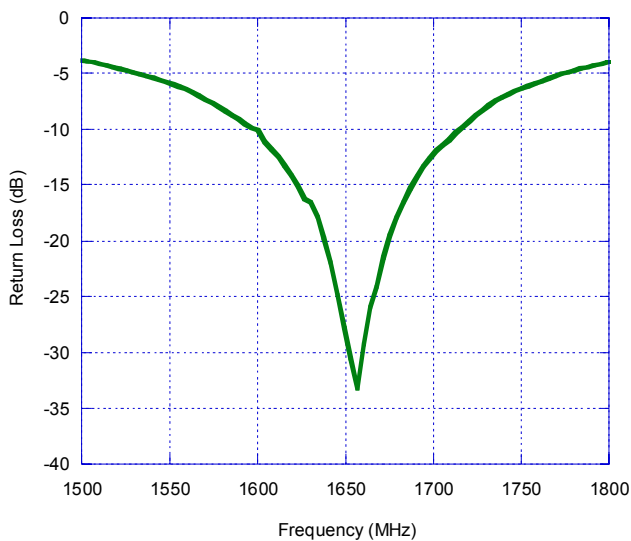
**Figure 11. LO-IF Isolation vs. Frequency**



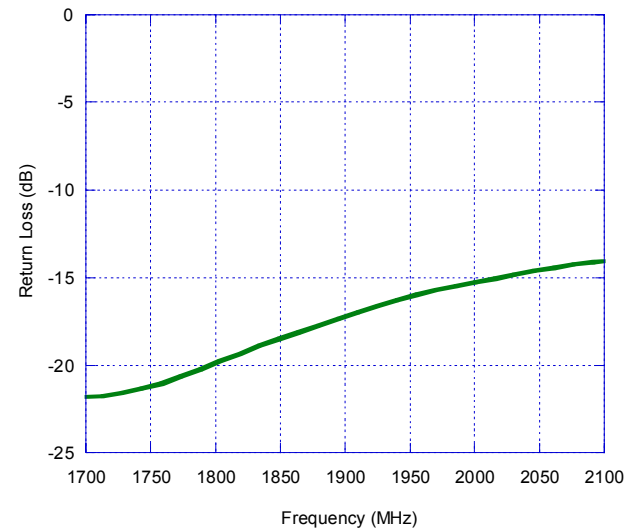
**Figure 12. LO-RF Isolation vs. Frequency**



**Figure 13. LO Port Return Loss @ 25°C**

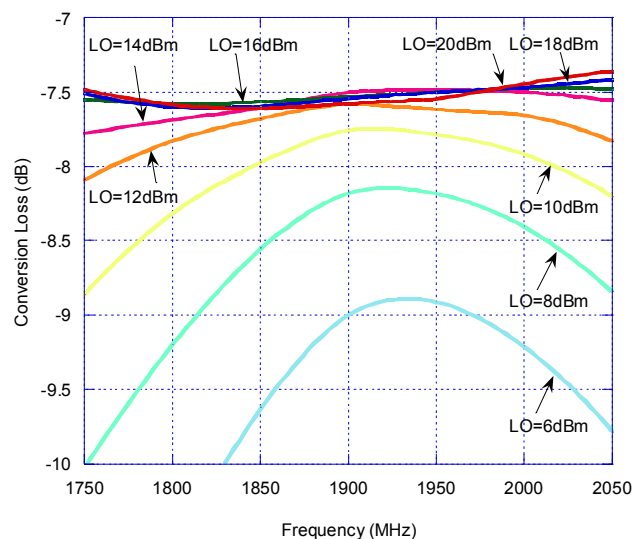


**Figure 14. RF Port Return Loss @ 25°C**

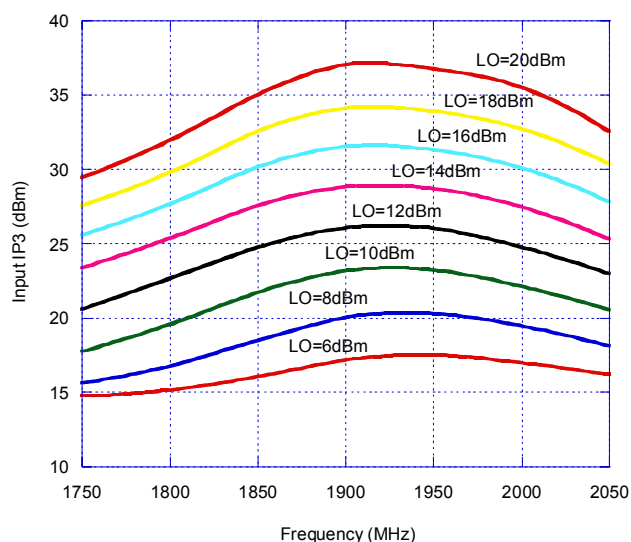


**Typical Performance Data @ +25 °C (RF=3 dBm, IF=260 MHz)**

**Figure 15. Conversion Loss across LO Power**



**Figure 16. Input IP3 across LO Power**



**Table 5. Spurious Response**

| Spurious Response |         |     |     |     |
|-------------------|---------|-----|-----|-----|
|                   | mRF+nLO |     |     |     |
|                   | nLO     |     |     |     |
| mRF               | 1       | 2   | 3   | 4   |
| 1                 | 5       | 37  | 30  | 50  |
| 2                 | 49      | 55  | 65  | 59  |
| 3                 | 75      | >85 | 78  | 80  |
| 4                 | >85     | 84  | >85 | >85 |

Normalized to dB below PIF

(RF=1900 Mhz @ 3 dBm, LO=1640 MHz @ 17 dBm)

**Table 6. Spurious Response**

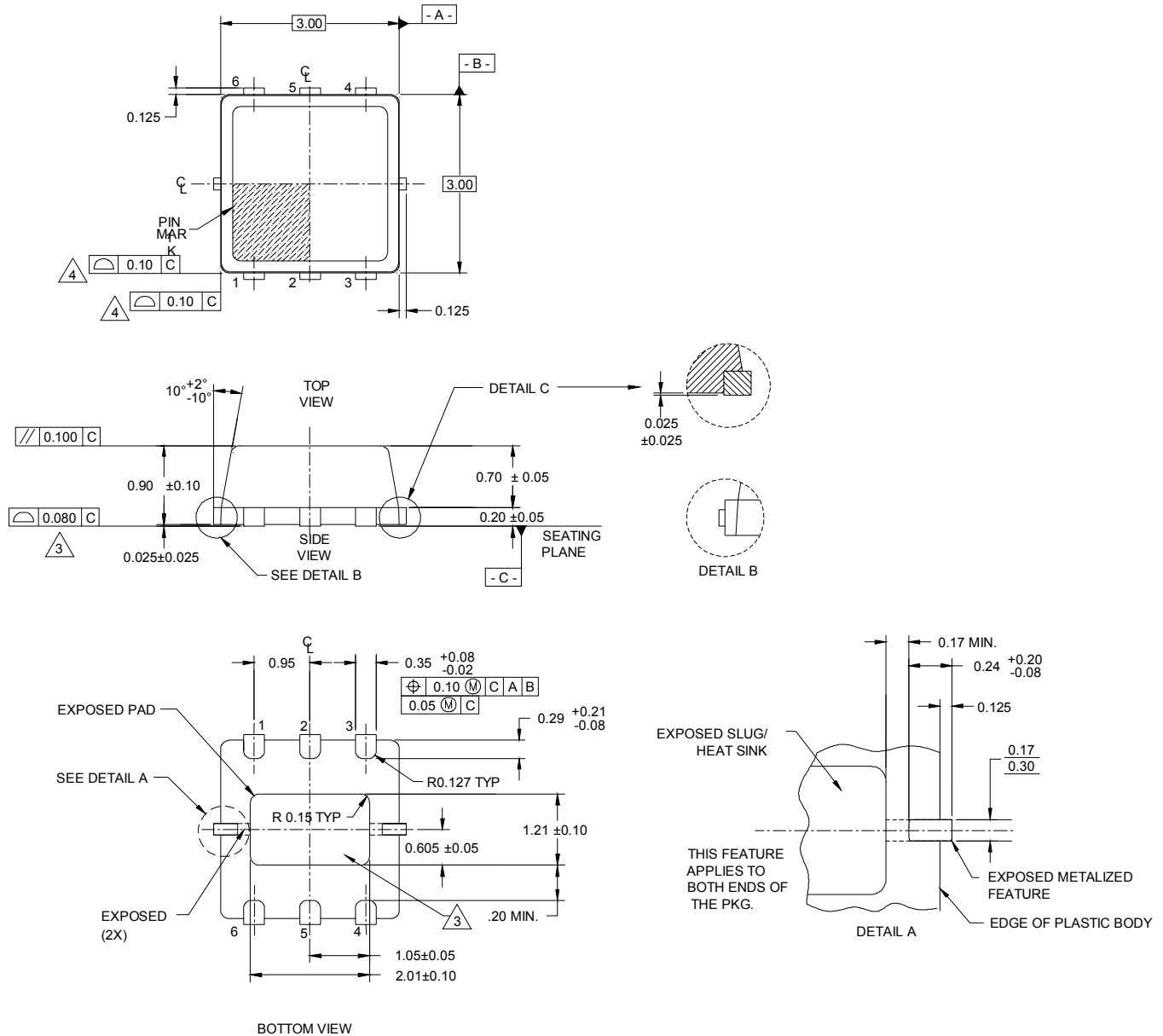
| Spurious Response |         |     |     |    |
|-------------------|---------|-----|-----|----|
|                   | mRF+nLO |     |     |    |
|                   | nLO     |     |     |    |
| mRF               | 1       | 2   | 3   | 4  |
| 1                 | 0       | 32  | 22  | 43 |
| 2                 | 57      | 49  | 61  | 62 |
| 3                 | 64      | 71  | 64  | 65 |
| 4                 | >85     | >85 | >85 | 81 |

Normalized to dB below PIF

(RF=1900 Mhz @ 3 dBm, LO=1640 MHz @ 17 dBm)

**Figure 17. Package Drawing**

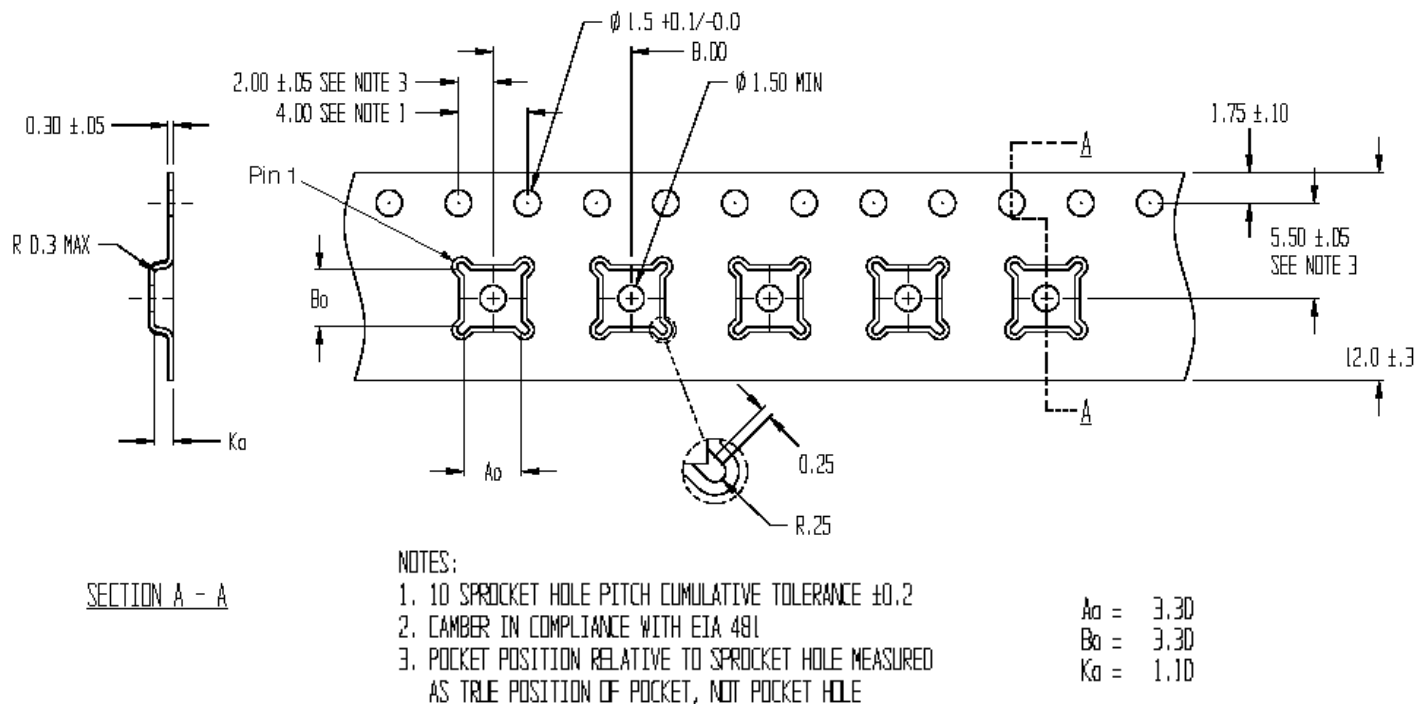
6-lead DFN



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.

### Figure 18. Tape and Reel Specifications

6-lead DFN



### Table 7. Dimensions

| Dimension    | DFN 3x3 mm   |
|--------------|--------------|
| Ao           | 3.23 ± 0.1   |
| Bo           | 3.17 ± 0.1   |
| Ko           | 1.37 ± 0.1   |
| P            | 4 ± 0.1      |
| W            | 8 +0.3, -0.1 |
| T            | 0.254 ± 0.02 |
| R7 Quantity  | 3000         |
| R13 Quantity | N.A.         |

Note: R7 = 7 inch Lock Reel, R13 = 13 inch Lock Reel

### Table 8. Ordering Information

| Order Code | Part Marking | Description            | Package           | Shipping Method        |
|------------|--------------|------------------------|-------------------|------------------------|
| 4134-01    | 4134         | PE4134-06DFN3x3-12800F | 6-lead 3x3 mm DFN | 12800 units / Canister |
| 4134-02    | 4134         | PE4134-06DFN3x3-3000C  | 6-lead 3x3 mm DFN | 3000 units / T&R       |
| 4134-00    | 4134-EK      | PE4134-06DFN3x3-EK     | Evaluation Board  | 1 / Box                |



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### **Preliminary Specification**

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### **Product Specification**

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