

Product Specification

PE4135

**High Linearity UltraCMOS™
Quad MOSFET Mixer**

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
- Small 6-lead 3x3 mm DFN package

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 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

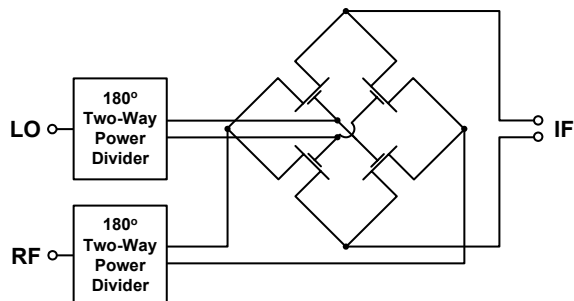


Figure 2. Package Type

6-lead DFN



Table 1. Electrical Specifications @ +25 °C

| Parameter ¹ | Minimum | Typical | Maximum | Units |
|------------------------------|---------|---------|---------|-------|
| Frequency Range: | | | | |
| LO | 750 | -- | 850 | MHz |
| RF | 820 | -- | 920 | MHz |
| IF ² | -- | 70 | -- | MHz |
| Conversion Loss ³ | | 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 |

- Notes:
1. Test conditions unless otherwise noted: IF = 70 MHz, LO input drive = 17 dBm, RF input drive = 3 dBm.
 2. 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.
 3. Conversion Loss includes loss of IF transformer (M/A COM ETC1-1-13, nominal loss 0.7 dB at 70 MHz).

Figure 3. Pin Configuration (Top View)

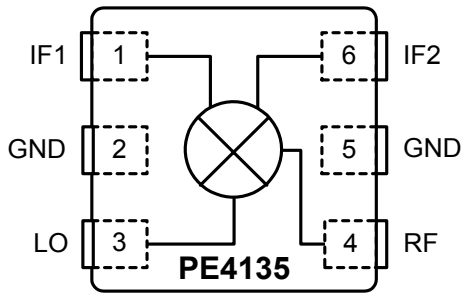


Table 2. Pin Descriptions

| 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 in Table 3.

Latch-Up Avoidance

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

Evaluation Kit

Figure 4. Evaluation Board Layout

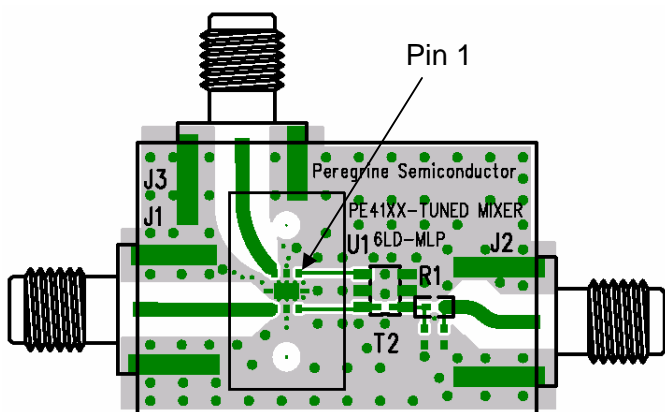


Table 4. Bill of Materials

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

Figure 5. Evaluation Board Schematic

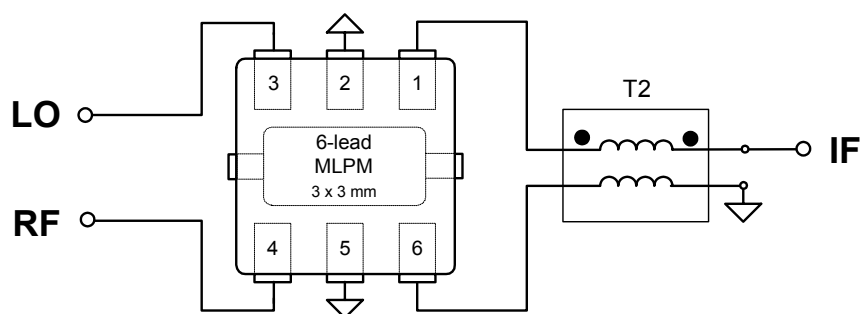
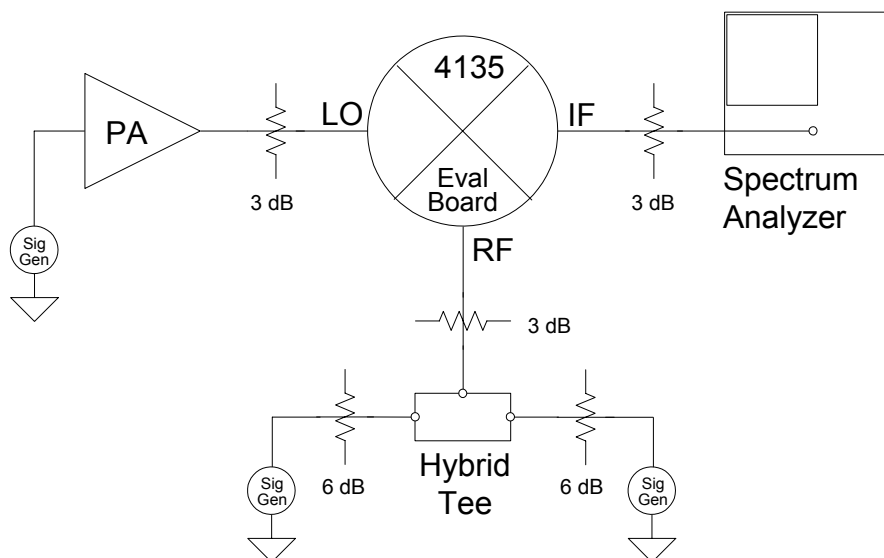


Figure 6. Evaluation Board Testing Block Diagram, 2-Tone Setup



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

Figure 7. Conversion Loss

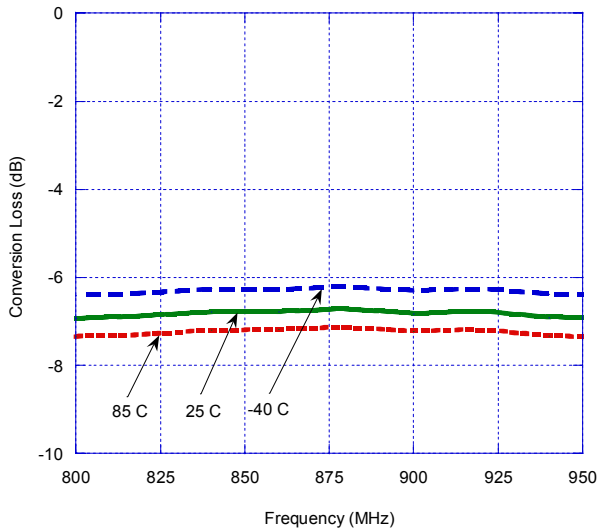


Figure 8. Input 1dB Compression

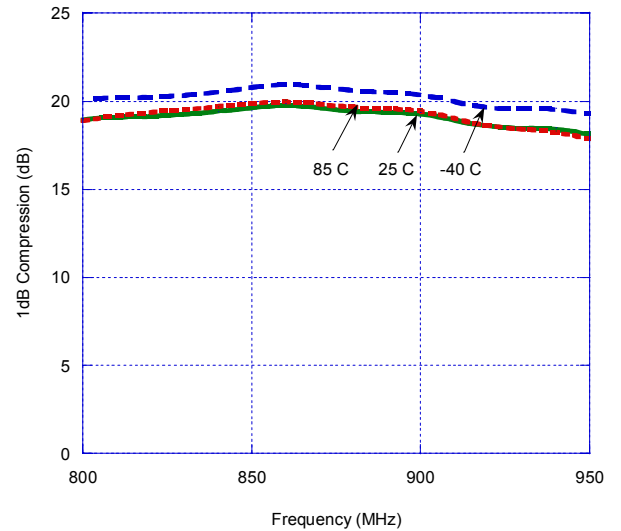


Figure 9. Input IP3 @ 25 °C

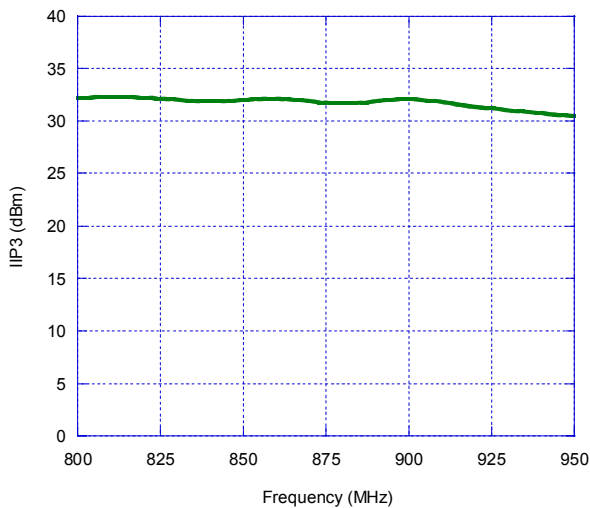
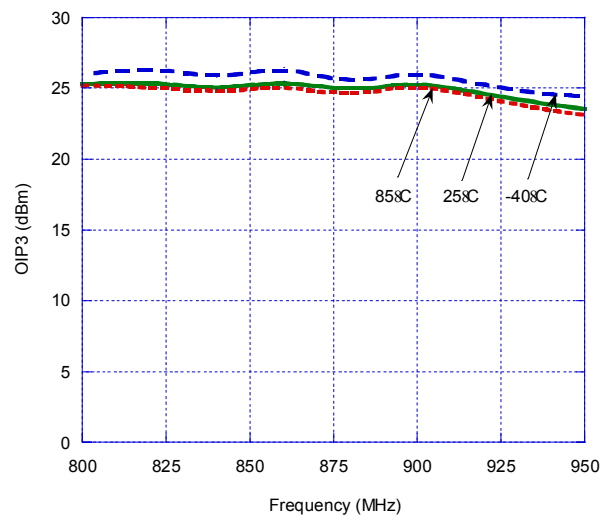


Figure 10. Output IP3



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

Figure 11. LO-IF Isolation

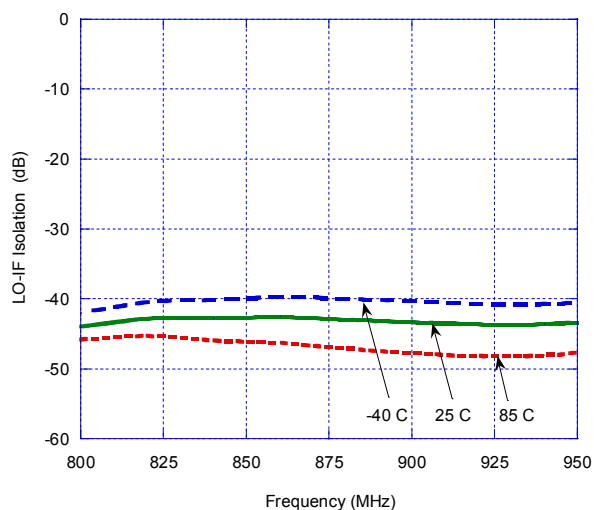


Figure 12. LO-RF Isolation

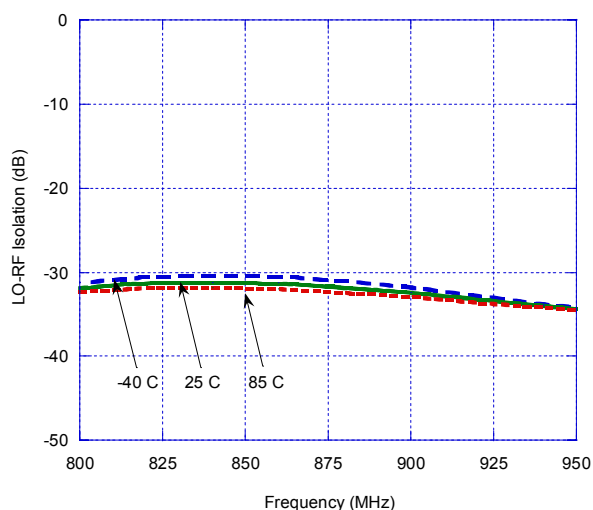


Figure 13. LO Port Return Loss @ 25°C

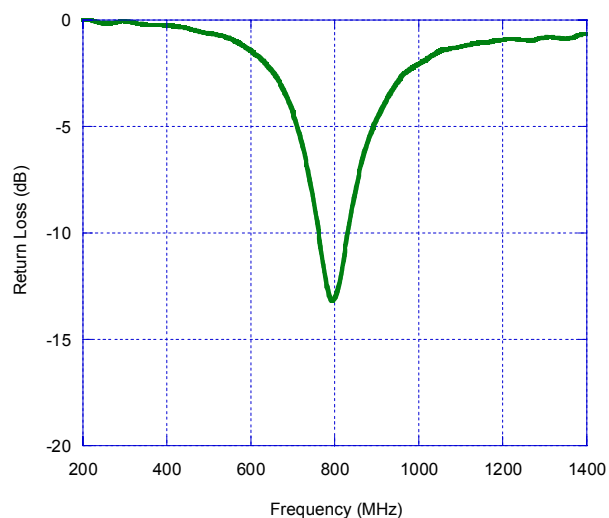
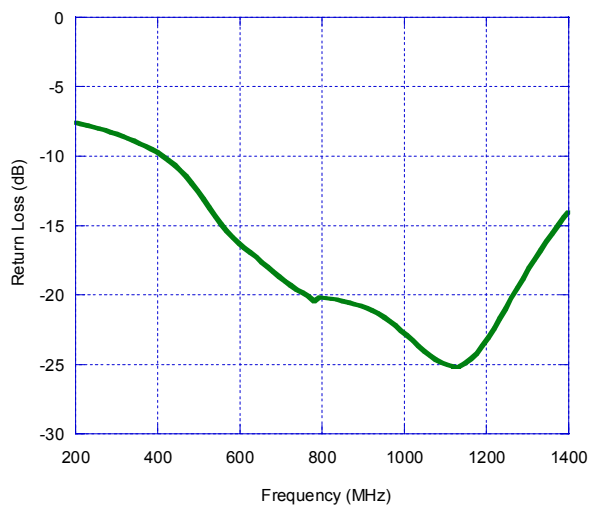


Figure 14. RF Port Return Loss @ 25°C



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

Figure 15. Input IP3 Across LO Power

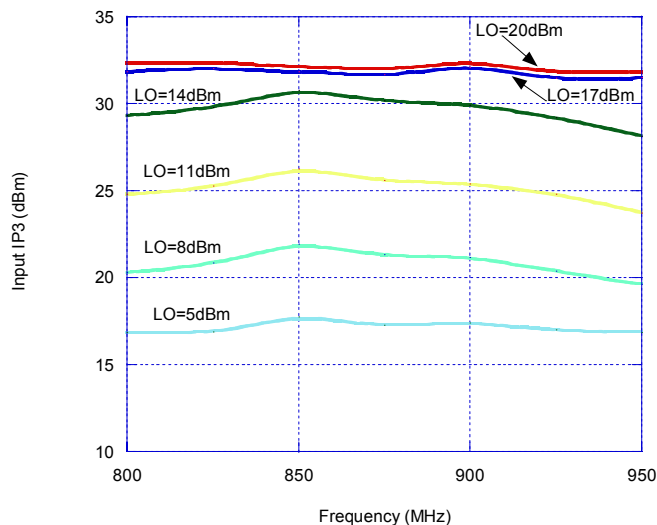


Figure 16. Conversion Loss Across LO Power

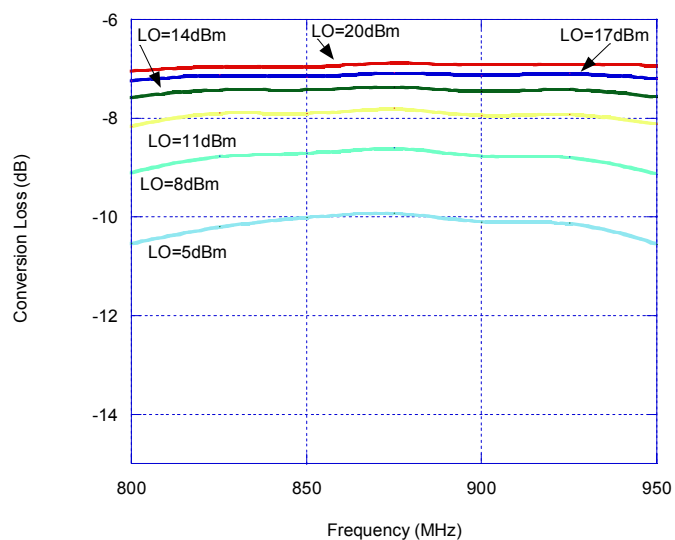


Table 5. Spurious Response

| | 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 |

Note: Normalized to dB below PIF
(RF=870 Mhz @ 3 dBm, LO=940 MHz @ 17 dBm)

Table 6. 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 |

Note: Normalized to dB below PIF
(RF=870 Mhz @ 3 dBm, LO=940 MHz @ 17 dBm)

6-lead DFN

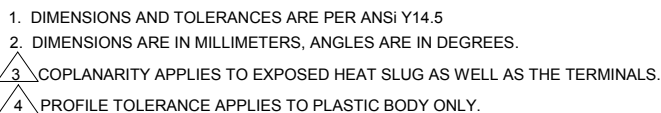


Figure 18. Tape and Reel Specifications

6-lead DFN

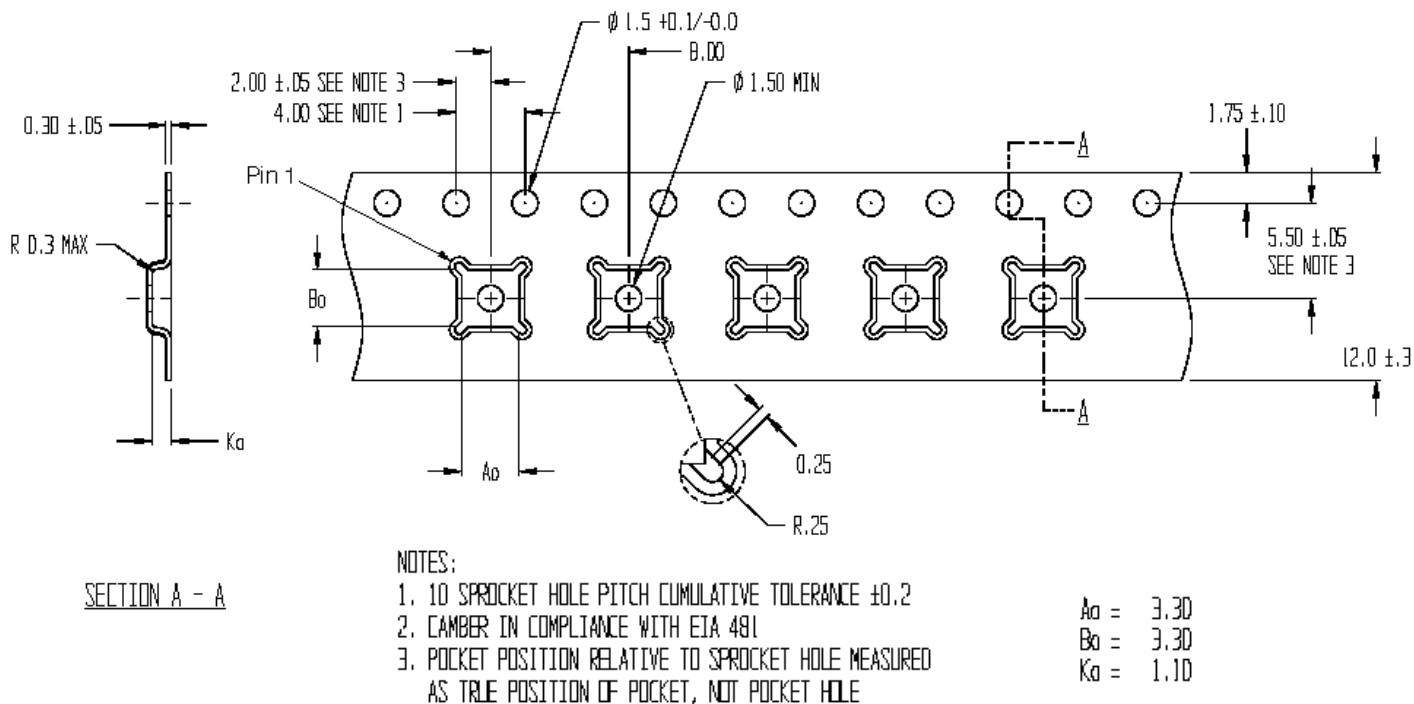


Table 7. Dimensions

| Dimension | DFN 3x3 mm |
|--------------|------------------|
| A_o | 3.23 ± 0.1 |
| B_o | 3.17 ± 0.1 |
| K_o | 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 |
|------------|--------------|----------------------------|-------------------------|------------------------|
| 4135-01 | 4135 | PE4135-06DFN 3x3mm-12800F | 6-lead 3x3 mm DFN | 12800 units / Canister |
| 4135-02 | 4135 | PE4135-06DFN 3x3mm-3000C | 6-lead 3x3 mm DFN | 3000 units / T&R |
| 4135-00 | PE4135-EK | PE4135-06DFN 3x3mm-EK | Evaluation Kit | 1 / Box |
| 4135-51 | 4135 | PE4135G-06DFN 3x3mm-12800F | Green 6-lead 3x3 mm DFN | 12800 units / Canister |
| 4135-52 | 4135 | PE4135G-06DFN 3x3mm-3000C | Green 6-lead 3x3 mm DFN | 3000 units / T&R |

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Data Sheet Identification

Advance Information

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Preliminary Specification

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Product Specification

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