

PE4125

High Linearity Quad MOSFET Mixer for GSM 800 & Cellular BTS

Features

- Integrated, single-ended RF & LO interfaces
- High linearity: IIP3 > +32 dBm, 820 - 920 MHz (+17 dBm LO)
- Low conversion loss: 6.9 dB (+17 dBm LO)
- High isolation: typical LO-RF at 43 dB, LO-RF at 31 dB
- Designed for low-side LO injection

Product Description

The PE4125 is a high linearity, passive Quad MOSFET Mixer for GSM 800 & Cellular Base Station Receivers and exhibits 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 PE4125 is optimized for frequency down-conversion using high-side LO injection for GSM 800 & Cellular Base Station applications, and is also suitable for use in up-conversion applications.

The PE4125 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

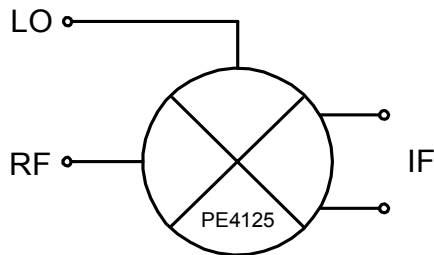


Figure 2. Package Type

8-lead TSSOP

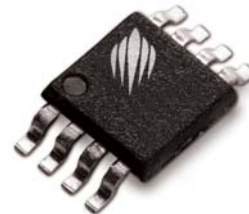


Table 1. AC and DC Electrical Specifications @ +25 °C ($Z_S = Z_L = 50 \Omega$)

| Parameter | Minimum | Typical | Maximum | Units |
|------------------------------|---------|---------|---------|-------|
| Frequency Range: | | | | |
| LO | 890 | -- | 990 | MHz |
| RF | 820 | -- | 920 | MHz |
| IF ¹ | -- | 70 | -- | MHz |
| Conversion Loss ² | | 7.0 | 7.4 | dB |
| Isolation: | | | | |
| LO-RF | 30 | 31.5 | | dB |
| LO-IF | 38 | 40 | | dB |
| Input IP3 | 30 | 32 | | dBm |
| Input 1 dB Compression | | 22 | | dBm |

Notes: 1. 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.

2. Conversion Loss includes loss of IF transformer (M/A COM ETC1-1-13, nominal loss 0.7dB 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 (Top View)

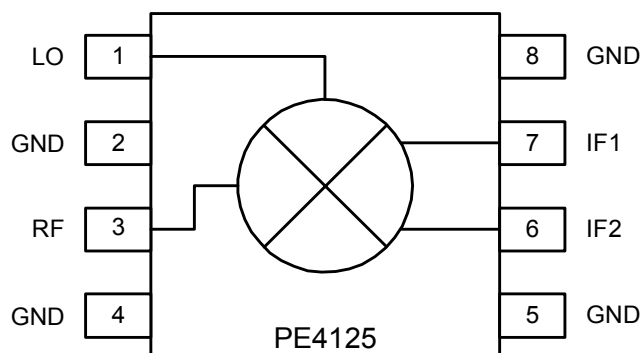


Table 2. Pin Descriptions

| 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 | | 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

Peregrine Specification 101/0054

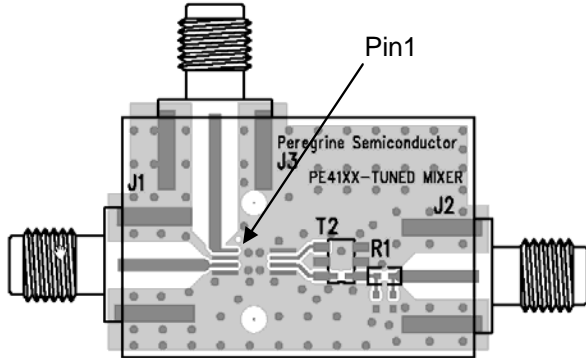


Table 4. Bill of Materials

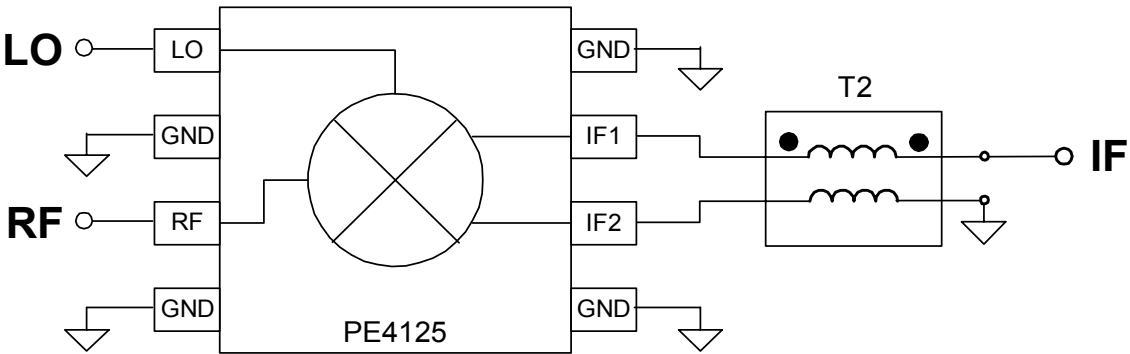
| Reference | Value/Description |
|------------------|-------------------|
| T2 | M/A Com ETC1-1-13 |
| U1 (Not Labeled) | PE4125 Mixer |
| R1 | 0Ω |
| J1, J2, J3 | SMA Connector |

Applications Support

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

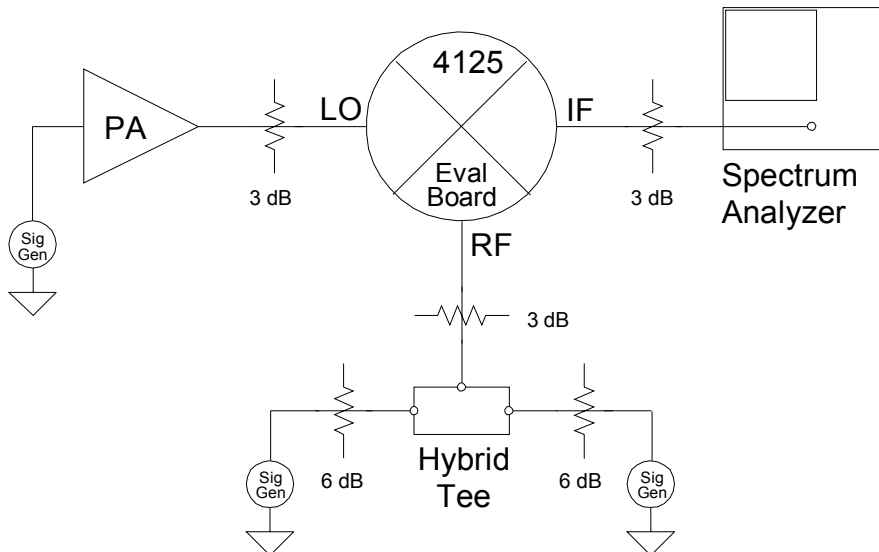
E-Mail: help@psemi.com (fastest response)
 Phone: (858) 731-9400

Figure 5. Evaluation Board Schematic Diagram



T2, M/A-Com E-Series RF 1:1 Transformer ETC1-1-13

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



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

Figure 7. Conversion Loss vs. Frequency

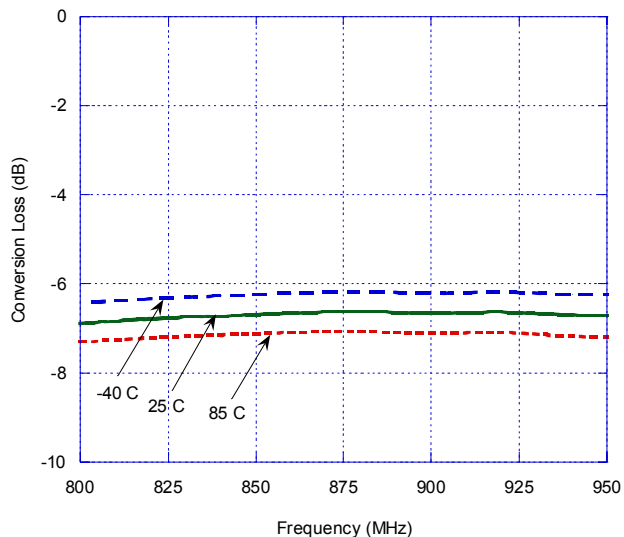


Figure 8. Input 1dB Compression vs. Frequency

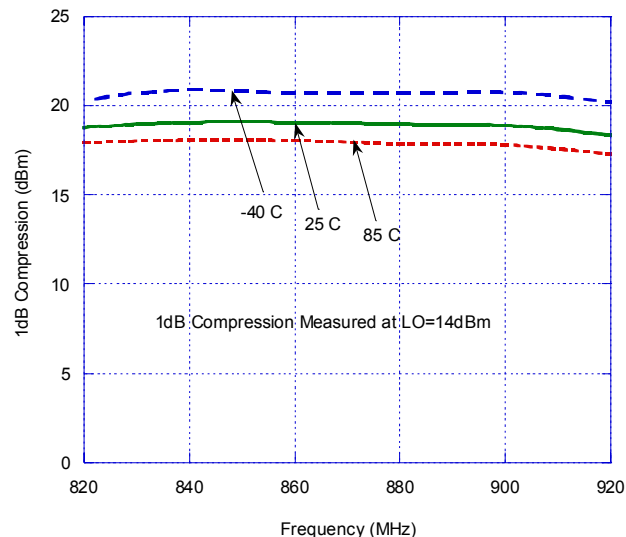


Figure 9. Input IP3 vs. Frequency

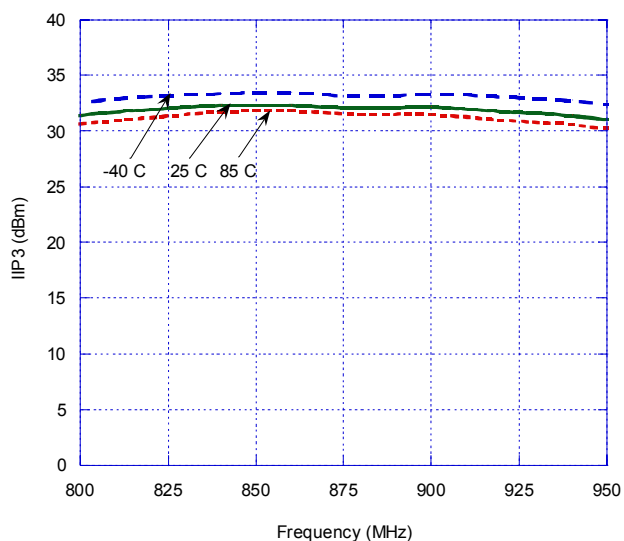
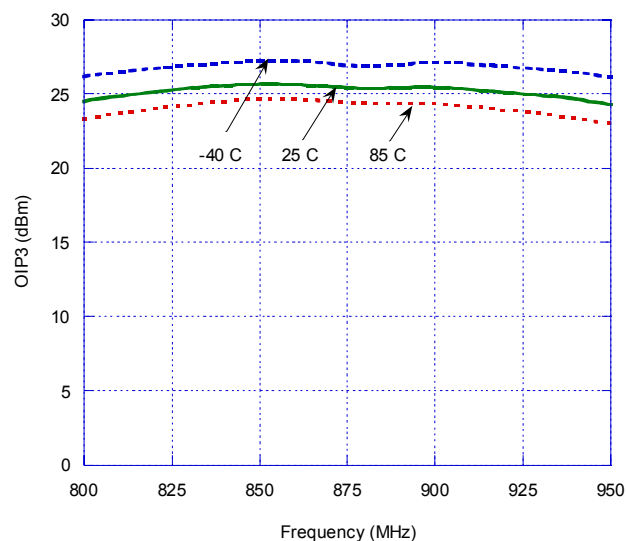


Figure 10. Output IP3 vs. Frequency



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

Figure 11. LO-RF Isolation vs. Frequency

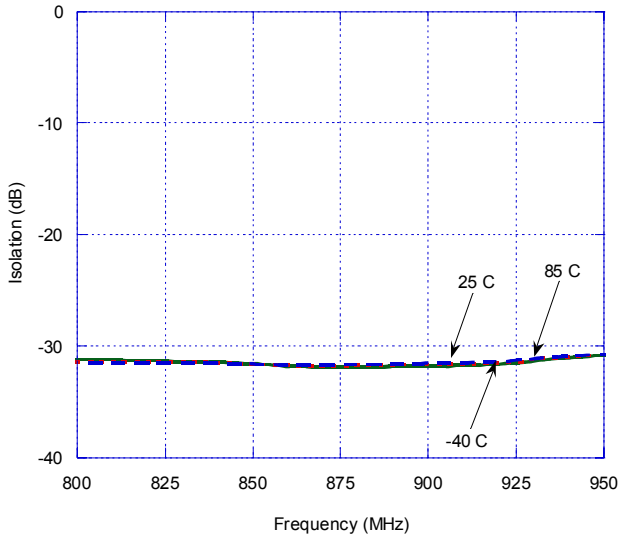


Figure 12. LO-IF Isolation vs. Frequency

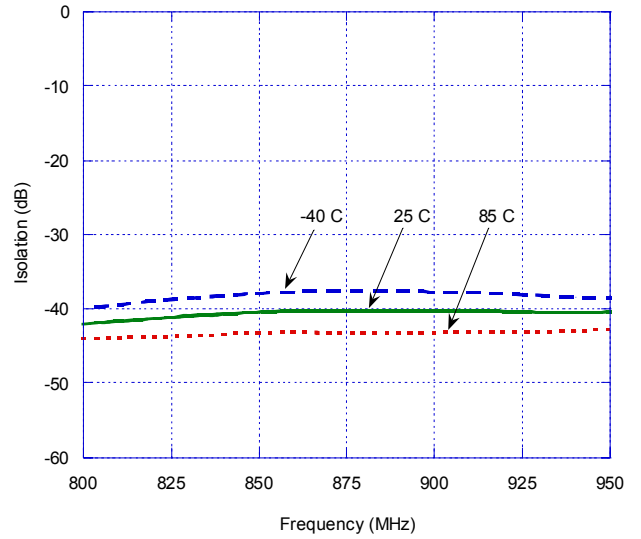


Figure 13. LO Port Return Loss vs. Frequency

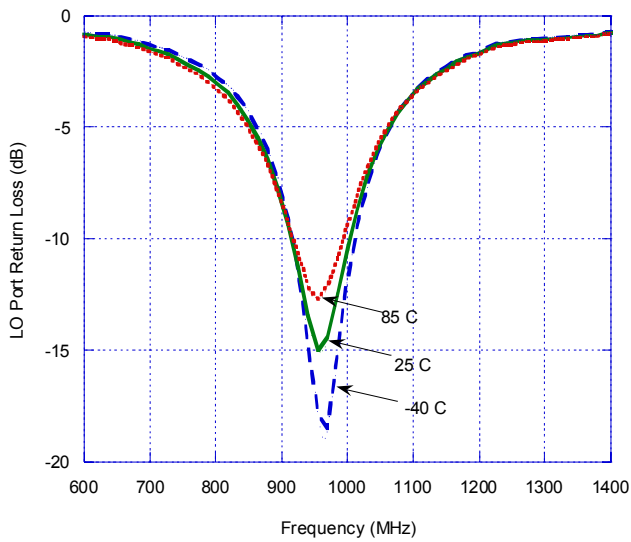


Figure 14. RF Port Return Loss vs. Frequency

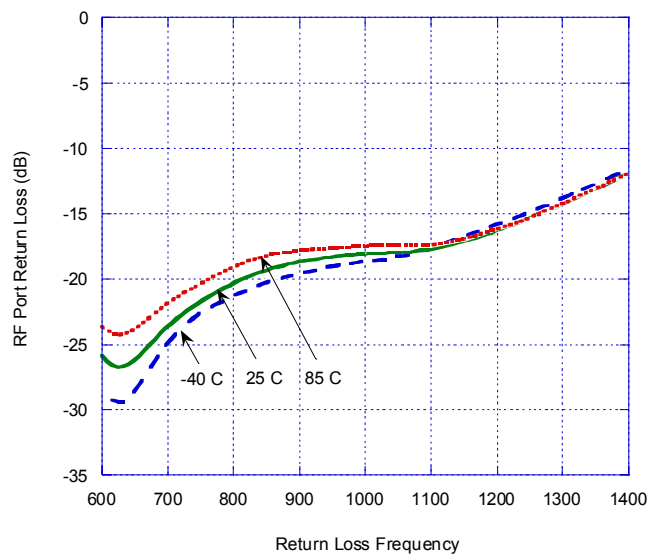


Table 5. Spurious Response

| mF _{RF} | mF _{RF} + nF _{LO} | | | |
|------------------|-------------------------------------|-----|-----|----|
| | nF _{LO} | | | |
| | 1 | 2 | 3 | 4 |
| 1 | 2 | 29 | 21 | 34 |
| 2 | 55 | 45 | 50 | 52 |
| 3 | 62 | >85 | 60 | 83 |
| 4 | >85 | >90 | >85 | 84 |

 Normalized to dB below P_{1F}

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

Table 6. Spurious Response

| mF _{RF} | mF _{RF} - nF _{LO} | | | |
|------------------|-------------------------------------|-----|-----|-----|
| | nF _{LO} | | | |
| | 1 | 2 | 3 | 4 |
| 1 | 0 | 29 | 12 | 32 |
| 2 | 45 | 70 | 55 | 60 |
| 3 | 59 | 66 | 59 | 67 |
| 4 | 85 | >85 | >85 | >85 |

 Normalized to dB below P_{1F}

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

Figure 15. Package Drawing

8-lead TSSOP

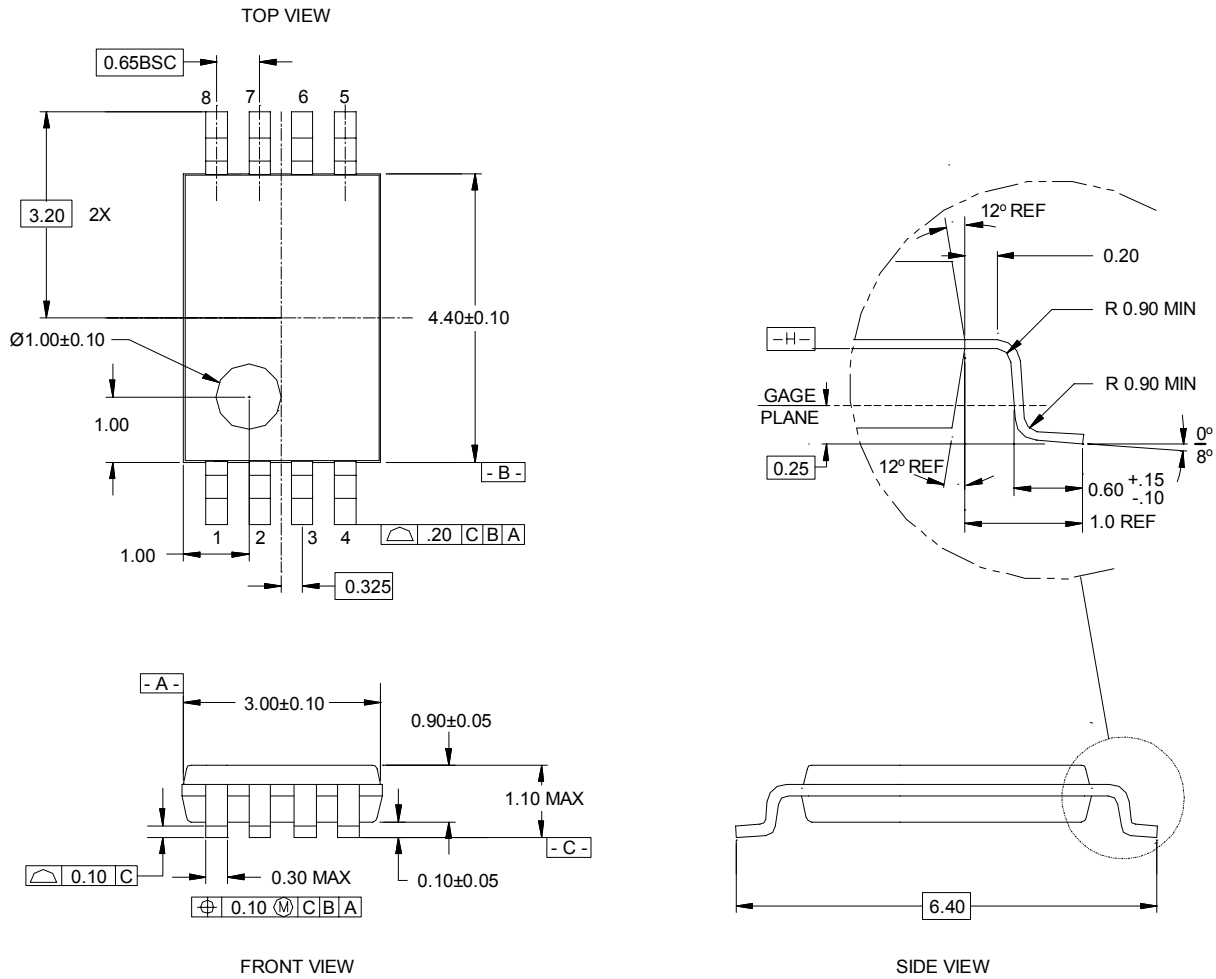


Table 7. Ordering Information

| Order Code | Part Marking | Description | Package | Shipping Method |
|------------|--------------|----------------------|------------------|------------------|
| 4125-21 | 4125 | PE4125-08TSSOP-100A | 8-lead TSSOP | 100 units / Tube |
| 4125-22 | 4125 | PE4125-08TSSOP-2000C | 8-lead TSSOP | 2000 units / T&R |
| 4125-00 | PE4125-EK | PE4125-08TSSOP-EK | Evaluation Board | 1 / Box |

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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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