

RF6555

2.0V TO 3.6V, 2.4GHZ FRONT END MODULE

The RF6555 integrates a complete solution in a single Front End Module (FEM) for WiFi and ZigBee® applications in the 2.4GHz to 2.5GHz band. This FEM integrates the PA plus harmonic filter in the transmit path. The RF6555 also has an integrated LNA with bypass mode internally. The RF6555 provides a single balanced TDD access for Rx and Tx paths along with two ports on the output for connecting a diversity solution or a test port. The device is provided in a 5mm x 5mm x 1mm, 24-pin laminate package.



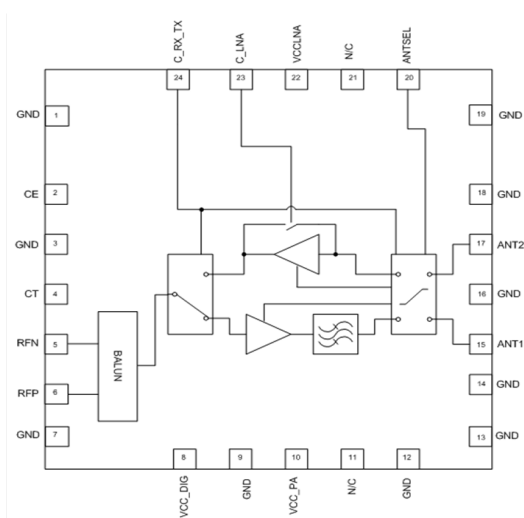
Package: Laminate, 24-Pin,
5mm x 5mm x 1mm

Features

- Tx Output Power = 18dBm
- Integrated RF Front End Module with Rx Balun, PA, Filter, LNA with Bypass Mode, and DP2T Switch
- Single Bidirectional Differential Transceiver Interface.
- Voltage Range = 2.0V to 3.6V

Applications

- ZigBee® 802.15.4 Based Systems for Remote Monitoring and Control
- Set-top Boxes
- AA Battery Operation
- 2.4GHz ISM Band Applications
- Smart Meters for Energy Management



Functional Block Diagram

Ordering Information

| | |
|---------------|--|
| RF6555SB | Standard 5-piece sample bag |
| RF6555SQ | Standard 25-piece sample bag |
| RF6555SR | Standard 100-piece reel |
| RF6555TR13 | Standard 2500-piece reel |
| RF6555PCK-410 | Fully assembled eval board w/ 5-piece sample bag |

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|-------------------------------------|-------------|------|
| DC Supply Voltage | 5.0 | V |
| DC Supply Current | 150 | mA |
| Operating Case Temperature | -40 to +85 | °C |
| Storage Temperature | -40 to +150 | °C |
| ESD Human Body Model RF Pins | 1000 | V |
| ESD Human Body Model All Other Pins | 500 | V |
| ESD Charge Device Model All Pins | 500 | V |
| Moisture Sensitivity Level | MSL 2 | |
| Maximum Tx Input Power | +5 | dBm |
| Maximum Rx Input Power | +8 | dBm |



Caution! ESD sensitive device.



RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

Nominal Operating Parameters

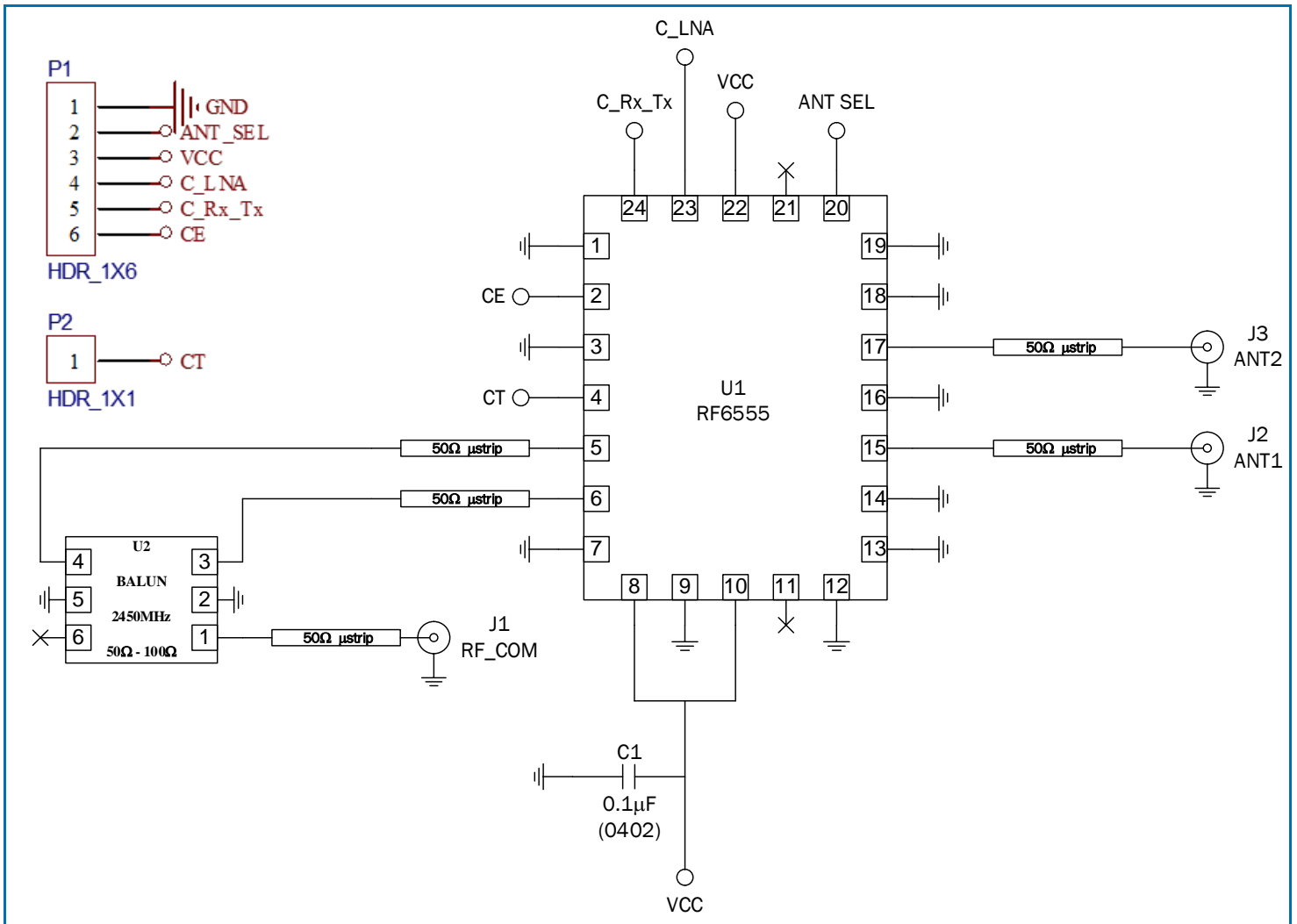
| Parameter | Specification | | | Unit | Condition |
|-------------------------------------|---------------|------|------|-----------------|--|
| | Min | Typ | Max | | |
| Parameter | | | | | |
| V _{BATT} | 2.0 | 3.0 | 3.6 | V _{DC} | |
| Operating Temperature Range | -40 | +25 | +85 | °C | |
| Z ₀ | | 50 | | Ω | |
| Off Mode Current | | 0.05 | 1.0 | μA | All logic low, Temp = 25°C; Over Voltage. |
| Storage Temperature | -40 | | +150 | °C | |
| ESD, HBM | 1000 | | | V | RF pins |
| ESD, HBM | 500 | | | V | All other pins |
| ESD, CDM | 500 | | | V | All pins |
| MSL | MSL3 | | | | |
| Current Sourced through CT Pin | | | 18 | mA | |
| Voltage Drop from CT Pin to RXP/RXN | | | 0.1 | V | |
| Tx Path | | | | | |
| Frequency | 2405 | | 2480 | MHz | |
| Input Return Loss | 10 | | | dB | Pins 5, 6 (RFM, RFP) 100Ω differential |
| Output Return Loss | 10 | | | dB | |
| Gain | 22 | 25 | | dB | 2.7V to 3.6V |
| | | | | dB | V _{CC} =2.0V; Temp=25°C |
| Gain Flatness | -0.8 | | +0.8 | dB | |
| Rated Output Power | 20 | | | dBm | Nominal conditions (V _B =3.3 to 3.6, All Temp) |
| | 18 | | | dBm | Nominal conditions (V _B =3.0 to 3.3, All Temp) |
| | 16 | | | dBm | Nominal conditions (V _B =2.7, All Temp) |
| | 14 | | | dBm | Nominal conditions (V _B =2.0, All Temp) |
| Saturated Output Power | | 22 | | dBm | V _B =3.6, Temp = 25C |
| | | 20 | | dBm | V _B =3.0, Temp = 25C |
| Supply Current | | 110 | 125 | mA | P _O =21dBm 802.15.4 OQPSK (V _B =3.6, All Temp) |
| | | 105 | 120 | mA | P _O =20dBm 802.15.4 OQPSK (V _B =3.0, All Temp) |
| | | 70 | 95 | mA | P _O =18dBm 802.15.4 OQPSK (V _B =3.0, All Temp) |

| Parameter | Specification | | | Unit | Condition |
|---------------------------------------|----------------|-----|------------|----------------------|--|
| | Min | Typ | Max | | |
| | | 50 | | mA | $P_O=14\text{dBm}$ 802.15.4 OQPSK ($V_B=2.0$, All Temp) |
| Thermal Resistance | | 78 | | $^{\circ}\text{C/W}$ | $V_{CC}=3.0\text{V}$, $P_{OUT}=18\text{dBm}$, $T_{REF}=85^{\circ}\text{C}$ |
| Harmonics 2f0 to 5f0 | | -45 | -42 | dBm/MHz | At 18dBm, $V_{CC}=3.0\text{V}$ to 3.6V |
| VSWR Stability and Load | 4:1 | | | | |
| VSWR No Damage | 8:1 | | | | |
| Gain Settling Time | | 1 | 10 | μS | |
| Rx Path | | | | | |
| Frequency | 2405 | | 2480 | MHz | |
| Gain | 8.5 | 11 | 13 | dB | |
| Noise Figure | | 3 | | dB | Temp = 25°C; over voltage and frequency |
| Current | | 8 | 12 | mA | Nominal conditions |
| IIP3 | | 7 | | dBm | |
| Gain Flatness | -0.5 | | +0.5 | dB | |
| Input Return Loss | 10 | 15 | | dB | |
| Output Return Loss | 10 | | | dB | Pins 5, 6 (RFM, RFP) 100 Ω differential |
| Amplitude Imbalance | -1 | | +1 | dB | |
| Phase Imbalance | -15 | | +15 | dB | |
| Maximum Input Power | 5 | | | dBm | |
| Bypass Mode | | | | | |
| Frequency | 2405 | | 2480 | MHz | |
| Insertion Loss/Noise Figure | | 5 | 6.5 | dB | SW1dB, Bypass 2.5dB, Balun 1.5dB |
| Current | | 50 | | μA | |
| IIP3 | | 23 | | dBm | |
| Gain Flatness | -0.5 | | 0.5 | dB | |
| Input Return Loss | 10 | 12 | | dB | |
| Output Return Loss | 10 | | | dB | Pins 5, 6 (RFM, RFP) 100 Ω differential |
| Amplitude Imbalance | -1 | | +1 | dB | |
| Phase Imbalance | -15 | | +15 | dB | |
| Maximum Input Power | 10 | | | dBm | |
| Logic | | | | | |
| Logic Level "HIGH" Input Voltage | $V_{BATT}-0.2$ | | V_{BATT} | V | |
| Logic Level "LOW" Input Voltage | 0.0 | | 0.2 | V | |
| Input Source Current at Logic "HIGH" | | 5 | 10 | μA | |
| Switch Leakage Current at Logic "LOW" | | | 1 | μA | |
| Antenna Switch | | | | | |
| RF to Control Isolation | | 50 | | dB | |
| ANT1 to ANT2 Isolation | | 20 | | dB | |
| T/R Switching Time | | | 1 | μS | |

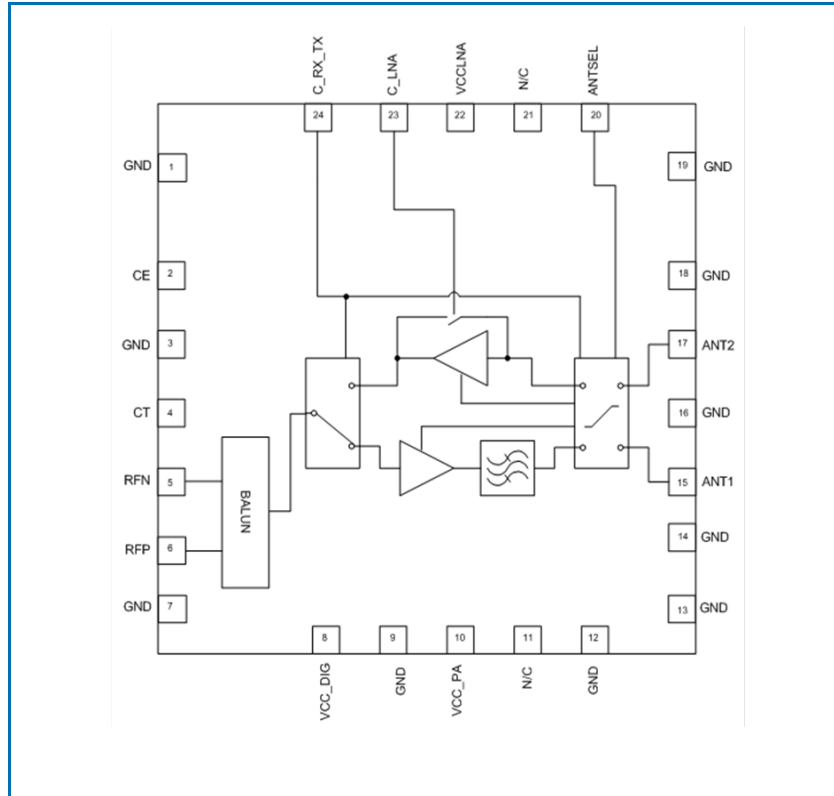
Control Logic Table

| Mode | CE | C_RX_TX | C_LNA | ANTSEL |
|-------------|------|---------|-------|--------|
| TX-ANT1 | High | High | Low | Low |
| TX-ANT2 | High | High | Low | High |
| RX-ANT1 LNA | High | Low | Low | Low |
| RX-ANT1 BYP | High | Low | High | Low |
| RX-ANT2 LNA | High | Low | Low | High |
| RX-ANT2 BYP | High | Low | High | High |
| Power Down | Low | Low | Low | Low |

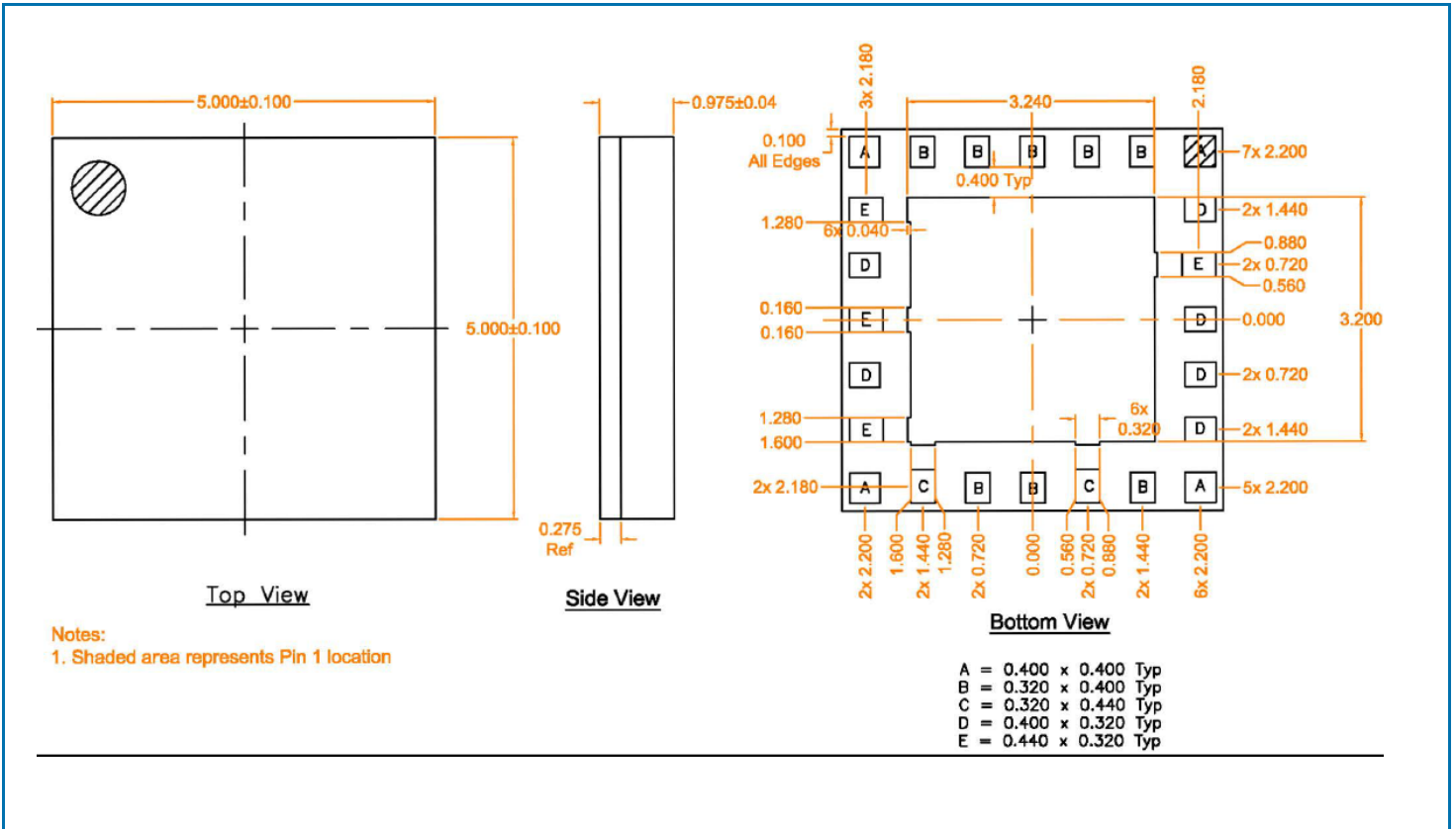
Applications Schematic



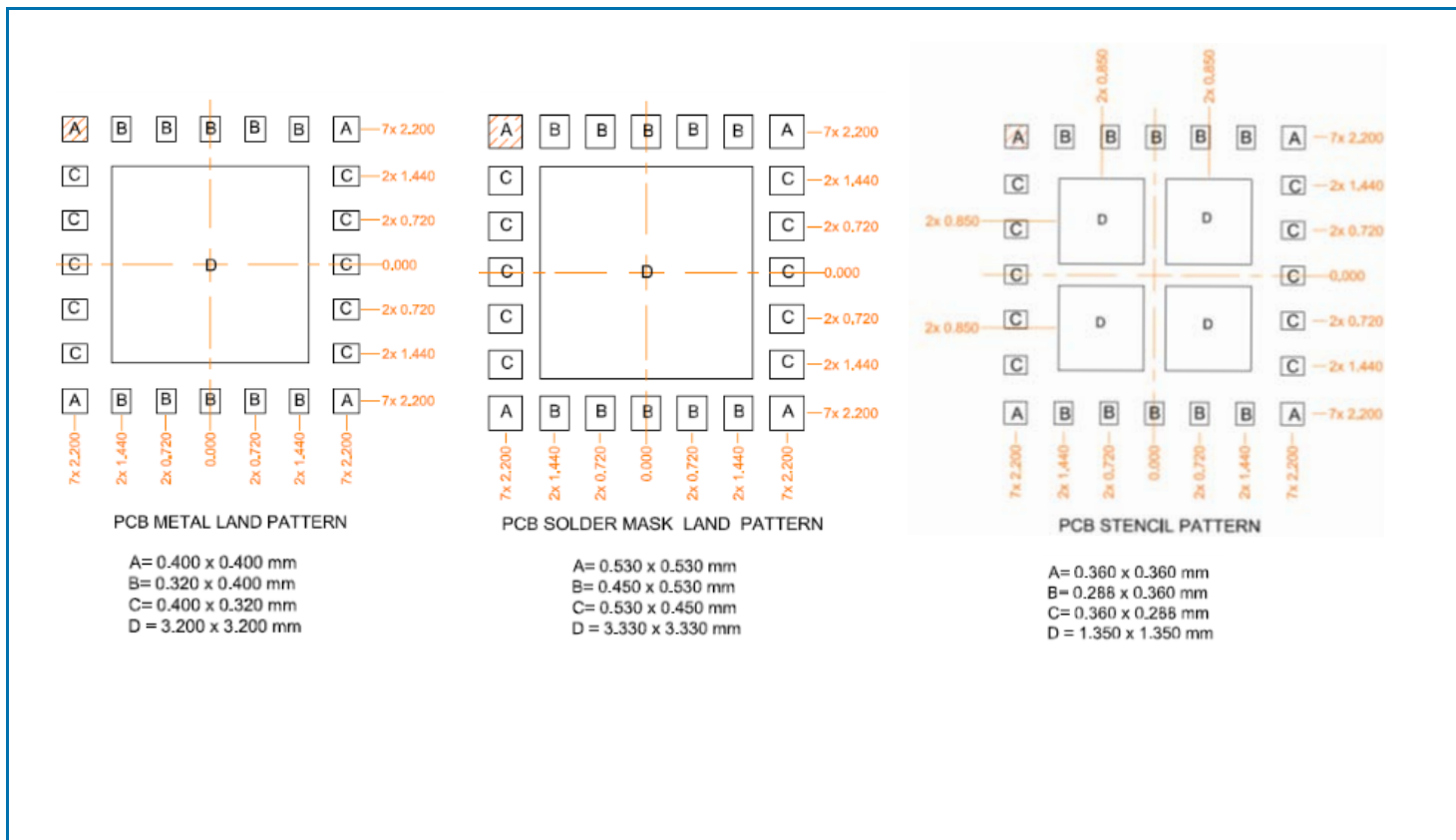
Pin Out



Package Drawing

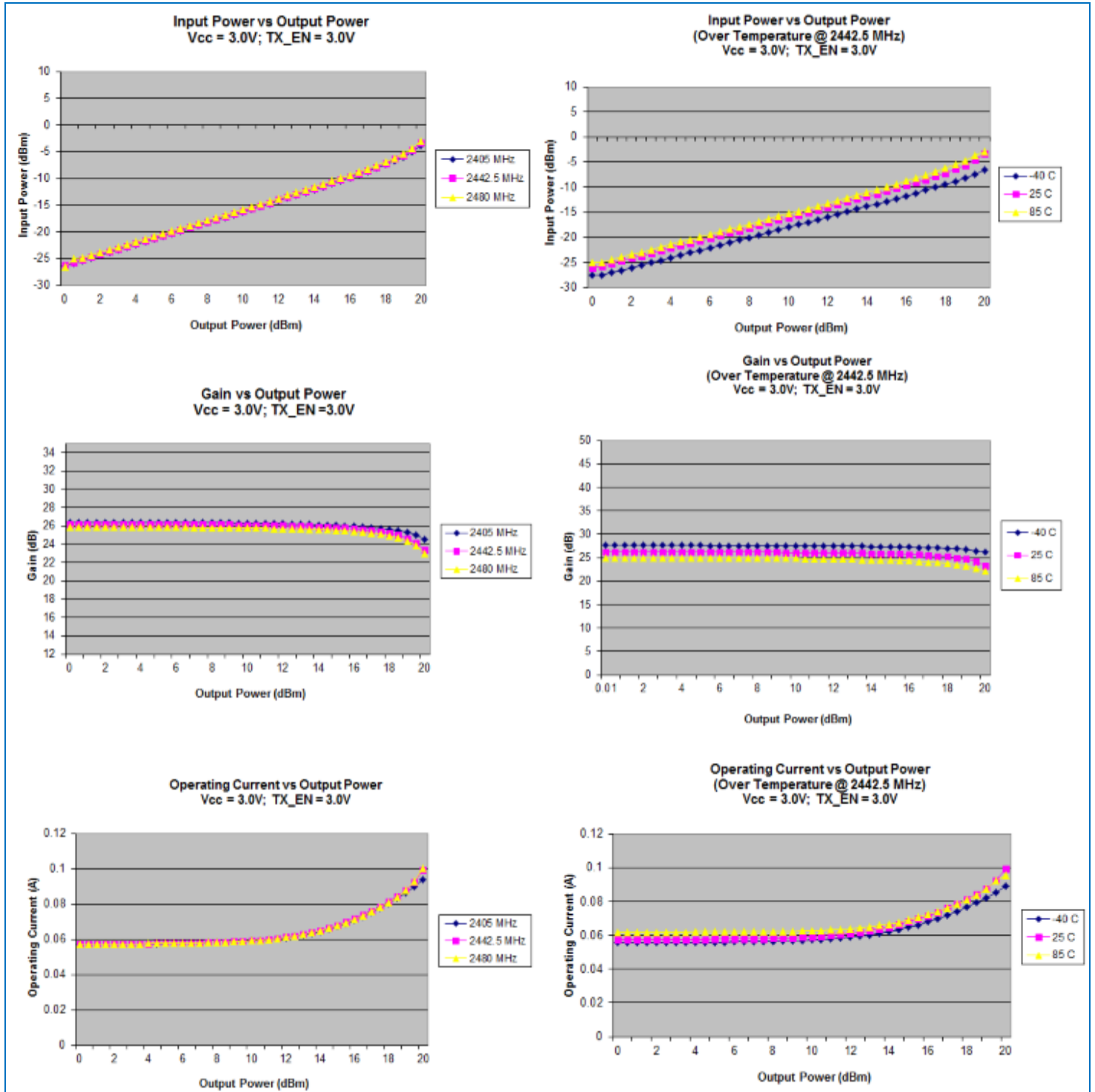


PCB Patterns



Thermal vias for center slug "D" should be incorporated into the PCB design. The number and size of thermal vias will depend on the application, power dissipation and electrical requirements. Example of the number and size of vias can be found on the RFMD evaluation board layout (gerber files are available upon request).

RF6555 2.4 GHz Front End Module



Pin Names and Descriptions

| Pin | Name | Description |
|-----|---------|--|
| 1 | GND | Ground. |
| 2 | CE | Control voltage pin for chip enable. See logic table. |
| 3 | GND | Ground. |
| 4 | CT | Center tap for passing DC voltage to RFN/RFP pins that connect to the TXVR SoIC. |
| 5 | RFN | Differential bi-directional RF port. Matched to 50Ω single-ended, 100Ω differential. |
| 6 | RFP | Differential bi-directional RF port. Matched to 50Ω single-ended, 100Ω differential. |
| 7 | GND | Ground. |
| 8 | VCC_DIG | Voltage supply pin for digital logic circuitry. |
| 9 | GND | Ground. |
| 10 | VCC_PA | Voltage supply pin for Tx power amplifier. |
| 11 | N/C | Not connected. |
| 12 | GND | Ground. |
| 13 | GND | Ground. |
| 14 | GND | Ground. |
| 15 | ANT1 | Antenna port 1. Match to 50Ω and DC blocked internally. |
| 16 | GND | GND Ground. |
| 17 | ANT2 | Antenna port 2. Matched to 50Ω and DC blocked internally. |
| 18 | GND | Ground. |
| 19 | GND | Ground. |
| 20 | ANTSEL | Control pin for antenna selection. See logic table. |
| 21 | N/C | Not connected. |
| 22 | VCC_LNA | Voltage supply pin for Rx low noise amplifier. |
| 23 | C_LNA | Control voltage for pin for LNA/bypass modes. See logic table. |
| 24 | C_RX_TX | Control voltage pin for Tx/Rx modes. See logic table. |