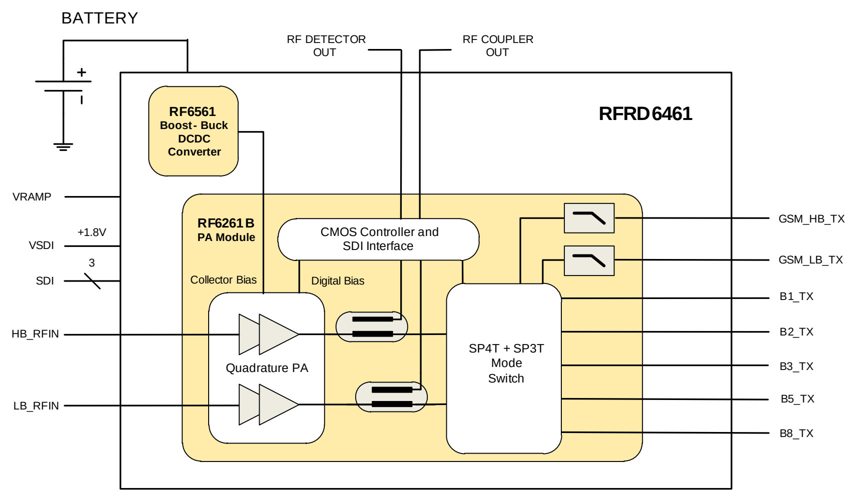
# RFRD6461

## 3G POWERSMART™ POWER PLATFORM

PCB Footprint: 7.6mm x 15.3mm x 1.02mm




Functional Block Diagram

## Features

- 2 Component Placement Power Platform
  - RF6261B Power Amplifier: 6.0mm x 8.0mm
  - RF6561 PA Power Management: 1.72mm x 2.53mm
- Multimode Capability
  - GSM/EDGE/EGPRS/EDGE-Evo
  - WCDMA/HSPA+
- Multi-band Coverage
  - Quad-band EDGE (QBE) (850/900/1800/1900)
  - ≤ Penta-band 3G/4G (UMTS Bands 1-6, 8-10)
- WiFi, Bluetooth, GPS Coexistence
- Quadrature PA Technology for Superior VSWR Tolerance and TRP Compliance
- 3-Wire SDI Programmable Control Interface
  - Optimized Transmit Efficiency for All Power Levels and Modes
  - Digitally Controlled PA Bias Settings
- Feedback for Power Control, Battery Current ($I_{BATT}$) Optimization
  - Common Integrated Directional Coupler Output
  - Common RF Detector Output
- Small PCB Footprint: Replaces Up To Five 3G PAs + QBE PA

## Applications

- 2G/3G/4G Multimode, Multi-band Smartphones, and Mobile Internet Devices
- 3G/4G Connected Devices

## Product Description

RFMD's RFRD6461 3G multi-band, multimode PowerSmart™ power platform is targeted at smartphones and mobile internet devices (MIDs) by providing extensive flexibility and customization, "user experience" focused performance with real-time battery life optimization, and a dramatically smaller front end solution size-all while accelerating an original equipment manufacturer's (OEM's) time to market.

At the heart of the RFRD6461 is the industry's first RF configurable power platform, designed to seamlessly merge RFMD's leading, industry-proven VSWR-tolerant, quadrature power amplifier technology with RFMD's patented power management technology in a new category of cellular sub-system. Although comprised of two separate component placements, the RF6261B (or one of its tri-band or dual-band derivatives - see RF6261B data sheet for these variants) and the RF6561, these components were developed to operate seamlessly as an agile and highly RF configurable power platform. The RF configurable power platform enables up to 5 bands of WCDMA/HSPA+ operation, and provides performance and battery life customization without hardware changes as well as the ability to maximize efficiency across power levels, data rates, and during non-ideal load conditions (VSWR).

### Ordering Information

| | |
|---|---|
| RFRD6461 | Fully Assembled Evaluation Board (only 6261B version available for evaluation) |

### Optimum Technology Matching® Applied

| | | | |
|---|---|---|---|
| ☑ GaAs HBT | ☐ SiGe BiCMOS | ☐ GaAs pHEMT | ☐ GaN HEMT |
| ☐ GaAs MESFET | ☐ Si BiCMOS | ☑ Si CMOS | ☐ BiFET HBT |
| ☐ InGaP HBT | ☐ SiGe HBT | ☐ Si BJT | |

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## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| $V_{BATT}$ - Battery Voltage | -0.3 to 6 | V |
| VSDI - SDI Supply Voltage | -0.3 to 3 | V |
| $V_{RAMP}$ - Ramp Control Voltage | -0.3 to 2.5 | V |
| $V_{CC}$ - PA Collector Voltage | -0.3 to 5.3 | V |
| $P_{IN}$ - RF Input Power | 16 | dBm |
| PA Duty Cycle (EGPRS / UMTS) | 75/100 | % |
| Storage Temperature (Ambient) | -55 to 125 | °C |
| Output Load VSWR | 10:1 | |
| Electrostatic Discharge (ESD)HBM - RF Outputs | Class 2 | |
| Electrostatic Discharge (ESD) HBM - RF Inputs | Class 2 | |
| Electrostatic Discharge (ESD) HBM - All Others | Class 2 | |

**Caution!** ESD sensitive device.

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.

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| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **General Operating and Performance Conditions** | | | | | |
| $V_{BATT}$ - Battery Voltage | 2.9 | 3.6 | 5.1 | V | |
| $I_{BATT(OFF)}$ - Leakage Current | | | 25 | µA | All circuits disabled |
| $V_{SDI}$ - SDI Supply Voltage | 1.6 | 1.8 | 3 | V | |
| $I_{SDI(OFF)}$ - SDI Leakage Current | 0 | 1 | 10 | µA | |
| $I_{SDI(IDLE)}$ - Idle SDI Current Drain | 0 | 1 | 10 | µA | No SDI activity; register memory contents retained |
| $I_{SDI(ON)}$ - Active SDI Current Drain | | | 10 | mA | During active SDI programming |
| $V_{RAMP}$ - Ramp Control Voltage | 0.132 | | 2.1 | V | Control voltage input to RF6561 |
| $Z_{IN}$ - RF Input Impedance (all RF ports) | | 50 | | Ω | |
| $Z_{OUT}$ - RF Output Impedance (all RF ports) | | 50 | | Ω | |
| Normal Operating Temperature (Ambient) | 15 | 25 | 35 | °C | |
| Extended Operating Temperature (Ambient) | -20 | | 85 | °C | |
| **SDI Interface Specifications** | | | | | |
| Voltage and Timing Requirements | | | | | 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1 unless otherwise defined |
| VSDI Supply Current 1 | | | 1.25 | mA | Master write operation |
| VSDI Supply Current 2 | | | 5 | mA | Master read operation |
| Input High Voltage | 0.7*VSDI | | VSDI+0.3 | V | |
| Input Low Voltage | -0.3 | | 0.3*VSDI | V | |
| Output High Voltage | 0.8*VSDI | | VSDI | V | |
| Output Low Voltage | 0 | | 0.2*VSDI | V | |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **SDI Interface Specifications (continued** | | | | | |
| Clock Frequency | 3.5 | | 26 | MHz | |
| Voltage and Timing Requirements (continued) | | | | | |
| Clock Duty Cycle | 45 | 50 | 55 | % | |
| Data Setup Time | 13.2 | | | ns | Master write operation |
| Data Hold Time | 13.2 | | | ns | Master read operation |
| Data Setup Time | 4 | | | ns | Master write operation |
| Data Hold Time | 15.8 | | | ns | Master read operation |
| Data Valid Clock Edge | | Falling | | | Data sent from the master is clocked on the falling edge of SDI_CLK, and data is captured on the rising edge of SDI_CLK. Message execution occurs on the falling edge of SDI_EN. |
| **2G Specifications** | | | | | |
| GSM850/GSM900 Band GMSK Mode | | | | | Output power set with RF detector using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, 25% duty cycle, unless otherwise defined. |
| Frequency Band, GSM850 | 824 | | 849 | MHz | |
| Frequency Band, GSM900 | 880 | | 915 | MHz | |
| RF Input Power | 11 | | 16 | dBm | To guarantee $P_{MAX}$ over extreme conditions |
| Maximum Output Power ($P_{MAX}$) | 35.0 | | | dBm | $V_{BATT} \geq 3.4V$ |
| Maximum Output Power (Extreme) | 32.5 | | | dBm | $V_{BATT}$ = 2.9V, Temp = 85 °C |
| Maximum Output Power Battery Current | | 1.96 | 2.125 | A | $P_{OUT}$ = 35.0dBm |
| Minimum Output Power Battery Current | | 29.5 | 50 | mA | $P_{OUT}$ = 6dBm |
| Noise Power in the Rx Band(non-composite) | | | | | RBW = 100kHz, 50 Averages, $P_{OUT}$ = 35.0dBm |
| 869MHz to 894MHz | | -82 | -79 | dBm | TxFreq = 836MHz |
| 925MHz to 935MHz | | -83 | -67 | dBm | TxFreq = 897MHzi |
| 935MHz to 960MHz | | -84 | -79 | dBm | |
| Harmonics | | | | | $P_{MAX}$ = 35.0dBm |
| 2nd Harmonic | | -21 | -13 | dBm | $V_{BATT}$ = 4.7V |
| 3rd Harmonic | | -42 | -18 | dBm | |
| 2Fo Cross Band Coupling | | -50 | -25 | dBm | $P_{MAX}$ = 35.0dBm |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 8:1, all phase angles, $P_{OUT}$ = 35dBm |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 10:1, all phase angles |
| Forward Isolation 1 | | -60 | -10 | dBm | $RF_{(IN)}$ applied, mode switch closed, $P_{(IN)}$ = -43dBm |
| Forward Isolation 2 | | -76 | -30 | dBm | $RF_{(IN)}$ applied, mode switch open, $P_{(IN)}$ = -43dBm |

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| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| DCS1800/PCS1900 Band GMSK Mode | | | | | Output power set with RF detector using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, 25% duty cycle, unless otherwise defined. |
| Frequency Band, DCS1800 | 1710 | | 1785 | MHz | |
| Frequency Band, PCS1900 | 1850 | | 1910 | MHz | |
| RF Input Power | 11 | | 16 | dBm | To guarantee $P_{MAX}$ over extreme conditions |
| Maximum Output Power ($P_{MAX}$) | 32.8 | | | dBm | $V_{BATT} \geq 3.4V$ |
| Maximum Output Power (Extreme) | 30.9 | | | dBm | $V_{BATT}$ = 2.9V, Temp = 85 °C |
| Maximum Output Power Battery Current | | 1.33 | 1.625 | A | $P_{OUT}$ = 32.8dBm |
| Minimum Output Power Battery Current | | 30 | 50 | mA | $P_{OUT}$ = 2dBm |
| Noise Power in the Rx Band (non-composite) | | | | | RBW = 100kHz, 50 Averages, $P_{OUT}$ = 32.8dBm |
| 1805MHz to 1880MHz | | -85.0 | -71 | dBm | TxFreq = 1747MHz |
| 1930MHz to 1990MHz | | -85.0 | -71 | dBm | TxFreq = 1880MHz |
| Harmonics | | | | | $P_{MAX}$ = 32.8dBm |
| 2nd Harmonic | | -33 | -13 | dBm | $V_{BATT}$ = 4.7V |
| 3rd Harmonic | | -45 | -18 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 8:1, all phase angles, $P_{OUT}$ = 32.8dBm |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 10:1, all phase angles |
| Forward Isolation 1 | | -54 | -10 | dBm | $RF_{(IN)}$ applied, mode switch closed, $P_{(IN)}$ = -43dBm |
| Forward Isolation 2 | | -76 | -30 | dBm | $RF_{(IN)}$ applied, mode switch open, $P_{(IN)}$ = -43dBm |
| **2.5G Specifications** | | | | | |
| GSM850/GSM900 Band 8PSK Mode | | | | | Output power set with RF detector using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, 25% duty cycle, unless otherwise defined. |
| Frequency Band, GSM850 | 824 | | 849 | MHz | |
| Frequency Band, GSM900 | 880 | | 915 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 28.8 | | | dBm | $V_{BATT} \geq 3.4V$ |
| Maximum Output Power (Extreme) | 26.9 | | | dBm | $V_{BATT}$ = 2.9V, Temp = 85 °C |
| Maximum Output Power Battery Current | | 0.97 | 1.125 | A | $P_{OUT}$ = 28.8dBm |
| Minimum Output Power Battery Current | | 28 | 50 | mA | $P_{OUT}$ = 6dBm |
| Gain | 23.5 | 31.5 | 33.5 | dB | $P_{OUT}$ = 28.8dBm, -20 °C ≤ Temp ≤ 85 °C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Modulation Spectrum at Offset | | | | | RBW = 30kHz for offset ≤ 1800kHz, else 100kHz; $P_{OUT}$ = 28.8dBm |
| 400kHz | | -63 | -57 | dBc | Linearity is software-configurable; 3.4V $V_{BATT}$ |
| 600kHz | | -75 | -64 | dBc | |
| EVM (Max RMS) | | 2.5 | 5 | % | Linearity is software-configurable |
| Noise Power in the Rx Band (non-composite) | | | | | RBW = 100kHz, 50 Averages, $P_{OUT}$ = 28.8dBm |


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| Parameter | Specification Min. | Specification Typ. | Specification Max. | Unit | Condition |
|---|---|---|---|---|---|
| **2.5G Specifications (continued)** | | | | | |
| GSM850/GSM900 Band 8PSK Mode (continued) | | | | | Output power set with RF detector using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, 25% duty cycle, unless otherwise defined. |
| 869MHz to 894MHz | | -83 | -79 | dBm | TxFreq = 836MHz |
| 925MHz to 935MHz | | -81 | -67 | dBm | TxFreq = 897MHz |
| 935MHz to 960MHz | | -82 | -79 | dBm | |
| Harmonics | | | | | $P_{MAX}$ = 28.8dBm |
| 2nd Harmonic | | -44 | -13 | dBm | |
| 3rd Harmonic | | -54 | -18 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 8:1, all phase angles, $P_{OUT}$ = 28.8 dBm |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 10:1, all phase angles |
| DCS1800/PCS1900 Band 8PSK Mode | | | | | Output power set with RF detector using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, 25% duty cycle, unless otherwise defined.. |
| Frequency Band, DCS1800 | 1710 | | 1785 | MHz | |
| Frequency Band, PCS1900 | 1850 | | 1910 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 28.3 | | | dBm | $V_{BATT} \geq$ 3.4V |
| Maximum Output Power (Extreme) | 26.4 | | | dBm | $V_{BATT}$ = 2.9V, Temp = 85 °C |
| Maximum Output Power Battery Current | | 0.95 | 1.25 | A | $P_{OUT}$ = 28.3dBm |
| Minimum Output Power Battery Current | | 29 | 50 | mA | $P_{OUT}$ = 2dBm |
| Gain | 26.5 | 30.0 | 35.7 | dB | $P_{OUT}$ = 28.3dBm, -20 °C ≤ Temp ≤ 85 °C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Modulation Spectrum at Offset | | | | | RBW = 30kHz for offset ≤ 1800kHz, else 100kHz; $P_{OUT}$ = 28.3dBm |
| 400kHz | | -65 | -57 | dBc | Linearity is software-configurable; 3.4V $V_{BATT}$ |
| 600kHz | | -77 | -64 | dBc | |
| EVM (Max RMS) | | 2.4 | 5 | % | Linearity is software-configurable |
| Noise Power in the Rx Band (non-composite) | | | | | RBW = 100kHz, 50 Averages, $P_{OUT}$ = 28.3dBm |
| 1805MHz to 1880MHz | | -87 | -71 | dBm | TxFreq = 1747MHz |
| 1930MHz to 1990MHz | | -87 | -71 | dBm | TxFreq = 1880MHz |
| Harmonics | | | | | $P_{MAX}$ = 28.3dBm |
| 2nd Harmonic | | -41 | -13 | dBm | |
| 3rd Harmonic | | -56 | -18 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 8:1, all phase angles, $P_{OUT}$ = 28.3dBm |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 10:1, all phase angles |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **3G Specifications** | | | | | |
| Band 1<br>WCDMA Mode | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, unless otherwise defined. |
| Frequency Band | 1920 | | 1980 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 27.3 | | | dBm | $V_{BATT}$ ≥ 3.4V |
| Maximum Output Power (Extreme) | 25.9 | | | dBm | $V_{BATT}$ = 2.9V, Temp = -20 °C to 85 °C |
| Maximum Linear Output Power ($P_{MAX}$ HSUPA) | 26.3 | | | dBm | $V_{BATT}$ ≥ 3.4V, HSUPA Subtest 3 |
| Typical Linear Output Power ($P_{TYP}$) | | 26.3 | | dBm | $V_{BATT}$ ≥ 3.4V, Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| Maximum Output Power Battery Current | | 500 | 525 | mA | $V_{BATT}$ ≥ 3.4V, ACLR at -41dBc |
| Typical Output Power Battery Current | | 375 | | mA | $V_{BATT}$ ≥ 3.7V, Temp = 25 °C, ACLR at -38dBc (software-configurable), Corresponds to Antenna $P_{OUT}$ = 23.5dBm |
| DG.09 Battery Current | | 23.2 | | mA | |
| 3dBm Battery Current | | 13 | | mA | Corresponds to Antenna $P_{OUT}$ = 0dBm |
| Gain | 21 | 25 | 29.3 | dB | $P_{OUT}$ = 27.3dBm, -20 °C ≤ Temp ? 85 °C, 2.9V ≤ VBATT ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Adjacent Channel Power Leakage (ACLR) at Offset | | | | | All Power Levels |
| 5MHz | | -41 | -38 | dBc | Linearity is software-configurable |
| 10MHz | | -54 | -48 | dBc | |
| EVM (Max RMS) | | 1.3 | 3.5 | % | |
| Noise Power in the Rx Band (non-composite) | | | | | $P_{MAX}$, 50 Averages, RBW = 1Hz |
| 2110MHz to 2170MHz | | -96 | -71 | dBm | Measured at duplex offset frequency ($F_{TX}$ + 180MHz) |
| Harmonics | | | | | |
| 2nd Harmonic | | -34 | -10 | dBm | |
| 3rd Harmonic | | -46 | -15 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 7:1, all phase angles |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 8:1, all phase angles |
| Band 2<br>WCDMA Mode | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, unless otherwise defined. |
| Frequency Band | 1850 | | 1910 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 28.1 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25 °C |
| Maximum Output Power (Extreme) | 26.7 | | | dBm | $V_{BATT}$ = 2.9V, Temp = -20 °C to 85 °C |
| Maximum Linear Output Power ($P_{MAX}$ HSUPA) | 27.1 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25 °C, HSUPA Subtest 3 |
| Typical Linear Output Power ($P_{TYP}$) | | 26.7 | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25 °C, Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| Maximum Output Power Battery Current | | 580 | 605 | mA | $V_{BATT}$ ≥ 3.4V, ACLR at -40dBc |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **3G Specifications (continued)** | | | | | |
| Band 2<br>WCDMA Mode (continued) | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, unless otherwise defined. |
| Typical Output Power Battery Current | | 400 | | mA | $V_{BATT}$ ≥ 3.7V, ACLR at -38dBc (software-configurable), Corresponds to Antenna $P_{OUT}$ = 23.5dBm |
| DG.09 Battery Current | | 25 | | mA | |
| 3dBm Battery Current | | 14 | | mA | Corresponds to Antenna $P_{OUT}$ = 0dBm |
| Gain | 21.5 | 26 | 30 | dB | $P_{OUT}$ = 28.1dBm, -20 °C ≤ Temp ≤ 85 °C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Adjacent Channel Power Leakage (ACLR) at Offset | | | | | All Power Levels |
| 5MHz | | -40 | -38 | dBc | Linearity is software-configurable |
| 10MHz | | -54 | -48 | dBc | |
| EVM (Max RMS) | | 1.2 | 3.5 | % | |
| Noise Power in the Rx Band (non-composite) | | | | | $P_{MAX}$, 50 Averages, RBW = 1Hz |
| 1930MHz to 1990MHz | | -89 | -66 | dBm | Measured at duplex offset frequency ($F_{TX}$ + 80MHz) |
| Harmonics | | | | | |
| 2nd Harmonic | | -29 | -10 | dBm | |
| 3rd Harmonic | | -45 | -15 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 7:1, all phase angles |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 8:1, all phase angles |
| Band 3, 9, 10<br>WCDMA Mode | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, unless otherwise defined. |
| Frequency Band | 1710 | | 1785 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 27.6 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25 °C |
| Maximum Output Power (Extreme) | 26.2 | | | dBm | $V_{BATT}$ = 2.9V, Temp = -20 °C to 85 °C |
| Typical Linear Output Power | | 26.5 | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25 °C, Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| Maximum Linear Output Power ($P_{MAX}$ HSUPA) | 26.6 | | | dBm | $V_{BATT}$ ≥3.4V, HSUPA Subtest 3 |
| Maximum Output Power Battery Current | | 540 | 565 | mA | $V_{BATT}$ ≥ 3.4V, Temp = 25 °C, ACLR at -41dBc |
| Typical Output Power Battery Current | | 385 | | mA | $V_{BATT}$ ≥ 3.7V, Temp = 25 °C, ACLR at -38dBc (software-configurable), Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| DG.09 Battery Current | | 25 | | mA | |
| 3dBm Battery Current | | 14 | | mA | Corresponds to Antenna $P_{OUT}$ = 0dBm |
| Gain | 22.2 | 26 | 29.4 | dB | $P_{OUT}$ = 27.6dBm, -20 °C ≤ Temp ≤ 85 °C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Adjacent Channel Power Leakage (ACLR) at Offset | | | | | All Power Levels |
| 5 MHz | | -41 | -38 | dBc | Linearity is software-configurable |
| 10 MHz | | -54 | -48 | dBc | |
| EVM (Max RMS) | | 1.1 | 3.5 | % | |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **3G Specifications (continued)** | | | | | |
| Band 3, 9, 10 WCDMA Mode (continued) | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25 °C, Load VSWR = 1:1, unless otherwise defined. |
| Noise Power in the Rx Band (non-composite) | | | | | $P_{MAX}$, 50 Averages, RBW = 1Hz |
| 1805MHz to 1880MHz | | -89 | -66 | dBm | Measured at duplex offset frequency ($F_{TX}$ + 95MHz) |
| Harmonics | | | | | |
| 2nd Harmonic | | -18 | -10 | dBm | |
| 3rd Harmonic | | -48 | -15 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 7:1, all phase angles |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 8:1, all phase angles |
| Band 4 WCDMA Mode (continued) | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, unless otherwise defined. |
| Frequency Band | 1710 | | 1755 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 27.3 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C |
| Maximum Output Power (Extreme) | 25.9 | | | dBm | $V_{BATT}$ = 2.9V, Temp = -20°C to 85°C |
| Typical Linear Output Power ($P_{TYP}$) | | 26.2 | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| Maximum Linear Output Power ($P_{MAX}$ HSUPA) | 26.3 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, HSUPA Subtest 3 |
| Maximum Output Power Battery Current | | 510 | 530 | mA | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, ACLR at -41dBc |
| Typical Output Power Battery Current | | 360 | | mA | $V_{BATT}$ ≥ 3.7V, Temp = 25°C, ACLR at -38dBc (software-configurable) , Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| DG.09 Battery Current | | 24 | | mA | |
| 3dBm Battery Current | | 14 | | mA | Corresponds to Antenna $P_{OUT}$ = 0dBm |
| Gain | 21.5 | 26 | 29.3 | dB | $P_{OUT}$ = 27.3dBm, -20°C ≤ Temp ≤ 85°C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Adjacent Channel Power Leakage (ACLR) at Offset | | | | | All Power Levels |
| 5 MHz | | -41 | -38 | dBc | Linearity is software-configurable |
| 10 MHz | | -54 | -48 | dBc | |
| EVM (Max RMS) | | 1.1 | 3.5 | % | |
| Noise Power in the Rx Band(non-composite) | | | | | $P_{MAX}$, 50 Averages, RBW = 1 Hz |
| 2110MHz to 2155MHz | | -96 | -71 | dBm | Measured at duplex offset frequency ($F_{TX}$ + 400MHz) |
| Harmonics | | | | | |
| 2nd Harmonic | | -17 | -10 | dBm | |
| 3rd Harmonic | | -49 | -15 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 7:1, all phase angles |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 8:1, all phase angles |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **3G Specifications (continued)** | | | | | |
| Band 5, 6<br>WCDMA Mode | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, unless otherwise defined. |
| Frequency Band | 824 | | 849 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 27.0 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C |
| Maximum Output Power (Extreme) | 25.6 | | | dBm | $V_{BATT}$ = 2.9V, Temp = -20°C to 85°C |
| Typical Linear Output Power ($P_{TYP}$) | | 25.9 | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| Maximum Linear Output Power ($P_{MAX}$ HSUPA) | 26.0 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, HSUPA Subtest 3 |
| Maximum Output Power Battery Current | | 460 | 485 | mA | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, ACLR at -45dBc |
| Typical Output Power Battery Current | | 330 | | mA | $V_{BATT}$ ≥ 3.7V, Temp = 25°C, ACLR at -38dBc (software-configurable) , Corresponds to Antenna $P_{OUT}$ = 23.5dBm |
| DG.09 Battery Current | | 24 | | mA | |
| 3dBm Battery Current | | 14 | | mA | Corresponds to Antenna $P_{OUT}$ = 0dBm |
| Gain | 22.5 | 28 | 30.5 | dB | $P_{OUT}$ = 27.0dBm, -20°C ≤ Temp ≤ 85°C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Adjacent Channel Power Leakage (ACLR) at Offset | | | | | All Power Levels |
| 5MHz | | -46 | -36 | dBc | Linearity is software-configurable |
| 10MHz | | -55 | -48 | dBc | |
| EVM (Max RMS) | | 1.0 | 3.5 | % | |
| Noise Power in the Rx Band(non-composite) | | | | | $P_{MAX}$; RBW = 1Hz, 50 Averages |
| 869MHz to 894MHz | | -87 | -68 | dBm | Measured at duplex offset frequency ($F_{TX}$ + 45MHz) |
| Harmonics | | | | | |
| 2nd Harmonic | | -15 | -10 | dBm | |
| 3rd Harmonic | | -38 | -13 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 7:1, all phase angles |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 8:1, all phase angles |
| Band 8<br>WCDMA Mode | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, unless otherwise defined |
| Frequency Band | 880 | | 915 | MHz | |
| Maximum Output Power ($P_{MAX}$) | 27.6 | | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C |
| Maximum Output Power (Extreme) | 26.2 | | | dBm | $V_{BATT}$ = 2.9V, Temp = -20°C to 85°C |
| Typical Linear Output Power ($P_{TYP}$) | | 26.3 | | dBm | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| Maximum Linear Output Power ($P_{MAX}$ HSUPA) | 26.6 | | | dBm | $V_{BATT}$ ≥3.4V, Temp = 25°C, HSUPA Subtest 3 |
| Maximum Output Power Battery Current | | 490 | 515 | mA | $V_{BATT}$ ≥ 3.4V, Temp = 25°C, ACLR at -43dBc |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **3G Specifications (continued)** | | | | | |
| Band 8<br>WCDMA Mode (continued) | | | | | Output power set with RF coupler using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, unless otherwise defined |
| Typical Output Power Battery Current | | 355 | | mA | $V_{BATT}$ ≥ 3.7V, Temp = 25°C, ACLR at -38dBc (software-configurable), Corresponds to Antenna $P_{OUT}$ = 23.5 dBm |
| DG.09 Battery Current | | 25 | | mA | |
| 3dBm Battery Current | | 14 | | mA | Corresponds to Antenna $P_{OUT}$ = 0dBm |
| Gain | 22.5 | 28 | 30.5 | dB | $P_{OUT}$ = 27.6dBm, -20°C ≤ Temp ≤ 85°C, 2.9V ≤ $V_{BATT}$ ≤ 5.1V, 1:1 ≤ VSWR ≤ 3:1 |
| Adjacent Channel Power Leakage (ACLR) at Offset | | | | | All Power Levels |
| 5MHz | | -44 | -38 | dBc | Linearity is software-configurable |
| 10MHz | | -55 | -48 | dBc | |
| EVM (Max RMS) | | 1.0 | 3.5 | % | |
| Noise Power in the Rx Band (non-composite) | | | | | RBW = 1Hz, 50 Averages, $P_{OUT}$ = 27.6 dBm |
| 925MHz to 960MHz | | -88 | -68 | dBm | Measured at duplex offset frequency ($F_{TX}$ + 45MHz) |
| Harmonics | | | | | |
| 2nd Harmonic | | -21 | -10 | dBm | |
| 3rd Harmonic | | -42 | -13 | dBm | |
| Load Stability, maximum spurious emissions | | | -36 | dBm | Load VSWR = 7:1, all phase angles |
| Load Ruggedness | no permanent performance degradation | | | | Load VSWR = 8:1, all phase angles |
| **RF Detector Specifications** | | | | | |
| GMSK/8PSK Modes<br>(see High Dynamic Range, Linear RF Detector Response section below for measured detector responses) | | | | | Output power set with RF detector using $P_{(IN)}$ control; 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, 25% duty cycle, unless otherwise defined. |
| GSM850/GSM900 Band | | | | | |
| High Power Output Voltage | 1.2 | 1.7 | 2 | V | At $P_{MAX}$ |
| Offset Voltage | 150 | 214 | 250 | mV | |
| High Power Detector Slope | 70 | 100 | | mV/dB | Measured at $P_{TYP}$, $P_{TYP}$ = 1dB |
| Medium Power Detector Slope | 30 | 38 | | mV/dB | Measured at 21dBm, 19dBm |
| Low Power Detector Slope | 3 | 12 | | mV/dB | Measured at 8dBm, 5dBm |
| DCS1800/PCS1900 Band | | | | | |
| High Power Output Voltage | 1.2 | 1.6 | 2 | V | At $P_{MAX}$ |
| High Power Detector Slope | 70 | 101 | | mV/dB | Measured at $P_{TYP}$, $P_{TYP}$ = 1dB |
| Medium Power Detector Slope | 30 | 39 | | mV/dB | Measured at 21dBm, 19dBm |
| Low Power Detector Slope | 3 | 9 | | mV/dB | Measured at 3dBm, 0dBm |


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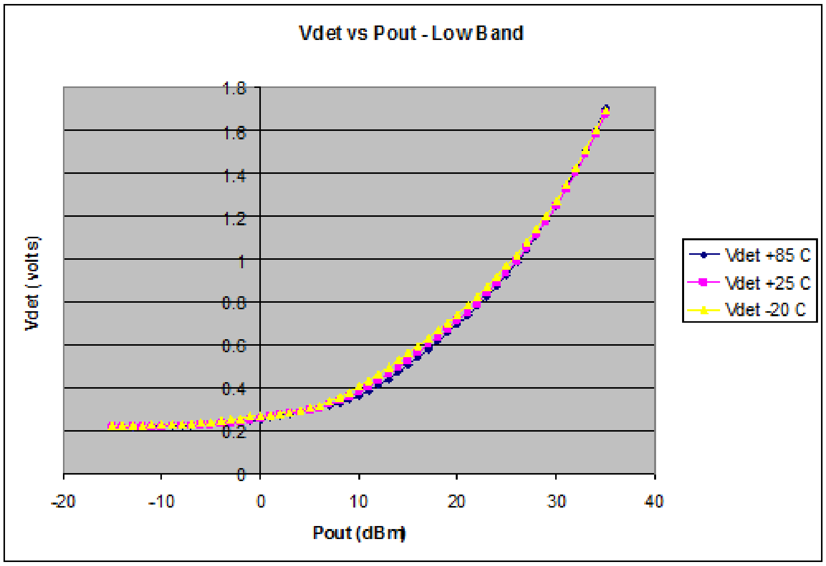
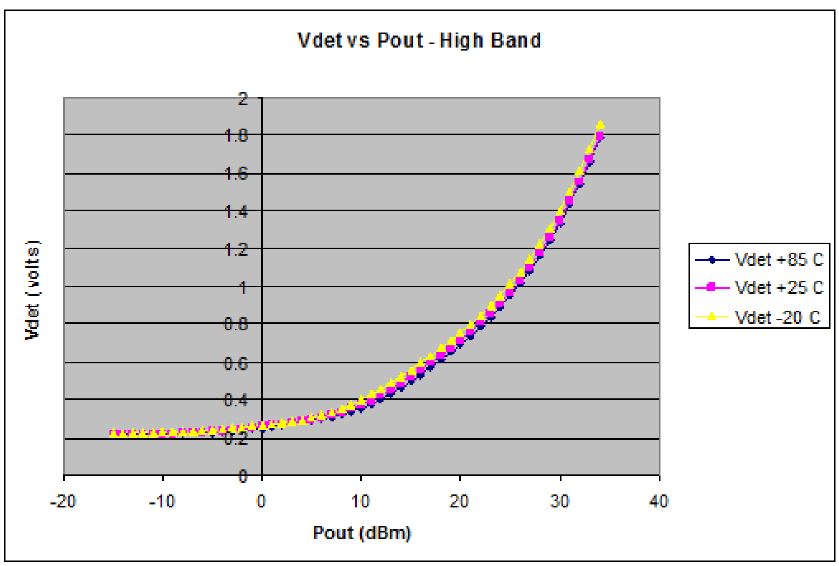
| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **RF Coupler Specifications** | | | | | |
| WCDMA Mode | | | | | 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, unless otherwise defined. |
| Band 1, 2, 3, 4, 9, 10 | | | | | |
| | | | | | |
| Coupling Factor | 35.5 | 38 | 39.5 | dB | |
| Coupling Variation with Temperature | -0.4 | 0 | 0.2 | dB | |
| Coupled Output Return Loss | | -15 | -12 | dB | |
| Band 5, 6, 8 | | | | | |
| Coupling Factor | 36 | 38 | 40 | dB | |
| Coupling Variation with Temperature | -0.4 | 0 | 0.2 | dB | |
| Coupled Output Return Loss | | -18 | -15 | dB | |
| **Mode Switch Specifications (single die)** | | | | | |
| Low Band (SP3T) + High Band (SP4T) | | | | | 3.8V $V_{BATT}$, Temp 25°C, Load VSWR = 1:1, unless otherwise defined. |
| Port to Port Isolation | | | | | |
| Band 5 – GSM LB | -26 | -27 | | dB | |
| Band 5 – Band 8 | -30 | -41 | | dB | |
| Band 8 – GSM LB | -26 | -27 | | dB | |
| | | | | | |
| Band 1 – GSM HB | -26 | -31 | | dB | |
| Band 2 – GSM HB | -27 | -35 | | dB | |
| Band 3 – GSM HB | -29 | -30 | | dB | |
| Band 4 – GSM HB | -24 | -29 | | dB | |
| Band 2 – Band 1 | -27 | -29 | | dB | |
| Band 3 – Band 2 | -28 | -39 | | dB | |

| Parameter | Condition |
|---|---|
| **WCDMA ModTC Test Conditions** | |
| Voice | General Test Conditions (RMC 12.2kbps) |
| Modulation | HPSK modulated carrier in 3.84BW<br>UL reference measurement channel (12.2kbps) ref. 3GPP 25.101 Annex A, section A.2.1<br>1 DPCCH, Spread code = 0, Relative power = -6.5 dB<br>1 DPDCH, Spread code = 16, Relative power = -1.1 dB |
| Pulse rate | CW testing (Not pulsed) |
| Input Power | Adjusted to meet output power requirement |
| HSUPA Subtest 3 | General Test Conditions (HSUPA), CM = 2.0dB, MPR = 1dB (power backoff) |
| Modulation | HPSK modulated carrier in 3.84BW<br>1 DPCCH, Spread code = 256, Relative power = -14.623dB<br>1 DPDCH, Spread code = 64, Relative power = -19.06dB<br>1 HS-DPCCH, Spread code =256, Relative power = -8.6dB |
| Pulse rate | CW testing (Not pulsed) |
| Input Power | Adjusted to meet output power requirement |

## High Dynamic Range, Linear RF Detector Response

Low Band and High Band (Representative of all Modes)



## Theory of Operation

RFRD6461 PowerSmart™ Power platform System Architecture
Internal to the RF6261B PA module are 2 RF paths: a low band path and a high band path implemented in GaAs HBT. There are only 2 RF inputs, one for each path. For the low band output, the path is switched between 3 outputs using a SP3T SOI (silicon on insulator) mode switch. The high band output is switched between 4 outputs using a SP4T SOI mode switch. Both switches are integrated onto a single die. In order to complete the front-end solution, the 2 GSM outputs are connected directly to an antenna switch. The 5 WCDMA outputs are connected to their respective duplexers, and the Tx ports are then routed to the same antenna switch. The antenna switch module (ASM) is recommended for multiplexing the 7 RF outputs to a single antenna port. Internal to the most available ASMs are integrated GSM Tx harmonic filters.

Each of the 2 RF paths has a dedicated directional coupler which is then cascaded into a single RF coupled output port. Additionally, the cascaded RF coupled port is internally applied to a high dynamic range linear RF detector implemented in CMOS which is then provided as a single detector output voltage.

Each of the 2 RF paths can be operated multi-mode: GSM saturated mode, EDGE/EDGE Evolution linear modes, and CDMA/WCDMA/HSPA+ linear modes. This is only accomplished by mating the PA module to the RF6561 PA power management IC (PMIC). The RF6561 was designed specifically for enabling the multi-mode operation of the single RF chain within the RF6261B PA module. To accomplish this, the RF6561 provides a scalable voltage to the PA device collectors to set the device load line for each mode. To cover all PA load line requirements while at the same time optimizing battery efficiency, boost and buck modes are utilized in a novel DC-DC converter architecture that reaches ~90% boost converter efficiencies (this includes all external losses due to the power inductor and PCB routing). The RF6561 output can provide > 2 Amps of current necessary for low band GMSK operation during poor TRP conditions, while at the same time providing ultra-low ripple voltage that meets stringent spurious emissions requirements. An external LC filter network is required like all switched mode power supplies. However, one primary innovation of the RF6561 is its ability to dither the clock frequency of the DC-DC converter PWM (pulse width modulator) using new and advanced algorithms that balance all spectrum requirements (patent pending).

The PowerSmart power platform is software configurable through the SDI bus. This enables 2 primary and key benefits. The first key benefit is the capability for dynamic and continuous optimization of transmit efficiency and current drain for every power level. The second key benefit is the ability to set a particular linearity target for every modulation format with full control of the PA bias.

Maximizing TRP (total radiated power) is addressed well with this solution. Each of the 2 RF paths inside the RF6261B utilizes a 2-stage quadrature architecture that is much more insensitive to load impedance variations relative to single-ended PA architectures. RF performance variations (output power, ACLR, EVM, harmonics, battery current, etc.) are minimized when subjected to varying antenna responses while operating in the mobile device.

The RF6261B and RF6561 solution was designed to provide optimal performance and battery efficiency across the entire RF dynamic range with its programmable SDI interface. The RF6261B PA efficiency is optimized by setting the PA device collector voltage ($V_{CC}$) and by programming the digital bias DACs. The collector $V_{CC}$ bias is provided by the RF6561 main output and controlled by the $V_{RAMP}$ analog input pin. The digital bias is programmed using 2 DACs on the RF6261B integrated CMOS controller, one for each gain stage. The 3 bias settings can then be scaled relative to the target output power and mode. Below -5dBm, the PA bias settings should be fixed to those used for -5dBm for all lower output powers. For high power operation, the RF6561 DC-DC converter is operated in boost mode. For medium and low power operation, the converter can be switched to ultra-efficient buck modes. The combinations of SDI programmable settings can be stored in mobile device memory in "lookup tables", or LUTs. The table structure, size, and resolutions can be customized by the system designer.

The RF6261B provides flexibility for transmit power control since both a single RF coupled output and single RF detector voltage are provided for all modes and all bands. The common RF detector detects forward power across a 40dB dynamic range using a new detector architecture that is very efficient. The common RF coupled output provides -40dB to -36dB of coupling for low band and high band. It is recommended that EDGE and WCDMA linear modes use some form of closed loop power control with the transceiver. In linear mode, output power will be controlled primarily by RF input power. For GMSK saturated mode, the option exists to use closed loop power control or open loop power control. For open loop, power is controlled directly with the

RF6561 VRAMP pin. The RF6561 and RF6261B are capable of accurately setting 2G output power across process, voltage, and temperature.

In addition to the main output of the RF6561 that provides the PA collector bias voltage, there is an auxiliary charge pump that provides a regulated 4V supply for the RF6261B. This supply is used by the PA bias circuits and CMOS mode switch control within the RF6261B. At low output power levels, the clock frequency for the auxiliary charge pump can be reduced to conserve battery current. Furthermore, there is an ultra-efficient bypass mode that directly connects the battery to the auxiliary charge pump output for operation at low output power levels.

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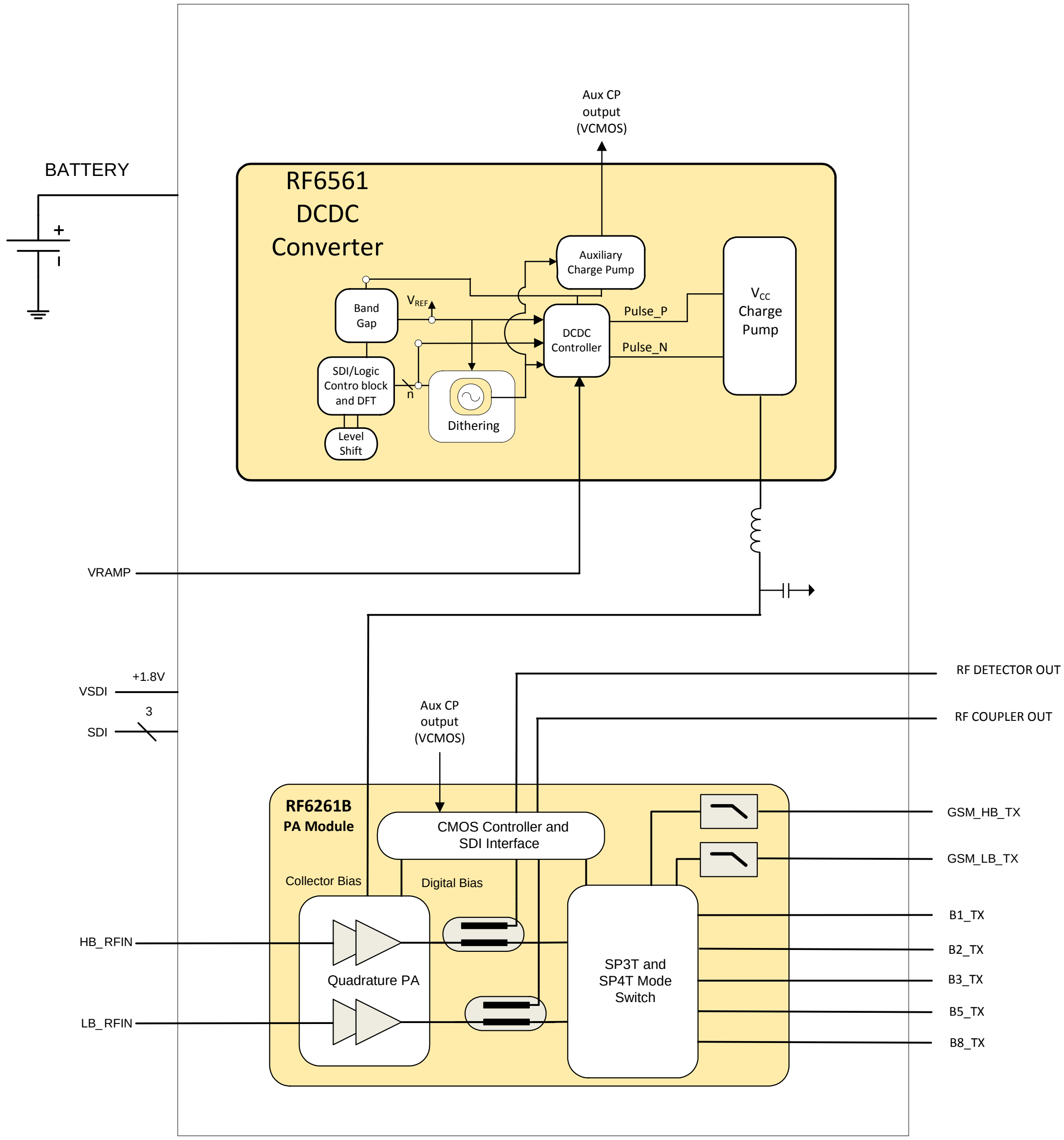
## Detailed Functional Block Diagram





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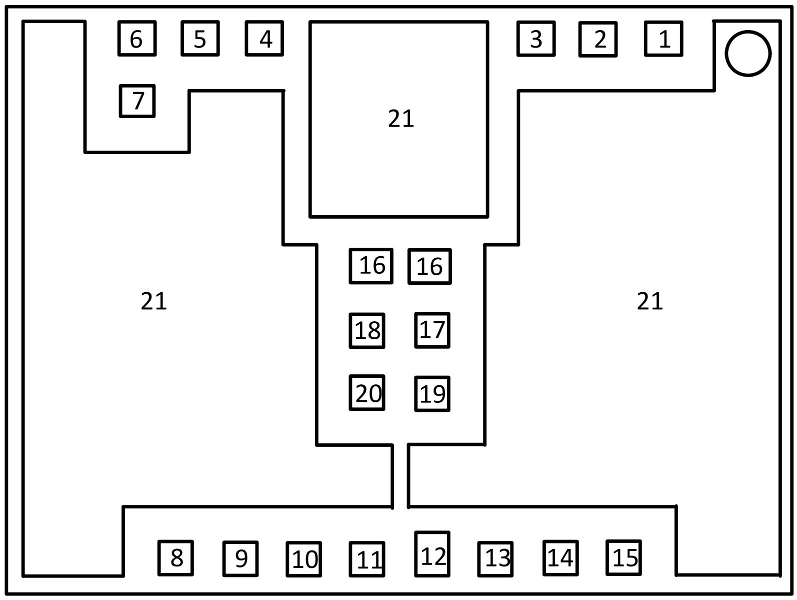
## RF6261B Pin Out

(Bottom View)

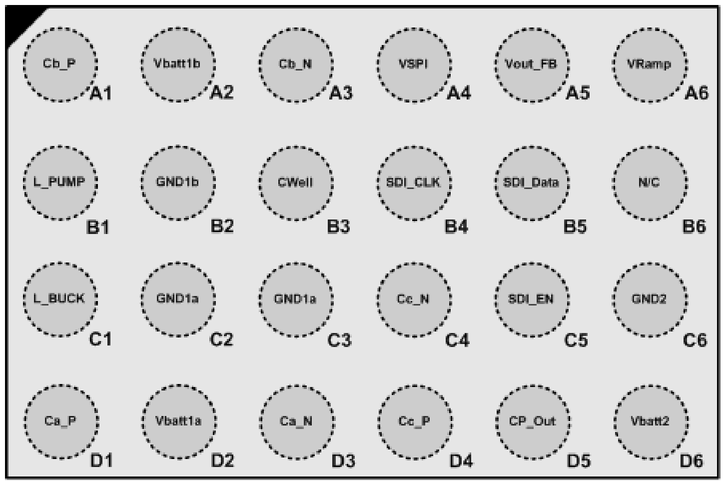



## RF6261B Pin Names and Descriptions

| Pin | Name | Description |
|---|---|---|
| 1 | B8_TX | WCDMA Band 8 RF output |
| 2 | B5_TX | WCDMA Band 5/6 RF output |
| 3 | GSM_LB_TX | GSM/EDGE Low Band RF output |
| 4 | B2_TX | WCDMA Band 2 RF output |
| 5 | B1_TX | WCDMA Band 1 RF output |
| 6 | GSM_HB_TX | GSM/EDGE High Band RF output |
| 7 | B3_TX | WCDMA Band 3/4/9/10 RF output |
| 8 | HB_RFIN | Multi-Mode High Band RF input |
| 9 | SDI_EN | SDI Enable input |
| 10 | SDI_DAT | SDI Data input/output |
| 11 | SDI_CLK | SDI Clock input |
| 12 | SDI_GND | SDI ground |
| 13 | N/C | No connect or ground |
| 14 | VSDI | SDI Voltage Supply input |
| 15 | LB_RFIN | Multi-Mode Low Band RF input |
| 16 | VCC | PA Collector Bias Voltage input (provided by RF6561) |
| 17 | RF_OUT | RF Coupler output |
| 18 | VBATT | Battery Voltage Supply input |
| 19 | FB_AM | RF Detector output (AM analog signal) |
| 20 | VCMOS | CMOS Voltage Supply input (provided by RF6561) |
| 21 | RF_GND | RF ground |

## RF6561 Pin Out

(Top View - Bumps Down)




## RF6561 Pin Names and Descriptions

| Pin | Name | Description |
|---|---|---|
| A1 | CB_P | Main charge pump phase “b” fly capacitor positive connection |
| A2 | VBATT1B | Battery Voltage Supply input for main charge pump phase “b” |
| A3 | CB_N | Main charge pump phase “b” fly capacitor negative connection |
| A4 | VSPI | SDI Voltage Supply input |
| A5 | VOUT_FB | Voltage feedback input |
| A6 | VRAMP | Analog input to control main charge pump buck output voltage |
| B1 | L_PUMP | PWM output to be connected to external inductor |
| B2 | GND1B | Ground for main charge pump phase “b” |
| B3 | CWELL | Holding capacitor for CMOS substrate |
| B4 | SDI_CLK | SDI clock input |
| B5 | SDI_DATA | SDI data input/output |
| B6 | N/C | No connect or ground |
| C1 | L_BUCK | PWM output to be connector to external inductor |
| C2 | GND1A | Ground for main charge pump phase “a” |
| C3 | GND1A | Ground for main charge pump phase “a” |
| C4 | CC_N | Auxiliary charge pump fly capacitor negative connection |
| C5 | SDI_EN | SDI enable input |
| C6 | GND2 | Ground |
| D1 | CA_P | Main charge pump phase “a” fly capacitor positive connection |
| D2 | VBATT1A | Battery Voltage Supply input for main charge pump phase “a” |
| D3 | CA_N | Main charge pump phase “a” fly capacitor negative connection |
| D4 | CC_P | Auxiliary charge pump fly capacitor positive connection |
| D5 | CP_OUT | Auxiliary charge pump output voltage (connected to RF6261B) |
| D6 | VBATT2 | Battery Voltage Supply input for auxiliary charge pump and other CMOS circuitry |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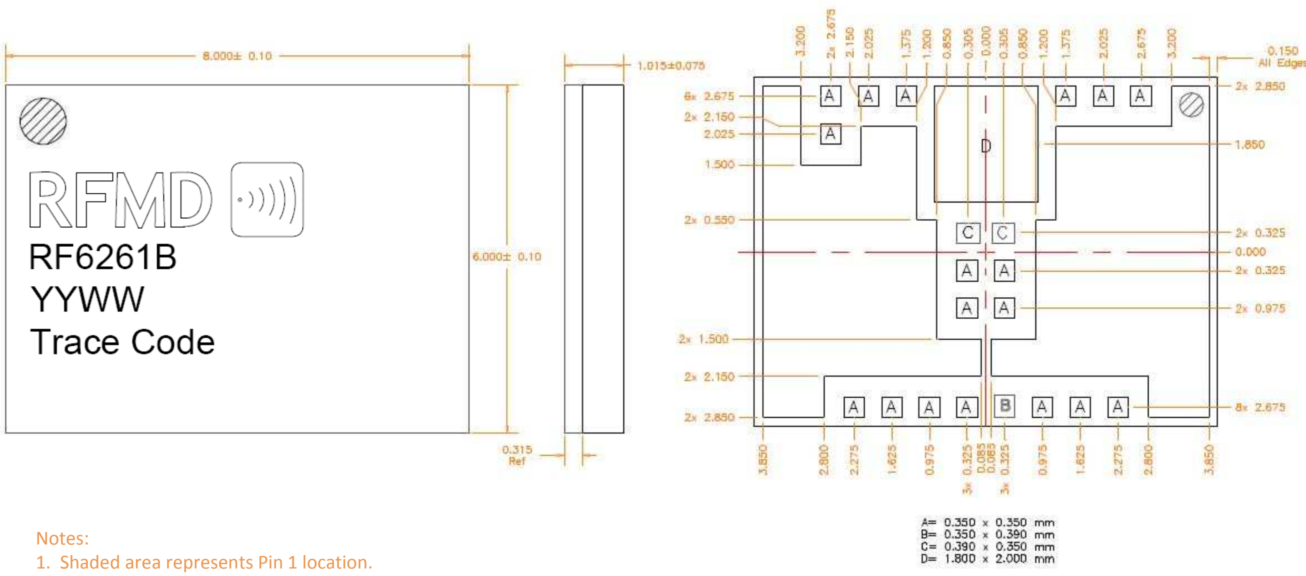
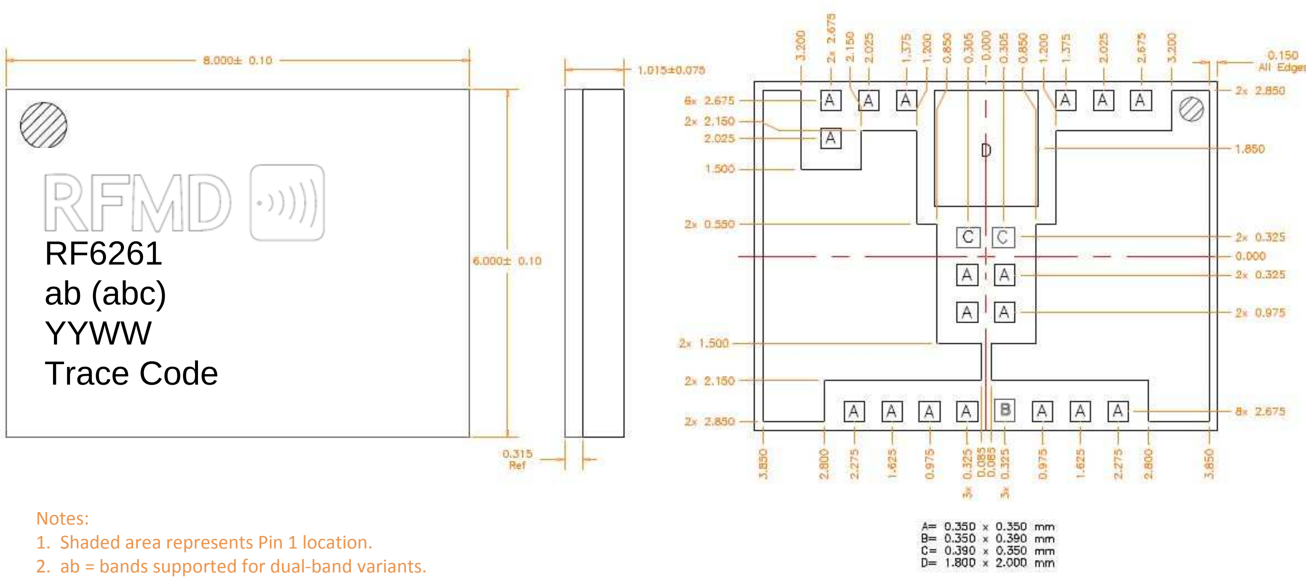
## RF6261B and Derivative Package Drawings

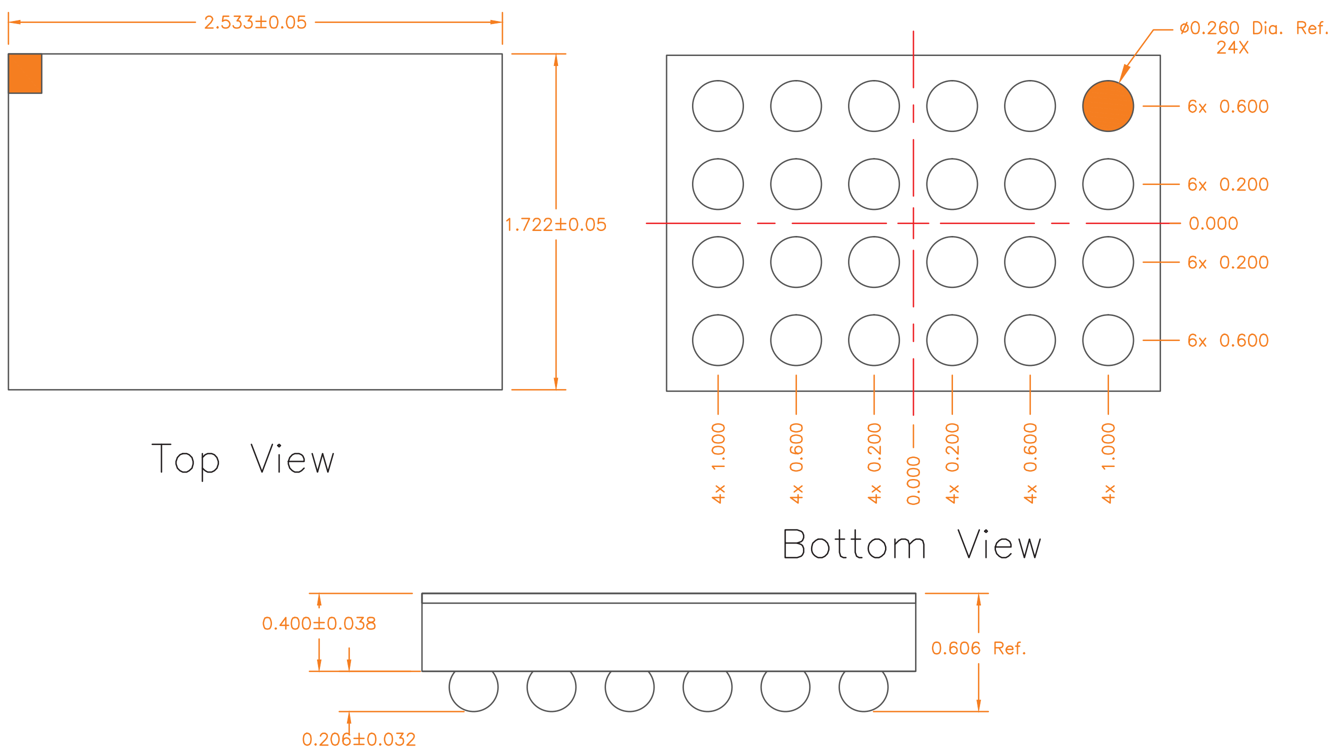



Notes:
1. Shaded area represents Pin 1 location.
2. YY represents Year and WW represents Week




Notes:
1. Shaded area represents Pin 1 location.
2. ab = bands supported for dual-band variants.
3. abc = bands supported for tri-band variants.
4. YY represents Year and WW represents Week

## RF6561 Package Drawing




Notes:
1. Shaded area represents Pin 1 location.



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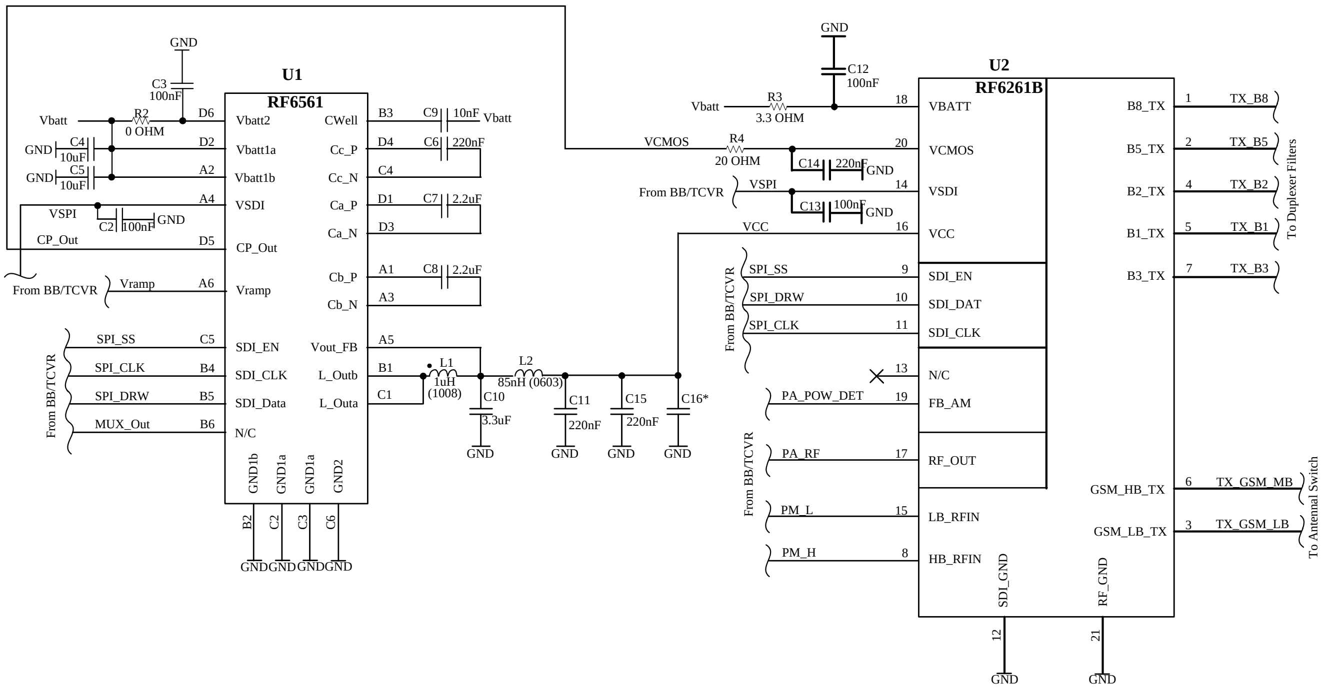
## Application Schematic



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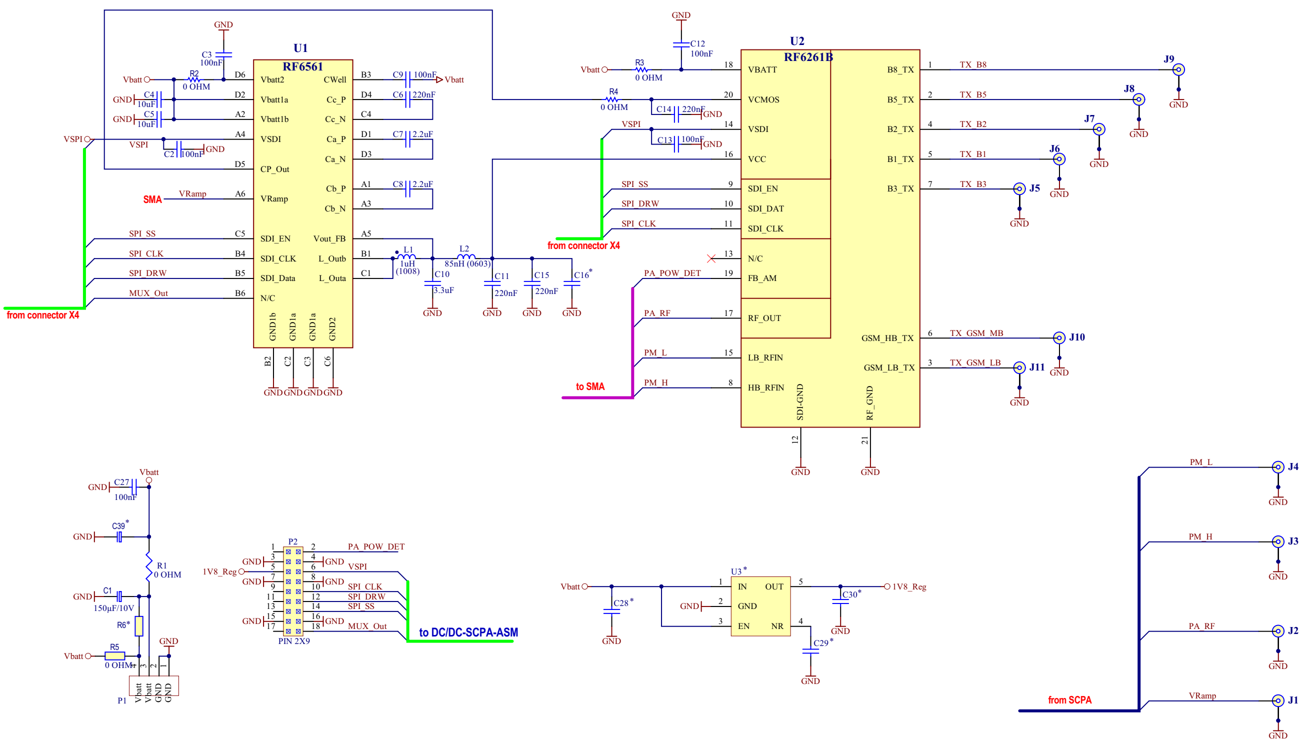
# Evaluation Board Schematic



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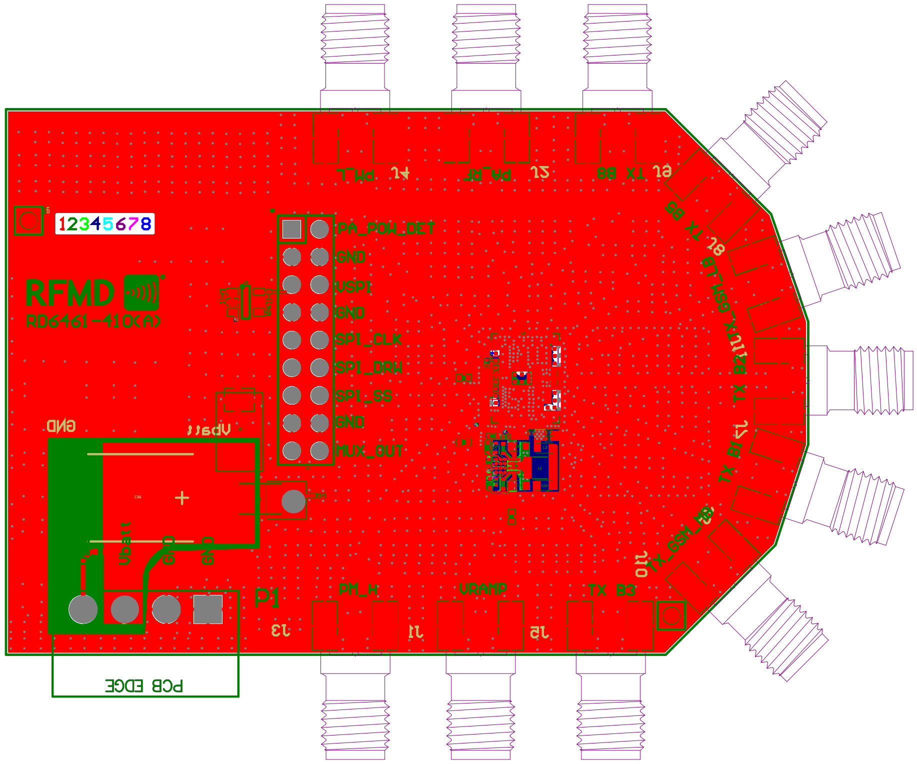
## Evaluation Board PCB



## PCB Design Requirements

PCBVia Technology

RFMD recommends the use of 2 stacked lasermicrovias to properly route the RF6561 and defines the minimum requirement.

PCB Stackup

Routing studies have shown that 6 layers should be the minimum layer count to properly route the RF6261B and RF6561 reference design. The outer 4 layers should be HDI (high density interconnect) dielectric prepregs. The inner 2 layers should be a core laminate. Standard FR-4 dielectric typical of handsets is acceptable. Due to the scale and pin pitch of the RF6561 component, a metal spacing design rule of 75μm is recommended.

PCB Surface Finish

The PCB surface finish used for RFMD's qualification process is electroless nickel, immersion gold. Typical thickness is 3μinch to 8μinch gold over 180μinch nickel.

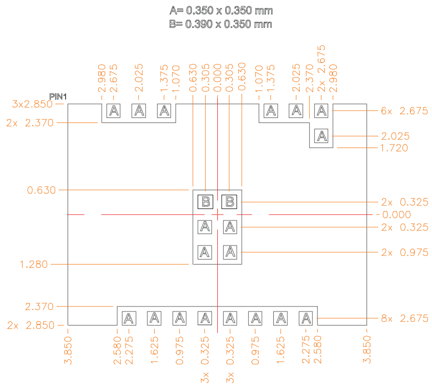
PCB Land Pattern Recommendation

PCB land patterns for RFMD components are based on IPC-7351 standards and RFMD empirical data. The pad pattern shown has been developed and tested for optimized assembly at RFMD. The PCBN land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.

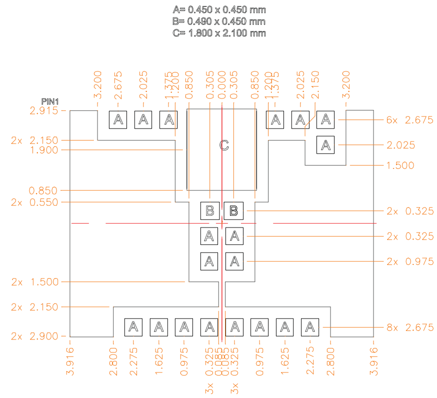
PCB Layout and Routing

Please refer to the document RFMD PowerSmart RFRD6461 Layout Recommendation.

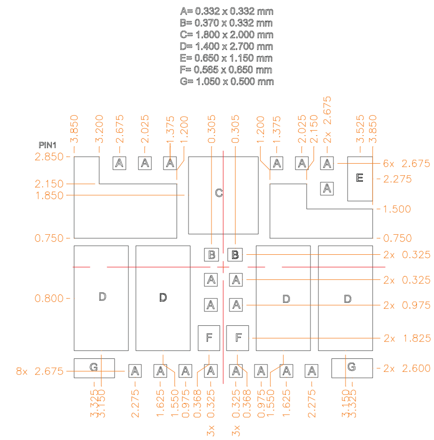
## PCB Metal, Solder Mask, and Solder Stencil Patterns (RF6261B)




PCB Metal Land Pattern



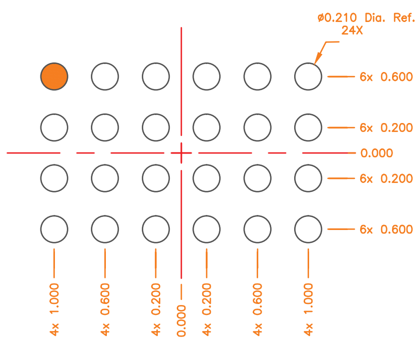

PCB Solder Mask Pattern



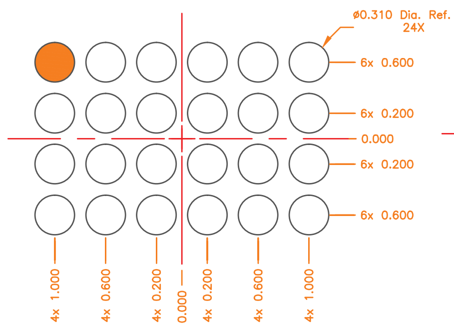

PCB Stencil Pattern

Notes:
1. Shaded area represents Pin 1 location.

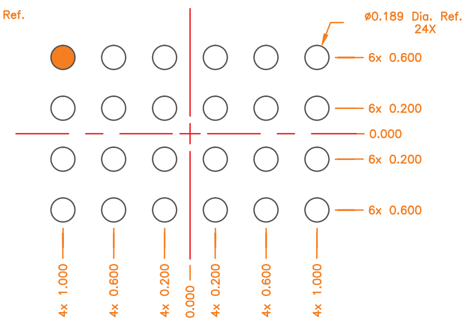
## PCB Metal, Solder Mask, and Solder Stencil Patterns (RF6561)




PCB Metal Land Pattern




PCB Solder Mask Pattern




PCB Stencil Pattern

Notes:
1. Shaded area represents Pin 1 location.

## SDI Register Maps and Programming

Please refer to the RFMD PowerSmart RFRD6461 Programming Guide.



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