

RFPA5512

WiFi Integrated PA Module
4.9GHz to 5.85GHz

The RFPA5512 is a three-stage power amplifier (PA) designed for 802.11a/n/ac applications. The integrated input and output 50Ω match greatly reduces the layout area, bill of materials and manufacturability cost in the customer application. The RFPA5512 is manufactured on an advanced InGaP heterojunction bipolar transistor (HBT) process and is capable of achieving linear powers up to 23dBm with an EVM <1.8% while maintaining excellent power added efficiency. The device is provided in a 4.0mm x 4.0mm x 0.9mm QFN package that meets or exceeds the power requirements of IEEE802.11a/n/ac WiFi RF systems.



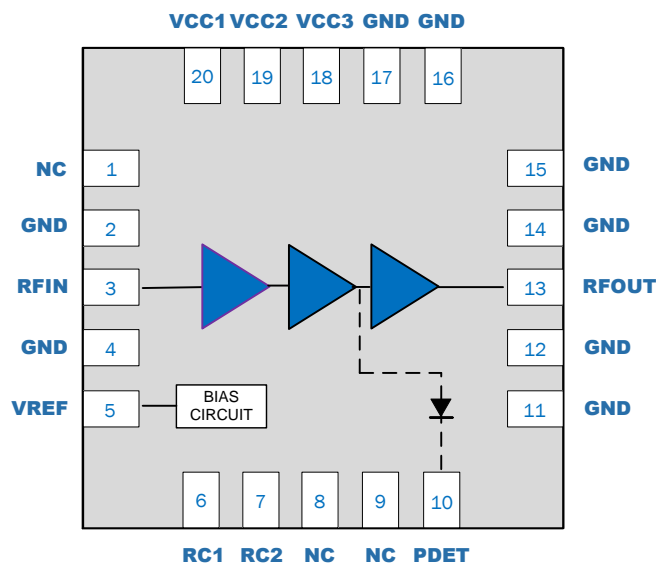
Package: QFN, 20-pin,
4.0mm x 4.0mm x 0.9mm

Features

- $P_{OUT} = 23\text{dBm}$, 5V, 11ac, 80MHz MCS9 @ 1.8% EVM
- $P_{out} = 25\text{dBm}$, 5V, 11n, 20/40 MHz, MCS7 @ 3%
- Typical Gain = 33dB
- High PAE
- Input and Output Matched to 50Ω
- Integrated Power Detector, Harmonic filter, and notch filter

Applications

- Customer Premise Equipment (CPE)
- Wireless Access Points, Gateways
- Routers
- Set-Top Box Applications
- Picocell/Femtocell



Functional Block Diagram

Ordering Information

| | |
|-----------------|--|
| RFPA5512SB | Standard 5-piece Sample Bag |
| RFPA5512SQ | Standard 25-piece Sample Bag |
| RFPA5512SR | Standard 100-piece Reel |
| RFPA5512TR13 | Standard 2500-piece Reel |
| RFPA5512PCK-410 | Fully Assembled Eval Board w/5-piece bag |

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|-------------|-----------------|
| DC Supply Voltage | -0.5 to +6 | V _{DC} |
| DC Supply Current | 1000 | mA |
| Operating Temperature Range | -40 to +85 | °C |
| Storage Temperature | -40 to +150 | °C |
| Maximum TX Input Power into 50Ω for 11a/n/ac (No Damage). *R1=0Ω | +10 | dBm |
| Maximum TX Input Power 10:1 VSWR for 11a/n/ac (No Damage). *R1=15Ω | +15 | dBm |
| Junction Temperature | +160 | C |
| Moisture Sensitivity Level (260°C JEDEC J-STD-020) | MSL2 | |

*Note: For R1 placement please refer to the applications schematic



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.

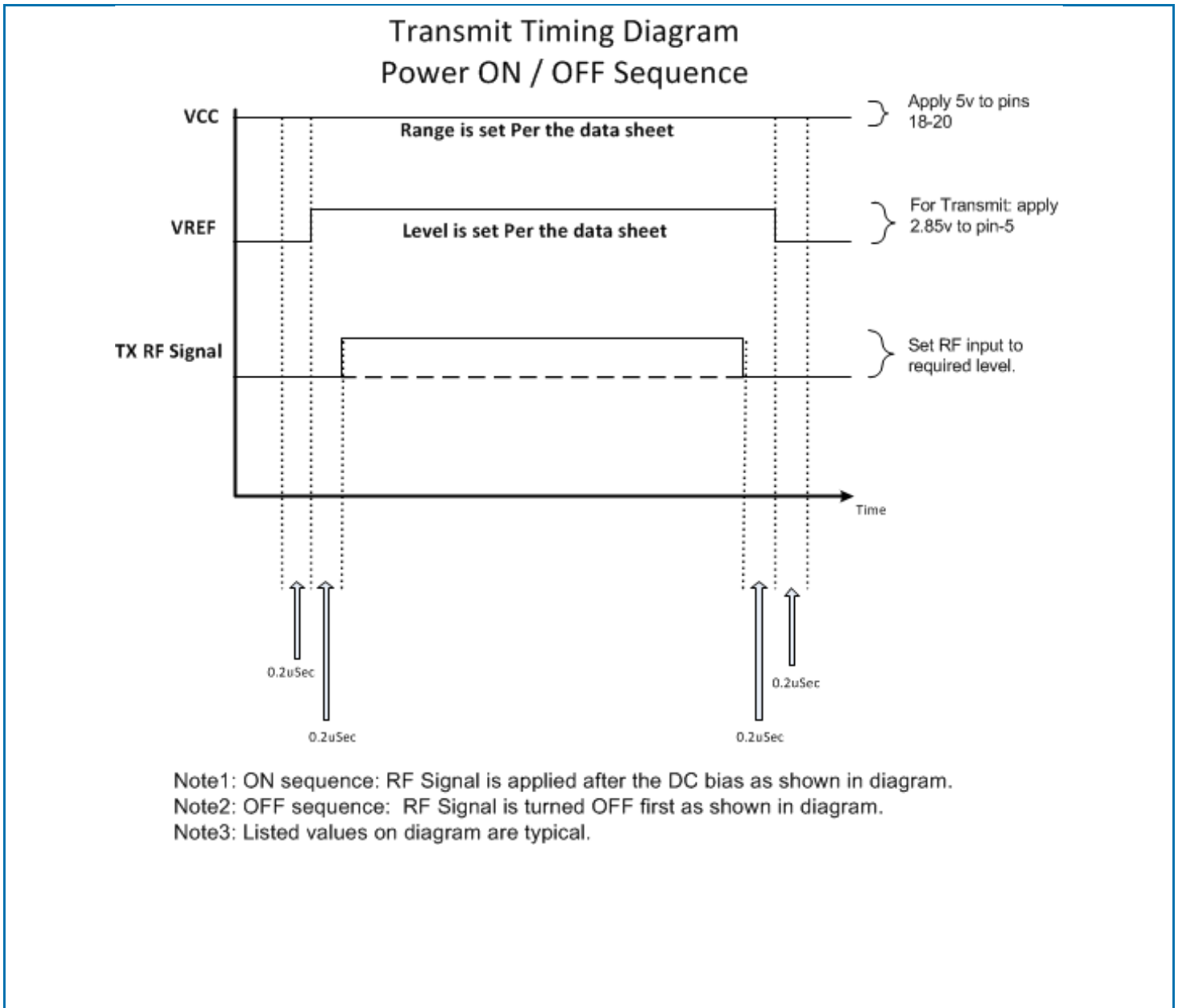
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied. This is an InGaP PA designed for high duty cycle applications with T_j>100°C.

Nominal Operating Parameters

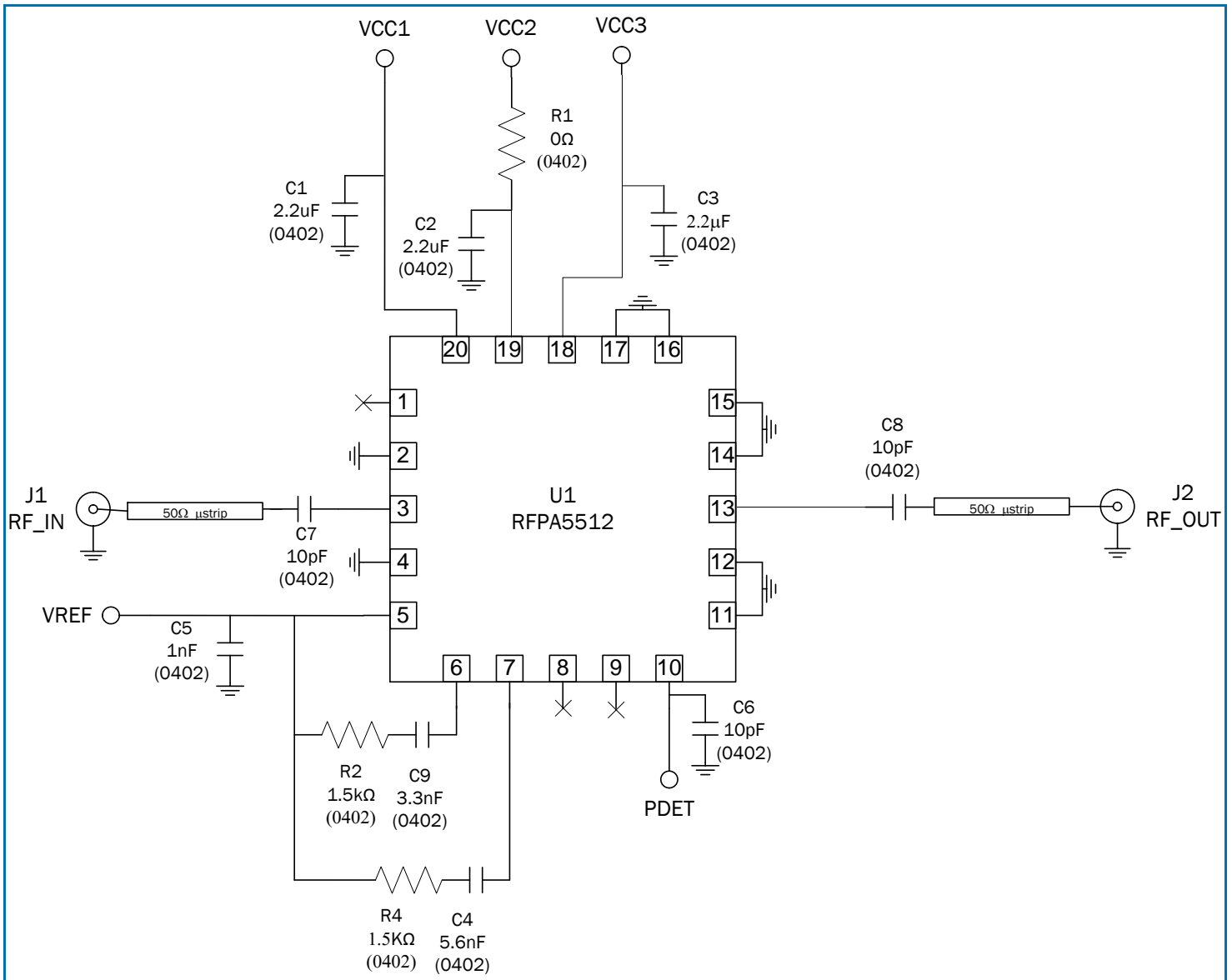
| Parameter | Specification | | | Unit | Condition |
|-----------------------------------|---------------|-------|-------|---------|---|
| | Min | Typ | Max | | |
| Compliance | | | | | IEEE802.11a/n/ac |
| Operating Frequency | 5.180 | | 5.925 | GHz | |
| Extended Operating Frequency | 4.900 | | 5.180 | GHz | |
| Power Supply V _{CC} | 4.75 | 5.00 | 5.25 | V | |
| Power Supply V _{REF} | 2.85 | 2.90 | 2.95 | V | |
| | | | | | T= +25°C, V_{CC}=5.0V, V_{REF} = 2.90V, Over Operating Frequency Range, Unless Otherwise Noted |
| IEEE802.11ac 80MHz Output Power | 22 | 23 | | dBm | MCS9, 256QAM |
| IEEE802.11ac 80MHz EVM | | 1.5 | 1.8 | % | |
| | | -36.5 | -35 | dB | |
| IEEE802.11n 20/40MHz Output Power | 23.5 | 25 | | dBm | MCS7, 64QAM |
| IEEE802.11n 40MHz EVM | | 2.5 | 3 | % | |
| | | -32.0 | -30.5 | dB | |
| Large Signal Gain | 31 | 33 | | dB | |
| Gain Variation over Temp | -2.0 | | +2.0 | dB | Over Any 100MHz Frequency band |
| Margin to Spectral Mask | | 5 | 0 | dB | P _{OUT} =25dBm; MCS0 80MHz |
| | | 5 | 0 | dB | P _{OUT} =26dBm; MCS0 40MHz |
| | | 5 | 0 | dB | P _{OUT} =27dBm; MCS0 20MHz, 11a 6Mbps |
| Operating Current | | 275 | 325 | mA | P _{OUT} =23dBm |
| | | 375 | 420 | mA | P _{OUT} =27dBm |
| Quiescent Current | | 140 | | mA | |
| V _{REF} Current | | 12 | | mA | |
| Leakage Current | | 100 | 250 | nA | RF OFF; V _{REF} = 0V |
| Second Harmonic | | -45 | -40 | dBm/MHz | P _{OUT} = 27dB Over Operating Frequency band. |
| Third Harmonic | | -50 | -45 | dBm/MHz | |
| OOB Rejection | | -5 | | dB | Gain (S21)@ 3.3 – 3.8GHz |
| | | 7 | | dB | Gain (S21)@ 7.0 GHz |

| Parameter | Specification | | | Unit | Condition |
|--|---------------|------|-----|------|---|
| | Min | Typ | Max | | |
| | | | | | T= +25°C, V_{CC}=5.0V, V_{REF} = 2.90V, Over Operating Frequency Range, Unless Otherwise Noted |
| Input Return Loss | | 15 | | dB | |
| Output Return Loss | | 12 | | dB | |
| Power Detector Range | | 0.25 | | V | P _{OUT} = 0dBm, RF=OFF |
| | | 0.65 | | V | P _{OUT} = 23dBm |
| | | 0.88 | | V | P _{OUT} = 27dBm |
| General Specifications | | | | | |
| PA Stability Output Power Range in to 4:1 VSWR | | | 27 | dBm | CW signal. No spurious above -41.25dBm/MHz for non-harmonic related signals. |
| Output P1dB | | 33 | | dBm | CW signal |
| Ramp ON/OFF time | | 200 | | nS | 10-90% / 90-10% of gain |
| Thermal Resistance* | | 35 | | °C/W | 100% Duty Cycle, P _{OUT} = 27dBm |
| ESD HBM | 500 | | | V | EIA/JESD22-114A; All pins |
| ESD CDM | 300 | | | V | JESD22-C101C; All pins |

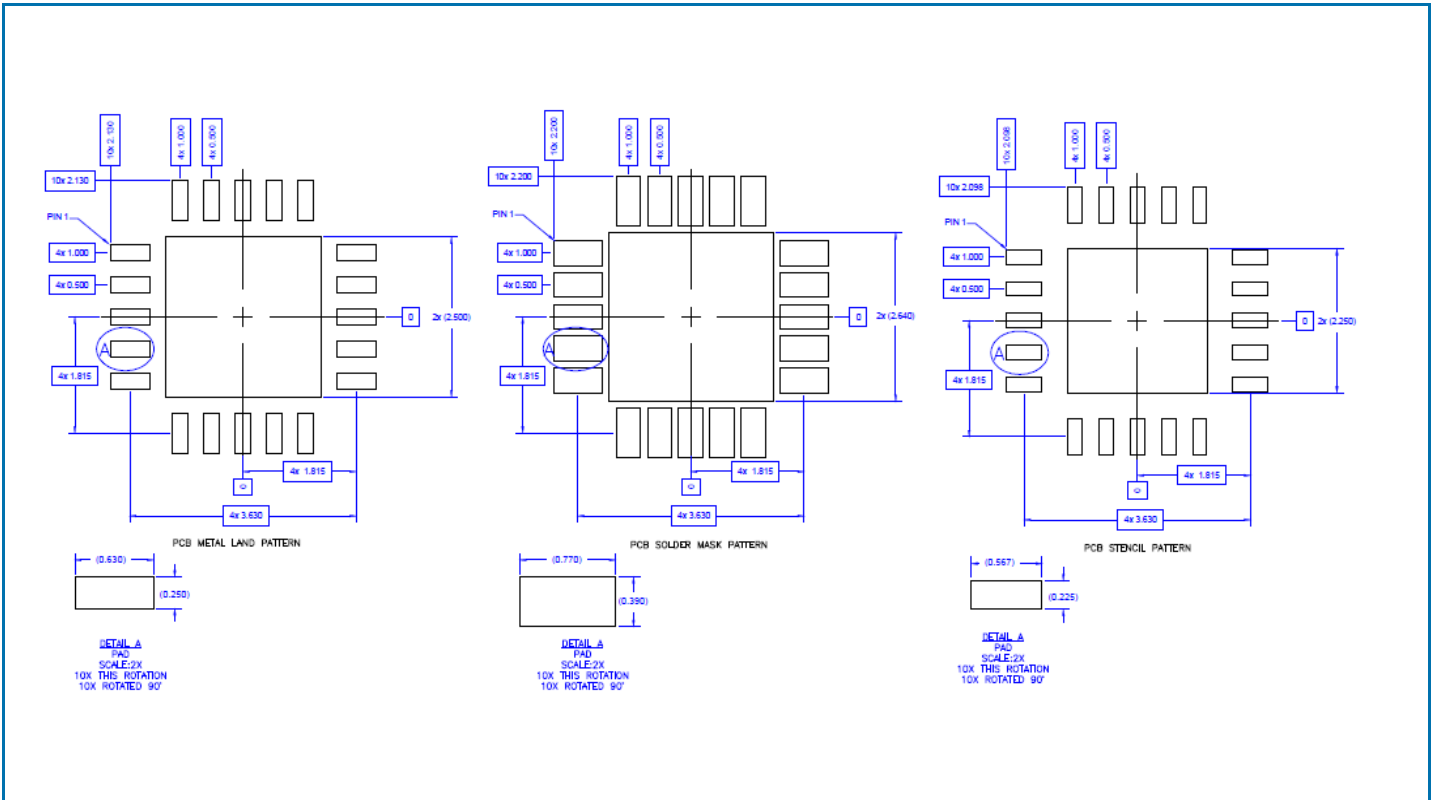
Timing Diagram



Evaluation Board Schematic



PCB Patterns (dimensions in mm)



Pin Names and Descriptions

| Pin | Name | Description |
|----------|-------|--|
| 1 | NC | Not connected internally. It may be left floating or connected to ground. |
| 2 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 3 | RFIN | RF input, internally matched to 50Ω and DC shorted. External DC blocking capacitor required. |
| 4 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 5 | VREF | Input bias voltage. This pin requires a regulated supply to maintain nominal bias current. |
| 6 | RC1 | Tuning RC pin 1. See EVB schematic for details. |
| 7 | RC2 | Tuning RC pin 2. See EVB schematic for details. |
| 8 | NC | Not connected internally. It may be left floating or connected to ground. |
| 9 | NC | Not connected internally. It may be left floating or connected to ground. |
| 10 | PDET | Power detector. Provides an output voltage proportional to the RF output power level. |
| 11 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 12 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 13 | RFOUT | RF output, internally matched to 50Ω and DC shorted. External DC blocking capacitor required. |
| 14 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 15 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 16 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 17 | GND | Ground connection. This pin is not connected internally and can be left floating or connected to ground. |
| 18 | VCC3 | Third stage supply voltage |
| 19 | VCC2 | Second stage supply voltage. |
| 20 | VCC1 | First stage supply voltage. |
| Pkg Base | GND | Ground connection. The back side of the package should be connected to the ground plan though as short of a connection as possible. PCB vias under the device are recommended. |