# *RDA6625e DATA SHEET*

*Version 0.4*

2019-07-23

## RDA6625e
## Front-end Module for
## Quad-Band GSM Wireless Communication

# RDA6625E Front-end Module

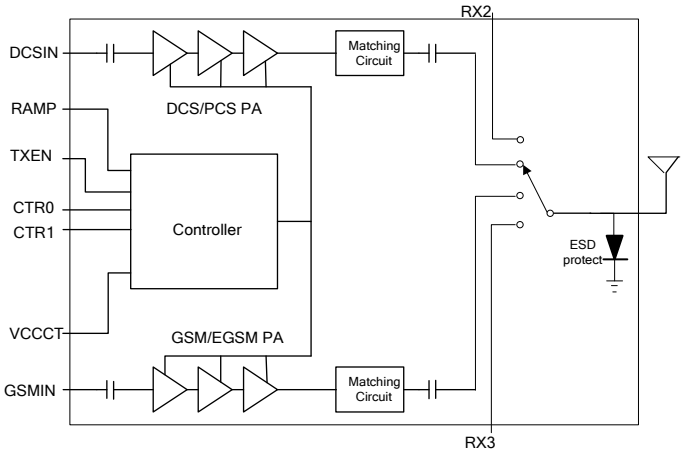
The RDA6625e is a high-power, high-efficiency quad-band front-end Module. This device is designed for GSM850, EGSM900, DCS1800, PCS1900 handheld digital cellular equipment. The module consists of quad band power amplifiers and antenna switch. The power amplifiers, switch and their controller are fabricated with GaAs HBT and CMOS respectively.

The device package is 5mm×5mm×1.1mm 32-pins LGA. The input and output are realized on-chip matched to 50Ω. The RDA6625e requires few external components, simplifying PCB layout and reducing PCB board space.

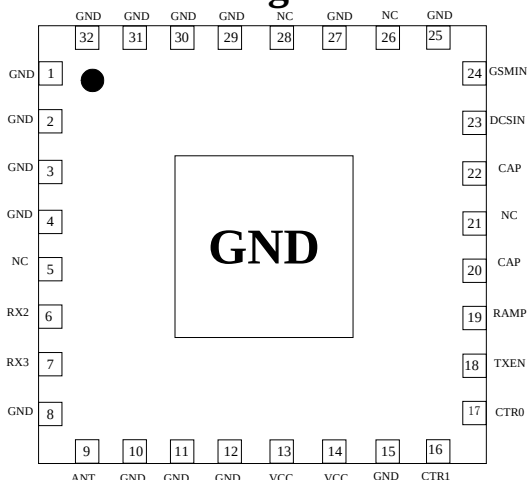
Features

- Ultra-Small 5mm×5mm Package
- Quad-Band Power Amplifier with RF switches
- ESD protection at Antenna
- Complete Power Control Solution
- High efficiency
- Low supply voltage (3~4.5V)
- Input/Output matched @ 50 Ω
- Advanced HBT/CMOS process

## Function Block Diagram




## Pin Assignment




## Pin Name definition

| Pin | Pin Name | Description | | Pin | Pin Name | Description |
|---|---|---|---|---|---|---|
| 1~4 | GND | Ground | | 18 | TXEN | TX enable pin |
| 5 | NC | Reserved | | 19 | RAMP | Ramp control pin |
| 6 | RX2 | RX port | | 20 | CAP | Connected capacitor |
| 7 | RX3 | RX port | | 21 | NC | Reserved |
| 8 | GND | Ground | | 22 | CAP | Connected capacitor |
| 9 | ANT | Antenna port | | 23 | DCSIN | DCS/PCS RF input port |
| 10~12 | GND | Ground | | 24 | GSMIN | GSM/EGSM RF input port |
| 13~14 | VCC | Power supply | | 25 | GND | Ground |
| 15 | GND | Ground | | 26,28 | NC | Reserved |
| 16 | CTR1 | Control logic pin | | 27 | GND | Ground |
| 17 | CTR0 | Control logic pin | | 29~32 | GND | Ground |

# Preliminary Electrical Target Specifications

The following tables list the electrical characteristics of the RDA6625E module. Table 1 lists the absolute maximum ratings. Table 2 shows the recommend operating conditions for this device. Table 3 shows the power truth table. Table 4 shows the electrical specifications for GSM850 mode nominal operating condition. Table 5 shows the electrical specifications for EGSM900 mode nominal operating condition. Table 6 shows the electrical specifications for DCS1800 mode nominal operating condition. Table 7 shows the electrical specifications for PCS1900 mode nominal operating condition. Table 8 shows the electrical specifications for receiver mode nominal operating condition.

### *Table 1. Absolute Maximum Ratings*

| Parameter | Rating | Unit |
|---|---|---|
| Supply Voltage (RF off) | -0.3 to 5 | V |
| Power Control Voltage (Vramp) | -0.3 to 3 | V |
| Input RF Power | +10 | dBm |
| Max Duty Cycle | 50 | % |
| Operating Case Temperature | -30 to +110 | °C |
| Storage Temperature | -30 to +150 | °C |

### *Table 2. Recommended Operating Conditions*

| Parameter | Minimum | Nominal | Maximum | Unit |
|---|---|---|---|---|
| Supply Voltage | 3 | 3.6 | 4.5 | V |
| Power Control Voltage ($V_{RAMP}$) | 0.23 | | 1.7 | V |
| TX Enable “ON” | 1.5 | | | V |
| TX Enable “OFF” | | | 0.5 | V |
| Logic control “High” | 1.5 | | | V |
| Logic control “Low” | | | 0.5 | V |
| Input RF Power | 1 | | 6 | dBm |
| Operating Temperature | -20 | +25 | +80 | °C |

*Table 3. Truth Table*

| | CTR1 | CTR0 | TXEN | RAMP |
|---|---|---|---|---|
| Default | 0 | 0 | 0 | - |
| Power Down | 0 | 0 | 0 | |
| GSM TX On | 1 | 0 | 1 | - |
| DCS TX On | 1 | 1 | 1 | - |
| RX2 On | 1 | 0 | 0 | - |
| RX3 On | 1 | 1 | 0 | - |

Note 1:

'0' denotes logic low which is typical 0V~0.5V. '1' denotes logic high which is typical 1.5V~3V.

*Table 4. Electrical Specifications for GSM850 Mode Application (1)*

| Parameters | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range | - | 824 | | 849 | MHz |
| Input Power Range | - | 1 | 3 | 6 | dBm |
| Maximum Output Power | $V_{RAMP}$=1.7V | 33 | 33.5 | | dBm |
| Total Efficiency | $V_{RAMP}$=1.7V; Pout=33dBm | | 40 | | % |
| Output Noise Power | RBW=100kHz; 20MHz offset; Pout≤33dBm | | -83 | -80 | dBm |
| Harmonics | Pout≤33dBm | | -35 | -30 | dBm |
| Forward Isolation 1 | TXENA='0'; Pin=6dBm | | -65 | | dBm |
| Forward Isolation 2 | TXENA='1'; Pin=6dBm; $V_{RAMP}$≤0.10V | | -40 | | dBm |
| Total Supply Current | $V_{RAMP}$=1.7V; Pout=33dBm | | 1.4 | | A |
| Input VSWR | | - | 1.8:1 | - | - |
| Stability (Spurious output) (2) | 12:1 VSWR | - | - | -70 | dBc |
| Ruggedness (No damage) (3) | 20:1 VSWR | - | - | - | - |
| Power Control Range | $V_{RAMP}$=0.23V to 1.7V | 40 | | | dB |

Notes:
(1). $V_{CC}$=3.6V, Freq = 835MHz, Tc = 25℃, unless otherwise specified
(2). Vcc=3.6V, Pin=3dBm, tested on evaluation board
(3). All phase, time=10s

*Table 5. Electrical Specifications for EGSM900 Mode Application (4)*

| Parameters | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range | - | 880 | | 915 | MHz |
| Input Power Range | - | 1 | 3 | 6 | dBm |
| Maximum Output Power | $V_{RAMP}$=1.7V | 33 | 33.5 | | dBm |
| Total Efficiency | $V_{RAMP}$=1.7V; Pout=33dBm | | 40 | | % |
| Output Noise Power | RBW=100kHz; 20MHz offset; Pout≤33dBm | | -83 | -80 | dBm |
| Harmonics | Pout≤33dBm | | -35 | -30 | dBm |
| Forward Isolation 1 | TXENA='0'; Pin=6dBm | | -65 | | dBm |
| Forward Isolation 2 | TXENA='1'; Pin=6dBm; $V_{RAMP}$≤0.10V | | -40 | | dBm |
| Total Supply Current | $V_{RAMP}$=1.7V; Pout=33dBm | | 1.4 | | A |
| Input VSWR | | - | 1.8:1 | - | - |
| Stability (Spurious output) (5) | 12:1 VSWR | - | - | -70 | dBc |
| Ruggedness (No damage) (6) | 20:1 VSWR | - | - | - | - |
| Power Control Range | $V_{RAMP}$=0.23V to 1.7V | 40 | | | dB |

Notes:
(4). $V_{CC}$=3.6V, Freq = 900MHz, Tc = 25℃, unless otherwise specified
(5). Vcc=3.6V, Pin=3dBm, tested on evaluation board
(6). All phase, time=10s

## *Table 6. Electrical Specifications for DCS1800 Mode Application (7)*

| Parameters | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range | - | 1710 | | 1785 | MHz |
| Input Power Range | - | 1 | 3 | 6 | dBm |
| Maximum Output Power | $V_{RAMP}$=1.7V | 30 | 30.5 | | dBm |
| Total Efficiency | $V_{RAMP}$=1.7V; Pout=30dBm | | 35 | | % |
| Output Noise Power | RBW=100kHz; 20MHz offset; Pout≤30dBm | | -83 | -80 | dBm |
| Harmonics | Pout≤30dBm | | -35 | -30 | dBm |
| Forward Isolation 1 | TXENA='0'; Pin=6dBm | | -65 | | dBm |
| Forward Isolation 2 | TXENA='1'; Pin=6dBm; $V_{RAMP}$≤0.10V | | -40 | | dBm |
| Total Supply Current | $V_{RAMP}$=1.7V; Pout=30dBm | | 0.9 | | A |
| Input VSWR | | - | 1.3:1 | - | - |
| Stability (Spurious output) (8) | 12:1 VSWR | - | - | -70 | dBc |
| Ruggedness (No damage) (9) | 20:1 VSWR | - | - | - | - |
| Power Control Range | $V_{RAMP}$=0.23V to 1.7V | 40 | | | dB |

Notes:
(7). $V_{CC}$=3.6V, Freq = 1750MHz, Tc = 25℃, unless otherwise specified
(8). Vcc=3.6V, Pin=3dBm, tested on evaluation board
(9). All phase, time=10s

## *Table 7. Electrical Specifications for PCS1900 Mode Application (10)*

| Parameters | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range | - | 1850 | | 1910 | MHz |
| Input Power Range | - | 1 | 3 | 6 | dBm |
| Maximum Output Power | $V_{RAMP}$=1.7V | 30 | 30.5 | | dBm |
| Total Efficiency | $V_{RAMP}$=1.7V; Pout=30dBm | | 35 | | % |
| Output Noise Power | RBW=100kHz; 20MHz offset; Pout≤30dBm | | -83 | -80 | dBm |
| Harmonics | Pout≤30dBm | | -35 | -30 | dBm |
| Forward Isolation 1 | TXENA='0'; Pin=6dBm | | -65 | | dBm |
| Forward Isolation 2 | TXENA='1'; Pin=6dBm; $V_{RAMP}$≤0.10V | | -40 | | dBm |
| Total Supply Current | $V_{RAMP}$=1.7V; Pout=30dBm | | 0.9 | | A |
| Input VSWR | | - | 1.3:1 | - | - |
| Stability (Spurious output) (11) | 12:1 VSWR | - | - | -70 | dBc |
| Ruggedness (No damage) (12) | 20:1 VSWR | - | - | - | - |
| Power Control Range | $V_{RAMP}$=0.23V to 1.7V | 40 | | | dB |

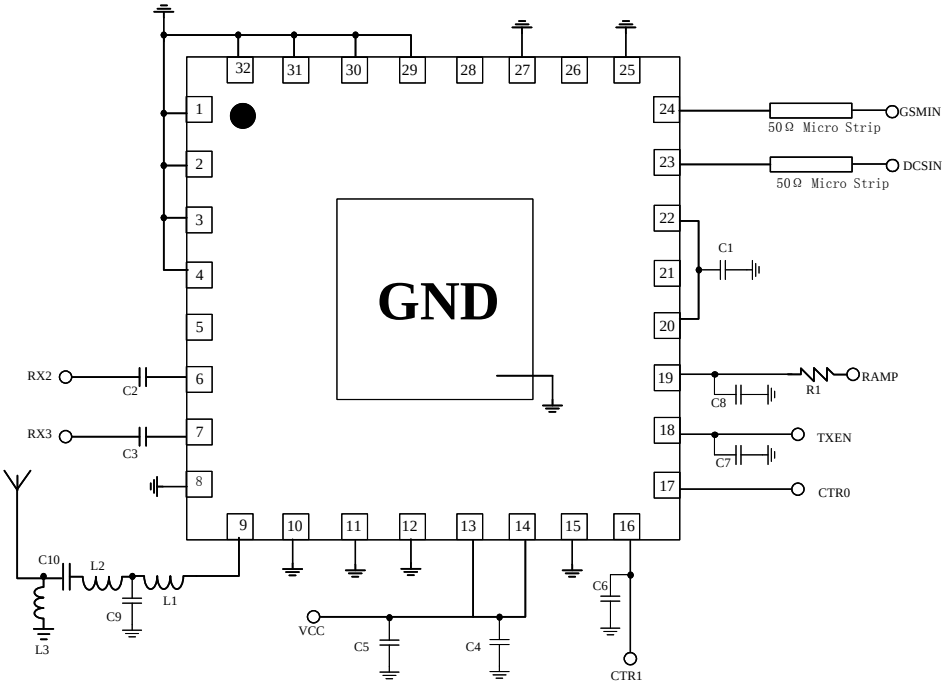
Notes:
(7). $V_{CC}$=3.6V, Freq = 1880MHz, Tc = 25℃, unless otherwise specified
(8). Vcc=3.6V, Pin=3dBm, tested on evaluation board
(9). All phase, time=10s

## *Table 6. Electrical Specifications for Receive Mode Application*

| Parameters | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range(13) | - | 869 | - | 1990 | MHz |
| RX Insertion Loss(14) | - | - | 1.3 | - | dB |
| Leakage Pout at RX3 port, GSM/EGSM TX mode ON | GSM/EGSM TX mode on, Pout=33dBm at ANT port | | -5 | 1 | dBm |
| Leakage Pout at RX2 port, DCS/PCS TX mode ON | DCS/PCS TX mode on, Pout=30dBm at ANT port | | -5 | 1 | dBm |
| Input VSWR | | - | 2:1 | - | - |

Note:
(13). GSM850=869~894MHz,EGSM900=925~960MHz,DCS1800=1805~1880MHz,PCS1900=1930~1990MHz
(14). Tested on evaluation board

## *Test Circuitry for RDA6625E Module*

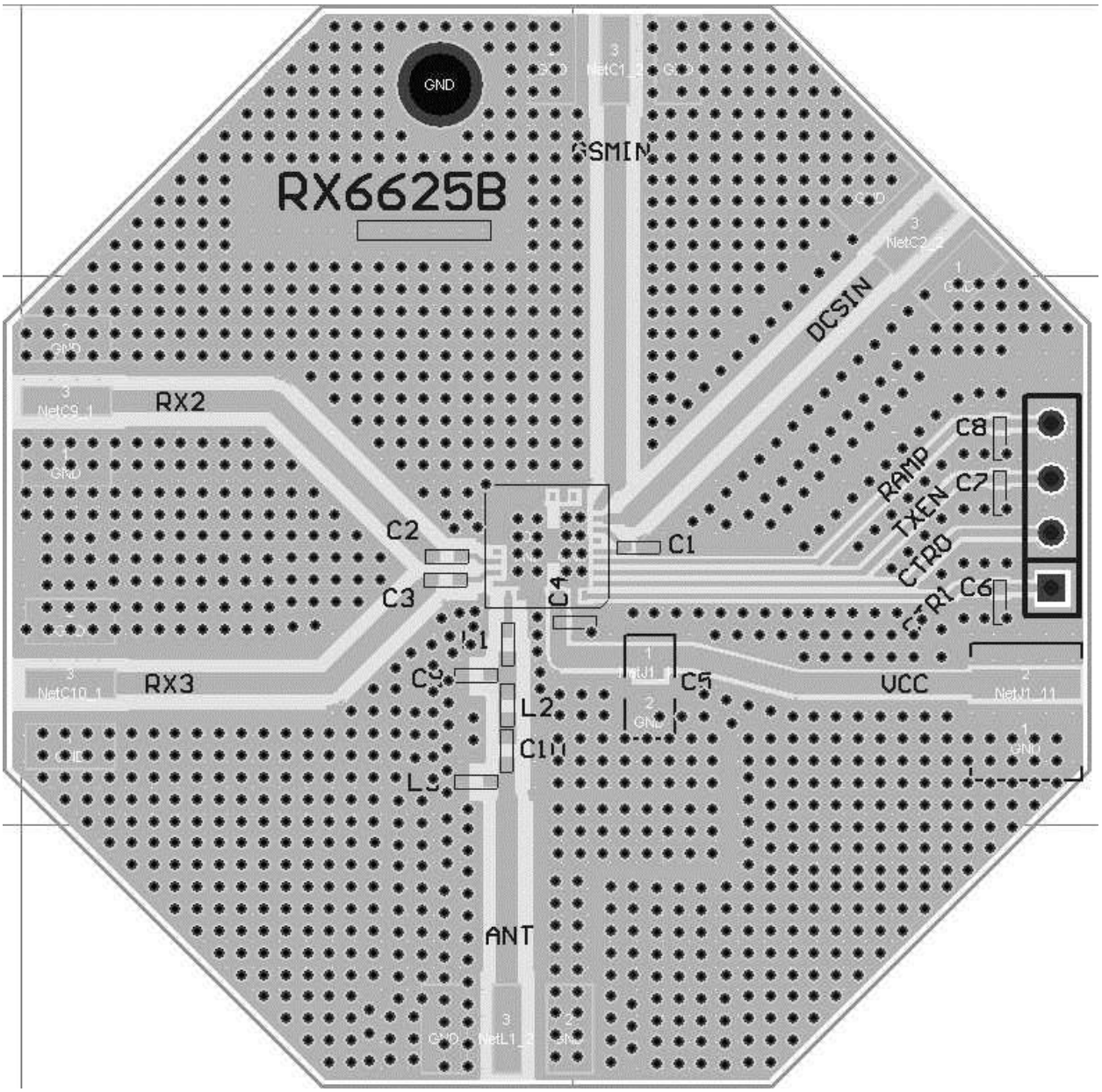



## *Component Value of Test Circuitry*

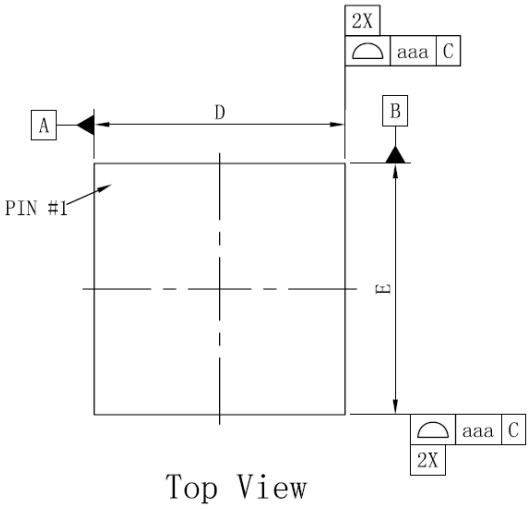
| Component | Value | | Component | Value |
|---|---|---|---|---|
| C1 | 1000pF | | C6 | 1000pF |
| C2 | 10pF | | C7 | 1000pF |
| C3 | 10pF | | C8 | 1000pF |
| C4 | 1000pF | | C9 | 1.2pF |
| C5 | 22uF | | C10 | 4.7pF |
| R1 | 10K | | L2 | 3.9nH |
| L1 | 2nH | | L3 | 27nH |

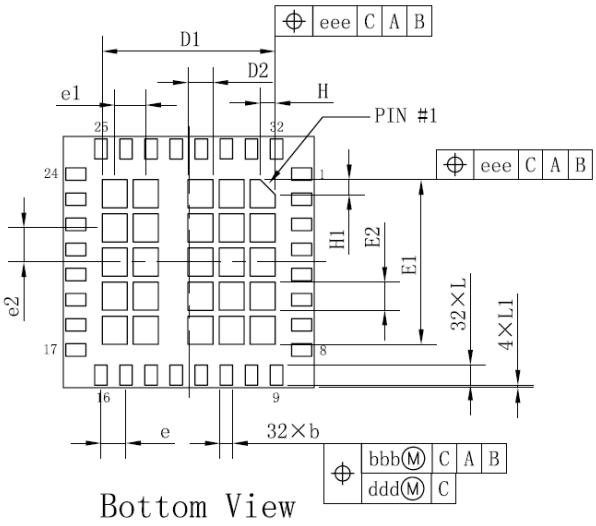
* C1, C4 and L4 should be placed as close as possible to the chip.

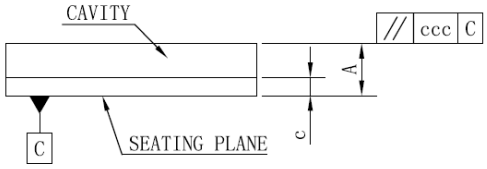
*Demo Board for RDA6625E Module*



# *Package Dimensions and Pin Descriptions*

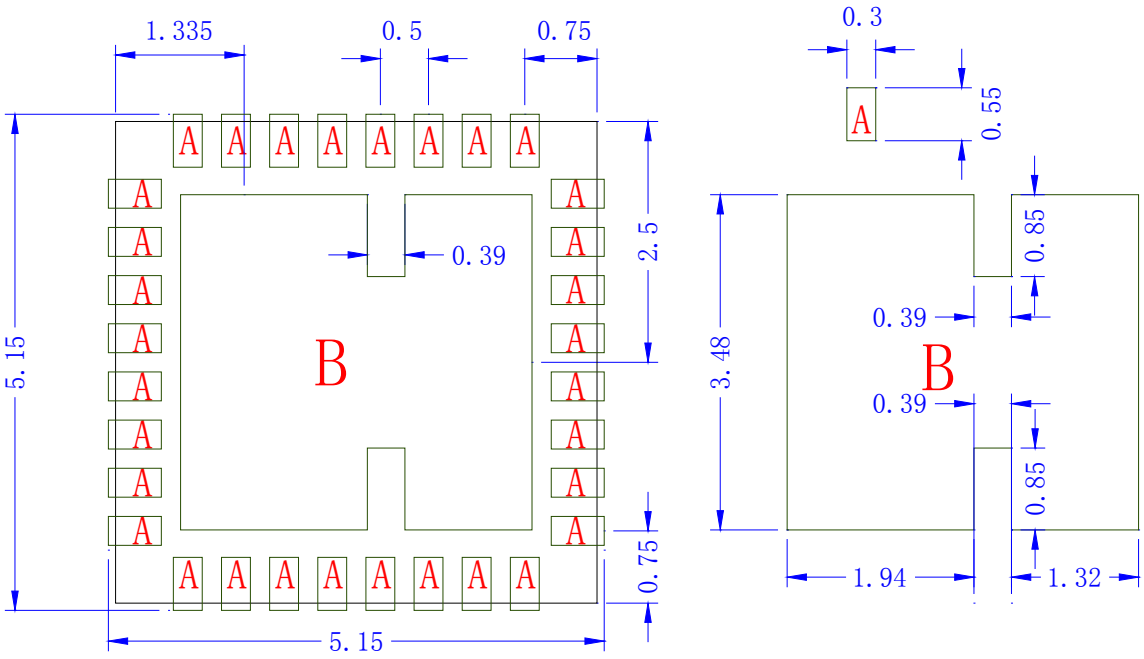


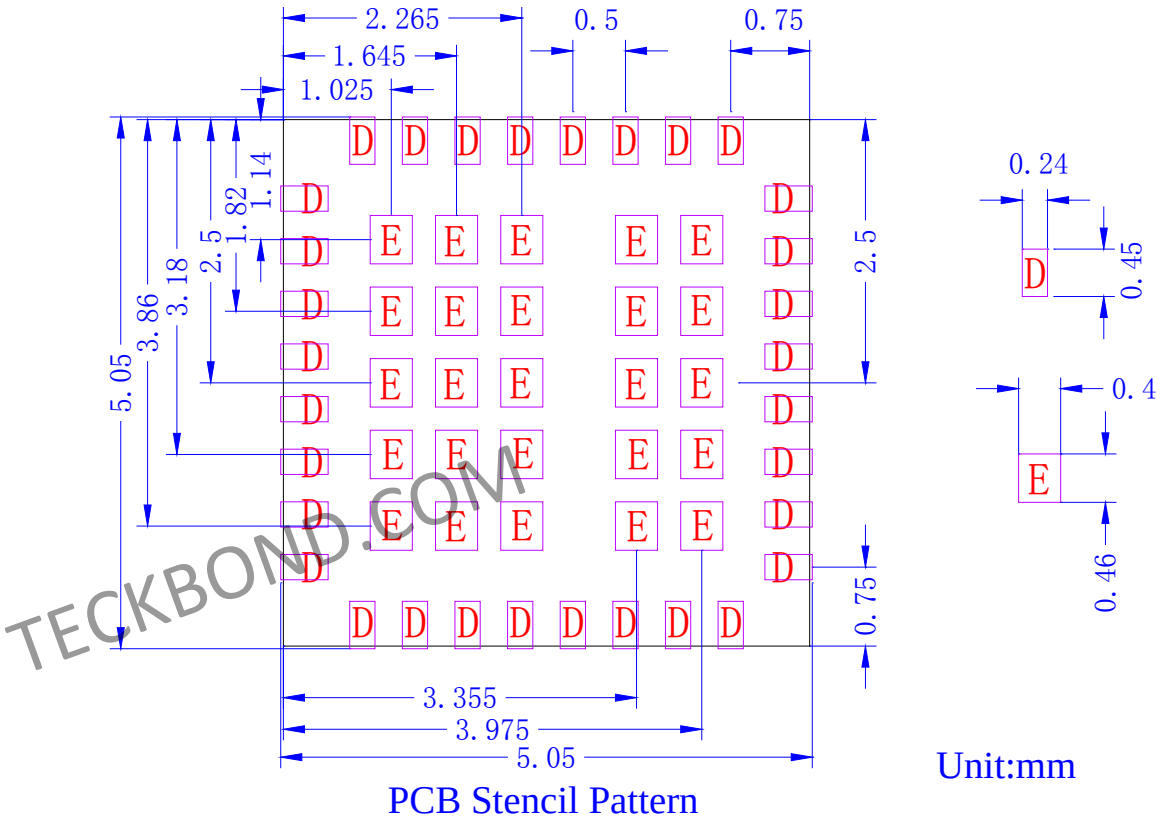




| symbol | Dimension in mm | | | Dimension in inch | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | -- | 1.040 | 1.140 | -- | 0.041 | 0.045 |
| c | 0.320 | 0.360 | 0.400 | 0.013 | 0.014 | 0.016 |
| D | 4.900 | 5.000 | 5.100 | 0.193 | 0.197 | 0.201 |
| E | 4.900 | 5.000 | 5.100 | 0.193 | 0.197 | 0.201 |
| D1 | 3.350 | 3.450 | 3.550 | 0.132 | 0.136 | 0.140 |
| E1 | 3.180 | 3.280 | 3.380 | 0.125 | 0.129 | 0.133 |
| D2 | 0.400 | 0.500 | 0.600 | 0.016 | 0.020 | 0.024 |
| E2 | 0.460 | 0.560 | 0.660 | 0.018 | 0.022 | 0.026 |
| H | -- | 0.300 | -- | -- | 0.012 | -- |
| H1 | -- | 0.300 | -- | -- | 0.012 | -- |
| L | 0.350 | 0.400 | 0.450 | 0.014 | 0.016 | 0.018 |
| L1 | 0.000 | 0.050 | 0.100 | 0.000 | 0.002 | 0.004 |
| e | -- | 0.500 | -- | -- | 0.020 | -- |
| e1 | -- | 0.620 | -- | -- | 0.024 | -- |
| e2 | -- | 0.680 | -- | -- | 0.027 | -- |
| b | 0.200 | 0.250 | 0.300 | 0.008 | 0.010 | 0.012 |
| aaa | 0.150 | | | 0.006 | | |
| bbb | 0.150 | | | 0.006 | | |
| ccc | 0.100 | | | 0.004 | | |
| ddd | 0.080 | | | 0.003 | | |
| eee | 0.150 | | | 0.006 | | |

## *Suggested PCB Design*



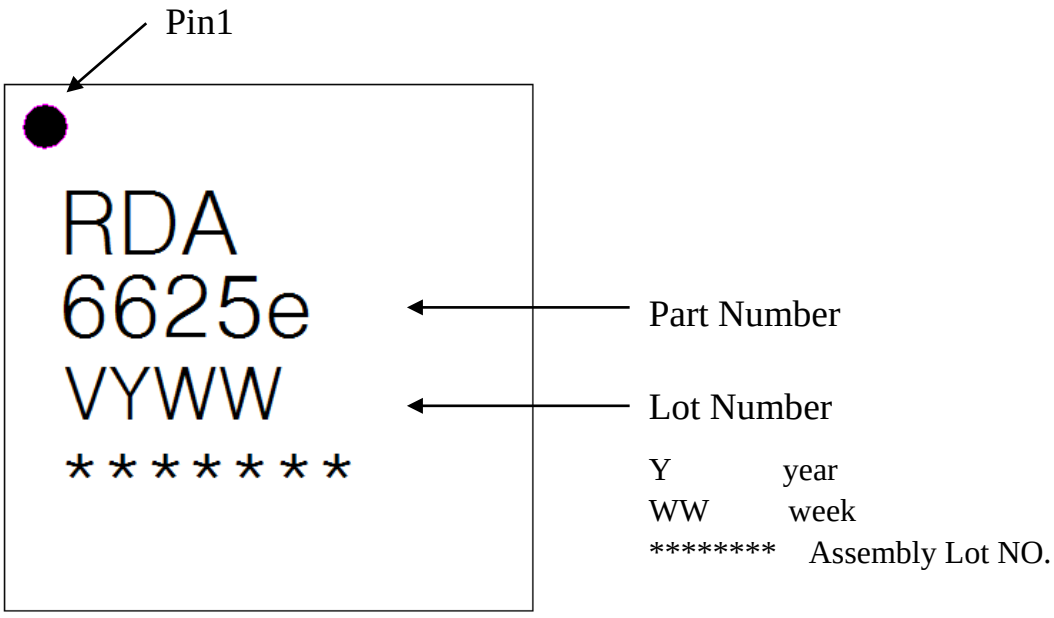

PCB Metal Land Pattern Unit:mm



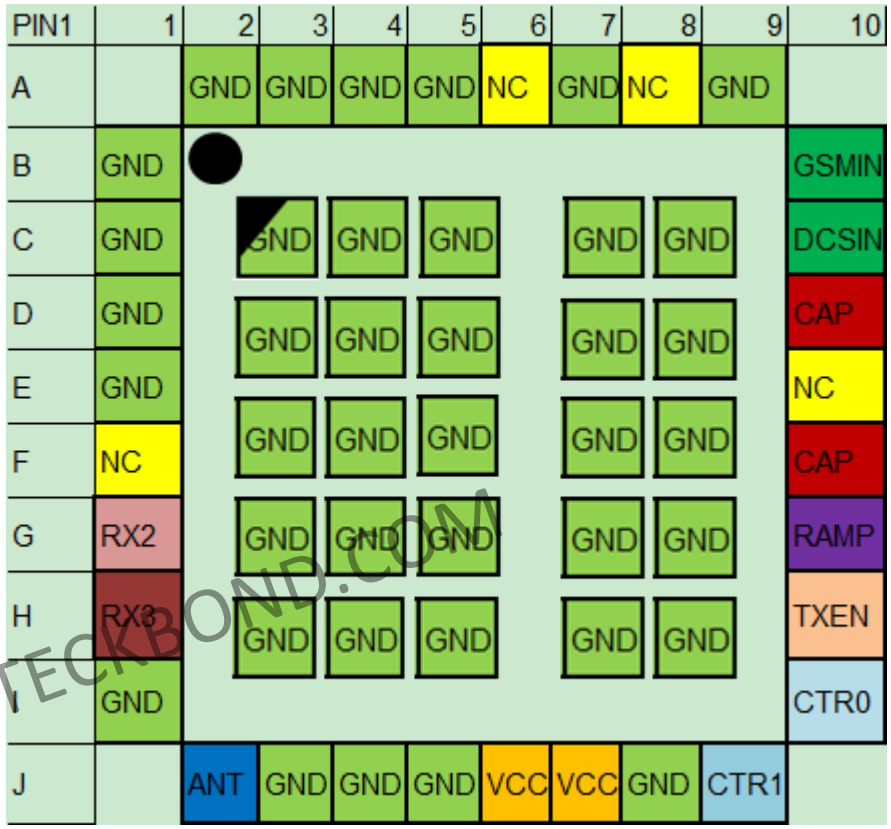

Unit:mm

PCB Stencil Pattern

*Marking Specification:*




*Ball Map:*



# Revision History

The following table summarizes revisions to this document.

| Rev | Date | Author | Change Description |
|---|---|---|---|
| 0.3 | 12/11/2015 | | Update Package Dimensions and Pin Descriptions |
| 0.4 | 07/23/2019 | | Update Package Dimensions and Pin Descriptions |

# RoHS Compliant

The product does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), and are therefore considered RoHS compliant.

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