

## Preliminary DATA SHEET

# GGQ1033: 300 to 1200MHz UHF 2Watts High Power Amplifier

### Product overview

GGQ1033 is a two-stage HBT high power amplifier for indoor/outdoor wireless application such as RFID or Lora system application. It works for 900MHz and can deliver 33dBm output peak power with 31dB power gain, and excellent linearity. The GGQ1033 input port is internally matched 50ohm and integrated temperature compensation circuits within a tiny lead frame package.

### Key Features

- 300MHz – 1200MHz
- 33dB Gain
- 50% PAE at 33dBm output power
- 33dBm output peak power
- Integrated temperature compensation circuits
- Compact and low-cost 3mm x 3mm QFN package (MSL3, 260°C per JEDEC J-STD-020)
- ESD Level: HBM 1200V; CDM 1200V
- ROHS compatible

### Applications

- wireless systems
- Power amplifier Module
- Customer Premises Equipment (CPE)
- Automatic meter readers
- RFID Readers

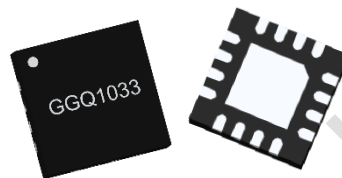


Figure 1. 16pin 3 x 3 mm QFN Package

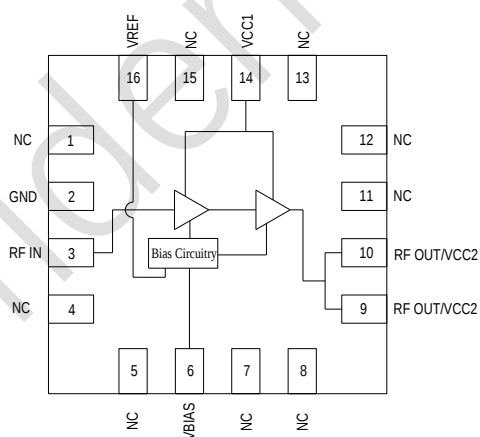


Figure 2. GGQ1033 Function Block Diagram

### Ordering Information

| Part No. | Description                                     |
|----------|-------------------------------------------------|
| GGQ1033  | 300-1200MHz 2W linear PA, 13' Reel with 4000pcs |

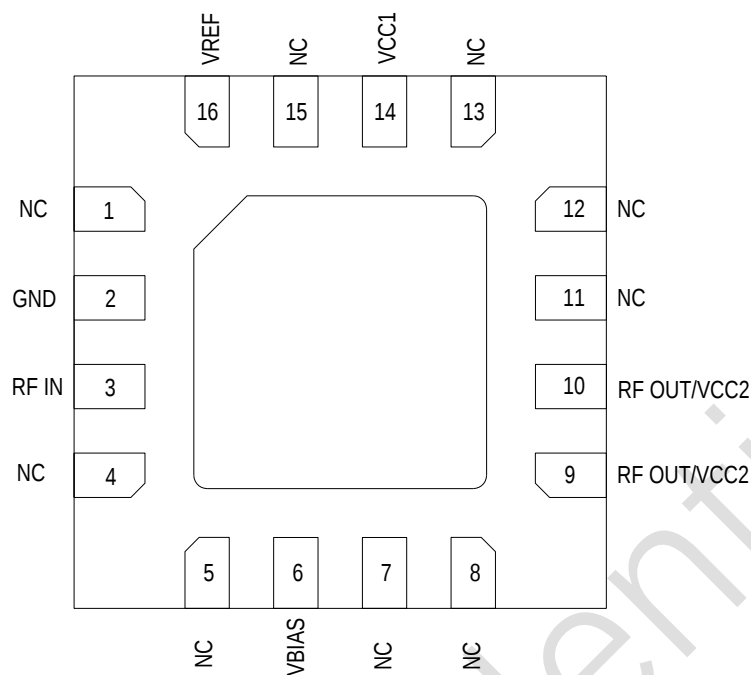


Figure 3. GGQ1033 Pinout (Top View)

Table 1. GGQ1033 Signal Descriptions

| Pin | Name  | Description          | Pin | Name       | Description                                 |
|-----|-------|----------------------|-----|------------|---------------------------------------------|
| 1   | NC    | Not Connected        | 9   | RFOUT/VCC2 | RF output port and Stage2 Collector Voltage |
| 2   | GND   | Ground               | 10  | RFOUT/VCC2 | RF output port and Stage2 Collector Voltage |
| 3   | RFIN  | RF input port        | 11  | NC         | Not connected                               |
| 4   | NC    | Not connected        | 12  | NC         | Not connected                               |
| 5   | NC    | Not connected        | 13  | NC         | Not connected                               |
| 6   | VBIAS | Bias circuit voltage | 14  | VCC1       | Stage1 Collector voltage                    |
| 7   | NC    | Not connected        | 15  | NC         | Not connected                               |
| 8   | NC    | Not connected        | 16  | VREF       | Reference voltage                           |

Table 2. GGQ1033 Absolute Maximum Ratings

| Parameter                      | Symbol            | Rating     | Unit |
|--------------------------------|-------------------|------------|------|
| Storage Temperature            | TSTG              | -55 to 125 | °C   |
| Operating Temperature          | TC                | -40 to 85  | °C   |
| Operating Junction Temperature | TJ                | 175        | °C   |
| Thermal Resistance             | Rθjc              |            | °C/W |
| Operating Voltage              | VCC1, VCC2, VBIAS | 5.5        | V    |
| Input Power                    | PIN               | 10         | dBm  |

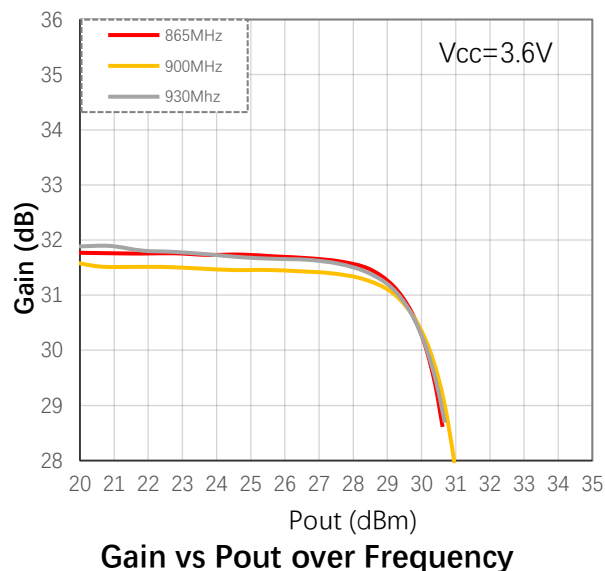
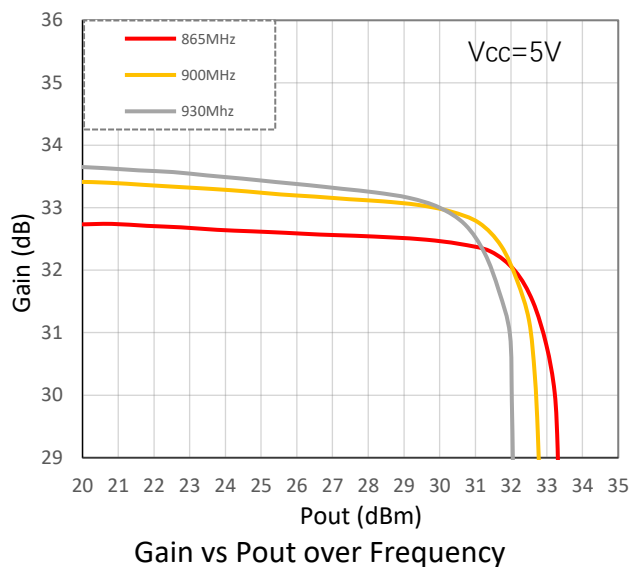
**Table 3. GGQ1033 Recommended Operating Conditions**

| Parameter              | Symbol            | Min | Typ | Max  | Unit |
|------------------------|-------------------|-----|-----|------|------|
| Operating Voltage      | VCC1, VCC2, VBIAS | 3   | 5   | 5.5  | V    |
| VREF reference voltage | VREF              |     | 3   |      | V    |
| IREF current           | IREF              |     | 8   | 15   | mA   |
| Operating frequency    | freq              | 300 |     | 1200 | MHz  |
| Operating temperature  | TC                | -40 | 25  | 85   | °C   |

**Table 4. GGQ1033 Electrical Specifications**

(VCC=VCC2 =VBIAS=5V, VREF=3V, f=920MHz, TC=+25 °C, Input /Output Load = 50Ω)

| Parameter              | Conditions                    | Min | Typ | Max | Unit |
|------------------------|-------------------------------|-----|-----|-----|------|
| Frequency              |                               |     | 920 |     | MHz  |
| Output P1dB            |                               |     | 32  |     | dBm  |
| Output P3dB            |                               |     | 33  |     | dBm  |
| Gain @ 20dBm           |                               |     | 33  |     | dB   |
| Power added efficiency | @Psat                         |     | 50  |     | %    |
| Quiescent current      |                               |     | 300 | 350 | mA   |
| ACPR @ 20dBm           | 20MHz LTE E-TM 1.1, 9.5dB PAR |     | -46 |     | dBc  |
| Input return loss      |                               |     | -10 |     | dB   |



**Figure 4. GGQ1033 Performance Data**

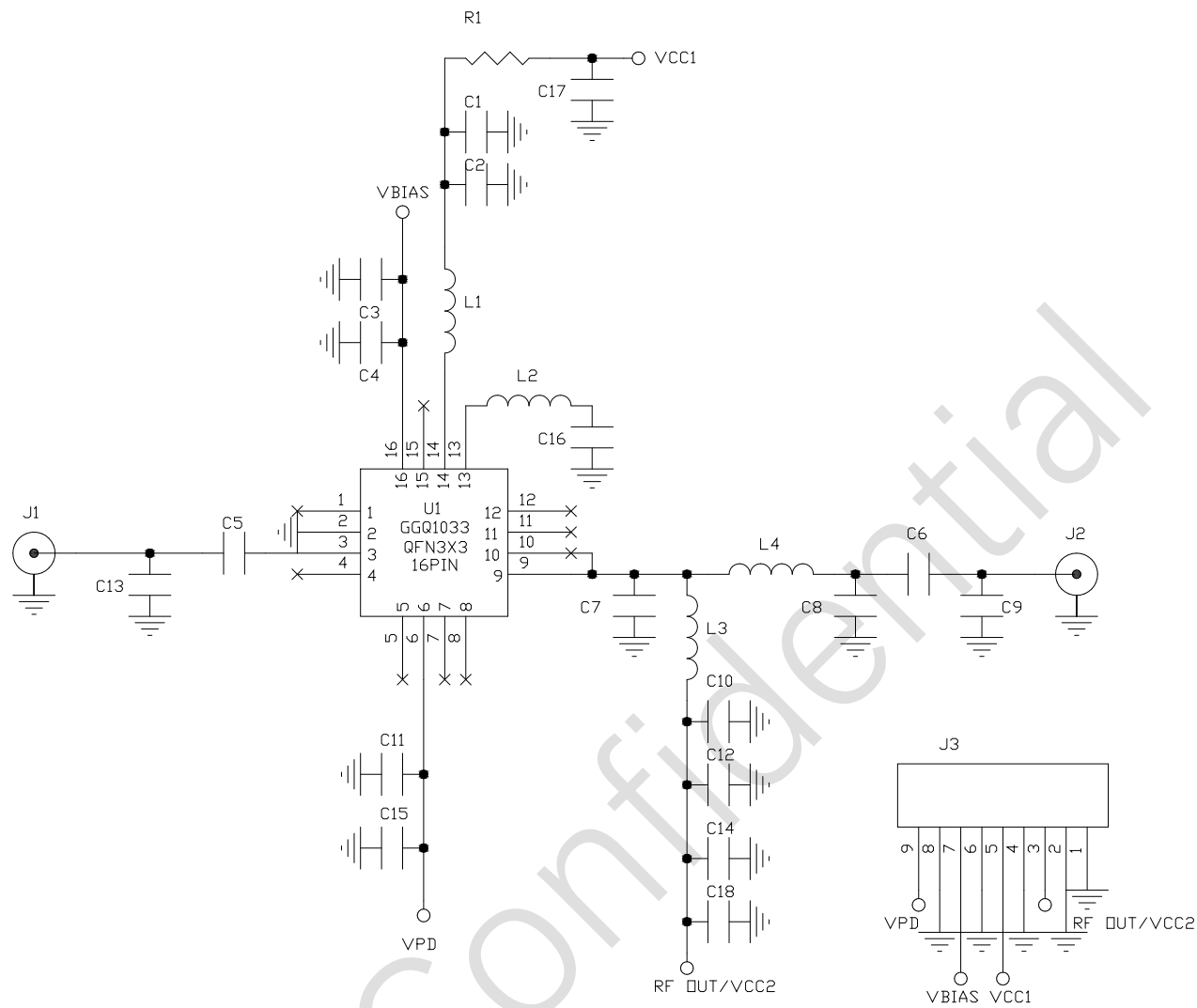


Figure 5. GGQ1033 Evaluation Board Schematic

Table 5. GGQ1033 Evaluation Board Bill of Materials (BOM) for 860-925MHz 5V application

| Component        | Description               | Size  |
|------------------|---------------------------|-------|
| C1, C4, C10, C11 | 1000pF 25V $\pm 10\%$ X7R | C0402 |
| C2, C12          | 100pF 25V $\pm 10\%$ X7R  | C0402 |
| C5, C6           | 47pF 25V $\pm 10\%$ X7R   | C0402 |
| C7               | 10pF 25V $\pm 10\%$ X7R   | C0402 |
| C8               | 4.7pF 25V $\pm 10\%$ X7R  | C0402 |
| C17, C18         | 4.7uF 16V $\pm 10\%$ X7R  | C1206 |
| R1               | 0R $\pm 5\%$ 1/16W        | R0402 |
| L1               | 3.5nH                     | L0402 |
| L3               | 10nH                      | L0603 |
| L4               | 2.4nH                     | L0402 |

Rest of the components on the schematic are not used in this part.

Table 6. GGQ1033 Evaluation Board Bill of Materials (BOM) for 860-925MHz 3.6V application

| Component        | Description         | Size  |
|------------------|---------------------|-------|
| C1, C4, C10, C11 | 1000pF 25V ±10% X7R | C0402 |
| C2, C12          | 100pF 25V ±10% X7R  | C0402 |
| C5, C6           | 47pF 25V ±10% X7R   | C0402 |
| C7               | 10pF 25V ±10% X7R   | C0402 |
| C8               | 4.3pF 25V ±10% X7R  | C0402 |
| C17, C18         | 4.7uF 16V ±10% X7R  | C1206 |
| R1               | 0R ±5% 1/16W        | R0402 |
| L1               | 3.5nH               | L0402 |
| L3               | 10nH                | L0603 |
| L4               | 1.7nH               | L0402 |

Rest of the components on the schematic are not used in this part.

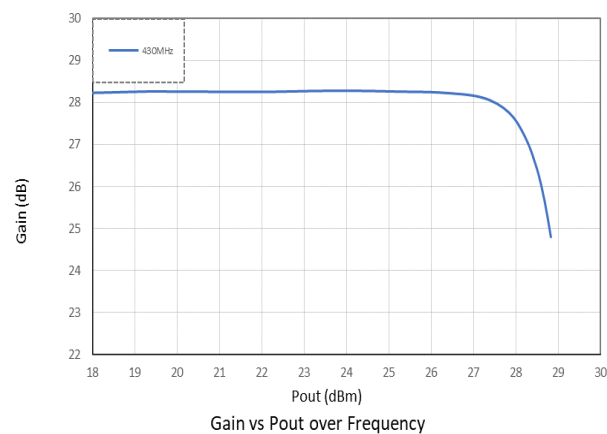
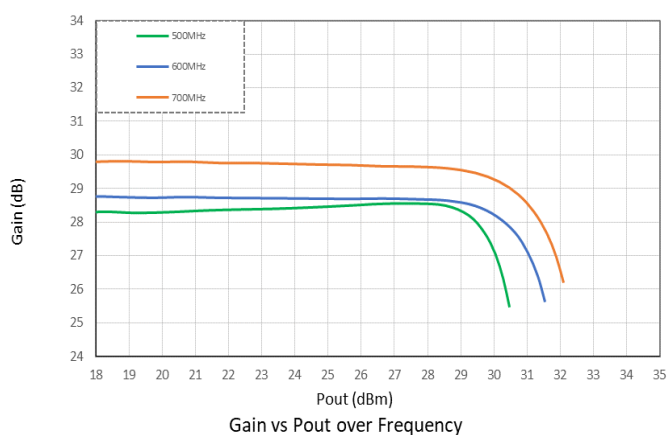


Table 6. GGQ1033 Evaluation Board Bill of Materials (BOM) for 400-700MHz 5V application

| Component        | Description                            | Size  |
|------------------|----------------------------------------|-------|
| C1, C4, C10, C11 | 1000pF 25V ±10% X7R                    | C0402 |
| C2, C12          | 100pF 25V ±10% X7R                     | C0402 |
| C5, C6           | 100pF 25V ±10% X7R                     | C0402 |
| C7               | 22pF 25V ±10% X7R, Close to output Pin | C0402 |
| C8               | 8pF 25V ±10% X7R                       | C0402 |
| C17, C18         | 4.7uF 16V ±10% X7R                     | C1206 |
| R1               | 0R ±5% 1/16W                           | R0402 |
| L1               | 3.5nH                                  | L0402 |
| L3               | 10nH                                   | L0603 |
| L4               | 6.4nH Sunlord MWSD1005C2N4CTM81        | L0402 |

Rest of the components on the schematic are not used in this part.

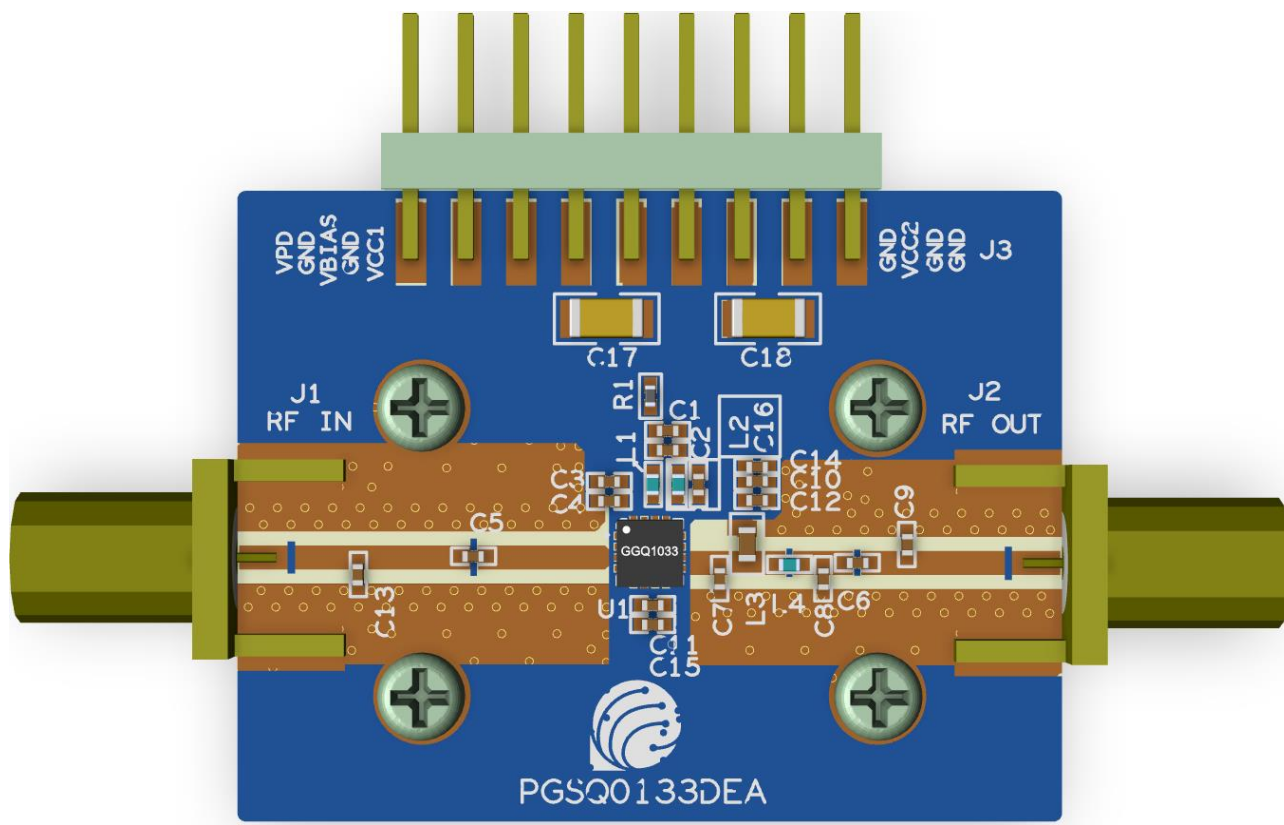


Figure 6. Evaluation board PCB information

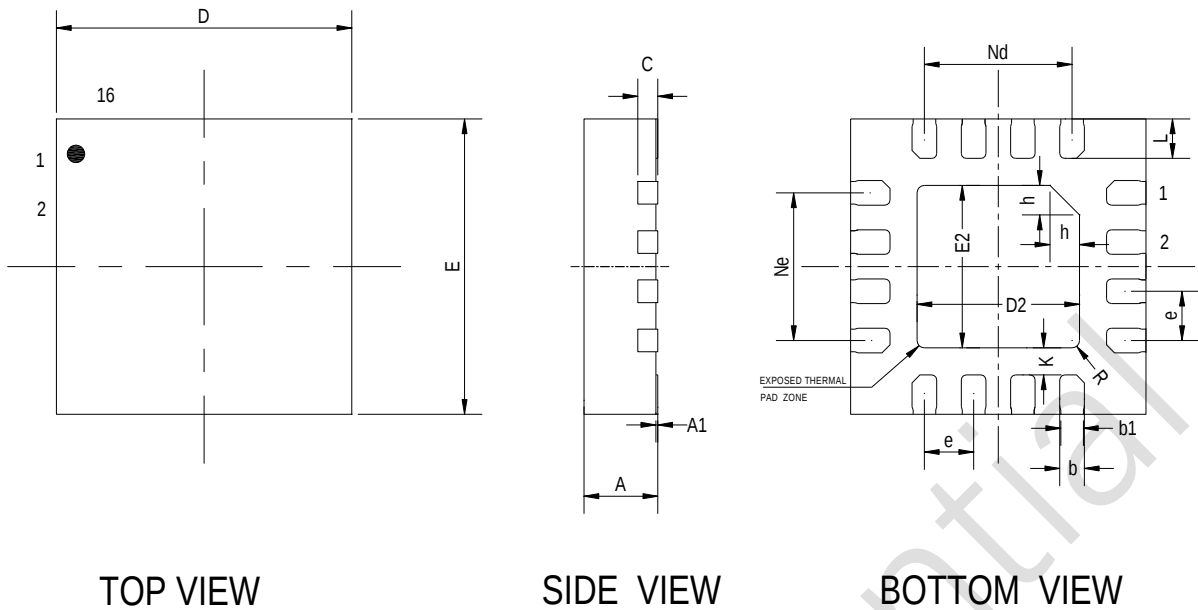
## Evaluation board test procedure

### Turn-on sequence

- 1 . Connect test equipment to the input and output port of Evaluation board and then connect DC ground.
- 2 . Turn on VCC1, VCC2 and VPD to 5V, then turn on VBIAS to 3V in order.
- 3 . Apply RF signal.

### Turn-off sequence

- 1 . Turn off RF signal.
- 2 . Turn off VBIAS, VPD, VCC1, and VCC2 in order.



| SYMBOL | MILLIMETER |       |       |
|--------|------------|-------|-------|
|        | MIN        | NOM   | MAX   |
| A      | 0.7        | 0.75  | 0.80  |
| A1     | 0          | 0.02  | 0.05  |
| b      | 0.2        | 0.25  | 0.3   |
| b1     | 0.23REF    |       |       |
| c      | 0.203REF   |       |       |
| D      | 2.90       | 3.00  | 3.10  |
| D2     | 1.6        | 1.65  | 1.70  |
| e      | 0.50BSC    |       |       |
| Ne     | 1.50BSC    |       |       |
| Nd     | 1.50BSC    |       |       |
| E      | 2.90       | 3.00  | 3.10  |
| E2     | 1.60       | 1.65  | 1.70  |
| L      | 0.35       | 0.4   | 0.45  |
| h      | 0.25       | 0.3   | 0.35  |
| K      | 0.225      | 0.275 | 0.325 |
| R      | 0.075REF   |       |       |

Figure 7. GGQ1033 Package Dimensions

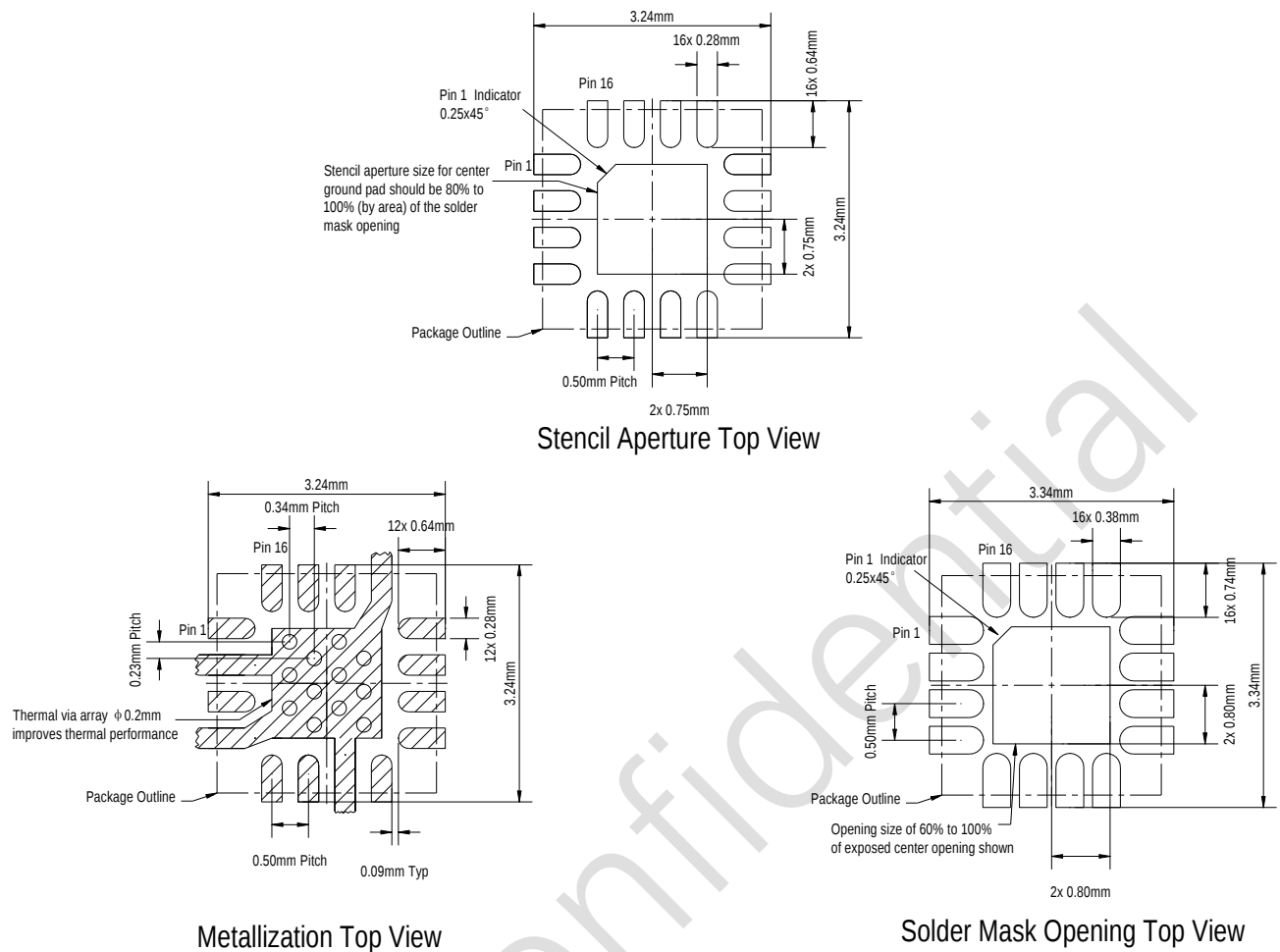


Figure 8. GGQ1033 PCB Layout Footprint

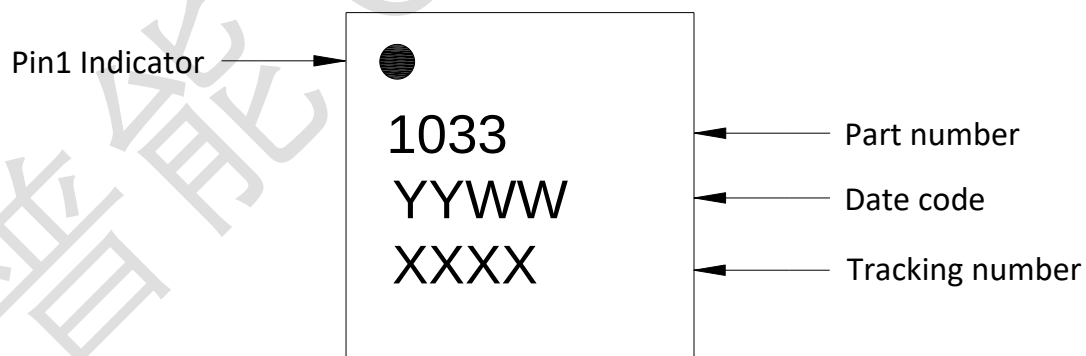
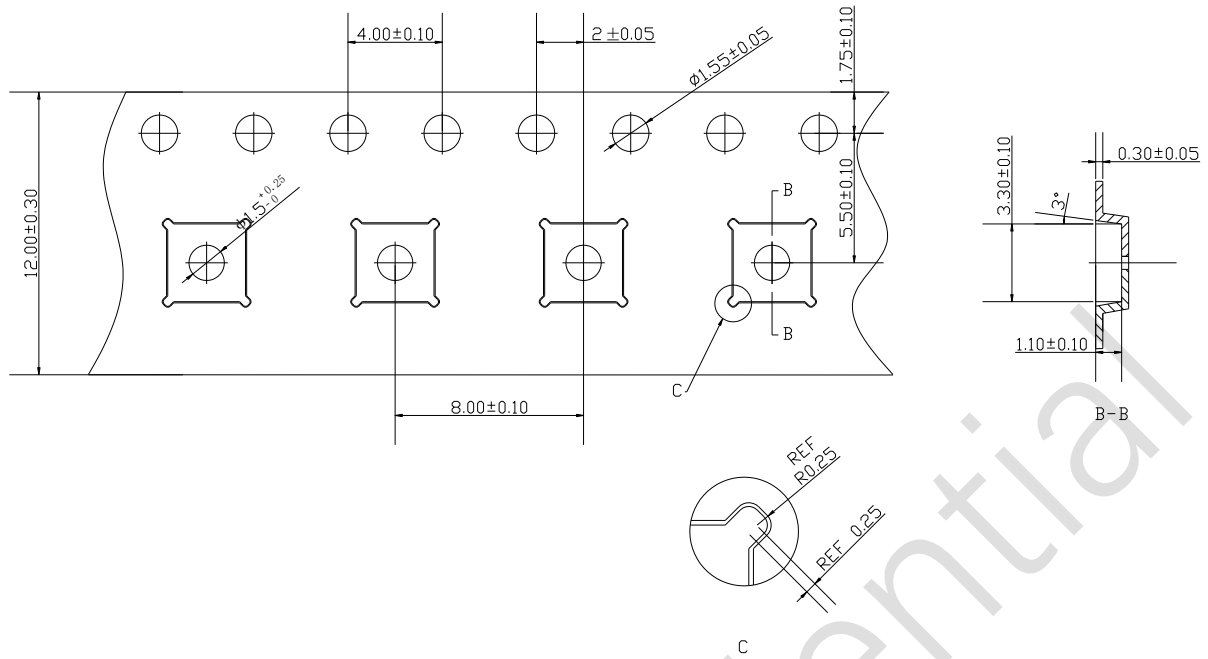


Figure 9. Typical Part Marking for the GGQ1033



#### Technical requirements:

- 1.The accumulative error of the distance between any 10 transmitting holes is  $\pm 0.1$  mm;
- 2.The lateral bending of the belt along the length direction is  $\leq 1\text{mm}/100\text{mm}$ ;
- 3.Roughness:  $Ra < 0.8\mu\text{m}$ ;
- 4.Carrier tape color:Black;

Figure 10. Tape and Reel Dimensions