Preliminary DATA SHEET

GGQ4033: 100 to 4000MHz 2Watts High Power and Linear Amplifier

Product overview

GGQ4033 is a single-stage HBT high power wideband amplifier for indoor/outdoor wireless application such as basestation, radio system application. It works for 2140MHz and can deliver 35dBm output peak power with 15dB power gain, and excellent linearity. It has integrated temperature compensation circuits within a tiny lead frame package.

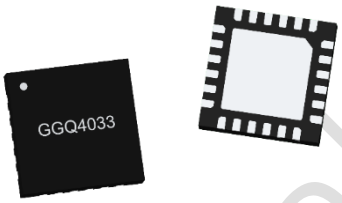


Figure 1. 24pin 4x4 mm QFN Package

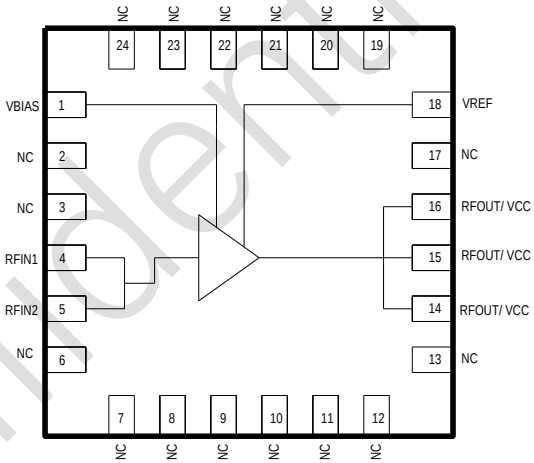


Figure 2. GGQ4033 Function Block Diagram

Key Features

- 100MHz – 4000MHz
- 15dB Gain @2140MHz
- 50% PAE at 33dBm output power
- 35dBm output peak power
- Integrated temperature compensation circuits
- Compact and low-cost 4mm x 4mm QFN package (MSL3, 260℃ per JEDEC J-STD-020)
- ESD Level: HBM 1000V; CDM 1000V
- ROHS compatible

Applications

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

Table 1. Pin-to-Pin Compatible PA Family

Part Num	Frequency (MHz)	3GPP Band
GGQ4033	100-4000MHz	n5,8,20,28,71

Ordering Information

Part No.	Description
GGQ4033	100-4000MHz 2W linear PA, 13’ Reel with 4000pcs

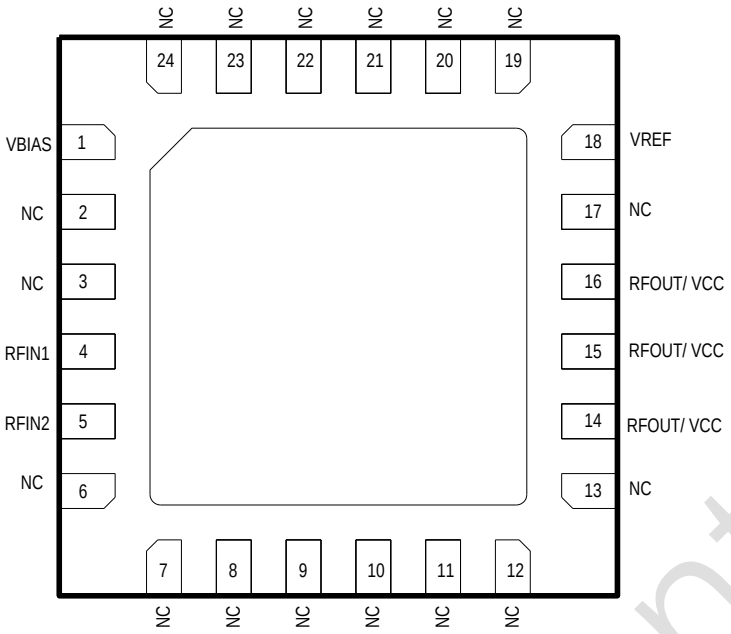


Figure 3. GGQ4033 Pinout (Top View)

Table 2. GGQ4033 Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	VBIAS	Bias circuit voltage	13	NC	Not connected
2	NC	Not connected	14	RFOUT/VCC	RF output port with external collector supply voltage
3	NC	Not connected	15	RFOUT/VCC	
4	RFIN	RF input port	16	RFOUT/VCC	
5	RFIN	RF input port	17	NC	Not connected
6	NC	Not connected	18	VREF	Reference voltage
7	NC	Not connected	19	NC	Not connected
8	NC	Not connected	20	NC	Not connected
9	NC	Not connected	21	NC	Not connected
10	NC	Not connected	22	NC	Not connected
11	NC	Not connected	23	NC	Not connected
12	NC	Not connected	24	NC	Not connected

Table 3. GGQ4033 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	VCC, VBIAS	5.5	V
	VREF	3.5	V
Input Power	PIN	20	dBm

Table 4. GGQ4033 Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Voltage	VCC, VBIAS	3	5	5.5	V
	VREF		3.2		V
Operating frequency	freq	100		4000	MHz
Operating temperature	TC	-40	25	85	˚C

Table 5. GGQ4033 Electrical Specifications

(VCC=VBAIS =5V, VREF=3.2V, f=2140MHz, TC=+25 ˚C, Input /Output Load = 50Ω)

Parameter	Conditions	Min	Typ	Max	Unit
Frequency		100	2140	4000	MHz
Output P1dB			33		dBm
Output P3dB			35		dBm
Gain @ Small signal			15		dB
Power added efficiency			12		%
Quiescent current			435		mA
ACPR @ 24dBm	WCDMA, TM1+64DPCH, PAR=9.7dB		-49		dBc
Input return loss			-10		dB

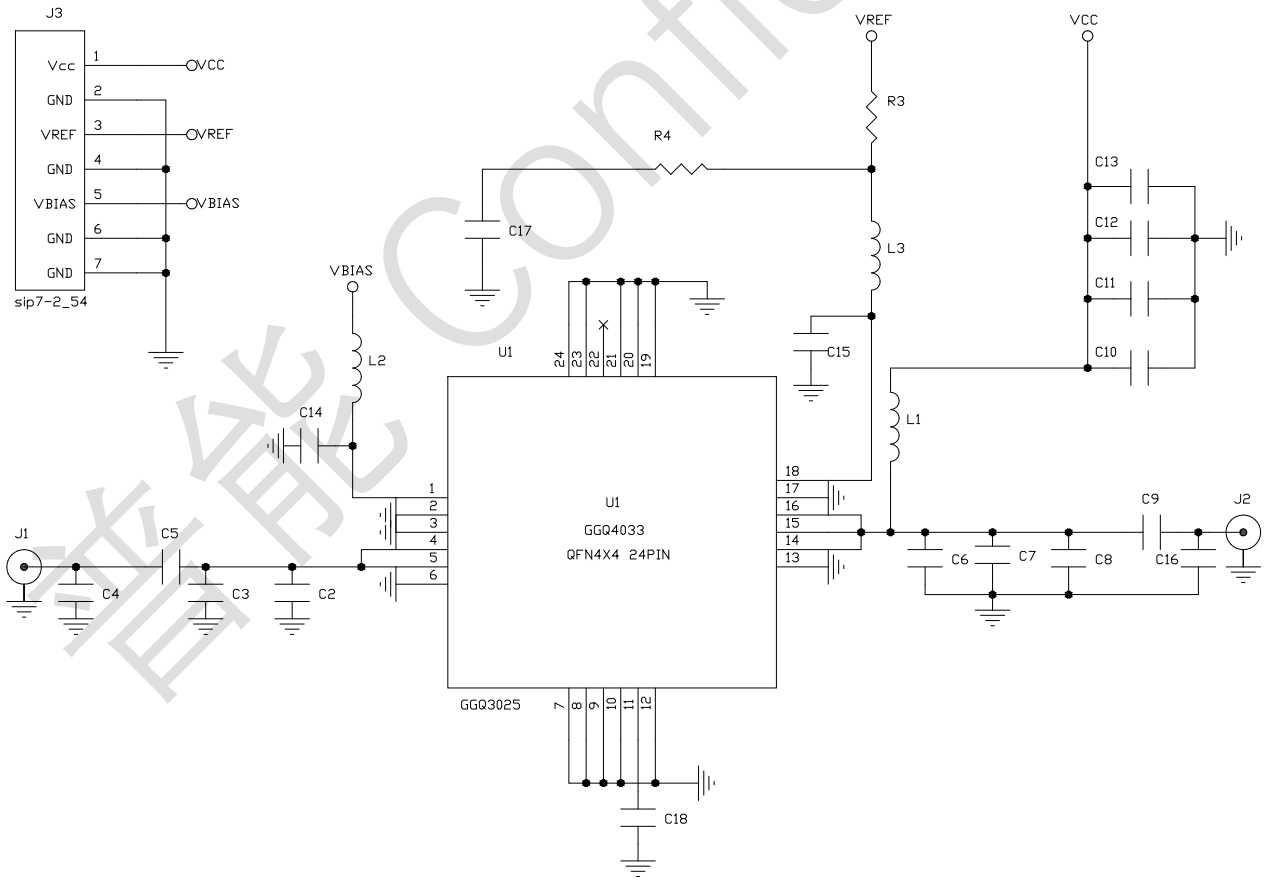


Figure 4. GGQ4033 Evaluation Board Schematic

Table 6. GGQ4033 DEMO Electrical typical performance (VCC=VBAIS =5V, VREF=5V, TC=+25 ˚C, Input /Output Load = 50Ω)

Parameter	Demo Typical Performance								Unit
DEMO Frequency	137 - 178	578 - 678	700 - 750	1300 - 1500	1805 - 1880	2110 - 2170	2300 - 2400		MHz
Test Frequency	155	628	725	1400	1845	2140	2350		MHz
Output P1dB	31	32.5	33.5	33	33	33	34		dBm
Output P3dB	33	33.5	35	34	34	35	35		dBm
Gain @ Small signal	22	22	21.5	15	15	15	15.5		dB
ACPR @ 24dBm, 20M LTE	/	-46	-47	-47	-46	-48	-48		dBc
Input Return loss	-14	-10	-17	-16	-25	-18	-14		dB

Table 7. GGQ4033 Evaluation Board Bill of Materials (BOM) for 137-178MHz application

Component	Description	Size
C2	22nH	C0603
C5	100pF 25V ±0.1pF X7R	C0603
C6	68pF 25V ±2% X7R	C0603
C9	12nH	C0603
C9’	100pF 25V ±10% X7R (Add a new block capacitor)	C0603
C10	100pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
C16	24pF 25V ±10% X7R	C0603
L1	27nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

Table 8. GGQ4033 Evaluation Board Bill of Materials (BOM) for 578-678MHz application

Component	Description	Size
C2	3.3nH	C0603
C5	15pF 25V ±0.1pF X7R	C0603
C4	3.3nH(Distance to C2: 6.5mm)	L0603
C6	10pF 25V ±2% X7R(Distance to GGQ4033: 17mm)	C0603
C9, C10	100pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
L1	27nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

Table 9. GGQ4033 Evaluation Board Bill of Materials (BOM) for 700-750MHz application

Component	Description	Size
C5	10pF 25V ±0.1pF X7R	C0603
C4	1.8nH(Distance to GGQ4033: 11.5mm)	L0603
C6	9.1pF 25V ±2% X7R(Distance to GGQ4033: 12mm)	C0603
C9, C10	47pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
L1	27nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

Table 10. GGQ4033 1.3-1.8GHz DEMO Electrical typical performance (VCC=VBAIS =5V, VREF=5V, TC=+25 ˚C, Input /Output Load = 50Ω)

Parameter	1.3-1.8GHz Demo Typical Performance						Unit
Frequency	1300	1400	1500	1600	1700	1800	MHz
Output P1dB	35	35	34.5	33.5	33.5	35	dBm
Output P3dB	36	36	35	34.5	34.5	36	dBm
Gain @ Small signal	16.1	16.1	15.8	15.8	16	15.3	dB
ACPR @ 24dBm, 20M LTE	-45	-45	-45	-45	-45	-45	dBc
Input Return loss	-11	-18	-20	-16	-15	-13	dB

Table 11. GGQ4033 Evaluation Board Bill of Materials (BOM) for 1300-1800MHz application

Component	Description	Size
C2	7.5pF 25V ±0.1pF X7R	C0603
C5	22pF 25V ±0.1pF X7R	C0603
C4	2.4pF 25V ±0.1pF X7R (distance to C2 14mm)	C0603
C8	10pF 25V ±0.1pF X7R	C0603
C7	3.6pF 25V ±0.1pF X7R (distance to C8 6.3mm)	C0603
C9, C10	22pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
L1	24nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

Table 12. GGQ4033 Evaluation Board Bill of Materials (BOM) for 1805-1880MHz application

Component	Description	Size
C2	6.2pF 25V ±0.1pF X7R	C0603
C5	22pF 25V ±0.1pF X7R	C0603
C4	3pF 25V ±0.1pF X7R (distance to C2 15mm)	C0603
C8	8.2pF 25V ±0.1pF X7R	C0603
C7	3.9pF 25V ±0.1pF X7R (distance to C8 6mm)	C0603
C9, C10	22pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
L1	24nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

Table 13. GGQ4033 Evaluation Board Bill of Materials (BOM) for 2110-2170MHz application

Component	Description	Size
C2	2.4pF 25V ±0.1pF X7R	C0603
C5	1.3pF 25V ±0.1pF X7R	C0603
C7, C8	2.2pF 25V ±0.1pF X7R	C0603
C9, C10	15pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
L1	24nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

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

Table 14. GGQ4033 Evaluation Board Bill of Materials (BOM) for 2300-2400MHz application

Component	Description	Size
C2	1.5pF 25V ±0.1pF X7R	C0603
C5	1pF 25V ±0.1pF X7R	C0603
C8	3pF 25V ±0.1pF X7R	C0603
C7	1.8pF 25V ±0.1pF X7R(distance to C8 3.5mm)	C0603
C9, C10	15pF 25V ±2% X7R	C0603
C11	10nF 25V ±10% X7R	C0603
C13	10uF 25V ±10% X7R	C1210
C14, C15	1uF 25V ±10% X7R	C0603
L1	24nH, Sunlord SDWL1608CP24NNHSTF	L0603
L3	220R ±5% 1/16W	R0603
R3, L2	0R ±5% 1/16W	R0603

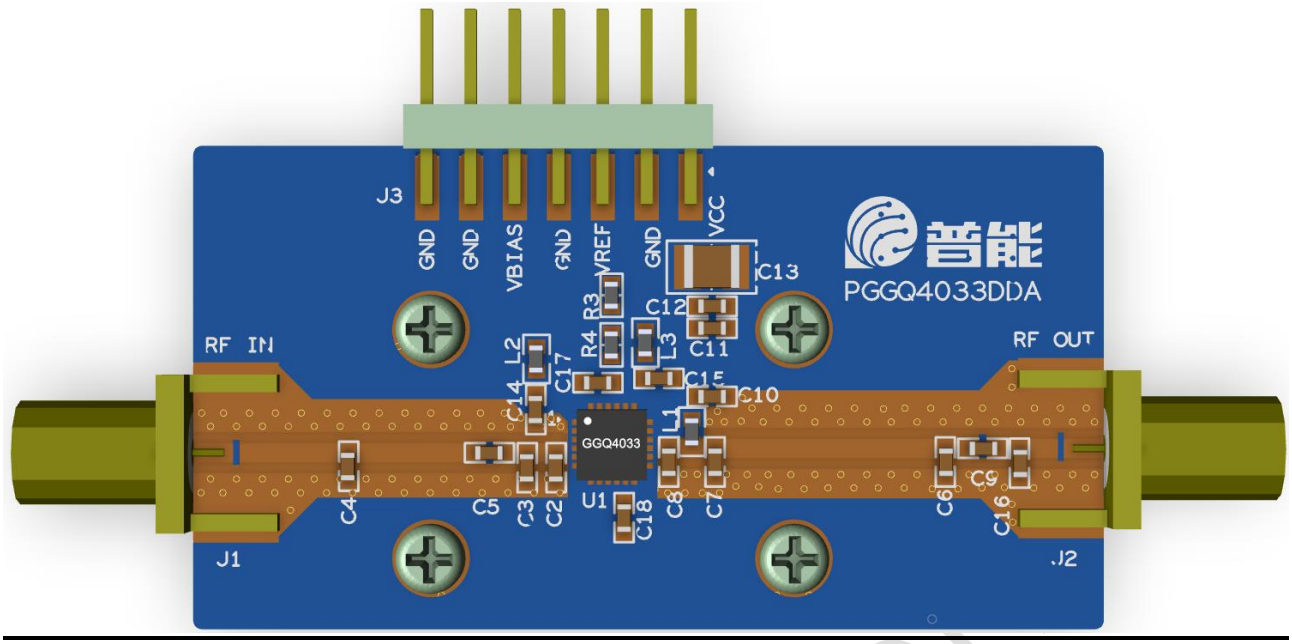


Figure 5. Evaluation board PCB information

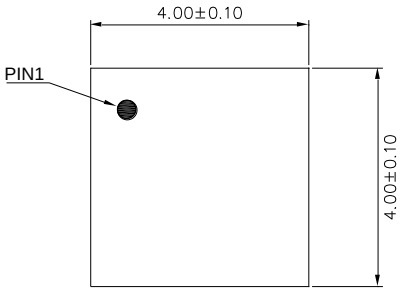
Evaluation board test procedure

Turn-on sequence

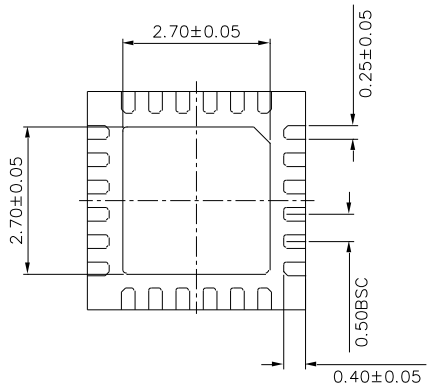
1．Connect test equipment to the input and output port of Evaluation board and then connect DC ground.
2．Turn on VCC and VBIAS to 5V, then turn on VREF to 5V in order.
3．Apply RF signal.

Turn-off sequence

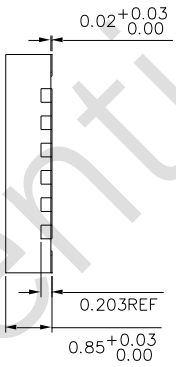
1．Turn off RF signal.
2．Turn off VREF, VBIAS and VCC in order.



TOP VIEW

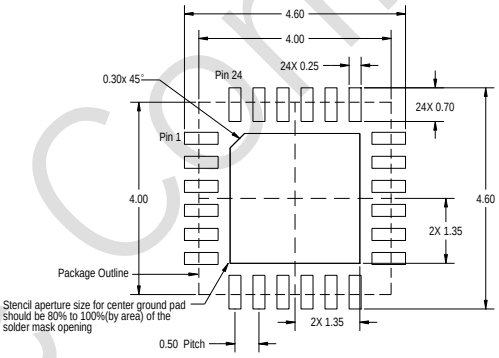


BOTTOM VIEW

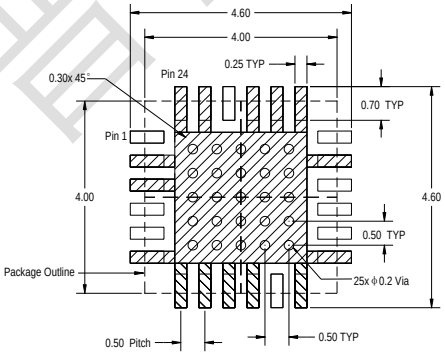


SIDE VIEW

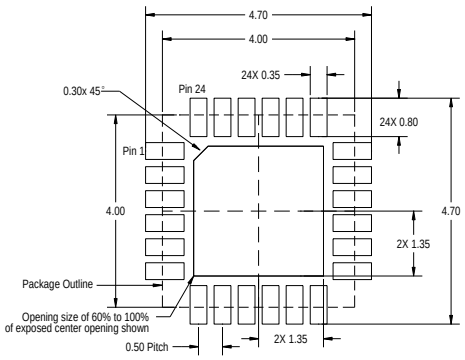
Figure 6. GGQ4033 Package Dimensions



Stencil Aperture Top View



Metallization Top View



Solder Mask Opening Top view

Figure 7. GGQ4033 PCB Layout Footprint

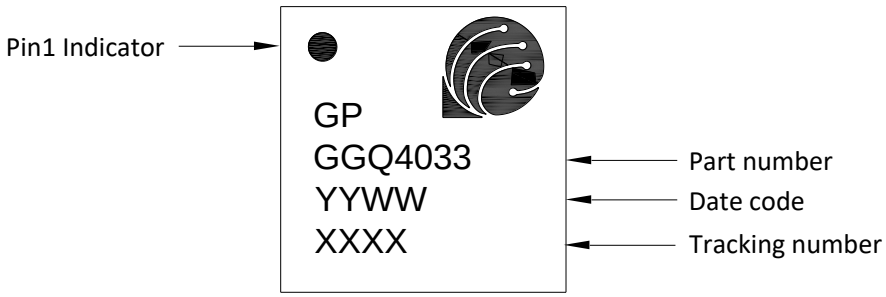
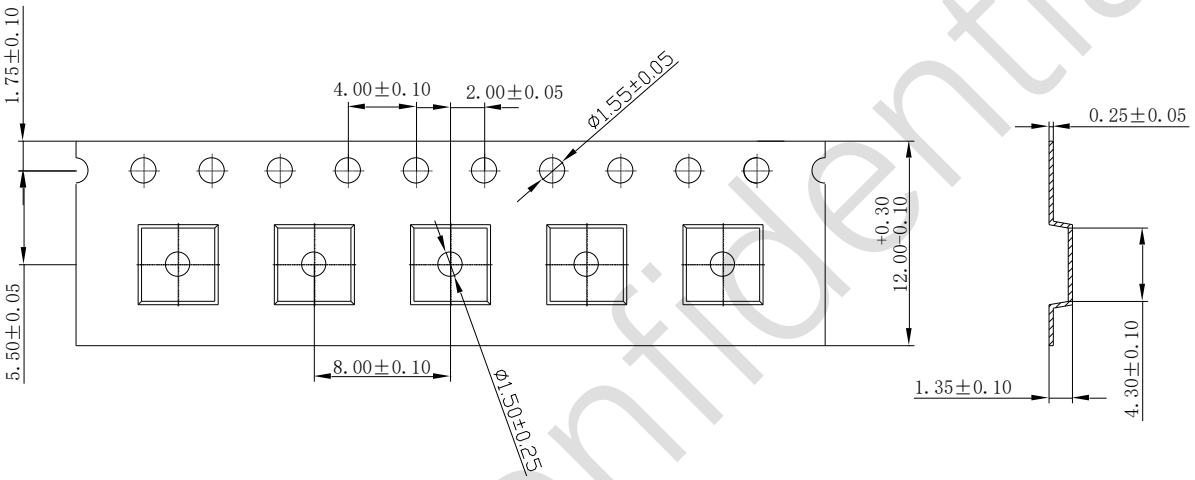


Figure 8. Typical Part Marking for the GGQ4033



Technical requirements：
1.The accumulative error of the distance between any 10 transmitting holes is ± 0.1 mm;
2.The lateral bending of the belt along the length direction is ⩽1mm/100mm;
3.Roughness：Ra＜0.8um;
4.Carrier tape color:Black.

Figure 9. Tape and Reel Dimensions