■ Product summary

CA0027AN is an IC that supplies power to GPS antenna, and outputs alarm signal by diagnosing connection status (Open/Short-circuit) of GPS antenna by monitoring current.
The threshold for short-circuit detection current can be adjusted by external resistor.
Limit current is determined along with the threshold, and the IC supports various GPS antenna flexibly.

■ Features

- Antenna supply voltage: VCC-0.28V (antenna current=20mA)
- Open detection current: 4.5mA(TYP)
- Short-circuit detection current: 25mA to 70mA(TYP)
- Limit current range: 35mA to 90mA(TYP)
- Open collector output
- Package type: SON 8pin 2.2mm×2.2mm back side thermal pad included
- Automotive grade(AEC-Q100 Grade-2 qualified)

■ Maximum ratings

Item	Symbol	Rating	Unit
Power supply voltage	VCC	7.0	V
Power dissipation※ Ta=25°C	Pd	Mounting board 1 : 2400 Mounting board 2 : 3200	mW
Junction temperature	Tjmax	+150	°C
Operating ambient temperature	Topr	-40 to +105	°C
Storage temperature	Tstg	-40 to 125	°C

※Measurements board information

Mounting board 1:114.3mm×76.2mm×t1.6mm, FR-4, 2-layer, Connect the thermal pad to the through via (φ=0.3mm, N=2)
Mounting board 2:114.3mm×76.2mm×t1.6mm, FR-4, 4-layer, Connect the thermal pad to the through via (φ=0.3mm, N=2)

Note

Be sure to ensure heat dissipation performance by soldering the backside thermal pad of the package and connecting to solid GND of the board.
Inadequate heat dissipation performance may cause malfunction or permanent breakdown.

■ Package thermal resistance

Item	Symbol	Mounting board Condition※	Value	Unit
Package thermal resistance	θja	Mounting board 1	51	°C/W
		Mounting board 2	38	
Between chip and package surface thermal resistance	ψjt	Mounting board 1	5.0	°C/W
		Mounting board 2	4.3	

※Measurements board information

Mounting board 1:114.3mm×76.2mm×t1.6mm, FR-4, 2-layer, Connect the thermal pad to the through via (φ=0.3mm, N=2)
Mounting board 2:114.3mm×76.2mm×t1.6mm, FR-4, 4-layer, Connect the thermal pad to the through via (φ=0.3mm, N=2)

■ Recommended operating conditions

Item	Symbol	Rating	Unit
Power supply voltage	VCC	3.0 to 5.5	V

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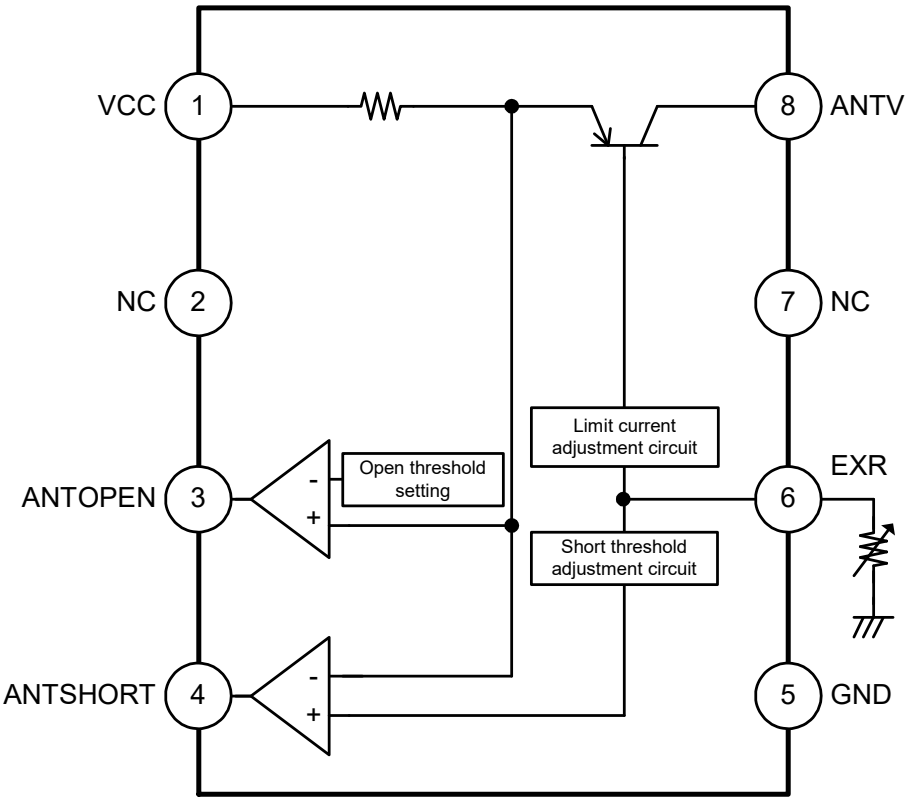
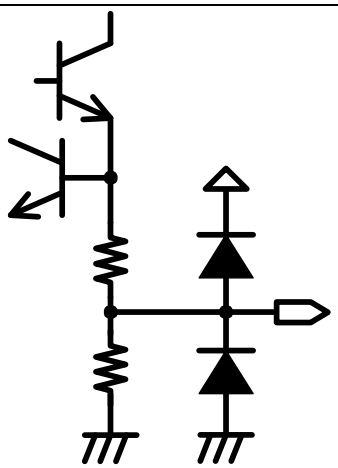
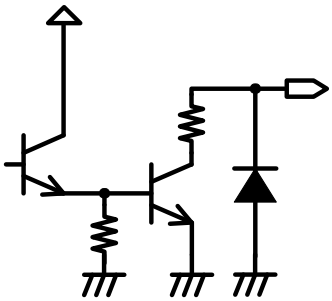
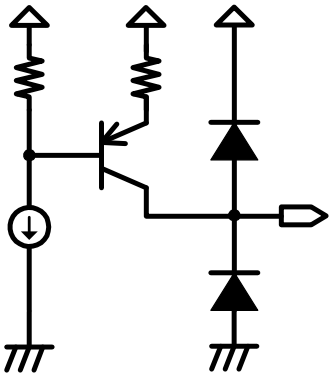
■ Block diagram



■ Terminal functions

No.	Symbol	Terminal Function
1	VCC	Power supply
2	NC	–
3	ANTOPEN	OPEN detect output (open collector output)
4	ANTSHORT	Short-circuit detect output (open collector output)
5	GND	Ground
6	EXR	External resistor input
7	NC	–
8	ANTV	Antenna power supply output

■ Equivalent circuit of input and output terminal

No.	Symbol	I/O	Equivalent circuit	Explanation
1	VCC	IN	–	Power supply pin
5	GND	IN	–	Grounding pin
6	EXR	IN		Input pin for external resistor Short-circuit detection current, limit current can be adjusted by connecting external resister to GND.
3,4	ANTOPEN ANTSHORT	OUT		Output pin for detection signals. Open collector output. Please be sure to connect pull-up resistor of 10k ohm and above to the power supply of receiving side.
8	ANTV	OUT		Output pin for antenna power supply

■ Electrical characteristics

Measurement condition：Unless otherwise specified VCC = 5.0V, Ta =-40 to 105ºC

Item	Symbol	Condition	MIN	TYP	MAX	UNIT
Consumption current *	ICC	While in normal operation of antenna, Antenna current = 20mA, EXR=4.7kΩ	5.0	10.0	15.0	mA
	ICCOP	When antenna is OPEN Antenna current =0mA, EXR=4.7kΩ	6.0	12.0	18.0	mA
	ICCSH	When antenna is causing short-circuit ANTV=0V, EXR=4.7kΩ	7.5	15.0	22.5	mA
ANTOPEN detection current	I_{tho}	-	1.0	4.5	8.0	mA
ANTSHORT detection current	I_{ths}	EXR=4.7kΩ	30	40.0	50	mA
L_level output current	IOL	VCC=3.0V, Vce=0.2V ANTOPEN, ANTSHORT	0.7	-	-	mA
H_level leak current	IOH	VCC=5.5V, Vce=5.5V ANTOPEN, ANTSHORT	-	-	1	μA
Limit current	ILIM	EXR=4.7kΩ, ANTV=0V	38.5	55.0	71.5	mA
Antenna supply voltage	ANTV	Antenna current: 20mA	VCC -0.37	VCC -0.28	VCC -0.19	V

*Not include antenna current

■ Truth table of antenna connection status

	ANTOPEN	ANTSHORT
Normal operation	H	H
Detect OPEN	L	H
Detect SHORT	H	L

Note

Inrush current may flow from VCC to the ANTV terminal immediately after turning on the power supply. Be careful because the inrush current temporarily makes SHORT detection state.

After turning on the power, the time for normal operation varies depending on the load capacitance connected to the ANTV terminal. Wait for 100 μs when load capacitance = 0.1 μF. If load capacitance = 1 μF, wait 1 ms before reading the output.

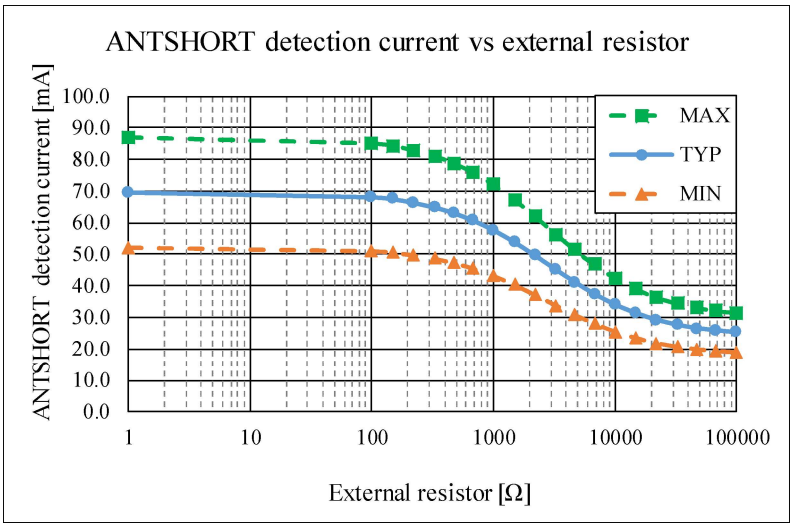
■ Variation of short-circuit detection current with external resistor (reference data)

・Calculation formula (Typ.)

ANTSHORT detection current = 280000/(4000+(8000×EXR[Ω])/(8000+EXR[Ω])) [mA]

Measurement condition VCC=5.0V, Ta=-40 to 105 ºC

External resistor		OPEN	4.7kΩ	150Ω	0Ω	UNIT
ANTSHORT Detection current	MAX (-40 to 105°C)	31.3	50.0	84.4	87.5	mA
	TYP (25°C)	25.0	40.0	67.5	70.0	
	MIN (-40 to 105°C)	18.8	30.0	50.6	52.5	



*The plots come near to the E6 line (1, 1.5, 2.2, 3.3, 4.7, 6.8).

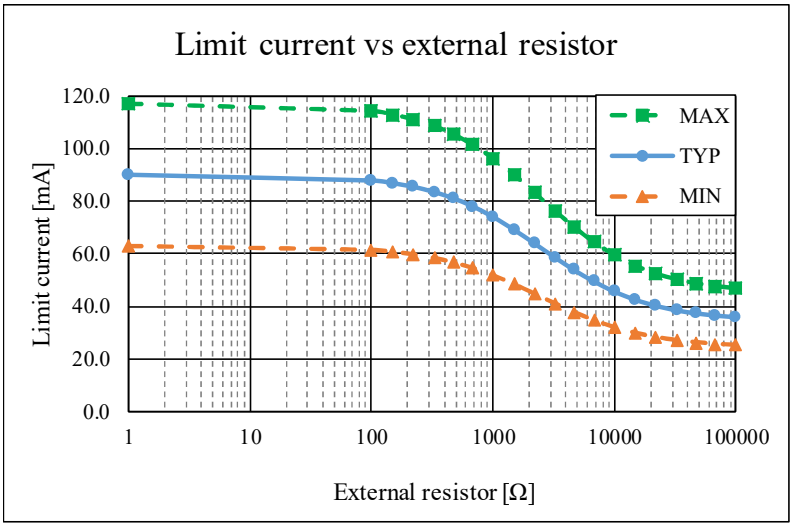
■ Variation of limit current with external resistor (Reference data)

・ Calculation formula (Typ.)

Limit current = ANTSHORT detection current +(80000/(4000+(3000×EXR[Ω])/(3000+EXR[Ω]))) [mA]

Measurement condition VCC=5.0V, Ta=-40 to 105 ºC

External resistor		OPEN	4.7kΩ	150Ω	0Ω	UNIT
Limit current	MAX (-40 to 105°C)	45.5	71.5	111.8	117.0	mA
	TYP (25°C)	35.0	55.0	86.0	90.0	
	MIN (-40 to 105°C)	24.5	38.5	60.2	63.0	

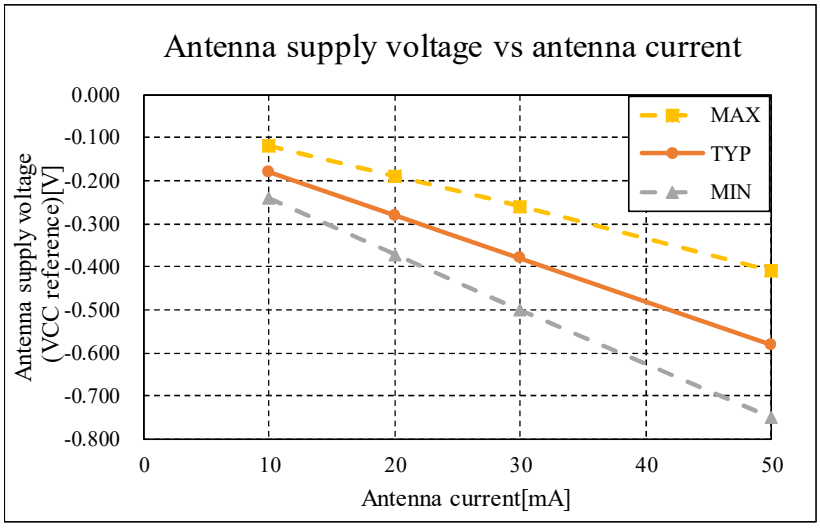


*The plots come near to the E6 line (1, 1.5, 2.2, 3.3, 4.7, 6.8).

■ Antenna current-dependent properties of antenna supply voltage (reference data)

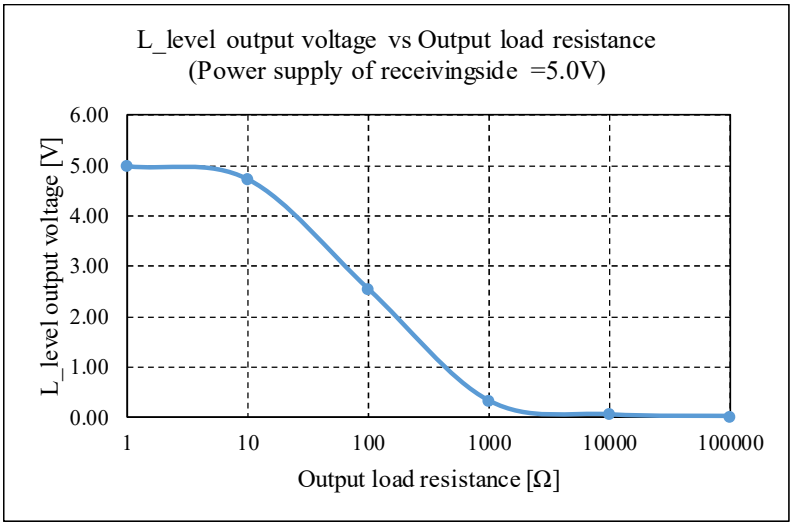
Measurement condition VCC=5.0V, Ta=-40 to 105 ºC

Antenna current		10mA	20mA	30mA	50mA	UNIT
Antenna supply voltage VCC reference	MAX (-40 to 105°C)	-0.120	-0.190	-0.260	-0.410	V
	TYP (25°C)	-0.180	-0.280	-0.380	-0.580	
	MIN (-40 to 105°C)	-0.240	-0.370	-0.500	-0.750	

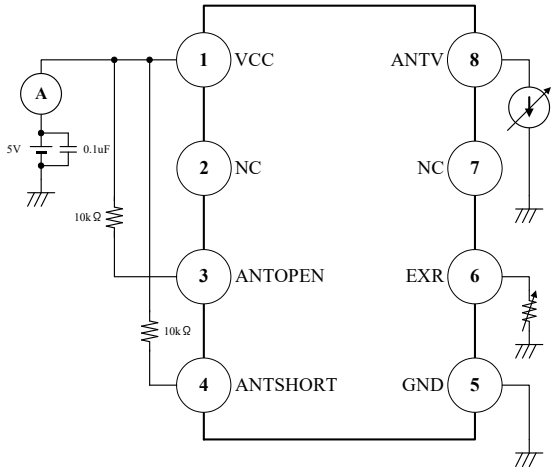


■ Output load resistance-dependent property of L_level output voltage (reference data)

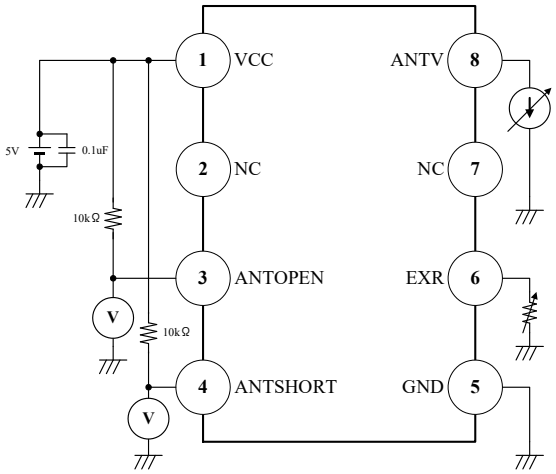
Measurement condition VCC=5.0V, Ta=25 ºC



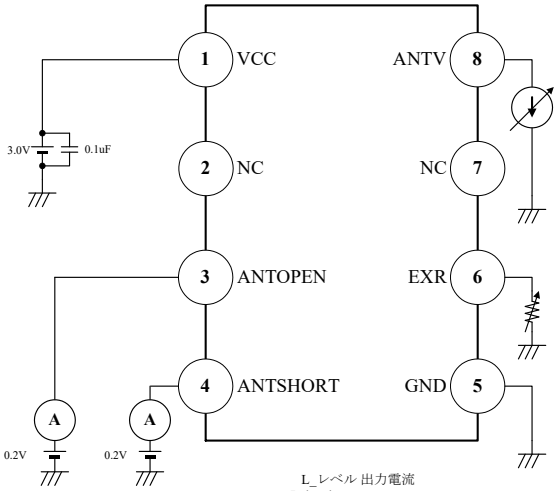
■ Measurement circuit diagram



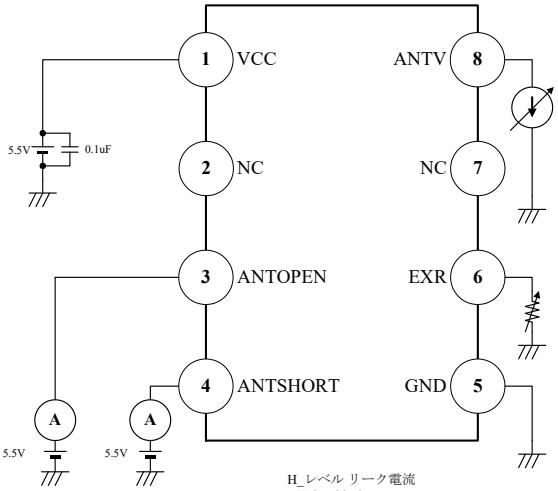
消費電流
Consumption current



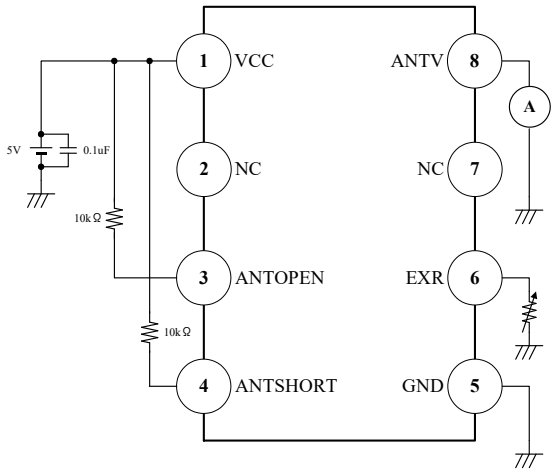
ANTOPEN検出電流、ANTSHORT検出電流
ANTOPEN detection current, ANTSHORT detection current



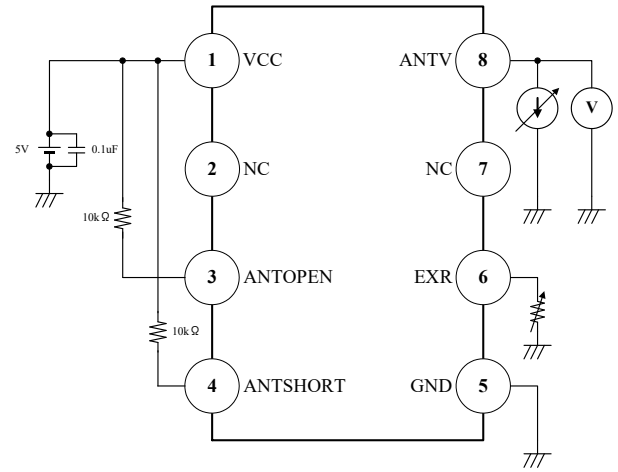
L_レベル 出力電流
L_level output current



H_レベル リーク電流
H_level leak current

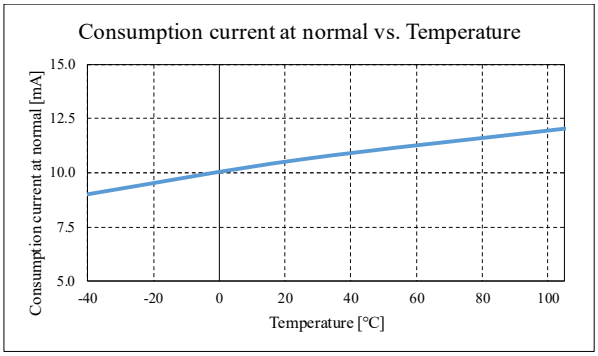


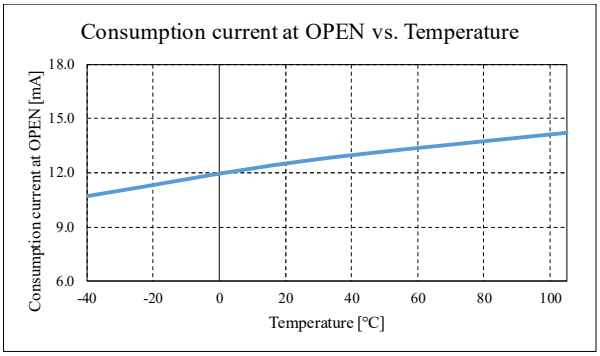
リミット電流
Limit current

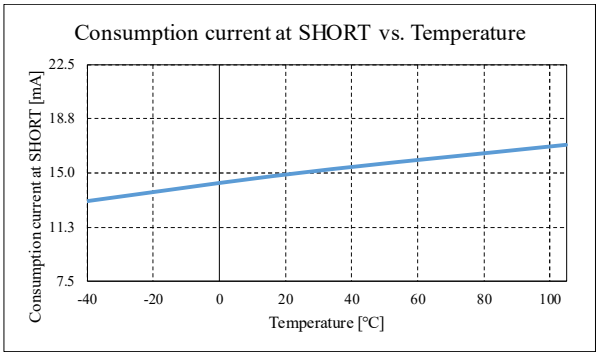


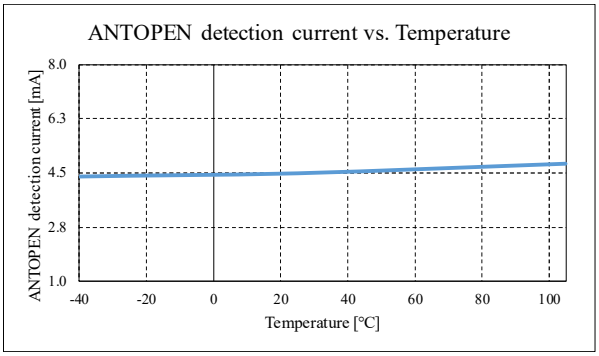
アンテナ供給電圧
Antenna supply voltage

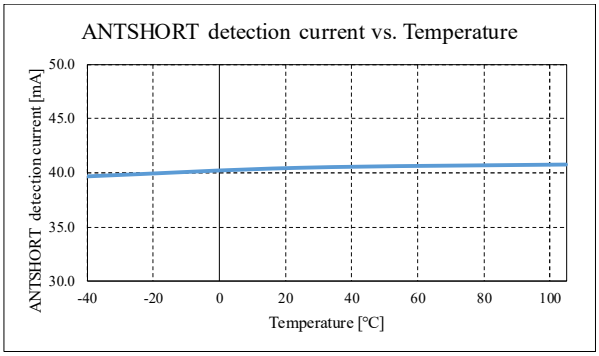
■ Temperature characteristics(Measurement condition VCC=5.0V, Ta=-40~105 ºC, EXR=4.7kΩ)

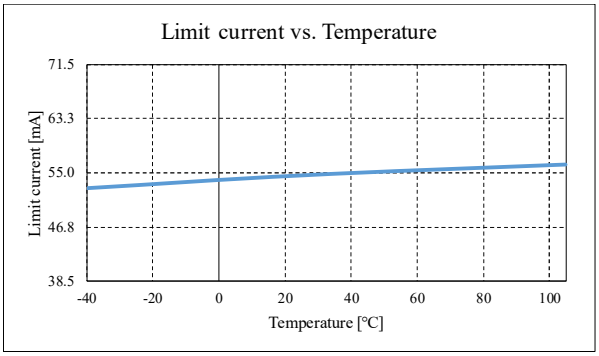


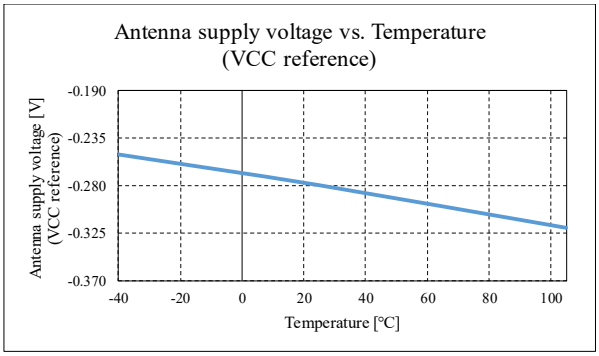




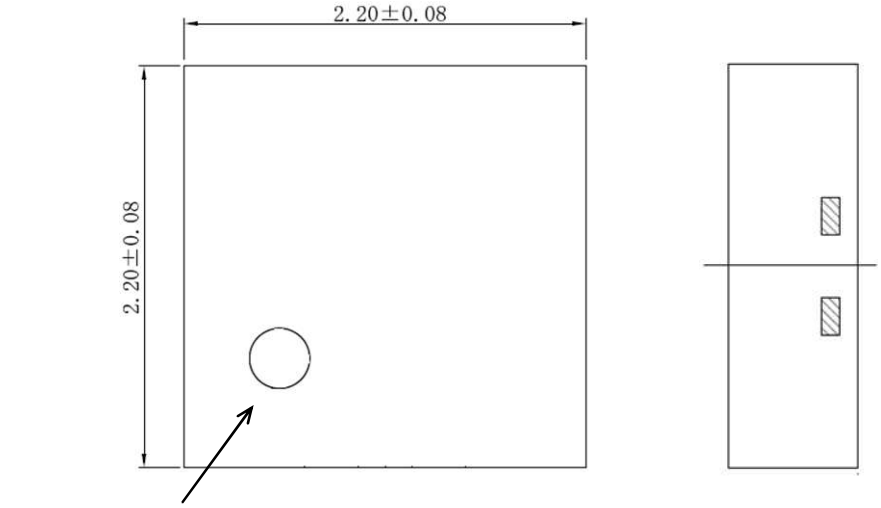




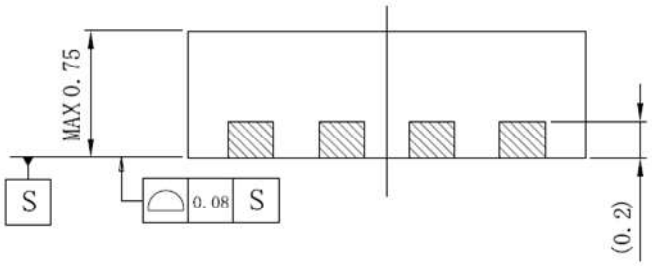


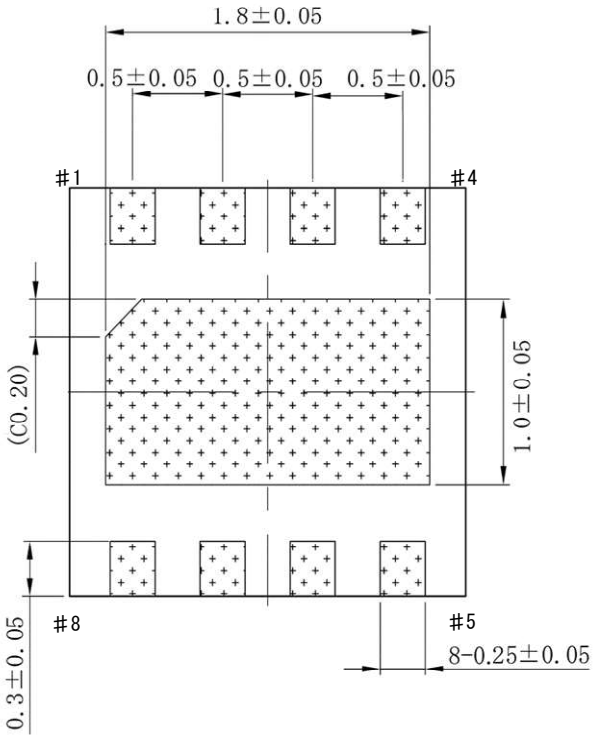


■ External dimensions



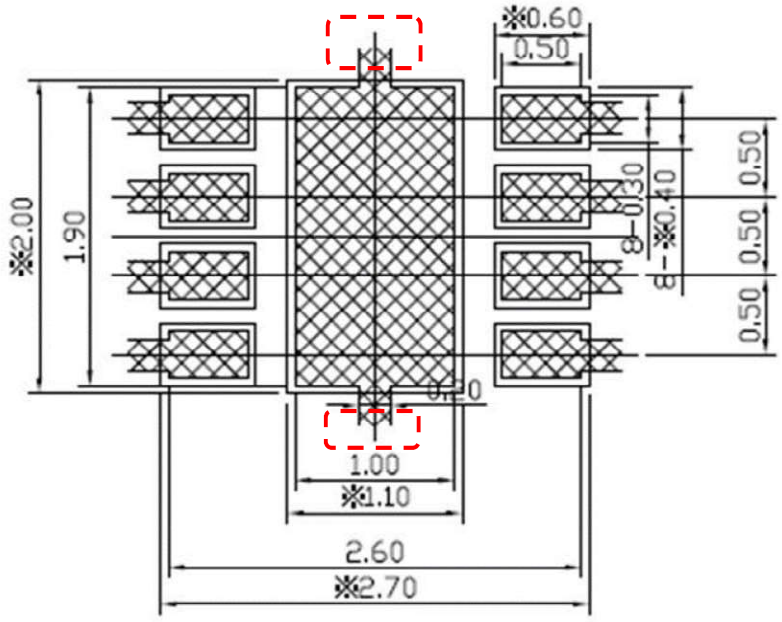
Package index





Unit: mm
※not to scale

■ Reference land pattern



Unit: mm
*not to scale

1 ▨ is Copper wiring
2 ※ indicates the dimension of the resist opening
3 The thickness of the resist film is equal to or thinner than the copper foil thickness

Note :
Be sure to ensure heat dissipation performance by connecting ⊏ ⊐ parts to GND of the board with a through via etc.

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