PRELIMINARY DATASHEET V0.4

2007-04-18

RDAT212
RF Front-end Module
for Bluetooth Wireless Communication

RDAT212 for Bluetooth (2400~2500MHz)

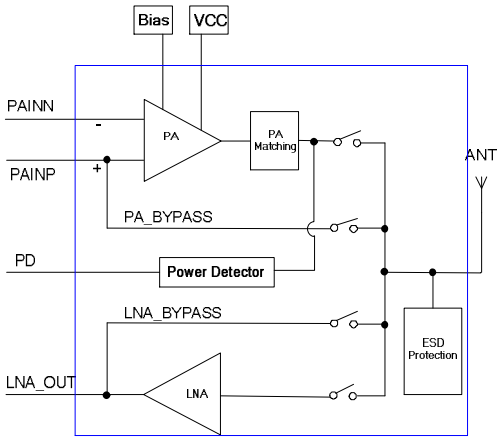
The RDAT212 includes a power amplifier, a low noise amplifier and an antenna switch. The PA and the LNA are manufactured on HBT and HEMT process respectively. This chip is designed for Bluetooth high power application. The package of this chip is $3\times3mm^2$ MLPQ (QFN)* with 16 pins.

PA and LNA bypass function is available for class 2 application. Shutdown function of PA and LNA is implemented. Power detector is integrated to monitor the output power.

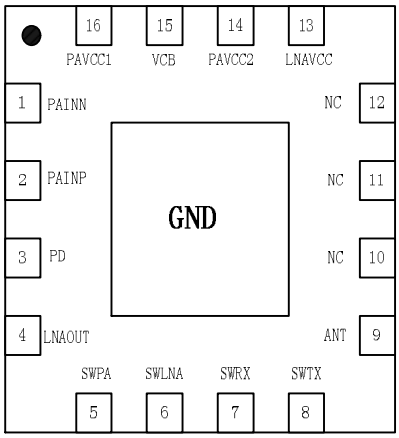
Features

- PA +LNA+ Antenna Switch
- 18dBm linear power@-30dBc IM3
- Integrate power detector
- 2.6dB noise figure and 8dBm IIP3 LNA
- PA and LNA bypass function
- Input/Output matched @ 50 Ω
- Low supply voltage (3.0V)

Function Block Diagram



Pin Assignment



Pin Name definition

Pin Number	Pin Name	
1	PAINN	PA RF in negative
2	PAINP	PA RF in positive and PA bypass function
3	PD	Power Detector
4	LNAOUT	LNA output and LNA bypass function
5	SWPA	Switch PA control
6	SWLNA	Switch LNA control
7	SWRX	Switch RX control
8	SWTX	Switch TX control
9	ANT	Antenna port
10	NC	Not connected
11	NC	Not connected
12	NC	Not connected
13	LNAVCC	LNA power supply
14	PAVCC2	PA power supply for 2nd stage
15	VCB	PA BIAS power supply
16	PAVCC2	PA power supply for 1st stage

Preliminary Electrical Target Specifications

The following tables list the electrical characteristics of the RDAT212. Table 1 lists the absolute maximum ratings. Table 2 is the logic function table. Table 3, 4, 5 show the electrical specifications for Bluetooth nominal operating conditions.

Table 1. Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (RF off)	+6	V
Control Voltage	+4	V
Input RF Power	10	dbm
Operating Case Temperature	-40 to +85	℃
Storage Temperature	-55 to +150	℃

Table 2. Logic Function Table

Mode	SWPA	SWLNA	SWRX	SWTX
PA On	2.8~3.0V	0	0	>2.5V
LNA On	0	2.8~3.0V	>2.5	0
PA BYPASS	0	0	0V	>2.5V
LNA BYPASS	0	0	>2.5V	0

Table 3. Electrical Specifications for Power Amplifier

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=2.8V, SWLNA=0V, SWRX=0V, SWTX=2.8V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω)

Characteristics	Test Condition	Min.	Typ.	Max.	Unit
Operating frequency		2400	-	2500	MHz
Quiescent Current			20		mA
Supply Current	Pout=20dBm			100	mA
Power gain	Pout=20dBm		20		dB
Input S11	Pin=-30dBm	-20		-10	dB
Output S22	Pin=-30dBm	-15		-6	dB
Bias current	Pout=20dBm			4	mA
IM3	Pout=18dBm		-30		dBc
Harmonics				-50	dBc

Table 4. Electrical Specifications for PA BYPASS MODE

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=0V, SWLNA=0V, SWRX=0V, SWTX=2.8V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω)

Characteristics	Test Condition	Min.	Typ.	Max.	Unit
Operating frequency		2400	-	2500	MHz
Input S11	Pin=-30dBm	-20		-10	dB
Output S22	Pin=-30dBm	-20		-10	dB
Insertion Loss			3.6		dB

Table 5. Electrical Specifications for LNA MODE

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=0V, SWLNA=3V, SWRX=3V, SWTX=0V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω)

Characteristics	Test Condition	Min.	Typ.	Max.	Unit
Operating frequency		2400	-	2500	MHz
Quiescent Current			4.5		mA
Power gain			10		dB
Input S11	Pin=-30dBm	-20		-10	dB
Output S22	Pin=-30dBm	-20		-10	dB
NF			2.6		dB
IIP3			8		dBm

Table 6. Electrical Specifications for LNA BYPASS MODE

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=0V, SWLNA=0V, SWRX=3V, SWTX=0V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω)

Characteristics	Test Condition	Min.	Typ.	Max.	Unit
Operating frequency		2400	-	2500	MHz
Input S11	Pin=-30dBm	-20		-10	dB
Output S22	Pin=-30dBm	-20		-10	dB
Insertion Loss			2.6		dB

PA Performance

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=2.8V, SWLNA=0V, SWRX=0V, SWTX=2.8V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω, temperature sweep -20~80℃)

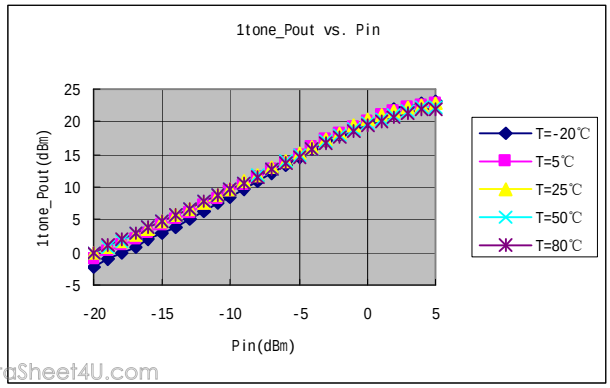


Fig1. 1_tone Pout vs. Pin

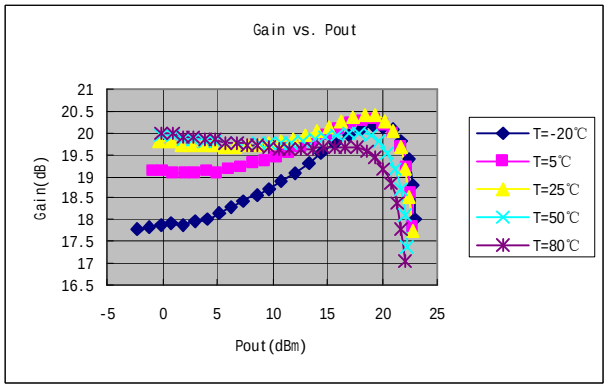


Fig2. Gain vs. 1_tone Pout

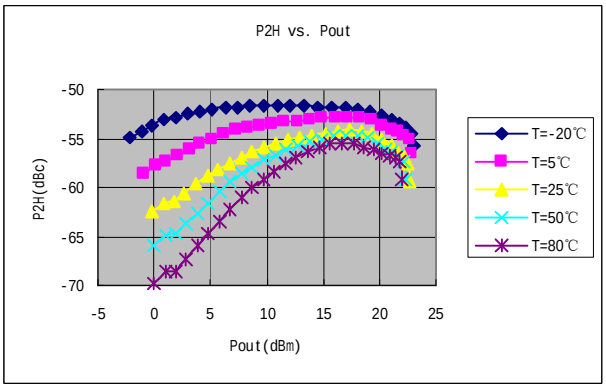


Fig3. 2nd harmonic vs. 1_tone Pout

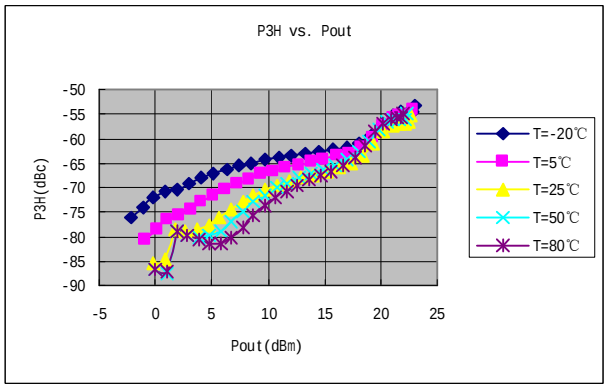


Fig4. 3rd harmonic vs. 1_tone Pout

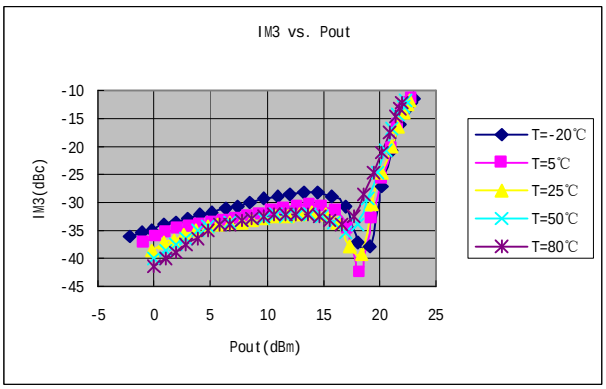


Fig5. 3rd intermodulation vs. Pout

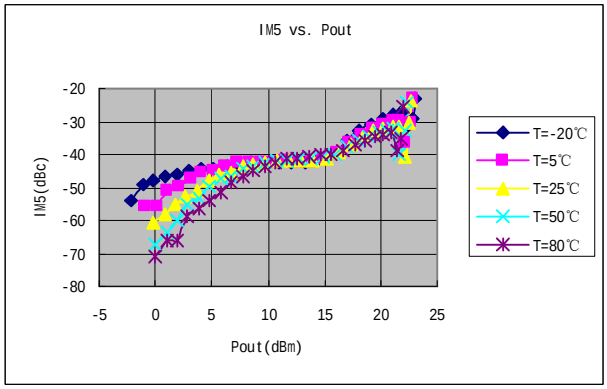


Fig6. 5th intermodulation vs. Pout

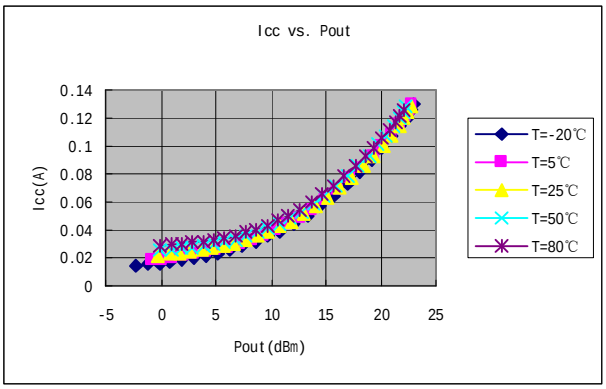


Fig9. ICC vs. Pout

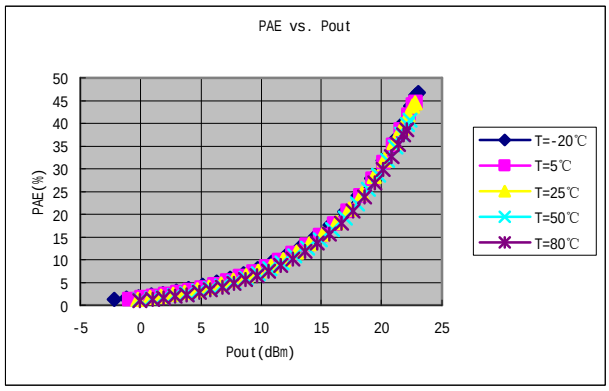


Fig10. PAE vs. Pout

Power Detector performance

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=2.8V, SWLNA=0V, SWRX=0V, SWTX=2.8V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω, temperature sweep -20~80℃)

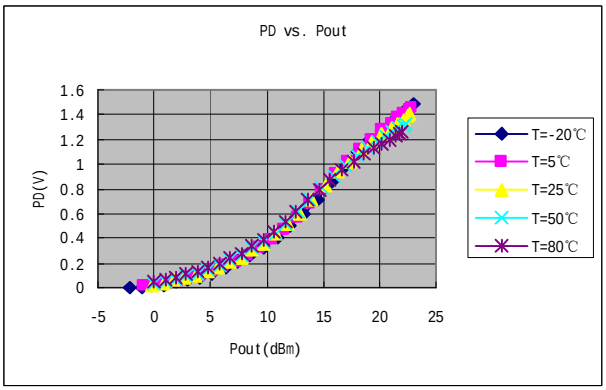


Fig11. Power Detector vs. Pout

LNA performance

(PAVCC1=PAVCC2=VCB=LNAVCC=3.3V, SWPA=0V, SWLNA=3V, SWRX=3V, SWTX=0V, f=2.45GHz, Ta=25℃, Zg=Zl=50Ω, temperature sweep -20~80℃)

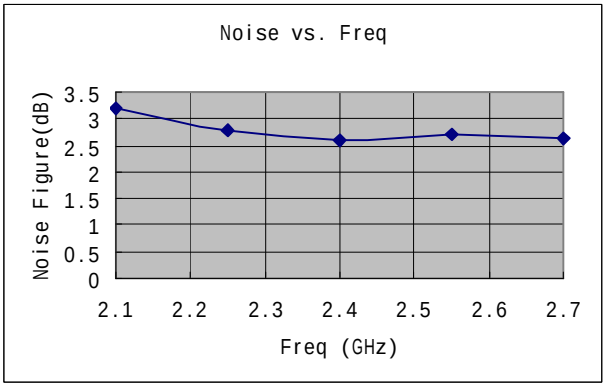


Fig12. Noise figure vs. frequency

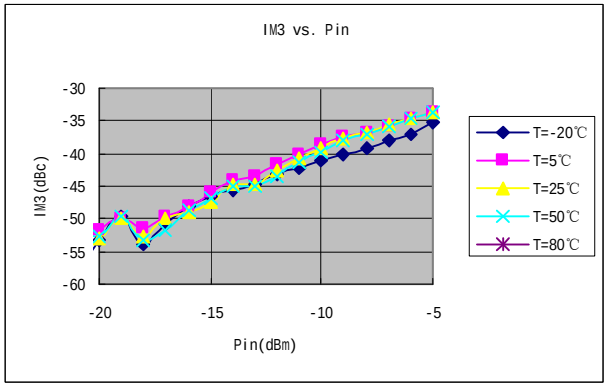
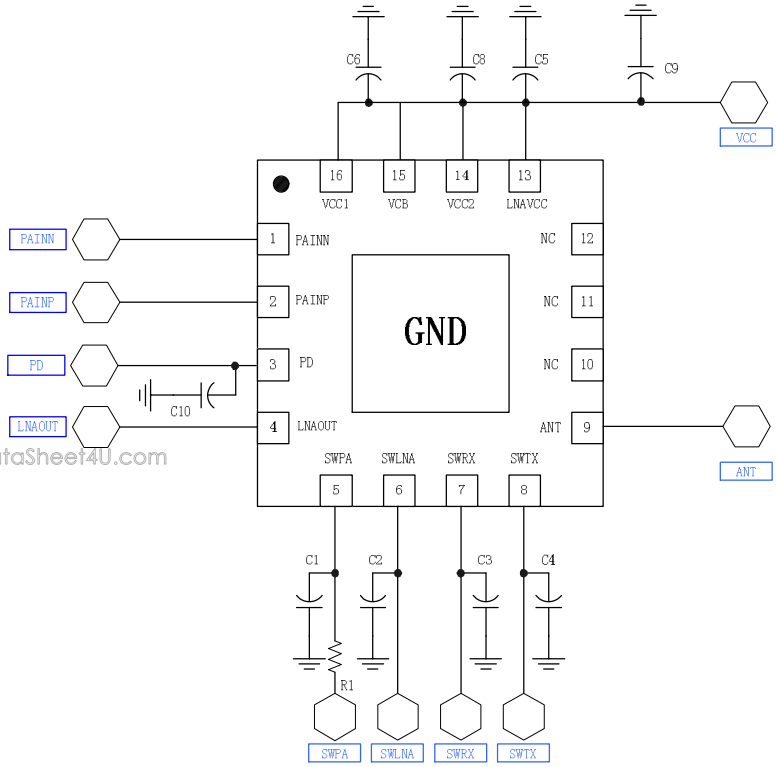


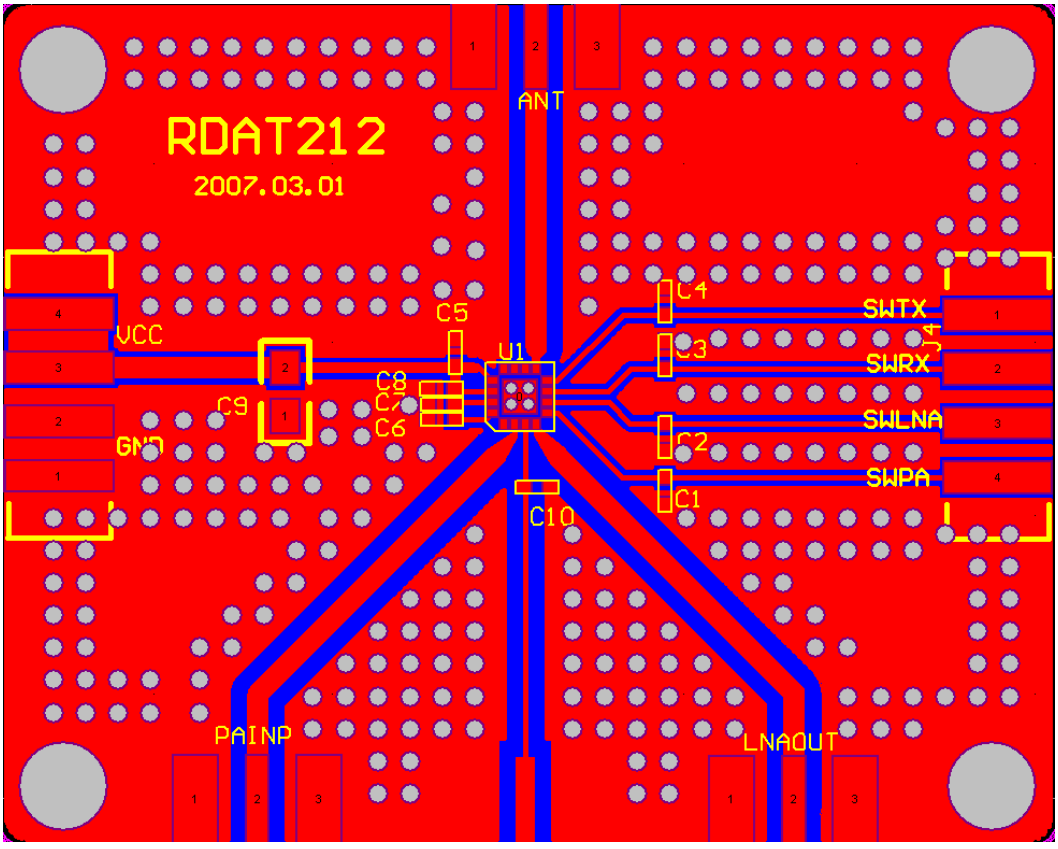
Fig13. 3rd intermodulation vs. Pin

Test Circuit for RDAT212

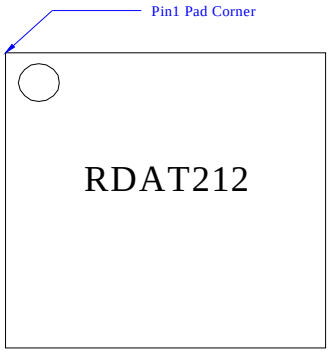


Component	Value
C1	1000 pF
C2	1000 pF
C3	1000 pF
C4	1000 pF
C5	820 pF
C6	680 pF
C8	1000 pF
C9	10 uF
C10	100 pF
R1	0 Ω (Tuning PA gain)

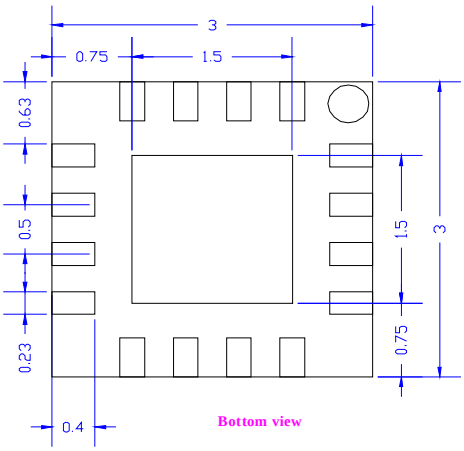
Recommended PCB Layout



Package Dimensions and Pin Descriptions

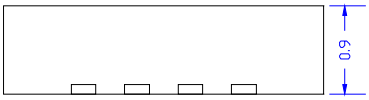


Top view



unit:mm

Bottom view



Side view

Recommended PCB Land Pattern

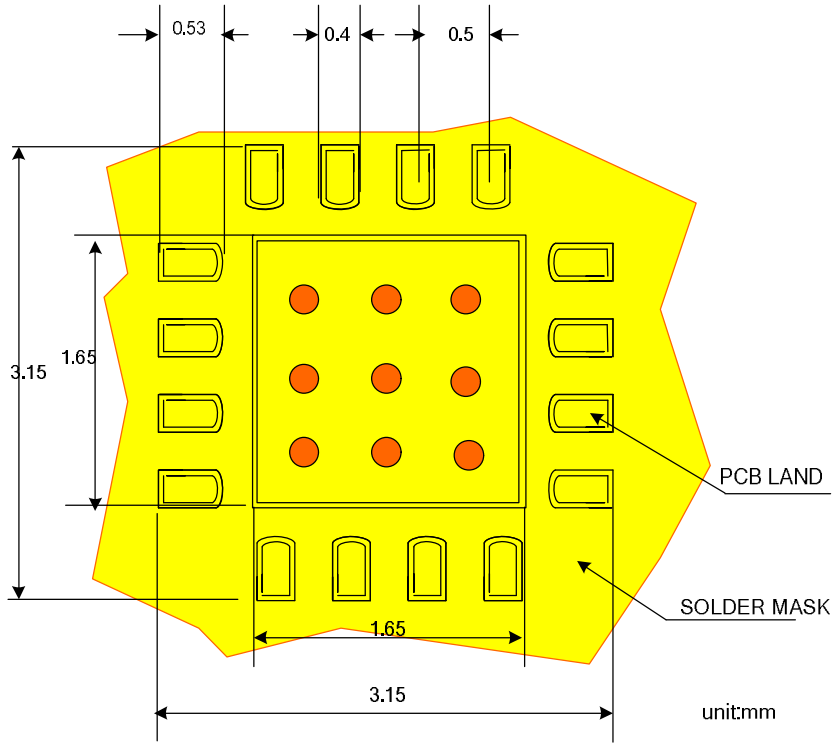


Fig. PCB Land Pattern for 16-Pin MLPQ

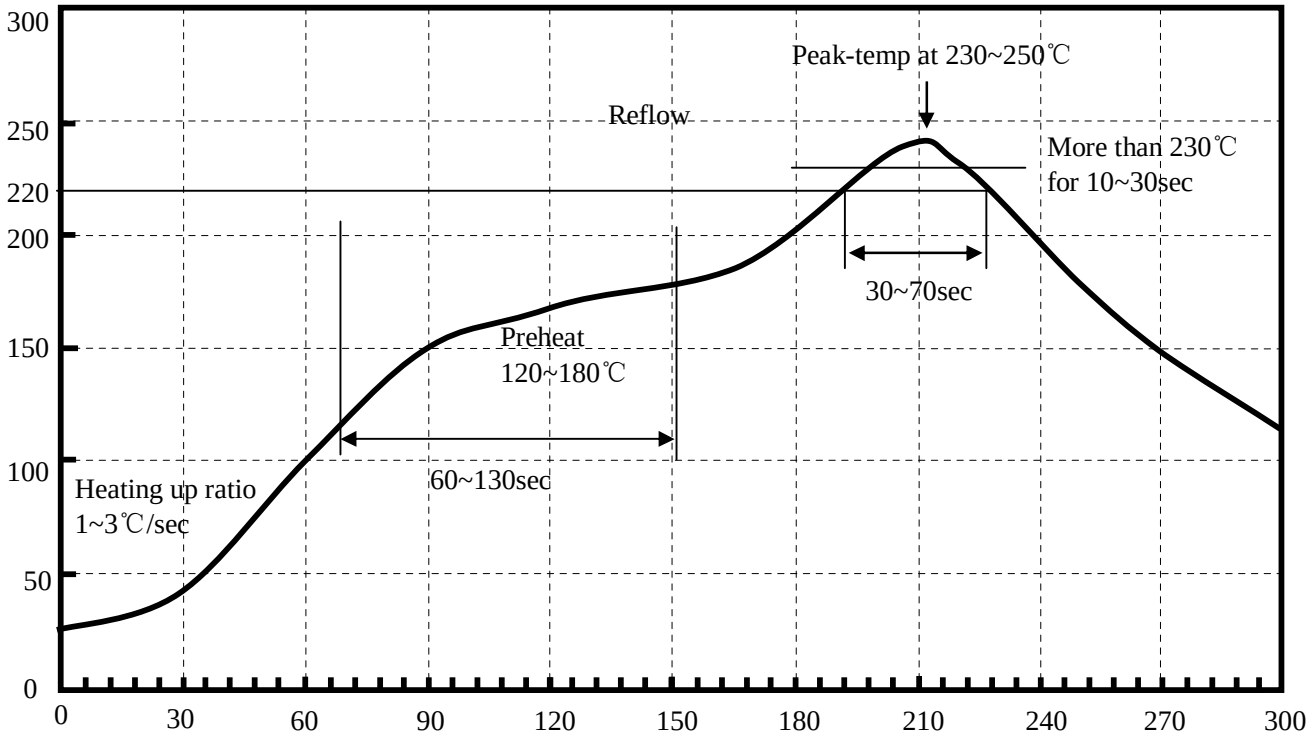


Fig. Recommended Temperature Sn95.5Ag4.0Cu0.5

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.

Disclaimer

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