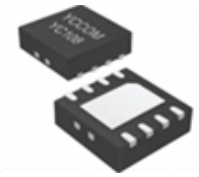
YC108B

Low Noise Amplifier

Description

The YC108B is a Wideband Flat Gain and high performance GaAs p-HEMT Low Noise Amplifier in a DFN 2X2 8L surface-mount package over a wide bandwidth from 0.6 to 4GHz from single positive supply biasing from 3.3 to 5 volts.
This LNA integrates a shutdown biasing capability to allow for operation in TDD applications.



8-Lead 2X2 mm DFN Package

Applications

- Base Station, Repeater, Automotive, IoT
- Cellular, PCS, GSM, UMTS, LTE, 5G
- Wideband Instrumentation
- Wireless Data, Satellite Terminals

Features

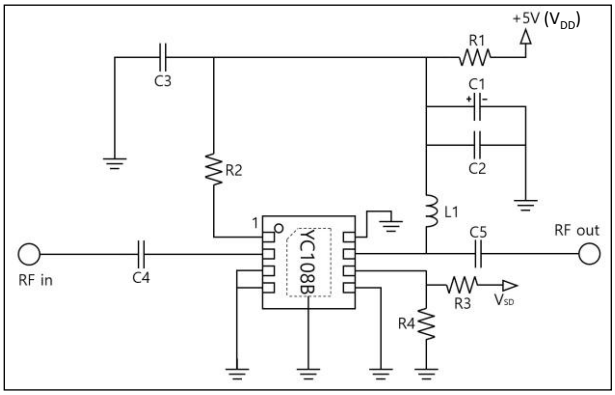
- NF = 0.60 dB @ 2.6 GHz
- Gain = 22.5 dB @ 2.6 GHz
- Gain Flatness : 2 dB (@ 1.0 ~ 3.5 GHz)
- P1dB = 20 dBm @ 2.6 GHz
- OIP3 = 36.5dBm @ 2.6 GHz and 5dBm/tone
- Integrated Shutdown Biasing Circuit
- RoHS2 Compliant/Lead-free

Electrical Specification

Parameter		Specification			Conditions	Unit
		Min.	Typ.	Max.		
Operational Frequency Range		600		4000		MHz
Test Frequency			2600			MHz
Gain		21.0	22.5		On State	dB
Isolation			-28.0		Off State	dB
Gain Flatness		1.5	2.0	2.5	1000 - 3500 MHZ	dB
Input Return Loss			-11.7			dB
Output Return Loss			-15.7			dB
Output P1dB		18.5	20.0			dBm
Output IP3		34.0	36.5		Pout = 5dBm/tone, Δf = 1MHz	dBm
Noise Figure [2]			0.60	0.90		dB
Device Voltage		3.0	5.0	5.25		V
Switching Speed	LNA On to Off		100			nS
	LNA Off to On		300			nS
Current (I_{DD})		55	65	75	On State	mA
			11		Off State	mA
Thermal Resistance			48.0		Channel to Case	℃/W

Notes:
1) Test conditions unless otherwise noted : V_{DD} = 5V, Temp. = 25℃, Z0 = 50Ω.
2) Noise figure data has input trace loss de-embedded.

Application Circuit



BOM		Tolerance
C1	10 uF	± 5%
C2	1000 pF	± 5%
C3	1000 pF	± 5%
C4	100 pF	± 5%
C5	100 pF	± 5%
L1	18 nH	± 5%
R1	0 Ω	± 5%
R2[1)]	5.6 kΩ	± 5%
R3	0 Ω	± 5%
R4	20 kΩ	± 5%

Notes:
1) R2 sets the current draw. Can be changed for the desired bias point.

Typical RF Performance (V_{DD}=5V)

Frequency	900	1800	2100	2600	3500	MHz
Gain	20.8	20.6	21.1	22.5	20.7	dB
Input Return Loss	-13.8	-16.5	-14.7	-11.7	-7.5	dB
Output Return Loss	-12.3	-15.1	-14.7	-15.7	-8.9	dB
Output P1dB	16.5	21.5	21.0	20.0	17.0	dBm
Output IP3 [1)]	29.5	36.0	37.5	36.5	35.0	dBm
Noise Figure [2)]	0.57	0.57	0.59	0.60	0.80	dB

Typical RF Performance (V_{DD} =3.3V)

Frequency	900	1800	2100	2600	3500	MHz
Gain	18.5	19.0	19.4	20.3	18.5	dB
Input Return Loss	-13.0	-12.8	-12.0	-9.5	-7.5	dB
Output Return Loss	-13.0	-15.8	-15.6	-18.2	-10	dB
Output P1dB	11.4	17.6	17.2	15.2	14.0	dBm
Output IP3 [1)]	22.3	28.5	30.1	28.9	25.8	dBm
Noise Figure [2)]	0.75	0.59	0.56	0.83	0.98	dB

Notes:
1) Pout = +5dBm/tone (2-tone, 1 MHz spacing).
2) Noise Figure data has input trace loss de-embedded.

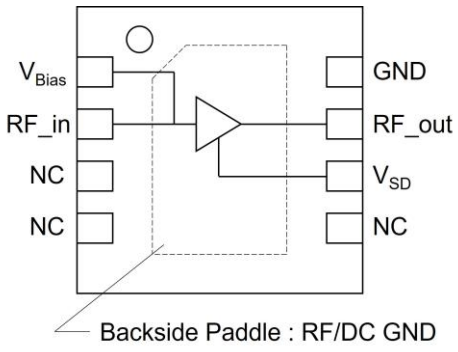
Recommended Operating Condition

Parameter	Min.	Typ.	Max.	Unit
Device Voltage	3.3	5.0	5.25	V
Operating Temperature	-40	25	105	℃
Storage Temperature	-50		150	℃

Absolute Maximum Ratings

Parameter	Min.	Unit
Device Voltage (V_{DD})	7	V
Supply Current	150	mA
Junction Temperature	180	℃
RF Input Power (CW, Ta=25℃)	29	dBm

Pin Description



Pin No.	Label	Description
1	V_{Bias}	Set for IDQ bias point.
2	RF_in	RF Input pin.
3, 4, 5	NC	Not connected internally.
6	V_{SD}	RF Output off state : >1.8V
		RF Output on state : <0.8V
7	RF_out & V_{DD}	RF output and Drain bias (V_{DD}) pin.
8	RF/DC GND	DC and RF Ground (Backside Paddle).

MSL Rating

Test	Rating	Standard
260 ℃ Convection Reflow	Level 3	JEDEC Standard IPC/JEDEC J-STD-020

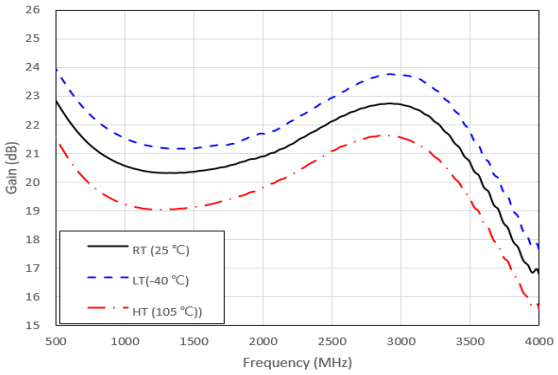
ESD Sensitivity Rating

Parameter	Rating	Standard
Charged Device Model (CDM)	Class C3	JEDEC JS-002
Human Body Model (HBM)	Class 1B	JEDEC JS-001

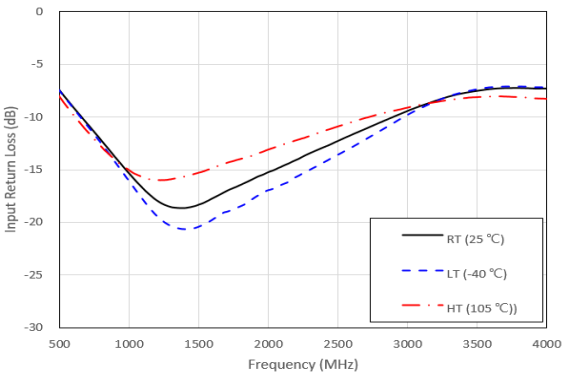
Performance Plots

V_{DD} = +5V, I_{DQ} = 65mA, Z_O = 50Ω

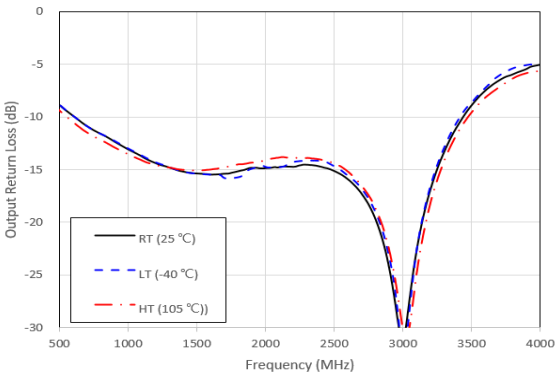
Gain



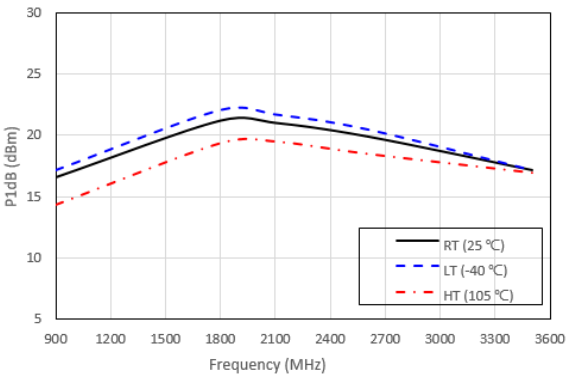
Input Return Loss (S11)



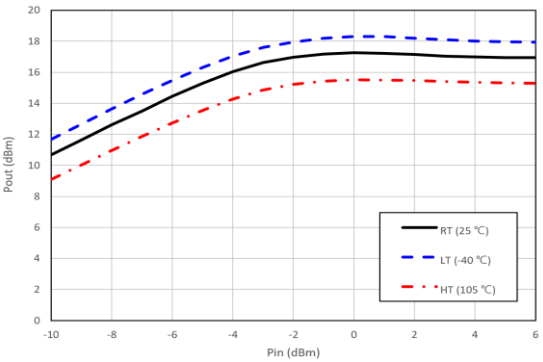
Output Return Loss (S22)



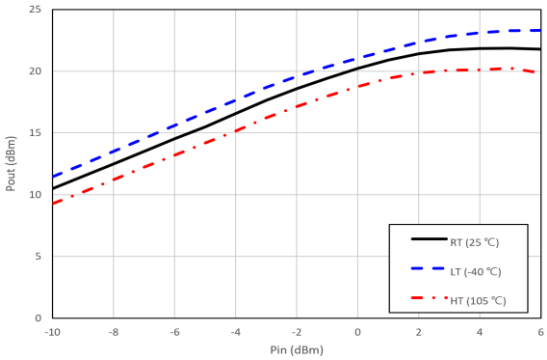
P1dB vs. Freq.



Pin vs. Pout (@900MHz)



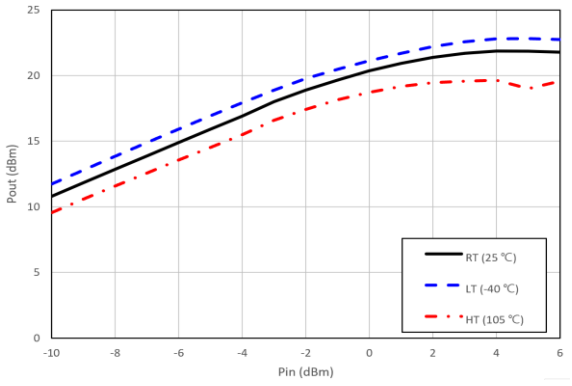
Pin vs. Pout (@1800MHz)



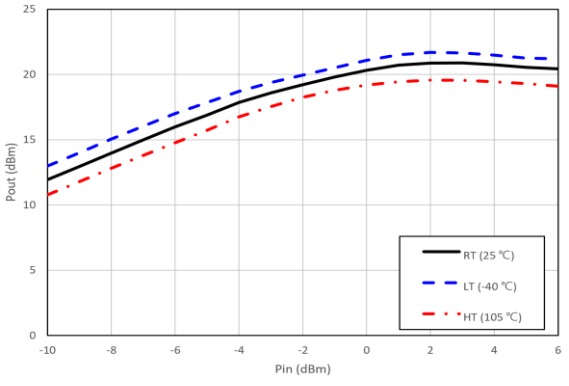
Performance Plots

V_{DD} = +5V, I_{DQ} = 65mA, Z_O = 50Ω

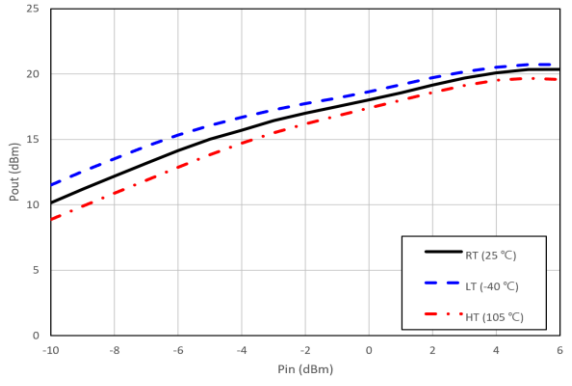
Pin vs. Pout (@2100MHz)



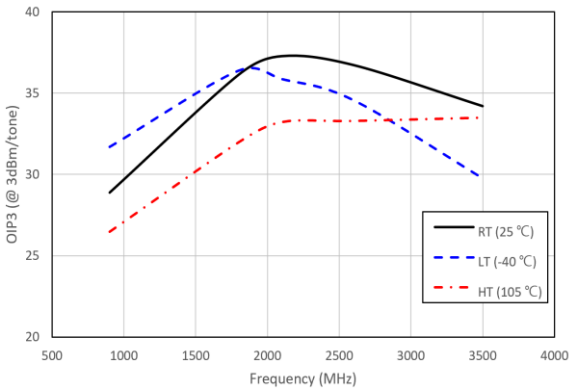
Pin vs. Pout (@2600MHz)



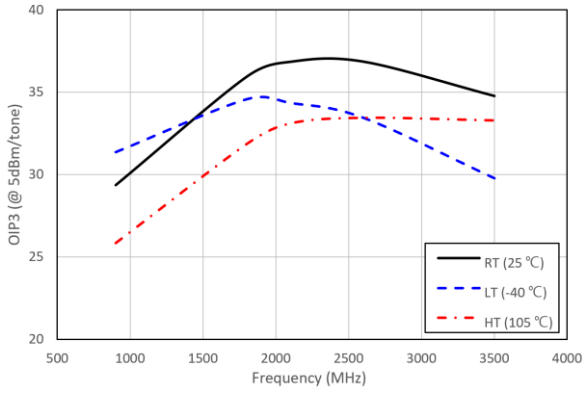
Pin vs. Pout (@3500MHz)



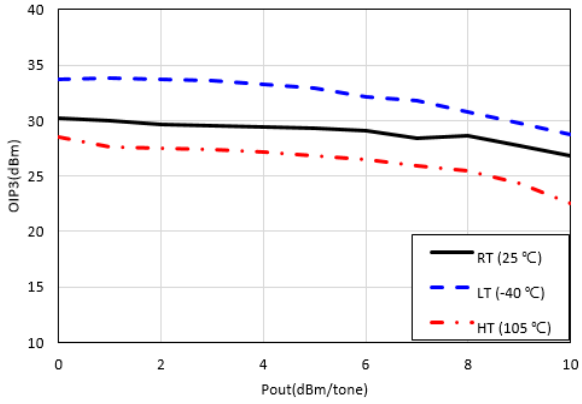
OIP3 vs. Freq. (@3dBm/tone)



OIP3 vs. Freq. (@5dBm/tone)



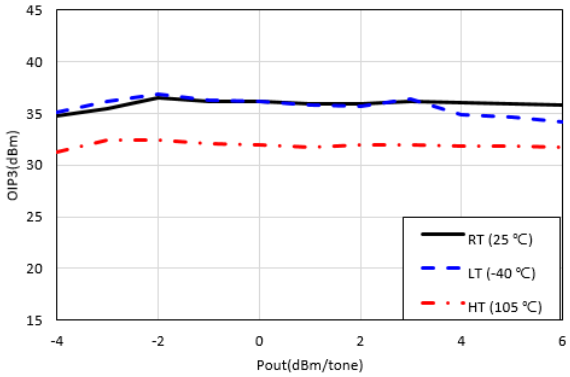
OIP3 vs. Tone power (@900MHz)



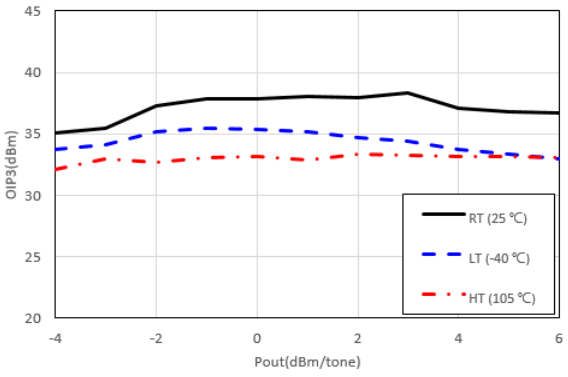
Performance Plots

V_{DD} = +5V, I_{DQ} = 65mA, Z_O = 50Ω

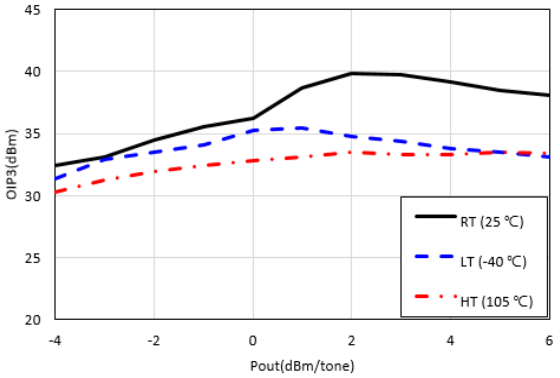
OIP3 vs. Tone power (@1800MHz)



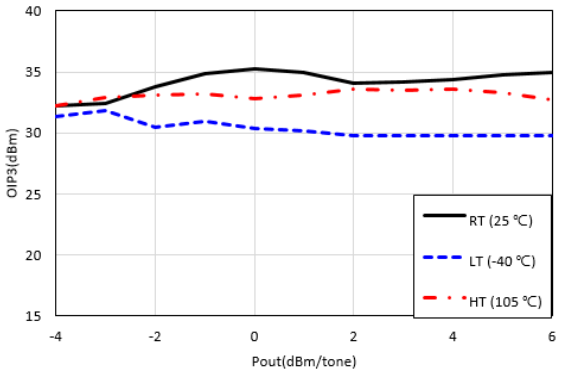
OIP3 vs. Tone power (@2100MHz)



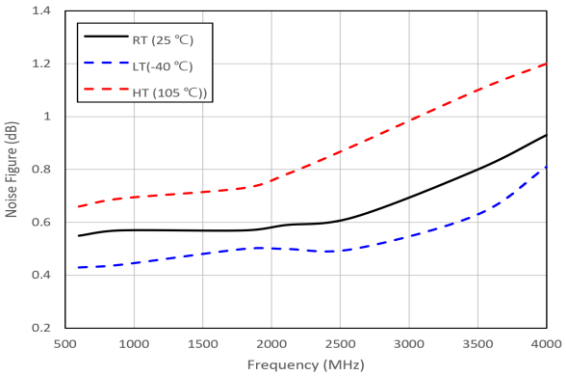
OIP3 vs. Tone power (@2600MHz)



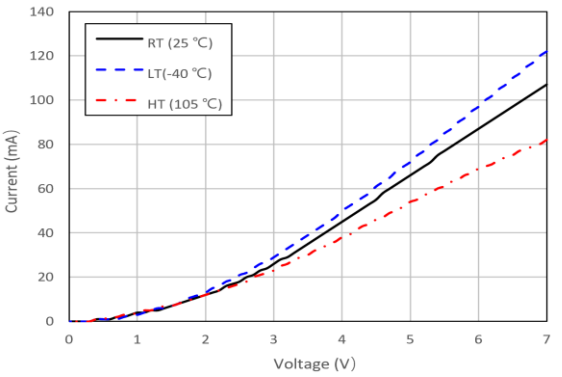
OIP3 vs. Tone power (@3500MHz)



NF vs. Frequency



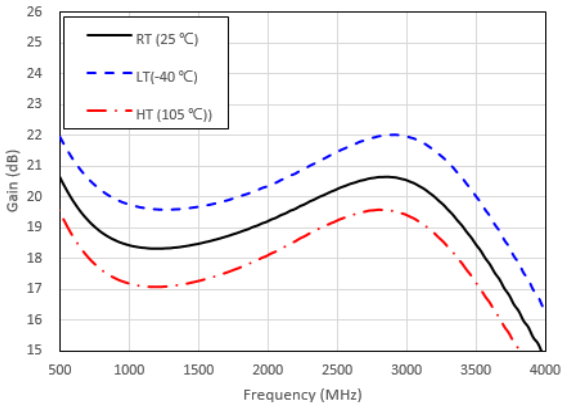
DC I-V Characteristics



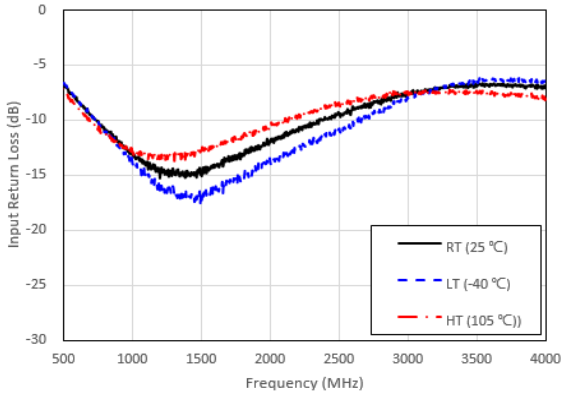
Performance Plots

V_{DD} = +3.3V, I_{DQ} = 40mA, Z_O = 50Ω

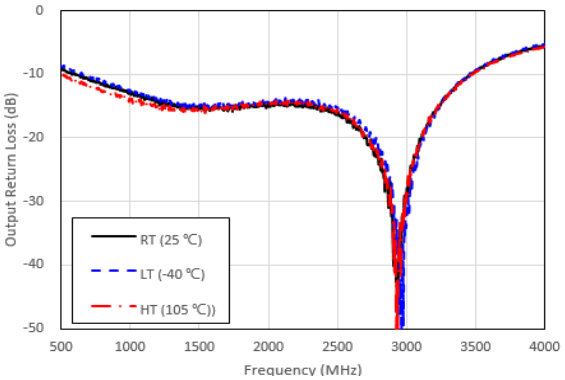
Gain



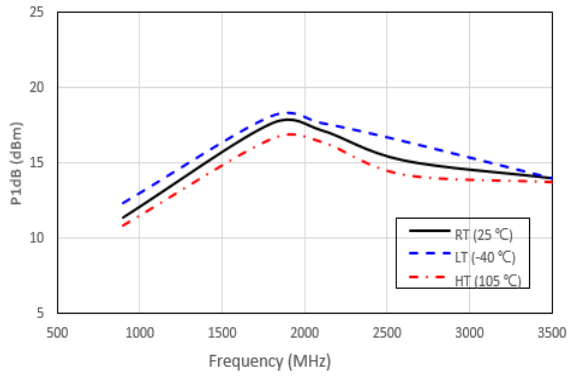
Input Return Loss (S11)



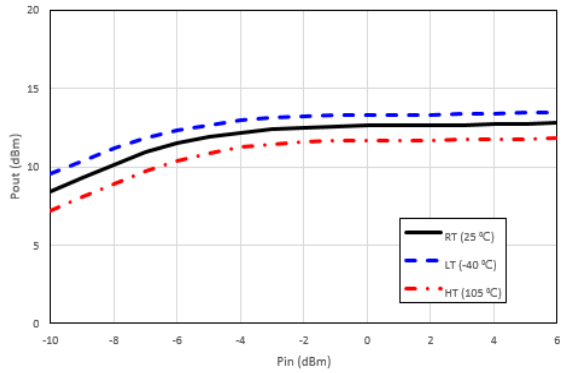
Output Return Loss (S22)



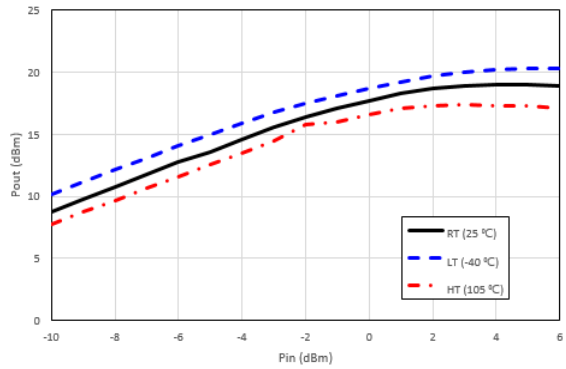
P1dB vs. Freq.



Pin vs. Pout (@900MHz)



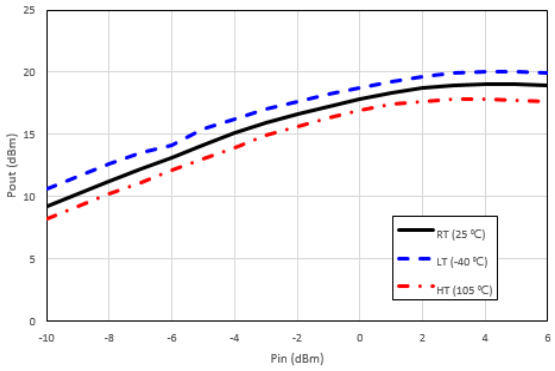
Pin vs. Pout (@1800MHz)



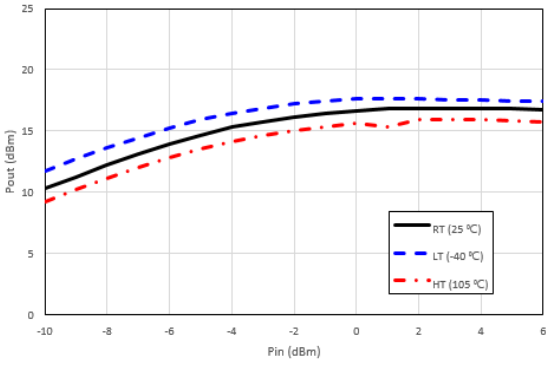
Performance Plots

V_{DD} = +3.3V, I_{DQ} = 40mA, Z_O = 50Ω

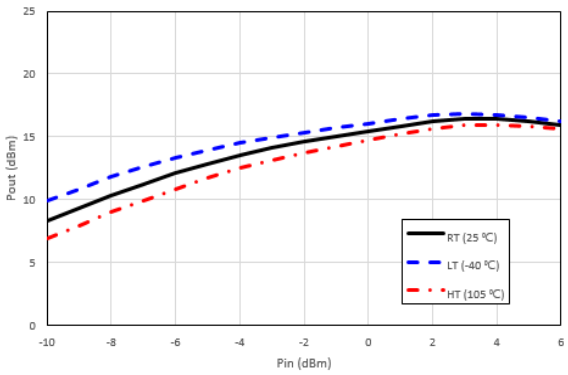
Pin vs. Pout (@2100MHz)



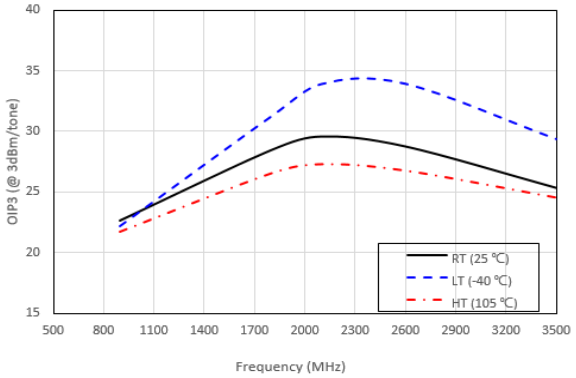
Pin vs. Pout (@2600MHz)



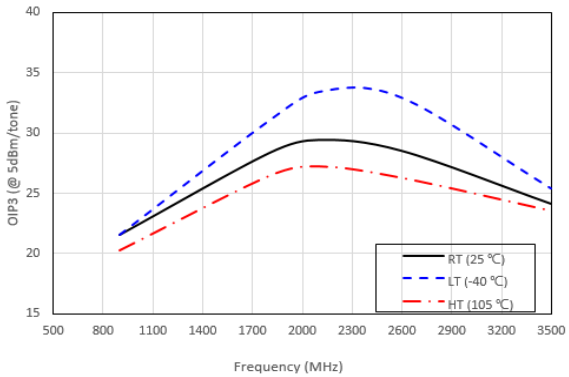
Pin vs. Pout (@3500MHz)



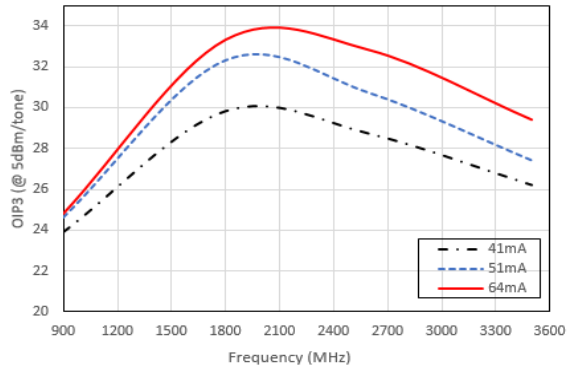
OIP3 vs. Freq. (@3dBm/tone)



OIP3 vs. Freq. (@5dBm/tone)



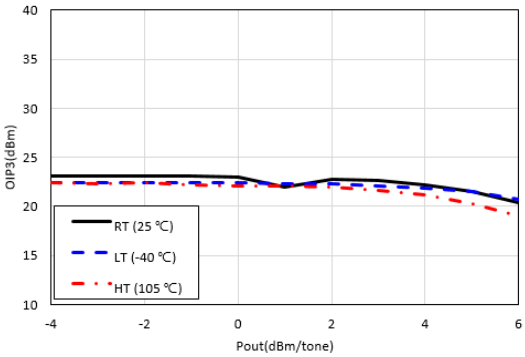
OIP3 vs. Frequency (@Ta=25℃)



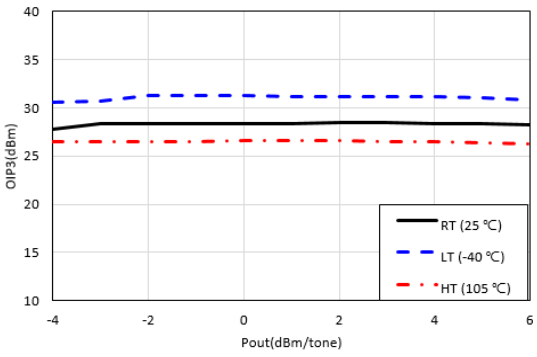
Performance Plots

V_{DD} = +3.3V, I_{DQ} = 40mA, Z_O = 50Ω

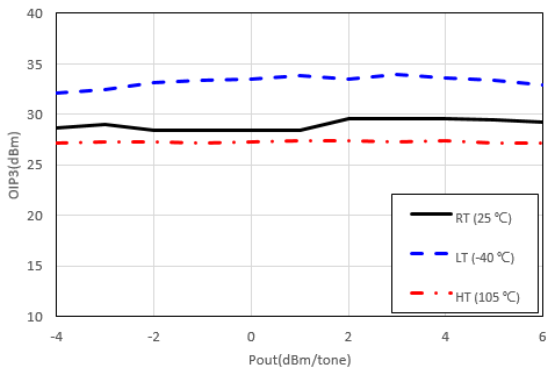
OIP3 vs. Tone power (@900MHz)



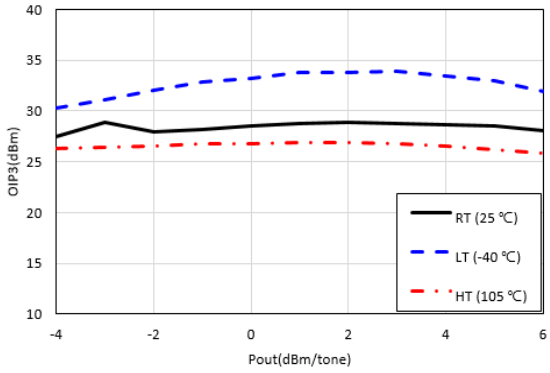
OIP3 vs. Tone power (@1800MHz)



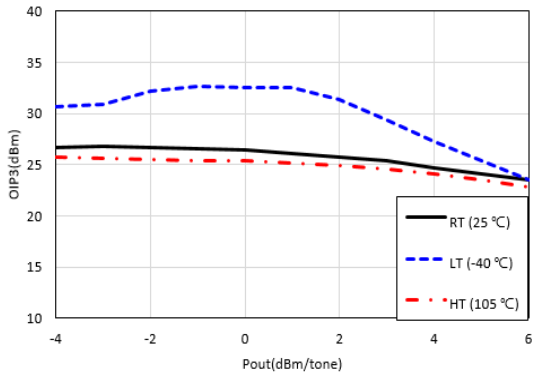
OIP3 vs. Tone power (@2100MHz)



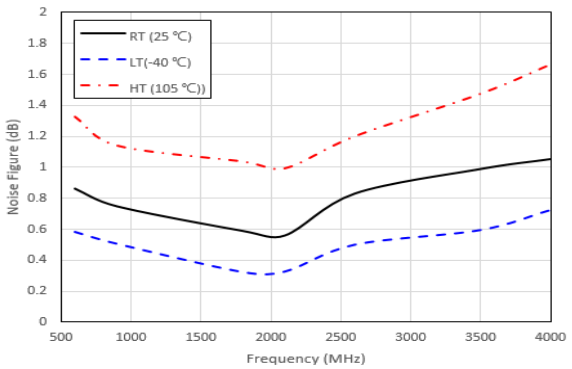
OIP3 vs. Tone power (@2600MHz)



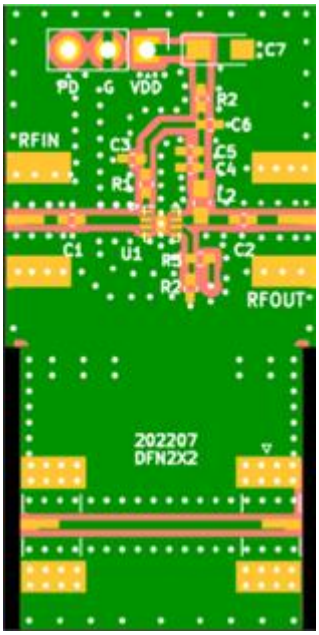
OIP3 vs. Tone power (@3500MHz)



NF vs. Freq.



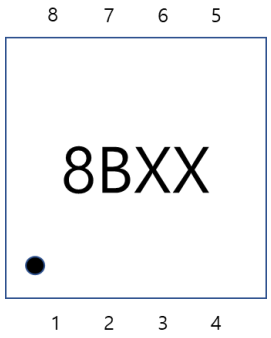
Evaluation Board PCB Information



Layer		Material	Layer Thickness (mm)	Note
Top	Copper	RO4350B	0.018	½ oz
Core	Core		0.254	10 mil
Inner 1	Copper		0.018	½ oz
Prepreg	Prepreg	FR4	0.600	
Inner 2	Copper	FR4	0.018	½ oz
Core	Core		0.600	
Bottom	Copper		0.018	½ oz

Note:
1) Transmission Line Width : 0.56 mm.
2) Spacing between T.L and GND : 0.49 mm.

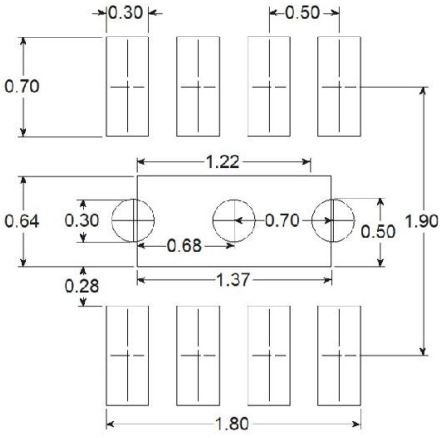
Package Marking



8B : Part Number (YC108B)

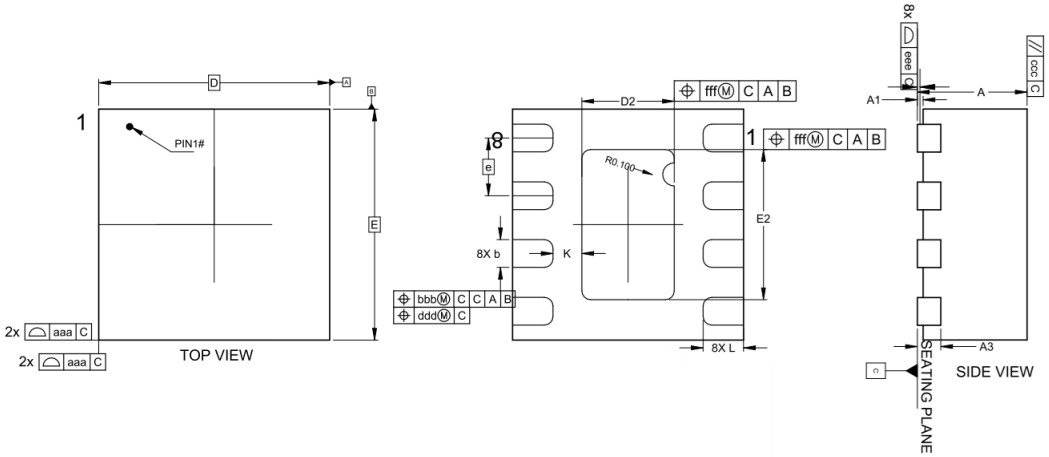
XX : Wafer No.

PCB Land Pattern



Unit : mm

Package Outline Drawing



Symbol	Min.	Typ.	Max.
A	0.85	0.90	0.95
A1	0	0.02	0.05
A3	-	0.20 REF	-
b	0.19	0.24	0.29
D		2.00BSC	
E		2.00BSC	
E2	1.25	1.3	1.35
D2	0.75	0.80	0.85
e		0.50BSC	
L	0.30	0.35	0.40
K	0.2		
aaa		0.15	
bbb		0.10	
ccc		0.10	
ddd		0.05	
eee		0.08	
fff		0.10	

Unit : mm