



# EMM5075VU

## Ku-Band Power Amplifier MMIC

### FEATURES

- High Output Power: Pout=33.0dBm (typ.)
- High Linear Gain: GL=26.0dB (typ.)
- Broad Band: 12.7~15.4GHz
- Impedance Matched Zin/Zout=50Ω
- Small Hermetic Metal-Ceramic SMT Package(VU)

### DESCRIPTION

The EMM5075VU is a MMIC amplifier that contains a three-stages amplifier, internally matched, for standard communications band in the 12.7 to 15.4GHz frequency range. SEDI's stringent Quality Assurance Program assures the highest reliability and consistent performance.



### ABSOLUTE MAXIMUM RATING

Item	Symbol	Rating	Unit
Drain-Source Voltage	V <sub>DD</sub>	10	V
Gate-Source Voltage	V <sub>GS</sub>	-3	V
Input Power	P <sub>in</sub>	26	dBm
Storage Temperature	T <sub>stg</sub>	-55 to +125	°C

### RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Unit
Drain-Source Voltage	V <sub>DD</sub>	≤ 7	V
Input Power	P <sub>in</sub>	≤ 16	dBm
Operating Case Temperature	T <sub>C</sub>	-40 to +85	°C

### ELECTRICAL CHARACTERISTICS (Case Temperature Ta=25°C)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
RF Frequency Range	f	V <sub>DD</sub> =+6V	12.7	-	15.4	GHz
Output Power at 1dB G.C.P.	P <sub>1dB</sub>	I <sub>DD(DC)</sub> =1200mA typ.	32	33	-	dBm
Power Gain at 1dB G.C.P.	G <sub>1dB</sub>	Z <sub>S</sub> =Z <sub>L</sub> =50ohm	20	25	-	dB
Power-added Efficiency at 1dB G.C.P.	η <sub>add</sub>		-	25	-	%
Drain Current at 1dB G.C.P.	I <sub>DDRF</sub>		-	1500	1800	mA
3rd. Order Intermodulation Distortion *	IM <sub>3</sub>	* df=+10MHz	-38	-44	-	dBc
Input Return Loss (at Pin=-20dBm)	RL <sub>IN</sub>	P <sub>o</sub> =20dBm S.C.L	-	-8	-	dB
Output Return Loss (at Pin=-20dBm)	RL <sub>OUT</sub>		-	-8	-	dB

G.C.P. : Gain Compression Point, SCL : Single Carrier Level

<b>ESD</b>	<b>Class 0</b>	<b>~ 250V</b>
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Note : Based on JEDEC JESD22-A114C

<b>CASE STYLE</b>	<b>VU</b>
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<b>RoHs Compliance</b>	<b>Yes</b>
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### ORDERING INFORMATION

Part Number	Order Unit	Packing
EMM5075VU	No Limitation	48 pcs./Tray × 4 Tray = 192 pcs./Packing
EMM5075VUT	500pcs.	500 pcs./Reel × 1 Reel = 500 pcs./Packing

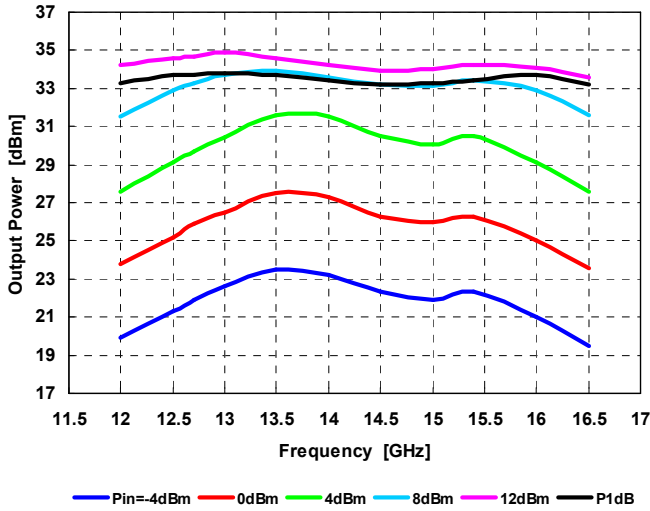


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## Ku-Band Power Amplifier MMIC

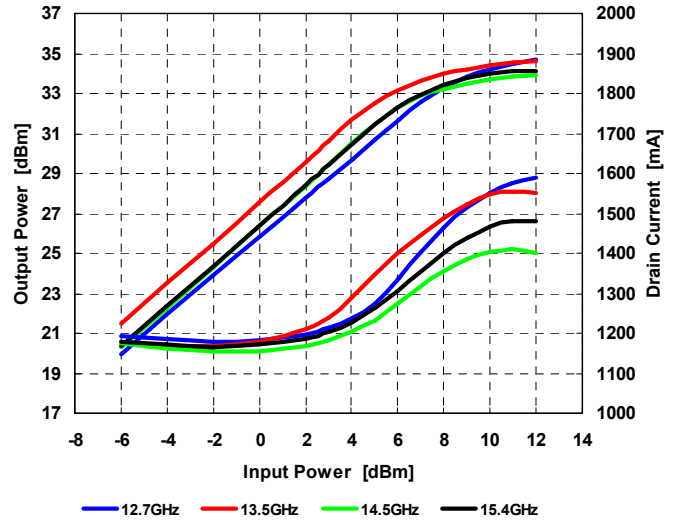
### OUTPUT POWER vs. FREQUENCY

@VDD=6V, IDD(DC)=1200mA



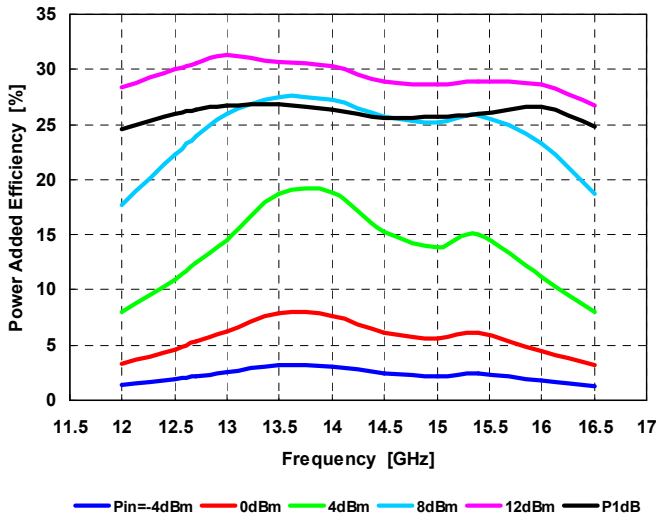
### OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER

@VDD=6V, IDD(DC)=1200mA



### POWER-ADDED EFFICIENCY vs FREQUENCY

@VDD=6V, IDD(DC)=1200mA



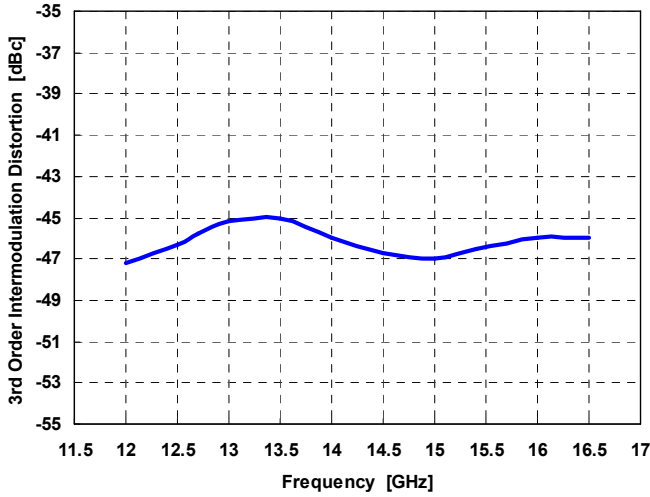


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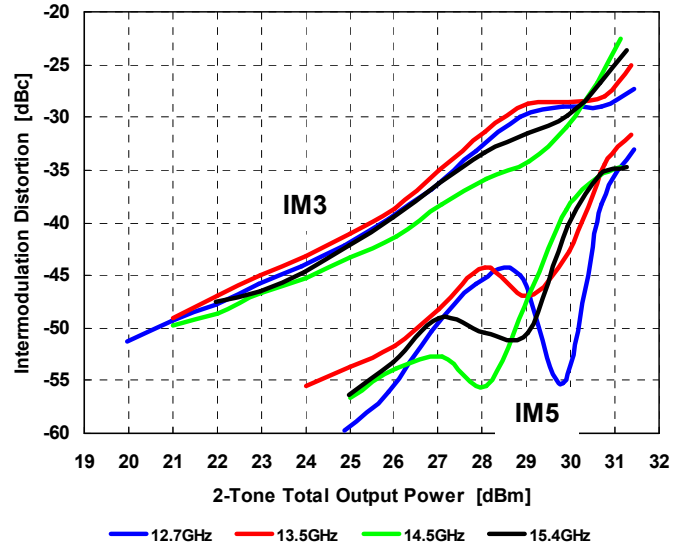
### IMD vs. FREQUENCY

@VDD=6V, IDD(DC)=1200mA, Pout=20dBm S.C.L.



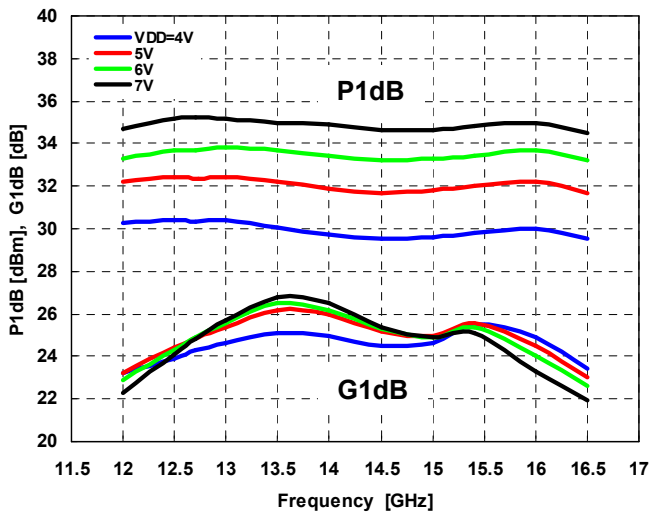
### IMD vs OUTPUT POWER

@VDD=6V, IDD(DC)=1200mA



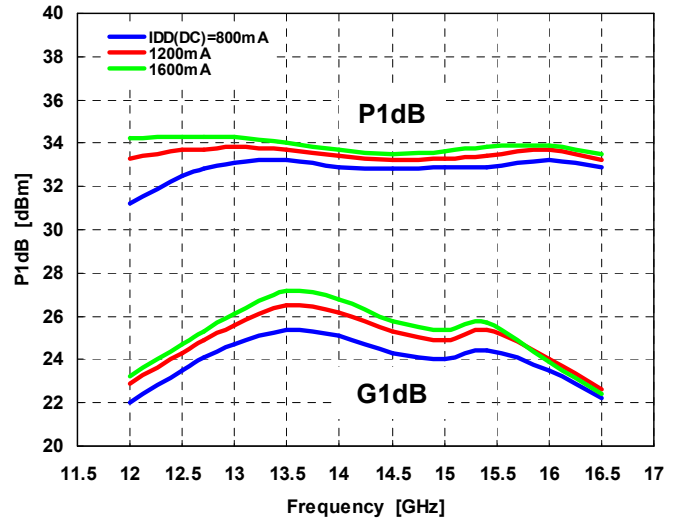
### P1dB, G1dB vs. Frequency by Drain Voltage

IDD(DC)=1200mA



### P1dB, G1dB vs. Frequency by Drain Current

@VDD=6V



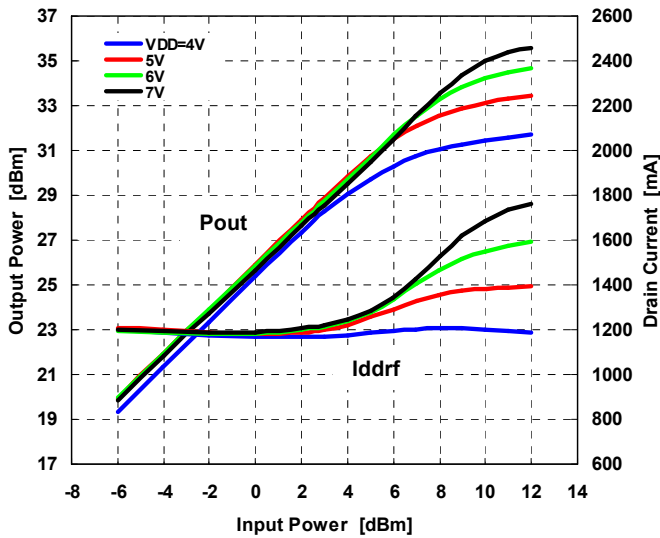


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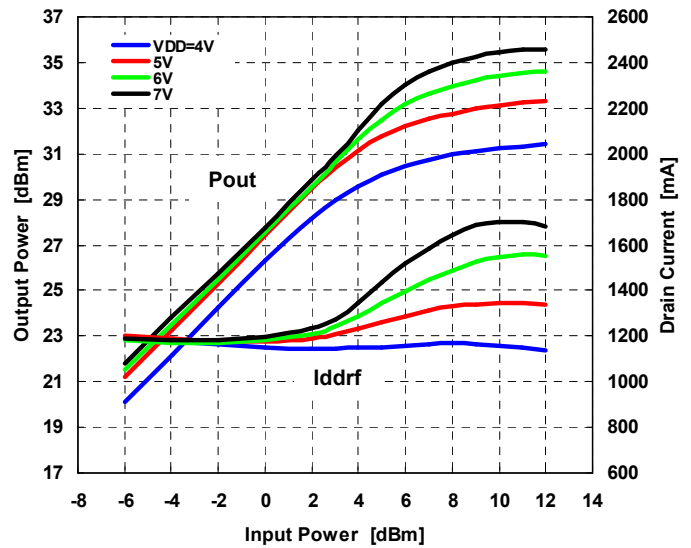
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@IDD(DC)=1200mA, f=12.7GHz



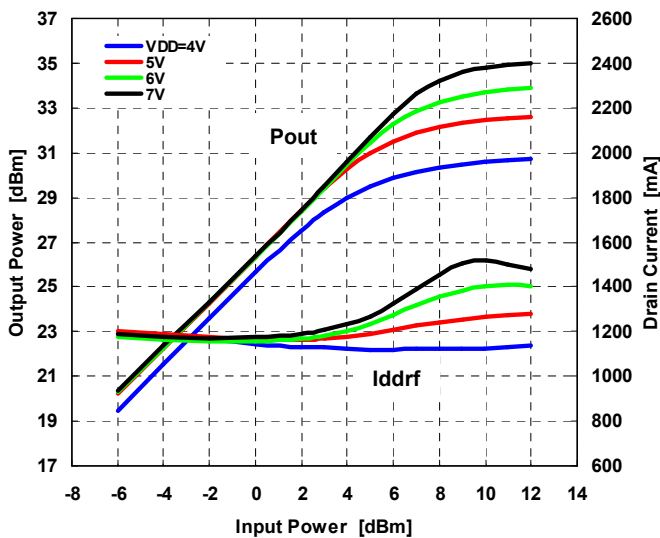
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@IDD(DC)=1200mA, f=13.5GHz



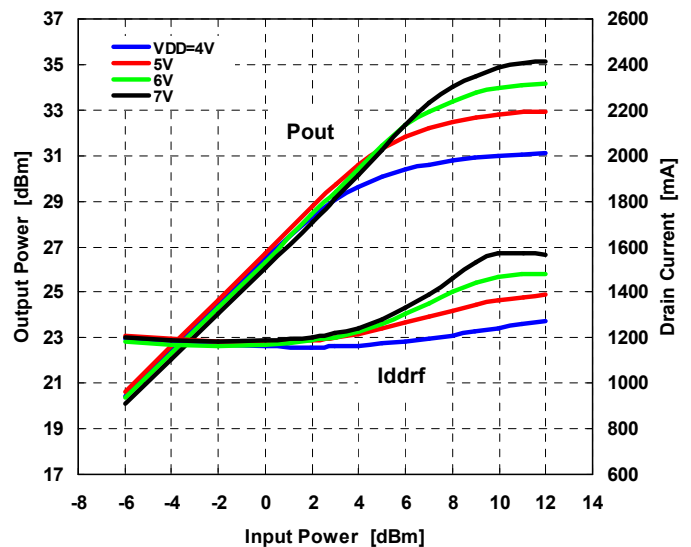
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@IDD(DC)=1200mA, f=14.5GHz



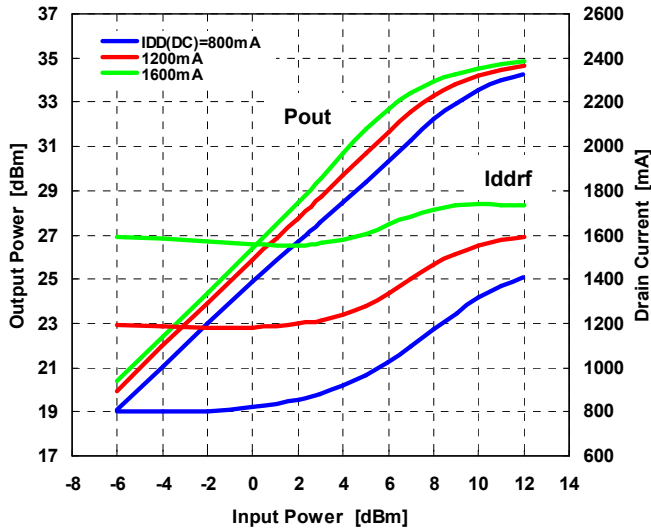
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@IDD(DC)=1200mA, f=15.4GHz



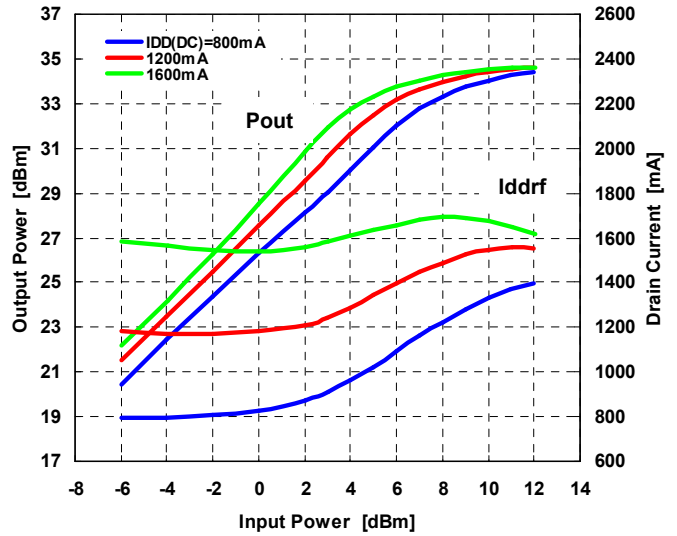
**OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current**

@VDD=6V, f=12.7GHz



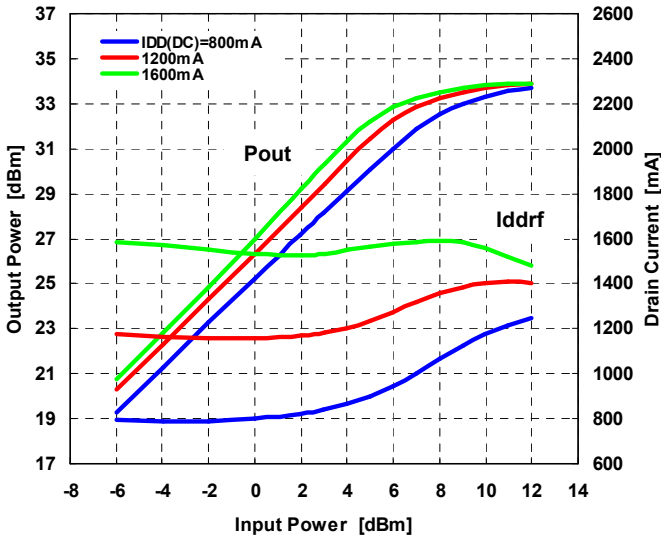
**OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current**

@VDD=6V, f=13.5GHz



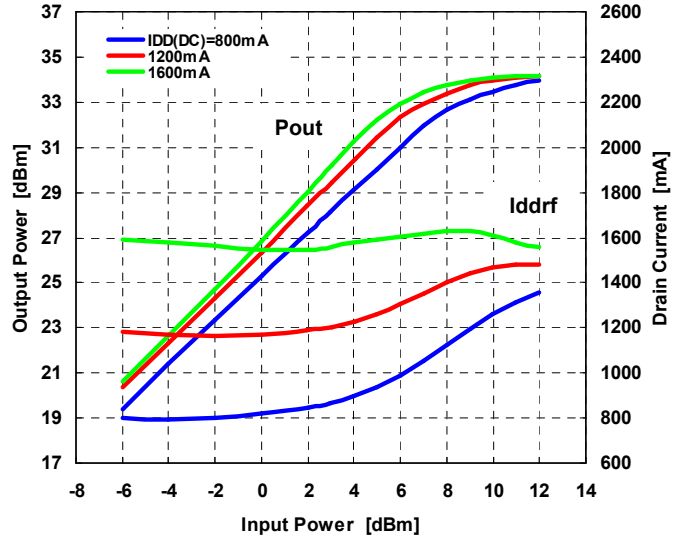
**OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current**

@VDD=6V, f=14.5GHz



**OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current**

@VDD=6V, f=15.4GHz



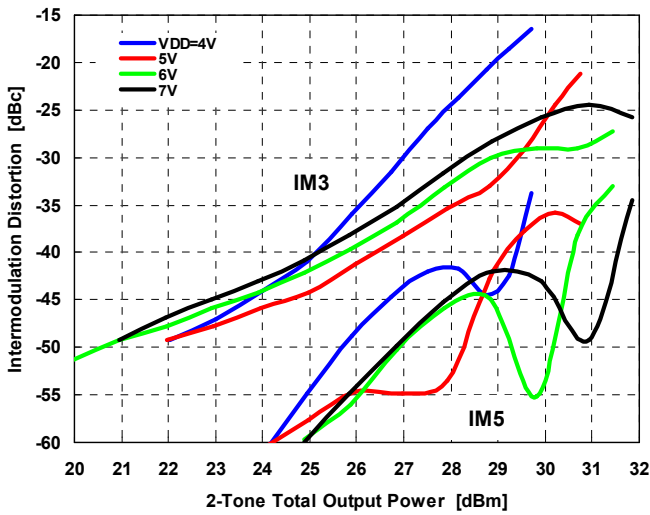


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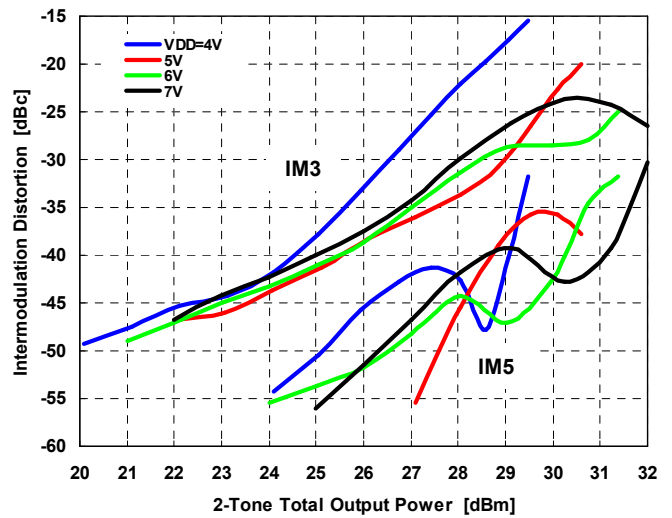
### IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

@IDD(DC)=1200mA, f=12.7GHz



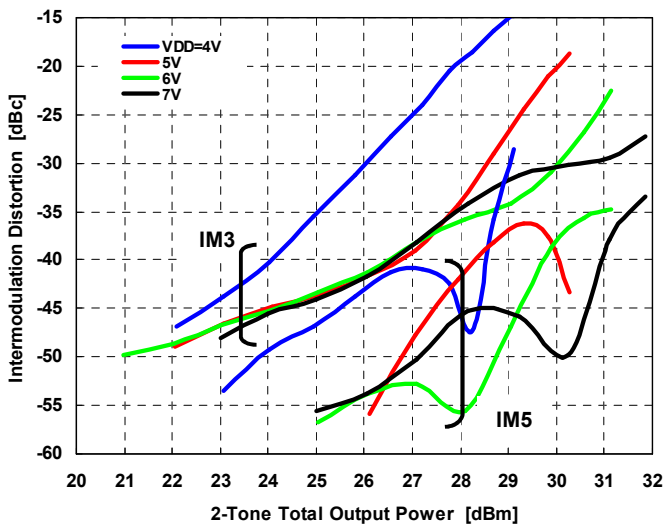
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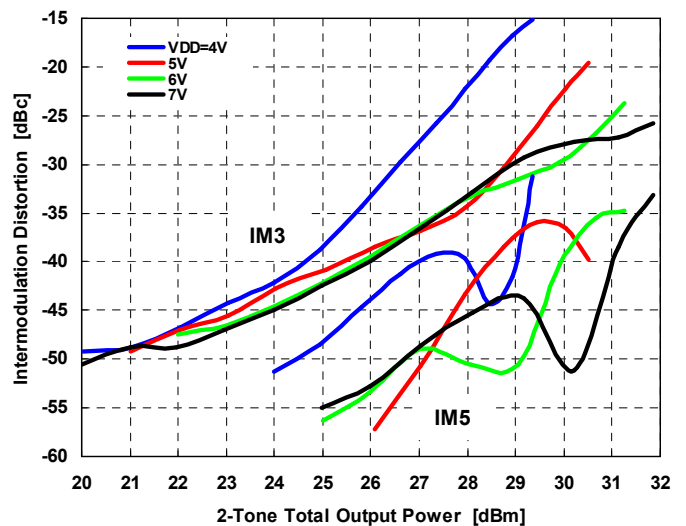
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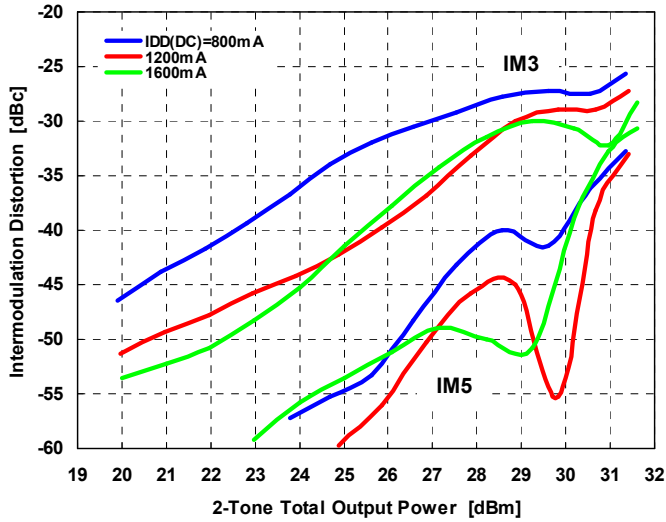


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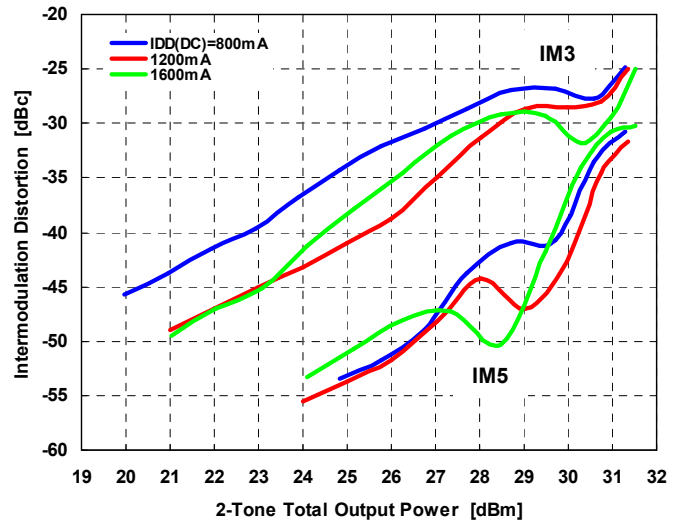
### IMD PERFORMANCE vs. OUTPUT POWER by Drain Current

@VDD=6V, f=12.7GHz



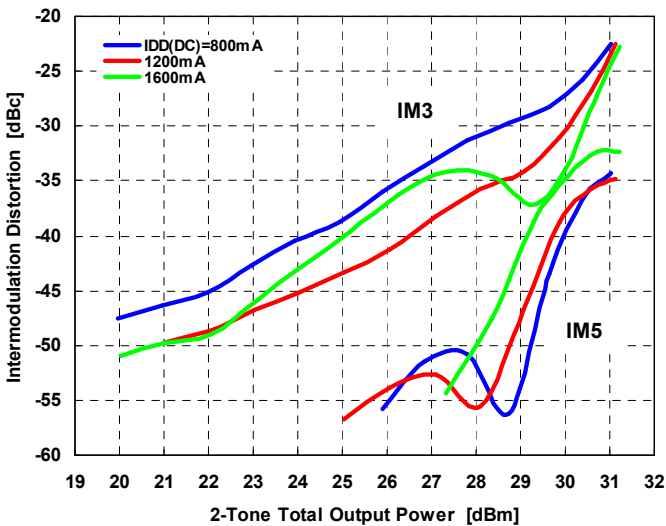
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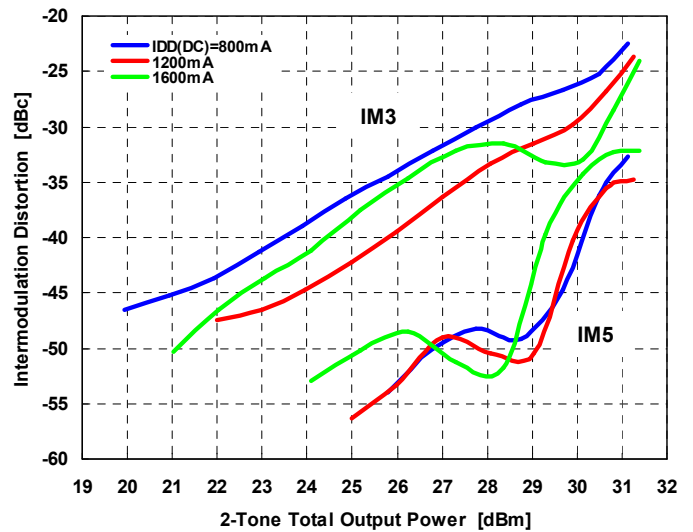
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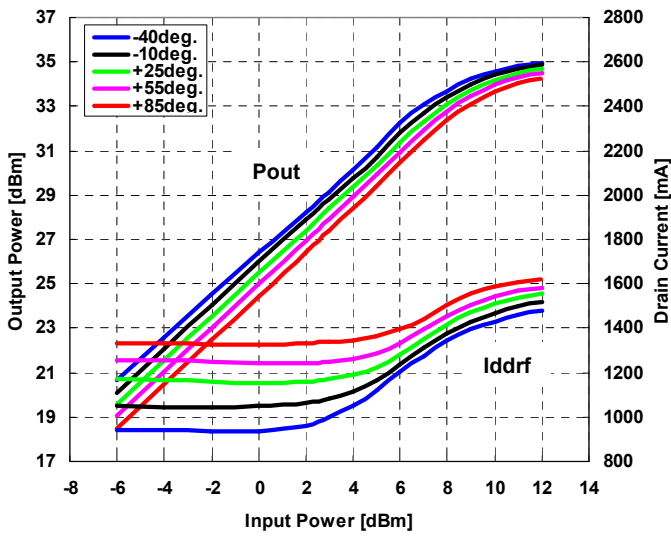


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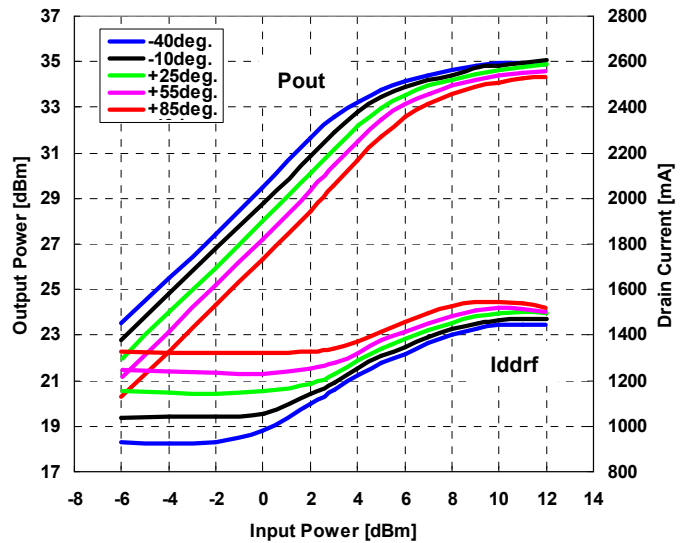
**OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Temperature**

@VDD=6V, IDD(DC)=1200mA(Ta=+25deg.), Freq.=12.7GHz



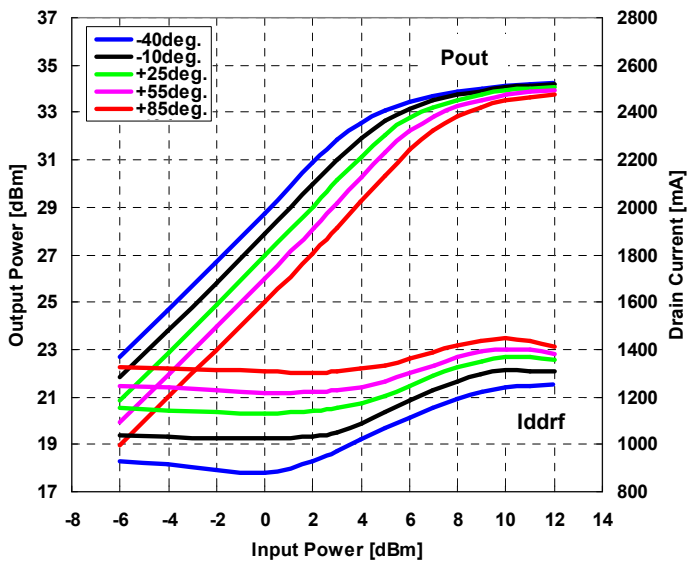
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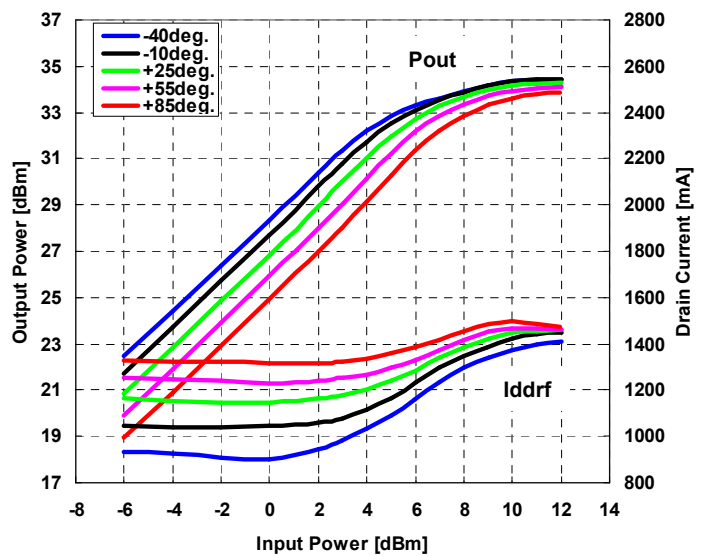
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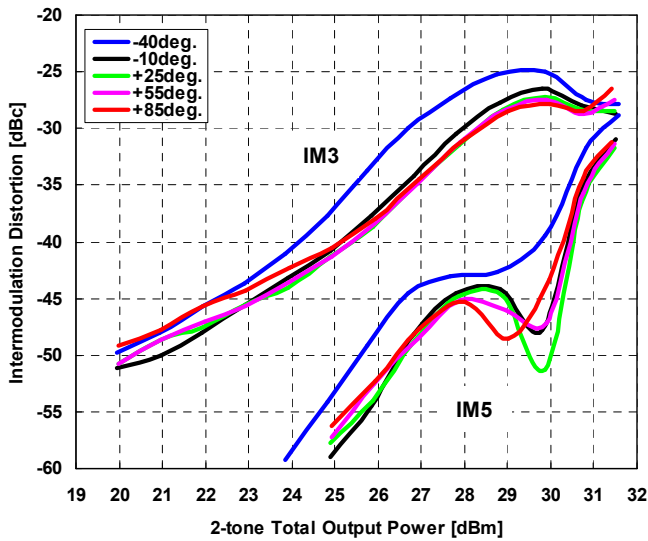
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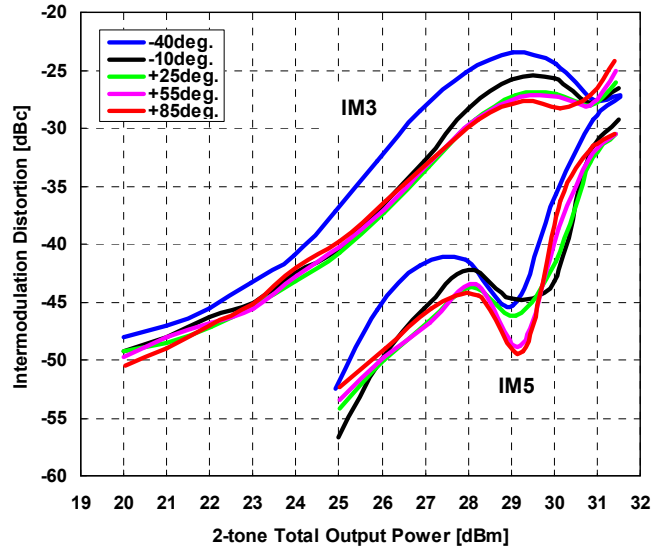
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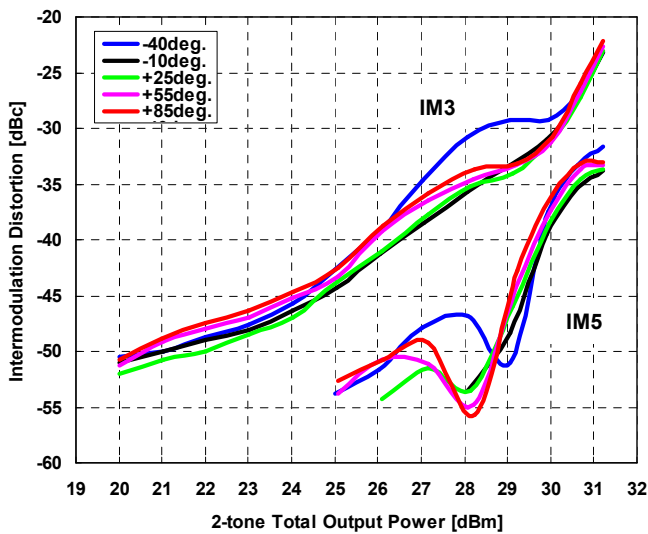
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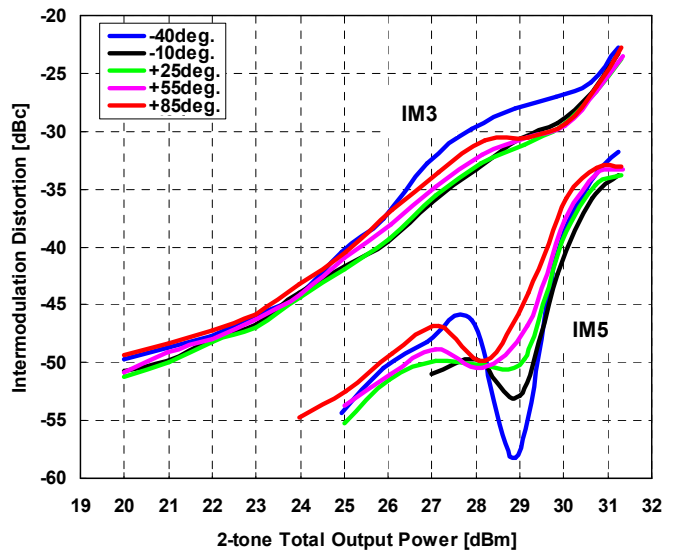
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### IMD PERFORMANCE vs. OUTPUT POWER by Temperature

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## Ku-Band Power Amplifier MMIC

### ■ S-PARAMETER

VDD=6V, IDD(DC)=1200mA

Frequency [GHz]	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.0	0.98	-31.4	0.07	10.1	0.00	148.6	0.97	-43.8
2.0	0.94	-63.4	0.23	-151.6	0.00	-147.9	0.91	-85.9
3.0	0.92	-91.4	0.34	92.9	0.00	-162.8	0.91	-123.0
4.0	0.94	-115.1	0.24	-1.9	0.00	160.8	0.93	-157.1
5.0	0.92	-138.3	0.12	-55.7	0.00	114.8	0.89	163.4
6.0	0.89	-165.3	0.07	-61.7	0.00	65.9	0.82	111.5
7.0	0.86	159.5	0.15	37.2	0.00	6.2	0.82	60.6
8.0	0.80	125.0	5.49	-72.1	0.00	-84.6	0.78	14.7
9.0	0.79	92.0	7.76	122.2	0.00	-127.2	0.61	-46.8
10.0	0.77	53.2	9.14	19.2	0.00	-138.8	0.50	-115.3
11.0	0.76	7.8	11.88	-78.8	0.00	-162.2	0.25	-155.6
12.0	0.79	-28.4	15.33	-179.5	0.00	-116.3	0.15	-47.7
12.2	0.79	-34.5	16.08	160.0	0.00	-105.6	0.20	-47.1
12.4	0.77	-39.5	16.90	139.3	0.00	-97.6	0.23	-48.4
12.6	0.76	-44.0	17.77	118.3	0.00	-103.2	0.26	-49.7
12.8	0.74	-48.3	18.64	97.1	0.00	-105.2	0.27	-50.1
13.0	0.73	-51.9	19.81	75.9	0.00	-114.8	0.28	-49.7
13.2	0.73	-56.9	21.23	53.4	0.00	-127.9	0.29	-50.9
13.4	0.74	-64.6	22.75	28.4	0.00	-146.6	0.31	-57.3
13.6	0.64	-77.2	22.65	1.0	0.00	170.4	0.26	-72.2
13.8	0.55	-78.3	22.27	-21.7	0.00	-170.9	0.21	-66.7
14.0	0.50	-85.0	22.05	-46.9	0.00	-156.1	0.18	-72.5
14.2	0.42	-91.1	21.10	-70.5	0.00	-163.2	0.13	-80.5
14.4	0.35	-95.3	20.19	-93.0	0.00	-161.3	0.08	-88.4
14.6	0.29	-98.2	19.50	-114.5	0.00	-162.0	0.03	-102.1
14.8	0.24	-103.5	19.06	-136.2	0.00	-158.6	0.03	104.6
15.0	0.18	-104.1	19.00	-157.4	0.00	-159.6	0.08	81.7
15.2	0.15	-99.8	19.42	-180.0	0.00	-157.1	0.12	67.1
15.4	0.14	-97.7	19.92	154.7	0.00	-156.7	0.16	51.7
15.6	0.15	-101.4	20.04	127.5	0.00	-159.4	0.16	31.3
15.8	0.16	-116.3	18.96	98.8	0.00	-168.2	0.13	5.9
16.0	0.16	-139.8	16.92	71.9	0.00	-176.1	0.08	-24.6
16.2	0.15	-170.2	15.17	48.4	0.00	179.7	0.02	-70.7
16.4	0.15	154.4	14.31	26.0	0.01	171.8	0.02	163.1
16.6	0.15	111.0	14.09	1.2	0.01	168.7	0.02	122.4
16.8	0.20	68.9	13.80	-27.7	0.01	160.2	0.01	-40.0
17.0	0.27	33.1	12.88	-59.9	0.01	151.0	0.07	-85.9
18.0	0.57	-56.0	3.97	157.9	0.00	131.8	0.30	-161.4
19.0	0.67	-87.2	1.05	54.6	0.01	92.1	0.19	132.6
20.0	0.63	-108.3	0.30	-35.1	0.00	43.6	0.37	2.2
21.0	0.44	-150.9	0.09	-121.3	0.00	172.3	0.61	-32.0
22.0	0.38	119.9	0.02	145.1	0.01	47.1	0.66	-55.1
23.0	0.42	50.3	0.01	-13.0	0.01	-41.5	0.63	-104.1
24.0	0.44	-36.6	0.01	-119.4	0.01	-122.6	0.71	-159.7
25.0	0.60	-100.2	0.01	148.1	0.01	149.3	0.76	177.9
26.0	0.69	-125.3	0.01	3.2	0.01	-0.1	0.75	169.1
27.0	0.69	-150.0	0.00	14.8	0.00	-100.2	0.71	157.3
28.0	0.65	173.7	0.01	-19.9	0.01	-19.4	0.70	138.5
29.0	0.64	127.2	0.01	-131.8	0.01	-136.7	0.55	109.1
30.0	0.63	72.0	0.01	176.4	0.00	-175.6	0.42	98.2
31.0	0.57	19.4	0.01	119.7	0.01	123.3	0.51	85.5
32.0	0.52	-45.9	0.00	2.3	0.00	5.9	0.68	67.2
33.0	0.53	-114.4	0.00	-119.1	0.00	-111.2	0.73	44.4
34.0	0.60	-146.9	0.01	161.4	0.01	166.6	0.60	8.2
35.0	0.64	-167.2	0.01	58.5	0.02	60.4	0.59	-50.3
36.0	0.61	158.7	0.02	-8.5	0.02	-9.4	0.64	-82.6
37.0	0.66	111.5	0.02	-87.3	0.02	-87.7	0.56	-101.4
38.0	0.73	70.6	0.00	85.6	0.01	130.1	0.30	166.7
39.0	0.70	48.1	0.02	-75.8	0.02	-74.8	0.40	70.6
40.0	0.63	28.1	0.02	175.2	0.02	174.3	0.42	42.8



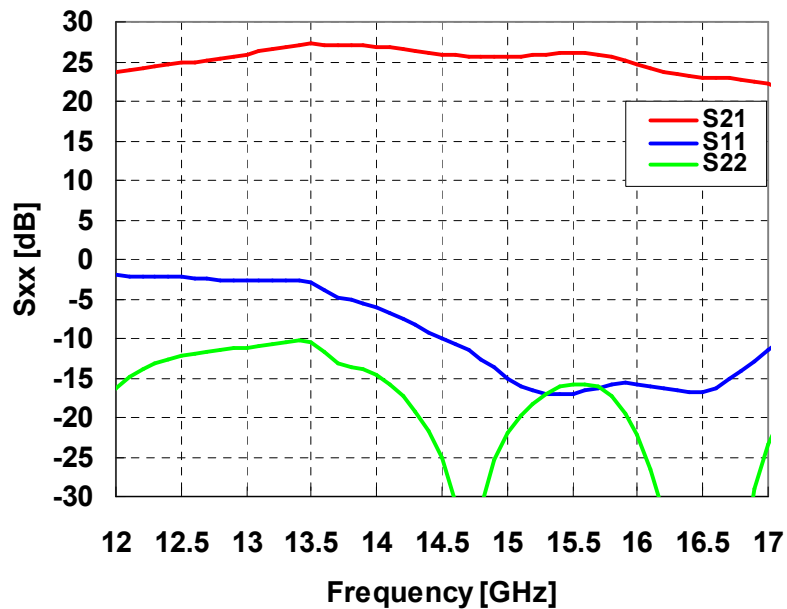
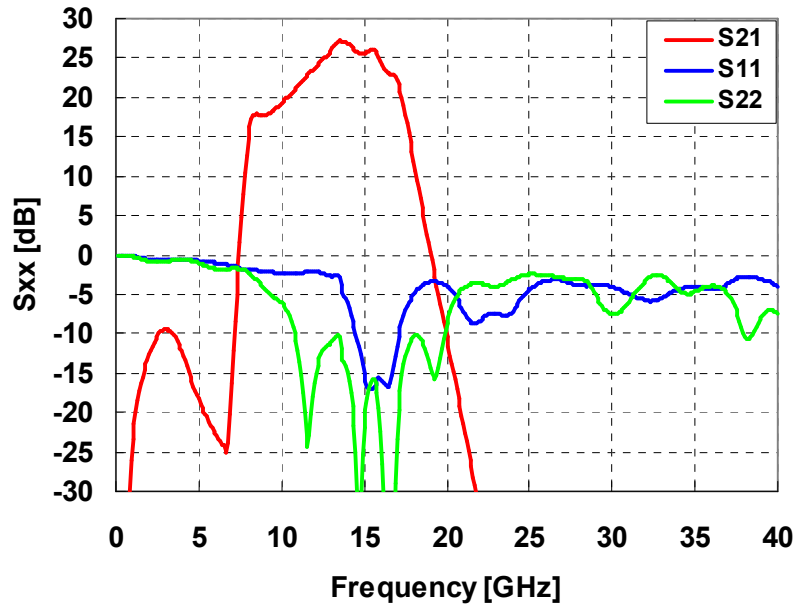


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Ku-Band Power Amplifier MMIC

## S-PARAMETER

VDD=6V, IDD(DC)=1200mA

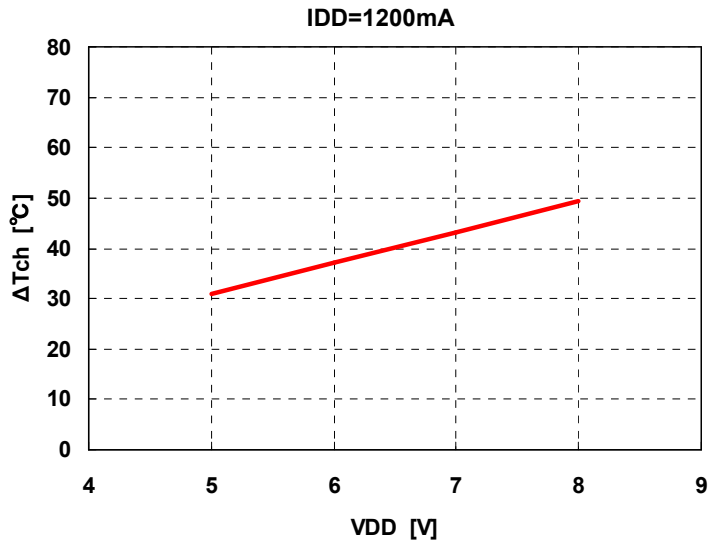




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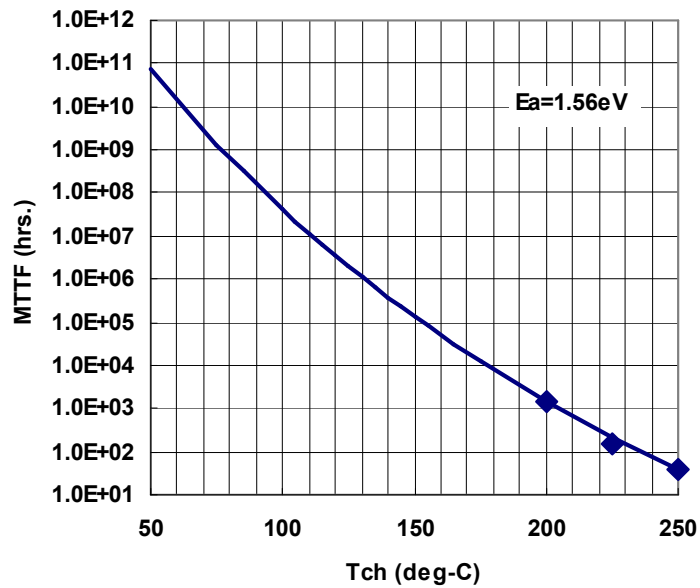
Ku-Band Power Amplifier MMIC

$\Delta T_{ch}$  vs. Drain Voltage  
(Reference)

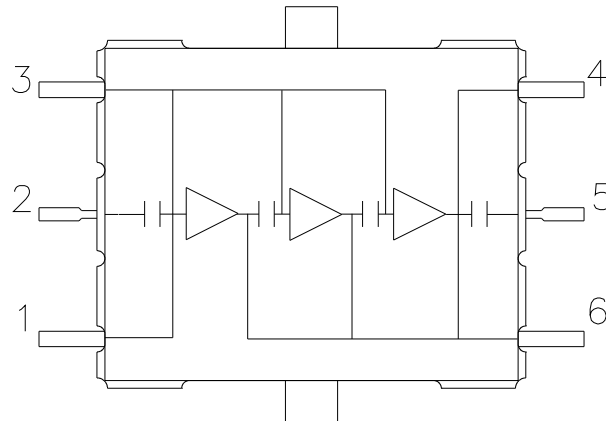


Note:  $\Delta T_{ch}$  : Temperature Rise from Backside of the Package to Channel.

MTTF vs. T<sub>ch</sub>



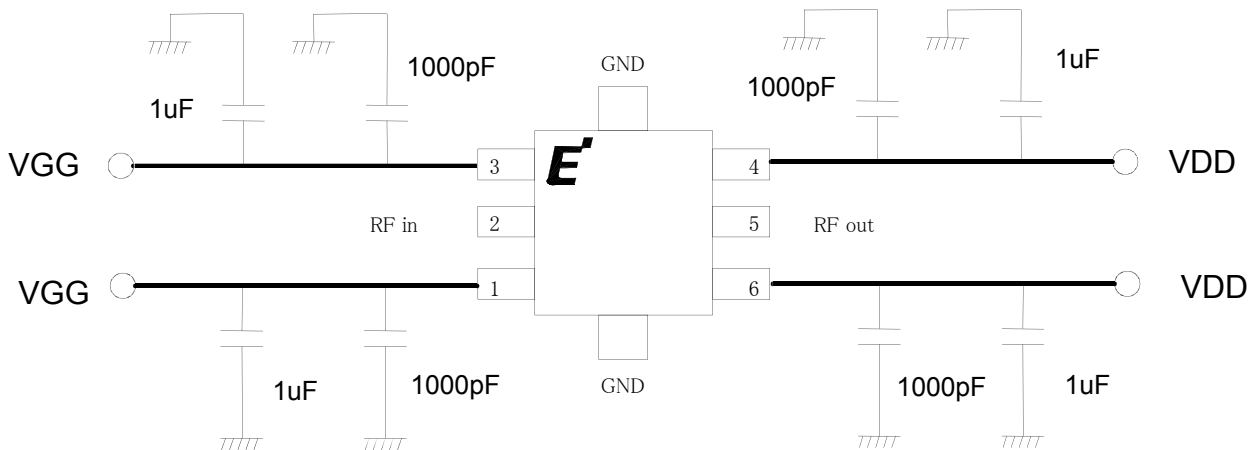
■ Block diagram



PIN ASSIGNMENT

- 1 : VGG
- 2 : RF in
- 3 : VGG
- 4 : VDD
- 5 : RF out
- 6 : VDD

■ Recommended Bias Circuit



Note 1: The capacitors are recommended on the bias supply line, close to the package, in order to prevent video oscillations which could damage the module.

Note 2: Two pins named VGG are internally connected.

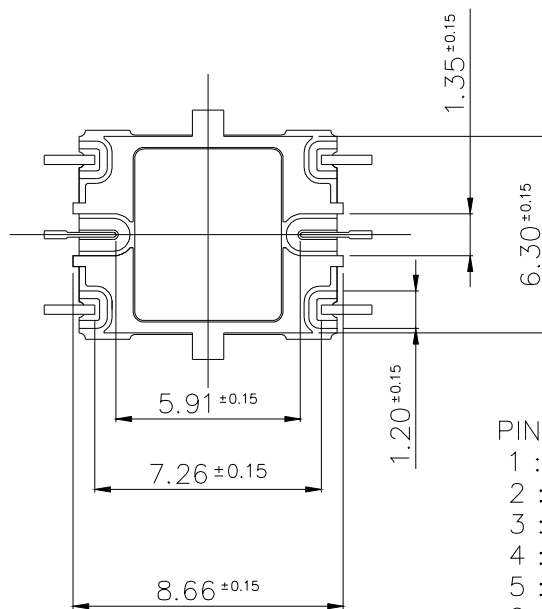
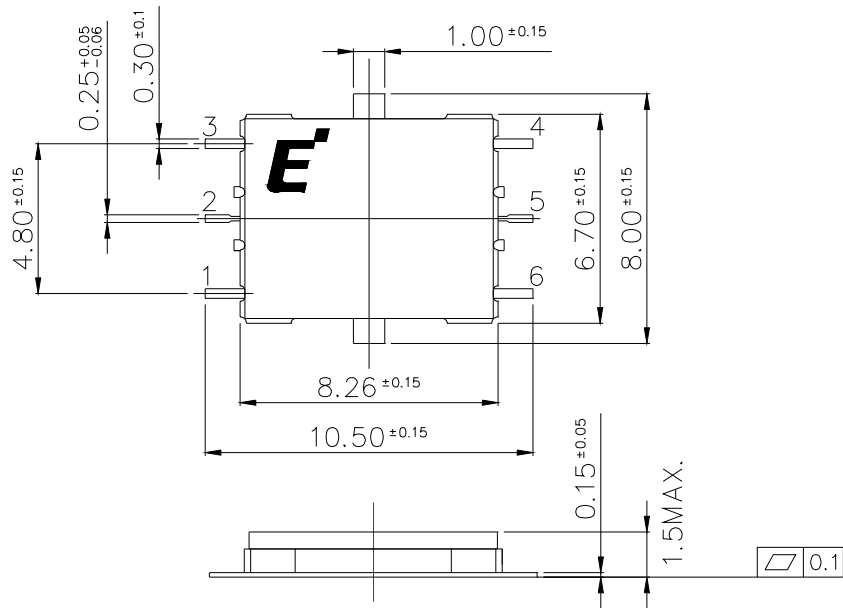
Note 3: Two pins named VDD are internally connected.



# EMM5075VU

Ku-Band Power Amplifier MMIC

■ Package Outline

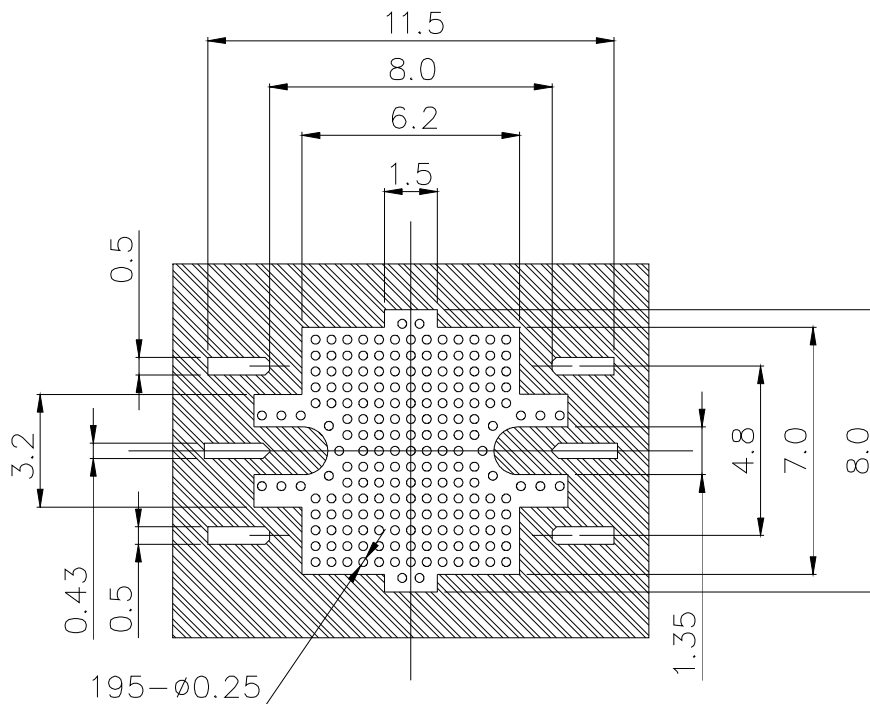


PIN Assignments

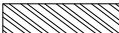
- 1 : VGG
- 2 : RF in
- 3 : VGG
- 4 : VDD
- 5 : RF out
- 6 : VDD

Flange : GND  
Unit : mm

■ PCB Pads and Solder-resist Pattern



Notes :

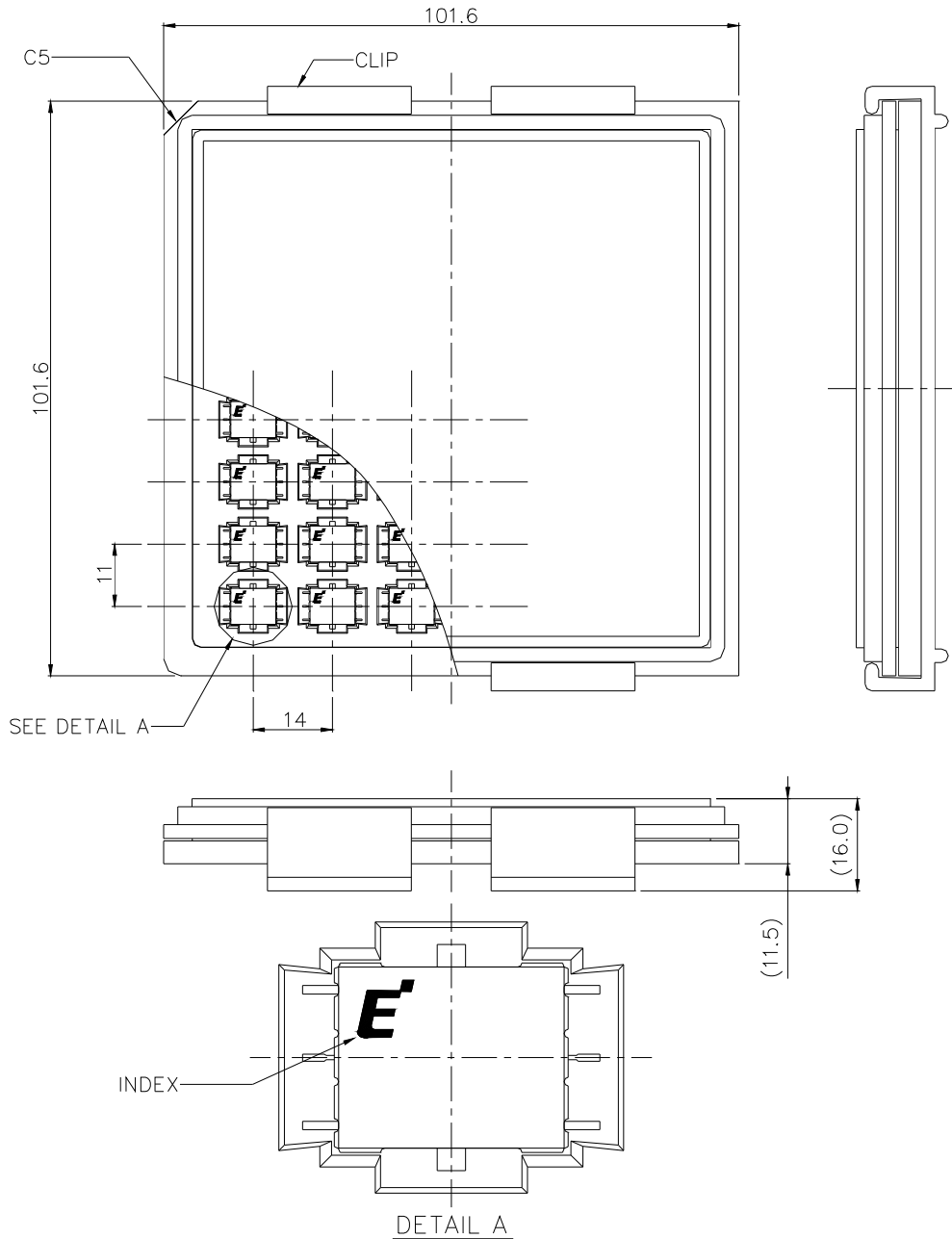
1. LAMINATE : Rogers Corporation RO4003, Thickness  $t=0.2\text{mm}$ , Cu Foil  $18\mu\text{m}$   
 Finish to copper foil ; Ni  $0.1\mu\text{m}$  min./Au  $0.1\pm 0.08\mu\text{m}$  (Both side)
2.  : Resist



# EMM5075VU

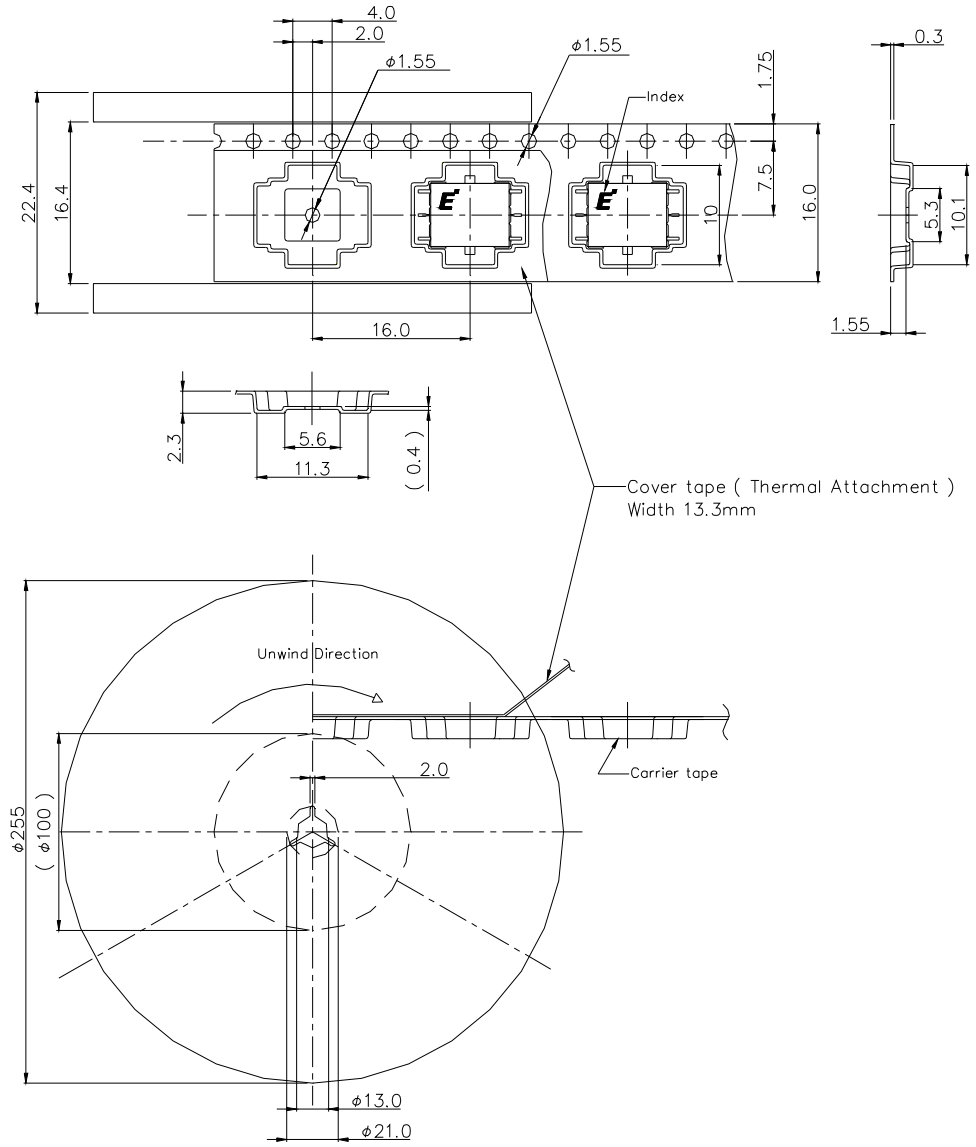
Ku-Band Power Amplifier MMIC

## 4-inch Tray Packing (Part No. : EMM5075VU)

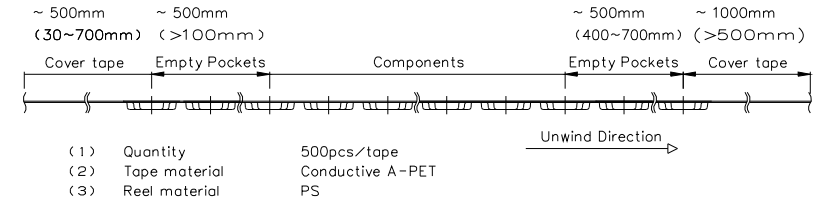


- (1) Maximum Quantity : 48 pcs./Tray
- (2) Tray Material : Conductive PS

### ■ Tape and Reel Packing (Part No. : EMM5075VUT)



Cover tape ( Thermal Attachment )  
Width 13.3mm



### ■ Mounting Method of SMD(Surface Mount Devices) for Lead-free solder

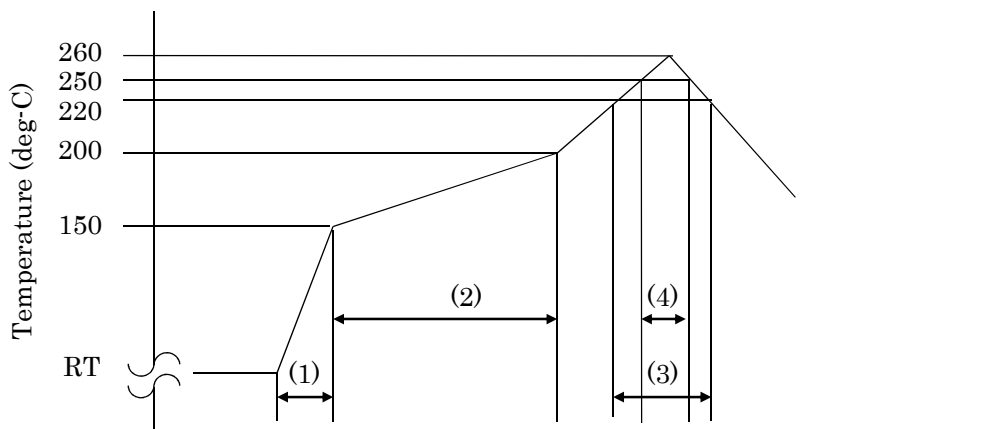
#### Mounting Condition

1. For soldering, Lead-free solder (Sn-3.0Ag-0.5Cu)\*<sup>1</sup> or equivalent shall be used.  
(\*1:The figure displays with weight %. A predominantly tin-rich alloy with 3.0% silver and 0.5% copper.)
2. A rosin type flux with a chlorine content of 0.2% or less shall be used. The rosin flux with low halogen content is recommended.
3. When soldering, use one of the following time/ temperature methods for acceptable solder joints. Make sure the devices have been properly prepared with flux prior soldering.

#### \* Reflow soldering method (Infrared reflow / Heat circulation reflow / Hot plate reflow):

Limit solder to 3 reflow cycles because resin is used in the modules manufacturing process. Excessive reflow cycles will effect the resin resulting in a potential failure or latent defect. The recommended reflow temperature profile is shown below. The temperature of the reflow profile must be measured at the device lead.

#### Reflow temperature profile and condition:



Condition	Temperature	Time
(1) Average Ramp-up Rate:	3deg-C/seconds	
(2) Preheating:	150 - 200deg-C,	60 - 180seconds
(3) Main heating:	220deg-C,	60seconds max.
(4) Peak Temperature:	260deg-C max., more than 250deg-C,	10 seconds max.

\* Measurement point: Device lead.

4. The above-recommended conditions were confirmed using the manufacture's equipment and materials. However, when soldering these products, the soldering condition should be verified by customer using their equipment and materials.



# EMM5075VU

## Ku-Band Power Amplifier MMIC

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- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
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