

EMM5075VU

Ku-Band Power Amplifier MMIC

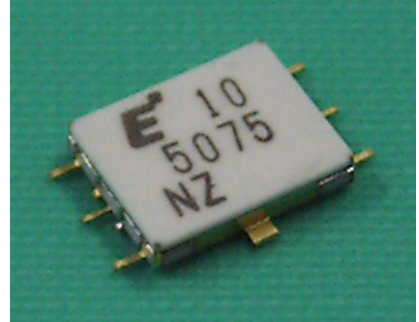
FEATURES

- High Output Power: Pout=33.0dBm (typ.)
- High Linear Gain: GL=24.0dB (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.

Eudyna Devices's stringent Quality Assurance Program assures the highest reliability and consistent performance.



ABSOLUTE MAXIMUM RATING

Item	Symbol	Rating	Unit
Drain-Source Voltage	V_{DD}	10	V
Gate-Source Voltage	V_{GG}	-3	V
Input Power	P_{in}	26	dBm
Storage Temperature	T_{stg}	-55 to +125	°C

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Unit
Drain-Source Voltage	V_{DD}	≤ 7	V
Input Power	P_{in}	≤ 16	dBm
Operating Case Temperature	T_C	-40 to +85	°C

ELECTRICAL CHARACTERISTICS (Case Temperature Ta=25°C)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
RF Frequency Range	f	$V_{DD}=+6V$	12.7	-	15.4	GHz
Output Power at 1dB G.C.P.	P_{1dB}	$I_{DD(DC)}=1200mA$ typ.	32	33	-	dBm
Power Gain at 1dB G.C.P.	G_{1dB}	$Z_S=Z_L=50ohm$	20	25	-	dB
Power-added Efficiency at 1dB G.C.P.	η_{add}		-	25	-	%
Drain Current at 1dB G.C.P.	I_{DDRF}		-	1500	1800	mA
3rd. Order Intermodulation Distortion *	IM_3	* df=+10MHz	38	44	-	dBc
Input Return Loss (at Pin=-20dBm)	RL_{IN}	Po=20dBm S.C.L	-	-8	-	dB
Output Return Loss (at Pin=-20dBm)	RL_{OUT}		-	-8	-	dB

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

ESD	Class 0	~ 249V
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Note : Based on JEDEC JESD22-A114C

CASE STYLE	VU
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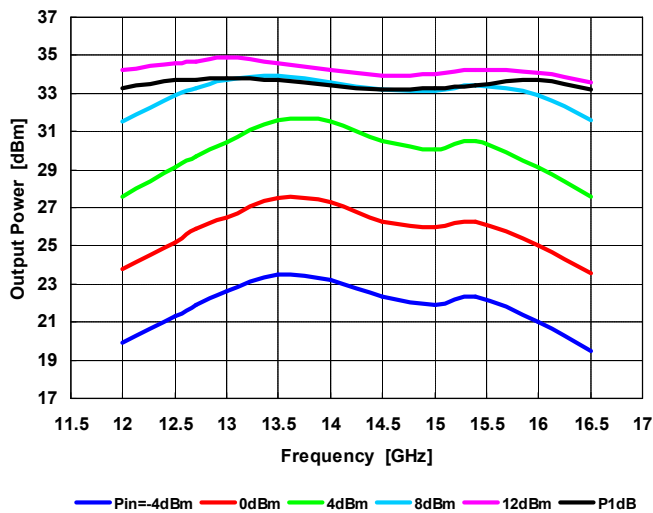
RoHs Compliance	Yes
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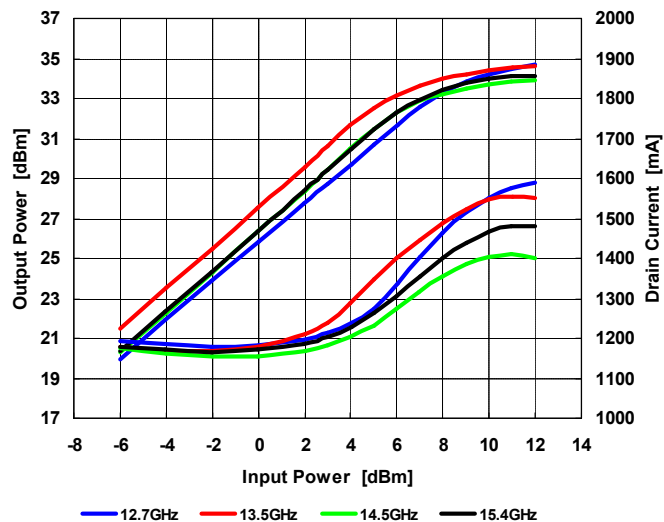
OUTPUT POWER vs. FREQUENCY

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



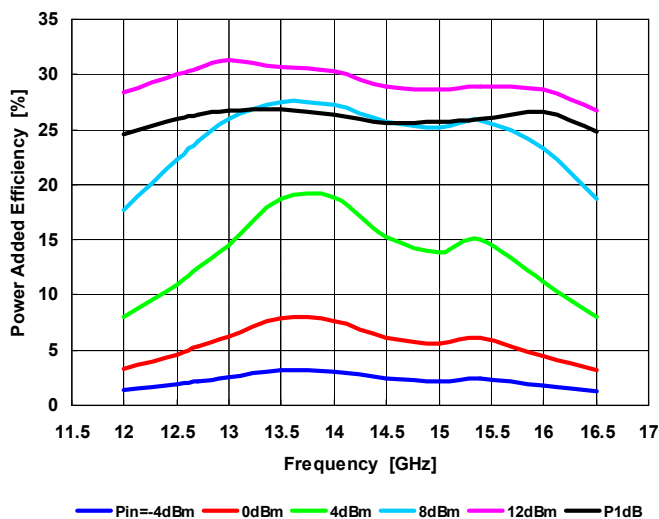
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER

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



POWER-ADDED EFFICIENCY vs FREQUENCY

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

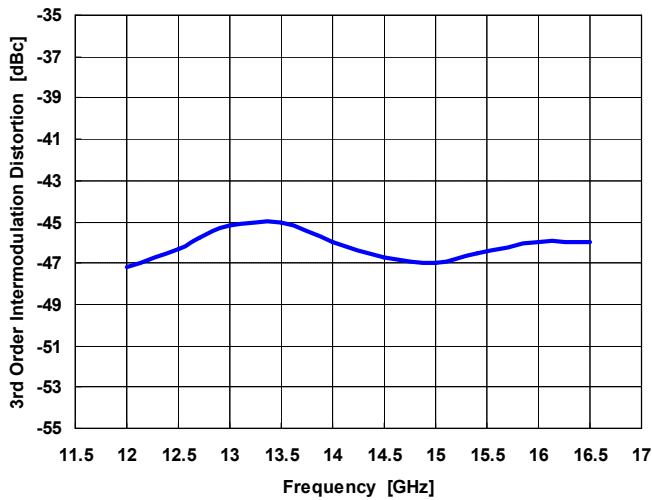


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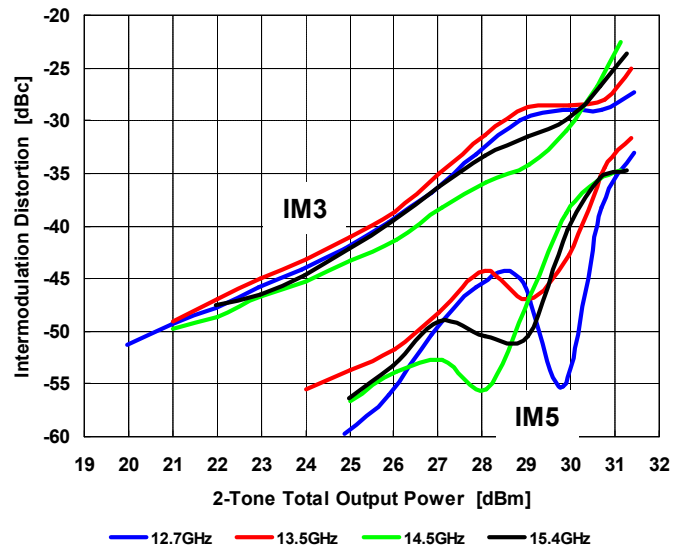
IMD vs. FREQUENCY

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



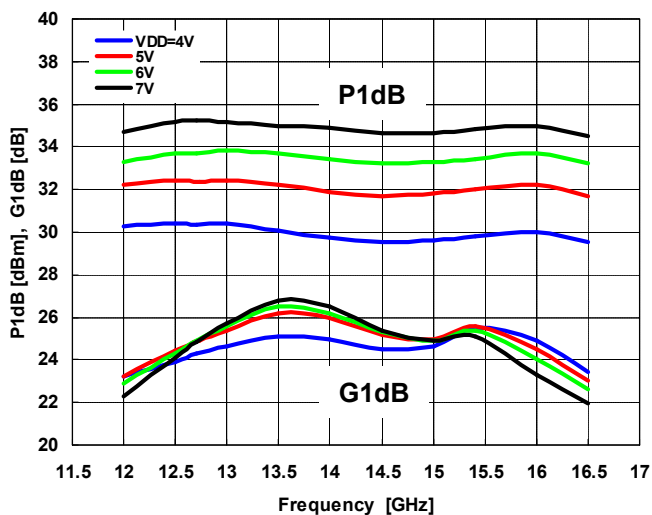
IMD vs OUTPUT POWER

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



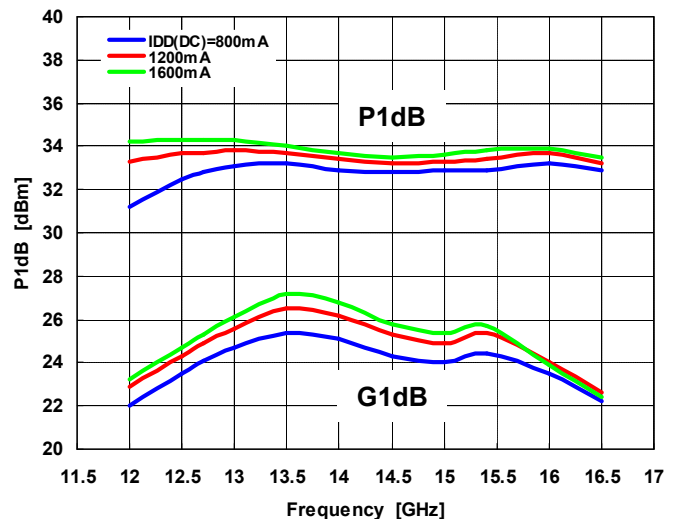
P1dB, G1dB vs. Frequency by Drain Voltage

IDD(DC)=1200mA



P1dB, G1dB vs. Frequency by Drain Current

@VDD=6V

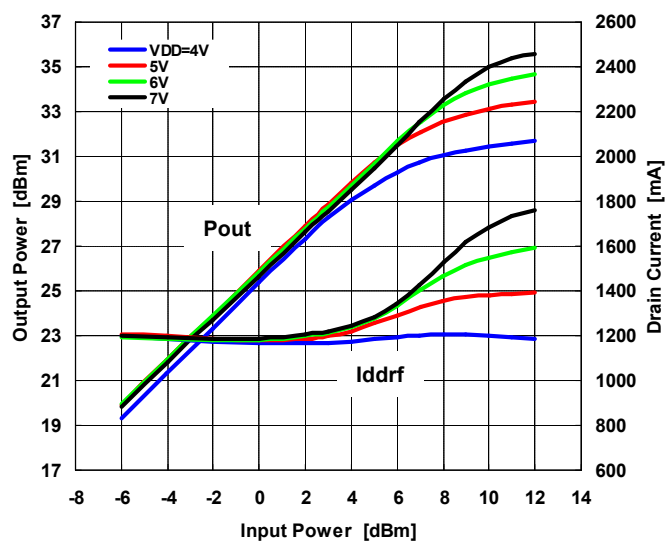


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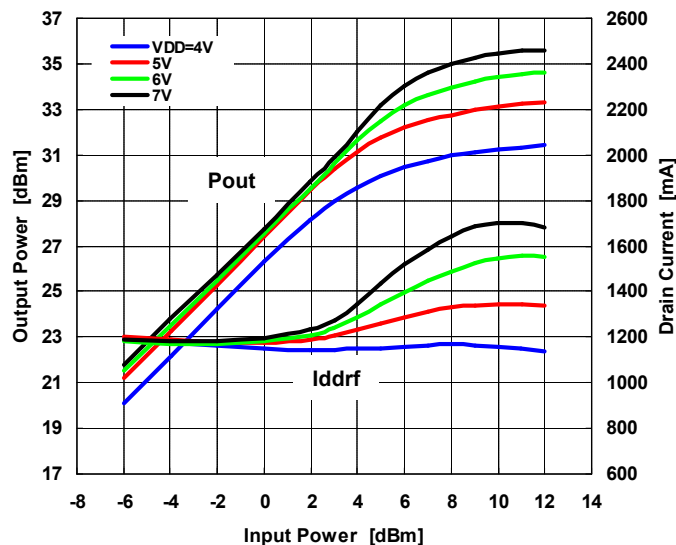
OUTPUT POWER, DRAIN CURRENT
vs. INPUT POWER by Drain Voltage

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



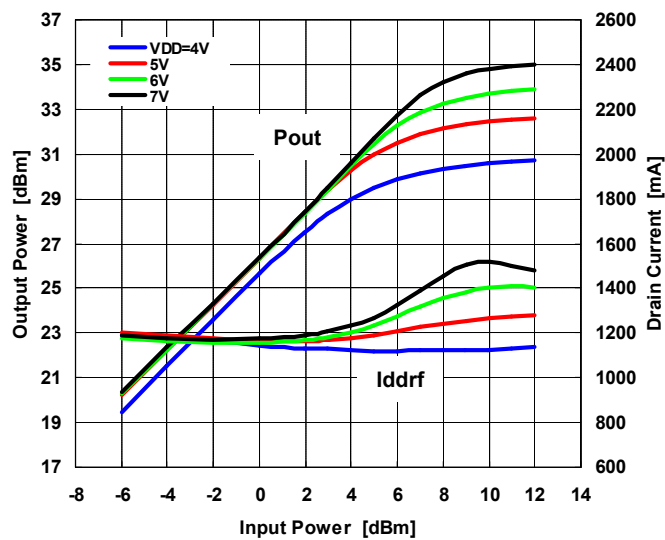
OUTPUT POWER, DRAIN CURRENT
vs. INPUT POWER by Drain Voltage

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



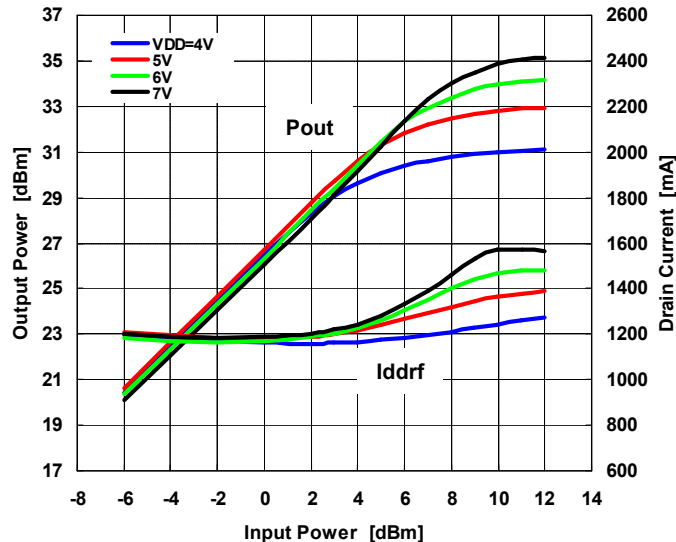
OUTPUT POWER, DRAIN CURRENT
vs. INPUT POWER by Drain Voltage

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



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

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

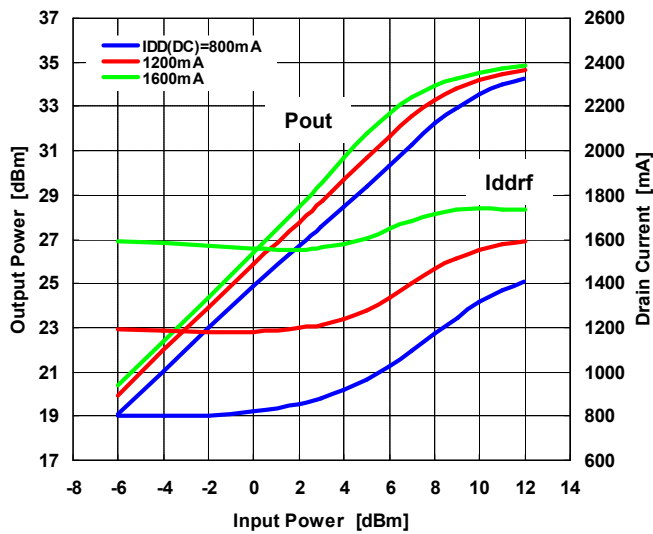


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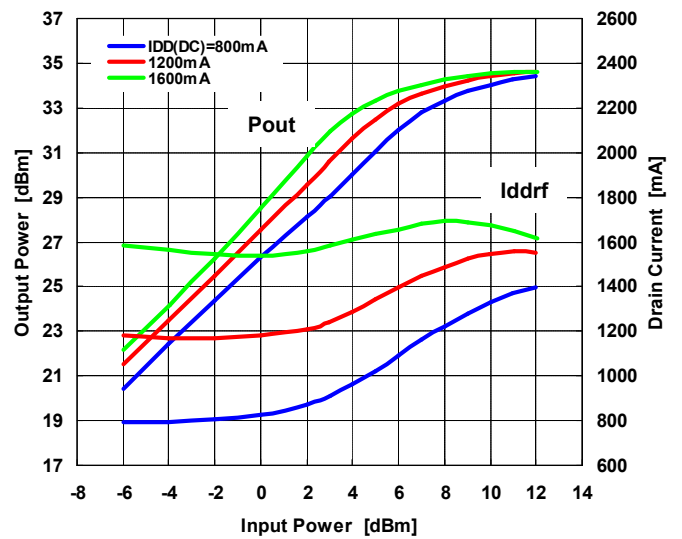
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

@VDD=6V, f=12.7GHz



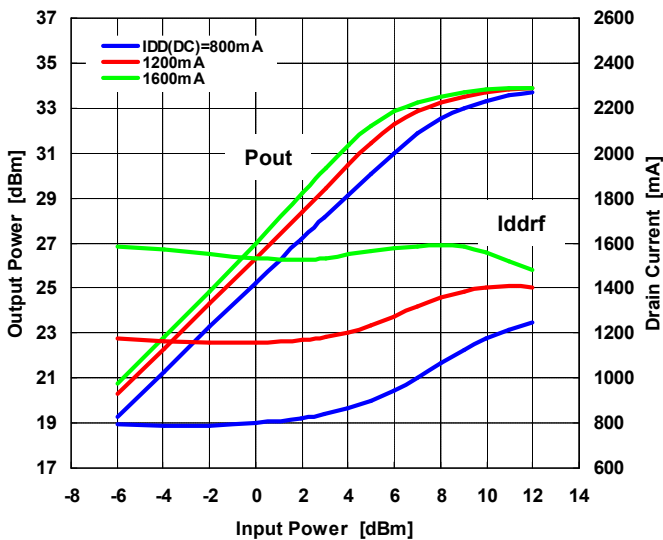
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

@VDD=6V, f=13.5GHz



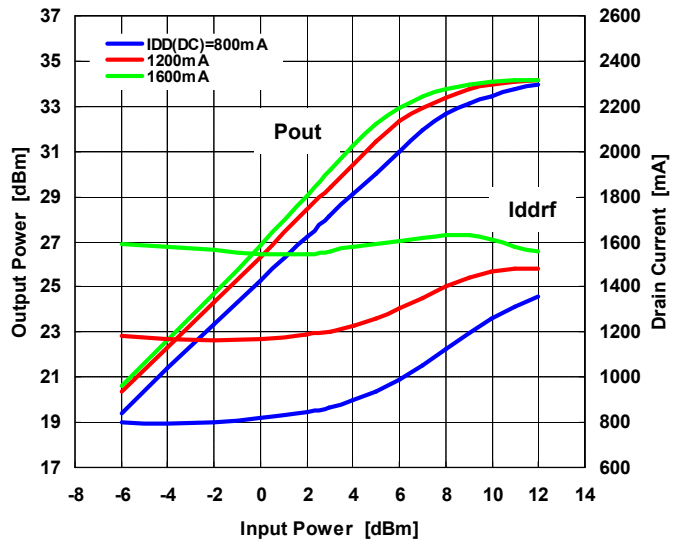
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

@VDD=6V, f=14.5GHz



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

@VDD=6V, f=15.4GHz

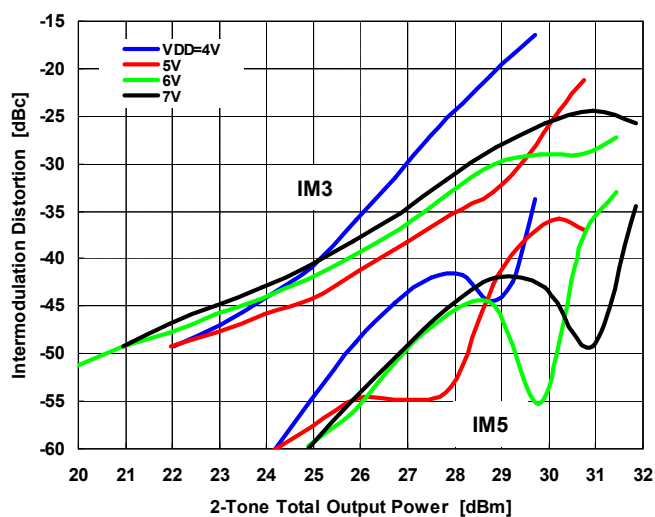


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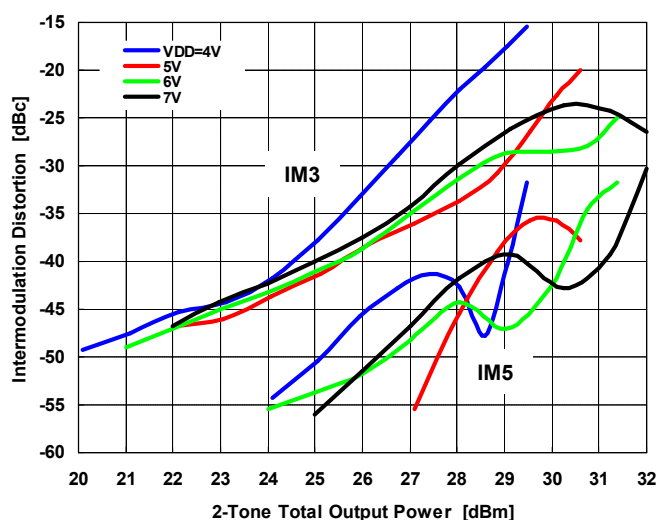
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

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



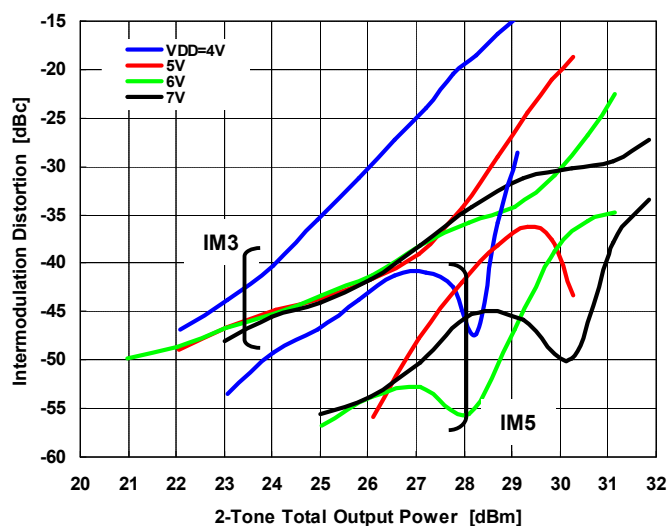
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

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



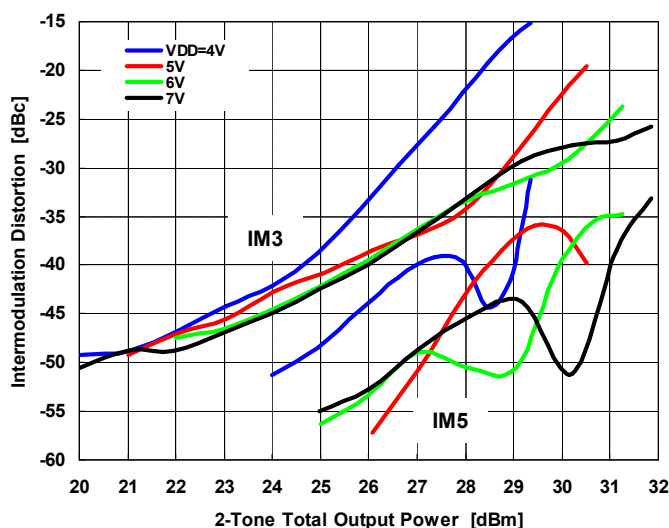
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

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



IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

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

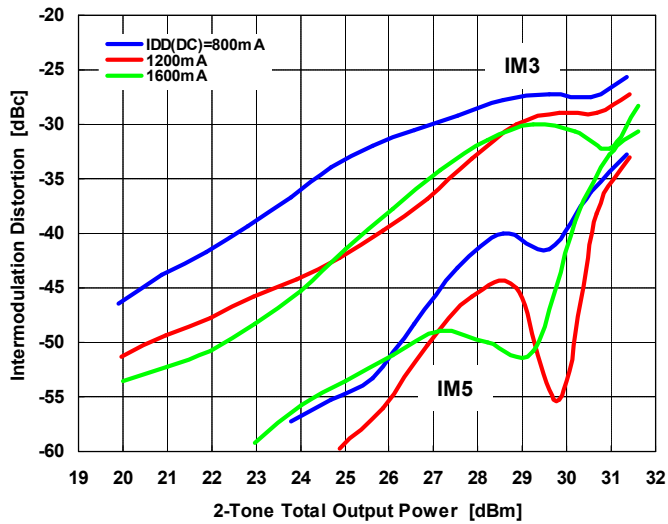


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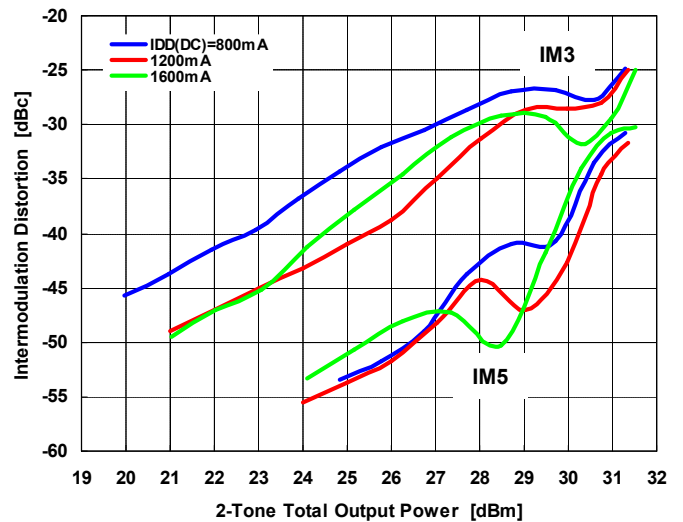
IMD PERFORMANCE vs. OUTPUT POWER by Drain Current

@VDD=6V, f=12.7GHz



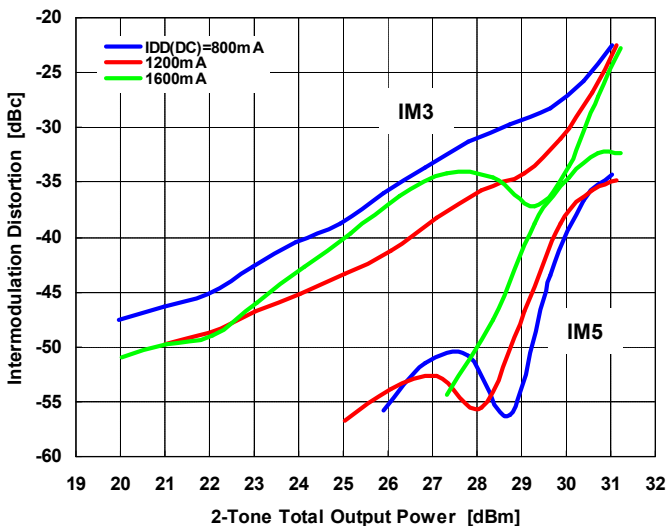
IMD PERFORMANCE vs. OUTPUT POWER by Drain Current

@VDD=6V, f=13.5GHz



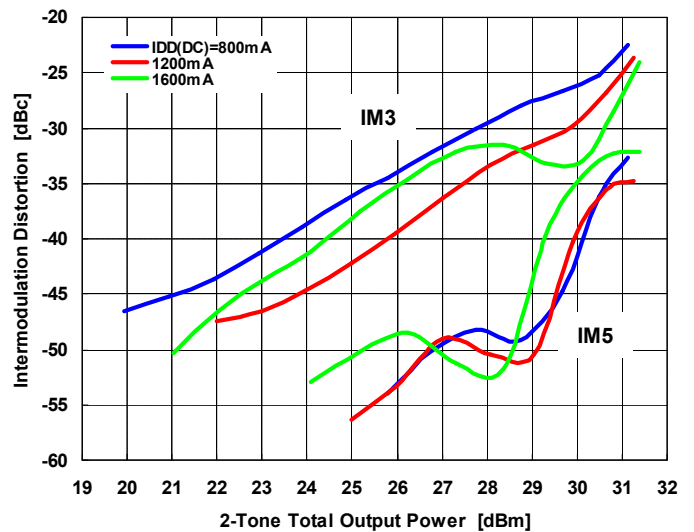
IMD PERFORMANCE vs. OUTPUT POWER by Drain Current

@VDD=6V, f=14.5GHz



IMD PERFORMANCE vs. OUTPUT POWER by Drain Current

@VDD=6V, f=15.4GHz

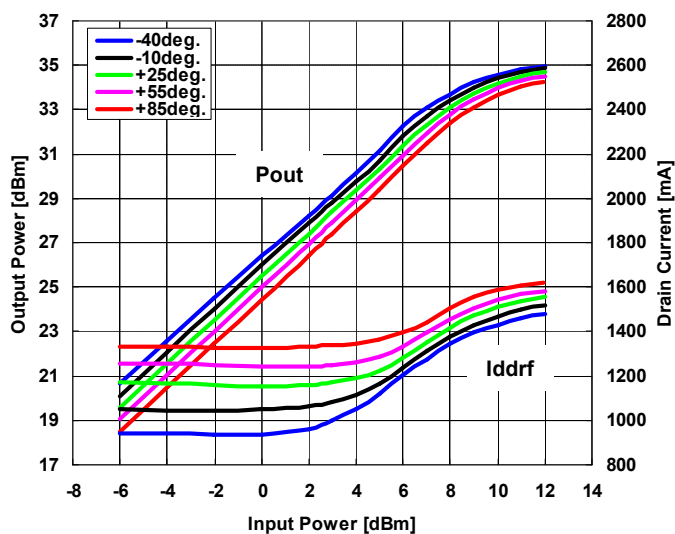


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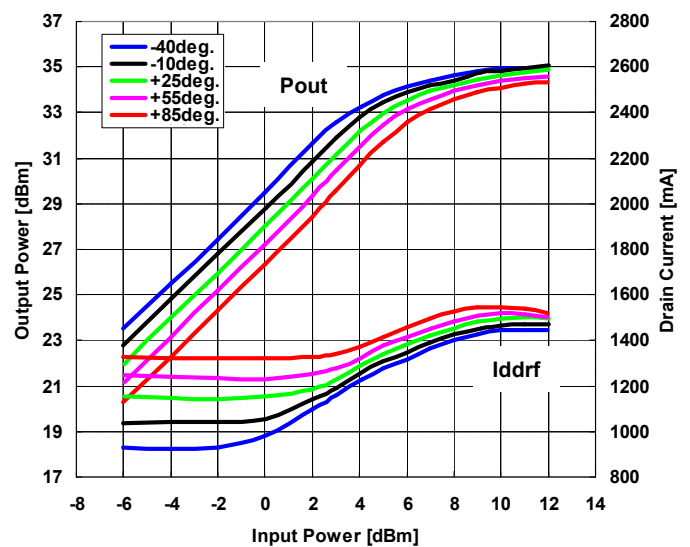
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Temperature

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



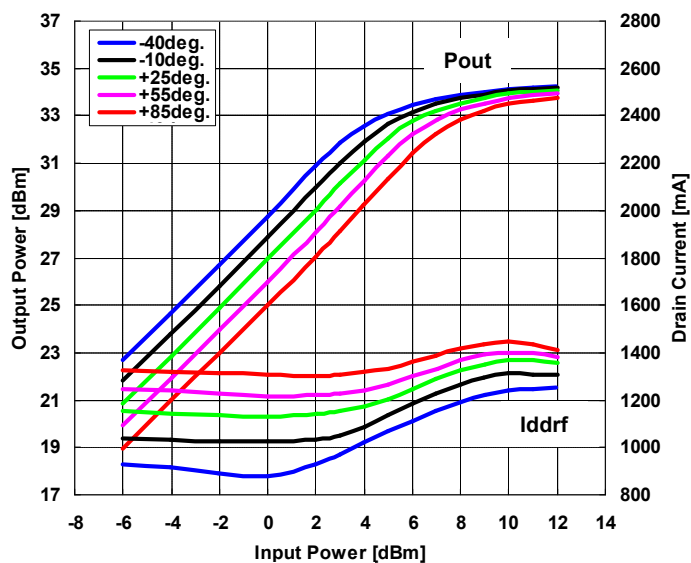
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@VDD=6V, IDD(DC)=1200mA(Ta=+25deg.), Freq.=13.5GHz



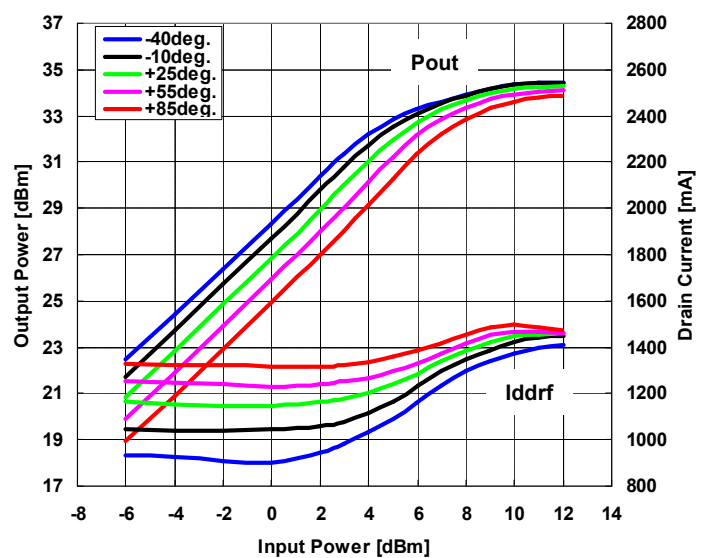
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OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Temperature

@VDD=6V, IDD(DC)=1200mA(Ta=+25deg.), Freq.=15.4GHz

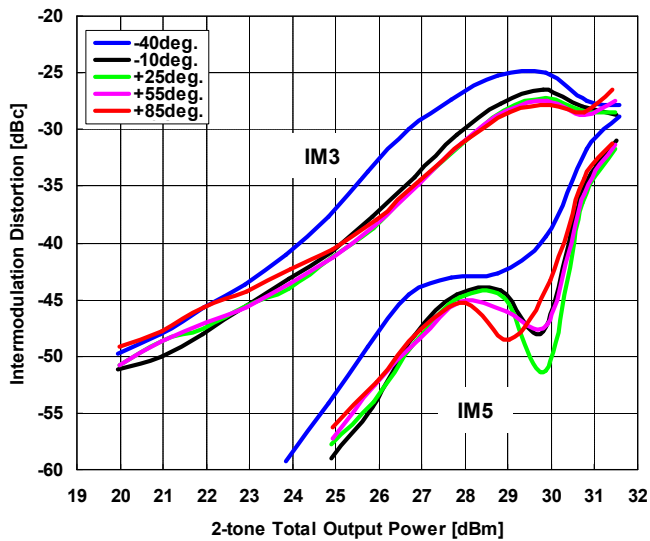


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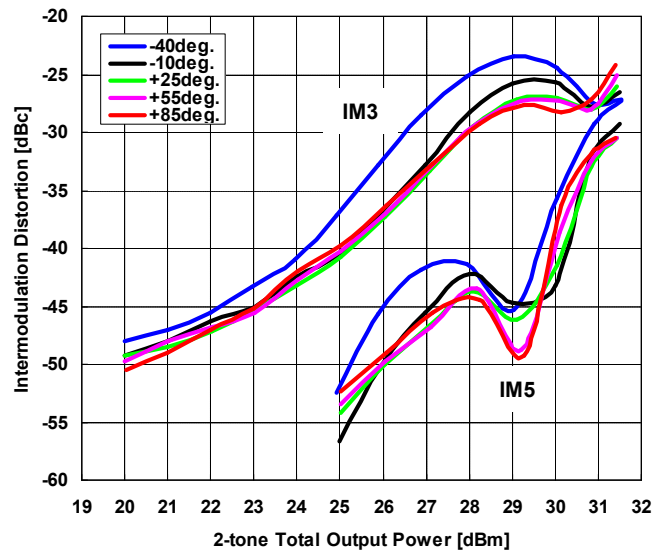
IMD PERFORMANCE vs. OUTPUT POWER by Temperature

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



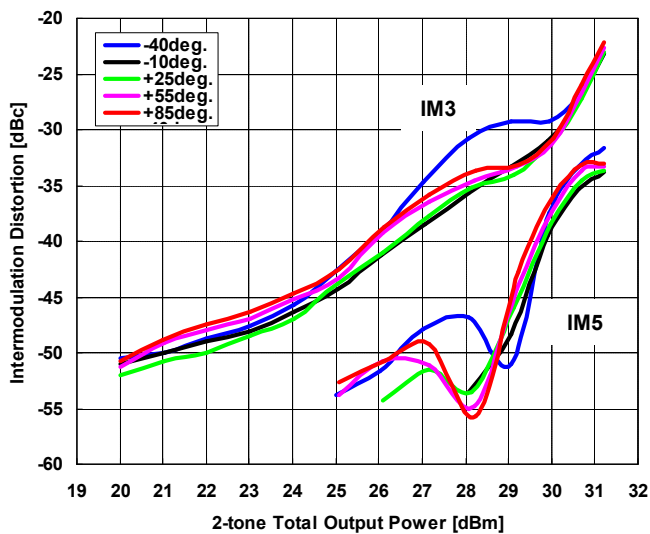
IMD PERFORMANCE vs. OUTPUT POWER by Temperature

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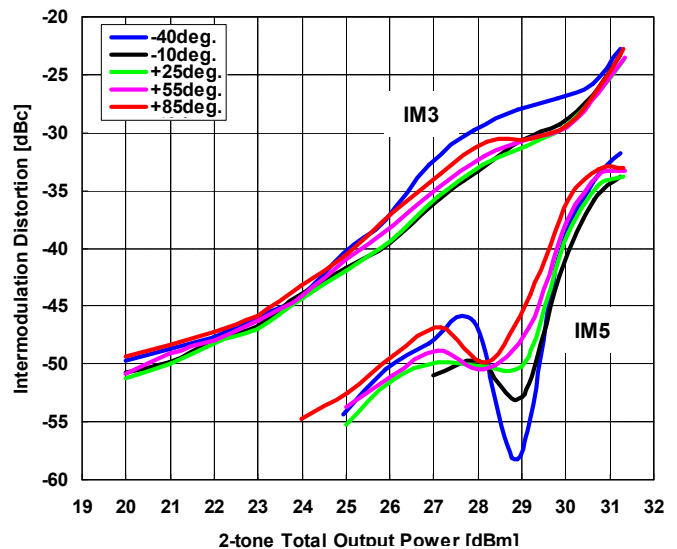
IMD PERFORMANCE vs. OUTPUT POWER by Temperature

@VDD=6V, IDD(DC)=1200mA(Ta=+25deg.), Freq.=14.5GHz



IMD PERFORMANCE vs. OUTPUT POWER by Temperature

@VDD=6V, IDD(DC)=1200mA(Ta=+25deg.), Freq.=15.4GHz



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■ S-PARAMETER

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

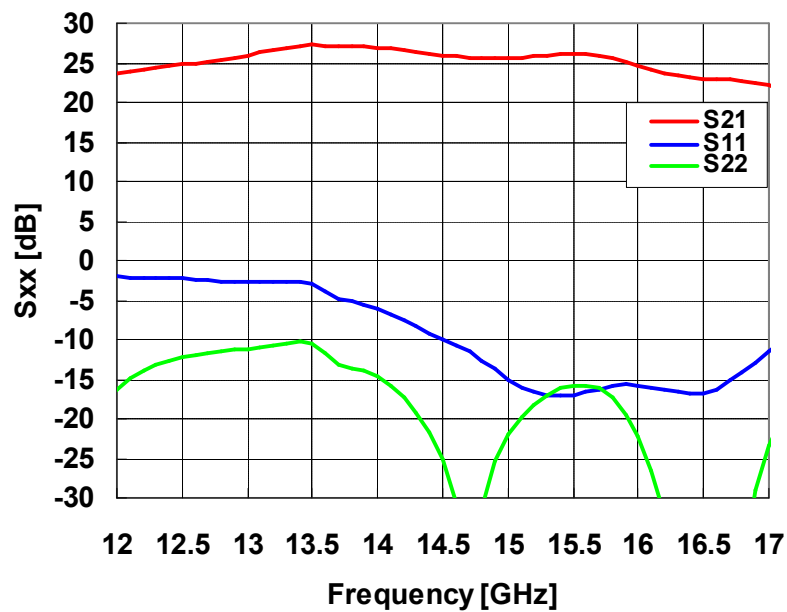
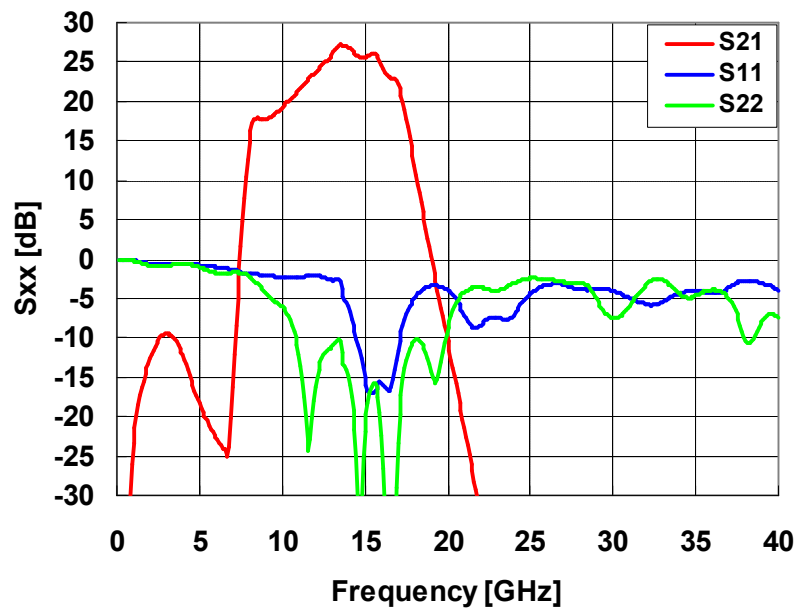
Frequency [GHz]	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.0	0.98	-31.4	0.07	10.1	0.00	148.6	0.97	-43.8
2.0	0.94	-63.4	0.23	-151.6	0.00	-147.9	0.91	-85.9
3.0	0.92	-91.4	0.34	92.9	0.00	-162.8	0.91	-123.0
4.0	0.94	-115.1	0.24	-1.9	0.00	160.8	0.93	-157.1
5.0	0.92	-138.3	0.12	-55.7	0.00	114.8	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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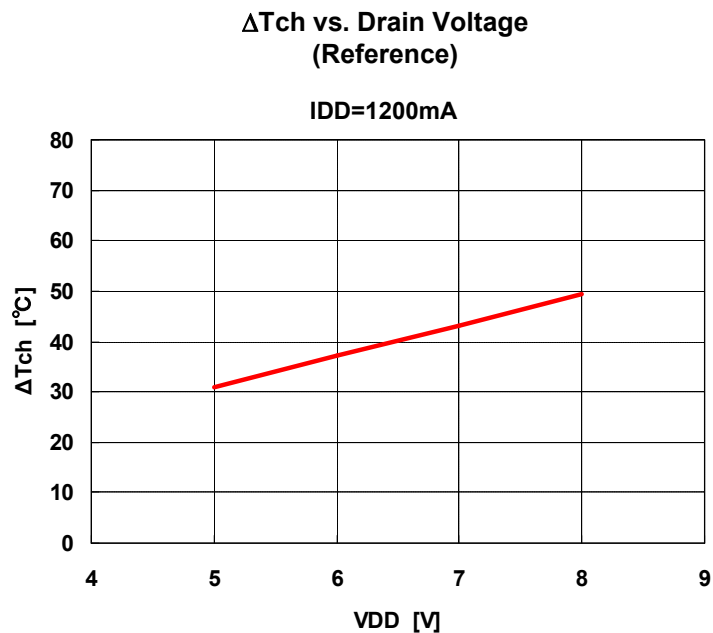
■ S-PARAMETER

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

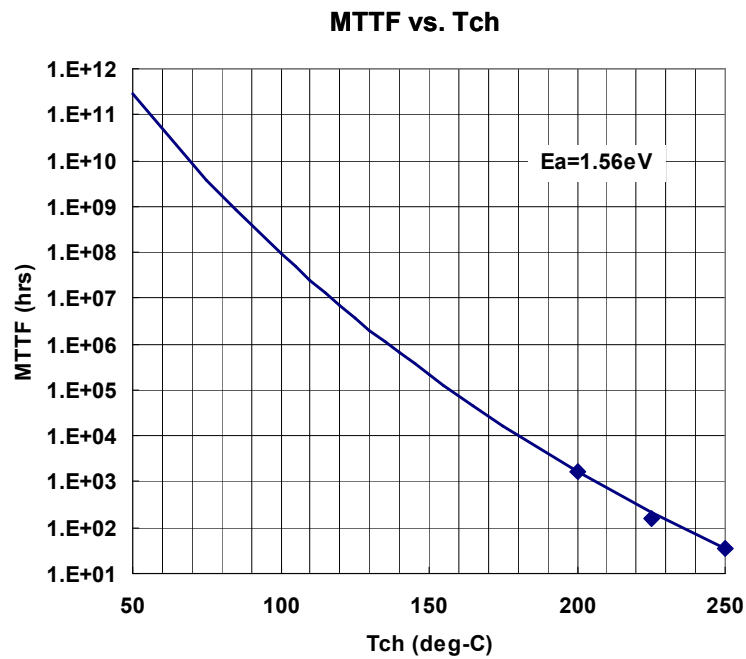


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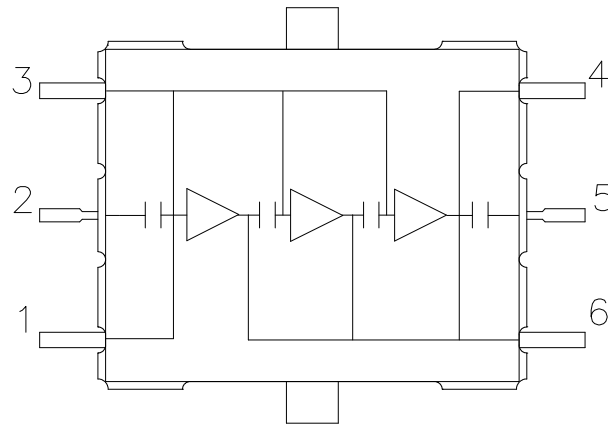
Note: ΔT_{ch} : Temperature Rise from Backside of the Package to Channel.



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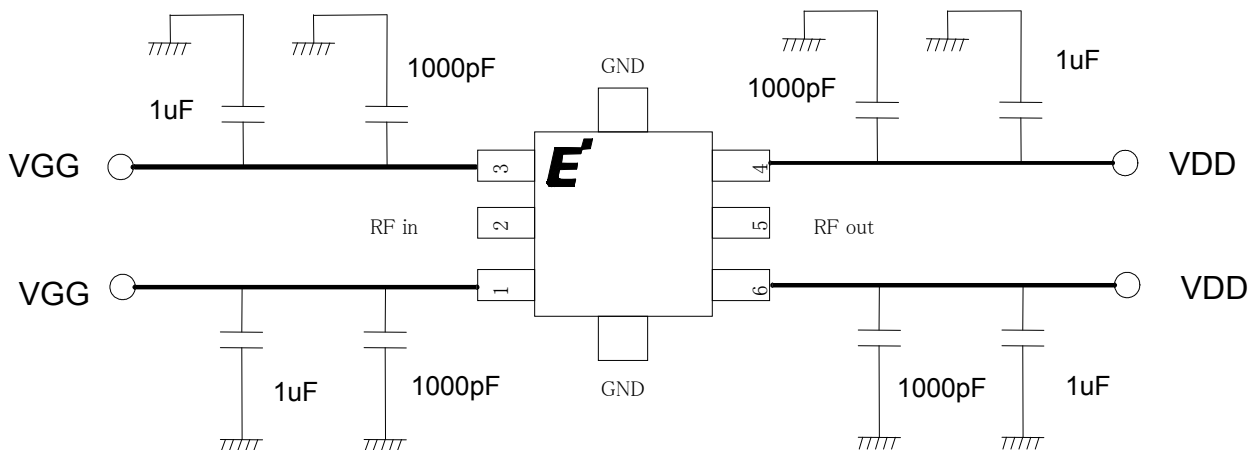
■ Block diagram



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.

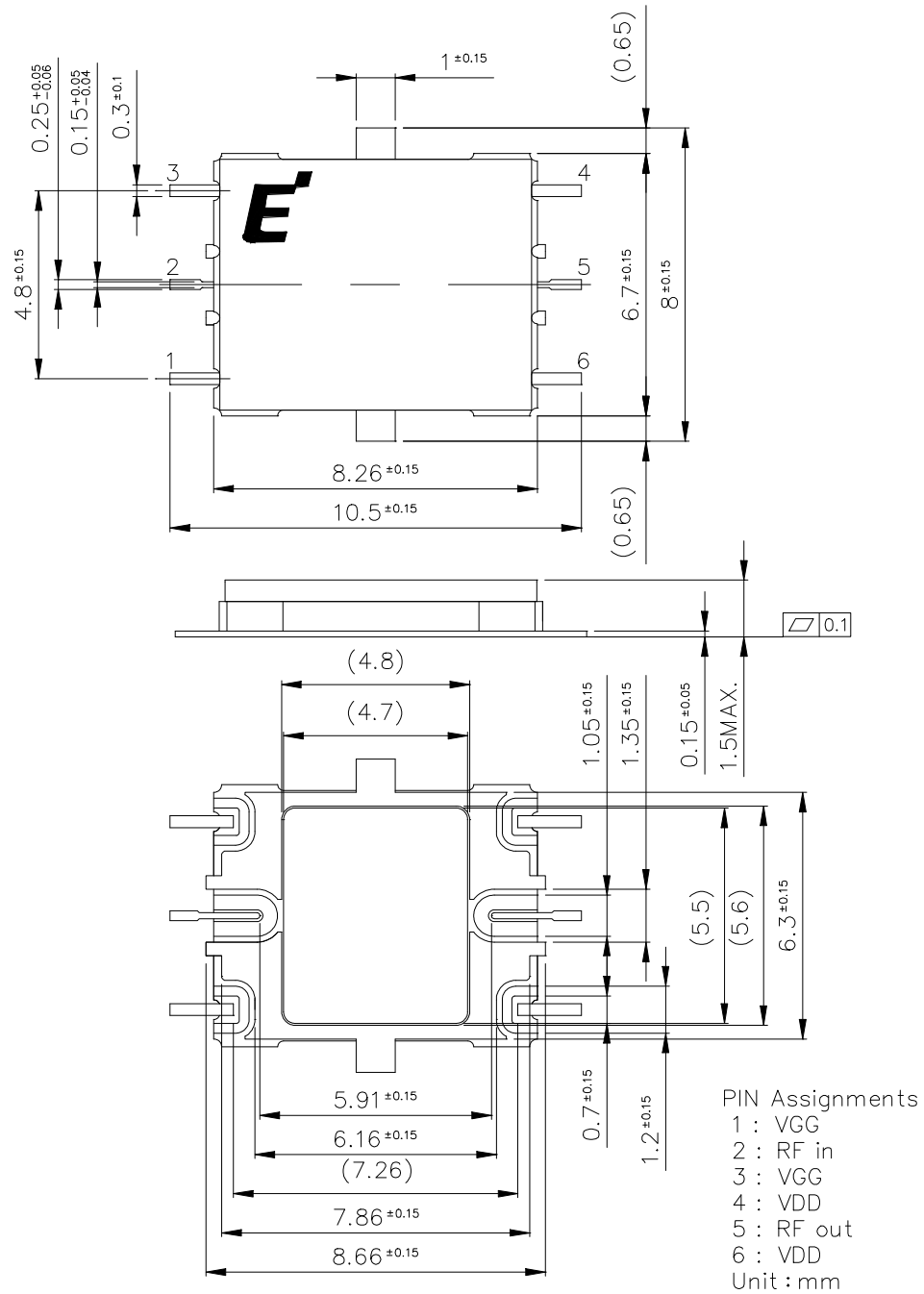
Note 2: Two pins named VGG are internally connected.

Note 3: Two pins named VDD are internally connected.

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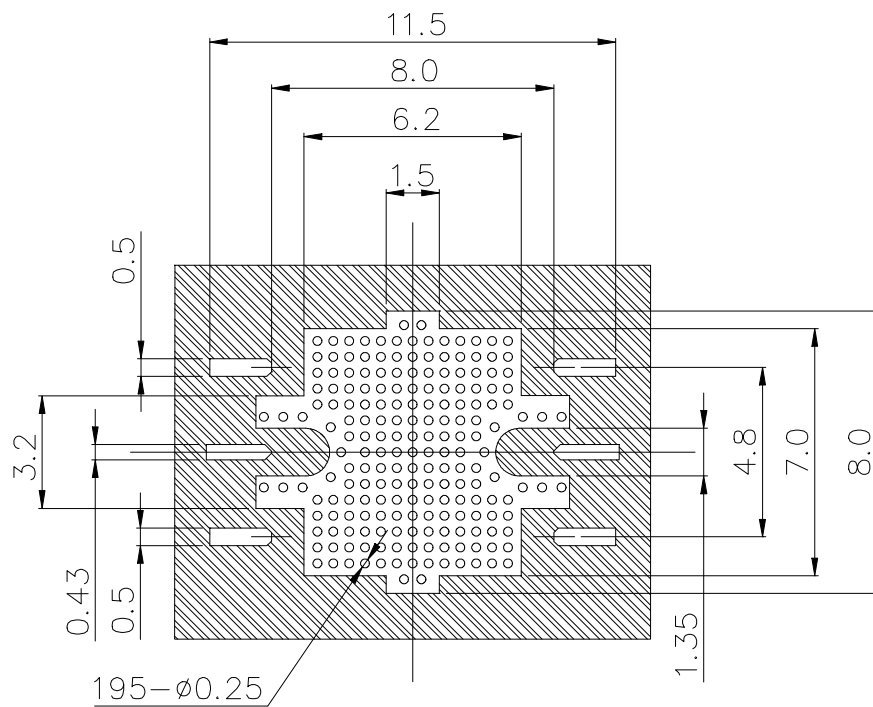
■ Package Outline



EMM5075VU

Ku-Band Power Amplifier MMIC

■ 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 $0.1\pm0.08\mu\text{m}$ (Both side)
2.  : Resist

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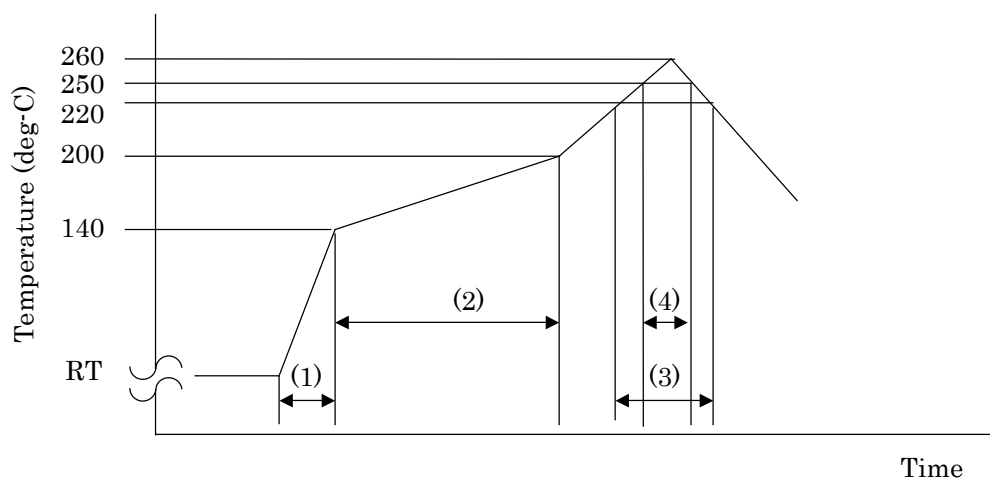
Mounting Condition

1. For soldering, Lead-free solder (Sn-3.0Ag-0.5Cu)*¹ 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 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:



- | | | |
|-----------------------|----------------|-------------------------|
| (1) Temperature rise: | 5deg-C/sec. | |
| (2) Preheating: | 140 - 220deg-C | 60 - 120sec. |
| (3) Main heating: | 220deg-C over. | 10 - 40sec. |
| (4) Main heating: | 250deg-C over. | 10 sec. (260deg-C 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

For further information please contact :

Eudyna Devices USA Inc.

2355 Zanker Rd.
San Jose, CA 95131-1138, U.S.A.
TEL: +1 408 232-9500
FAX: +1 408 428-9111

Eudyna Devices Europe Ltd.

Network House
Norreys Drive
Maidenhead, Berkshire SL6 4FJ
United Kingdom
TEL: +44 (0) 1628 504800
FAX: +44 (0) 1628 504888

Eudyna Devices International Srl

Via Teglio 8/2 - 20158
Milano, Italy
TEL: +39-02-3705 2921
FAX: +39-02-3705 2920

Eudyna Devices Asia Pte. Ltd.

Hong Kong Branch
Suite 1906B, Tower 6, China Hong Kong City
33 Canton Road, Tsimshatsui, Kowloon
Hong Kong
TEL: +852-2377-0227
FAX: +852-2377-3921

Eudyna Devices Inc.

1000 Kamisukiahara, showa-cho
Nakakomagun, Yamanashi
409-3883, Japan
(Kokubo Industrial Park)
TEL +81-55-275-4411
FAX +81-55-275-9461

Sales Division

1, Kanai-cho, Sakae-ku
Yokohama, 244-0845, Japan
TEL +81-45-853-8156
FAX +81-45-853-8170

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