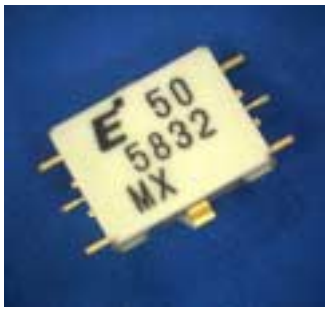
EMM5832VU

K-Band Power Amplifier MMIC



FEATURES

- High Output Power: Pout=31.0dBm (typ.)
- High Linear Gain: GL=20.0dB (typ.)
- Broad Band: 21.2~26.5GHz
- Impedance Matched Zin/Zout=50Ω
- Small Hermetic Metal-Ceramic SMT Package(VU)

DESCRIPTION

The EMM5832VU is a MMIC amplifier that contains a four-stage amplifier, internally matched, for standard communications band in the 21.2 to 26.5GHz 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}	22	dBm
Storage Temperature	T_{stg}	-55 to +125	℃

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Unit
Drain-Source Voltage	V_{DD}	≦7	V
Input Power	P_{in}	≦12	dBm
Operating Case Temperature	T_C	-40 to +85	℃

ELECTRICAL CHARACTERISTICS (Case Temperature Ta=25℃)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
RF Frequency Range	f	V_{DD}=+6V	21.2	-	26.5	GHz
Output Power at 1dB G.C.P.	P_{1dB}	$I_{DD(DC)}$=800mA typ.	28	31	-	dBm
Power Gain at 1dB G.C.P.	G_{1dB}	Z_S=Z_L=50ohm	16	19	23	dB
Power-added Efficiency at 1dB G.C.P.	N_{add}		-	20	-	%
Drain Current at 1dB G.C.P.	I_{DDRF}		-	1000	1500	mA
3rd. Order Intermodulation Distortion *	IM_3	* df=+10MHz	28	33	-	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

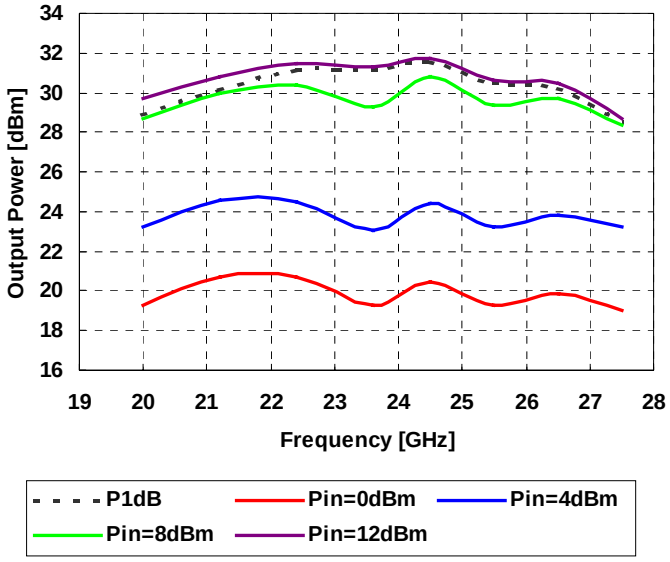
G.C.P. : Gain Compression Point
S.C.L. : Single Carrier Level

ESD	Class 0	~199V

Note : Based on EIAJ ED4701 C-111A(C=100pF, R=1.5kohm)

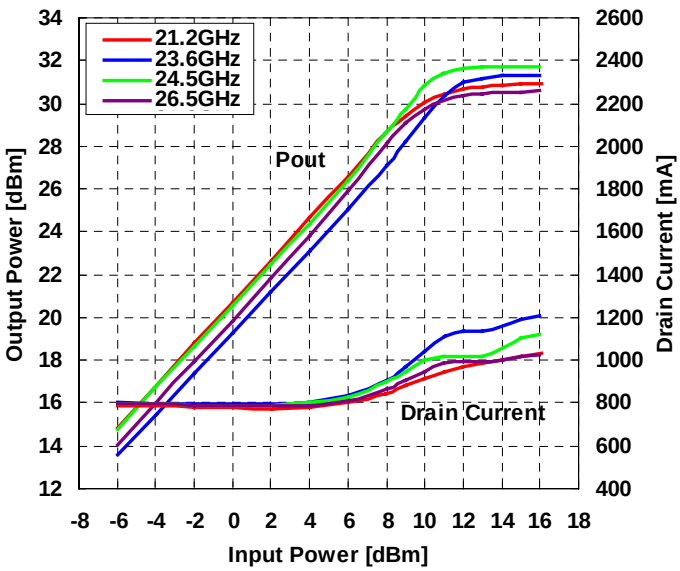
OUTPUT POWER vs. FREQUENCY

VDD=6V, IDD(DC)=800mA



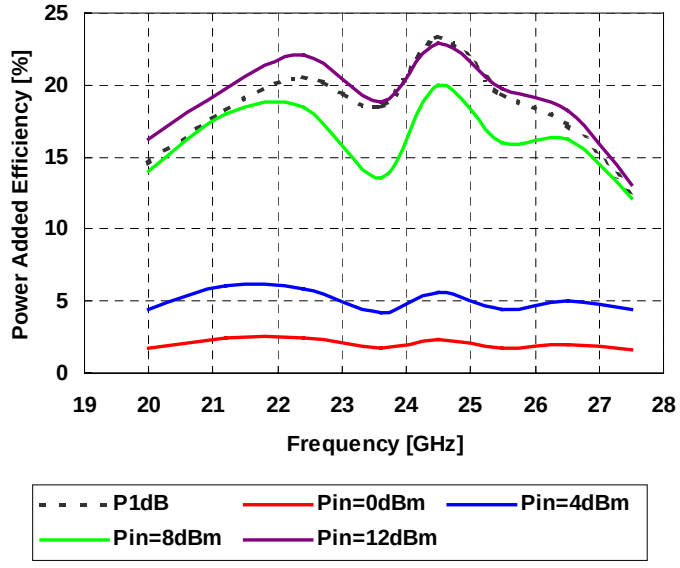
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER

VDD=6V, IDD(DC)=800mA



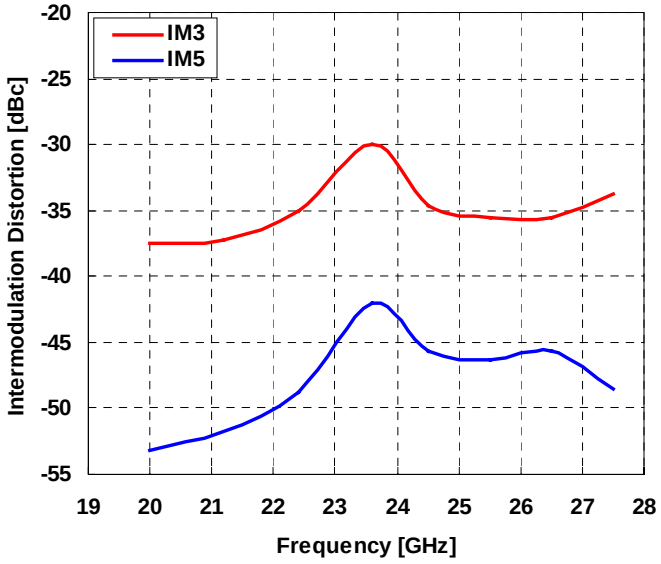
POWER-ADDED EFFICIENCY vs FREQUENCY

VDD=6V, IDD(DC)=800mA



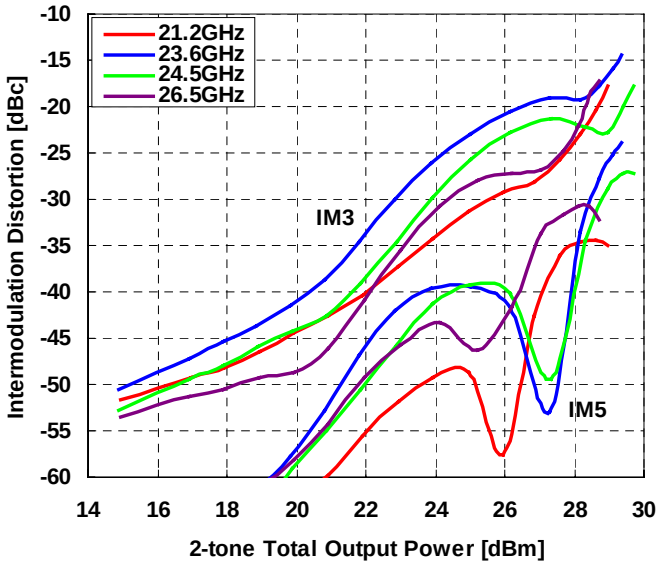
IMD vs. FREQUENCY

VDD=6V, IDD(DC)=800mA, Pout=20dBm S.C.L



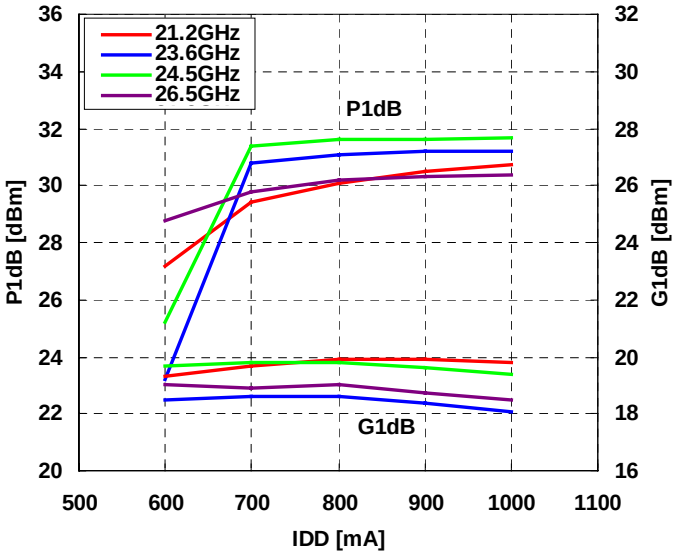
IMD vs OUTPUT POWER

VDD=6V, IDD(DC)=800mA



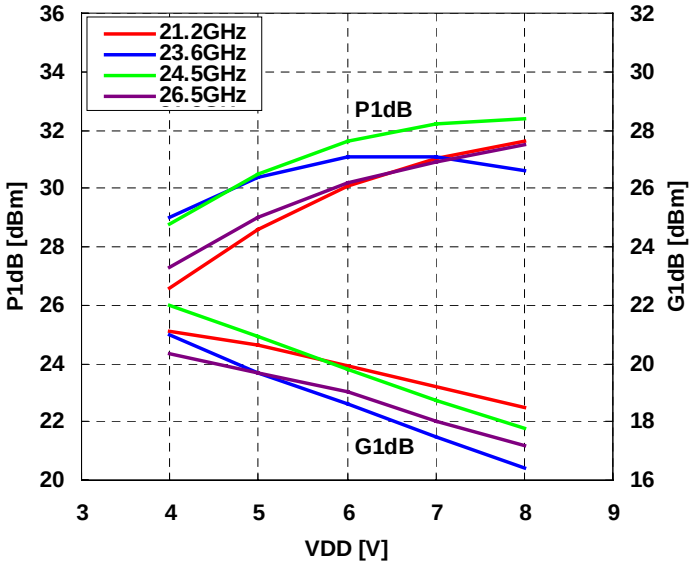
OUTPUT POWER, GAIN vs. DRAIN CURRENT

VDD=6V



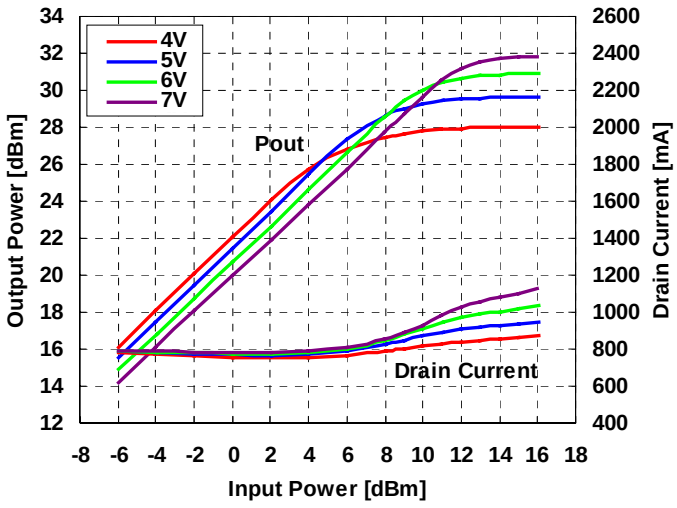
OUTPUT POWER, GAIN vs. DRAIN VOLTAGE

IDD(DC)=800mA



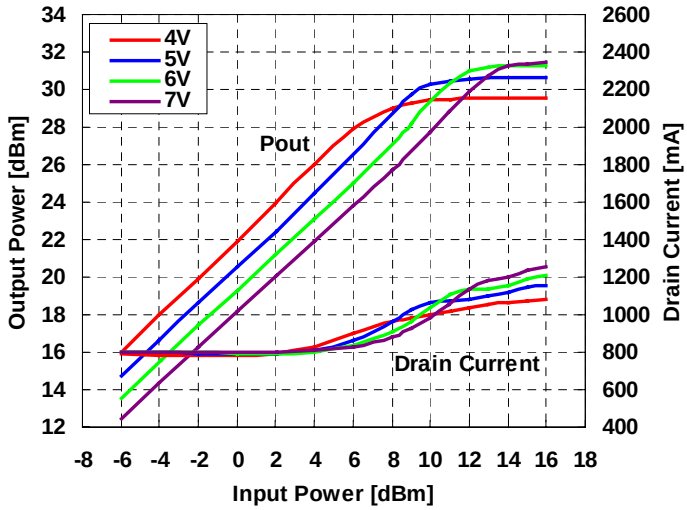
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=800mA, f=21.2GHz



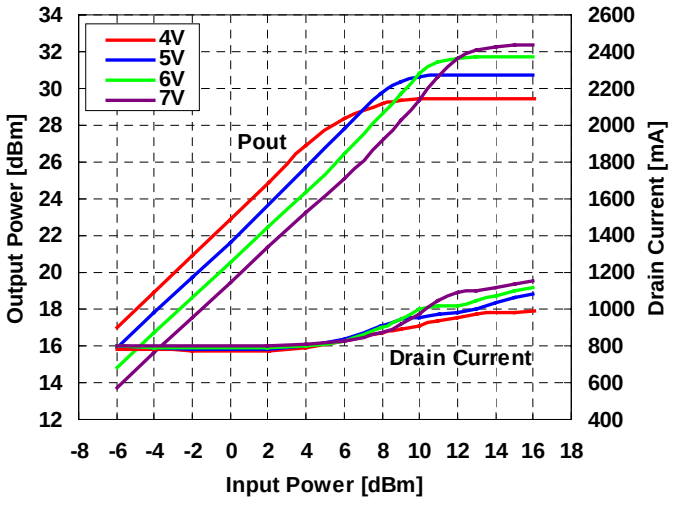
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=800mA, f=23.6GHz



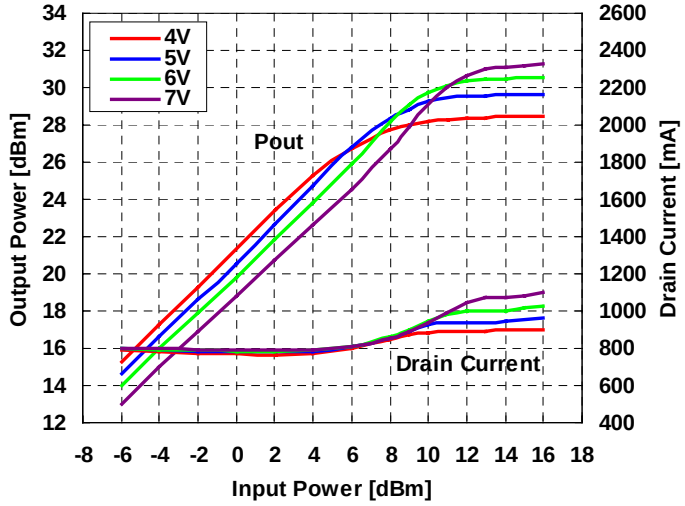
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=800mA, f=24.5GHz



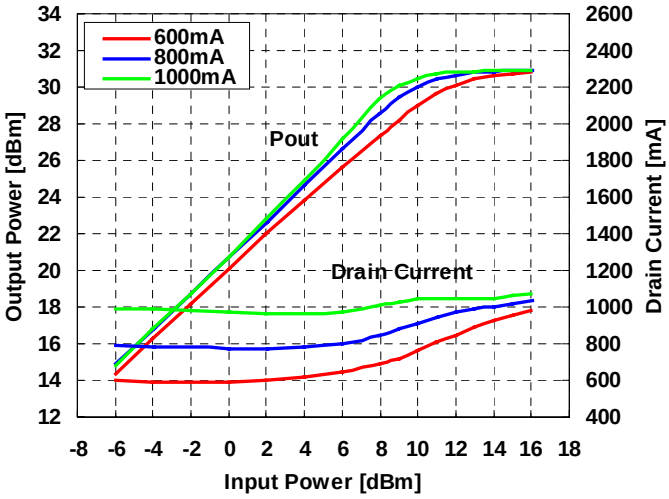
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=800mA, f=26.5GHz



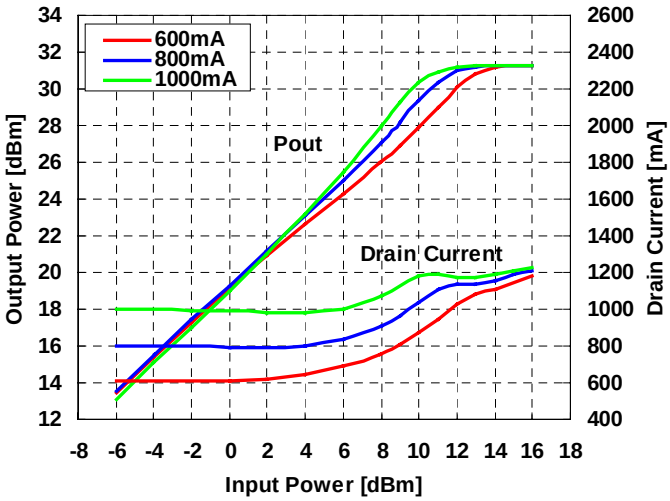
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V, f=21.2GHz



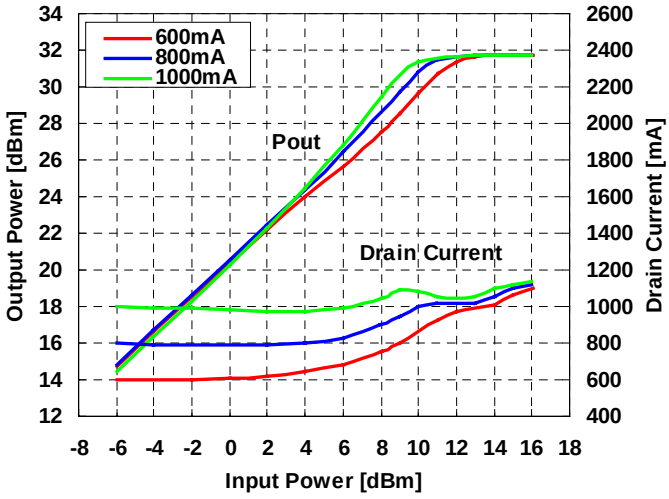
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V, f=23.6GHz



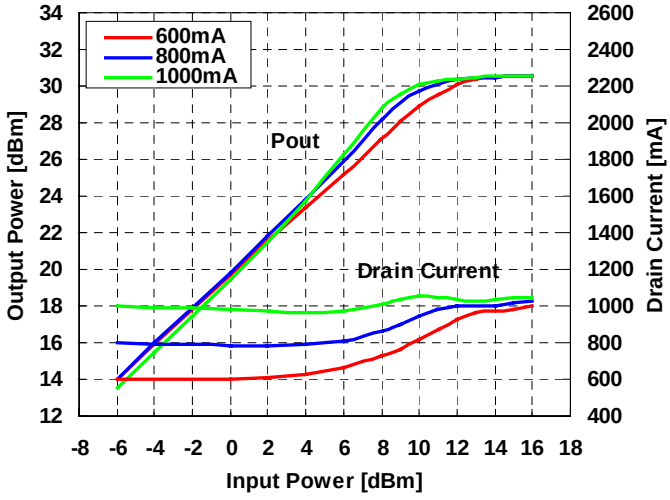
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V, f=24.5GHz



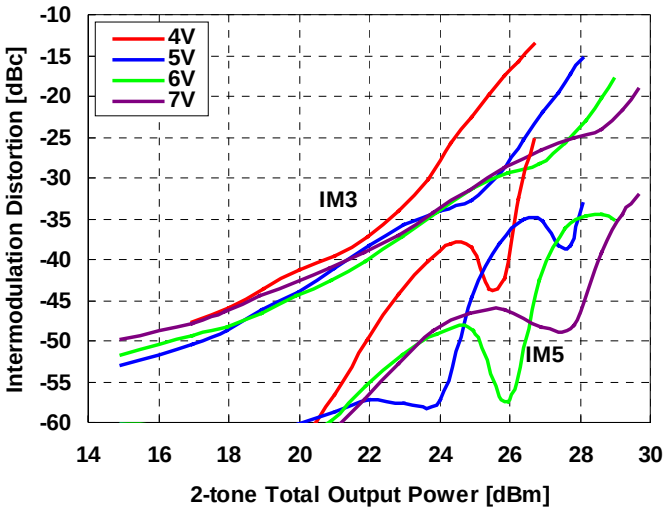
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V, f=26.5GHz



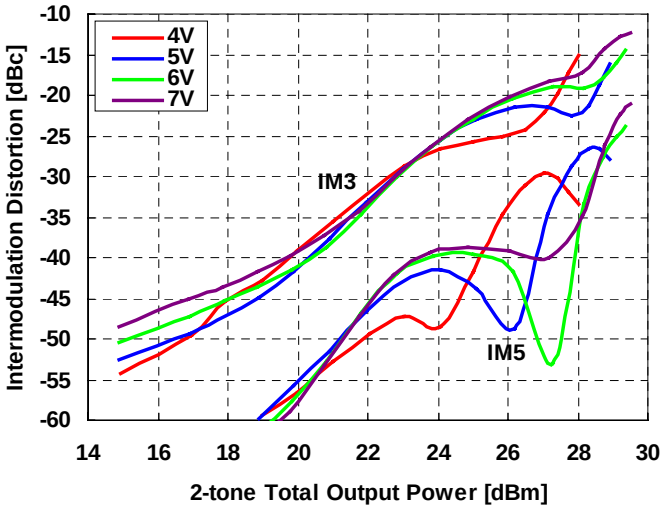
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

IDD(DC)=800mA, f=21.2GHz



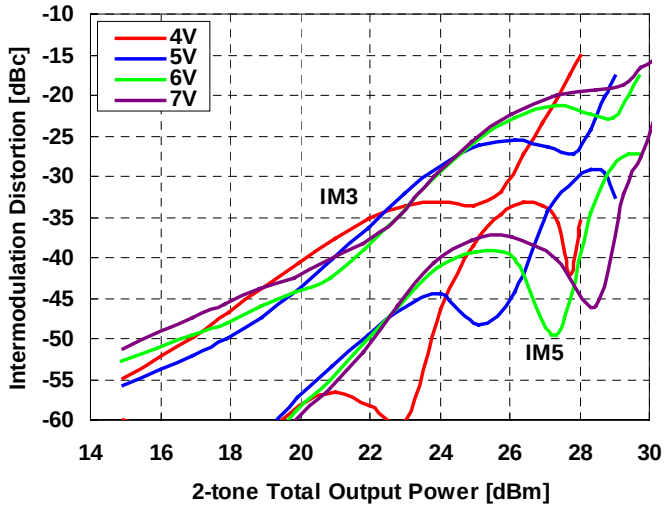
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

IDD(DC)=800mA, f=23.6GHz



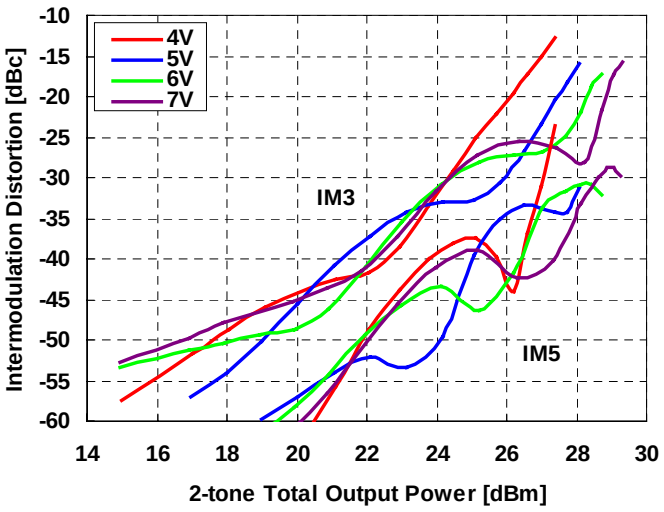
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

IDD(DC)=800mA, f=24.5GHz



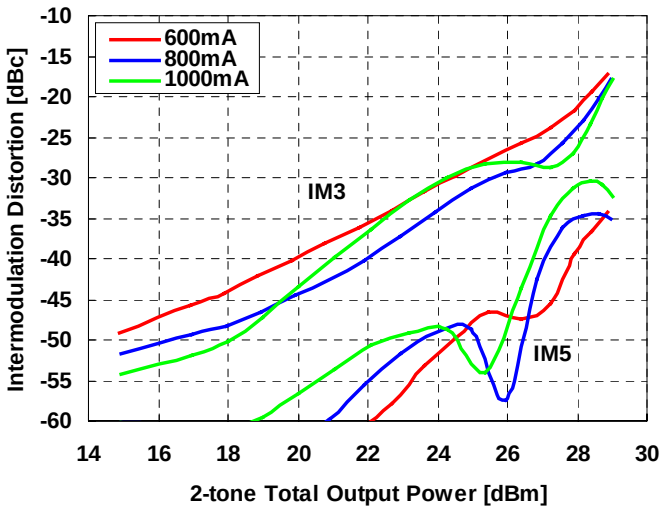
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

IDD(DC)=800mA, f=26.5GHz



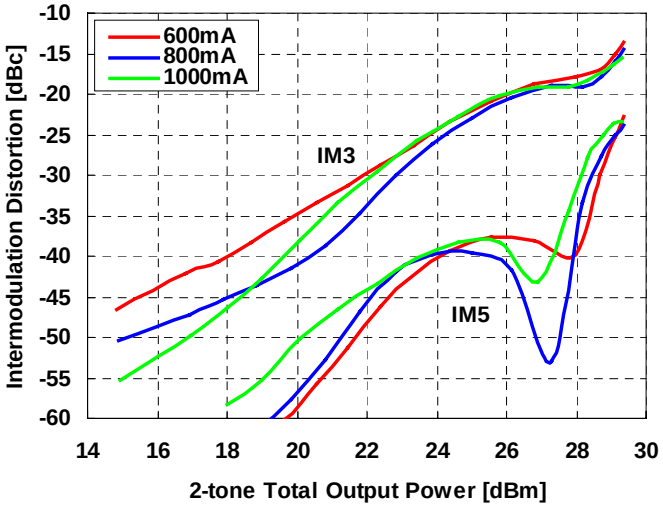
IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

VDD=6V, f=21.2GHz



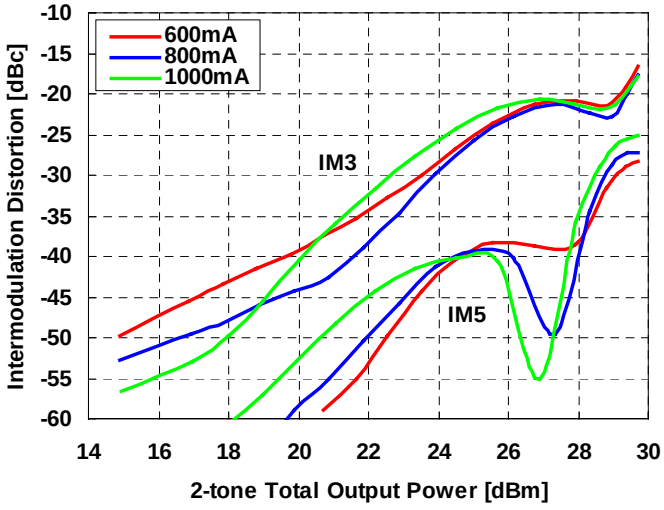
IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

VDD=6V, f=23.6GHz



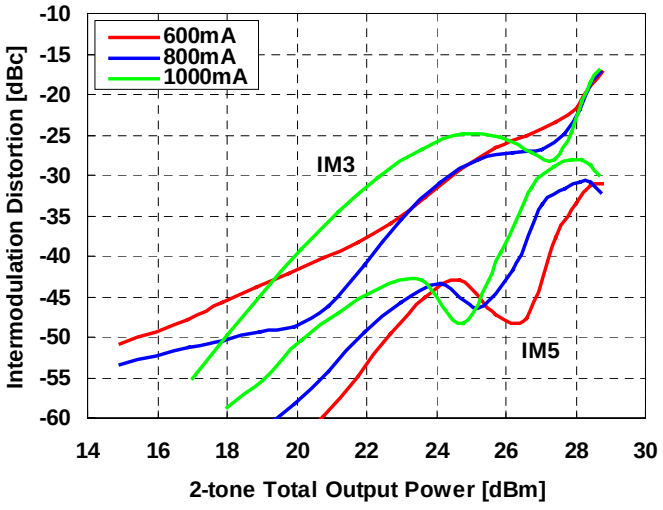
IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

VDD=6V, f=24.5GHz



IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

VDD=6V, f=26.5GHz



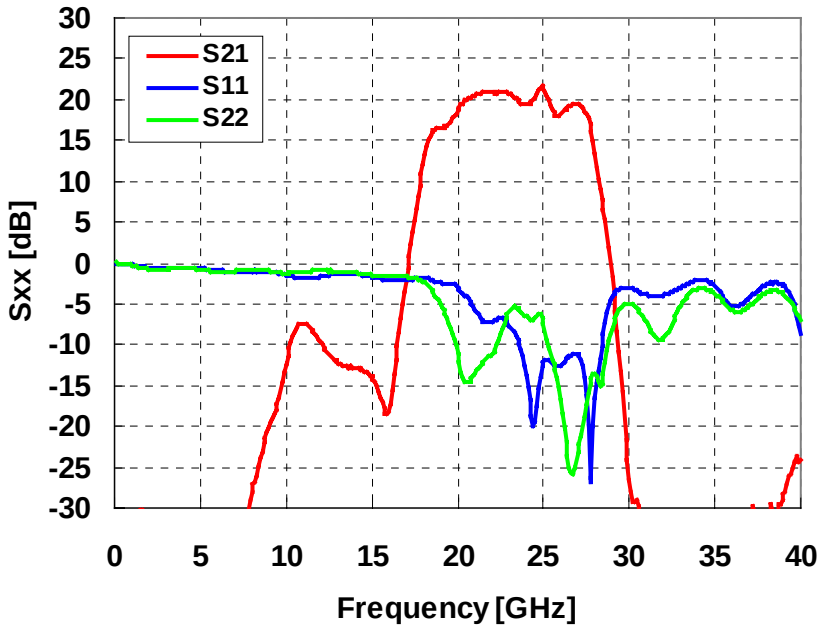
■S-PARAMETER

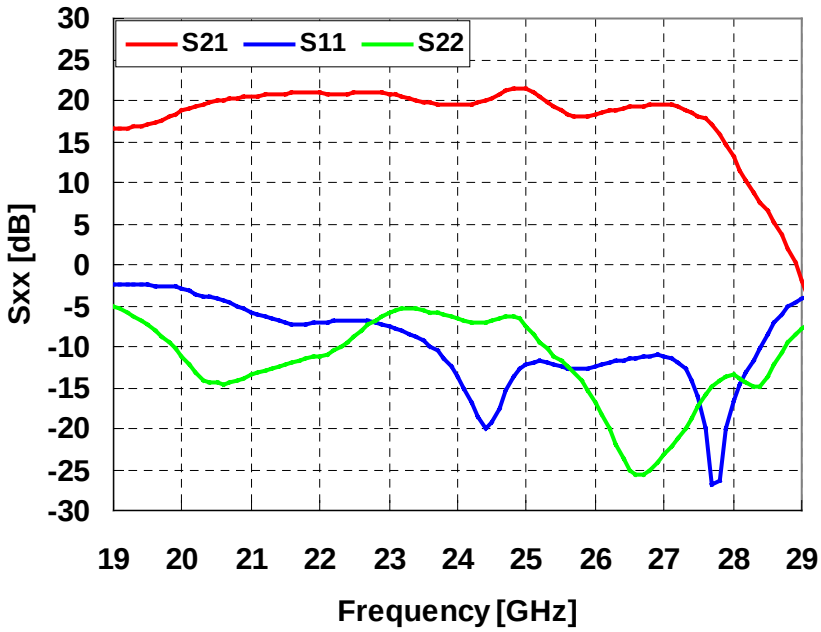
VDD=6V, IDD=800mA

Frequency	S11		S21		S12		S22	
[GHz]	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.0	0.98	-32.4	0.01	-30.1	0.00	165.4	0.97	-49.9
2.0	0.93	-62.5	0.02	45.1	0.00	144.3	0.92	-90.2
3.0	0.93	-84.7	0.02	-38.2	0.00	167.6	0.92	-120.7
4.0	0.94	-103.5	0.02	-94.5	0.00	166.4	0.93	-149.6
5.0	0.93	-127.4	0.02	-130.9	0.00	132.8	0.91	174.3
6.0	0.90	-159.1	0.02	-169.6	0.00	102.5	0.88	136.1
7.0	0.89	168.7	0.02	170.9	0.00	14.9	0.89	107.2
8.0	0.89	143.8	0.04	153.3	0.00	-13.0	0.92	84.9
9.0	0.89	121.2	0.10	105.3	0.00	-100.8	0.90	55.4
10.0	0.84	89.4	0.24	47.3	0.00	-158.6	0.87	15.9
11.0	0.80	45.0	0.43	-60.8	0.00	162.8	0.89	-12.3
12.0	0.83	9.7	0.33	-147.1	0.00	-68.9	0.90	-25.2
13.0	0.85	-7.1	0.25	156.4	0.00	-83.4	0.89	-34.6
14.0	0.85	-16.0	0.23	110.3	0.00	-135.2	0.87	-51.2
15.0	0.83	-33.3	0.20	62.6	0.01	-170.4	0.84	-78.8
16.0	0.78	-64.9	0.12	72.6	0.01	115.9	0.83	-105.9
17.0	0.79	-99.5	0.79	67.6	0.00	21.9	0.82	-125.5
18.0	0.81	-120.6	4.02	-21.4	0.00	-82.4	0.77	-142.9
19.0	0.76	-128.6	6.67	-150.4	0.00	-115.8	0.56	-164.7
20.0	0.71	-139.8	8.59	118.6	0.00	174.5	0.27	139.1
21.0	0.52	-175.1	10.65	17.0	0.00	64.8	0.21	-19.6
21.2	0.48	172.6	10.84	-2.4	0.00	22.7	0.23	-34.5
21.4	0.45	159.4	10.99	-22.2	0.00	-26.9	0.24	-49.2
21.6	0.43	145.7	11.12	-41.7	0.00	-102.6	0.25	-66.2
21.8	0.43	133.3	11.17	-61.3	0.00	-157.3	0.27	-86.0
22.0	0.44	120.9	11.06	-80.7	0.00	128.8	0.28	-107.0
22.2	0.45	109.7	10.93	-99.4	0.00	63.7	0.30	-124.3
22.4	0.46	100.0	11.02	-117.8	0.00	20.8	0.34	-139.3
22.6	0.46	91.2	11.12	-136.6	0.00	-0.5	0.39	-152.2
22.8	0.44	84.0	11.12	-157.0	0.00	-12.0	0.46	-164.9
23.0	0.42	77.6	10.93	-176.4	0.00	-34.0	0.51	-176.8
23.2	0.39	72.6	10.63	163.5	0.00	-50.9	0.54	173.3
23.4	0.36	66.2	10.12	145.1	0.00	-57.0	0.53	164.9
23.6	0.32	59.2	9.66	128.0	0.00	-64.5	0.52	160.0
23.8	0.27	50.4	9.53	111.5	0.00	-73.2	0.49	157.5
24.0	0.20	38.1	9.38	95.6	0.00	-73.5	0.47	156.9
24.2	0.14	16.4	9.47	79.2	0.00	-77.1	0.45	158.0
24.4	0.10	-31.6	9.97	62.5	0.00	-70.3	0.45	160.3
24.6	0.13	-93.2	10.88	43.7	0.00	-60.7	0.47	159.0
24.8	0.21	-131.1	11.84	19.9	0.01	-71.2	0.48	151.3
25.0	0.25	-155.7	11.72	-7.8	0.01	-92.4	0.42	140.5
25.2	0.26	-171.8	10.52	-33.0	0.01	-111.0	0.34	135.6
25.4	0.25	179.6	9.21	-53.4	0.01	-126.2	0.28	134.8
25.6	0.24	175.9	8.30	-70.4	0.01	-127.9	0.24	130.5
25.8	0.23	174.3	7.97	-85.2	0.00	-130.5	0.20	121.0
26.0	0.24	172.5	8.12	-101.7	0.00	-136.5	0.15	106.8
26.2	0.25	168.8	8.57	-121.4	0.00	-143.3	0.10	88.6
26.4	0.26	162.7	8.90	-143.6	0.00	-158.3	0.07	61.7
26.6	0.27	154.5	9.23	-167.8	0.00	-165.8	0.05	23.1
26.8	0.28	145.3	9.45	166.6	0.00	-172.7	0.06	-16.6
27.0	0.28	132.0	9.41	137.8	0.00	-165.6	0.07	-50.7
28.0	0.15	-125.7	4.59	-25.6	0.01	96.4	0.21	-173.2
29.0	0.62	-168.9	0.81	-156.4	0.01	-99.6	0.40	-168.3
30.0	0.71	155.4	0.05	150.2	0.01	-179.6	0.56	172.9
31.0	0.64	119.8	0.01	157.7	0.01	-15.9	0.43	158.8
32.0	0.64	88.1	0.01	167.4	0.01	-107.6	0.34	124.5
33.0	0.71	76.0	0.00	-172.0	0.01	-116.2	0.55	81.1
34.0	0.79	67.6	0.00	-164.3	0.01	-133.6	0.69	62.8
35.0	0.72	42.5	0.01	-119.5	0.01	-124.2	0.65	45.5
36.0	0.54	-9.8	0.02	-174.3	0.02	-177.1	0.51	-3.1
37.0	0.61	-49.6	0.03	115.0	0.03	115.8	0.55	-50.8
38.0	0.74	-53.9	0.03	28.5	0.03	24.8	0.66	-59.6
39.0	0.73	-53.6	0.04	-22.8	0.04	-28.7	0.65	-65.9
40.0	0.37	-82.9	0.06	-120.3	0.06	-118.6	0.45	-100.3

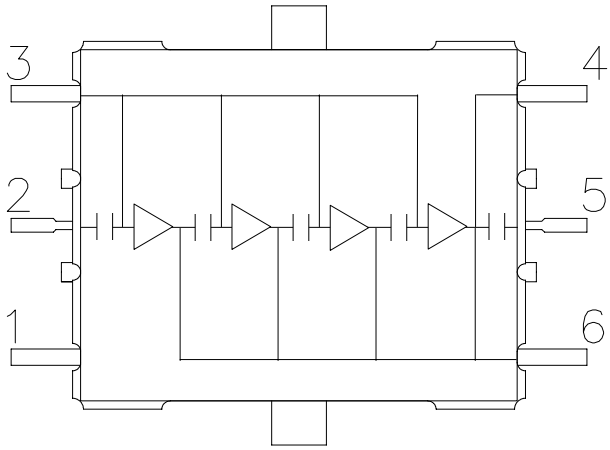
■S-PARAMETER

VDD=6V, IDD(DC)=800mA



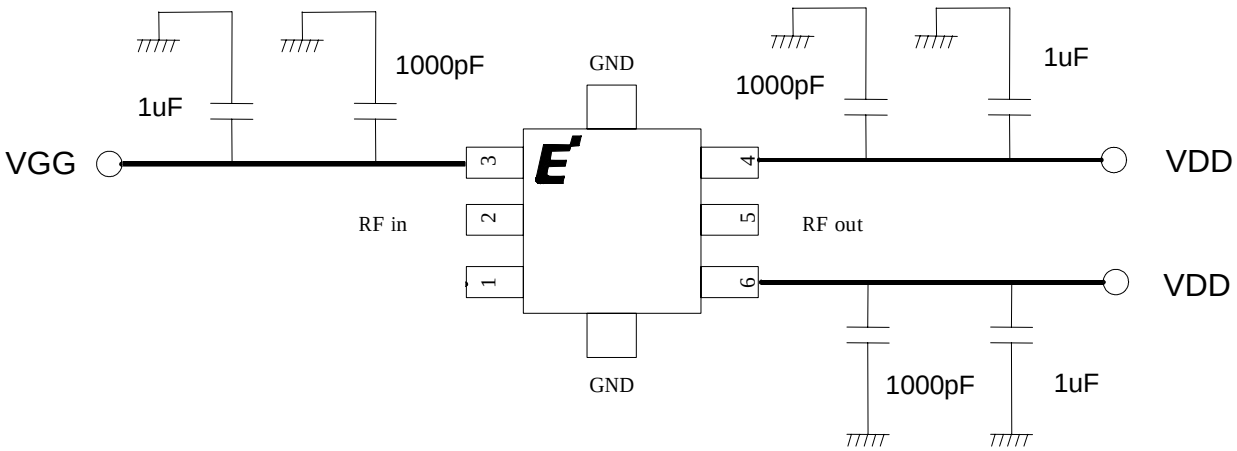


■ Block diagram



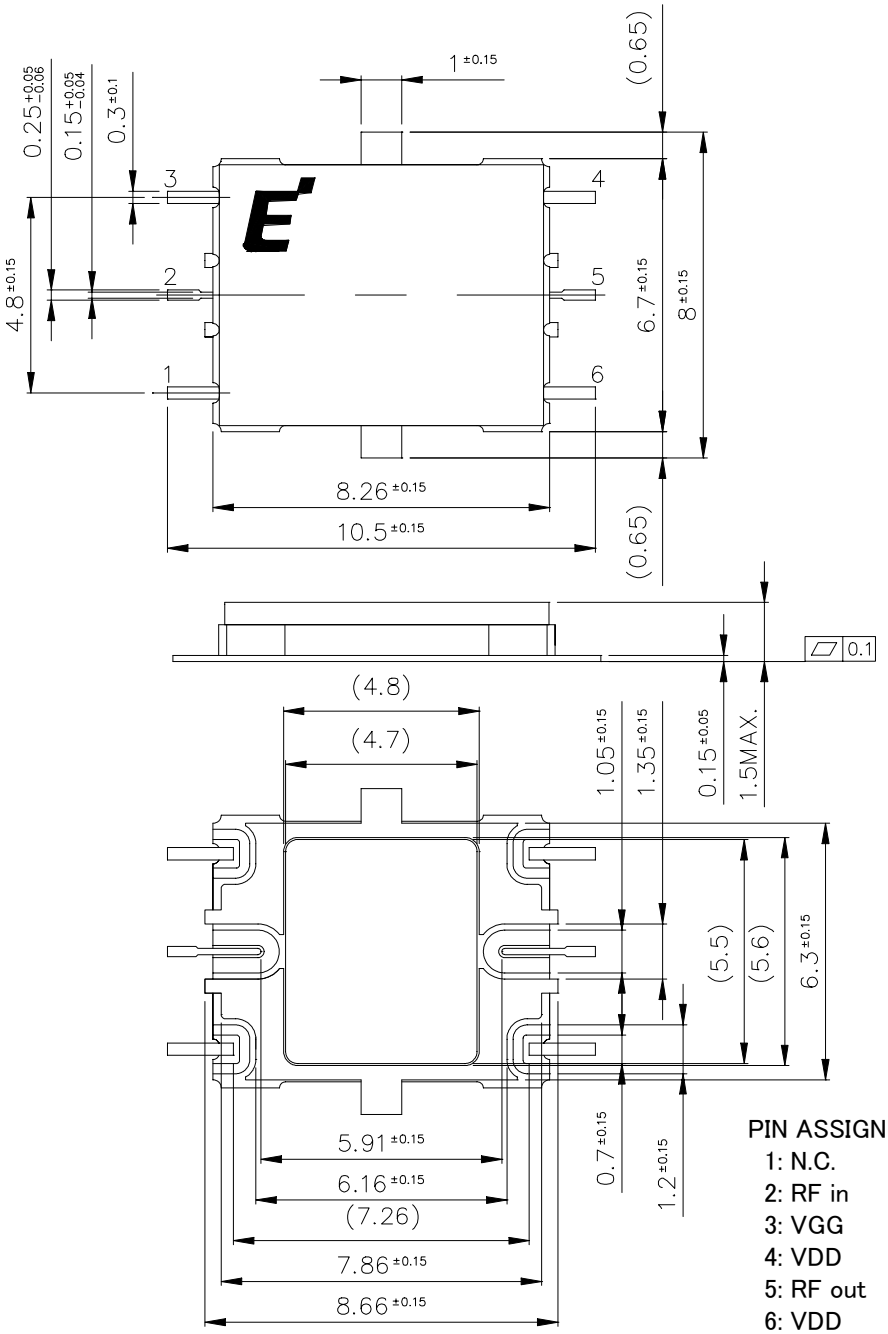
PIN ASSIGMENT
1 : N.C.
2 : RF in
3 : VGG
4 : VDD
5 : RF out
6 : VDD

■ 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 VDD are internally connected.

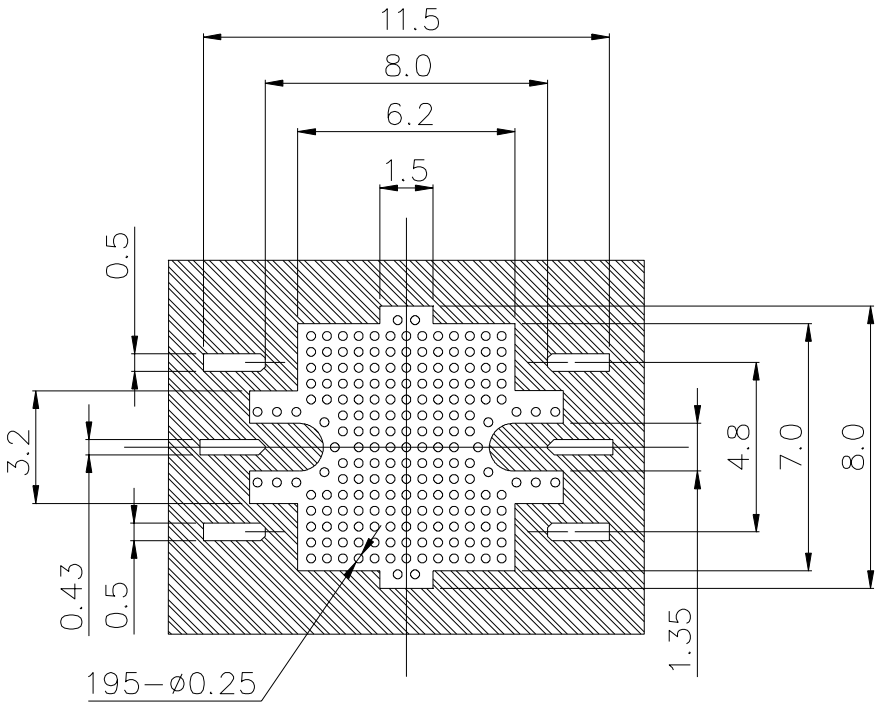
■ **Package Outline**



PIN ASSIGNMENT
1: N.C.
2: RF in
3: VGG
4: VDD
5: RF out
6: VDD

Unit : mm

■ **PCB Pads and Solder-resist Pattern**

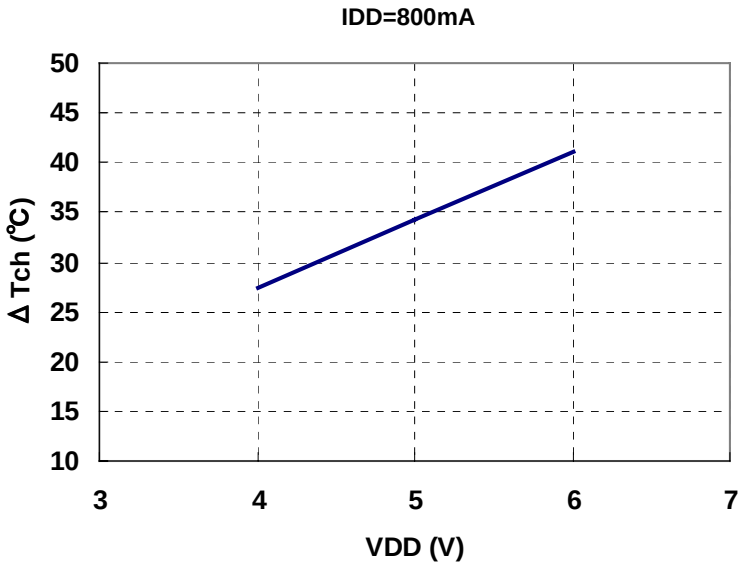


Notes :

1.LAMINATE : Rogers Corporation RO4003, Thickness t=0.2mm, Cu Foil 18 μ m
Finish to copper foil ; Ni 0.1 μ m min./Au 0.1±0.08 μ m (Both side)

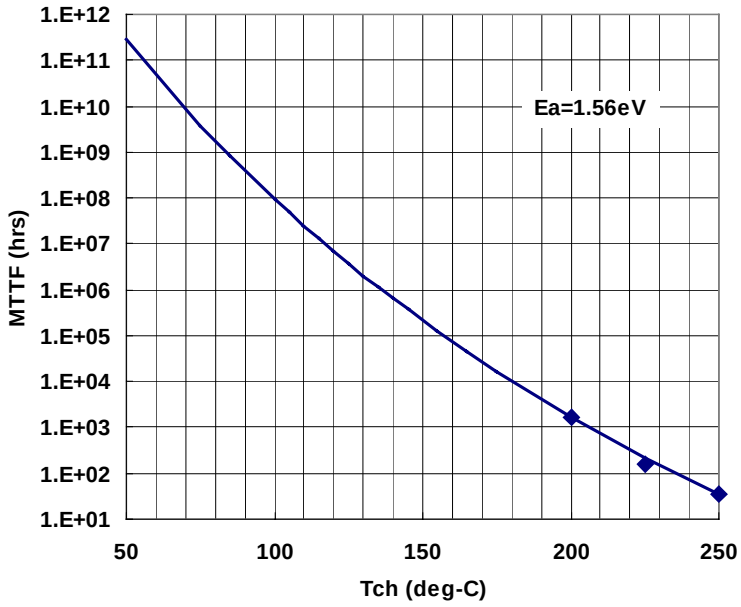
2. ▨ : Resist

ΔTch vs. Drain Voltage (Reference)



Note: ΔTch : Temperature Rise from Backside of the Package to Channel.

MTTF vs. Tch



■ Mounting Instructions for VU Package for Lead-free solder

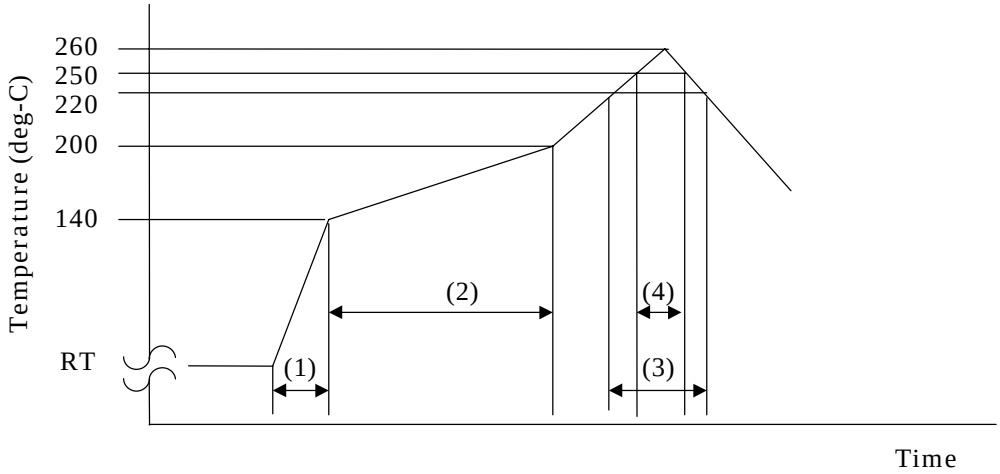
Mounting Condition

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.

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: +39-02-8738-1695

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

CAUTION

Eudyna Devices Inc. products contain **gallium arsenide (GaAs)** which can be hazardous to the human body and the environment. For safety, observe the following procedures:

・Do not put these products into the mouth.

・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.

・Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.