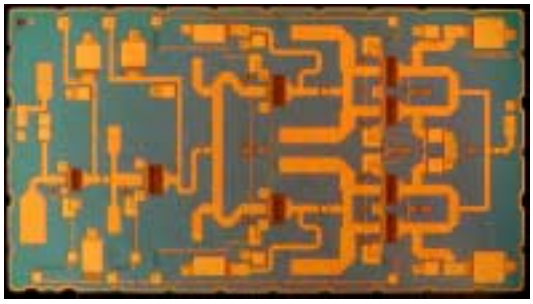
FMM5829X

K-Band Power Amplifier MMIC



FEATURES

- •High Output Power; P1dB = 31 dBm (Typ.)
- •High Linear Gain; GL = 23 dB(Typ.)
- •Frequency Band ; 21.0 - 27.0 GHz
- •High Linearity ; OIP3 = 39dBm
- •Impedance Matched Zin/Zout = 50Ω

DESCRIPTION

The FMM5829X is a power amplifier MMIC that contains a four stage amplifier, internally matched, for standard communications band in 21.0 to 27.0GHz frequency range. This product is well suited for point-to-point radio applications.

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

ABSOLUTE MAXIMUM RATING

Item	Symbol	Condition	Rating	Unit
Drain-Source Voltage	VDD		10	V
Gate-Source Voltage	VGG		-3	V
Input Power	Pin		22	dBm
Storage Temperature	Tstg		-55 ~ +125	degC

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Recommend	Unit
Drain-Source Voltage	VDD		≦7	V
Input Power	Pin		12	dBm
Operating Backside Temperature	Top		-40 ~ +85	degC

This Product should be hermetically packaged.

ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25℃)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Frequency Range	f	VDD=6V	21	-	27	GHz
Output Power at 1dB G.C.P.	P1dB	IDD(DC)=800mA(typ)	29.0	31.0	-	dBm
Power Gain at 1dB G.C.P.	G1dB	Zs=Zl=50ohm	19	22	25	dB
Power-added Efficiency at 1dB G.C.P.	Nadd		-	21	-	%
Third Order Intermodulation*	IM3*	*df=10MHz,Po=20dBm (SCL)	-34	-38	-	dBc
Drain Current at 1dB G.C.P.	Iddrf		-	1000	1500	mA
Input Return Loss (at Pin=-20dBm)	RLin		-	-8		dB
Output Return Loss (at Pin=-20dBm)	RLout		-	-8	-	dB

Note : RF parameter sample size 10ps. Criteria (accept/reject)=(0/1)

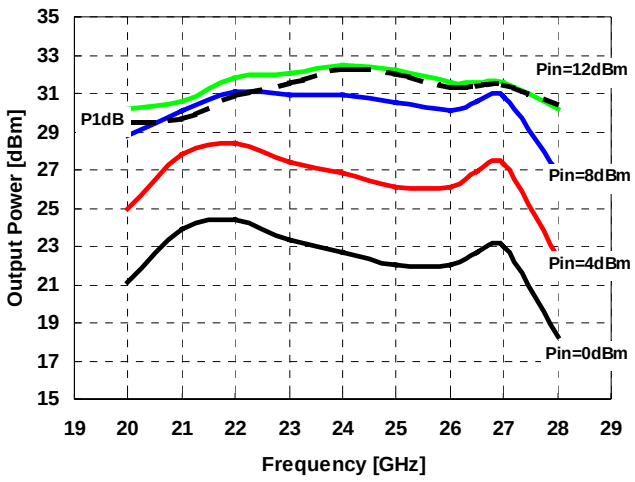
G.C.P. : Gain Compression Point
S.C.L. : Single Carrier Level

ESD	**Class 0**	**~ 199V**

Note : Based on EIAJ ED-4701 C-111A(C=100pF, R=1.5kΩ)

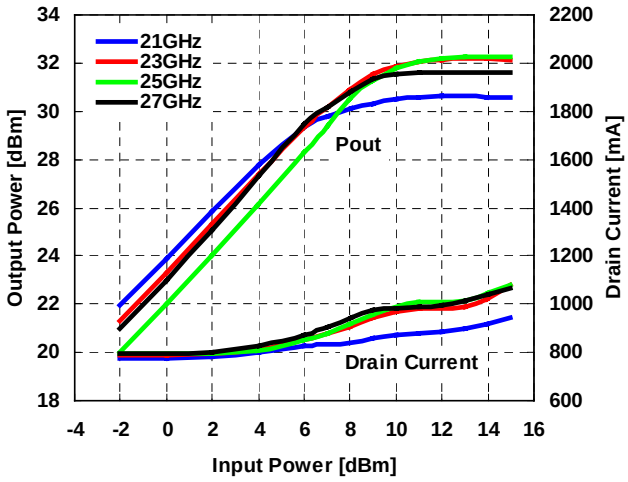
Output Power vs. Frequency

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



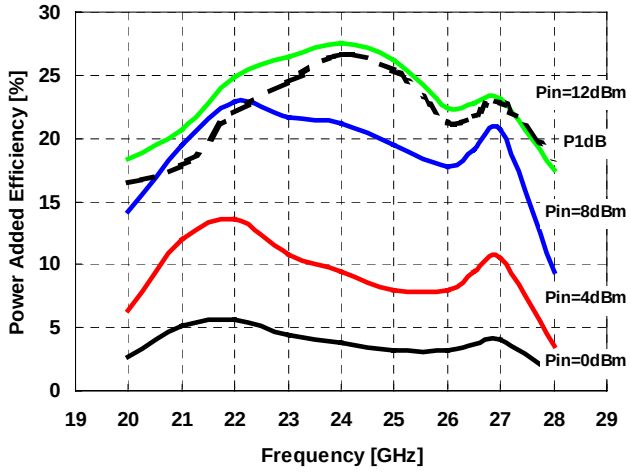
Output Power, Drain Current vs. Input Power

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



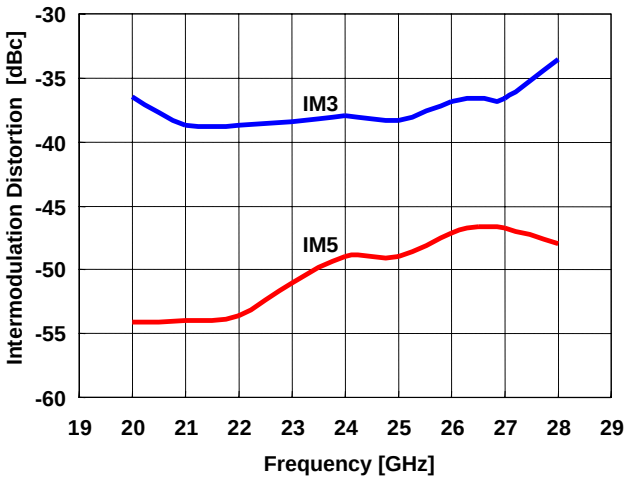
Power Added Efficiency vs. Frequency

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



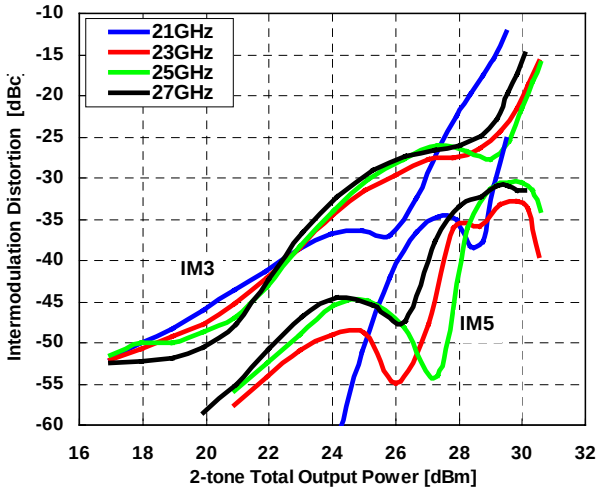
IMD vs. Frequency

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



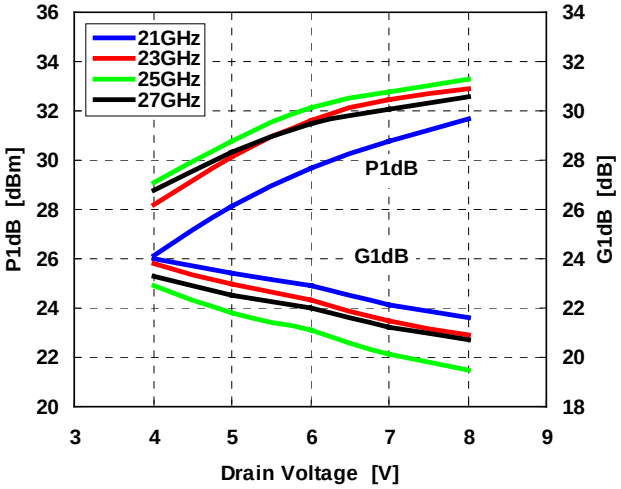
IMD vs. Output Power

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



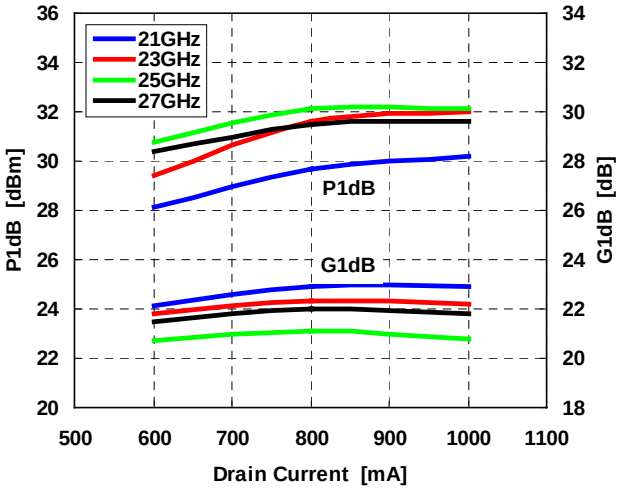
Output Power, Gain vs. Drain Voltage

IDD(DC)=800mA



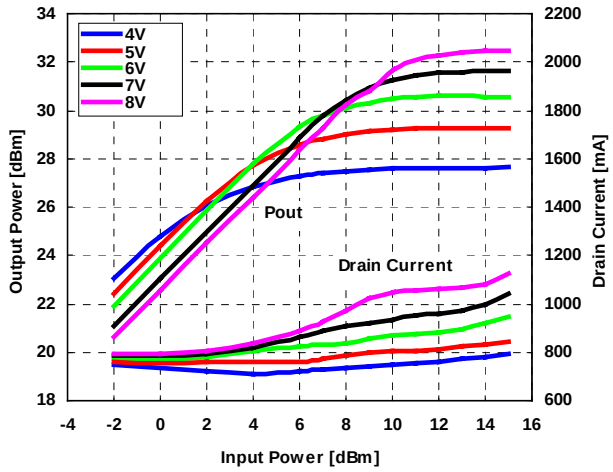
Output Power, Gain vs. Drain Current

VDD=6V



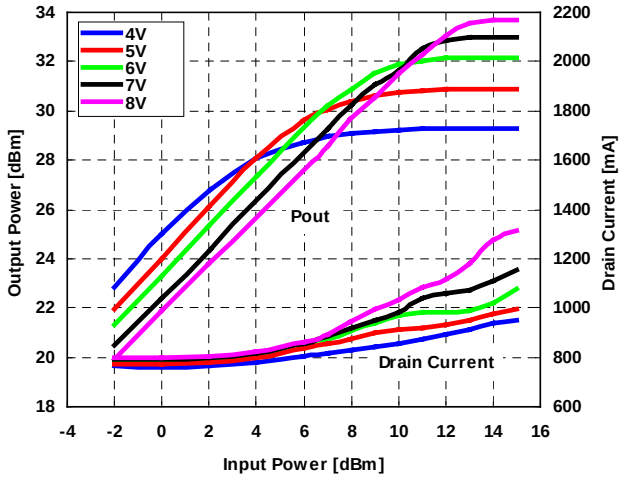
Output Power, Drain Current vs. Input Power by Drain Voltage

IDD(DC)=800mA, f=21GHz



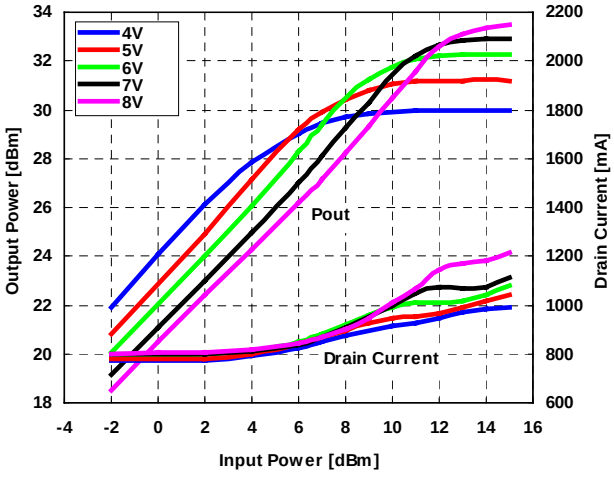
Output Power, Drain Current vs. Input Power by Drain Voltage

IDD(DC)=800mA, f=23GHz



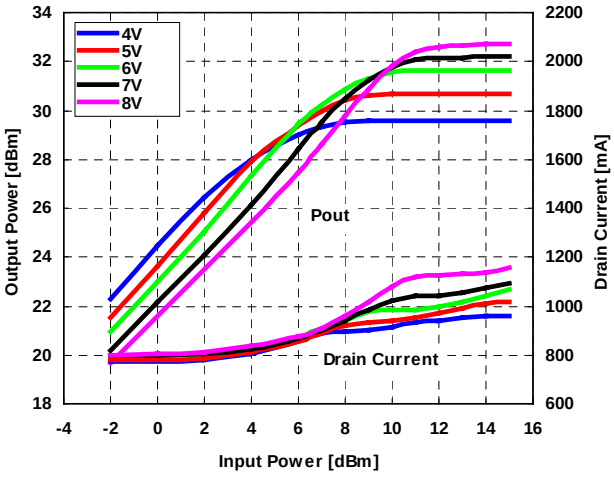
Output Power, Drain Current vs. Input Power by Drain Voltage

IDD(DC)=800mA, f=25GHz



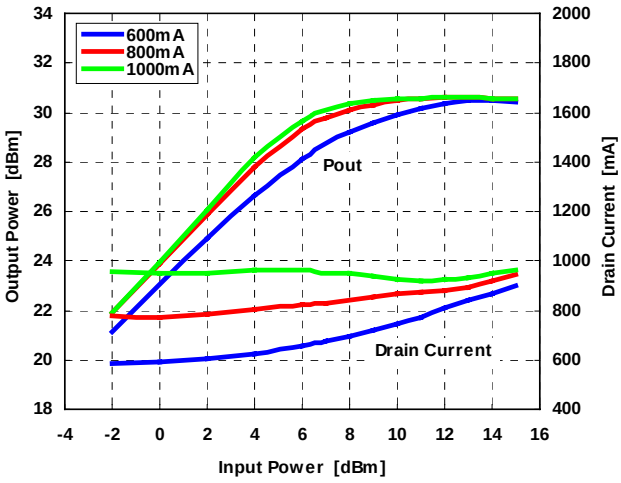
Output Power, Drain Current vs. Input Power by Drain Voltage

IDD(DC)=800mA, f=27GHz



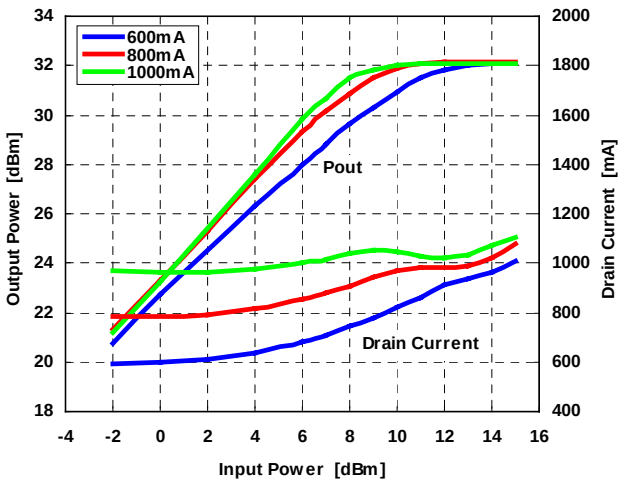
Output Power, Drain Current vs. Input Power by Drain Current

VDD=6V, f=21GHz



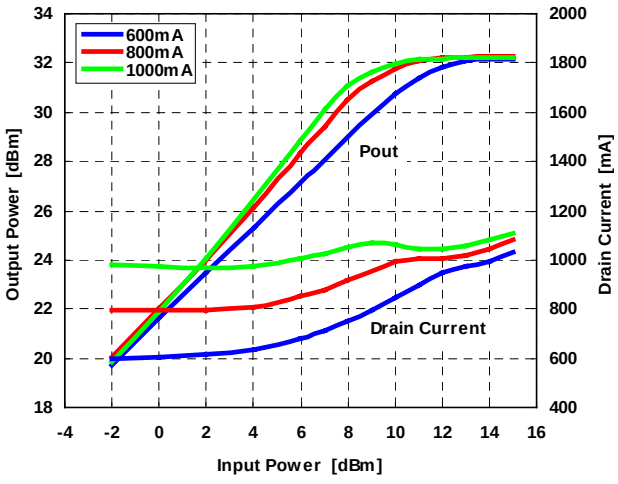
Output Power, Drain Current vs. Input Power by Drain Current

VDD=6V, f=23GHz



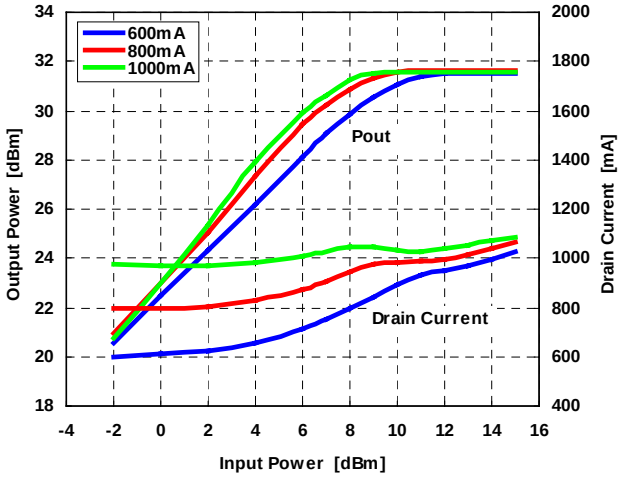
Output Power, Drain Current vs. Input Power by Drain Current

VDD=6V, f=25GHz



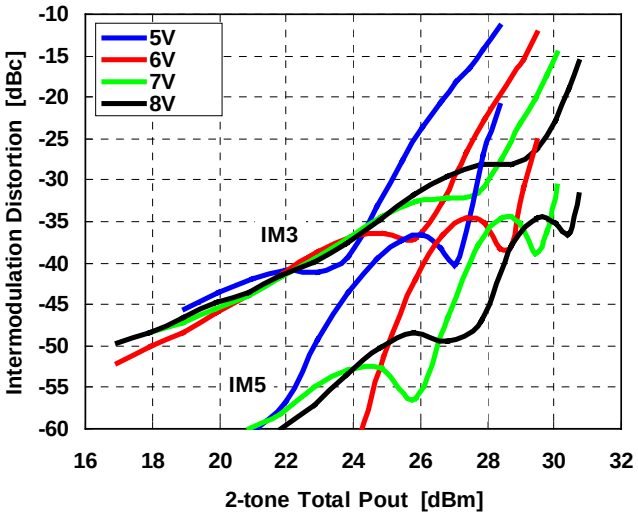
Output Power, Drain Current vs. Input Power by Drain Current

VDD=6V, f=27GHz



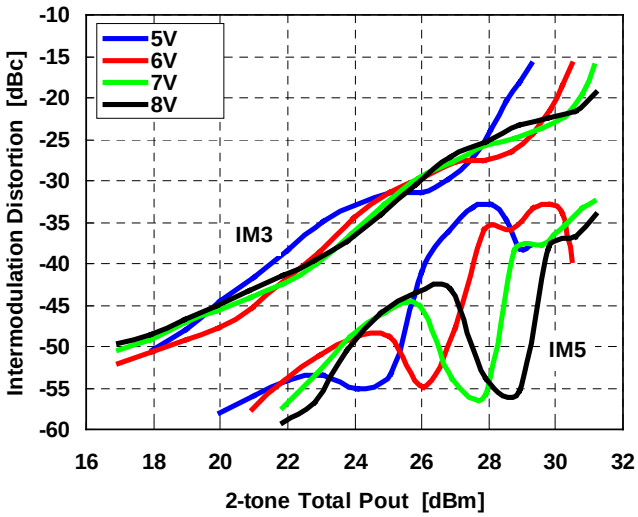
IMD vs. Output Power by Drain Voltage

IDD(DC)=800mA, f=21GHz



IMD vs. Output Power by Drain Voltage

IDD(DC)=800mA, f=23GHz



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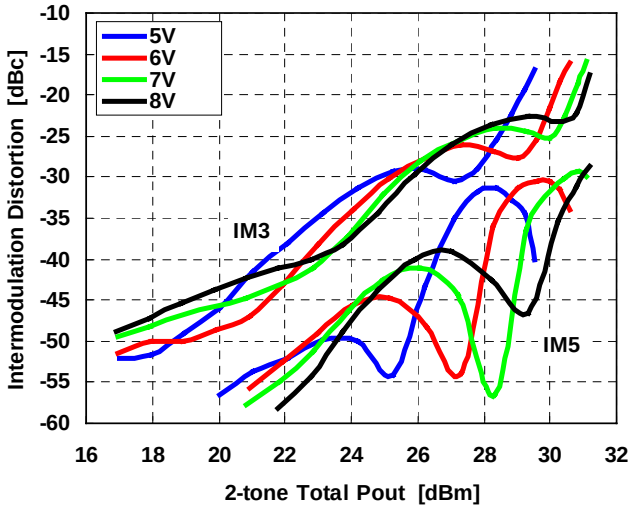
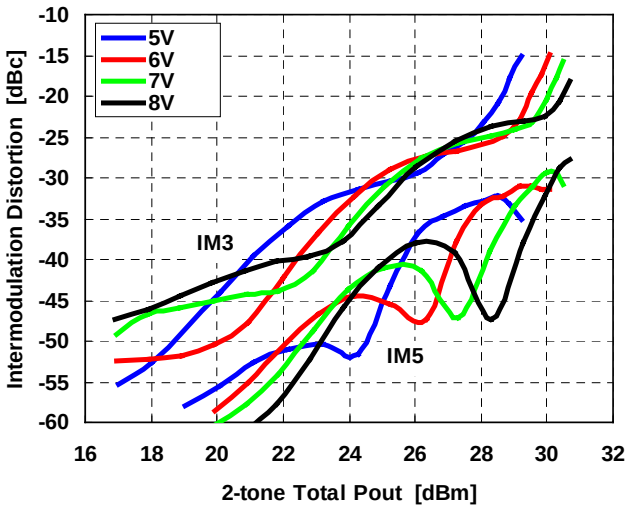
IDD(DC)=800mA, f=25GHz



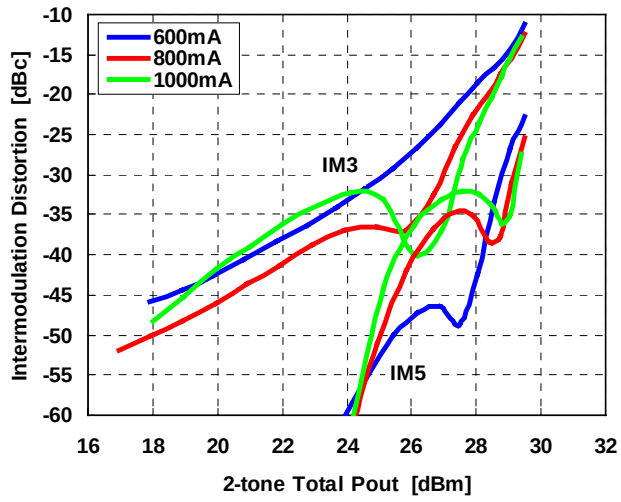
IMD vs. Output Power by Drain Voltage

IDD(DC)=800mA, f=27GHz



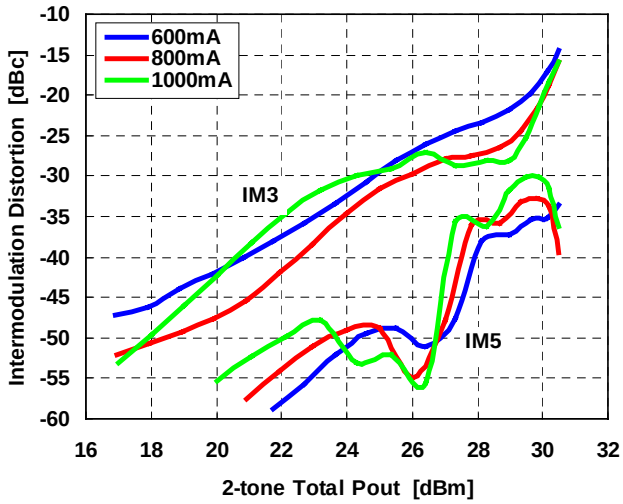
IMD vs. Output Power by Drain Current

VDD=6V, f=21GHz



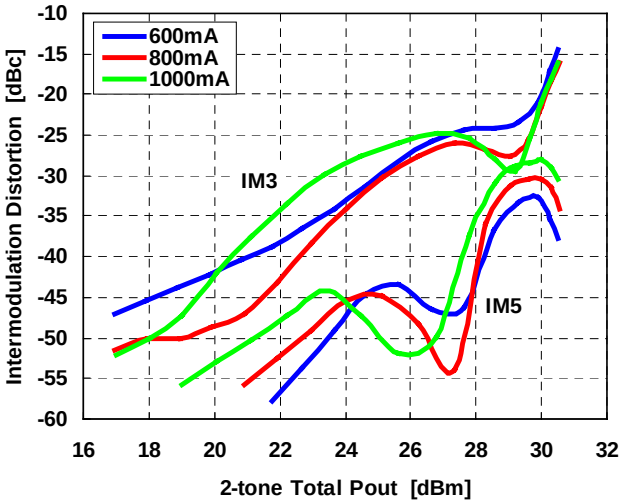
IMD vs. Output Power by Drain Current

VDD=6V, f=23GHz



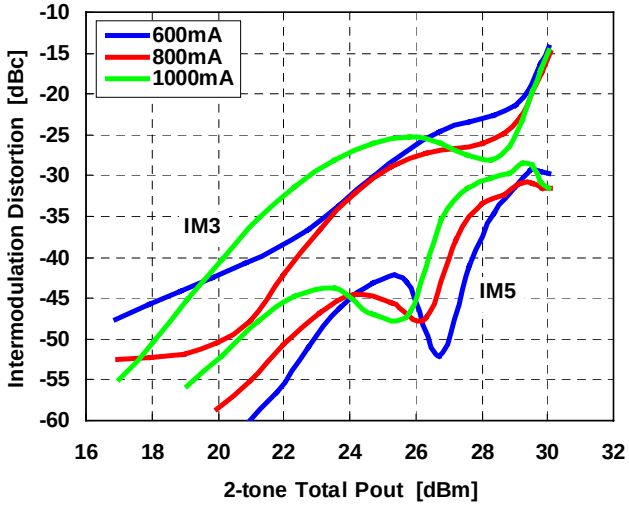
IMD vs. Output Power by Drain Current

VDD=6V, f=25GHz



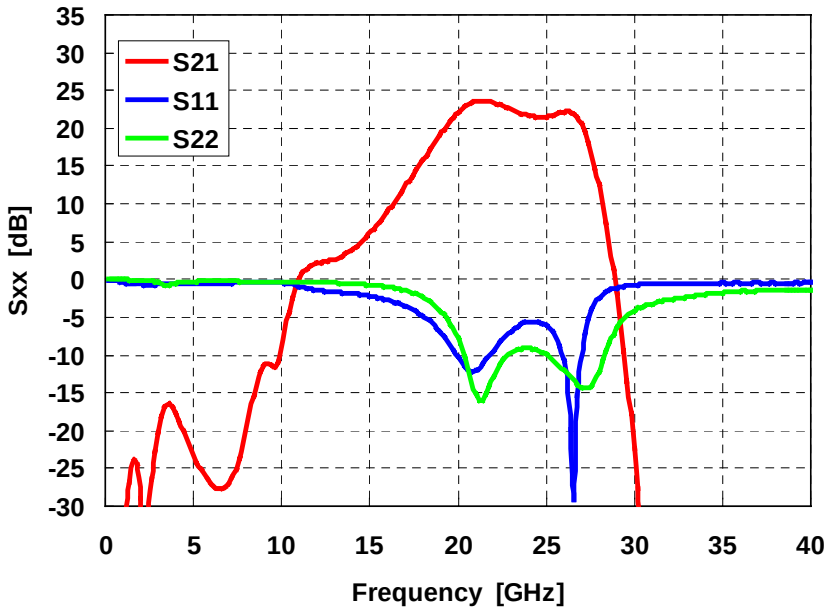
IMD vs. Output Power by Drain Current

VDD=6V, f=27GHz

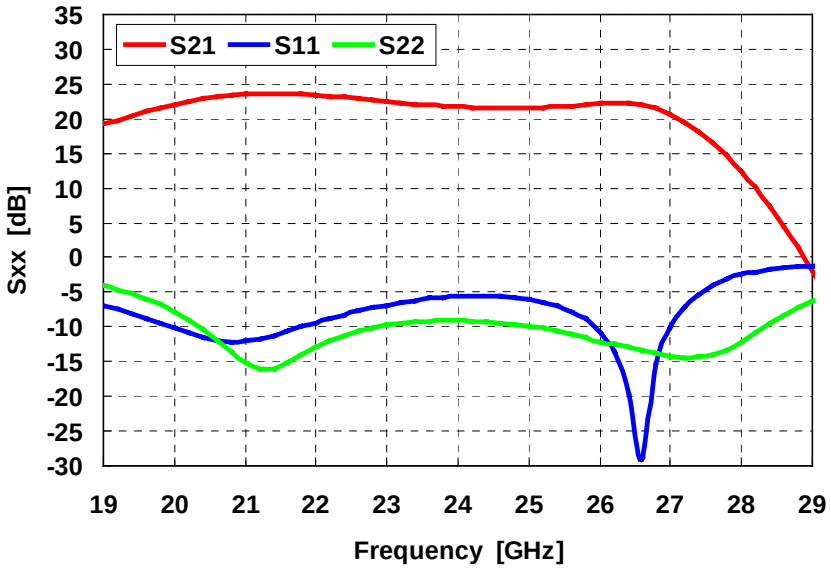


■S-PARAMETER

@VDD=6V, IDD=800mA



@VDD=6V, IDD=800mA



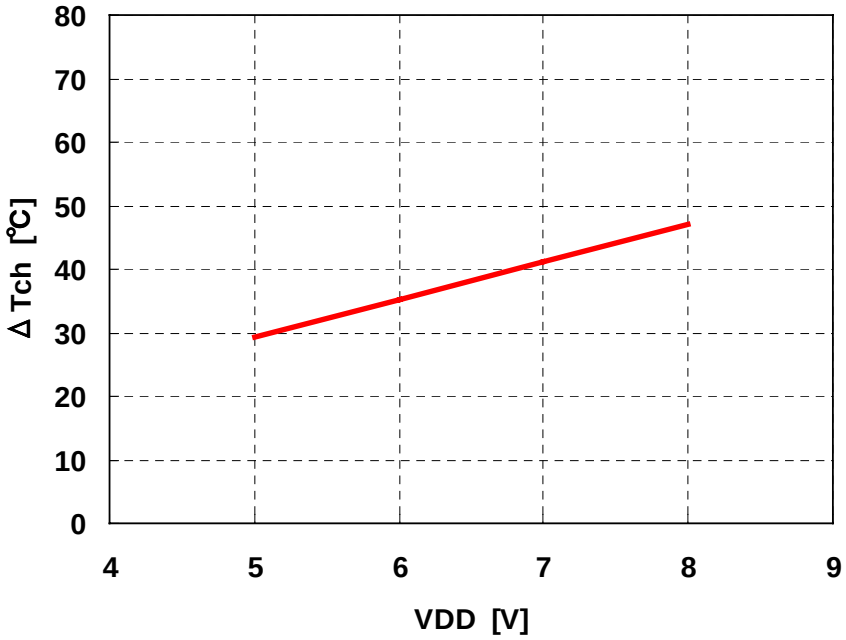
■S-PARAMETER

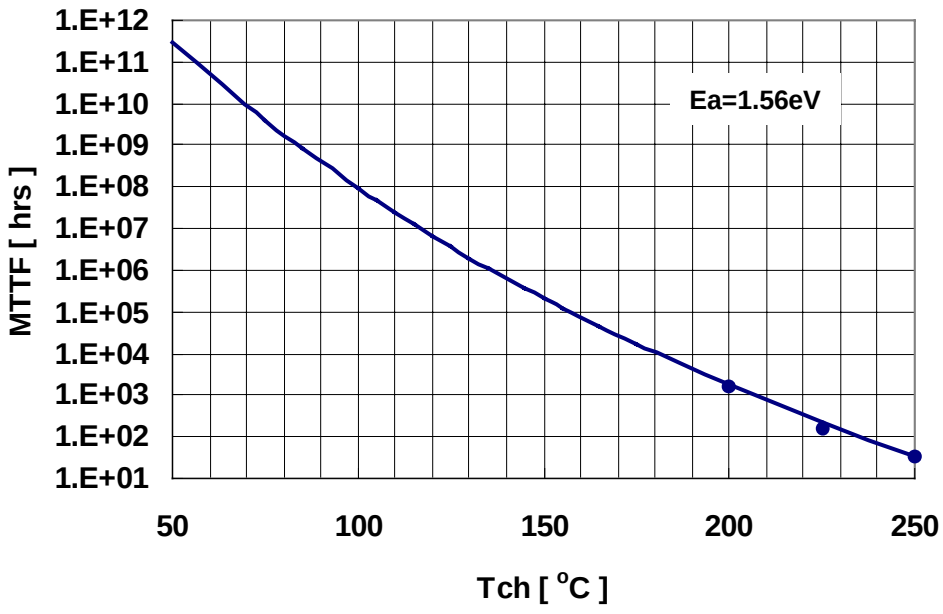
VDD=6V, IDD=800mA

Frequency	S11		S21		S12		S22	
[GHz]	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.0	0.95	-46.52	0.02	22.82	0.00	75.66	1.00	-34.80
2.0	0.93	-82.53	0.04	56.73	0.00	-144.46	0.98	-66.71
3.0	0.93	-109.37	0.10	67.04	0.00	12.27	0.96	-94.62
4.0	0.93	-130.21	0.13	-58.16	0.00	-164.67	0.94	-113.92
5.0	0.94	-146.80	0.07	-118.46	0.00	-130.04	0.97	-133.59
6.0	0.94	-160.74	0.04	-138.70	0.00	139.94	0.98	-151.02
7.0	0.95	-172.97	0.04	-134.08	0.00	54.63	0.97	-166.40
8.0	0.95	175.84	0.10	-130.87	0.00	-4.39	0.97	179.94
9.0	0.95	164.96	0.27	171.39	0.00	-90.07	0.97	167.40
10.0	0.95	153.37	0.35	144.98	0.00	-158.98	0.97	155.21
11.0	0.90	141.87	1.01	78.71	0.00	150.77	0.96	143.27
12.0	0.85	133.80	1.28	1.73	0.00	85.46	0.96	131.39
13.0	0.83	125.44	1.36	-55.99	0.00	91.85	0.95	119.43
14.0	0.80	115.80	1.58	-104.99	0.00	30.67	0.94	106.90
15.0	0.78	104.59	2.02	-152.62	0.00	29.14	0.92	93.46
16.0	0.73	91.67	2.80	157.35	0.00	43.85	0.89	78.27
17.0	0.67	76.49	4.10	103.03	0.00	1.77	0.84	60.95
18.0	0.58	57.35	6.14	42.40	0.00	-66.66	0.76	39.80
19.0	0.45	30.88	9.07	-25.14	0.00	59.15	0.62	12.21
20.0	0.31	-11.12	12.64	-101.25	0.00	59.30	0.41	-27.35
21.0	0.25	-81.26	14.97	175.66	0.00	-113.49	0.17	-103.83
21.2	0.26	-95.83	15.15	158.89	0.00	18.99	0.16	-130.13
21.4	0.28	-110.02	15.23	142.20	0.00	136.79	0.16	-157.96
21.6	0.29	-122.42	15.18	125.41	0.00	123.31	0.17	177.04
21.8	0.32	-133.00	15.02	108.90	0.00	57.33	0.20	158.15
22.0	0.34	-142.44	14.78	92.74	0.00	81.33	0.23	142.94
22.2	0.36	-151.02	14.52	76.77	0.00	-16.38	0.25	130.63
22.4	0.39	-158.21	14.22	61.07	0.00	113.20	0.28	119.89
22.6	0.41	-165.59	13.90	45.49	0.00	87.24	0.30	110.55
22.8	0.43	-172.08	13.59	30.13	0.00	63.06	0.31	101.86
23.0	0.45	-178.18	13.28	14.94	0.00	79.64	0.33	94.02
23.2	0.47	176.15	12.98	-0.03	0.00	30.87	0.34	86.18
23.4	0.49	170.83	12.74	-14.96	0.00	35.39	0.34	79.76
23.6	0.51	165.17	12.55	-29.90	0.00	6.94	0.35	72.97
23.8	0.52	159.85	12.35	-44.98	0.00	15.72	0.35	65.85
24.0	0.52	154.19	12.17	-60.13	0.00	-45.32	0.35	58.54
24.2	0.53	149.03	12.03	-75.24	0.00	5.77	0.35	51.37
24.4	0.53	143.99	11.92	-90.38	0.00	-3.23	0.34	44.29
24.6	0.52	139.08	11.89	-105.69	0.00	5.71	0.33	37.47
24.8	0.51	133.70	11.88	-121.55	0.00	-55.25	0.33	29.73
25.0	0.50	128.47	11.93	-137.63	0.00	-13.22	0.32	21.96
25.2	0.48	122.94	12.05	-154.24	0.00	17.56	0.31	13.58
25.4	0.45	116.83	12.21	-171.38	0.00	-1.67	0.29	3.97
25.6	0.41	111.18	12.41	170.66	0.00	-40.60	0.28	-5.76
25.8	0.36	104.32	12.63	151.62	0.00	-120.63	0.26	-15.50
26.0	0.29	97.35	12.83	131.32	0.00	-56.34	0.25	-25.73
26.2	0.21	90.19	12.93	109.68	0.00	-86.35	0.24	-36.56
26.4	0.10	84.65	12.80	86.82	0.00	4.47	0.23	-49.93
26.6	0.04	-148.03	12.48	62.47	0.00	10.48	0.22	-62.47
26.8	0.17	-135.67	11.81	36.74	0.00	-7.20	0.20	-74.09
27.0	0.31	-144.63	10.79	10.29	0.00	70.86	0.19	-85.15
28.0	0.76	170.55	4.20	-118.89	0.00	1.80	0.25	-114.71
29.0	0.87	144.56	0.80	128.02	0.00	-54.60	0.48	-152.28
30.0	0.92	128.25	0.08	53.68	0.00	-83.60	0.62	171.26
31.0	0.93	115.72	0.01	118.01	0.00	60.51	0.69	147.18
32.0	0.94	105.45	0.01	95.87	0.00	-108.88	0.74	129.01
33.0	0.94	97.03	0.00	43.09	0.00	-113.34	0.77	114.56
34.0	0.94	88.32	0.00	-59.06	0.00	-12.11	0.79	102.54
35.0	0.95	81.22	0.00	-165.76	0.00	-27.51	0.82	91.08
36.0	0.94	74.36	0.00	-125.92	0.00	-145.32	0.83	81.44
37.0	0.95	67.41	0.00	115.52	0.00	124.56	0.84	71.65
38.0	0.95	61.06	0.00	-78.22	0.00	-179.38	0.85	62.52
39.0	0.94	55.13	0.01	-170.29	0.00	-70.65	0.85	54.05
40.0	0.95	48.92	0.00	-79.65	0.00	115.57	0.86	45.74

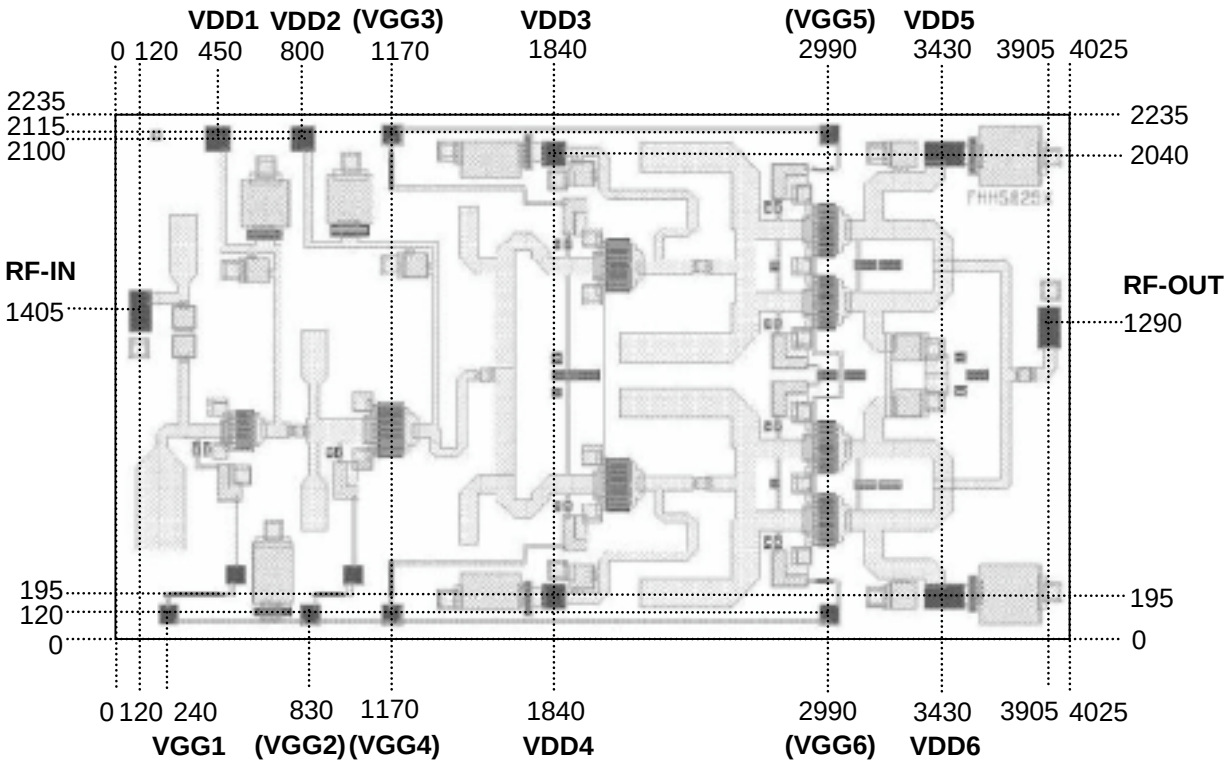
ΔTch vs. Drain Voltage (Reference)

IDD(DC)=800mA





■ **Chip Outline and Bonding Pad Locations (Dimension in Micro-Meters)**

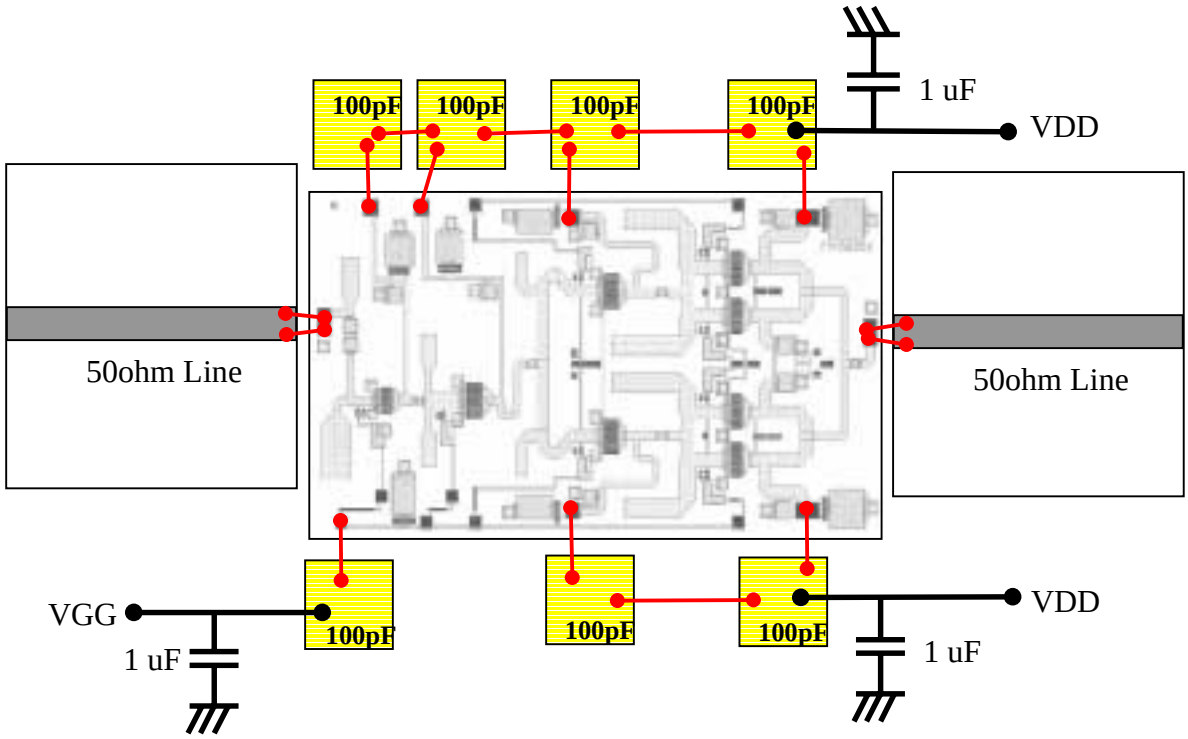


Chip Size : 4025±30um x 2235±30um
Chip Thickness : 60±20um
Bonding Pad Size :
RF-Pad : 120um x 80um
VGG-Pad : 80um x 80um
VDD-Pad : 100um x 100um

Note : Gate voltage is required from either or both bonding pad(VGG1 or/and VGG2~6).

■ Assembly Diagrams

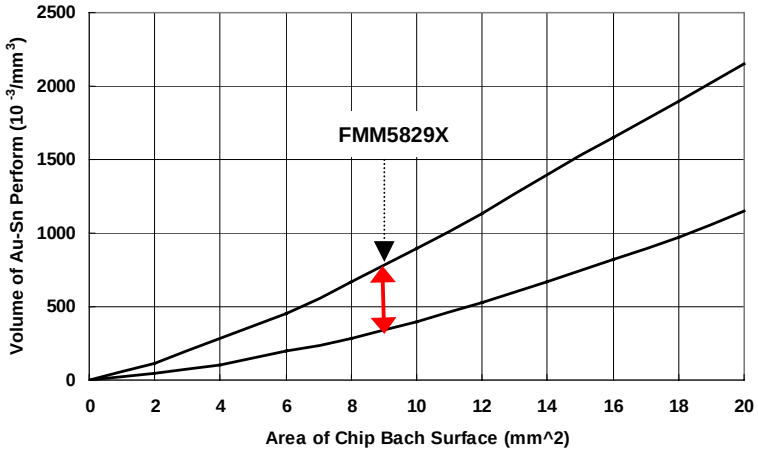
Recommended assembly



"Copper" is the recommended material for the package or carrier.

■DIE ATTACH

1) The die-attach station must have accurate temperature control and an inert forming gas should be used.
2) Chips should be kept at room temperature except during die-attach.
3) Place package or carrier on the heated stage.
4) Lightly grasp the chip edges by the longer side using tweezers.
   Die attach conditions
   Stage Temperature : 300 to 310 deg.C
   Time : less than 15 seconds
   AuSn Preform Volume : per next Figure



■ WIRE BONDING

The bonding equipment must be properly grounded. The following or equivalent equipment, tools, materials, and conditions are recommended.

1) Bonding Equipment and Bonding Tool.
   Bonding Equipment : West Bond Model 7400 (Manual Bonder)
   Bonding Tool : CCOD-1/16-S-437-60-F-2010-MP (Deweyl)
2) Bonding Wire
   Material : Hard or Half hard gold
   Diameter : 0.7 to 1.0 mil
3) Bonding Conditions
   Method : Thermal Compression Bonding with Ultrasonic Power
   Tool Force : 0.196 N ± 0.0196 N
   Stage Temperature : 215 deg.C ± 5 deg.C
   Tool Heater : None
   Ultrasonic Power Transmitter : West Bond Model 1400
   Duration : 150 mS/Bond

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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.