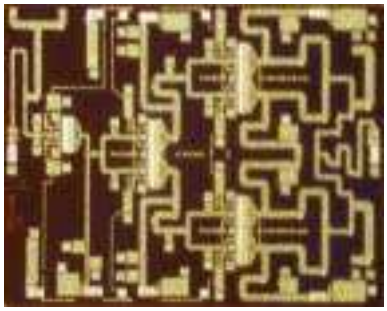
EMM5068X

X-Band Power Amplifier MMIC



FEATURES

- High Output Power: Pout=33.0dBm (typ.)
- High Linear Gain: GL=26.0dB (typ.)
- Broad Band: 9.5~13.3GHz
- Impedance Matched Zin/Zout=50Ω

DESCRIPTION

The EMM5068X is a MMIC amplifier that contains a three-stage amplifier, internally matched, for standard communications band in the 9.5 to 13.3GHz 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}	<=6	V
Input Power	P_{in}	<=12	dBm
Operating Backside Temperature	Top	-40 to +85	℃

This product should be hermetically packaged.

ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25°C)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Frequency Range	f	V_{DD}=6V	9.5	-	13.3	GHz
Output Power at 1dB G.C.P.	P_{1dB}	I_{DD}=1500mA typ.	31.0	33.0	-	dBm
Power Gain at 1dB G.C.P.	G_{1dB}	Zs=Zl=50ohm	21	25	-	dB
Power-added Efficiency at 1dB G.C.P.	η_{add}		-	21	-	%
Third Order Intermodulation*	IM_3	* : Δf=10MHz ,	-38	-45	-	dBc
Drain Current at 1dB G.C.P.	I_{DD}	2-Tone Test,	-	1500	1900	mA
Input Return Loss (at Pin=-20dBm)	RL_{in}	P_{out}=20dBm S.C.L.	-	-8	-	dB
Output Return Loss (at Pin=-20dBm)	RL_{out}		-	-8	-	dB

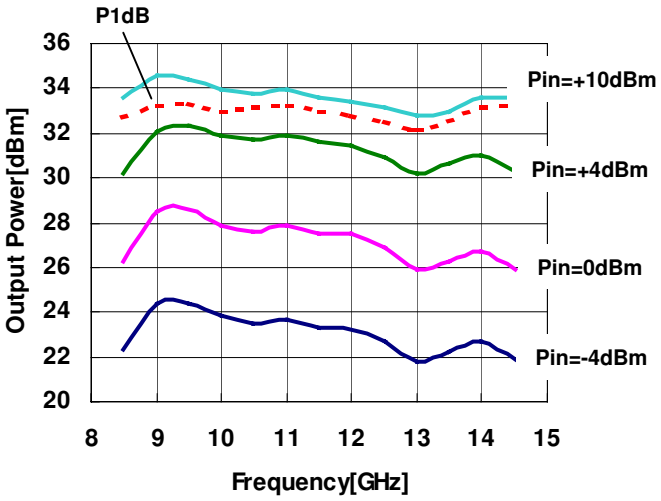
Note : RF parameter sample size 10pcs. Criteria (accept/reject)=(0/1) G.C.P.:Gain Compression Point
S.C.L.:Single Carrier Level

ESD	Class 0	~ 199 V

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

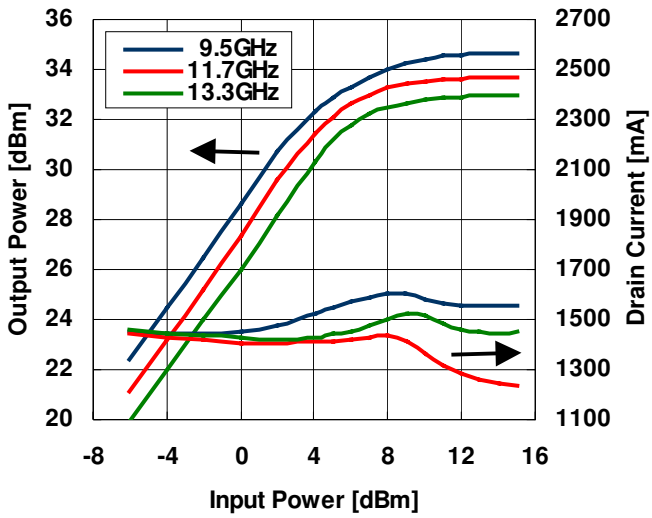
OUTPUT POWER vs. FREQUENCY

VDD=6V, IDD(DC)=1500mA



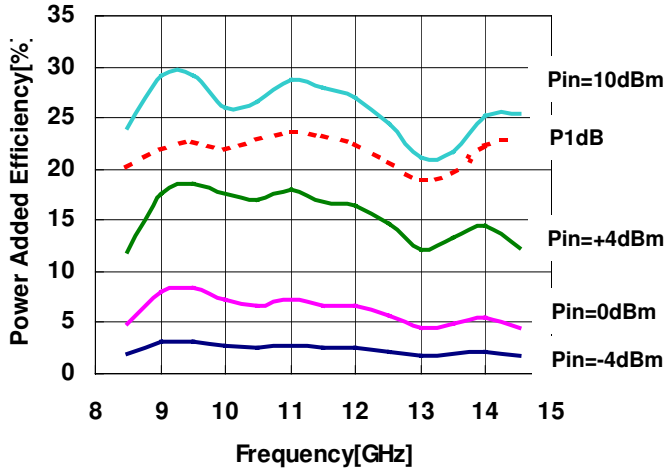
OUTPUT POWER , DRAIN CURRENT vs. INPUT POWER

VDD=6V, IDD(DC)=1500mA



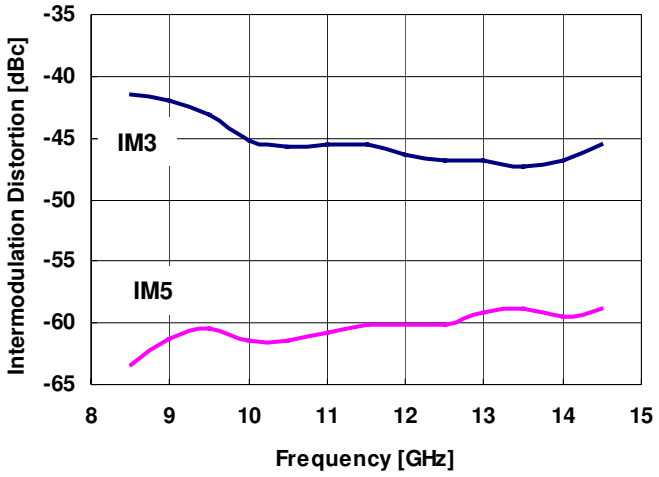
POWER ADDED EFFICIENCY vs FREQUENCY

VDD=6V, IDD(DC)=1500mA



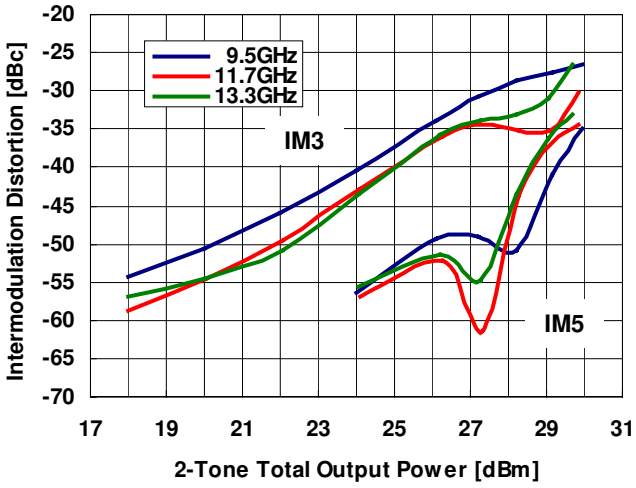
IMD vs. FREQUENCY

VDD=6V, IDD(DC)=1500mA, Pout=20dBm S.C.L.



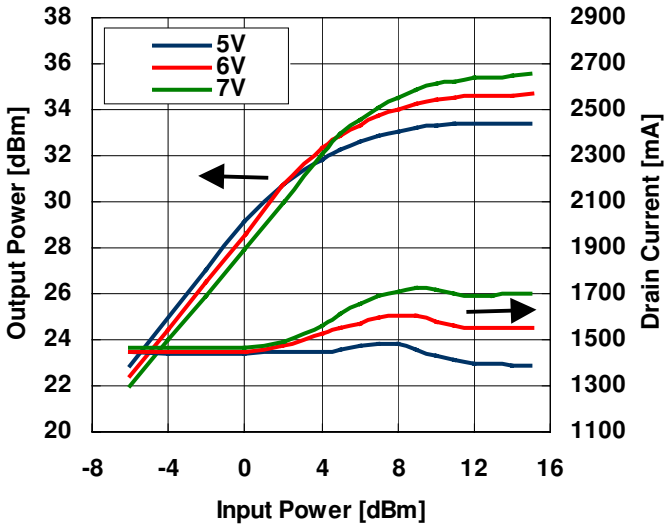
IMD vs OUTPUT POWER

VDD=6V, IDD(DC)=1500mA



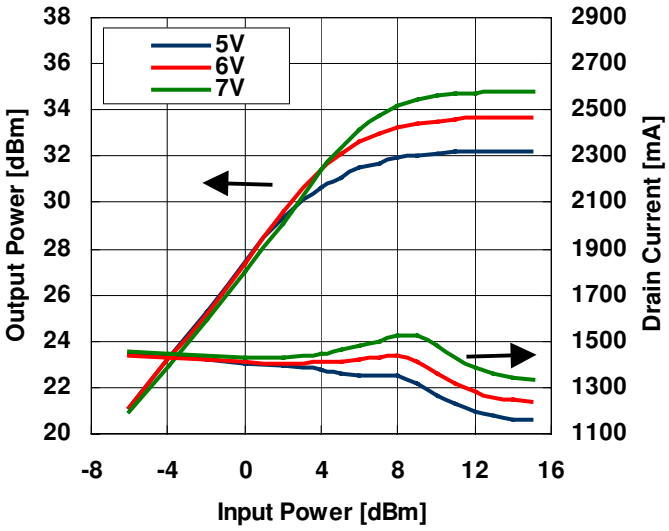
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=1500mA @9.5GHz



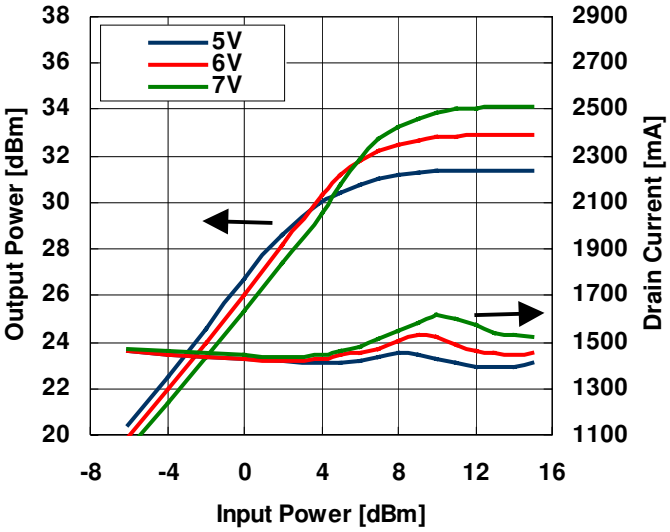
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=1500mA @11.7GHz



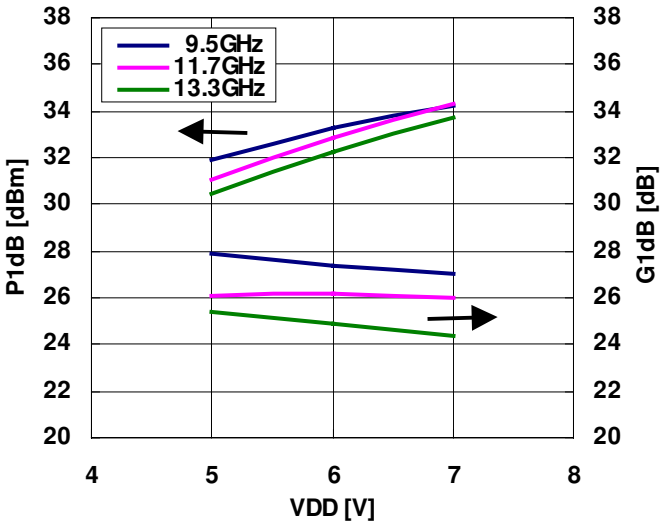
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

IDD(DC)=1500mA @13.3GHz



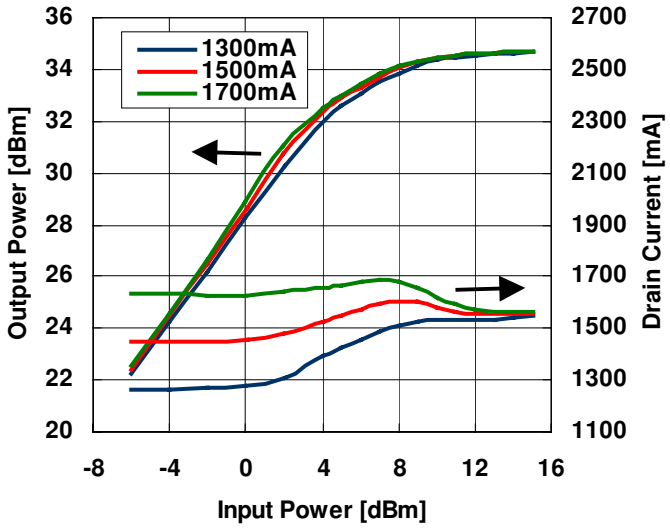
OUTPUT POWER, GAIN vs. DRAIN VOLTAGE

IDD(DC)=1500mA



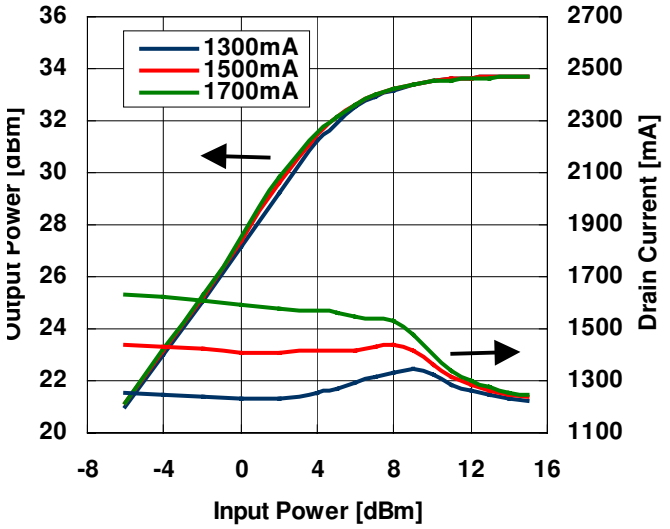
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V @9.5GHz



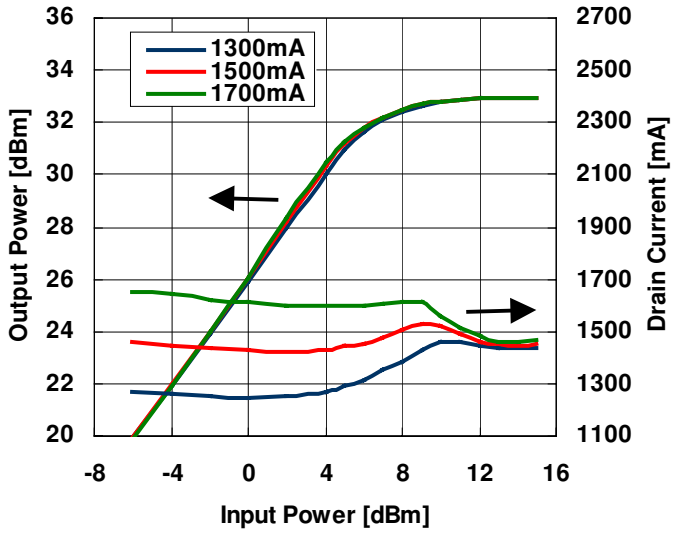
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V @11.7GHz



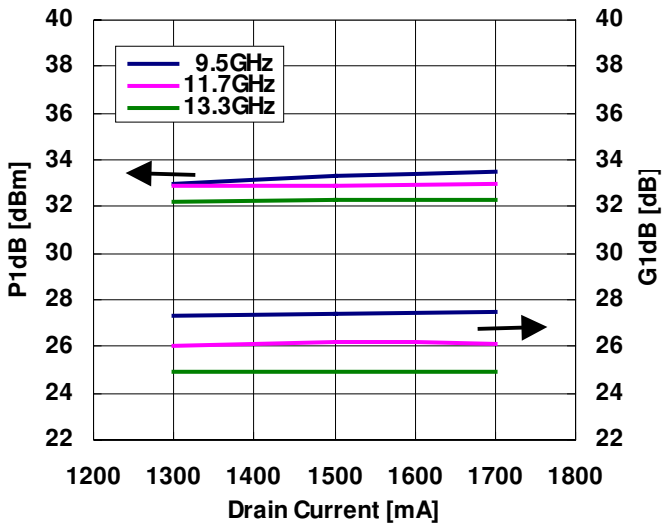
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

VDD=6V @13.3GHz



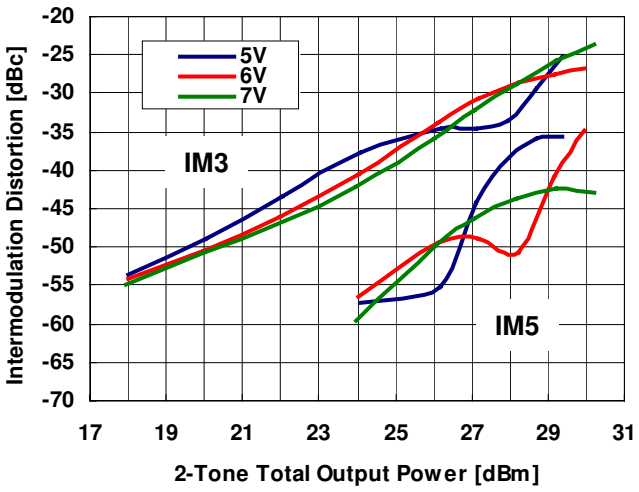
OUTPUT POWER, GAIN vs. Drain Current

VDD=6V



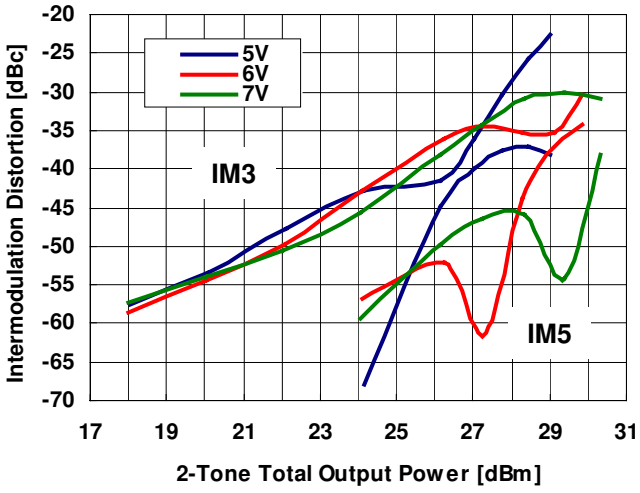
IMD PERFORMANCE vs OUTPUT POWER by Drain Voltage

IDD(DC)=1500mA @9.5GHz



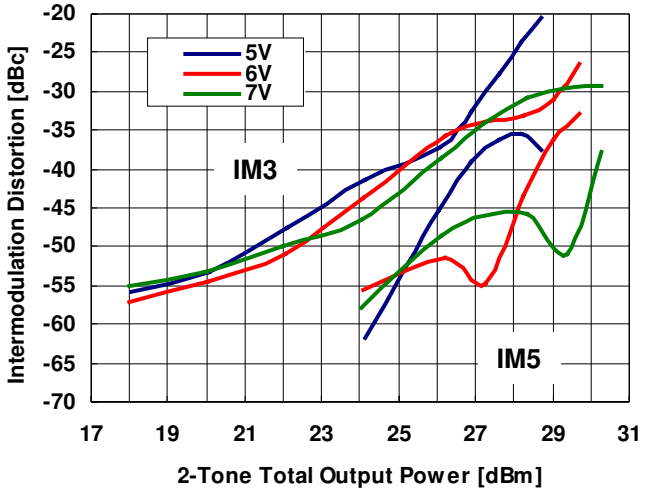
IMD PERFORMANCE vs OUTPUT POWER by Drain Voltage

IDD(DC)=1500mAV @11.7GHz



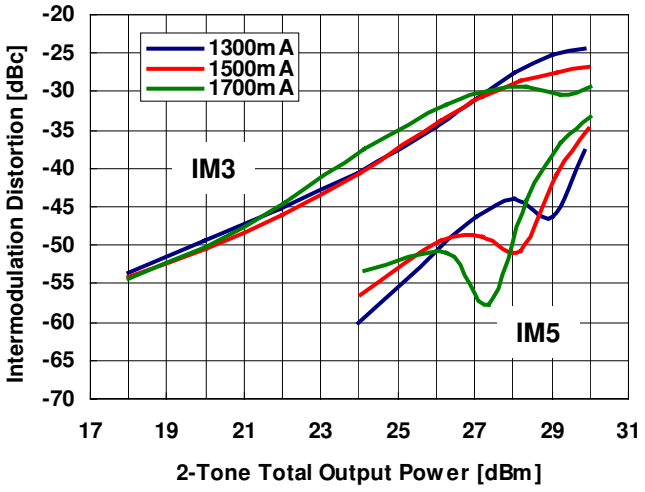
IMD PERFORMANCE vs OUTPUT POWER by Drain Voltage

IDD(DC)=1500mA @13.3GHz



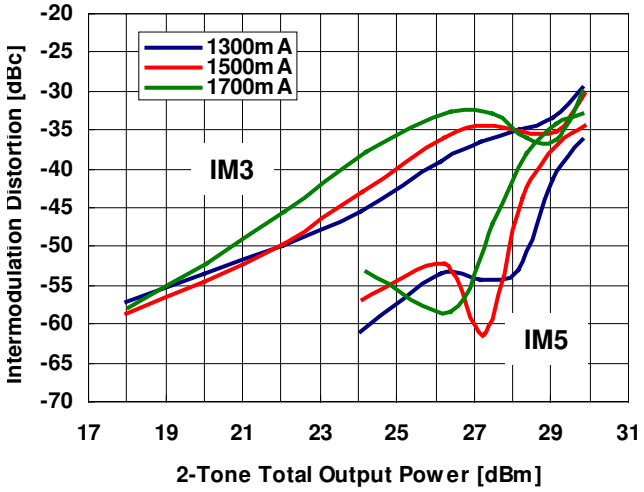
IMD PERFORMANCE vs OUTPUT POWER by Drain Current

VDD=6V @9.5GHz



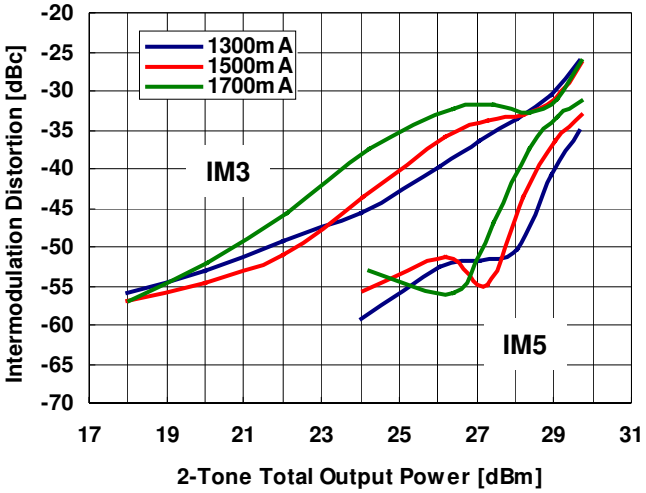
IMD PERFORMANCE vs OUTPUT POWER by Drain Current

VDD=6V @11.7GHz



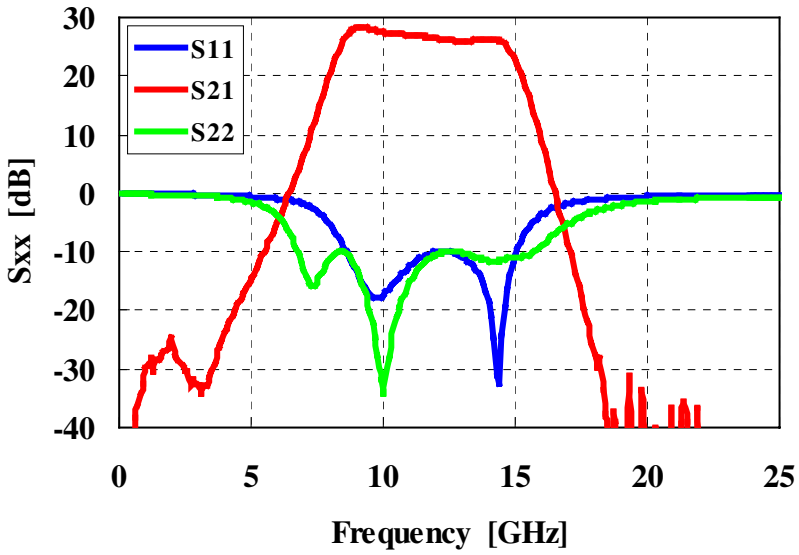
IMD PERFORMANCE vs OUTPUT POWER by Drain Current

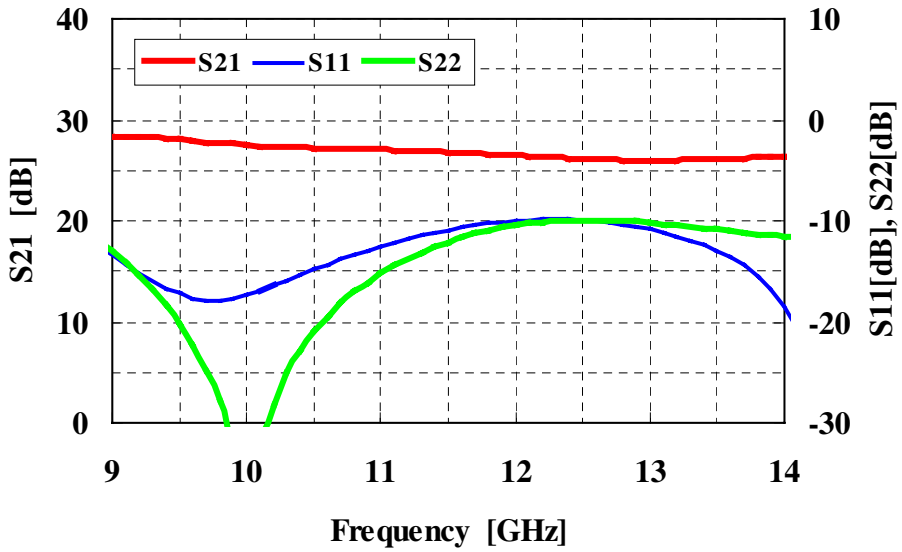
VDD=6V @13.3GHz



■S-PARAMETER

VDD=6V, IDD(DC)=1500mA





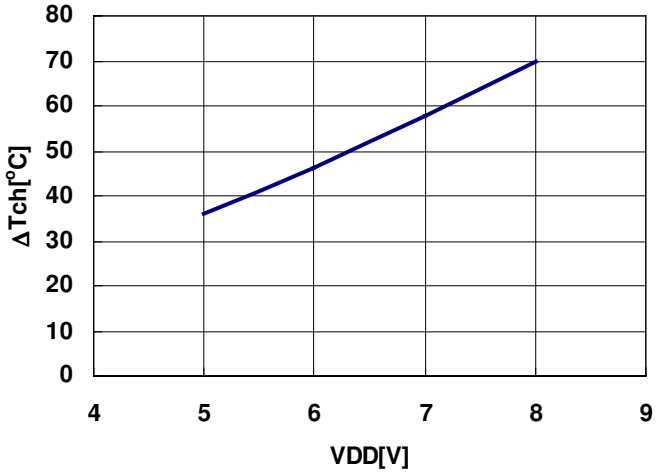
■S-PARAMETER

VDD=6V, IDD(DC)=1500mA

Frequency	S11		S21		S12		S22	
[GHz]	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.5	0.997	-14.6	0.006	-127.4	0.000	170.8	0.998	-20.4
1.0	0.994	-29.1	0.032	80.1	0.000	19.2	0.987	-40.9
1.5	0.990	-43.3	0.038	-40.1	0.000	-20.0	0.974	-59.5
2.0	0.985	-57.3	0.058	-116.6	0.000	-122.6	0.973	-77.9
2.5	0.981	-71.4	0.029	-174.1	0.000	-61.2	0.972	-96.1
3.0	0.974	-85.1	0.023	-179.7	0.000	129.9	0.963	-114.2
3.5	0.966	-98.9	0.030	-160.1	0.000	159.2	0.946	-132.1
4.0	0.957	-112.6	0.065	-178.2	0.000	89.1	0.920	-150.0
4.5	0.950	-126.4	0.113	155.6	0.000	-43.2	0.886	-168.4
5.0	0.937	-140.7	0.187	130.9	0.000	-61.8	0.840	171.4
5.5	0.922	-155.7	0.322	104.9	0.000	-101.3	0.769	147.9
6.0	0.901	-171.8	0.575	75.4	0.000	109.7	0.641	118.6
6.5	0.869	170.0	1.065	43.8	0.000	91.1	0.442	80.6
7.0	0.810	148.7	2.136	9.0	0.000	28.9	0.225	23.0
7.5	0.701	123.3	4.795	-35.3	0.000	33.0	0.177	-76.4
8.0	0.527	95.2	10.871	-96.3	0.000	-176.5	0.280	-141.2
8.5	0.348	67.2	20.300	-173.9	0.000	50.2	0.320	171.4
9.0	0.214	34.4	25.905	102.6	0.000	-79.3	0.223	128.4
9.5	0.138	-13.3	25.257	29.1	0.000	-119.7	0.097	97.0
10.0	0.136	-67.3	23.769	-34.2	0.000	179.2	0.020	6.9
10.5	0.182	-104.4	22.940	-92.9	0.000	-168.1	0.090	-83.9
11.0	0.238	-131.1	22.476	-151.0	0.000	100.8	0.173	-105.6
11.5	0.285	-156.0	21.890	151.0	0.000	117.1	0.249	-126.0
12.0	0.316	178.5	21.046	92.8	0.000	47.7	0.300	-145.9
12.5	0.319	150.9	20.347	34.7	0.000	-135.0	0.318	-164.9
13.0	0.288	120.8	19.952	-24.4	0.000	-177.2	0.309	178.1
13.5	0.224	87.6	20.255	-87.1	0.000	138.7	0.286	162.8
14.0	0.119	49.7	20.738	-157.3	0.000	121.3	0.265	148.4
14.5	0.061	157.1	19.414	120.4	0.000	49.4	0.270	126.7
15.0	0.298	112.6	13.643	28.5	0.000	-28.1	0.284	85.5
15.5	0.509	62.4	6.720	-58.8	0.000	-109.4	0.299	31.9
16.0	0.662	20.7	2.728	-133.8	0.000	177.2	0.359	-14.4
16.5	0.758	-12.6	1.037	161.5	0.000	-53.7	0.451	-47.7
17.0	0.819	-38.9	0.371	105.8	0.000	-161.1	0.544	-72.2
17.5	0.857	-59.9	0.133	56.1	0.000	-130.2	0.629	-91.9
18.0	0.885	-77.4	0.042	5.7	0.001	-136.6	0.698	-108.0
18.5	0.905	-91.8	0.011	-25.9	0.001	-161.5	0.753	-121.8
19.0	0.915	-104.3	0.002	100.4	0.001	177.0	0.796	-133.7
19.5	0.929	-115.4	0.002	-40.8	0.001	158.1	0.830	-144.2
20.0	0.939	-125.3	0.002	28.7	0.002	137.0	0.853	-153.7
20.5	0.942	-134.3	0.004	80.1	0.002	124.6	0.870	-162.3
21.0	0.950	-142.4	0.002	70.2	0.002	124.1	0.882	-170.2
21.5	0.952	-149.7	0.011	78.0	0.002	117.8	0.893	-177.3
22.0	0.958	-156.9	0.006	130.5	0.002	100.3	0.903	175.7
22.5	0.961	-163.5	0.008	-73.5	0.002	81.7	0.908	169.2
23.0	0.961	-169.7	0.003	108.4	0.002	78.1	0.912	162.9
23.5	0.963	-175.8	0.006	77.8	0.003	61.9	0.914	156.9
24.0	0.965	178.4	0.006	48.9	0.003	45.9	0.916	151.0
24.5	0.965	172.9	0.002	18.1	0.002	36.9	0.917	145.1
25.0	0.966	167.5	0.005	46.2	0.003	42.1	0.916	139.5

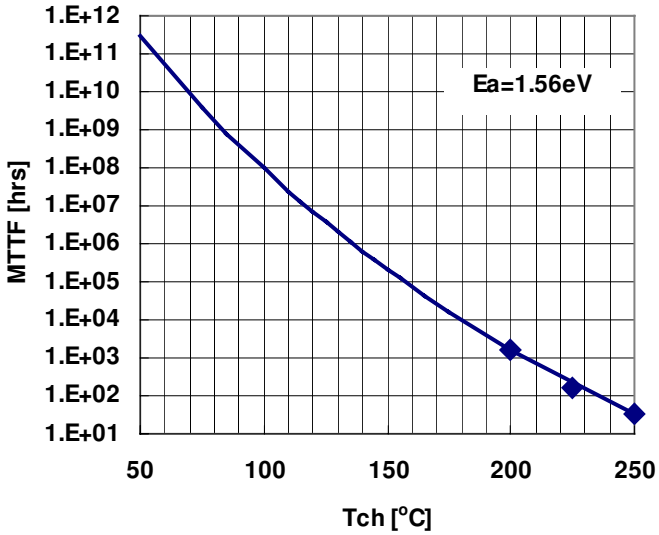
ΔTch vs. DRAIN VOLTAGE
(Reference Data)

IDD(DC)=1500mA



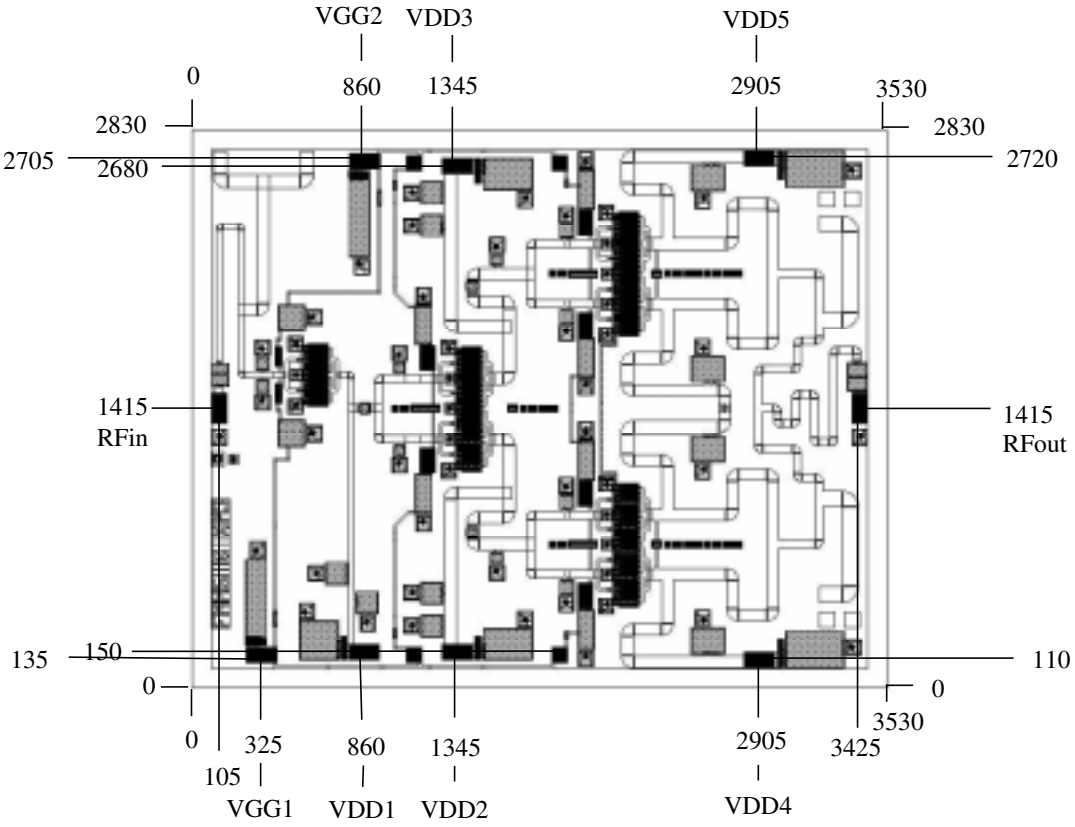
Note : ΔTch : Case to Channel Temperature Rise

MTTF vs. Tch



■ CHIP OUTLINE

Unit : μm



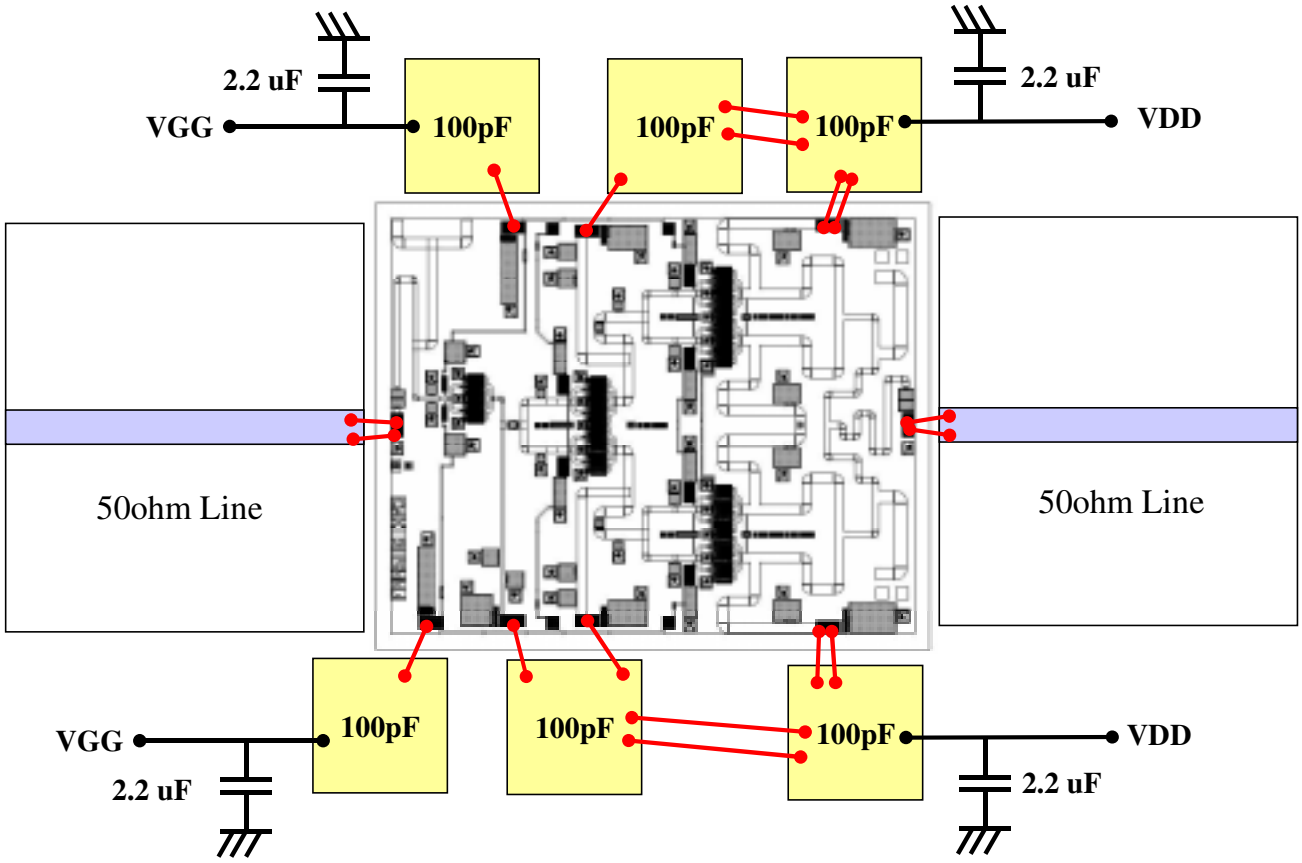
Chip Size : 3530±30μm x 2830±30μm

Chip Thickness : 60±20μm

Pad Dimensions : 80μm x 160μm

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

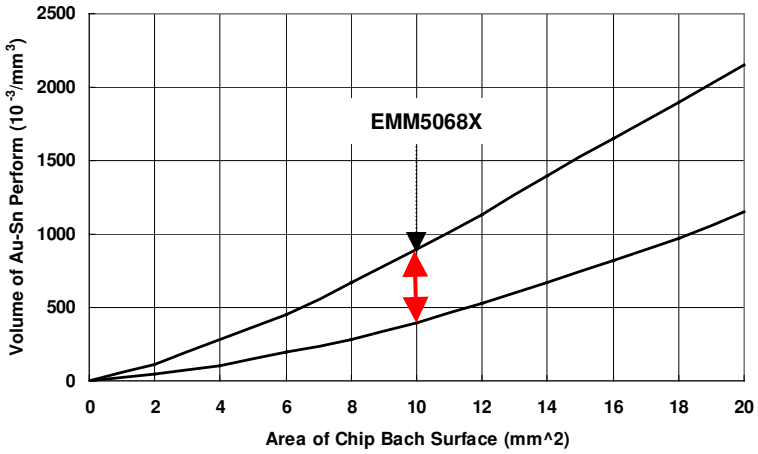
■ BONDUNG DIAGRAM & RECOMMENDED EXTERNAL CIRCUIT



"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

EMM5068X

X-band Power Amplifier MMIC

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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.