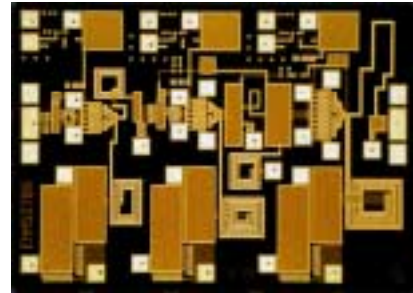


# EMM5078X

## C-Band Power Amplifier MMIC



### FEATURES

- High Output Power: Pout = 26 dBm (Typ.)
- High Linear Gain: GL = 30 dB(Typ.)
- Broad Band: 3.4 – 8.5 GHz
- Impedance Matched Zin/Zout = 50Ω

### DESCRIPTION

The EMM5078X is a wide band power amplifier MMIC that contains a three stage amplifier, internally matched, for standard communications band in 3.4 to 8.5GHz frequency range. Eudyna'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>GG</sub>	-3	V
Input Power	P <sub>in</sub>	22	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>	<=6	V
Input Power	P <sub>in</sub>	<=2	dBm
Operating Backside Temperature	Top	-40 to +85	°C

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 <sub>DD</sub> =6V	3.4	-	8.5	GHz
Output Power at 1dB G.C.P.	P <sub>1dB</sub>	I <sub>DD</sub> (DC)=300mA typ.	23.0	26.0	-	dBm
Power Gain at 1dB G.C.P.	G <sub>1dB</sub>	Z <sub>s</sub> =Z <sub>l</sub> =50ohm	24	29	-	dB
Power-added Efficiency at 1dB G.C.P.	η <sub>add</sub>		-	18	-	%
Third Order Intermodulation*	IM <sub>3</sub>	*:Δf=10MHz ,	-35	-40	-	dBc
Drain Current at 1dB G.C.P.	IDD	2-Tone Test,	-	350	450	mA
Input Return Loss (at Pin=-20dBm)	RL <sub>in</sub>	Pout=15dBm S.C.L.	-	-10	-	dB
Output Return Loss (at Pin=-20dBm)	RL <sub>out</sub>		-	-10	-	dB

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

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

<b>ESD</b>	<b>Class 0</b>	<b>~ 249V</b>
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Note : Based on JEDEC JESD22-A114C

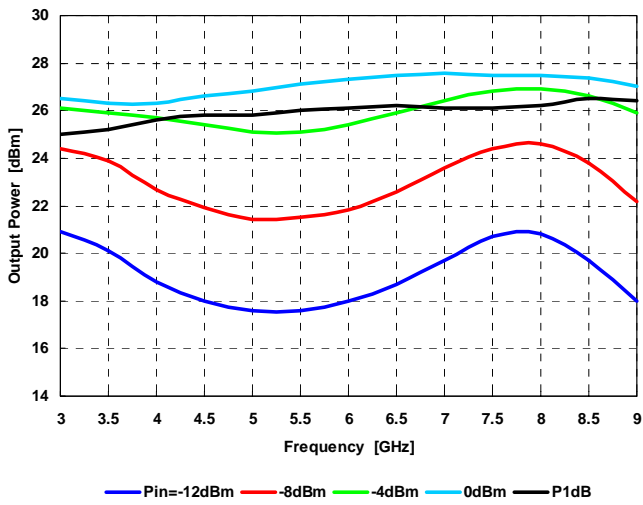
<b>RoHs Compliance</b>	<b>Yes</b>
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# EMM5078X

## C-band Power Amplifier MMIC

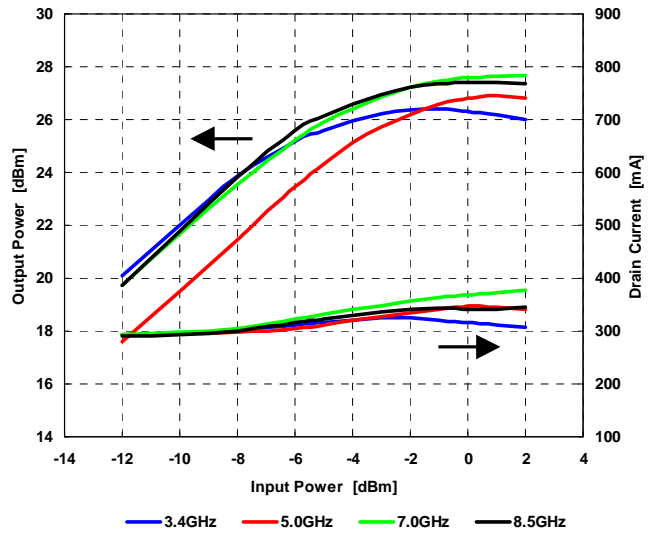
Output Power vs. Frequency

@VDD=6V, IDD(DC)=300mA



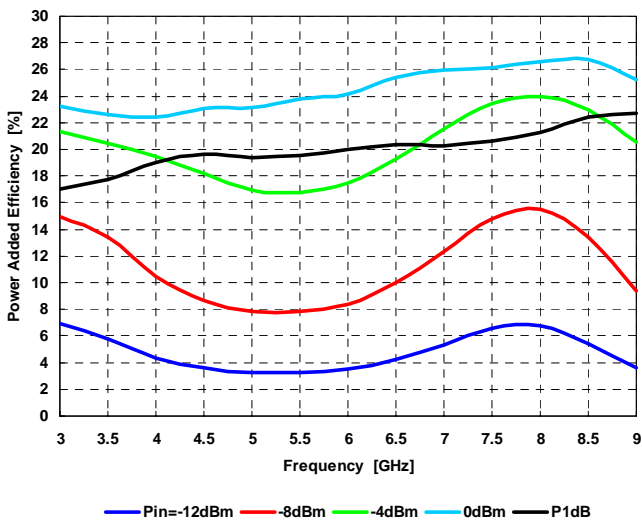
Output Power, Drain Current vs. Input Power

@VDD=6V, IDD(DC)=300mA



Power Added Efficiency vs. Frequency

@VDD=6V, IDD(DC)=300mA



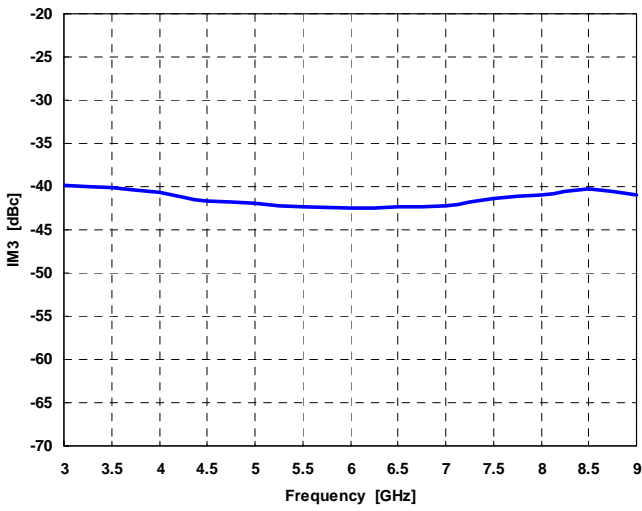
**Eudyna**

# EMM5078X

## C-Band Power Amplifier MMIC

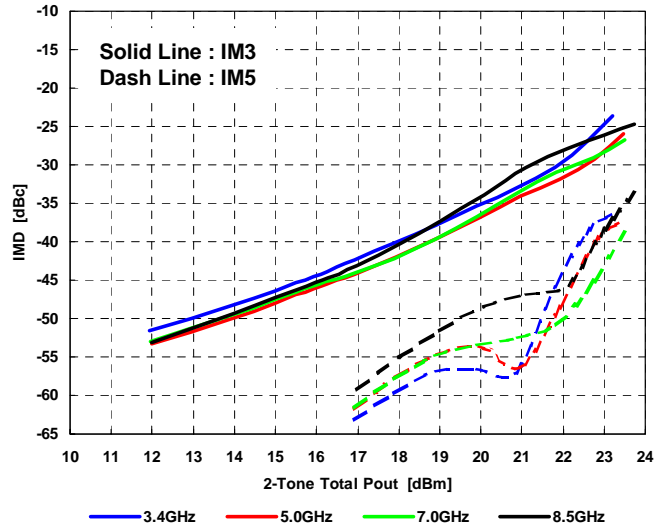
### IM3 vs. Frequency

@VDD=6V, IDD(DC)=350mA, @Po=15dBm S.C.L.



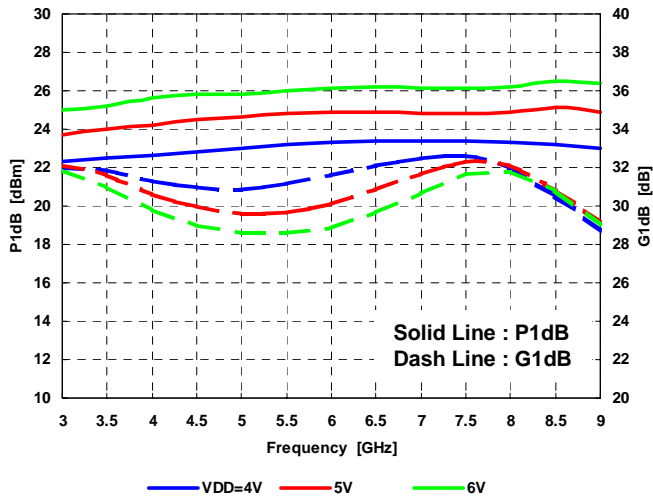
### IMD vs. Output Power

@VDD=6V, IDD(DC)=300mA



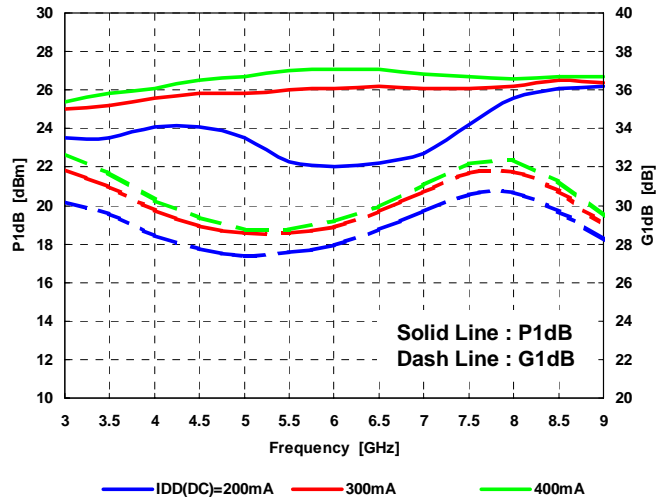
### P1dB, G1dB vs. Frequency by Drain Voltage

@IDD(DC)=300mA



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

@VDD=6V

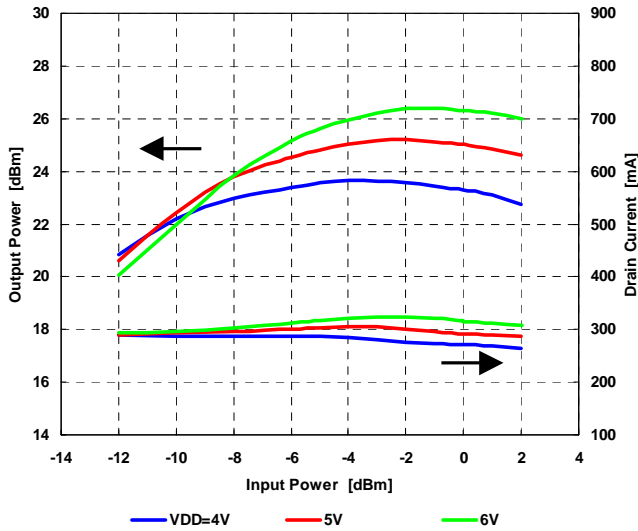


# EMM5078X

## C-band Power Amplifier MMIC

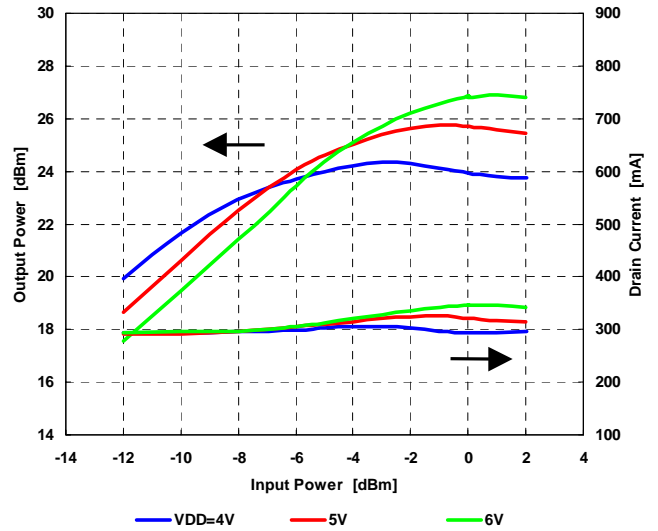
Output Power, Drain Current vs. Input Power by Drain Voltage

@f=3.4GHz, IDD(DC)=300mA



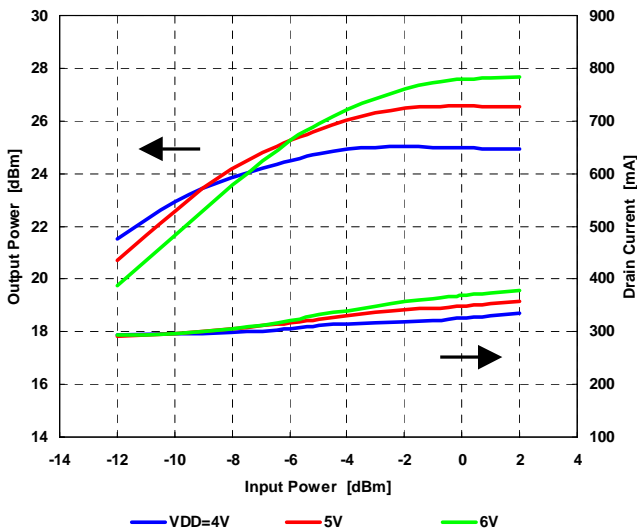
Output Power, Drain Current vs. Input Power by Drain Voltage

@f=5.0GHz, IDD(DC)=300mA



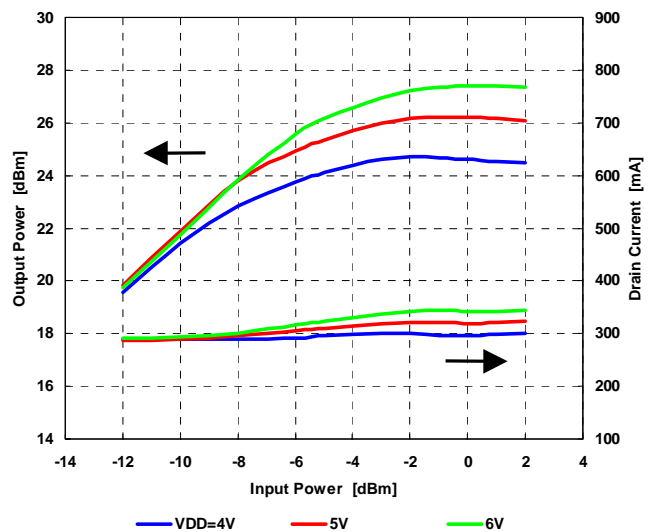
Output Power, Drain Current vs. Input Power by Drain Voltage

@f=7.0GHz, IDD(DC)=300mA



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

@f=8.5GHz, IDD(DC)=300mA

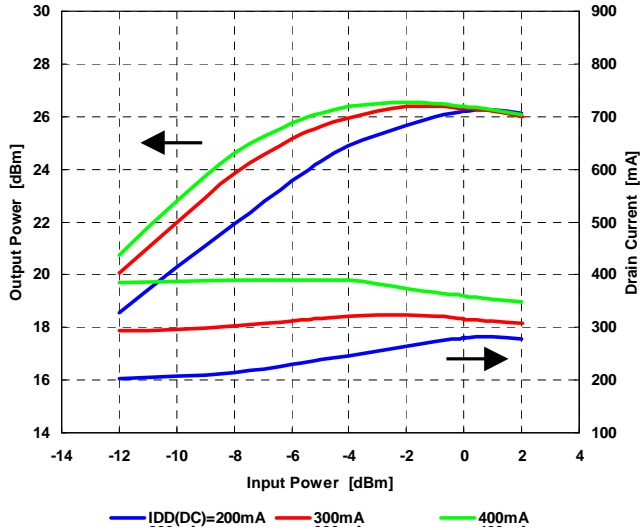


# EMM5078X

## C-Band Power Amplifier MMIC

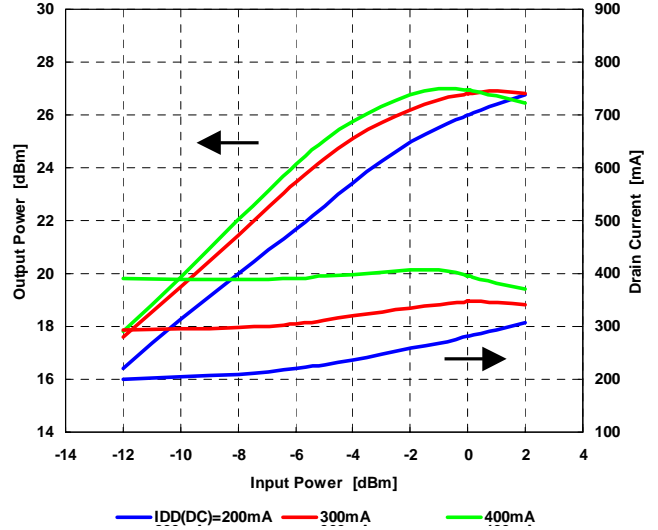
Output Power, Drain Current vs. Input Power by Drain Current

@f=3.4GHz, VDD=6V



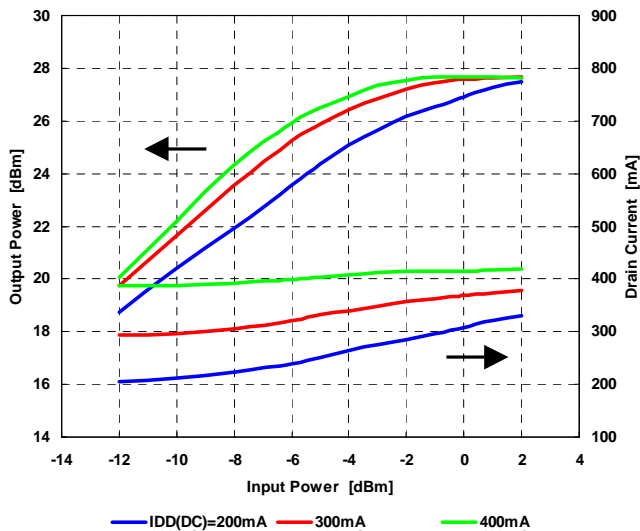
Output Power, Drain Current vs. Input Power by Drain Current

@f=5.0GHz, VDD=6V



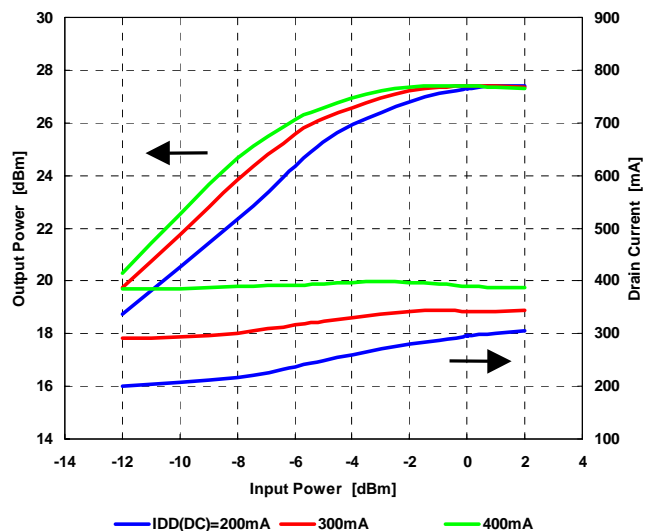
Output Power, Drain Current vs. Input Power by Drain Current

@f=7.0GHz, VDD=6V



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

@f=8.5GHz, VDD=6V

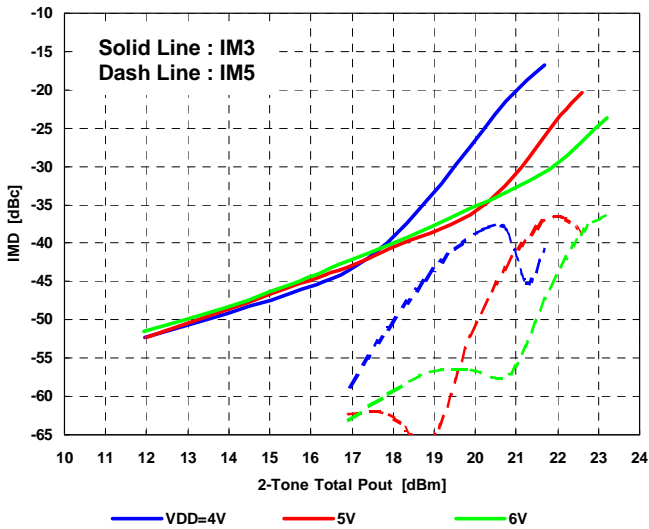


# EMM5078X

## C-band Power Amplifier MMIC

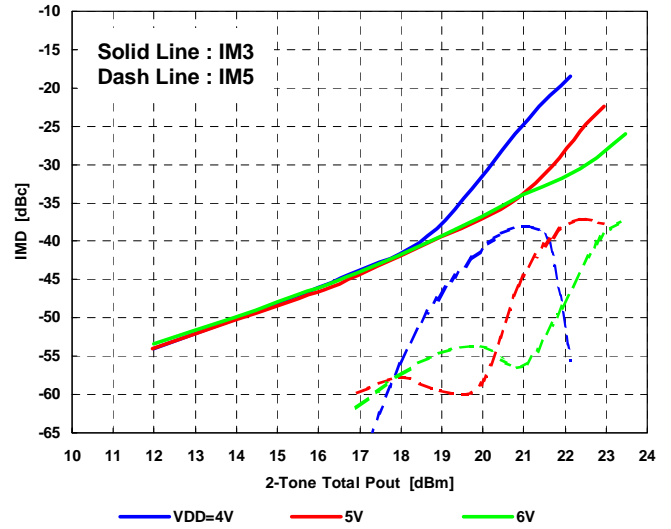
### IMD vs. Output Power by Drain Voltage

@f=3.4GHz, IDD(DC)=300mA



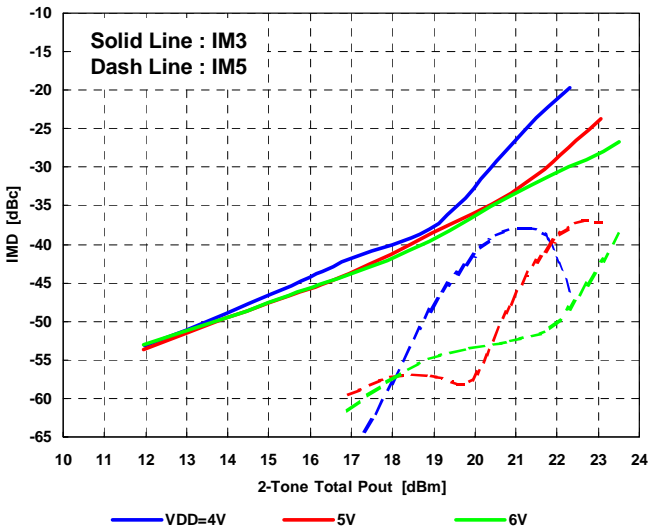
### IMD vs. Output Power by Drain Voltage

@f=5.0GHz, IDD(DC)=300mA



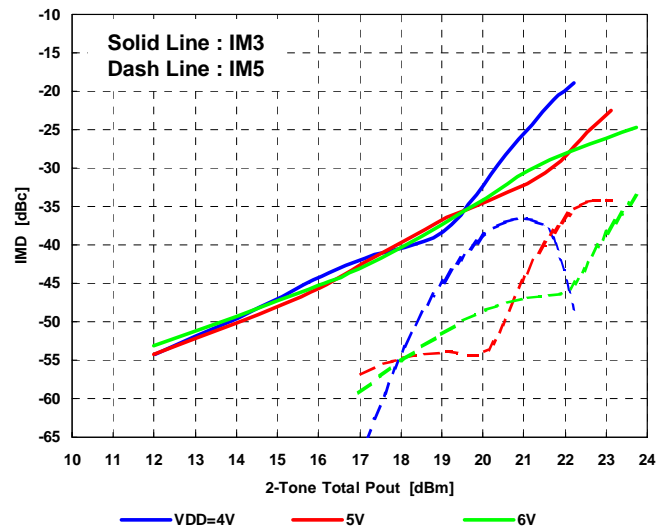
### IMD vs. Output Power by Drain Voltage

@f=7.0GHz, IDD(DC)=300mA



### IMD vs. Output Power by Drain Voltage

@f=8.5GHz, IDD(DC)=300mA

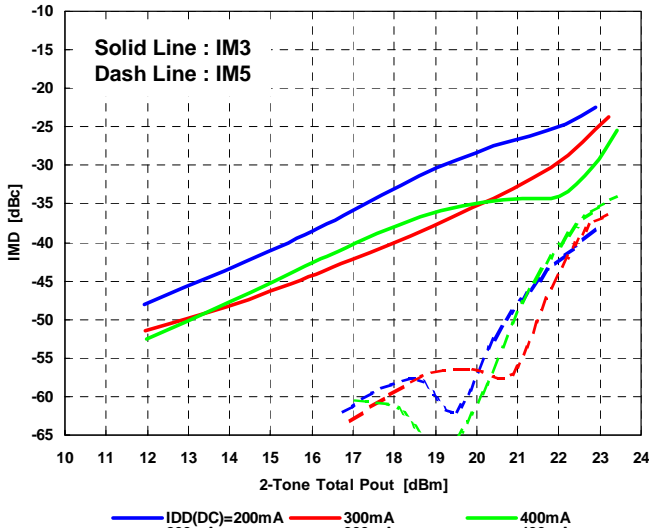


# EMM5078X

## C-Band Power Amplifier MMIC

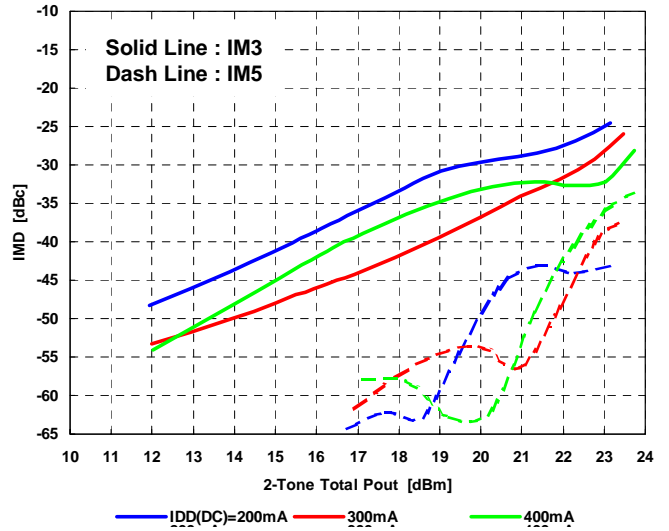
IMD vs. Output Power by Drain Current

@f=3.4GHz, VDD=6V



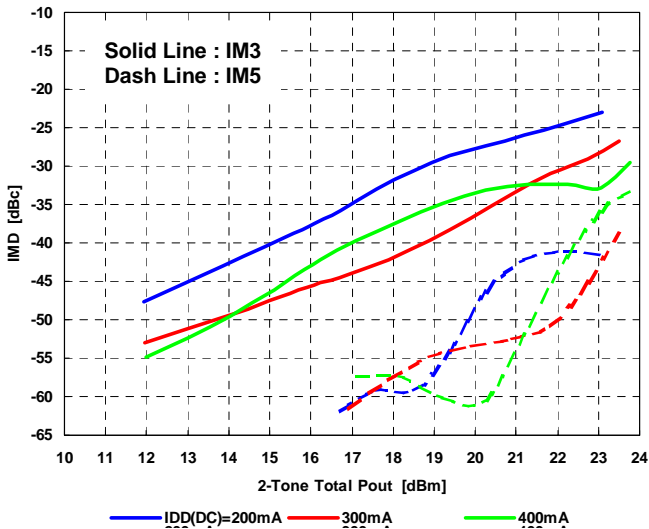
IMD vs. Output Power by Drain Current

@f=5.0GHz, VDD=6V



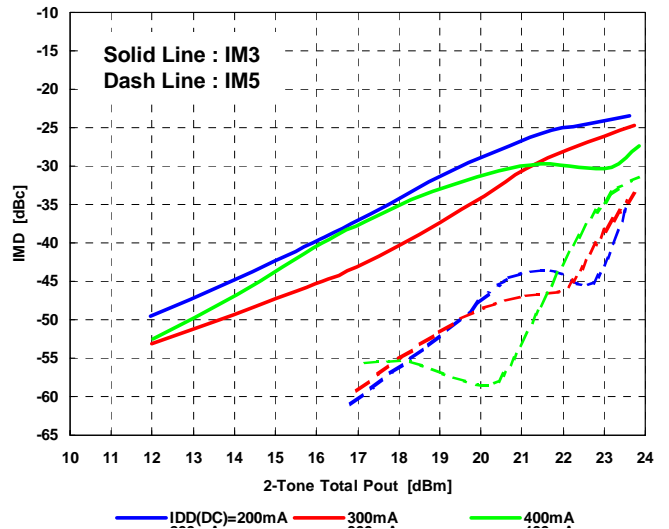
IMD vs. Output Power by Drain Current

@f=7.0GHz, VDD=6V



IMD vs. Output Power by Drain Current

@f=8.5GHz, VDD=6V

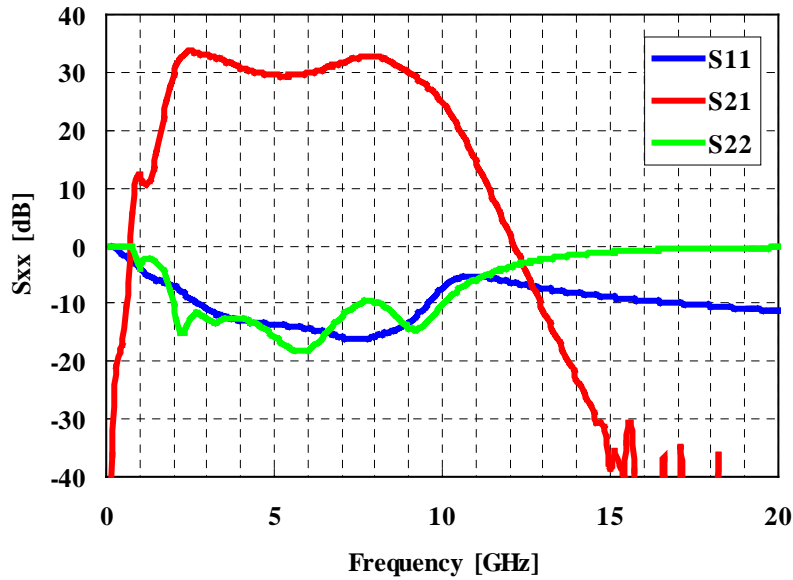


# EMM5078X

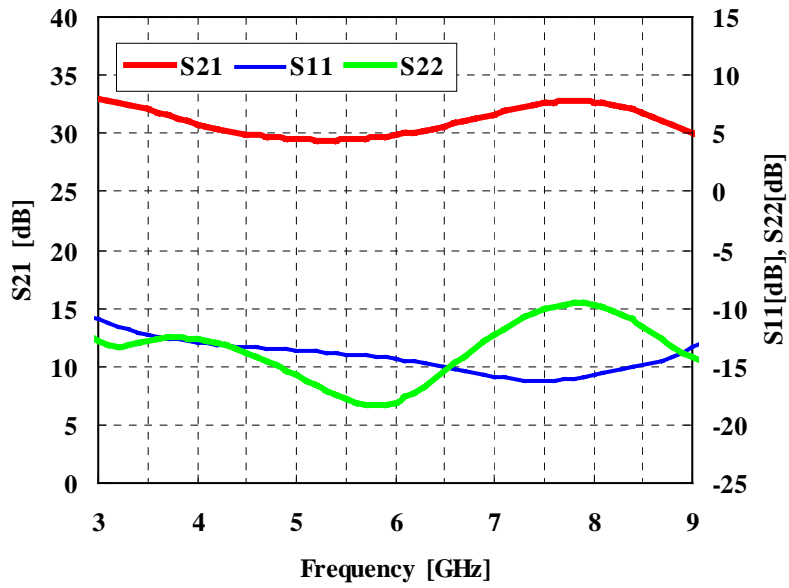
## C-band Power Amplifier MMIC

### ■ S-Parameter

VDD/IDD(DC)=6V/300mA



VDD/IDD(DC)=6V/300mA





# EMM5078X

## C-Band Power Amplifier MMIC

### ■ S-Parameter

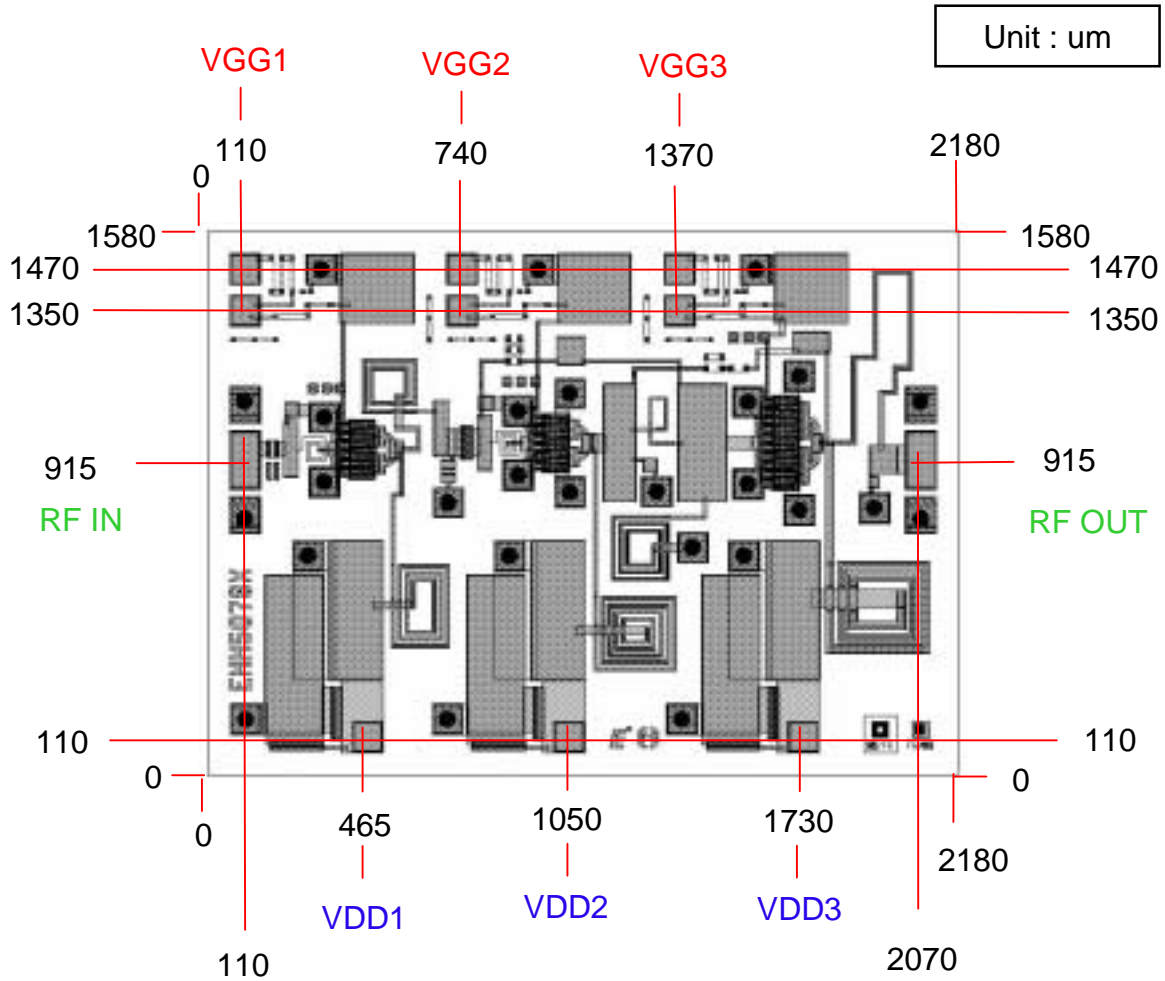
VDD=6V, IDD(DC)=300mA

Frequency [GHz]	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.0	0.635	-54.5	4.197	32.3	0.001	-85.8	0.640	-81.5
2.0	0.450	-77.8	30.316	-85.9	0.000	55.2	0.310	-166.2
3.0	0.282	-95.5	44.371	96.0	0.000	164.7	0.229	-138.8
3.1	0.272	-96.3	43.902	83.6	0.000	166.9	0.220	-137.8
3.2	0.264	-97.1	43.096	71.4	0.000	145.8	0.217	-136.3
3.3	0.256	-97.6	42.303	59.6	0.000	130.3	0.219	-135.1
3.4	0.250	-98.1	41.078	48.3	0.000	122.8	0.224	-134.8
3.5	0.244	-98.6	40.021	37.5	0.000	95.6	0.229	-135.5
3.6	0.239	-99.2	38.846	27.3	0.000	108.9	0.233	-136.8
3.7	0.235	-99.8	37.689	17.4	0.000	63.1	0.236	-138.6
3.8	0.231	-100.4	36.677	8.0	0.000	60.8	0.236	-140.6
3.9	0.229	-101.2	35.635	-1.1	0.000	79.5	0.236	-142.7
4.0	0.225	-101.9	34.722	-9.8	0.000	58.7	0.233	-144.7
4.1	0.223	-102.7	33.947	-18.4	0.000	61.9	0.229	-146.7
4.2	0.220	-103.7	33.140	-26.8	0.000	77.0	0.224	-148.5
4.3	0.218	-104.9	32.546	-34.8	0.000	70.6	0.218	-150.3
4.4	0.217	-106.1	31.888	-42.7	0.000	54.2	0.211	-151.8
4.5	0.215	-107.3	31.375	-50.5	0.000	69.5	0.204	-153.0
4.6	0.214	-108.8	30.904	-58.3	0.000	52.2	0.197	-154.2
4.7	0.212	-110.2	30.602	-65.8	0.000	44.6	0.188	-155.0
4.8	0.211	-111.7	30.260	-73.2	0.000	57.5	0.180	-155.5
4.9	0.210	-113.4	30.028	-80.6	0.000	60.2	0.172	-155.7
5.0	0.208	-115.3	29.828	-87.9	0.000	40.9	0.163	-155.4
5.1	0.207	-117.2	29.767	-95.2	0.000	35.2	0.155	-154.7
5.2	0.206	-119.2	29.596	-102.5	0.000	55.3	0.147	-153.5
5.3	0.204	-121.4	29.628	-109.7	0.000	27.5	0.140	-151.7
5.4	0.203	-123.6	29.629	-116.9	0.000	31.7	0.134	-149.5
5.5	0.201	-126.4	29.747	-124.1	0.000	-10.4	0.128	-146.4
5.6	0.200	-129.1	29.937	-131.3	0.000	-9.2	0.124	-142.9
5.7	0.198	-131.9	30.100	-138.5	0.000	21.7	0.121	-138.7
5.8	0.196	-135.0	30.437	-145.8	0.000	-11.5	0.121	-134.5
5.9	0.194	-138.1	30.749	-153.2	0.000	4.4	0.122	-130.1
6.0	0.191	-141.6	31.130	-160.7	0.000	-1.7	0.125	-125.8
6.1	0.189	-145.4	31.603	-168.1	0.000	-10.0	0.131	-122.1
6.2	0.186	-149.3	32.060	-175.7	0.000	5.0	0.138	-118.8
6.3	0.183	-153.9	32.625	176.6	0.000	-22.9	0.147	-116.1
6.4	0.181	-158.5	33.322	168.8	0.000	-25.1	0.157	-114.1
6.5	0.178	-163.5	34.010	160.8	0.000	-26.6	0.169	-112.9
6.6	0.174	-169.0	34.772	152.7	0.000	-42.4	0.183	-112.6
6.7	0.171	-174.9	35.483	144.4	0.000	-43.9	0.196	-112.8
6.8	0.168	178.7	36.428	135.9	0.000	-56.9	0.211	-113.9
6.9	0.165	171.8	37.308	127.1	0.000	-62.5	0.227	-115.4
7.0	0.162	164.3	38.210	118.2	0.000	-56.2	0.243	-117.4
7.1	0.159	156.4	39.127	108.9	0.000	-73.4	0.258	-120.1
7.2	0.157	147.7	40.012	99.5	0.000	-78.0	0.273	-123.3
7.3	0.155	138.4	40.906	89.7	0.000	-88.2	0.287	-127.0
7.4	0.155	128.6	41.781	79.7	0.000	-95.4	0.301	-131.1
7.5	0.155	118.7	42.344	69.4	0.000	-107.5	0.312	-135.8
7.6	0.155	108.5	43.101	58.6	0.001	-113.9	0.321	-141.0
7.7	0.157	98.4	43.317	47.8	0.001	-121.6	0.328	-146.5
7.8	0.159	88.2	43.499	36.8	0.001	-132.1	0.331	-152.5
7.9	0.161	78.6	43.524	25.6	0.001	-140.7	0.331	-159.0
8.0	0.165	69.5	43.111	14.3	0.001	-144.6	0.327	-165.6
8.1	0.167	61.0	42.735	2.8	0.001	-159.2	0.319	-172.7
8.2	0.171	53.4	41.744	-8.7	0.001	-168.2	0.309	179.9
8.3	0.173	46.3	40.924	-20.0	0.001	-175.7	0.295	172.3
8.4	0.176	40.2	39.901	-31.3	0.001	174.8	0.282	164.1
8.5	0.181	34.9	38.708	-42.7	0.001	171.1	0.265	155.3
8.6	0.185	30.6	37.334	-53.8	0.001	156.3	0.249	146.4
8.7	0.189	26.9	35.809	-65.0	0.001	151.3	0.231	136.4
8.8	0.195	23.8	34.352	-76.1	0.001	143.8	0.215	125.7
8.9	0.203	21.3	32.993	-87.1	0.001	127.6	0.203	114.5
9.0	0.214	19.0	31.483	-98.1	0.000	125.7	0.194	102.1
10.0	0.427	-13.0	17.319	148.7	0.000	17.6	0.309	-2.5
11.0	0.542	-60.8	5.437	38.7	0.000	-70.9	0.507	-46.0
12.0	0.482	-90.6	1.224	-41.5	0.000	-106.5	0.654	-70.4
13.0	0.425	-107.7	0.275	-99.8	0.000	-107.5	0.758	-87.8
14.0	0.387	-119.5	0.069	-136.6	0.000	-130.3	0.832	-101.4
15.0	0.359	-128.9	0.012	170.8	0.000	-153.3	0.882	-112.5
16.0	0.337	-136.7	0.006	164.6	0.000	-167.0	0.913	-121.7
17.0	0.317	-143.5	0.001	-144.4	0.000	-144.5	0.934	-129.6
18.0	0.301	-149.6	0.002	-47.6	0.001	-159.0	0.947	-136.4
19.0	0.286	-155.0	0.004	142.7	0.001	-178.6	0.956	-142.3

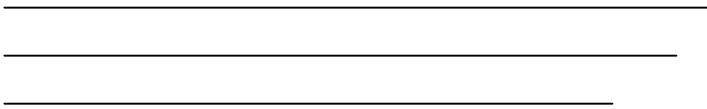
# EMM5078X

## C-band Power Amplifier MMIC

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



Chip Size :  $2180 \pm 30 \mu\text{m} \times 1580 \pm 30 \mu\text{m}$   
Chip Thickness :  $85 \pm 20 \mu\text{m}$   
Bonding Pad Size :  $90 \mu\text{m} \times 90 \mu\text{m}$ (VDD, VGG),  $90 \mu\text{m} \times 170 \mu\text{m}$  (RF)

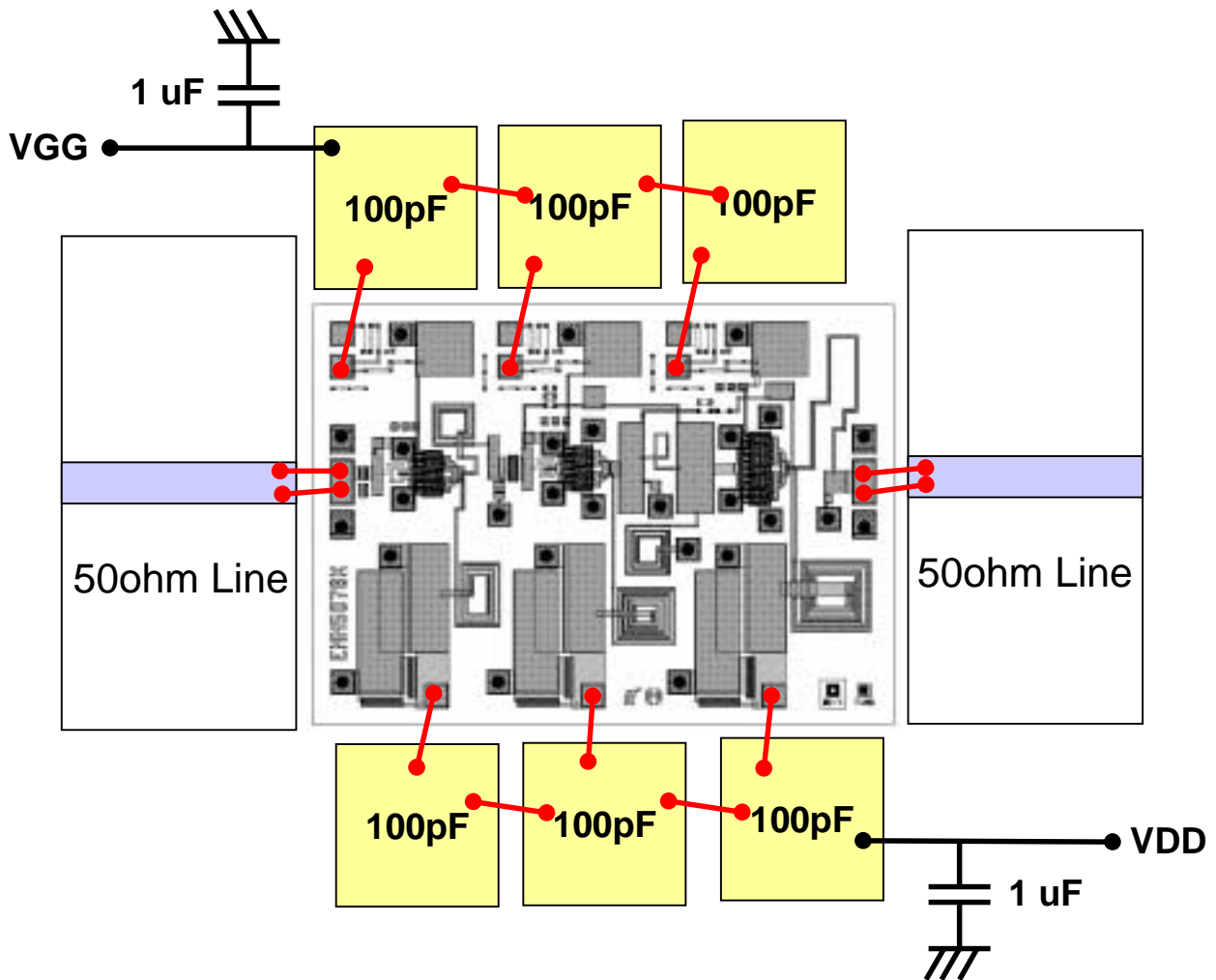


# EMM5078X

C-Band Power Amplifier MMIC

## ■ Assembly Diagrams

### Recommended assembly



“Copper” is the recommended material for the package or carrier.

# EMM5078X

## C-band Power Amplifier MMIC

### ■ DIE ATTACH

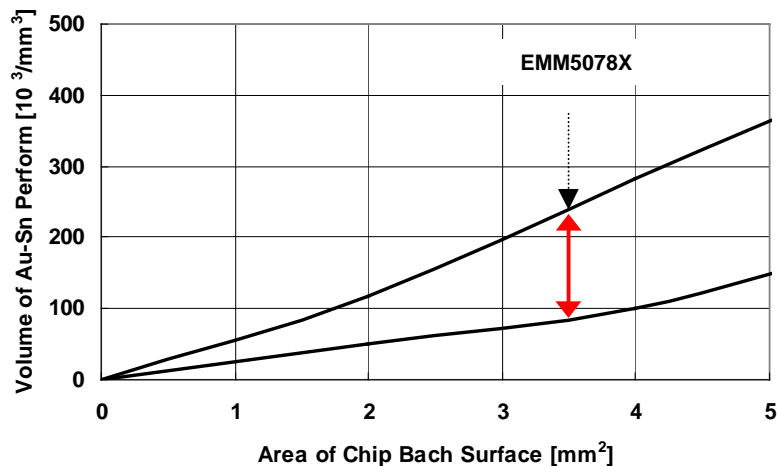
- 1) The die-attach station must have accurate temperature control, and an inert forming gas should be used.
- 2) Chips should be kept at room temperature except during die-attach.
- 3) Place package or carrier on the heated stage.
- 4) Lightly grasp the chip edges by the longer side using tweezers.

#### 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

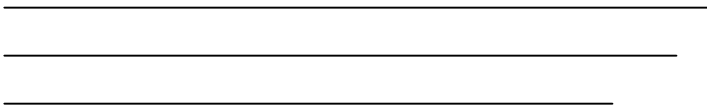
Stage Temperature : 215 deg.C +/- 5 deg.C

Tool Heater : None

Ultrasonic Power Transmitter : West Bond Model 1400

Duration : 150 mS/Bond

**Eudyna**



# **EMM5078X**

## **C-Band Power Amplifier MMIC**

**For further information please contact :**

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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.

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