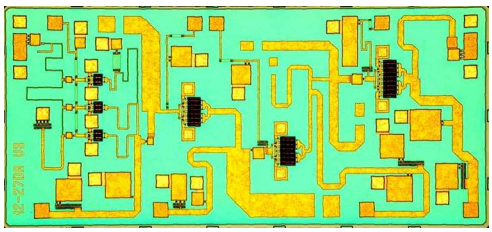
EMM5834X

Ku / K-Band Power Amplifier MMIC

FEATURES

•Output Power; P1dB = 26 dBm (Typ.)
•High Gain; G1dB = 23 dB(Typ.)
•Wide Frequency Band ; 12.7 - 27.0 GHz
•Impedance Matched Zin/Zout = 50Ω



DESCRIPTION

The EMM5834X is a wide band power amplifier MMIC that contains a four stage amplifier, internally matched, for standard communications band in 12.7 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	Rating	Unit
Drain-Source Voltage	V_{DD}	10	V
Gate-Source Voltage	V_{GG}	-3	V
Input Power	P_{in}	16	dBm
Storage Temperature	T_{stg}	-55 to +125	°C

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Conditions	Unit
Drain-Source Voltage	V_{DD}	<=6	V
Input Power	P_{in}	<=6	dBm
Operating Backside Temperature	Top	-40 to +85	°C

This product should be hermetically packaged.

ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25°C)

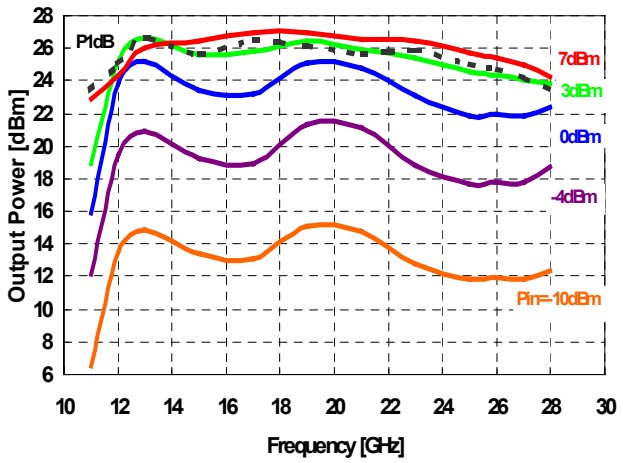
Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Frequency Range	f	V_{DD}=6V	12.7	-	27	GHz
Output Power at 1dB G.C.P.	P_{1dB}	I_{DD}=300mA typ.	23	26	-	dBm
Power Gain at 1dB G.C.P.	G_{1dB}		19	23	-	dB
Power-added Efficiency at 1dB G.C.P.	η_{add}		-	18	-	%
Third Order Intermodulation*	IM_3	* :Δf=10MHz ,	-26	-35	-	dBc
Drain Current at 1dB G.C.P.	I_{DD}	2-Tone Test,	-	370	600	mA
Input Return Loss (at Pin=-20dBm)	RL_{in}	P_{out}=15dBm S.C.L.	-	-10	-	dB
Output Return Loss (at Pin=-20dBm)	RL_{out}		-	-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

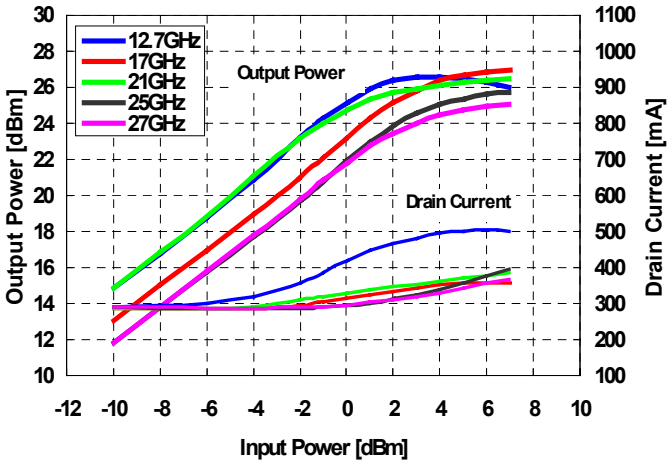
ESD	Class 0	~ 199V

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

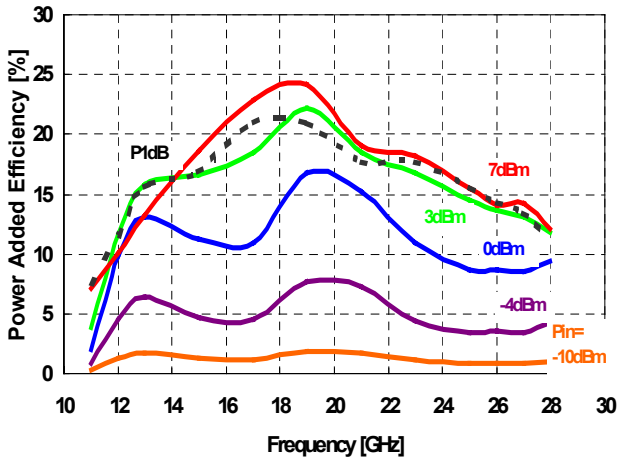
Output Power vs. Frequency
@VDD=6V, IDD(DC)=300mA



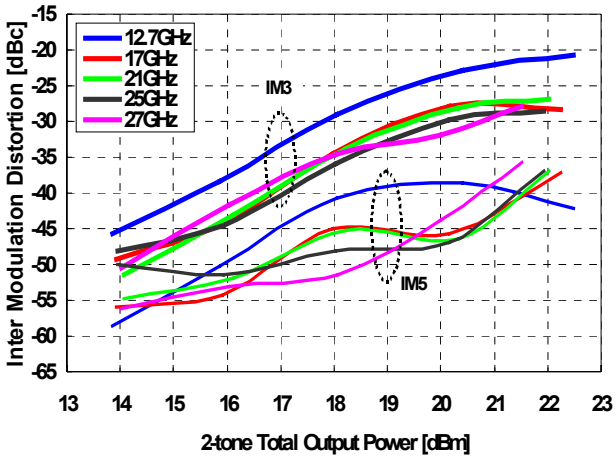
Output Power, Drain Current vs. Input Power
@VDD=6V, IDD(DC)=300mA



Power Added Efficiency vs. Frequency
@VDD=6V, IDD(DC)=300mA

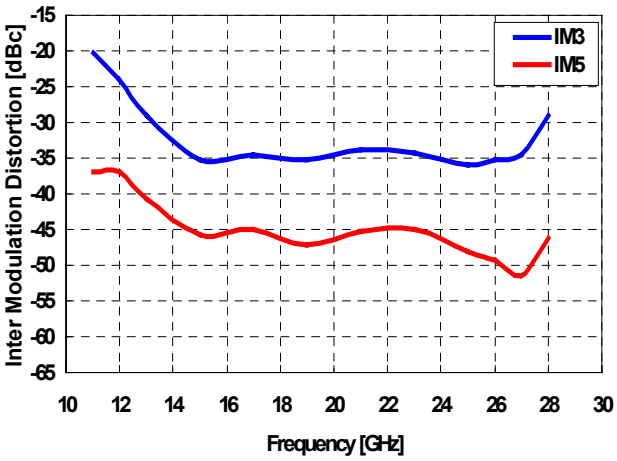


IMD vs. Output Power
@VDD=6V, IDD(DC)=300mA



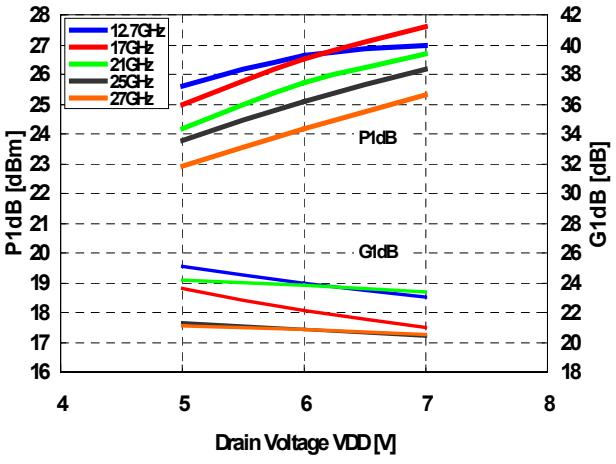
IMD vs. Frequency

@VDD=6V, IDD(DC)=300mA, Pout=15dBm S.C.L



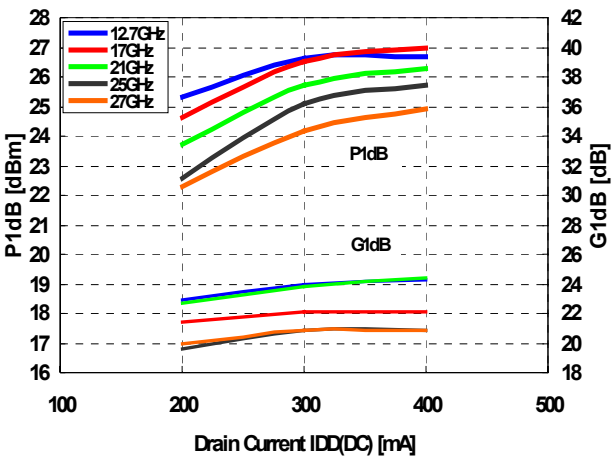
Output Power, Gain vs. Drain Voltage

@IDD(DC)=300mA



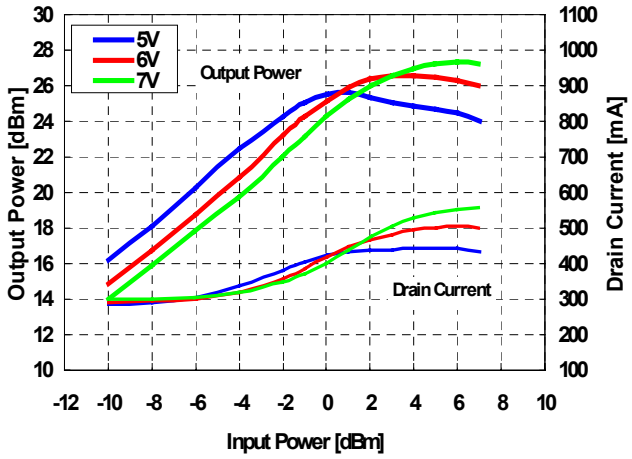
Output Power, Gain vs. Drain Current

@VDD=6V



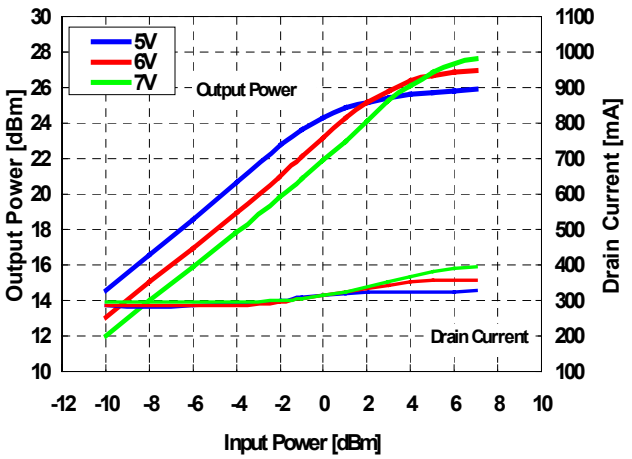
Output Power, Drain Current vs. Input Power by Drain Voltage

@f=12.7GHz, IDD(DC)=300mA



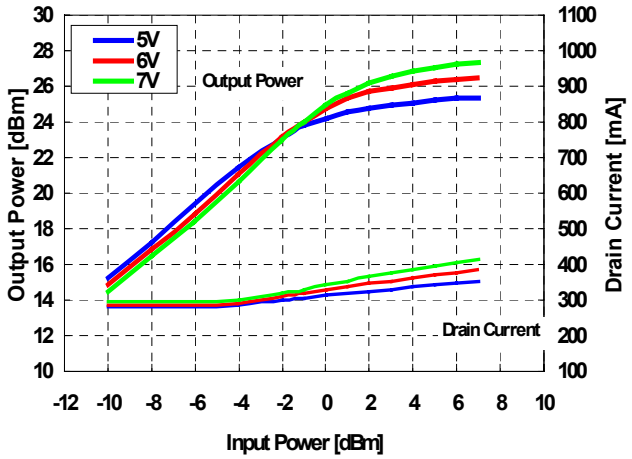
Output Power, Drain Current vs. Input Power by Drain Voltage

@f=17GHz, IDD(DC)=300mA



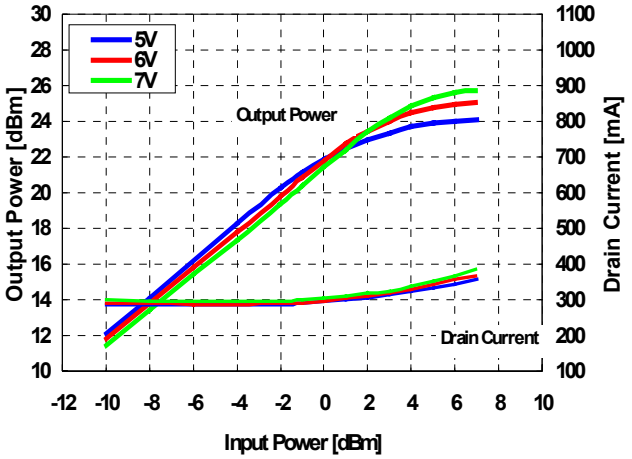
Output Power, Drain Current vs. Input Power by Drain Voltage

@f=21GHz, IDD(DC)=300mA

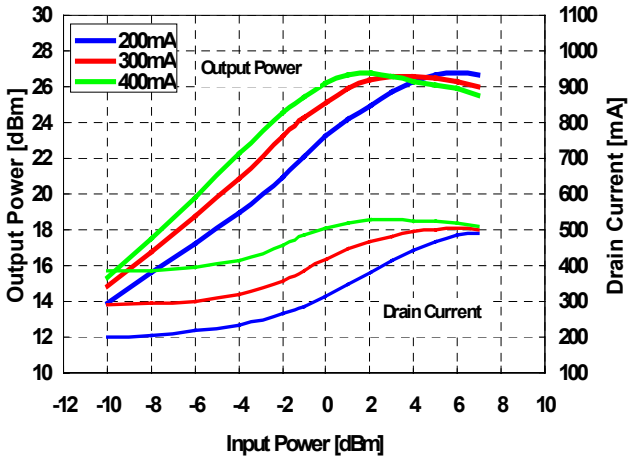


Output Power, Drain Current vs. Input Power by Drain Voltage

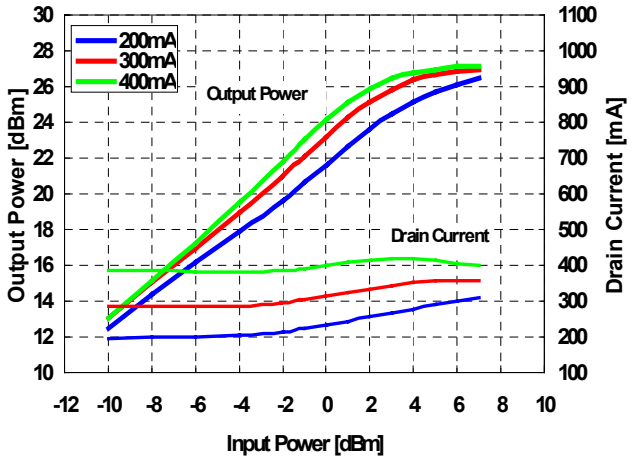
@f=27GHz, IDD(DC)=300mA



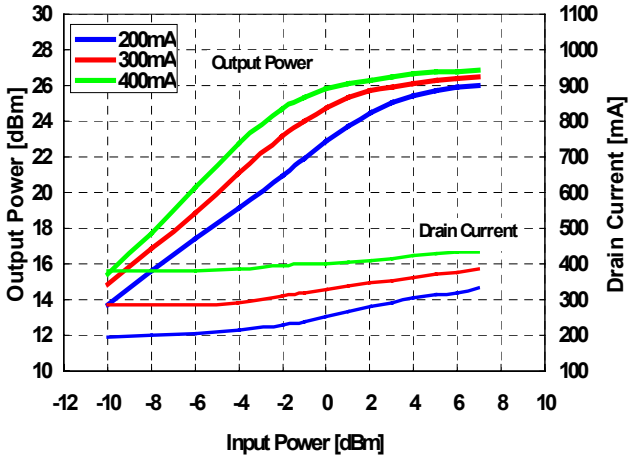
Output Power, Drain Current vs. Input Power by Drain Current
@f=12.7GHz, VDD=6V



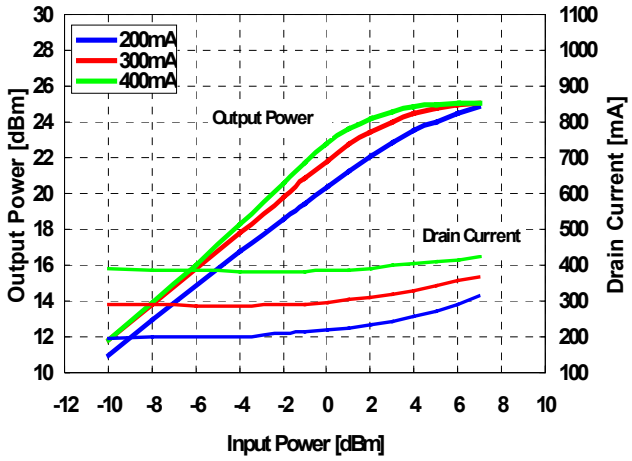
Output Power, Drain Current vs. Input Power by Drain Current
@f=17GHz, VDD=6V



Output Power, Drain Current vs. Input Power by Drain Current
@f=21GHz, VDD=6V

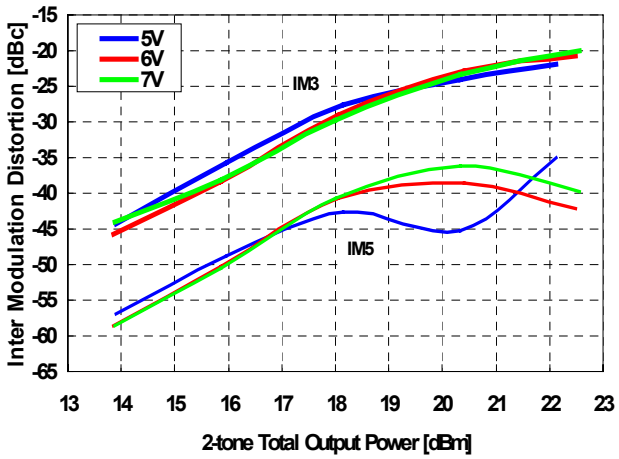


Output Power, Drain Current vs. Input Power by Drain Current
@f=27GHz, VDD=6V



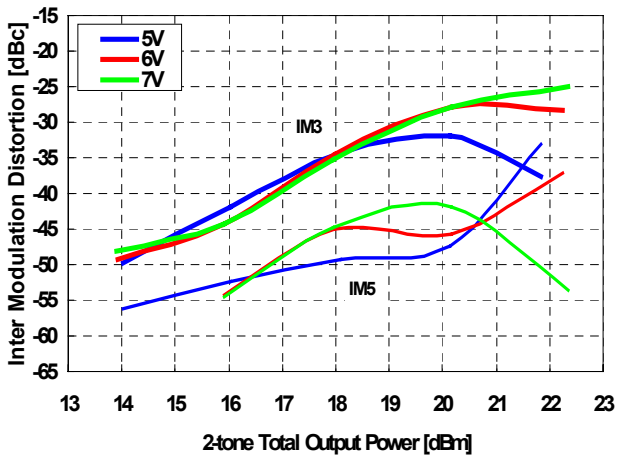
IMD vs. Output Power by Drain Voltage

@f=12.7GHz, IDD(DC)=300mA



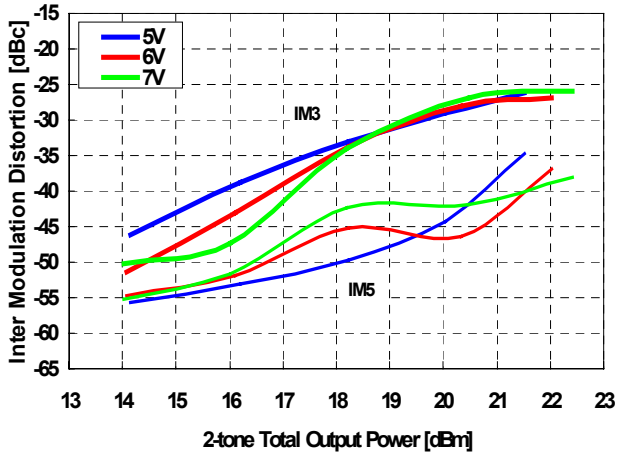
IMD vs. Output Power by Drain Voltage

@f=17GHz, IDD(DC)=300mA



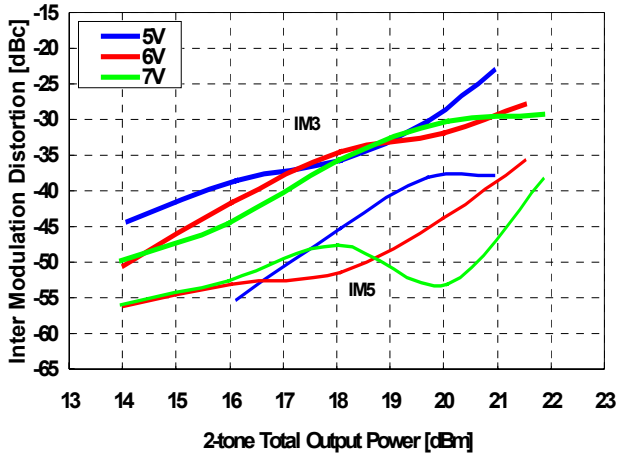
IMD vs. Output Power by Drain Voltage

@f=21GHz, IDD(DC)=300mA

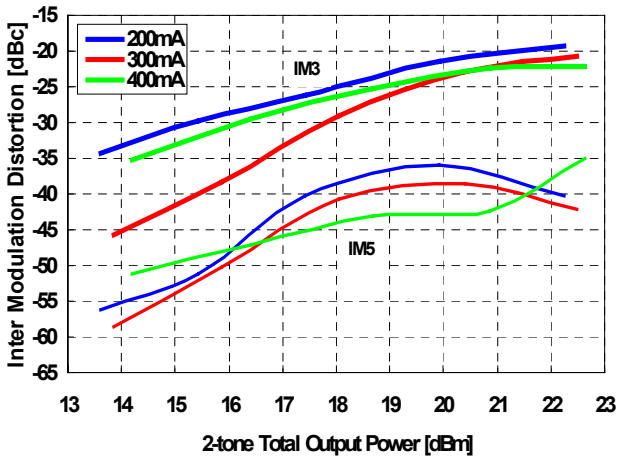


IMD vs. Output Power by Drain Voltage

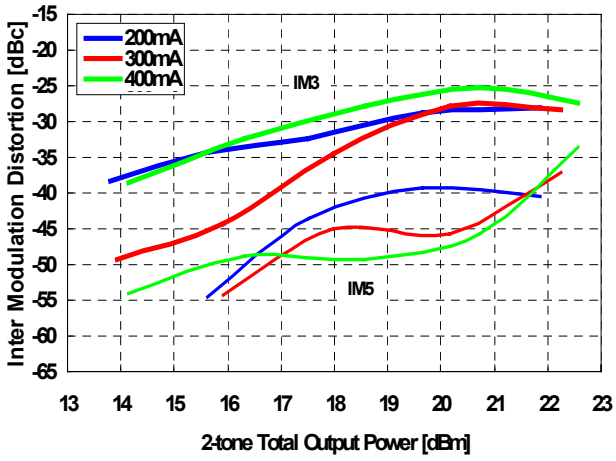
@f=27GHz, IDD(DC)=300mA



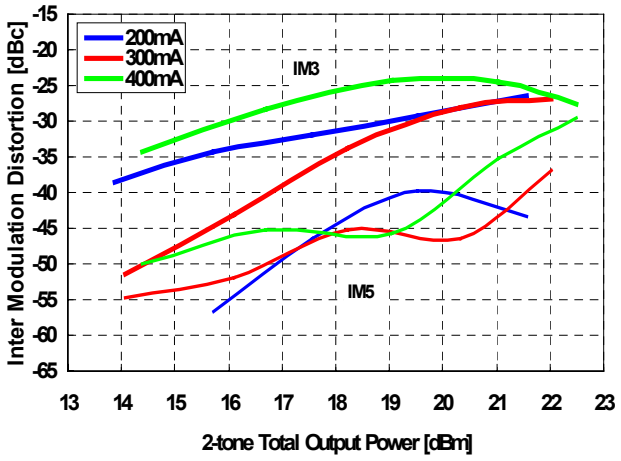
IMD vs. Output Power by Drain Current
@f=12.7GHz, VDD=6V



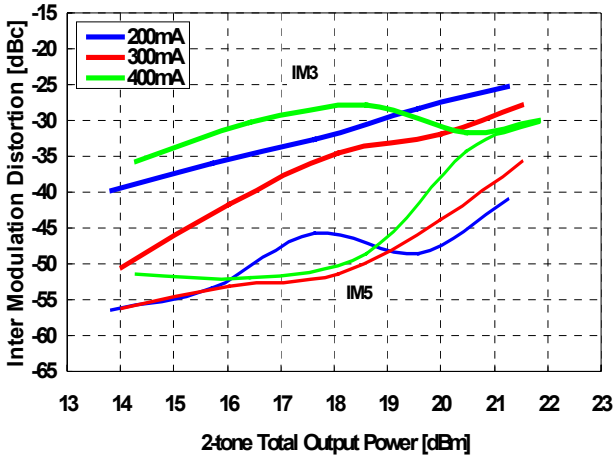
IMD vs. Output Power by Drain Current
@f=17GHz, VDD=6V



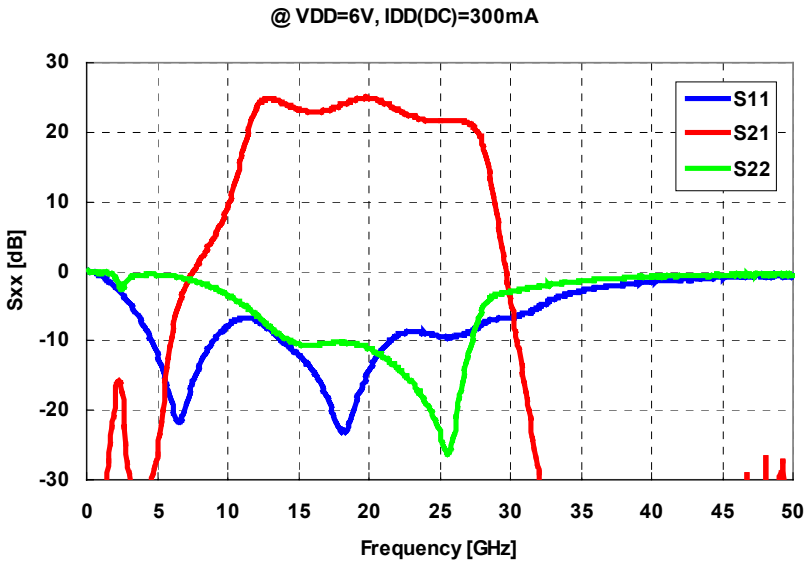
IMD vs. Output Power by Drain Current
@f=21GHz, VDD=6V

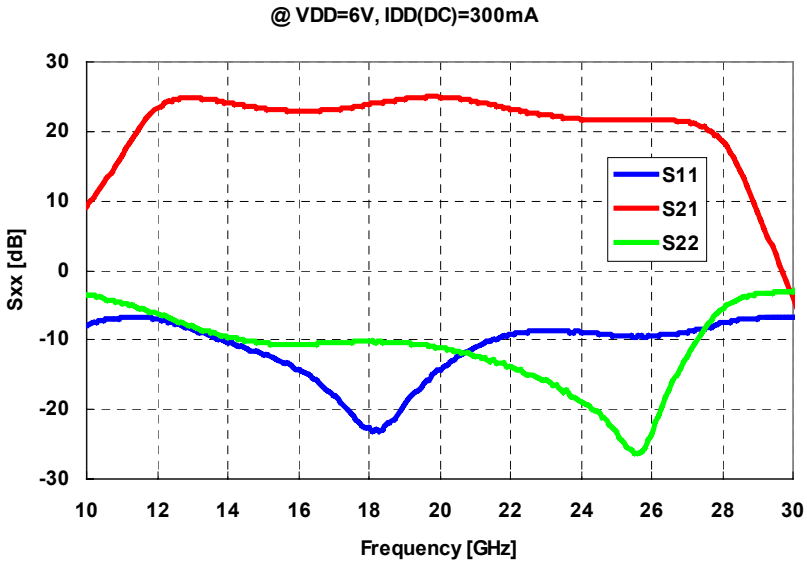


IMD vs. Output Power by Drain Current
@f=27GHz, VDD=6V



■ **S-Parameter**


@ VDD=6V, IDD(DC)=300mA
Sxx [dB]
Frequency [GHz]
S11
S21
S22
30
20
10
0
-10
-20
-30
0
5
10
15
20
25
30
35
40
45
50


@ VDD=6V, IDD(DC)=300mA
Sxx [dB]
Frequency [GHz]
S11
S21
S22
30
20
10
0
-10
-20
-30
10
12
14
16
18
20
22
24
26
28
30

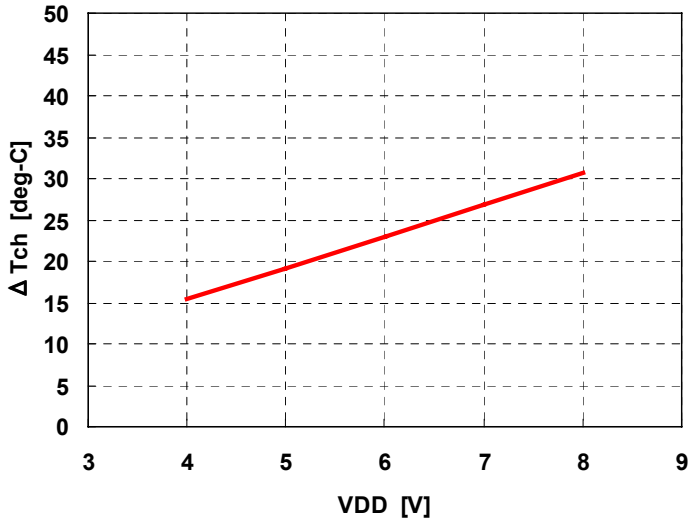
■ S-Parameter

Freq.	S11		S21		S12		S22	
GHz	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
1.0	0.9364	-42.16	0.0173	91.32	0.0001	90.00	0.9705	-48.09
2.0	0.7812	-81.39	0.0866	-95.26	0.0001	-171.87	0.9164	-91.14
3.0	0.6008	-117.15	0.0361	63.31	0.0001	-131.99	0.8766	-108.46
4.0	0.4254	-151.08	0.0114	92.76	0.0001	95.71	0.9449	-135.96
5.0	0.2654	172.75	0.0496	148.46	0.0001	26.57	0.9470	-158.24
6.0	0.1382	120.00	0.4097	102.31	0.0000	90.00	0.9345	-178.20
7.0	0.1247	29.61	0.8893	16.24	0.0001	-63.43	0.8907	162.82
8.0	0.2184	-24.49	1.2973	-44.79	0.0001	22.62	0.8341	144.85
9.0	0.3199	-56.88	1.8931	-92.65	0.0003	43.73	0.7652	126.73
10.0	0.4069	-84.14	3.2336	-132.46	0.0001	118.30	0.6859	107.56
11.0	0.4609	-110.53	7.8616	176.68	0.0002	-114.44	0.6031	87.01
12.0	0.4482	-137.09	16.5903	90.45	0.0003	85.43	0.5160	63.83
12.5	0.4190	-148.66	18.7073	43.74	0.0002	122.91	0.4739	51.49
13.0	0.3791	-158.44	18.8635	1.56	0.0002	171.47	0.4301	38.34
13.5	0.3415	-166.35	18.2229	-36.28	0.0001	-51.34	0.3942	25.44
14.0	0.3117	-173.16	17.3261	-70.47	0.0004	99.46	0.3656	11.48
14.5	0.2884	179.83	16.5197	-101.96	0.0002	-148.39	0.3443	-2.57
15.0	0.2649	172.43	15.9096	-131.47	0.0002	105.95	0.3294	-16.42
15.5	0.2456	163.53	15.5321	-159.70	0.0006	-141.04	0.3160	-30.62
16.0	0.2197	152.38	15.3884	172.80	0.0002	177.27	0.3108	-44.25
16.5	0.1924	138.65	15.4297	145.60	0.0001	116.57	0.3091	-56.59
17.0	0.1604	123.63	15.7534	118.68	0.0000	-180.00	0.3081	-69.08
17.5	0.1372	102.04	16.2360	91.14	0.0003	-66.50	0.3067	-80.34
18.0	0.1166	77.07	16.9396	63.15	0.0021	29.03	0.3047	-91.07
18.5	0.1107	40.95	17.7663	33.76	0.0005	105.95	0.3009	-100.77
19.0	0.1270	10.27	18.5339	3.08	0.0005	-86.27	0.2931	-110.10
19.5	0.1570	-18.52	18.9621	-28.82	0.0005	87.84	0.2837	-119.04
20.0	0.1943	-38.14	18.9627	-61.17	0.0007	15.83	0.2716	-126.66
20.5	0.2368	-56.50	18.3970	-93.92	0.0004	-173.37	0.2530	-134.34
21.0	0.2787	-74.08	17.3632	-125.68	0.0006	-155.30	0.2298	-141.02
21.5	0.3149	-90.70	16.3173	-156.67	0.0004	-152.85	0.2089	-146.80
22.0	0.3427	-107.39	15.1908	173.17	0.0004	157.48	0.1868	-151.92
22.5	0.3682	-124.45	14.2478	143.68	0.0004	138.01	0.1610	-156.86
23.0	0.3781	-141.04	13.4796	114.33	0.0004	126.87	0.1424	-160.66
23.5	0.3842	-158.57	12.8187	84.98	0.0005	128.66	0.1159	-166.49
24.0	0.3812	-176.04	12.3604	55.18	0.0005	93.30	0.0939	-171.74
24.5	0.3794	165.28	12.0174	24.95	0.0006	75.47	0.0726	-179.61
25.0	0.3757	145.99	11.8535	-6.54	0.0006	96.01	0.0509	162.79
25.5	0.3775	125.86	11.8023	-39.56	0.0005	62.95	0.0419	122.93
26.0	0.3830	105.17	11.8585	-74.57	0.0003	43.60	0.0632	74.85
26.5	0.3962	84.89	12.0356	-112.74	0.0004	-30.96	0.1152	51.97
27.0	0.4087	65.61	12.1294	-154.82	0.0005	-67.22	0.1983	37.78
27.5	0.4269	48.48	11.9840	157.33	0.0002	57.09	0.3150	23.65
28.0	0.4490	33.54	10.9988	101.22	0.0001	-82.87	0.4673	7.13
29.0	0.5021	6.64	4.4476	-20.99	0.0002	-106.39	0.6835	-33.61
30.0	0.5071	-13.97	1.0263	-105.33	0.0000	26.57	0.7080	-55.94
31.0	0.5147	-25.92	0.2519	-167.14	0.0003	-178.03	0.7314	-69.40
32.0	0.5508	-31.91	0.0601	134.22	0.0007	-105.26	0.7604	-80.08
33.0	0.6245	-39.98	0.0042	87.96	0.0004	113.96	0.7954	-88.22
34.0	0.6836	-50.00	0.0020	-49.58	0.0004	64.09	0.8141	-95.73
35.0	0.7313	-57.97	0.0038	157.75	0.0001	55.01	0.8355	-102.17
36.0	0.7485	-65.77	0.0053	165.16	0.0003	-28.18	0.8564	-107.84
37.0	0.7731	-72.50	0.0026	-119.47	0.0005	-28.52	0.8650	-113.51
38.0	0.8007	-78.20	0.0034	71.83	0.0003	47.86	0.8752	-117.97
39.0	0.8122	-83.09	0.0078	-50.87	0.0008	-177.95	0.9058	-121.72
40.0	0.8263	-88.26	0.0063	-108.00	0.0009	66.63	0.9189	-127.13

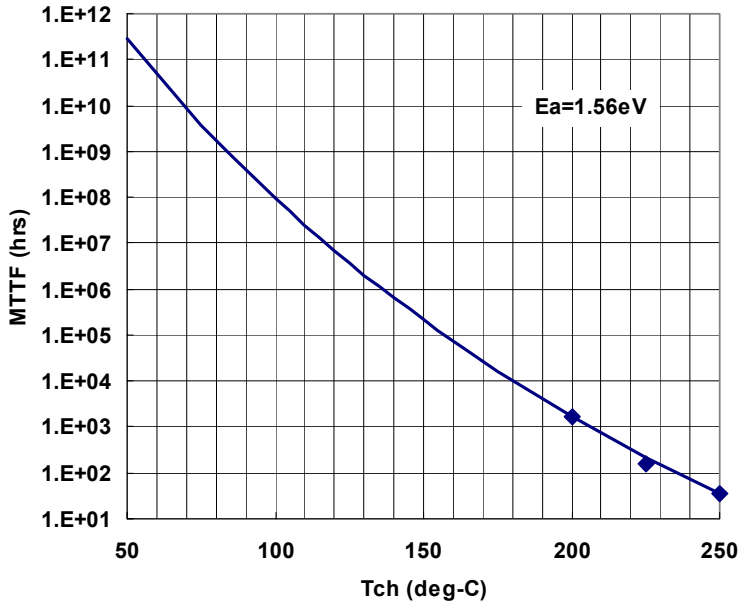
■ **Channel Temperature rise and MTTF**

ΔTch vs. Drain Voltage (Reference)

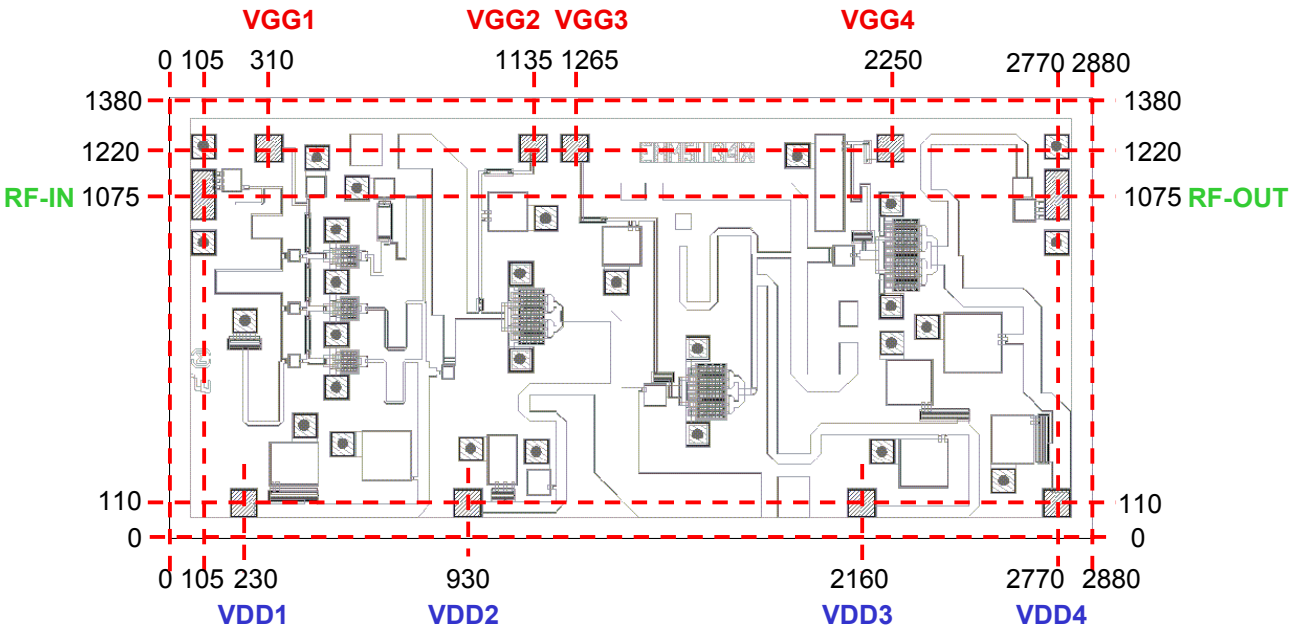
IDD=300mA



MTTF vs. Tch



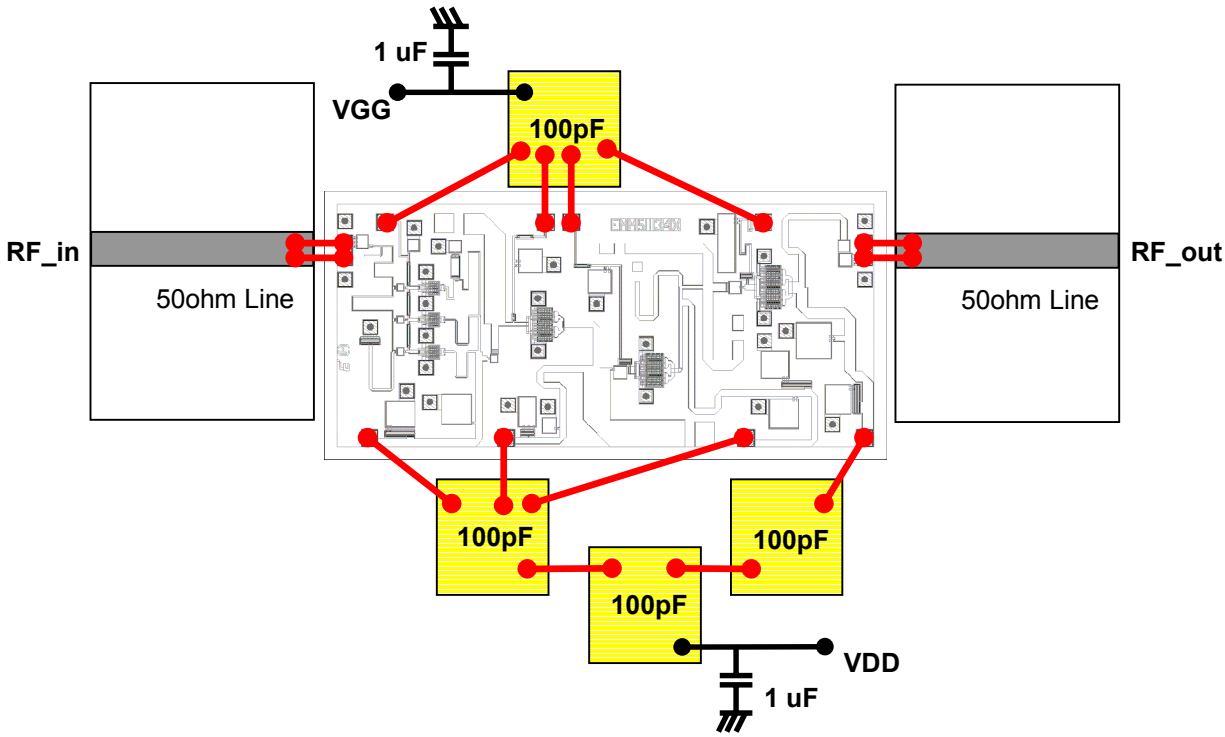
■ **Chip Outline and Bonding Pad Locations (Dimension in Micro-Meters)**



Chip Size : 2880±30um x 1380±30um
Chip Thickness : 60±20um
Bonding Pad Size : 80um x 80um(VDD, VGG), 160um x 80um (RF)

■ Assembly Diagrams

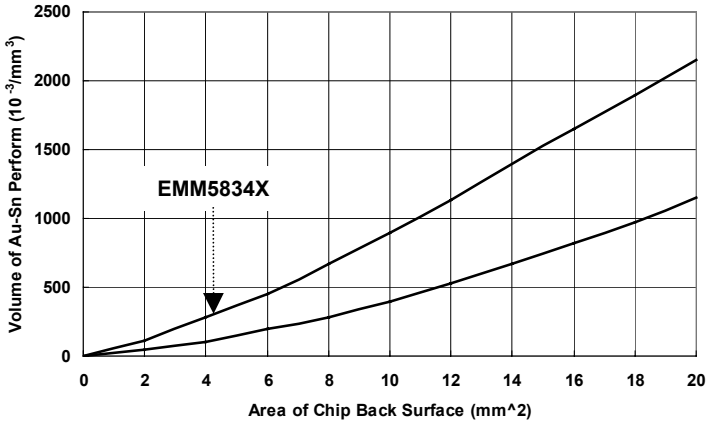
Recommended assembly



“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

EMM5834X

Ku / K-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.