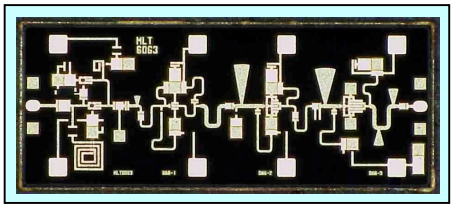
FMM5125X

15/60GHz Frequency Multiplier MMIC

FEATURES

- Input/Output Frequency : 15 / 60 GHz
- Wide Frequency Band : 57 - 64 GHz
- Conversion Loss : Lc = 5dB (Typ.) @fout = 60 GHz, Pin = 10 dBm
- High Output Power : Po = 5dBm (Typ.) @fout = 60 GHz, Pin = 10 dBm
- Impedance Matched Zin/Zout = 50Ω



DESCRIPTION

The FMM5125X is a by 4 frequency multiplier MMIC designed for applications in the 57-64 GHz frequency range. This product is well suited for wireless LAN and point-to-point radio.
Eudyna's stringent Quality Assurance Program assures the highest reliability and consistent performance.

ABSOLUTE MAXIMUM RATING (Case Temperature Tc=25°C)

Item	Symbol	Rating	Unit
DC Input Voltage	V_{DD}	+4	V
DC Input Voltage	V_{GG}	-3	V
Input Power	Pin	15	dBm
Storage Temperature	T_{stg}	-55 to +125	°C

RECOMMENDED OPERATING CONDITION (Case Temperature Tc=25°C)

Item	Symbol	Condition	Unit
DC Input Voltage	V_{DD}	3	V
Backside Temperature	Tb	-45 to + 85	°C

ELECTRICAL CHARACTERISTICS (Case Temperature Tc=25°C)

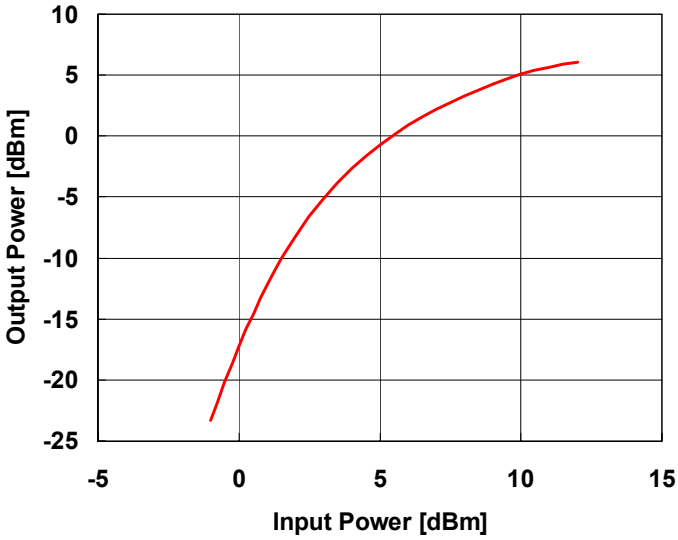
Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Output Power	Pout	V_{DD}=3V	-5	5	-	dBm
		V_{GG}=0V				
		Pin=10 dBm				
Total Drain Current	I_{DDt}	*fin* =14.25~16 GHz	-	100	-	mA
Input Return Loss	RL_{in}	*f* = 14.25~16 GHz	-	8	-	dB
Output Return Loss	RL_{out}	*f* = 57~64 GHz	-	12	-	dB

These values are representative for CW on chip measurements that are made without bonding wires at the RF ports.

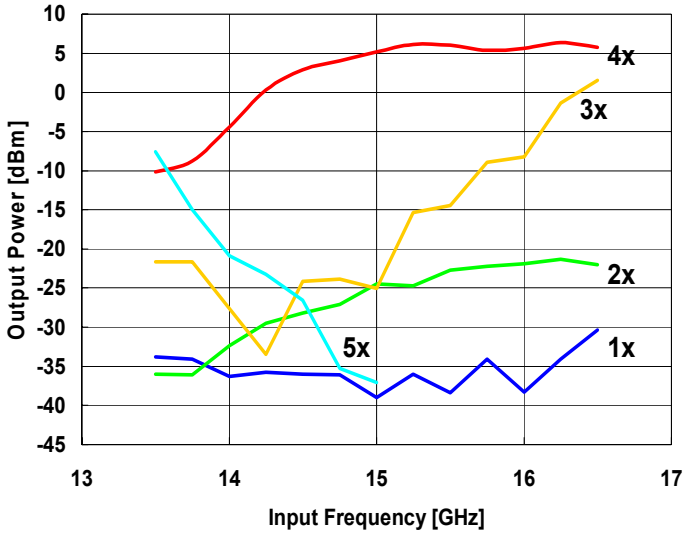
ESD	Class 0	~ 199V

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

Output Power vs. Input Power
Bias Condition: Vdd = 3V, Idd = 100 mA
fin = 15 GHz

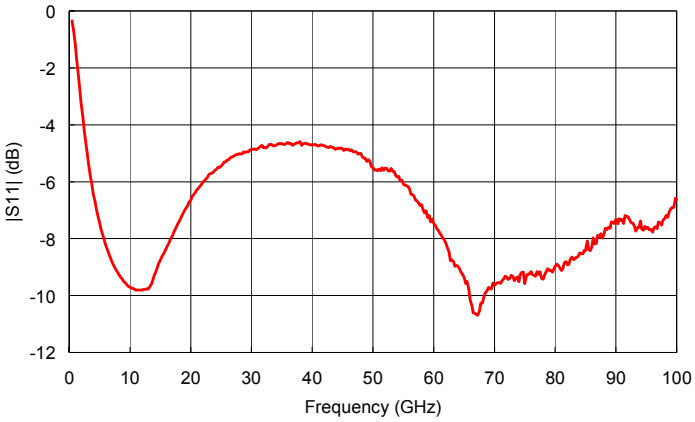


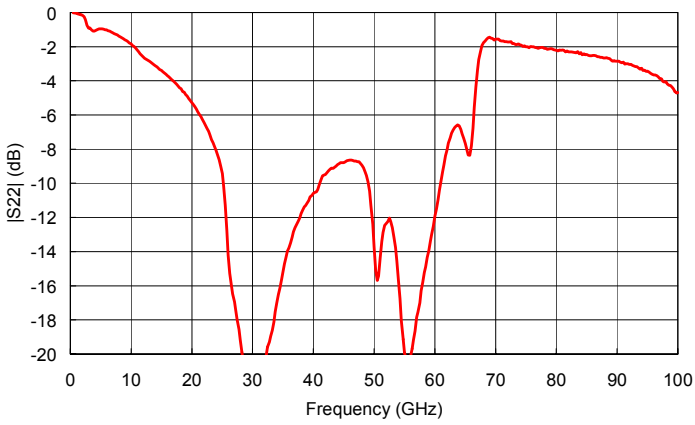
Output Power vs. Frequency
Bias Condition: Vdd = 3V, Idd = 100 mA
Pin = 10 dBm



Typical on chip measurements

S-PARAMETERS
V_{DD} = 3V, V_{GG} = 0V, I_{DD} = 100 mA





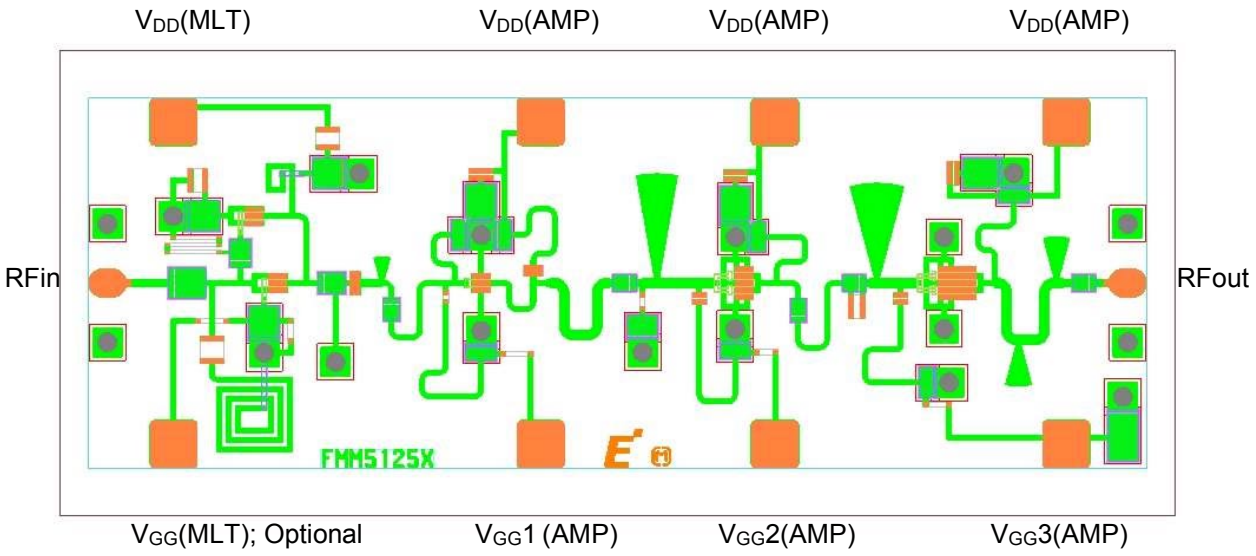
Typical on chip measurements

S-PARAMETERS
Vdd = 3V, Vgg = 0V, Idd = 100 mA

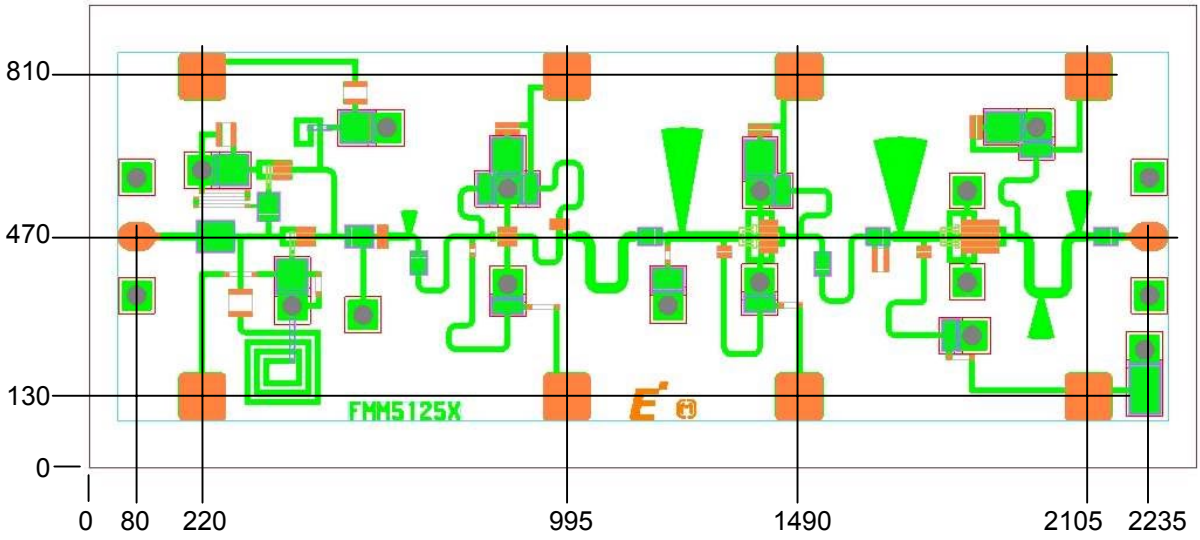
Freq.	S11		S21		S12		S22		Freq.	S11		S21		S12		S22	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1	0.874	-40.2	0.003	85.0	0.0003	107.0	0.995	-12.2	51	0.528	120.6	4.543	-4.8	0.0009	-17.5	0.191	-123.7
2	0.689	-68.7	0.005	-71.0	0.0007	35.7	0.982	-24.5	52	0.530	117.0	4.181	-45.6	0.0020	-20.6	0.241	-130.1
3	0.558	-88.1	0.011	55.7	0.0008	-62.7	0.899	-35.3	53	0.529	112.8	4.203	-76.5	0.0020	-25.7	0.235	-143.6
4	0.477	-101.9	0.006	-115.6	0.0004	-91.0	0.882	-43.0	54	0.511	108.2	4.486	-109.2	0.0003	-19.5	0.165	-153.1
5	0.425	-112.0	0.002	-164.9	0.0003	-100.2	0.896	-52.3	55	0.496	104.3	4.754	-140.3	0.0011	-140.8	0.101	-133.9
6	0.389	-119.8	0.001	-176.4	0.0004	-125.0	0.890	-62.5	56	0.487	100.2	5.109	-172.8	0.0017	85.7	0.098	-105.3
7	0.364	-125.5	0.001	176.9	0.0003	-147.4	0.873	-72.5	57	0.465	96.5	5.270	154.7	0.0019	34.9	0.128	-85.1
8	0.347	-129.5	0.001	150.1	0.0004	-152.2	0.853	-82.0	58	0.457	92.4	5.457	122.9	0.0023	66.4	0.162	-75.1
9	0.335	-132.6	0.001	120.1	0.0006	-157.7	0.833	-91.3	59	0.433	89.0	5.609	91.7	0.0027	42.3	0.201	-71.7
10	0.327	-134.5	0.002	93.8	0.0010	170.6	0.810	-100.5	60	0.423	84.4	5.793	59.5	0.0048	33.0	0.253	-68.3
11	0.324	-135.7	0.004	46.7	0.0015	124.2	0.779	-109.6	61	0.407	81.3	5.935	25.8	0.0044	23.8	0.320	-68.6
12	0.323	-136.4	0.007	-18.1	0.0014	60.1	0.741	-117.3	62	0.390	77.1	6.042	-7.2	0.0036	-6.3	0.396	-74.1
13	0.325	-136.1	0.009	-63.8	0.0013	-9.1	0.720	-124.7	63	0.365	73.1	5.809	-42.6	0.0035	-31.3	0.453	-83.2
14	0.342	-135.0	0.010	-127.1	0.0004	-59.7	0.699	-132.5	64	0.356	72.3	5.888	-75.8	0.0031	-20.4	0.465	-92.8
15	0.365	-136.3	0.008	-169.1	0.0001	-50.7	0.676	-140.2	65	0.340	66.9	6.089	-112.6	0.0018	-32.9	0.414	-95.5
16	0.383	-137.9	0.006	171.6	0.0005	-81.6	0.654	-148.0	66	0.310	64.5	6.186	-160.6	0.0006	-72.2	0.406	-77.4
17	0.403	-139.6	0.006	153.8	0.0007	-97.3	0.629	-156.1	67	0.293	66.1	4.622	144.4	0.0027	55.5	0.677	-76.4
18	0.424	-141.9	0.008	140.9	0.0012	-143.2	0.603	-164.4	68	0.307	67.7	2.634	103.0	0.0044	22.5	0.816	-94.1
19	0.446	-144.3	0.008	111.4	0.0013	165.8	0.576	-173.1	69	0.327	63.1	1.520	74.8	0.0046	22.1	0.847	-106.4
20	0.465	-147.0	0.008	78.8	0.0008	142.1	0.545	177.7	70	0.330	58.4	0.956	54.1	0.0043	12.7	0.836	-114.9
21	0.484	-150.3	0.008	60.0	0.0005	132.6	0.512	167.6	71	0.332	53.1	0.634	37.2	0.0064	-5.4	0.825	-121.4
22	0.501	-153.4	0.007	42.1	0.0002	115.1	0.476	156.6	72	0.341	48.2	0.454	23.1	0.0056	-36.7	0.819	-127.0
23	0.515	-156.8	0.006	11.7	0.0004	-78.1	0.438	144.3	73	0.342	42.4	0.348	9.0	0.0050	-16.5	0.810	-132.1
24	0.525	-159.7	0.004	-0.5	0.0007	-112.1	0.395	129.4	74	0.334	37.0	0.277	-5.3	0.0058	0.9	0.804	-136.1
25	0.534	-162.4	0.002	-23.0	0.0019	-164.0	0.337	107.2	75	0.332	30.8	0.217	-18.1	0.0031	-28.4	0.794	-139.9
26	0.547	-165.8	0.001	101.2	0.0024	144.1	0.195	86.3	76	0.348	23.8	0.184	-31.1	0.0056	-52.0	0.795	-143.6
27	0.555	-168.7	0.004	91.9	0.0019	121.6	0.142	84.4	77	0.348	19.1	0.149	-48.1	0.0046	-58.7	0.785	-146.7
28	0.561	-172.0	0.005	59.6	0.0016	114.9	0.110	69.6	78	0.338	13.2	0.133	-63.5	0.0025	-18.6	0.786	-150.8
29	0.564	-174.8	0.010	56.2	0.0017	70.4	0.085	51.8	79	0.350	5.7	0.106	-79.4	0.0025	-69.9	0.784	-153.1
30	0.571	-177.7	0.014	31.8	0.0009	110.1	0.073	30.9	80	0.356	-0.3	0.094	-91.7	0.0041	-66.0	0.775	-156.6
31	0.572	179.9	0.016	5.1	0.0005	59.0	0.080	7.8	81	0.350	-6.2	0.080	-102.5	0.0061	-46.0	0.776	-159.6
32	0.575	176.5	0.019	-12.3	0.0010	73.4	0.094	-9.4	82	0.358	-13.8	0.064	-124.4	0.0055	-55.7	0.767	-162.8
33	0.583	174.1	0.023	-28.2	0.0013	91.6	0.113	-24.5	83	0.366	-21.0	0.062	-136.6	0.0057	-69.6	0.764	-166.4
34	0.581	171.6	0.026	-43.4	0.0019	100.2	0.141	-33.2	84	0.376	-27.5	0.054	-149.5	0.0049	-74.6	0.764	-169.7
35	0.585	168.3	0.030	-56.1	0.0010	83.5	0.174	-42.2	85	0.379	-35.4	0.041	-172.5	0.0064	-61.5	0.754	-172.8
36	0.588	165.8	0.037	-69.6	0.0019	79.1	0.205	-52.7	86	0.385	-42.5	0.027	177.1	0.0040	-79.0	0.749	-175.5
37	0.583	163.1	0.042	-84.2	0.0017	99.0	0.235	-61.5	87	0.403	-51.5	0.020	150.8	0.0062	-69.7	0.743	-179.0
38	0.590	159.7	0.052	-100.7	0.0012	87.2	0.258	-69.3	88	0.405	-57.8	0.015	152.4	0.0060	-95.9	0.736	178.1
39	0.586	157.4	0.058	-105.8	0.0020	74.4	0.277	-76.4	89	0.415	-68.2	0.012	150.3	0.0063	-98.4	0.725	174.5
40	0.582	154.3	0.071	-121.8	0.0023	42.6	0.295	-83.0	90	0.430	-78.3	0.014	162.0	0.0066	-120.6	0.720	171.4
41	0.579	151.3	0.091	-130.3	0.0023	48.0	0.314	-86.2	91	0.430	-88.3	0.005	135.0	0.0064	-134.0	0.716	168.1
42	0.580	148.5	0.115	-142.9	0.0019	19.1	0.336	-94.2	92	0.435	-97.7	0.005	-110.8	0.0024	-152.3	0.705	163.7
43	0.578	145.6	0.152	-155.1	0.0018	54.7	0.350	-100.6	93	0.419	-108.5	0.008	141.6	0.0061	-151.9	0.694	160.4
44	0.573	142.7	0.210	-167.3	0.0016	31.8	0.359	-106.0	94	0.428	-118.2	0.006	173.6	0.0037	-137.3	0.687	156.3
45	0.572	139.3	0.292	179.9	0.0010	30.8	0.363	-112.4	95	0.415	-131.3	0.008	147.2	0.0027	-167.1	0.675	152.1
46	0.572	136.4	0.435	166.3	0.0016	45.9	0.370	-118.9	96	0.409	-142.4	0.012	-141.5	0.0038	175.0	0.656	147.5
47	0.566	132.7	0.683	149.6	0.0021	49.3	0.368	-126.3	97	0.426	-155.2	0.002	17.8	0.0036	-177.8	0.642	141.8
48	0.562	129.2	1.161	129.5	0.0015	64.2	0.357	-135.4	98	0.432	-169.3	0.007	-50.6	0.0029	150.4	0.627	137.7
49	0.544	125.2	2.157	100.7	0.0027	43.9	0.319	-147.3	99	0.449	177.4	0.007	-115.4	0.0006	-12.8	0.607	132.1
50	0.531	122.6	3.905	52.8	0.0027	46.9	0.206	-155.1	100	0.466	158.1	0.010	-150.4	0.0011	-177.0	0.583	126.9

Typical on chip measurements

CHIP OUTLINE



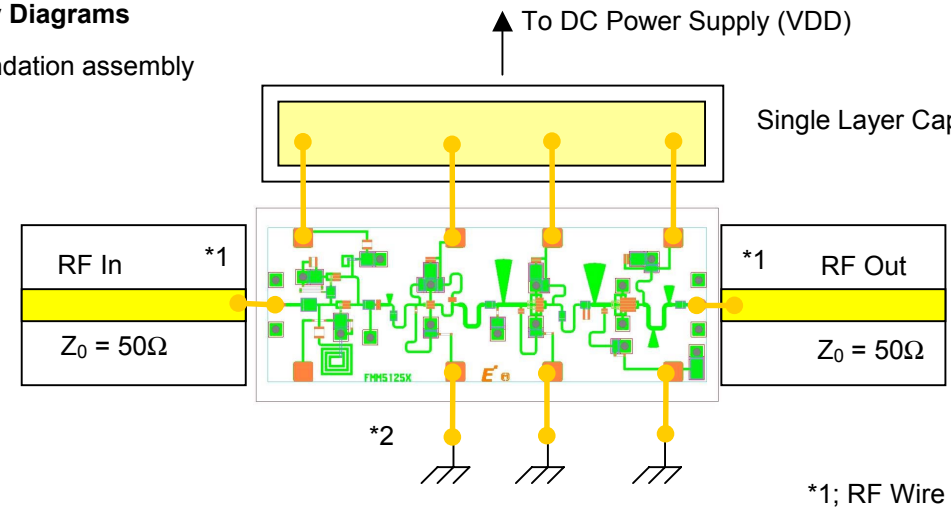
Bonding Pad Locations (Dimension in Micron Meters)



Pad Dimensions	Unit; μm
DC Pads; 100 x 100 μm	Chip size; 2315 x 940 μm
RF Pads; 80 x 60 μm	Chip Thickness; 70 μm

Assembly Diagrams

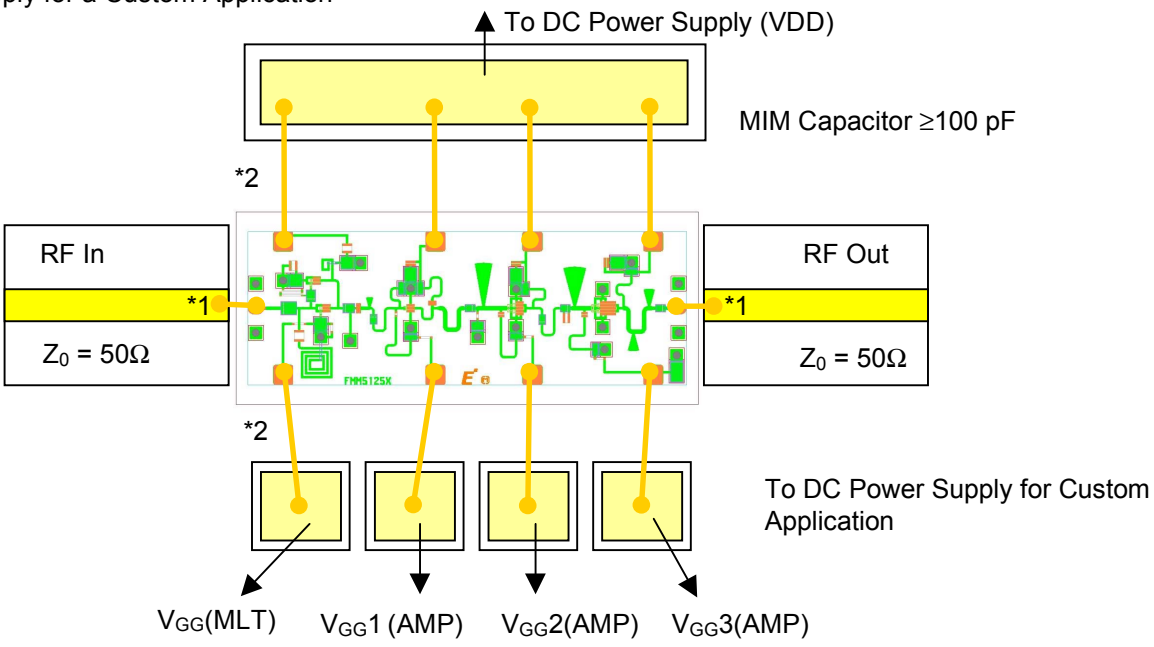
Recommendation assembly



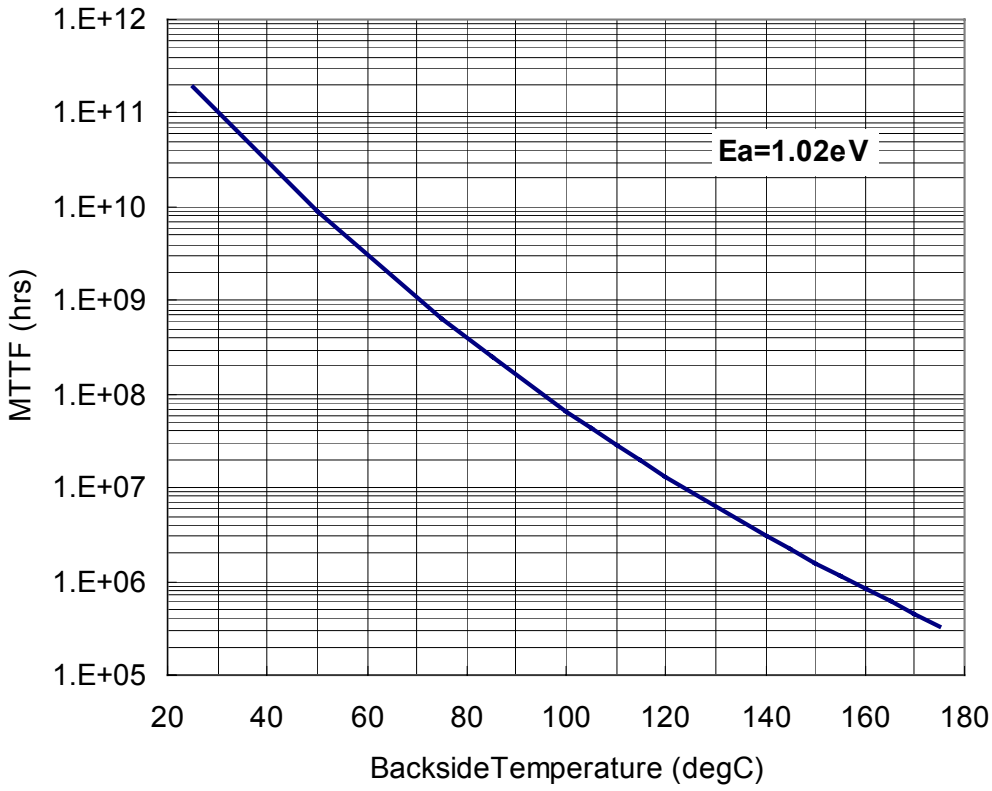
*1; RF Wire Length = 150 μm

*2; DC Wire Length ≤ 1000 μm

DC Power Supply for a Custom Application



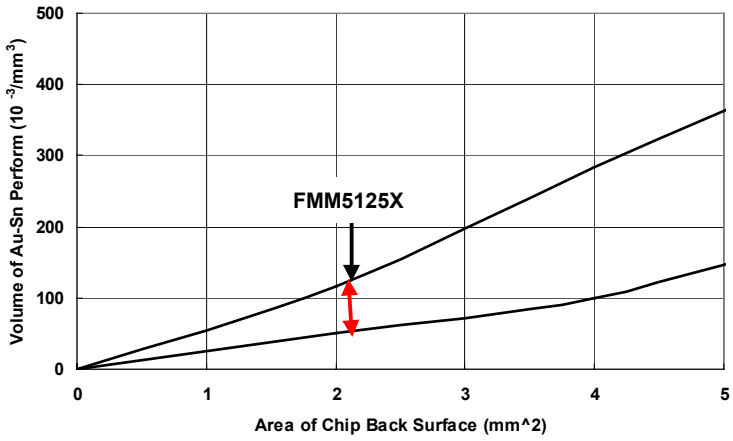
MTTF vs. Backside Temperature



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 Perform 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.

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