FMM5714X

37-42GHz Low Noise Amplifier MMIC

FEATURES

- Low Noise Figure : NF = 3dB (Typ.)
- High Associated Gain : Gas = 22dB (Typ.)
- Wide Frequency Band : 37-42GHz
- High Output Power : P1dB = 20dBm (Typ.) @f=42GHz
- Impedance Matched Zin/Zout = 50Ω

DESCRIPTION

The FMM5714X is a LNA MMIC designed for applications in the 37-42 GHz frequency range. This product is well suited for satellite communications, radio link, and applications where low noise and high dynamic range are required.
Eudyna Device's stringent Quality Assurance Program assures the highest reliability and consistent performance.

ABSOLUTE MAXIMUM RATING

Item	Symbol	Rating	Unit
Drain-Source Voltage	V_{DD}	4	V
Gate-Source Voltage	V_{GG}	-3	V
Input Power	P_{in}	18	dBm
Storage Temperature	T_{stg}	-55 to +125	℃

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Unit
Drain-Source Voltage	V_{DD}	≦3	V
Inpur Power	P_{in}	8	dBm
Operating Backside Temperature	Top	-40 to +85	℃

*** This product should be hermetically packaged.**

ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25℃)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Frequency	Freq.	VDD=3V IDD(DC)=200mA f=37GHz	37	-	42	GHz
Associate Gain	Gas		17	22	-	dB
Noise Figure	NF		-	3	4	dB
Gate Voltage	Vgg		-0.8	-0.25	-0.01	V
Input Return Loss	RL_{IN}		-	-10	-	dB
Output Return Loss	RL_{OUT}		-	-10	-	dB
1dB Compression Output Power	P1dB	VDD=3V,IDD(DC)=200mA *1 : f=37GHz, *2 : f=42GHz	-	17 *1 20 *2	-	dBm

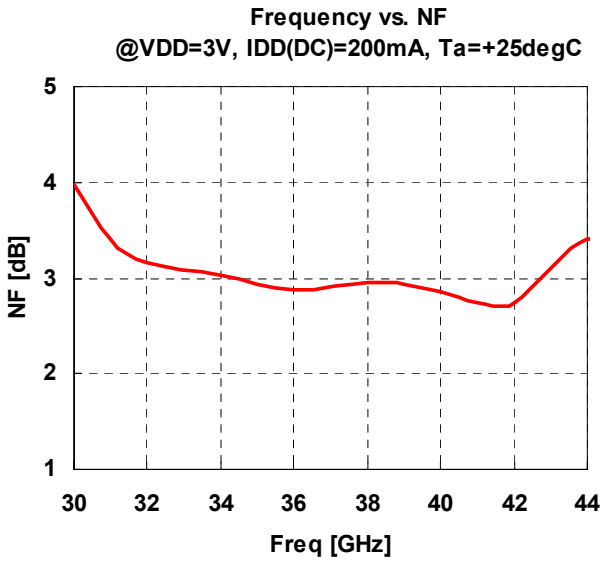
* The Electrical Characteristics are guaranteed by the wafer acceptance test, the number of the sample is 10pcs/wafer.
Criteria (accept,reject)=(0,1)

ESD	Class 0	~ 250V

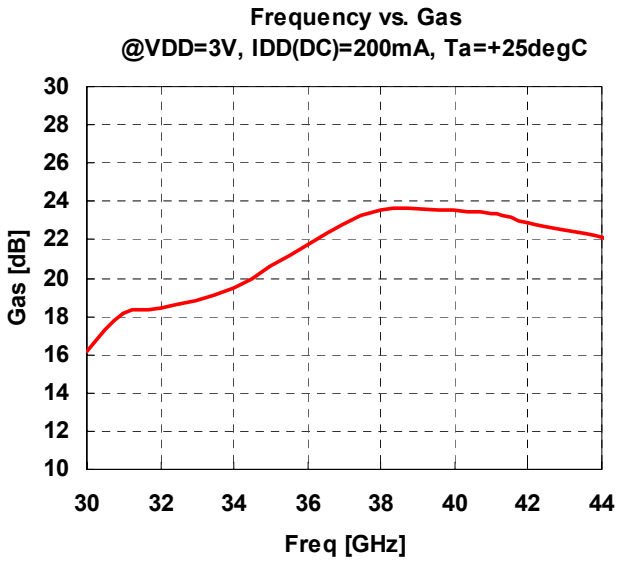
Note : Based on JEDEC JESD22-A114-C

RoHs Compliance	YES

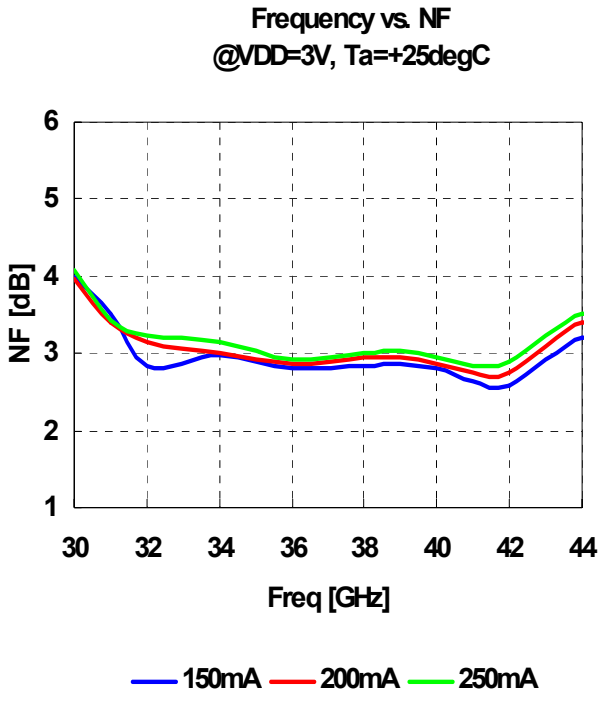
Frequency vs. NF



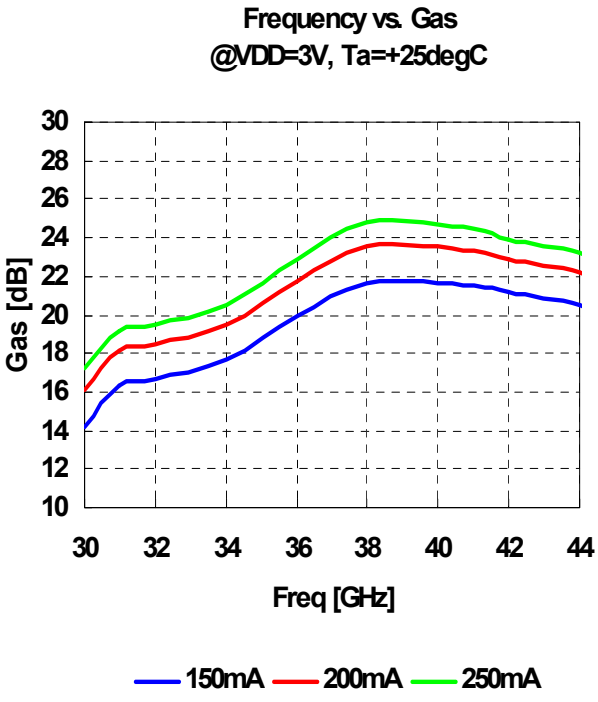
Frequency vs. Gas



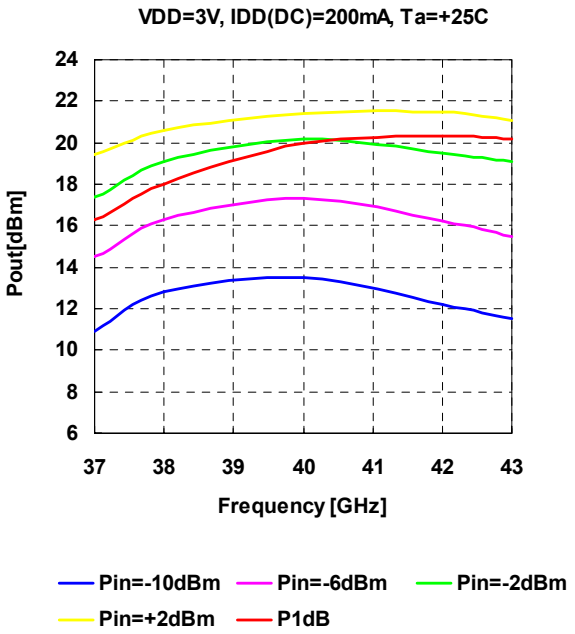
Frequency vs. NF by Drain Current



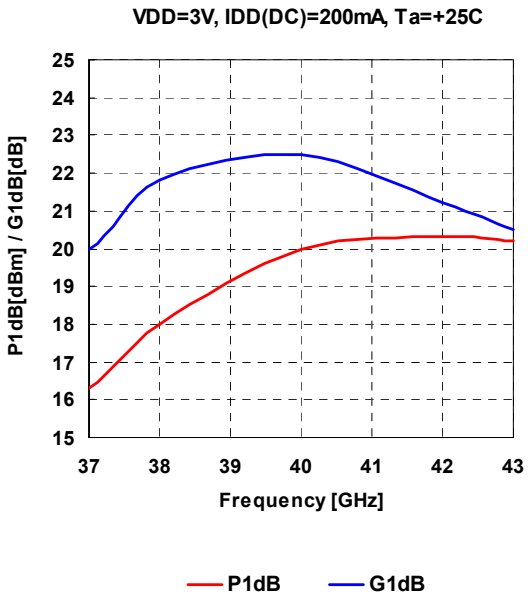
Frequency vs. Gas by Drain Current



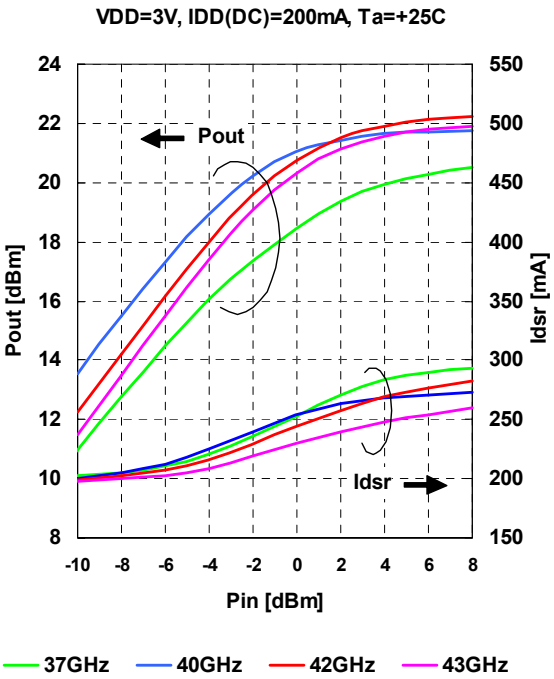
Frequency vs. Output Power



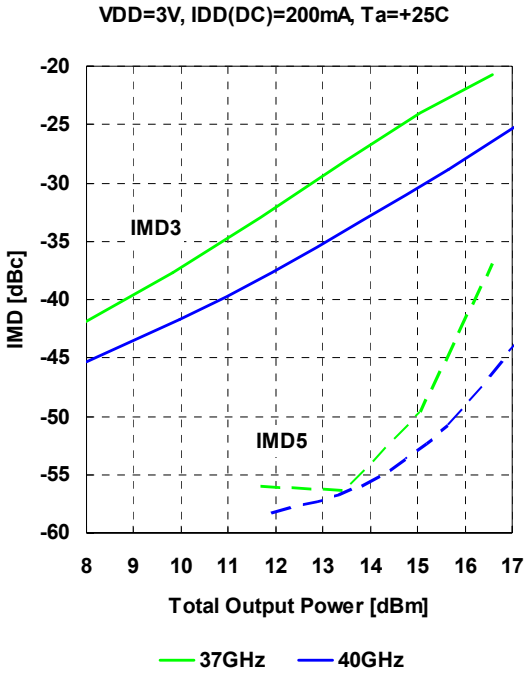
Frequency vs. P1dB, G1dB



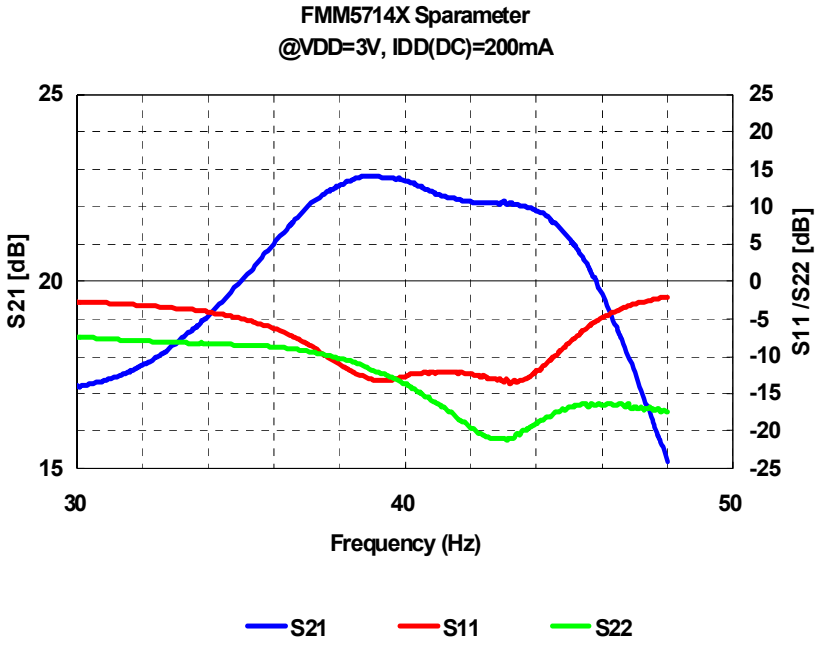
Input Power vs. Output Power by Frequency



Output Power vs. IMD by Frequency

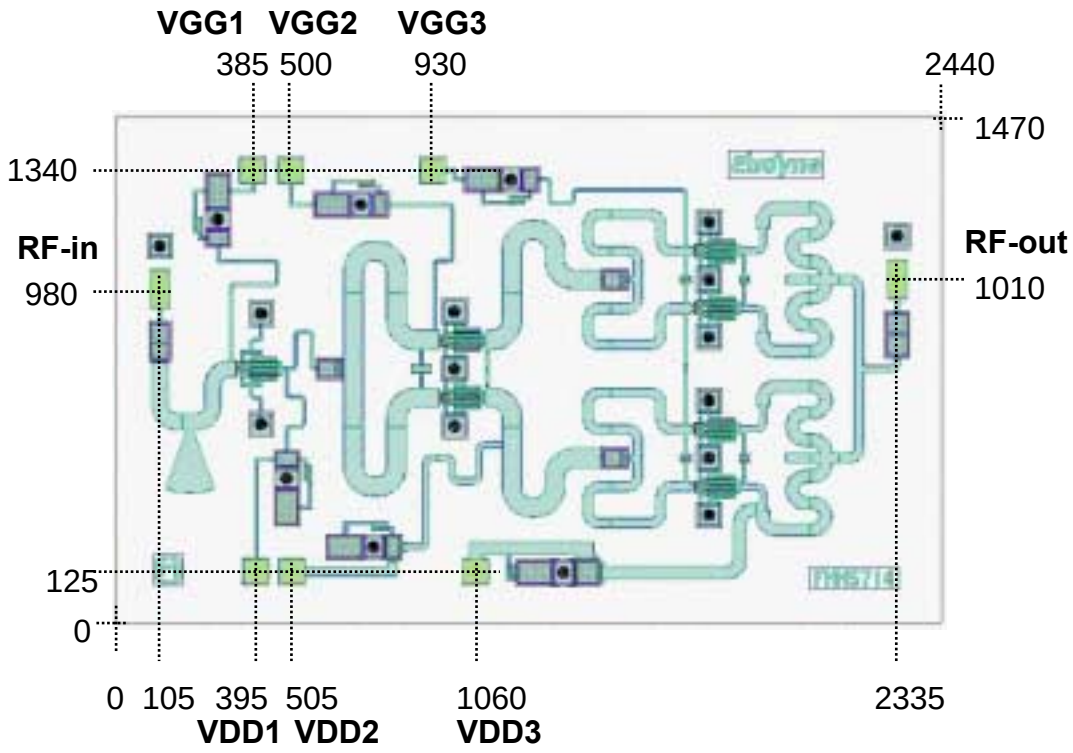


Frequency vs. S-parameter



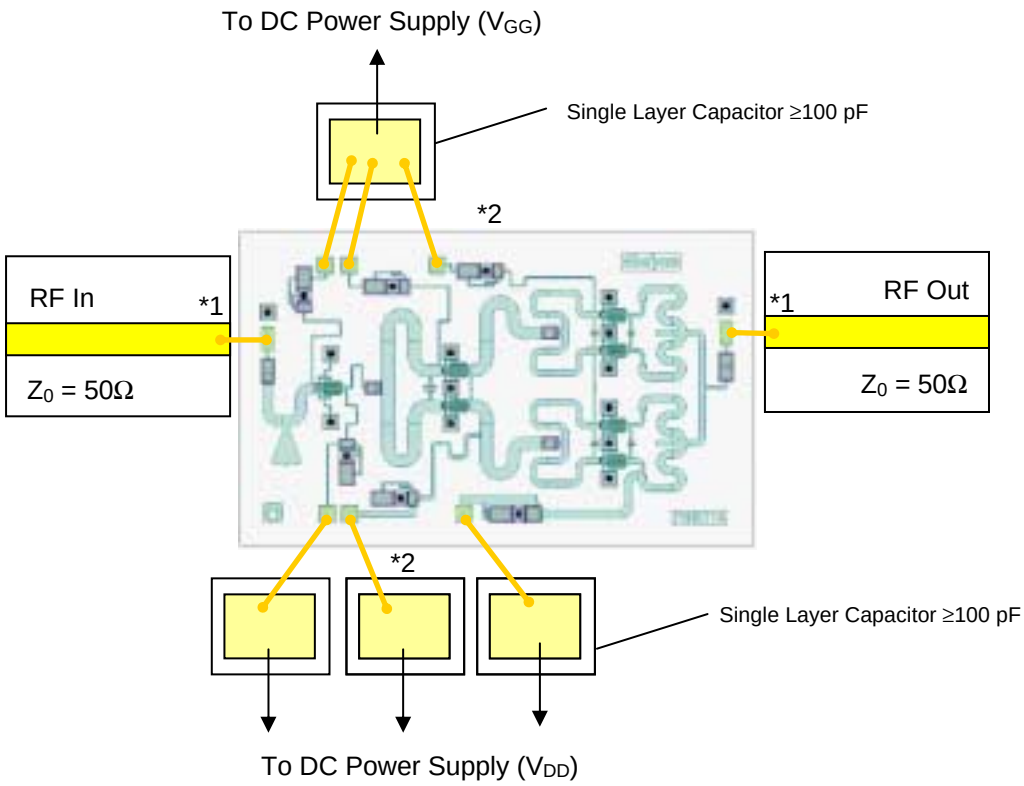
Freq. [GHz]	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG
20	7.307E-01	161.795	6.344E+00	33.064	1.12E-03	60.408	6.547E-01	94.414
21	7.491E-01	150.815	6.074E+00	7.843	7.36E-04	56.073	6.498E-01	84.424
22	7.621E-01	139.992	6.057E+00	-17.404	9.56E-04	39.483	6.442E-01	74.011
23	7.704E-01	129.143	6.234E+00	-43.478	1.12E-03	23.603	6.317E-01	62.861
24	7.770E-01	118.029	6.524E+00	-70.991	6.55E-04	57.911	6.162E-01	50.954
25	7.805E-01	106.767	6.828E+00	-99.959	8.85E-04	16.203	5.890E-01	39.121
26	7.782E-01	95.403	7.065E+00	-129.682	1.08E-03	37.569	5.534E-01	27.537
27	7.731E-01	83.326	7.176E+00	-159.922	9.33E-04	21.448	5.139E-01	16.458
28	7.648E-01	71.303	7.201E+00	170.493	1.19E-03	4.984	4.790E-01	6.739
29	7.520E-01	58.741	7.198E+00	141.590	1.55E-03	-6.654	4.487E-01	-2.352
30	7.356E-01	45.543	7.250E+00	113.695	1.61E-03	-21.313	4.285E-01	-11.528
31	7.173E-01	31.728	7.417E+00	86.259	1.18E-03	-40.743	4.119E-01	-20.788
32	6.932E-01	16.475	7.737E+00	58.927	1.90E-03	-56.644	4.011E-01	-30.733
33	6.635E-01	-0.340	8.256E+00	31.147	1.61E-03	-85.699	3.905E-01	-41.355
34	6.227E-01	-19.267	9.020E+00	2.457	2.22E-03	-100.607	3.839E-01	-52.903
35	5.653E-01	-42.284	1.002E+01	-27.979	2.13E-03	-121.943	3.756E-01	-65.667
36	4.844E-01	-69.836	1.124E+01	-60.421	2.67E-03	-159.016	3.651E-01	-80.545
37	3.859E-01	-105.954	1.254E+01	-95.784	2.92E-03	165.831	3.432E-01	-97.616
38	2.787E-01	-153.478	1.344E+01	-133.615	3.30E-03	131.808	3.065E-01	-116.820
39	2.236E-01	143.119	1.381E+01	-172.525	4.08E-03	101.869	2.565E-01	-139.190
40	2.301E-01	83.597	1.364E+01	149.372	6.11E-03	80.131	2.070E-01	-161.072
41	2.485E-01	33.693	1.310E+01	112.139	6.66E-03	30.864	1.526E-01	173.676
42	2.426E-01	-11.429	1.279E+01	76.178	6.71E-03	-0.401	1.045E-01	140.538
43	2.125E-01	-65.985	1.281E+01	38.666	4.13E-03	-61.339	9.016E-02	90.072
44	2.528E-01	-136.481	1.243E+01	-1.992	4.05E-03	-56.373	1.116E-01	30.051
45	3.872E-01	160.895	1.143E+01	-44.778	3.62E-03	-81.657	1.458E-01	-10.864
46	5.721E-01	115.906	9.624E+00	-87.747	6.37E-03	-114.300	1.490E-01	-41.133
47	7.046E-01	80.994	7.553E+00	-127.596	6.92E-03	179.801	1.459E-01	-66.783
48	7.907E-01	54.301	5.752E+00	-163.638	2.29E-03	139.551	1.343E-01	-88.721

Chip Outline and Bonding PAD Locations



Chip Size : 2.44 x 1.47 mm
Chip Thickness : 60 um +/- 20um
Bonding Pad Size
RF-in/out : 60 x 120 um
DC : 80 x 80 um

Bonding Layout and Recommended External Circuit



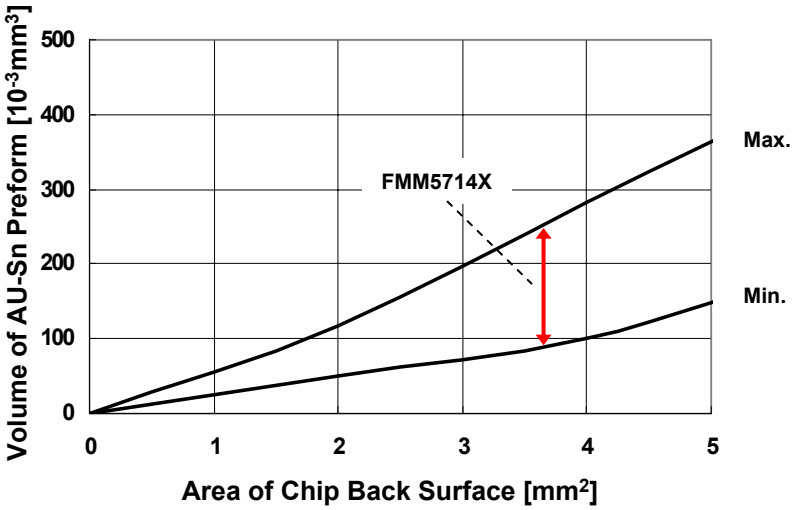
*1; RF Wire Length < 200 μm

*2; DC Wire Length < 1000 μm

"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 degC
Time : less than 15 seconds
AuSn Preform Volume : see below Figure



■ WIRE BONDING

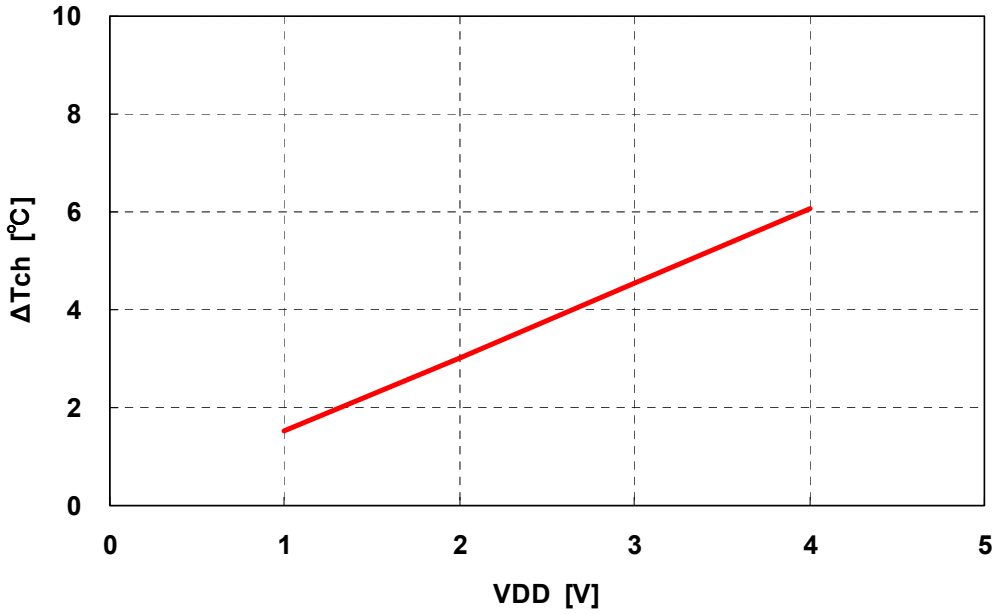
The bonding equipment must be properly grounded. The following or equivalent equipment, tools, materials, and conditions are recommended.

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 : 215degC +/- 5 degC
Tool Heater : None
Ultrasonic Power Transmitter : West Bond Model 1400
Duration : 150 mS/Bond

Reliability Data

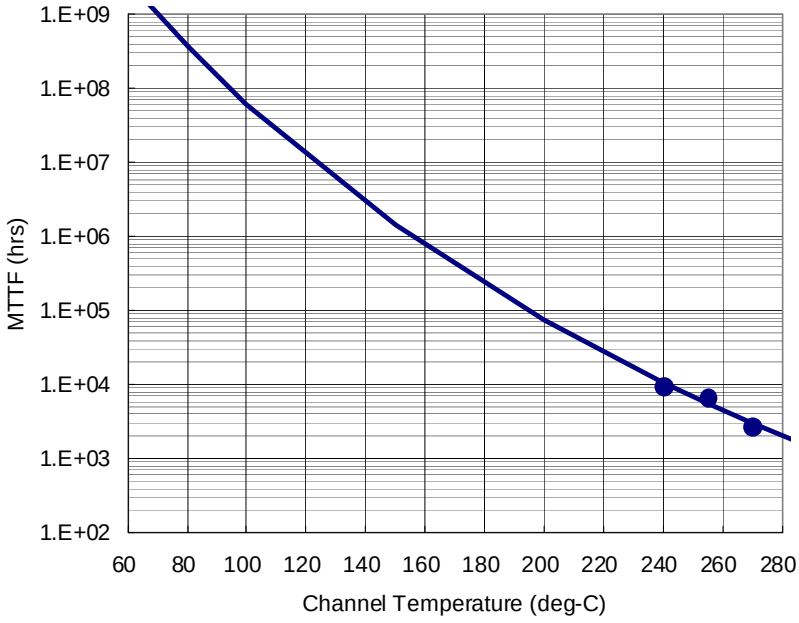
⊿Tch vs. Drain Voltage (Reference)

IDD=200mA



Note: ⊿Tch : Temperature Rise from Backside of the Package to Channel.

MTTF vs. Tch



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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.