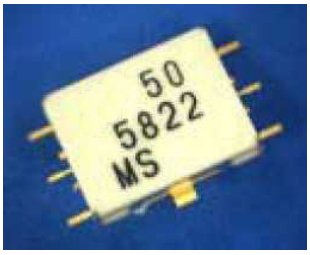
FMM5822VU

K-Band Power Amplifier MMIC

FEATURES

•High Output Power: Pout=32.0dBm (typ.)
•High Linear Gain: GL=22.0dB (typ.)
•Broad Band: 17.7 to 19.7GHz
•Impedance Matched Zin/Zout=50ohm
•Small Hermetic Metal-Ceramic SMT Package(VU)



DESCRIPTION

•The FMM5822VU is a MMIC amplifier that contains a three-stage amplifier, internally matched, for standard communications band in the 17.7 to 19.7GHz frequency range.
•Smitomo Electric Industries'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}	+25	dBm
Storage Temperature	T_{stg}	-55 to +125	deg.C

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Unit
Drain-Source Voltage	V_{DD}	=< 7	V
Input Power	P_{in}	=< 15	dBm
Operating Case Temperature	T_C	-40 to +85	deg.C

ELECTRICAL CHARACTERISTICS (Case Temperature Tc=25℃)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
RF Frequency Range	f	VDD=6.0V	17.7	-	19.7	GHz
Output Power at 1dB G.C.P.	P1dB	Idd(DC)=850mA (typ.)	29.0	32	-	dBm
Power Gain at 1dB G.C.P.	G1dB	Zs=Zl=50ohm	17	21	25	dB
Power-added Efficiency at 1dB G.C.P.	Nadd		-	24	-	%
Drain Current at 1dB G.C.P.	Iddrf		-	1100	1600	mA
Third Order Intermodulation Distortion	IM3	* : df=+10MHz	34	37	-	dBc
Input Return Loss (at Pin=-20dBm)	RLin	Po=20dBm (S.C.L.)	-	-8	-	dB
Output Return Loss (at Pin=-20dBm)	RLout		-	-8	-	dB

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

ESD	Class 0	=< 250V

Note : Based on JEDEC JESD22-A114C (C=100pF, R=1.5kohm)

CASE STYLE	VU

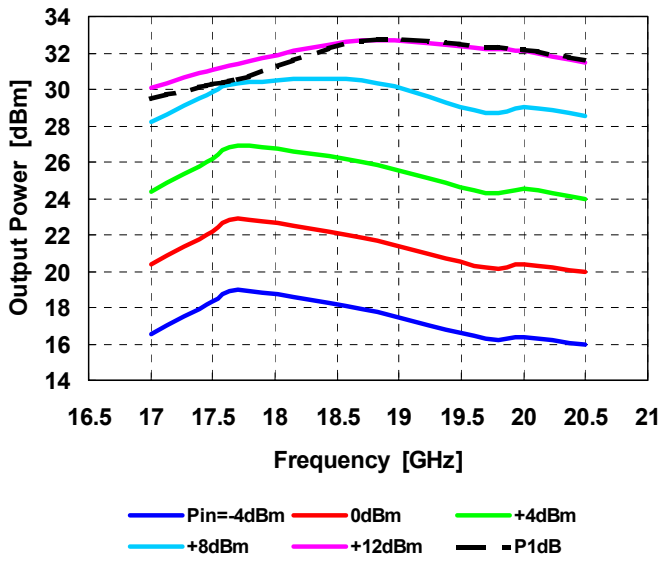
RoHS COMPLIANCE	Yes

ORDERING INFORMATION

Part Number	Order Unit	Packing
FMM5822VU	No Limitation	48 pcs./Tray x 4Tray = 192 pcs./Packing
FMM5822VUT	500 pcs.	500 pcs./Reel x 1Reel = 500 pcs./Packing

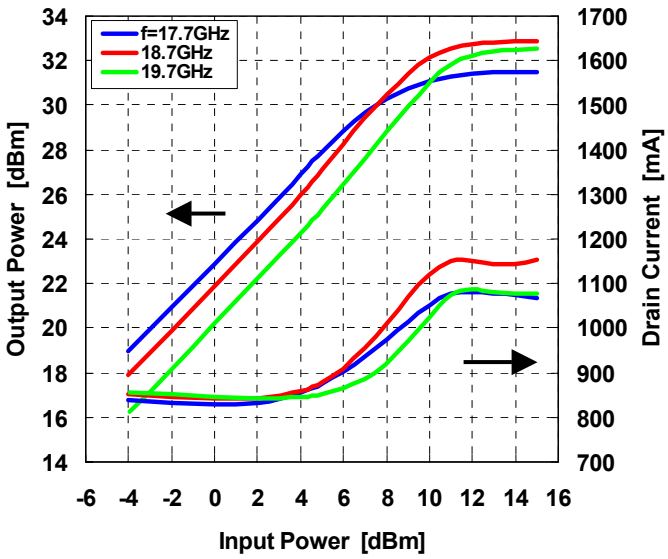
OUTPUT POWER vs. FREQUENCY

@VDD=6V, IDD(DC)=850mA



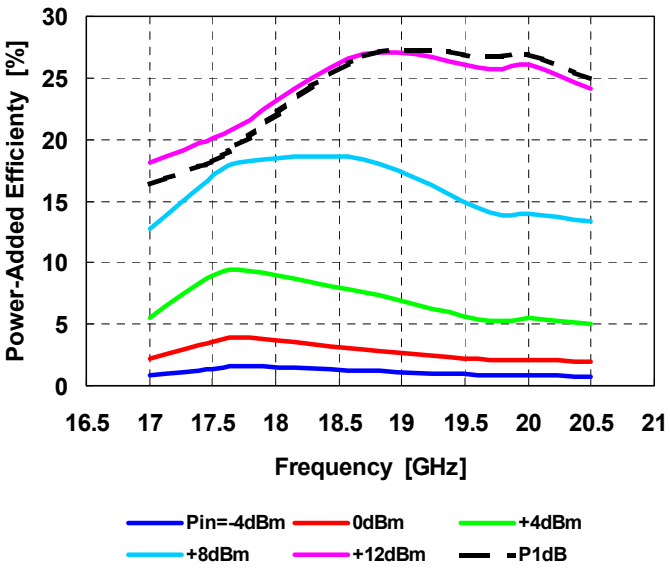
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER

@VDD=6V, IDD(DC)=850mA



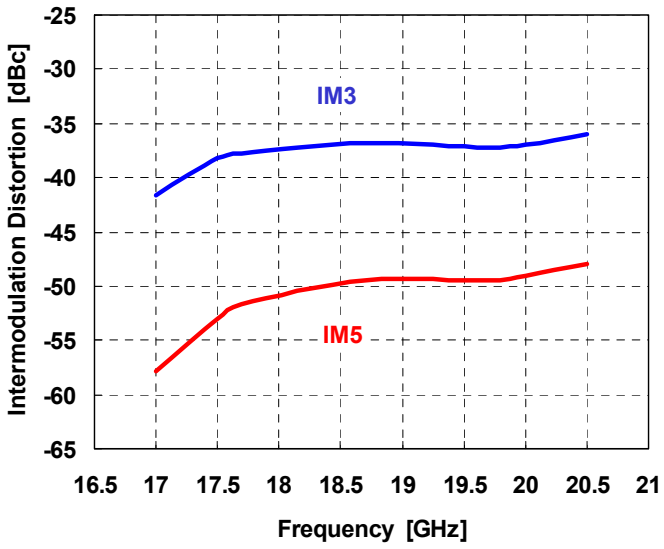
POWER-ADDED EFFICIENCY vs. FREQUENCY

@VDD=6V, IDD(DC)=850mA



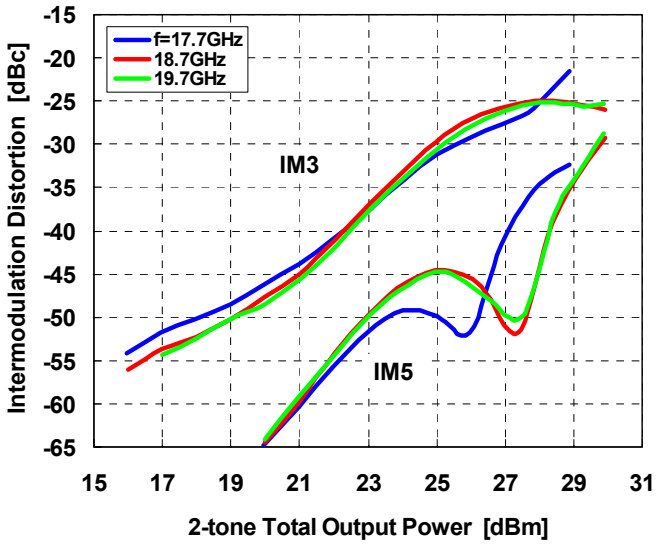
IMD vs. FREQUENCY

@VDD=6V, IDD(DC)=850mA, Po=20dBm S.C.L.



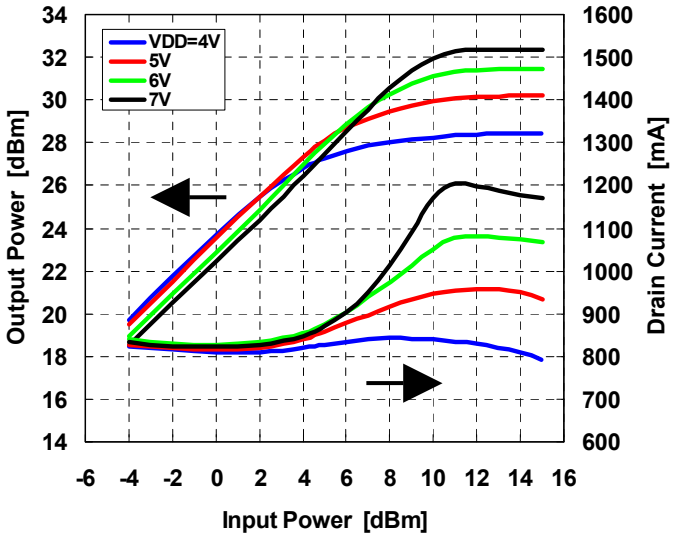
IMD vs. OUTPUT POWER

@VDDD=6V, IDD(DC)=850mA



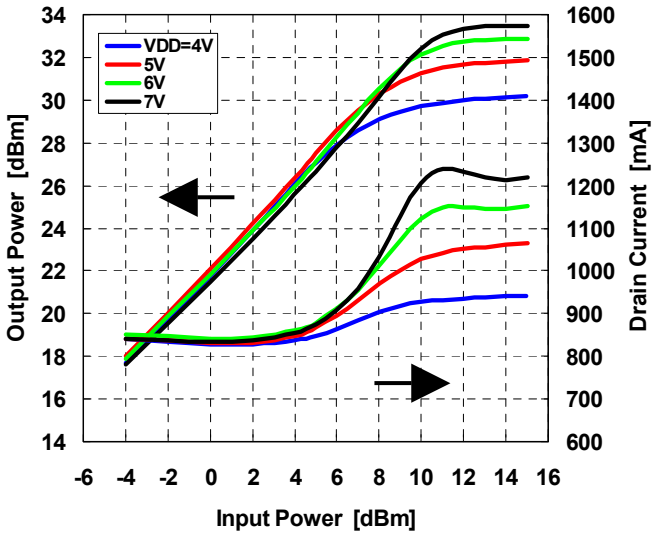
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@f=17.7GHz, IDD(DC)=850mA



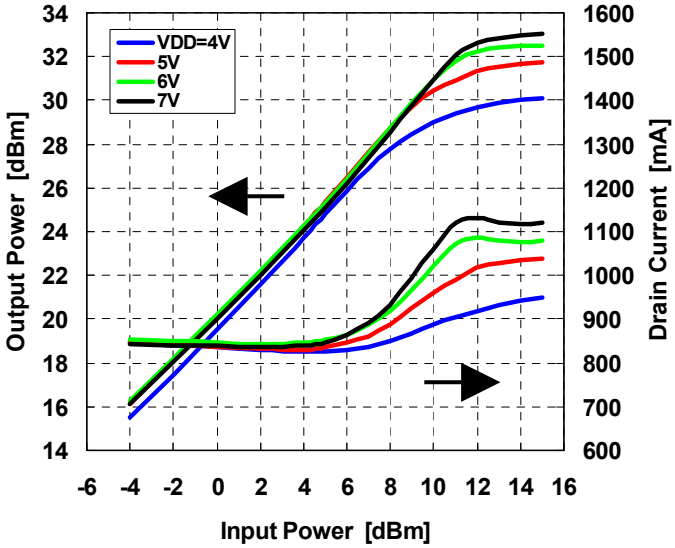
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@f=18.7GHz, IDD(DC)=850mA



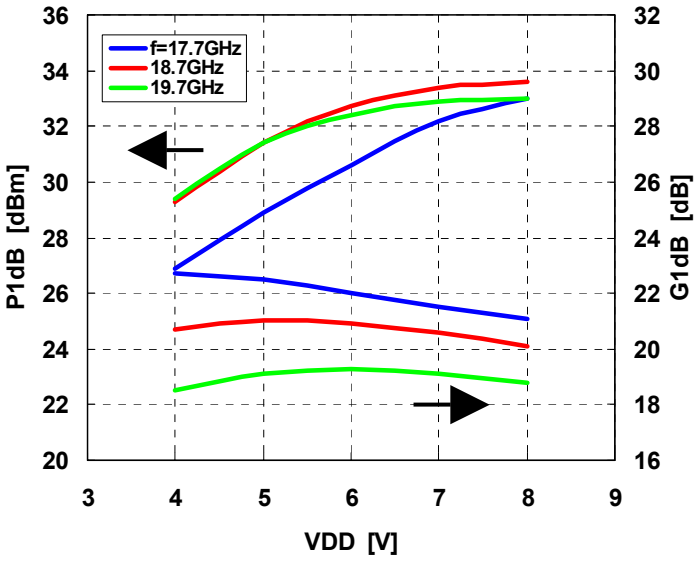
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Voltage

@f=19.7GHz, IDD(DC)=850mA



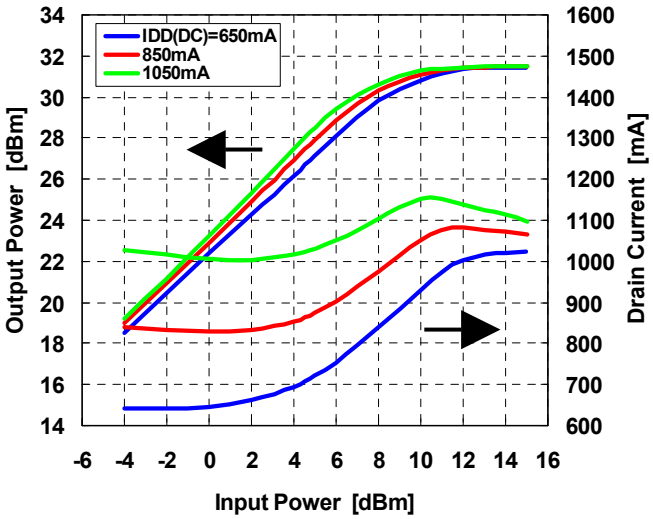
OUTPUT POWER, GAIN vs. DRAIN VOLTAGE

@IDD(DC)=850mA



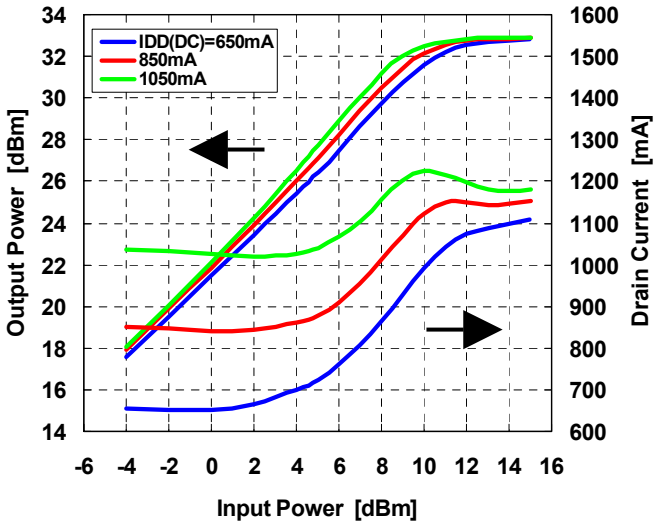
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

@f=17.7GHz, VDD=6V



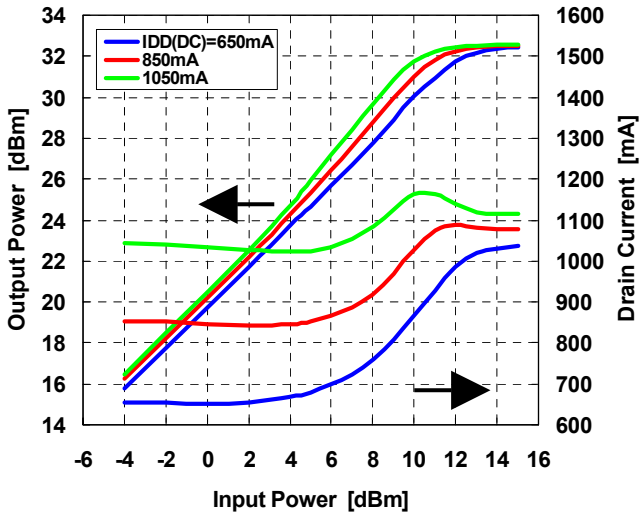
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

@f=18.7GHz, VDD=6V



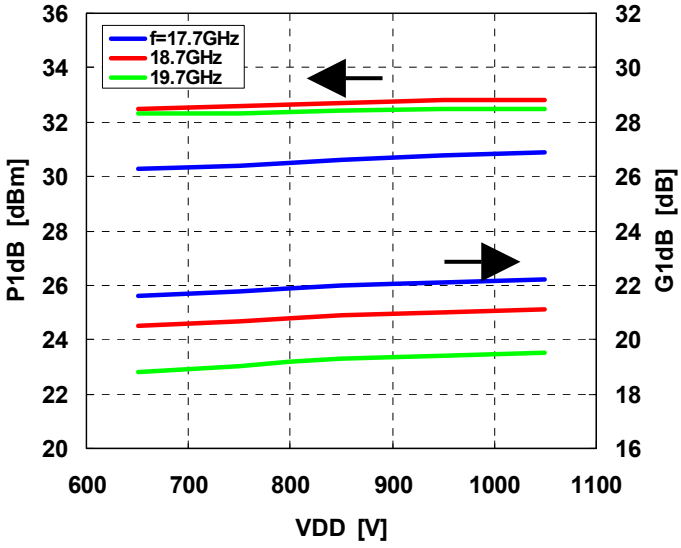
OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER by Drain Current

@f=19.7GHz, VDD=6V



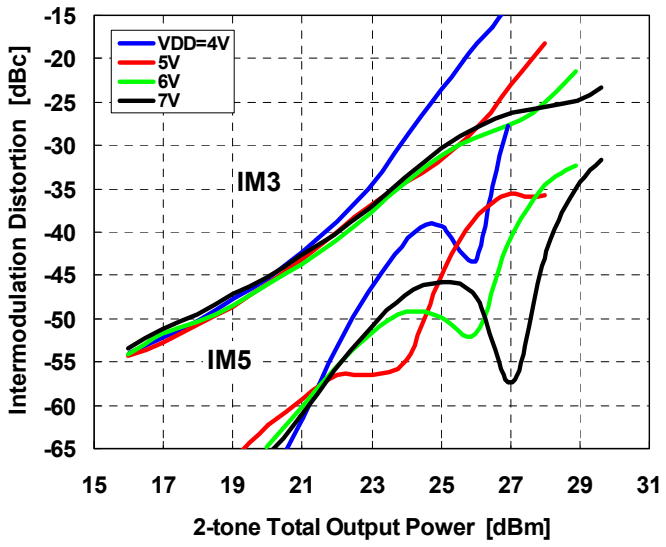
OUTPUT POWER, GAIN vs. DRAIN CURRENT

@VDD=6V



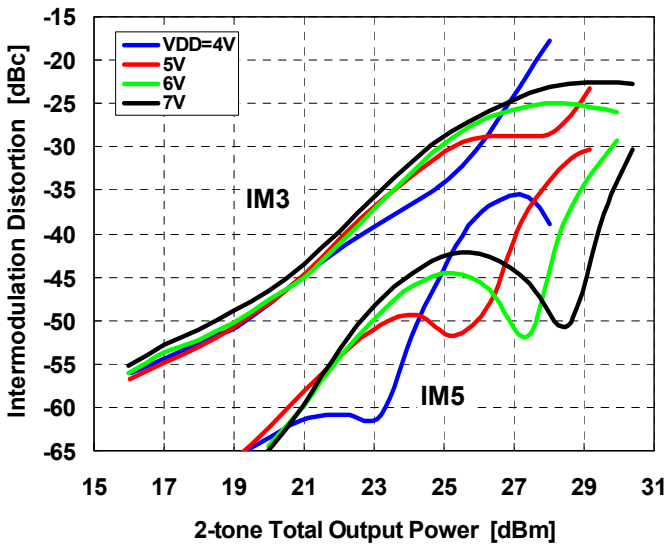
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

@f=17.7GHz, IDD(DC)=850mA



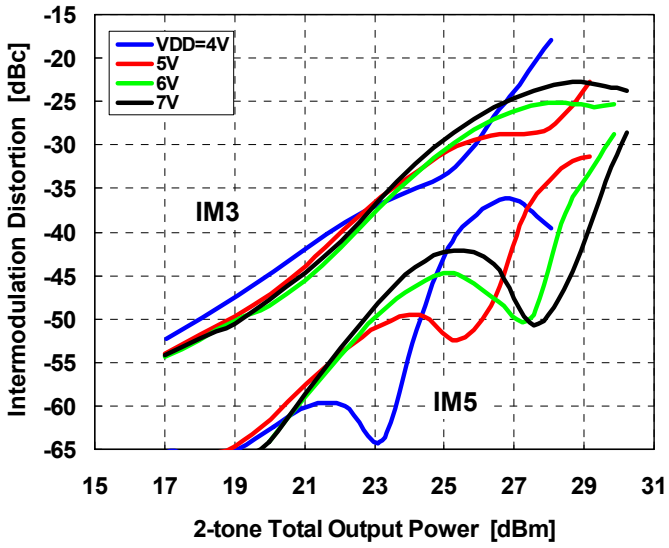
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

@f=18.7GHz, IDD(DC)=850mA



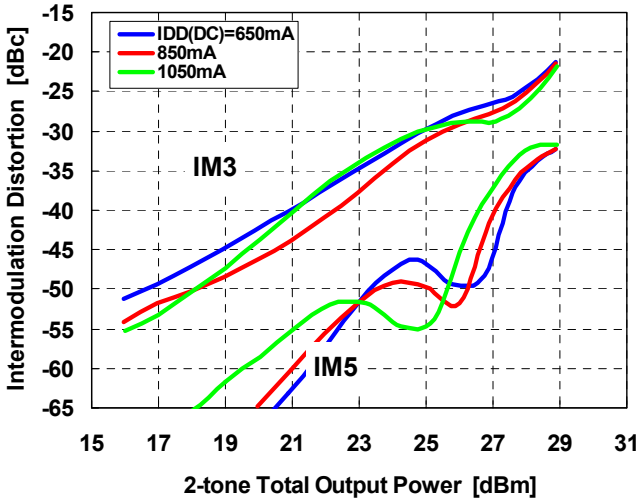
IMD PERFORMANCE vs. OUTPUT POWER by Drain Voltage

@f=19.7GHz, IDD(DC)=850mA



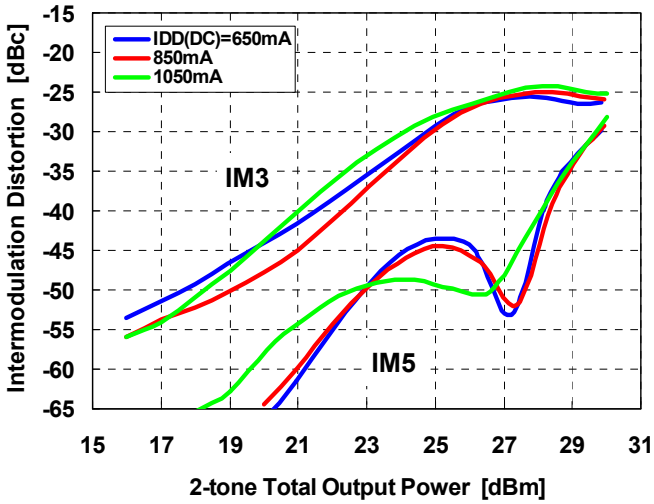
IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

@f=17.7GHz, VDD=6V



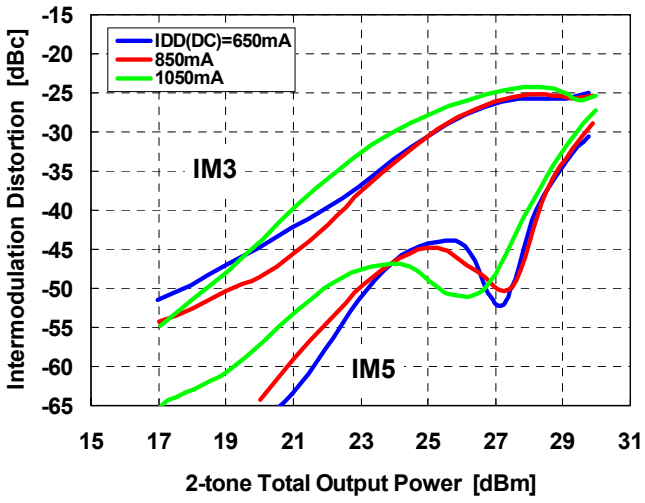
IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

@f=18.7GHz, VDD=6V



IMD PERFORMANCE vs. OUTPUT POWER
by Drain Current

@f=19.7GHz, VDD=6V



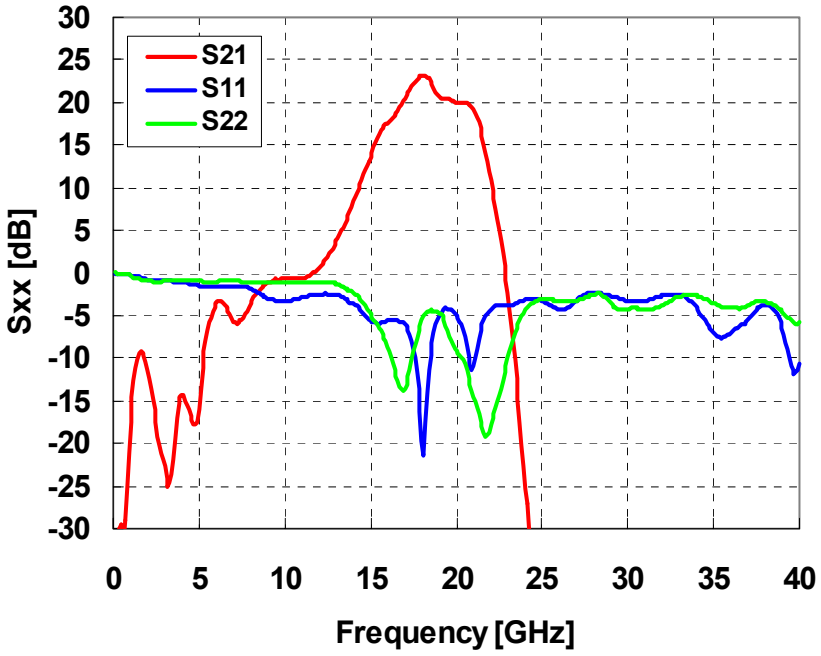
■S-PARAMETER

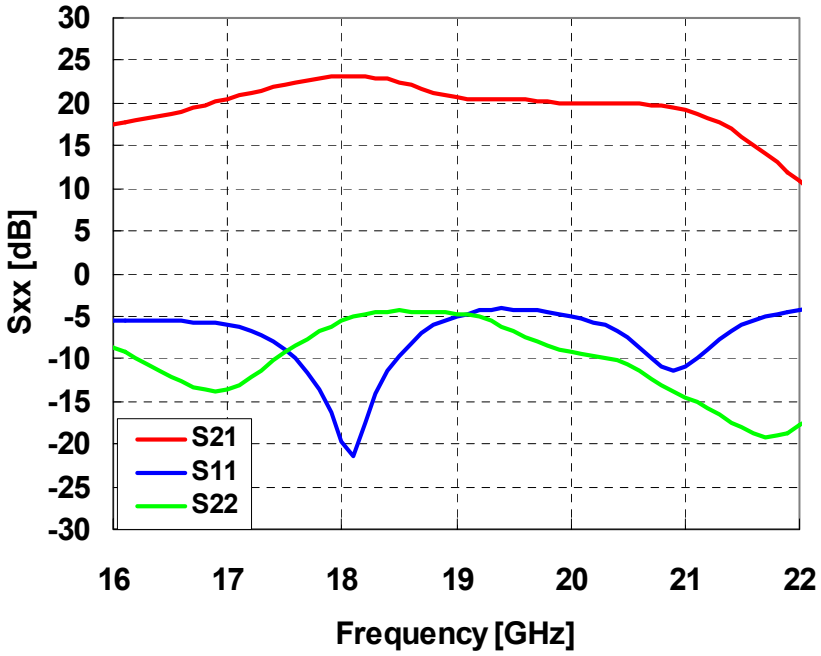
VDD=6V, IDD=850mA

Frequency	S11		S21		S12		S22	
[GHz]	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	1.00	-4.5	0.01	-31.6	0.001	26.9	1.00	-6.0
1.0	0.97	-43.8	0.13	24.9	0.001	1.1	0.97	-58.4
2.0	0.92	-80.3	0.27	153.9	0.001	-166.0	0.90	-101.2
3.0	0.90	-109.6	0.07	94.9	0.001	124.1	0.90	-136.0
4.0	0.88	-141.0	0.19	90.1	0.001	72.2	0.91	-173.1
5.0	0.84	-178.0	0.16	81.0	0.001	52.7	0.90	149.0
6.0	0.84	141.4	0.66	-5.3	0.001	-9.5	0.89	114.1
7.0	0.84	103.6	0.52	-87.6	0.001	-25.2	0.90	82.0
8.0	0.81	67.3	0.66	-127.5	0.001	-85.5	0.89	51.5
9.0	0.71	30.8	0.88	168.2	0.001	-131.7	0.88	20.2
10.0	0.68	-6.8	0.93	106.5	0.001	-157.5	0.88	-8.9
11.0	0.72	-36.3	0.94	53.7	0.001	-152.8	0.88	-29.4
12.0	0.75	-53.0	1.07	9.7	0.003	-72.2	0.88	-43.2
13.0	0.74	-63.8	1.53	-35.1	0.008	-129.0	0.86	-57.5
14.0	0.66	-79.3	2.64	-88.7	0.005	159.6	0.77	-78.0
15.0	0.53	-110.3	4.80	-158.0	0.008	135.7	0.57	-107.2
16.0	0.52	-151.8	7.56	112.9	0.004	118.4	0.37	-134.5
17.0	0.50	168.6	10.68	28.7	0.004	130.1	0.21	-104.9
17.1	0.48	164.0	11.05	19.2	0.004	132.0	0.22	-98.4
17.2	0.46	159.1	11.49	9.7	0.005	128.0	0.25	-92.7
17.3	0.43	153.9	11.95	-0.2	0.005	121.5	0.27	-88.7
17.4	0.40	148.5	12.39	-10.3	0.005	117.2	0.31	-86.2
17.5	0.36	143.3	12.82	-20.8	0.005	112.3	0.34	-85.3
17.6	0.32	136.5	13.14	-31.3	0.005	107.8	0.38	-85.3
17.7	0.27	128.5	13.46	-42.1	0.005	104.2	0.42	-86.0
17.8	0.21	117.0	13.84	-53.0	0.005	96.5	0.46	-87.3
17.9	0.15	100.7	14.18	-64.4	0.005	90.6	0.49	-89.5
18.0	0.10	72.1	14.32	-76.1	0.004	83.2	0.53	-92.1
18.1	0.08	18.4	14.36	-88.1	0.004	76.4	0.55	-95.2
18.2	0.13	-24.4	14.27	-99.6	0.003	66.1	0.58	-98.1
18.3	0.20	-43.9	14.03	-111.4	0.003	61.4	0.59	-101.1
18.4	0.27	-56.5	13.81	-123.0	0.002	52.7	0.60	-104.0
18.5	0.33	-65.9	13.34	-134.4	0.002	53.8	0.60	-106.7
18.6	0.39	-74.4	12.74	-145.4	0.001	54.7	0.60	-109.1
18.7	0.45	-81.5	12.08	-155.7	0.001	65.8	0.60	-110.9
18.8	0.50	-87.4	11.56	-164.4	0.001	111.9	0.59	-112.7
18.9	0.53	-92.6	11.03	-172.9	0.001	142.2	0.59	-114.7
19.0	0.56	-97.2	10.85	178.8	0.001	152.9	0.58	-117.1
19.1	0.59	-102.2	10.64	170.7	0.002	162.0	0.57	-119.8
19.2	0.60	-106.5	10.58	162.0	0.002	160.8	0.55	-122.2
19.3	0.62	-110.3	10.59	153.4	0.002	156.6	0.53	-124.8
19.4	0.62	-114.0	10.62	143.7	0.003	148.8	0.49	-127.0
19.5	0.62	-117.6	10.58	133.9	0.004	141.1	0.46	-127.7
19.6	0.61	-121.2	10.50	123.4	0.004	131.6	0.43	-127.8
19.7	0.60	-124.7	10.30	113.6	0.004	121.6	0.40	-126.7
19.8	0.59	-128.3	10.15	103.8	0.004	114.9	0.38	-125.6
19.9	0.58	-131.9	10.02	94.4	0.004	108.2	0.36	-124.5
20.0	0.57	-136.0	9.99	84.8	0.004	102.9	0.35	-123.9
20.1	0.55	-140.6	10.01	74.5	0.004	99.2	0.34	-123.4
20.2	0.52	-146.8	10.05	64.4	0.005	95.8	0.33	-123.8
20.3	0.50	-153.8	10.06	53.2	0.005	87.8	0.32	-124.5
20.4	0.46	-162.5	10.07	42.0	0.005	78.1	0.31	-126.8
20.5	0.42	-173.6	10.02	30.0	0.005	66.4	0.30	-129.8
21.0	0.28	82.5	9.03	-34.2	0.005	19.0	0.19	-143.1
22.0	0.61	-38.5	3.51	-168.2	0.005	-94.2	0.13	53.7
23.0	0.64	-116.2	0.76	76.2	0.005	-157.8	0.32	-83.6
24.0	0.70	176.2	0.05	15.0	0.004	150.4	0.60	-142.9
25.0	0.69	149.9	0.02	69.9	0.003	149.6	0.70	-164.8
26.0	0.61	146.6	0.02	45.8	0.003	110.4	0.68	-179.8
27.0	0.69	143.8	0.01	18.7	0.001	71.3	0.69	157.3
28.0	0.76	118.3	0.01	-55.1	0.002	-82.9	0.75	130.7
29.0	0.73	89.3	0.01	-122.4	0.003	-179.0	0.66	115.3
30.0	0.69	63.9	0.00	133.0	0.003	112.1	0.62	120.9

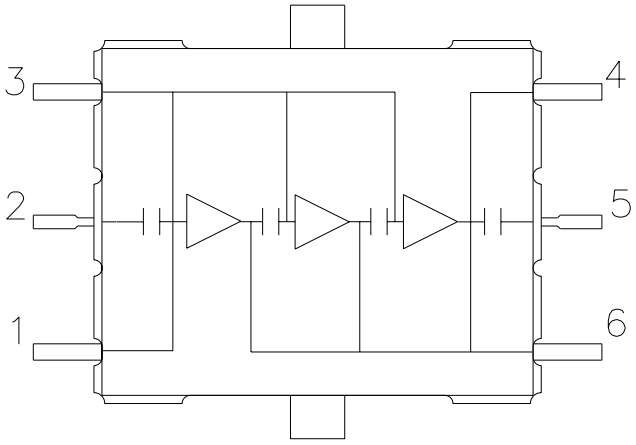
■S-PARAMETER

VDD=6V, IDD(DC)=850mA



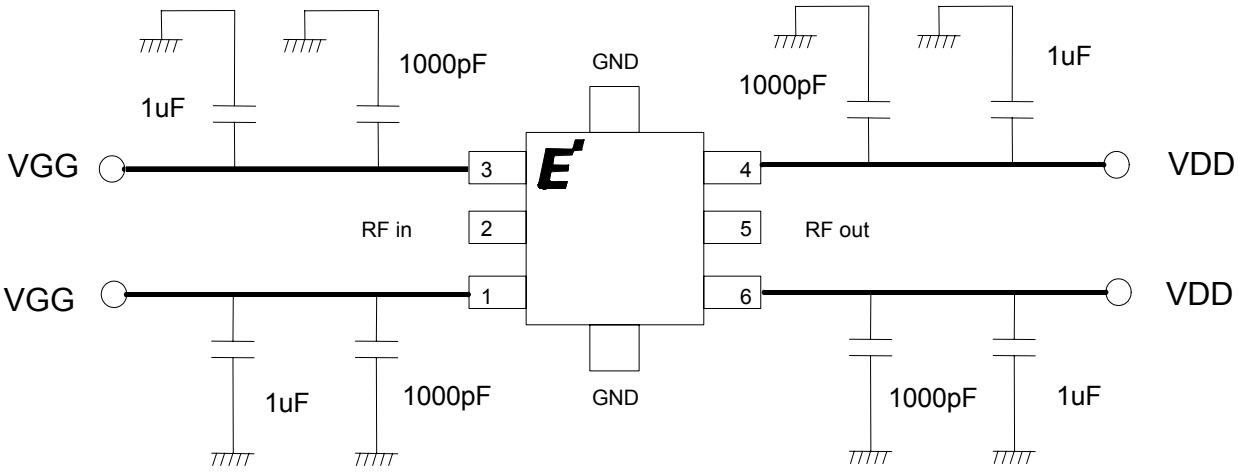


■Block Diagram



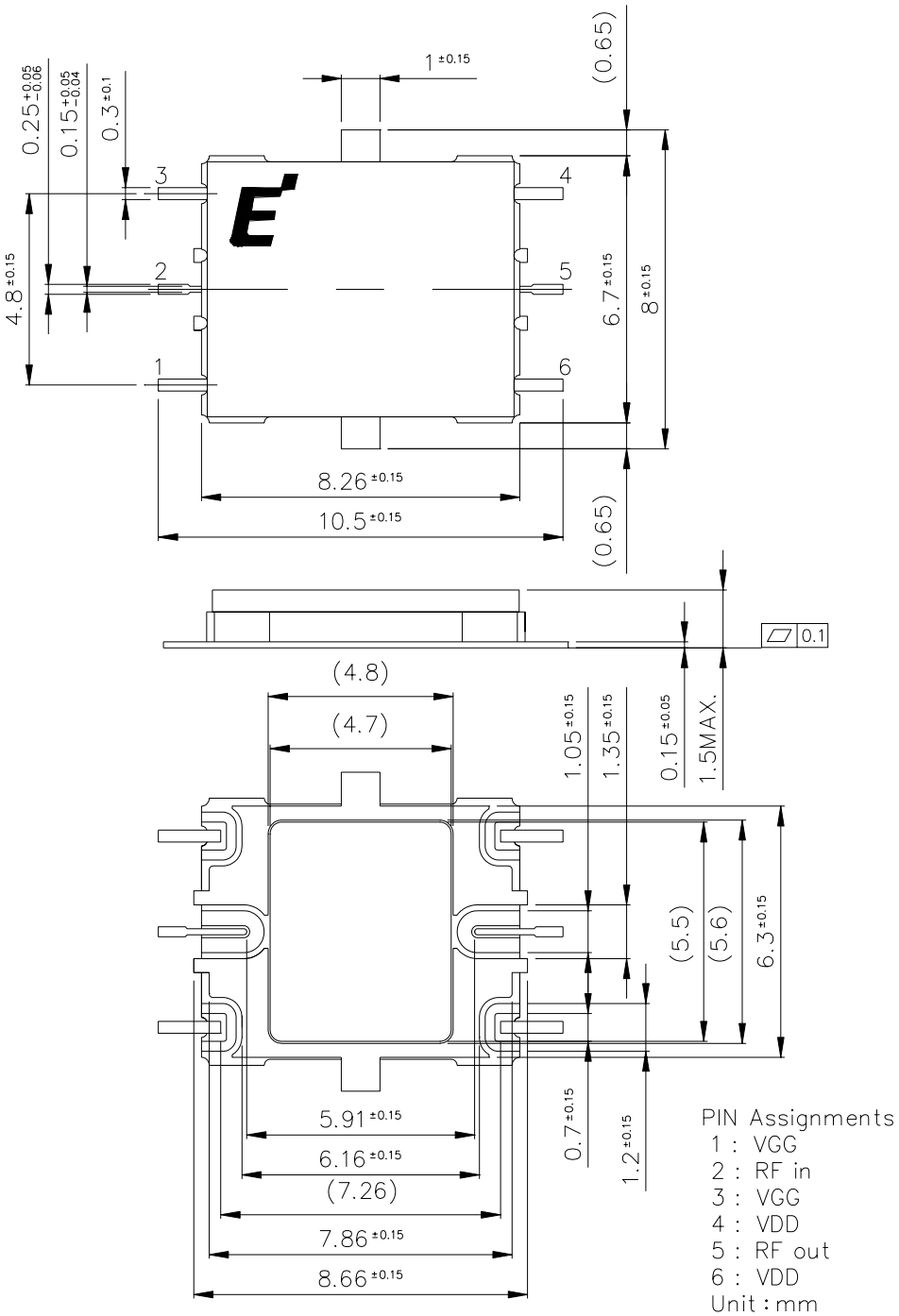
PIN ASSIGMENT
1 : VGG
2 : RF in
3 : VGG
4 : VDD
5 : RF out
6 : VDD

■Recommended Bias Circuit

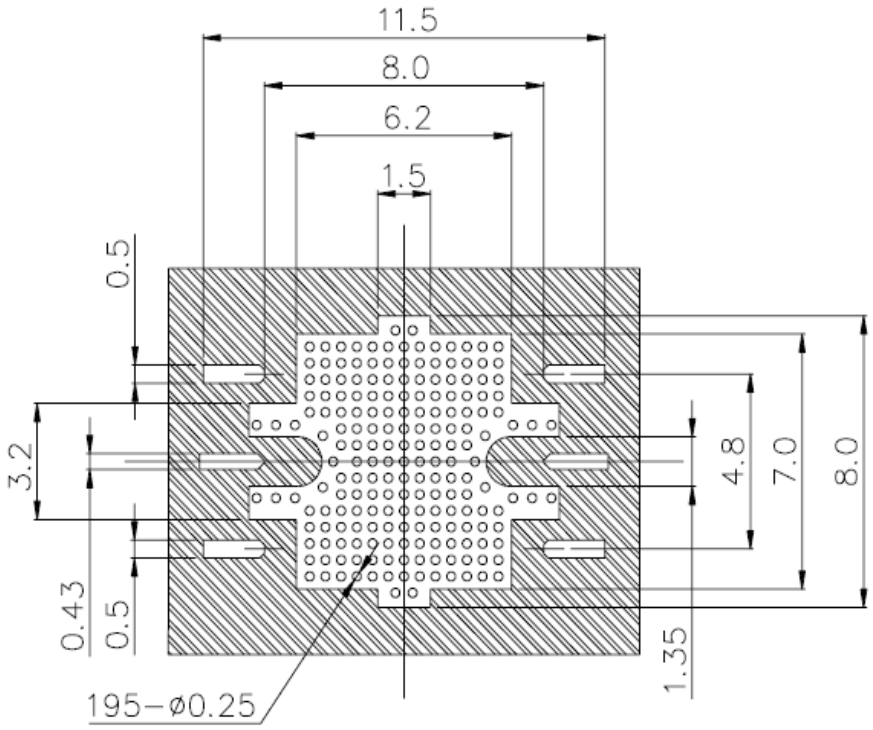


Note 1: The capacitors are recommended on the bias supply line, close to the package, in order to prevent video oscillations which could damage the module.
Note 2: Two pins named VGG are internally connected.
Note 3: Two pins named VDD are internally connected.

■Package Outline and Pin Assignment



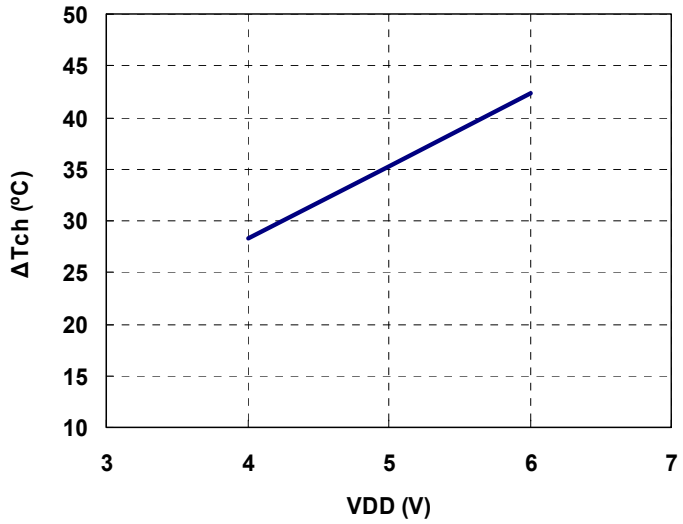
■ PCB Pads and Solder-resist Pattern



Notes :
1.LAMINATE : Rogers Corporation RO4003, Thickness t=0.2mm, Cu Foil 18 μm
Finish to copper foil ; Ni 0.1 μm min./Au 0.1±0.08 μm (Both side)
2. ▨ : Resist

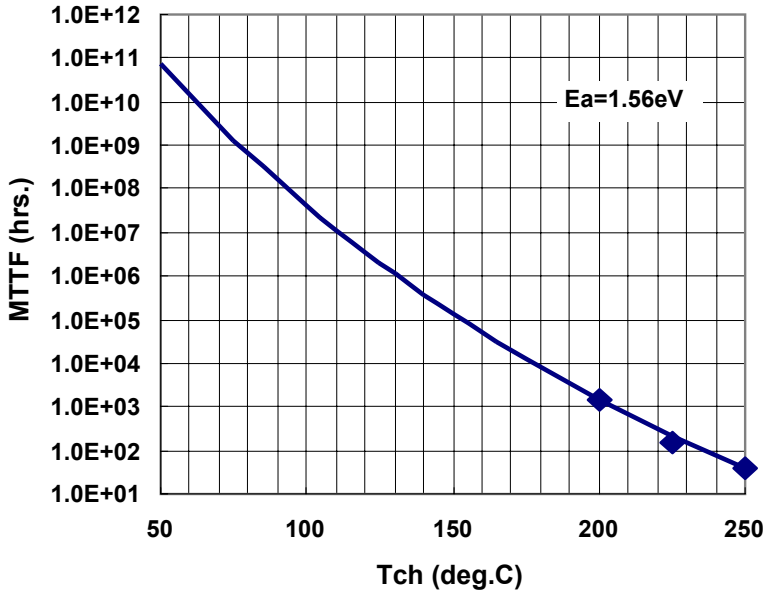
Unit : mm

ΔTch vs. Drain Voltage (Reference)
IDD=850mA



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

MTTF vs. Tch



■Mounting Method of SMD (Surface Mount Devices) for Lead-free solder

Mounting Condition

(1)For soldering, Lead-free solder (Sn-3.0Ag-0.5Cu)*1 or equivalent shall be used.

(*1: The figure displays with weight %. A predominantly tin-rich alloy with 3.0% silver and 0.5% copper.)

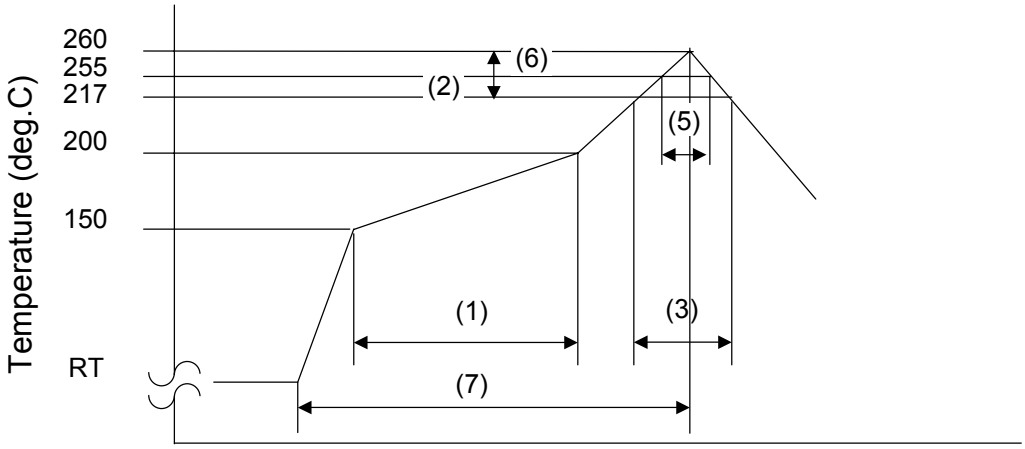
(2)A rosin type flux with a chlorine content of 0.2% or less shall be used. The rosin flux with low halogen content is recommended.

(3)When soldering, use one of the following time / temperature methods for acceptable solder joints. Make sure the devices have been properly prepared with flux prior soldering.

*** Reflow soldering method (Infrared reflow / Heat circulation reflow / Hot plate reflow):**

Limit solder to 3 reflow cycles because resin is used in the modules manufacturing process. Excessive reflow cycles will effect the resin resulting in a potential failure or latent defect. The recommended reflow temperature profile is shown below. The temperature of the reflow profile must be measured at the device body surface.

Reflow temperature profile and condition:



(1) Preheating:	150 – 200 deg.C, 60 – 120 seconds
(2) Ramp-up Rate:	3 deg.C /seconds max
(3) Liquidous temperature and time:	217 deg.C, 60 – 150 seconds
(4) Peak Temperature:	260 deg.C
(5) Time Peak Temperature within 5 deg.C:	< 30seconds
(6) Ramp-down Rate:	6 deg.C /seconds max
(7) Time RT to peak temperature:	8 minutes max

* Measurement point: Center of the package body surface

(4) The above-recommended conditions were confirmed using the manufacture's equipment and materials. However, when soldering these products, the soldering condition should be verified by customer using their equipment and materials.

For further information please contact:

http://global-sei.com/Electro-optic/about/office.html

CAUTION

This product 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.