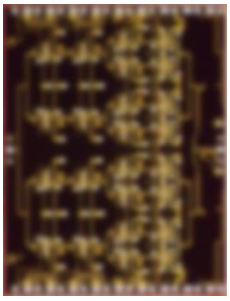
SMM5738X

81 – 86GHz Power Amplifier MMIC

FEATURES

- Frequency Band : 81 to 86GHz
- High Output Power: 26.5dBm(Typ.)
- Liner Gain :26dB(typ.)
- 32 dBm output Third Order Intercept (OIP3)



DESCRIPTION

The Power Amplifier is a four stage GaAs HEMT MMIC, with an integrated Power Detector, which operates between 81 and 86 GHz. The Power Amplifier features small signal gain of 26dB, output power of 24.5 dBm at 1dB gain compression and saturated power of 26.5 dBm. Sumitomo Electric's stringent Quality Assurance Program assures the highest reliability and consistent performance.

ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Drain Voltage	V_D	4.5	V
Gate Voltage	V_G	-1.5 to +0.5	V
Input Power Level	P_{IN}	+18	dBm
Storage Temperature	T_{STG}	-40 to +125	deg.C

RECOMMENDED OPERATEING CONDITIONS

Item	Symbol	Rating	Unit
Drain Voltage	V_D	4.0	V
Gate Voltage	V_G	-0.5 to +0.3	V
Input Power Level	P_{IN}	Up to +6	dBm
Operating Backside Temperature	T_{OP}	-40 to +85	deg.C

ELECTRICAL CARACTERISTICS (Case Temperature Tc=25deg.C)

Item	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Frequency Range	f	$V_{D1}=V_{D2}=V_{D3}=V_{D4}$	81	-	86	GHz
Gain	G_a	$=V_{D5}=V_{D6}=V_{D7}=V_{D8}=4.0V$	20.0	26.0	32.0	dB
Output Power at 1dB G.C.P.	P_{1dB}	I_D=1300mA*	-	24.5	-	dBm
Saturation Power	P_{sat}	G.C.P. : Gain Compression Point	25	26.5	-	dBm
3rd Order Output Intercept Point *1	OIP_3	*1: Pout @ 2tone=+20 dBm	28	32	-	dBm
Input Return Loss	RL_{IN}		-	15	-	dB
Output Return Loss	RL_{OUT}		-	15	-	dB
Total Current Consumption	I_D		-	1300	-	mA
Detector Voltage** at Pout=15 dBm	Vdiff1	**:Vref(without RF)-Vdet(RF)	-	115	-	mV/dB
Detector Voltage** at Pout=24 dBm	Vdiff2		-	500	-	mV/dB
Detector Voltage Slope at @Pout from 15 to 16 dBr	DVdiff1		-	20	-	mV/dB
Detector Voltage Slope at @Pout from 20 to 21 dBr	DVdiff2		-	45	-	mV/dB

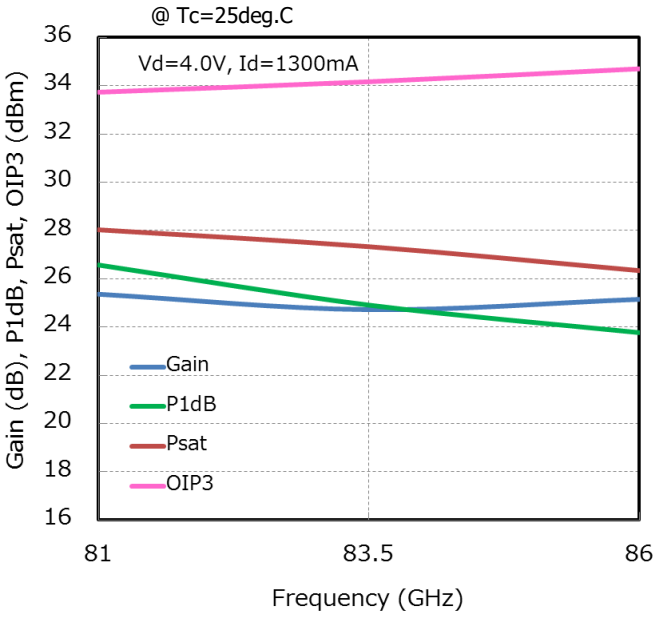
* : Adjust V_G Voltage between -0.5 to +0.3V to set to $I_D=I_{D1}+I_{D2}+I_{D3}+I_{D4}+I_{D5}+I_{D6}+I_{D7}+I_{D8}$=1300mA

ESD	Class 0B	125 to 249V

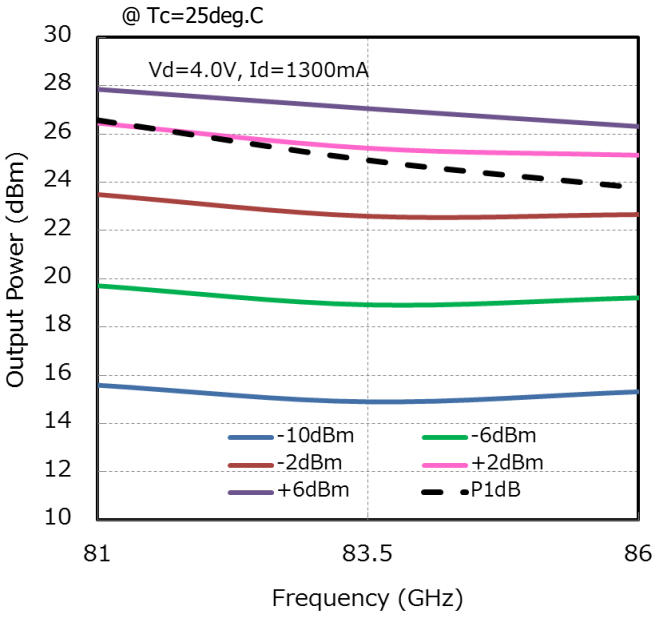
Based on ANSI/ESDA/JEDEC/ JS-001-2017 (C=100pF, R-1.5k ohm)

RoHS COMPLIANCE	Yes

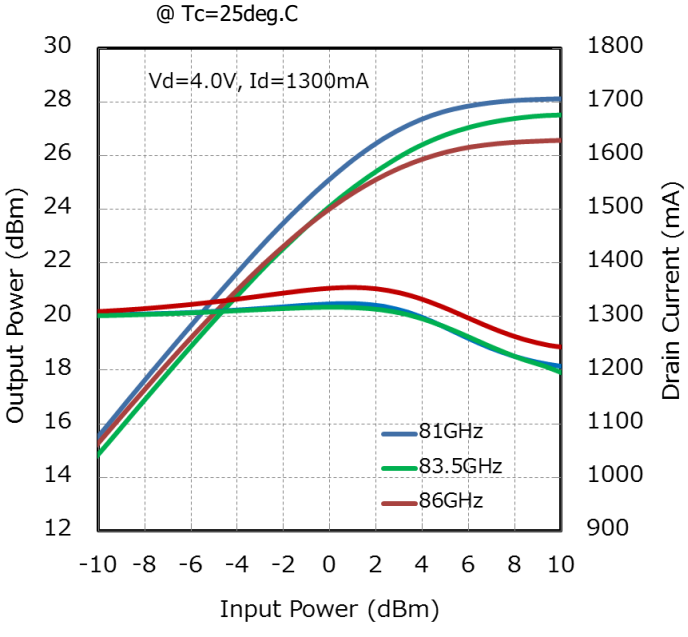
Gain, P1dB, Psat, OIP3 vs. Frequency



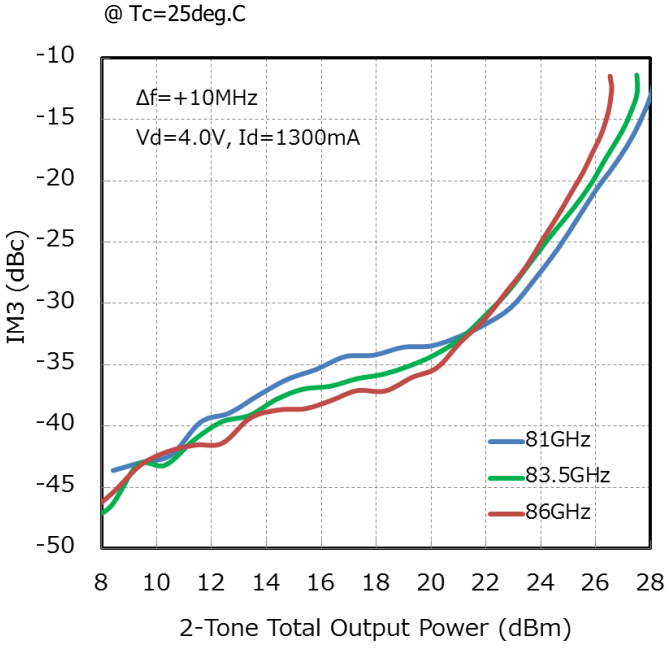
Output Power vs. Frequency



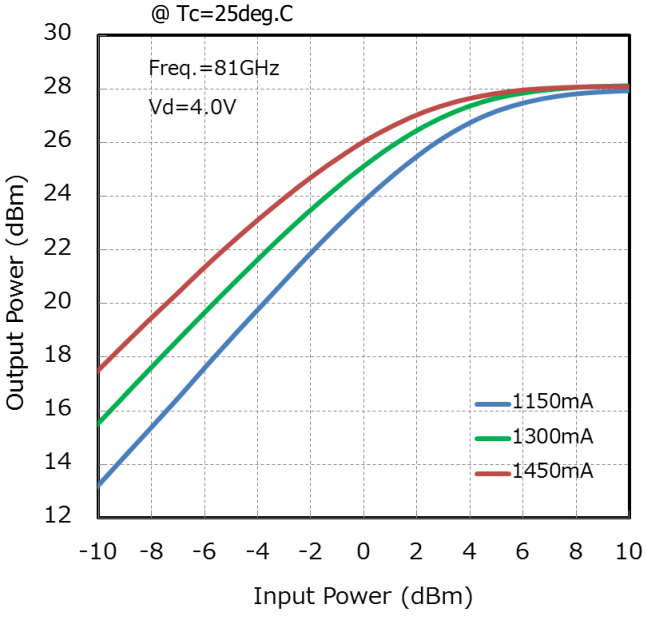
Output Power vs. Input Power



IM3 vs. Output Power



Output Power vs. Input Power by Drain Current



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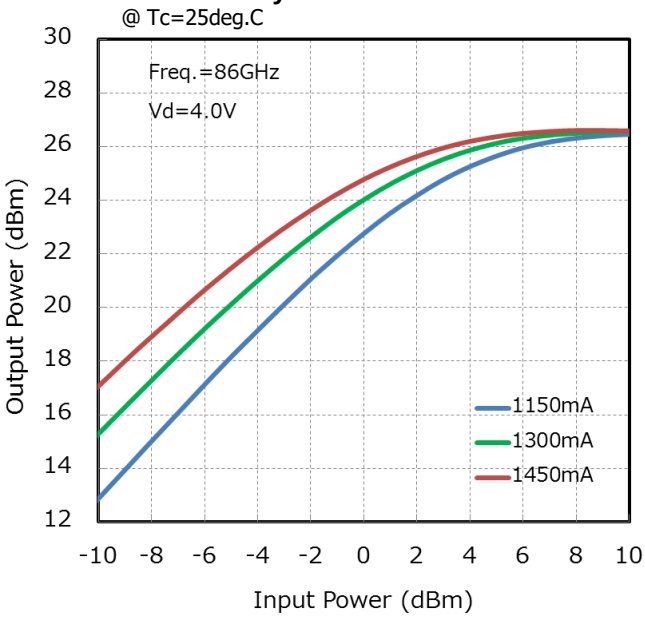
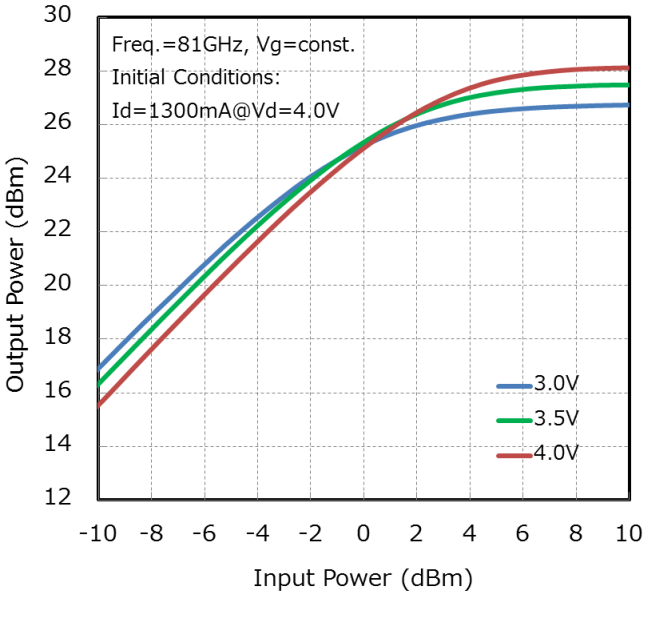
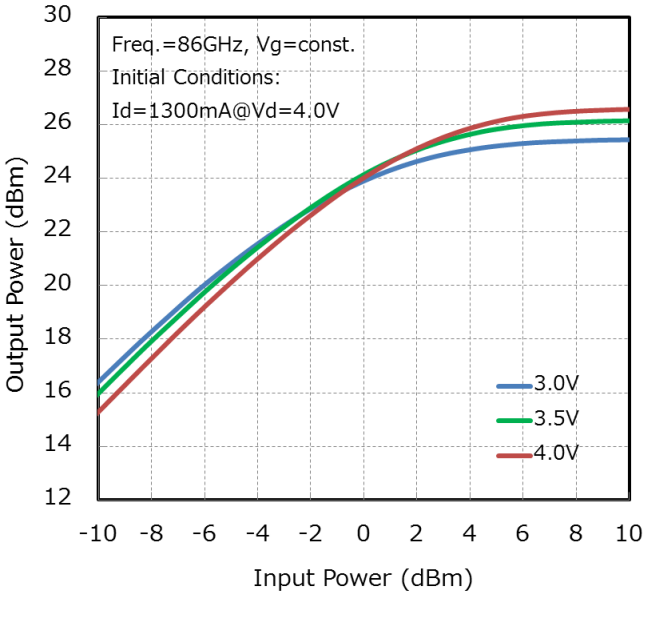


Output Power vs. Input Power by Drain Voltage

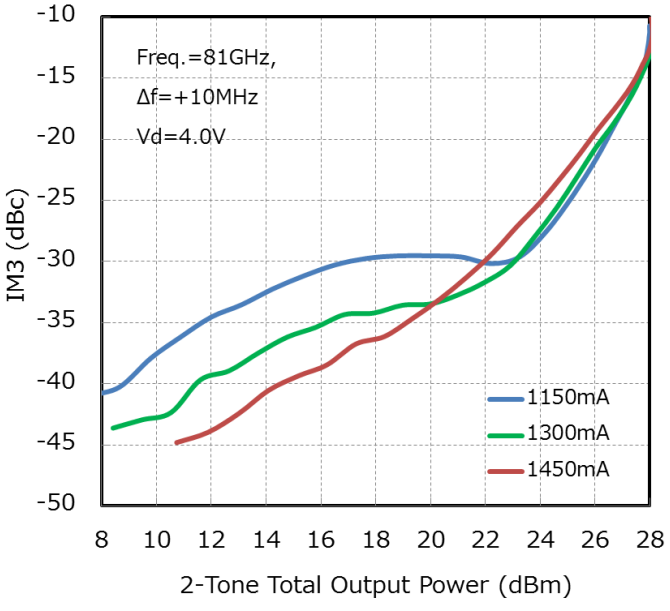


Output Power vs. Input Power by Drain Voltage



IM3 vs. Output Power by Drain Current

@ Tc=25deg.C



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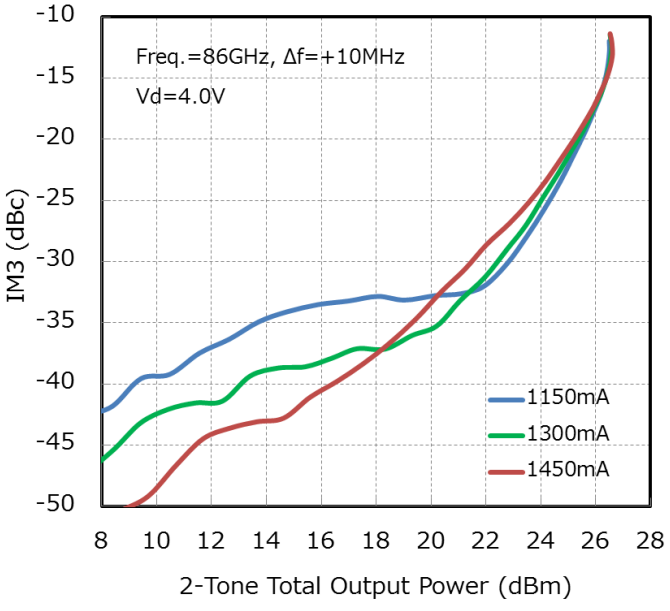
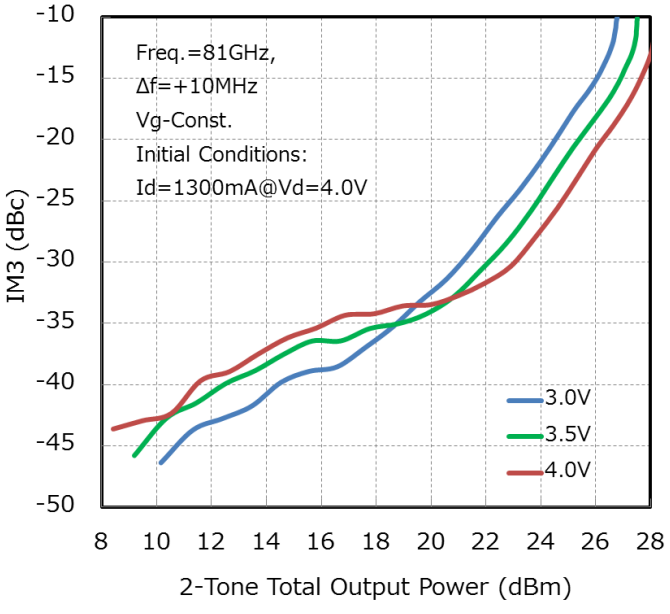


IM3 vs. Output Power by Drain Voltage

@ Tc=25deg.C



IM3 vs. Output Power by Drain Voltage

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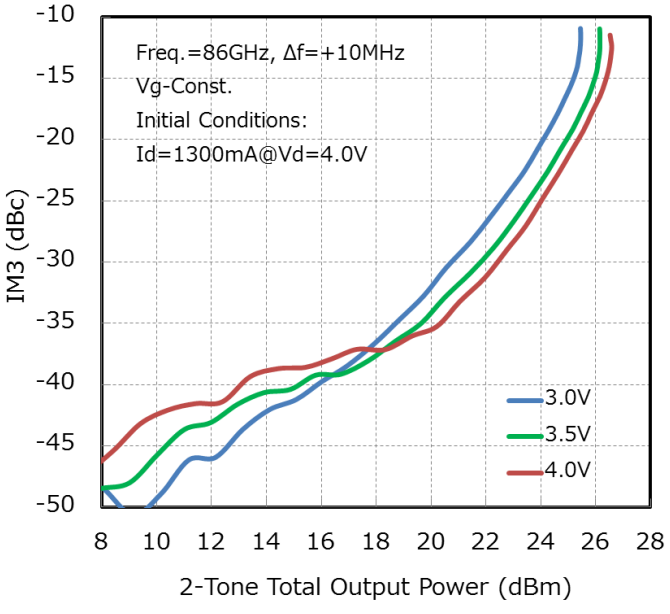
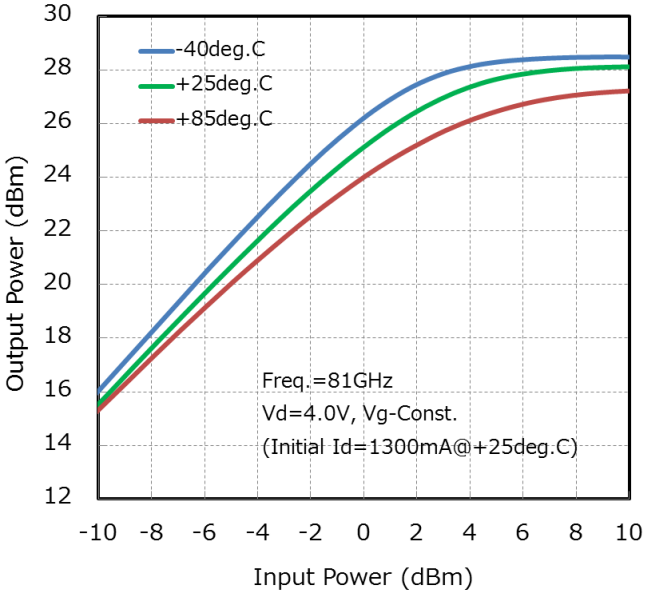
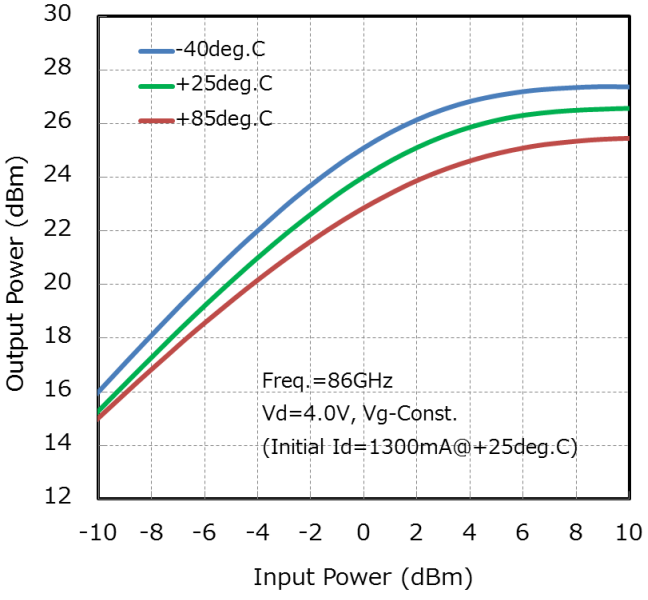


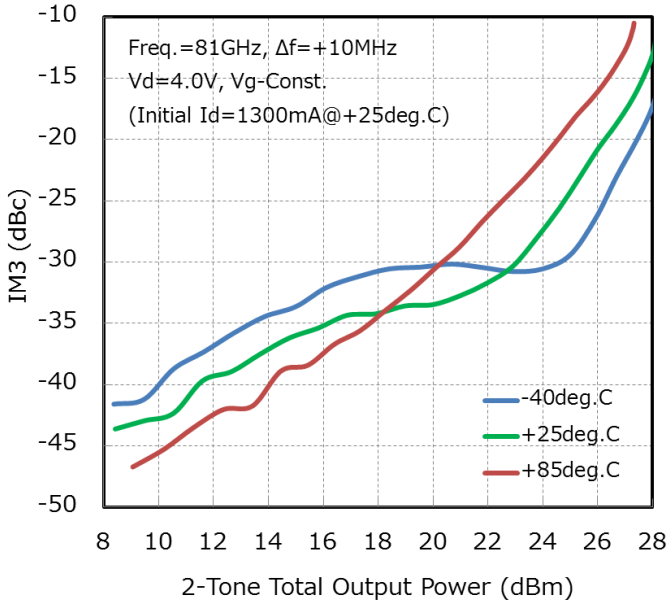
Output Power vs. Input Power by Temperature



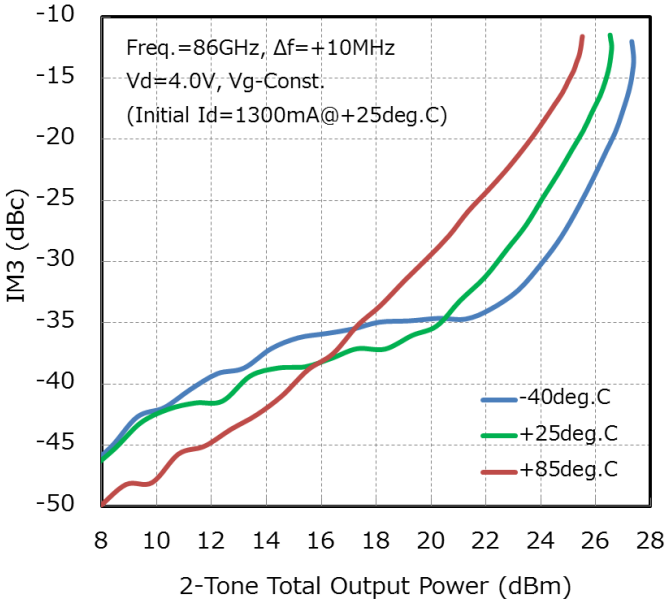
Output Power vs. Input Power by Temperature



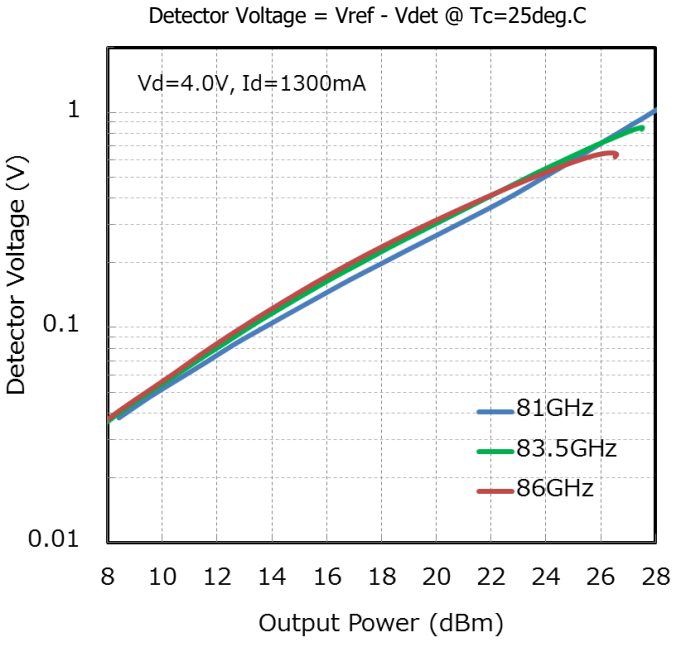
IM3 vs. Output Power by Temperature



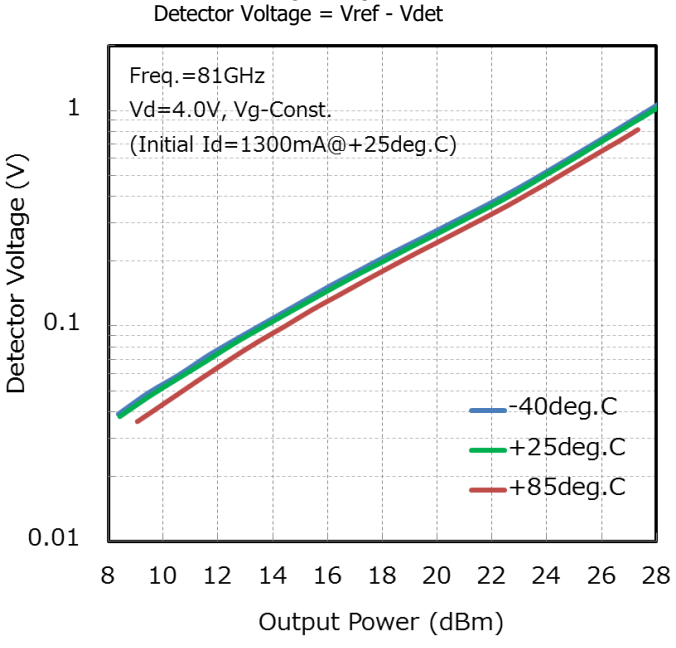
IM3 vs. Output Power by Temperature



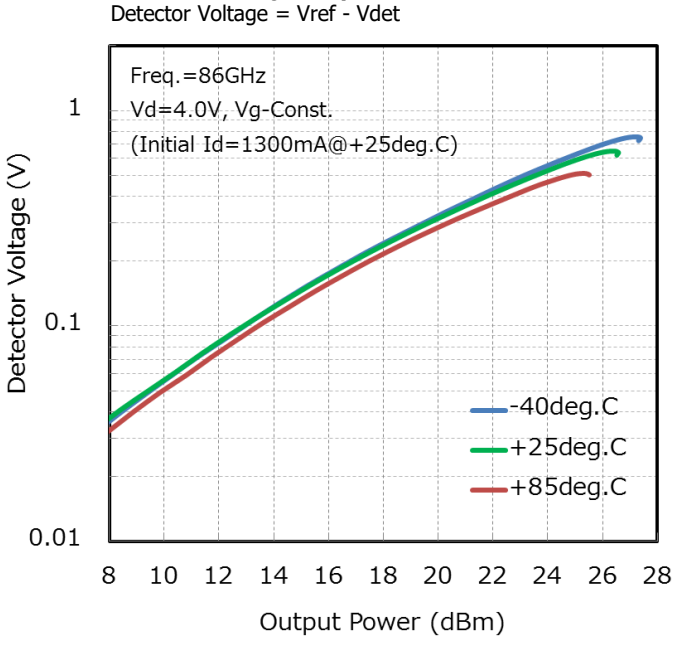
Power Detector vs. Output Power



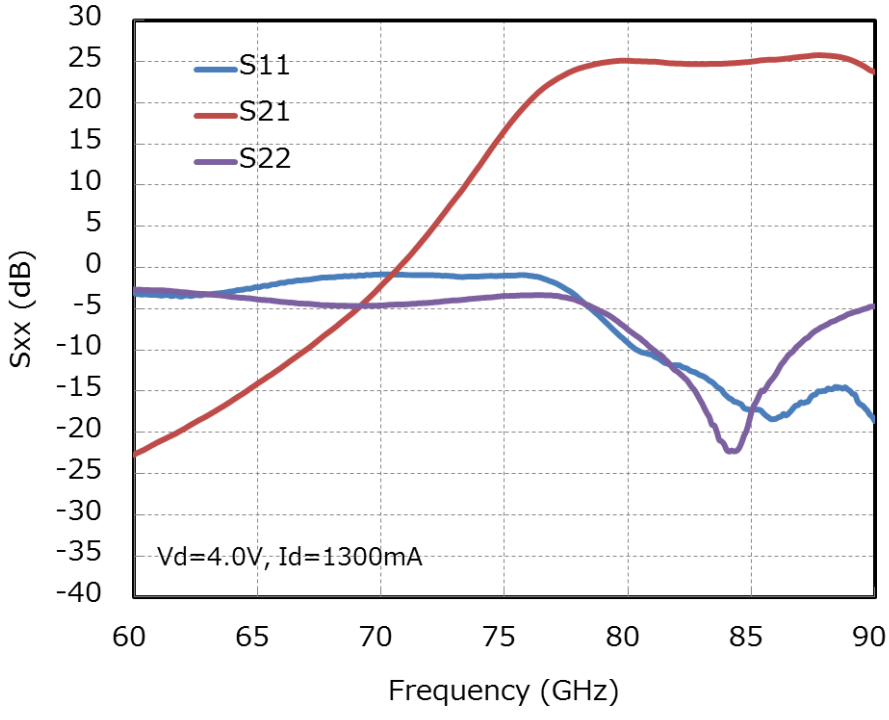
Power Detector vs. Output Power by temperature

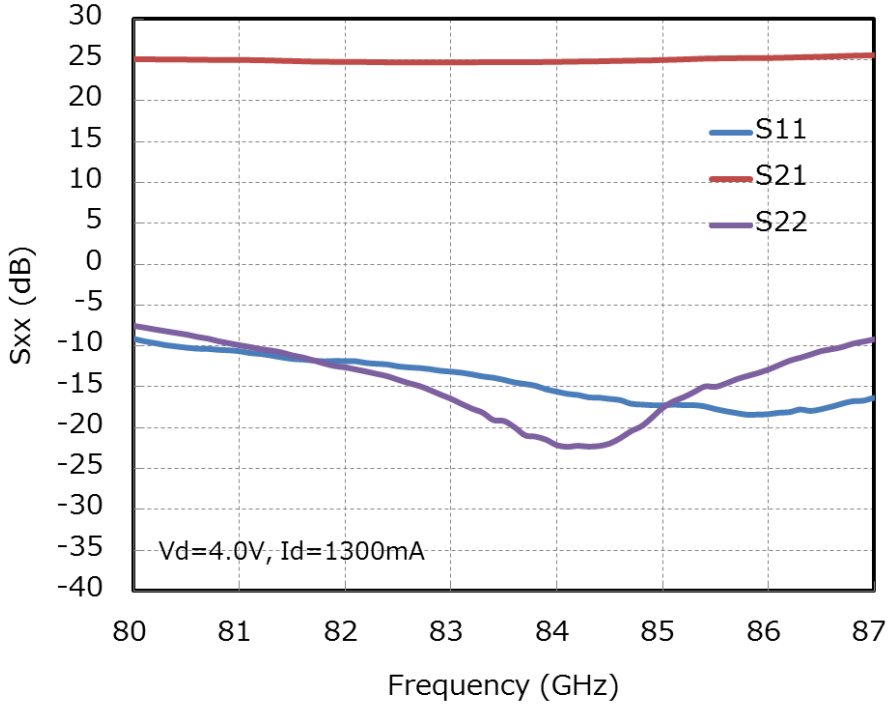


Power Detector vs. Output Power by temperature

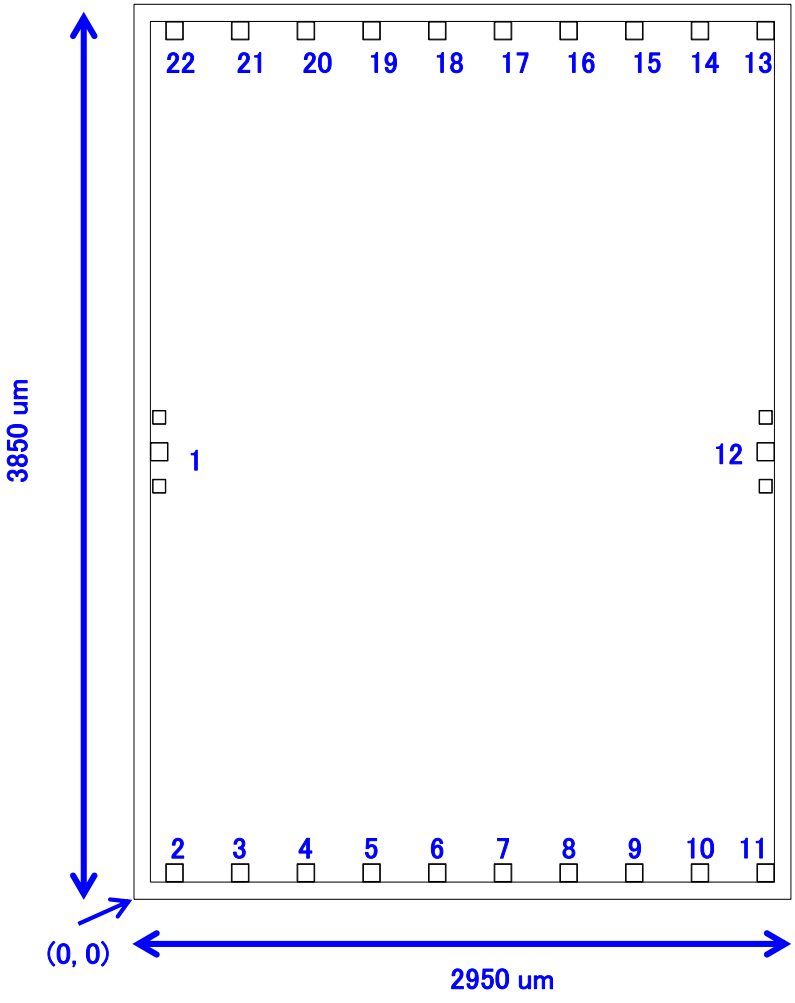


■ S-PARAMETERS





■ Chip outline and Pin Assignment

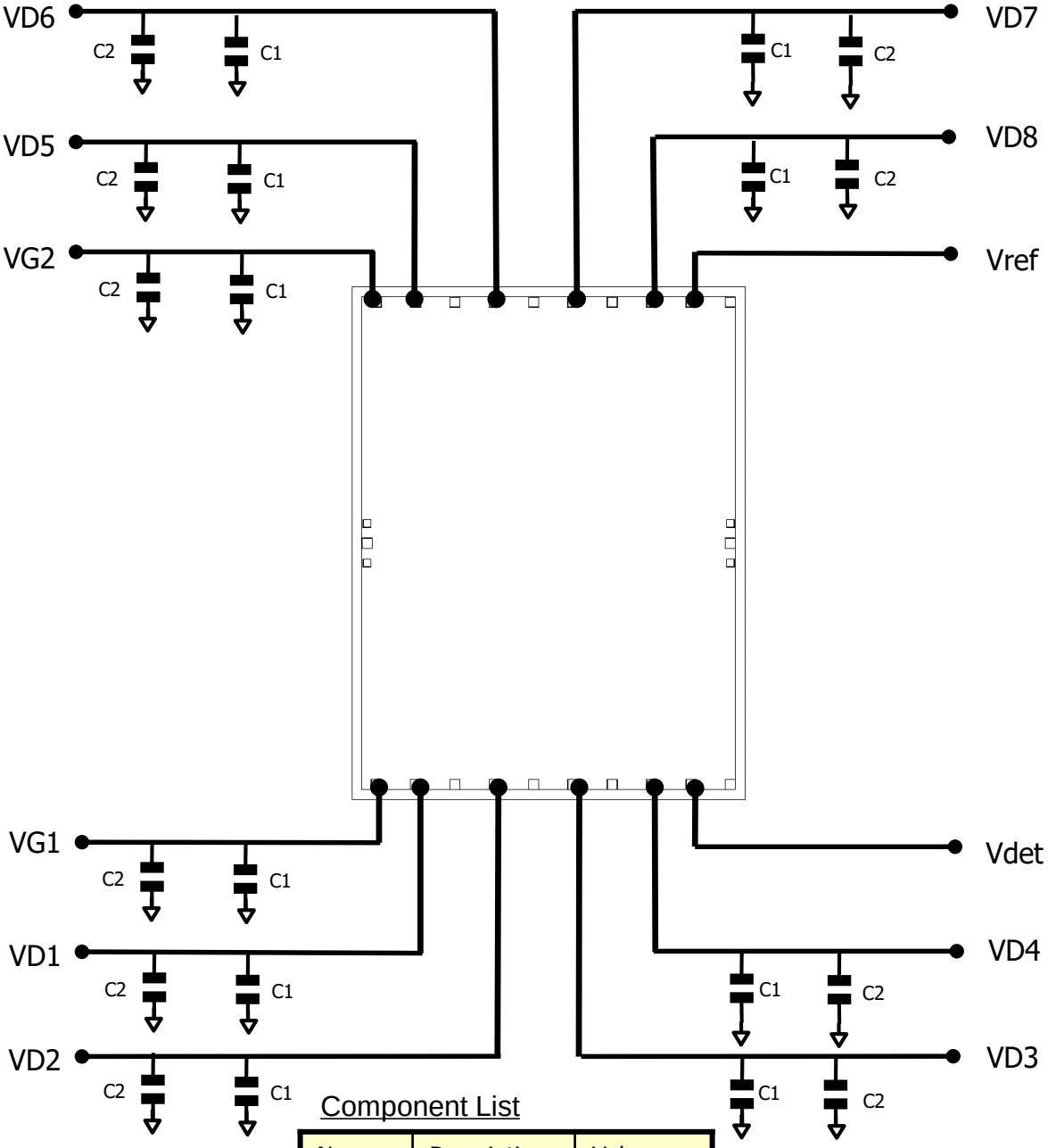


Unit : um

No.	Pin	X	Y
1	RF Input	90	1925
2	VG1	175	95
3	VD1	475	95
4	NC	775	95
5	VD2	1075	95
6	NC	1375	95
7	VD3	1675	95
8	NC	1975	95
9	VD4	2275	95
10	Vdet	2575	95
11	NC	2860	95
12	RF Output	2860	1925
13	NC	2860	3755
14	Vref	2575	3755
15	VD8	2275	3755
16	NC	1975	3755
17	VD7	1675	3755
18	NC	1375	3755
19	VD6	1075	3755
20	NC	775	3755
21	VD5	475	3755
22	VG2	175	3755

Chip Size : 2950±30μm x 3850±30μm
Thickness : 60±20μm
RF Pad Size : 80μm x 80μm
DC Pad Size : 110μm x 90μm

■ Typical Application



Component List

Name	Description	Value
C1	Capacitor	100pF
C2	Capacitor	0.1uF

■ BARE DIE INDEMNIFICATION

All devices are DC probed and visually inspected at SEI, and non-compliant devices are removed. The RF electrical characteristics of the bare dice are warranted by the sampling inspection procedures. The standard sampling inspection procedure shall include the number of the sampling dice, position of the sampling dice in the wafer and RF electrical characteristics of the sampling dice measured in the test fixture. Customer shall understand that all the bare dice will not be 100% RF tested by SEI. It is the customer responsibility to verify performance of the devices.

Customer shall comply with the storage and handling requirements for condition and period of storage of the bare dice agreed by customer and SEI. Warranty will not apply when customer disregards the storage and handling requirements.

Warranty will not apply to the electrical characteristics and product quality to the bare dice after assembly by customer.

SEI will indemnify customer for warranty failures, provided however that the indemnification to customer shall be limited to supply of bare dice for substitution.

CAUTION

Sumitomo Electric Device Innovations, 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.