

SAC3110Q6

GaAs MMIC Power Amplifier
13.5GHz~14.75GHz 38dBm

Rev 2.0

Features

- Frequency: 13.5GHz~14.75GHz
- Gain: 29dB
- Output P_{1dB}: 38dBm
- Supply Voltage: +7V
- ACPR: -29dBc@P_{OUT}=36dBm
- Package Size: 6mm×6mm×1.1mm

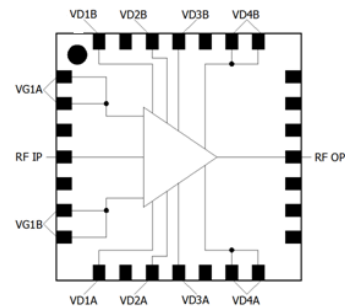
Typical Applications

- SATCOM
- Point-to-Point Radios
- Test and Measurement

General Description

SAC3110Q6 is a GaAs MMIC power amplifier chip being housed in a leadless 6x6 mm surface mount package. It operates between 13.5GHz~14.75GHz. The amplifier provides 29 dB of gain, 38 dBm of output P_{1dB} and 30% PAE while requiring from a +7V supply.

Functional Diagram



Electrical Performance (T_A=25°C, V_D= +7V, I_D=2.25A, Z₀=50Ω)

Parameter	Condition	Min.	Typ.	Max.	Units
Output Power for 1 dB Compression (OP _{1dB})	V _D =+7V VGS=-0.8V* f=13.5GHz~ 14.75GHz Pin=-30dBm	36	38	-	dBm
Gain		26	29	-	dB
Gain Flatness		-	±1.5	-	dB
Drain Current		-	2.6	3.6	A
Drain Voltage(V _D)		7	-	8	V
Input Return Loss		-	-12	-	dB
PAE	P _{OUT} =P _{1dB}	-	30	-	%
ACPR **	P _{OUT} =36dBm	-	-29.5	-	dBc
	P _{OUT} =36.5dBm	-	-27	-	dBc
	P _{OUT} =37dBm	-	-26.5	-	dBc
ACPR ***	P _{OUT} =36dBm	-	-30.5	-	dBc
	P _{OUT} =36.5dBm	-	-27.5	-	dBc
	P _{OUT} =37dBm	-	-27.2	-	dBc
EVM **	P _{OUT} =36dBm	-	6.2	-	%
	P _{OUT} =36.5dBm	-	6.5	-	%
	P _{OUT} =37dBm	-	6.5	-	%
EVM ***	P _{OUT} =36dBm	-	5.5	-	%
	P _{OUT} =36.5dBm	-	6	-	%
	P _{OUT} =37dBm	-	6.4	-	%
Thermal Resistance	T _{base} =70°C	-	4.1	-	°C/W

* IDQ=2.25A

** f=14.25GHz, VDS=7V, IDQ=2.25A, 8PSK, ρ=0.5, Sybmol=2M

*** f=14.25GHz, VDS=7V, IDQ=2.45A, 8PSK, ρ=0.5, Sybmol=2M

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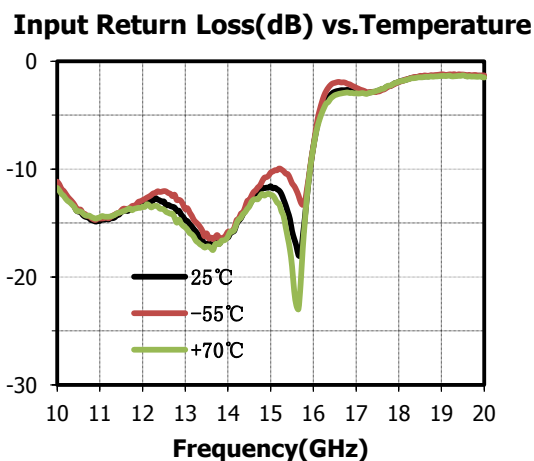
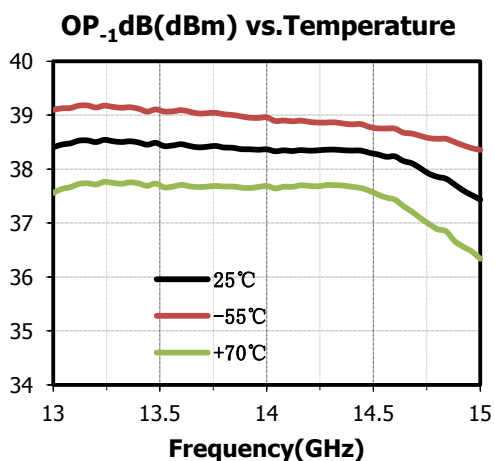
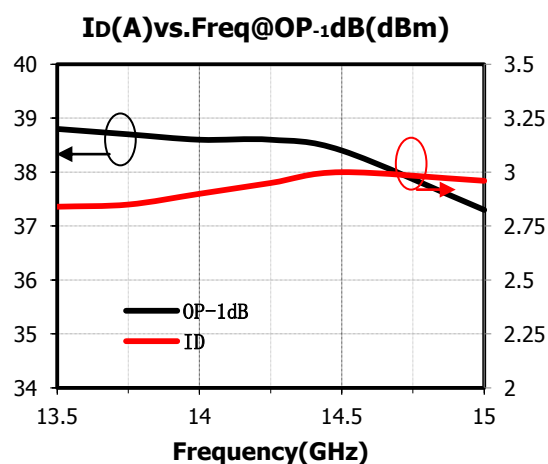
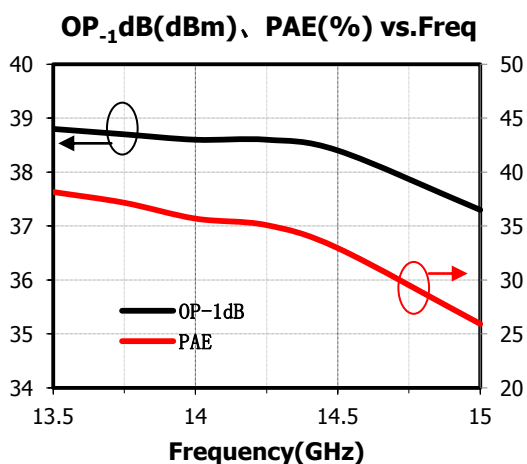
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Absolute Maximum Ratings

Maximum Input Power	+20dBm	Operating Temperature	-55°C~+70°C
Channel Temperature	150°C	Storage Temperature	-65°C~+150°C
Maximum V_D	+8.5V	Maximum V_G	-2V
ESD	Class 1A	Output Port Mismatch	3:1

Typical Performance Curve

*Bias Conditions: $V_D=7V$, $I_D=2.25A$ $T_A=25^\circ C$ CW Operation

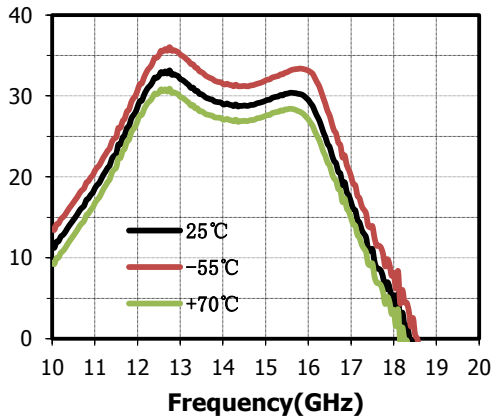


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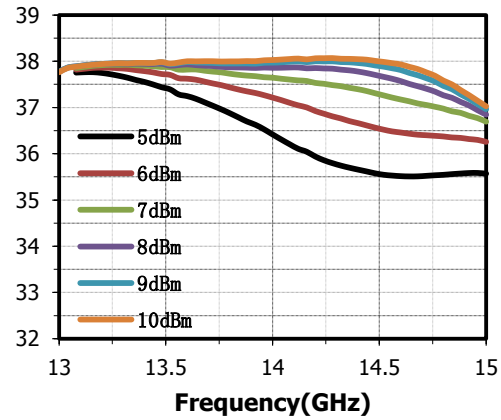
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Small Signal Gain(dB) vs.Temperature

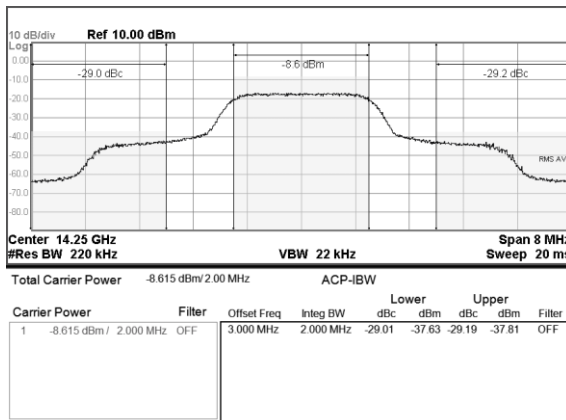


Input Power(dBm)vs.Output Power(dBm)

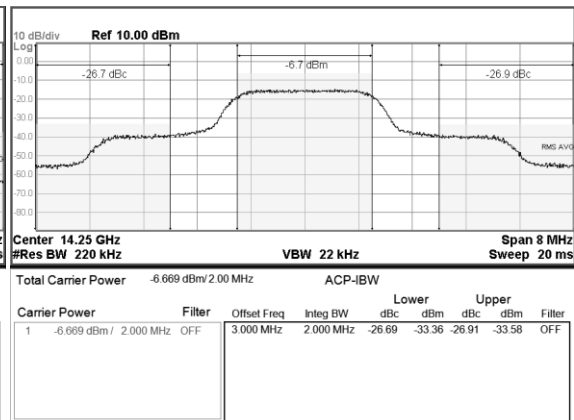


ACPR Performance

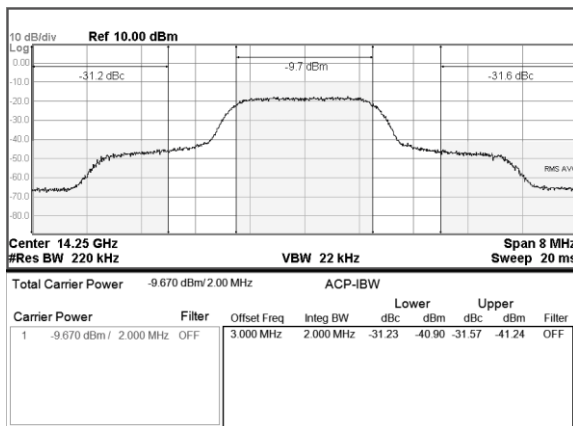
P_{OUT}=36dBm IDQ=2.25A



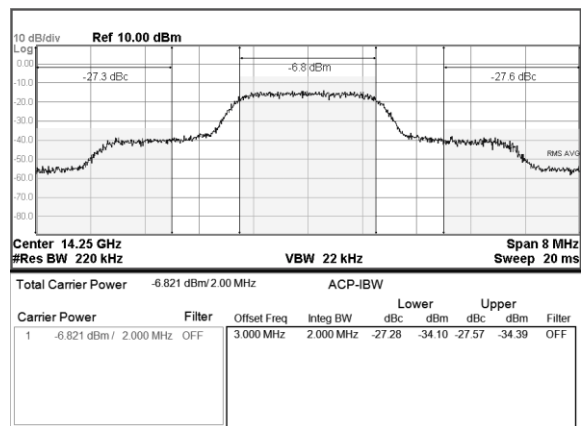
P_{OUT}=37dBm IDQ=2.25A



P_{OUT}=36dBm IDQ=2.45A



P_{OUT}=37dBm IDQ=2.45A



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EVM Performance

P_{OUT}=36.5dBm IDQ=2.25A

P_{OUT}=36.5dBm IDQ=2.45A

EVM	= 6.6896	%rms	17.756	% pk at sym	849
Mag Err	= 4.4720	%rms	-14.371	% pk at sym	576
Phase Err	= 2.8820	deg	9.2286	deg pk at sym	849
Freq Err	= -36.173	Hz	SNR (MER)	= 23.492	dB
IQ Offset	= -34.873	dB	Amp Droop	= -76.42	udB/sym
Quad Err	= 27.712	mdeg	Gain lmb	= -0.007	dB

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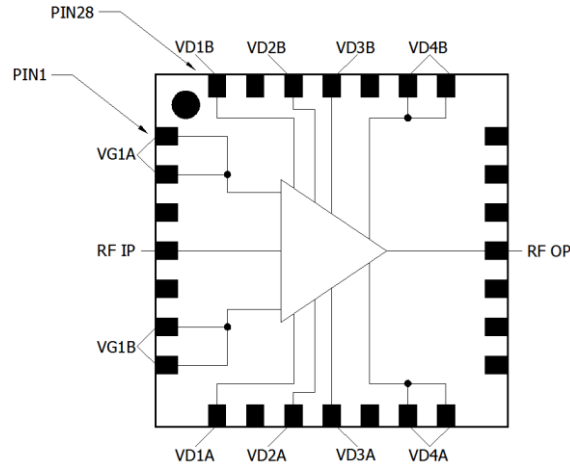
0 01010111 00110101 11011110 11010101 01101000 00000101
48 01001110 00000110 10110110 10011000 01101111 10100110
96 10010101 11010101 10000101 11101110 00110001 10011110
144 01000110 01111111 10100010 01100110 01110100 10000001
192 00100110 10111110 10110000 10010100 10111110 00011001
240 10111000 11010101 01000100 11111000 01000001 01011001
288 11001110 00101111 11111101 10010010 00001100 00010110
    
```

EVM	= 5.9975	%rms	16.463	% pk at sym	994
Mag Err	= 4.2154	%rms	-14.947	% pk at sym	234
Phase Err	= 2.4684	deg	8.6854	deg pk at sym	530
Freq Err	= -34.182	Hz	SNR (MER)	= 24.441	dB
IQ Offset	= -36.336	dB	Amp Droop	= -29.45	udB/sym
Quad Err	= -27.011	mdeg	Gain lmb	= 0.056	dB

```

0 10101110 11111010 10100111 10101110 01101001 01010111
48 10001001 11111001 11111110 10110100 10110000 11000111
96 00101000 01101100 10110111 00010100 10011001 00011000
144 11100010 11001011 10010111 00001010 10000111 01011111
192 01101001 00111111 11110110 11000110 10100110 11101010
240 11001001 10010011 10110001 00101110 01111110 10010010
288 10001100 01111100 00110001 11001000 11011011 10101011
    
```

Pin Descriptions



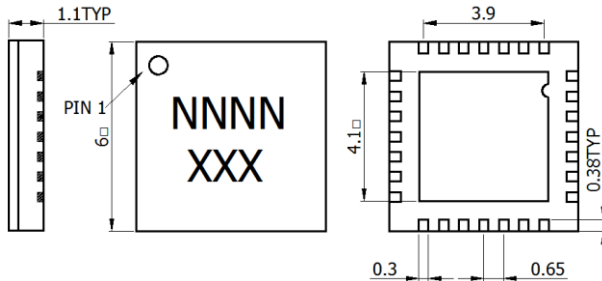
Pin No.	Function	Pin No.	Function	Pin No.	Function	Pin No.	Function
1	VG1A	8	VD1A	15	GND	22	VD4B
2	VG1A	9	GND	16	GND	23	VD4B
3	GND	10	VD2A	17	GND	24	GND
4	RFIP	11	VD3A	18	RFOP	25	VD3B
5	GND	12	GND	19	GND	26	VD2B
6	VG1B	13	VD4A	20	GND	27	GND
7	VG1B	14	VD4A	21	GND	28	VD1B

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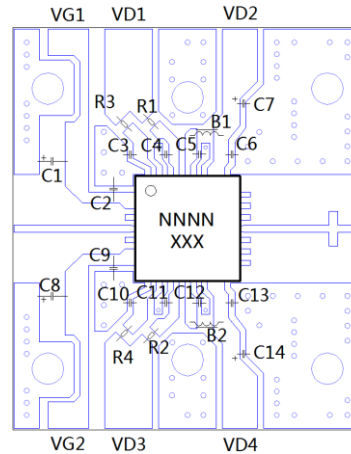
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Outline Drawing (all dimensions in mm)



Evaluation PCB Assembly Diagram

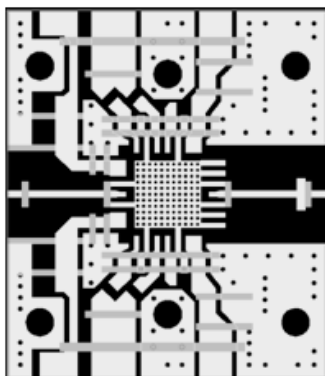


VG1~VG3、VD1~VD2 Bonding pad size:100x100um
VG1A~VG3A、VD1A~VD2A Bonding pad size:100x100um
RF IN、RF OUT Bonding pad size:100x120um
VD3 Bonding pad size:200x100um

List of Materials for Evaluation PCB

Reference Des.	Manuf.	Part Number	Size
C2~C6、C9~C13	Murata	GRM155R61A225KED95D	0402
C1、C7、C8、C14	AVX	TCJA106M010R0200	1206
PCB	Rogers.	RO4003c t=0.203	—
U1	SAC	SAC3110Q6	QFN6
B1、B2	Murata	BLM18BA100SN1D	0603
R1~R4	—	OR	0603

Evaluation PCB



Notes

The SAC3110Q6 is biased with a positive drain voltage supply and negative gate voltage supply when the drain voltage is set to 7 V. The recommended gate voltage is set to -0.6~-0.9 V.

Attention

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.