RFPA1002

9.8GHz TO 13.5GHz HIGH LINEARITY POWER AMPLIFIER

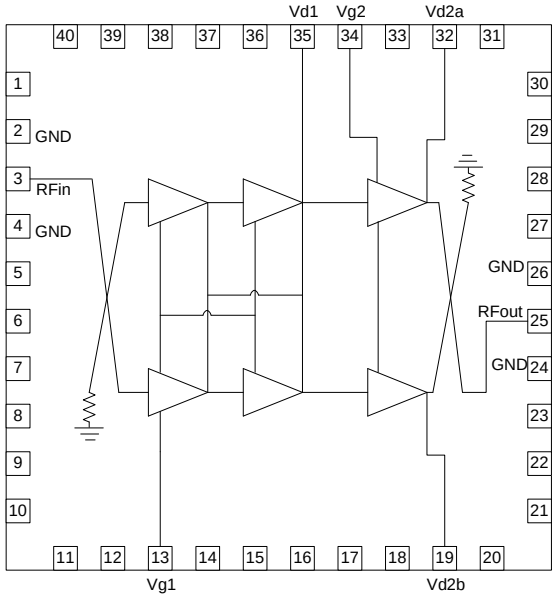
Package: Ceramic QFN, 40-pin, 6mm x 6mm x 0.95mm

Features

- Frequency Range: 9.8GHz to 13.5GHz
- Small Signal Gain: 26dB
- IM3 at +17dBm (SCL): +50dBc
- IM3 at +22dBm (SCL): +39dBc
- IM3 at +25dBm (SCL): +32dBc
- OIP3 at +17dBm (SCL): +42dBm
- RL (Input): 10 dB
- RL (Output): 16 dB
- V_D: 6.5V
- I_D: 1.07A
- 6mm x 6mm QFN

Applications

- Point-Point Radio
- Point-Multipoint Radio



Functional Block Diagram

Product Description

RFMD's RFPA1002 is a high linearity power amplifier in a surface mount package designed for use in transmitters that operate at frequencies between 9.8GHz to 13.5GHz. It provides 26dB of small-signal gain. This power amplifier is optimized for linear operation with an output third order intercept point (OIP3) of ≥ +42dBm. The RFPA1002 is manufactured with depletion mode GaAs pHEMT process.

Ordering Information

RFPA1002S2	2-Piece sample bag
RFPA1002SB	5-Piece bag
RFPA1002SQ	25-Piece bag
RFPA1002SR	100-Piece reel
RFPA1002TR7	750-Piece 7" reel
RFPA1002PCBA-410	Evaluation Board

Optimum Technology Matching® Applied

☐ GaAs HBT	☐ SiGe BiCMOS	☑ GaAs pHEMT	☐ GaN HEMT
☐ GaAs MESFET	☐ Si BiCMOS	☐ Si CMOS	☐ BiFET HBT
☐ InGaP HBT	☐ SiGe HBT	☐ Si BJT	

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Absolute Maximum Ratings

Parameter	Rating	Unit
V_{D1}, V_{D2}, V_{D3}	+8	V
V_G	0	V
Junction Temperature		°C
Continuous P_{DISS} (T = 85 °C) (derate 37 mW/ °C above T = 85 °C)		°C/W
Storage Temperature	-65 to +150	°C
Operating Temperature	-40 to +85	°C
ESD Sensitivity (HBM)	1A	HBM

Caution! ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Operational Frequency	9.8		13.5	GHz	
Positive Supply Voltage (V_{DD})	4.5	6.5 and 7		V	
Drain current (I_D)		1070		mA	
Small-signal Gain		26		dB	
Gain Dynamic Range (using gate bias)		20		dB	
P1dB		+32		dBm	
IM3		50		dBc	at P_{OUT} = 17dBm (SCL) in 9.8GHz to 10.7GHz frequency range
		39		dBc	at P_{OUT} = 22dBm (SCL) in 9.8GHz to 10.7GHz frequency range
		30		dBc	at P_{OUT} = 25dBm (SCL) in 9.8GHz to 10.7GHz frequency range
		50		dBc	at P_{OUT} = 17dBm (SCL) in 10.7GHz to 11.7GHz frequency range
		38		dBc	at P_{OUT} = 22dBm (SCL) in 10.7GHz to 11.7GHz frequency range
		31		dBc	at P_{OUT} = 25dBm (SCL) in 10.7GHz to 11.7GHz frequency range
		52		dBc	at P_{OUT} = 17dBm (SCL) in 12.75GHz to 13.25GHz frequency range
		39		dBc	at P_{OUT} = 22dBm (SCL) in 12.75GHz to 13.25GHz frequency range
		35		dBc	at P_{OUT} = 25dBm (SCL) in 12.75GHz to 13.25GHz frequency range
IM5		75		dBc	at P_{OUT} = 17dBm (SCL) in 9.8GHz to 13.5GHz frequency range
		60		dBc	at P_{OUT} = 22dBm (SCL) in 9.8GHz to 13.5GHz frequency range
Input Return Loss (RL_{IN})		10		dB	
Output Return Loss (RL_{OUT})		16		dB	
Noise Figure				dB	
ESD sensitivity (HBM)		>400		V	
ESD sensitivity (CDM)				V	

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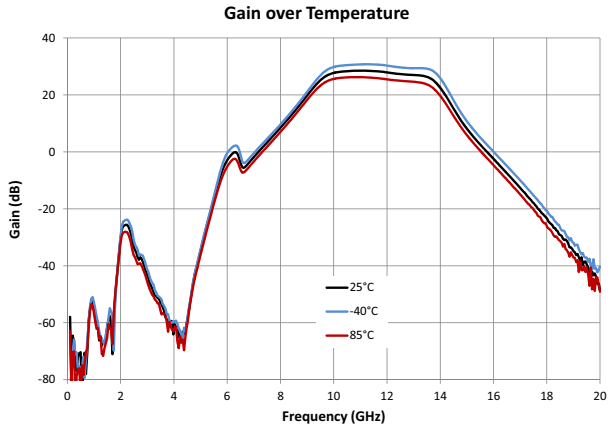
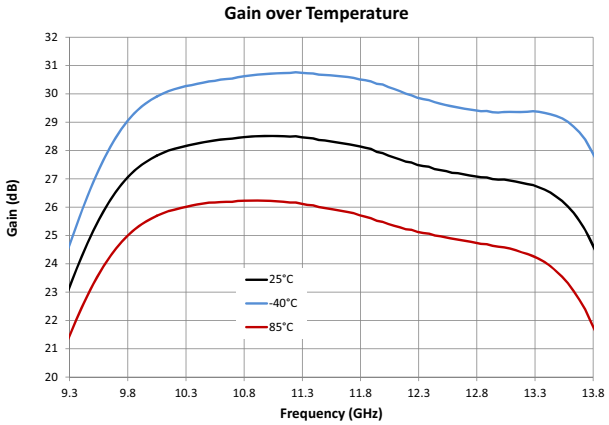
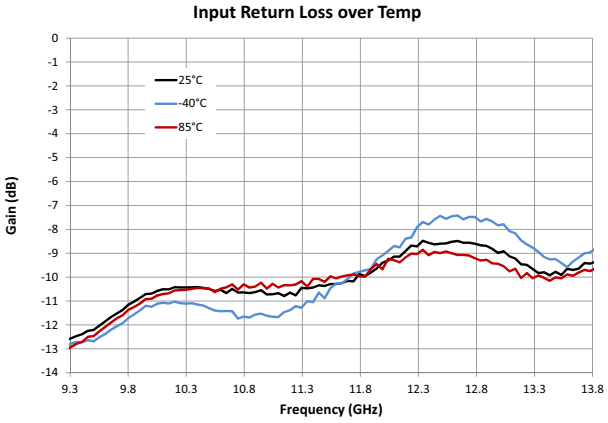
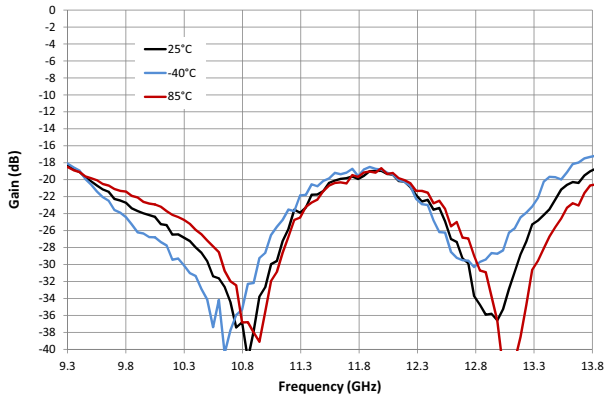
Typical Electrical Performance

Measurements performed on connectorized Evaluation Board and RF I/O Loss has been de-embedded (see EVB Layout). All measurements were taken at $V_{D1} = V_{D2} = V_{D3} = 6.5V$, $I_{D1} = 86mA$, $I_{D2} = 230mA$, $I_{D3} = 740mA$ unless otherwise noted.

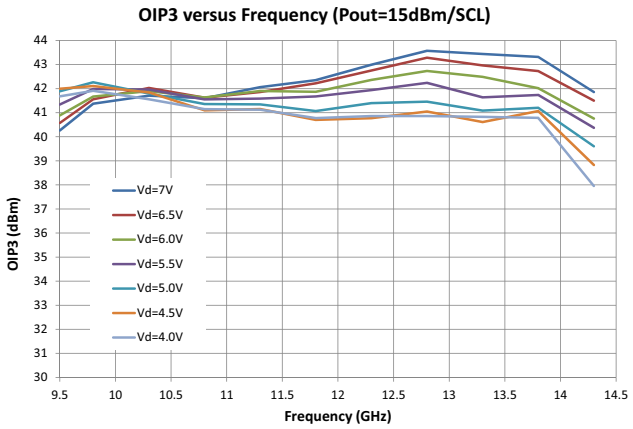


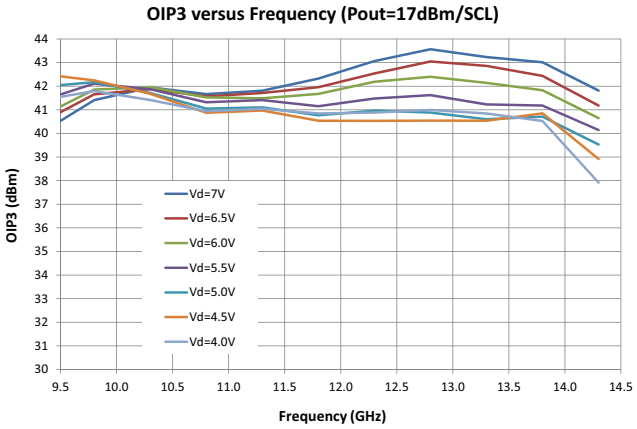


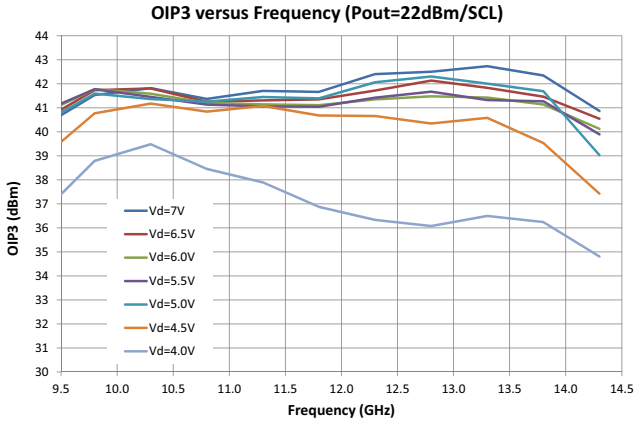


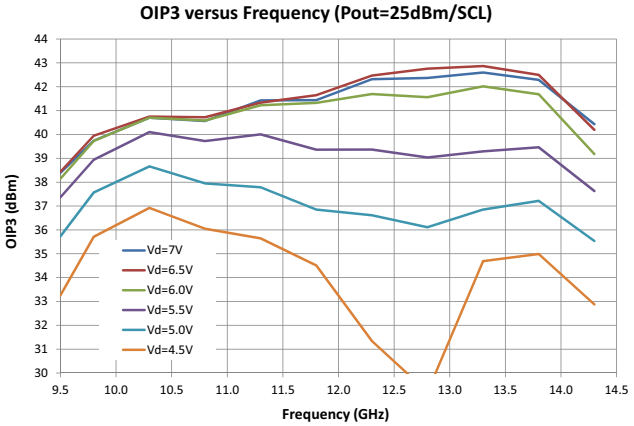


Typical Electrical Performance
(continued)









V_D	I_{D1} (mA)	I_{D2} (mA)	I_{D3} (mA)	I_D (Total)	P_{DISS} (W)
7.0	88	231	742	1061	7.4
6.5	87	227	732	1047	6.8
6.0	84	220	723	1028	6.2
5.5	82	212	713	1007	5.5
5.0	77	203	702	982	4.9
4.5	74	193	687	954	4.3
4.0	70	183	673	926	3.7

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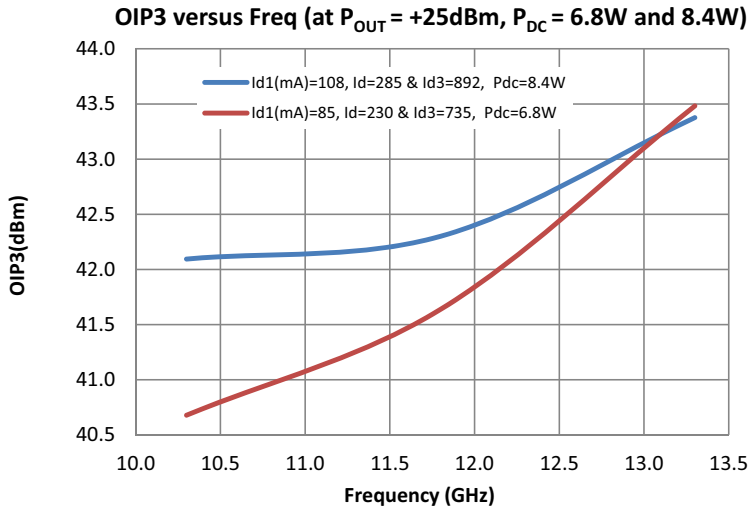
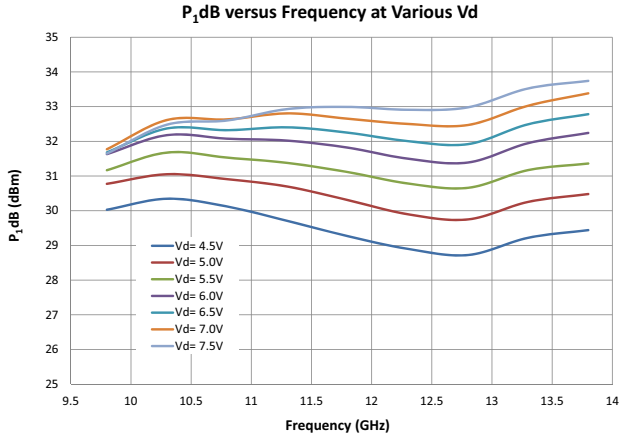
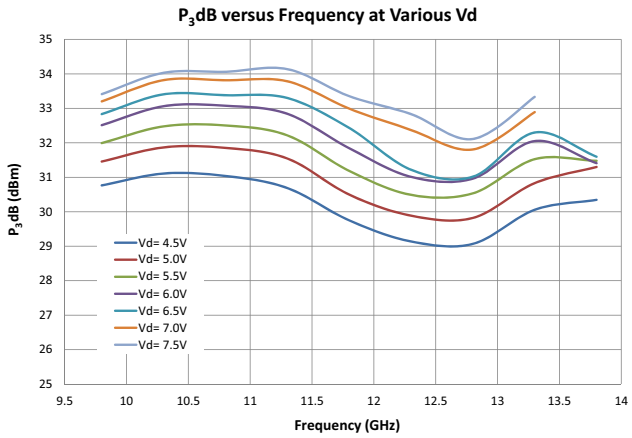
Typical Electrical Performance
(continued)

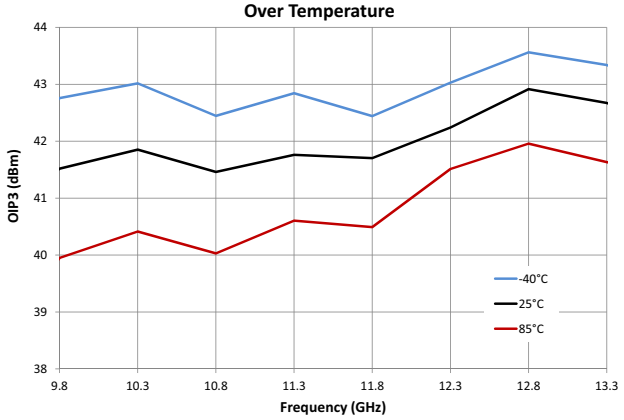




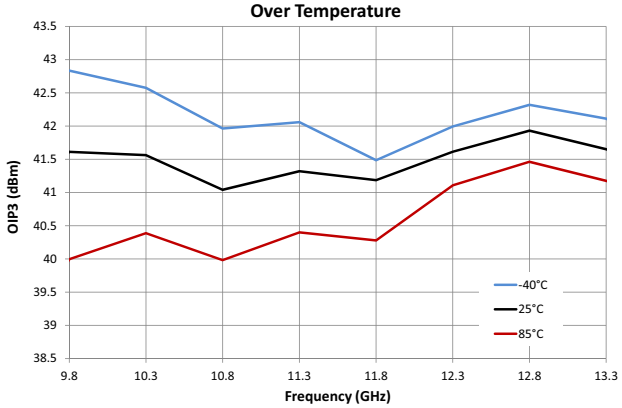


Typical Electrical Performance
(continued)

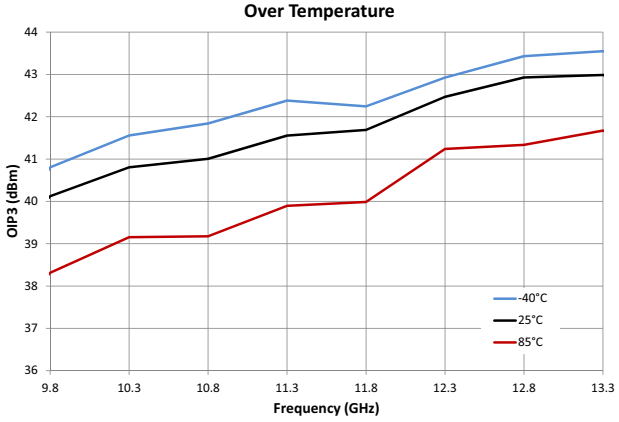
OIP3 versus Frequency (Pout=17dBm/SCL)
Over Temperature



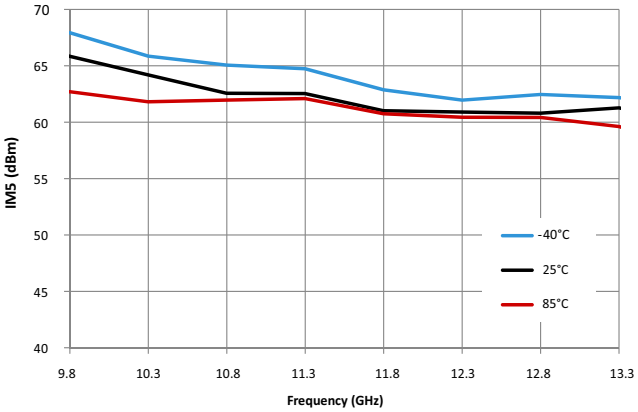
OIP3 versus Frequency (Pout=22dBm/SCL)
Over Temperature



OIP3 versus Frequency (Pout=25dBm/SCL)
Over Temperature



IM5 versus Frequency (Pout=+22dBm/SCL)
Over Temperature



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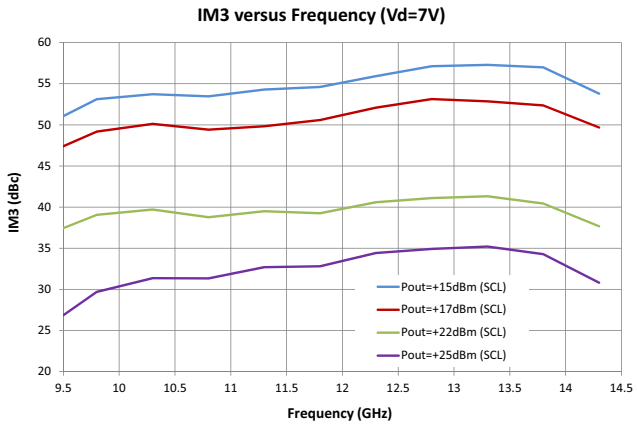
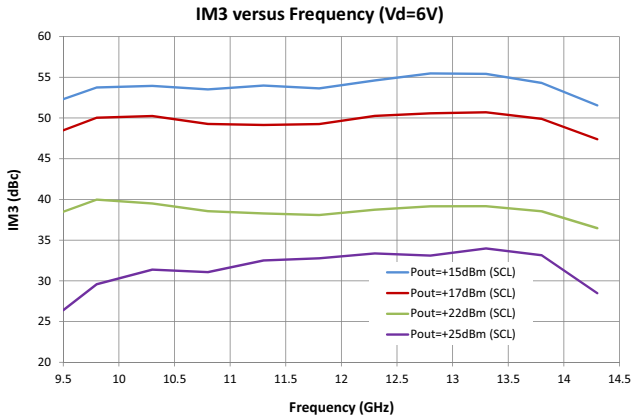
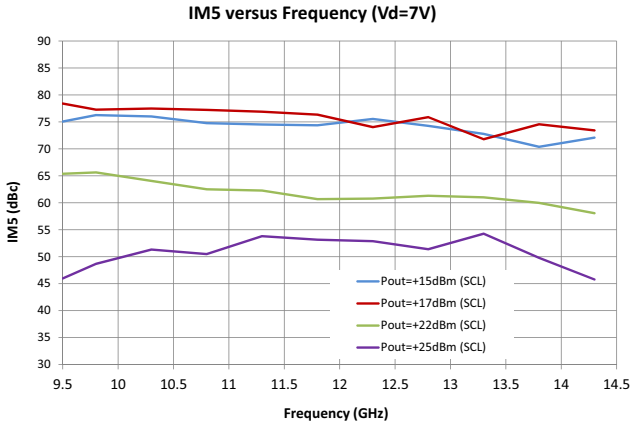
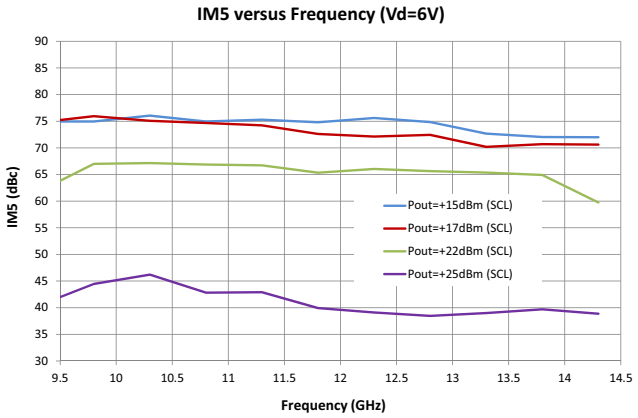
Typical Electrical Performance
(continued)



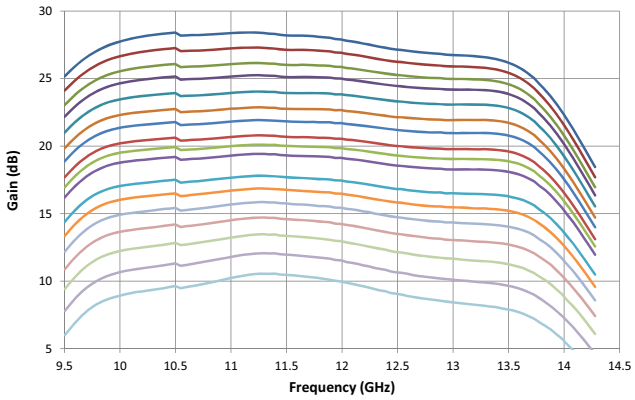




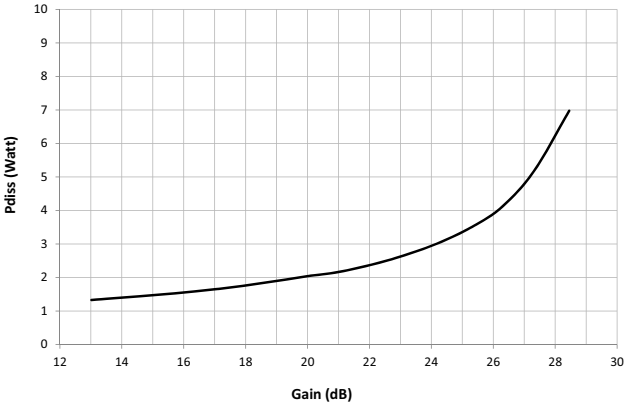


Typical Electrical Performance
(continued)

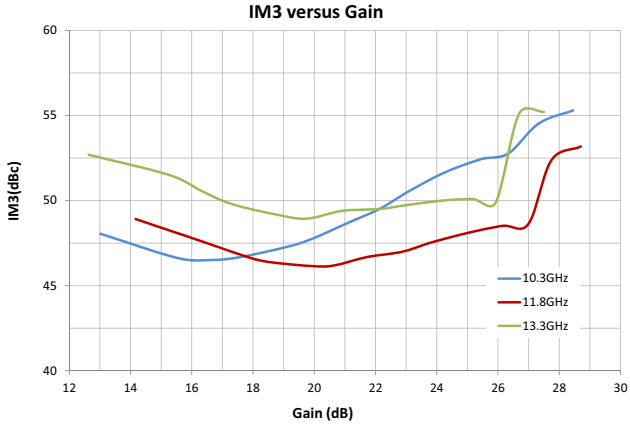
Gain versus Frequency (Gain Control Using Vg)



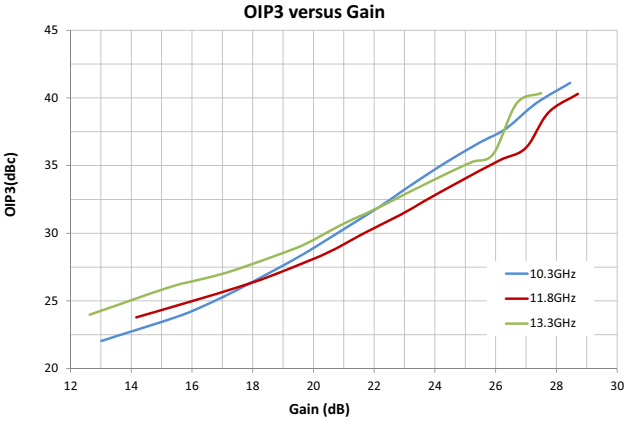
Pdiss versus Gain



IM3 versus Gain



OIP3 versus Gain



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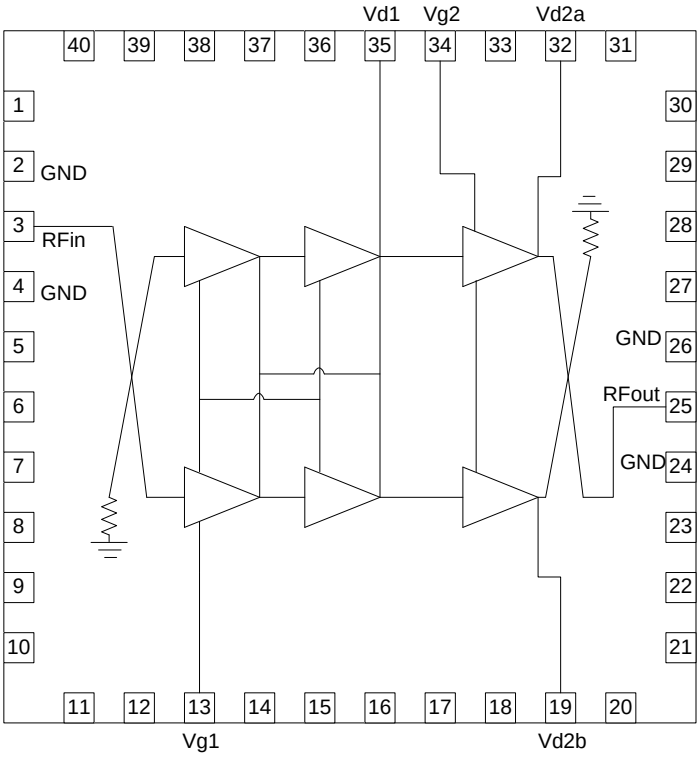
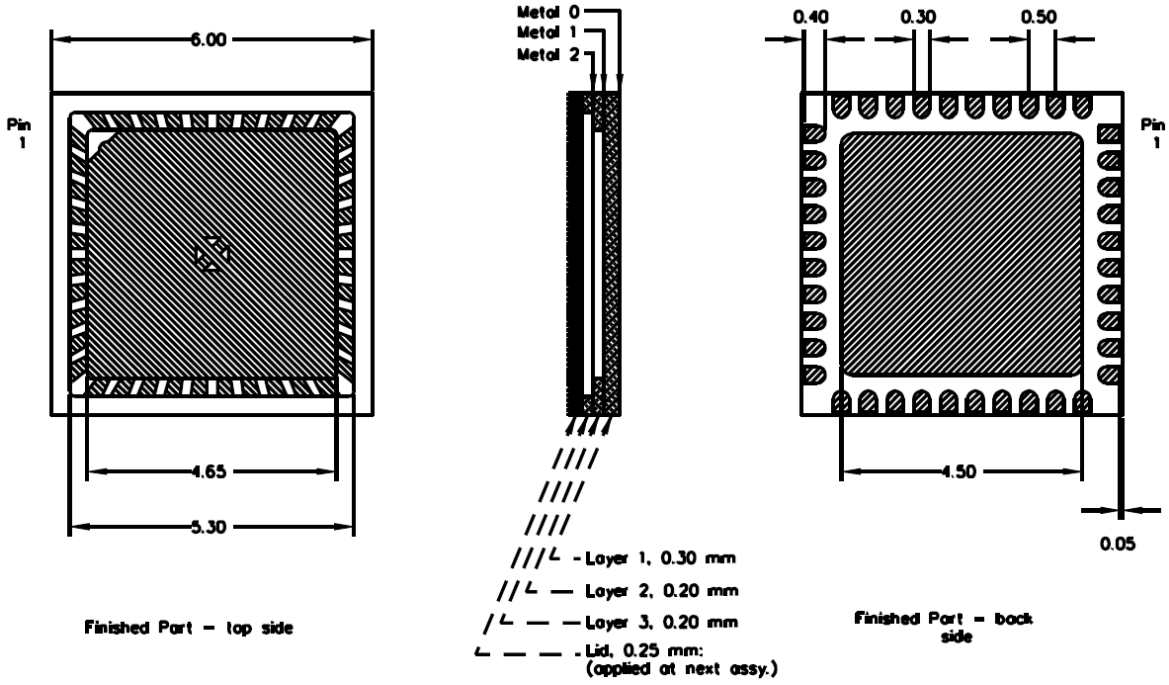
Pin Names and Descriptions

Pin	Name	Description
1	N/C	Not connected.
2	GND	Ground.
3	RFIN	RF input.
4	GND	Ground.
5	N/C	Not connected.
6	N/C	Not connected.
7	N/C	Not connected.
8	N/C	Not connected.
9	N/C	Not connected.
10	N/C	Not connected.
11	N/C	Not connected.
12	N/C	Not connected.
13	VG1	Gate bias 1.
14	N/C	Not connected.
15	N/C	Not connected.
16	N/C	Not connected.
17	N/C	Not connected.
18	N/C	Not connected.
19	VD2B	Drain bias 2.
20	N/C	Not connected.
21	N/C	Not connected.
22	N/C	Not connected.
23	N/C	Not connected.
24	GND	Ground.
25	RFOUT	RF output.
26	GND	Ground.
27	N/C	Not connected.
28	N/C	Not connected.
29	DET	(Not Available; Reserved for future addition of detector.) Detector Out.
30	REF	(Not Available; Reserved for future addition of detector.) Detector Reference.
31	N/C	Not connected.
32	VD2A	Drain bias 2.
33	N/C	Not connected.
34	VG2	Gate bias 2.
35	VD1	Drain bias 1.
36	N/C	Not connected.
37	N/C	Not connected.
38	N/C	Not connected.
39	N/C	Not connected.
40	N/C	Not connected.

Pin Out



Package Drawing



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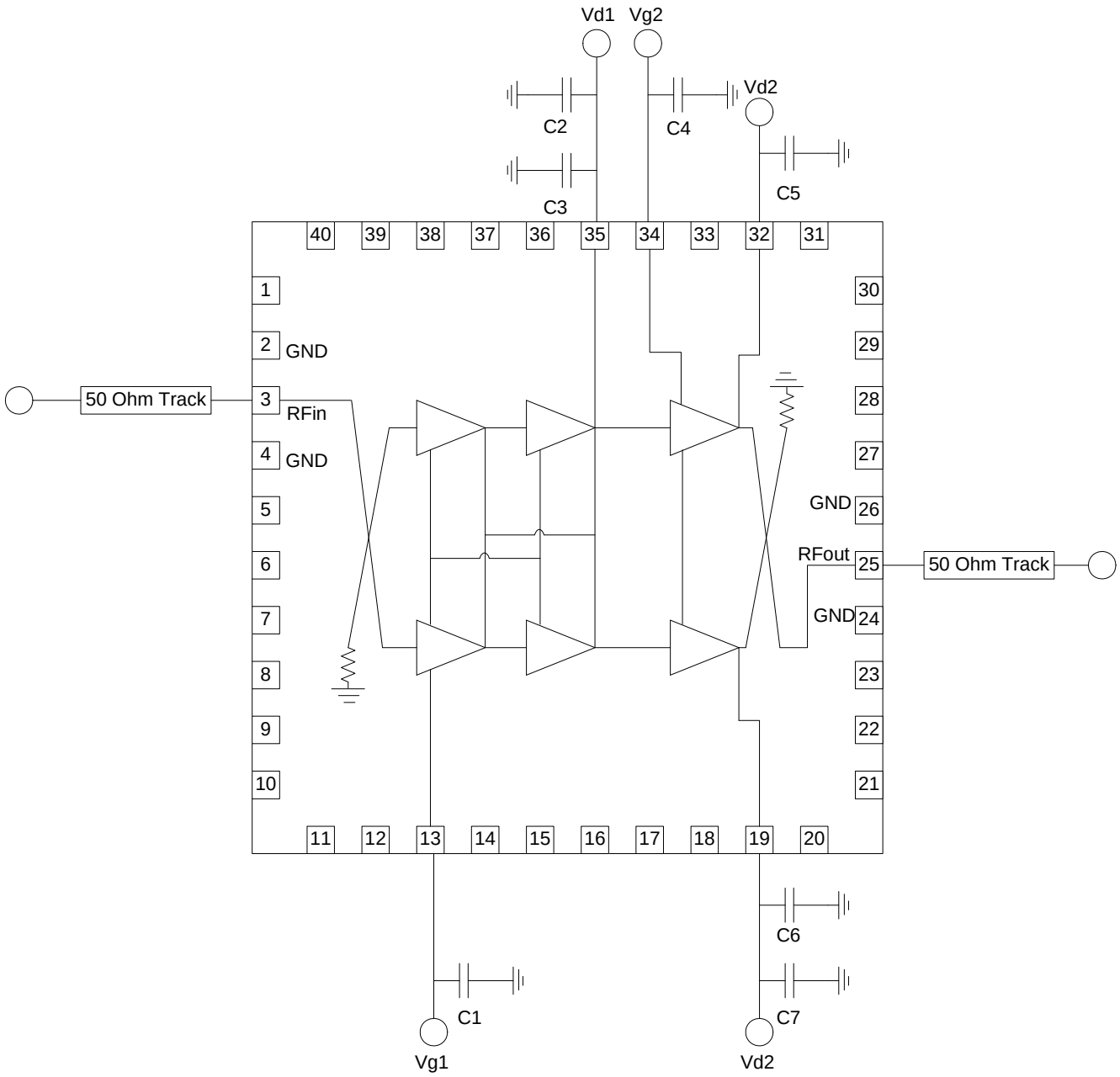
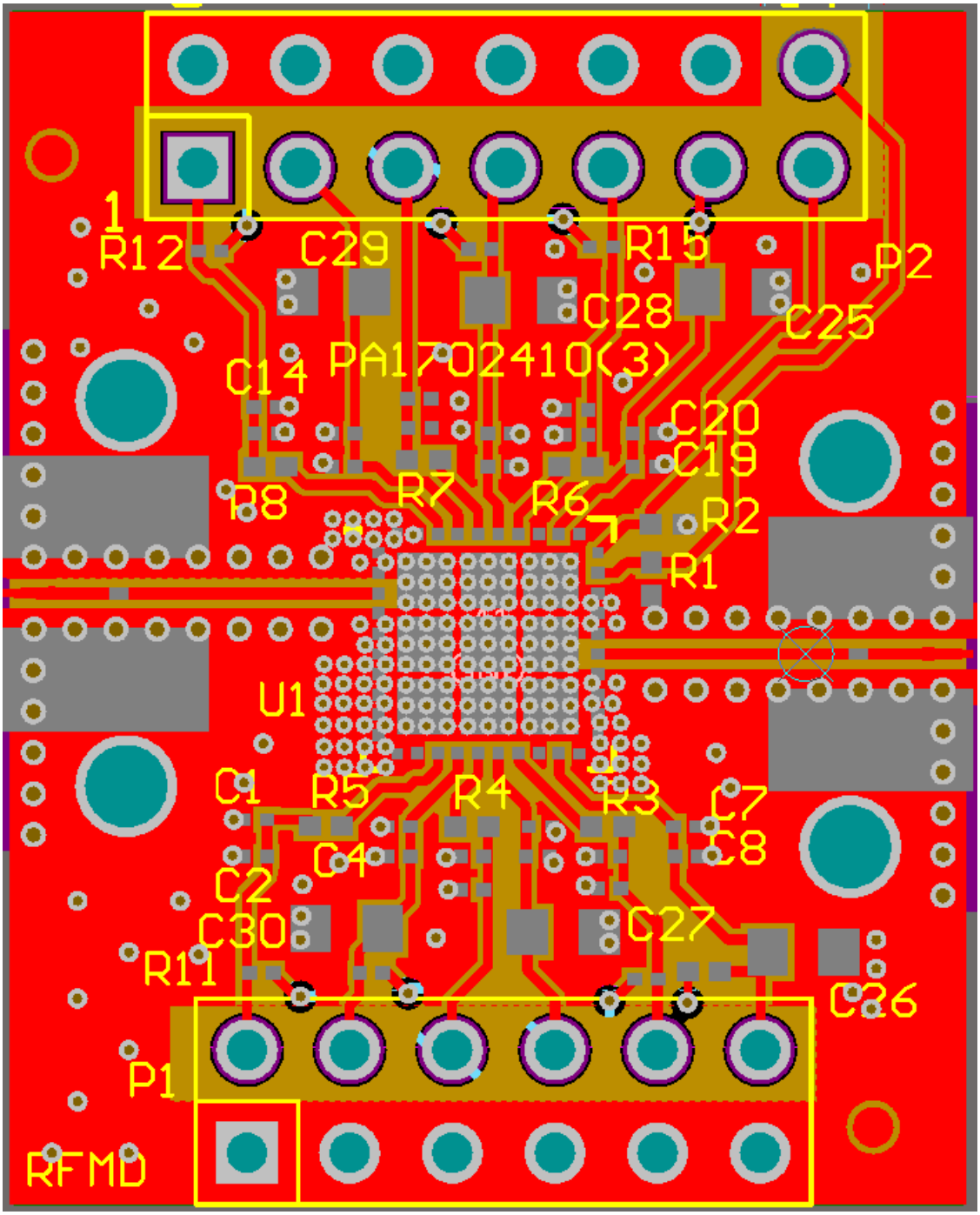
Sample Application Circuit Schematic



Evaluation Board Bill of Materials (BOM)

Description	Reference Designator
1μF Cap, 0201	C1, C3, C4, C5, C6
4.7μF Cap, 0603	C2, C7

Evaluation Board Layout



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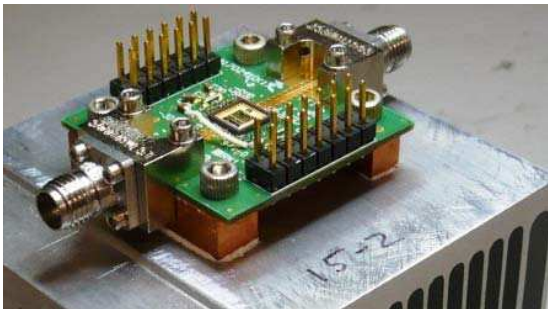

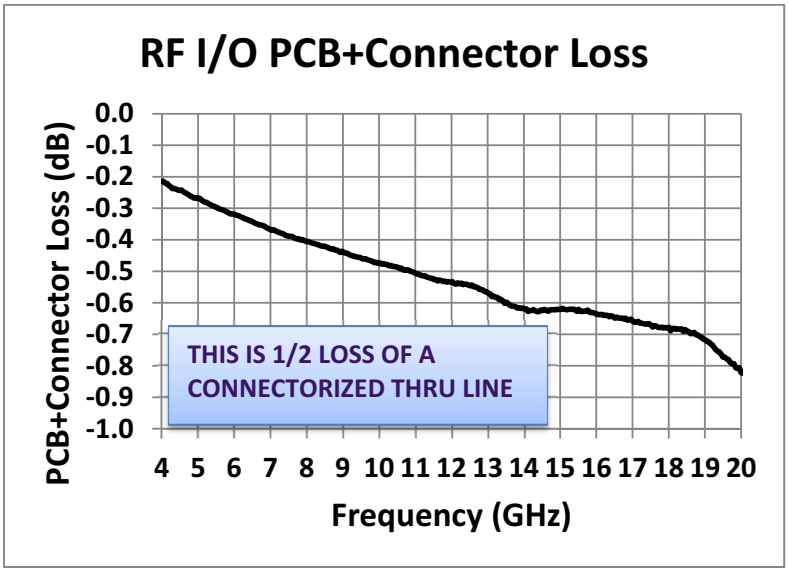
RF I/O PCB+Connector Loss
PCB+Connector Loss (dB)
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Frequency (GHz)
THIS IS 1/2 LOSS OF A
CONNECTORIZED THRU LINE