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RFCM2680

45MHz TO 1003MHz GaAs/GaN POWER DOUBLER MODULE

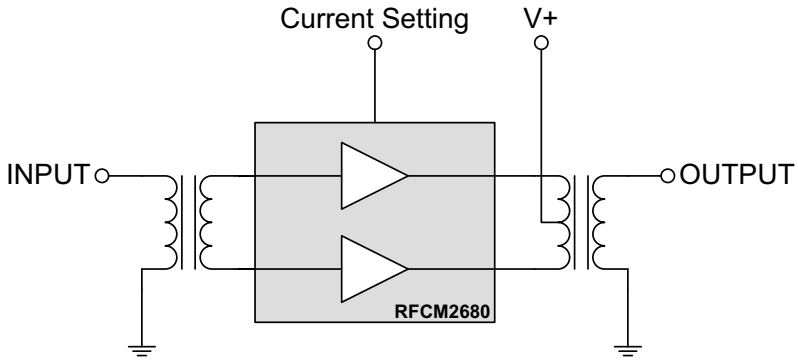
Package: 9-pin, 9.0mm x 8.0mm x 1.375mm

Features

- Excellent Linearity
- Superior Return Loss Performance
- Extremely Low Distortion
- Optimal Reliability
- Low Noise
- Unconditionally Stable Under all Terminations
- Extremely High Output Capability
- 22.5dB Min. Gain at 1003MHz
- 450mA Max. at 24VDC

Applications

- 45MHz to 1003MHz CATV Amplifier Systems



Functional Block Diagram

Product Description

The RFCM2680 is a Power Doubler amplifier SMD Module. The part employs GaAs pHEMT die and GaN HEMT die, has high output capability, and is operated from 45MHz to 1003MHz. It provides excellent linearity and superior return loss performance with low noise and optimal reliability.

DC current of the device can be externally adjusted for optimum distortion performance versus power consumption over a wide range of output level.

Ordering Information

RFCM2680SB	Sample bag with 5 pieces
RFCM2680SR	7” Reel with 100 pieces
RFCM2680TR7	7” Reel with 500 pieces
RFCM2680TR13	13” Reel with 1000 pieces
RFCM2680PCBA-410	Fully Assembled 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
RF Input Voltage (single tone; on evaluation board)	60	dBmV
DC Supply Over-Voltage (5 minutes)	30	V
Storage Temperature	-40 to +100	°C
Operating Mounting Base Temperature	-30 to +100	°C

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.

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RoHS (Restriction of Hazardous Substances): Compliant per EU Directive 2002/95/EC.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					V+ = 24V; T_{MB} = 30°C; Z_S = Z_L = 75Ω; I_{DC} = I_{DC} Typical
Power Gain	21.0	21.5	22.0	dB	f = 45MHz
	22.5	23.0	24.0	dB	f = 1003MHz
Slope[1]	1.0	1.5	2.5	dB	f = 45MHz to 1003MHz
Flatness of Frequency Response			1	dB	f = 45MHz to 1003MHz (Peak to Valley)
Input Return Loss	20			dB	f = 45MHz to 320MHz
	19			dB	f = 320MHz to 640MHz
	18			dB	f = 640MHz to 870MHz
	16			dB	f = 870MHz to 1003MHz
Output Return Loss	20			dB	f = 45MHz to 320MHz
	19			dB	f = 320MHz to 640MHz
	18			dB	f = 640MHz to 870MHz
	17			dB	f = 870MHz to 1003MHz
Noise Figure		3.0	4.0	dB	f = 50MHz to 1003MHz
Output P1dB		32		dBm	
Output IP3		49		dBm	6MHz tone spacing at 16dBm/tone
Total Current Consumption (DC)		430.0	450.0	mA	
Distortion data 40MHz to 550MHz					V+ = 24V; T_{MB} = 30°C; Z_S = Z_L = 75Ω; I_{DC} = I_{DC} typical
CTB		-73	-69	dBc	V_O = 60dBmV at 1003MHz, 18dB extrapolated tilt, 79 analog channels plus 75 digital channels (-6dB offset)[2][4]
XMOD		-66	-61	dBc	
CSO		-75	-65	dBc	
CIN	55	58		dB	
Distortion data 40MHz to 550MHz					V+ = 24V; T_{MB} = 30°C; Z_S = Z_L = 75Ω; I_{DC} = 370mA
CTB		-73		dBc	V_O = 57dBmV at 1003MHz, 18dB extrapolated tilt, 79 analog channels plus 75 digital channels (-6dB offset)[3][4]
XMOD		-67		dBc	
CSO		-76		dBc	
CIN		59		dB	

[1] The slope is defined as the difference between the gain at the start frequency and the gain at the stop frequency.
[2] 79 analog channels, NTSC frequency raster: 55.25MHz to 547.25MHz, +42dBmV to +51.4dBmV tilted output level, plus 75 digital channels, -6dB offset relative to the equivalent analog carrier.
[3] 79 analog channels, NTSC frequency raster: 55.25MHz to 547.25MHz, +39dBmV to +48.4dBmV tilted output level, plus 75 digital channels, -6dB offset relative to the equivalent analog carrier.
[4] Composite Second Order (CSO) - The CSO parameter (both sum and difference products) is defined by the NCTA. Composite Triple Beat (CTB) - The CTB parameter is defined by the NCTA. Cross Modulation (XMOD) - Cross modulation (XMOD) is measured at baseband (selective voltmeter method), referenced to 100% modulation of the carrier being tested. Carrier to Intermodulation Noise (CIN) - The CIN parameter is defined by ANSI/SCTE 17 (Test procedure for carrier to noise).

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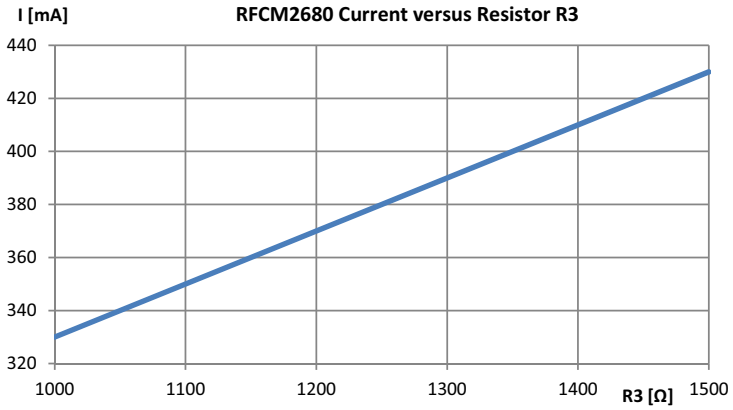
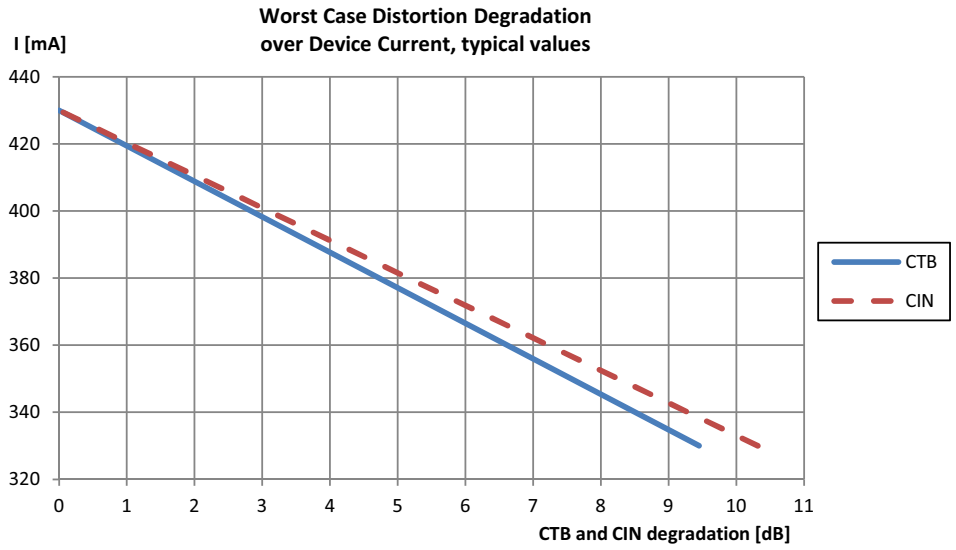
Current Adjustment Using Resistor R3

The RFCM2680 can be operated over a wide range of current to provide optimal required performance with minimum current consumption. Changing the value of resistor R3 on application circuit allows a variation of the current between 430mA and 330mA (typ.). Recommended current consumption is between 370mA to 430mA. Within this range, gain change less than 0.2dB and the noise figure changes less than 0.1dB.



Device Current [mA], typical	R3 [Ω]
430	1500
410	1400
390	1300
370	1200
350	1100
330	1000
	V+ = 24V; T_{MB} = 30°C; Z_S = Z_L = 75Ω

Change of Distortion Performance Over Current

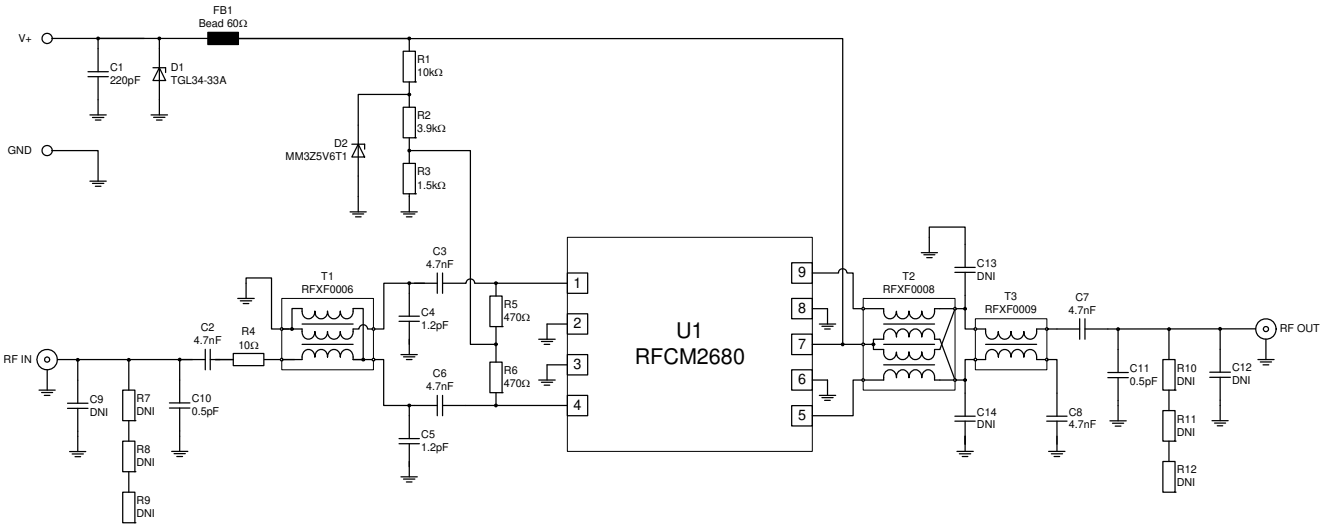


Test conditions:

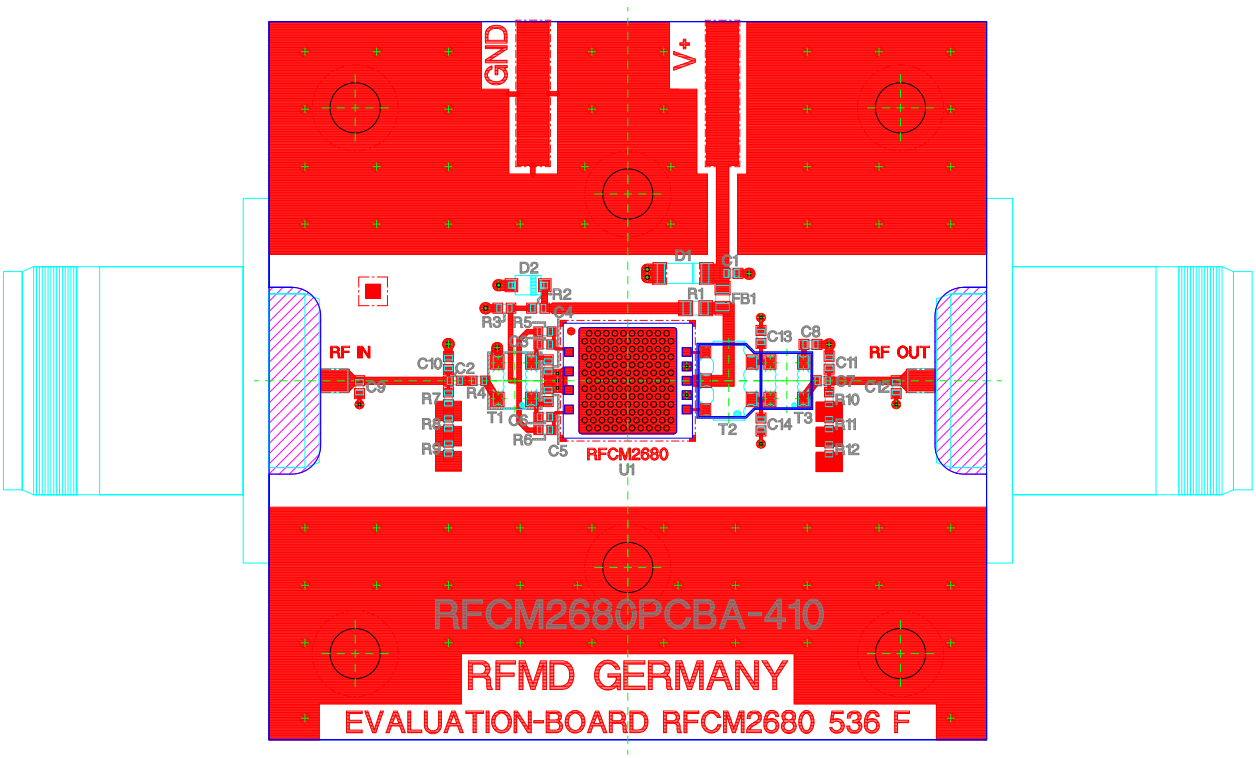
V+= 24V; T_{MB} = 30°C; Z_S = Z_L = 75Ω;

V_O = 60dBmV at 1003MHz, 18dB extrapolated tilt, 79 analog channels plus 75 digital channels (-6dB offset)

Application Circuit



Evaluation Board Layout



Note:

The ground plane of the RFCM2680 module should be soldered onto a board equipped with as many thermal vias as possible. Underneath this thermal via array a heat sink with thermal grease needs to be placed which is able to dissipate the complete module DC power (up to 10.4W). In any case the module backside temperature should not exceed 100°C.

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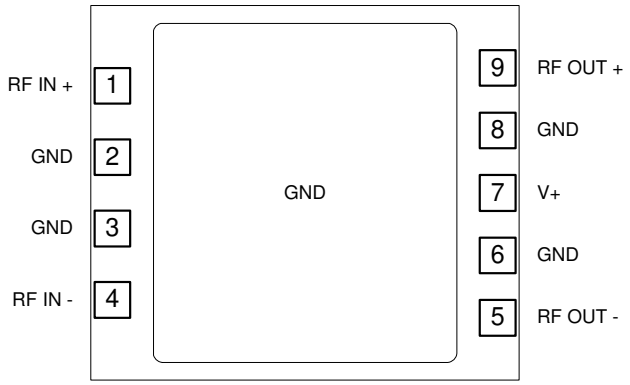
Component Chart

Component Type	Value	Quantity	Designator	Comment
Evaluation Board	RFCM2680PCBA-410	1		
Capacitor	220 pF	1	C1	
Capacitor	4.7 nF	5	C2, C3, C6, C7, C8	
Capacitor	1.2 pF	2	C4, C5	
Capacitor	DNI	4	C9, C12, C13, C14	optional to improve matching in application
Capacitor	0.5pF	2	C10, C11	
Resistor	10kΩ	1	R1	
Resistor	3.9kΩ	1	R2	
Resistor	1.5kΩ	1	R3	
Resistor	10Ω	1	R4	
Resistor	470Ω	2	R5, R6	
Resistor	DNI	6	R7-R12	optional to improve matching in application
Impedance Bead	60Ω at 100MHz	1	FB1	
Transient Voltage Suppressor Diode	TGL34-33A	1	D1	
Zener Diode	MM3Z5V6T1G	1	D2	
Transformer	RFXF0006	1	T1	
Transformer	RFXF0008	1	T2	
Transformer	RFXF0009	1	T3	
DUT	RFCM2680	1	U1	

Pin Configuration



Pin Names and Description

Pin	Name	Description
1	RF IN+	RF AMP Positive Input
2, 3, 6, 8	GND	Ground pins
4	RF IN-	RF AMP Negative Input
5	RF OUT-	RF AMP Negative Output
7	V+	Supply Voltage, +24V
9	RF OUT+	RF AMP Positive Output

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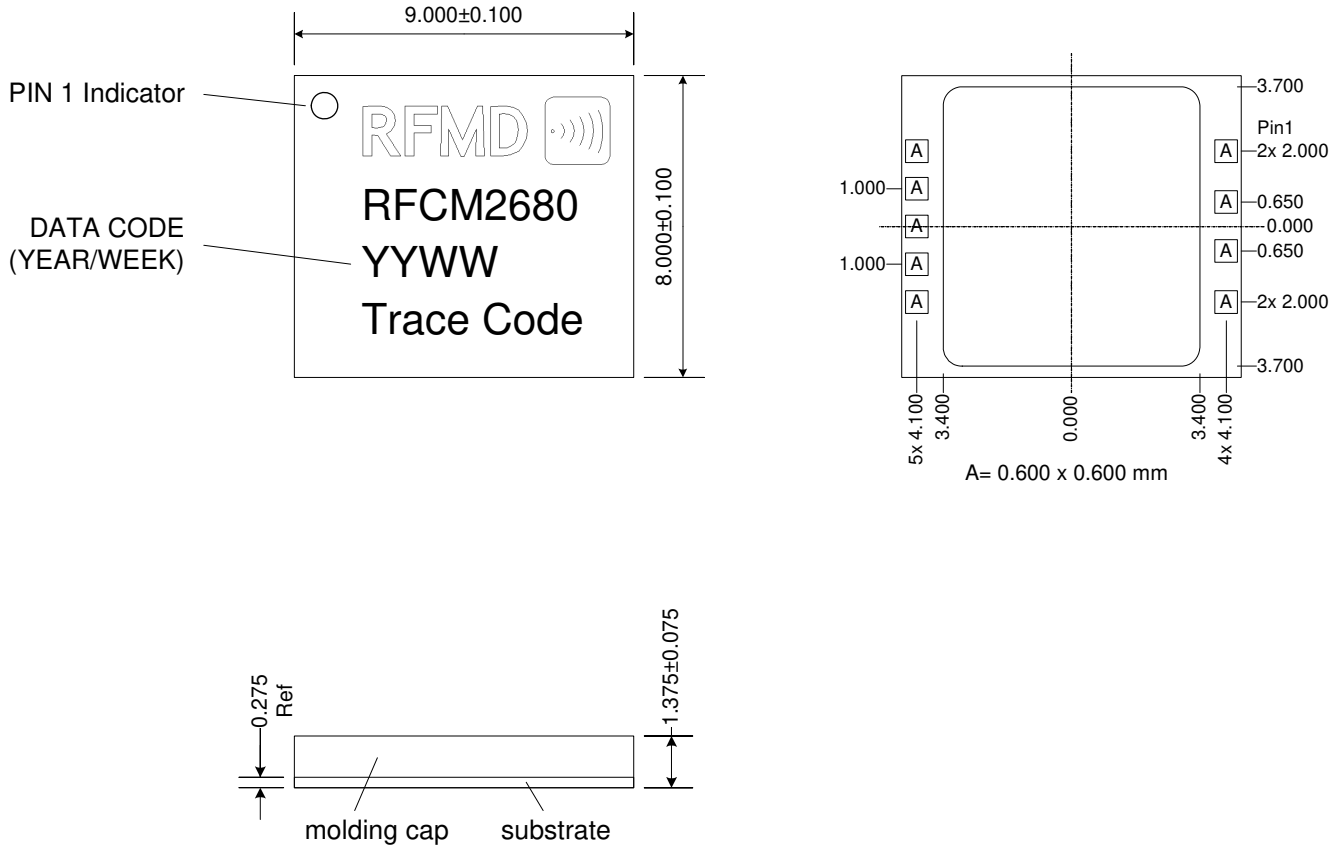
Package Drawing

Dimensions in millimeters



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