

## GRF1202

### LOG AVERAGE POWER DETECTOR

#### 0.4 to 8 GHz

#### FEATURES

- Detector Slope: 0.027 volts per dB (-60 to +5 dBm)
- Linear Logarithmic Power Detector
- RoHS Compliant

#### APPLICATIONS

- High-volume, cost-sensitive logarithmic power detector applications

#### ORDERING INFORMATION

[Buy it Now](#)

#### DESCRIPTION

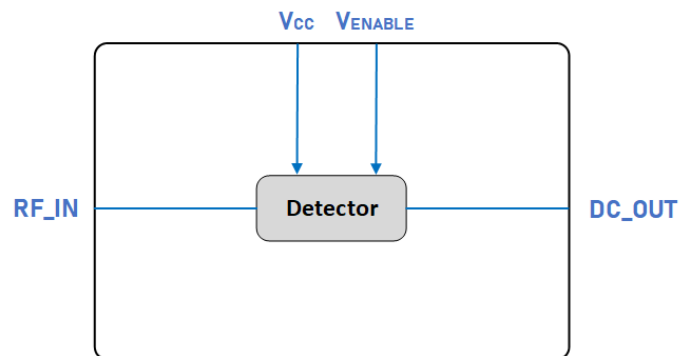
The GRF1202 is a logarithmic, average power detector IC designed for cost-sensitive applications in the 0.4 to 8 GHz frequency range.

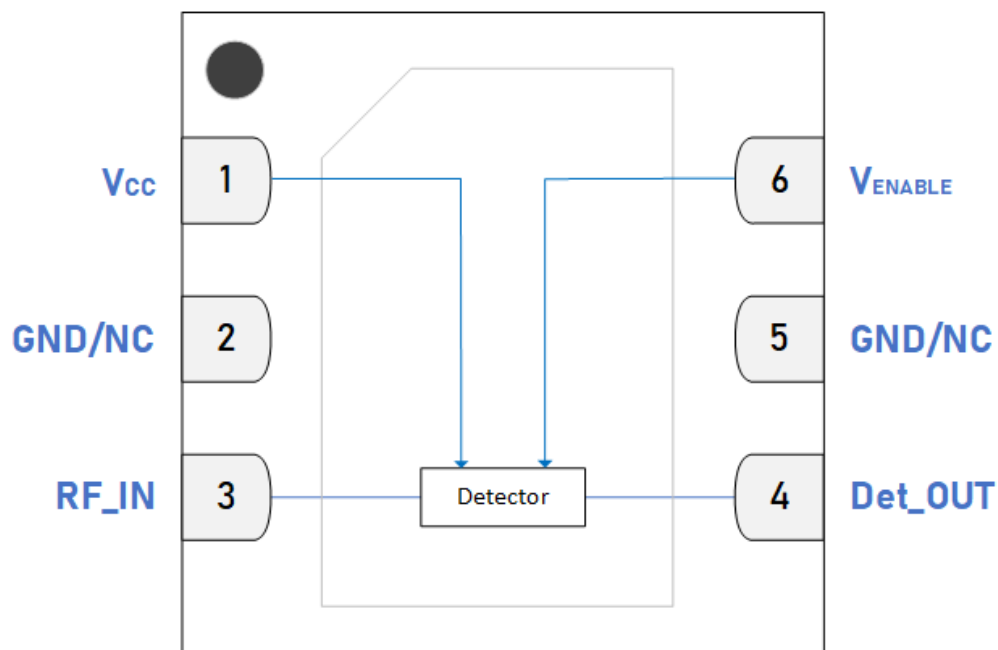
The device can be operated from a supply voltage range of 3.3 to 6.0 volts and housed in a 1.5 x 1.5 x 0.5 mm 6-pin plastic DFN package.

Please consult with the GRF applications engineering team for additional performance data.

Additional tunes can be found on the GRF1202 “Custom Tunes” product page: [GRF1202 Custom Tunes](#)

#### BLOCK DIAGRAM





**Pin Out (Top View)**



## Pin Assignments

Pin	Name	Description	Note
1	V <sub>CC</sub>	Supply Voltage	Connects to V <sub>CC</sub> through an external resistor.
2	GND/NC	Ground or No Connect	No internal connection to die.
3	RF_IN	Detector RF Input	An external DC blocking capacitor must be used.
4	Det_OUT	Detector DC Output	DC coupled to measure detected output power.
5	GND/NC	Ground or No Connect	No internal connection to die.
6	V <sub>ENABLE</sub>	Enable Voltage Input	Can be connected to V <sub>CC</sub> through an external resistor.
PKG BASE	GND	Ground	Provides DC and RF ground for detector, as well as thermal heat sink. Recommend multiple 8 mil vias beneath the package for optimal RF and thermal performance. Refer to evaluation board top layer graphic on schematic page.

## Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V	0	6	V
RF Input Power: Load VSWR < 2:1, Modulation: CW	P <sub>IN MAX</sub>		20	dBm
Operating Temperature (Package Base)	T <sub>PKG BASE</sub>	-40	105	°C
Maximum Channel Temperature (MTTF > 10 <sup>6</sup> Hours)	T <sub>MAX</sub>		170	°C

## Electrostatic Discharge

Human Body Model	HBM	1000		V
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## Storage

Storage Temperature	T <sub>STG</sub>	-65	150	°C
Moisture Sensitivity Level	MSL		1	--



**Caution! ESD Sensitive Device.**

**Exceeding Absolute Maximum Rating conditions may cause permanent damage.**

Note: For additional information, please refer to [Manufacturing Note MN-001 - Packaging and Manufacturing Information](#).



All Guerrilla RF products are provided in RoHS compliant lead (Pb)-free packaging. For additional information, please refer to the [Certificate of RoHS Compliance](#).



## Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Voltage	$V_{CC}$	3.3	5	6	V	
Operating Temperature Range	$T_{PKG\ BASE}$	-40		105	°C	
RF Frequency Range	$F_{RF}$	0.4	2	8	GHz	See notes 1 & 2.
RF1 Port Impedance	$Z_{RFIN}$		50		$\Omega$	Single-ended.

**Note 1:** Operation outside of this range is supported by using different custom tunes. Examples of other optimized tunes can be found here: [GRF1202 Custom Tunes](#)

**Note 2:** Contact the Guerrilla RF Applications team for guidance on optimizing the tuning of the device for alternative bands.



## Nominal Operating Parameters - General

The following conditions apply unless noted otherwise; Typical Application Schematic,  $V_{CC} = 5\text{ V}$ ,  $I_{CC} = 18\text{ mA}$ ,  $50\ \Omega$  system impedance,  $F_{TEST} = 2.0\text{ GHz}$ ,  $T_{PKG\ BASE} = 25\text{ }^\circ\text{C}$ . Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency (50 $\Omega$ source)	$F_{TEST}$		2		GHz	$V_{CC} = 5\text{ V}$ .
DC_Out (no RF applied)	DC_Out		1.7		V	
DC_Out (-60 dBm RF Input Power)	DC_Out		1.7		V	
DC_Out (-40 dBm RF Input Power)	DC_Out		2.1		V	
DC_Out (-20 dBm RF Input Power)	DC_Out		2.7		V	
DC_Out (0 dBm RF Input Power)	DC_Out		3.3		V	
DC_Out (5 dBm RF Input Power)	DC_Out		3.5		V	
Detector Output Rise Time	$T_{RISE}$		450		ns	
Detector Output Fall Time	$T_{FALL}$		440		ns	
Supply Current	$I_{CC}$		18		mA	$V_{CC} = 5\text{ V}$ .
Maximum Die Temperature Package Heat Sink Temperature = 85 $^\circ\text{C}$ (Infrared Scan).	$T_{MAX}$		92		$^\circ\text{C}$	$V_{CC} = 5\text{ V}$ .

## Nominal Operating Parameters - General

The following conditions apply unless noted otherwise; Typical Application Schematic,  $V_{CC} = 3.4\text{ V}$ ,  $I_{CC} = 18\text{ mA}$ ,  $50\ \Omega$  system impedance,  $F_{TEST} = 2.0\text{ GHz}$ ,  $T_{PKG\ BASE} = 25\text{ }^\circ\text{C}$ . Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency (50 $\Omega$ source)	$F_{TEST}$		2		GHz	$V_{CC} = 3.4\text{ V}$ .
DC_Out (no RF applied)	DC_Out		0.4		V	
DC_Out (-60 dBm RF Input Power)	DC_Out		0.5		V	
DC_Out (-40 dBm RF Input Power)	DC_Out		0.8		V	
DC_Out (-20 dBm RF Input Power)	DC_Out		1.4		V	
DC_Out (0 dBm RF Input Power)	DC_Out		2.0		V	
DC_Out (5 dBm RF Input Power)	DC_Out		2.1		V	
Detector Output Rise Time	$T_{RISE}$		460		ns	
Detector Output Fall Time	$T_{FALL}$		450		ns	
Supply Current	$I_{CC}$		18		mA	$V_{CC} = 3.4\text{ V}$ .
Maximum Die Temperature Package Heat Sink Temperature = 85 $^\circ\text{C}$ (Infrared Scan).	$T_{MAX}$		TBD		$^\circ\text{C}$	$V_{CC} = 3.4\text{ V}$ .

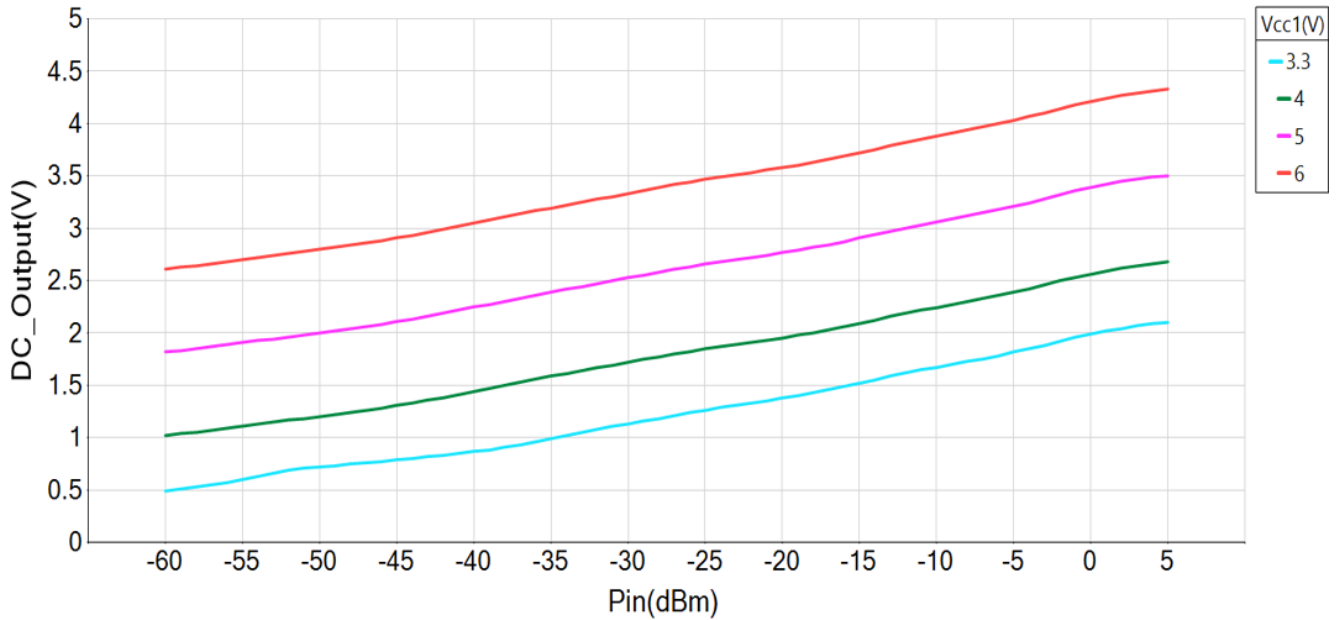
### Thermal Data

Thermal Resistance (Infrared Scan)	$\Theta_{JC}$		61		$^\circ\text{C}/\text{W}$	On Standard Evaluation Board (see note 2).
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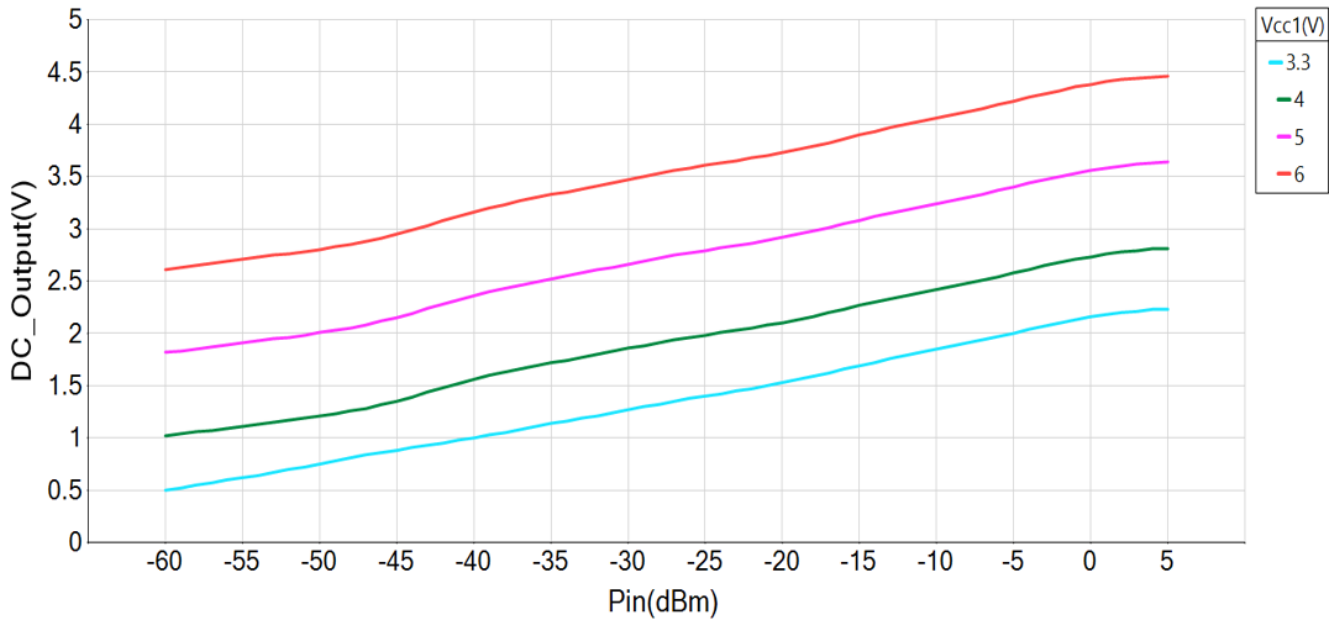
**Note 2:** MTTF >  $10^6$  hours for  $T_j \leq 170\text{ }^\circ\text{C}$

### GRF1202 Typical Operating Curves: Pin = -60 to +5 dBm

GRF1202 Vout vs Pin at Frequency = 700 MHz



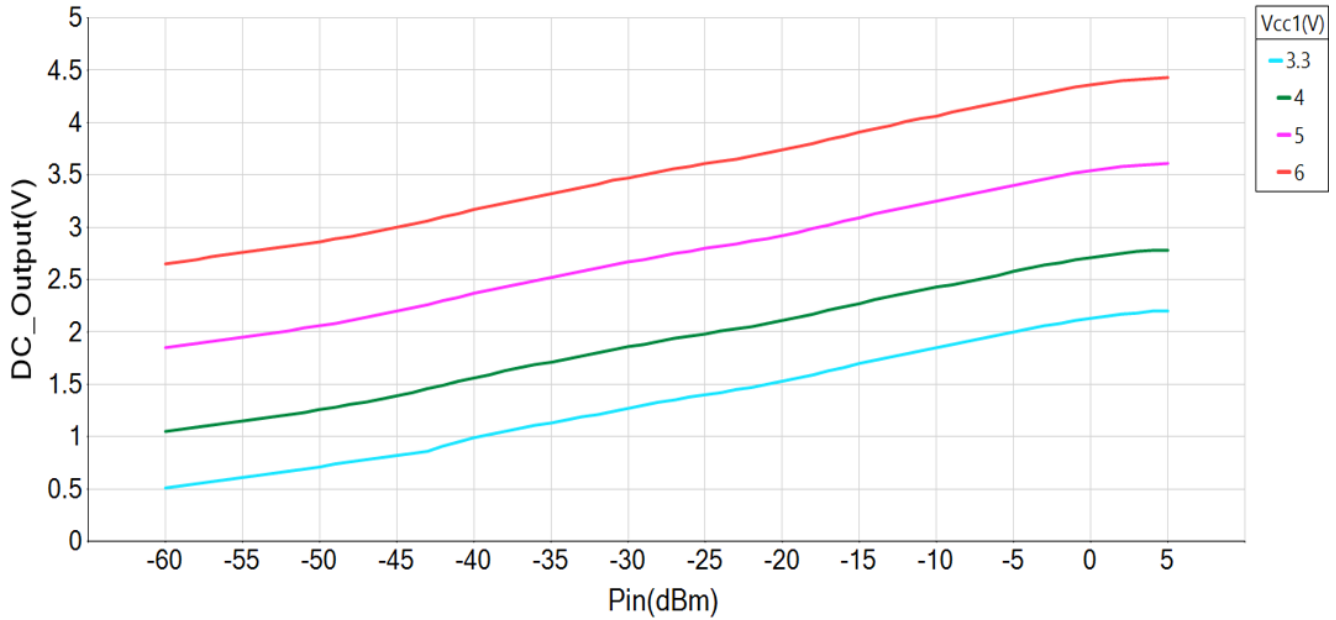
GRF1202 Vout vs Pin at Frequency = 1400 MHz



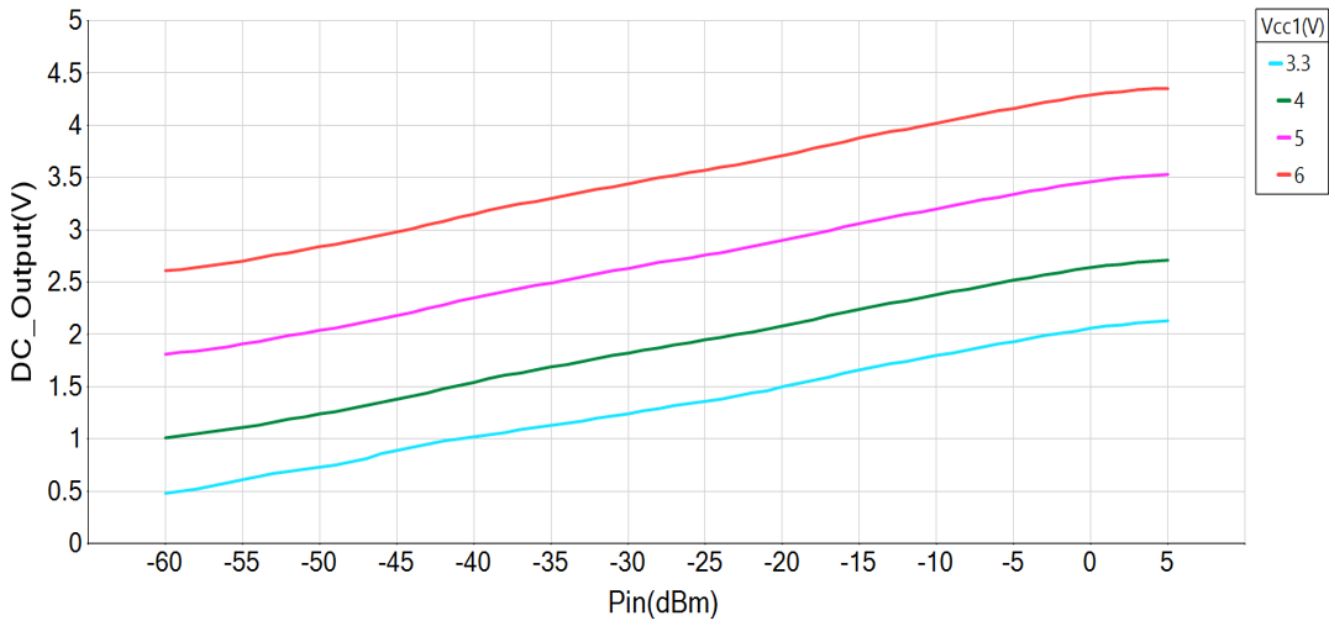


### GRF1202 Typical Operating Curves: Pin = -60 to +5 dBm

GRF1202 Vout vs Pin at Frequency = 2000 MHz

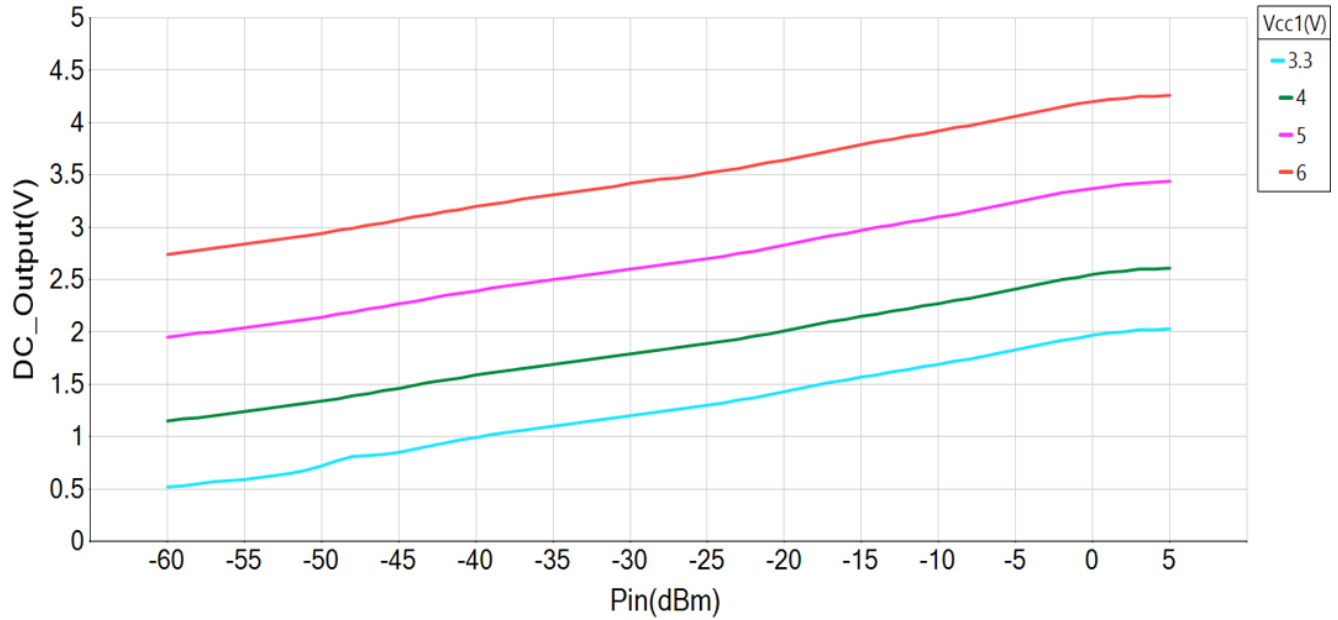


GRF1202 Vout vs Pin at Frequency = 3000 MHz

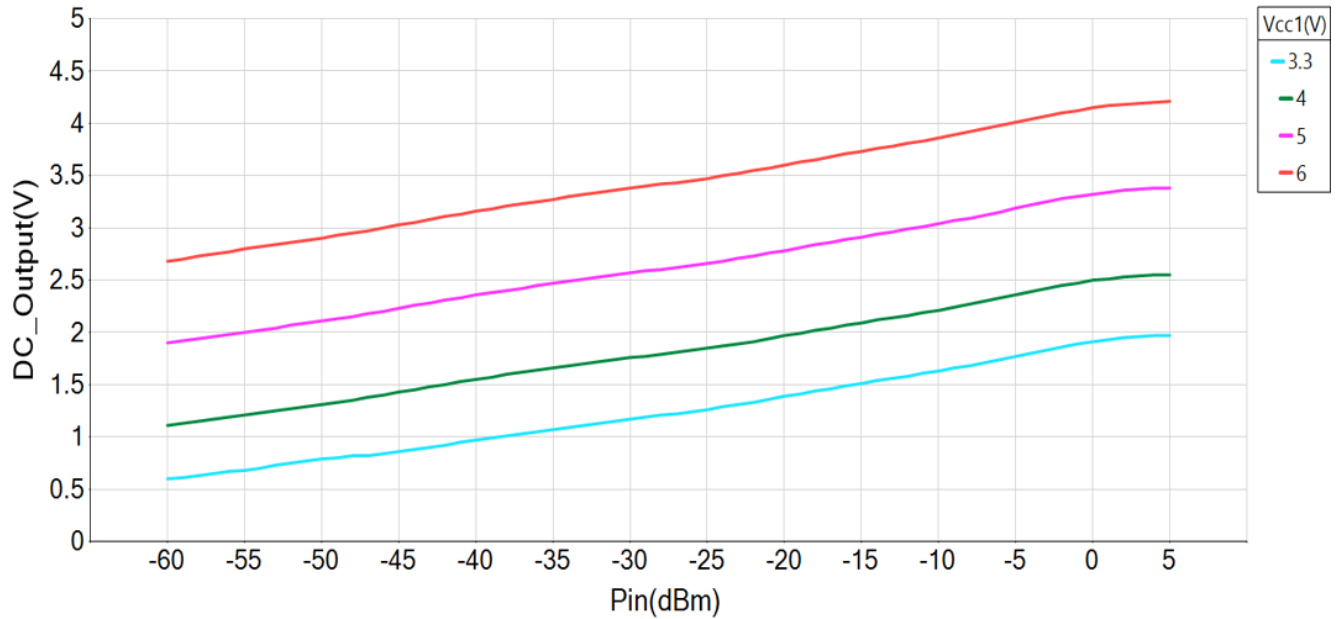


### GRF1202 Typical Operating Curves: Pin = -60 to +5 dBm

GRF1202 Vout vs Pin at Frequency = 4000 MHz

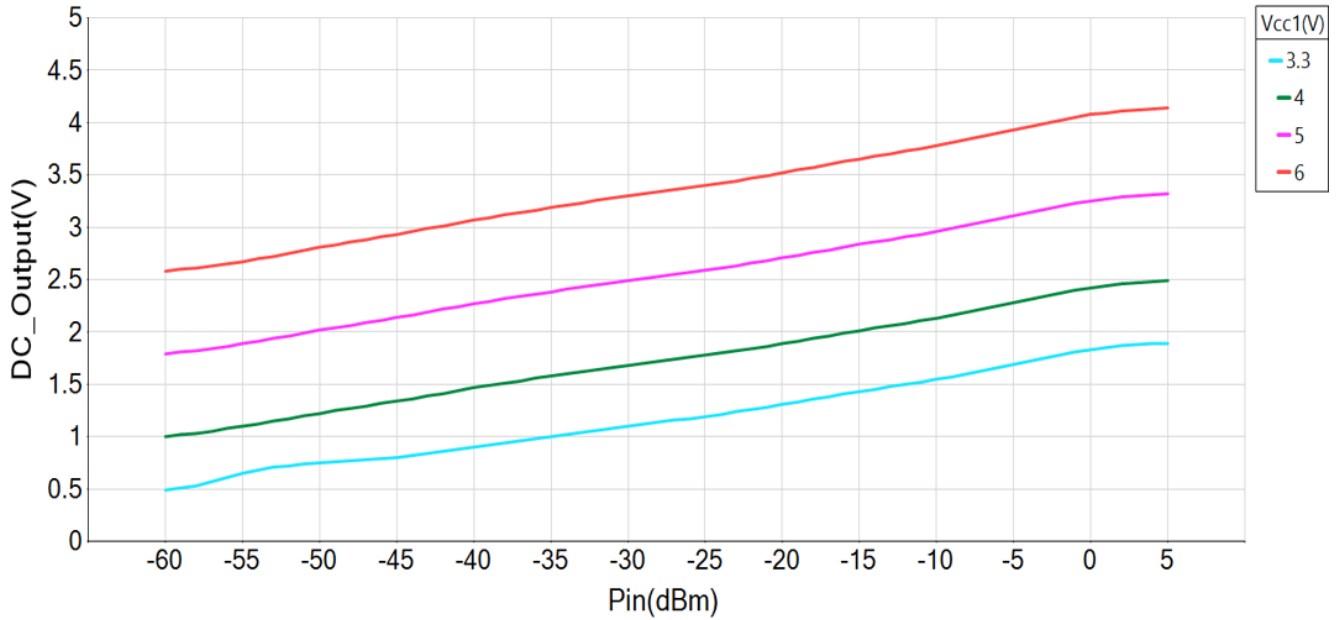


GRF1202 Vout vs Pin at Frequency = 4500 MHz

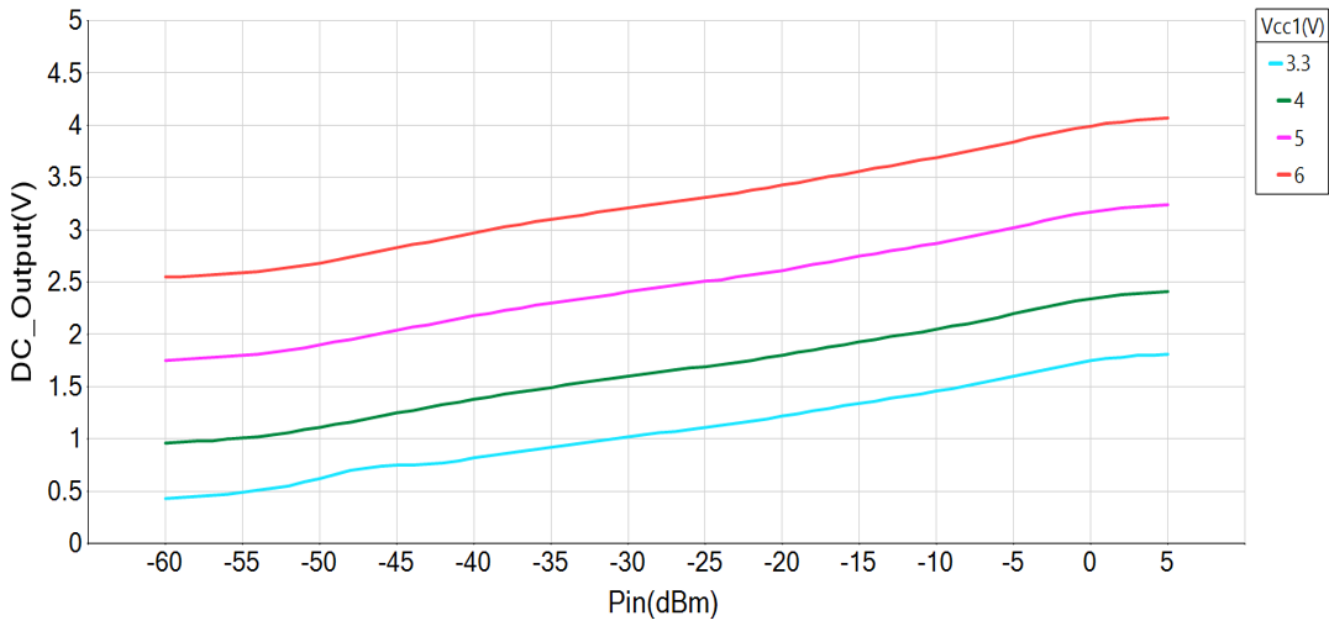


### GRF1202 Typical Operating Curves: Pin = -60 to +5 dBm

GRF1202 Vout vs Pin at Frequency = 5000 MHz

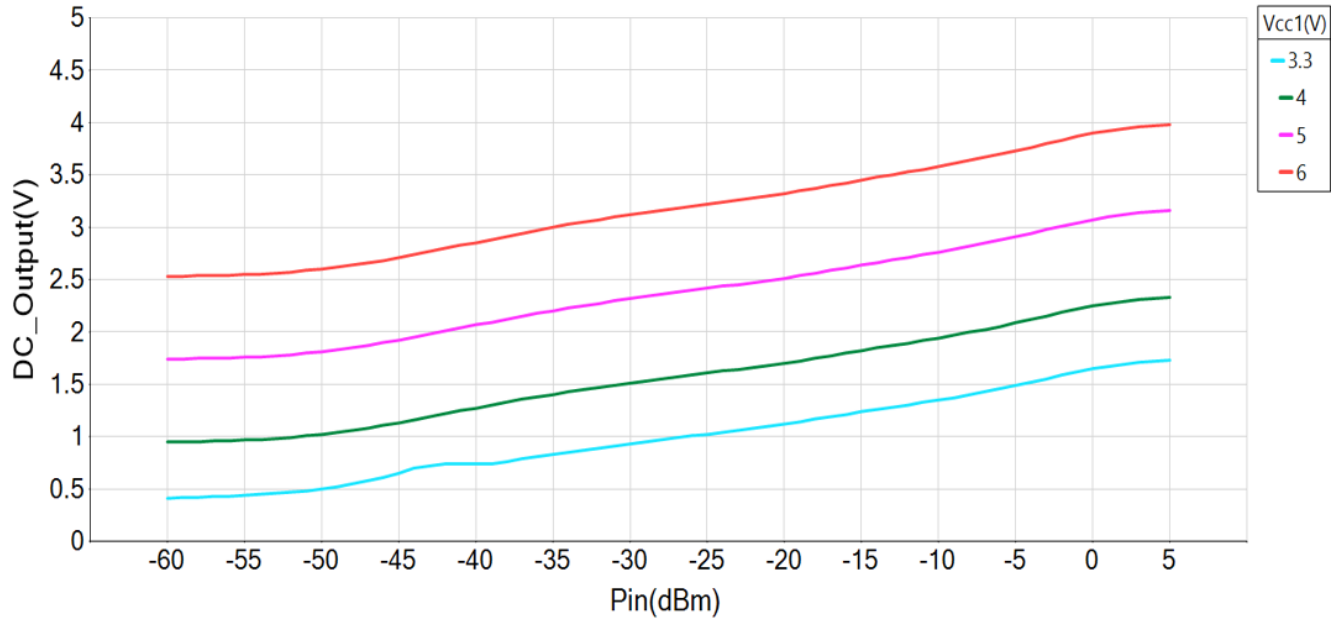


GRF1202 Vout vs Pin at Frequency = 5500 MHz



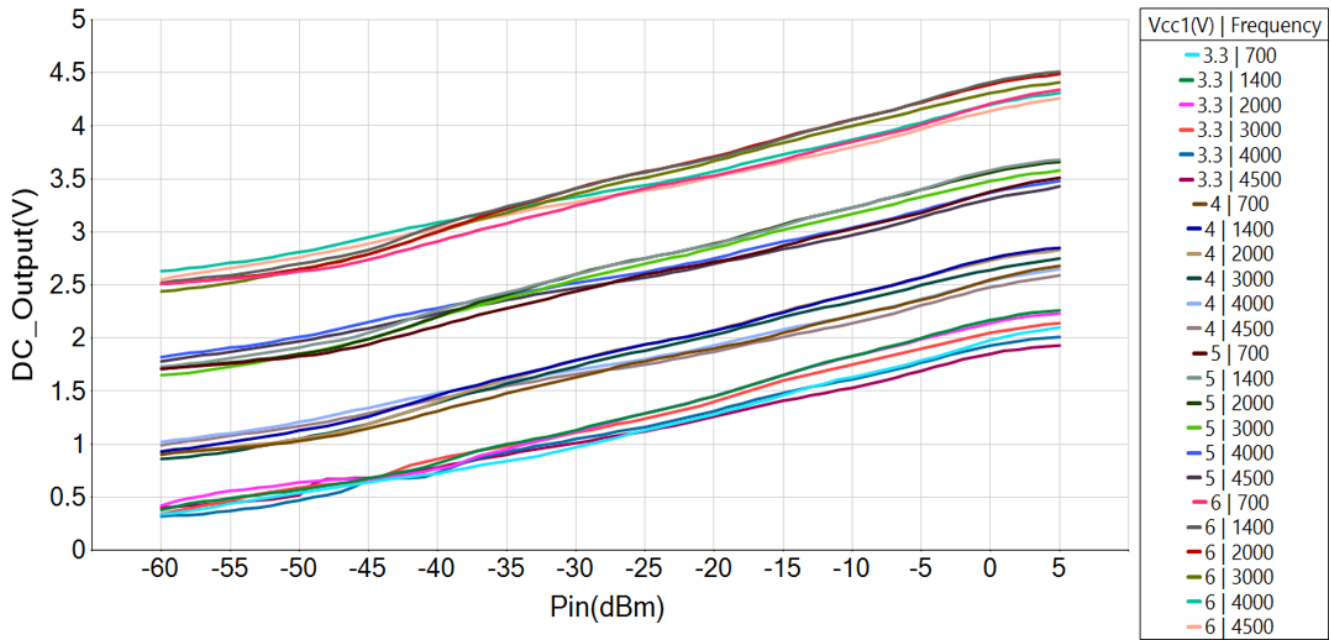
### GRF1202 Typical Operating Curves: Pin = -60 to +5 dBm

GRF1202 Vout vs Pin at Frequency = 6000 MHz

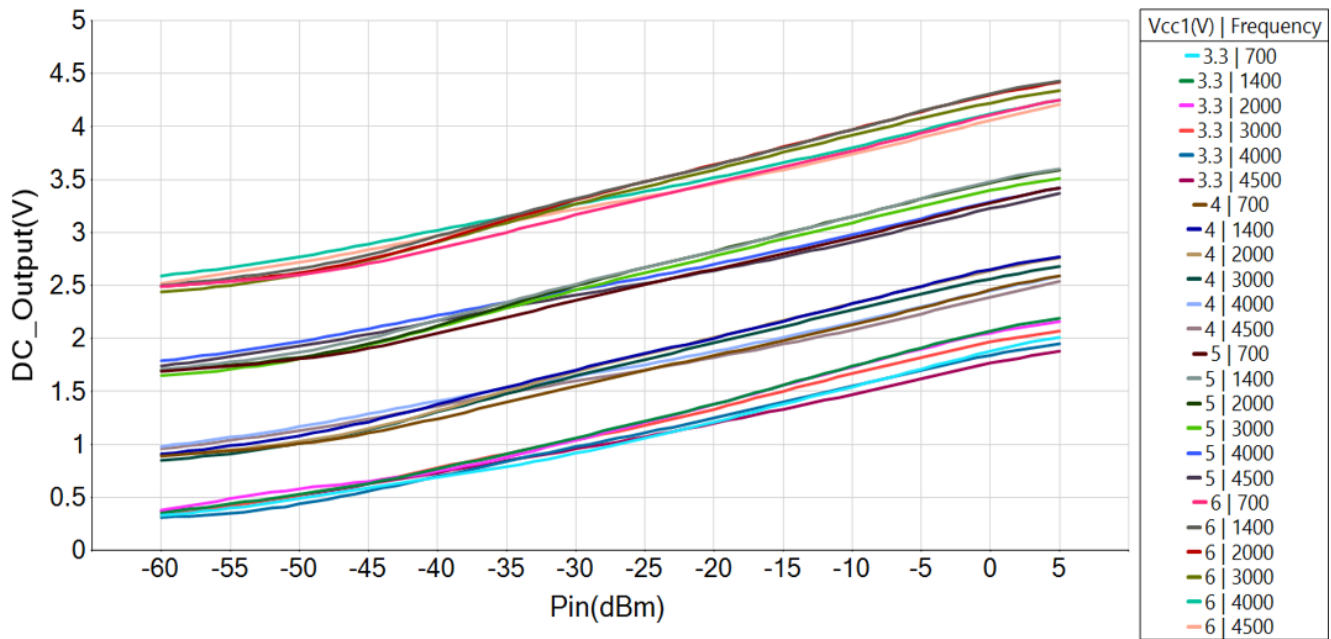


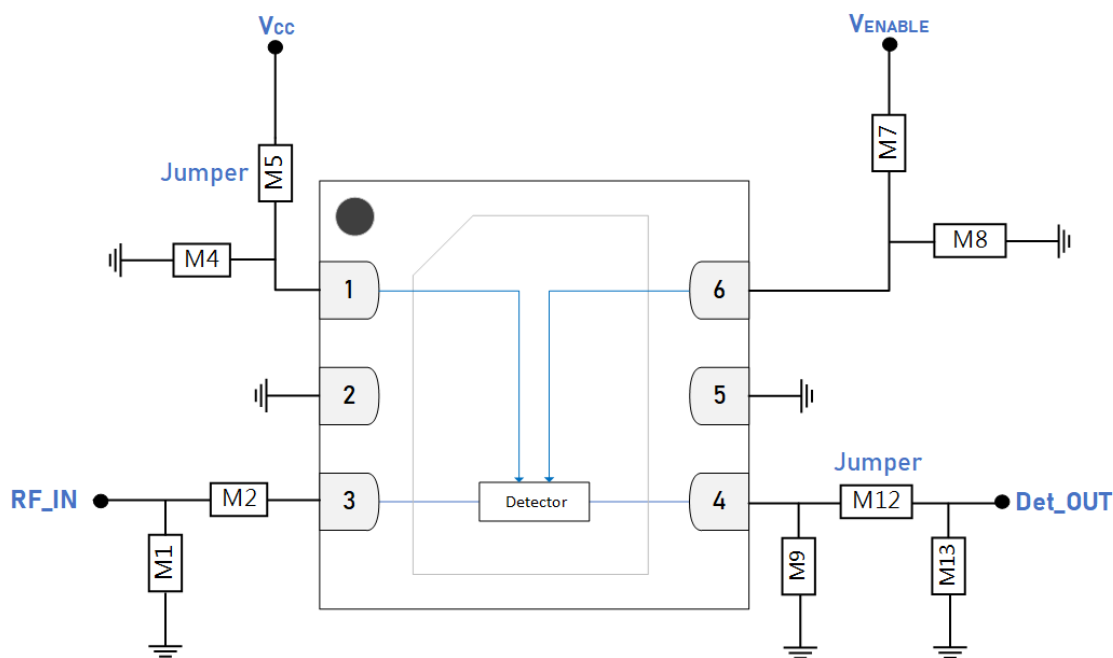
### GRF1202 Typical Operating Curves: Pin = -60 to +5 dBm

GRF1202 Vout vs Pin at Modulation = CW

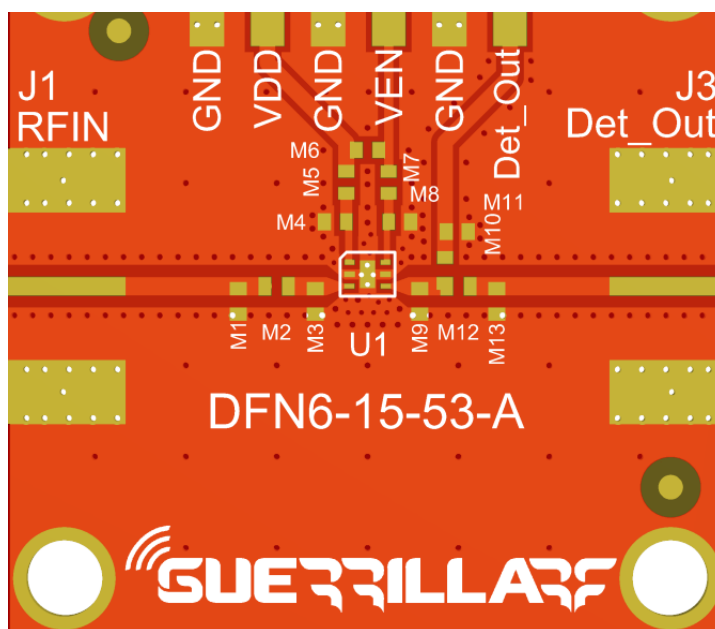


GRF1202 Vout vs Pin at Modulation = LTE\_10MHz\_50RB





GRF1202 Evaluation Board Schematic

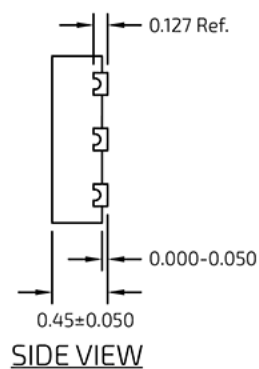
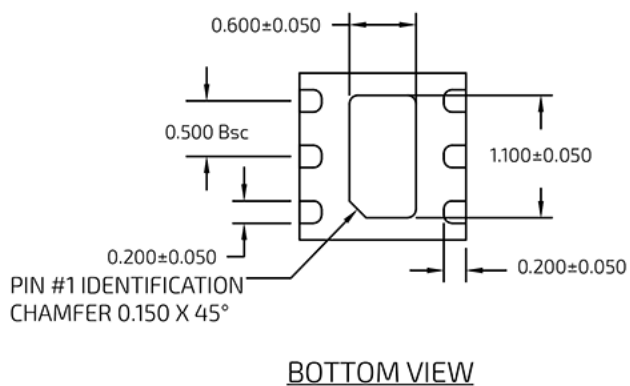
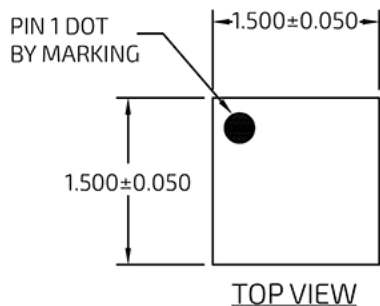


GRF1202 Evaluation Board Assembly Diagram



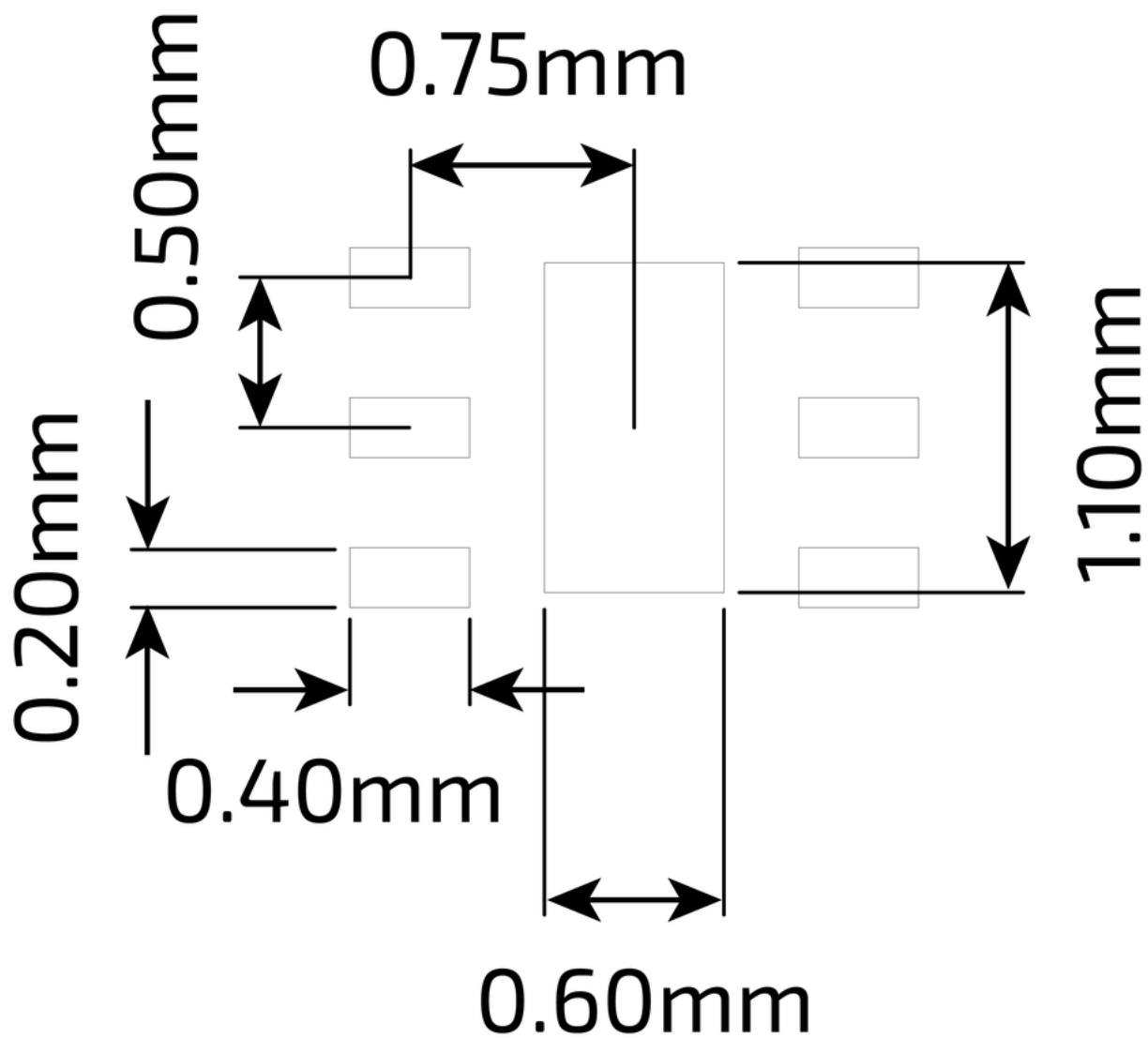
**GRF1202 Evaluation Board Assembly Diagram Reference: 5 V, 25 mA**

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Resistor	Various	5%	50 Ω	0402	ok
M2	Capacitor	Murata	GRM	100 pF	0402	ok
M3, M6, M10	DNP	--	--	--	--	--
M4	Capacitor	Murata	GRM	0.1 μF	0402	ok
M5	Resistor (jumper)	Various	5%	0 Ω	0402	ok
M8	Capacitor	Murata	GRM	10 pF	0402	ok
M7	Resistor	Various	5%	806 Ω	0402	ok
M9	Capacitor	Murata	GRM	100 pF	0402	ok
M12	Resistor (jumper)	Various	5%	0 Ω	0402	ok
M13	Resistor	Various	5%	10 kΩ	0402	ok
Evaluation Board	DFN6-15-53-A					



### DFN 6 1.5x1.5mm Package Dimensions





DFN 6 1.5x1.5mm Suggested PCB Footprint (Top View)

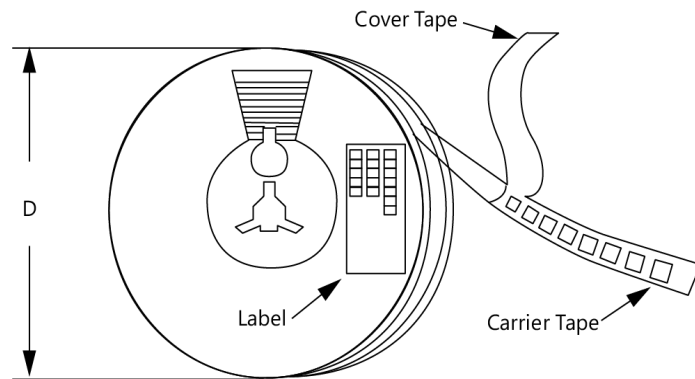
**Package Marking Diagram**



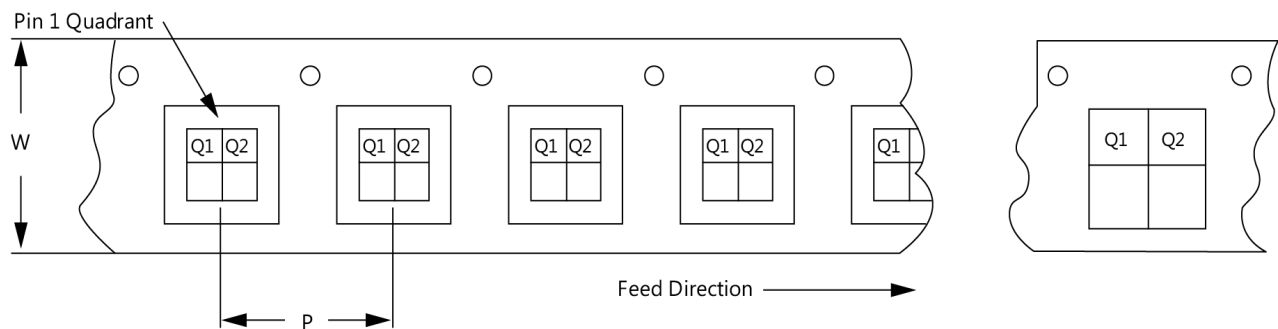
Line 1: "Y" = YEAR (single digit). "WW" = WORK WEEK the Device was assembled.  
 Line 2: "XXXX" = Device Part Number.

**Tape and Reel Information**

Guerrilla RF's tape and reel specification complies with Electronics Industries Association (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). Devices are loaded with pins down into the carrier pocket with protective cover tape and reeled onto a plastic reel. Each reel is packaged in a cardboard box. There are product labels on the reel, the protective ESD bag, and the outside surface of the box. For the latest reel specifications and package information (including units/reel), please visit [Package Manufacturing Information](#) | [Guerrilla RF](#) (guerrilla-rf.com).



Tape and Reel Packaging with Reel Diameter Noted (D)



Carrier Tape Width (W), Pitch (P), Feed Direction and Pin 1 Quadrant Information



**Revision History**

<b>Revision Date</b>	<b>Description of Change</b>
July 31, 2023	Advance Data Sheet.
August 30, 2023	Preliminary Data Sheet.
October 23, 2023	Updated EVB schematic & BOM (removed M7, changed M8 to 10 pF, changed M9 to 806 Ω). Added "RoHS Compliant" to Features list on page-1.
December 9, 2023	Changed lower end of Frequency Range from 100 MHz to 400 MHz.
December 18, 2023	Changed upper end of Frequency Range from +4 GHz to 6 GHz and added 0.7 to 6 GHz Plots.
September 18, 2024	Release Ø Data Sheet. Updated specifications, test schematic and BOM. Added new evaluation board.
October 4, 2024	Raised upper frequency range from 6 GHz to 8 GHz.



Data Sheet Classifications

Data Sheet Status	Notes
Advance	S-parameter and NF data based on EM simulations for the fully packaged device using foundry-supplied transistor S-parameters. Linearity estimates based on device size, bias condition and experience with related devices.
Preliminary	All data based on evaluation board measurements taken within the Guerrilla RF Applications Lab. Any MIN/MAX limits represented within the data sheet are based solely on <i>estimated</i> part-to-part variations and process spreads. All parametric values are subject to change pending the collection of additional data.
Release Ø	All data based on measurements taken with <i>production-released</i> material. TYP values are based on a combination of ATE and bench-level measurements, with MIN/MAX limits defined using <i>modelled estimates</i> that account for part-to-part variations and expected process spreads. Although unlikely, future refinements to the TYP/MIN/MAX values may be in order as multiple lots are processed through the factory.
Release A-Z	All data based on measurements taken with production-released material <i>derived from multiple lots which have been fabricated over an extended period of time</i> . MIN/MAX limits may be refined over previous releases as more statistically significant data is collected to account for process spreads.

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