DATA SHEET

GRF1202
LOG AVERAGE POWER DETECTOR 0.4 to 8 GHz

RELEASE Ø DATA SHEET

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

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DESCRIPTION

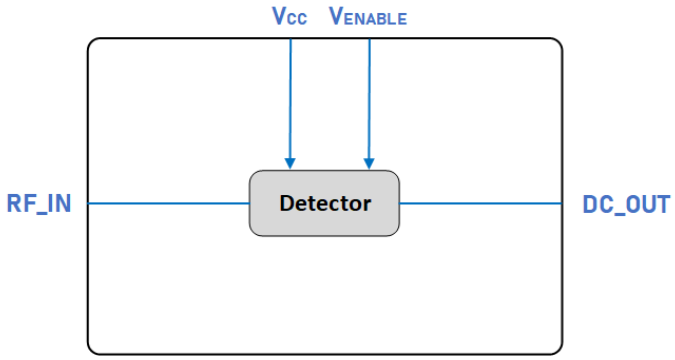
The GRF1202 is a logarithmic, average power detector IC designed for cost-sensitive applications in the 0.4 to 8 GHz frequency range.

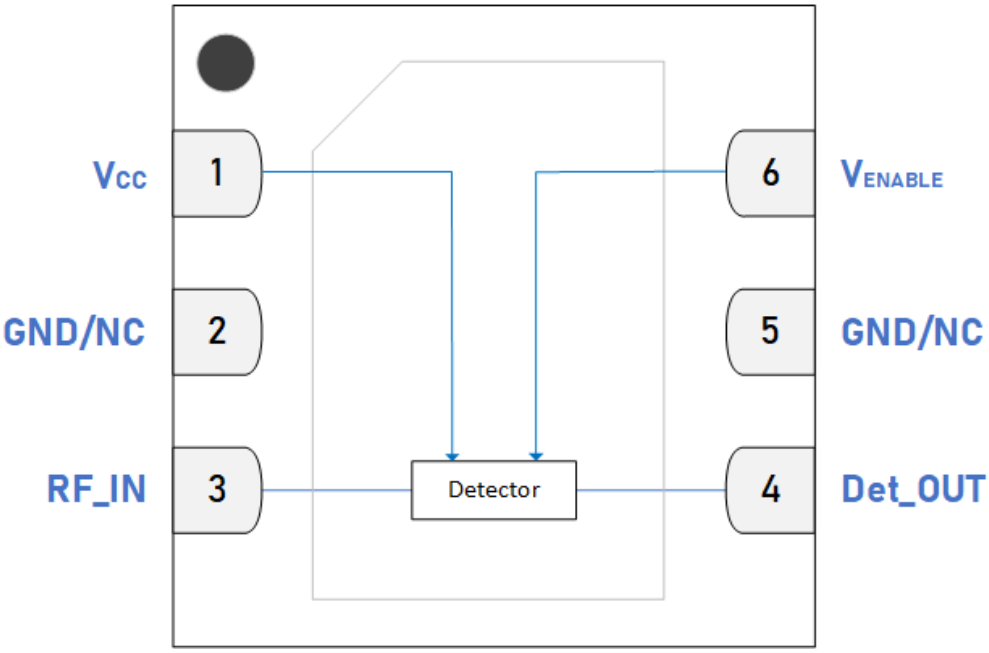
The device can be operated from a supply voltage range of 3.3 to 6.0 volts and housed in a 1.5 x 1.5 x 0.5 mm 6-pin plastic DFN package.

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_{CC}	Supply Voltage	Connects to V_{CC} 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_{ENABLE}	Enable Voltage Input	Can be connected to V_{CC} 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	$P_{IN\ MAX}$		20	dBm
Operating Temperature (Package Base)	$T_{PKG\ BASE}$	-40	105	°C
Maximum Channel Temperature (MTTF >10^6 Hours)	T_{MAX}		170	°C

Electrostatic Discharge

Human Body Model	HBM	1000		V

Storage

Storage Temperature	T_{STG}	-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		Ω	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 V, I_{CC} = 18 mA, 50 Ω system impedance, F_{TEST} = 2.0 GHz, $T_{PKG\ BASE}$ = 25 °C. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency (50 Ω source)	F_{TEST}		2		GHz	V_{CC} = 5 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 V.
Maximum Die Temperature Package Heat Sink Temperature = 85 °C (Infrared Scan).	T_{MAX}		92		°C	V_{CC} = 5 V.

Nominal Operating Parameters - General

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

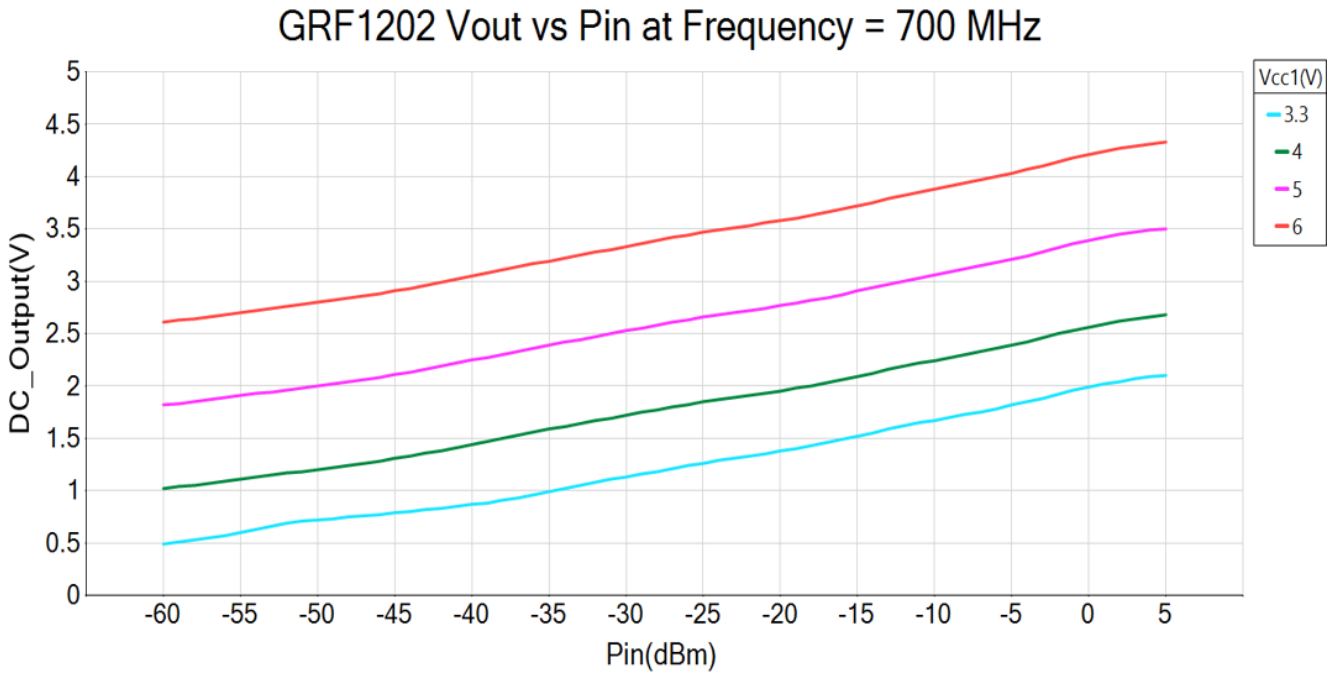
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency (50 Ω source)	F_{TEST}		2		GHz	V_{CC} = 3.4 V.
DC_Out (no RF applied)	DC_Out		0.4		V	
DC_Out (-60 dBm RF Input Power)	DC_Out		0.5		V	
DC_Out (-40 dBm RF Input Power)	DC_Out		0.8		V	
DC_Out (-20 dBm RF Input Power)	DC_Out		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 V.
Maximum Die Temperature Package Heat Sink Temperature = 85 °C (Infrared Scan).	T_{MAX}		TBD		°C	V_{CC} = 3.4 V.

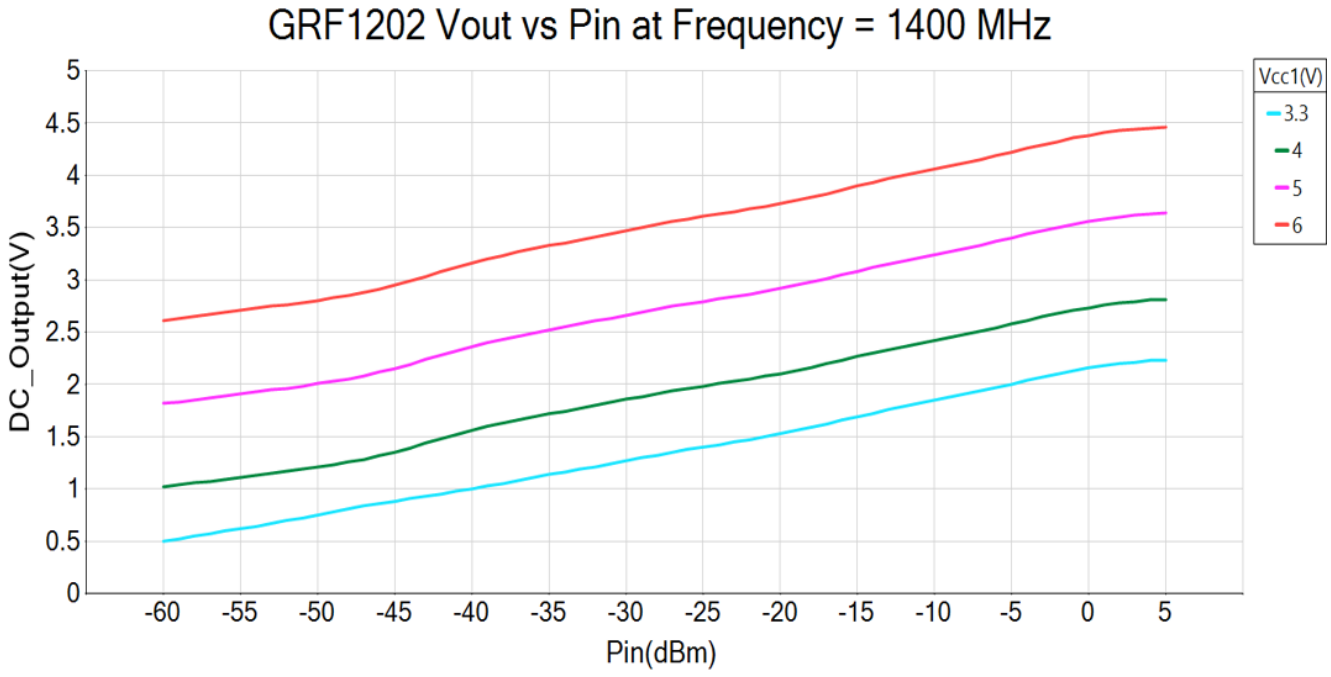
Thermal Data

Thermal Resistance (Infrared Scan)	Θ_{JC}		61		°C/W	On Standard Evaluation Board (see note 2).

Note 2: MTTF > 10^6 hours for $T_j \leq 170$ °C

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





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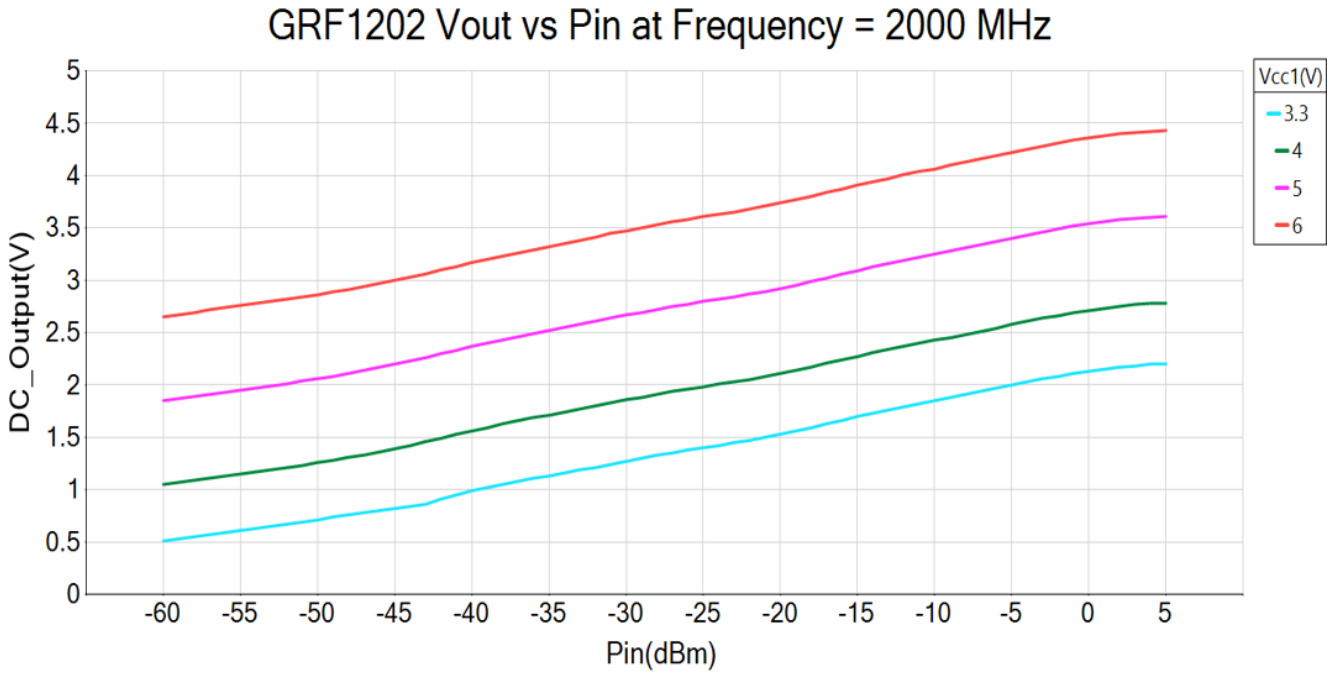

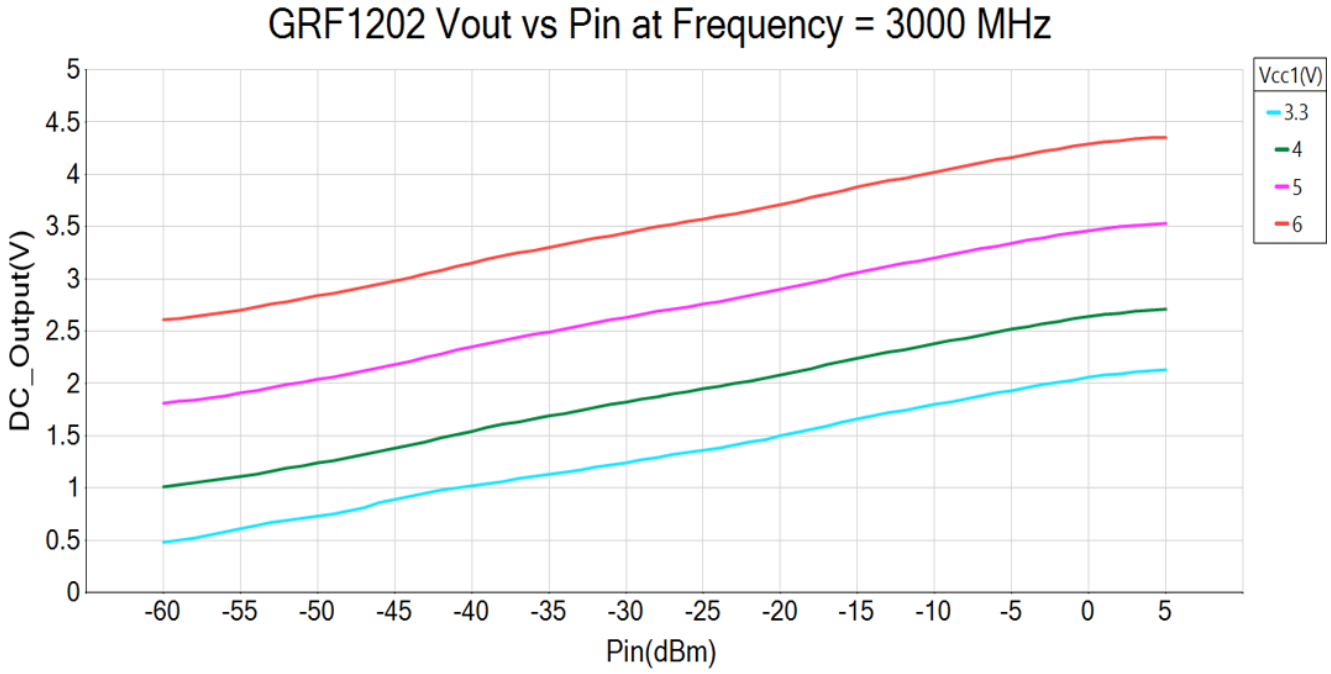

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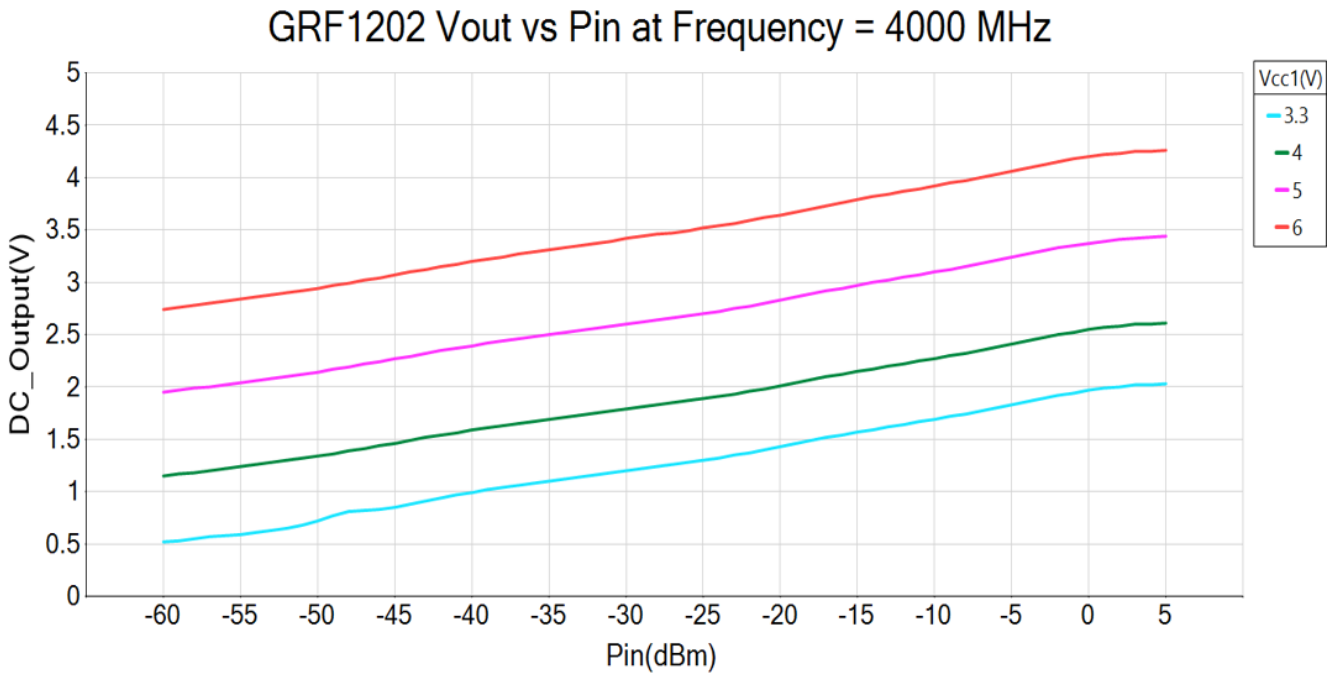

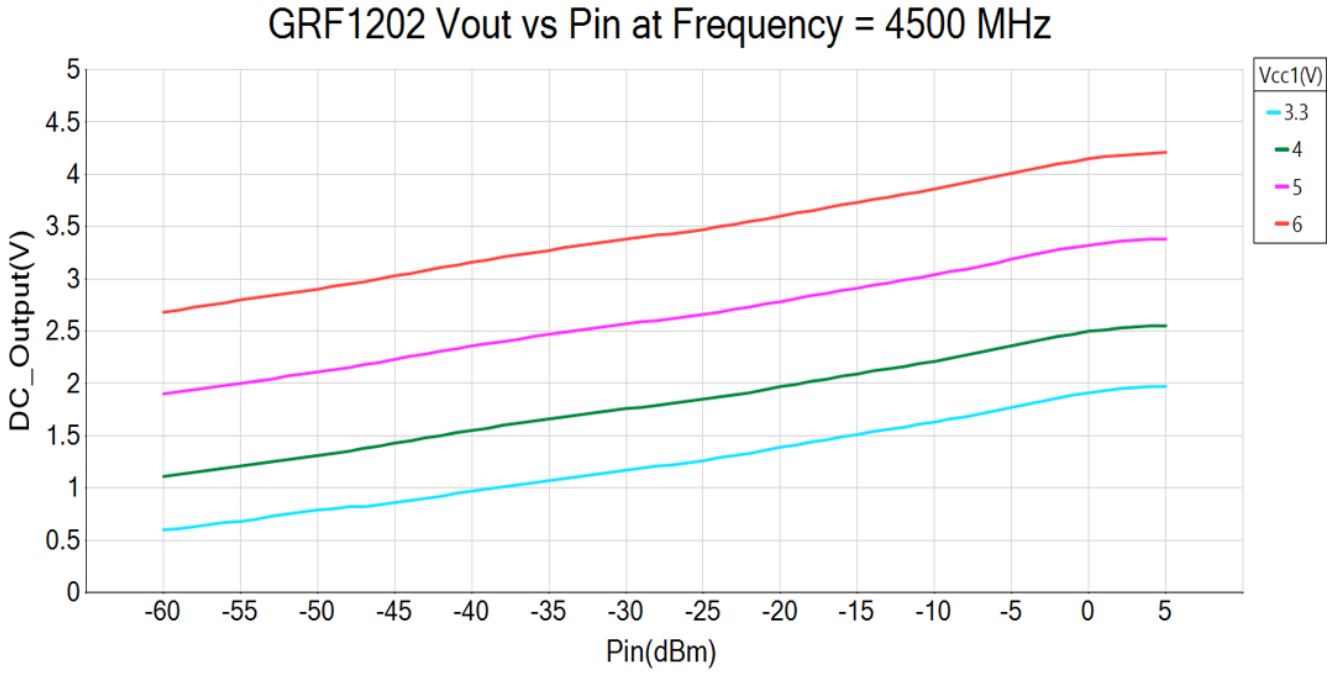

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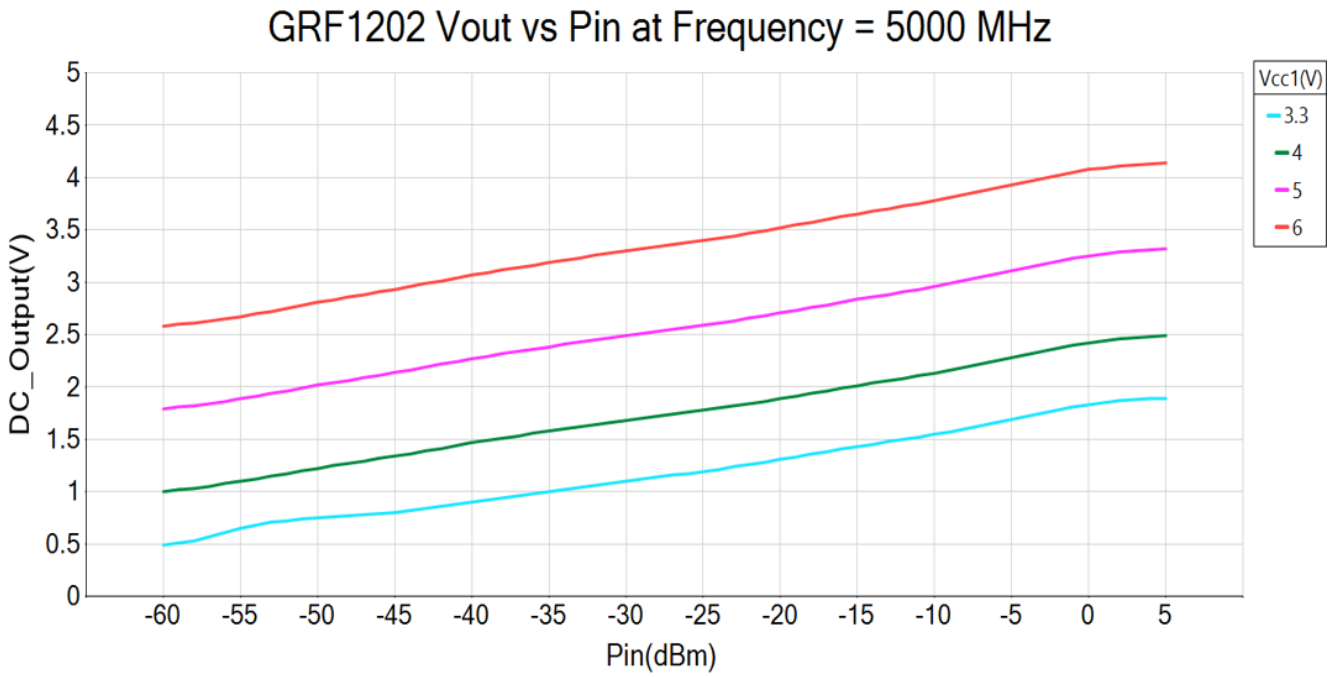

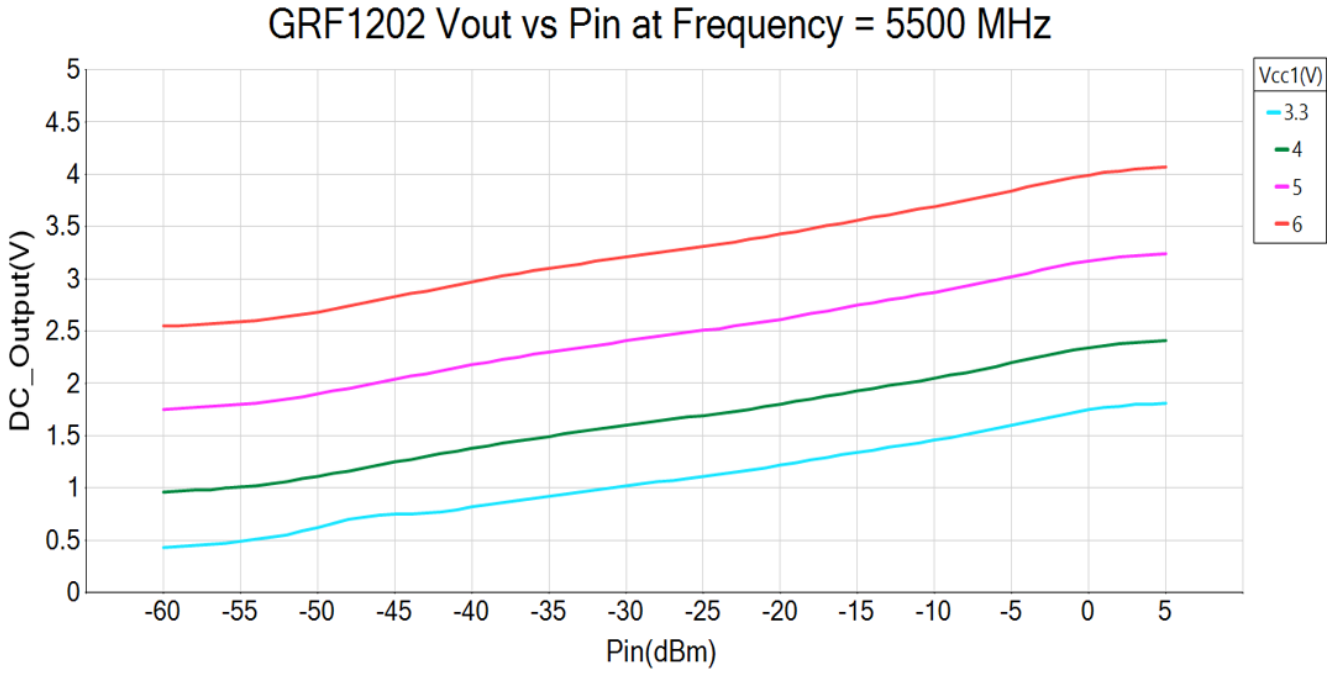

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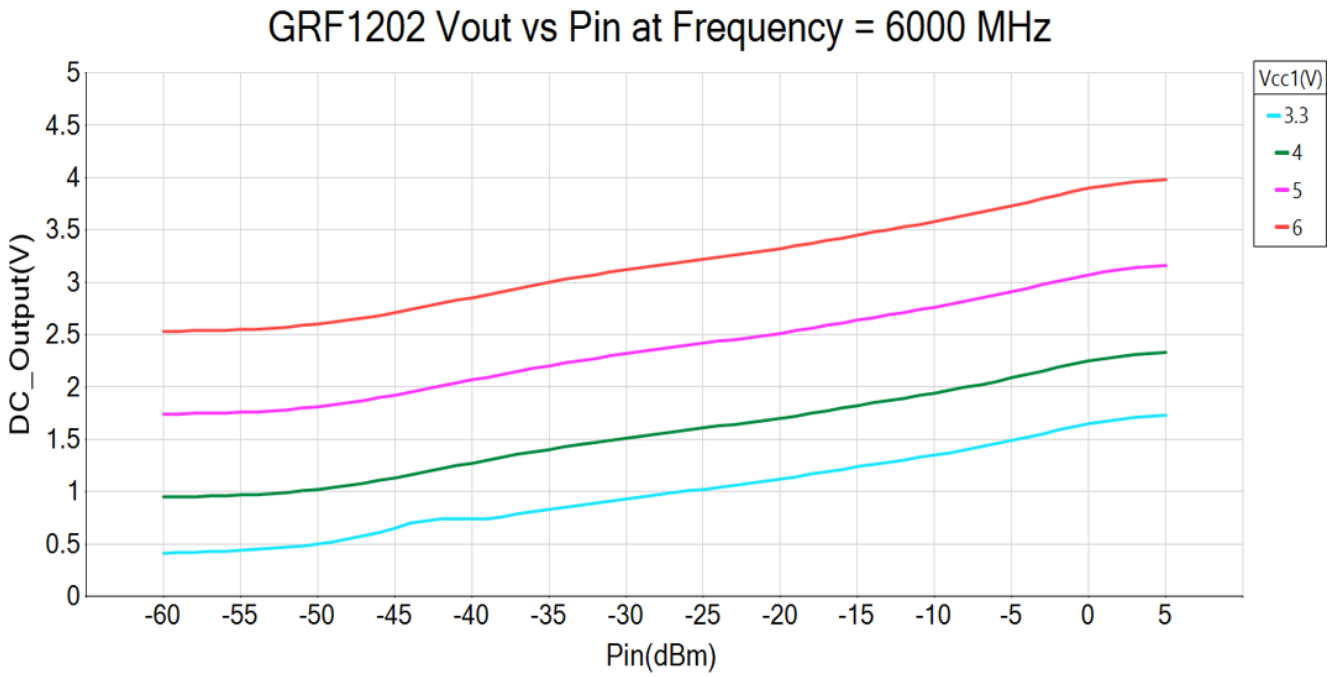

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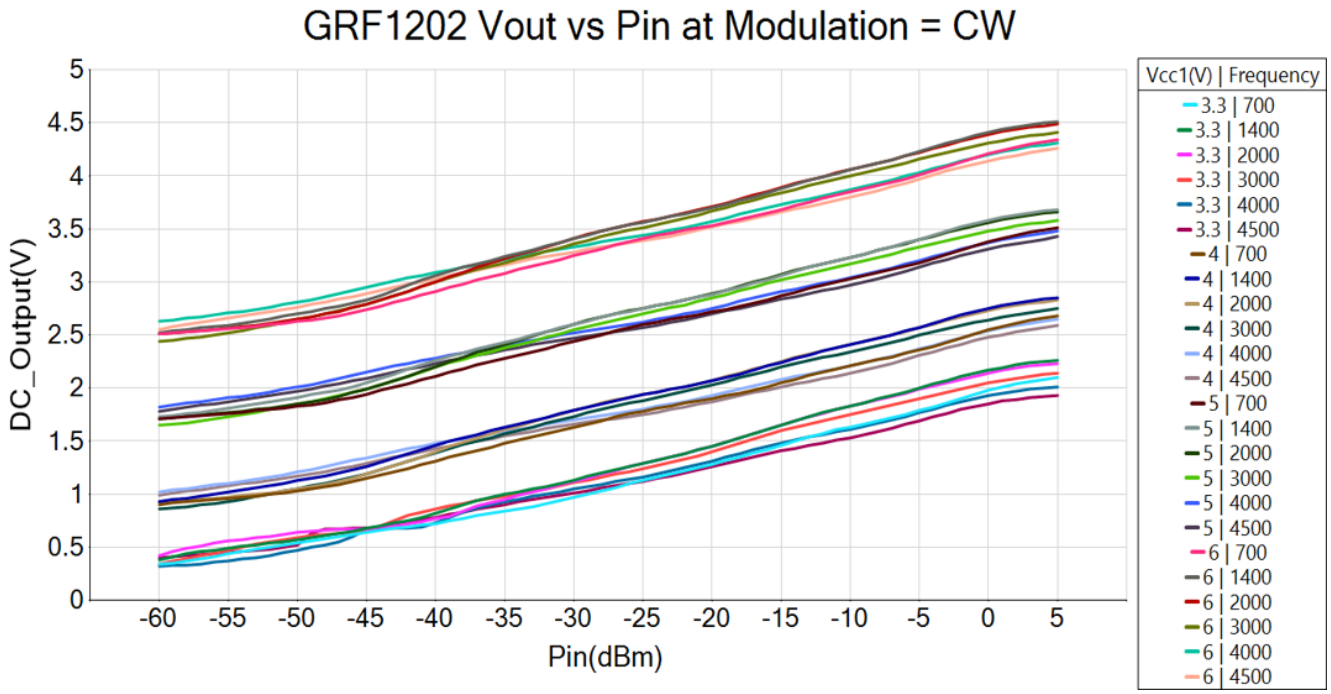
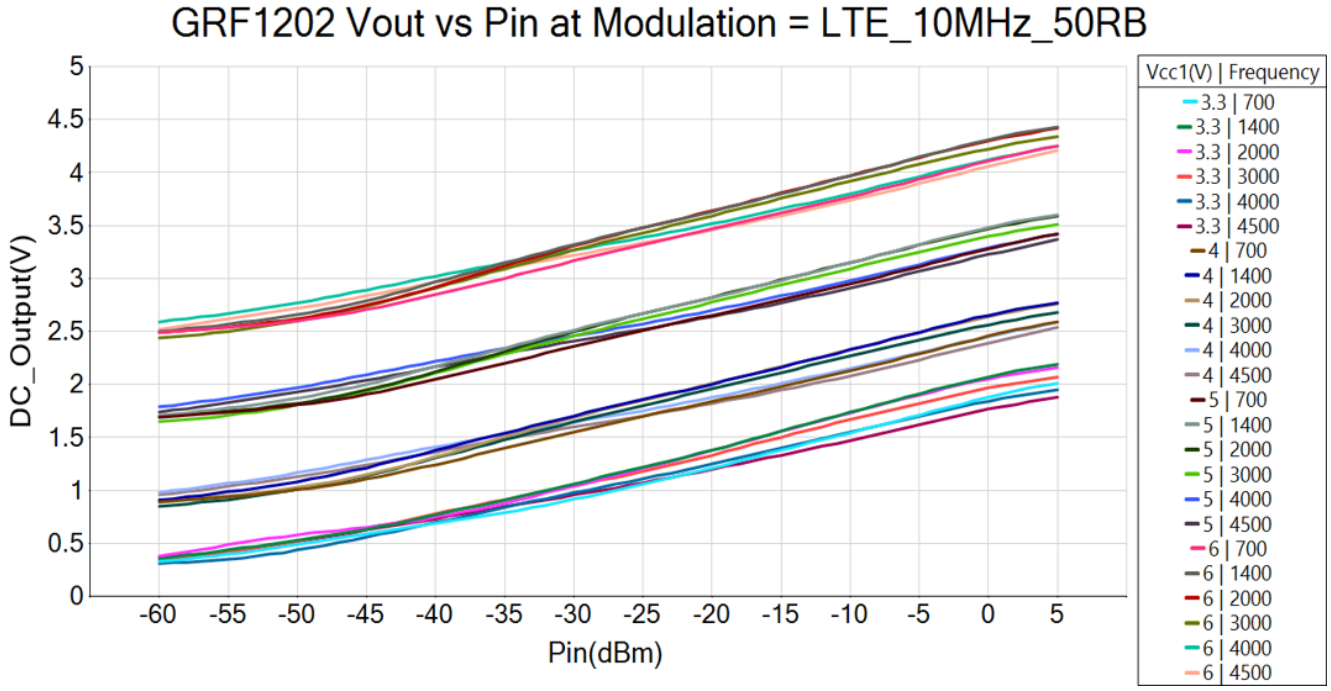
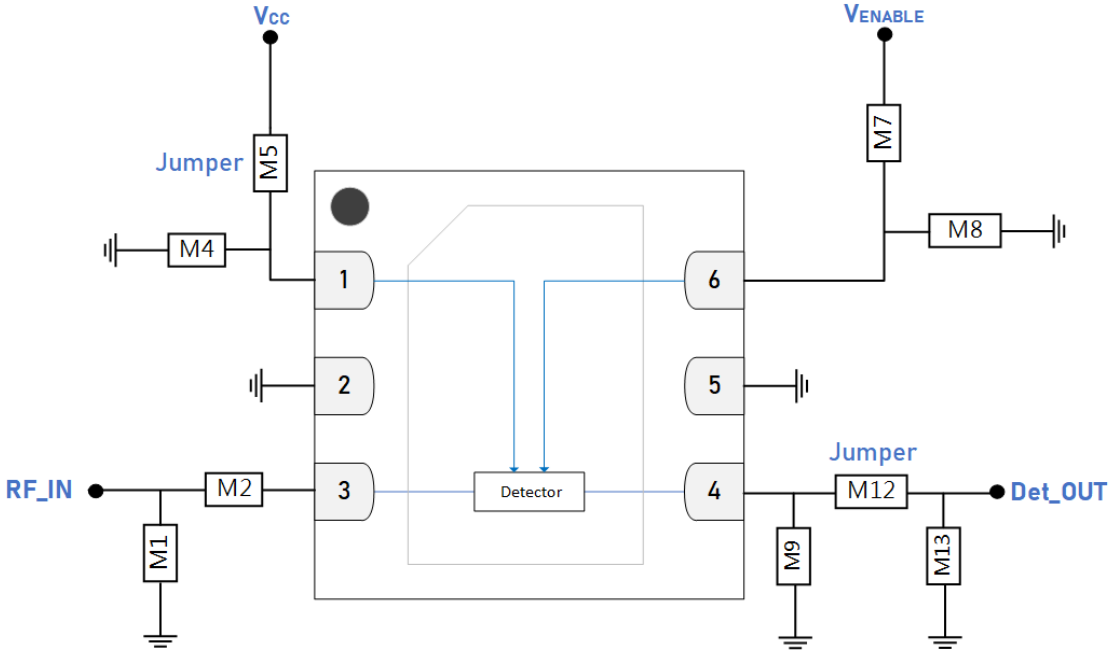
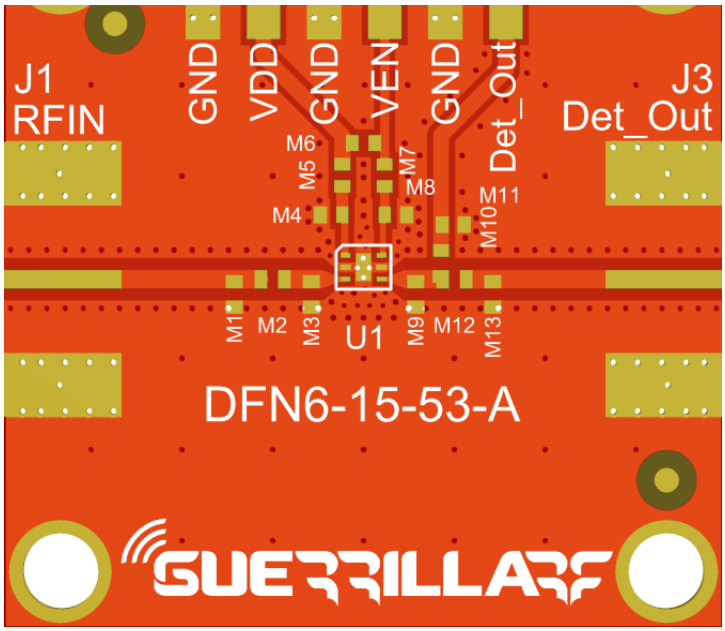






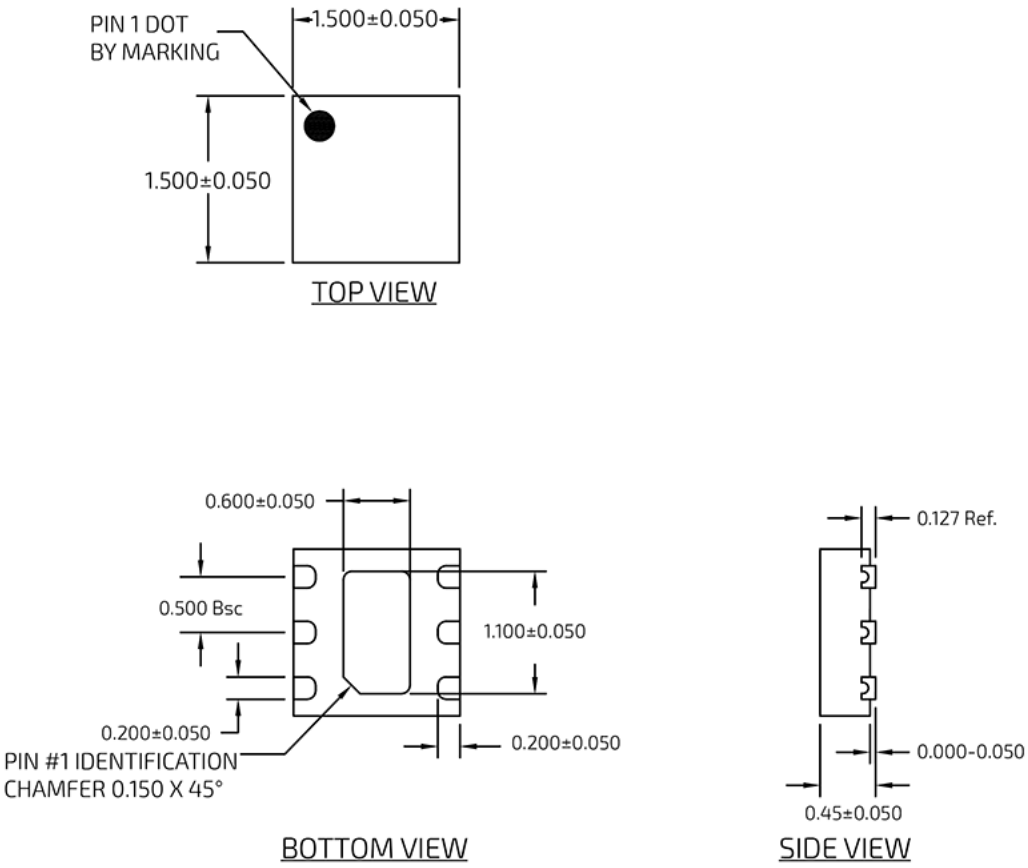
GRF1202 Evaluation Board Schematic



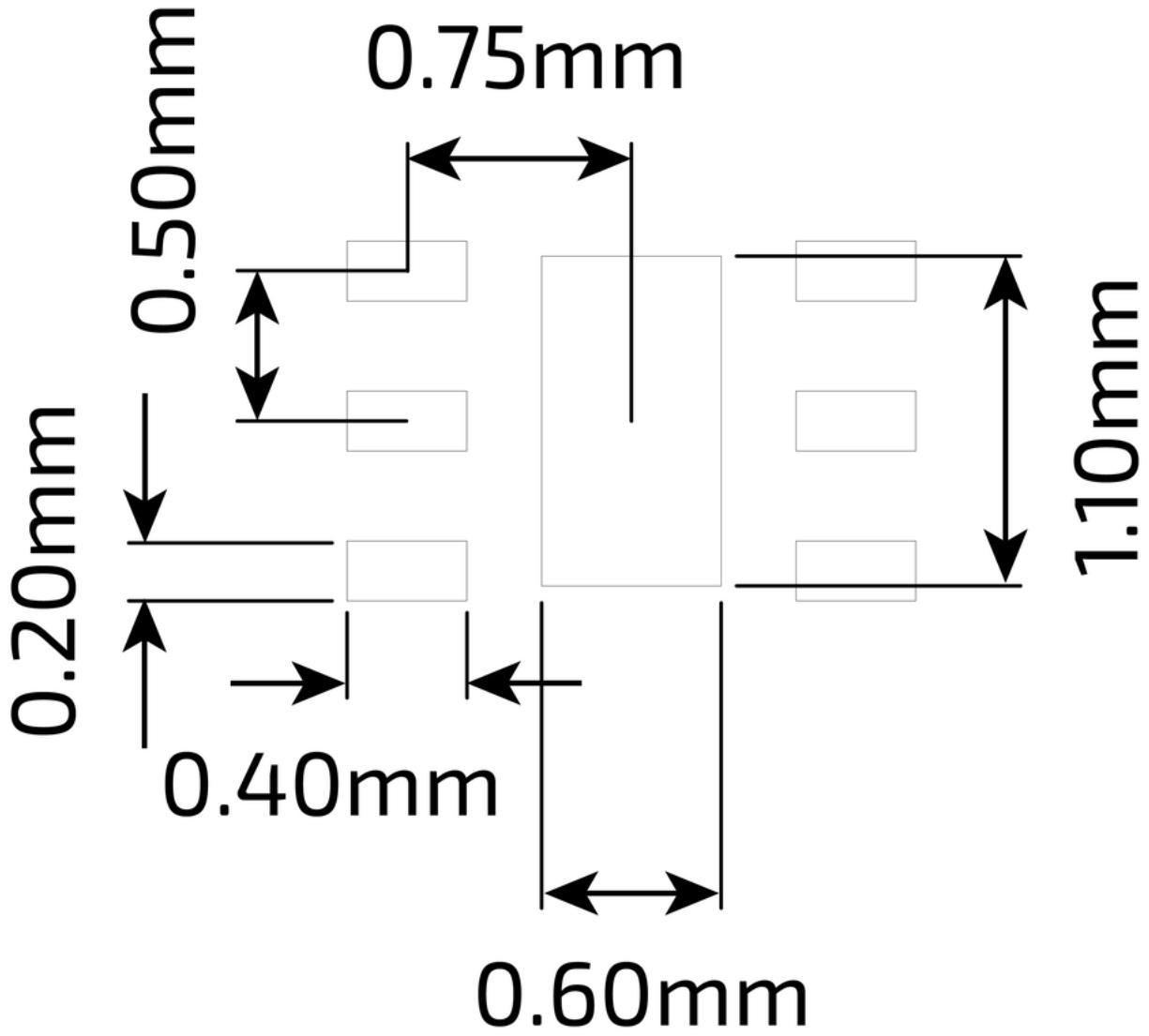
GRF1202 Evaluation Board Assembly Diagram

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



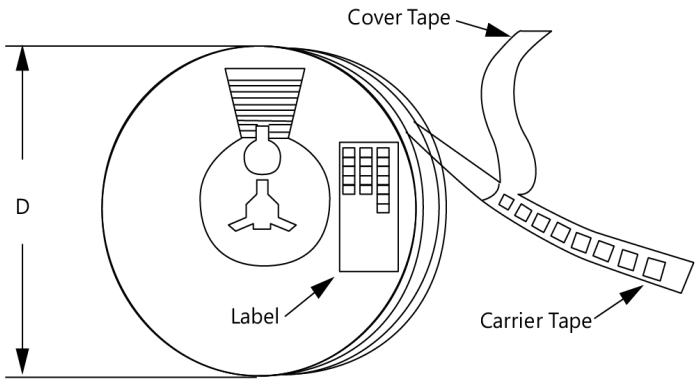
DFN 6 1.5x1.5mm Suggested PCB Footprint (Top View)

Package Marking Diagram

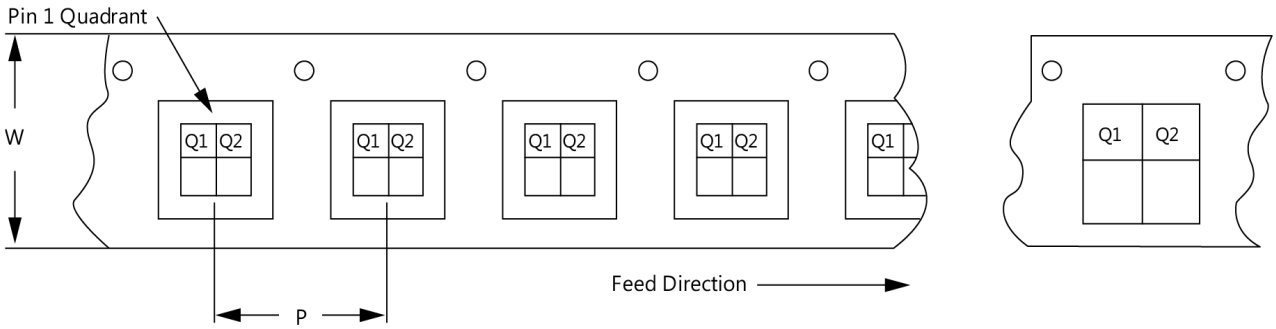
Line 1: "Y" = YEAR (single digit). "WW" = WORK WEEK the Device was assembled.
Line 2: "XXXX" = Device Part Number.

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

Revision Date	Description of Change
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 *estimated* 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 *production-released* material. TYP values are based on a combination of ATE and bench-level measurements, with MIN/MAX limits defined using *modelled estimates* 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 *derived from multiple lots which have been fabricated over an extended period of time*. 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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