



GRF2374

LOW CURRENT LNA WITH BYPASS 0.1 to 3.8 GHz

RELEASE Ø DATA SHEET

FEATURES

- Flexible Bias Voltage: 2.7 to 5.5 Volts
- Process: InGaP HBT
- Simple Matching to 50 Ohms
- Compact 1.5 x 1.5 mm DFN-6 Package

Reference: 3.3 V / 15 mA / 2.4 GHz

- Gain: 14.3 dB
- OP1dB: 11 dBm
- OIP3: 23.5 dBm
- Evaluation Board Noise Figure: 1.4 dB
- Bypass Mode Gain: -1.7 dB
- Bypass Mode OP1dB: 6.5 dBm
- Bypass Mode OIP3: 19.5 dBm

APPLICATIONS

- WiFi Access Points
- Mobile WiFi Devices
- Cellular Boosters
- Drones
- Set Top Boxes
- VHF/UHF/900/2400 ISM

ORDERING INFORMATION Buy it Now

DESCRIPTION

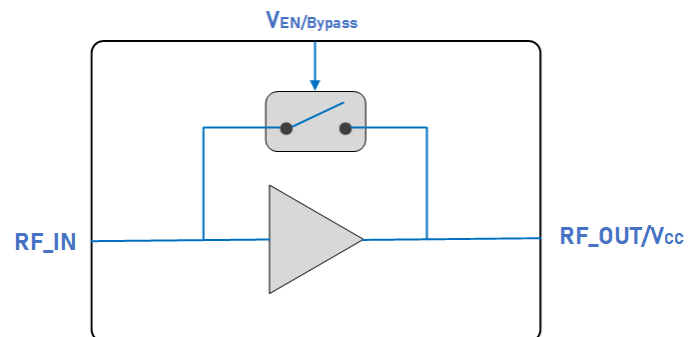
The GRF2374 is a low noise amplifier (LNA) with bypass designed for high-performance WLAN/ISM and other applications up to 3.8 GHz. The device is ideal for low power, cost sensitive bypass amplifier applications.

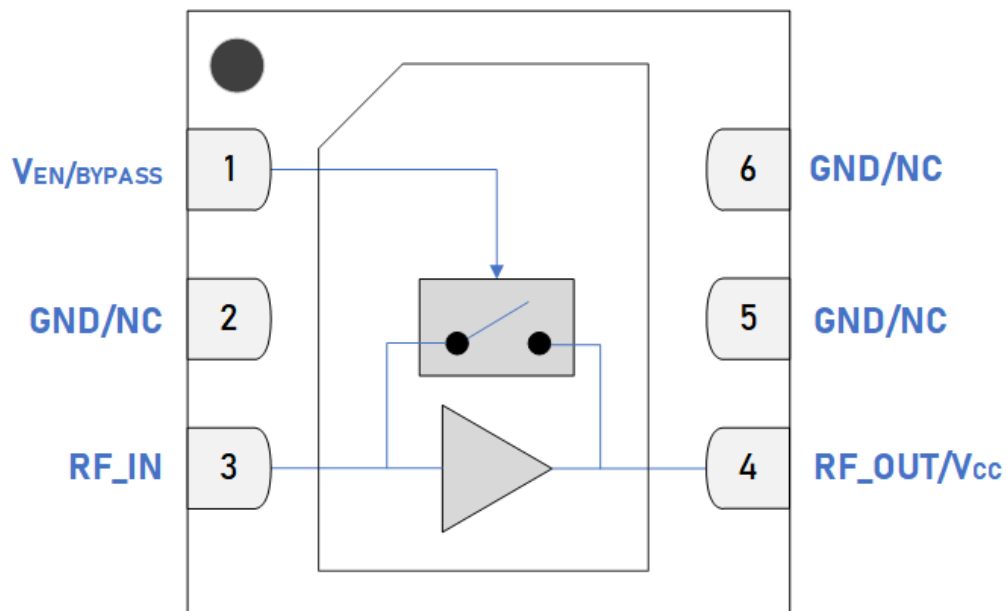
The LNA is operated from a single positive supply of 2.7 to 5.5 V with typical bias condition of 3.3 volts and 15 mA.

Please consult with the GRF applications engineering team for custom tuning/evaluation board data and device S-parameters.

Additional tunes can be found on the GRF2374 "Custom Tunes" product page: [GRF2374 Custom Tunes](#)

BLOCK DIAGRAM





Pin Out (Top View)

Pin Assignments

Pin	Name	Description	Note
1	V _{ENABLE} /BYPASS	Enable/Bypass Control	V _{ENABLE} and series resistor sets I _{CCQ} . V _{ENABLE} < 0.2 volts disables device. On-die pull-down resistor will turn the device off if this node is allowed to float.
2, 5, 6	GND/NC	Ground or No Connect	No internal connection to die. These pins can be left unconnected or connected to ground (highly recommended). Use a via as close to the pin as possible if grounded.
3	RF_IN	RF Input	An external DC-blocking capacitor must be used.
4	RF_OUT/V _{CC}	RF Output	Requires external bias inductor followed by DC block.
PKG BASE	GND	Ground	Provides DC and RF ground for device, 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.

Control Logic Truth Table

Mode	Description	V _{EN} /BYPASS
High Gain	High Gain	High
Bypass	Linear Bypass Mode	Low
Logic Level "0"	Logic Low	0 to 0.3 V
Logic Level "1"	Logic High	1.5 V to V _{CC}

Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{CC}	0	5.5	V
RF Input Power: Load VSWR < 2:1, $V_{CC} = 5\text{ V}$	$P_{IN\text{ MAX}}$		20	dBm
Operating Temperature (Package Base)	$T_{PKG\text{ BASE}}$	-40	85	°C
Maximum Channel Temperature (MTTF > 10 ⁶ Hours)	T_{MAX}		150	°C
Maximum Dissipated Power	$P_{DISS\text{ MAX}}$		100	mW

Electrostatic Discharge

Human Body Model	HBM	500		V
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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}	2.7	3.3	5.5	V	
Operating Temperature (Package Base)	T _{PKG BASE}	-40		85	°C	
RF Frequency Range	F _{RF}	0.1	2.4	3.8	GHz	Typical Application Schematic with external matching components (notes 1 & 2) .
RF_IN Port Impedance	Z _{RFIN}		50		Ω	Single-ended.
RF_OUT Port Impedance	Z _{RFOUT}		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: [GRF2374 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 using the 0.1 to 3.8 GHz tuning set. $V_{CC} = 3.3\text{ V}$, $V_{EN/BYPASS} = 3.3\text{ V}$, $I_{CCQ} = 15\text{ mA}$, $F_{TEST} = 2.4\text{ GHz}$. $T_{PKG\text{ BASE}} = 25\text{ °C}$. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Current	I_{CCQ}		15		mA	$V_{CC} = 3.3\text{ V}$, $V_{EN/BYPASS} = 3.3\text{ V}$.
Enable Current	I_{ENABLE}		1.9		mA	$V_{CC} = 3.3\text{ V}$, $V_{EN/BYPASS} = 3.3\text{ V}$.
Switching Rise Time	T_{RISE}		10		ns	Bypass Mode to Gain Mode (note 3) .
Switching Fall Time	T_{FALL}		15		ns	Gain Mode to Bypass Mode (note 4) .

Disabled Mode

Leakage Current	$I_{LEAKAGE}$		3.8		mA	$V_{CC} = 3.3\text{ V}$, $V_{EN/BYPASS} = 0\text{ V}$.
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Thermal Data

Thermal Resistance: Infrared Scan	Θ_{JC}		700		°C/W	On standard evaluation board (note 5) .
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Note 3: Switching Time: 50% of $V_{EN/BYPASS}$ to 90% of P_{OUT} .

Note 4: Switching Time: 50% of $V_{EN/BYPASS}$ to 10% of P_{OUT} .

Note 5: MTTF > 10^6 hours for $T_{CHANNEL} \leq 150\text{ °C}$.

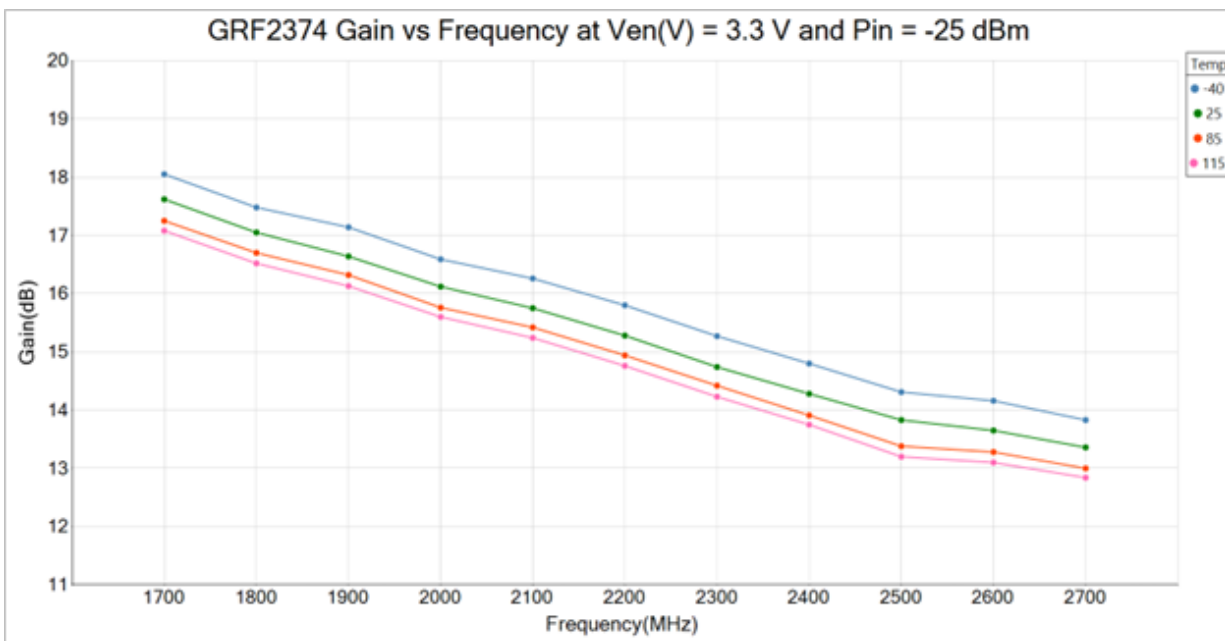
Nominal Operating Parameters - RF

The following conditions apply unless noted otherwise: typical application schematic using the 0.1 to 3.8 GHz tuning set. $V_{CC} = 3.3\text{ V}$, $V_{EN/BYPASS} = 3.3\text{ V}$, $I_{CCQ} = 15\text{ mA}$, $F_{TEST} = 2.4\text{ GHz}$, $T_{PKG\text{ BASE}} = 25\text{ }^{\circ}\text{C}$. Evaluation board losses are included within the specifications.

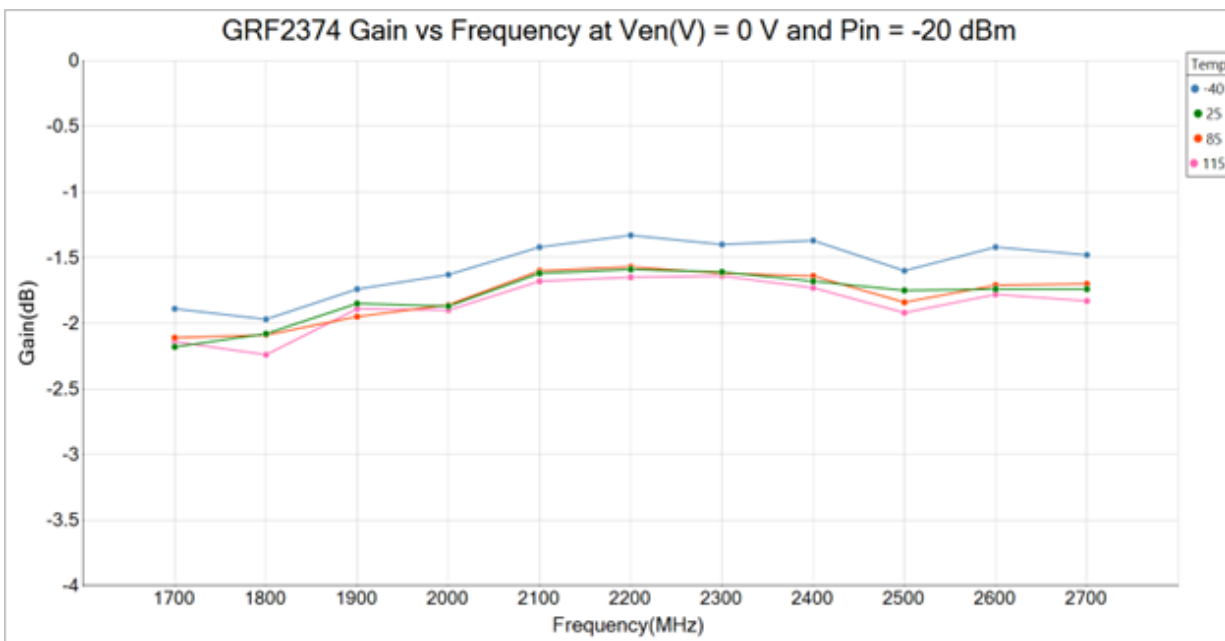
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
High Gain Mode						V _{CC} = 3.3 V, V _{EN/BYPASS} = 3.3 V.
Gain	S21		14.3		dB	
Input Power for 1% EVM (Gain Mode)	IP1%		-18		dBm	Waveform: 802.11g/n PAR; 11.6 dB.
Output 3rd Order Intercept Point	OIP3		23.5		dBm	-5 dBm P _{OUT} per tone at 2 MHz spacing (2399 and 2401 MHz).
Output 1 dB Compression Power	OP1dB		11		dBm	
Noise Figure	NF		1.4		dB	On standard evaluation board.
Bypass Mode						V _{CC} = 3.3 V, V _{EN/BYPASS} = 0 V.
Gain	S21		-1.7		dB	
Input Power for 1% EVM (Bypass Mode)	IP1%		-20		dBm	Waveform: 802.11g/n PAR; 11.6 dB.
Output 3rd Order Intercept Point	OIP3		19.5		dBm	-5 dBm P _{OUT} per tone at 2 MHz spacing (2399 and 2401 MHz).
Output 1 dB Compression Power	OP1dB		6.5		dBm	

GRF2374 Typical Operating Curves: 3.3 V, 15 mA, 0.1 to 3.8 GHz Tune

Gain Mode

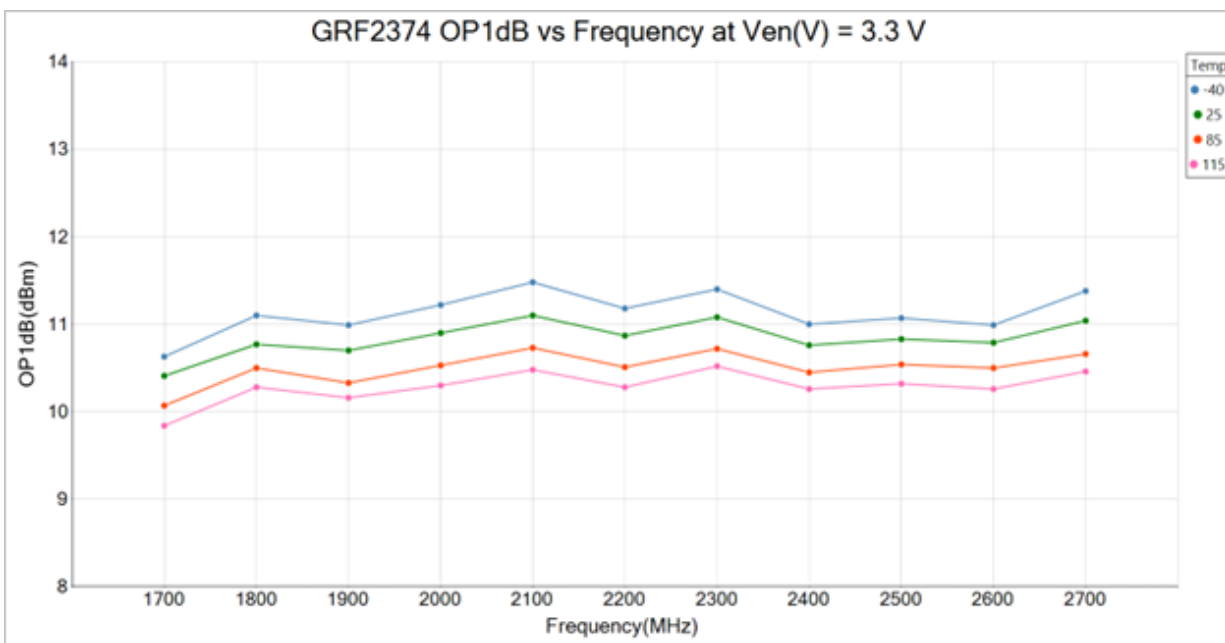


Bypass Mode

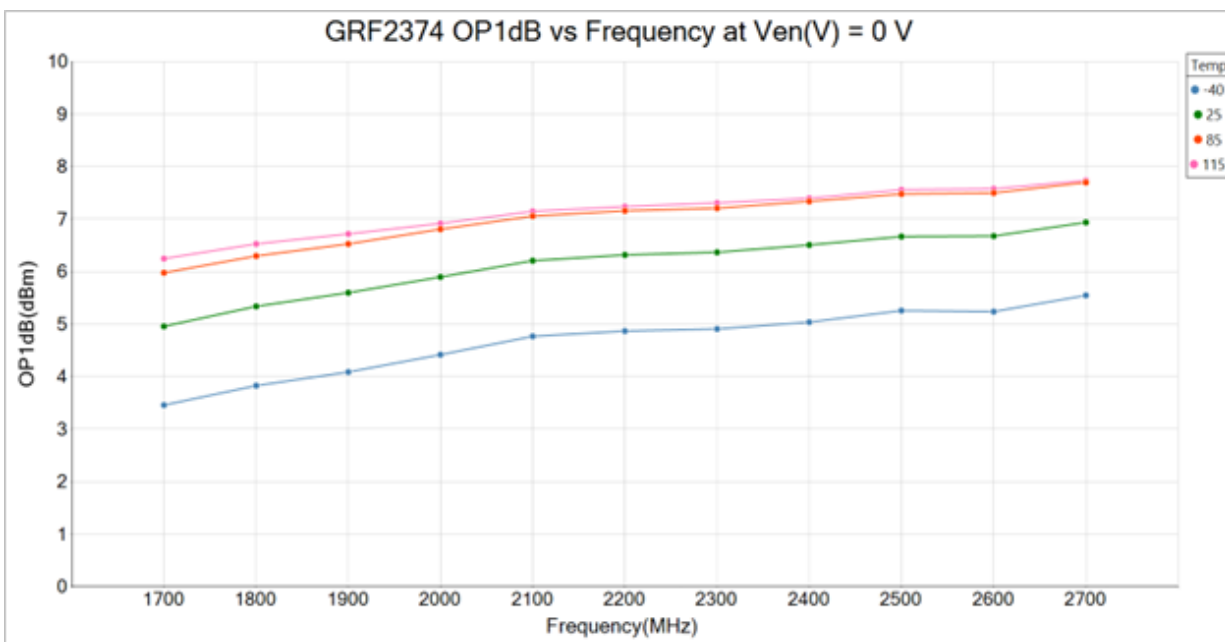


GRF2374 Typical Operating Curves: 3.3 V, 15 mA, 0.1 to 3.8 GHz Tune

Gain Mode

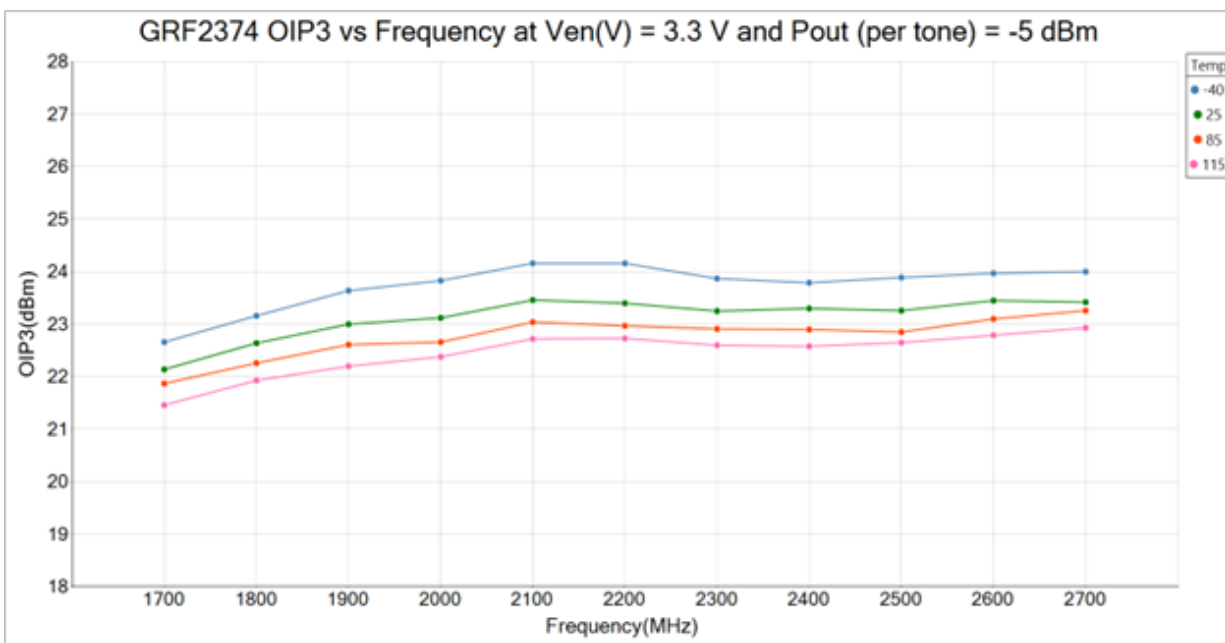


Bypass Mode

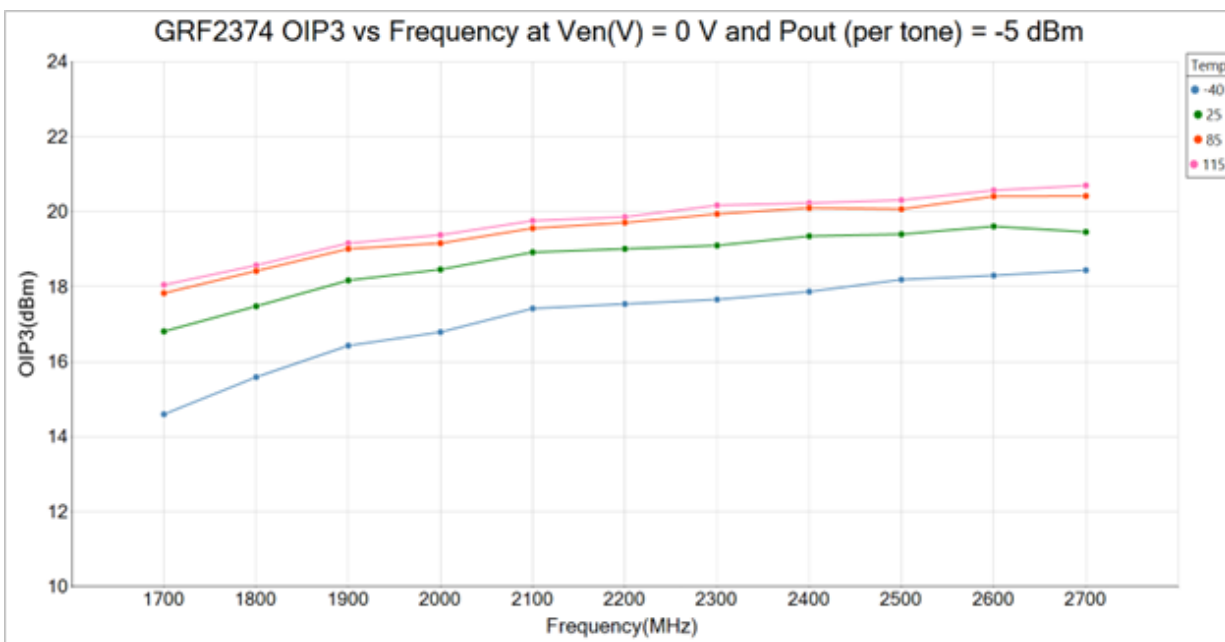


GRF2374 Typical Operating Curves: 3.3 V, 15 mA, 0.1 to 3.8 GHz Tune

Gain Mode

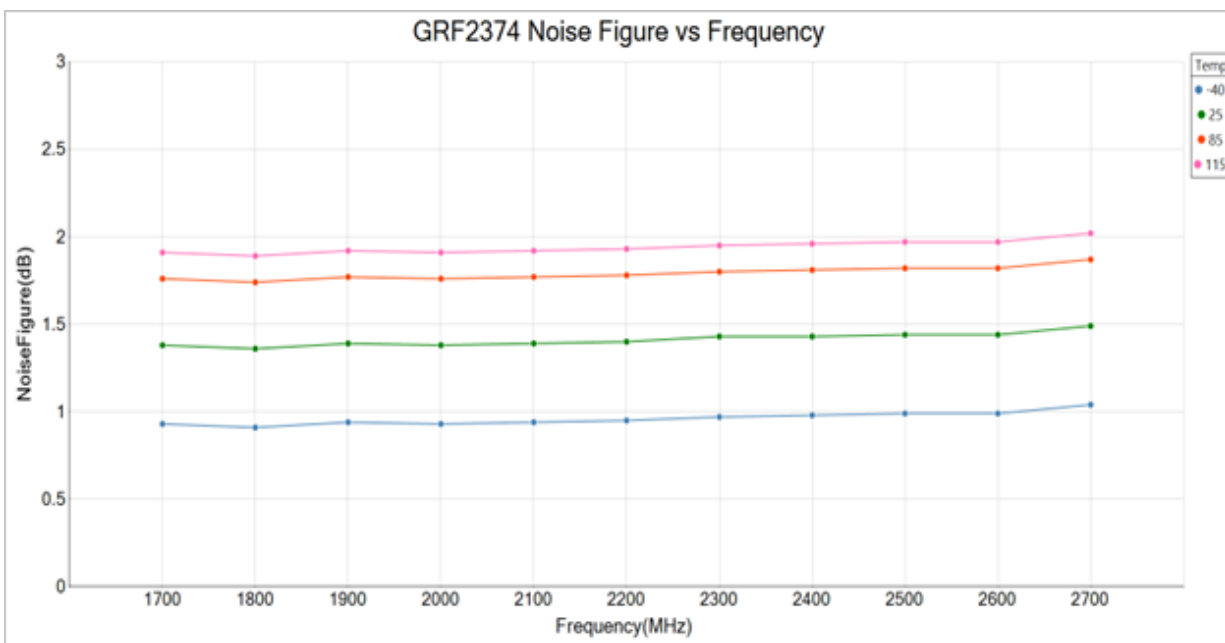


Bypass Mode

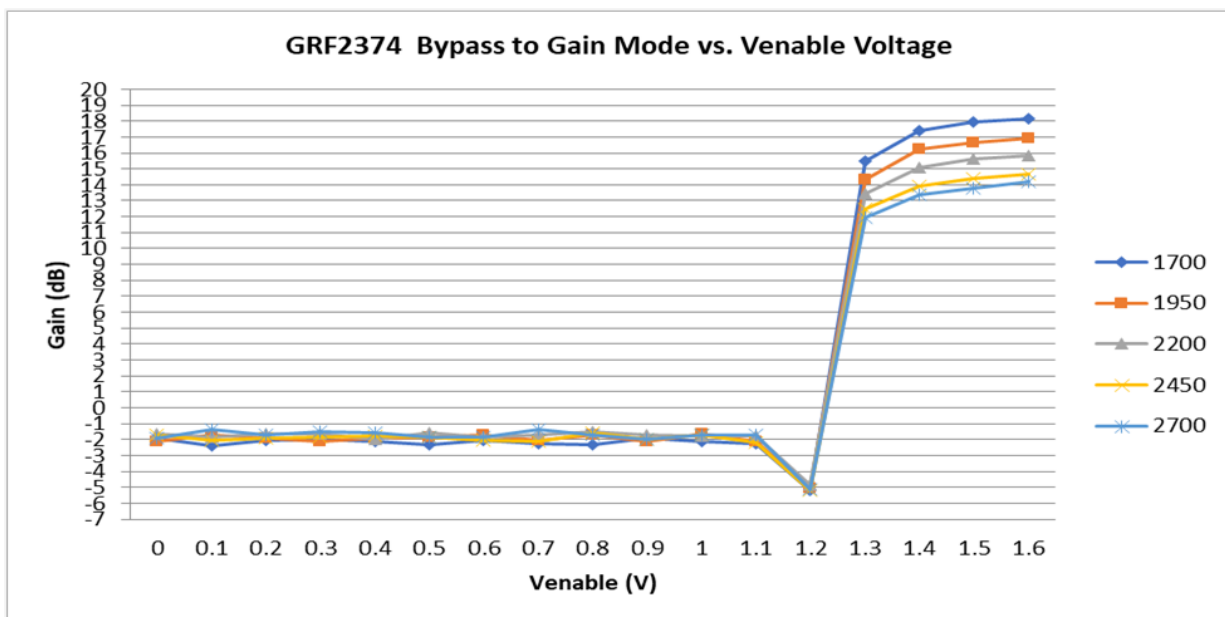


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Gain Mode

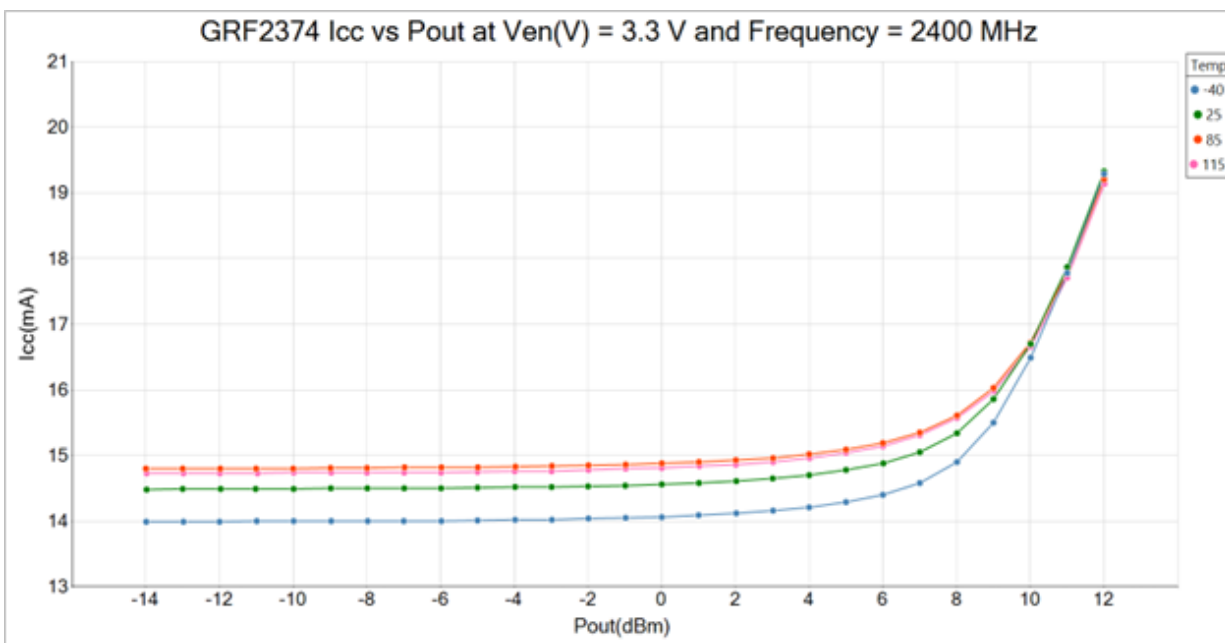


Bypass to Gain Mode

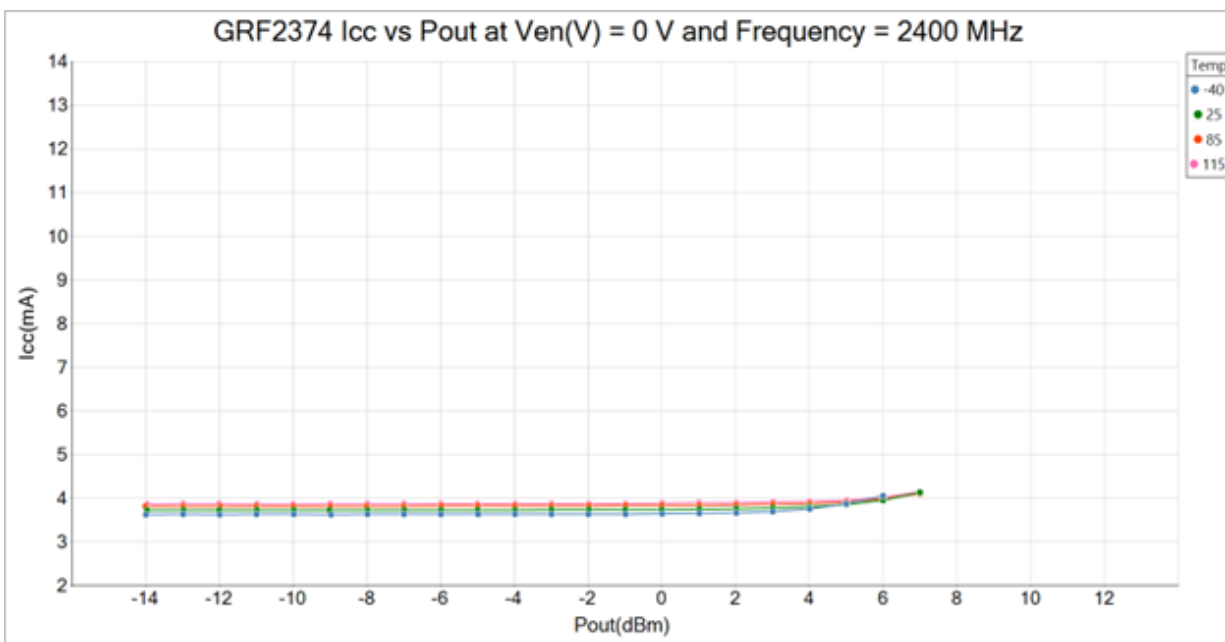


GRF2374 Typical Operating Curves: 3.3 V, 15 mA, 0.1 to 3.8 GHz Tune

Gain Mode

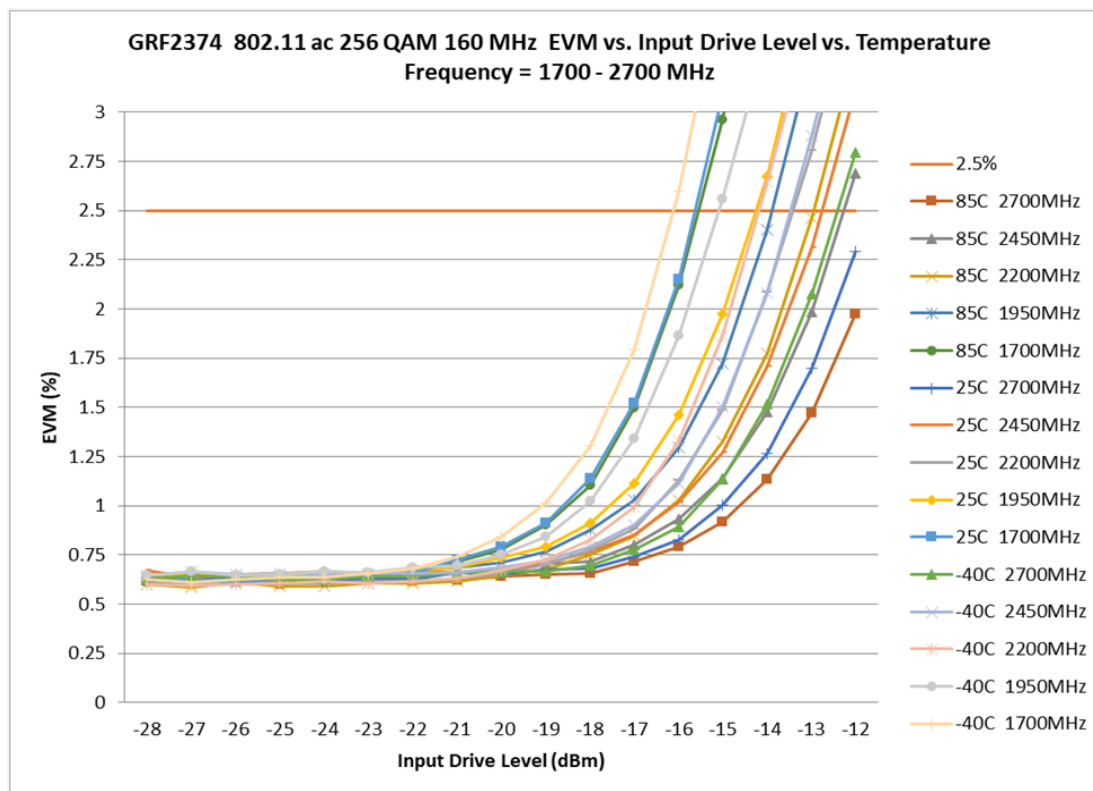


Bypass Mode

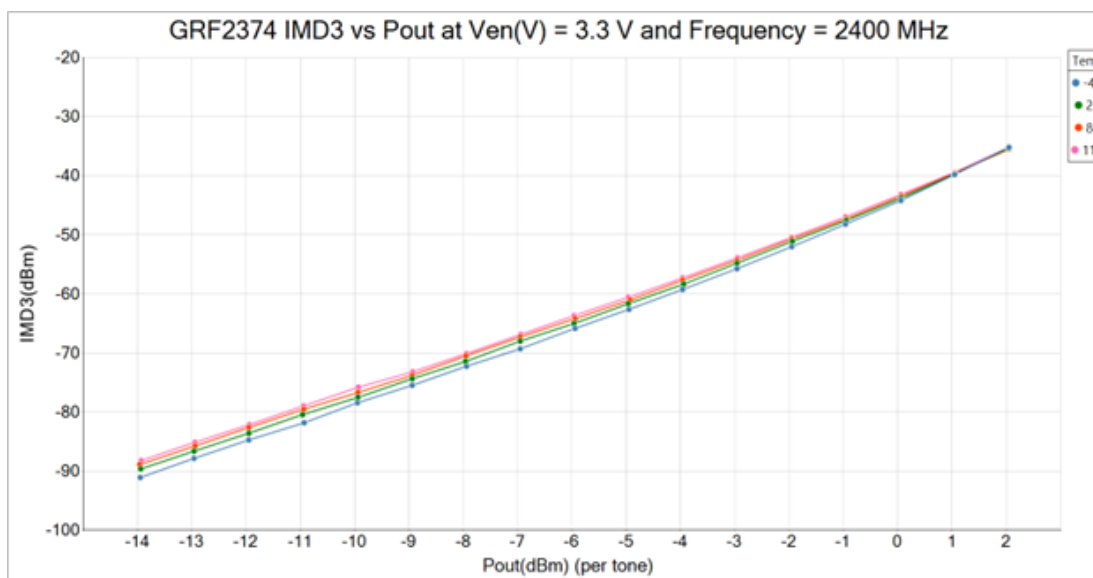


GRF2374 Typical Operating Curves: 3.3 V, 15 mA, 0.1 to 3.8 GHz Tune

Gain Mode

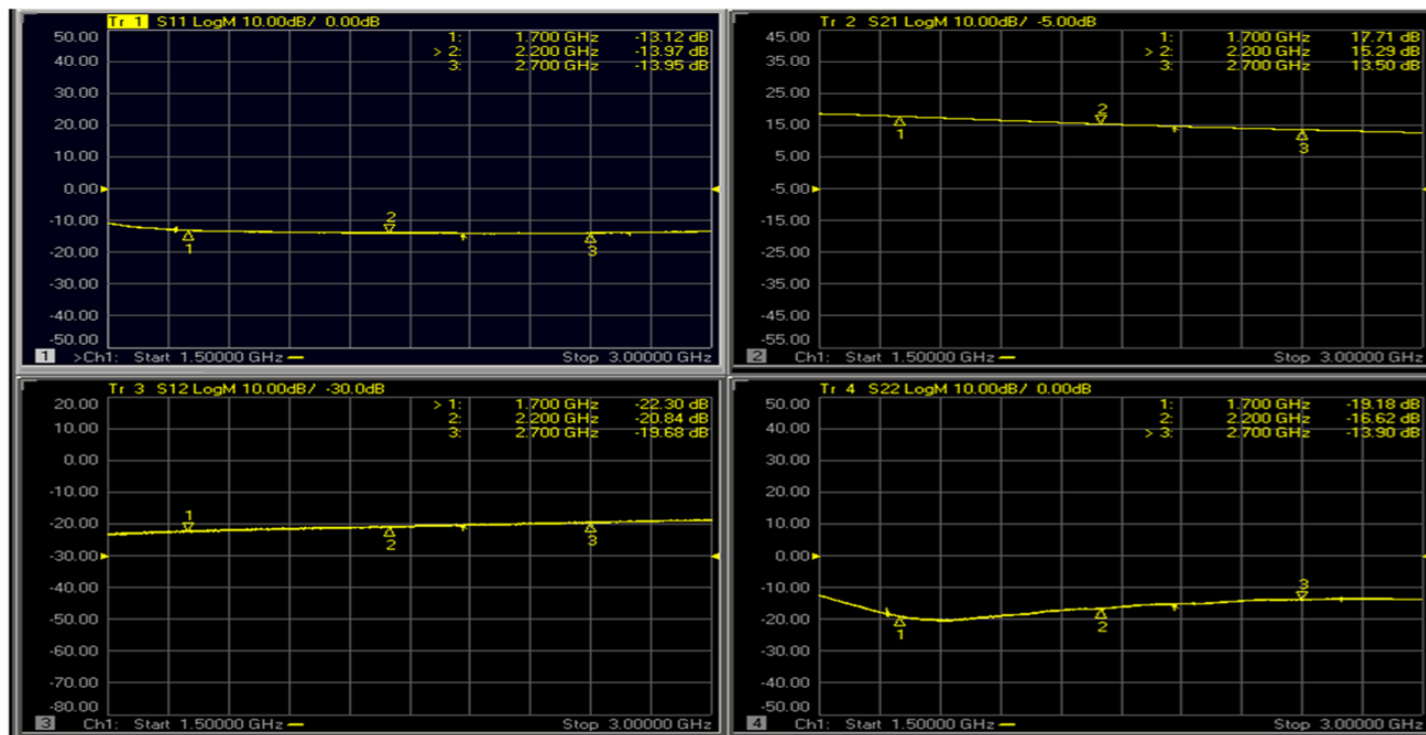


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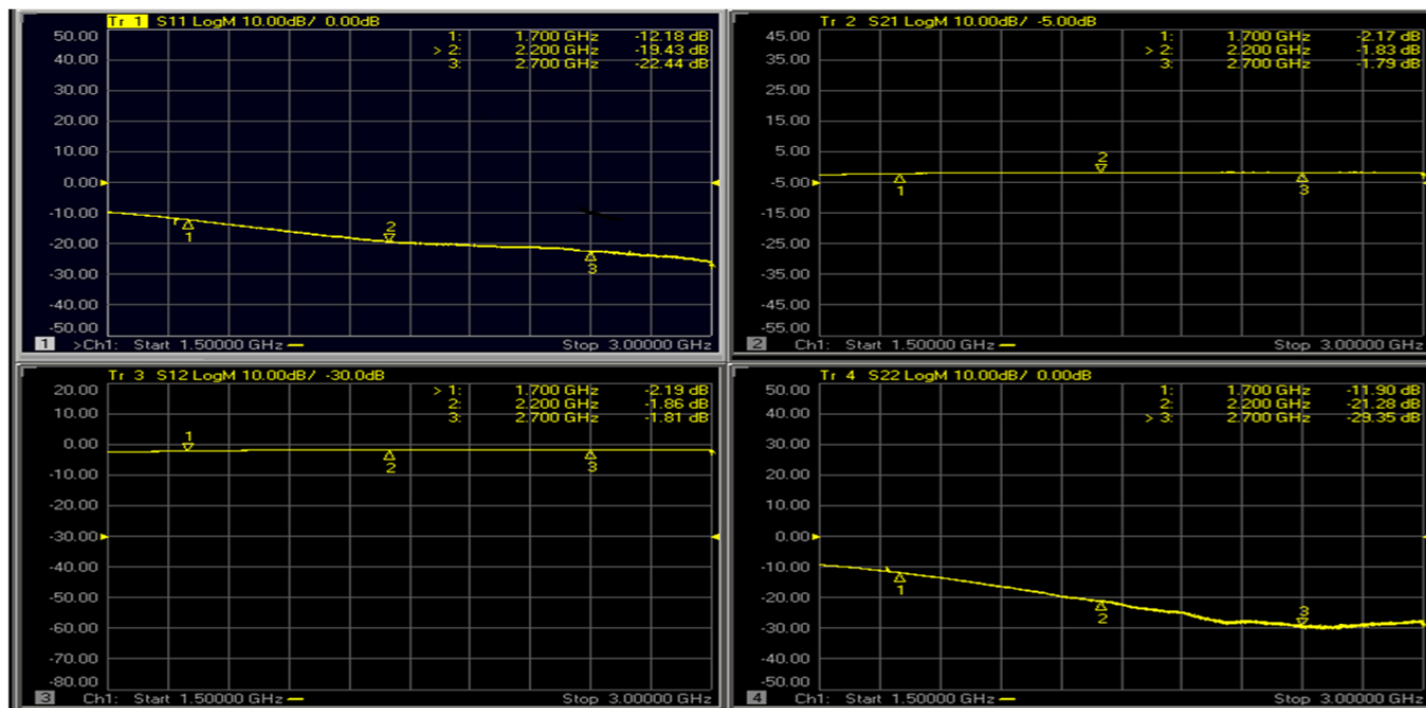
GRF2374 Typical Operating Curves: S-parameters: 0.1 to 3.8 GHz Tune

Gain Mode



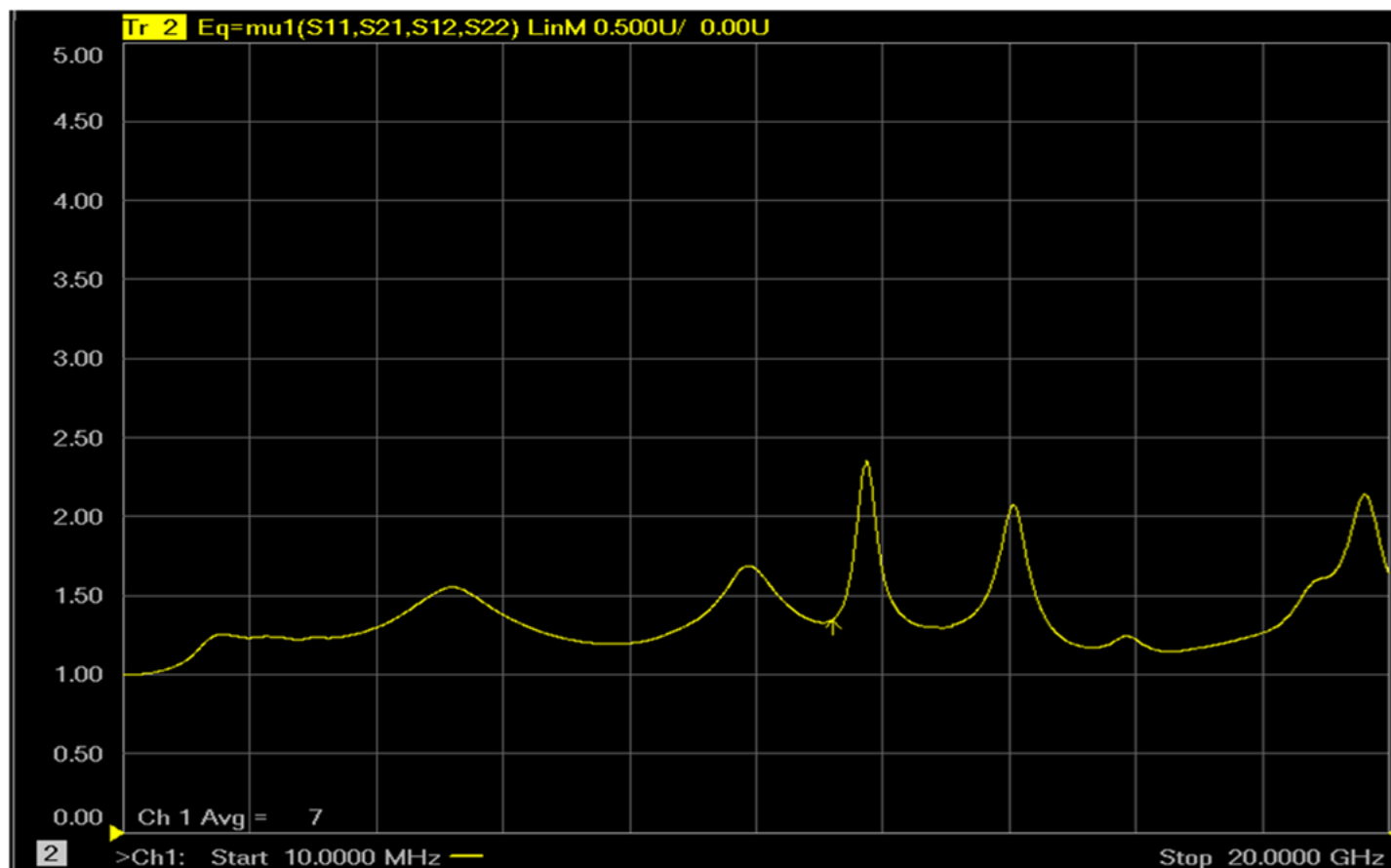
GRF2374 Typical Operating Curves: S-parameters: 0.1 to 3.8 GHz Tune

Bypass Mode

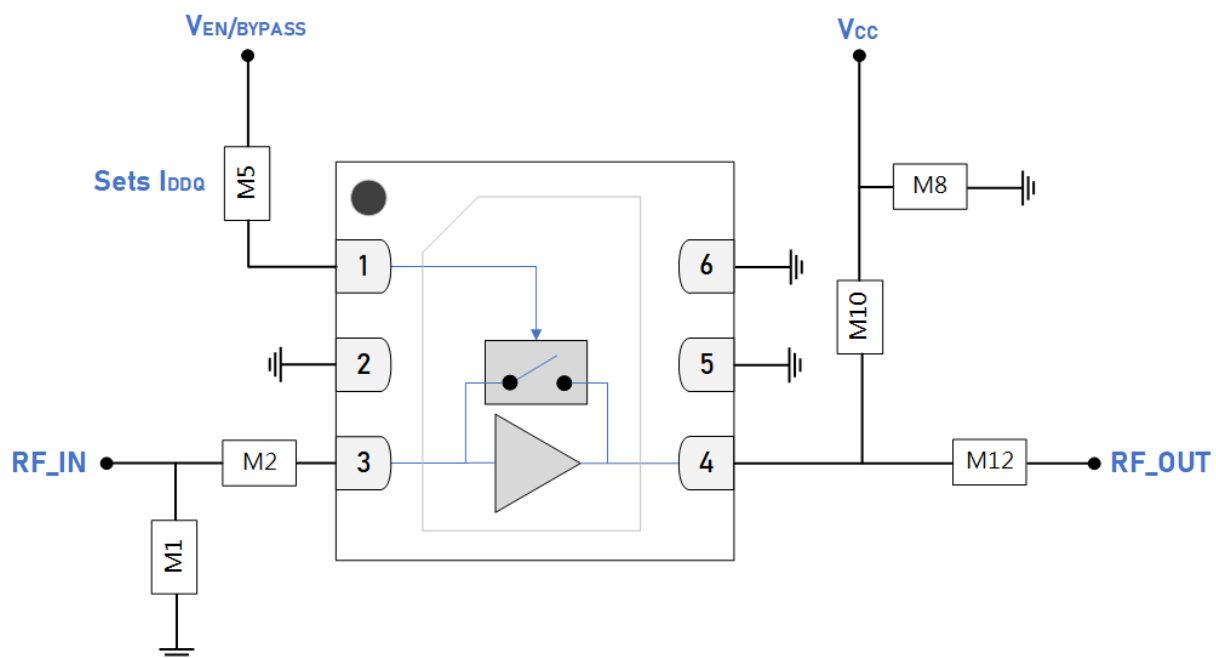


GRF2374 Typical Operating Curves: Stability Mu Factor (10 MHz to 20 GHz)

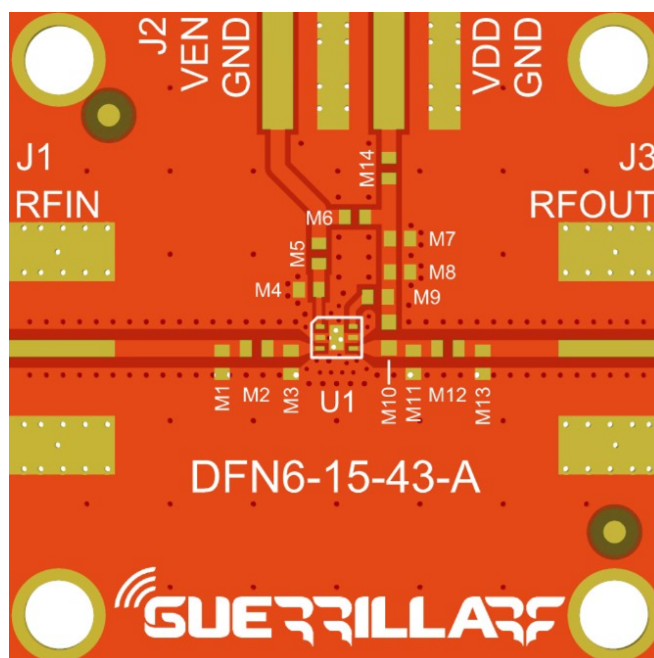
Gain Mode



Note: $\mu \geq 1.0$ implies unconditional stability.



GRF2374 Standard Evaluation Board Schematic

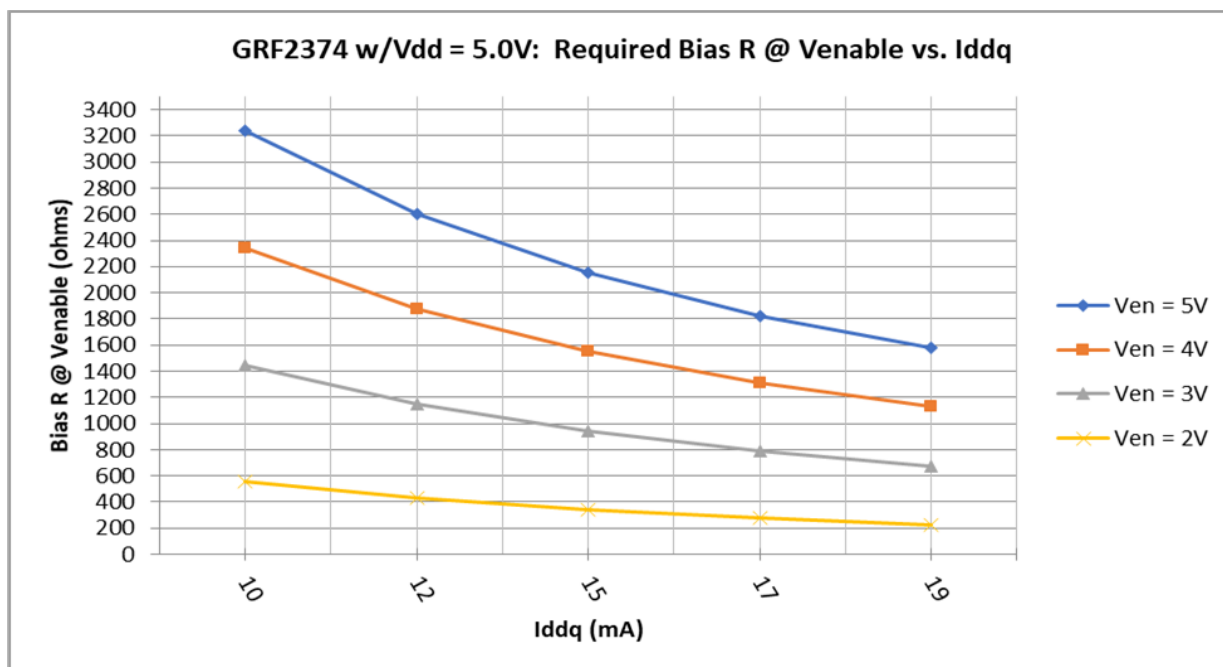
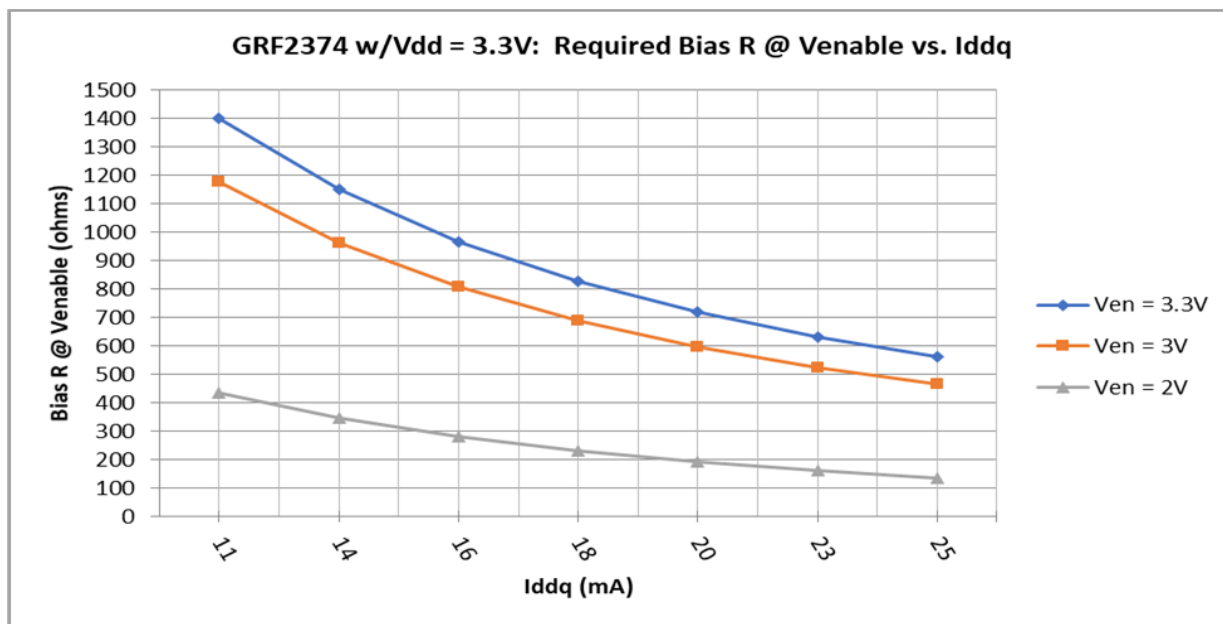


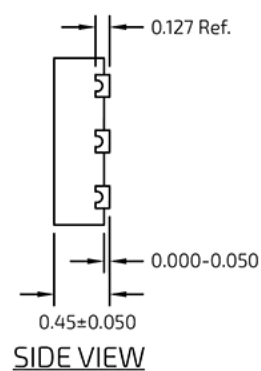
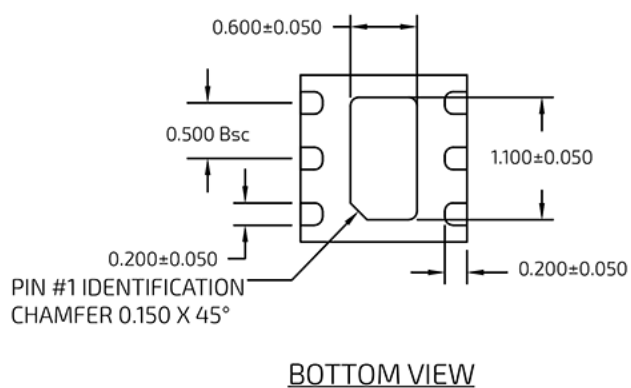
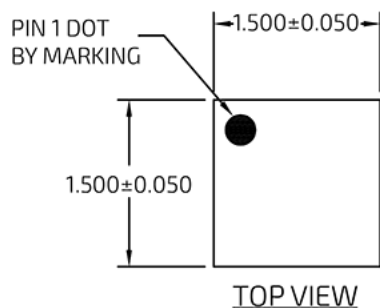
GRF2374 Evaluation Board Assembly Diagram

GRF2374 Evaluation Board Assembly Diagram Reference: 0.1 to 3.8 GHz Tune

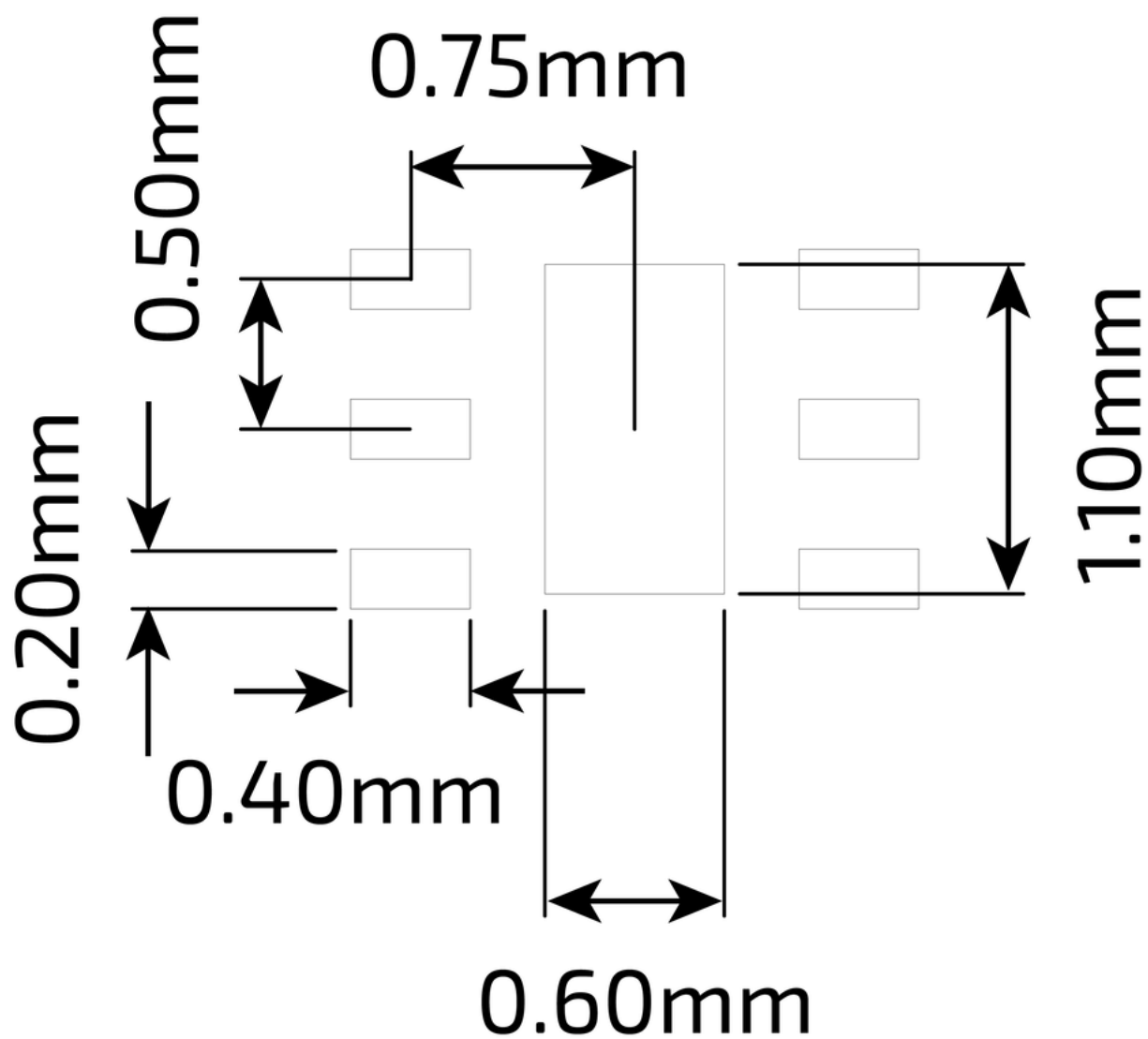
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Inductor	Murata	LQG	5.1 nH	0402	ok
M2	Capacitor	Murata	GJM	3.0 pF	0402	ok
M5 (sets I _{CCQ})	Resistor	Various	5%	see curves	0402	ok
M8	Capacitor	Murata	GRM	0.1 µF	0402	ok
M10	Inductor	Murata	LQG	3.0 nH	0402	ok
M12	Capacitor	Murata	GJM	2.7 pF	0402	ok
Evaluation Board	DFN6-15-43-A					

GRF2374 Bias Resistor Selection Curves





DFN 6 1.5x1.5mm Package Dimensions



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

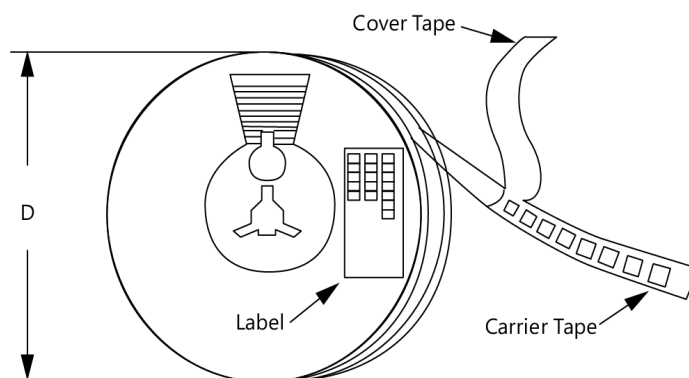
Package Marking Diagram



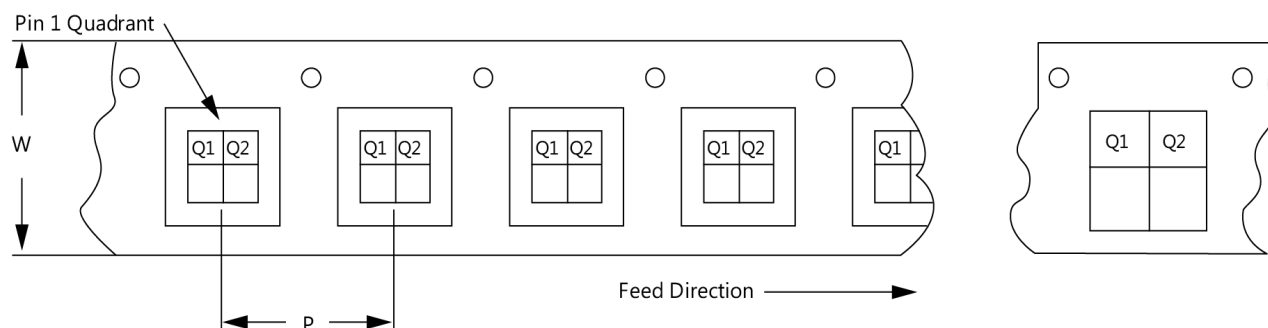
Line 1: "Y" = YEAR (single digit). "WW" = WORK WEEK the Device was assembled.
Line 2: "XXXX" = Device Part Number.

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
May 31, 2019	Preliminary Data Sheet.
September 22, 2022	Changed HBM to 500 volts.
October 12, 2022	Updated switching times.
September 18, 2024	Upgraded Data Sheet to newest format only.
October 2, 2024	Release Ø Data Sheet. Updated specifications and added new plots.



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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