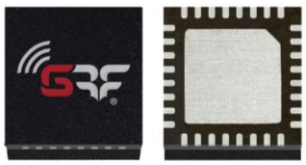
DATA SHEET



GRF5910

PRELIMINARY DATA SHEET

GaN HEMT Power Transistor
10 Watt P_{SAT}
9.8-10.7 GHz

FEATURES

- Operating Frequency Range: 9.8 to 10.7 GHz
- Operating Drain Voltage: 24 Volt
- Maximum Output Power: 10 Watt (P_{SAT})
- Internally matched
- 100% DC & RF Production Tested
- Compact 5 x 5 mm QFN-32 Package

Reference: 24 V / 250 mA / 9.8 GHz

- Saturated Gain: 21.2 dB
- Saturated Drain Efficiency: 31.9%
- Saturated Output Power: 41.1 dBm

APPLICATIONS

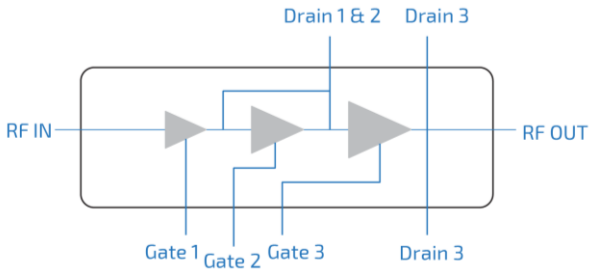
- Aerospace and Defense
- Radar
- Communications
- Test Instrumentation

DESCRIPTION

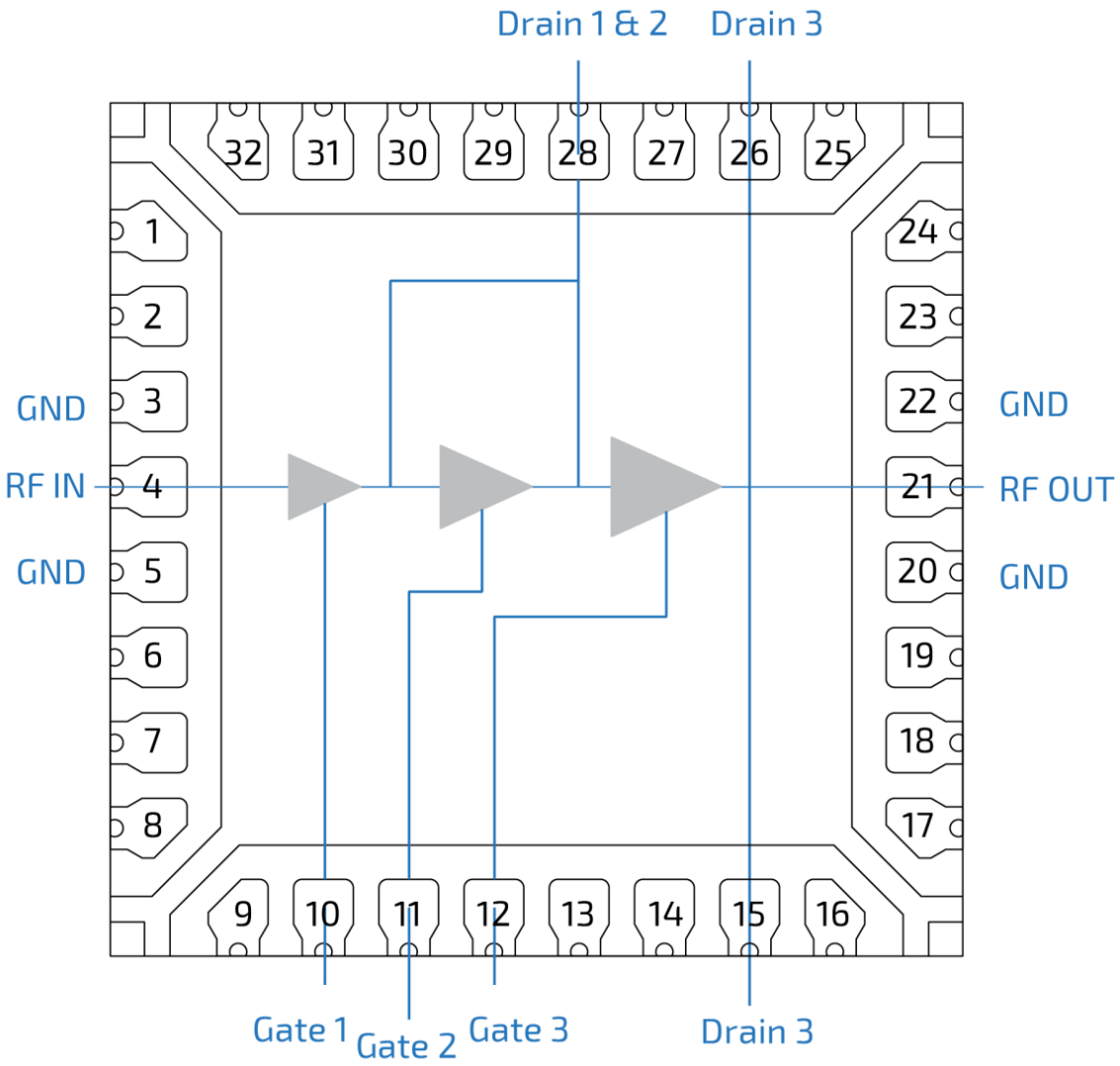
The GRF5910 is a 10 W (P_{SAT}) internally matched discrete GaN-on-SiC HEMT which operates from 9.8 to 10.7 GHz on a 24 V supply rail. The wide bandwidth makes the GRF5910 suitable for a variety of applications including aerospace and defense, radar, communications, test instrumentation, and pulse operations. The device is housed in an industry-standard 5 x 5 mm surface mount QFN-32 package. Lead free and RoHS compliant.

Please consult with the GRF applications engineering team for custom tuning/evaluation board data.

BLOCK DIAGRAM



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QFN-32 5 x 5 mm Pin Out (Top View)

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Pin Assignments

Pin	Name	Description	Note
1, 2, 6, 7, 8, 9, 13, 14, 16, 17, 18, 19, 23, 24, 25, 27, 29, 30, 31, 32	GND/NC	Ground or No Connect	No internal connection to die. It is strongly recommended that these pins be connected to ground.
3, 5, 20, 22	GND	Ground	Internal connection to die. These pins must be connected to ground.
4	RF_IN	RF input	
10	Gate1	Stage 1 gate	Connected to Gate terminal of first stage.
11	Gate2	Stage 2 gate	Connected to Gate terminal of second stage.
12	Gate3	Stage 3 gate	Connected to Gate terminal of third stage.
15, 26	Drain3	Stage 3 drain	Connected to DRAIN terminal of third stage.
28	Drain1&2	Stage 1&2 drain	Connected to DRAIN terminal of first and second stage.
21	RF_OUT	RF ouput	
PKG BASE	SOURCE	Source Connection	Connected to the SOURCE terminals of the GaN transistor. Provides DC and RF ground as well as thermal heat sink. **In order to match the device's rated performance, it is strongly recommended to use multiple thermal vias beneath the package for optimal RF and thermal performance**. Refer to evaluation board top layer graphic on schematic page.

GaN HEMT Power-up / Power-down Procedure:

To turn the transistor ON:

1. Set V_{GS} to -5 V.
2. Turn on V_{DS} to normal operation voltage (24 V).
3. Slowly increase V_{G1} & V_{G2} to set $I_{DQ1\&2}$ current to 45 mA.
4. Slowly increase V_{G3} to set I_{DQ3} current to 205 mA.
5. Apply RF power.

To turn the transistor OFF:

1. Turn the RF power off.
2. Decrease V_{GS} to -5 V.
3. Turn off V_{DS}. Wait a few seconds for Drain capacitor to discharge.
4. Turn off V_{GS}.

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Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Operating Voltage	V_{DS}		50	V
Drain to Gate Breakdown Voltage	B_{VDG}		TBD	V
Drain to Source Voltage	V_{DS}		150	V
Gate to Source Voltage	V_{GS}	-8	2	V
Drain Current	ID		TBD	mA
RF Input Power: 50 Ω, V_{DS} = 24 V, I_{DQ} = 250 mA, $T_{PKG\ BASE}$ = 85 °C.	$P_{IN\ MAX}$		TBD	dBm
RF Input Power: 10:1 VSWR, V_{DS} = 24 V, I_{DQ} = 250 mA, $T_{PKG\ BASE}$ = 85 °C.	$P_{IN\ MAX}$		TBD	dBm
Output Mismatch Stress: V_{DS} = 24 V, P_{OUT} = P_{SAT} pulsed = TBD.	$VSWR_{MAX}$		TBD	
Operating Temperature (package base).	$T_{PKG\ BASE}$	-40	105	°C
Maximum Junction Temperature (MTTF > 10^6 hours).	$T_{J\ MAX}$		225	°C
Maximum Dissipated Power	$P_{DISS\ MAX}$		TBD	W

Electrostatic Discharge

Human Body Model	HBM	TBD		V
Charged Device Model	CDM	TBD		V

Storage

Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		TBD	--

Note 1: Exceeding any of these limits may cause permanent damage to the device or reduce the lifetime (MTTF).
Note 2: Guerrilla-RF does not recommend sustained operation above the maximum operating conditions.

Caution! ESD Sensitive Device.
Exceeding Absolute Maximum Rating conditions may cause permanent damage.

Note: For additional information, please refer to *Manufacturing Note MN-001 — Package and Manufacturing Information*.

All Guerrilla RF products are provided in RoHS compliant lead (Pb)-free packaging requiring no exemptions. Additional information for this topic can be found at this link - *Environmental and Restricted Substance Statement Library*

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Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
RF Frequency Range	F_{TEST}	9.8	9.8	10.7	GHz	Typical application schematic
Drain to Source Voltage	V_{DS}	TBD	24	TBD	V	Typical application schematic.
Drain Current (Quiescent)	I_{DQ}		250		mA	Typical application schematic.
Drain Current: RF	$I_{D\text{-}Drive}$		1600		mA	Typical application schematic.
Gate Voltage	V_{GS}		-2.4		V	Typical application schematic.
Gate Current: RF	$I_{G\text{-}Drive}$		TBD		mA	Typical application schematic, P_{OUT} = 10 W.
Operating Temperature	$T_{PKG\ BASE}$	-40		85	°C	On package base.
Gate Port Impedance	Z_{RF_IN}		50		Ω	Typical application schematic.
Drain Port Impedance	Z_{RF_OUT}		50		Ω	Typical application schematic.

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Nominal Operating Parameters – General

The following conditions apply unless noted otherwise: typical application schematic using the 9.8 to 10.7 GHz tuning set, V_{DS} = 24 V, I_{DQ} = 250 mA, P_{OUT} = 10 W, F_{TEST} = 9.8 GHz, Pulsed CW (100 µs pulse width, 10% duty cycle, no modulation), 50 Ω system impedance, T_{AMB} = 25 °C, $T_{PKG\ BASE}$ = -40 to 85 °C. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Drain Source Breakdown Voltage	BV_{DS}	50			V	
Drain Source Leakage Current	I_{DLK}		TBD		mA	V_{GS} = -8 V, V_{DS} = 24 V.
Drain Current: Quiescent	I_{DQ}		250		mA	No RF applied.
Gate Threshold Voltage	V_{GS}	-3.4		-1.5	V	V_{DS} = 24 V.
Gate Bias Voltage	V_{GS}		-2.4		V	
Drain Voltage	V_{DS}		24		V	
Drain Current: RF	$I_{D\text{-}DRIVE}$		1600		mA	RF applied, P_{OUT} = 10 W.
Gate Current: RF	$I_{G\text{-}DRIVE}$		TBD		mA	RF applied, P_{OUT} = 10 W.
Gate Leakage Current	$I_{G\text{-}LEAK}$		TBD		µA	

Thermal And Reliability Information: CW, $T_{CHANNEL}$ = 85 °C

Thermal Resistance (Infrared Scan)	θ_{JC}		TBD		°C /W	P_{OUT} = TBD. On standard evaluation board.
Channel Temperature	$T_{CHANNEL}$		TBD		°C	

Note 5: MIN/MAX limits defined using modelled estimates that account for part-to-part variations and expected process spreads. As additional production lots are fabricated, accumulated test data will be used to refine the MIN/MAX limits.

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Nominal Operating Parameters – RF: 9.8 to 10.7 GHz

The following conditions apply unless noted otherwise: typical application schematic using the 9.8 to 10.7 GHz tuning set, V_{DS} = 24 V, I_{DQ} = 250 mA, P_{OUT} = 10 W, F_{TEST} = 9.8 GHz, Pulsed CW (100 µs pulse width, 10% duty cycle, no modulation), 50 Ω system impedance, T_{AMB} = 25 °C, $T_{PKG\ BASE}$ = -40 to 85 °C. Evaluation board losses are included within the specifications.

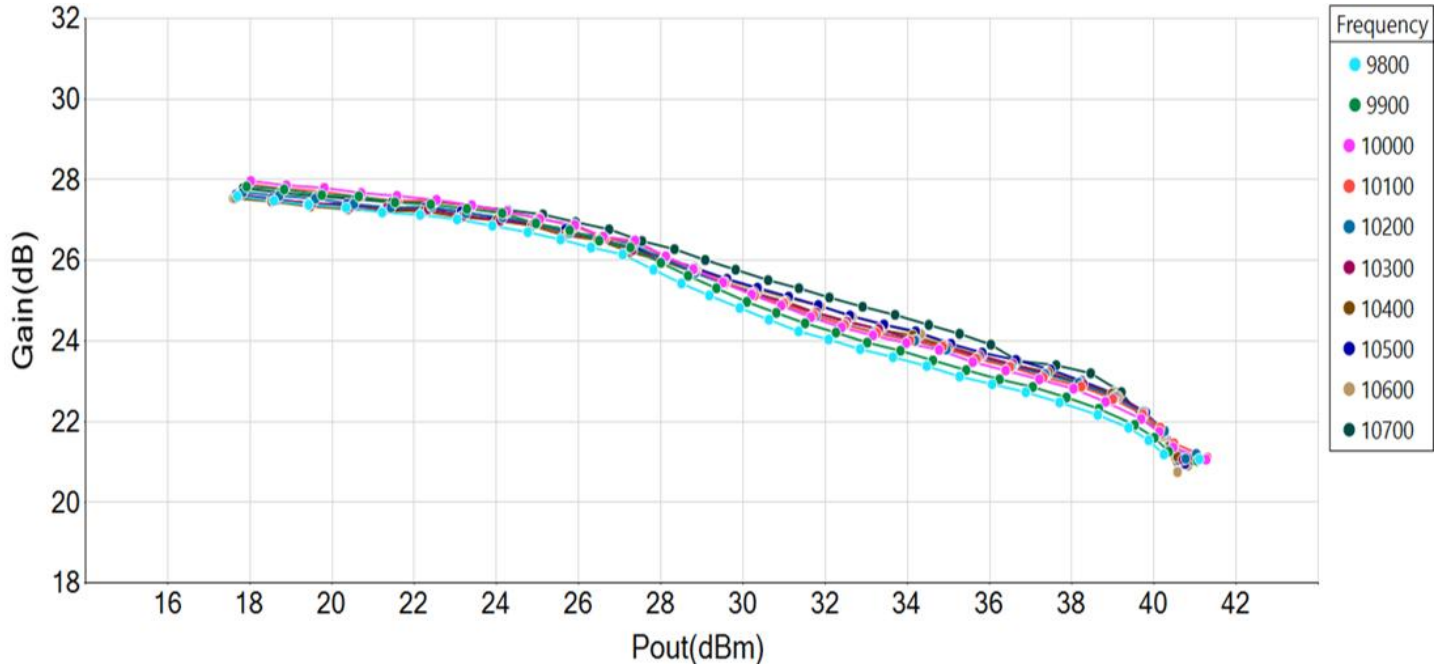
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Small Signal Gain	G_{SS}		28		dB	At $I_{DS} \leq 1.1 * I_{DQ}$.
Power Gain	G_{MAX}		28		dB	Max gain vs. power.
Saturated Gain	G_{SAT}		21.2		dB	At Pin=20dBm.
Saturated Drain Efficiency	$D_{Eff\ (SAT)}$		33.5		%	
Saturated Output Power	P_{SAT}		41.1		dBm	
Ruggedness	Ψ	At 2.5 dB compression. Output VSWR = 10:1 (all angles)				No damage or shift in performance.

Note 6: MIN/MAX limits defined using modelled estimates that account for part-to-part variations and expected process spreads. As additional production lots are fabricated, accumulated test data will be used to refine the MIN/MAX limits.

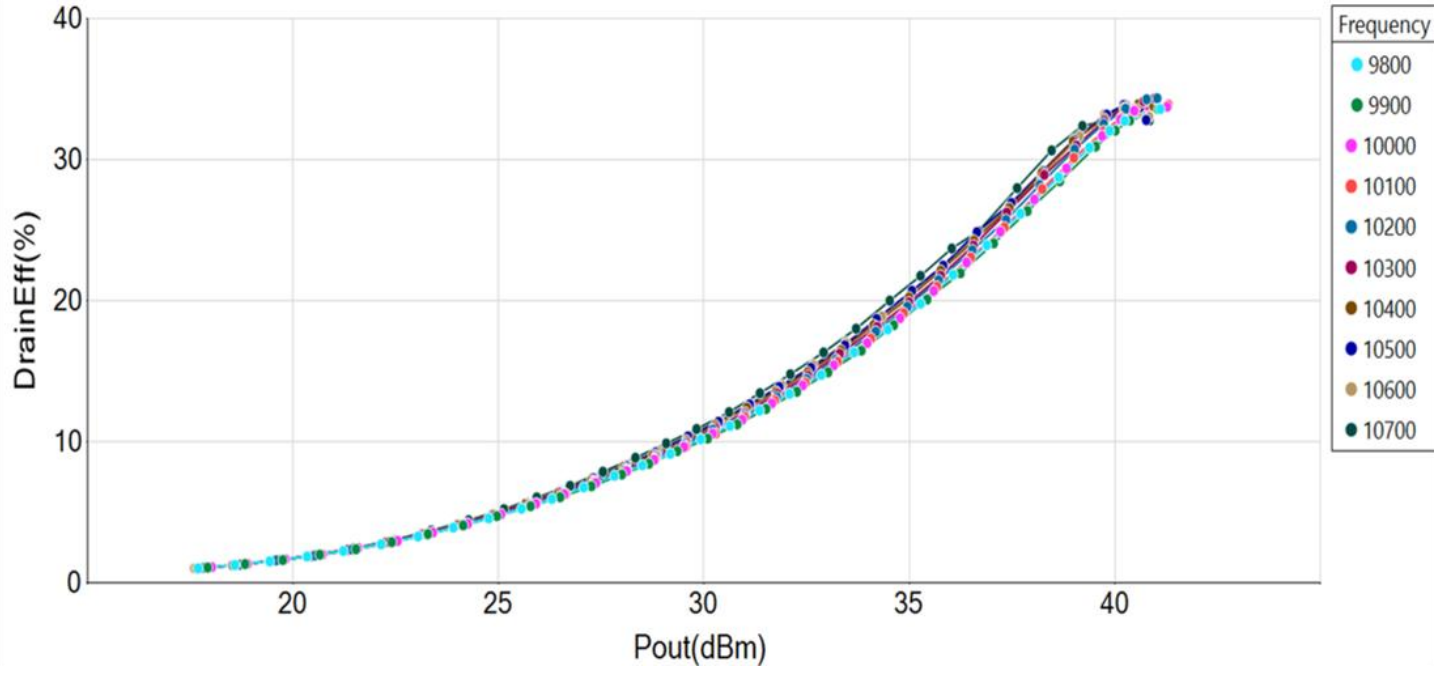
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Typical Operating Curves: 9.8 to 10.7 GHz, 24 V, 250 mA, Pulsed CW (10% duty cycle, 100 µs pulse width)

Gain vs. Output Power and Frequency



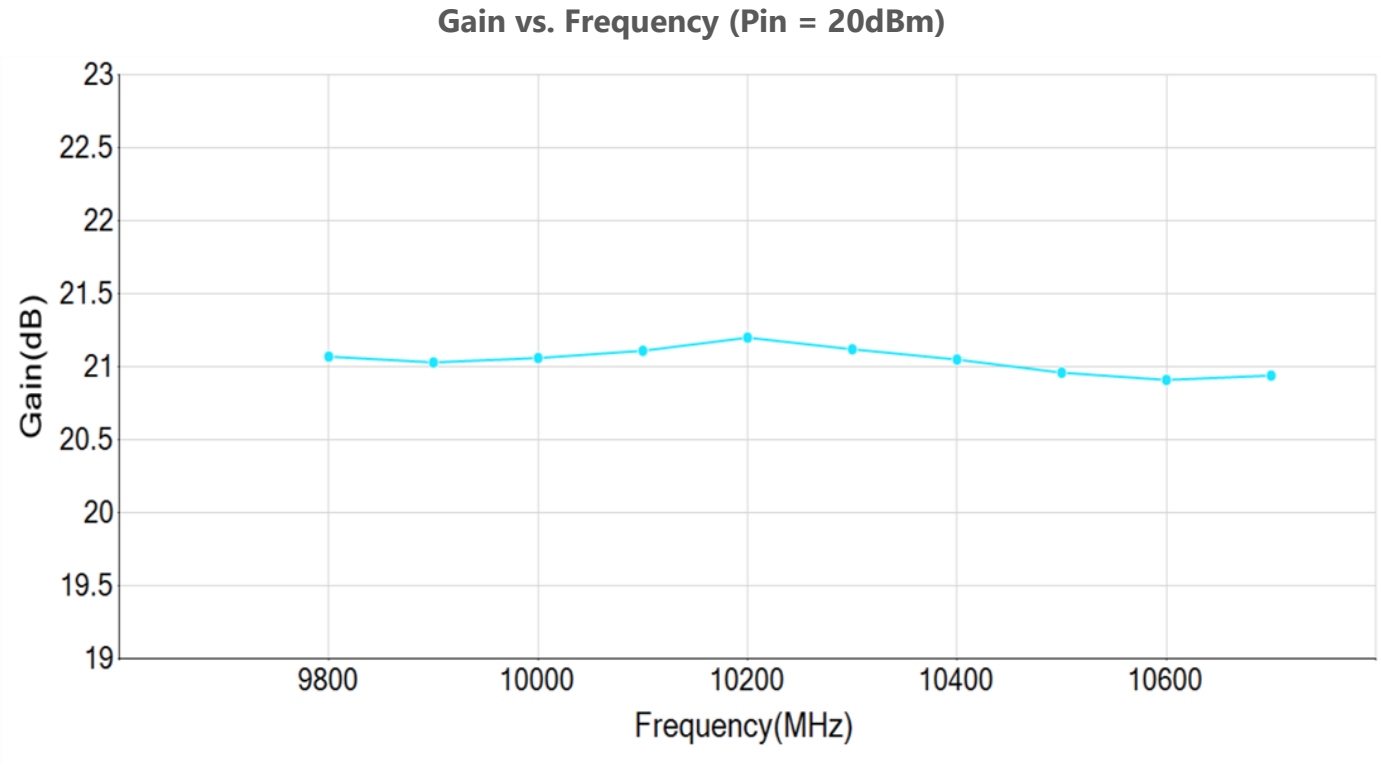
Drain Efficiency vs. Output Power and Frequency



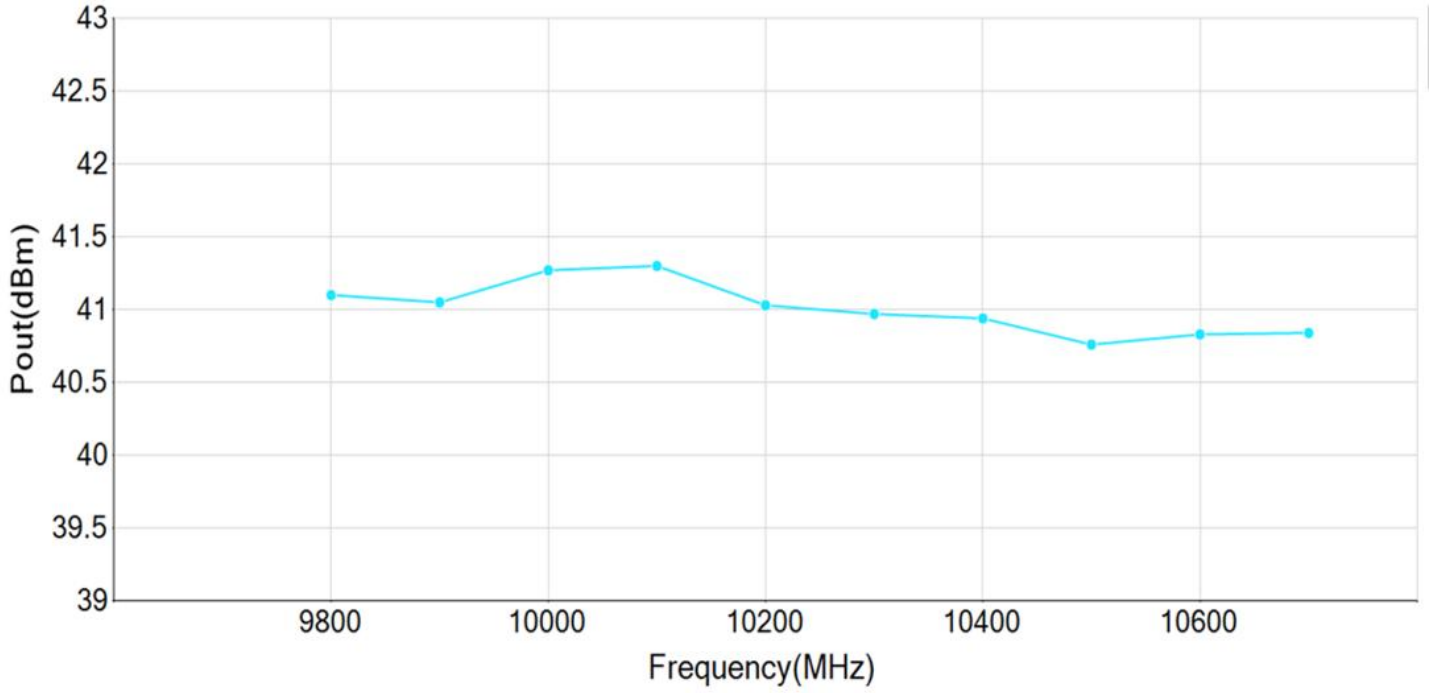
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Typical Operating Curves: 9.8 to 10.7 GHz, 24 V, 250 mA, Pulsed CW (10% duty cycle, 100 µs pulse width)

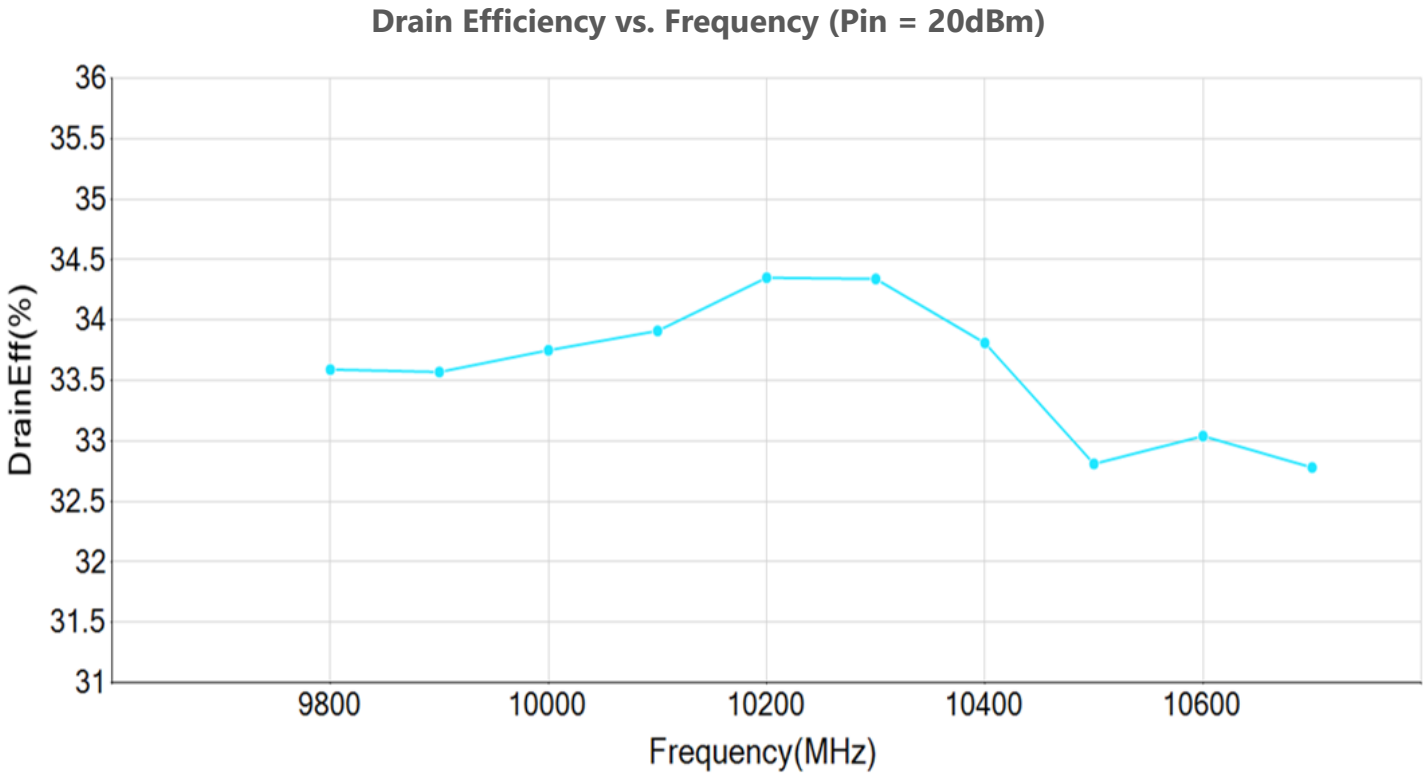


P_{OUT} vs. Frequency (Pin = 20dBm)

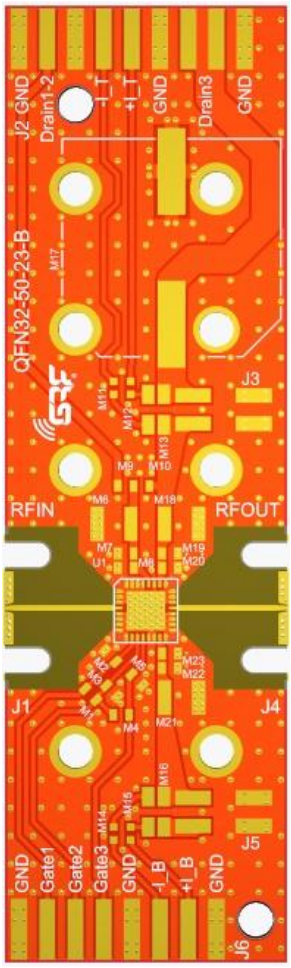


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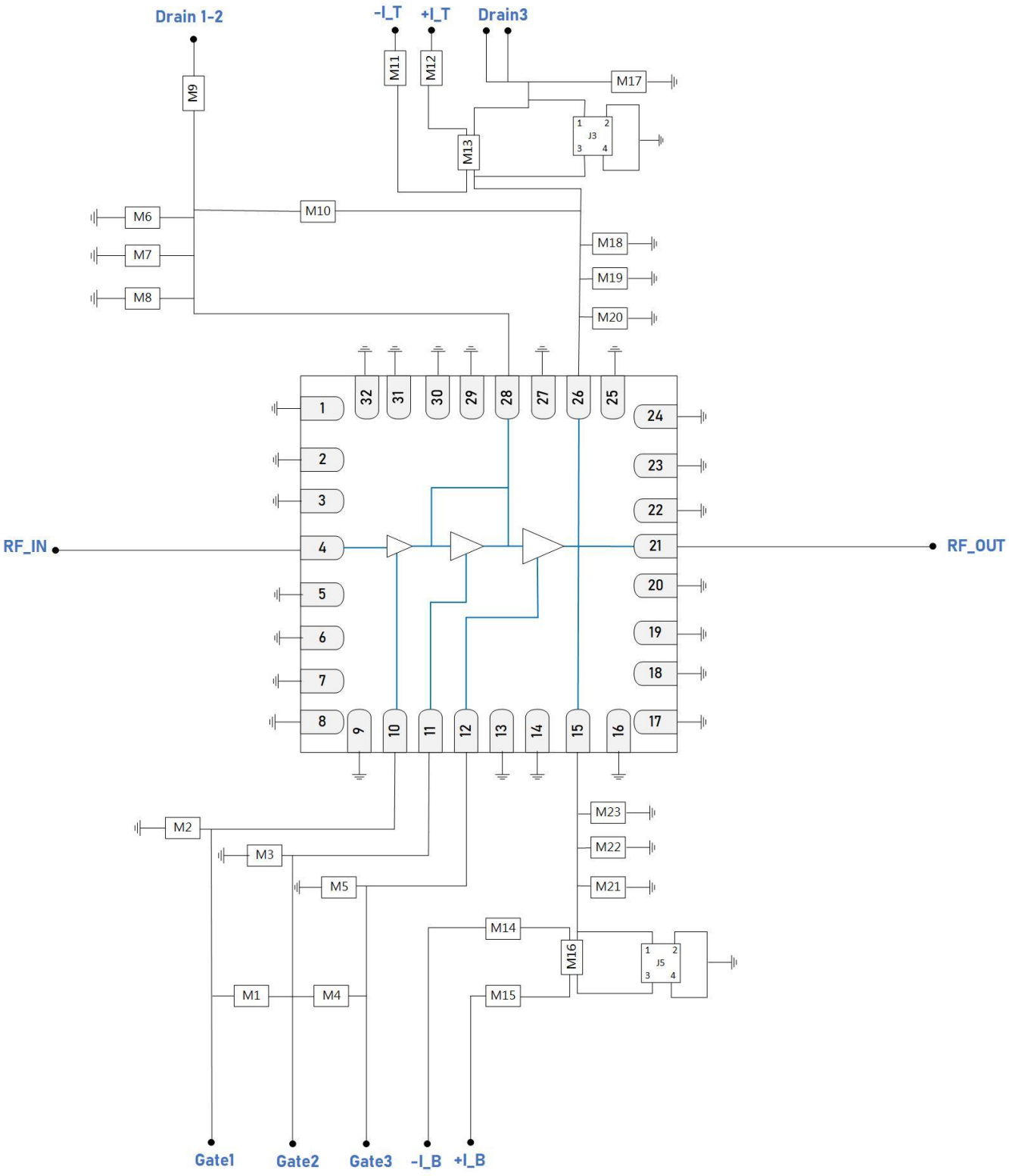
Typical Operating Curves: 9.8 to 10.7 GHz, 24 V, 250 mA, Pulsed CW (10% duty cycle, 100 µs pulse width)



GRF5910 Evaluation Board Assembly Diagram



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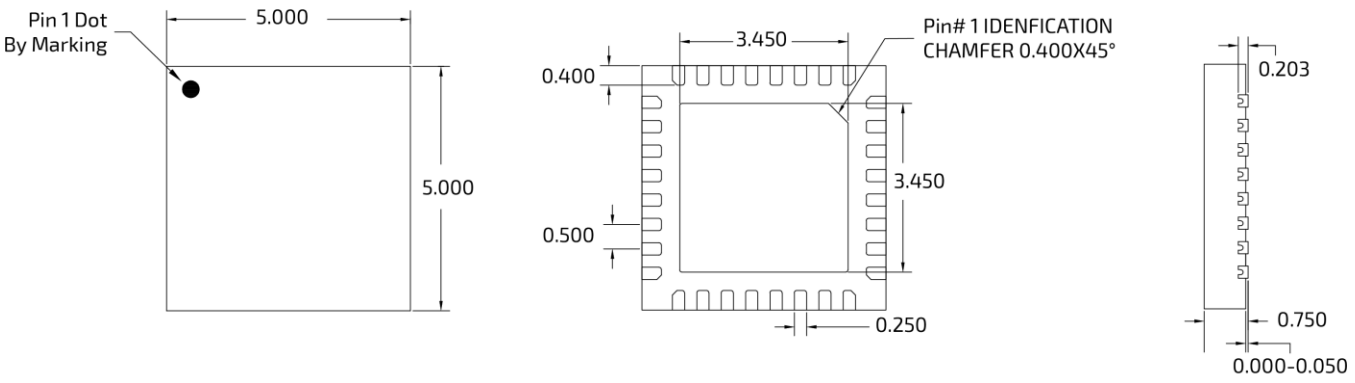
GRF5910 Standard Evaluation Board Schematic

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GRF5910 Evaluation Board Assembly Diagram Reference: 9.8 to 10.7 GHz Tune

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1, M4, M9	DNP	--	--	--	--	--
M2, M3, M5	Capacitor	Murata	GQM	10 nF	0603	ok
M6, M18, M21	Capacitor			10 uF	1210	ok
M7, M8	Capacitor	Murata	GQM	10 nF	0603	ok
M10	Resistor	Various	5%	0 Ω	0603	ok
M11, M12	Resistor	Various	5%	1K Ω	0603	ok
M13, M16	Resistor	Ohmite	5%	0.01Ω	1206	ok
M14, M15	Resistor	Various	5%	1K Ω	0603	ok
M17	Capacitor	Murata	GQM	220uF	12.5mm	ok
M19, M20	Capacitor	Murata	GQM	10 nF	0603	ok
M22, M23	Capacitor	Murata	GQM	10 nF	0603	ok
J1, J4	SMA Connector	Various	--	--	--	--
J2, J3, J5, J6	DC Connector	Various	--	--	--	--
Evaluation Board	QFN32-50-23-B	--	--	--	--	--

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QFN-32 5 x 5 mm Package Dimensions

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Package Marking Diagram

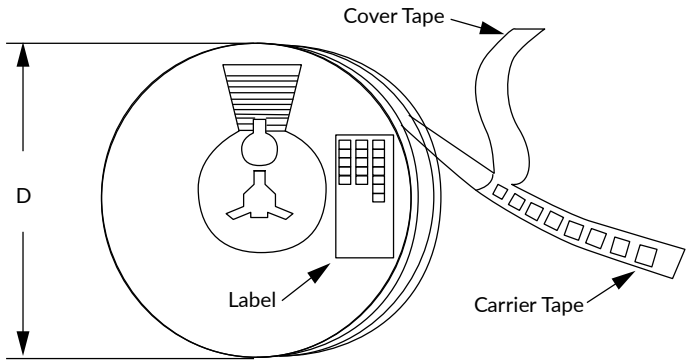


- Line 1: "YY" = YEAR. "WW" = WORK WEEK the device was assembled.
- Line 2: "GRF" = Guerrilla RF.
- Line 3: "XXXX" = Device PART NUMBER.

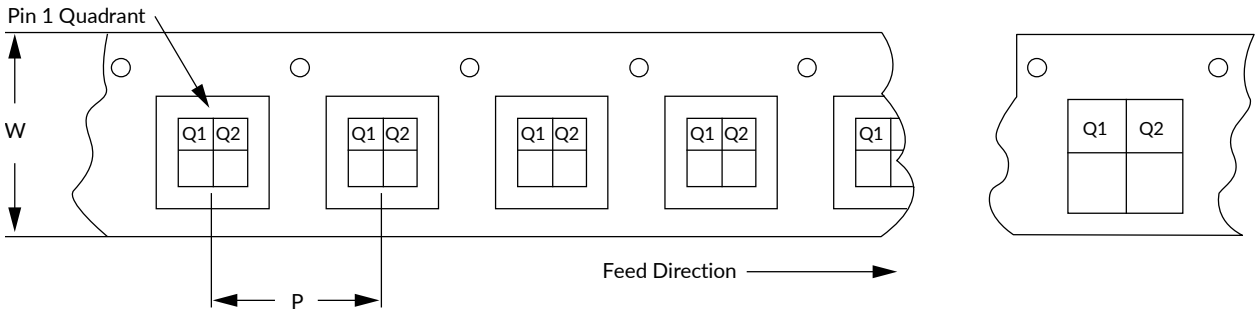
Tape and Reel Information

Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table, which includes units per reel.

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 Tape and Reel Reference Table, please refer to: [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

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Revision History

Revision Date	Description of Change
November 16, 2026	Preliminary Data Sheet

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 limited evaluation board measurements taken within the Guerrilla RF Applications Lab. All parametric values are subject to change pending the collection of additional data.
Release 0	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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