



GRF0110

GaN HEMT Power Transistor 110 Watt P3dB DC to 3.7 GHz

FEATURES

- Operating Frequency Range: DC to 3.7 GHz
- Operating Drain Voltage: 28 and 50 Volt
- Maximum Output Power: 110 Watt (P3dB)
- Suitable for Pulsed, Linear Applications
- 100% DC & RF Production Tested
- NI-360 Air Cavity Ceramic Package

Reference: 50 V / 110 mA / 3.2 GHz

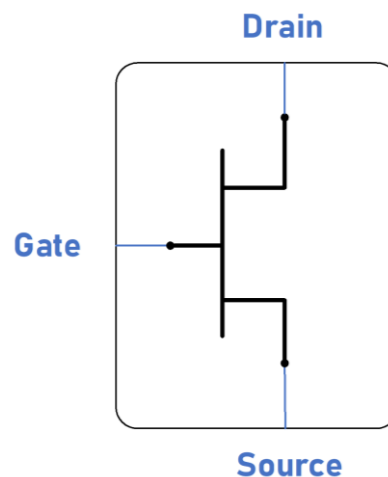
- Saturated Gain: 13.8 dB
- Saturated Drain Efficiency: 70%
- Saturated Output Power: 50.9 dBm

DESCRIPTION

The GRF0110 is a 110 W (P3dB) unmatched discrete GaN-on-SiC HEMT which operates from DC to 3.7 GHz on a 50 V supply rail. The wide bandwidth makes the GRF0110 suitable for a variety of applications including cellular infrastructure, radar, communications, and test instrumentation, and can support both linear and pulse operations. The device is housed in an NI-360 Air Cavity Ceramic package. Lead free and RoHS compliant.

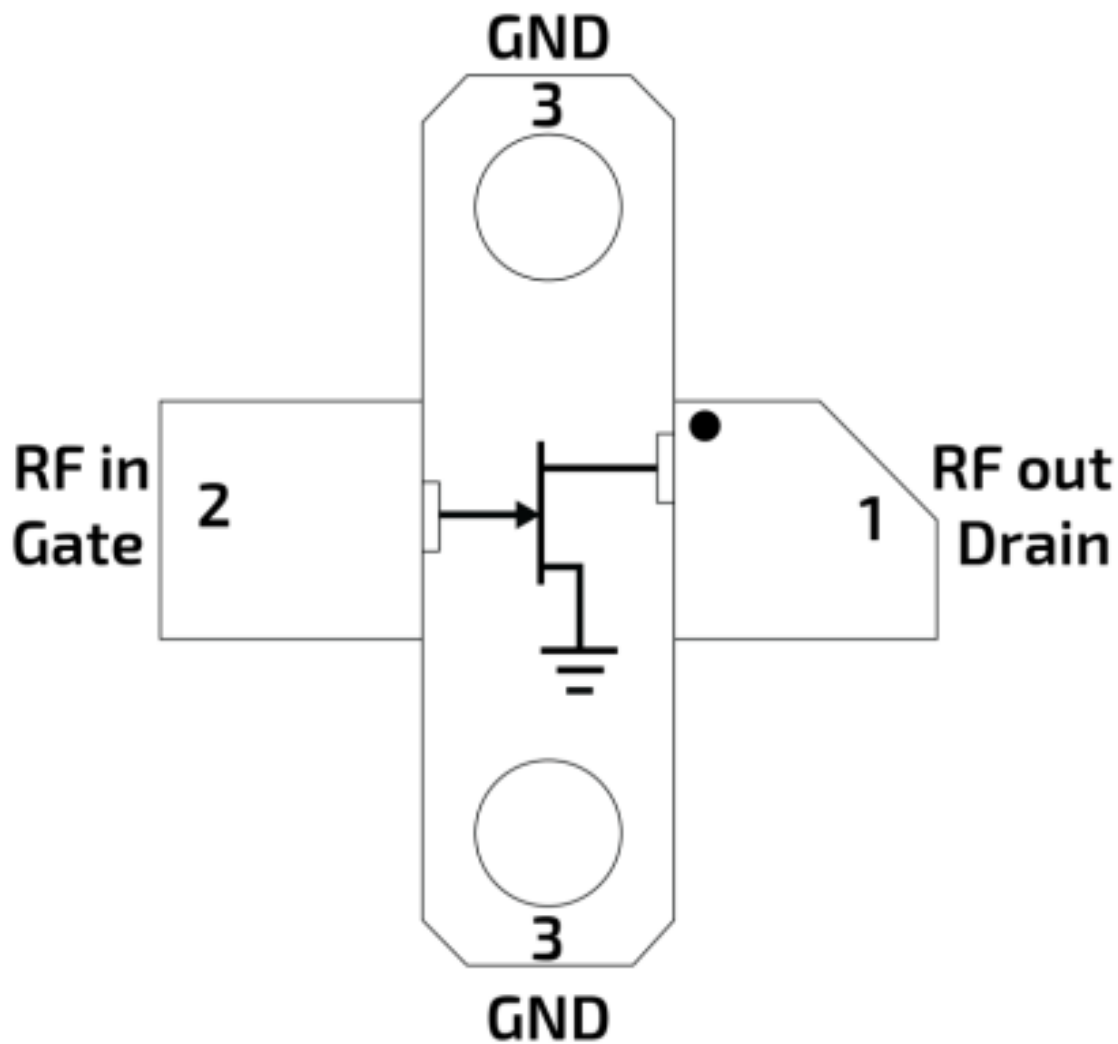
Please consult with the GRF applications engineering team for custom tuning/evaluation board data.

BLOCK DIAGRAM



APPLICATIONS

- Cellular Infrastructure
- Radar
- Communications
- Test Instrumentation



Pin Out (Top View)

Pin Assignments

Pin	Name	Description	Note
Gate	RF_IN	Gate Voltage	Connected to GATE terminal of GaN transistor.
Drain	RF_OUT	Drain Voltage	Connected to DRAIN terminal of GaN transistor.
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 (50 V).
3. Slowly increase V_{GS} to set I_{DQ} current to 110 mA.
4. 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} .

Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Operating Voltage	V_{DS}		55	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	I_D		TBD	mA
RF Input Power: 50 Ω , $V_{DS} = 50$ V, $I_{DS} = 110$ mA, $T_{PKG\ BASE} = 85$ °C.	$P_{IN\ MAX}$		TBD	dBm
RF Input Power: 10:1 VSWR, $V_{DS} = 50$ V, $I_{DS} = 110$ mA, $T_{PKG\ BASE} = 85$ °C.	$P_{IN\ MAX}$		TBD	dBm
Output Mismatch Stress: $V_{DS} = 50$ 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](#)

Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
RF Frequency Range	F_{TEST}	DC		3.7	GHz	Typical application schematic (notes 3 & 4).
Drain to Source Voltage	V_{DS}	TBD	50	TBD	V	Typical application schematic.
Drain Current (Quiescent)	I_{DQ}		110		mA	Typical application schematic.
Drain Current: RF	$I_{D-DRIVE}$	TBD	TBD	TBD	mA	Typical application schematic.
Gate Voltage	V_{GS}		-2.5		V	Typical application schematic.
Gate Current: RF	$I_{G-DRIVE}$		TBD		mA	Typical application schematic, $P_{OUT} = 110$ W.
Operating Temperature	$T_{PKG\ BASE}$	-40		85	°C	On package base.
Gate Port Impedance	Z_{RFIN}		50		Ω	Typical application schematic.
Drain Port Impedance	Z_{RFOUT}		50		Ω	Typical application schematic.

Note 3: Operation outside of this range is possible, but with degraded performance of some parameters.

Note 4: 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 2.2 to 3.2 GHz tuning set, $V_{DS} = 50$ V, $I_{DS} = 110$ mA, $P_{OUT} = 110$ W, $F_{TEST} = 3.2$ GHz, Pulsed CW (100 μ s 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}	150			V	
Drain Source Leakage Current	I_{DLK}		13		mA	$V_{GS} = -8$ V, $V_{DS} = 50$ V.
Drain Current: Quiescent	I_{DQ}		110		mA	No RF applied.
Gate Threshold Voltage	V_{GS}	-3.4		-1.5	V	$V_{DS} = 50$ V.
Gate Bias Voltage	V_{GS}		-2.5		V	
Drain Voltage	V_{DS}		50		V	
Drain Current: RF	$I_{D-DRIVE}$		TBD		mA	RF applied, $P_{OUT} = 110$ W.
Gate Current: RF	$I_{G-DRIVE}$		TBD		mA	RF applied, $P_{OUT} = 110$ W.
Gate Leakage Current	I_{G-LEAK}		TBD		μ A	

Thermal And Reliability Information: Pulsed 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.

Nominal Operating Parameters – RF: DC to 3.2 GHz

The following conditions apply unless noted otherwise: typical application schematic using the 2.2 to 3.2 GHz tuning set, $V_{DS} = 50$ V, $I_{DS} = 110$ mA, $P_{OUT} = 110$ W, $F_{TEST} = 3.2$ GHz, Pulsed CW (100 μ s 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.

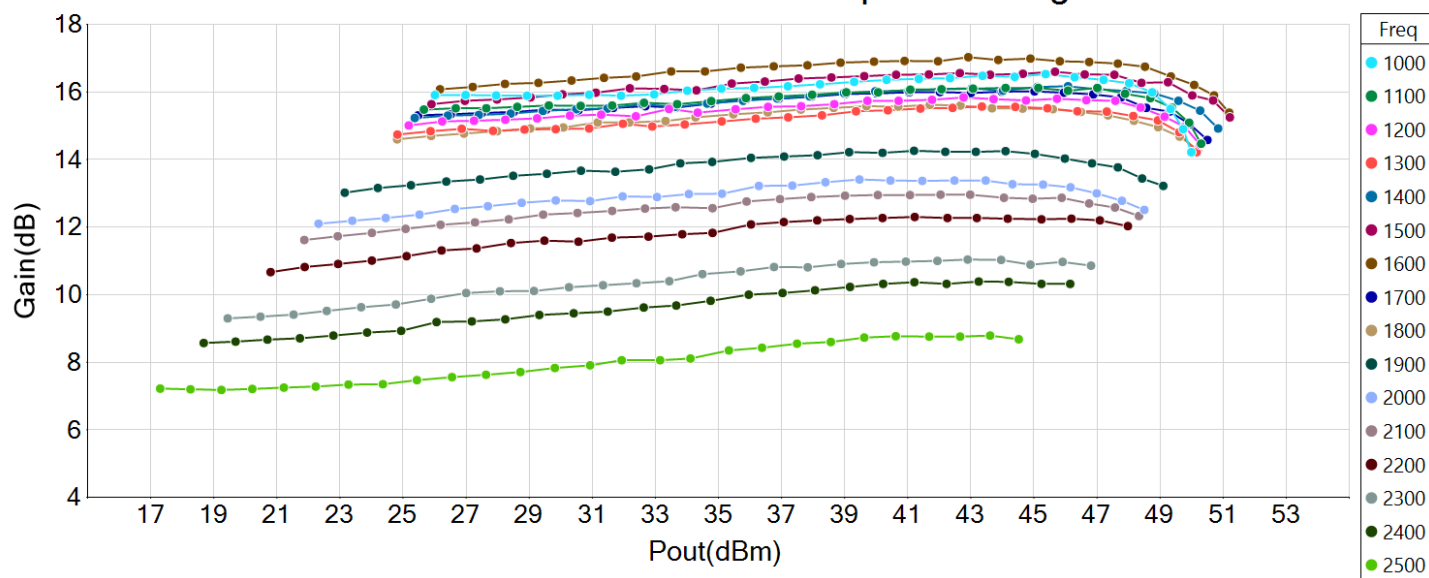
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Small Signal Gain	G_{SS}		15.2		dB	At $I_{DS} \leq 1.1 \cdot I_{DS}$.
Power Gain	G_{MAX}		12.8		dB	Max gain vs. power.
Saturated Gain	G_{SAT}		12.8		dB	At 3 dB compression referenced to G_{MAX} .
Saturated Drain Efficiency	$D_{EFF(SAT)}$		64		%	
Saturated Output Power	P_{SAT}		50.4		dBm	
Ruggedness	Ψ	At 3 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.

Typical Operating Curves: 1.0 to 2.5 GHz, $V_{DS}=50$ V, $I_{DQ}=110$ mA, Pulsed CW (10% duty cycle, 100 μ s pulse width)

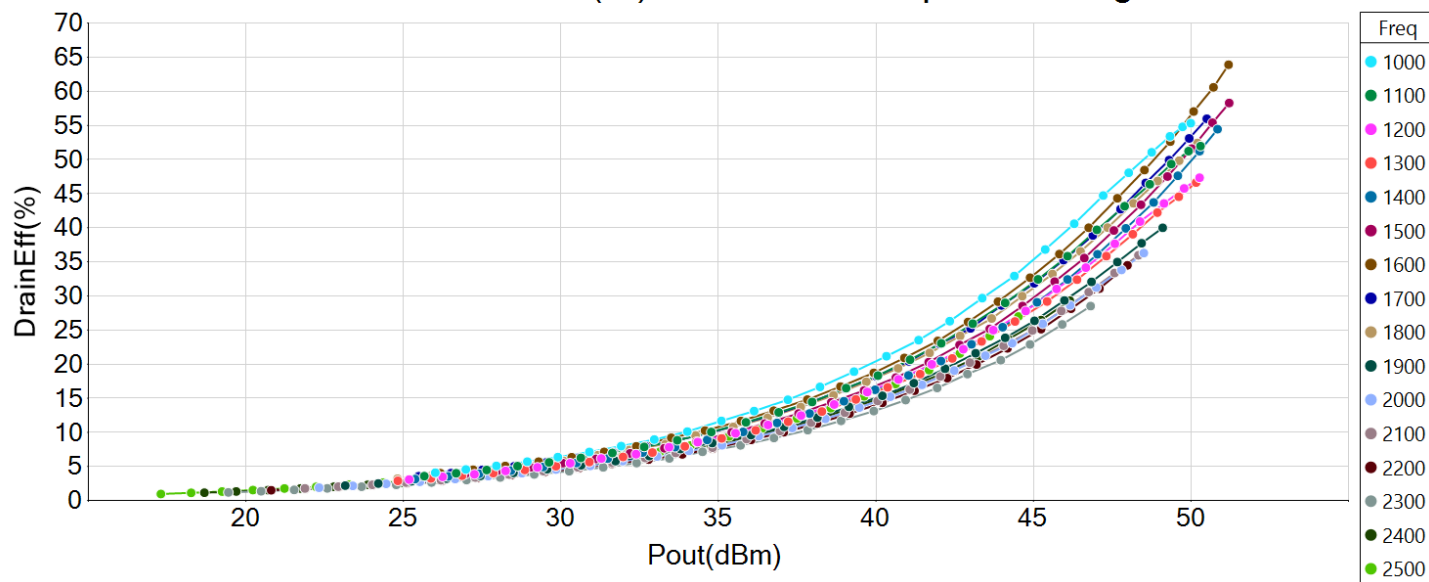
Gain vs. Output Power and Frequency

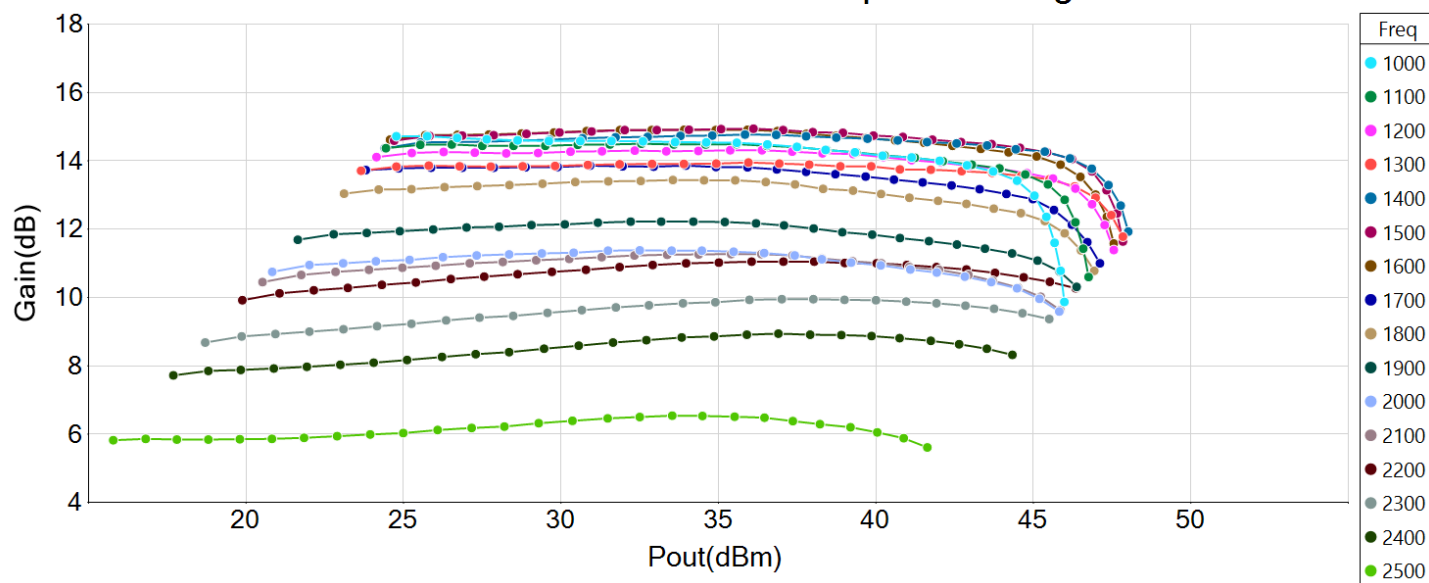
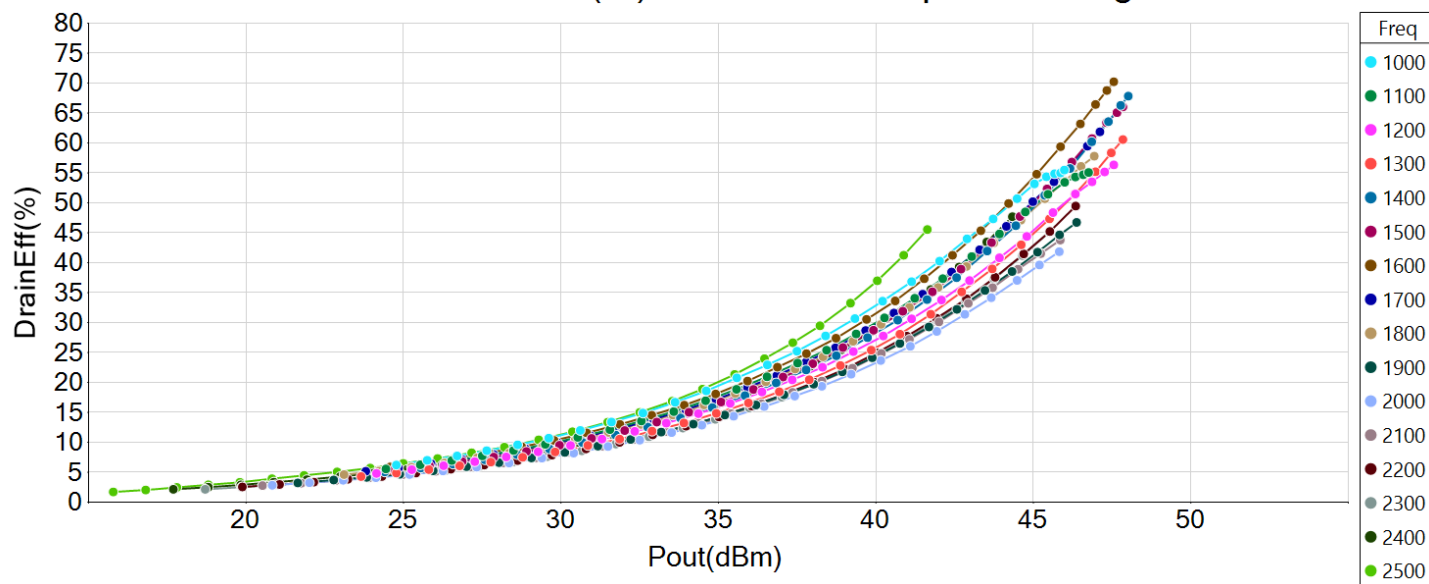
GRF0110 Gain vs Pout at Temp = 25C degC



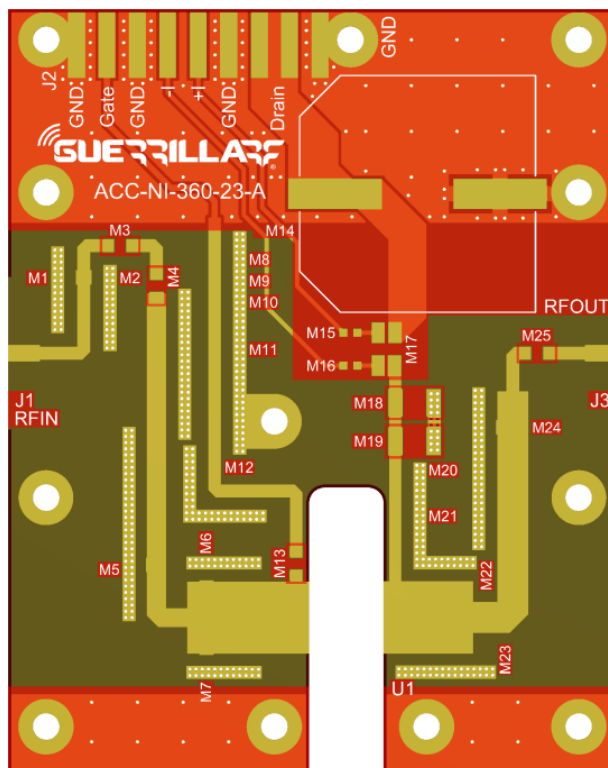
Drain Efficiency vs. Output Power and Frequency

GRF0110 DrainEff(%) vs Pout at Temp = 25C degC



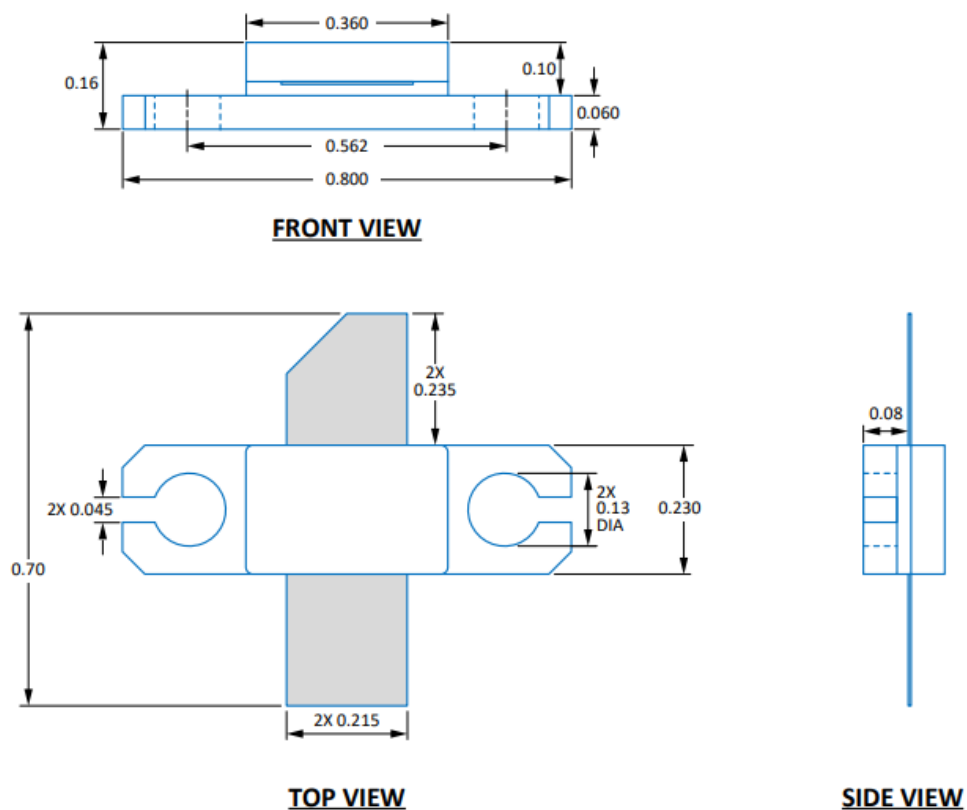
Typical Operating Curves: 2.2 to 3.2 GHz, $V_{DS}=28$ V, $I_{DQ}=110$ mA CW
Gain vs. Output Power and Frequency
GRF0110 Gain vs Pout at Temp = 25C degC

Drain Efficiency vs. Output Power and Frequency
GRF0110 DrainEff(%) vs Pout at Temp = 25C degC


GRF0110 Evaluation Board Assembly Diagram



GRF0110 Evaluation Board Assembly Diagram Reference: 1.1 to 1.7 GHz Tune

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1, M2	Resistor	Various	5%	1 K Ω	0805	ok
M3	Resistor	Various	5%	10 Ω	0805	ok
M4, M21, M25	Capacitor	Johansen	N/A	33 pF	0805	no
M5, M6, M7	Capacitor	Johansen	N/A	1.8 pF	0805	no
M8	Capacitor	Murata	GRM	10 nF	0805	ok
M9	Resistor	Various	N/A	10 K Ω	0805	ok
M10	Capacitor	Murata	GCM	100 nF	0805	ok
M11	Capacitor	Murata	GRM	22 pF	0805	no
M13	Resistor	Various	5%	5.1 Ω	0805	ok
M14	Capacitor	Various	N/A	220 μ F		ok
M15, M16	Resistor	Various	5%	1 K Ω	0603	ok
M17	Resistor	Ohmite	LVK	0.01 Ω	1206	ok
M18, M19	Capacitor	Murata	GRM	10 μ F	1210	ok
M22	Capacitor	Johansen	N/A	2.0 pF	0805	no
M23	Capacitor	Johansen	N/A	2.7 pF	0805	no
M24	Capacitor	Johansen	N/A	1.0 pF	0805	no
J1, J3	SMA Connector	Various	--	--	--	--
J2	DC Connector	Various	--	--	--	--
U1	GRF0110	Guerrilla RF	--	--	--	no
Evaluation Board	ACC-Ni-360-23-A	--	--	--	--	--



NI-360 Air Cavity Ceramic Package (ACC)

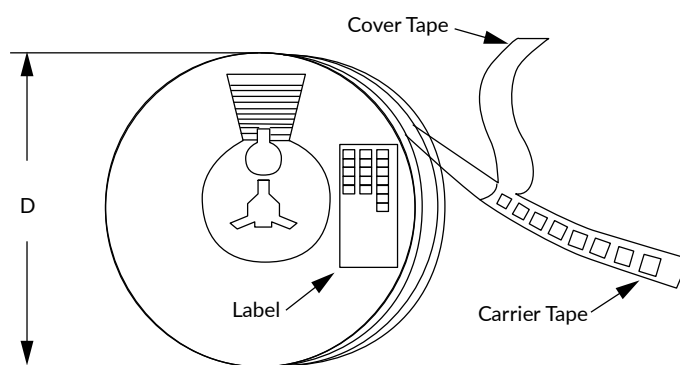
Package Dimensions and Suggested PCB Footprint (Top View)

Tape and Reel Information

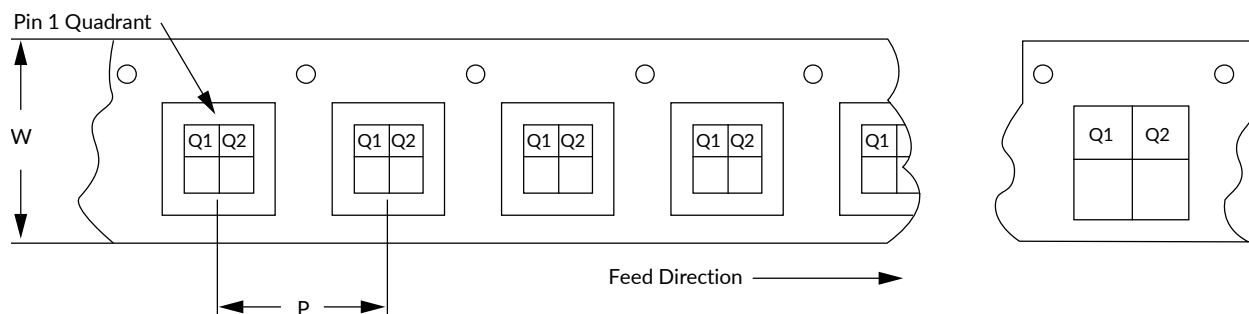
Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table, 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: <https://www.guerrilla-rf.com/prodFiles/Manufacturing/MN001.pdf>



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
August 10, 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 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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