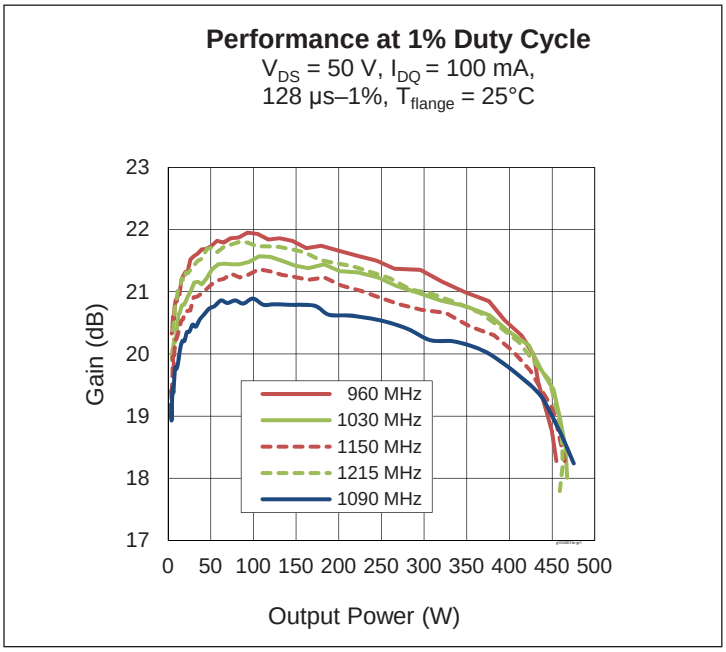
GTVA104001FA

Thermally-Enhanced High Power RF GaN on SiC HEMT
400 W, 50 V, 960 – 1215 MHz

Description

The GTVA104001FA is a 400-watt GaN on SiC high electron mobility transistor (HEMT) for use in the 960 to 1215 MHz frequecy band. It features input matching, high efficiency, and a thermally-enhanced surface-mount package with earless flange.

GTVA104001FA
Package H-37265J-2



Features

- GaN on SiC HEMT technology
- Input matched
- Typical pulsed CW performance: pulse width = 128 µs, duty cycle = 10%, 960 - 1215 MHz, V_{DS} = 50 V, I_{DQ} = 100 mA
  - Output power = 400 W
  - Drain Efficiency = 70 %
  - Gain = 19 dB
- Human Body Model Class 2 (per ANSI/ESDA/JEDEC JS-001)
- Capable of handling 10:1 VSWR (all phase angles) at V_{DS} = 50 V, I_{DQ} = 100 mA, f = 1090 MHz, P_{OUT} = 400 W peak
- Pb-free and RoHS compliant

RF Characteristics

Pulsed RF Performance Specifications (tested in Wolfspeed production Doherty test fixture)
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 390 W peak, f = 1030 MHz, 128 µs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	18.5	19.5	21.5	dB
Drain Efficiency	η_D	73	77	—	%

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-source Breakdown Voltage	V_{GS} = –8 V, I_D = 10 mA	$V_{(BR)DSS}$	150	—	—	V
Drain-source Leakage Current	V_{GS} = –8 V, V_{DS} = 10 V	I_{DSS}	—	—	5.8	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 42 mA	$V_{GS(th)}$	–3.8	–3.0	–2.3	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Drain Operating Voltage		V_{DD}	0	—	50	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 0.11 A	$V_{GS(Q)}$	—	–2.8	—	V

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	125	V
Gate-source Voltage	V_{GS}	–10 to +2	V
Gate Current	I_G	20	mA
Drain Current	I_D	4.6	A
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

Thermal Characteristics

T_{FLANGE} = 70°C, P_{DISS} = 100 W, V_{DD} = 50 V, I_{DQ} = 100 mA, 400 W (peak), 1030 MHz, 128 µs pulse width, 10% duty cycle

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.14	°C/W

Ordering Information

Device

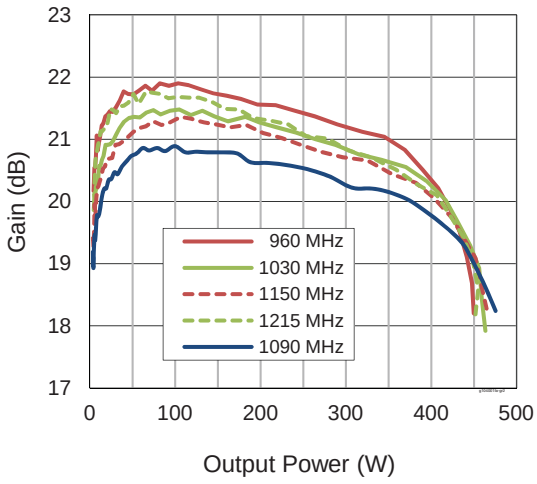
Type and Version	Order Code	Package	Shipping
GTVA104001FA V1 R0	GTVA104001FA-V1-R0	H-37265J-2, earless flange	Tape & Reel, 50 pcs
GTVA104001FA V1 R2	GTVA104001FA-V1-R2	H-37265J-2, earless flange	Tape & Reel, 250 pcs

Evaluation Board

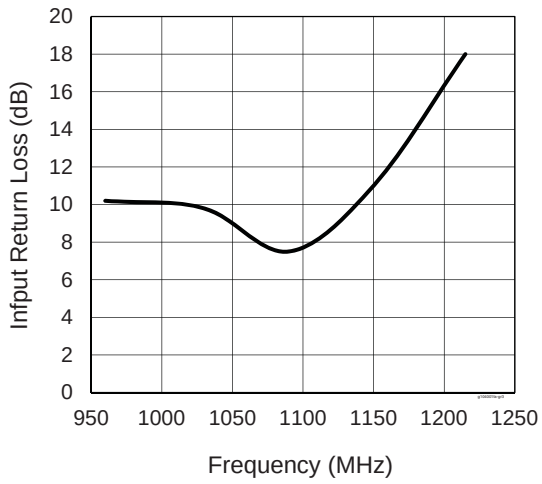
Type and Version	Frequency	Description
LTN/GTVA104001FA-V1	960 – 1215 MHz	Class AB, Rogers 3010, 0.64 mm [0.025"] thick, 2 oz. copper, ε_r = 10.2

Typical Performance (data taken in an Infineon production test fixture)

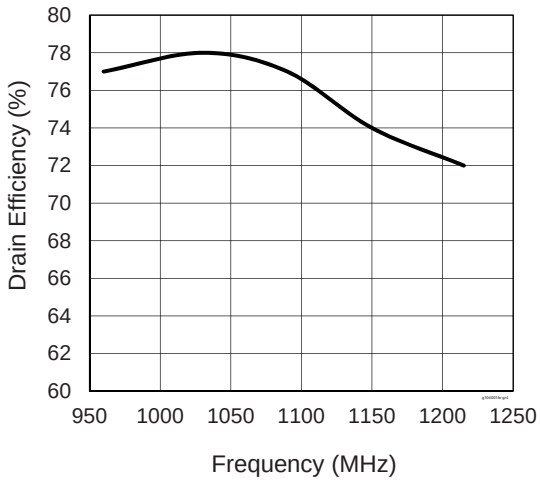
Performance at 10% Duty Cycle
V_{DS} = 50 V, I_{DQ} = 100 mA,
128 µs–10%, T_{flange} = 25°C



Input Return Loss
V_{DS} = 50 V, I_{DQ}= 100 mA,
P_{OUT} = 400 W_{PEAK},128 µs–10%



Drain Efficiency
V_{DS} = 50 V, I_{DQ}= 100 mA,
P_{OUT} = 400 W_{PEAK},128 µs–10%



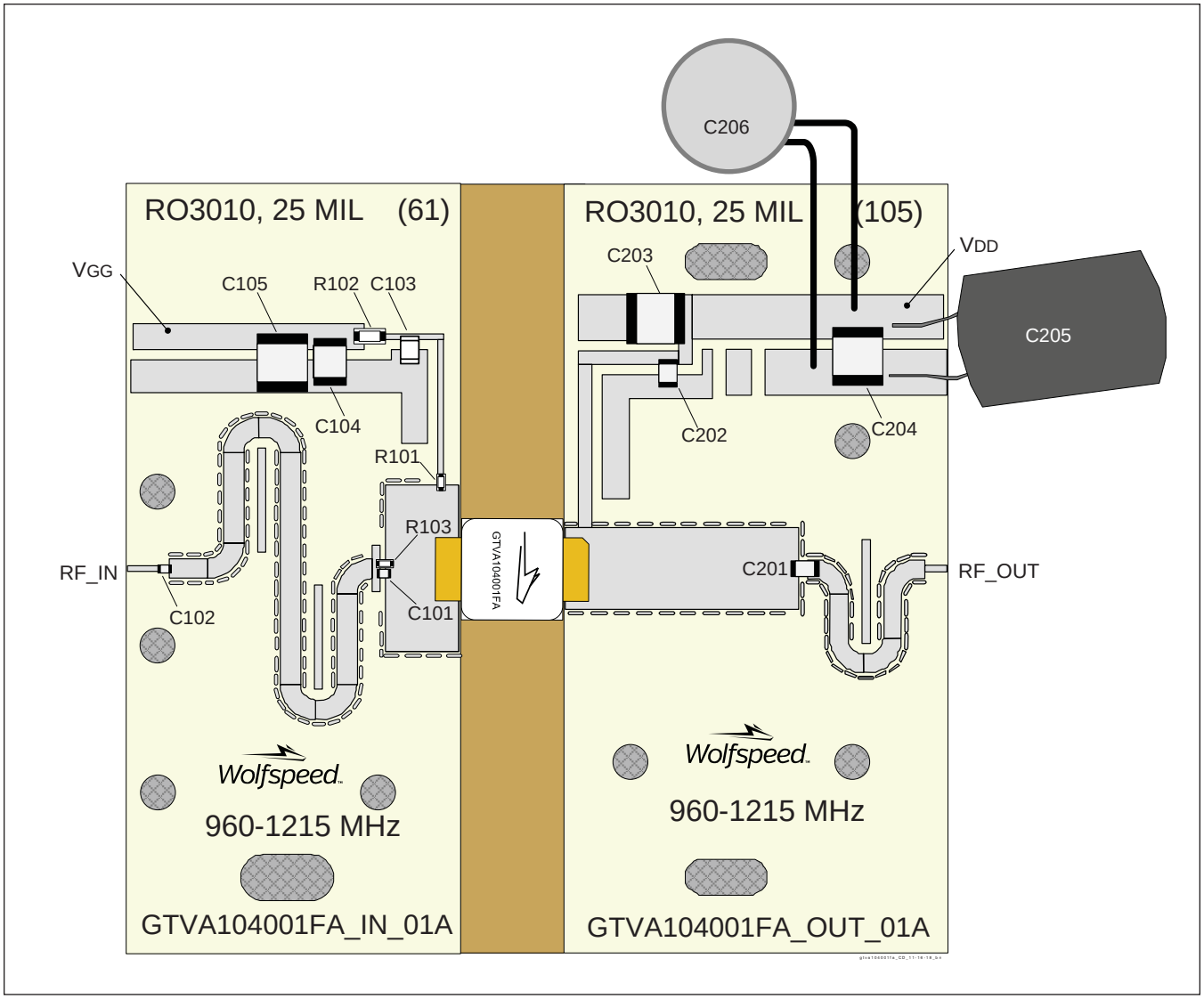
Load Pull Performance

Pulsed CW signal: 16 µsec, 10% duty cycle, 50 V, 100 mA, class AB

		P_{3dB}													
		Max Output Power					Max PAE					Z Optimum			
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]
960	0.38 – j2.87	3.22 – j1.38	18.89	70.9	56.99	500	4.11 – j0.9	19.60	73.5	56.40	437	5.19 – j0.35	19.72	74.6	55.61	364
1030	0.61 – j3.12	2.08 + j0.09	18.88	64.7	56.75	473	3.35 + j0.1	19.30	72.6	56.00	398	4.31 + j0.38	19.75	72.4	55.61	364
1090	0.74 – j3.26	2.32 – j0.15	18.71	65.7	56.78	476	3.21 + j0.07	19.35	71.7	56.40	437	3.94 + j0.32	19.46	72.9	55.98	396
1150	1.29 – j4.30	2.79 – j0.45	18.51	68.4	56.83	482	3.56 + j0.17	19.00	73.4	56.50	447	4.44 + j0.47	19.27	73.2	55.75	376
1215	1.89 – j4.87	2.65 – j0.76	18.47	65.1	56.79	478	3.60 – j0.51	18.95	69.5	56.40	437	4.80 + j0.11	19.02	72.2	55.65	367

Reference Circuit tuned for 960 to 1215 MHz

Reference Circuit Assembly	
DUT	GTVA104001FA V1
Test Fixture Part No.	LTN/GTVA104001FA-V1
PCB	Rogers 3010, 0.64 mm [0.025"] thick, 2 oz. copper, ε_r = 10.2
Find Gerber files for this test fixture on the Wolfspeed Web site at **http://www.wolfspeed.com/RF**	



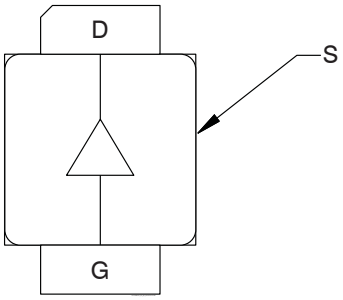
Assembly diagram (not to scale)

Reference Circuit (cont.)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C102	Capacitor, 56 pF	ATC	ATC100A560JW150XB
C103	Capacitor, 56 pF	ATC	ATC100B560JW500XB
C104	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C105	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
R101, R103	Resistor, 10 ohms	Panasonic – ECG	ERJ-3GEYJ100V
R102	Resistor, 5.6 ohms	Panasonic – ECG	ERJ-8RQJ5R6V
Output			
C201, C202	Capacitor, 10 pF	ATC	ATC100B560JW500XB
C203, C204	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C205	Capacitor, 220 µF	Panasonic Electronic Components	ECA-2AHG221
C206	Capacitor, 3300 µF	Nichicon	UVR2A332MRD

Pinout Diagram (top view)



Pin	Description
D	Drain
G	Gate
S	Source (flange)

Package Outline Specifications

Package H-37265J-2

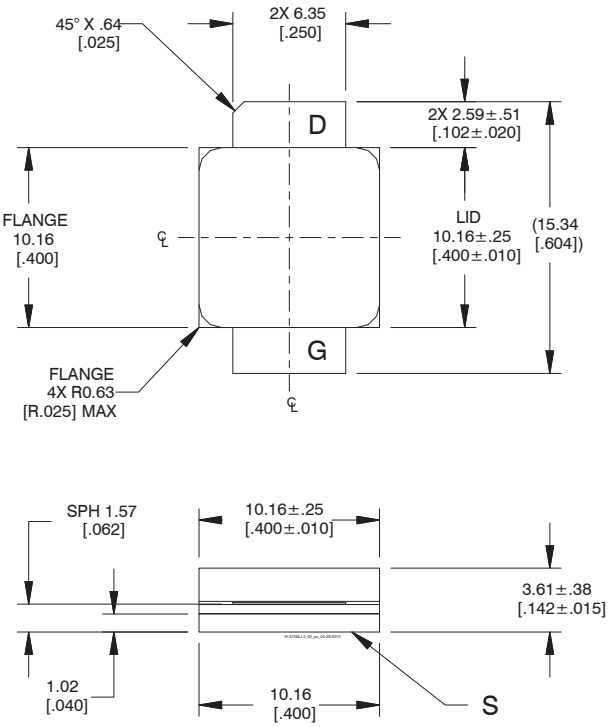


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Pins: D – drain; G – gate; S – source.
5. Lead thickness: 0.10 + 0.051/-0.025 mm [.004 +0.002/-0.001 inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Revision History

Revision	Date	Data Sheet	Page	Subjects (major changes at each revision)
01	2016-05-03	Advance	All	Proposed specifications for new product development
02	2018-05-08	Advance	All	Converted to Wolfspeed Data Sheet, updated DC and thermal characteristics
03	2018-11-14	Production	All	Showing released product specifications, including updated characteristics tables, performance graphs, reference circuit information

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Notes

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