GTVA311801FA

Thermally-Enhanced High Power RF GaN on SiC HEMT
180 W, 50 V, 2700 – 3100 MHz

GTVA311801FA
Package H-36275-4

Description

The GTVA311801FA is a 180-watt GaN on SiC high electron mobility transistor (HEMT) for use in the 2700 to 3100 MHz frequecy band. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.

Features

- GaN on SiC HEMT technology
- Broadband internal input matching
- Typical pulsed CW performance (class AB), 2700 – 3100 MHz, 50 V, 300 µs pulse width, 10% duty cycle
  - Output power at P_{3dB} = 180 W
  - Drain efficiency = 65%
  - Gain (P_{3dB}) = 15.5 dB
- Capable of handling 10:1 VSWR @ 50 V, 150 W CW output power
- Human Body Model Class 1B (per ANSI/ESDA/JEDEC JS-001)
- Pb-free and RoHS compliant

RF Characteristics[1]

Pulsed CW Specifications (tested in Wolfspeed class AB test fixture)
V_{DD} = 50 V, I_{DQ} = 20 mA, $P_{OUT(PEAK)}$ = 180 W, f = 3100 MHz, pulse width = 128 µs, duty cycle = 10%

Characteristics	Symbol	Min	Typ	Max	Units
Gain	G_{ps}	13.5	15.5	-	dB
Drain Efficiency	ηD	56	60	-	%

Note [1]: All published data at T_{CASE} = 25°C unless otherwise indicated.

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}	—	—	8.32	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 21 mA	$V_{GS(th)}$	–3.8	–3.0	–2.3	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Voltage		V_{DD}	0	—	50	V
Gate Quiescent Voltage	V_{DS} = 50 V, I_D = 20 mA	$V_{GS(Q)}$	—	–3.0	—	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	7.5	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

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case (T_{CASE} = 70°c, 150 W CW)	$R_{\theta JC}$	1.16	°C/W

Electrical Characteristics When Tested in GTVA311801FA-V1

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
RF Characteristics[1] (T_C = 25 °C, F = 2.7 - 3.1 GHz unless otherwise noted)						
Output Power[2]	P_{OUT}	–	52	–	dBm	V_{DD} = 50 V, I_{DQ} = 20 mA, P_{IN} = 37 dBm
Drain Efficiency[2]	η	–	60	–	%	V_{DD} = 50 V, I_{DQ} = 20 mA, P_{IN} = 37 dBm
Gain[2]	G	–	15	–	dB	V_{DD} = 50 V, I_{DQ} = 20 mA, P_{IN} = 37 dBm

[1] Measured in the GTVA311801FA-V1 Application Circuit
[2] Pulsed 300 µs, 10% Duty Cycle

Typical Performance of the GTVA311801FA-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 20 mA, PW = 300 us, DC = 10%, Operating Temp = +25 °C, P_{IN} = 37 dBm

Figure 1. Input Power vs Gain as a Function of Frequency

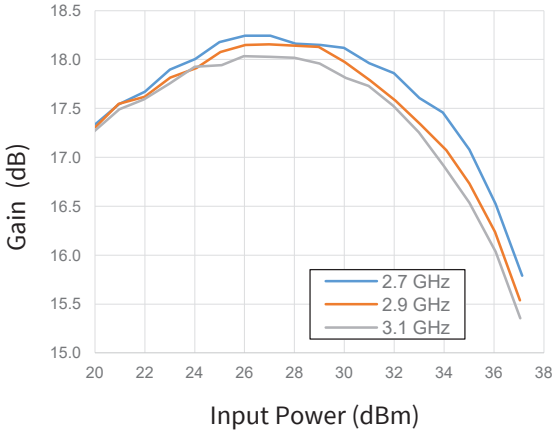


Figure 2. Input Power vs Drain Efficiency as a Function of Frequency

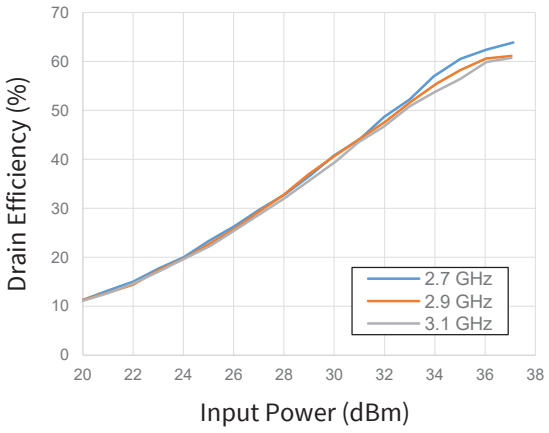


Figure 3. Input Power vs Output Power as a Function of Frequency

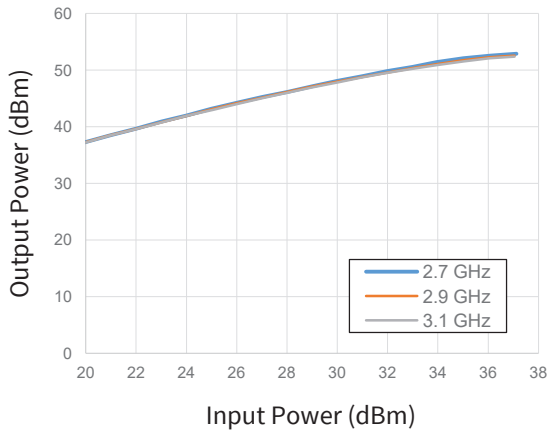
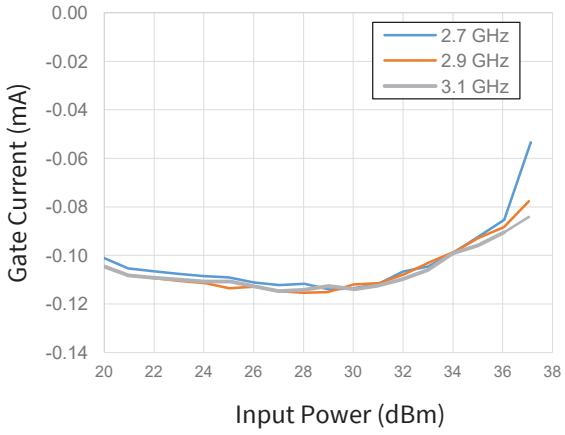


Figure 4. Input Power vs Gate Current as a Function of Frequency



Typical Performance of the GTVA311801FA-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 20 mA, PW = 300 us, DC = 10%, Operating Temp = +25 °C, P_{IN} = 37 dBm

Figure 5. Input Power vs Peak Drain Current as a Function of Frequency

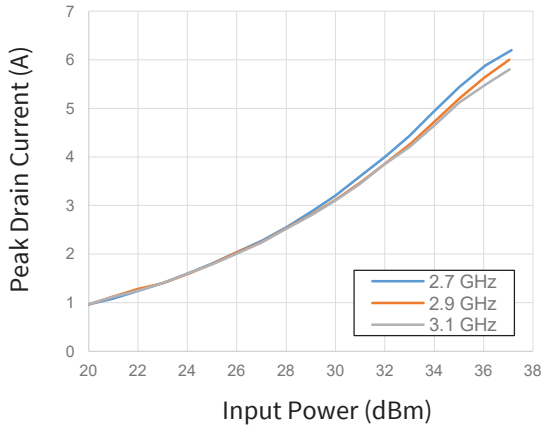


Figure 6. Gain vs Frequency

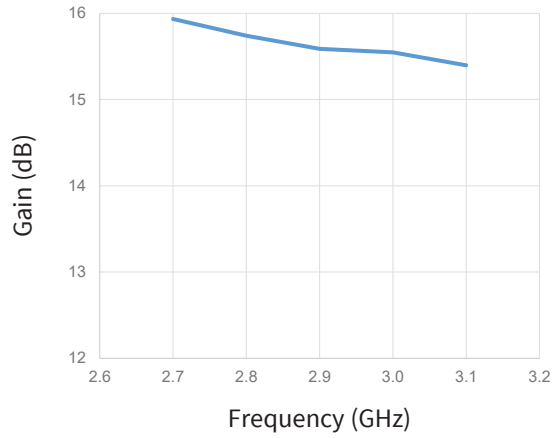


Figure 7. Drain Efficiency vs Frequency

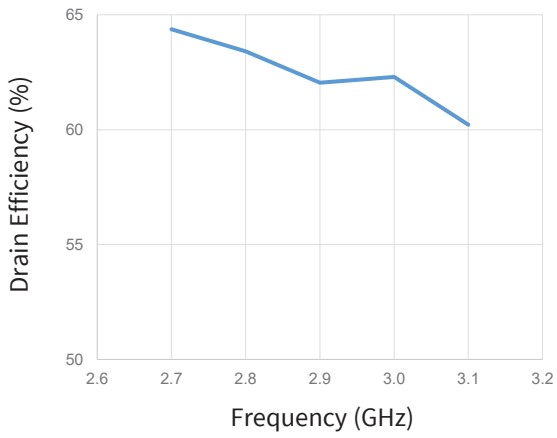


Figure 8. Output Power vs Frequency

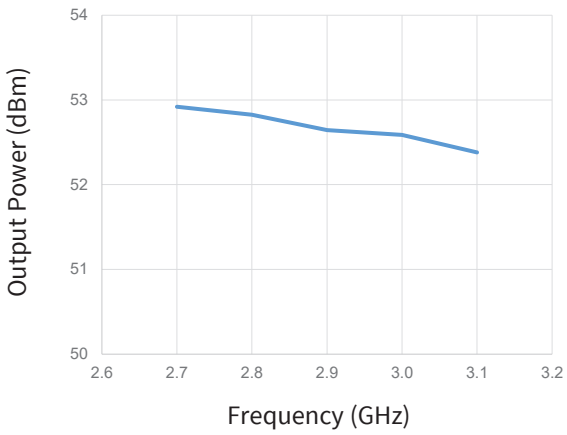
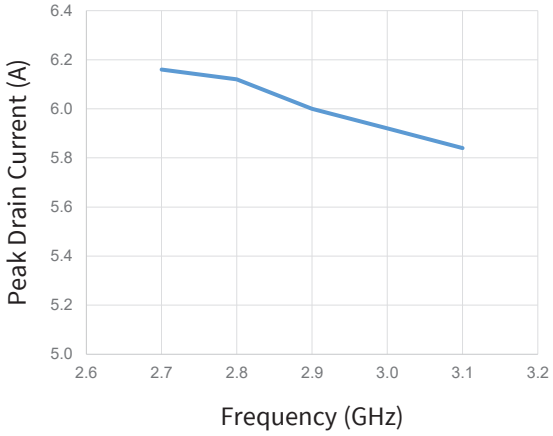


Figure 9. Peak Drain Current vs Frequency



Typical Performance of the GTVA311801FA-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 200 mA, Operating Temp = +25 °C, P_{IN} = -20 dBm

Figure 10. S21 Wide Band-Gain vs Frequency

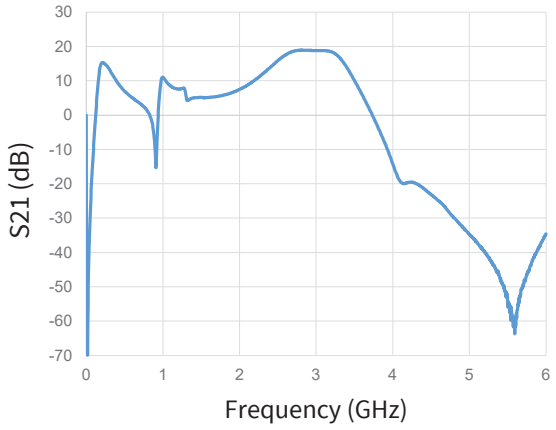


Figure 11. S21 Narrow Band-Gain vs Frequency

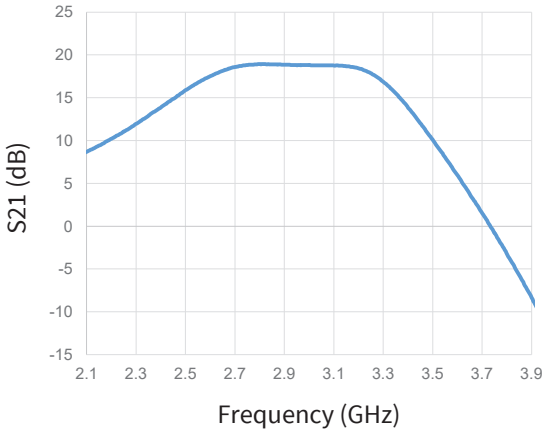


Figure 12. S22 Wide Band RL vs Frequency

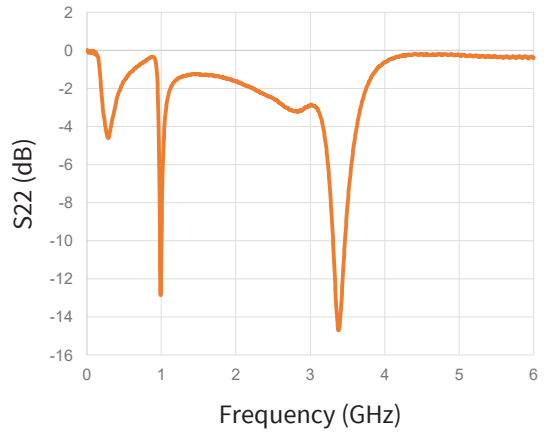


Figure 13. S22 Narrow Band RL vs Frequency

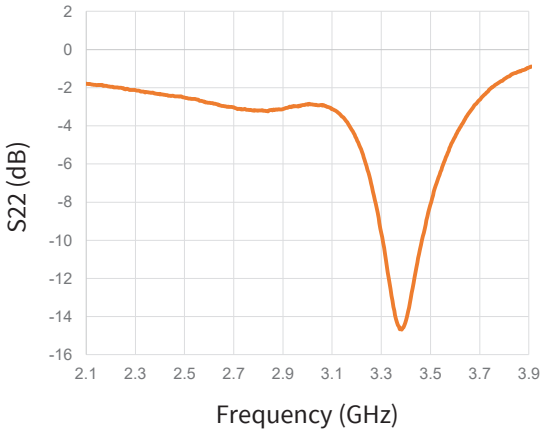


Figure 14. S11 Wide Band RL vs Frequency

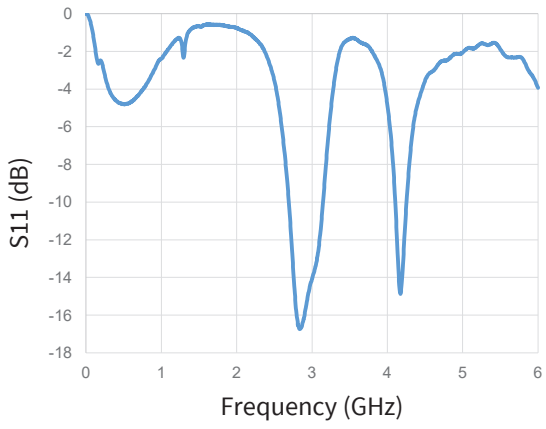
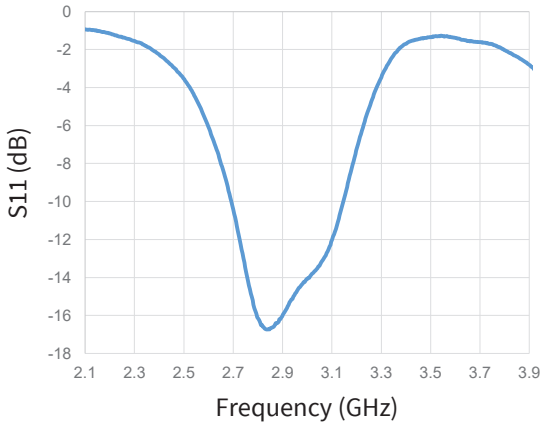
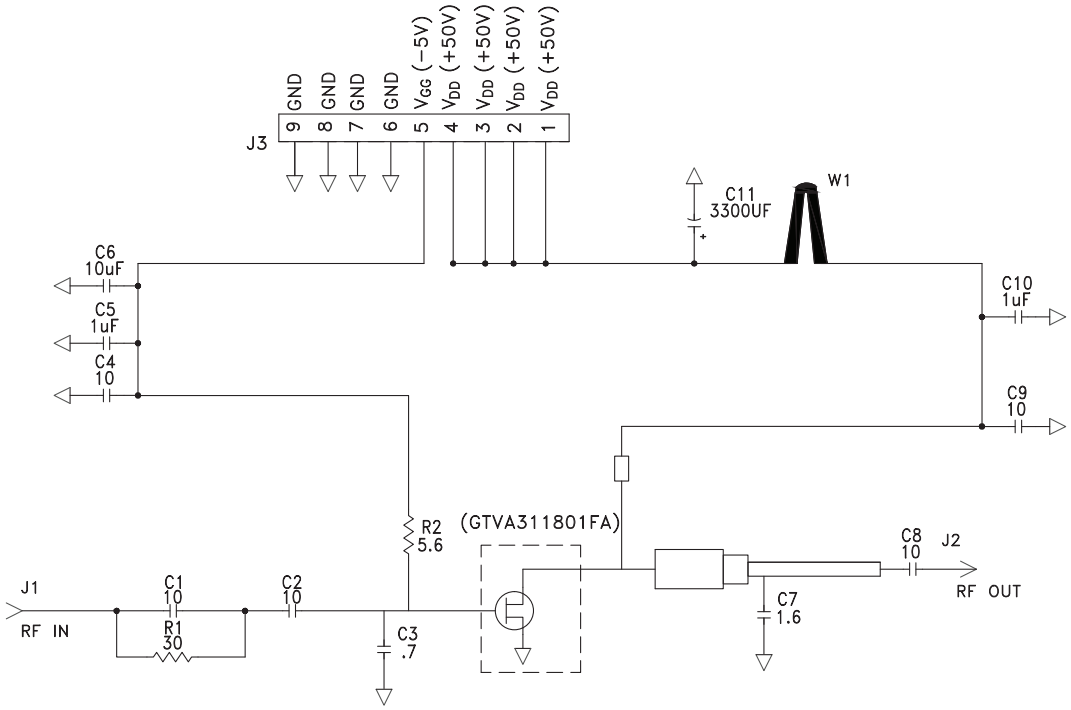


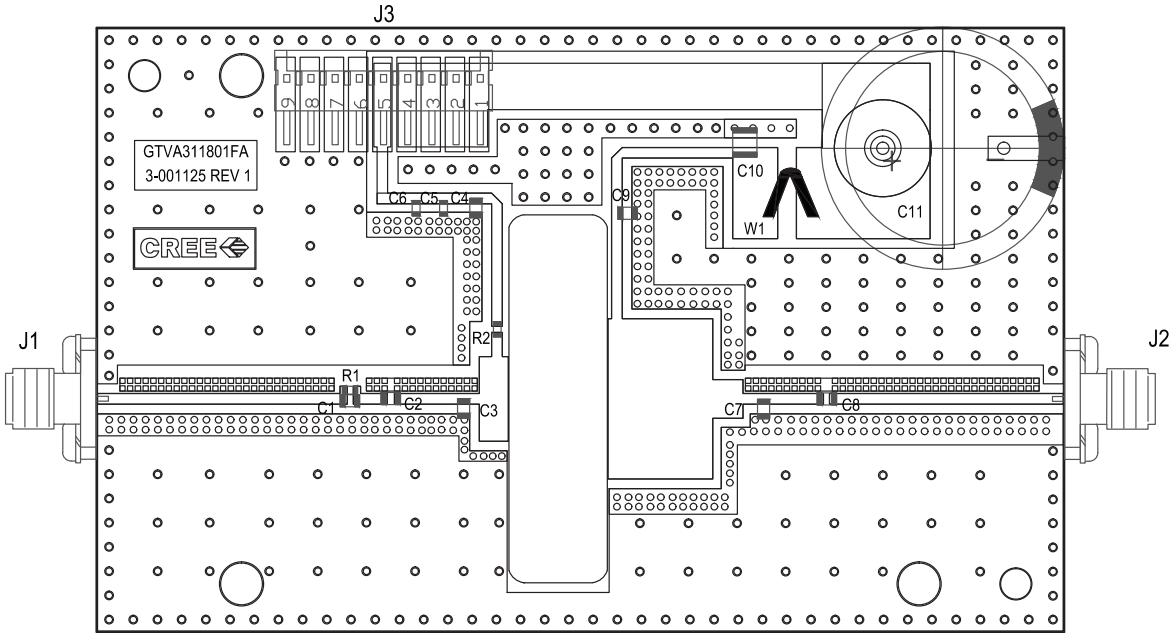
Figure 15. S11 Narrow Band RL vs Frequency



GTVA311801FA-V1 Application Circuit Schematic



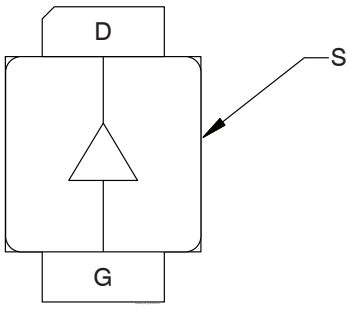
GTVA311801FA-V1 Application Circuit



GTVA311801FA-V1 Application Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 30 OHMs, +/- 1%, 0603	1
R2,	RES, 5.6 OHMS, +/- 1%, 0603	1
C1,C2, C4, C8, C9	CAP, 10pF, 0805, ATC 600F	5
C3	CAP, .7pF, 0805, ATC, 600F	1
C5	CAP, 1uF, 0603, ATC 600S	1
C6,	CAP, 10uF, 0603	4
C7	CAP, 1.6pF, 0805, ATC, 600F	1
C10	CAP, 1uF, +/- 10%, 100V,	1
C11	CAP, 3300uF	4
	Baseplate 2.5” x 4”, CU, custom	1
W1	Wire, 3.25”, 18AWG	2
Q1	Transistor, GTVA311801FA	1

Pinout Diagram (top view)



Pin	Description
D	Drain
G	Gate
S	Source (flange)

Package Outline Specifications

Package H-37265J-2

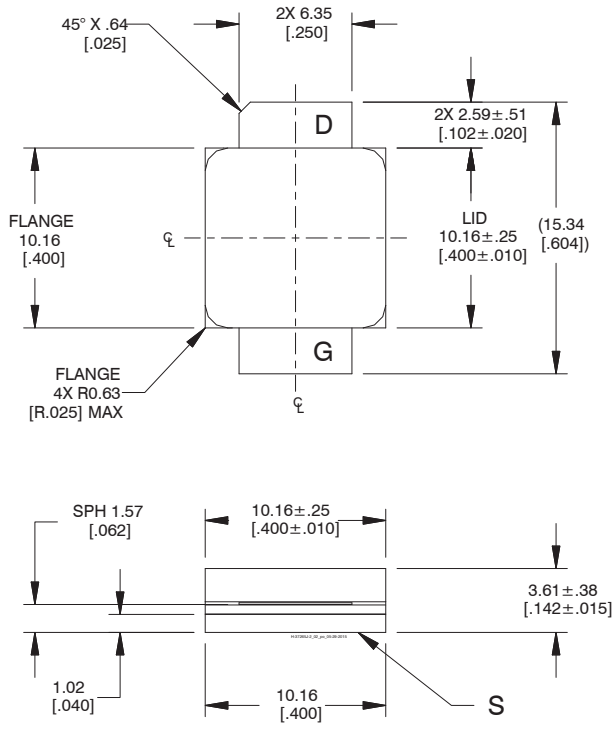


Diagram Notes—unless otherwise specified:

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].

Product Ordering Information

Order Number	Description	Unit of Measure	Image
GTVA311801FA-V1-R0	GaN HEMT, Tape & Reel, 50 pcs	Each	
GTVA311801FA-V1-R2	GaN HEMT, Tape & Reel, 250 pcs	Each	
LTN/GTVA311801FA V1	Test Board with GaN HEMT installed IFF, 2700 - 3100 MHz	Each	

For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/rf

Sales Contact
rfsales@cree.com

Notes & Disclaimer

Specifications are subject to change without notice. “Typical” parameters are the average values expected by Cree in large quantities and are provided for information purposes only. Cree products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. No responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from use of the information contained herein. No license is granted by implication or otherwise under any patent or patent rights of Cree.