

GTVA311801FA

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

Description

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



GTVA311801FA
Package H-36275-4

Features

- GaN on SiC HEMT technology
- Broadband internal input matching
- Typical pulsed CW performance (class AB), 2700 – 3100 MHz, 50 V, 300 μ s 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 Characteristics¹

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 μ s, duty cycle = 10%

Characteristics	Symbol	Min	Typ	Max	Units
Gain	G_{ps}	13.5	15.5	-	dB
Drain Efficiency	η_D	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	$V_{GS} = -8\text{ V}, I_D = 10\text{ mA}$	$V_{(BR)DSS}$	150	—	—	V
Drain-source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$	I_{DSS}	—	—	8.32	mA
Gate Threshold Voltage	$V_{DS} = 10\text{ V}, I_D = 21\text{ mA}$	$V_{GS(th)}$	-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	$V_{DS} = 50\text{ V}, I_D = 20\text{ mA}$	$V_{GS(Q)}$	—	-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 ($T_{CASE} = 70^\circ\text{C}, 150\text{ W CW}$)	$R_{\theta JC}$	1.16	°C/W



Electrical Characteristics When Tested in GTVA311801FA-V1

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
RF Characteristics¹ (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

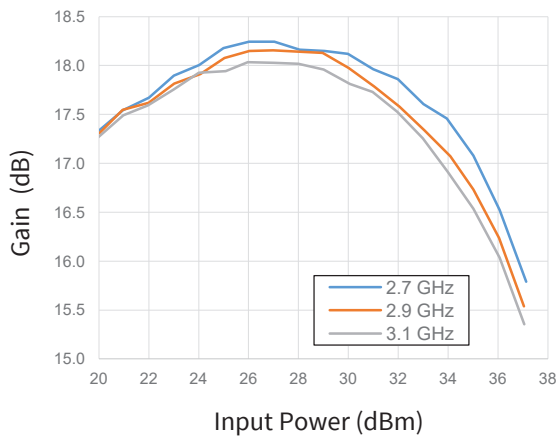


Figure 2. Input Power vs Drain Efficiency as a Function of Frequency

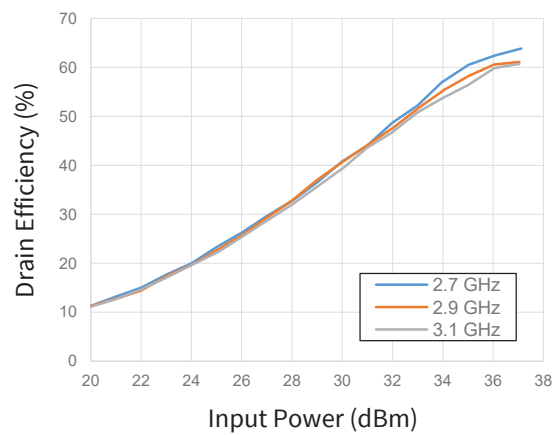


Figure 3. Input Power vs Output Power as a Function of Frequency

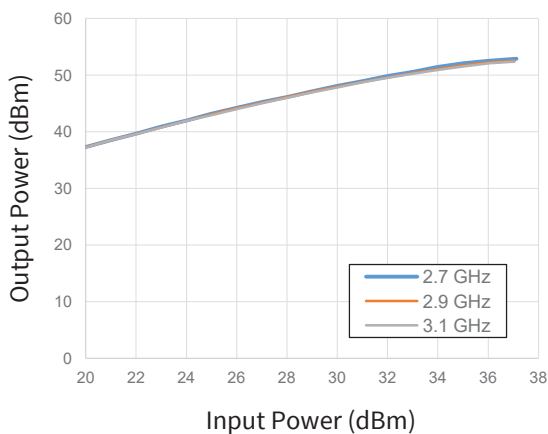
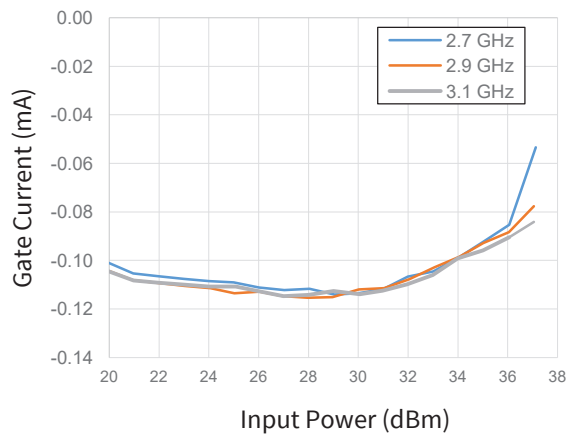


Figure 4. Input Power vs Gate Current as a Function of Frequency





Typical Performance of the GTVA311801FA-V1

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

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

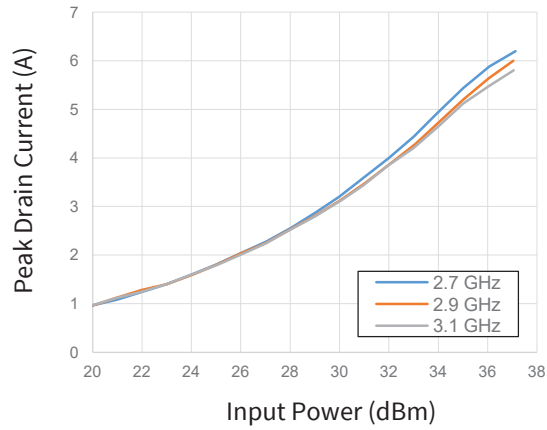


Figure 6. Gain vs Frequency

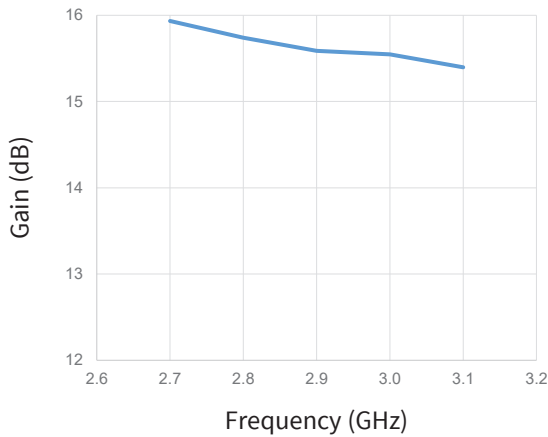


Figure 7. Drain Efficiency vs Frequency

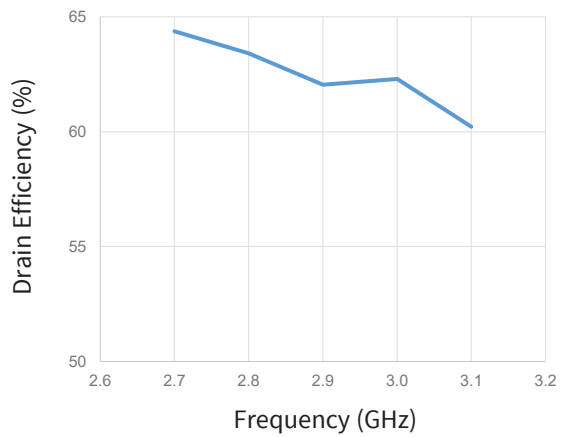


Figure 8. Output Power vs Frequency

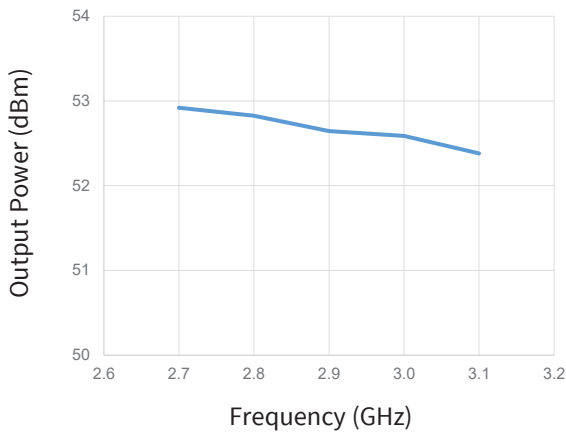
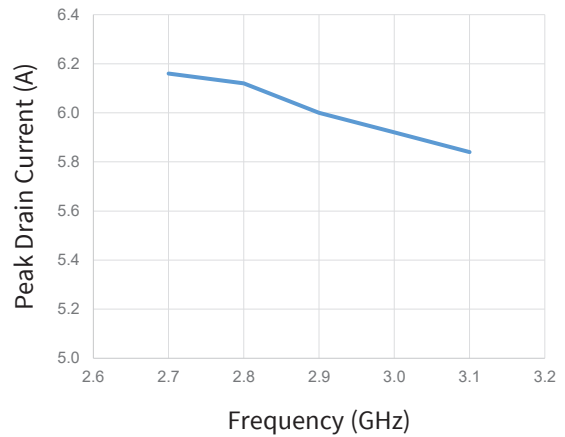


Figure 9. Peak Drain Current vs Frequency





Typical Performance of the GTVA311801FA-V1

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

Figure 10. S21 Wide Band-Gain vs Frequency

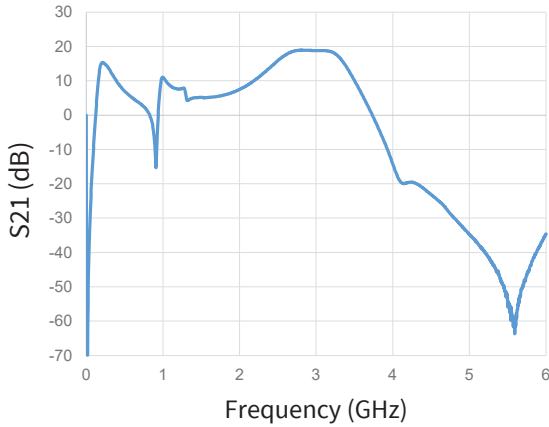


Figure 11. S21 Narrow Band-Gain vs Frequency

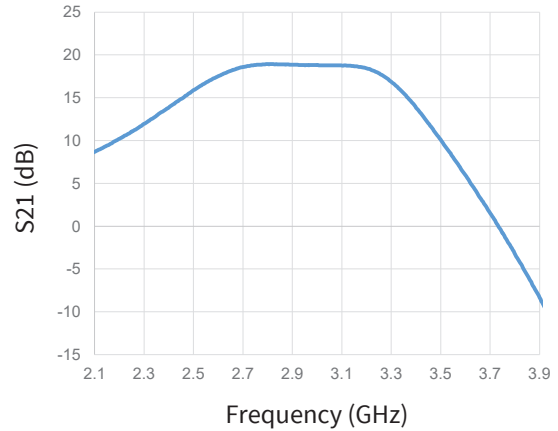


Figure 12. S22 Wide Band RL vs Frequency

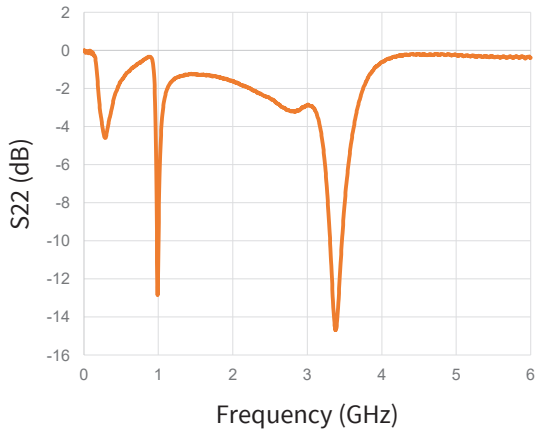


Figure 13. S22 Narrow Band RL vs Frequency

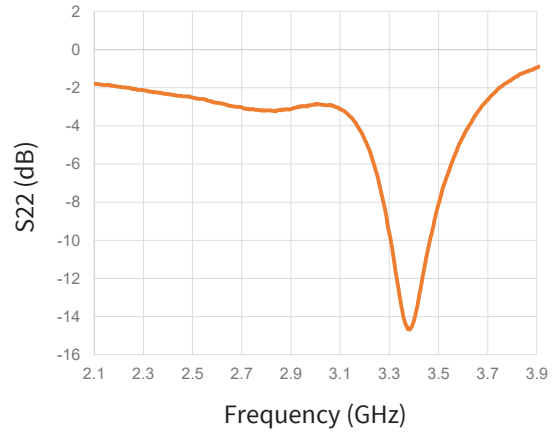


Figure 14. S11 Wide Band RL vs Frequency

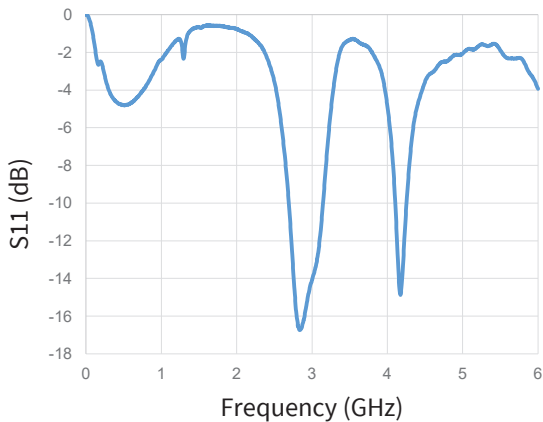
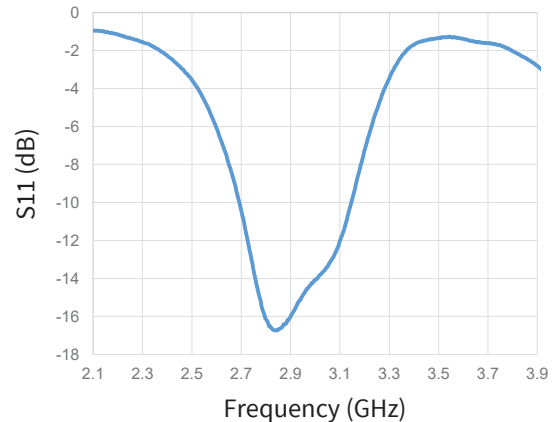
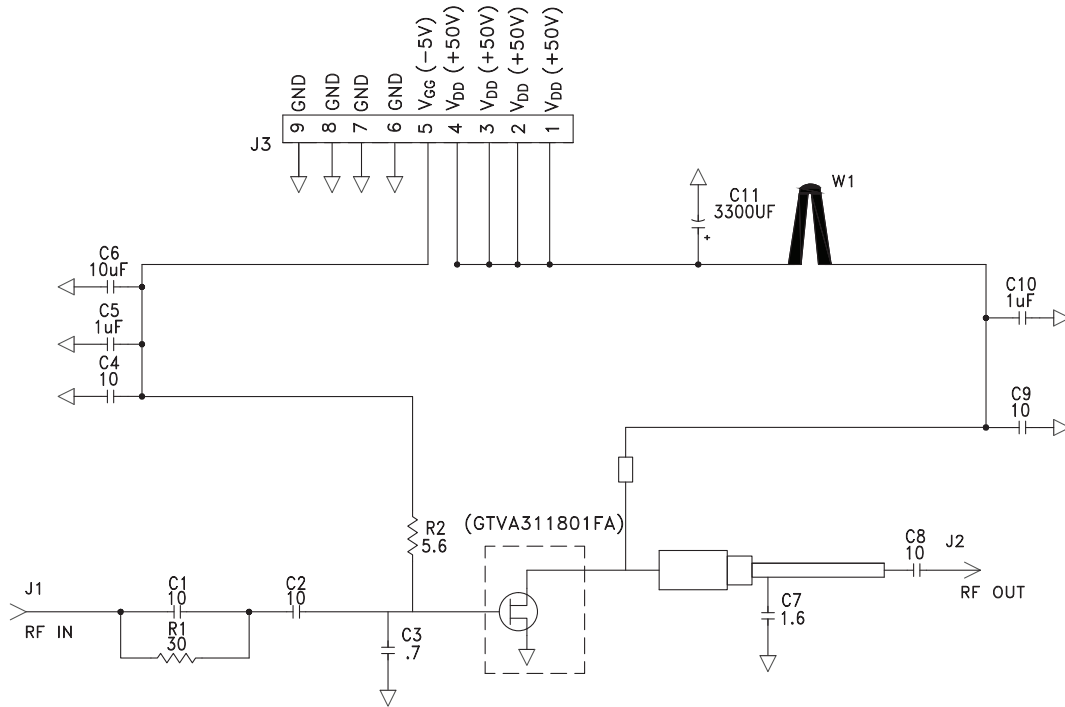


Figure 15. S11 Narrow Band RL vs Frequency

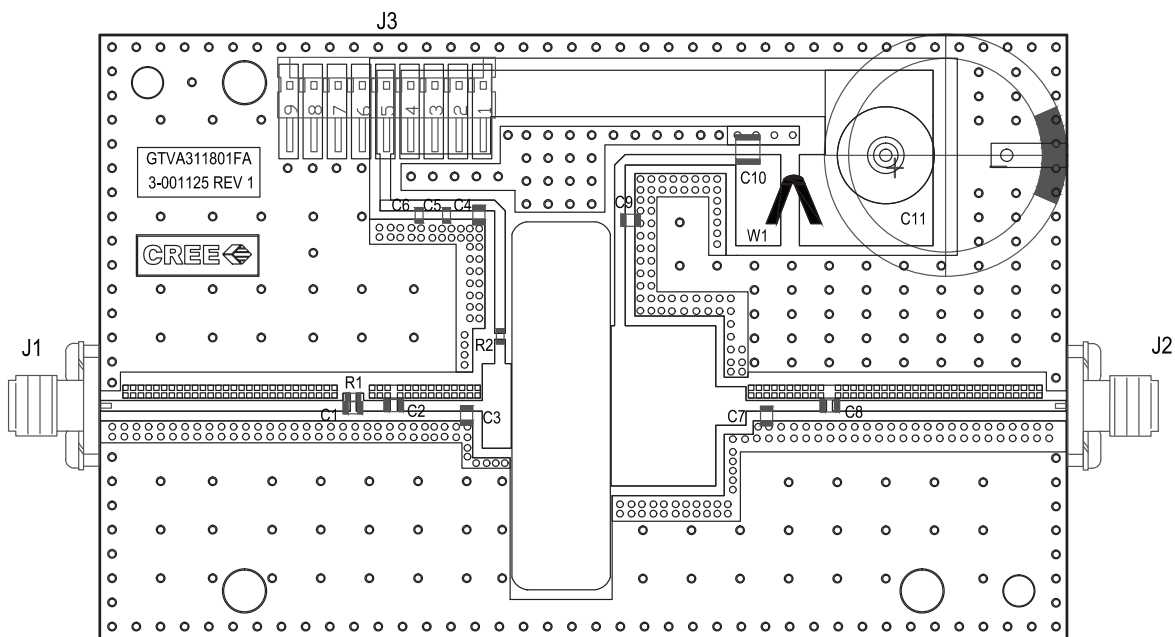




GTVA311801FA-V1 Application Circuit Schematic



GTVA311801FA-V1 Application Circuit



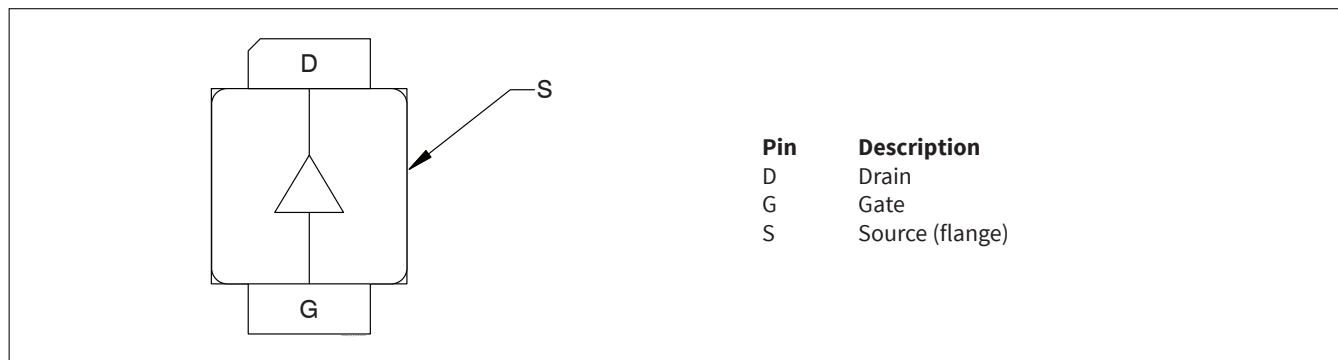


GTVA311801FA-V1 Application Circuit Bill of Materials

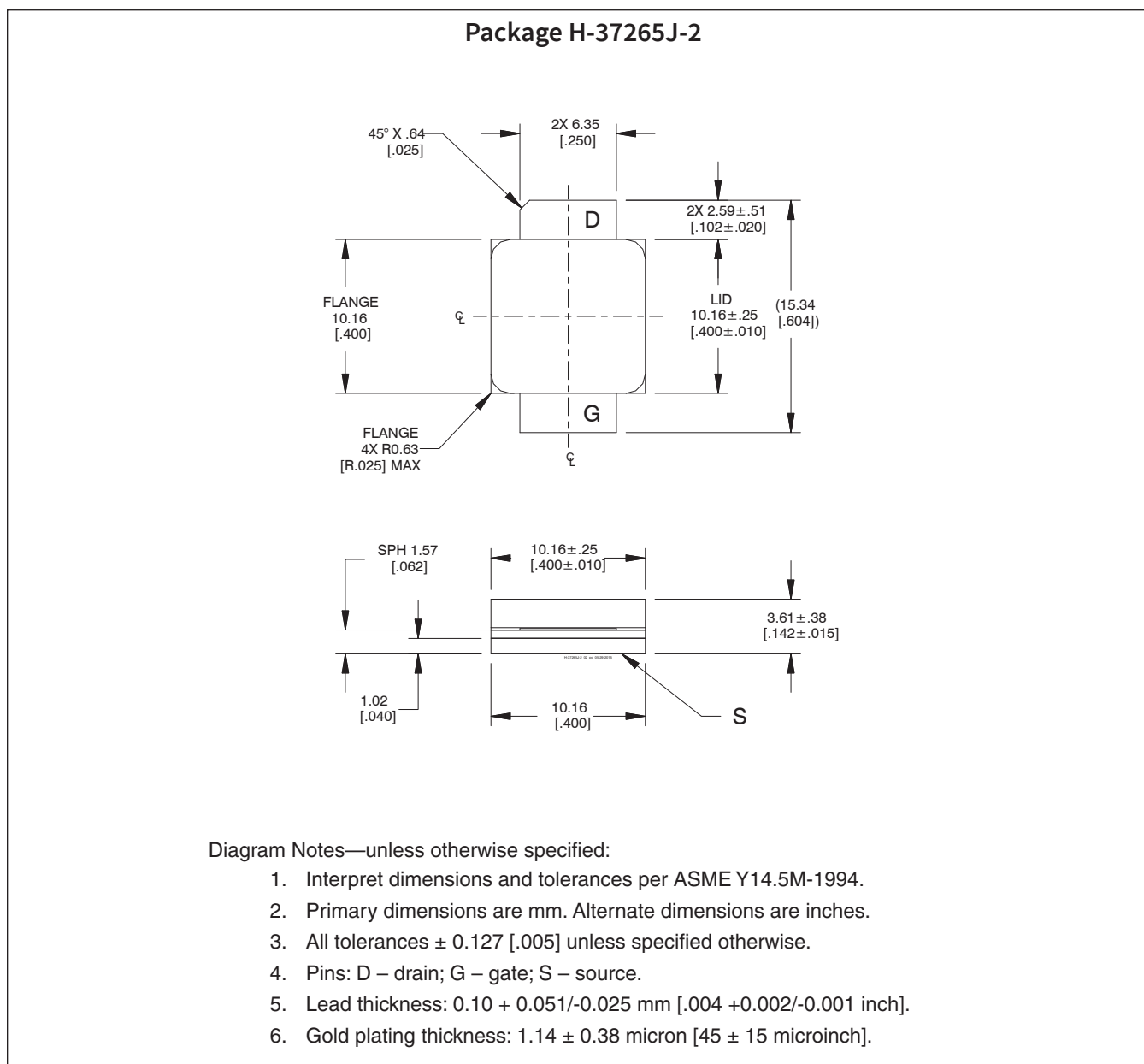
Designator	Description	Qty
R1	RES, 30 OHMs, +/- 1%, 0603	1
R2,	RES, 5.6 OHMS, +/- 1%, 0603	1
C1,C2, C4, C8, C9	CAP, 10pF, 0805, ATC 600F	5
C3	CAP, .7pF, 0805, ATC, 600F	1
C5	CAP, 1uF, 0603, ATC 600S	1
C6,	CAP, 10uF, 0603	4
C7	CAP, 1.6pF, 0805, ATC, 600F	1
C10	CAP, 1uF, +/- 10%, 100V,	1
C11	CAP, 3300uF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



Pinout Diagram (top view)



Package Outline Specifications





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	



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Notes & Disclaimer

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