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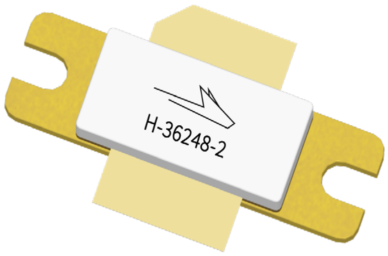
GTVA355001EC

Thermally-Enhanced High Power RF GaN on SiC HEMT
500 W, 50 V, 2900 – 3500 MHz

Description

The GTVA355001EC is a 500-watt GaN on SiC high electron mobility transistor (HEMT) for use in the 2900 to 3500 MHz frequecy band. It features input and output matching, high efficiency, and a thermally-enhanced package.



GTVA355001EC
Package H-36248-2

Features

- GaN on SiC HEMT technology
- Broadband internal input and output matching
- Typical pulsed performance (class AB), 3500 MHz, 50 V, 300 µs pulse width, 10% duty cycle
  - Output power at P_{3dB} = 500 W
  - Drain efficiency = 65%
  - Gain = 13 dB
- Pb-free and RoHS compliant

RF Characteristics

Pulsed Specifications (tested in Wolfspeed test fixture)
V_{DD} = 50 V, I_{DQ} = 200 mA, P_{OUT} = 450 W, pulse width = 128 µs, duty cycle = 10%

Characteristic	Symbol	Min	Typ	Max	Unit
Gain at 2900 MHz	G_{ps}	12.5	13.5	—	dB
Gain at 3500 MHz	G_{ps}	11.5	12.5	—	dB
Return Loss at 2900 MHz	R	—	-12.5	-7	dB
Return Loss at 3500 MHz	R	—	-15	-8	dB
Drain Efficiency at 2900 MHz	η_D	61.5	70	—	%
Drain Efficiency at 3500 MHz	η_D	55	64	—	%

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 = 65 mA	$V_{(BR)DSS}$	125	—	—	V
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 65 mA	$V_{GS(th)}$	—	–3.0	—	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Drain Operating Voltage		V_{DD}	0	—	50	V
Gate Quiescent Voltage	V_{DS} = 50 V, I_D = 200 mA	$V_{GS(Q)}$	—	–3	—	V

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	150	V
Gate-source Voltage	V_{GS}	–10 to +2	V
Gate Current	I_G	60	mA
Drain Current	I_D	20	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[1]	$R_{\theta JC}$	0.44	°C/W
Thermal Resistance, Junction to Case[2]	$R_{\theta JC}$	0.48	°C/W

[1] T_{CASE} = 85°C, P_{DISS} = 300 W, 300 µs pulse width, 20% duty cycle
[2] T_{CASE} = 85°C, P_{DISS} = 300 W, 500 µs pulse width, 20% duty cycle

Ordering Information

Type and Version	Order Code	Package	Shipping
GTVA355001EC V1 R0	GTVA355001EC-V1-R0	H-36248-2	Tape & Reel, 50 pcs

Evaluation Boards

Type and Version	Frequency	Description
LTN/GTVA355001EC-V1	2900 - 3500 MHz	Class AB, RO4350B, 0.508mm thick

Typical Performance of the GTVA355001EC-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 200 mA, Pulse Width = 300 µs, Duty Cycle = 20%, P_{IN} = 45 dBm, T_{BASE} = +25 °C

Figure 1. Output Power vs. Frequency as a Function of Temperature

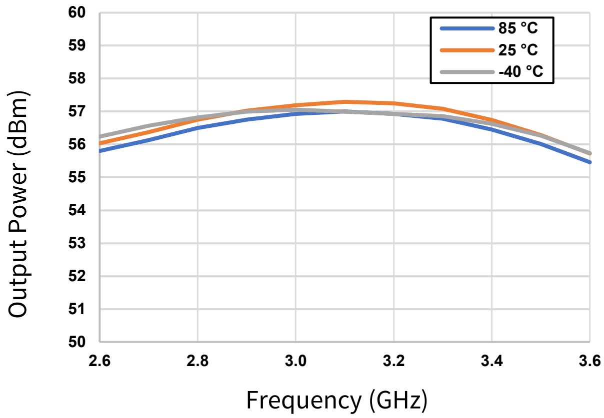


Figure 2. Output Power vs. Frequency as a Function of Input Power

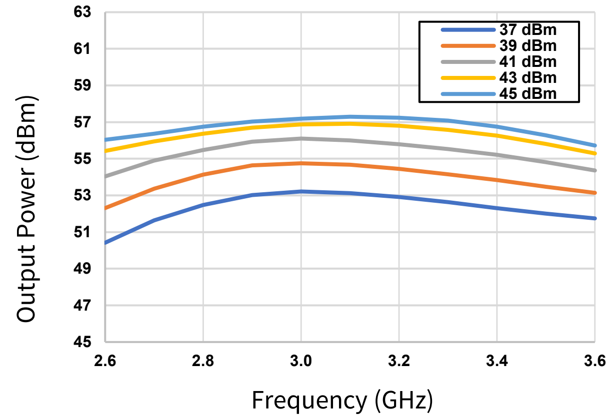


Figure 3. Power Added Efficiency vs. Frequency as a Function of Temperature

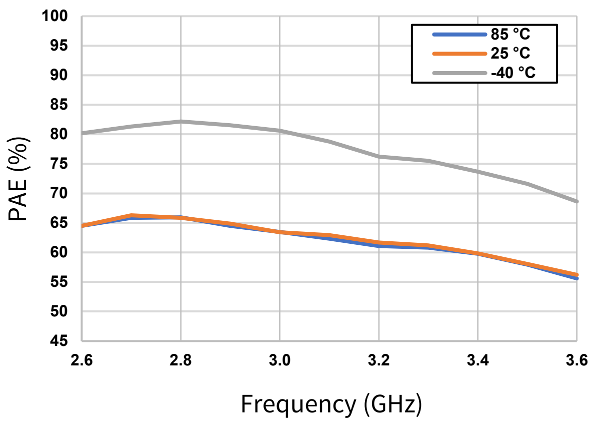


Figure 4. Power Added Efficiency vs. Frequency as a Function of Input Power

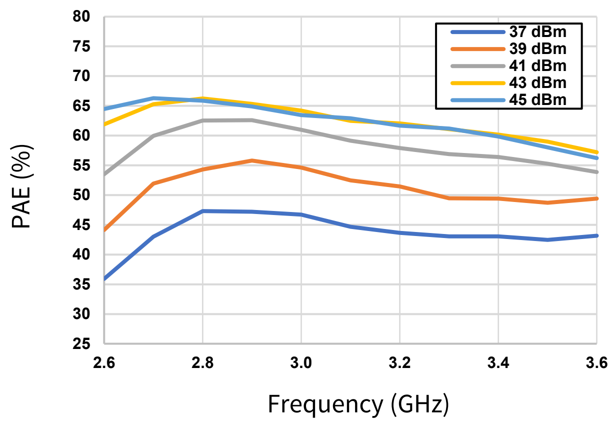


Figure 5. Drain Current vs. Frequency as a Function of Temperature

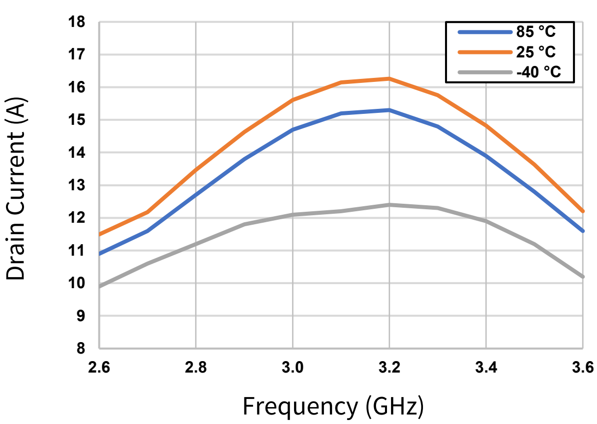
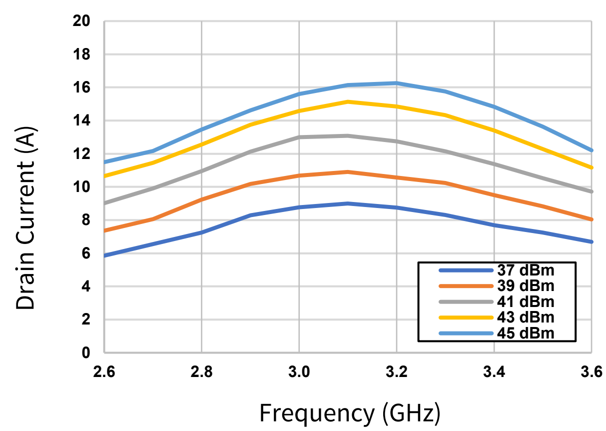


Figure 6. Drain Current vs. Frequency as a Function of Input Power



Typical Performance of the GTVA355001EC-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 200 mA, Pulse Width = 300 µs, Duty Cycle = 20%, P_{IN} = 45 dBm, T_{BASE} = +25 °C

Figure 7. Output Power vs. Frequency as a Function of VDD

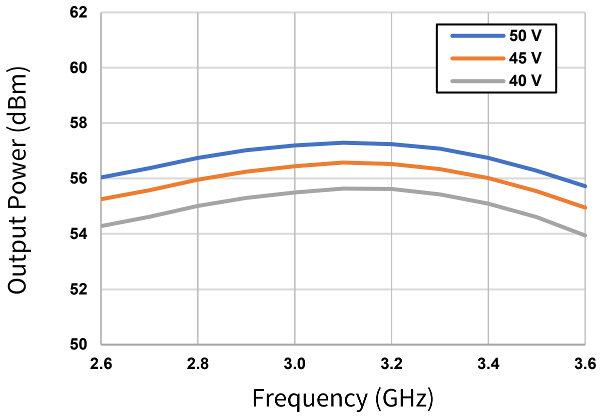


Figure 8. Output Power vs. Frequency as a Function of IDQ

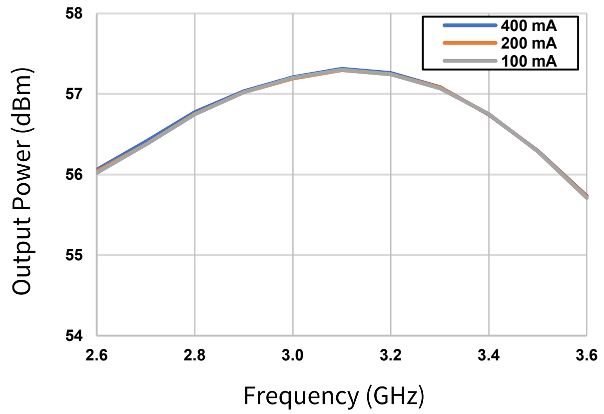


Figure 9. Power Added Efficiency vs. Frequency as a Function of VDD

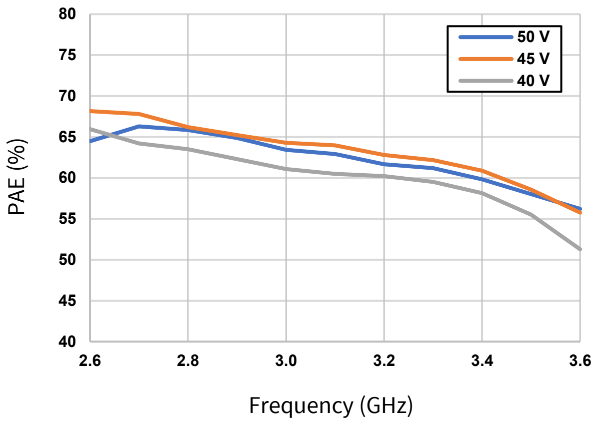


Figure 10. Power Added Efficiency vs. Frequency as a Function of IDQ

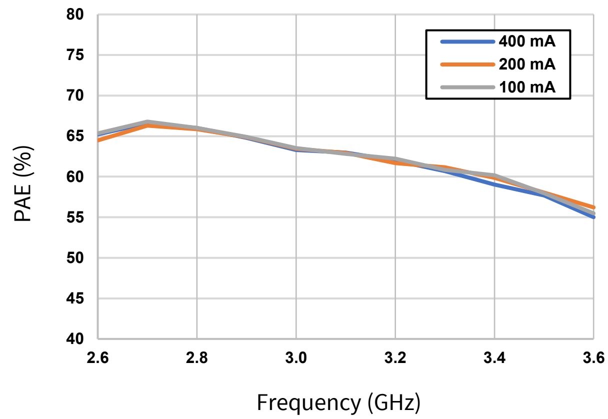


Figure 11. Drain Current vs. Frequency as a Function of VDD

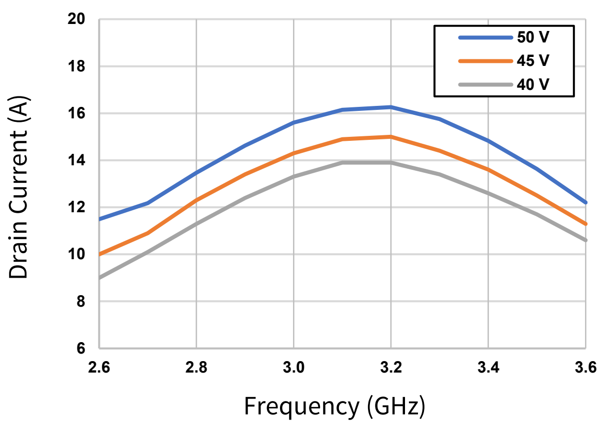
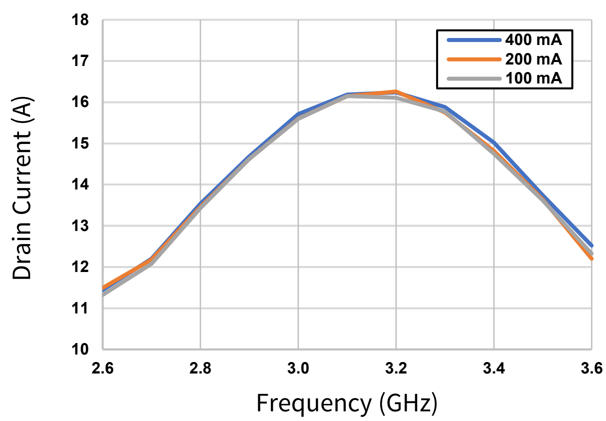


Figure 12. Drain Current vs. Frequency as a Function of IDQ



Typical Performance of the GTVA355001EC-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 200 mA, Pulse Width = 300 µs, Duty Cycle = 20%, P_{IN} = 45 dBm, T_{BASE} = +25 °C

Figure 13. Output Power vs. Input Power as a Function of Frequency

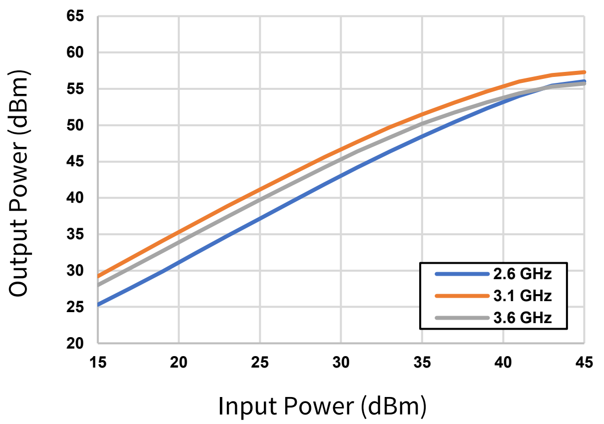


Figure 14. Power Added Efficiency vs. Input Power as a Function of Frequency

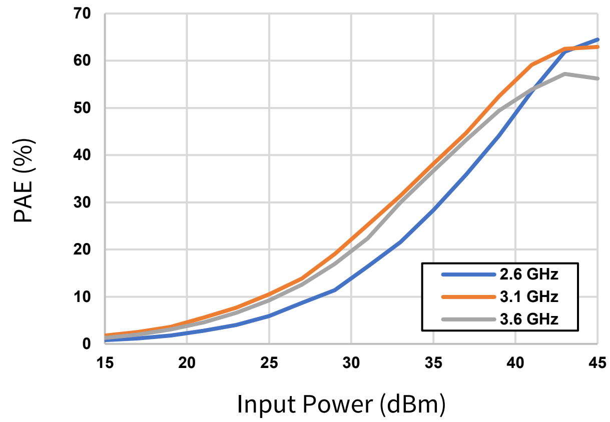


Figure 15. Large Signal Gain vs. Input Power as a Function of Frequency

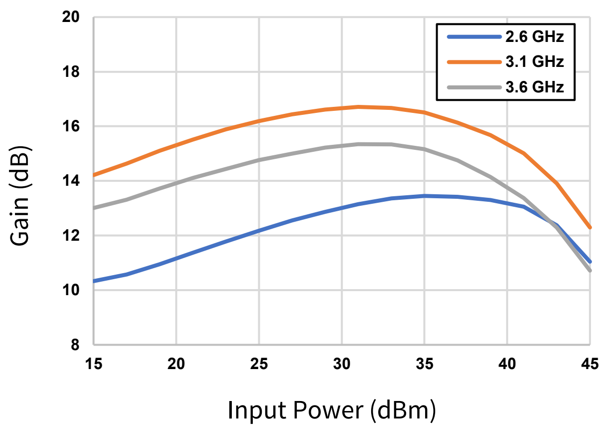


Figure 16. Drain Current vs. Input Power as a Function of Frequency

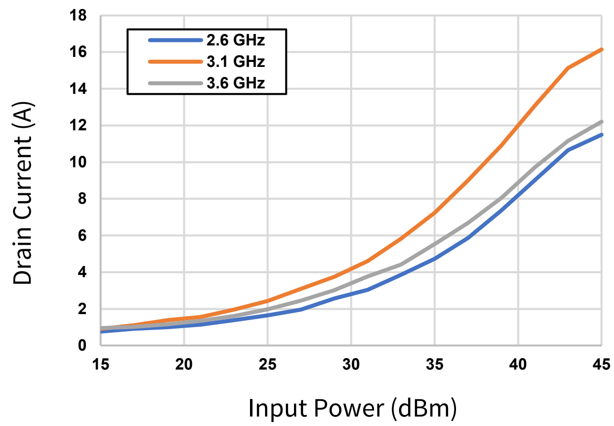


Figure 17. Gate Current vs. Input Power as a Function of Frequency

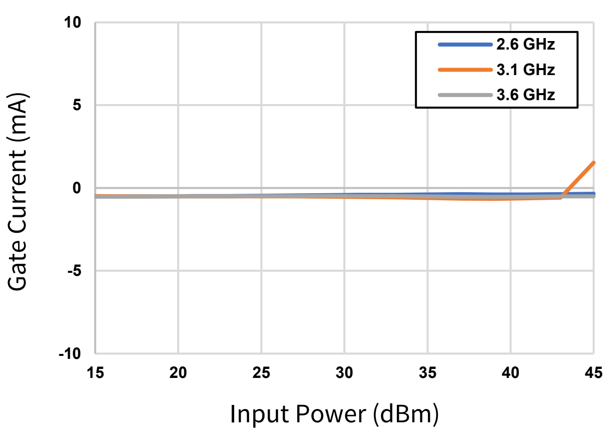
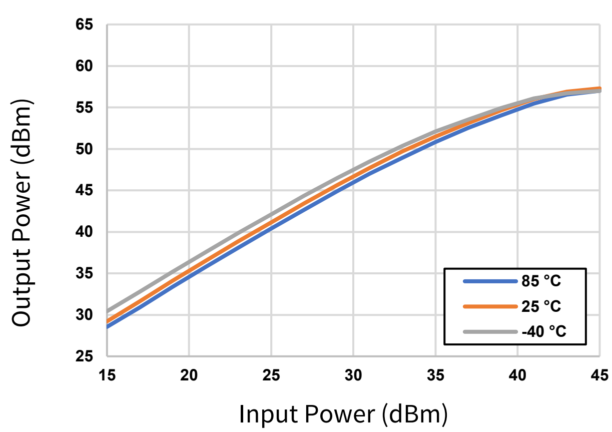


Figure 18 . Output Power vs. Input Power as a Function of Temperature



Typical Performance of the GTVA355001EC-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 200 mA, Pulse Width = 300 µs, Duty Cycle = 20%, P_{IN} = 45 dBm, T_{BASE} = +25 °C

Figure 19. Power Added Efficiency vs. Input Power as a Function of Temperature

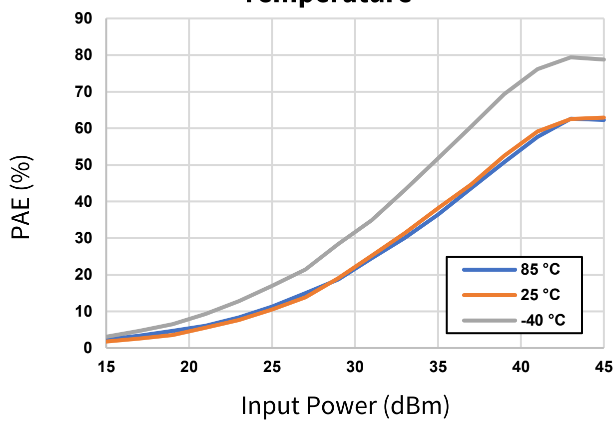


Figure 20. Large Signal Gain vs. Input Power as a Function of Temperature

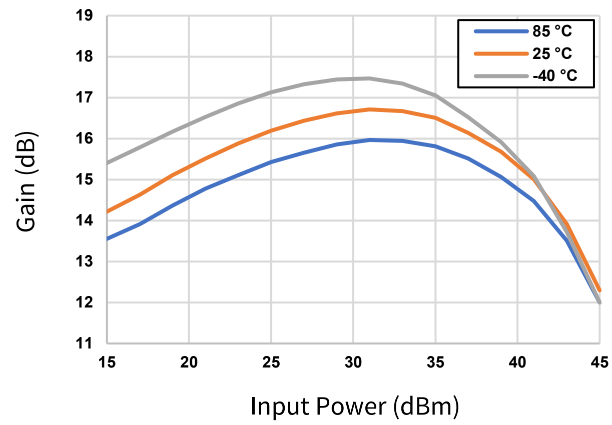


Figure 21. Drain Current vs. Input Power as a Function of Temperature

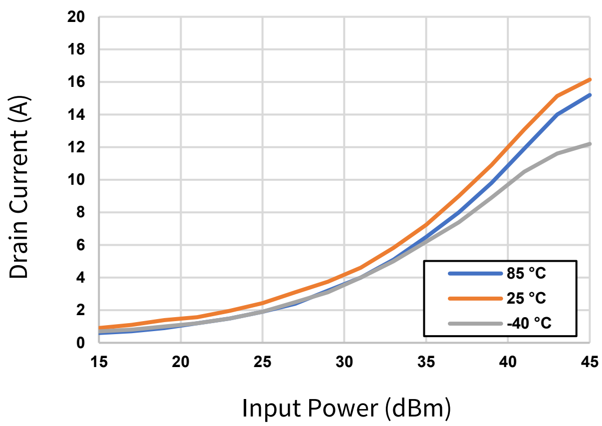


Figure 22. Gate Current vs. Input Power as a Function of Temperature

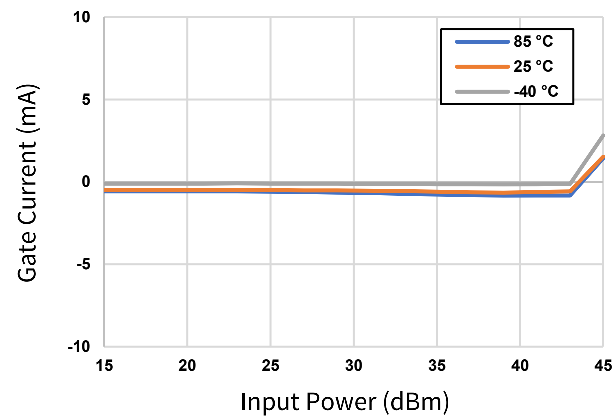


Figure 23. Output Power vs. Input Power as a Function of IDQ

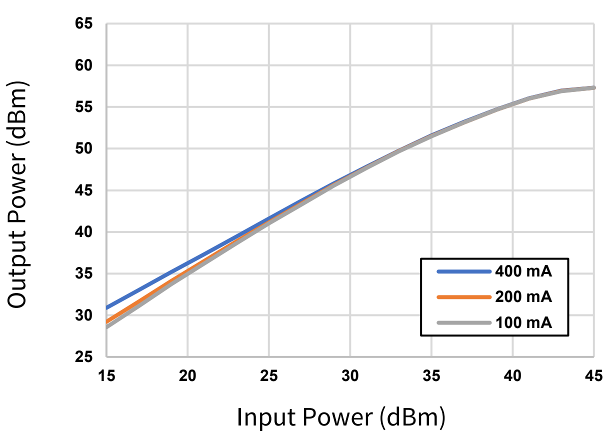
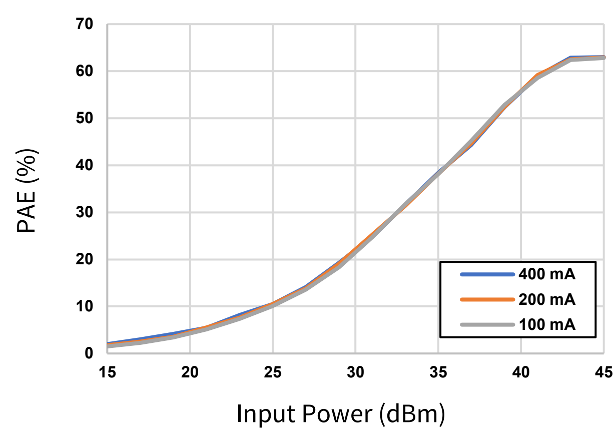


Figure 24. Power Added Efficiency vs. Input Power as a Function of IDQ



Typical Performance of the GTVA355001EC-V1

Test conditions unless otherwise noted: V_{DD} = 50 V, I_{DQ} = 200 mA, Pulse Width = 300 µs, Duty Cycle = 20%, P_{IN} = 45 dBm, T_{BASE} = +25 °C

Figure 25. Large Signal Gain vs. Input Power as a Function of IDQ

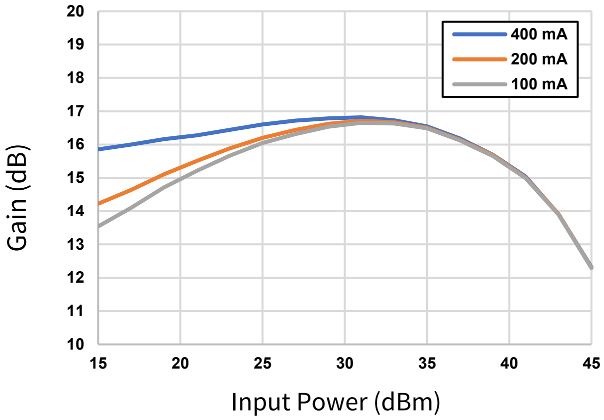


Figure 26. Drain Current vs. Input Power as a Function of IDQ

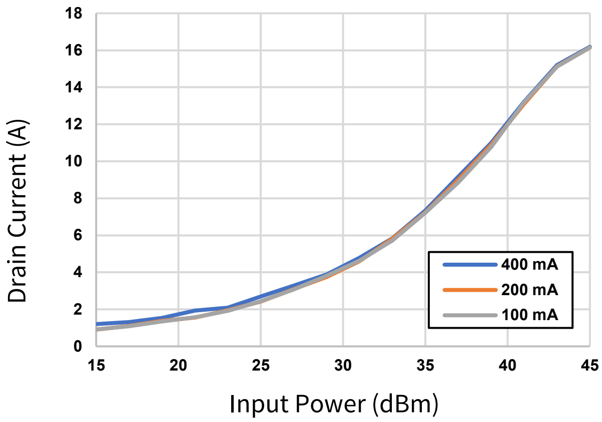
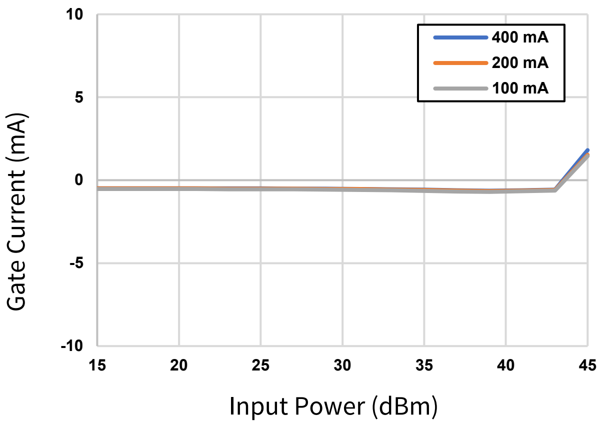
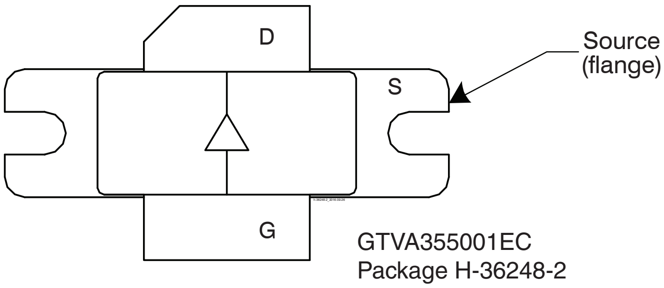


Figure 27. Gate Current vs. Input Power as a Function of IDQ



Pinout Diagram (top view)



Pin	Description
D	Drain
G	Gate
S	Source (flange)

GTVA355001EC Application Circuit Bill of Materials

Component	Description	Manufacturer	P/N
Input			
C101, C105, C106	Capicacitor, 10 pF	ATC	ATC600F100JT250X
C102	Capacitor, 1000000 pF, 100V, 1 µF	Digi-Key	490-14464-1-ND
C103	Capacitor, 10000000 pF, 25V, 10 µF	Digi-Key	490-7202-1-ND
C104	Capacitor, 1.1 pF	ATC	ATC600F1R1CT250X
R101	Resistor, 5.6 ohms	Digi-Key	P5.6PCT-ND
R102	Resistor, 30 ohms	Digi-Key	P30GCT-ND
Output			
C201, C203, C204	Capacitor, 10 pF	ATC	ATC600F100JT250X
C202, C205	Capacitor, 1000000 pF, 1 µF	Digi-Key	445-1411-2-ND
C206	Capacitor, 6800000000 pF, 6800 µF	Digi-Key	493-14771-ND

Package Outline Specifications

Package H-36248-2

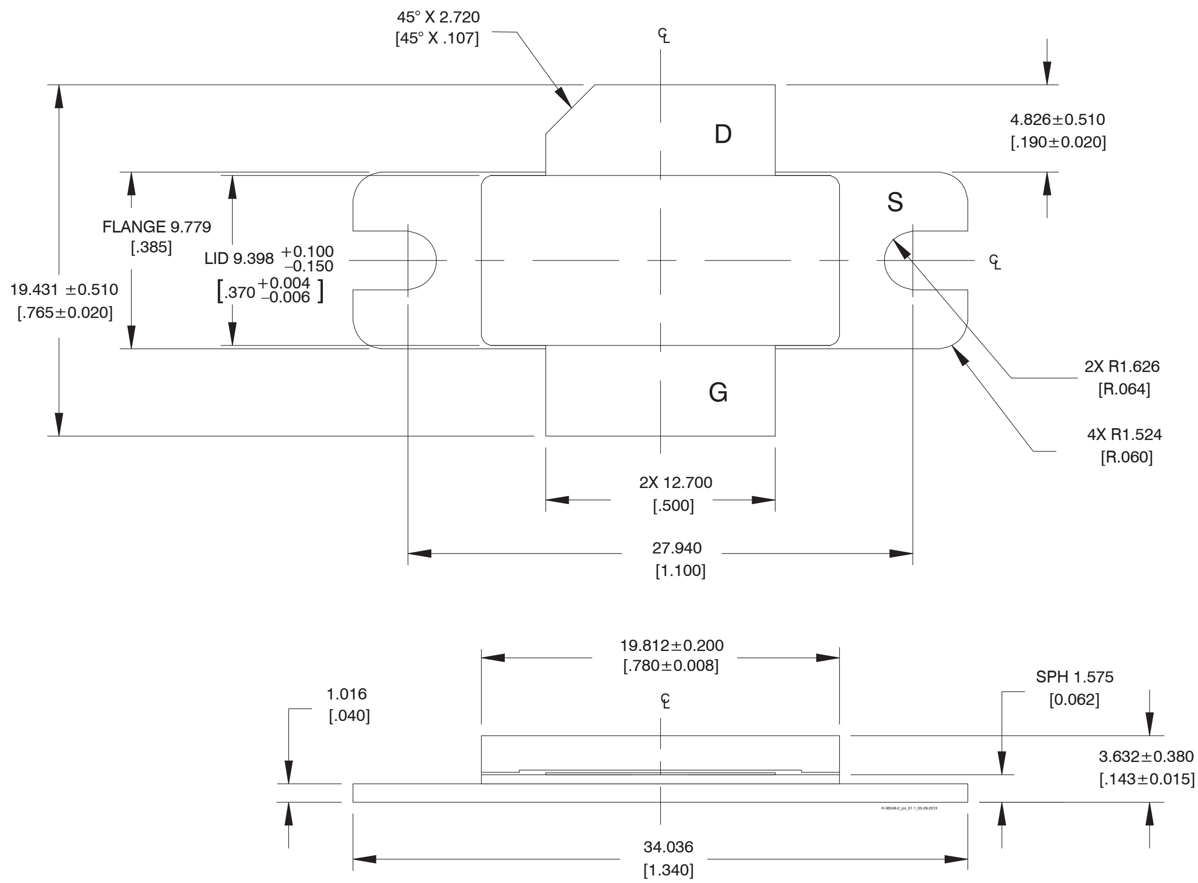


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994
2. Primary dimensions are mm; alternate dimensions are inches
3. All tolerances ± 0.127 [0.005]
4. Pins: D – drain, G – gate, S – source
5. Lead thickness: 0.10 +0.051/–0.025 mm [0.004 +0.002/–0.001 inch]
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

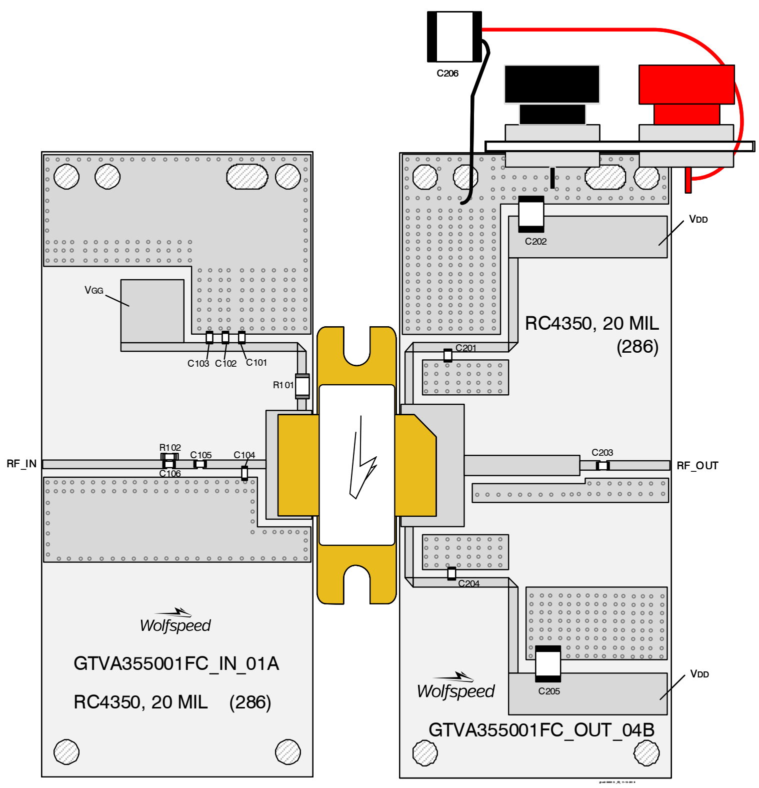
Load Pull Performance

Single Side Load Pull Performance - 10 µs, 10% duty cycle, class AB, V_{DD} = 50 V, 300 mA

		DUT P3dB									
		Max Eff					Max Power				
Freq MHz	Z_{source} ohm	Z_L ohm	Gain P3 dB	Drain Eff P3 %	P_{3dB} dBm	P_{3dB} W	Z_L ohm	Gain P3 dB	Drain Eff P3 %	P_{3dB} dBm	P_{3dB} W
2900	2.4-j5.9	3.87-j2.67	14.17	73.53	56.92	492.04	1.75-j3.26	12.93	65.49	58.84	765.6
3100	4.09-j6.09	3.22-j2.28	14.14	71.84	57.08	510.51	1.7-j3.59	12.76	61.55	58.67	736.21
3300	6.37-j3.9	2.65-j2.07	14.28	70.72	56.86	485.29	1.73-j3.74	13.04	62.27	58.75	749.89
3500	4.86-j1.36	2.48-j2.48	14.43	68.72	56.88	487.53	1.78-j4.0	13.2	60.67	58.56	717.79

GTVA355001EC Application Circuit Drawing

DUT	GTVA355001EC
Test Fixture Part No.	LNT/GTVA355001EC V1
PCB	Rogers 4350, 0.508 mm [0.20"] thick, 2 oz. copper, ε_r = 3.66
Find Gerber files for this text fixture on the Wolfspeed Web site at **www.wolfspeed.com/RF**	



Reference circuit assembly diagram (not to scale)

For more information, please contact:

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Sales Contact
RFSales@cree.com

Notes

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