

GTVA107001EC/FC

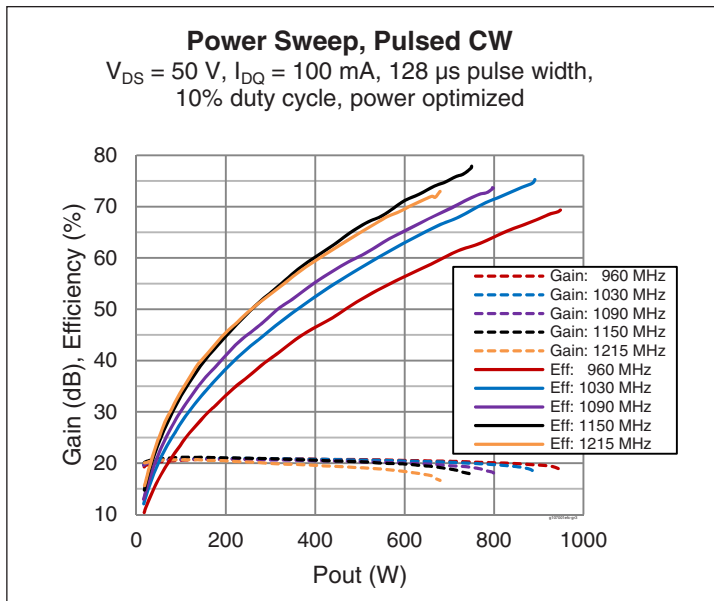
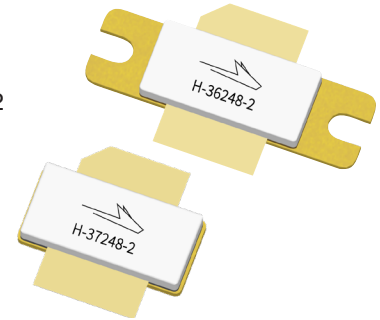
Thermally-Enhanced High Power RF GaN on SiC HEMT 700 W, 50 V, DC - 1.4 GHz

Description

The GTVA107001EC and GTVA107001FC are 700-watt GaN on SiC high electron mobility transistors (HEMT) for use in the DC - 1.4 GHz frequency band. They feature input matching, high efficiency, and thermally-enhanced packages.

GTVA107001EC
Package H-36248-2

GTVA107001FC
Package H-37248-2



Features

- GaN on SiC HEMT technology
- Input matched
- Typical pulsed CW performance (class AB), 1030 MHz, 50 V, 128 μs pulse width, 10% duty cycle
 - Output power $P_{3dB} = 890\text{ W}$
 - Drain efficiency = 75%
 - Gain = 18 dB
- Capable of withstanding a 10:1 load mismatch (all phase angles at 700 W peak power under pulse conditions: 50 V, 100 mA I_{DQ} , 128 μs pulse width, 10% duty cycle
- Human Body Model Class IC (per ANSI/ESDA/JEDEC JS-001)
- Pb-free and RoHS-compliant

RF Characteristics

Pulsed RF Performance (tested in Wolfspeed production test fixture)

GTVA107001EC: $V_{DD} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, $P_{OUT} = 700\text{ W}$, $f = 1030\text{ MHz}$, 128 μs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17.5	20	22	dB
Drain Efficiency	η_D	67	70	—	%

GTVA107001FC: $V_{DD} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, $P_{OUT} = 700\text{ W}$, $f = 1030\text{ MHz}$, 128 μs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17.5	20	22	dB
Drain Efficiency	η_D	65	70	—	%

All published data at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-source Breakdown Voltage	$V_{GS} = -8\text{ V}$, $I_D = 10\text{ mA}$	$V_{(BR)DSS}$	150	—	—	V
Drain-source Leakage Current	$V_{GS} = -8\text{ V}$, $V_{DS} = 10\text{ V}$	I_{DSS}	—	—	12	mA
Gate Threshold Voltage	$V_{DS} = 10\text{ V}$, $I_D = 84\text{ mA}$	$V_{GS(th)}$	-6.2	-3.0	-2.2	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Drain Operating Voltage		V_{DD}	0	—	50	V
Gate Quiescent Voltage	$V_{DS} = 50\text{ V}$, $I_D = 0.10\text{ A}$	$V_{GS(Q)}$	—	-3.2	—	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	100	mA
Drain Current	I_D	10	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

¹ $T_{CASE} = 85\text{ °C}$, $P_{diss} = 334\text{ W}$, 50 V , $I_{DQ} = 100\text{ mA}$, $128\text{ }\mu\text{s}$ pulse width, 10% duty cycle

² $T_{CASE} = 85\text{ °C}$, $P_{diss} = 254\text{ W}$, 50 V , $I_{DQ} = 100\text{ mA}$, Mode-S signal

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case ¹	$R_{\theta JC}$	0.21	°C/W
Thermal Resistance, Junction to Case ²	$R_{\theta JC}$	0.25	°C/W

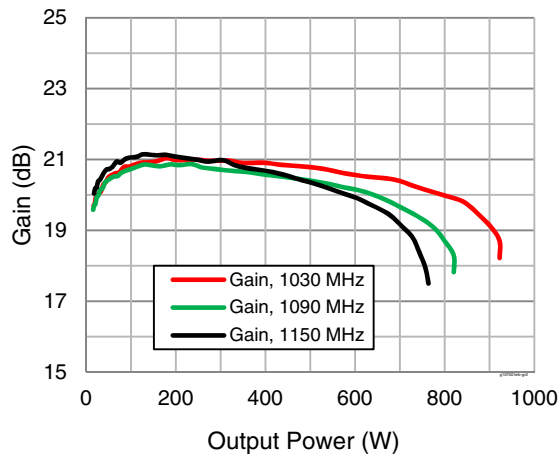
Ordering Information

Type and Version	Order Code	Package and Description	Shipping
GTVA107001EC V1 R0	GTVA107001EC-V1-R0	H-36248-2, bolt-down flange	Tape & Reel, 50 pcs
GTVA107001EC V1 R2	GTVA107001EC-V1-R2	H-36248-2, bolt-down flange	Tape & Reel, 250 pcs
GTVA107001FC V1 R0	GTVA107001FC-V1-R0	H-37248-2, earless flange	Tape & Reel, 50 pcs
GTVA107001FC V1 R2	GTVA107001FC-V1-R0	H-37248-2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in Wolfspeed production test fixture)

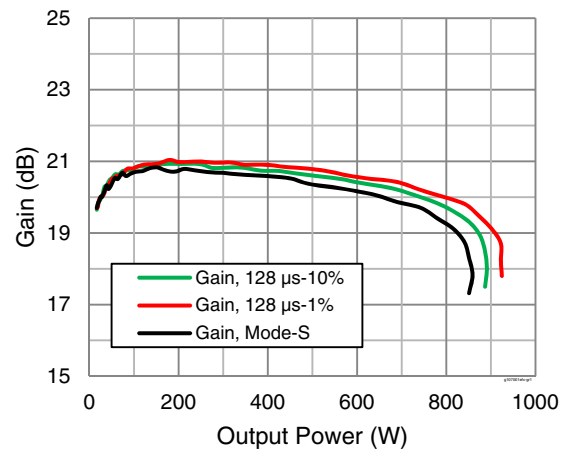
Power Sweep: Gain v. Output Power

(series show gain at frequency)
 $V_{DS} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, 128 μs pulse width,
 10% duty cycle, power optimized



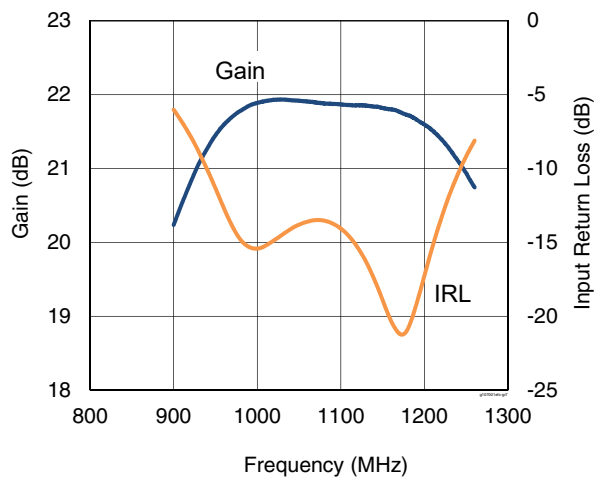
Power Sweep: Gain v. Output Power

(series show gain at various duty cycles)
 $V_{DS} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, $f = 1030\text{ MHz}$



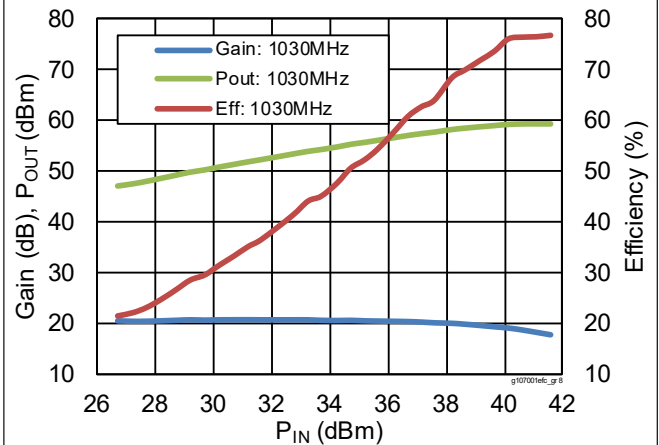
CW Performance Small Signal

Gain & Input Return Loss
 $V_{DD} = 50\text{ V}$, $I_{DQ(MAIN)} = 1000\text{ mA}$



MODE-S: (32 μs -ON/18- μs -OFF)x48, LTDF-6.4%

$V_{DS} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, measured on 24th
 pulse



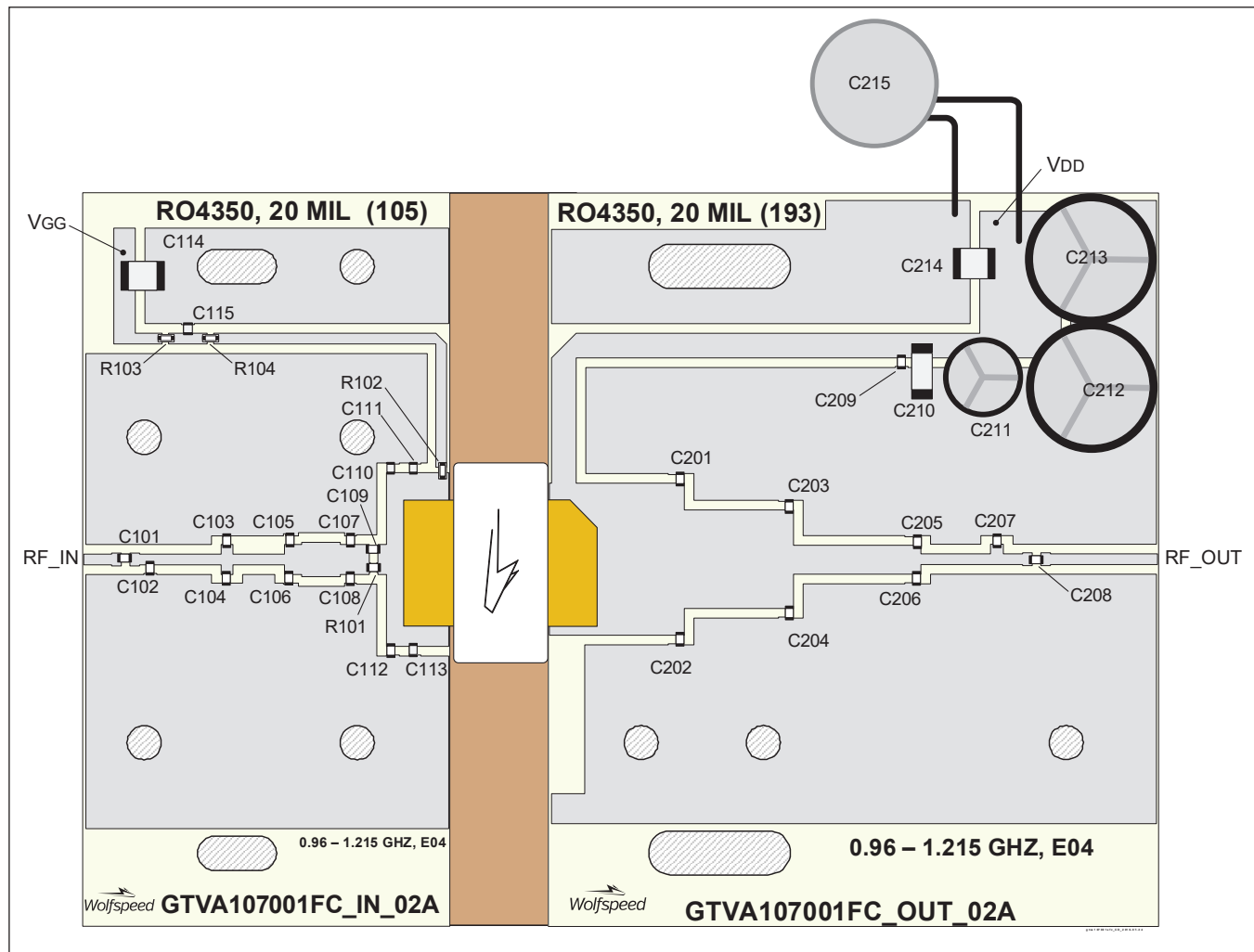
Load Pull Performance

Each Side Load Pull Performance –16 μ s pulse width, 10% duty cycle, class AB, $V_{DD} = 50$ V, 60 mA

Freq [MHz]	Max Output Power					Max Efficiency					Z Optimum					
	P _{OUT} [dBm]	P _{OUT} [W]	Eff [%]	Gain [dB]	Z _{Load} [Ω]	P _{OUT} [dBm]	P _{OUT} [W]	Eff [%]	Gain [dB]	Z _{Load} [Ω]	P _{OUT} [dBm]	P _{OUT} [W]	Eff [%]	Gain [dB]	Z _{Load} [Ω]	Z _{Source} [Ω]
960	60.37	1088.93	75.03	19.66	1.28+j0.10	59.43	877.00	83.15	20.84	1.37+j0.85	60.02	1004.62	79.99	20.45	1.28+j0.52	0.38-j1.05
1030	60.14	1032.76	74.45	19.58	1.28+j0.19	58.68	737.90	83.12	20.88	1.61+j1.01	60.01	1002.31	78.22	20.00	1.39+j0.43	0.43-j1.15
1090	59.88	972.75	73.06	19.08	1.32+j0.28	58.73	746.45	80.44	19.94	1.83+j0.97	59.70	933.25	77.40	19.53	1.48+j0.52	0.66-j1.27
1150	59.34	859.01	67.27	19.46	1.51+j0.13	58.30	676.08	77.38	20.91	1.72+j1.07	59.21	833.68	72.17	20.07	1.59+j0.46	0.81-j1.44
1200	59.20	831.76	66.29	19.34	1.54+j0.11	58.12	648.63	75.83	20.09	2.19+j0.97	59.09	810.96	70.51	19.79	1.68+j0.33	1.00-j1.73
1215	59.02	797.99	65.34	19.44	1.59+j0.01	57.74	594.29	73.93	20.63	2.02+j1.07	58.94	783.43	70.07	19.97	1.70+j0.33	1.55-j1.60

Reference Circuit tuned for 0.960 to 1.215 GHz

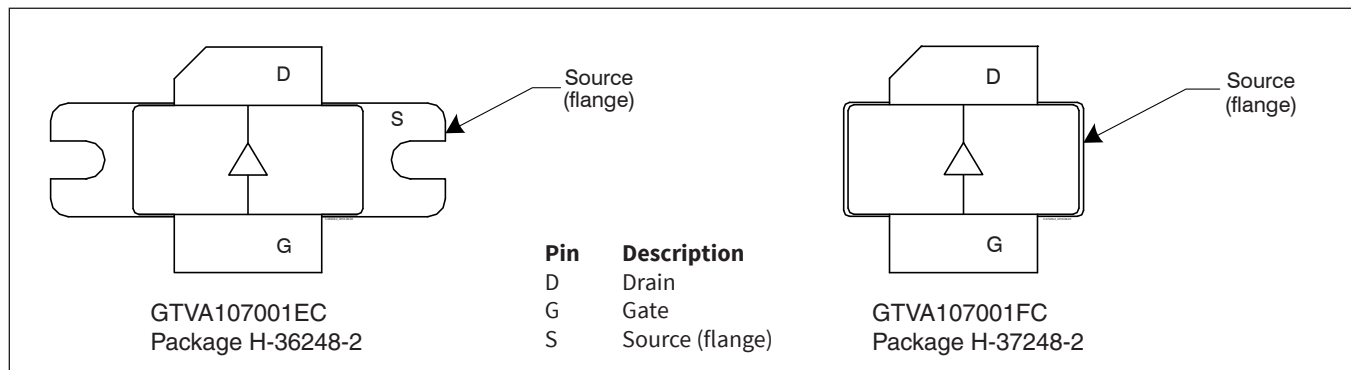
DUT	GTVA107001EC V1 or GTVA107001FC V1
Reference Circuit Part No.	LTN/GTVA107001FC V1 or LTN/GTVA107001FC V1
PCB	Rogers 4350, 0.508 mm [.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$



Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)**Components Information**

Component	Description	Manufacturer	P/N
Input			
C101, C109, C115	Capacitor, 56 pF	ATC	ATC800A560JT250XT
C102	Capacitor, 0.4 pF	ATC	ATC600F0R4AT250XT
C103, C104	Capacitor, 1 pF	ATC	ATC600F1R0BT250XT
C105	Capacitor, 3.6 pF	ATC	ATC600F3R6BT250XT
C106	Capacitor, 3.3 pF	ATC	ATC600F3R3BT250XT
C107, C108	Capacitor, 0.2 pF	ATC	ATC600F0R2AT250XT
C110, C112, C113	Capacitor, 5.6 pF	ATC	ATC600F5R6BT250XT
C111	Capacitor, 6.8 pF	ATC	ATC600F6R8BT250XT
C114	Capacitor, 1 μ F	TDK Corporation	C4532X7R2A105M230KA
R101, R102	Resistor, 10 W	Panasonic – ECG	ERJ-3GEYJ100V
R103	Resistor, 5.6 W	Panasonic – ECG	ERJ-8RQJ5R6V
R104	Resistor, 100 W	Panasonic – ECG	ERJ-3GEYJ101V
Output			
C201	Capacitor, 7.5 pF	ATC	ATC600F7R5BT250XT
C202	Capacitor, 6.8 pF	ATC	ATC600F6R8BT250XT
C203, C204	Capacitor, 2.4 pF	ATC	ATC600F2R4BT250XT
C205, C206, C207	Capacitor, 1.5 pF	ATC	ATC600F1R5BT250XT
C208	Capacitor, 39 pF	ATC	ATC600F390JT250XT
C209	Capacitor, 56 pF	ATC	ATC800A560JT250XT
C210	Capacitor, 10 μ F	TDK Corporation	C5750X5R1H106K230KA
C211	Capacitor, 22 μ F	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C212	Capacitor, 100 μ F	Cornell Dubilier Electronics (CDE)	SK101M100ST
C213	Capacitor, 220 μ F	Panasonic – ECG	ECA-2AHG221
C214	Capacitor, 1 μ F	TDK Corporation	C4532X7R2A105M230KA
C215	Capacitor, 100 V, 6800 μ F	Panasonic – ECG	ECO-S2AP682EA

Pinout Diagrams (top view)

Package Outline Specifications

Package H-36248-2

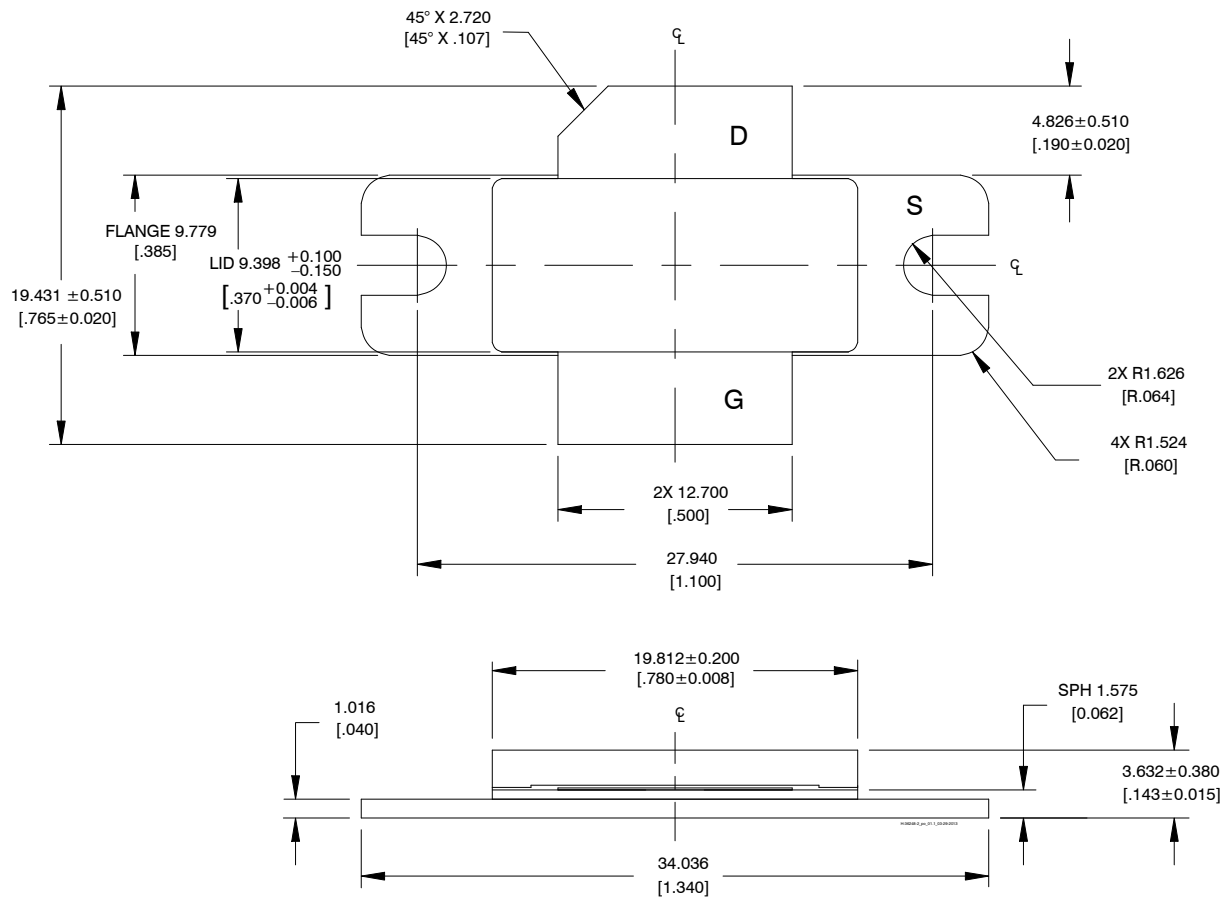


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.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].

Package Outline Specifications

Package H-37248-2

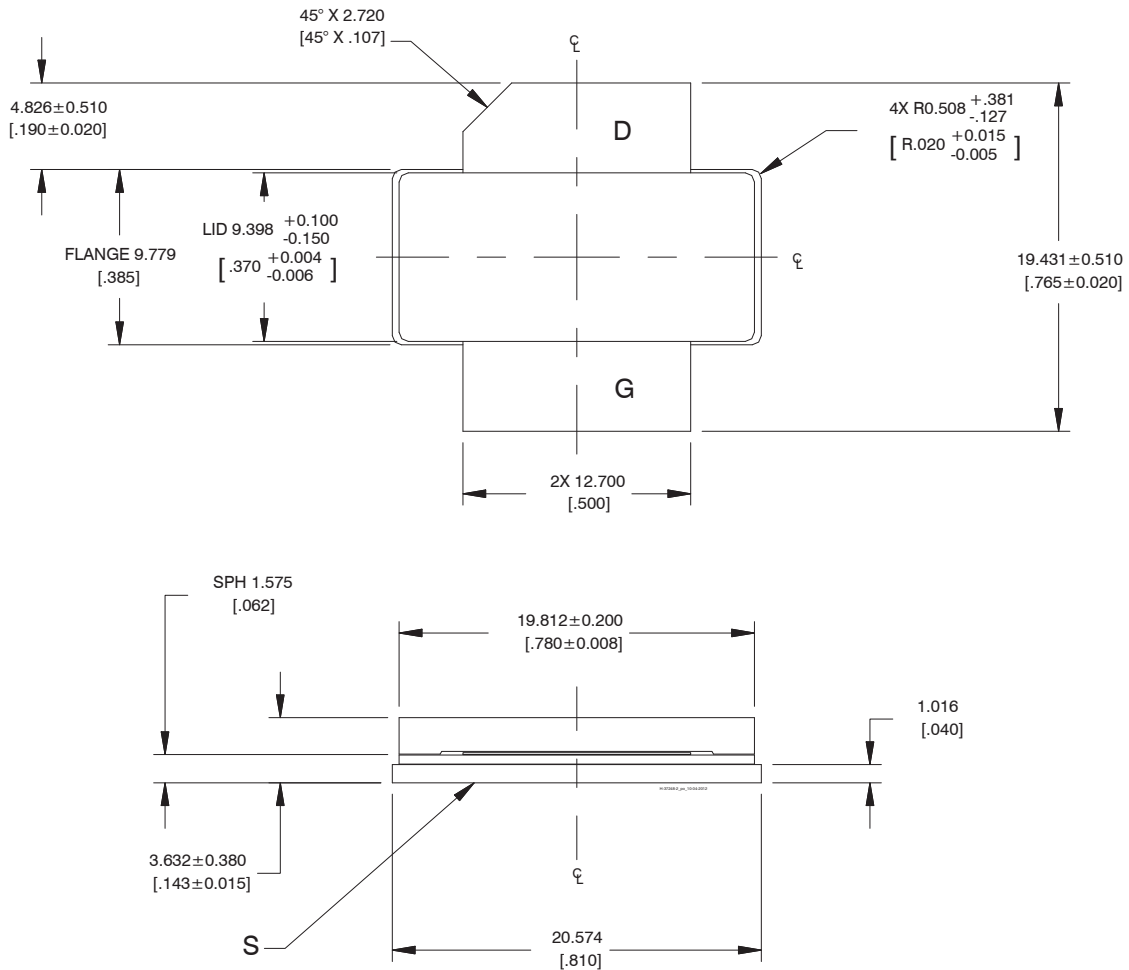


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6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes at each revision)
01	2016-09-27	Advance	All	Data Sheet reflects advance specification for product development
02	2018-05-21	Preliminary	All	Data Sheet shows typical performance information and reference circuit
02.1	2018-07-19	Production	All 1, 3 4	Data Sheet reflects released product specification Updated Typ pulsed CW performance, added Mode S graph Added loadpull information, added C215 to reference circuit and component list
02.2	2018-10-02	Production	2	Updated thermal characteristics
03	2019-02-15	Production	All	Add product GTVA107001FC V1

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Notes

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