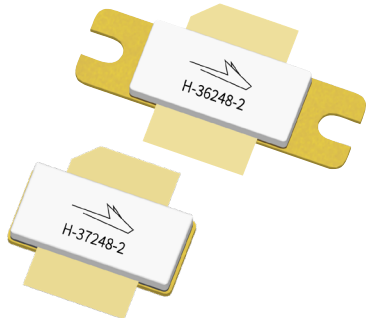
# GTVA107001EC/FC

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

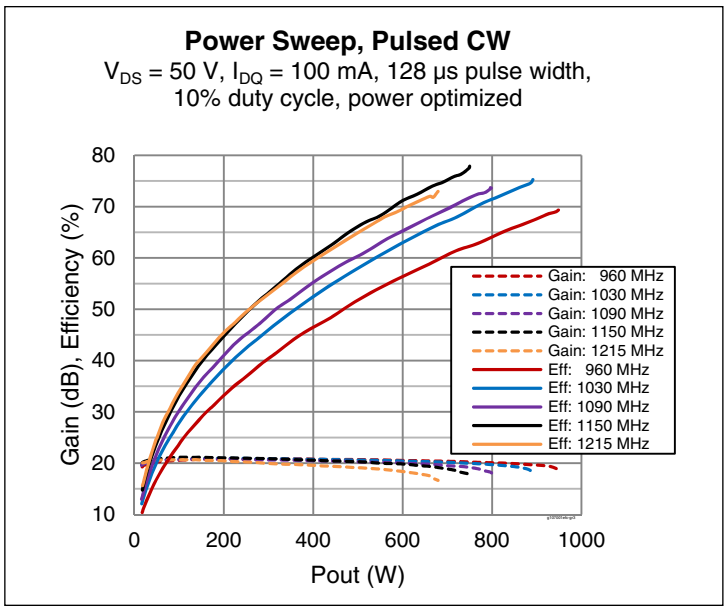
### Description

The GTVA107001EC and GTVA107001FC are 700-watt GaN on SiC high electron mobility transistors (HEMT) for use in the DC - 1.4 GHz frequecy band.

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 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 V, $I_{DQ}$ = 100 mA, $P_{OUT}$ = 700 W, $f$ = 1030 MHz, 128 µs pulse width, 10% duty cycle

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Gain | $G_{ps}$ | 17.5 | 20 | 22 | dB |
| Drain Efficiency | $\eta_D$ | 67 | 70 | — | % |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Gain | $G_{ps}$ | 17.5 | 20 | 22 | dB |
| Drain Efficiency | $\eta_D$ | 65 | 70 | — | % |

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 | $I_{DSS}$ | — | — | 12 | mA |
| Gate Threshold Voltage | $V_{DS}$ = 10 V, $I_D$ = 84 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 V, $I_D$ = 0.10 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 °C, $P_{diss}$ = 334 W, 50 V, $I_{DQ}$ = 100 mA, 128 µs pulse width, 10% duty cycle
[2] $T_{CASE}$ = 85 °C, $P_{diss}$ = 254 W, 50 V, $I_{DQ}$ = 100 mA, Mode-S signal

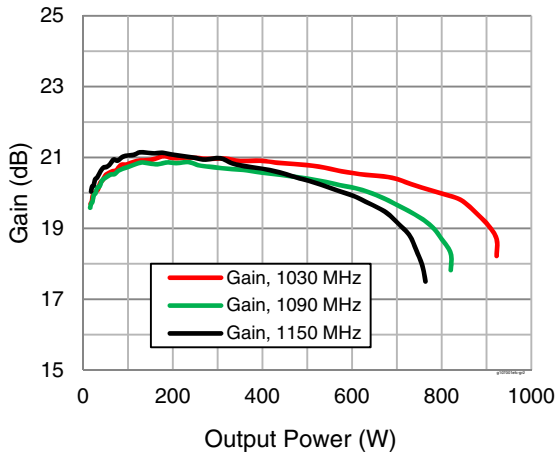
| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case [1] | $R_{\theta JC}$ | 0.21 | °C/W |
| Thermal Resistance, Junction to Case [2] | $R_{\theta JC}$ | 0.25 | °C/W |

## Ordering Information

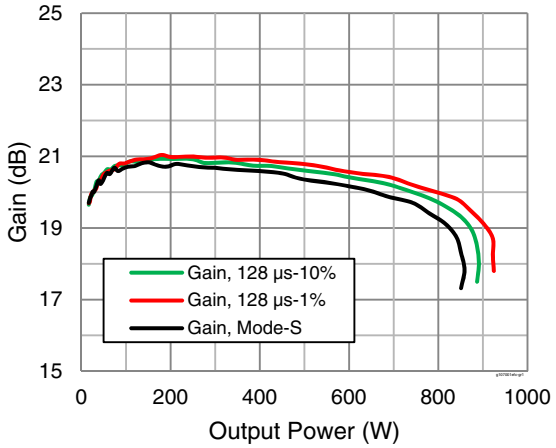
| Type and Version | Order Code | Package and Description | Shipping |
|---|---|---|---|
| GTVA107001EC V1 R0 | GTVA107001EC-V1-R0 | H-36248-2, bolt-down flange | Tape & Reel, 50 pcs |
| GTVA107001EC V1 R2 | GTVA107001EC-V1-R2 | H-36248-2, bolt-down flange | Tape & Reel, 250 pcs |
| GTVA107001FC V1 R0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

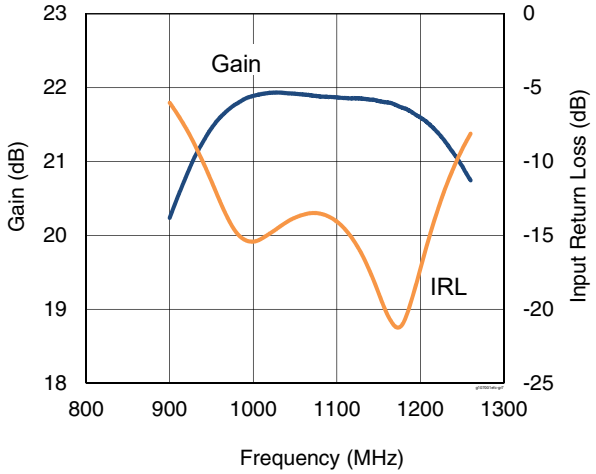
**Power Sweep: Gain v. Output Power**
(series show gain at frequency)
$V_{DS}$ = 50 V, $I_{DQ}$ = 100 mA, 128 µs pulse width,
10% duty cycle, power optimized



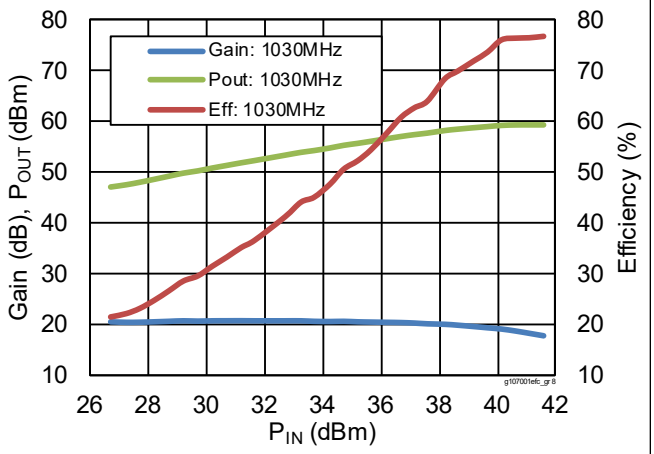

**Power Sweep: Gain v. Output Power**
(series show gain at various duty cycles)
$V_{DS}$ = 50 V, $I_{DQ}$ = 100 mA, $f$ = 1030 MHz




**CW Performance Small Signal**
Gain & Input Return Loss
$V_{DD}$ = 50 V, $I_{DQ(MAIN)}$ = 1000 mA




**MODE-S: (32µs-ON/18-µs-OFF)x48, LTDF-6.4%**
$V_{DS}$ = 50 V, $I_{DQ}$ = 100 mA, measured on 24th pulse



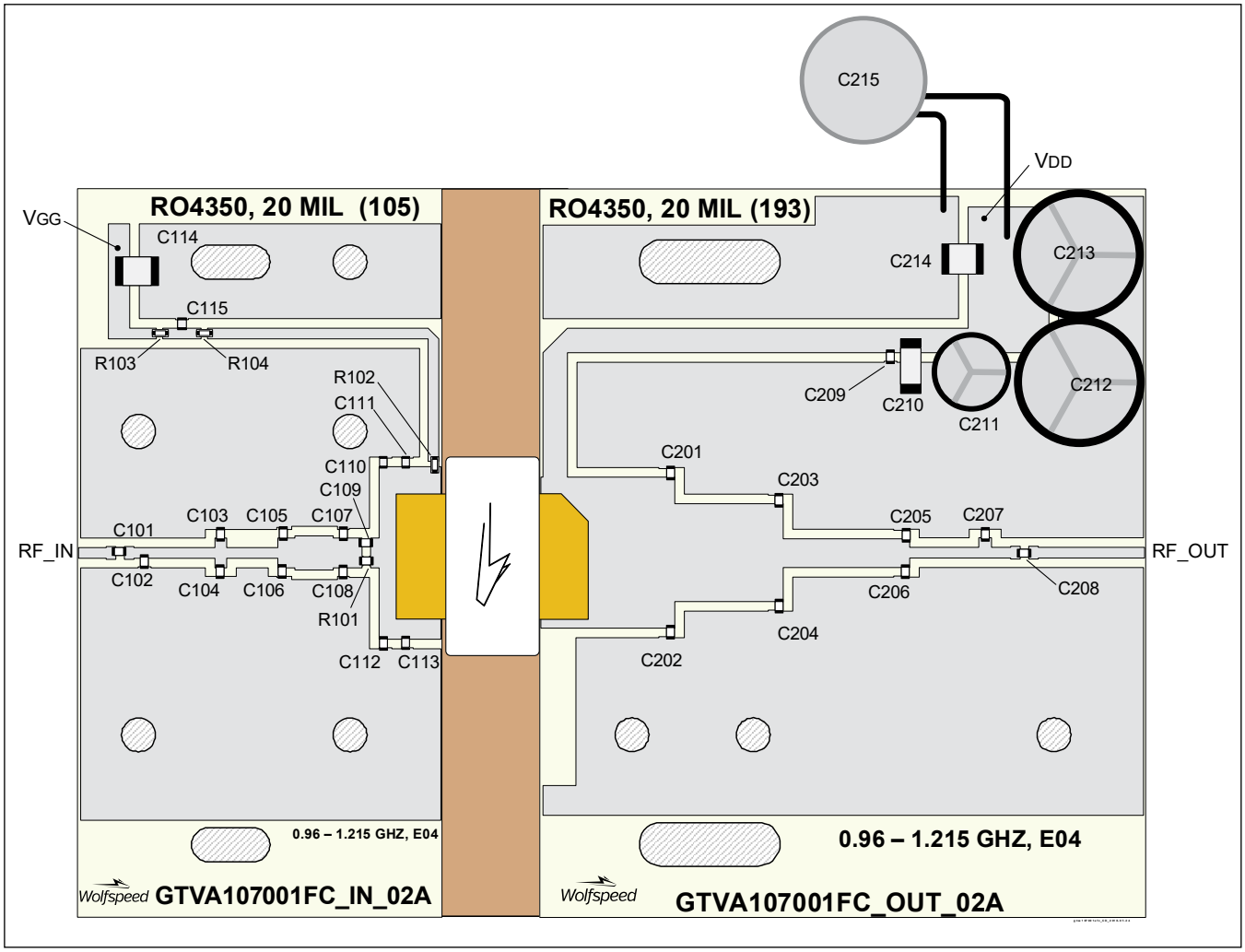
## Load Pull Performance

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

| | Max Output Power | | | | | Max Efficiency | | | | | Z Optimum | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Freq [MHz] | $P_{OUT}$ [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, $\varepsilon_r$ = 3.66 |



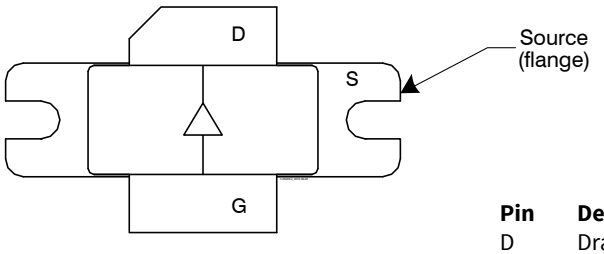

*Reference circuit assembly diagram (not to scale)*

## Reference Circuit (cont.)

### Components Information

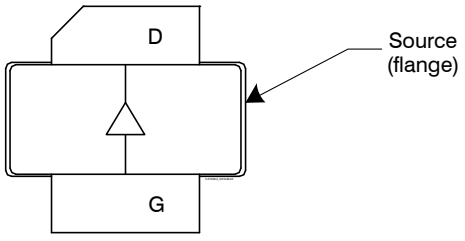
| Component | Description | Manufacturer | P/N |
|---|---|---|---|
| **Input** | | | |
| C101, C109, C115 | Capacitor, 56 pF | ATC | ATC800A560JT250XT |
| C102 | Capacitor, 0.4 pF | ATC | ATC600F0R4AT250XT |
| C103, C104 | Capacitor, 1 pF | ATC | ATC600F1R0BT250XT |
| C105 | Capacitor, 3.6 pF | ATC | 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 µF | 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 µF | TDK Corporation | C5750X5R1H106K230KA |
| C211 | Capacitor, 22 µF | Cornell Dubilier Electronics (CDE) | SEK220M100ST |
| C212 | Capacitor, 100 µF | Cornell Dubilier Electronics (CDE) | SK101M100ST |
| C213 | Capacitor, 220 µF | Panasonic – ECG | ECA-2AHG221 |
| C214 | Capacitor, 1 µF | TDK Corporation | C4532X7R2A105M230KA |
| C215 | Capacitor, 100 V, 6800 µF | Panasonic – ECG | ECO-S2AP682EA |

## Pinout Diagrams (top view)




GTVA107001EC
Package H-36248-2

| Pin | Description |
|---|---|
| D | Drain |
| G | Gate |
| S | Source (flange) |




GTVA107001FC
Package H-37248-2

## Package Outline Specifications

### Package H-36248-2

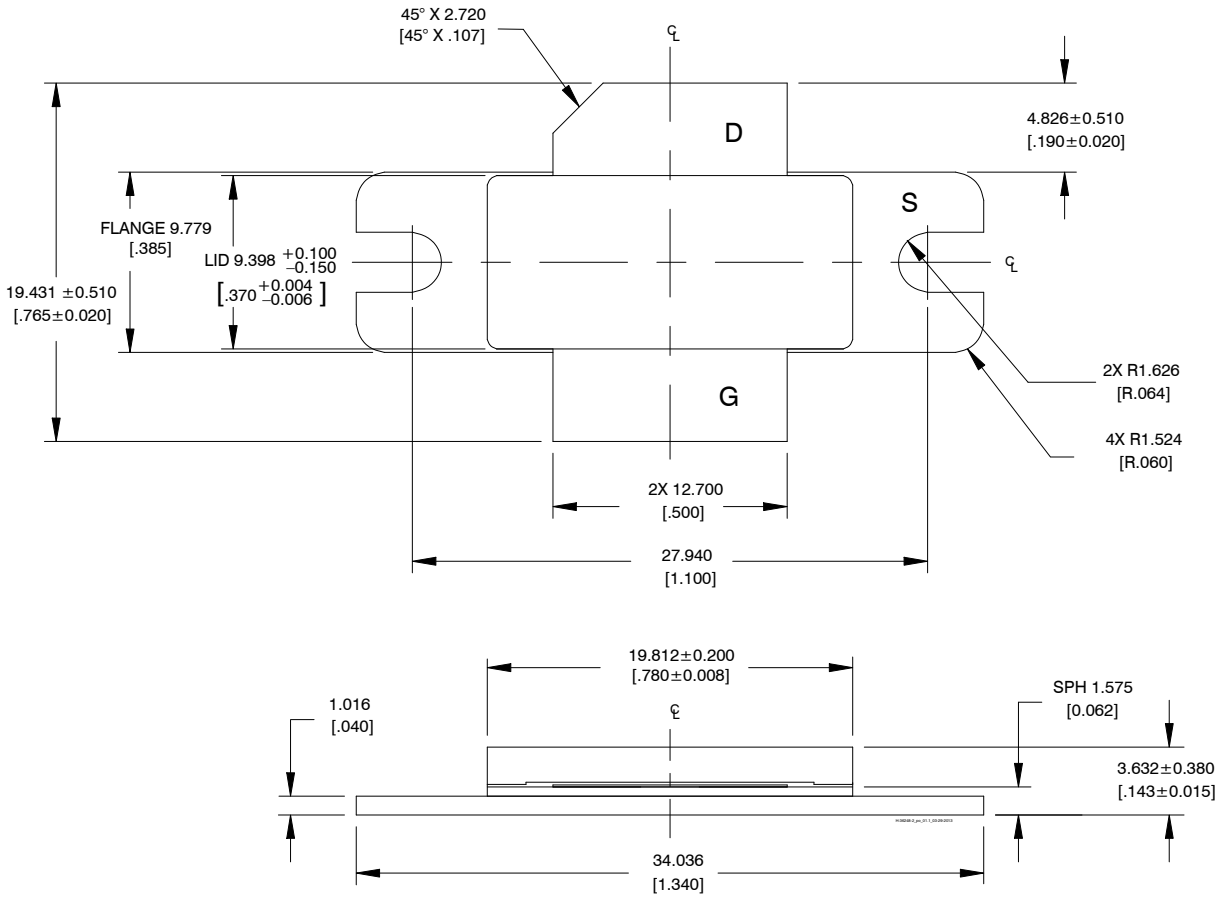



Diagram Notes—unless otherwise specified:

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

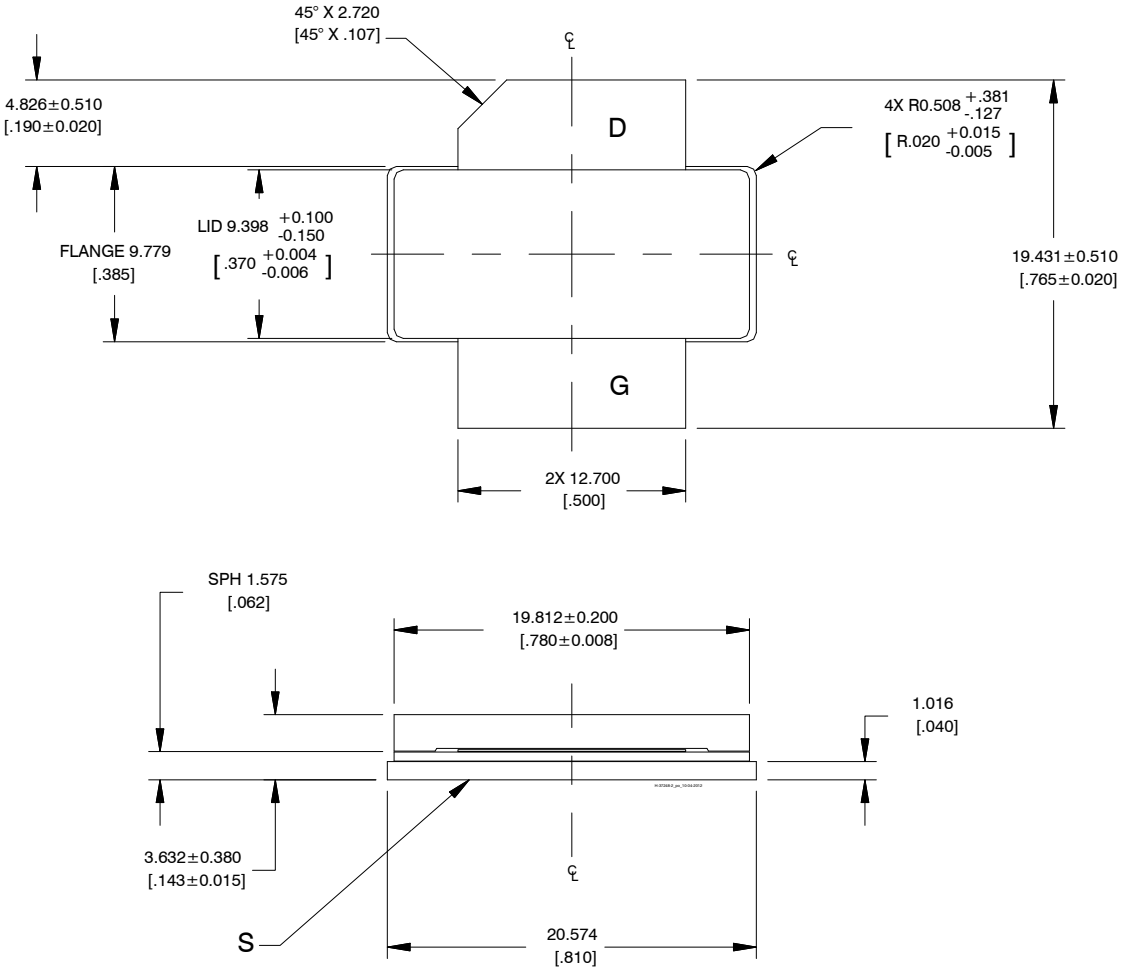



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## Revision History

| 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<br>1, 3<br>4 | Data Sheet reflects released product specification<br>Updated Typ pulsed CW performance, added Mode S graph<br>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 |
| 3.1 | 2021-10-14 | Production | 1 | Removed "thermally-enchanced" wording |

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## Notes

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