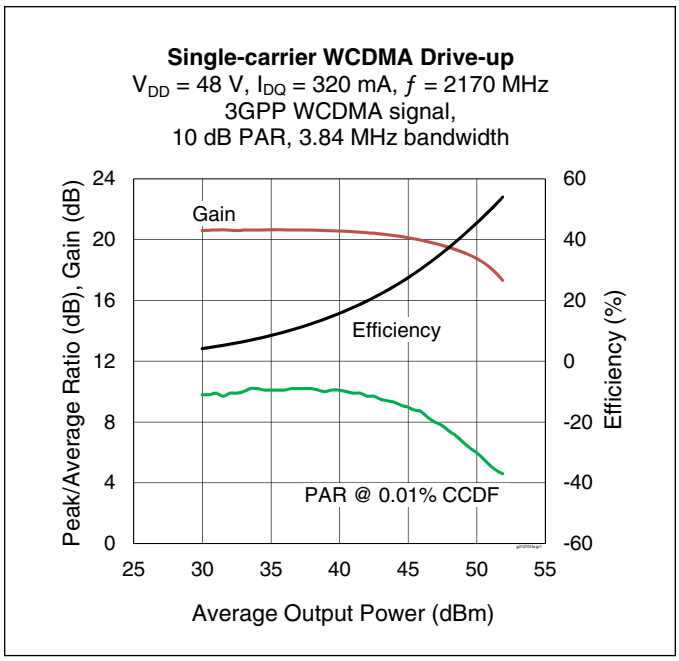
# GTVA212701FA

## Thermally-Enhanced High Power RF GaN on SiC HEMT
## 270 W, 48 V, 2110 – 2200 MHz


Package Types: H-87265J-2

### Description

The GTVA212701FA is a 270-watt GaN on SiC high electron mobility transistor (HEMT) for use in the 2110 to 2200 MHz frequecy band. It features input matching, high efficiency, and a thermally-enhanced earless package.




### Features

- GaN on SiC HEMT technology
- Input matched
- Typical pulsed CW performance (class AB), 2180 MHz, 48 V, 10 µs pulse width, 10% duty cycle
  - Output power $P_{3dB}$ = 300 W
  - Drain efficiency = 68.5%
  - Gain = 17.5 dB
- Human Body Model Class 1B (per ANSI/ESDA/JEDEC JS-001)
- Capable of handling 10:1 VSWR @ 48 V, 56.2 W (WCDMA) output power
- Low thermal resistance
- Pb-free and RoHS-compliant

### RF Characteristics

**Single-carrier WCDMA Specifications** (tested in the test fixture)

$V_{DD}$ = 48 V, $I_{DQ}$ = 320 mA, 56.2 W average output power, $f$ = 2180 MHz. 3GPP WCDMA signal: 3.84 MHz channel bandwidth, 10 dB PAR at 0.01% CCDF.

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Gain | $G_{ps}$ | 18 | 19 | — | dB |
| Drain Efficiency | $\eta_D$ | 35 | 38 | — | % |
| Adjacent Channel Power Ratio | ACPR | — | –29 | –26 | dBc |
| Output PAR @ 0.01% CCDF | OPAR | 6.4 | 7.0 | — | dB |

Note:
All published data at $T_{CASE}$ = 25°C unless otherwise indicated
ESD: Electrostatic discharge sensitive device—observe handling precautions!

RoHS compliant

## DC Characteristics

| Characteristic | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Drain-source Breakdown Voltage | $V_{BR(DSS)}$ | 150 | — | — | V | $V_{GS}$ = -8 V, $I_D$ = 10 mA |
| Drain-source Leakage Current | $I_{DSS}$ | — | — | 4.5 | mA | $V_{GS}$ = -8 V, $V_{DS}$ = 10 V |
| Gate Threshold Voltage | $V_{DSX(th)}$ | –3.8 | –3.0 | –2.3 | V | $V_{DS}$ = 10 V, $I_D$ = 32 mA |

## Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Drain Operating Voltage | $V_{DD}$ | 0 | — | 50 | V | |
| Gate Quiescent Voltage | $V_{GS(Q)}$ | –3.4 | –3.0 | -2.5 | | $V_{DS}$ = 48 V, $I_D$ = 320 mA |

## Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-source Voltage | $V_{DSS}$ | 125 | V |
| Operating Voltage | $V_{DD}$ | 55 | |
| Gate-Source Voltage | $V_{GS}$ | –10 to +2 | |
| Gate Current | $I_G$ | 32 | mA |
| Drain Current | $I_D$ | 12 | A |
| Junction Temperature | $T_J$ | 225 | °C |
| Storage Temperature Range | $T_{STG}$ | –65 to +150 | |

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 ($T_{CASE}$ = 70°c, 56.2 W (CW), 48 V, $I_{DQ}$ = 320 mA, 2170 MHz)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance | $R_{\theta JC}$ | 1.1 | °C/W |

## Ordering Information

| Type and Version | Order Code | Package | Shipping |
|---|---|---|---|
| GTVA212701FA V2 R0 | GTVA212701FA-V2-R0 | H-87265J-2, single-ended, earless flange | Tape & Reel, 50 pcs |
| GTVA212701FA V2 R2 | GTVA212701FA-V2-R2 | H-87265J-2, single-ended, earless flange | Tape & Reel, 250 pcs |

## **Typical Performance** (data taken in the production test fixture)

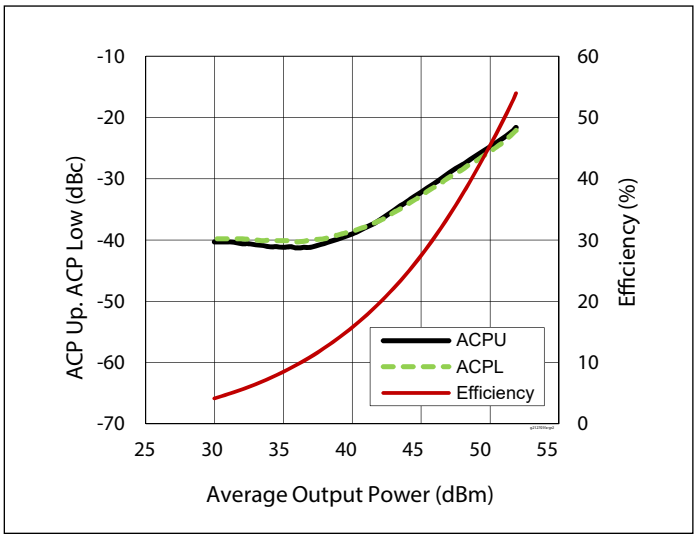



**Figure 1.** Single-carrier WCDMA Drive-up

$V_{DD}$ = 48 V, $I_{DQ}$ = 320 mA, $f$ = 2170 MHz
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

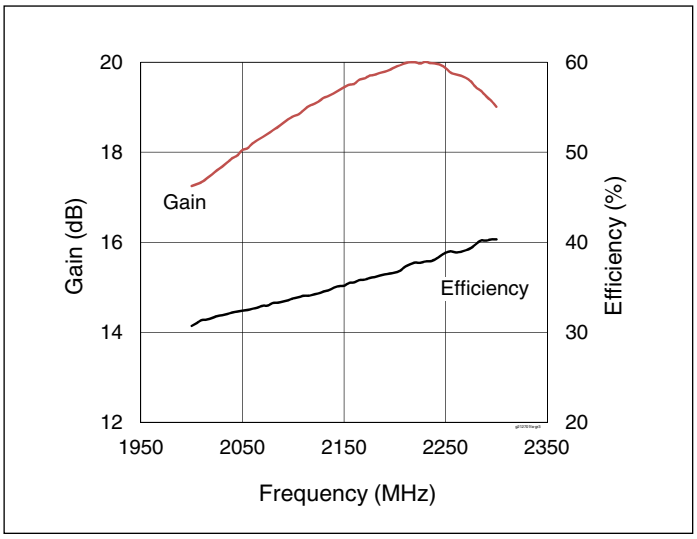



**Figure 2.** Single-carrier WCDMA Broadband

$V_{DD}$ = 48 V, $I_{DQ}$ = 320 mA,
$P_{OUT}$ = 47.5 dBm
3GPP WCDMA signal, 10 dB PAR

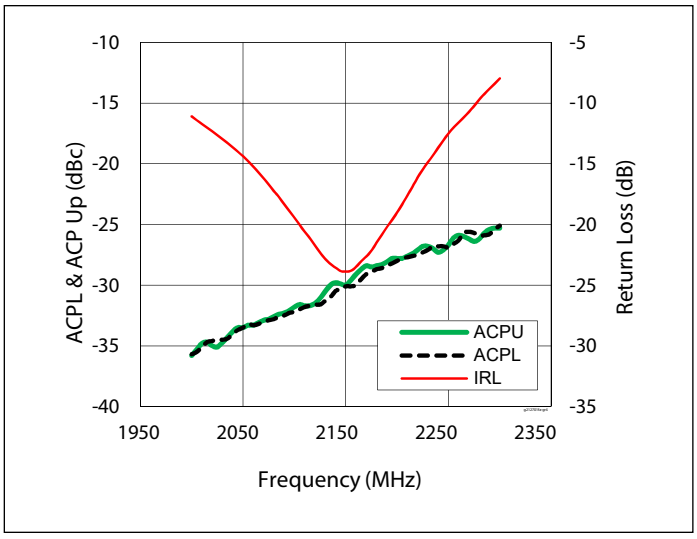



**Figure 3.** Single-carrier WCDMA Broadband

$V_{DD}$ = 48 V, $I_{DQ}$ = 320 mA,
$P_{OUT}$ = 47.5 dBm
3GPP WCDMA signal, 10 dB PAR

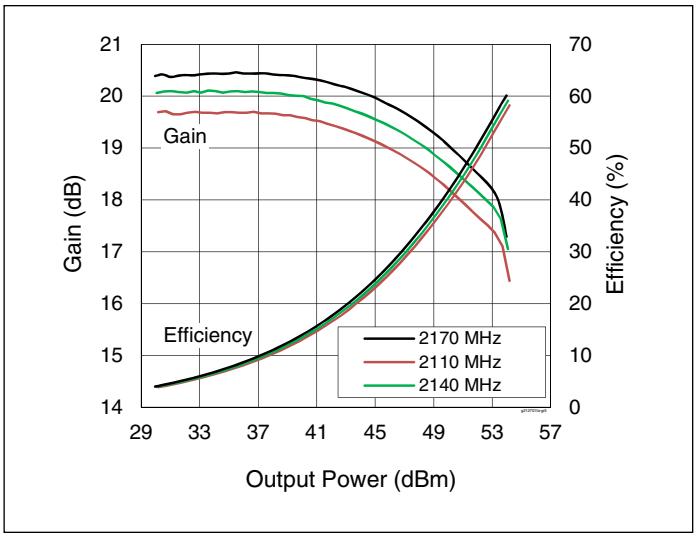



**Figure 4.** CW Performance Across Frequency

$V_{DD}$ = 48 V, $I_{DQ}$ = 320 mA

## Typical Performance (cont.)

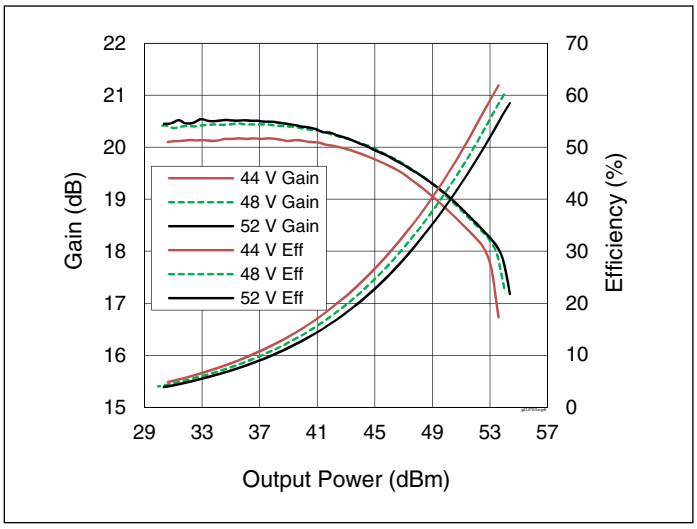



**Figure 5.** CW Performance at Various $V_{DD}$

$I_{DQ}$ = 320 mA, $f$ = 2170 MHz

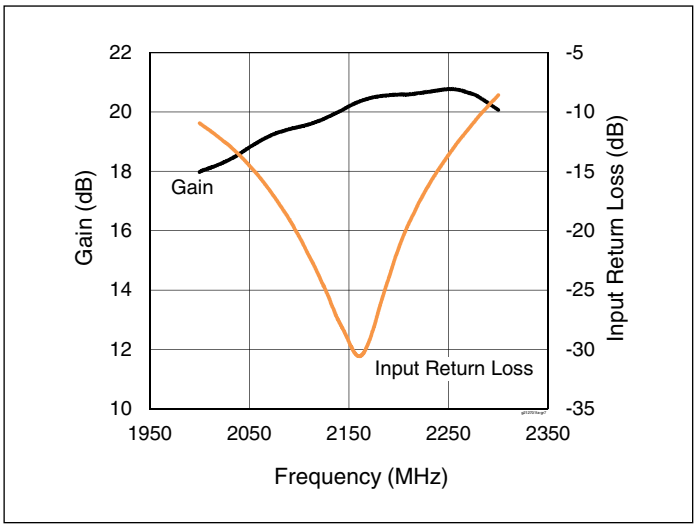



**Figure 6.** CW Small Signal Performance

$V_{DD}$ = 48 V, $I_{DQ}$ = 320 mA

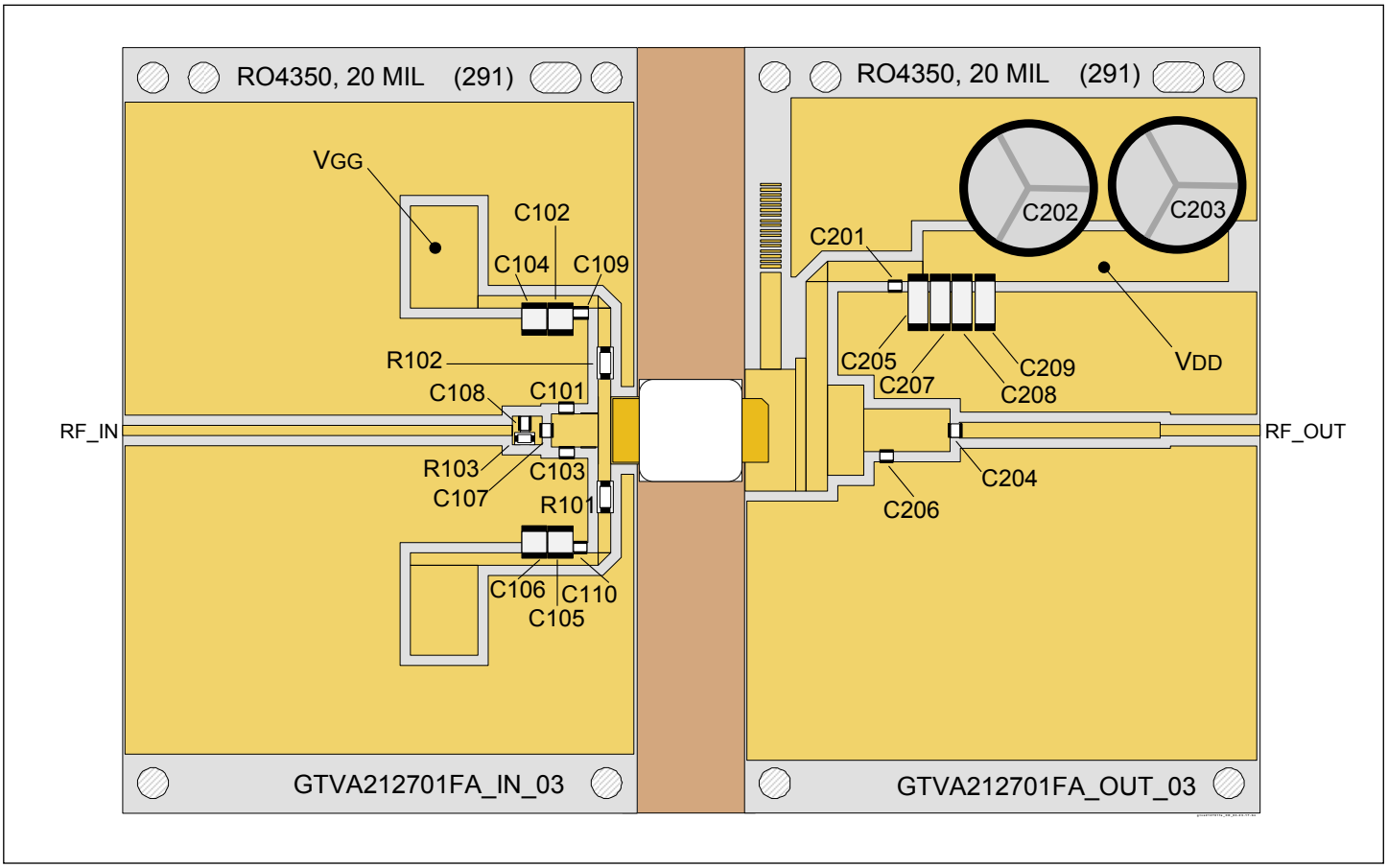
## Load Pull

**Pulsed CW signal:** – 10 µsec, 10% duty cycle; $V_{DD}$ = 48 V, $I_{DQ}$ = 300 mA

| Class AB | | $P_{3dB}$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Zs [Ω] | Zl [Ω] | Gain [dB] | $P_{3dB}$ [dBm] | $P_{3dB}$ [W] | $\eta_D$ [%] | Zl [Ω] | Gain [dB] | $P_{3dB}$ [dBm] | $P_{3dB}$ [W] | $\eta_D$ [%] |
| 2110 | 6.38 – j6.61 | 3.01 – j3.1 | 17.28 | 55.72 | 373.2 | 67.5 | 3.01 – j1.41 | 18.57 | 54.74 | 297.6 | 73.9 |
| 2170 | 4.78 – j4.24 | 3.01 – j3.1 | 17.37 | 55.71 | 372.3 | 68.8 | 3.13 – j1.84 | 18.55 | 54.78 | 300.7 | 73.2 |
| 2200 | 4.09 – j4.3 | 3.01 – j3.1 | 16.97 | 55.80 | 380.2 | 65.6 | 3.08 – j1.97 | 18.6 | 54.88 | 307.6 | 74.7 |

## Evaluation Board, 2110 to 2200 MHz

| | |
|---|---|
| Evaluation Board Part Number | LTN/GTVA212701FA-V2 |
| PCB Information | Rogers 4350, 0.508 mm [.020”] thick, 2 oz. copper, $\varepsilon_r$ = 3.66 |




Reference circuit assembly diagram (not to scale)

## Components Information

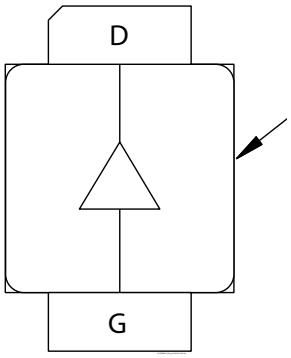
| Component | Description | Manufacturer | P/N |
|---|---|---|---|
| In | | | |
| C101 | Capacitor, 2 pF | ATC | ATC800A2R0BT250XT |
| C102, C104, C105, C106 | Capacitor, 10 µF | Taiyo Yuden | UMK325C7106MM-T |
| C103 | Capacitor, 0.2 pF | ATC | ATC800A0R2BT250XT |
| C107 | Capacitor, 15 pF | ATC | ATC800A150GT250XT |
| C108 | Capacitor, 12 pF | ATC | ATC800A120JT250XT |
| C109, C110 | Capacitor, 24 pF | ATC | ATC800A240JT250XT |
| R101, R102 | Resistor, 10 ohms | Panasonic Electronic Components | ERJ-8GEYJ100V |
| R103 | Resistor, 10 ohms | Yageo | RC0805JR-0710RL |
| Out | | | |
| C201 | Capacitor, 1.5 pF | ATC | ATC600S1R5CT250XT |
| C202, C210 | Capacitor, 0.5 pF | ATC | ATC600S0R5CT250XT |
| C203 | Capacitor, 1.0 pF | ATC | ATC600S1R0CT250XT |
| C204 | Capacitor, 6.8 pF | ATC | ATC800A6R8CT250XT |

## Bias Sequencing

**Bias On**
1. Ensure RF is turned off
2. Apply pinch-off voltage of –5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

**Bias Off**
1. Turn RF off
2. Apply pinch-off voltage to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

## Pinout Diagram (top view)




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

## Package Outline Specifications – Package H-87265J-2

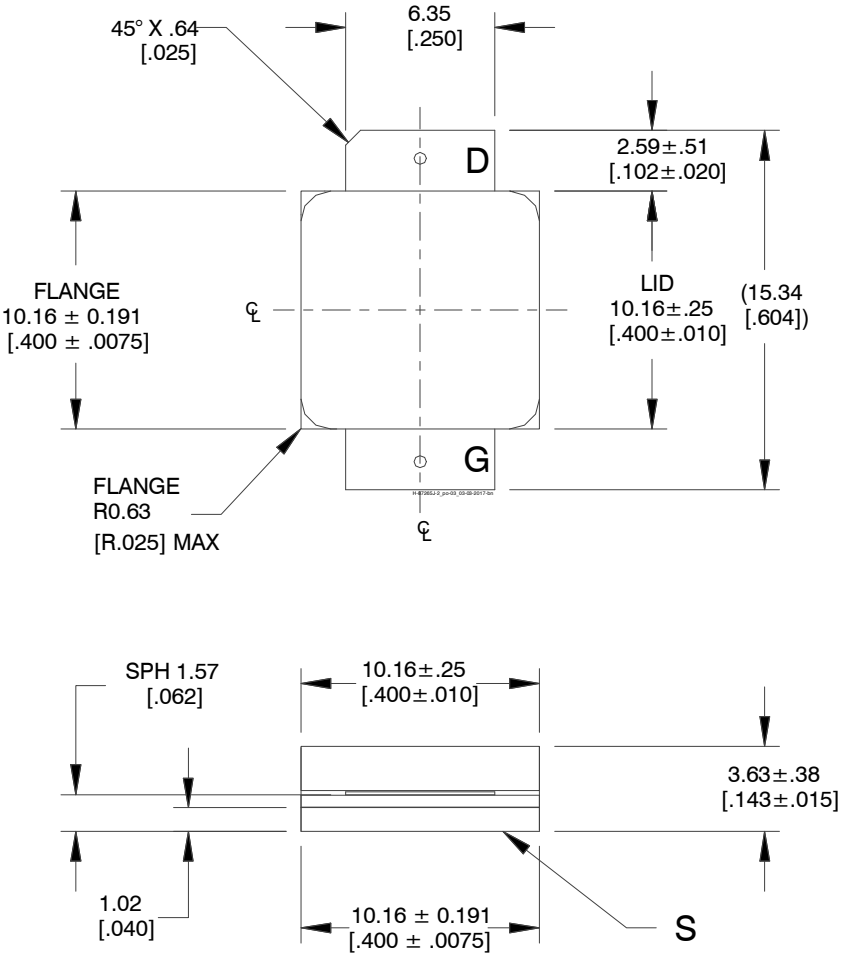



Diagram Notes—unless otherwise specified:

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]
4. Pins: D – drain; G – gate; S – source
5. Lead thickness: 0.13 ± 0.05 mm [.005 ± .002 inch]
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

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