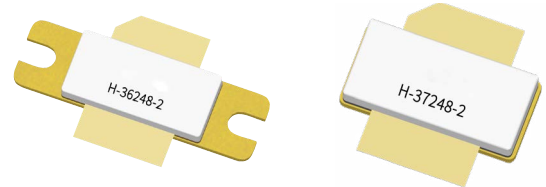


GTVA126001EC/FC

Thermally-Enhanced High Power RF GaN
HEMT 600 W, 50 V, DC – 1.4 GHz

Description

The GTVA126001EC and GTVA126001FC are 600 W GaN on SiC high electron mobility transistors (HEMT) for use in the DC to 1400 MHz frequency band. They feature input matching, high efficiency, and thermally-enhanced packages.



Package Types: H-36248-2
PN's: GTVA126001EC

Package Types: H-37248-2
PN's: GTVA126001FC

Features

- GaN on SiC HEMT technology
- Input matched
- Typical pulsed CW performance (class AB), 1200 MHz, 50 V, 300 μ s pulse width, 10% duty cycle
 - Output power $P_{3dB} = 600$ W
 - Drain efficiency = 65%
 - Gain = 18 dB
- Capable of withstanding a 10:1 load mismatch (all phase angles) at 600 W peak power under pulse conditions: 300 μ s pulse width, 10% duty cycle, $V_{DD} = 50$ V, $I_{DQ} = 100$ mA
- Human body model class 1 C (per ANSI/ESDA/JEDEC JS-001)
- Pb-free and RoHS compliant

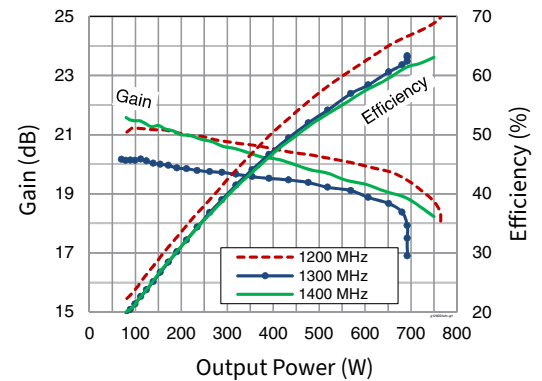


Figure 1. Power Sweep: Gain & Efficiency
50 V, $I_{DQ} = 100$ mA, 300 μ s Pulse Width,
10% Duty Cycle

RF Characteristics

Pulsed RF performance (tested in the test fixture)

$V_{DD} = 50$ V, $I_{DQ} = 100$ mA, $P_{OUT} = 600$ W, $f = 1400$ MHz, 300 μ s pulse width, 10% duty cycle

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|------------------|----------|------|------|------|------|
| Gain | G_{ps} | 19 | 20 | 22 | dB |
| Drain Efficiency | η_o | 56 | 63 | – | % |

All published data at $T_{CASE} = 25$ °C unless otherwise indicated

Note:

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

| Characteristics | 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 | $V_{GS} = -8\text{ V}, V_{DS} = 50\text{ V}$ | I_{DSS} | – | – | 12 | mA |
| Gate Threshold Voltage | $V_{DS} = 10\text{ V}, I_D = 85\text{ mA}$ | $V_{GS(th)}$ | -3.8 | -3.0 | -2.3 | V |

Recommended Operating Conditions

| Parameter | Conditions | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------|---|-------------|------|------|------|------|
| Drain Operating Voltage | | V_{DD} | 0 | – | 50 | V |
| Gate Quiescent Voltage | $V_{DS} = 50\text{ V}, I_D = 100\text{ mA}$ | $V_{GS(Q)}$ | -4.3 | -3.2 | -2.4 | 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

| Characteristics | Symbol | Value | Unit |
|---------------------------------|-----------------|-------|------|
| Thermal Resistance ¹ | $R_{\theta JC}$ | 0.28 | °C/W |
| Thermal Resistance ² | $R_{\theta JC}$ | 0.42 | °C/W |

Notes:

¹ $T_{CASE} = 85\text{ °C}$, $P_{DISS} = 334\text{ W}$, 500 μs pulse width, 10% duty cycle.

² $T_{CASE} = 85\text{ °C}$, $P_{DISS} = 333\text{ W}$, CW.

Ordering Information

| Type and Version | Order Code | Package and Description | Shipping |
|--------------------|--------------------|---|----------------------|
| GTVA126001EC V1 R0 | GTVA126001EC-V1-R0 | H-36248-2, Single-Ended, Bolt-Down Flange | Tape & Reel, 50 pcs |
| GTVA126001EC V1 R2 | GTVA126001EC-V1-R2 | H-36248-2, Single-Ended, Bolt-Down Flange | Tape & Reel, 250 pcs |
| GTVA126001FC V1 R0 | GTVA126001FC-V1-R0 | H-37248-2, Single-Ended, Earless Flange | Tape & Reel, 50 pcs |
| GTVA126001FC V1 R2 | GTVA126001FC-V1-R2 | H-37248-2, Single-Ended, Earless Flange | Tape & Reel, 250 pcs |

Typical Performance

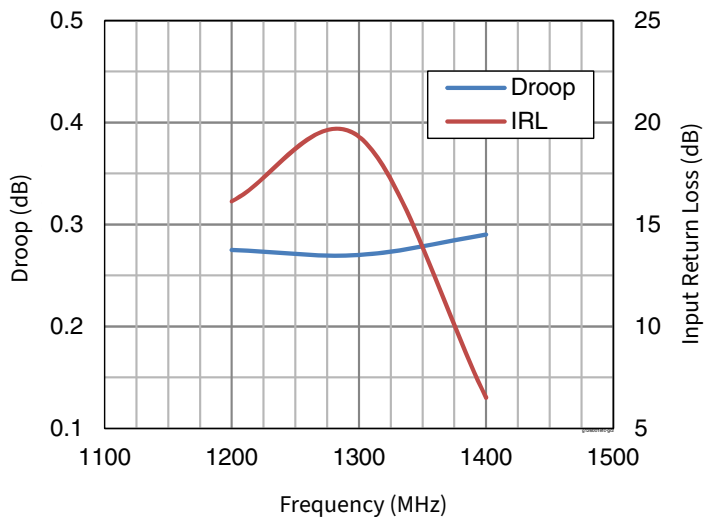


Figure 2. Pulse Droop and IRL $V_{DS} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, P_{OUT} @ P_{3dB} 300 μs Pulse Width, 10% Duty Cycle

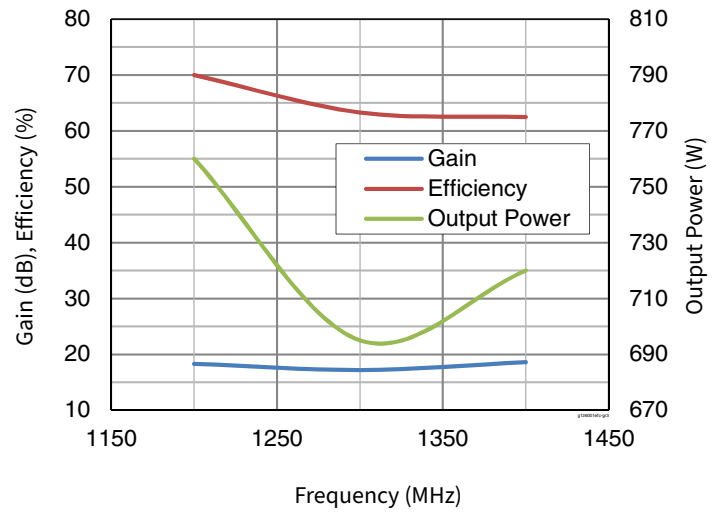


Figure 3. Frequency Sweep $V_{DS} = 50\text{ V}$, $I_{DQ} = 100\text{ mA}$, P_{OUT} @ P_{3dB} 300 μs Pulse Width, 10% Duty Cycle

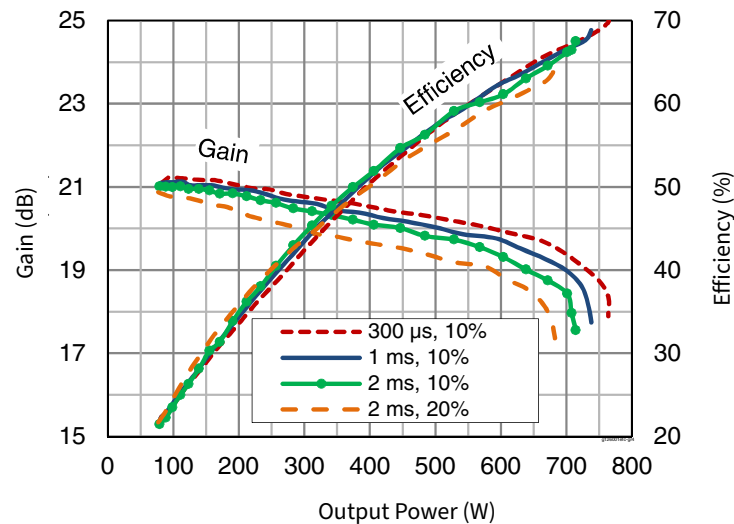


Figure 4. Power Sweep: 50 V, $I_{DQ} = 100\text{ mA}$, $f = 1200\text{ MHz}$

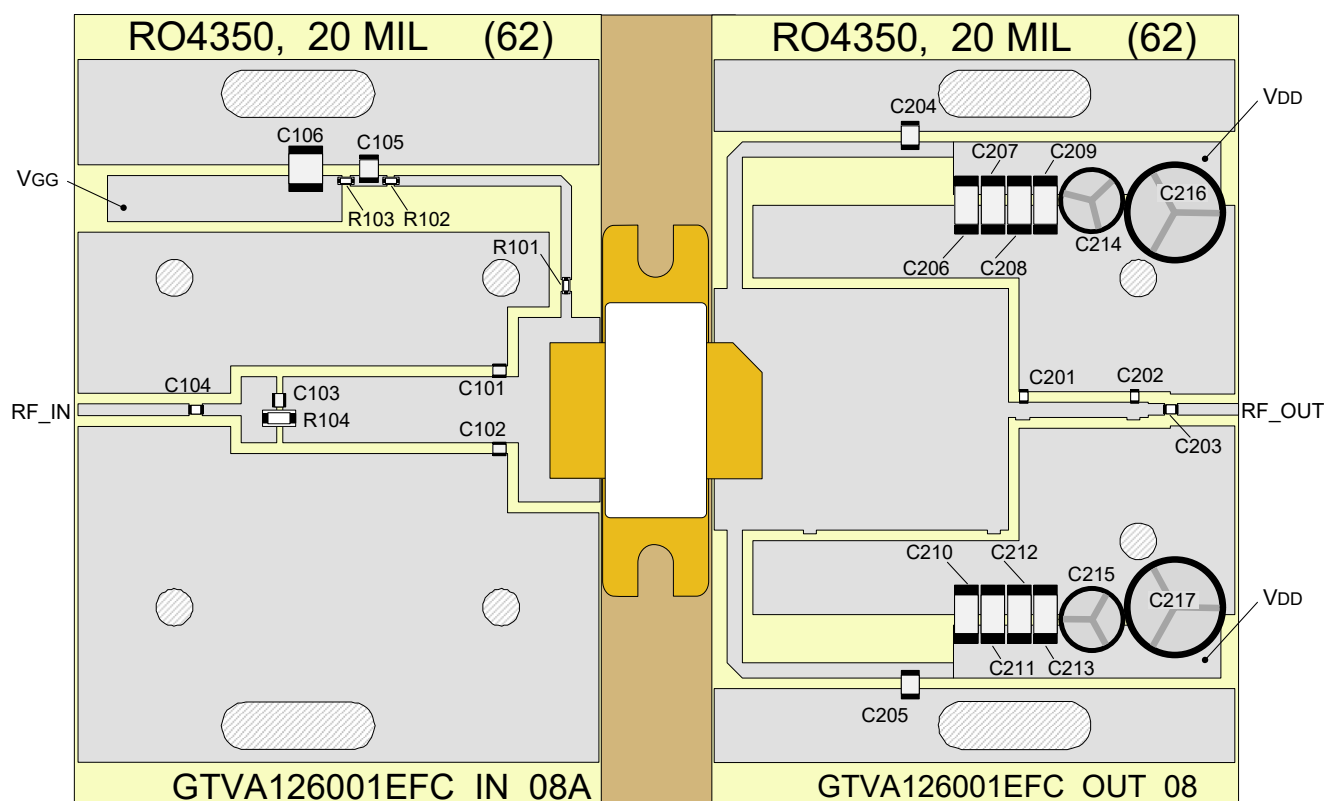
Load Pull Performance

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] |
| 1200 | 59.20 | 832 | 66.29 | 19.34 | $1.54 + j0.11$ | 58.12 | 649 | 75.83 | 20.09 | $2.19 + j0.97$ | 59.09 | 811 | 70.51 | 19.79 | $1.68 + j0.33$ | $1.00 - j1.73$ |
| 1300 | 58.62 | 728 | 59.62 | 18.89 | $1.12 + j0.12$ | 57.56 | 570 | 71.85 | 20.53 | $1.54 + j0.94$ | 58.41 | 693 | 67.11 | 19.98 | $1.22 + j0.44$ | $4.43 - j1.20$ |
| 1400 | 58.55 | 716 | 59.68 | 19.65 | $1.00 + j0.21$ | 57.35 | 543 | 70.39 | 20.18 | $1.38 + j0.85$ | 58.27 | 671 | 65.89 | 20.23 | $1.15 + j0.45$ | $2.35 + j0.66$ |

Reference Circuit Tuned for DC - 1.4 GHz

| | |
|-----------------------|--|
| DUT | GTVA126001EC/FC V1 |
| Test Fixture Part No. | LTN/GTVA126001EC V1, LTN/GTVA126001FC V1 |
| PCB | Rogers 4350, 0.508 mm [.020"] Thick, 2 oz. Copper, $\epsilon_r = 3.66$ |

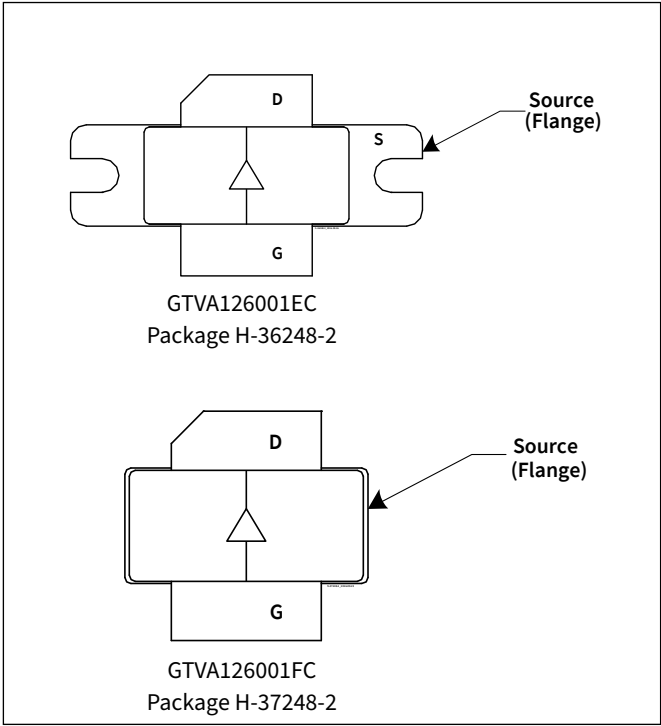


Reference circuit assembly diagram (not to scale)

Reference Circuit (Cont.)

| Components Information | | | |
|--|-------------------------|------------------------------------|---------------------|
| Component | Description | Manufacturer | P/N |
| Input | | | |
| C101, C102 | Capacitor, 1.2 pF | ATC | ATC800A1R2CT250T |
| C103, C104 | Capacitor, 56 pF | ATC | ATC800A560JT250T |
| C105 | Capacitor, 39 pF | ATC | ATC100B390JW500XB |
| C106 | Capacitor, 1 μF | TDK Corporation | C4532X7R2A105M230KA |
| R101 | Resistor, 10 ohms | Panasonic Electronic Components | ERJ-3GEYJ100V |
| R102 | Resistor, 100 ohms | Panasonic Electronic Components | ERJ-3GEYJ101V |
| R103 | Resistor, 5.6 ohms | Panasonic Electronic Components | ERJ-8RQJ5R6V |
| R104 | Resistor, 30 ohms | Panasonic Electronic Components | ERJ-8GEYJ300V |
| Output | | | |
| C201 | Capacitor, 1.6 pF | ATC | ATC800A1R6CT250T |
| C202 | Capacitor, 3.6 pF | ATC | ATC100A3R6CW150XB |
| C203 | Capacitor, 56 pF | ATC | ATC800A560JT250T |
| C204, C205 | Capacitor, 39 pF | ATC | ATC100B390JW500XB |
| C206, C207, C208, C209, C210, C211, C212, C213 | Capacitor, 10 μF, 100 V | TDK Corporation | C5750X7S2A106M230KB |
| C214, C215 | Capacitor, 22 μF | Cornell Dubilier Electronics (CDE) | SEK220M100ST |
| C216, C217 | Capacitor, 220 μF | Panasonic Electronic Components | ECA-2AHG221 |

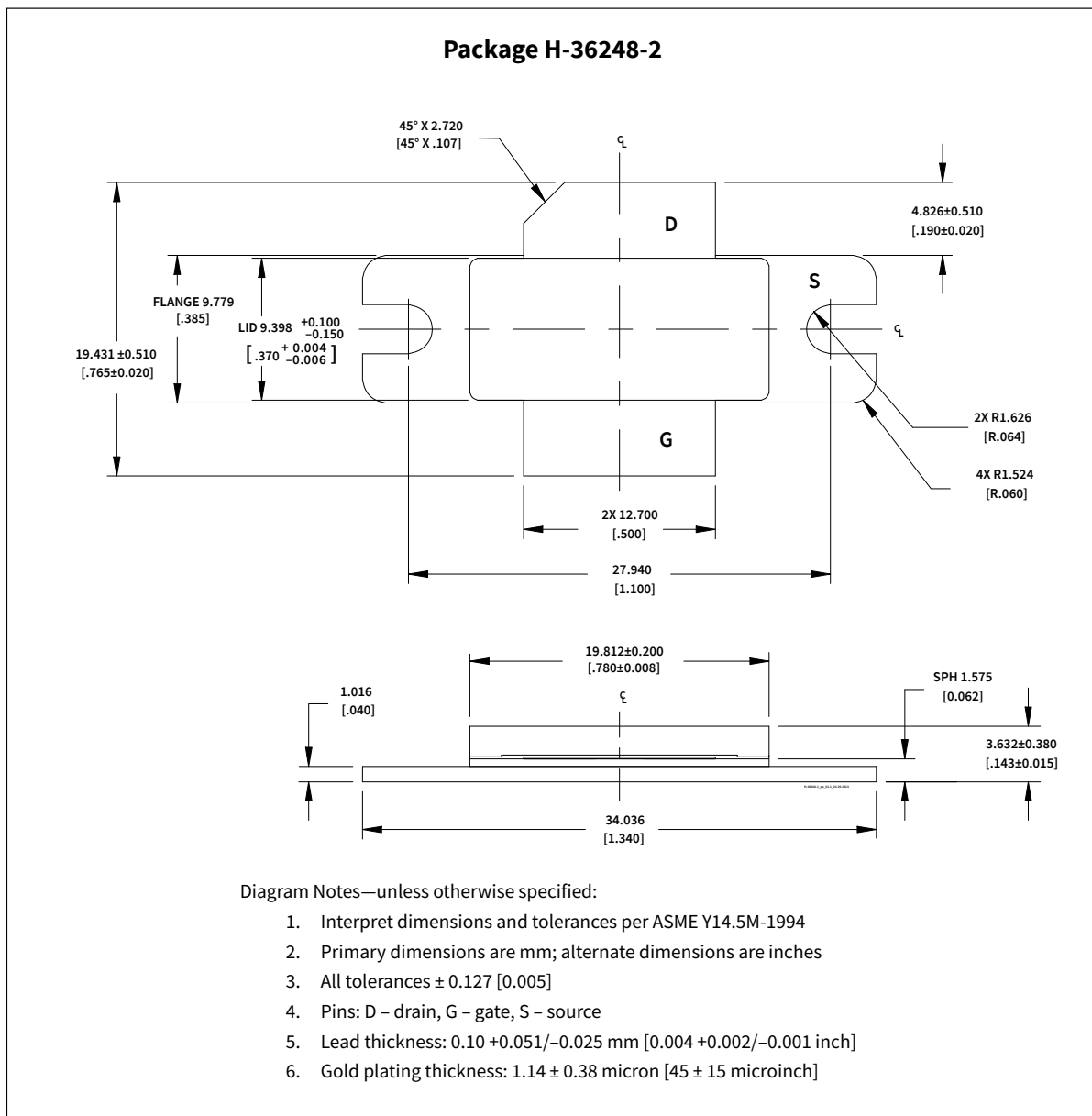
Pinout Diagrams (Top View)



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

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

Package Outline Specifications



Package H-37248-2

Technical drawing showing the top and side views of Package H-37248-2. The drawing includes dimensions and tolerances in millimeters and inches.

Top View Dimensions:

- Top edge: 4.826 ± 0.510 [$.190 \pm 0.020$]
- Left edge: FLANGE 9.779 [$.385$]
- Inner left edge: LID 9.398 $+0.100$ -0.150 [$.370$ $+0.004$ -0.006]
- Top right corner: $45^\circ \times 2.720$ [$45^\circ \times .107$]
- Right edge: $4X R0.508$ $+0.381$ -0.127 [$R.020$ $+0.015$ -0.005]
- Bottom edge: $2X 12.700$ [$.500$]
- Overall height: 19.431 ± 0.510 [$.765 \pm 0.020$]

Side View Dimensions:

- Top edge: SPH 1.575 [$.062$]
- Top edge: 19.812 ± 0.200 [$.780 \pm 0.008$]
- Bottom edge: 3.632 ± 0.380 [$.143 \pm 0.015$]
- Bottom edge: 20.574 [$.810$]
- Right edge: 1.016 [$.040$]

Diagram Notes—unless otherwise specified:

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

Revision History

| Revision | Date | Data Sheet | Page | Subjects (Major Changes at Each Revision) |
|----------|------------|-------------|------|---|
| 01 | 2016-09-27 | Advance | All | Proposed Specification for New Product Development |
| 02 | 2017-07-10 | Advance | All | Includes GTVA126001FC Product, Package H-37248-4 |
| 03 | 2017-11-17 | Preliminary | All | Add Preliminary Performance Information and Circuit Specifications |
| 04 | 2018-05-01 | Preliminary | All | Converted to the Data Sheet |
| 05 | 2019-02-06 | Production | All | Information for Production-Released Device, Including Firm Specifications, Operating Conditions and Performance, and Reference Circuit Specifications |
| 05-c | 2019-06-21 | Production | 2 | Edited Thermal Characteristics Note for ¹ T _{CASE} and ² T _{CASE} |
| 06 | 2020-03-10 | Production | All | Updated Frequency Range |
| 06.1 | 2023-09-29 | Production | All | Removed branding |

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