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## HVV0405-175 HIGH VOLTAGE, HIGH RUGGEDNESS

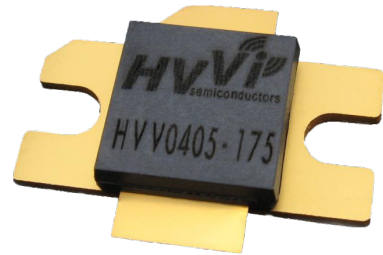
**UHF Pulsed Power Transistor**

**400-500 MHz, 300 $\mu$ s Pulse, 10% Duty Cycle**

**For UHF band, Weather and Long Range Radar Applications**

### FEATURES

- Silicon MOSFET Technology
- Operation from 24V to 50V
- High Power Gain
- Extreme Ruggedness
- Internal Input Matching
- Excellent Thermal Stability
- All Gold Bonding Scheme



### TYPICAL PERFORMANCE

High voltage vertical technology is well suited for high power pulsed applications in the UHF band including weather and long range radar applications.

| MODE     | FREQUENCY<br>(MHz) | VDD<br>(V) | IDQ<br>(mA) | Power<br>(W) | GAIN<br>(dB) | EFFICIENCY<br>(%) | IRL<br>(dB) |
|----------|--------------------|------------|-------------|--------------|--------------|-------------------|-------------|
| Class AB | 450                | 50         | 50          | 175          | 25           | 55                | 20:1        |

**Table 1:** Typical RF Performance in broadband test fixture at 25°C temperature with RF pulse conditions of pulse width = 300 $\mu$ s and pulse period = 3ms.

### DESCRIPTION

The high power HVV0405-175 device is an enhancement mode RF MOSFET power transistor designed for pulsed applications in the UHF-Band from 420MHz to 480MHz. The high voltage HVVFET™ technology produces over 175W of pulsed output power while offering high gain, high efficiency, and ease of matching with a 50 V supply. The vertical device structure assures high reliability and ruggedness as the device is specified to withstand a 20:1 VSWR at all phase angles under full rated output power.

### ORDERING INFORMATION

Device Part Number: HVV0405-175

Demo Kit Part Number: HVV0405-175-EK

Available through Richardson Electronics (<http://rfwireless.rell.com/>)

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### ELECTRICAL CHARACTERISTICS

| Symbol        | Parameter              | Conditions                | Min | Typical | Max | Unit    |
|---------------|------------------------|---------------------------|-----|---------|-----|---------|
| $V_{BR(DSS)}$ | Drain-Source Breakdown | $V_{GS}=0V, I_D=5mA$      | 95  | 102     | -   | V       |
| $I_{DSS}$     | Drain Leakage Current  | $V_{GS}=0V, V_{DS}=48V$   | -   | 50      | 200 | $\mu A$ |
| $I_{GSS}$     | Gate Leakage Current   | $V_{GS}=5V, V_{DS}=0V$    | -   | 1       | 5   | $\mu A$ |
| $G_P^1$       | Power Gain             | $F=450MHz$                | 23  | 25      | -   | dB      |
| $IRL^1$       | Input Return Loss      | $F=450MHz$                | -   | -7      | -4  | dB      |
| $\eta_D^1$    | Drain Efficiency       | $F=450MHz$                | 52  | 55      | -   | %       |
| $V_{GS(Q)}^2$ | Gate Quiescent Voltage | $V_{DD}=50V, I_{DQ}=50mA$ | 1.1 | 1.45    | 1.8 | V       |
| $V_{TH}$      | Threshold Voltage      | $V_{DD}=5V, I_D=300\mu A$ | 0.7 | 1.2     | 1.7 | V       |

### PULSE CHARACTERISTICS

| Symbol  | Parameter   | Conditions | Min | Typical | Max | Unit |
|---------|-------------|------------|-----|---------|-----|------|
| $T_r^1$ | Rise Time   | $F=450MHz$ | -   | <25     | 50  | nS   |
| $T_f^1$ | Fall Time   | $F=450MHz$ | -   | <22     | 50  | nS   |
| $PD^1$  | Pulse Droop | $F=450MHz$ | -   | 0.3     | 0.5 | dB   |

### THERMAL CHARACTERISTICS

| Symbol          | Parameter          | Max  | Unit          |
|-----------------|--------------------|------|---------------|
| $\theta_{JC}^1$ | Thermal Resistance | 0.40 | $^{\circ}C/W$ |

### RUGGEDNESS PERFORMANCE

| Symbol  | Parameter               | Test Condition | Max  | Units |
|---------|-------------------------|----------------|------|-------|
| $LMT^1$ | Load Mismatch Tolerance | $F = 450 MHz$  | 20:1 | VSWR  |

The HVV0405-175 device is capable of withstanding an output load mismatch corresponding to a 20:1 VSWR at rated output power and nominal operating voltage across the frequency band of operation.

**<sup>1</sup>NOTE: All parameters measured under pulsed conditions at 175W output power measured at the 10% point of the pulse with pulse width = 300 $\mu$ sec, duty cycle = 10% and  $V_{DD} = 50V, I_{DQ} = 50mA$  in a broadband matched test fixture.**

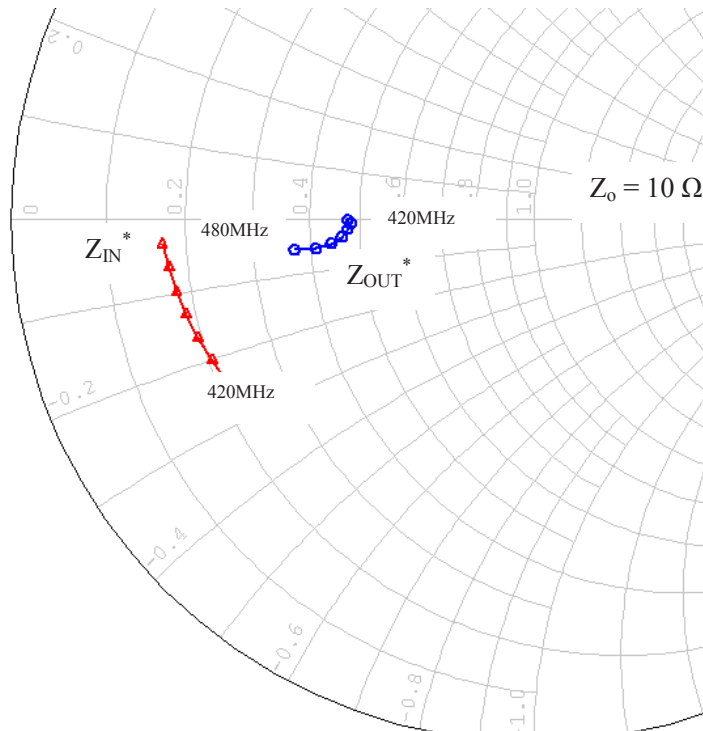
**<sup>2</sup>NOTE: Amount of gate voltage required to attain nominal quiescent current.**

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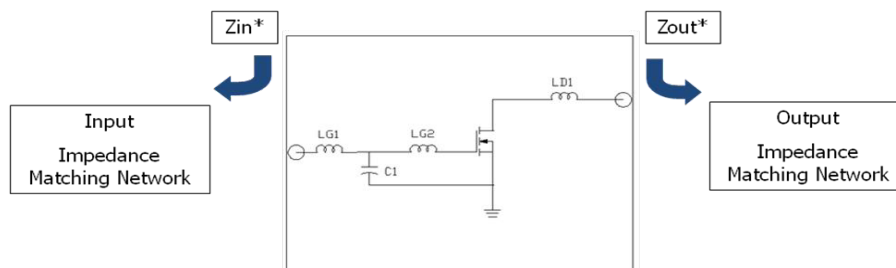
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Test Circuit Impedance

| Frequency | $Z_{in}^*(\text{ohms})$ | $Z_{out}^*(\text{ohms})$ |
|-----------|-------------------------|--------------------------|
| 420 MHz   | 2.14-j2.38              | 4.75-j0.01               |
| 430 MHz   | 2.05-j2.01              | 4.82-j0.08               |
| 440 MHz   | 1.95j-1.65              | 4.75-j0.20               |
| 450 MHz   | 1.87-j1.30              | 4.62-j0.37               |
| 460 MHz   | 1.80-j0.98              | 4.40-j0.48               |
| 470 MHz   | 1.75-j.064              | 4.10-j0.56               |
| 480 MHz   | 1.68-j0.33              | 3.70-j0.55               |

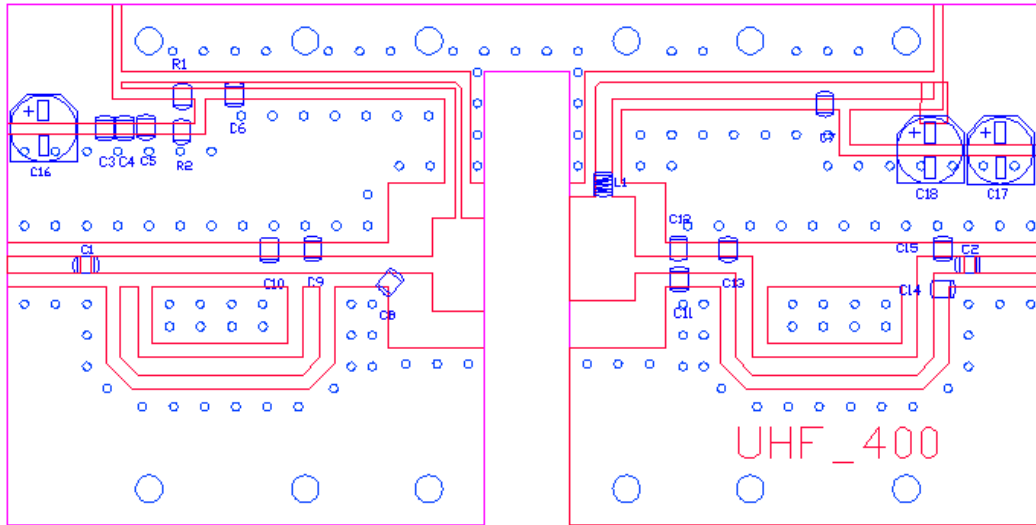


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Demonstration Board Outline

Demonstration Circuit Board Picture

| Part              | Description                                             | Part Number        | Manufacturer      |
|-------------------|---------------------------------------------------------|--------------------|-------------------|
| C1,C2,C6,C7 :     | 220 pF ATC 100B Chip Capacitor                          | 100B221JP500X      | ATC               |
| C3                | 1.0 uF, 100V Chip Capacitor (X7R 1210)                  | GRM32ER72A105MA01L | Murata            |
| C4                | 10K pF 100V Chi Capacitor (X7R 1206)                    | C1206C103K1RACTU   | Kemet             |
| C5                | 1K pF 100V Chi Capacitor (X7R 1206)                     | C1206C102K1RACTU   | Kemet             |
| R1:               | 56 Ohms Chip Resistor (1206) SMD                        | RC1206JR-07100KL   | DIGI-KEY          |
| R2:               | 1.5 K Ohms Chip Resistor (1206) SMD                     | RC1206JR-07100KL   | DIGI-KEY          |
| C8:               | 22.0 pF ATC 100B Chip Capacitor                         | 100B220BW 150X     | ATC               |
| C9:               | 15.0 pF ATC 100B Chip Capacitor                         | 100B150JP500X      | ATC               |
| C10:              | 3.9 pF ATC 100B Chip Capacitor                          | 100B3R9JP500X      | ATC               |
| C11,C12:          | 12 pF ATC 100B Chip Capacitor                           | 100B120JP500X      | ATC               |
| C13:              | 24.0 pF ATC 100B Chip Capacitor                         | 100B240JP500X      | ATC               |
| C14:              | 10 pF ATC 100B Chip Capacitor                           | 100B100JP500X      | ATC               |
| C15:              | 1.0 pF ATC 100B Chip Capacitor                          | 100B1R0JP500X      | ATC               |
| C16:              | 10uF 63V Elect FK SMD                                   | PCE3479CT-ND       | Digi Key          |
| L1                | 43 nH Coilcraft mini spring Inductor                    | B10T_L_            | Coil craft        |
| C17, C18:         | 100uF 63V Elect FK SMD                                  | PCE3483CT-ND       | Digi Key          |
| RF Connectors (2) | Type "N" RF connectors                                  | 5919CC-TB-7        | Coaxicom          |
| DC Drain Conn     | Connector Jack Banana Nylon Red                         | J151-ND            | DIGI-KEY          |
| DC Ground Conn.   | Connector Jack Banana Nylon Black                       | J152-ND            | DIGI-KEY          |
| DC Gate Conn.     | Connector Jack Banana Nylon Green                       | J153-ND            | DIGI-KEY          |
| PCB Board         | PCB: Arlon, 30 mils thick, 2.55 Dielectric, 2 oz Copper | DS2525             | DS Electronics    |
| Heat Sink         | Cool Innovations Aluminum Heat Sink                     |                    | Cool Innovation   |
| Device Clamp      | Cool Innovations Nylon Clamp Foot                       | FXT000158 Rv.B     | Cool Innovation   |
| S.S. Screws (3)   | 4-40 X 1/4 Stainless Steel Hex Head Socket Screws       | P242393            | Copper State Bolt |
| Alloy Screws (4)  | 4-40 X 1/2 Alloy Socket Cap screw Hex Head              | SCAS-0440-08C      | Small Parts Inc   |
| Metal Washers(4)  | #4 Washer Zinc PLTD Steel Lock                          | ZSLW-004-M         | Small Parts Inc   |

(AutoCAD Files for Demonstration Board available online at [www.hvvi.com/products](http://www.hvvi.com/products))

HVV0405-175 Demonstration Circuit Board Bill of Materials



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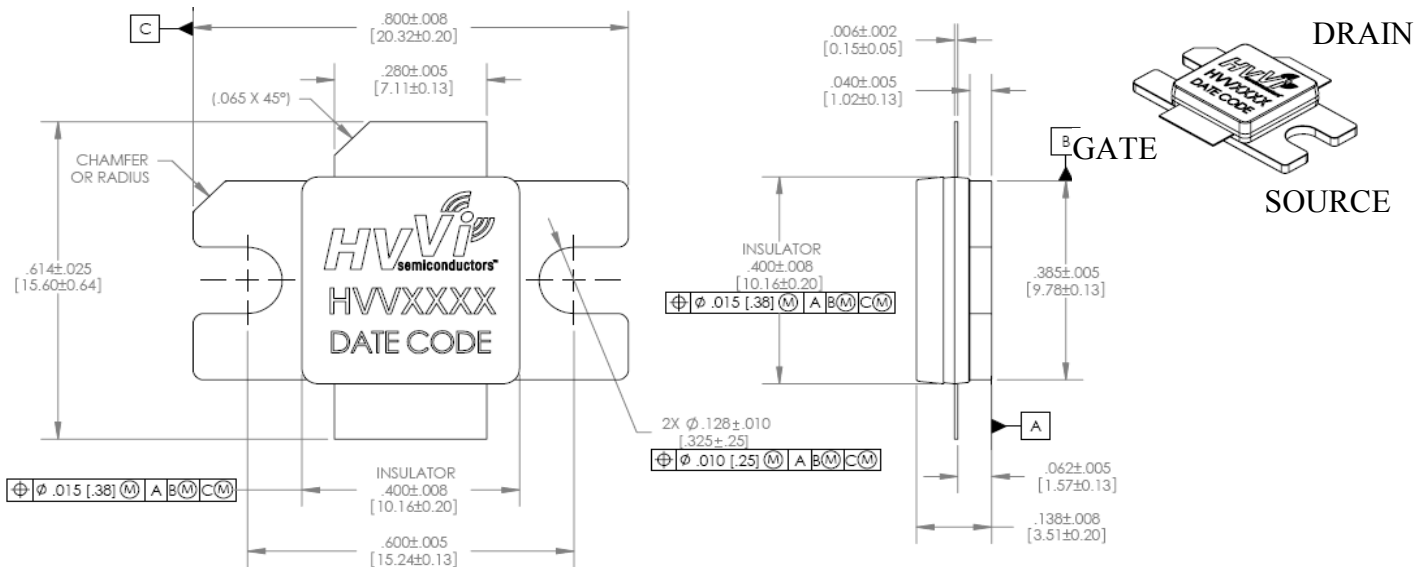
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### PACKAGE DIMENSIONS



**Note: Drawing is not actual size.**

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