HVV1012-550 High Voltage, High Ruggedness

L-Band High Power Pulsed Transistor
1025-1150 MHz, 10µs Pulse, 1% Duty
For Airborne DME Applications

The innovative Semiconductor Company!

FEATURES

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

TYPICAL PERFORMANCE

High voltage vertical technology is well suited for high power pulsed applications at L-Band for airborne distance measuring equipment (DME).

At Pin (W)	FREQUENCY (MHz)	VDD (V)	IDQ (mA)	Power (W)	GAIN (dB)	η(%)	IRL (dB)	VSWR
12	1150	50	100	640	17.3	48	-12	20:1

Table 1: Typical RF Performance in broadband text fixture at 25°C temperature with RF pulse conditions of pulse width = 10µs and pulse duty cycle = 1%.

DESCRIPTION

The high power HVV1012-550 device is an enhancement mode RF MOSFET power transistor designed for pulsed applications in the L-Band from 1025MHz to 1150MHz. The high voltage HVVFET™ technology produces over 550W 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: HVV1012-550
Evaluation Kit Part Number: HVV1012-550-EK
Available through Richardson Electronics (http://www.rell.com/)

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ABSOLUTE MAXIMUM RATING (IEC 134)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	95	V
V_{GSS}	Gate-Source Voltage	-10, 10	V
$I_{DS(max)}$	Drain Current	40	A
P_D[1]	Power Dissipation	5000	W
P_{in}	Input Power	28	W
T_S	Storage Temperature	-40 to +150	°C
T_J	Junction Temperature	200	°C

THERMAL/RUGGEDNESS PERFORMANCE

Symbol	**Parameter**	**Max**	**Unit**
θ_{JC}[2]	Thermal Resistance	0.03	°C/W

Symbol	Parameter	Test Condition	Max	Units
LMT[2]	Load Mismatch Tolerance	F = 1150 MHz	20:1	VSWR

The HVV1012-550 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.

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}=50V	-	100	400	µA
I_{GSS}	Gate Leakage Current	V_{GS}=5V,V_{DS}=0V	-	2	10	µA
G_P[2]	Power Gain	F=1025, 1150MHz, Pin=12W	16.5	17.3	-	dB
IRL[2]	Input Return Loss	F=1025, 1150MHz, Pin=12W	-	-12	-7	dB
η_D[2]	Drain Efficiency	F=1025, 1150MHz, Pin=12W	44	48	-	%
Pout	Power out	F=1150MHz, Pin=12W	-	640	-	W
$V_{GS(Q)}$[3]	Gate Quiescent Voltage	V_{DD}=50V,I_{DQ}=100mA	1.0	1.4	1.7	V
V_{TH}	Threshold Voltage	V_{DD}=5V, I_D=300µA	0.7	1.2	1.7	V

Typical performance at 1025MHz with an input power of 12W.

G_P[2]	Power Gain	F=1025MHz, Pin=12W	-	17	-	dB
IRL[2]	Input Return Loss	F=1025MHz, Pin=12W	-	-11	-	dB
η_D[2]	Drain Efficiency	F=1025MHz, Pin=12W	-	54	-	%
Pout	Power out	F=1025MHz, Pin=12W	-	640	-	W

PULSE CHARACTERISTICS

Symbol	Parameter	Conditions	Min	Typical	Max	Units
t_r[4]	Rise Time	F=1150MHz	-	<35	50	ns
t_f[4]	Fall Time	F=1150MHz	-	<15	50	ns
PD[4]	Pulse Droop	F=1150MHz	-	0.1	0.3	dB

Notes:
1) Rated at T_{CASE} = 25°C

2) All parameters measured under pulsed conditions at 12W input power measured at the 10% point of the pulse with pulse width = 10µsec, duty cycle = 1% and V_{DD} = 50V, I_{DQ} = 100mA in a broadband matched test fixture.

3) Amount of gate voltage required to attain nominal quiescent current.

4) Guaranteed by design.

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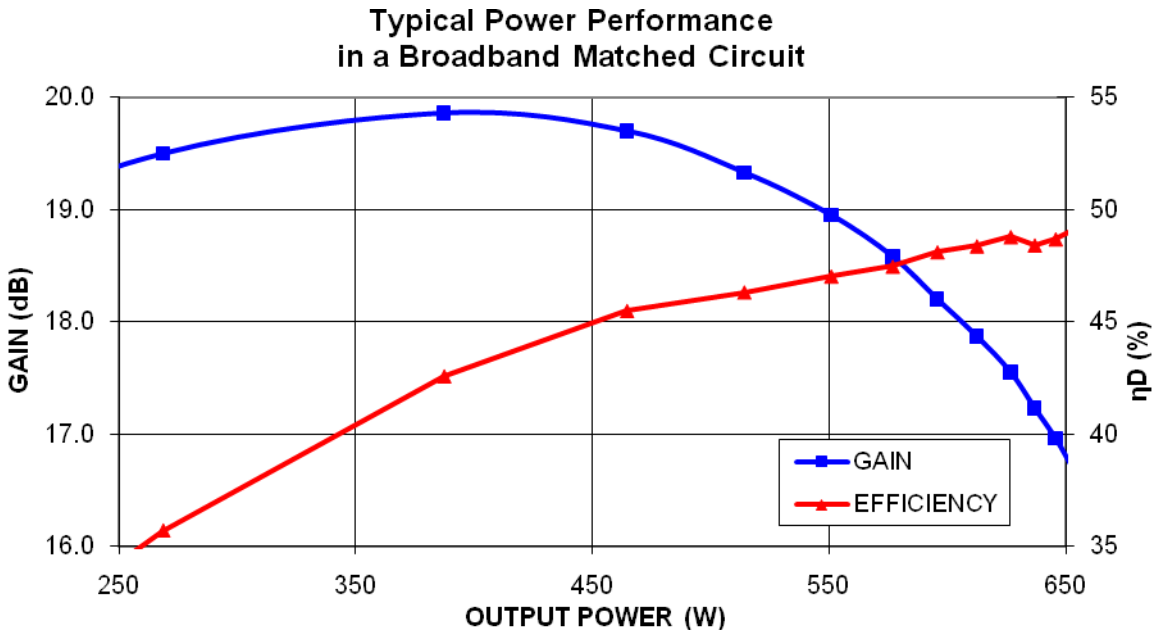
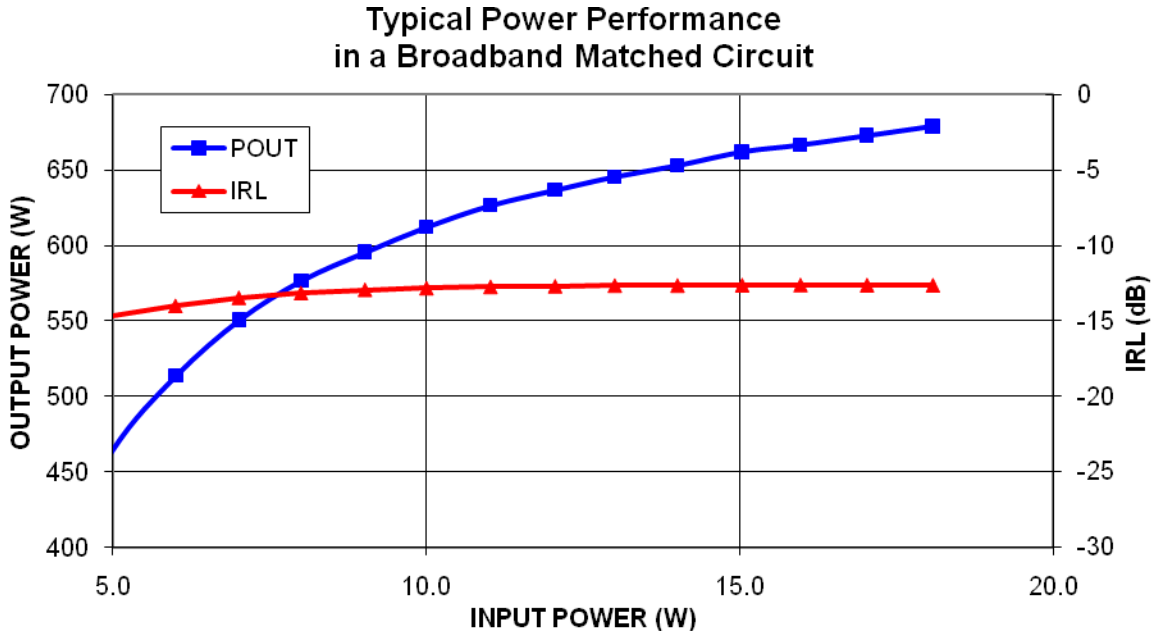


Typical device performance under Class AB mode of operation and RF pulse conditions of 10µs pulse width and 1% duty cycle with V_{DD} = 50V and I_{DQ} = 100mA. The device was measured at 1150MHz.



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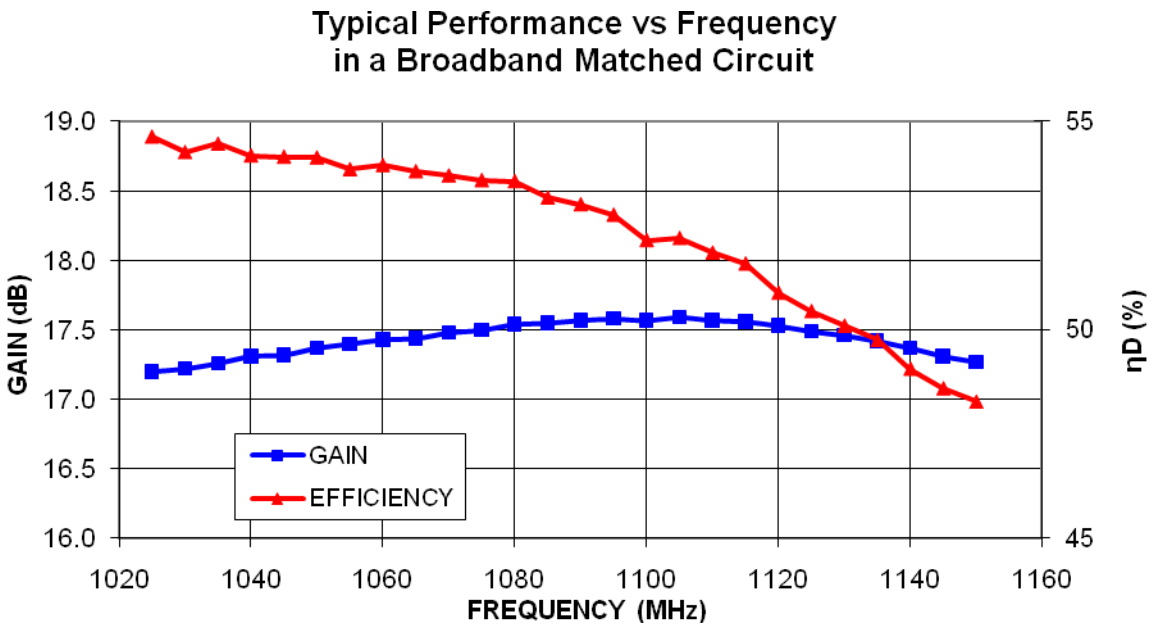
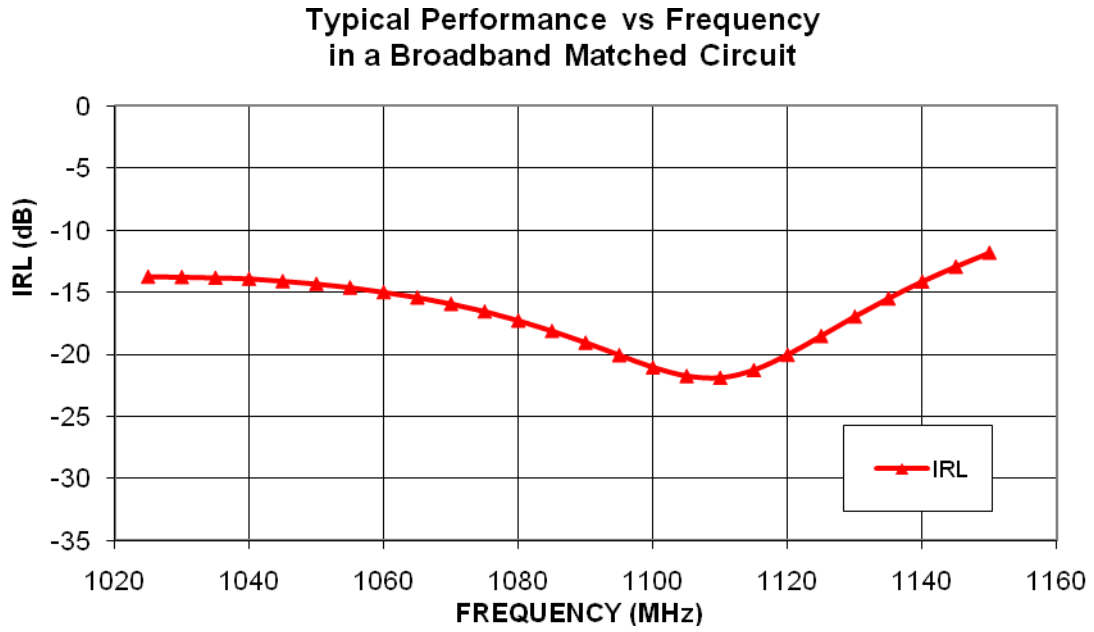


Typical device performance under Class AB mode of operation and RF pulse conditions of 10µs pulse width and 1% duty cycle with V_{DD} = 50V and I_{DQ} = 100mA. The device was measured at an input power of 12W.



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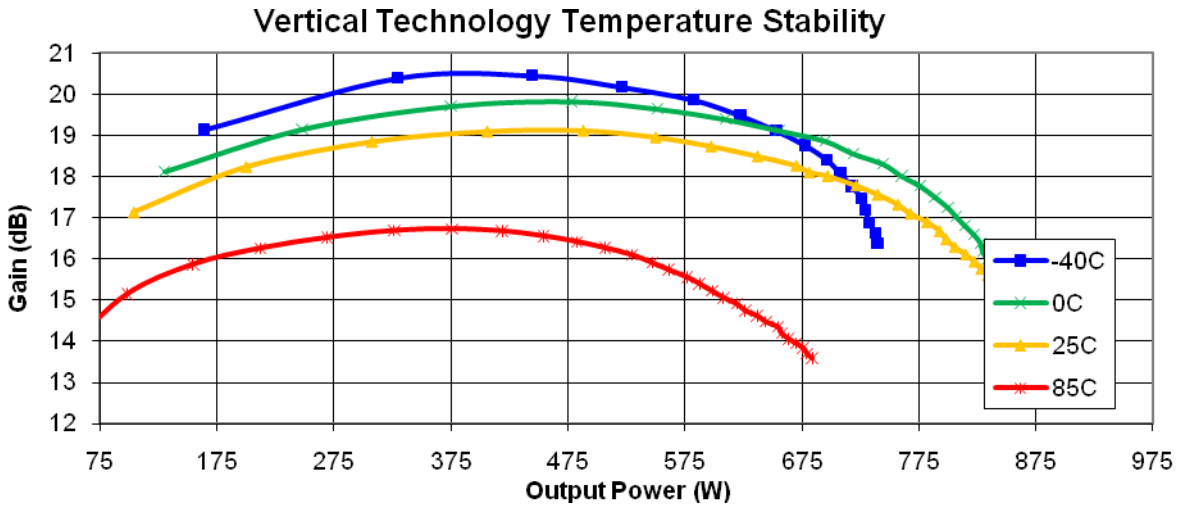


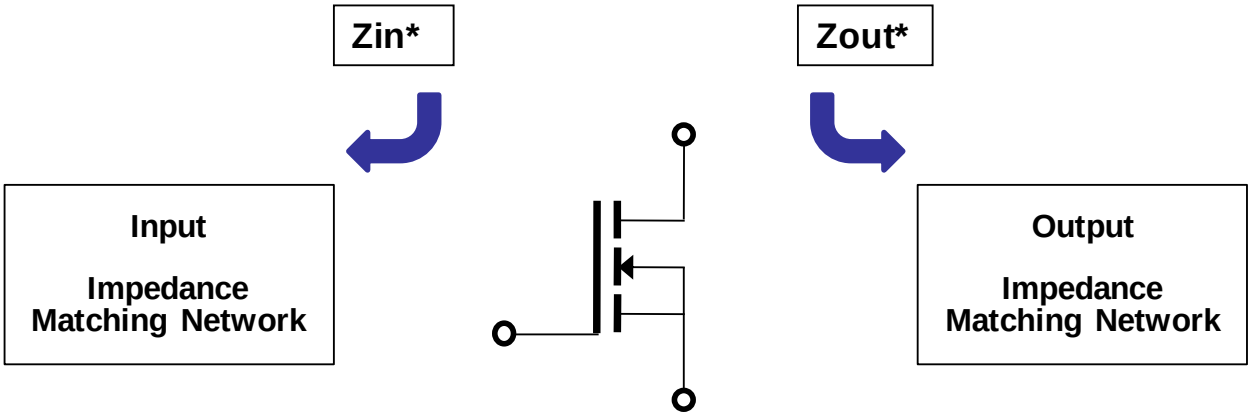
Typical device performance under Class AB mode of operation at 1090MHz and RF pulse conditions of 10µs pulse width and 1% duty cycle with VDD = 50 V and IDQ = 100mA. The high voltage silicon vertical technology shows less than 1.5dB of power degradation over an extreme case teperature rise of 125°C.

Measured at P1dB Compression Point			
TEMP	Gain (dB)	Power (W)	Power (dBm)
-40C	19.5	622	57.9
0C	18.9	695	58.4
25C	18.1	681	58.3
85C	15.7	561	57.5

HVV1012-550 Performance over Temperature

Test Circuit Impedances

Frequency	Zin* (ohms)	Zout* (ohms)
1025MHz	0.95-j1.4	1.2-j2.8
1060MHz	0.97-j1.2	1.1-j2.5
1150MHz	1.1-j0.66	1.0-j1.9



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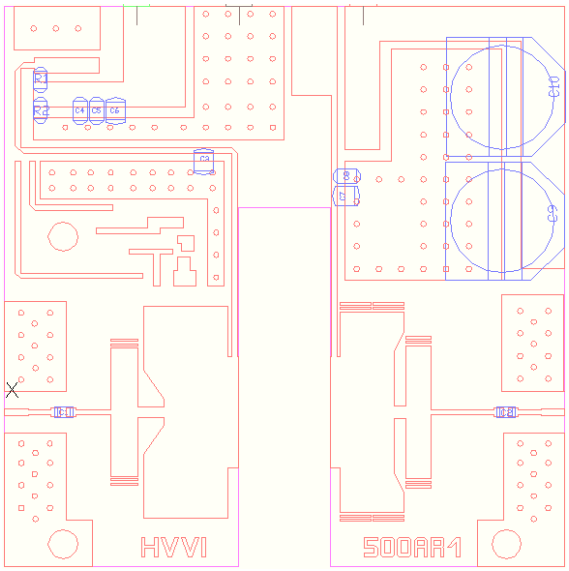

Demonstration Board Outline

Demonstration Circuit Board Picture

Part	Description	Part Number	Manufacturer
C1, C2:	39 pF AVX 805 Chip Capacitor	712-1388-1-ND	Digi Key
C3,C7:	39 pF ATC 1210 100B Chip Capacitor	478-2646-1-ND	Digi Key
C4:	1K pF 100V Chip Capacitor (X7R 1206)	399-1222-2-ND	Digi Key
C5, C8:	10K pF 100V Chip Capacitor (X7R 1206)	399-1236-2-ND	Digi Key
C6:	10 uF 6V Tantalum SMD	478-3134-1-ND	Digi Key
C9, C10:	220 uF 63V Elect FK SMD	PCE3484TR-ND	Digi Key
R1:	470 Ohms Chip Resistor (1206)	311-470ERCT-ND	Digi Key
R2:	100 K Ohms Chip Resistor (1206)	311-100KERCT-ND	Digi Key
RF Connectors	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: 25 mils thick, 10.2 Dielectric, 1 oz Copper		DS Electronics
Device Clamp	HV800 Package Nylon Clamp Foot	FXT000116	Cool Innovation
Heat Sink	Cool Innovations Aluminum Heat Sink	3-252510RS3411	Cool Innovation
S.S. Screws (4)	4-40 X 1/4 Stainless Steel Socket Hex Head	P242393	Copper State Bolt
Alloy Screws (4)	4-40 X 1/2 Alloy Socket Cap screw Hex	SCAS-0440-08C	Small Parts Inc
Metal Washer (6)	#4 Washer Zinc PLTD Steel Lock	ZSLW-004-M	Small Parts Inc
Alloy Screws (2)	4-40 X 3/4 Alloy Socket Cap Screw Head	SCAS-0440-12M	Small Parts Inc

HVV1012-550 Demonstration Circuit Board Bill of Materials

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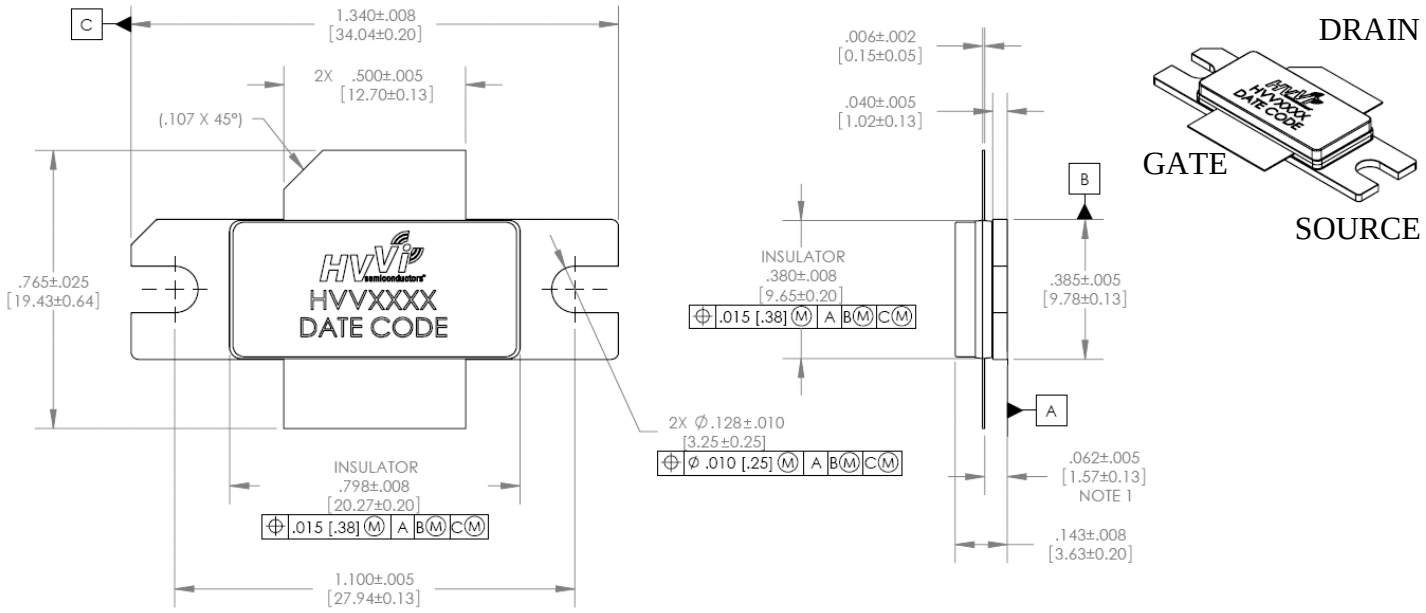
PACKAGE DIMENSIONS



Note: Drawing is not actual size.