SEMICONDUCTOR

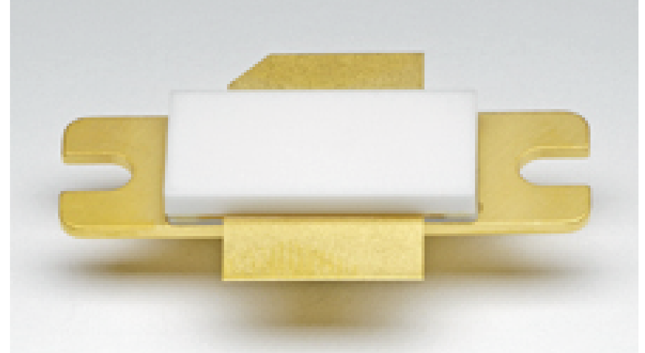
HVV1011-600

600 Watts, 50V, 1030-1090MHz, 50µs Pulse, 2% Duty

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

PACKAGE



TYPICAL PERFORMANCE

High voltage vertical technology is well suited for high power pulsed applications in the L-Band including IFF, TCAS and Mode-S applications.

At Pin (W)	FREQUENCY (MHz)	VDD (V)	IDQ (mA)	Power (W)	GAIN (dB)	η(%)	IRL (dB)	VSWR
12	1090	50	100	715	18	56	-18	20:1

Table 1: Typical RF Performance in broadband text fixture at 25°C temperature with RF pulse conditions of pulse width = 50µs and pulse duty cycle = 2%.

DESCRIPTION

The high power HVV1011-600 device is an enhancement mode RF MOSFET power transistor designed for pulsed applications in the L-Band from 1030MHz to 1090MHz. The high voltage HVVFET™ technology produces over 600W 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: HVV1011-600
Evaluation Kit Part Number: HVV1011-600-EK

REV. A

HVV1011-600 High Voltage, High Ruggedness

L-Band High Power Pulsed Transistor

1030/1090 MHz, 50µs Pulse, 2% Duty

For TCAS, IFF and Mode-S Applications

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	2350	W
P_{in}	Input Power	27	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	0.075	°C/W

Symbol	Parameter	Test Condition	Max	Units
LMT[2]	Load Mismatch Tolerance	F = 1090 MHz	20:1	VSWR

The HVV1011-600 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=1090MHz, Pin=12W	17	18	-	dB
IRL[2]	Input Return Loss	F=1090MHz, Pin=12W	-	-18	-12	dB
η_D[2]	Drain Efficiency	F=1090MHz, Pin=12W	52	56	-	%
Pout	Power Out	F=1090MHz, Pin=12W	-	715	-	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 1030 MHz at an input power of 12W.

Symbol	Parameter	Conditions	Min	Typical	Max	Unit
G_P[2]	Power Gain	F=1030MHz, Pin=12W	-	17.5	-	dB
IRL[2]	Input Return Loss	F=1030MHz, Pin=12W	-	-12	-	dB
η_D[2]	Drain Efficiency	F=1030MHz, Pin=12W	-	55	-	%
Pout	Power Out	F=1030MHz, Pin=12W	-	670	-	W

PULSE CHARACTERISTICS

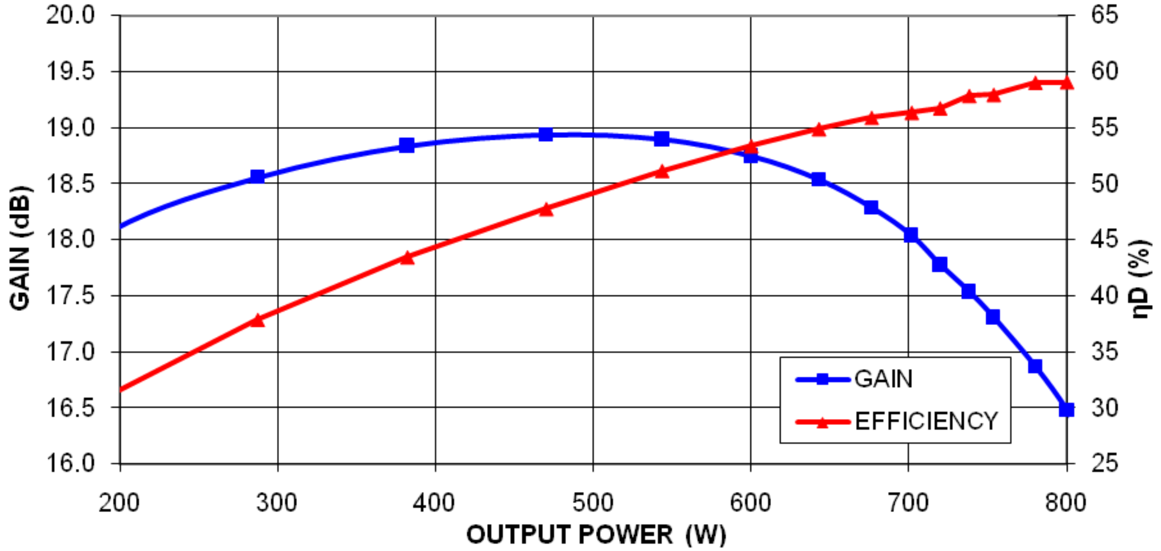
Symbol	Parameter	Conditions	Min	Typical	Max	Units
t_r[4]	Rise Time	F=1090MHz	-	<35	50	nS
t_f[4]	Fall Time	F=1090MHz	-	<15	50	nS
PD[4]	Pulse Droop	F=1090MHz	-	0.45	0.6	dB

Notes:
1) Rated at T_{CASE} = 25°C

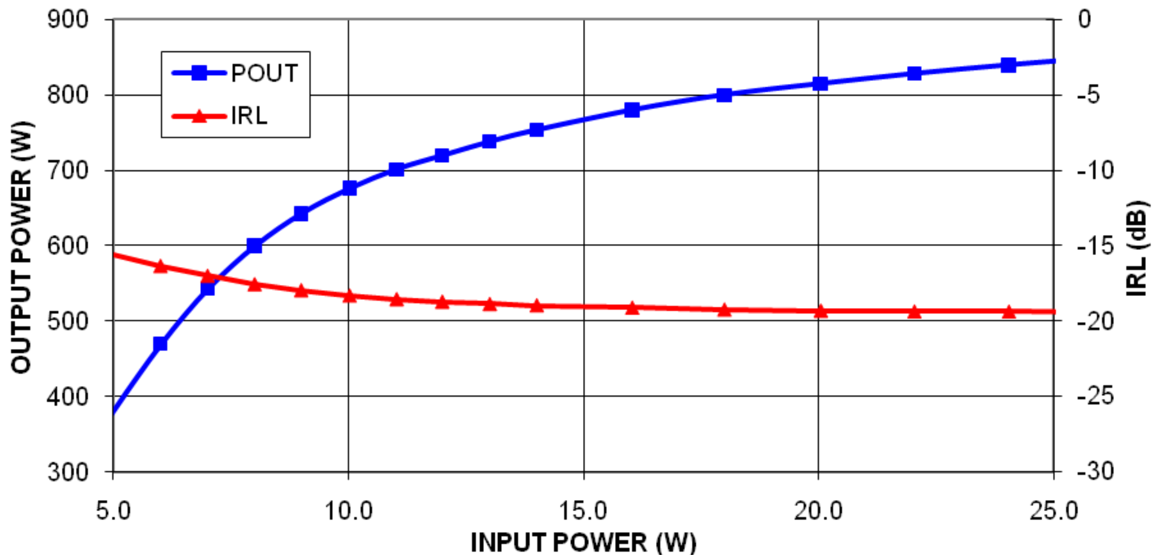
2) All parameters measured under pulsed conditions at 12W input power measured at the 10% point of the pulse with pulse width = 50µsec, duty cycle = 2% and V_{DD} = 50V, I_{DQ} = 100mA in a broadband matched test fixture.

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

4) Guaranteed by design.



Typical device performance under Class AB mode of operation and RF pulse conditions of 50µs pulse width and 2% duty cycle with V_{DD} = 50V and I_{DQ} = 100mA. The device was measured at 1090MHz.



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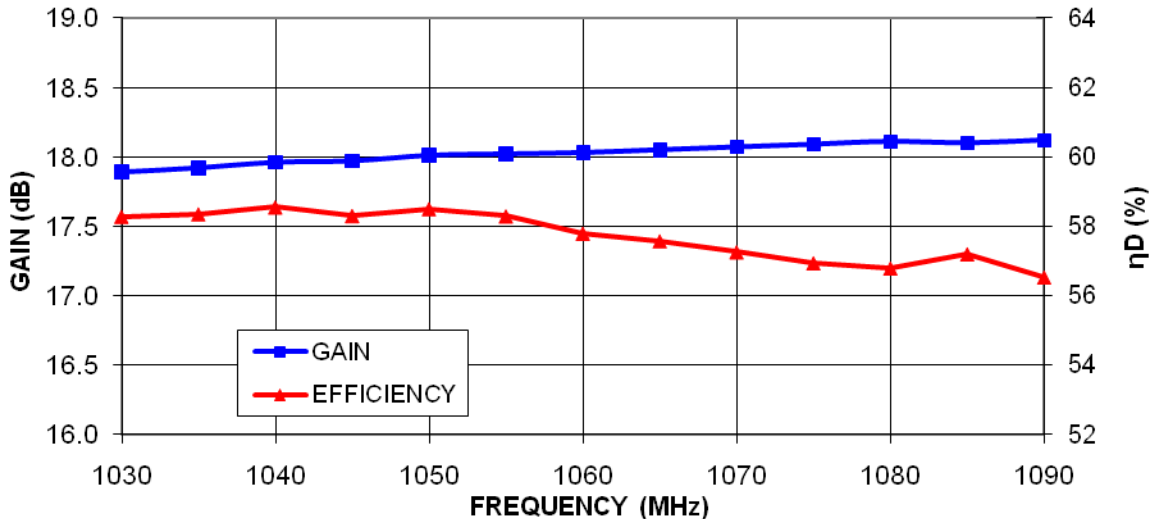

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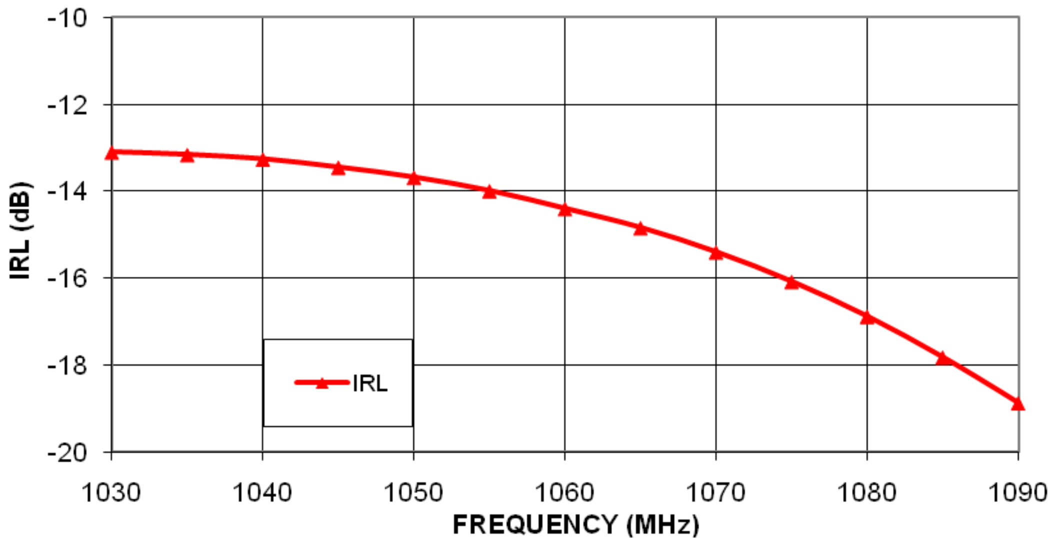

Typical device performance under Class AB mode of operation and RF pulse conditions of 50µs pulse width and 2% duty cycle with V_{DD} = 50V and I_{DQ} = 100mA. The device was measured at an input power of 12W.

HVV1011-600 High Voltage, High Ruggedness

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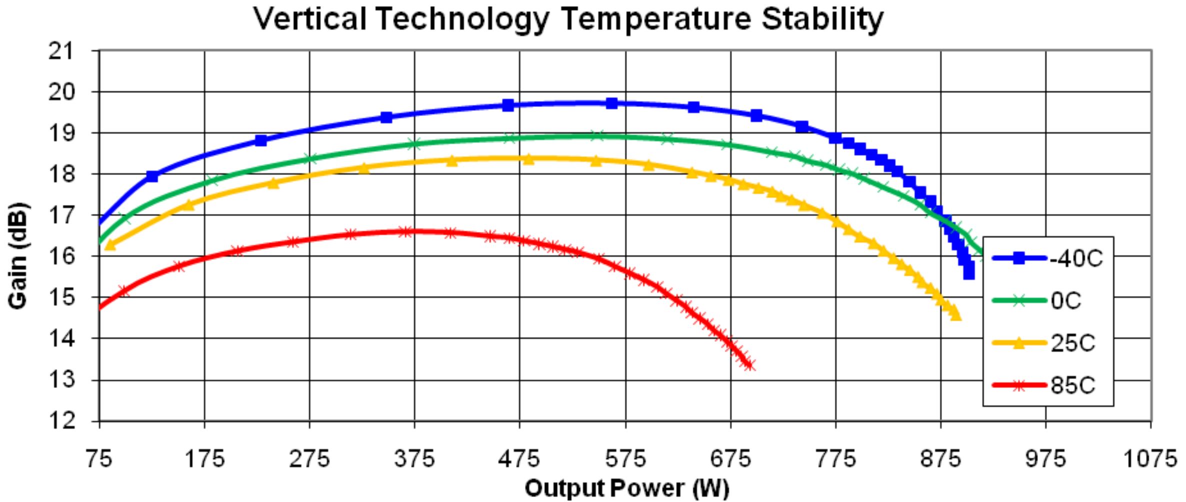
For TCAS, IFF and Mode-S Applications



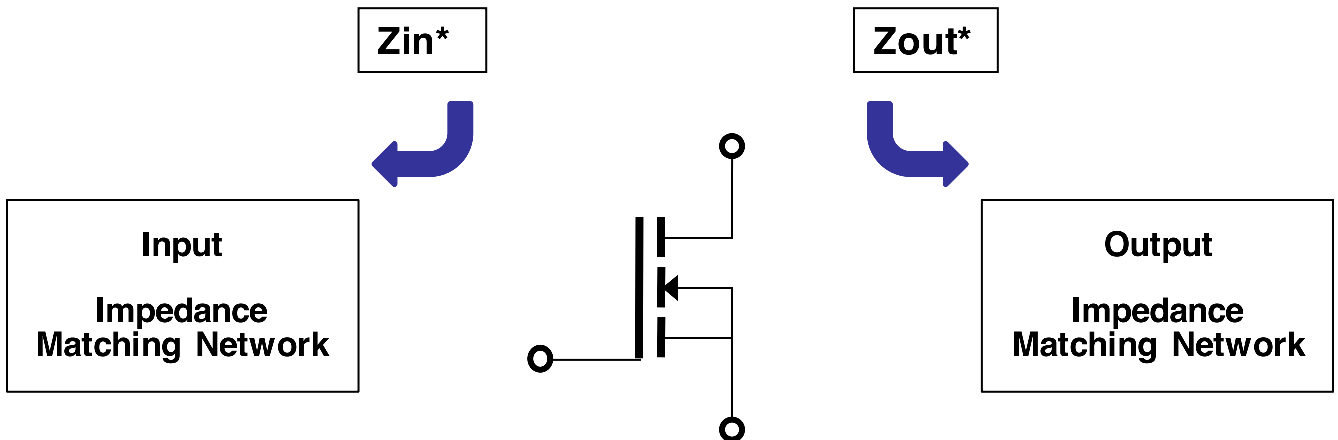
Typical device performance under Class AB mode of operation at 1090MHz and RF pulse conditions of 50µs pulse width and 2% duty cycle with V_{DD} = 50V and I_{DQ} = 100mA. The high voltage silicon vertical technology shows less than 2dB of power degradation over an extreme case teperature rise of 125°C.

Measured at P1dB Compression Point			
TEMP	**Gain (dB)**	**Power (W)**	**Power (dBm)**
-40C	18.7	787	59.0
0C	17.9	802	59.0
25C	17.4	733	58.7
85C	16.6	580	57.6

HVV1011-600 Performance over Temperature

Test Circuit Impedances

Frequency	Zin* (ohms)	Zout* (ohms)
1030MHz	0.95-j1.35	1.1-j2.7
1090MHz	1.0-j1.0	1.0-j2.3



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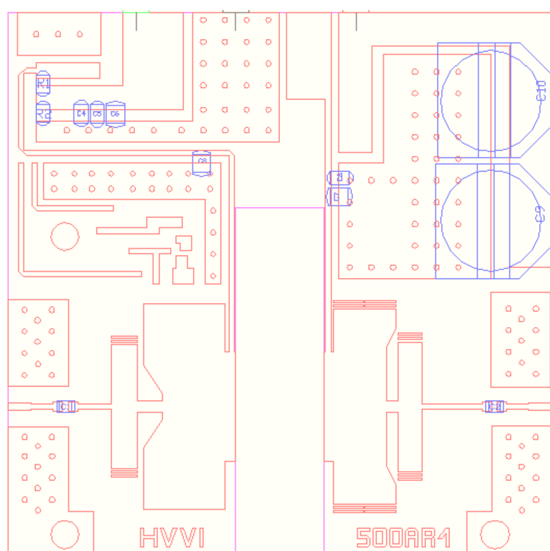
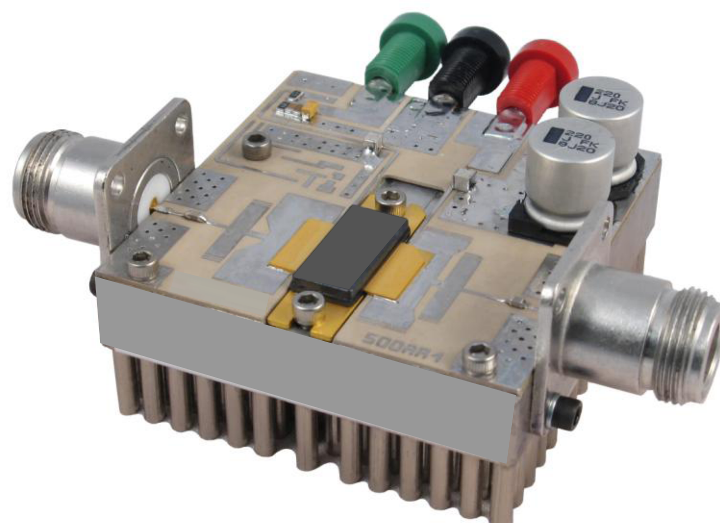


Demonstration Board Outline

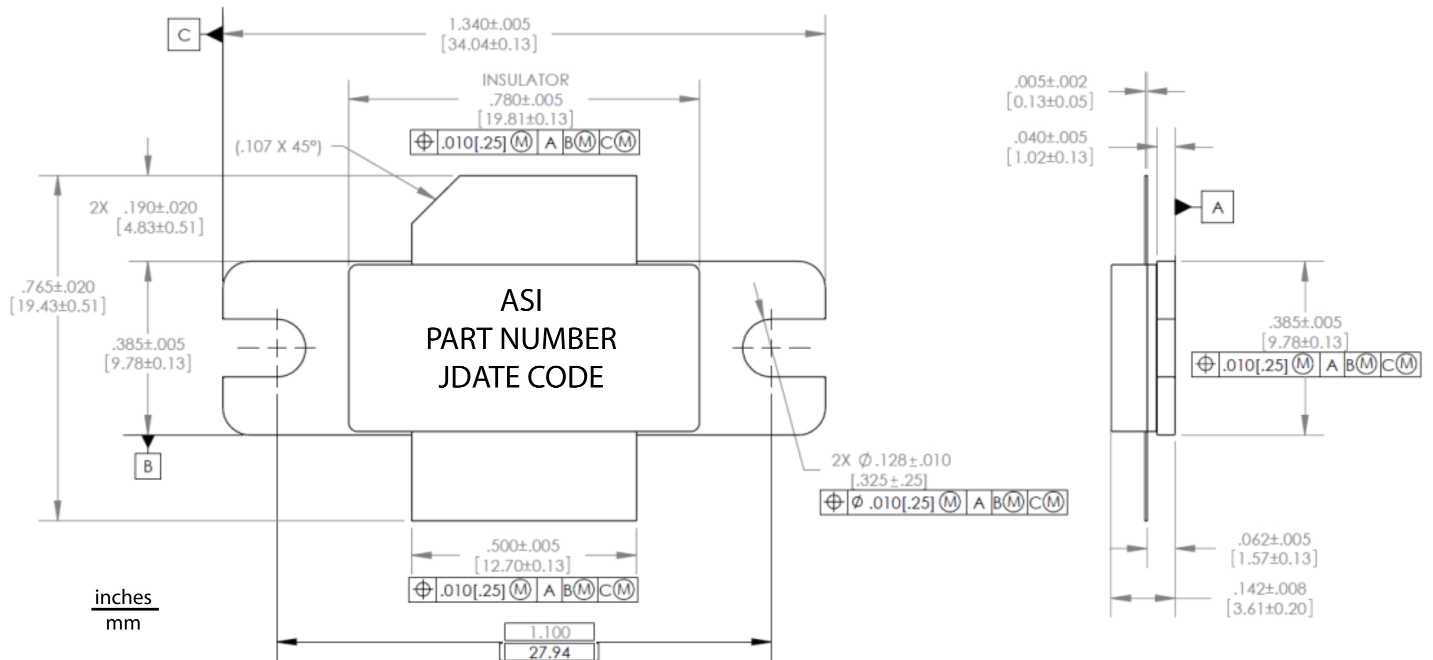


Demonstration Circuit Board Picture

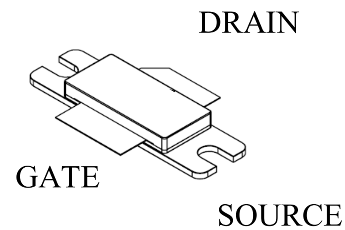
Part	Description	Part Number	Manufacturer
C1, C2:	39 pF AVX 805 Chip Capacitor	712-1388-1-ND	Digi Key
C3,C7:	39 pF ATC 1210 100B Chip Capacitor	478-2646-1-ND	Digi Key
C4:	1K pF 100V Chip Capacitor (X7R 1206)	399-1222-2-ND	Digi Key
C5, C8:	10K pF 100V Chip Capacitor (X7R 1206)	399-1236-2-ND	Digi Key
C6:	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

HVV1011-600 Demonstration Circuit Board Bill of Materials

PACKAGE DIMENSIONS



Note: Drawing is not actual size.



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