

**HVV1011-600 High Voltage, High Ruggedness***L-Band High Power Pulsed Transistor**1030/1090 MHz, 50 $\mu$ s Pulse, 2% Duty**For TCAS, IFF and Mode-S Applications***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 in the L-Band including IFF, TCAS and Mode-S applications.

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

Table 1: Typical RF Performance in broadband test fixture at 25°C temperature with RF pulse conditions of pulse width = 50 $\mu$ s 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

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

**HVV1011-600 High Voltage, High Ruggedness***L-Band High Power Pulsed Transistor**1030/1090 MHz, 50 $\mu$ s Pulse, 2% Duty**For TCAS, IFF and Mode-S Applications***ABSOLUTE MAXIMUM RATING (IEC 134)**

Symbol	Parameter	Value	Unit
V <sub>DSS</sub>	Drain-Source Voltage	95	V
V <sub>GSS</sub>	Gate-Source Voltage	-10, 10	V
I <sub>DS(max)</sub>	Drain Current	40	A
P <sub>D</sub> <sup>1</sup>	Power Dissipation	2350	W
P <sub>in</sub>	Input Power	27	W
T <sub>S</sub>	Storage Temperature	-40 to +150	°C
T <sub>J</sub>	Junction Temperature	200	°C

**THERMAL/RUGGEDNESS PERFORMANCE**

Symbol	Parameter	Max	Unit
$\theta_{JC}^2$	Thermal Resistance	0.075	°C/W

Symbol	Parameter	Test Condition	Max	Units
LMT <sup>2</sup>	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 <sub>BR(DSS)</sub>	Drain-Source Breakdown	V <sub>GS</sub> =0V, I <sub>D</sub> =5mA	95	102	-	V
I <sub>DSS</sub>	Drain Leakage Current	V <sub>GS</sub> =0V, V <sub>DS</sub> =50V	-	100	400	$\mu$ A
I <sub>GSS</sub>	Gate Leakage Current	V <sub>GS</sub> =5V, V <sub>DS</sub> =0V	-	2	10	$\mu$ A
G <sub>p</sub> <sup>2</sup>	Power Gain	F=1090MHz, Pin=12W	17	18	-	dB
IRL <sup>2</sup>	Input Return Loss	F=1090MHz, Pin=12W	-	-18	-12	dB
$\eta_D^2$	Drain Efficiency	F=1090MHz, Pin=12W	52	56	-	%
P <sub>out</sub>	Power Out	F=1090MHz, Pin=12W	-	715	-	W
V <sub>GS(O)3</sub>	Gate Quiescent Voltage	V <sub>DD</sub> =50V, I <sub>DO</sub> =100mA	1.0	1.4	1.7	V
V <sub>TH</sub>	Threshold Voltage	V <sub>DD</sub> =5V, I <sub>D</sub> =300 $\mu$ A	0.7	1.2	1.7	V

Typical performance at 1030 MHz at an input power of 12W.

G <sub>p</sub> <sup>2</sup>	Power Gain	F=1030MHz, Pin=12W	-	17.5	-	dB
IRL <sup>2</sup>	Input Return Loss	F=1030MHz, Pin=12W	-	-12	-	dB
$\eta_D^2$	Drain Efficiency	F=1030MHz, Pin=12W	-	55	-	%
P <sub>out</sub>	Power Out	F=1030MHz, Pin=12W	-	670	-	W

**HVV1011-600 High Voltage, High Ruggedness***L-Band High Power Pulsed Transistor**1030/1090 MHz, 50 $\mu$ s Pulse, 2% Duty**For TCAS, IFF and Mode-S Applications***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 <sup>4</sup>	Pulse Droop	F=1090MHz	-	0.45	0.6	dB

*Notes:**1) Rated at  $T_{CASE} = 25^{\circ}C$* *2) All parameters measured under pulsed conditions at 12W input power measured at the 10% point of the pulse with pulse width = 50 $\mu$ sec, 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.*

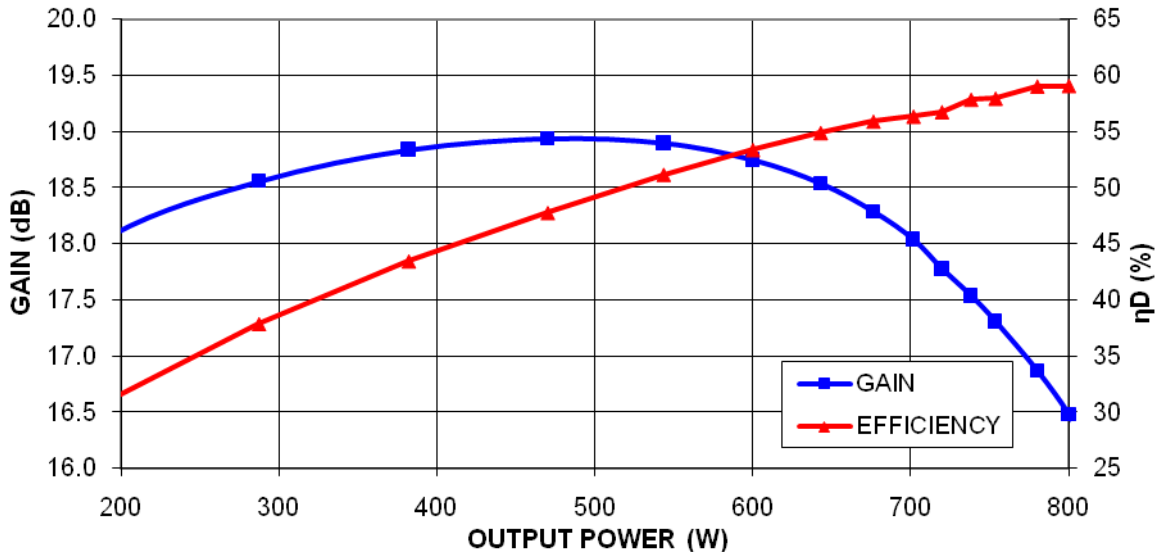
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*L-Band High Power Pulsed Transistor*

*1030/1090 MHz, 50µs Pulse, 2% Duty*

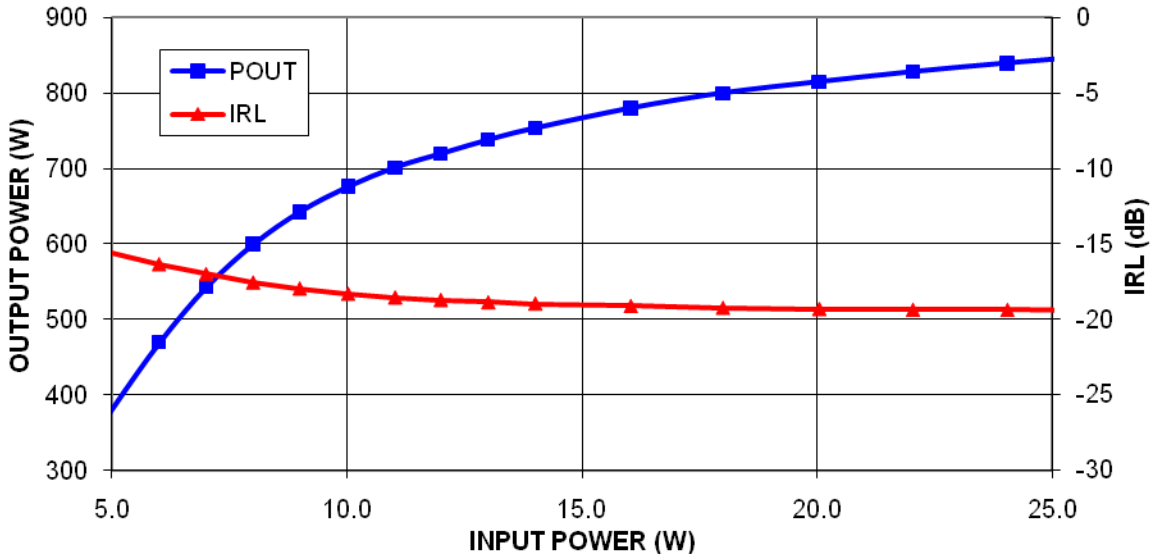
*For TCAS, IFF and Mode-S Applications*

**Typical Power Performance  
in a Broadband Matched Circuit**



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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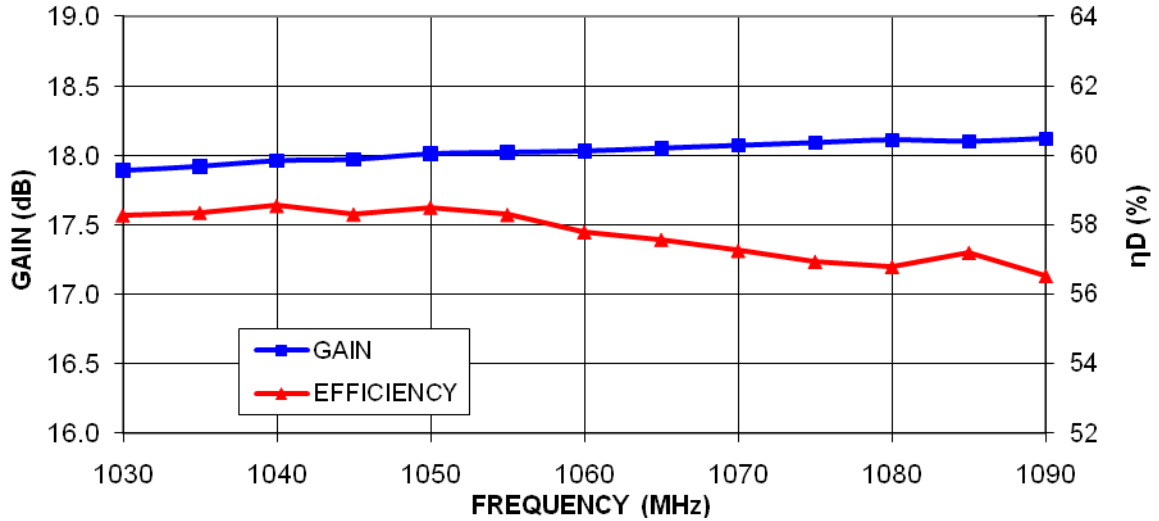
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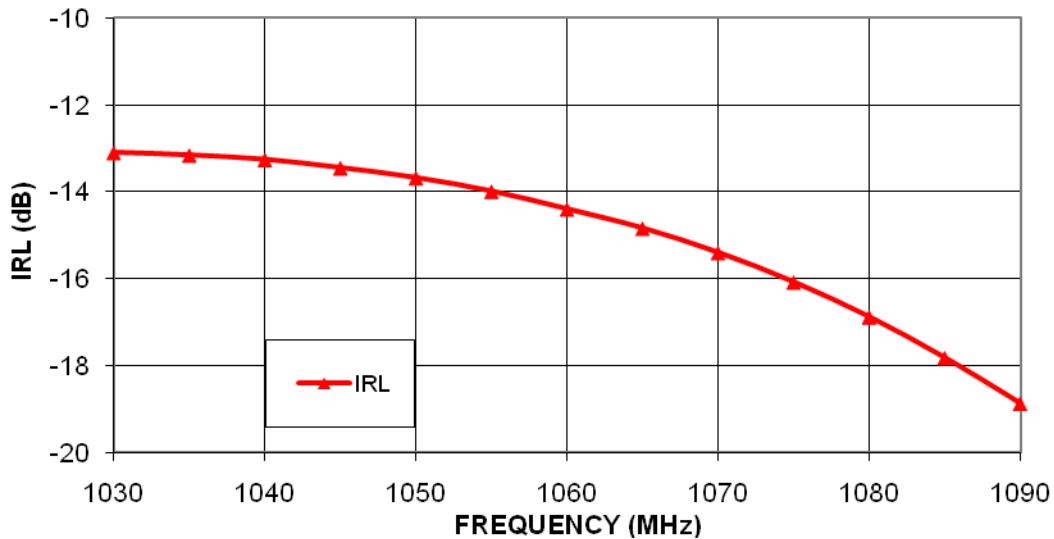
*For TCAS, IFF and Mode-S Applications*

**Typical Performance vs Frequency  
in a Broadband Matched Circuit**



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.

**Typical Performance vs Frequency  
in a Broadband Matched Circuit**



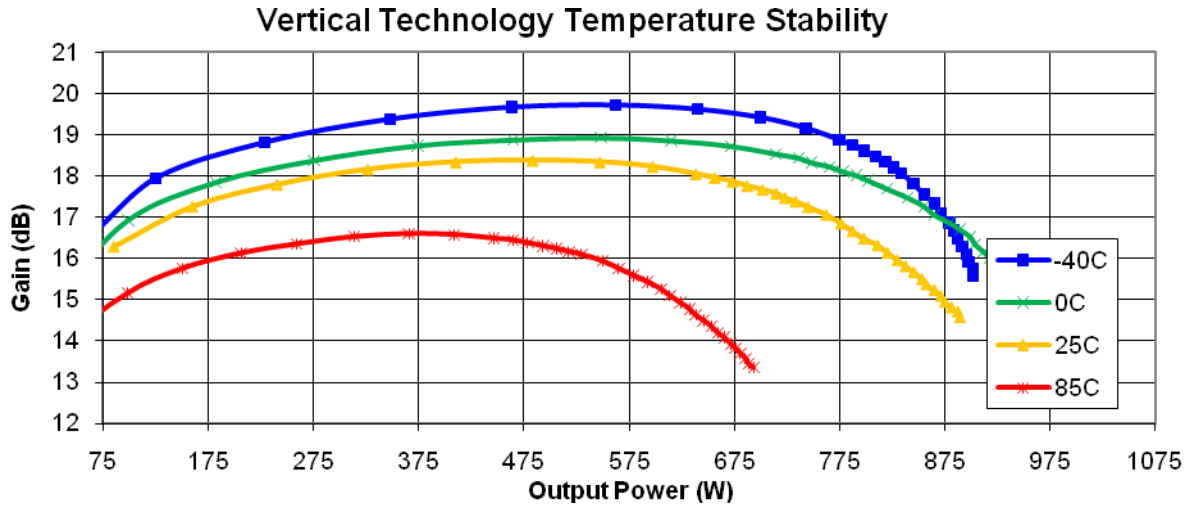
Typical device performance under Class AB mode of operation and RF pulse conditions of 50µs pulse width and 2% duty cycle with  $V_{DD} = 50V$  and  $I_{DQ} = 100mA$ . The device was measured at an input power of 12W.

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*L-Band High Power Pulsed Transistor*

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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

**HVV1011-600 High Voltage, High Ruggedness**

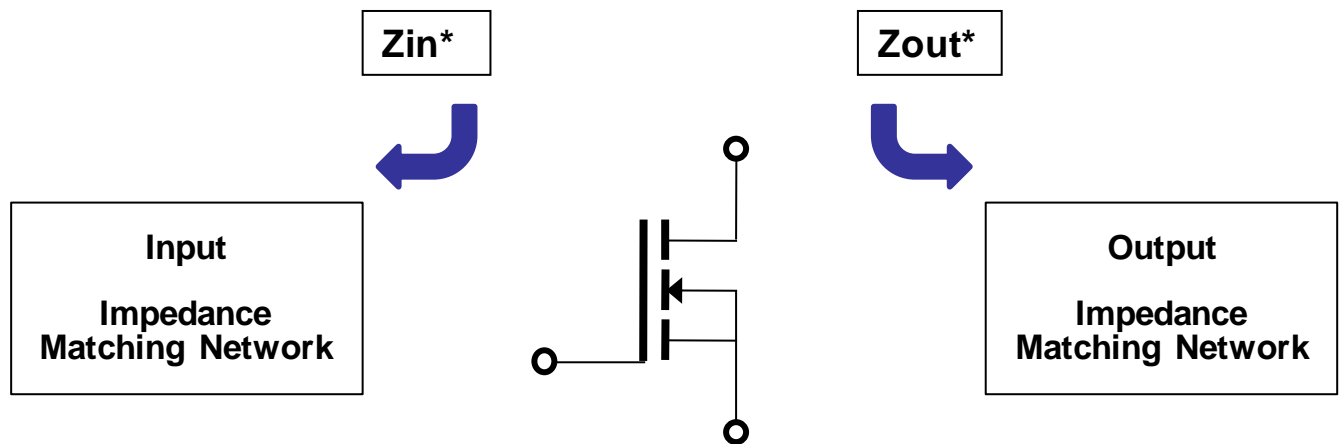
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**Test Circuit Impedances**

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

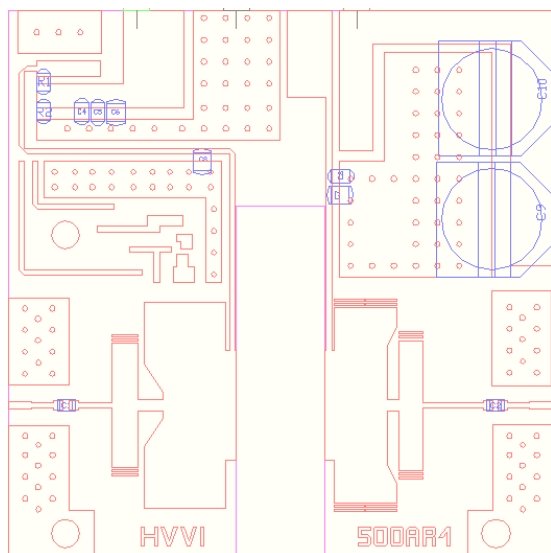


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Demonstration Board Outline



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

