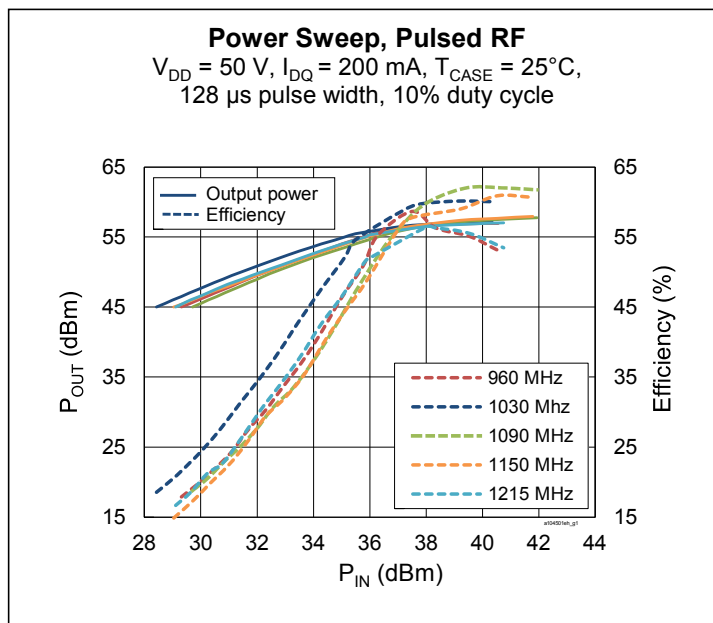


## Thermally-Enhanced High Power RF LDMOS FET 450 W, 50 V, 960 – 1215 MHz

### Description

The PTVA104501EH LDMOS FET is designed for use in power amplifier applications in the 960 to 1215 MHz frequency band. Features include high gain and thermally-enhanced package with bolt-down flange. Manufactured with Infineon's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTVA104501EH  
Package H-33288-2



### Features

- Broadband internal input and output matching
- High gain and efficiency
- Integrated ESD protection
- Human Body Model Class 2 (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Excellent ruggedness
- Pb-free and RoHS compliant
- Capable of withstanding a 10:1 load mismatch (all phase angles) at 450 W peak under RF pulse, 128  $\mu\text{s}$ , 10% duty cycle.

### RF Characteristics

#### Pulsed RF Performance (tested in Infineon test fixture)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$ ,  $P_{OUT} = 450\text{ W}$  (peak),  $f_1 = 960\text{ MHz}$ ,  $f_2 = 1090\text{ MHz}$ ,  $f_3 = 1215\text{ MHz}$ , RF pulse 128  $\mu\text{s}$ , 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	16.5	17.5	—	dB
Drain Efficiency	$\eta_D$	53	58	—	%
Gain Flatness	$\Delta G$	—	0.85	1.8	dB
Return Loss	IRL	—	-9.5	-6	dB

All published data at  $T_{CASE} = 25^\circ\text{C}$  unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

## RF Characteristics

**Typical RF Performance** (not subject to production test, verified by design/characterization in Infineon test fixture)  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$ , Input signal ( $t_r = 7.0\text{ ns}$ ,  $t_f = 7.0\text{ ns}$ ),  $128\text{ }\mu\text{s}$  pulse width, 10% duty cycle, class AB test

Mode of Operation	f (MHz)	IRL (dB)	P <sub>1dB</sub>			P <sub>3dB</sub>			Max P <sub>droop</sub> (pulse) @ P <sub>1dB</sub>	t <sub>r</sub> (ns) @ P <sub>1dB</sub>	t <sub>f</sub> (ns) @ P <sub>1dB</sub>
			Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)			
128 $\mu\text{s}$ , 10%	960	-7.5	18.0	56	460	16.0	53	490	0.15	5	<2
	1030	-13.0	18.5	59	470	16.5	60	540	0.15	5	<2
	1090	-8.0	17.8	61	510	15.8	61	590	0.20	5	<2
	1150	-15.0	18.1	59	540	16.1	60	620	0.20	5	<2
	1215	-9.0	18.3	56	460	16.3	53	510	0.20	5	<2

## DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	$V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	1	$\mu\text{A}$
	$V_{DS} = 111\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	10	$\mu\text{A}$
On-State Resistance	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.1	—	$\Omega$
Operating Gate Voltage	$V_{DS} = 50\text{ V}$ , $I_{DQ} = 200\text{ mA}$	$V_{GS}$	3.0	3.5	4.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1	$\mu\text{A}$

## Maximum Ratings

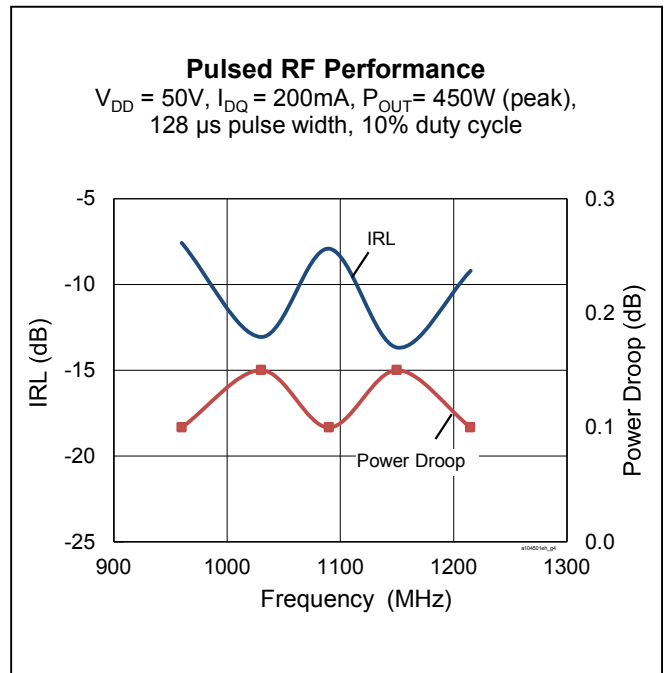
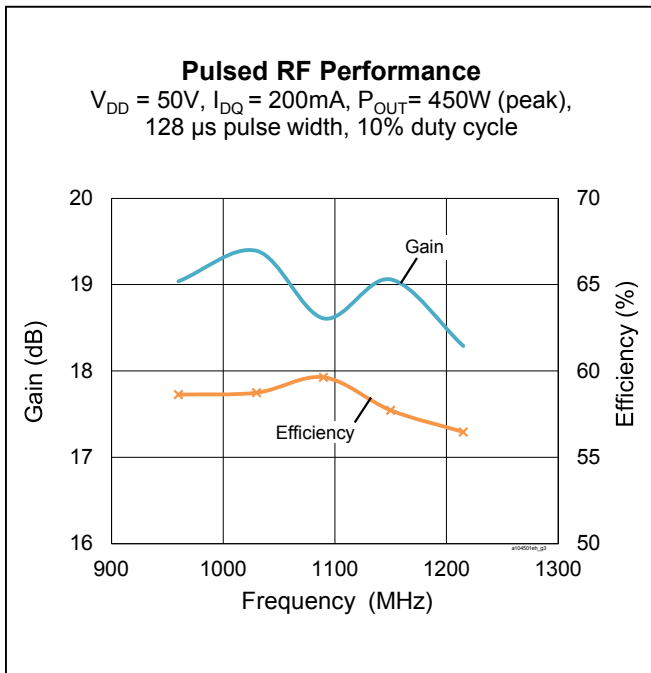
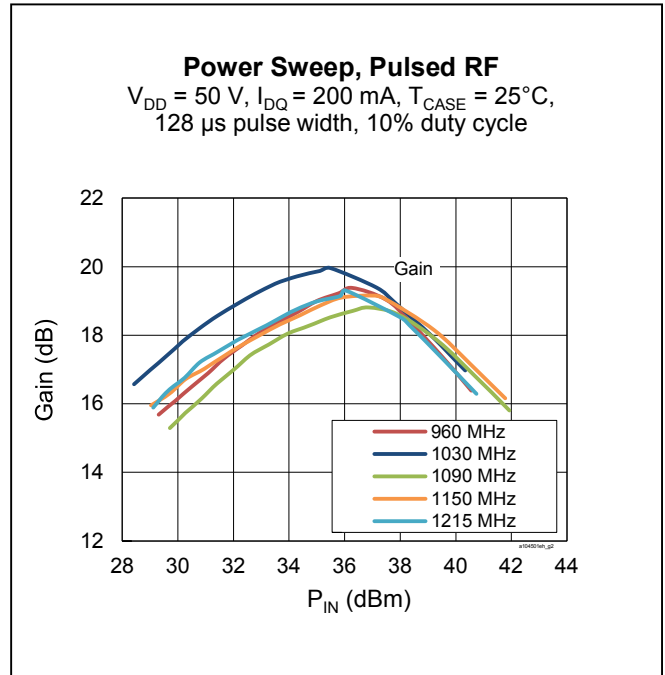
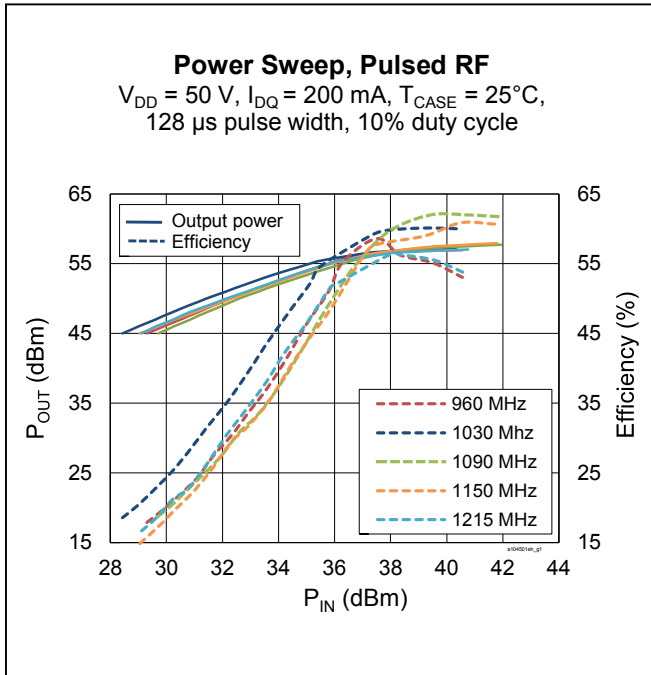
Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	105	V
Gate-Source Voltage	$V_{GS}$	-6 to +12	V
Operating Voltage	$V_{DD}$	0 to +55	V
Junction Temperature	$T_J$	225	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}\text{C}$
Thermal Resistance	$R_{\theta JC}$	0.25	$^{\circ}\text{C/W}$

( $T_{CASE} = 70^{\circ}\text{C}$ , 430 W CW,  $f = 1090\text{ MHz}$ ,  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$ )

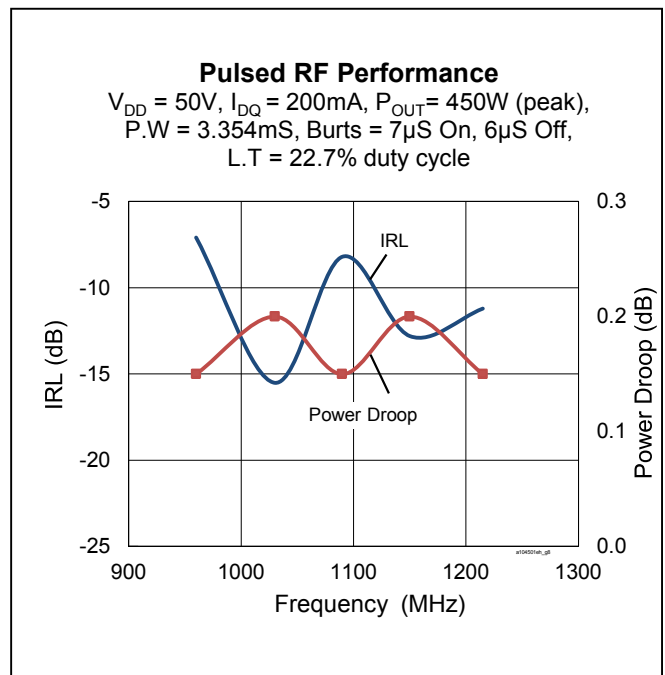
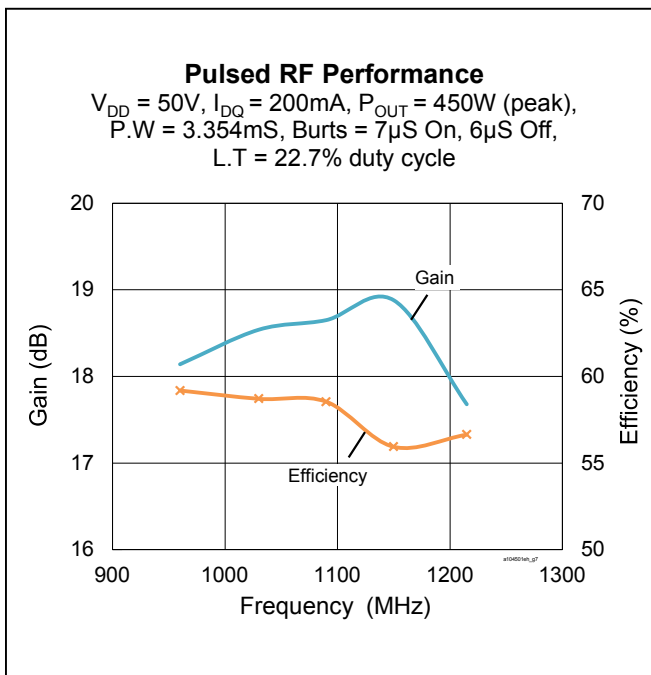
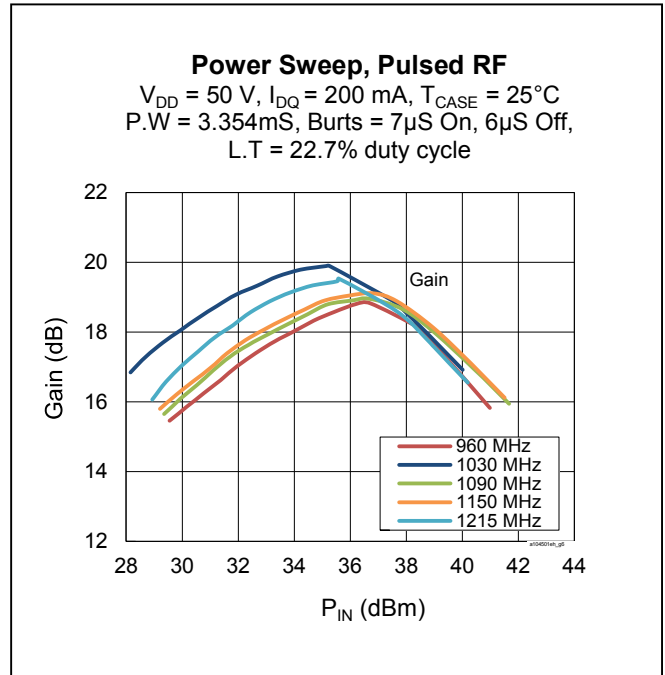
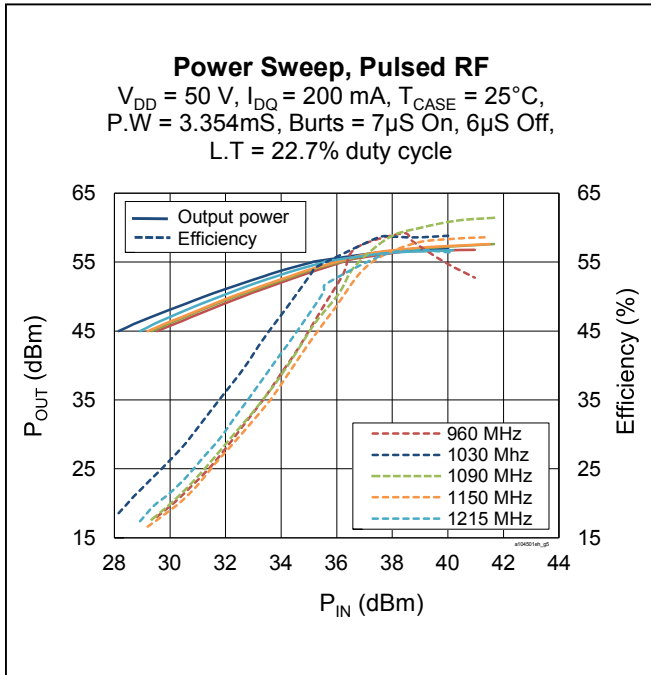
## Ordering Information

Type and Version	Order Code	Package Description	Shipping
PTVA104501EH V1 R0	PTVA104501EHV1R0XTMA1	H-33288-2	Tape & Reel, 50 pcs
PTVA104501EH V1 R250	PTVA104501EH V1R250XTMA1	H-33288-2	Tape & Reel, 250 pcs

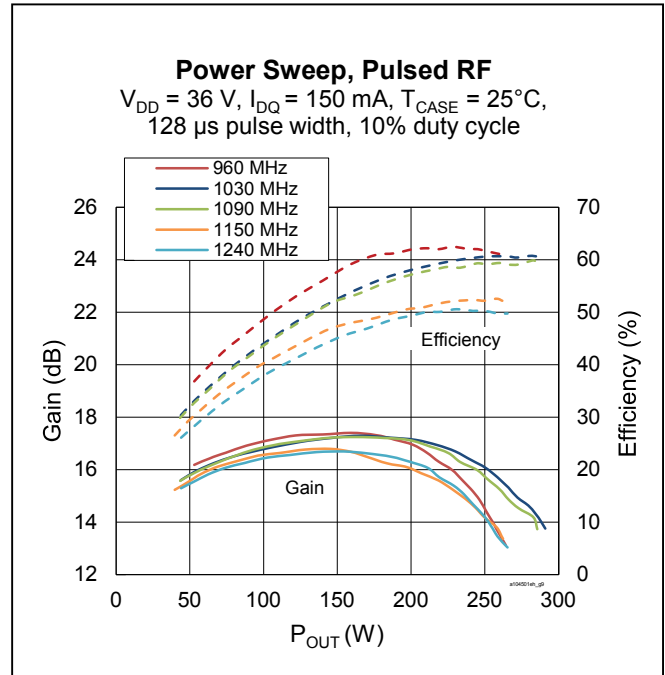
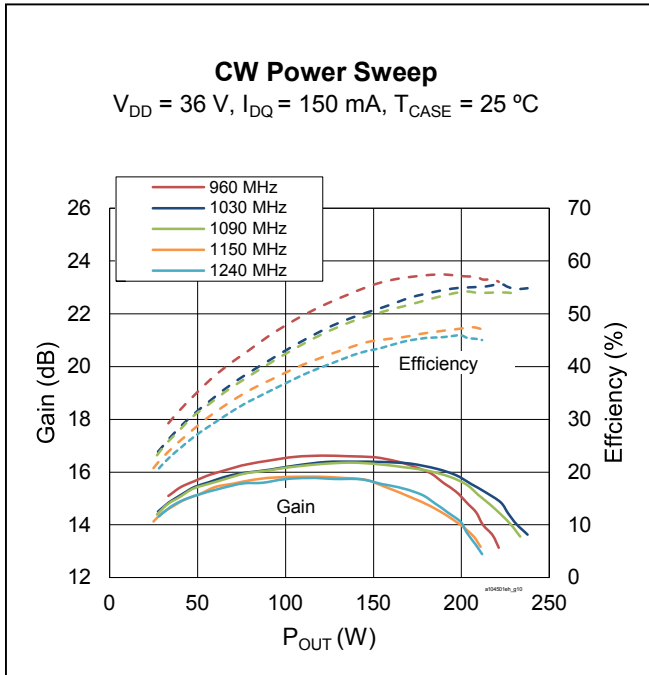
**Typical RF Performance** (data taken in production test fixture)



Typical RF Performance (cont.)

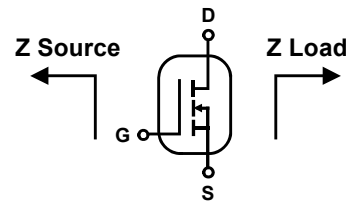


Typical RF Performance (cont.)



## Broadband Circuit Impedance

Freq [MHz]	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
960	2.04	-0.30	0.79	-0.02
1030	1.71	-0.18	0.73	0.64
1090	1.45	0.09	0.95	1.09
1150	1.23	0.41	1.26	0.98
1215	1.07	0.77	0.71	0.93



## Load Pull Performance

**Load Pull at Max P<sub>OUT</sub> Point** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 200 mA

Freq [MHz]	ZI [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
960	1.35 - j0.70	43.30	57.83	606.74	14.53	54.90	1.29 - j1.37
1030	0.99 - j0.78	42.14	57.62	578.10	15.48	50.96	1.02 - j1.43
1090	1.24 - j0.84	41.37	57.40	549.54	16.03	50.52	1.06 - j1.51
1215	1.56 - j0.99	39.24	56.92	492.04	17.68	48.12	1.13 - j1.66

**Load Pull at Max G<sub>T</sub> Point** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 200 mA

Freq [MHz]	ZI [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
960	1.35 - j0.70	40.10	55.70	371.54	15.60	58.76	2.15 - j2.60
1030	0.99 - j0.78	38.16	55.33	341.19	17.17	59.44	2.73 - j2.02
1090	1.24 - j0.84	36.05	54.14	259.42	18.09	56.31	3.55 - j0.42
1215	1.56 - j0.99	33.38	53.42	219.79	20.04	49.44	1.34 - j0.08

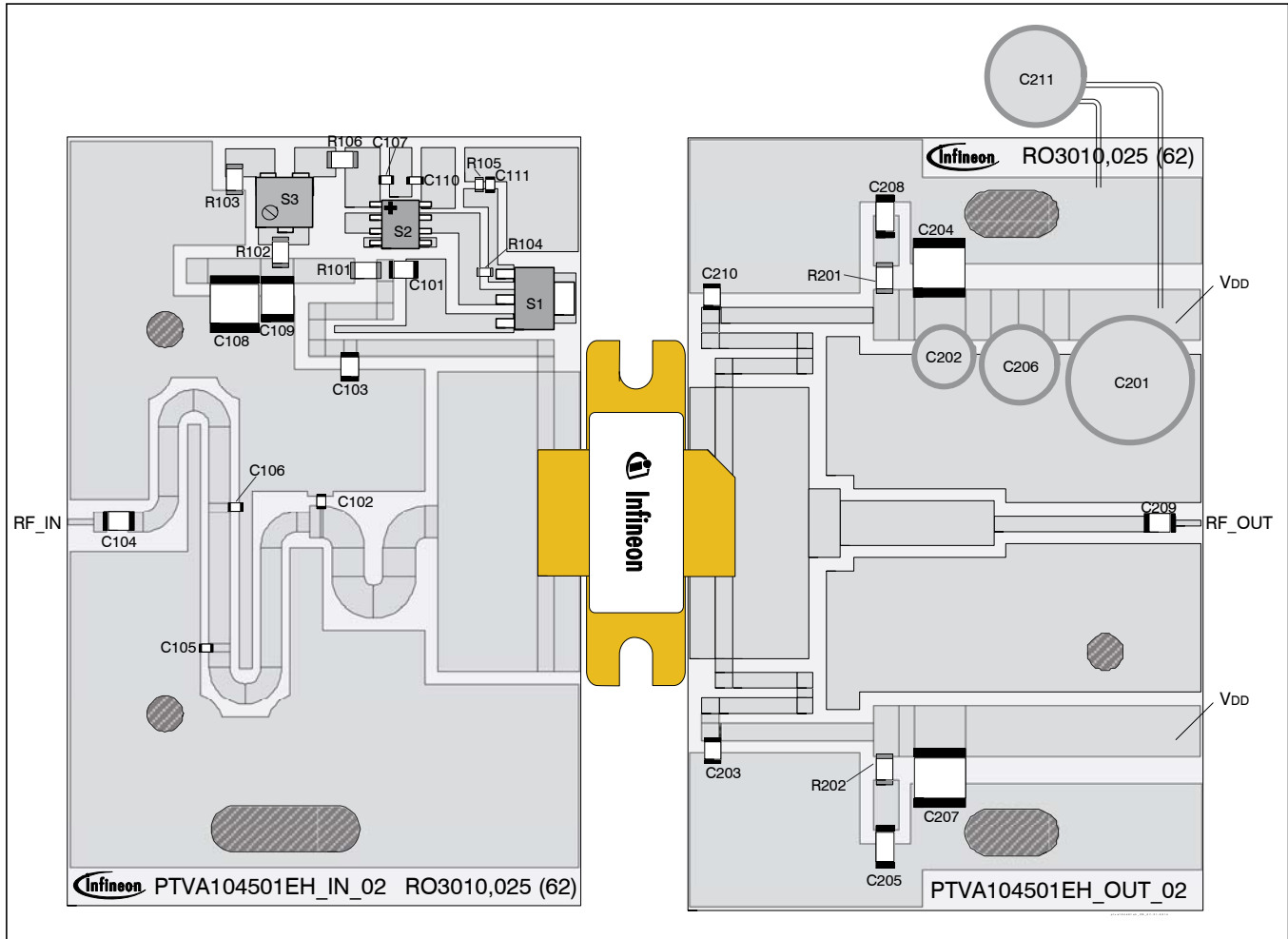
**Load Pull at Max Efficiency Point** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 200 mA

Freq [MHz]	ZI [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
960	1.35 - j0.70	42.00	57.27	533.33	15.27	62.15	1.60 - j1.79
1030	0.99 - j0.78	39.44	56.34	430.53	16.90	61.78	2.27 - j1.50
1090	1.24 - j0.84	37.54	55.36	343.56	17.82	59.60	2.72 - j1.29
1215	1.56 - j0.99	36.19	55.58	361.41	19.39	56.63	1.65 - j0.92

**Z Optimum** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 200 mA

Freq [MHz]	ZI [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
960	1.35 - j0.70	42.62	57.62	578.10	15.00	60.03	1.50 - j1.61
1030	0.99 - j0.78	39.82	56.62	459.20	16.80	61.39	2.03 - j1.45
1090	1.24 - j0.84	38.71	56.21	417.83	17.50	58.60	2.02 - j1.38
1215	1.56 - j0.99	37.79	56.47	443.61	18.68	53.43	1.29 - j1.37

Reference Circuit



Reference circuit assembly diagram (not to scale)

Find Gerber files for this test fixture on the Infineon Web site at [www.infineon.com/rfpower](http://www.infineon.com/rfpower)

**Reference Circuit** (cont.)

**Reference Circuit Assembly**

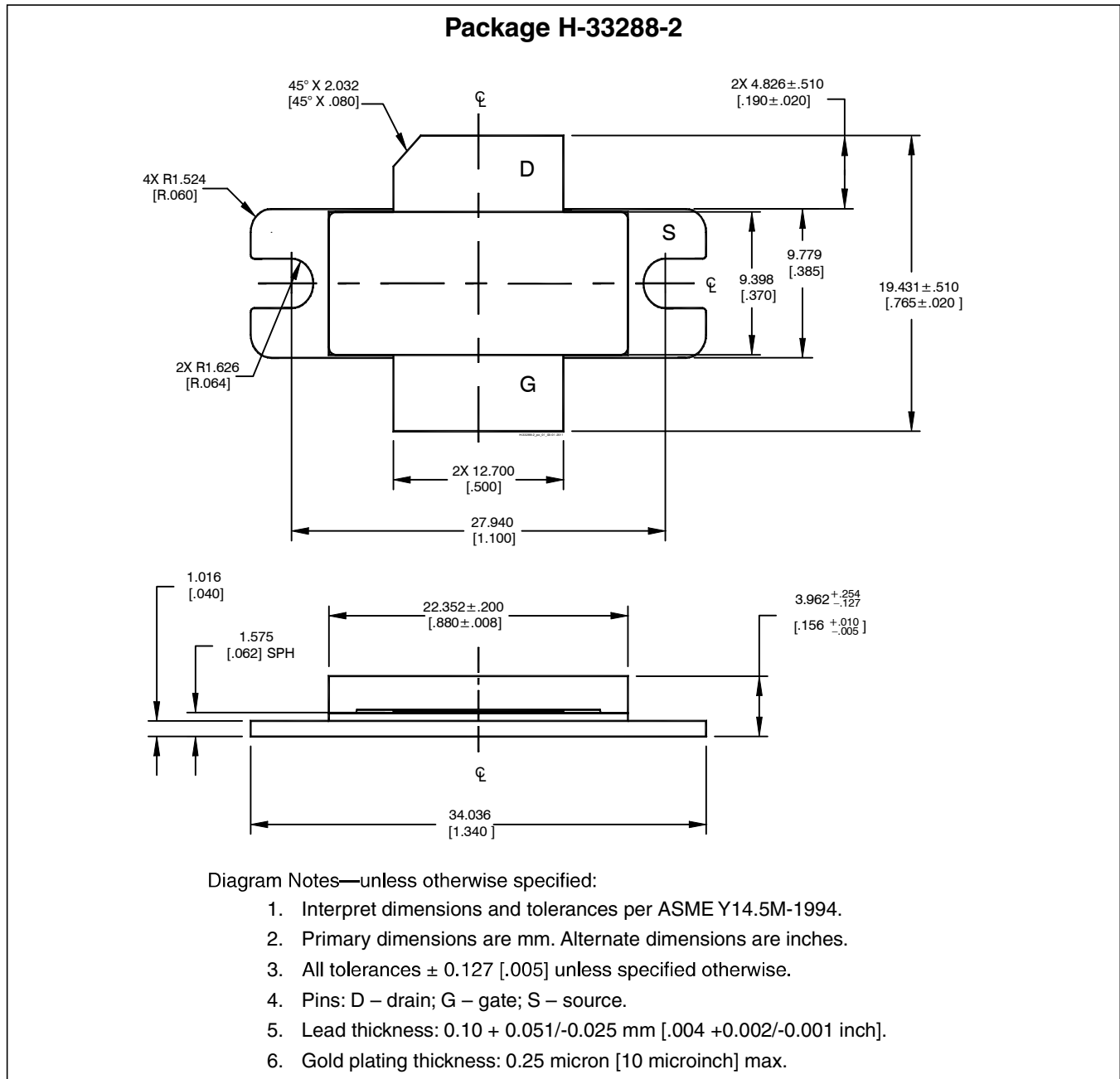
DUT	PTVA104501EH
Test Fixture Part No.	LTN/PTVA104501EH V1
PCB	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$

**Components Information**

Component	Description	Suggested Manufacturer	P/N
<b>Input</b>			
C101, C103	Capacitor, 39 pF	ATC	100B 390
C102	Capacitor, 3.3 pF	ATC	800A 3R3
C104	Capacitor, 56 pF	ATC	100B 560
C105	Capacitor, 3.9 pF	ATC	800A 3R9
C106	Capacitor, 2.4 pF	ATC	800A 2R4
C107, C110, C111	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
C108	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C109	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
R101	Resistor, 20 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ200V
R102	Resistor, 1k $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ102V
R103	Resistor, 2k $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ202V
R104	Resistor, 1.2k $\Omega$	Panasonic Electronic Components	ERJ-3GEYJ122V
R105	Resistor, 1.3k $\Omega$	Panasonic Electronic Components	ERJ-3GEYJ132V
R106	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
S1	Transistor	Infineon Technologies	BCP56
S2	Voltage Regulator	Texas Instruments	LM78L05ACM
S3	Potentiometer, 2k $\Omega$	Bourns Inc.	3224W-1-202E
<b>Output</b>			
C201	Capacitor, 100 $\mu$ F	Cornell Dubilier Electronics (CDE)	SK101M100ST
C202	Capacitor, 10 $\mu$ F	Cornell Dubilier Electronics (CDE)	SEK100M100ST
C203, C210	Capacitor, 39 pF	ATC	100B 390
C204, C207	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C205, C208	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
C206	Capacitor, 22 $\mu$ F	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C209	Capacitor, 56 pF	ATC	100B 560
C211	Capacitor, 6800 $\mu$ F	Panasonic Electronic Components	ECO-S2AP682EA
R201, R202	Resistor, 5.6 $\Omega$	Panasonic Electronic Components	ERJ-8RQJ5R6V



## Package Outline Specifications



Find the latest and most complete information about products and packaging at the Infineon Internet page <http://www.infineon.com/rfpower>

## Revision History

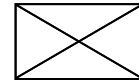
Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2013-05-21	Advance	All	Data Sheet reflects advance specification for product development
02	2014-07-22	Production	All	Data Sheet reflects released product specification
02.1	2016-04-19	Production	2 1, 2	Updated conditions for drain leakage current in DC Characteristics Added ESD rating, updated ordering information
02.2	2017-01-31	Production	2	Corrected typo in package description, updated operating voltage and junction temperature
02.3	2017-09-20	Production	5	Added two new graphs ( $V_{DD} = 36V$ )

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