

PTVA120251EA

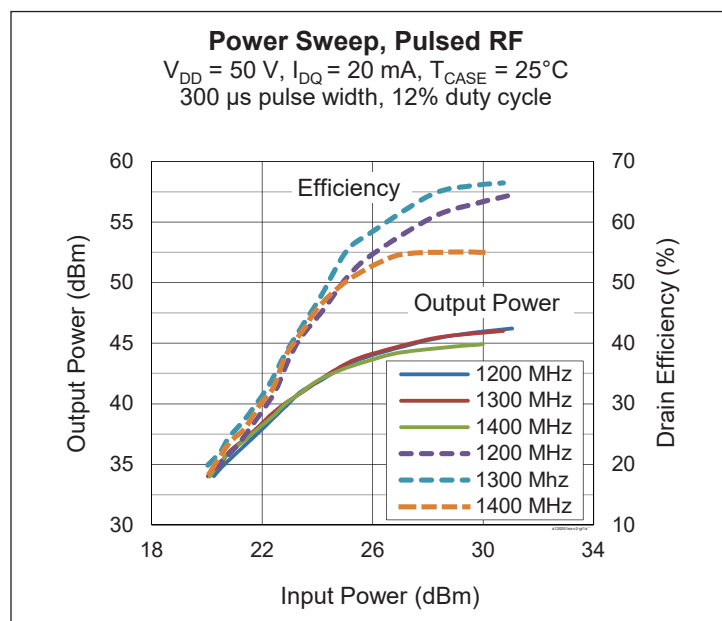
Thermally-Enhanced High Power RF LDMOS FET 25 W, 50 V, 500 – 1400 MHz

Description

The PTVA120251EA LDMOS FET is designed for use in power amplifier applications in the 500 MHz to 1400 MHz frequency band. Features include high gain and a thermally-enhanced package with bolt-down flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTVA120251EA
Package H-36265-2



Features

- Unmatched input and output
- High gain and efficiency
- Integrated ESD protection
- ESD HBM 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 $P_{OUT} = 25\text{ W}$, under CW conditions

RF Characteristics

Typical RF Performance (not subject to production test, verified by design/characterization in Wolfspeed test fixture)
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 0.02\text{ A}$, Input signal ($t_r = 5\text{ ns}$, $t_f = 6.5\text{ ns}$), 300 μs pulse width, 12% duty cycle, class AB test

Mode of operation	f (MHz)	IRL (dB)	P_{1dB}			P_{3dB}			$P_{\text{droop(pulse)}}$ dB @ 30 W	t_r (ns)	t_f (ns)
			Gain (dB)	Eff (%)	P_{OUT} (W)	Gain (dB)	Eff (%)	P_{OUT} (W)			
Pulsed RF	1200	12	16.4	52	31	14.4	56	41	0.27	6	8
Pulsed RF	1300	11	16.0	56	32	14.0	59	40	0.20	6	8
Pulsed RF	1400	14	15.8	53	34	13.8	56	38	0.24	6	8

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics

Pulsed RF Performance (tested in WolfSpeed test fixture)

$V_{DD} = 50\text{ V}$, $I_{DQ} = 0.02\text{ A}$, $P_{OUT} = 25\text{ W}$, $f_1 = 1200\text{ MHz}$, $f_2 = 1300\text{ MHz}$, $f_3 = 1400\text{ MHz}$, 300 μs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	η_D	47	54	—	%
Return Loss	IRL	—	-13	-9	dB

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}	—	—	1.0	μA
	$V_{DS} = 105\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	1.4	—	Ω
Operating Gate Voltage	$V_{DS} = 50\text{ V}$, $I_{DQ} = 150\text{ mA}$	V_{GS}	3	3.35	4	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1.0	μA

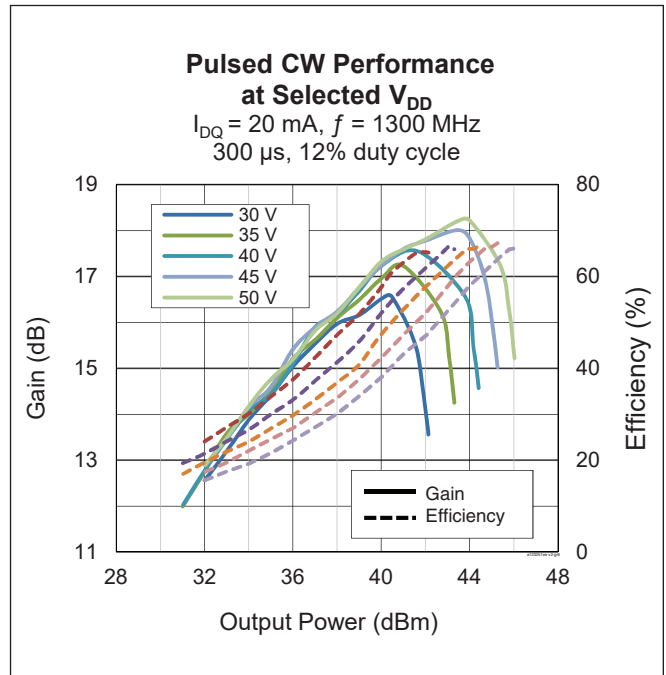
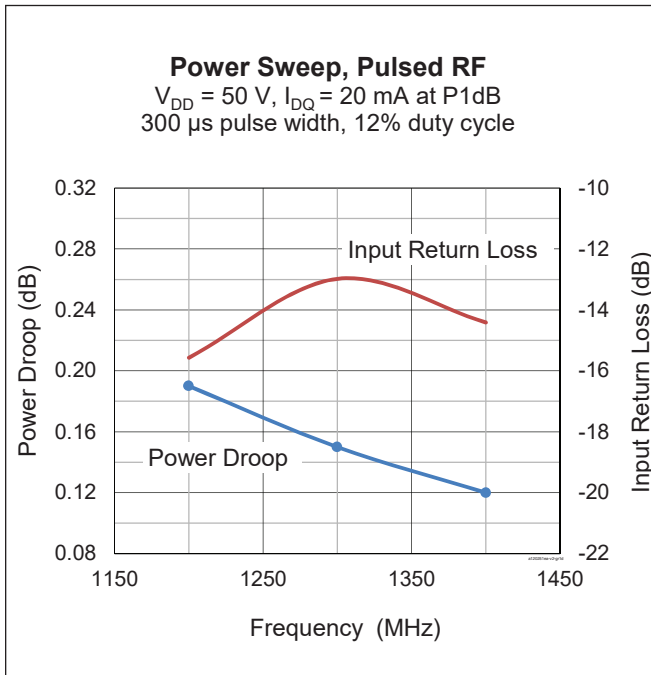
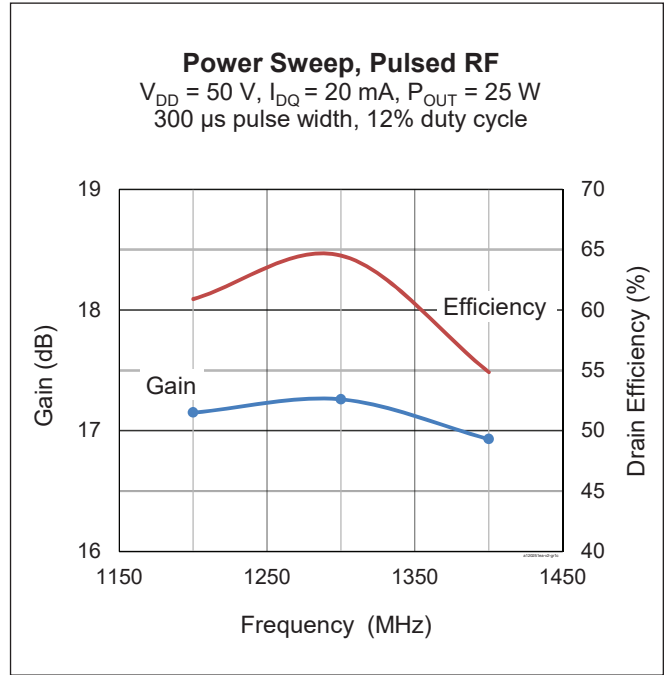
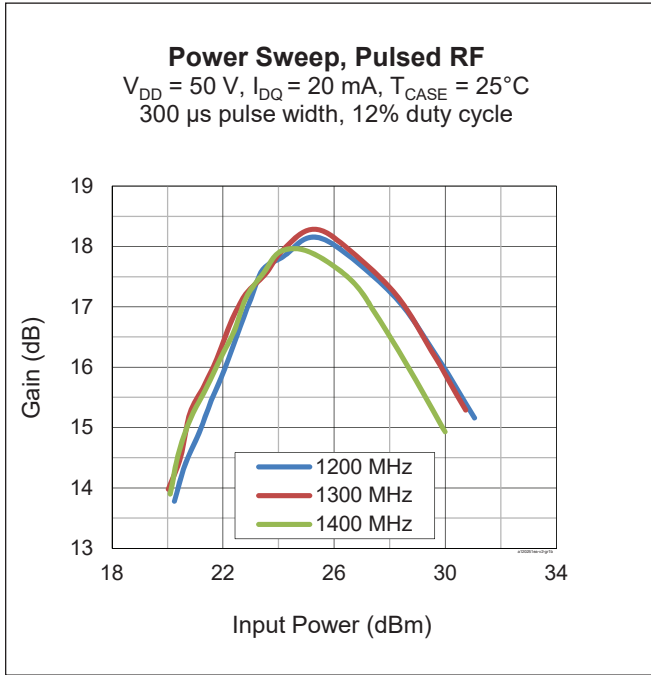
Maximum Ratings

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 ($T_{CASE} = 70^{\circ}\text{C}$, $V_{DD} = 50\text{ V}$, 25 W CW)	$R_{\theta JC}$	3.7	$^{\circ}\text{C/W}$

Ordering Information

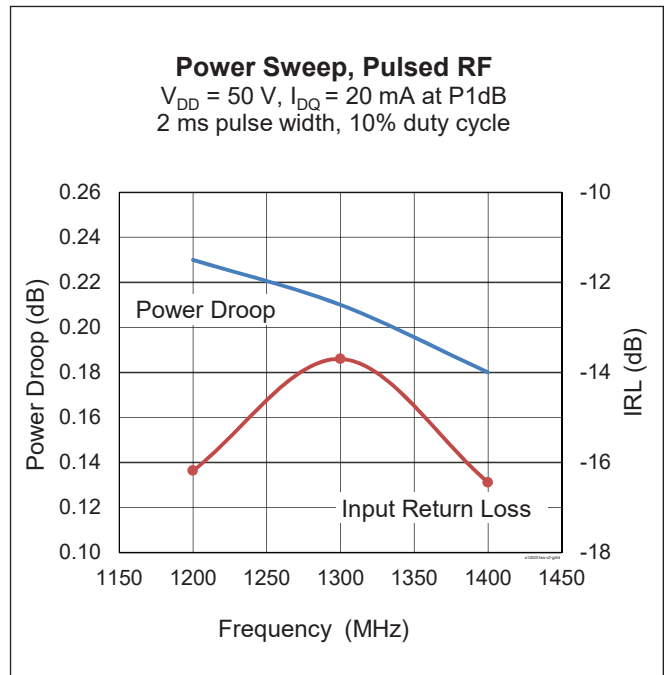
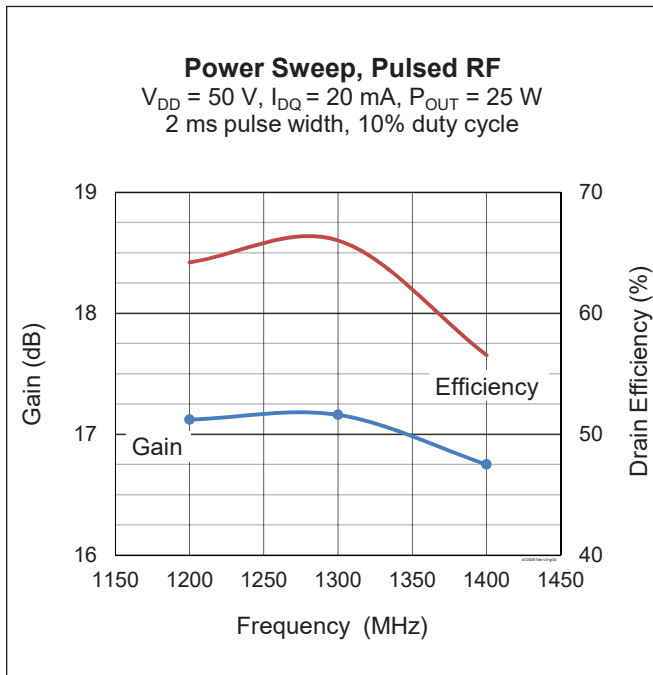
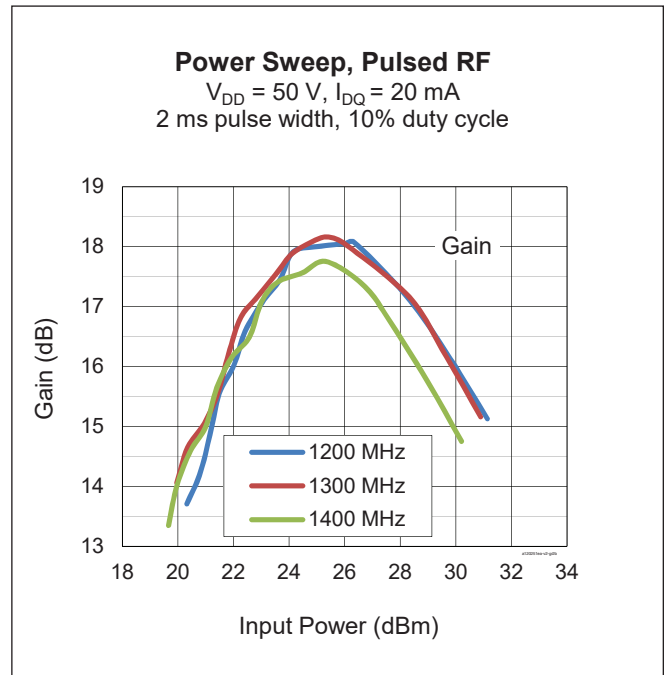
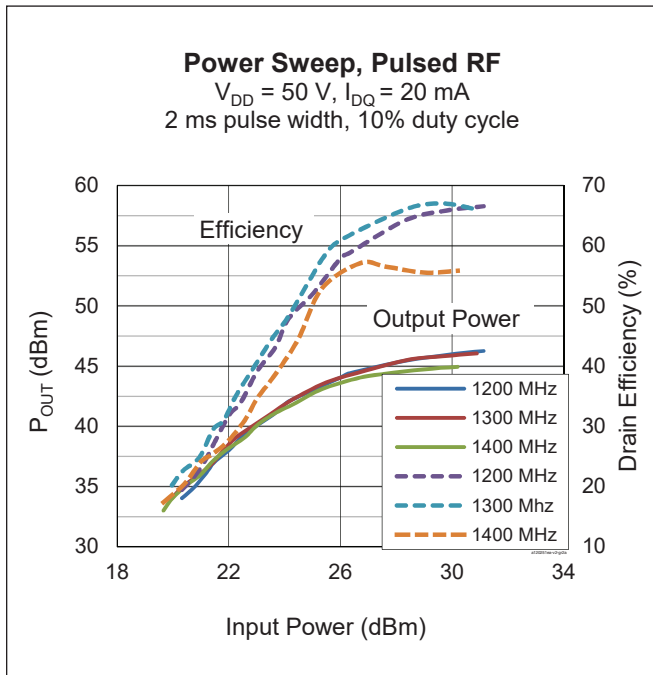
Type and Version	Order Code	Package and Description	Shipping
PTVA120251EA V2 R0	PTVA120251EA-V2-R0	H-36265-2, bolt-down	Tape & Reel, 50 pcs
PTVA120251EA V2 R250	PTVA120251EA-V2-R250	H-36265-2, bolt-down	Tape & Reel, 250 pcs

Typical RF Performance (data taken in production test fixture)

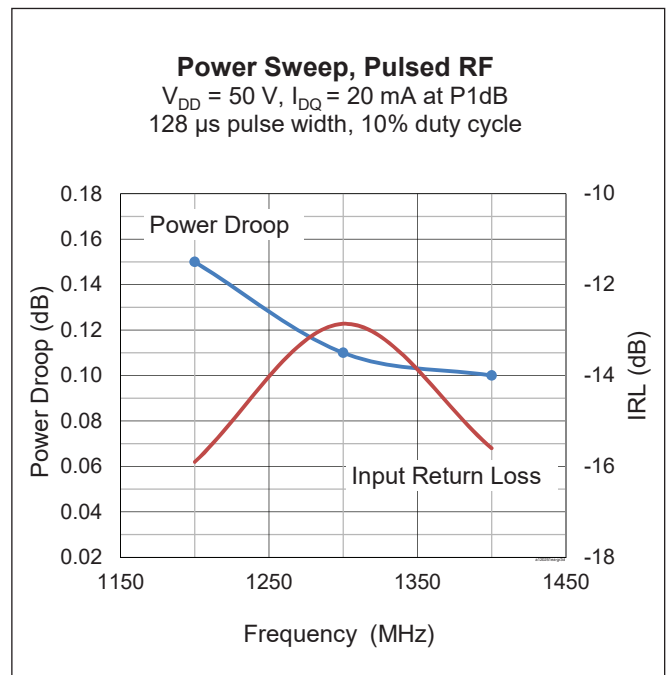
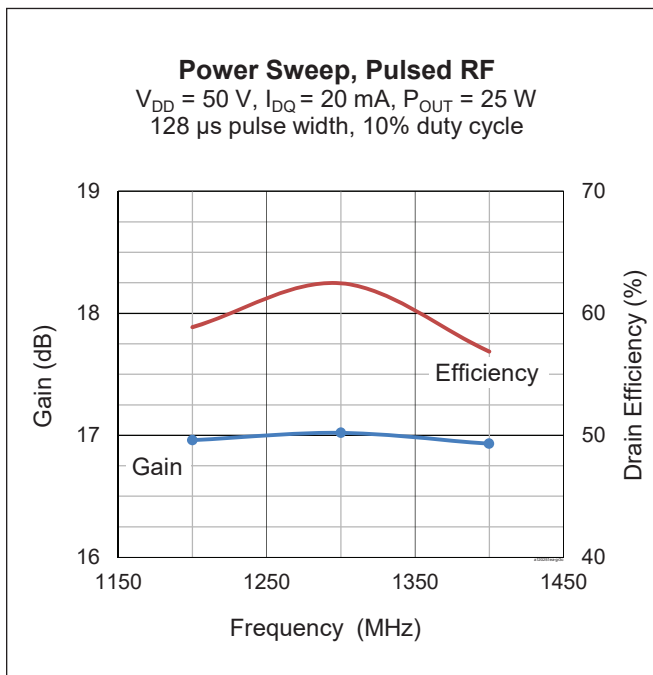
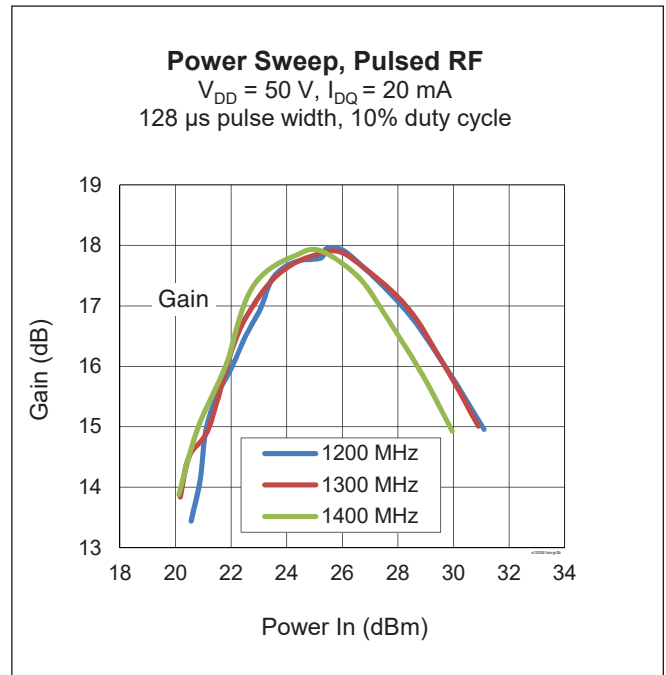
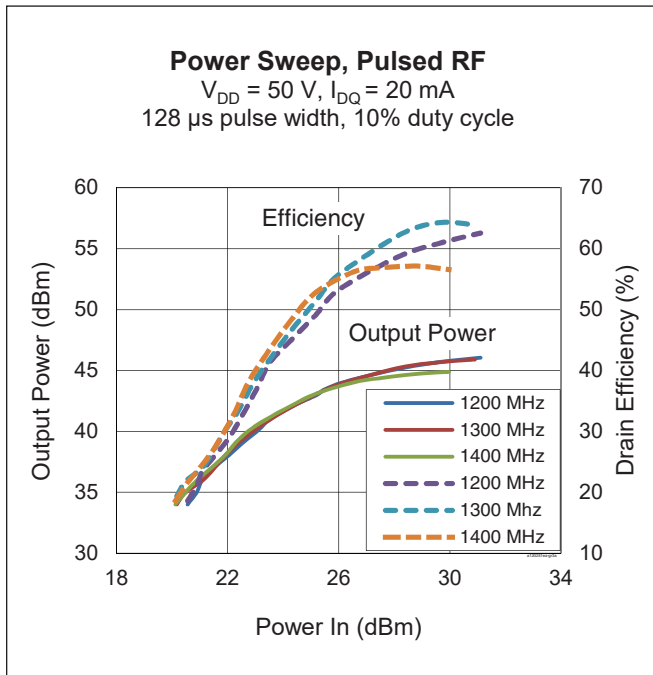




Typical RF Performance (cont.)

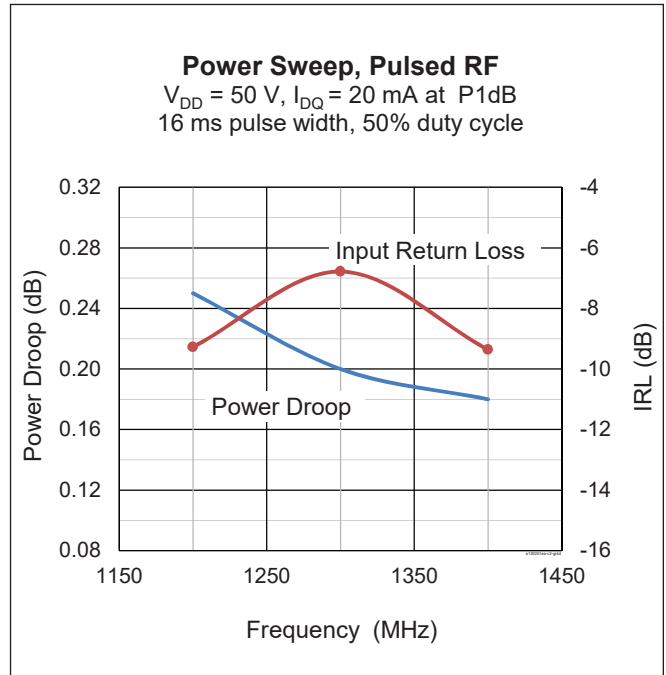
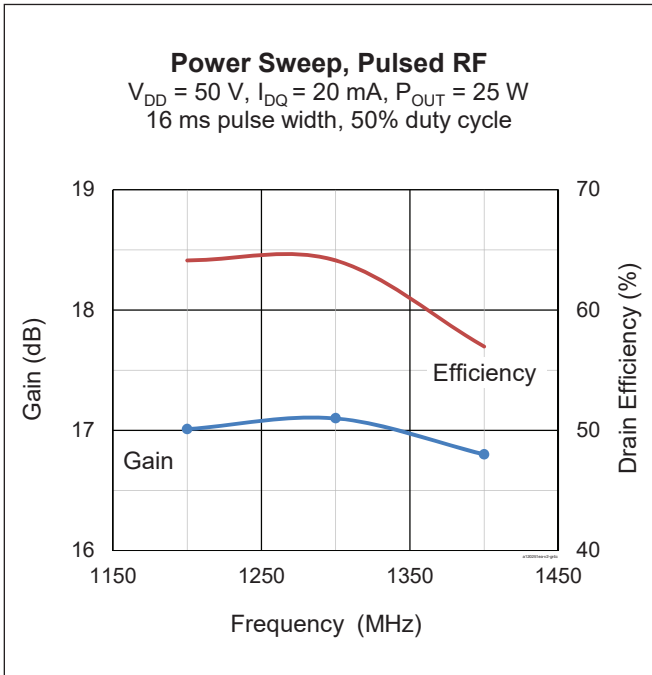
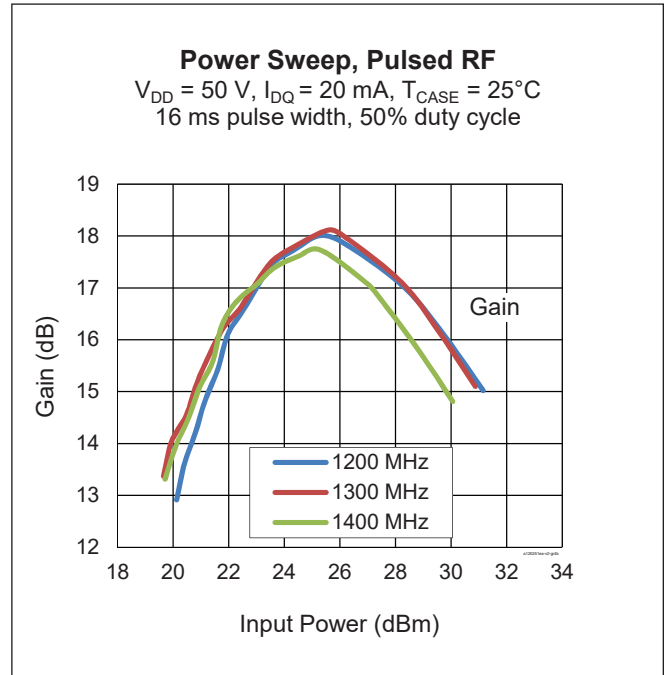
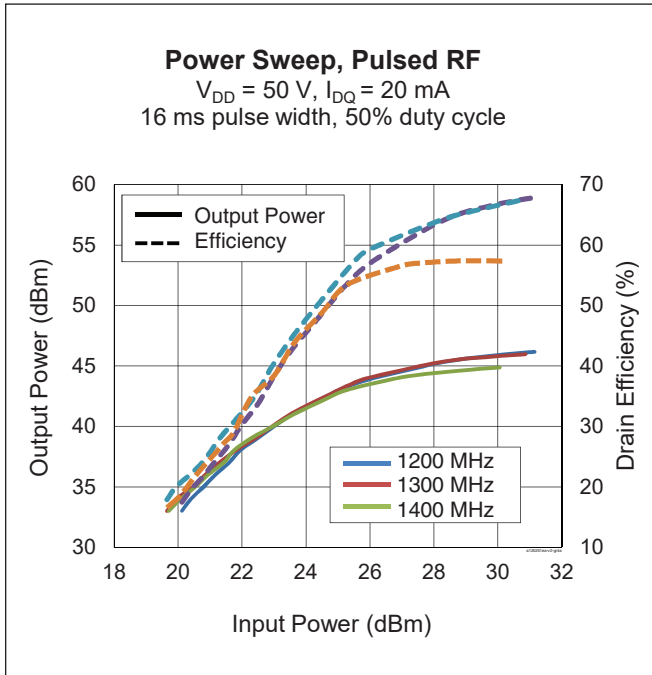


Typical RF Performance (cont.)



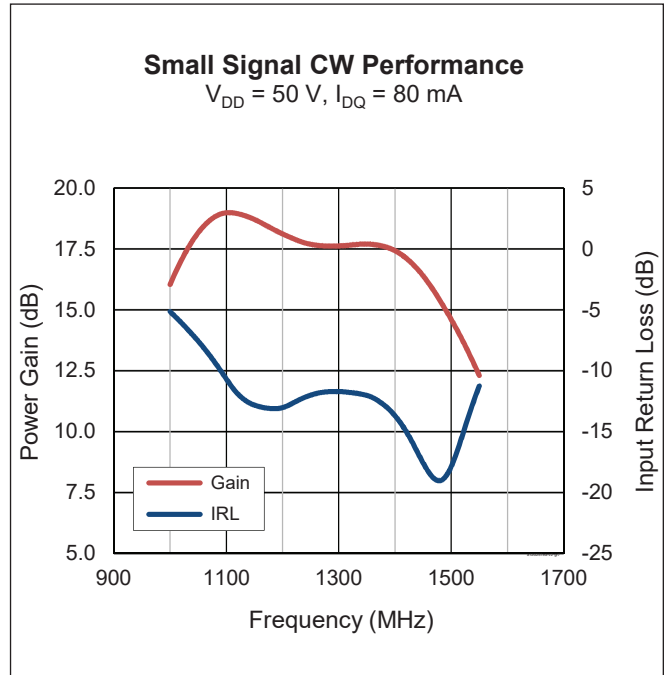
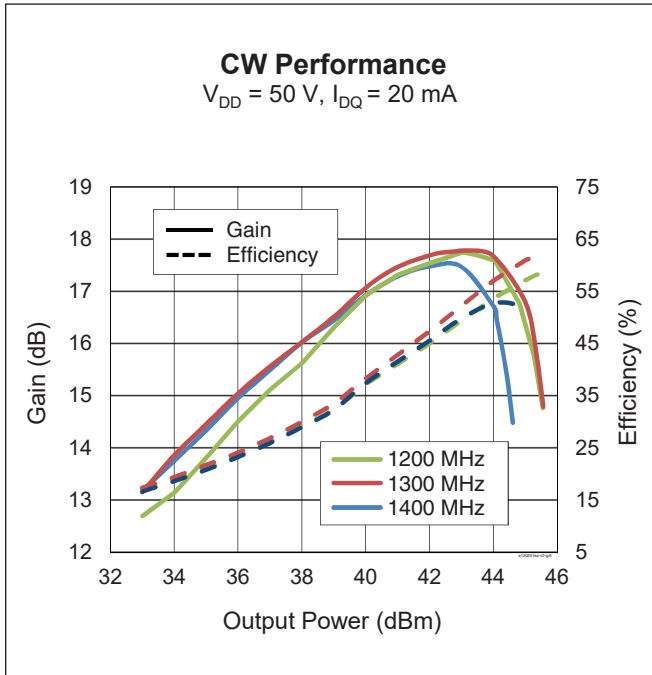


Typical RF Performance (cont.)



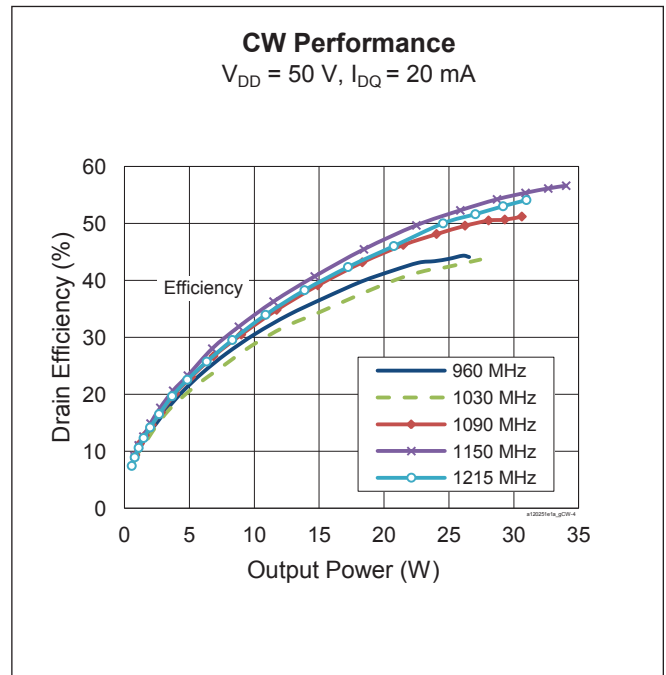
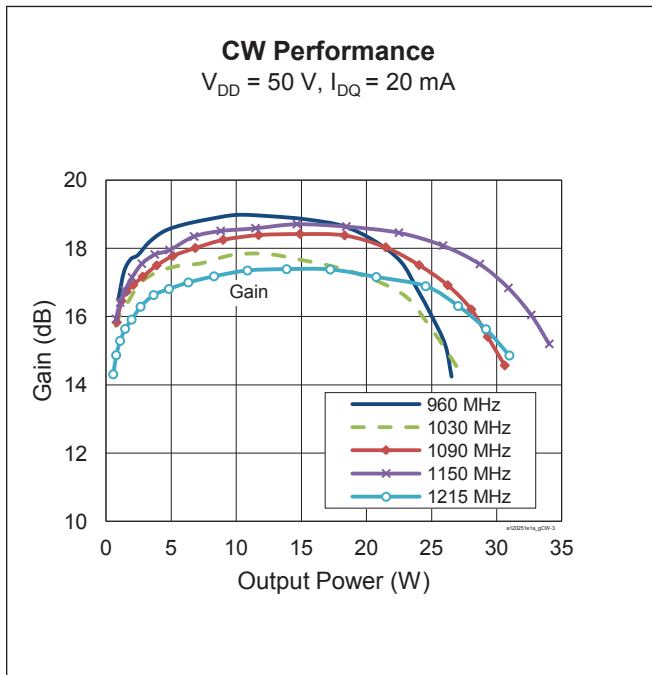
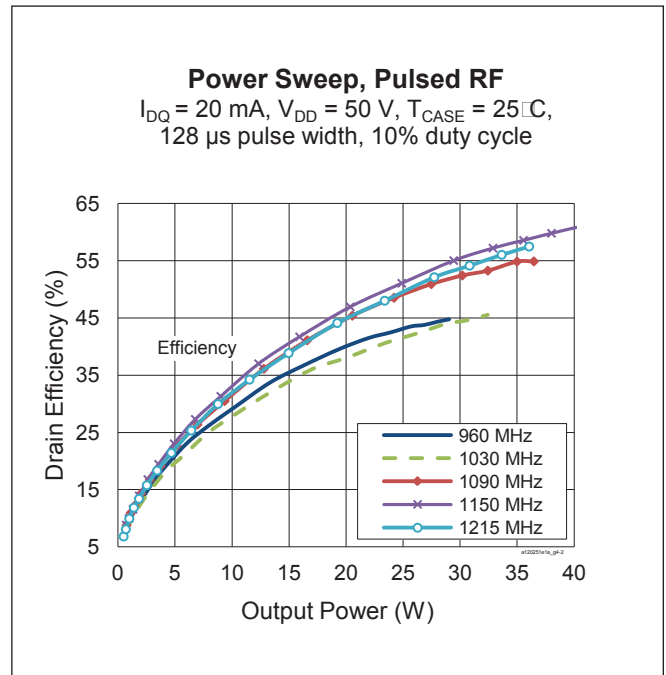
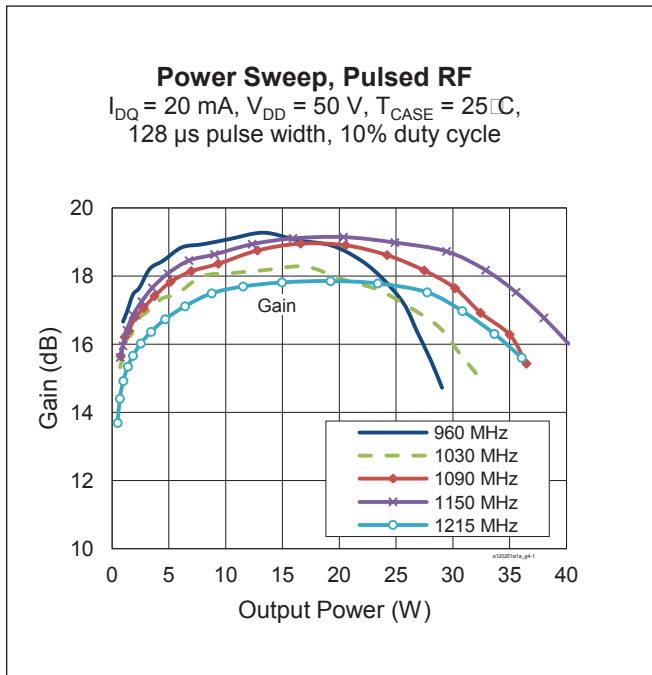


Typical RF Performance (tested with LTN/PTVA120251EA E4 test fixture, 960 MHz – 1215 MHz)



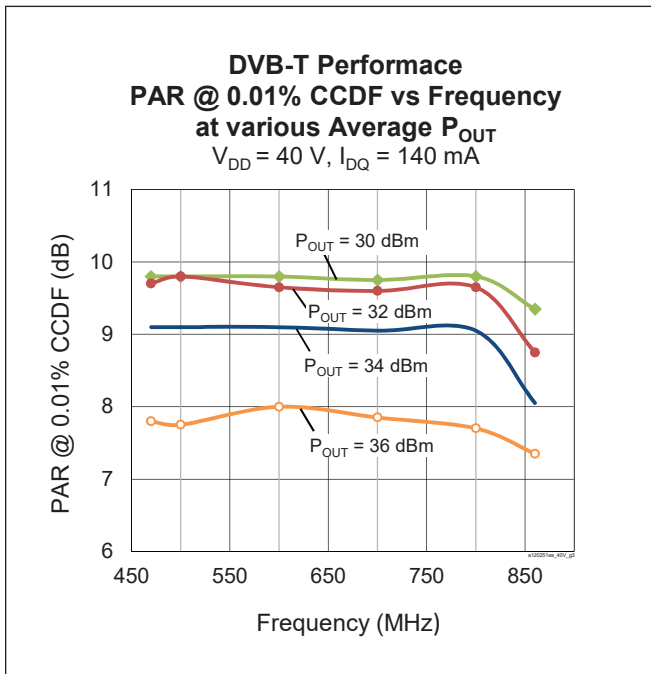
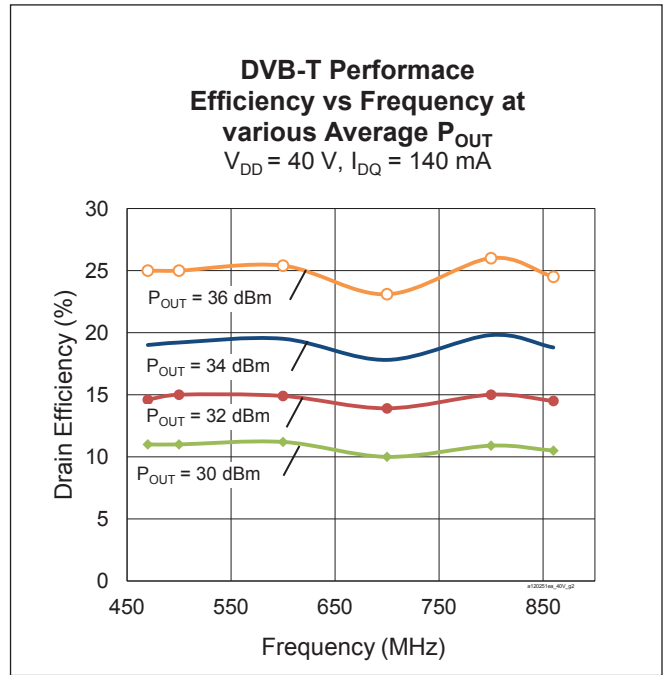
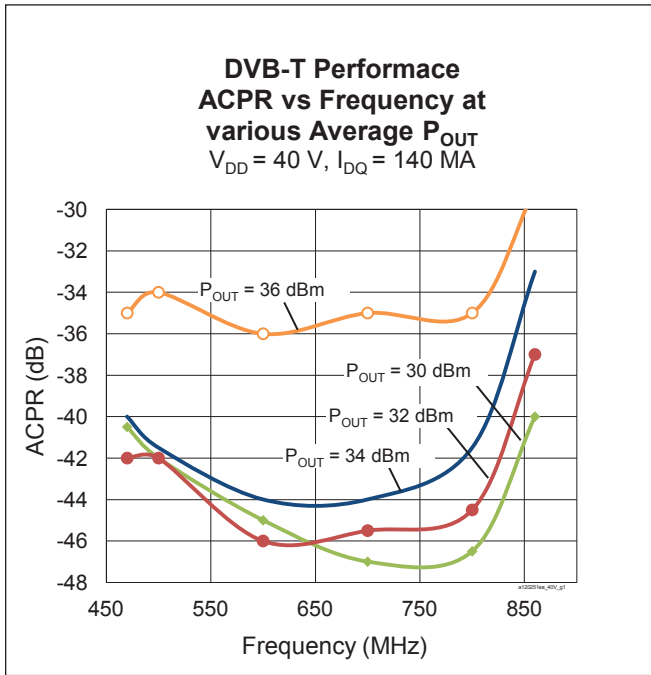
See next page for further performance characterization

Typical RF Performance (cont.) (tested with LTN/PTVA120251EA E4 test fixture, 960 MHz – 1215 MHz)

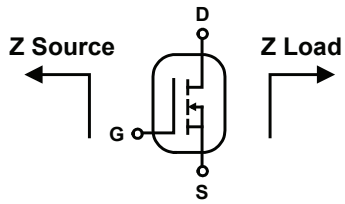


Typical RF Performance (cont.) (tested with LTN/PTVA120251EA E3 test fixture, 470 MHz – 860 MHz)

Test Conditions: DVB-T 8 MHz unclipped input signal, output PAR measured at 0.01% point of CCDF curve, ACPR measured over 200 KHz BW at 4.1 MHz offset from carrier center frequency.



Broadband Circuit Impedance



Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
1200	4.31	-0.22	6.46	7.63
1300	5.06	-0.79	6.29	7.27
1400	4.94	-1.96	6.14	8.72

See next page for reference circuit information

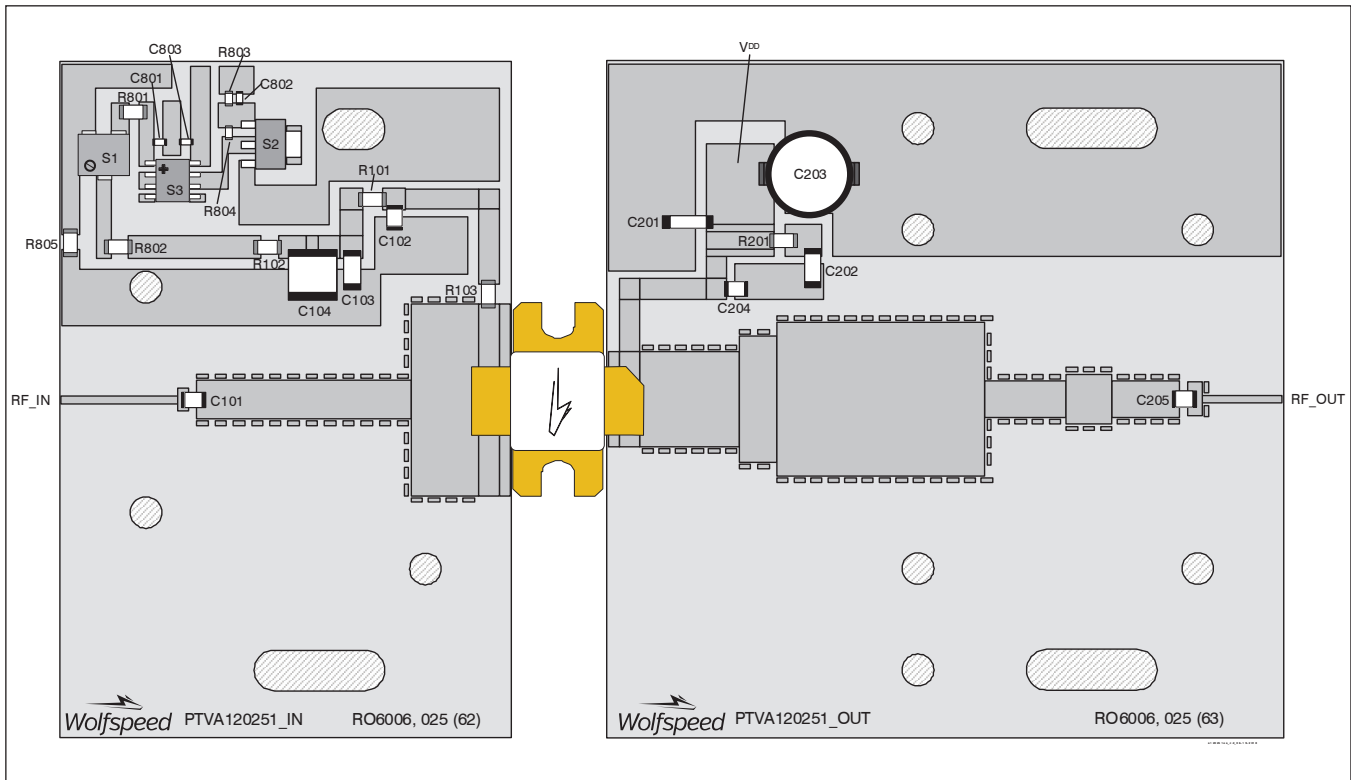


Reference Circuits

DUT	Test Fixture Part No.	PCB	Frequency (MHz)
PTVA120251EA	LTN/PTVA120251EA V2 *	Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 6.15$	1200 – 1400
PTVA120251EA	LTN/PTVA120251EA E2 †	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$	1200 – 1400
PTVA120251EA	LTN/PTVA120251EA E3 †	Rogers 4350B, 0.762mm [.030"] thick, 2 oz. copper, $\epsilon_r = 3.48$	470 – 860
PTVA120251EA	LTN/PTVA120251EA E4 †	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$	960 – 1215

* See pages 11 – 12 for assembly information. Find Gerber files for this reference circuit on the Wolfspeed Web site at www.wolfspeed.com/RF

† Gerber files for this reference circuit are available on request.



Assembly diagram for reference circuit LTN/PTVA120251EA V2, 1200 MHz to 1400 MHz (not to scale)

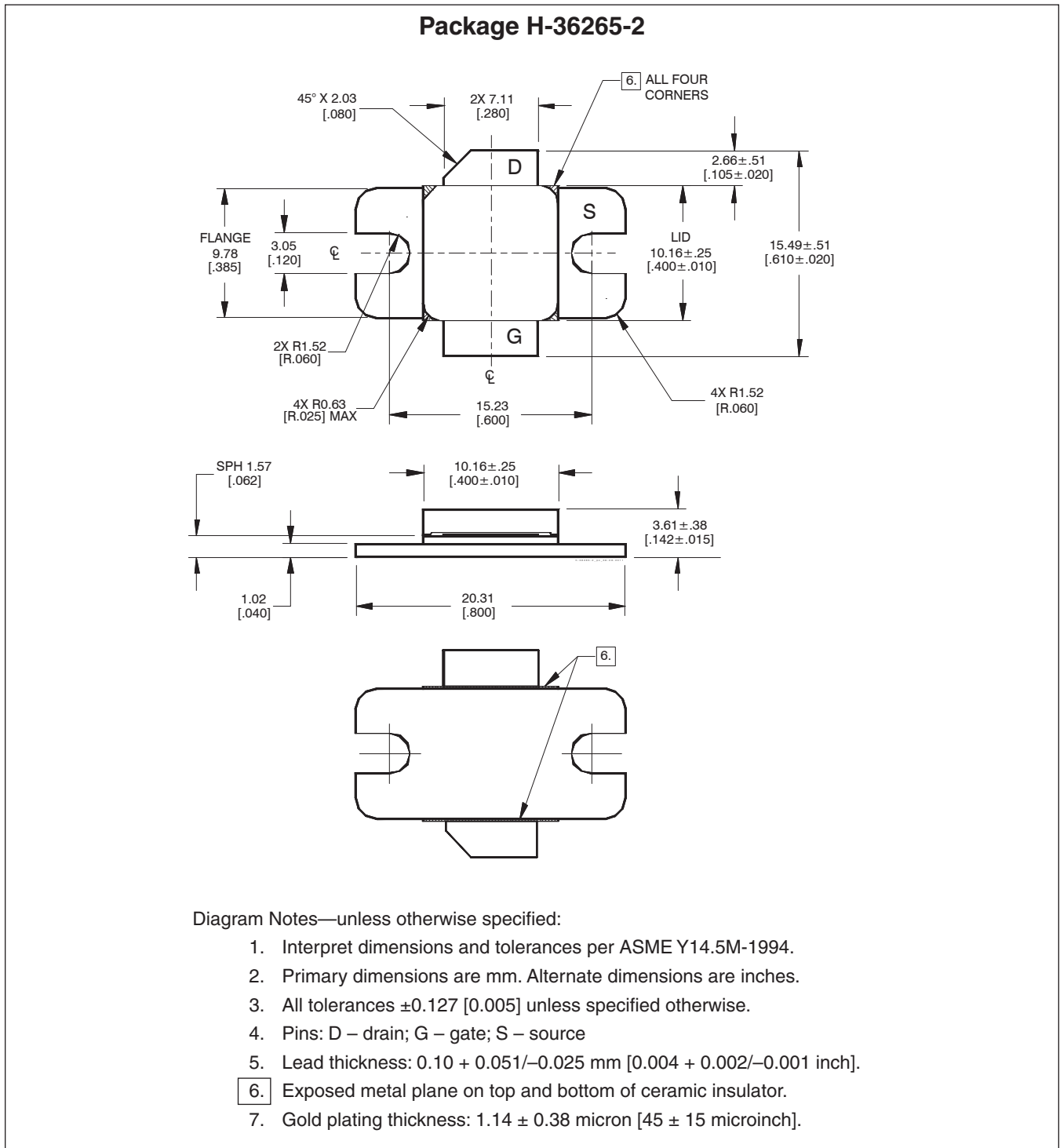


Reference Circuit (cont.)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C102	Capacitor, 56 pF	ATC	ATC100B560JW500XB
C103	Capacitor, 1 μF	TDK Corporation	C4532X7R2A105M230KA
C104	Capacitor, 10 μF	TDK Corporation	C5750X5R1H106K230KA
C801, C802, C803	Capacitor, 1000 pF	Kemet	C1812C560KHGACTU
R101	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R102	Resistor, 0 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103, R801	Resistor, 10 ohms	Panasonic – ECG	ERJ-3GEYJ100V
R802, R805	Resistor, 2K ohms	Panasonic Electronic Components	ERJ-8GEYJ202V
R803	Chip resistor, 1.3K ohms	Panasonic Electronic Components	ERJ-3GEYJ132V
R804	Chip resistor, 1.2K ohms	Panasonic Electronic Components	ERJ-3GEYJ122V
S1	Potentiometer 2K ohms	Bourns Inc.	3224W-1-202E
S2	Voltage regulator	Fairchild Semiconductor	LM7805
S3	Transistor	Fairchild Semiconductor	BCP56
Output			
C201	Capacitor, 10 μF	TDK Corporation	C5750X5R1H106K230KA
C202	Capacitor, 1 μF	TDK Corporation	C4532X7R2A105M230KA
C203	Capacitor, 100 μF	Cornell Dubilier Electronics	SK101M100ST
C204, C205	Capacitor, 56 pF	ATC	ATC100B560JW500XB
C206	Capacitor, 6800 μF	Panasonic Electronic Components	ECO-S2AP682EA
R101	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8GEYJ5R6V

Package Outline Specifications



Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2012-06-04	Preliminary	All	First release of Data Sheet for pre-production product
02	2012-10-29	Preliminary	6	Add DVB-T performance graphs
03	2013-03-25	Production	All 1 – 2 3 – 8 9 – 11	Data Sheet reflects released product specifications and performance Update tables with current data Add further graphs Add load pull performance and reference circuit information
04	2014-10-03	Production	11 – 12 1, 3 – 7	New circuit design. Characterization in new circuit.
04.1	2015-06-15	Production	2	Updated max of IRL in pulsed RF performance table
04.2	2016-04-19	Production	2	Updated ordering information
04.3	2017-02-07	Production	2	Updated operating voltage and junction temperature
05	2018-06-19	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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