PTVA102001EA

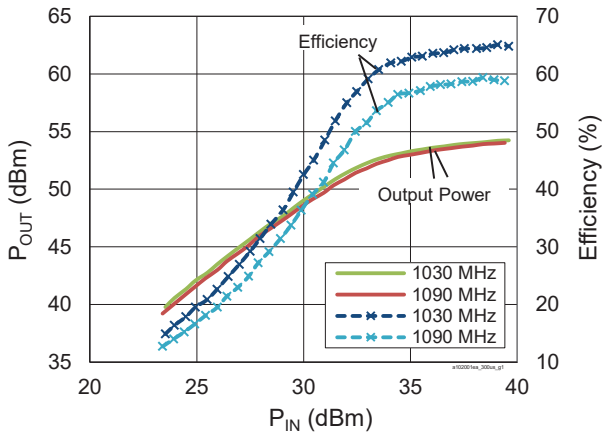
Thermally-Enhanced High Power RF LDMOS FET
200 W, 50 V, 960 – 1600 MHz

Description

The PTVA102001EA is a 200-watt LDMOS FET intended for use in power amplifier applications in the 960 to 1600 MHz frequency band. Features include high gain and thermally-enhanced package with bolt-down flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTVA102001EA
Package H-36265-2

Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
300µs pulse width, 10% duty cycle



Features

- Input matched
- Capable of handling 10:1 VSWR @50 V, 200 W (CW) output power
- Integrated ESD protection
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Pulsed RF Performance (tested in Wolfspeed production test fixture)
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 200 W, f = 1090 MHz, 300 µs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18.5	—	dB
Drain Efficiency	η_D	56	59.5	—	%

All published data at T_{CASE} = 25°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 Wolfspeed test fixture)

V_{DD} = 50 V, I_{DQ} = 100 mA, Input signal (t_r = 5 ns, t_f = 6.5 ns), T_{CASE} = 25°C, class AB test

Mode of Operation	*f* (MHz)	IRL (dB)	P_{1dB}			P_{3dB}			$P_{droop\ (pulse)}$ @ 200 W	t_r (ns)	t_f (ns)
			Gain (dB)	Eff (%)	P_{OUT} (W)	Gain (dB)	Eff (%)	P_{OUT} (W)			
300 µs, 10% Duty Cycle	1030	–10	18.5	60	204	16.5	62	240	0.10	6.0	7.9
1 ms, 10% Duty Cycle	1030	–10	18.3	60	200	16.3	62	235	0.20	—	—
20 ms, 10% Duty Cycle	1030	–10	18.2	59	195	16.2	61	225	0.25	—	—
16 ms, 50% Duty Cycle	1030	–10	18.2	58	190	16.2	60	215	0.30	—	—

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	V_{DS} = 50 V, V_{GS} = 0 V	I_{DSS}	—	—	1	µA
	V_{DS} = 111 V, V_{GS} = 0 V	I_{DSS}	—	—	10	µA
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1	µA
On-State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.34	—	Ω
Operating Gate Voltage	V_{DS} = 50 V, I_{DQ} = 100 mA	V_{GS}	3.1	3.35	3.5	V

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	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C

Thermal Characteristics

T_{CASE} = 70°C, 167 W (CW), 50 V, I_{DQ} = 100 mA, 1030 MHz

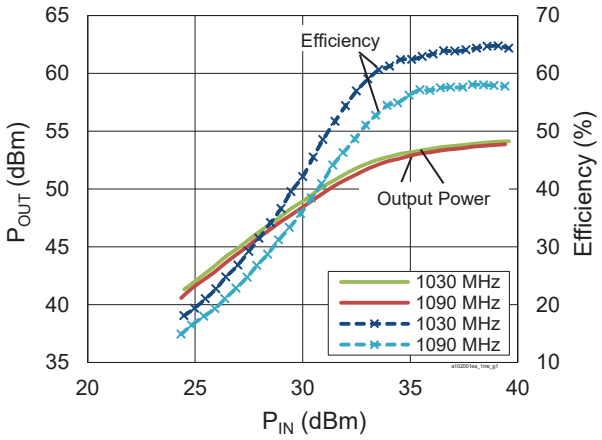
Characteristic	Symbol	Value	Unit
Thermal Resistance	$R_{\theta JC}$	0.70	°C/W

Ordering Information

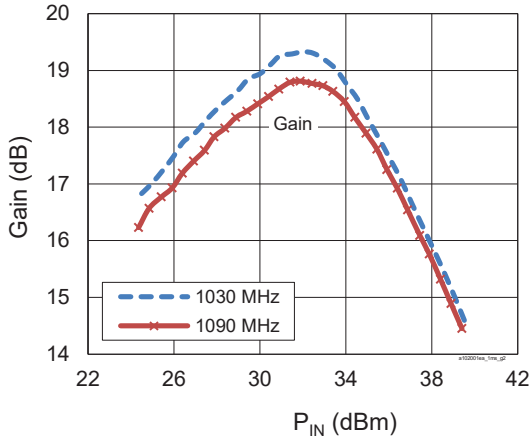
Type and Version	Order Code	Package Description	Shipping
PTVA102001EA V1 R0	PTVA102001EA-V1-R0	H-36265-2, bolt-down	Tape & Reel, 50 pcs
PTVA102001EA V1 R2	PTVA102001EA-V1-R2	H-36265-2, bolt-down	Tape & Reel, 250 pcs

Typical RF Performance (data taken in production test fixture)

Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
1ms pulse width, 10% duty cycle

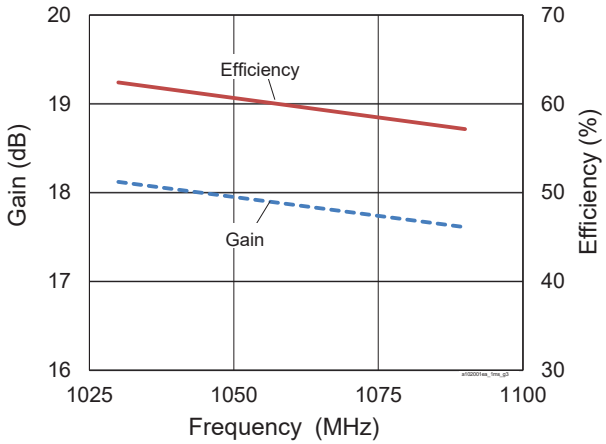


Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
1ms pulse width, 10% duty cycle

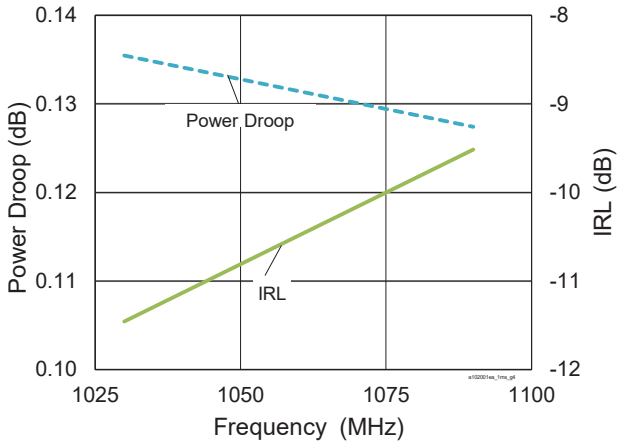


Typical RF Performance (cont.)

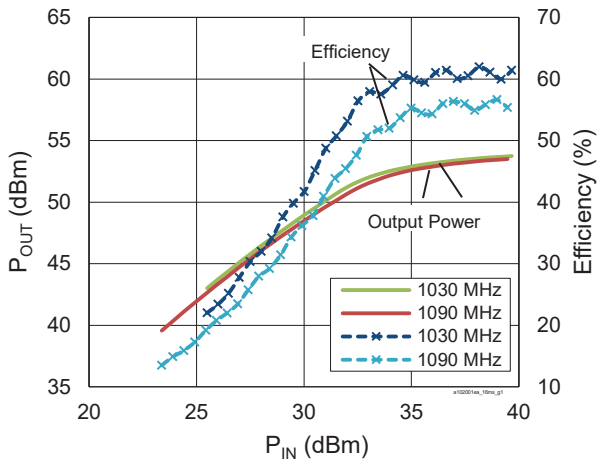
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 200 W,
1ms pulse width, 10% duty cycle



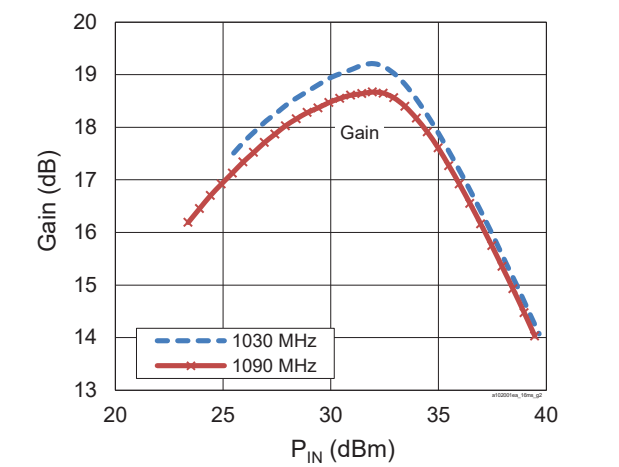
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 200 W,
1ms pulse width, 10% duty cycle



Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
16ms pulse width, 50% duty cycle

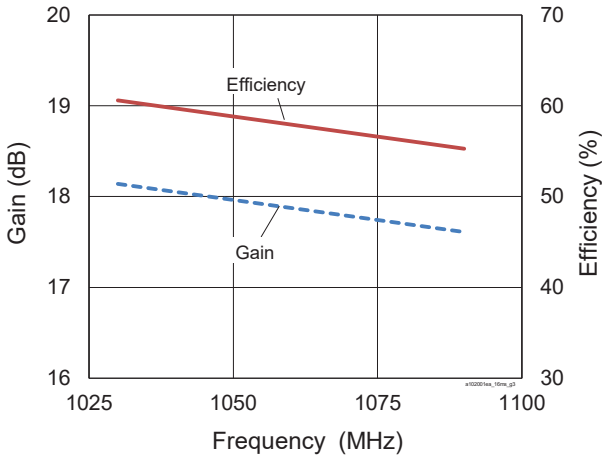


Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
16ms pulse width, 50% duty cycle

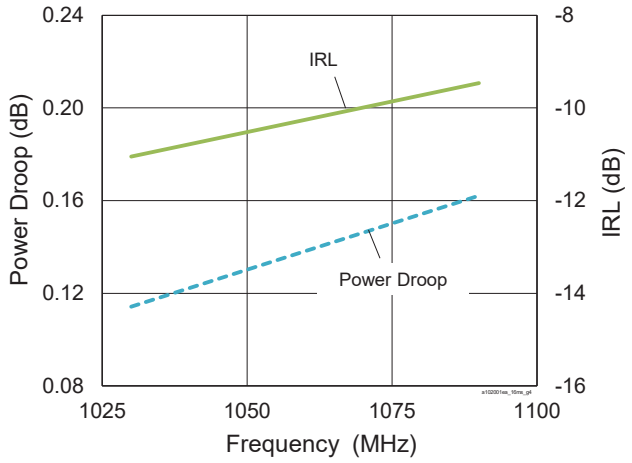


Typical RF Performance (cont.)

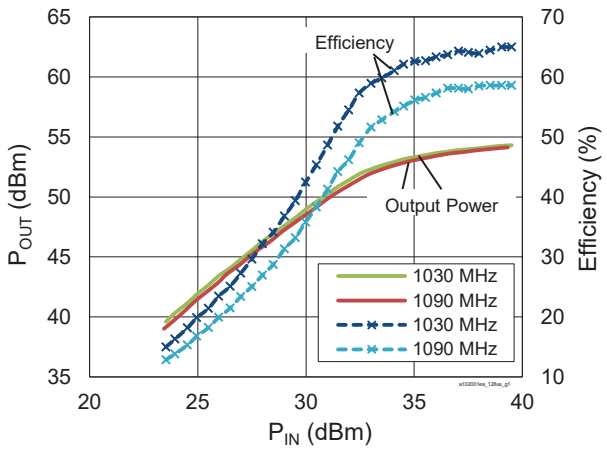
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 190 W,
16ms pulse width, 50% duty cycle



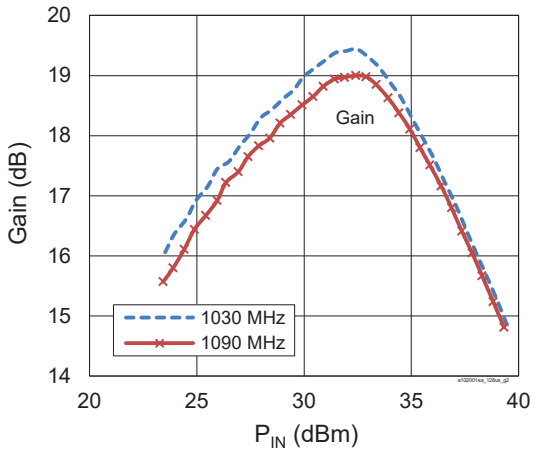
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 190 W,
16ms pulse width, 50% duty cycle



Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
128µS pulse width, 1% duty cycle

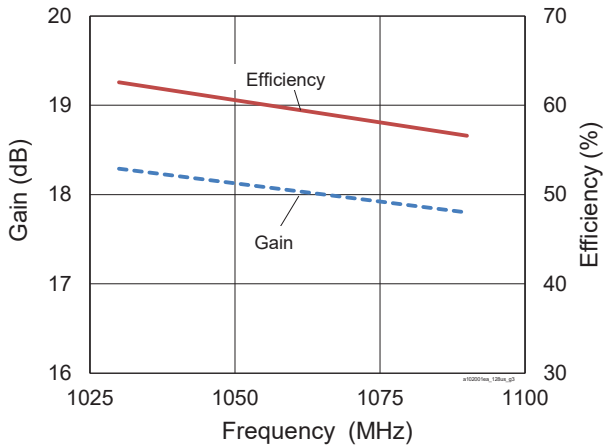


Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
128µS pulse width, 1% duty cycle

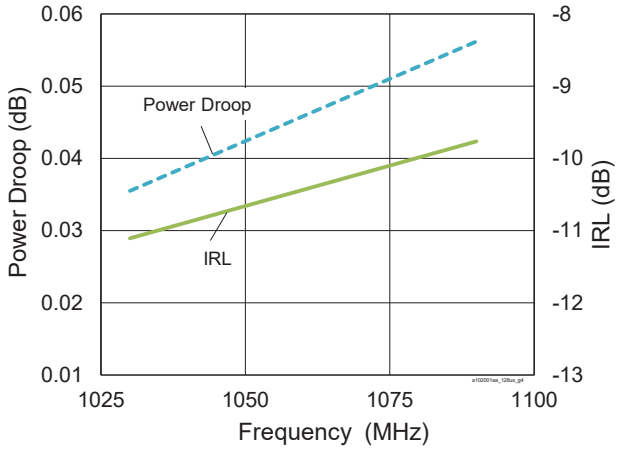


Typical RF Performance (cont.)

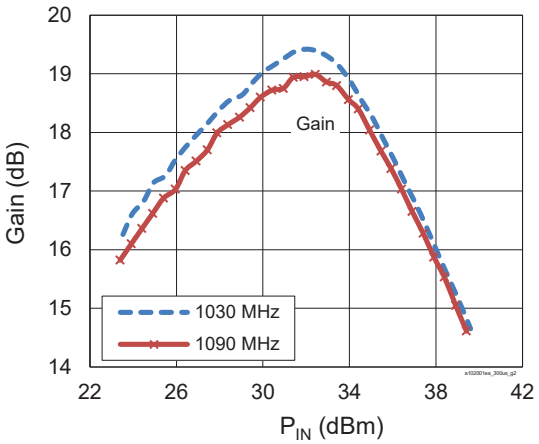
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 210 W,
128µS pulse width, 1% duty cycle



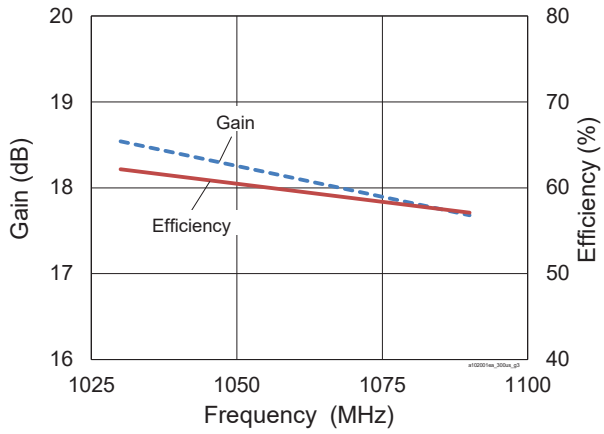
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 210 W,
128µS pulse width, 1% duty cycle



Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 100 mA, T_{CASE} = 25°C,
300µs pulse width, 10% duty cycle

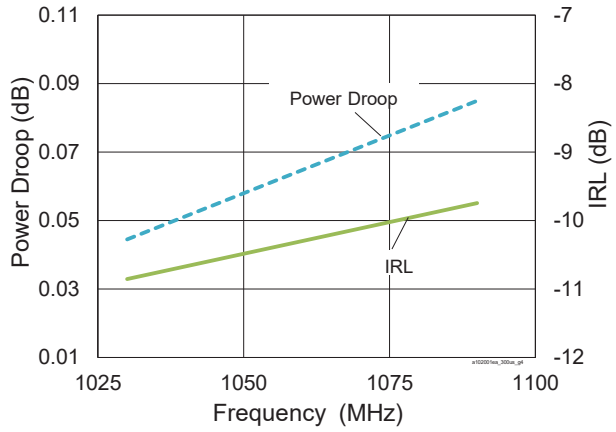


Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 205 W,
300µs pulse width, 10% duty cycle

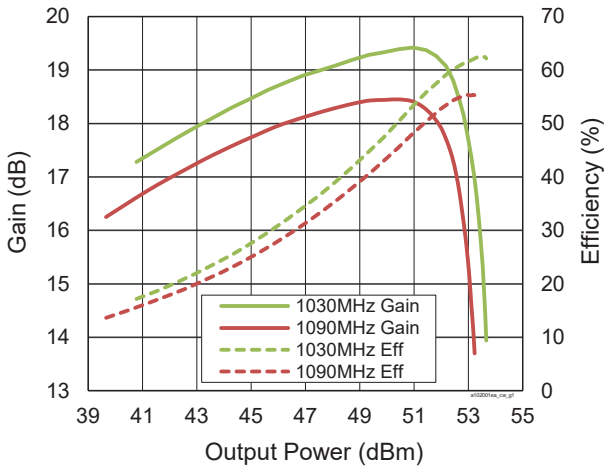


Typical RF Performance (cont.)

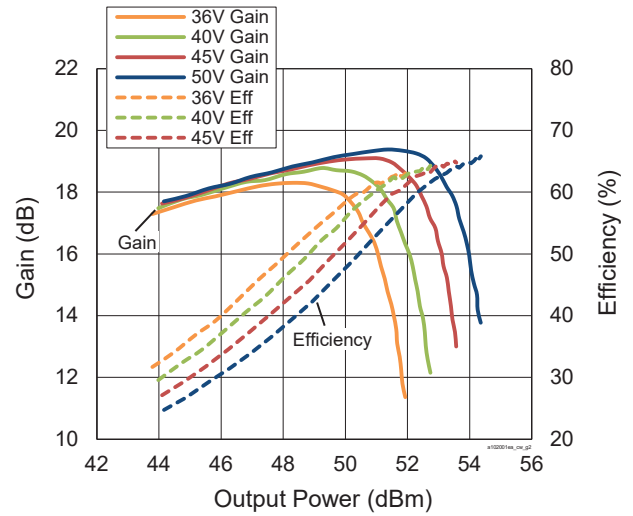
Pulsed RF Performance
V_{DD} = 50 V, I_{DQ} = 100 mA, P_{OUT} = 205 W,
300µs pulse width, 10% duty cycle



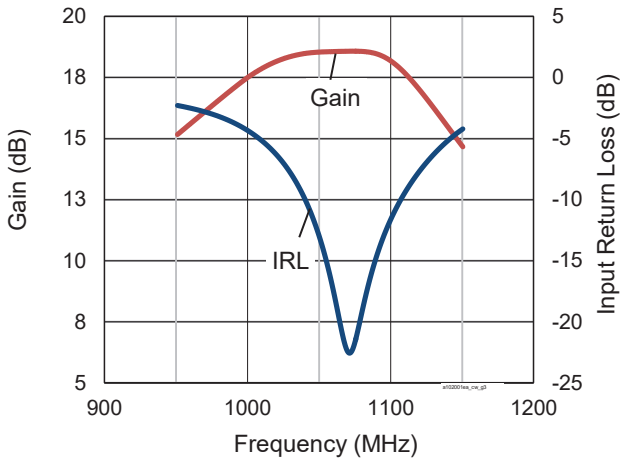
CW Performance
V_{DD} = 50 V, I_{DQ} = 100 mA



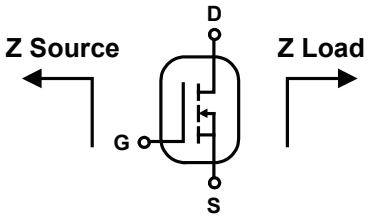
Pulse CW Performance at Various V_{DD}
300µs pulse width, 10% duty cycle,
I_{DQ} = 100mA, f=1030 MHz



Small Signal CW Performance
Gain & Input Return Loss
V_{DD} = 50 V, I_{DQ} = 100 mA



Load Pull Performance



Pulsed CW signal: 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, I_{DQ} = 90 mA

		P3dB				
		Maximum Power				
Freq [MHz]	**Z_{IN} [Ω]**	**P_{OUT} [dBm]**	**P_{OUT} [W]**	**P_G [dB]**	**PAE Eff [%]**	**Z_{OUT} [Ω]**
960	0.97 – j4.50	54.99	315	16.56	59.8	2.04 – j0.34
1030	1.25 – j5.26	54.59	288	15.63	57.5	2.26 – j0.43
1090	1.80 – j5.85	54.53	284	15.64	58.9	1.77 – j0.33
1150	2.37 – j7.11	54.53	284	15.23	57.0	2.04 – j0.65
1200	2.51 – j6.97	54.31	270	15.13	55.3	2.09 – j0.67
1300	4.92 – j7.48	54.55	285	14.70	56.4	1.80 – j0.99
1400	10.54 – j3.45	54.41	276	14.27	55.7	1.43 – j1.28
1500	7.87 – j0.31	54.36	273	13.62	53.1	1.66 – j1.93
1600	3.97 – j1.99	54.19	262	13.10	52.3	1.49 – j2.21

Pulsed CW signal: 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, I_{DQ} = 90 mA

		P3dB				
		Maximum Efficiency				
Freq [MHz]	**Z_{IN} [Ω]**	**P_{OUT} [dBm]**	**P_{OUT} [W]**	**P_G [dB]**	**PAE Eff [%]**	**Z_{OUT} [Ω]**
960	0.97 – j4.50	53.57	228	18.32	70.0	1.73 + j1.19
1030	1.25 – j5.26	53.42	220	17.35	67.2	1.63 + j0.98
1090	1.80 – j5.85	53.38	218	17.14	67.3	1.50 + j0.72
1150	2.37 – j7.11	53.47	222	16.82	65.8	1.41 + j0.42
1200	2.51 – j6.97	52.40	174	17.04	65.4	1.08 + j0.60
1300	4.92 – j7.48	53.17	207	16.41	65.5	1.17 – j0.02
1400	10.54 – j3.45	52.99	199	15.95	63.4	0.85 – j0.61
1500	7.87 – j0.31	53.17	208	15.20	60.8	1.01 – j1.19
1600	3.97 – j1.99	53.15	207	14.51	58.5	0.94 – j1.66

Load Pull Performance (cont.)

Pulsed CW signal: 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, I_{DQ} = 90 mA

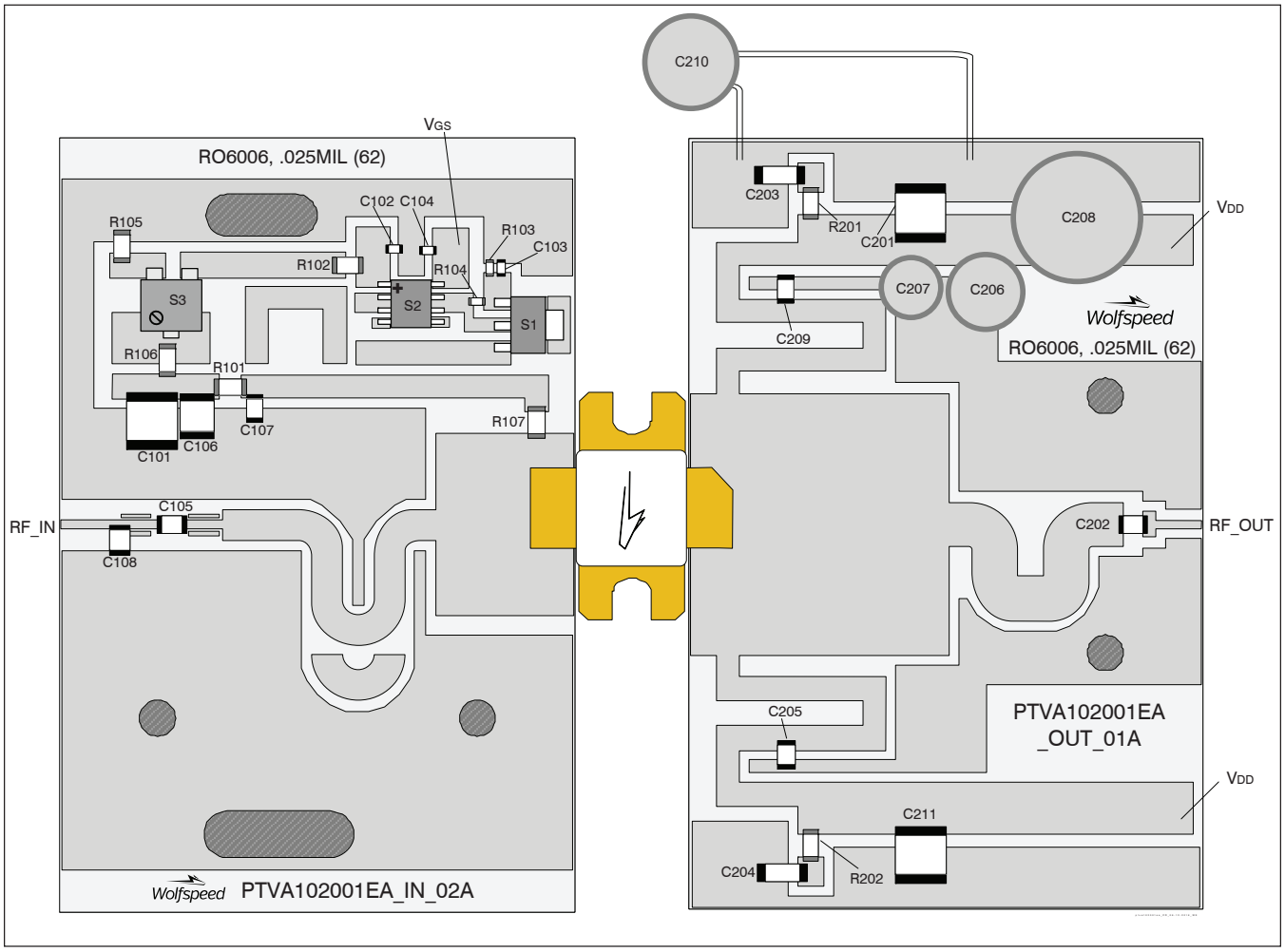
		P3dB				
		Z Optimized				
Freq [MHz]	**Z_{IN} [Ω]**	**P_{OUT} [dBm]**	**P_{OUT} [W]**	**P_G [dB]**	**PAE Eff [%]**	**Z_{OUT} [Ω]**
960	0.97 – j4.50	54.51	282	17.55	67.5	1.94 + j0.54
1030	1.25 – j5.26	54.18	262	16.79	65.1	1.85 + j0.51
1090	1.80 – j5.85	54.17	261	16.54	65.3	1.71 + j0.28
1150	2.37 – j7.11	54.12	258	16.28	63.9	1.65 + j0.04
1200	2.51 – j6.97	53.78	239	16.23	62.9	1.48 + j0.06
1300	4.92 – j7.48	53.99	251	15.79	62.3	1.54 – j0.32
1400	10.54 – j3.45	53.89	245	15.34	62.0	1.07 – j0.84
1500	7.87 – j0.31	53.86	243	14.71	59.5	1.22 – j1.43
1600	3.97 – j1.99	53.71	235	14.09	57.5	1.05 – j1.82

See next page for reference circuit information

Reference Circuit, 1030 – 1090 MHz

Reference Circuit Assembly

DUT	PTVA102001EA
Test Fixture Part No.	LTN/PTVA102001EA V1
PCB	Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, ε_r = 6.15



Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C102, C103, C104	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
C105, C107	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C106	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C108	Capacitor, 3.6 pF	ATC	ATC100B3R6CW500XB
R101	Resistor, 5.6 Ω	Panasonic Electronic Components	ERJ-8RQJ5R6V
R102, R107	Resistor, 10 Ω	Panasonic Electronic Components	ERJ-8GEYJ100V
R103	Resistor, 1.3K Ω	Panasonic Electronic Components	ERJ-3GEYJ132V
R104	Resistor, 1.2K Ω	Panasonic Electronic Components	ERJ-3GEYJ122V
R105	Resistor, 2000 Ω	Panasonic Electronic Components	ERJ-8GEYJ202V
R106	Resistor, 1000 Ω	Panasonic Electronic Components	ERJ-8GEYJ102V
S1	Transistor	Infineon Technologies	BCP56
S2	Voltage Regulator	Texas Instruments	LM78L05ACM
S3	Potentiometer, 2k Ω	Bourns Inc.	3224W-1-202E
Output			
C201, C211	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C202, C205, C209	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C203, C204	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C206	Capacitor, 22 µF	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C207	Capacitor, 10 µF	Cornell Dubilier Electronics (CDE)	SEK100M100ST
C208	Capacitor, 100 µF	Cornell Dubilier Electronics (CDE)	SK101M100ST
C210	Capacitor, 6800 µF	Panasonic Electronic Components	ECO-S2AP682EA
R201, R202	Resistor, 5.6 Ω	Panasonic Electronic Components	ERJ-8RQJ5R6V

Package Outline Specifications

Package H-36265-2

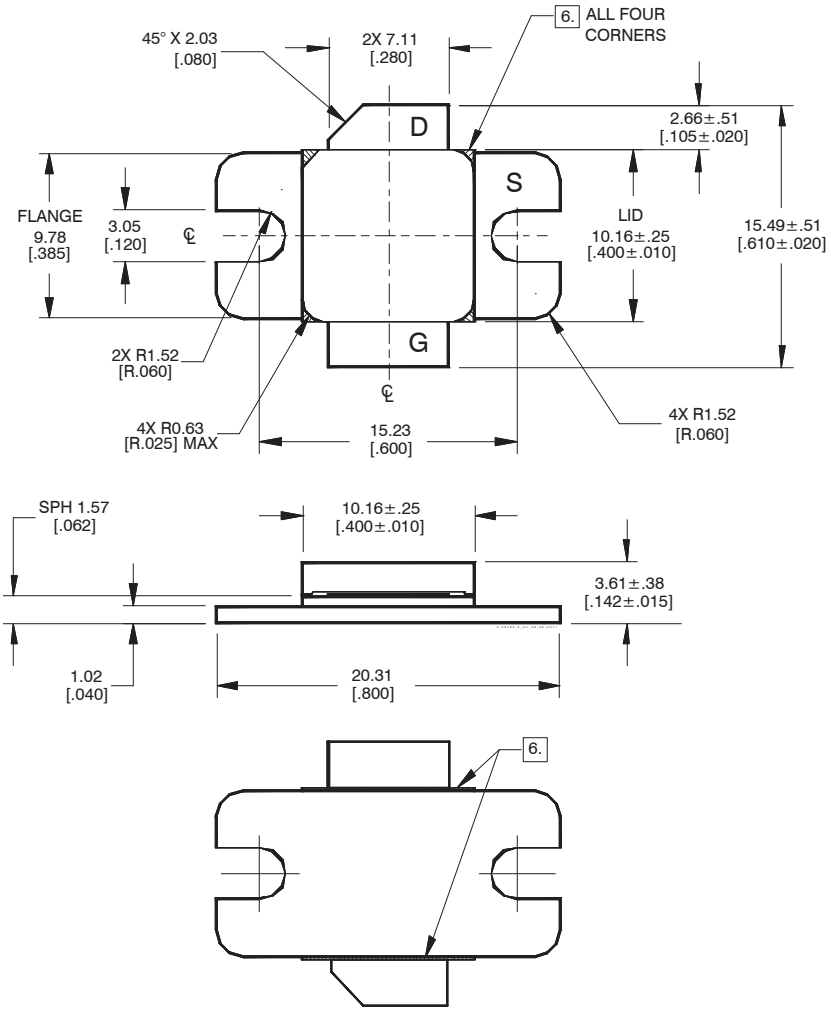


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ±0.127 [0.005] unless specified otherwise.
4. Pins: D – drain; G – gate; S – source
5. Lead thickness: 0.10 + 0.051/–0.025 mm [0.004 + 0.002/–0.001 inch].
6. Exposed metal plane on top and bottom of ceramic insulator.
7. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes at each revision)
01	2015-07-22	Advance	All	Data Sheet reflects advance specification for product development
02	2015-09-22	Production	All	Data Sheet reflects released product specification
02.1	2017-02-08	Production	2	Updated operating voltage and junction temperature
03	2017-08-17	Production	1 2 5 8, 9	Extend bandwidth to 1600 MHz New Thermal Characteristics table Remove duplicate graph Add load pull points
04	2018-06-12	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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