

# PTVA102001EA

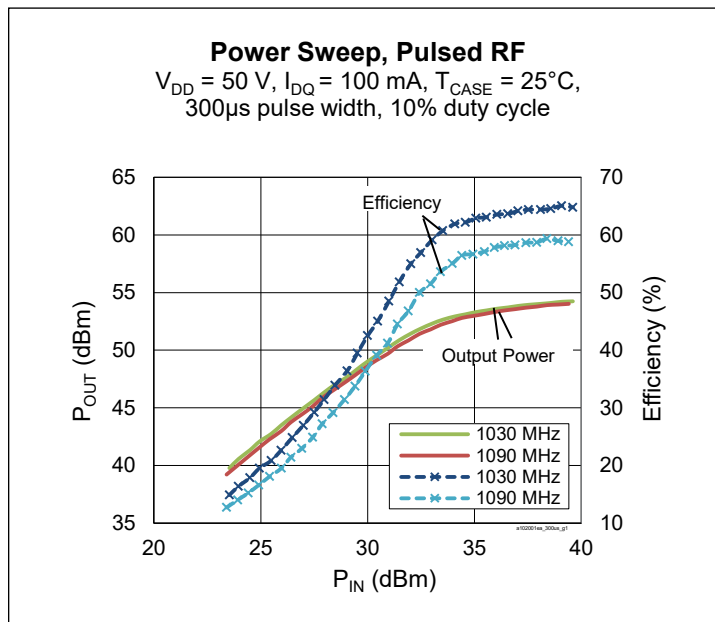
## Thermally-Enhanced High Power RF LDMOS FET 200 W, 50 V, 960 – 1600 MHz

### 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 an advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTVA102001EA  
Package H-36265-2



### 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 the production test fixture)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 100\text{ mA}$ ,  $P_{OUT} = 200\text{ W}$ ,  $f = 1090\text{ MHz}$ , 300  $\mu\text{s}$  pulse width, 10% duty cycle

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

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 the test fixture)

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

Mode of Operation	f (MHz)	IRL (dB)	P <sub>1dB</sub>			P <sub>3dB</sub>			P <sub>droop (pulse) @ 200 W</sub>	t <sub>r</sub> (ns)	t <sub>f</sub> (ns)
			Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)			
300 $\mu\text{s}$ , 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	$V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	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	$\mu\text{A}$
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1	$\mu\text{A}$
On-State Resistance	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.34	—	$\Omega$
Operating Gate Voltage	$V_{DS} = 50\text{ V}$ , $I_{DQ} = 100\text{ mA}$	$V_{GS}$	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	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^\circ\text{C}$

## Thermal Characteristics

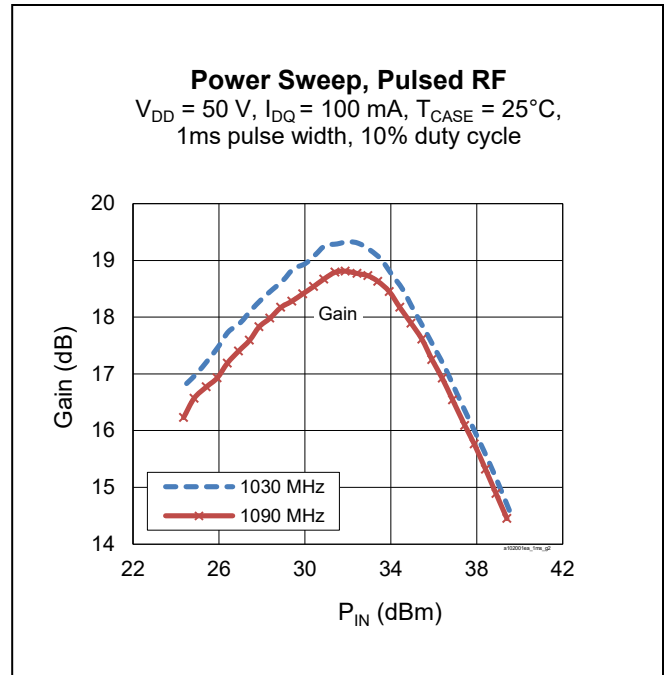
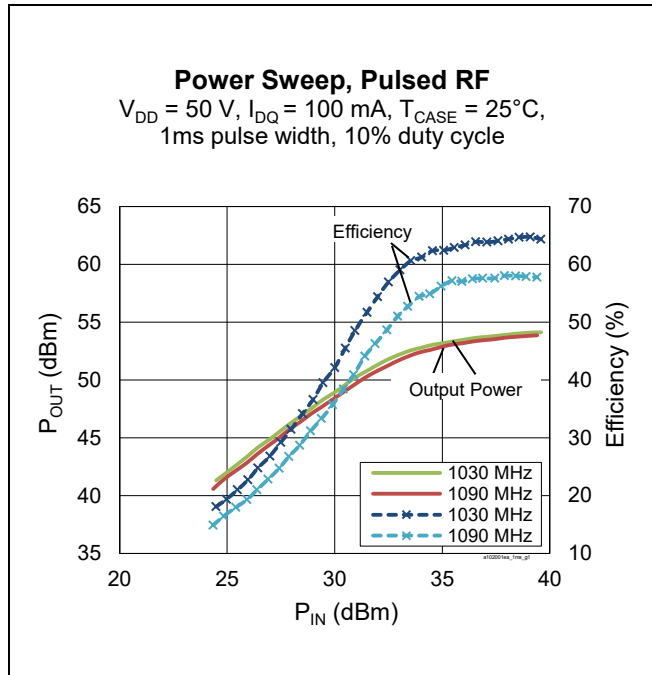
$T_{CASE} = 70^\circ\text{C}$ , 167 W (CW), 50 V,  $I_{DQ} = 100\text{ mA}$ , 1030 MHz

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

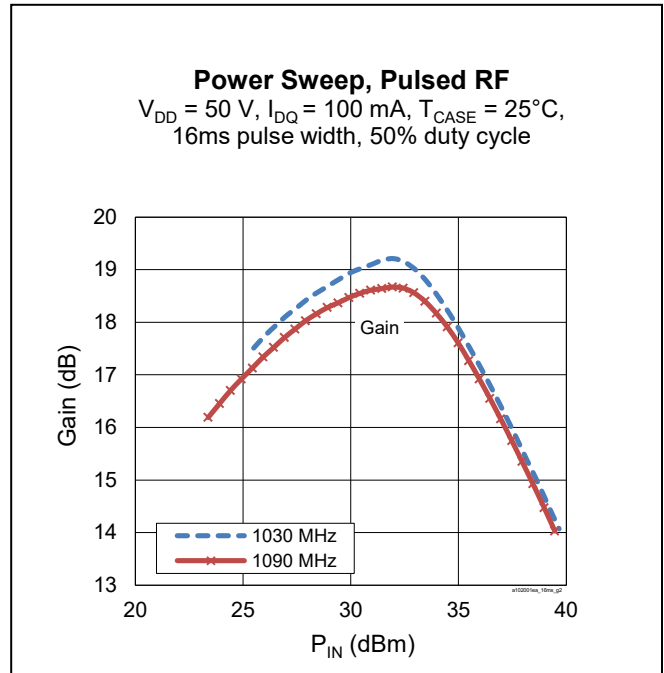
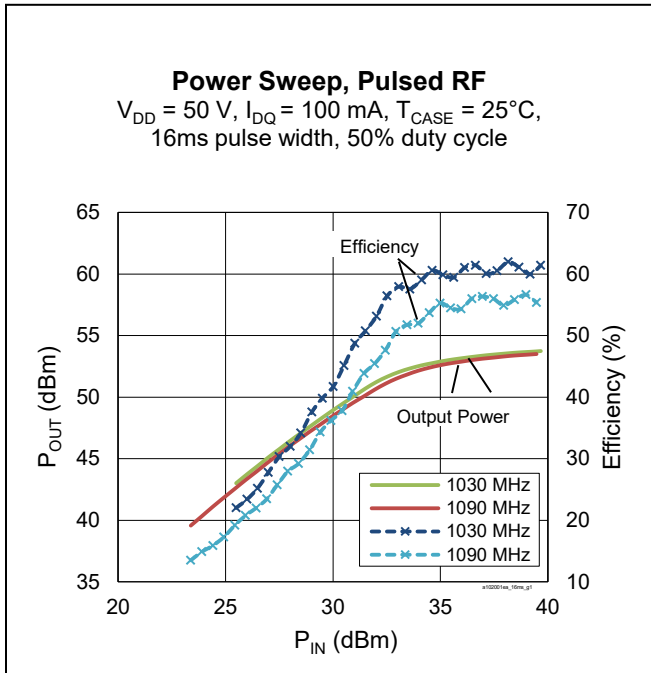
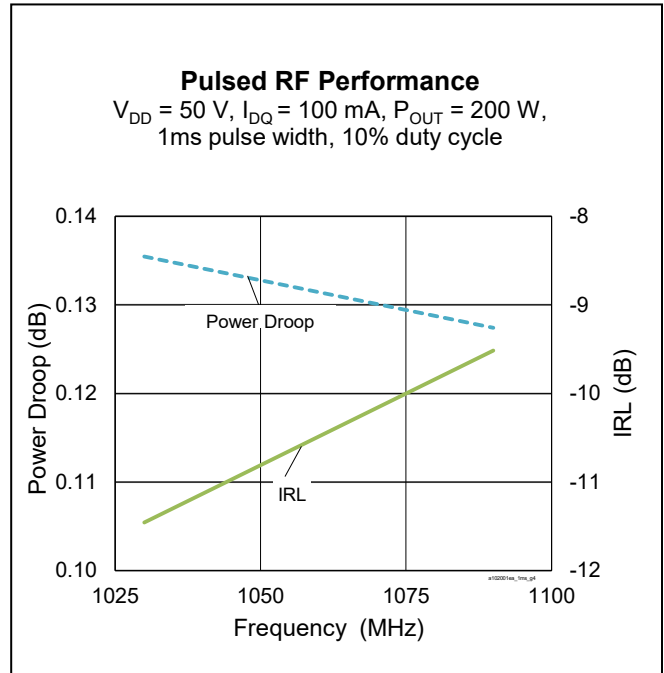
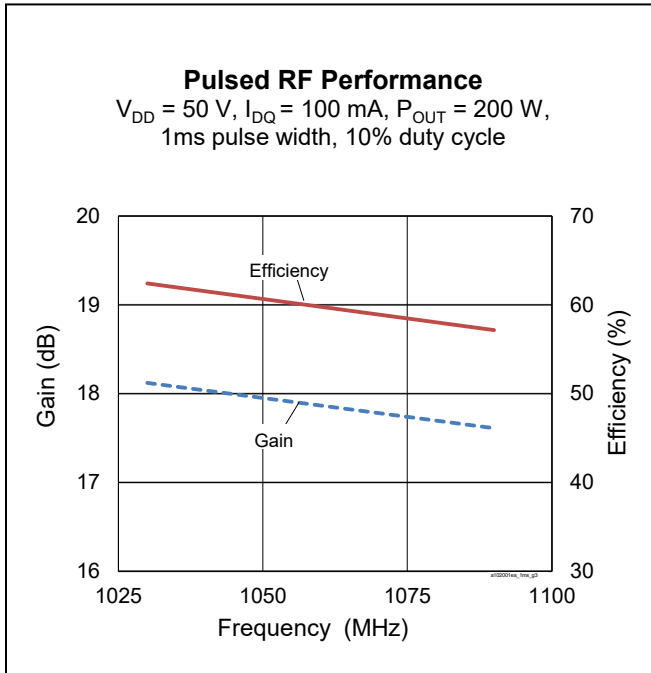
### Ordering Information

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

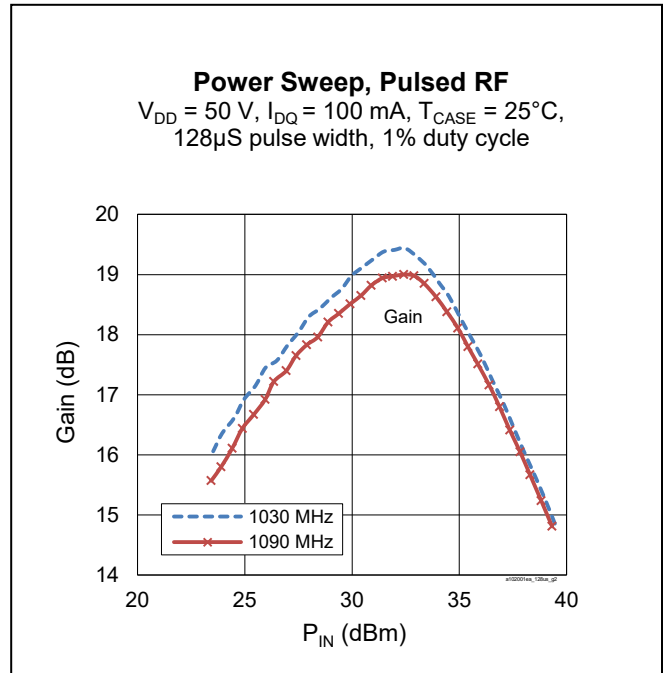
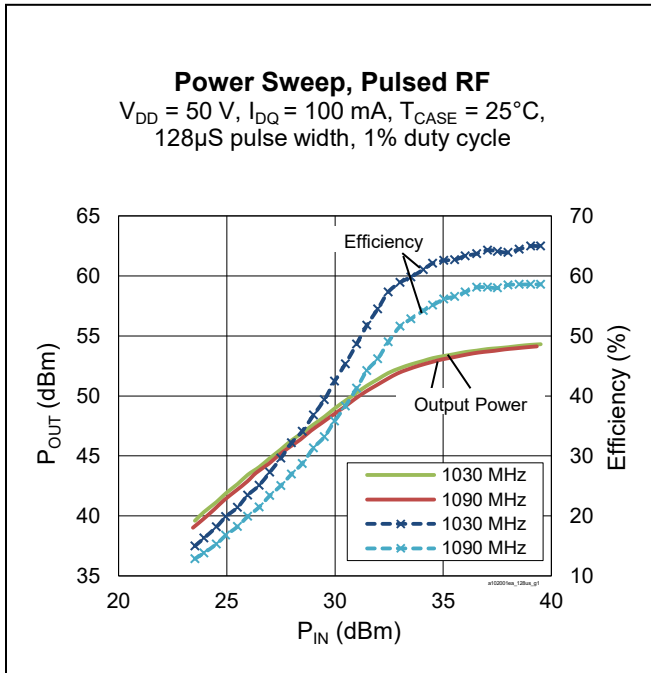
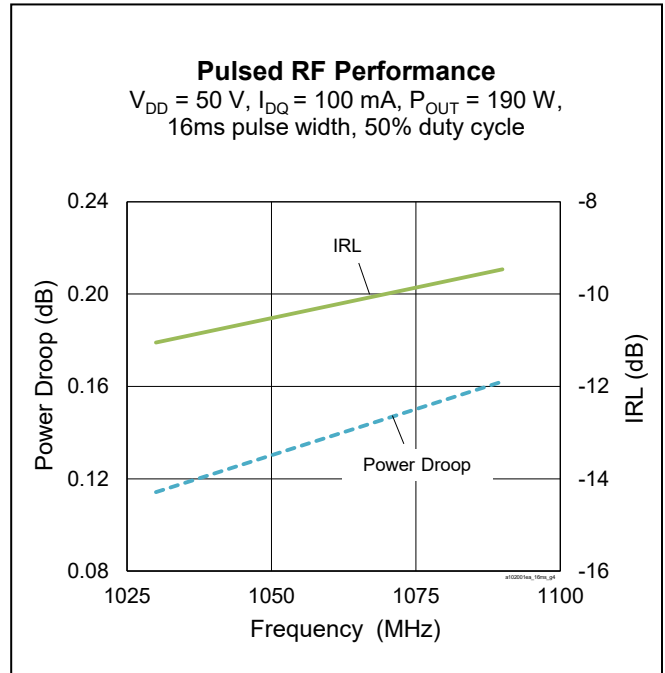
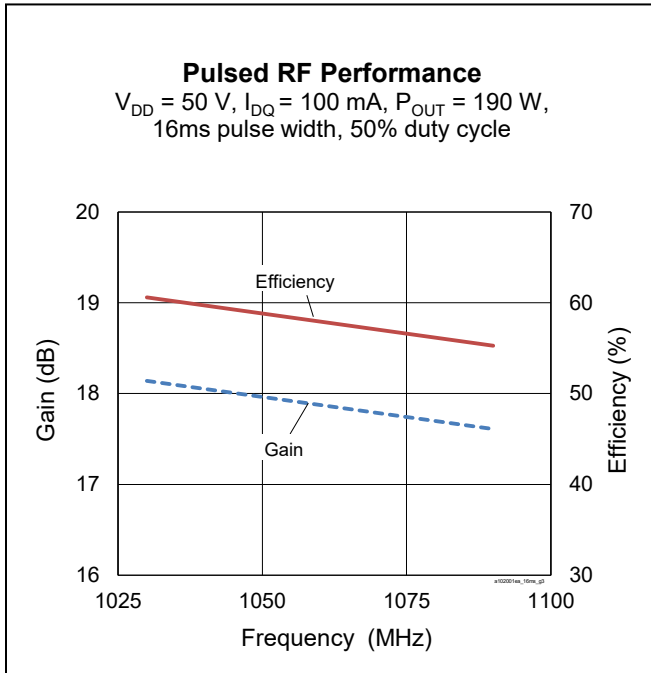
### Typical RF Performance (data taken in production test fixture)



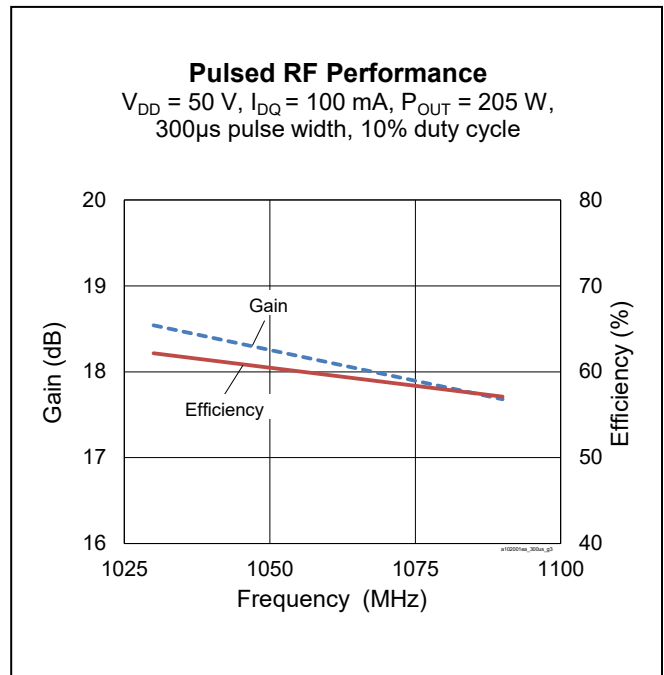
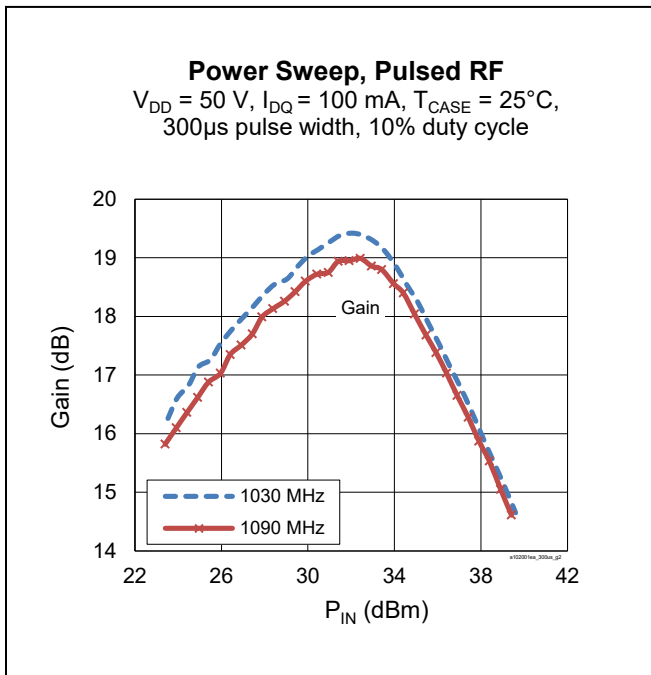
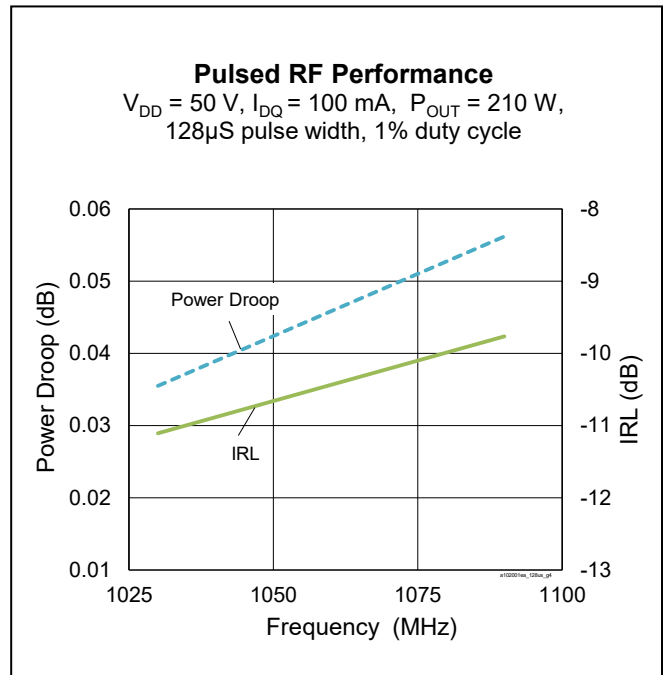
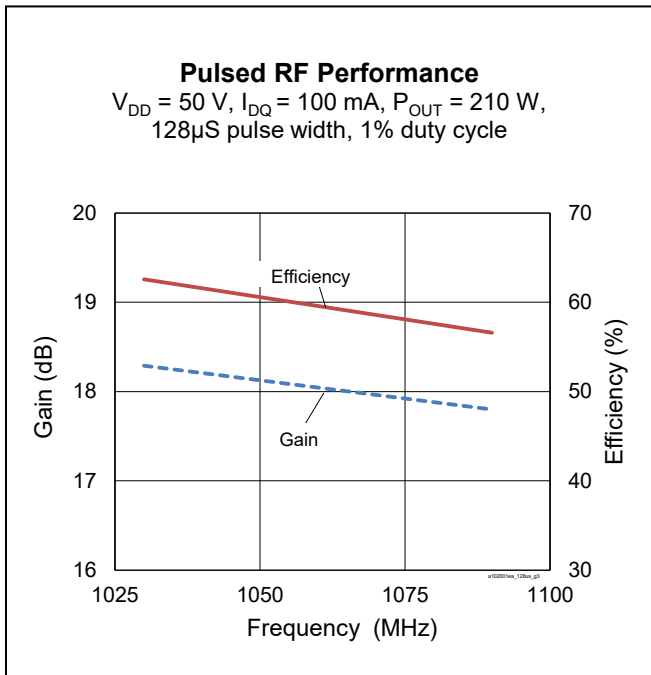
**Typical RF Performance (cont.)**



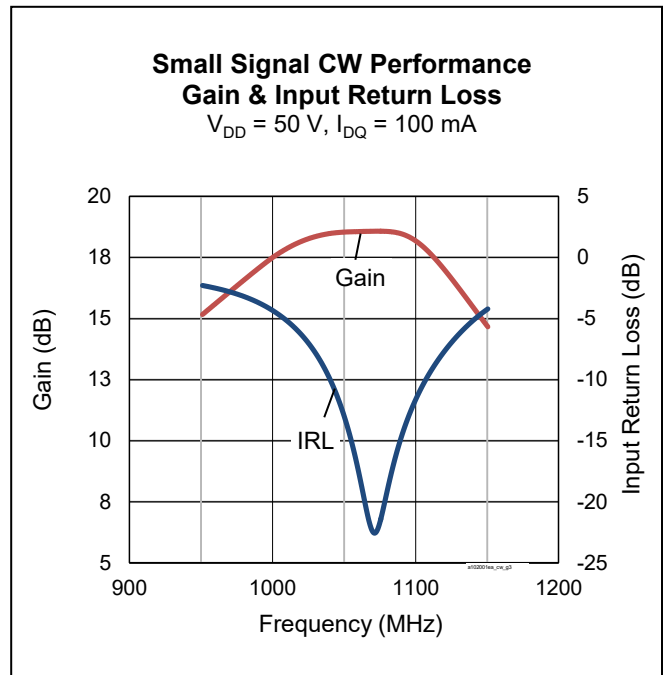
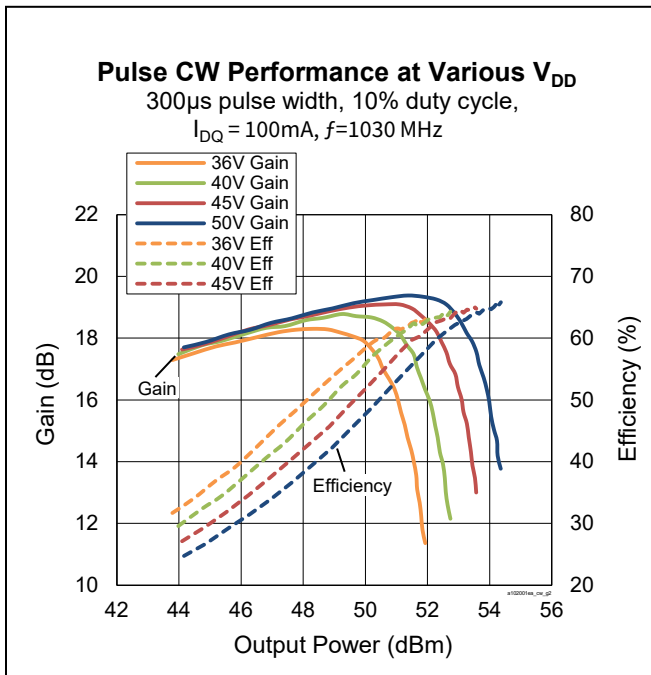
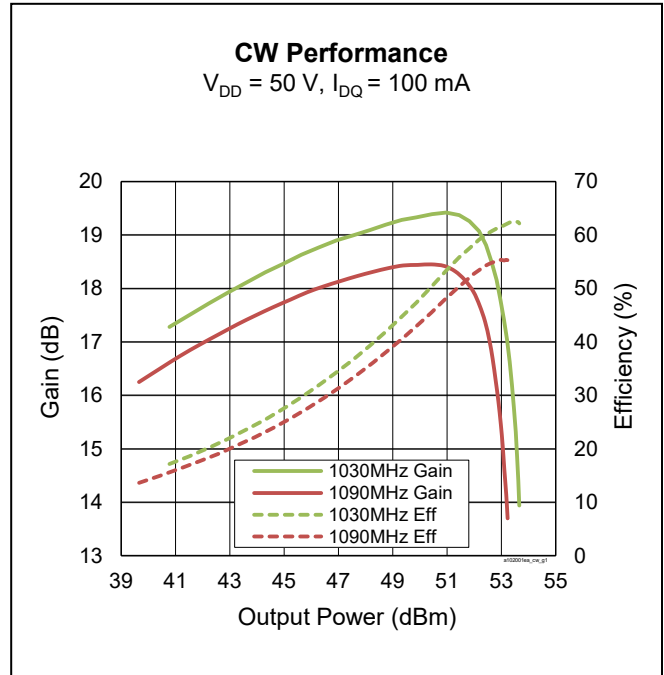
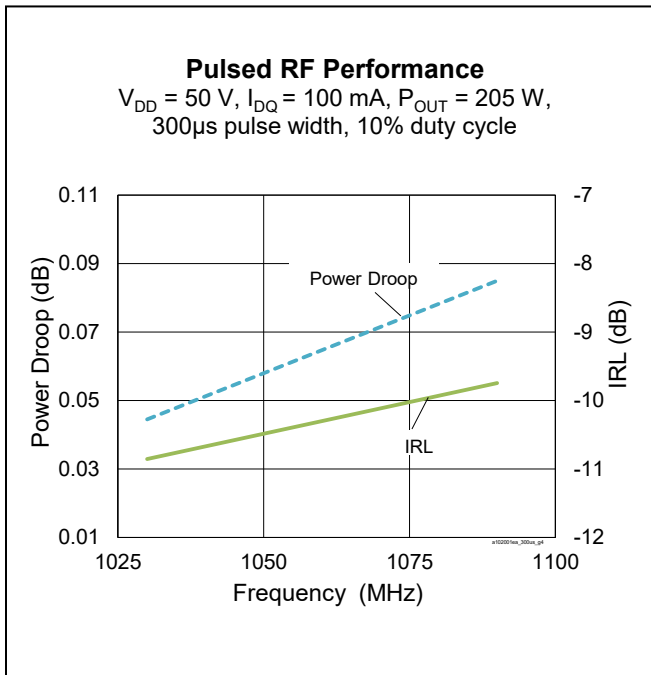
**Typical RF Performance (cont.)**



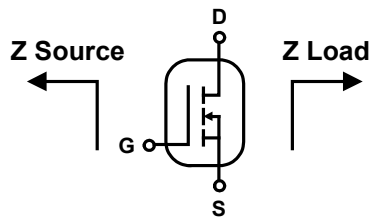
**Typical RF Performance (cont.)**



**Typical RF Performance (cont.)**



## Load Pull Performance



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

P3dB						
Maximum Power						
Freq [MHz]	$Z_{IN}$ [ $\Omega$ ]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	$P_G$ [dB]	PAE Eff [%]	$Z_{OUT}$ [ $\Omega$ ]
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  $\mu$ s pulse width, 10% duty cycle, class AB,  $V_{DD} = 50$  V,  $I_{DQ} = 90$  mA

P3dB						
Maximum Efficiency						
Freq [MHz]	$Z_{IN}$ [ $\Omega$ ]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	$P_G$ [dB]	PAE Eff [%]	$Z_{OUT}$ [ $\Omega$ ]
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  $\mu$ s pulse width, 10% duty cycle, class AB,  $V_{DD} = 50$  V,  $I_{DQ} = 90$  mA

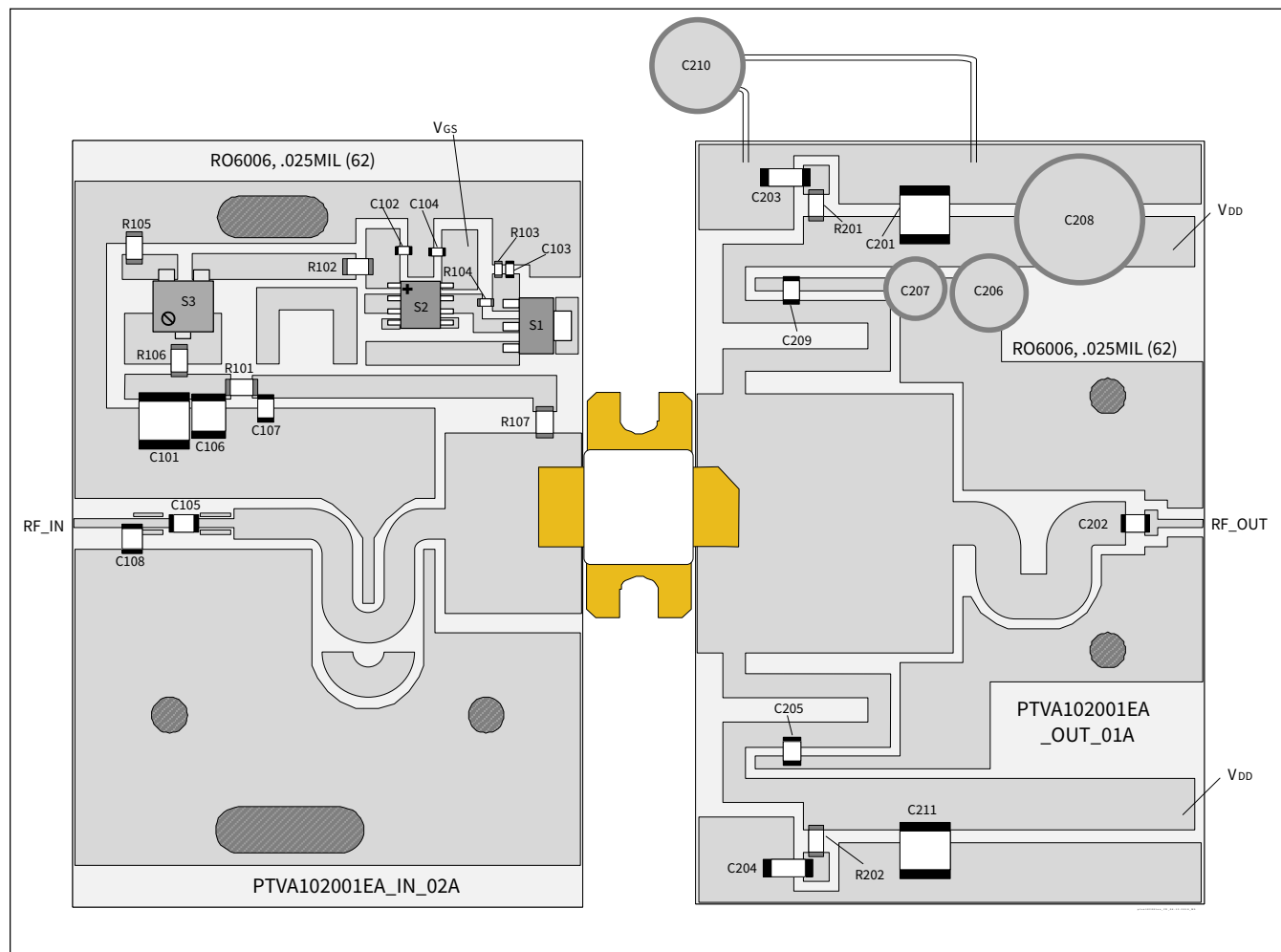
		<b>P3dB</b>				
		<b>Z Optimized</b>				
<b>Freq [MHz]</b>	<b>Z<sub>IN</sub> [<math>\Omega</math>]</b>	<b>P<sub>OUT</sub> [dBm]</b>	<b>P<sub>OUT</sub> [W]</b>	<b>P<sub>G</sub> [dB]</b>	<b>PAE Eff [%]</b>	<b>Z<sub>OUT</sub> [<math>\Omega</math>]</b>
960	0.97 - j4.50	54.51	282	17.55	67.5	1.94 + j0.54
1030	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, $\epsilon_r = 6.15$



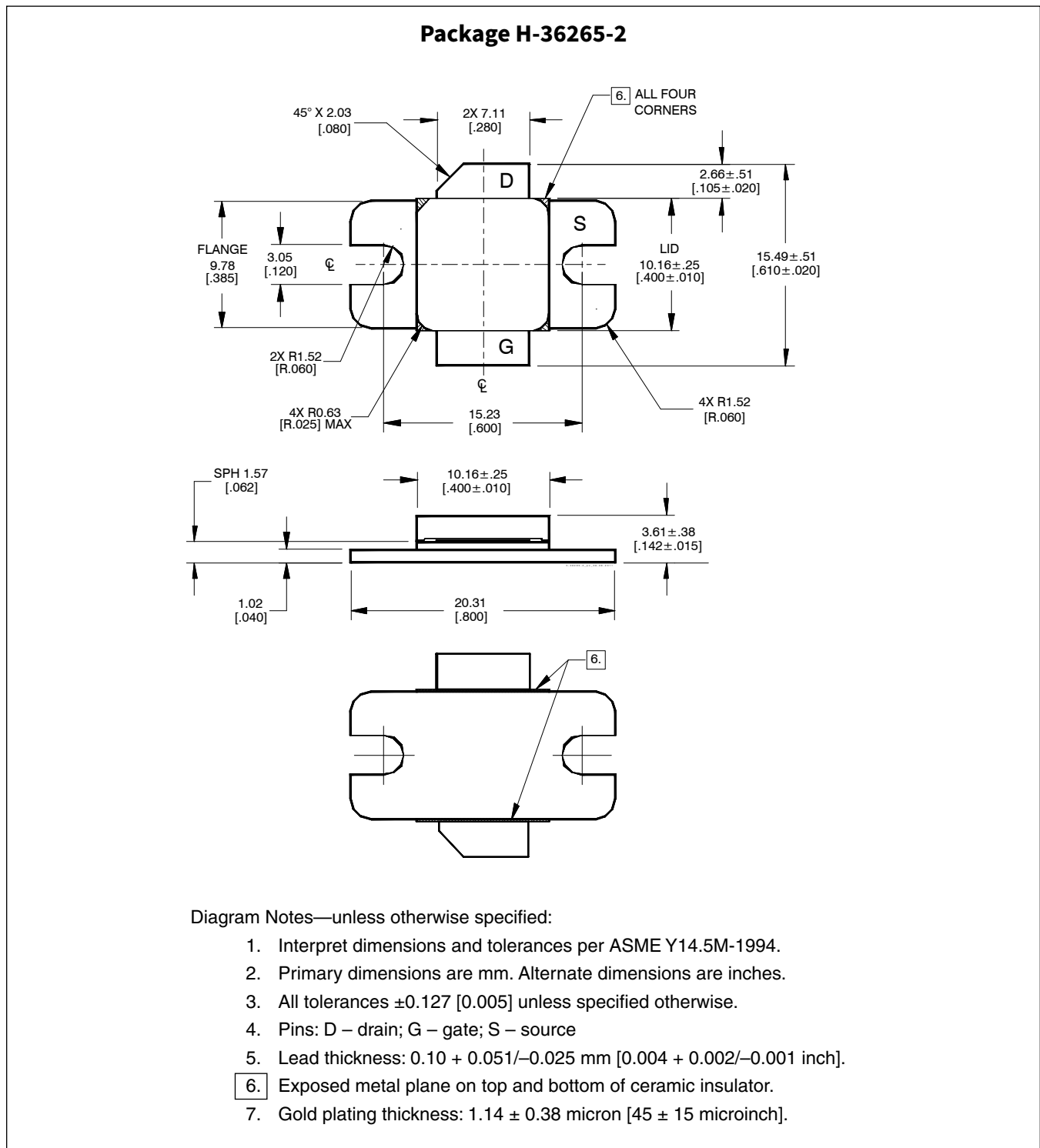
Reference circuit assembly diagram (not to scale)

## Reference Circuit (cont.)

### Components Information

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

## Package Outline Specifications



## Notes & Disclaimer

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