

# PTVA030121EA

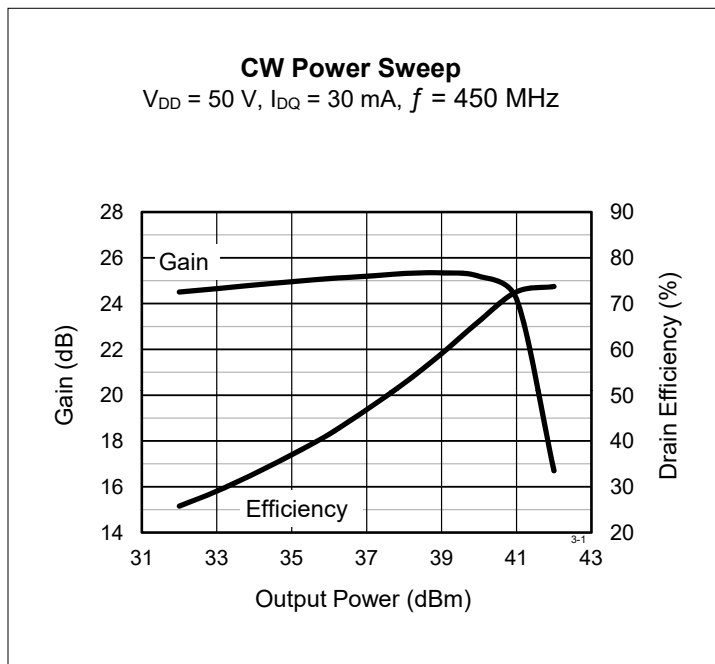
## Thermally-Enhanced High Power RF LDMOS FET 12 W, 50 V, 390 – 450 MHz

### Description

The PTVA030121EA is an LDMOS FET characterized for use in power amplifier applications in the 390 MHz to 450 MHz frequency band. Features include high gain and a thermally-enhanced package. Manufactured with an advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTVA030121EA  
Package H-36265-2



### Features

- Unmatched input and output
- Integrated ESD protection
- Human Body Model Class 1C (per ANSI/ESDA/ JEDEC JS-001)
- High gain, low thermal resistance
- Excellent ruggedness
- Capable of withstanding a 13:1 load mismatch at 50 V, 12 W, CW conditions
- Pb-free and RoHS compliant

### RF Characteristics

#### CW Measurements

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 50\text{ mA}$ ,  $P_{OUT} = 12\text{ W}$ ,  $f = 450\text{ MHz}$

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	Gps	23	25	—	dB
Drain Efficiency	$\eta_D$	66	69	—	%

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

## DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_{DS} = 1\text{ mA}$	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	$V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	1.0	$\mu\text{A}$
	$V_{DS} = 105\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	10.0	$\mu\text{A}$
On-State Resistance	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	2.8	—	$\Omega$
Operating Gate Voltage	$V_{DS} = 50\text{ V}$ , $I_{DQ} = 50\text{ mA}$	$V_{GS}$	—	3.6	—	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1.0	$\mu\text{A}$

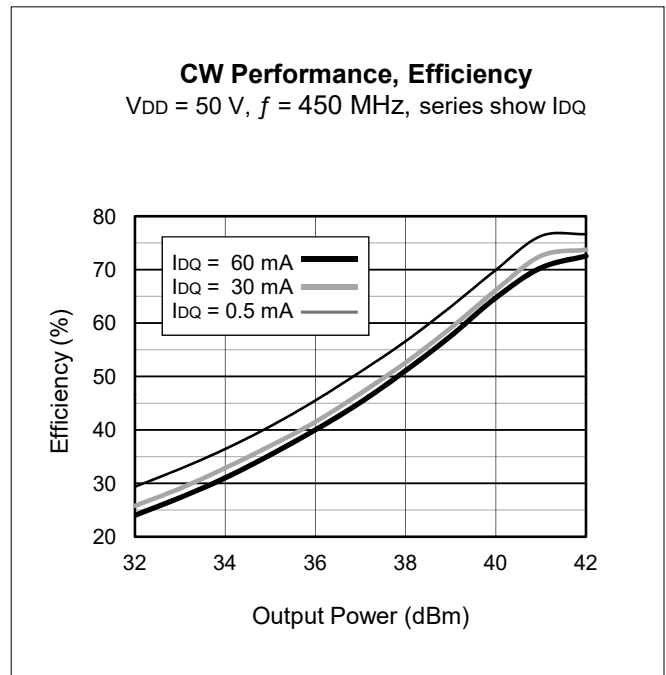
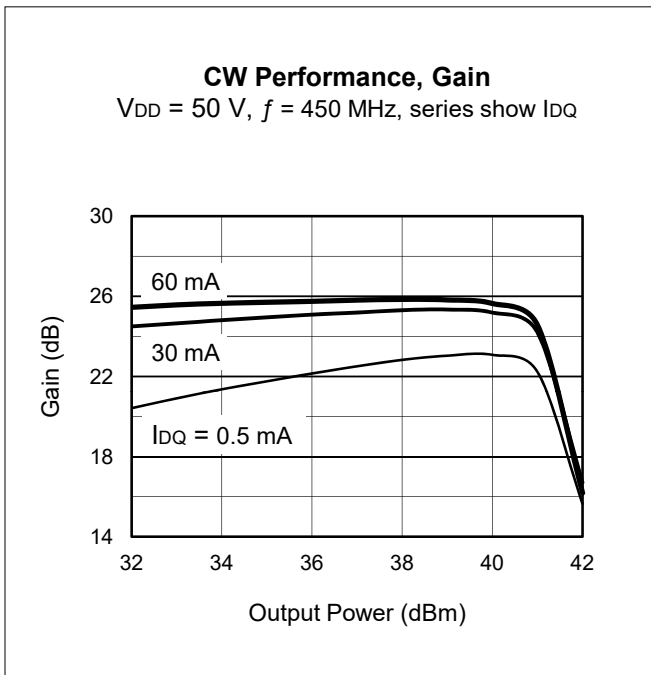
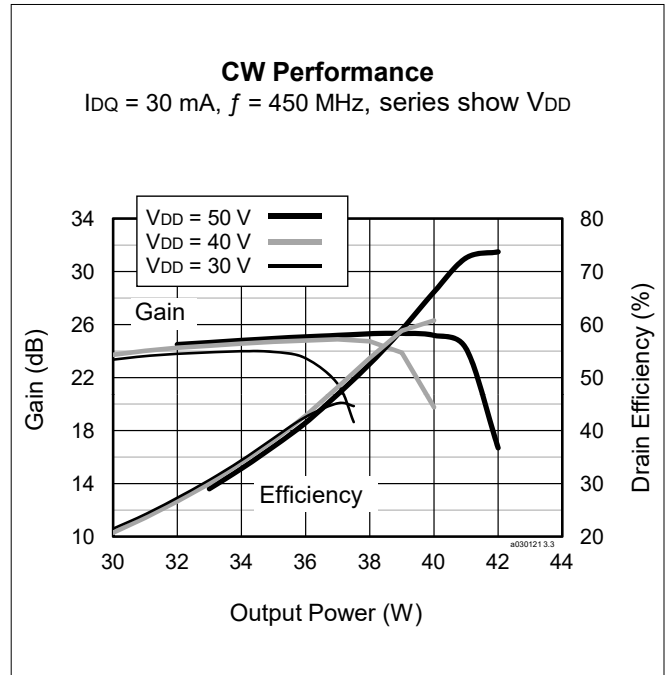
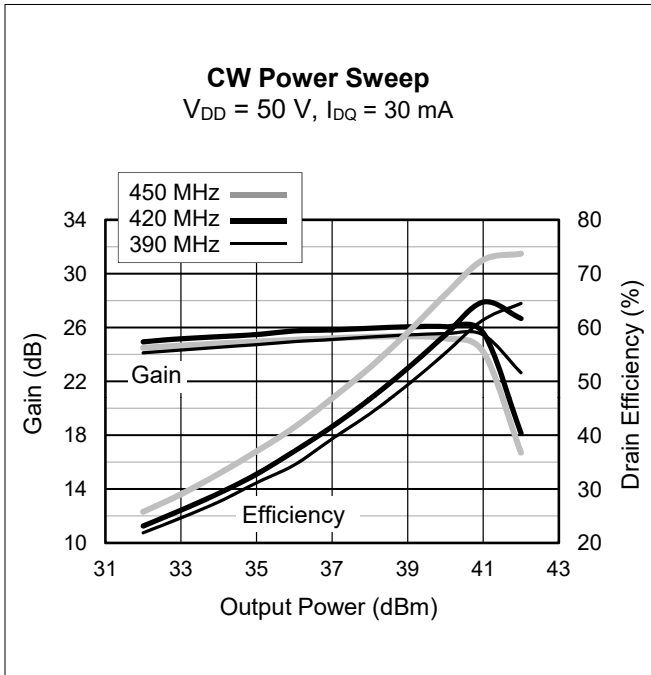
## Maximum Ratings

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 ( $T_{CASE} 70^{\circ}\text{C}$ , 12 W CW)	$R_{\theta JC}$	6.5	$^{\circ}\text{C/W}$

## Ordering Information

Type and Version	Order Code	Package and Description	Shipping
PTVA030121EA V1 R0	PTVA030121EA-V1-R0	H-36265-2, bolt-down	Tape & Reel, 50pcs
PTVA030121EA V1 R250	PTVA030121EA-V1-R250	H-36265-2, bolt-down	Tape & Reel, 250pcs

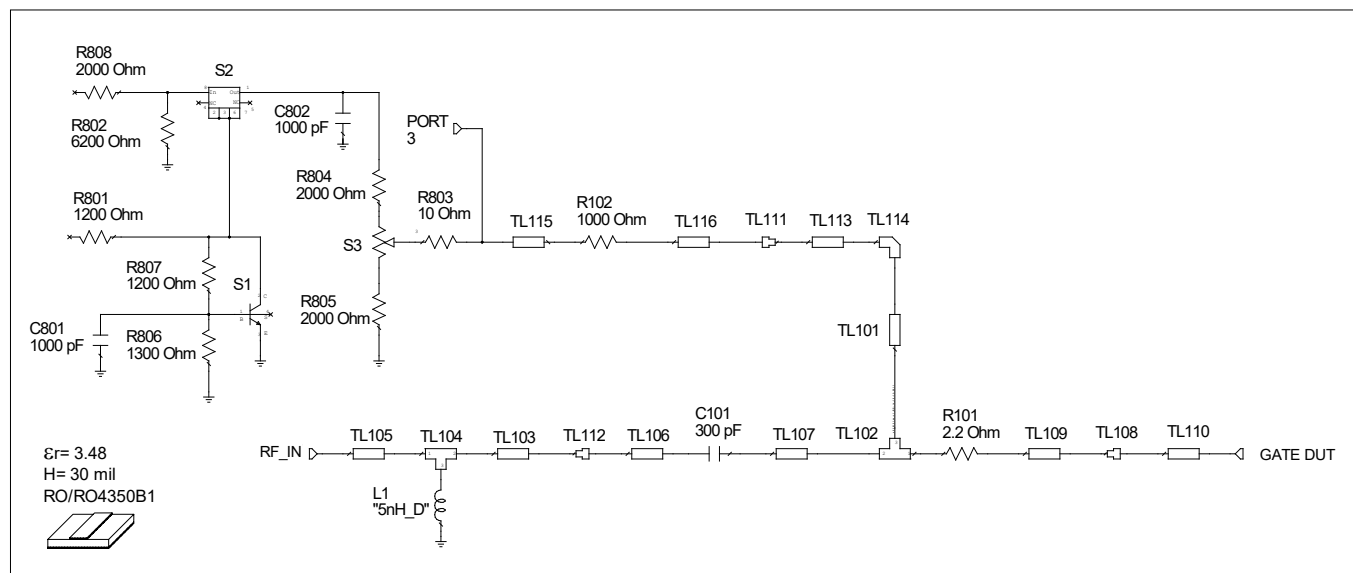
**Typical Performance** (data taken in a production test circuit)



## Broadband Circuit Impedance

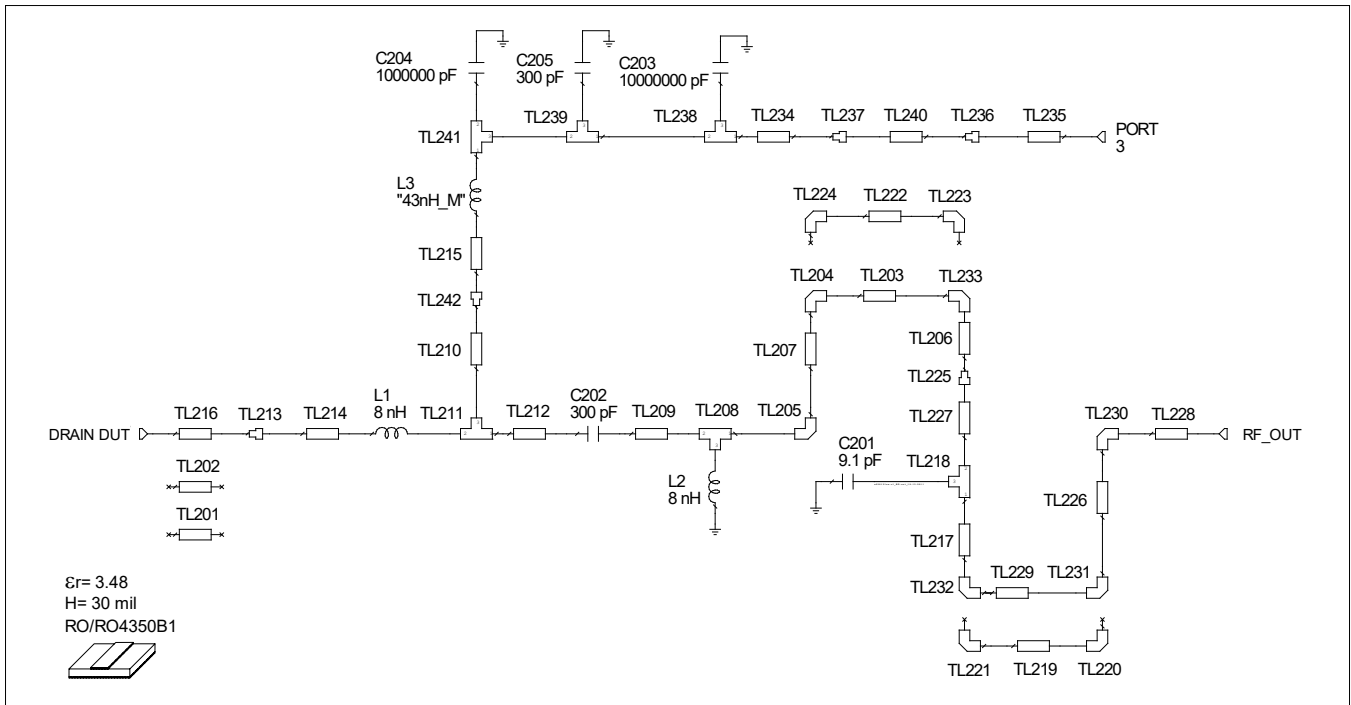
Frequency MHz	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
390	22.20	34.88	4.26	15.04
405	21.95	34.74	4.46	15.82
420	21.39	34.99	4.66	16.62
435	20.61	35.80	4.88	17.42
450	19.77	37.03	5.11	18.23

## Reference Circuit



Reference circuit input schematic for  $f = 450$  MHz

**Reference Circuit** (cont.)



Reference circuit output schematic for  $f = 450$  MHz

**Reference Circuit Assembly**

DUT	PTFA030121EA
Test Fixture Part No.	LTN/PTFA030121EA
PCB	Rogers RO4350, 0.508 mm [0.020"] thick, 1 oz. copper, $\epsilon_r = 3.48$

**Electrical Characteristics at 450 MHz**

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
<b>Input</b>			
TL101	0.009 $\lambda$ , 92.76 $\Omega$	W = 0.51, L = 3.81	W = 20, L = 150
TL102	0.001 $\lambda$ , 45.29 $\Omega$	W1 = 2.03, W2 = 2.03, W3 = 0.51	W1 = 80, W2 = 80, W3 = 20
TL103	0.001 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 0.43	W = 64, L = 17
TL105	0.025 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 10.13	W = 64, L = 39
TL106, TL109	0.003 $\lambda$ , 45.29 $\Omega$	W = 2.03, L = 1.27	W = 80, L = 50
TL107	0.002 $\lambda$ , 45.29 $\Omega$	W = 2.03, L = 0.76	W = 80, L = 30
TL110	0.013 $\lambda$ , 16.51 $\Omega$	W = 7.62, L = 5.08	W = 300, L = 200
TL113	0.002 $\lambda$ , 92.76 $\Omega$	W = 0.51, L = 1.02	W = 20, L = 40
TL115	0.013 $\lambda$ , 54.31 $\Omega$	W = 1.52, L = 5.08	W = 60, L = 200
TL116	0.003 $\lambda$ , 54.31 $\Omega$	W = 1.52, L = 1.02	W = 60, L = 40

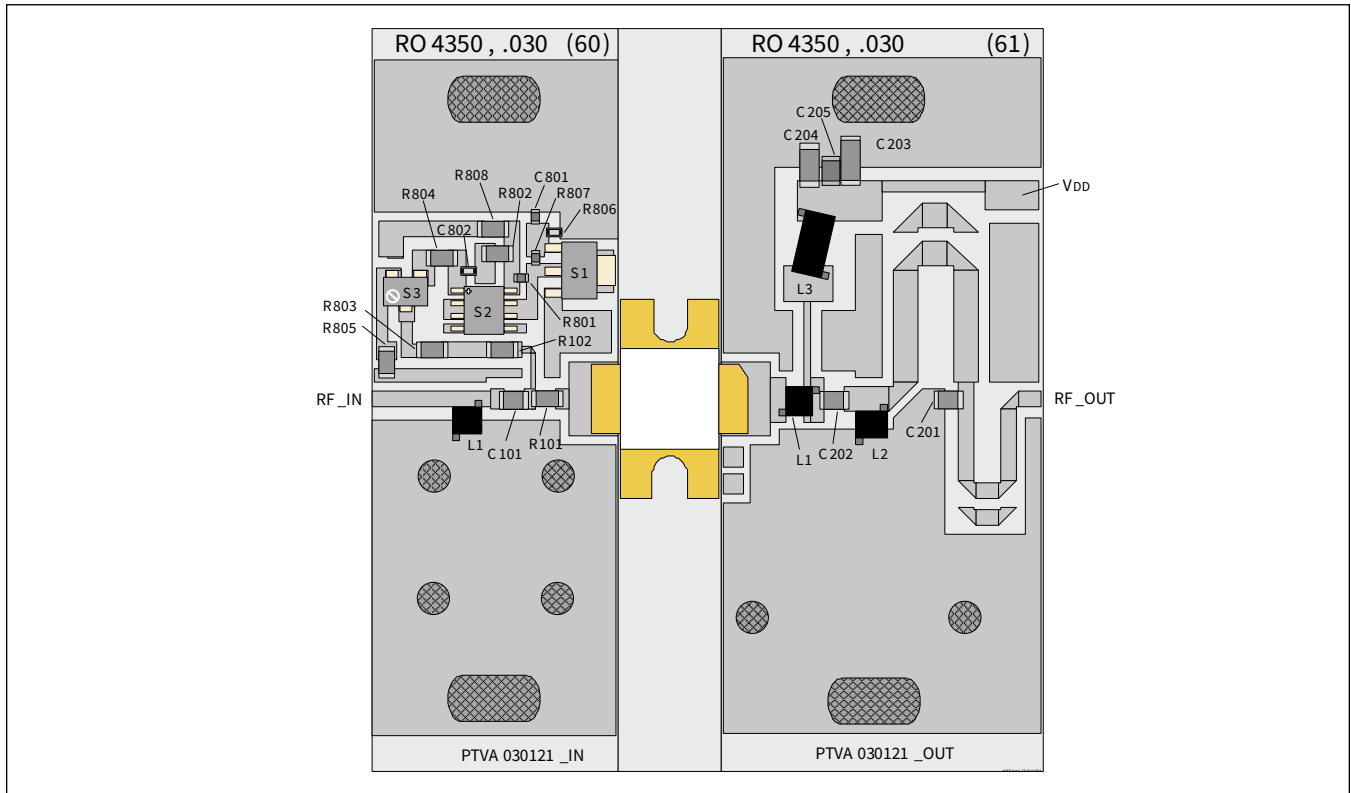
table continued next page

**Reference Circuit** (cont.)

**Electrical Characteristics at 450 MHz**

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
<b>Output</b>			
TL201, TL202	0.005 $\lambda$ , 45.29 $\Omega$	W = 2.03, L = 2.04	W = 80, L = 81
TL203	0.006 $\lambda$ , 38.92 $\Omega$	W = 2.54, L = 2.54	W = 100, L = 100
TL206, TL207	0.029 $\lambda$ , 38.92 $\Omega$	W = 2.54, L = 11.43	W = 100, L = 450
TL209	0.009 $\lambda$ , 38.92 $\Omega$	W = 2.54, L = 3.56	W = 100, L = 140
TL210	0.018 $\lambda$ , 78.46 $\Omega$	W = 0.76, L = 7.62	W = 30, L = 300
TL211	0.002 $\lambda$ , 25.11 $\Omega$	W1 = 4.57, W2 = 4.57, W3 = 0.76	W1 = 180, W2 = 180, W3 = 30
TL212	0.003 $\lambda$ , 25.11 $\Omega$	W = 4.57, L = 1.27	W = 180, L = 50
TL214	0.004 $\lambda$ , 25.11 $\Omega$	W = 4.57, L = 1.52	W = 180, L = 60
TL215	0.010 $\lambda$ , 23.09 $\Omega$	W = 5.08, L = 3.81	W = 200, L = 150
TL216	0.013 $\lambda$ , 16.51 $\Omega$	W = 7.62, L = 5.08	W = 300, L = 200
TL217	0.018 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 7.29	W = 64, L = 287
TL219	0.006 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 2.41	W = 64, L = 95
TL222	0.006 $\lambda$ , 38.92 $\Omega$	W = 2.54, L = 2.54	W = 100, L = 100
TL226	0.018 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 7.34	W = 64, L = 289
TL227	0.002 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 0.84	W = 64, L = 33
TL228	0.006 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 2.30	W = 64, L = 91
TL229	0.006 $\lambda$ , 52.21 $\Omega$	W = 1.63, L = 2.41	W = 64, L = 95
TL234	0.005 $\lambda$ , 27.14 $\Omega$	W = 4.14, L = 2.12	W = 163, L = 84
TL235	0.014 $\lambda$ , 34.38 $\Omega$	W = 3.02, L = 5.51	W = 119, L = 2 17
TL240	0.026 $\lambda$ , 61.53 $\Omega$	W = 1.23, L = 10.63	W = 48, L = 419
TL241	0.010 $\lambda$ , 38.92 $\Omega$	W1 = 2.54, W2 2.54, W3 = 4.14	W1 = 100, W2 = 100, W3 = 163

Reference Circuit (cont.)



Reference circuit assembly diagram (not to scale)

Component ID	Description	Suggested Supplier	P/N
<b>Input</b>			
C101	Chip capacitor, 300 pF	ATC	ATC100B301JW200XB
C801, C802	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
L1	Inductor, 5 nH	Coilcraft	A02TGLB
R101	Resistor, 2.2 Ω	Panasonic Electronic Components	ERJ-8GEYJ2R2V
R102	Resistor, 1000 Ω	Panasonic Electronic Components	ERJ-8GEYJ102V
R801, R807	Resistor, 1200 Ω	Panasonic Electronic Components	ERJ-3GEYJ122V
R802	Resistor, 6200 Ω	Panasonic Electronic Components	ERJ-8GEYJ622V
R803	Resistor, 10 Ω	Panasonic Electronic Components	ERJ-8GEYJ100V
R804, R805, R808	Resistor, 2000 Ω	Panasonic Electronic Components	ERJ-8GEYJ202V
R806	Resistor, 1300 Ω	Panasonic Electronic Components	ERJ-3GEYJ132V
S1	Transistor	Infineon Technologies	BCP56
S2	Voltage regulator	Fairchild Semiconductor	LM7805CT
S3	Potentiometer, 2K Ω	Bourns Inc.	3224W-1-202E

table continued next page

**Reference Circuit** (cont.)

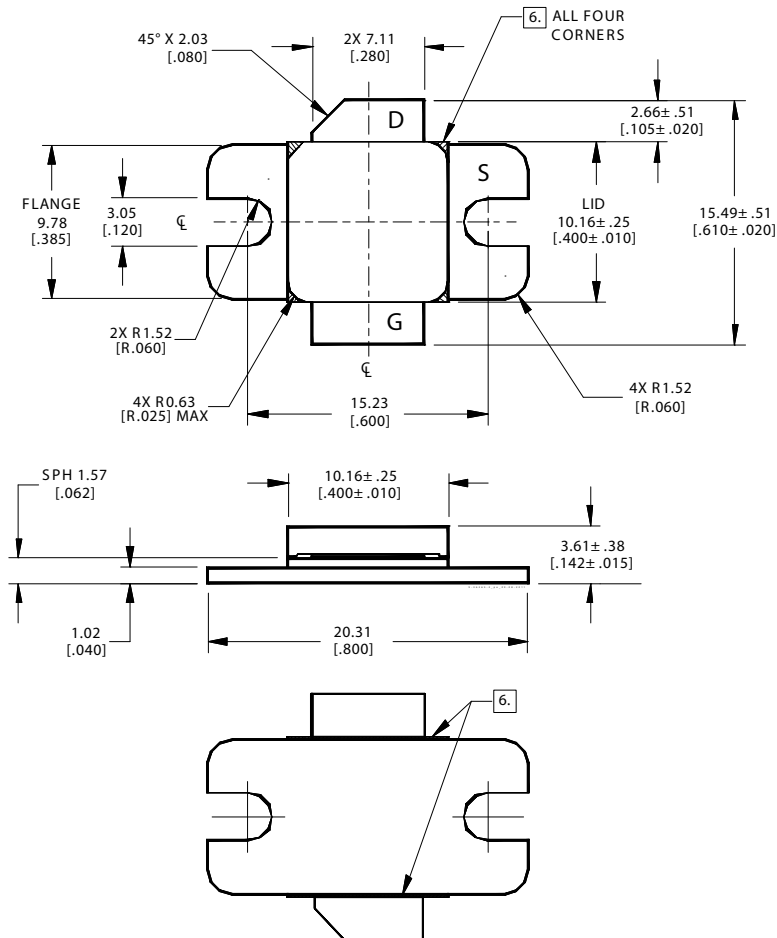
Component ID	Description	Suggested Supplier	P/N
<b>Output</b>			
C201	Chip capacitor, 9.1 pF	ATC	ATC100B9R1BW500XB
C202	Chip capacitor, 300 pF	ATC	ATC100B301JW200XB
C203	Chip capacitor, 10 $\mu$ F	TDK Corporation	C5750X7S2A106M230KB
C204	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105K230KA
C205	Chip capacitor, 300 pF	ATC	ATC100B301JW200XB
L1, L2	Inductor, 8 nH	Coilcraft	A03TGLB
L3	Inductor, 43 nH	Coilcraft	B10TGLB

**See next page for package mechanical specifications**



## 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  $\pm 0.127$  [.005] unless specified otherwise.
4. Pins: D - drain, G - gate, S - source.
5. Lead thickness:  $0.10 +0.051/-0.025$  [.004 +.002/- .001].
6. Exposed metal plane on top and bottom of ceramic insulator.
7. Gold plating thickness:  $1.14 \pm 0.38$  micron [ $45 \pm 15$  microinch].

## Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2010-10-08	Advance	All	Data Sheet reflects advance specification for product development
02	2010-12-13	Advance	All	Change part number
03	2011-05-07	Preliminary	All	Change part number, update to Preliminary, add specifications
04	2011-11-10	Production	All	Data Sheet reflects released product specification
05	2013-07-02	Production	2 7, 8	Update DC Characteristics and Max Ratings table, add order codes Add manufacturer
05.1	2016-04-19	Production	1, 2	Added ESD rating, updated ordering information
05.2	2017-02-02	Production	2	Updated operating voltage and junction temperature
06	2018-06-13	Production	All	Converted to the Data Sheet

## Notes & Disclaimer

---

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.