

# PTVA030121EA

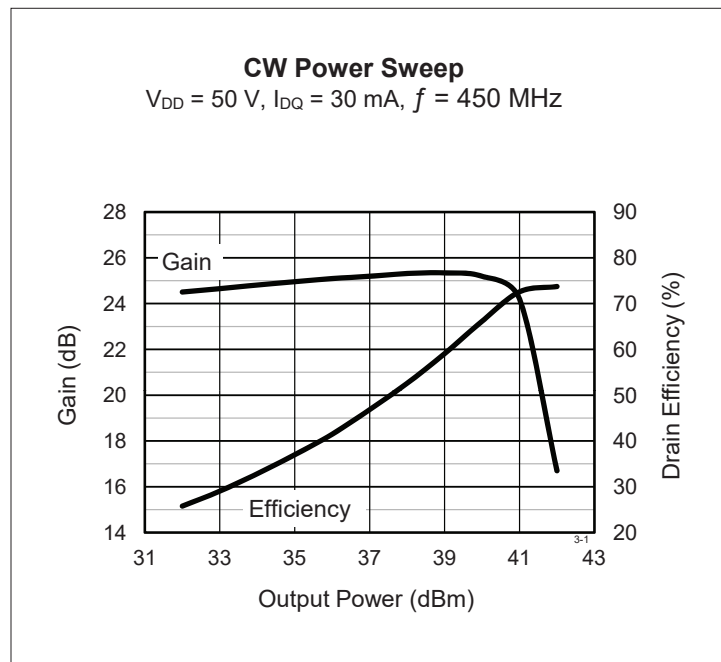
## Thermally-Enhanced High Power RF LDMOS FET 12 W, 50 V, 390 – 450 MHz

### 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 Wolfspeed's 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	$\mu\text{A}$

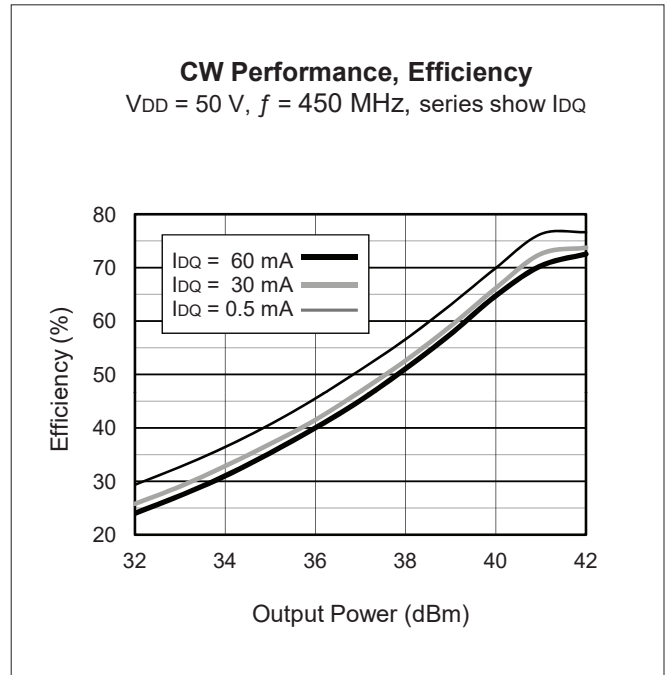
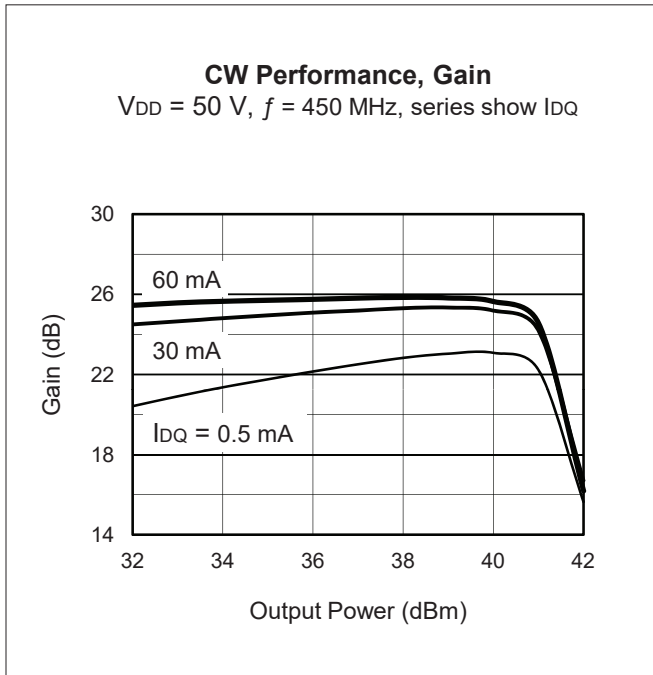
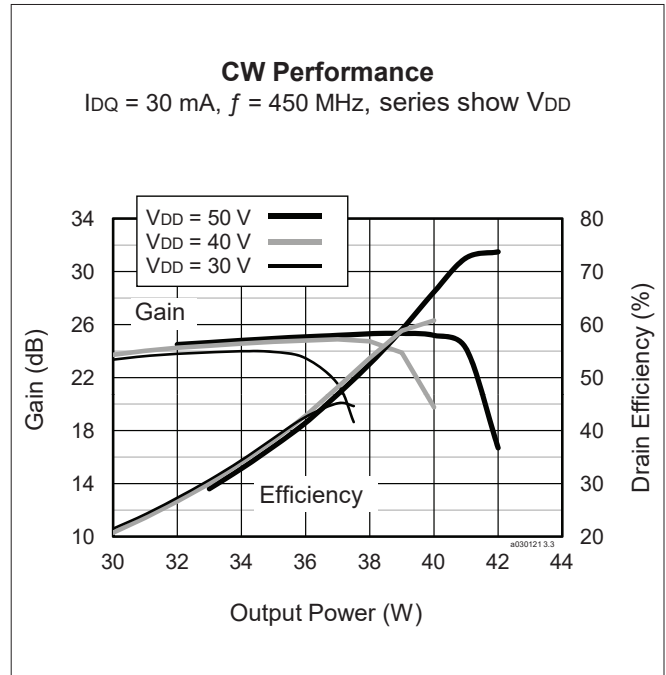
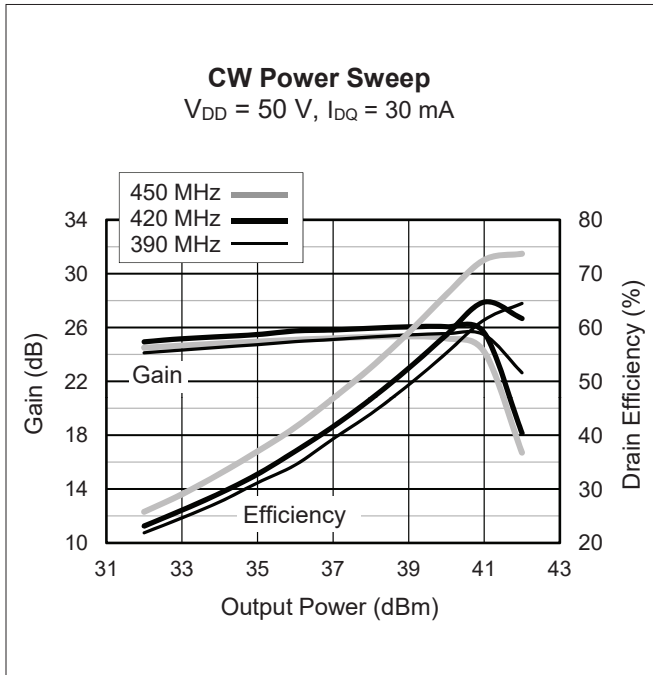
## Maximum Ratings

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

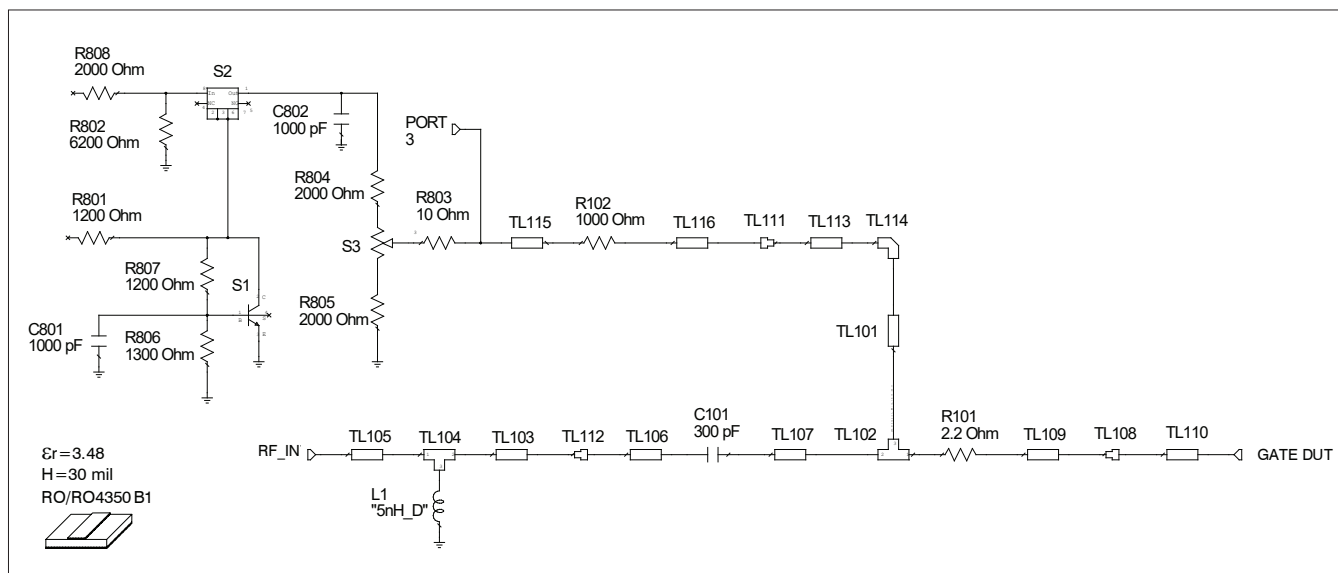
**Typical Performance** (data taken in a production test circuit)



### Broadband Circuit Impedance

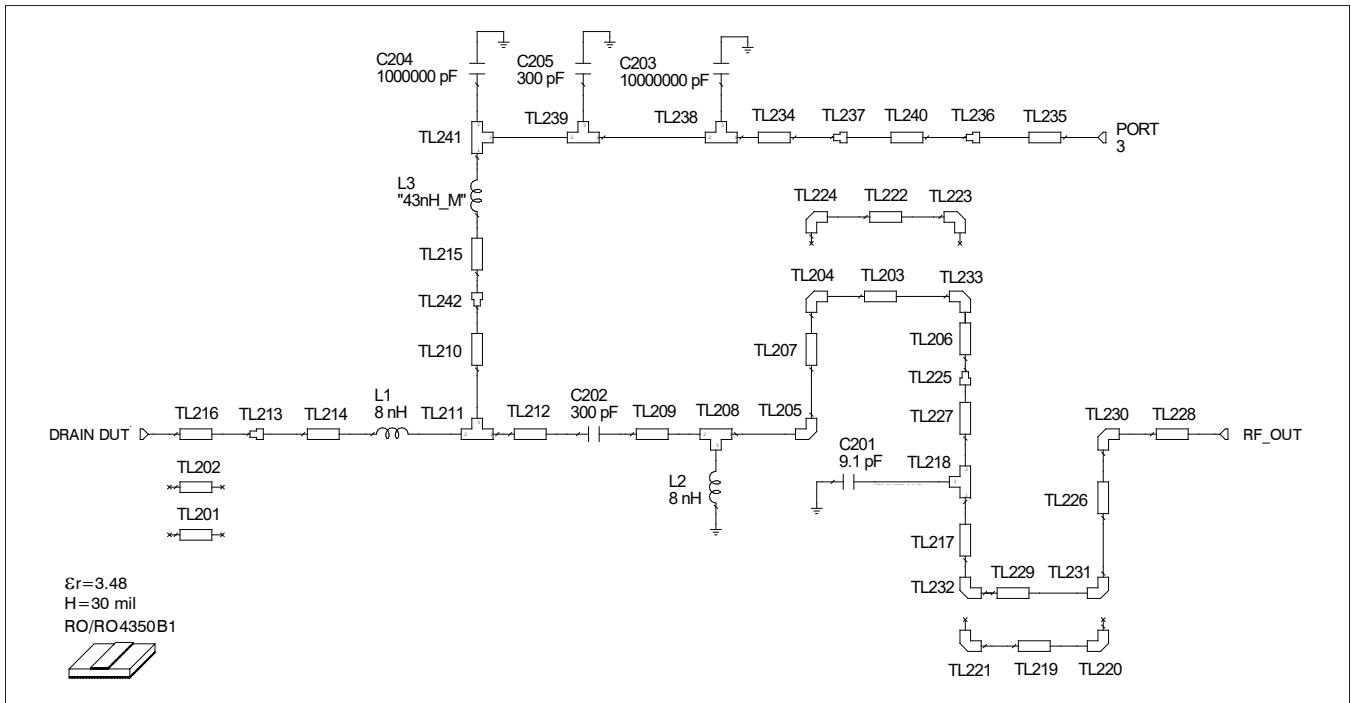
Frequency MHz	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
390	22.20	34.88	4.26	15.04
405	21.95	34.74	4.46	15.82
420	21.39	34.99	4.66	16.62
435	20.61	35.80	4.88	17.42
450	19.77	37.03	5.11	18.23

### Reference Circuit



Reference circuit input schematic for  $f = 450$  MHz

Reference Circuit (cont.)



Reference circuit output schematic for  $f = 450 \text{ MHz}$

Reference Circuit Assembly

DUT	PTFA030121EA
Test Fixture Part No.	LTN/PTFA030121EA
PCB	Rogers RO4350, 0.508 mm [0.020"] thick, 1 oz. copper, $\epsilon_r = 3.48$
Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">www.wolfspeed.com/RF</a>	

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

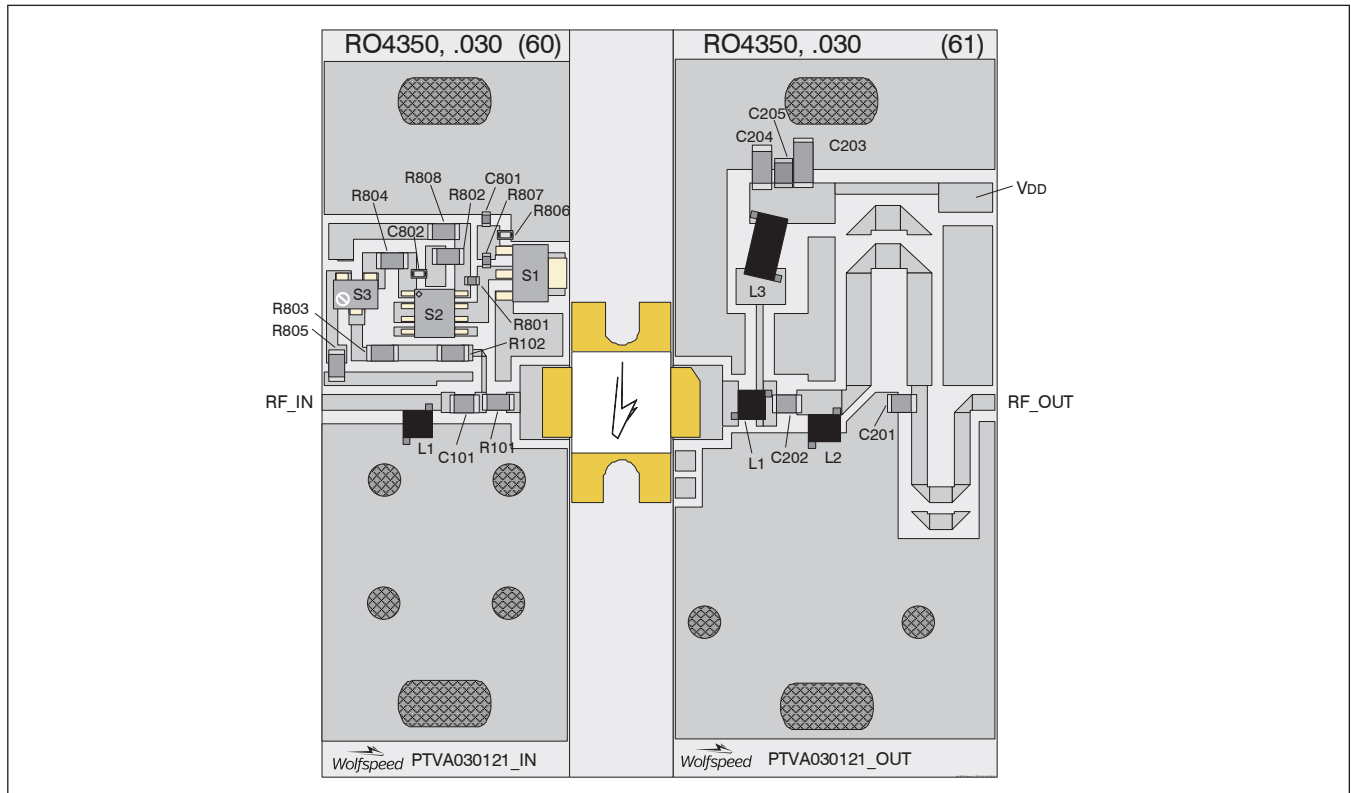
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## Reference Circuit (cont.)

## 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

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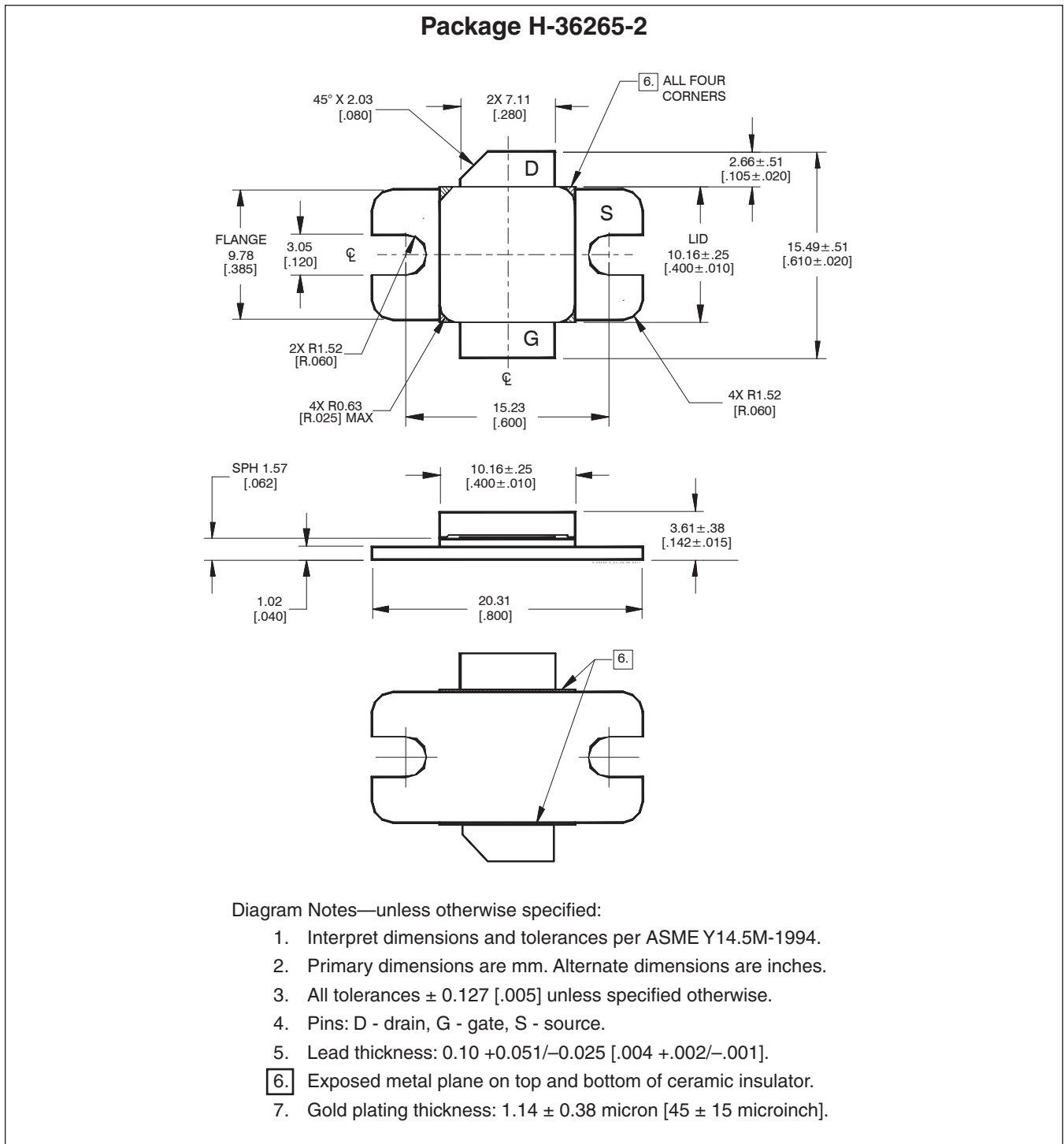
**Reference Circuit** (cont.)

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



## 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 Wolfspeed Data Sheet

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## Notes

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