

PTVA030121EA

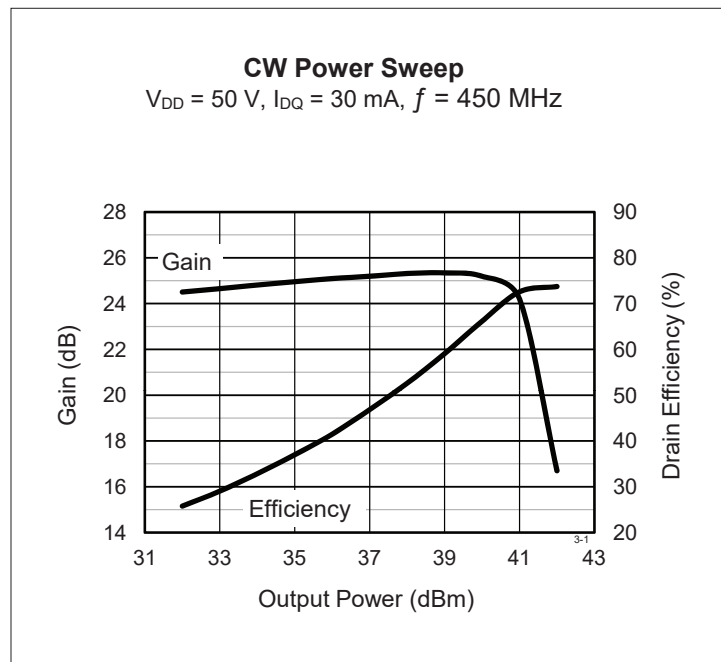
Thermally-Enhanced High Power RF LDMOS FET 12 W, 50 V, 390 – 450 MHz

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 | η_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 | μA |
| | $V_{DS} = 105\text{ V}, V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 10.0 | μA |
| On-State Resistance | $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 2.8 | — | Ω |
| 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 | μA |

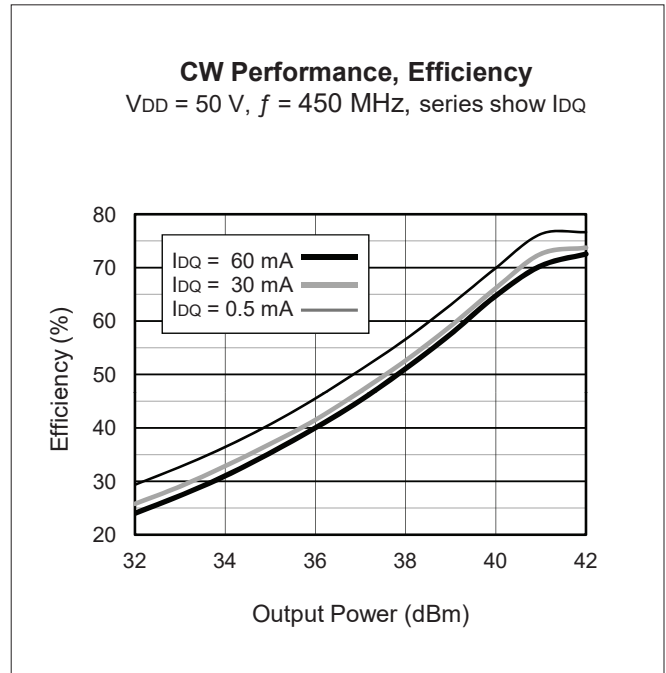
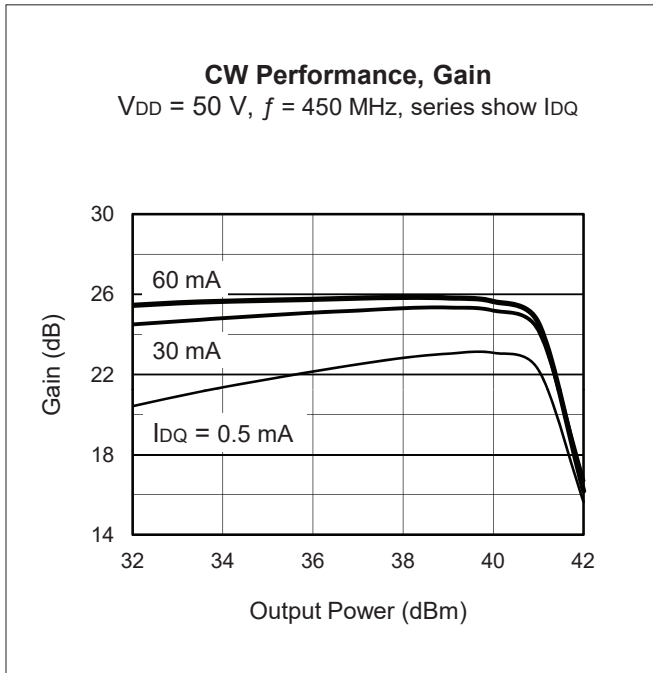
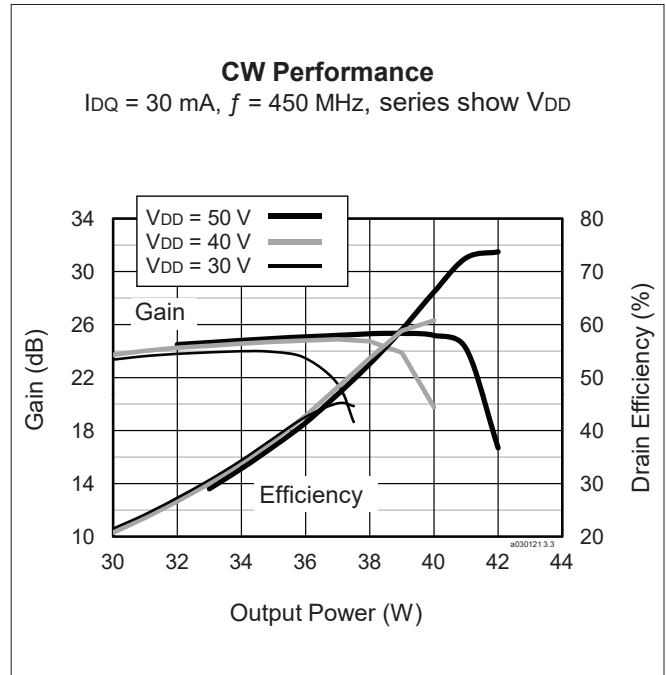
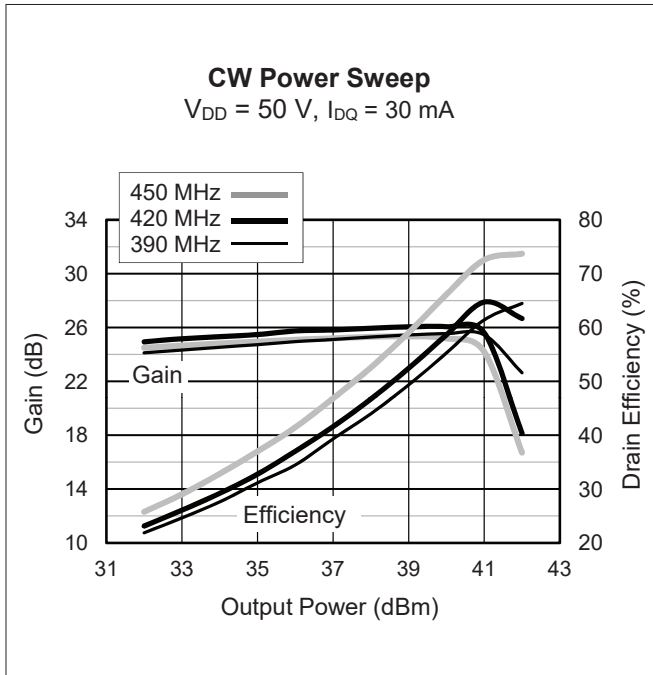
Maximum Ratings

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

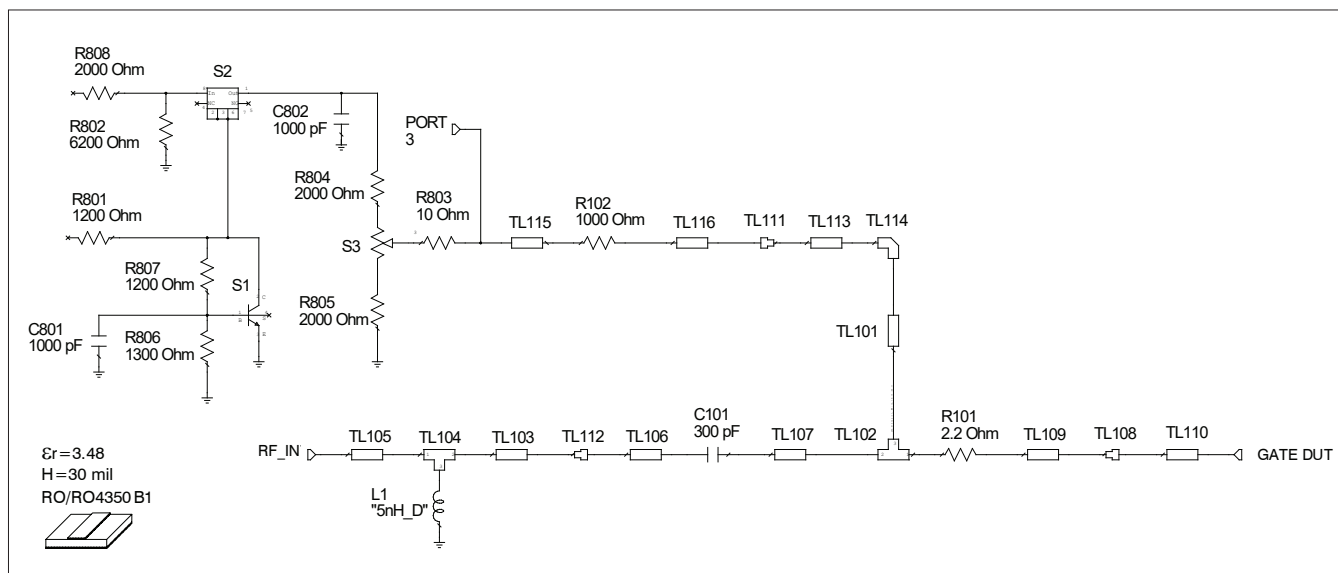
Typical Performance (data taken in a production test circuit)



Broadband Circuit Impedance

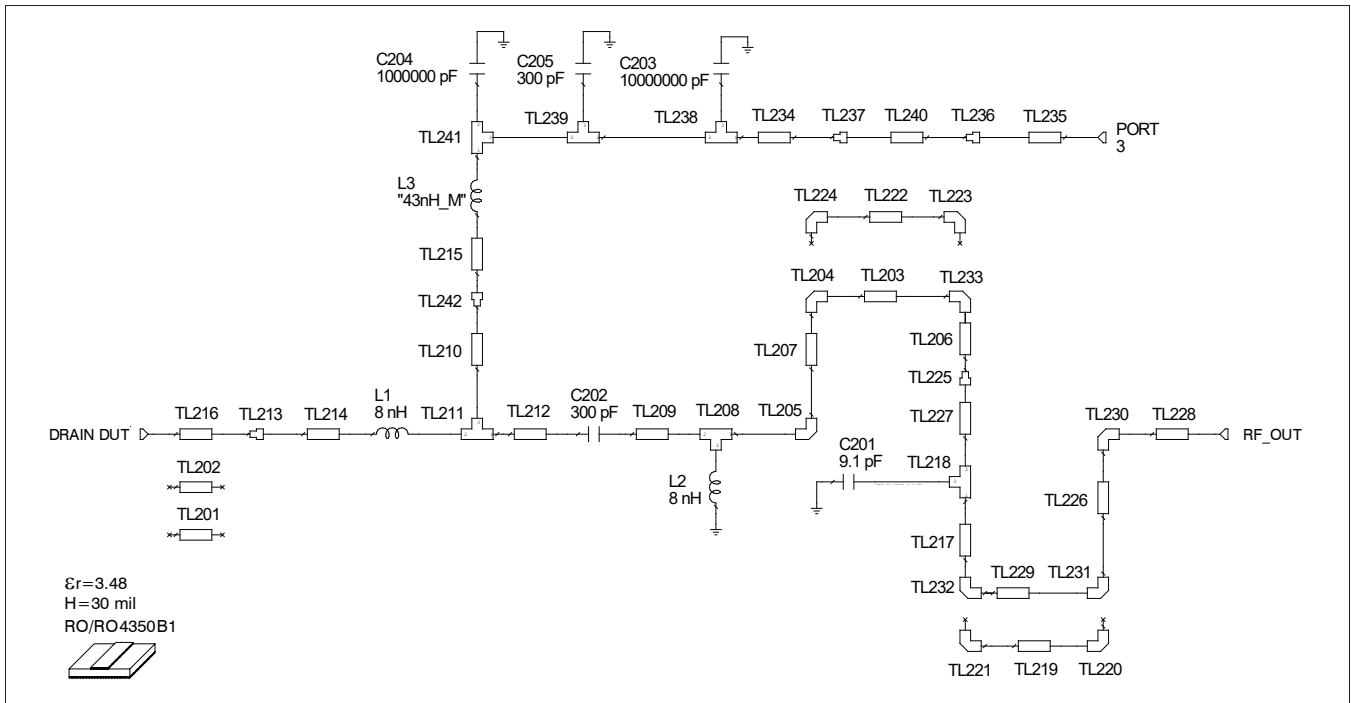
| Frequency MHz | Z Source Ω | | Z Load Ω | |
|------------------|-------------------|-------|-----------------|-------|
| | R | jX | R | jX |
| 390 | 22.20 | 34.88 | 4.26 | 15.04 |
| 405 | 21.95 | 34.74 | 4.46 | 15.82 |
| 420 | 21.39 | 34.99 | 4.66 | 16.62 |
| 435 | 20.61 | 35.80 | 4.88 | 17.42 |
| 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, $\epsilon_r = 3.48$ |
| Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF | |

Electrical Characteristics at 450 MHz

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

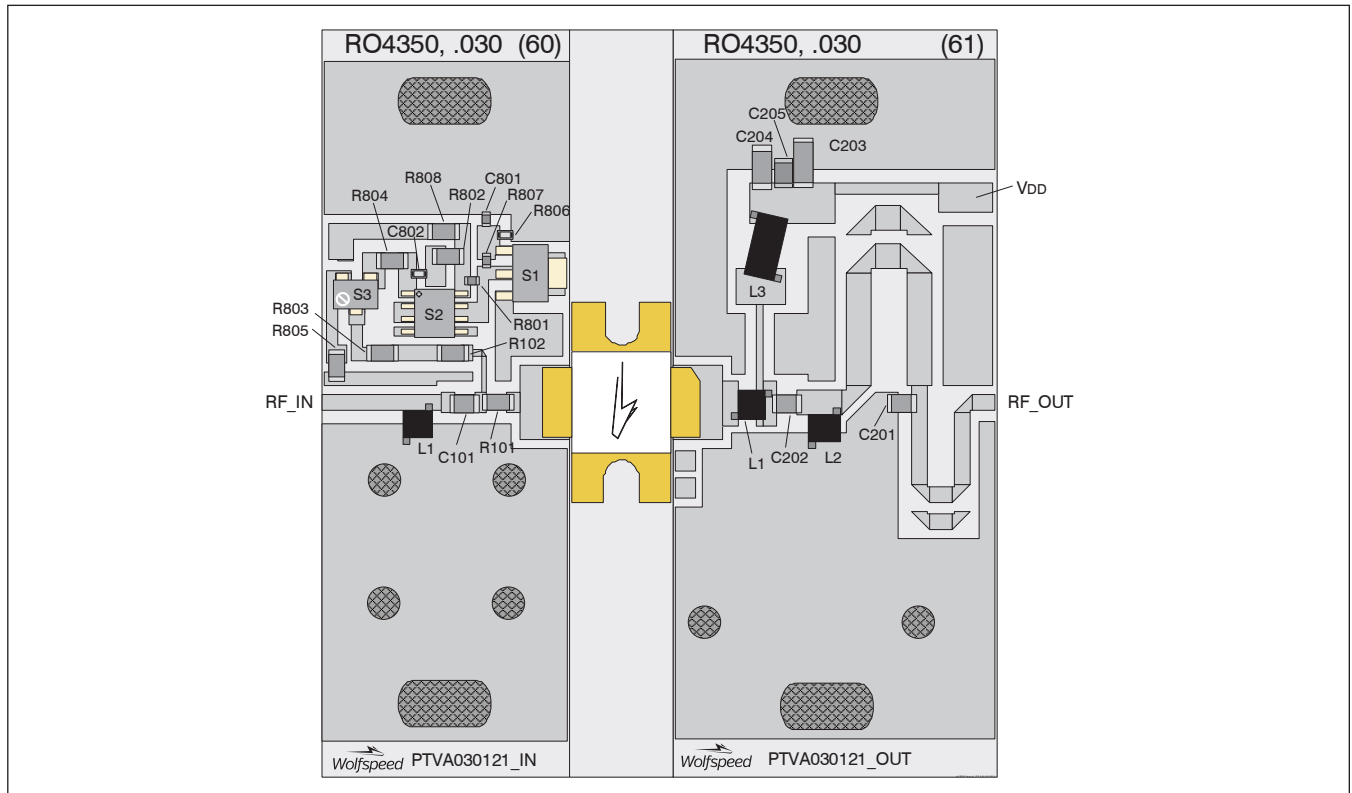
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Reference Circuit (cont.)

Electrical Characteristics at 450 MHz

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

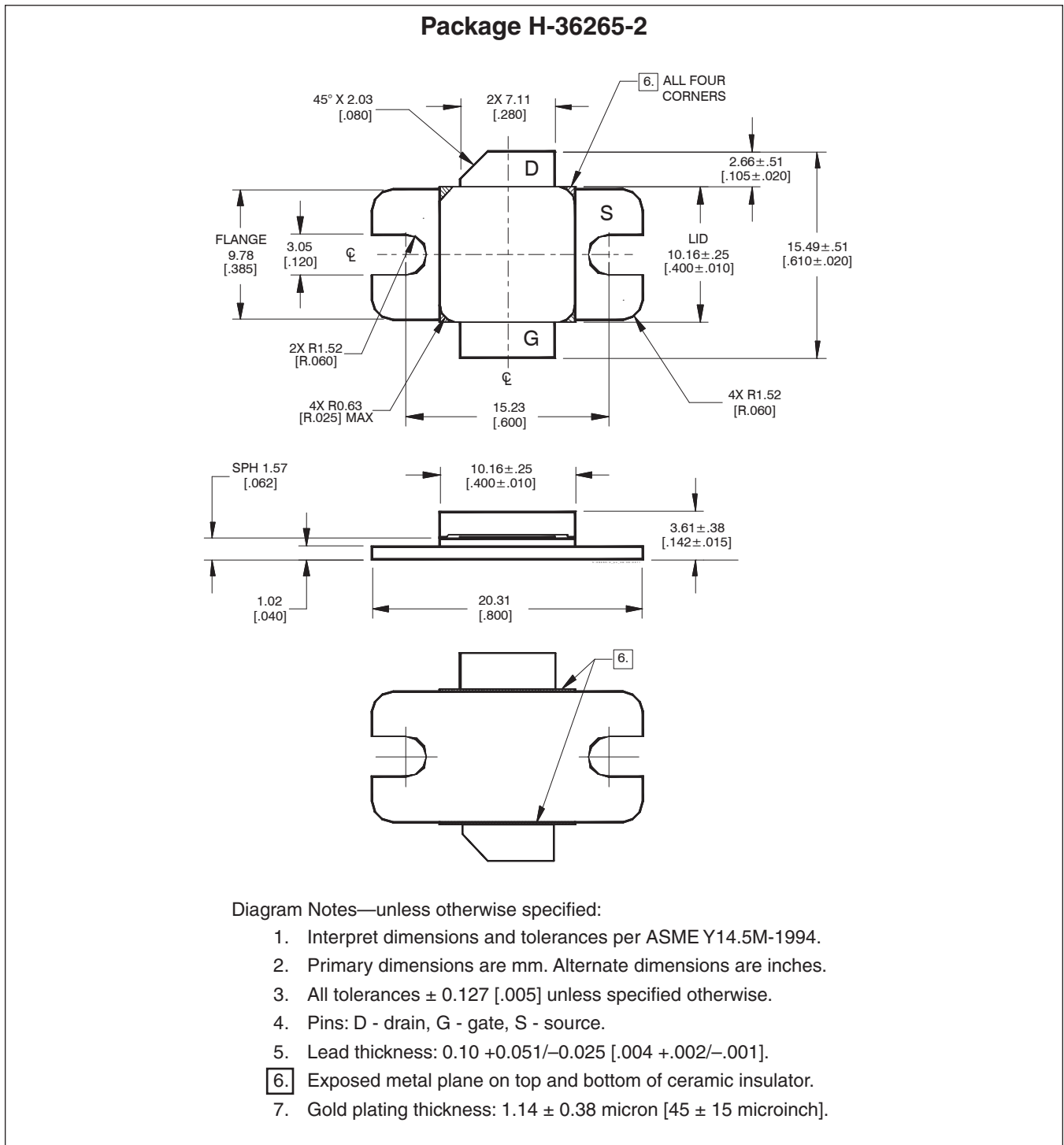
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Reference Circuit (cont.)

| Component ID | Description | Suggested Supplier | P/N |
|---------------|----------------------------|--------------------|---------------------|
| Output | | | |
| C201 | Chip capacitor, 9.1 pF | ATC | ATC100B9R1BW500XB |
| C202 | Chip capacitor, 300 pF | ATC | ATC100B301JW200XB |
| C203 | Chip capacitor, 10 μ F | TDK Corporation | C5750X7S2A106M230KB |
| C204 | Capacitor, 1 μ 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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