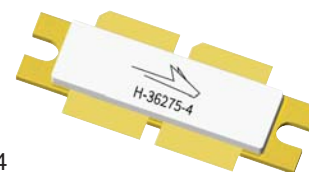


PTVA101K02EV

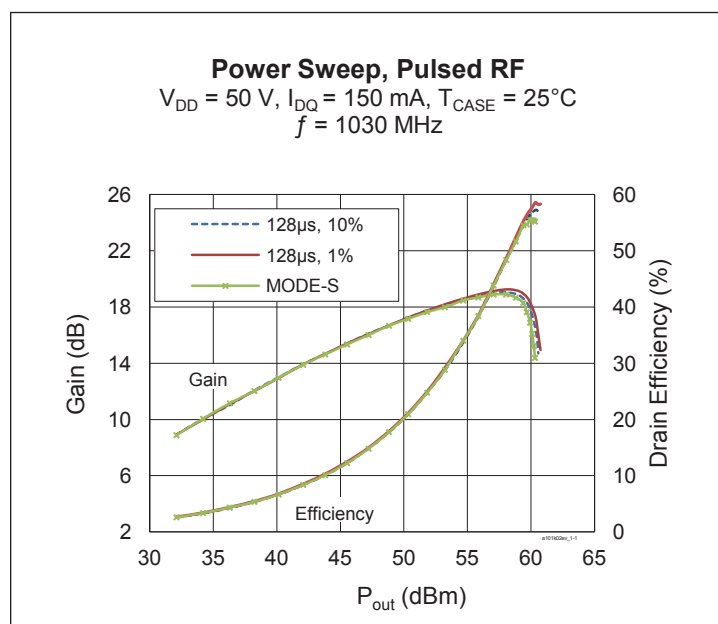
Thermally-Enhanced High Power RF LDMOS FET 1000 W, 50 V, 1030 / 1090 MHz

Description

The PTVA101K02EV LDMOS FET is designed for use in power amplifier applications in the 1030 MHz / 1090 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.



PTVA101K02EV
Package H-36275-4



Features

- Broadband input matching
- High gain and efficiency
- Integrated ESD protection
- Human Body Model Class 2 (per ANSI/ESDA/ JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant
- Capable of withstanding a 10:1 load mismatch (all phase angles) at 1000 W under MODE-S pulse condition, (32µS ON / 18µS OFF) X 80, LTDF = 6.4%.

RF Characteristics

Pulsed RF Performance (tested in Wolfspeed test fixture)

$V_{DD} = 50\text{ V}$, $I_{DQ} = 0.15\text{ A}$, $P_{OUT} = 900\text{ W}$, $f = 1030\text{ MHz}$, 128 µs pulse width, 10% duty cycle

| Characteristic | Symbol | Min | Typ | Max | Unit |
|------------------|----------|-----|-----|-----|------|
| Gain | G_{ps} | 17 | 18 | 21 | dB |
| Drain Efficiency | η_D | 62 | 65 | — | % |

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 Wolfspeed test fixture)
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 75\text{ mA}$ per side, 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 _{1dB} | | | P _{3dB} | | | P _{droop(pulse)} dB @ 1000 W | t _r (ns) | t _f (ns) |
|--|------------|-------------|------------------|------------|-------------------------|------------------|------------|-------------------------|--|------------------------|------------------------|
| | | | Gain (dB) | Eff (%) | P _{OUT} (W) | Gain (dB) | Eff (%) | P _{OUT} (W) | | | |
| 128 μs , 10% | 1030 | 20 | 18 | 56 | 980 | 16 | 57 | 1090 | 0.18 | 7 | 8 |
| 128 μs , 1% | 1030 | 20 | 18.1 | 57 | 1010 | 16.1 | 58 | 1130 | 0.16 | 7 | 8 |
| MODE-S (32 μs ON / 18 μs OFF)X80, LTDF=6.4% | 1030 | 20 | 17.9 | 54 | 930 | 14.9 | 55 | 1060 | 0.45 | 7 | 8 |
| 128 μs , 10% | 1090 | 13 | 18.3 | 59 | 920 | 16.2 | 60 | 1050 | 0.16 | 7 | 8 |
| 128 μs , 1% | 1090 | 14 | 18.4 | 60 | 950 | 16.4 | 61 | 1080 | 0.17 | 7 | 8 |

DC Characteristics (each side)

| 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 | μA |
| | $V_{DS} = 105\text{ V}$, $V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 10 | μA |
| On-State Resistance | $V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 0.1 | — | Ω |
| Operating Gate Voltage | $V_{DS} = 50\text{ V}$, $I_{DQ} = 150\text{ mA}$ | V_{GS} | 3 | 3.35 | 4 | V |
| Gate Leakage Current | $V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$ | I_{GSS} | — | — | 1.0 | μA |

Maximum Ratings

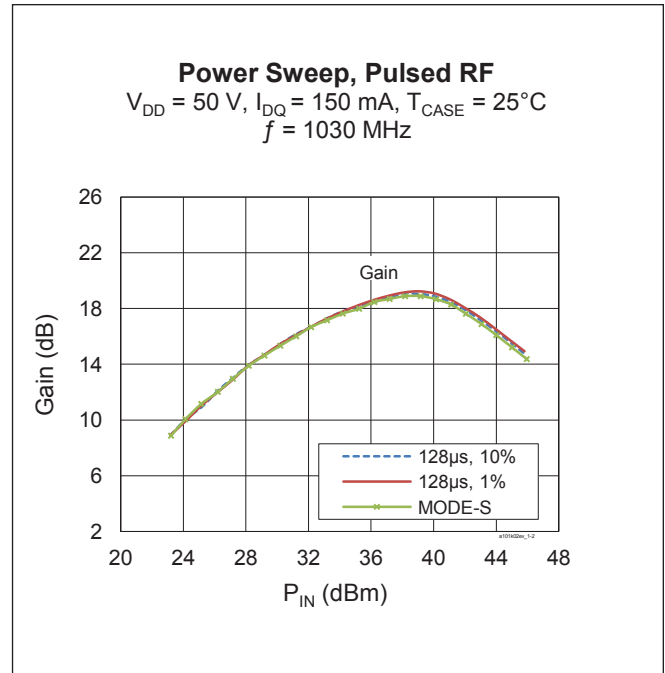
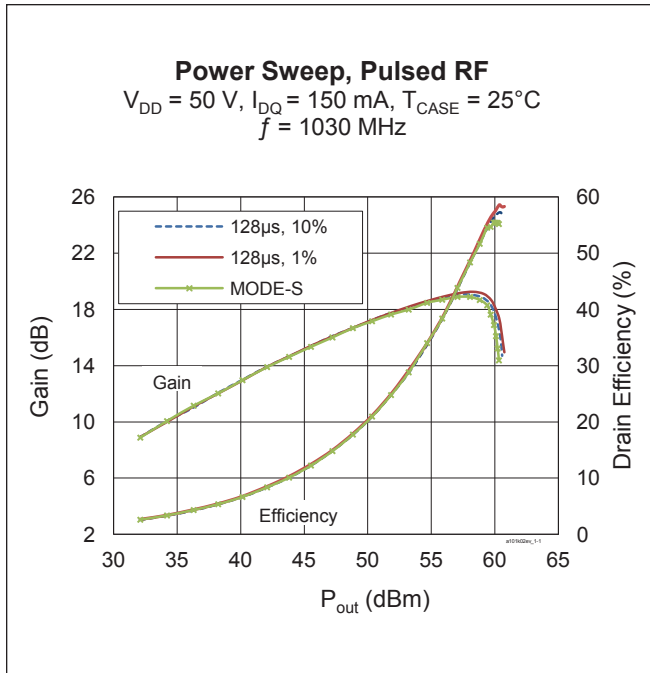
| Parameter | Symbol | Value | Unit |
|--|-----------------|-------------|--------------------|
| Drain-Source Voltage | V_{DSS} | 105 | V |
| Gate-Source Voltage | V_{GS} | -6 to +12 | V |
| Operating Voltage | V_{DD} | 0 to +55 | V |
| Junction Temperature | T_J | 225 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{STG} | -65 to +150 | $^\circ\text{C}$ |
| Thermal Resistance ($T_{CASE} = 70^\circ\text{C}$, 1000 W, MODE-S) | $R_{\theta JC}$ | 0.16 | $^\circ\text{C/W}$ |



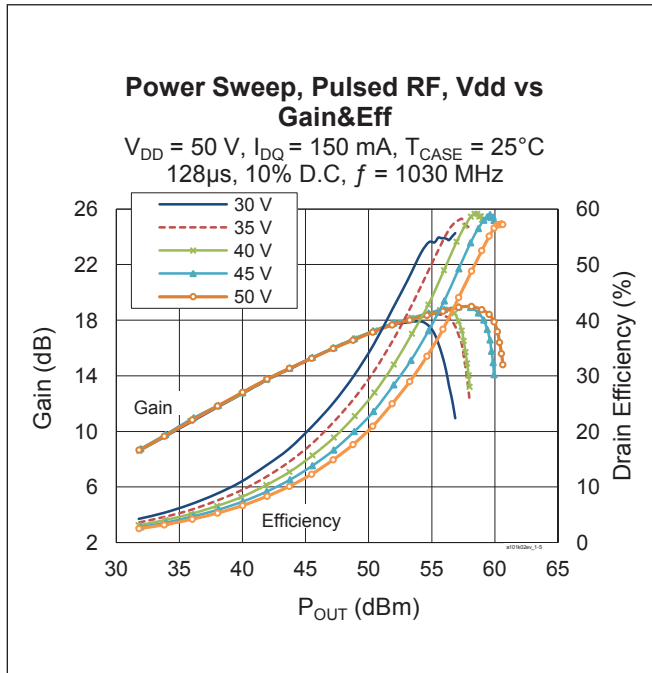
Ordering Information

| Type and Version | Order Code | Package and Description | Shipping |
|----------------------|----------------------|-------------------------|---------------------|
| PTVA101K02EV V1 R0 | PTVA101K02EV-V1-R0 | H-36275-4, bolt-down | Tape & Reel, 50pcs |
| PTVA101K02EV V1 R250 | PTVA101K02EV-V1-R250 | H-36275-4, bolt-down | Tape & Reel, 250pcs |

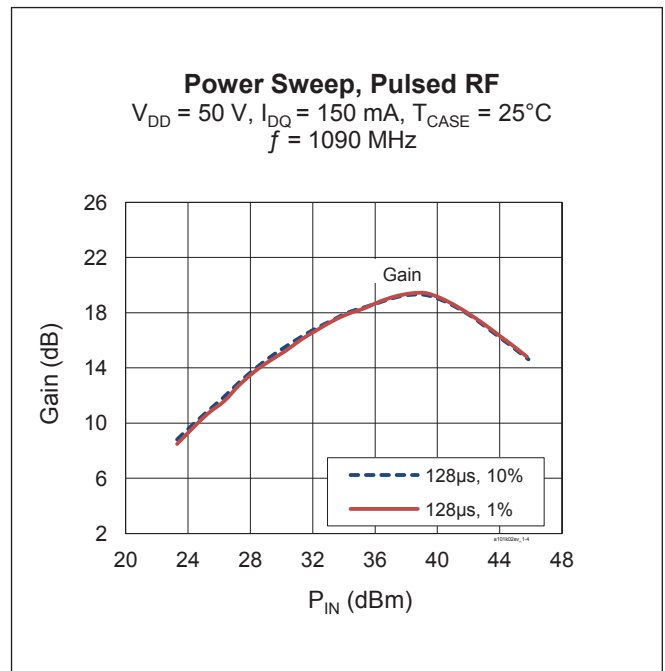
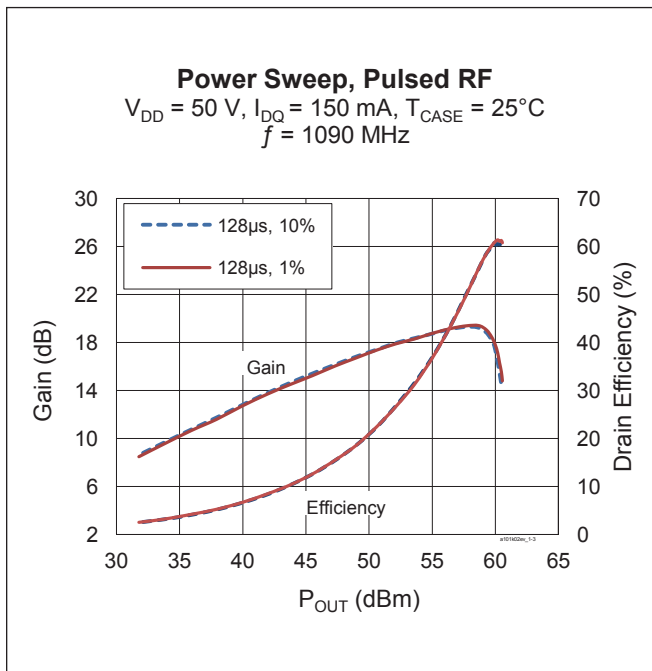
Typical RF Performance (tested with LTN/PTVA101K02EV V1 test fixture, 1030 MHz)



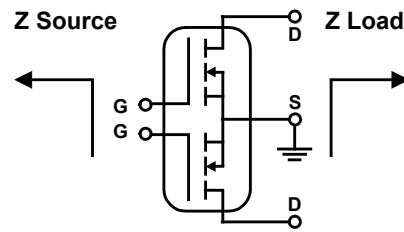
Typical RF Performance (cont.) (tested with LTN/PTVA101K02EV V1 test fixture, 1030 MHz)



Typical RF Performance (tested with LTN/PTVA101K02EV E6 test fixture, 1090 MHz)



Broadband Circuit Impedance



| Freq [MHz] | Z Source Ω | | Z Load Ω | |
|------------|-------------------|------|-----------------|-------|
| | R | jX | R | jX |
| 1030 | 2.00 | 1.51 | 1.48 | 0.07 |
| 1090 | 2.35 | 0.64 | 1.12 | -0.28 |

Note: Measurement on single side.

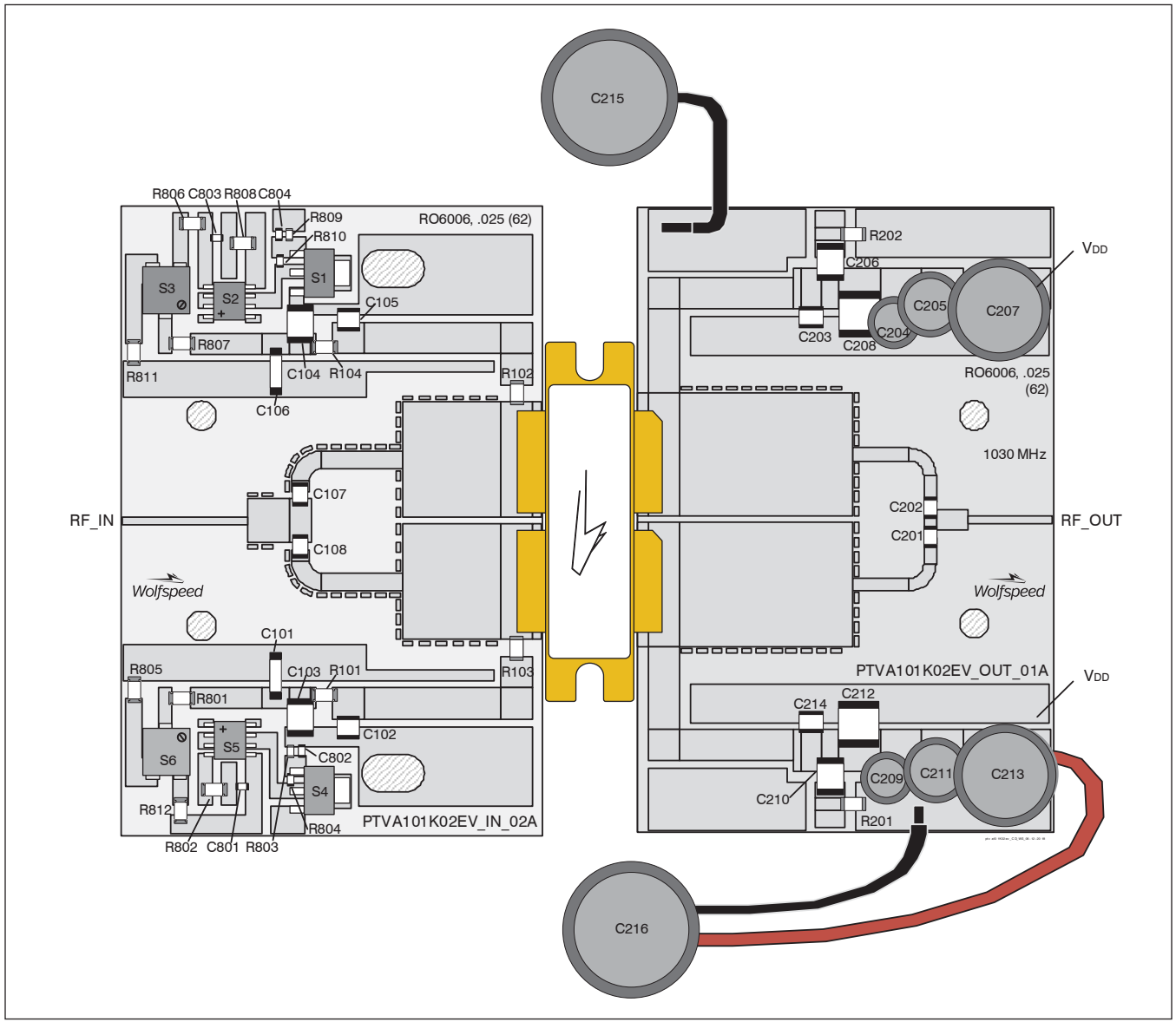
Load Pull Performance

Each Side Load Pull Performance –16 μ s pulse width, 10% duty cycle, class AB, $V_{DD} = 50$ V, 100 mA

| Freq [MHz] | Max Output Power | | | | | Max Efficiency | | | | | Z Optimum | | | | | |
|------------|------------------------|----------------------|---------|-----------|--------------------------------|------------------------|----------------------|---------|-----------|--------------------------------|------------------------|----------------------|---------|-----------|--------------------------------|----------------------------------|
| | P _{OUT} [dBm] | P _{OUT} [W] | Eff [%] | Gain [dB] | Z _{Load} [Ω] | P _{OUT} [dBm] | P _{OUT} [W] | Eff [%] | Gain [dB] | Z _{Load} [Ω] | P _{OUT} [dBm] | P _{OUT} [W] | Eff [%] | Gain [dB] | Z _{Load} [Ω] | Z _{Source} [Ω] |
| 960 | 58.10 | 645.65 | 61.90 | 16.46 | 1.14 - j0.08 | 56.00 | 398.11 | 72.20 | 18.68 | 0.79 + j0.69 | 57.50 | 562.34 | 68.00 | 17.50 | 0.91 + j0.33 | 1.41 - j1.62 |
| 1030 | 57.80 | 602.56 | 55.60 | 16.00 | 0.91 - j0.08 | 56.00 | 398.11 | 71.00 | 18.80 | 0.71 + j0.66 | 57.10 | 512.86 | 65.00 | 17.50 | 0.78 + j0.34 | 1.76 - j2.12 |
| 1090 | 57.90 | 616.60 | 61.80 | 16.95 | 0.95 + j0.27 | 56.20 | 416.87 | 69.80 | 18.68 | 0.83 + j0.90 | 57.40 | 549.54 | 65.70 | 17.73 | 0.87 + j0.62 | 2.34 - j2.39 |
| 1150 | 57.36 | 544.50 | 50.52 | 15.80 | 1.11 + j0.12 | 56.90 | 489.78 | 65.00 | 17.63 | 0.94 + j0.76 | 57.20 | 524.81 | 61.20 | 17.00 | 1.01 + j0.48 | 3.21 - j1.47 |
| 1215 | 57.26 | 532.11 | 53.90 | 15.60 | 1.20 + j0.01 | 55.40 | 346.74 | 62.30 | 17.46 | 0.59 + j0.81 | 56.70 | 467.74 | 58.45 | 16.60 | 0.88 + j0.49 | 2.37 - j0.84 |



Reference Circuit (LTN/PTVA101K02EV V1 test fixture, 1030 MHz)



Reference circuit assembly diagram (not to scale)*

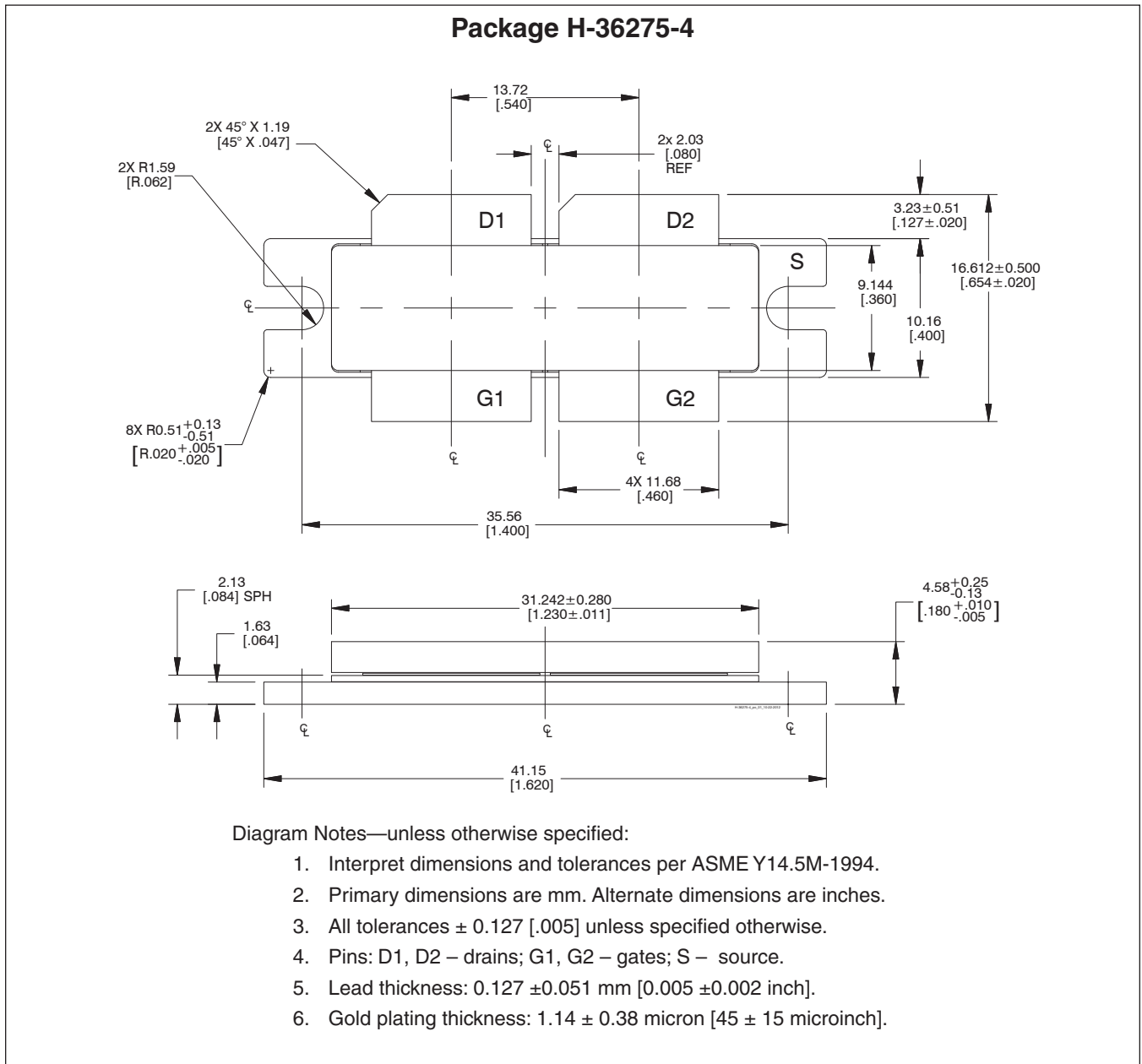
Reference Circuit (cont.)**Reference Circuit Assembly**

| DUT | Test Fixture Part No. | PCB | Frequency (MHz) |
|--------------|-----------------------|--|-----------------|
| PTVA101K02EV | LTN/PTVA101K02EV V1 | Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 6.15$ | 1030 MHz |
| PTVA101K02EV | LTN/PTVA101K02EV E4 | Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 6.15$ | 1090 MHz |
| PTVA101K02EV | LTN/PTVA101K02EV E6 | Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$ | 1090 MHz |
| PTVA101K02EV | LTN/PTVA101K02EV E8 | Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$ | 1030 MHz |

Components Information

| Component | Description | Suggested Manufacturer | P/N |
|---------------------------|-------------------------|------------------------------------|---------------------|
| Input | | | |
| C101, C106 | Capacitor, 10 μ F | TDK Corporation | C5750X5R1H106K230KA |
| C102, C105, C107, C108 | Capacitor, 39 pF | ATC | ATC100B390KW500XB |
| C103, C104 | Capacitor, 1 μ F | TDK Corporation | C4532X7R2A105M230KA |
| C801, C802, C803, C804 | Capacitor, 1000 pF | Panasonic Electronic Components | ECJ-1VB1H102K |
| R101, R104, R801, R807 | Resistor, 10 Ohm | Panasonic Electronic Components | ERJ-8GEYJ100V |
| R102, R103 | Resistor, 100 Ohm | Panasonic Electronic Components | ERJ-8GEYJ101V |
| R802, R808 | Resistor, 6200 Ohm | Panasonic Electronic Components | ERJ-8GEYJ623V |
| R803, R809 | Resistor, 1300 Ohm | Panasonic Electronic Components | ERJ-3GEYJ132V |
| R804, R810 | Resistor, 1200 Ohm | Panasonic Electronic Components | ERJ-3GEYJ122V |
| R805, R806, R811, R812 | Resistor, 2000 Ohm | Panasonic Electronic Components | ERJ-8GEYJ202V |
| S1, S4 | Transistor | Infineon Technologies | BCP56 |
| S2, S5 | Voltage regulator | National Semiconductor | LM7805 |
| S3, S6 | Potentiometer, 2k ohm | Bourns Inc. | 3224W-202ECT-ND |
| Output | | | |
| C201, C202, C203, C214 | Capacitor, 39 pF | ATC | ATC100B390KW500XB |
| C204, C209 | Capacitor, 100 μ F | Panasonic Electronic Components | EEV-HD1V101P |
| C205, C211 | Capacitor, 22 μ F | Cornell Dubilier Electronics (CDE) | SEK220M100ST |
| C206, C210 | Capacitor, 1 μ F | TDK Corporation | C4532X7R2A105M230KA |
| C207, C213 | Capacitor, 100 μ F | Cornell Dubilier Electronics (CDE) | SK101M100ST |
| C208, C212 | Capacitor, 10 μ F | TDK Corporation | C5750X5R1H106K230KA |
| C215, C216 | Capacitor, 6800 μ F | Panasonic Electronic Components | ECO-S2AP682EA |
| R201, R202 | Resistor, 5600 Ohm | Panasonic Electronic Components | ERJ-8GEYJ562V |

Package Outline Specifications



Revision History

| Revision | Date | Data Sheet Type | Page | Subjects (major changes since last revision) |
|----------|------------|-----------------|------|--|
| 01 | 2012-06-07 | Preliminary | All | Data Sheet reflects preliminary specification |
| 02 | 2013-04-15 | Production | 1 | Data Sheet reflects released product specification |
| 02.1 | 2016-04-19 | Production | 1, 2 | Added ESD rating, updated ordering information |
| 02.2 | 2017-02-09 | Production | 2 | Updated operating voltage and junction temperature |
| 03 | 2018-06-12 | Production | All | Converted to Wolfspeed Data Sheet |

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Notes

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