

# PTVA042502EC/FC

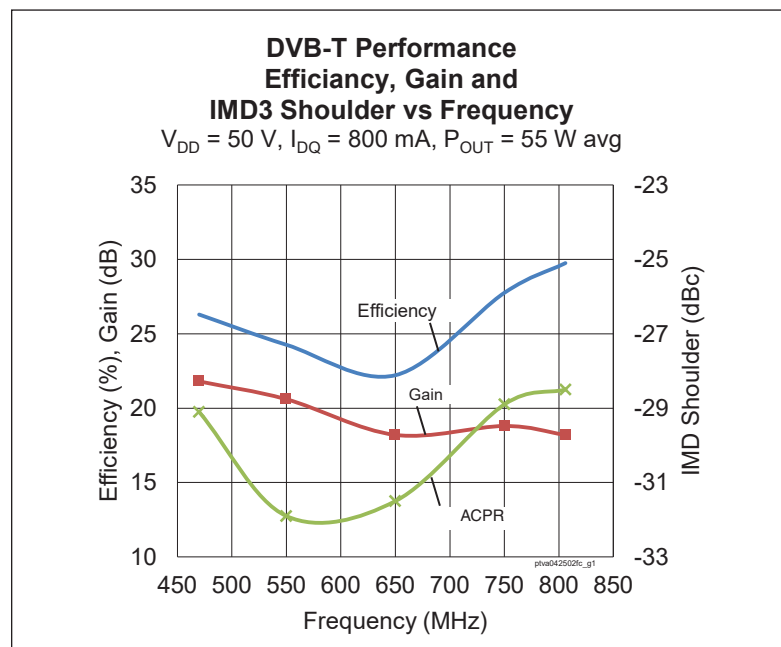
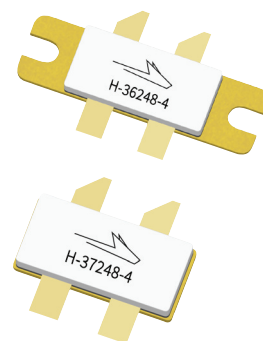
## Thermally-Enhanced High Power RF LDMOS FETs 250 W, 50 V, 470 – 806 MHz

### Description

The PTVA042502EC and PTVA042502FC LDMOS FETs are designed for use in power amplifier applications in the 470 MHz to 806 MHz frequency band. Features include high gain and thermally-enhanced package with bolt-down or earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTVA042502EC  
Package H-36248-4

PTVA042502FC  
Package H-37248-4



### Features

- Input matched
- Integrated ESD protection
- Human Body Model Class 1C (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- RoHS compliant
- Capable of withstanding a 10:1 VSWR at 55W average power under DVB-T signal condition

### RF Characteristics

#### DVB-T (8K OFDM, 64QAM) Characteristics (tested in Wolfspeed test fixture)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 800\text{ mA}$ ,  $f = 806\text{ MHz}$ , input PAR = 10.5 dB (unclipped), output PAR = 7.8 dB @ 0.01% CCDF probability

| Characteristic  | Symbol    | Min  | Typ   | Max | Unit |
|---|-----------|------|-------|-----|------|
| Average Output Power  | $P_{OUT}$ | —    | 55    | —   | W    |
| Gain  | $G_{ps}$  | 17.5 | 19    | —   | dB   |
| Drain Efficiency  | $\eta_D$  | 23   | 25.5  | —   | %    |
| Adjacent Channel Power Ratio<br>(ACPR integrated over 200 KHz BW at + 4.3 MHz offset from center frequency) | ACPR      | —    | -29.5 | -25 | dBc  |

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 | $V_{GS} = 0\text{ V}, I_{DS} = 10\text{ mA}$   | $V_{(BR)DSS}$ | 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            | $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$  | $R_{DS(on)}$  | —   | 0.1 | —    | $\Omega$      |
| Operating Gate Voltage         | $V_{DS} = 50\text{ V}, I_{DQ} = 800\text{ mA}$ | $V_{GS}$      | 3.0 | 3.7 | 4.0  | V             |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}, V_{DS} = 0\text{ V}$    | $I_{GSS}$     | —   | —   | 1.0  | $\mu\text{A}$ |

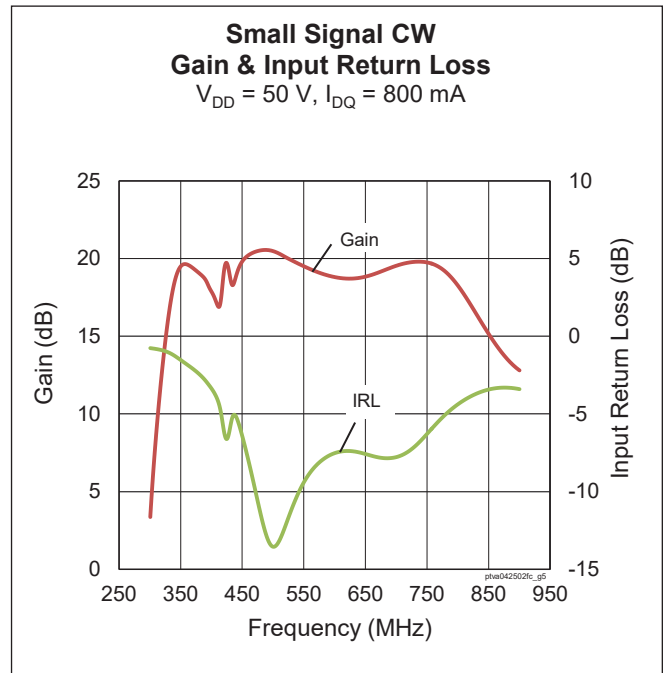
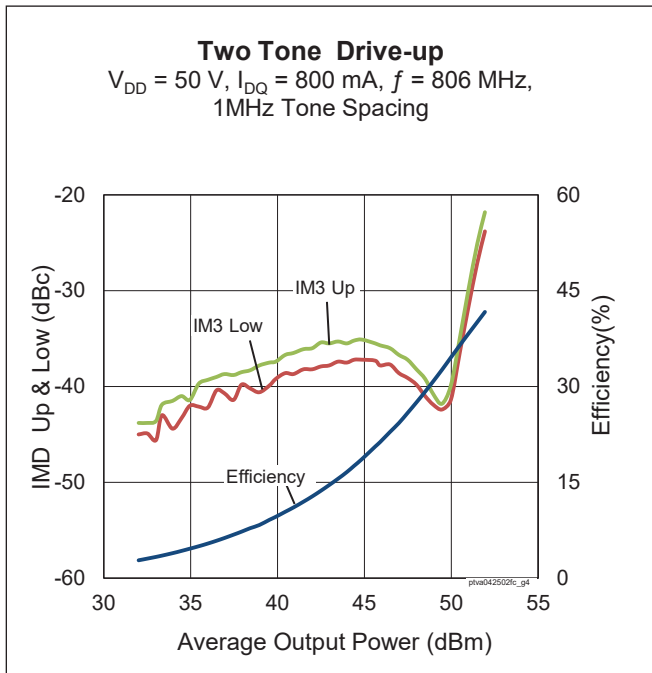
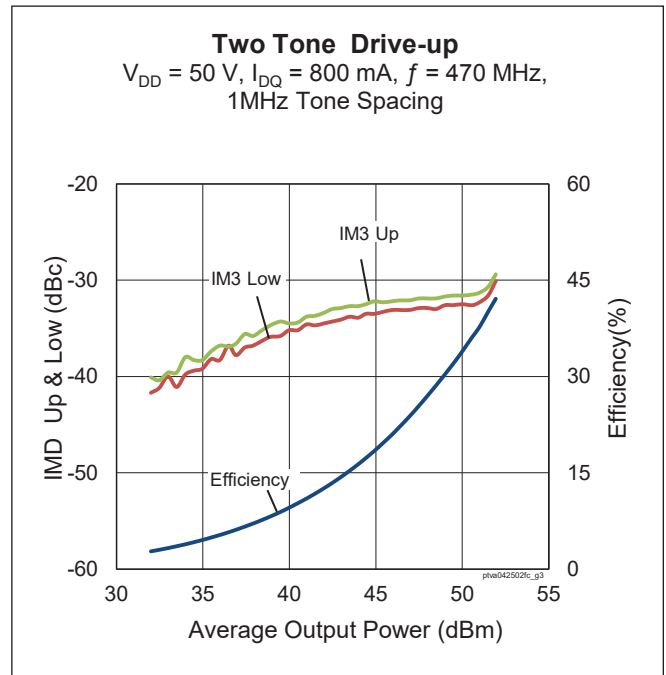
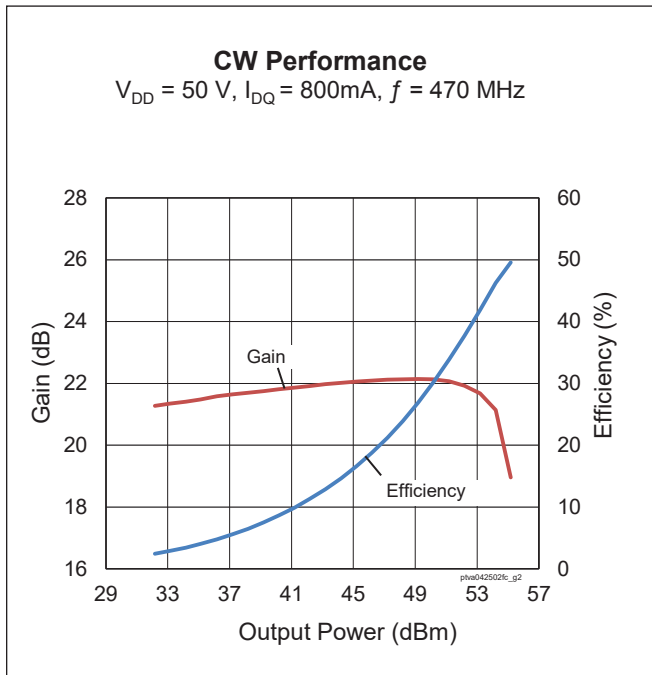
## Maximum Ratings

| 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 ( $T_{CASE} = 70^{\circ}\text{C}, 55\text{ W CW}$ ) | $R_{\theta JC}$ | 0.4         | $^{\circ}\text{C/W}$ |

## Ordering Information

| Type and Version     | Order Code           | Package and Description         | Shipping            |
|----------------------|----------------------|---------------------------------|---------------------|
| PTVA042502EC V1 R0   | PTVA042502EC-V1-R0   | H-36248-4, push-pull, bolt-down | Tape & Reel, 50pcs  |
| PTVA042502EC V1 R250 | PTVA042502EC-V1-R250 | H-36248-4, push-pull, bolt-down | Tape & Reel, 250pcs |
| PTVA042502FC V1 R0   | PTVA042502FC-V1-R0   | H-37248-4, push-pull, earless   | Tape & Reel, 50pcs  |
| PTVA042502FC V1 R250 | PTVA042502FC-V1-R250 | H-37248-4, push-pull, earless   | Tape & Reel, 250pcs |

Typical Performance





### Load Pull Performance

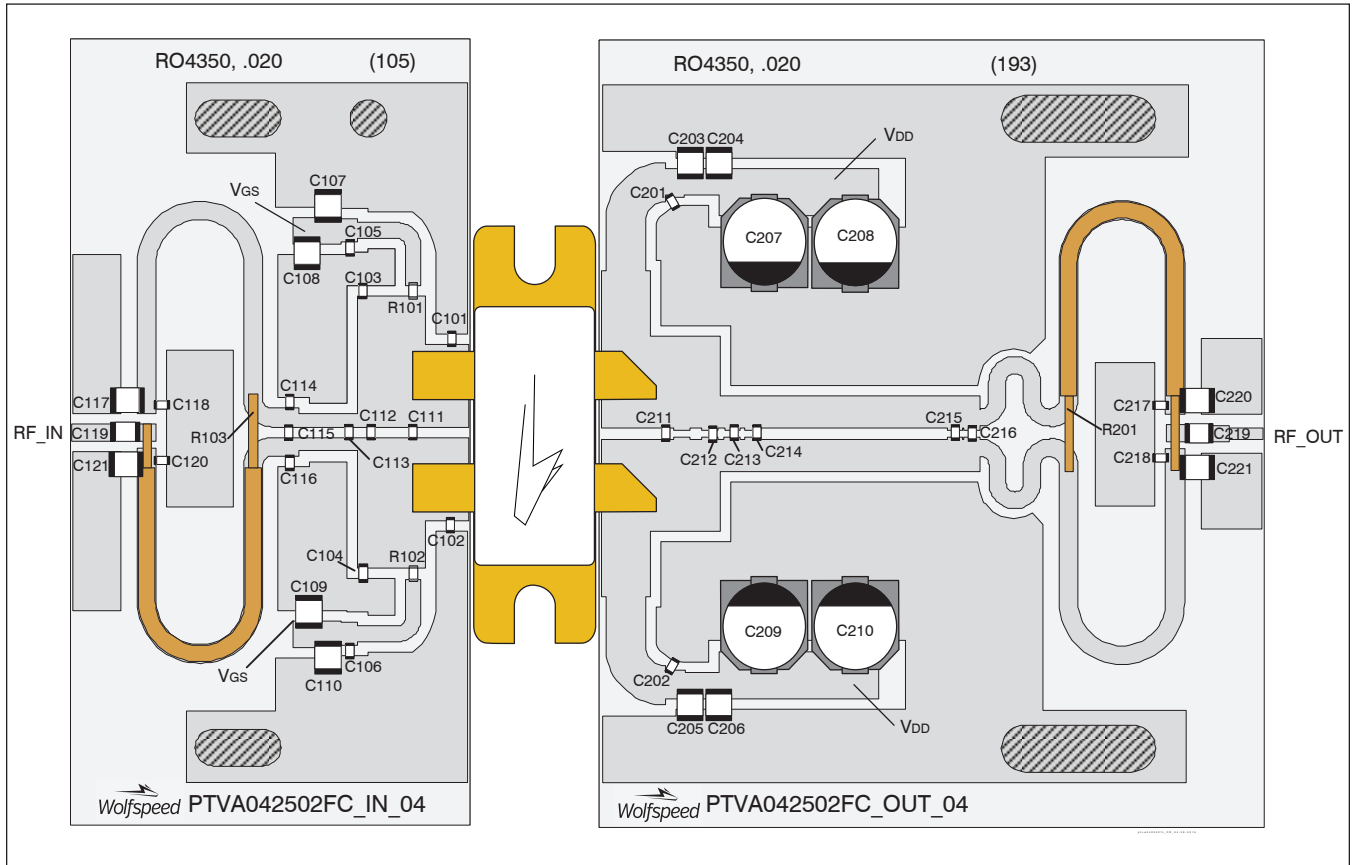
Pulsed CW signal: 16  $\mu$ s, 10% duty cycle, 50 V, 100 mA

|            |                             | P <sub>1dB</sub>            |           |                        |                      |         |                             |           |                        |                      |         |
|------------|-----------------------------|-----------------------------|-----------|------------------------|----------------------|---------|-----------------------------|-----------|------------------------|----------------------|---------|
|            |                             | Max Output Power            |           |                        |                      |         | Max PAE                     |           |                        |                      |         |
| Freq [MHz] | Z <sub>s</sub> [ $\Omega$ ] | Z <sub>I</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] | Z <sub>I</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] |
| 500        | 0.9 - j1.4                  | 2.9 + j0.8                  | 22.4      | 54.05                  | 254                  | 71.2    | 2.5 + j4.5                  | 24.6      | 50.59                  | 115                  | 79.5    |
| 600        | 0.7 - j2.0                  | 2.2 + j0.8                  | 21.1      | 52.15                  | 164                  | 61.8    | 2.2 + j3.6                  | 23.4      | 49.27                  | 85                   | 76.3    |
| 700        | 1.4 - j2.8                  | 2.1 + j0.8                  | 20.5      | 52.64                  | 184                  | 59.6    | 1.9 + j3.4                  | 22.9      | 49.97                  | 99                   | 75.3    |
| 859        | 3.7 - j4.9                  | 2.0 + j0.2                  | 19.1      | 52.38                  | 173                  | 62.2    | 1.8 + j1.9                  | 21.2      | 50.44                  | 111                  | 74.1    |

Pulsed CW signal: 16  $\mu$ s, 10% duty cycle, 50 V, 100 mA

|            |                             | P <sub>3dB</sub>            |           |                        |                      |         |                             |           |                        |                      |         |
|------------|-----------------------------|-----------------------------|-----------|------------------------|----------------------|---------|-----------------------------|-----------|------------------------|----------------------|---------|
|            |                             | Max Output Power            |           |                        |                      |         | Max PAE                     |           |                        |                      |         |
| Freq [MHz] | Z <sub>s</sub> [ $\Omega$ ] | Z <sub>I</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] | Z <sub>I</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] |
| 500        | 0.9 - j1.4                  | 2.9 + j0.6                  | 20.3      | 54.58                  | 287                  | 74.1    | 2.6 + j4.1                  | 22.4      | 51.49                  | 141                  | 80.0    |
| 600        | 0.7 - j2.0                  | 2.3 + j0.7                  | 19.0      | 52.77                  | 189                  | 62.2    | 2.3 + j3.2                  | 21.1      | 50.39                  | 109                  | 76.9    |
| 700        | 1.4 - j2.8                  | 2.2 + j0.7                  | 18.4      | 53.34                  | 216                  | 60.2    | 1.8 + j3.2                  | 20.7      | 50.60                  | 115                  | 75.8    |
| 859        | 3.7 - j4.5                  | 2.0 + j0.1                  | 17.0      | 53.11                  | 205                  | 63.9    | 1.8 + j1.8                  | 19.1      | 51.08                  | 128                  | 73.6    |

Reference Circuit , 470 – 806 MHz



Reference circuit assembly diagram (not to scale)

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

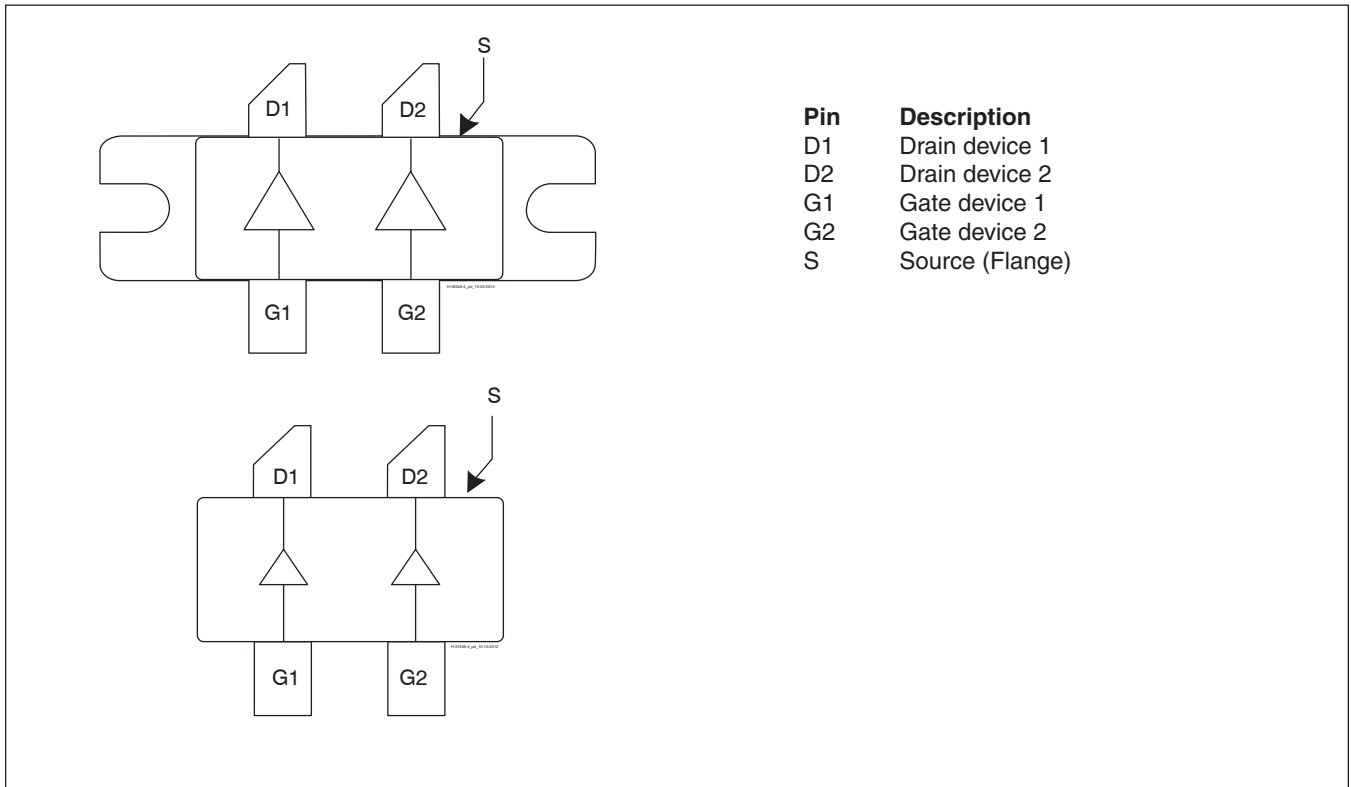
|   |   |
|---|---|
| DUT   | PTVA042502EC or PTVA042502FC  |
| Test Fixture Part No.   | LTN/PTVA042502EC V1 or LTN/PTVA042502FC V1  |
| PCB   | Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 470 - 806$ MHz |
| Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">www.wolfspeed.com/RF</a> |   |

**Components Information**

| Component                          | Description            | Manufacturer                     | P/N                |
|------------------------------------|------------------------|----------------------------------|--------------------|
| <b>Input</b>                       |                        |                                  |                    |
| C101, C102                         | Capacitor, 20 pF       | ATC                              | ATC100A200JW150XB  |
| C103, C104, C112, C115             | Capacitor, 8.2 pF      | ATC                              | ATC100A8R2JW150XB  |
| C105, C106                         | Capacitor, 120 pF      | ATC                              | ATC700A120KP150XB  |
| C107, C108, C109, C110, C117, C121 | Capacitor, 4.7 $\mu$ F | Murata Electronics North America | GRM32ER71H475KA88L |
| C111, C113                         | Capacitor, 10 pF       | ATC                              | ATC100A100JW150XB  |
| C114, C116                         | Capacitor, 6.8 pF      | ATC                              | ATC100A6R8JW150XB  |
| C118, C120                         | Capacitor, 100 pF      | ATC                              | ATC100A101JW150XB  |
| C119                               | Capacitor, 91 pF       | ATC                              | ATC100A910JW150XB  |
| R101, R102                         | Resistor, 1K $\Omega$  | Panasonic Electronic Components  | ERJ-8GEYJ102V      |
| R103                               | Coax, 25 $\Omega$      | AMWAYE                           | UT-090C-25         |
| <b>Output</b>                      |                        |                                  |                    |
| C201, C202                         | Capacitor, 270 pF      | ATC                              | ATC700A271KP150XB  |
| C203, C204, C205, C206, C220, C221 | Capacitor, 4.7 $\mu$ F | Murata Electronics North America | GRM32ER71H475KA88L |
| C207, C208, C209, C210             | Capacitor, 100 $\mu$ F | Panasonic Electronic Components  | EEE-FP1V101AP      |
| C211                               | Capacitor, 3.9 pF      | ATC                              | ATC100A3R9CW150XB  |
| C212                               | Capacitor, 6.8 pF      | ATC                              | ATC100A6R8JW150XB  |
| C213, C215                         | Capacitor, 8.2 pF      | ATC                              | ATC100A8R2JW150XB  |
| C214                               | Capacitor, 5.6 pF      | ATC                              | ATC100A5R6CW150XB  |
| C216                               | Capacitor, 3.3 pF      | ATC                              | ATC100A3R3CW150XB  |
| C217, C218                         | Capacitor, 100 pF      | ATC                              | ATC100A101JW150XB  |
| C219                               | Capacitor, 91 pF       | ATC                              | ATC100A910JW150XB  |
| R201                               | Coax, 25 $\Omega$      | AMWAYE                           | UT-090C-25         |



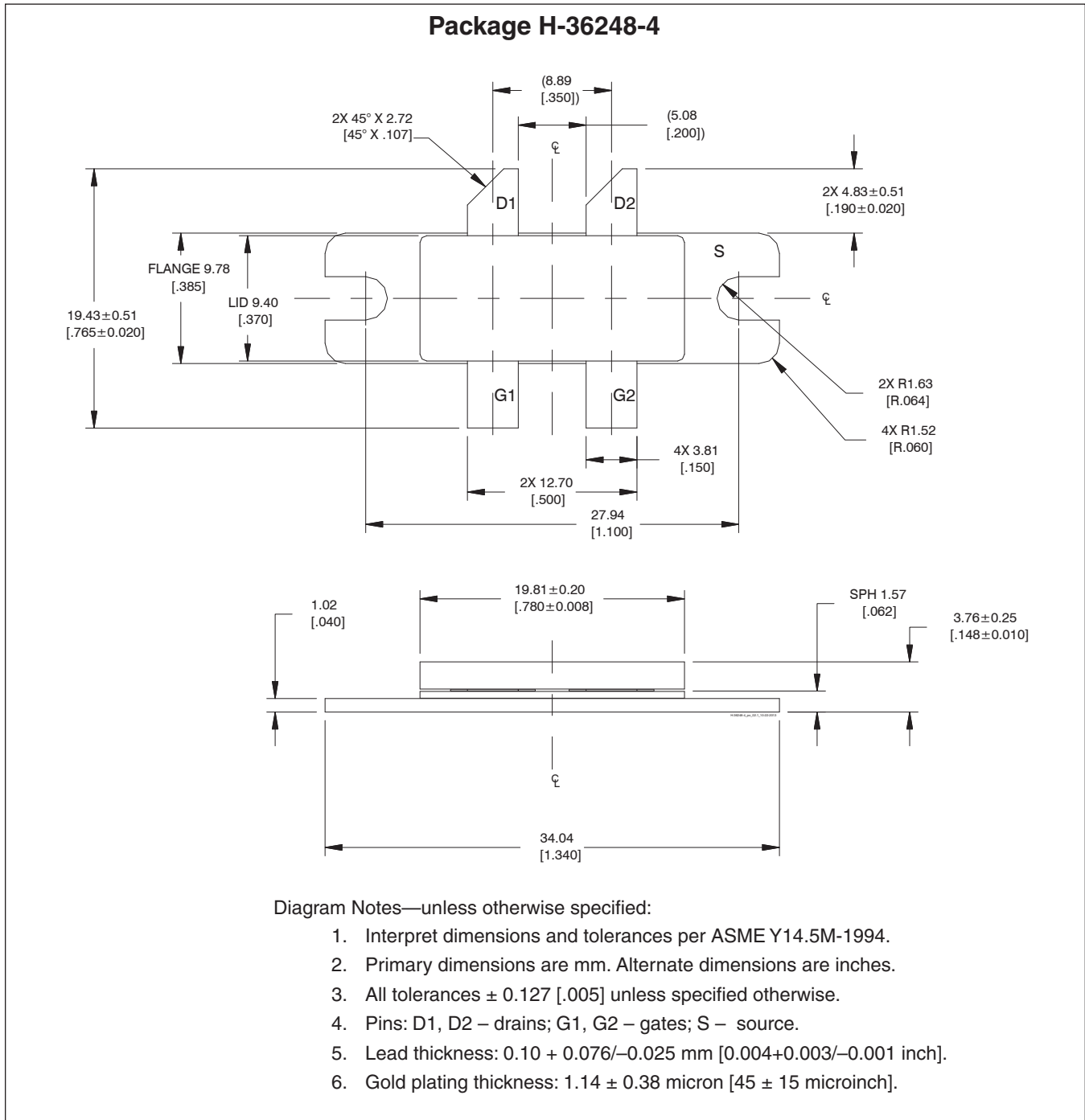
**Pinout Diagram** (top view)



Lead connections for PTVA042502EC and PTVA042502FC

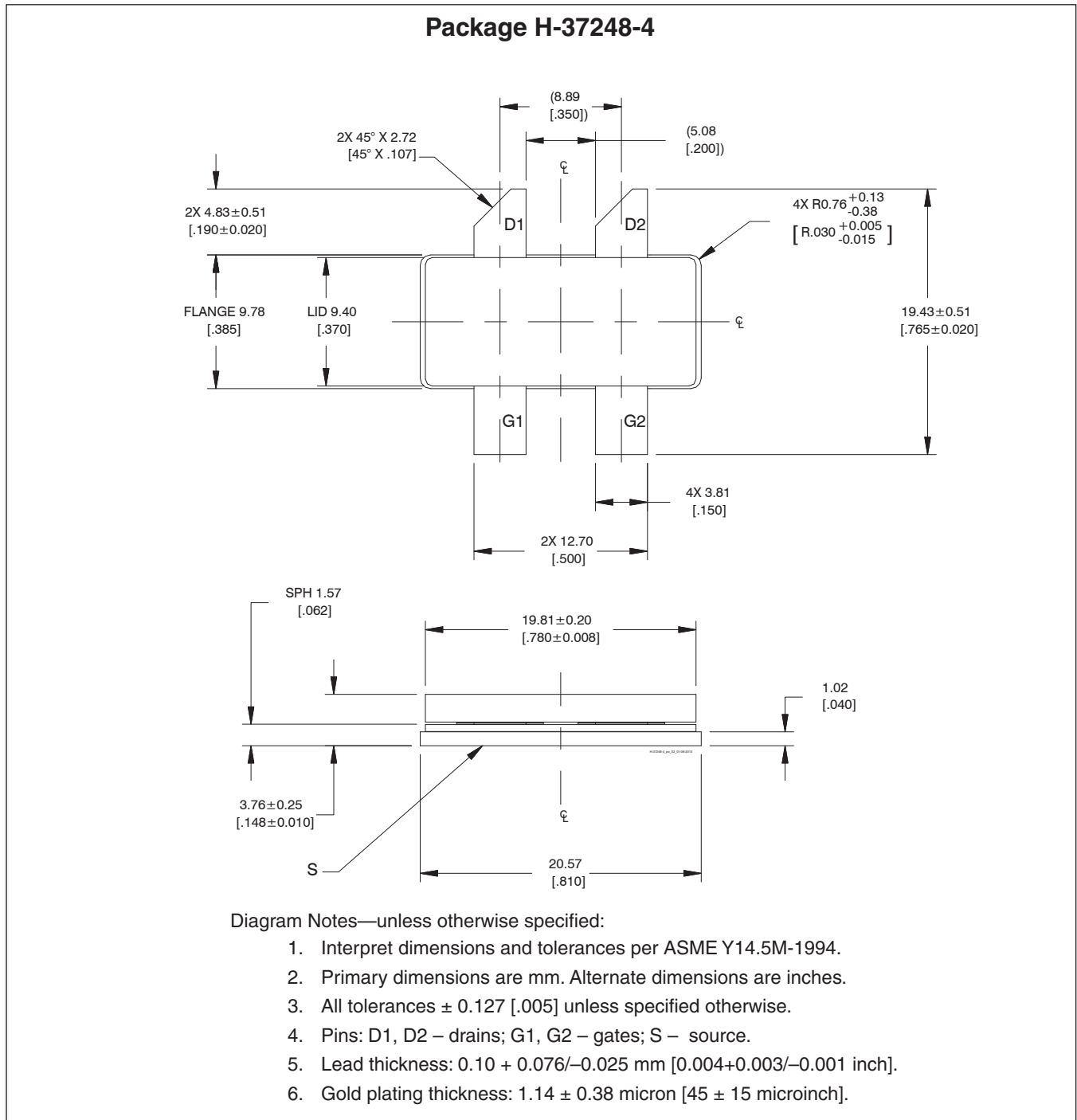


**Package Outline Specifications**





Package Outline Specifications (cont.)



## Revision History

| Revision | Date       | Data Sheet Type | Page                    | Subjects (major changes since last revision)   |
|----------|------------|-----------------|-------------------------|--|
| 01       | 2012-09-19 | Preliminary     | All                     | Data Sheet reflects preliminary specification  |
| 02       | 2013-10-01 | Preliminary     | 1, 3<br>1, 2, 4, 5<br>6 | Updated DVB-T characteristics, updated frequency range, Updated DVB-T performance graphs<br>Added H-36248-4 package information, pinout diagram and package outline<br>Updated package outline specification |
| 02.1     | 2013-10-20 | Preliminary     | 1, 2                    | Removed obsolete Pulsed Characteristics from Features, Removed Obsolete Pulsed CW table  |
| 03       | 2014-05-26 | Production      | All<br>1, 2<br>3, 4     | Data Sheet reflects released product specification<br>Updated Features, DVB-T Characteristics table, thermal resistance<br>Updated all graphs, added loadpull information                                    |
| 03.1     | 2016-04-19 | Production      | 1, 2                    | Added ESD rating, updated ordering information   |
| 03.2     | 2017-02-09 | Production      | 2                       | Updated operating voltage and junction temperature   |
| 04       | 2018-11-02 | Production      | All                     | Converted to Wolfspeed data sheet  |

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## Notes

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