

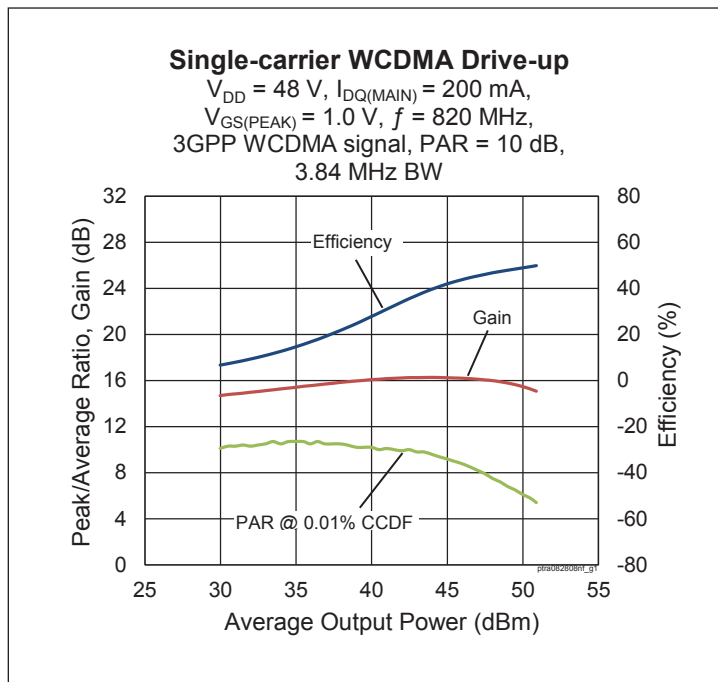
## Thermally-Enhanced High Power RF LDMOS FET 280 W, 48 V, 790 – 820 MHz

### Description

The PTRA082808NF is a 280-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 790 to 820 MHz frequency band. Features include input and output matching, high gain and thermally-enhanced package with earless flanges. Manufactured with Infineon's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTRA082808NF  
Package PG-HBSOF-6-2



### Features

- Broadband internal input and output matching
- Asymmetrical design
  - Main :  $P_{1dB} = 115\text{ W Typ}$
  - Peak :  $P_{1dB} = 165\text{ W Typ}$
- Typical Pulsed CW performance, 820 MHz, 48 V, Doherty configuration
  - Output power at  $P_{3dB} = 250\text{ W}$
  - Efficiency = 55.6 %
  - Gain = 16.2 dB
- Capable of handling 10:1 VSWR @ 48 V, 56.2 W (CW) output power
- Human Body Model Class 1C (per ANSI/ESDA/ JEDEC JS-001)
- Integrated ESD protection
- Low thermal resistance
- Pb-free and RoHS compliant

### RF Characteristics

#### Single-carrier WCDMA Specifications (tested in Infineon Doherty test fixture)

$V_{DD} = 48\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$ ,  $V_{GS(PEAK)} = 1.0\text{ V}$ ,  $P_{OUT} = 56.2\text{ W avg}$ ,  $f = 820\text{ MHz}$ , 3GPP, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

| Characteristic               | Symbol   | Min  | Typ   | Max   | Unit |
|------------------------------|----------|------|-------|-------|------|
| Gain                         | $G_{ps}$ | 15.2 | 15.5  | —     | dB   |
| Drain Efficiency             | $\eta_D$ | 42.7 | 44.5  | —     | %    |
| Adjacent Channel Power Ratio | ACPR     | —    | -36.4 | -33.5 | dBc  |
| Output PAR @ 0.01% CCDF      | OPAR     | 6.6  | 7.3   | —     | dB   |

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

**ESD:** Electrostatic discharge sensitive device—observe handling precautions!

**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   | $\mu\text{A}$ |
|                                | $V_{DS} = 105\text{ V}$ , $V_{GS} = 0\text{ V}$         | $I_{DSS}$     | —   | —    | 10  | $\mu\text{A}$ |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$          | $I_{GSS}$     | —   | —    | 1   | $\mu\text{A}$ |
| On-State Resistance (Main)     | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$        | $R_{DS(on)}$  | —   | 0.3  | —   | $\Omega$      |
|                                | (Peak) $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$  | —   | 0.12 | —   | $\Omega$      |
| Operating Gate Voltage (Main)  | $V_{DS} = 3.6\text{ V}$ , $I_{DQ} = 0.2\text{ A}$       | $V_{GS}$      | 3.0 | 3.6  | 4.1 | V             |
|                                | (Peak) $V_{DS} = 1.0\text{ V}$ , $I_{DQ} = 0\text{ A}$  | $V_{GS}$      | —   | 1    | —   | V             |

**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 | $^{\circ}\text{C}$ |

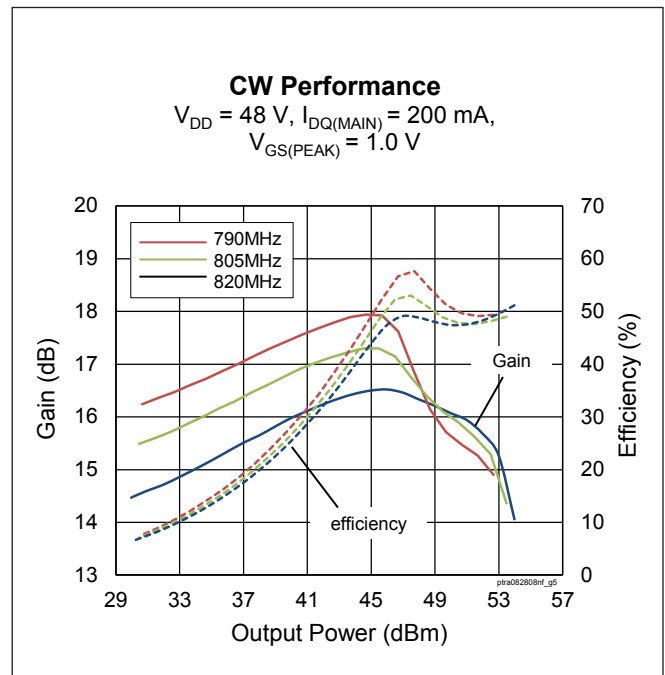
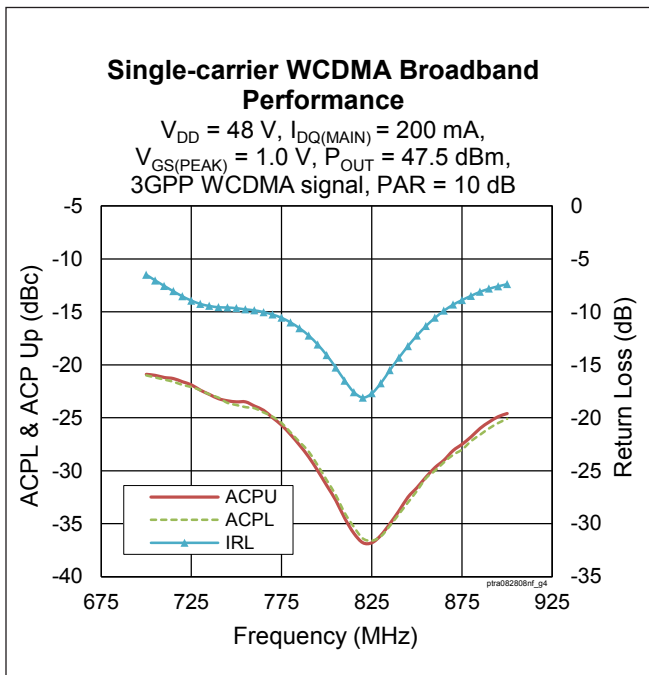
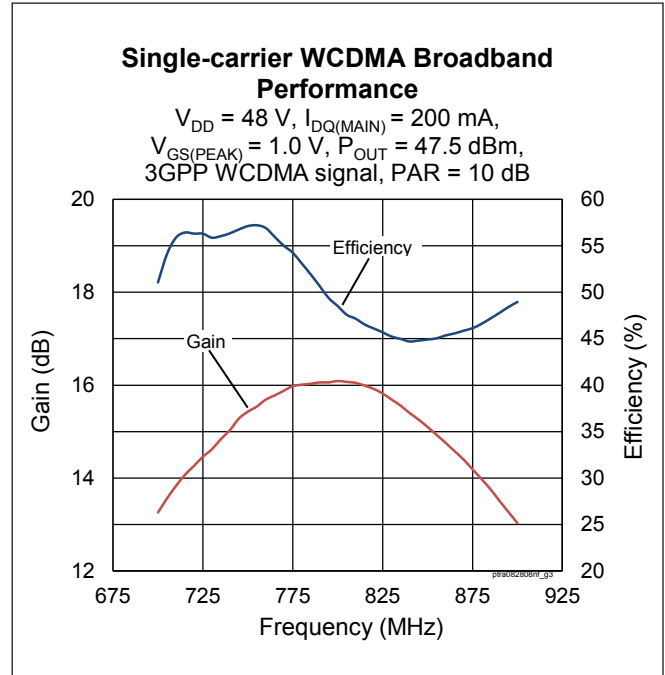
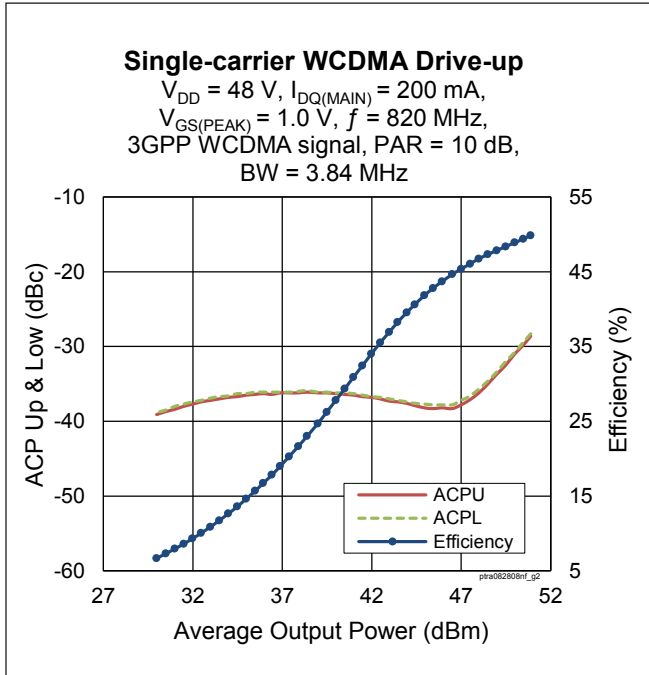
**Thermal Characteristics**

| Parameter  | Symbol          | Value | Unit                        |
|--|-----------------|-------|-----------------------------|
| Thermal Resistance (Main, $T_{CASE} = 70^{\circ}\text{C}$ , 56.2 W CW) | $R_{\theta JC}$ | 0.766 | $^{\circ}\text{C}/\text{W}$ |
| (Peak, $T_{CASE} = 70^{\circ}\text{C}$ , 200 W CW)                     | $R_{\theta JC}$ | 0.208 | $^{\circ}\text{C}/\text{W}$ |

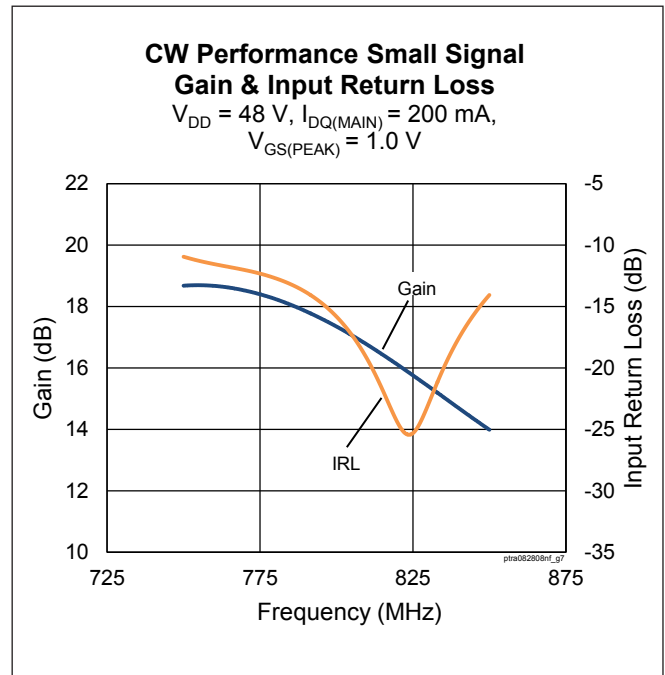
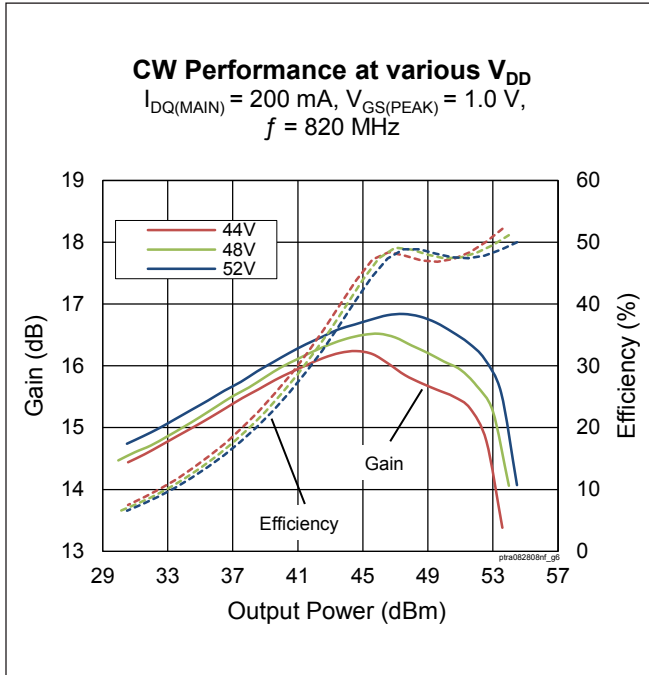
**Ordering Information**

| Type and Version   | Order Code            | Package Description | Shipping             |
|--------------------|-----------------------|---------------------|----------------------|
| PTRA082808NF V1 R5 | PTRA082808NFV1R5XUMA1 | PG-HBSOF-6-2        | Tape & Reel, 500 pcs |

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



Typical Performance (cont.)



## Load Pull Performance

**Main Side Load Pull Performance** – Pulsed CW signal: 10  $\mu$ s, 10% duty cycle, 48 V,  $I_{DQ} = 250$  mA

|                   |  | <b>P<sub>1dB</sub></b>                     |                  |                              |                            |                                |  |                  |                              |                            |                                |
|-------------------|--|--|------------------|------------------------------|----------------------------|--------------------------------|--|------------------|------------------------------|----------------------------|--------------------------------|
|                   |  | <b>Max Output Power</b>                    |                  |                              |                            |                                | <b>Max Drain Efficiency</b>                |                  |                              |                            |                                |
| <b>Freq [MHz]</b> | <b>Z<sub>s</sub> [<math>\Omega</math>]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>1dB</sub> [dBm]</b> | <b>P<sub>1dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>1dB</sub> [dBm]</b> | <b>P<sub>1dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> |
| 790               | 1.8 – j4.4                                 | 2.4 – j1.6                                 | 20.24            | 51.73                        | 149                        | 58.9                           | 5.4 + j2.6                                 | 22.49            | 48.72                        | 74                         | 69.8                           |
| 805               | 1.8 – j5.2                                 | 2.6 – j1.8                                 | 20.28            | 51.47                        | 140                        | 58.6                           | 5.4 + j2.5                                 | 22.41            | 48.74                        | 75                         | 70.2                           |
| 820               | 1.8 – j5.2                                 | 2.9 – j1.8                                 | 20.65            | 51.41                        | 138                        | 60.9                           | 5.3 + j1.9                                 | 22.51            | 48.97                        | 79                         | 70.4                           |

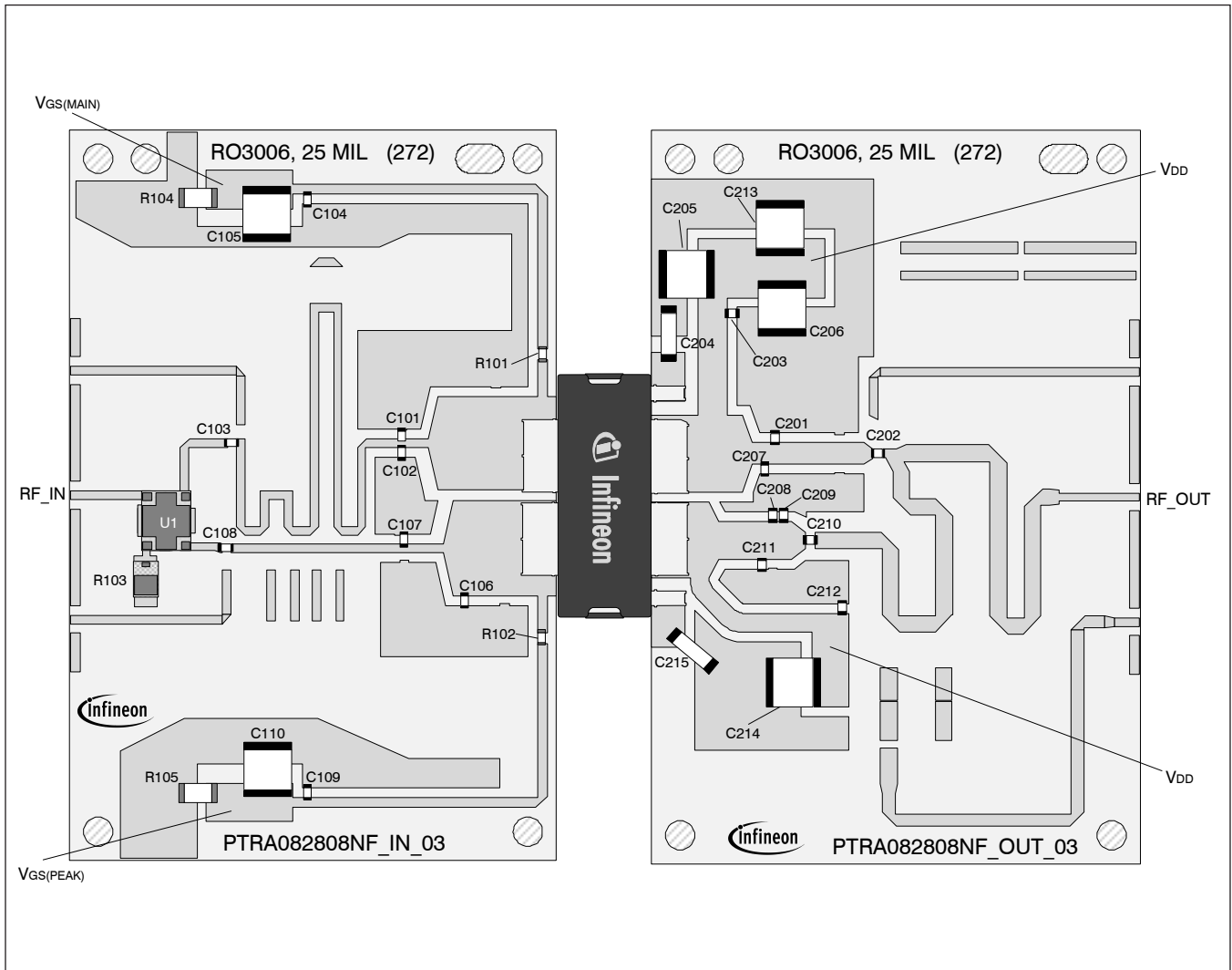
|                   |  | <b>P<sub>3dB</sub></b>                     |                  |                              |                            |                                |  |                  |                              |                            |                                |
|-------------------|--|--|------------------|------------------------------|----------------------------|--------------------------------|--|------------------|------------------------------|----------------------------|--------------------------------|
|                   |  | <b>Max Output Power</b>                    |                  |                              |                            |                                | <b>Max Drain Efficiency</b>                |                  |                              |                            |                                |
| <b>Freq [MHz]</b> | <b>Z<sub>s</sub> [<math>\Omega</math>]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>3dB</sub> [dBm]</b> | <b>P<sub>3dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>3dB</sub> [dBm]</b> | <b>P<sub>3dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> |
| 790               | 1.8 – j4.4                                 | 2.6 – j1.9                                 | 18.3             | 52.53                        | 179                        | 62.7                           | 5.5 + j0.2                                 | 20.27            | 50.63                        | 116                        | 71.2                           |
| 805               | 1.8 – j5.2                                 | 2.8 – j2.6                                 | 18.3             | 52.29                        | 169                        | 60.2                           | 5.6 + j0.0                                 | 20.18            | 50.61                        | 115                        | 71.2                           |
| 820               | 1.8 – j5.2                                 | 2.9 – j3.1                                 | 18.4             | 52.24                        | 168                        | 60.0                           | 5.6 + j1                                   | 20.45            | 50.13                        | 103                        | 71.3                           |

**Peak Side Load Pull Performance** – Pulsed CW signal: 10  $\mu$ s, 10% duty cycle, 48 V,  $I_{DQ} = 350$  mA

|                   |  | <b>P<sub>1dB</sub></b>                     |                  |                              |                            |                                |  |                  |                              |                            |                                |
|-------------------|--|--|------------------|------------------------------|----------------------------|--------------------------------|--|------------------|------------------------------|----------------------------|--------------------------------|
|                   |  | <b>Max Output Power</b>                    |                  |                              |                            |                                | <b>Max Drain Efficiency</b>                |                  |                              |                            |                                |
| <b>Freq [MHz]</b> | <b>Z<sub>s</sub> [<math>\Omega</math>]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>1dB</sub> [dBm]</b> | <b>P<sub>1dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>1dB</sub> [dBm]</b> | <b>P<sub>1dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> |
| 790               | 1.5 – j4.1                                 | 1.8 – j1.3                                 | 16.26            | 53.30                        | 214                        | 60.4                           | 3.9 + j1.2                                 | 17.03            | 50.89                        | 123                        | 72.8                           |
| 805               | 1.5 – j4.1                                 | 1.9 – j1.3                                 | 16.02            | 53.07                        | 203                        | 60.1                           | 3.6 + j1.3                                 | 16.84            | 50.77                        | 119                        | 73.2                           |
| 820               | 1.4 – j4.6                                 | 2.0 – j1.4                                 | 16.4             | 53.00                        | 200                        | 61.0                           | 3.1 + j2.2                                 | 16.87            | 50.78                        | 120                        | 73.0                           |

|                   |  | <b>P<sub>3dB</sub></b>                     |                  |                              |                            |                                |  |                  |                              |                            |                                |
|-------------------|--|--|------------------|------------------------------|----------------------------|--------------------------------|--|------------------|------------------------------|----------------------------|--------------------------------|
|                   |  | <b>Max Output Power</b>                    |                  |                              |                            |                                | <b>Max Drain Efficiency</b>                |                  |                              |                            |                                |
| <b>Freq [MHz]</b> | <b>Z<sub>s</sub> [<math>\Omega</math>]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>3dB</sub> [dBm]</b> | <b>P<sub>3dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>3dB</sub> [dBm]</b> | <b>P<sub>3dB</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> |
| 790               | 1.5 – j4.1                                 | 2.0 – j1.4                                 | 14.37            | 54.07                        | 255                        | 65.3                           | 3.6 – j0.1                                 | 15.05            | 52.54                        | 180                        | 73.9                           |
| 805               | 1.5 – j4.1                                 | 2.0 – j2.3                                 | 14.84            | 53.86                        | 243                        | 60.5                           | 3.7 + j1.2                                 | 14.84            | 51.42                        | 139                        | 73.8                           |
| 820               | 1.4 – j4.6                                 | 2.1 – j1.5                                 | 14.43            | 53.77                        | 238                        | 64.0                           | 3.6 + j0.7                                 | 15.13            | 51.83                        | 152                        | 73.6                           |

Reference Circuit , 790 – 820 MHz



Reference circuit assembly diagram (not to scale)

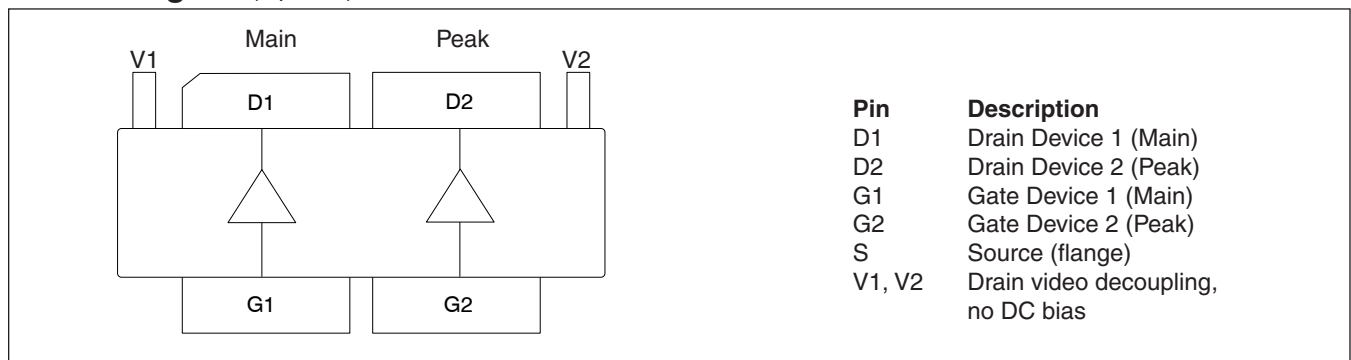
**Reference Circuit** (cont.)

**Reference Circuit Assembly**

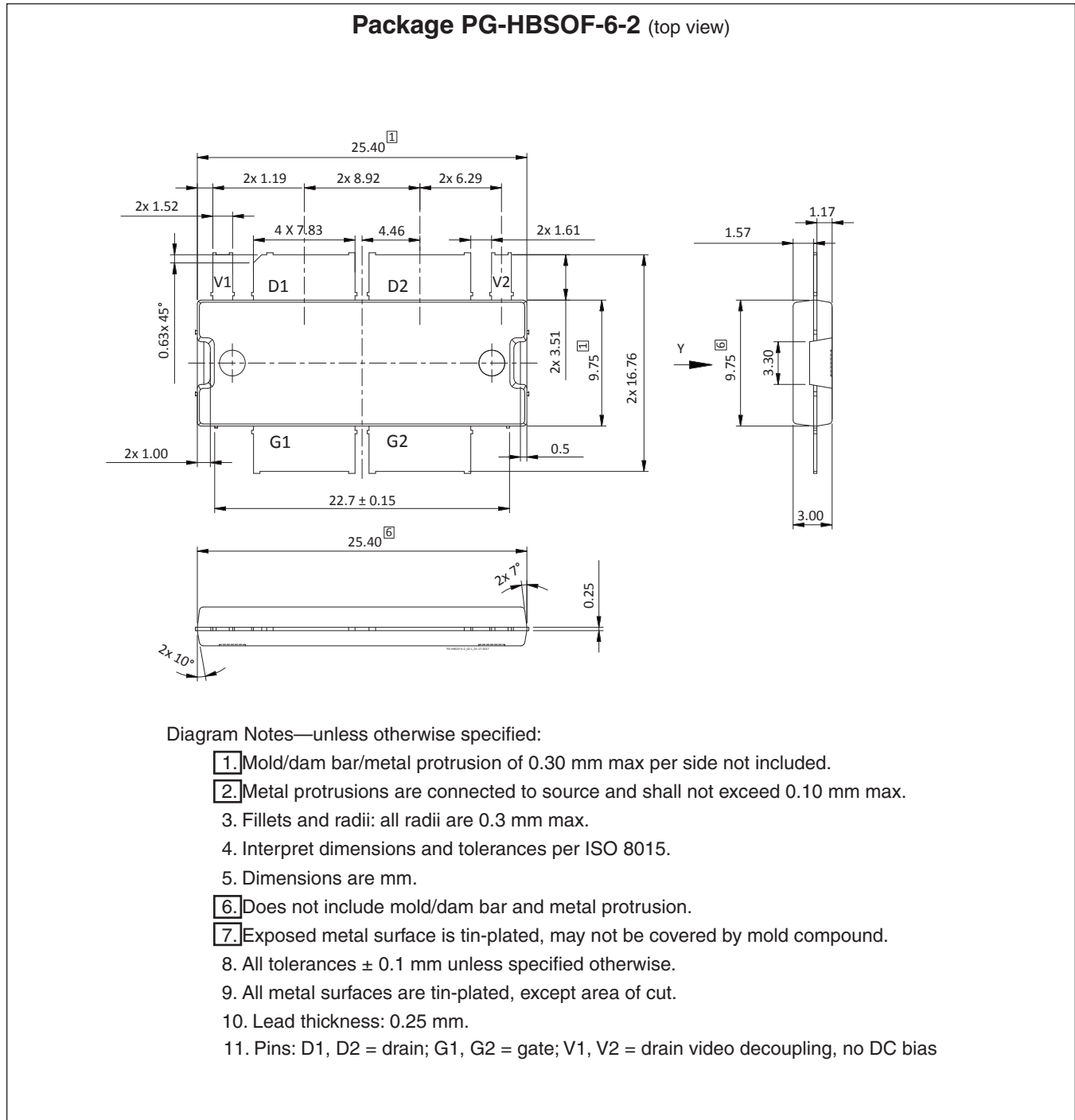
|   |   |
|---|---|
| DUT   | PTRA082808NF V1   |
| Test Fixture Part No.   | LTA/PTRA082808NF V1   |
| PCB   | Rogers 3006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 790 - 820$ MHz |
| Find Gerber files for this test fixture on the Infineon Web site at <a href="http://www.infineon.com/rfpower">http://www.infineon.com/rfpower</a> |   |

**Components Information**

| Component                          | Description                 | Manufacturer                    | P/N                 |
|------------------------------------|-----------------------------|---------------------------------|---------------------|
| <b>Input</b>                       |                             |                                 |                     |
| C101, C102                         | Capacitor, 5.6 pF           | ATC                             | ATC800A5R6CT250T    |
| C103, C104, C108, C109             | Capacitor, 56 pF            | ATC                             | ATC800A560JT250T    |
| C105, C110                         | Capacitor, 10 $\mu$ F       | TDK Corporation                 | C5750X5R1H106K230KA |
| C106                               | Capacitor, 10 pF            | ATC                             | ATC800A100JT250T    |
| C107                               | Capacitor, 1.5 pF           | ATC                             | ATC800A1R5CT250T    |
| R101, R102                         | Resistor, 10 ohms           | Panasonic Electronic Components | ERJ-8GEYJ100V       |
| R103                               | Resistor, 50 ohms           | ANAREN                          | C8A50Z4A            |
| R104, R105                         | Resistor, 1000 ohms         | Panasonic Electronic Components | ERJ-8GEYJ102V       |
| U1                                 | Hybrid Coupler              | ANAREN                          | X3C07P1-05S         |
| <b>Output</b>                      |                             |                                 |                     |
| C201                               | Capacitor, 3.0 pF           | ATC                             | ATC800A3R0CT250T    |
| C202                               | Capacitor, 15 pF            | ATC                             | ATC800A150JT250T    |
| C203, C210, C212                   | Capacitor, 82 pF            | ATC                             | ATC800A820JT250T    |
| C204, C205, C206, C213, C214, C215 | Capacitor, 10 $\mu$ F, 100V | TDK Corporation                 | C5750X7S2A106M230KB |
| C207                               | Capacitor, 6.8 pF           | ATC                             | ATC800A6R8CT250T    |
| C208                               | Capacitor, 3.9 pF           | ATC                             | ATC800A3R9CT250T    |
| C209                               | Capacitor, 2.2 pF           | ATC                             | ATC800A2R2CT250T    |
| C211                               | Capacitor, 10 pF            | ATC                             | ATC800A100JT250T    |

**Pinout Diagram** (top view)


## Package Outline Specifications



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Package Outline Specifications (cont.)

Package PG-HBSOF-6-2 (bottom view)

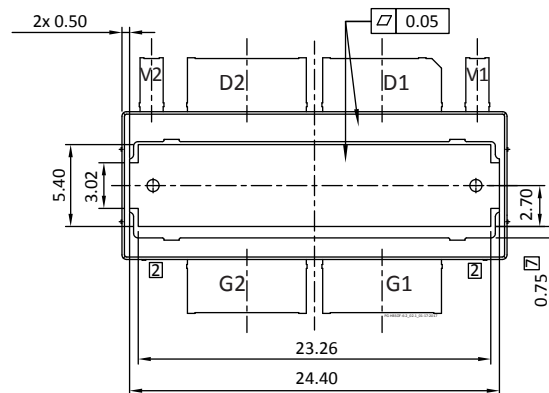


Diagram Notes—unless otherwise specified:

1. Mold/dam bar/metal protrusion of 0.30 mm max per side not included.
2. Metal protrusions are connected to source and shall not exceed 0.10 mm max.
3. Fillets and radii: all radii are 0.3 mm max.
4. Interpret dimensions and tolerances per ISO 8015.
5. Dimensions are mm.
6. Does not include mold/dam bar and metal protrusion.
7. Exposed metal surface is tin-plated, may not be covered by mold compound.
8. All tolerances  $\pm 0.1$  mm unless specified otherwise.
9. All metal surfaces are tin-plated, except area of cut.
10. Lead thickness: 0.25 mm.
11. Pins: D1, D2 = drain; G1, G2 = gate; V1, V2 = drain video decoupling, no DC bias

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## Revision History

| Revision | Date       | Data Sheet Type | Page      | Subjects (major changes since last revision)                                       |
|----------|------------|-----------------|-----------|--|
| 01       | 2016-05-18 | Advance         | All       | Data Sheet reflects advance specification for product development                  |
| 01.1     | 2016-09-06 | Advance         | 1         | Revised frequency range  |
| 02       | 2016-11-01 | Advance         | 2<br>3,4  | Revised pinout diagram<br>Revised package outline                                  |
| 03       | 2016-11-04 | Production      | All       | Data Sheet reflects released product specification                                 |
| 03.1     | 2016-12-07 | Production      | 1         | Revised Maximum Ratings table  |
| 03.2     | 2017-01-12 | Production      | 8, 9      | Revised typo in package outline  |
| 03.3     | 2017-03-30 | Production      | 1<br>3, 4 | Updated RF Characteristics table<br>Fixed missing labels on CW performance graphs  |
| 04       | 2017-08-21 | Production      | 6, 7      | Updated PCB layout and components information                                      |
| 04.1     | 2017-01-30 | Production      | 1, 2      | Corrected unit for OPAR. Corrected Operating gate voltage for main and peak sides. |

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