

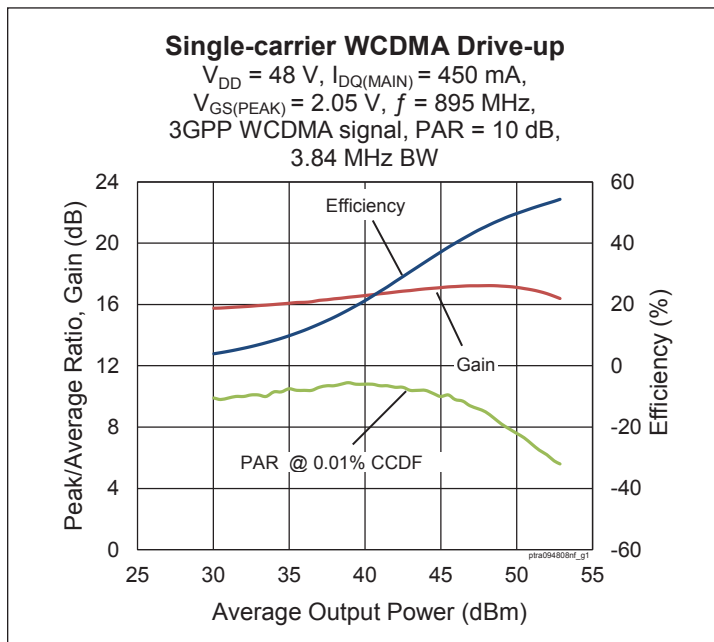
Thermally-Enhanced High Power RF LDMOS FET 480 W, 48 V, 859 – 960 MHz

Description

The PTRA094808NF is a 480-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 859 to 960 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.



PTRA094808NF
Package PG-HBSOF-6-2



Features

- Broadband internal input and output matching
- Asymmetrical design
 - Main : $P_{1dB} = 210\text{ W Typ}$
 - Peak : $P_{1dB} = 340\text{ W Typ}$
- Typical Pulsed CW performance, 896 MHz, 48 V, Doherty configuration
 - Output power at $P_{1dB} = 300\text{ W}$
 - Output power at $P_{3dB} = 420\text{ W}$
 - Efficiency = 53%
 - Gain = 17.5 dB
- Capable of handling 10:1 VSWR @ 48 V, 100 W (CW) output power
- Integrated ESD protection
- Human Body Model class 1C (per ANSI/ESDA/ JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

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

$V_{DD} = 48\text{ V}$, $I_{DQ} = 450\text{ mA}$, $V_{GS(PEAK)} = 2.05\text{ V}$, $P_{OUT} = 87\text{ W avg}$, $f = 895\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

| Characteristic | Symbol | Min | Typ | Max | Unit |
|------------------------------|----------|------|-------|-------|------|
| Linear Gain | G_{ps} | 16.5 | 17.5 | — | dB |
| Drain Efficiency | η_D | 48.5 | 52.5 | — | % |
| Adjacent Channel Power Ratio | ACPR | — | -30.5 | -26.5 | dBc |
| Output PAR@0.01% CCDF | OPAR | 7.1 | 7.5 | — | 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 | $V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 1 | μA |
| | $V_{DS} = 105\text{ V}, V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 10 | μA |
| Gate Leakage Current | $V_{GS} = 14\text{ V}, V_{DS} = 0\text{ V}$ | I_{GSS} | — | — | 1 | μA |
| On-State Resistance (Main) | $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 0.08 | — | Ω |
| | (Peak) $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 0.05 | — | Ω |
| Operating Gate Voltage (Main) | $V_{DS} = 48\text{ V}, I_{DQ} = 0.45\text{ A}$ | V_{GS} | 3 | 3.5 | 4 | V |
| | (Peak) $V_{DS} = 48\text{ V}, I_{DQ} = 0\text{ A}$ | V_{GS} | — | 2.05 | — | 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 | $^{\circ}\text{C}$ |

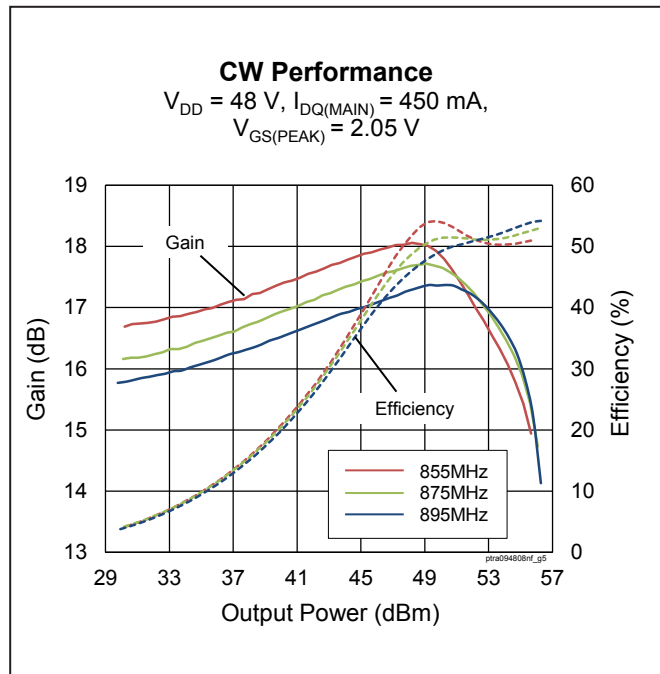
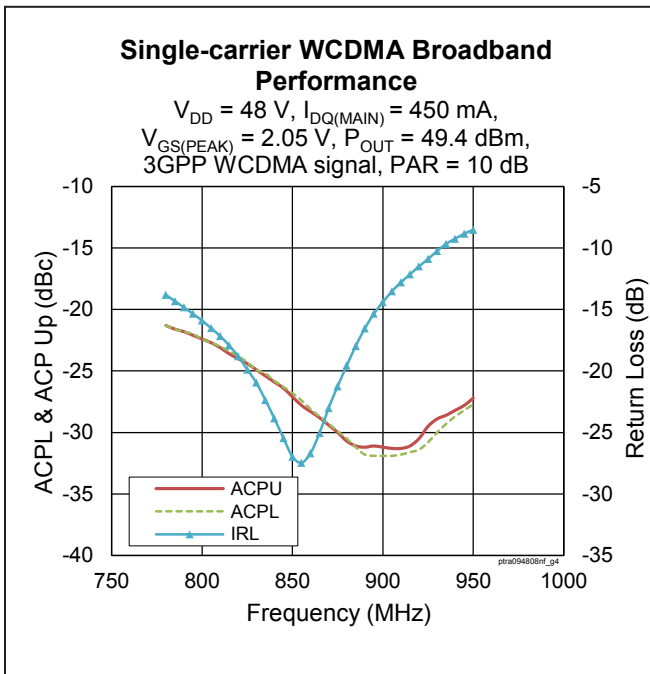
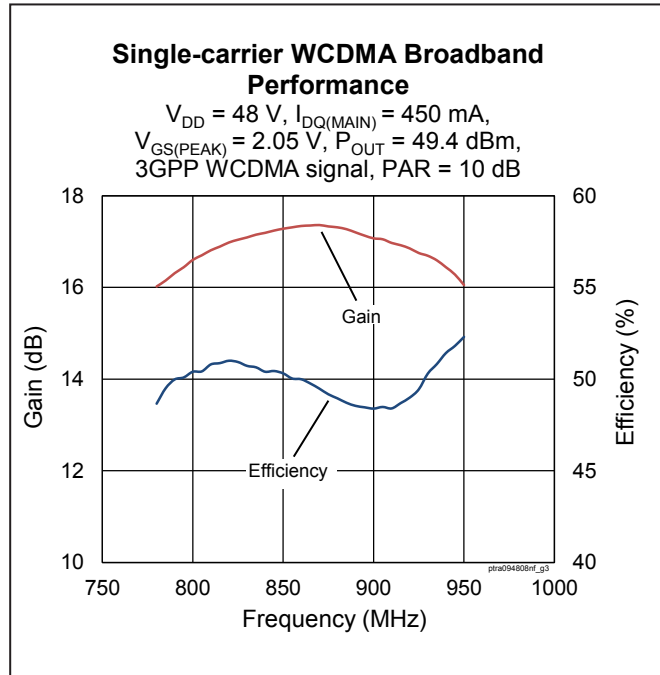
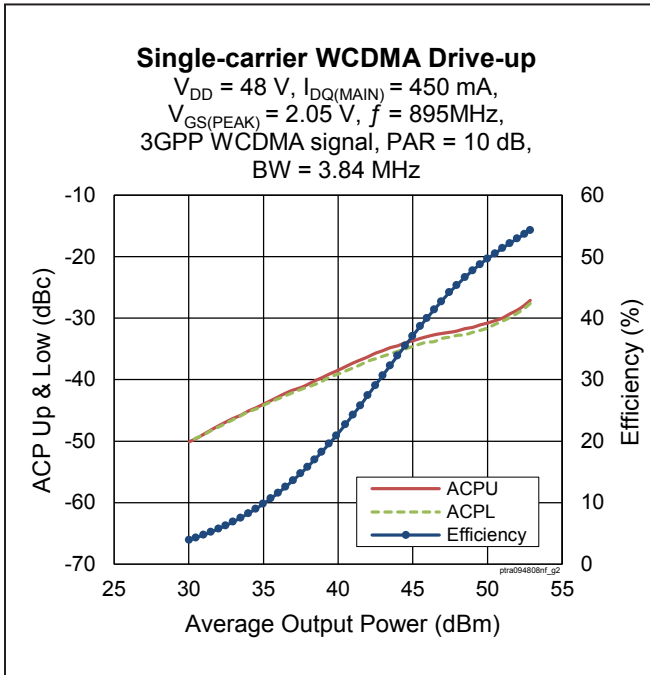
Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|----------------------|
| Thermal Resistance (Main, $T_{CASE} = 70^{\circ}\text{C}$, 87.1 W CW) | $R_{\theta JC}$ | 0.51 | $^{\circ}\text{C/W}$ |

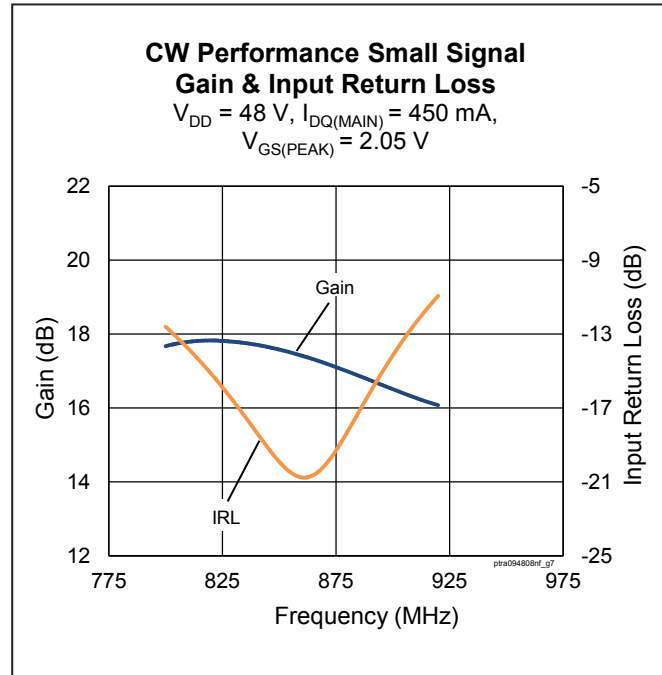
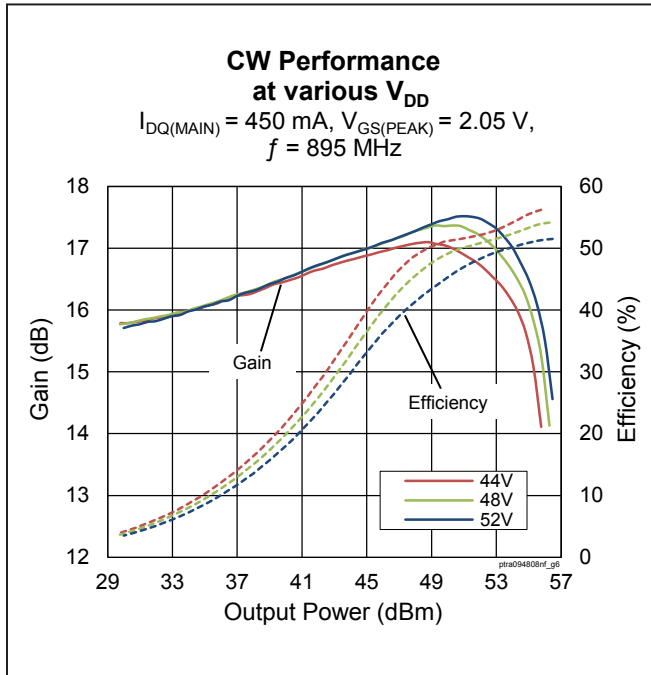
Ordering Information

| Type and Version | Order Code | Package Description | Shipping |
|--------------------|-----------------------|---------------------|----------------------|
| PTRA094808NF V1 R5 | PTRA094808NFV1R5XUMA1 | PG-HBSOF-6-2 | Tape & Reel, 500 pcs |

Typical RF Performance (data taken in production test fixture)



Typical RF Performance (cont.)



Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10 μ sec, 10% duty cycle, $V_{DD} = 48$ V, $I_{DQ} = 350$ mA, class AB

| | | P_{1dB} | | | | | | | | | |
|-------------------|--|--|------------------|------------------------------|----------------------------|-------------------------------|--|------------------|------------------------------|----------------------------|-------------------------------|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [Ω] | Z_I [Ω] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | ηD [%] | Z_I [Ω] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | ηD [%] |
| 865 | 1.4-j4.1 | 1.93-j1.35 | 20.25 | 53.40 | 219 | 57.4 | 4.16-j0.34 | 22.1 | 51.50 | 141 | 67.2 |
| 880 | 1.6-j4.65 | 1.67-j1.24 | 19.8 | 53.40 | 219 | 54.6 | 4.0-j0.5 | 22.1 | 51.50 | 141 | 67.7 |
| 895 | 2.0-j4.33 | 1.87-j1.62 | 20 | 53.37 | 217 | 56.7 | 4.08-j0.33 | 22 | 51.37 | 137 | 67.6 |

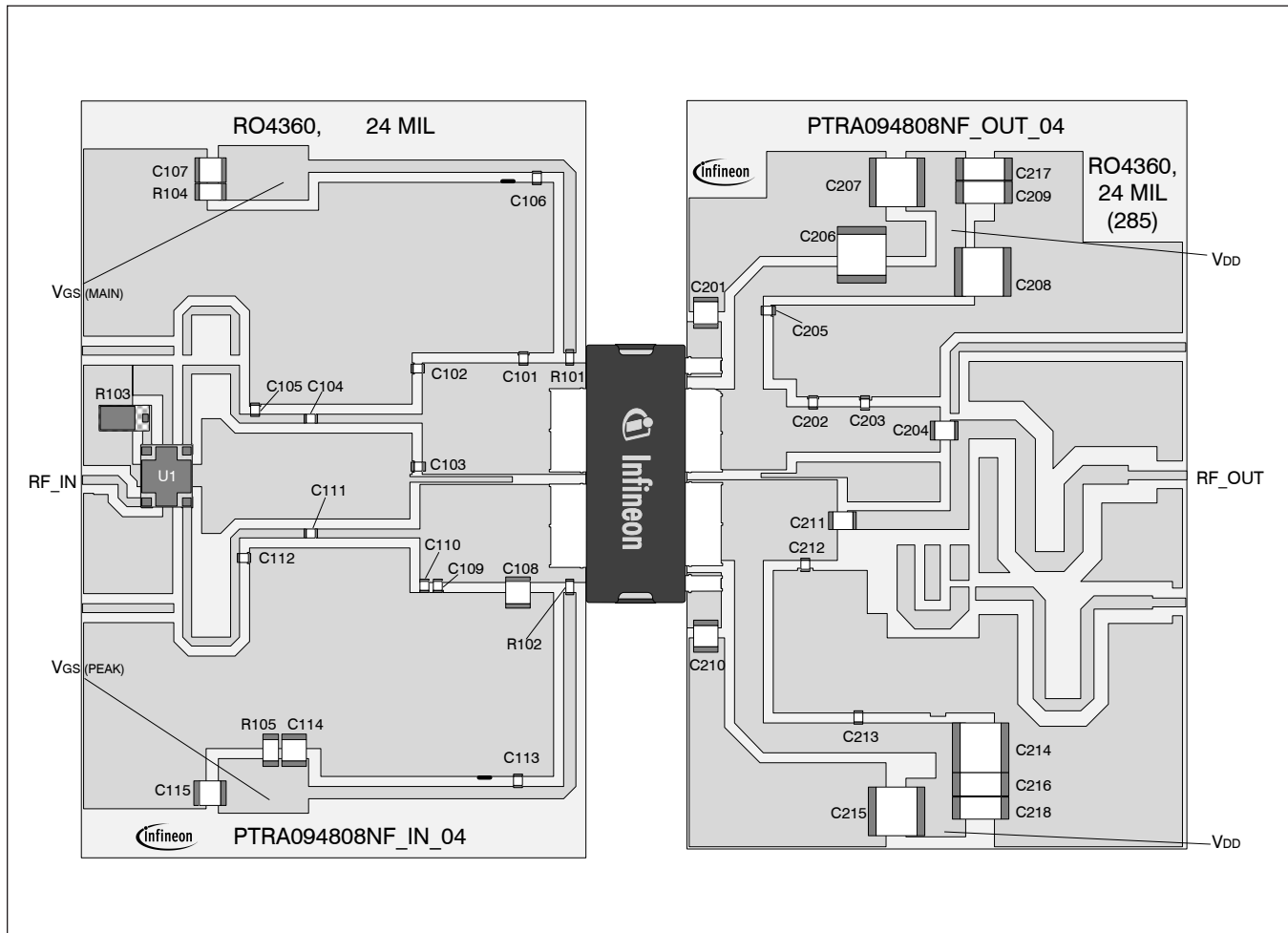
| | | P_{3dB} | | | | | | | | | |
|-------------------|--|--|------------------|------------------------------|----------------------------|-------------------------------|--|------------------|------------------------------|----------------------------|-------------------------------|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [Ω] | Z_I [Ω] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | ηD [%] | Z_I [Ω] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | ηD [%] |
| 865 | 1.4-j4.1 | 2.09-1.87 | 18.4 | 54.30 | 270 | 61.8 | 3.8+0 | 20 | 52.62 | 182 | 69.1 |
| 880 | 1.6-j4.65 | 1.87-1.73 | 18 | 54.20 | 263 | 58.7 | 3.56+0.05 | 19.85 | 52.67 | 184 | 69.5 |
| 895 | 2.0-j4.33 | 1.81-1.78 | 17.9 | 54.20 | 263 | 59.1 | 3.33+0.04 | 19.73 | 52.65 | 184 | 69.43 |

Peak Side Load Pull Performance – Pulsed CW signal: 10 μ sec, 10% duty cycle, $V_{DD} = 48$ V, $V_{GS(PEAK)} = 2$ V, class C

| | | P_{1dB} | | | | | | | | | |
|-------------------|--|--|------------------|------------------------------|----------------------------|-------------------------------|--|------------------|------------------------------|----------------------------|-------------------------------|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [Ω] | Z_I [Ω] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | ηD [%] | Z_I [Ω] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | ηD [%] |
| 865 | 1.57-j3.71 | 1.17-j1.97 | 16 | 55.80 | 380 | 58.8 | 1.01-j0.55 | 17.1 | 53.17 | 207 | 71.1 |
| 880 | 1.58-j3.55 | 1.15-j3.55 | 16 | 55.70 | 372 | 59.0 | 1.08-j0.83 | 17 | 53.70 | 234 | 70.9 |
| 895 | 1.82-3.82 | 1.14-j2.05 | 16 | 55.84 | 384 | 60.9 | 1.11-j1.04 | 16.9 | 54.10 | 257 | 71.1 |

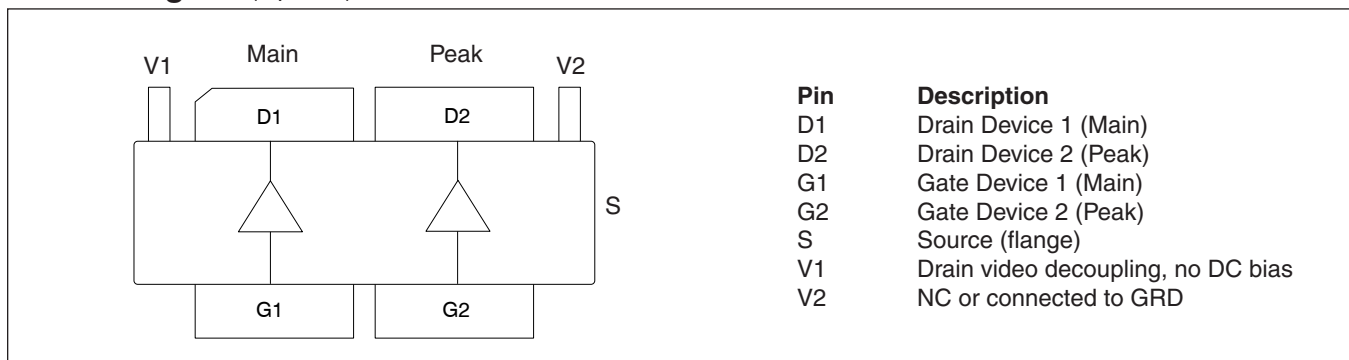
| | | P_{3dB} | | | | | | | | | |
|-------------------|--|--|------------------|------------------------------|----------------------------|-------------------------------|--|------------------|------------------------------|----------------------------|-------------------------------|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [Ω] | Z_I [Ω] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | ηD [%] | Z_I [Ω] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | ηD [%] |
| 865 | 1.57-j3.71 | 1.2-1.97 | 14 | 56.68 | 466 | 61.9 | 1.17-0.93 | 15.1 | 55.12 | 325 | 71.2 |
| 880 | 1.58-j3.55 | 1.32-2.11 | 13.8 | 56.46 | 443 | 60.6 | 1.15-1.05 | 15 | 55.00 | 316 | 70.7 |
| 895 | 1.82-3.82 | 1.19-2.09 | 13.9 | 56.59 | 456 | 62.4 | 1.05-1.04 | 14.8 | 54.72 | 296 | 71.0 |

Reference Circuit, 869 – 894 MHz



Reference circuit assembly diagram (not to scale)

Pinout Diagram (top view)



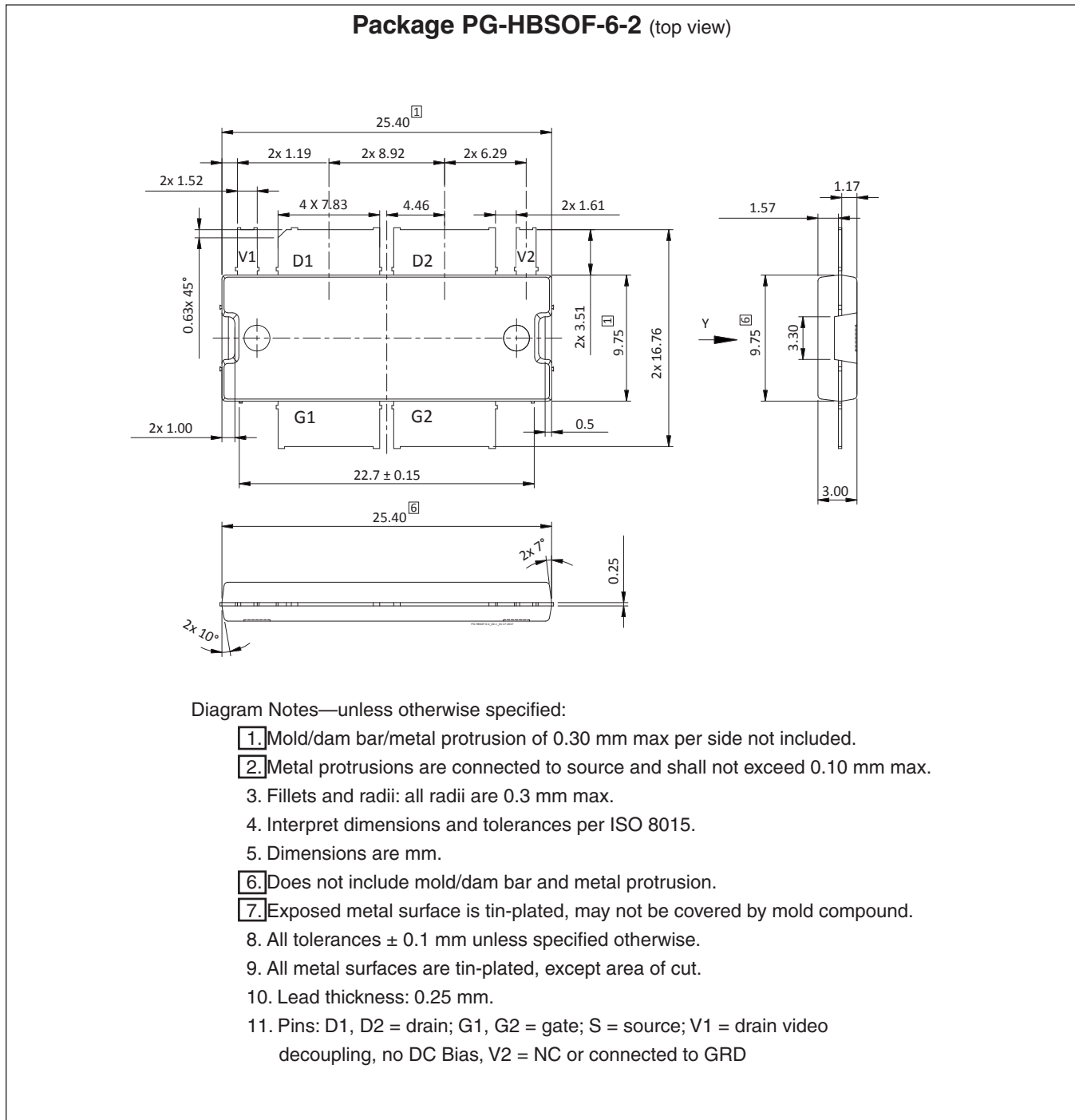
Reference Circuit (cont.)
Reference Circuit Assembly

| | |
|---|---|
| DUT | PTRA094808NF V1 |
| Test Fixture Part No. | LTA/PTRA094808NF V1 |
| PCB | Rogers 4360, 0.609 mm [0.024"] thick, 2 oz. copper, $\epsilon_r = 6.15$, $f = 869 - 894$ MHz |
| Find Gerber files for this test fixture on the Infineon Web site at http://www.infineon.com/rfpower | |

Components Information

| Component | Description | Manufacturer | P/N |
|------------------------------|-----------------------------|---------------------------------|---------------------|
| Input | | | |
| C101 | Capacitor, 6.8 pF | ATC | ATC600F6R8BT250T |
| C102 | Capacitor, 2.7 pF | ATC | ATC600F2R7BT250T |
| C103, C105 | Capacitor, 1.8 pF | ATC | ATC600F1R8BT250T |
| C104, C111 | Capacitor, 33 pF | ATC | ATC600F330JT250T |
| C106, C113 | Capacitor, 68 pF | ATC | ATC600F680JT250T |
| C107, C114, C115 | Capacitor, 10 μ F | Taiyo Yuden | UMK325C7106MM-T |
| C108 | Capacitor, 8.2 pF | ATC | ATC100B8R2BT500XB |
| C109 | Capacitor, 2.0 pF | ATC | ATC600F2R0BT250T |
| C110 | Capacitor, 1.0 pF | ATC | ATC600F1R0BT250T |
| C112 | Capacitor, 3.3 pF | ATC | ATC600F3R3BT250T |
| R101, R102 | Resistor, 5.6 ohms | Panasonic Electronic Components | ERJ-8RQJ5R6V |
| R103 | Resistor, 50 ohms | ANAREN | C16A50Z4 |
| R104, R105 | Resistor, 1000 ohms | Panasonic Electronic Components | ERJ-8GEYJ102V |
| U1 | Hybrid Coupler | CEMAX | CMX09Q02 |
| Output | | | |
| C201, C210 | Capacitor, 10 μ F | Taiyo Yuden | UMK325C7106MM-T |
| C202 | Capacitor, 10 pF | ATC | ATC600F100JT250T |
| C203 | Capacitor, 1.5 pF | ATC | ATC600F1R5CT250T |
| C204 | Capacitor, 20 pF | ATC | ATC100B200JT500XB |
| C205 | Capacitor, 68 pF | ATC | ATC600F680JT250T |
| C206, C207, C208, C214, C215 | Capacitor, 10 μ F, 50V | Taiyo Yuden | UMK325C7106MM-T |
| C209, C216, C217, C218 | Capacitor, 10 μ F, 100V | TDK Corporation | C5750X7S2A106M230KB |
| C211 | Capacitor, 47 pF | ATC | ATC100B470JT500XB |
| C212 | Capacitor, 12 pF | ATC | ATC600F120JT250T |
| C213 | Capacitor, 47 pF | ATC | ATC600F470JT250T |

Package Outline Specifications



Find the latest and most complete information about products and packaging at the Infineon Internet page <http://www.infineon.com/rfpower>

Package Outline Specifications

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

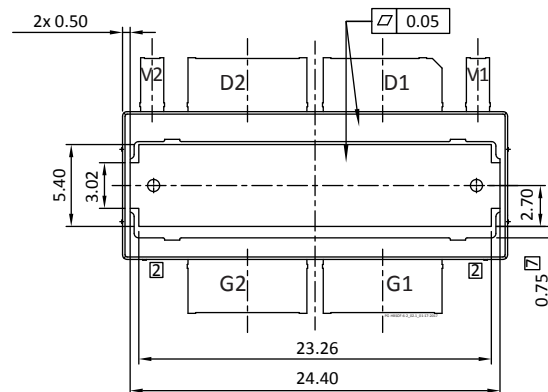


Diagram Notes—unless otherwise specified:

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 ± 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; S = source; V1 = drain video decoupling, no DC Bias, V2 = NC or connected to GRD

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Revision History

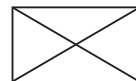
| Revision | Date | Data Sheet Type | Page | Subjects (major changes since last revision) |
|----------|------------|-----------------|------|---|
| 01 | 2016-09-30 | Advance | All | Data Sheet reflects advance specification for product development |
| 02 | 2017-04-28 | Production | All | Data Sheet reflects released product specification |
| 03 | 2017-08-21 | Production | 6, 7 | Updated PCB layout and components information |

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