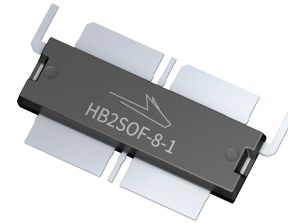


PXAE183708NB

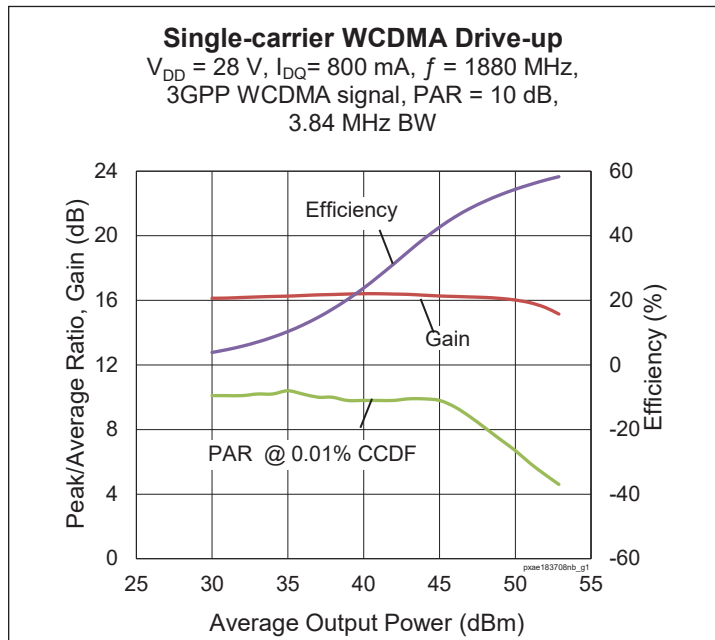
Thermally-Enhanced High Power RF LDMOS FET 320 W, 28 V, 1805 – 1880 MHz

Description

The PXAE183708NB is a 320-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 1805 to 1880 MHz frequency band. Features include input and output matching, high gain and thermally-enhanced package with earless flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PXAE183708NB
Package PG-HB2SOF-8-1



Features

- Broadband internal input and output matching
- Asymmetrical Doherty design
 - Main: $P_{3dB} = 160\text{ W Typ}$
 - Peak: $P_{3dB} = 315\text{ W Typ}$
- Typical Pulsed CW performance, 1880 MHz, 28 V, Doherty configuration, 10 μs pulse width, 10% duty cycle, Class AB (main), Class C (peak)
 - Output power at $P_{1dB} = 320\text{ W}$
 - Output power at $P_{3dB} = 430\text{ W}$
 - Drain efficiency = 60%
 - Gain = 13.5 dB
- Capable of handling 10:1 VSWR @ 28 V, 54 W (1C WCDMA) output power
- Human Body Model Class 2 (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 Wolfspeed Doherty production test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 800\text{ mA}$, $P_{OUT} = 54\text{ W avg}$, $V_{GSPK} = 1.5\text{ V}$, $f = 1880\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|----------|------|-------|-----|------|
| Gain | G_{ps} | 15.3 | 16 | — | dB |
| Drain Efficiency | η_D | 48 | 50.5 | — | % |
| Adjacent Channel Power Ratio | ACPR | — | -29.5 | -25 | dBc |
| Output PAR at 0.01% probability on CCDF | OPAR | 6.8 | 7.7 | — | dB |

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 | $V_{GS} = 0\text{ V}, I_{DS} = 10\text{ mA}$ | $V_{(BR)DSS}$ | 65 | — | — | V |
| Drain Leakage Current | $V_{DS} = 28\text{ V}, V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 1 | μA |
| | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 10 | μA |
| Gate Leakage Current | $V_{GS} = 10\text{ V}, V_{DS} = 0\text{ V}$ | 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) $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 0.04 | — | Ω |
| Operating Gate Voltage (main) | $V_{DS} = 28\text{ V}, I_{DQ} = 800\text{ mA}$ | V_{GS} | 2.7 | 2.9 | 3.3 | V |
| | (peak) $V_{DS} = 28\text{ V}, I_{DQ} = 0\text{ mA}$ | V_{GS} | — | 1.5 | — | V |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---------------------------|-----------|-------------|--------------------|
| Drain-Source Voltage | V_{DSS} | 65 | V |
| Gate-Source Voltage | V_{GS} | -6 to +10 | V |
| Operating Voltage | V_{DD} | 0 to +32 | V |
| Junction Temperature | T_J | 225 | $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{STG} | -65 to +150 | $^{\circ}\text{C}$ |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|-----------------|-------|----------------------|
| Thermal Resistance (Main, $T_{CASE} = 70^{\circ}\text{C}, 54\text{ W CW}$) | $R_{\theta JC}$ | 0.63 | $^{\circ}\text{C/W}$ |

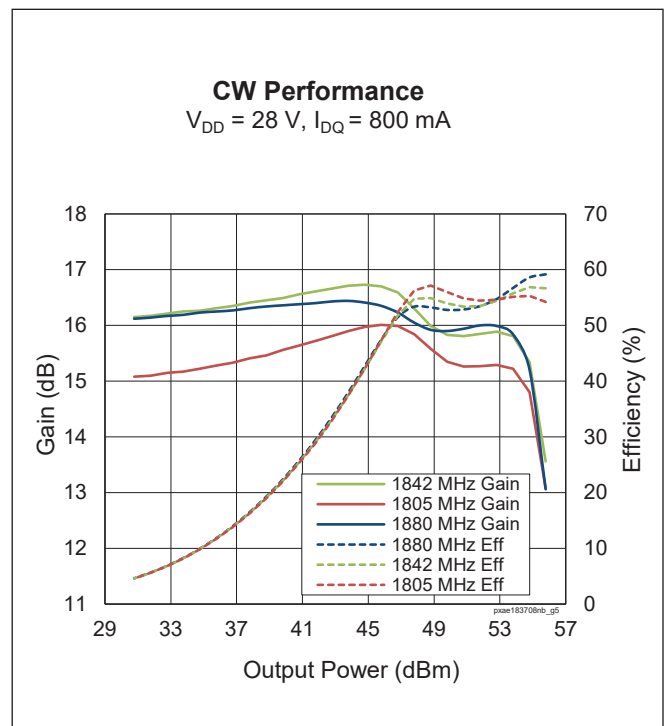
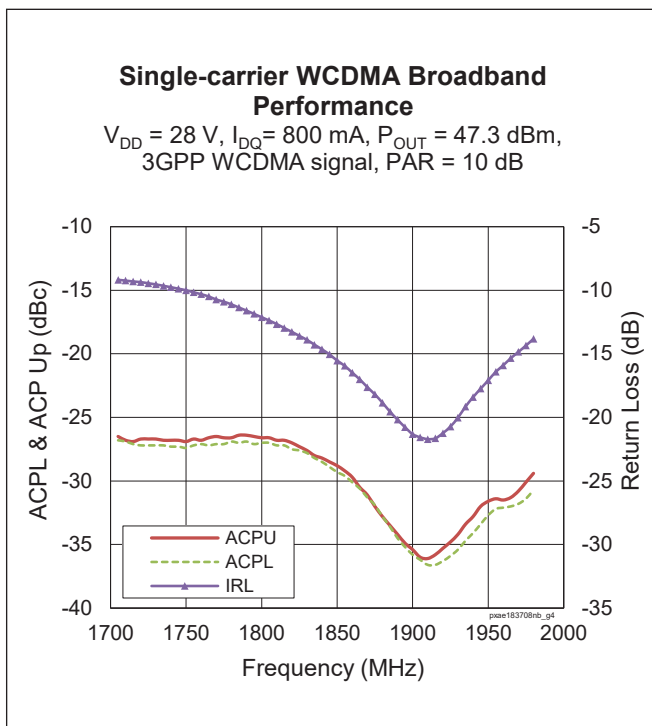
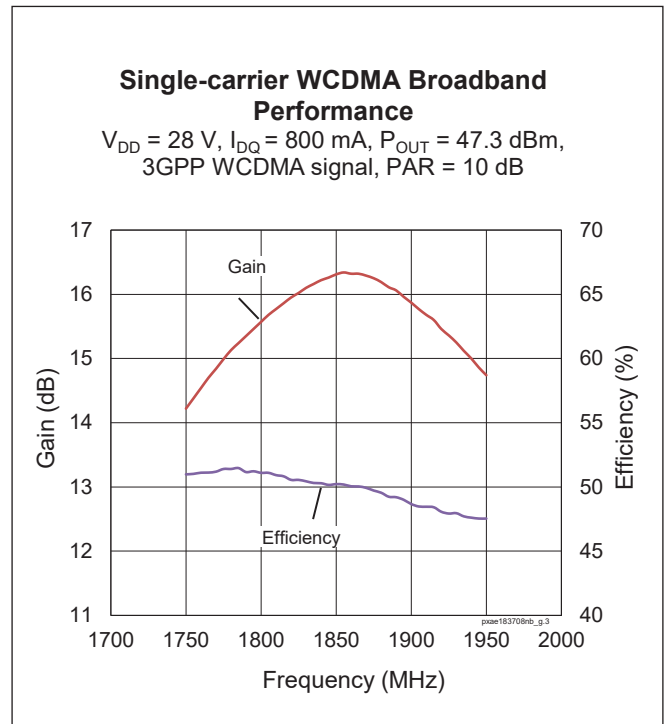
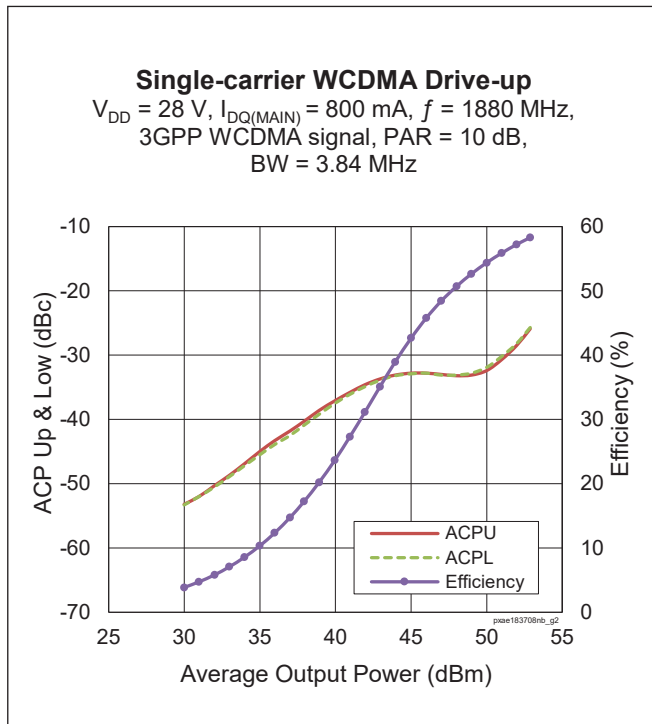
Moisture Sensitivity Level

| Level | Test Signal | Package Temperature | Unit |
|-------|---------------------|---------------------|--------------------|
| 3 | IPC/JEDEC J-STD-020 | 260 | $^{\circ}\text{C}$ |

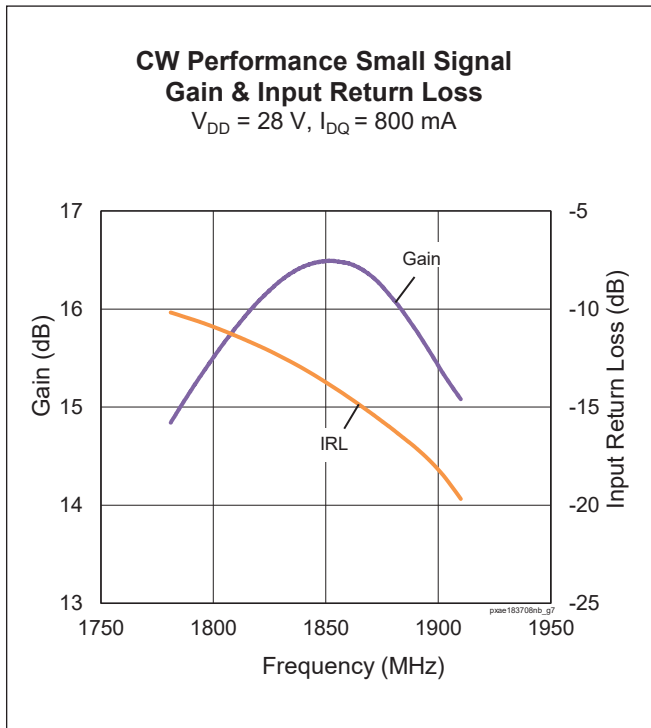
Ordering Information

| Type and Version | Order Code | Package | Shipping |
|--------------------|--------------------|---------------|----------------------|
| PXAE183708NB V1 R2 | PXAE183708NB-V1-R2 | PG-HB2SOF-8-1 | Tape & Reel, 250 pcs |

Typical Performance (data taken in test fixture)



Typical Performance (data taken in test fixture)



Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10 μ s, 10% duty cycle, 28 V, I_{DQ} = 850 mA, class AB

| | | P_{1dB} | | | | | | | | | |
|-------------------|--------------------------|--------------------------|------------------|------------------------------|----------------------------|--|-----------------------------|------------------|------------------------------|----------------------------|--|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [W] | Z_L [W] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | η_D [%] | Z_L [W] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | η_D [%] |
| 1805 | 4.4-j10.8 | 1.2-j2.5 | 19.4 | 52.30 | 171 | 57.6 | 2.4-j1.3 | 21.9 | 50.10 | 103 | 68.4 |
| 1842.5 | 7.4-j13.2 | 1.2-j2.7 | 19.2 | 52.30 | 170 | 56.7 | 2.1-j1.5 | 21.7 | 50.50 | 112 | 67.9 |
| 1880 | 16.8-j14.6 | 1.2-j2.9 | 19.3 | 52.20 | 165 | 55.9 | 2.1-j1.7 | 21.7 | 50.30 | 106 | 65.8 |

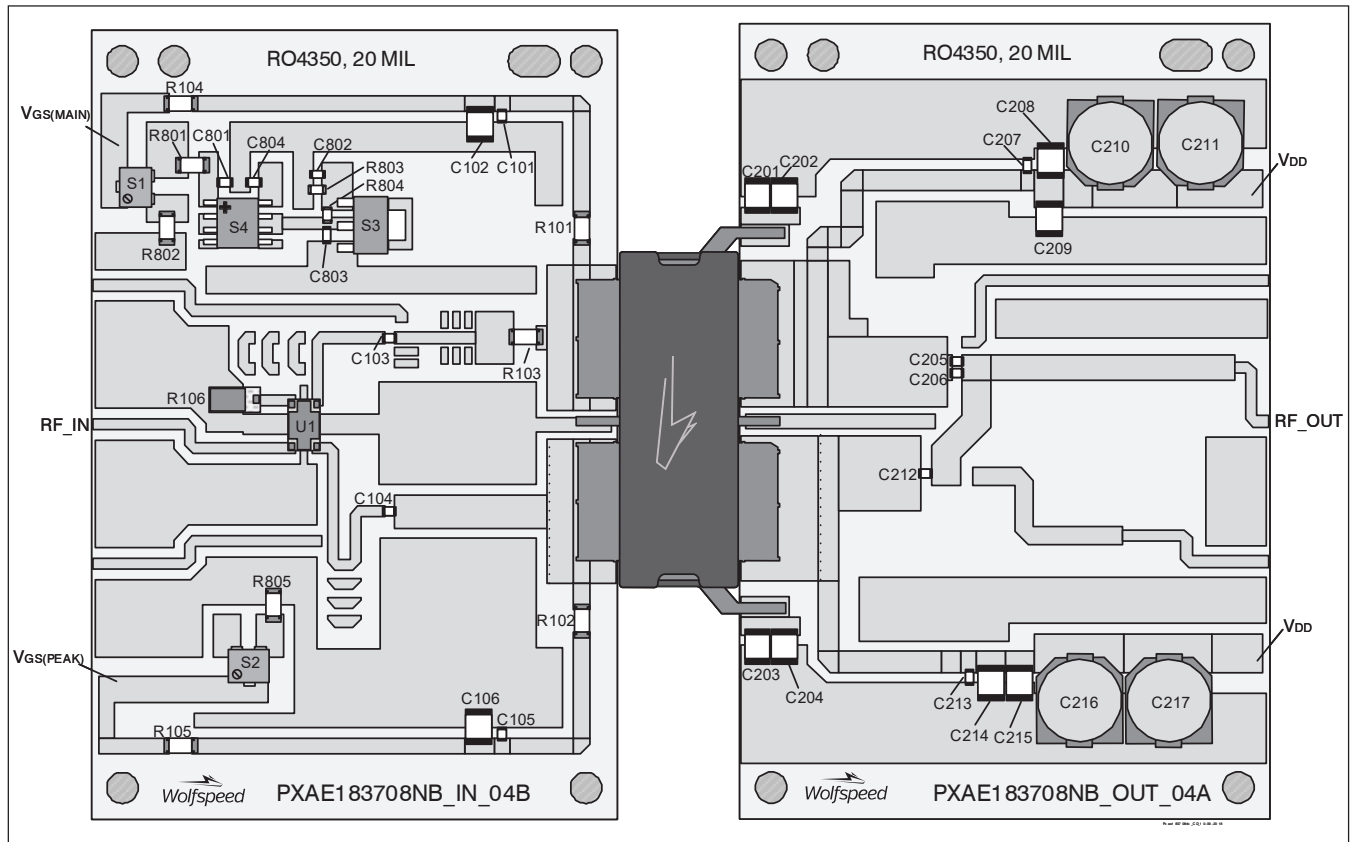
| | | P_{3dB} | | | | | | | | | |
|-------------------|--------------------------|--------------------------|------------------|------------------------------|----------------------------|--|-----------------------------|------------------|------------------------------|----------------------------|--|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [W] | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] |
| 1805 | 4.4-j10.8 | 1.2-j2.6 | 17.3 | 53.20 | 209 | 60.5 | 2.1-j1.9 | 19.3 | 51.90 | 155 | 71.0 |
| 1842.5 | 7.4-j13.2 | 1.2-j2.9 | 17.2 | 53.10 | 204 | 58.9 | 2.0-j1.7 | 19.5 | 51.60 | 144 | 70.6 |
| 1880 | 16.8-j14.6 | 1.3-j3.0 | 17.4 | 53.00 | 200 | 59.4 | 2.0-j1.9 | 19.4 | 51.60 | 143 | 69.0 |

Peak Side Load Pull Performance – Pulsed CW signal: 10 μ s, 10% duty cycle, 28 V, $V_{GS(PEAK)}$ = 2.4 V, class B

| | | P_{1dB} | | | | | | | | | |
|-------------------|--------------------------|--------------------------|------------------|------------------------------|----------------------------|--|-----------------------------|------------------|------------------------------|----------------------------|--|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [W] | Z_L [W] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | η_D [%] | Z_L [W] | Gain [dB] | P_{1dB} [dBm] | P_{1dB} [W] | η_D [%] |
| 1805 | 2.9-j6.7 | 2.0-j4.5 | 17.4 | 54.90 | 306 | 56.0 | 2.2-j1.7 | 18.9 | 52.20 | 164 | 69.1 |
| 1842.5 | 5.4-j7.1 | 2.4-j4.8 | 17.6 | 54.80 | 305 | 54.4 | 2.1-j2.1 | 19.2 | 52.60 | 181 | 69.0 |
| 1880 | 8.4-j4.2 | 2.4-j4.9 | 17.9 | 54.80 | 300 | 55.4 | 2.1-j2.2 | 19.3 | 52.20 | 166 | 68.3 |

| | | P_{3dB} | | | | | | | | | |
|-------------------|--------------------------|--------------------------|------------------|------------------------------|----------------------------|--|-----------------------------|------------------|------------------------------|----------------------------|--|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| Freq [MHz] | Z_s [W] | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] |
| 1805 | 2.9-j6.7 | 2.4-j4.6 | 15.3 | 55.70 | 369 | 59.1 | 2.6-j2.1 | 16.7 | 53.70 | 234 | 68.8 |
| 1842.5 | 5.4-j7.1 | 2.5-j4.8 | 15.6 | 55.60 | 366 | 57.7 | 2.6-j2.6 | 16.9 | 54.20 | 260 | 68.3 |
| 1880 | 8.4-j4.2 | 2.9-5.1 | 15.7 | 55.50 | 357 | 57.5 | 2.5-j2.7 | 17.1 | 53.90 | 245 | 68.4 |

Reference Circuit, 1805 – 1880 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit Assembly

| | |
|---|---|
| DUT | PXAE183708NB-V1 |
| Test Fixture Part No. | LTA/PXAE183708NB-V1 |
| PCB | Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$, $f = 1805 - 1800$ MHz |
| Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF | |

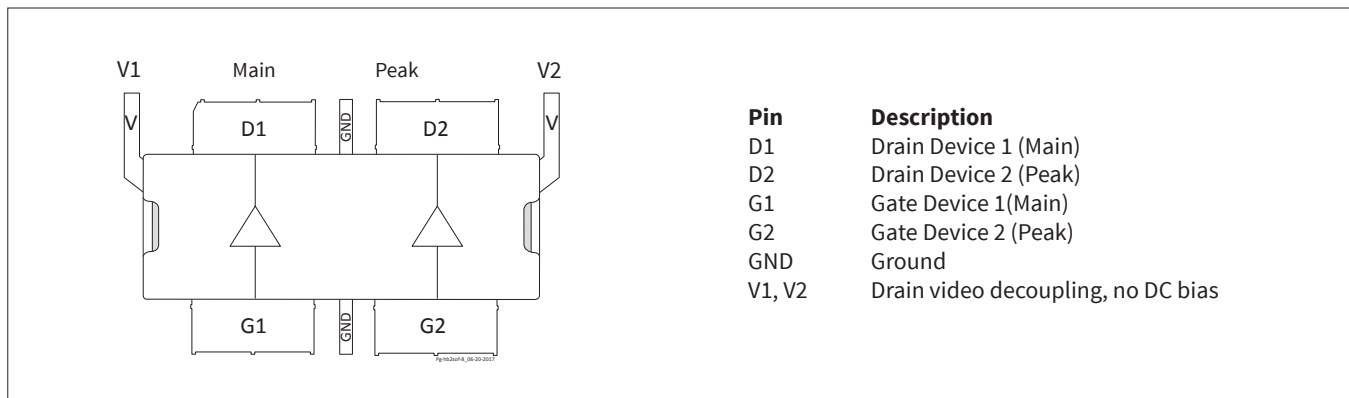


Reference Circuit, 1805 – 1880 MHz

Components Information

| Component | Description | Manufacturer | P/N |
|--|-------------------------|----------------------------------|---------------------|
| Input | | | |
| C101, C105 | Capacitor, 33 pF | ATC | ATC800A330JT250XT |
| C102, C106 | Capacitor, 10 μF, 50 V | Taiyo Yuden | UMK325C7106MM-T |
| C103, C104 | Capacitor, 22 pF | ATC | ATC800A220JT250XT |
| R101, R102 | Resistor, 5.1 ohms | Panasonic Electronic Components | ERJ-8GEYJ5R1V |
| R103, R104, R105 | Resistor, 10 ohms | Panasonic Electronic Components | ERJ-8GEYJ100V |
| R106 | Resistor, 50 ohms | Richardson | C16A50Z4 |
| C801, C802, C803, C804 | Capacitor, 1000 pF | Murata Electronics North America | GRM188R71H102KA01J |
| R801 | Resistor, 1K ohms | Panasonic Electronic Components | ERJ-8GEYJ102V |
| R802 | Resistor, 51 ohms | Panasonic Electronic Components | ERJ-8GEYJ510V |
| R803 | Resistor, 1.3K ohms | Panasonic Electronic Components | ERJ-3GEYJ132V |
| R804 | Resistor, 1.2K ohms | Panasonic Electronic Components | ERJ-3GEYJ122V |
| R805 | Resistor, 10 ohms | Panasonic Electronic Components | ERJ-8GEYJ100V |
| S1, S2 | Potentiometer, 2K ohms | Bourns Inc. | 3224W-1-202E |
| S3 | Voltage Regulator | Texas Instruments | LM78L05ACM |
| S4 | Transistor | Diodes Incorporated | BCP5616TA |
| U1 | Hybrid coupler | Anaren | X3C20F1-02S |
| Output | | | |
| C201, C202, C203, C204, C208, C209, C214, C215 | Capacitor, 10 μF, 100 V | TDK Corporation | C5750X7S2A106M230KB |
| C205, C206 | Capacitor, 2.4 pF | ATC | ATC800A2R4CT250XT |
| C207, C212, C213 | Capacitor, 33 pF | ATC | ATC800A330JT250XT |
| C210, C211, C216, C217 | Capacitor, 220 μF | Panasonic Electronic Components | EEE-FP1V221AP |

Pinout Diagram (top view)

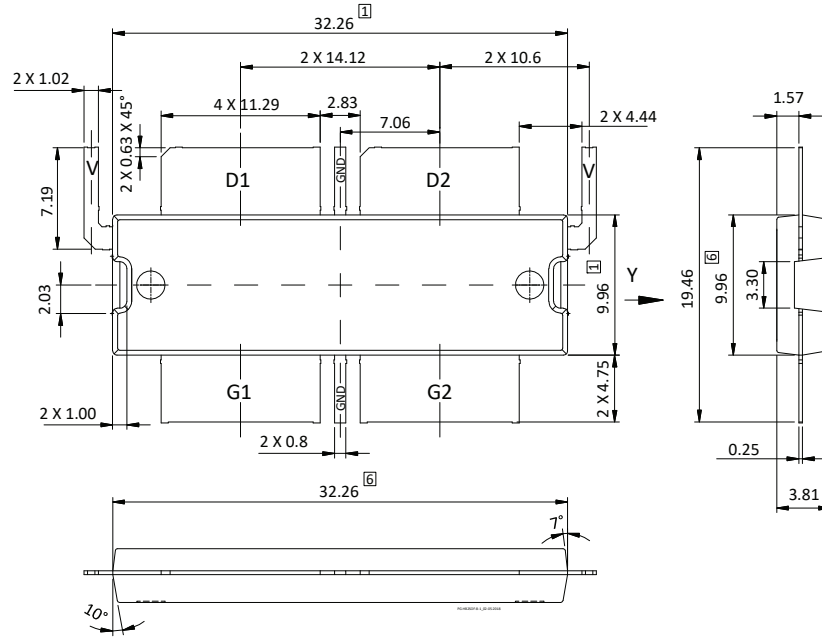


Lead connections for PXAE183708NB

Package Outline Specifications

Package PG-HB2SOF-8-1

Top and Side View



Bottom View

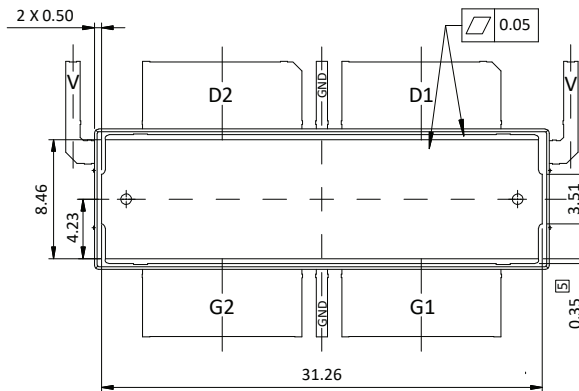


Diagram Notes—unless otherwise specified:

- 1. Mold/Dam Bar/Metal protusion of 0.30mm max per side not included.
- 2. Fillets and radii: all radii are 0.3 mm max unless specified otherwise
- 3. Interpret dimensions and tolerances per ISO 8015
- 4. Dimensions are mm
- 5. Exposed metal surface are tin plated, may not be covered by mold compound
- 6. Does not include mold/dam bar/metal protusion.
- 7. All tolerances ± 0.1 mm unless specified otherwise
- 9. All metal surfaces pre-plated, except area of cut
- 9. Lead thickness: 0.25 mm
- 10. Pins: D1, D2 – drain; G1, G2 – gate; GND – ground; V – Drain video decoupling, no DC bias



Revision History

| Revision | Date | Data Sheet Type | Page | Subjects (major changes since last revision) |
|----------|------------|-----------------|------|---|
| 01 | 2018-03-26 | Advance | All | Data Sheet reflects advance specification for product development |
| 02 | 2018-04-26 | Advance | All | Converted to Wolfspeed Data Sheet |
| 03 | 2019-02-07 | Production | All | Data Sheet reflects released product specification |

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Notes

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