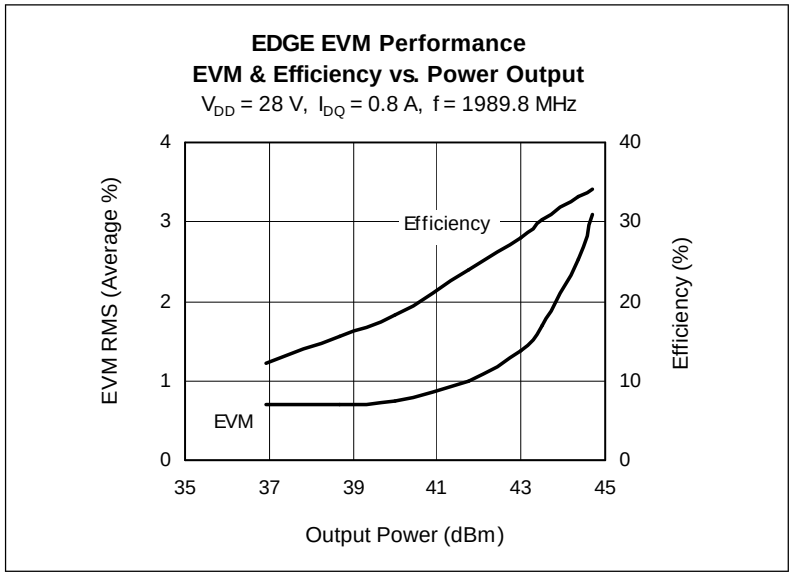
# LDMOS Field Effect Transistor
# 60 W, DCS/PCS Band
# 1805–1880 MHz, 1930–1990 MHz

## Description

The PTF180601 is a 60 W, internally matched *GOLDMOS* FET intended for EDGE applications in the DCS/PCS Band. Full gold metallization ensures excellent device lifetime and reliability.




## Features

- Broadband internal matching
- Typical two-tone performance
  - Average output power = 30 W
  - Gain = 16.5 dB
  - Efficiency = 35%
- Typical CW performance
  - Output power at P–1dB = 75 W
  - Gain = 15.5 dB
  - Efficiency = 47%
- Integrated ESD protection: Human Body Model, Class 1 (minimum)
- Excellent thermal stability
- Low HCI Drift
- Capable of handling 10:1 VSWR @ 28 V, 60 W (CW) output power

PTF180601C
Package 21248


PTF180601E
Package 30248


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

## RF Characteristics at $T_{CASE}$ = 25°C unless otherwise indicated

**EDGE Measurements** (not subject to production test—verified by design/characterization in Infineon test fixture)

$V_{DD}$ = 28 V, $I_{DQ}$ = 800 mA, $P_{OUT}$ = 22 W, f = 1989.8 MHz

| Characteristic | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Error Vector Magnitude | EVM (RMS) | — | 1.7 | — | % |
| Modulation Spectrum @ 400 KHz | ACPR | — | –60 | — | dBc |
| Modulation Spectrum @ 600 KHz | ACPR | — | –73 | — | dBc |
| Gain | $G_{ps}$ | — | 16.5 | — | dB |
| Drain Efficiency | $\eta_D$ | — | 32 | — | % |

**Two–Tone Measurements** (tested in Infineon test fixture)

$V_{DD}$ = 28 V, $I_{DQ}$ = 800 mA, $P_{OUT}$ = 60 W PEP, f = 1930 MHz, Tone Spacing = 1 MHz

| Characteristic | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Gain | $G_{ps}$ | 15 | 16.5 | — | dB |
| Drain Efficiency | $\eta_D$ | 30 | 35 | — | % |
| Intermodulation Distortion | IMD | — | –30 | –28 | dBc |

## Electrical Characteristics at $T_{CASE}$ = 25°C unless otherwise indicated

| Characteristic | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain–Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_{DS}$ = 10 µA | $V_{(BR)DSS}$ | 65 | — | — | V |
| Drain Leakage Current | $V_{DS}$ = 28 V, $V_{GS}$ = 0 V | $I_{DSS}$ | — | — | 1.0 | µA |
| On–State Resistance | $V_{GS}$ = 10 V, $V_{DS}$ = 0.1 V | $R_{DS(on)}$ | — | 0.135 | — | Ω |
| Operating Gate Voltage | $V_{DS}$ = 28 V, $I_{DQ}$ = 800 mA | $V_{GS}$ | 2.5 | 3.2 | 4.0 | V |
| Gate Leakage Current | $V_{GS}$ = 10 V, $V_{DS}$ = 0 V | $I_{GSS}$ | — | 0.01 | 1.0 | µA |

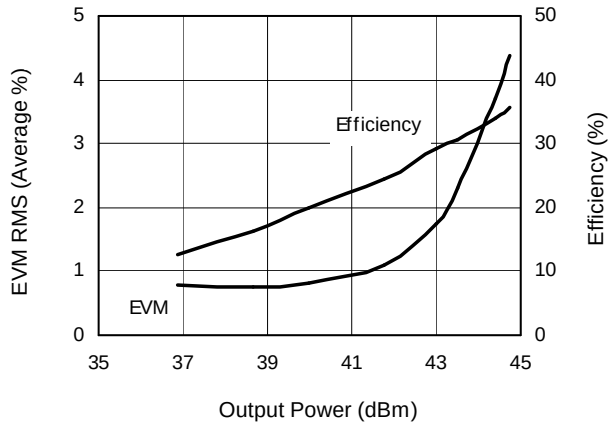
## Maximum Ratings

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain–Source Voltage | | $V_{DSS}$ | 65 | V |
| Gate–Source Voltage | | $V_{GS}$ | –0.5 to +12 | V |
| Junction Temperature | | $T_J$ | 200 | °C |
| Total Device Dissipation | PTF180601C | $P_D$ | 159 | W |
| Above 25°C derate by | | | 0.91 | W/°C |
| Total Device Dissipation | PTF180601E | $P_D$ | 180 | W |
| Above 25°C derate by | | | 1.03 | W/°C |
| Storage Temperature Range | | $T_{STG}$ | –40 to +150 | °C |
| Thermal Resistance | PTF180601C | $R_{\theta JC}$ | 1.1 | °C/W |
| ($T_{CASE}$ = 70°C, 60 W CW) | PTF180601E | | 0.97 | °C/W |

## Typical Performance (measurements taken in production test fixture, at $T_{CASE}$ = 25°C unless otherwise indicated)

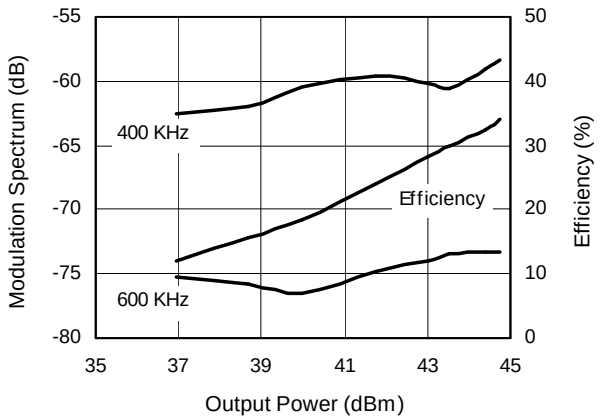
**EDGE EVM Performance at 26 V**

$V_{DD}$ = 26 V, $I_{DQ}$ = 0.8 A, f = 1989.8 MHz



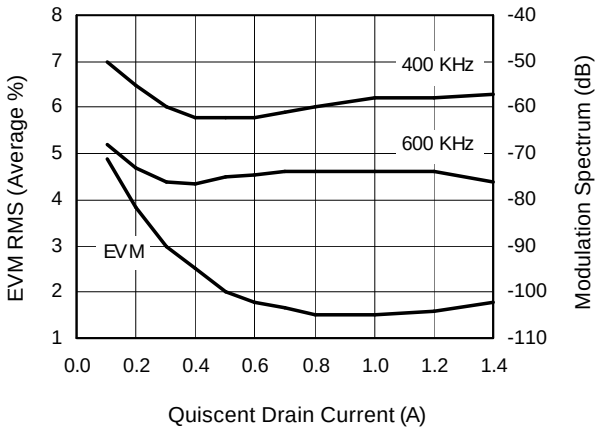

**EDGE Modulation Spectrum Performance Mod Spectrum vs. Power Output**

$V_{DD}$ = 28 V, $I_{DQ}$ = 0.8 A, f = 1989.8 MHz



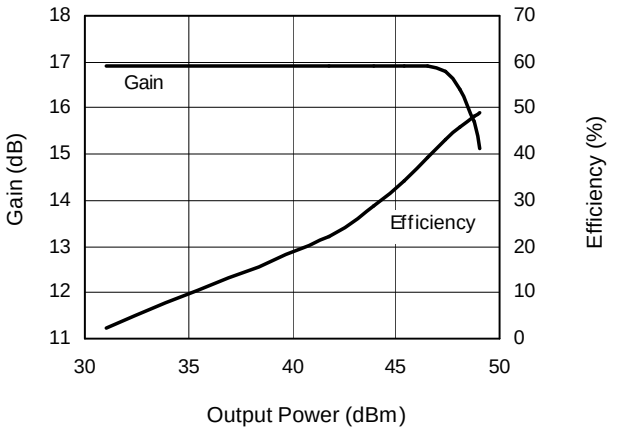

**EVM & Modulation Spectrum Performance**

f = 1989.8 MHz, Output Power = 22 W




**Gain & Efficiency vs. Output Power**

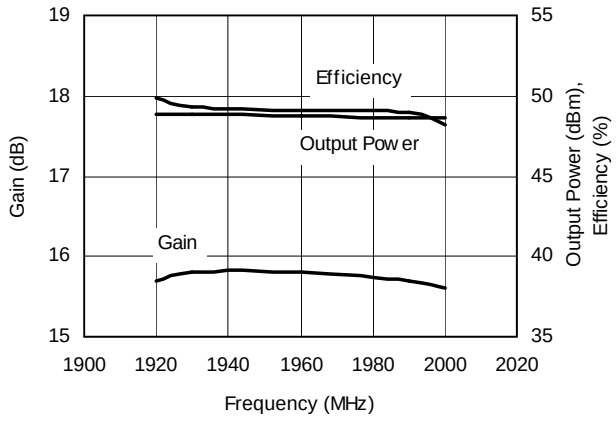
$V_{DD}$ = 28 V, $I_{DQ}$ = 0.8 A, f = 1990 MHz



## Typical Performance (cont.)

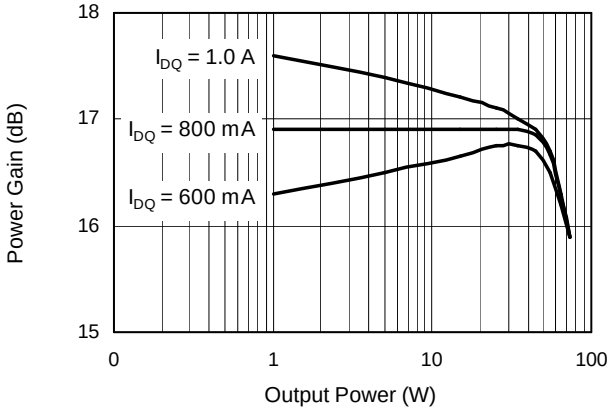
**Output Power, Gain & Efficiency (at P-1dB) vs. Frequency**

$V_{DD}$ = 28 V, $I_{DQ}$ = 0.8 A



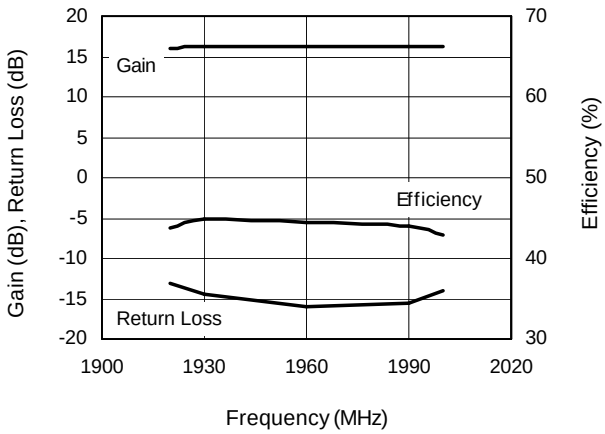

**Power Gain vs. Output Power**

$V_{DD}$ = 28 V, f = 1990 MHz



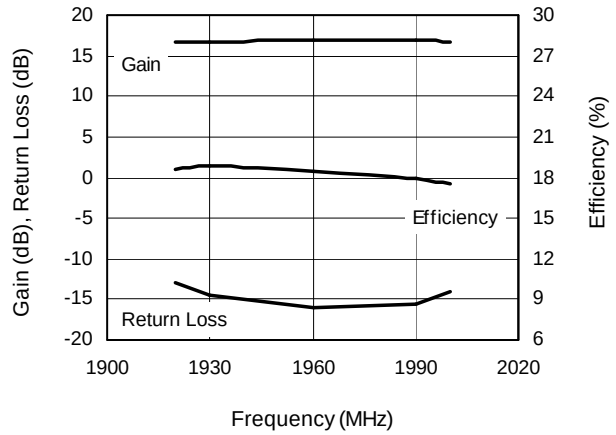

**Broadband Test Fixture Performance**

$V_{DD}$ = 28 V, $I_{DQ}$ = 0.8 A, $P_{OUT}$ = 60 W




**Broadband Test Fixture Performance**

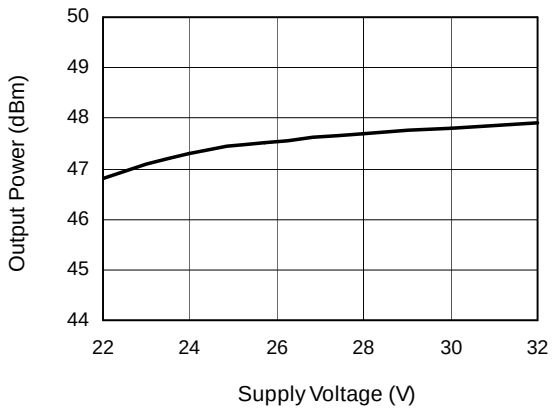
$V_{DD}$ = 28 V, $I_{DQ}$ = 0.8 A, $P_{OUT}$ = 10 W



## Typical Performance (cont.)

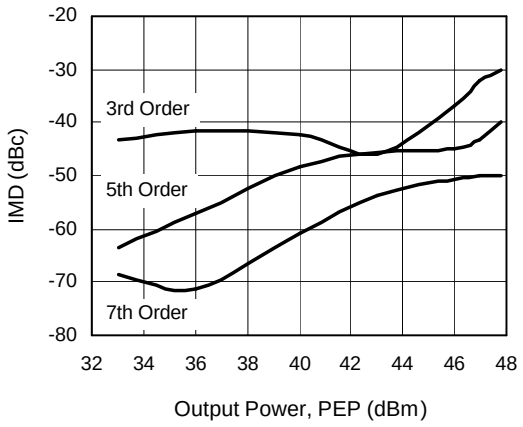
**Output Power vs. Supply Voltage**

$I_{DQ}$ = 0.8 A, f = 1990 MHz




**Intermodulation Distortion vs. Output Power**

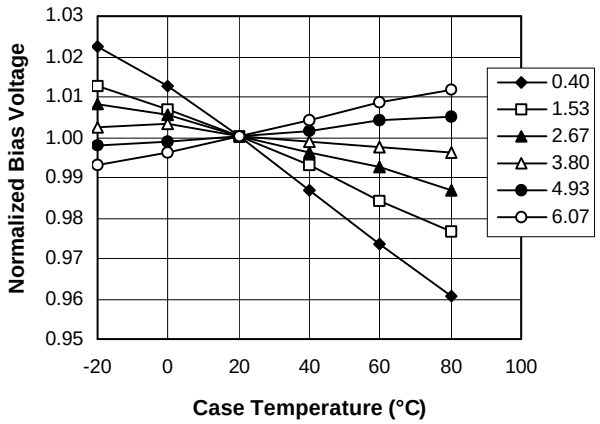
$V_{DD}$ = 28 V, $I_{DQ}$ = 0.8 A, $F_1$ = 1990 MHz, $F_2$ = 1991 MHz



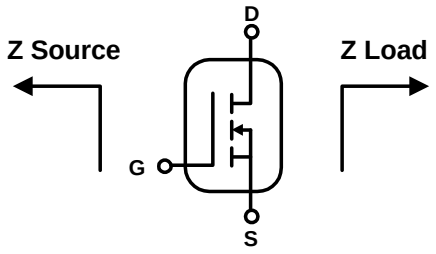

**Gate-Source Voltage vs. Case Temperature**

Voltage normalized to typical gate voltage.

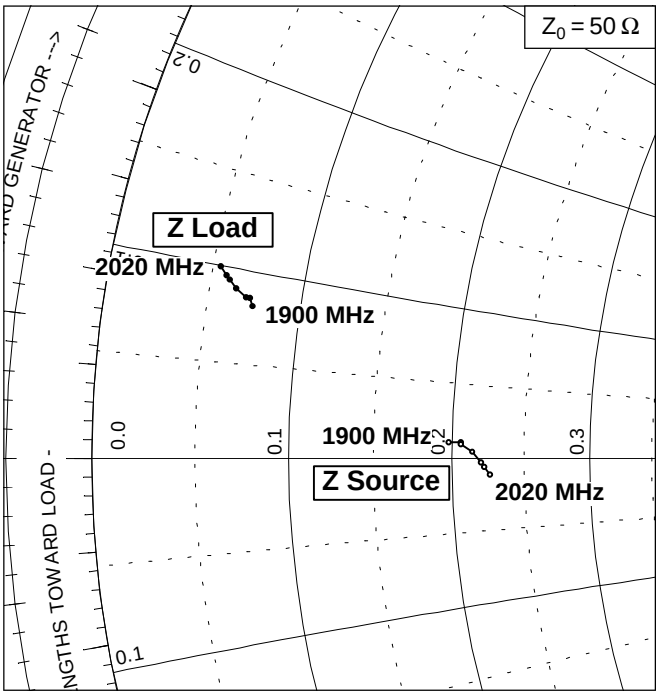
Series show current.



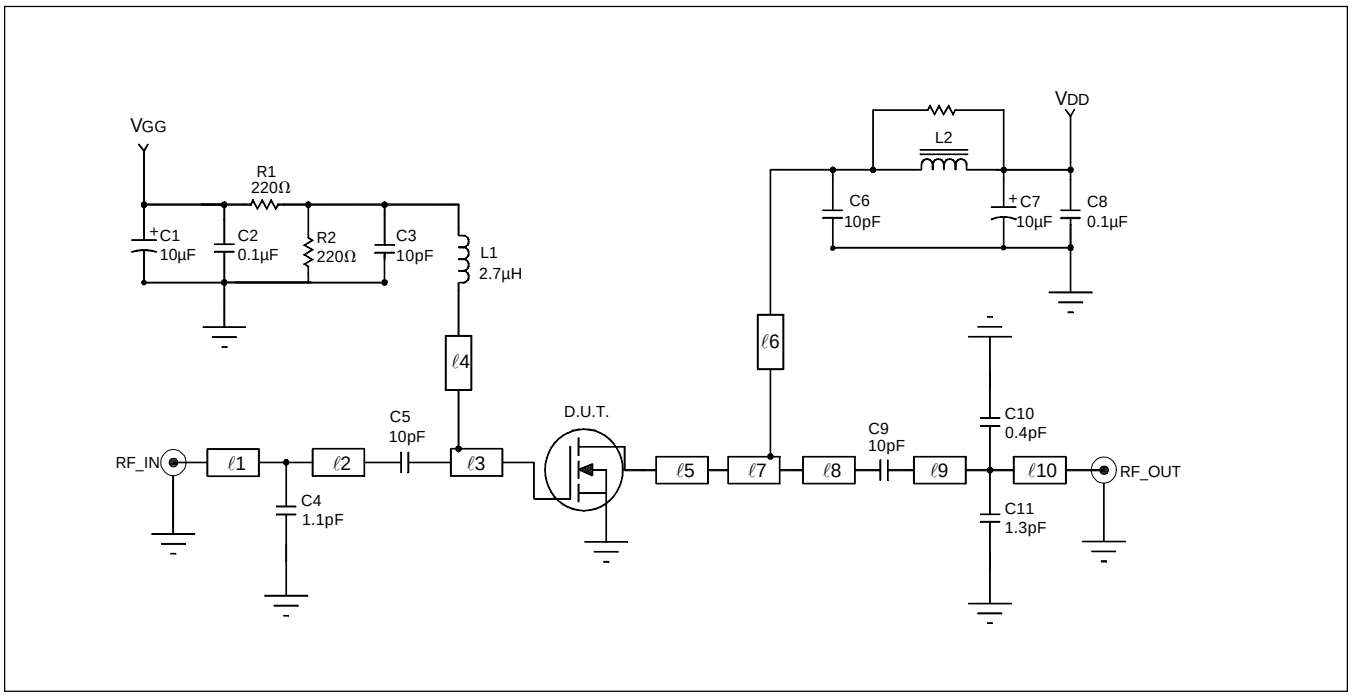
## Broadband Circuit Impedance Data




| Frequency | Z Source Ω | | Z Load Ω | |
|---|---|---|---|---|
| MHz | R | jX | R | jX |
| 1900 | 9.9 | 0.55 | 3.7 | 4.1 |
| 1920 | 10.3 | 0.56 | 3.6 | 4.3 |
| 1930 | 10.3 | 0.50 | 3.5 | 4.3 |
| 1960 | 10.7 | 0.23 | 3.2 | 4.5 |
| 1990 | 11.0 | –0.15 | 3.0 | 4.7 |
| 2000 | 11.1 | –0.30 | 2.9 | 4.8 |
| 2020 | 11.3 | –0.58 | 2.7 | 5.0 |

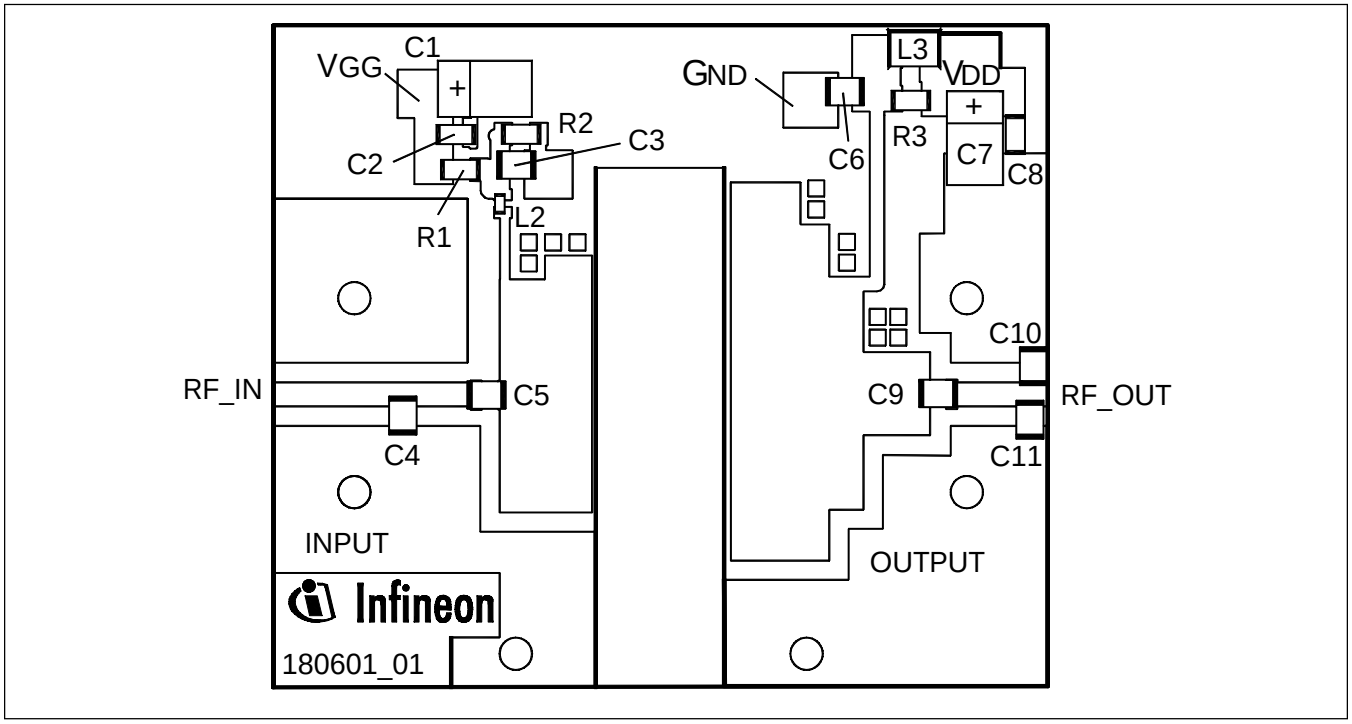



## Reference Circuit




*Reference Circuit Schematic for 1990 MHz*

## Reference Circuit (cont.)




*Reference circuit[1] (not to scale)*

Circuit Assembly Information

| | | | |
|---|---|---|---|
| DUT | PTF180601 | LDMOS Transistor | |
| PCB | 1.27 mm [0.050"] thick, $\varepsilon_r$ = 6.0 | TMM6 | 2 oz. copper, both sides |

| Microstrip | Electrical Characteristics at 1990 MHz | Dimensions: L x W (mm.) | Dimensions: L x W (in.) |
|---|---|---|---|
| $\ell$1 | 0.140 λ, 50 Ω | 10.16 x 1.88 | 0.400 x 0.074 |
| $\ell$2 | 0.068 λ, 50 Ω | 4.95 x 1.88 | 0.195 x 0.074 |
| $\ell$3 | 0.112 λ, 9.24 Ω | 7.14 x 18.31 | 0.281 x 0.721 |
| $\ell$4 | 0.064 λ, 78 Ω | 4.83 x 0.76 | 0.190 x 0.030 |
| $\ell$5 | 0.127 λ, 6.64 Ω | 8.13 x 26.42 | 0.320 x 1.040 |
| $\ell$6 | 0.206 λ, 65 Ω | 15.24 x 1.14 | 0.600 x 0.045 |
| $\ell$7 | 0.035 λ, 9 Ω | 2.54 x 18.16 | 0.100 x 0.715 |
| $\ell$8 | 0.077 λ, 21.87 Ω | 5.26 x 6.53 | 0.207 x 0.257 |
| $\ell$9 | 0.075 λ, 50 Ω | 5.46 x 1.88 | 0.215 x 0.074 |
| $\ell$10 | 0.023 λ, 50 Ω | 1.65 x 1.88 | 0.065 x 0.074 |

[1] *Gerber files for this circuit are available on request.*

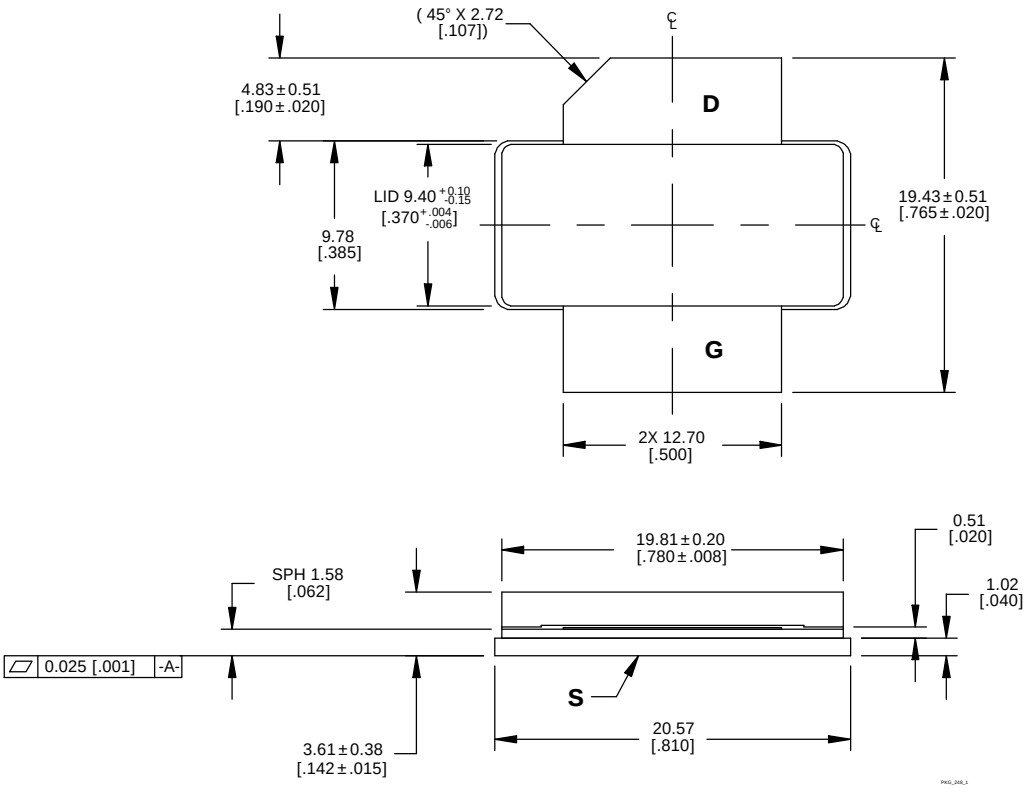
## Reference Circuit (cont.)

| Component | Description | Manufacturer | P/N or Comment |
|---|---|---|---|
| C1, C7 | Capacitor, 10 µF, 35 V, SMD | Digi-Key | PCS6106TR-ND<br>Tantalum TE Series |
| C2, C8 | Capacitor, 0.1 µF, 50 V | Digi-Key | PCC103BCT-ND |
| C3, C5, C6, C9 | Capacitor, 10 pF | ATC | 100B 100 |
| C4 | Capacitor, 1.1 pF | ATC | 100B 1R1 |
| C10 | Capacitor, 0.4 pF | ATC | 100B 0R4 |
| C11 | Capacitor, 1.3 pF | ATC | 100B 1R3 |
| L1 | Chip Inductor, 2.7 µH | Digi-Key | PCD1287CT-ND |
| L2 | Ferrite, 6 mm | Philips | 53/3/4.6-452 |
| R1, R2 | Resistor, 220 Ω | Digi-Key | P220ECT |
| R3 | Resistor, 1.0 Ω | Digi-Key | 1.0 PCT |

## Package Outline Specifications

| Type | Package Outline | Package Description | Marking |
|---|---|---|---|
| PTF180601C | 21248 | Earless ceramic | PTF180601C |
| PTF180601E | 30248 | Thermally enhanced, flange mount | PTF180601E |

### Package 21248




Notes: Unless otherwise specified

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. Pins: D = drain, S = source, G = gate
4. Lead thickness: 0.10 +0.051/–0.025 [.004 +.002/–.001]

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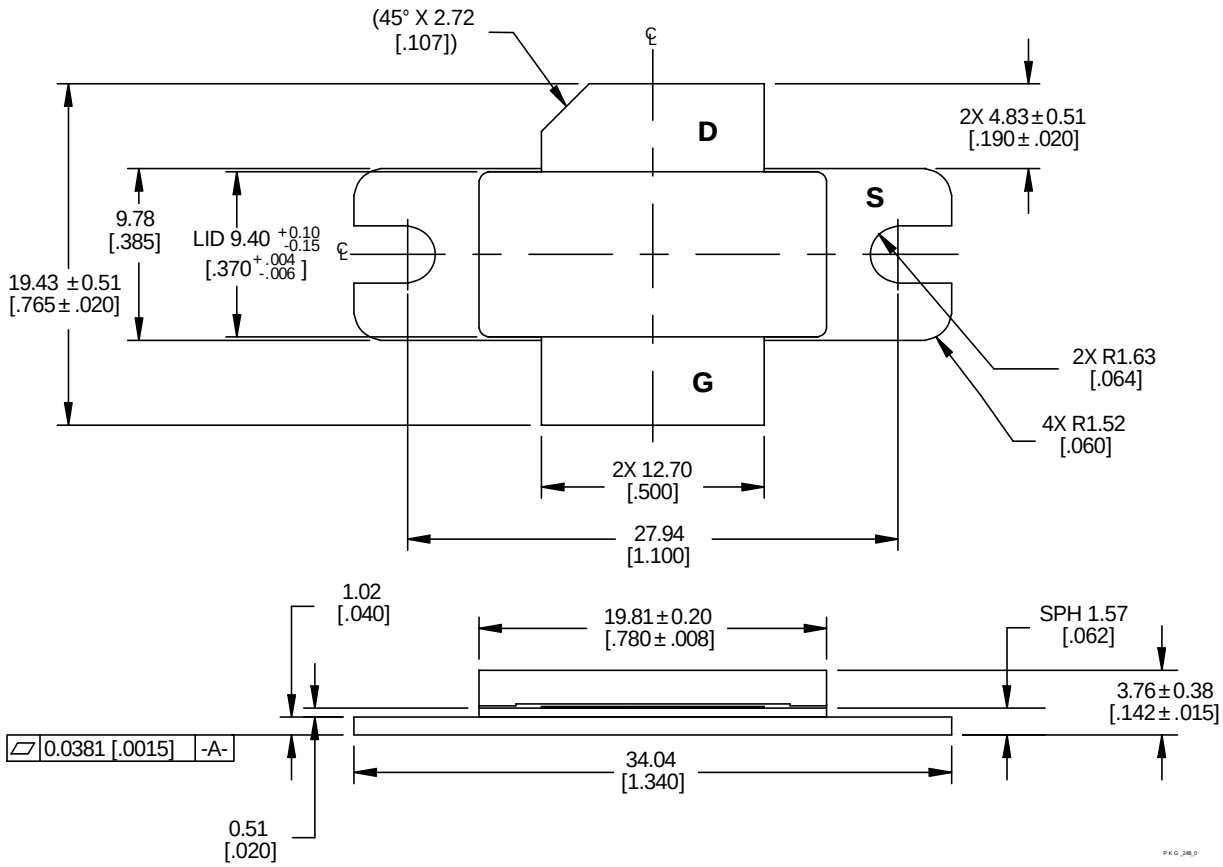
## Package Outline Specifications (cont.)

### Package 30248

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**PTF180601**

| **Revision History:** | **2004-05-03** |
|---|---|
| Previous Version: | 2003-12-22, Data Sheet |
| Page | Subjects (major changes since last revision) |
| | PTF180601E added. |
| | |
| | |
| | |
| | |

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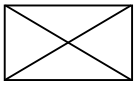

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