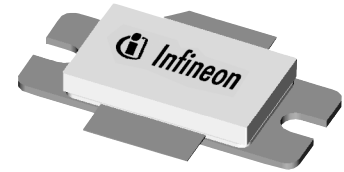


Thermally-Enhanced High Power RF LDMOS FETs 180 W, 2110 – 2170 MHz

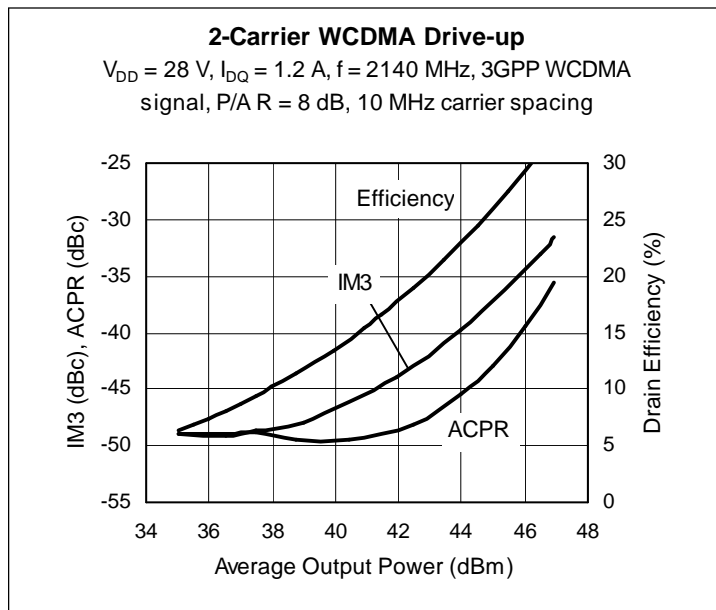
Description

The PTFA211801E and PTFA211801F are thermally-enhanced, 180-watt, internally matched LDMOS FETs intended for WCDMA applications. They are characterized for single- and two-carrier WCDMA operation from 2110 to 2170 MHz. Thermally-enhanced packaging provides the coolest operation available.

PTFA211801E
 Package H-36260-2



PTFA211801F
 Package H-37260-2



Features

- Thermally-enhanced packages, Pb-free and RoHS-compliant
- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 28 V
 - Average output power = 45.5 dBm
 - Linear Gain = 15.5 dB
 - Efficiency = 27.5%
 - Intermodulation distortion = -36 dBc
 - Adjacent channel power = -41 dBc
- Typical CW performance, 2170 MHz, 30 V
 - Output power at P-1dB = 180 W
 - Efficiency = 52%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 150 W (CW) output power

RF Characteristics

WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 35\text{ W}$ average

$f_1 = 2135\text{ MHz}$, $f_2 = 2145\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------------------|----------|------|------|-----|------|
| Gain | G_{ps} | 14.5 | 15.5 | — | dB |
| Drain Efficiency | η_D | 26 | 27.5 | — | % |
| Intermodulation Distortion | IMD | — | -36 | -34 | dBc |

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

CW Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 150\text{ W}$ average, $f = 2170\text{ MHz}$

| Characteristic | Symbol | Min | Typ | Max | Unit |
|------------------|------------|-----|-----|-----|------|
| Gain Compression | G_{comp} | — | 0.5 | 1.0 | dB |

Two-tone Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 140\text{ W PEP}$, $f = 2140\text{ MHz}$, tone spacing = 1 MHz

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------------------|----------|-----|------|-----|------|
| Gain | G_{ps} | — | 15.5 | — | dB |
| Drain Efficiency | η_D | — | 38.5 | — | % |
| Intermodulation Distortion | IMD | — | -28 | — | dBc |

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} | — | — | 1.0 | μA |
| Drain Leakage Current | $V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 10.0 | μA |
| On-State Resistance | $V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 0.05 | — | Ω |
| Operating Gate Voltage | $V_{DS} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$ | V_{GS} | 2.0 | 2.5 | 3.0 | V |
| Gate Leakage Current | $V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$ | I_{GSS} | — | — | 1.0 | μA |

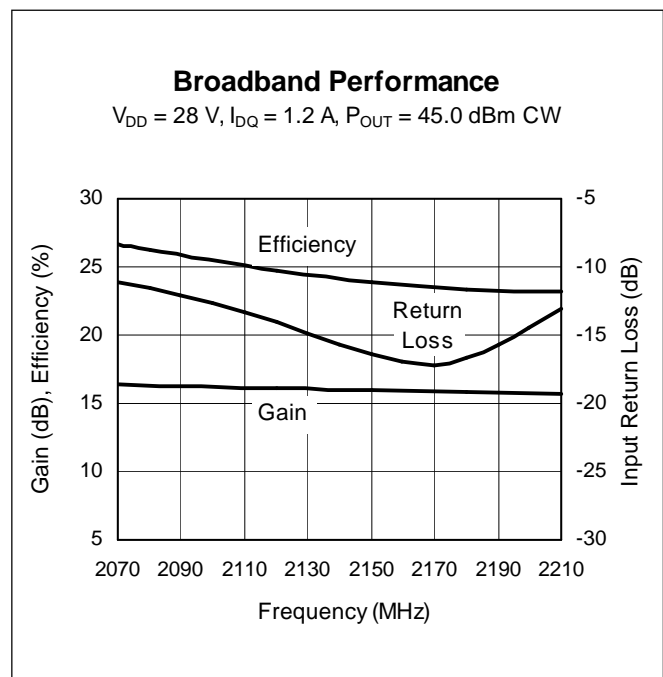
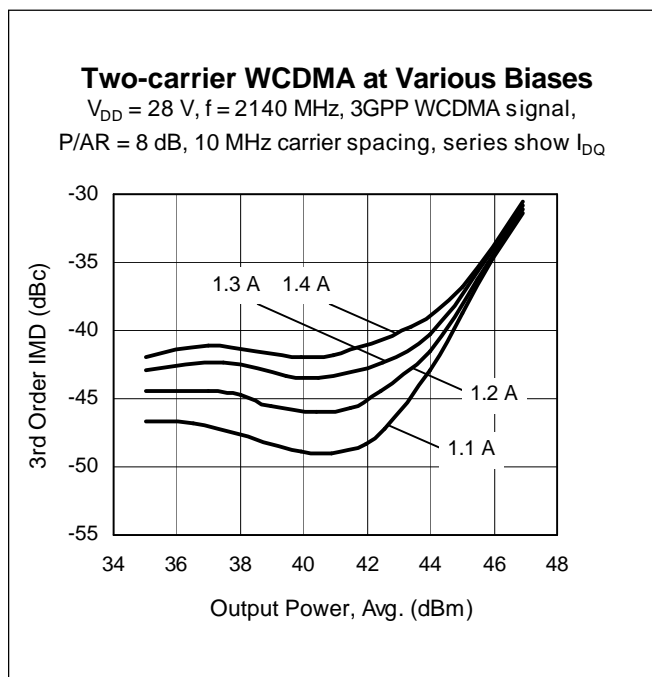
Maximum Ratings

| 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 | $^{\circ}\text{C}$ |
| Total Device Dissipation | P_D | 565 | W |
| Above 25 $^{\circ}\text{C}$ derate by | | 3.23 | W/ $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{STG} | -40 to +150 | $^{\circ}\text{C}$ |
| Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$, 150 W CW) | $R_{\theta JC}$ | 0.31 | $^{\circ}\text{C}/\text{W}$ |

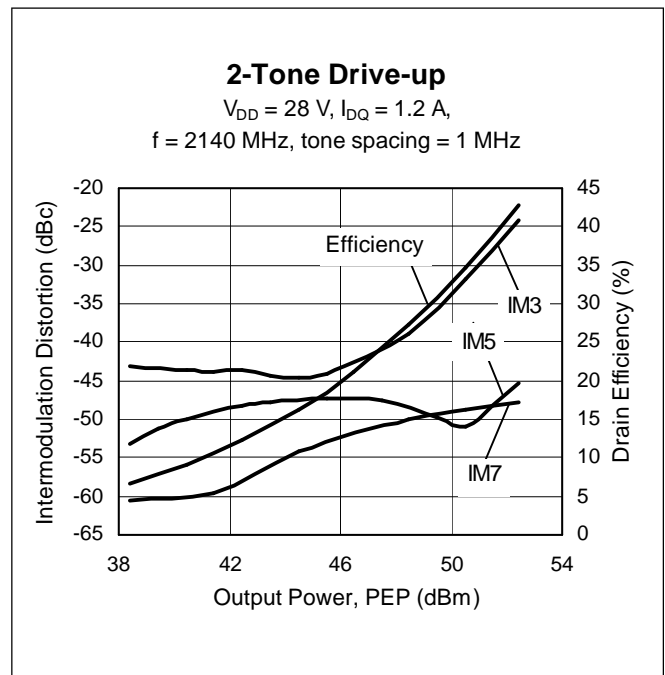
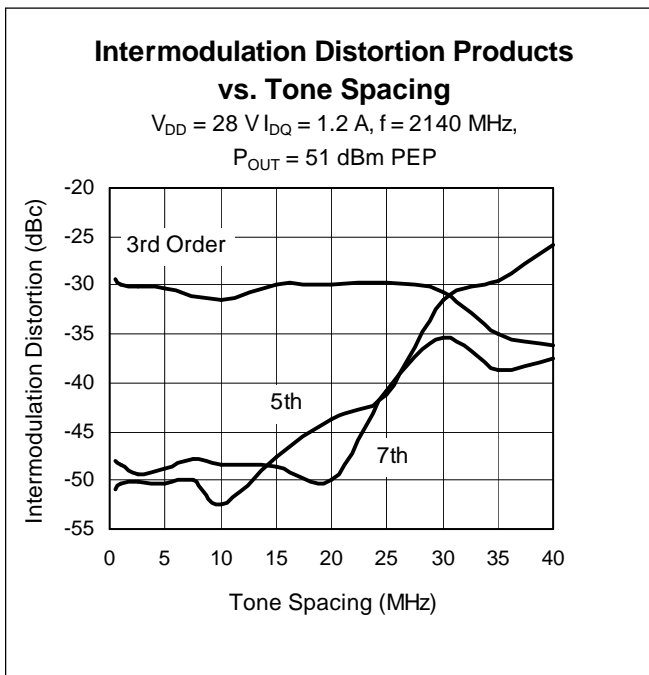
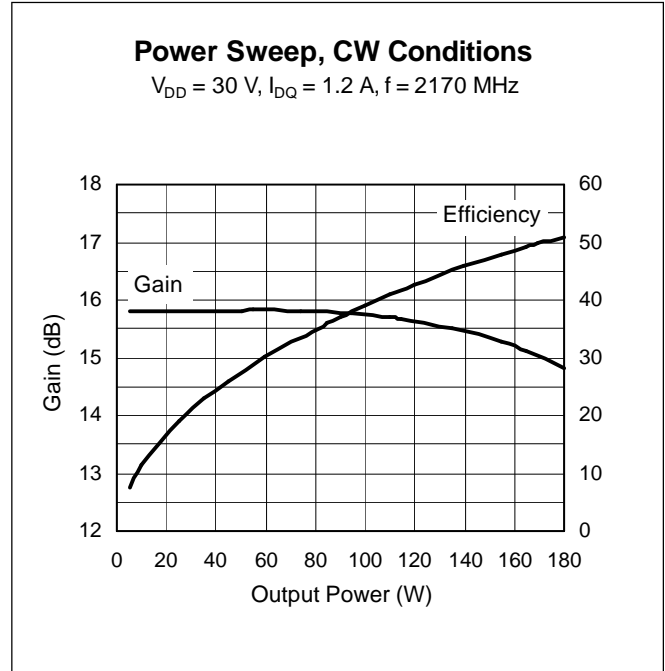
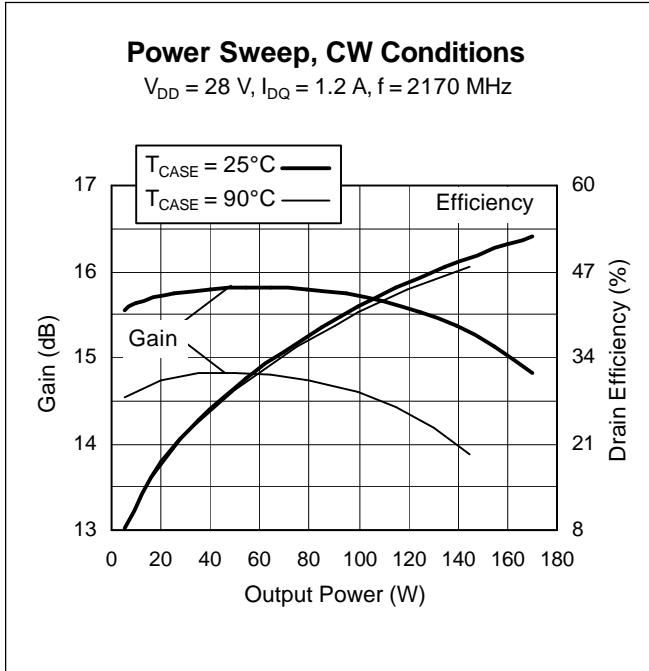
Ordering Information

| Type and Version | Package Type | Package Description | Marking |
|------------------|--------------|---|-------------|
| PTFA211801E V4 | H-36260-2 | Thermally-enhanced slotted flange, single-ended | PTFA211801E |
| PTFA211801F V4 | H-37260-2 | Thermally-enhanced earless flange, single-ended | PTFA211801F |

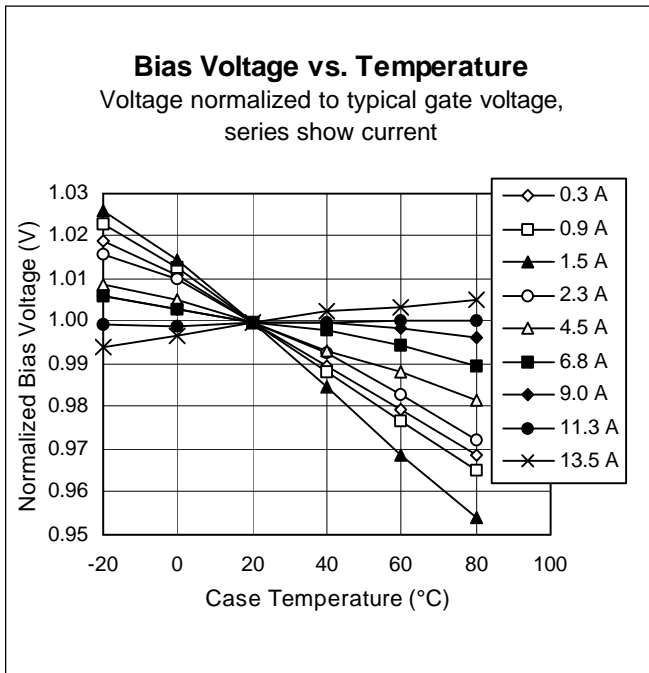
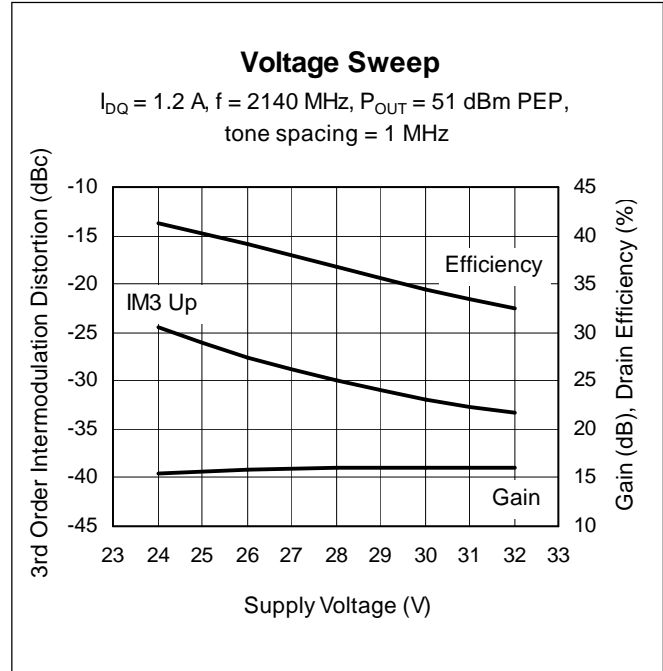
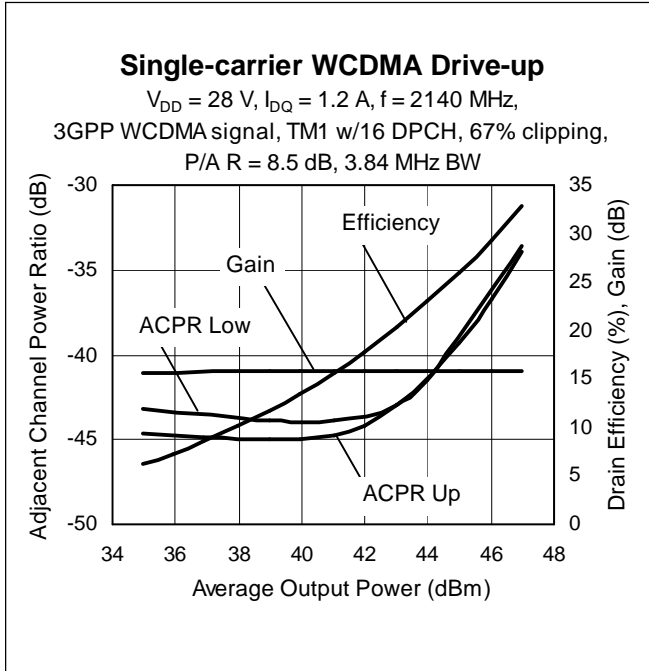
Typical Performance (data taken in a production test fixture)



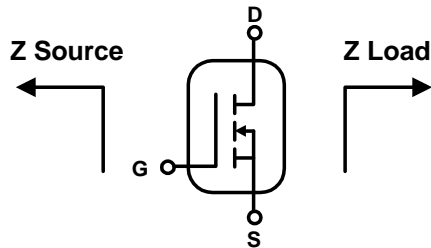
Typical Performance (cont.)



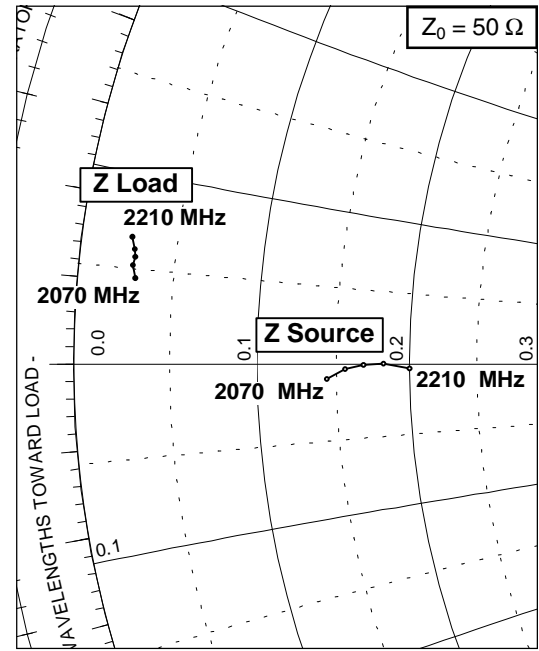
Typical Performance (cont.)



Broadband Circuit Impedance

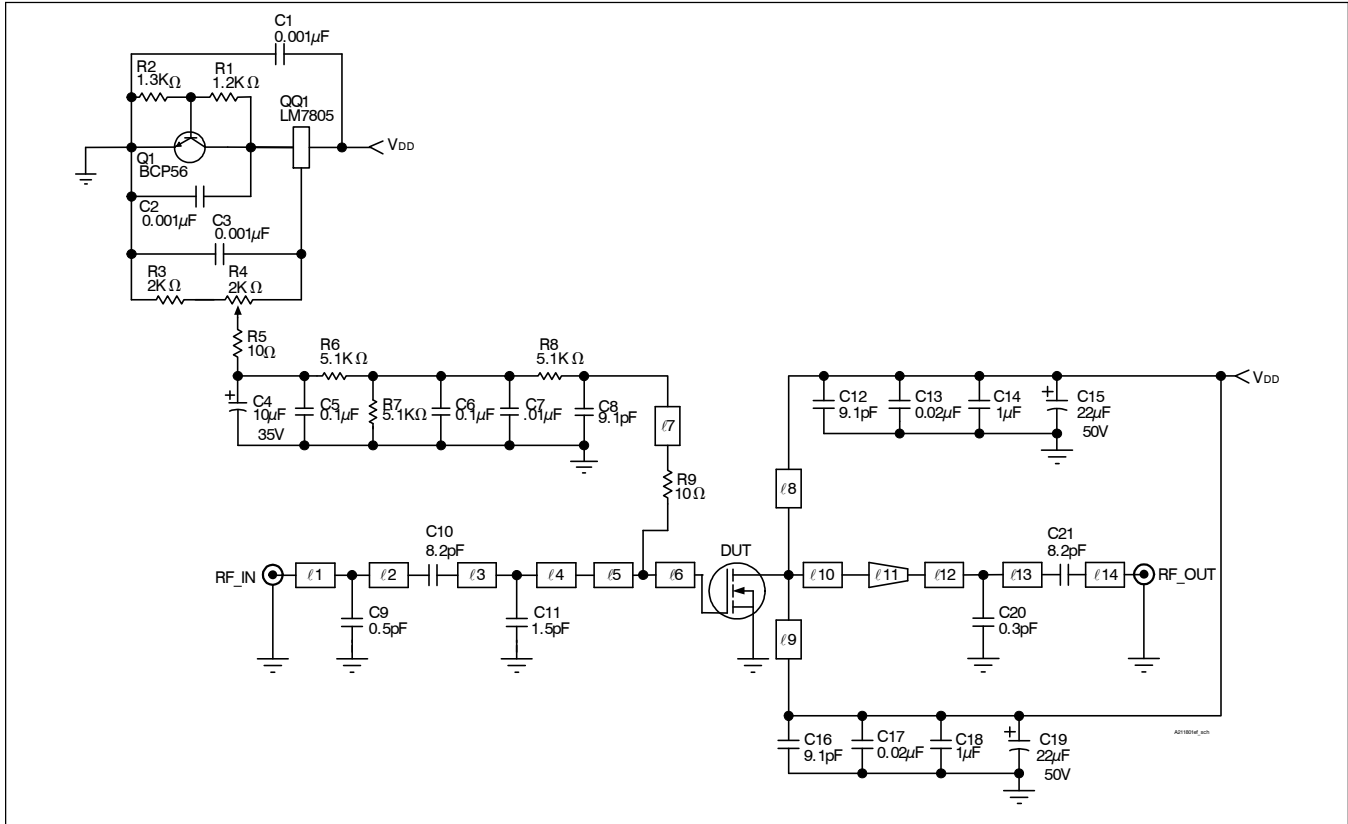


| Frequency MHz | Z Source W | | Z Load W | |
|------------------|------------|------|----------|-----|
| | R | jX | R | jX |
| 2070 | 7.2 | -0.5 | 1.5 | 2.3 |
| 2110 | 7.8 | -0.2 | 1.4 | 2.6 |
| 2140 | 8.4 | -0.0 | 1.4 | 2.8 |
| 2170 | 9.1 | 0.0 | 1.4 | 3.0 |
| 2210 | 10.0 | -0.2 | 1.3 | 3.4 |



See next page for reference circuit information

Reference Circuit



Reference circuit schematic for $f = 2140 \text{ MHz}$

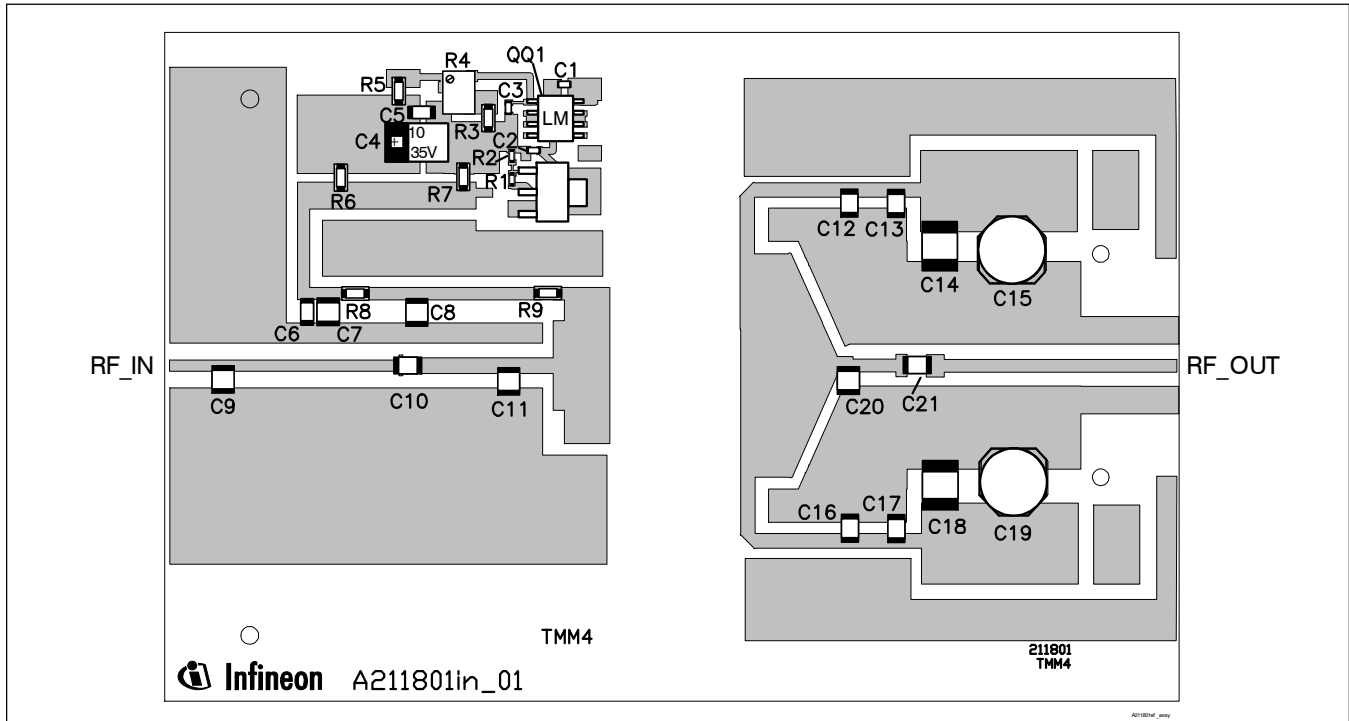
Circuit Assembly Information

| | | | |
|-----|---|------------------|--------------|
| DUT | PTFA211801E or PTFA211801F | LDMOS Transistor | |
| PCB | 0.76 mm [.030"] thick, $\epsilon_r = 4.5$ | Rogers TMM4 | 2 oz. copper |

| Microstrip | Electrical Characteristics at 2140 MHz ¹ | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|-------------|---|------------------------|-------------------------|
| l1 | 0.097 λ , 50.0 Ω | 7.37 x 1.40 | 0.290 x 0.055 |
| l2 | 0.267 λ , 50.0 Ω | 19.86 x 1.40 | 0.782 x 0.055 |
| l3 | 0.136 λ , 42.0 Ω | 10.24 x 1.85 | 0.403 x 0.073 |
| l4 | 0.087 λ , 42.0 Ω | 6.50 x 1.85 | 0.256 x 0.073 |
| l5 | 0.018 λ , 11.4 Ω | 1.24 x 10.24 | 0.049 x 0.403 |
| l6 | 0.077 λ , 6.9 Ω | 5.23 x 17.78 | 0.206 x 0.700 |
| l7 | 0.207 λ , 48.0 Ω | 15.70 x 1.50 | 0.618 x 0.059 |
| l8, l9 | 0.256 λ , 45.0 Ω | 19.30 x 1.65 | 0.760 x 0.065 |
| l10 | 0.087 λ , 5.0 Ω | 5.84 x 25.40 | 0.230 x 1.000 |
| l11 (taper) | 0.073 λ , 5.0 Ω / 40.0 Ω | 5.59 x 25.40 / 1.98 | 0.220 x 1.000 / 0.078 |
| l12 | 0.019 λ , 40.0 Ω | 1.45 x 1.98 | 0.057 x 0.078 |
| l13 | 0.087 λ , 50.0 Ω | 6.65 x 1.40 | 0.262 x 0.055 |
| l14 | 0.403 λ , 50.0 Ω | 30.73 x 1.40 | 1.210 x 0.055 |

¹Electrical characteristics are rounded.

Reference Circuit (cont.)

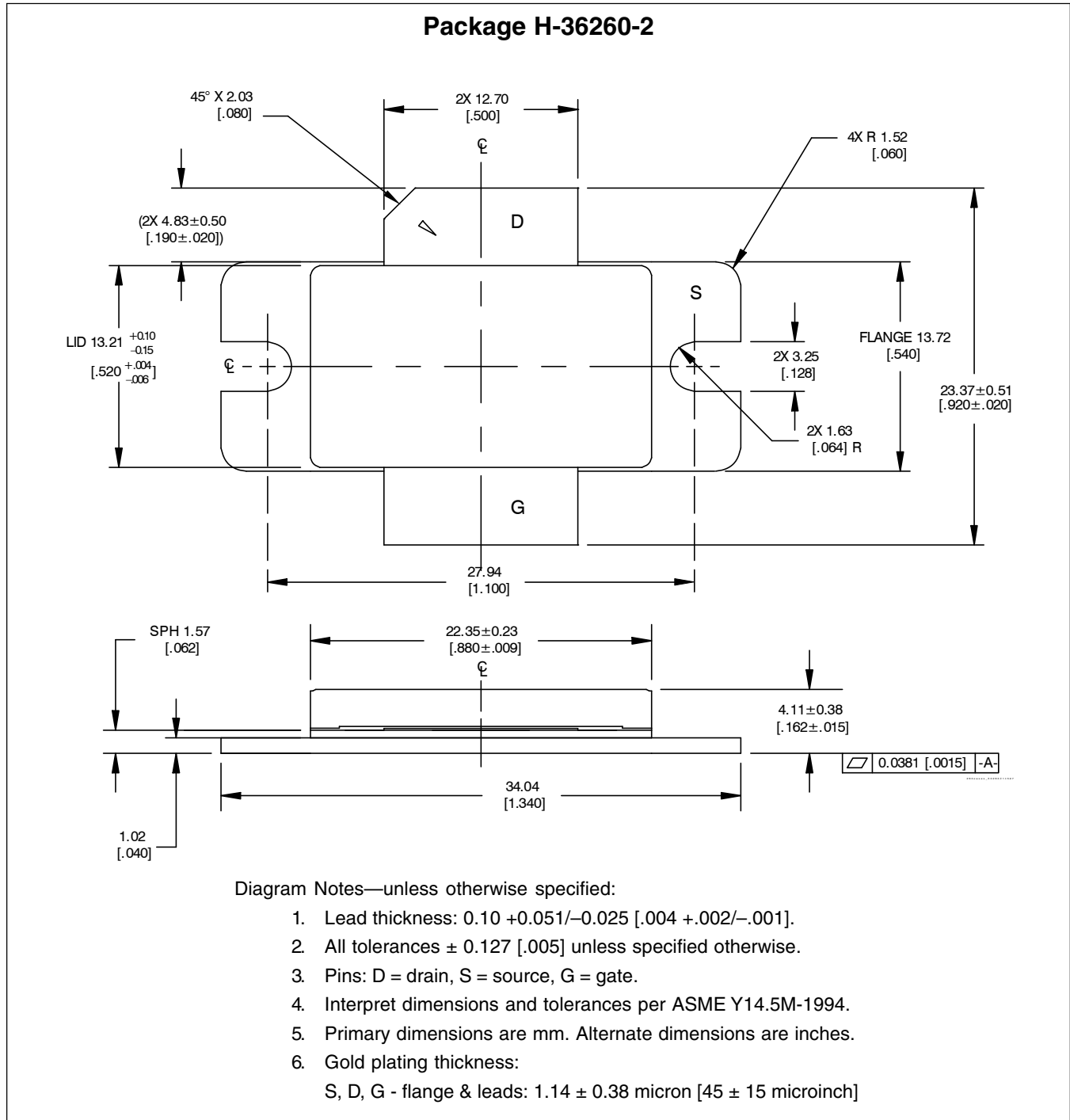


Reference circuit assembly diagram* (not to scale)

| Component | Description | Suggested Manufacturer | P/N or Comment |
|--------------|--|------------------------|-----------------|
| C1, C2, C3 | Capacitor, 0.001 μ F | Digi-Key | PCC1772CT-ND |
| C4 | Tantalum capacitor, 10 μ F, 35 V | Digi-Key | PCS6106TR-ND |
| C5, C6 | Capacitor, 0.1 μ F | Digi-Key | PCC104BCT |
| C7 | Capacitor, 0.01 μ F | ATC | 200B103 |
| C8, C12, C16 | Ceramic capacitor, 9.1 pF | ATC | 100B 9R1 |
| C9 | Ceramic capacitor, 0.5 pF | ATC | 100B 0R5 |
| C10, C21 | Ceramic capacitor, 8.2 pF | ATC | 100B 8R2 |
| C11 | Ceramic capacitor, 1.5 pF | ATC | 100B 1R5 |
| C13, C17 | Ceramic capacitor, 0.02 μ F | ATC | 200B 203 |
| C14, C18 | Ceramic capacitor, 1 μ F | ATC | 920C105 |
| C15, C19 | Electrolytic capacitor, 22 μ F, 50 V | Digi-Key | PCE3374CT-ND |
| C20 | Ceramic capacitor, 0.3 pF | ATC | 100B 0R3 |
| Q1 | Transistor | Infineon Technologies | BCP56 |
| QQ1 | Voltage regulator | National Semiconductor | LM7805 |
| R1 | Chip resistor, 1.2 k-ohms | Digi-Key | P1.2KGCT-ND |
| R2 | Chip resistor, 1.3 k-ohms | Digi-Key | P1.3KGCT-ND |
| R3 | Chip resistor, 2 k-ohms | Digi-Key | P2KECT-ND |
| R4 | Potentiometer, 2 k-ohms | Digi-Key | 3224W-202ETR-ND |
| R5, R9 | Chip resistor, 10 ohms | Digi-Key | P10ECT-ND |
| R6, R7, R8 | Chip resistor, 5.1 k-ohms | Digi-Key | P5.1KECT-ND |

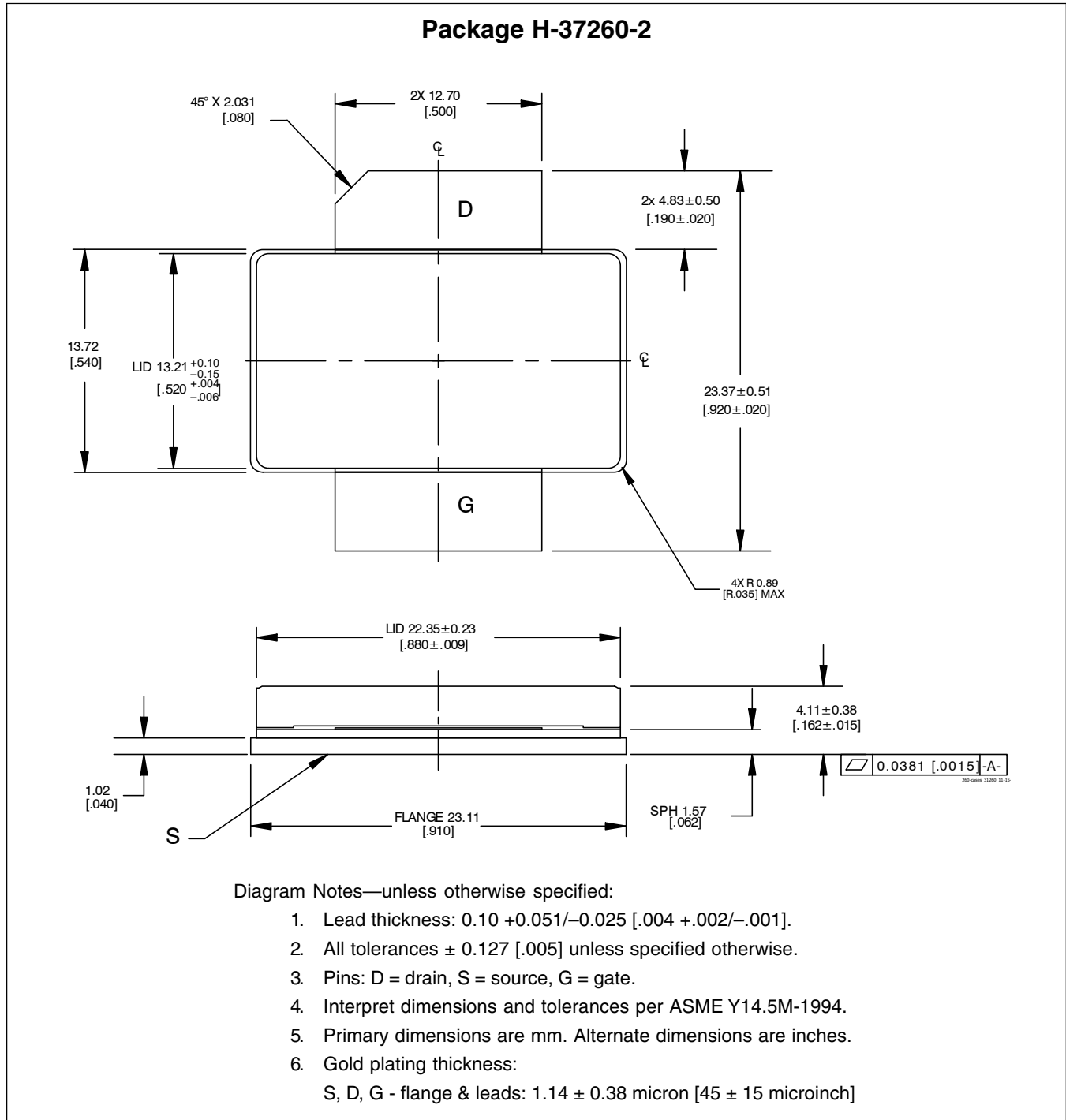
*Gerber Files for this circuit available on request

Package Outline Specifications



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Package Outline Specifications (cont.)



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| | | |
|--------------------------|--|------------|
| Revision History: | 2007-11-15 | Data Sheet |
| Previous Version: | 2005-06-10, Data Sheet | |
| Page | Subjects (major changes since last revision) | |
| 1, 3, 9, 10 | Update product to V 4.1, with new package technologies. Update package outline diagrams. | |
| | | |
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| | | |

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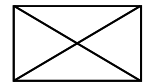
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+1 877 465 3667 (1-877-GO-LDMOS) USA

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Edition 2007-11-15**Published by**

Infineon Technologies AG

81726 München, Germany

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