

# ANTREX Electronics

## Electronic Components Sourcing Information

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### Product Reference Information

|                      |                           |
|----------------------|---------------------------|
| <b>Part Number:</b>  | AFT20S015NR1              |
| <b>Manufacturer:</b> | NXP USA Inc.              |
| <b>Package:</b>      | Please confirm with sales |
| <b>Availability:</b> | Please confirm with sales |

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**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



# RF Power LDMOS Transistors

## N-Channel Enhancement-Mode Lateral MOSFETs

These 1.5 W RF power LDMOS transistors are designed for cellular base station applications covering the frequency range of 1805 to 2700 MHz.

### 2100 MHz

- Typical Single-Carrier W-CDMA Performance:  $V_{DD} = 28$  Vdc,  $I_{DQ} = 132$  mA,  $P_{out} = 1.5$  W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

| Frequency | $G_{ps}$<br>(dB) | $\eta_D$<br>(%) | Output PAR<br>(dB) | ACPR<br>(dBc) | IRL<br>(dB) |
|-----------|------------------|-----------------|--------------------|---------------|-------------|
| 2110 MHz  | 17.5             | 22.0            | 8.9                | -43.0         | -11         |
| 2140 MHz  | 17.6             | 22.0            | 9.0                | -44.0         | -12         |
| 2170 MHz  | 17.6             | 22.0            | 9.1                | -44.0         | -14         |

### 1800 MHz

- Typical Single-Carrier W-CDMA Performance:  $V_{DD} = 28$  Vdc,  $I_{DQ} = 132$  mA,  $P_{out} = 1.5$  W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

| Frequency | $G_{ps}$<br>(dB) | $\eta_D$<br>(%) | Output PAR<br>(dB) | ACPR<br>(dBc) | IRL<br>(dB) |
|-----------|------------------|-----------------|--------------------|---------------|-------------|
| 1805 MHz  | 18.0             | 21.0            | 9.2                | -42.0         | -11         |
| 1840 MHz  | 18.1             | 22.0            | 9.2                | -44.0         | -10         |
| 1880 MHz  | 18.0             | 22.0            | 9.1                | -45.0         | -10         |

### 2600 MHz

- Typical Single-Carrier W-CDMA Performance:  $V_{DD} = 28$  Vdc,  $I_{DQ} = 132$  mA,  $P_{out} = 2.1$  W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

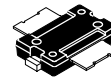
| Frequency | $G_{ps}$<br>(dB) | $\eta_D$<br>(%) | Output PAR<br>(dB) | ACPR<br>(dBc) | IRL<br>(dB) |
|-----------|------------------|-----------------|--------------------|---------------|-------------|
| 2300 MHz  | 15.7             | 23.0            | 9.0                | -45.0         | -6          |
| 2400 MHz  | 16.0             | 23.0            | 8.8                | -44.0         | -7          |
| 2500 MHz  | 15.8             | 23.0            | 8.6                | -43.0         | -6          |
| 2600 MHz  | 15.8             | 21.0            | 8.5                | -43.0         | -7          |
| 2700 MHz  | 15.5             | 20.0            | 8.4                | -42.0         | -8          |

### Features

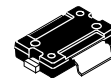
- Greater negative gate-source voltage range for improved Class C operation
- Designed for digital predistortion error correction systems
- Optimized for Doherty applications

## AFT20S015N AFT20S015GN

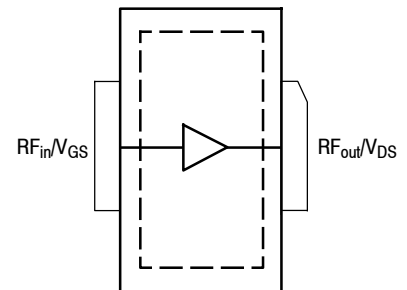
**1805–2700 MHz, 1.5 W AVG., 28 V  
AIRFAST RF POWER LDMOS  
TRANSISTORS**



**TO-270-2  
PLASTIC  
AFT20S015N**



**TO-270-2 GULL  
PLASTIC  
AFT20S015GN**



(Top View)

Note: The backside of the package is the source terminal for the transistor.

**Figure 1. Pin Connections**

**Table 1. Maximum Ratings**

| Rating                                                                     | Symbol    | Value       | Unit      |
|----------------------------------------------------------------------------|-----------|-------------|-----------|
| Drain-Source Voltage                                                       | $V_{DS}$  | -0.5, +65   | Vdc       |
| Gate-Source Voltage                                                        | $V_{GS}$  | -6.0, +10   | Vdc       |
| Operating Voltage                                                          | $V_{DD}$  | 32, +0      | Vdc       |
| Storage Temperature Range                                                  | $T_{stg}$ | -65 to +150 | °C        |
| Case Operating Temperature Range                                           | $T_C$     | -40 to +150 | °C        |
| Operating Junction Temperature Range (1,2)                                 | $T_J$     | -40 to +225 | °C        |
| CW Operation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | CW        | 11<br>0.1   | W<br>W/°C |

**Table 2. Thermal Characteristics**

| Characteristic                                                                                                                      | Symbol          | Value (2,3) | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|------|
| Thermal Resistance, Junction to Case<br>Case Temperature $77^\circ\text{C}$ , 1.5 W CW, 28 Vdc, $I_{DQ} = 132\text{ mA}$ , 2140 MHz | $R_{\theta JC}$ | 4.2         | °C/W |

**Table 3. ESD Protection Characteristics**

| Test Methodology                      | Class |
|---------------------------------------|-------|
| Human Body Model (per JESD22-A114)    | 1C    |
| Machine Model (per EIA/JESD22-A115)   | A     |
| Charge Device Model (per JESD22-C101) | IV    |

**Table 4. Moisture Sensitivity Level**

| Test Methodology                     | Rating | Package Peak Temperature | Unit |
|--------------------------------------|--------|--------------------------|------|
| Per JESD22-A113, IPC/JEDEC J-STD-020 | 3      | 260                      | °C   |

**Table 5. Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

**Off Characteristics**

|                                                                                                   |           |   |   |    |                 |
|---------------------------------------------------------------------------------------------------|-----------|---|---|----|-----------------|
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 65\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) | $I_{DSS}$ | — | — | 10 | $\mu\text{Adc}$ |
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 28\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) | $I_{DSS}$ | — | — | 1  | $\mu\text{Adc}$ |
| Gate-Source Leakage Current<br>( $V_{GS} = 5\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )              | $I_{GSS}$ | — | — | 1  | $\mu\text{Adc}$ |

**On Characteristics**

|                                                                                                               |              |     |     |     |     |
|---------------------------------------------------------------------------------------------------------------|--------------|-----|-----|-----|-----|
| Gate Threshold Voltage<br>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 17.6\text{ }\mu\text{Adc}$ )                    | $V_{GS(th)}$ | 1.5 | 2.0 | 2.5 | Vdc |
| Gate Quiescent Voltage<br>( $V_{DD} = 28\text{ Vdc}$ , $I_D = 132\text{ mAdc}$ , Measured in Functional Test) | $V_{GS(Q)}$  | 2.4 | 3.0 | 3.4 | Vdc |
| Drain-Source On-Voltage<br>( $V_{GS} = 10\text{ Vdc}$ , $I_D = 176\text{ Adc}$ )                              | $V_{DS(on)}$ | 0.1 | 0.2 | 0.3 | Vdc |

1. Continuous use at maximum temperature will affect MTTF.

2. MTTF calculator available at <http://www.nxp.com>.

3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.nxp.com/RF> and search for AN1955.

(continued)

**Table 5. Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (continued)

| Characteristic                                                                                                                                                                                                                                                                                                                                                            | Symbol   | Min  | Typ   | Max   | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|-------|-------|------|
| <b>Functional Tests</b> <sup>(1,2)</sup> (In NXP Test Fixture, 50 ohm system) $V_{DD} = 28\text{ Vdc}$ , $I_{DQ} = 132\text{ mA}$ , $P_{out} = 1.5\text{ W Avg.}$ , $f = 2170\text{ MHz}$ , Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ $\pm 5\text{ MHz}$ Offset. |          |      |       |       |      |
| Power Gain                                                                                                                                                                                                                                                                                                                                                                | $G_{ps}$ | 16.0 | 17.6  | 19.0  | dB   |
| Drain Efficiency                                                                                                                                                                                                                                                                                                                                                          | $\eta_D$ | 20.0 | 22.0  | —     | %    |
| Output Peak-to-Average Ratio @ 0.01% Probability on CCDF                                                                                                                                                                                                                                                                                                                  | PAR      | 8.6  | 9.1   | —     | dB   |
| Adjacent Channel Power Ratio                                                                                                                                                                                                                                                                                                                                              | ACPR     | —    | -44.0 | -41.0 | dBc  |
| Input Return Loss                                                                                                                                                                                                                                                                                                                                                         | IRL      | —    | -14   | -9    | dB   |

**Load Mismatch** (In NXP Test Fixture, 50 ohm system)  $I_{DQ} = 132\text{ mA}$ ,  $f = 2140\text{ MHz}$ 

|                                                                                                                            |                       |
|----------------------------------------------------------------------------------------------------------------------------|-----------------------|
| VSWR 10:1 at 32 Vdc, 14 W CW <sup>(3)</sup> Output Power<br>(3 dB Input Overdrive from 12 W CW <sup>(3)</sup> Rated Power) | No Device Degradation |
|----------------------------------------------------------------------------------------------------------------------------|-----------------------|

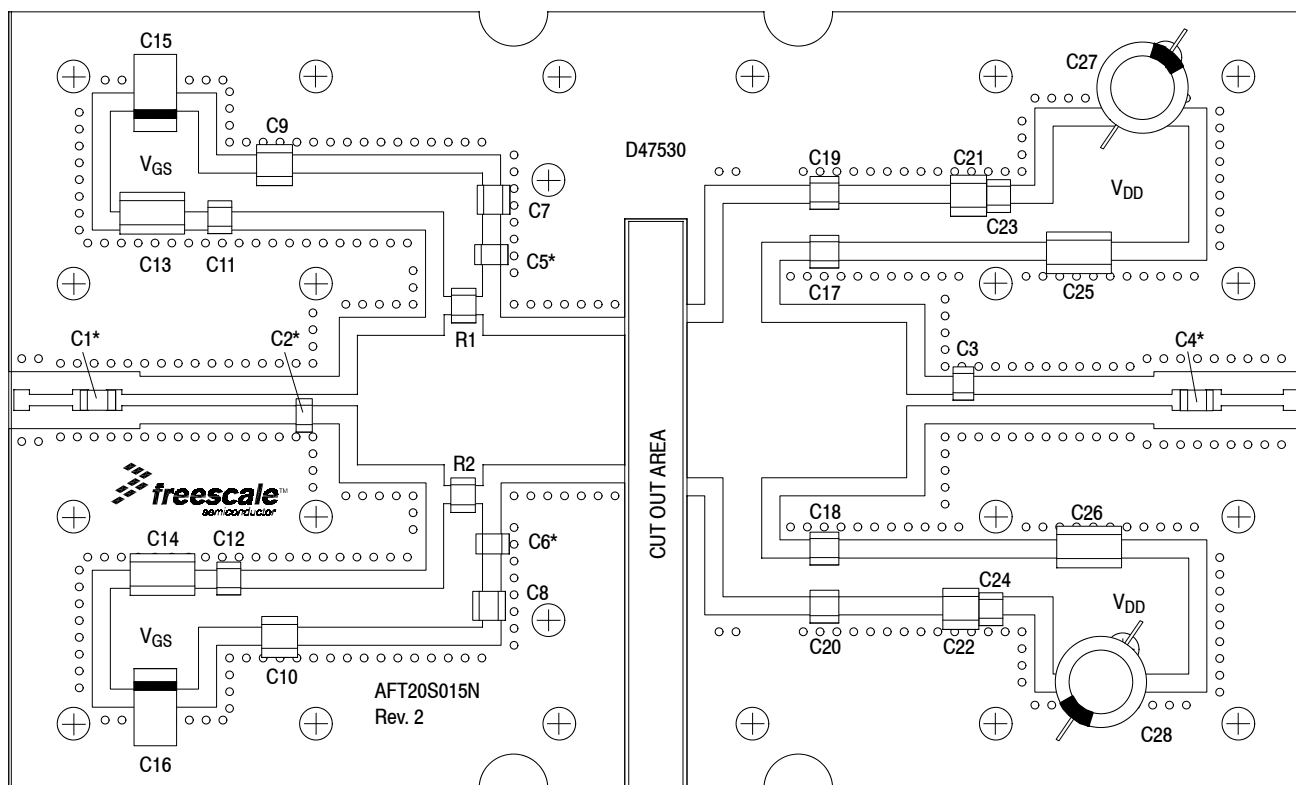
**Typical Performance** (In NXP Test Fixture, 50 ohm system)  $V_{DD} = 28\text{ Vdc}$ ,  $I_{DQ} = 132\text{ mA}$ , 2110–2170 MHz Bandwidth

|                                                                                                           |               |   |                       |   |       |
|-----------------------------------------------------------------------------------------------------------|---------------|---|-----------------------|---|-------|
| $P_{out}$ @ 1 dB Compression Point, CW                                                                    | P1dB          | — | 16.2 <sup>(3,4)</sup> | — | W     |
| AM/PM<br>(Maximum value measured at the P3dB compression point across the 2110–2170 MHz frequency range.) | $\Phi$        | — | -16                   | — | °     |
| VBW Resonance Point<br>(IMD Third Order Intermodulation Inflection Point)                                 | $VBW_{res}$   | — | 170                   | — | MHz   |
| Gain Flatness in 60 MHz Bandwidth @ $P_{out} = 1.5\text{ W Avg.}$                                         | $G_F$         | — | 0.05                  | — | dB    |
| Gain Variation over Temperature<br>( $-30^\circ\text{C}$ to $+85^\circ\text{C}$ )                         | $\Delta G$    | — | 0.01                  | — | dB/°C |
| Output Power Variation over Temperature<br>( $-30^\circ\text{C}$ to $+85^\circ\text{C}$ ) <sup>(3)</sup>  | $\Delta P1dB$ | — | 0.004                 | — | dB/°C |

**Table 6. Ordering Information**

| Device        | Tape and Reel Information                             | Package   |
|---------------|-------------------------------------------------------|-----------|
| AFT20S015NR1  | R1 Suffix = 500 Units, 24 mm Tape Width, 13-inch Reel | TO-270-2  |
| AFT20S015GNR1 |                                                       | TO-270G-2 |

1. Part internally matched on input.
2. Measurements made with device in straight lead configuration, before any lead forming operation is applied. Lead forming is used for gull wing (GN) parts.
3. Exceeds recommended operating conditions. See CW operation data in Maximum Ratings table.
4. Calculated from load pull P3dB measurements.



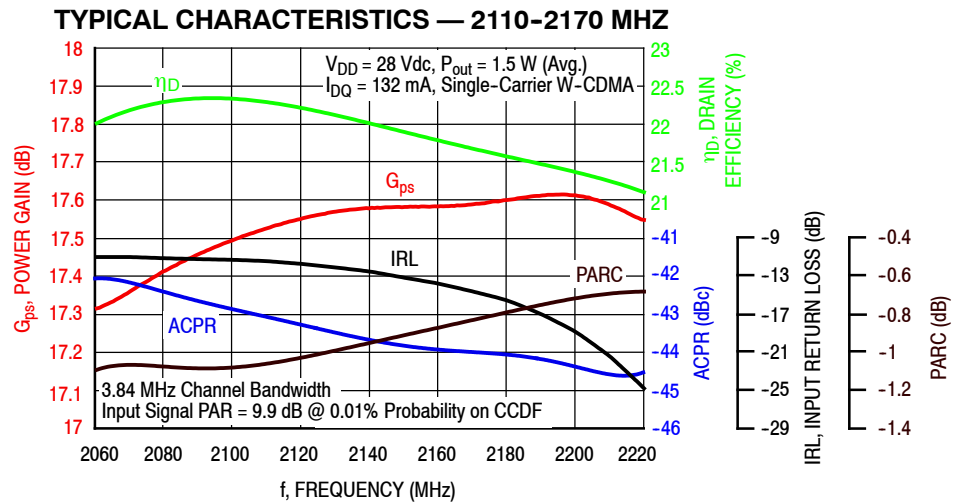
\*C1, C2, C4, C5 and C6 are mounted vertically.

Note: NXP has begun the transition of marking printed circuit boards (PCBs) with the NXP exception logo. PCBs may have either Freescale or NXP markings during the transition period. These changes will have no impact on form, fit or function of the current product.

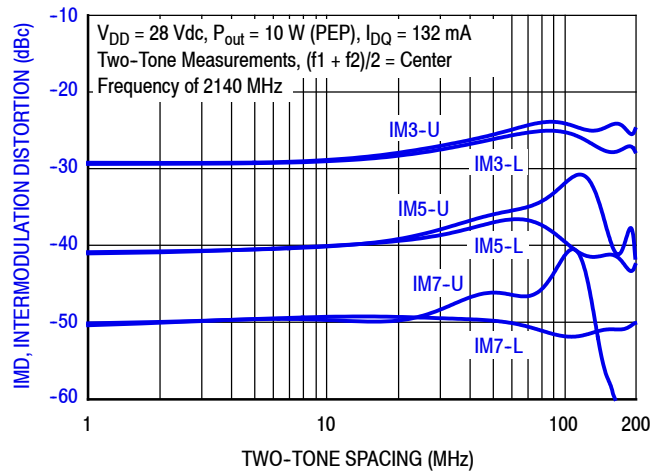
**Figure 2. AFT20S015N Test Circuit Component Layout — 2110–2170 MHz**

**Table 7. AFT20S015N Test Circuit Component Designations and Values — 2110–2170 MHz**

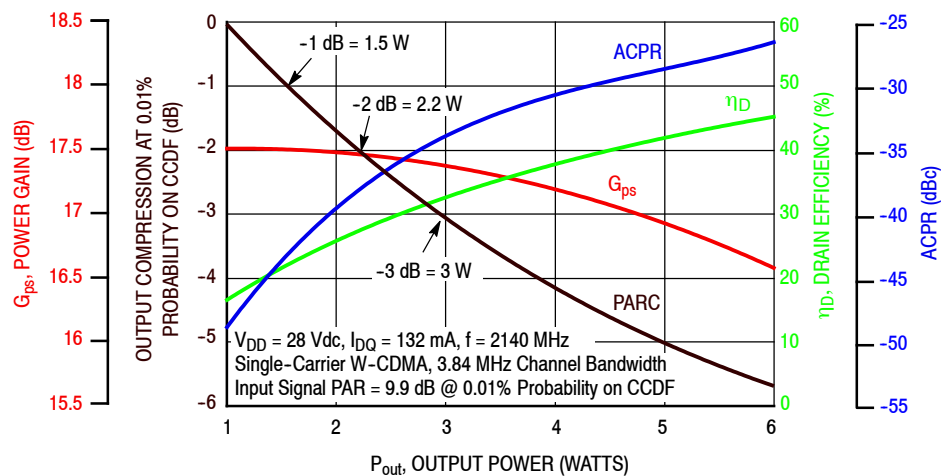
| Part               | Description                                 | Part Number          | Manufacturer |
|--------------------|---------------------------------------------|----------------------|--------------|
| C1                 | 8.2 pF Chip Capacitor                       | ATC100B8R2CT500XT    | ATC          |
| C2                 | 2.4 pF Chip Capacitor                       | ATC800B2R4BT500XT    | ATC          |
| C3                 | 1.7 pF Chip Capacitor                       | ATC100B1R7BT500XT    | ATC          |
| C4                 | 9.1 pF Chip Capacitor                       | ATC100B9R1CT500XT    | ATC          |
| C5, C6             | 6.8 pF Chip Capacitors                      | ATC100B6R8CT500XT    | ATC          |
| C7, C8             | 240 pF Chip Capacitors                      | ATC100B241JT200XT    | ATC          |
| C9, C10, C21, C22  | 220 pF Chip Capacitors                      | C1812C224K5RAC-TU    | Kemet        |
| C11, C12, C23, C24 | 0.1 $\mu$ F Chip Capacitors                 | CDR33BX104AKWS       | AVX          |
| C13, C14, C25, C26 | 2.2 $\mu$ F Chip Capacitors                 | C1825C225J5RAC-TU    | Kemet        |
| C15, C16           | 22 $\mu$ F, 35 V Tantalum Capacitors        | T491X226K035AT       | Kemet        |
| C17, C18, C19, C20 | 75 pF Chip Capacitors                       | ATC800B750JT500XT    | ATC          |
| C27, C28           | 470 $\mu$ F, 63 V Electrolytic Capacitors   | MCGPR63V477M13X26-RH | Multicomp    |
| R1, R2             | 1 $\Omega$ Chip Resistors                   | CRCW12061R00FKEA     | Vishay       |
| PCB                | Rogers RO4350B, 0.020", $\epsilon_r = 3.66$ | D47530               | MTL          |



**Figure 3. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @  $P_{out} = 1.5$  Watts Avg.**

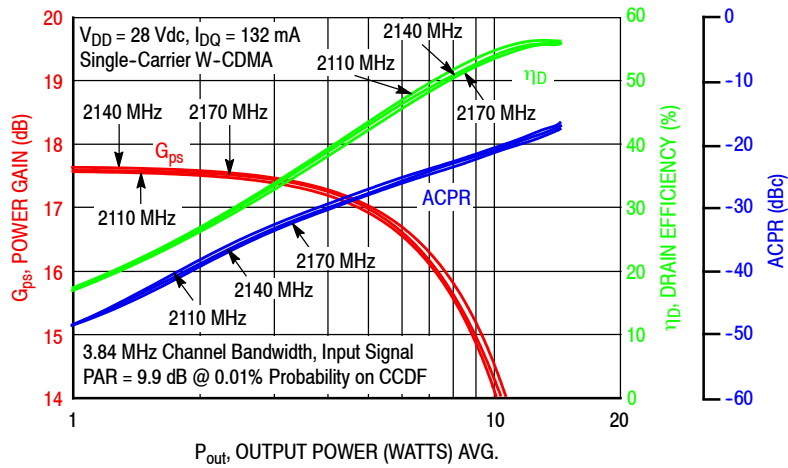


**Figure 4. Intermodulation Distortion Products versus Two-Tone Spacing**

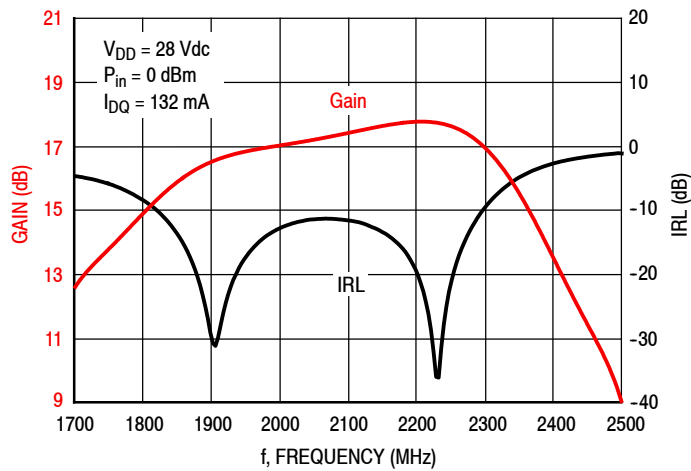


**Figure 5. Output Peak-to-Average Ratio Compression (PARC) versus Output Power**

## TYPICAL CHARACTERISTICS — 2110-2170 MHz

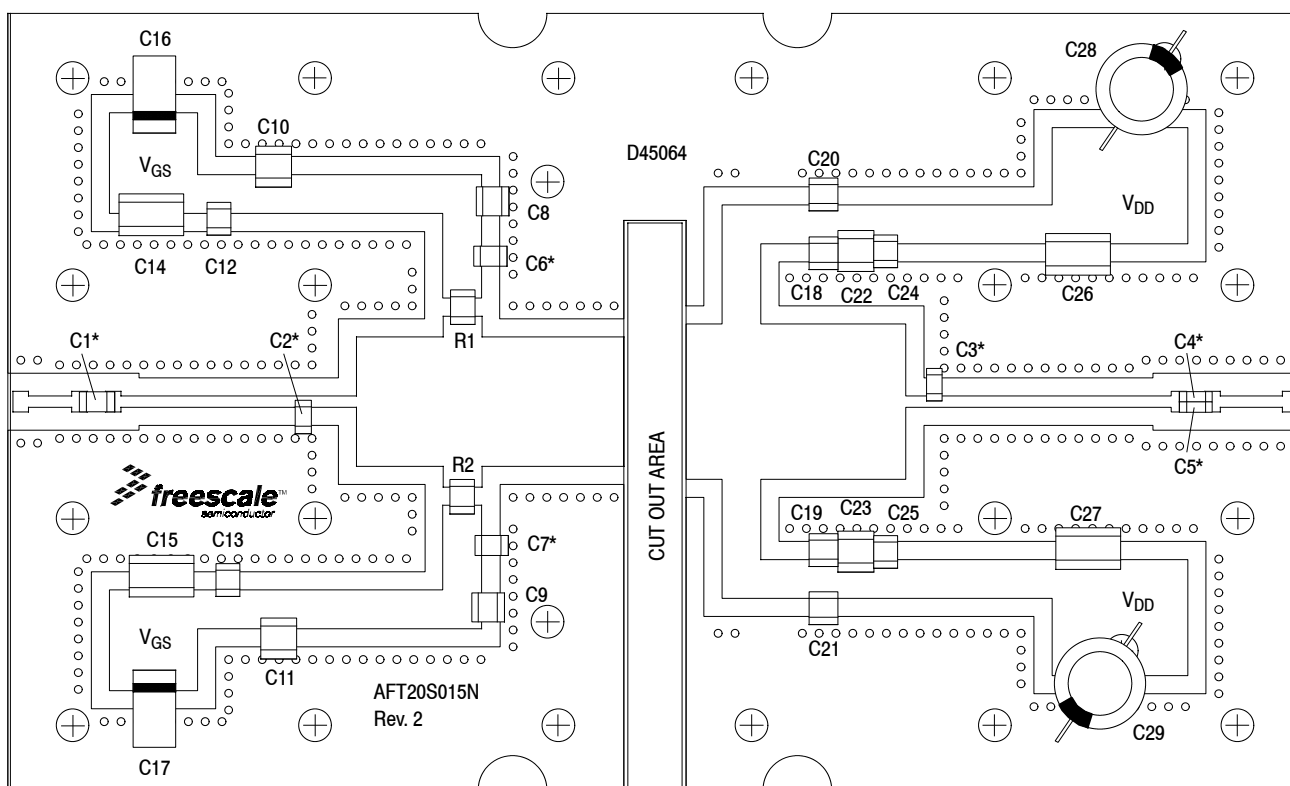


**Figure 6. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power**



**Figure 7. Broadband Frequency Response**

## ALTERNATE CHARACTERIZATION — 1805-1880 MHz



\*C1, C2, C3, C4, C5, C6 and C7 are mounted vertically.

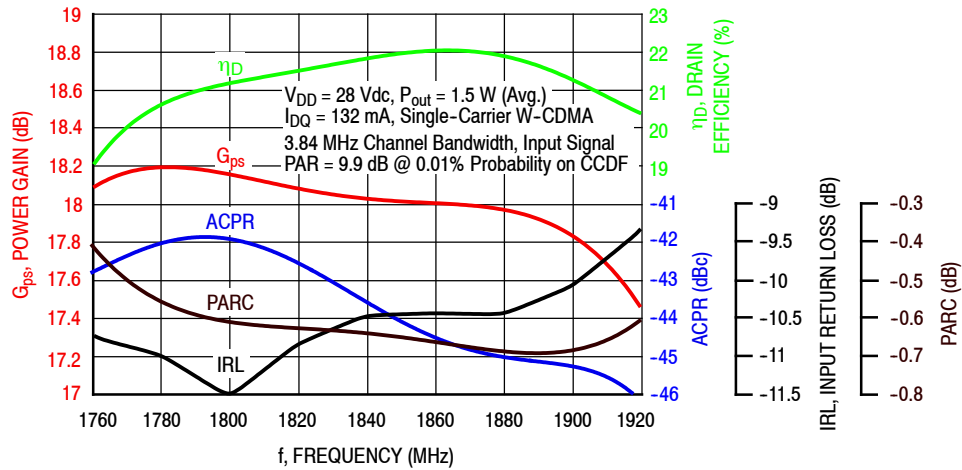
Note: NXP has begun the transition of marking printed circuit boards (PCBs) with the NXP exception logo. PCBs may have either Freescale or NXP markings during the transition period. These changes will have no impact on form, fit or function of the current product.

**Figure 8. AFT20S015N Test Circuit Component Layout — 1805-1880 MHz**

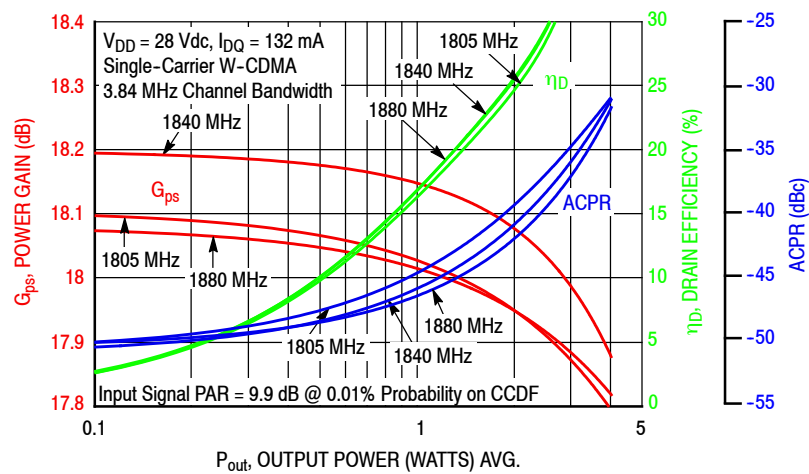
**Table 8. AFT20S015N Test Circuit Component Designations and Values — 1805-1880 MHz**

| Part               | Description                                 | Part Number          | Manufacturer |
|--------------------|---------------------------------------------|----------------------|--------------|
| C1                 | 11 pF Chip Capacitor                        | ATC100B11R0CT500XT   | ATC          |
| C2, C3             | 3.3 pF Chip Capacitors                      | ATC800B3R3BT500XT    | ATC          |
| C4, C5             | 47 pF Chip Capacitors                       | ATC600F47BT250XT     | ATC          |
| C6, C7             | 6.8 pF Chip Capacitors                      | ATC100B6R8CT500XT    | ATC          |
| C8, C9             | 240 pF Chip Capacitors                      | ATC100B241JT200XT    | ATC          |
| C10, C11, C22, C23 | 220 pF Chip Capacitors                      | C1812C224K5RAC-TU    | Kemet        |
| C12, C13, C24, C25 | 0.1 $\mu$ F Chip Capacitors                 | CDR33BX104AKWS       | AVX          |
| C14, C15, C26, C27 | 2.2 $\mu$ F, 50 V Chip Capacitors           | C1825C225J5RAC-TU    | Kemet        |
| C16, C17           | 22 $\mu$ F, 35 V Tantalum Capacitors        | T491X226K035AT       | Kemet        |
| C18, C19, C20, C21 | 75 pF Chip Capacitors                       | ATC800B750JT500XT    | ATC          |
| C28, C29           | 470 $\mu$ F, 63 V Electrolytic Capacitors   | MCGPR63V477M13X26-RH | Multicomp    |
| R1, R2             | 1 $\Omega$ Chip Resistors                   | CRCW12061R00FKEA     | Vishay       |
| PCB                | Rogers RO4350B, 0.020", $\epsilon_r = 3.66$ | D45064               | MTL          |

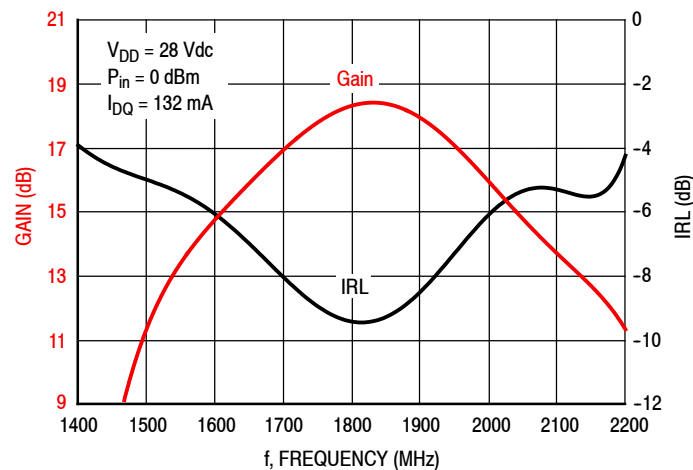
## ALTERNATE CHARACTERIZATION — 1805-1880 MHz



**Figure 9. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @  $P_{out} = 1.5$  Watts Avg.**

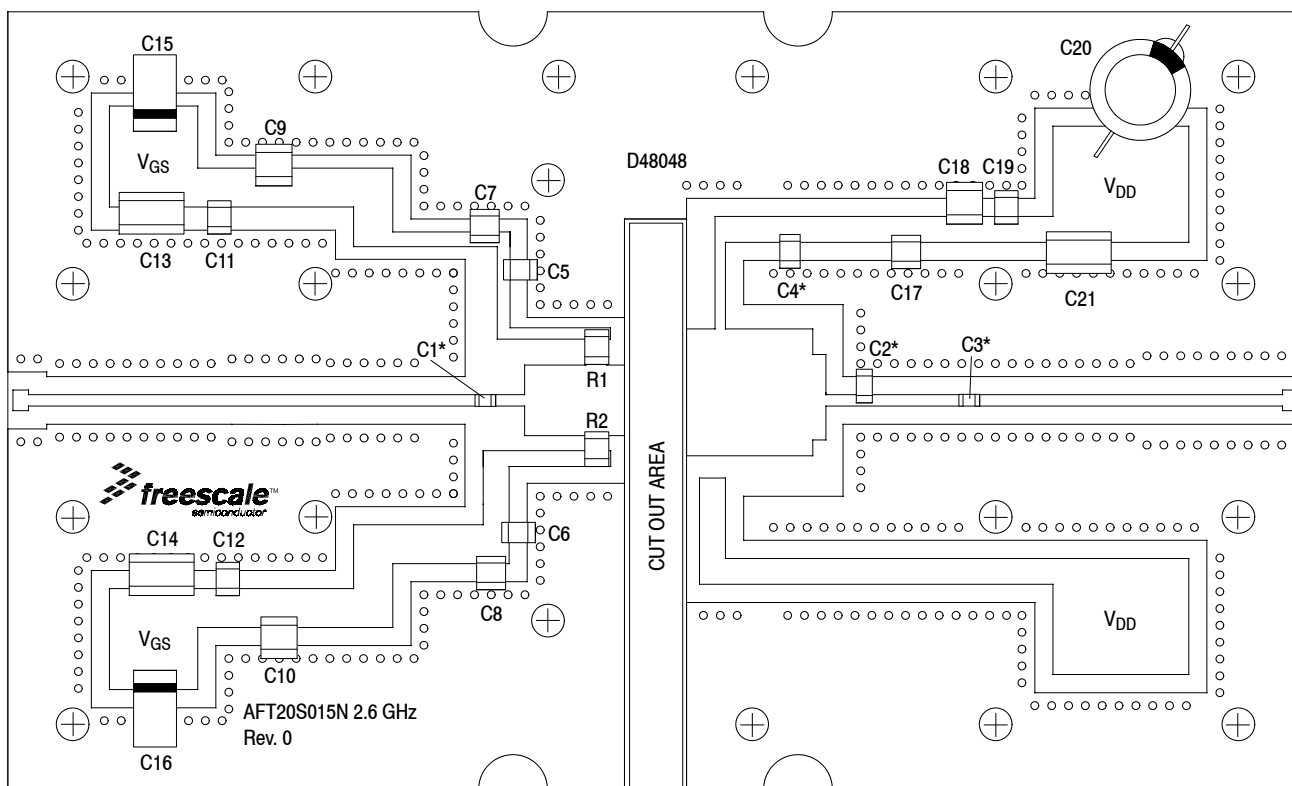


**Figure 10. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power**



**Figure 11. Broadband Frequency Response**

## ALTERNATE CHARACTERIZATION — 2300-2700 MHz



\*C1, C2, C3 and C4 are mounted vertically.

Note: NXP has begun the transition of marking printed circuit boards (PCBs) with the NXP exception logo. PCBs may have either Freescale or NXP markings during the transition period. These changes will have no impact on form, fit or function of the current product.

**Figure 12. AFT20S015N Test Circuit Component Layout — 2300-2700 MHz**

**Table 9. AFT20S015N Test Circuit Component Designations and Values — 2300-2700 MHz**

| Part          | Description                                 | Part Number          | Manufacturer |
|---------------|---------------------------------------------|----------------------|--------------|
| C1            | 4.3 pF Chip Capacitor                       | ATC600F4R3CT250XT    | ATC          |
| C2            | 1.3 pF Chip Capacitor                       | ATC800B1R3BT500XT    | ATC          |
| C3            | 8.2 pF Chip Capacitor                       | ATC600F8R2BT250XT    | ATC          |
| C4            | 6.8 pF Chip Capacitor                       | ATC100B6R8CT500XT    | ATC          |
| C5, C6        | 6.8 pF Chip Capacitors                      | ATC800B6R8CT500XT    | ATC          |
| C7, C8, C17   | 2.2 $\mu$ F Chip Capacitors                 | C3225X7R1H225KT      | TDK          |
| C9, C10, C18  | 220 nF Chip Capacitors                      | C1812C224K5RAC-TU    | Kemet        |
| C11, C12, C19 | 0.1 $\mu$ F Chip Capacitors                 | CDR33BX104AKWS       | AVX          |
| C13, C14, C21 | 2.2 $\mu$ F Chip Capacitors                 | C1825C225J5RAC-TU    | Kemet        |
| C15, C16      | 22 $\mu$ F, 35 V Tantalum Capacitors        | T491X226K035AT       | Kemet        |
| C20           | 470 $\mu$ F, 63 V Electrolytic Capacitor    | MCGPR63V477M13X26-RH | Multicomp    |
| R1, R2        | 4.75 $\Omega$ Chip Resistors                | CRCW12064R75FKEA     | Vishay       |
| PCB           | Rogers RO4350B, 0.020", $\epsilon_r = 3.66$ | D48048               | MTL          |

## ALTERNATE CHARACTERIZATION — 2300-2700 MHz

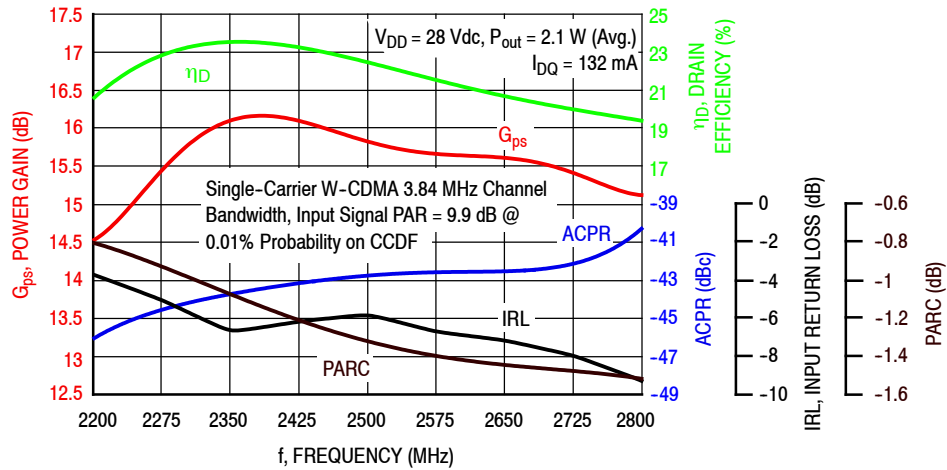


Figure 13. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @  $P_{out} = 2.1$  Watts Avg.

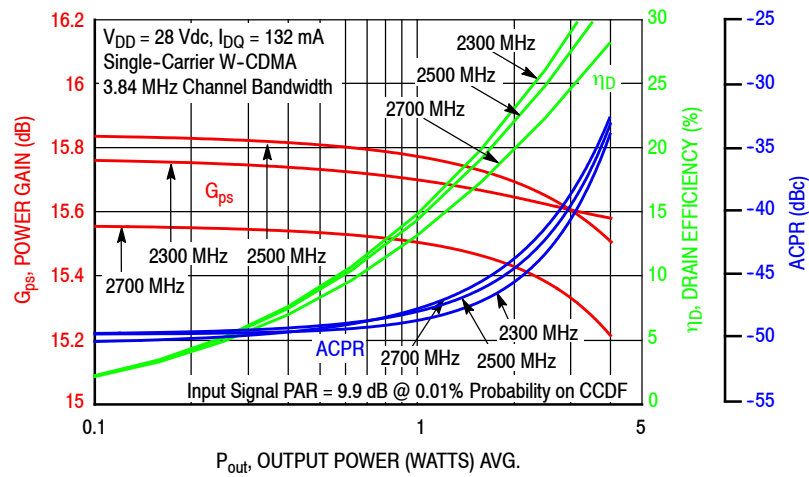


Figure 14. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power

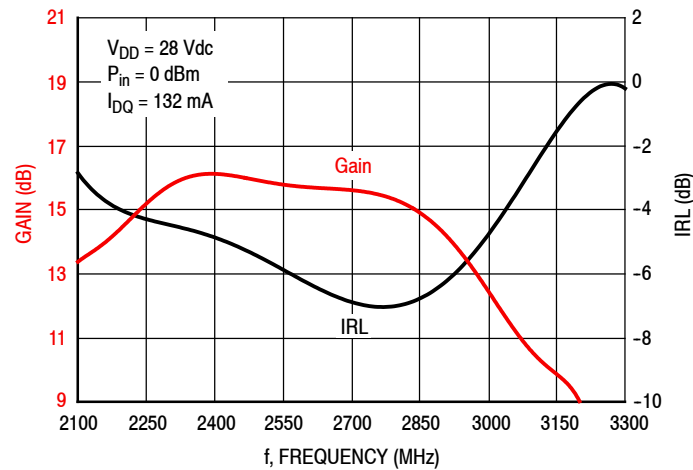
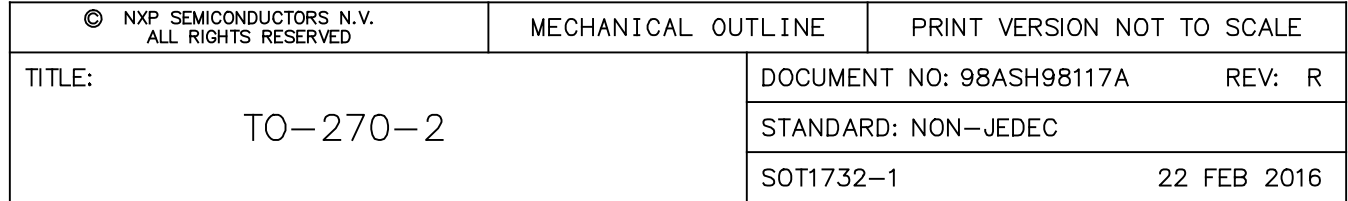
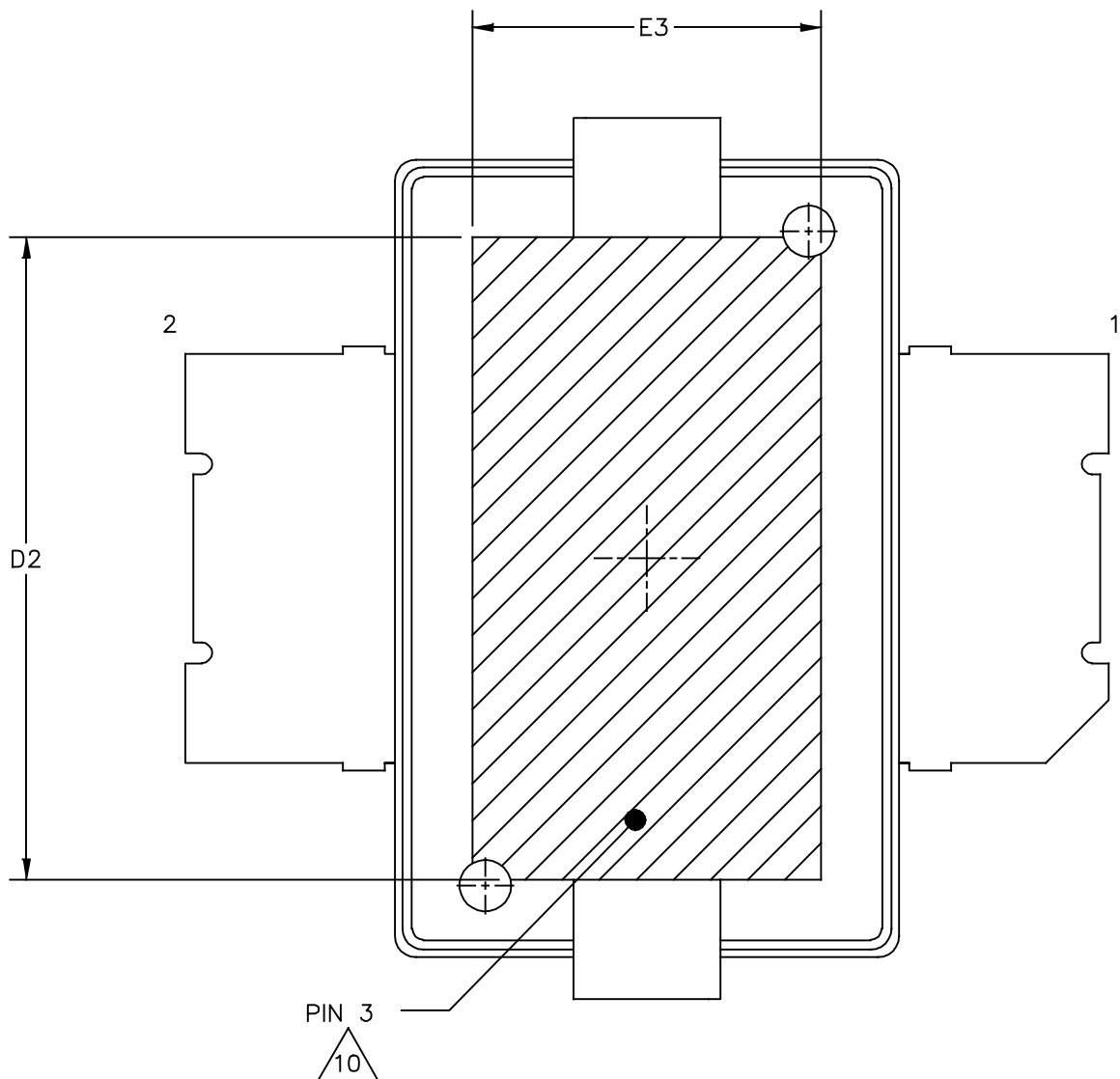


Figure 15. Broadband Frequency Response

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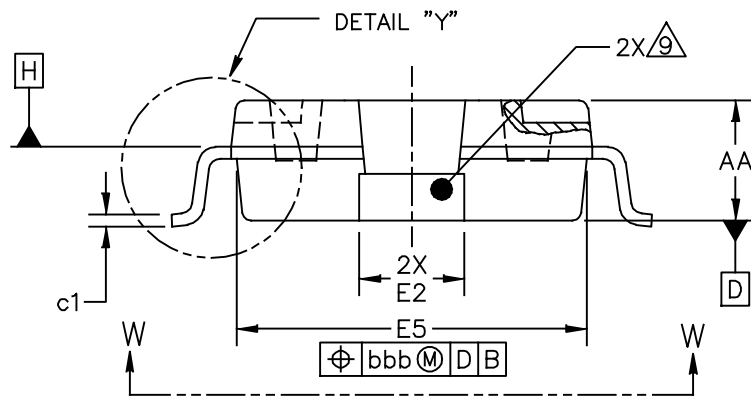
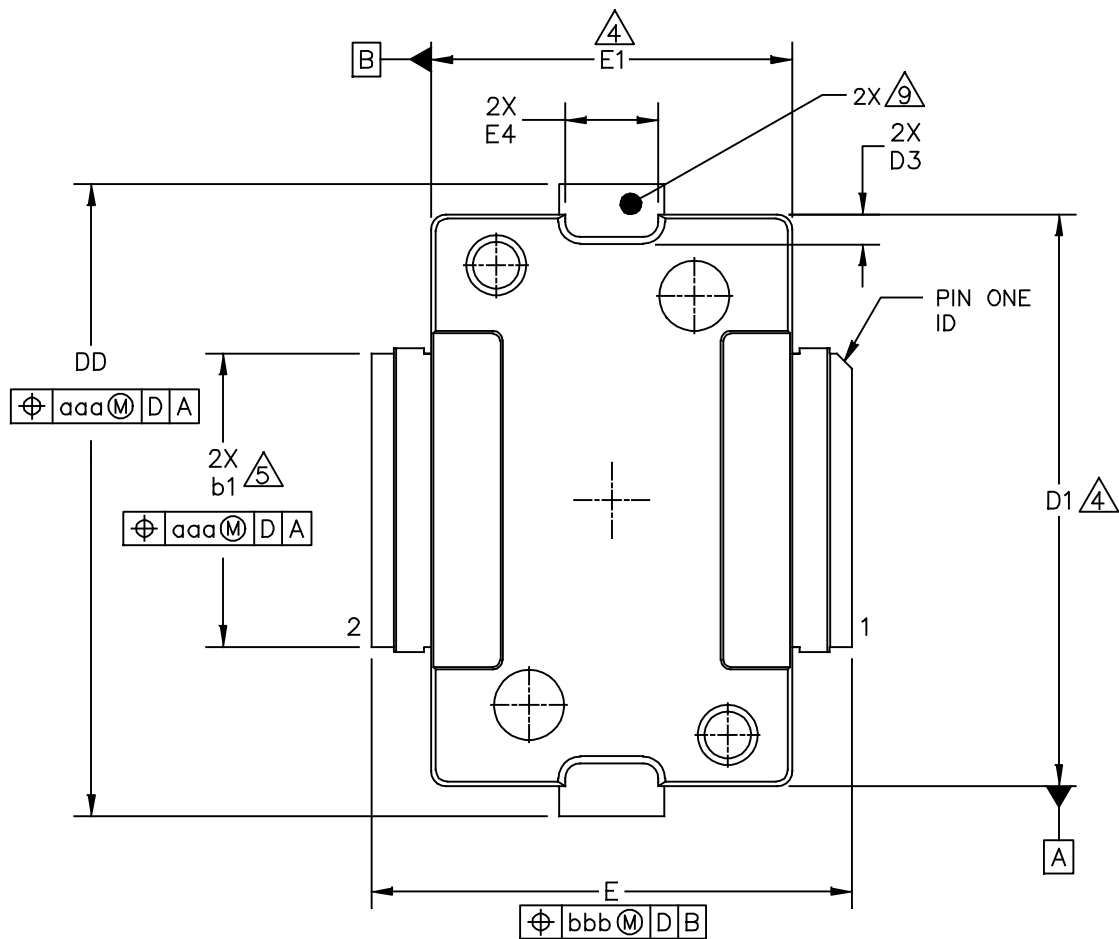
VIEW W-W  
BOTTOM VIEW

|                                                  |                    |                                      |             |
|--------------------------------------------------|--------------------|--------------------------------------|-------------|
| © NXP SEMICONDUCTORS N.V.<br>ALL RIGHTS RESERVED | MECHANICAL OUTLINE | PRINT VERSION NOT TO SCALE           |             |
| TITLE:<br><br>TO-270-2                           |                    | DOCUMENT NO: 98ASH98117A      REV: R |             |
|                                                  |                    | STANDARD: NON-JEDEC                  |             |
|                                                  |                    | SOT1732-1                            | 22 FEB 2016 |

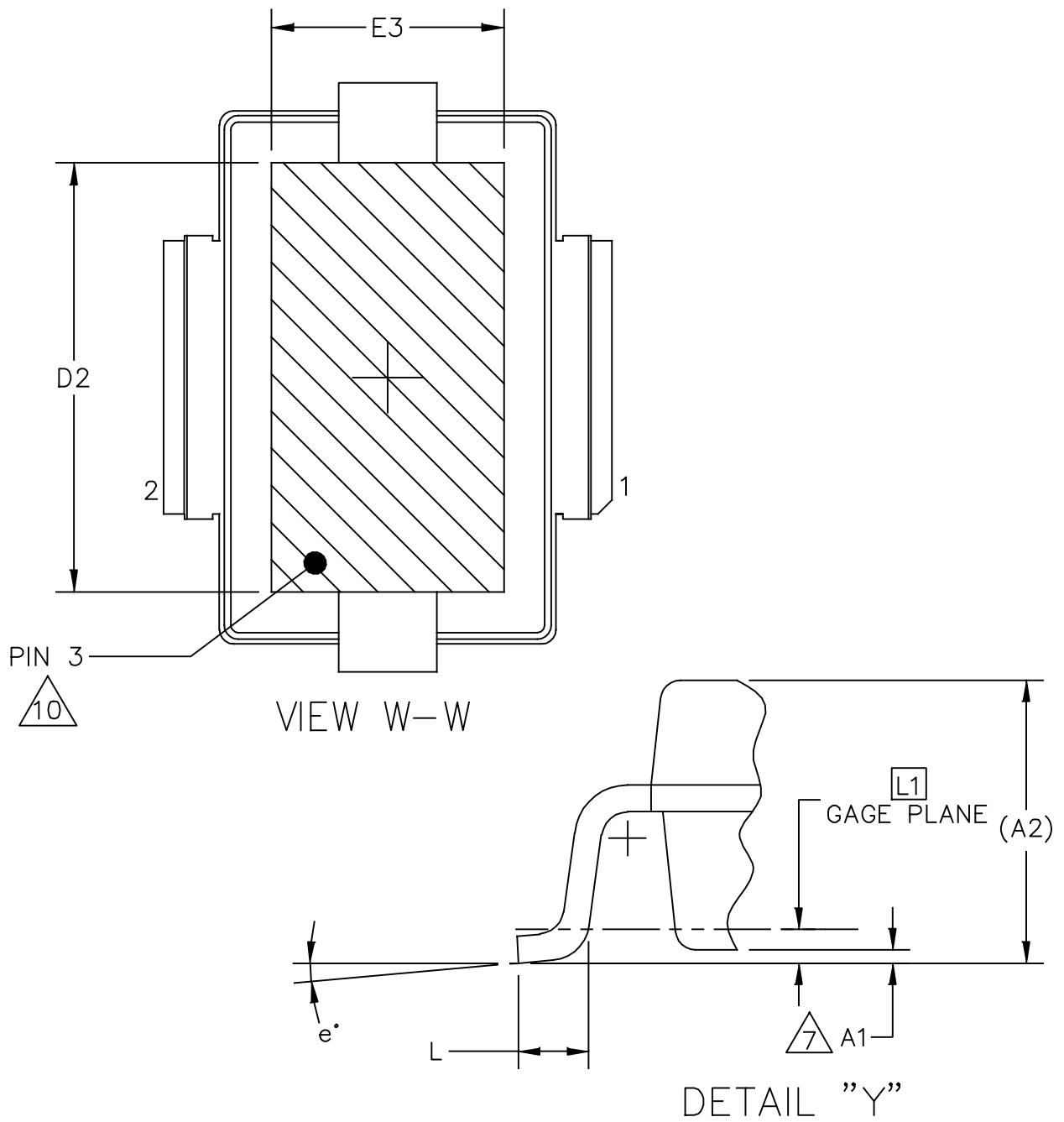
NOTES:

1. CONTROLLING DIMENSION: INCH
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
3. DATUM PLANE H IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 INCH (0.15 MM) PER SIDE. DIMENSIONS D1 AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.
5. DIMENSION b1 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 INCH (0.13 MM) TOTAL IN EXCESS OF THE b1 DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
7. DIMENSION A2 APPLIES WITHIN ZONE J ONLY.
8. DIMENSIONS DD AND E2 DO NOT INCLUDE MOLD PROTRUSION. OVERALL LENGTH INCLUDING MOLD PROTRUSION SHOULD NOT EXCEED 0.430 INCH (10.92 MM) FOR DIMENSION DD AND 0.080 INCH (2.03 MM) FOR DIMENSION E2. DIMENSIONS DD AND E2 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE D.
9. THESE SURFACES OF THE HEAT SLUG ARE NOT PART OF THE SOLDERABLE SURFACES AND MAY REMAIN UNPLATED.
10. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG. DIMENSIONS D2 AND E3 REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA OF THE HEAT SLUG.

| AREA OF THE HEAT SINK                            |      |       |            |                    |                                                      |          |                            |            |      |
|--------------------------------------------------|------|-------|------------|--------------------|------------------------------------------------------|----------|----------------------------|------------|------|
| DIM                                              | INCH |       | MILLIMETER |                    | DIM                                                  | INCH     |                            | MILLIMETER |      |
|                                                  | MIN  | MAX   | MIN        | MAX                |                                                      | MIN      | MAX                        | MIN        | MAX  |
| AA                                               | .078 | .082  | 1.98       | 2.08               | E4                                                   | .058     | .066                       | 1.47       | 1.68 |
| A1                                               | .039 | .043  | 0.99       | 1.09               | E5                                                   | .231     | .235                       | 5.87       | 5.97 |
| A2                                               | .040 | .042  | 1.02       | 1.07               | F                                                    | .025 BSC |                            | 0.64 BSC   |      |
| DD                                               | .416 | .424  | 10.57      | 10.77              | b1                                                   | .193     | .199                       | 4.90       | 5.06 |
| D1                                               | .378 | .382  | 9.60       | 9.70               | c1                                                   | .007     | .011                       | 0.18       | 0.28 |
| D2                                               | .290 | ----- | 7.37       | -----              | aaa                                                  | .004     |                            | 0.10       |      |
| D3                                               | .016 | .024  | 0.41       | 0.61               | bbb                                                  | .008     |                            | 0.20       |      |
| E                                                | .436 | .444  | 11.07      | 11.28              |                                                      |          |                            |            |      |
| E1                                               | .238 | .242  | 6.04       | 6.15               |                                                      |          |                            |            |      |
| E2                                               | .066 | .074  | 1.68       | 1.88               |                                                      |          |                            |            |      |
| E3                                               | .150 | ----- | 3.81       | -----              |                                                      |          |                            |            |      |
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|                                                  |      |       |            |                    | STANDARD: NON-JEDEC                                  |          |                            |            |      |
|                                                  |      |       |            |                    | SOT1732-1                                            |          |                            |            |      |



|                                                  |                                 |                            |
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| TITLE:<br><br>TO-270G-2                          | DOCUMENT NO: 98ASA99301D REV: D |                            |
|                                                  | STANDARD: JEDEC TO-270 BA       |                            |
|                                                  | SOT1731-1 28 MAR 2016           |                            |



|                                                  |                    |                            |             |
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| TITLE:<br><br>TO-270G-2                          |                    | DOCUMENT NO: 98ASA99301D   | REV: D      |
|                                                  |                    | STANDARD: JEDEC TO-270 BA  |             |
|                                                  |                    | SOT1731-1                  | 28 MAR 2016 |

NOTES:

1. CONTROLLING DIMENSION: INCH

2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.

3. DATUM PLANE H IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.

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5. DIMENSION b1 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 INCH (0.13 MM) TOTAL IN EXCESS OF THE b1 DIMENSION AT MAXIMUM MATERIAL CONDITION.

6. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.

7. DIMENSION A1 IS MEASURED WITH REFERENCE TO DATUM D. THE POSITIVE VALUE IMPLIES THAT THE BOTTOM OF THE PACKAGE IS HIGHER THAN THE BOTTOM OF THE LEAD.

8. DIMENSIONS DD AND E2 DO NOT INCLUDE MOLD PROTRUSION. OVERALL LENGTH INCLUDING MOLD PROTRUSION SHOULD NOT EXCEED 0.430 INCH (10.92 MM) FOR DIMENSION DD AND 0.080 INCH (2.03 MM) FOR DIMENSION E2.

9. THESE SURFACES OF THE HEAT SLUG ARE NOT PART OF THE SOLDERABLE SURFACES AND MAY REMAIN UNPLATED.

10. HATCHING REPRESENTS THE EXPOSED AND SOLDERABLE AREA OF THE HEAT SLUG. DIMENSIONS D2 AND E3 REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA OF THE HEAT SLUG.

| INCH                                             |        |      | MILLIMETER |                    | DIM                                                  | INCH                       |      | MILLIMETER |      |
|--------------------------------------------------|--------|------|------------|--------------------|------------------------------------------------------|----------------------------|------|------------|------|
| DIM                                              | MIN    | MAX  | MIN        | MAX                |                                                      | MIN                        | MAX  | MIN        | MAX  |
| AA                                               | .078   | .082 | 1.98       | 2.08               | L                                                    | .018                       | .024 | 0.46       | 0.61 |
| A1                                               | .001   | .004 | 0.03       | 0.10               | L1                                                   | .010 BSC                   |      | 0.25 BSC   |      |
| A2                                               | (.083) |      | (2.11)     |                    | b1                                                   | .193                       | .199 | 4.90       | 5.06 |
| DD                                               | .416   | .424 | 10.57      | 10.77              | c1                                                   | .007                       | .011 | 0.18       | 0.28 |
| D1                                               | .378   | .382 | 9.60       | 9.70               | e                                                    | 2°                         | 8°   | 2°         | 8°   |
| D2                                               | .290   | —    | 7.37       | —                  | aaa                                                  | .004                       |      | 0.10       |      |
| D3                                               | .016   | .024 | 0.41       | 0.61               | bbb                                                  | .008                       |      | 0.20       |      |
| E                                                | .316   | .324 | 8.03       | 8.23               |                                                      |                            |      |            |      |
| E1                                               | .238   | .242 | 6.04       | 6.15               |                                                      |                            |      |            |      |
| E2                                               | .066   | .074 | 1.68       | 1.88               |                                                      |                            |      |            |      |
| E3                                               | .150   | —    | 3.81       | —                  |                                                      |                            |      |            |      |
| E4                                               | .058   | .066 | 1.47       | 1.68               |                                                      |                            |      |            |      |
| E5                                               | .231   | .235 | 5.87       | 5.97               |                                                      |                            |      |            |      |
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| TITLE:<br><br>TO—270G—2                          |        |      |            |                    | DOCUMENT NO: 98ASA99301D                      REV: D |                            |      |            |      |
|                                                  |        |      |            |                    | STANDARD: JEDEC TO—270 BA                            |                            |      |            |      |
|                                                  |        |      |            |                    | SOT1731—1                                            |                            |      |            |      |

## PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following documents, software and tools to aid your design process.

### Application Notes

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Plastic Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers
- AN3789: Clamping of High Power RF Transistors and RFICs in Over-Molded Plastic Packages

### Software

- Electromigration MTTF Calculator
- RF High Power Model
- .s2p File

### Development Tools

- Printed Circuit Boards

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | Apr. 2013 | <ul style="list-style-type: none"><li>• Initial Release of Data Sheet</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1        | Nov. 2013 | <ul style="list-style-type: none"><li>• Upper frequency limit changed from 2690 to 2700 MHz to reflect measurement data, p. 1</li><li>• Table 2, Thermal Characteristics: changed 2170 to 2140 MHz to reflect recent thermal test results, p. 2</li><li>• Table 5, Electrical Characteristics, Load Mismatch: updated VSWR power levels (8 W CW to 14 W CW, 7 W CW to 12 W CW) to reflect recent characterization data test results, p. 3</li><li>• Table 5, Electrical Characteristics, Typical Performance: changed P1dB from 7 W to 16.2 W based on P3dB load pull calculations, p. 3</li><li>• Figs. 2, 8, 12, Test Circuit Component Layout: added MTL number, pp. 4, 7, 9</li><li>• Tables 6, 7, 8, Test Circuit Component Designations and Values: updated PCB description to reflect most current board specifications from Rogers and added MTL part number, pp. 4, 7, 9</li></ul> |
| 2        | Apr. 2020 | <ul style="list-style-type: none"><li>• Package Outline Drawings: TO-270-2 package outline updated to Rev. R, pp. 11–13. TO-270G-2 package outline updated to Rev. D, pp. 14–16.</li><li>• General updates made to align data sheet to current standard</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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