

# RF Power LDMOS Transistors

## High Ruggedness N-Channel Enhancement-Mode Lateral MOSFETs

RF power transistors designed for both narrowband and broadband ISM, broadcast and aerospace applications operating at frequencies from 1.8 to 2000 MHz. These devices are fabricated using NXP's enhanced ruggedness platform and are suitable for use in applications where high VSWRs are encountered.

**Typical Performance:**  $V_{DD} = 50$  Volts

| Frequency (MHz)            | Signal Type                              | P <sub>out</sub> (W) | G <sub>ps</sub> (dB) | $\eta_D$ (%) | IMD <sup>(1)</sup> (dBc) |
|----------------------------|------------------------------------------|----------------------|----------------------|--------------|--------------------------|
| 1.8 to 30 <sup>(2,6)</sup> | Two-Tone<br>(10 kHz spacing)             | 25 PEP               | 25                   | 51           | -30                      |
| 30-512 <sup>(3,6)</sup>    | Two-Tone<br>(200 kHz spacing)            | 25 PEP               | 17.1                 | 30.1         | -32                      |
| 512 <sup>(4)</sup>         | Pulse (100 $\mu$ sec,<br>20% Duty Cycle) | 25 Peak              | 25.4                 | 74.5         | —                        |
| 512 <sup>(4)</sup>         | CW                                       | 25                   | 25.5                 | 74.7         | —                        |
| 1030 <sup>(5)</sup>        | CW                                       | 25                   | 22.5                 | 60           | —                        |

### Load Mismatch/Ruggedness

| Frequency (MHz)     | Signal Type                              | VSWR                         | P <sub>in</sub> (W)           | Test Voltage | Result                |
|---------------------|------------------------------------------|------------------------------|-------------------------------|--------------|-----------------------|
| 30 <sup>(2)</sup>   | CW                                       | >65:1<br>at all Phase Angles | 0.23<br>(3 dB Overdrive)      | 50           | No Device Degradation |
| 512 <sup>(3)</sup>  | CW                                       |                              | 1.6<br>(3 dB Overdrive)       |              |                       |
| 512 <sup>(4)</sup>  | Pulse<br>(100 $\mu$ sec, 20% Duty Cycle) |                              | 0.14 Peak<br>(3 dB Overdrive) |              |                       |
| 512 <sup>(4)</sup>  | CW                                       |                              | 0.14<br>(3 dB Overdrive)      |              |                       |
| 1030 <sup>(5)</sup> | CW                                       |                              | 0.34<br>(3 dB Overdrive)      |              |                       |

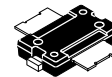
1. Distortion products are referenced to one of two tones. See p. 13, 20.
2. Measured in 1.8-30 MHz broadband reference circuit.
3. Measured in 30-512 MHz broadband reference circuit.
4. Measured in 512 MHz narrowband test circuit.
5. Measured in 1030 MHz narrowband test circuit.
6. The values shown are the minimum measured performance numbers across the indicated frequency range.

### Features

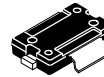
- Wide operating frequency range
- Extreme ruggedness
- Unmatched, capable of very broadband operation
- Integrated stability enhancements
- Low thermal resistance
- Extended ESD protection circuit

**MRFE6VS25NR1**  
**MRFE6VS25GNR1**

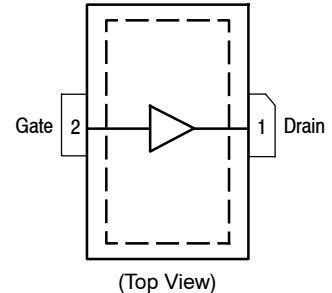
**1.8-2000 MHz, 25 W, 50 V  
WIDEBAND  
RF POWER LDMOS TRANSISTORS**



**TO-270-2  
PLASTIC  
MRFE6VS25NR1**



**TO-270G-2  
PLASTIC  
MRFE6VS25GNR1**



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, +133  | Vdc  |
| Gate-Source Voltage                  | $V_{GS}$  | -6.0, +10   | Vdc  |
| Storage Temperature Range            | $T_{stg}$ | -65 to +150 | °C   |
| Case Operating Temperature           | $T_C$     | -40 to +150 | °C   |
| Operating Junction Temperature (1,2) | $T_J$     | -40 to +225 | °C   |

**Table 2. Thermal Characteristics**

| Characteristic                                                                                                                                                  | Symbol          | Value (2,3) | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|------|
| Thermal Resistance, Junction to Case<br>CW: Case Temperature 80°C, 25 W CW, 50 Vdc, $I_{DQ} = 10$ mA, 512 MHz                                                   | $R_{\theta JC}$ | 1.2         | °C/W |
| Thermal Impedance, Junction to Case<br>Pulse: Case Temperature 77°C, 25 W Peak, 100 $\mu$ sec Pulse Width,<br>20% Duty Cycle, 50 Vdc, $I_{DQ} = 10$ mA, 512 MHz | $Z_{\theta JC}$ | 0.29        | °C/W |

**Table 3. ESD Protection Characteristics**

| Test Methodology                      | Class             |
|---------------------------------------|-------------------|
| Human Body Model (per JESD22-A114)    | 2, passes 2500 V  |
| Machine Model (per EIA/JESD22-A115)   | B, passes 250 V   |
| Charge Device Model (per JESD22-C101) | IV, passes 2000 V |

**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**

|                                                                                    |               |     |     |     |           |
|------------------------------------------------------------------------------------|---------------|-----|-----|-----|-----------|
| Gate-Source Leakage Current<br>( $V_{GS} = 5$ Vdc, $V_{DS} = 0$ Vdc)               | $I_{GSS}$     | —   | —   | 400 | nAdc      |
| Drain-Source Breakdown Voltage<br>( $V_{GS} = 0$ Vdc, $I_D = 50$ mA)               | $V_{(BR)DSS}$ | 133 | 142 | —   | Vdc       |
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 50$ Vdc, $V_{GS} = 0$ Vdc)  | $I_{DSS}$     | —   | —   | 2   | $\mu$ Adc |
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 100$ Vdc, $V_{GS} = 0$ Vdc) | $I_{DSS}$     | —   | —   | 7   | $\mu$ Adc |

**On Characteristics**

|                                                                                              |              |     |      |     |     |
|----------------------------------------------------------------------------------------------|--------------|-----|------|-----|-----|
| Gate Threshold Voltage<br>( $V_{DS} = 10$ Vdc, $I_D = 85$ $\mu$ Adc)                         | $V_{GS(th)}$ | 1.5 | 2.0  | 2.5 | Vdc |
| Gate Quiescent Voltage<br>( $V_{DD} = 50$ Vdc, $I_D = 10$ mAdc, Measured in Functional Test) | $V_{GS(Q)}$  | 2.0 | 2.4  | 3.0 | Vdc |
| Drain-Source On-Voltage<br>( $V_{GS} = 10$ Vdc, $I_D = 210$ mAdc)                            | $V_{DS(on)}$ | —   | 0.28 | —   | Vdc |

**Dynamic Characteristics**

|                                                                                                   |           |   |      |   |    |
|---------------------------------------------------------------------------------------------------|-----------|---|------|---|----|
| Reverse Transfer Capacitance<br>( $V_{DS} = 50$ Vdc $\pm 30$ mV(rms)ac @ 1 MHz, $V_{GS} = 0$ Vdc) | $C_{rss}$ | — | 0.26 | — | pF |
| Output Capacitance<br>( $V_{DS} = 50$ Vdc $\pm 30$ mV(rms)ac @ 1 MHz, $V_{GS} = 0$ Vdc)           | $C_{oss}$ | — | 14.2 | — | pF |
| Input Capacitance<br>( $V_{DS} = 50$ Vdc, $V_{GS} = 0$ Vdc $\pm 30$ mV(rms)ac @ 1 MHz)            | $C_{iss}$ | — | 39.2 | — | pF |

1. Continuous use at maximum temperature will affect MTTF.

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

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)</sup> (In NXP Test Fixture, 50 ohm system) $V_{DD} = 50\text{ Vdc}$ , $I_{DQ} = 10\text{ mA}$ , $P_{out} = 25\text{ W Peak}$ (5 W Avg.), $f = 512\text{ MHz}$ , 100 $\mu\text{sec}$ Pulse Width, 20% Duty Cycle |          |      |      |      |      |
| Power Gain                                                                                                                                                                                                                                       | $G_{ps}$ | 24.0 | 25.4 | 27.0 | dB   |
| Drain Efficiency                                                                                                                                                                                                                                 | $\eta_D$ | 70.0 | 74.5 | —    | %    |
| Input Return Loss                                                                                                                                                                                                                                | IRL      | —    | -16  | -10  | dB   |

**Load Mismatch/Ruggedness** (In NXP Test Fixture, 50 ohm system)  $I_{DQ} = 10\text{ mA}$ 

| Frequency (MHz) | Signal Type                                     | VSWR                         | $P_{in}$ (W)                  | Test Voltage, $V_{DD}$ | Result                |
|-----------------|-------------------------------------------------|------------------------------|-------------------------------|------------------------|-----------------------|
| 512             | Pulse<br>(100 $\mu\text{sec}$ , 20% Duty Cycle) | >65:1<br>at all Phase Angles | 0.14 Peak<br>(3 dB Overdrive) | 50                     | No Device Degradation |
|                 | CW                                              |                              | 0.14<br>(3 dB Overdrive)      |                        |                       |

**Table 6. Ordering Information**

| Device        | Shipping Information                                  | Package   |
|---------------|-------------------------------------------------------|-----------|
| MRFE6VS25NR1  | R1 Suffix = 500 Units, 24 mm Tape Width, 13-Inch Reel | TO-270-2  |
| MRFE6VS25GNR1 |                                                       | TO-270G-2 |

1. Measurements made with device in straight lead configuration before any lead forming operation is applied. Lead forming is used for gull wing (GN) parts.

## TYPICAL CHARACTERISTICS

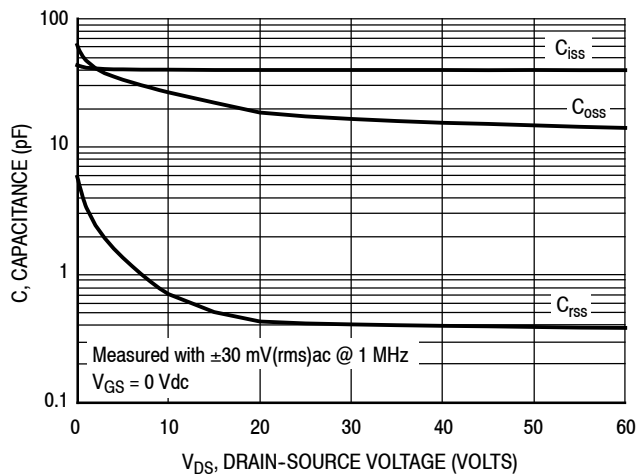


Figure 2. Capacitance versus Drain-Source Voltage

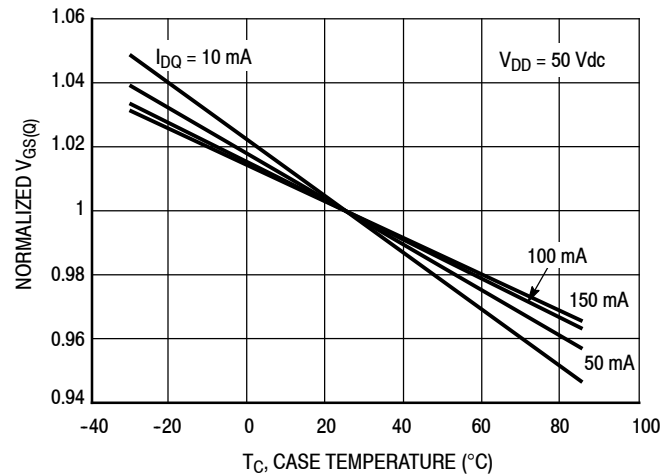
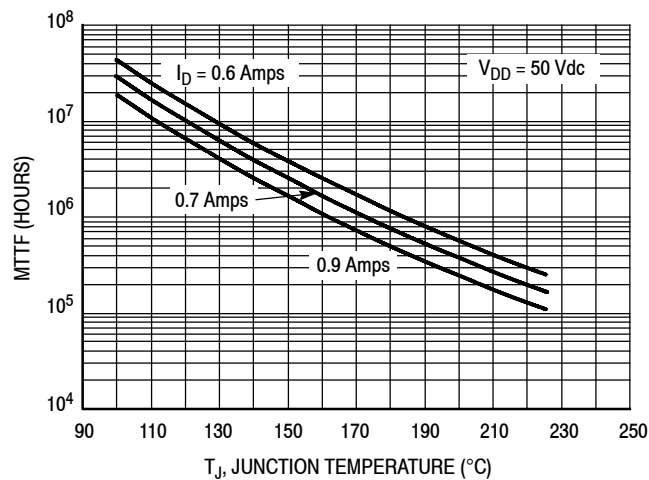


Figure 3. Normalized V<sub>GS</sub> and Quiescent Current versus Case Temperature

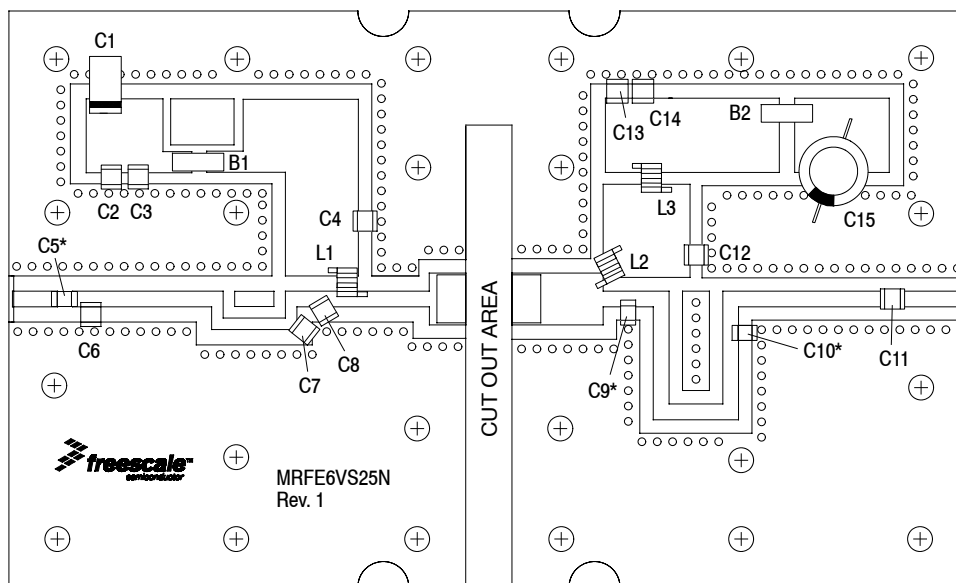
| I <sub>DQ</sub> (mA) | Slope (mV/°C) |
|----------------------|---------------|
| 10                   | -2.160        |
| 50                   | -1.790        |
| 100                  | -1.760        |
| 150                  | -1.680        |



**Note:** MTTF value represents the total cumulative operating time under indicated test conditions.

Figure 4. MTTF versus Junction Temperature — CW

## 512 MHz NARROWBAND PRODUCTION TEST FIXTURE

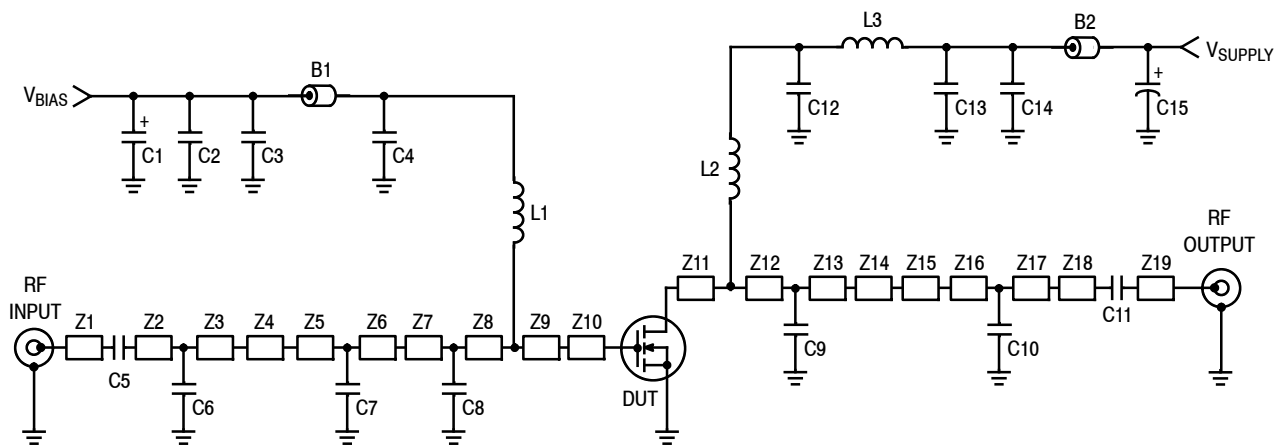


\*C5, C9 and C10 are mounted vertically.

Figure 5. MRFE6VS25NR1 Narrowband Test Circuit Component Layout — 512 MHz

Table 7. MRFE6VS25NR1 Narrowband Test Circuit Component Designations and Values — 512 MHz

| Part         | Description                              | Part Number          | Manufacturer |
|--------------|------------------------------------------|----------------------|--------------|
| B1, B2       | Long Ferrite Beads                       | 2743021447           | Fair-Rite    |
| C1           | 22 $\mu$ F, 35 V Tantalum Capacitor      | T491X226K035AT       | Kemet        |
| C2, C13      | 0.1 $\mu$ F Chip Capacitors              | CDR33BX104AKWY       | AVX          |
| C3, C14      | 0.01 $\mu$ F Chip Capacitors             | C0805C103K5RAC       | Kemet        |
| C4, C11, C12 | 180 pF Chip Capacitors                   | ATC100B181JT300XT    | ATC          |
| C5           | 18 pF Chip Capacitor                     | ATC100B180JT500XT    | ATC          |
| C6           | 2.7 pF Chip Capacitor                    | ATC100B2R7BT500XT    | ATC          |
| C7           | 15 pF Chip Capacitor                     | ATC100B150JT500XT    | ATC          |
| C8           | 36 pF Chip Capacitor                     | ATC100B360JT500XT    | ATC          |
| C9           | 4.3 pF Chip Capacitor                    | ATC100B4R3CT500XT    | ATC          |
| C10          | 13 pF Chip Capacitor                     | ATC100B130JT500XT    | ATC          |
| C15          | 470 $\mu$ F, 63 V Electrolytic Capacitor | MCGPR63V477M13X26-RH | Multicomp    |
| L1           | 33 nH Inductor                           | 1812SMS-33NJLC       | Coilcraft    |
| L2           | 12.5 nH Inductor                         | A04TJLC              | Coilcraft    |
| L3           | 82 nH Inductor                           | 1812SMS-82NJLC       | Coilcraft    |
| PCB          | 0.030", $\epsilon_r = 2.55$              | AD255A               | Arlon        |



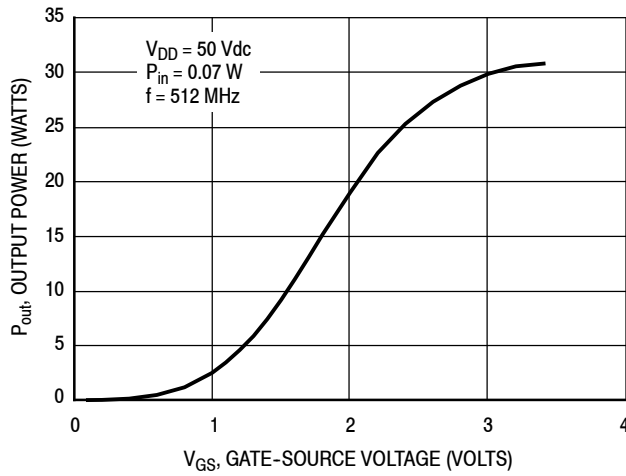
**Figure 6. MRFE6VS25NR1 Narrowband Test Circuit Schematic — 512 MHz**

**Table 8. MRFE6VS25NR1 Narrowband Test Circuit Microstrips — 512 MHz**

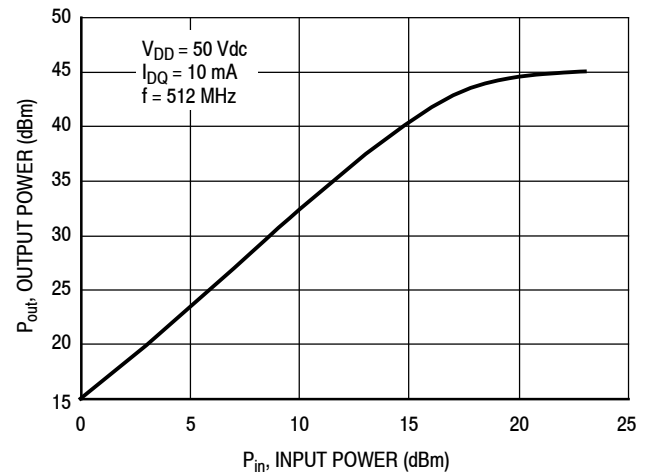
| Microstrip | Description                | Microstrip | Description                |
|------------|----------------------------|------------|----------------------------|
| Z1         | 0.235" × 0.082" Microstrip | Z11        | 0.475" × 0.270" Microstrip |
| Z2         | 0.042" × 0.082" Microstrip | Z12        | 0.091" × 0.082" Microstrip |
| Z3         | 0.682" × 0.082" Microstrip | Z13        | 0.170" × 0.082" Microstrip |
| Z4*        | 0.200" × 0.060" Microstrip | Z14*       | 0.670" × 0.082" Microstrip |
| Z5         | 0.324" × 0.060" Microstrip | Z15        | 0.280" × 0.082" Microstrip |
| Z6*        | 0.200" × 0.060" Microstrip | Z16*       | 0.413" × 0.082" Microstrip |
| Z7         | 0.067" × 0.082" Microstrip | Z17*       | 0.259" × 0.082" Microstrip |
| Z8         | 0.142" × 0.082" Microstrip | Z18        | 0.761" × 0.082" Microstrip |
| Z9         | 0.481" × 0.082" Microstrip | Z19        | 0.341" × 0.082" Microstrip |
| Z10        | 0.190" × 0.270" Microstrip |            |                            |

\* Line length includes microstrip bends

## TYPICAL CHARACTERISTICS — 512 MHz

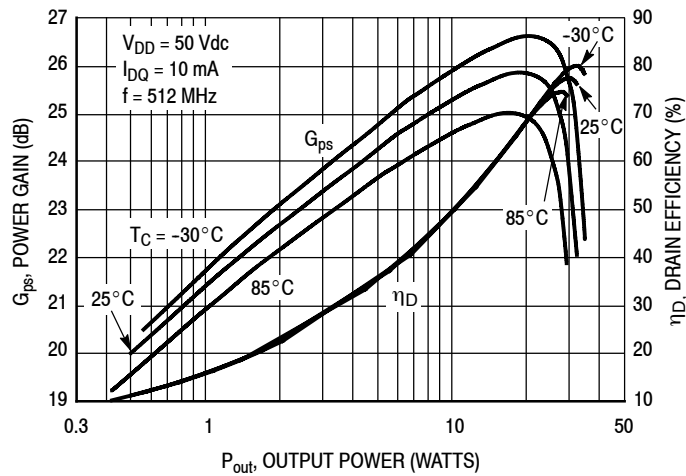


**Figure 7. CW Output Power versus Gate-Source Voltage at a Constant Input Power**



| f<br>(MHz) | P1dB<br>(W) | P3dB<br>(W) |
|------------|-------------|-------------|
| 512        | 27.8        | 31.4        |

**Figure 8. CW Output Power versus Input Power**



**Figure 9. Power Gain and Drain Efficiency versus CW Output Power**

## 512 MHz NARROWBAND PRODUCTION TEST FIXTURE

$V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 10 \text{ mA}$ ,  $P_{out} = 25 \text{ W Peak}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 512      | $1.56 + j11.6$           | $9.5 + j18.3$          |

$Z_{source}$  = Test circuit impedance as measured from gate to ground.

$Z_{load}$  = Test circuit impedance as measured from drain to ground.

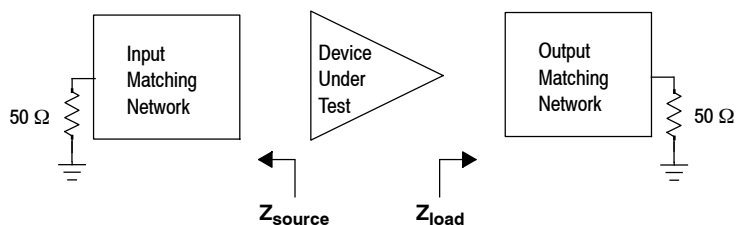


Figure 10. Narrowband Series Equivalent Source and Load Impedance — 512 MHz

## 1.8-30 MHz BROADBAND REFERENCE CIRCUIT

**Table 9. 1.8-30 MHz Broadband Performance** (In NXP Reference Circuit, 50 ohm system)

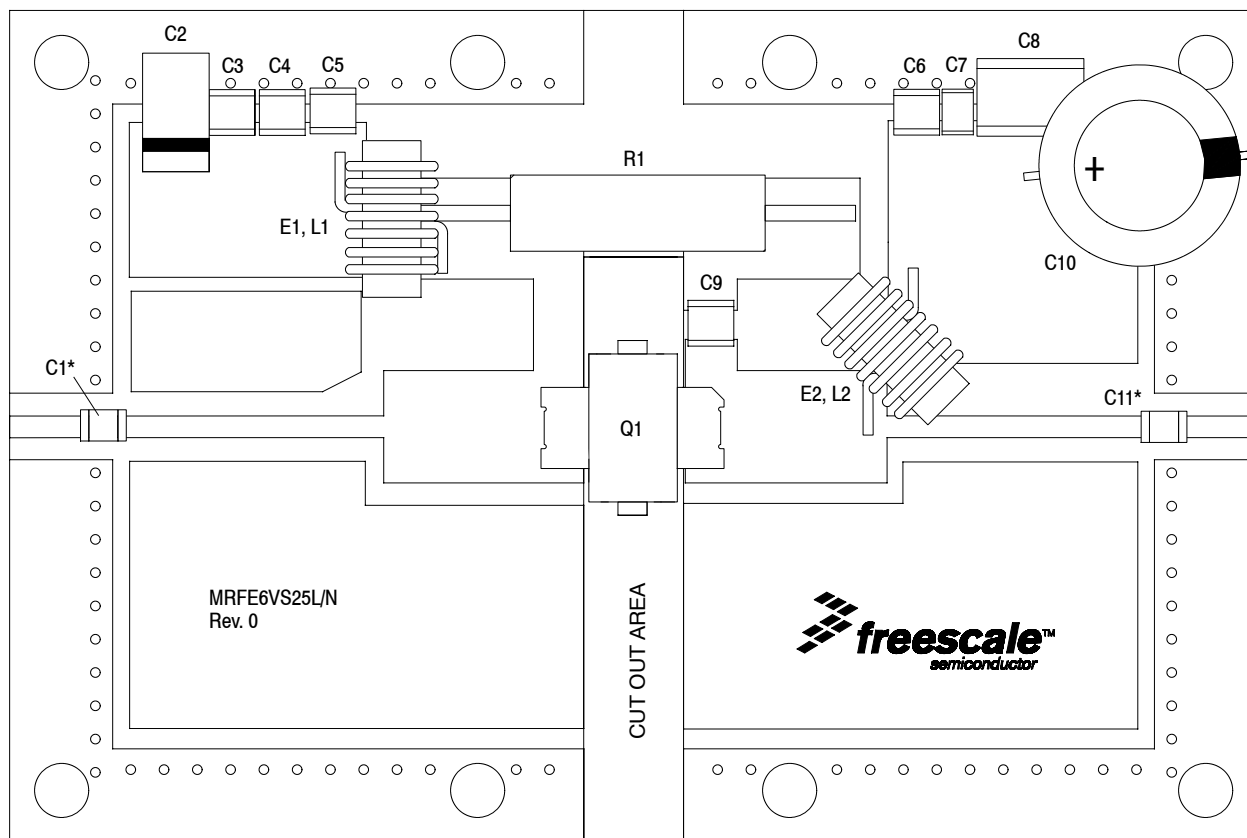
$V_{DD} = 50$  Volts,  $I_{DQ} = 100$  mA

| Signal Type                  | $P_{out}$<br>(W) | f<br>(MHz) | $G_{ps}$<br>(dB) | $\eta_D$<br>(%) | IMD<br>(dBc) |
|------------------------------|------------------|------------|------------------|-----------------|--------------|
| Two-Tone<br>(10 kHz spacing) | 25 PEP           | 1.8        | 25.7             | 51.5            | -30.7        |
|                              |                  | 10         | 25.8             | 50.7            | -34.8        |
|                              |                  | 30         | 24.8             | 50.7            | -33.0        |

**Table 10. Load Mismatch/Ruggedness** (In NXP Reference Circuit)

| Frequency<br>(MHz) | Signal Type | VSWR                            | $P_{in}$<br>(W)          | Test Voltage, $V_{DD}$ | Result                   |
|--------------------|-------------|---------------------------------|--------------------------|------------------------|--------------------------|
| 30                 | CW          | >65:1<br>at all Phase<br>Angles | 0.23<br>(3 dB Overdrive) | 50                     | No Device<br>Degradation |

## 1.8-30 MHz BROADBAND REFERENCE CIRCUIT



\*C1 and C11 are mounted vertically.

**Figure 11. MRFE6VS25NR1 Broadband Reference Circuit Component Layout — 1.8-30 MHz**

**Table 11. MRFE6VS25NR1 Broadband Reference Circuit Component Designations and Values — 1.8-30 MHz**

| Part                | Description                                          | Part Number               | Manufacturer                       |
|---------------------|------------------------------------------------------|---------------------------|------------------------------------|
| C1, C5, C6, C9, C11 | 20K pF Chip Capacitors                               | ATC200B203KT50XT          | ATC                                |
| C2                  | 10 $\mu$ F, 35 V Tantalum Capacitor                  | T491D106K035AT            | Kemet                              |
| C3                  | 0.1 $\mu$ F Chip Capacitor                           | CDR33BX104AKWY            | AVX                                |
| C4                  | 2.2 $\mu$ F Chip Capacitor                           | C3225X7R1H225KT           | TDK                                |
| C7                  | 0.1 $\mu$ F Chip Capacitor                           | GRM319R72A104KA01D        | Murata                             |
| C8                  | 2.2 $\mu$ F Chip Capacitor                           | G2225X7R225KT3AB          | ATC                                |
| C10                 | 220 $\mu$ F, 100 V Electrolytic Capacitor            | MCGPR100V227M16X26-RH     | Multicomp                          |
| E1                  | #43 Ferrite Toroid                                   | 5943001101                | Fair-Rite                          |
| E2                  | #61 Ferrite Toroid                                   | 5961001101                | Fair-Rite                          |
| L1                  | 4 Turns, 22 AWG, Toroid Transformer with Ferrite E1  | 8077 Copper Magnetic Wire | Belden                             |
| L2                  | 26 Turns, 22 AWG, Toroid Transformer with Ferrite E2 | 8077 Copper Magnetic Wire | Belden                             |
| Q1                  | RF Power LDMOS Transistor                            | MRFE6VS25NR1              | NXP                                |
| R1                  | 1 k $\Omega$ , 3 W Axial Leaded Resistor             | CPF31K0000FKE14           | Vishay                             |
| PCB                 | 0.030", $\epsilon_r = 4.8$                           | S1000                     | Shenzhen Multilayer PCB Technology |

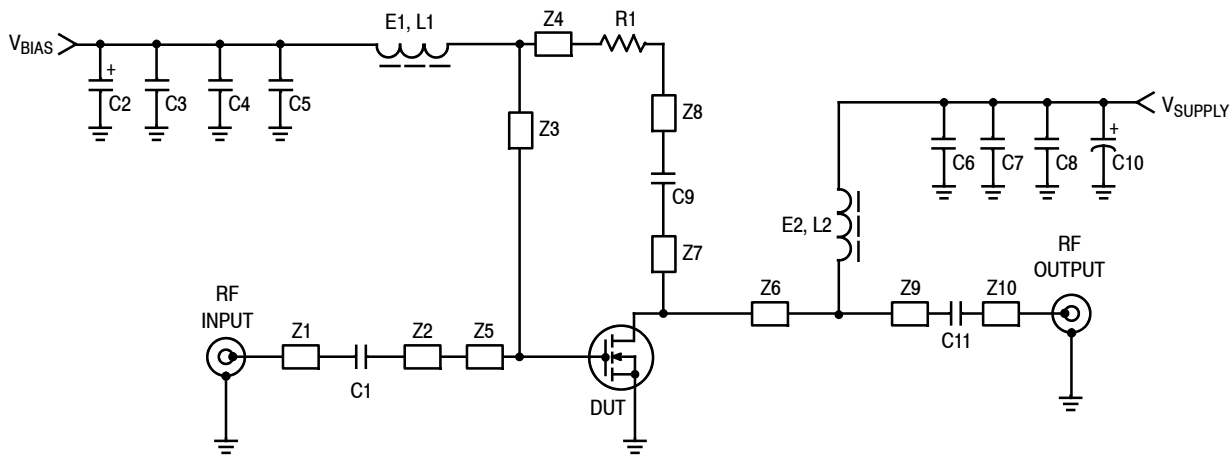
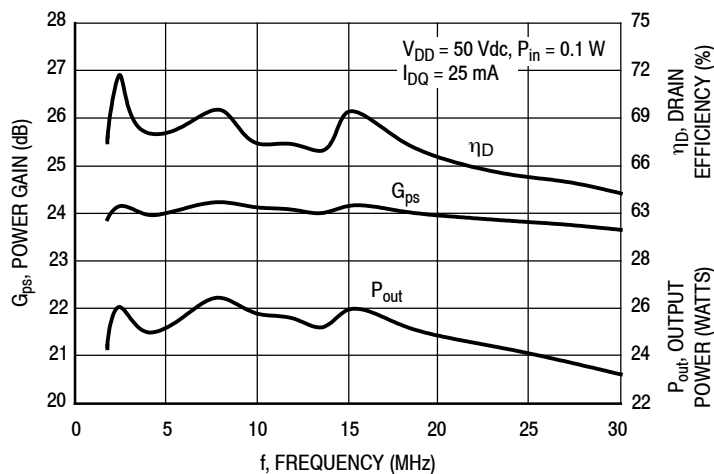


Figure 12. MRFE6VS25NR1 Broadband Reference Circuit Schematic — 1.8-30 MHz

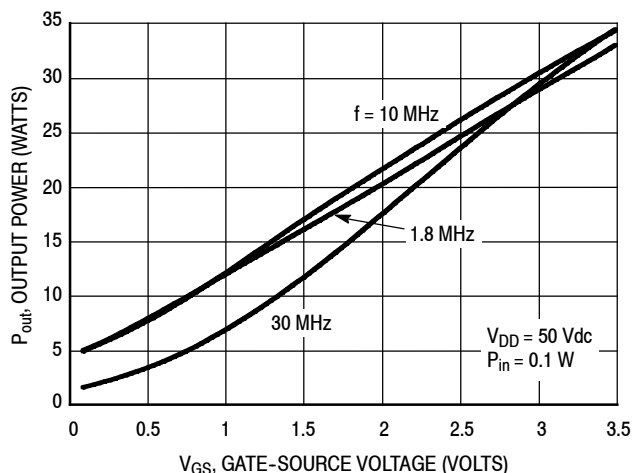
Table 12. MRFE6VS25NR1 Broadband Reference Test Circuit Microstrips — 1.8-30 MHz

| Microstrip | Description                | Microstrip | Description                |
|------------|----------------------------|------------|----------------------------|
| Z1, Z10    | 0.141" × 0.047" Microstrip | Z4, Z8     | 0.422" × 0.241" Microstrip |
| Z2, Z9     | 0.625" × 0.047" Microstrip | Z5, Z6     | 0.469" × 0.263" Microstrip |
| Z3         | 0.119" × 0.219" Microstrip | Z7         | 0.119" × 0.063" Microstrip |

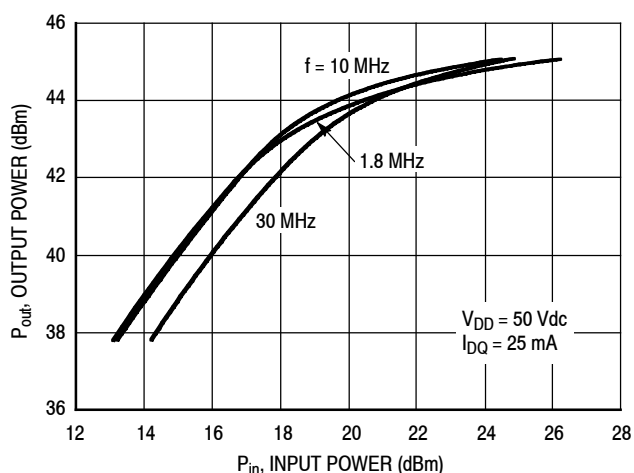
## TYPICAL CHARACTERISTICS — 1.8-30 MHz BROADBAND REFERENCE CIRCUIT



**Figure 13. Power Gain, CW Output Power and Drain Efficiency versus Frequency at a Constant Input Power**

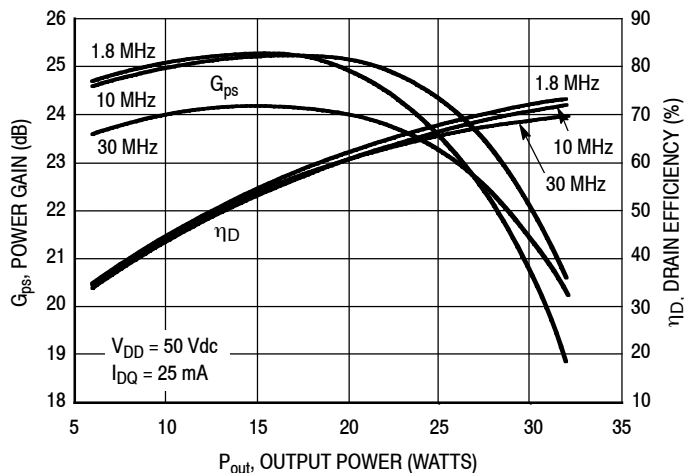


**Figure 14. CW Output Power versus Gate-Source Voltage at a Constant Input Power**



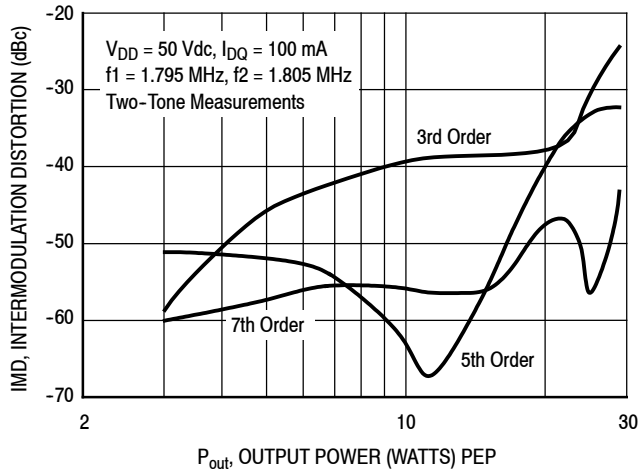
| f (MHz) | P1dB (W) | P3dB (W) |
|---------|----------|----------|
| 1.8     | 23       | 28       |
| 10      | 25       | 30       |
| 30      | 25       | 30       |

**Figure 15. CW Output Power versus Input Power**

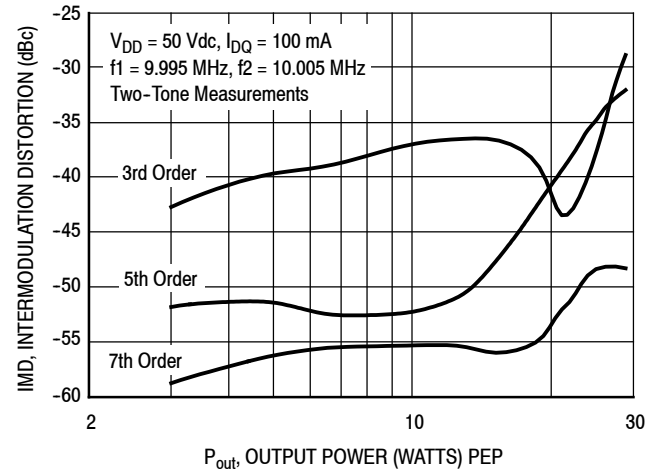


**Figure 16. Power Gain and Drain Efficiency versus CW Output Power**

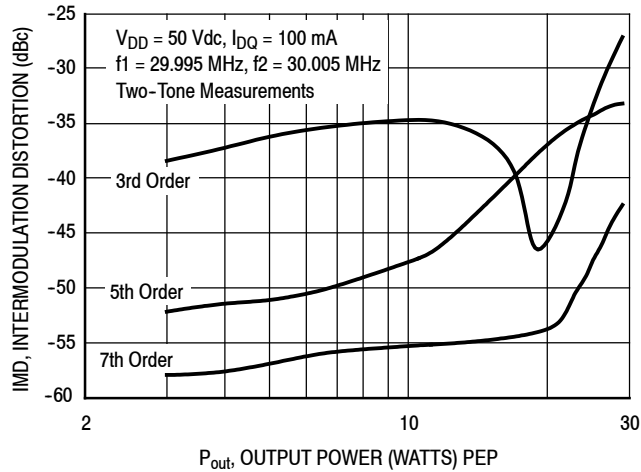
# **TYPICAL CHARACTERISTICS — 1.8-30 MHz** **BROADBAND REFERENCE CIRCUIT — TWO-TONE (1)**



**Figure 17. Intermodulation Distortion Products versus Output Power — 1.8 MHz**



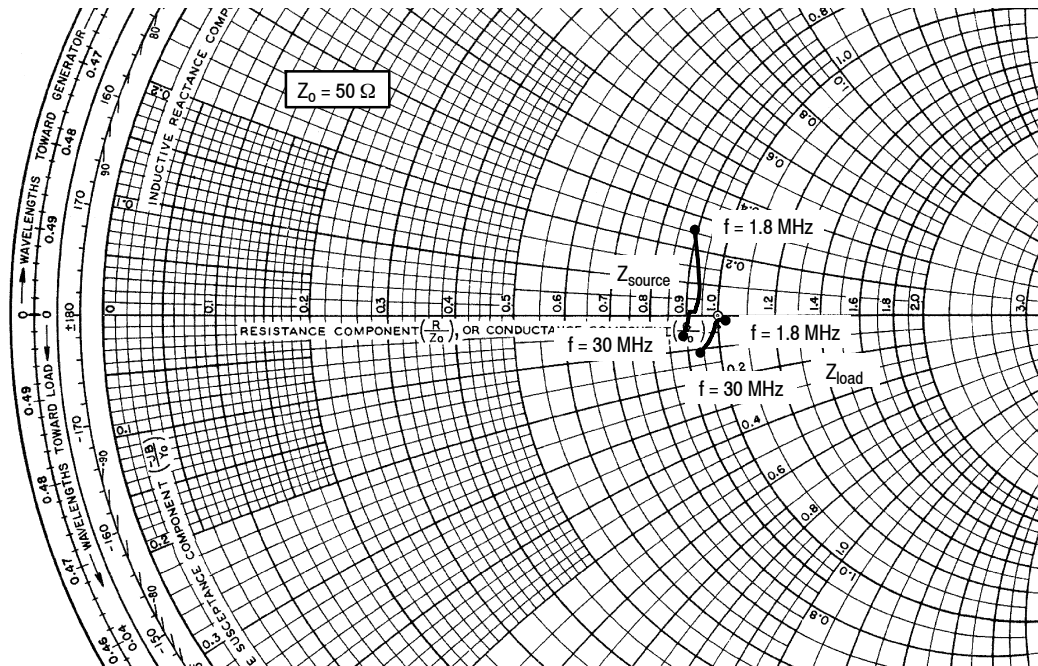
**Figure 18. Intermodulation Distortion Products versus Output Power — 10 MHz**



**Figure 19. Intermodulation Distortion Products versus Output Power — 30 MHz**

1. The distortion products are referenced to one of the two tones and the peak envelope power (PEP) is 6 dB above the power in a single tone.

## 1.8-30 MHz BROADBAND REFERENCE CIRCUIT



$V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 25 \text{ mA}$ ,  $P_{out} = 25 \text{ W CW}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 1.8      | $44.4 + j12.8$           | $50.8 - j0.70$         |
| 5        | $47.2 + j4.40$           | $50.0 - j0.70$         |
| 10       | $46.4 + j1.50$           | $49.7 - j0.90$         |
| 15       | $46.0 + j0.70$           | $49.4 - j1.60$         |
| 20       | $45.7 - j0.40$           | $48.8 - j2.90$         |
| 25       | $45.1 - j1.60$           | $47.9 - j4.30$         |
| 30       | $44.6 - j2.90$           | $47.0 - j5.70$         |

$Z_{source}$  = Test circuit impedance as measured from gate to ground.

$Z_{load}$  = Test circuit impedance as measured from drain to ground.

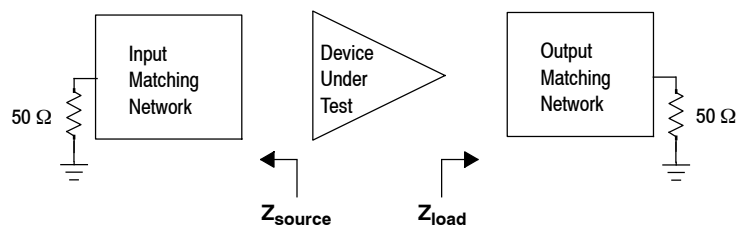


Figure 20. Broadband Series Equivalent Source and Load Impedance — 1.8-30 MHz

## 30-512 MHz BROADBAND REFERENCE CIRCUIT

**Table 13. 30-512 MHz Broadband Performance** (In NXP Reference Circuit, 50 ohm system)

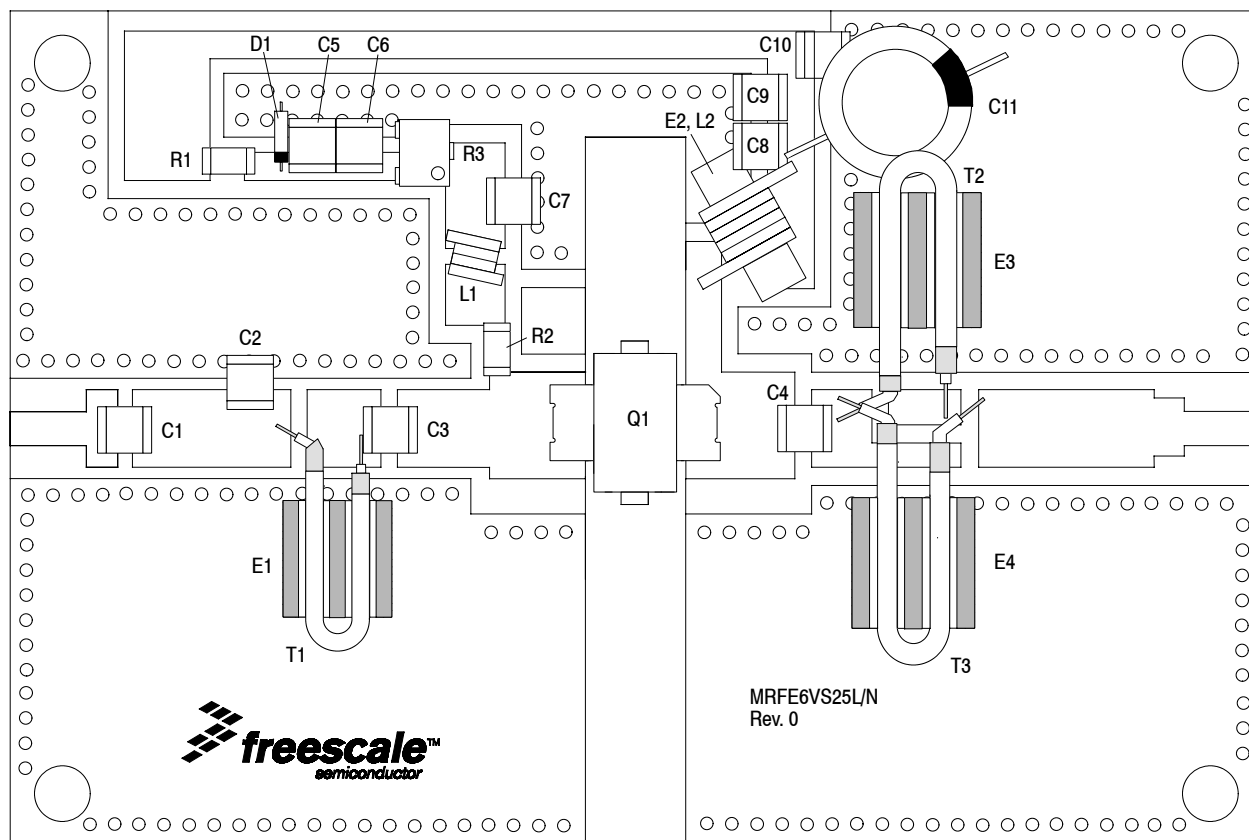
$V_{DD} = 50$  Volts,  $I_{DQ} = 100$  mA

| Signal Type                   | $P_{out}$<br>(W) | f<br>(MHz) | $G_{ps}$<br>(dB) | $\eta_D$<br>(%) | IMD<br>(dBc) |
|-------------------------------|------------------|------------|------------------|-----------------|--------------|
| Two-Tone<br>(200 kHz spacing) | 25 PEP           | 30         | 17.1             | 34.8            | -32.4        |
|                               |                  | 100        | 18.1             | 37.7            | -33.3        |
|                               |                  | 512        | 17.3             | 30.1            | -38.5        |

**Table 14. Load Mismatch/Ruggedness** (In NXP Reference Circuit)

| Frequency<br>(MHz) | Signal Type | VSWR                            | $P_{in}$<br>(W)         | Test Voltage, $V_{DD}$ | Result                   |
|--------------------|-------------|---------------------------------|-------------------------|------------------------|--------------------------|
| 512                | CW          | >65:1<br>at all Phase<br>Angles | 1.6<br>(3 dB Overdrive) | 50                     | No Device<br>Degradation |

### 30-512 MHz BROADBAND REFERENCE CIRCUIT

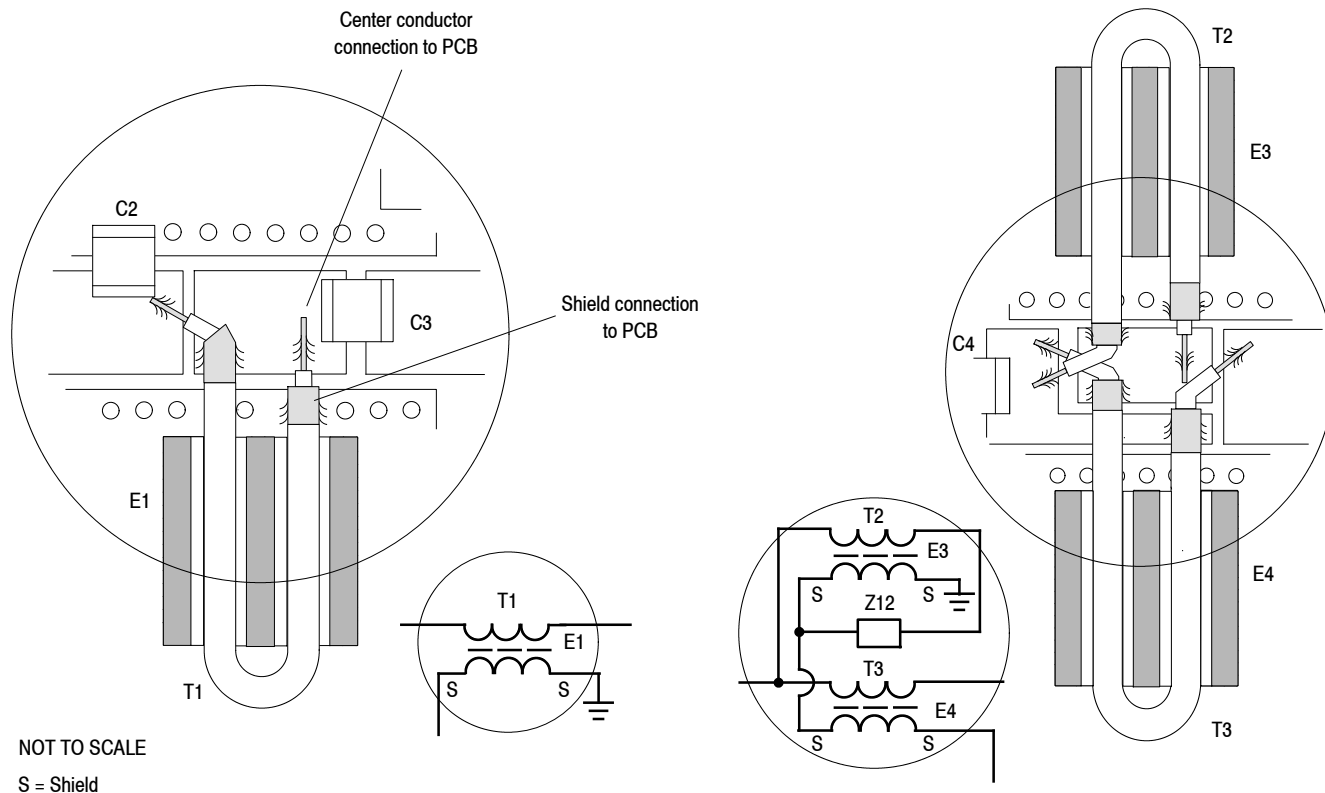


Note: See Figure 21a for a more detailed view of the semi-flex cables with shields and #61 multi-aperture cores.

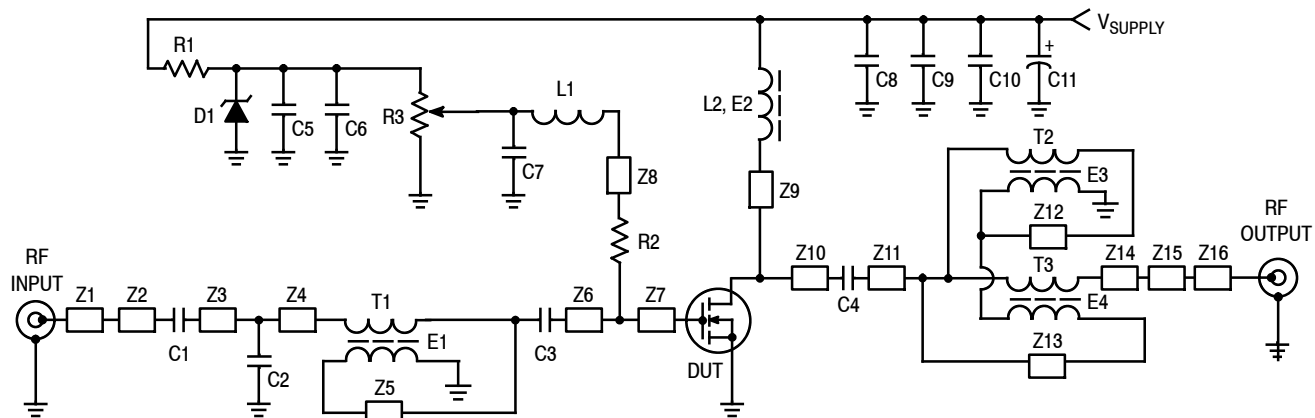
**Figure 21. MRFE6VS25NR1 Broadband Reference Circuit Component Layout — 30-512 MHz**

**Table 15. MRFE6VS25NR1 Broadband Reference Circuit Component Designations and Values — 30-512 MHz**

| Part               | Description                                         | Part Number               | Manufacturer            |
|--------------------|-----------------------------------------------------|---------------------------|-------------------------|
| C1, C3, C6, C7, C8 | 1,000 pF Chip Capacitors                            | ATC100B102JT50XT          | ATC                     |
| C2                 | 2.7 pF Chip Capacitor                               | ATC100B2R7BT500XT         | ATC                     |
| C4                 | 15 nF Chip Capacitor                                | C3225CH2A153JT            | TDK                     |
| C5, C9             | 10 nF Chip Capacitors                               | GRM3195C1E103JA01         | Murata                  |
| C10                | 1 $\mu$ F Chip Capacitor                            | C3225JB2A105KT            | TDK                     |
| C11                | 220 $\mu$ F, 100 V Electrolytic Capacitor           | MCGPR100V227M16X26-RH     | Multicomp               |
| D1                 | 8.2 V, 1 W Zener Diode                              | 1N4738A                   | Fairchild Semiconductor |
| E1, E3, E4         | #61 Multi-aperture Cores                            | 2861001502                | Fair-Rite               |
| E2                 | Ferrite Core Bead                                   | 21-201-J                  | Ferronics               |
| L1                 | 47 nH Inductor                                      | 1812SMS-47NJLC            | Coilcraft               |
| L2                 | 4 Turns, 20 AWG, Toroid Transformer with Ferrite E2 | 8076 Copper Magnetic Wire | Belden                  |
| Q1                 | RF Power LDMOS Transistor                           | MRFE6VS25NR1              | NXP                     |
| R1                 | 5.6 k $\Omega$ , 1/4 W Chip Resistor                | CRCW12065K60FKEA          | Vishay                  |
| R2                 | 15 $\Omega$ , 1/4 W Chip Resistor                   | CRCW120615R0FKEA          | Vishay                  |
| R3                 | 5 k $\Omega$ Potentiometer CMS Cermet Multi-turn    | 3224W-1-502E              | Bourns                  |
| T1                 | 25 $\Omega$ Semi-flex Cable, 0.945" Shield Length   | D260-4118-0000            | Microdot                |
| T2, T3             | 25 $\Omega$ Semi-flex Cables, 1.340" Shield Length  | D260-4118-0000            | Microdot                |
| PCB                | 0.030", $\epsilon_r = 3.5$                          | TC350                     | Arlon                   |



**Figure 21a. Detailed View of Semi-flex Cables with Shields and #61 Multi-aperture Cores**

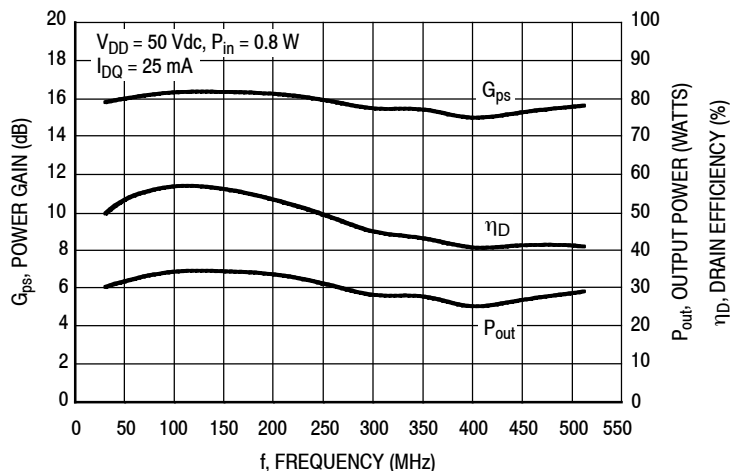


**Figure 22. MRFE6VS25NR1 Broadband Reference Circuit Schematic — 30-512 MHz**

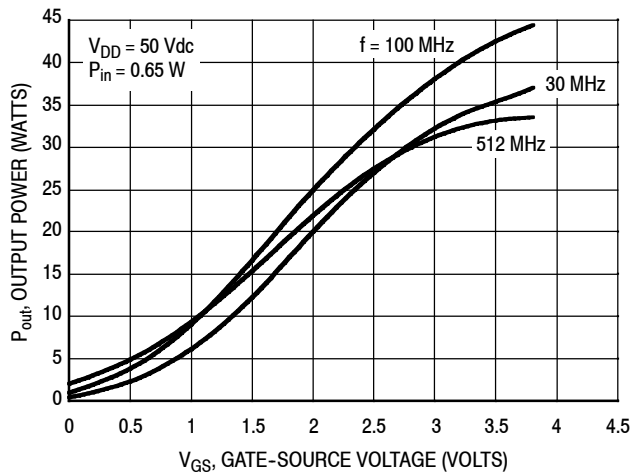
**Table 16. MRFE6VS25NR1 Broadband Reference Circuit Microstrips — 30-512 MHz**

| Microstrip | Description                | Microstrip | Description                |
|------------|----------------------------|------------|----------------------------|
| Z1         | 0.180" × 0.080" Microstrip | Z9         | 0.080" × 0.310" Microstrip |
| Z2         | 0.080" × 0.190" Microstrip | Z10        | 0.260" × 0.260" Microstrip |
| Z3         | 0.230" × 0.190" Microstrip | Z11        | 0.140" × 0.190" Microstrip |
| Z4         | 0.150" × 0.190" Microstrip | Z12        | 0.170" × 0.080" Microstrip |
| Z5         | 0.180" × 0.190" Microstrip | Z13        | 0.210" × 0.060" Microstrip |
| Z6         | 0.220" × 0.190" Microstrip | Z14        | 0.420" × 0.190" Microstrip |
| Z7         | 0.230" × 0.260" Microstrip | Z15        | 0.070" × 0.140" Microstrip |
| Z8         | 0.140" × 0.150" Microstrip | Z16        | 0.190" × 0.080" Microstrip |

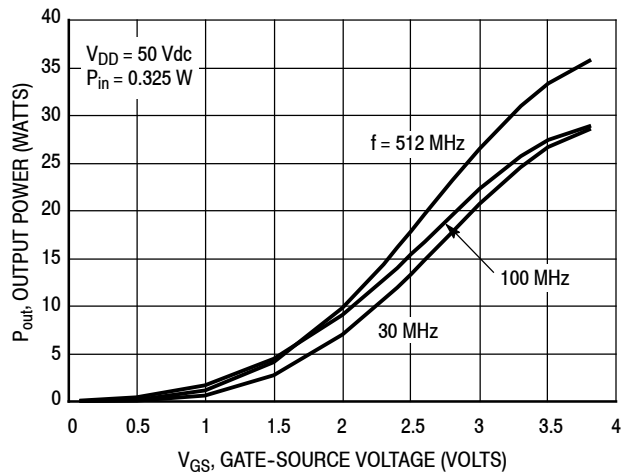
## TYPICAL CHARACTERISTICS — 30-512 MHz BROADBAND REFERENCE CIRCUIT



**Figure 23. Power Gain, CW Output Power and Drain Efficiency versus Frequency at a Constant Input Power**

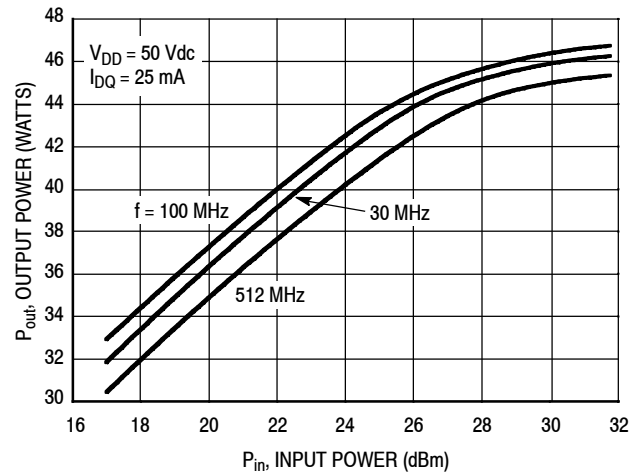


**Figure 24. CW Output Power versus Gate-Source Voltage at a Constant Input Power — 0.65 W**



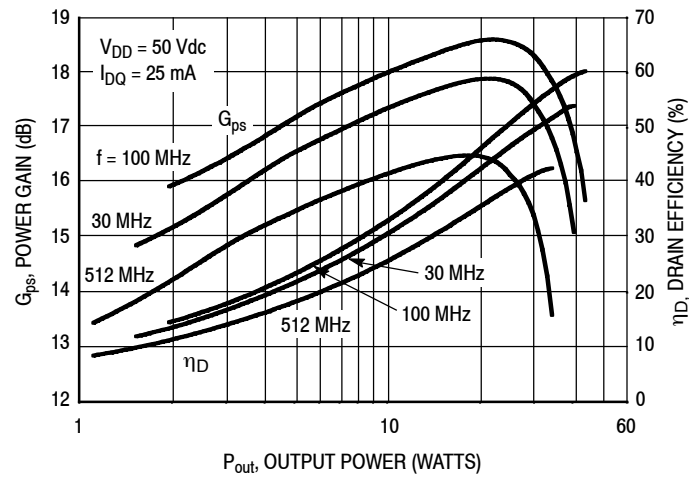
**Figure 25. CW Output Power versus Gate-Source Voltage at a Constant Input Power — 0.325 W**

## TYPICAL CHARACTERISTICS — 30-512 MHz BROADBAND REFERENCE CIRCUIT



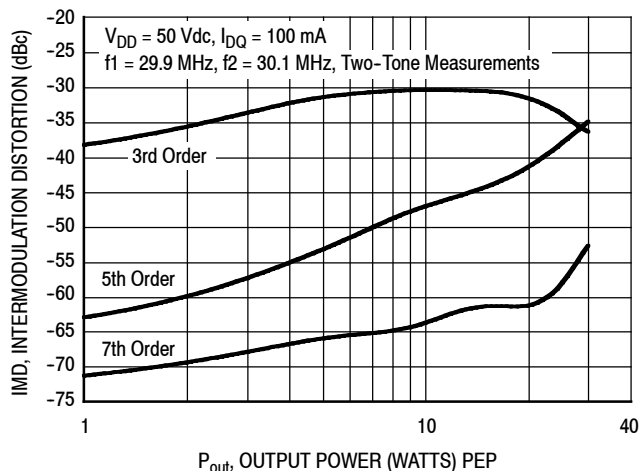
| f<br>(MHz) | P1dB<br>(W) | P3dB<br>(W) |
|------------|-------------|-------------|
| 30         | 34.4        | 52.5        |
| 100        | 37.2        | 47.8        |
| 512        | 30.1        | 34.3        |

**Figure 26. CW Output Power versus Input Power**

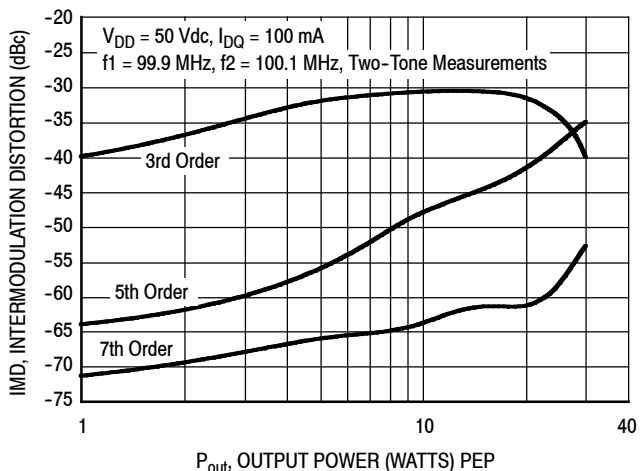


**Figure 27. Power Gain and Drain Efficiency  
versus CW Output Power**

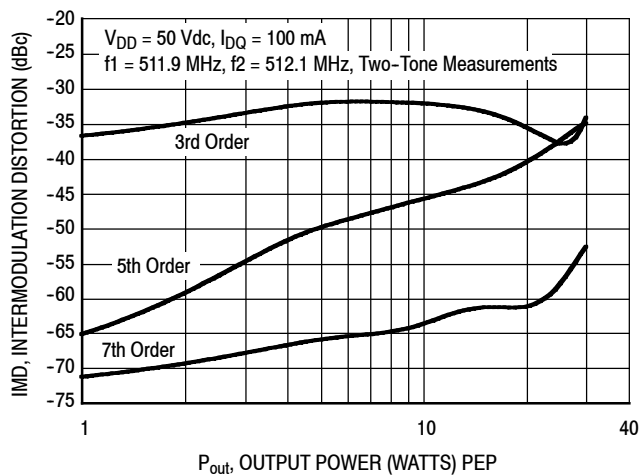
## TYPICAL CHARACTERISTICS — 30-512 MHz BROADBAND REFERENCE CIRCUIT — TWO-TONE (1)



**Figure 28. Intermodulation Distortion Products versus Output Power — 30 MHz**



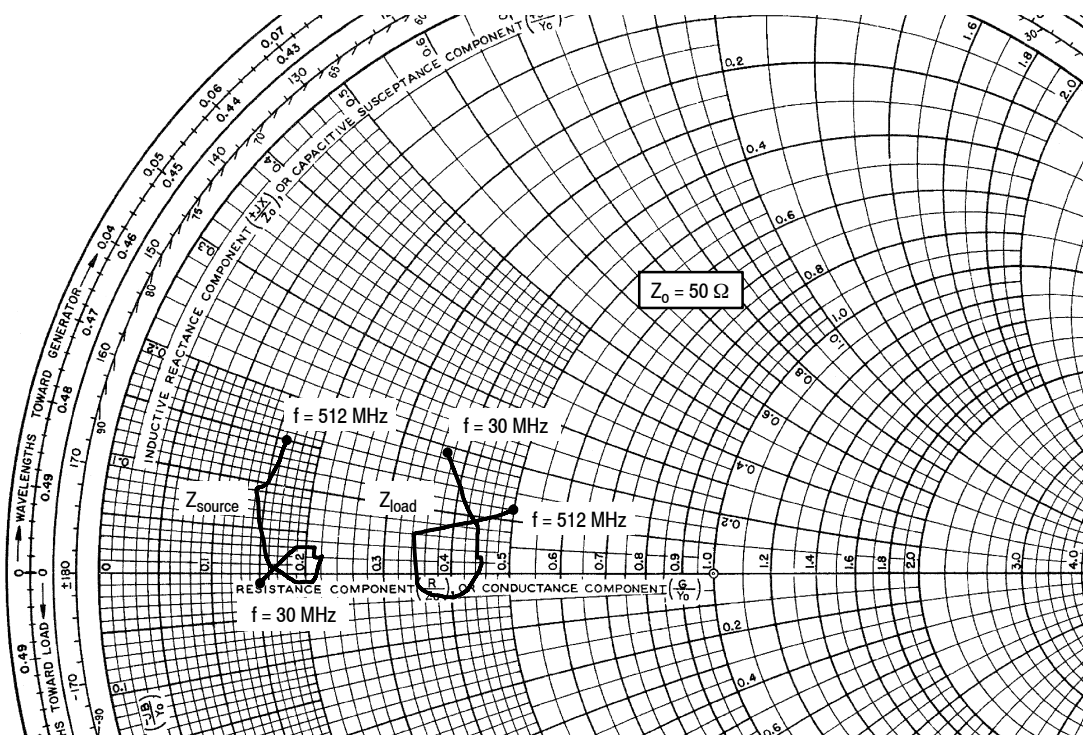
**Figure 29. Intermodulation Distortion Products versus Output Power — 100 MHz**



**Figure 30. Intermodulation Distortion Products versus Output Power — 512 MHz**

1. The distortion products are referenced to one of the two tones and the peak envelope power (PEP) is 6 dB above the power in a single tone.

### 30-512 MHz BROADBAND REFERENCE CIRCUIT



$V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 25 \text{ mA}$ ,  $P_{out} = 25 \text{ W CW}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 30       | $7.60 - j0.40$           | $18.3 + j9.40$         |
| 64       | $9.30 + j1.40$           | $21.9 + j4.00$         |
| 88       | $10.3 + j1.40$           | $22.2 + j1.90$         |
| 98       | $10.6 + j1.20$           | $22.2 + j1.40$         |
| 100      | $10.7 + j1.20$           | $22.3 + j1.30$         |
| 108      | $10.9 + j0.90$           | $22.5 + j0.50$         |
| 144      | $10.7 - j0.40$           | $21.2 - j1.50$         |
| 170      | $9.70 - j0.60$           | $19.8 - j1.80$         |
| 230      | $8.10 + j0.30$           | $17.4 - j0.80$         |
| 352      | $7.20 + j4.30$           | $17.0 + j2.80$         |
| 450      | $7.40 + j5.00$           | $21.3 + j4.60$         |
| 512      | $8.10 + j7.60$           | $25.2 + j5.90$         |

$Z_{source}$  = Test circuit impedance as measured from gate to ground.

$Z_{load}$  = Test circuit impedance as measured from drain to ground.

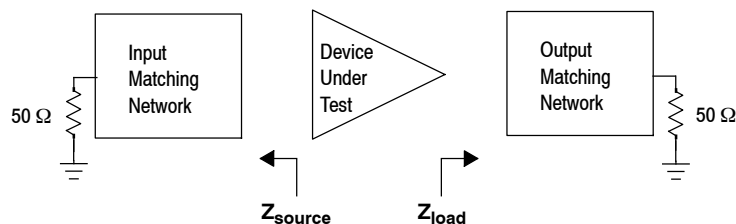


Figure 31. Broadband Series Equivalent Source and Load Impedance — 30-512 MHz

## 1030 MHz NARROWBAND REFERENCE CIRCUIT

**Table 17. 1030 MHz Narrowband Performance** (In NXP Reference Circuit, 50 ohm system)

$V_{DD} = 50$  Volts,  $I_{DQ} = 25$  mA

| Signal Type | $P_{out}$<br>(W) | f<br>(MHz) | $G_{ps}$<br>(dB) | $\eta_D$<br>(%) |
|-------------|------------------|------------|------------------|-----------------|
| CW          | 25               | 1030       | 22.5             | 60.0            |

**Table 18. Load Mismatch/Ruggedness** (In NXP Reference Circuit)

| Frequency<br>(MHz) | Signal Type | VSWR                            | $P_{in}$<br>(W)          | Test Voltage, $V_{DD}$ | Result                   |
|--------------------|-------------|---------------------------------|--------------------------|------------------------|--------------------------|
| 1030               | CW          | >65:1<br>at all Phase<br>Angles | 0.34<br>(3 dB Overdrive) | 50                     | No Device<br>Degradation |

## 1030 MHz NARROWBAND REFERENCE TEST FIXTURE

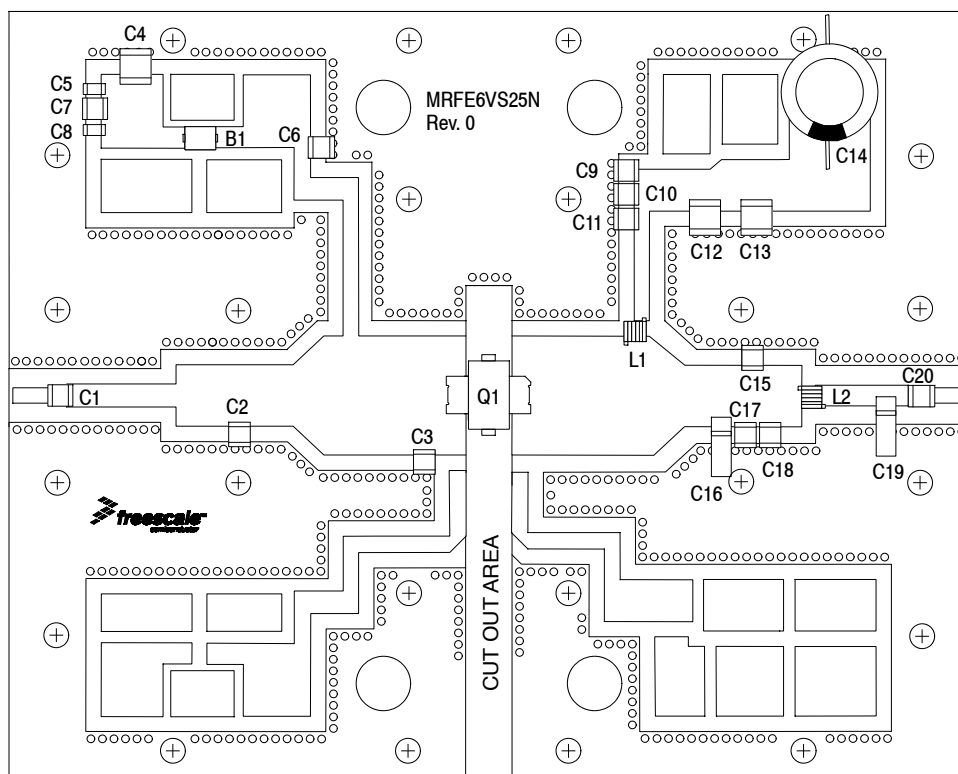


Figure 32. MRFE6VS25NR1 Narrowband Reference Circuit Component Layout — 1030 MHz

Table 19. MRFE6VS25NR1 Narrowband Reference Circuit Component Designations and Values — 1030 MHz

| Part     | Description                         | Part Number          | Manufacturer        |
|----------|-------------------------------------|----------------------|---------------------|
| B1       | Short Ferrite Bead                  | 2743019447           | Fair-Rite           |
| C1, C3   | 22 pF Chip Capacitors               | ATC100B220JT500XT    | ATC                 |
| C2       | 6.2 pF Chip Capacitor               | ATC100B6R2BT500XT    | ATC                 |
| C4       | 10 $\mu$ F Chip Capacitor           | GRM55DR61H106KA88L   | Murata              |
| C5       | 0.01 $\mu$ F Chip Capacitor         | GRM319R72A103KA01D   | Murata              |
| C6       | 43 pF Chip Capacitor                | ATC100B430JT500XT    | ATC                 |
| C7       | 0.1 $\mu$ F Chip Capacitor          | GRM32MR71H104JA01L   | Murata              |
| C8       | 1.0 $\mu$ F Chip Capacitor          | GRM31MR71H105KA88L   | Murata              |
| C9       | 0.1 $\mu$ F Chip Capacitor          | C1206C104K1RAC-TU    | Kemet               |
| C10      | 20K pF Chip Capacitor               | ATC200B203KT50XT     | ATC                 |
| C11      | 470 pF Chip Capacitor               | ATC100B471JT200XT    | ATC                 |
| C12, C13 | 22 $\mu$ F Chip Capacitors          | C5750KF1H226ZT       | TDK                 |
| C14      | 470 pF, 63 V Electrolytic Capacitor | MCGPR63V477M13X26-RH | Multicomp           |
| C15, C17 | 4.3 pF Chip Capacitors              | ATC100B4R3CT500XT    | ATC                 |
| C16, C19 | 0.6-4.5 pF Tuning Capacitors        | 27271SL              | Johanson Components |
| C18      | 2.2 pF Chip Capacitor               | ATC100B2R2JT500XT    | ATC                 |
| C20      | 20 pF Chip Capacitor                | ATC100B200JT500XT    | ATC                 |
| L1       | 43 nH, 10 Turn Inductor             | B10TJLC              | Coilcraft           |
| L2       | 2.5 nH, 1 Turn Inductor             | A01TKLC              | Coilcraft           |
| Q1       | RF Power LDMOS Transistor           | MRFE6VS25NR1         | NXP                 |
| PCB      | 0.030", $\epsilon_r = 3.5$          | TL350                | Arlon               |

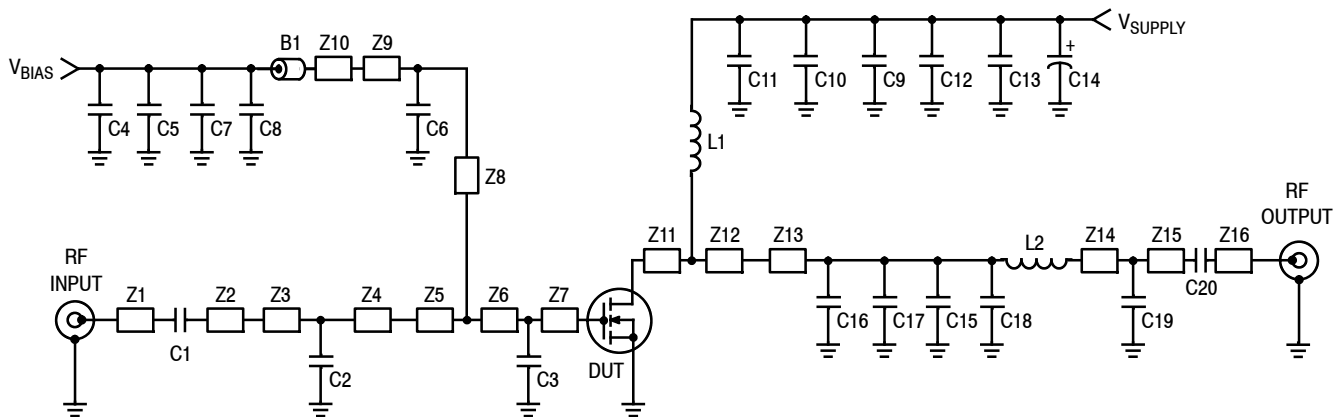


Figure 33. MRFE6VS25NR1 Narrowband Reference Circuit Schematic — 1030 MHz

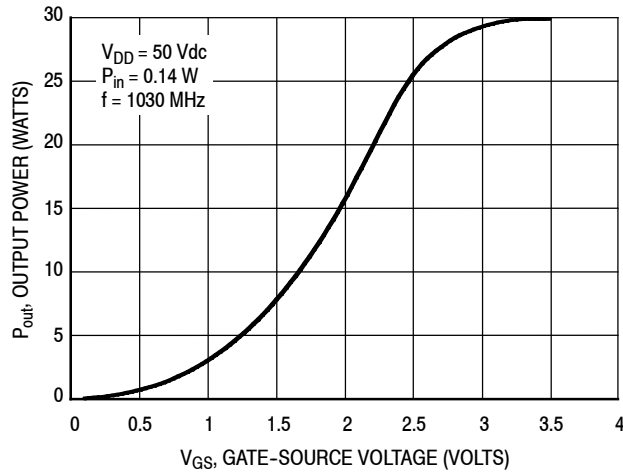
Table 20. MRFE6VS25NR1 Narrowband Reverence Test Circuit Microstrips — 1030 MHz

| Microstrip | Description                    |
|------------|--------------------------------|
| Z1         | 0.200" × 0.080" Microstrip     |
| Z2         | 0.569" × 0.120" Microstrip     |
| Z3         | 0.339" × 0.320" Microstrip     |
| Z4         | 0.272" × 0.320" Microstrip     |
| Z5, Z12    | 0.160" × 0.320" × 0.620" Taper |
| Z6         | 0.522" × 0.620" Microstrip     |
| Z7         | 0.218" × 0.620" Microstrip     |
| Z8*        | 0.094" × 1.121" Microstrip     |

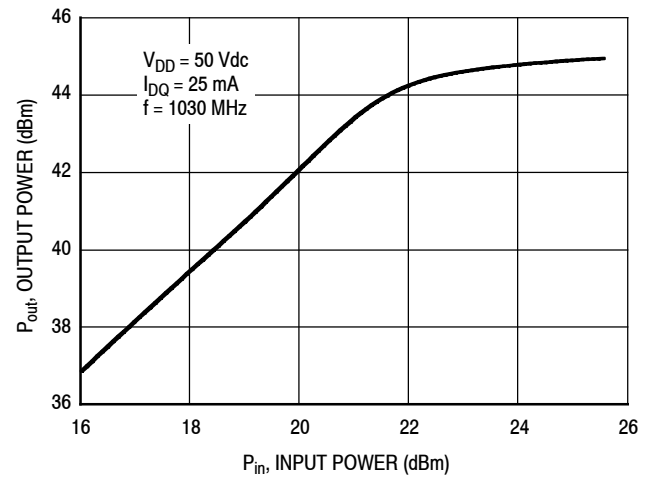
| Microstrip | Description                |
|------------|----------------------------|
| Z9         | 0.350" × 0.378" Microstrip |
| Z10        | 0.151" × 0.108" Microstrip |
| Z11        | 0.699" × 0.620" Microstrip |
| Z13        | 0.243" × 0.320" Microstrip |
| Z14        | 0.350" × 0.320" Microstrip |
| Z15        | 0.450" × 0.107" Microstrip |
| Z16        | 0.200" × 0.107" Microstrip |

\* Line length includes microstrip bends

## TYPICAL CHARACTERISTICS — 1030 MHz NARROWBAND REFERENCE CIRCUIT

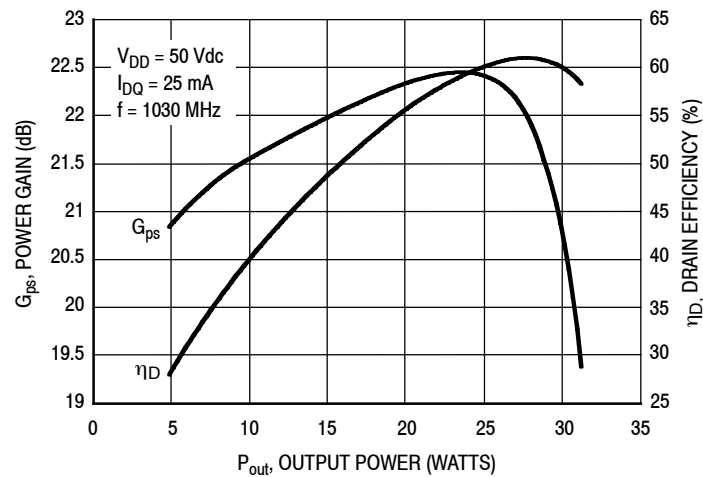


**Figure 34. CW Output Power versus Gate-Source Voltage at a Constant Input Power**



| f<br>(MHz) | P1dB<br>(W) | P3dB<br>(W) |
|------------|-------------|-------------|
| 1030       | 29          | 31          |

**Figure 35. CW Output Power versus Input Power**



**Figure 36. Power Gain and Drain Efficiency versus CW Output Power**

## 1030 MHz NARROWBAND REFERENCE CIRCUIT

$V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 25 \text{ mA}$ ,  $P_{out} = 25 \text{ W CW}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 1030     | $0.74 + j4.53$           | $3.08 + j7.78$         |

$Z_{source}$  = Test circuit impedance as measured from gate to ground.

$Z_{load}$  = Test circuit impedance as measured from drain to ground.

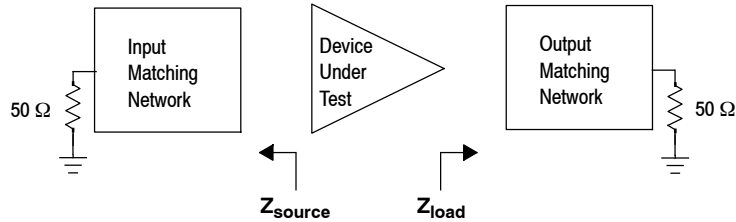


Figure 37. Narrowband Series Equivalent Source and Load Impedance — 1030 MHz

The drawing consists of two views: a front view (top) and a side view (bottom).

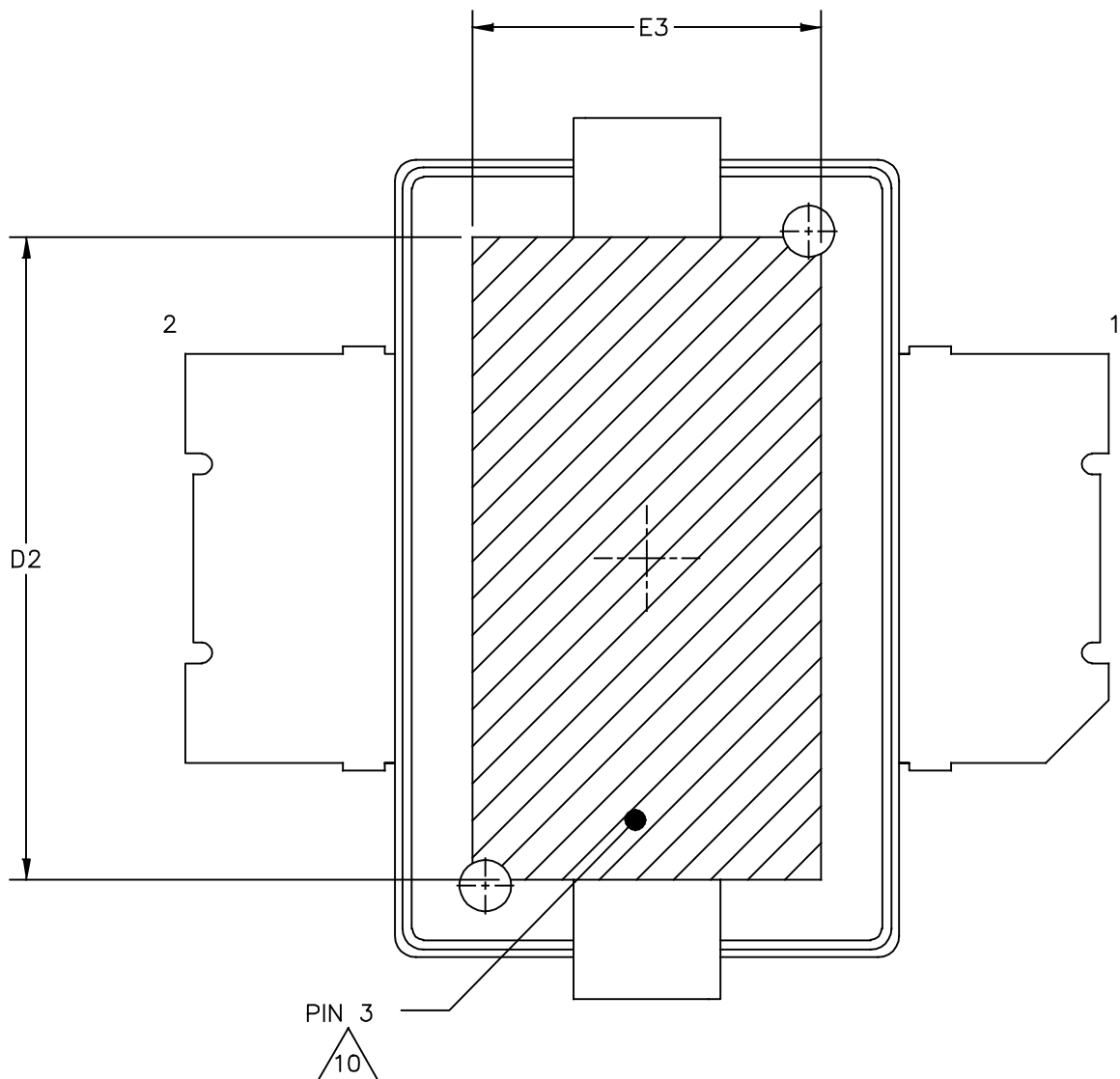
**Front View (Top):**

- Dimensions:**
  - $E1$ : Distance from the left edge to the center of the top feature.
  - $2X E4$ : Width of the top feature.
  - $2X D3$ : Distance from the center of the top feature to the right edge.
  - $DD$ : Total height of the part.
  - $2X b1$ : Distance from the top edge to the center of the bottom feature.
  - $E$ : Total width of the part.
  - $D1$ : Distance from the bottom edge to the center of the bottom feature.
- Feature Callouts:**
  - $\triangle 4$ : Feature 4, located at the top center.
  - $\triangle 9$ : Feature 9, located at the top right.
  - $\triangle 5$ : Feature 5, located at the bottom center.
- Sectional View:** A horizontal section line is shown at the bottom, with a callout  $\triangle 7$  indicating a specific feature.

**Side View (Bottom):**

- Dimensions:**
  - $c1$ : Distance from the left edge to the center of the top feature.
  - $A1$ : Distance from the bottom edge to the center of the top feature.
  - $A2$ : Distance from the bottom edge to the center of the bottom feature.
  - $2X F$ : Width of the top feature.
  - $2X E2$ : Width of the bottom feature.
  - $E5$ : Total width of the part.
  - $AA$ : Total height of the part.
- Feature Callouts:**
  - $\triangle 9$ : Feature 9, located at the top right.
  - $\triangle 7$ : Feature 7, located at the bottom center.
- Sectional View:** A horizontal section line is shown at the bottom, with a callout  $\triangle 7$  indicating a specific feature.

**MRFE6VS25NR1 MRFE6VS25GNR1**



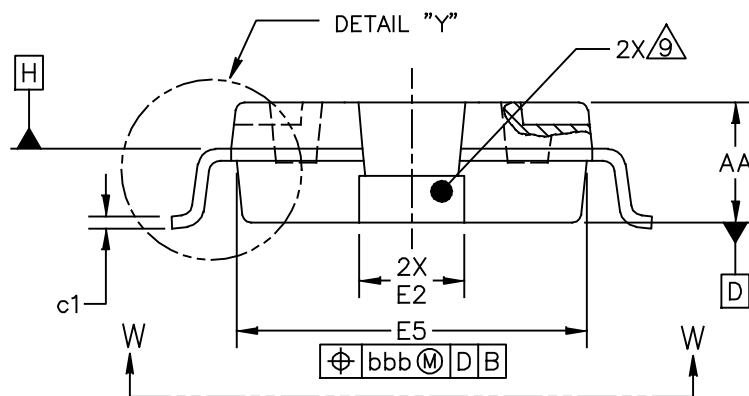
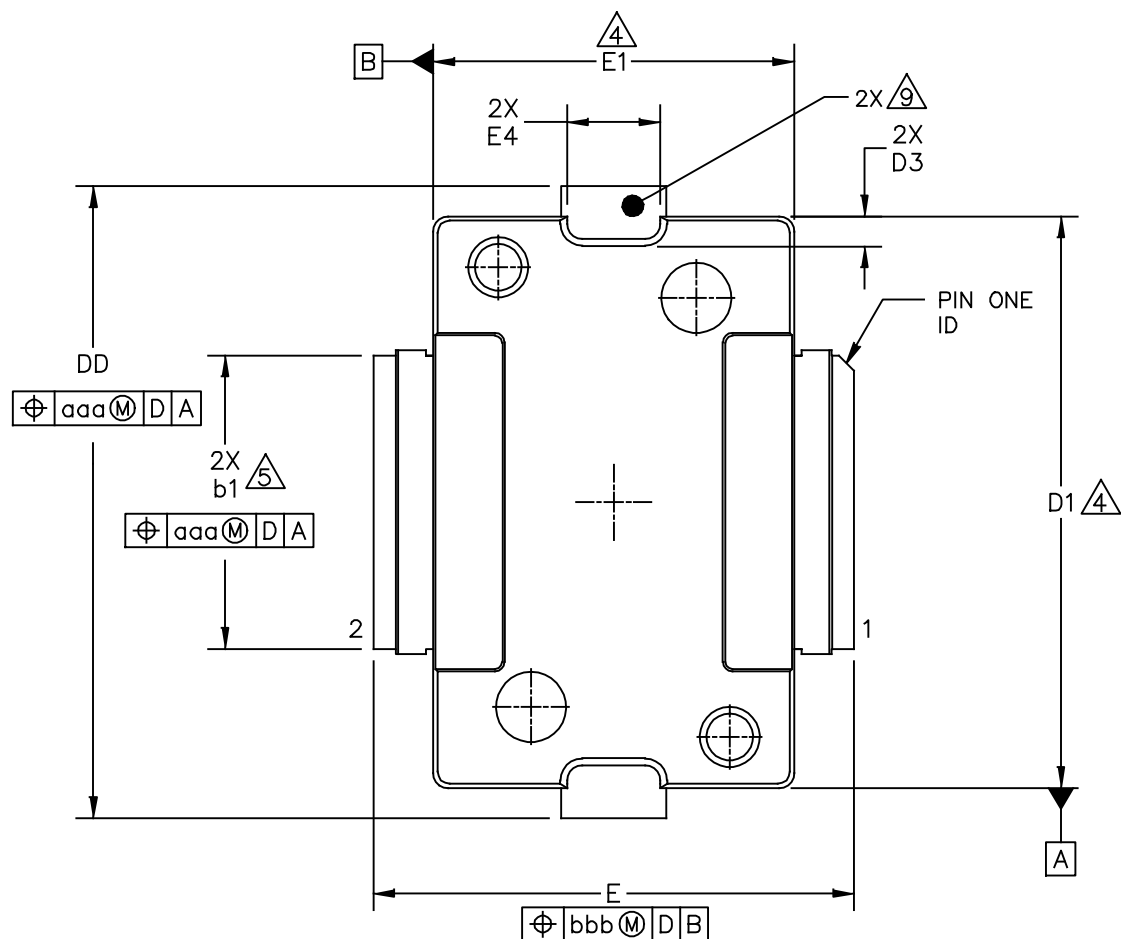
VIEW W-W  
BOTTOM VIEW

|                                                  |                                      |                            |
|--------------------------------------------------|--------------------------------------|----------------------------|
| © 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                |

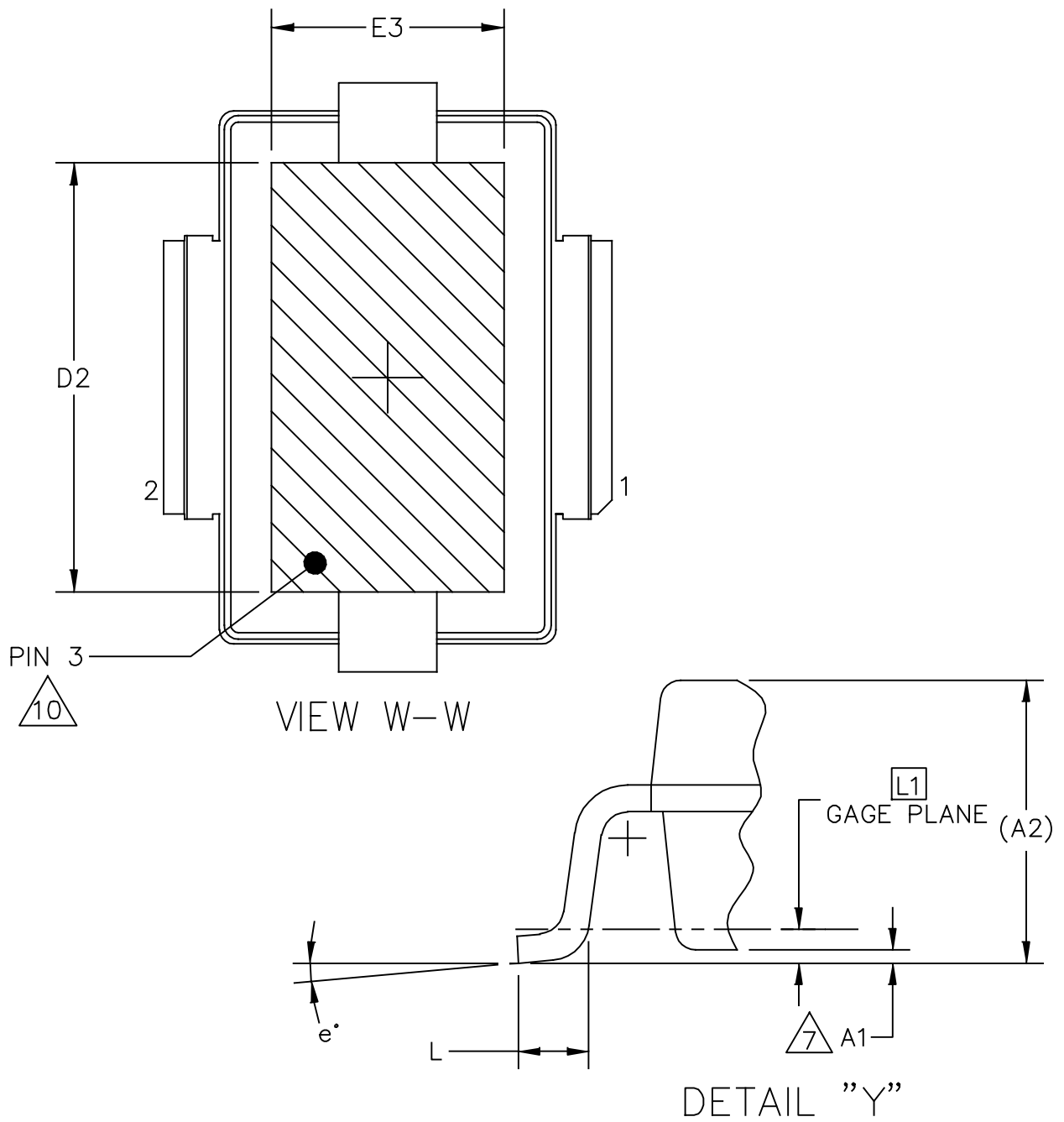
NOTES:

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 NEXT STEP                            |      |      |            |                    |                                                      |          |                            |            |      |
|--------------------------------------------------|------|------|------------|--------------------|------------------------------------------------------|----------|----------------------------|------------|------|
| INCH                                             |      |      | MILLIMETER |                    | INCH                                                 |          |                            | MILLIMETER |      |
| DIM                                              | MIN  | MAX  | MIN        | MAX                | DIM                                                  | 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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|                                                  | STANDARD: JEDEC TO-270 BA       |                            |
|                                                  | SOT1731-1                       | 28 MAR 2016                |



|                                                  |                                 |                            |
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|                                                  | 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.

4. DIMENSIONS "D1" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 INCH (0.15MM) 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 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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|                                                  |        |      |            |                    | 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 Over-Molded Plastic Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers
- AN3263: Bolt Down Mounting Method for High Power RF Transistors and RFICs in Over-Molded Plastic Packages
- AN3789: Clamping of High Power RF Transistors and RFICs in Over-Molded Plastic Packages

### Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices
- EB38: Measuring the Intermodulation Distortion of Linear Amplifiers

### Software

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

### Development Tools

- Printed Circuit Boards

For Software and Tools, do a Part Number search at <http://www.nxp.com>, and select the "Part Number" link. Go to the Software & Tools tab on the part's Product Summary page to download the respective tool.

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | June 2012 | <ul style="list-style-type: none"><li>• Initial Release of Data Sheet</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1        | Dec. 2012 | <ul style="list-style-type: none"><li>• Added part number MRFE6VS25G NR1, p. 1</li><li>• Added 1265A-03 (TO-270-2 Gull) package isometric, p. 1, and Mechanical Outline, p. 30-32</li><li>• Load Mismatch/Ruggedness tables: changed output power to input power to clarify the conditions used during test, p. 1, 3, 9, 22</li><li>• Figs. 17, 18 and 19, Intermodulation Distortion Products versus Output Power (1.8, 10, 30 MHz): corrected x-axis data to show Watts (PEP) measurement, p. 13</li><li>• Added 30-512 MHz Broadband Reference Circuit as follows:<ul style="list-style-type: none"><li>- Typical Performance table, p. 1</li><li>- Table 12, Broadband Performance, p. 15</li><li>- Table 13, Load Mismatch/Ruggedness, p. 15</li><li>- Fig. 21, Broadband Reference Circuit Component Layout, p. 16</li><li>- Table 14, Broadband Reference Circuit Component Designations and Values, p. 16</li><li>- Fig. 21a, Detailed View of Semi-flex Cables with Shields and #61 Multi-aperture Cores, p. 17</li><li>- Fig. 22, Broadband Reference Circuit Schematic, p. 17</li><li>- Table 15, Broadband Reference Circuit Microstrips, p. 17</li><li>- Fig. 23, Power Gain, CW Output Power and Drain Efficiency versus Frequency at a Constant Input Power, p. 18</li><li>- Fig. 24, CW Output Power versus Gate-Source Voltage at a Constant Input Power, <math>P_{in} = 0.65</math> W, p. 18</li><li>- Fig. 25, CW Output Power versus Gate-Source Voltage at a Constant Input Power, <math>P_{in} = 0.325</math> W, p. 18</li><li>- Fig. 26, CW Output Power versus Input Power, p. 19</li><li>- Fig. 27, Power Gain and Drain Efficiency versus CW Output Power, p. 19</li><li>- Fig. 28, Intermodulation Distortion Products versus Output Power - 30 MHz, p. 20</li><li>- Fig. 29, Intermodulation Distortion Products versus Output Power - 100 MHz, p. 20</li><li>- Fig. 30, Intermodulation Distortion Products versus Output Power - 512 MHz, p. 20</li><li>- Fig. 31, Broadband Series Equivalent Source and Load Impedance, p. 21</li></ul></li></ul> |
| 2        | Mar. 2019 | <ul style="list-style-type: none"><li>• Fig. 1, Pin Connections, corrected Drain (Pin 1) and Gate (Pin 2) to reflect correct pin numbers, p. 1</li><li>• Table 6, Ordering Information, added table, p. 3</li><li>• Package Outline Drawings: TO-270-2 package outline updated to Rev. R, pp. 27-29. TO-270G-2 package outline updated to Rev. D, pp. 30-32.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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