

Advance Information

The RF Small Signal Line

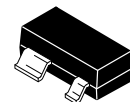
GaAs MESFET AGC Amplifier

The MRF9820T1 is a high performance GaAs AGC amplifier suitable for use in low noise front end amplifier or downconverter applications. The device contains two enhancement mode MESFETs connected in cascode to allow access to both gates for gain control or injection of LO signals. This device is well suited for low voltage, low current front-end applications such as paging, cellular, GSM, DECT, and other portable wireless systems.

- Low Noise Figure: 1.5 dB @ 940 MHz, 1 mA
- Built In ESD Protection
- Does Not Require a Negative Supply Voltage
- RF Power Gain 16 dB @ 940 MHz, 1 mA
- High Third Order Intercept Point
- Industry Standard SOT-143 Surface Mount Package
- Order MRF9820T1 for Tape and Reel Packaging.
T1 Suffix = 3,000 Units per 8 mm, 7 inch Reel.

MRF9820T1

**SURFACE MOUNT
LOW NOISE
ENHANCEMENT MODE
GaAs CASCODE**



**CASE 318A-05, STYLE 11
(SOT-143)**

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-----------|-------------|----------------------------|
| Drain-Source Voltage | V_{DS} | 6 | Vdc |
| Gate 1-Source Voltage | V_{G1S} | -4 | Vdc |
| Gate 2-Source Voltage | V_{G2S} | -4 | Vdc |
| Drain Current — Continuous | I_D | I_{DSS} | — |
| Total Device Dissipation @ $T_C = 75^\circ\text{C}$ Derate above 75°C | P_D | 231 4.3 | mW mW/ $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Operating Channel Temperature | T_{ch} | 150 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Rating | Symbol | Max | Unit |
|-------------------------------------|-------------------|-----|---------------------------|
| Thermal Resistance, Channel to Case | $R_{\theta ch-C}$ | 325 | $^\circ\text{C}/\text{W}$ |

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Value | Unit |
|---|----------------|------------------------|---------------|
| Gate 1 Leakage Current ($V_{DS} = 2\text{ V}$, $V_{G1S} = 0.425\text{ V}$, $V_{G2S} = 1\text{ V}$) | I_{G1S} | 4 | μA |
| Gate 2 Leakage Current ($V_{DS} = 2\text{ V}$, $V_{G1S} = 0.5\text{ V}$, $V_{G2S} = 0.425\text{ V}$) | I_{G2S} | 4 | μA |
| Threshold Voltage ($V_{DS} = 3\text{ V}$, $V_{G2S} = 1\text{ V}$, $I_D = 1\text{ mA}$) | V_{th} | 275 (min) 425 (max) | mV |
| Gate 1-to-Source Cutoff Voltage ($V_{DS} = 2\text{ V}$, $V_{G2S} = 1\text{ V}$, $I_D = 200\ \mu\text{A}$) | $V_{G1S(off)}$ | 100 (min) 360 (max) | mV |
| Gate 2-to-Source Cutoff Voltage ($V_{DS} = 2\text{ V}$, $V_{G1S} = 0.5\text{ V}$, $I_D = 200\ \mu\text{A}$) | $V_{G2S(off)}$ | 10 (min) 370 (max) | mV |
| Forward Transconductance ($V_{DS} = 2\text{ V}$, $V_{G2S} = 1\text{ V}$, $I_D = 1\text{ mA}$) | g_m | 9 (min) | mS |
| Drain-to-Source Leakage Current ($V_{DS} = 2\text{ V}$, $V_{G1S} = 0\text{ V}$, $V_{G2S} = 0\text{ V}$) | $I_{DS(off)}$ | 2 (max) | μA |

NOTE – **CAUTION** – MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

PERFORMANCE CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Value | Unit |
|--|----------|------------------------|------|
| RF Power Gain ($V_{DS} = 3\text{ V}$, $V_{G2} = 1.7\text{ V}$, $I_D = 1\text{ mA}$, $f = 940\text{ MHz}$) | G_{ps} | 14 (min) | dB |
| Noise Figure ($V_{DS} = 3\text{ V}$, $V_{G2} = 1.7\text{ V}$, $I_D = 1\text{ mA}$, $f = 940\text{ MHz}$) | NF | 1.5 (typ) 2.0 (max) | dB |
| Input Third Order Intercept Point | IIP3 | -3 (typ) -8 (min) | dBm |

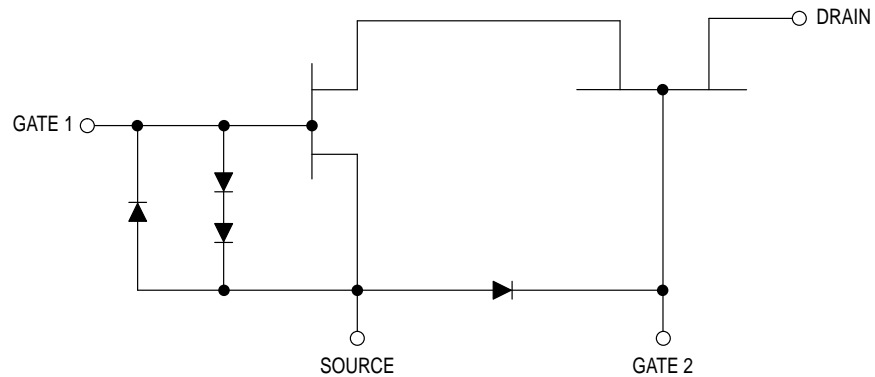


Figure 1. Electrical Schematic of GaAs AGC Amplifier

TYPICAL CHARACTERISTICS

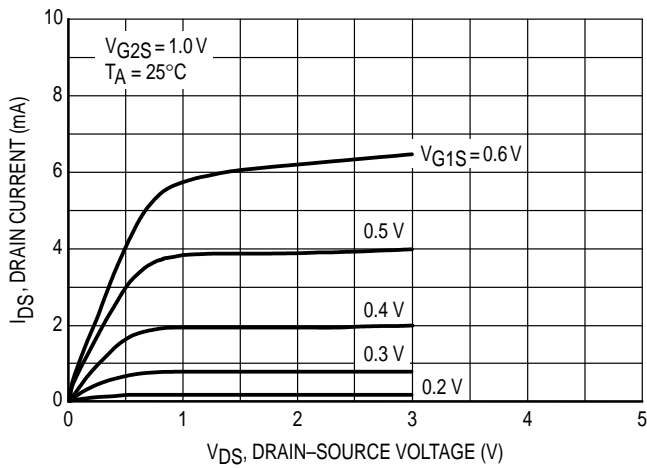


Figure 2. Drain Current versus V_{DS} ; Stepping V_{G1S}

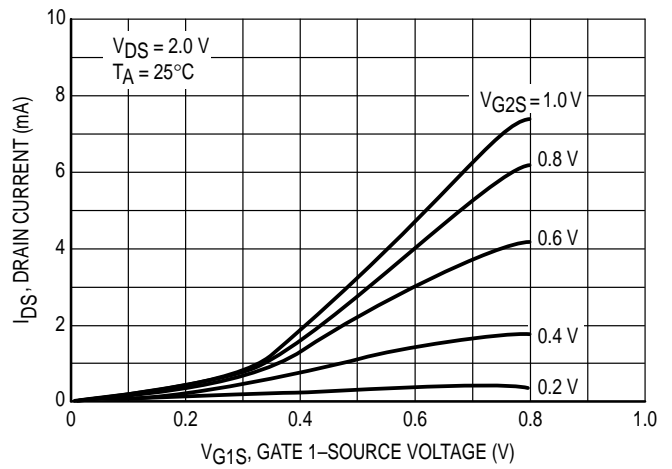


Figure 3. Drain Current versus V_{G1S} ; Stepping V_{G2S}

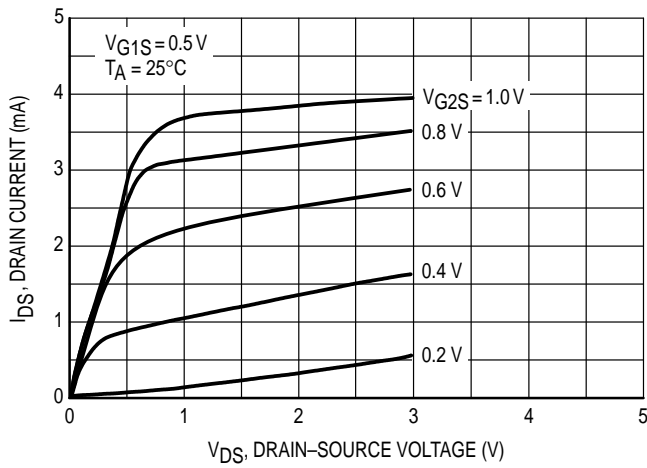


Figure 4. Drain Current versus V_{DS} ; Stepping V_{G2S}

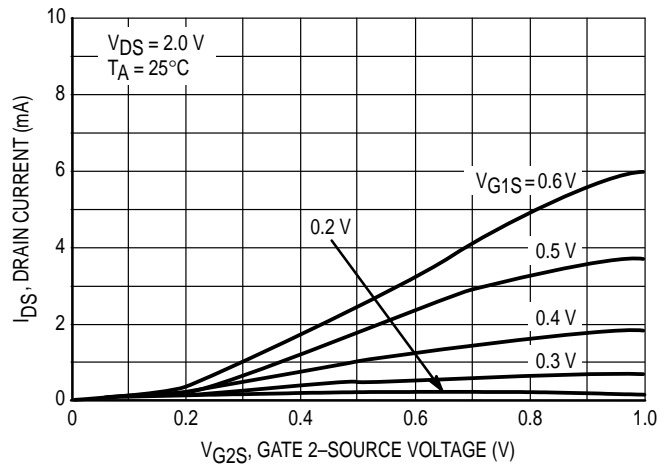
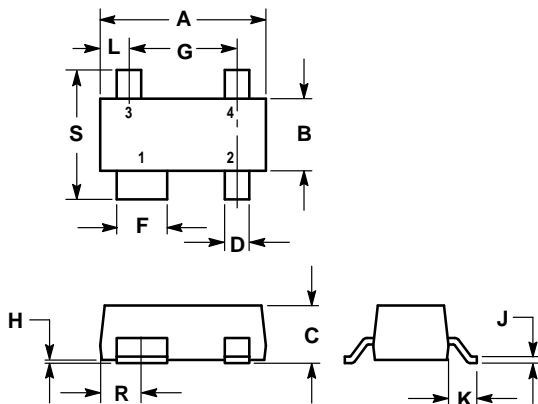


Figure 5. Drain Current versus V_{G2S} ; Stepping V_{G1S}

PACKAGE DIMENSIONS




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 2.80 | 3.04 | 0.110 | 0.120 |
| B | 1.20 | 1.39 | 0.047 | 0.055 |
| C | 0.84 | 1.14 | 0.033 | 0.045 |
| D | 0.39 | 0.50 | 0.015 | 0.020 |
| F | 0.79 | 0.93 | 0.031 | 0.037 |
| G | 1.78 | 2.03 | 0.070 | 0.080 |
| H | 0.013 | 0.10 | 0.0005 | 0.004 |
| J | 0.08 | 0.15 | 0.003 | 0.006 |
| K | 0.46 | 0.60 | 0.018 | 0.024 |
| L | 0.445 | 0.60 | 0.0175 | 0.024 |
| R | 0.72 | 0.83 | 0.028 | 0.033 |
| S | 2.11 | 2.48 | 0.083 | 0.098 |

- STYLE 11:
 PIN 1. SOURCE
 2. GATE 1
 3. GATE 2
 4. DRAIN

**CASE 318A-05
 ISSUE R**

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