Advance Information

The RF Small Signal Line

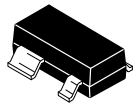
GaAs MESFET AGC Amplifier

MRF9820T1

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

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.



**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°C Derate above 75°C	P_D	231 4.3	mW mW/°C
Storage Temperature Range	T_{stg}	–55 to +150	°C
Operating Channel Temperature	T_{ch}	150	°C

THERMAL CHARACTERISTICS

Rating	Symbol	Max	Unit
Thermal Resistance, Channel to Case	$R_{\theta ch–C}$	325	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

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

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

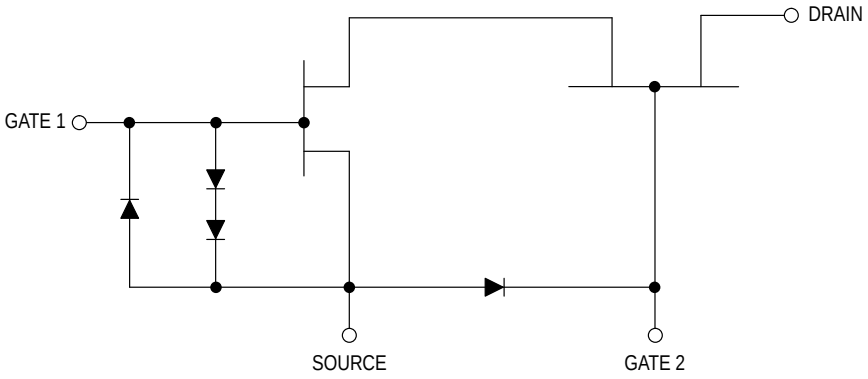


Figure 1. Electrical Schematic of GaAs AGC Amplifier

TYPICAL CHARACTERISTICS

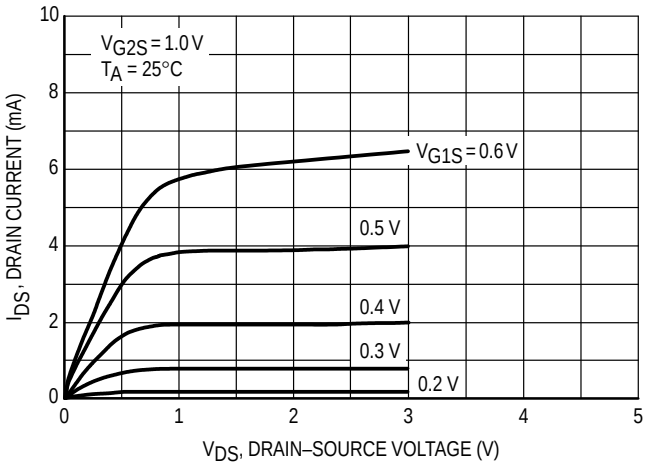


Figure 2. Drain Current versus V_{DS}; Stepping V_{G1S}

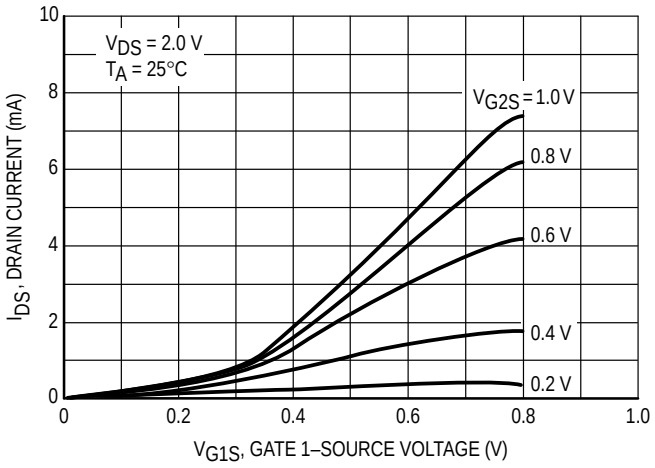


Figure 3. Drain Current versus V_{G1S}; Stepping V_{G2S}

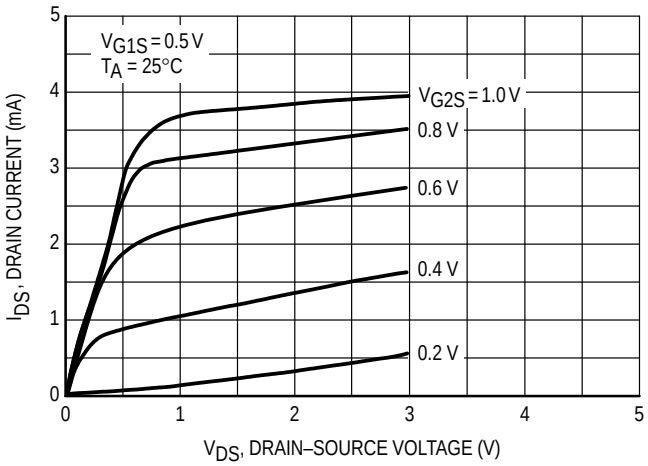


Figure 4. Drain Current versus V_{DS}; Stepping V_{G2S}

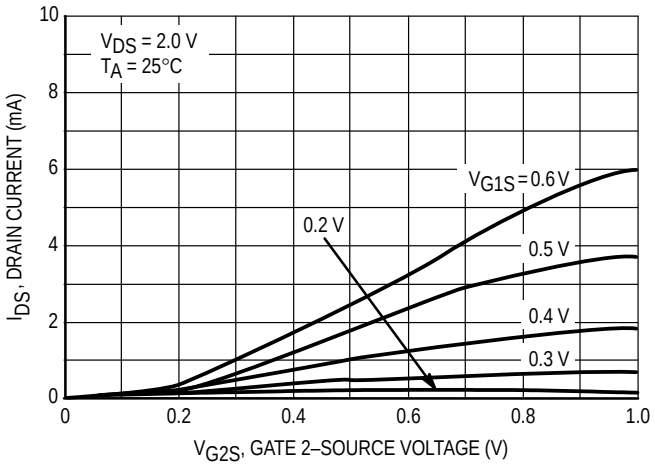
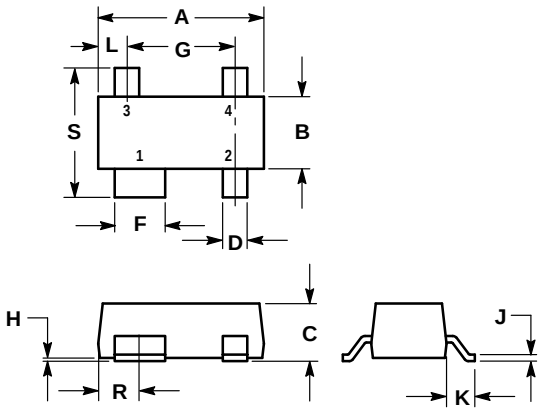


Figure 5. Drain Current versus V_{G2S}; Stepping V_{G1S}

PACKAGE DIMENSIONS



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

	MILLIMETERS		INCHES	
DIM	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

How to reach us:
USA / EUROPE / Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 303–675–2140 or 1–800–441–2447

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 602–244–6609
– US & Canada ONLY 1–800–774–1848

INTERNET: http://motorola.com/sps

JAPAN: Nippon Motorola Ltd.: SPD, Strategic Planning Office, 4–32–1,
Nishi–Gotanda, Shinagawa–ku, Tokyo 141, Japan. 81–3–5487–8488

ASIA / PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298