

**GaAs N-channel Dual Gate MES FET**

**Description**

SGM2004M is an N-channel dual gate GaAs MES FET for UHF band low-noise amplification. This FET is suitable for a wide range of applications including TV tuners, cellular radios and DBS IF amplifiers.

**Features**

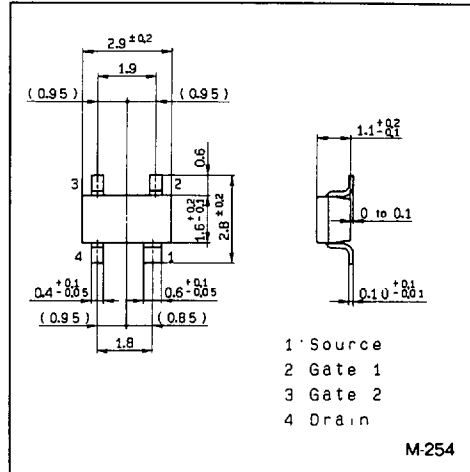
- Low voltage operation
- Low noise : NF = 1.6 dB (Typ.) at 800 MHz
- High gain : Ga = 18 dB (Typ.) at 800 MHz
- Low cross-modulation
- High stability
- Built-in gate-protection diode
- Standard SOT-143 package

**Application**

UHF band amplifier, mixer and oscillator

**Package Outline**

Unit : mm



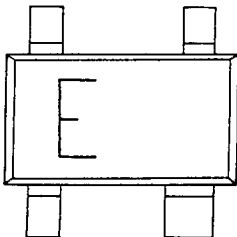
**Structure**

GaAs N-channel dual gate metal semiconductor field effect transistor

**Absolute Maximum Ratings (Ta = 25 °C)**

• Drain to source voltage	V <sub>DSX</sub>	12	V
• Gate 1 to source voltage	V <sub>G1S</sub>	- 5	V
• Gate 2 to source voltage	V <sub>G2S</sub>	- 5	V
• Drain current	I <sub>D</sub>	55	mA
• Allowable power dissipation	P <sub>D</sub>	150	mW
• Channel temperature	T <sub>CH</sub>	150	°C
• Storage temperature	T <sub>STG</sub>	- 55 to + 150	°C

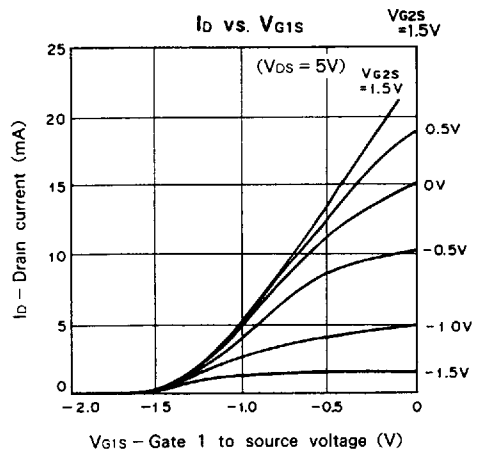
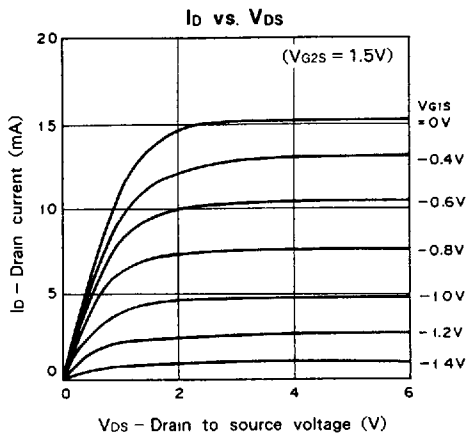
**Mark**

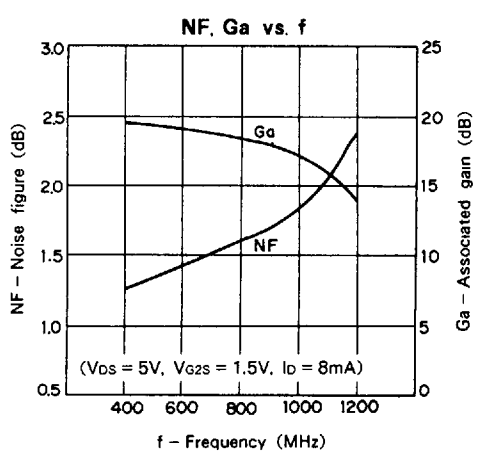
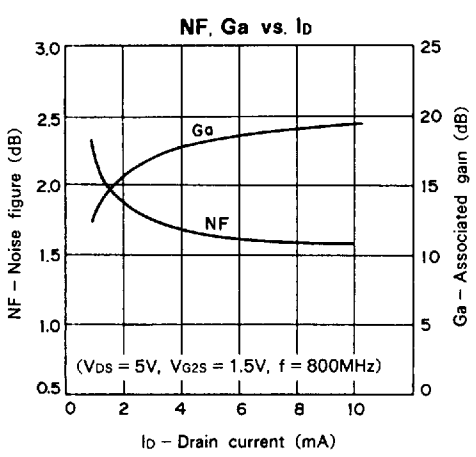
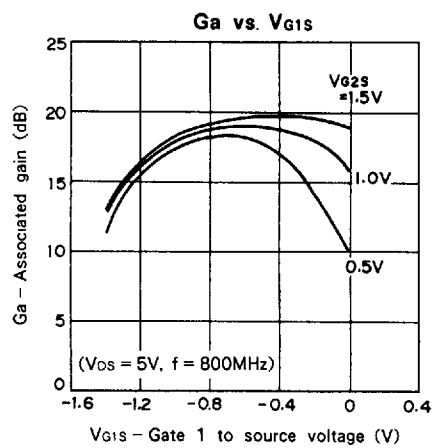
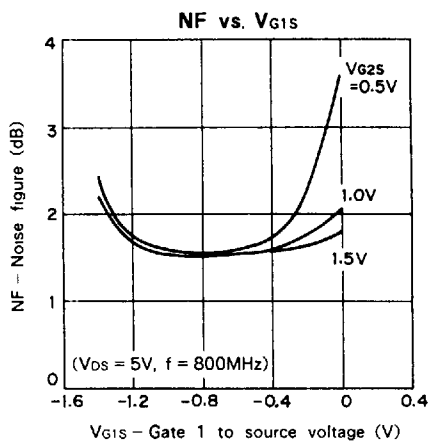
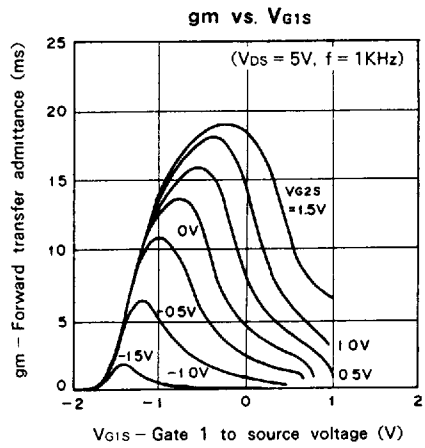
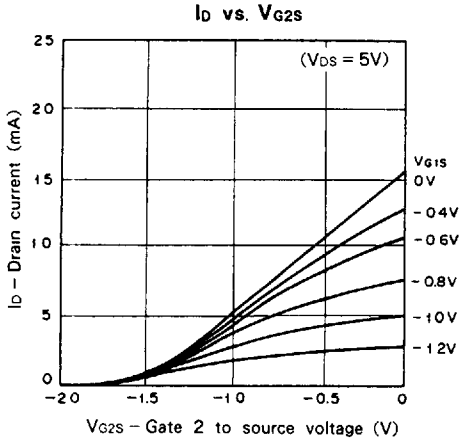


**Electrical Characteristics (Ta = 25 °C)**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to source voltage	V <sub>DSX</sub>	I <sub>D</sub> = 20 μA V <sub>G1S</sub> = 0V V <sub>G2S</sub> = -4.0V	11			V
Gate 1 cutoff current	I <sub>G1SS</sub>	V <sub>G1S</sub> = -4.5V V <sub>G2S</sub> = 0V V <sub>DS</sub> = 0V			-8	μA
Gate 2 cutoff current	I <sub>G2SS</sub>	V <sub>G2S</sub> = -4.5V V <sub>G1S</sub> = 0V V <sub>DS</sub> = 0V			-8	μA
Gate 2 to drain cutoff current	I <sub>G2D0</sub>	V <sub>G2D</sub> = -12V			-10	μA
Drain saturation current	I <sub>DSS</sub>	V <sub>DS</sub> = 5V V <sub>G1S</sub> = 0V V <sub>G2S</sub> = 0V	8		28	mA
Gate 1 cutoff voltage	V <sub>G1S</sub> (OFF)	V <sub>DS</sub> = 5V I <sub>D</sub> = 100 μA V <sub>G2S</sub> = 0V			-2.5	V
Gate 2 cutoff voltage	V <sub>G2S</sub> (OFF)	V <sub>DS</sub> = 5V I <sub>D</sub> = 100 μA V <sub>G1S</sub> = 0V			-2.5	V
Forward transfer admittance	g <sub>m</sub>	V <sub>DS</sub> = 5V I <sub>D</sub> = 8mA V <sub>G2S</sub> = 1.5V f = 1KHz	11	15		mS
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 5V I <sub>D</sub> = 8mA V <sub>G2S</sub> = 1.5V f = 1MHz		0.9	2	pF
Reverse transfer capacitance	C <sub>rss</sub>			25	40	fF
Noise figure	NF	V <sub>DS</sub> = 5V I <sub>D</sub> = 8mA V <sub>G2S</sub> = 1.5V		1.6	2.5	dB
Associated gain	G <sub>a</sub>	f = 800MHz	15	18		dB

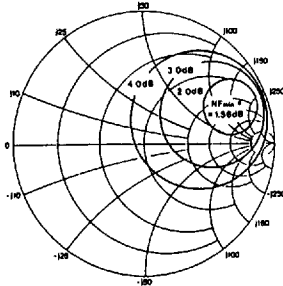
**Typical Characteristics (Ta = 25 °C)**





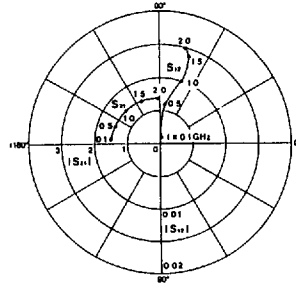
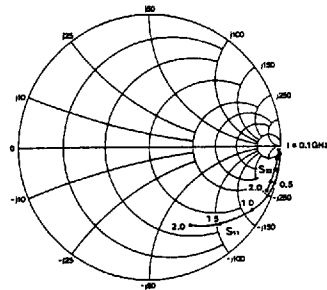
Noise Figure Characteristics ( $V_{DS} = 5V$ ,  $V_{G2S} = 1.5V$ ,  $I_D = 8 \text{ mA}$ )

at 800 MHz


















f (MHz)	Ga (dB)	NFmin (dB)	NF50 (dB)	Rn ( $\Omega$ )	$\Gamma$ (S)		$\Gamma$ (L)	
					MAG	ANG	MAG	ANG
600	19.3	1.45	3.61	53.4	.830	17.3°	.862	1.3°
800	18.5	1.56	3.69	55.8	.793	22.2°	.895	5.8°
1000	16.4	1.77	3.73	60.3	.714	26.0°	.832	5.2°

S-parameters vs. Frequency Characteristics ( $V_{DS} = 5V$ ,  $V_{G2S} = 1.5V$ ,  $I_D = 8 \text{ mA}$ )



f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.00	-3.2°	1.50	175°	.001	78.2°	.978	-1.4°
200	.999	-6.3°	1.49	171°	.003	89.2°	.979	-2.3°
300	.992	-9.7°	1.49	166°	.004	92.7°	.975	-3.3°
400	.981	-12.7°	1.48	162°	.004	80.4°	.970	-4.4°
500	.974	-15.8°	1.47	157°	.006	82.4°	.968	-5.3°
600	.967	-18.8°	1.47	153°	.006	60.0°	.966	-6.0°
700	.950	-22.1°	1.47	149°	.008	78.7°	.968	-7.2°
800	.939	-25.3°	1.46	144°	.009	76.4°	.965	-8.2°
900	.926	-28.5°	1.46	140°	.010	78.1°	.966	-9.4°
1000	.911	-31.5°	1.46	135°	.010	70.9°	.965	-10.2°
1100	.894	-34.3°	1.46	131°	.011	74.7°	.976	-11.1°
1200	.863	-37.3°	1.45	126°	.011	60.9°	.953	-12.7°
1300	.843	-40.6°	1.44	122°	.012	74.5°	.956	-13.7°
1400	.818	-43.7°	1.43	117°	.013	77.1°	.952	-14.6°
1500	.792	-47.1°	1.41	113°	.014	70.7°	.950	-15.7°
1600	.769	-50.3°	1.40	108°	.014	70.1°	.944	-16.4°
1700	.746	-53.4°	1.39	104°	.014	76.3°	.946	-17.2°
1800	.725	-56.5°	1.39	100°	.014	79.2°	.947	-18.2°
1900	.696	-59.2°	1.38	95.8°	.015	76.2°	.949	-19.4°
2000	.665	-61.8°	1.37	91.2°	.015	74.6°	.948	-20.4°

## Package Name

Type	Package name		Package	Features					
	Symbol	Description		Material	Lead pitch	Lead shape	Lead pull out direction		
Inserted	Standard	D I P	DUAL IN-LINE PACKAGE		P C	2.54mm (100MIL)	Through Hole Lead	2-direction	
		S I P	SINGLE IN LINE PACKAGE		P	2.54mm (100MIL)	Through Hole Lead	1-direction	
		Z I P	ZIG ZAG IN-LINE PACKAGE		P	2.54mm (100MIL) Zig-Zag in-line	Through Hole Lead	1-direction	
		P G A	PIN GRID ARRAY		C	2.54mm (100MIL)	Through Hole Lead	Package under side	
		PIGGY BACK	PIGGY BACK		C	2.54mm (100MIL)	Through Hole Lead	2-direction	
	Shrink	SDIP	SHRINK DUAL IN-LINE PACKAGE		P	1.778mm (70MIL)	Through Hole Lead	2-direction	
		SZIP	SHRINK ZIG-ZAG IN-LINE PACKAGE		P	1.778mm (70MIL) Zig-Zag in-line	Through Hole Lead	1-direction	
	Surface mounted	Standard flat package	Q F P	QUAD FLAT L LEADED PACKAGE		P C	1.0mm 0.8mm 0.65mm	Gull-Wing	4-direction
			S O P	SMALL OUTLINE L-LEADED PACKAGE		P	1.27mm (50MIL)	Gull-Wing	2-direction
		Standard 2-direction chip carrier	S O J	SMALL OUTLINE J-LEADED PACKAGE		P	1.27mm (50MIL)	J-Lead	2-direction
Shrink flat package		VQFP	VERY SMALL QUAD FLAT PACKAGE		P	0.5mm	Gull-Wing	4-direction	
		VSOP	VERY SMALL OUTLINE PACKAGE		P	0.65mm	Gull-Wing	2-direction	
		TSOP	THIN SMALL OUTLINE PACKAGE		P	0.5mm (0.55mm)	Gull-Wing	2-direction	
Standard chip carrier		Q F J	QUAD FLAT J-LEADED PACKAGE		P	1.27mm (50MIL)	J-Lead	4-direction	
		Q F N	QUAD FLAT NON-LEADED PACKAGE		C	1.27mm (50MIL)	Leadless	Package under side	

\* P .....Plastic, C .....Ceramic

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