MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

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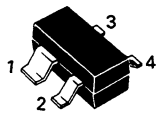
MRF0211
MRF0211L

The RF Line
NPN Silicon High-Frequency Transistor

. . . designed primarily for use in the high-gain, low-noise small-signal amplifiers for operation up to 3.5 GHz. Also usable in applications requiring fast switching times.

- High Current-Gain-Bandwidth Product — f_T = 5.5 GHz (Typ) @ I_C = 40 mAdc
- Low Noise Figure @ f = 1 GHz — $NF_{(matched)}$ = 1.8 dB (Typ)
- High Power Gain — $G_{pe\ (matched)}$ = 13 dB (Typ)
- Surface Mount SOT-143 Offers Improved RF Performance
  - Lower Package Parasitics
  - Higher Gain
- Available In Both Standard and Low Profile Packages
- Tape and Reel Packaging Options
- Higher Voltage Version of MRF5711
- Electrically Similar to NEC NE 02133

**SURFACE MOUNT
HIGH FREQUENCY
TRANSISTOR
NPN SILICON**



**SOT-143
CASE 318B-03
STANDARD PROFILE
(MRF0211)**

**CASE 318A-04
LOW PROFILE
(MRF0211L)**

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	15	Vdc
Collector-Base Voltage	V_{CBO}	30	Vdc
Emitter-Base Voltage	V_{EBO}	2.5	Vdc
Collector-Current — Continuous	I_C	70	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	0.58 4.64	Watts mW/°C
Total Device Dissipation @ T_C = 75°C (Note 1) Derate above 75°C	P_D	0.58 7.73	Watts mW/°C
Maximum Junction Temperature	T_{Jmax}	150	°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	216	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	130	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 1 mAdc, I_B = 0)	$V_{(BR)CEO}$	15	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 0.1 mAdc, I_E = 0)	$V_{(BR)CBO}$	30	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 50 μAdc, I_C = 0)	$V_{(BR)EBO}$	2.5	—	—	Vdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	—	—	10	μAdc

Note 1. Case Temperature is measured on the collector lead where it first contacts the printed circuit board closest to the package.

(continued)

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

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS						
DC Current Gain (I_C = 30 mAdc, V_{CE} = 5 Vdc)		h_{FE}	50	—	300	—
DYNAMIC CHARACTERISTICS						
Collector-Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1 MHz)	Figure 1	C_{cb}	—	0.7	1	pF
Current Gain — Bandwidth Product (V_{CE} = 10 Vdc, I_C = 40 mA, f = 1 GHz)	Figure 7	f_T	—	5.5	—	GHz
FUNCTIONAL TESTS						
Gain at Noise Figure (Tuned) (V_{CE} = 10 Vdc, I_C = 5 mAdc)	Figure 4 f = 0.5 GHz f = 1 GHz	G_{NFmin}	 — —	 19 13	 — —	dB
Noise Figure (Tuned) (V_{CE} = 10 Vdc, I_C = 5 mAdc)	Figure 4 f = 0.5 GHz f = 1 GHz f = 2 GHz	NF_{min}	 — — —	 0.9 1.8 3	 — — —	dB
Power Gain in 50 Ω System (V_{CE} = 10 Vdc, I_C = 5 mA, f = 1 GHz)	Figure 2	G_{NF}	—	9.5	—	dB
Noise Figure in 50 Ω System (V_{CE} = 10 Vdc, I_C = 5 mA, f = 1 GHz)	Figure 2	NF	—	2.7	3	dB
Insertion Gain (V_{CE} = 10 Vdc, I_C = 25 mA, f = 1 GHz)		S_{21}^2	11	13.5	—	dB
Maximum Unilateral Gain (V_{CE} = 10 Vdc, I_C = 25 mA, f = 1 GHz)		G_{Umax}	—	15.5	—	dB

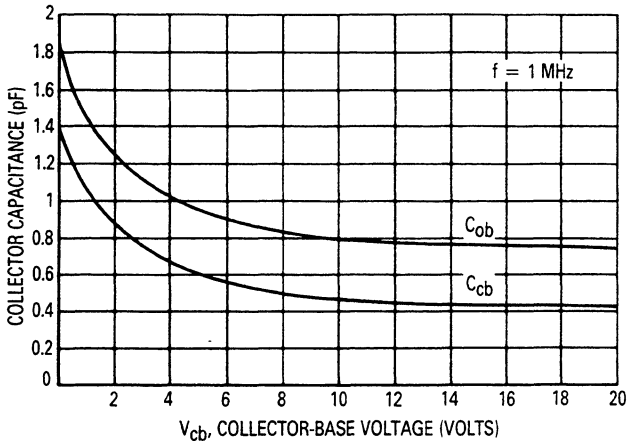


Figure 1. Device Capacitances versus Voltage

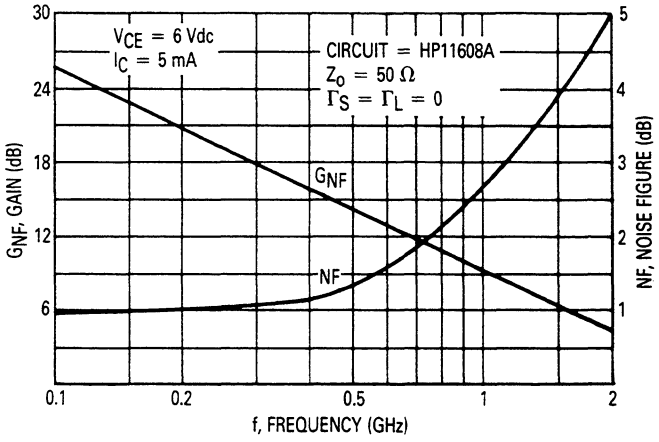


Figure 2. Gain and Noise Figure versus Frequency

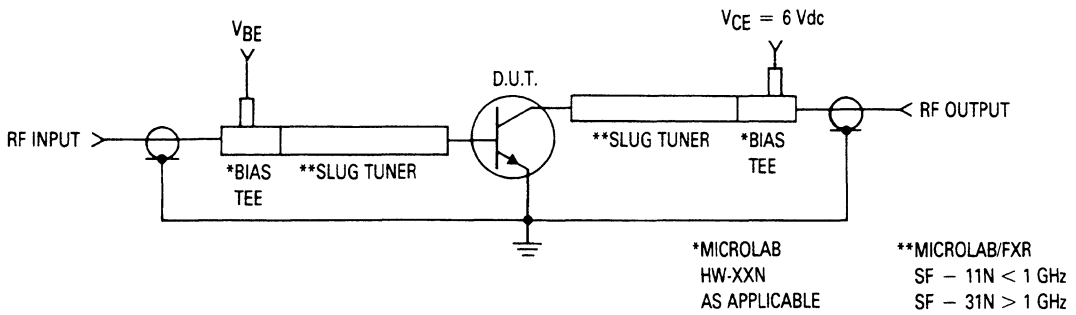


Figure 3. Functional Circuit Schematic

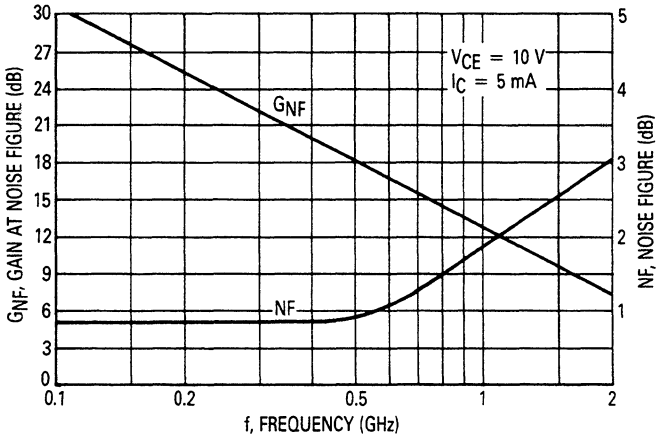


Figure 4. Gain at Noise Figure and Noise Figure versus Frequency

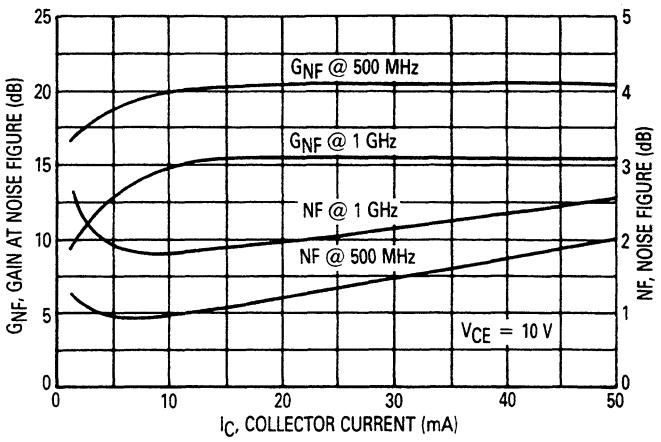


Figure 5. Gain at Noise Figure and Noise Figure versus Collector Current

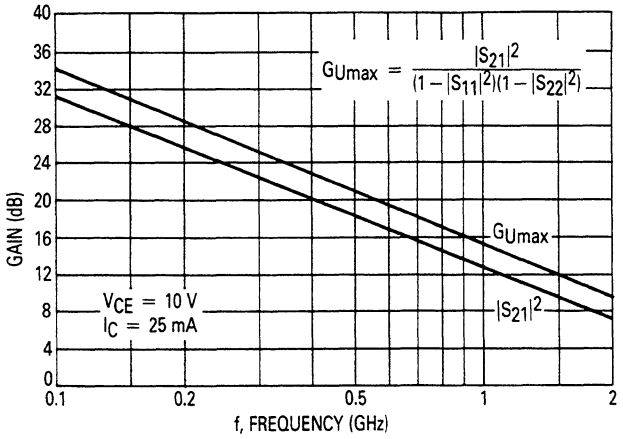


Figure 6. Unilateral-Gain and Insertion Gain versus Frequency

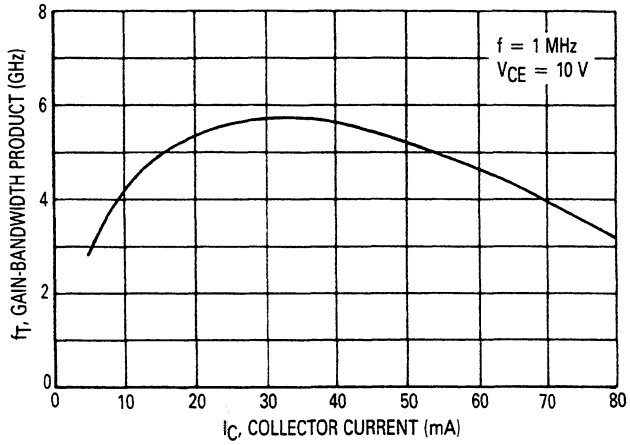
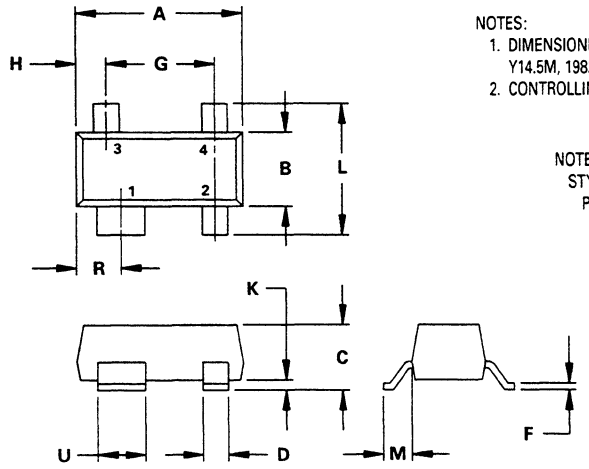


Figure 7. Gain-Bandwidth Product versus Collector Current

OUTLINE DIMENSIONS



NOTES:
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIM: INCH

NOTES:
STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. EMITTER
4. BASE

		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	1.05	1.24	0.041	0.049
*	C	0.84	1.14	0.033	0.045
	D	0.38	0.50	0.015	0.020
	F	0.08	0.15	0.003	0.006
	G	1.78	2.03	0.070	0.080
	H	0.445	0.60	0.0175	0.024
	K	0.10	0.25	0.004	0.010
*	K	0.013	0.102	0.0005	0.004
	L	2.11	2.48	0.083	0.098
	M	0.46	0.60	0.018	0.024
	R	0.71	0.83	0.028	0.033
	U	0.79	0.88	0.031	0.035

***Low Profile = CASE 318A-04**

CASE 318B-03
SOT-143

COMMON EMITTER S-PARAMETERS

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
5	5	100	0.84	−50	13.2	151	0.04	64	0.90	−22
		200	0.81	−87	10.4	130	0.06	49	0.74	−35
		500	0.74	−139	5.6	100	0.07	32	0.50	−48
		1000	0.68	−175	2.9	77	0.09	32	0.42	−58
		1500	0.66	167	2	61	0.09	40	0.44	−67
		2000	0.65	149	1.5	51	0.11	51	0.44	−73
	10	100	0.76	−66	20.6	144	0.03	60	0.83	−32
		200	0.73	−106	14.8	122	0.05	44	0.62	−49
		500	0.69	−153	7.1	96	0.06	37	0.36	−63
		1000	0.65	178	3.7	76	0.08	44	0.28	−71
		1500	0.62	162	2.5	63	0.09	51	0.30	−77
		2000	0.61	145	1.9	54	0.12	59	0.20	−78
	25	100	0.65	−89	28.8	134	0.03	55	0.71	−44
		200	0.67	−126	18.2	114	0.04	45	0.48	−64
		500	0.65	−163	8.3	92	0.05	45	0.27	−80
		1000	0.63	172	4.2	76	0.07	55	0.20	−90
		1500	0.60	158	2.8	64	0.10	60	0.22	−92
		2000	0.59	142	2.2	55	0.13	63	0.20	−90
	50	100	0.62	−110	30.4	126	0.02	51	0.62	−49
		200	0.66	−142	18.0	109	0.03	45	0.41	−65
		500	0.66	−171	7.9	90	0.04	52	0.25	−79
		1000	0.64	168	4.1	75	0.06	62	0.20	−91
		1500	0.62	155	2.7	62	0.10	65	0.20	−93
		2000	0.60	140	2.1	55	0.13	67	0.14	−90
10	5	100	0.86	−46	13.2	153	0.03	69	0.92	−18
		200	0.82	−81	10.6	132	0.05	51	0.80	−28
		500	0.72	−134	5.9	102	0.07	36	0.57	−38
		1000	0.65	−171	3.2	78	0.08	38	0.49	−46
		1500	0.63	169	2.1	62	0.08	47	0.52	−55
		2000	0.61	149	1.6	51	0.10	60	0.53	−61
	10	100	0.77	−60	20.7	145	0.03	62	0.85	−26
		200	0.72	−98	15.2	124	0.04	48	0.66	−38
		500	0.65	−147	7.5	97	0.06	42	0.44	−46
		1000	0.59	−177	3.9	77	0.07	48	0.37	−51
		1500	0.58	165	2.6	64	0.09	56	0.39	−59
		2000	0.56	145	2	54	0.13	65	0.40	−62
	25	100	0.67	−80	29.4	136	0.02	57	0.75	−35
		200	0.66	−118	19.3	116	0.03	47	0.53	−48
		500	0.63	−158	8.9	94	0.05	47	0.33	−55
		1000	0.61	175	4.6	77	0.07	57	0.26	−60
		1500	0.58	161	3.1	64	0.09	61	0.29	−65
		2000	0.57	144	2.3	55	0.12	66	0.30	−65
	50	100	0.65	−99	32.2	129	0.02	54	0.67	−38
		200	0.65	−135	19.5	110	0.03	44	0.45	−48
		500	0.64	−167	8.5	91	0.04	53	0.31	−51
		1000	0.61	170	4.2	75	0.06	62	0.26	−55
		1500	0.59	157	2.9	63	0.09	58	0.30	−61
		2000	0.58	141	2.3	54	0.11	71	0.31	−63

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