The RF Line

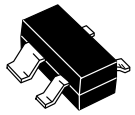
NPN Silicon High-Frequency Transistor

. . . 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 = 1.0 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
- Higher Voltage Version of MRF5711LT1
- Electrically Similar to NEC NE 02133
- Available in tape and reel packaging:
  T1 suffix = 3,000 units per reel

MRF0211LT1

**SURFACE MOUNT
HIGH–FREQUENCY
TRANSISTOR
NPN SILICON**



**CASE 318A–05, STYLE 1
LOW PROFILE**

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 (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 Case	$R_{\theta JC}$	130	°C/W

DEVICE MARKING

MRF0211LT1 = 15

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

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector–Emitter Breakdown Voltage (I_C = 1.0 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
ON CHARACTERISTICS						
DC Current Gain (I_C = 30 mAdc, V_{CE} = 5.0 Vdc)		h_{FE}	50	—	300	—
DYNAMIC CHARACTERISTICS						
Collector–Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	Figure 1	C_{cb}	—	0.7	1.0	pF
Current Gain — Bandwidth Product (V_{CE} = 10 Vdc, I_C = 40 mA, f = 1.0 GHz)	Figure 7	f_T	—	5.5	—	GHz
FUNCTIONAL TESTS						
Gain at Noise Figure (Tuned) (V_{CE} = 10 Vdc, I_C = 5.0 mAdc)	Figure 4 f = 0.5 GHz f = 1.0 GHz	G_{NFmin}	 — —	 19 13	 — —	dB
Noise Figure (Tuned) (V_{CE} = 10 Vdc, I_C = 5.0 mAdc)	Figure 4 f = 0.5 GHz f = 1.0 GHz f = 2.0 GHz	NF_{min}	 — — —	 0.9 1.8 3.0	 — —	dB
Power Gain in 50 Ω System (V_{CE} = 10 Vdc, I_C = 5.0 mA, f = 1.0 GHz)	Figure 2	G_{NF}	—	9.5	—	dB
Noise Figure in 50 Ω System (V_{CE} = 10 Vdc, I_C = 5.0 mA, f = 1.0 GHz)	Figure 2	NF	—	2.7	3.0	dB
Insertion Gain (V_{CE} = 10 Vdc, I_C = 25 mA, f = 1.0 GHz)		S_{21}^2	11	13.5	—	dB
Maximum Unilateral Gain (V_{CE} = 10 Vdc, I_C = 25 mA, f = 1.0 GHz)		G_{Umax}	—	15.5	—	dB

TYPICAL CHARACTERISTICS

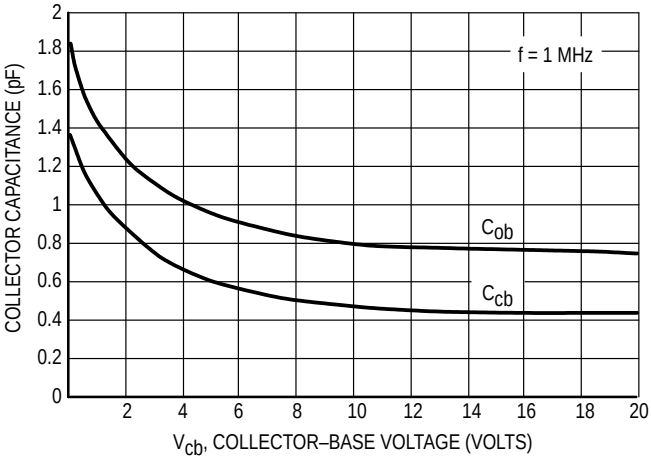


Figure 1. Device Capacitances versus Voltage

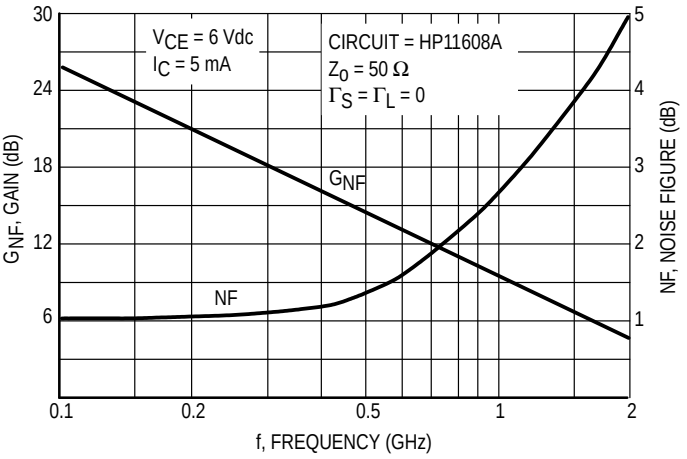


Figure 2. Gain and Noise Figure versus Frequency

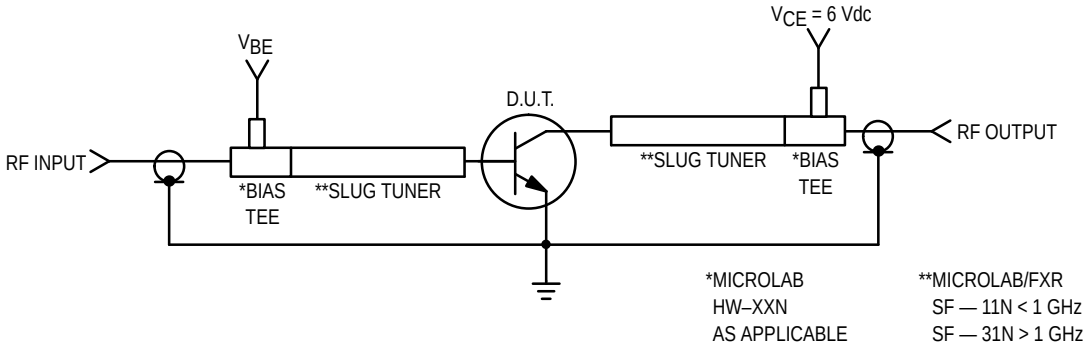


Figure 3. Functional Circuit Schematic

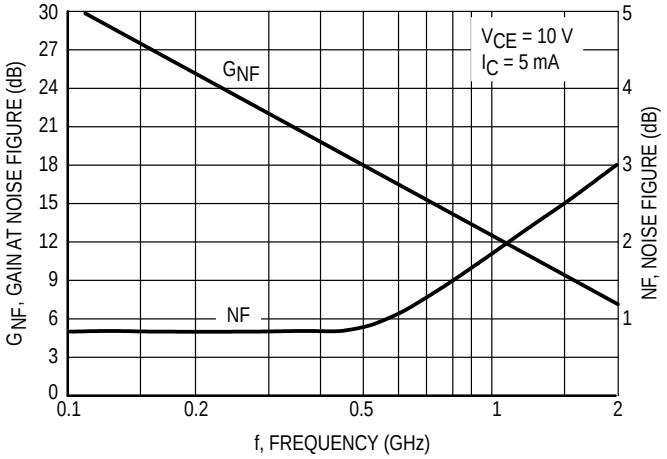


Figure 4. Gain at Noise Figure and Noise Figure versus Frequency

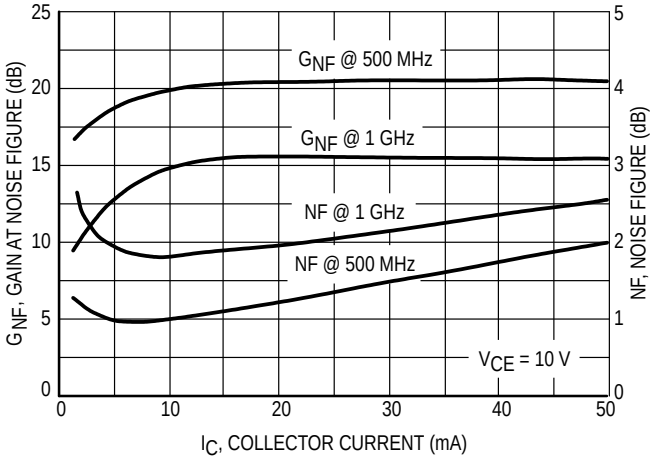


Figure 5. Gain at Noise Figure and Noise Figure versus Collector Current

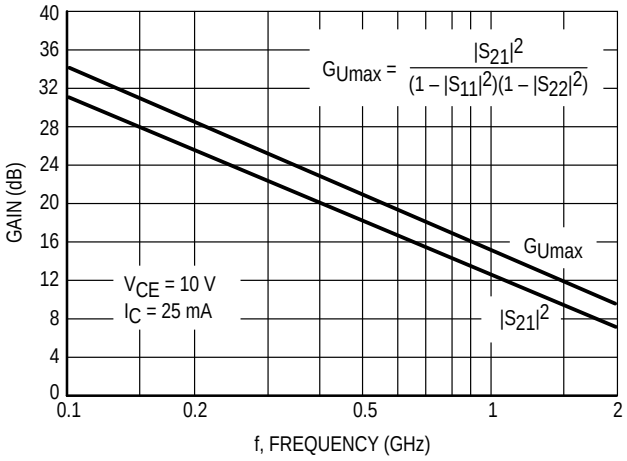


Figure 6. Unilateral–Gain and Insertion Gain versus Frequency

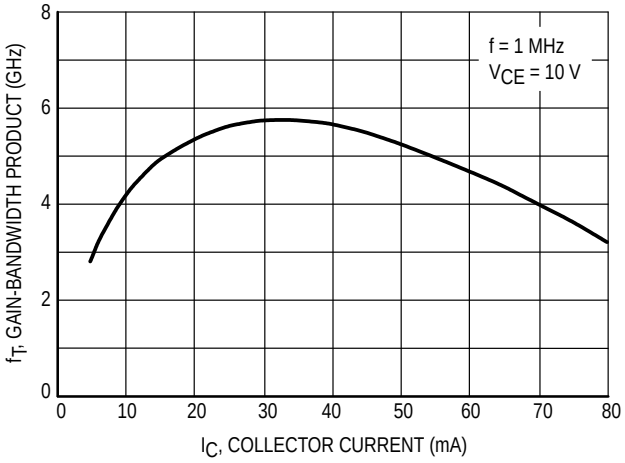
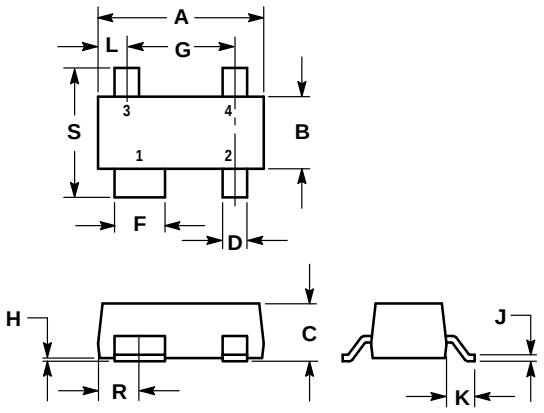


Figure 7. Gain–Bandwidth Product versus Collector Current

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
5.0	5.0	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	2.0	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	5.0	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	2.0	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

Table 1. Common Emitter S–Parameters

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

CASE 318A–05
ISSUE J

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