

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

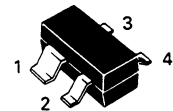
The RF Line
NPN Silicon
High-Frequency Transistor

... designed primarily for use in high-gain, low-noise small-signal amplifiers for operation up to 2.5 GHz. Also usable in applications requiring fast switching times.

- High Current-Gain-Bandwidth Product — $f_T = 3.8$ GHz (Typ) @ $I_C = 15$ mAdc
- Low Noise Figure @ $f = 1$ GHz — $NF_{(matched)} = 1.8$ dB (Typ)
- High Power Gain — $G_{pe(matched)} = 13.5$ dB (Typ) @ $f = 1$ GHz
- Guaranteed RF Parameters
- Surface Mounted SOT-143 Offers Improved RF Performance
 - Lower Package Parasitics
 - High Gain
- Available In Both Standard Profile (MRF9011) and Low Profile (MRF9011L)
- Tape and Reel Packaging Options

MRF9011
MRF9011L

SURFACE MOUNTED
HIGH FREQUENCY
TRANSISTOR
NPN SILICON



CASE 318B-01
SOT-143

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	15	Vdc
Collector-Base Voltage	V_{CBO}	25	Vdc
Emitter-Base Voltage	V_{EBO}	2	Vdc
Collector-Current — Continuous	I_C	30	mAdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	0.30 3.3	Watt mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	300	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ 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, $I_E = 0$)	$V_{(BR)CBO}$	25	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 0.1$ mAdc, $I_C = 0$)	$V_{(BR)EBO}$	2	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 15$ Vdc, $I_E = 0$)	I_{CBO}	—	—	50	nAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 5$ mAdc, $V_{CE} = 5$ Vdc)	h_{FE}	30	80	200	—
--	----------	----	----	-----	---

(continued)



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

Characteristic	Symbol	Min	Typ	Max	Unit	
DYNAMIC CHARACTERISTICS						
Current-Gain-Bandwidth Product ($I_C = 15\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1\text{ GHz}$)	Figure 6	f_T	—	3.8	—	GHz
Collector-Base Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1\text{ MHz}$)	Figure 1	C_{cb}	—	0.55	1	pF
FUNCTIONAL TESTS						
Power Gain at Minimum Noise Figure ($V_{CE} = 10\text{ Vdc}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$)	Figure 5	GNF_{min}	—	13.5	—	dB
Noise Figure ($V_{CE} = 10\text{ Vdc}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$)	Figure 5	NF_{min}	—	1.8	—	dB
Power Gain in $50\ \Omega$ System ($V_{CE} = 10\text{ Vdc}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$)	Figure 2	GNF	9	10.2	—	dB
Noise Figure ($V_{CE} = 10\text{ Vdc}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$)	Figure 2	NF	—	2.3	3	dB

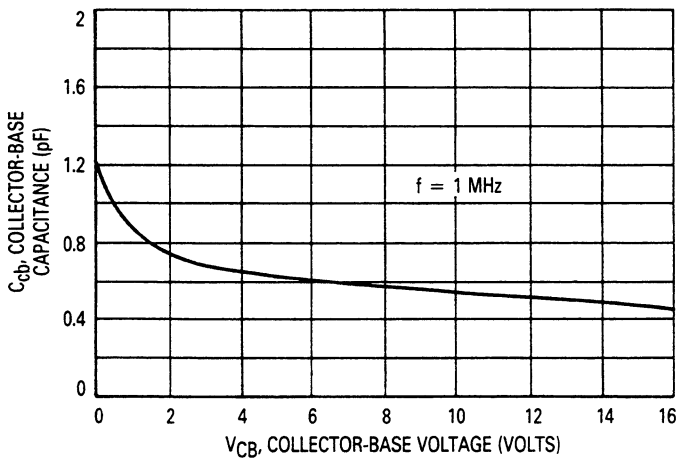


Figure 1. Collector-Base Capacitance versus Collector-Base Voltage

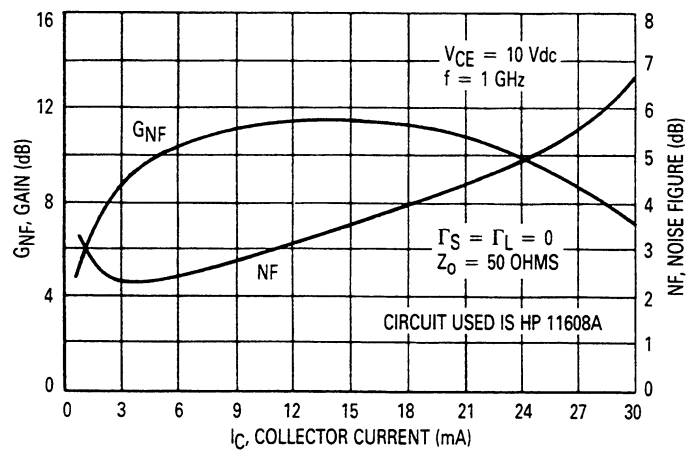


Figure 2. Gain and Noise Figure versus Collector Current

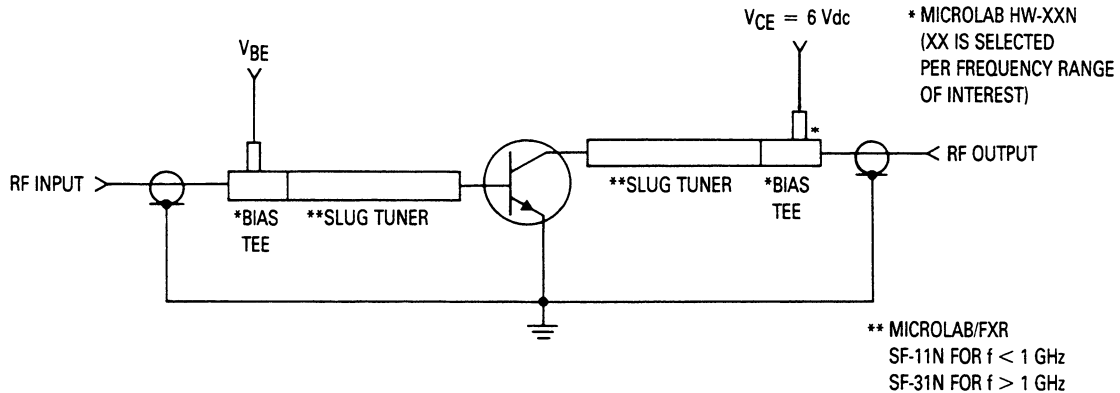


Figure 3. Functional Circuit Schematic

This page intentionally left blank.



This page intentionally left blank.



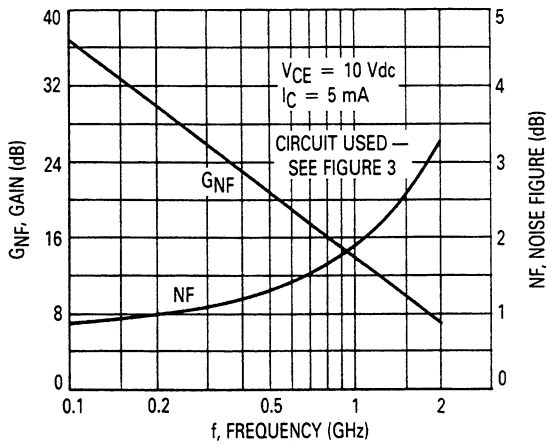


Figure 4. Gain and Noise Figure versus Frequency

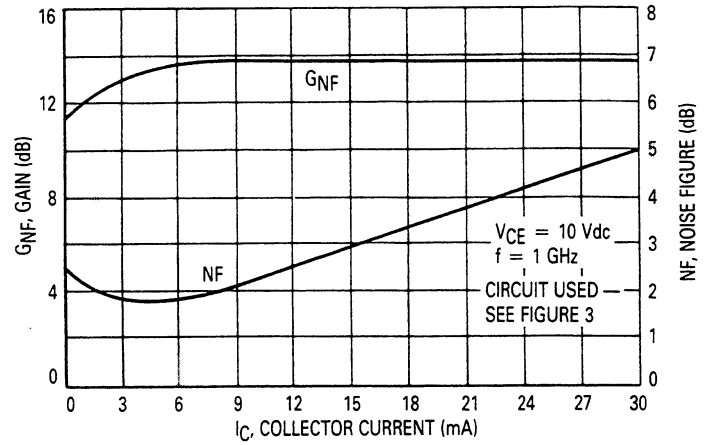


Figure 5. Gain and Noise Figure versus Collector Current

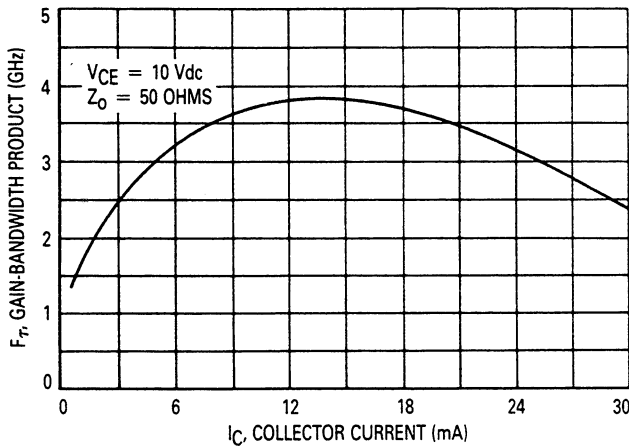


Figure 6. Gain-Bandwidth Product versus Collector Current

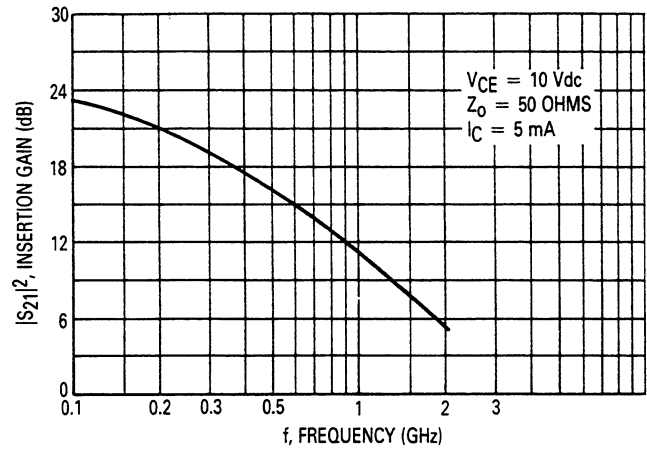


Figure 7. Insertion Gain versus Frequency

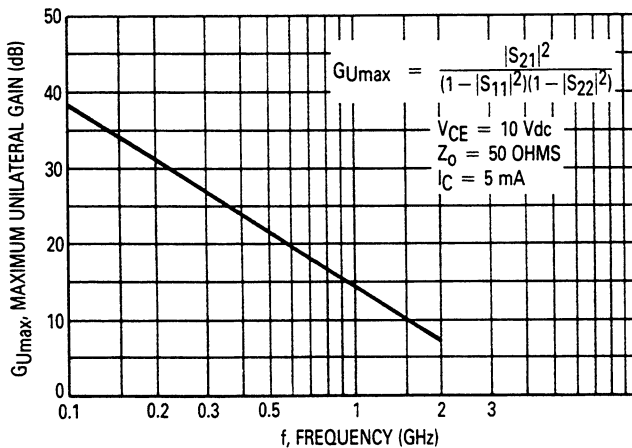
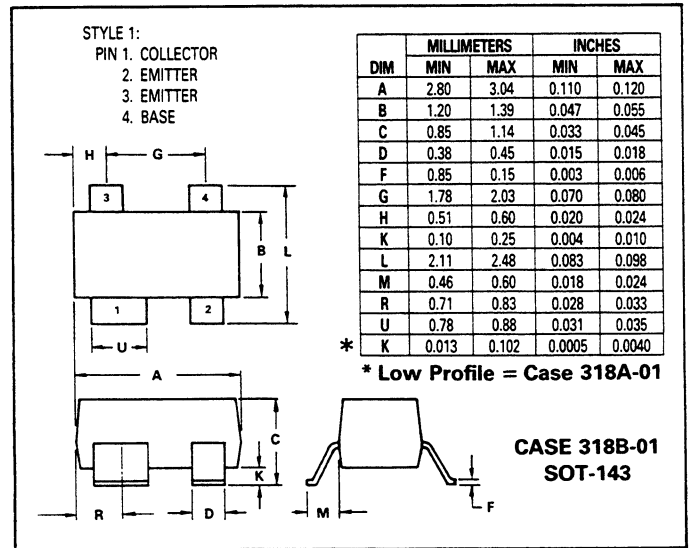


Figure 8. Maximum Unilateral Gain versus Frequency

OUTLINE DIMENSIONS



COMMON EMITTER S-PARAMETERS


VCE (Vdc)	IC (mA)	f (MHz)	S11		S21		S12		S22		
			S11	∠φ	S21	∠φ	S12	∠φ	S22	∠φ	
5	5	100	0.85	-41	13.64	153	0.03	65	0.93	-17	
		200	0.78	-76	10.77	134	0.05	54	0.80	-29	
		500	0.71	-131	6.10	102	0.08	35	0.55	-42	
		1000	0.66	-169	3.22	77	0.08	33	0.45	-48	
		2000	0.60	152	1.65	47	0.11	46	0.47	-63	
	10	100	0.72	-59	20.01	145	0.03	62	0.87	-23	
		200	0.70	-100	14.31	123	0.04	49	0.67	-36	
		500	0.66	-150	7.03	94	0.06	38	0.44	-43	
		1000	0.63	179	3.57	73	0.07	45	0.37	-46	
		2000	0.58	147	1.79	46	0.11	57	0.41	-60	
	15	100	0.65	-75	23.44	138	0.02	57	0.81	-27	
		200	0.66	-118	15.56	116	0.04	46	0.59	-38	
		500	0.65	-159	7.10	90	0.05	42	0.40	-40	
		1000	0.63	174	3.57	71	0.06	52	0.35	-43	
		2000	0.59	144	1.77	45	0.11	62	0.40	-58	
	20	100	0.61	-89	24.32	133	0.02	51	0.77	-28	
		200	0.66	-130	15.11	111	0.03	43	0.55	-35	
		500	0.66	-166	6.68	88	0.04	46	0.41	-34	
		1000	0.65	171	3.32	69	0.06	56	0.39	-39	
		2000	0.61	143	1.65	43	0.10	65	0.44	-56	
	30	100	0.63	-132	13.18	118	0.02	47	0.72	-15	
		200	0.68	-157	7.07	104	0.02	44	0.66	-16	
		500	0.69	-177	3.23	90	0.03	55	0.62	-24	
		1000	0.70	165	1.78	71	0.05	65	0.59	-38	
		2000	0.66	138	0.93	42	0.09	79	0.62	-62	
	10	5	100	0.85	-38	13.67	155	0.03	70	0.93	-14
			200	0.80	-71	10.97	136	0.05	56	0.83	-24
			500	0.70	-126	6.35	104	0.07	37	0.60	-35
			1000	0.65	-166	3.39	78	0.07	36	0.51	-40
			2000	0.58	154	1.74	48	0.10	50	0.54	-55
10		100	0.75	-55	20.12	147	0.02	66	0.88	-19	
		200	0.71	-94	14.60	125	0.04	50	0.72	-30	
		500	0.65	-145	7.33	96	0.05	39	0.50	-35	
		1000	0.62	-177	3.74	74	0.06	46	0.45	-38	
		2000	0.57	149	1.88	47	0.10	60	0.49	-53	
15		100	0.68	-68	23.53	140	0.02	61	0.85	-22	
		200	0.67	-110	15.90	119	0.03	49	0.65	-31	
		500	0.64	-155	7.45	92	0.04	42	0.47	-32	
		1000	0.62	177	3.74	71	0.06	53	0.44	-35	
		2000	0.58	146	1.90	45	0.09	65	0.50	-51	
20		100	0.64	-79	24.77	135	0.02	56	0.81	-23	
		200	0.64	-122	15.81	114	0.03	46	0.62	-29	
		500	0.64	-161	7.10	89	0.04	46	0.48	-28	
		1000	0.62	174	3.53	70	0.05	56	0.46	-33	
		2000	0.59	145	1.75	44	0.09	68	0.53	-50	
30		100	0.61	-114	16.25	123	0.01	48	0.79	-15	
		200	0.63	-147	9.10	107	0.02	49	0.71	-15	
		500	0.65	-172	4.22	90	0.03	53	0.66	-22	
		1000	0.66	168	2.27	71	0.05	63	0.63	-33	
		2000	0.63	140	1.15	41	0.08	79	0.67	-53	



MOTOROLA

This page intentionally left blank.



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



MOTOROLA

19429 PRINTED IN USA (1994) MPS/POD

MRF9011/D

