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The RF Line

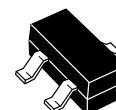
NPN Silicon High-Frequency Transistor

Designed for low noise, wide dynamic range front-end amplifiers and low-noise VCO's. Available in a surface-mountable plastic package. This Motorola small-signal plastic transistor offers superior quality and performance at low cost.

- High Gain-Bandwidth Product
 $f_T = 7.0 \text{ GHz (Typ) @ 30 mA}$
- Low Noise Figure
 $NF = 1.7 \text{ dB (Typ) @ 500 MHz}$
- High Gain
 $G_{NF} = 17 \text{ dB (Typ) @ 10 mA/500 MHz}$
- State-of-the-Art Technology
Fine Line Geometry
Ion-Implanted Arsenic Emitters
Gold Top Metallization and Wires
Silicon Nitride Passivation
- Available in tape and reel packaging options:
T1 suffix = 3,000 units per reel

MMBR911LT1

$I_C = 60 \text{ mA}$
LOW NOISE
HIGH-FREQUENCY
TRANSISTOR
NPN SILICON



CASE 318-08, STYLE 6
SOT-23
LOW PROFILE

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CBO}	20	Vdc
Emitter-Base Voltage	V_{EBO}	2.0	Vdc
Collector Current — Continuous	I_C	60	mA
Power Dissipation @ $T_{case} = 75^\circ\text{C}$ (1) Derate linearly above $T_{case} = 75^\circ\text{C}$	$P_{D(max)}$	333 4.44	mW mW/ $^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Maximum Junction Temperature	T_{Jmax}	150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	225	$^\circ\text{C/W}$

DEVICE MARKING

MMBR911LT1 = 7P

NOTE:

1. Case temperature measured on collector lead immediately adjacent to body of package.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ($I_C = 1.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	12	—	—	Vdc
Collector–Base Breakdown Voltage ($I_C = 0.1\text{ mA}$, $I_E = 0$)	$V_{(BR)CBO}$	20	—	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 0.1\text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	2.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 15\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	50	nAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 30\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	h_{FE}	30	—	200	—
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DYNAMIC CHARACTERISTICS

Collector–Base Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{cb}	—	—	1.0	pF
Current Gain–Bandwidth Product ($V_{CE} = 10\text{ Vdc}$, $I_C = 30\text{ mAdc}$, $f = 1.0\text{ GHz}$)	f_T	—	6.0	—	GHz

FUNCTIONAL TESTS

Gain @ Noise Figure ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	$f = 0.5\text{ GHz}$	G_{NF}	—	17	—	dB
	$f = 1.0\text{ GHz}$		—	11	—	
Noise Figure ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	$f = 0.5\text{ GHz}$	NF	—	2.0	—	dB
	$f = 1.0\text{ GHz}$		—	2.9	—	

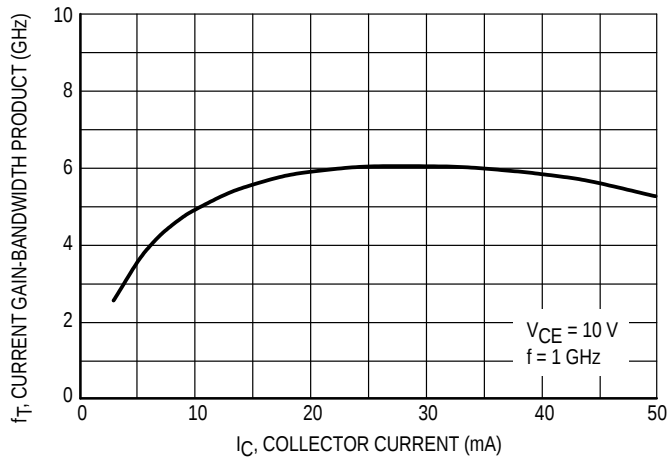


Figure 1. Current Gain–Bandwidth versus Collector Current @ 1.0 GHz

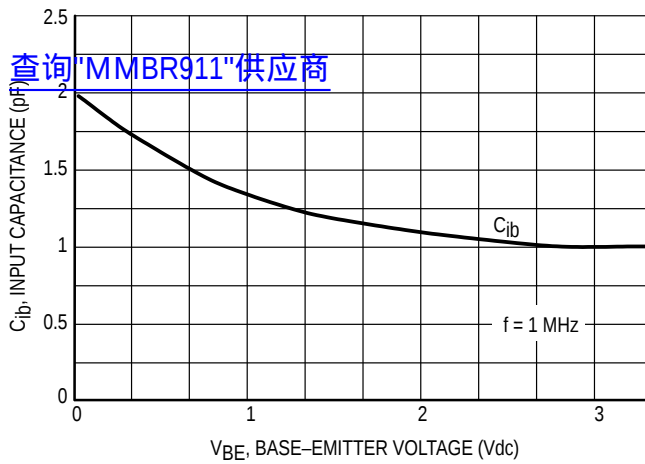


Figure 2. Input Capacitance versus Base-Emitter Voltage

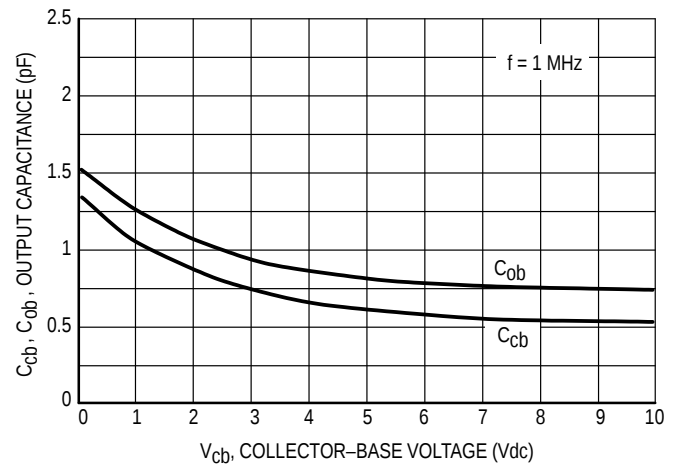


Figure 3. Output Capacitances versus Collector-Base Voltage

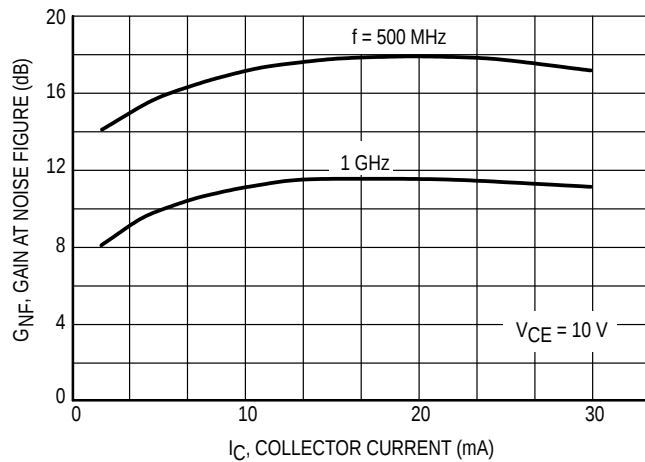


Figure 4. Gain at Noise Figure versus Collector Current

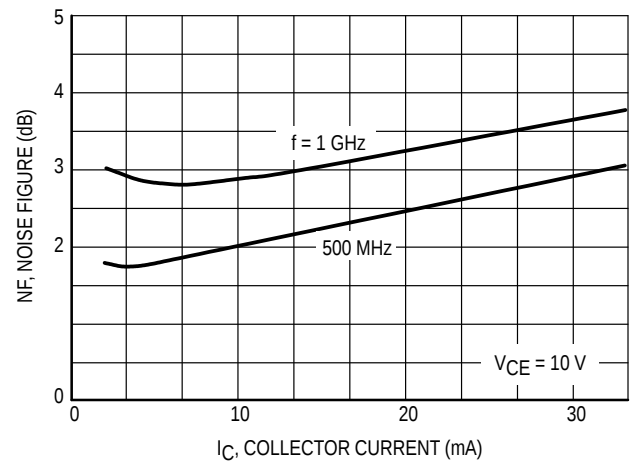


Figure 5. Noise Figure versus Collector Current

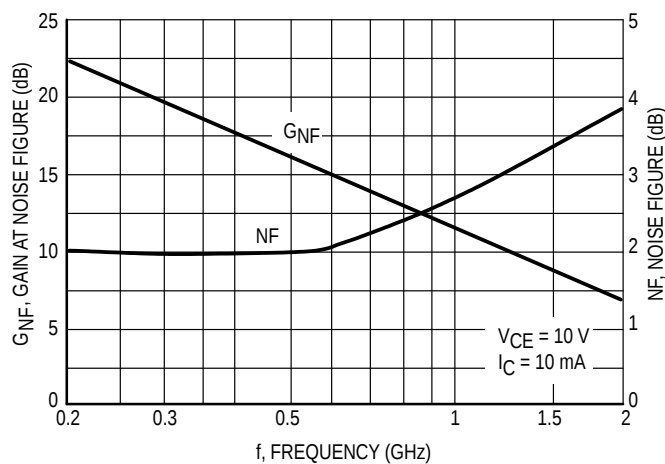


Figure 6. Gain at Noise Figure and Noise Figure versus Frequency

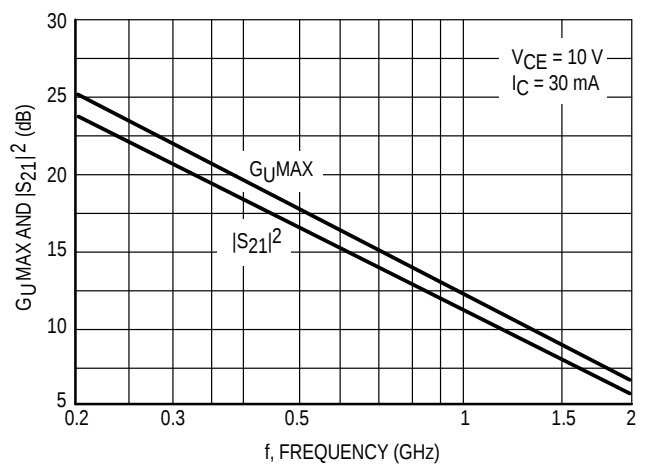


Figure 7. Maximum Unilateral Gain and Insertion Gain versus Frequency

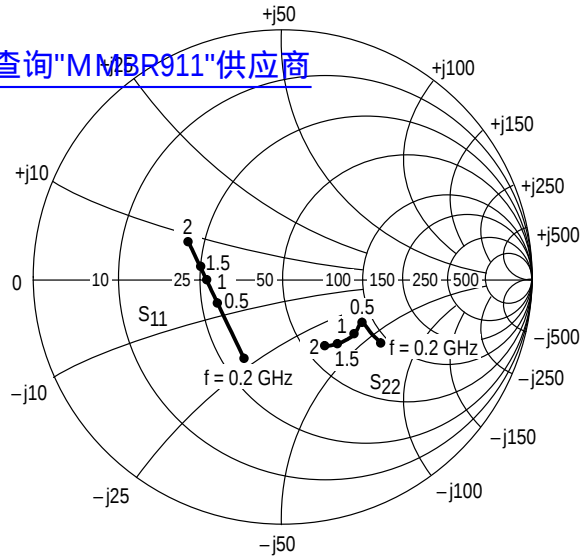


Figure 8. Input and Output Reflection Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

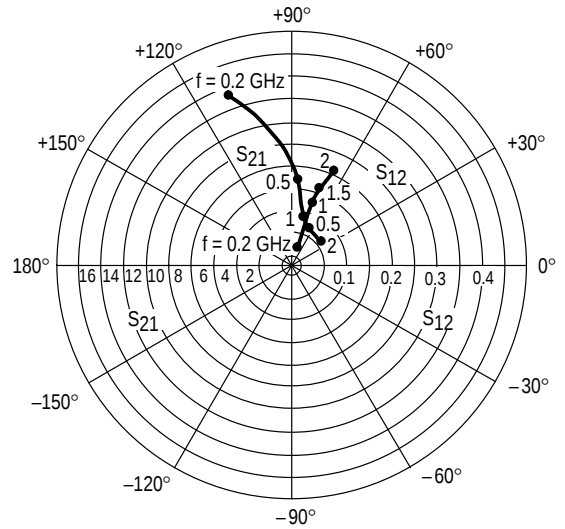


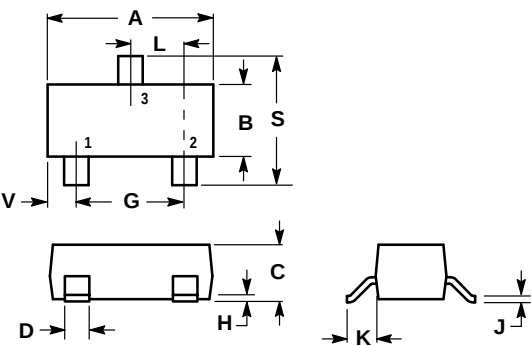
Figure 9. Forward and Reverse Transmission Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

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
10	2.0	200	0.82	-45	4.14	145	0.06	66	0.88	-16
		500	0.60	-96	3.23	112	0.09	49	0.71	-27
		1000	0.47	-149	2.16	85	0.11	49	0.62	-34
		1500	0.46	-179	1.59	71	0.13	55	0.58	-43
		2000	0.47	162	1.35	57	0.16	62	0.56	-51
	5.0	200	0.66	-63	8.63	134	0.05	64	0.75	-25
		500	0.43	-117	5.29	100	0.07	58	0.55	-31
		1000	0.37	-163	3.05	82	0.11	63	0.48	-36
		1500	0.38	176	2.17	70	0.15	65	0.45	-44
		2000	0.40	160	1.81	57	0.19	65	0.43	-51
	10	200	0.49	-83	12.70	124	0.04	65	0.62	-30
		500	0.33	-134	6.42	94	0.07	66	0.44	-32
		1000	0.32	-171	3.53	80	0.12	70	0.41	-36
		1500	0.35	173	2.46	69	0.16	69	0.38	-45
		2000	0.37	159	2.04	58	0.20	66	0.35	-52
	20	200	0.36	-103	15.25	114	0.03	69	0.52	-32
		500	0.28	-149	6.95	90	0.06	72	0.39	-30
		1000	0.29	-176	3.73	78	0.12	73	0.37	-35
		1500	0.33	172	2.60	68	0.17	71	0.34	-43
		2000	0.36	158	2.14	58	0.21	67	0.32	-52
	30	200	0.32	-114	15.64	109	0.03	71	0.48	-29
		500	0.27	-156	6.92	88	0.06	73	0.38	-27
		1000	0.29	-178	3.71	78	0.12	74	0.37	-33
		1500	0.34	170	2.58	68	0.16	72	0.34	-44
		2000	0.37	156	2.13	57	0.21	68	0.32	-51

Table 1. Common Emitter S-Parameters

PACKAGE DIMENSIONS

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- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

CASE 318-08
ISSUE AF

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MMBR911LT1/D