

MMBR911LT1
MMBR911LT1G

* G Denotes RoHS Compliant, Pb Free Terminal Finish

**NPN SILICON
LOW NOISE, HIGH-FREQUENCY TRANSISTOR**
DESCRIPTION:

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

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

- High Gain-Bandwidth Product
 $f_T = 7.0 \text{ GHz (Typ) @ } 30 \text{ mA}$
- Low Noise Figure
 $NF = 1.7 \text{ dB (Typ) @ } 500 \text{ MHz}$
- High Gain
 $GNF = 17 \text{ dB (Typ) @ } 10 \text{ mA/500 MHz}$
- 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


**CASE 318-08, STYLE 6
SOT-23
LOW PROFILE**
MAXIMUM RATINGS

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

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THERMAL CHARACTERISTICS

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

ELECTRICAL SPECIFICATIONS (TC=25°C unless otherwise noted)

OFF CHARACTERISTICS

Symbol	Characteristics	Value			Unit
		Min.	Typ.	Max.	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage ($I_C=1.0$ mA, $I_B=0$)	12	-	-	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_C=0.1$ mA, $I_E=0$)	20	-	-	Vdc
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ($I_E=0.1$ mA, $I_C=0$)	2.0	-	-	Vdc
I_{CBO}	Collector Cutoff Current ($V_{CB}=15$ Vdc, $I_E=0$)	-	-	50	nAdc

ON CHARACTERISTICS

Symbol	Characteristics	Value			Unit
		Min.	Typ.	Max.	
H_{FE}	DC Current Gain ($I_C=30$ mAdc, $V_{CE}=10$ Vdc)	30	-	200	-

DYNAMIC CHARACTERISTICS

Symbol	Characteristics	Value			Unit
		Min.	Typ.	Max.	
C_{cb}	Collector-Base Capacitance ($V_{CB}=10$ Vdc, $I_E=0$, $f=1.0$ MHz)	-	-	1.0	pF
f_T	Current Gain-Bandwidth Product ($V_{CE}=10$ Vdc, $I_C=30$ mAdc, $f=1.0$ GHz)	-	6.0	-	GHz

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FUNCTIONAL TESTS

Symbol	Test Conditions	Value			Unit	
		Min.	Typ.	Max.		
G _{NF}	Gain @ Noise Figure (I _C =10 mA _{dc} , V _{CE} =10 V _{dc})	f=0.5 GHz	-	17	-	dB
		f=1.0 GHz	-	11	-	
NF	Noise Figure (I _C =10 mA _{dc} , V _{CE} =10 V _{dc})	f=0.5 GHz	-	2.0	-	dB
		f=1.0 GHz	-	2.9	-	

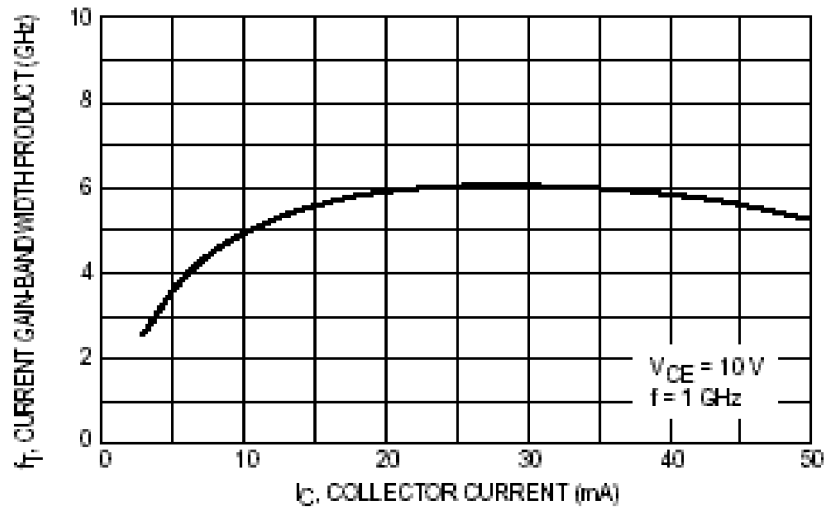


Figure 1. Current Gain–Bandwidth versus Collector Current @ 1.0 GHz

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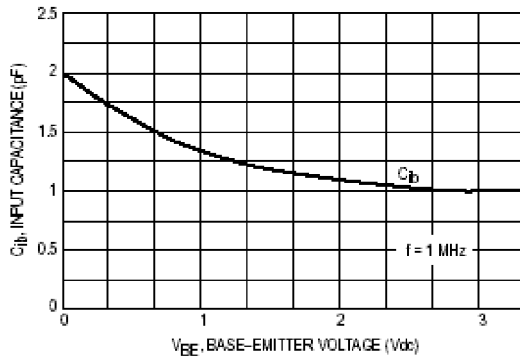


Figure 2. Input Capacitance versus Base-Emitter Voltage

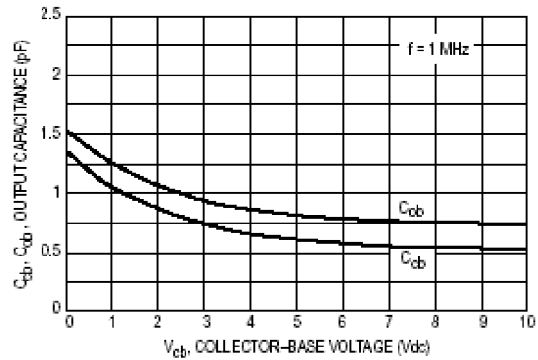


Figure 3. Output Capacitances versus Collector-Base Voltage

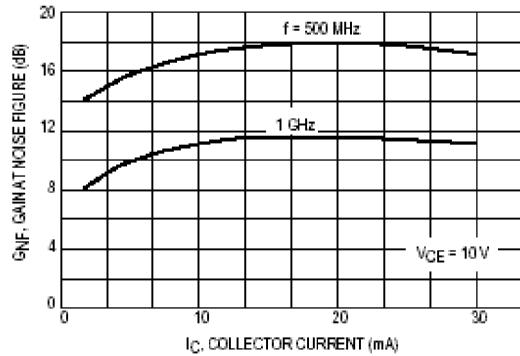


Figure 4. Gain at Noise Figure versus Collector Current

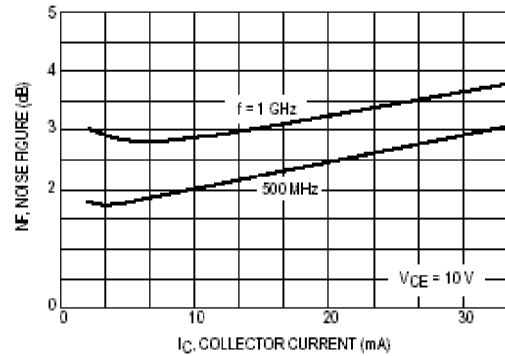


Figure 5. Noise Figure versus Collector Current

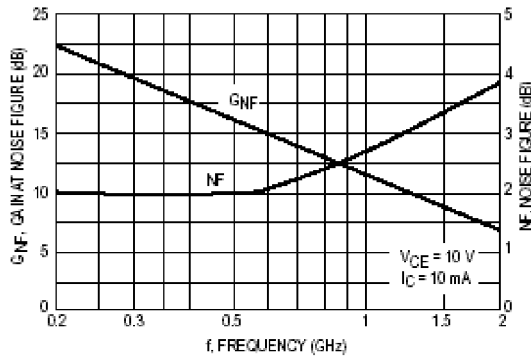


Figure 6. Gain at Noise Figure and Noise Figure versus Frequency

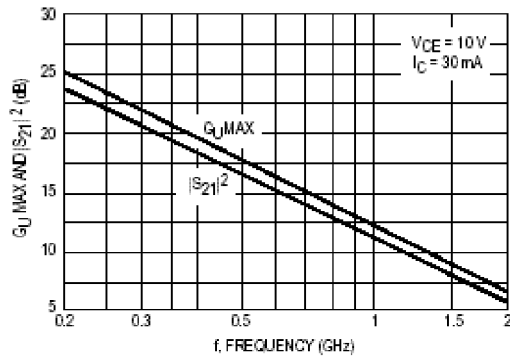


Figure 7. Maximum Unilateral Gain and Insertion Gain versus Frequency

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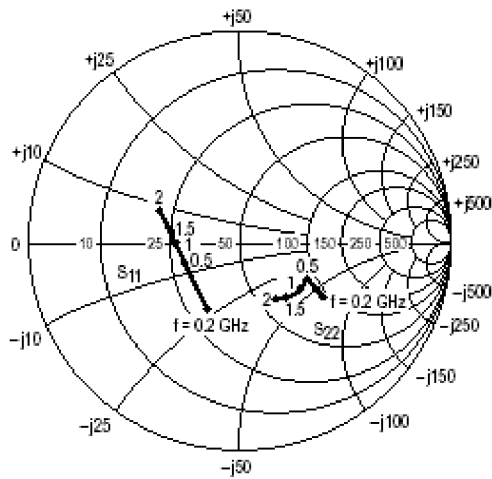


Figure 8. Input and Output Reflection Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

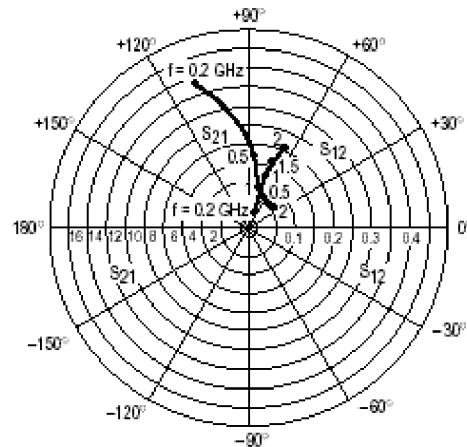


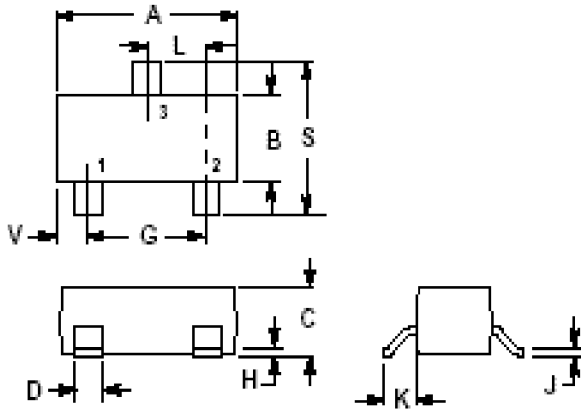
Figure 9. Forward and Reverse Transmission Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

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

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PACKAGE DIMENSIONS



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	0.1167	2.80	3.04
B	0.0472	0.0601	1.20	1.40
C	0.0300	0.0440	0.89	1.11
D	0.0100	0.0200	0.37	0.80
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	0.0265	0.35	0.69
L	0.0300	0.0401	0.89	1.02
S	0.0830	0.1030	2.10	2.64
V	0.0177	0.0236	0.45	0.60

STYLE:

1. BASE
2. EMITTER
3. COLLECTOR

**CASE 318-08
ISSUE AF**