ADVANCED POWER TECHNOLOGY RF ®

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MMBR911LT1
MMBR911LT1G

NPN SILICON
LOW NOISE, HIGH-FREQUENCY TRANSISTOR

* G Denotes RoHS Compliant, Pb Free Terminal Finish

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 mA
LOW NOISE
HIGH–FREQUENCY
TRANSISTOR
NPN SILICON

FEATURES:

- High Gain–Bandwidth Product
  fT = 7.0 GHz (Typ) @ 30 mA
- Low Noise Figure
  NF = 1.7 dB (Typ) @ 500 MHz
- High Gain
  GNF = 17 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

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°C (1) Derate linearly above T_{case} = 75°C	333 4.44	mW mW/°C
T_{STG}	Storage Temperature	-55 to +150	ºC
T_{Jmax}	Maximum Junction Temperature	150	ºC

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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

FUNCTIONAL TESTS

Symbol	Test Conditions		Value			Unit
			Min.	Typ.	Max.	
G_{NF}	Gain @ Noise Figure (I_C=10 mAdc, V_{CE}=10 Vdc) f=0.5 GHz f=1.0 GHz		- -	17 11	- -	dB
NF	Noise Figure (I_C=10 mAdc, V_{CE}=10 Vdc) f=0.5 GHz f=1.0 GHz		- -	2.0 2.9	- -	dB
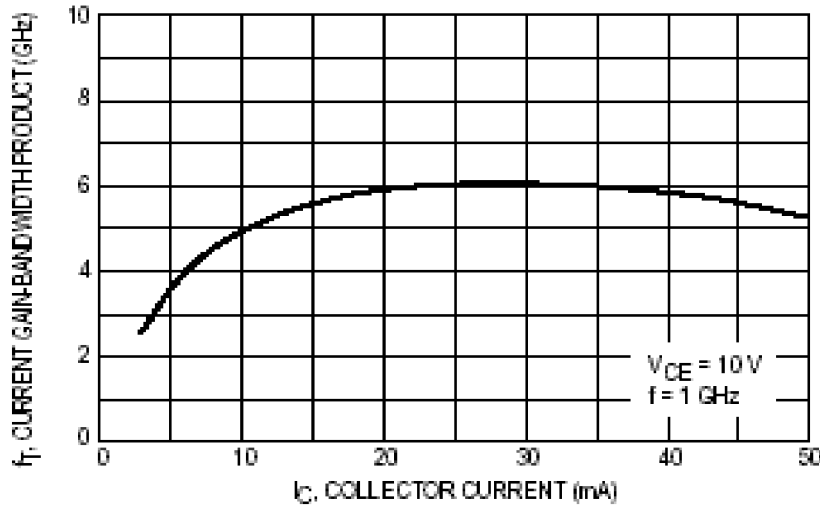
Figure 1. Current Gain–Bandwidth versus
Collector Current @ 1.0 GHz
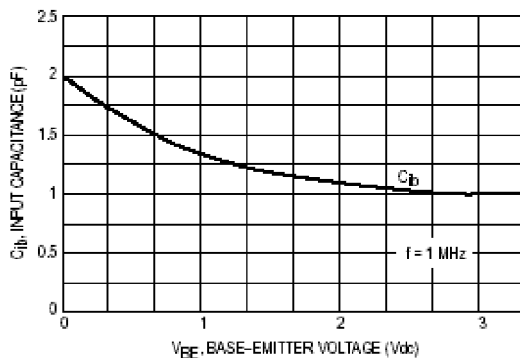
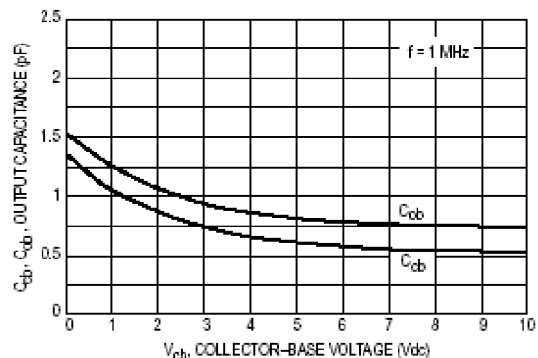Figure 2. Input Capacitance versus Base–Emitter Voltage

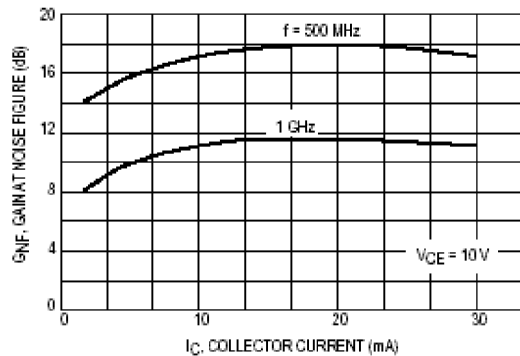Figure 3. Output Capacitances versus Collector–Base Voltage

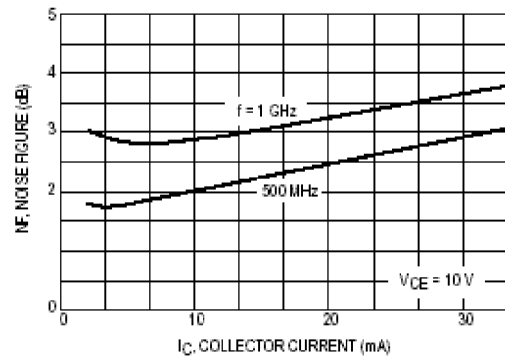Figure 4. Gain at Noise Figure versus Collector Current

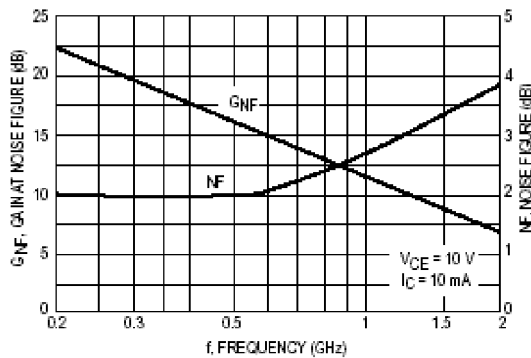Figure 5. Noise Figure versus Collector Current

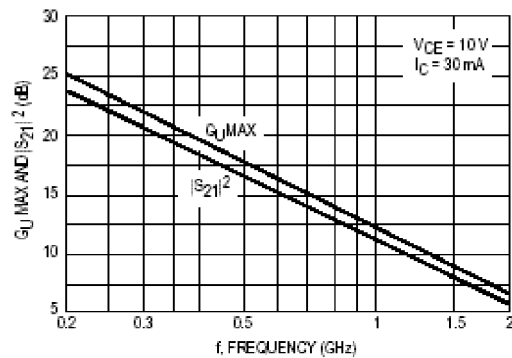Figure 6. Gain at Noise Figure and Noise Figure versus Frequency

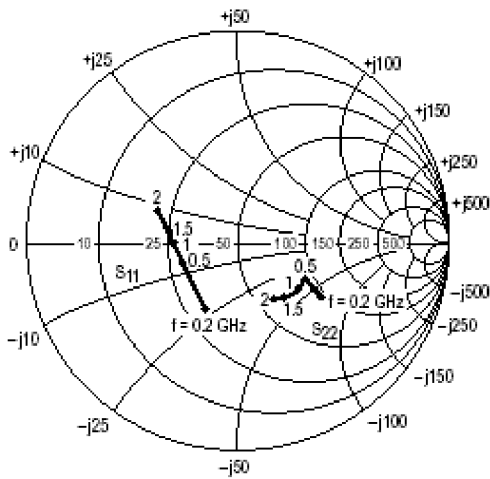Figure 7. Maximum Unilateral Gain and Insertion Gain versus Frequency

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

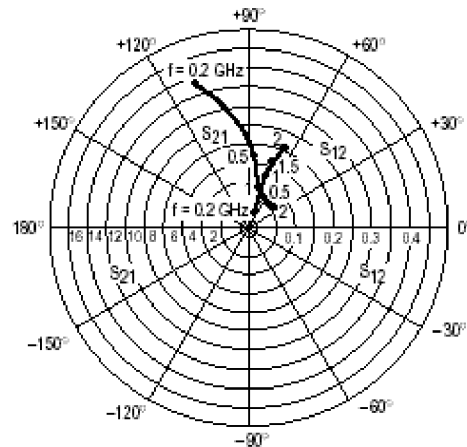Figure 9. Forward and Reverse Transmission
Coefficients versus Frequency
V_{CE} = 10 V, I_C = 30 mA

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\lvert S_{11}\rvert$	$\angle\phi$	$\lvert S_{21}\rvert$	$\angle\phi$	$\lvert S_{12}\rvert$	$\angle\phi$	$\lvert S_{22}\rvert$	$\angle\phi$
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
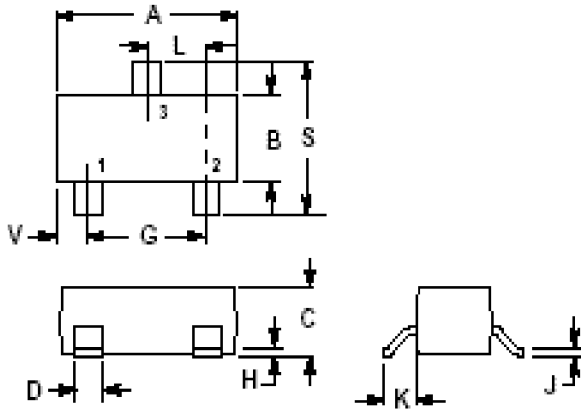
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

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