

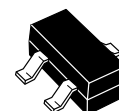
The RF Line NPN Silicon High-Frequency Transistors

... designed for low noise, wide dynamic range front-end amplifiers and low-noise VCO's. Available in a surface-mountable plastic package, as well as the popular TO-226AA (TO-92) package. This Motorola series of small-signal plastic transistors offers superior quality and performance at low cost.

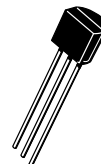
- High Gain-Bandwidth Product
 $f_T = 7.0 \text{ GHz (Typ) @ } 30 \text{ mA}$
- Low Noise Figure
 $NF = 1.7 \text{ dB (Typ) @ } 500 \text{ MHz}$
- High Gain
 $G_{NF} = 17 \text{ dB (Typ) @ } 10 \text{ mA/500 MHz}$
- State-of-the-Art Technology
Fine Line Geometry
Ion-Implanted Arsenic Emitters
Gold Top Metallization and Wires
Silicon Nitride Passivation
- Available in tape and reel packaging options by adding suffix:
T1 suffix = 3,000 units per reel
T3 suffix = 10,000 units per reel

**MMBR911LT1
MPS911**

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



**CASE 318-07, STYLE 6
SOT-23
LOW PROFILE
MMBR911LT1, T3**



**CASE 29-04, STYLE 2
TO-226AA
(TO-92)
MPS911**

MAXIMUM RATINGS

Rating	Symbol	MPS911	MMBR911LT1, T3	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 @ $T_{case} = 75^\circ\text{C}$ Derate linearly above $T_{case} = 75^\circ\text{C}$ @	$P_{D(max)}$	625 —	333 4.44	mW mW/°C
Storage Temperature	T_{stg}		-55 to +150	°C
Maximum Junction Temperature	T_{Jmax}		150	°C

THERMAL CHARACTERISTICS

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

DEVICE MARKING

MMBR911LT1, T3 = 7P



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	—	7.0 6.0	—	GHz

FUNCTIONAL TESTS

Gain @ Noise Figure ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	G_{NF}	—	16.5	—	dB
MPS911 $f = 0.5\text{ GHz}$	—	—	11	—	
MMBR911LT1, T3 $f = 0.5\text{ GHz}$	—	—	17	—	
$f = 1.0\text{ GHz}$	—	—	11	—	
Noise Figure ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	NF	—	1.7	—	dB
MPS911 $f = 0.5\text{ GHz}$	—	—	2.7	—	
MMBR911LT1, T3 $f = 0.5\text{ GHz}$	—	—	2.0	—	
$f = 1.0\text{ GHz}$	—	—	2.9	—	

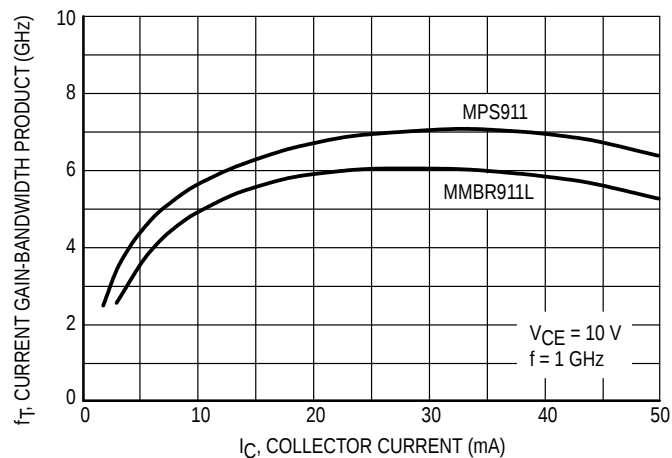


Figure 1. Current Gain–Bandwidth versus Collector Current @ 1.0 GHz

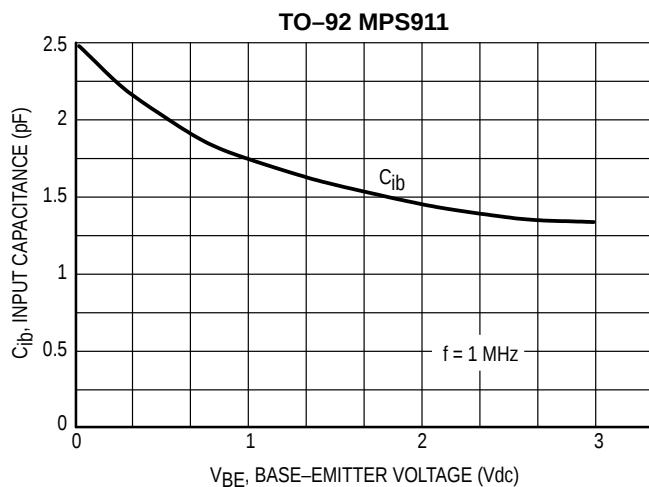


Figure 2. Input Capacitance versus Base-Emitter Voltage

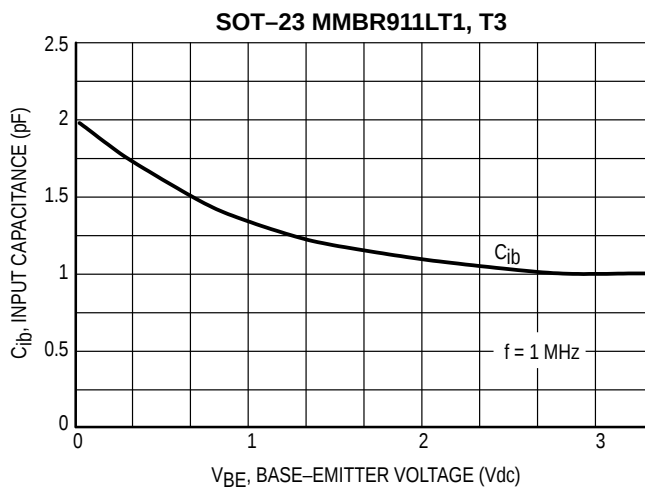


Figure 3. Input Capacitance versus Base-Emitter Voltage

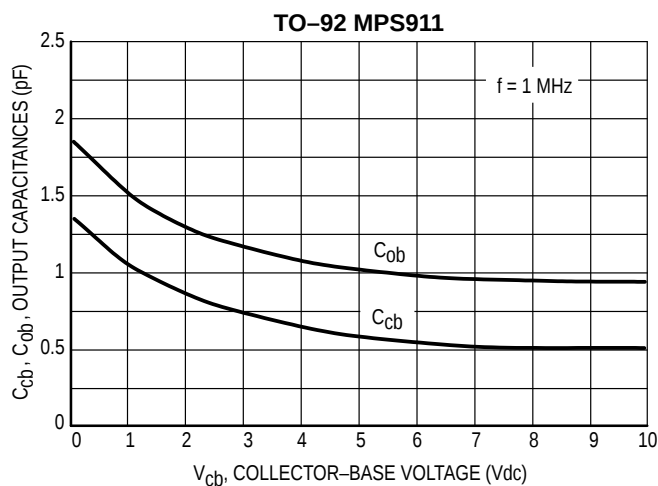


Figure 4. Output Capacitances versus Collector-Base Voltage

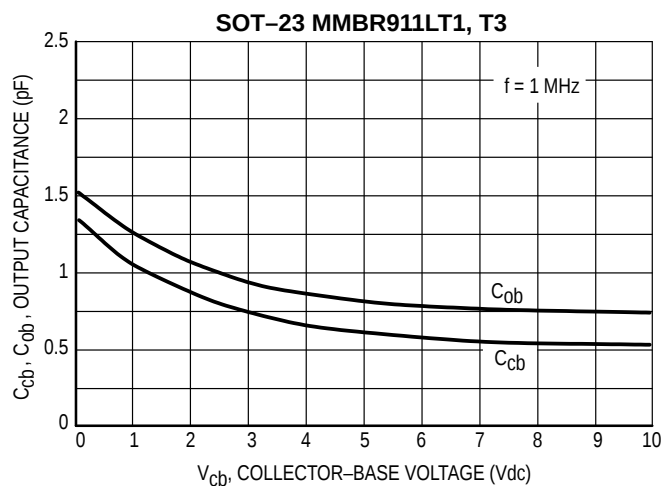


Figure 5. Output Capacitances versus Collector-Base Voltage

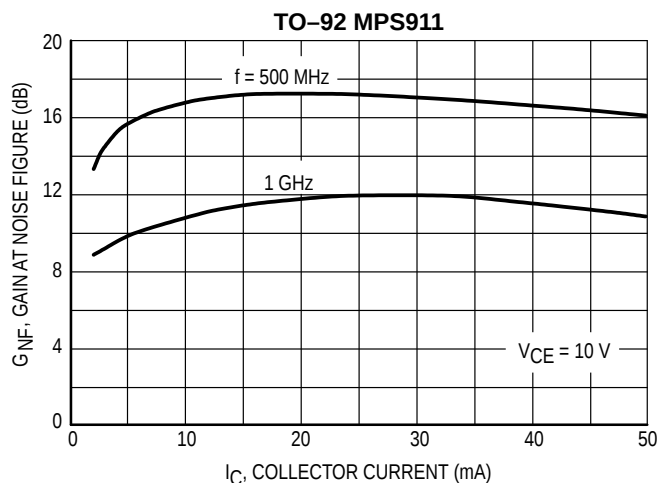


Figure 6. Gain at Noise Figure versus Collector Current

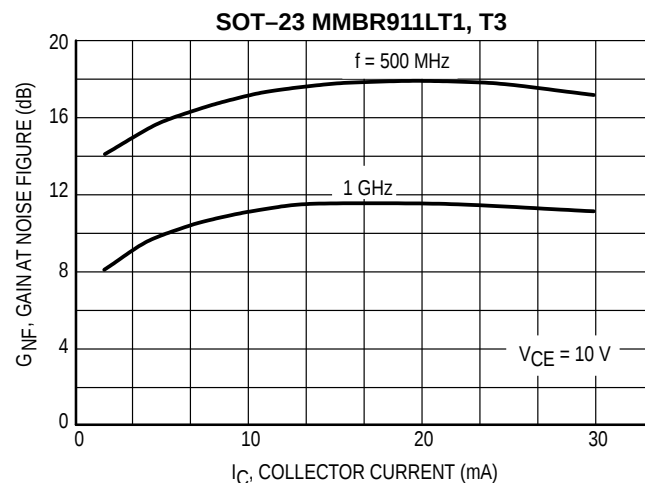


Figure 7. Gain at Noise Figure versus Collector Current

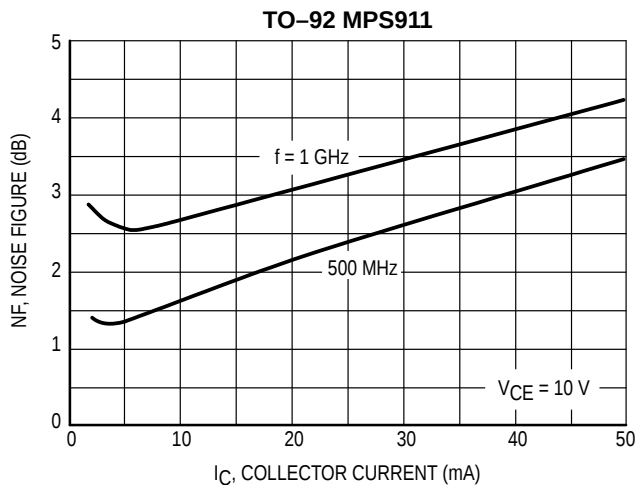


Figure 8. Noise Figure versus Collector Current

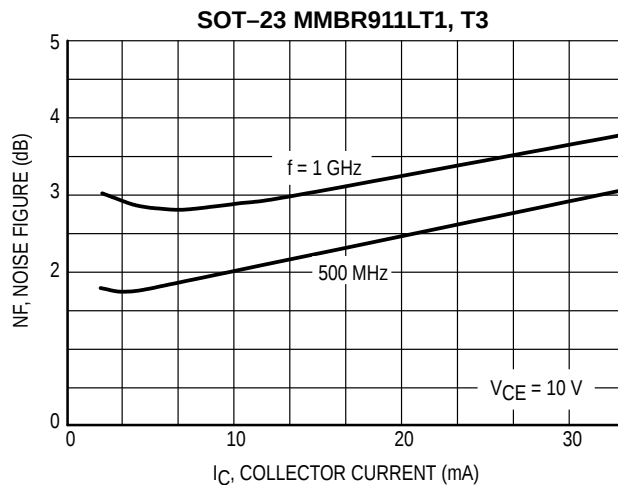


Figure 9. Noise Figure versus Collector Current

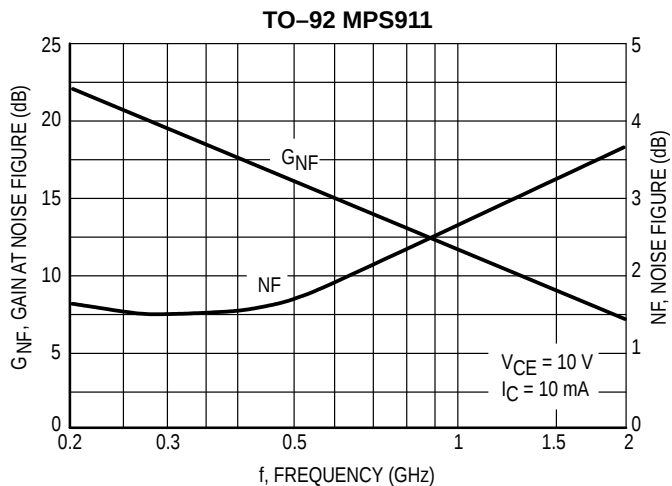


Figure 10. Gain at Noise Figure and Noise Figure versus Frequency

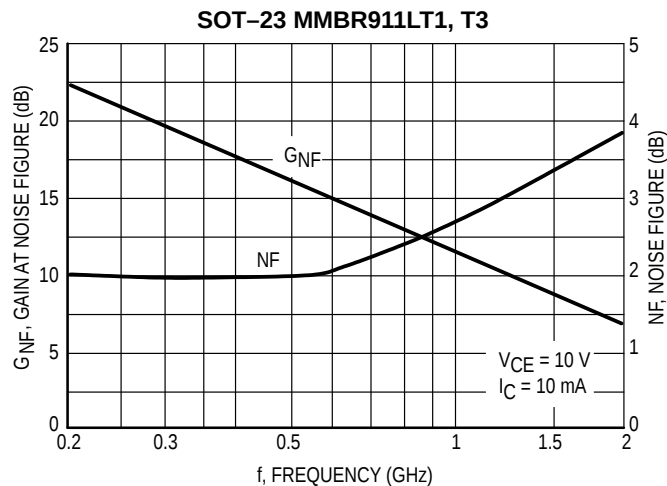


Figure 11. Gain at Noise Figure and Noise Figure versus Frequency

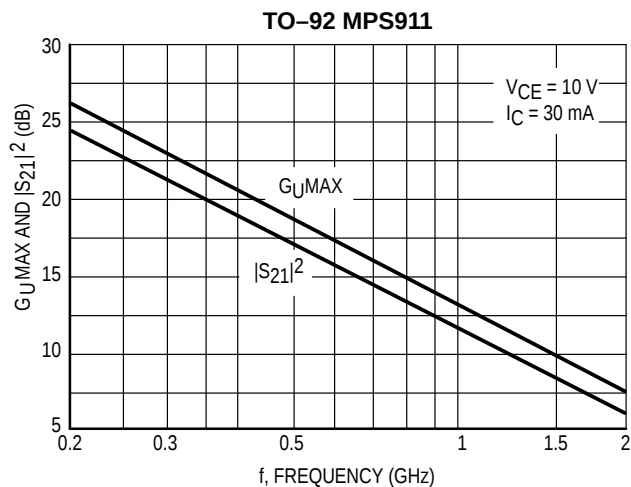


Figure 12. Maximum Unilateral Gain and Insertion Gain versus Frequency

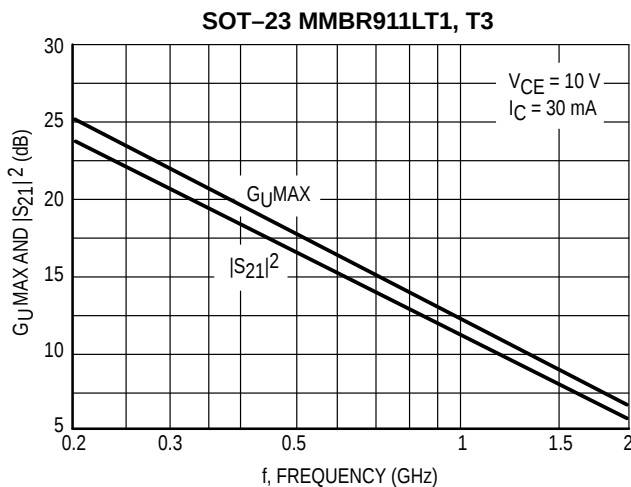


Figure 13. Maximum Unilateral Gain and Insertion Gain versus Frequency

TO-92 MPS911

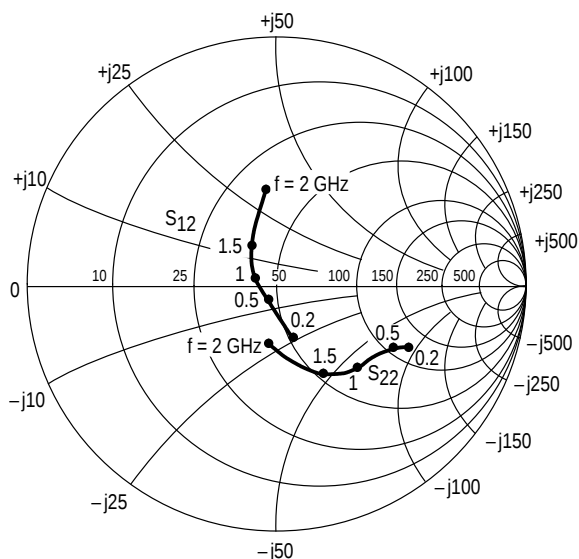


Figure 14. Input and Output Reflection Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

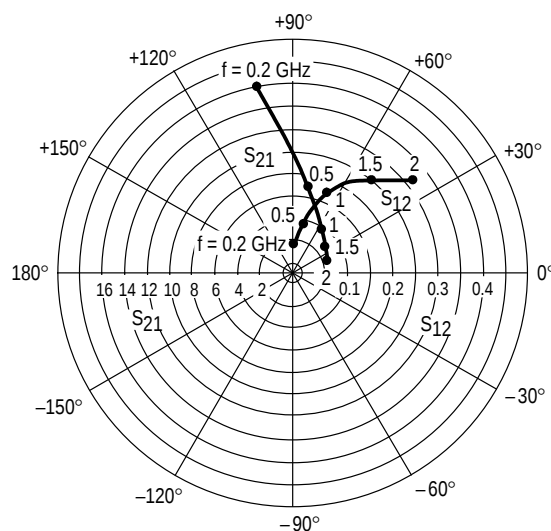


Figure 15. Forward and Reverse Transmission Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

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	0.78	-46	4.42	134	0.06	69	0.95	-18
		500	0.46	-107	3.35	98	0.10	56	0.78	-30
		1000	0.30	172	2.23	61	0.14	54	0.66	-48
		1500	0.41	118	1.66	34	0.20	51	0.57	-70
		2000	0.60	89	1.43	11	0.29	45	0.46	-107
	5.0	200	0.72	-55	8.75	126	0.05	68	0.87	-23
		500	0.31	-107	5.23	92	0.09	63	0.68	-31
		1000	0.18	178	3.05	61	0.15	60	0.57	-46
		1500	0.27	122	2.22	38	0.22	52	0.50	-66
		2000	0.45	94	1.90	17	0.30	43	0.38	-97
	10	200	0.48	-64	12.79	114	0.04	73	0.74	-24
		500	0.16	-100	6.19	85	0.09	71	0.60	-29
		1000	0.09	165	3.45	59	0.17	63	0.50	-44
		1500	0.22	112	2.50	36	0.25	50	0.41	-65
		2000	0.41	90	2.14	16	0.32	38	0.26	-98
	20	200	0.29	-67	15.30	106	0.04	78	0.65	-23
		500	0.08	-92	6.76	82	0.09	75	0.55	-27
		1000	0.06	144	3.71	58	0.17	64	0.46	-43
		1500	0.20	108	2.65	30	0.25	51	0.37	-63
		2000	0.38	89	2.25	18	0.32	38	0.23	-94
	30	200	0.20	-70	16.04	103	0.04	80	0.61	-22
		500	0.05	-97	6.90	81	0.09	77	0.53	-25
		1000	0.07	138	3.76	58	0.17	66	0.46	-41
		1500	0.20	109	2.68	38	0.25	52	0.37	-61
		2000	0.38	90	2.28	20	0.32	40	0.24	-91
	50	200	0.13	-78	15.26	99	0.04	82	0.62	-18
		500	0.03	-145	6.48	79	0.09	78	0.56	-23
		1000	0.11	126	3.55	56	0.17	67	0.49	-40
		1500	0.24	105	2.56	36	0.25	53	0.39	-62
		2000	0.43	87	2.17	17	0.32	40	0.25	-95

Table 1. Common Emitter S-Parameters

SOT-23 MMBR911LT1, T3

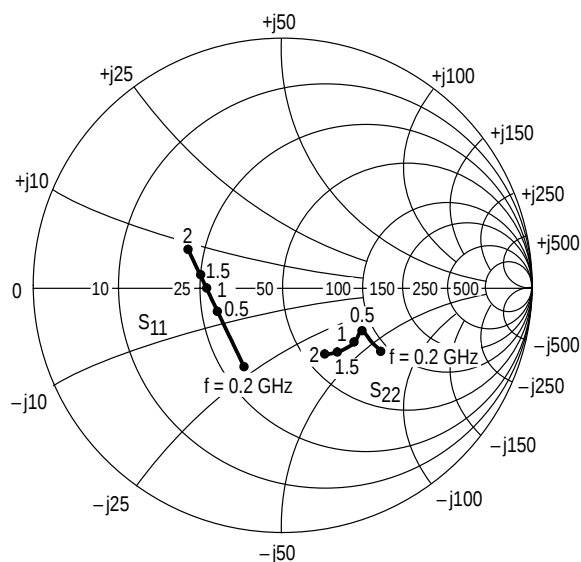


Figure 16. Input and Output Reflection Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

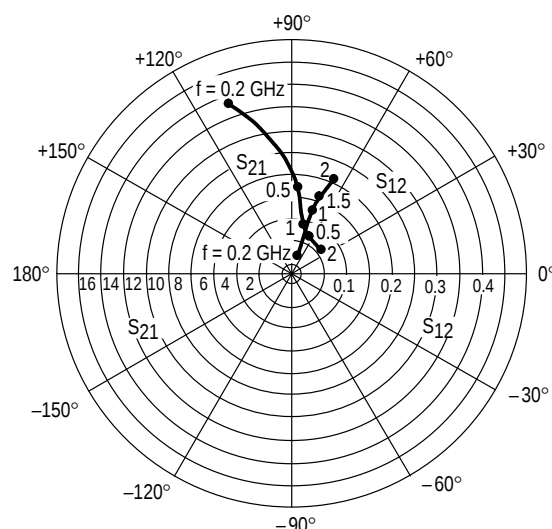
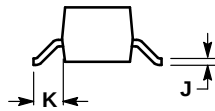
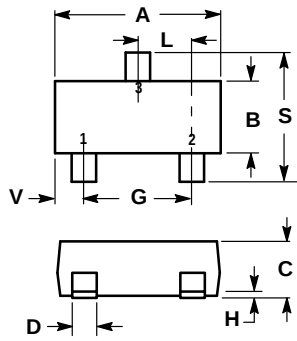


Figure 17. Forward and Reverse Transmission Coefficients versus Frequency
 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

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 2. Common Emitter S-Parameters

PACKAGE DIMENSIONS



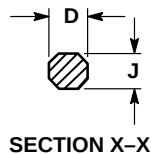
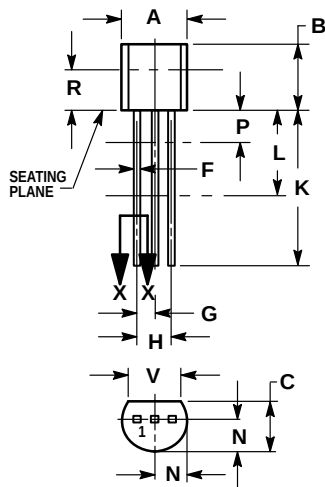
STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

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	0.0180	0.0236	0.45	0.60
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.0984	2.10	2.50
V	0.0177	0.0236	0.45	0.60

**CASE 318-07
ISSUE AD
MMBR911LT1, T3**



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

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

**CASE 29-04
ISSUE AD
MPS911**

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MOTOROLA



MMBR911LT1/D

