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 GHz (Typ) @ 30 mA
- Low Noise Figure
  NF = 1.7 dB (Typ) @ 500 MHz
- High Gain
  G_{NF} = 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

MMBR911LT1
MPS911

I_C = 60 mA
LOW NOISE
HIGH-FREQUENCY
TRANSISTORS
NPN SILICON

CASE 318-08, STYLE 6
SOT-23
LOW PROFILE
MMBR911LT1

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

MAXIMUM RATINGS

Rating	Symbol	MPS911	MMBR911LT1	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°C (1) MMBR911LT1, @ T_A = 25°C MPS911	$P_{D(max)}$	625	333	mW
Derate linearly above T_{case} = 75°C MMBR911LT1, above T_A = 25°C MPS911		5	4.44	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	MMBR911LT1	$R_{\theta JC}$	225	°C/W
Thermal Resistance, Junction to Ambient	MPS911	$R_{\theta JC}$	200	°C/W

DEVICE MARKING

MMBR911LT1 = 7P

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

REV 7

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic			Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Collector–Emitter Breakdown Voltage (I_C = 1.0 mA, I_B = 0)			$V_{(BR)CEO}$	12	—	—	Vdc
Collector–Base Breakdown Voltage (I_C = 0.1 mA, I_E = 0)			$V_{(BR)CBO}$	20	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 0.1 mA, I_C = 0)			$V_{(BR)EBO}$	2.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)			I_{CBO}	—	—	50	nAdc
ON CHARACTERISTICS							
DC Current Gain (I_C = 30 mAdc, V_{CE} = 10 Vdc)			h_{FE}	30	—	200	—
DYNAMIC CHARACTERISTICS							
Collector–Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)			C_{cb}	—	—	1.0	pF
Current Gain–Bandwidth Product (V_{CE} = 10 Vdc, I_C = 30 mAdc, f = 1.0 GHz)	MPS911		f_T	—	7.0	—	GHz
	MMBR911LT1			—	6.0	—	
FUNCTIONAL TESTS							
Gain @ Noise Figure (I_C = 10 mAdc, V_{CE} = 10 Vdc)	MPS911	f = 0.5 GHz	G_{NF}	—	16.5	—	dB
		f = 1.0 GHz		—	11	—	
	MMBR911LT1	f = 0.5 GHz		—	17	—	
		f = 1.0 GHz		—	11	—	
Noise Figure (I_C = 10 mAdc, V_{CE} = 10 Vdc)	MPS911	f = 0.5 GHz	NF	—	1.7	—	dB
		f = 1.0 GHz		—	2.7	—	
	MMBR911LT1	f = 0.5 GHz		—	2.0	—	
		f = 1.0 GHz		—	2.9	—	

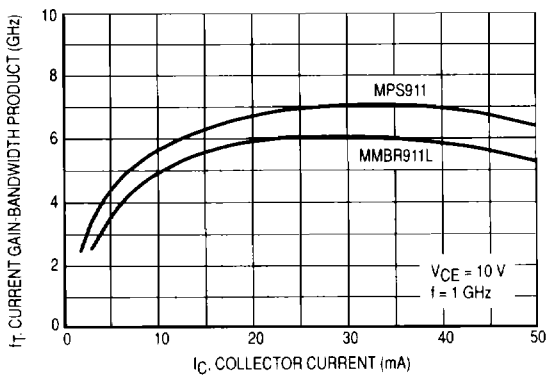

Figure 1. Current Gain–Bandwidth versus Collector Current @ 1.0 GHz

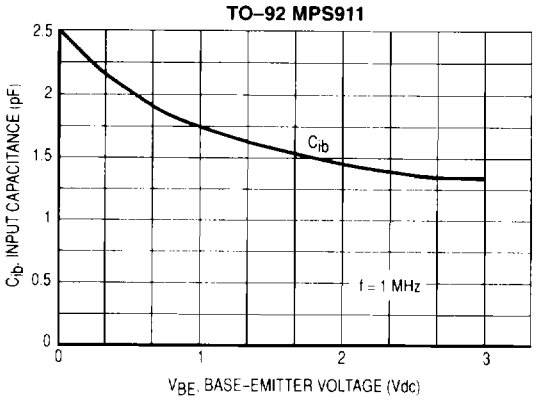

Figure 2. Input Capacitance versus Base–Emitter Voltage

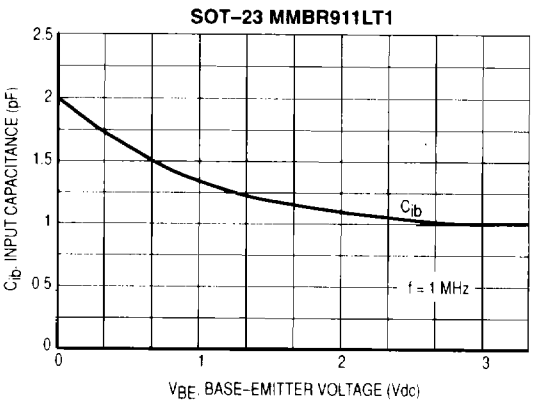

Figure 3. Input Capacitance versus Base–Emitter Voltage

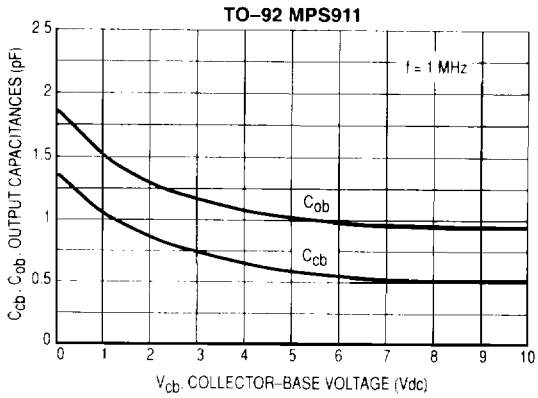

Figure 4. Output Capacitances versus Collector–Base Voltage

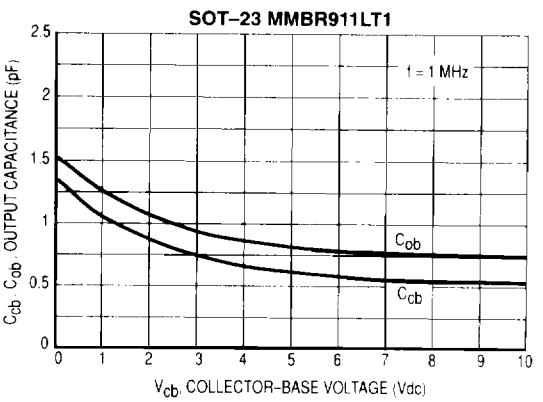

Figure 5. Output Capacitances versus Collector–Base Voltage

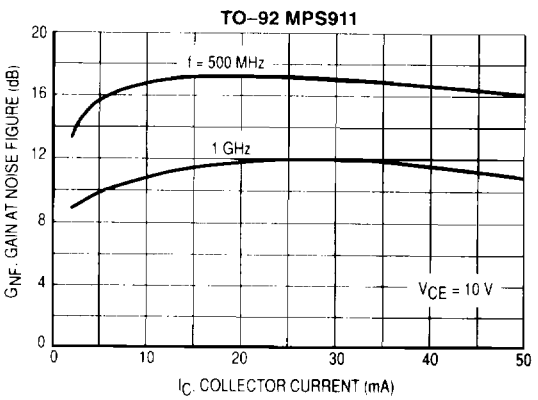

Figure 6. Gain at Noise Figure versus Collector Current

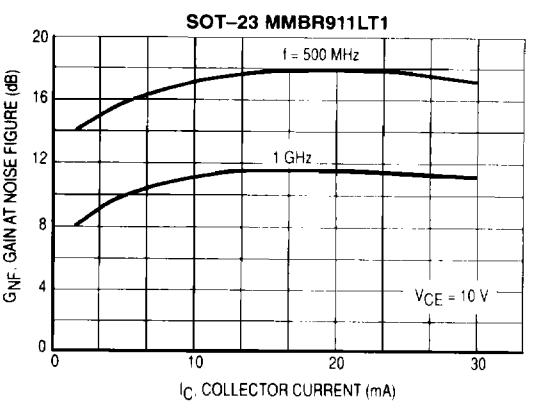

Figure 7. Gain at Noise Figure versus Collector Current

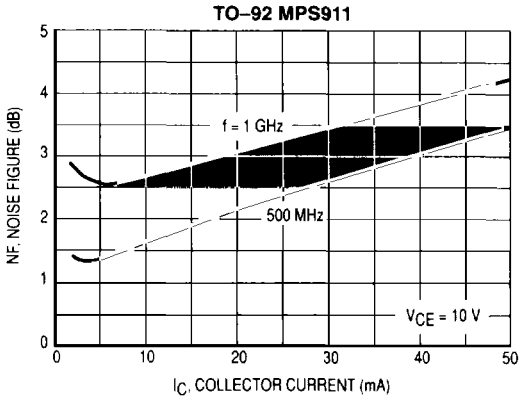

Figure 8. Noise Figure versus Collector Current

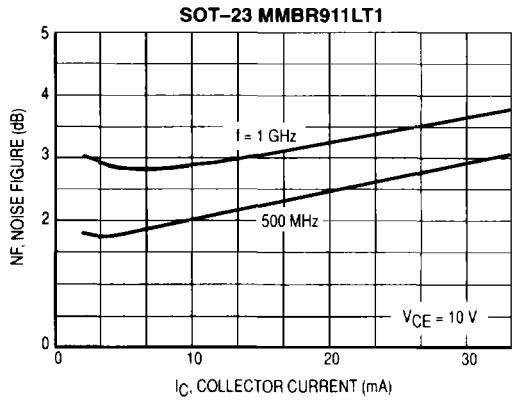

Figure 9. Noise Figure versus Collector Current

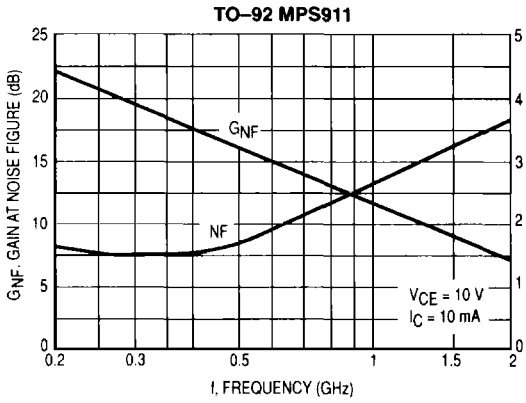

Figure 10. Gain at Noise Figure and Noise Figure versus Frequency

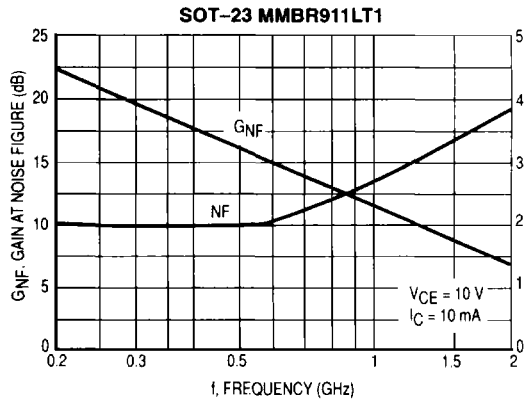

Figure 11. Gain at Noise Figure and Noise Figure versus Frequency

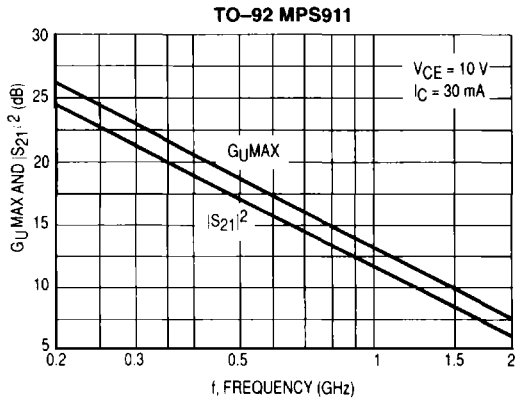

Figure 12. Maximum Unilateral Gain and Insertion Gain versus Frequency

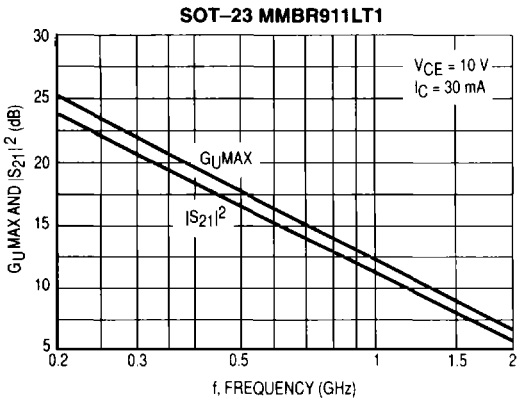

Figure 13. Maximum Unilateral Gain and Insertion Gain versus Frequency

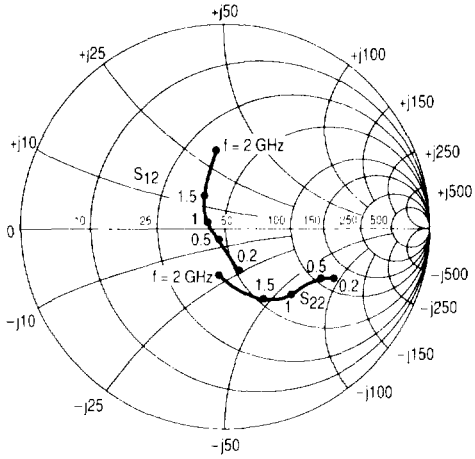

Figure 14. Input and Output Reflection Coefficients versus Frequency V_{CE} = 10 V, I_C = 30 mA

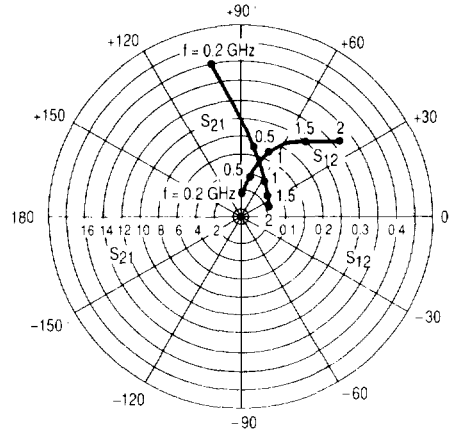

Figure 15. Forward and Reverse Transmission Coefficients versus Frequency V_{CE} = 10 V, I_C = 30 mA

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\lvert S_{11}\rvert$	∠ϕ	$\lvert S_{21}\rvert$	∠ϕ	$\lvert S_{12}\rvert$	∠ϕ	$\lvert S_{22}\rvert$	∠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

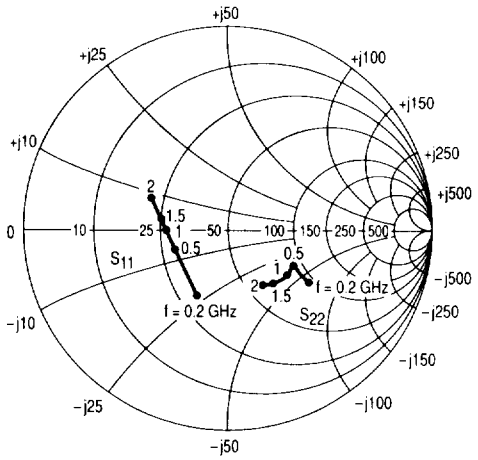

Figure 16. Input and Output Reflection Coefficients versus Frequency V_{CE} = 10 V, I_C = 30 mA

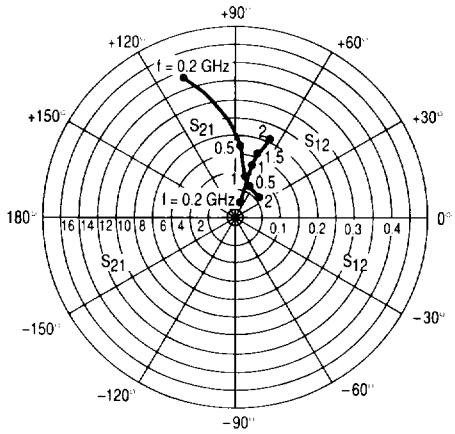

Figure 17. Forward and Reverse Transmission Coefficients versus Frequency V_{CE} = 10 V, I_C = 30 mA

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 2. Common Emitter S–Parameters