

MOTOROLA SEMICONDUCTOR
TECHNICAL DATA

NPN Silicon High Frequency Transistors

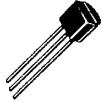
... designed for low noise, wide dynamic range front-end amplifiers and low-noise VCO's. Available in two surface-mountable plastic package styles, as well as the popular TO-92 package. This Motorola series of small-signal plastic transistors offers superior quality and performance at low cost.

- High Gain-Bandwidth Product
 $f_T = 8 \text{ GHz (Typ) @ } 50 \text{ mA}$
- Low Noise Figure
 $NF = 2 \text{ dB (Typ) @ } 500 \text{ MHz}$
- High Gain
 $G_{NF} = 17 \text{ dB (Typ) @ } 30 \text{ mA/500 MHz}$
- State-of-the-Art Technology
 Fine Line Geometry
 Ion-Implanted Arsenic Emitters
 Gold Top Metallization and Wires
 Silicon Nitride Passivation
- Tape and Reel Packaging Options
- MMBR571 Available in Low Profile, Add L Suffix


3

**MPS571
MXR571
MMBR571**


**LOW NOISE
HIGH RF GAIN**



TO-92
CASE 29
MPS571



SOT-89
CASE 345
MXR571



SOT-23
CASE 318
MMBR571
Standard and Low Profile

MAXIMUM RATINGS

Ratings	Symbol	MPS571	MXR571	MMBR571	Unit
Collector-Emitter Voltage	V_{CEO}		10		Vdc
Collector-Base Voltage	V_{CBO}		20		Vdc
Emitter-Base Voltage	V_{EBO}		3		Vdc
Collector Current — Continuous	I_C		80		mA
Power Dissipation @ $T_A = 25^\circ\text{C}$	PD	625	400 (Free Air)	200 (Free Air)	mW
Storage Temperature	T_{stg}		-55 to +150		$^\circ\text{C}$

6367254 MOTOROLA SC (XSTRS/R F)
MPS571, MXR571, MMBR571

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

Characteristic	Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage (I _C = 0.1 mA, I _B = 0)	V _{(BR)CEO}	10	12	—	Vdc	
Collector-Base Breakdown Voltage (I _C = 1 mA, I _E = 0)	V _{(BR)CBO}	20	—	—	Vdc	
Emitter-Base Breakdown Voltage (I _E = 50 μA, I _C = 0)	V _{(BR)EBO}	2.5	—	—	Vdc	
Collector Cutoff Current (V _{CB} = 8 Vdc, I _E = 0)	I _{CBO}	—	—	10	μAdc	
ON CHARACTERISTICS						
DC Current Gain (I _C = 30 mA, V _{CE} = 5 Vdc)	h _{FE}	50	—	300	—	
DYNAMIC CHARACTERISTICS						
Collector-Base Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1 MHz)	C _{cb}	—	0.7	1	pF	
Current Gain-Bandwidth Product (V _{CE} = 5 Vdc, I _C = 50 mA, f = 1 GHz)	f _T	—	6	—	GHz	
			7	—		
			8	—		
FUNCTIONAL TESTS						
Gain <i>vs</i> Noise Figure (I _C = 10 mA, V _{CE} = 5 Vdc)	MPS571 f = 0.5 GHz f = 1 GHz MXR571 f = 0.5 GHz f = 1 GHz MMBR571 f = 0.5 GHz f = 1 GHz	GNF	—	14 9 15 9.5 16.5 10.5	—	dB
Noise Figure (I _C = 10 mA, V _{CE} = 5 Vdc)	MPS571 f = 0.5 GHz f = 1 GHz MXR571 f = 0.5 GHz f = 1 GHz MMBR571 f = 0.5 GHz f = 1 GHz	NF	—	2 2.6 2.1 2.7 2 2.6	—	dB

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Figure 1. Maximum Available Gain versus Frequency

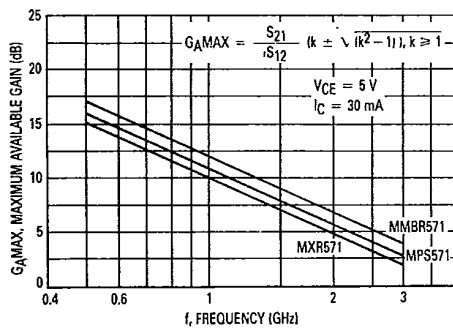
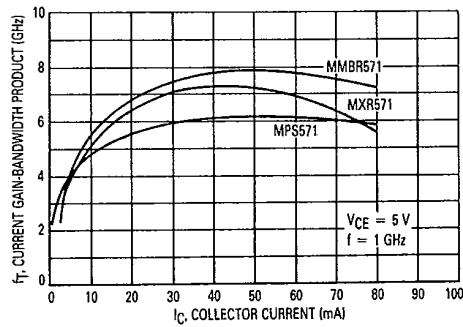


Figure 2. Current Gain-Bandwidth versus Collector Current @ 1 GHz



6367254 MOTOROLA SC (XSTRS/R F)
MPS571, MXR571, MMBR571

89D 78710 D T-31-21

Figure 3. Input Capacitance versus Emitter Base Voltage

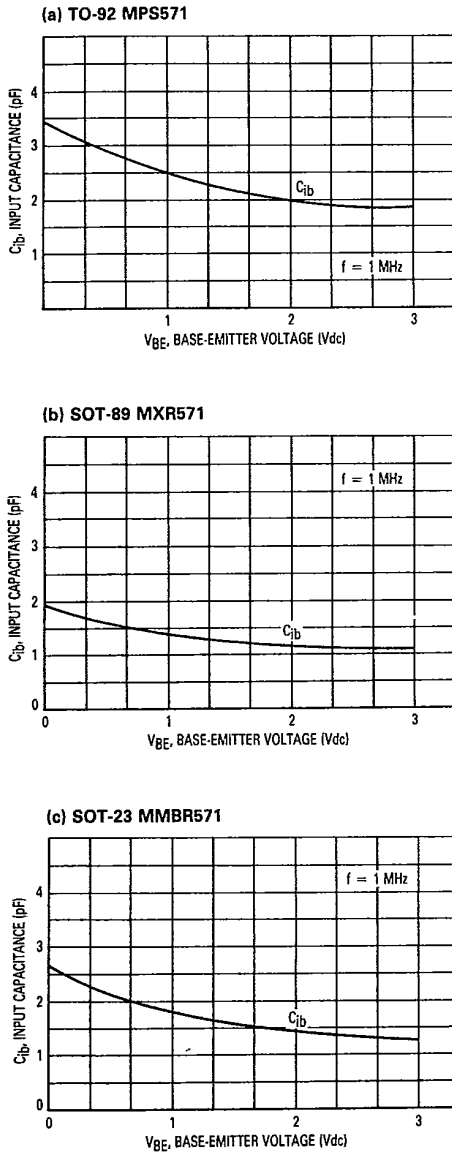
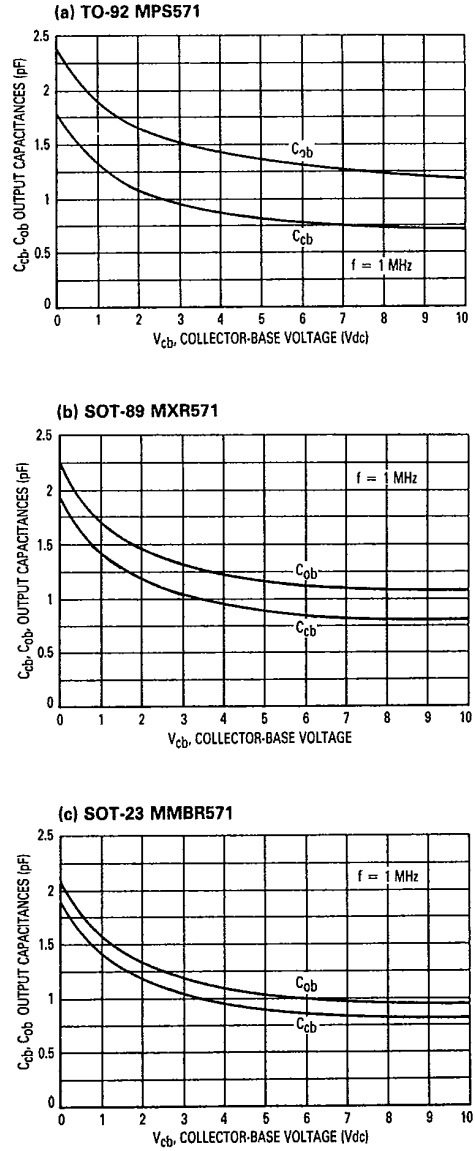


Figure 4. Output Capacitances versus Collector-Base Voltage



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Figure 5. Gain at Noise Figure versus Collector Current

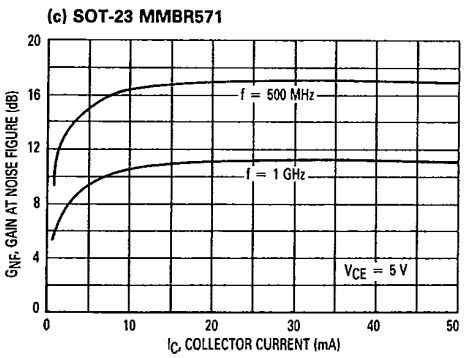
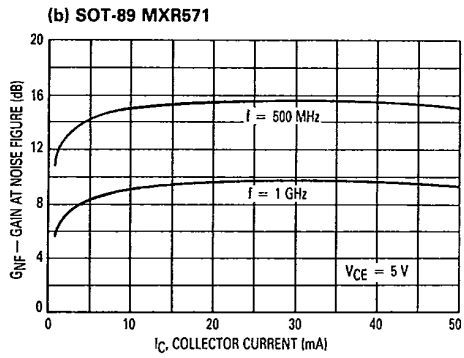
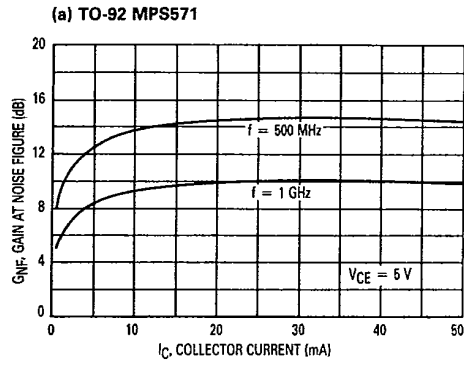
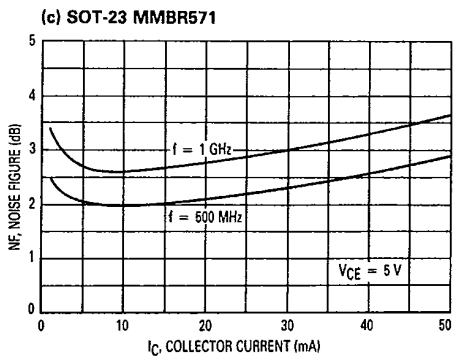
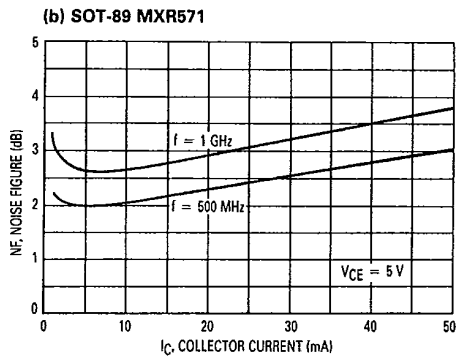
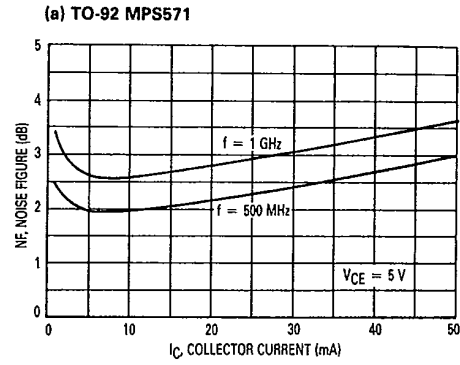


Figure 6. Noise Figure versus Collector Current



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MOTOROLA SC (XSTRS/R F)
MPS571, MXR571, MMBR571

89D 78/12 UT-31-21

Figure 7. Gain at Noise Figure and Noise Figure versus Frequency

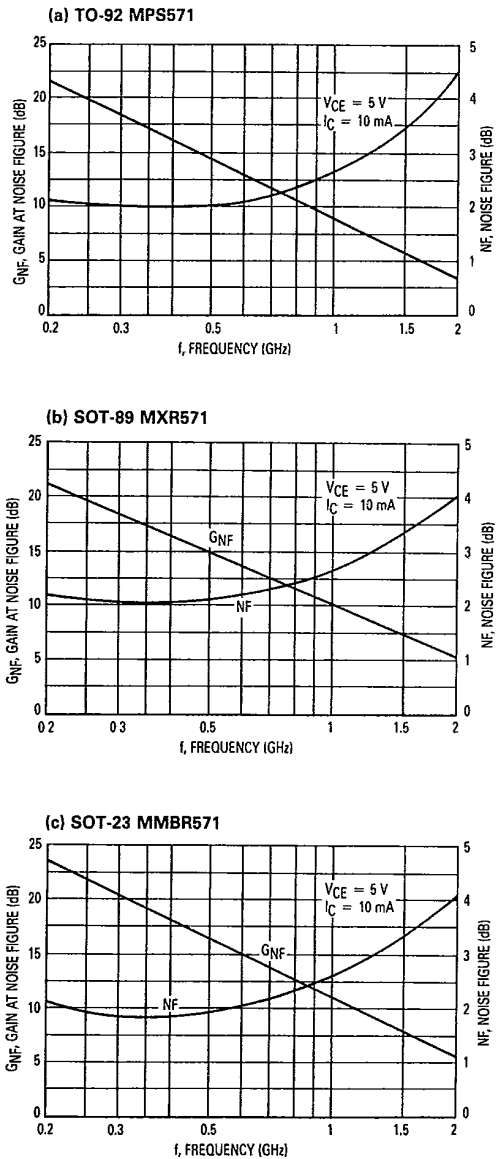
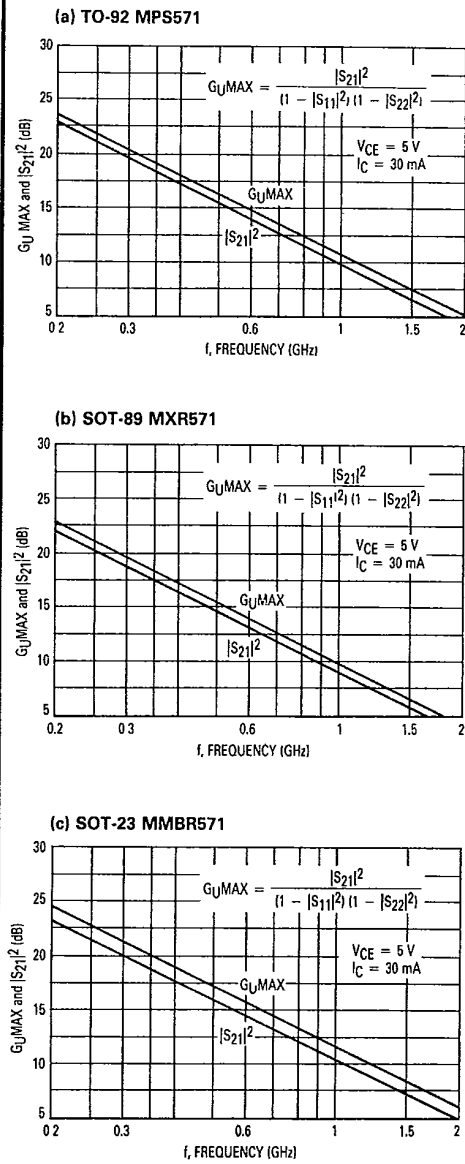


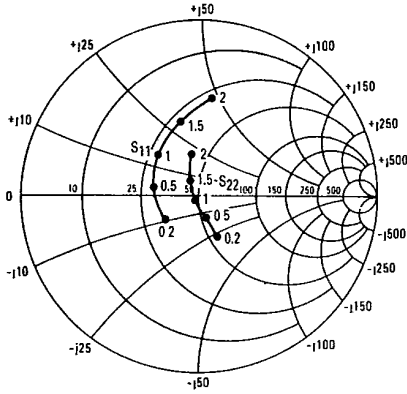
Figure 8. Maximum Unilateral Gain and Insertion Gain versus Frequency



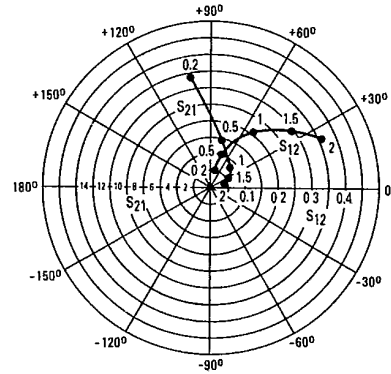
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TO-92 MPS571

INPUT/OUTPUT REFLECTION COEFFICIENTS
versus FREQUENCY
 $V_{CE} = 5\text{ V}, I_C = 30\text{ mA}$



FORWARD/REVERSE TRANSMISSION COEFFICIENTS versus FREQUENCY
 $V_{CE} = 5\text{ V}, I_C = 30\text{ mA}$



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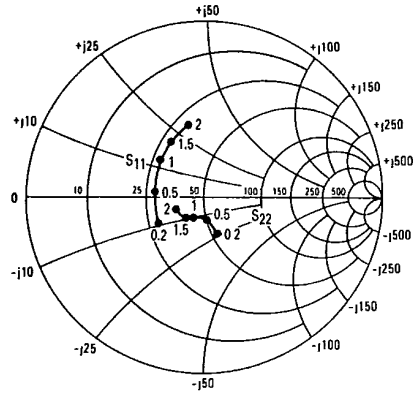
COMMON EMITTER S-PARAMETERS

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
5	5	200	0.62	-80	8.22	122	0.07	56	0.63	-44
		500	0.40	-148	4.52	87	0.11	50	0.36	-58
		1000	0.39	155	2.61	54	0.16	48	0.23	-78
		1500	0.46	122	1.86	32	0.23	42	0.15	-114
		2000	0.59	100	1.50	14	0.31	33	0.14	173
		15	200	0.33	-121	12.88	105	0.05	67	0.37
	500	0.28	-175	5.62	79	0.10	65	0.18	-67	
	1000	0.32	143	2.99	53	0.19	55	0.08	-94	
	1500	0.40	117	2.14	32	0.27	42	0.07	171	
	2000	0.55	95	1.74	17	0.35	30	0.198	117	
	30	200	0.23	-143	13.65	99	0.05	75	0.26	-62
	500	0.23	169	5.75	76	0.11	70	0.13	-68	
	1000	0.30	130	3.05	50	0.21	55	0.04	-136	
	1500	0.41	106	2.11	28	0.29	38	0.12	130	
	2000	0.56	85	1.70	11	0.36	23	0.26	102	
	50	200	0.21	-158	13.96	96	0.05	79	0.21	-61
	500	0.23	162	5.82	75	0.11	72	0.11	-66	
	1000	0.30	128	3.09	49	0.21	56	0.03	-149	
1500	0.41	105	2.11	28	0.29	39	0.12	127		
2000	0.56	84	1.70	11	0.36	23	0.27	100		

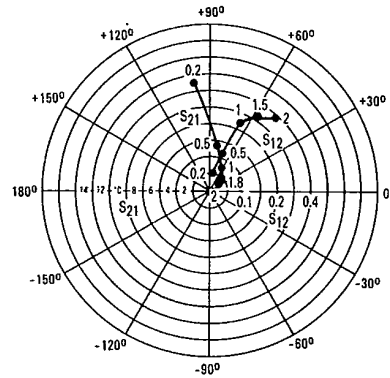
MPS571, MXR571, MMBR571

SOT-89 MXR571

INPUT/OUTPUT REFLECTION COEFFICIENTS
versus FREQUENCY
V_{CE} = 5 V, I_C = 30 mA



FORWARD/REVERSE TRANSMISSION
COEFFICIENTS versus FREQUENCY
V_{CE} = 5 V, I_C = 30 mA



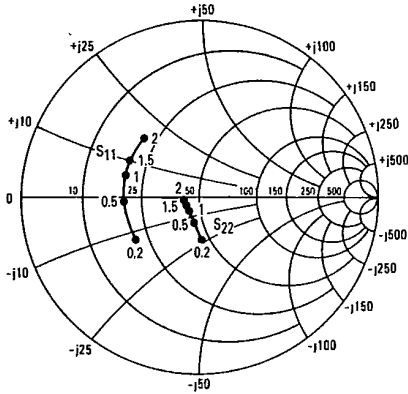
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COMMON EMITTER S-PARAMETERS

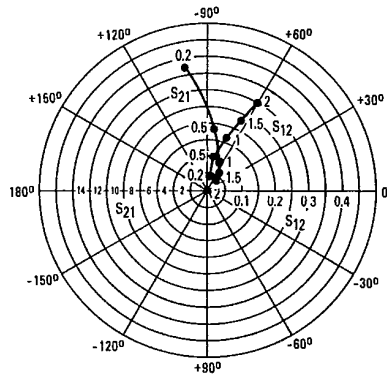
V _{CE} (Volts)	I _C (mA)	f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
			S ₁₁	∠φ	S ₂₁	∠φ	S ₁₂	∠φ	S ₂₂	∠φ
5	5	200	0.60	-84	7.94	120	0.08	56	0.58	-45
		500	0.39	-152	4.17	86	0.11	54	0.34	-56
		1000	0.39	161	2.32	62	0.19	58	0.27	-71
		1500	0.44	132	1.64	45	0.26	55	0.25	-90
		2000	0.49	106	1.33	31	0.32	52	0.26	-106
	15	200	0.33	-126	11.89	101	0.06	67	0.32	-63
		500	0.29	-178	5.13	81	0.11	69	0.18	-73
		1000	0.33	148	2.75	62	0.22	65	0.15	-99
		1500	0.37	123	1.93	47	0.30	56	0.16	-118
		2000	0.42	100	1.55	34	0.37	49	0.17	-139
	30	200	0.28	-149	12.74	97	0.05	74	0.23	-69
		500	0.27	174	5.37	79	0.11	73	0.13	-82
		1000	0.32	144	2.85	62	0.22	66	0.13	-112
		1500	0.36	120	2.02	47	0.31	57	0.15	-132
		2000	0.40	98	1.62	35	0.38	49	0.17	-152
	50	200	0.26	-162	13.03	94	0.05	77	0.18	-71
		500	0.27	169	5.43	79	0.12	75	0.11	-85
		1000	0.32	142	2.88	62	0.22	67	0.12	-117
		1500	0.36	119	2.02	47	0.31	57	0.15	-137
		2000	0.40	97	1.60	35	0.38	49	0.17	-155

SOT-23 MMBR571

INPUT/OUTPUT REFLECTION COEFFICIENTS
 versus FREQUENCY
 $V_{CE} = 5\text{ V}, I_C = 30\text{ mA}$



FORWARD/REVERSE TRANSMISSION
 COEFFICIENTS versus FREQUENCY
 $V_{CE} = 5\text{ V}, I_C = 30\text{ mA}$



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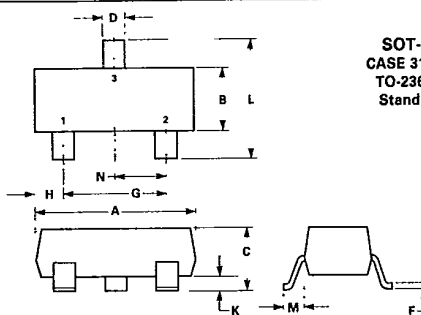
COMMON EMITTER S-PARAMETERS

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
5	5	200	0.68	-82	8.41	126	0.07	53	0.61	-45
		500	0.52	-142	4.62	93	0.10	46	0.35	-60
		1000	0.50	179	2.57	72	0.14	53	0.26	-71
		1500	0.51	161	1.82	57	0.19	58	0.24	-77
		2000	0.52	143	1.48	45	0.24	59	0.22	-86
	15	200	0.46	-125	13.65	108	0.05	60	0.35	-73
		500	0.43	-169	6.03	86	0.09	66	0.17	-94
		1000	0.44	168	3.20	72	0.16	67	0.14	-111
		1500	0.45	152	2.21	58	0.22	64	0.11	-118
		2000	0.46	137	1.80	48	0.29	59	0.10	-131
	30	200	0.42	-148	14.79	102	0.04	68	0.26	-87
		500	0.41	-177	6.31	84	0.09	72	0.14	-115
		1000	0.42	165	3.35	71	0.16	70	0.12	-135
		1500	0.44	151	2.29	59	0.23	65	0.11	-144
		2000	0.44	135	1.84	48	0.30	60	0.10	-157
50	200	0.41	-159	15.14	98	0.04	73	0.21	-96	
	500	0.42	179	6.38	83	0.09	75	0.13	-124	
	1000	0.43	163	3.35	70	0.16	71	0.12	-143	
	1500	0.44	148	2.32	58	0.23	66	0.10	-151	
	2000	0.45	134	1.84	48	0.30	60	0.09	-163	

MPS571, MXR571, MMBR571

OUTLINE DIMENSIONS

**SOT-23
CASE 318-02
TO-236AA
Standard**

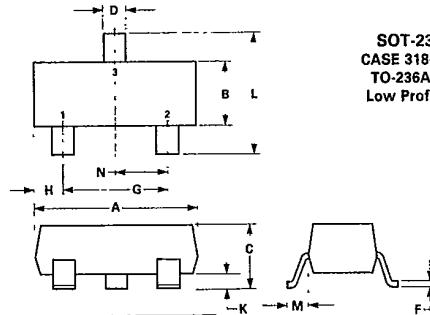


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.80	3.04	0.1102	0.1197
B	1.20	1.40	0.0472	0.0551
C	0.85	1.20	0.033	0.0472
D	0.37	0.46	0.0150	0.0177
F	0.665	0.130	0.0264	0.0051
G	1.78	2.04	0.0701	0.0807
H	0.51	0.60	0.0200	0.0236
K	0.10	0.25	0.0040	0.0098
L	2.10	2.50	0.0830	0.0984
M	0.45	0.60	0.0180	0.0235
N	0.63	1.02	0.0250	0.0401

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

NOTES
1. DIMENSIONING AND TOLERANCING PER ANSI
2. Y14.5M, 1982.
CONTROLLING DIMENSION: MILLIMETERS

**SOT-23
CASE 318-03
TO-236AB
Low Profile**



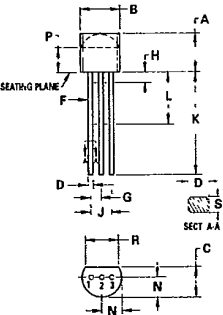
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.80	3.04	0.1102	0.1197
B	1.20	1.40	0.0472	0.0551
C	0.89	1.11	0.035	0.044
D	0.37	0.46	0.015	0.0177
F	0.665	0.130	0.0264	0.0051
G	1.78	2.04	0.0701	0.0807
H	0.51	0.60	0.0200	0.0236
K	0.13	0.100	0.005	0.0040
L	2.10	2.50	0.0830	0.0984
M	0.45	0.60	0.018	0.0235
N	0.89	1.02	0.0350	0.0401

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

NOTES
1. DIMENSIONING AND TOLERANCING PER ANSI
2. Y14.5M, 1982.
CONTROLLING DIMENSION: MILLIMETERS

NOTES
1. CONTOUR OF PACKAGE BEYOND ZONE "P" IS UNCONTROLLED.
2. DIM "F" APPLIES BETWEEN "H" AND "L". DIM "D" & "S" APPLIES BETWEEN "L" & 12.70 mm (0.5") FROM SEATING PLANE. LEAD DIM IS UNCONTROLLED IN "H" & BEYOND 12.70 mm (0.5") FROM SEATING PLANE.

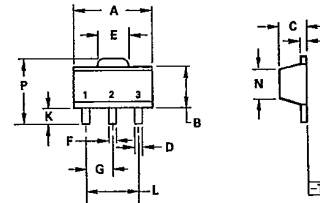
**TO-92
CASE 29-02
TO-226AA
PLASTIC**



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.32	5.33	0.170	0.210
B	4.44	5.21	0.175	0.205
C	3.18	4.19	0.125	0.165
D	0.41	0.56	0.016	0.022
F	0.41	0.48	0.016	0.019
G	1.14	1.40	0.045	0.055
H	—	2.54	—	0.100
J	2.41	2.67	0.095	0.105
K	12.70	—	0.500	—
L	6.35	—	0.250	—
N	2.03	2.67	0.080	0.105
P	2.92	—	0.115	—
R	3.43	—	0.135	—
S	0.36	0.41	0.014	0.016

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

**SOT-89
CASE 345-01
PLASTIC**



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.40	4.60	0.174	0.181
B	2.29	2.60	0.091	0.102
C	1.40	1.60	0.056	0.062
D	0.36	0.46	0.015	0.018
E	1.62	1.80	0.064	0.070
F	0.44	0.53	0.018	0.020
G	1.50 BSC	—	0.059 BSC	—
J	0.35	0.44	0.014	0.017
K	0.80	1.04	0.032	0.040
L	3.00 BSC	—	0.118 BSC	—
N	2.04	2.28	0.081	0.089
P	3.94	4.25	0.156	0.167

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

NOTES
1. DIMENSIONS A AND B ARE DATUMS.
2. -T- IS SEATING PLANE.
3. POSITIONAL TOLERANCE FOR LEADS
Ⓜ 0.10 (0.004) Ⓜ T B(S) A(S)
4. DIMENSIONING AND TOLERANCING PER ANSI
Y14.5, 1973
5. CONTROLLING DIM. MILLIMETERS