The RF Line

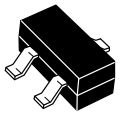
NPN Silicon Low Noise, High-Frequency Transistors

Designed for use in high gain, low noise small–signal amplifiers. This series features excellent broadband linearity and is offered in a variety of packages.

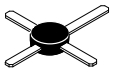
- Fully Implanted Base and Emitter Structure
- 9 Finger, 1.25 Micron Geometry with Gold Top Metal
- Gold Sintered Back Metal
- Available in tape and reel packaging options:
  T1 suffix = 3,000 units per reel
  T3 suffix = 10,000 units per reel
- MRF947R, T3 is Emitter–Base Pin out reversed.
  All electricals same as MRF947

MMBR941
MRF941
MRF947
MRF9411
SERIES

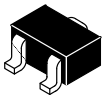
I_C = 50 mA
LOW NOISE
HIGH–FREQUENCY
TRANSISTORS



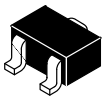
CASE 318–08, STYLE 6
SOT–23
LOW PROFILE
MMBR941LT1, T3, MMBR941BLT1, T3



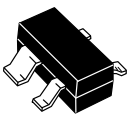
CASE 317–01, STYLE 2
MACRO–X
MRF941



CASE 419–02, STYLE 3
MRF947AT1, MRF947BT1, T3,
MRF947T1, T3



CASE 419–02, STYLE 6
MRF947RT3



CASE 318A–05, STYLE 1
SOT–143
LOW PROFILE
MRF9411LT1, MRF9411BLT1, T3

MAXIMUM RATINGS

Rating	Symbol	MRF941	MMBR941LT1, T3	MRF9411LT1	MRF947 Series	Unit
Collector–Emitter Voltage	V_{CEO}	10	10	10	10	Vdc
Collector–Base Voltage	V_{CBO}	20	20	20	20	Vdc
Emitter–Base Voltage	V_{EBO}	1.5	1.5	1.5	1.5	Vdc
Power Dissipation (1) T_C = 75°C Derate linearly above T_{case} = 75°C @	P_{Dmax}	0.4 4.0	0.25 3.33	0.25 3.33	0.188 2.5	Watts mW/°C
Collector Current — Continuous (2)	I_C	50	50	50	50	mA
Maximum Junction Temperature	T_{Jmax}	150	150	150	150	°C
Storage Temperature	T_{stg}	–55 to +150	–55 to +150	–55 to +150	–55 to +150	°C
Thermal Resistance, Junction to Case	$R_{\theta JC}$	250	300	300	400	°C/W
Maximum Junction Temperature	T_{Jmax}	150	150	150	150	°C

DEVICE MARKING

MMBR941LT1, T3 = 7Y	MMBR941BLT1, T3 = 7N	MRF947T1, T3 = A	MRF947BT1, T3 = H
MRF9411LT1 = 10	MRF9411BLT1, T3 = 18	MRF947AT1 = G	MRF947RT3 = I

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (3)						
Collector–Emitter Breakdown Voltage (I_C = 0.1 mA, I_B = 0)	All	$V_{(BR)CEO}$	10	12	—	Vdc
Collector–Base Breakdown Voltage (I_C = 0.1 mA, I_E = 0)	All	$V_{(BR)CBO}$	20	23	—	Vdc
Emitter Cutoff Current (V_{EB} = 1.0 V, I_C = 0)	All	I_{EBO}	—	—	0.1	μAdc
Collector Cutoff Current (V_{CB} = 10 V, I_E = 0)	All	I_{CBO}	—	—	0.1	μAdc
ON CHARACTERISTICS (3)						
DC Current Gain (V_{CE} = 6.0 V, I_C = 5.0 mA)	(MRF941, MMBR941LT1, T3, MRF9411LT1) (MMBR941BLT1, T3, MRF9411BLT1, T3)	h_{FE}	50 100	— —	200 200	—
DC Current Gain (V_{CE} = 1.0 V, I_C = 500 μA)	MRF947T1, MRF947BT1	h_{FE_1}	50	—	—	—
DC Current Gain (V_{CE} = 6.0 V, I_C = 5.0 mA)	MRF947T1, T3; MRF947RT3 MRF947AT1 MRF947BT1, T3	h_{FE_2} h_{FE_3} h_{FE_4}	50 75 100	— — —	— 150 200	—
DYNAMIC CHARACTERISTICS						
Collector–Base Capacitance (V_{CB} = 10 V, I_E = 0, f = 1.0 MHz)	All	C_{cb}	—	0.35	—	pF
Current Gain — Bandwidth Product (V_{CE} = 6.0 V, I_C = 15 mA, f = 1.0 GHz)	All	f_T	—	8.0	—	GHz

NOTES:
1. To calculate the junction temperature use $T_J = P_D \times R_{\theta JA} + T_{CASE}$. Case temperature measured on collector lead immediately adjacent to body of package.
2. I_C — Continuous (MTBF ≈ 10 years).
3. Pulse width ≤ 300 μs, duty cycle ≤ 2% pulsed.

PERFORMANCE CHARACTERISTICS

Conditions	Symbol	MRF941			MRF9411LT1			MMBR941LT1, T3			MRF947 Series			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Insertion Gain	$\|S_{21}\|^2$													dB
(V_{CE} = 6.0 V, I_C = 15 mA, f = 1.0 GHz)		—	16	—	—	16	—	—	14	—	—	14	—	
(V_{CE} = 6.0 V, I_C = 15 mA, f = 2.0 GHz)		—	10	—	—	10	—	—	8.0	—	—	10.8	—	
Maximum Unilateral Gain (1)	$G_{U\ max}$													dB
(V_{CE} = 6.0 V, I_C = 15 mA, f = 1.0 GHz)		—	18	—	—	18	—	—	16	—	—	14.8	—	
(V_{CE} = 6.0 V, I_C = 15 mA, f = 2.0 GHz)		—	12	—	—	12	—	—	10	—	—	11.6	—	
Noise Figure — Minimum (Figure 9)	NF_{MIN}													dB
(V_{CE} = 6.0 V, I_C = 5.0 mA, f = 1.0 GHz)		—	1.3	—	—	1.3	—	—	1.3	—	—	1.8	—	
(V_{CE} = 6.0 V, I_C = 5.0 mA, f = 2.0 GHz)		—	2.1	—	—	2.1	—	—	2.1	—	—	2.1	—	
Associated Gain at Minimum NF (Figure 9)	G_{NF}													dB
(V_{CE} = 6.0 V, I_C = 5.0 mA, f = 1.0 GHz)		—	15	—	—	15	—	—	14	—	—	14	—	
(V_{CE} = 6.0 V, I_C = 5.0 mA, f = 2.0 GHz)		—	9.5	—	—	9.5	—	—	8.5	—	—	10.5	—	
Noise Figure — 50 ohm Source	$NF_{50\ \Omega}$	—	1.9	2.8	—	1.9	2.8	—	1.9	2.8	—	1.9	2.8	dB
(V_{CE} = 6.0 V, I_C = 5.0 mA, f = 1.0 GHz)														

NOTES:
1. Maximum Unilateral Gain is $GU_{max} = \frac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$

TYPICAL CHARACTERISTICS
MRF941; MMBR941LT1, T3; MMBR941BLT1, T3; MRF9411LT1; MRF9411BLT1, T3

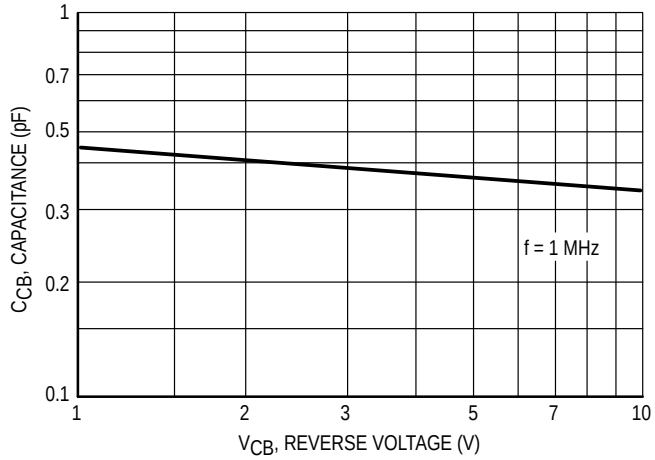


Figure 1. Collector–Base Capacitance versus Voltage

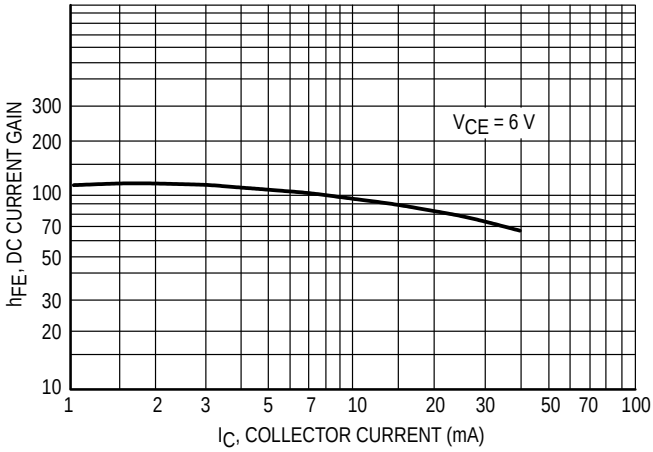


Figure 2. DC Current Gain versus Collector Current

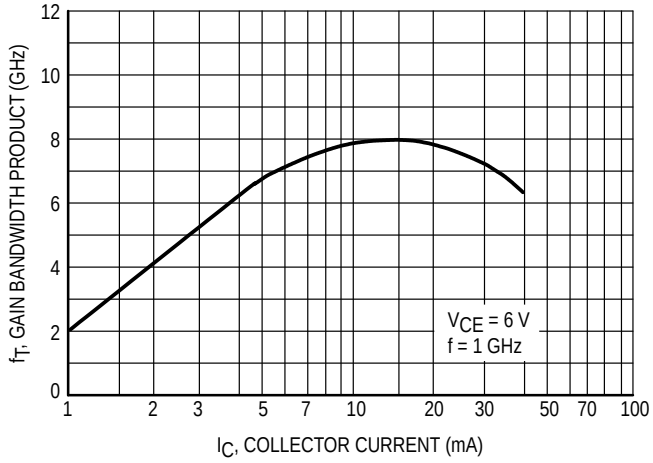


Figure 3. Gain Bandwidth Product versus Collector Current

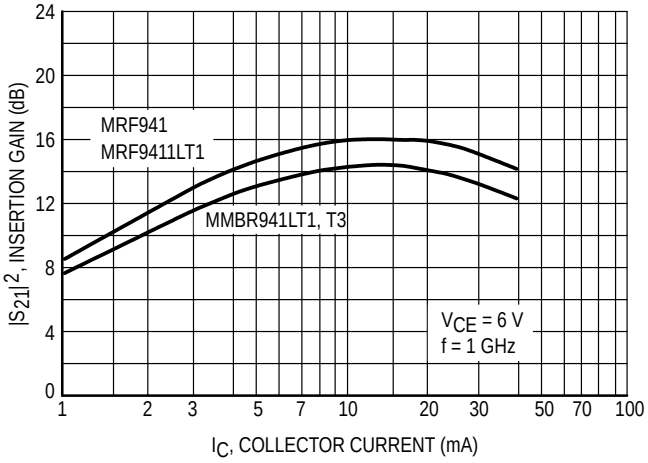


Figure 4. Insertion Gain versus Collector Current

FORWARD INSERTION GAIN AND MAXIMUM UNILATERAL GAIN versus FREQUENCY

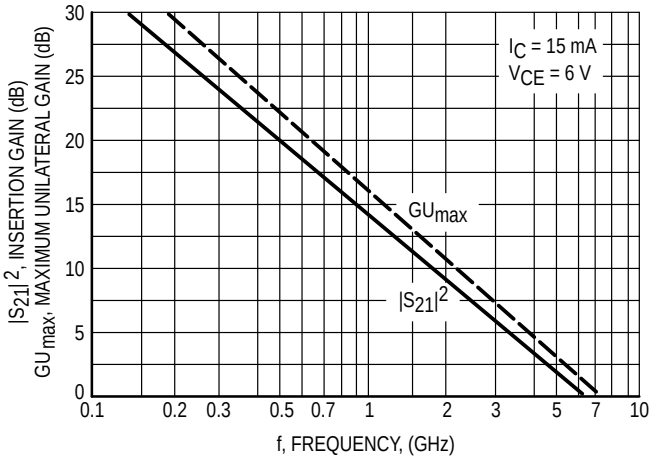


Figure 5. MMBR941LT1, T3

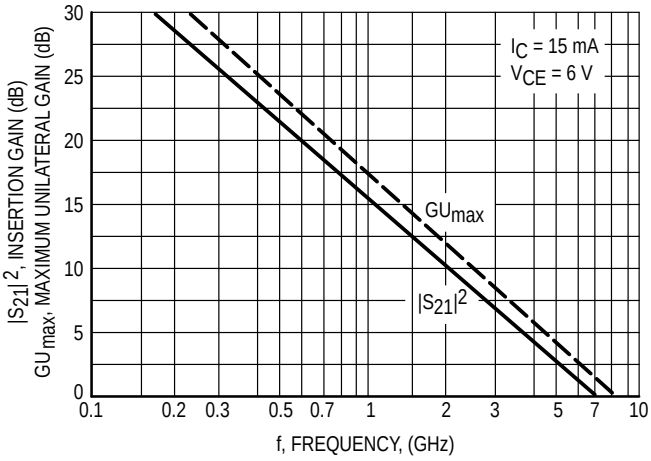


Figure 6. MRF941, MRF9411LT1

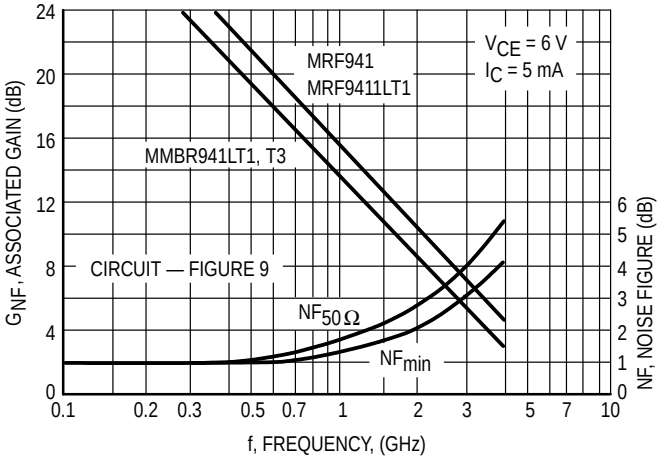


Figure 7. Noise Figure and Associated Gain versus Frequency

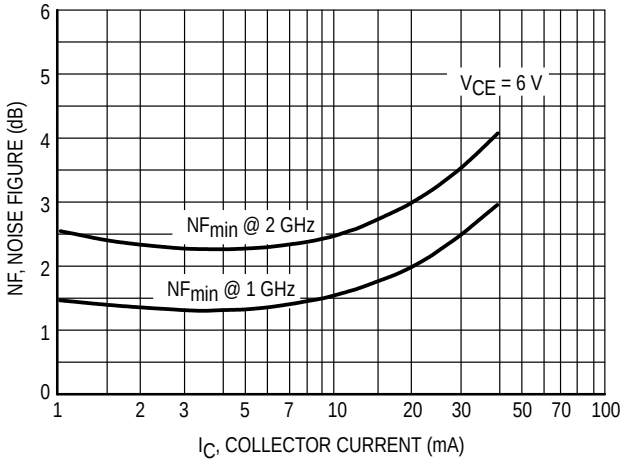


Figure 8. Minimum Noise Figure versus Collector Current

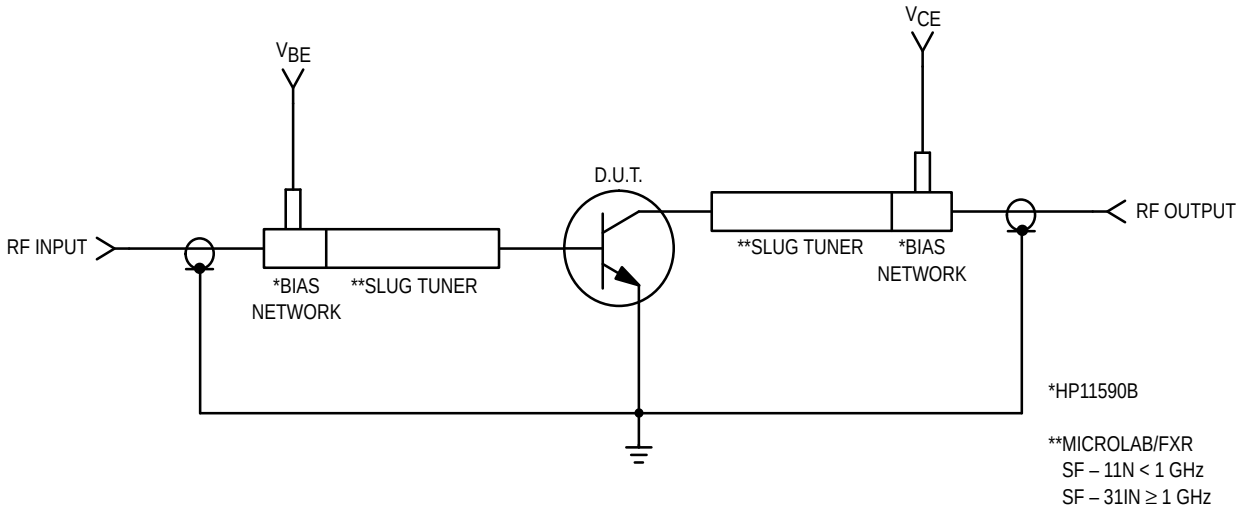


Figure 9. Functional Circuit Schematic (all devices)

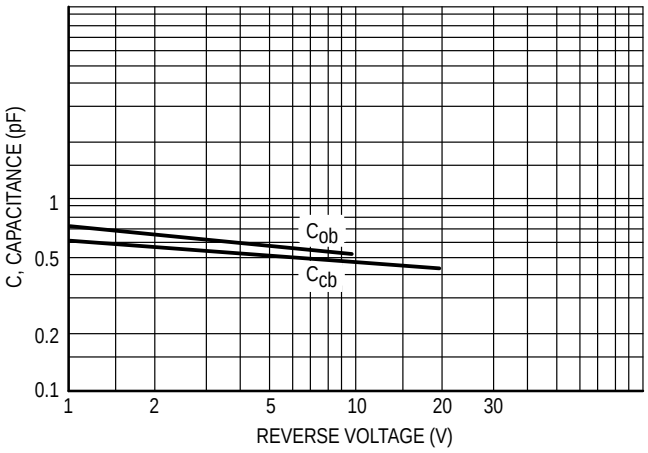


Figure 10. Capacitance versus Voltage

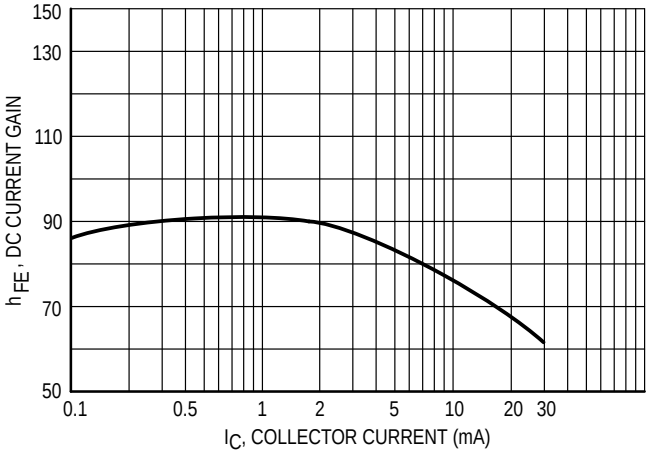


Figure 11. DC Current Gain versus Collector Current

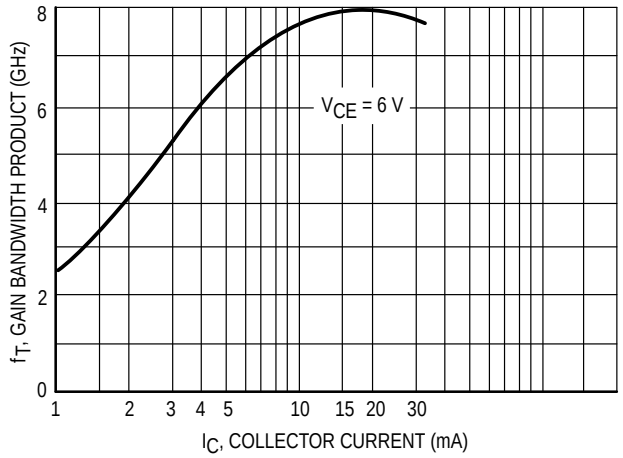


Figure 12. Gain–Bandwidth Product versus Collector Current

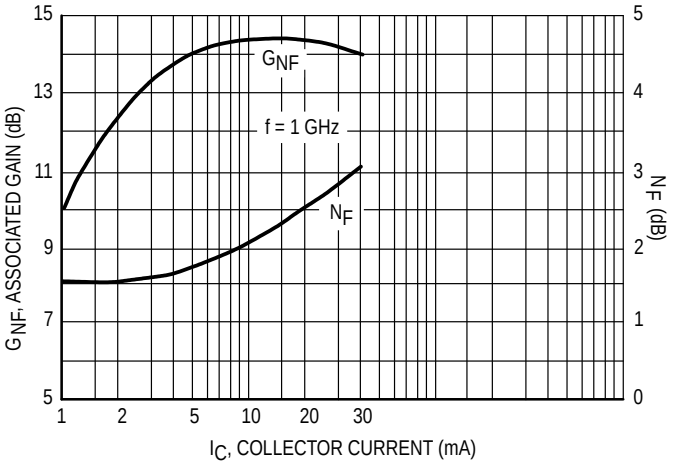


Figure 13. Associated Gain and Noise Figure versus Collector Current

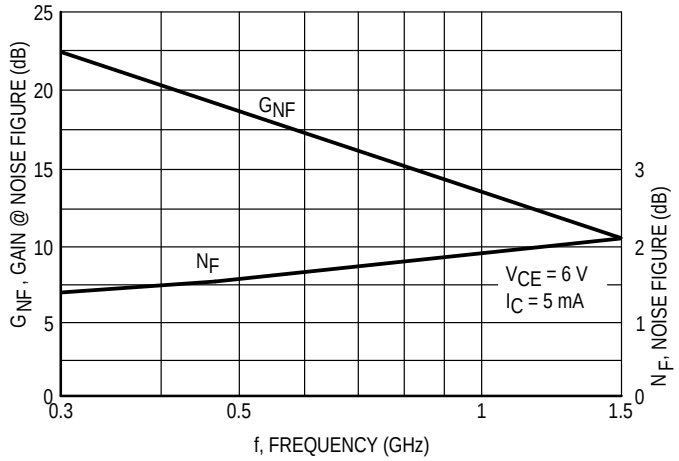


Figure 14. Noise Figure and Associated Gain versus Frequency

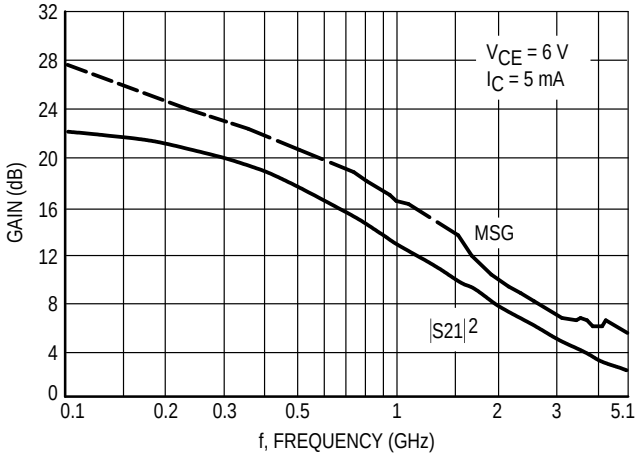


Figure 15. Forward Insertion Gain and Maximum Stable Power Gain versus Frequency

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
6.0	5.0	100	0.82	−24	14.5	162	0.02	81	0.96	−11
		200	0.77	−47	13.2	147	0.03	68	0.89	−21
		400	0.62	−84	10.3	124	0.04	53	0.73	−33
		600	0.54	−110	8.1	108	0.06	49	0.63	−39
		800	0.46	−131	6.4	98	0.06	49	0.58	−44
		1000	0.42	−148	5.3	90	0.07	52	0.55	−46
		1500	0.36	177	3.6	74	0.09	56	0.51	−53
		2000	0.34	145	2.7	61	0.11	59	0.50	−61
		2500	0.36	118	2.2	51	0.14	60	0.49	−69
		3000	0.42	90	1.9	44	0.16	56	0.46	−75
		3500	0.51	77	1.7	35	0.22	53	0.41	−90
		4000	0.58	58	1.6	28	0.23	47	0.37	−100
		5000	0.72	44	1.5	9.0	0.26	33	0.39	−151
		6000	0.86	35	1.4	−14	0.30	24	0.55	167
	10	100	0.67	−37	24.4	154	0.02	88	0.91	−17
		200	0.48	−67	20	135	0.02	55	0.79	−29
		400	0.45	−111	13.4	112	0.03	56	0.59	−37
		600	0.40	−136	9.8	99	0.04	57	0.50	−41
		800	0.44	−155	7.5	90	0.06	61	0.47	−43
		1000	0.35	−170	6.1	84	0.06	62	0.45	−44
		1500	0.31	159	4.1	70	0.08	66	0.45	−50
		2000	0.32	130	3.1	59	0.11	66	0.44	−58
		2500	0.34	107	2.4	50	0.15	65	0.44	−66
		3000	0.41	82	2.1	43	0.17	59	0.41	−71
		3500	0.49	72	1.9	35	0.21	54	0.36	−85
		4000	0.55	54	1.7	27	0.23	46	0.33	−93
		5000	0.68	42	1.6	10	0.27	32	0.32	−144
		6000	0.82	34	1.5	−12	0.30	23	0.48	−169
	15	100	0.57	−47	30.1	149	0.02	63	0.87	−20
		200	0.48	−83	23.2	128	0.02	64	0.72	−31
		400	0.40	−126	14.4	107	0.03	65	0.52	−37
		600	0.36	−150	10.2	95	0.04	65	0.46	−39
		800	0.34	−167	7.8	87	0.05	66	0.43	−42
		1000	0.33	180	6.3	81	0.06	67	0.42	−42
		1500	0.27	151	4.2	69	0.08	72	0.43	−49
		2000	0.32	124	3.1	59	0.12	69	0.42	−56
		2500	0.34	103	2.5	49	0.15	67	0.42	−64
		3000	0.41	80	2.1	42	0.17	59	0.40	−69
		3500	0.49	70	1.9	34	0.20	54	0.35	−84
		4000	0.55	52	1.7	27	0.28	47	0.32	−90
		5000	0.68	41	1.7	9.0	0.26	33	0.31	−143
		6000	0.82	33	1.5	−13	0.29	23	0.46	169
	30	100	0.41	−74	37.8	139	0.01	69	0.79	−24
		200	0.37	−116	25.8	118	0.01	65	0.62	−32
		400	0.37	−152	14.7	100	0.02	72	0.47	−32
		600	0.36	−170	10.1	90	0.03	70	0.43	−33
		800	0.35	176	7.7	83	0.04	71	0.42	−36
		1000	0.35	167	6.1	78	0.06	75	0.42	−38
		1500	0.34	142	4.1	65	0.08	72	0.44	−44
		2000	0.36	118	3.1	55	0.11	71	0.43	−53
		2500	0.38	100	2.4	46	0.14	68	0.44	−62
		3000	0.45	77	2.1	40	0.17	61	0.42	−68
		3500	0.53	68	1.8	32	0.21	58	0.37	−82
		4000	0.59	51	1.6	25	0.24	48	0.34	−92
		5000	0.72	40	1.5	7.0	0.26	34	0.33	−143
		6000	0.85	31	1.4	−15	0.30	24	0.48	171

Table 1. MRF941 Common Emitter S–Parameters

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
1.0	0.5	100	0.97	−11	1.78	170	0.03	83	0.99	−4.7
		200	0.96	−22	1.74	161	0.06	76	0.99	−9.1
		500	0.90	−53	1.60	133	0.13	56	0.93	−21
		900	0.75	−89	1.37	105	0.18	37	0.83	−33
		1000	0.72	−98	1.32	100	0.18	33	0.82	−36
		1500	0.63	−132	1.07	74	0.19	20	0.75	−47
		2000	0.57	−163	0.89	55	0.16	15	0.72	−57
		3000	0.55	144	0.67	30	0.15	40	0.71	−76
	1.0	100	0.95	−13	3.37	169	0.03	81	0.99	−6.2
		200	0.93	−27	3.27	158	0.06	73	0.98	−12
		500	0.81	−62	2.85	128	0.12	52	0.86	−26
		900	0.63	−101	2.21	101	0.15	37	0.73	−38
		1000	0.60	−110	2.08	96	0.15	34	0.71	−40
		1500	0.51	−144	1.59	73	0.16	27	0.64	−49
		2000	0.46	−173	1.28	56	0.16	29	0.61	−58
		3000	0.46	138	0.95	30	0.19	44	0.60	−75
6.0	5.0	100	0.82	−25	14.6	159	0.02	77	0.94	−13
		200	0.75	−47	12.6	142	0.04	68	0.85	−22
		400	0.55	−79	9.2	120	0.05	61	0.69	−31
		600	0.42	−98	6.9	106	0.07	60	0.60	−32
		800	0.33	−114	5.3	97	0.08	61	0.56	−33
		1000	0.28	−129	4.5	90	0.09	62	0.52	−33
		1500	0.25	−155	3.1	77	0.13	67	0.51	−37
		2000	0.16	176	2.4	66	0.16	68	0.51	−36
		2500	0.21	151	2.0	57	0.20	69	0.48	−40
		3000	0.18	122	1.7	50	0.23	68	0.48	−44
		3500	0.30	108	1.5	42	0.27	66	0.45	−46
		4000	0.29	91	1.4	37	0.32	64	0.42	−53
	10	100	0.67	−37	23.5	149	0.02	74	0.88	−18
		200	0.54	−64	18.1	129	0.03	68	0.73	−28
		400	0.37	−96	11.3	108	0.05	67	0.56	−31
		600	0.26	−114	8.0	98	0.06	67	0.50	−30
		800	0.21	−130	6.0	91	0.08	70	0.47	−30
		1000	0.18	−147	5.1	85	0.09	70	0.45	−30
		1500	0.18	−167	3.4	74	0.13	72	0.46	−34
		2000	0.11	159	2.6	64	0.17	71	0.46	−34
		2500	0.17	140	2.2	56	0.21	69	0.44	−38
		3000	0.15	107	1.8	59	0.25	67	0.45	−41
		3500	0.27	100	1.7	42	0.28	65	0.42	−42
		4000	0.26	85	1.5	37	0.33	61	0.39	−49
	15	100	0.56	−46	28.6	143	0.02	73	0.83	−22
		200	0.43	−75	20.2	122	0.03	67	0.65	−30
		400	0.29	−107	11.8	104	0.04	70	0.50	−30
		600	0.22	−125	8.2	95	0.06	74	0.46	−28
		800	0.18	−141	6.2	88	0.08	74	0.45	−27
		1000	0.16	−158	5.1	83	0.09	74	0.43	−28
		1500	0.17	−174	3.4	72	0.13	73	0.44	−32
		2000	0.11	150	2.6	63	0.17	72	0.45	−33
		2500	0.17	138	2.2	55	0.21	70	0.43	−37
		3000	0.15	102	1.9	49	0.25	67	0.44	−39
		3500	0.28	98	1.7	42	0.29	65	0.40	−41
		4000	0.25	82	1.5	37	0.32	61	0.38	−47

(continued)

Table 2. MMBR941LT1, T3 Common Emitter S–Parameters

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
6.0	20	100	0.49	−52	31.5	139	0.01	70	0.79	−23
		200	0.36	−84	21.1	118	0.02	69	0.60	−29
		400	0.25	−115	12.1	101	0.04	73	0.48	−29
		600	0.20	−134	8.3	93	0.06	74	0.45	−26
		800	0.16	−150	6.2	87	0.07	75	0.44	−26
		1000	0.15	−166	5.1	82	0.09	75	0.42	−26
		1500	0.16	−176	3.5	75	0.14	74	0.44	−31
		2000	0.12	144	2.6	63	0.17	73	0.45	−32
		2500	0.17	133	2.2	55	0.22	70	0.43	−36
		3000	0.16	101	1.9	49	0.25	68	0.44	−39
		3500	0.28	98	1.6	41	0.29	65	0.41	−40
		4000	0.26	82	1.5	36	0.33	61	0.39	−47
	30	100	0.41	−65	34.3	134	0.01	70	0.74	−25
		200	0.30	−99	21.6	113	0.02	70	0.56	−28
		400	0.23	−131	11.9	98	0.04	76	0.47	−25
		600	0.20	−147	8.1	91	0.06	76	0.45	−24
		800	0.18	−163	6.1	84	0.07	78	0.44	−23
		1000	0.17	−177	5.0	80	0.09	78	0.43	−24
		1500	0.18	174	3.4	70	0.13	76	0.45	−30
		2000	0.14	141	2.5	61	0.17	74	0.47	−31
		2500	0.20	131	2.1	54	0.21	71	0.45	−36
		3000	0.18	104	1.8	47	0.25	69	0.46	−39
		3500	0.31	100	1.6	40	0.29	65	0.42	−42
		4000	0.29	84	1.5	35	0.33	62	0.40	−48

Table 2. MMBR941LT1, T3 Common Emitter S−Parameters (continued)

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
1.0	0.5	100	0.97	−10	1.78	171	0.03	83	100	−4.7
		200	0.97	−20	1.75	163	0.05	77	100	−9.2
		500	0.93	−49	1.62	137	0.12	57	0.94	−21
		900	0.81	−84	1.43	110	0.18	36	0.86	−35
		1000	0.79	−92	1.38	104	0.19	32	0.84	−38
		1500	0.72	−125	1.12	78	0.20	14	0.77	−50
		2000	0.68	−152	0.92	57	0.20	1	0.74	−61
		3000	0.66	169	0.68	27	0.16	−11	0.73	−82
	1.0	100	0.95	−13	3.37	170	0.03	82	0.99	−6.2
		200	0.94	−25	3.30	161	0.05	74	0.98	−12
		500	0.88	−59	2.96	133	0.16	53	0.89	−27
		1000	0.70	−107	2.26	101	0.16	29	0.74	−44
		1500	0.64	−139	1.72	78	0.17	15	0.66	−55
		2000	0.61	−165	1.36	59	0.17	6.7	0.62	−65
		3000	0.61	160	0.97	32	0.14	3.0	0.61	−84

(continued)

Table 3. MRF9411LT1 Common Emitter S−Parameters

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
6.0	5.0	100	0.73	−24	14	164	0.02	92	0.96	−11
		200	0.74	−47	12.9	150	0.03	65	0.90	−20
		400	0.66	−83	10.4	129	0.05	56	0.75	−32
		600	0.62	−108	8.4	115	0.06	45	0.65	−40
		800	0.56	−127	6.7	105	0.07	46	0.60	−43
		1000	0.54	−141	5.6	96	0.07	51	0.57	−46
		1500	0.46	−166	3.9	82	0.08	55	0.52	−50
		2000	0.43	172	2.9	70	0.09	56	0.50	−54
		2500	0.41	151	2.3	62	0.11	61	0.48	−60
		3000	0.44	128	1.9	55	0.14	62	0.49	−65
		3500	0.49	117	1.6	47	0.15	61	0.46	−74
		4000	0.57	101	1.4	42	0.16	62	0.47	−81
		5000	0.60	92	1.2	32	0.21	60	0.46	−105
		6000	0.58	88	1.0	20	0.25	61	0.51	−137
	10	100	0.64	−39	23.6	157	0.01	59	0.91	−16
		200	0.60	−71	20	139	0.02	70	0.80	−27
		400	0.54	−112	13.9	117	0.03	57	0.61	−39
		600	0.52	−135	10.3	104	0.04	50	0.51	−43
		800	0.49	−151	8.0	96	0.05	54	0.46	−44
		1000	0.47	−161	6.5	89	0.06	60	0.46	−46
		1500	0.41	177	4.4	77	0.08	62	0.44	−47
		2000	0.40	158	3.2	67	0.09	65	0.43	−52
		2500	0.39	139	2.6	60	0.11	68	0.41	−56
		3000	0.44	118	2.1	53	0.13	69	0.43	−62
		3500	0.49	110	1.8	47	0.15	67	0.39	−72
		4000	0.54	96	1.6	42	0.18	65	0.41	−78
		5000	0.63	88	1.3	32	0.23	61	0.40	−101
		6000	0.58	86	1.1	20	0.26	62	0.44	−136
	15	100	0.56	−51	29.5	152	0.01	78	0.87	−20
		200	0.53	−88	23.5	131	0.02	63	0.73	−31
		400	0.51	−128	15.1	111	0.03	63	0.54	−40
		600	0.49	−148	11.8	99	0.04	56	0.46	−42
		800	0.48	−161	8.3	92	0.04	59	0.42	−41
		1000	0.46	−170	6.7	86	0.05	59	0.41	−44
		1500	0.41	−171	4.4	75	0.07	70	0.42	−45
		2000	0.40	152	3.3	66	0.09	71	0.41	−50
		2500	0.39	135	2.6	59	0.11	71	0.41	−55
		3000	0.45	116	2.2	53	0.14	73	0.42	−61
		3500	0.50	108	1.9	46	0.17	70	0.39	−70
		4000	0.55	94	1.6	41	0.19	67	0.41	−76
		5000	0.61	87	1.3	32	0.22	62	0.34	−114
		6000	0.58	85	1.1	21	0.27	63	0.43	−135
	30	100	0.45	−82	36.3	142	0.01	62	0.79	−23
		200	0.48	−121	25.5	121	0.01	48	0.62	−31
		400	0.49	−152	14.6	103	0.02	58	0.47	−33
		600	0.50	−166	10.2	93	0.03	60	0.44	−34
		800	0.49	−175	7.7	87	0.04	65	0.42	−34
		1000	0.48	177	6.1	81	0.05	76	0.43	−37
		1500	0.45	162	4.1	71	0.07	75	0.45	−39
		2000	0.45	145	3.0	62	0.09	78	0.44	−46
		2500	0.44	130	2.4	56	0.11	79	0.44	−53
		3000	0.50	113	1.9	50	0.13	79	0.45	−58
		3500	0.55	105	1.6	43	0.15	75	0.44	−70
		4000	0.61	92	1.5	39	0.19	73	0.45	−76
		5000	0.65	84	1.2	30	0.24	68	0.43	−100
		6000	0.61	82	1.0	19	0.28	64	0.48	−135

Table 3. MRF9411LT1 Common Emitter S–Parameters (continued)

V_{CE} (Vdc)	I_C (mA)	f (MHz)	NF_{min} (dB)	Γ_o (MAG, ANGLE)	r_N
6	5	1000 1500	1.8 2.1	0.33 ∠ 77 0.26 ∠ 141	0.28 0.3

Table 4. MRF947 Series Typical Noise Parameters

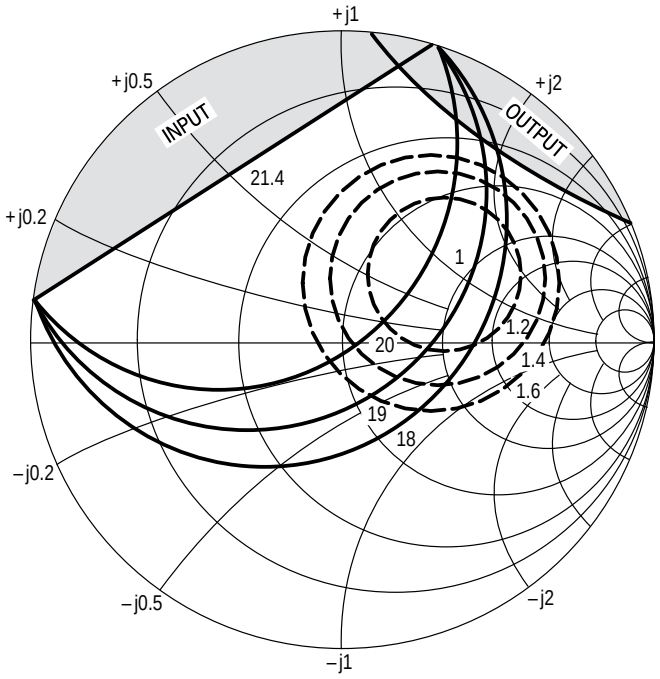
V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
1.0	0.5	100	0.966	−11.46	1.776	170.10	0.031	82.57	0.998	−4.70
		200	0.956	−23.02	1.735	160.72	0.061	75.42	0.991	−9.25
		500	0.892	−54.71	1.587	132.34	0.135	54.85	0.923	−21.14
		900	0.749	−91.29	1.355	104.19	0.185	35.43	0.827	−33.53
		1000	0.720	−100.07	1.300	98.21	0.190	31.61	0.808	−35.99
		1500	0.637	−134.17	1.057	72.77	0.196	18.05	0.743	−47.18
		2000	0.587	−163.82	0.883	53.17	0.176	12.30	0.708	−58.12
		3000	0.572	149.42	0.672	27.46	0.149	33.04	0.680	−81.83
	1.0	100	0.941	−14.07	3.391	168.35	0.031	81	0.991	−6.46
		200	0.921	−28.11	3.285	157.61	0.060	73	0.974	−12.40
		500	0.806	−64.76	2.844	127.72	0.123	51.40	0.852	−26.69
		900	0.638	−103.89	2.196	100.55	0.158	35.25	0.717	−38.67
		1500	0.533	−145.86	1.580	72.45	0.168	25.20	0.619	−50.31
		2000	0.495	−173.94	1.281	54.58	0.164	25.37	0.581	−59.87
		3000	0.494	143.54	0.956	28.72	0.187	39.10	0.554	−81.37
2.0	0.5	100	0.979	−9.26	1.827	172.62	0.030	84.74	0.996	−4.04
		200	0.960	−18.37	1.909	164.83	0.060	79.81	0.991	−8.55
		500	0.920	−42.91	1.652	143.57	0.132	64.52	0.940	−18.86
		1000	0.749	−77.43	1.451	116.35	0.196	46.87	0.842	−32.38
		1500	0.674	−104.70	1.190	93.78	0.214	35.67	0.774	−39.43
		2000	0.548	−128.41	1.077	79.19	0.189	33.18	0.692	−43.43
		3000	0.480	−177.94	0.808	60.10	0.153	55.32	0.625	−52.49
	2.0	100	0.907	−16.39	6.640	167.45	0.029	80.99	0.977	−8.61
		200	0.846	−31.62	6.419	155.54	0.054	72.92	0.944	−16.93
		500	0.711	−67.85	4.874	128.23	0.104	57.29	0.770	−31.67
		1000	0.495	−106.45	3.178	102.77	0.138	49.89	0.603	−41.27
		1500	0.405	−131.24	2.358	86.49	0.157	52.19	0.542	−44.76
		2000	0.314	−154.66	1.910	75.22	0.173	58.26	0.490	−43.65
		3000	0.296	157.52	1.394	59.09	0.228	67.66	0.454	−47.05
	5.0	100	0.780	−27.85	14.100	158.94	0.027	77.86	0.932	−15.42
		200	0.676	−51.21	12.219	141.68	0.046	66.87	0.831	−27.35
		500	0.470	−94.63	7.373	112.66	0.078	58.67	0.568	−39.84
		1000	0.327	−131.66	4.148	92.48	0.114	62.28	0.436	−42.57
		1500	0.271	−152.62	2.921	80.85	0.151	66.45	0.413	−44.18
		2000	0.218	−177.42	2.295	71.76	0.188	69.38	0.394	−40.58
		3000	0.237	138.31	1.661	58.25	0.265	70.37	0.372	−42.71

(continued)

Table 5. MRF947 Series Common Emitter S–Parameters

V_{CE} (Volts)	I_C (mA)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ	Mag	∠ϕ
2.0	10	100	0.608	−43.09	21.812	149.09	0.022	71.64	0.859	−22.70
		200	0.488	−73.47	16.618	128.80	0.038	64.60	0.689	−35.49
		500	0.330	−118.69	8.427	103.30	0.065	66.23	0.438	−41.16
		1000	0.262	−152.10	4.484	87.25	0.109	70.70	0.354	−40.02
		1500	0.227	−168.95	3.114	77.14	0.155	72.85	0.358	−41.98
		2000	0.197	166.15	2.423	69.47	0.198	73.10	0.355	−37.94
		3000	0.233	128.04	1.755	57.14	0.281	71.04	0.338	−40.40
	30	100	0.353	−99.56	25.543	130.99	0.018	69.51	0.653	−28.97
		200	0.353	−134.75	15.823	111.86	0.026	68.27	0.484	−33.62
		500	0.346	−163.46	6.979	93.31	0.054	75.98	0.367	−28.62
		1000	0.337	177.40	3.637	80.00	0.103	78.84	0.351	−30.05
		1500	0.324	165.83	2.518	71.06	0.150	79.14	0.372	−35.60
		2000	0.319	148.22	1.975	62.92	0.197	78.29	0.378	−34.91
		3000	0.374	122.07	1.441	50.52	0.290	74.82	0.363	−41.67
6.0	0.5	100	0.978	−8.66	1.791	173.27	0.024	85.89	0.995	−3.57
		200	0.964	−16.94	1.889	166.10	0.049	79.87	0.994	−7.32
		500	0.932	−40.03	1.643	146.36	0.110	66.84	0.953	−16.19
		1000	0.765	−72.66	1.473	120.56	0.165	50.45	0.869	−28.01
		1500	0.688	−99.80	1.206	98.40	0.184	39.36	0.812	−34.63
		2000	0.554	−123.40	1.099	83.59	0.162	38.05	0.735	−38.23
		3000	0.463	−174.05	0.823	63.88	0.136	63.33	0.671	−46.47
	2.0	100	0.918	−14.76	6.614	168.34	0.023	83.55	0.983	−7.19
		200	0.862	−28.56	6.456	157.28	0.045	75.14	0.956	−14.02
		500	0.729	−62.16	5.010	131.12	0.089	60.10	0.809	−26.64
		1000	0.504	−98.85	3.344	105.76	0.121	53.16	0.654	−35.06
		1500	0.397	−123.02	2.485	89.51	0.137	55.48	0.599	−38.01
		2000	0.295	−145.96	2.013	78.14	0.152	61.91	0.553	−37.03
		3000	0.257	161.75	1.452	61.78	0.202	72.72	0.523	−40.30
	5.0	100	0.806	−24.38	14.025	160.52	0.022	78.28	0.947	−12.67
		200	0.704	−45.03	12.425	144.30	0.040	70.14	0.861	−22.52
		500	0.487	−85.18	7.751	115.51	0.068	61.61	0.627	−32.81
		1000	0.316	−120.17	4.399	95.11	0.101	64.59	0.505	−34.64
		1500	0.245	−140.68	3.112	83.14	0.134	69.35	0.488	−36.12
		2000	0.177	−166.20	2.447	74.39	0.167	72.13	0.473	−33.43
		3000	0.185	139.55	1.743	60.74	0.237	74.04	0.457	−35.82
	10	100	0.657	−36.69	22.098	151.43	0.019	74.63	0.888	−18.25
		200	0.526	−63.52	17.304	131.70	0.033	67.90	0.741	−28.80
		500	0.328	−104.79	9.028	105.89	0.056	66.80	0.509	−32.64
		1000	0.228	−138.09	4.844	89.49	0.096	72.77	0.438	−31.28
		1500	0.184	−156.11	3.359	79.89	0.138	75.02	0.440	−33.55
		2000	0.140	175.01	2.591	72.03	0.175	76.11	0.441	−30.73
		3000	0.172	126.26	1.852	59.99	0.249	74.64	0.430	−33.31
	20	100	0.492	−53.13	28.934	141.62	0.017	72.00	0.808	−22.96
		200	0.372	−85.00	19.971	121.25	0.028	69.78	0.630	−30.71
		500	0.249	−126.97	9.335	99.50	0.053	73.73	0.454	−28.28
		1000	0.201	−156.11	4.878	86.00	0.094	77.63	0.418	−26.90
		1500	0.174	−171.44	3.358	77.41	0.138	78.54	0.432	−30.20
		2000	0.149	160.61	2.580	70.07	0.177	78.20	0.444	−28.32
		3000	0.193	120.90	1.852	58.27	0.253	75.92	0.435	−31.73

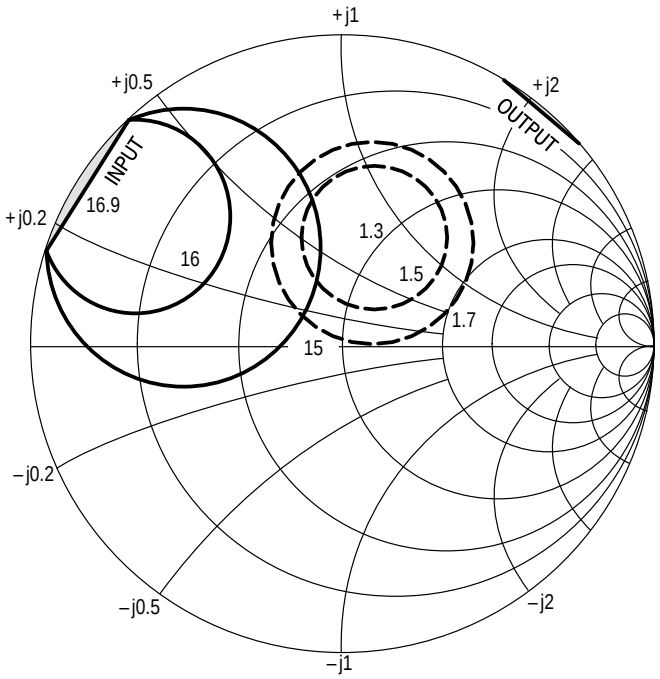
Table 5. MRF947 Series Common Emitter S–Parameters (continued)



V_{CE} = 6.0 V
I_C = 5.0 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
0.5	1.0	0.42 ∠ 32°	18	0.71

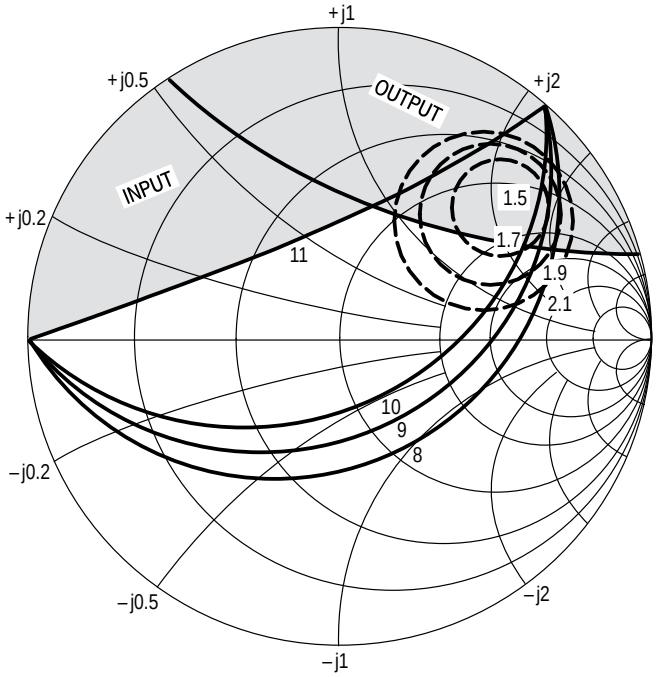
Figure 16. MRF941 Constant Gain and Noise Figure Contours (f = 0.5 GHz)



V_{CE} = 6.0 V
I_C = 5.0 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
1.0	1.30	0.38 ∠ 72°	16	0.98

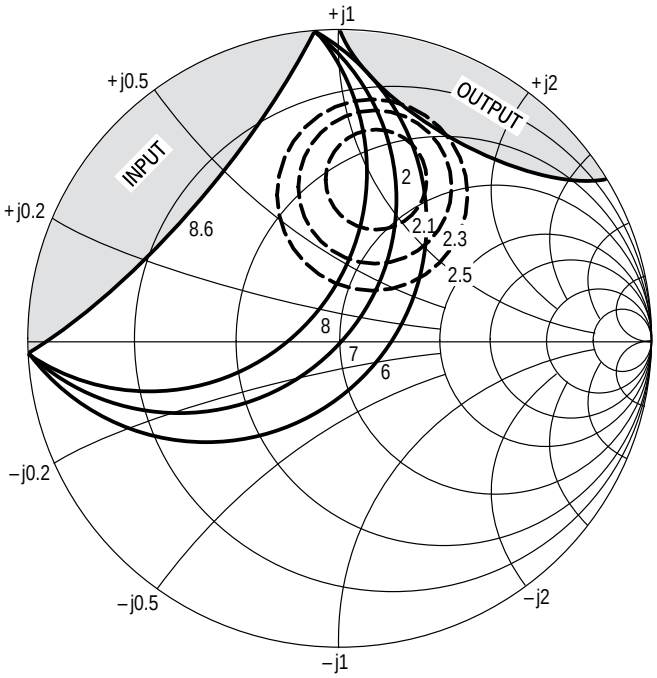
Figure 17. MRF941 Constant Gain and Noise Figure Contours (f = 1.0 GHz)



V_{CE} = 1.0 V
I_C = 0.5 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
0.5	1.54	0.71 ∠ 39°	38	0.28

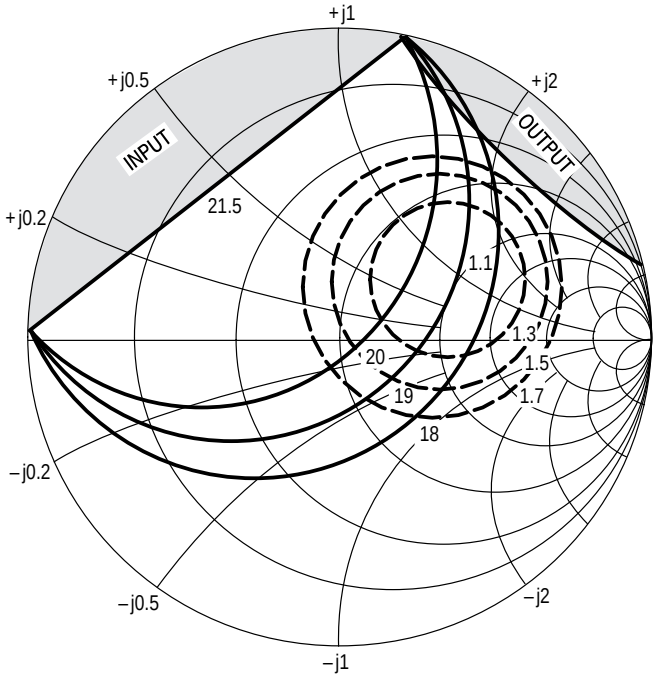
Figure 18. MMBR941LT1, T3 Constant Gain and Noise Figure Contours (f = 1.0 GHz)



V_{CE} = 1.0 V
I_C = 0.5 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
1.0	1.95	0.55 ∠ 76°	28	0.51

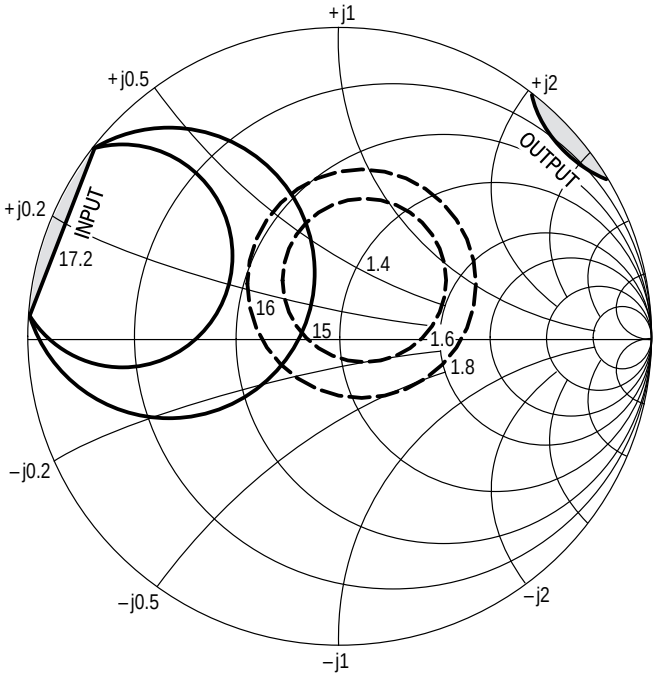
Figure 19. MMBR941LT1, T3 Constant Gain and Noise Figure Contours (f = 0.5 GHz)



V_{CE} = 6.0 V
I_C = 5.0 mA
▢ — AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
0.5	1.10	0.43 ∠ 30°	18	0.67

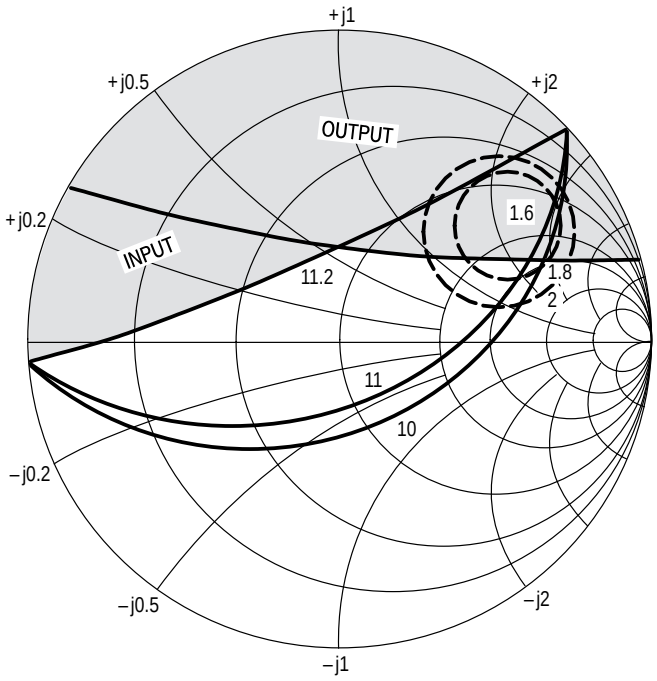
Figure 20. MMBR941LT1, T3 Constant Gain and Noise Figure Contours (f = 0.5 GHz)



V_{CE} = 6.0 V
I_C = 5.0 mA
▢ — AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
1.0	1.40	0.22 ∠ 64°	13	0.96

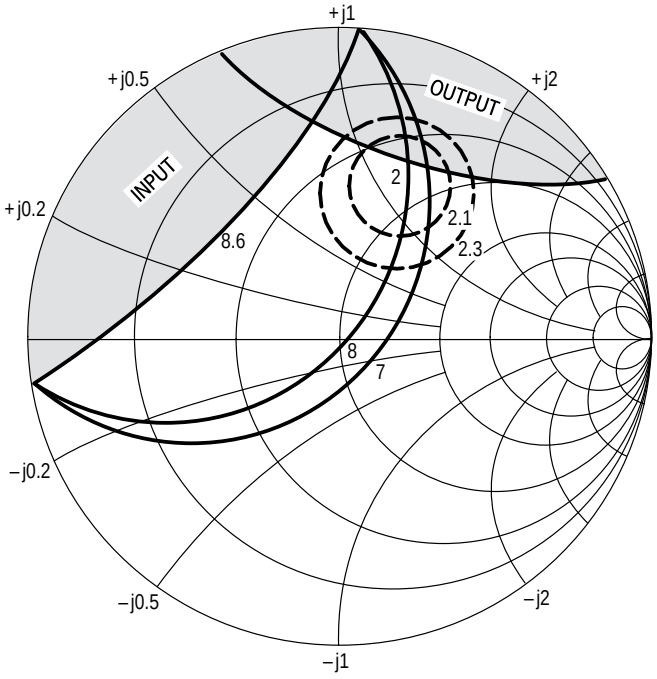
Figure 21. MMBR941LT1, T3 Constant Gain and Noise Figure Contours (f = 1.0 GHz)



V_{CE} = 1.0 V
I_C = 0.5 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
0.5	1.60	0.70 ∠ 35°	40	0.22

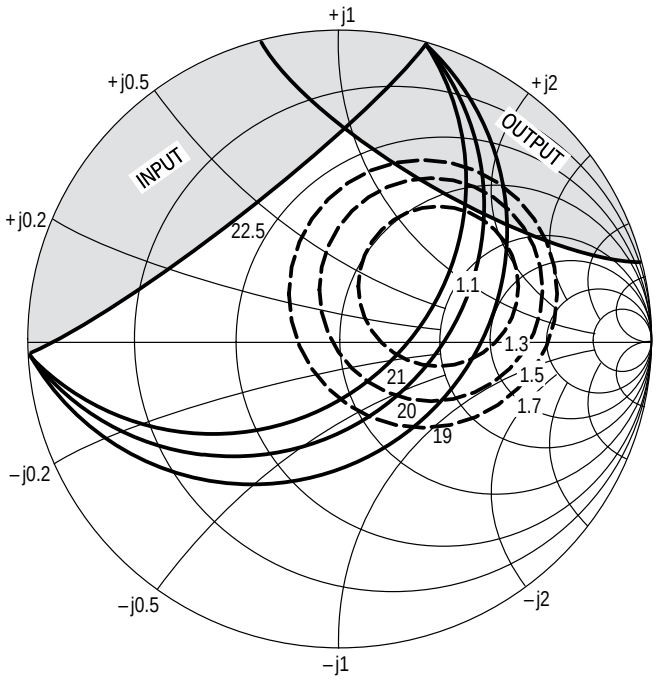
Figure 22. MRF9411LT1 Constant Gain and Noise Figure Contours (f = 0.5 GHz)



V_{CE} = 1.0 V
I_C = 0.5 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
1.0	1.95	0.55 ∠ 69°	30	0.39

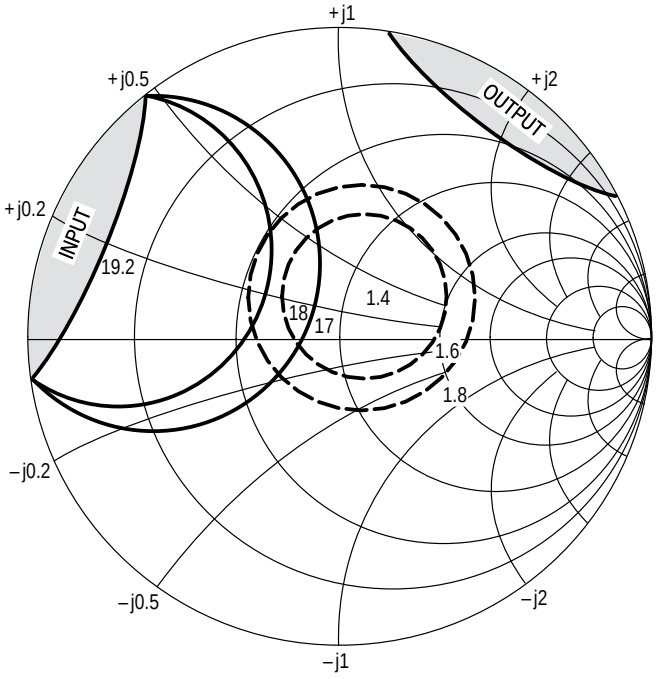
Figure 23. MRF9411LT1 Constant Gain and Noise Figure Contours (f = 1.0 GHz)



V_{CE} = 6.0 V
I_C = 5.0 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
0.5	1.10	0.40 ∠ 28°	17	0.43

Figure 24. MRF9411LT1 Constant Gain and Noise Figure Contours (f = 0.5 GHz)



V_{CE} = 6.0 V
I_C = 5.0 mA
— AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	ΓMS NF OPT	Rn	K
1.0	1.40	0.17 ∠ 60°	13	0.74

Figure 25. MRF9411LT1 Constant Gain and Noise Figure Contours (f = 1.0 GHz)

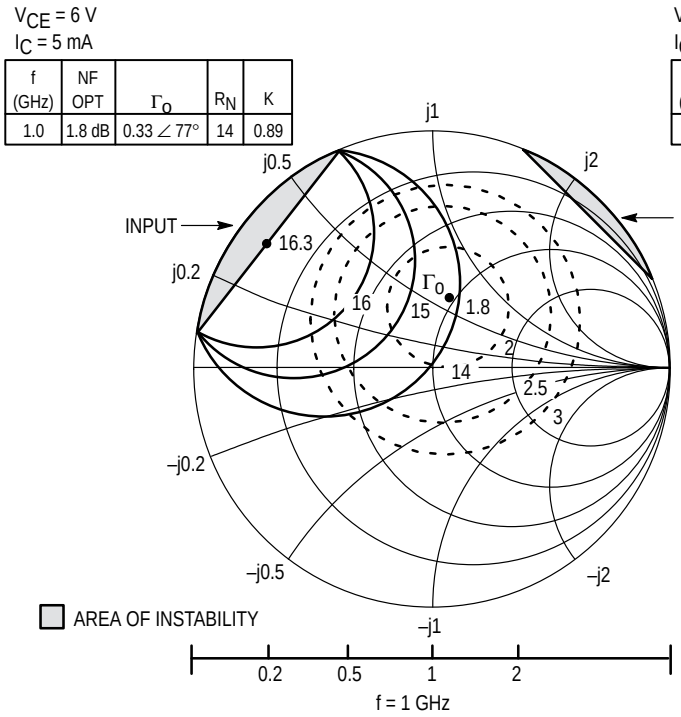


Figure 26. MRF947 Series Constant Gain and Noise Figure Contours

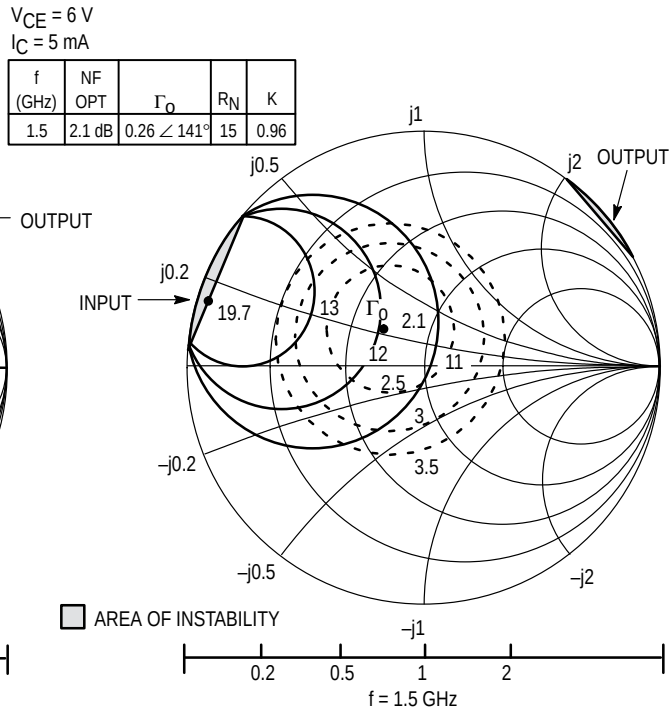


Figure 27. MRF947 Series Constant Gain and Noise Figure Contours

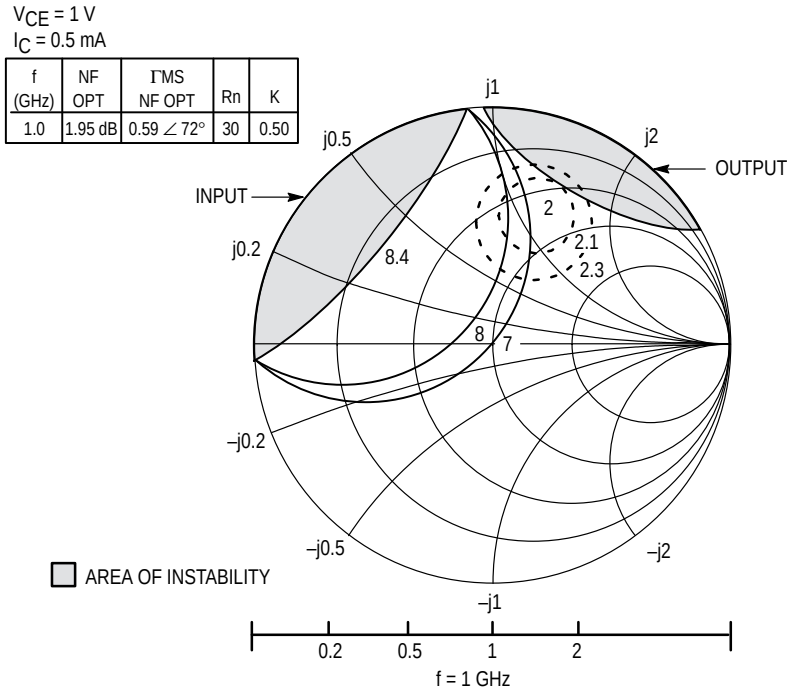
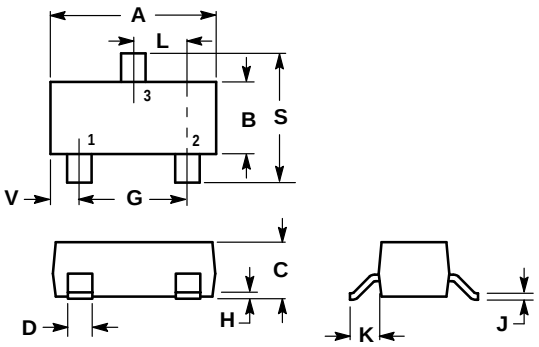


Figure 28. MRF947 Series Constant Gain and Noise Figure Contours

PACKAGE DIMENSIONS

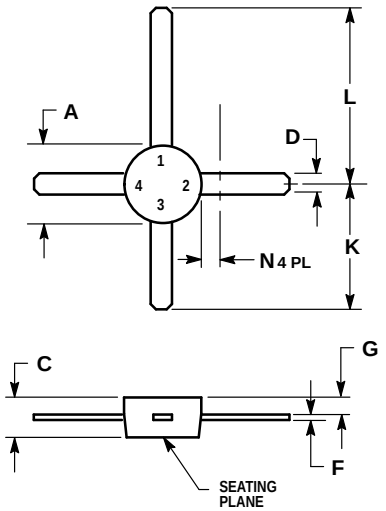


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIUMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	INCHES		MILLIMETERS	
DIM	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 AE
MMBR941LT1, T3, MMBR941BLT1, T3

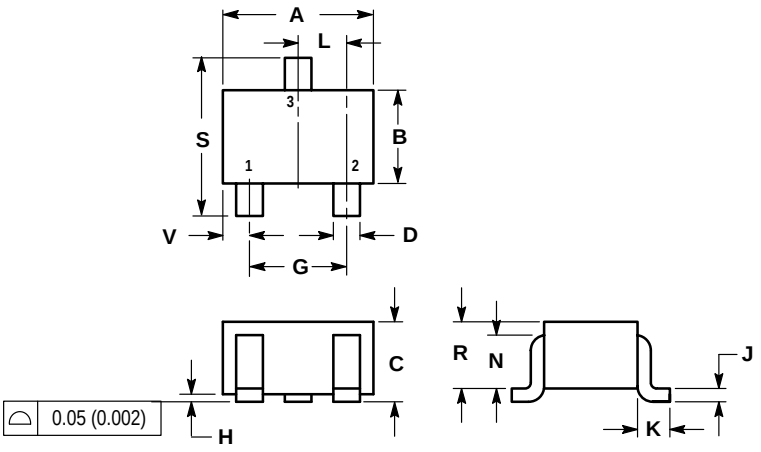


NOTES:
1. DIMENSION D NOT APPLICABLE IN ZONE N.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.44	5.21	0.175	0.205
C	1.90	2.54	0.075	0.100
D	0.84	0.99	0.033	0.039
F	0.20	0.30	0.080	0.012
G	0.76	1.14	0.030	0.045
K	7.24	8.13	0.285	0.320
L	10.54	11.43	0.415	0.450
N	—	1.65	—	0.065

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

CASE 317–01
ISSUE E
MRF941



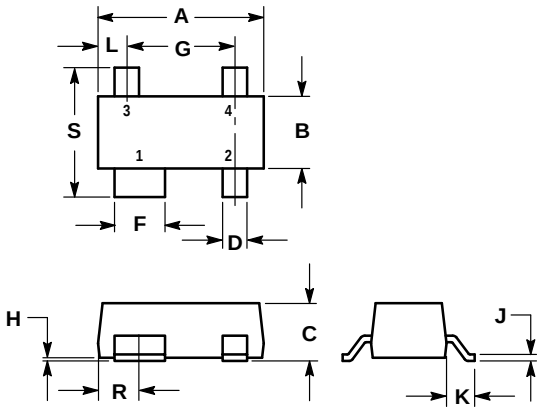
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.035	0.049	0.90	1.25
D	0.012	0.016	0.30	0.40
G	0.047	0.055	1.20	1.40
H	0.000	0.004	0.00	0.10
J	0.004	0.010	0.10	0.25
K	0.017 REF		0.425 REF	
L	0.026 BSC		0.650 BSC	
N	0.028 REF		0.700 REF	
R	0.031	0.039	0.80	1.00
S	0.079	0.087	2.00	2.20
V	0.012	0.016	0.30	0.40

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

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

CASE 419–02
ISSUE G
MRF947AT1, MRF947BT1, T3,
MRF947T1, T3
MRF947RT3



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

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.80	3.04	0.110	0.120
B	1.20	1.39	0.047	0.055
C	0.84	1.14	0.033	0.045
D	0.39	0.50	0.015	0.020
F	0.79	0.93	0.031	0.037
G	1.78	2.03	0.070	0.080
H	0.013	0.10	0.0005	0.004
J	0.08	0.15	0.003	0.006
K	0.46	0.60	0.018	0.024
L	0.445	0.60	0.0175	0.024
R	0.72	0.83	0.028	0.033
S	2.11	2.48	0.083	0.098

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

CASE 318A–05
ISSUE J
MRF9411LT1, MRF9411BLT1, T3

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MMBR941LT1/D