NEC

SILICON TRANSISTOR
2SC3603

NPN EPITAXIAL SILICON TRANSISTOR
FOR MICROWAVE LOW-NOISE AMPLIFICATION

The 2SC3603 is an NPN epitaxial transistor designed for low-noise amplification at 0.5 to 4.0 GHz. This transistor has low-noise and high-gain characteristics in a wide collector current region, and has a wide dynamic range.

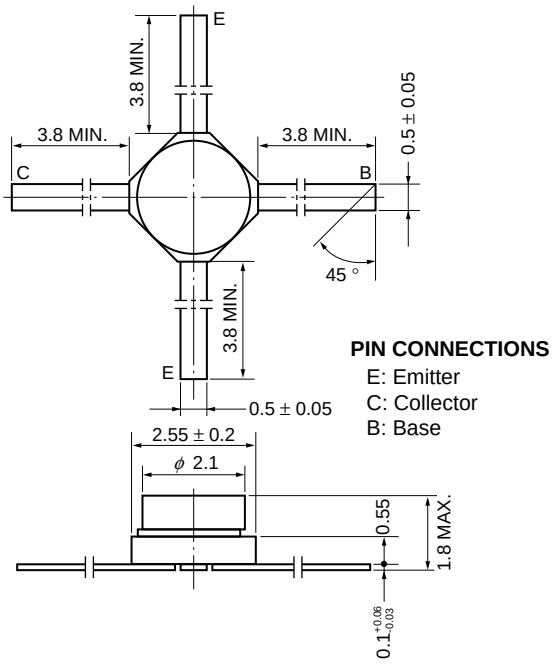
FEATURES

- Low noise : NF = 2.1 dB TYP. @ f = 2.0 GHz
- High power gain : G_A = 10 dB TYP. @ f = 2.0 GHz

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	12	V
Emitter to Base Voltage	V_{EBO}	3	V
Collector Current	I_C	100	mA
Total Power Dissipation	$P_{T\ (T_C = 25\ °C)}$	580	mW
Junction Temperature	T_j	200	°C
Storage Temperature	T_{stg}	-65 to +150	°C

PACKAGE DIMENSIONS (in mm)



PIN CONNECTIONS
E: Emitter
C: Collector
B: Base

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 10 V, I_E = 0			1.0	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0			1.0	μA
DC Current Gain	h_{FE}	V_{CE} = 10 V, I_C = 20 mA Pulse	50	120	300	
Gain Bandwidth Product	f_T	V_{CE} = 10 V, I_C = 20 mA		7		GHz
Reverse Transfer Capacitance	C_{re}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		0.5	1.0	pF
Noise Figure	NF^{Note}	V_{CE} = 10 V, I_C = 7 mA, f = 2 GHz		2.1	3.4	dB
Insertion Gain	$\|S_{21e}\|^2$	V_{CE} = 10 V, I_C = 20 mA, f = 2 GHz	7.0	9.0		dB
Maximum Available Gain	MAG	V_{CE} = 10 V, I_C = 20 mA, f = 2 GHz	10.0	12.0		dB
Power Gain	G_A	V_{CE} = 10 V, I_C = 7 mA, f = 2 GHz		10		dB

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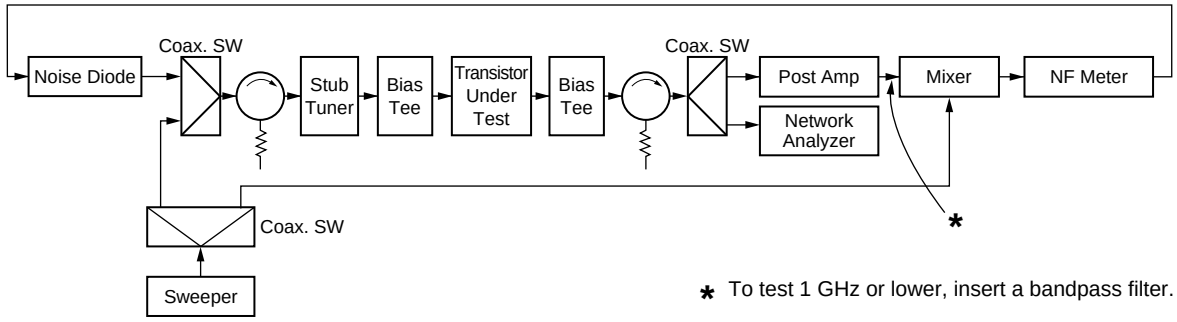
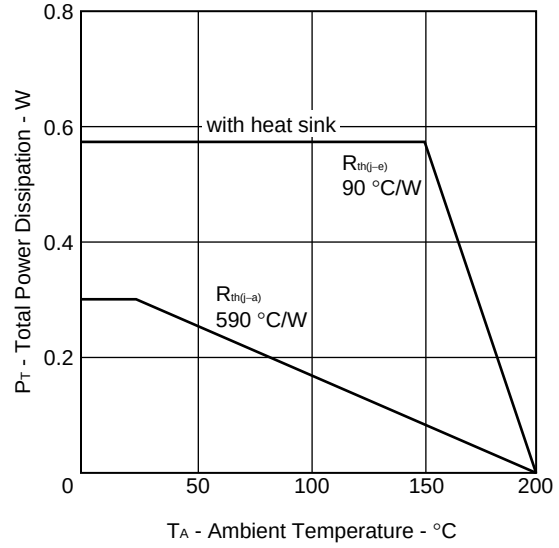
Note Test block diagram



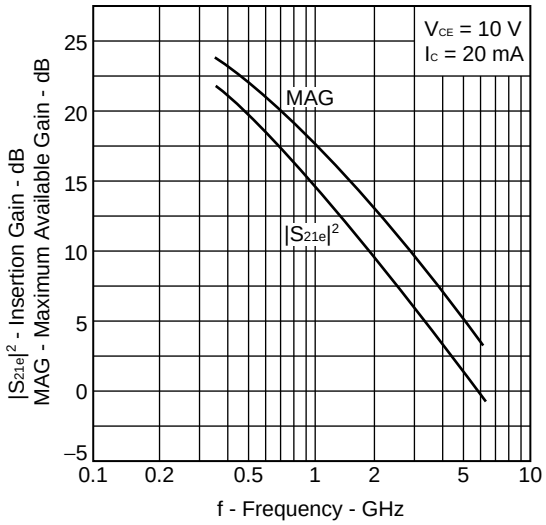
* To test 1 GHz or lower, insert a bandpass filter.

TYPICAL CHARACTERISTICS (T_A = 25 °C)

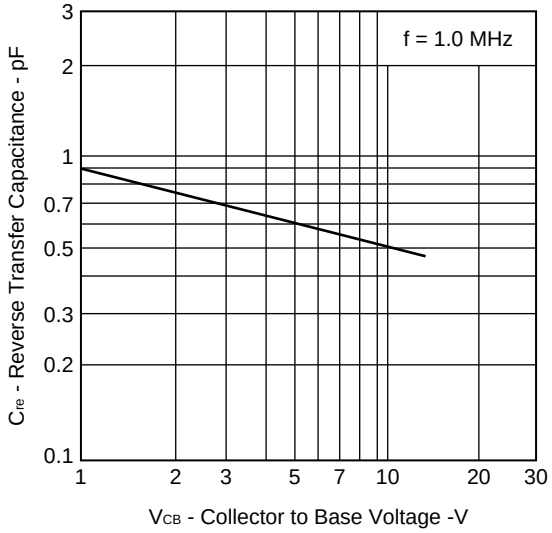
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



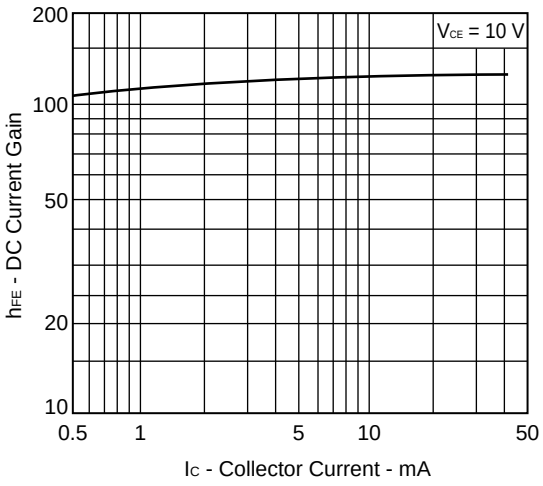
MAG AND INSERTION GAIN vs. FREQUENCY



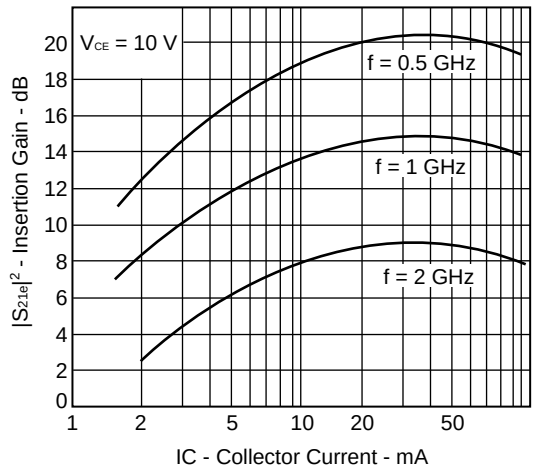
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



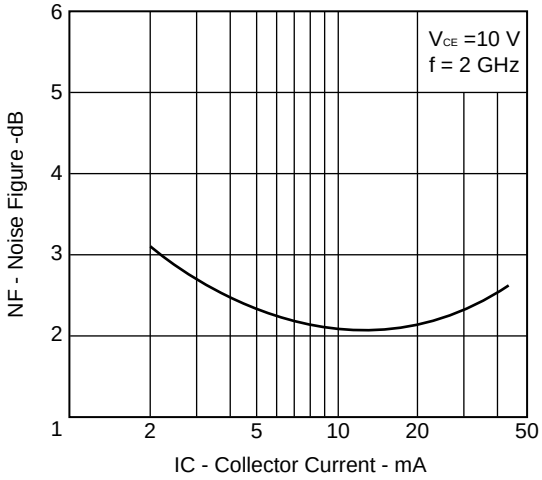
DC CURRENT GAIN vs. COLLECTOR CURRENT



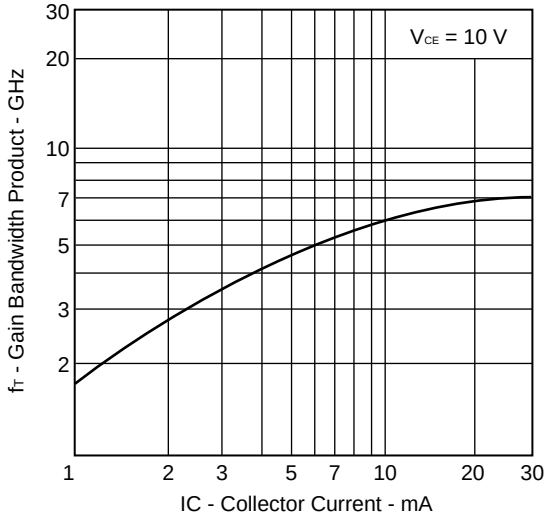
INSERTION GAIN vs.
COLLECTOR CURRENT



NOISE FIGURE vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs.
COLLECTOR CURRENT



S PARAMETER

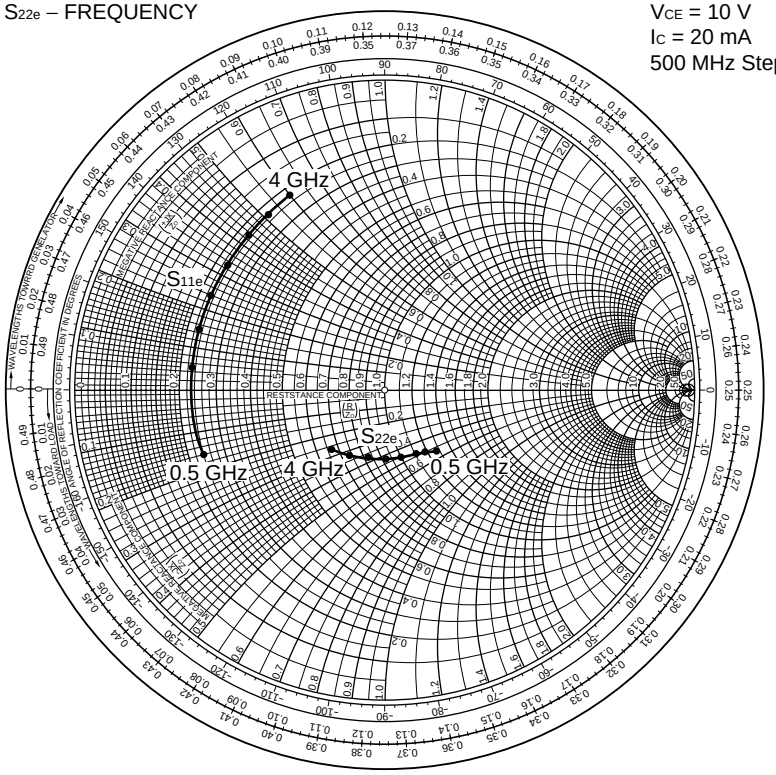
V_{CE} = 10 V, I_C = 20 mA, Z_O = 50 Ω

f (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
500	.629	−160.8	10.100	92.6	.040	41.5	.256	−49.0
1000	.631	175.8	5.411	75.1	.048	51.4	.244	−57.2
1500	.628	162.5	3.565	60.6	.070	59.2	.232	−66.8
2000	.646	152.2	2.720	48.4	.086	56.0	.22	−77.4
2500	.659	142.1	2.161	38.8	.105	52.2	.213	−89.1
3000	.677	132.0	1.916	25.7	.127	45.1	.217	−103.1
3500	.695	123.8	1.585	14.3	.151	39.7	.232	−119.5
4000	.713	116.5	1.392	5.3	.168	34.8	.254	−134.0

S PARAMETER

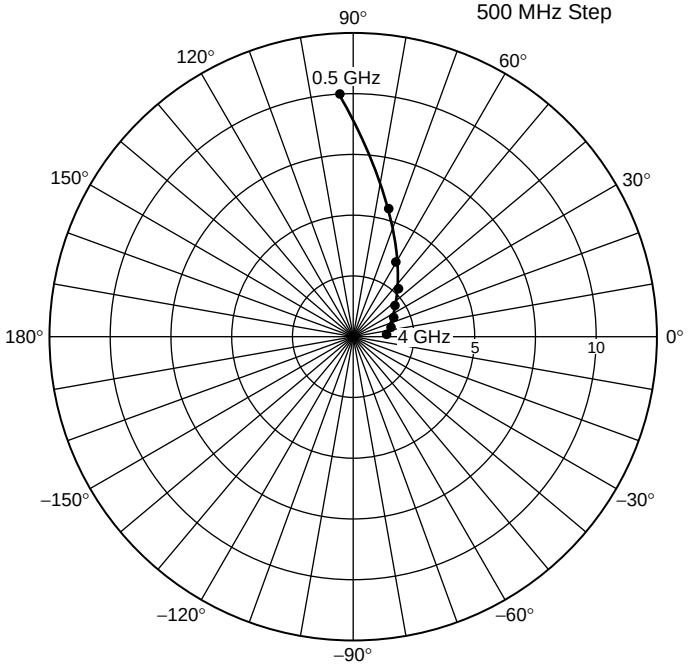
S_{11e}, S_{22e} – FREQUENCY

V_{CE} = 10 V
I_C = 20 mA
500 MHz Step



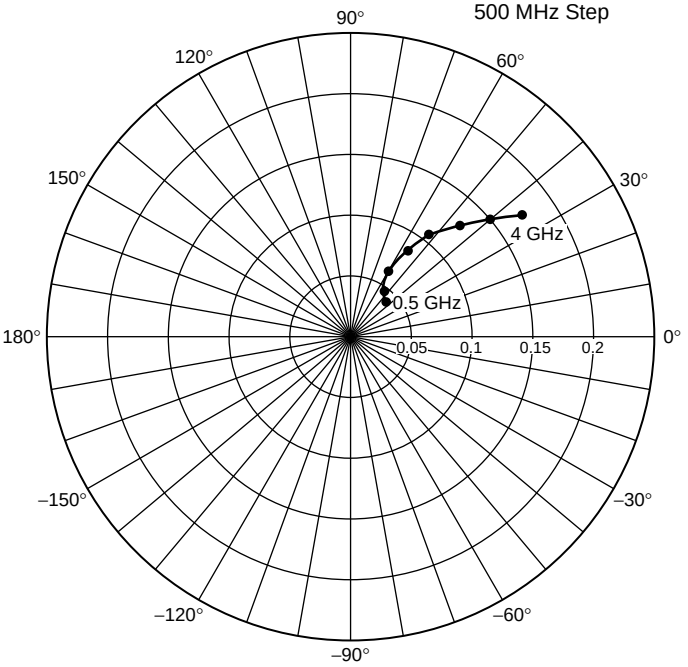
S_{21} – FREQUENCY

V_{CC} = 10 V
I_C = 20 mA
500 MHz Step



S_{12} – FREQUENCY

V_{CE} = 10 V
I_C = 20 mA
500 MHz Step



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