NEC

SILICON TRANSISTOR
2SC3583

MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR

DESCRIPTION

The 2SC3583 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This is achieved by direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique.

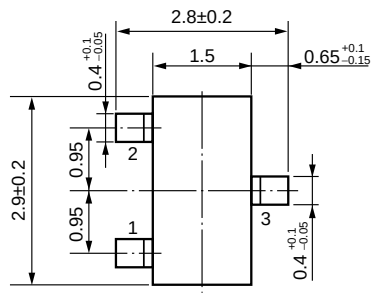
FEATURES

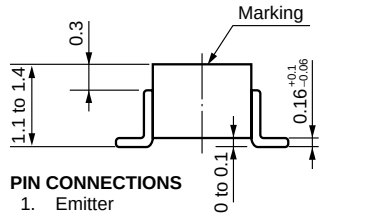
- NF 1.2 dB TYP. @f = 1.0 GHz
- Ga 13 dB TYP. @f = 1.0 GHz

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	10	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_C	65	mA
Total Power Dissipation	P_T	200	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

PACKAGE DIMENSIONS
(Units: mm)





PIN CONNECTIONS
1. Emitter
2. Base
3. Collector

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CBO}			1.0	μA	V_{CB} = 10 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			1.0	μA	V_{EB} = 1 V, I_E = 0
DC Current Gain	h_{FE} *	50	100	250		V_{CE} = 8 V, I_C = 20 mA
Gain Bandwidth Product	f_T		9		GHz	V_{CE} = 8 V, I_C = 20 mA
Feed-Back Capacitance	C_{re} **		0.35	0.9	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
Insertion Power Gain	$\|S_{21e}\|^2$	11	13		dB	V_{CE} = 8 V, I_C = 20 mA, f = 1.0 GHz
Maximum Available Gain	MAG		15		dB	V_{CE} = 8 V, I_C = 20 mA, f = 1.0 GHz
Noise Figure	NF		1.2	2.5	dB	V_{CE} = 8 V, I_E = 7 mA, f = 1.0 GHz

* Pulse Measurement PW ≤ 350 μs, Duty Cycle ≤ 2 %

** The emitter terminal and the case shall be connected to the gurad terminal of the three-terminal capacitance bridge.

h_{FE} Classification

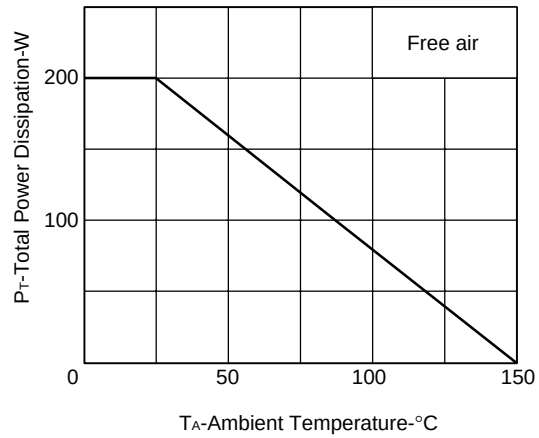
Class	R33/Q *	R34/R *	R35/S *
Marking	R33	R34	R35
h_{FE}	50 to 100	80 to 160	125 to 250

* Old Specification / New Specification

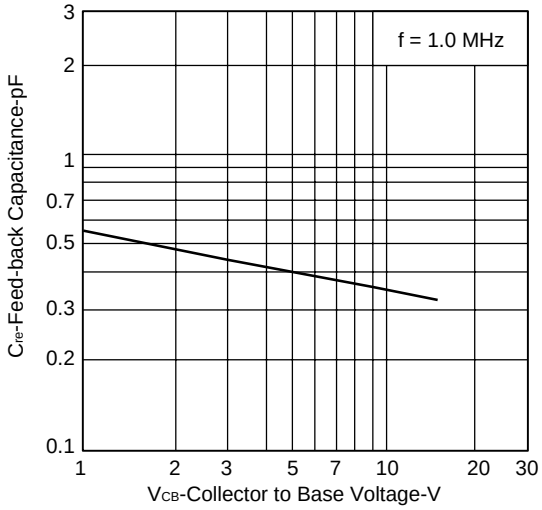
Document No. P10360EJ4V1DS00 (4th edition)
Date Published March 1997 N
Printed in Japan

TYPICAL CHARACTERISTICS (T_A = 25 °C)

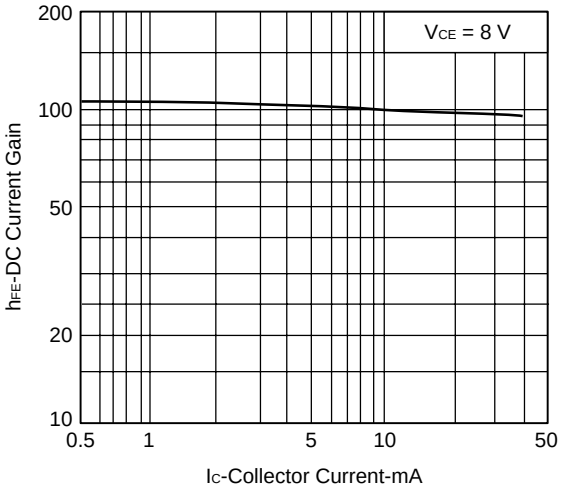
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



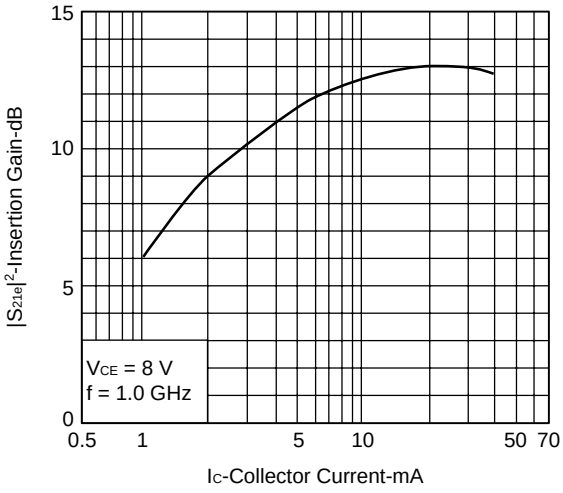
FEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



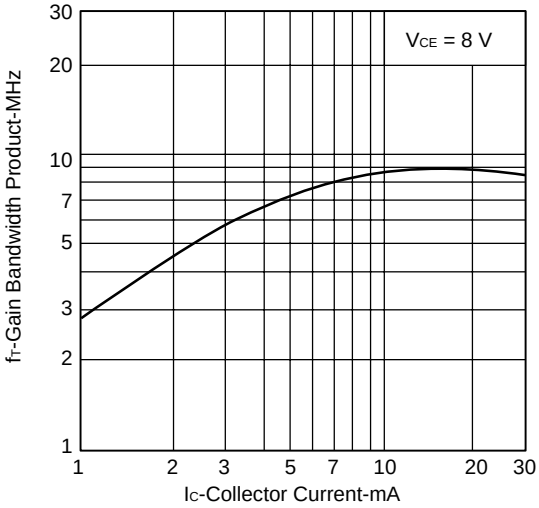
DC CURRENT GAIN vs.
COLLECTOR CURRENT



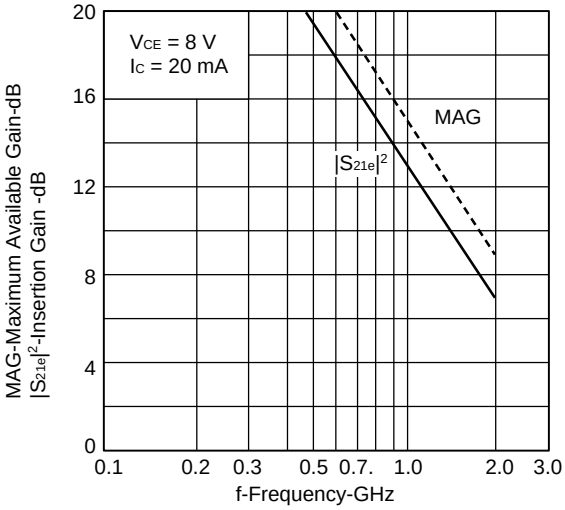
INSERTION GAIN vs.
COLLECTOR CURRENT

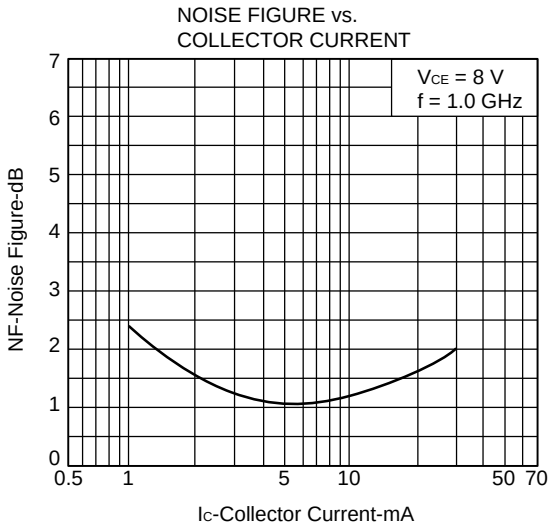


GAIN BANDWIDTH PRODUUT vs.
COLLECTOR CURRENT



INSERTION GAIN, MAXIMUM AVAILABLE
GAIN vs. FREQUENCY





S-PARAMETER

V_{CE} = 8.0 V, I_C = 5.0 mA, Z_O = 50 Ω

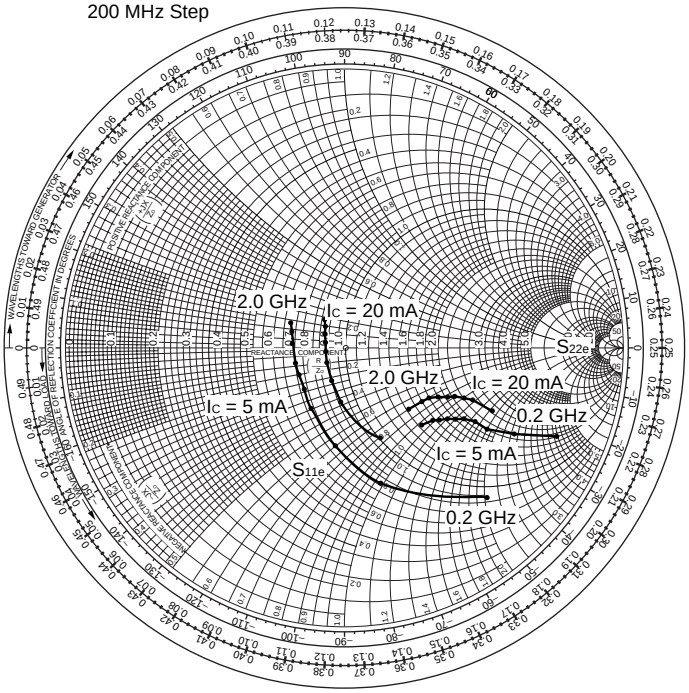
f (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
200	0.728	−45.3	12.107	138.7	0.036	66.2	0.825	−21.6
400	0.490	−74.5	8.097	114.2	0.065	61.6	0.675	−26.6
600	0.343	−93.2	6.260	102.3	0.079	61.6	0.582	−29.0
800	0.253	−110.1	4.623	90.1	0.090	61.2	0.529	−28.6
1000	0.202	−131.1	4.004	83.6	0.101	61.3	0.500	−30.1
1200	0.176	−148.9	3.250	75.8	0.125	60.8	0.470	−31.4
1400	0.176	−162.8	3.021	69.4	0.144	60.0	0.448	−33.4
1600	0.179	173.9	2.575	63.4	0.160	59.8	0.427	−34.8
1800	0.186	163.3	2.520	58.9	0.188	59.1	0.406	−37.5
2000	0.211	151.1	2.183	53.4	0.202	58.9	0.386	−44.5

V_{CE} = 8.0 V, I_C = 20 mA, Z_O = 50 Ω

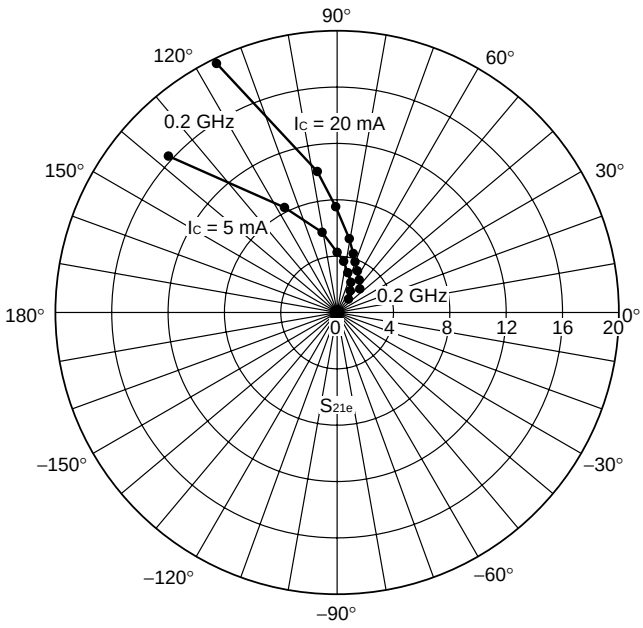
f (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
200	0.366	−66.8	19.757	116.9	0.033	62.6	0.587	−22.5
400	0.194	−88.9	10.502	98.8	0.055	70.6	0.485	−23.8
600	0.124	−104.3	7.591	91.1	0.072	74.6	0.453	−24.3
800	0.077	−132.0	5.446	82.0	0.095	73.2	0.419	−23.2
1000	0.063	−156.4	4.653	77.6	0.107	72.1	0.413	−24.2
1200	0.065	179.5	3.754	71.6	0.135	72.1	0.392	−26.4
1400	0.074	168.0	3.460	66.5	0.164	70.1	0.369	−29.9
1600	0.108	147.0	2.934	61.9	0.178	69.6	0.347	−32.2
1800	0.116	137.6	2.870	58.2	0.205	66.3	0.333	−34.3
2000	0.134	131.2	2.479	53.4	0.221	64.0	0.312	−42.1

S-PARAMETER

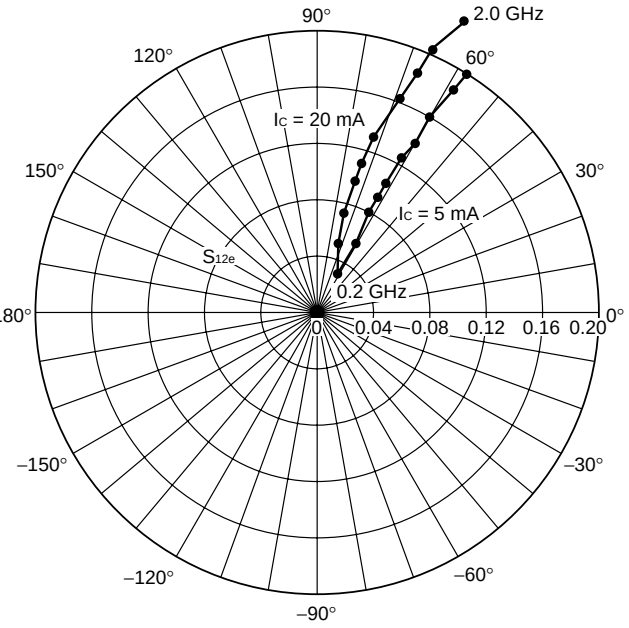
S_{11e}, S_{22e}-FREQUENCY CONDITION V_{CE} = 8 V
200 MHz Step



S_{21e}-FREQUENCY CONDITION V_{CE} = 8 V



S_{12e}-FREQUENCY CONDITION V_{CE} = 8 V



[MEMO]

[MEMO]

[MEMO]

M4 96.5