

MICROWAVE LOW NOISE AMPLIFIER  
NPN SILICON EPITAXIAL TRANSISTOR

DESCRIPTION

The 2SC3356 is an NPN silicon epitaxial transistor designed for low noise amplifier at VHF, UHF and CATV band.

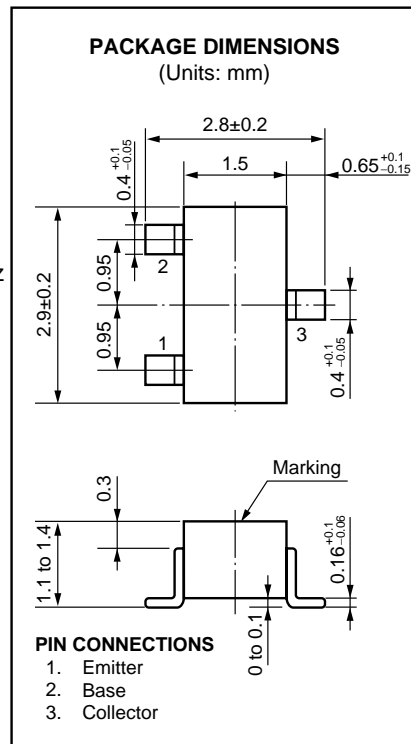
It has dynamic range and good current characteristic.

FEATURES

- Low Noise and High Gain  
NF = 1.1 dB TYP.,  $G_a = 11$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 7$  mA,  $f = 1.0$  GHz
- High Power Gain  
MAG = 13 dB TYP. @  $V_{CE} = 10$  V,  $I_c = 20$  mA,  $f = 1.0$  GHz

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$  °C)

Collector to Base Voltage	$V_{CBO}$	20	V
Collector to Emitter Voltage	$V_{CEO}$	12	V
Emitter to Base Voltage	$V_{EBO}$	3.0	V
Collector Current	$I_c$	100	mA
Total Power Dissipation	$P_T$	200	mW
Junction Temperature	$T_j$	150	°C
Storage Temperature	$T_{stg}$	-65 to +150	°C



ELECTRICAL CHARACTERISTICS ( $T_A = 25$  °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	$I_{CBO}$			1.0	$\mu A$	$V_{CB} = 10$ V, $I_E = 0$
Emitter Cutoff Current	$I_{EBO}$			1.0	$\mu A$	$V_{EB} = 1.0$ V, $I_C = 0$
DC Current Gain	$h_{FE}^*$	50	120	300		$V_{CE} = 10$ V, $I_c = 20$ mA
Gain Bandwidth Product	$f_T$		7		GHz	$V_{CE} = 10$ V, $I_c = 20$ mA
Feed-Back Capacitance	$C_{re}^{**}$		0.55	1.0	pF	$V_{CB} = 10$ V, $I_E = 0$ , $f = 1.0$ MHz
Insertion Power Gain	$ S_{21e} ^2$		11.5		dB	$V_{CE} = 10$ V, $I_c = 20$ mA, $f = 1.0$ GHz
Noise Figure	NF		1.1	2.0	dB	$V_{CE} = 10$ V, $I_c = 7$ mA, $f = 1.0$ GHz

\* Pulse Measurement  $PW \leq 350$   $\mu s$ , Duty Cycle  $\leq 2$  %

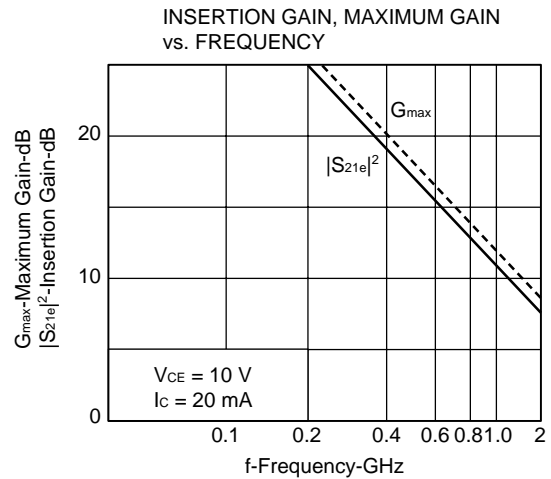
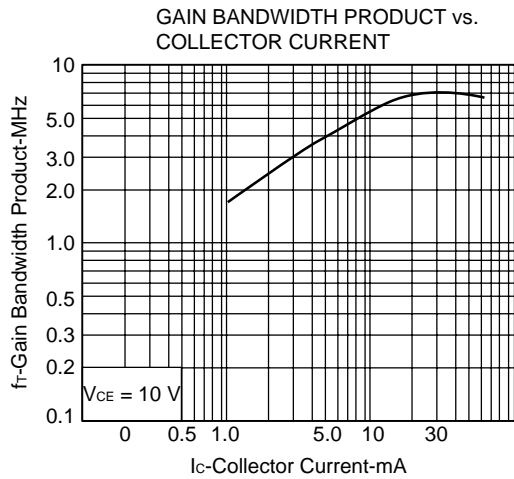
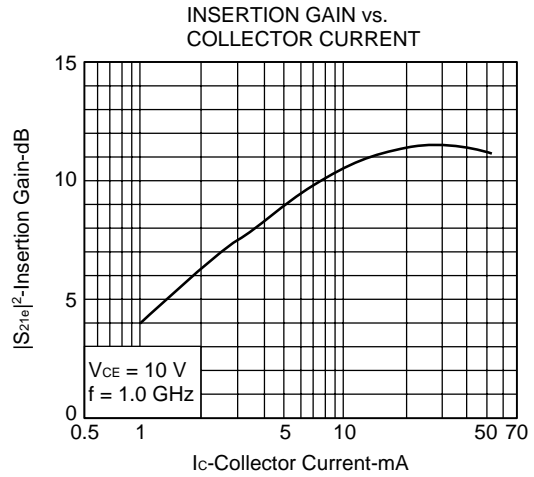
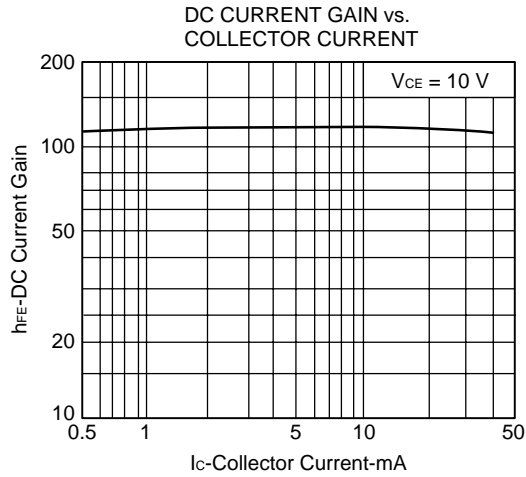
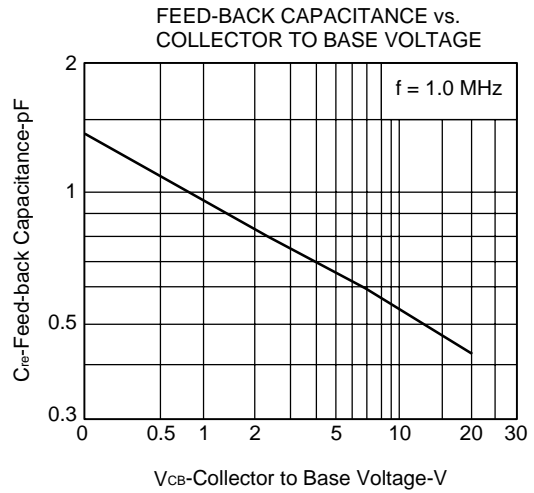
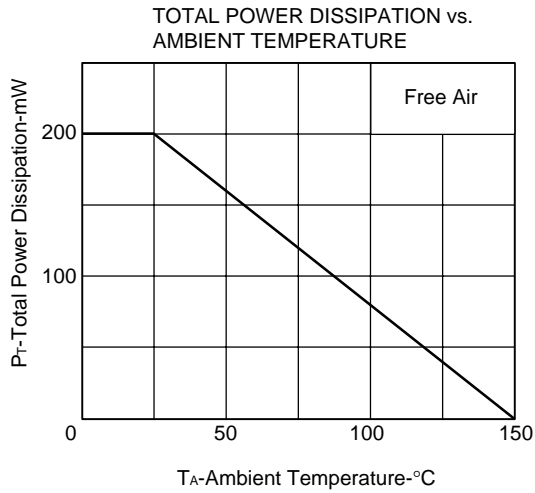
\*\* The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

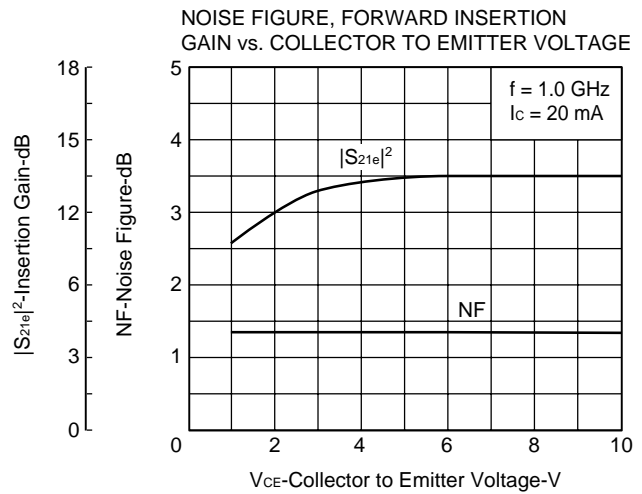
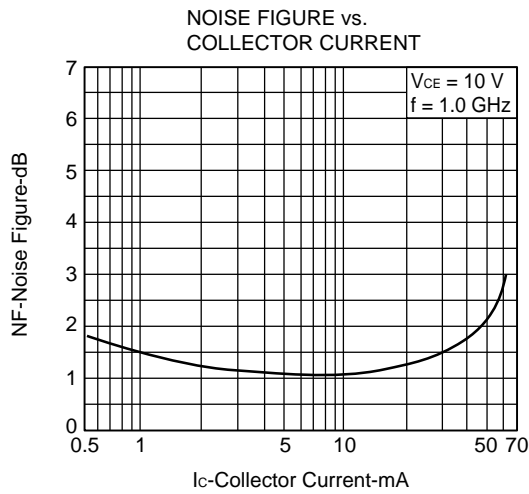
$h_{FE}$  Classification

Class	R23/Q *	R24/R *	R25/S *
Marking	R23	R24	R25
$h_{FE}$	50 to 100	80 to 160	125 to 250

\* Old Specification / New Specification

TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)





**S-PARAMETER**

$V_{CE} = 10\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $Z_o = 50\ \Omega$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.651	-69.3	10.616	129.3	0.051	59.2	0.735	-28.1
400	0.467	-113.3	6.856	104.4	0.071	54.4	0.550	-34.1
600	0.391	-139.3	4.852	90.9	0.086	56.0	0.468	-33.9
800	0.360	-159.2	3.802	81.2	0.101	59.1	0.426	-33.6
1000	0.360	-176.9	3.098	72.9	0.118	61.0	0.397	-35.7
1200	0.361	172.7	2.646	67.3	0.137	63.5	0.373	-38.3
1400	0.381	160.3	2.298	59.3	0.157	63.3	0.360	-43.0
1600	0.398	152.2	2.071	55.2	0.180	64.1	0.337	-45.9
1800	0.423	143.3	1.836	49.0	0.203	63.7	0.320	-52.3
2000	0.445	137.6	1.689	46.2	0.220	64.7	0.302	-52.2

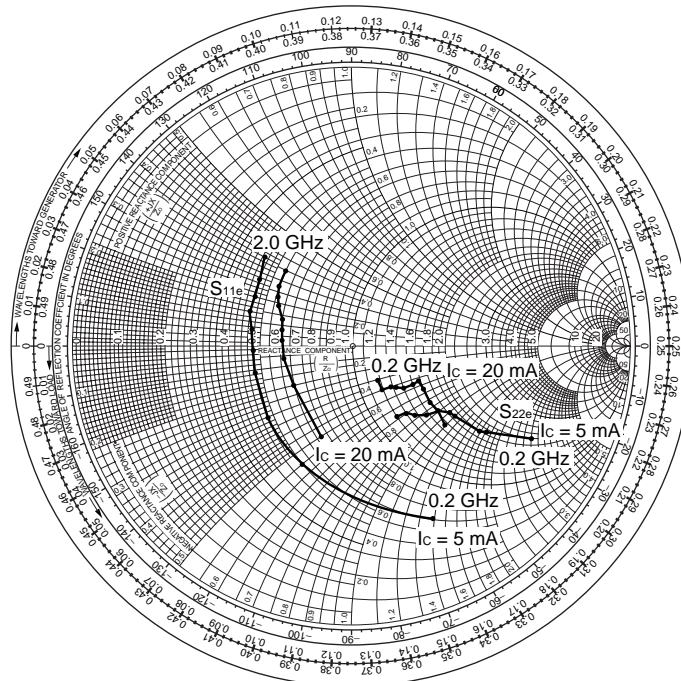
$V_{CE} = 10\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $Z_o = 50\ \Omega$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.339	-107.0	16.516	108.7	0.035	66.1	0.459	-36.6
400	0.258	-147.3	8.928	92.1	0.060	71.0	0.343	-32.9
600	0.243	-167.7	6.022	83.0	0.085	71.9	0.305	-29.9
800	0.242	177.0	4.633	76.2	0.109	72.2	0.284	-29.4
1000	0.260	164.5	3.744	69.9	0.136	70.4	0.266	-31.7
1200	0.269	157.6	3.193	65.7	0.160	69.9	0.246	-35.0
1400	0.294	148.7	2.750	58.8	0.187	66.7	0.233	-40.4
1600	0.314	143.1	2.479	55.5	0.212	65.2	0.208	-43.6
1800	0.343	136.5	2.185	50.1	0.238	62.4	0.190	-50.5
2000	0.367	131.4	2.016	47.8	0.254	61.6	0.173	-48.3

S-PARAMETER

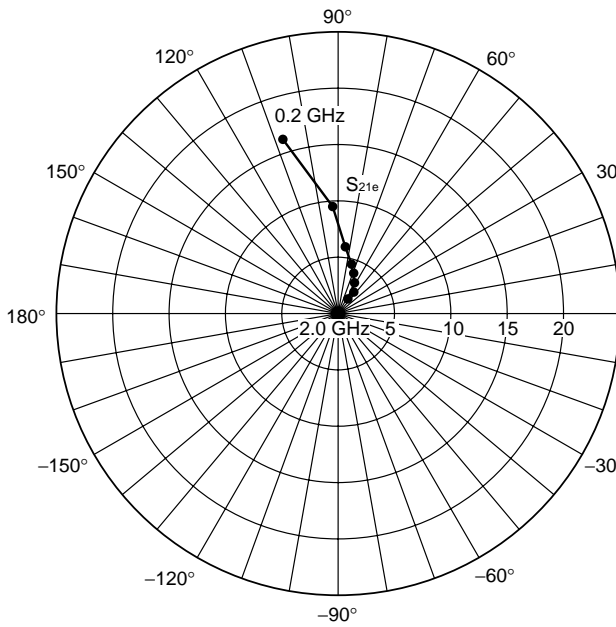
S<sub>11e</sub>, S<sub>22e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 10 V  
200 MHz Step



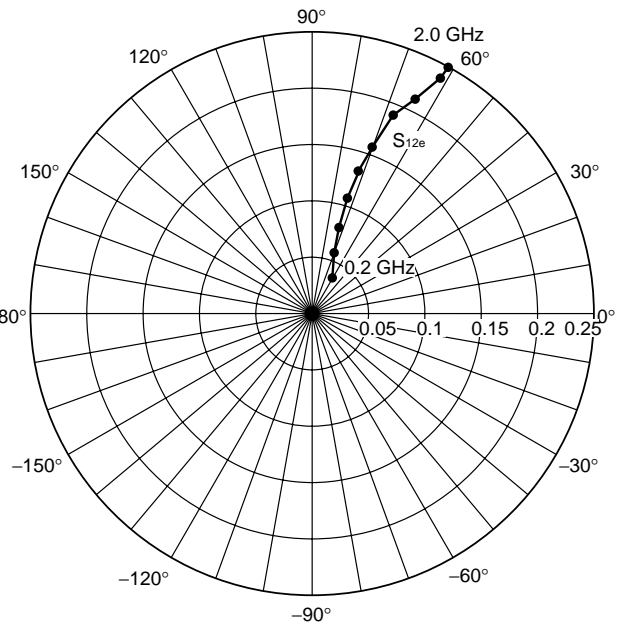
S<sub>21e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 10 V  
I<sub>c</sub> = 20 mA



S<sub>12e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 10 V  
I<sub>c</sub> = 20 mA



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Anti-radioactive design is not implemented in this product.