

**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.

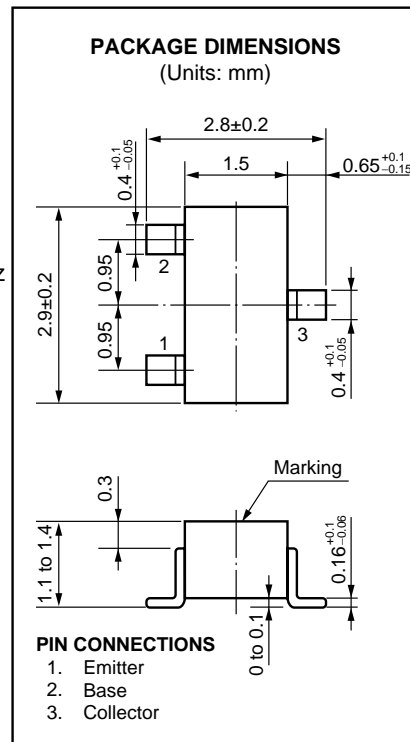
It has dynamic range and good current characteristic.

**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 ( $T_A = 25^\circ\text{C}$ )**

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	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	$I_{CBO}$			1.0	$\mu\text{A}$	$V_{CB} = 10$ V, $I_E = 0$
Emitter Cutoff Current	$I_{EBO}$			1.0	$\mu\text{A}$	$V_{EB} = 1.0$ 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  $PW \leq 350 \mu\text{s}$ , Duty Cycle  $\leq 2\%$

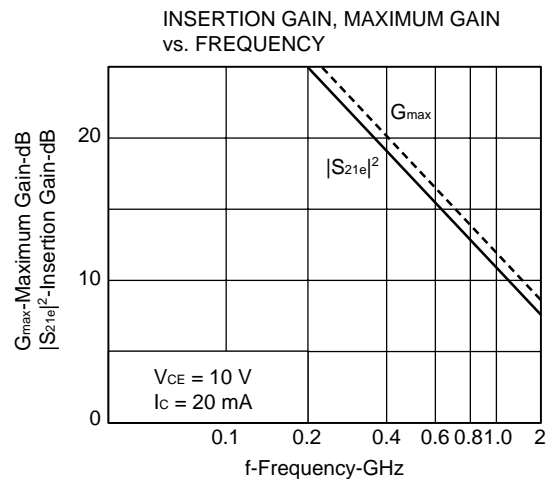
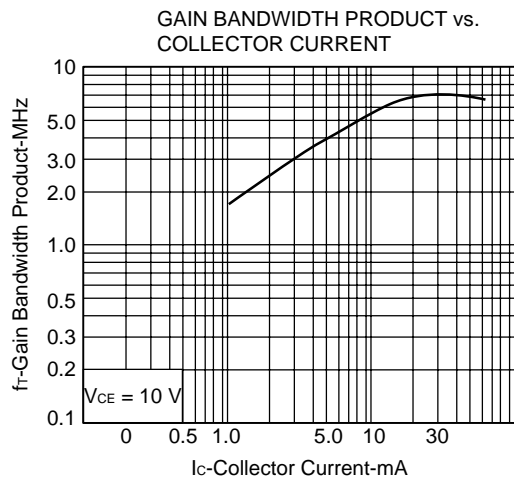
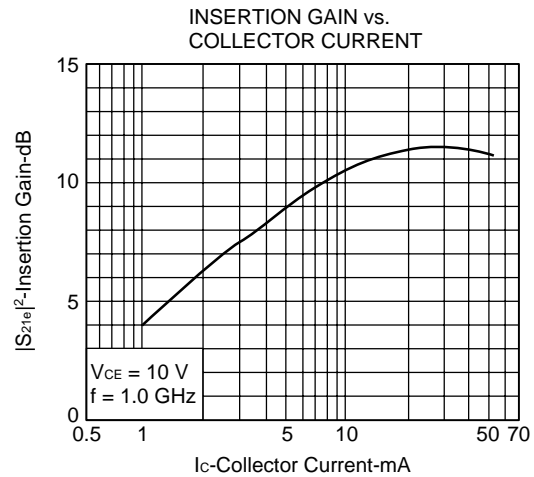
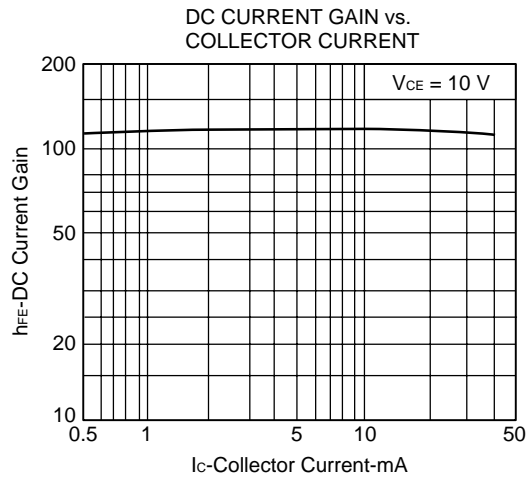
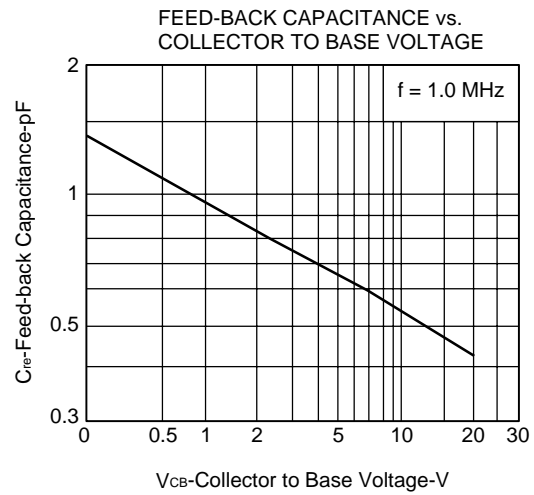
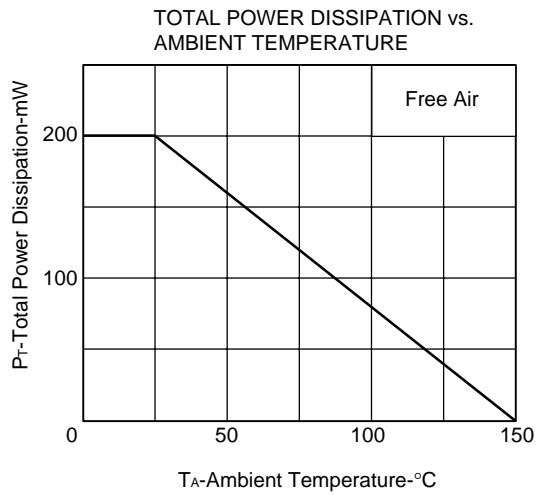
\*\* The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

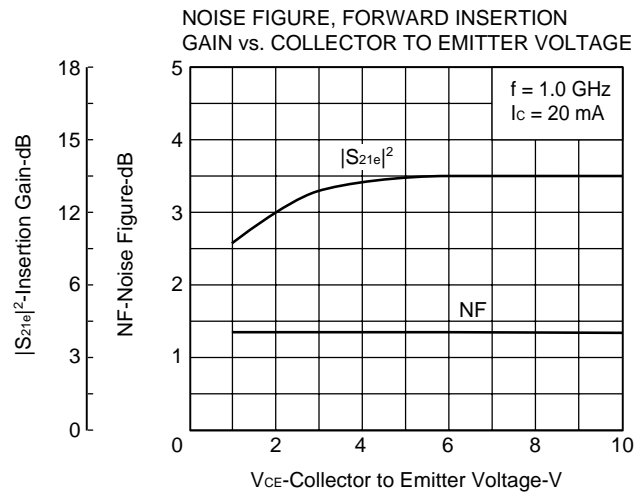
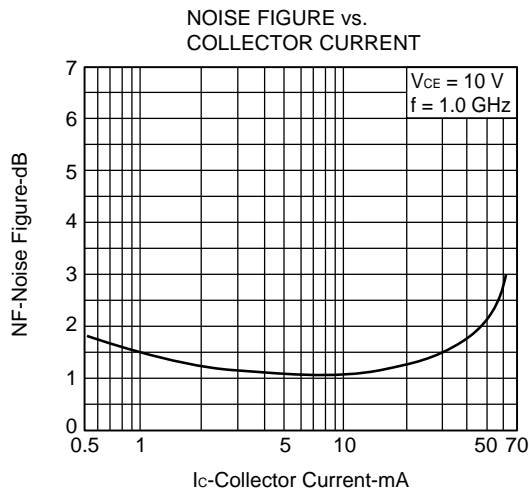
 **$h_{FE}$  Classification**

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 ( $T_A = 25^\circ\text{C}$ )





### S-PARAMETER

$V_{CE} = 10\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $Z_0 = 50\ \Omega$

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

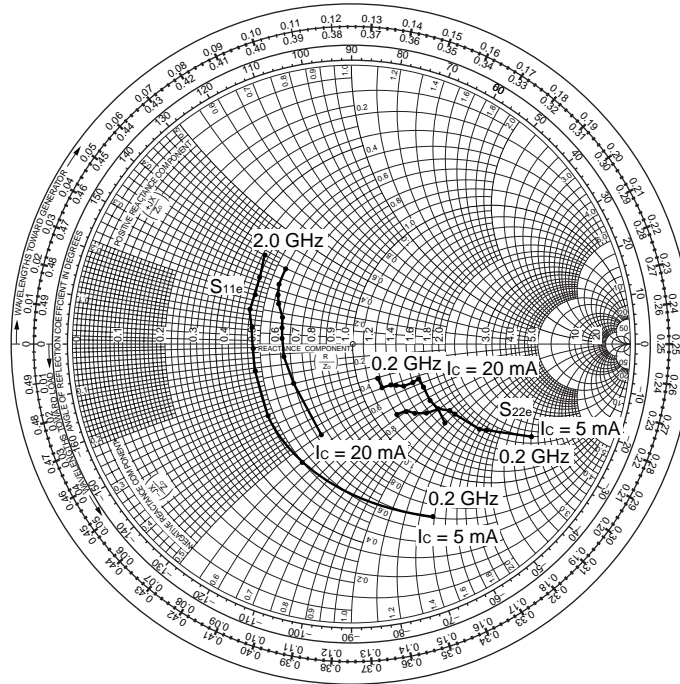
$V_{CE} = 10\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $Z_0 = 50\ \Omega$

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

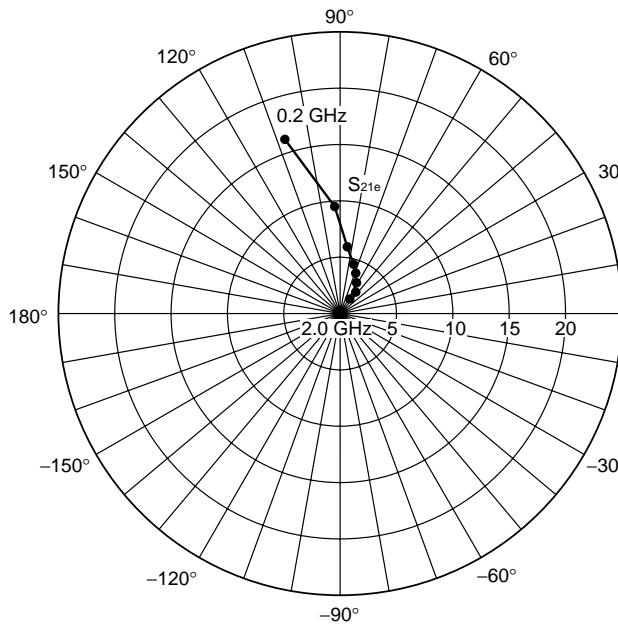
$S_{11e}$ ,  $S_{22e}$ -FREQUENCY

CONDITION  $V_{CE} = 10\text{ V}$   
200 MHz Step



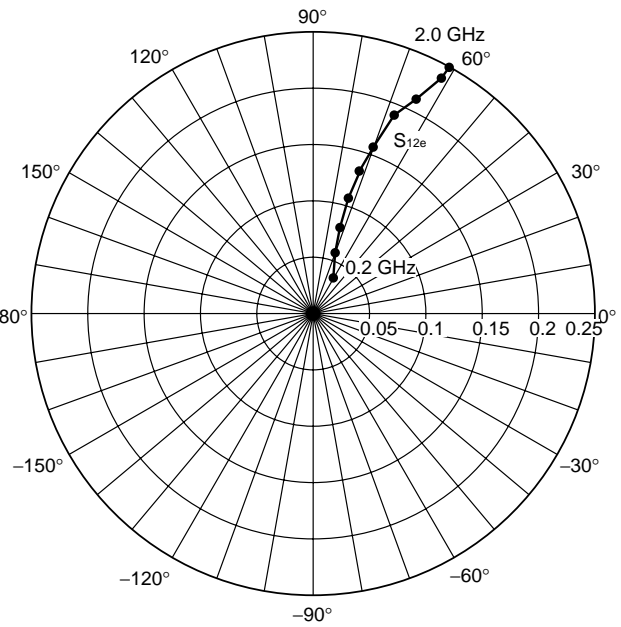
$S_{21e}$ -FREQUENCY

CONDITION  $V_{CE} = 10\text{ V}$   
 $I_c = 20\text{ mA}$



$S_{12e}$ -FREQUENCY

CONDITION  $V_{CE} = 10\text{ V}$   
 $I_c = 20\text{ mA}$



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Anti-radioactive design is not implemented in this product.