

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

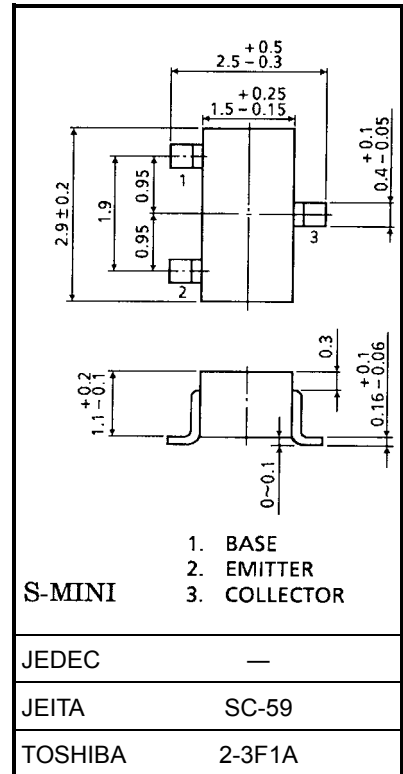
# 2SC5109

For VCO Application

Unit: mm

## Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V <sub>CB0</sub>	20	V
Collector-emitter voltage	V <sub>CEO</sub>	10	V
Emitter-base voltage	V <sub>EBO</sub>	3	V
Base current	I <sub>B</sub>	30	mA
Collector current	I <sub>C</sub>	60	mA
Collector power dissipation	P <sub>C</sub>	150	mW
Junction temperature	T <sub>j</sub>	125	°C
Storage temperature range	T <sub>stg</sub>	-55~125	°C



Weight: 0.012 g (typ.)

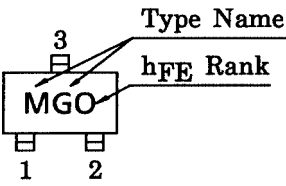
## Electrical Characteristics (Ta = 25°C)

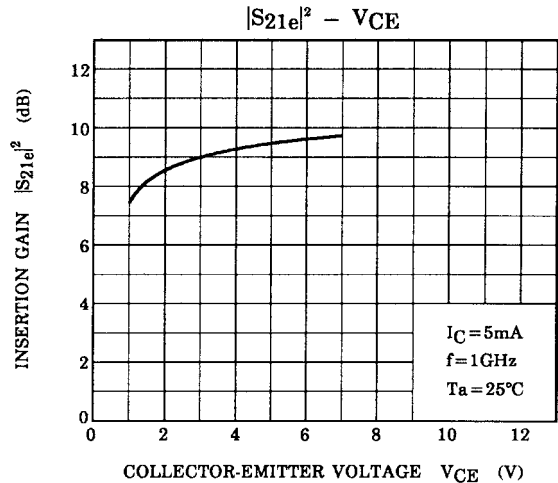
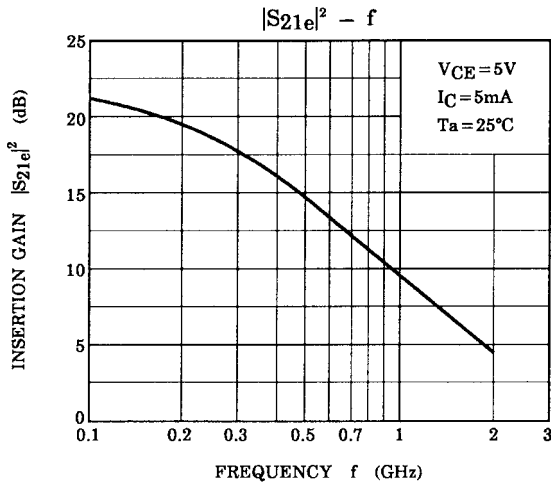
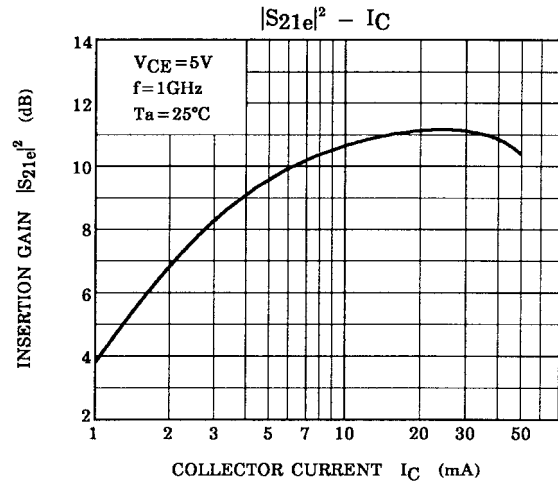
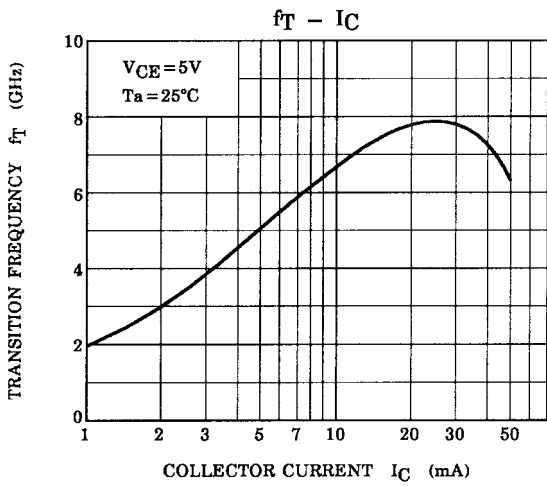
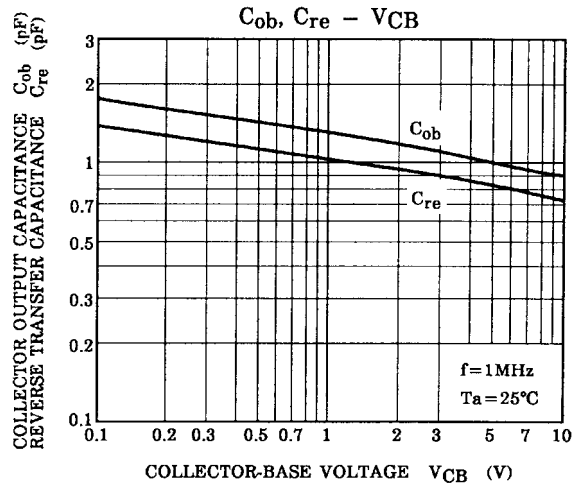
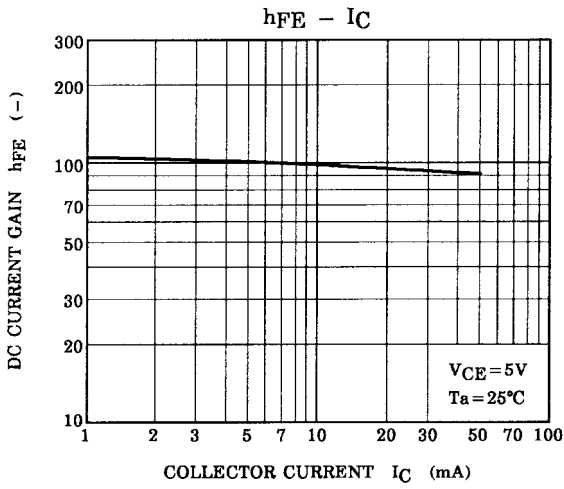
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0	—	—	0.1	μA
Emitter cut-off current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0	—	—	0.1	μA
DC current gain	h <sub>FE</sub> (Note 1)	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA	80	—	240	
Transition frequency	f <sub>T</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA	4	6	—	GHz
Insertion gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA, f = 1 GHz	7	11	—	dB
Output capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, f = 1 MHz (Note 2)	—	0.7	—	pF
Reverse transfer capacitance	C <sub>re</sub>		—	0.5	0.9	pF
Collector-base time constant	C <sub>c.rbb'</sub>	V <sub>CB</sub> = 5 V, I <sub>C</sub> = 3 mA, f = 30 MHz	—	5.5	10	ps

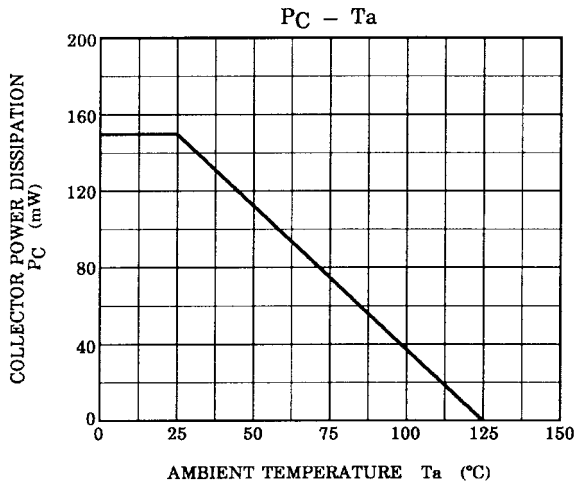
Note 1: h<sub>FE</sub> classification O: 80~160, Y: 120~240

Note 2: C<sub>re</sub> is measured by 3 terminal method with capacitance bridge.

**Marking**





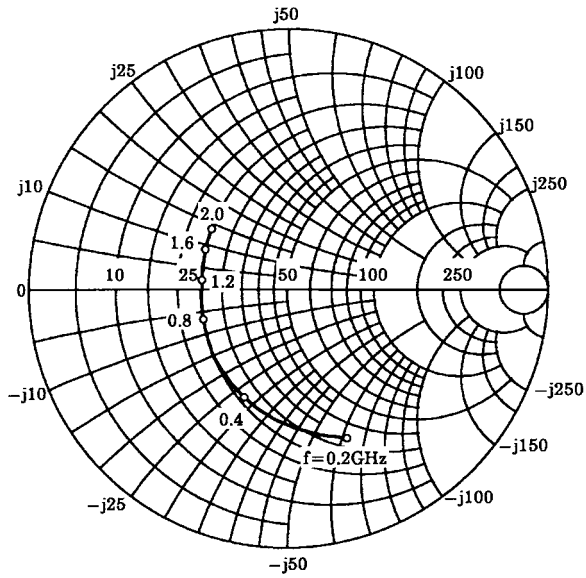


**S-Parameter  $Z_0 = 50 \Omega$ ,  $T_a = 25^\circ\text{C}$**

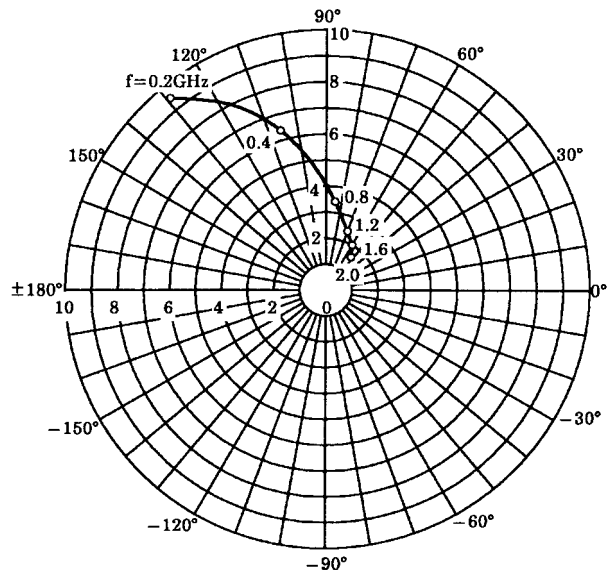
**$V_{CE} = 5 \text{ V}$ ,  $I_C = 5 \text{ mA}$**

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.631	-67.7	9.526	129.8	0.062	55.9	0.687	-38.7
400	0.441	-111.7	6.393	106.3	0.084	49.5	0.459	-48.5
600	0.363	-139.8	4.611	93.6	0.100	50.6	0.360	-50.6
800	0.338	-159.8	3.599	84.6	0.117	52.9	0.312	-51.1
1000	0.331	-175.0	2.990	77.5	0.134	55.1	0.286	-51.6
1200	0.337	171.9	2.556	71.2	0.152	57.2	0.271	-53.0
1400	0.344	161.7	2.252	65.3	0.174	58.6	0.265	-55.7
1600	0.359	152.1	2.011	60.3	0.196	58.5	0.259	-59.5
1800	0.373	144.6	1.845	55.4	0.217	57.9	0.254	-63.6
2000	0.391	138.5	1.691	50.8	0.238	58.3	0.249	-68.8

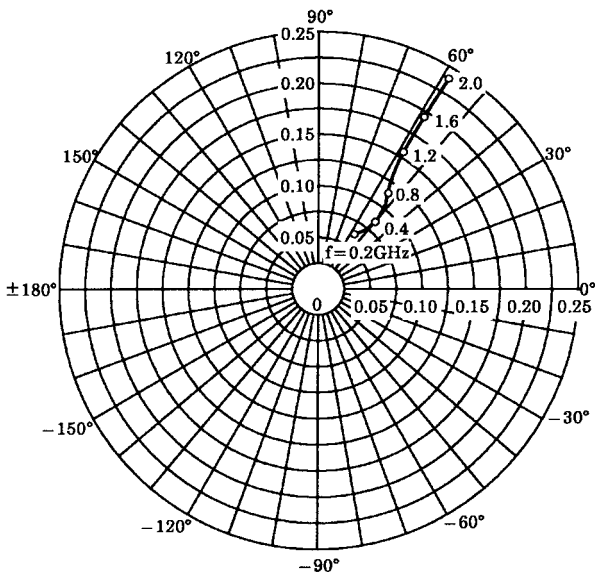
S11e  
 VCE=5V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



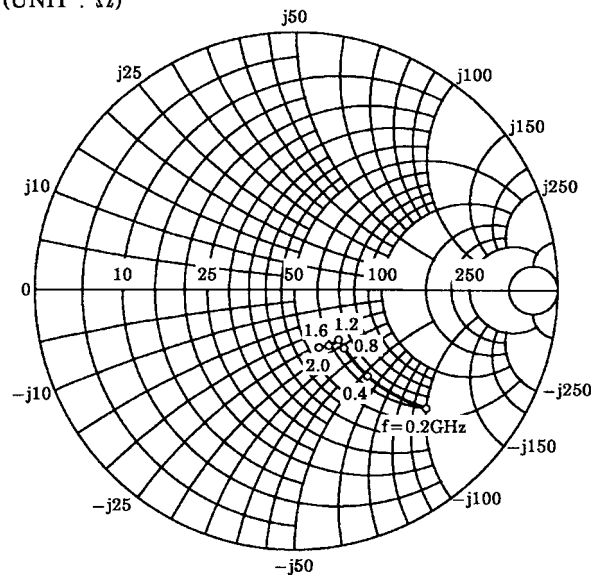
S21e  
 VCE=5V  
 IC=5mA  
 Ta=25°C



S12e  
 VCE=5V  
 IC=5mA  
 Ta=25°C



S22e  
 VCE=5V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



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