

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

# 2SC5106

For VCO Application

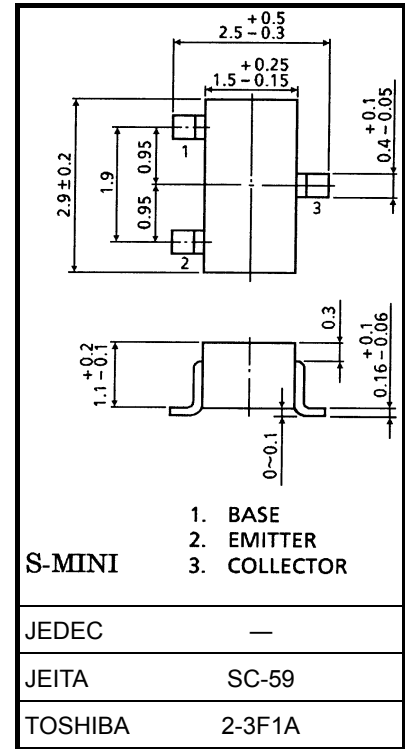
## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V <sub>CBO</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>	15	mA
Collector current	I <sub>C</sub>	30	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 to 125	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm



Weight: 0.012 g (typ.)

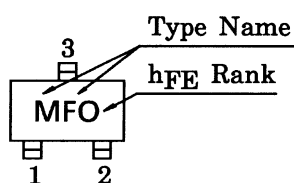
## Electrical Characteristics (Ta = 25°C)

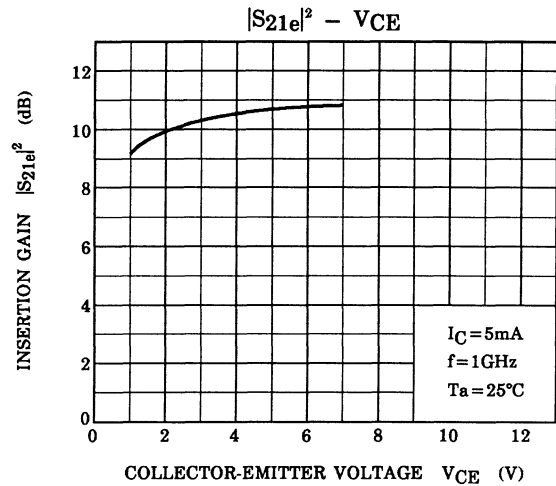
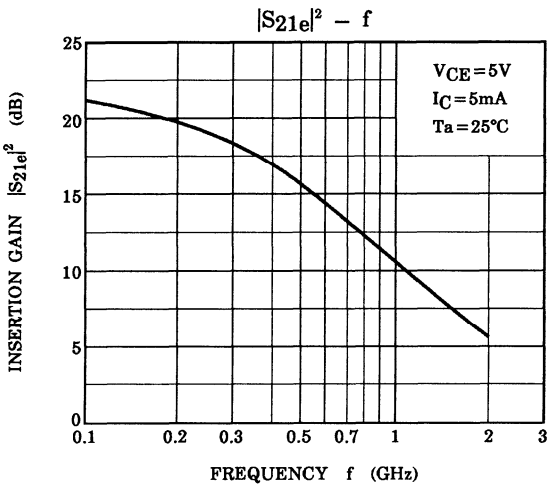
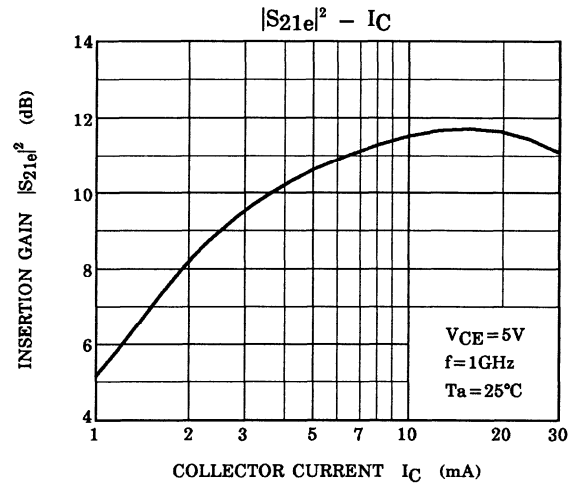
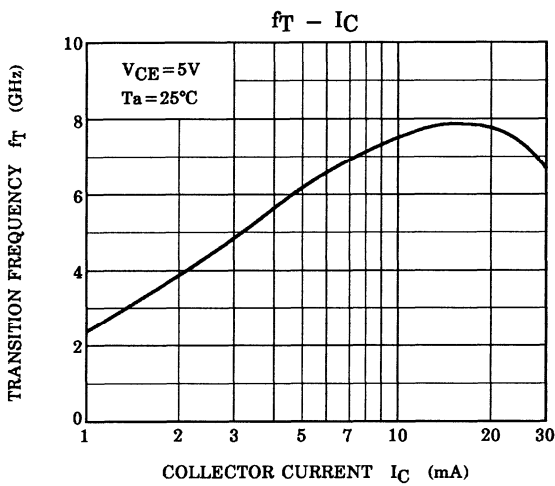
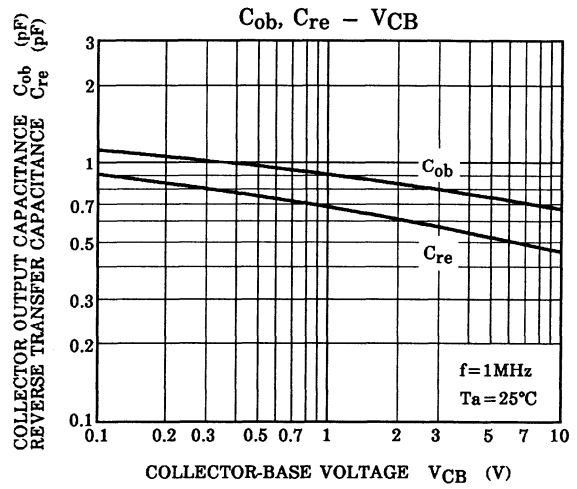
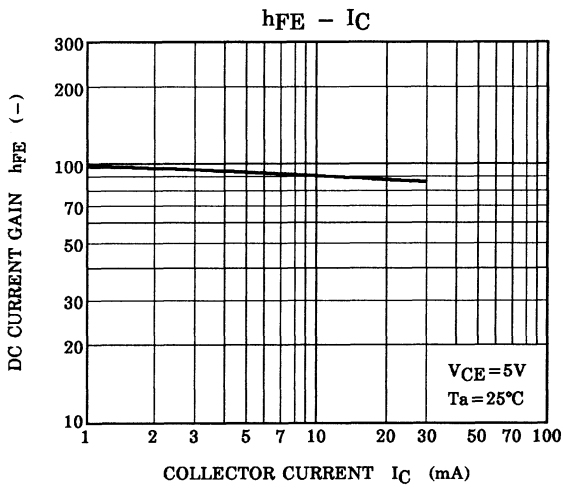
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 10\text{ V}, I_E = 0$	—	—	1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 1\text{ V}, I_C = 0$	—	—	1	$\mu\text{A}$
DC current gain	$h_{FE}$ (Note 1)	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}$	80	—	240	
Transition frequency	$f_T$	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}$	4	6	—	GHz
Insertion gain	$ S_{21e} ^2$	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}, f = 1\text{ GHz}$	7	11	—	dB
Output capacitance	$C_{ob}$	$V_{CB} = 5\text{ V}, I_E = 0, f = 1\text{ MHz}$ (Note 2)	—	0.75	—	pF
Reverse transfer capacitance	$C_{re}$		—	0.55	0.95	pF
Collector-base time constant	$C_{c.rbb'}$	$V_{CB} = 5\text{ V}, I_C = 3\text{ mA}, f = 30\text{ MHz}$	—	6	15	ps

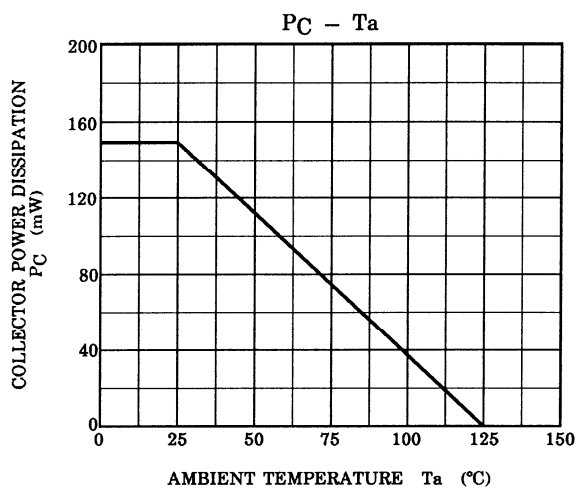
Note 1:  $h_{FE}$  classification O: 80 to 160, Y: 120 to 240

Note 2:  $C_{re}$  is measured by 3 terminal method with capacitance bridge.

## Marking





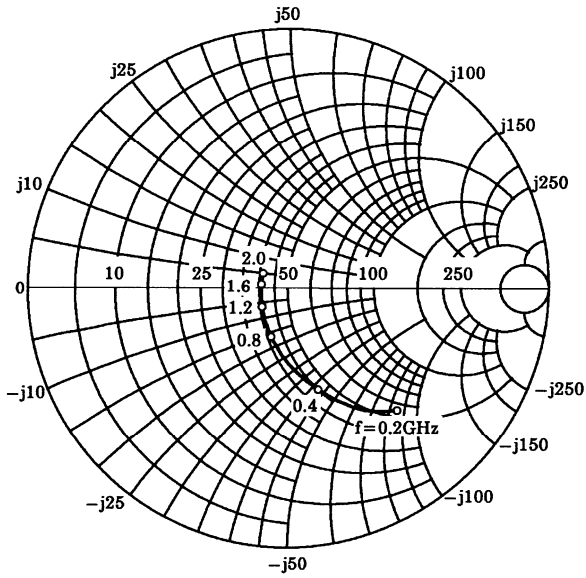


**S-Parameter  $Z_O = 50 \Omega, T_a = 25^\circ\text{C}$**

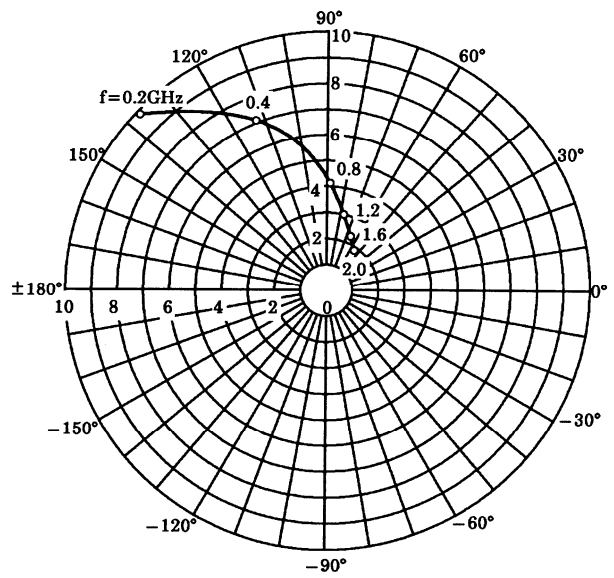
**$V_{CE} = 5 \text{ V}, I_C = 5 \text{ mA}$**

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.654	-45.3	9.794	136.6	0.047	64.8	0.775	-27.8
400	0.414	-75.6	7.062	112.6	0.071	58.7	0.570	-35.0
600	0.273	-94.9	5.232	98.7	0.090	58.5	0.472	-35.8
800	0.193	-111.7	4.118	89.4	0.108	59.5	0.424	-35.5
1000	0.146	-128.1	3.412	82.0	0.127	60.4	0.398	-35.5
1200	0.116	-147.4	2.927	75.5	0.147	61.0	0.381	-36.2
1400	0.101	-169.6	2.571	69.8	0.169	60.7	0.373	-37.9
1600	0.098	171.6	2.299	64.4	0.189	59.5	0.363	-40.4
1800	0.105	155.8	2.079	59.8	0.208	58.6	0.351	-43.5
2000	0.118	142.1	1.928	55.4	0.230	58.4	0.338	-46.1

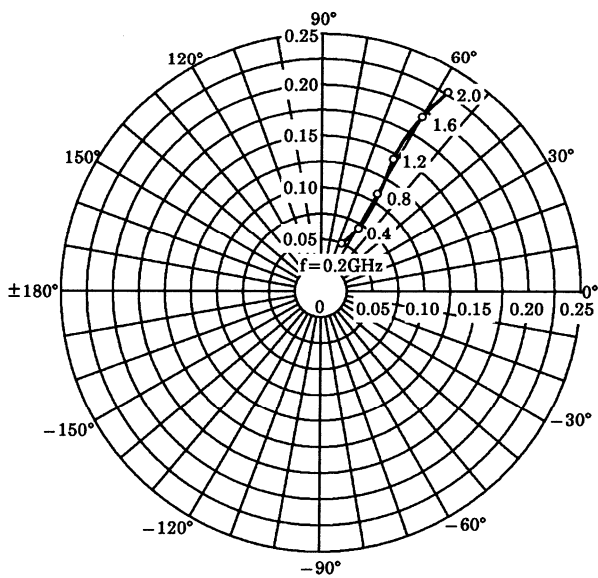
S11e  
 VCE=5V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



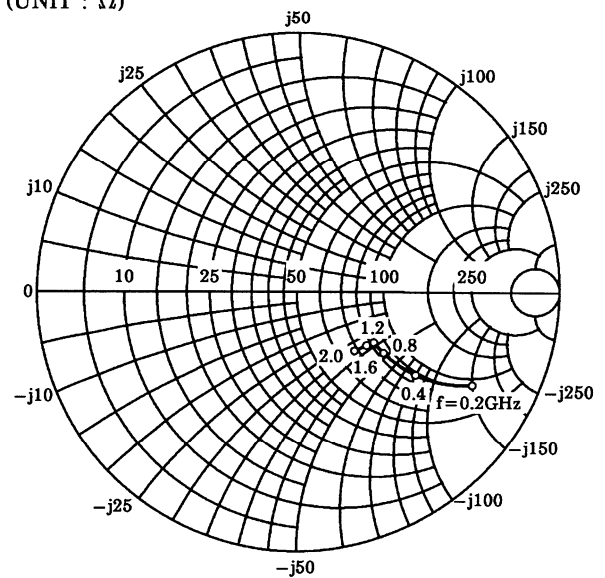
S21e  
 VCE=5V  
 IC=5mA  
 Ta=25°C



S12e  
 VCE=5V  
 IC=5mA  
 Ta=25°C



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



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