

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

## 2SC5111

For VCO Application

Unit: mm

Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	20	V
Collector-emitter voltage	$V_{CEO}$	10	V
Emitter-base voltage	$V_{EBO}$	3	V
Base current	$I_B$	30	mA
Collector current	$I_C$	60	mA
Collector power dissipation	$P_C$	100	mW
Junction temperature	$T_j$	125	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 125	$^\circ\text{C}$

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.).

		1. BASE
		2. EMITTER
		3. COLLECTOR
SSM		
JEDEC	—	
JEITA	—	
TOSHIBA	2-2H1A	

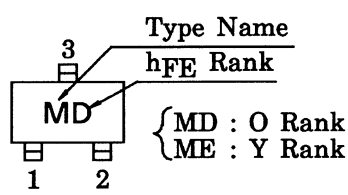
Weight: 2.4 mg (typ.)

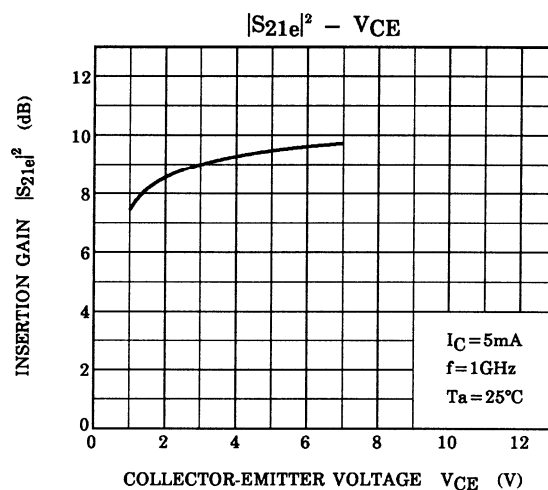
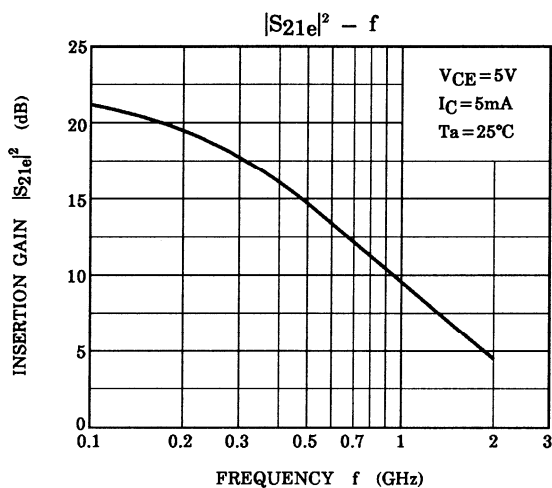
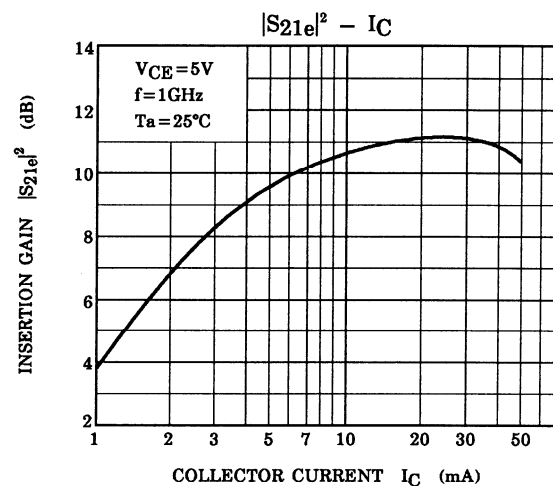
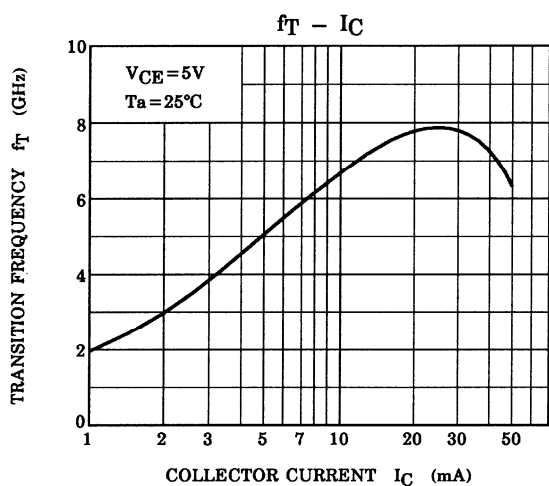
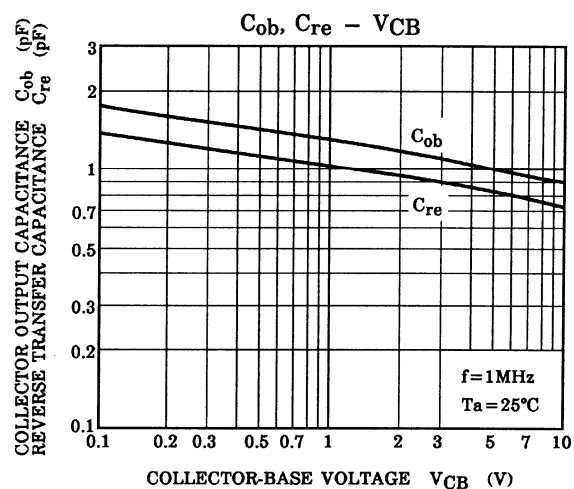
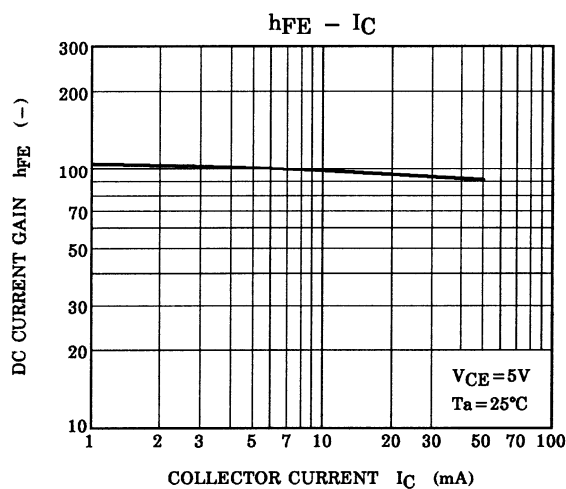
Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

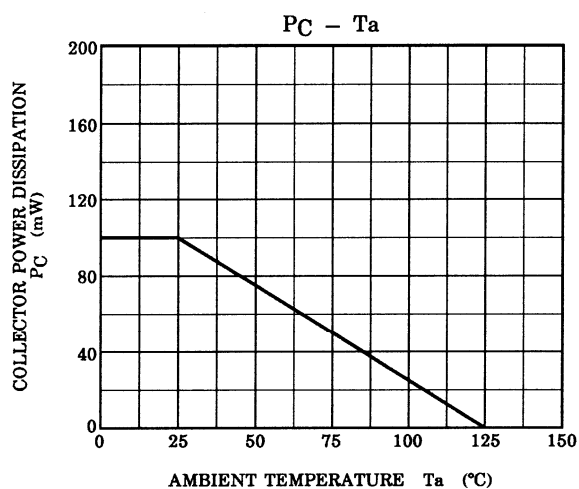
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 10\text{ V}, I_E = 0$	—	—	1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 1\text{ V}, I_C = 0$	—	—	1	$\mu\text{A}$
DC current gain	$h_{FE}$ (Note 1)	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}$	80	—	240	
Transition frequency	$f_T$	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}$	3	5	—	GHz
Insertion gain	$ S_{21e} ^2$	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}, f = 1\text{ GHz}$	6	10	—	dB
Output capacitance	$C_{ob}$	$V_{CB} = 5\text{ V}, I_E = 0, f = 1\text{ MHz}$ (Note 2)	—	0.9	—	pF
Reverse transfer capacitance	$C_{re}$		—	0.7	1.1	pF
Collector-base time constant	$C_c \cdot r_{bb'}$	$V_{CB} = 5\text{ V}, I_C = 3\text{ mA}, f = 30\text{ MHz}$	—	6	15	ps

Note 1:  $h_{FE}$  classification O: 80 to 160, Y: 120 to 240Note 2:  $C_{re}$  is measured by 3 terminal method with capacitance bridge.

Marking





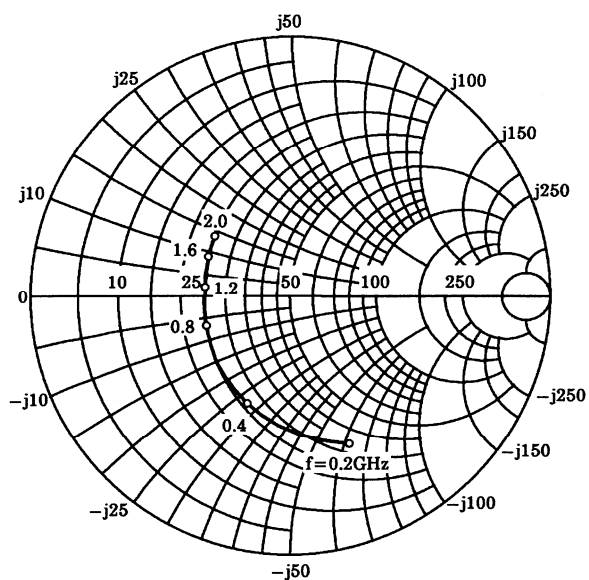


### S-Parameter $Z_O = 50 \Omega$ , $T_a = 25^\circ\text{C}$

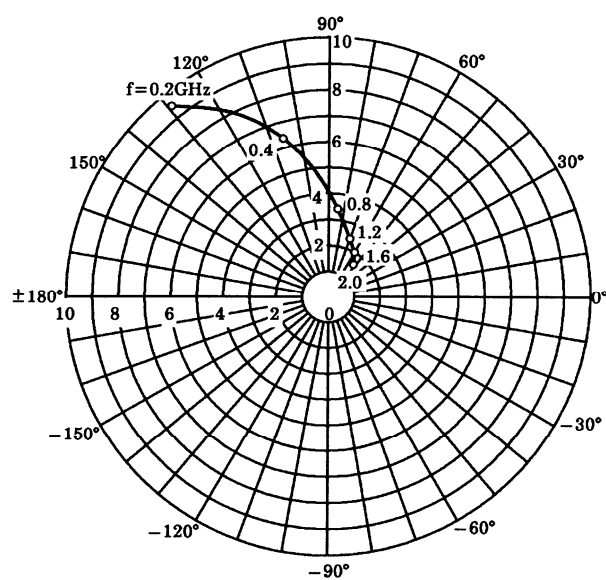
$V_{CE} = 5 \text{ V}$ ,  $I_C = 5 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.631	-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

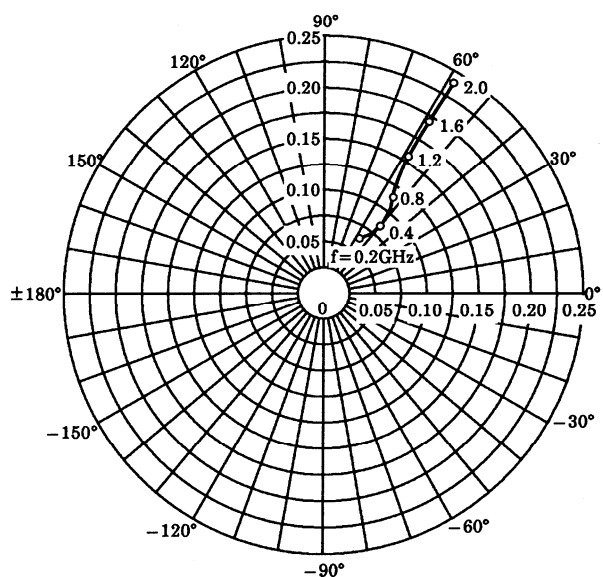
$S_{11e}$   
 $V_{CE} = 5V$   
 $I_C = 5mA$   
 $T_a = 25^\circ C$   
 (UNIT :  $\Omega$ )



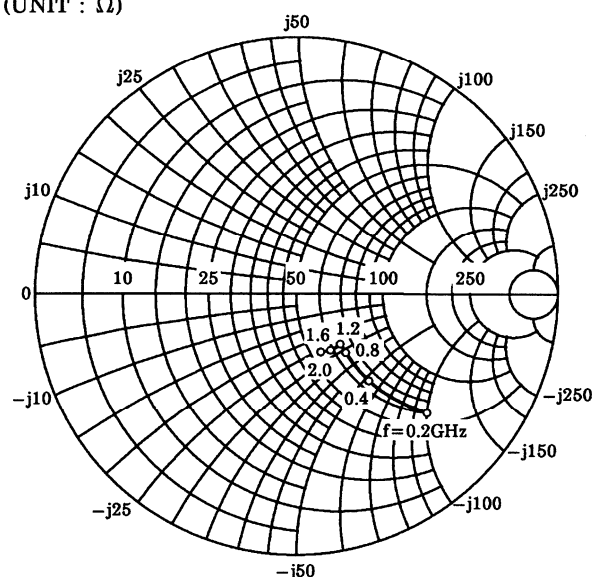
$S_{21e}$   
 $V_{CE} = 5V$   
 $I_C = 5mA$   
 $T_a = 25^\circ C$



$S_{12e}$   
 $V_{CE} = 5V$   
 $I_C = 5mA$   
 $T_a = 25^\circ C$



$S_{22e}$   
 $V_{CE} = 5V$   
 $I_C = 5mA$   
 $T_a = 25^\circ C$   
 (UNIT :  $\Omega$ )



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