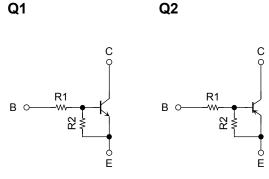
TOSHIBA Transistor Silicon NPN · PNP Epitaxial Type (PCT Process) (Bias Resistor Built-in Transistor)



Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Two devices are incorporated into an Extreme-Super-Mini (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.

Equivalent Circuit and Bias Resistor Values



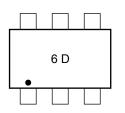
1.6±0.05 1.2±0.05 1.0±0.05 6 0.5 0.2±0.05 1.6±0.05 5 0.5 05 0.55±0.0 (E1) (B1) (B1) 1. EMITTER1 2. BASE1 3. COLLECTOR2 (C2) 4. EMITTER2 (E2) 5. BASE2 (B2) 6. COLLECTOR1 (C1) ES6 JEDEC _ JEITA TOSHIBA 2-2N1G

R1: 47 kΩ

R2: 47 kΩ

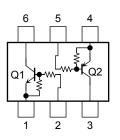
(Q1, Q2 common)

Marking



Equivalent Circuit (top view)

Weight: 0.003 g (typ.)



Unit: mm

Absolute Maximum Ratings (Ta = 25°C) (Q1)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	50	V
Collector-emitter voltage	V _{CEO}	50	V
Emitter-base voltage	V _{EBO}	10	V
Collector current	Ι _C	100	mA

Absolute Maximum Ratings (Ta = 25°C) (Q2)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	-50	V
Collector-emitter voltage	V _{CEO}	-50	V
Emitter-base voltage	V _{EBO}	-10	V
Collector current	Ι _C	-100	mA

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P _C (Note 1)	100	mW
Junction temperature	Tj	150	°C
Storage temperature range	T _{stg}	-55~150	°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).

Note 1: Total rating

Electrical Characteristics (Ta = 25°C) (Q1)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I _{CBO}	$V_{CB}=50~V,~I_{E}=0$	_	_	100	nA
	ICEO	$V_{CE}=50~V,~I_B=0$	_	_	500	
Emitter cut-off current	I _{EBO}	$V_{EB} = 10 \text{ V}, I_{C} = 0$	0.082	_	0.15	mA
DC current gain	h _{FE}	$V_{CE} = 5 \text{ V}, \text{ I}_{C} = 10 \text{ mA}$	80	_	_	
Collector-emitter saturation voltage	V _{CE (sat)}	$I_{C} = 5 \text{ mA}, I_{B} = 0.25 \text{ mA}$	_	0.1	0.3	V
Input voltage (ON)	V _{I (ON)}	$V_{CE} = 0.2 \text{ V}, I_{C} = 5 \text{ mA}$	1.5	_	5.0	V
Input voltage (OFF)	VI (OFF)	$V_{CE} = 5 \text{ V}, \text{ I}_{C} = 0.1 \text{ mA}$	1.0	_	1.5	V
Transition frequency	f _T	$V_{CE} = 10 \text{ V}, I_{C} = 5 \text{ mA}$		250		MHz
Collector output capacitance	C _{ob}	$V_{CB} = 10 \text{ V}, \text{ I}_{E} = 0, \text{ f} = 1 \text{ MHz}$		3	6	pF

Electrical Characteristics (Ta = 25°C) (Q2)

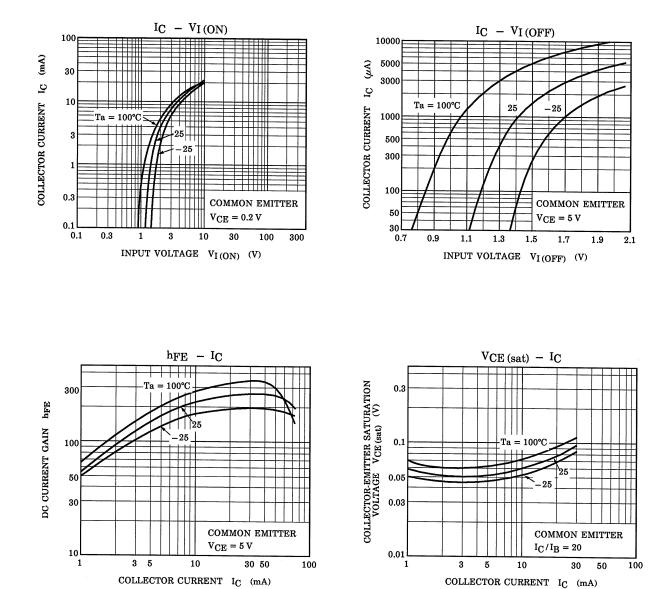
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I _{CBO}	$V_{CB}=-50~V,~I_{E}=0$	_	_	-100	nA
	ICEO	$V_{CE} = -50 \text{ V}, \text{ I}_B = 0$	_	_	-500	
Emitter cut-off current	I _{EBO}	$V_{EB} = -10 \text{ V}, I_C = 0$	-0.082	_	-0.15	mA
DC current gain	h _{FE}	$V_{CE} = -5 \text{ V}, \text{ I}_{C} = -10 \text{ mA}$	80	_	_	
Collector-emitter saturation voltage	V _{CE (sat)}	$I_C = -5 \text{ mA}, I_B = -0.25 \text{ mA}$	_	-0.1	-0.3	V
Input voltage (ON)	V _{I (ON)}	$V_{CE} = -0.2$ V, $I_C = -5$ mA	-1.5	_	-5.0	V
Input voltage (OFF)	VI (OFF)	$V_{CE} = -5 \text{ V}, \text{ I}_{C} = -0.1 \text{ mA}$	-1.0	_	-1.5	V
Transition frequency	f _T	$V_{CE} = -10 \text{ V}, \text{ I}_{C} = -5 \text{ mA}$		200		MHz
Collector output capacitance	C _{ob}	$V_{CB} = -10 \text{ V}, \text{ I}_{E} = 0, \text{ f} = 1 \text{ MHz}$		3	6	pF

Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input resistor	R1	—	32.9	47	61.1	kΩ
Resistor ratio	R1/R2	—	0.9	1.0	1.1	

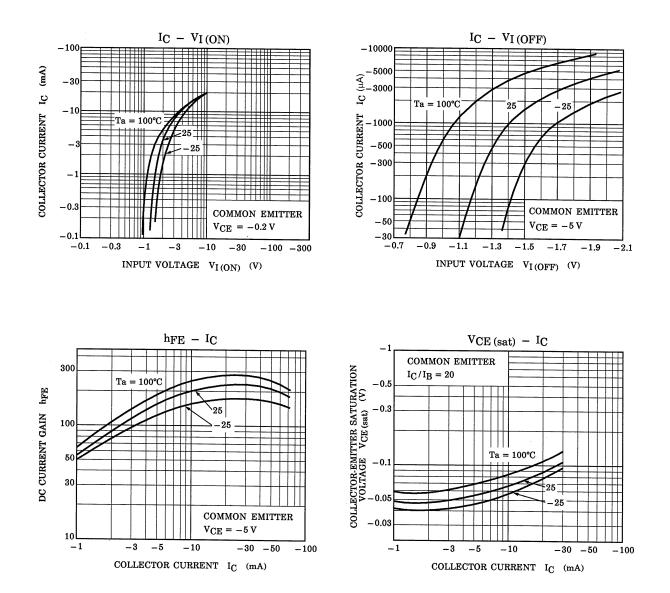
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Q1



TOSHIBA

Q2



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