

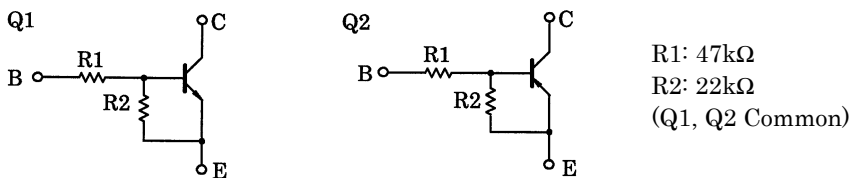
TOSHIBA Transistor  
Silicon NPN/PNP Epitaxial Type (PCT Process) (Transistor with Built-in Bias Resistor)

## RN4989

Switching, Inverter Circuit, Interface Circuit  
and Driver Circuit Applications

- Including two devices in US6 (ultra super mini type with 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process

### Equivalent Circuit and Bias Resistor Values



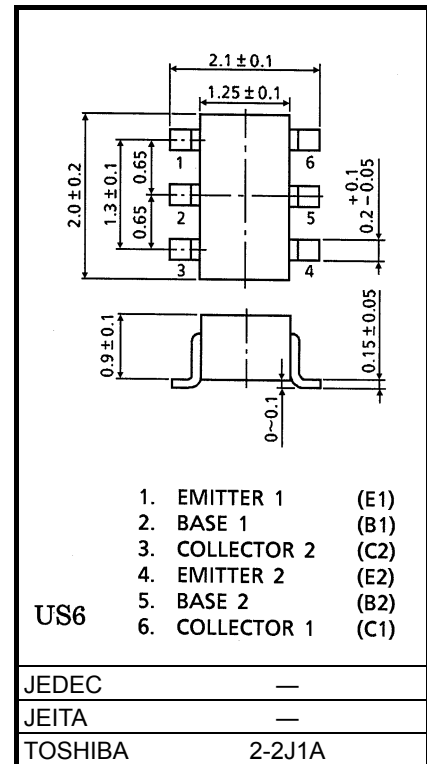
### Q1 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V <sub>CBO</sub>	50	V
Collector-emitter voltage	V <sub>CEO</sub>	50	V
Emitter-base voltage	V <sub>EBO</sub>	15	V
Collector current	I <sub>C</sub>	100	mA

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V <sub>CBO</sub>	-50	V
Collector-emitter voltage	V <sub>CEO</sub>	-50	V
Emitter-base voltage	V <sub>EBO</sub>	-15	V
Collector current	I <sub>C</sub>	-100	mA

Unit: mm



Weight: 6.8 mg (typ.)

Start of commercial production  
1992-10

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

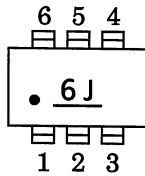
Characteristic	Symbol	Rating	Unit
Collector power dissipation	$P_C$ *	200	mW
Junction temperature	$T_j$	150	°C
Storage temperature range	$T_{stg}$	-55 to 150	°C

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.

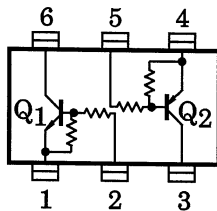
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

\* : Total rating

## Marking



## Equivalent Circuit (Top View)



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

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	—	$V_{CB} = 50V, I_E = 0$	—	—	100	nA
	$I_{CEO}$	—	$V_{CE} = 50V, I_B = 0$	—	—	500	
Emitter cut-off current	$I_{EBO}$	—	$V_{EB} = 15V, I_C = 0$	0.167	—	0.311	mA
DC current gain	$h_{FE}$	—	$V_{CE} = 5V, I_C = 10mA$	70	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	$I_C = 5mA, I_B = 0.25mA$	—	0.1	0.3	V
Input voltage (ON)	$V_I(ON)$	—	$V_{CE} = 0.2V, I_C = 5mA$	2.2	—	5.8	V
Input voltage (OFF)	$V_I(OFF)$	—	$V_{CE} = 5V, I_C = 0.1mA$	1.5	—	2.6	V
Transition frequency	$f_T$	—	$V_{CE} = 10V, I_C = 5mA$	—	250	—	MHz
Collector output capacitance	$C_{ob}$	—	$V_{CB} = 10V, I_E = 0, f = 1\text{ MHz}$	—	3	6	pF

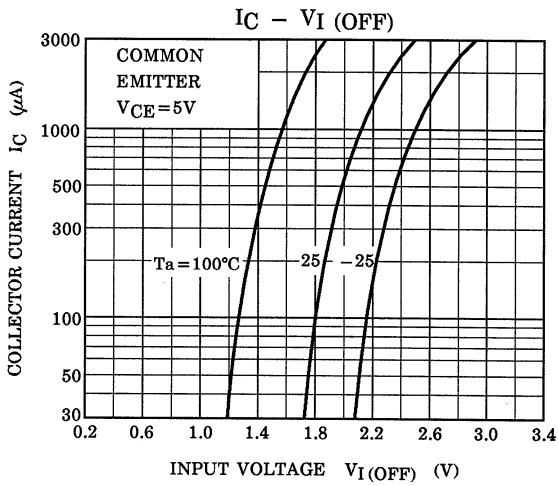
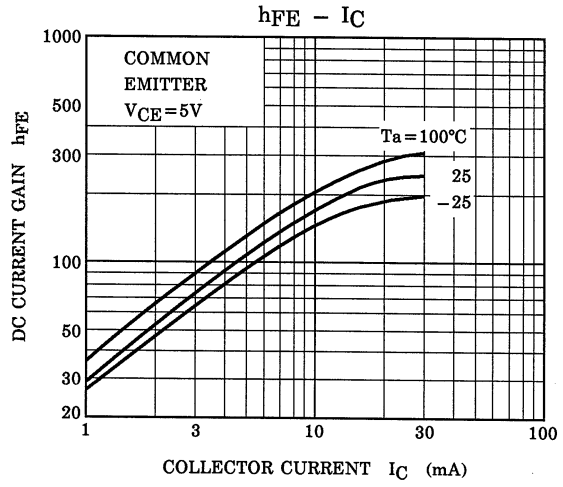
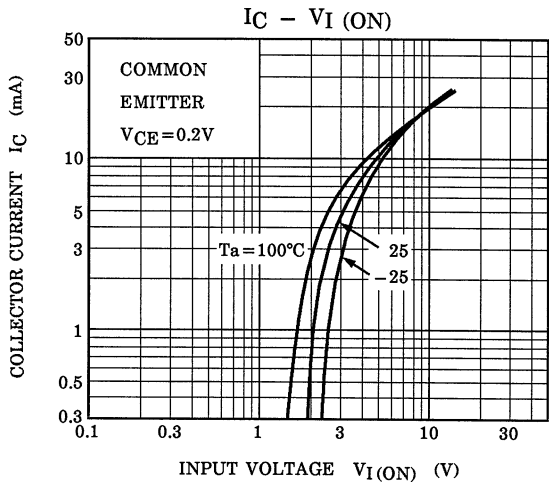
**Q2 Electrical Characteristics (Ta = 25°C)**

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	—	$V_{CB} = -50V, I_E = 0$	—	—	-100	nA
	$I_{CEO}$	—	$V_{CE} = -50V, I_B = 0$	—	—	-500	
Emitter cut-off current	$I_{EBO}$	—	$V_{EB} = -15V, I_C = 0$	-0.167	—	-0.311	mA
DC current gain	$h_{FE}$	—	$V_{CE} = -5V, I_C = -10mA$	70	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	$I_C = -5mA, I_B = -0.25mA$	—	-0.1	-0.3	V
Input voltage (ON)	$V_I(ON)$	—	$V_{CE} = -0.2V, I_C = -5mA$	-2.2	—	-5.8	V
Input voltage (OFF)	$V_I(OFF)$	—	$V_{CE} = -5V, I_C = -0.1mA$	-1.5	—	-2.6	V
Transition frequency	$f_T$	—	$V_{CE} = -10V, I_C = -5mA$	—	200	—	MHz
Collector output capacitance	$C_{ob}$	—	$V_{CB} = -10V, I_E = 0$	—	3	6	pF

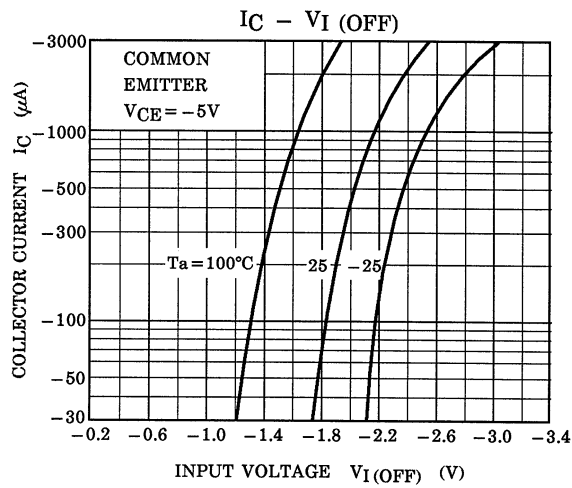
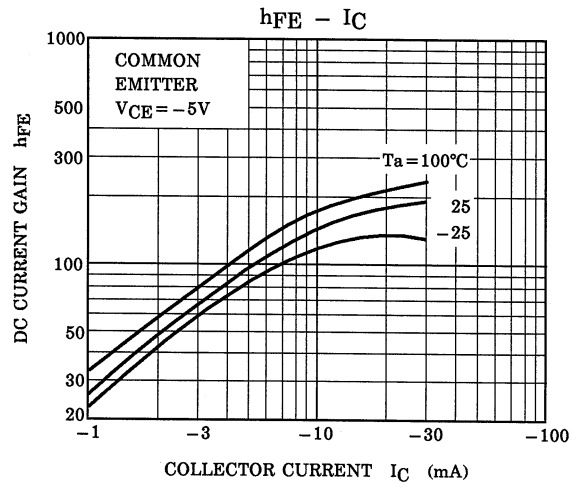
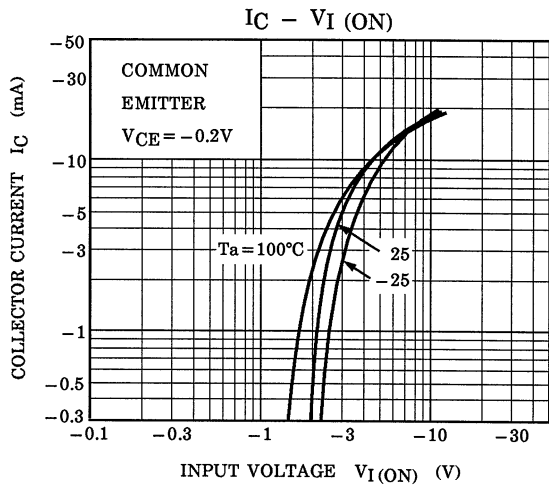
**Q1, Q2 Common Electrical Characteristics (Ta = 25°C)**

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input resistor	R1	—	—	32.9	47	61.1	kΩ
Resistor ratio	R1/R2	—	—	1.92	2.14	2.35	—

**Q1**



Q2



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