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

RN4607

1. Applications

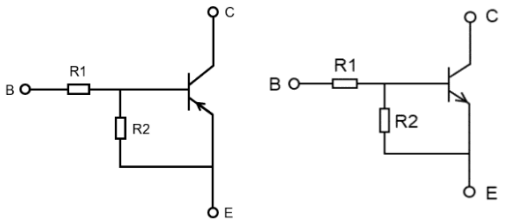
- Switching
- Inverter Circuit,
- Interface Circuit
- Driver Circuit

2. Features

- Including two devices in SM6 (super mini type with 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process and iniaturize equipment.

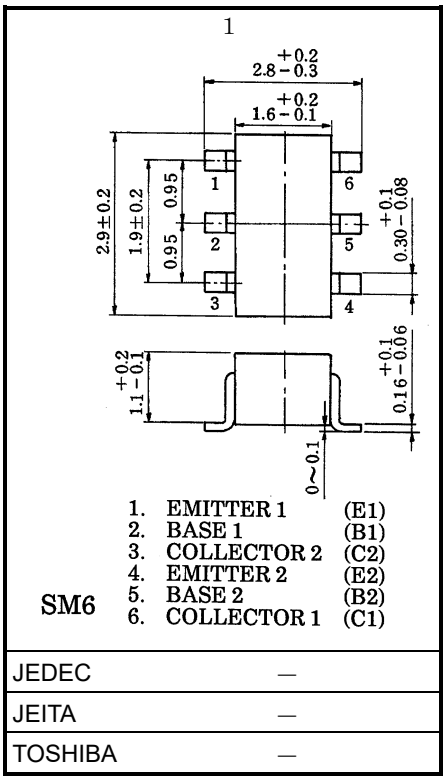
3. Equivalent Circuit and Bias Resistor Values

Q1 Q2



Part No (Q1, Q2 Common)	R1 (kΩ)	R2 (kΩ)
RN4607	10	47

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	—

Weight: 15 mg (typ.)

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−100	mA

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	100	mA

Start of commercial production
1988-11

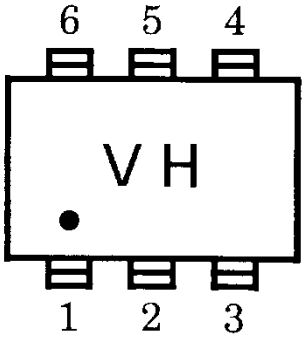
6. Q1, Q2 Common Absolute Maximum Ratings (Note) (Ta = 25 °C)

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C (Note 1)	300	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55 to 150	°C

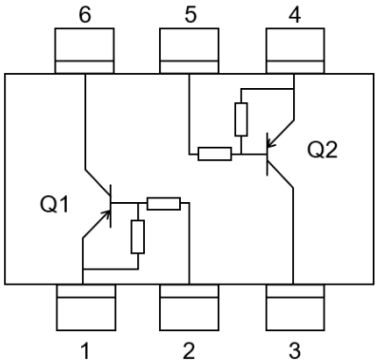
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Note 1: Total rating

7. Marking



8. Equivalent Circuit (Top View)



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

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = −50 V, I_E = 0 mA	—	—	−100	nA
	I_{CEO}	—	V_{CE} = −50 V, I_B = 0 mA	—	—	−500	
Emitter cut-off current	I_{EBO}	—	V_{EB} = −6 V, I_C = 0 mA	−0.081	—	−0.15	mA
DC current gain	h_{FE}	—	V_{CE} = −5 V, I_C = −10 mA	80	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	I_C = −5 mA, I_B = −0.25 mA	—	−0.1	−0.3	V
Input voltage (ON)	$V_{I\ ON)}$	—	V_{CE} = −0.2 V, I_C = −5 mA	−0.7	—	−1.8	V
Input voltage (OFF)	$V_{I(OFF)}$	—	V_{CE} = −5 V, I_C = −0.1 mA	−0.5	—	−1.0	V
Transition frequency	f_T	—	V_{CE} = −10 V, I_C = −5 mA	—	200	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = - 10 V, I_E = 0 mA, f = 1MHz	—	3	6	pF

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

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = 50 V, I_E = 0 mA	—	—	100	nA
	I_{CEO}	—	V_{CE} = 50 V, I_B = 0 mA	—	—	500	
Emitter cut-off current	I_{EBO}	—	V_{EB} = 6 V, I_C = 0 mA	0.081	—	0.15	mA
DC current gain	h_{FE}	—	V_{CE} = 5 V, I_C = 10 mA	80	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	$V_{I(ON)}$	—	V_{CE} = 0.2 V, I_C = 5 mA	0.7	—	1.8	V
Input voltage (OFF)	$V_{I(OFF)}$	—	V_{CE} = 5 V, I_C = 0.1 mA	0.5	—	1.0	V
Transition frequency	f_T	—	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	3	6	pF

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

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input resistance	R1	—	—	7	10	13	kΩ
Resistance ratio	R1 / R2	—	—	0.191	0.213	0.232	—

12. Characteristics curves (Note) (Q1, Q2)

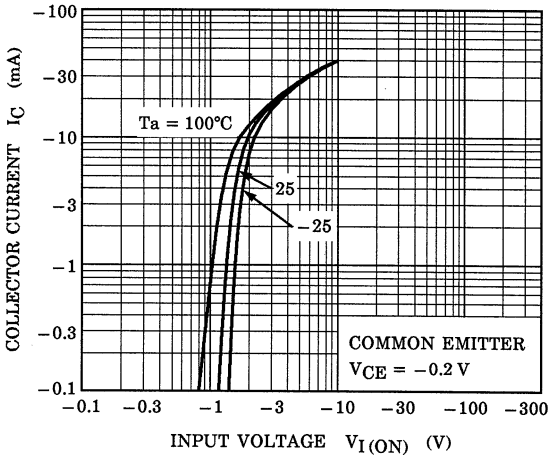


Fig 12.1 Q1 I_C – $V_{I(ON)}$

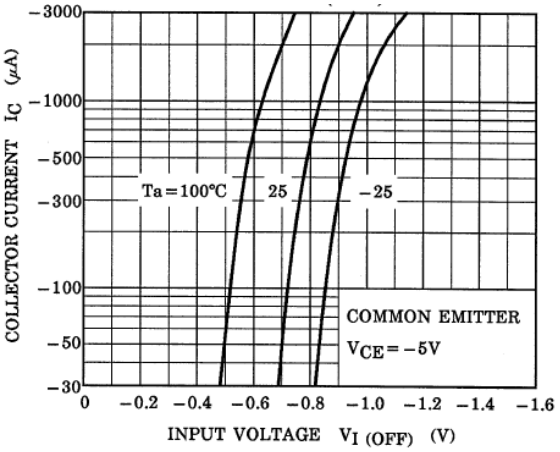


Fig 12.2 Q1 I_C – $V_{I(OFF)}$

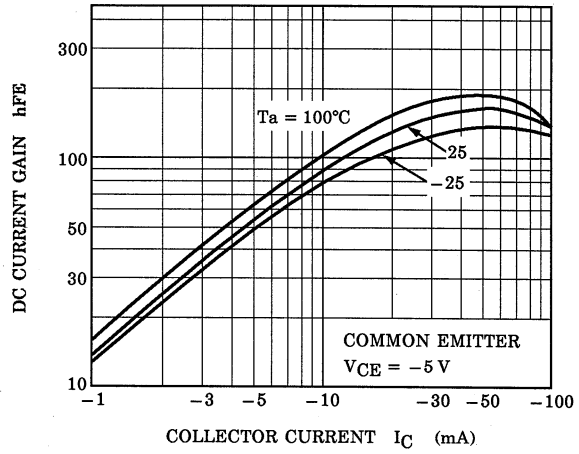


Fig 12.3 Q1 h_{FE} – I_C

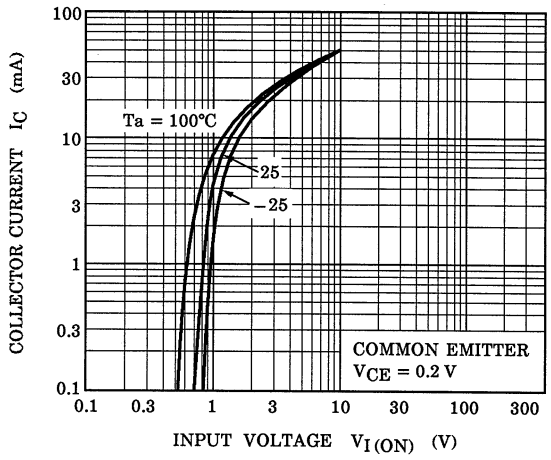


Fig 12.4 Q2 I_C – $V_{I(ON)}$

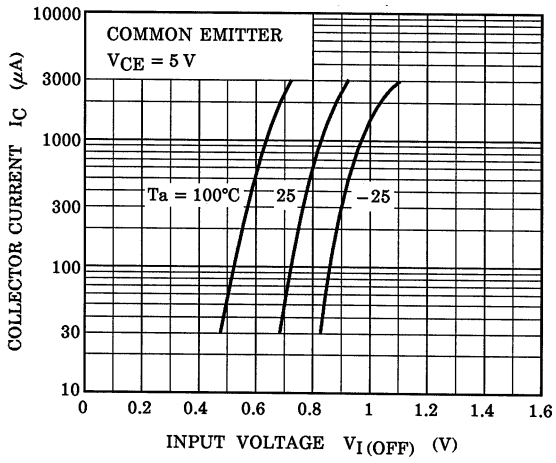


Fig 12.5 Q2 I_C – $V_{I(OFF)}$

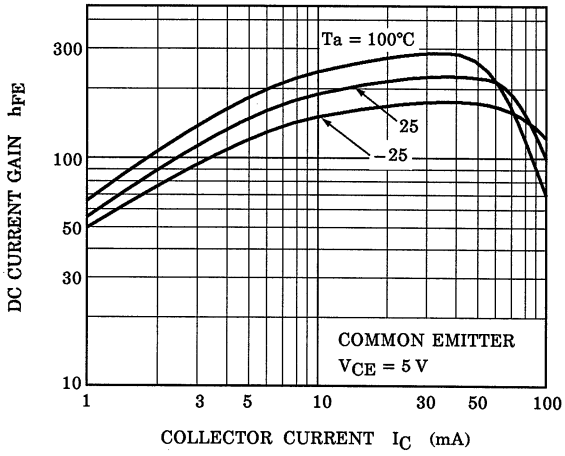


Fig 12.6 Q2 h_{FE} – I_C

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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