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

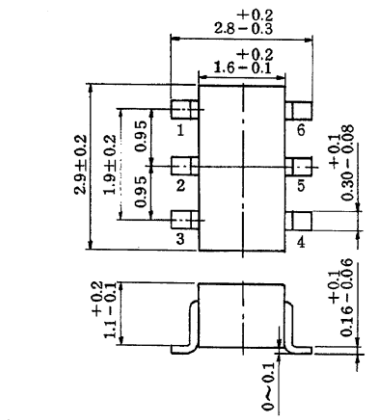
RN46A1

Switching, Inverter Circuit,

Interface Circuit and Driver Circuit

- 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 miniaturize equipment.

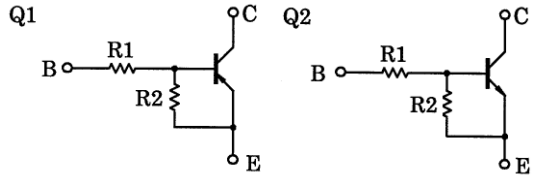
Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3N1A

Weight: 0.015g (typ.)

Equivalent Circuit and Bias Resistor Values



Q1 Q2

R1: 22kΩ R1: 10kΩ

R2: 22kΩ R2: 10kΩ

Q1: RN2403 Equivalent
Q2: RN1402 Equivalent

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}	−10	V
Collector current	I_C	−100	mA

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}	10	V
Collector current	I_C	100	mA

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

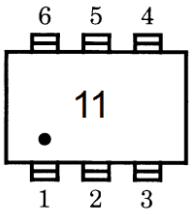
Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C *	300	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55 to 150	°C

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).

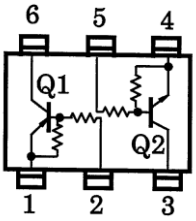
* : Total rating

Start of commercial production
1999-04

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} = –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} = –10 V, I_C = 0 mA	–0.17	—	–0.33	mA
DC current gain	h_{FE}	—	V_{CE} = –5 V, I_C = –10 mA	70	—	—	—
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	–1.3	—	–3.0	V
Input voltage (OFF)	$V_{I\ (OFF)}$	—	V_{CE} = –5 V, I_C = –0.1 mA	–1.0	—	–1.5	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 = 1 MHz	—	3	—	pF
Input resistance	R1	—	—	15.4	22	28.6	kΩ
Resistance ratio	R1/R2	—	—	0.9	1.0	1.1	—

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} = 10 V, I_C = 0 mA	0.38	—	0.71	mA
DC current gain	h_{FE}	—	V_{CE} = 5 V, I_C = 10 mA	50	—	—	—
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	1.2	—	2.4	V
Input voltage (OFF)	$V_{I\ (OFF)}$	—	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	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	—	pF
Input resistance	R1	—	—	7	10	13	kΩ
Resistance ratio	R1/R2	—	—	0.9	1.0	1.1	—

Q1 characteristics curves

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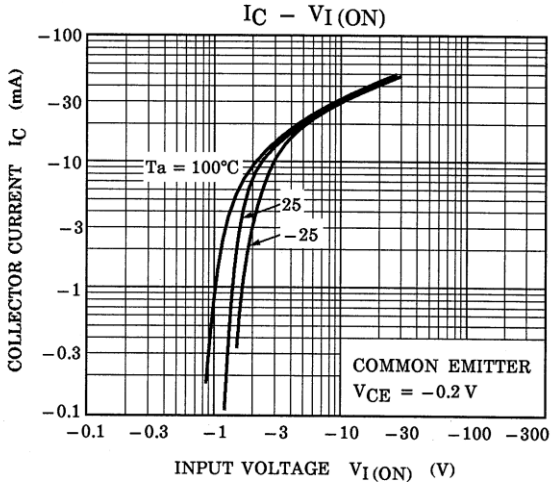

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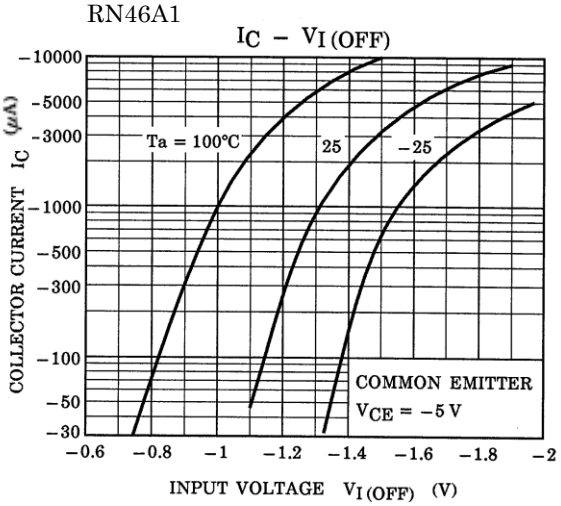

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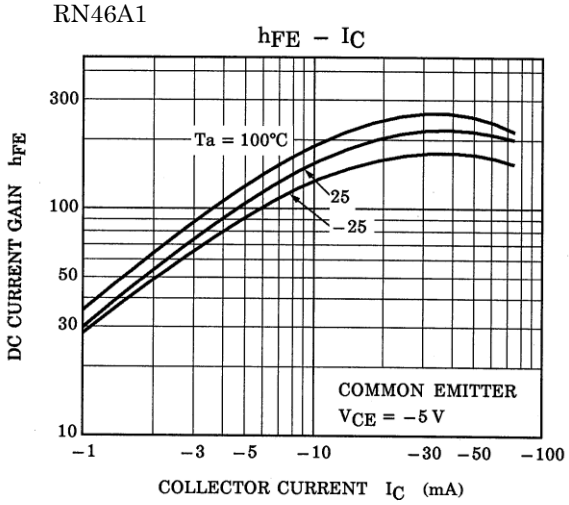
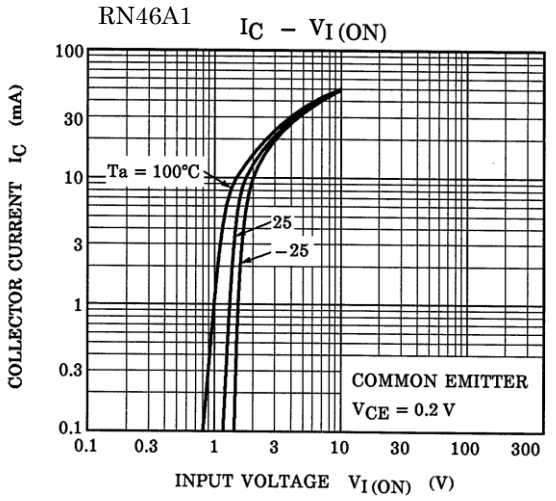
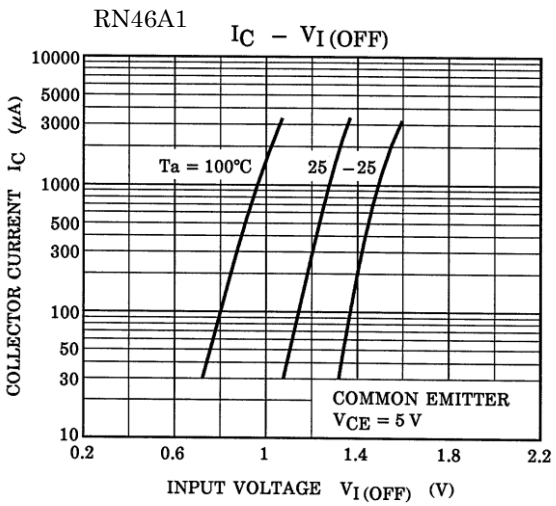
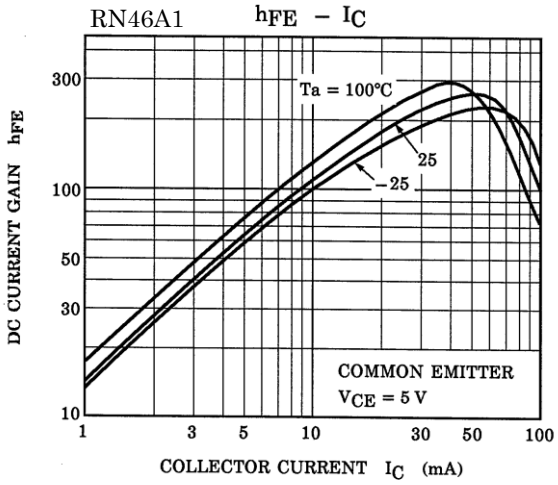


The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Q2 characteristics curves







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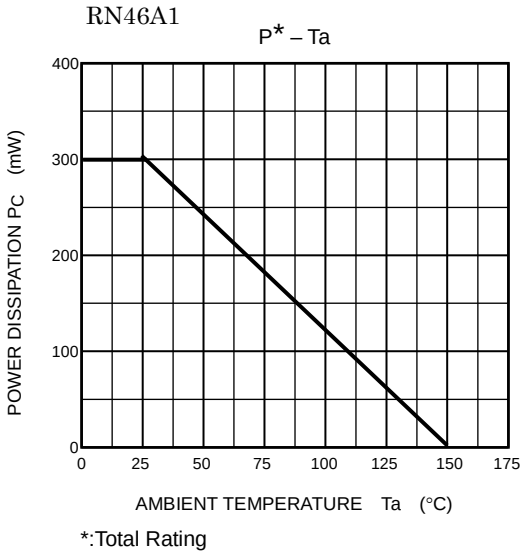
Q1,Q2 characteristics curve



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