

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

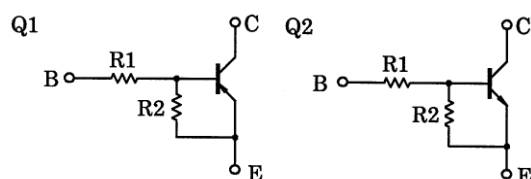
# RN46A1

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.

## Equivalent Circuit and Bias Resistor Values



Q1  
R1: 22kΩ  
R2: 22kΩ

Q2  
R1: 10kΩ  
R2: 10kΩ

Q1: RN2403 Equivalent

Q2: RN1402 Equivalent

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	VCBO	-50	V
Collector-emitter voltage	VCEO	-50	V
Emitter-base voltage	VEBO	-10	V
Collector current	IC	-100	mA

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	VCBO	50	V
Collector-emitter voltage	VCEO	50	V
Emitter-base voltage	VEBO	10	V
Collector current	IC	100	mA

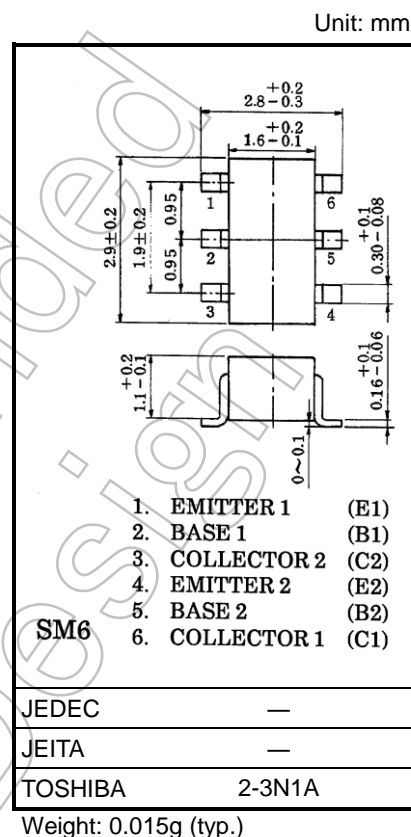
## Q1, Q2 Common Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector power dissipation	PC *	300	mW
Junction temperature	Tj	150	°C
Storage temperature range	Tstg	-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.

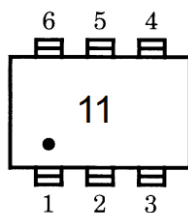
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

\* : Total rating

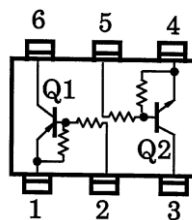


Start of commercial production  
1999-04

## Marking



## Equivalent Circuit (Top View)



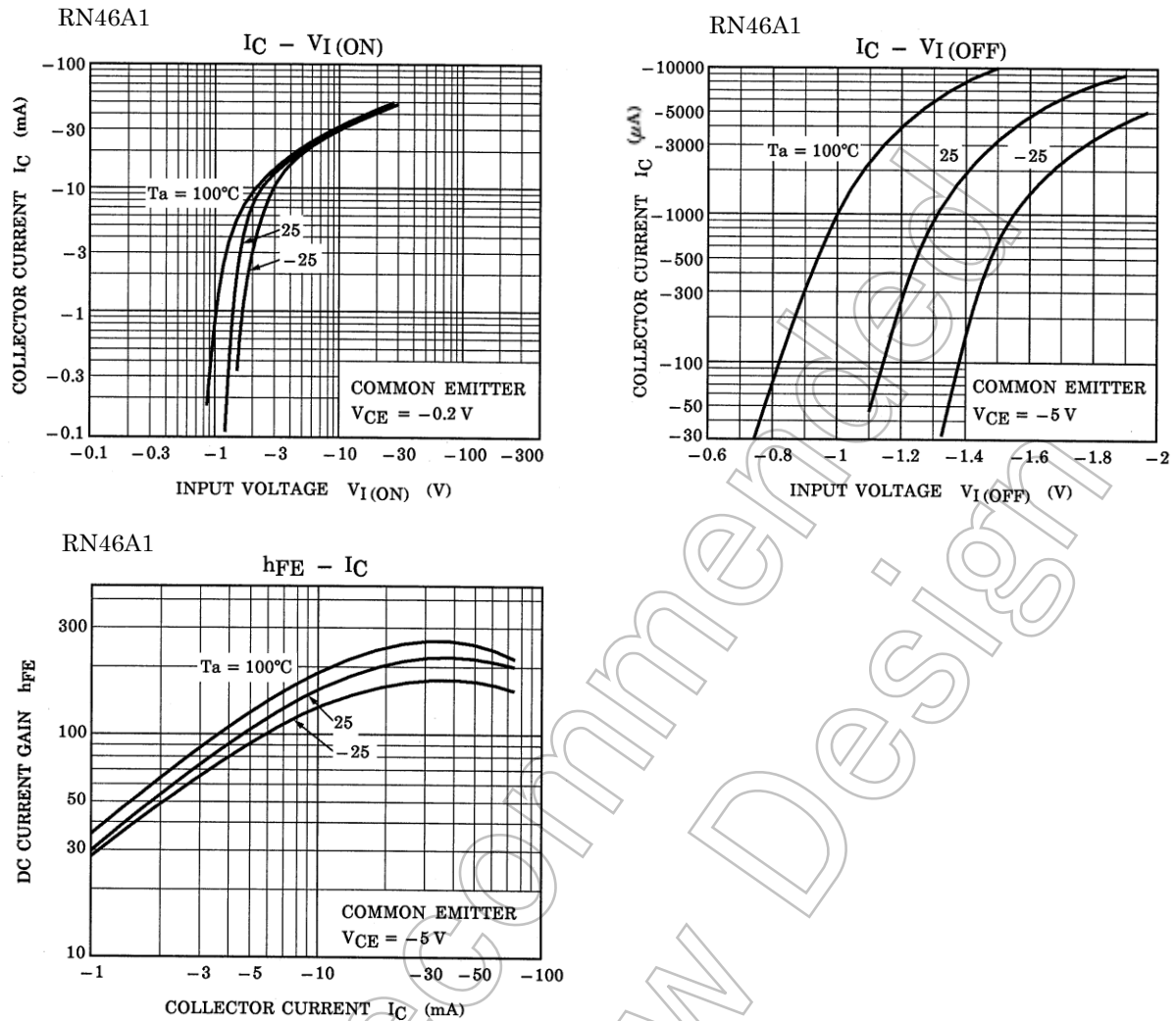
## Q1 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	ICBO	—	V <sub>CB</sub> = -50 V, I <sub>E</sub> = 0 mA	—	—	-100	nA
	ICEO	—	V <sub>CE</sub> = -50 V, I <sub>B</sub> = 0 mA	—	—	-500	
Emitter cut-off current	IEBO	—	V <sub>EB</sub> = -10 V, I <sub>C</sub> = 0 mA	-0.17	—	-0.33	mA
DC current gain	hFE	—	V <sub>CE</sub> = -5 V, I <sub>C</sub> = -10 mA	70	—	—	—
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	—	I <sub>C</sub> = -5 mA, I <sub>B</sub> = -0.25 mA	—	-0.1	-0.3	V
Input voltage (ON)	V <sub>I</sub> (ON)	—	V <sub>CE</sub> = -0.2 V, I <sub>C</sub> = -5 mA	-1.3	—	-3.0	V
Input voltage (OFF)	V <sub>I</sub> (OFF)	—	V <sub>CE</sub> = -5 V, I <sub>C</sub> = -0.1 mA	-1.0	—	-1.5	V
Transition frequency	f <sub>T</sub>	—	V <sub>CE</sub> = -10 V, I <sub>C</sub> = -5 mA	—	200	—	MHz
Collector output capacitance	C <sub>ob</sub>	—	V <sub>CB</sub> = -10 V, I <sub>E</sub> = 0 mA, f = 1 MHz	—	3	—	pF
Input resistance	R <sub>1</sub>	—	—	15.4	22	28.6	kΩ
Resistance ratio	R <sub>1</sub> /R <sub>2</sub>	—	—	0.9	1.0	1.1	—

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

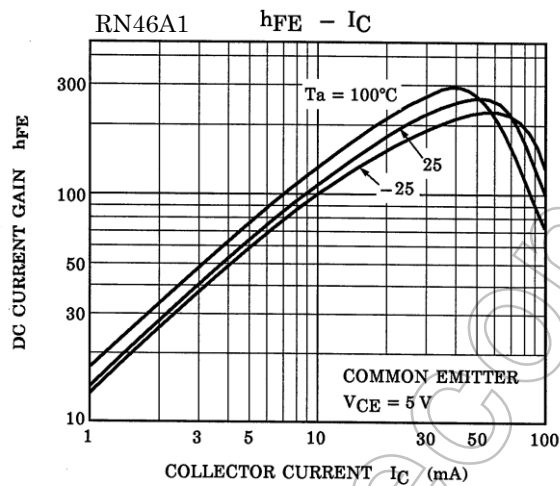
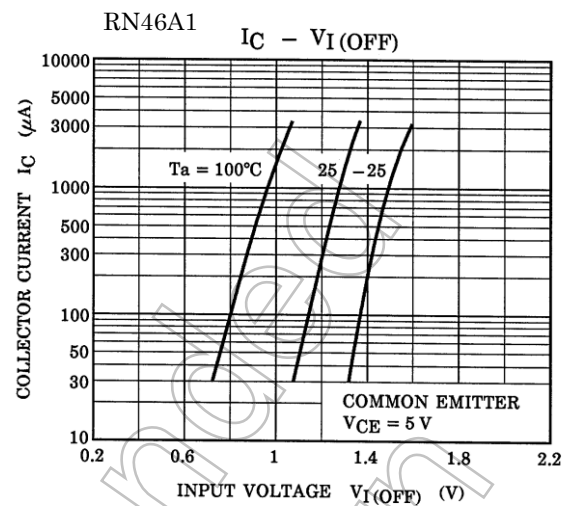
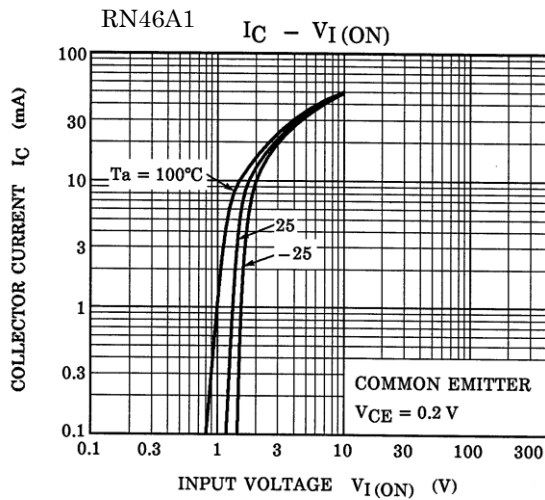
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	ICBO	—	V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0 mA	—	—	100	nA
	ICEO	—	V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0 mA	—	—	500	
Emitter cut-off current	IEBO	—	V <sub>EB</sub> = 10 V, I <sub>C</sub> = 0 mA	0.38	—	0.71	mA
DC current gain	hFE	—	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA	50	—	—	—
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	—	I <sub>C</sub> = 5 mA, I <sub>B</sub> = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	V <sub>I</sub> (ON)	—	V <sub>CE</sub> = 0.2 V, I <sub>C</sub> = 5 mA	1.2	—	2.4	V
Input voltage (OFF)	V <sub>I</sub> (OFF)	—	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.1 mA	1.0	—	1.5	V
Transition frequency	f <sub>T</sub>	—	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5 mA	—	250	—	MHz
Collector output capacitance	C <sub>ob</sub>	—	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA, f = 1 MHz	—	3	—	pF
Input resistance	R <sub>1</sub>	—	—	7	10	13	kΩ
Resistance ratio	R <sub>1</sub> /R <sub>2</sub>	—	—	0.9	1.0	1.1	—

## Q1 characteristics curves



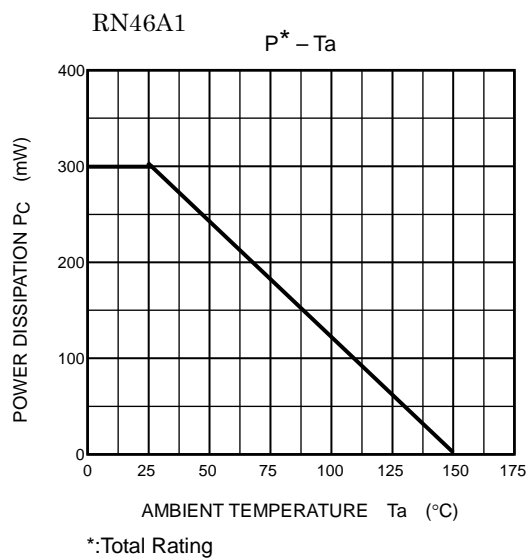
The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

## Q2 characteristics curves



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

## Q1,Q2 characteristics curve



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

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