

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

RN49A2

Switching, Inverter Circuit, Interface Circuit and Driver Circuit

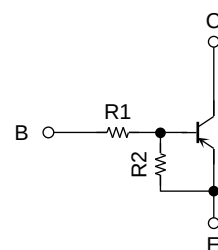
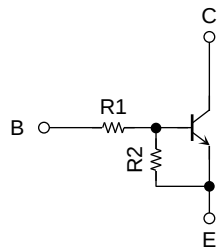
Unit: mm

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

Equivalent Circuit and Bias Resistor Values

Q1

Q2



Q1

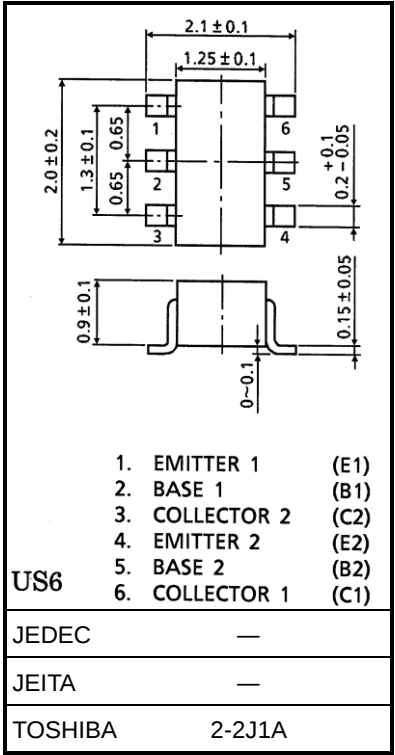
R1: 47 kΩ, R2: 47 kΩ

Q2

R1: 2.2 kΩ, R2: 47 kΩ

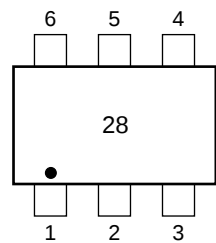
Q1: RN1104F equivalent

Q2: RN2105F equivalent

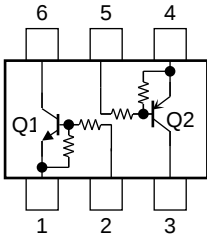


Weight: 0.006g (typ.)

Marking



Equivalent Circuit (top view)



Start of commercial production
1999-10

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	I _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}	–5	V
Collector current	I _C	–100	mA

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

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P _C (Note 1)	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).

Note 1: Total rating

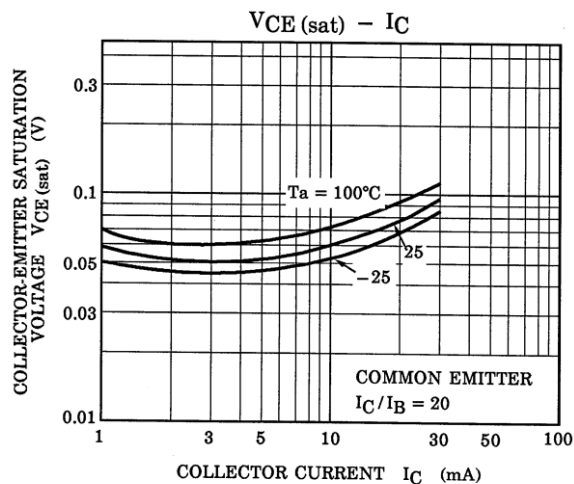
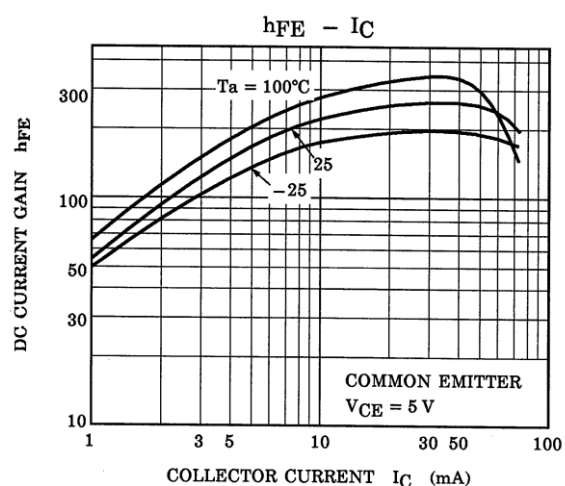
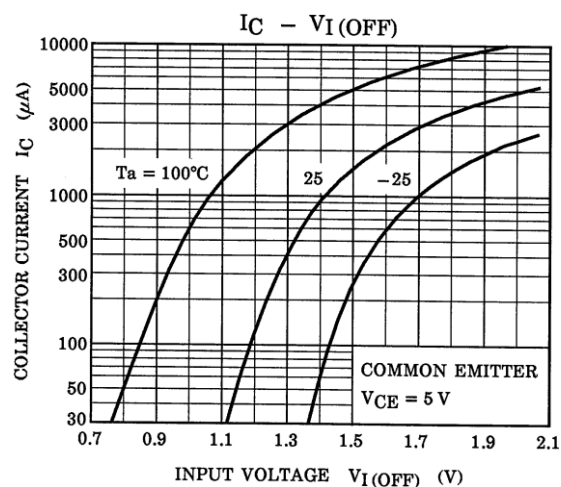
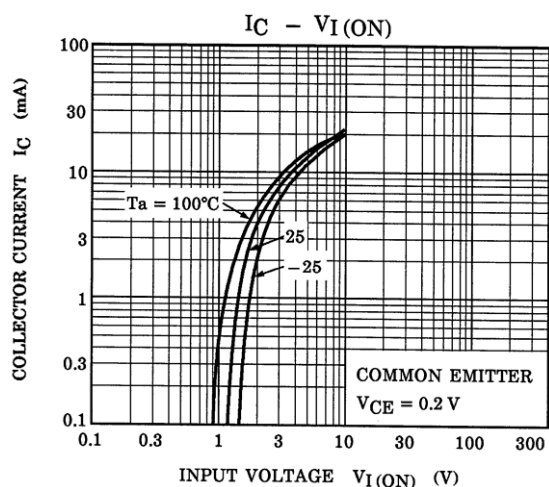
Electrical Characteristics (Ta = 25°C) (Q1)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	ICBO	V _{CB} = 50 V, I _E = 0 mA	—	—	100	nA
	ICEO	V _{CE} = 50 V, I _B = 0 mA	—	—	500	
Emitter cut-off current	IEBO	V _{EB} = 10 V, I _C = 0 mA	0.082	—	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	1.5	—	5.0	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	—	250	—	MHz
Collector output capacitance	C _{ob}	V _{CB} = 10 V, I _E = 0 mA, f = 1 MHz	—	3	—	pF
Input resistance	R _I	—	32.9	47	61.1	kΩ
Resistance ratio	R _{1/R2}	—	0.9	1.0	1.1	—

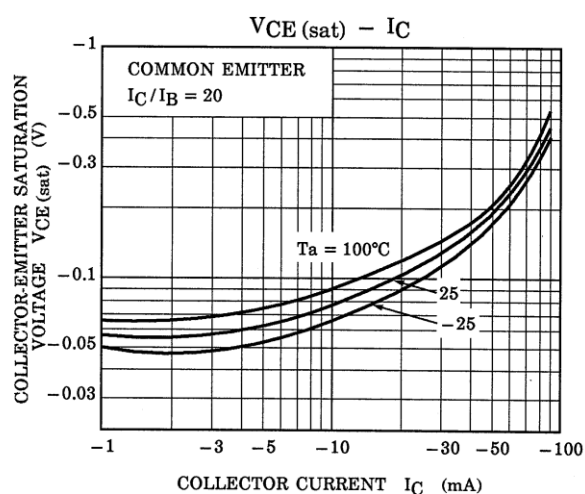
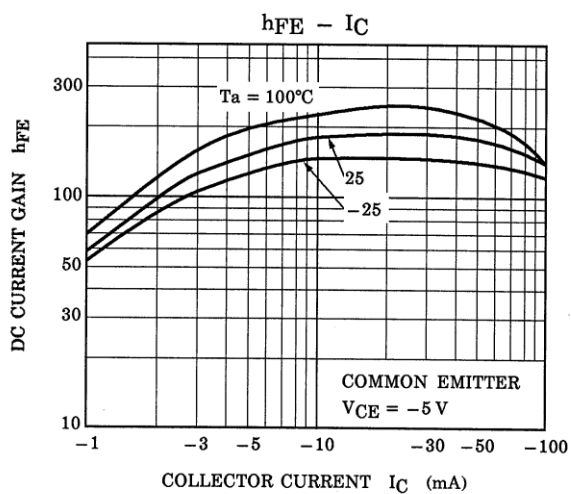
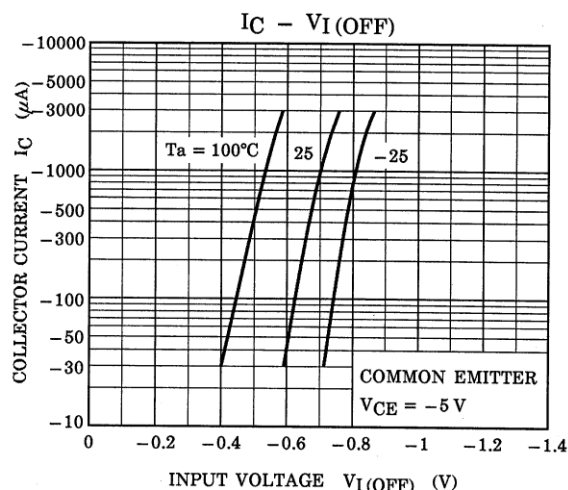
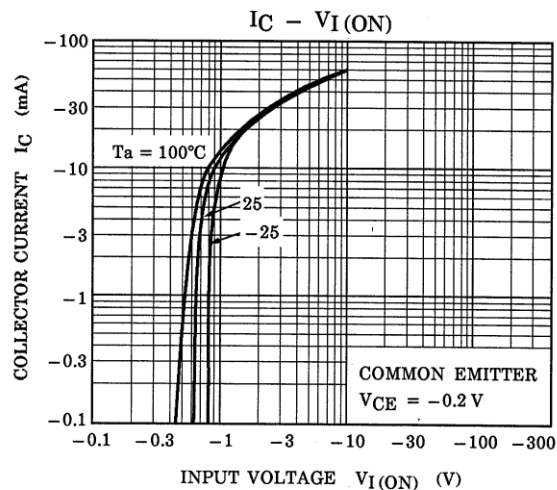
Electrical Characteristics (Ta = 25°C) (Q2)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	ICBO	V _{CB} = -50 V, I _E = 0 mA	—	—	-100	nA
	ICEO	V _{CE} = -50 V, I _B = 0 mA	—	—	-500	
Emitter cut-off current	IEBO	V _{EB} = -5 V, I _C = 0 mA	-0.078	—	-0.145	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	-0.6	—	-1.1	V
Input voltage (OFF)	V _{I (OFF)}	V _{CE} = -5 V, I _C = -0.1 mA	-0.5	—	-0.8	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	R _I	—	1.54	2.2	2.86	kΩ
Resistance ratio	R _{1/R2}	—	0.0421	0.0468	0.0515	—

Characteristics Curves Q1

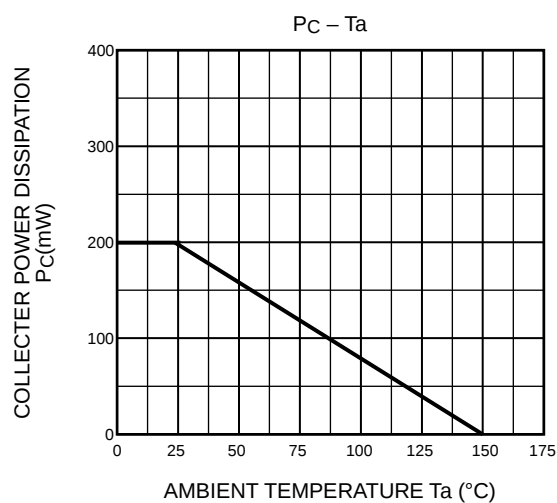


Characteristics Curves Q2



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

Characteristics Curves Q1,Q2 Common



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

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