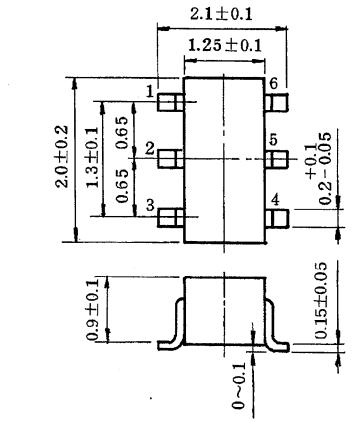
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

RN1970, RN1971

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Including two devices in US6 (ultra super mini type 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2970 to RN2971

Unit: mm



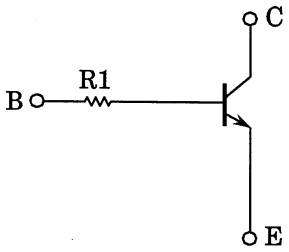
1. EMITTER 1 (E1)
2. EMITTER 2 (E2)
3. BASE 2 (B2)
4. COLLECTOR 2 (C2)
5. BASE 1 (B1)
6. COLLECTOR 1 (C1)

US6

JEDEC	—
JEITA	—
TOSHIBA	2-2J1B

Weight: 6.8mg (typ.)

Equivalent Circuit



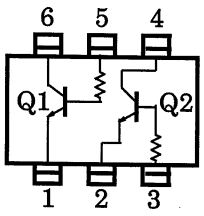
Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

Characterisstic	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
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

Equivalent Circuit (Top View)

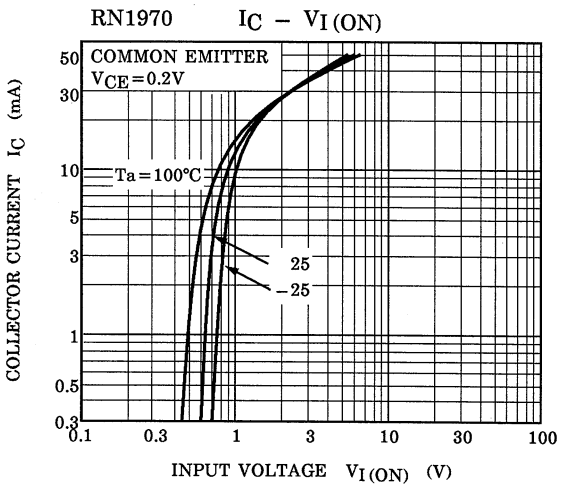


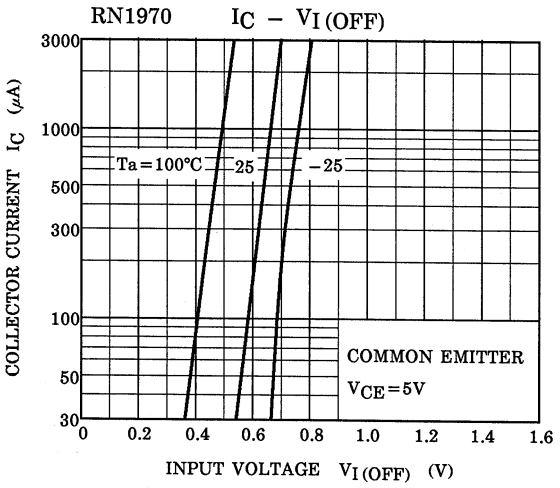
Start of commercial production
1992-01

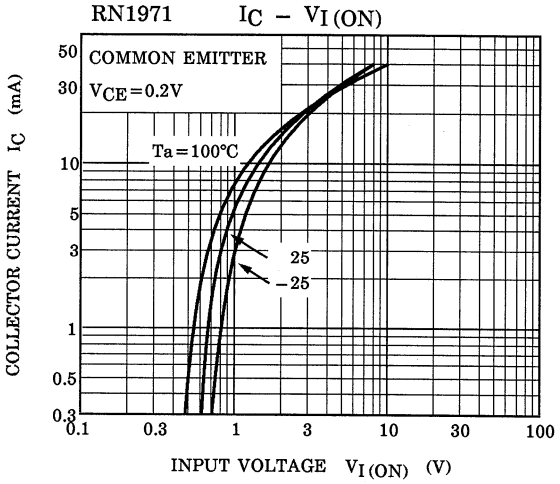
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

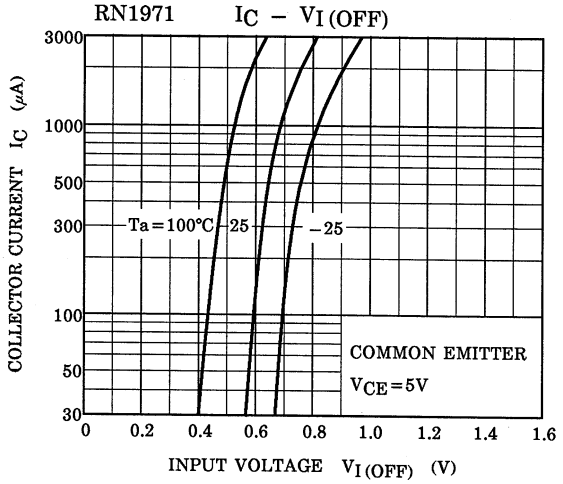
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	—	V_{CB} = 5V, I_E = 0	—	—	100	nA
Emitter cut-off current		I_{EBO}	—	V_{EB} = 5V, I_C = 0	—	—	100	nA
DC current gain		h_{FE}	—	V_{CE} = 5V, I_C = 1mA	120	—	700	—
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	—	I_C = 5mA, I_B = 0.25mA	—	0.1	0.3	V
Translation frequency		f_T	—	V_{CE} = 10V, I_C = 5mA	—	250	—	MHz
Collector output capacitance		C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1MHz	—	3	6	pF
Input resistor	RN1970	R1	—	—	3.29	4.7	6.11	kΩ
	RN1971				7	10	13	

(Q1, Q2 Common)

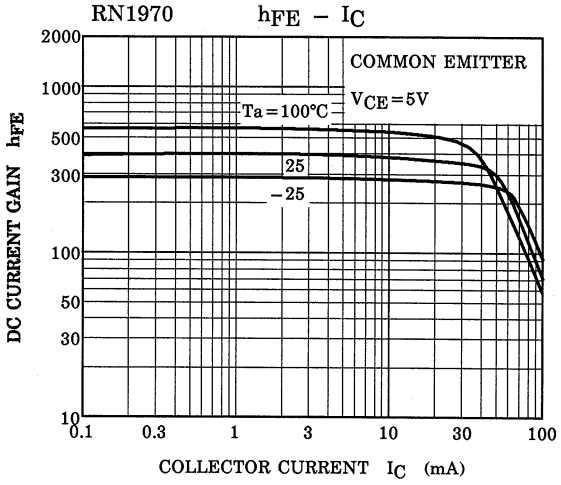

RN1970 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE}=0.2V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
50
30
10
5
3
1
0.5
0.3
0.1
0.3
1
3
10
30
100

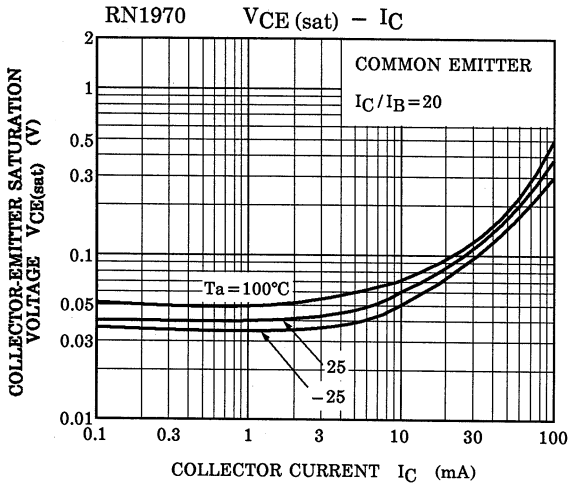

RN1970 I_C – $V_{I(OFF)}$
Ta=100°C
25
−25
COMMON EMITTER
V_{CE}=5V
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)
3000
1000
500
300
100
50
30
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

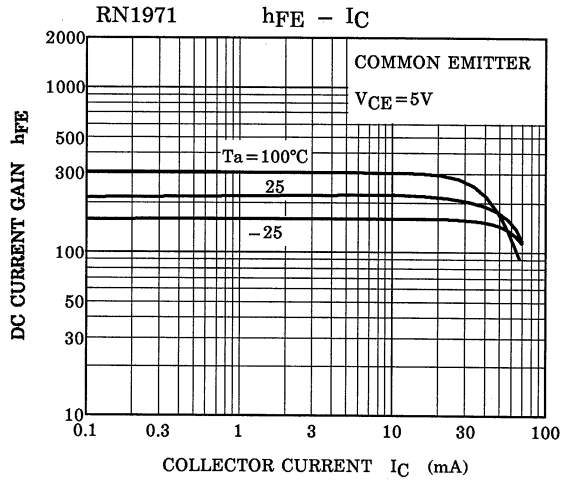

RN1971 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE}=0.2V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
50
30
10
5
3
1
0.5
0.3
0.1
0.3
1
3
10
30
100

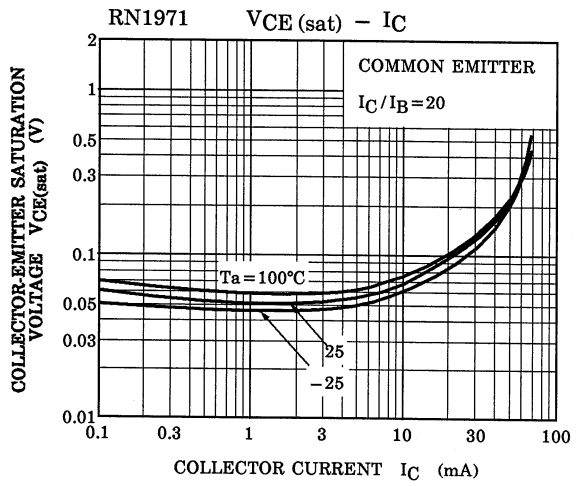

RN1971 I_C – $V_{I(OFF)}$
Ta=100°C
25
−25
COMMON EMITTER
V_{CE}=5V
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)
3000
1000
500
300
100
50
30
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

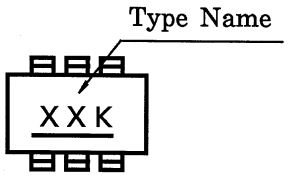
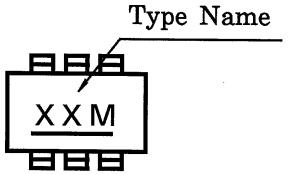
(Q1, Q2 Common)


RN1970 hFE – IC
COMMON EMITTER
VCE=5V
Ta=100°C
25
−25
DC CURRENT GAIN hFE
COLLECTOR CURRENT IC (mA)
2000
1000
500
300
100
50
30
10
0.1
0.3
1
3
10
30
100


RN1970 VCE (sat) – IC
COMMON EMITTER
IC/IB=20
Ta=100°C
25
−25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (V)
COLLECTOR CURRENT IC (mA)
2
1
0.5
0.3
0.1
0.05
0.03
0.01
0.1
0.3
1
3
10
30
100


RN1971 hFE – IC
COMMON EMITTER
VCE=5V
Ta=100°C
25
−25
DC CURRENT GAIN hFE
COLLECTOR CURRENT IC (mA)
2000
1000
500
300
100
50
30
10
0.1
0.3
1
3
10
30
100


RN1971 VCE (sat) – IC
COMMON EMITTER
IC/IB=20
Ta=100°C
25
−25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (V)
COLLECTOR CURRENT IC (mA)
2
1
0.5
0.3
0.1
0.05
0.03
0.01
0.1
0.3
1
3
10
30
100

Type Name	Marking
RN1970	
RN1971	

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