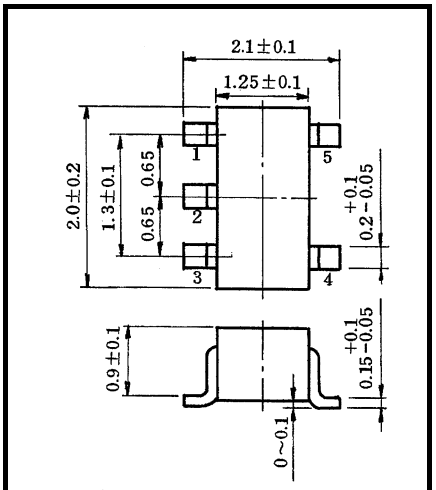
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN1707, RN1708, RN1709

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Including two devices in USV (ultra super mini type with 5 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2707 to RN2709

Unit: mm

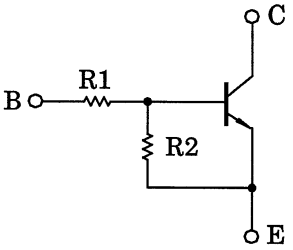


1. BASE 1 (B1)
2. EMITTER (E)
3. BASE 2 (B2)
4. COLLECTOR 2 (C2)
5. COLLECTOR 1 (C1)

USV	
JEDEC	—
JEITA	—
TOSHIBA	2-2L1A

Weight: 6.2mg (typ.)

Equivalent Circuit and Bias Resistor Values

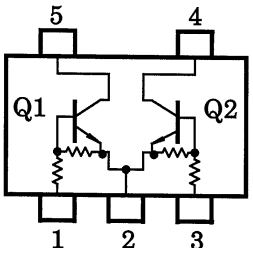


Type No.	R1 (kΩ)	R2 (kΩ)
RN1707	10	47
RN1708	22	47
RN1709	47	22

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

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1707 to 1709	V_{CBO}	50	V
Collector-emitter voltage	RN1707 to 1709	V_{CEO}	50	V
Emitter-base voltage	RN1707	V_{EBO}	6	V
	RN1708		7	
	RN1709		15	
Collector current	RN1707 to 1709	I_C	100	mA
Collector power dissipation		P_C*	200	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to150	°C

Equivalent Circuit (Top View)



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).

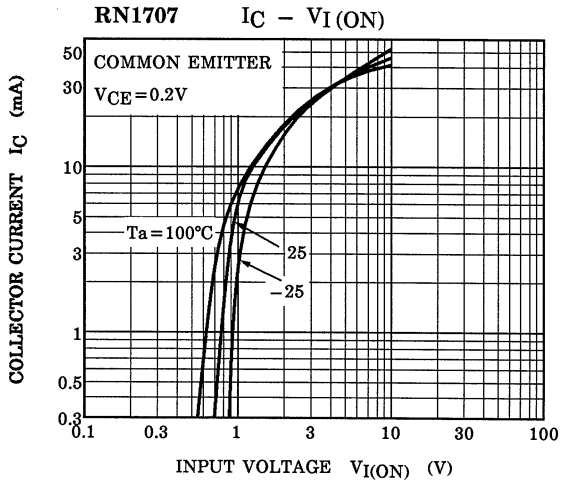
*: Total rating

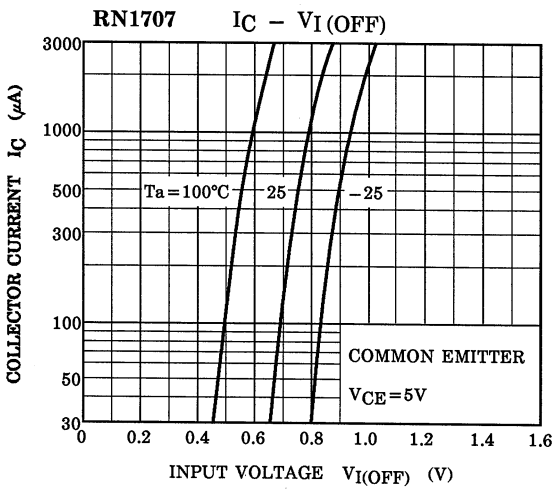
Start of commercial production
1992-01

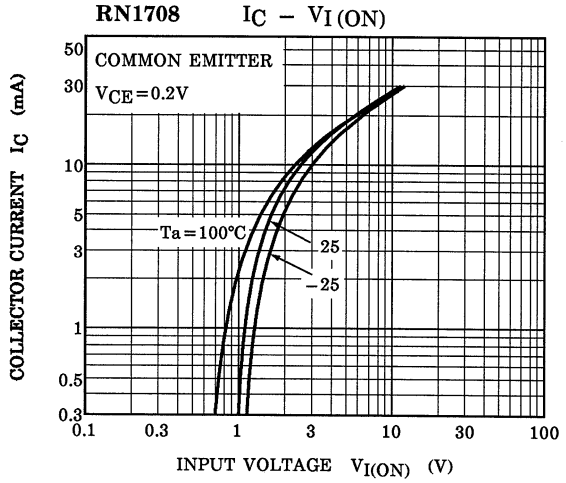
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

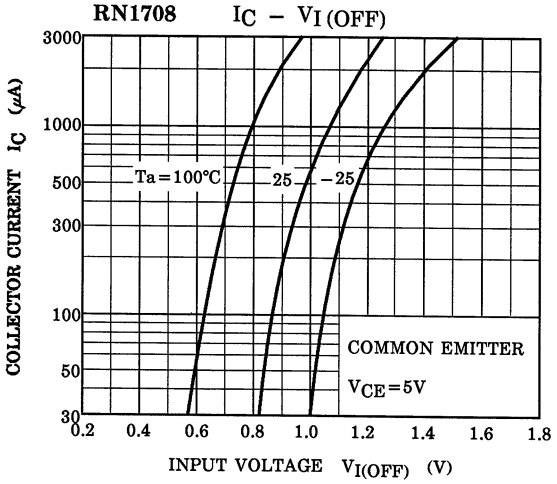
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1707 to 1709	I_{CBO}	—	V_{CB} = 50V, I_E = 0	—	—	100	nA
		I_{CEO}	—	V_{CE} = 50V, I_B = 0	—	—	500	nA
Emitter cut-off current	RN1707	I_{EBO}	—	V_{EB} = 6V, I_C = 0	0.081	—	0.15	mA
	RN1708		—	V_{EB} = 7V, I_C = 0	0.078	—	0.145	
	RN1709		—	V_{EB} = 15V, I_C = 0	0.167	—	0.311	
DC current gain	RN1707	h_{FE}	—	V_{CE} = 5V, I_C = 10mA	80	—	—	—
	RN1708		—		80	—	—	
	RN1709		—		70	—	—	
Collector-emitter saturation voltage	RN1707 to 1709	$V_{CE\ (sat)}$	—	I_C = 5mA, I_B = 0.25mA	—	0.1	0.3	V
Input voltage (ON)	RN1707	$V_{I\ (ON)}$	—	V_{CE} = 0.2V, I_C = 5mA	0.7	—	1.8	V
	RN1708		—		1.0	—	2.6	
	RN1709		—		2.2	—	5.8	
Input voltage (OFF)	RN1707	$V_{I\ (OFF)}$	—	V_{CE} = 5V, I_C = 0.1mA	0.5	—	1.0	V
	RN1708		—		0.6	—	1.16	
	RN1709		—		1.5	—	2.6	
Transition frequency	RN1707 to 1709	f_T	—	V_{CE} = 10V, I_C = 5mA	—	250	—	MHz
Collector output capacitance	RN1707 to 1709	C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1MHz	—	3	6	pF
Input resistor	RN1707	R1	—	—	7	10	13	kΩ
	RN1708		—		15.4	22	28.6	
	RN1709		—		32.9	47	61.1	
Resistor ratio	RN1707	R1/R2	—	—	0.191	0.213	0.232	—
	RN1708		—		0.421	0.468	0.515	
	RN1709		—		1.92	2.14	2.35	

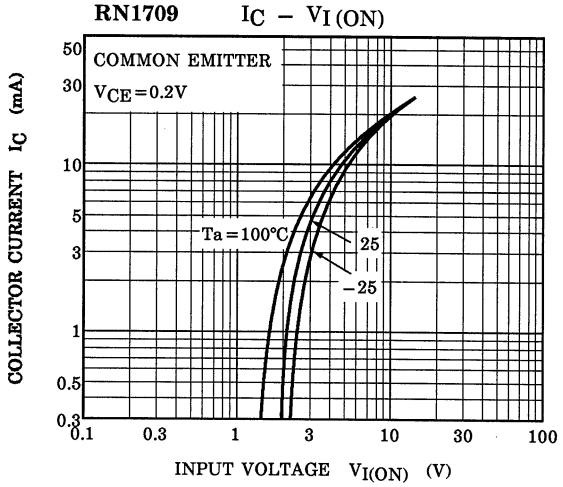
(Q1, Q2 Common)

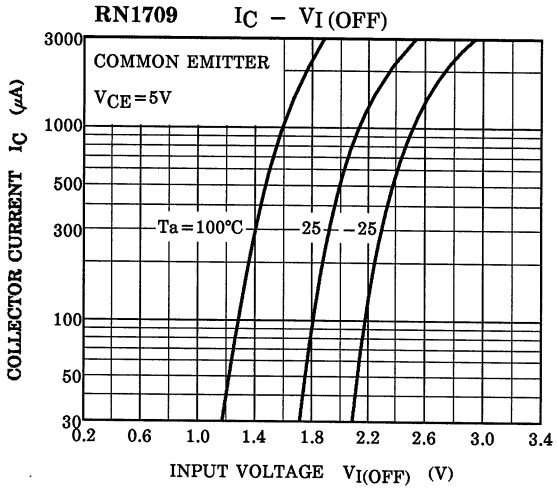

RN1707 I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE}=0.2V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)


RN1707 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)


RN1708 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)

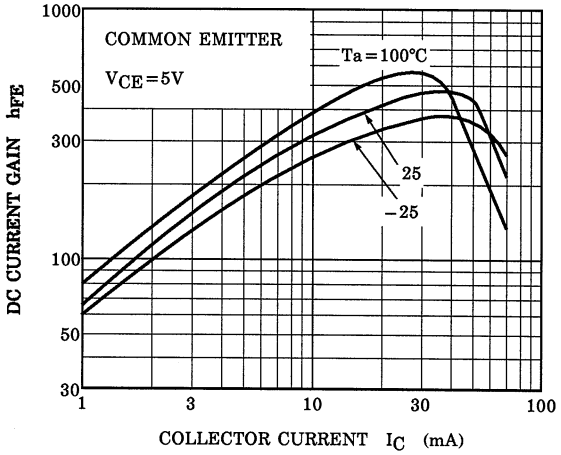

RN1708 I_C – $V_{I(OFF)}$
Ta=100°C
25
−25
COMMON EMITTER
V_{CE}=5V
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)


RN1709 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)

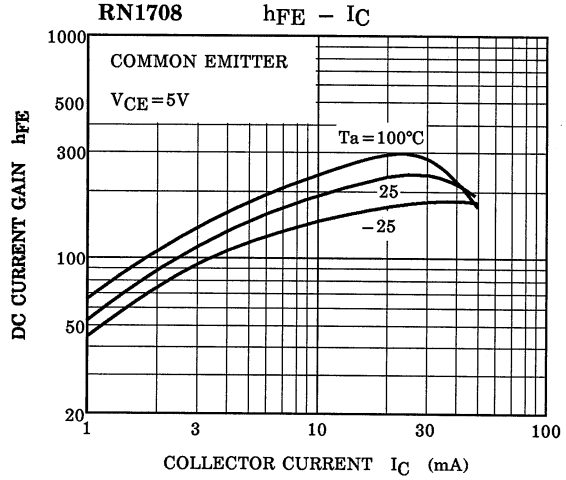

RN1709 I_C – $V_{I(OFF)}$
COMMON EMITTER
V_{CE}=5V
Ta=100°C
25
−25
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)

(Q1, Q2 Common)

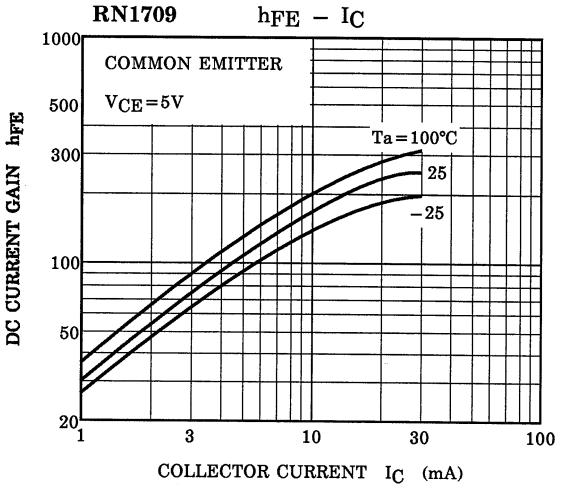
RN1707 h_{FE} – I_C



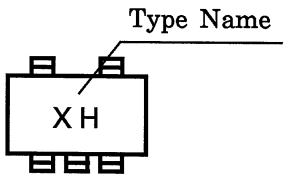
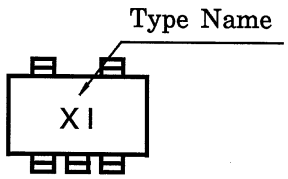
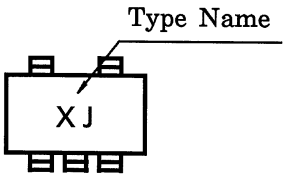
RN1708 h_{FE} – I_C



RN1709 h_{FE} – I_C



Marking

Type Name	Marking
RN1707	
RN1708	
RN1709	

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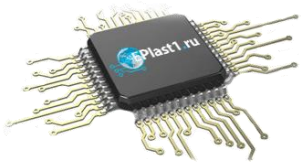

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