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

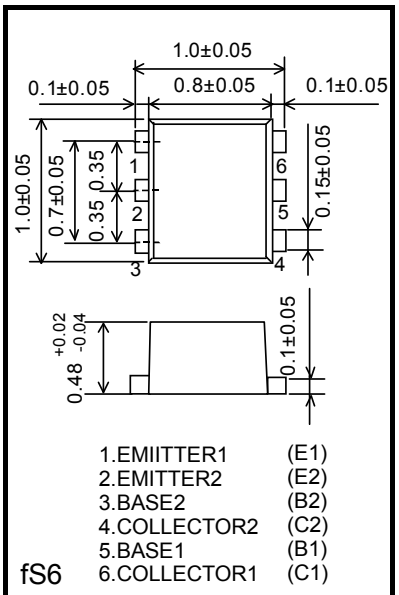
RN1972FS,RN1973FS

Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

Two devices are incorporated into a fine pitch small mold (6-pin) package

- Incorporating a bias resistor into a transistor reduces parts count.
  Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.
- Complementary to RN2972FS, RN2973FS

Unit: mm



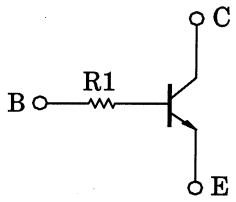
1.EMIITTER1	(E1)
2.EMITTER2	(E2)
3.BASE2	(B2)
4.COLLECTOR2	(C2)
5.BASE1	(B1)
6.COLLECTOR1	(C1)

fS6

JEDEC	—
JEITA	—
TOSHIBA	2-1F1C

Weight: 0.001 g (typ.)

Equivalent Circuit and Bias Resistor Values



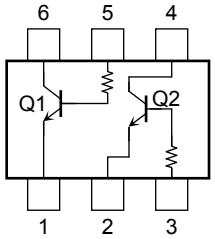
Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	50	mA
Collector power dissipation	P_C(Note 1)	50	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°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

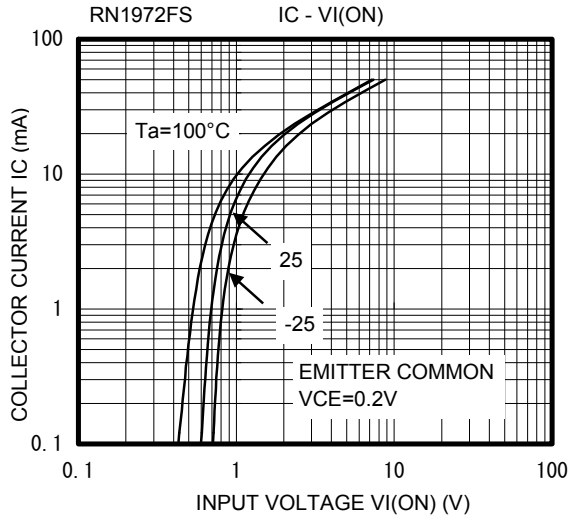
Equivalent Circuit (top view)

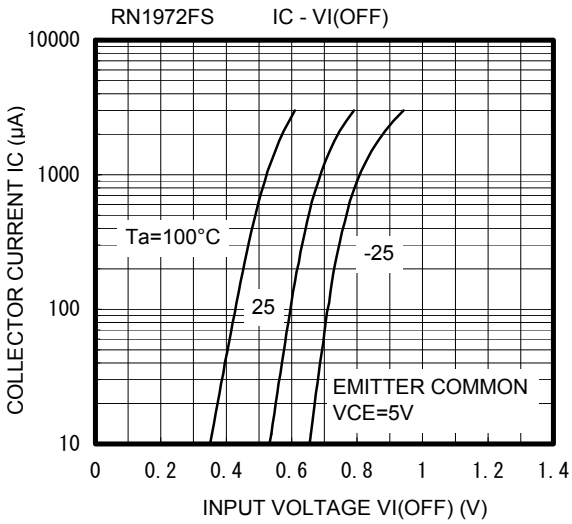


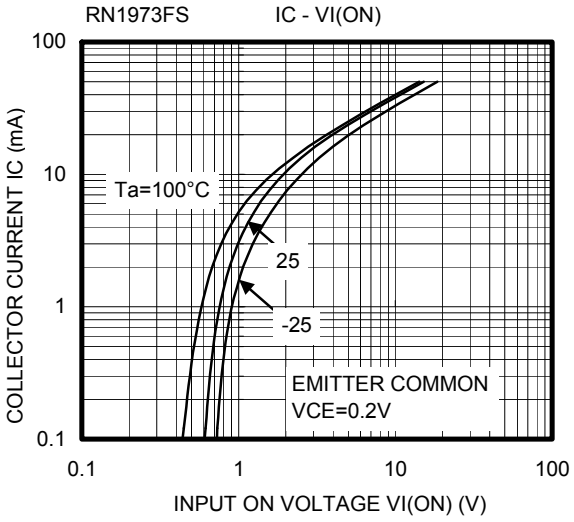
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

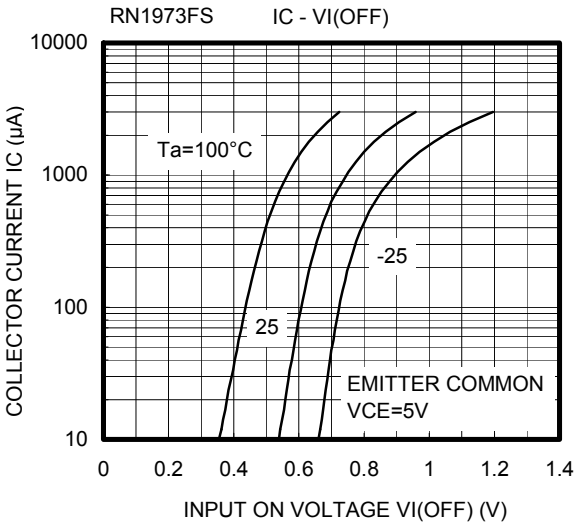
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = 20 V, I_E = 0	—	—	100	nA
Emitter cut-off current		I_{EBO}	V_{EB} = 5 V, I_C = 0	—	—	100	nA
DC current gain		h_{FE}	V_{CE} = 5 V, I_C = 1 mA	300	—	—	
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	—	0.15	V
Collector output capacitance		C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	1.2	—	pF
Input resistor	RN1972FS	R1	—	17.6	22	26.4	kΩ
	RN1973FS			37.6	47	56.4	

(Q1, Q2 common)

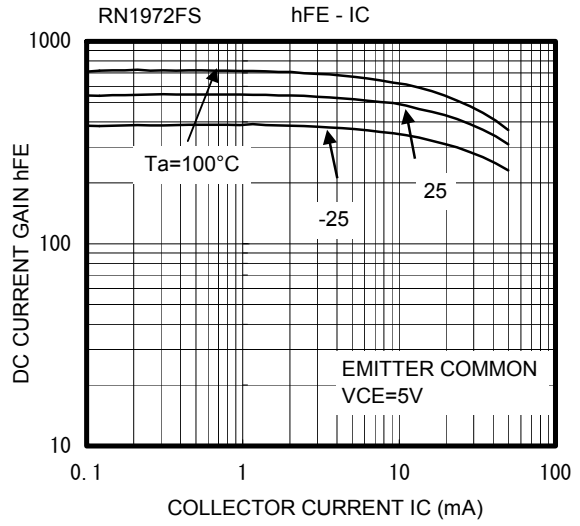

RN1972FS IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMITTER COMMON
VCE=0.2V
100
10
1
0.1
0.1
1
10
100

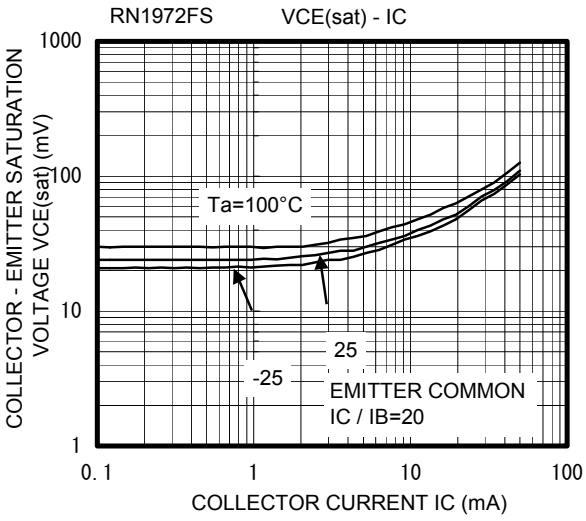

RN1972FS IC - VI(OFF)
COLLECTOR CURRENT IC (μA)
INPUT VOLTAGE VI(OFF) (V)
Ta=100°C
25
-25
EMITTER COMMON
VCE=5V
10000
1000
100
10
0
0.2
0.4
0.6
0.8
1
1.2
1.4

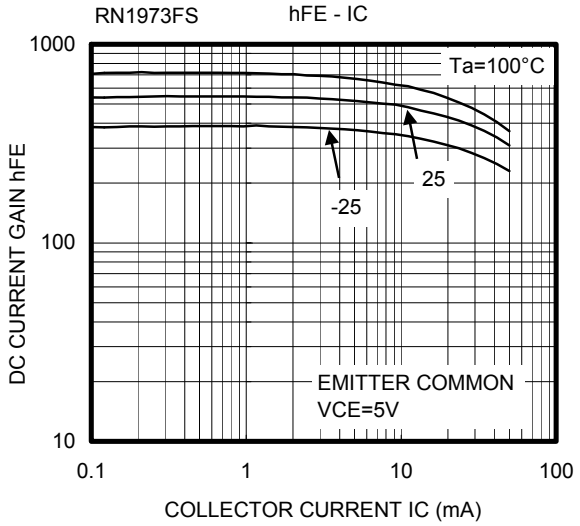

RN1973FS IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT ON VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMITTER COMMON
VCE=0.2V
100
10
1
0.1
0.1
1
10
100

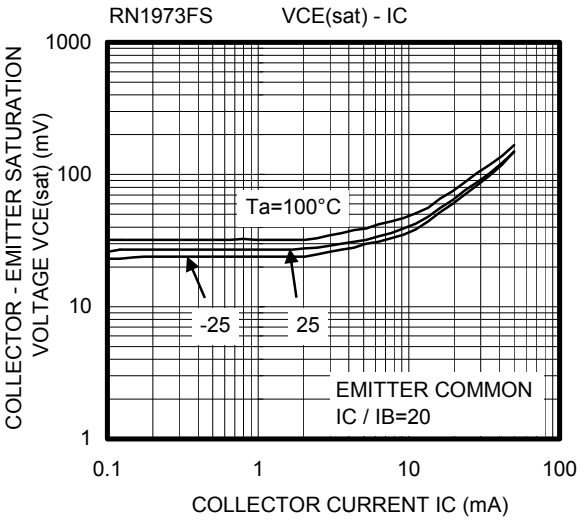

RN1973FS IC - VI(OFF)
COLLECTOR CURRENT IC (μA)
INPUT ON VOLTAGE VI(OFF) (V)
Ta=100°C
25
-25
EMITTER COMMON
VCE=5V
10000
1000
100
10
0
0.2
0.4
0.6
0.8
1
1.2
1.4

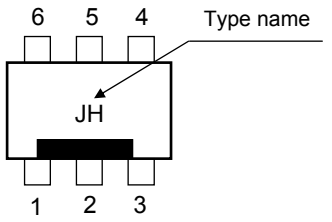
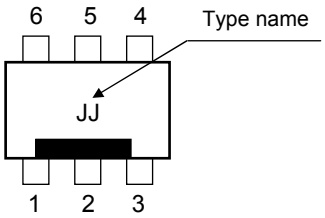
(Q1, Q2 common)


RN1972FS hFE - IC
DC CURRENT GAIN hFE
1000
100
10
0.1
1
10
100
COLLECTOR CURRENT IC (mA)
Ta=100°C
25
-25
EMITTER COMMON
VCE=5V


RN1972FS VCE(sat) - IC
COLLECTOR - EMITTER SATURATION VOLTAGE VCE(sat) (mV)
1000
100
10
1
0.1
1
10
100
COLLECTOR CURRENT IC (mA)
Ta=100°C
25
-25
EMITTER COMMON
IC / IB=20


RN1973FS hFE - IC
DC CURRENT GAIN hFE
1000
100
10
0.1
1
10
100
COLLECTOR CURRENT IC (mA)
Ta=100°C
25
-25
EMITTER COMMON
VCE=5V


RN1973FS VCE(sat) - IC
COLLECTOR - EMITTER SATURATION VOLTAGE VCE(sat) (mV)
1000
100
10
1
0.1
1
10
100
COLLECTOR CURRENT IC (mA)
Ta=100°C
-25
25
EMITTER COMMON
IC / IB=20

Type Name	Marking
RN1972FS	
RN1973FS	

Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic discharge. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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