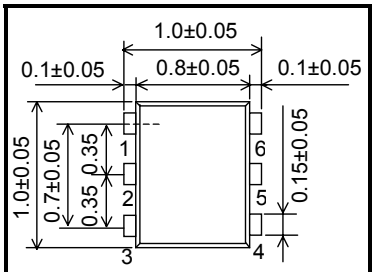
Preliminary TOSHIBA Transistor Silicon NPN・PNP Epitaxial Type (PCT Process) (Transistor with Built-in Bias Resistor)

RN49P1FS

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 the parts count.
  Reducing the parts count enables the manufacture of ever more compact equipment and saves assembly costs.
- Lead (Pb) - free

Unit: mm



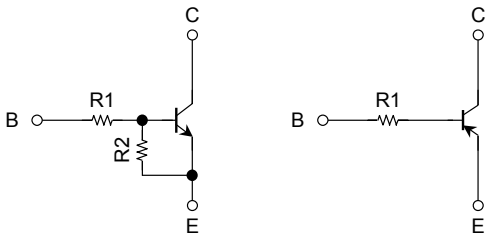
1. EMITTER1 (E1)
2. EMITTER2 (E2)
3. BASE2 (B2)
4. COLLECTOR2 (C2)
5. BASE1 (B1)
6. COLLECTOR1 (C1)

JEDEC	—
JEITA	—
TOSHIBA	—

Weight: 0.001 g (typ.)

Equivalent Circuit and Bias Resistor Values

Q1 **Q2**



Q1

R1: 10 kΩ, R2: 10 kΩ

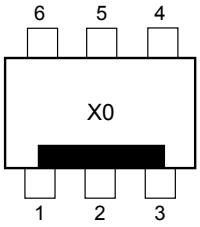
Q2

R1: 10 kΩ

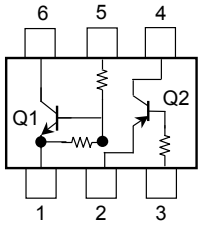
Q1: RN1102FS

Q2: RN2111FS

Marking



Equivalent Circuit (top view)



Maximum Ratings (Ta = 25°C) (Q1)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	10	V
Collector current	I_C	50	mA

Maximum Ratings (Ta = 25°C) (Q2)

Characteristic	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

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

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C (Note)	50	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°C

Note: Total rating

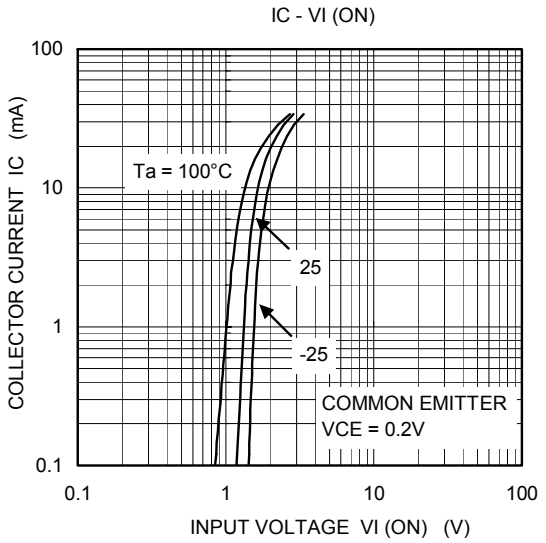
Electrical Characteristics (Ta = 25°C) (Q1)

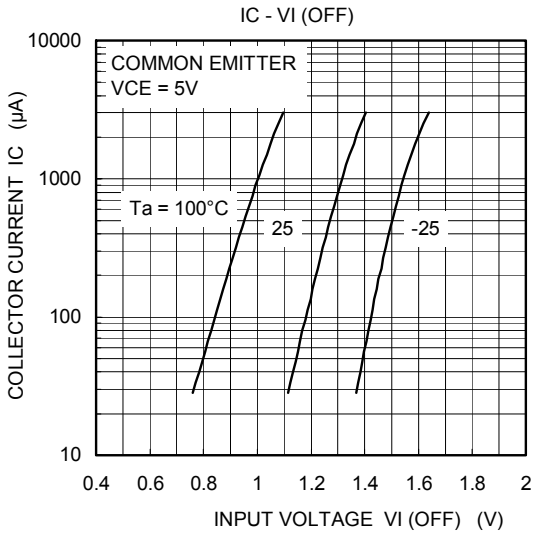
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 20 V, I_E = 0	—	—	100	nA
	I_{CEO}	V_{CE} = 20 V, I_B = 0	—	—	500	
Emitter cutoff current	I_{EBO}	V_{EB} = 10 V, I_C = 0	0.41	—	0.63	mA
DC current gain	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	60	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	—	0.15	V
Input voltage (ON)	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.0	—	2.2	V
Input voltage (OFF)	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	0.8	—	1.5	V
Collector output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	1.2	—	pF
Input resistor	R1	—	8	10	12	kΩ
Resistor ratio	R1/R2	—	0.8	1.0	1.2	

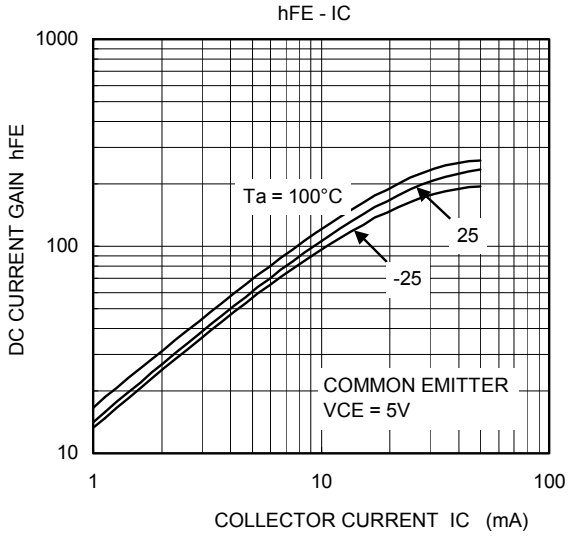
Electrical Characteristics (Ta = 25°C) (Q2)

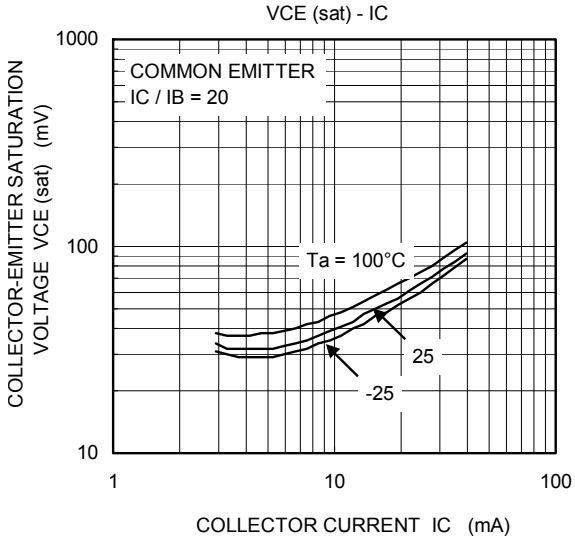
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cutoff current	I_{CBO}	V_{CB} = −20 V, I_E = 0	—	—	−100	nA
Emitter cutoff current	I_{EBO}	V_{EB} = −5 V, I_C = 0	—	—	−100	mA
DC current gain	h_{FE}	V_{CE} = −5 V, I_C = −1 mA	300	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	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	R1	—	8	10	12	kΩ

Q1

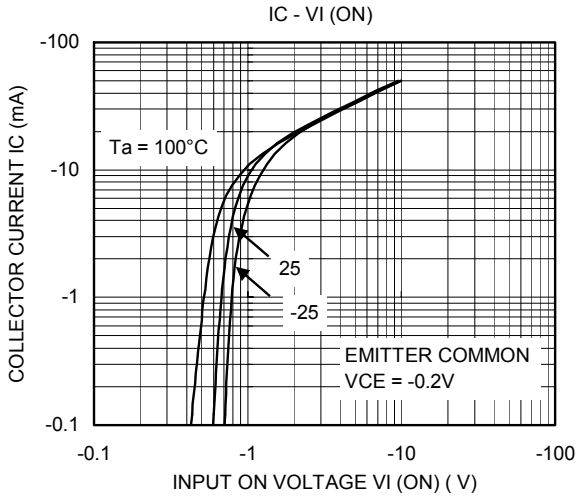

IC - VI (ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI (ON) (V)
Ta = 100°C
25
-25
COMMON EMITTER
VCE = 0.2V
100
10
1
0.1
0.1
1
10
100

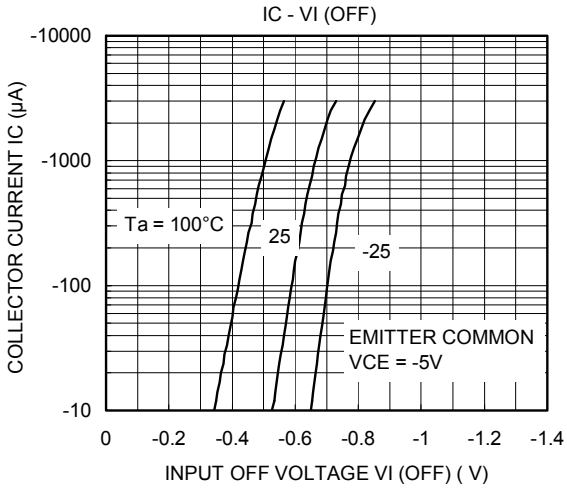

IC - VI (OFF)
COLLECTOR CURRENT IC (μA)
INPUT VOLTAGE VI (OFF) (V)
COMMON EMITTER
VCE = 5V
Ta = 100°C
25
-25
10000
1000
100
10
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

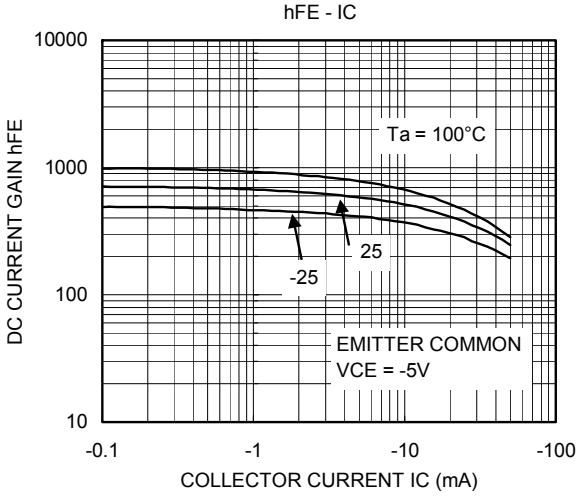

hFE - IC
DC CURRENT GAIN hFE
COLLECTOR CURRENT IC (mA)
Ta = 100°C
25
-25
COMMON EMITTER
VCE = 5V
1000
100
10
1
10
100

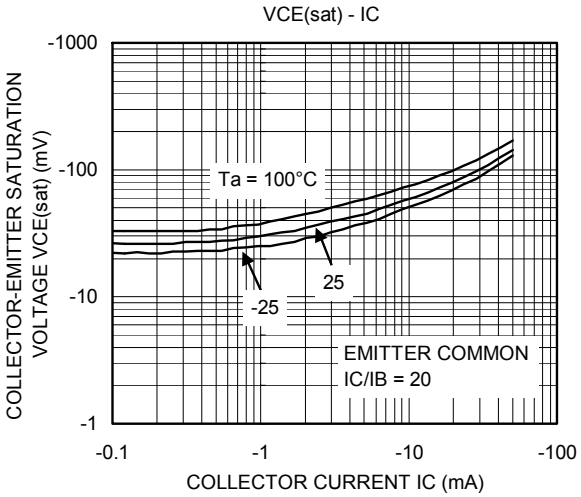

VCE (sat) - IC
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (mV)
COLLECTOR CURRENT IC (mA)
COMMON EMITTER
IC / IB = 20
Ta = 100°C
25
-25
1000
100
10
1
10
100

Q2


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


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


hFE - IC
DC CURRENT GAIN hFE
10000
1000
100
10
Ta = 100°C
25
-25
EMITTER COMMON
VCE = -5V
-0.1
-1
-10
-100
COLLECTOR CURRENT IC (mA)


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

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