

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

RN47A5

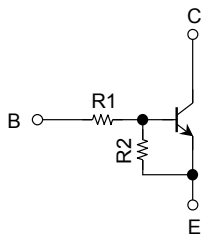
Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

Unit: mm

- Two devices are incorporated into an Ultra-Super-Mini (5 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.

Equivalent Circuit and Bias Resistor Values

Q1



Q1

R1: 47 kΩ, R2: 47 kΩ

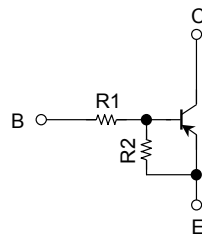
Q2

R1: 4.7 kΩ, R2: 10 kΩ

Q1: RN1104F

Q2: RN2116F

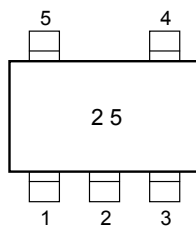
Q2



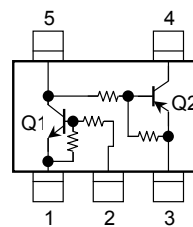
1. EMITTER 1 (E1)	
2. BASE 1 (B1)	
3. EMITTER 2 (E2)	
4. COLLECTOR 2 (C2)	
5. COLLECTOR 1 (C1)	
USV	BASE 2 (B2)
JEDEC	—
JEITA	—
TOSHIBA	2-2L1D

Weight: 0.0062g (typ.)

Marking



Equivalent Circuit (top view)



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

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}	-7	V
Collector current	I_C	-100	mA

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

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P_C (Note)	200	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-55~150	°C

Note: Total rating

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
	I_{CEO}	$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	I_{EBO}	$V_{EB} = 10\text{ V}, I_C = 0$	0.082	—	0.15	mA
DC current gain	h_{FE}	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	80	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	1.5	—	5.0	V
Input voltage (OFF)	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	1.0	—	1.5	V
Transition frequency	f_T	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector output capacitance	C_{ob}	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	3	—	pF
Input resistor	R1	—	32.9	47	61.1	kΩ
Resistor ratio	R1/R2	—	0.8	1.0	1.2	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = -50\text{ V}, I_E = 0$	—	—	-100	nA
	I_{CEO}	$V_{CE} = -50\text{ V}, I_B = 0$	—	—	-500	
Emitter cut-off current	I_{EBO}	$V_{EB} = -7\text{ V}, I_C = 0$	-0.36	—	-0.68	mA
DC current gain	h_{FE}	$V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$	50	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	-0.1	-0.3	V
Input voltage (ON)	$V_{I(ON)}$	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-0.7	—	-2.5	V
Input voltage (OFF)	$V_{I(OFF)}$	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-0.3	—	-1.1	V
Transition frequency	f_T	$V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$	—	200	—	MHz
Collector output capacitance	C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	3	—	pF
Input resistor	R1	—	3.29	4.7	6.11	kΩ
Resistor ratio	R1/R2	—	—	0.47	—	