

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

RN47A5

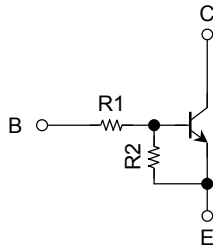
Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications.

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 enable the manufacture of ever more compact equipment and save assembly cost.

Equivalent Circuit and Bias Resistor Values

Q1



Q1

R1: 47 kΩ, R2: 47 kΩ

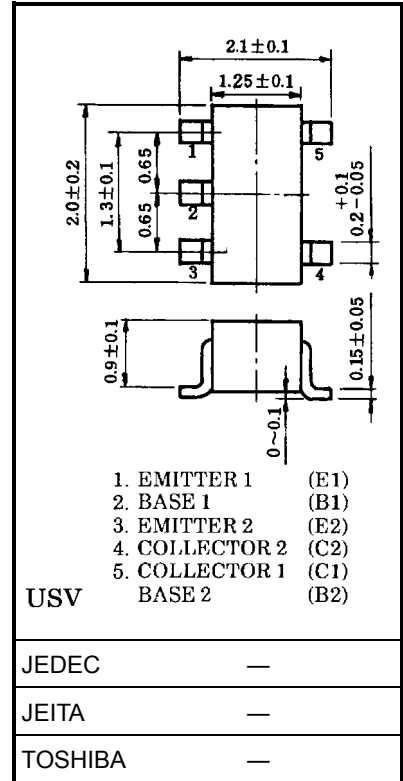
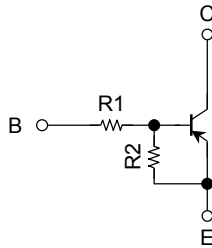
Q2

R1: 4.7 kΩ, R2: 10 kΩ

Q1: RN1104F

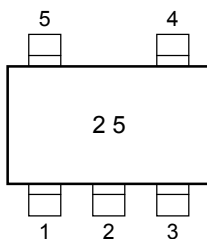
Q2: RN2116F

Q2

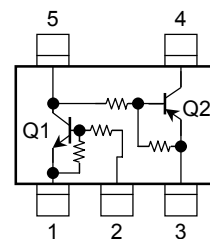


Weight: g (typ.)

Marking



Equivalent Circuit (top view)



Maximum Ratings (Ta = 25°C) (Q1)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CB0}	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 _{CB0}	-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	6	pF
Input resistor	R1	—	32.9	47	61.1	k Ω
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	6	pF
Input resistor	R1	—	3.29	4.7	6.11	k Ω
Resistor ratio	R1/R2	—	—	0.47	—	

RESTRICTIONS ON PRODUCT USE

000707EAA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.