

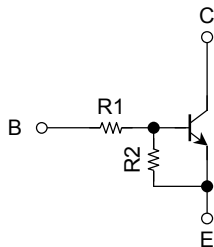
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

## RN1961FE, RN1962FE, RN1963FE RN1964FE, RN1965FE, RN1966FE

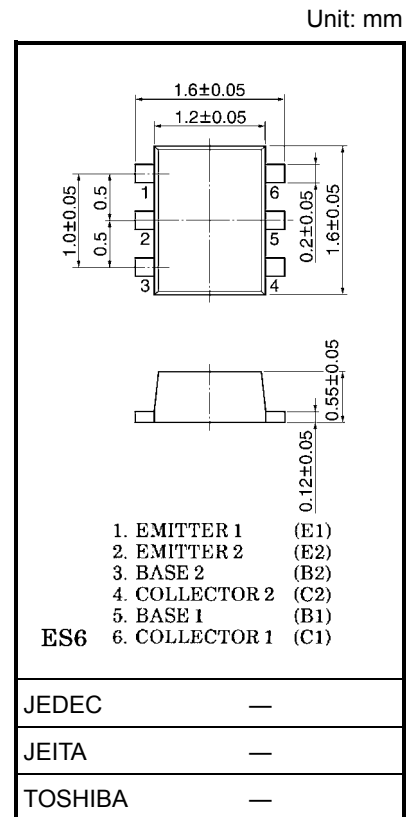
Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications.

- Two devices are incorporated into an Extreme-Super-Mini (6 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.
- Complementary to RN2961FE~RN2966FE

### Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1961FE	4.7	4.7
RN1962FE	10	10
RN1963FE	22	22
RN1964FE	47	47
RN1965FE	2.2	47
RN1966FE	4.7	47



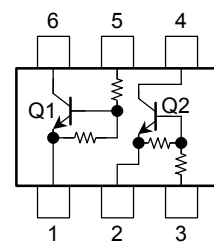
Weight: g (typ.)

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

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
		5	
Collector current	$I_C$	100	mA
Collector power dissipation	$P_C$ (Note)	100	mW
Junction temperature	$T_j$	150	°C
Storage temperature range	$T_{stg}$	-55~150	°C

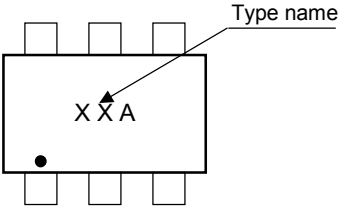
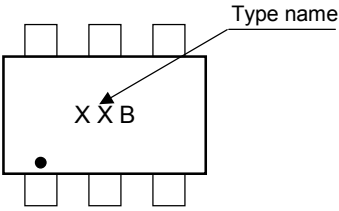
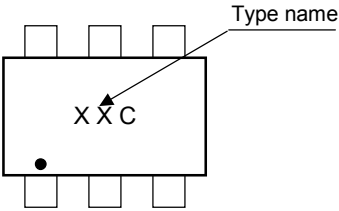
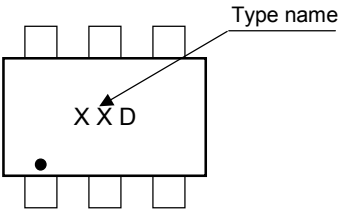
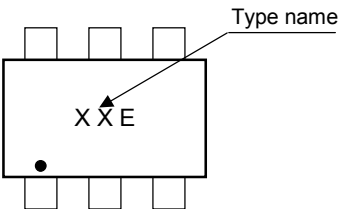
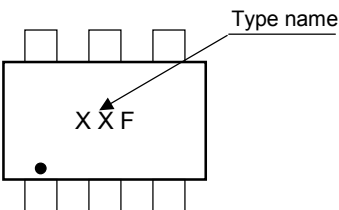
Note: Total rating

### Equivalent Circuit (top view)



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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1961FE~1966FE	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1961FE	$I_{EBO}$	$V_{EB} = 10\text{ V}, I_C = 0$	0.82	—	1.52	mA
	RN1962FE			0.38	—	0.71	
	RN1963FE			0.17	—	0.33	
	RN1964FE			0.082	—	0.15	
	RN1965FE	$V_{EB} = 5\text{ V}, I_C = 0$	0.078	—	0.145		
	RN1966FE		0.074	—	0.138		
DC current gain	RN1961FE	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	30	—	—	
	RN1962FE			50	—	—	
	RN1963FE			70	—	—	
	RN1964FE			80	—	—	
	RN1965FE			80	—	—	
	RN1966FE			80	—	—	
Collector-emitter saturation voltage	RN1961FE~1966FE	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1961FE	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	1.1	—	2.0	V
	RN1962FE			1.2	—	2.4	
	RN1963FE			1.3	—	3.0	
	RN1964FE			1.5	—	5.0	
	RN1965FE			0.6	—	1.1	
	RN1966FE			0.7	—	1.3	
Input voltage (OFF)	RN1961FE~1964FE	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	1.0	—	1.5	V
	RN1965FE, 1966FE			0.5	—	0.8	
Transition frequency	RN1961FE~1966FE	$f_T$	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1961FE~1966FE	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	3	6	pF
Input resistor	RN1961FE	$R_1$	—	3.29	4.7	6.11	k $\Omega$
	RN1962FE			7	10	13	
	RN1963FE			15.4	22	28.6	
	RN1964FE			32.9	47	61.1	
	RN1965FE			1.54	2.2	2.86	
	RN1966FE			3.29	4.7	6.11	
Resistor ratio	RN1961FE~1964FE	$R_1/R_2$	—	0.9	1.0	1.1	
	RN1965FE			0.0421	0.0468	0.0515	
	RN1966FE			0.09	0.1	0.11	

Type Name	Marking
RN1961FE	
RN1962FE	
RN1963FE	
RN1964FE	
RN1965FE	
RN1966FE	

**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.