

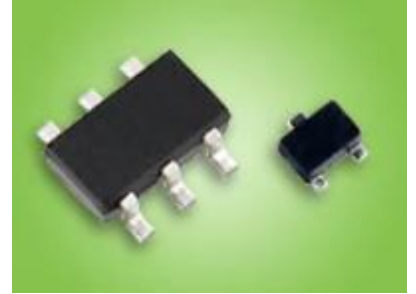
## Introduction to Toshiba Bias Resistor Built-in Transistors (Digital Transistors)

Toshiba has a lineup of transistors with built-in resistors (BRT: Bias Resistor Built-in Transistors) that combine various resistance values with NPN / PNP transistors (BJT: Bipolar junction transistors) in a small package.

### Toshiba, a leading company in transistors

Since Toshiba succeeded in developing a transistor in 1951, it has been one of the major transistor vendors [Note] who have continued to market products as a pioneer in the industry since the early days of semiconductors. We will continue to provide a wide range of highly reliable transistor products based on our experience in delivering products to many customers.

[Note] according to a survey by Toshiba (as of March 1<sup>st</sup>, 2021)



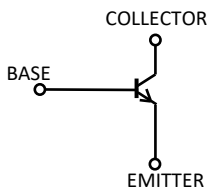
### High-quality, safe and secure delivery at plants in Japan and Thailand

Our transistor products are mainly surface-mount type small packages. High-quality, stable production at plants in Japan and Thailand enables safe and safety delivery. We will respond quickly and seriously to sudden delivery problems as well.

### Bias Resistor Built-in Transistors (Digital Transistors) overview

It is a transistor with a resistor added between the base, base - emitter of the bipolar transistor. For this reason, the circuit configuration easier with fewer external components such as bias resistors. The main use is for switching. The following is an example of adding a resistor to the NPN transistor / PNP transistor.

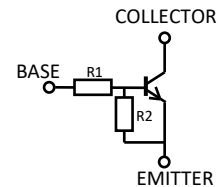
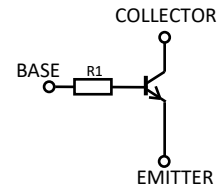
#### NPN Transistor



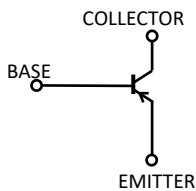
Add a resistor to the base terminal (input resistor)



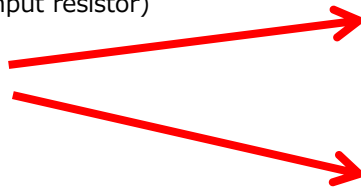
Base terminal and base-emitter terminal Add resistance between



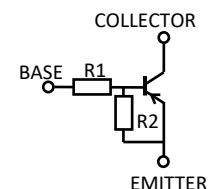
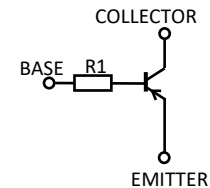
#### PNP Transistor



Add a resistor to the base terminal (input resistor)



Base terminal and base-emitter terminal Add resistance between

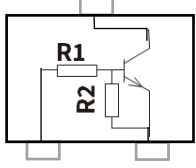
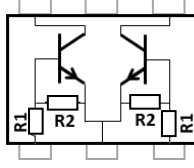
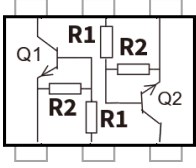


## Bias Resistor Built-in Transistors (Digital Transistors) Selection guide

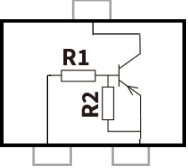
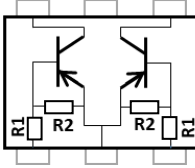
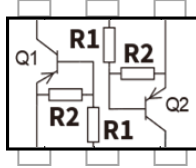
As shown in the figure below, we have a lineup, including 1in1 and 2in1 transistors with built-in resistors for NPN transistors and PNP transistors in the package.

### Internal Connections

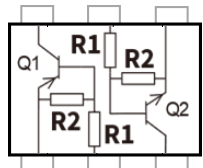

#### NPN type

1in1	2in1	
NPN x 1	Common emitter NPN x 2	Point-symmetrical NPN x 2
		

#### PNP type













1in1	2in1	
PNP x 1	Common emitter NPN x 2	Point-symmetrical NPN x 2
		




#### NPN+PNP type




2in1	
Point-symmetrical PNP+NPN	Point-symmetrical NPN+PNP
	

## • Bias Resistor Built-in Transistors (Digital Transistors) selection table

[Single product]

$V_{CE0}$ (V)	$I_C$ (mA)	Resistance		VESM (SOT-723)  1.2x1.2		SSM (SOT-416)  1.6x1.6		USM (SOT-323)  2.0x2.1		S-Mini (SOT-346)  2.9x2.5	
		R1 (typ.)	R2 (typ.)								
		(kΩ)	(kΩ)	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
		Part Number									
50	100	4.7	4.7	<a href="#">RN1101MFV</a>	<a href="#">RN2101MFV</a>	<a href="#">RN1101</a>	<a href="#">RN2101</a>	<a href="#">RN1301</a>	<a href="#">RN2301</a>	<a href="#">RN1401</a>	<a href="#">RN2401</a>
		10	10	<a href="#">RN1102MFV</a>	<a href="#">RN2102MFV</a>	<a href="#">RN1102</a>	<a href="#">RN2102</a>	<a href="#">RN1302</a>	<a href="#">RN2302</a>	<a href="#">RN1402</a>	<a href="#">RN2402</a>
		22	22	<a href="#">RN1103MFV</a>	<a href="#">RN2103MFV</a>	<a href="#">RN1103</a>	<a href="#">RN2103</a>	<a href="#">RN1303</a>	<a href="#">RN2303</a>	<a href="#">RN1403</a>	<a href="#">RN2403</a>
		47	47	<a href="#">RN1104MFV</a>	<a href="#">RN2104MFV</a>	<a href="#">RN1104</a>	<a href="#">RN2104</a>	<a href="#">RN1304</a>	<a href="#">RN2304</a>	<a href="#">RN1404</a>	<a href="#">RN2404</a>
		2.2	47	<a href="#">RN1105MFV</a>	<a href="#">RN2105MFV</a>	<a href="#">RN1105</a>	<a href="#">RN2105</a>	<a href="#">RN1305</a>	<a href="#">RN2305</a>	<a href="#">RN1405</a>	<a href="#">RN2405</a>
		4.7	47	<a href="#">RN1106MFV</a>	<a href="#">RN2106MFV</a>	<a href="#">RN1106</a>	<a href="#">RN2106</a>	<a href="#">RN1306</a>	<a href="#">RN2306</a>	<a href="#">RN1406</a>	<a href="#">RN2406</a>
		10	47	<a href="#">RN1107MFV</a>	<a href="#">RN2107MFV</a>	<a href="#">RN1107</a>	<a href="#">RN2107</a>	<a href="#">RN1307</a>	<a href="#">RN2307</a>	<a href="#">RN1407</a>	<a href="#">RN2407</a>
		22	47	<a href="#">RN1108MFV</a>	<a href="#">RN2108MFV</a>	<a href="#">RN1108</a>	<a href="#">RN2108</a>	<a href="#">RN1308</a>	<a href="#">RN2308</a>	<a href="#">RN1408</a>	<a href="#">RN2408</a>
		47	22	<a href="#">RN1109MFV</a>	<a href="#">RN2109MFV</a>	<a href="#">RN1109</a>	<a href="#">RN2109</a>	<a href="#">RN1309</a>	<a href="#">RN2309</a>	<a href="#">RN1409</a>	<a href="#">RN2409</a>
		4.7	-	<a href="#">RN1110MFV</a>	<a href="#">RN2110MFV</a>	<a href="#">RN1110</a>	<a href="#">RN2110</a>	<a href="#">RN1310</a>	<a href="#">RN2310</a>	<a href="#">RN1410</a>	<a href="#">RN2410</a>
		10	-	<a href="#">RN1111MFV</a>	<a href="#">RN2111MFV</a>	<a href="#">RN1111</a>	<a href="#">RN2111</a>	<a href="#">RN1311</a>	<a href="#">RN2311</a>	<a href="#">RN1411</a>	<a href="#">RN2411</a>
		22	-	<a href="#">RN1112MFV</a>	<a href="#">RN2112MFV</a>	<a href="#">RN1112</a>	<a href="#">RN2112</a>	<a href="#">RN1312</a>	<a href="#">RN2312</a>	<a href="#">RN1412</a>	<a href="#">RN2412</a>
		47	-	<a href="#">RN1113MFV</a>	<a href="#">RN2113MFV</a>	<a href="#">RN1113</a>	<a href="#">RN2113</a>	<a href="#">RN1313</a>	<a href="#">RN2313</a>	<a href="#">RN1413</a>	<a href="#">RN2413</a>
		1	10	<a href="#">RN1114MFV</a>	<a href="#">RN2114MFV</a>	<a href="#">RN1114</a>	<a href="#">RN2114</a>	<a href="#">RN1314</a>	-	<a href="#">RN1414</a>	<a href="#">RN2414</a>
		2.2	10	<a href="#">RN1115MFV</a>	<a href="#">RN2115MFV</a>	<a href="#">RN1115</a>	<a href="#">RN2115</a>	<a href="#">RN1315</a>	<a href="#">RN2315</a>	<a href="#">RN1415</a>	<a href="#">RN2415</a>
		4.7	10	<a href="#">RN1116MFV</a>	<a href="#">RN2116MFV</a>	<a href="#">RN1116</a>	<a href="#">RN2116</a>	<a href="#">RN1316</a>	<a href="#">RN2316</a>	<a href="#">RN1416</a>	<a href="#">RN2416</a>
		10	4.7	<a href="#">RN1117MFV</a>	<a href="#">RN2117MFV</a>	<a href="#">RN1117</a>	<a href="#">RN2117</a>	<a href="#">RN1317</a>	<a href="#">RN2317</a>	<a href="#">RN1417</a>	<a href="#">RN2417</a>
		47	10	<a href="#">RN1118MFV</a>	-	<a href="#">RN1118</a>	-	<a href="#">RN1318</a>	<a href="#">RN2318</a>	<a href="#">RN1418</a>	<a href="#">RN2418</a>
		1	-	<a href="#">RN1119MFV</a>	<a href="#">RN2119MFV</a>	-	-	-	-	-	-
		100	100	<a href="#">RN1130MFV</a>	<a href="#">RN2130MFV</a>	-	-	-	-	-	-
100	-	<a href="#">RN1131MFV</a>	<a href="#">RN2131MFV</a>	-	-	-	-	-	-		
200	-	<a href="#">RN1132MFV</a>	<a href="#">RN2132MFV</a>	-	-	-	-	-	-		

$V_{CE0}$ (V)	$I_C$ (mA)	Resistance		SOT23 (SOT-23)  2.9x2.4	
		R1 (typ.)	R2 (typ.)		
		(kΩ)	(kΩ)	NPN	PNP
		Part Number			
50	100	4.7	4.7	<a href="#">TDTC143E</a>	<a href="#">TDTA143E</a>
		10	10	<a href="#">TDTC114E</a>	<a href="#">TDTA114E</a>
		22	22	<a href="#">TDTC124E</a>	<a href="#">TDTA124E</a>
		47	47	<a href="#">TDTC144E</a>	<a href="#">TDTA144E</a>
		2.2	47	<a href="#">TDTC123J</a>	<a href="#">TDTA123J</a>
		4.7	47	<a href="#">TDTC143Z</a>	<a href="#">TDTA143Z</a>
		10	47	<a href="#">TDTC114Y</a>	<a href="#">TDTA114Y</a>

$V_{CE0}$ (V)	$I_C$ (mA)	Resistance		S-Mini (SOT-346)  2.9x2.5	
		R1 (typ.)	R2 (typ.)		
		(kΩ)	(kΩ)	NPN	PNP
		Part Number			
50	800	1	1	<a href="#">RN1421</a>	<a href="#">RN2421</a>
		2.2	2.2	<a href="#">RN1422</a>	<a href="#">RN2422</a>
		4.7	4.7	<a href="#">RN1423</a>	<a href="#">RN2423</a>
		10	10	<a href="#">RN1424</a>	<a href="#">RN2424</a>
		0.47	10	<a href="#">RN1425</a>	<a href="#">RN2425</a>
		1	10	<a href="#">RN1426</a>	<a href="#">RN2426</a>
		2.2	10	<a href="#">RN1427</a>	<a href="#">RN2427</a>

• Bias Resistor Built-in Transistors (Digital Transistors) selection table

[2in1 product]

• Common emitter

V <sub>CE0</sub>   (V)	I <sub>C</sub>   (mA)	Resistance		ESV (SOT-553) 1.6x1.6		USV (SOT-353) 2.0x2.1		SMV (SOT-25) 2.9x2.8	
		R1 (typ.)	R2 (typ.)						
		(kΩ)	(kΩ)	NPNx2	PNPx2	NPNx2	PNPx2	NPNx2	PNPx2
		Part Number							
50	100	4.7	4.7	<a href="#">RN1701JE</a>	<a href="#">RN2701JE</a>	<a href="#">RN1701</a>	<a href="#">RN2701</a>	<a href="#">RN1501</a>	<a href="#">RN2501</a>
		10	10	<a href="#">RN1702JE</a>	<a href="#">RN2702JE</a>	<a href="#">RN1702</a>	<a href="#">RN2702</a>	<a href="#">RN1502</a>	<a href="#">RN2502</a>
		22	22	<a href="#">RN1703JE</a>	<a href="#">RN2703JE</a>	<a href="#">RN1703</a>	<a href="#">RN2703</a>	<a href="#">RN1503</a>	<a href="#">RN2503</a>
		47	47	<a href="#">RN1704JE</a>	<a href="#">RN2704JE</a>	<a href="#">RN1704</a>	<a href="#">RN2704</a>	<a href="#">RN1504</a>	<a href="#">RN2504</a>
		2.2	47	<a href="#">RN1705JE</a>	<a href="#">RN2705JE</a>	<a href="#">RN1705</a>	<a href="#">RN2705</a>	<a href="#">RN1505</a>	<a href="#">RN2505</a>
		4.7	47	<a href="#">RN1706JE</a>	<a href="#">RN2706JE</a>	<a href="#">RN1706</a>	<a href="#">RN2706</a>	<a href="#">RN1506</a>	<a href="#">RN2506</a>
		10	47	<a href="#">RN1707JE</a>	<a href="#">RN2707JE</a>	<a href="#">RN1707</a>	<a href="#">RN2707</a>	<a href="#">RN1507</a>	<a href="#">RN2507</a>
		22	47	<a href="#">RN1708JE</a>	<a href="#">RN2708JE</a>	<a href="#">RN1708</a>	<a href="#">RN2708</a>	<a href="#">RN1508</a>	-
		47	22	<a href="#">RN1709JE</a>	<a href="#">RN2709JE</a>	<a href="#">RN1709</a>	<a href="#">RN2709</a>	<a href="#">RN1509</a>	-
		4.7	-	<a href="#">RN1710JE</a>	<a href="#">RN2710JE</a>	<a href="#">RN1710</a>	<a href="#">RN2710</a>	<a href="#">RN1510</a>	<a href="#">RN2510</a>
		10	-	<a href="#">RN1711JE</a>	<a href="#">RN2711JE</a>	<a href="#">RN1711</a>	<a href="#">RN2711</a>	<a href="#">RN1511</a>	<a href="#">RN2511</a>
		22	-	-	<a href="#">RN2712JE</a>	-	-	-	-
		47	-	-	<a href="#">RN2713JE</a>	-	-	-	-



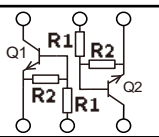
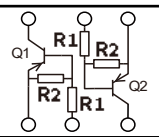
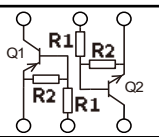
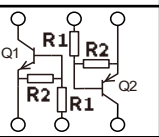












































• Point-symmetrical



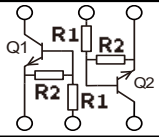
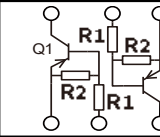
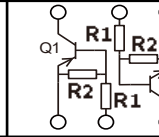
































V <sub>CE0</sub>   (V)	I <sub>C</sub>   (mA)	Resistance		ES6 (SOT-563) 1.6x1.6			
		R1 (typ.)	R2 (typ.)				
		(kΩ)	(kΩ)	NPNx2	PNPx2	PNP+NPN	NPN+PNP
		Part Number					
50	100	4.7	4.7	<a href="#">RN1901FE</a>	<a href="#">RN2901FE</a>	<a href="#">RN4901FE</a>	<a href="#">RN4981FE</a>
		10	10	<a href="#">RN1902FE</a>	<a href="#">RN2902FE</a>	<a href="#">RN4902FE</a>	<a href="#">RN4982FE</a>
		22	22	<a href="#">RN1903FE</a>	<a href="#">RN2903FE</a>	<a href="#">RN4903FE</a>	<a href="#">RN4983FE</a>
		47	47	<a href="#">RN1904FE</a>	<a href="#">RN2904FE</a>	<a href="#">RN4904FE</a>	<a href="#">RN4984FE</a>
		2.2	47	<a href="#">RN1905FE</a>	<a href="#">RN2905FE</a>	<a href="#">RN4905FE</a>	<a href="#">RN4985FE</a>
		4.7	47	<a href="#">RN1906FE</a>	<a href="#">RN2906FE</a>	<a href="#">RN4906FE</a>	<a href="#">RN4986FE</a>
		10	47	<a href="#">RN1907FE</a>	<a href="#">RN2907FE</a>	<a href="#">RN4907FE</a>	<a href="#">RN4987FE</a>
		22	47	<a href="#">RN1908FE</a>	<a href="#">RN2908FE</a>	<a href="#">RN4908FE</a>	<a href="#">RN4988FE</a>
		47	22	<a href="#">RN1909FE</a>	<a href="#">RN2909FE</a>	<a href="#">RN4909FE</a>	<a href="#">RN4989FE</a>
		4.7	-	<a href="#">RN1910FE</a>	<a href="#">RN2910FE</a>	<a href="#">RN4910FE</a>	<a href="#">RN4990FE</a>
		10	-	<a href="#">RN1911FE</a>	<a href="#">RN2911FE</a>	<a href="#">RN4911FE</a>	<a href="#">RN4991FE</a>

•Bias Resistor Built-in Transistors (Digital Transistors) selection table

[2in1 product]

•Point-symmetrical

V <sub>CE0</sub>   (V)	I <sub>C</sub>   (mA)	Resistance		<div style="text-align: center;">  <p><b>US6</b> (SOT-363)</p>  <p>2.0x2.1</p> </div>			
		R1 (typ.)	R2 (typ.)				
		(kΩ)	(kΩ)	NPNx2	PNPx2	PNP+NPN	NPN+PNP
				Part Number			
50	100	4.7	4.7	<a href="#">RN1901</a> 	<a href="#">RN2901</a> 	<a href="#">RN4901</a> 	<a href="#">RN4981</a> 
		10	10	<a href="#">RN1902</a> 	<a href="#">RN2902</a> 	<a href="#">RN4902</a> 	<a href="#">RN4982</a> 
		22	22	<a href="#">RN1903</a> 	<a href="#">RN2903</a> 	<a href="#">RN4903</a> 	<a href="#">RN4983</a> 
		47	47	<a href="#">RN1904</a> 	<a href="#">RN2904</a> 	<a href="#">RN4904</a> 	<a href="#">RN4984</a> 
		2.2	47	<a href="#">RN1905</a> 	<a href="#">RN2905</a> 	<a href="#">RN4905</a> 	<a href="#">RN4985</a> 
		4.7	47	<a href="#">RN1906</a> 	<a href="#">RN2906</a> 	<a href="#">RN4906</a> 	<a href="#">RN4986</a> 
		10	47	<a href="#">RN1907</a> 	<a href="#">RN2907</a> 	<a href="#">RN4907</a> 	<a href="#">RN4987</a> 
		22	47	<a href="#">RN1908</a> 	<a href="#">RN2908</a> 	<a href="#">RN4908</a> 	<a href="#">RN4988</a> 
		47	22	<a href="#">RN1909</a> 	<a href="#">RN2909</a> 	<a href="#">RN4909</a> 	<a href="#">RN4989</a> 
		4.7	-	<a href="#">RN1910</a> 	<a href="#">RN2910</a> 	<a href="#">RN4910</a> 	<a href="#">RN4990</a> 
		10	-	<a href="#">RN1911</a> 	<a href="#">RN2911</a> 	<a href="#">RN4911</a> 	-
47/2.2	47/47	-	-	-	<a href="#">RN49A2</a> 		

V <sub>CE0</sub>   (V)	I <sub>C</sub>   (mA)	Resistance		<div style="text-align: center;">  <p><b>SM6</b> (SOT-26)</p>  <p>2.9x2.8</p> </div>		
		R1 (typ.)	R2 (typ.)			
		(kΩ)	(kΩ)	NPNx2	PNPx2	PNP+NPN
				Part Number		
50	100	4.7	4.7	<a href="#">RN1601</a> 	<a href="#">RN2601</a> 	<a href="#">RN4601</a> 
		10	10	<a href="#">RN1602</a> 	<a href="#">RN2602</a> 	<a href="#">RN4602</a> 
		22	22	<a href="#">RN1603</a> 	<a href="#">RN2603</a> 	<a href="#">RN4603</a> 
		47	47	<a href="#">RN1604</a> 	<a href="#">RN2604</a> 	<a href="#">RN4604</a> 
		2.2	47	<a href="#">RN1605</a> 	<a href="#">RN2605</a> 	<a href="#">RN4605</a> 
		4.7	47	<a href="#">RN1606</a> 	<a href="#">RN2606</a> 	<a href="#">RN4606</a> 
		10	47	<a href="#">RN1607</a> 	<a href="#">RN2607</a> 	<a href="#">RN4607</a> 
		22	47	<a href="#">RN1608</a> 	<a href="#">RN2608</a> 	<a href="#">RN4608</a> 
		47	22	<a href="#">RN1609</a> 	-	<a href="#">RN4609</a> 
		4.7	∞	<a href="#">RN1610</a> 	<a href="#">RN2610</a> 	<a href="#">RN4610</a> 
		10	∞	<a href="#">RN1611</a> 	-	<a href="#">RN4611</a> 
22	∞	-	-	<a href="#">RN4612</a> 		

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