

Introduction to Toshiba small package Bipolar Transistors

Toshiba offers a wide range of Bipolar Transistors (BJT : Bipolar junction transistor) mounted in small packages, including single-type and combined-type diodes.

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 November 25th, 2021)



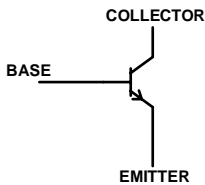
High-quality, safe and secure delivery at plants in Japan and Thailand

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.

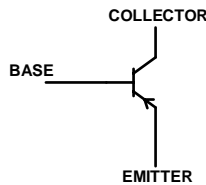
Transistor overview

A bipolar transistor is one of the typical semiconductors that controls the current flowing through the collector by the base current, and to operate as "amplification" and "switching" on the electric circuit. As shown in the figure below, there are two types, NPN type and PNP type.

NPN Transistor



PNP Transistor



When selecting a transistor product, it is necessary to consider the breakdown voltage (VCEO: collector-emitter withstand voltage), current (IC: collector current), hFE: DC current amplification factor, package / mounting area, etc.










Features of bipolar transistor










































Bipolar transistors have the following advantages and disadvantages compared to MOSFETs. We recommend the optimum usage according to the circuit to be used.

	Bipolar transistor	MOSFET
Advantages	<ul style="list-style-type: none">- Strong ESD susceptibility- High breakdown voltage (VCEO)- The transistor turns on even if the base voltage is low.	<ul style="list-style-type: none">- There are a few external parts- Switching speed is fast- Current does not flow into the gate terminal
Disadvantages	<ul style="list-style-type: none">- Switching speed is slow- Large number of external parts	<ul style="list-style-type: none">- ESD susceptibility is relatively weak- The gate voltage (Vth) required to turn on the MOSFET is generally higher than bipolar transistors-It is necessary to pay attention to the influence of the body diode when using it



•Bipolar Transistors selection table
[Single product]

Classification	V _{CEO} (V)	I _c (mA)	CST3 (SOT-883)		VESM (SOT-723)		SSM (SOT-416)	
			Bottom View					
			 1.0x0.6		 1.2x1.2		 1.6x1.6	
			Part Number					
			NPN	PNP	NPN	PNP	NPN	PNP
General Purpose	50	100	2SC6026CT 	2SA2154CT 				
	50	150			2SC6026MFV 	2SA2154MFV 	2SC4738 	2SA1832 

Classification	$ V_{CE0} $ (V)	$ I_c $ (mA)	USM (SOT-323)		UFM (SOT-323F)		S-Mini (SOT-346)		SOT23 (SOT-23)		SOT-23F	
			 2.0x2.1		 2.0x2.1		 2.9x2.5		 2.9x2.4		 2.9x2.8	
			Part Number									
			NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
General Purpose	30	500		2SA1588 				2SA1182 				
	50	150	2SC4116 	2SA1586 			2SC2712 	2SA1162 	TBC847 	TBC857 		
			TTC4116FU 	TTA1586FU 								
	50	500							TMBT3904 	TMBT3906 		
							2SC3325 	2SA1313 				
	45						TTC1949 	TTA1713 				
Low Noise	120	100	2SC4117 	2SA1587 			2SC2713 	2SA1163 				
Low Saturation	15	800						2SA1362 				
Muting	20	300	2SC4213 				2SC3326 					
High Current	20	2500				2SA2215 						TTA502 
	25	800					2SC3265 	2SA1298 				
	50	1000			2SC6135 					TTC500 	TTA500 	
	50	1700				2SA2195 						
	50	2000									TTA501 	
	50	2500			2SC6100 					TTC501 		
	120	1000								TTC502 		
High Breakdown	300	100						2SA1721 				

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