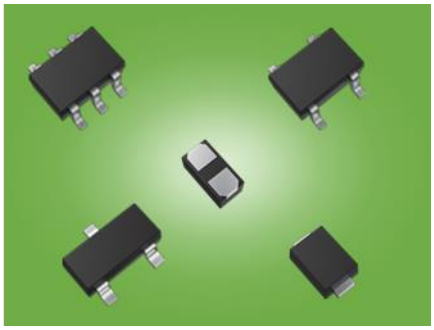
Introduction of Toshiba Small Signal Schottky Barrier Diode

Toshiba offers a wide range of Schottky Barrier Diodes (SBD) mounted in small packages, including low-voltage types and low leakage current types.

Toshiba, a leading company in Diodes

Since Toshiba started mass production of diodes in 1956, it has been one of the major diode vendors 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 diode products based on our experience in delivering products to many customers.

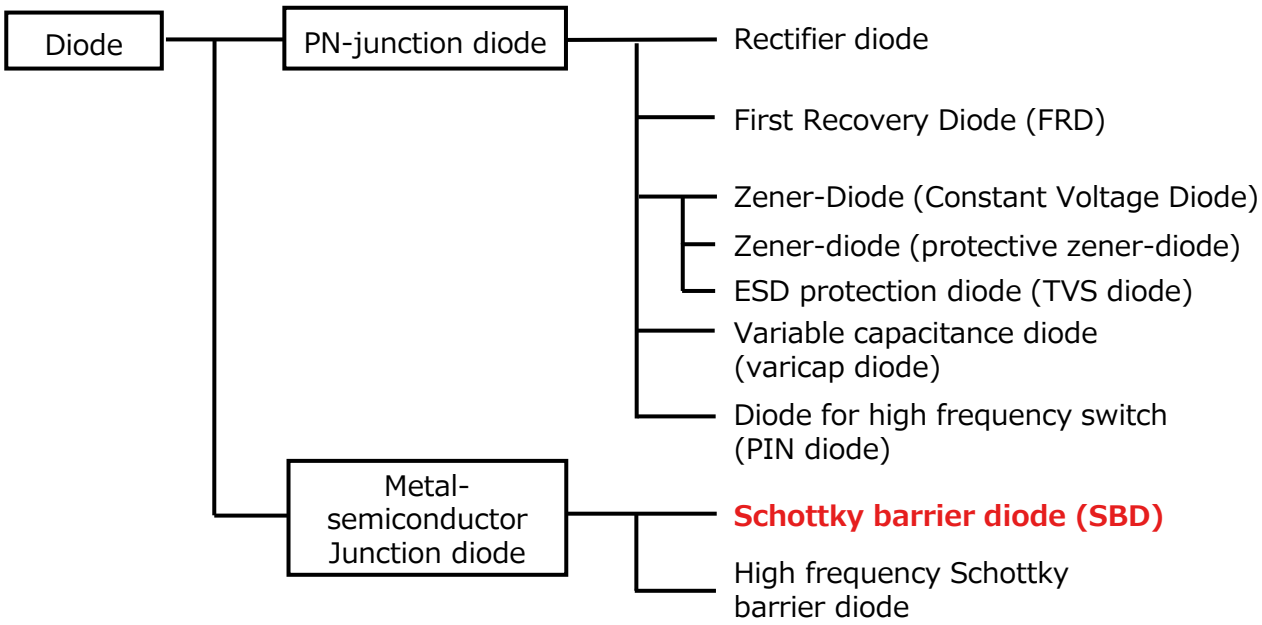


High-quality, stable production system at plants in Japan and Thailand

Our diode products are mainly surface mount type small packages. We will provide high-quality, stable production at our plants in Japan and Thailand.

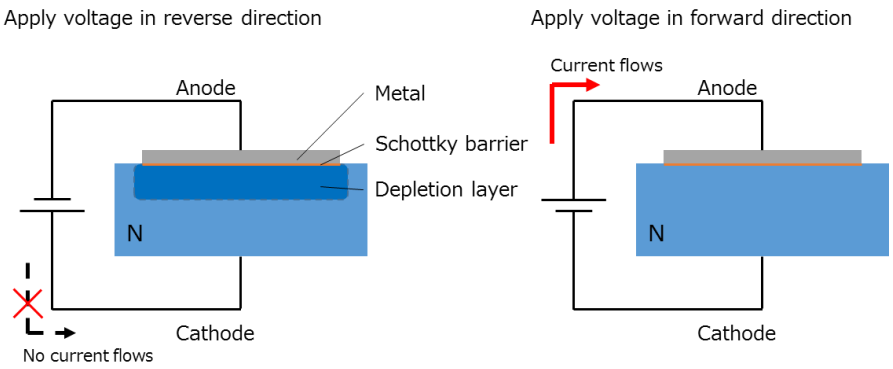
Schottky barrier diode overview

A diode is a two-terminal semiconductor device with one PN junction or an alternative junction. They are broadly classified as shown in the figure below. A Schottky barrier diode is utilizing a Schottky barrier created by junction between a metal and semiconductor. Compared to PN-junction diode, this diode has a lower forward-voltage (V_F) and faster switching performance. Therefore, power supply circuits can be made more efficient and more compact, and they are widely used in IoT, communication equipment, power supplies, industrial applications, etc.

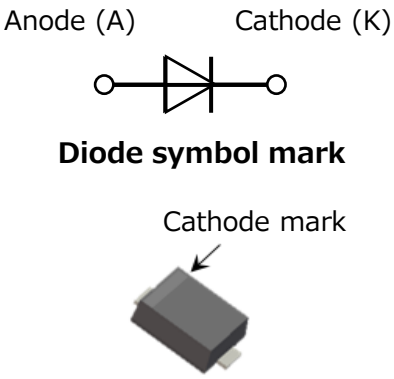


Basic Structure and Operation of Schottky Barrier Diode (SBD)

A schottky barrier diode has the same properties as PN junction diodes in that current flows (forward direction) and no current flows (reverse direction) according to the direction of the applied voltage. Therefore it is also used as rectifying devices. The electrode terminals are called the anode(A) and cathode(K), and current flows when the anode electrode has a positive voltage.



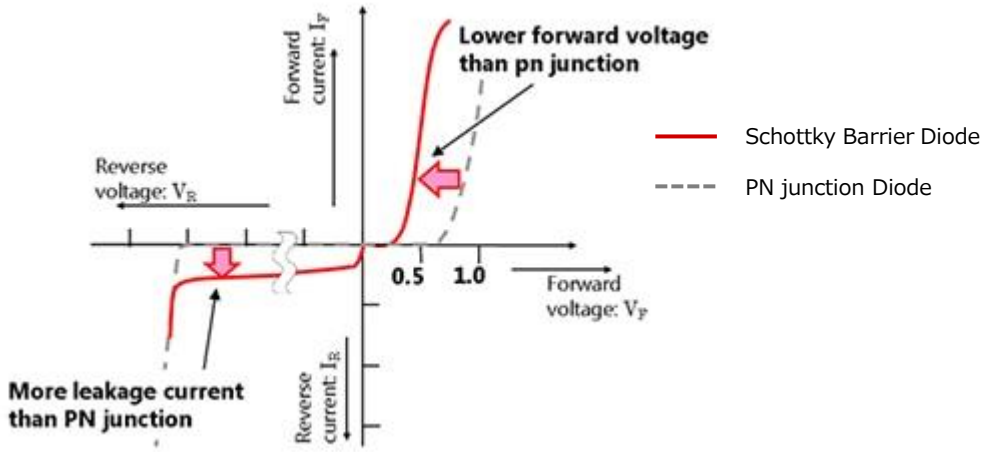
Structural drawing of SBD (example)



Diode Package (Example)

A depletion layer is created in a part of semiconductor by the junction (Schottky junction) of a metal and a semiconductor, enabling rectifying operations to be performed in the same way as a PN junction diode. A energy barrier called a Schottky barrier is formed at the junction, and current can be flow through by applying a voltage. However, it has the advantage of low forward voltage (V_F) and high speed switching characteristic because it allows current to flow with less energy than a PN junction diode. By utilizing such characteristics, it contribute to higher efficiency and miniaturization of power supply circuits, etc.

Since the reverse current (I_R) increases than PN junction diode, it is sensitive to heat (thermal runaway). Therefore, attention must be paid to thermal design and operating conditions.



Schottky Barrier Diode Current vs. Voltage Characteristics (Example)

The characteristic of V_F vs. I_R depend on the metallic material. We offer a lineup of low VF and low IR products in a various packages and ratings. We would appreciate you to select the suitable product from the selection table for the Schottky barrier diodes next section.

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Schottky Barrier Diode Selection Table (1)

Io > 0.5A | Io < 0.5A(1) | Io < 0.5A(2) | Click

VR	Io	Part Number	Feature	VF typ (V)	IR max (μA)	Int. Circuit	Pin	Package (Toshiba)	Package dimension (mm)	Buy Online
60V	2.0A	CUHS20F60	High Voltage / High current	0.52	70	Single	2	US2H	2.5×1.4×0.6	Buy Online
		CUHS20S60	High voltage/ Low VF	0.46	650		2	US2H	2.5×1.4×0.6	Buy Online
	1.5A	CUHS15F60	High Voltage / High current	0.66	50		2	US2H	2.5×1.4×0.6	Buy Online
		CUHS15S60	High voltage/ Low VF	0.60	450		2	US2H	2.5×1.4×0.6	Buy Online
	1.0A	CUHS10F60	High voltage/ Low VF	0.56	40		2	US2H	2.5×1.4×0.6	Buy Online
40V	2.0A	CUHS20F40	High current/ Low IR	0.47	60	Single	2	US2H	2.5×1.4×0.6	Buy Online
		CUHS20S40	High current/ Low VF	0.40	300		2	US2H	2.5×1.4×0.6	Buy Online
	1.5A	CCS15F40	High current/ Low IR	0.59	25	Single	2	CST2C	1.6 x 0.8 x 0.48	Buy Online
		CCS15S40	High current/ Low VF	0.47	200		2	CST2C	1.6 x 0.8 x 0.48	Buy Online
		CUS15S40	High current/ Low VF	0.47	200		2	USC	2.5×1.25×0.9	Buy Online
		CUHS15F40	High current/ Low IR	0.57	50		2	US2H	2.5×1.4×0.6	Buy Online
		CUHS15S40	High current/ Low VF	0.45	200		2	US2H	2.5×1.4×0.6	Buy Online
	1.0A	CLS10F40	High current/ Low IR	0.52	25	Single	2	CL2E	1.0 x 0.6 x 0.28	Buy Online
		CBS10F40	High current/ Low IR	0.63	20		2	CST2B	1.2 x 0.8 x 0.38	Buy Online
		CBS10S40	High current/ Low VF	0.48	150		2	CST2B	1.2 x 0.8 x 0.38	Buy Online
		CUS10F40	High current/ Low IR	0.60	20		2	USC	2.5×1.25×0.9	Buy Online
		CUS10S40	High current/ Low VF	0.45	150		2	USC	2.5×1.25×0.9	Buy Online
	0.5A	CTS05F40	High speed switching / Low IR	0.74	15	Single	2	CST2	1.0 x 0.6 x 0.38	Buy Online
		CTS05S40	High speed switching	0.56	50		2	CST2	1.0 x 0.6 x 0.38	Buy Online
		CUS05F40	High speed switching / Low IR	0.74	15		2	USC	2.5×1.25×0.9	Buy Online
		CUS05S40	High speed switching	0.56	50		2	USC	2.5×1.25×0.9	Buy Online
30V	2.0A	CUHS20F30	High current/ Low IR	0.40	60	Single	2	US2H	2.5×1.4×0.6	Buy Online
		CUHS20S30	High current/ Low VF	0.34	500		2	US2H	2.5×1.4×0.6	Buy Online
	1.5A	CCS15S30	High current/ Low VF	0.39	500	Single	2	CST2C	1.6 x 0.8 x 0.48	Buy Online
		CUS15S30	High current/ Low VF	0.39	500		2	USC	2.5×1.25×0.9	Buy Online
		CUHS15F30	High current/ Low IR	0.46	50		2	US2H	2.5×1.4×0.6	Buy Online
		CUHS15S30	High current/ Low VF	0.37	500		2	US2H	2.5×1.4×0.6	Buy Online
	1.0A	CBS10S30	High current/ Low VF	0.39	500	Single	2	CST2B	1.2 x 0.8 x 0.38	Buy Online
		CUS10F30	High current/ Low VF	0.43	50		2	USC	2.5×1.25×0.9	Buy Online
		CUS10S30	High current/ Low VF	0.37	500		2	USC	2.5×1.25×0.9	Buy Online
	0.5A	CTS05S30	High speed switching	0.41	300	Single	2	CST2	1.0 x 0.6 x 0.38	Buy Online
		CBS05F30	High speed switching	0.38	50		2	CST2B	1.2 x 0.8 x 0.38	Buy Online
		CUS05F30	High speed switching	0.38	50		2	USC	2.5×1.25×0.9	Buy Online
		CUS05S30	High speed switching	0.41	300		2	USC	2.5×1.25×0.9	Buy Online

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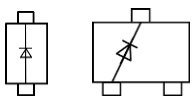
Schottky Barrier Diode Selection Table (2)

Io > 0.5A | Io < 0.5A(1) | Io < 0.5A(2) | Click

VR	Io	Part Number	Feature	VF typ (V)	IR max (μA)	Int. Circuit	Pin	Package (Toshiba)	Package dimension (mm)	Buy Online
40V	0.1A	1SS417CT	High speed switching / Low IR	0.56	5	Single	2	CST2	1.0 x 0.6 x 0.38	Buy Online
		1SS417	High speed switching / Low IR	0.56	5		2	SOD-923	1.0 x 0.6 x 0.4	Buy Online
		CES388	High speed switching	0.54	5		2	ESC	1.6×0.8×0.6	Buy Online
		CUS357	High speed switching	0.54	5		2	USC	2.5×1.25×0.9	Buy Online
		1SS423	High speed switching	0.56	5	Single	3	SSM	1.6×1.6×0.7	Buy Online
30V	0.2A	CTS521	High speed switching / Low VF	0.45	30	Single	2	CST2	1.0 x 0.6 x 0.38	Buy Online
		CES521	High speed switching / Low VF	0.45	30		2	ESC	1.6×0.8×0.6	Buy Online
		CUS521	High speed switching / Low VF	0.45	30		2	USC	2.5×1.25×0.9	Buy Online
		CTS520	High speed switching	0.52	5		2	CST2	1.0 x 0.6 x 0.38	Buy Online
		CES520	Low leak current	0.52	5		2	ESC	1.6×0.8×0.6	Buy Online
		CUS520	Low leak current	0.52	5		2	USC	2.5×1.25×0.9	Buy Online
	0.1A	1SS416CT	High speed switching / Low VF	0.38	50	Single	2	CST2	1.0 x 0.6 x 0.38	Buy Online
		1SS416	High speed switching / Low VF	0.38	50		2	SOD-923	1.0 x 0.6 x 0.4	Buy Online
		1SS422	Low forward voltage	0.38	50	Series	3	SSM	1.6×1.6×0.7	Buy Online
		DSF01S30SL	Low forward voltage	0.41	50	Single	2	SL2	0.62 x 0.32 x 0.3	Buy Online
		DSR01S30SL	Low leak current	0.51	0.7		2	SL2	0.62 x 0.32 x 0.3	Buy Online
20V	0.3A	1SS404	High current/ Low VF	0.38	50	Single	2	USC	2.5×1.25×0.9	Buy Online
	0.2A	1SS424	High current/ Low VF	0.42	50	Single	2	ESC	1.6×0.8×0.6	Buy Online
	0.05A	1SS413CT	High speed switching / Low IR	0.5	0.5	Single	2	CST2	1.0 x 0.6 x 0.38	Buy Online
		1SS413	High speed switching / Low IR	0.5	0.5		2	SOD-923	1.0 x 0.6 x 0.4	Buy Online
		1SS405	High speed switching / Low IR	0.5	0.5		2	ESC	1.6×0.8×0.6	Buy Online
		1SS406	High speed switching / Low IR	0.5	0.5		2	USC	2.5×1.25×0.9	Buy Online
10V	0.1A	1SS389	Low forward voltage	0.35	20	Single	2	ESC	1.6×0.8×0.6	Buy Online
		1SS367	Low forward voltage	0.35	20		2	USC	2.5×1.25×0.9	Buy Online
		1SS385FV	Low forward voltage	0.35	20	K Com.	3	VESM	1.2×1.2×0.5	Buy Online
		1SS385	Low forward voltage	0.35	20	K Com.	3	SSM	1.6×1.6×0.7	Buy Online

Pin assignment:



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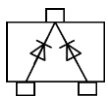

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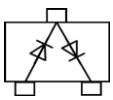

Cathode common (K com.)

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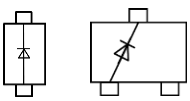
Schottky Barrier Diode Selection Table (3)

Io > 0.5A | Io < 0.5A(1) | Io < 0.5A(2) | Click

VR	Io	Part Number	Feature	VF typ (V)	IR max (μA)	Int. Circuit	Pin	Package (Toshiba)	Package dimension (mm)	Buy Online
40V	0.1A	1SS322	High speed switching	0.54	5	Single	3	USM	2.0×2.1×0.9	Buy Online
		1SS393	High speed switching	0.54	5	K com.	3	USM	2.0×2.1×0.9	Buy Online
		1SS294	High speed switching	0.54	5	Single	3	S-Mini	2.9×2.5×1.1	Buy Online
		1SS392	High speed switching	0.54	5	K com.	3	S-Mini	2.9×2.5×1.1	Buy Online
		HN2S02JE	High speed switching	0.54	5	Separate	5	ESV	1.6×1.6×0.55	Buy Online
		HN2S02FU	High speed switching	0.54	5		6	US6	2.0×2.1×0.9	Buy Online
30V	0.2A	TBAT54	Low IR / Low VF	0.45	2	Single	3	SOT23	2.9×2.4×0.9	Buy Online
		TBAT54C	Low IR / Low VF	0.45	2	K com.	3	SOT23	2.9×2.4×0.9	Buy Online
		TBAT54S	Low IR / Low VF	0.45	2	Series	3	SOT23	2.9×2.4×0.9	Buy Online
		TBAT54A	Low IR / Low VF	0.45	2	A com.	3	SOT23	2.9×2.4×0.9	Buy Online
20V	0.3A	1SS401	High current/ Low VF	0.38	50	Single	3	USM	2.0×2.1×0.9	Buy Online
	0.2A	HN2S04FU	High current/ Low VF	0.36	50	Separate	6	US6	2.0×2.1×0.9	Buy Online
	0.05A	HN2S03FU	High speed switching / Low IR	0.5	0.5		6	US6	2.0×2.1×0.9	Buy Online
10V	0.1A	1SS395	Low forward voltage	0.35	20	Single	3	USM	2.0×2.1×0.9	Buy Online
		1SS378	Low forward voltage	0.35	20	K com.	3	USM	2.0×2.1×0.9	Buy Online
		1SS372	Low forward voltage	0.35	20	Series	3	USM	2.0×2.1×0.9	Buy Online
		1SS394	Low forward voltage	0.35	20	Single	3	S-Mini	2.9×2.5×1.1	Buy Online
		1SS377	Low forward voltage	0.35	20	K com.	3	S-Mini	2.9×2.5×1.1	Buy Online
		1SS374	Low forward voltage	0.35	20	Series	3	S-Mini	2.9×2.5×1.1	Buy Online
		HN2S01FU	Low forward voltage	0.35	20	Separate	6	US6	2.0×2.1×0.9	Buy Online
		HN2S01F	Low forward voltage	0.35	20		6	SM6	2.9×2.8×1.1	Buy Online
	0.05A	1SS321	Low leak current	0.63	0.5	K com.	3	S-Mini	2.9×2.5×1.1	Buy Online

Pin assignment:



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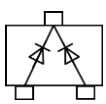
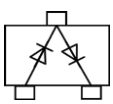


Cathode common (K com.)



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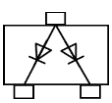

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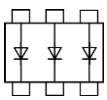

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- **Application Notes** Click
- **Frequently Asked Question (FAQ) of Diodes** Click
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