

HBAT-5402

Clipping/clamping diode

Description



Lifecycle status: **Active**



Features

Lower frequency, general purpose, Schottky Diode. Used primarily for clipping and clamping clamp applications, the low series resistance, low capacitance and fast switching time makes this an ideal choice. $R_s=2.4$ Ohms. $C_t=3.0$ pF. $V_{br}=30V$. $V_f=800mV$ @ $I_F=100mA$

HBAT-5400, 5402, 540B, 540C

High Performance Schottky Diode for Transient Suppression



Data Sheet

Description

The HBAT-540x series of Schottky diodes, commonly referred to as clipping/clamping diodes, are optimal for circuit and waveshape preservation applications with high speed switching. Low series resistance, R_s , makes them ideal for protecting sensitive circuit elements against high current transients carried on data lines. With picosecond switching, the HBAT-540x can respond to noise spikes with rise times as fast as 1 ns. Low capacitance minimizes waveshape loss that causes signal degradation.

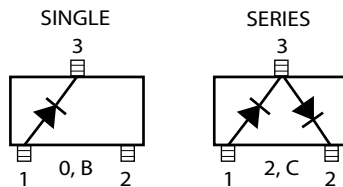
Features

- Ultra-low Series Resistance for Higher Current Handling
- Low Capacitance
- Low Series Resistance
- Lead-free Option Available

Applications

RF and computer designs that require circuit protection, high-speed switching, and voltage clamping.

Package Lead Code Identification (Top View)



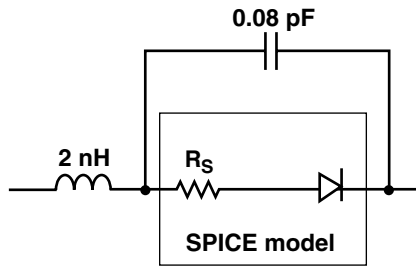
Absolute Maximum Ratings, $T_A = 25^\circ\text{C}$

Symbol	Parameter	Unit	Absolute Maximum ^[1]	
			HBAT-5400/-5402	HBAT-540B/-540C
I_F	DC Forward Current	mA	220	430
I_{F-peak}	Peak Surge Current (1 μs pulse)	A	1.0	1.0
P_T	Total Power Dissipation	mW	250	825
P_{INV}	Peak Inverse Voltage	V	30	30
T_J	Junction Temperature	$^\circ\text{C}$	150	150
T_{STG}	Storage Temperature	$^\circ\text{C}$	-65 to 150	-65 to 150
θ_{JC}	Thermal Resistance, junction to lead	$^\circ\text{C}/\text{W}$	500	150

Note:

1. Operation in excess of any one of these conditions may result in permanent damage to the device.

Linear and Non-linear SPICE Model^[2]



Note:

2. To effectively model the packaged HBAT-540x product, please refer to Application Note AN1124.

SPICE Parameters

Parameter	Unit	Value
BV	V	40
CJO	pF	3.0
EG	eV	0.55
IBV	A	10E-4
IS	A	1.0E-7
N		1.0
RS	Ω	2.4
PB	V	0.6
PT		2
M		0.5

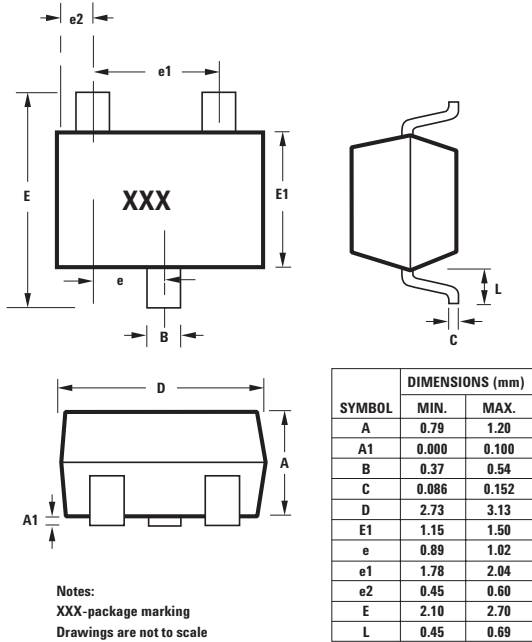
HBAT-540x DC Electrical Specifications, $T_A = +25^\circ\text{C}$ ^[1]

Part Number HBAT-Code ^[2]	Package Marking Code	Lead Configuration	Package	V_F (mV)	Maximum Forward Voltage	Minimum Breakdown Voltage	Typical Capacitance	Typical Series Resistance	Maximum Eff. Carrier Lifetime
					V_{BR} (V)	C_T (pF)	R_S (Ω)	t (ps)	
-5400	V0	0	Single	SOT-23	800 ^[3]	30 ^[4]	3.0 ^[5]	2.4	100 ^[6]
-540B		B		SOT-323 (3-lead SC-70)					
-5402	V2	2	Series	SOT-23	800 ^[3]	30 ^[4]	3.0 ^[5]	2.4	100 ^[6]
-540C		C		SOT-323 (3-lead SC-70)					

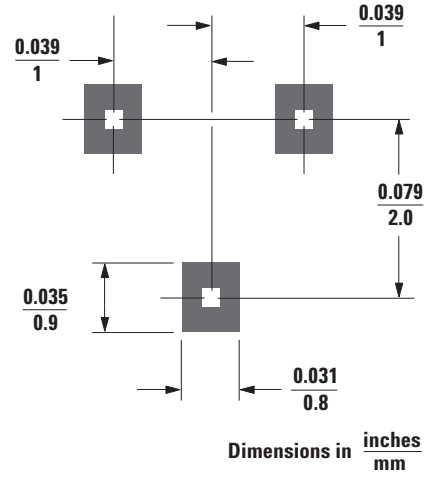
Notes:

1. $T_A = +25^\circ\text{C}$, where T_A is defined to be the temperature at the package pins where contact is made to the circuit board.
2. Package marking code is laser marked.
3. $I_F = 100$ mA; 100% tested
4. $I_R = 100$ μA ; 100% tested
5. $V_F = 0$; $f = 1$ MHz
6. Measured with Karkauer method at 20 mA guaranteed by design.

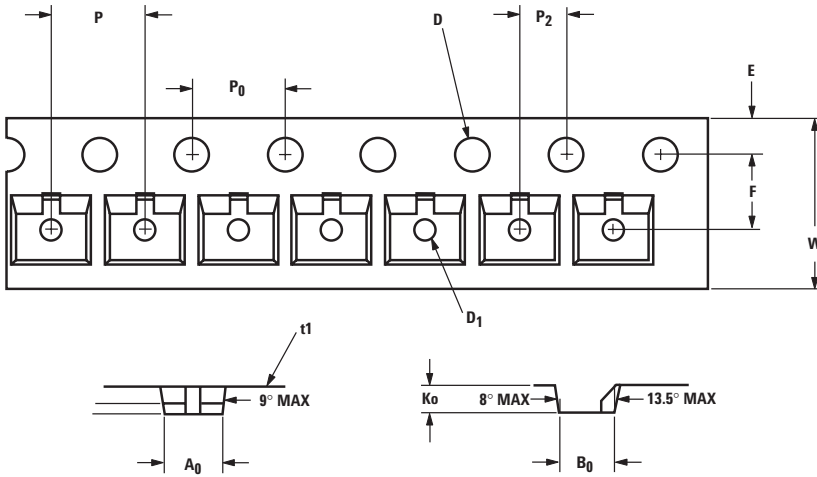
Package Dimensions Outline SOT-23



Recommended PCB Pad Layout for Avago's SOT-23 Products



Tape Dimensions and Product Orientation For Outline SOT-23



DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	A_0	3.15 ± 0.10	0.124 ± 0.004
	WIDTH	B_0	2.77 ± 0.10	0.109 ± 0.004
	DEPTH	K_0	1.22 ± 0.10	0.048 ± 0.004
	PITCH	P	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D_1	$1.00 + 0.05$	0.039 ± 0.002
PERFORATION	DIAMETER	D	$1.50 + 0.10$	$0.059 + 0.004$
	PITCH	P_0	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	$8.00 + 0.30 - 0.10$	$0.315 + 0.012 - 0.004$
	THICKNESS	t_1	0.229 ± 0.013	0.009 ± 0.0005
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.05	0.138 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P_2	2.00 ± 0.05	0.079 ± 0.002

The key factors in these equations are: R_s , the series resistance of the diode where heat is generated under high current conditions; θ_{chip} , the chip thermal resistance of the Schottky die; and $\theta_{package}$, or the package thermal resistance.

R_s for the HBAT-540x family of diodes is typically 2.4Ω , other than the HSMS-270x family, this is the lowest of any Schottky diode available. Chip thermal resistance is typically $40^\circ\text{C}/\text{W}$; the thermal resistance of the iron-alloy-leadframe, SOT-23 package is typically $460^\circ\text{C}/\text{W}$; and the thermal resistance of the copper-leadframe, SOT-323 package is typically $110^\circ\text{C}/\text{W}$. The impact of package thermal resistance on the current handling capability of these diodes can be seen in Figures 3 and 4. Here the computed values of junction temperature vs. forward current are shown for three values of ambient temperature. The SOT-323 products, with their copper leadframes, can safely handle almost twice the current of the larger SOT-23 diodes. Note that the term "ambient temperature" refers to the temperature of the diode's leads, not the air around the circuit board. It can be seen that the HBAT-540B and HBAT-540C products in the SOT-323 package will safely withstand a steady-state forward current of 330 mA when the diode's terminals are maintained at 75°C .

For pulsed currents and transient current spikes of less than one microsecond in duration, the junction does not have time to reach thermal steady state. Moreover, the diode junction may be taken to temperatures higher than 150°C for short time periods without impacting device MTTF. Because of these factors, higher currents can be safely handled. The HBAT-540x family has the second highest current handling capability of any Avago diode, next to the HSMS-270x series.

Part Number Ordering Information

Part Number	No. of Devices	Container
HBAT-5400-BLKG	100	Antistatic Bag
HBAT-5400-TR1G	3,000	7" Reel
HBAT-5400-TR2G	10,000	13" Reel
HBAT-5402-BLKG	100	Antistatic Bag
HBAT-5402-TR1G	3,000	7" Reel
HBAT-5402-TR2G	10,000	13" Reel
HBAT-540B-BLKG	100	Antistatic Bag
HBAT-540B-TR1G	3,000	7" Reel
HBAT-540B-TR2G	10,000	13" Reel
HBAT-540C-BLKG	100	Antistatic Bag
HBAT-540C-TR1G	3,000	7" Reel
HBAT-540C-TR2G	10,000	13" Reel