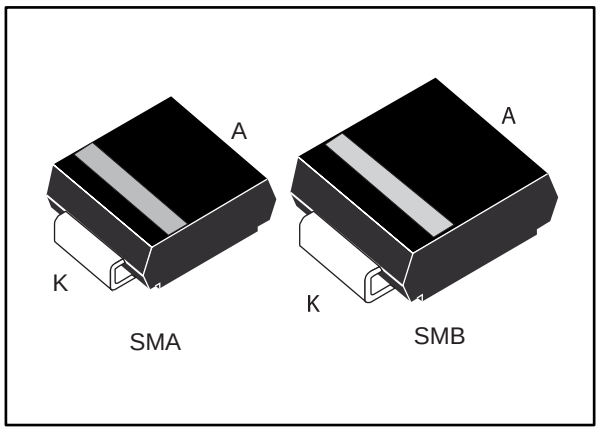
STTH1R04-Y

Automotive ultrafast recovery diode

Datasheet - production data



Features

- AEC-Q101 qualified
- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature
- ECOPACK®2 compliant component

Description

This device that uses ST's new 400 V planar Pt doping technology, is specially suited for switching mode base drive and transistor circuits.

Packaged in SMB and SMA, it is intended for use in low voltage, high frequency inverters, freewheeling and polarity protection in automotive applications.

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	1 A
V_{RRM}	400 V
T_j (max.)	175 °C
V_F (typ.)	0.9 V
t_{rr} (typ.)	14 ns

1 Characteristics

Table 2: Absolute ratings (limiting values per diode at 25 °C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage		T_j = -40 °C to +175 °C	400	V
$I_{F(AV)}$	Average forward current, δ = 0.5, square wave	SMA	T_l = 130 °C	1.0	A
		SMB	T_l = 140 °C		
I_{FSM}	Surge non repetitive forward current		t_p = 10 ms sinusoidal	30	A
			t_p = 8.3 ms sinusoidal	37	
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Operating junction temperature(1)			-40 to +175	°C

Notes:

(1)$(dP_{tot}/dT_j) < (1/R_{th(j-a)})$ condition to avoid thermal runaway for a diode on its own heatsink.

Table 3: Thermal resistance parameters

Symbol	Parameter		Maximum value	Unit
$R_{th(j-l)}$	Junction to lead	SMA	30	°C/W
		SMB	25	

Table 4: Static electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-		5	µA
		T_j = 125 °C		-	5	50	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 1 A	-	1.30	1.60	V
		T_j = 100 °C		-	1.05	1.30	
		T_j = 150 °C		-	0.90	1.15	

Notes:

(1)Pulse test: t_p = 5 ms, δ < 2%

(2)Pulse test: t_p = 380 µs, δ < 2%

To evaluate the conduction losses, use the following equation:

$P = 0.9 \times I_{F(AV)} + 0.250 \times I_F{}^2{}_{(RMS)}$

Table 5: Dynamic electrical characteristics per diode (T_j = 25 °C, unless otherwise specified)

Symbol	Parameters	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 1 A dI_F/dt = -50 A/µs V_R = 30 V	-		30	ns
		I_F = 1 A dI_F/dt = -100 A/µs V_R = 30 V	-	14	20	
I_{RM}	Reverse recovery current	I_F = 1 A dI_F/dt = -200 A/µs V_R = 320 V T_j = 125 °C	-	2.5	3.5	A
V_{FP}	Forward recovery voltage	I_F = 1 A dI_F/dt = 100 A/µs	-	2.9		V
t_{fr}	Forward recovery time	I_F = 1 A dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_F (max)	-		50	ns

1.1 Characteristics (curves)

Figure 1: Conduction losses versus average forward current

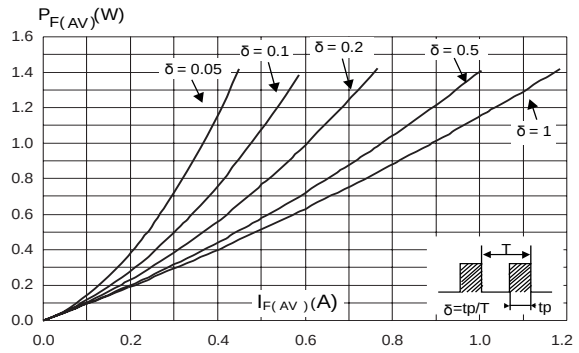


Figure 2: Forward voltage drop versus forward current

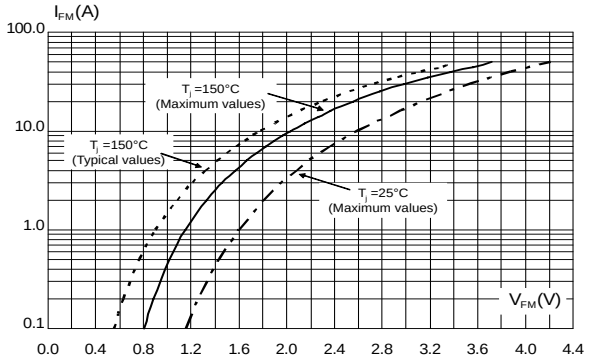


Figure 3: Relative variation of thermal impedance junction to case ambient versus pulse duration (SMA)

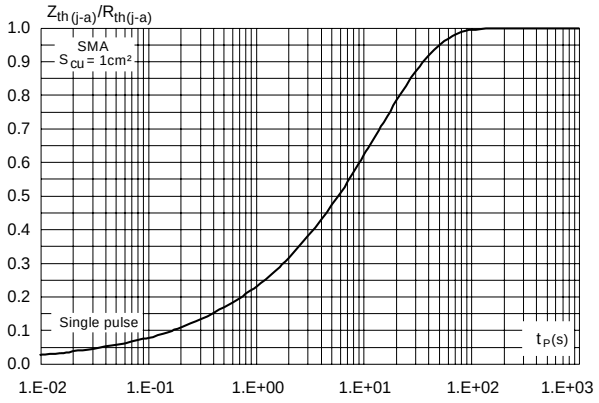


Figure 4: Relative variation of thermal impedance junction to case ambient versus pulse duration (SMB)

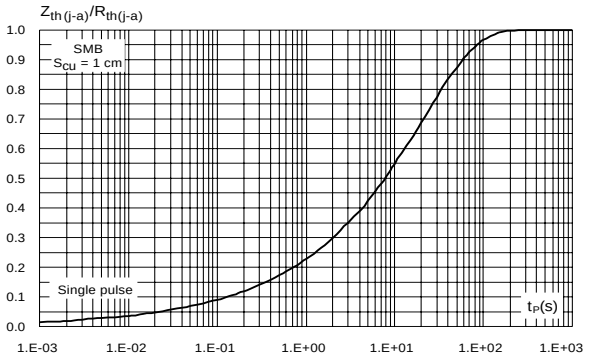


Figure 5: Junction capacitance versus reverse voltage applied (typical values)

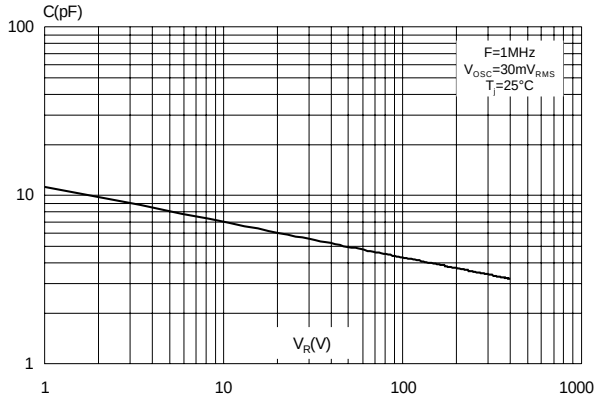


Figure 6: Reverse recovery charges versus dI_F / dt (typical values)

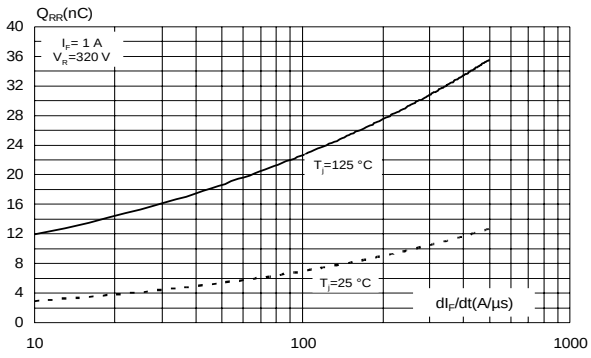


Figure 7: Reverse recovery time versus dI_F / dt (typical values)

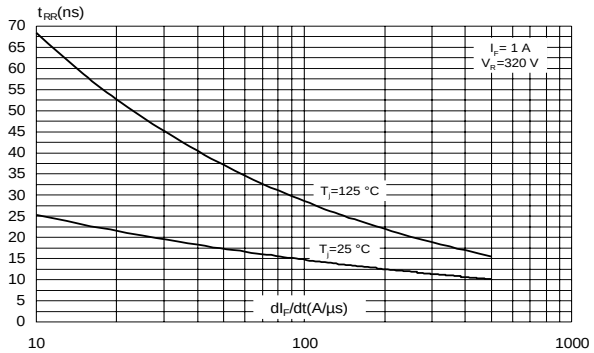


Figure 8: Peak reverse recovery current versus dI_F / dt (typical values)

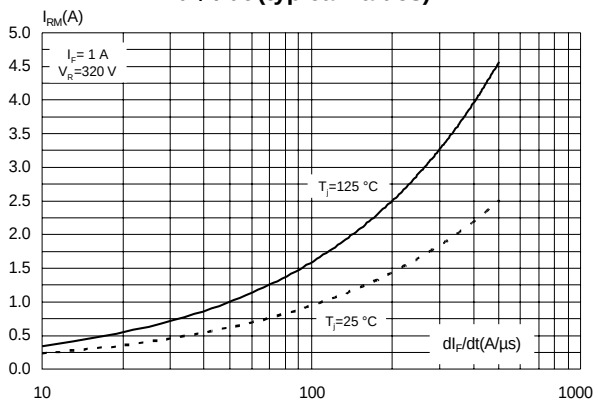


Figure 9: Relative variation of dynamic parameters versus junction temperature

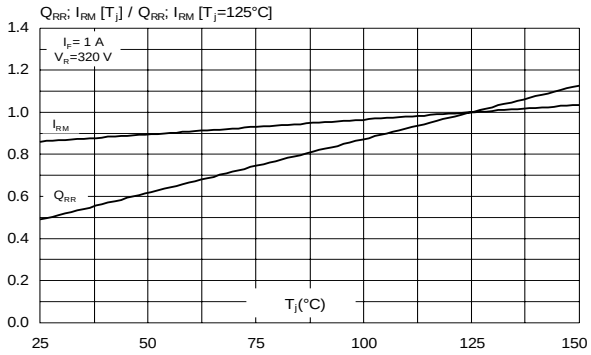


Figure 10: Transient peak forward voltage versus dI_F / dt (typical values)

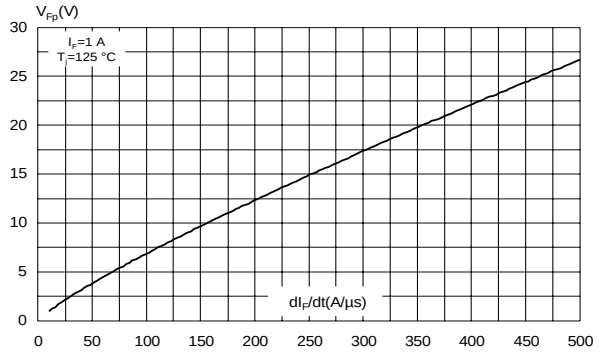


Figure 11: Forward recovery time versus dI_F / dt (typical values)

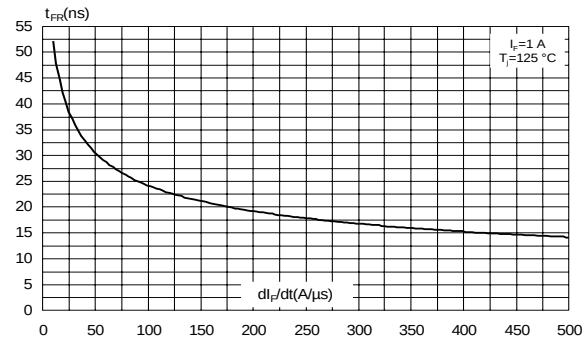


Figure 12: Thermal resistance junction to ambient total versus copper surface under each lead (SMA)

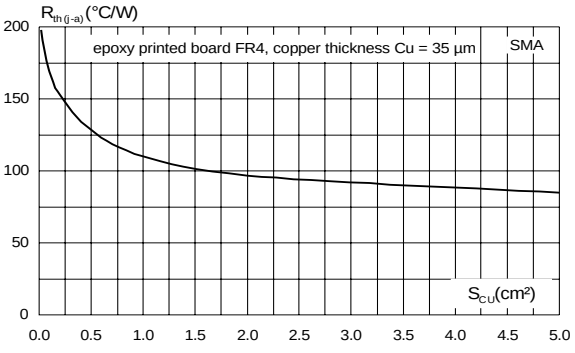
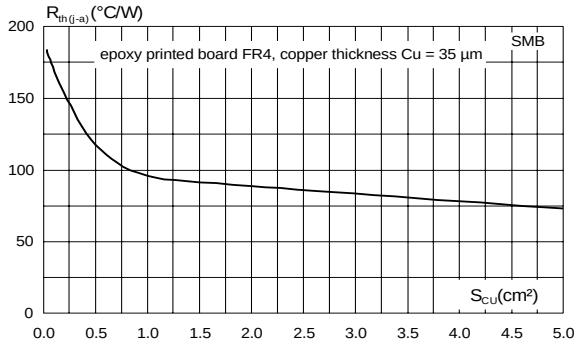


Figure 13: Thermal resistance junction to ambient total versus copper surface under each lead (SMB)



2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: ***www.st.com***. ECOPACK® is an ST trademark.

2.1 SMA package information

Figure 14: SMA package outline

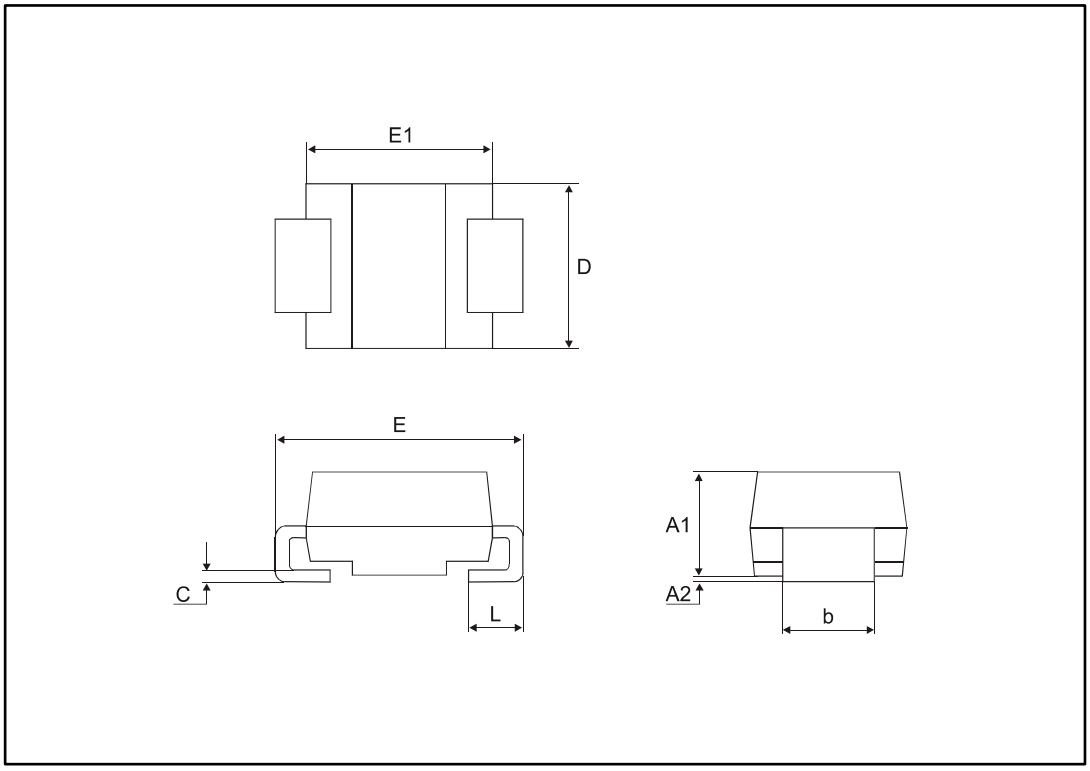
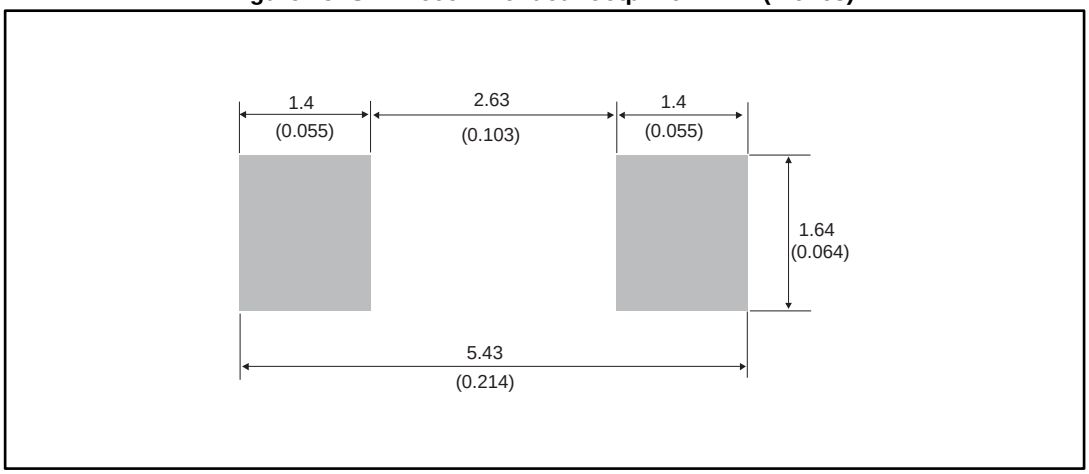


Table 6: SMA package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.097
A2	0.05	0.20	0.002	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.006	0.016
D	2.25	2.90	0.089	0.114
E	4.80	5.35	0.189	0.211
E1	3.95	4.60	0.156	0.181
L	0.75	1.50	0.030	0.059

Figure 15: SMA recommended footprint in mm (inches)



2.2 SMB package information

Figure 16: SMB package outline

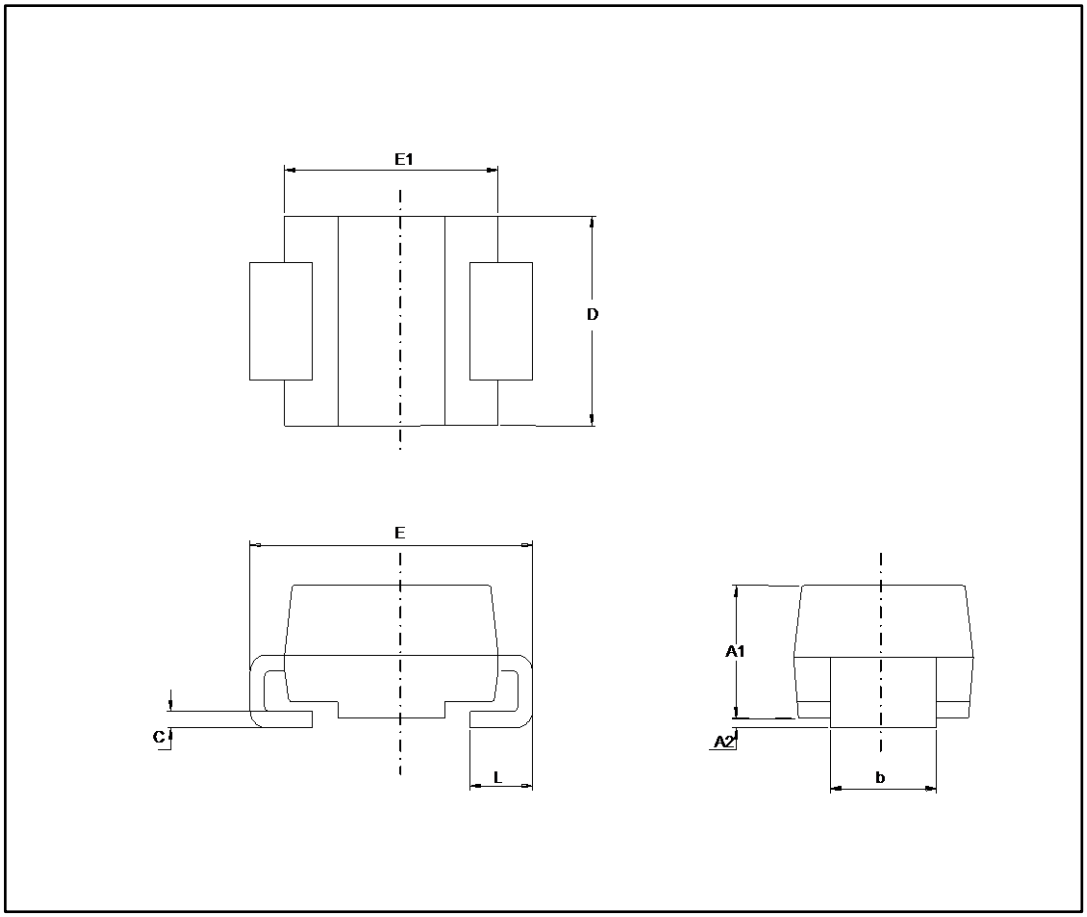
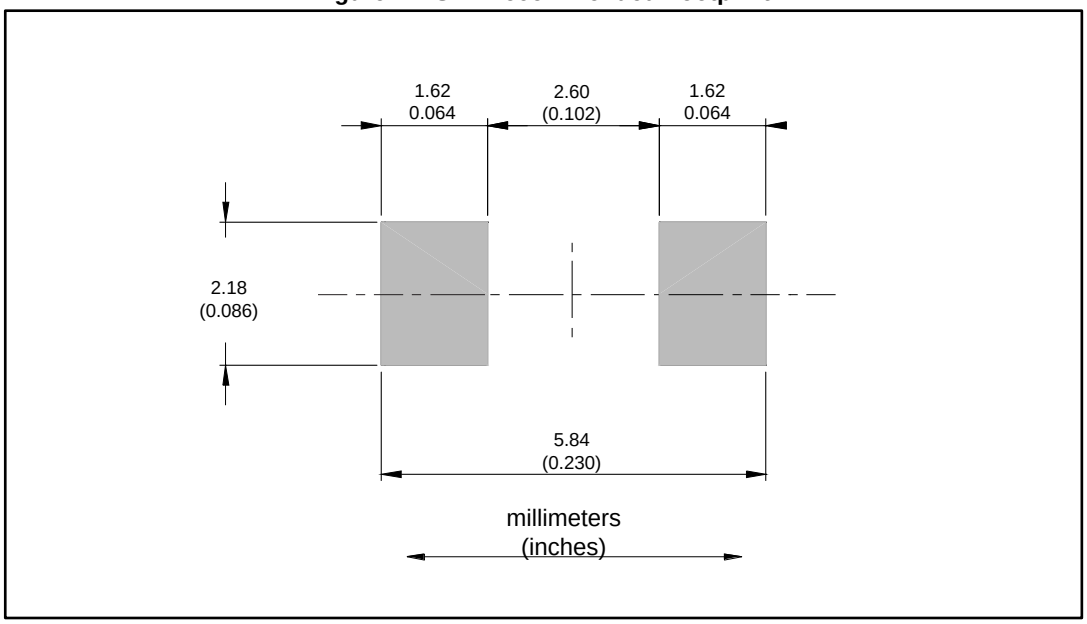


Table 7: SMB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.0748	0.0965
A2	0.05	0.20	0.0020	0.0079
b	1.95	2.20	0.0768	0.0867
c	0.15	0.40	0.0059	0.0157
D	3.30	3.95	0.1299	0.1556
E	5.10	5.60	0.2008	0.2205
E1	4.05	4.60	0.1594	0.1811
L	0.75	1.50	0.0295	0.0591

Figure 17: SMB recommended Footprint



3 Ordering information

Table 8: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH1R04AY	HR4Y	SMA	0.068 g	5000	Tape and reel
STTH1R04UY	BR4Y	SMB	0.12 g	2500	Tape and reel

4 Revision history

Table 9: Document revision history

Date	Revision	Changes
09-Jul-2013	1	First issue
16-Mar-2017	2	Updated *Table 2: "Absolute ratings (limiting values per diode at 25 °C, unless otherwise specified)"*.

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