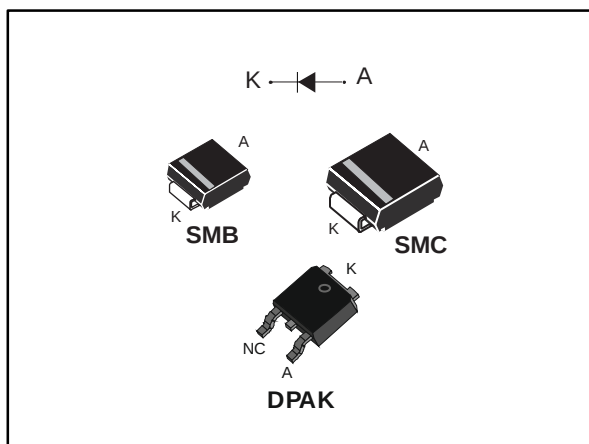


Automotive ultrafast recovery diode

Datasheet - production data



Description

This device uses ST's new 200 V planar Pt doping technology, and it is especially suited for switching mode base drive and transistor circuits.

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

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	4 A
V_{RRM}	200 V
T_j (max.)	175 °C
V_F (typ.)	0.76 V
t_{rr} (typ.)	16 ns

Features

- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature
- PPAP capable
- AEC-Q101 qualified

1 Characteristics

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

Symbol	Parameter			Value	Unit
V _{RRM}	Repetitive peak reverse voltage		T _J = -40 °C to + 175 °C	200	V
I _{F(RMS)}	Forward rms current			10	A
I _{F(AV)}	Average forward current δ = 0.5, square wave	DPAK	T _c = 160 °C	4	A
		SMB, SMC	T _{lead} = 95 °C		
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms sinusoidal		70	A
T _{stg}	Storage temperature range			-65 to +175	°C
T _j	Maximum 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 parameters

Symbol	Parameter		Maximum	Unit
$R_{th(j-c)}$	Junction to case	DPAK	3.5	°C/W
$R_{th(j-l)}$	Junction to lead	SMB, SMC	20	

Table 4: Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-		3	μA
		$T_j = 125\text{ °C}$		-	2	20	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 4\text{ A}$	-	0.95	1.05	V
		$T_j = 150\text{ °C}$		-	0.76	0.83	

Notes:

⁽¹⁾Pulse test: $t_p = 5\text{ ms}$, $\delta < 2\%$

⁽²⁾Pulse test: $t_p = 380\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.67 \times I_{F(AV)} + 0.04 I_{F^2(RMS)}$$

Table 5: Dynamic characteristics

Symbol	Parameters	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 1\text{ A}$; $dI_F/dt = -50\text{ A}/\mu\text{s}$; $V_R = 30\text{ V}$	-	24	30	ns
			$I_F = 1\text{ A}$; $dI_F/dt = -100\text{ A}/\mu\text{s}$; $V_R = 30\text{ V}$	-	16	20	
I_{RM}	Reverse recovery current	$T_j = 125\text{ }^{\circ}\text{C}$	$I_F = 4\text{ A}$; $dI_F/dt = -200\text{ A}/\mu\text{s}$; $V_R = 160\text{ V}$	-	4.4	5.5	A
t_{rr}	Reverse recovery time			-	27		ns
Q_{rr}	Reverse recovery charges			-	60		nC

1.1 Characteristics (curves)

Figure 1: Peak current versus duty cycle

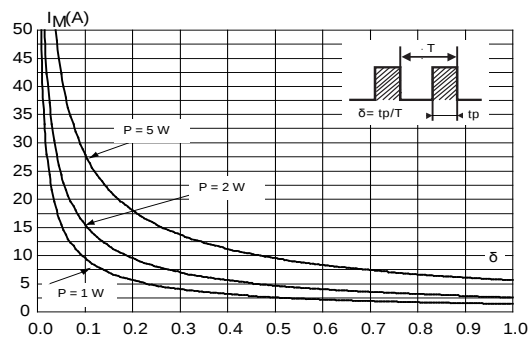


Figure 2: Forward voltage drop versus forward current (typical values)

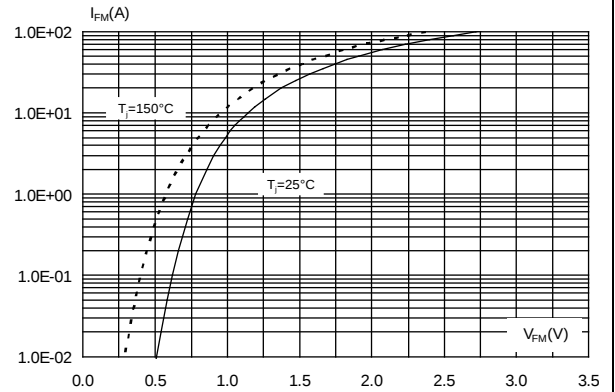


Figure 3: Forward voltage drop versus forward current (maximum values)

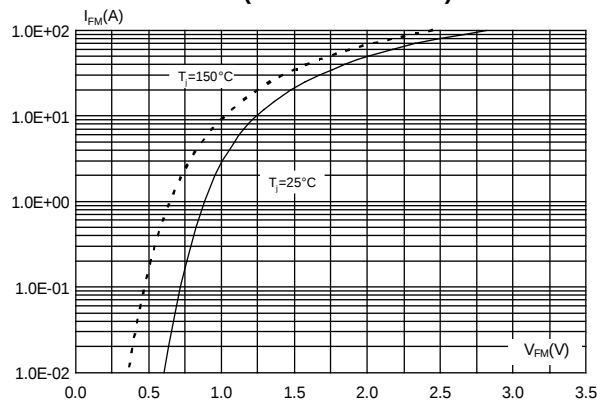


Figure 4: Relative variation of thermal impedance, junction to case, versus pulse duration

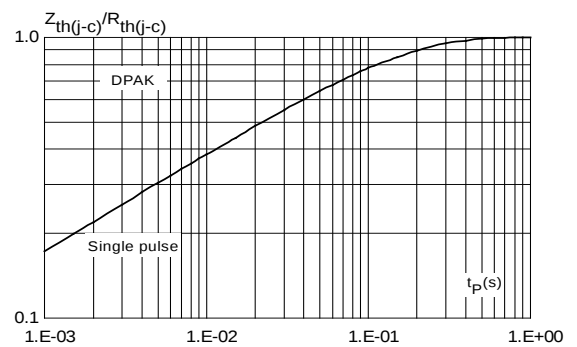


Figure 5: Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMB)

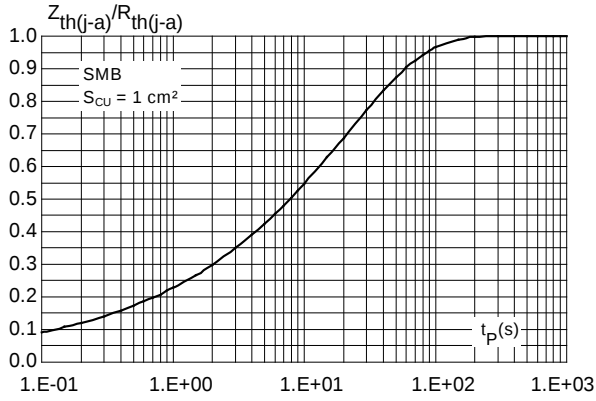


Figure 6: Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMC)

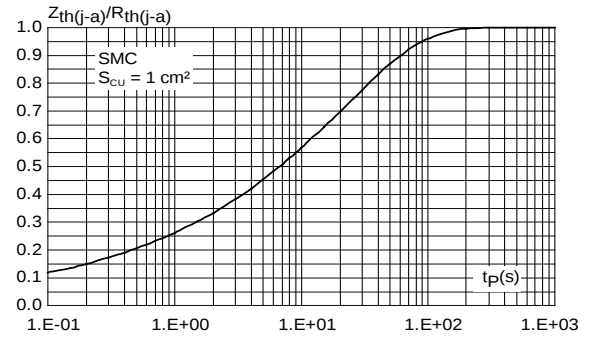


Figure 7: Junction capacitance versus reverse applied voltage (typical values)

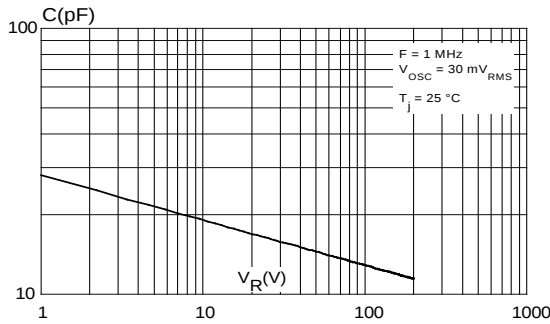


Figure 8: Reverse recovery charges versus dIF/dt (typical values)

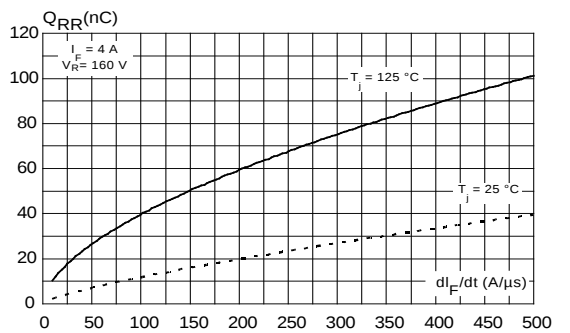


Figure 9: Reverse recovery time versus dIF/dt (typical values)

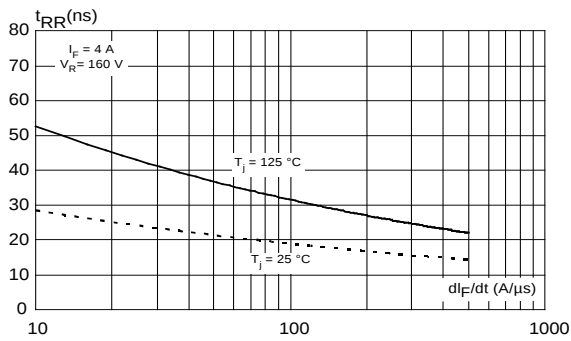


Figure 10: Peak reverse recovery current versus dIF/dt (typical values)

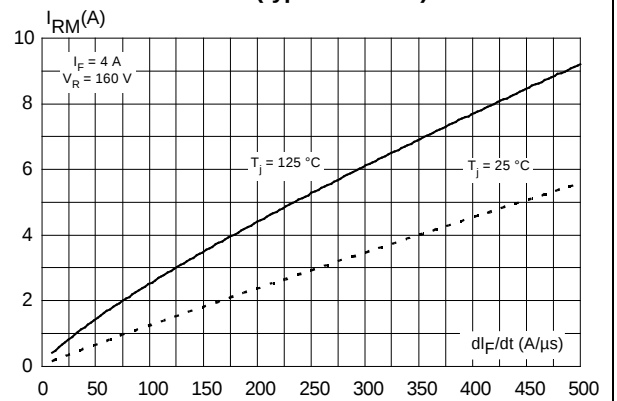
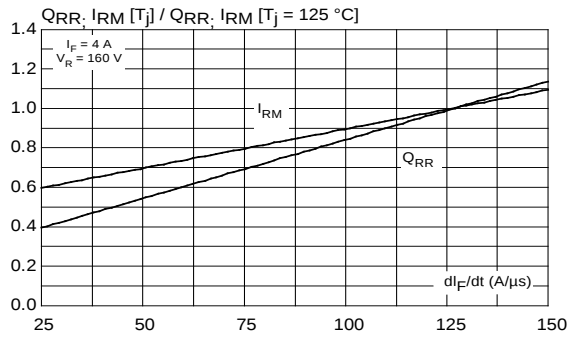
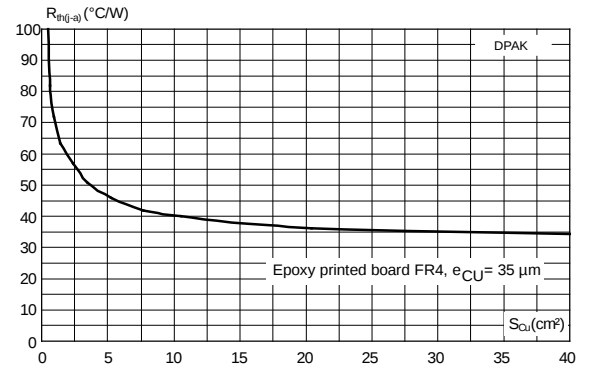
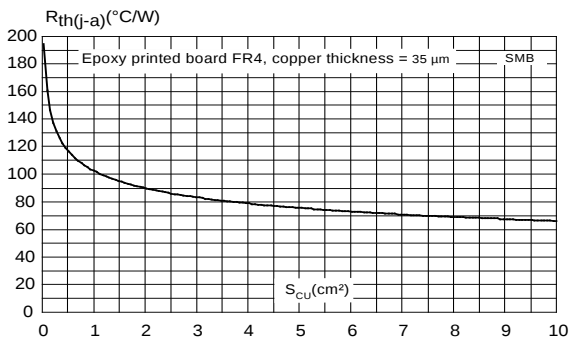
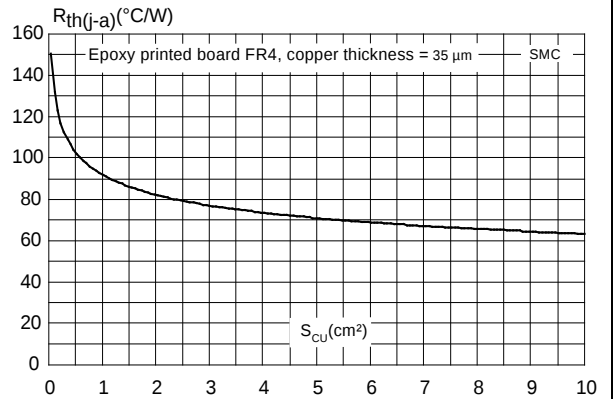


Figure 11: Dynamic parameters versus junction temperature**Figure 12: Thermal resistance, junction to ambient, versus copper surface under tab****Figure 13: Thermal resistance, junction to ambient, versus copper surface under each lead****Figure 14: Thermal resistance, junction to ambient, versus copper surface under each lead**

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 DPAK package information

Figure 15: DPAK package outline

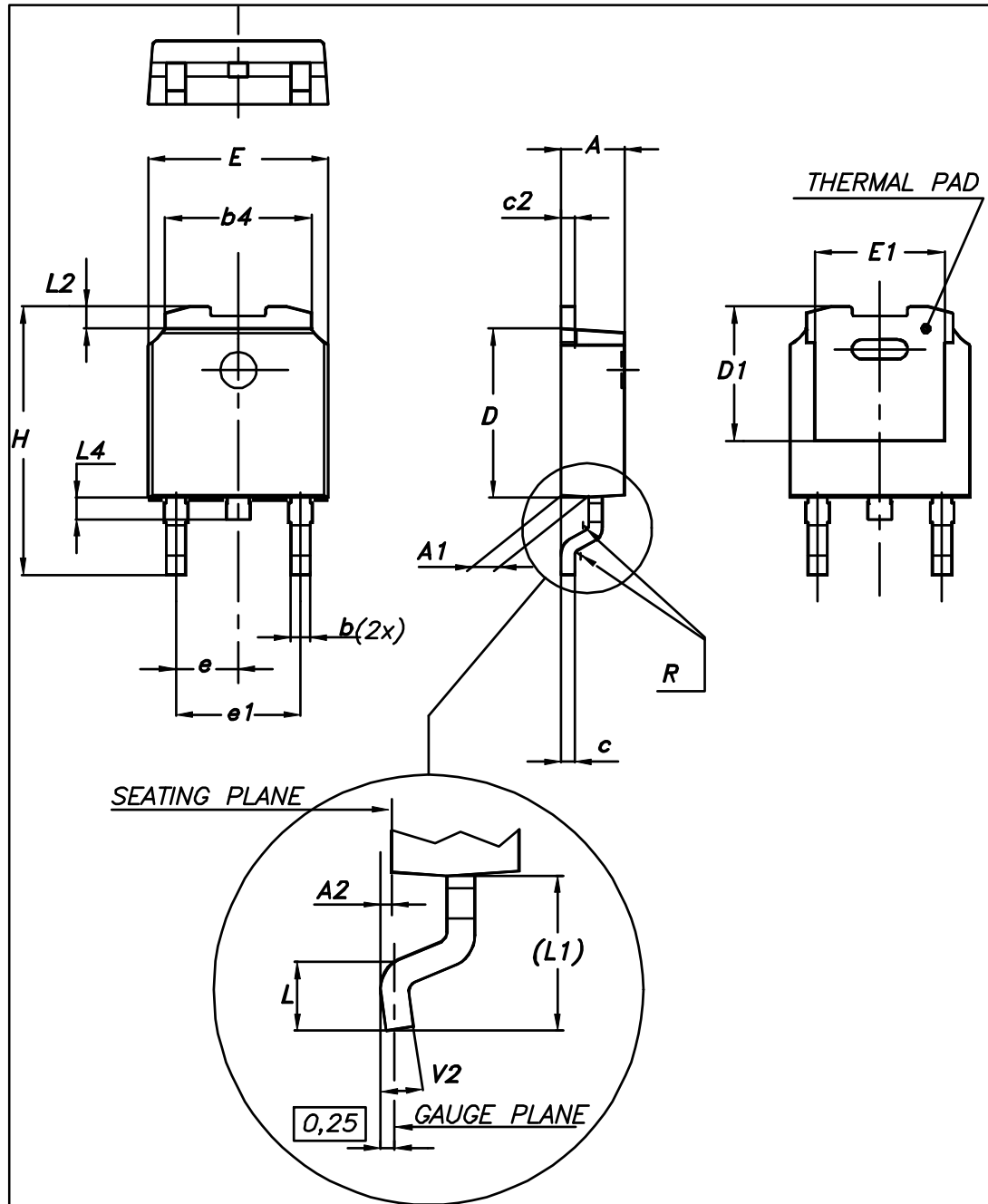
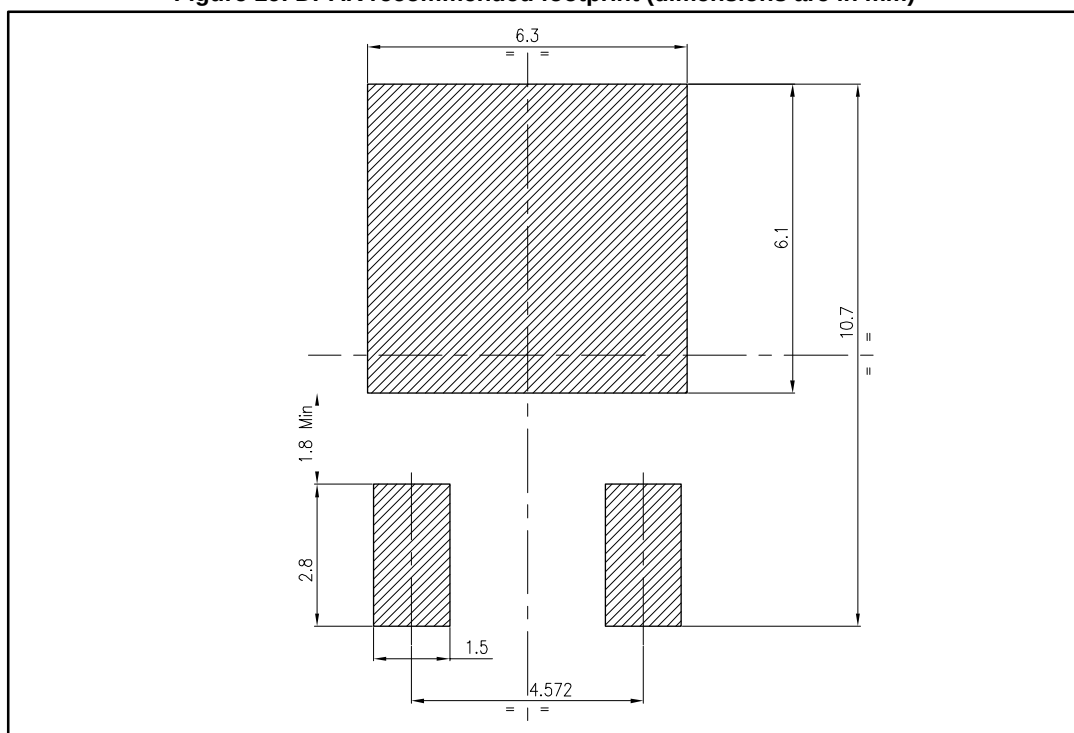


Table 6: DPAK mechanical data

Dim.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
b	0.64		0.90	0.025		0.035
b4	5.20		5.40	0.205		0.213
c	0.45		0.60	0.018		0.024
c2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
D1	4.95	5.10	5.25	0.201	0.195	0.207
E	6.40		6.60	0.252		0.260
E1	4.60	4.70	4.80	0.181	0.185	0.189
e	2.16	2.28	2.40	0.085	0.090	0.094
e1	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L	1.00		1.50	0.039		0.059
(L1)	2.60	2.80	3.00	0.102	0.110	0.118
L2	0.65	0.80	0.95	0.026	0.031	0.037
L4	0.60		1.00	0.024		0.039
R		0.20			0.008	
V2	0°		8°	0°		8°

Figure 16: DPAK recommended footprint (dimensions are in mm)



2.2 SMC package information

Figure 17: SMC package outline

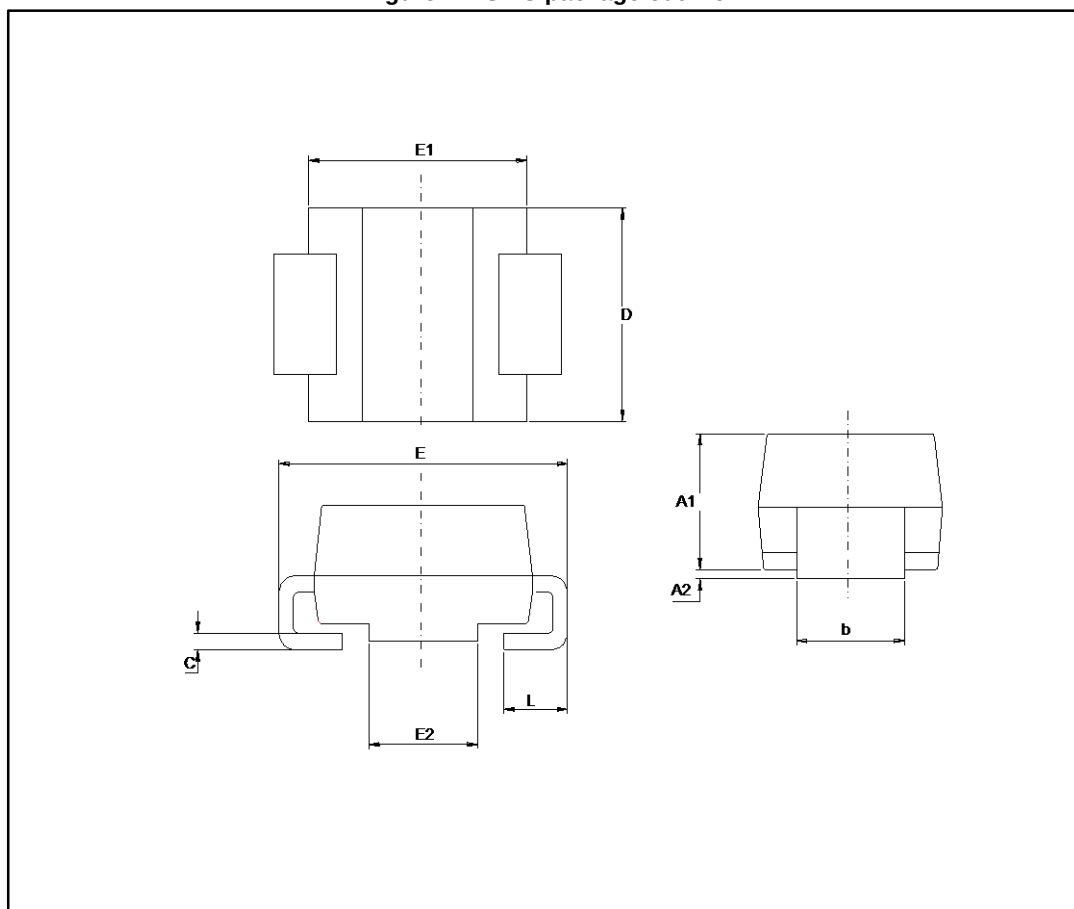
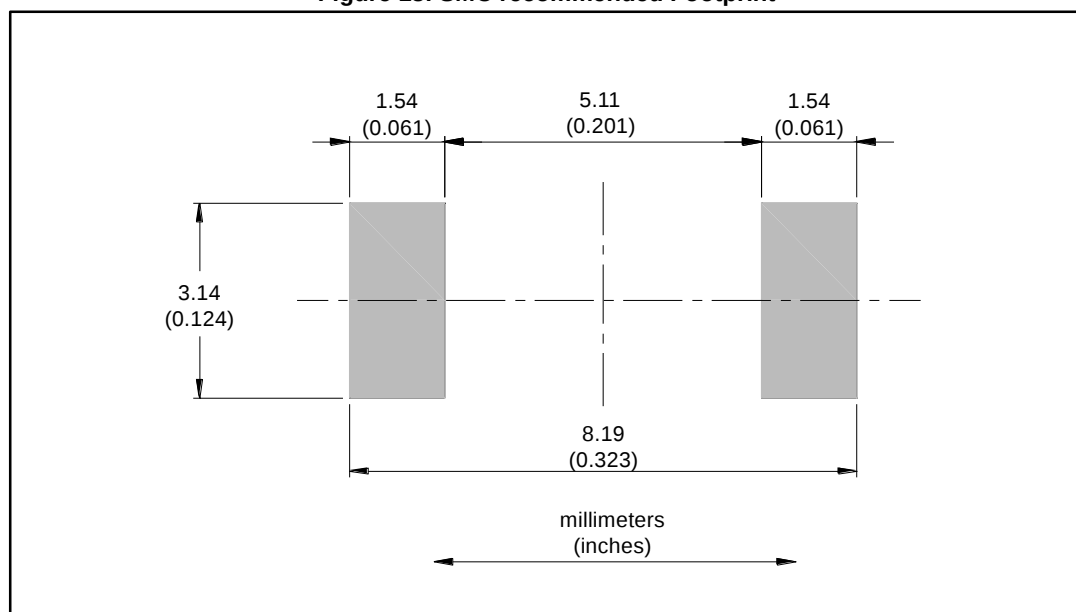


Table 7: SMC package mechanical data

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	2.90	3.20	0.1142	0.1260
c	0.15	0.40	0.0059	0.0157
D	5.55	6.25	0.2185	0.2461
E	7.75	8.15	0.3051	0.3209
E1	6.60	7.15	0.2598	0.2815
E2	4.40	4.70	0.1732	0.1850
L	0.75	1.50	0.0295	0.0591

Figure 18: SMC recommended Footprint



2.3 SMB package information

Figure 19: SMB package outline

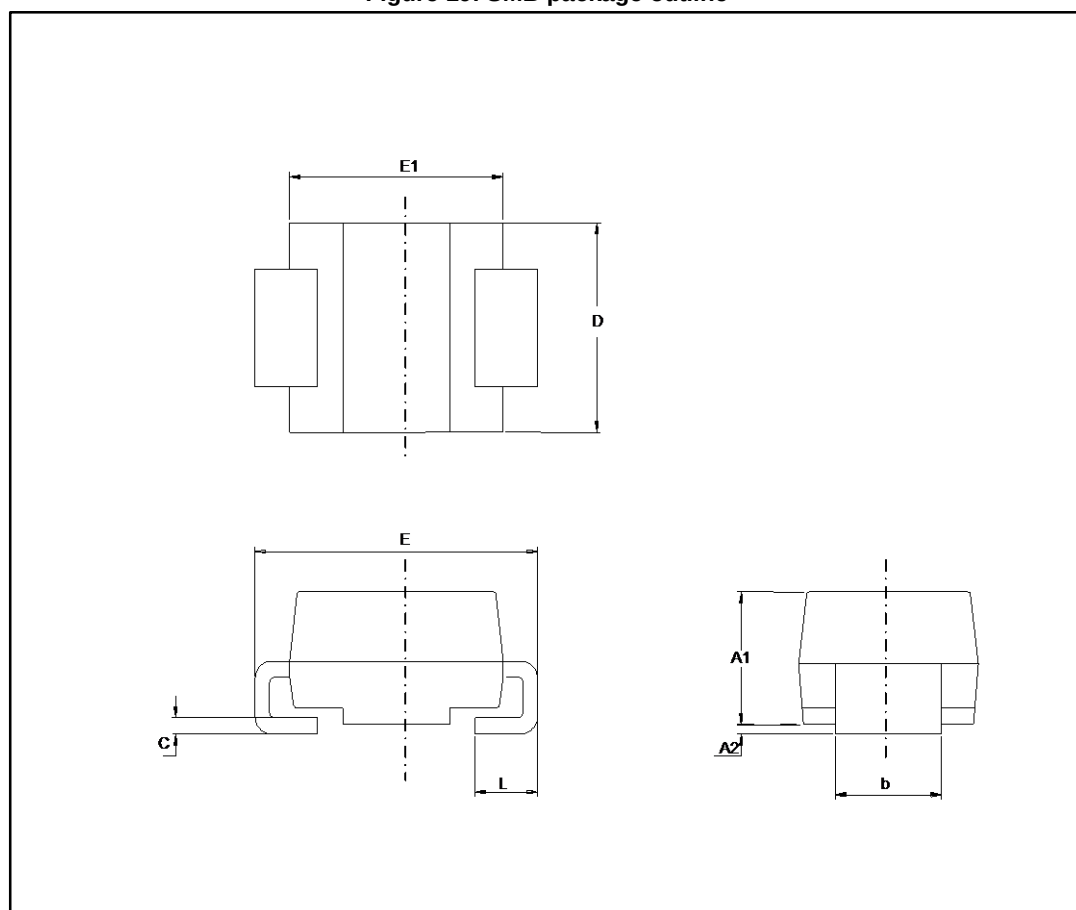
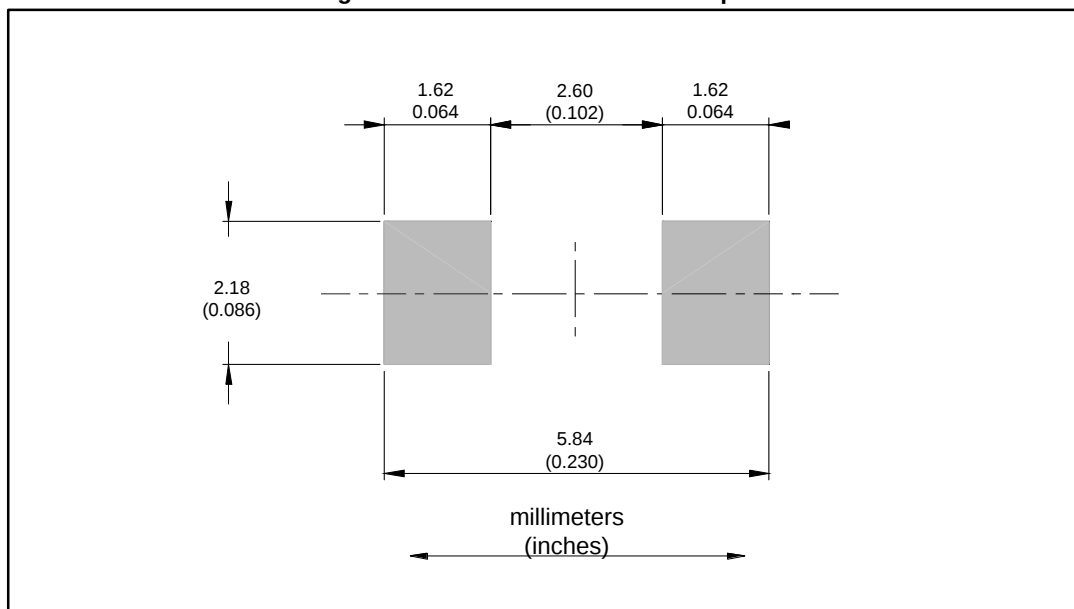


Table 8: SMB package mechanical data

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 20: SMB recommended Footprint



3 Ordering information

Figure 21: Ordering information scheme

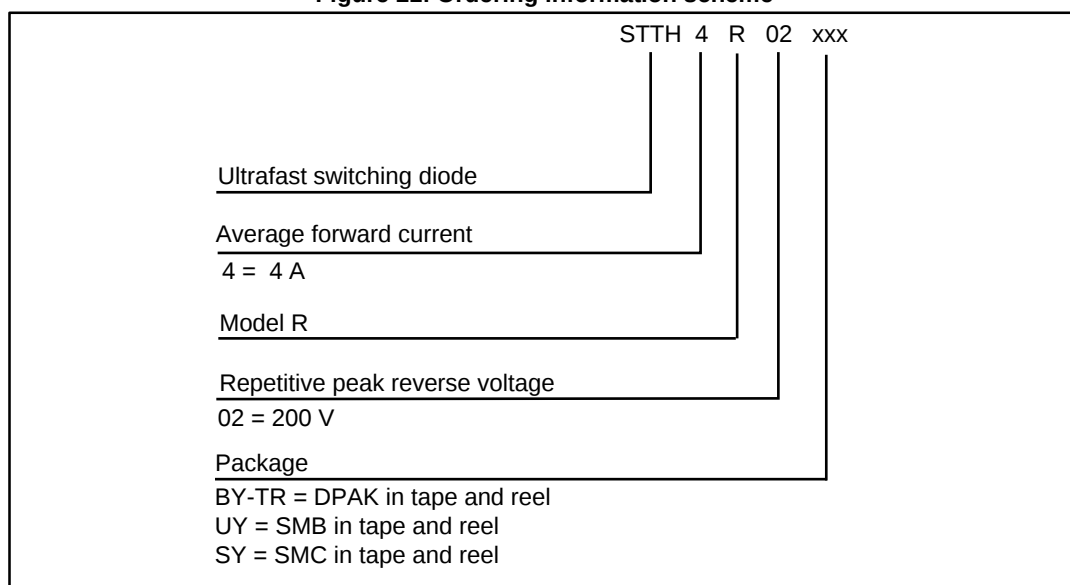


Table 9: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH4R02BY-TR	STTH4 R02BY	DPAK	0.320 g	2500	Tape and reel
STTH4R02UY	4R2UY	SMB	0.110 g	2500	Tape and reel
STTH4R02SY	4R2SY	SMC	0.243 g	2500	Tape and reel

4 Revision history

Table 10: Document revision history

Date	Revision	Changes
03-Dec-2010	1	First issue
14-Apr-2016	2	Added device in DPAK. Updated features and description in cover page. Updated Table 2: "Absolute ratings (limiting values at 25 °C, unless otherwise specified)" , Table 3: "Thermal parameters" and Table 5: "Dynamic characteristics" . Updated Figure 2: "Forward voltage drop versus forward current (typical values)" and Figure 3: "Forward voltage drop versus forward current (maximum values)" . Updated Section 4: "Ordering information" .

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