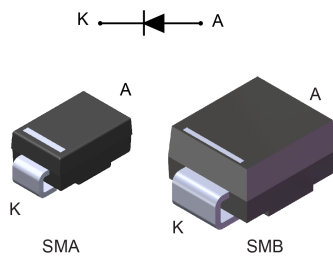


40 V power Schottky rectifier



Features

- Very small conduction losses
- Negligible switching losses
- Low forward voltage drop
- Surface mount miniature packages
- Avalanche rated
- ECOPACK[®]2 compliant

Applications

- Reverse polarity protection
- Set-top box power supply
- TV power supply
- Battery charger

Description

Single chip Schottky rectifiers suited to switched mode power supplies and high frequency DC to DC converters.

Packaged in SMA and SMB, the **STPS140** is ideal for use in surface mounting and used in low voltage, high frequency inverters, free-wheeling and polarity protection applications.

Product status	
STPS140	
Product summary	
Symbol	Value
$I_{F(AV)}$	1 A
V_{RRM}	40 V
$T_{j(max.)}$	150 °C
$V_{F(typ.)}$	0.43 V

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter		Value	Unit	
V_{RRM}	Repetitive peak reverse voltage		40	V	
$I_{F(RMS)}$	Forward rms current		7	A	
$I_{F(AV)}$	Average forward current $\delta = 0.5$, square wave	SMA $T_L = 130\text{ °C}$	1	A	
		SMB $T_L = 135\text{ °C}$			
I_{FSM}	Surge non repetitive forward current		$t_p = 10\text{ ms}$ sinusoidal	60	A
P_{ARM}	Repetitive peak avalanche power		$t_p = 10\text{ }\mu\text{s}$, $T_j = 125\text{ °C}$	65	W
T_{stg}	Storage temperature range		-65 to +150	°C	
T_j	Operating junction temperature ⁽¹⁾		+150	°C	

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

Table 2. Thermal resistance parameter

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

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-		12	μA
		$T_j = 100\text{ °C}$		-	0.25	2	mA
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 1\text{ A}$	-		0.55	V
		$T_j = 125\text{ °C}$		-	0.43		
		$T_j = 25\text{ °C}$	$I_F = 2\text{ A}$	-		0.65	
		$T_j = 125\text{ °C}$		-	0.53	0.60	

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:

$$P = 0.40 \times I_{F(AV)} + 0.10 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

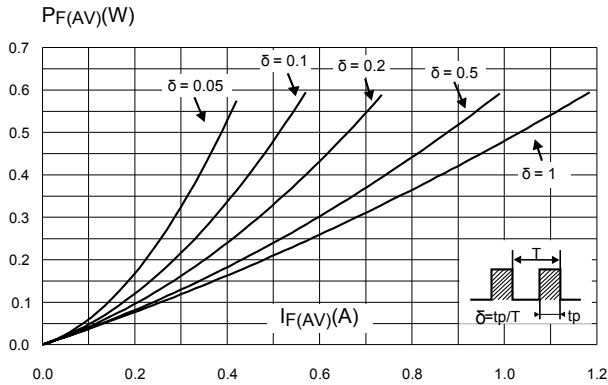
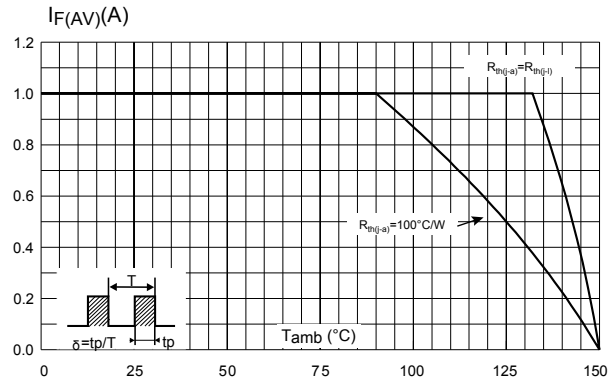
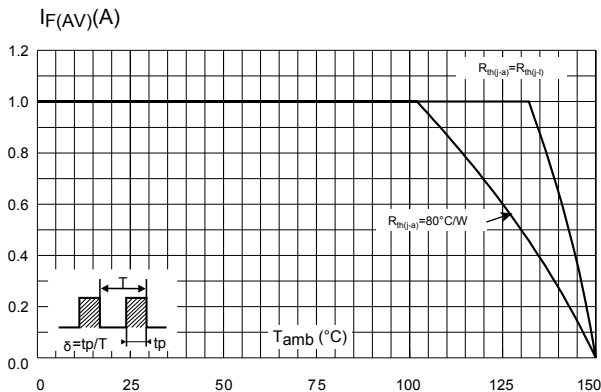
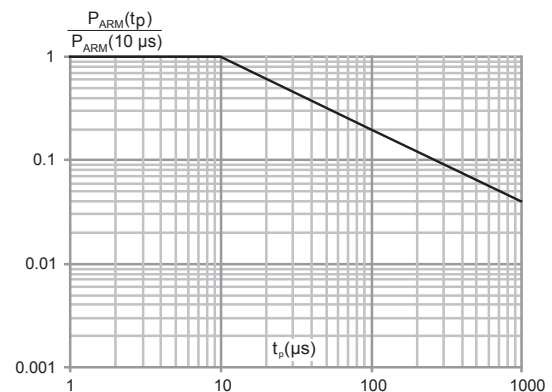
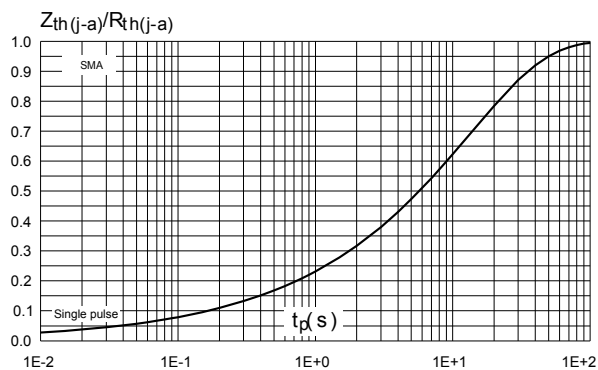
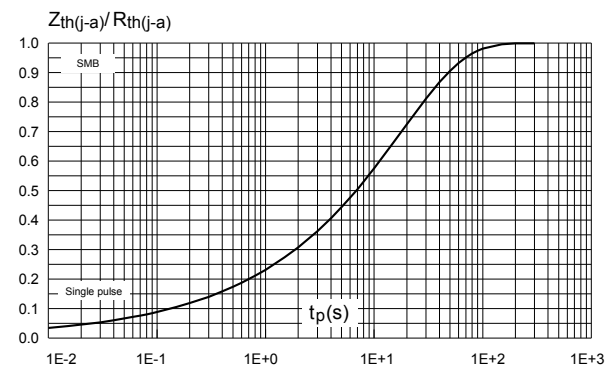
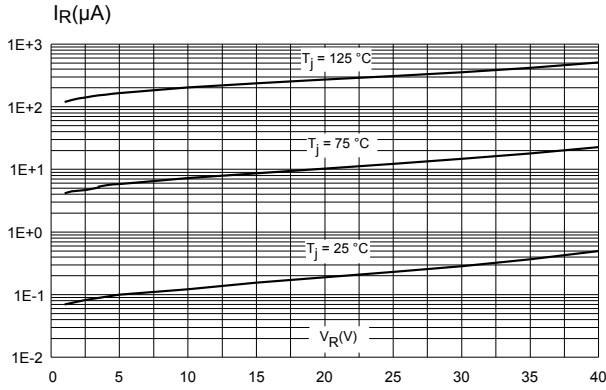
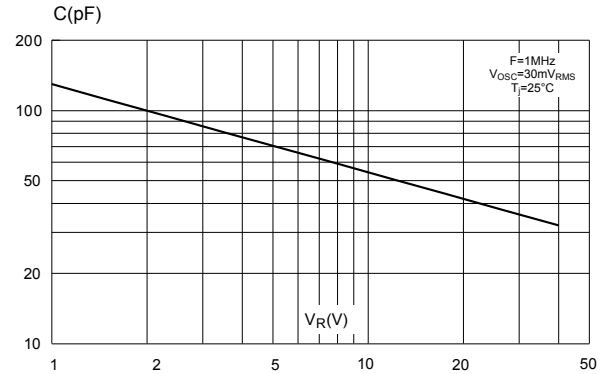
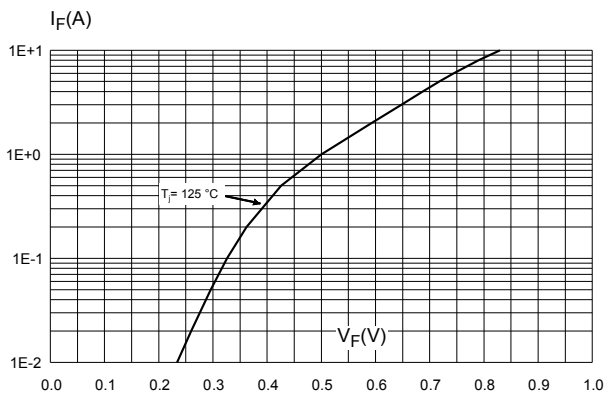
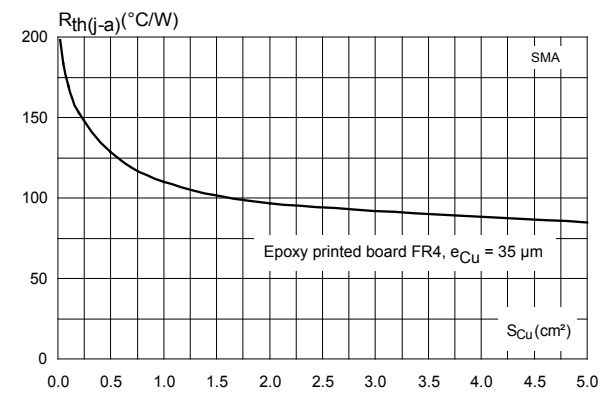
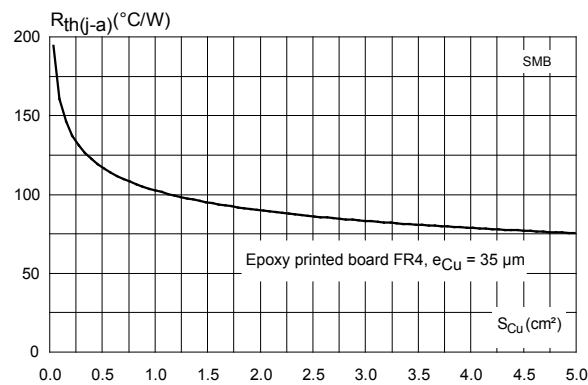
1.1 Characteristics (curves)
Figure 1. Average forward power dissipation versus average forward current

Figure 2. Average forward current versus ambient temperature (SMA, $\delta = 0.5$)

Figure 3. Average forward current versus ambient temperature (SMB, $\delta = 0.5$)

Figure 4. Normalized avalanche power derating versus pulse duration ($T_j = 125^\circ\text{C}$)

Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration (SMA)

Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration (SMB)


Figure 7. Reverse leakage current versus reverse voltage applied (typical values)

Figure 8. Junction capacitance versus reverse voltage applied (typical values)

Figure 9. Forward voltage drop versus forward current (maximum values)

Figure 10. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

Figure 11. Thermal resistance junction to ambient versus copper surface under each lead (typical values)


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 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 12. SMB package outline

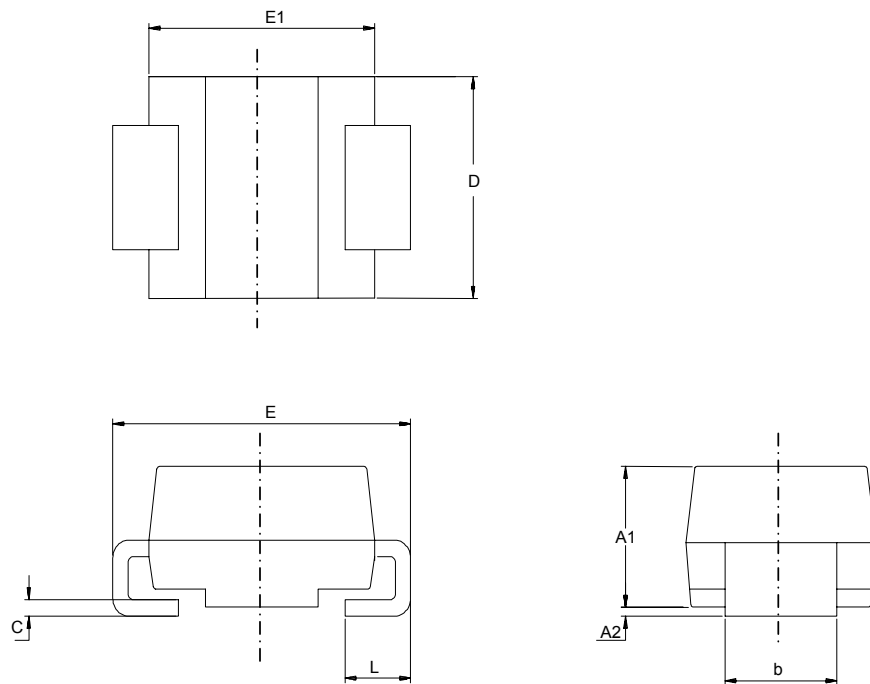
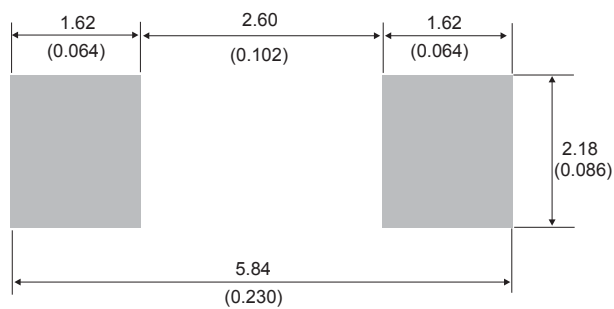


Table 4. SMB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.096
A2	0.05	0.20	0.002	0.008
b	1.95	2.20	0.076	0.087
c	0.15	0.40	0.005	0.016
D	3.30	3.95	0.129	0.156
E	5.10	5.60	0.200	0.220
E1	4.05	4.60	0.159	0.181
L	0.75	1.50	0.029	0.059

Figure 13. SMB recommended footprint



2.2 SMA package information

- Epoxy meets UL94, V0
- Cooling method : by conduction (C)

Figure 14. SMA package outline

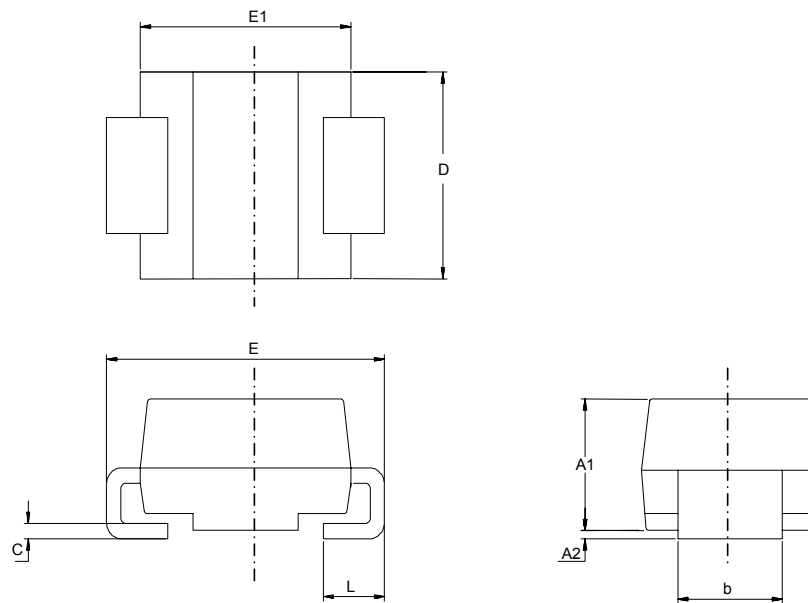
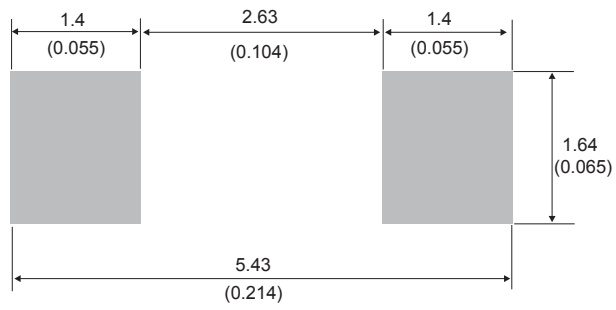


Table 5. SMA package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	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)



3 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPS140A	S140	SMA	68 mg	5000	Tape and reel
STPS140U	G14	SMB	107 mg	2500	Tape and reel

Revision history

Table 7. Document revision history

Date	Revision	Changes
Jul-2003	7.2	Last update.
Aug-2004	7.3	SMA package dimensions update. Reference A1 max. changed from 2.70 mm (0.106 inch.) to 2.03 mm (0.080).
21-Nov-2018	8	Updated Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified) , Figure 4. Normalized avalanche power derating versus pulse duration (T_j = 125 °C) , Section 2.1 and Section 2.2 .

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