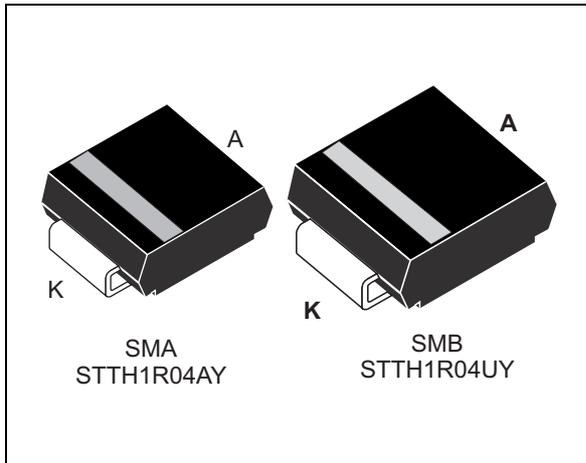


## Automotive ultrafast recovery diode

Datasheet - production data



### Features

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

### Description

The STTH1R04-Y series uses ST's new 400 V planar Pt doping technology. Specially suited for switching mode base drive and transistor circuits.

Packaged in surface mount packages, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection for all automotive application.

**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 at 25 °C, unless otherwise specified)**

Symbol	Parameter		Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage		400	V	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	SMA	1.0	A	
		SMB			
$I_{FSM}$	Surge non repetitive forward current	$T_{lead} = 130\text{ °C}$		30	A
		$T_{lead} = 140\text{ °C}$			
$T_{stg}$	Storage temperature range		-65 to +175	°C	
$T_j$	Operating junction temperature <sup>(1)</sup>		-40 to 175	°C	

1. On infinite heatsink with 10 mm lead length

**Table 3. Thermal parameters**

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

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$			5	$\mu\text{A}$
		$T_j = 125\text{ °C}$			5	50	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 1.0\text{ A}$			1.6	V
		$T_j = 100\text{ °C}$			1.05	1.3	
		$T_j = 150\text{ °C}$			0.9	1.15	

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:

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

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$			30	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$		14	20	
$I_{RM}$	Reverse recovery current	$I_F = 1\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 320\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$		2.5	3.5	A
$t_{fr}$	Forward recovery time	$I_F = 1\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25\text{ }^\circ\text{C}$			50	ns
$V_{FP}$	Forward recovery voltage	$I_F = 1\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 25\text{ }^\circ\text{C}$		2.9		V

Figure 1. Conduction losses versus average forward current

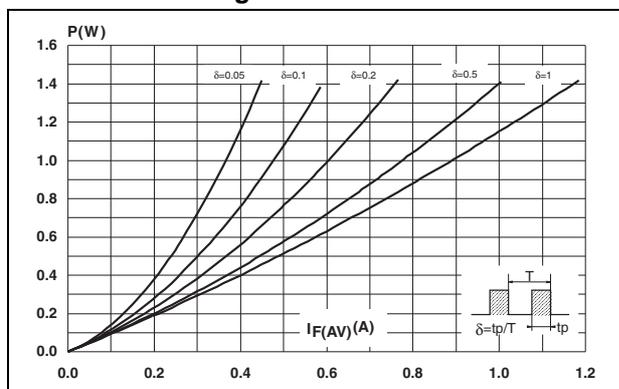


Figure 2. Forward voltage drop versus forward current

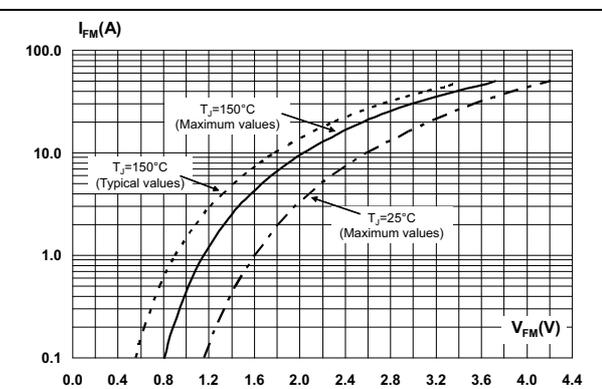


Figure 3. Relative variation of thermal impedance junction to ambient versus pulse duration, SMA

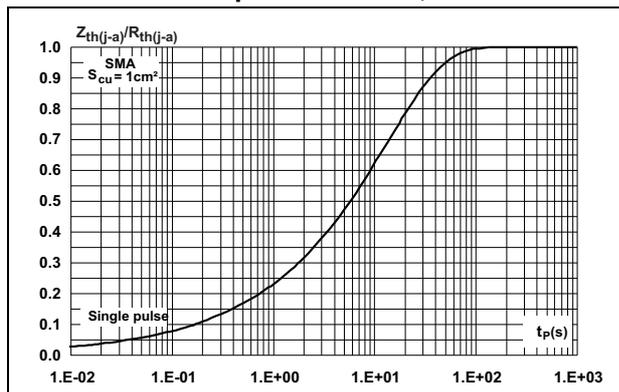


Figure 4. Relative variation of thermal impedance junction to ambient versus pulse duration, SMB

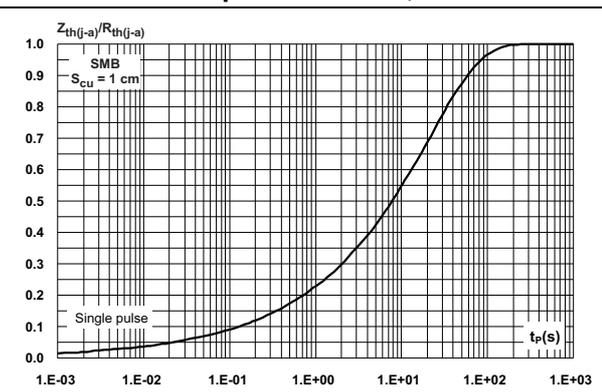


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

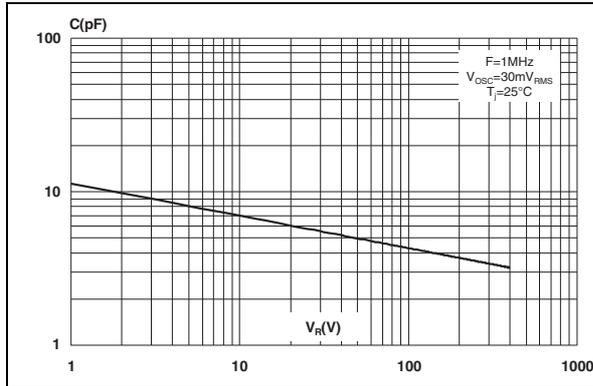


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)

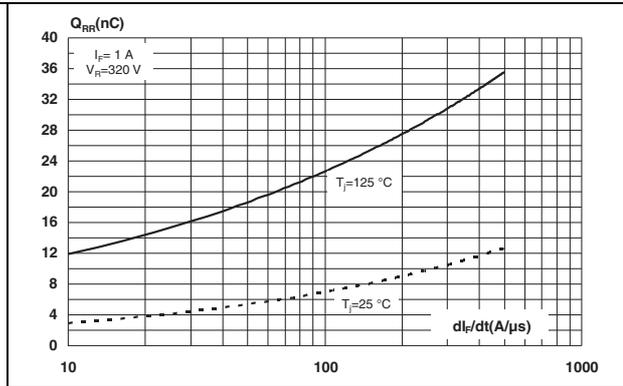


Figure 7. Reverse recovery time versus  $di_F/dt$  (typical values)

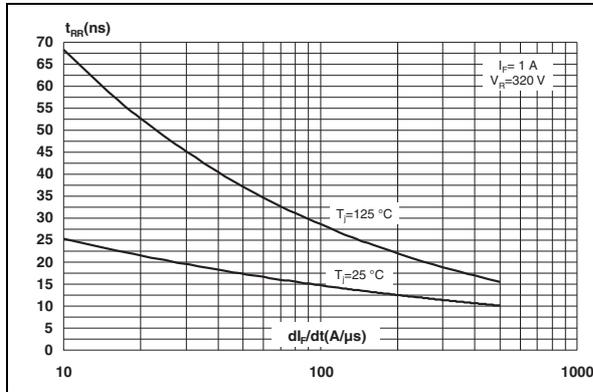


Figure 8. Peak reverse recovery current versus  $di_F/dt$  (typical values)

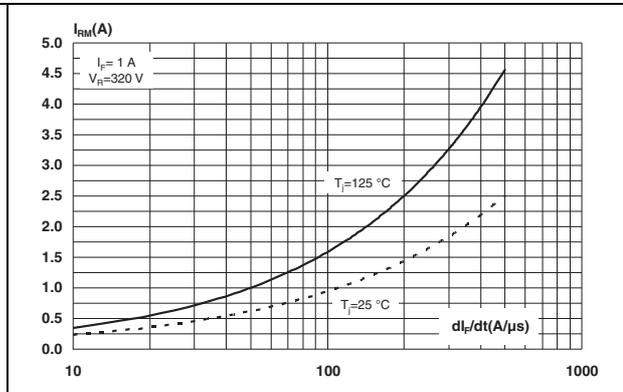


Figure 9. Relative variations of dynamic parameters versus junction temperature

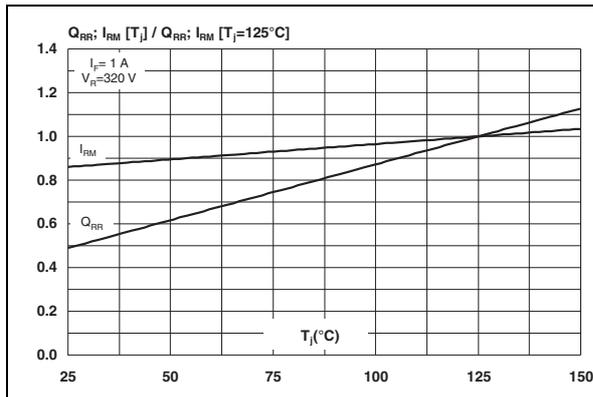


Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values)

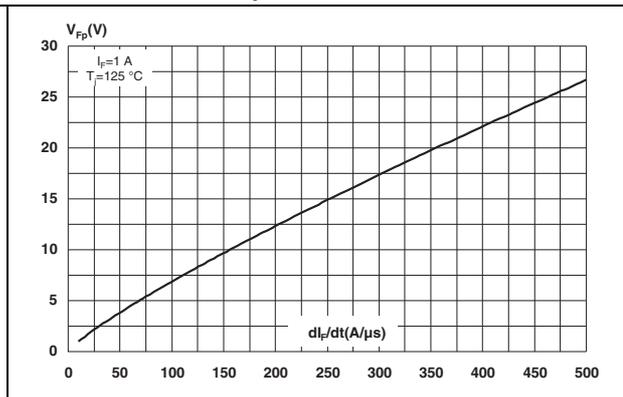


Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)

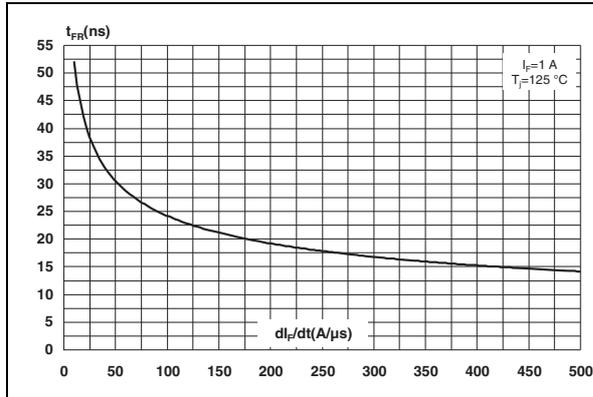


Figure 12. Thermal resistance junction to ambient versus copper surface under each lead

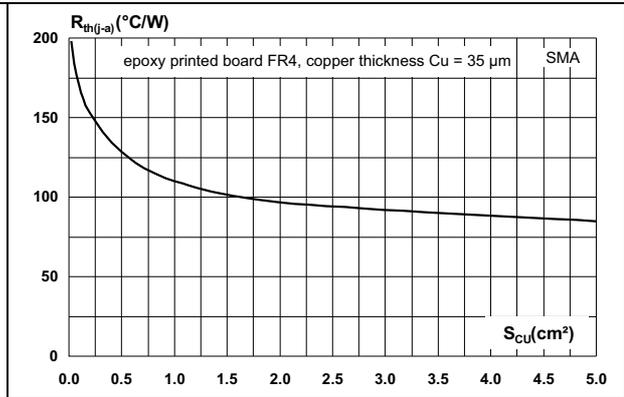
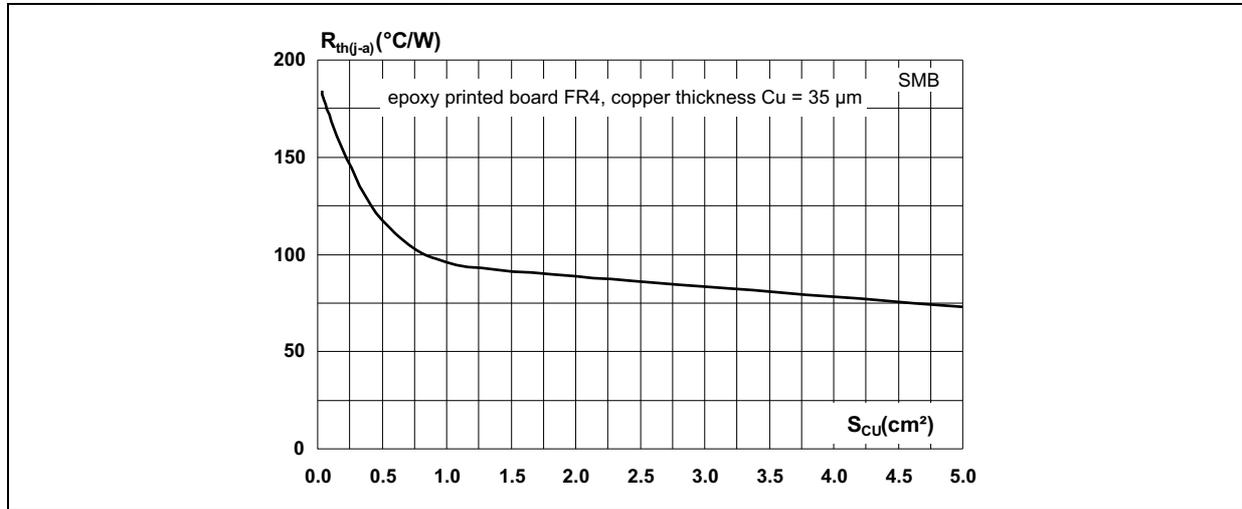


Figure 13. Thermal resistance junction to ambient versus copper surface under each lead



## 2 Package information

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

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

Figure 14. SMB dimension definitions

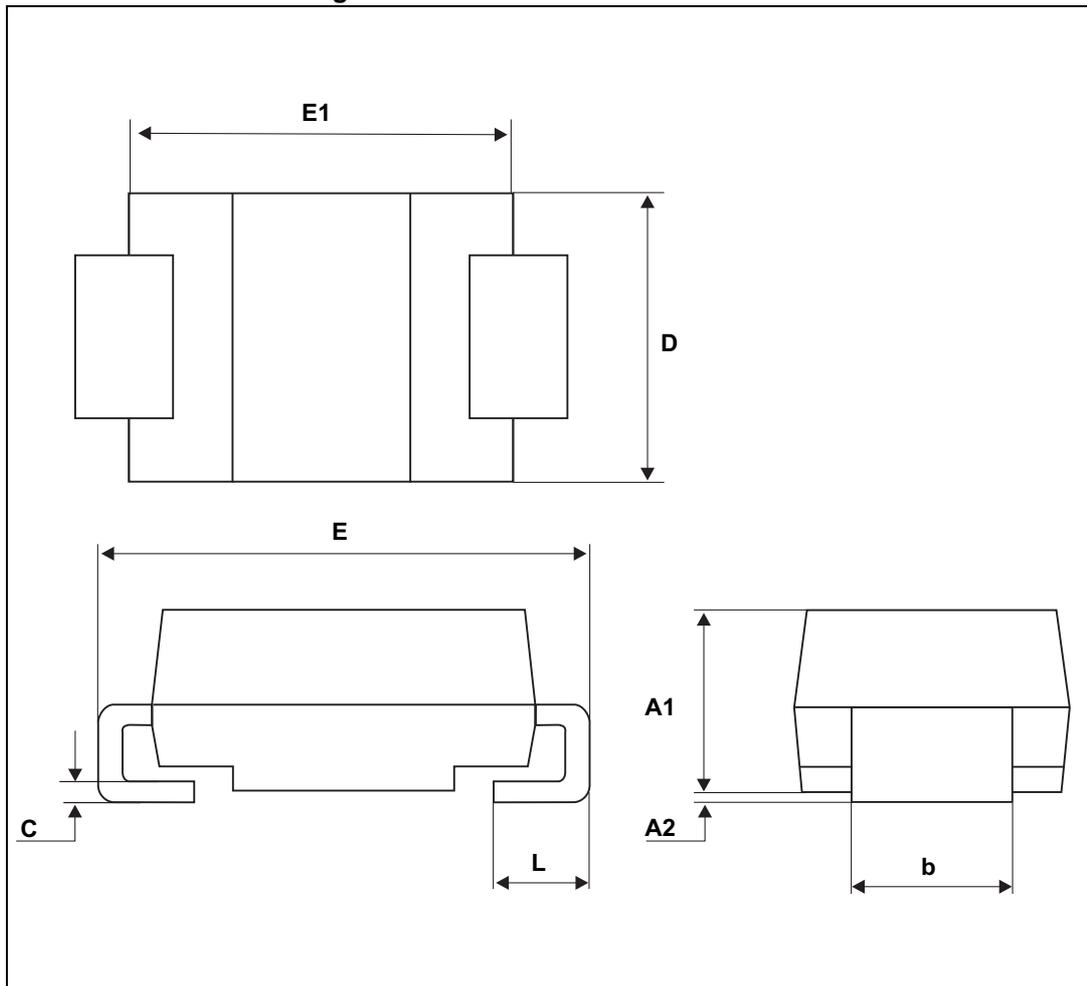


Table 6. SMB dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A1	1.90		2.45	0.075		0.096
A2	0.05		0.20	0.002		0.008
b	1.95		2.20	0.077		0.087
c	0.15		0.40	0.006		0.016
D	3.30		3.95	0.130		0.156
E	5.10		5.60	0.201		0.220
E1	4.05		4.60	0.159		0.181
L	0.75		1.50	0.030		0.059

Figure 15. SMB footprint, dimensions in mm (inches)

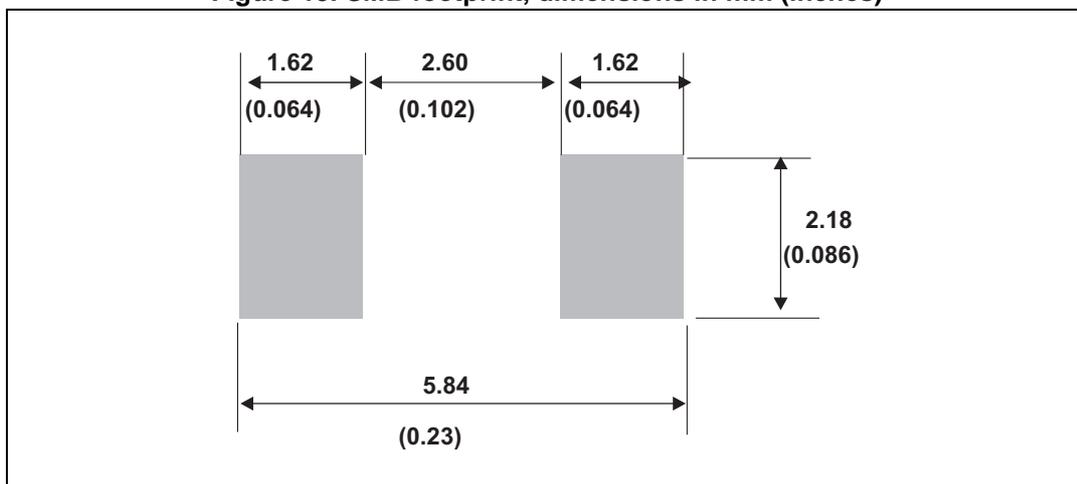


Figure 16. SMA dimension definitions

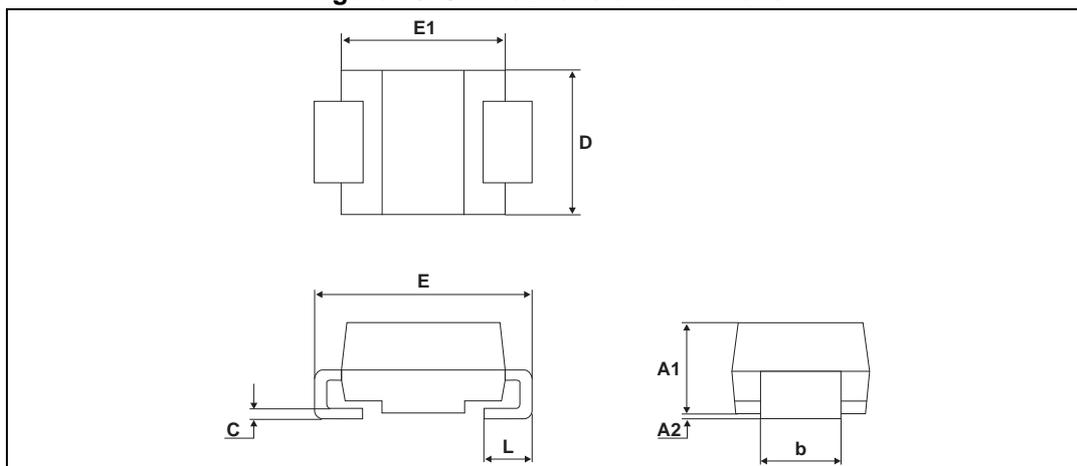
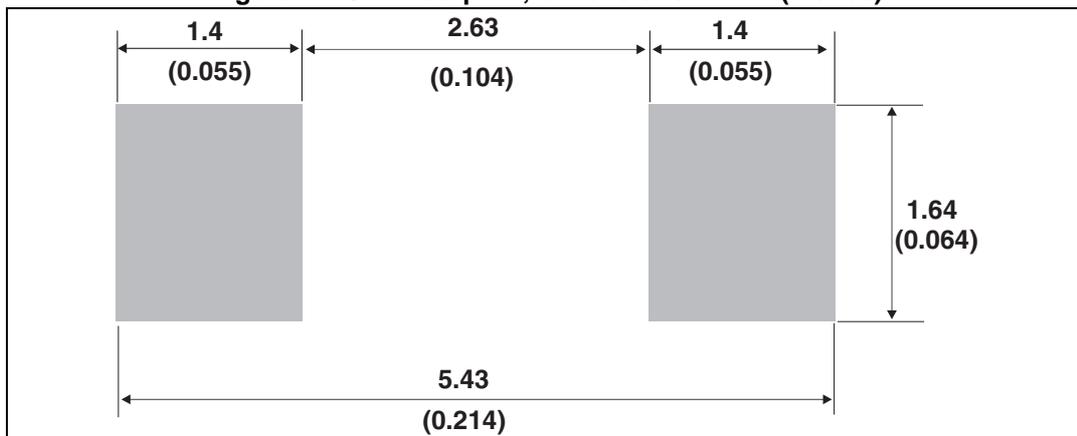


Table 7. SMA dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A1	1.90		2.45	0.075		0.094
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 17. SMA footprint, dimensions in mm (inches)



### 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	Description of changes
09-Jul-2013	1	First issue

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