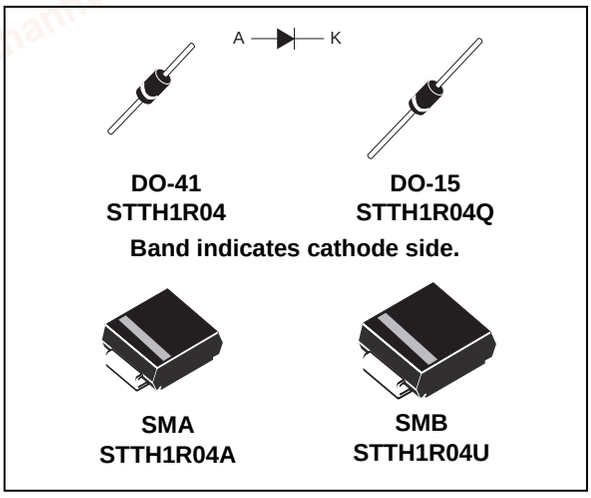
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STTH1R04

Ultrafast recovery diode

Datasheet - production data



Features

- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature

Description

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

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

Table 1. Device summary

$I_{F(AV)}$	1 A
V_{RRM}	400 V
$T_{j\ (max)}$	175 °C
$V_{F\ (typ)}$	0.9 V
$t_{rr\ (typ)}$	14 ns

This is information on a product in full production. www.st.com

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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, δ = 0.5	DO-41	T_{lead} = 100 °C	1.0	A
		DO-15	T_{lead} = 105 °C		
		SMA	T_{lead} = 125 °C		
		SMB	T_{lead} = 140 °C		
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		30	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature(1)			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	Lead length = 10 mm on infinite heatsink	DO-41	55	°C/W
			DO-15	50	
$R_{th(j-l)}$	Junction to lead		SMA	35	
			SMB	25	

Table 4. Static electrical characteristics

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 = 1.0 A			1.5	V
		T_j = 100 °C			1.0	1.25	
		T_j = 150 °C			0.9	1.15	

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

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Table 5. Dynamic characteristics (T_j = 25 °C unless otherwise stated)

Symbol	Parameter	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, T_j = 25 °C			30	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25 °C		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
t_{fr}	Forward recovery time	I_F = 1 A dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_{Fmax}, T_j = 25 °C			50	ns
V_{FP}	Forward recovery voltage	I_F = 1 A dI_F/dt = 100 A/µs		3.5		V

Figure 1. Conduction losses versus average forward current

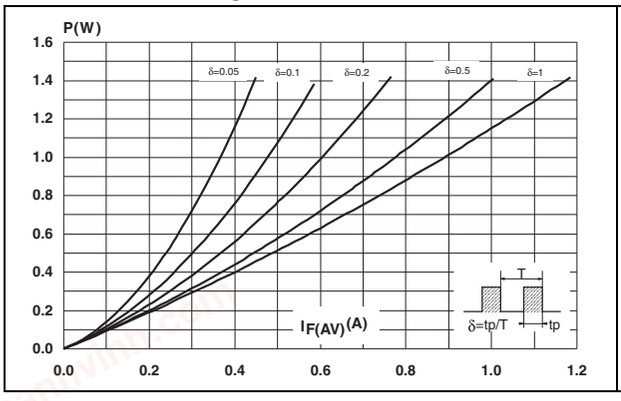


Figure 2. Forward voltage drop versus forward current

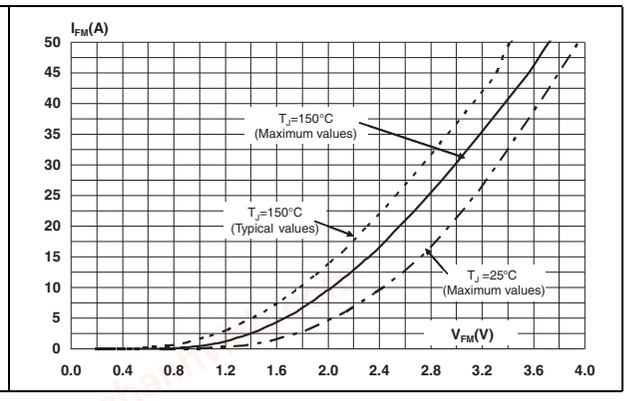


Figure 3. Relative variation of thermal impedance junction to lead versus pulse duration (DO-41)

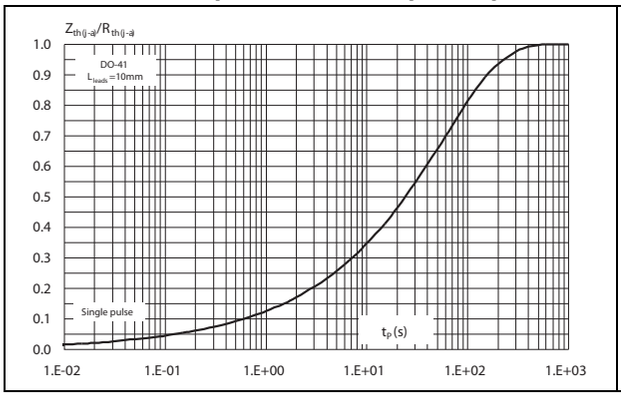
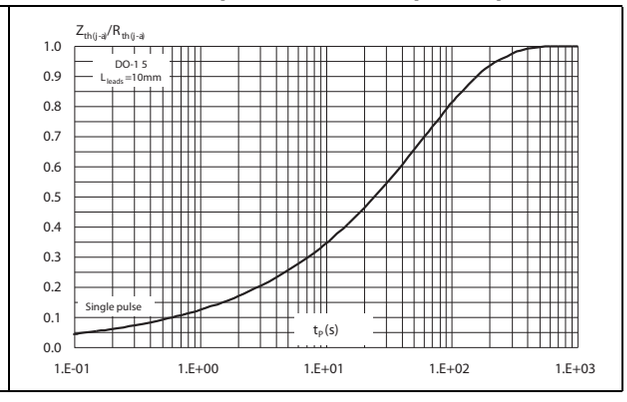


Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (DO-15)



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Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration, SMA

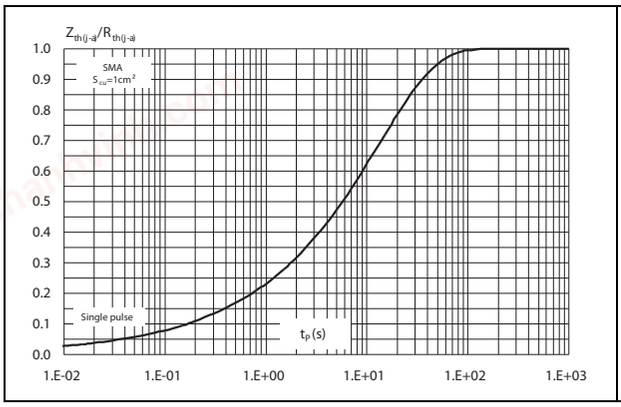


Figure 6. Relative variation of thermal impedance junction to lead versus pulse duration, SMB

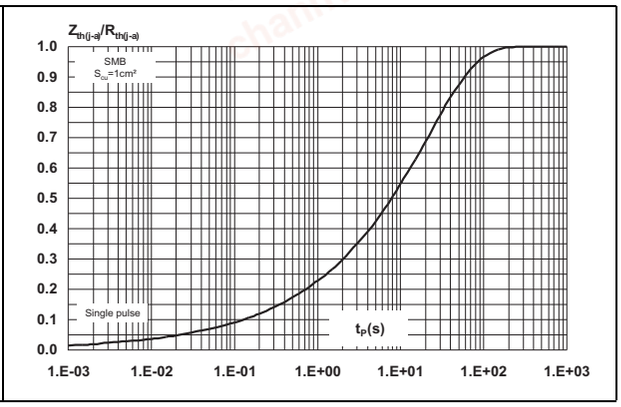


Figure 7. Junction capacitance versus reverse voltage applied (typical values)

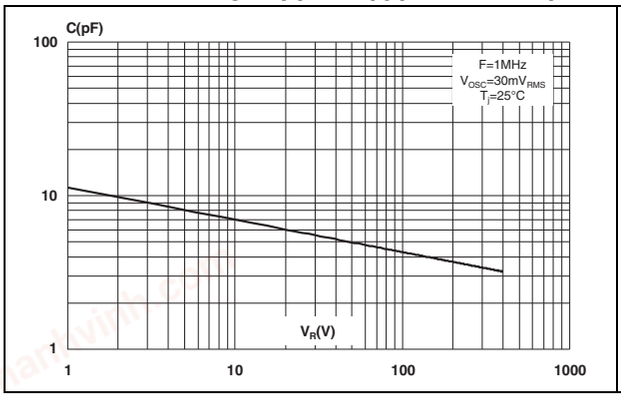


Figure 8. Reverse recovery charges versus dI_F/dt (typical values)

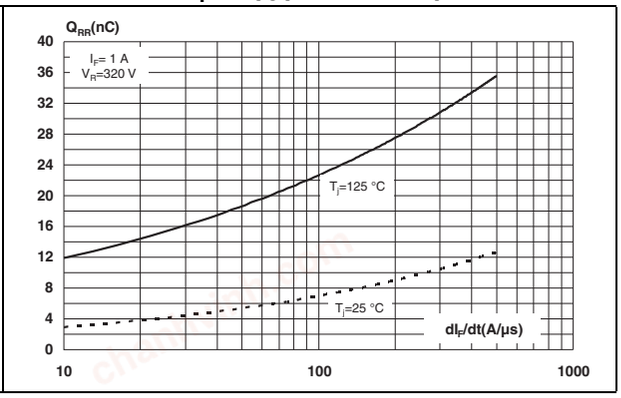


Figure 9. Reverse recovery time versus dI_F/dt (typical values)

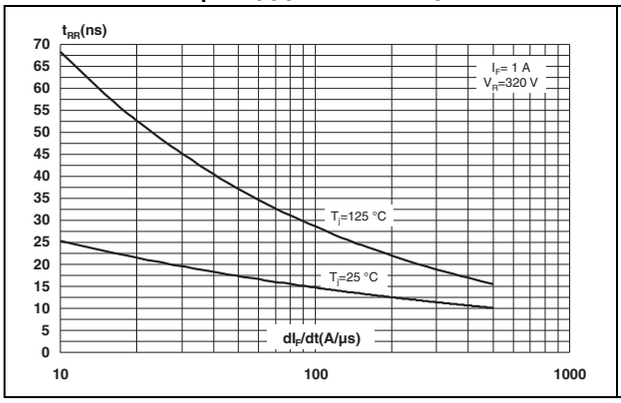
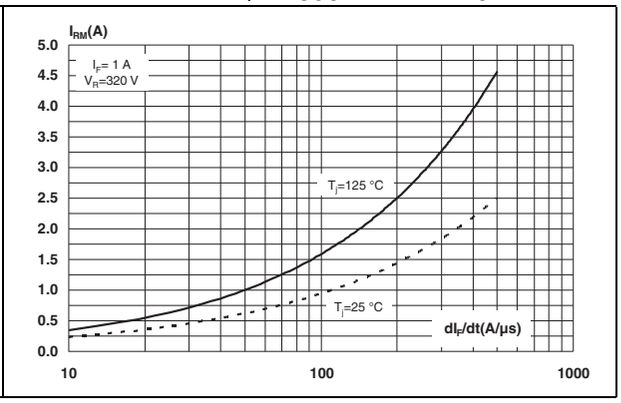


Figure 10. Peak reverse recovery current versus dI_F/dt (typical values)



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Figure 11. Relative variations of dynamic parameters versus junction temperature

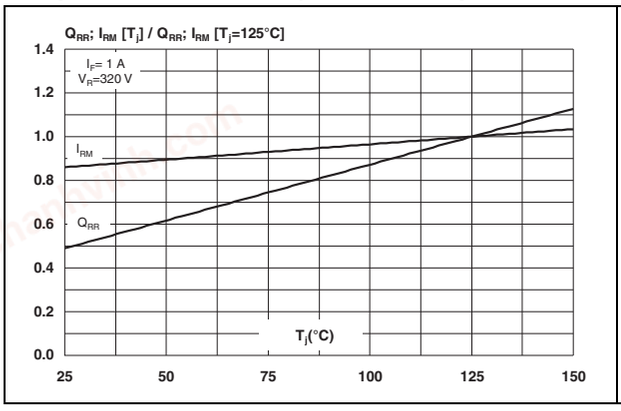


Figure 12. Transient peak forward voltage versus dI_F/dt (typical values)

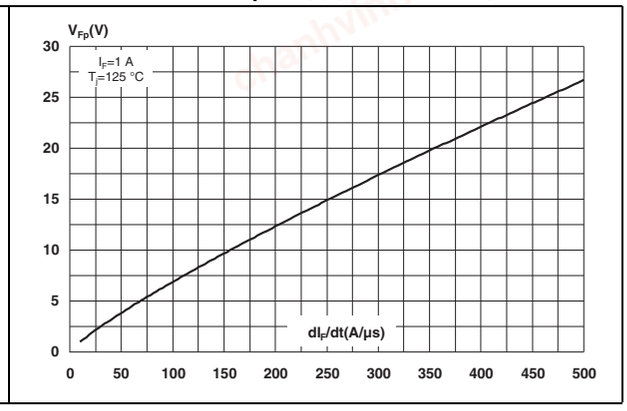


Figure 13. Forward recovery time versus dI_F/dt (typical values)

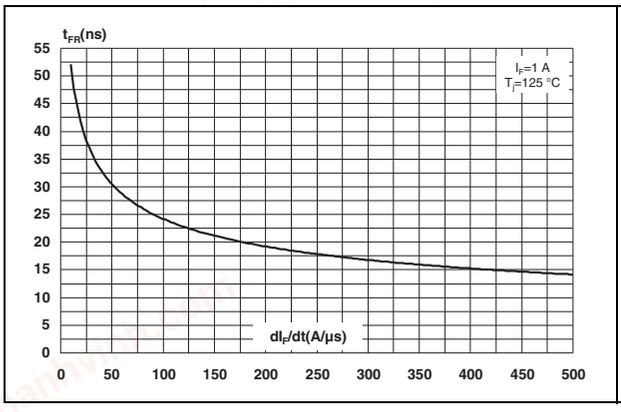


Figure 14. Thermal resistance versus lead length (DO-41)

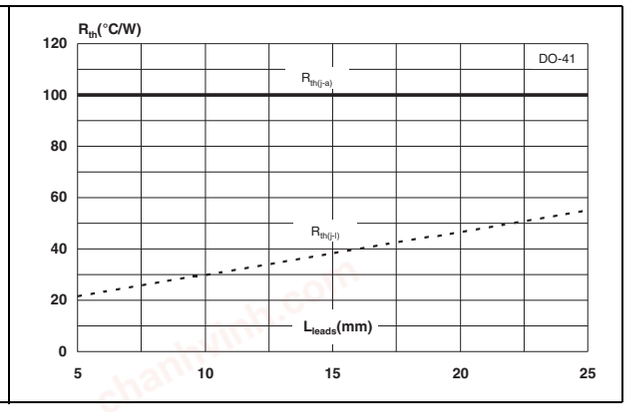


Figure 15. Thermal resistance junction to ambient versus lead length, DO-15

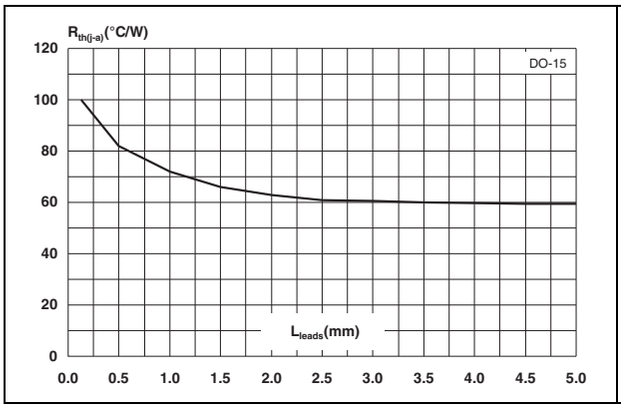
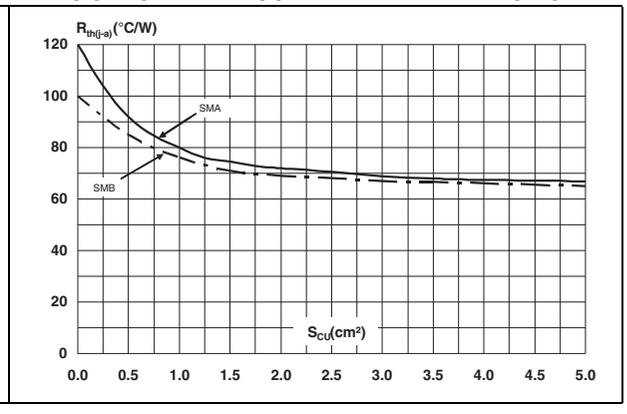


Figure 16. Thermal resistance junction to ambient versus copper surface under each lead, SMA, SMB, (epoxy FR4, copper thickness = 35 µm)



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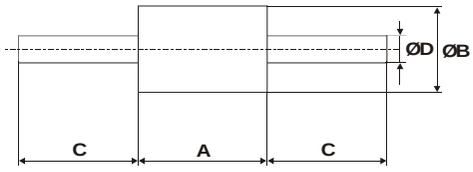
2 Package information

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

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 DO-14 (plastic) package information

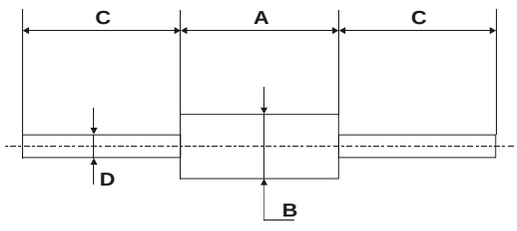
Table 6. DO-41 (plastic) dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.1	5.20	0.160	0.205
B	2	2.71	0.080	0.107
C	25.4		1	
D	0.712	0.863	0.028	0.034

2.2 DO-15 package information

Table 7. DO-15 dimensions

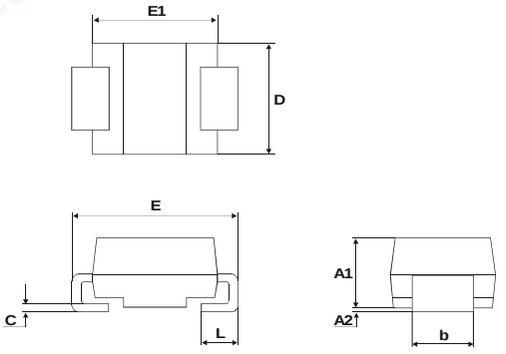


Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	6.05	6.75	0.238	0.266
B	2.95	3.53	0.116	0.139
C	26	31	1.024	1.220
D	0.71	0.88	0.028	0.035

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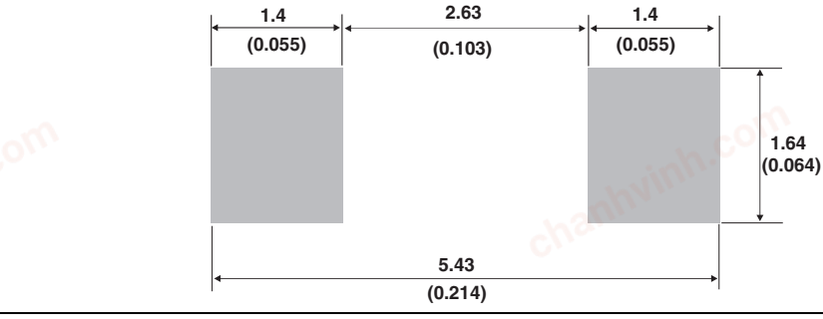
2.3 SMA package information

Table 8. SMA dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	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

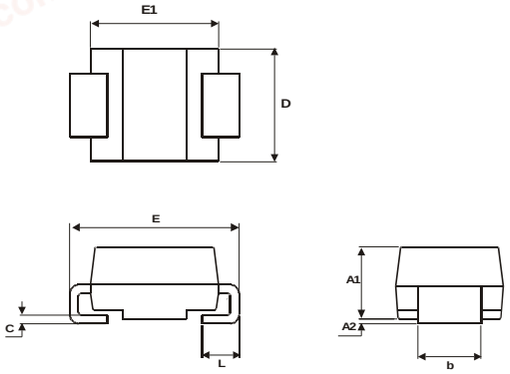
Figure 17. Footprint, dimensions in mm (inches)



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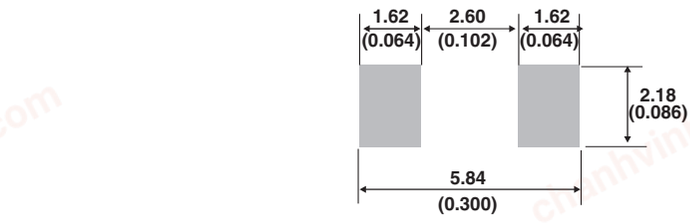
2.4 SMB package information

Table 9. SMB dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	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 18. Footprint, dimensions in mm (inches)



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3 Ordering information

Table 10. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH1R04	STTH1R04	DO-41	0.34 g	1000	Ammopack
STTH1R04RL	STTH1R04	DO-41	0.34 g	5000	Tape and reel
STTH1R04Q	STTH1R04Q	DO-15	0.4 g	1000	Ammopack
STTH1R04QRL	STTH1R04Q	DO-15	0.4 g	6000	Tape and reel
STTH1R04A	HR4	SMA	0.068 g	5000	Tape and reel
STTH1R04U	BR4	SMB	0.12 g	2500	Tape and reel

4 Revision history

Table 11. Document revision history

Date	Revision	Description of changes
30-May-2008	1	First issue
12-Nov-2015	2	Updated *Figure 3*, *Figure 4*, *Figure 5* and *Figure 6*. Minor text changes.

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