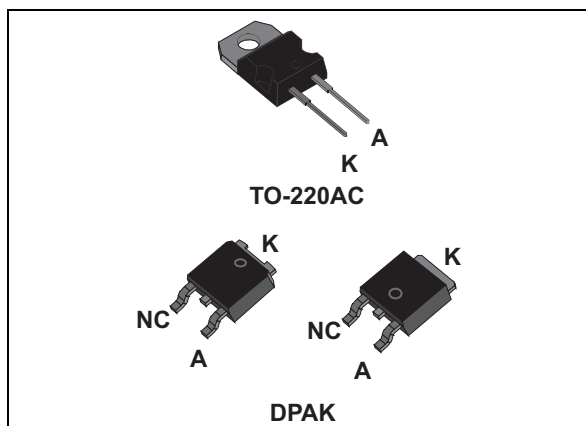


Turbo 2 ultrafast high voltage rectifier

Datasheet - production data



Description

The STTH506 has been developed using ST's Turbo 2 600 V technology. It is well suited for use in switching power supplies and industrial applications.

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	5 A
V_{RRM}	600 V
$t_{rr} (max)$	30 ns
$T_j (max)$	175 °C
$V_F (typ)$	1.1 V

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces conduction and switching losses
- ECOPACK[®]2 compliant component for DPAK on demand

1 Characteristics

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

Symbol	Parameter			Value	Unit	
V _{RRM}	Repetitive peak reverse voltage			600	V	
I _{F(RMS)}	RMS forward current		TO-220AC	20	A	
			DPAK	10	A	
I _{F(AV)}	Average forward current, δ = 0.5, square wave.	T _c = 145° C	TO-220AC, DPAK	5	A	
I _{FSM}	Surge non repetitive forward current		t _p = 10 ms Sinusoidal	TO-220AC	70	A
			DPAK	55	A	
T _{stg}	Storage temperature range			-65 to + 175	°C	
T _j	Maximum operating junction temperature ⁽¹⁾			175	°C	

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

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC, DPAK	3.5	° C/W

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ \text{C}$	$V_R = V_{RRM}$			5	μA
		$T_j = 150^\circ \text{C}$			13	130	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ \text{C}$	$I_F = 5 \text{ A}$			1.85	V
		$T_j = 150^\circ \text{C}$			1.10	1.40	

1. Pulse test: $t_p = 5 \text{ ms}$, $\delta < 2\%$
 2. Pulse test: $t_p = 380 \mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 1.07 \times I_{F(AV)} + 0.066 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
t_{rr}	Reverse recovery time	$I_F = 0.5 \text{ A}$, $I_{rr} = 0.25 \text{ A}$, $I_R = 1 \text{ A}$, $T_j = 25^\circ \text{ C}$			30	ns
		$I_F = 1 \text{ A}$, $di_F/dt = -50 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$, $T_j = 25^\circ \text{ C}$		35	50	
I_{RM}	Reverse recovery current	$I_F = 5 \text{ A}$, $di_F/dt = -100 \text{ A}/\mu\text{s}$, $V_R = 400 \text{ V}$, $T_j = 125^\circ \text{ C}$		3.5	5	A
Q_{RR}	Reverse recovery charges	$I_F = 5 \text{ A}$, $di_F/dt = -100 \text{ A}/\mu\text{s}$, $V_R = 400 \text{ V}$, $T_j = 125^\circ \text{ C}$		175		nC
t_{fr}	Forward recovery time	$I_F = 5 \text{ A}$, $di_F/dt = 100 \text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ \text{ C}$			180	ns
V_{FP}	Forward recovery voltage	$I_F = 5 \text{ A}$, $di_F/dt = 100 \text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ \text{ C}$		4		V

Figure 1. Conduction losses versus average current

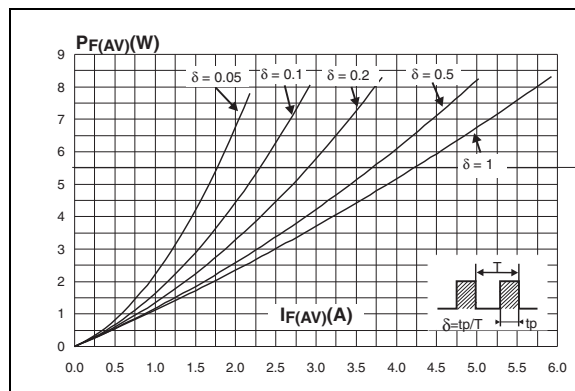


Figure 2. Forward voltage drop versus forward current

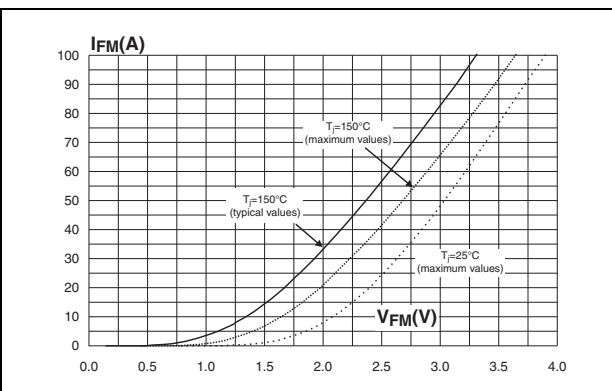


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK)

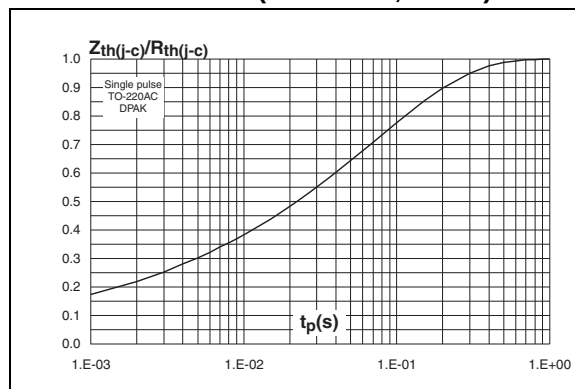


Figure 4. Peak reverse recovery current versus di_F/dt (typical values)

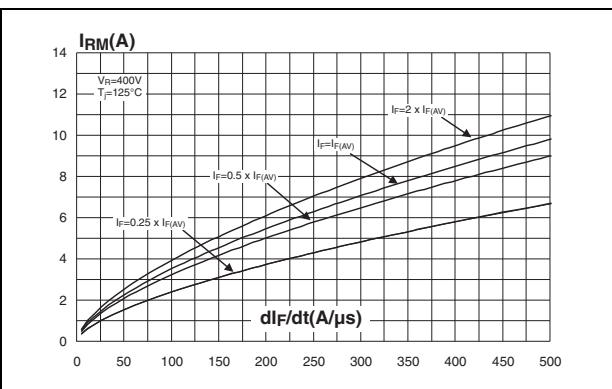


Figure 5. Reverse recovery time versus dl_F/dt (typical values)

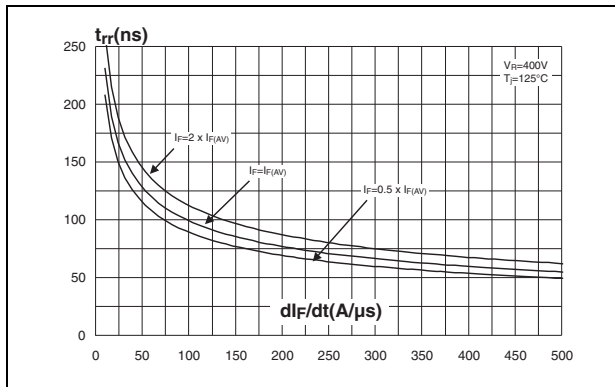


Figure 6. Reverse recovery charges versus dl_F/dt (typical values)

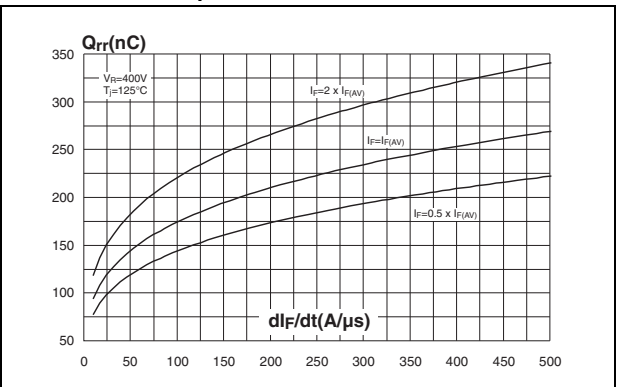


Figure 7. Softness factor versus dl_F/dt (typical values)

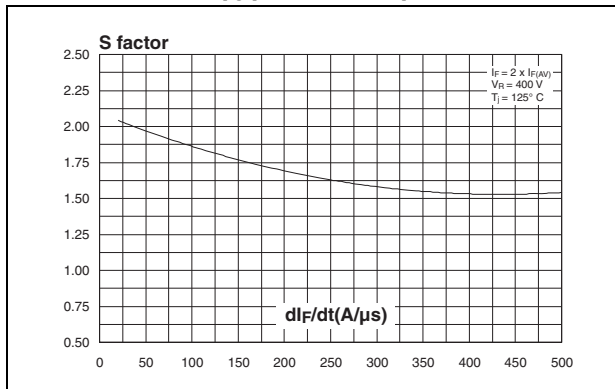


Figure 8. Relative variations of dynamic parameters versus junction temperature

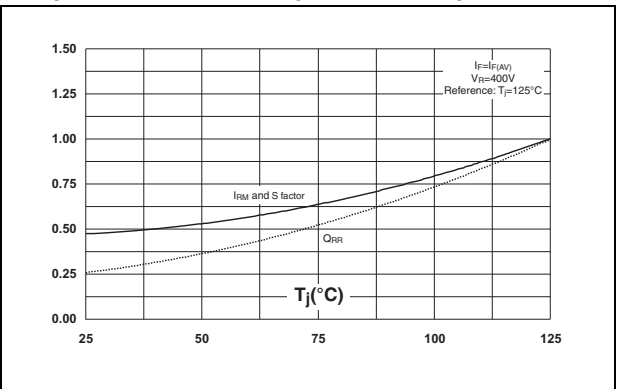


Figure 9. Transient peak forward voltage versus dl_F/dt (typical values)

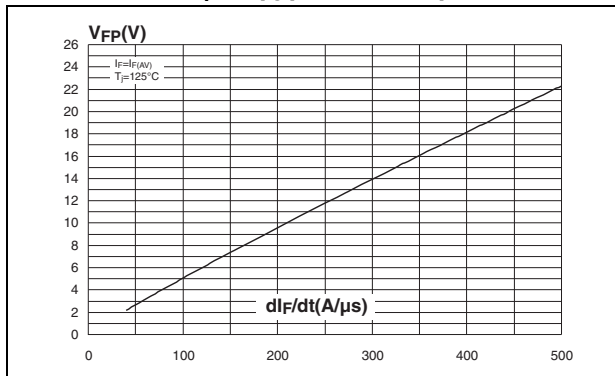


Figure 10. Forward recovery time versus dl_F/dt (typical values)

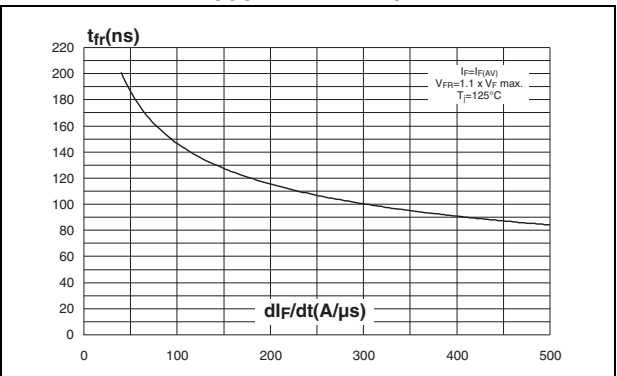


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

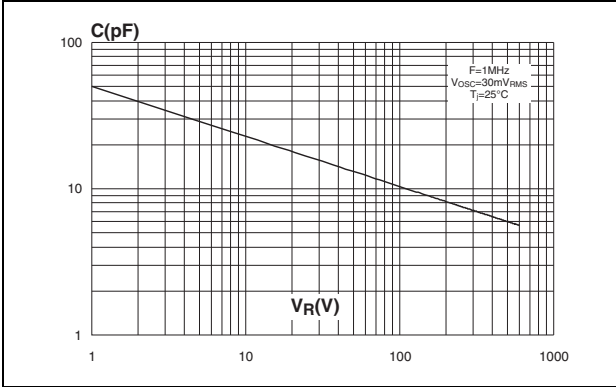
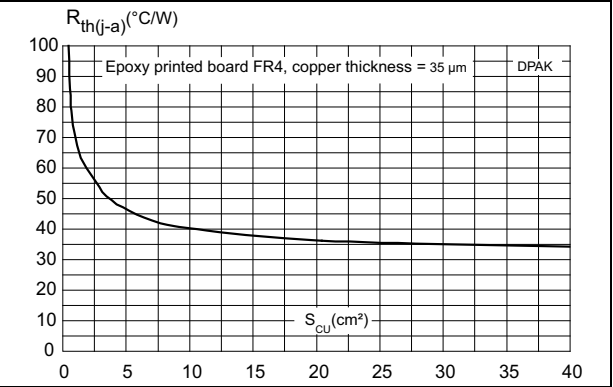


Figure 12. Thermal resistance junction to ambient versus copper surface under tab

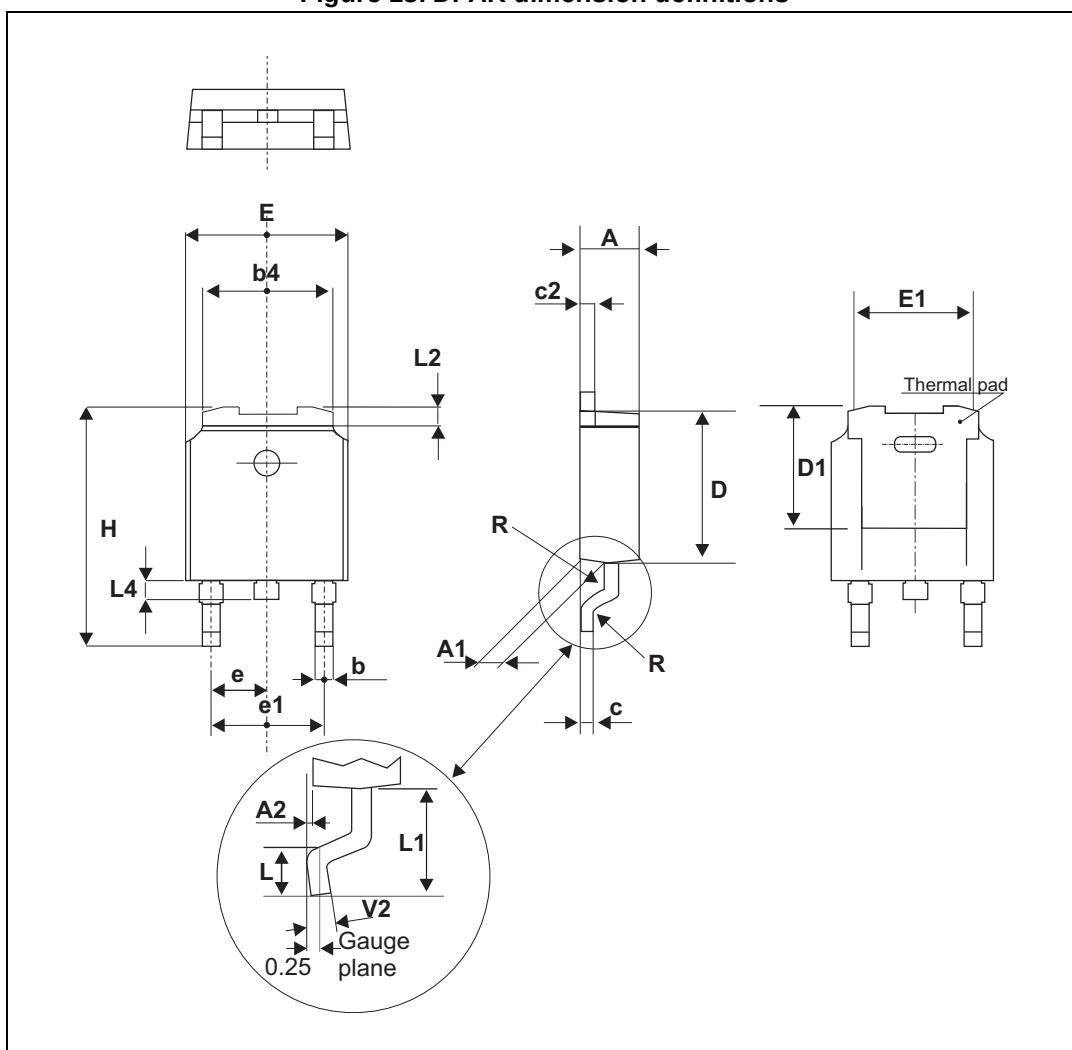


2 Package Information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 Nm for TO-220AC
- Maximum torque value: 0.7 Nm for TO-220AC

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.

Figure 13. DPAK dimension definitions



Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. DPAK dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		2.40	0.085		0.094
A1	0.90		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.01
b	0.64		0.90	0.025		0.035
b4	4.95		5.46	0.195		0.215
c	0.46		0.61	0.018		0.024
c2	0.46		0.60	0.018		0.024
D	5.97		6.22	0.235		0.245
D1	5.10			0.201		
E	6.35		6.73	0.250		0.265
E1	4.32			0.170		
e1	4.4		4.7	0.173		0.185
H	9.35		10.40	0.368		0.407
L	1.0		1.78	0.039		0.070
L2			1.27			0.05
L4	0.6		1.02	0.024		0.040
V2	0°		8°	0°		8°

Figure 14. DPAK footprint dimensions (in mm)

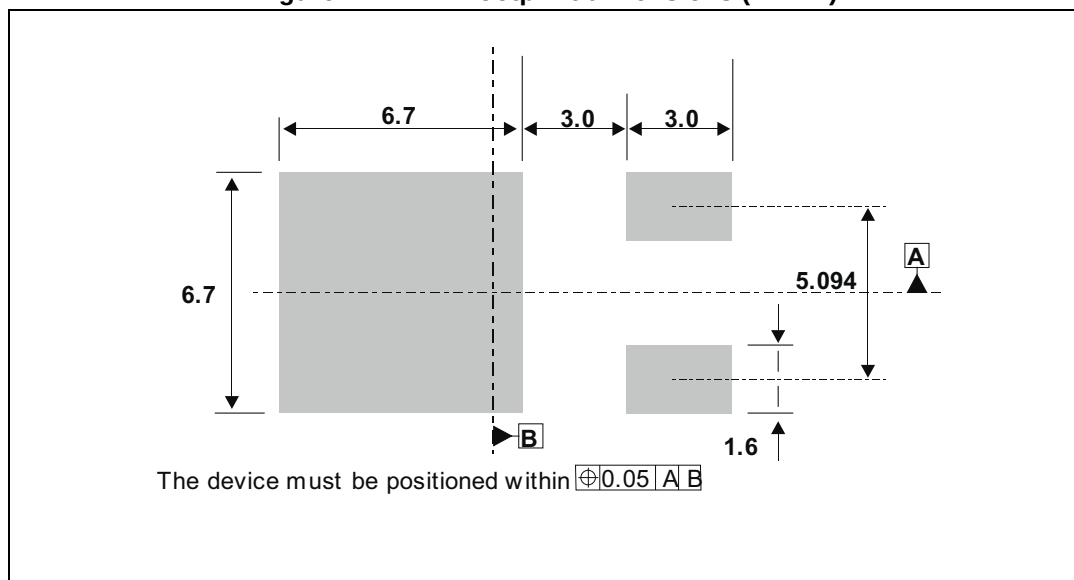


Figure 15. TO-220AC dimension definitions

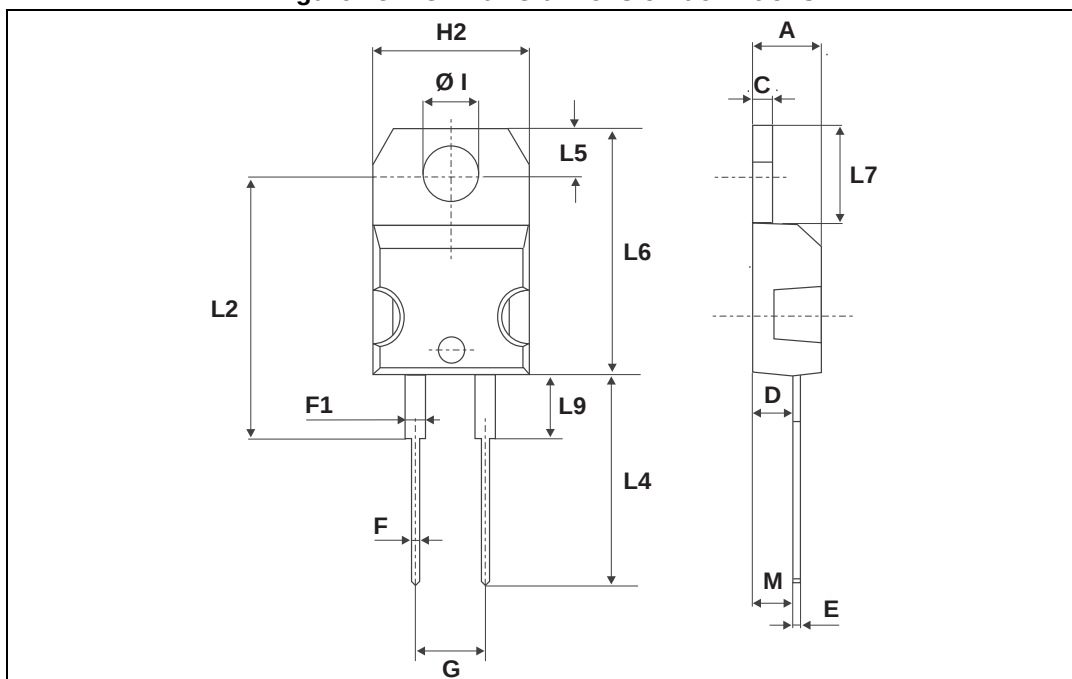


Table 7. TO-220AC dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.066
G	4.95		5.15	0.194		0.202
H2	10.00		10.40	0.393		0.409
L2		16.40 typ.			0.645 typ.	
L4	13.00		14.00	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.259
L9	3.50		3.93	0.137		0.154
M		2.6 typ.			0.102 typ.	
Diam. I	3.75		3.85	0.147		0.151

3 Ordering Information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH506B-TR	STTH506B	DPAK	0.30 g	2500	Tape and reel
STTH506B	STTH506B	DPAK	0.30 g	75	Tube
STTH506D	STTH506D	TO-220AB	1.86 g	50	Tube

4 Revision history

Table 9. Document revision history

Date	Revision	Description of Changes
14-Oct-2008	1	First issue.
08-Aug-2014	2	Updated DPAK package information and removed TO-220AB package.
26-Nov-2014	3	Updated Figure 13 and Figure 14 .

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