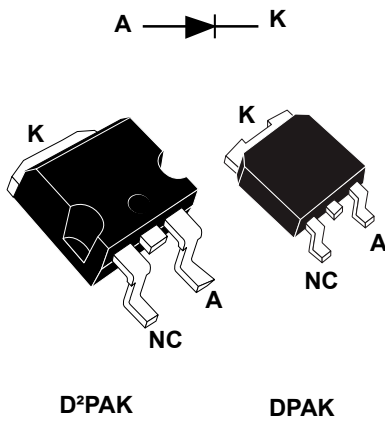



## Automotive 600 V, 5 A ultrafast diode



## Features

- AEC-Q101 qualified 
- Ultrafast switching
- Low reverse recovery current
- Reduces switching losses
- Low thermal resistance
- **ECOPACK** compliant

## Applications

- Switching diode
- Free-wheeling diode
- Automotive DC/DC converter

## Description

This 5A, 600 V ultrafast diode is specially suited as a boost diode in continuous mode power factor correction and hard switching conditions.

This **STTH5R06-Y** is also intended for use as a free wheeling diode in power supplies and other power switching applications.

## Product status links

[STTH5R06-Y](#)

## Product summary

$I_{F(AV)}$	5 A
$V_{RRM}$	600 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	1.5 V
$T_{rr(max.)}$	35 ns

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage	$T_j$ from -40 °C to 175 °C	600	V
$I_{F(RMS)}$	Forward rms current	D <sup>2</sup> PAK	25	A
		DPAK	10	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$ , square wave	D <sup>2</sup> PAK, DPAK $T_C = 145$ °C	5	A
$I_{FSM}$	Surge non repetitive forward current	D <sup>2</sup> PAK	70	A
		DPAK	50	
$T_{stg}$	Storage temperature range		-65 to +175	°C
$T_j$	Operating junction temperature range		-40 to +175	°C

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

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 2. Thermal parameters**

Symbol	Parameter		Maximum value	Unit
$R_{th(j-c)}$	Junction to case	Per diode	2.2	°C/W

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25$ °C	$V_R = V_{RRM}$	-		30	μA
		$T_j = 125$ °C		-	30	300	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25$ °C	$I_F = 5$ A	-		3.20	V
		$T_j = 125$ °C		-	1.50	1.95	

1. Pulse test:  $t_p = 5$  ms,  $\delta < 2\%$

2. Pulse test:  $t_p = 380$  μs,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 1.35 \times I_{F(AV)} + 0.12 \times I_F^2_{(RMS)}$$

**Table 4. Dynamic electrical characteristics**

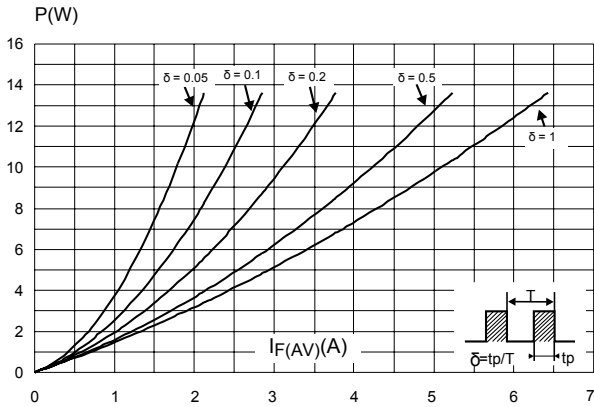
Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ °C}$	$I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$	-		20	ns
			$I_F = 1\text{ A}, V_R = 30\text{ V}, dI_F/dt = -50\text{ A}/\mu\text{s}$	-		35	
$I_{RM}$	Reverse recovery current	$T_j = 125\text{ °C}$	$I_F = 5\text{ A}, V_R = 400\text{ V}, dI_F/dt = -200\text{ A}/\mu\text{s}$	-	4.5	6	A
$S_{factor}$	Softness factor			-	0.5		-
$Q_{rr}$	Reverse recovery charge			-	110		nC
$t_{fr}$	Forward recovery time	$T_j = 25\text{ °C}$	$I_F = 5\text{ A}, V_{FR} = 2.5\text{ V}, dI_F/dt = 40\text{ A}/\mu\text{s}$			220	ns
$V_{FP}$	Forward recovery voltage					4.5	V

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

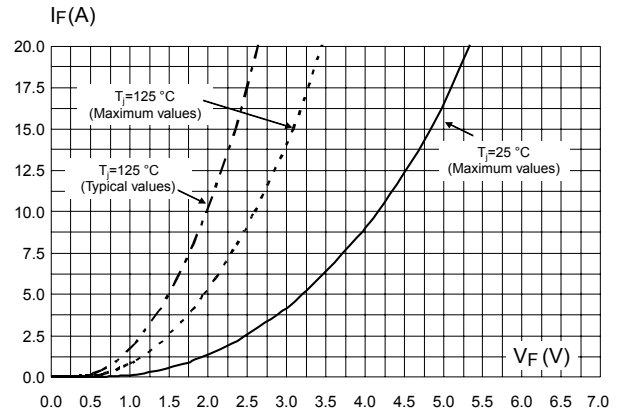
- AN604: Calculation of conduction losses in a power rectifier
- AN5028: Calculation of turn-off power losses generated by an ultrafast diode

## 1.1 Characteristics (curves)

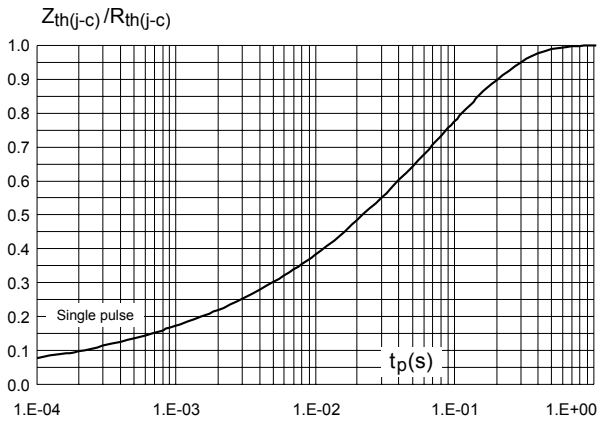
**Figure 1. Average forward power dissipation versus average forward current**



**Figure 2. Forward voltage drop versus forward current**



**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration**



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

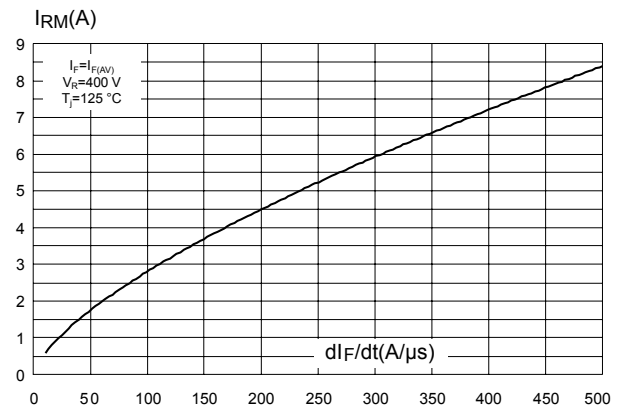


Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)

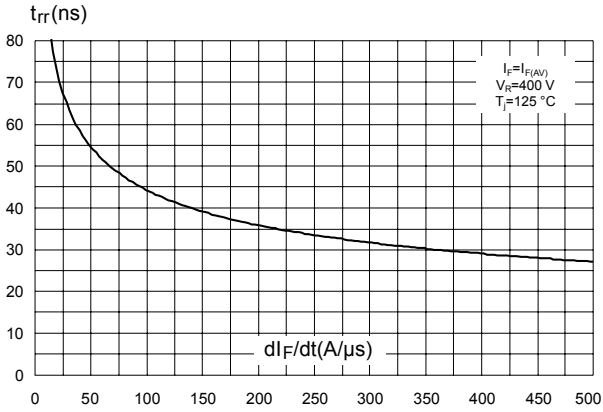


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)

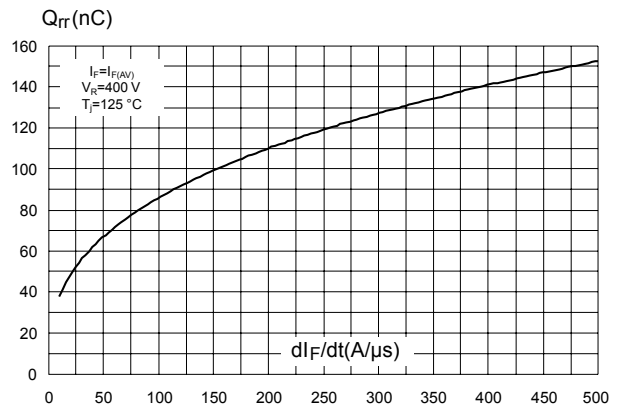


Figure 7. Softness factor versus  $di_F/dt$  (typical values)

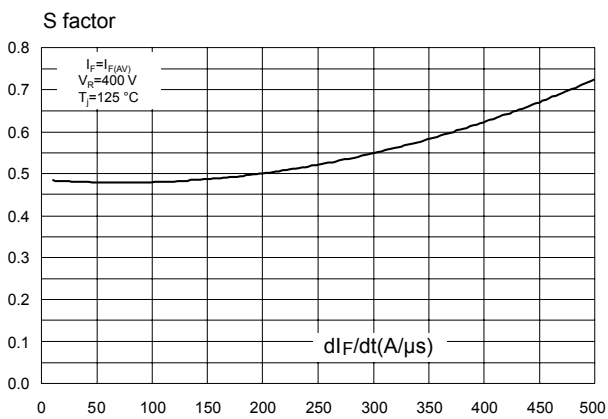


Figure 8. Relative variations of dynamic parameters versus junction temperature

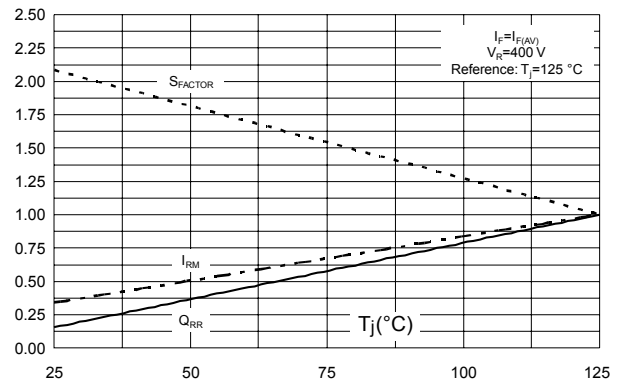


Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)

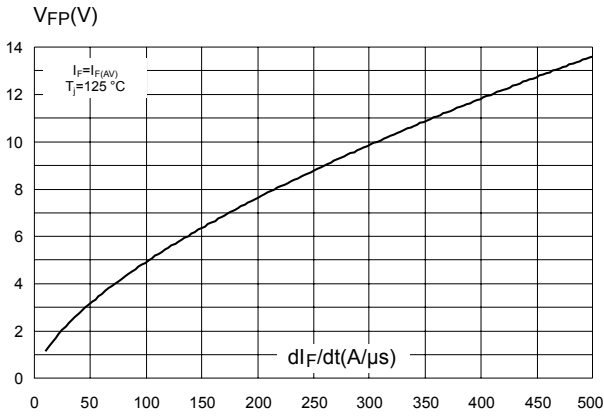


Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)

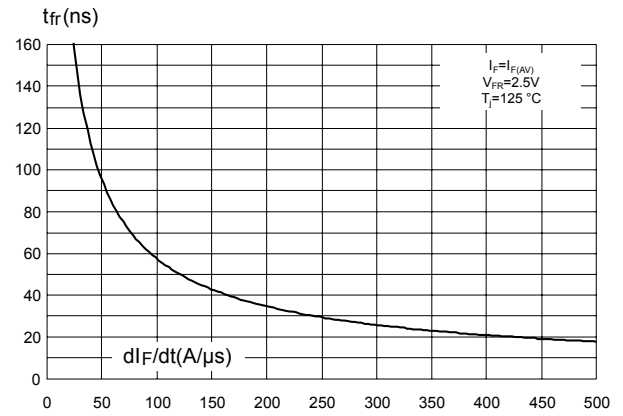


Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)

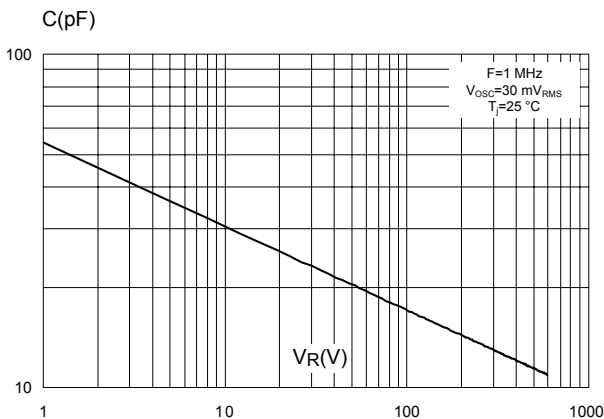


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (typical values)

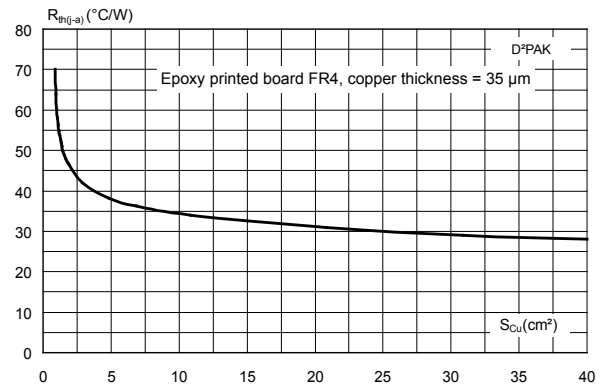
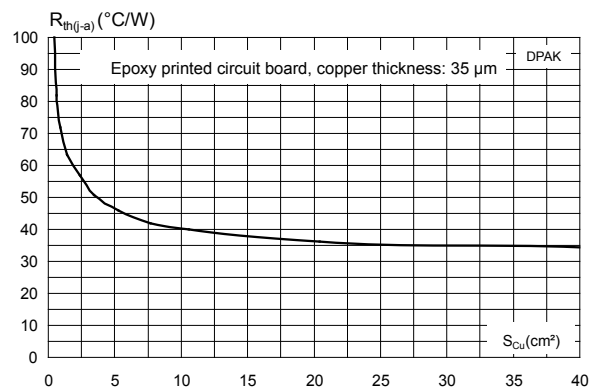


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (typical values)



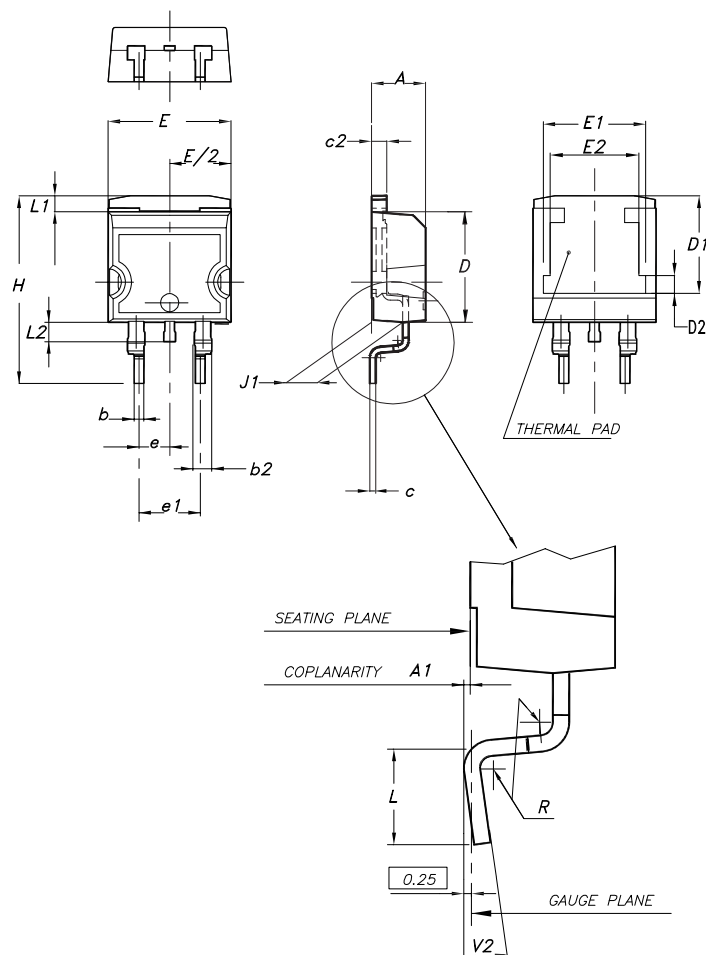
## 2 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 D<sup>2</sup>PAK package information

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

Figure 14. D<sup>2</sup>PAK package outline

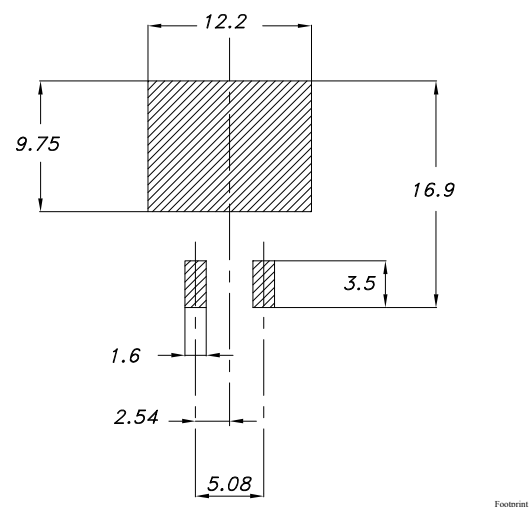


**Note:** This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

**Table 5. D<sup>2</sup>PAK package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.028		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.018		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50	7.75	8.00	0.295	0.305	0.315
D2	1.10	1.30	1.50	0.043	0.051	0.060
E	10.00		10.40	0.394		0.409
E1	8.30	8.50	8.70	0.335	0.343	0.346
E2	6.85	7.05	7.25	0.266	0.278	0.282
e		2.54			0.100	
e1	4.88		5.28	0.190		0.205
H	15.00		15.85	0.591		0.624
J1	2.49		2.69	0.097		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.049		0.055
L2	1.30		1.75	0.050		0.069
R		0.40			0.015	
V2	0°		8°	0°		8°

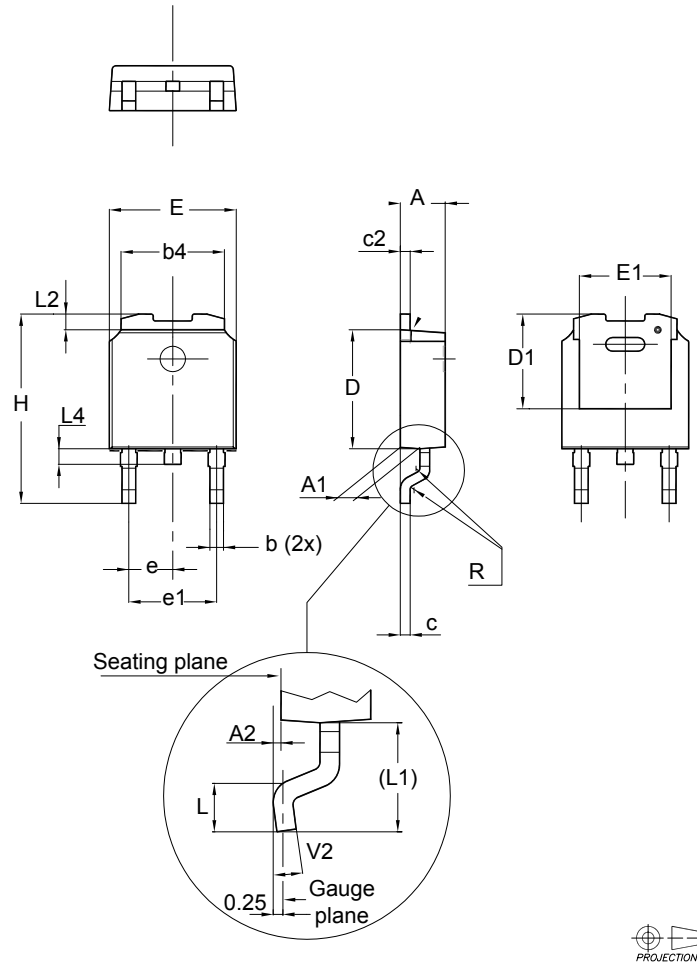
**Figure 15. D<sup>2</sup>PAK recommended footprint (dimensions are in mm)**



## 2.2 DPAK package information

- Epoxy meets UL94, V0

Figure 16. DPAK package outline

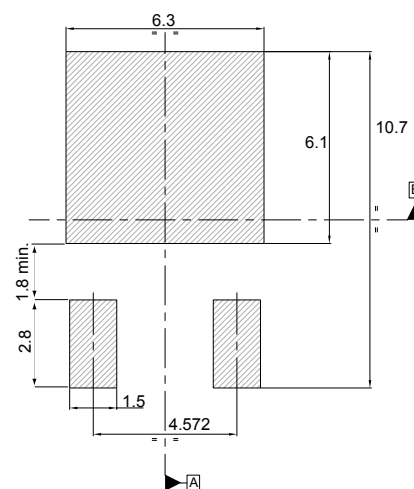


**Table 6. DPAK mechanical data**

Dim.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	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	0.195	0.201	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	2.159	2.286	2.413	0.085	0.090	0.095
e1	4.445	4.572	4.699	0.175	0.180	0.185
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°

1. Inches dimensions given for reference only

**Figure 17. DPAK recommended footprint (dimensions are in mm)**



The device must be positioned within  $\Phi 0.05 \text{ A B}$

### 3 Ordering information

**Table 7. Order code**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH5R06GY-TR	STTH5R06GY	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel
STTH5R06BY-TR	STTH5R06BY	DPAK	0.35 g	2500	Tape and reel

## Revision history

**Table 8. Document revision history**

Date	Revision	Changes
03-Nov-2011	1	First issue.
18-Mar-2019	2	Added <a href="#">Section Applications</a> . Updated <a href="#">Table 7</a> . Order code.

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