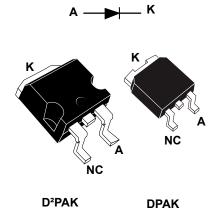


Automotive 600 V, 5 A ultrafast diode



Features



- · 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	Paramet	Value	Unit			
V_{RRM}	Repetitive peak reverse voltage	T _j from -40 °C to	T _j from -40 °C to 175 °C		V	
l=	Forward rms current	D ² PAK	D ² PAK			
I _{F(RMS)} Forward rms current	DPAK		10	A		
I _{F(AV)}	Average forward current, δ = 0.5, square wave	D ² PAK, DPAK	T _C = 145 °C	5	Α	
l	Surgo pop ropotitivo fonyard gurrant	D ² PAK	$t_{\rm p}$ = 10 ms sinusoidal	70	Α	
IFSM	I _{FSM} Surge non repetitive forward current		t _p = 10 ms sinusoidai	50	A	
T _{stg}	Storage temperature range	-65 to +175	°C			
Tj	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.	Тур.	Max.	Unit
I _R ⁽¹⁾	L (1) Poverse leekage surrent		V _R = V _{RRM}	-		30	
'R\'	I _R ⁽¹⁾ Reverse leakage current	T _j = 125 °C	VR - VRRM	-	30	300	μA
V _E (2)	V- (2) Forward valtage drap		I _F = 5 A	-		3.20	V
V _F ⁽²⁾ Forward voltage drop	T _j = 125 °C	-		1.50	1.95		

- 1. Pulse test: $t_p = 5$ ms, $\delta < 2\%$
- 2. Pulse test: t_p =380 μ s, δ < 2%

To evaluate the conduction losses, use the following equation:

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

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Table 4. Dynamic electrical characteristics

Symbol	Parameter		Test conditions			Max.	Unit
t _{rr}	Davoraa raaayary tima	T _i = 25 °C	I _F = 0.5 A, I _{rr} = 0.25 A, I _R = 1 A	-		20	no
۲rr	Reverse recovery time	1j = 25 C	$I_F = 1 \text{ A}, V_R = 30 \text{ V}, dI_F/dt = -50 \text{ A/}\mu\text{s}$	-		35	ns
I _{RM}	Reverse recovery current		$I_F = 5 \text{ A}, V_R = 400 \text{ V}, dI_F/dt = -200 \text{ A}/\mu\text{s}$	-	4.5	6	Α
S _{factor}	Softness factor	T _j = 125 °C		_	0.5		-
Q _{rr}	Reverse recovery charge			-	110		nC
t _{fr}	Forward recovery time	T 25 °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	1j = 25 C				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

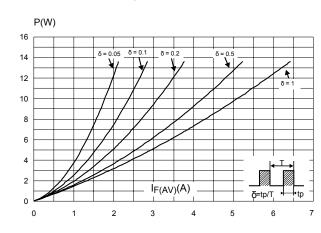


Figure 2. Forward voltage drop versus forward current

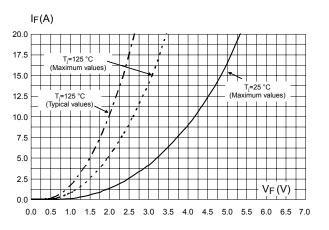


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

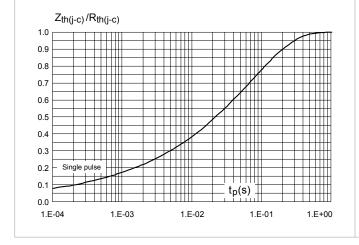
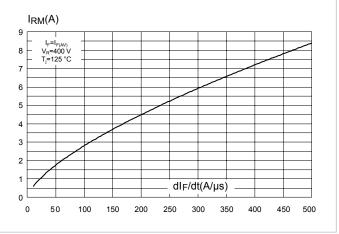


Figure 4. Peak reverse recovery current versus dl_F/dt (typical values)



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

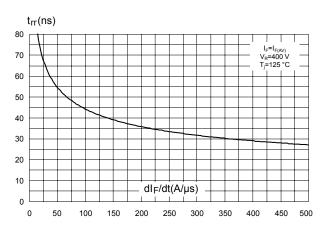


Figure 6. Reverse recovery charges versus dl_F/dt (typical values)

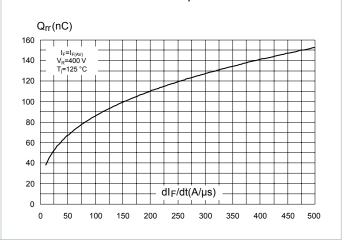


Figure 7. Softness factor versus dl_F/dt (typical values)

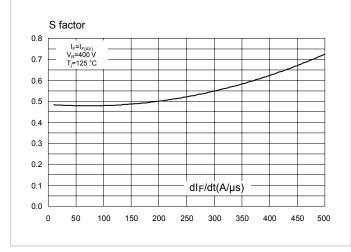
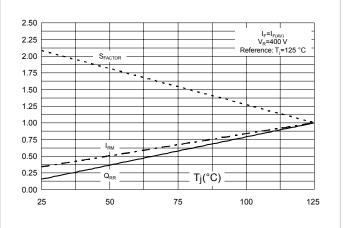


Figure 8. Relative variations of dynamic parameters versus junction temperature



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

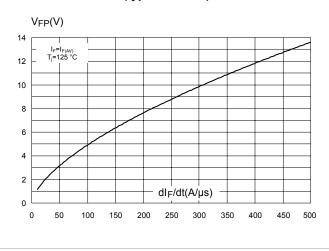


Figure 10. Forward recovery time versus dl_F/dt (typical values)

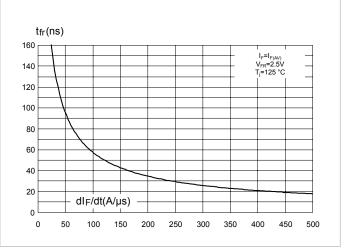


Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)

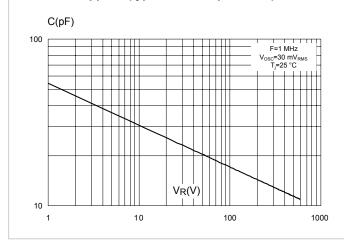


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (typical values)

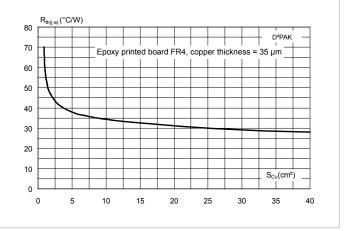
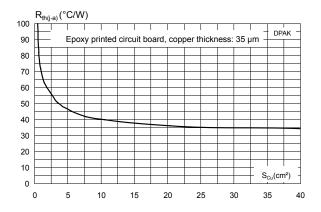


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (typical values)



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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 D²PAK package information

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

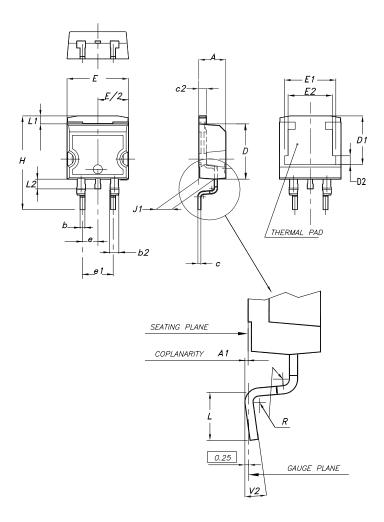


Figure 14. D²PAK package outline

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

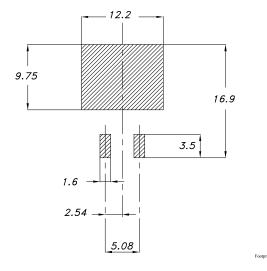
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Table 5. D²PAK package mechanical data

	Dimensions							
Ref.	Millimeters			Inches (for reference only)				
	Min.	Тур.	Max.	Min.	Тур.	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		
С	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		
Е	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		
е		2.54			0.100			
e1	4.88		5.28	0.190		0.205		
Н	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. D²PAK recommended footprint (dimensions are in mm)



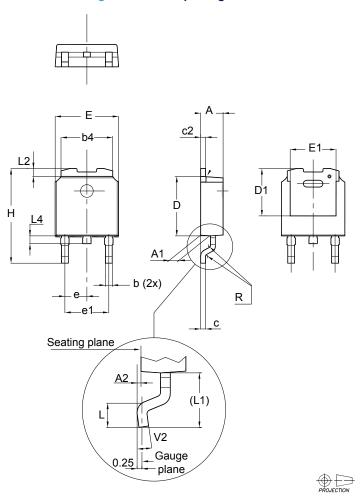
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2.2 DPAK package information

• Epoxy meets UL94, V0

Figure 16. DPAK package outline



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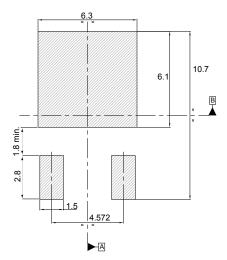


Table 6. DPAK mechanical data

			Dime	nsions			
Dim.		Millimeters			Inches ⁽¹⁾		
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	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	
С	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	
е	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	
Н	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 \$\begin{array}{c} \operate{0} \operate{0}

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3 Ordering information

Table 7. Order code

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH5R06GY-TR	STTH5R06GY	D²PAK	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 Section Applications. Updated Table 7. Order code.	

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