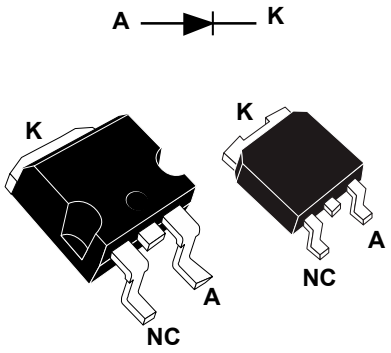
STTH5R06-Y

Datasheet

Automotive 600 V, 5 A ultrafast diode



D²PAK DPAK

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^2PAK		25	A
		DPAK		10	
$I_{F(AV)}$	Average forward current, δ = 0.5, square wave	D^2PAK, DPAK	T_C = 145 °C	5	A
I_{FSM}	Surge non repetitive forward current	D^2PAK	t_p = 10 ms sinusoidal	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, δ < 2%*
2. *Pulse test: t_p =380 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

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

Table 4. Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j = 25 °C	I_F = 0.5 A, I_{rr} = 0.25 A, I_R = 1 A	-		20	ns
			I_F = 1 A, V_R = 30 V, dI_F/dt = -50 A/µs	-		35	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 5 A, V_R = 400 V, dI_F/dt = -200 A/µs	-	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 °C	I_F = 5 A, V_{FR} =2.5 V, dI_F/dt = 40 A/µs			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

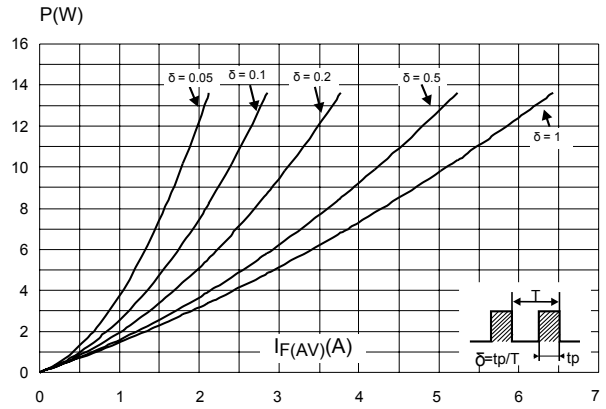


Figure 2. Forward voltage drop versus forward current

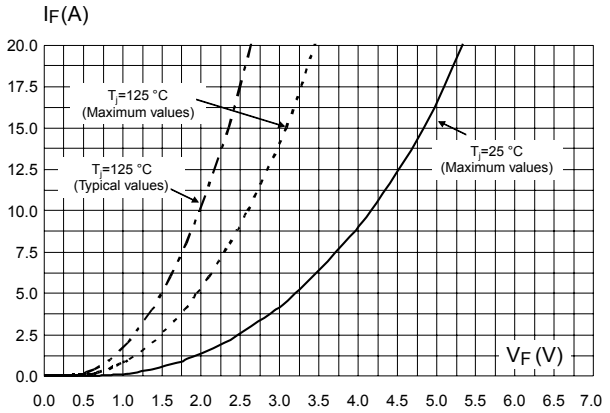


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

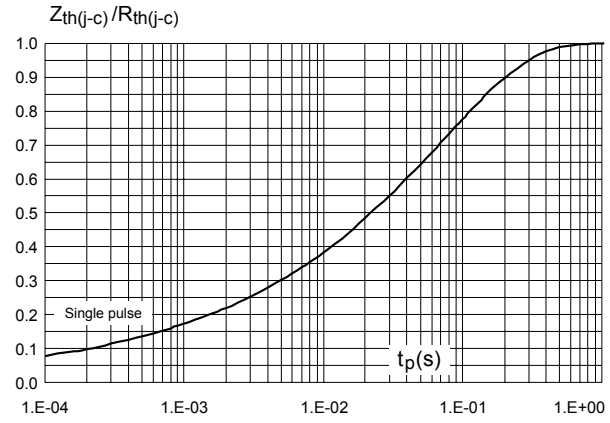


Figure 4. Peak reverse recovery current versus dI_F/dt (typical values)

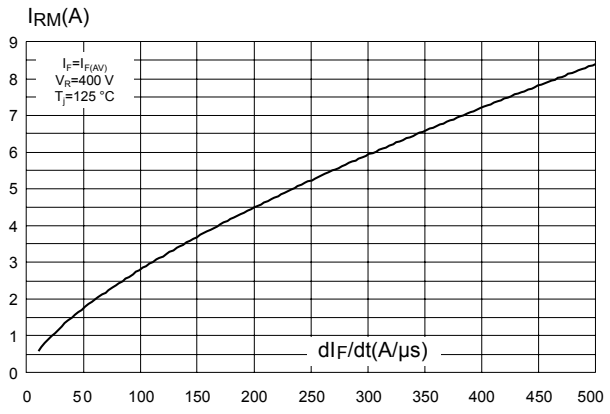


Figure 5. Reverse recovery time versus dI_F/dt (typical values)

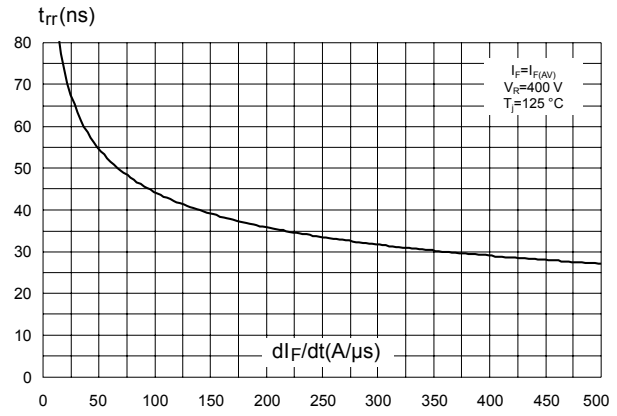


Figure 6. Reverse recovery charges versus dI_F/dt (typical values)

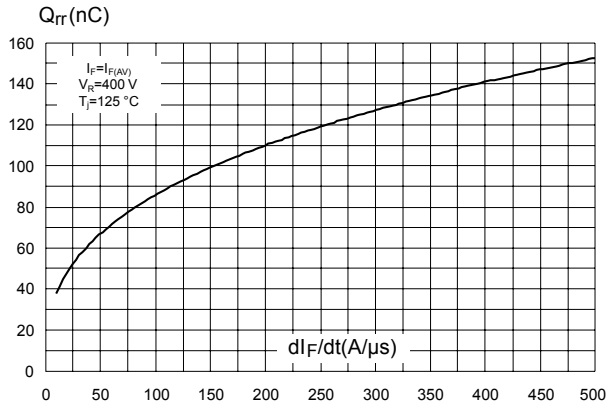


Figure 7. Softness factor versus dI_F/dt (typical values)

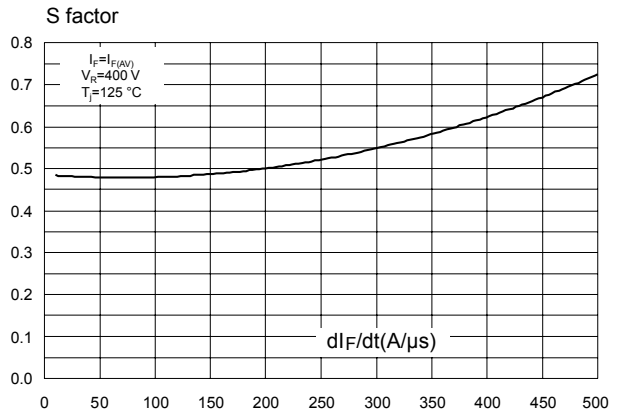


Figure 8. Relative variations of dynamic parameters versus junction temperature

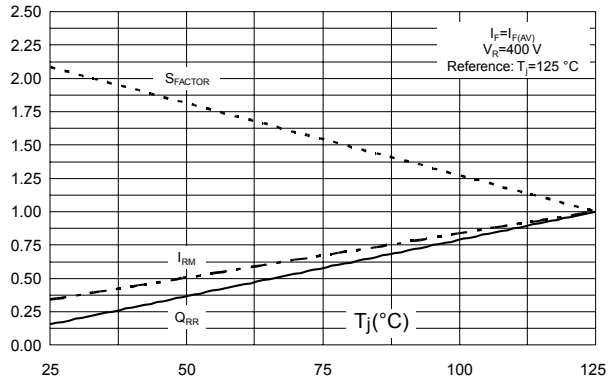


Figure 9. Transient peak forward voltage versus dI_F/dt (typical values)

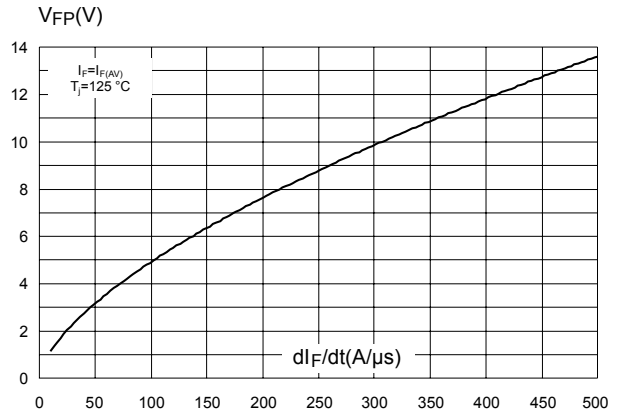


Figure 10. Forward recovery time versus dI_F/dt (typical values)

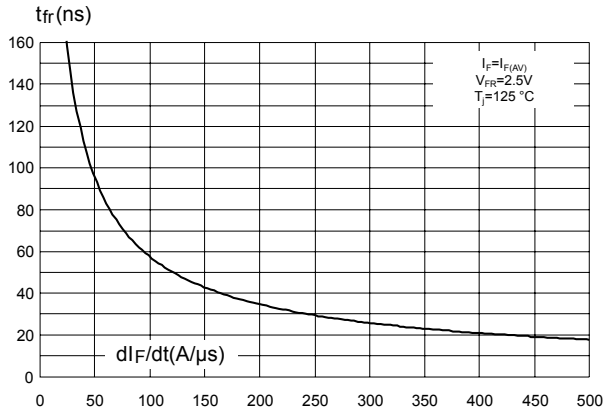


Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)

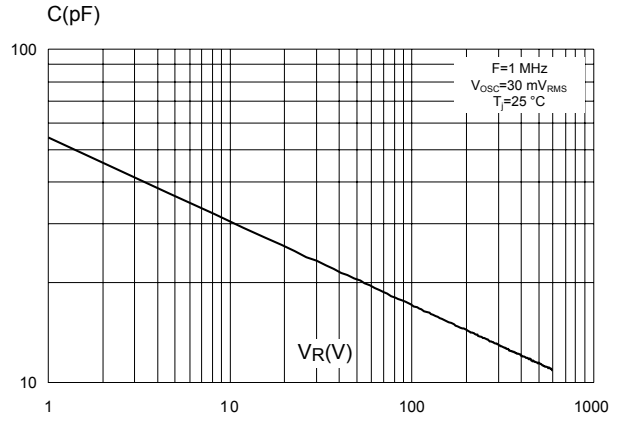


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (typical values)

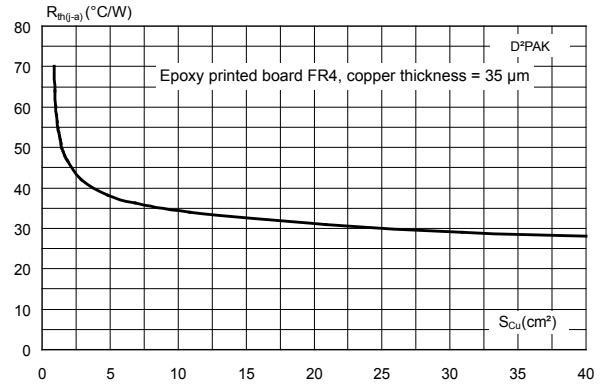
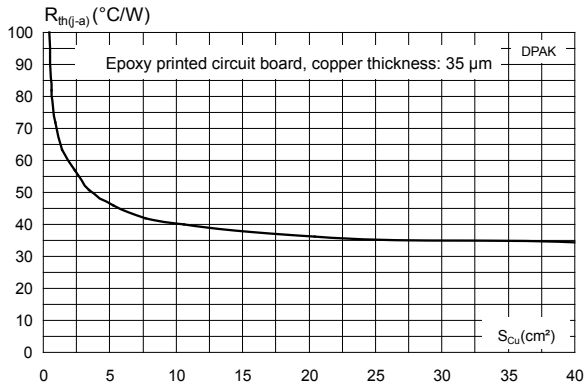


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (typical values)



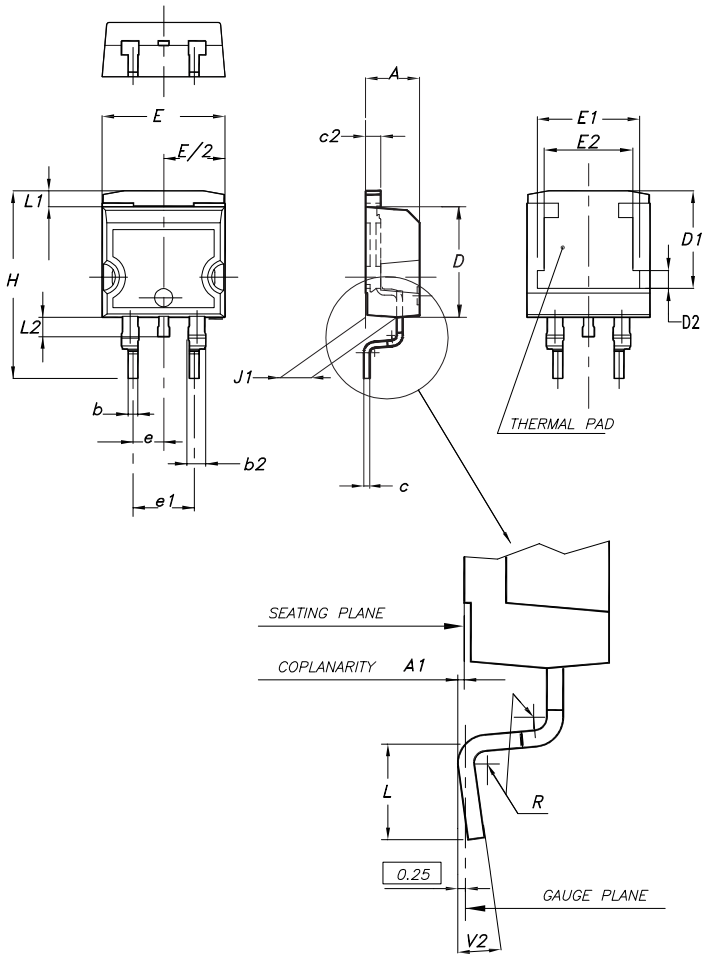
2 Package information

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. ECOPACK is an ST trademark.

2.1 D²PAK package information

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

Figure 14. D²PAK package outline

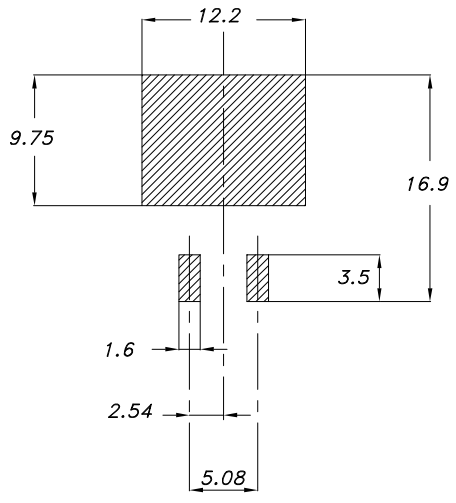


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. **D²PAK 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. **D²PAK recommended footprint (dimensions are in mm)**



2.2 DPAK package information

- Epoxy meets UL94, V0

Figure 16. **DPAK package outline**

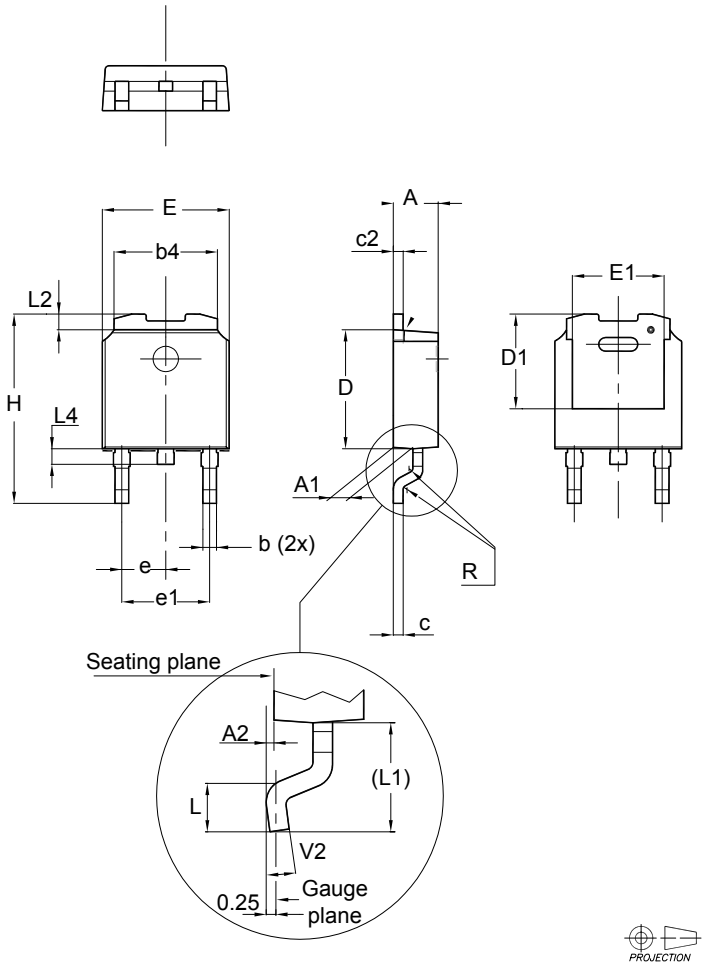
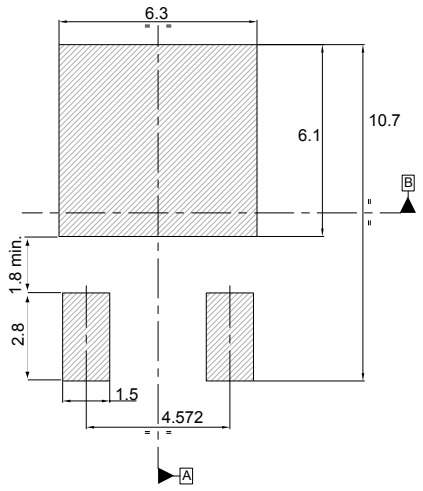


Table 6. DPAK mechanical data

Dim.	Dimensions					
	Millimeters			Inches[1]		
	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 ⌖ 0 05 A B

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.