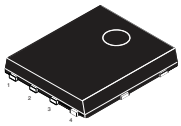
STL120N2VH5

N-channel 20 V, 0.002 Ω, 28 A STripFET™ V Power MOSFET in PowerFLAT™ 5x6 package

Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D
STL120N2VH5	20 V	< 0.003 Ω	28 A

- Improved die-to-footprint ratio
- Very low profile package
- Very low thermal resistance
- Conduction losses reduced
- Switching losses reduced
- 2.5 V gate drive
- Very low threshold device



PowerFLAT™ 5x6

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™V technology. The device has been optimized to achieve very low on-state resistance, contributing to an FOM that is among the best in its class.

Figure 1. Internal schematic diagram

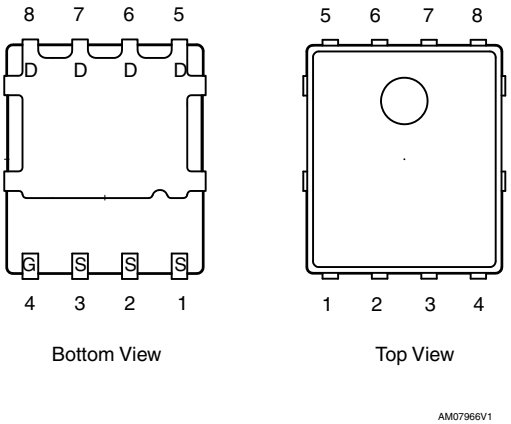


Table 1. Device summary

Order code	Marking	Package	Packaging
STL120N2VH5	120N2VH5	PowerFLAT™ 5x6	Tape and reel

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	20	V
V_{GS}	Gate-source voltage	± 8	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	120	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	75	A
I_D (2)	Drain current (continuous) at T_{pcb} = 25 °C	28	A
I_{DM} (2),(3)	Drain current (pulsed)	112	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	80	W
P_{TOT} (2)	Total dissipation at T_{pcb} = 25 °C	4	W
	Derating factor (2)	0.03	W/°C
T_j T_{stg}	Operating junction temperature storage temperature	- 55 to 150	°C

1. The value is rated according to Rthj-case
2. When mounted on FR-4 board of 1in², 2oz Cu. t < 10 sec
3. Pulse width limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max.	1.56	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb max.	31.25	°C/W

1. When mounted on FR-4 board of 1in², 2oz Cu. t < 10 sec

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	20	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25 °C, I_D = I_{AR}, V_{DD} = 14 V)	300	mJ

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS} = 0	20			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0) V_{DS} =20 V, T_C = 125 °C	V_{DS} = 20 V			1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 8 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.70			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 4.5 V, I_D = 14 A V_{GS} = 2.5 V, I_D = 14 A		0.002 0.0028	0.003 0.004	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 15 V, f = 1 MHz, V_{GS} = 0	-	4660 870 130	-	pF pF pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD} = 10 V, I_D = 14 A R_G = 4.7 Ω V_{GS} = 4.5 V (see *Figure 13*)	-	21 60 76 55	-	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 10 V, I_D = 28 A, V_{GS} = 2.5 V (see *Figure 14*)	-	29 9.8 13	-	nC nC nC

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)		-		28 112	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 28 A, V_{GS} = 0	-		1.1	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 28 A, di/dt = 100 A/µs, V_{DD} = 16 V (see *Figure 15*)	-	34 30 1.4		ns nC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 28 A, di/dt = 100 A/µs, V_{DD} = 16 V, T_j = 150 °C (see *Figure 15*)	-	35 31 1.8		ns nC A

1. Pulse width limited by safe operating area.
2. Pulsed: Pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

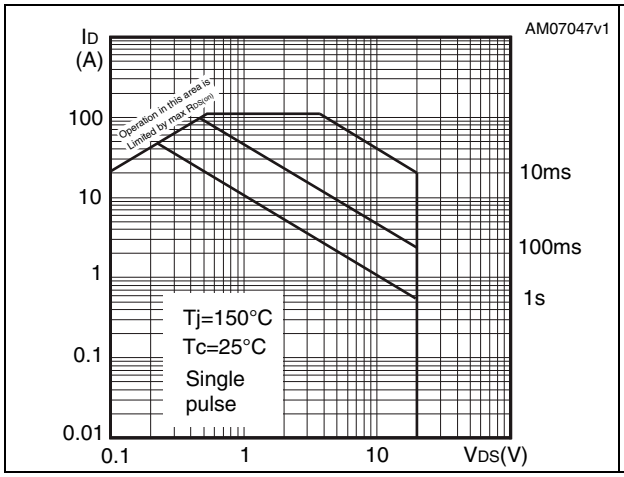


Figure 3. Thermal impedance

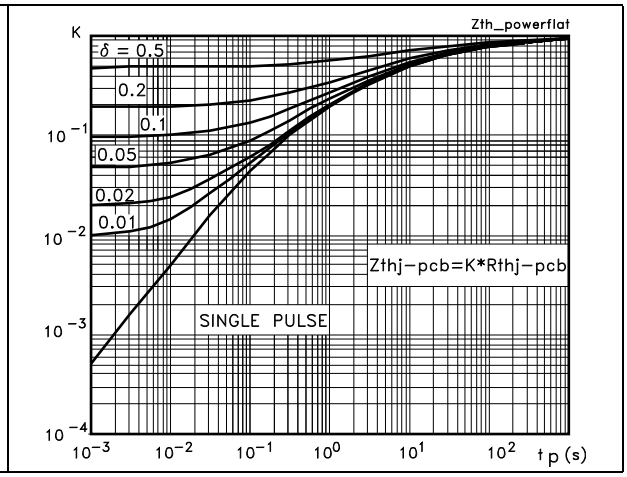


Figure 4. Output characteristics

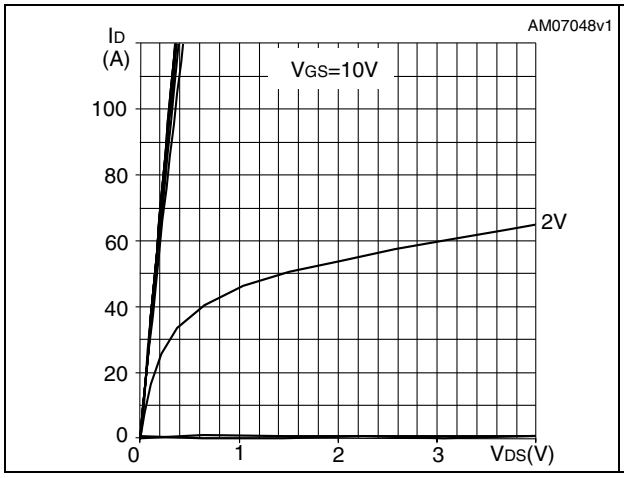


Figure 5. Transfer characteristics

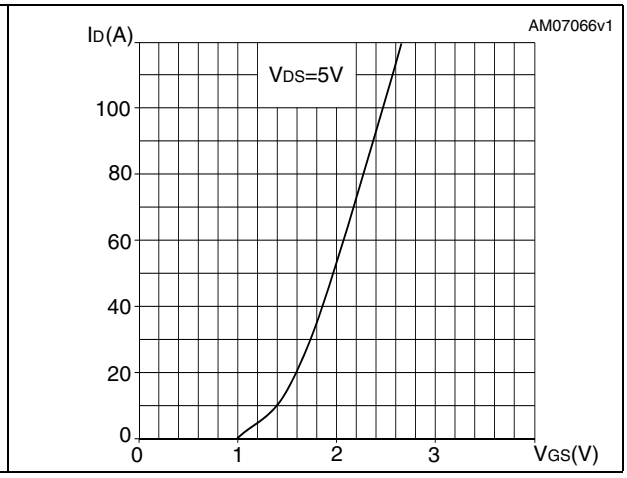


Figure 6. Normalized B_{VDSS} vs temperature

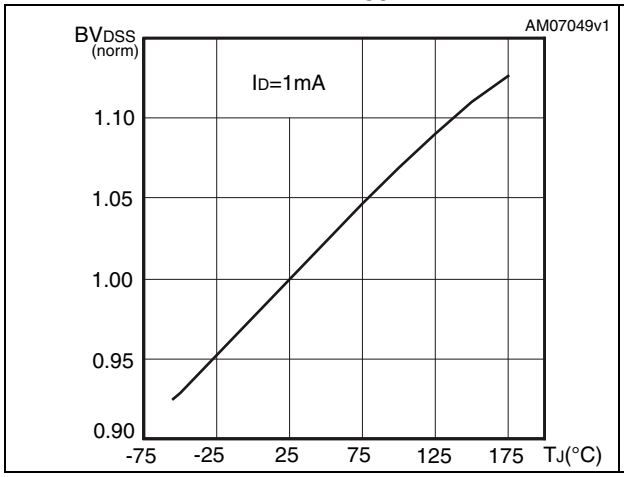


Figure 7. Static drain-source on resistance

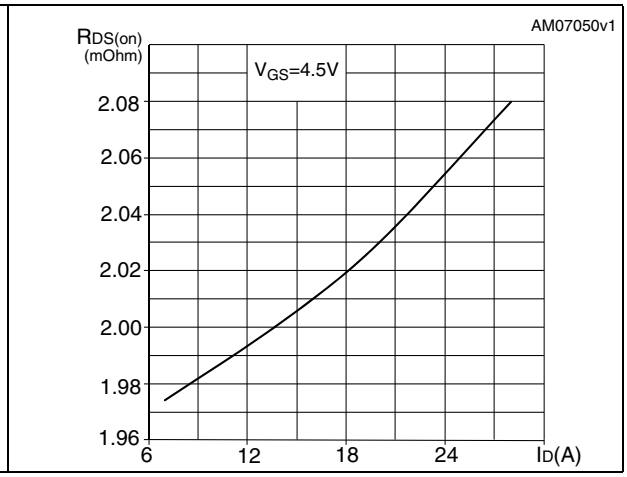


Figure 8. Gate charge vs gate-source voltage

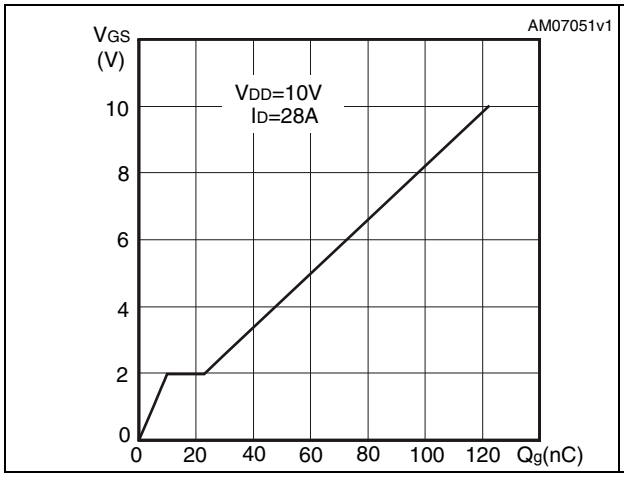


Figure 9. Capacitance variations

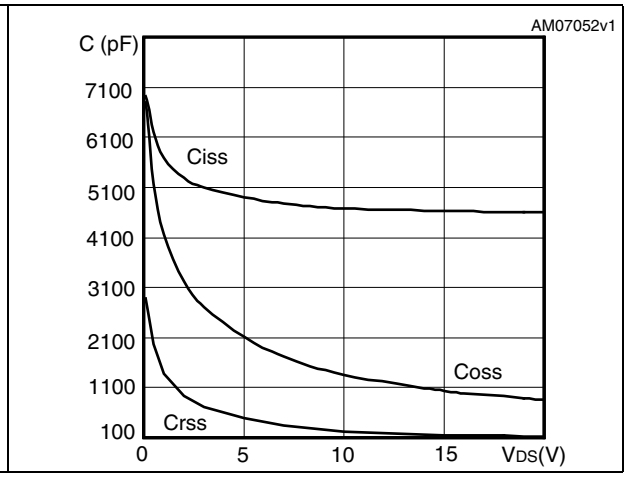


Figure 10. Normalized gate threshold voltage vs temperature

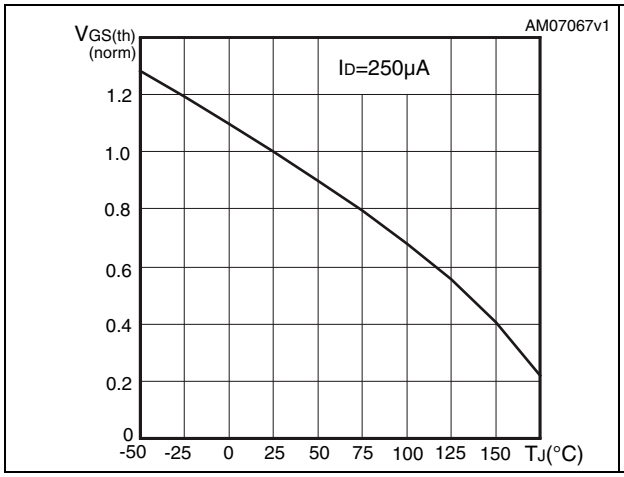


Figure 11. Normalized on resistance vs temperature

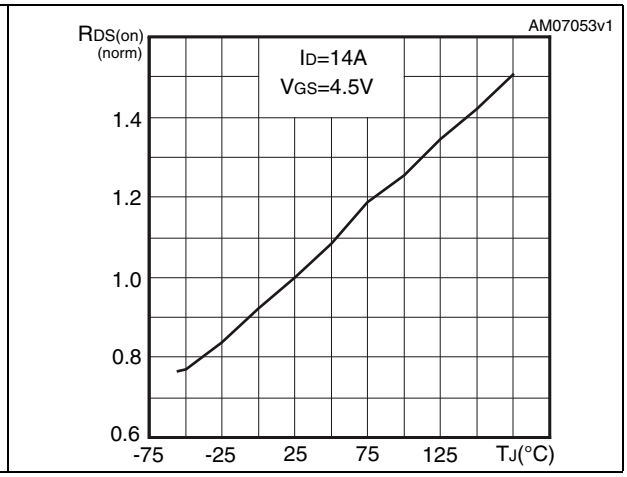
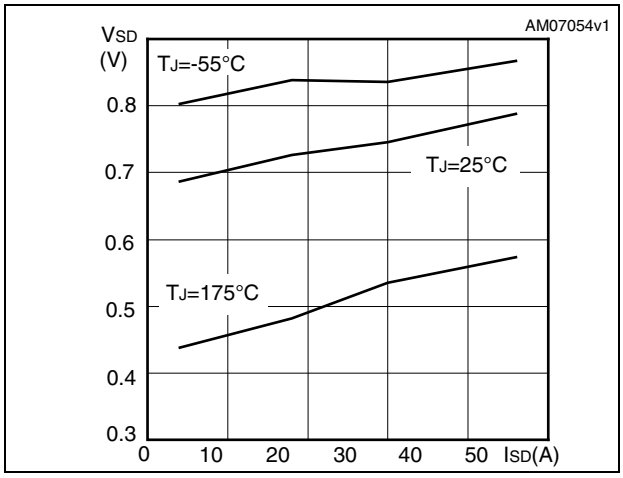


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

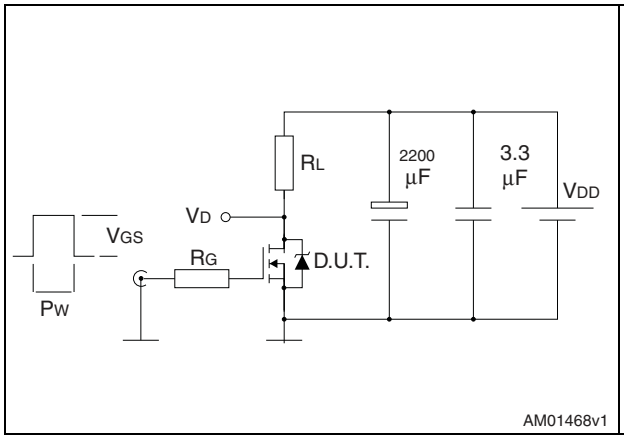


Figure 14. Gate charge test circuit

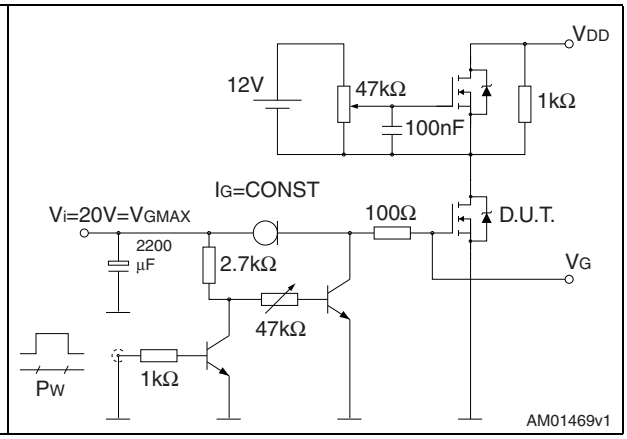


Figure 15. Test circuit for inductive load switching and diode recovery times

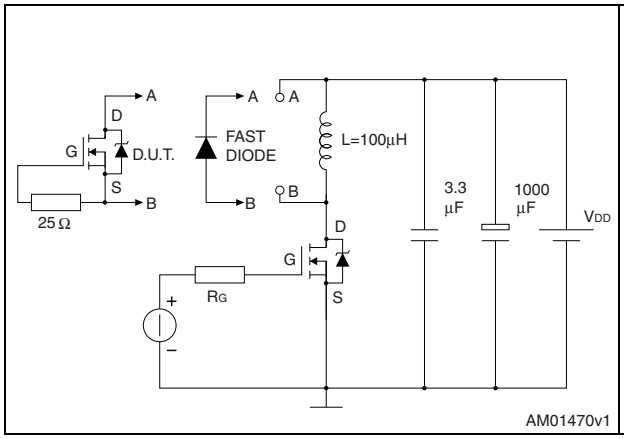


Figure 16. Unclamped inductive load test circuit

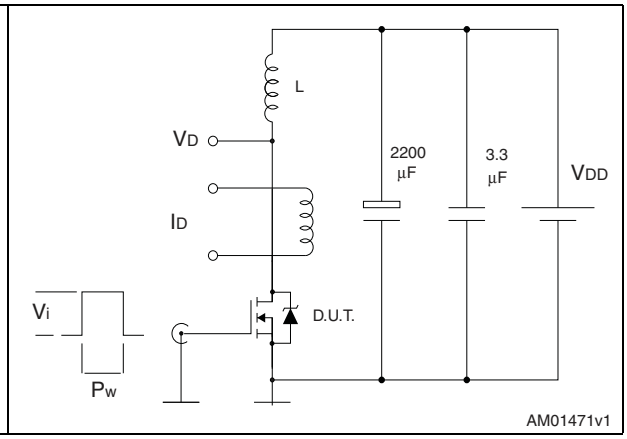


Figure 17. Unclamped inductive waveform

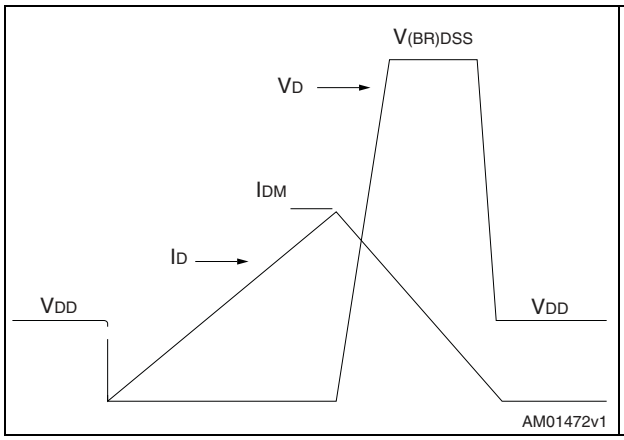
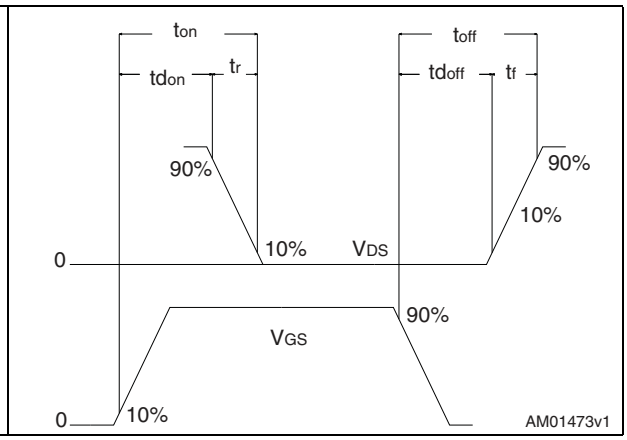


Figure 18. Switching time waveform



4 Package mechanical data

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.

Table 8. PowerFLAT™ 5x6 type C-B mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.83	0.93
A1	0	0.02	0.05
A3		0.20	
b	0.35	0.40	0.47
D		5.00	
D1		4.75	
D2	4.15	4.20	4.25
E		6.00	
E1		5.75	
E2	3.43	3.48	3.53
E4	2.58	2.63	2.68
e		1.27	
L	0.70	0.80	0.90

Figure 19. PowerFLAT™ 5x6 type C-B drawing

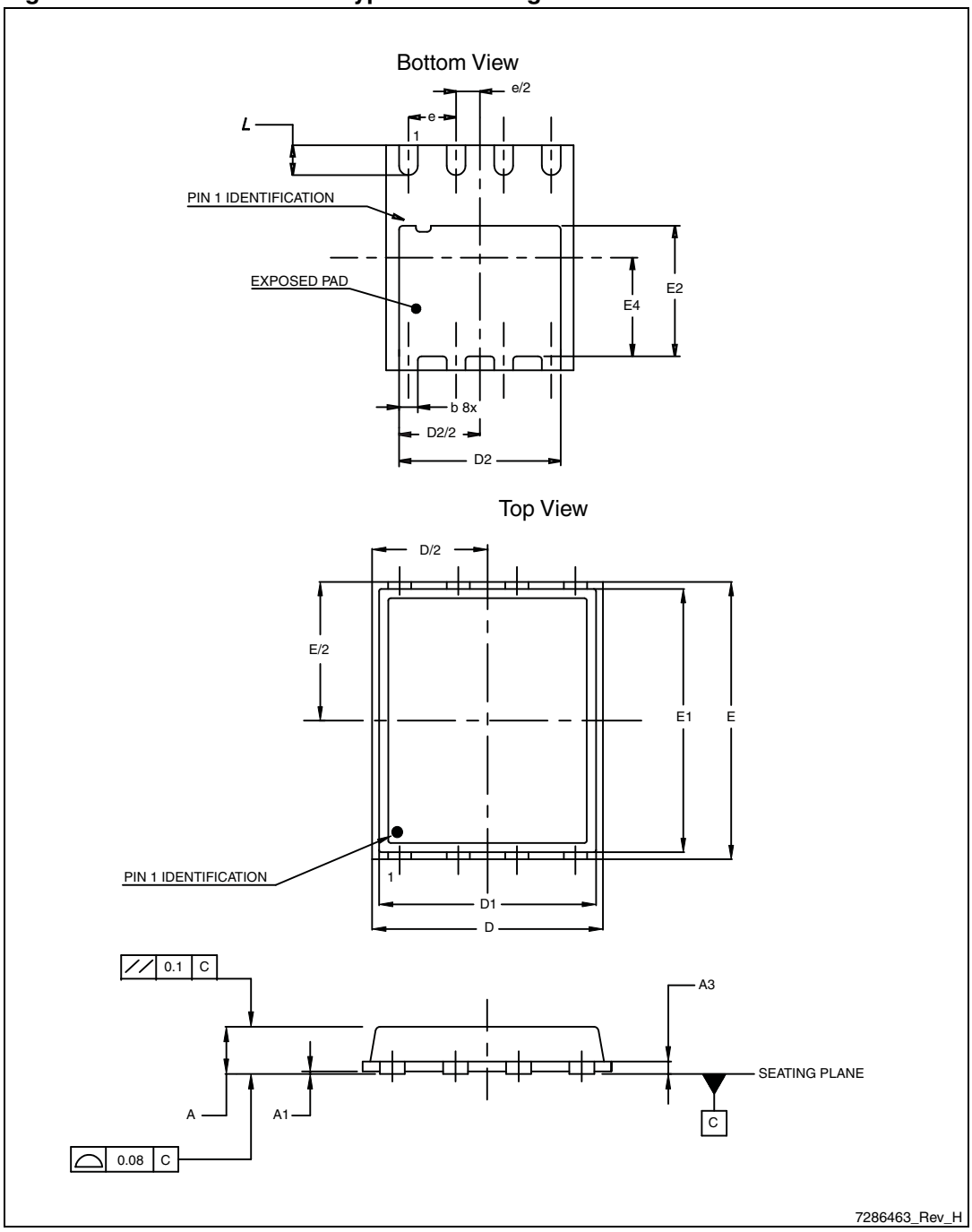


Table 9. PowerFLAT™ 5x6 type S-C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D		5.20	
E		6.15	
D2	4.11		4.31
E2	3.50		3.70
e		1.27	
e1		0.65	
L	0.715		1.015
K	1.05		1.35

Figure 20. PowerFLAT™ 5x6 type S-C mechanical data

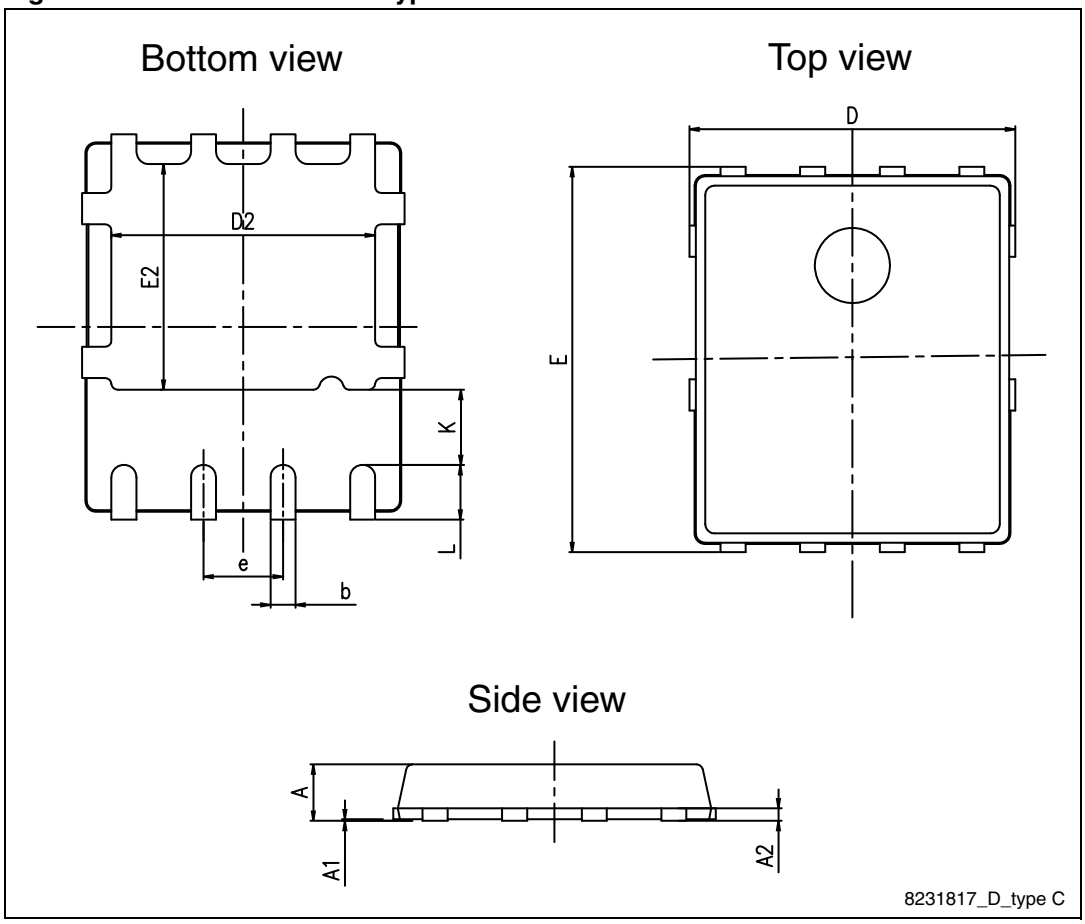
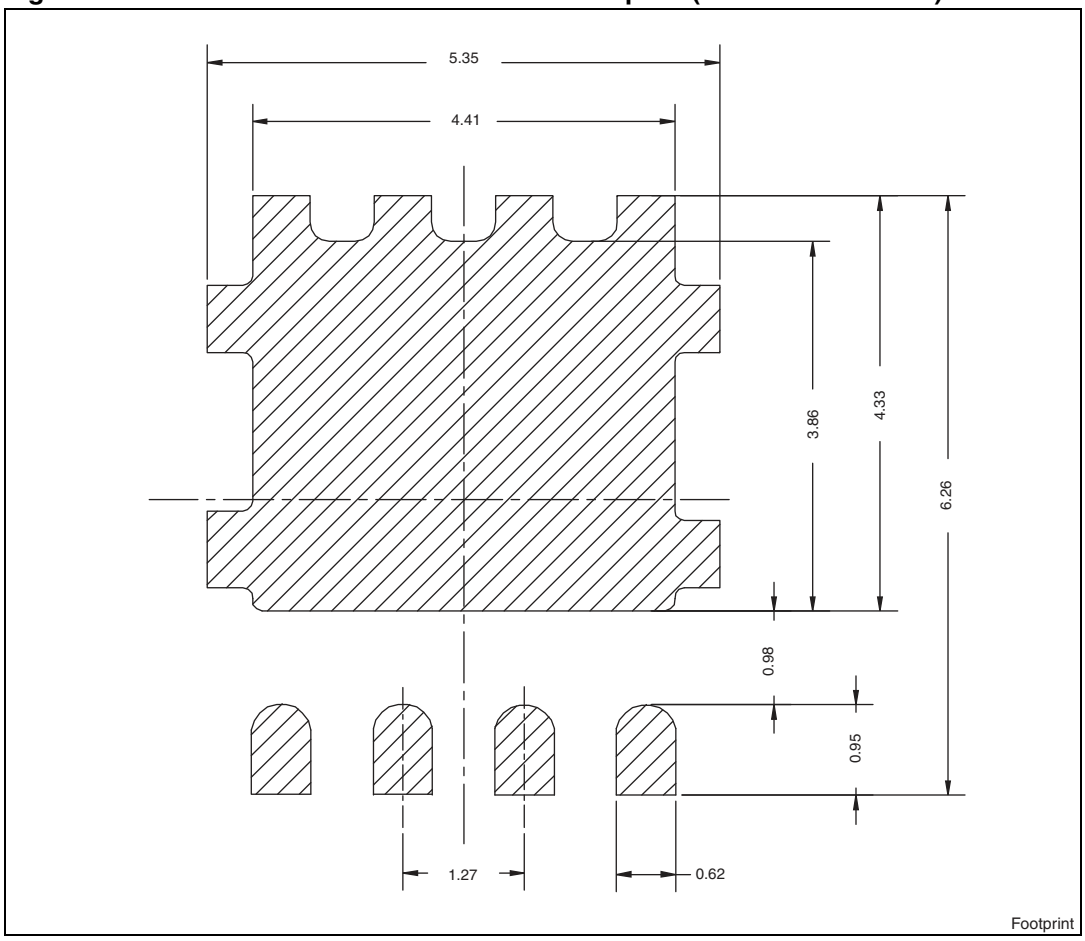


Figure 21. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



5 Packaging mechanical data

Figure 22. PowerFLAT™ 5x6 tape

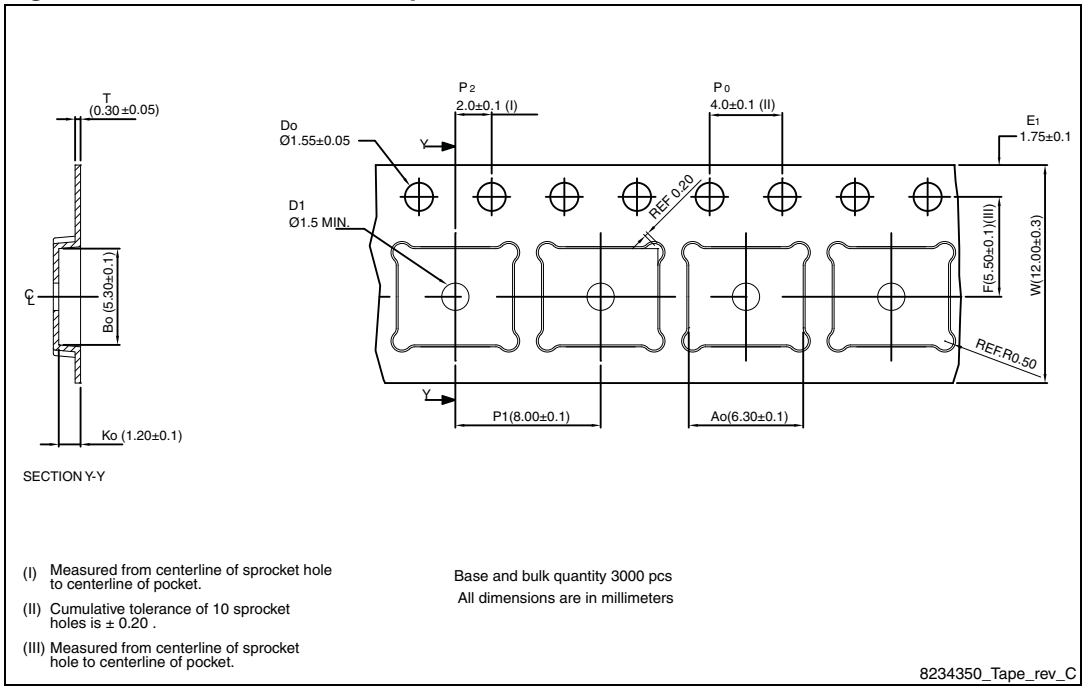


Figure 23. PowerFLAT™ 5x6 package orientation in carrier tape.

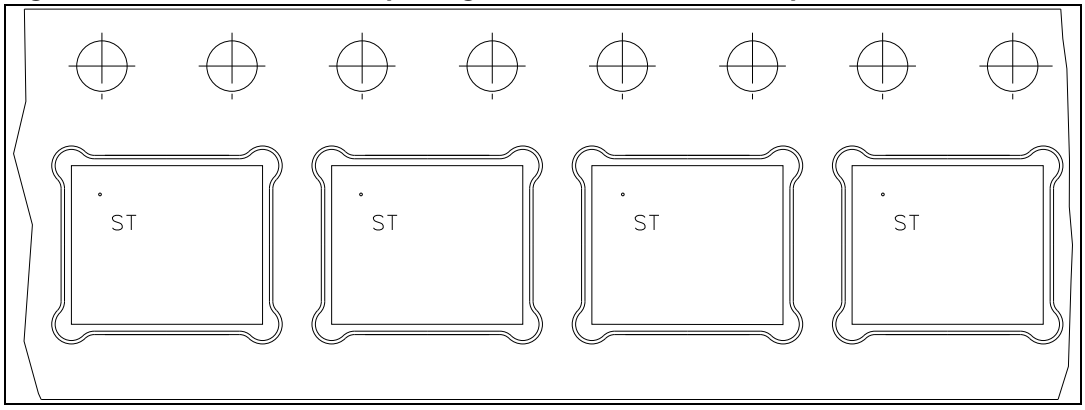
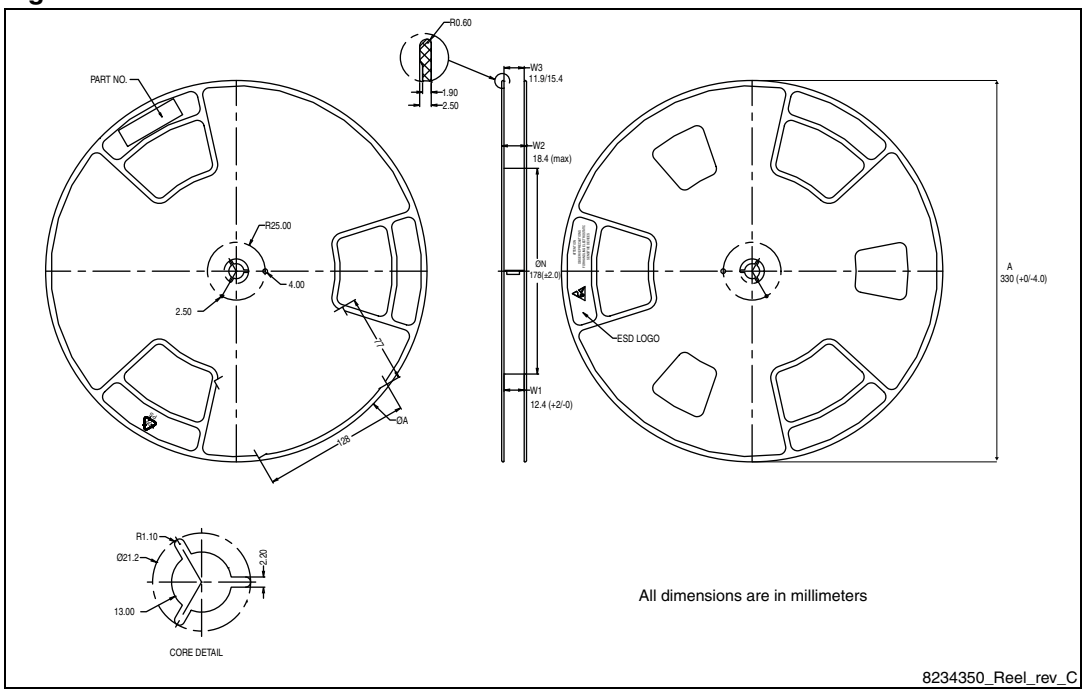


Figure 24. PowerFLAT™ 5x6 reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
20-Apr-2009	1	First issue.
01-Mar-2012	2	Document status promoted from preliminary data to datasheet *Section 4: Package mechanical data* has been modified: – *Table 8: PowerFLAT™ 5x6 type C-B mechanical data*, *Table 9: PowerFLAT™ 5x6 type S-C mechanical data*, *Figure 19: PowerFLAT™ 5x6 type C-B drawing*, *Figure 20: PowerFLAT™ 5x6 type S-C mechanical data* and *Figure 21: PowerFLAT™ 5x6 recommended footprint (dimensions in mm)* have been added.