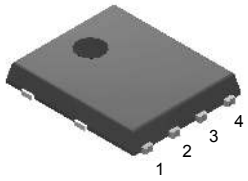
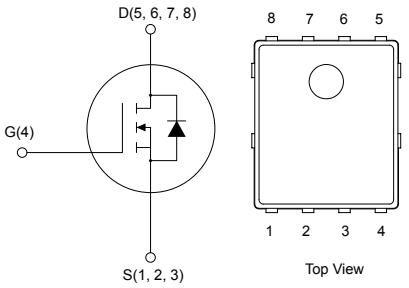
STL125N8F7AG

Datasheet

Automotive N-channel 80 V, 3.6 mΩ typ., 120 A, STripFET F7 Power MOSFET in a PowerFLAT 5x6 package



PowerFLAT 5x6



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STL125N8F7AG	80 V	4.5 mΩ	120 A

- AEC-Q101 qualified
- Among the lowest $R_{DS(on)}$ on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness
- Wettable flank package

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Product status link
STL125N8F7AG

Product summary	
Order code	STL125N8F7AG
Marking	125N8F7
Package	PowerFLAT 5x6
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current (continuous) at T_C = 25 °C (1)	120	A
	Drain current (continuous) at T_C = 100 °C	96	
I_{DM}(2)	Drain current (pulsed)	480	A
P_{TOT}	Total power dissipation at T_C = 25 °C	167	W
I_{AV}	Avalanche current, repetitive or not repetitive (pulse width limited by maximum junction temperature)	50	A
E_{AS}	Single pulse avalanche energy (T_J = 25 °C, I_D = I_{AV}, V_{DD} = 60 V, R_G min = 47 Ω)	170	mJ
T_J	Operating junction temperature range	-55 to 175	°C
T_{stg}	Storage temperature range		°C

1. *Current limited by package.*
2. *Pulse width limited by safe operating area.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.9	°C/W
R_{thJB}(1)	Thermal resistance, junction-to-board	31.3	°C/W

1. *When mounted on an FR-4 board of 1 inch², 2oz Cu, t < 10s.*

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 250 µA, V_{GS} = 0 V	80			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 80 V			1	µA
I_{GSS}	Gate-body leakage current	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS} , I_D = 250 µA	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 60 A		3.6	4.5	mΩ

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 40 V, f = 1 MHz, V_{GS} = 0 V	-	5570	-	pF
C_{oss}	Output capacitance		-	1110	-	pF
C_{rss}	Reverse transfer capacitance		-	77	-	pF
Q_g	Total gate charge	V_{DD} = 40 V, I_D = 120 A, V_{GS} = 0 to 10 V (see Figure 13. Test circuit for gate charge behavior)	-	76	-	nC
Q_{gs}	Gate-source charge		-	37	-	nC
Q_{gd}	Gate-drain charge		-	17	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 60 V, I_D = 50 A, R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	23	-	ns
t_r	Rise time		-	39	-	ns
$t_{d(off)}$	Turn-off delay time		-	47	-	ns
t_f	Fall time		-	23	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current				120	A
V_{SD} (1)	Source-drain voltage	I_{SD} = 120 A, V_{GS} = 0 V	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 100 A, di/dt = 100 A/µs, V_{DD} = 64 V (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	49		ns
Q_{rr}	Reverse recovery charge		-	66		nC
I_{RRM}	Reverse recovery current		-	2.7		A

1. *Pulsed: pulse duration = 300 µs, duty cycle 1.5%.*

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

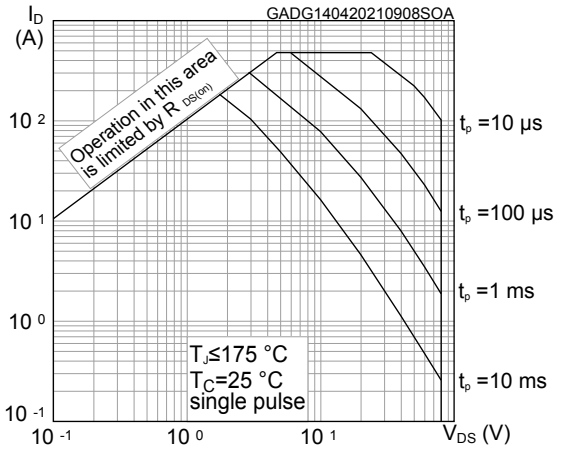


Figure 2. Maximum transient thermal impedance

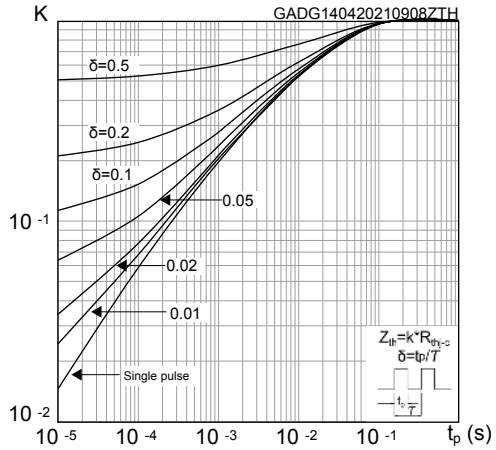


Figure 3. Typical output characteristics

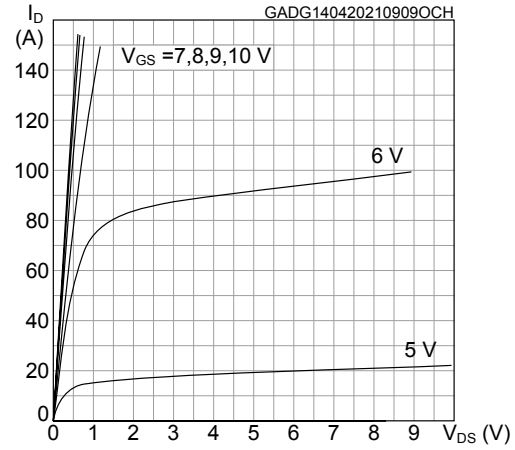


Figure 4. Typical transfer characteristics

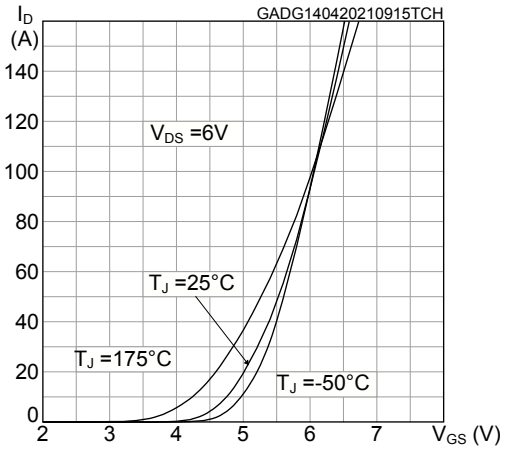


Figure 5. Typical gate charge characteristics

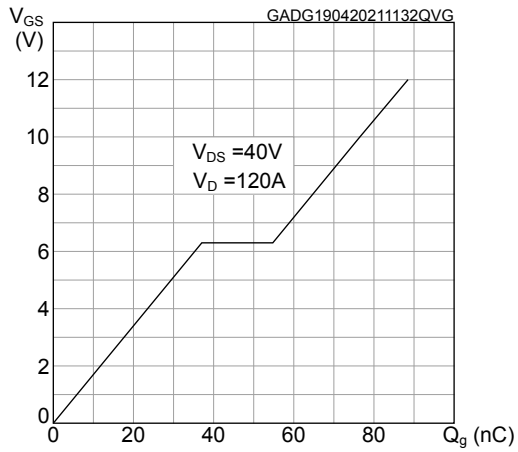


Figure 6. Typical drain-source on-resistance

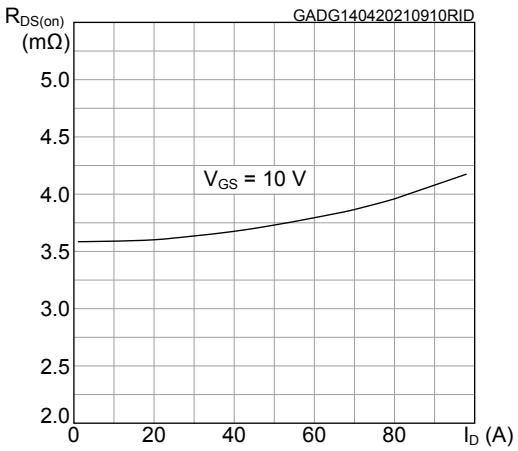


Figure 7. Typical capacitance characteristics

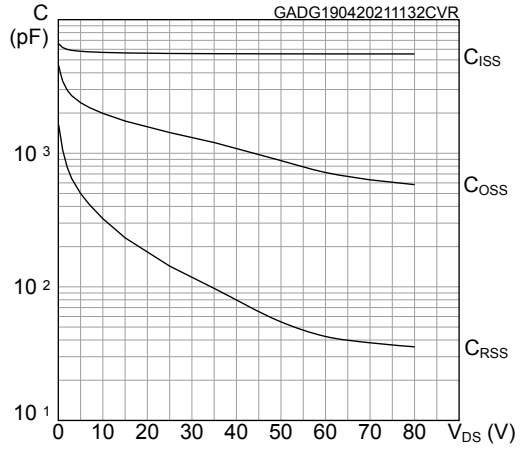


Figure 8. Normalized gate threshold voltage vs temperature

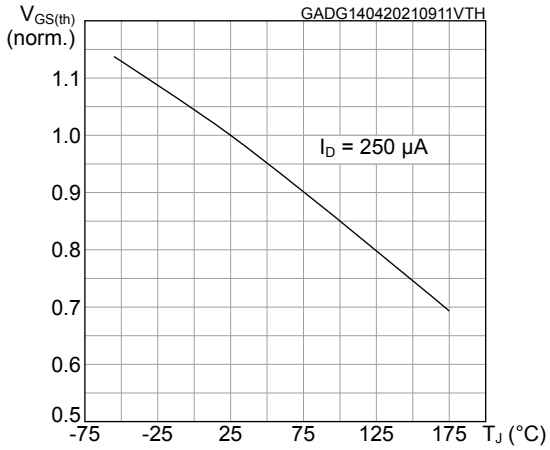


Figure 9. Normalized on-resistance vs temperature

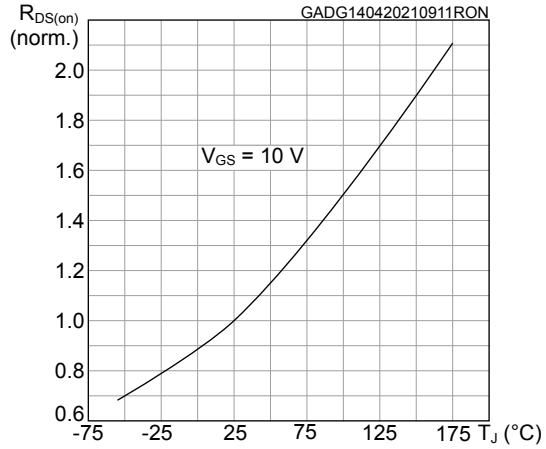


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

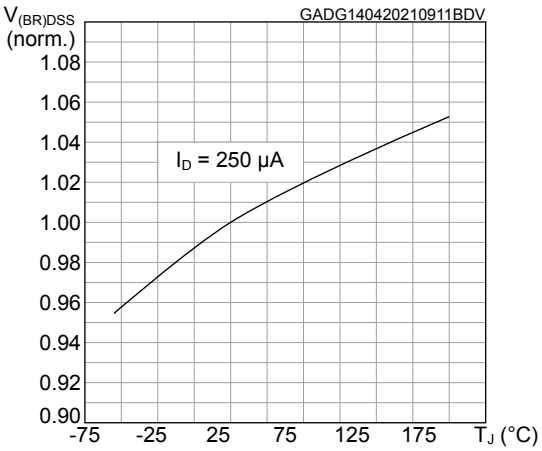
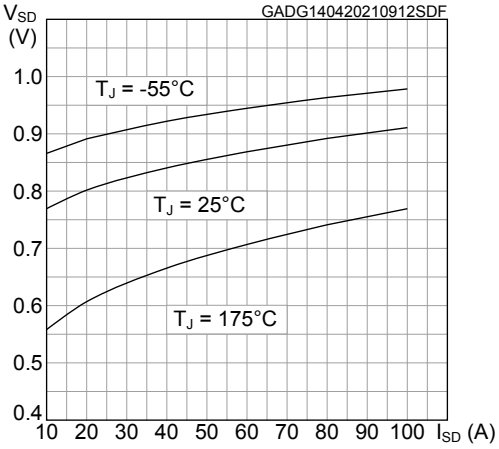


Figure 11. Typical reverse diode forward characteristics



3 Test circuits

Figure 12. Test circuit for resistive load switching times

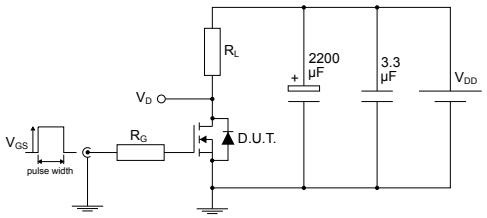


Figure 13. Test circuit for gate charge behavior

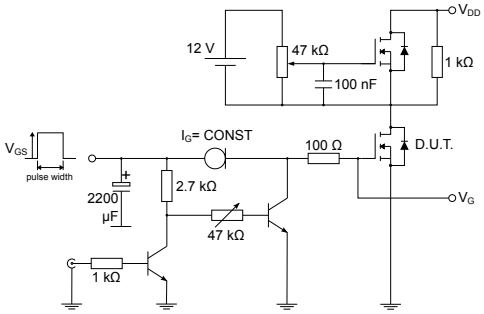


Figure 14. Test circuit for inductive load switching and diode recovery times

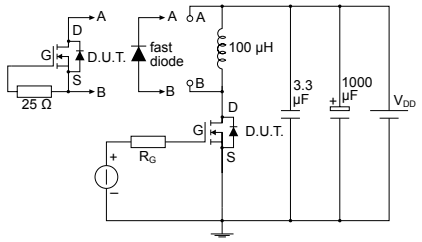


Figure 15. Unclamped inductive load test circuit

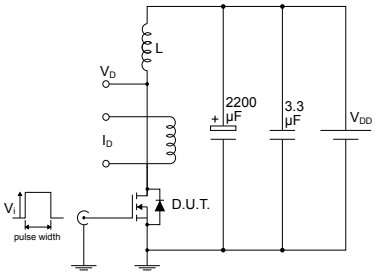


Figure 16. Unclamped inductive waveform

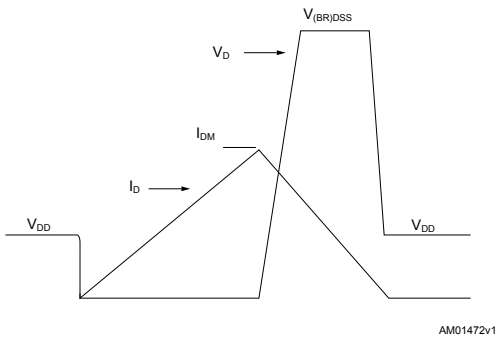
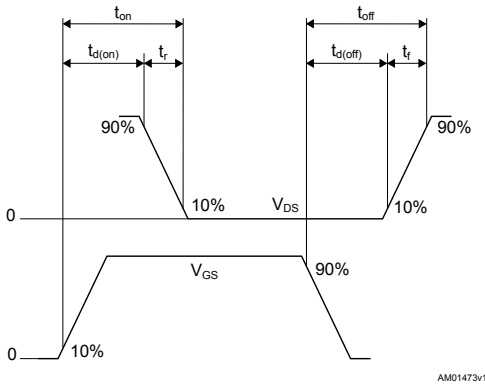


Figure 17. Switching time waveform

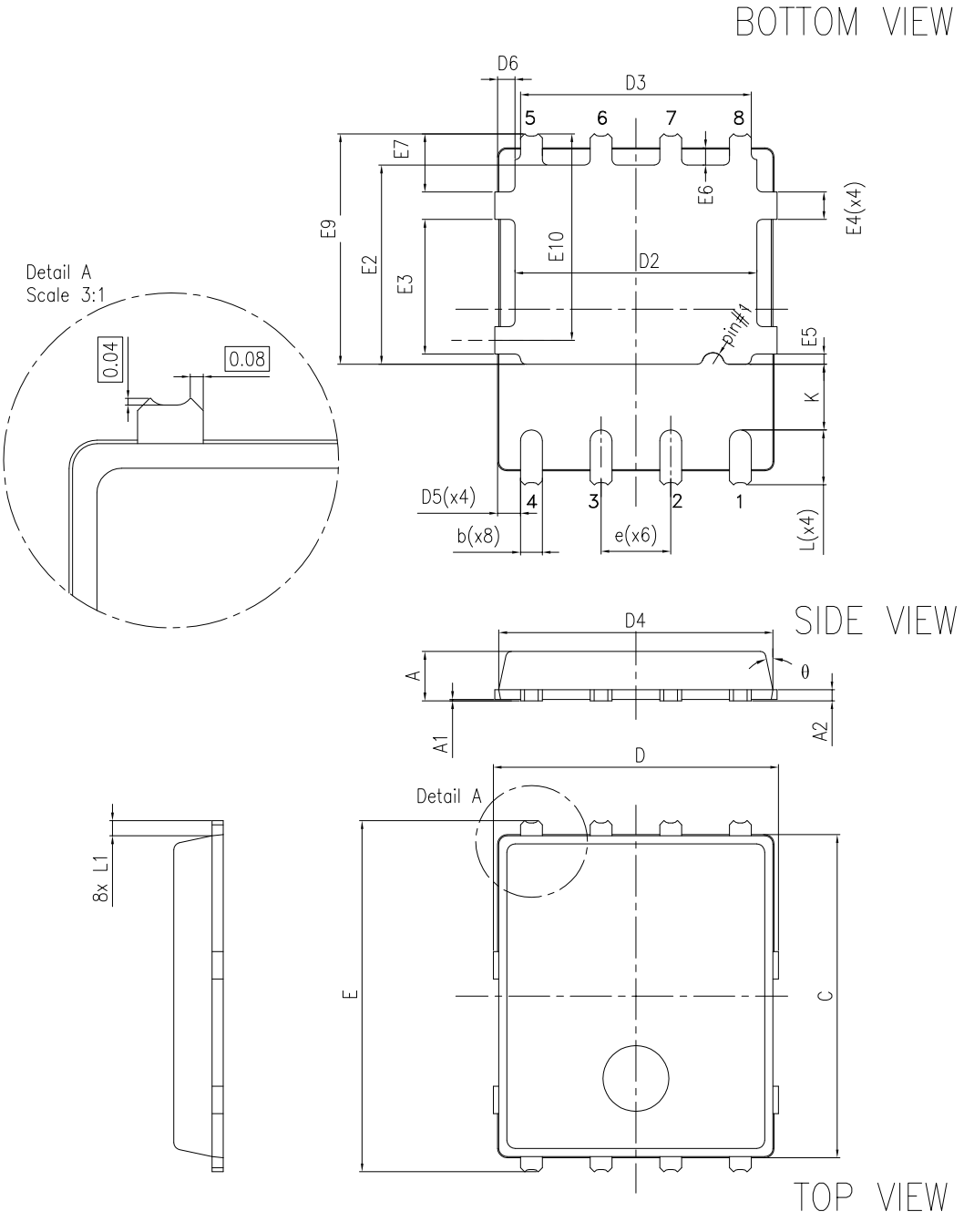


4 Package information

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.

4.1 PowerFLAT 5x6 WF type C package information

Figure 18. PowerFLAT 5x6 WF type C package outline

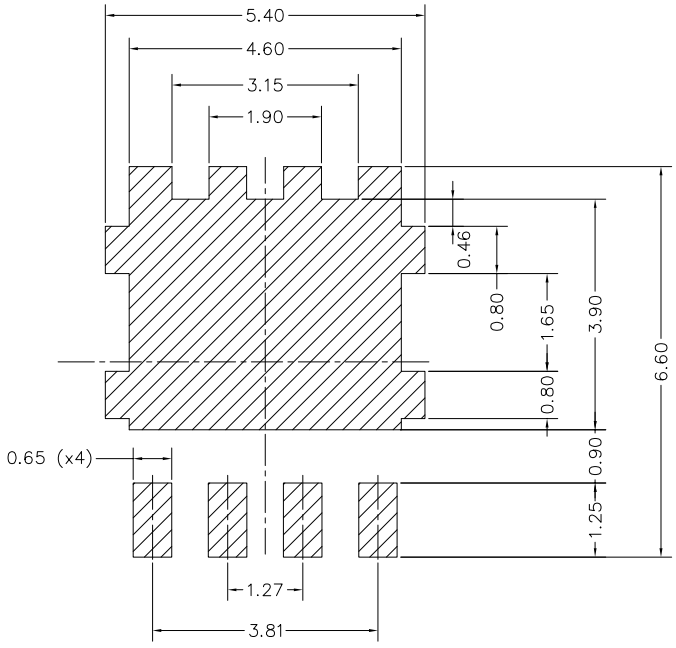


8231817_WF_typeC_r20

Table 7. **PowerFLAT 5x6 WF type C mechanical data**

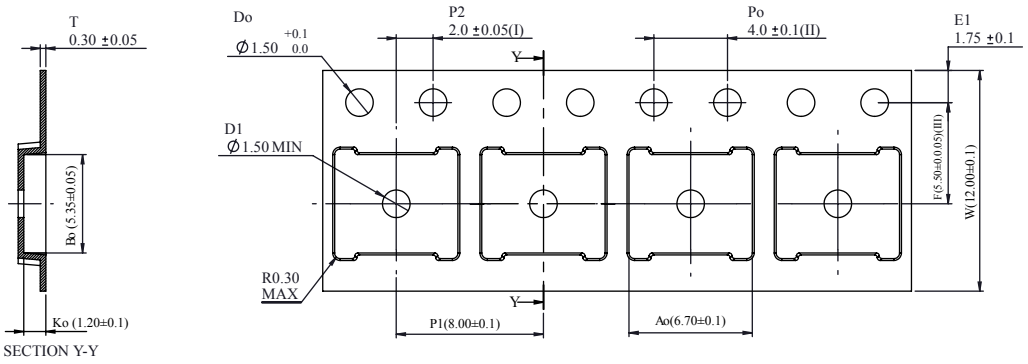
Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.00		0.05
A2		0.25	
b	0.30		0.50
C	5.80	6.00	6.10
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.10
D5	0.25	0.40	0.55
D6	0.15	0.30	0.45
e		1.27	
E	6.20	6.40	6.60
E2	3.50		3.70
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28
E6	0.20	0.325	0.45
E7	0.85	1.00	1.15
E9	4.00	4.20	4.40
E10	3.55	3.70	3.85
K	1.05		1.35
L	0.90	1.00	1.10
L1	0.175	0.275	0.375
θ	0°		12°

Figure 19. PowerFLAT 5x6 recommended footprint (dimensions are in mm)



4.2 PowerFLAT 5x6 WF packing information

Figure 20. PowerFLAT 5x6 WF tape (dimensions are in mm)



(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.

Base and bulk qua ntity 3000 pcs

8234350_TapeWF_rev_C

Figure 21. PowerFLAT 5x6 package orientation in carrier tape

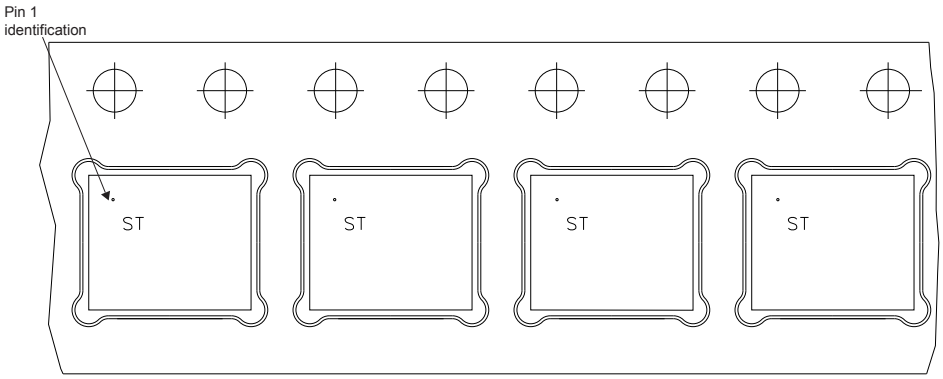
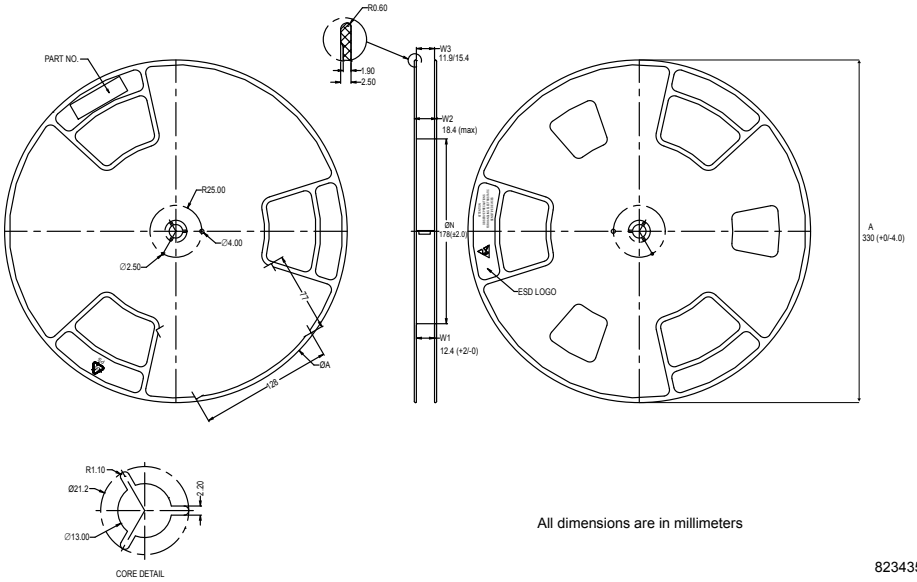


Figure 22. PowerFLAT 5x6 reel (dimensions are in mm)



Revision history

Table 8. **Document revision history**

Date	Version	Changes
14-Apr-2021	1	First release.

Contents