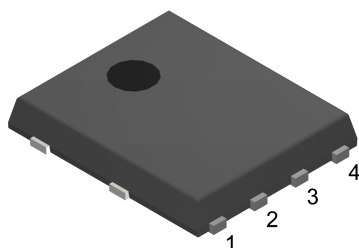
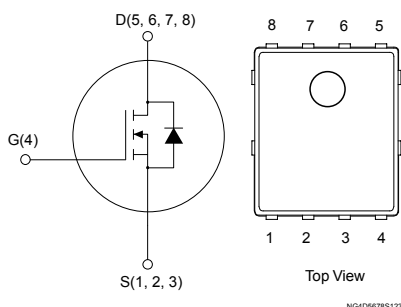


N-channel 30 V, 0.0016 Ω typ., 33 A, STripFET™ H6 Power MOSFET in a PowerFLAT 5x6 package



PowerFLAT™ 5x6



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	Package
STL150N3LLH6	30 V	0.002 Ω	33 A	PowerFLAT™ 5x6

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the STripFET™ H6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low R_{DS(on)} in all packages.



Product status link

[STL150N3LLH6](#)

Product summary

Order code	STL150N3LLH6
Marking	150N3LH6
Package	PowerFLAT™ 5x6
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	150	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	93	
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	33	A
	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	20.8	A
$P_{TOT}^{(1)}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	80	W
$P_{TOT}^{(2)}$	Total power dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4	W
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$)	200	mJ
I_{AV}	Not-repetitive avalanche current, (pulse width limited by T_{jmax})	20	A
T_{stg} T_J	Storage temperature range Operating junction temperature range	-55 to 150	$^\circ\text{C}$

1. The value is rated according to R_{thj-c} .
2. The value is rated according to $R_{thj-pcb}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.56	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	

1. When mounted on an 1-inch² FR-4, 2 Oz copper board, $t < 10\text{ s}$.

2 Electrical characteristics

($T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 30\text{ V}$			1	μA
		$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 30\text{ V}$, $T_{\text{C}} = 125\text{ }^{\circ}\text{C}$ ⁽¹⁾			10	μA
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$			± 100	nA
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	1			V
$R_{\text{DS(on)}}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 16.5\text{ A}$		0.0016	0.002	Ω
		$V_{\text{GS}} = 4.5\text{ V}$, $I_{\text{D}} = 16.5\text{ A}$		0.0025	0.0034	

1. Defined by design, not subject to production test.

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{\text{DS}} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	4040	-	pF
C_{oss}	Output capacitance		-	740	-	
C_{rss}	Reverse transfer capacitance		-	425	-	
Q_{g}	Total gate charge	$V_{\text{DD}} = 15\text{ V}$, $I_{\text{D}} = 33\text{ A}$, $V_{\text{GS}} = 0\text{ to }4.5\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	40	-	nC
Q_{gs}	Gate-source charge		-	16.3	-	
Q_{gd}	Gate-drain charge		-	15.8	-	
R_{g}	Gate input resistance	$f = 1\text{ MHz}$, $I_{\text{D}} = 0\text{ A}$	-	1.4	-	Ω

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$	Turn-on delay time	$V_{\text{DD}} = 15\text{ V}$, $I_{\text{D}} = 16.5\text{ A}$, $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	17	-	ns
t_{r}	Rise time		-	18	-	
$t_{\text{d(off)}}$	Turn-off delay time		-	75	-	
t_{f}	Fall time		-	46	-	

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		33	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		132	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 33\text{ A}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 33\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	34		ns
Q_{rr}	Reverse recovery charge		-	35		nC
I_{RRM}	Reverse recovery current		-	2.1		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

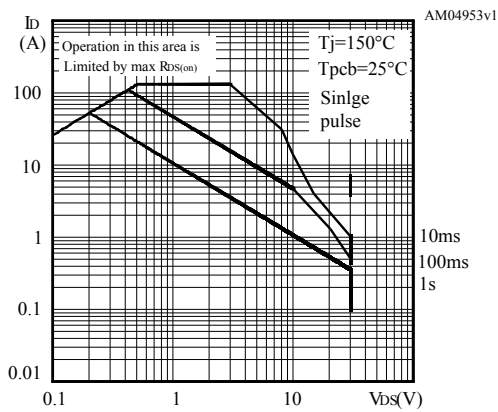


Figure 2. Thermal impedance

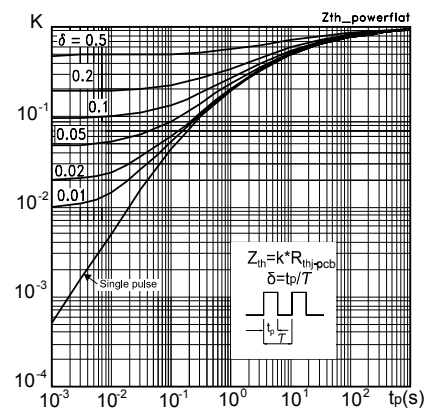


Figure 3. Output characteristics

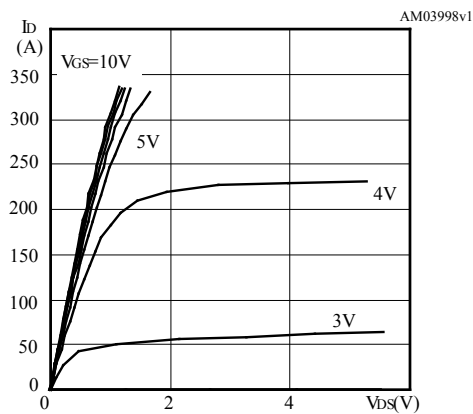


Figure 4. Transfer characteristics

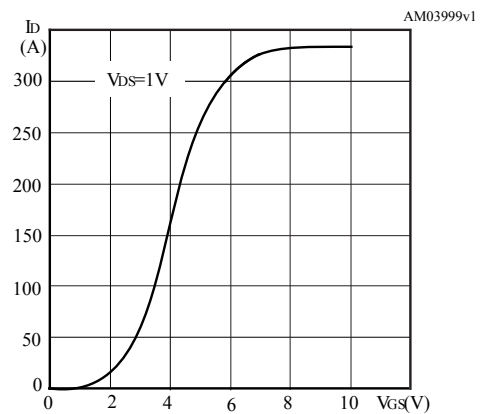


Figure 5. Normalized $V_{(BR)DSS}$ vs temperature

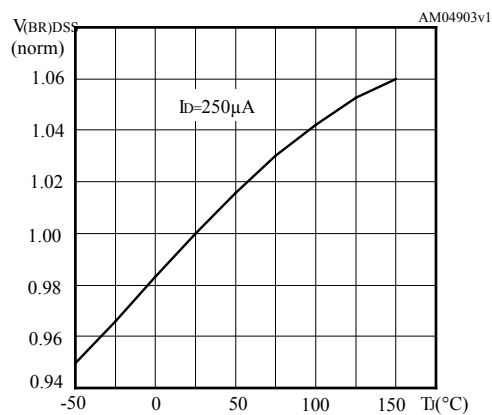


Figure 6. Static drain-source on-resistance

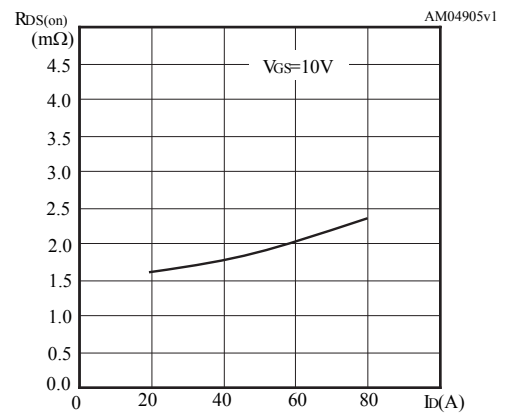


Figure 7. Gate charge vs gate-source voltage

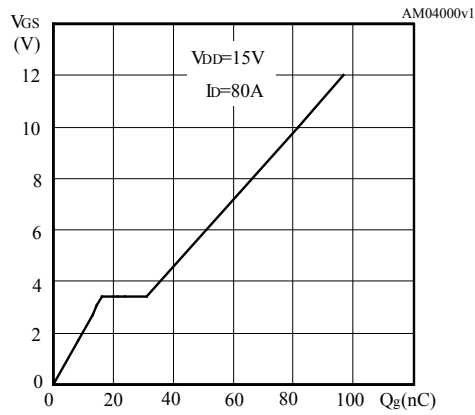


Figure 8. Capacitance variations

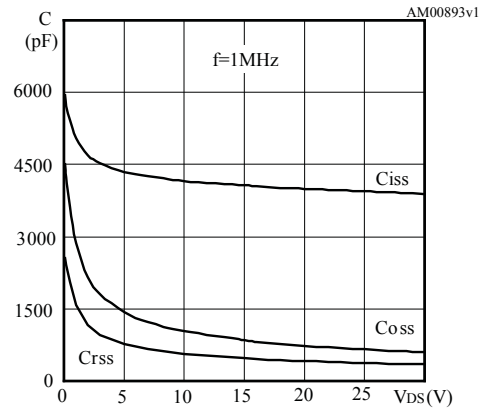


Figure 9. Normalized gate threshold voltage vs temperature

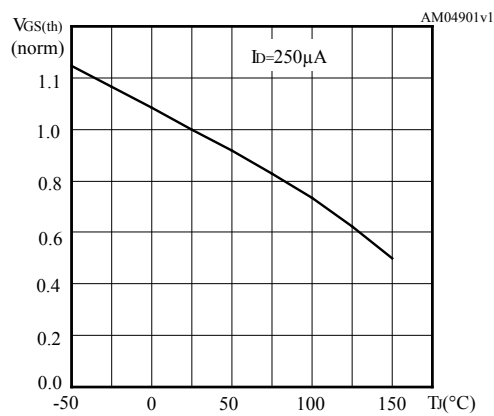


Figure 10. Normalized on-resistance vs temperature

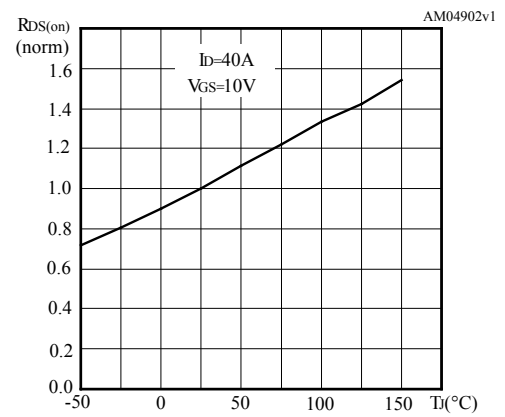
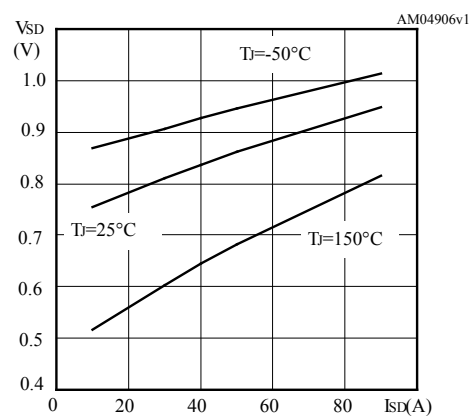
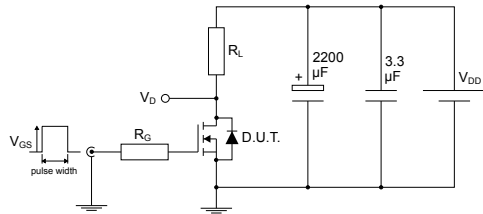


Figure 11. Source-drain diode forward characteristics



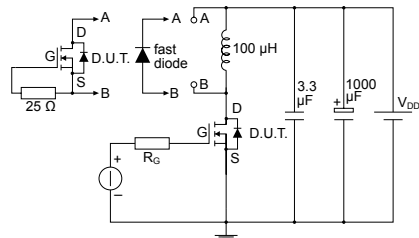
3 Test circuits

Figure 12. Test circuit for resistive load switching times


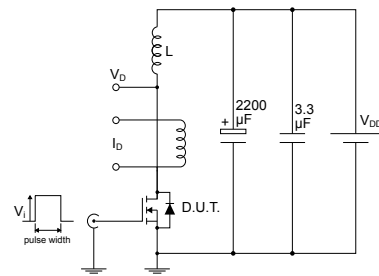
AM01468v1

Figure 13. Test circuit for gate charge behavior

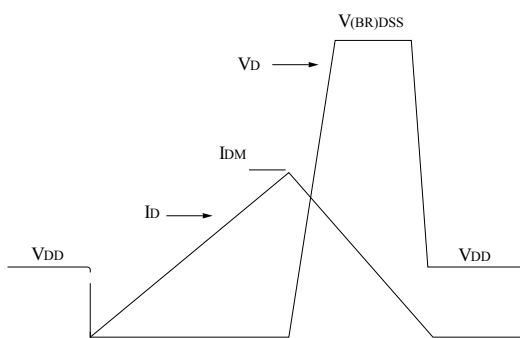

AM01469v1

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


AM01470v1

Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform

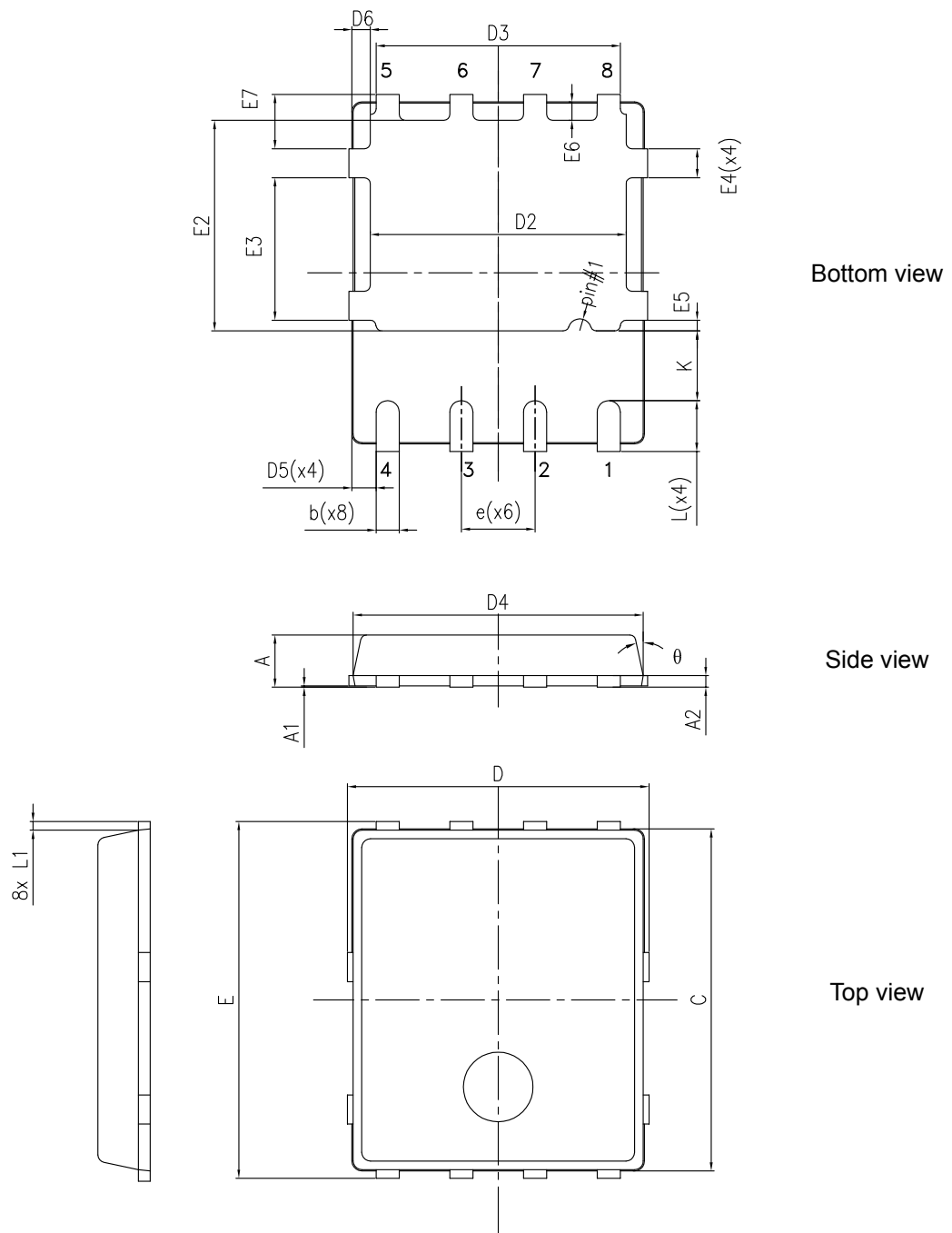

AM01473v1

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 type C package information

Figure 18. PowerFLAT™ 5x6 type C package outline

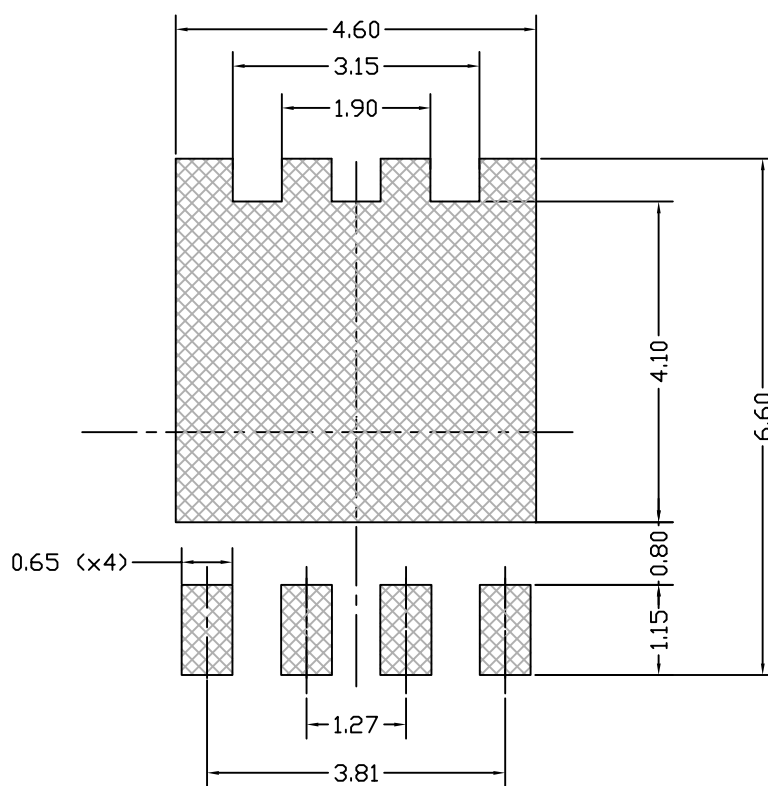


8231817_typeC_Rev18

Table 7. PowerFLAT™ 5x6 type C package 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
C	5.80	6.00	6.20
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.20
D5	0.25	0.40	0.55
D6	0.15	0.30	0.45
e		1.27	
E	5.95	6.15	6.35
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	0.75	0.90	1.05
K	1.05		1.35
L	0.725		1.025
L1	0.05	0.15	0.25
θ	0°		12°

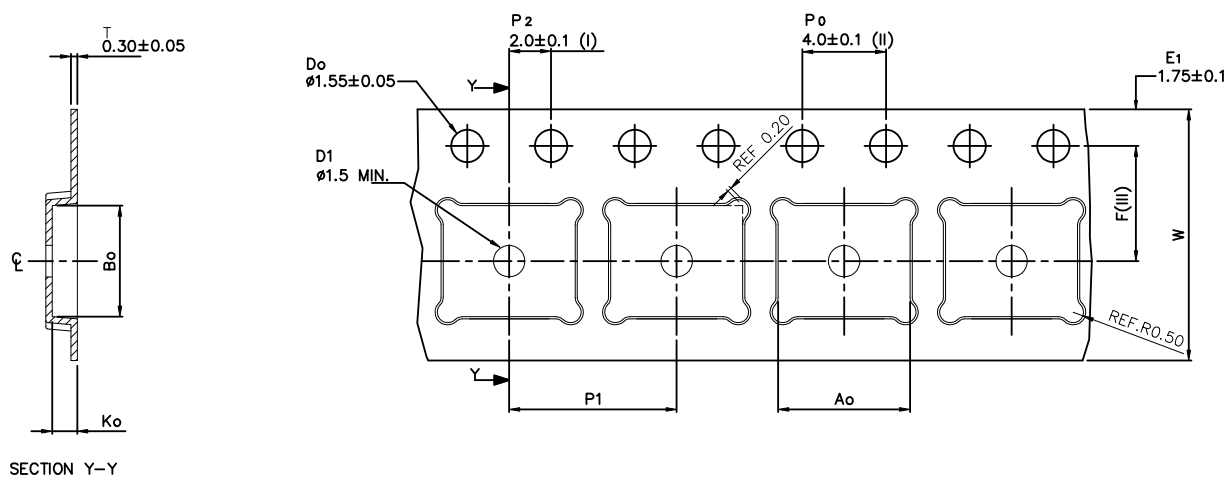
Figure 19. PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)



8231817_FOOTPRINT_simp_Rev_18

4.2 PowerFLAT™ 5x6 packing information

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



Ao	6.30	+/-	0.1
Bo	5.30	+/-	0.1
Ko	1.20	+/-	0.1
F	5.50	+/-	0.1
P1	8.00	+/-	0.1
W	12.00	+/-	0.3

- (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 quantity 3000 pcs
All dimensions are in millimeters

8234350_Tape_rev_C

Figure 21. PowerFLAT™ 5x6 package orientation in carrier tape

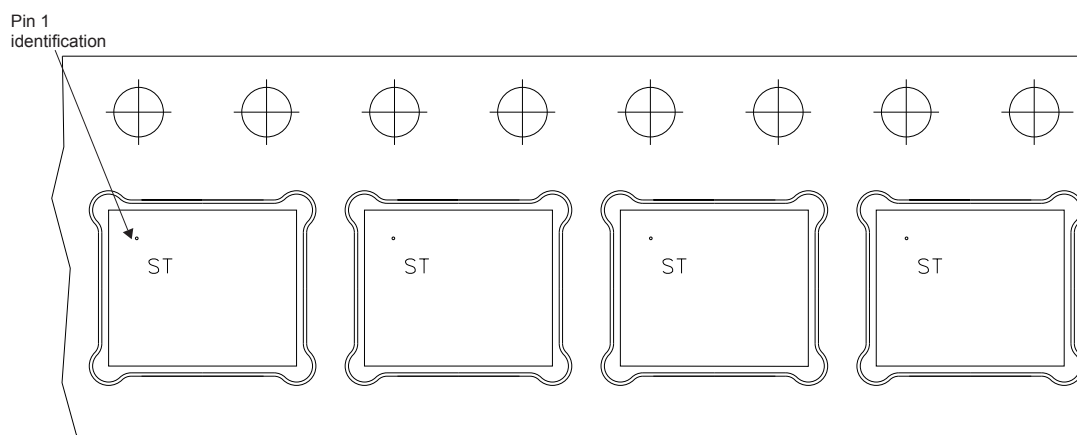
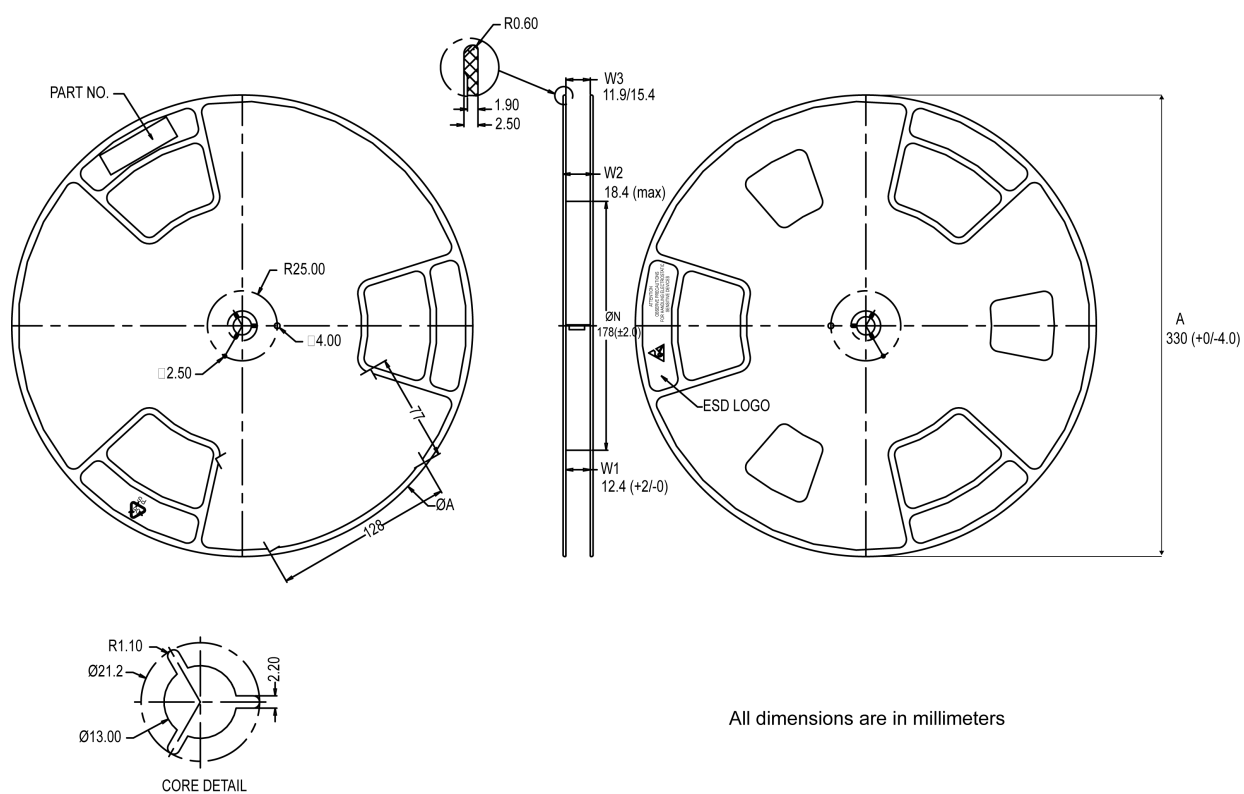


Figure 22. PowerFLAT™ 5x6 reel



8234350_Reel_rev_C

Revision history

Table 8. Document revision history

Date	Version	Changes
21-Jan-2009	1	First release.
08-Sep-2009	2	Document status promoted from preliminary data to datasheet
11-Nov-2010	3	Corrected title in first page $R_{DS(on)}$ max value has been corrected.
03-Apr-2019	4	Modified marking on cover page. Minor text changes.

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