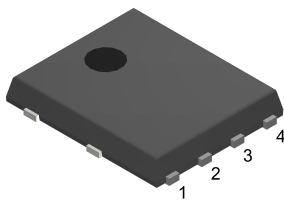
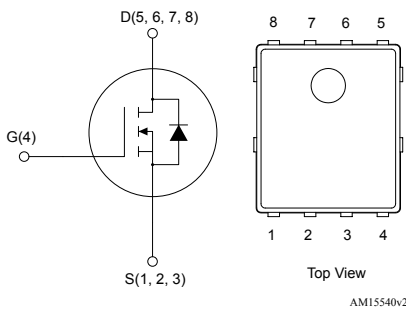


# N-channel 30 V, 1.4 mΩ typ., 35 A STripFET F5 Power MOSFET in a PowerFLAT 5x6 package


**PowerFLAT 5x6**


## Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STL150N3LLH5	30 V	1.75 mΩ	35 A <sup>(1)</sup>

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

- Low on-resistance  $R_{DS(on)}$
- High avalanche ruggedness
- Low gate drive power loss

## Applications

- Switching applications

## Description

This N-channel Power MOSFET is developed using the STripFET F5 technology and has been optimized to achieve very low on-state resistance, contributing to a FoM that is among the best in its class.



### Product status link

[STL150N3LLH5](#)

### Product summary

<b>Order code</b>	STL150N3LLH5
<b>Marking</b>	150N3LH5
<b>Package</b>	PowerFLAT 5x6
<b>Packing</b>	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	$\pm 22$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	195	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	122	
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	35	A
	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	21.8	
$I_{DM}^{(3)}$	Drain current (pulsed)	140	A
$P_{TOT}^{(1)}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	114	W
$P_{TOT}^{(2)}$	Total power dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4	W
$T_{stg}$	Storage temperature range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating junction temperature range		

1. This value is rated according to  $R_{thj-c}$ .
2. This value is rated according to  $R_{thj-pcb}$ .
3. Pulse width is limited by safe operating area.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.1	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	

1. When mounted on a 1-inch<sup>2</sup> FR-4 board, 2oz Cu,  $t < 10\text{ s}$ .

**Table 3. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AV}$	Not-repetitive avalanche current (pulse width limited by $T_J$ max)	17	A
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$ , $I_D = I_{AV}$ , $V_{DD} = 24\text{ V}$ )	300	mJ

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	30			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 30\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 30\text{ V}$ , $T_C = 125\text{ }^{\circ}\text{C}$			10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 22\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1	1.55	2.2	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 17.5\text{ A}$		1.4	1.75	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 17.5\text{ A}$		1.9	2.4	m $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	5800	-	pF
$C_{oss}$	Output capacitance		-	1147	-	
$C_{rss}$	Reverse transfer capacitance		-	127	-	
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 35\text{ A}$ , $V_{GS} = 4.5\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	40	-	nC
$Q_{gs}$	Gate-source charge		-	13.4	-	
$Q_{gd}$	Gate-drain charge		-	14.9	-	
$R_g$	Gate input resistance	$f = 1\text{ MHz}$ , gate DC Bias = $0\text{ V}$ , test signal level = $20\text{ mV}$ , $I_D = 0\text{ V}$	-	1.1	-	$\Omega$

**Table 6. Switching times**

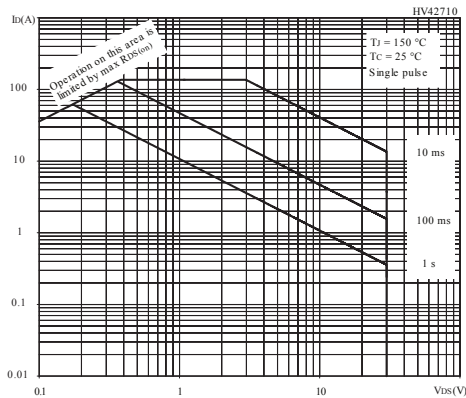
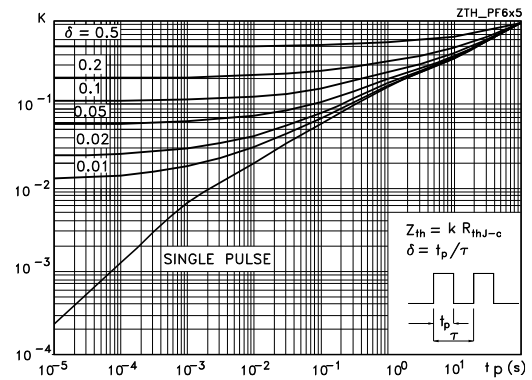
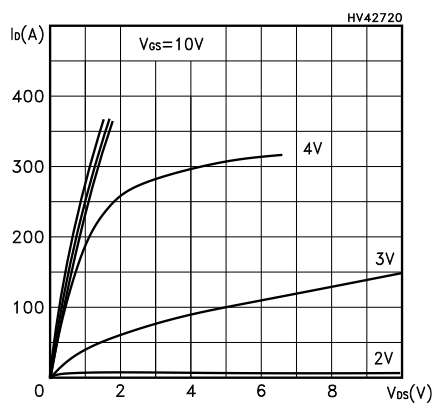
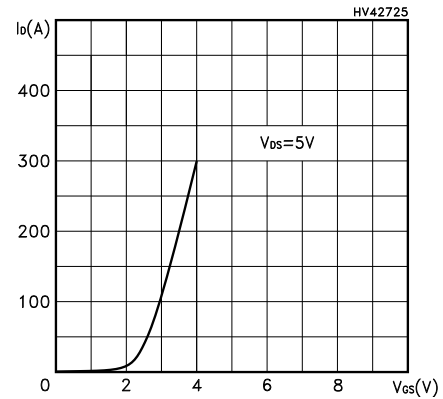
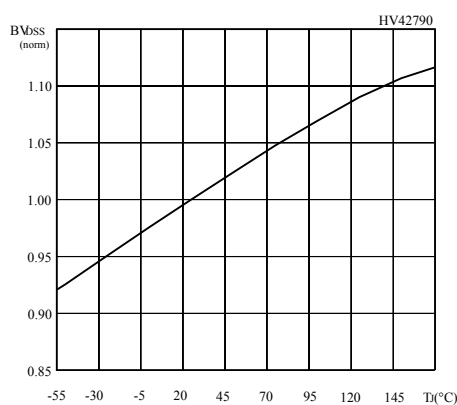
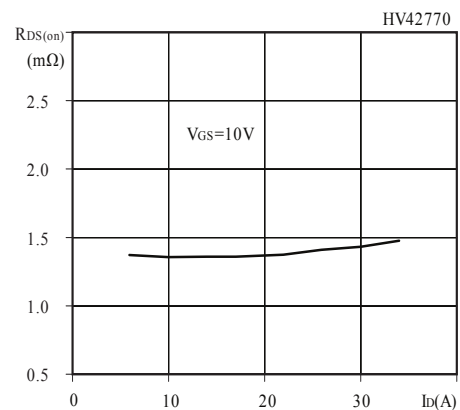
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$ , $I_D = 17.5\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	17.2	-	ns
$t_r$	Rise time		-	30.8	-	
$t_{d(off)}$	Turn-off delay time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	65.8	-	
$t_f$	Fall time		-	47.8	-	

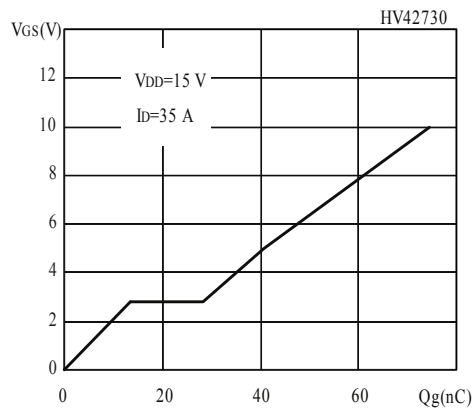
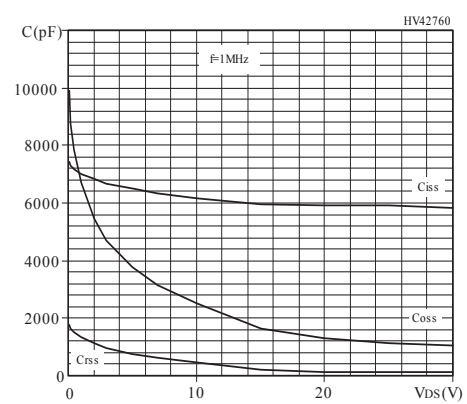
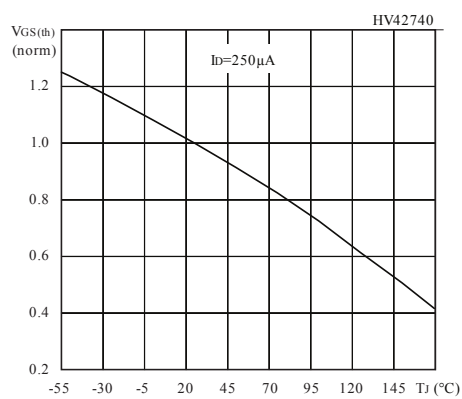
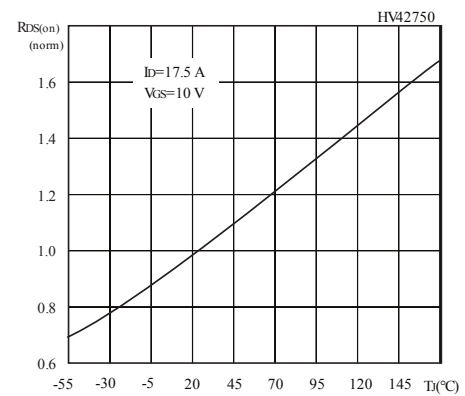
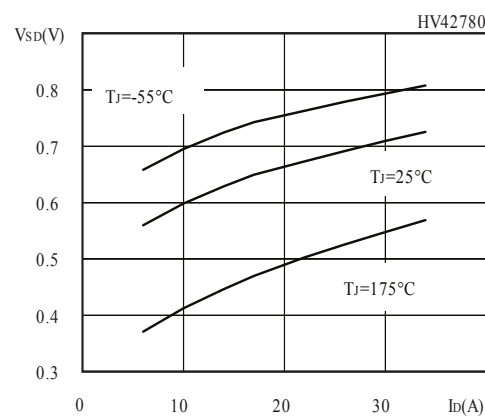
**Table 7. Source-drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		35	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		140	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$ , $I_{SD} = 35\text{ A}$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 35\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 25\text{ V}$ (see <a href="#">Figure 14. Test circuit for inductive load switching and diode recovery times</a> )	-	43.8		ns
$Q_{rr}$	Reverse recovery charge		-	46		nC
$I_{RRM}$	Reverse recovery current		-	2.1		A

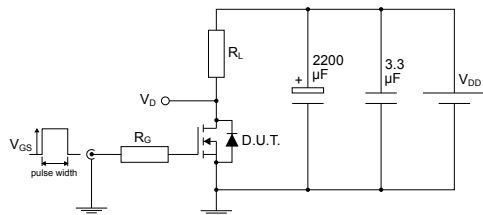
1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

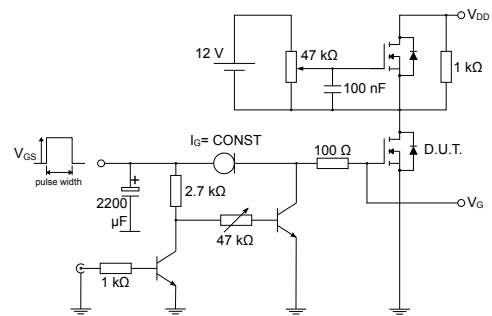
**Figure 1. Safe operating area**

**Figure 2. Thermal impedance**

**Figure 3. Output characteristics**

**Figure 4. Transfer characteristics**

**Figure 5. Normalized  $B_{VDS}$  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**


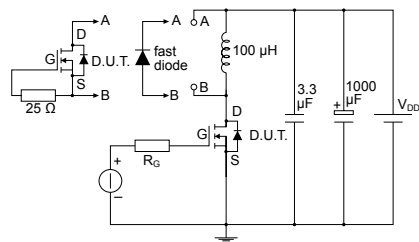
### 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**


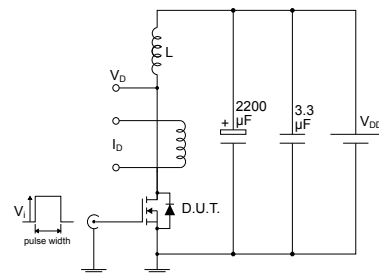
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**Figure 13. Test circuit for gate charge behavior**


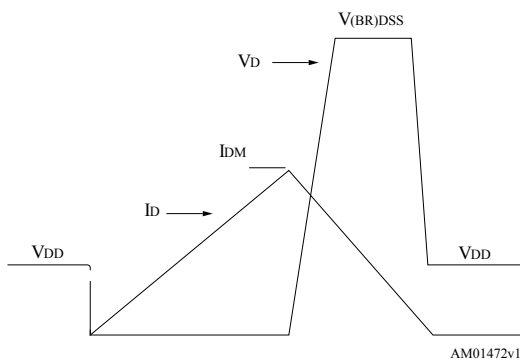
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**Figure 14. Test circuit for inductive load switching and diode recovery times**


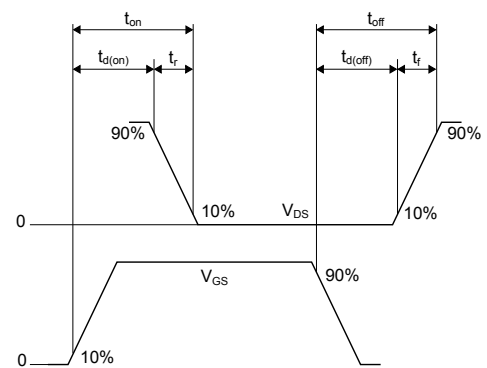
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**Figure 15. Unclamped inductive load test circuit**


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**Figure 16. Unclamped inductive waveform**


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**Figure 17. Switching time waveform**


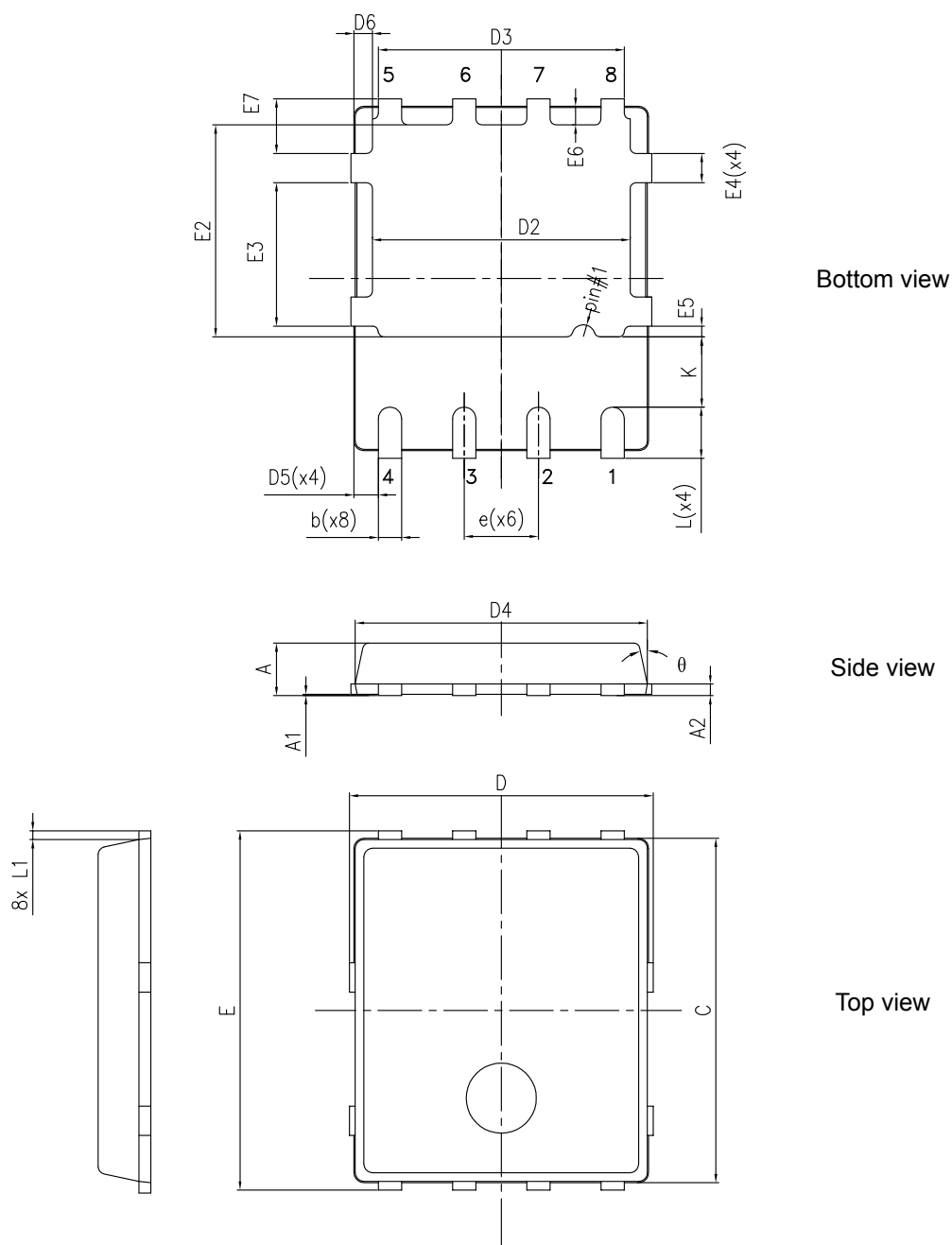
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## 4 Package information

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](http://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\_Rev20

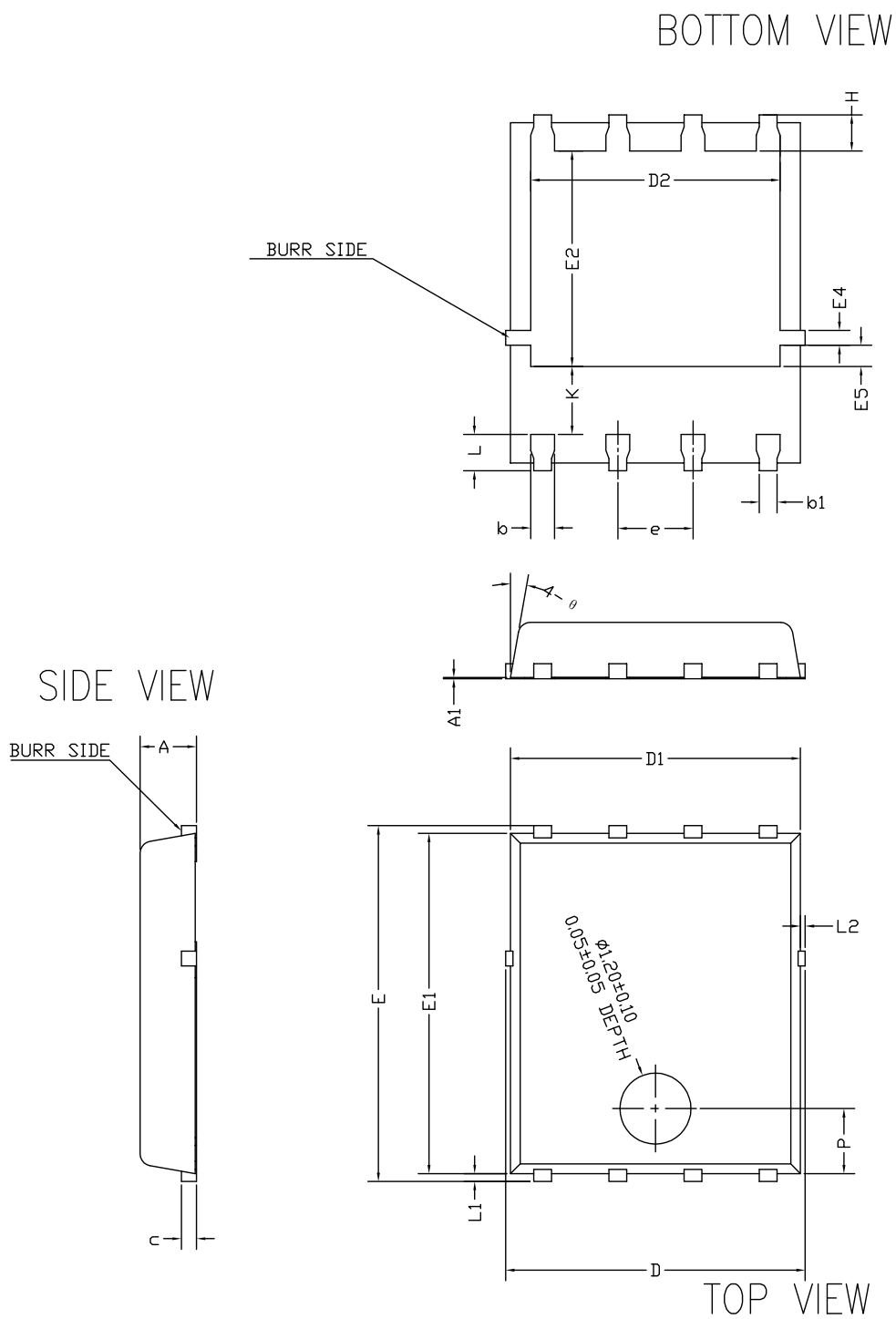


**Table 8. PowerFLAT 5x6 type C package mechanical data**

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°

## 4.2 PowerFLAT 5x6 type C SUBCON package information

Figure 19. PowerFLAT 5x6 type C SUBCON package outline

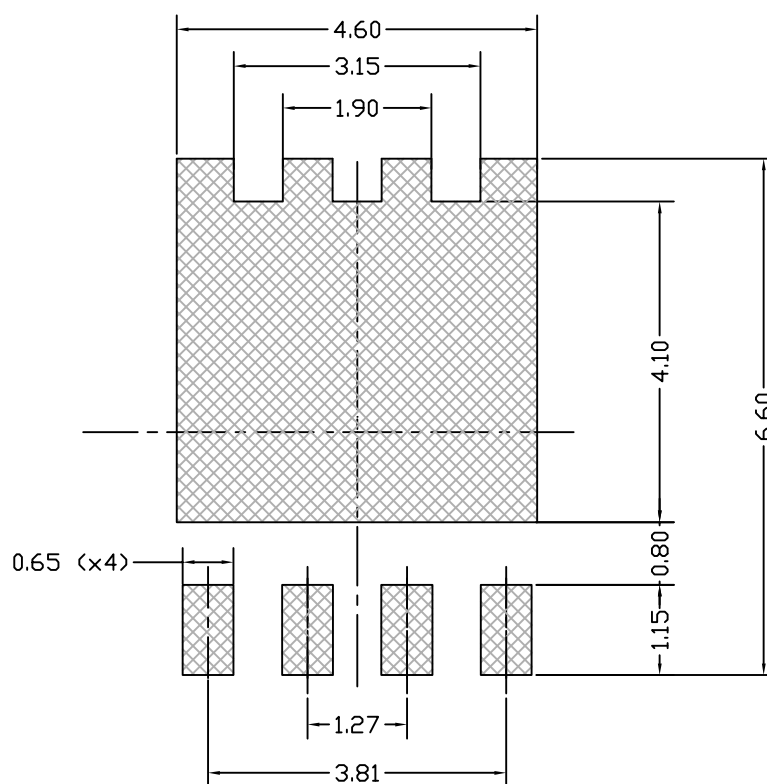


8472137\_SUBCON\_998G\_REV4

**Table 9. PowerFLAT 5x6 type C SUBCON package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	0.90	0.95	1.00
A1		0.02	
b	0.35	0.40	0.45
b1		0.30	
c	0.21	0.25	0.34
D			5.10
D1	4.80	4.90	5.00
D2	4.01	4.21	4.31
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.54	3.64	3.74
E4	0.15	0.25	0.35
E5	0.26	0.36	0.46
H	0.51	0.61	0.71
K	0.95		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2			0.10
P	1.00	1.10	1.20
θ	8°	10°	12°

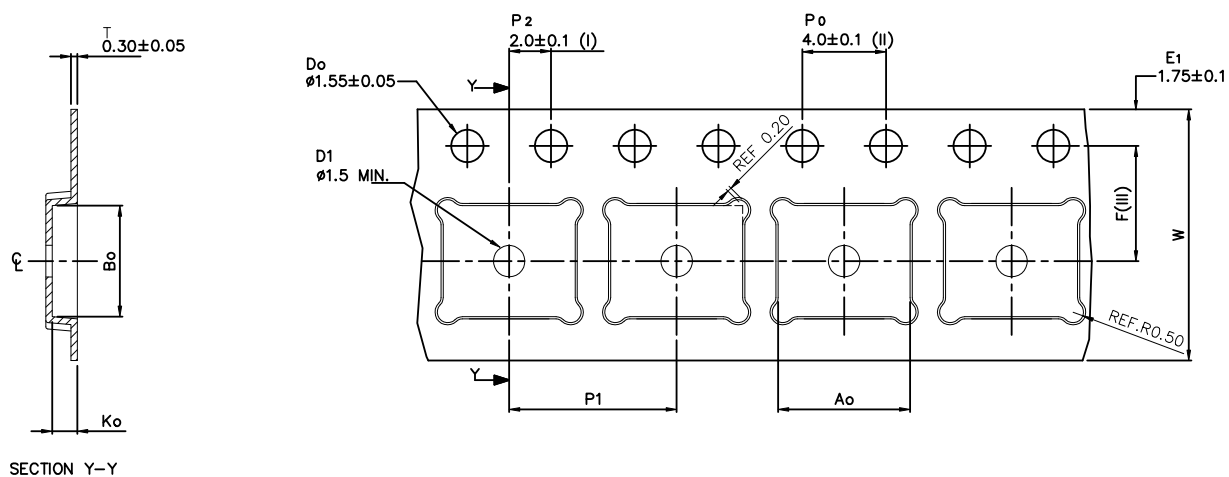
**Figure 20. PowerFLAT 5x6 recommended footprint (dimensions are in mm)**



8231817\_FOOTPRINT\_simp\_Rev\_20

### 4.3 PowerFLAT 5x6 packing information

**Figure 21. 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.

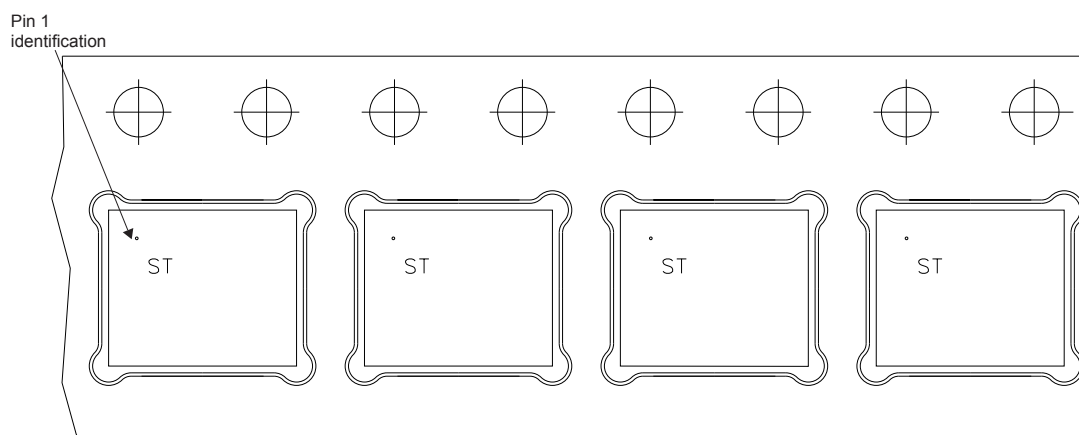
(II) Cumulative tolerance of 10 sprocket holes is  $\pm 0.20$ .

(III) Measured from centreline of sprocket hole to centreline of pocket

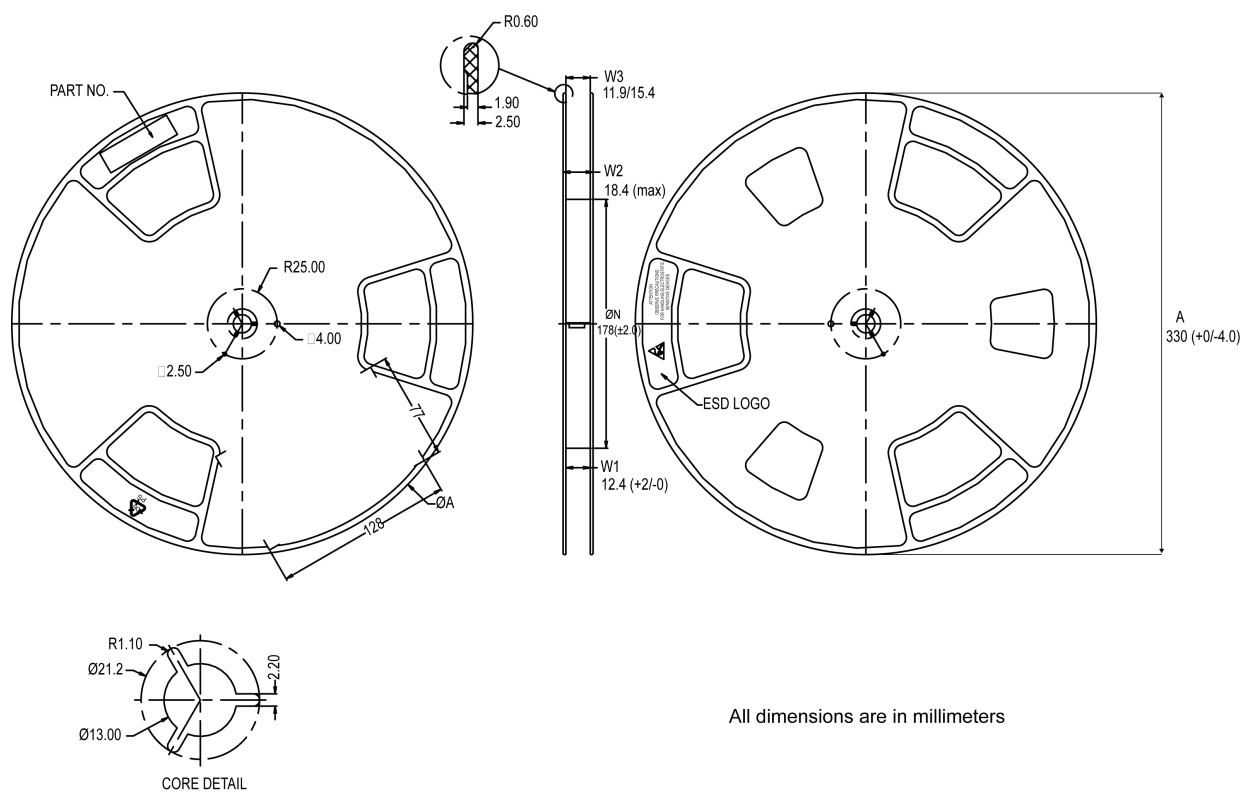
Base and bulk quantity 3000 pcs  
 All dimensions are in millimeters

8234350\_Tape\_rev\_C

**Figure 22. PowerFLAT 5x6 package orientation in carrier tape**



**Figure 23. PowerFLAT 5x6 reel**



All dimensions are in millimeters

8234350\_Reel\_rev\_C

## Revision history

**Table 10. Document revision history**

Date	Revision	Changes
22-Oct-2007	1	First release
01-Apr-2008	2	Document status promoted from preliminary data to datasheet
23-Sep-2008	3	$V_{GS}$ value has been changed on <i>Table 2</i> and <i>Table 5</i>
24-Jan-2020	4	$V_{GS(th)}$ value has been changed on <i>Table 5</i>
12-Jun-2009	5	<i>Section 4: Package mechanical data</i> has been updated. Minor text changes.
05-Oct-2011	6	– Modified: <i>Figure 1</i> and marking in <i>Table 1</i> – Modified: $I_D$ value in <i>Figure 11</i> – Updated: <i>Figure 13, 14, 15</i> and <i>16</i> – Updated: <i>Section 4: Package mechanical data</i>
12-Feb-2020	7	Updated <a href="#">Section 4 Package information</a> . Minor text changes.

## Contents

<b>1</b>	<b>Electrical ratings .....</b>	<b>2</b>
<b>2</b>	<b>Electrical characteristics.....</b>	<b>3</b>
2.1	Electrical characteristics (curves) .....	5
<b>3</b>	<b>Test circuits .....</b>	<b>7</b>
<b>4</b>	<b>Package information.....</b>	<b>8</b>
4.1	PowerFLAT 5x6 type C package information.....	8
4.2	PowerFLAT 5x6 type C SUBCON package information.....	9
4.3	PowerFLAT 5x6 packing information .....	12
	<b>Revision history .....</b>	<b>15</b>



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