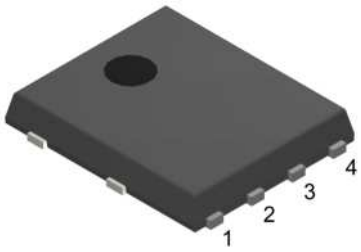
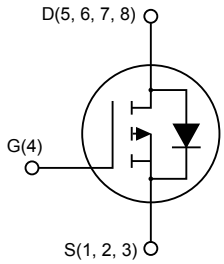
STL42P6LLF6

Datasheet

P-channel -60 V, 23 mΩ typ., -42 A STripFET F6 Power MOSFET in a PowerFLAT 5x6 package



PowerFLAT™ 5x6



AM01475v4

Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STL42P6LLF6	-60 V	26 mΩ	-42 A

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

Applications

- Switching applications

Description

This device is a P-channel Power MOSFET developed using the STripFET F6 technology, with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

Product status
STL42P6LLF6

Product summary	
Order code	STL42P6LLF6
Marking	42P6LLF6
Package	PowerFLAT 5x6
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	-60	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	-42	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	-30	A
I_D (1) (3)	Drain current (pulsed)	-168	A
I_D (2)	Drain current (continuous) at T_{pcb}= 25 °C	-9	A
I_D (2)	Drain current (continuous) at T_{pcb}= 100 °C	-6.6	A
I_{DM} (3) (2)	Drain current (pulsed)	-36	A
P_{TOT} (1)	Total power dissipation at T_C = 25 °C	100	W
P_{TOT} (2)	Total power dissipation at T_{pcb}= 25 °C	4.8	W
T_{stg}	Storage temperature range	-55 to 175	°C
T_j	Operating junction temperature range		

1. *The value is rated by $R_{thj\text{-}case}$.*
2. *The value is rated by $R_{thj\text{-}pcb}$.*
3. *Pulse width is limited by safe operating area.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	1.5	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb	31.3	°C/W

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

2 Electrical characteristics

(T_C= 25 °C unless otherwise specified)

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = -250 µA	-60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = -60 V			-1	µA
		V_{GS} = 0 V, V_{DS} = -60 V, T_C = 125 °C(1)			-10	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = ± 20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = -250 µA	-1		-2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = -10 V, I_D = -4.5 A		23	26	mΩ
		V_{GS} = -4.5 V, I_D= -4.5 A		28	34	

1. *Defined by design, not subject to production testing*

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = -25 V, f = 1 MHz, V_{GS} = 0 V	-	3780	-	pF
C_{oss}	Output capacitance		-	262	-	pF
C_{rss}	Reverse transfer capacitance		-	170	-	pF
Q_g	Total gate charge	V_{DD} = -30 V, I_D = -9 A, V_{GS} = -4.5 V (see Figure 13. Gate charge test circuit)	-	30	-	nC
Q_{gs}	Gate-source charge		-	10.8	-	nC
Q_{gd}	Gate-drain charge		-	10.5	-	nC
R_G	Gate input resistance	I_D = 0 A, f = 1 MHz	-	1.7	-	Ω

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = -30 V, I_D = -4.5 A, R_G = 4.7 Ω, V_{GS} = -10 V (see Figure 12. Switching times test circuit for resistive load)	-	51.4	-	ns
t_r	Rise time		-	39	-	ns
$t_{d(off)}$	Turn-off-delay time		-	171	-	ns
t_f	Fall time		-	21	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-42		A
I_{SDM} (1)	Source-drain current (pulsed)		-	-168		A
V_{SD} (2)	Forward on voltage	V_{GS} = 0 V, I_{SD} = -9 A	-		-1.1	V
t_{rr}	Reverse recovery time	I_{SD} = -9 A, di/dt = 100 A/µs, V_{DD} = -4.8 V, T_j = 150 °C (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	34		ns
Q_{rr}	Reverse recovery charge		-	48		nC
I_{RRM}	Reverse recovery current		-	-2.8		A

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

2.1 Electrical characteristics (curves)

Note: For the P-channel Power MOSFET, current polarity of voltages and current have to be reversed.

Figure 1. Safe operating area

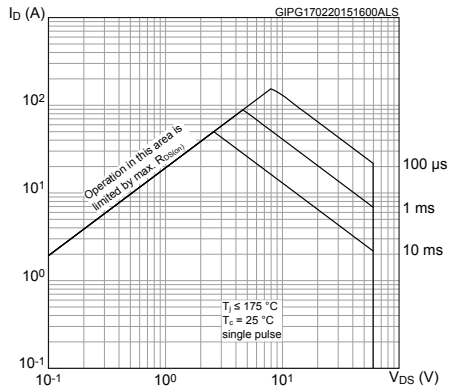


Figure 2. Thermal impedance

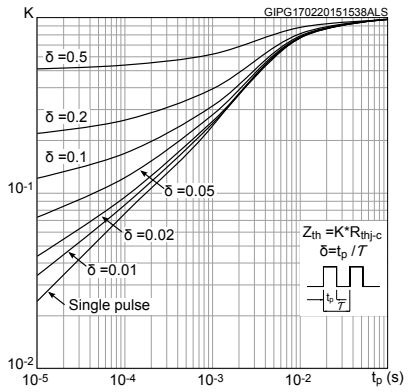


Figure 3. Output characteristics

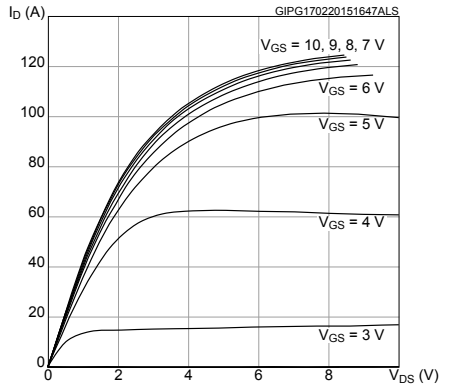


Figure 4. Transfer characteristics

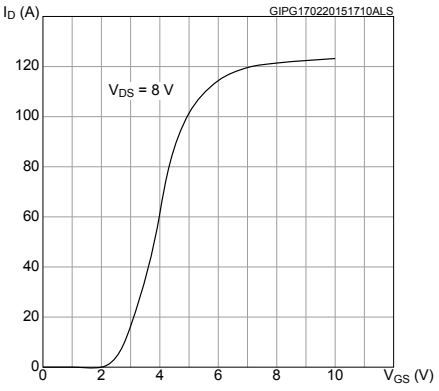


Figure 5. Normalized gate threshold voltage vs temperature

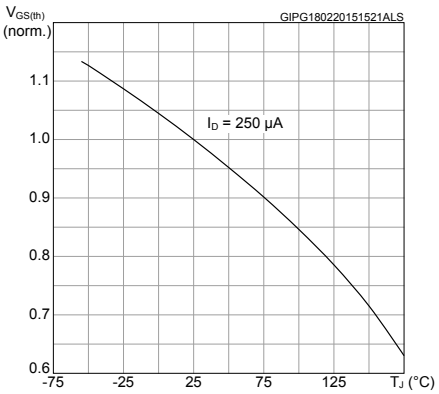


Figure 6. Normalized $V_{(BR)DSS}$ vs temperature

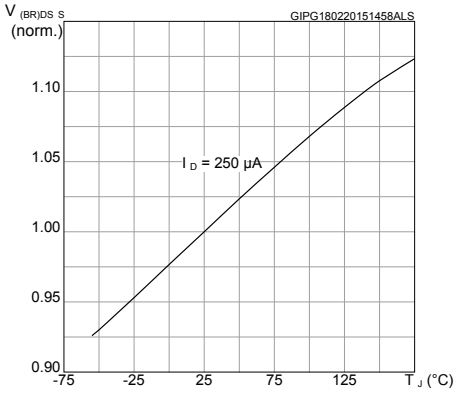


Figure 7. Static drain-source on-resistance

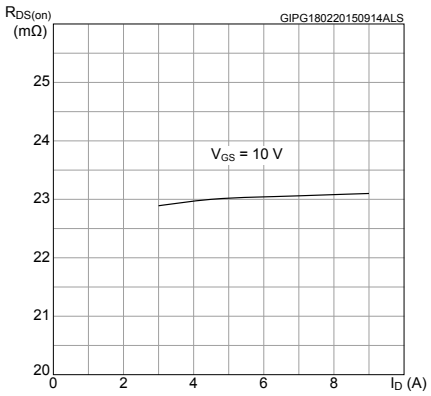


Figure 8. Normalized on-resistance vs. temperature

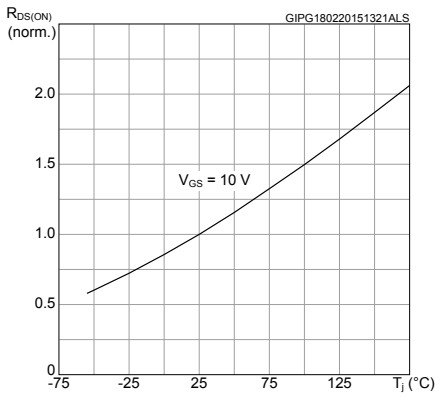


Figure 9. Gate charge vs gate-source voltage

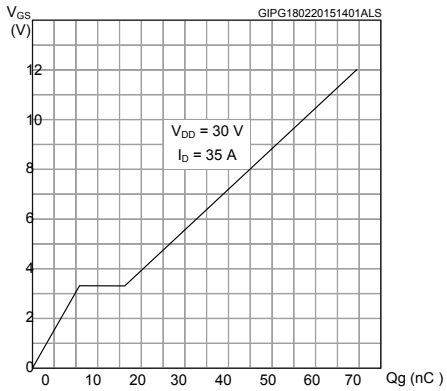


Figure 10. Capacitance variations voltage

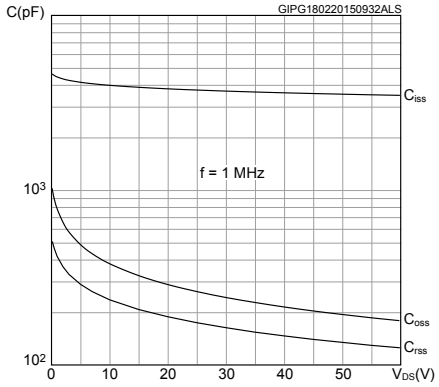
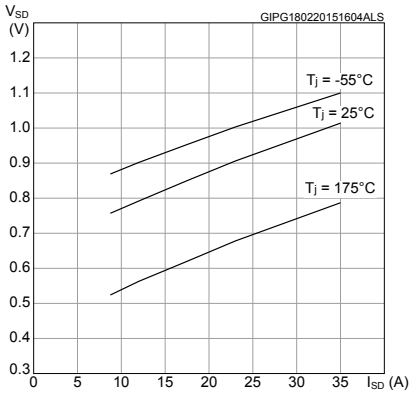


Figure 11. Source-drain diode forward characteristics



3 Test circuits

Figure 12. Switching times test circuit for resistive load

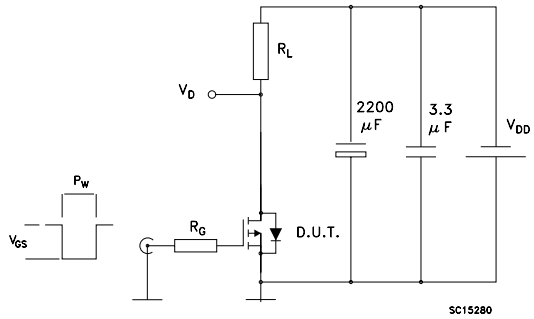


Figure 13. Gate charge test circuit

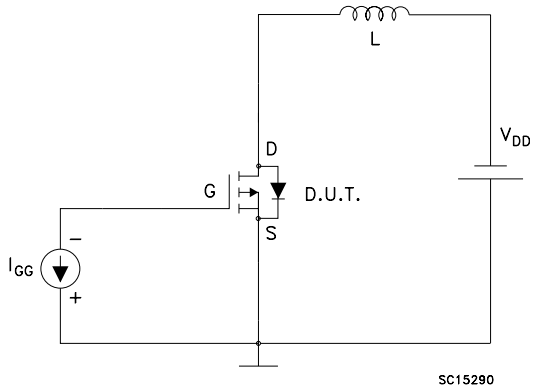
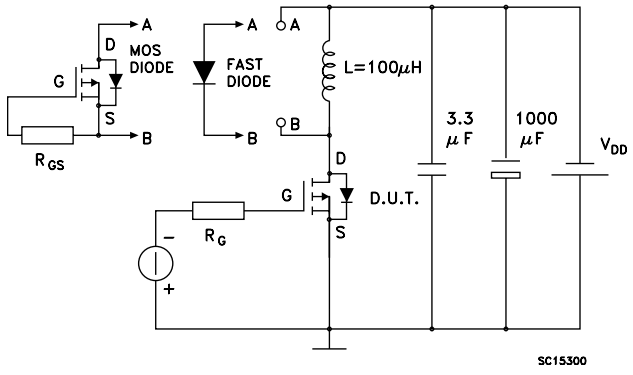


Figure 14. Test circuit for inductive load switching and diode recovery times

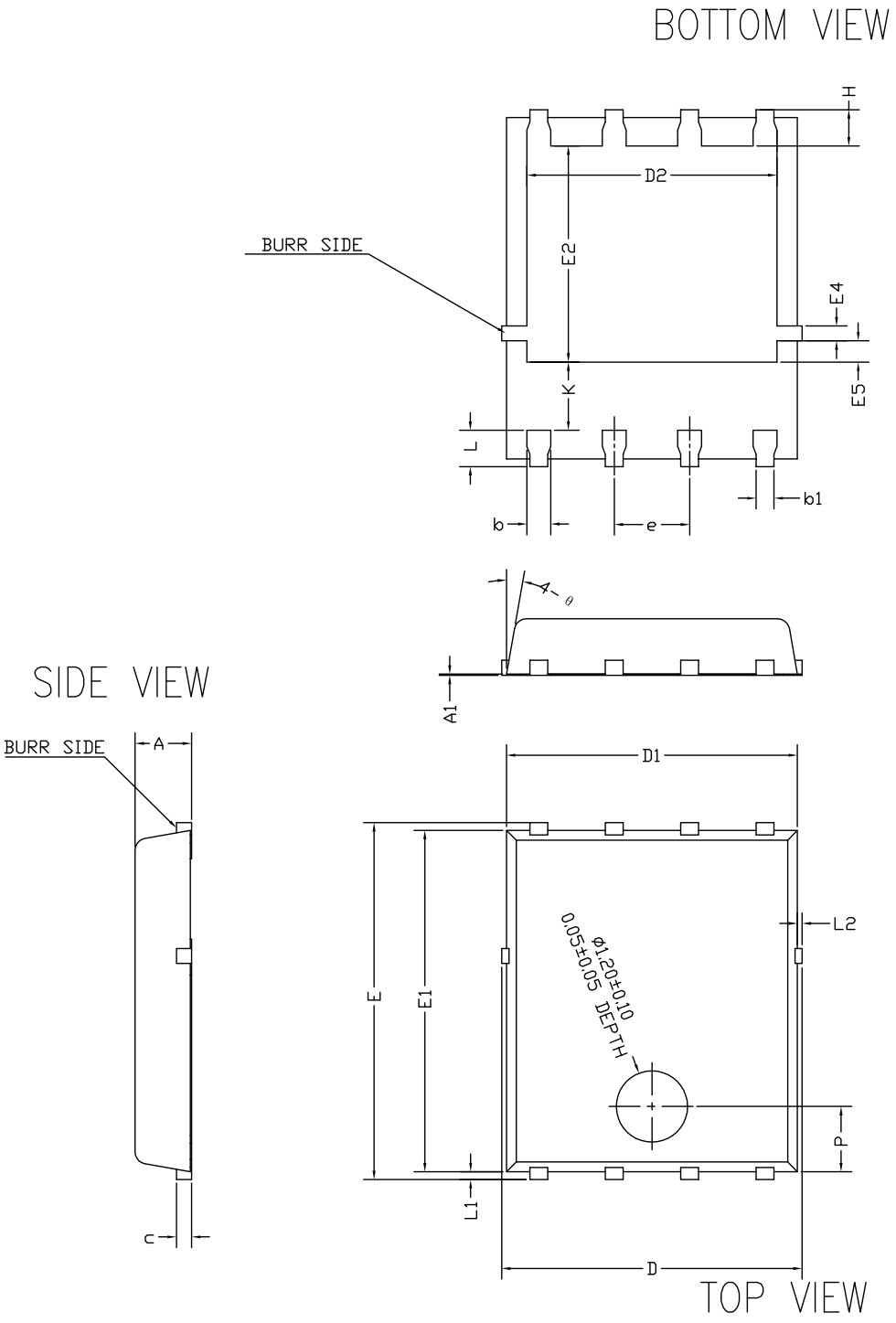


4 Package information

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 SUBCON package information

Figure 15. **PowerFLAT 5x6 type C SUBCON package outline**



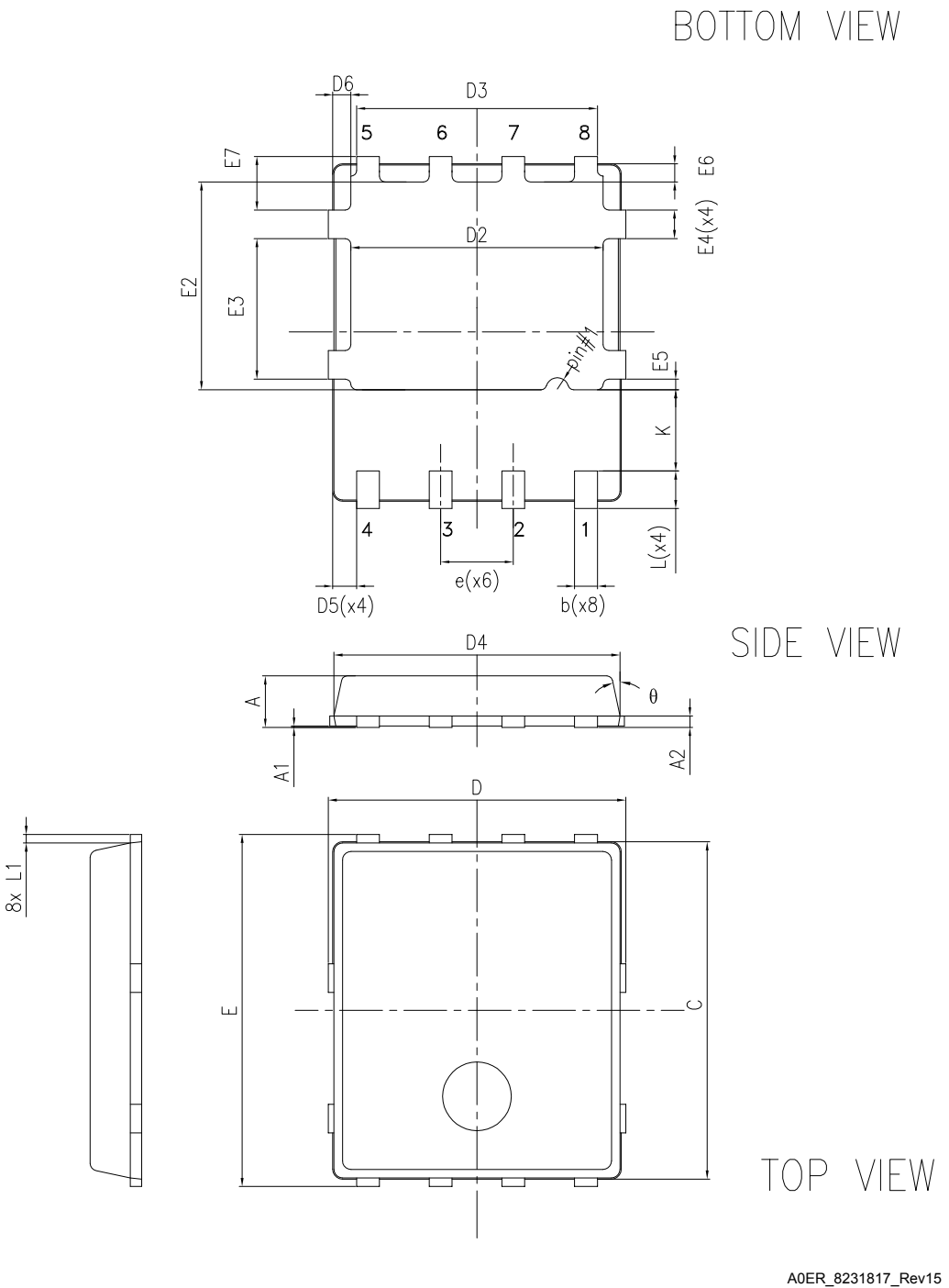
8472137_SUBCON_998G_REV4

Table 7. 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°

4.2 PowerFLAT 5x6 type R package information

Figure 16. PowerFLAT 5x6 type R package outline

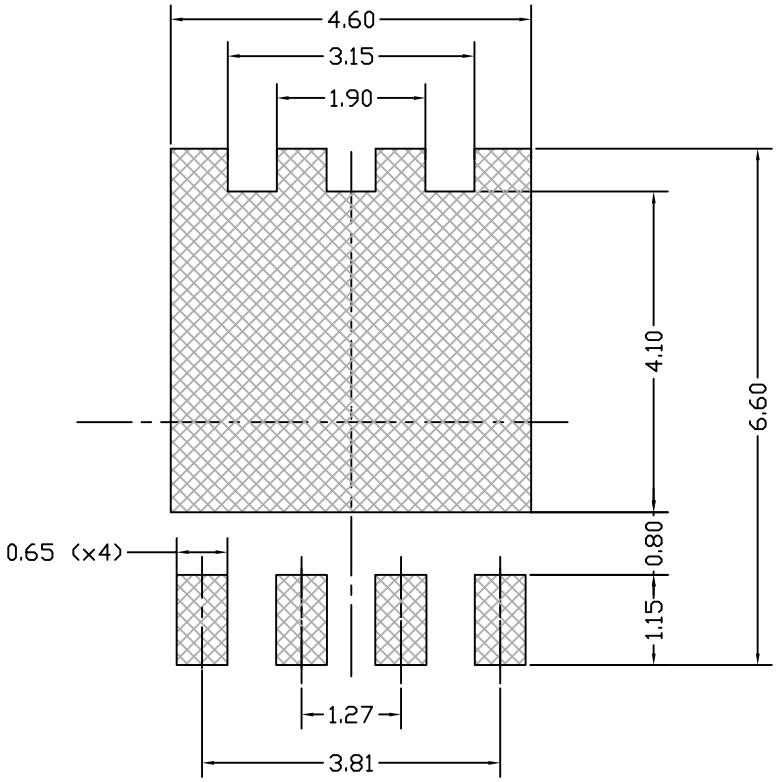


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Table 8. **PowerFLAT 5x6 type R mechanical data**

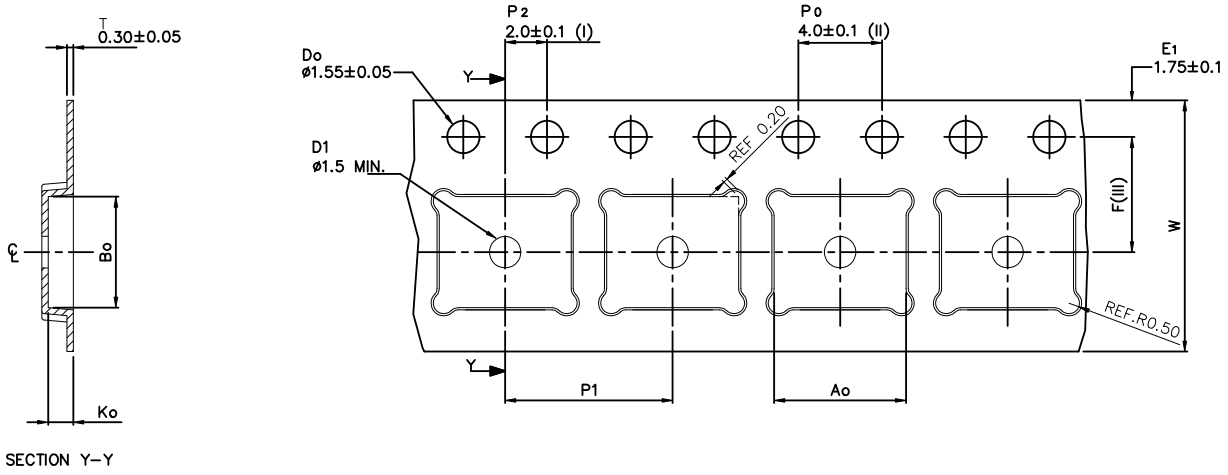
Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
C	5.80	6.00	6.20
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.20
D5	0.25	0.40	0.55
D6	0.15	0.30	0.45
e		1.27	
E	5.95	6.15	6.35
E2	3.50		3.70
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28
E6	0.20	0.325	0.45
E7	0.75	0.90	1.05
K	1.275		1.575
L	0.60		0.80
L1	0.05	0.15	0.25
θ	0°		12°

Figure 17. **PowerFLAT 5x6 recommended footprint (dimensions are in mm)**



4.3 PowerFLAT 5x6 packing information

Figure 18. 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 19. PowerFLAT 5x6 package orientation in carrier tape

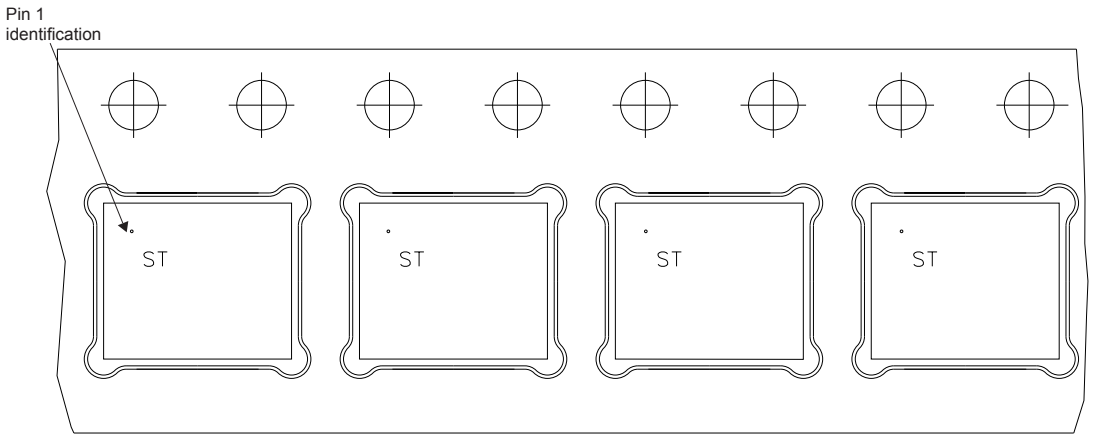
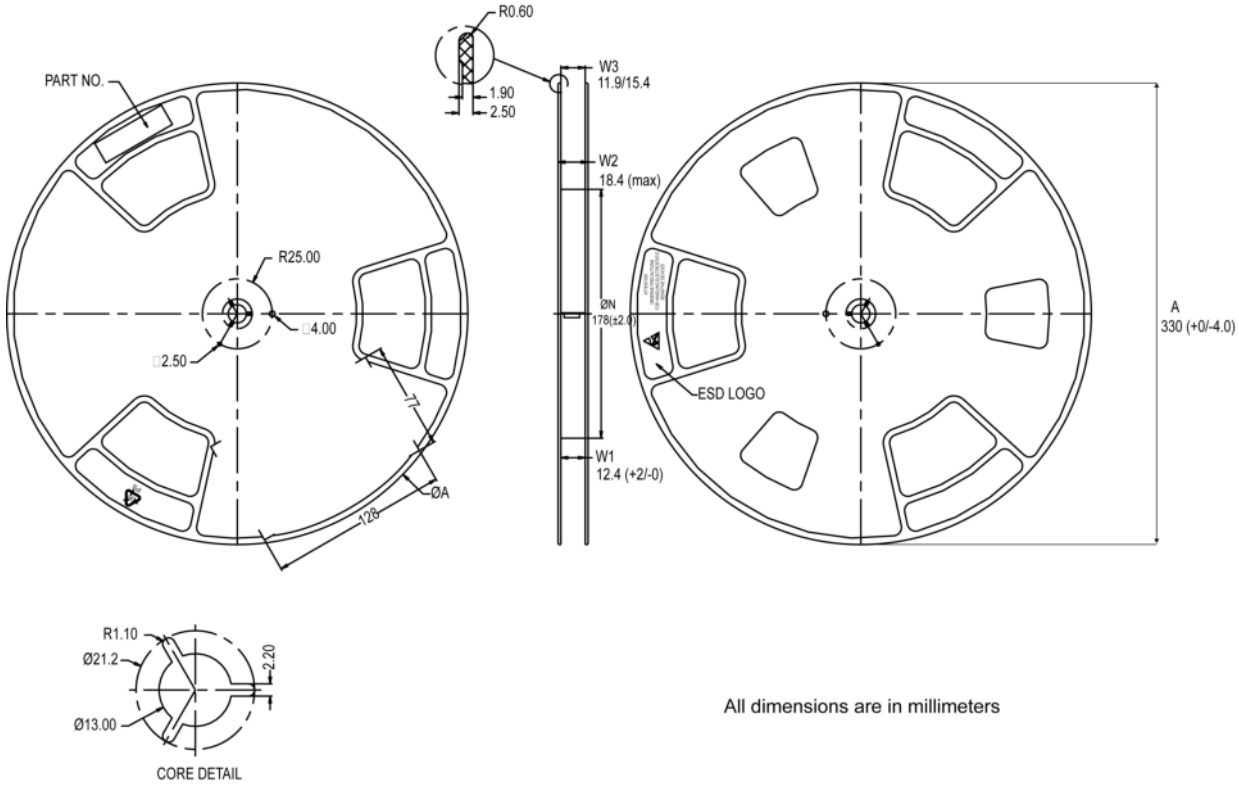


Figure 20. **PowerFLAT 5x6 reel**



Revision history

Table 9. Document revision history

Date	Revision	Changes
28-Oct-2013	1	First release.
25-Aug-2014	2	Modified: *Figure 1: "Internal schematic diagram"* Updated: *Section 10: "Package mechanical data"* Minor text changes
24-Feb-2015	3	In title description on cover page, changed 0.02 Ω to 0.023 Ω In features table on cover page, changed 0.028 Ω to 0.026 Ω Updated *Table 2: Absolute maximum ratings* Updated *Table 4: Static* – renamed table and updated Static drain-source on-resistance values Updated *Table 5: Dynamic* – test conditions and all typical values Updated *Table 6: Switching times* – test conditions and all typical values Updated *Table 7: Source-drain diode* – test conditions and all typical values Added *Section 2.2: Electrical characteristics (curves)* Updated *Section 4: Package mechanical data* Minor text changes
15-Nov-2016	4	Updated title, features table and description on cover page Updated *Table 2: "Absolute maximum ratings"* Updated *Table 4: "Static", Table 5: "Dynamic", Table 6: "Switchingtimes"* and T*able 7: "Source drain diode"* Updated *Figure 9: "Normalized on-resistance vs. temperature"* Updated *Section 4.1: "PowerFLAT™ 5x6 type R package information"* Minor text changes
19-Nov-2019	5	Added: Section 4.1 PowerFLAT 5x6 type C SUBCON package information. Minor text changes.

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