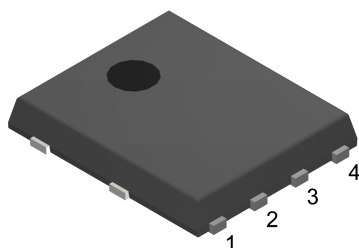
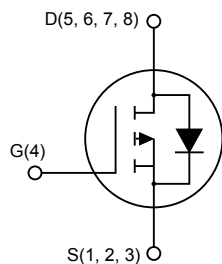


P-channel -60 V, 23 mΩ typ., -42 A STripFET F6 Power MOSFET in a PowerFLAT 5x6 package



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 $T_C = 25\text{ }^\circ\text{C}$	-42	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	-30	A
$I_D^{(1)(3)}$	Drain current (pulsed)	-168	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	-9	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	-6.6	A
$I_{DM}^{(3)(2)}$	Drain current (pulsed)	-36	A
$P_{TOT}^{(1)}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	100	W
$P_{TOT}^{(2)}$	Total power dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	W
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature range		

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

Table 2. Thermal data

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

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

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	-60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = -60\text{ V}$			-1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = -60\text{ V}$, $T_C = 125\text{ °C}^{(1)}$			-10	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	-1		-2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = -10\text{ V}$, $I_D = -4.5\text{ A}$		23	26	m Ω
		$V_{GS} = -4.5\text{ V}$, $I_D = -4.5\text{ A}$		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	$V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	3780	-	pF
C_{oss}	Output capacitance		-	262	-	pF
C_{rss}	Reverse transfer capacitance		-	170	-	pF
Q_g	Total gate charge	$V_{DD} = -30\text{ V}$, $I_D = -9\text{ A}$, $V_{GS} = -4.5\text{ V}$ (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	$I_D = 0\text{ A}$, $f = 1\text{ MHz}$	-	1.7	-	Ω

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = -30\text{ V}$, $I_D = -4.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = -10\text{ V}$ (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	$V_{GS} = 0\text{ V}$, $I_{SD} = -9\text{ A}$	-		-1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = -9\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = -4.8\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (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

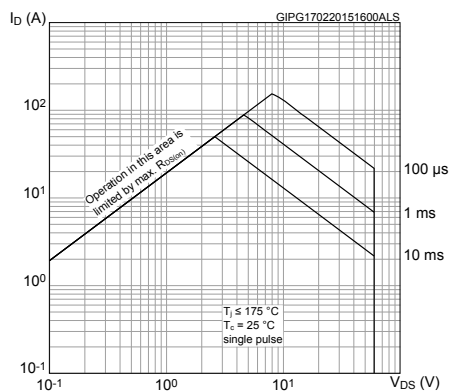


Figure 2. Thermal impedance

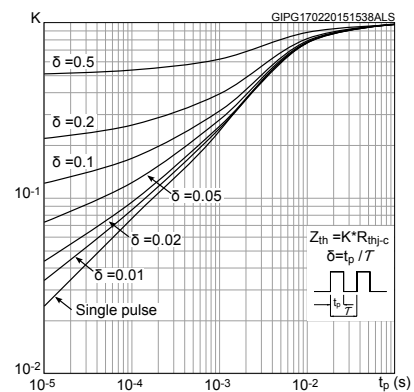


Figure 3. Output characteristics

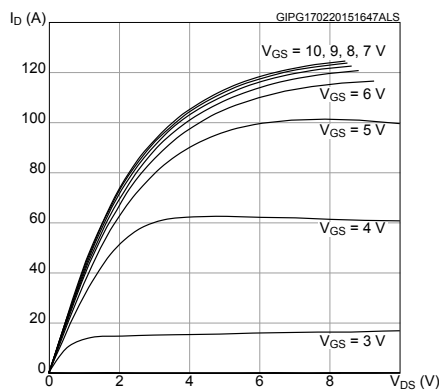


Figure 4. Transfer characteristics

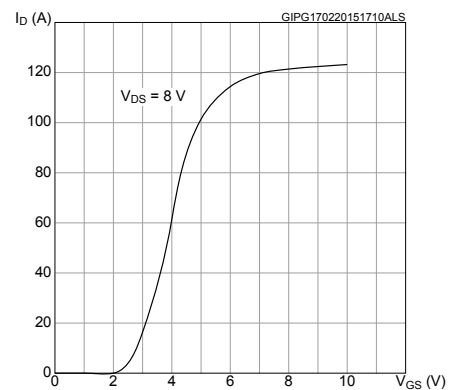


Figure 5. Normalized gate threshold voltage vs temperature

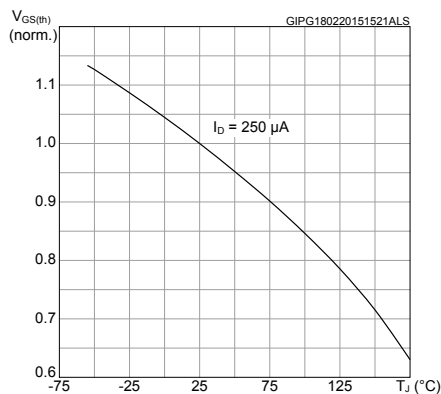


Figure 6. Normalized $V_{(BR)DSS}$ vs temperature

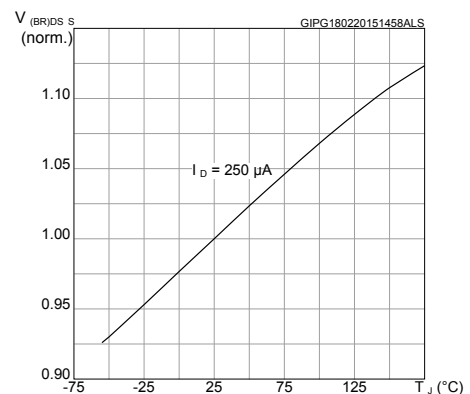
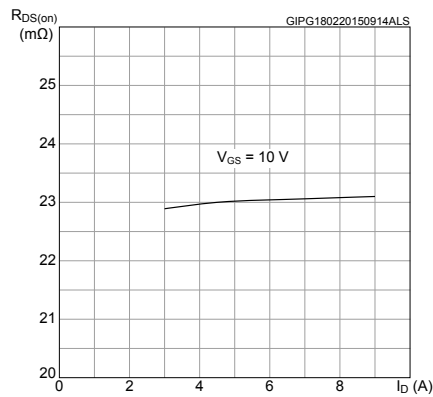
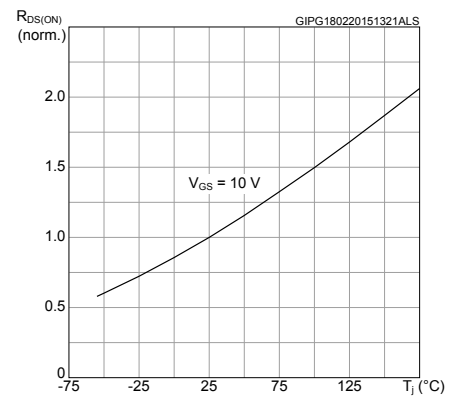
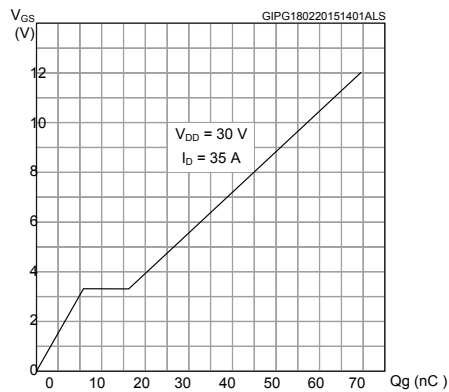
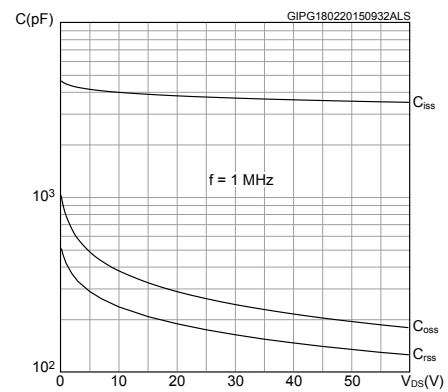
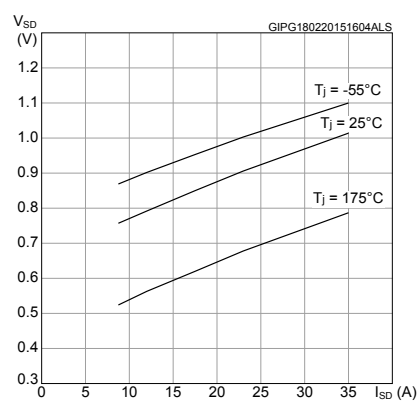


Figure 7. Static drain-source on-resistance

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

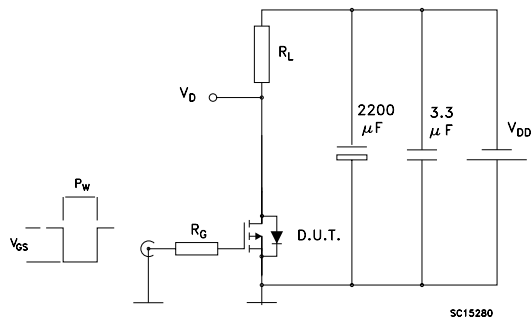


Figure 13. Gate charge test circuit

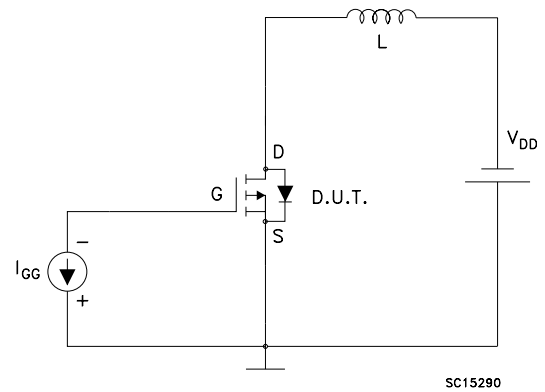
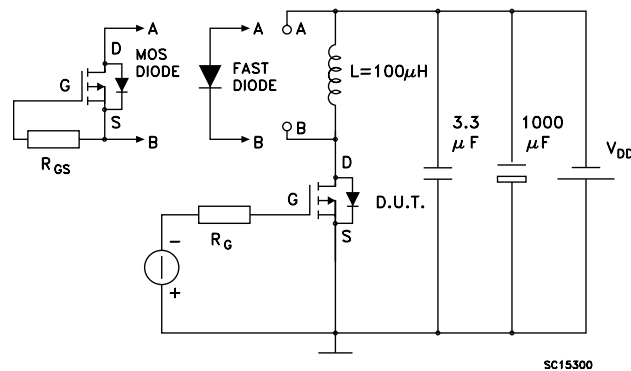


Figure 14. Test circuit for inductive load switching and diode recovery times

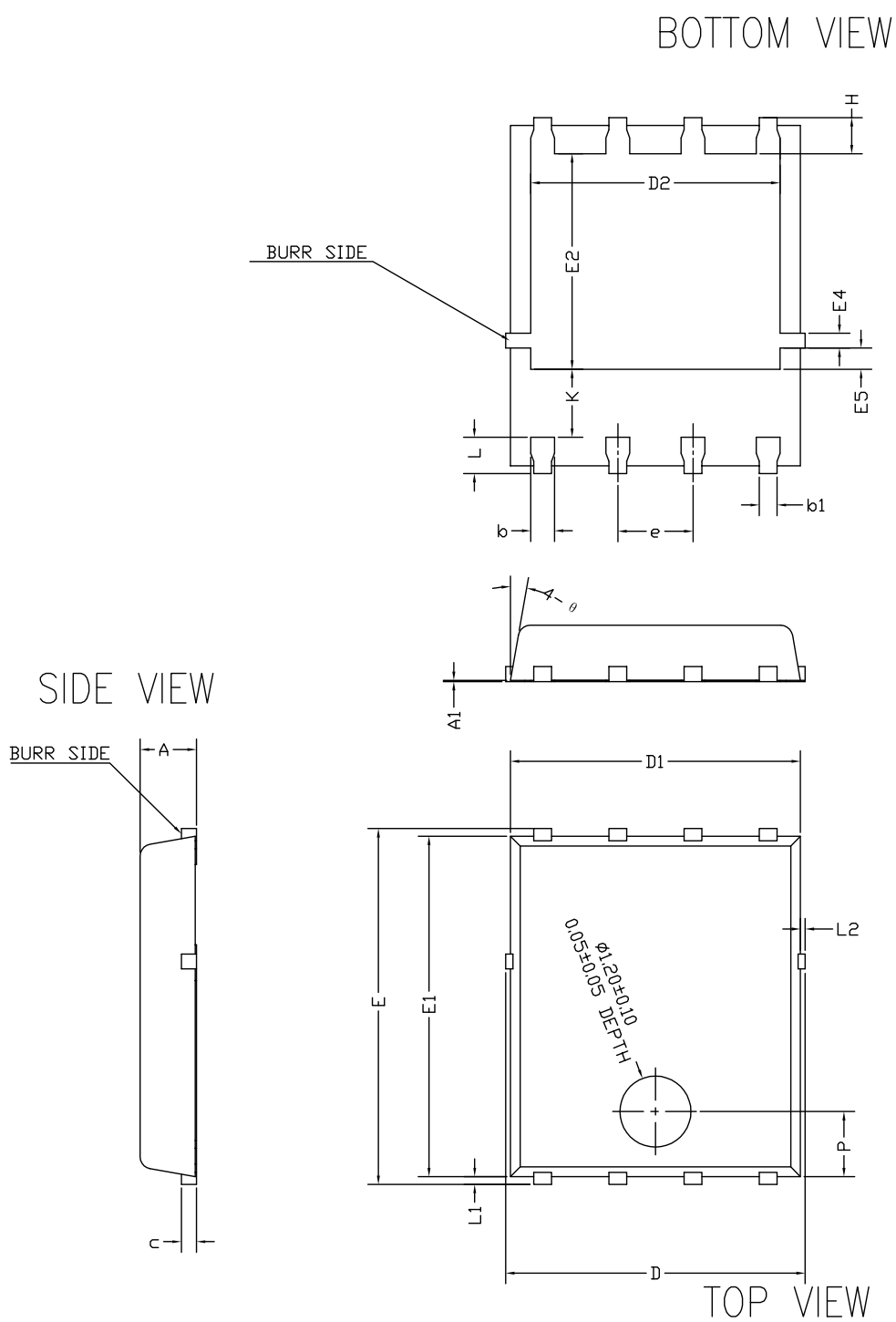


4 Package information

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



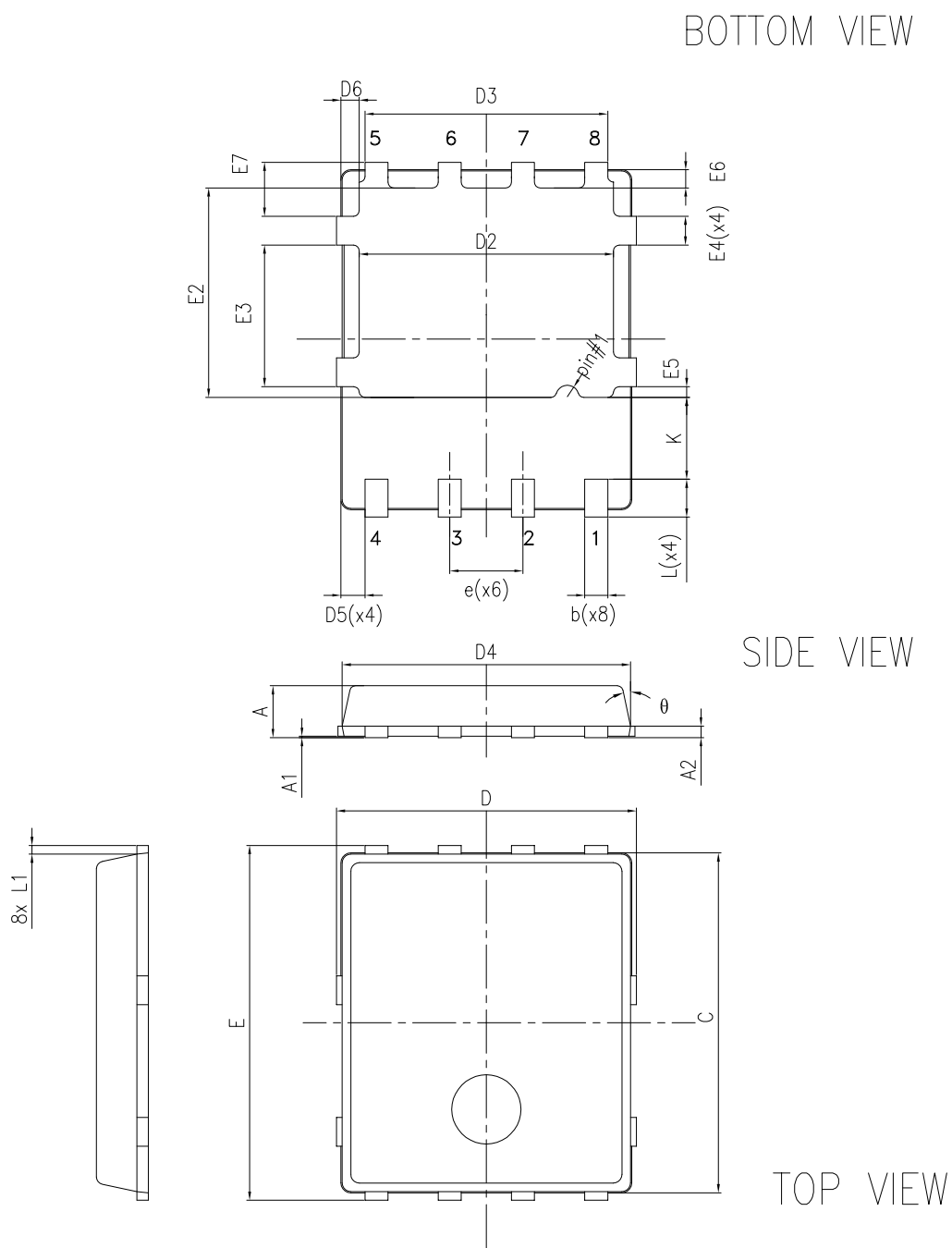
8472137_SUBCON_998G_REV4

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



A0ER_8231817_Rev15

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°

Technical drawing of a mechanical part, showing front and side views with dimensions.

Front View (Top):

- Overall width: 4.60
- Width of the central slot: 1.90
- Width of the side flanges: 3.15
- Height of the main body: 4.10
- Height of the side flanges: 0.80
- Overall height: 5.60

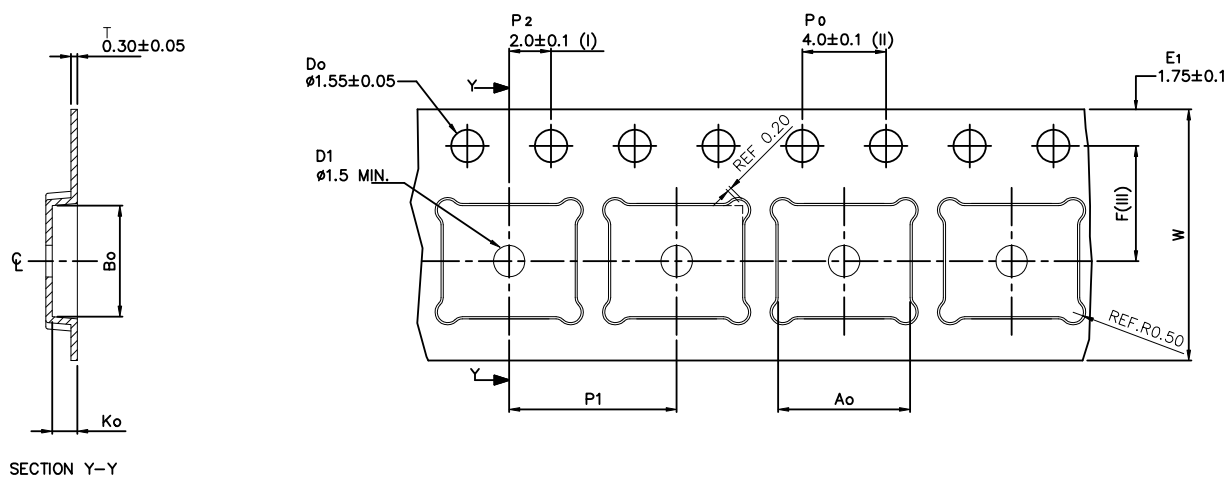
Side View (Bottom):

- Overall width: 3.81
- Width of the central slot: 1.27
- Width of the side flanges: 0.65 (x4)
- Height of the main body: 1.15

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4.3 PowerFLAT 5x6 packing information

Figure 18. PowerFLAT 5x6 tape (dimensions are in mm)



A0	6.30 +/– 0.1
B0	5.30 +/– 0.1
K0	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

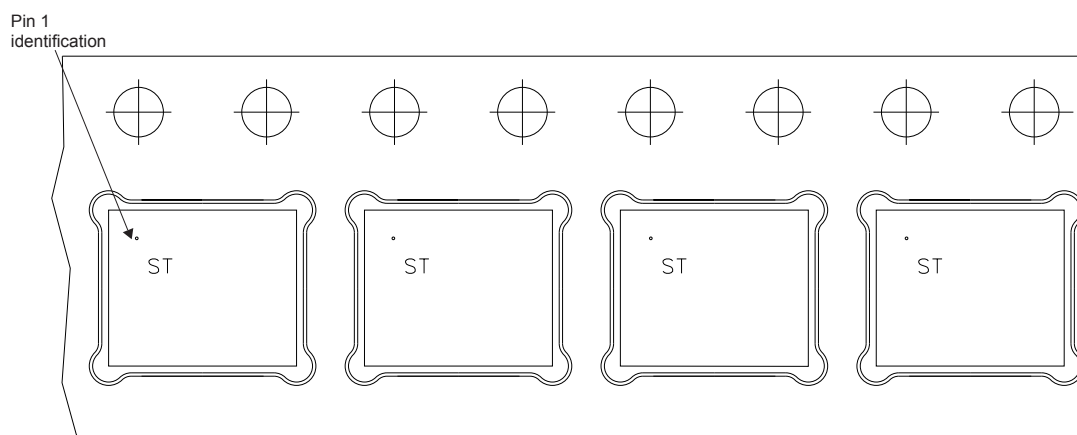
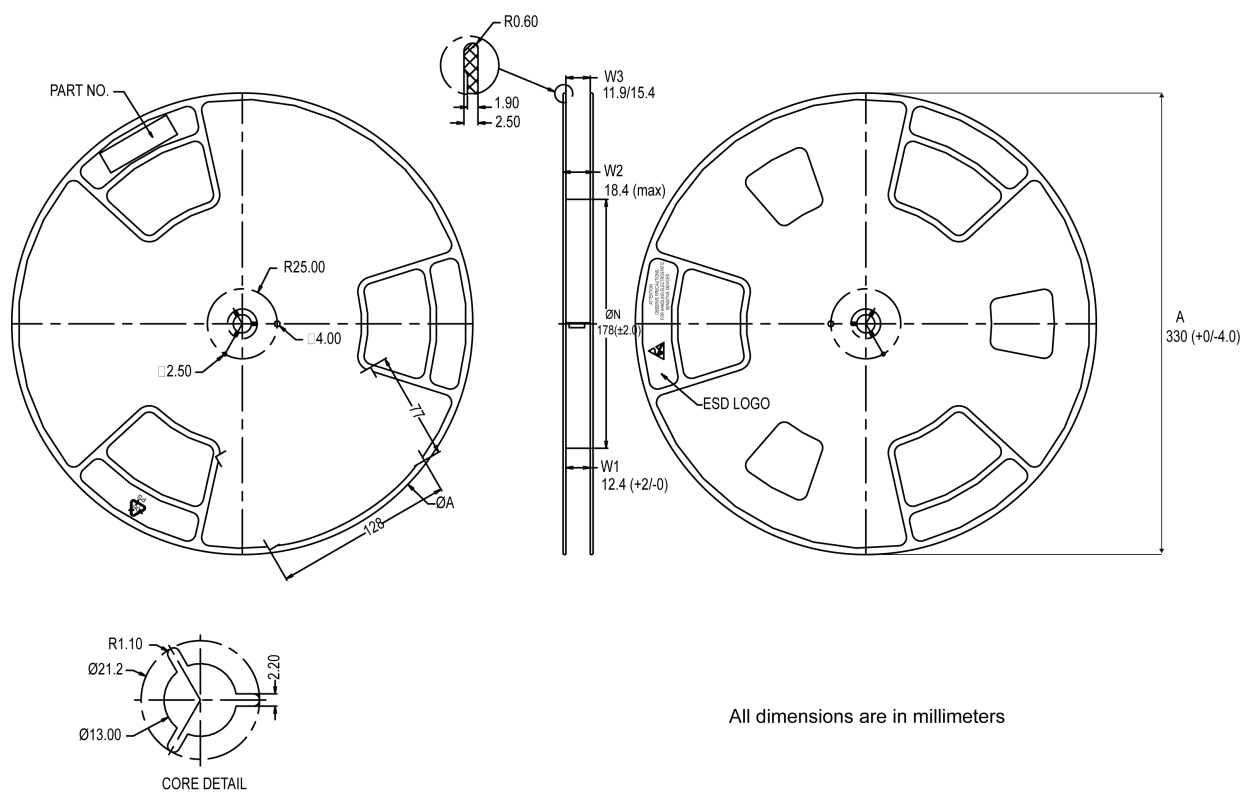


Figure 20. PowerFLAT 5x6 reel



8234350_Reel_rev_C

Revision history

Table 9. Document revision history

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

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