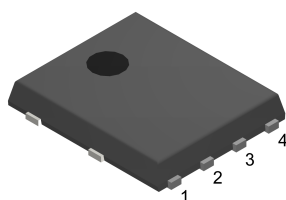
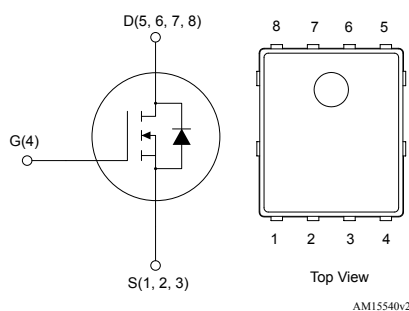


N-channel 100 V, 7 mΩ typ., 70 A STripFET F7 Power MOSFET in a PowerFLAT 5x6 package



PowerFLAT 5x6



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STL90N10F7	100 V	8 mΩ	70 A	100 W

- 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

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

[STL90N10F7](#)

Product summary

Order code	STL90N10F7
Marking	90N10F7
Package	PowerFLAT 5x6
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	70	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	50	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	16	A
	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	11	A
$I_{DM}^{(1)(3)}$	Drain current (pulsed)	280	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	64	A
$P_{TOT}^{(1)}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	100	W
$P_{TOT}^{(2)}$	Total power dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	5	W
$E_{AS}^{(4)}$	Single pulse avalanche energy	300	mJ
T_{stg}	Storage temperature range	- 55 to 175	$^\circ\text{C}$
T_J	Operating junction temperature range		$^\circ\text{C}$

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.
4. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 10\text{ A}$, $V_{DD} = 50\text{ V}$.

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	

1. When mounted on 1 inch², 2 Oz. Cu FR-4 board.

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = 20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 8\text{ A}$		7	8	m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	3100	4030	pF
C_{oss}	Output capacitance		-	700	910	pF
C_{rss}	Reverse transfer capacitance		-	45	58	pF
Q_g	Total gate charge	$V_{DD} = 50\text{ V}$, $I_D = 16\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	45	60	nC
Q_{gs}	Gate-source charge		-	18		nC
Q_{gd}	Gate-drain charge		-	13		nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 8\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	19	-	ns
t_r	Rise time		-	32	-	ns
$t_{d(off)}$	Turn-off-delay time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	36	-	ns
t_f	Fall time		-	13	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 16\text{ A}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 16\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 80\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	70	90	ns
Q_{rr}	Reverse recovery charge		-	125		nC
I_{RRM}	Reverse recovery current		-	3.6		A

1. Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

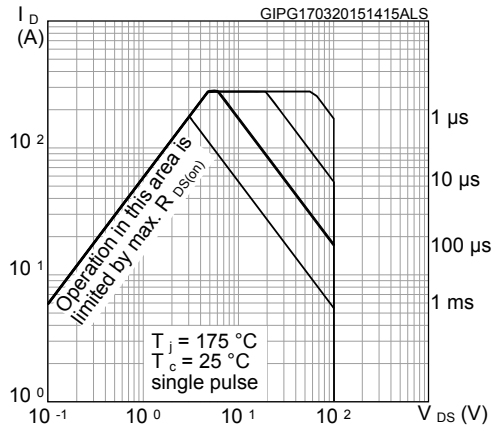


Figure 2. Thermal impedance

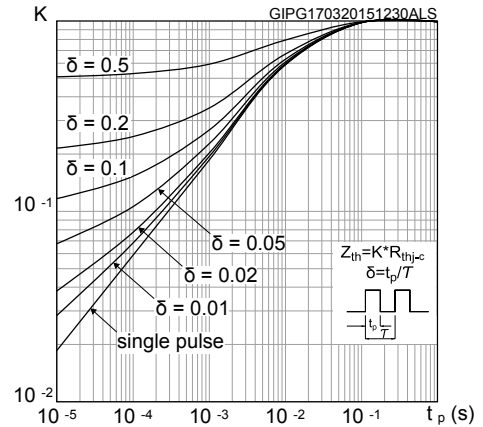


Figure 3. Output characteristics

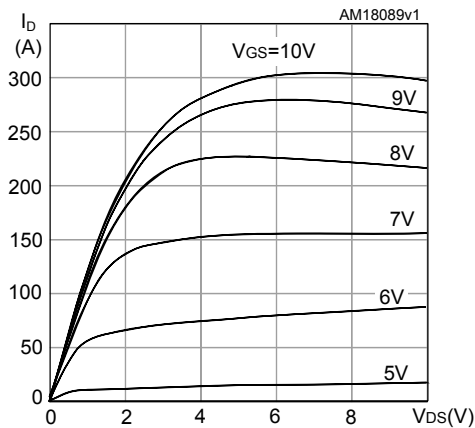


Figure 4. Transfer characteristics

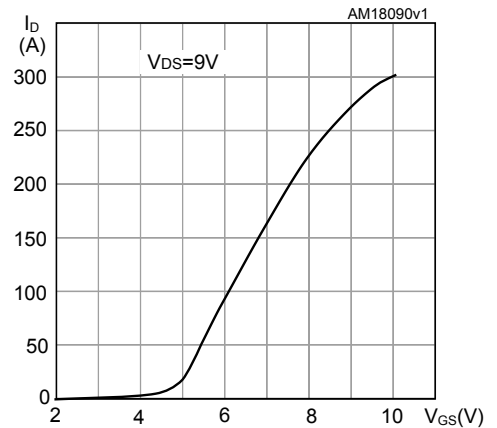


Figure 5. Gate charge vs gate-source voltage

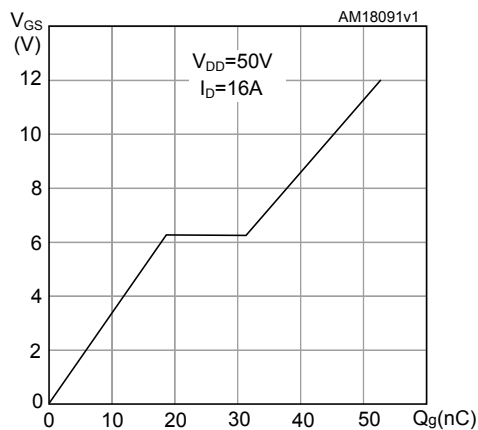


Figure 6. Static drain-source on-resistance

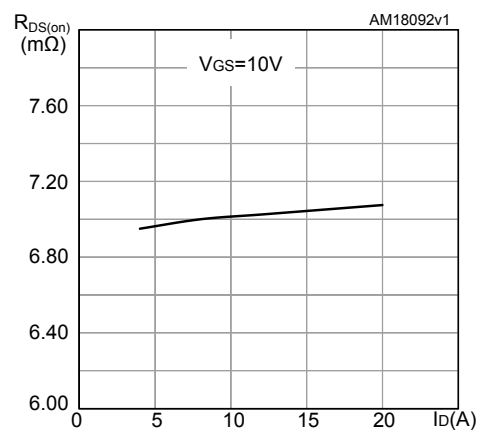


Figure 7. Capacitance variations

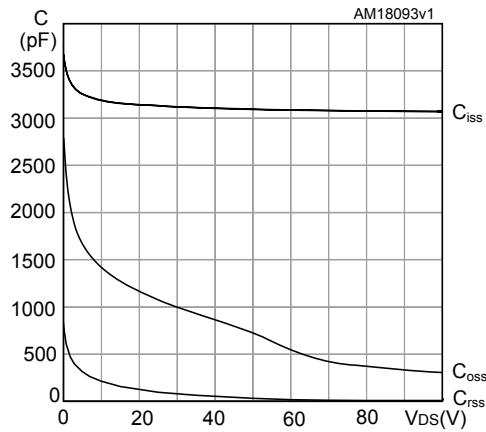


Figure 8. Normalized gate threshold voltage vs temperature

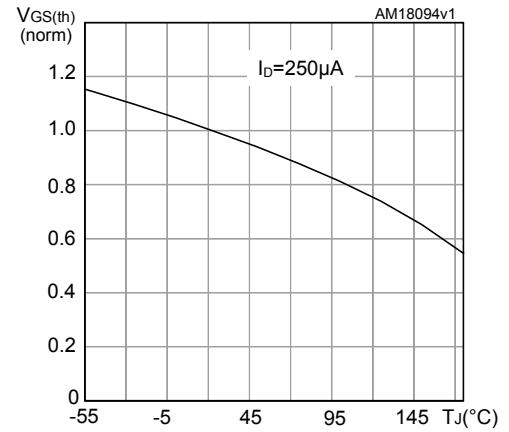


Figure 9. Normalized on-resistance vs temperature

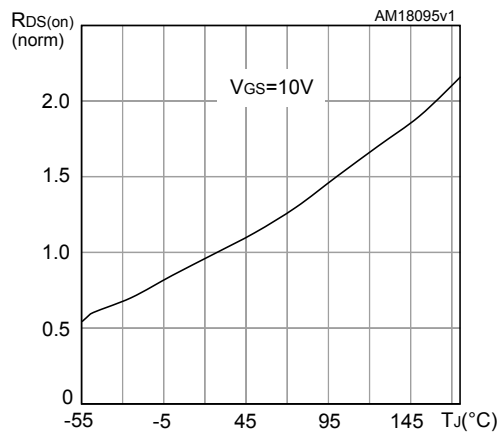


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

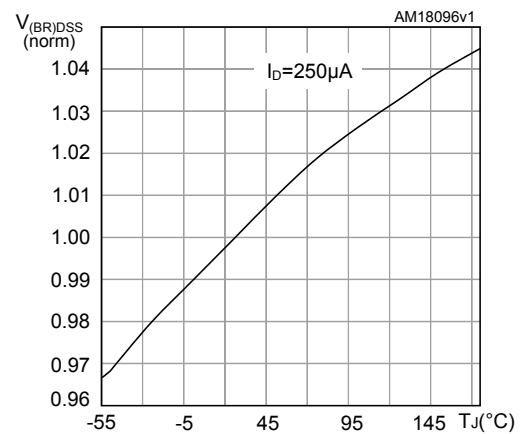
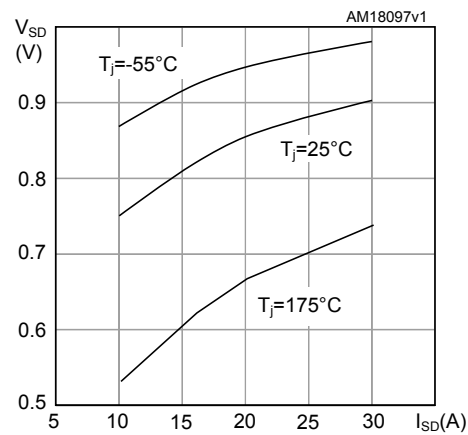
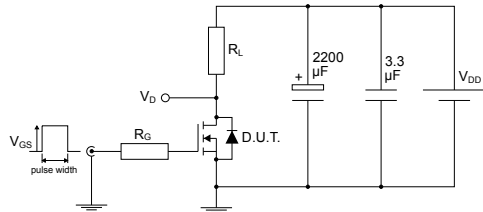


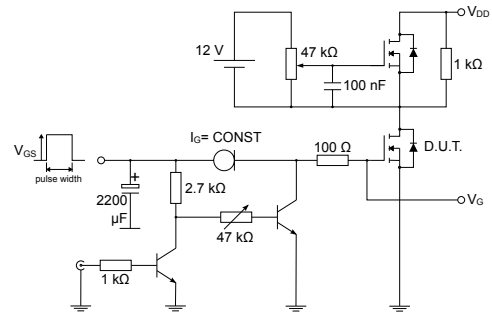
Figure 11. Source-drain diode forward characteristics



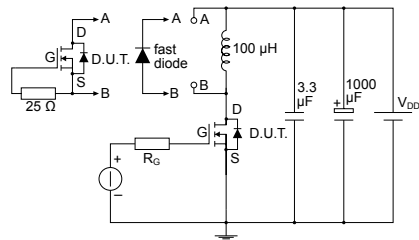
3 Test circuits

Figure 12. Test circuit for resistive load switching times


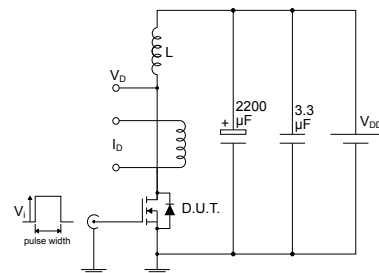
AM01468v1

Figure 13. Test circuit for gate charge behavior


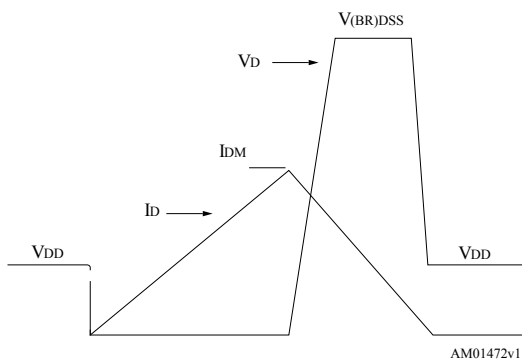
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Figure 14. Test circuit for inductive load switching and diode recovery times


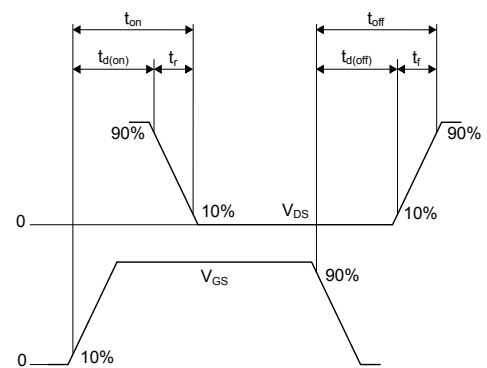
AM01470v1

Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform


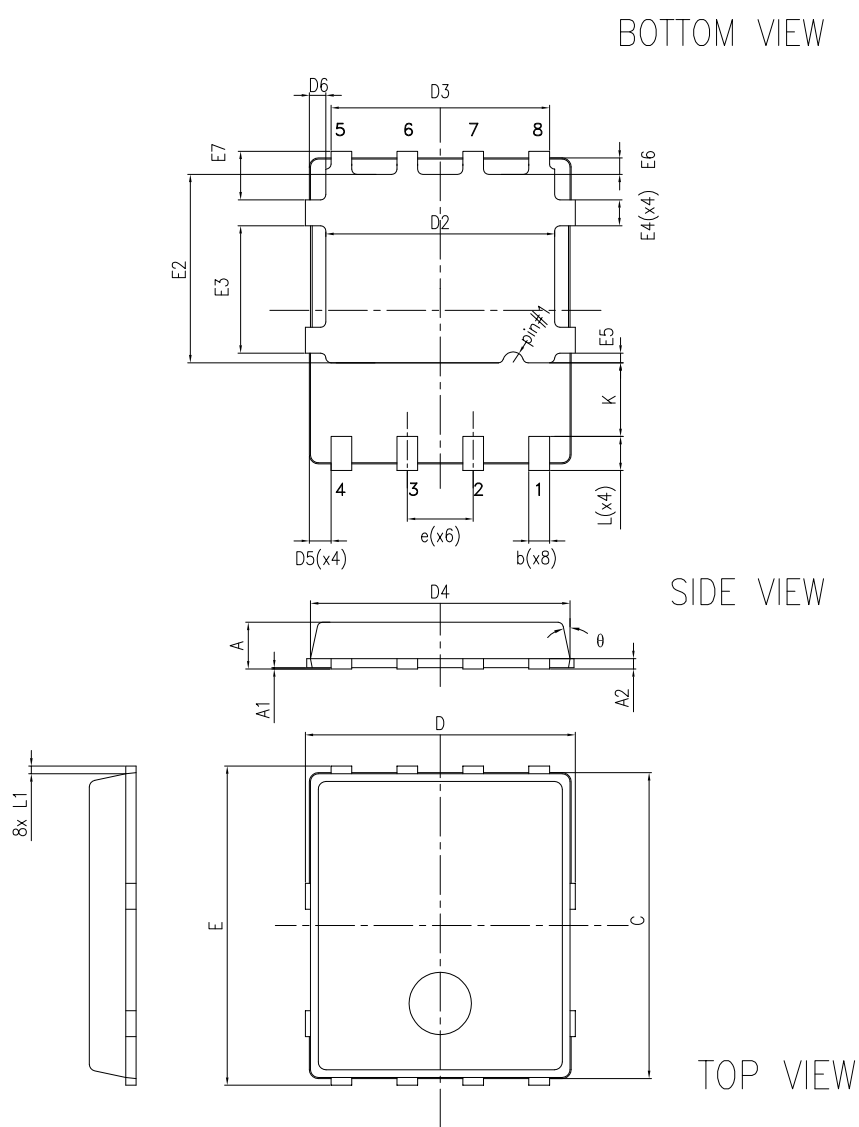
AM01473v1

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 R package information

Figure 18. PowerFLAT 5x6 type R package outline



A0ER_8231817_Rev20

Table 7. 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°

4.2 PowerFLAT 5x6 type R SUBCON package information

Figure 19. PowerFLAT 5x6 type R SUBCON package outline

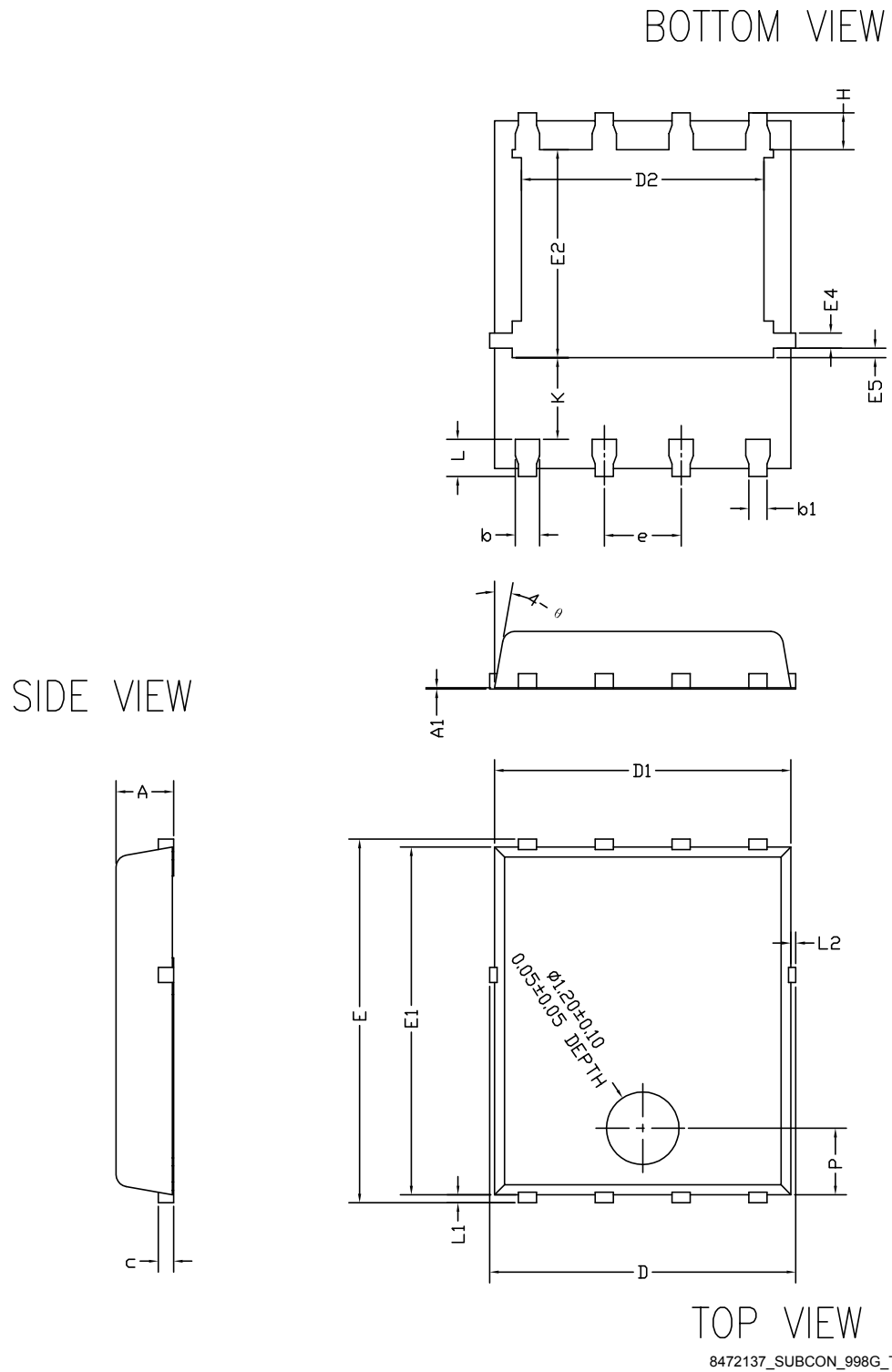
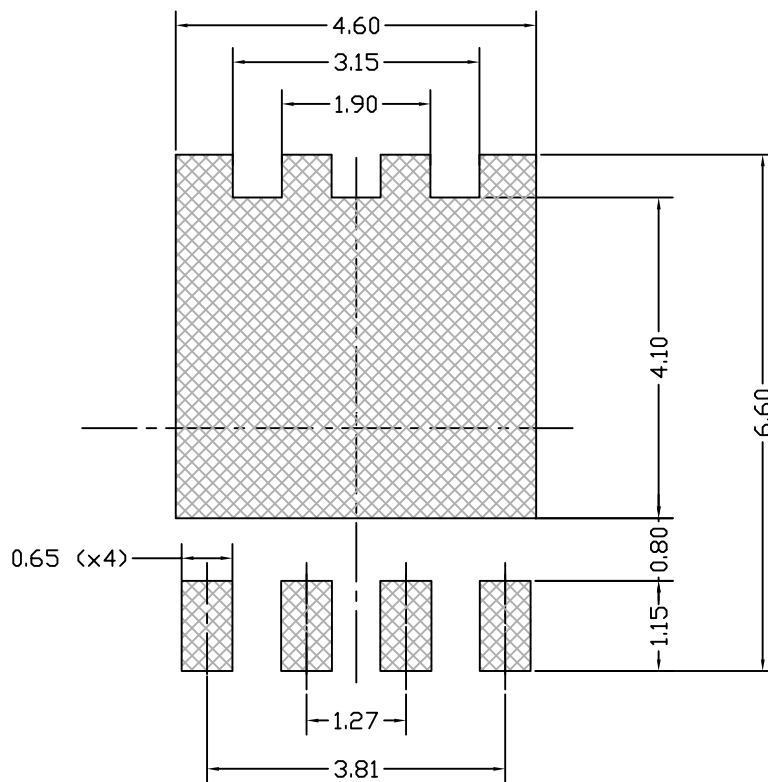


Table 8. PowerFLAT 5x6 type R SUBCON package mechanical data

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	3.91	4.01	4.11
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.34	3.44	3.54
E4	0.15	0.25	0.35
E5	0.06	0.16	0.26
H	0.51	0.61	0.71
K	1.10		
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°

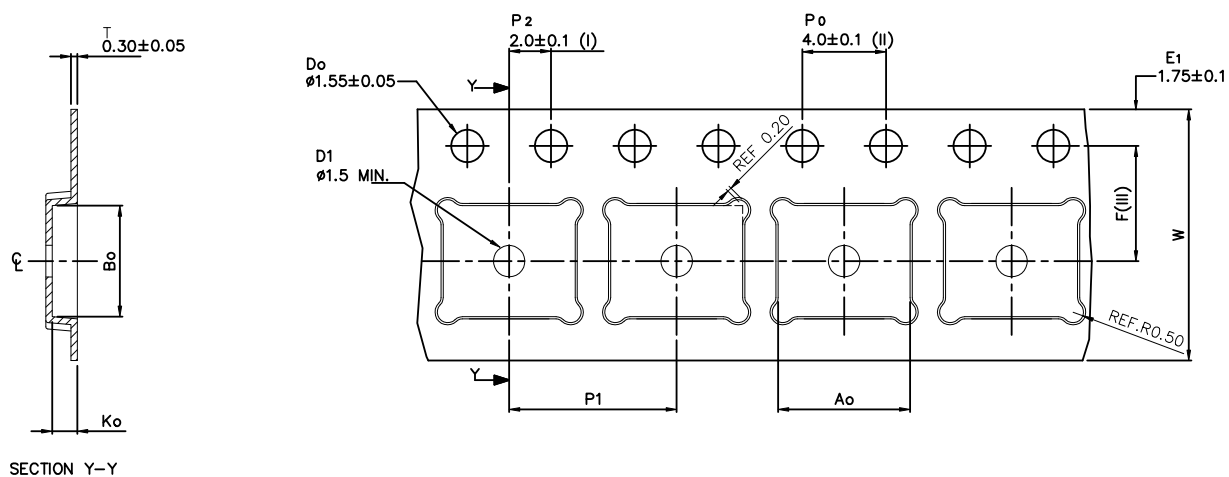
Figure 20. PowerFLAT 5x6 recommended footprint (dimensions are in mm)



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 ± 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

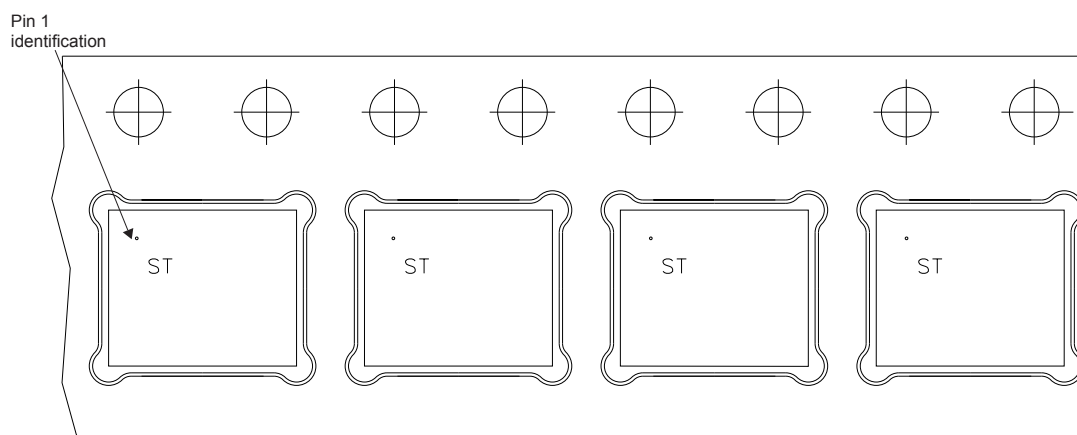
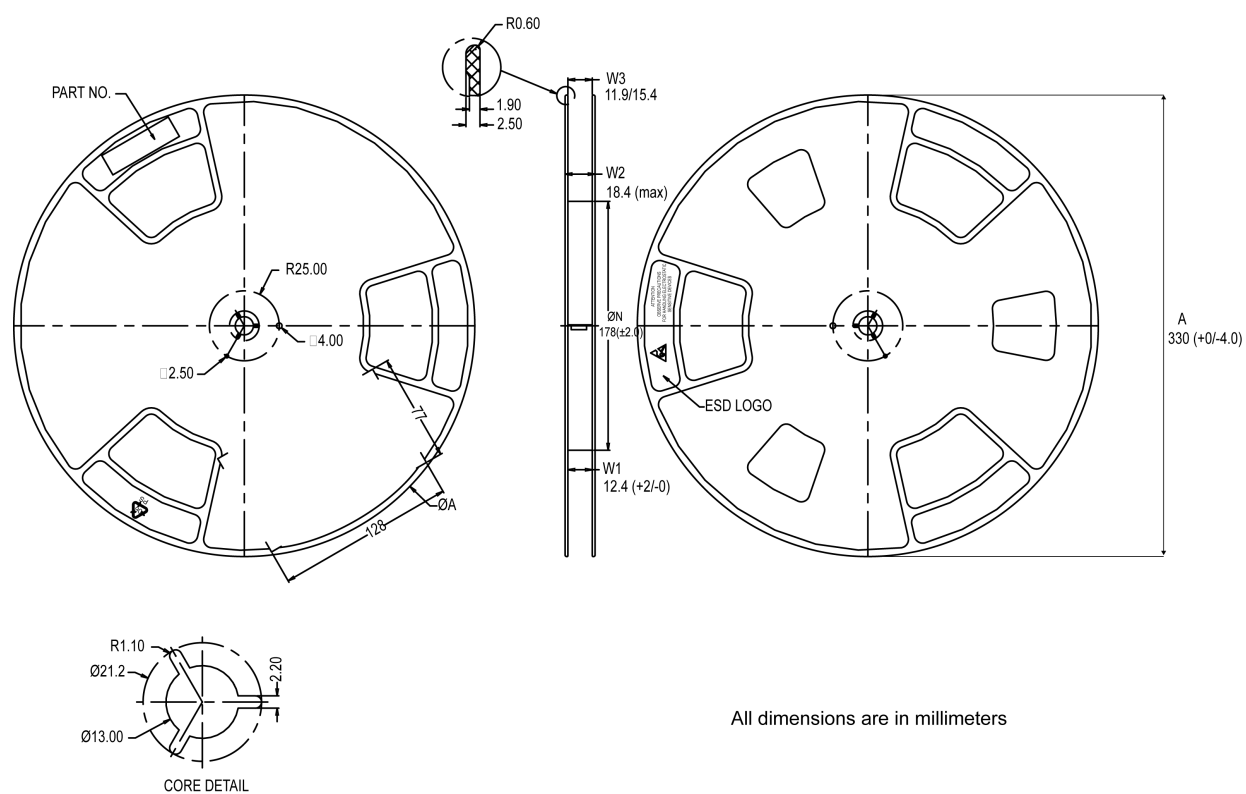


Figure 23. PowerFLAT 5x6 reel



8234350_Reel_rev_C

Revision history

Table 9. Document revision history

Date	Revision	Changes
16-Apr-2013	1	First release.
06-Mar-2014	2	– Modified: $R_{DS(on)}$ value in cover page – Modified: $V_{GS(th)}$ values in Table 4 – Modified: $R_{DS(on)}$ typ. and max values in Table 4 – Modified: typical values in Table 5, 6 and 7 – Updated: Section 4: Package mechanical data – Added: Section 2.1: Electrical characteristics (curves) – Updated: Section 4: Package mechanical data – Document status promoted from preliminary data to production data
16-Dec-2014	3	– Updated title, features and description in cover page. – Updated $R_{DS(on)}$ values and Figure 7: Static drain-source onresistance.
17-Mar-2015	4	–Text edits throughout document –Updated cover page title description –Updated cover page features table –In <i>table 2. Absolute maximum ratings</i>, added "E_{AS}" information and footnote 4 –In <i>table 3. Thermal data</i>, added footnote 1 –Renamed <i>table 4. Static</i> (was On/off states) –Updated <i>table 5. Dynamic</i> –Updated <i>table 7. Source drain diode</i> –In <i>Section 2.1 Electrical characteristics (curves)</i>, updated figures 2, 3, 10 and 11 –Updated and renamed <i>Section 4 Package information</i>
01-Aug-2017	5	- Updated <i>Absolute maximum ratings</i>. - Updated <i>Static and Source-drain diode</i>. - Updated <i>Internal schematic diagram</i>. - Minor text changes.
29-Aug-2017	6	- Updated <i>Table 3. Static</i>. - Minor text changes.
10-Feb-2020	7	- Updated Section 4 Package information. - Minor text changes.

Contents

1	Electrical ratings	2
2	Electrical characteristics.....	3
2.1	Electrical characteristics (curves)	4
3	Test circuits	6
4	Package information.....	7
4.1	PowerFLAT 5x6 type R package information.....	7
4.2	PowerFLAT 5x6 type R SUBCON package information.....	8
4.3	PowerFLAT 5x6 packing information	11
	Revision history	14

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