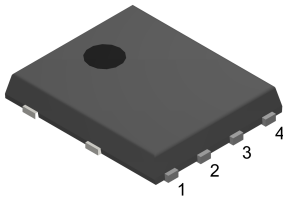
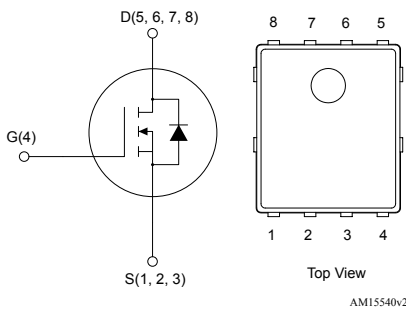


N-channel 100 V, 20 mΩ typ., 10 A STripFET F7 Power MOSFET in a PowerFLAT 5x6 package


PowerFLAT 5x6


Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STL40N10F7	100 V	24 mΩ	10 A	5 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

[STL40N10F7](#)

Product summary

Order code	STL40N10F7
Marking	40N10F7
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 $T_C = 25\text{ }^\circ\text{C}$	40	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	28	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	10	A
	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	7	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	40	A
$P_{TOT}^{(1)}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	70	W
$P_{TOT}^{(2)}$	Total power dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	5	W
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.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max.	2.08	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max.	30	

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

2 Electrical characteristics

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

Table 3. On/Off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\ \text{V}$, $V_{DS} = 100\ \text{V}$			10	μA
		$V_{GS} = 0\ \text{V}$, $V_{DS} = 100\ \text{V}$, $T_C = 125\text{ °C}$			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	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	3		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 10\ \text{A}$		20	24	m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0\ \text{V}$	-	1270	-	pF
C_{oss}	Output capacitance		-	290	-	pF
C_{rSS}	Reverse transfer capacitance		-	24	-	pF
Q_g	Total gate charge	$V_{DD} = 50\ \text{V}$, $I_D = 32\ \text{A}$, $V_{GS} = 10\ \text{V}$ (see Figure 13. Test circuit for gate charge behavior)	-	19	-	nC
Q_{gs}	Gate-source charge		-	9	-	nC
Q_{gd}	Gate-drain charge		-	4.5	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ \text{V}$, $I_D = 16\ \text{A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\ \text{V}$	-	12	-	ns
t_r	Rise time		-	17.5	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 12. Test circuit for resistive load switching times)	-	22	-	ns
t_f	Fall time		-	5.6	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current	$I_{SD} = 32\text{ A}$, $V_{GS} = 0\text{ V}$	-		32	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				128	A
$V_{SD}^{(2)}$	Forward on voltage				1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 32\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	41		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 80\text{ V}$, $T_J = 150^\circ\text{ C}$	-	47		nC
I_{RRM}	Reverse recovery current	(see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	2.3		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

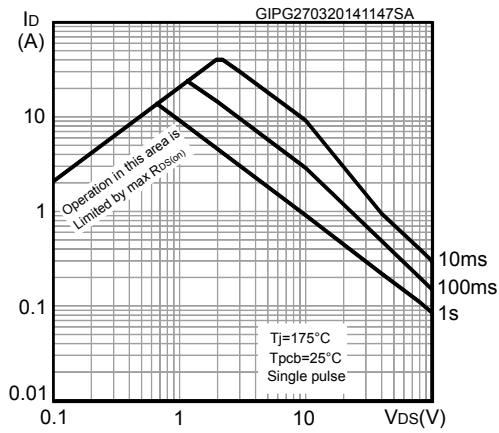


Figure 2. Thermal impedance

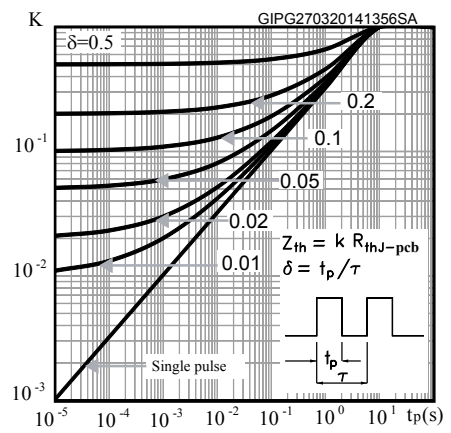


Figure 3. Output characteristics

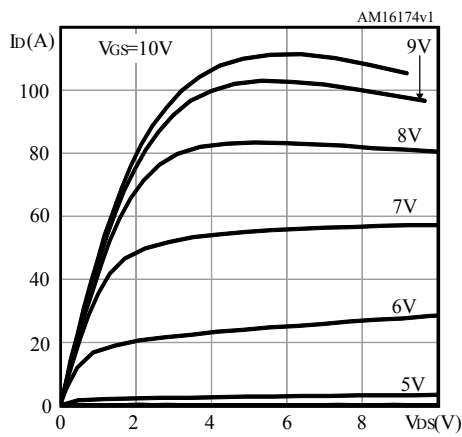


Figure 4. Transfer characteristics

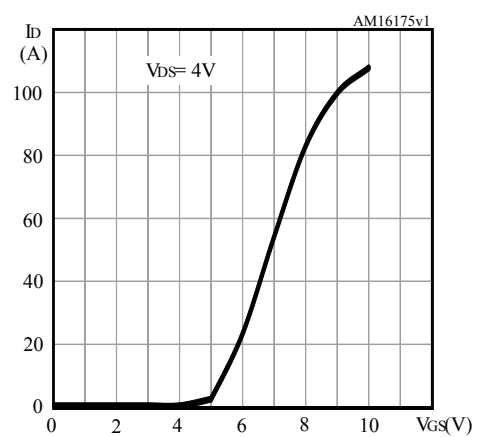


Figure 5. Gate charge vs gate-source voltage

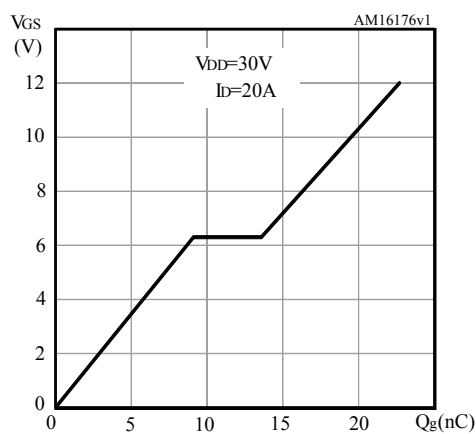


Figure 6. Static drain-source on-resistance

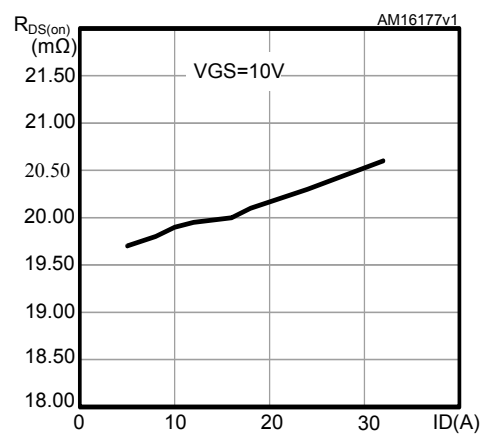


Figure 7. Capacitance variations

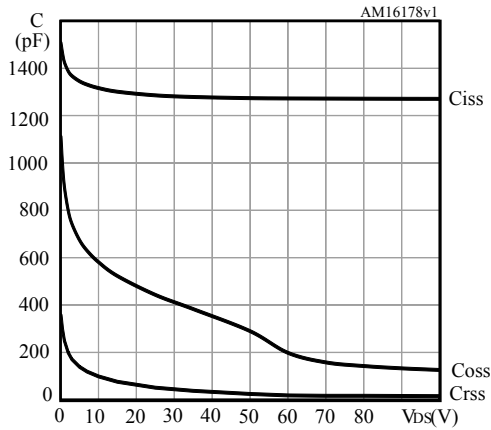


Figure 8. Normalized gate threshold voltage vs temperature

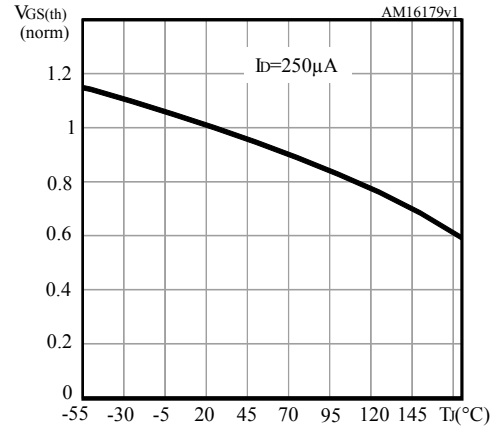


Figure 9. Normalized on-resistance vs temperature

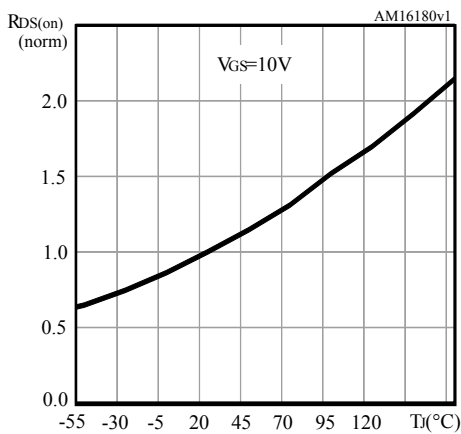


Figure 10. Normalized V_{(BR)DSS} vs temperature

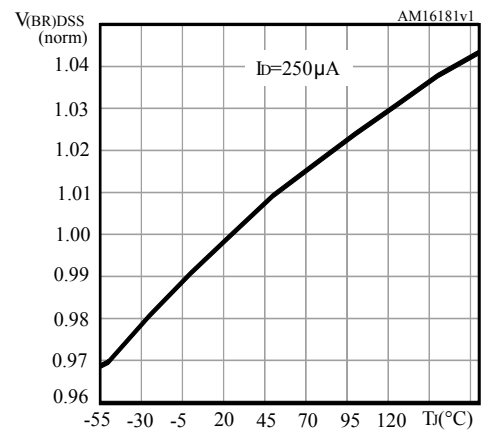
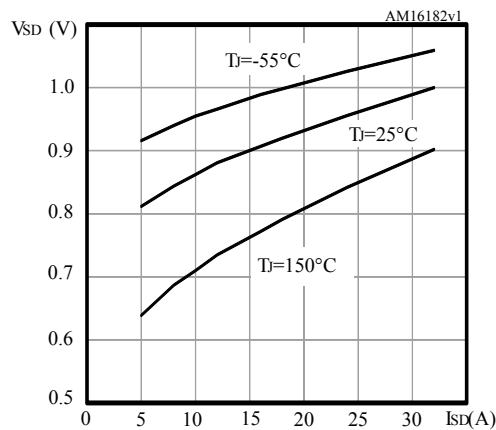
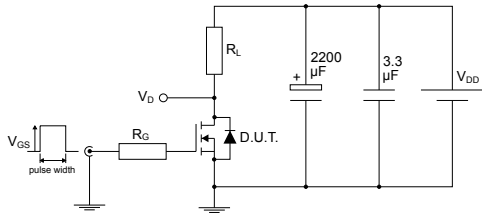


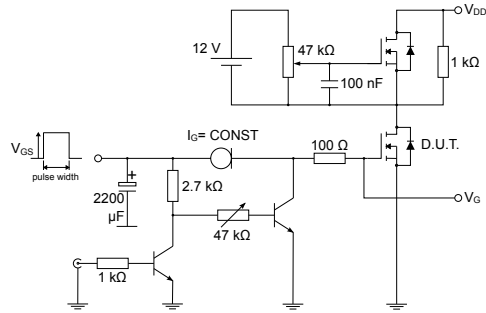
Figure 11. Source-drain diode forward characteristics



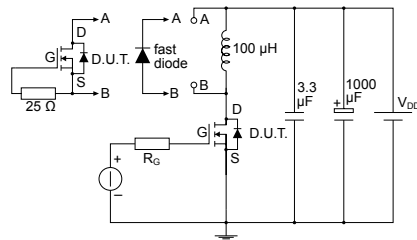
3 Test circuits

Figure 12. Test circuit for resistive load switching times


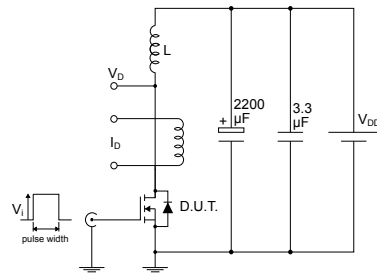
AM01468v1

Figure 13. Test circuit for gate charge behavior


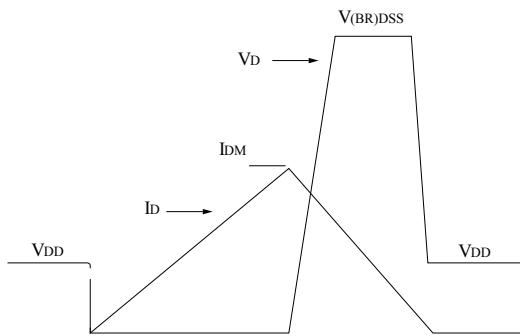
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Figure 14. Test circuit for inductive load switching and diode recovery times


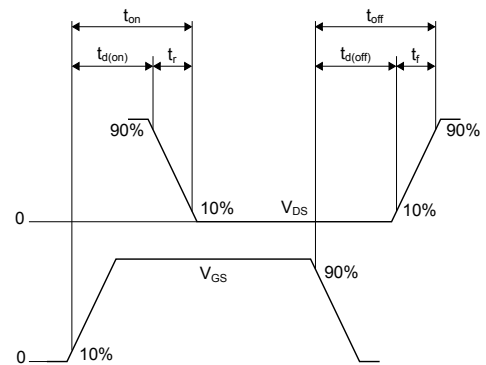
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Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform


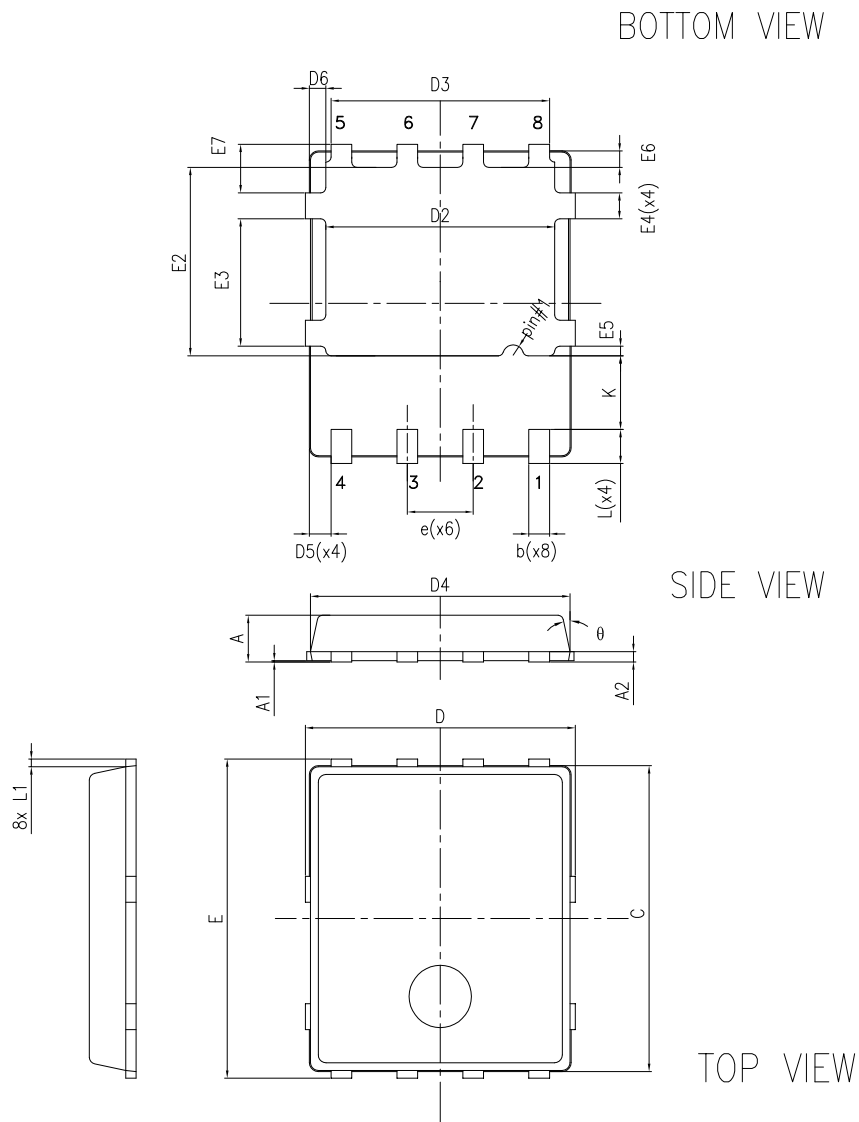
AM01473v1

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



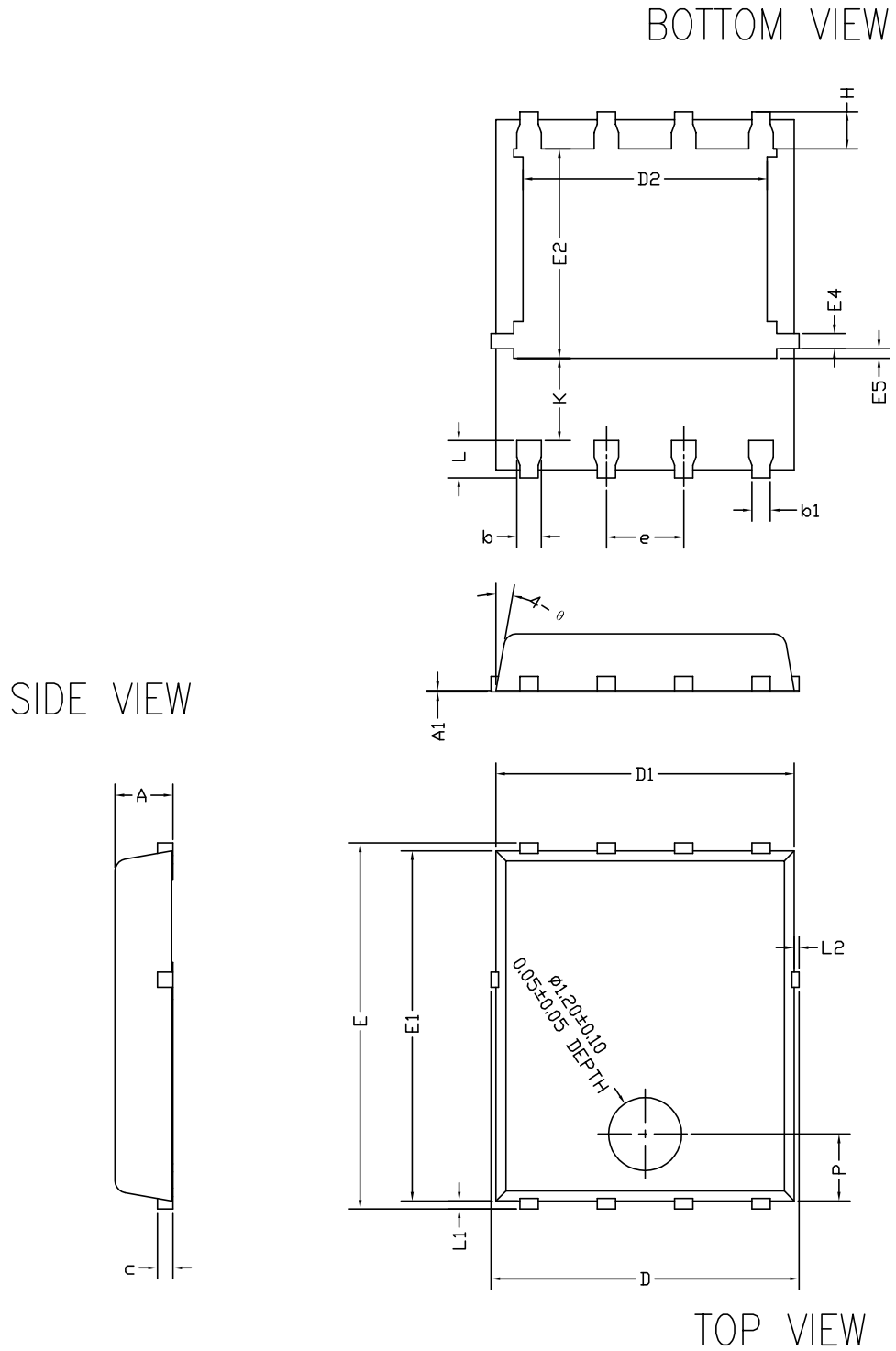
A0ER_8231817_Rev20

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

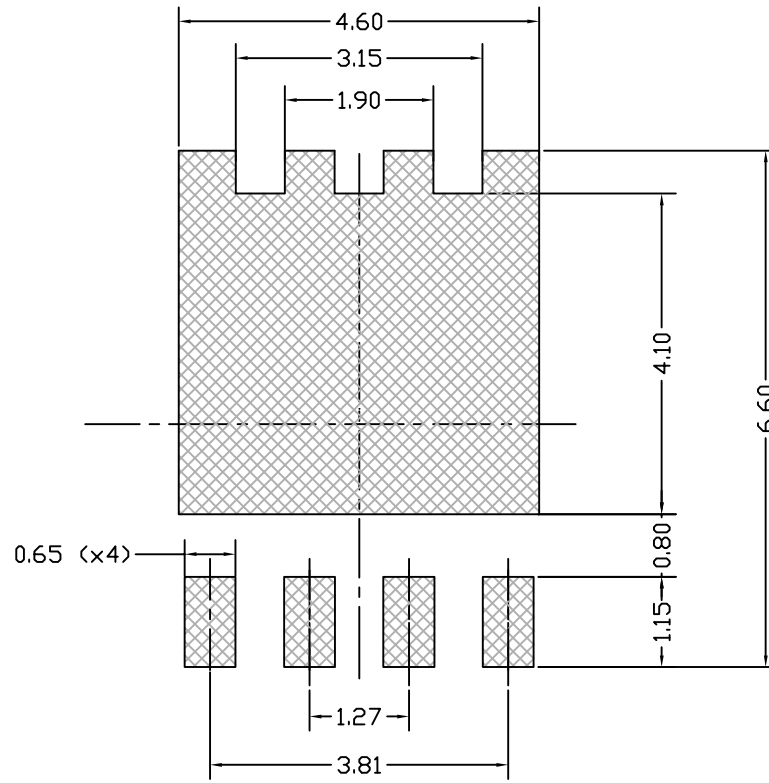


8472137_SUBCON_998G_Type_R_REV4

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°

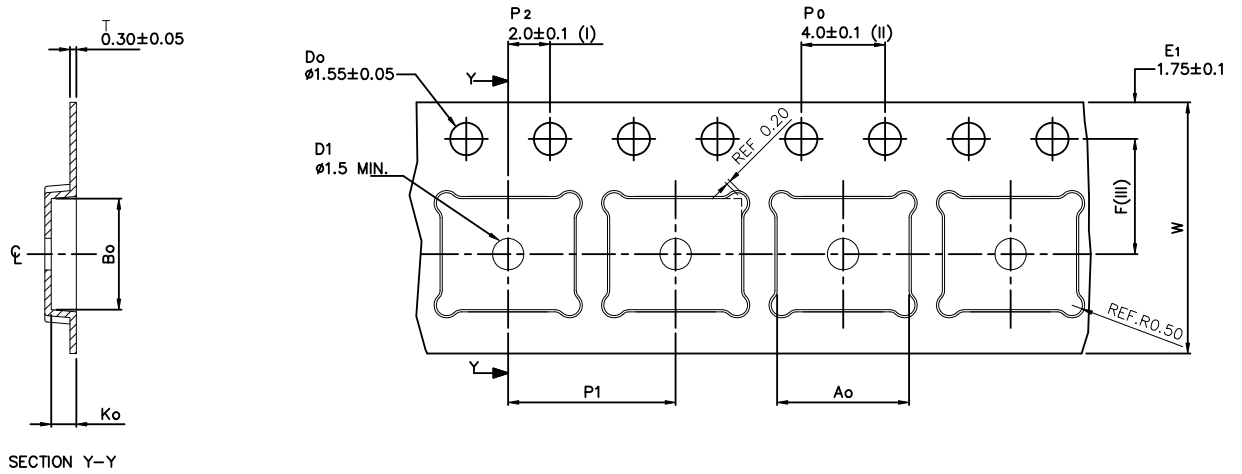
Figure 20. PowerFLAT 5x6 recommended footprint (dimensions are in mm)



8231817_FOOTPRINT_simp_Rev_20

4.3 PowerFLAT 5x6 packing information

Figure 21. PowerFLAT 5x6 tape (dimensions are in mm)



A_0	6.30	+/- 0.1
B_0	5.30	+/- 0.1
K_0	1.20	+/- 0.1
F	5.50	+/- 0.1
P_1	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

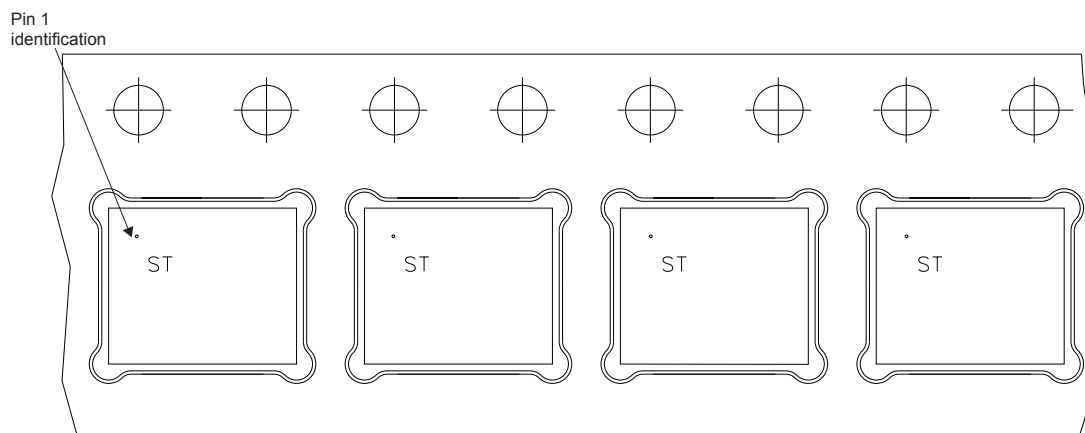
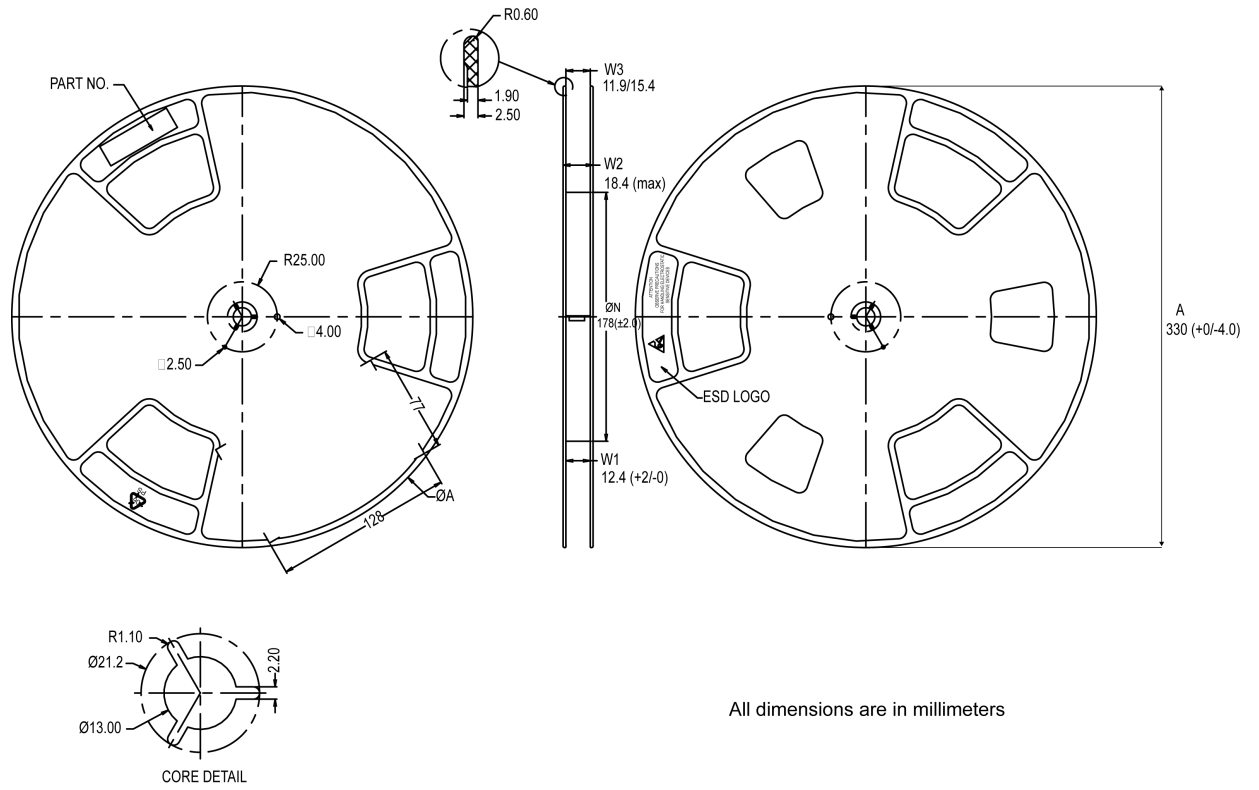


Figure 23. PowerFLAT 5x6 reel



All dimensions are in millimeters

8234350_Reel_rev_C

Revision history

Table 9. Document revision history

Date	Revision	Changes
20-May-2015	1	First release.
02-Nov-2015	2	Document status promoted from preliminary to production data. Modified: $V_{GS(th)}$ values in tab 4. Updated the entire typical values in tab 5, tab 6 and tab7 Added Electrical characteristics (curves) Updated Figure 13, 14, 15 and 16 Minor text changes.
18-Dec-2015	3	Updated title, features and description. Updated <i>Table 2: "Absolute maximum ratings"</i> and <i>Table 4: "On/Off states"</i> . Minor text changes.
01-Feb 2016	4	Updated <i>Table 5: "Dynamic"</i> . Minor text changes.
21-Feb-2020	5	Updated Section 4 Package information . Minor text changes.

Contents

1	Electrical ratings	2
2	Electrical characteristics	3
2.1	Electrical characteristics (curves)	5
3	Test circuits	7
4	Package information	8
4.1	PowerFLAT 5x6 type R package information	8
4.2	PowerFLAT 5x6 type R SUBCON package information	10
4.3	PowerFLAT 5x6 packing information	13
	Revision history	15

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