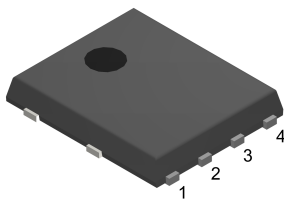
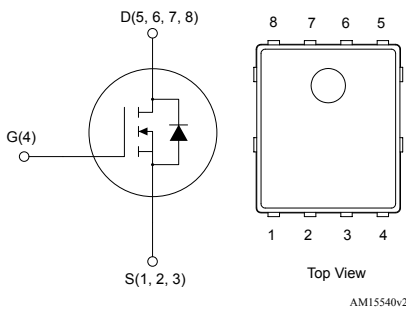


N-channel 60 V, 4.6 mΩ typ., 90 A STripFET F7 Power MOSFET in a PowerFLAT 5x6 package


PowerFLAT 5x6


Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL90N6F7	60 V	5.4 mΩ	90 A

- 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

[STL90N6F7](#)

Product summary

Order code	STL90N6F7
Marking	90N6F7
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 $T_C = 25\text{ }^{\circ}\text{C}$	90	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	66	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	360	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	21	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	15	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	84	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	94	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	4.8	W
T_{stg}	Storage temperature	-55 to 175	$^{\circ}\text{C}$
T_j	Max. operating junction temperature	175	$^{\circ}\text{C}$

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

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max.	31.3	$^{\circ}\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case max.	1.6	$^{\circ}\text{C/W}$

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

2 Electrical characteristics

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

Table 3. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 10.5\text{ A}$		0.0046	0.0054	Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1600	-	pF
C_{oss}	Output capacitance		-	880	-	pF
C_{rss}	Reverse transfer capacitance		-	66	-	pF
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 21\text{ A}$, $V_{GS} = 10\text{ V}$	-	25	-	nC
Q_{gs}	Gate-source charge		-	7.2	-	nC
Q_{gd}	Gate-drain charge		-	8.1	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 10.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	15	-	ns
t_r	Rise time		-	17.6	-	ns
$t_{d(off)}$	Turn-off delay time		-	24.4	-	ns
t_f	Fall time		-	7.8	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 21\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 21\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 48\text{ V}$	-	39.6		ns
Q_{rr}	Reverse recovery charge		-	36		nC
I_{RRM}	Reverse recovery current		-	1.8		A

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

2.1 Electrical characteristics curves

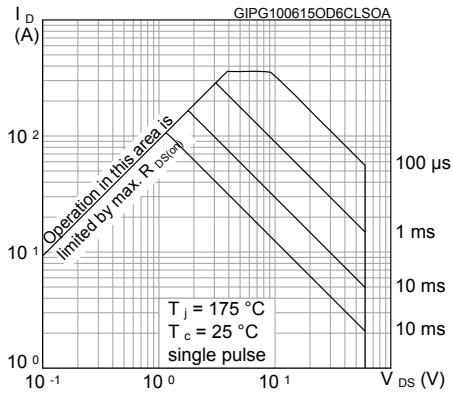
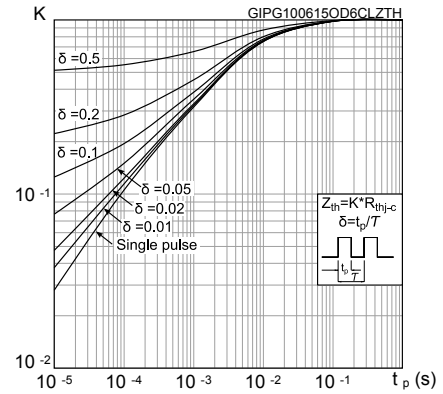
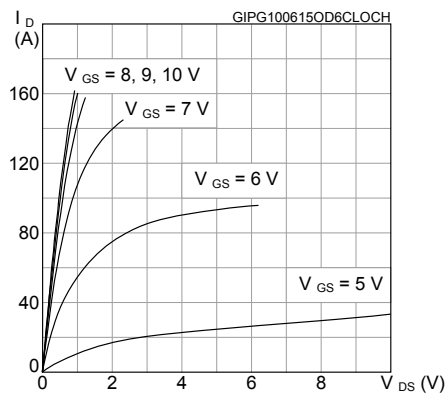
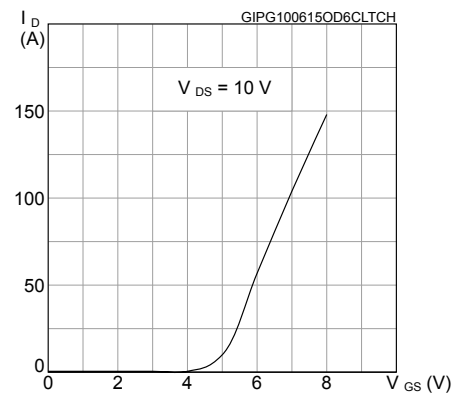
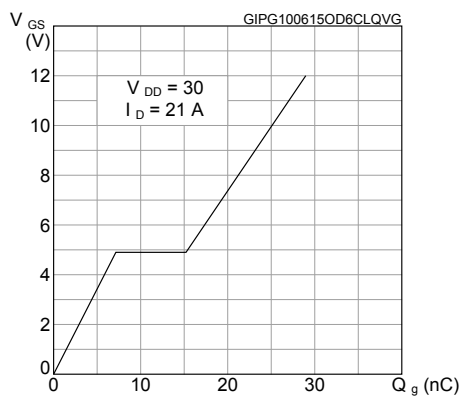
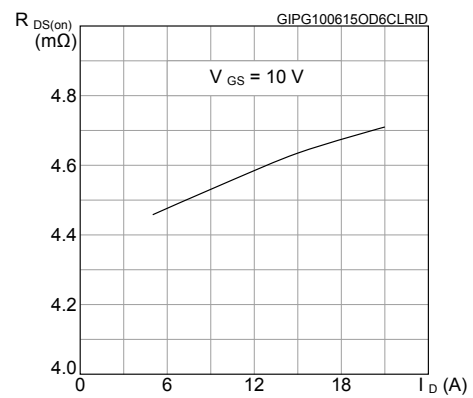
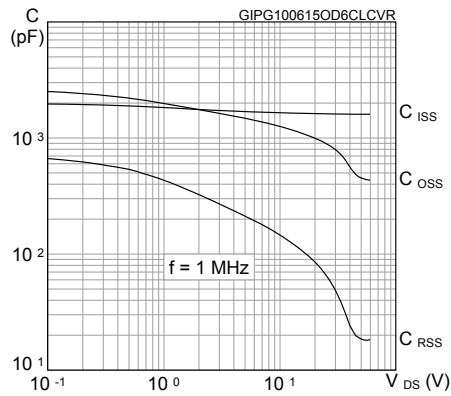
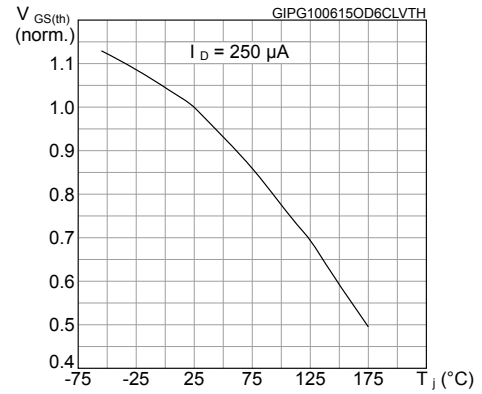
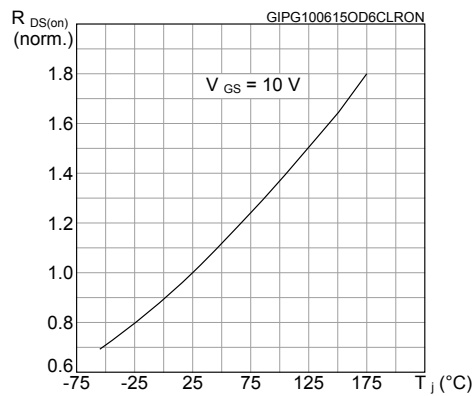
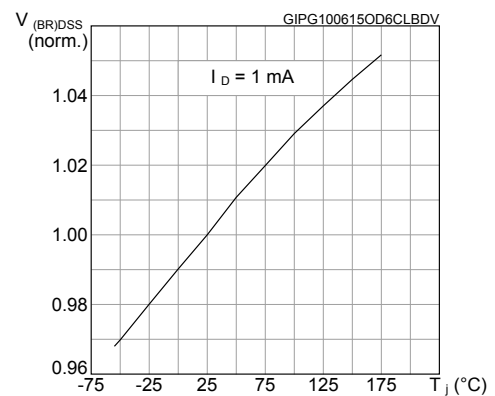
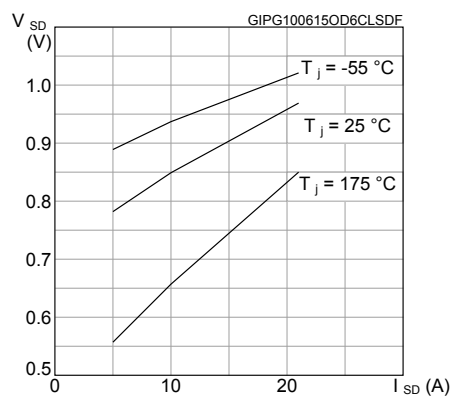
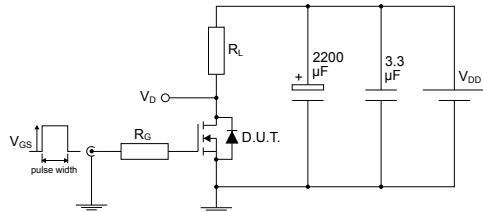
Figure 1. Safe operating area

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


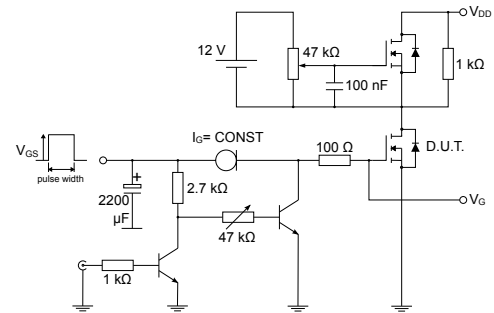
3 Test circuits

Figure 12. Test circuit for resistive load switching times



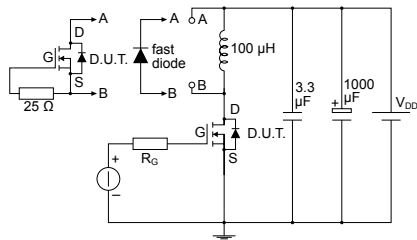
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Figure 13. Test circuit for gate charge behavior



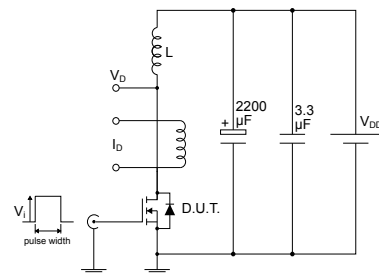
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Figure 14. Test circuit for inductive load switching and diode recovery times



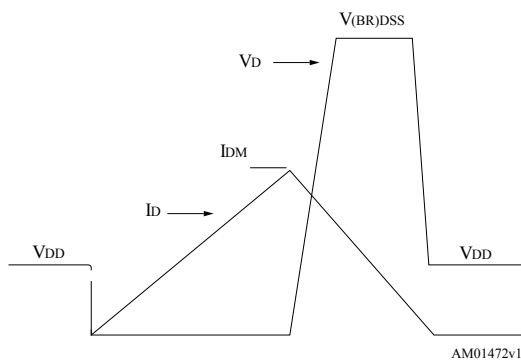
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Figure 15. Unclamped inductive load test circuit



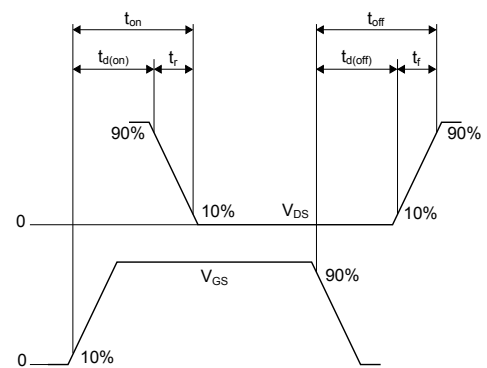
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Figure 16. Unclamped inductive waveform



AM01472v1

Figure 17. Switching time waveform



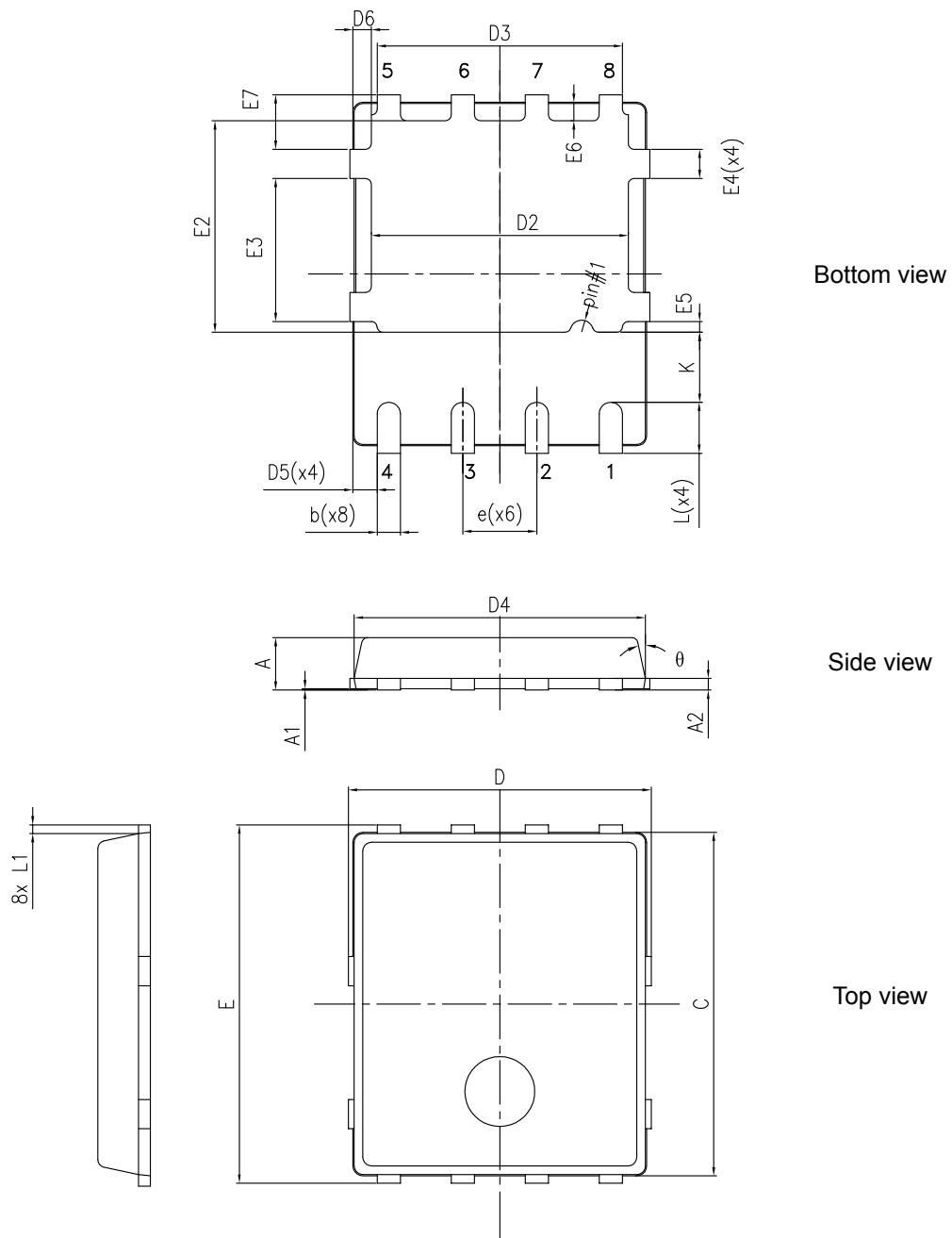
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4 Package information

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. ECOPACK is an ST trademark.

4.1 PowerFLAT 5x6 type C package information

Figure 18. PowerFLAT 5x6 type C package outline



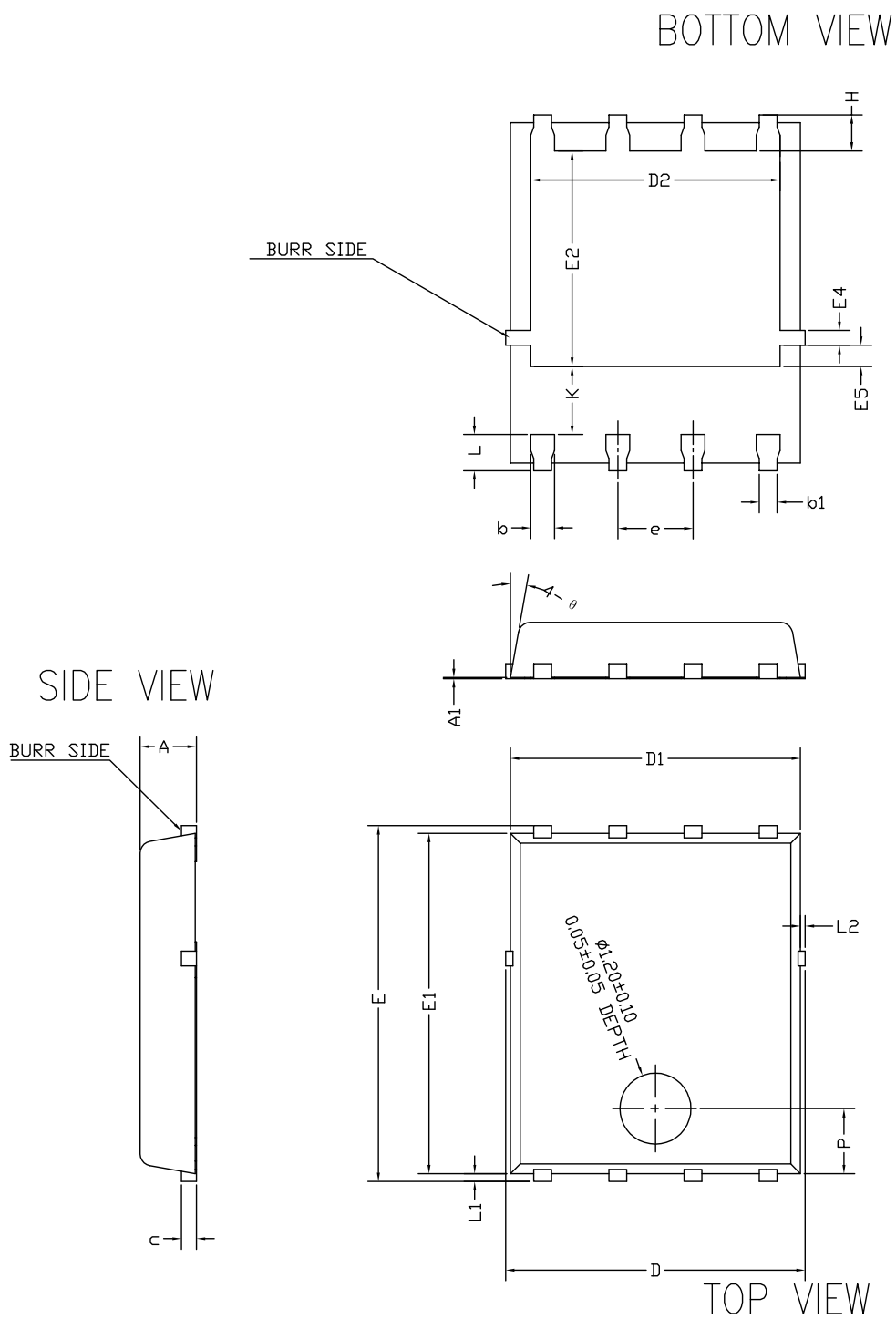
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Table 7. PowerFLAT 5x6 type C package mechanical data

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

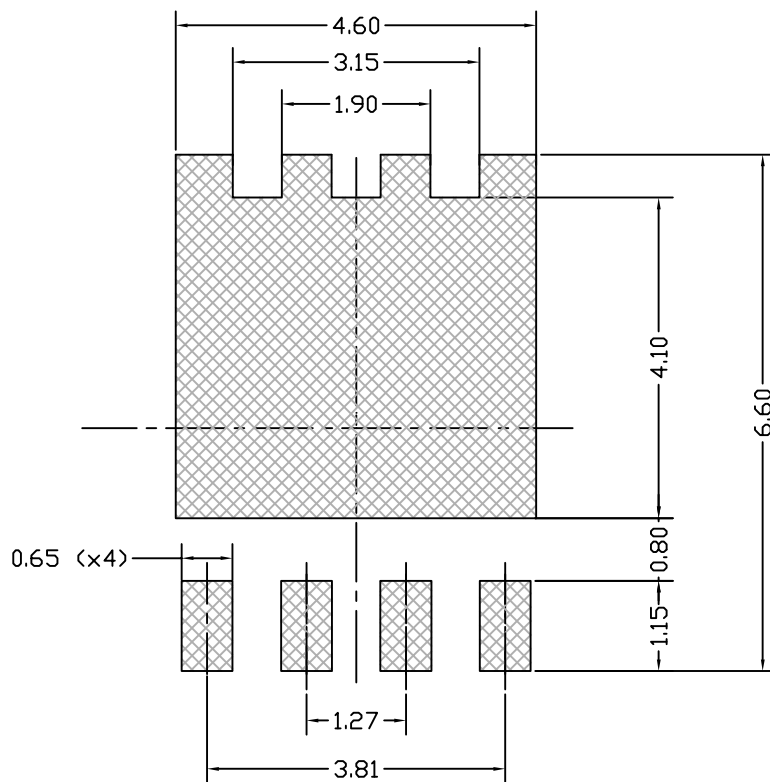


8472137_SUBCON_998G_REV4

Table 8. 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_18

Revision history

Table 9. Document revision history

Date	Revision	Changes
03-Mar-2015	1	First release.
10-Jun-2015	2	In Section 2 Electrical characteristics: - updated Table 5: Dynamic - updated Table 6: Switching times - updated Table 7: Source-drain diode Added Section 2.1 Electrical characteristics (curves)
24-Jan-2020	3	Updated Section 4 Package information . Minor text changes.

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