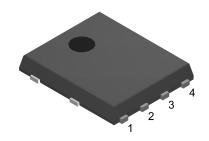
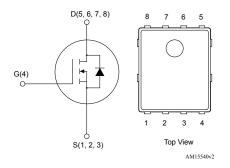


N-channel 60 V, 2.4 m Ω typ., 140 A, STripFET F7 Power MOSFET in a PowerFLAT 5x6 package



PowerFLAT™ 5x6



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STL140N6F7	60 V	2.8 mΩ	140 A	125 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
- Logic level V_{GS(th)}

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 STL140N6F7

Product summary		
Order code STL140N6F		
Marking	140N6F7	
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 _{case} = 25 °C	140	A
ID.	Drain current (continuous) at T _{case} = 100 °C	107	
I _{DM} ⁽¹⁾⁽²⁾	Drain current (pulsed)	560	А
I _D ⁽³⁾	Drain current (continuous) at T _{pcb} = 25 °C	30	A
ID(G)	Drain current (continuous) at T _{pcb} = 100 °C	21	_ A
I _{DM} ⁽²⁾⁽³⁾	Drain current (pulsed)	116	Α
P _{TOT} ⁽¹⁾	Total power dissipation at T _{case} = 25 °C	125	W
P _{TOT} ⁽³⁾	Total power dissipation at T _{pcb} = 25 °C	4.8	W
E _{AS} ⁽⁴⁾	Single pulse avalanche energy	38	mJ
T _{stg}	Storage temperature range	-55 to 175	°C
Tj	Operating junction temperature range	-99 10 179	

- 1. This value is rated according to R_{thj-c} .
- 2. Pulse width is limited by safe operating area.
- 3. This value is rated according to $R_{thj-pcb}$
- 4. Starting $T_j = 25 \,^{\circ}\text{C}$, $I_D = 16 \, \text{A}$, $V_{DD} = 40 \, \text{V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R _{thj-pcb} ⁽¹⁾	R _{thj-pcb} ⁽¹⁾ Thermal resistance junction-pcb		°C/W
R _{thj-case}	R _{thj-case} Thermal resistance junction-case		C/VV

1. When mounted on a 1-inch² FR-4 board, 2oz Cu, t < 10 s

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2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	V _{GS} = 0 V, I _D = 1 mA	60			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 60 V			1	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	2		4	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 15 A		2.4	2.8	mΩ

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
C _{iss}	Input capacitance			3110	-	
C _{oss}	Output capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V V_{DD} = 30 V, I_{D} = 30 A, V_{GS} = 0 to 10 V (see Figure 13. Test circuit for gate charge behavior)	-	1520	-	pF
C _{rss}	Reverse transfer capacitance		-	193	-	
Qg	Total gate charge		-	55	-	
Q _{gs}	Gate-source charge		-	19	-	nC
Q _{gd}	Gate-drain charge		-	18	-	

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time		-	24	-	
t _r	Rise time	V_{DD} = 30 V, I_D = 15 A R _G = 4.7 Ω , V_{GS} = 10 V (see Figure 12. Test circuit	-	68	-	
t _{d(off)}	Turn-off delay time	for resistive load switching times and Figure 17. Switching time waveform)	-	39	-	ns
t _f	Fall time	rigure 17. Switching time waveloning	-	20	-	

Table 6. Source-drain diode

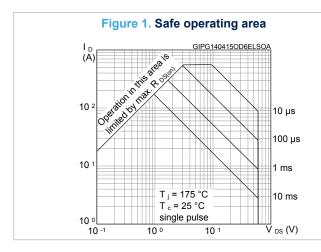
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{SD} ⁽¹⁾	Forward on voltage	V _{GS} = 0 V, I _{SD} = 30 A	-		1.2	V
t _{rr}	Reverse recovery time	I _{SD} = 30 A, di/dt = 100 A/μs, V _{DD} = 48 V	-	42.4		ns
Q _{rr}	Reverse recovery charge	(see Figure 14. Test circuit for inductive	-	38.2		nC
I _{RRM}	Reverse recovery current	load switching and diode recovery times)	-	1.8		Α

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

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2.1 Electrical characteristics (curves)



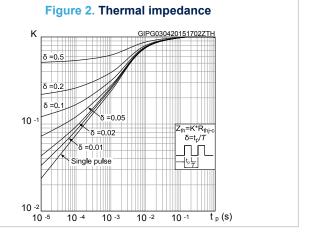


Figure 3. Output characteristics

(A) V GS = 9,10 V
250

200

150

V GS = 7 V

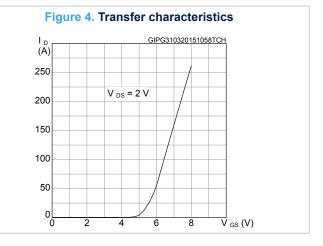
100

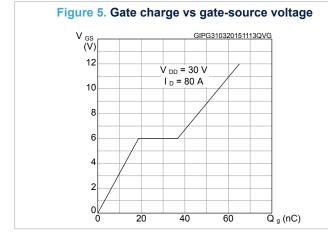
100

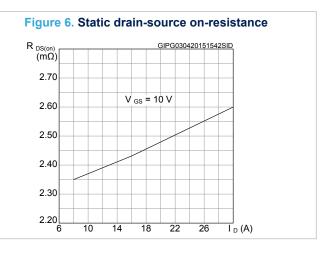
V GS = 6 V

100

2 4 6 8 V DS (V)







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10 0

10 ¹

10 -1

Ŭ _{DS} (V)

Figure 8. Normalized gate threshold voltage vs temperature

V_{GS(th)}
(norm.)

1.1

1.0

0.9

0.8

0.7

0.6

0.5

-75
-25
25
75
125

T_j (°C)

Figure 9. Normalized on-resistance vs temperature

R DS(on) (norm.)

1.8

1.6

1.4

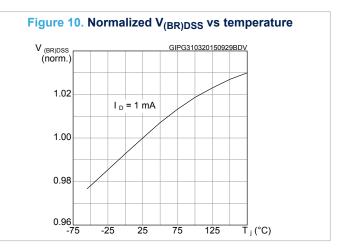
1.2

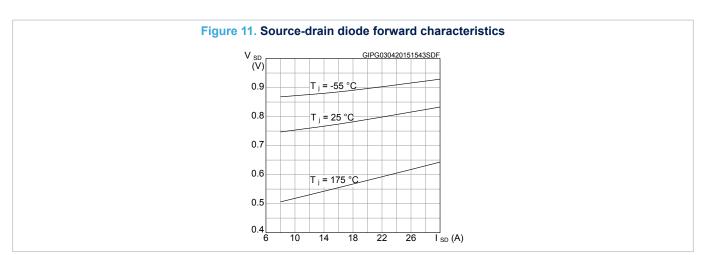
1.0

0.8

0.6

-75 -25 25 75 125 T (°C)





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3 Test circuits

Figure 12. Test circuit for resistive load switching times

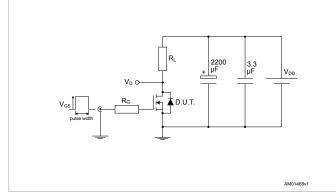


Figure 13. Test circuit for gate charge behavior

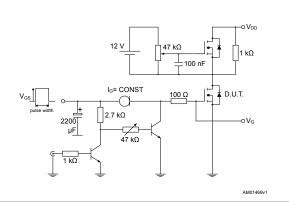


Figure 14. Test circuit for inductive load switching and diode recovery times

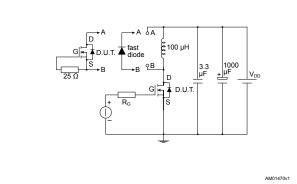


Figure 15. Unclamped inductive load test circuit

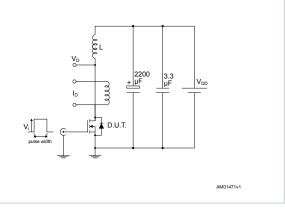


Figure 16. Unclamped inductive waveform

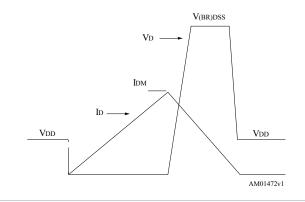
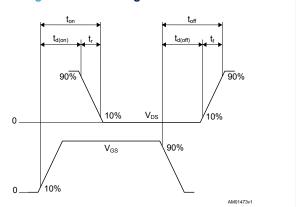


Figure 17. Switching time waveform



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4 Package information

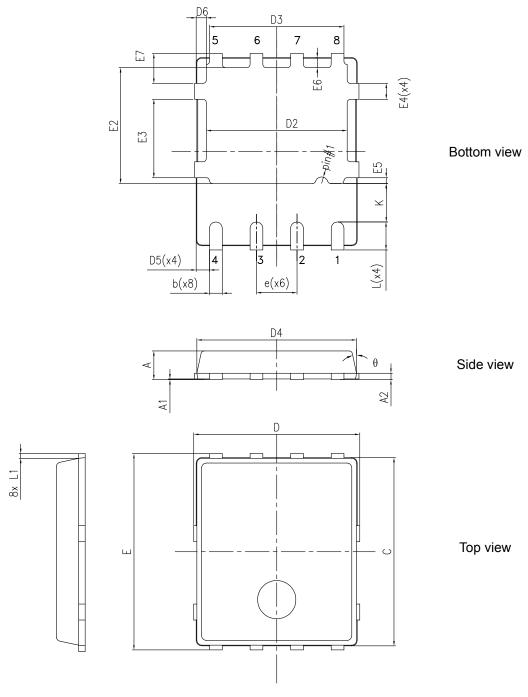
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

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4.1 PowerFLAT 5x6 type C package information

Figure 18. PowerFLAT 5x6 type C package outline



8231817_typeC_Rev18

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Table 7. PowerFLAT 5x6 type C package mechanical data

Dim.		mm	
Dim.	Min.	Тур.	Max.
Α	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
С	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
е		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°

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4.2 PowerFLAT 5x6 type SUBCON package information

Figure 19. PowerFLAT 5x6 type SUBCON package outline

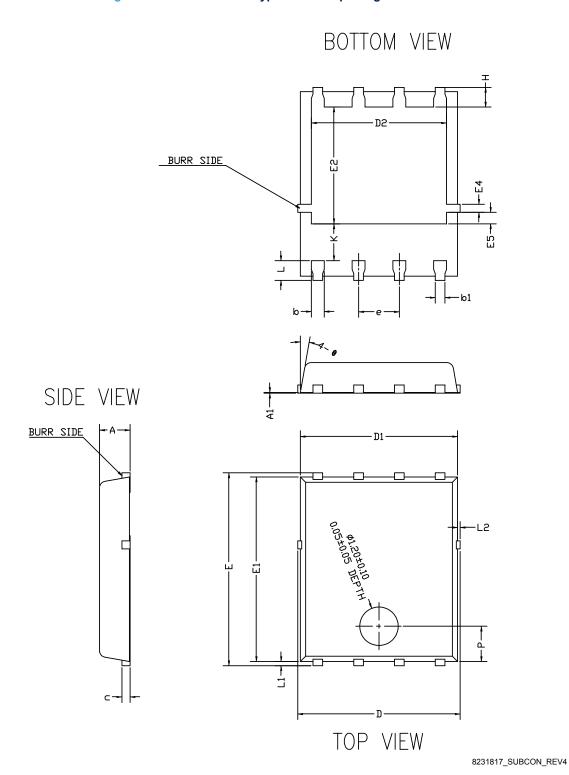




Table 8. PowerFLAT 5x6 type SUBCON package mechanical data

Div		mm	
Dim.	Min.	Тур.	Max.
Α	0.90	0.95	1.00
A1		0.02	
b	0.35	0.40	0.45
b1		0.30	
С	0.21	0.25	0.34
D	4.80		5.10
D1	4.80	4.90	5.00
D2	4.01	4.21	4.31
е	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
Н	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
Р	1.00	1.10	1.20
θ	8°	10°	12°

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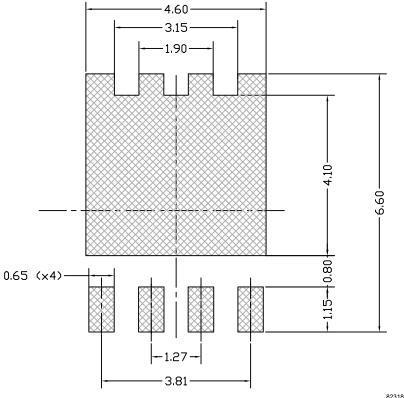


Figure 20. PowerFLAT 5x6 recommended footprint (dimensions are in mm)

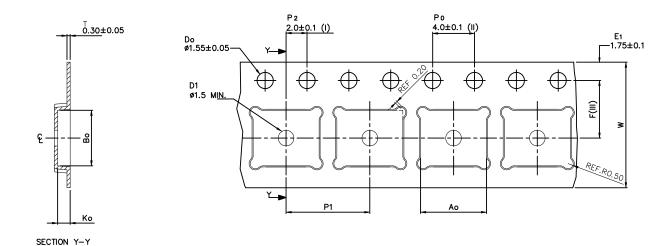
8231817_FOOTPRINT_simp_Rev_18

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4.3 PowerFLAT 5x6 packing information

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

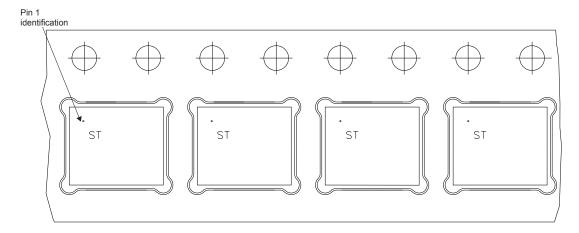


- Ao 6.30 +/- 0.1
 Bo 5.30 +/- 0.1
 Ko 1.20 +/- 0.1
 F 5.50 +/- 0.1
 P1 8.00 +/- 0.1
 W 12.00 +/- 0.3
- (I) Measured from centreline of sprocket hole to centreline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is ±0.20.
- (III) Measured from centreline of sprocket hole to centreline of 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



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PART NO.

R25.00

R25.00

R25.00

R25.00

R1.10

R27.02

R27.

Figure 23. PowerFLAT 5x6 reel

8234350_Reel_rev_C

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Revision history

Table 9. Document revision history

Date	Revision	Changes
02-Aug-2013	1	First release.
18-Mar-2014	2	Updated V _{DS} value in <i>Table 2: Absolute maximum ratings</i> and <i>Table 4: On /off states</i> . Updated Section 4: Package mechanical data. Minor text changes.
09-Apr-2015	3	Text edits and formatting changes throughout document On cover page: -updated title description -updated device 'Features' and 'Description' Updated section 1 Electrical ratings Updated section 2 Electrical characteristics Added section 2.1 Electrical characteristics (curves) Updated and renamed Section 4 Package information (was Package mechanical data) Updated and renamed Section 4.2 Packing information (was Section 5 Packaging mechanical data)
19-May-2015	4	In Section 2.1 Electrical characteristics (curves): - Updated Figure 24: Capacitance variations
21-Apr-2017	5	Added E _{AS} in <i>Table 2: "Absolute maximum ratings"</i> Updated <i>Section 4.1: "PowerFLAT™ 5x6 type C package information"</i> Minor text changes.
10-Sep-2019	6	Added: Section 4.2 PowerFLAT 5x6 type SUBCON package information. Minor text changes.
01-Oct-2019	7	Updated Section 4.2 PowerFLAT 5x6 type SUBCON package information. Minor text changes

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