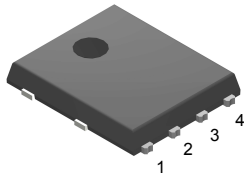
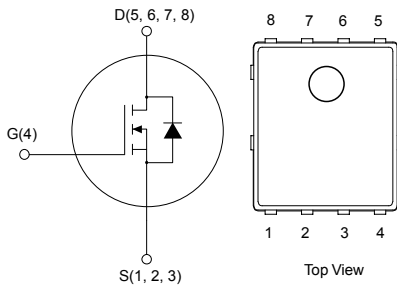


Automotive-grade N-channel 30 V, 23 mΩ typ., 10 A, STripFET™ H6 Power MOSFET in a PowerFLAT 5x6 package


PowerFLAT™ 5x6


NG405678S123



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STL19N3LLH6AG	30 V	33 mΩ	10 A	50 W

- AEC-Q101 qualified
- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss
- Logic level
- Wettable flank package

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the STripFET™ H6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low R_{DS(on)} in all packages.

Product status link

[STL19N3LLH6AG](#)

Product summary

Order code	STL19N3LLH6AG
Marking	19N3LLH6
Package	PowerFLAT 5x6
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{case} = 25\text{ }^\circ\text{C}$	10	A
	Drain current (continuous) at $T_{case} = 100\text{ }^\circ\text{C}$	10	
$I_{DM}^{(2)}$	Drain current (pulsed)	40	A
P_{TOT}	Total dissipation at $T_{case} = 25\text{ }^\circ\text{C}$	50	W
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature range		

1. Current limited by package. At $T_{case} = 25\text{ }^\circ\text{C}$ the silicon is able to sustain 30 A.
2. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	3	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	

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

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
$I_{AV}^{(1)}$	Avalanche current, repetitive or not repetitive	10	A
$E_{AS}^{(2)}$	Single pulse avalanche energy	130	mJ

1. Pulse width limited by T_{jmax}
2. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 25\text{ V}$

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 30\text{ V}$			1	μA
		$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 30\text{ V}$, $T_{\text{case}} = 125\text{ }^{\circ}\text{C}^{(1)}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$			± 100	nA
$V_{\text{GS}(\text{th})}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{\text{DS}(\text{on})}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 5\text{ A}$		23	33	m Ω
		$V_{\text{GS}} = 4.5\text{ V}$, $I_{\text{D}} = 5\text{ A}$		33	43	

1. Defined by design, not subject to production test.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{\text{DS}} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	321	-	pF
C_{oss}	Output capacitance		-	68	-	
C_{rss}	Reverse transfer capacitance		-	34	-	
Q_{g}	Total gate charge	$V_{\text{DD}} = 15\text{ V}$, $I_{\text{D}} = 10\text{ A}$, $V_{\text{GS}} = 0\text{ to }4.5\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	3.7	-	nC
Q_{gs}	Gate-source charge		-	1	-	
Q_{gd}	Gate-drain charge		-	1.7	-	

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d}(\text{on})}$	Turn-on delay time	$V_{\text{DD}} = 15\text{ V}$, $I_{\text{D}} = 5\text{ A}$, $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	2.4	-	ns
t_{r}	Rise time		-	2.5	-	
$t_{\text{d}(\text{off})}$	Turn-off delay time		-	12.8	-	
t_{f}	Fall time		-	2.5	-	

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		10	A
$I_{\text{SDM}}^{(1)}$	Source-drain current (pulsed)		-		40	A

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 10\text{ A}$	-		1.12	V
t_{rr}	Reverse recovery time	$I_{SD} = 1\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 24\text{ V}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	15.1		ns
Q_{rr}	Reverse recovery charge		-	7.5		nC
I_{RRM}	Reverse recovery current		-	1		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

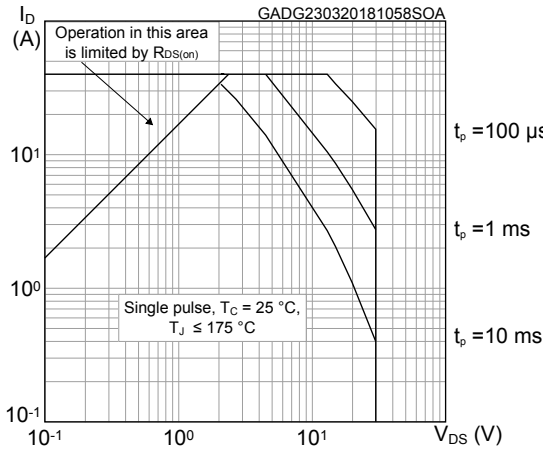


Figure 2. Thermal impedance

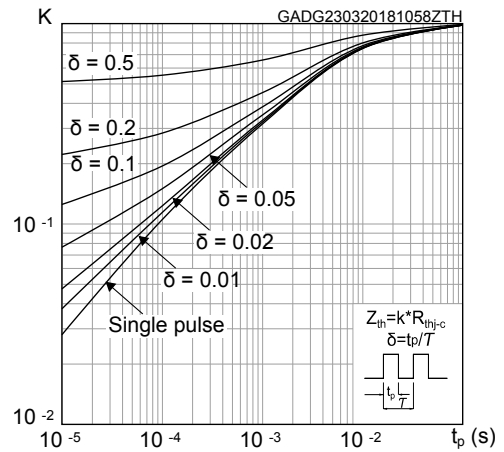


Figure 3. Output characteristics

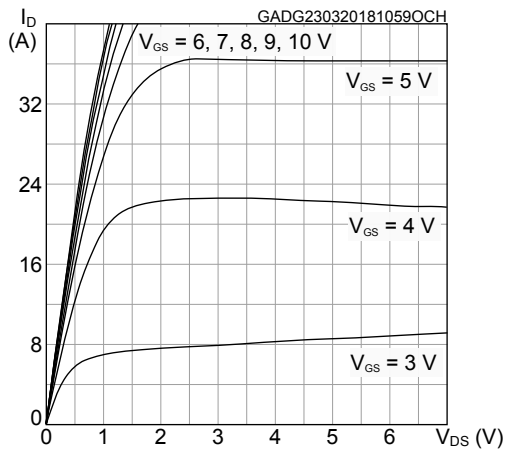


Figure 4. Transfer characteristics

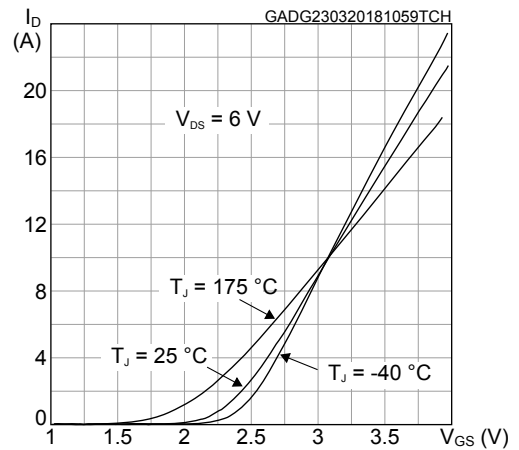


Figure 5. Gate charge vs gate-source voltage

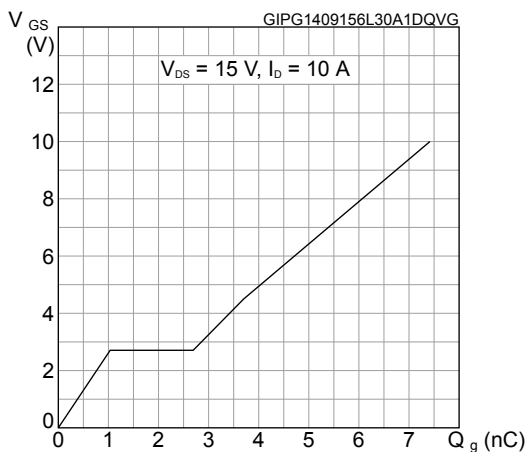


Figure 6. Static drain-source on-resistance

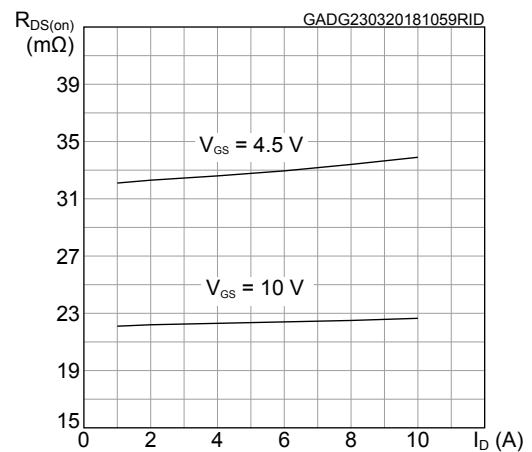


Figure 7. Capacitance variations

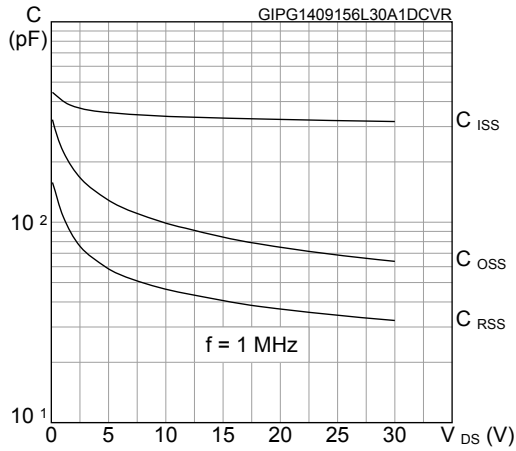


Figure 8. Normalized gate threshold voltage vs temperature

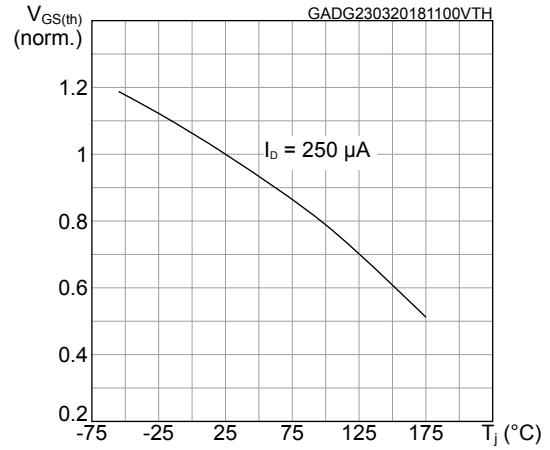


Figure 9. Normalized on-resistance vs temperature

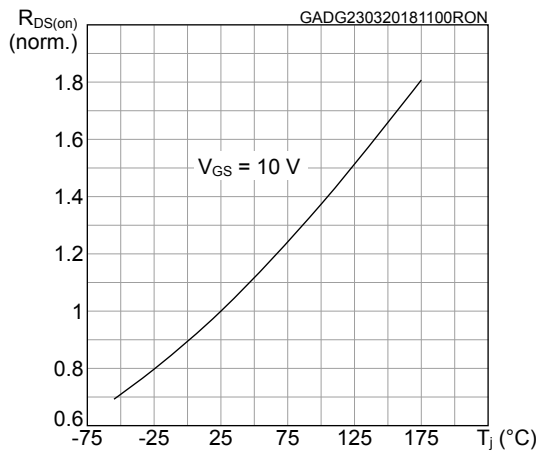


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

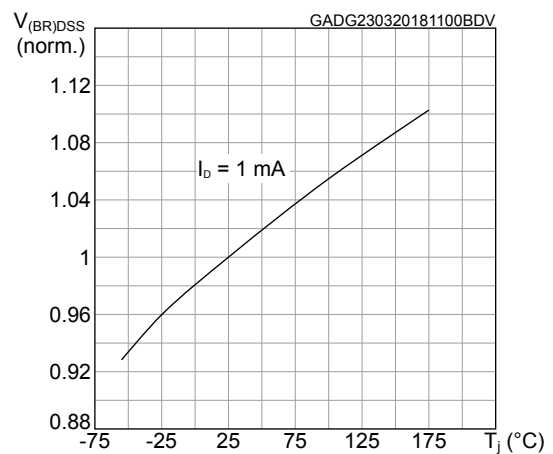
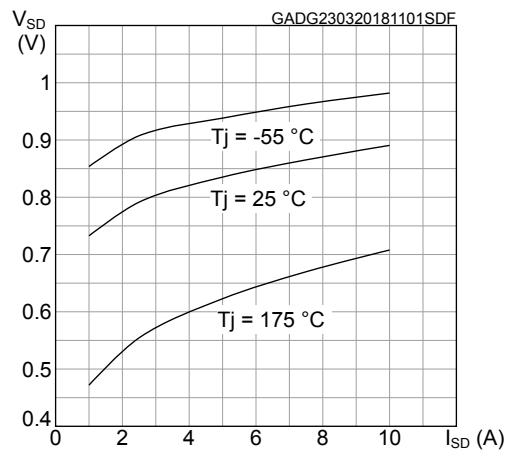
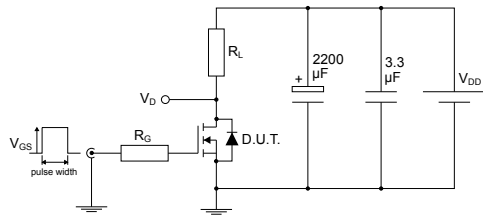


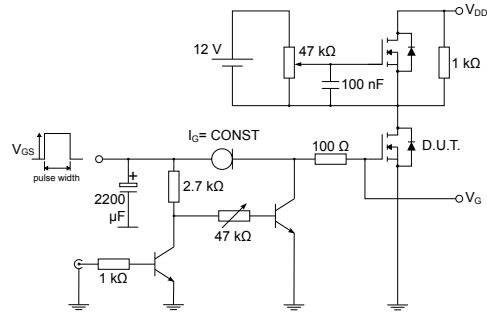
Figure 11. Source-drain diode forward characteristics



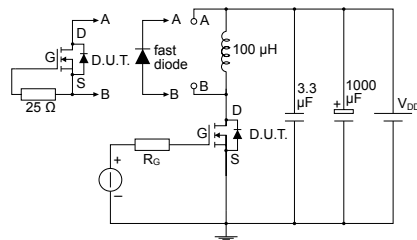
3 Test circuits

Figure 12. Test circuit for resistive load switching times


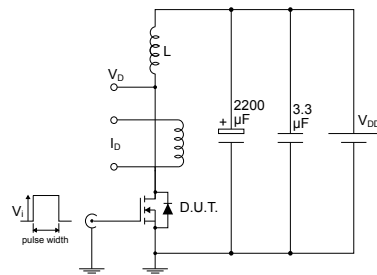
AM01468v1

Figure 13. Test circuit for gate charge behavior


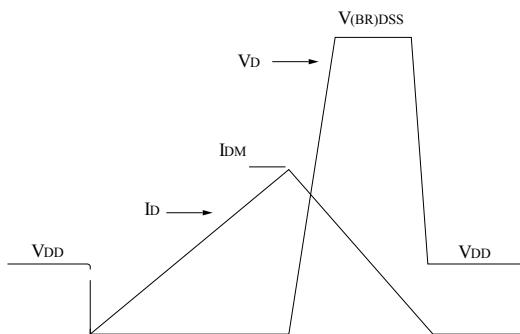
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Figure 14. Test circuit for inductive load switching and diode recovery times


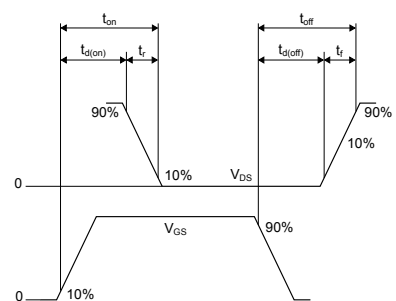
AM01470v1

Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform


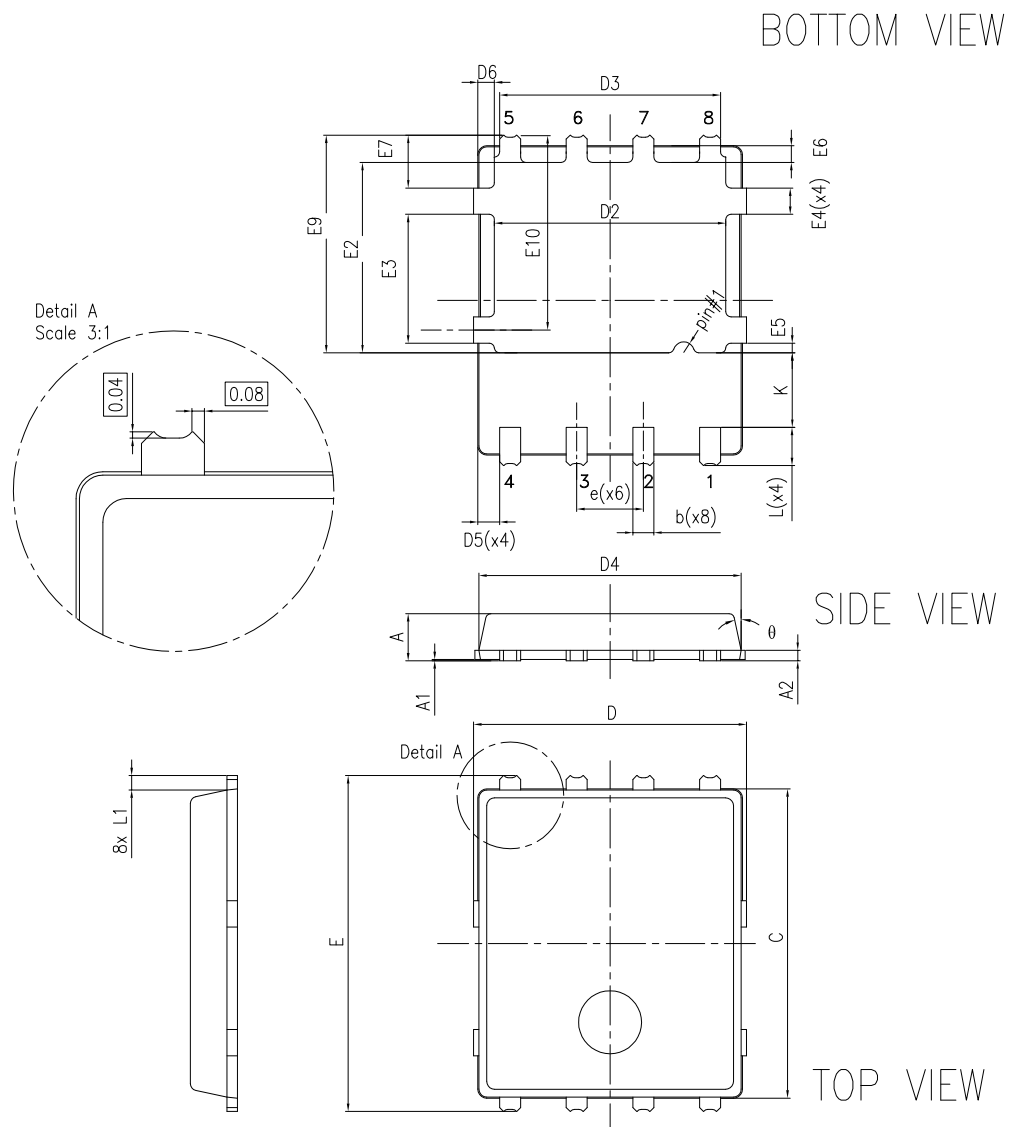
AM01473v1

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 WF type R package information

Figure 18. PowerFLAT™ 5x6 WF type R package outline

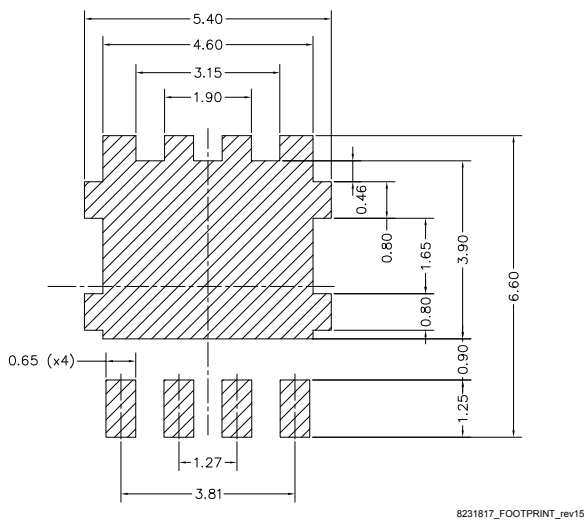


8231817_R_WF_Rev_15

Table 8. PowerFLAT™ 5x6 WF type R mechanical data

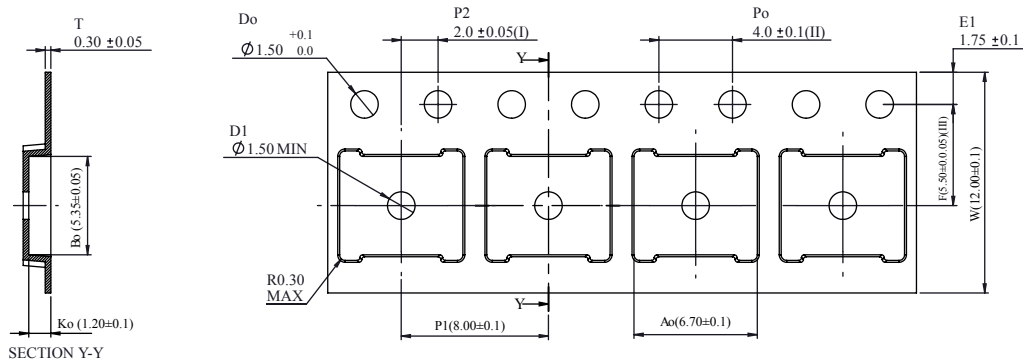
Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
C	5.80	6.00	6.10
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.10
D5	0.25	0.4	0.55
D6	0.15	0.3	0.45
e		1.27	
E	6.20	6.40	6.60
E2	3.50		3.70
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28
E6	0.20	0.325	0.45
E7	0.85	1.00	1.15
E9	4.00	4.20	4.40
E10	3.55	3.70	3.85
K	1.275		1.575
L	0.725	0.825	0.925
L1	0.175	0.275	0.375
θ	0°		12°

Figure 19. PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)



4.2 PowerFLAT™ 5x6 WF packing information

Figure 20. PowerFLAT™ 5x6 WF tape (dimensions are in mm)



- (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

8234350_TapeWF_rev_C

Figure 21. PowerFLAT™ 5x6 package orientation in carrier tape

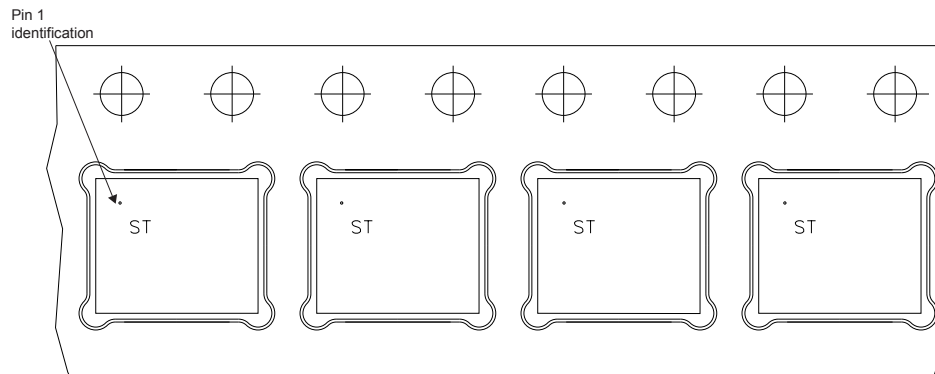
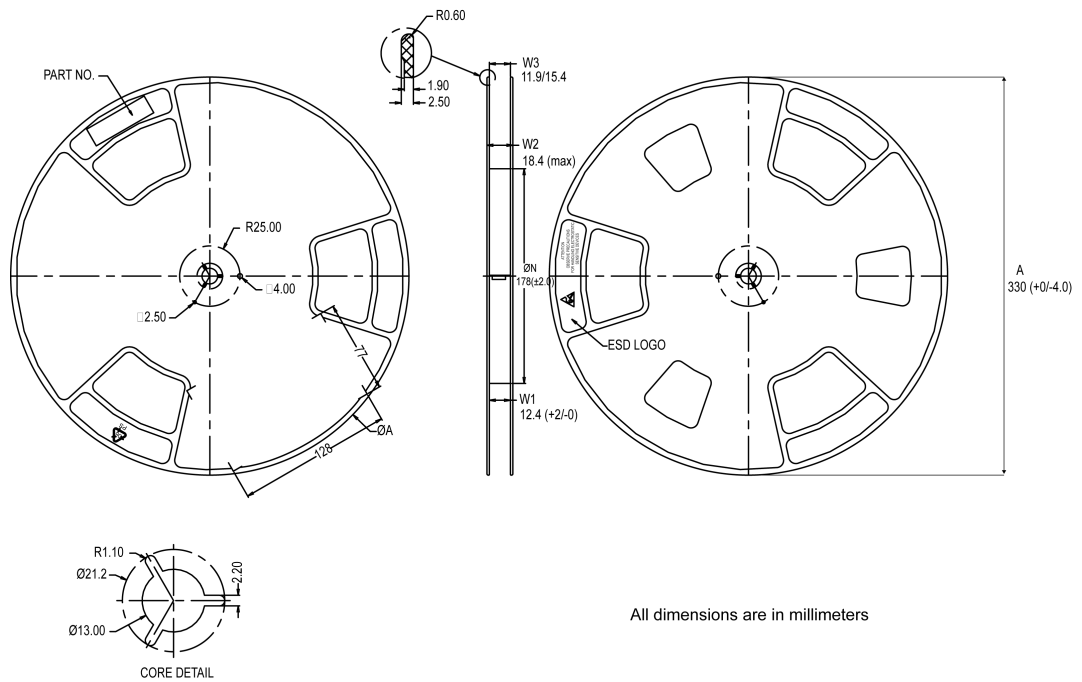


Figure 22. PowerFLAT™ 5x6 reel (dimensions are in mm)



8234350_Reel_rev_C

Revision history

Table 9. Document revision history

Date	Version	Changes
05-Apr-2018	1	Initial release. The document status is production data.

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 WF type R package information	8
4.2	PowerFLAT™ 5x6 WF packing information	10
	Revision history	12

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