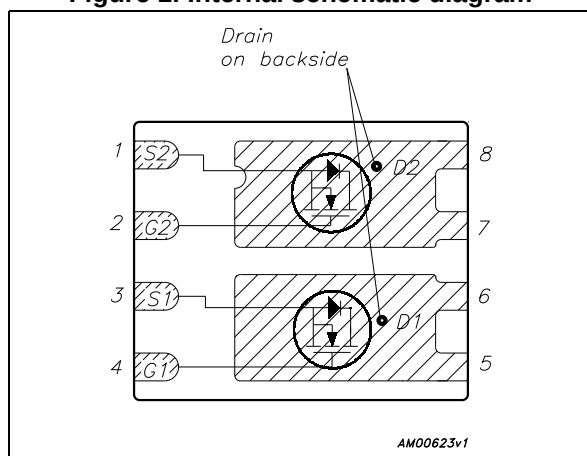


Automotive-grade dual N-channel 30 V, 0.016 Ω typ., 40 A STripFET™ H5 Power MOSFET in a PowerFLAT™ 5x6 DI package

Datasheet - production data



Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STL40DN3LLH5	30 V	0.018 Ω	40 A

- AEC-Q101 qualified
- Low on-resistance
- High avalanche ruggedness
- Low gate drive power loss
- Wettable flank package



Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™ H5 technology. The device has been optimized to achieve very low on-state resistance, contributing to a FoM that is among the best in its class.

Table 1. Device summary

Order code	Marking	Package	Packing
STL40DN3LLH5	40DN3LH5	PowerFLAT™ 5x6 double island	Tape and reel

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3 **Test circuits** 8

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 22	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	40	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	28	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	11	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb}=100^\circ\text{C}$	7	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	44	A
$I_{DM}^{(1)(3)}$	Drain current (pulsed)	160	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25^\circ\text{C}$	50	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	4.7	W
T_J	Operating junction temperature range	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature range		

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

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	3.0	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	32	$^\circ\text{C/W}$

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

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}^{(1)}$			10	μA
I_{GSS}	Gate body leakage current	$V_{GS} = \pm 22\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1	1.5		V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 5.5\text{ A}$		0.016	0.018	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 5.5\text{ A}$		0.02	0.025	Ω

1. Defined by design, not subject to production test

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	475	-	pF
C_{oss}	Output capacitance		-	97	-	pF
C_{rss}	Reverse transfer capacitance		-	19	-	pF
Q_g	Total gate charge	$V_{DD} = 15\text{ V}$, $I_D = 11\text{ A}$	-	4.5	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 4.5\text{ V}$	-	1.7	-	nC
Q_{gd}	Gate-drain charge	(see Figure 13)	-	1.9	-	nC

Table 6. Switching times

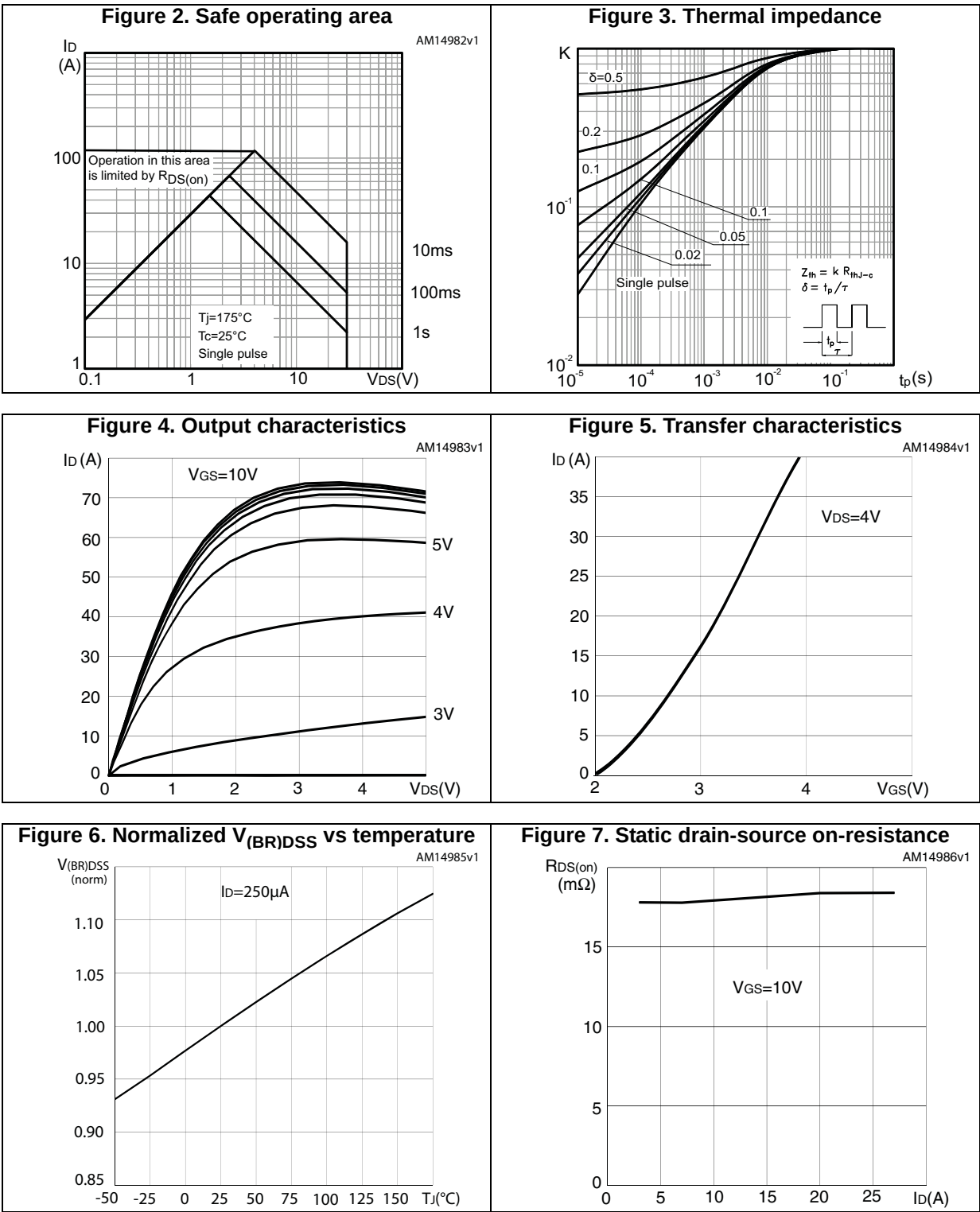
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$, $I_D = 11\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 12)	-	4	-	ns
t_r	Rise time		-	22	-	ns
$t_{d(off)}$	Turn-off delay time		-	13	-	ns
t_f	Fall time		-	2.8	-	ns

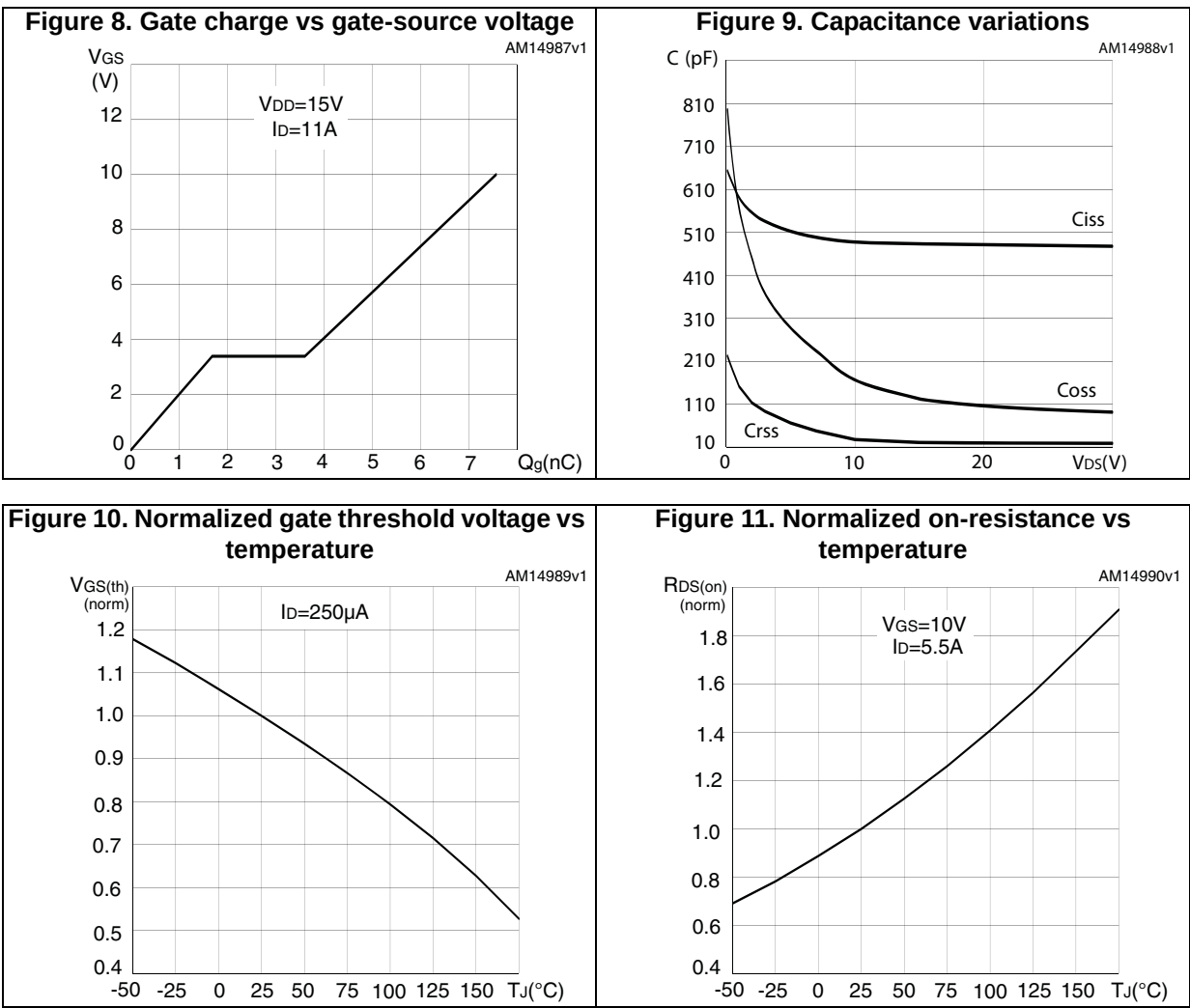
Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 11\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 11\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$	-	16.2		ns
Q_{rr}	Reverse recovery charge		-	1		nC
I_{RRM}	Reverse recovery current		-	8.1		A

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

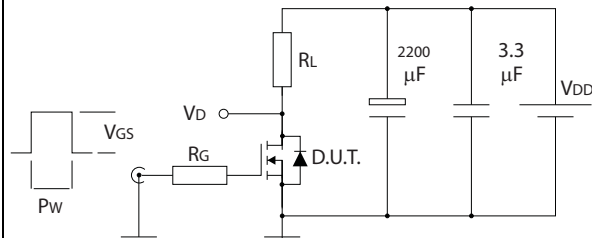
2.1 Electrical characteristics (curves)





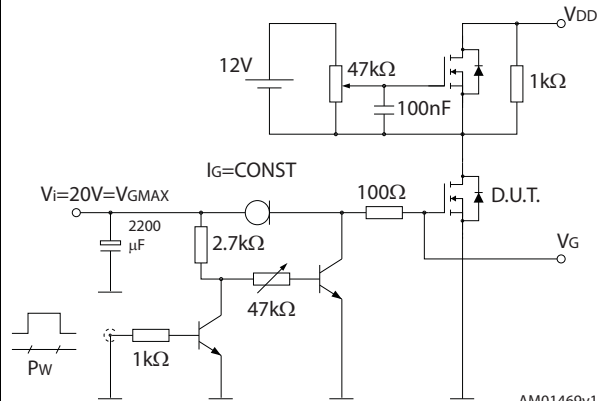
3 Test circuits

Figure 12. witching times test circuit for resistive load



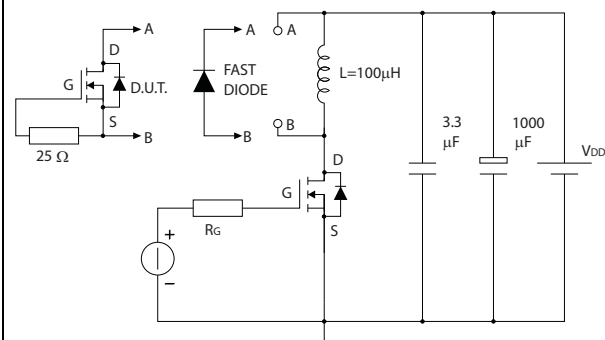
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Figure 13. Gate charge test circuit



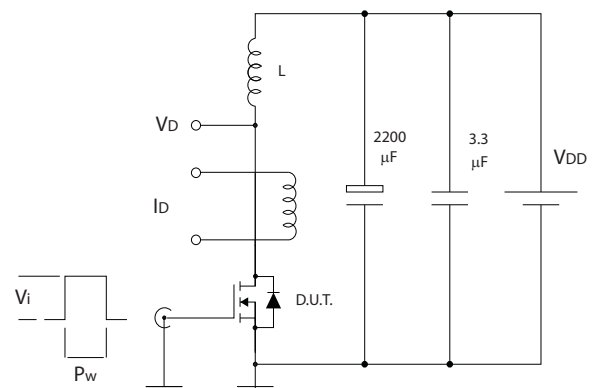
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Figure 14. est circuit for inductive load switching and diode recovery times



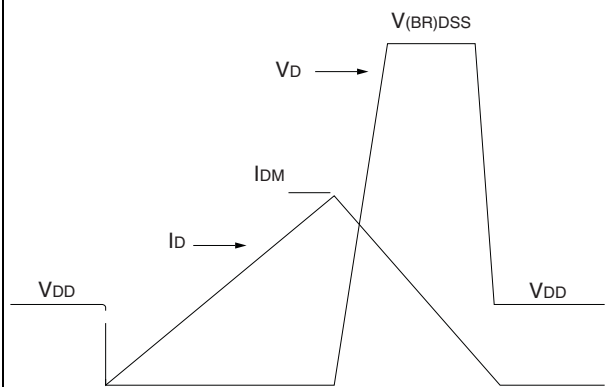
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Figure 15. Unclamped inductive load test circuit



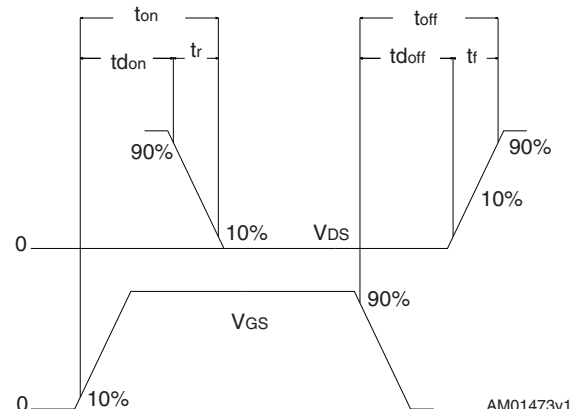
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Figure 16. Unclamped inductive waveform



AM01472v1

Figure 17. Switching time waveform



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 double island WF type R

Figure 18. PowerFLAT 5x6 double island WF type R outline

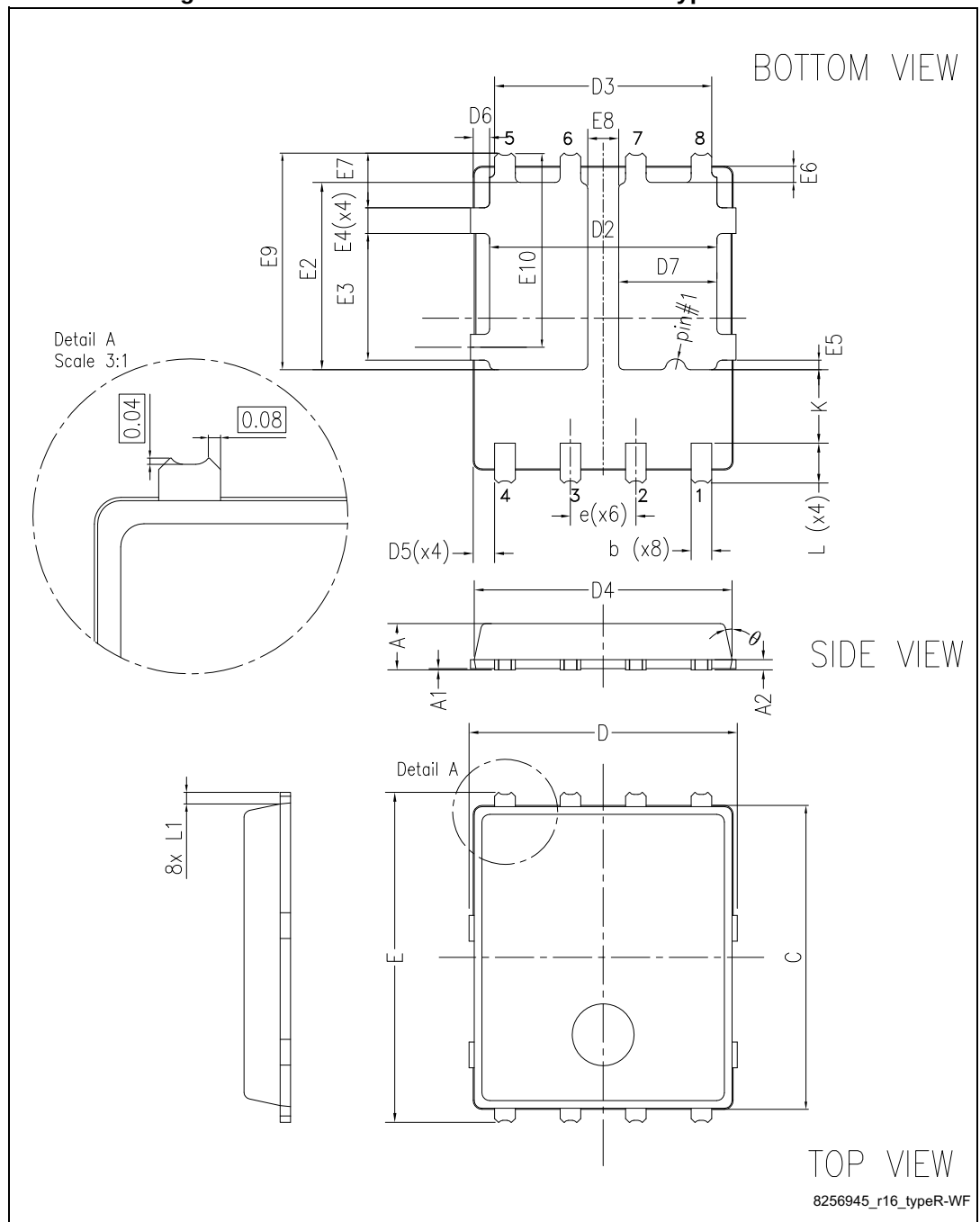
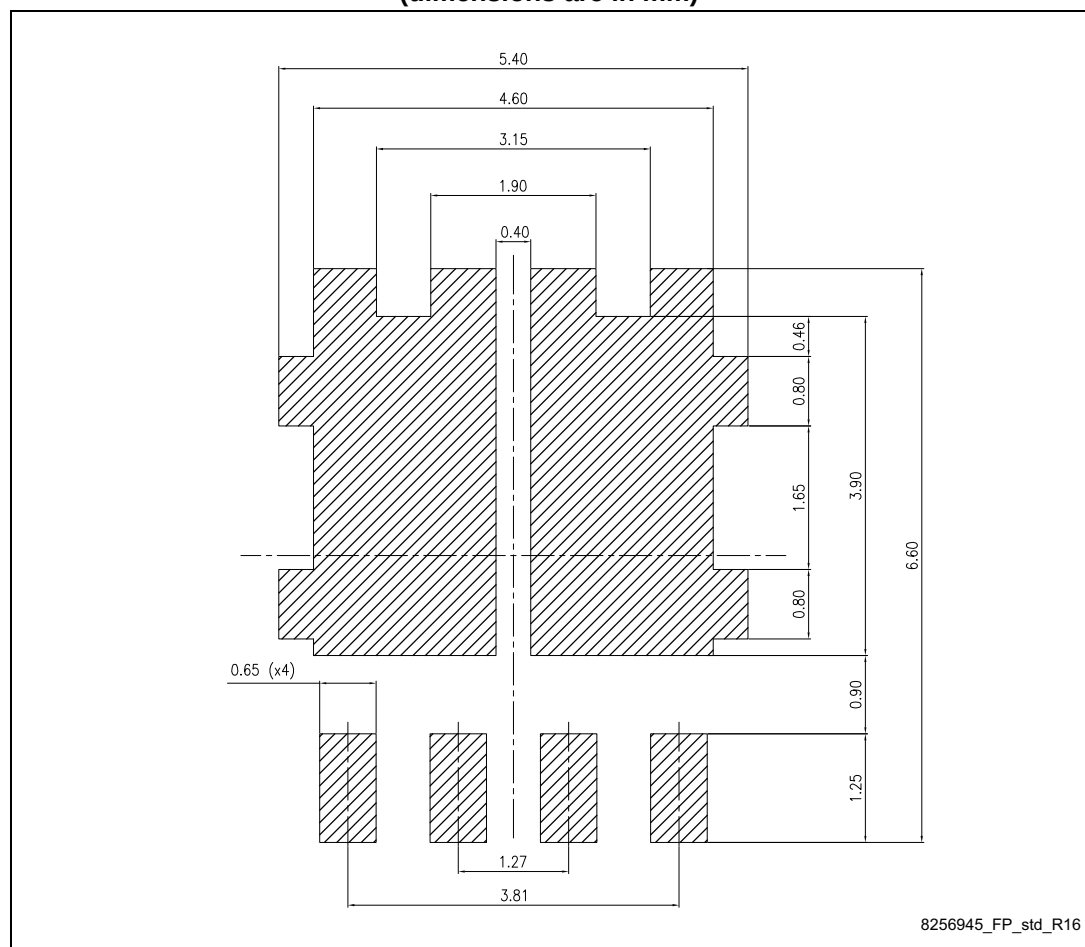


Table 8. PowerFLAT 5x6 double island WF type R mechanical data

Ref.	Dimensions (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	5.10
D5	0.25	0.40	0.55
D6	0.15	0.30	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
E8	0.55	1.00	0.75
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°

(dimensions are in mm)



5 Packing information

Figure 20. PowerFLAT™ 5x6 WF tape

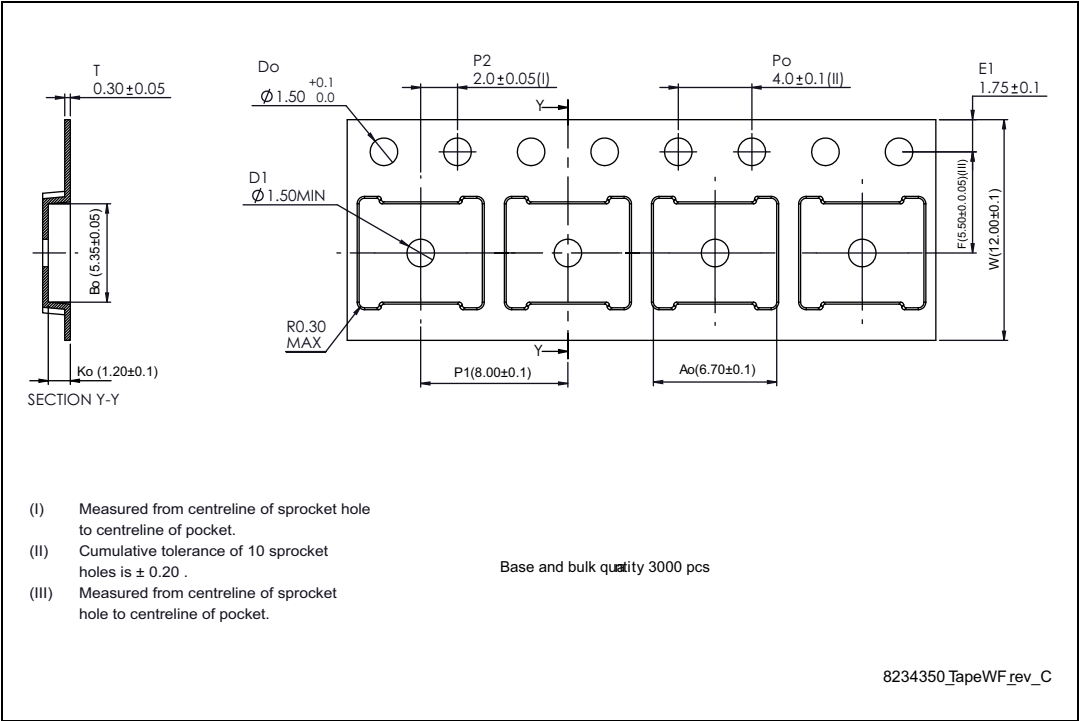


Figure 21. PowerFLAT™ 5x6 package orientation in carrier tape

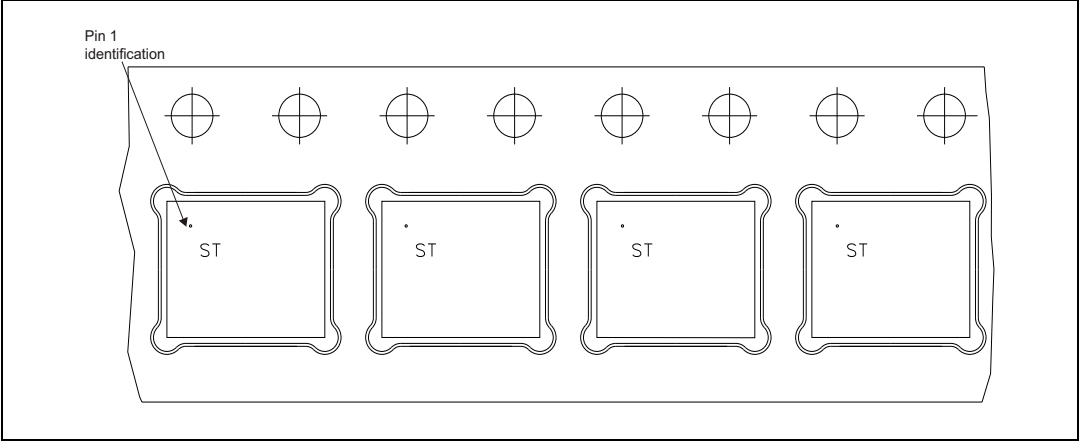
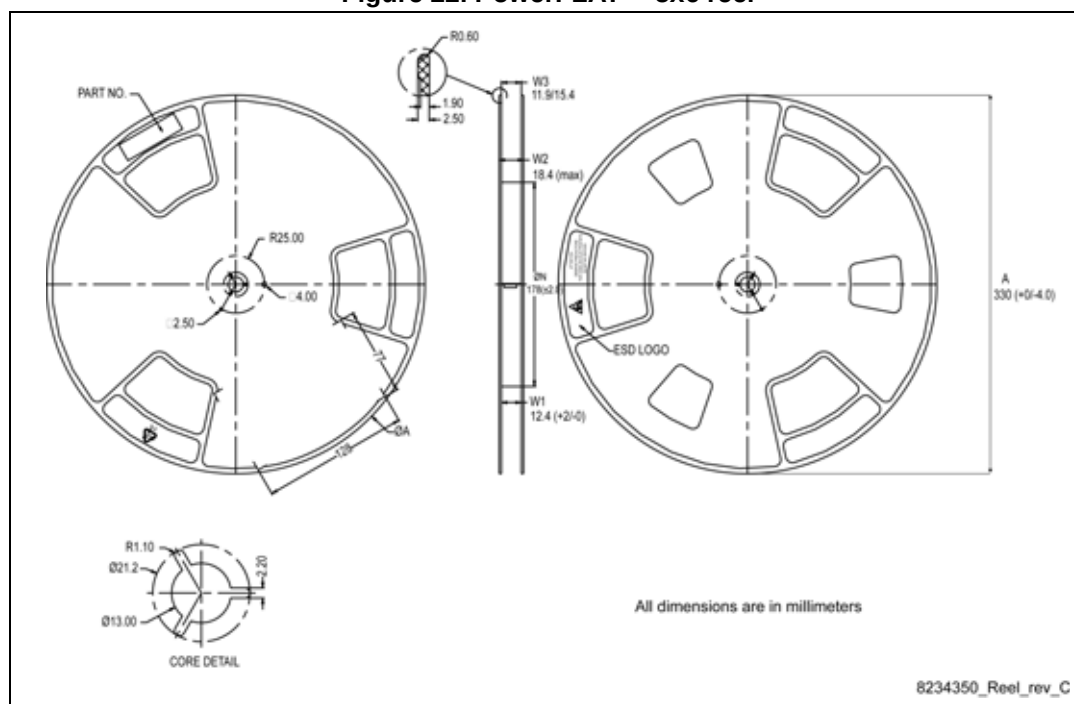


Figure 22. PowerFLAT™ 5x6 reel



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
24-Jan-2011	1	First release.
03-Oct-2012	2	Section 2.1: Electrical characteristics (curves) has been added. Document status promoted from preliminary data to datasheet. Minor text changes.
14-Dec-2012	3	Modified the Applications section on the coverpage to "Automotive switching applications".
23-Feb-2015	4	Updated Section 4: Package mechanical data and added Section 5: Packing information. Updated title and features in cover page. Minor text changes.
27-Oct-2015	5	Updated title and features in cover page. Updated <i>Table 2, Table 3, Table 4 and Table 7</i> . Updated <i>Section 4: Package information</i> Minor text changes.
11-Mar-2016	6	Updated silhouette in cover page. Updated <i>Table 1: Device summary, Table 2: Absolute maximum ratings, Table 3: Thermal resistance and Table 4: On/off states</i> . Updated <i>Figure 2: Safe operating area</i> . Updated <i>Section 4.1: PowerFLAT 5x6 double island WF type R</i> Updated <i>Section 5: Packing information</i> . Minor text changes.
7-Oct-2016	7	Updated marking and <i>Section 4.1: PowerFLAT 5x6 double island WF type R</i> . Minor text changes.

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