

Automotive-grade dual N-channel 60 V, 21 mΩ typ., 32 A
STripFET™ F6 Power MOSFET in a PowerFLAT™ 5x6 DI package

Datasheet - production data

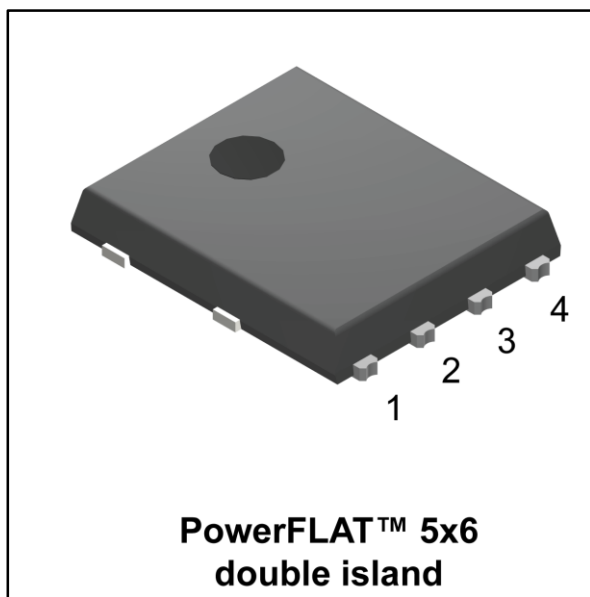
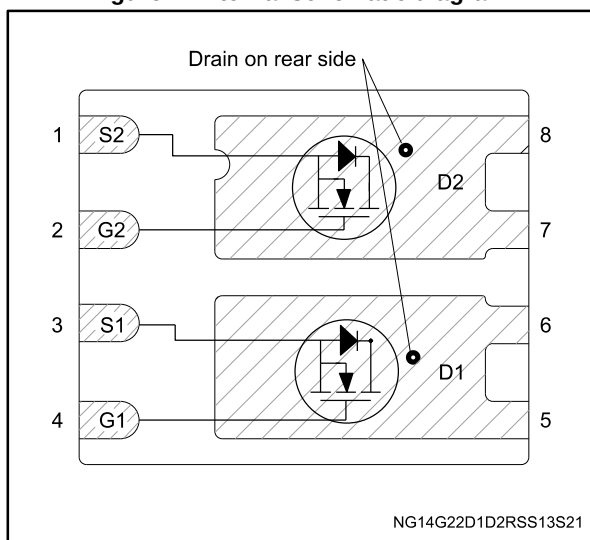


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STL8DN6LF6AG	60 V	27 mΩ	32 A	55 W

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



Applications

- Switching applications

Description

This device is a dual N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low R_{DS(on)} in all packages.

Table 1: Device summary

Order code	Marking	Package	Packing
STL8DN6LF6AG	8DN6LF6	PowerFLAT™ 5x6 double island	Tape and reel

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_{case} = 25\text{ }^{\circ}\text{C}$	32	A
	Drain current (continuous) at $T_{case} = 100\text{ }^{\circ}\text{C}$	23	
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	9.6	A
	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	6.8	
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	38	A
$I_{DM}^{(2)(2)}$	Drain current (pulsed)	128	A
P_{TOT}	Total dissipation at $T_{case} = 25\text{ }^{\circ}\text{C}$ (one channel active)	55	W
P_{TOT}	Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$ (one channel active)	4.8	
T_{stg}	Storage temperature range	-55 to 175	$^{\circ}\text{C}$
T_j	Operating junction temperature range		

Notes:(1) When mounted on a 1-inch² FR-4, 2 Oz copper board, $t < 10\text{ s}$.

(2) Pulse width is limited by safe operating area

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.7	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	

Notes:(1) When mounted on a 1-inch² FR-4, 2 Oz copper board, $t < 10\text{ s}$.

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AV}	Avalanche current, not repetitive	32	A
$E_{AS}^{(1)}$	Single pulse avalanche energy	120	mJ

Notes:(1) starting $T_j = 25\text{ }^{\circ}\text{C}$, $I_D = 38\text{ A}$, $V_{DD} = 43.5\text{ V}$.

2 Electrical characteristics

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

Table 5: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 60\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$			± 100	nA
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{\text{DS(on)}}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 9.6\text{ A}$		21	27	m Ω
		$V_{\text{GS}} = 4.5\text{ V}$, $I_{\text{D}} = 9.6\text{ A}$		25	31	

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{\text{DS}} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	1340	-	pF
C_{oss}	Output capacitance		-	90	-	
C_{rss}	Reverse transfer capacitance		-	60	-	
Q_{g}	Total gate charge	$V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 9.6\text{ A}$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	27	-	nC
Q_{gs}	Gate-source charge		-	4.6	-	
Q_{gd}	Gate-drain charge		-	4.3	-	

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$	Turn-on delay time	$V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 12.5\text{ A}$, $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	9.6	-	ns
t_{r}	Rise time		-	20	-	
$t_{\text{d(off)}}$	Turn-off delay time		-	56	-	
t_{f}	Fall time		-	7	-	

Table 8: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		9.6	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		38	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 9.6\text{ A}$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 25\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 48\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	22.5		ns
Q_{rr}	Reverse recovery charge		-	22.2		nC
I_{RRM}	Reverse recovery current		-	2.0		A

Notes:

(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)

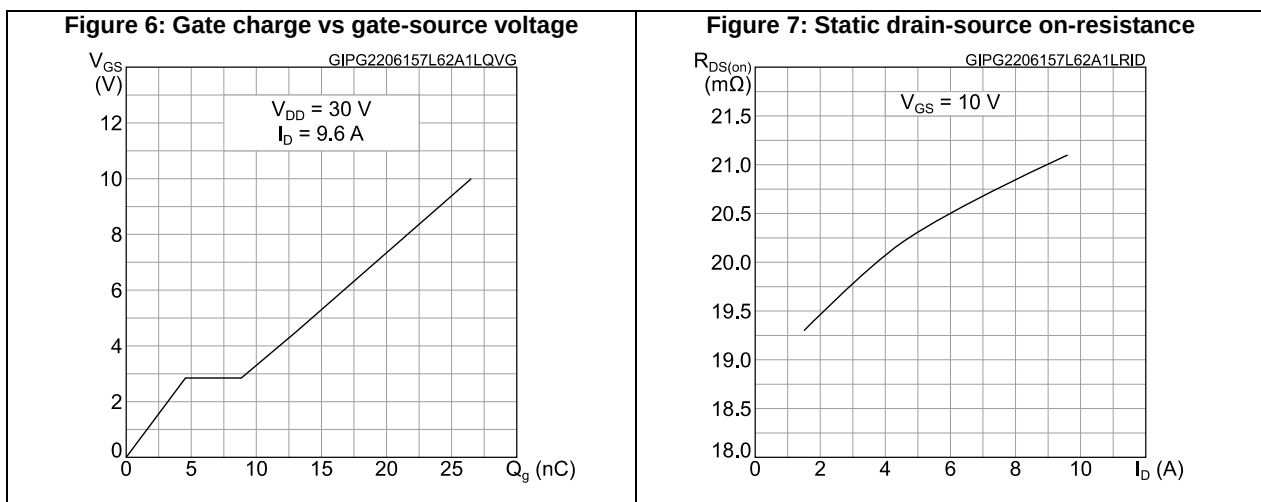
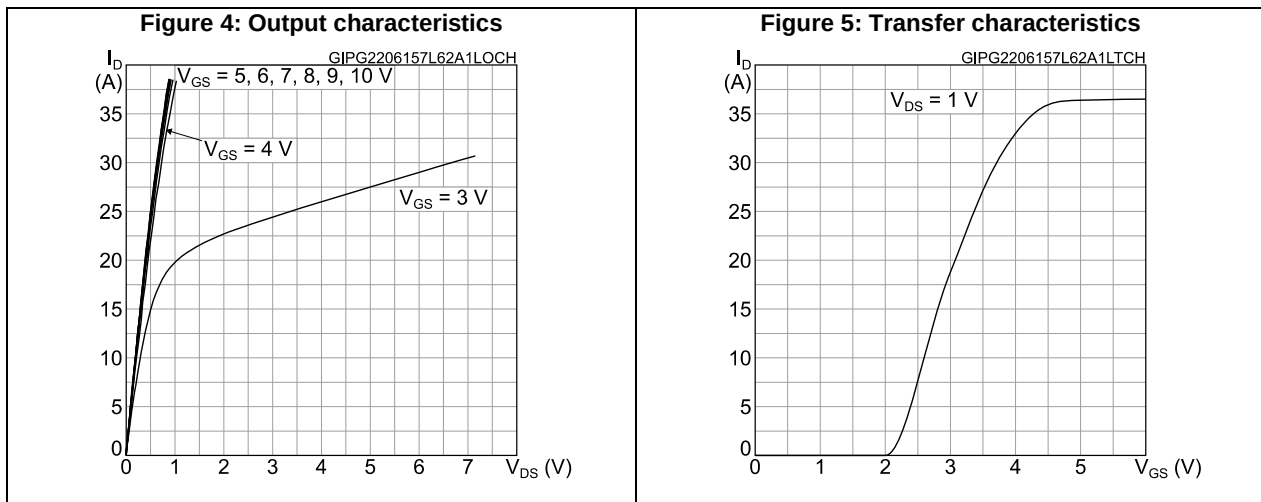
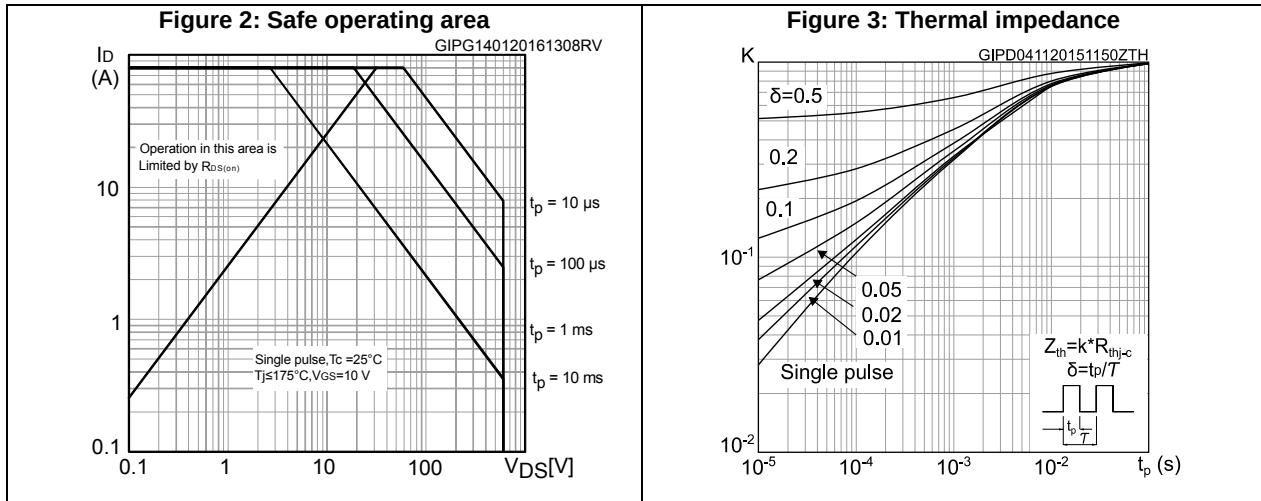


Figure 8: Capacitance variations

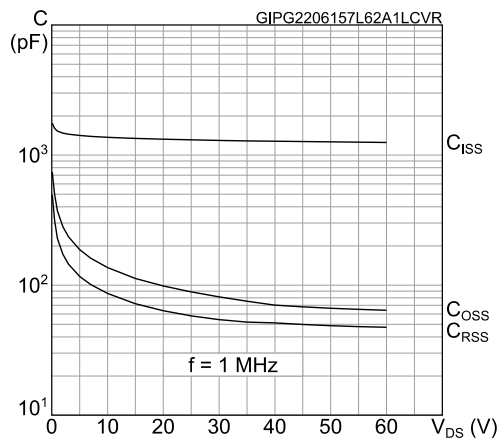


Figure 9: Normalized gate threshold voltage vs temperature

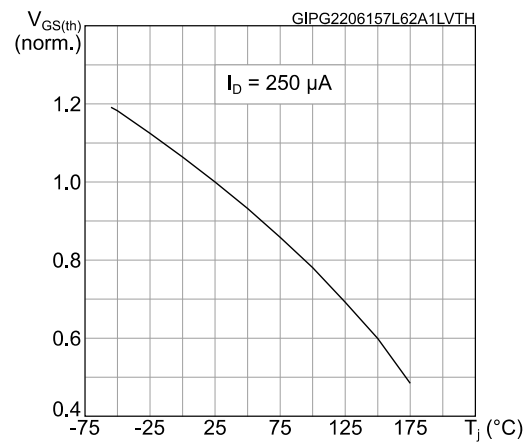


Figure 10: Normalized on-resistance vs temperature

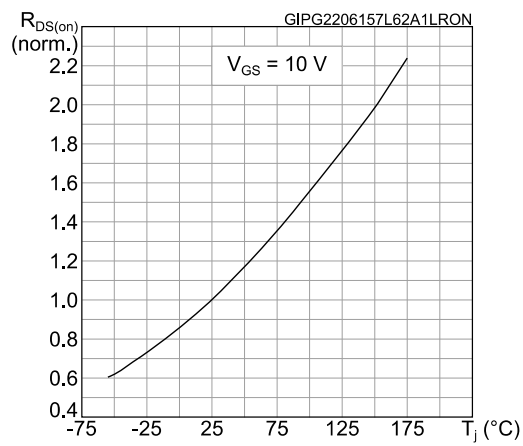


Figure 11: Normalized V(BR)DSS vs temperature

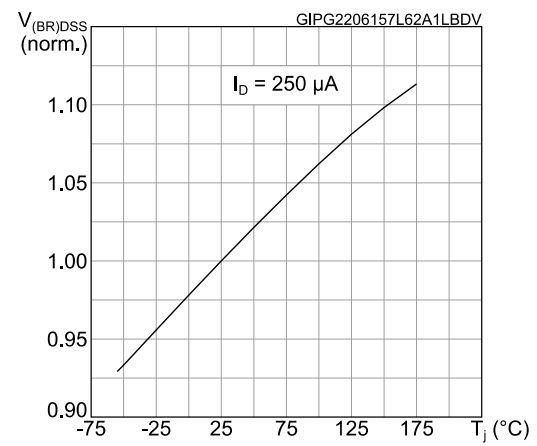
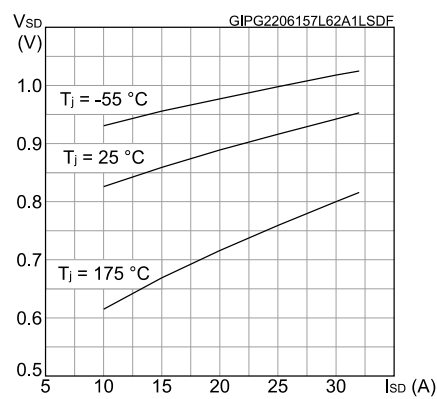
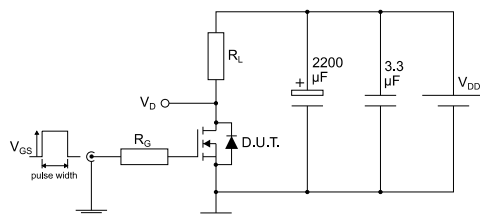


Figure 12: Source-drain diode forward characteristics



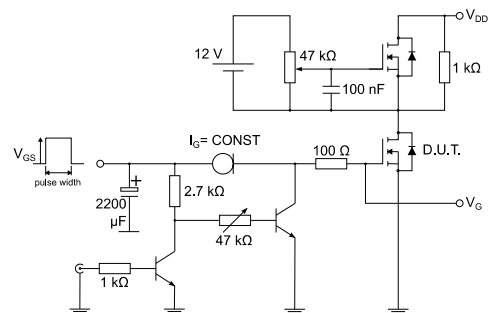
3 Test circuits

Figure 13: Test circuit for resistive load switching times



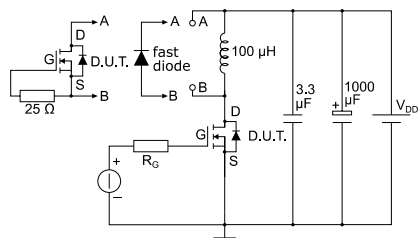
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Figure 14: Test circuit for gate charge behavior



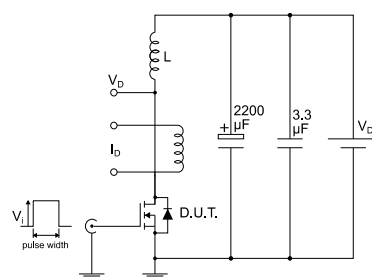
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Figure 15: Test circuit for inductive load switching and diode recovery times



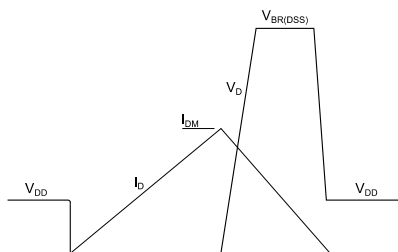
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Figure 16: Unclamped inductive load test circuit



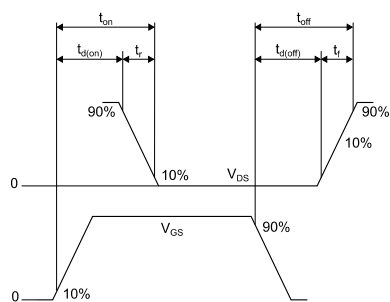
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Figure 17: Unclamped inductive waveform



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Figure 18: 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 double island WF type R package information

Figure 19: PowerFLAT™ 5x6 double island WF type R package outline

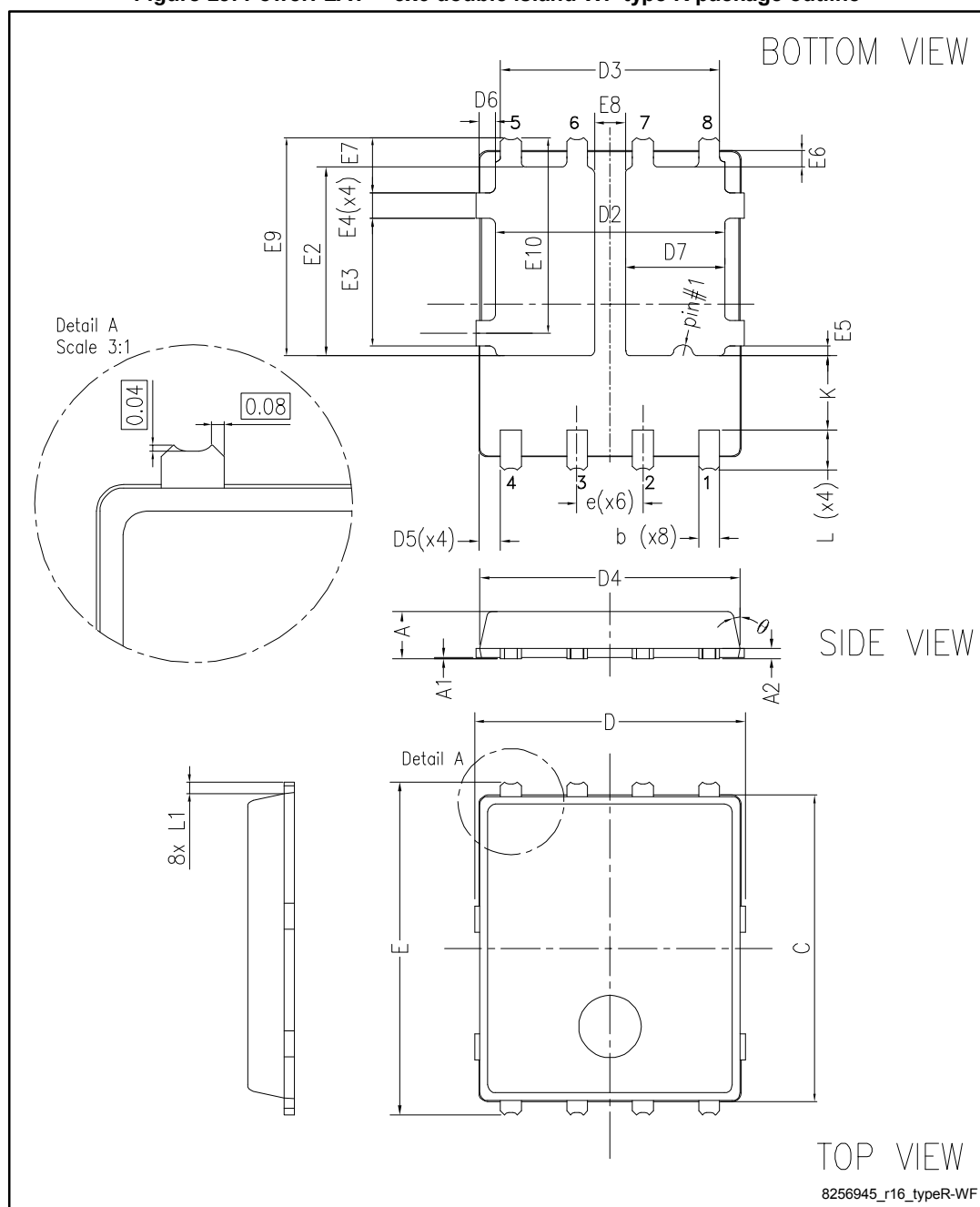
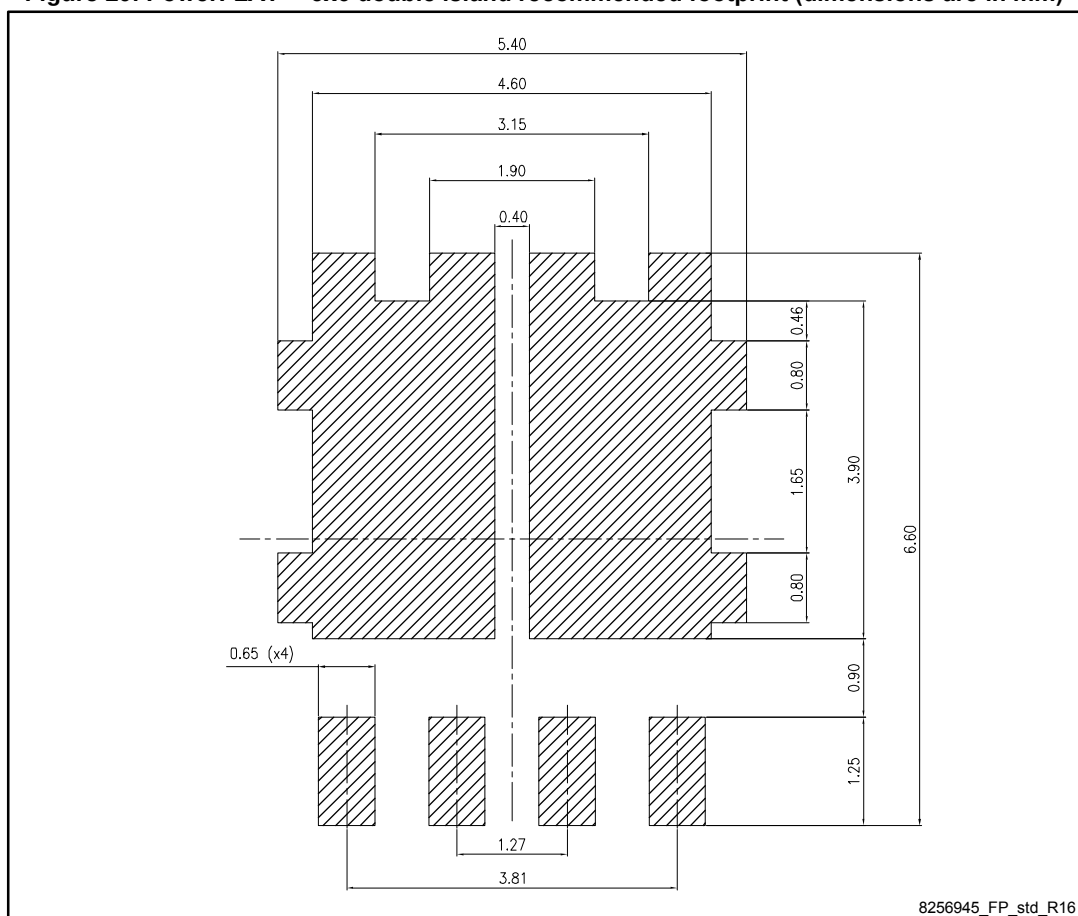


Table 9: PowerFLAT™ 5x6 double island WF type R mechanical data

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	6.20
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
D7	1.68		1.98
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°

Figure 20: PowerFLAT™ 5x6 double island recommended footprint (dimensions are in mm)



4.2 PowerFLAT™ 5x6 WF packing information

Figure 21: PowerFLAT™ 5x6 WF tape (dimensions are in mm)

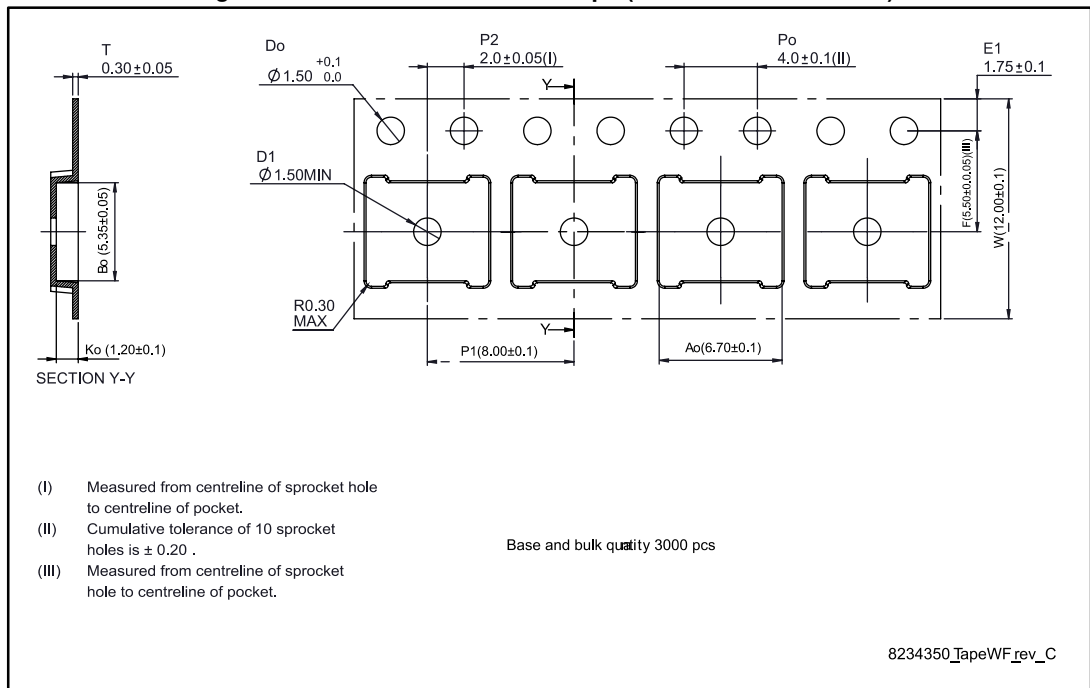


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

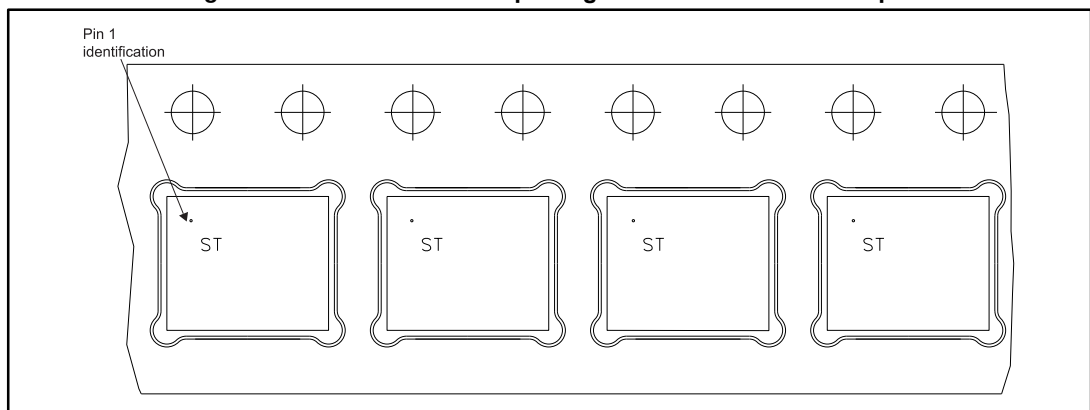
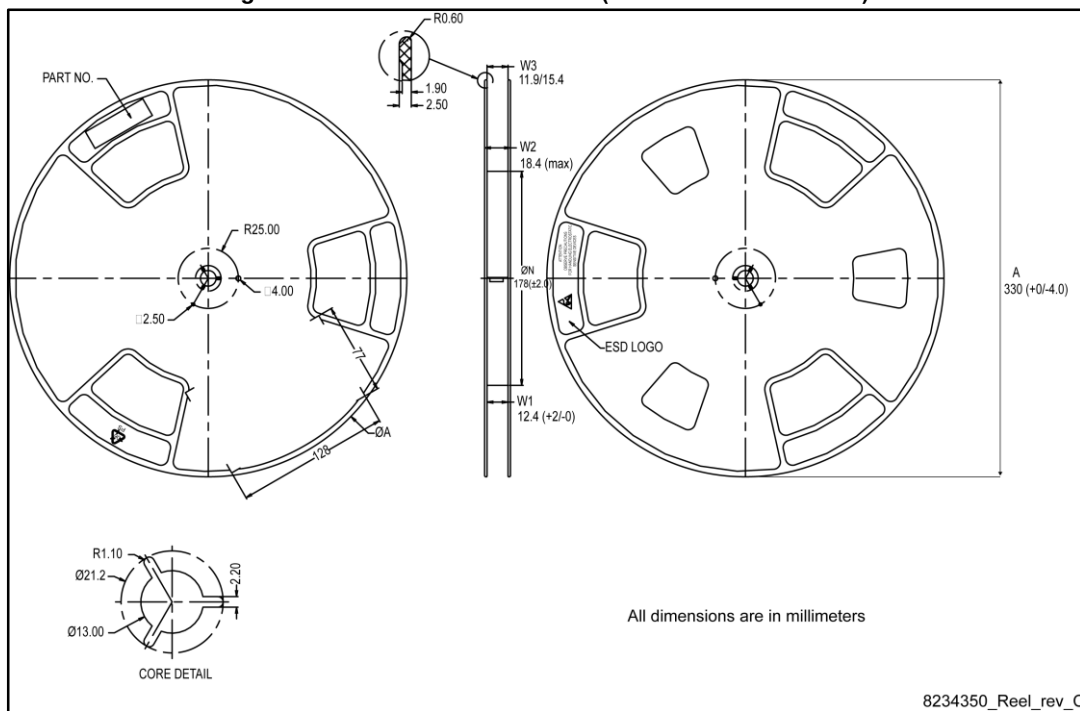


Figure 23: PowerFLAT™ 5x6 reel (dimensions are in mm)



5 Revision history

Table 10: Document revision history

Date	Revision	Changes
24-Jun-2015	1	First release.
07-Jul-2015	2	Minor text edits throughout document.
19-Jan-2016	3	Updated title. Updated <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 3: "Thermal data"</i> and <i>Table 4: "Avalanche characteristics"</i> . Updated <i>Figure 2: "Safe operating area"</i> and <i>Figure 3: "Thermal impedance"</i> . Minor text changes.
21-Sep-2016	4	Updated <i>Table 2: "Absolute maximum ratings"</i> . Updated <i>Section 4.1: "PowerFLAT™ 5x6 double island WF type R package information"</i> . Minor text changes.

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