

## Automotive-grade dual N-channel 60 V, 27 mΩ typ., 20 A STripFET™ II Power MOSFET in a PowerFLAT™ 5x6 double island package

Datasheet - production data

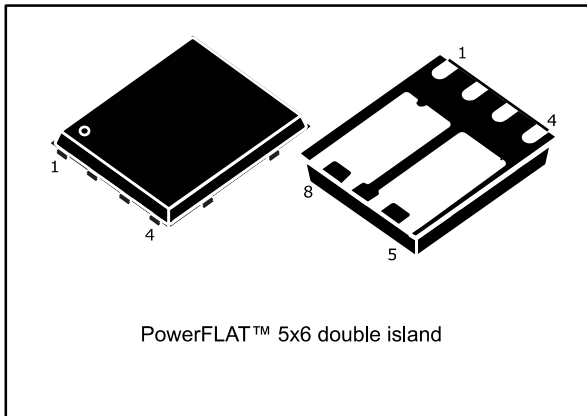
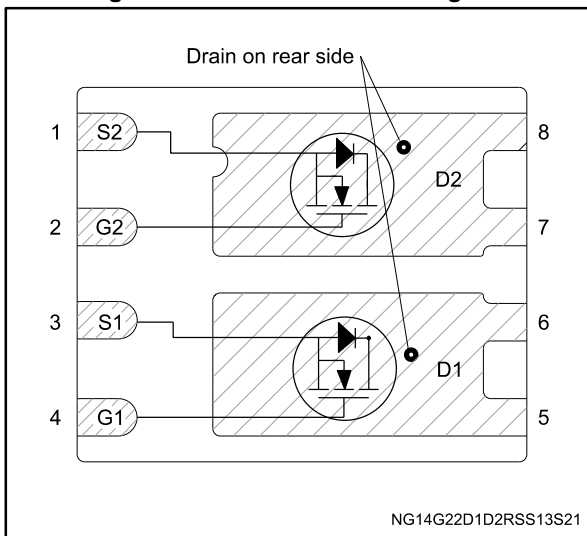


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>TOT</sub>
STL20DNF06LAG	60 V	40 mΩ	20 A	75 W

- Designed for Automotive applications and AEC-Q101 qualified
- PowerFLAT™ 5x6 double island with wettable flanks
- Logic level V<sub>GS(th)</sub>
- Maximum junction temperature: T<sub>J</sub> = 175 °C

### Applications

- Switching applications

### Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process is specifically designed to minimize input capacitance and gate charge. It is therefore ideal as a primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer applications. It is also suitable for any application with low gate charge drive requirements.

Table 1: Device summary

Order code	Marking	Package	Packing
STL20DNF06LAG	20DNF06L	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	$\pm 20$	V
$I_D^{(1)(2)}$	Drain current (continuous) at $T_{case} = 25\text{ °C}$	20	A
	Drain current (continuous) at $T_{case} = 100\text{ °C}$	20	
$I_{DM}^{(1)(3)}$	Drain current (pulsed)	80	A
$I_D^{(4)}$	Drain current (continuous) at $T_{pcb} = 25\text{ °C}$	7.4	A
	Drain current (continuous) at $T_{pcb} = 100\text{ °C}$	5.2	
$I_{DM}$	Drain current (pulsed)	29.6	A
$P_{TOT}$	Total dissipation at $T_{case} = 25\text{ °C}$	75	W
$P_{TOT}$	Total dissipation at $T_{pcb} = 25\text{ °C}$	4.8	
$T_{stg}$	Storage temperature	-55 to 175	°C
$T_j$	Operating junction temperature		

**Notes:**

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

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.0	°C/W
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	

**Notes:**

- (1) When mounted on a 1-inch<sup>2</sup> FR-4, 2 Oz copper board,  $t < 10\text{ s}$ .

**Table 4: Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AV}$	Avalanche current, not repetitive	7.4	A
$E_{AS}^{(1)}$	Single pulse avalanche energy	210	mJ

**Notes:**

- (1) starting  $T_j = 25\text{ °C}$ ,  $I_D = I_{AV}$ , per channel.

## 2 Electrical characteristics

( $T_{\text{case}} = 25\text{ °C}$  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
$I_{\text{DSS}}$	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$ , $V_{\text{DS}} = 60\text{ V}$			1	$\mu\text{A}$
		$V_{\text{GS}} = 0\text{ V}$ , $V_{\text{DS}} = 60\text{ V}$ , $T_{\text{C}} = 125\text{ °C}$			100	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$ , $V_{\text{GS}} = \pm 20\text{ V}$			$\pm 100$	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	$V_{\text{GS}} = 10\text{ V}$ , $I_{\text{D}} = 4\text{ A}$		27	40	m $\Omega$
		$V_{\text{GS}} = 5\text{ V}$ , $I_{\text{D}} = 4\text{ A}$		32	50	

**Table 6: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{\text{ISS}}$	Input capacitance	$V_{\text{DS}} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{\text{GS}} = 0\text{ V}$	-	670	-	pF
$C_{\text{OSS}}$	Output capacitance		-	170	-	
$C_{\text{RSS}}$	Reverse transfer capacitance		-	56	-	
$Q_{\text{g}}$	Total gate charge	$V_{\text{DD}} = 25\text{ V}$ , $I_{\text{D}} = 7.4\text{ A}$ , $V_{\text{GS}} = 10\text{ V}$ (see <a href="#">Figure 15: "Gate charge test circuit"</a> )	-	22.5	-	nC
$Q_{\text{gs}}$	Gate-source charge		-	2.5	-	
$Q_{\text{gd}}$	Gate-drain charge		-	7	-	

**Table 7: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d}(\text{on})}$	Turn-on delay time	$V_{\text{DD}} = 30\text{ V}$ , $I_{\text{D}} = 3.7\text{ A}$ $R_{\text{G}} = 4.7\text{ }\Omega$ , $V_{\text{GS}} = 10\text{ V}$ (see <a href="#">Figure 14: "Switching times test circuit for resistive load"</a> and <a href="#">Figure 19: "Switching time waveform"</a> )	-	7	-	ns
$t_{\text{r}}$	Rise time		-	15.4	-	
$t_{\text{d}(\text{off})}$	Turn-off delay time		-	36.8	-	
$t_{\text{f}}$	Fall time		-	7.7	-	

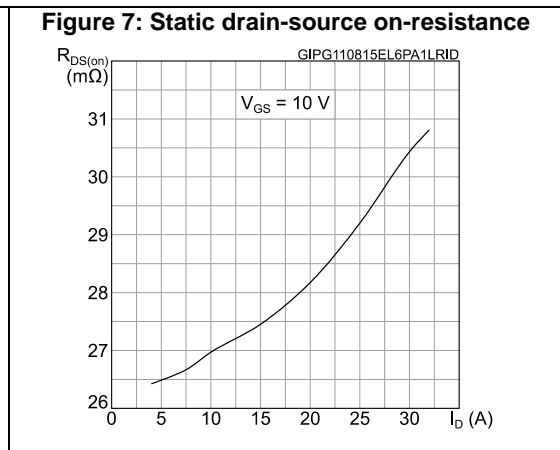
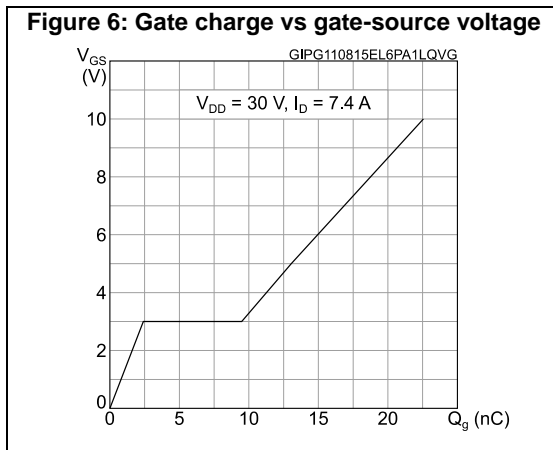
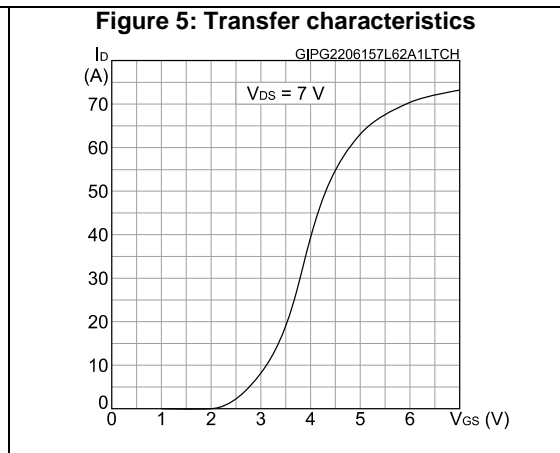
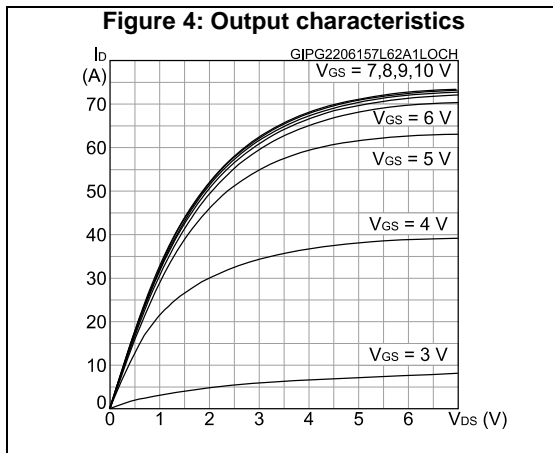
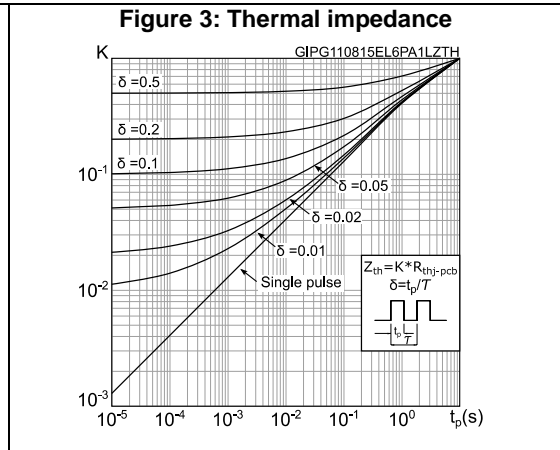
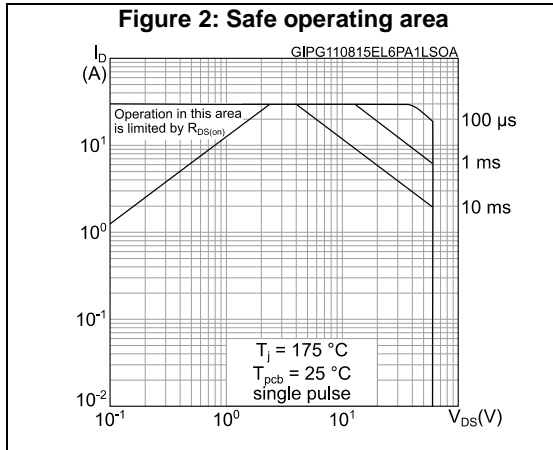
Table 8: Source-drain diode

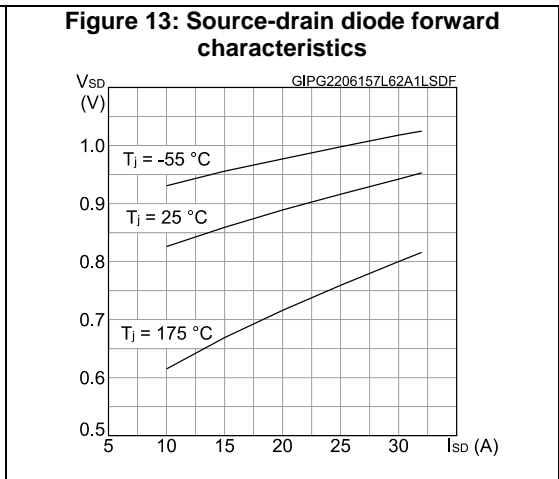
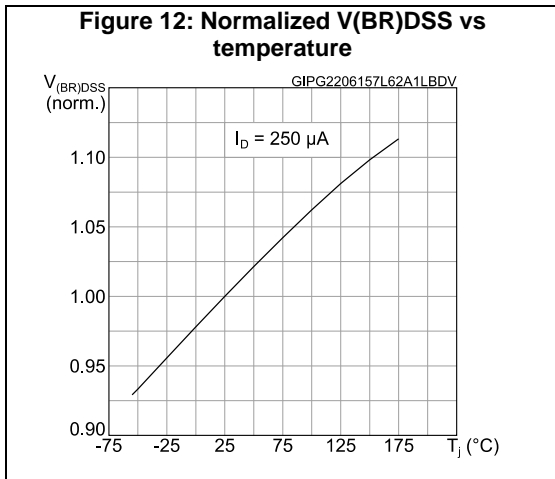
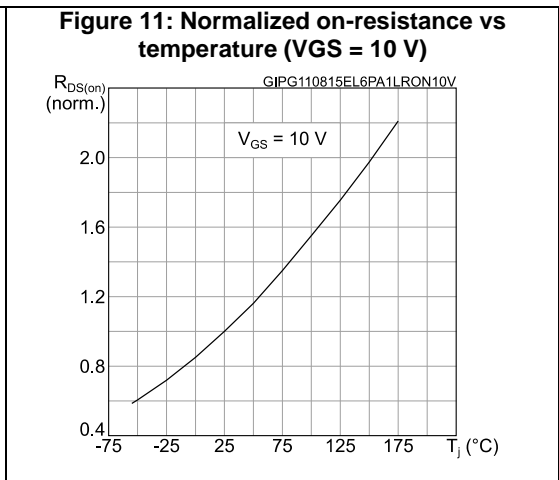
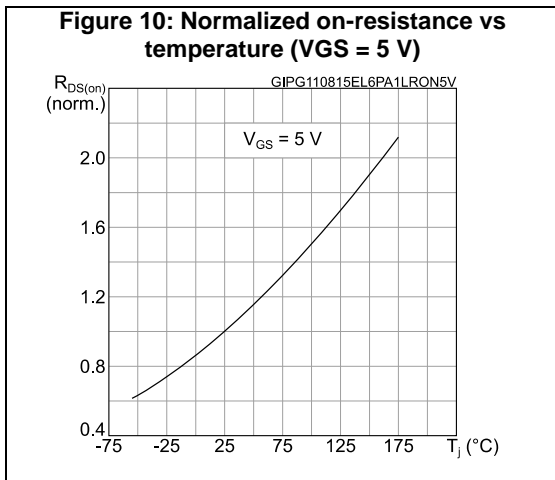
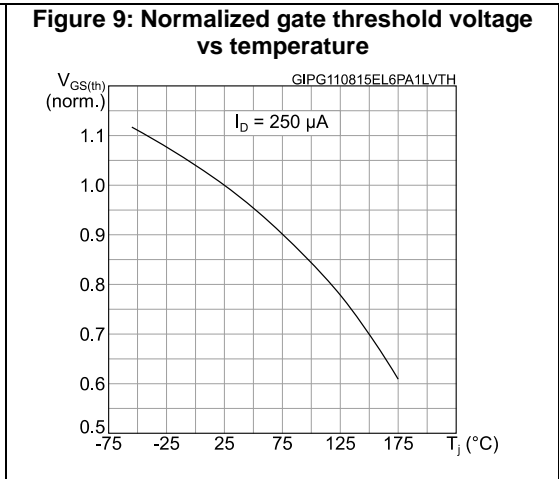
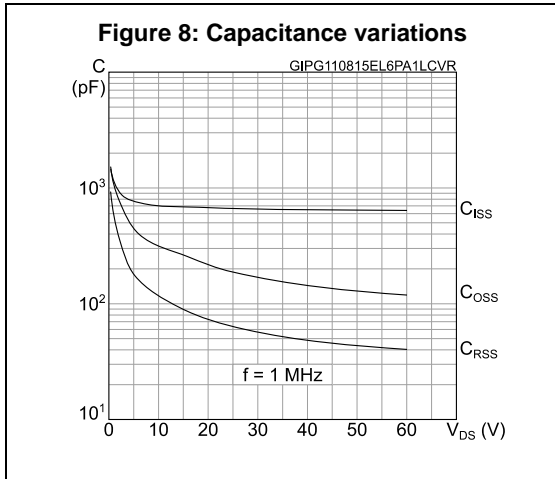
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		7.4	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		29.6	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$ , $I_{SD} = 7.4\text{ A}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 7.4\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 48\text{ V}$ (see <a href="#">Figure 16: "Test circuit for inductive load switching and diode recovery times"</a> )	-	28		ns
$Q_{rr}$	Reverse recovery charge		-	31.6		nC
$I_{RRM}$	Reverse recovery current		-	2.26		A

**Notes:**

- (1) Pulse width is limited by safe operating area.  
(2) Pulse test: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

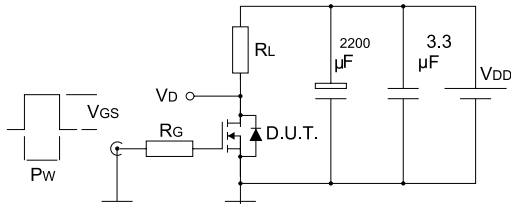
## 2.1 Electrical characteristics (curves)





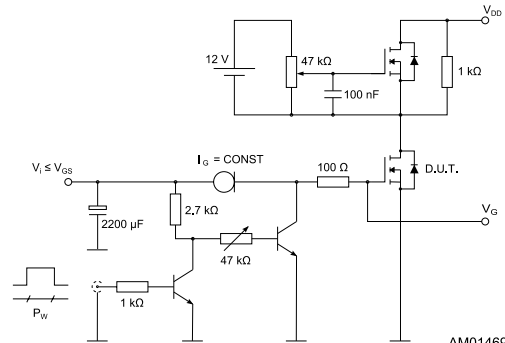
### 3 Test circuits

**Figure 14: Switching times test circuit for resistive load**



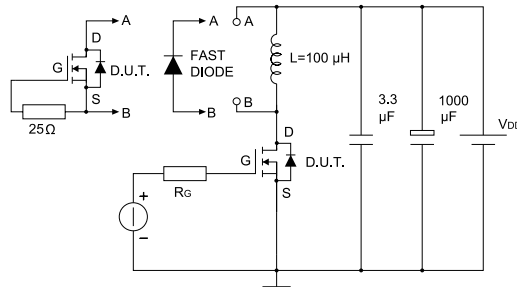
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**Figure 15: Gate charge test circuit**



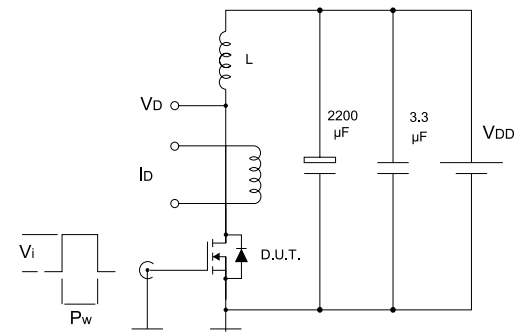
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**Figure 16: Test circuit for inductive load switching and diode recovery times**



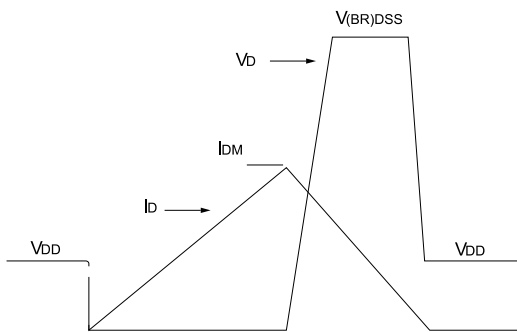
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**Figure 17: Unclamped inductive load test circuit**



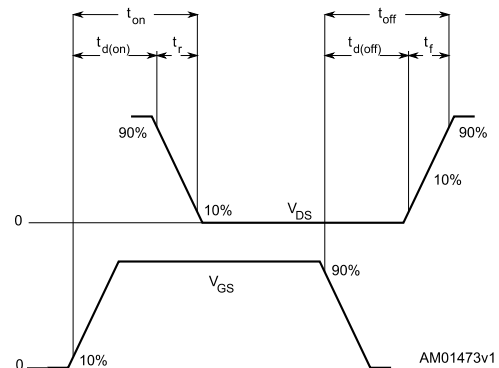
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**Figure 18: Unclamped inductive waveform**



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**Figure 19: 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](http://www.st.com). ECOPACK® is an ST trademark.

### 4.1 PowerFLAT™ 5x6 double island WF type R package information

Figure 20: PowerFLAT™ 5x6 double island WF type R package outline

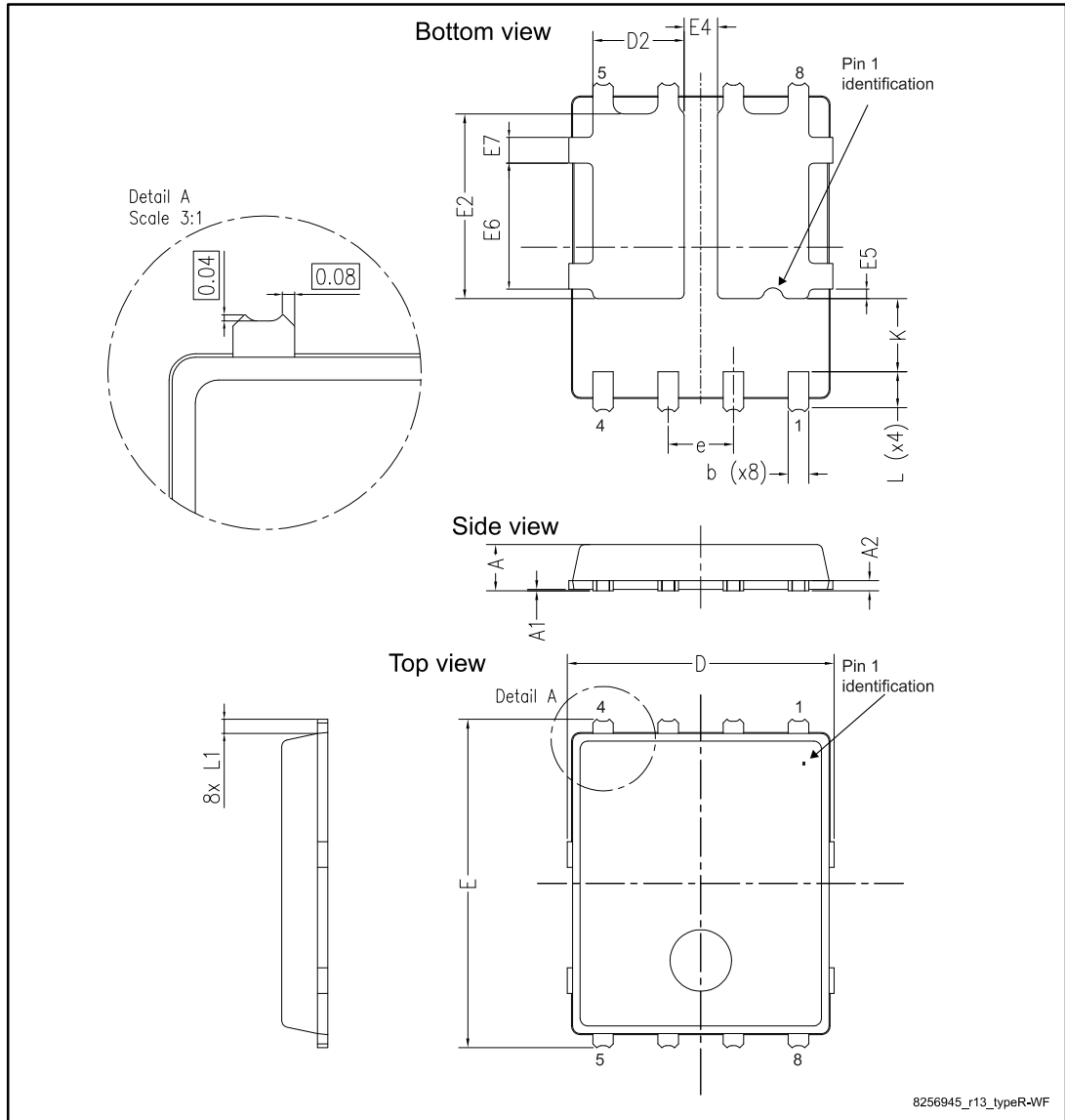
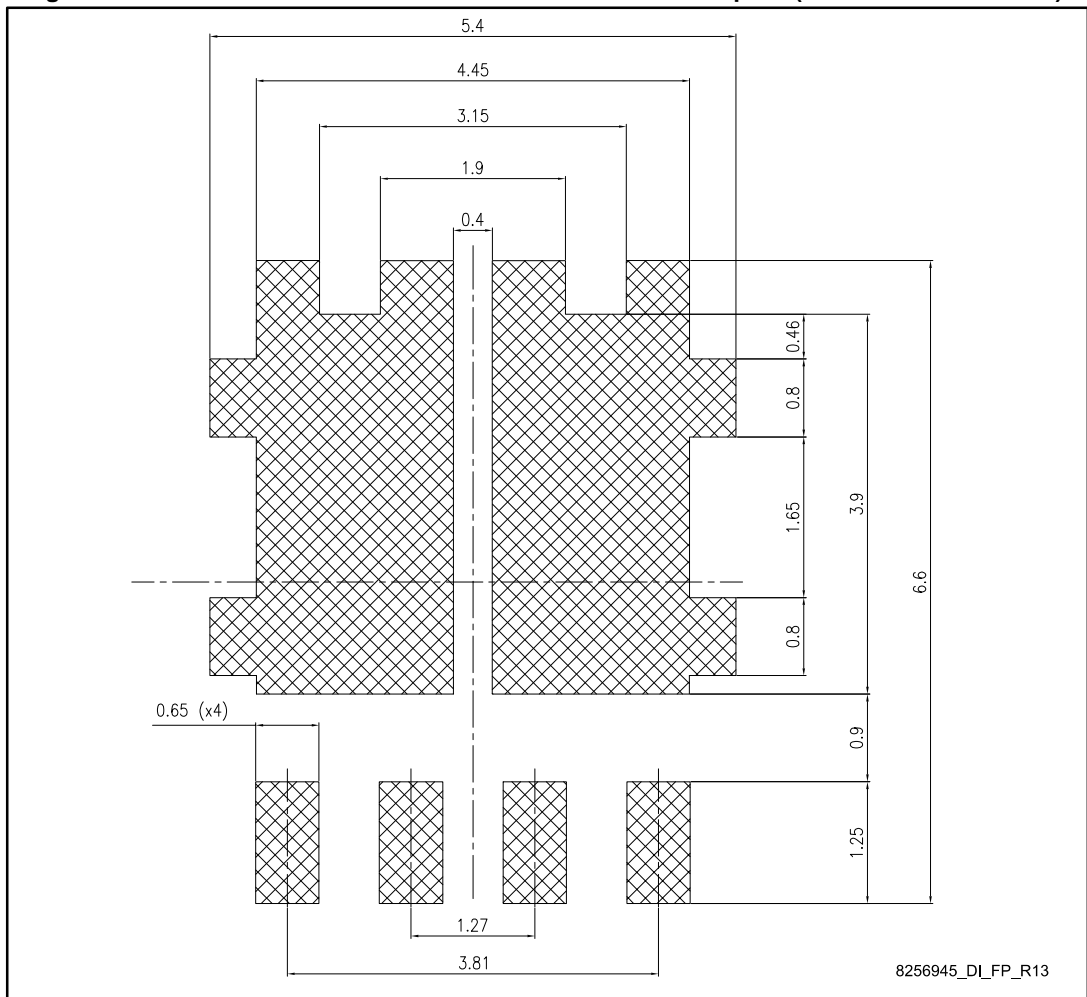


Table 9: PowerFLAT™ 5x6 double island WF type R mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D	5.00	5.20	5.40
D2	1.68		1.88
E	6.20	6.40	6.60
E2	3.50		3.70
E4	0.55		0.75
E5	0.08		0.28
E6	2.35		2.55
E7	0.40		0.60
e		1.27	
L	0.70		0.90
L1		0.275	
K	1.275		1.575

Figure 21: PowerFLAT™ 5x6 double island recommended footprint (dimensions are in mm)



## 4.2 PowerFLAT™ 5x6 WF packing information

Figure 22: PowerFLAT™ 5x6 WF tape

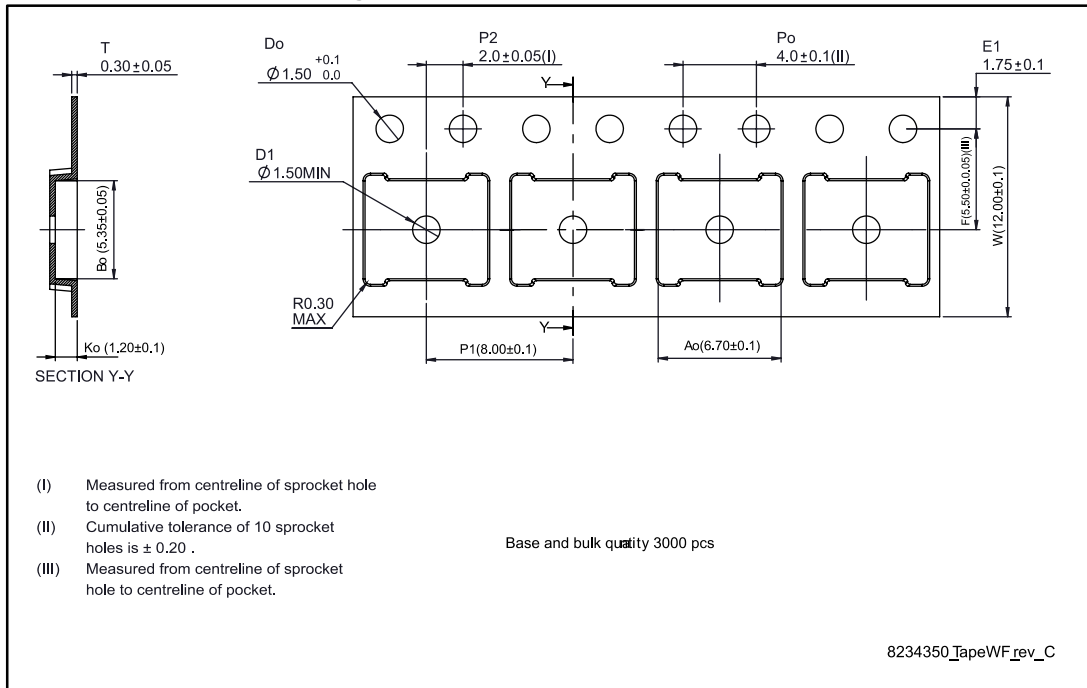


Figure 23: PowerFLAT™ 5x6 package orientation in carrier tape

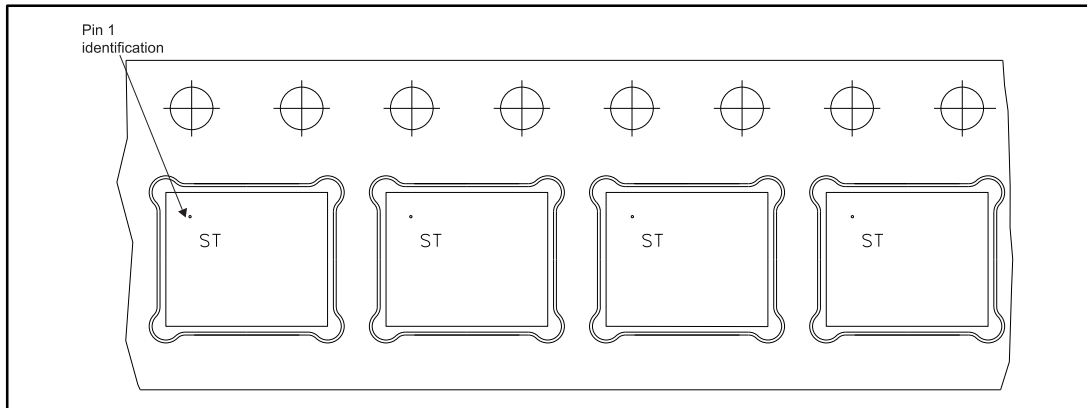
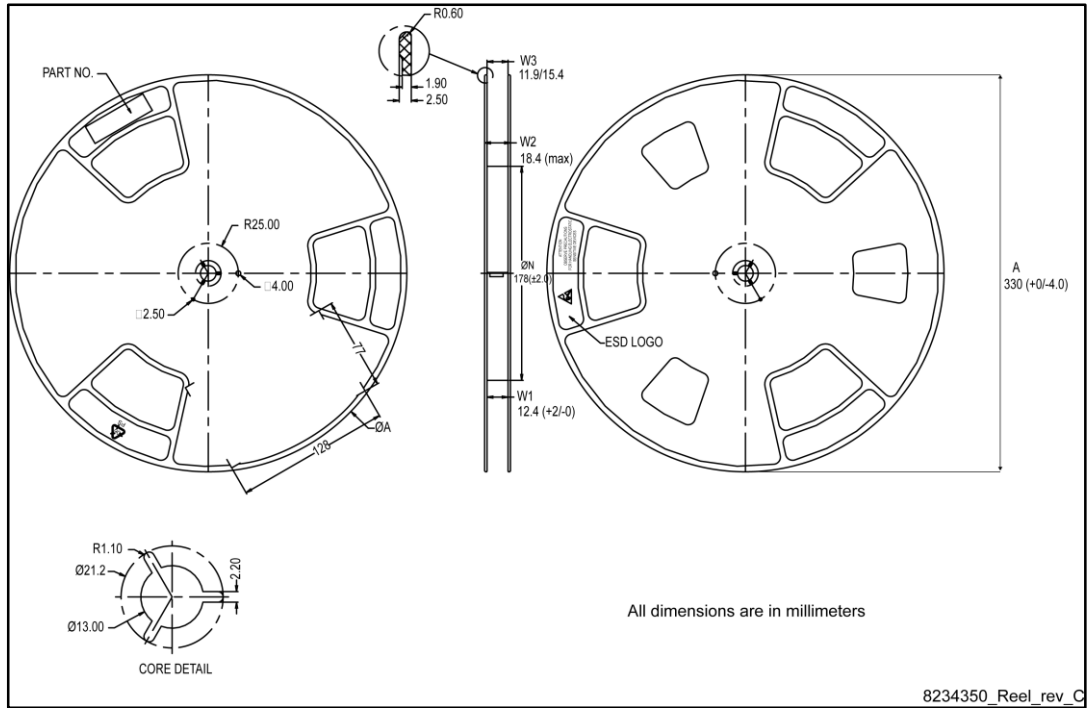


Figure 24: PowerFLAT™ 5x6 reel



## 5 Revision history

Table 10: Document revision history

Date	Revision	Changes
29-Sep-2015	1	First release.

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