

## Automotive-grade N-channel 60 V, 0.012 $\Omega$ typ., 60 A STripFET™ II Power MOSFET in a D<sup>2</sup>PAK package

Datasheet - production data

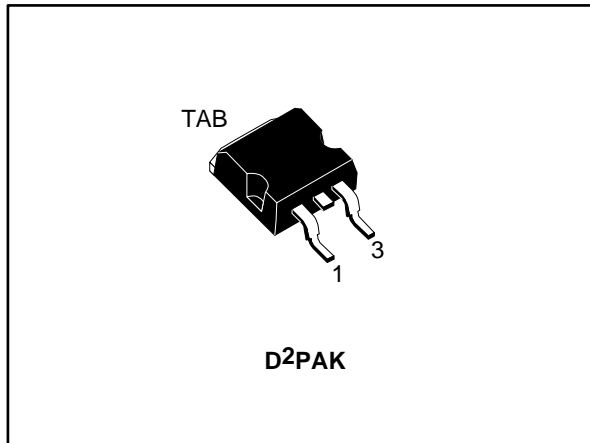
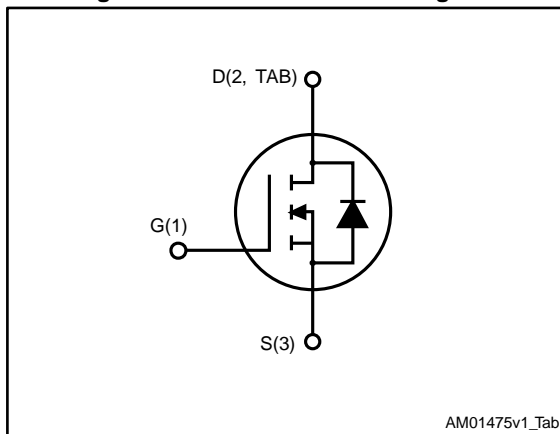


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>TOT</sub>
STB60NF06LT4	60 V	0.014 $\Omega$	60 A	110 W

- Designed for automotive applications and AEC-Q101 qualified
- Exceptional dv/dt capability
- 100% avalanche tested
- Application-oriented characterization
- 175°C operating range
- Low threshold drive

### 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
STB60NF06LT4	B60NF06L	D <sup>2</sup> PAK	Tape and reel

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# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-source voltage ( $V_{GS} = 0$ V)	60	V
$V_{DGR}$	Drain-gate voltage ( $R_{GS} = 20$ k $\Omega$ )	60	V
$V_{GS}$	Gate-source voltage	$\pm 15$	V
$I_D$	Drain current (continuous) at $T_{case} = 25$ °C	60	A
	Drain current (continuous) at $T_{case} = 100$ °C	42	
$I_{DM}^{(1)}$	Drain current (pulsed)	240	A
$P_{TOT}$	Total dissipation at $T_{case} = 25$ °C	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	20	V/ns
$T_{stg}$	Storage temperature	-65 to 175	°C
$T_j$	Operating junction temperature		

**Notes:**

<sup>(1)</sup> Pulse width is limited by safe operating area.

<sup>(2)</sup>  $I_{SD} \leq 60$  A,  $di/dt \leq 600$  A/ $\mu$ s;  $T_j \leq T_{jmax}$ ,  $V_{DD} = 80\% V_{(BR)DSS}$ .

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.36	°C/W
$R_{thj-PCB}^{(1)}$	Thermal resistance junction-PCB	35	

**Notes:**

<sup>(1)</sup> When mounted on a 1-inch<sup>2</sup> FR-4, 2 Oz copper board.

**Table 4: Avalanche characteristics**

Symbol	Parameter	Value	Unit
$E_{AS}^{(1)}$	Single pulse avalanche energy	320	mJ

**Notes:**

<sup>(1)</sup> starting  $T_j = 25$  °C,  $I_D = 30$  A,  $V_{DD} = 30$  V.

## 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	$\mu\text{A}$
		$V_{\text{GS}} = 0\text{ V}$ , $V_{\text{DS}} = 60\text{ V}$ , $T_{\text{case}} = 125\text{ °C}$			10	
$I_{\text{GSS}}$	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$ , $V_{\text{GS}} = \pm 15\text{ V}$			$\pm 100$	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	$V_{\text{GS}} = 5\text{ V}$ , $I_{\text{D}} = 30\text{ A}$		0.014	0.016	$\Omega$
		$V_{\text{GS}} = 10\text{ V}$ , $I_{\text{D}} = 30\text{ A}$		0.012	0.014	

**Table 6: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{\text{iss}}$	Input capacitance	$V_{\text{DS}} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{\text{GS}} = 0\text{ V}$	-	2000	-	$\text{pF}$
$C_{\text{oss}}$	Output capacitance		-	360	-	
$C_{\text{riss}}$	Reverse transfer capacitance		-	125	-	
$Q_{\text{g}}$	Total gate charge	$V_{\text{DD}} = 48\text{ V}$ , $I_{\text{D}} = 60\text{ A}$ , $V_{\text{GS}} = 4.5\text{ V}$ , $R_{\text{G}} = 4.7\text{ }\Omega$ (see <a href="#">Figure 14: "Gate charge test circuit"</a> )	-	35	66	nC
$Q_{\text{gs}}$	Gate-source charge		-	10	-	
$Q_{\text{gd}}$	Gate-drain charge		-	20	-	

**Table 7: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d}(\text{on})}$	Turn-on delay time	$V_{\text{DD}} = 30\text{ V}$ , $I_{\text{D}} = 30\text{ A}$ , $R_{\text{G}} = 4.7\text{ }\Omega$ , $V_{\text{GS}} = 4.5\text{ V}$ (see <a href="#">Figure 13: "Switching times test circuit for resistive load"</a> and <a href="#">Figure 18: "Switching time waveform"</a> )	-	35	-	ns
$t_{\text{r}}$	Rise time		-	220	-	
$t_{\text{d}(\text{off})}$	Turn-off delay time		-	55	-	
$t_{\text{f}}$	Fall time		-	30	-	

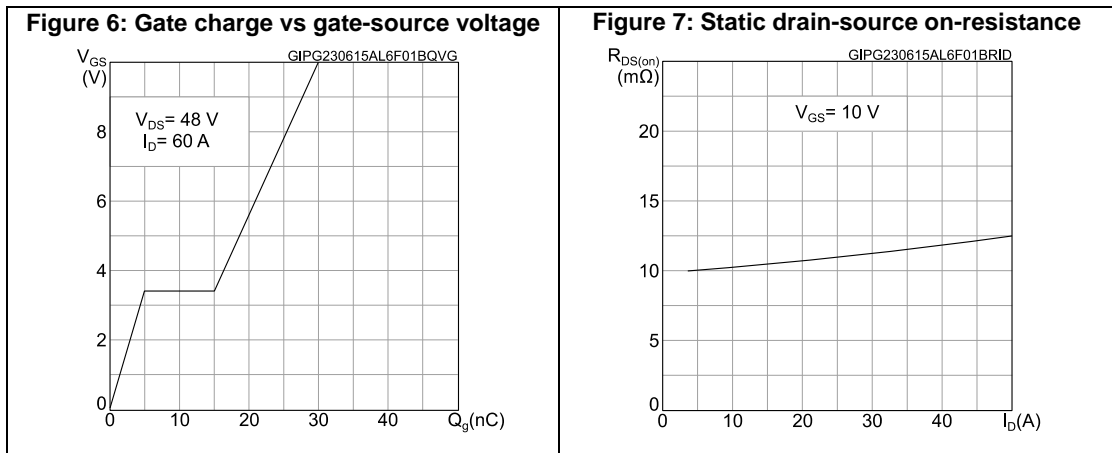
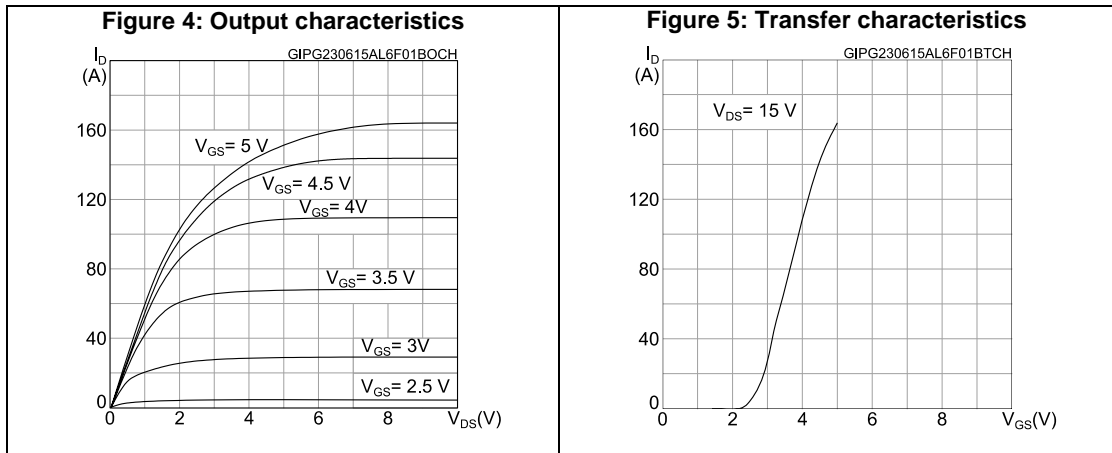
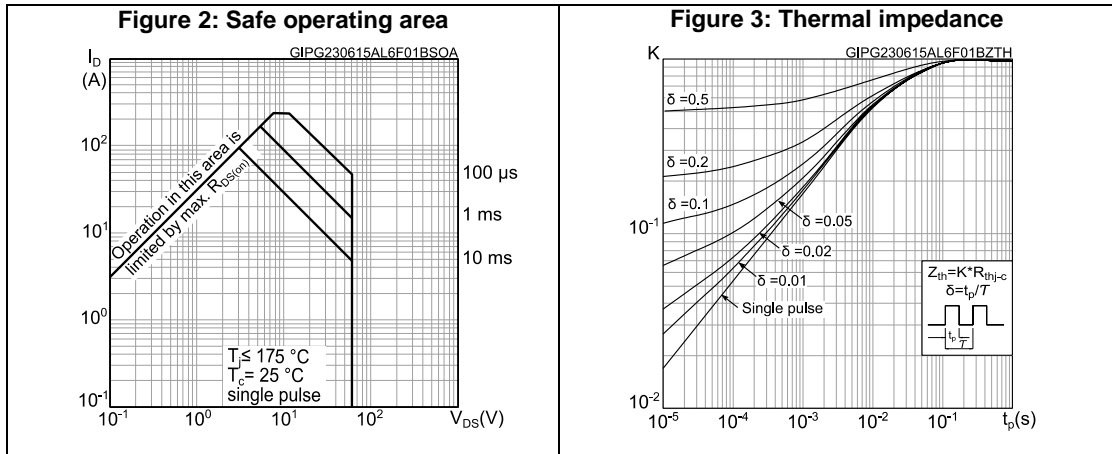
Table 8: Source-drain diode

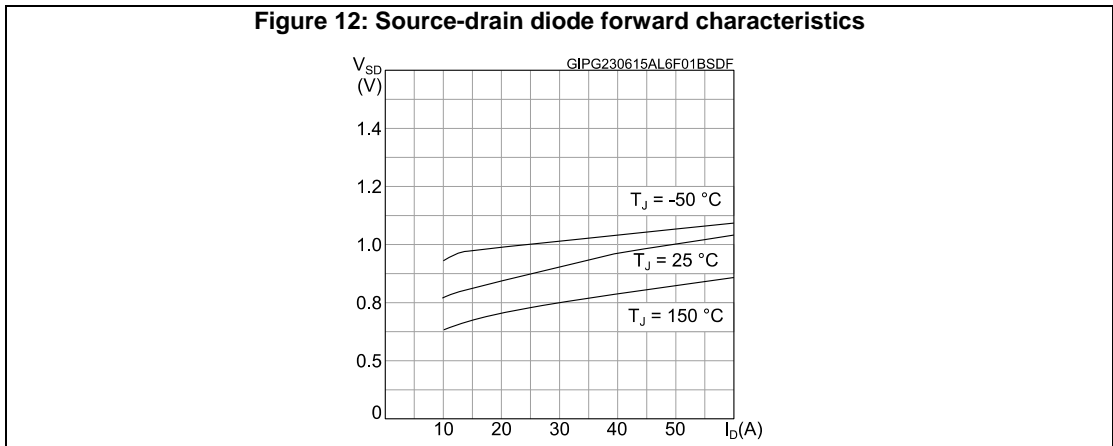
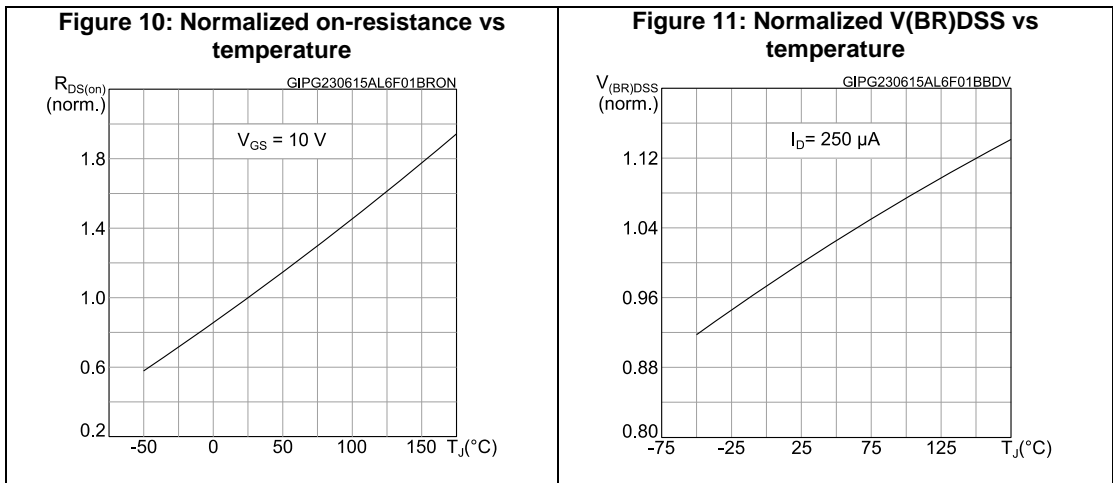
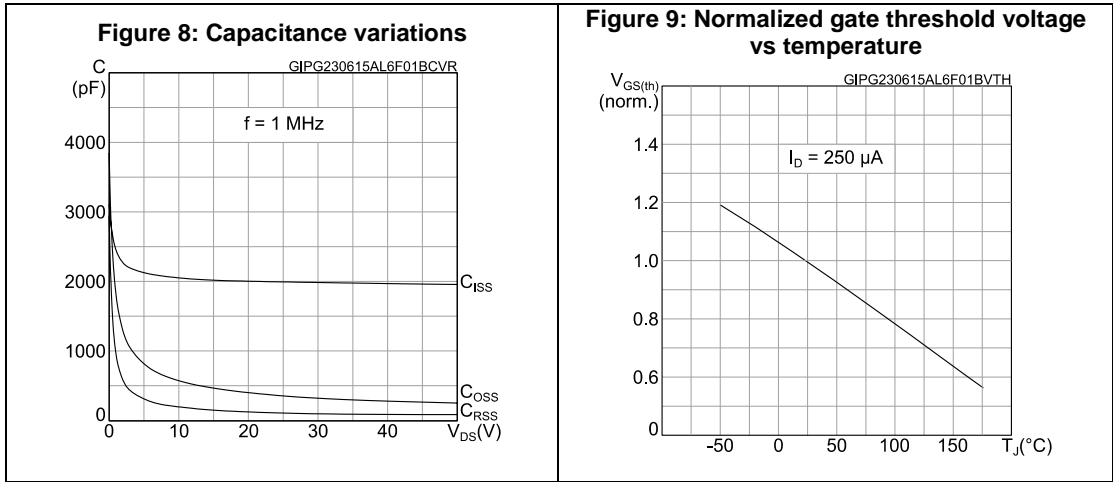
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		60	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		240	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$ , $I_{SD} = 60\text{ A}$	-		1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 60\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 30\text{ V}$ , $T_j = 150\text{ °C}$ (see <i>Figure 15: "Test circuit for inductive load switching and diode recovery times"</i> )	-	110		ns
$Q_{rr}$	Reverse recovery charge		-	250		nC
$I_{RRM}$	Reverse recovery current		-	4.5		A

**Notes:**

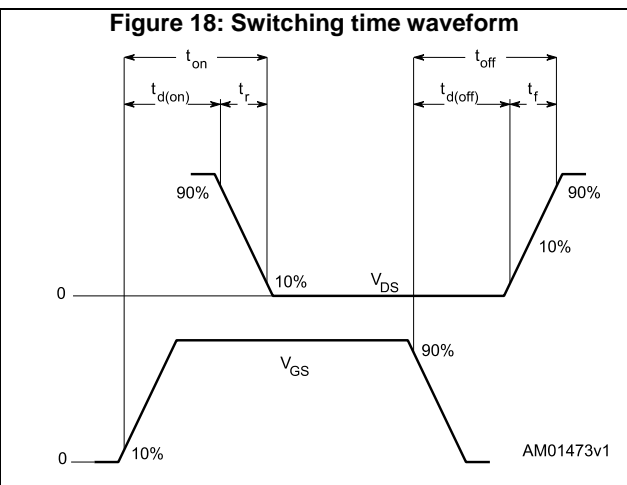
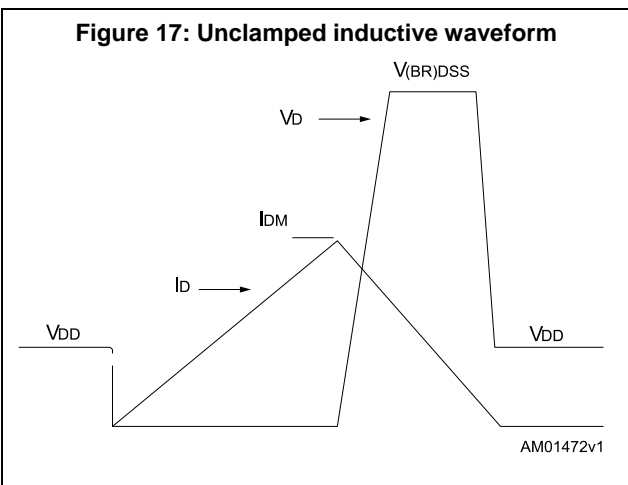
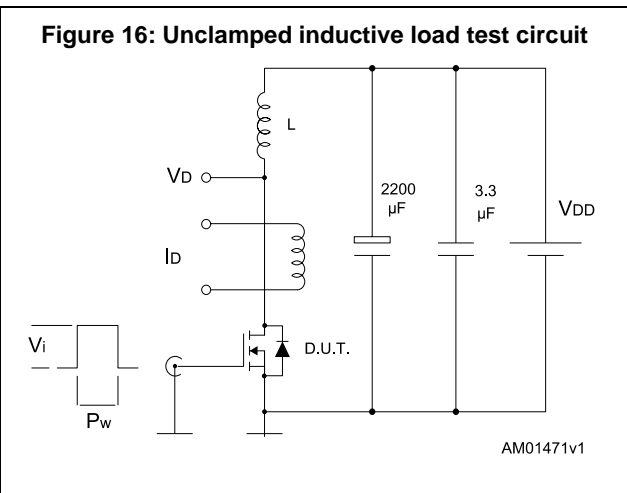
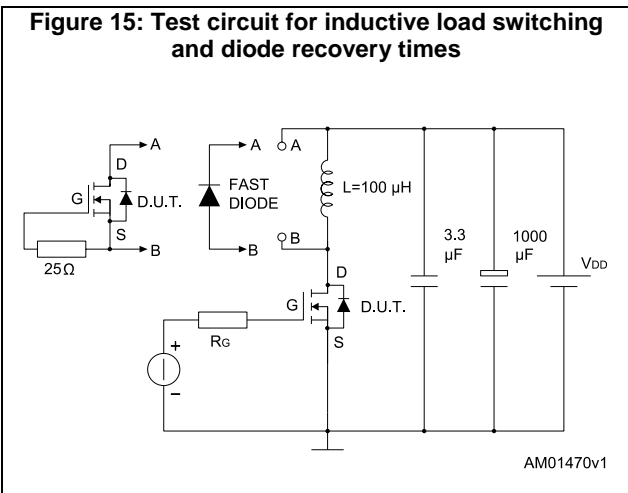
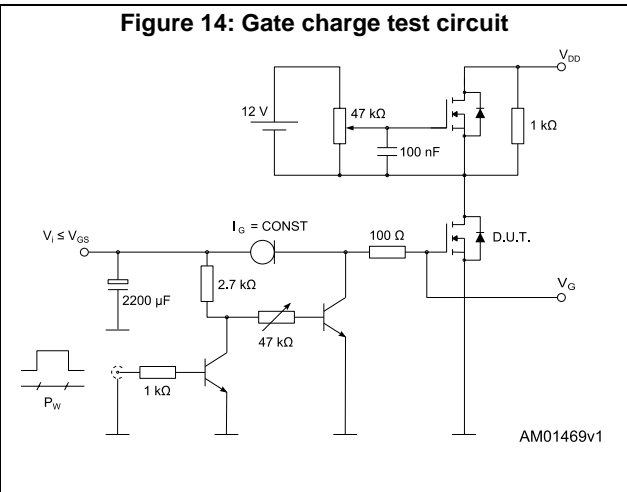
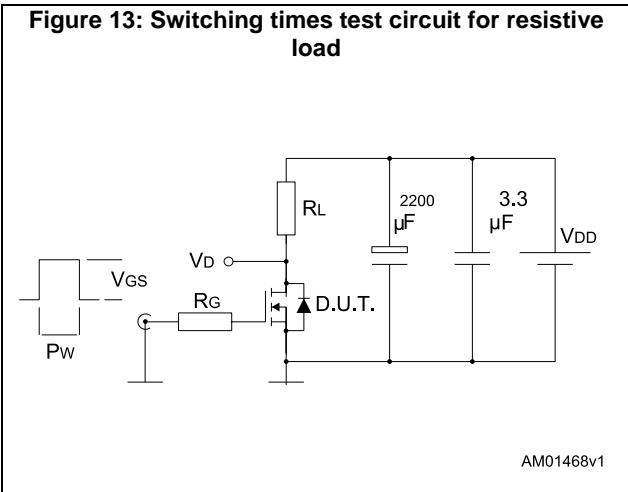
- (1) Pulse width is limited by safe operating area.  
(2) Pulse test: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)





### 3 Test circuits





## 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 D<sup>2</sup>PAK (TO-263) type A package information

Figure 19: D<sup>2</sup>PAK (TO-263) type A package outline

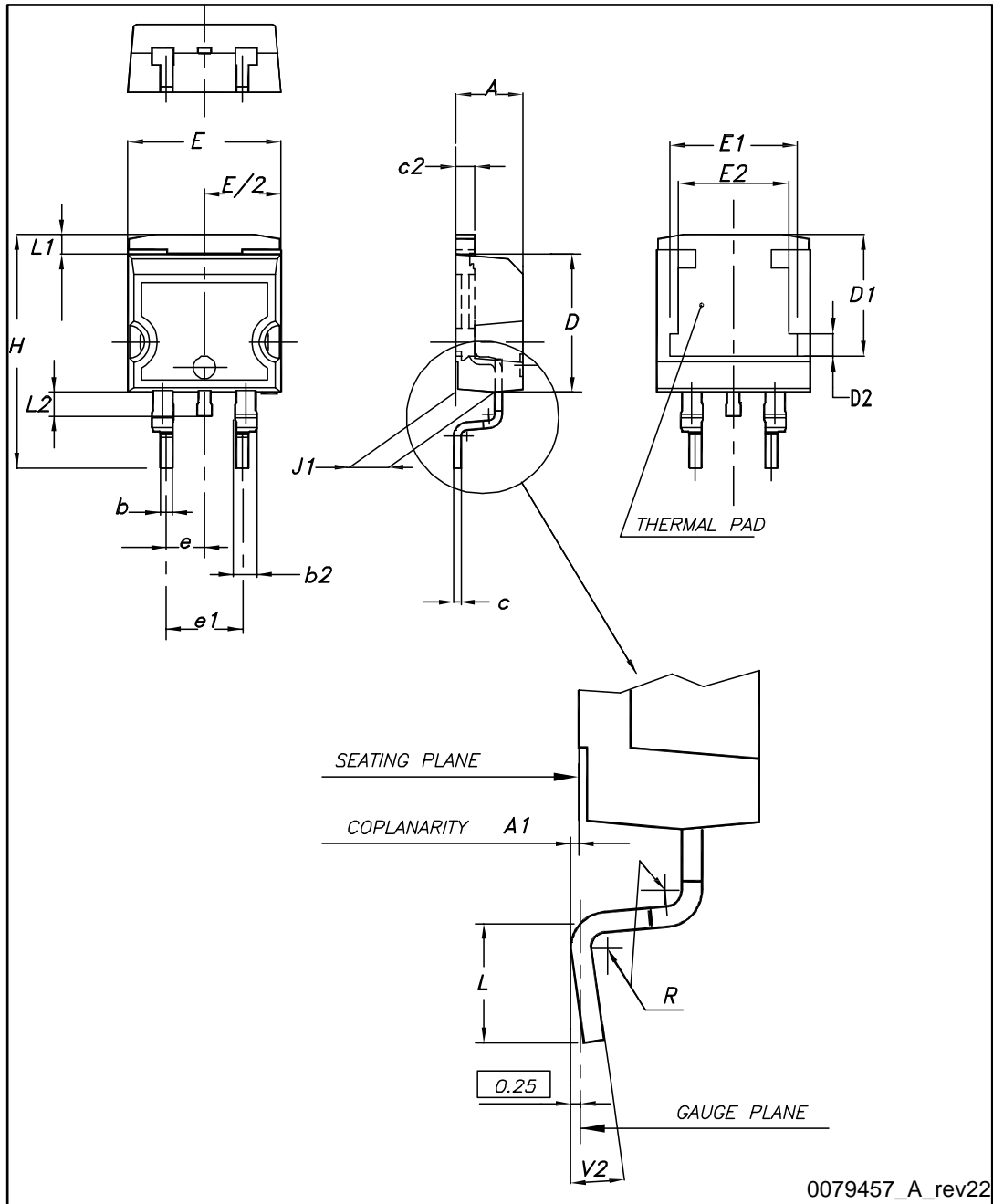
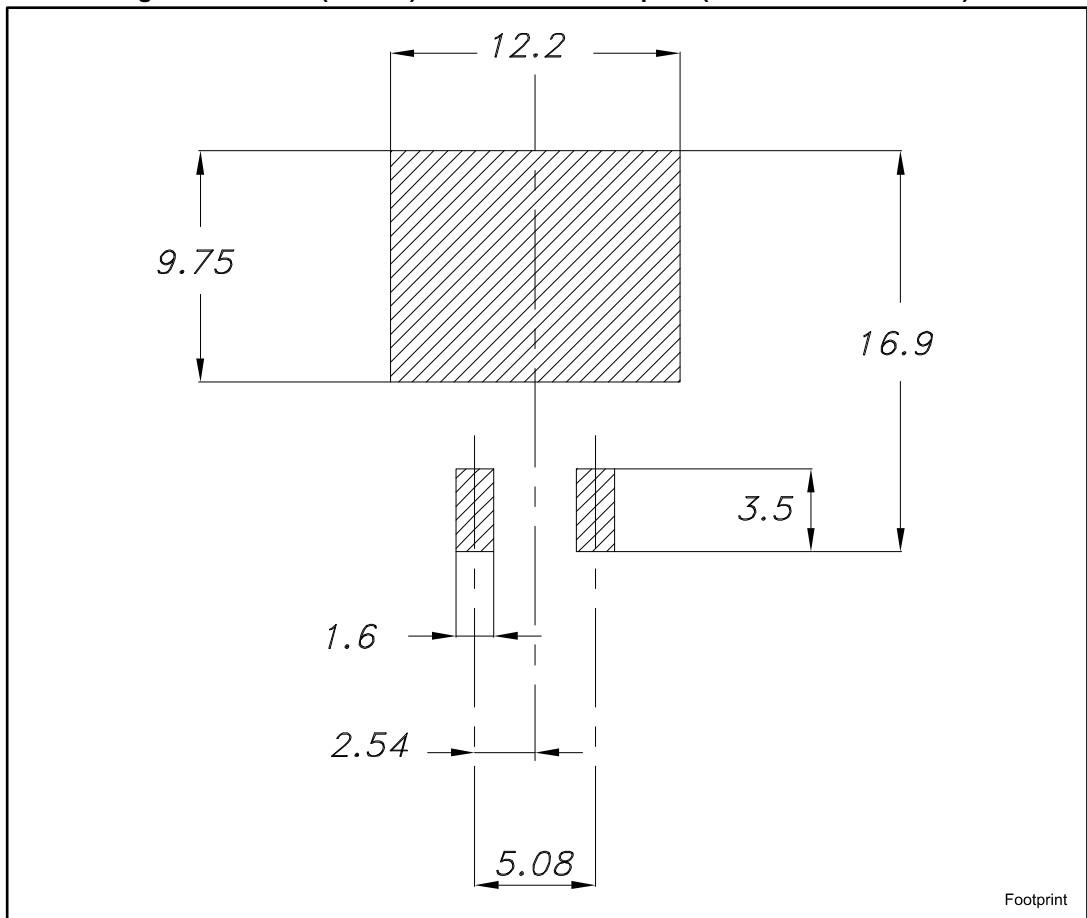


Table 9: D<sup>2</sup>PAK (TO-263) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 20: D<sup>2</sup>PAK (TO-263) recommended footprint (dimensions are in mm)



Footprint

### 4.2 D<sup>2</sup>PAK packing information

Figure 21: Tape

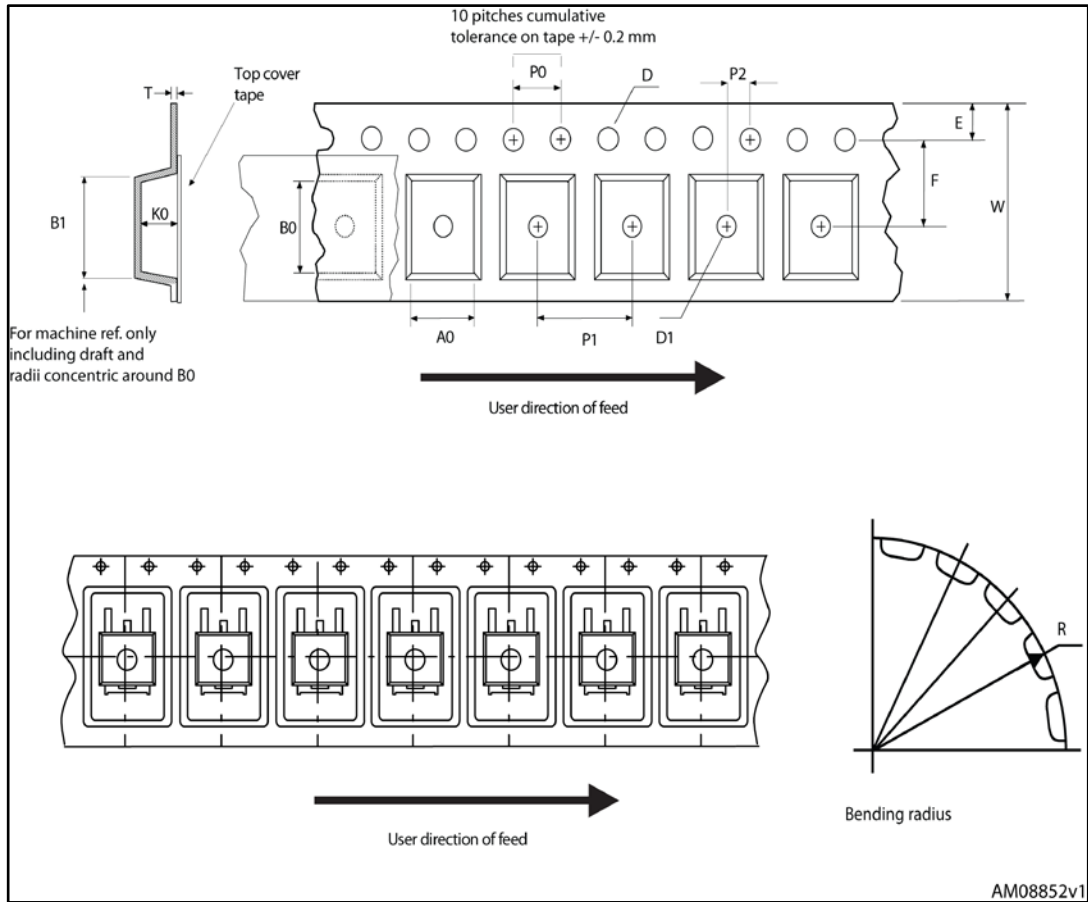


Figure 22: Reel

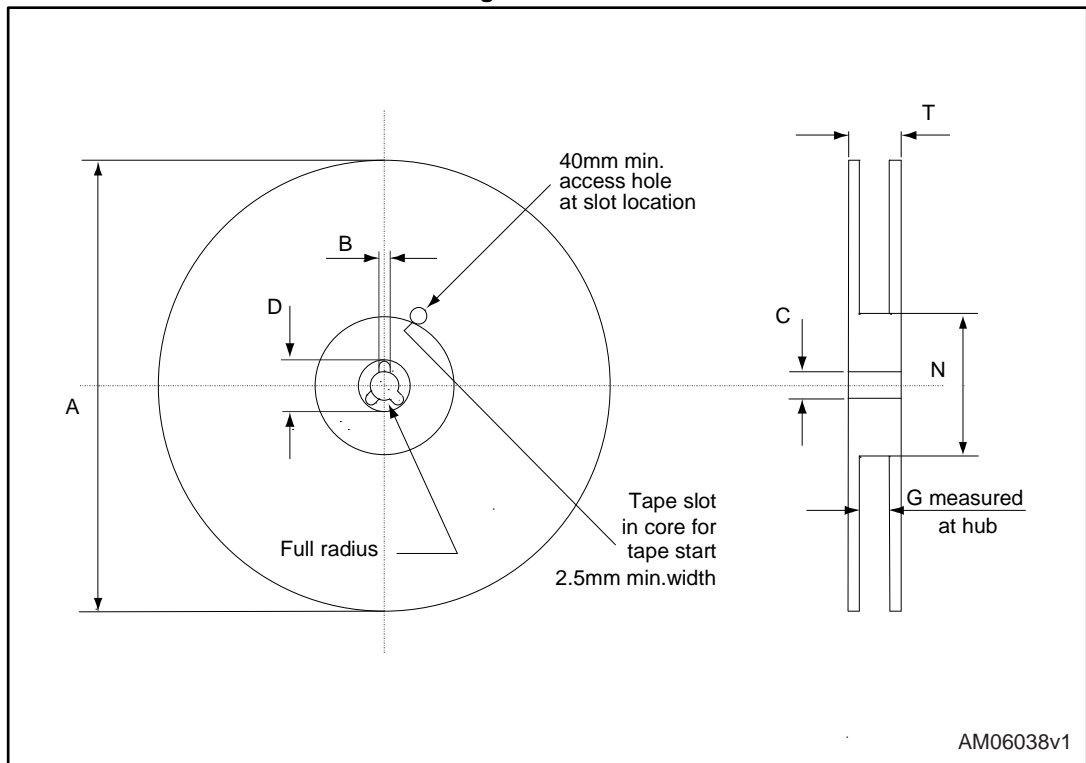


Table 10: D<sup>2</sup>PAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

## 5 Revision history

Table 11: Document revision history

Date	Revision	Changes
24-Jun-2015	1	First release.

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