STB60NF06LT4

Automotive-grade N-channel 60 V, 0.012 Ω typ., 60 A STripFET™ II Power MOSFET in a D²PAK package

Datasheet - production data

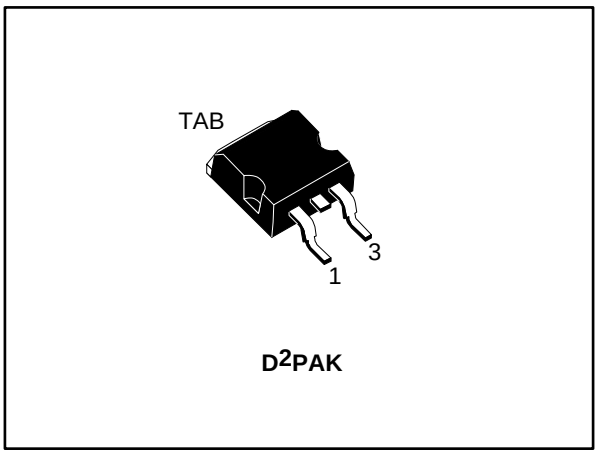
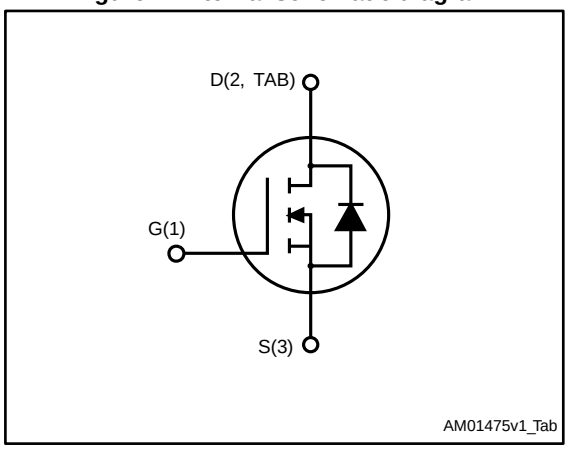


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STB60NF06LT4	60 V	0.014 Ω	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	D²PAK	Tape and reel

Contents

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 kΩ)	60	V
V_{GS}	Gate-source voltage	±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:

(1) Pulse width is limited by safe operating area.

(2) I_{SD} ≤ 60 A, di/dt ≤ 600 A/µs; T_j ≤ T_{jmax}, V_{DD} = 80% $V_{(BR)DSS}$.

Table 3: Thermal data

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

Notes:

(1) When mounted on a 1-inch² FR-4, 2 Oz copper board.

Table 4: Avalanche characteristics

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

Notes:

(1) starting T_j = 25 °C, I_D = 30 A, V_{DD} = 30 V.

2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 5: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 250 µA	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 60 V			1	µA
		V_{GS} = 0 V, V_{DS} = 60 V, T_{case} = 125 °C			10	
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = ±15 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 5 V, I_D = 30 A		0.014	0.016	Ω
		V_{GS} = 10 V, I_D = 30 A		0.012	0.014	

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	2000	-	pF
C_{oss}	Output capacitance		-	360	-	
C_{rss}	Reverse transfer capacitance		-	125	-	
Q_g	Total gate charge	V_{DD} = 48 V, I_D = 60 A, V_{GS} = 4.5 V, R_G = 4.7 Ω (see *Figure 14: "Gate charge test circuit"*)	-	35	66	nC
Q_{gs}	Gate-source charge		-	10	-	
Q_{gd}	Gate-drain charge		-	20	-	

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 V, I_D = 30 A, R_G = 4.7 Ω, V_{GS} = 4.5 V (see *Figure 13: "Switching times test circuit for resistive load"* and *Figure 18: "Switching time waveform"*)	-	35	-	ns
t_r	Rise time		-	220	-	
$t_{d(off)}$	Turn-off delay time		-	55	-	
t_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 V, I_{SD} = 60 A	-		1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 60 A, di/dt = 100 A/µs, V_{DD} = 30 V, T_j = 150 °C (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	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 µs, duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

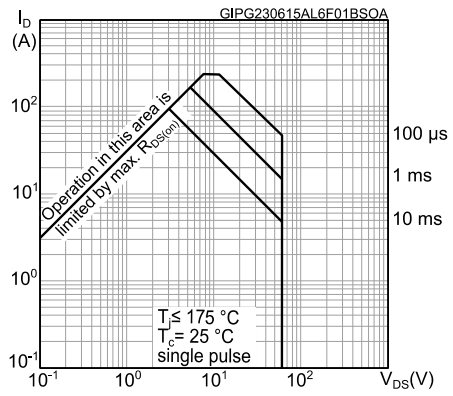


Figure 3: Thermal impedance

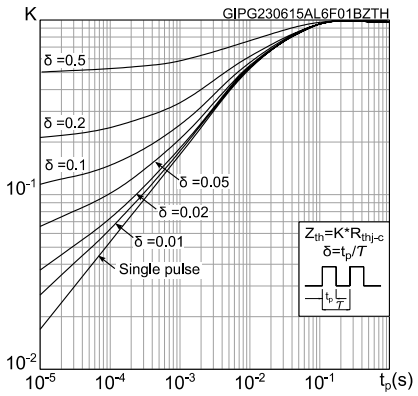


Figure 4: Output characteristics

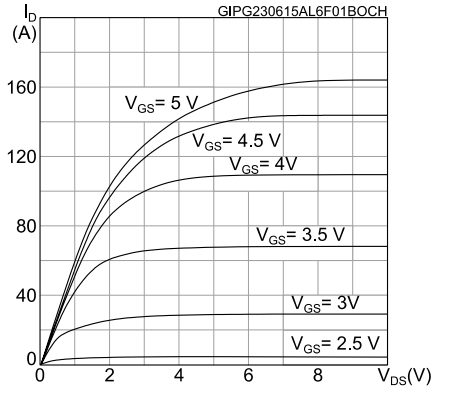


Figure 5: Transfer characteristics

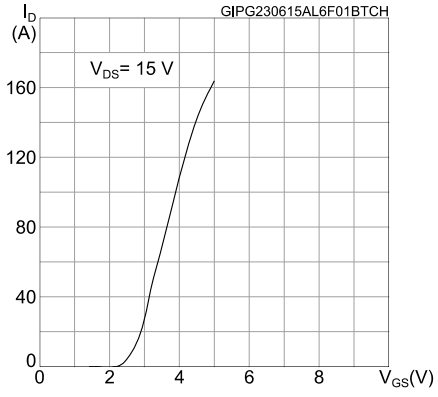


Figure 6: Gate charge vs gate-source voltage

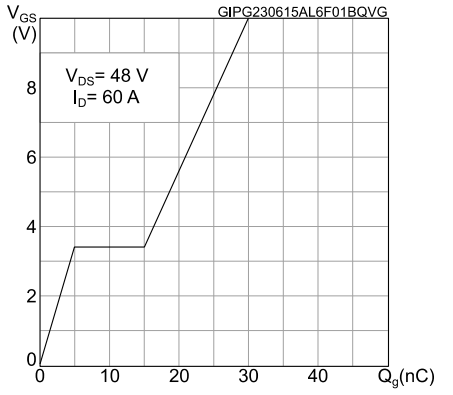


Figure 7: Static drain-source on-resistance

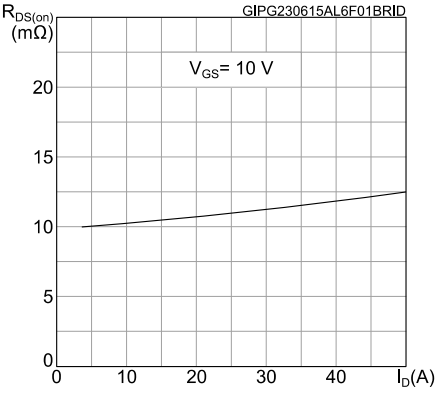


Figure 8: Capacitance variations

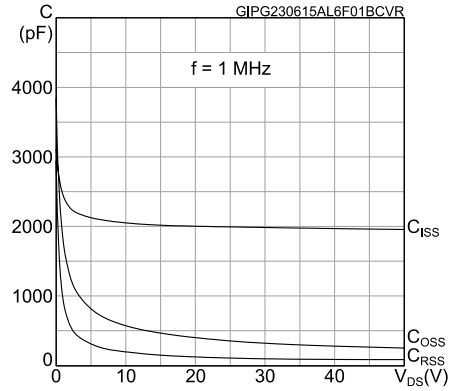


Figure 9: Normalized gate threshold voltage vs temperature

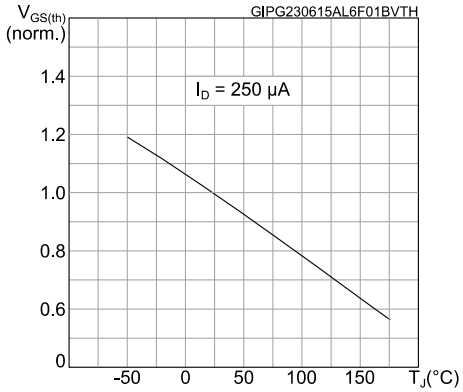


Figure 10: Normalized on-resistance vs temperature

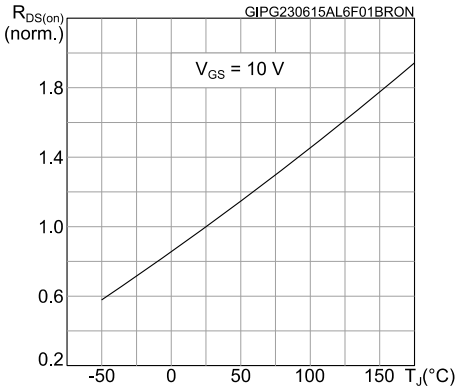


Figure 11: Normalized V(BR)DSS vs temperature

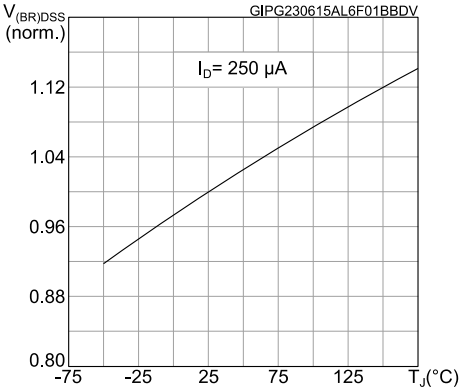
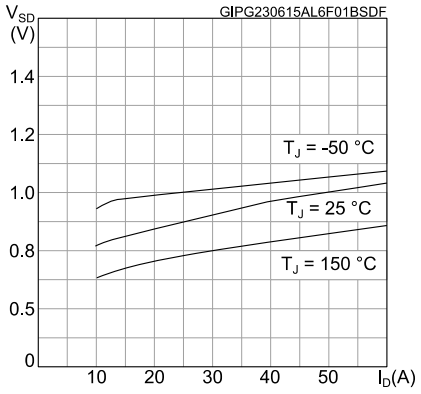


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

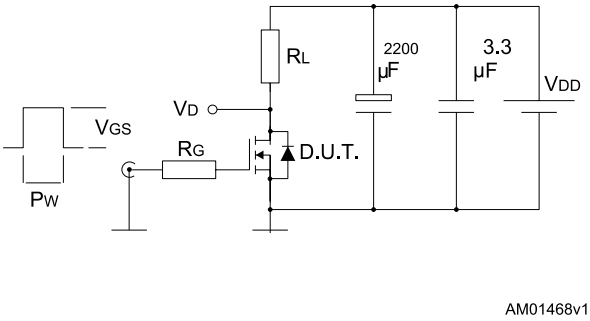


Figure 14: Gate charge test circuit

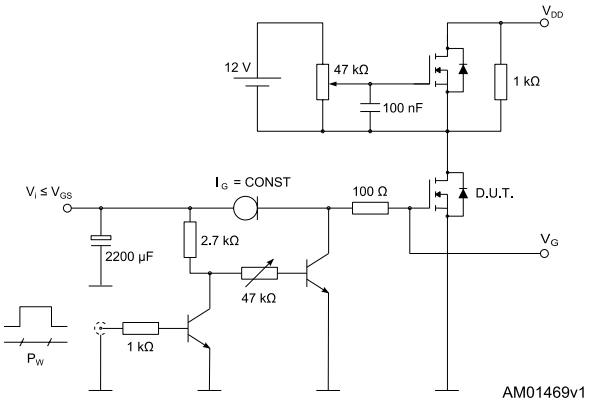


Figure 15: Test circuit for inductive load switching and diode recovery times

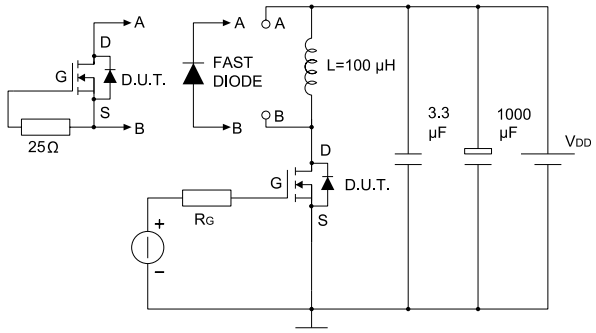


Figure 16: Unclamped inductive load test circuit

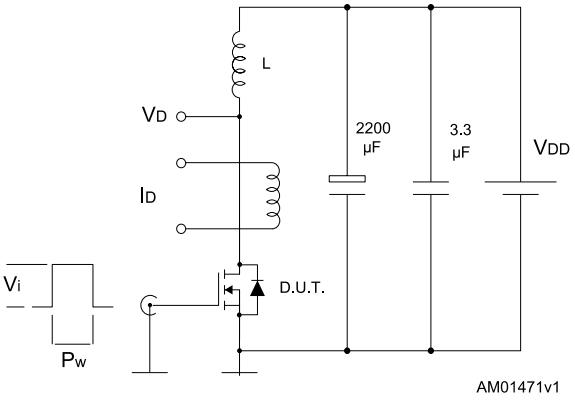


Figure 17: Unclamped inductive waveform

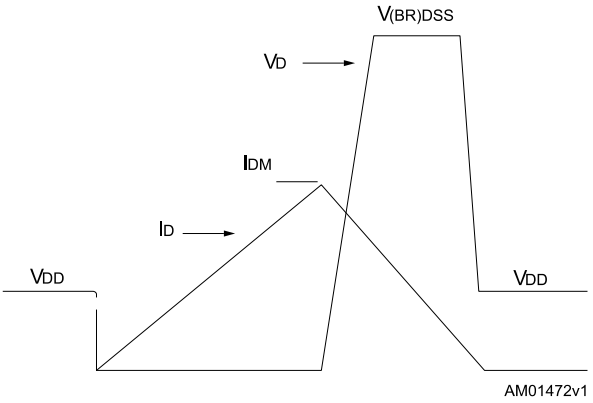
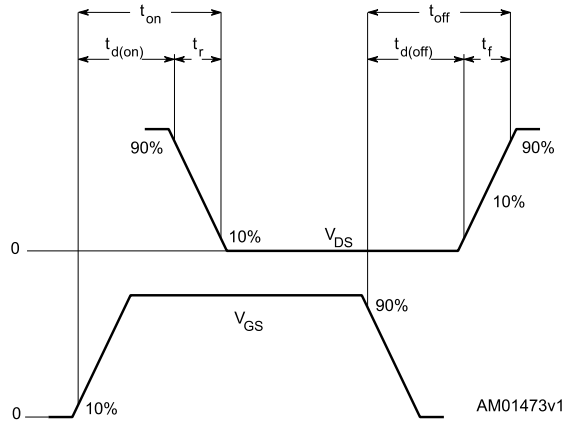


Figure 18: Switching time waveform



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 D²PAK (TO-263) type A package information

Figure 19: D²PAK (TO-263) type A package outline

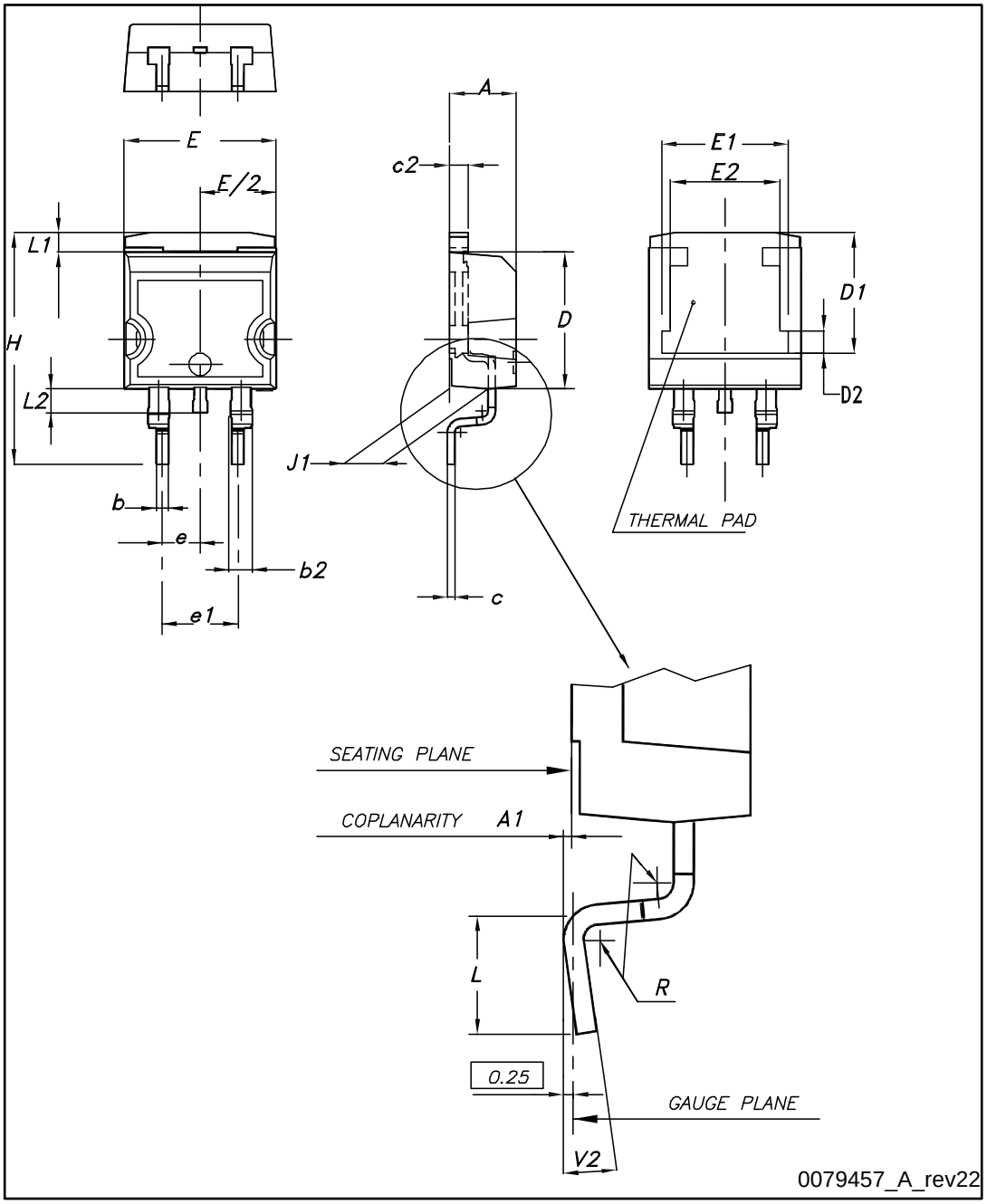
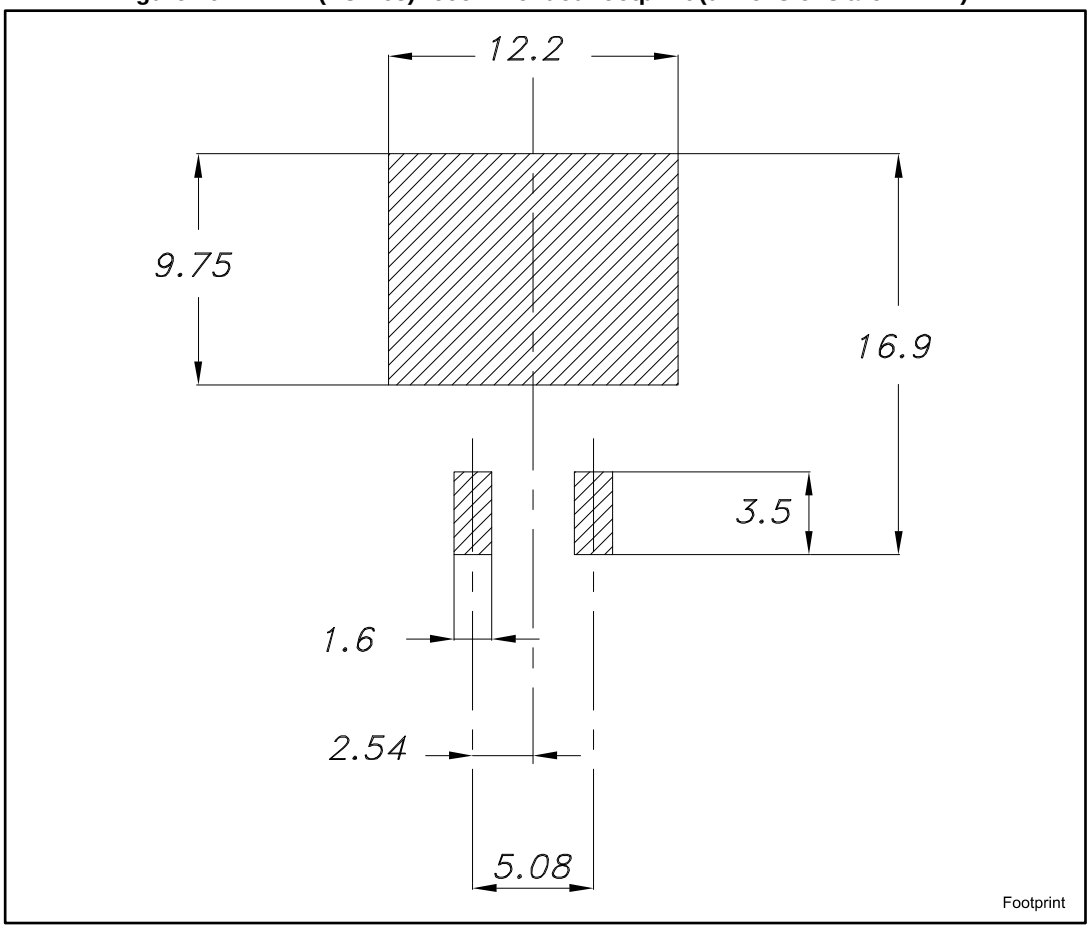


Table 9: D²PAK (TO-263) type A package mechanical data

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: D²PAK (TO-263) recommended footprint (dimensions are in mm)



4.2 D²PAK packing information

Figure 21: Tape

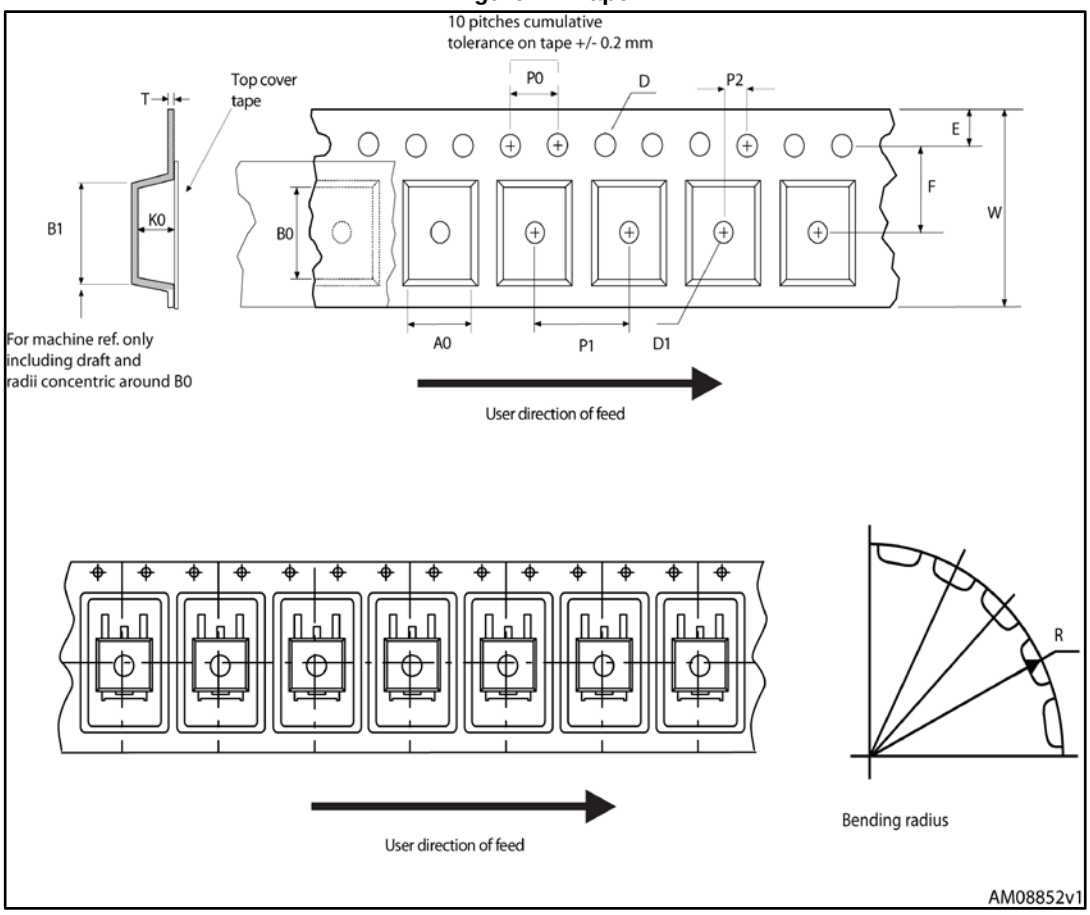


Figure 22: Reel

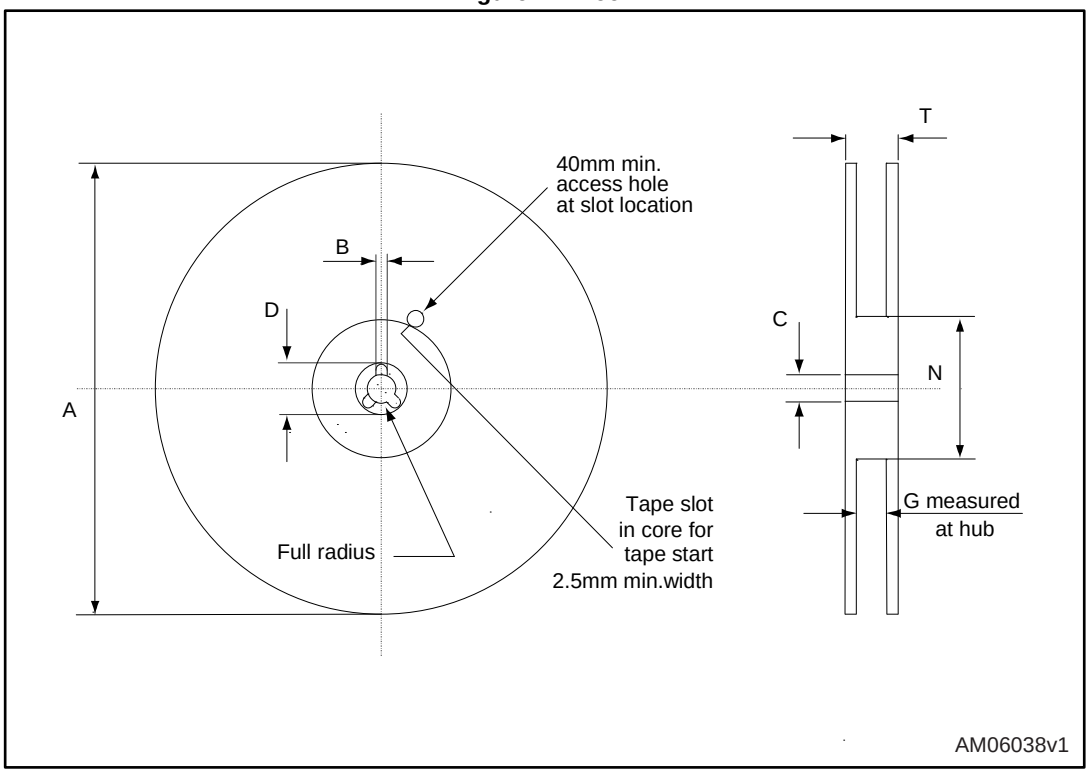


Table 10: D²PAK tape and reel mechanical data

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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