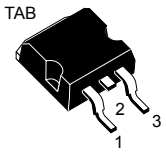
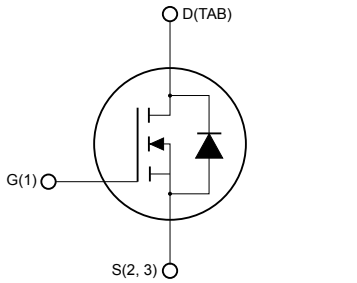
Automotive-grade N-channel 100 V, 7 mΩ typ., 80 A, STripFET™ F7 Power MOSFET in an H²PAK-2 package



H²PAK-2



DTG1S23NZ

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STH80N10LF7-2AG	100 V	10 mΩ	80 A	110 W

- AEC-Q101 qualified
- Among the lowest $R_{DS(on)}$ on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Product status link
STH80N10LF7-2AG

Product summary	
Order code	STH80N10LF7-2AG
Marking	80N10LF7
Package	H²PAK-2
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current (continuous) at T_{case} = 25 °C	80	A
	Drain current (continuous) at T_{case} = 100 °C	54	
I_{DM} (1)	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at T_{case} = 25 °C	110	W
E_{AS} (2)	Single pulse avalanche energy	108	mJ
T_{stg}	Storage temperature range	-55 to 175	°C
T_j	Operating junction temperature range		

1. *Pulse width is limited by safe operating area.*
2. *$T_j \leq 25$ °C, I_D=80 A, V_{DD}= 60 V*

Table 2. 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	

1. *When mounted on a 1-inch² FR-4 board, 2oz Cu.*

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 1 mA	100			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 100 V			1	µA
		(1) V_{GS} = 0 V, V_{DS} = 100 V T_j= 125 °C			10	
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = ± 20 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} = 10 V, I_D = 40 A		7	10	mΩ
		V_{GS} = 4.5 V, I_D = 40 A		9	16	

1. *Defined by design, not subject to production test.*

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	2900	-	pF
C_{oss}	Output capacitance		-	1077	-	
C_{rss}	Reverse transfer capacitance		-	99	-	
Q_g	Total gate charge	V_{DD} = 50 V, I_D = 80 A, V_{GS} = 4.5 V (see Figure 13. Test circuit for gate charge behavior)	-	28.3	-	nC
Q_{gs}	Gate-source charge		-	10.4	-	
Q_{gd}	Gate-drain charge		-	14.3	-	

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 50 V, I_D = 40 A R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 12. Test circuit for resistive load switching times)	-	14.7	-	ns
t_r	Rise time		-	33	-	
$t_{d(off)}$	Turn-off delay time		-	69.3	-	
t_f	Fall time		-	21	-	

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		80	A
I_{SDM} (1)	Source-drain current (pulsed)		-		320	A
V_{SD} (2)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 80 A	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 80 A, di/dt = 100 A/µs, V_{DD} = 80 V (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	55.7		ns
Q_{rr}	Reverse recovery charge		-	79.6		nC
I_{RRM}	Reverse recovery current		-	2.9		A

1. *Pulse width limited by safe operating area.*
2. *Pulse test: pulse duration = 300 µs, duty cycle 1.5%.*

2.1 Electrical characteristics curves

Figure 1. Safe operating area

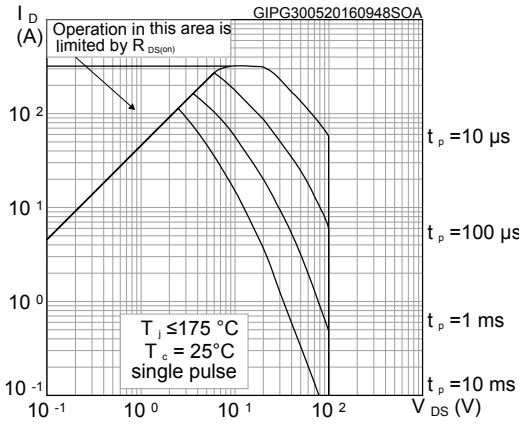


Figure 2. Thermal impedance

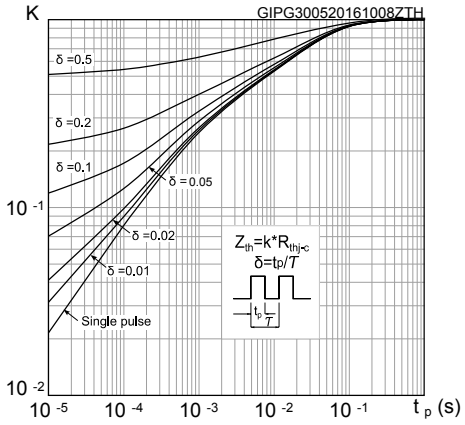


Figure 3. Output characteristics

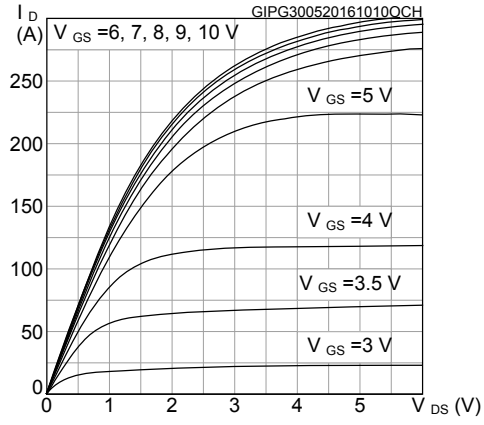


Figure 4. Transfer characteristics

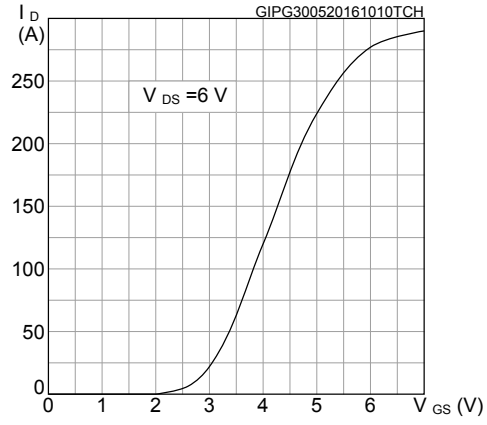


Figure 5. Gate charge vs gate-source voltage

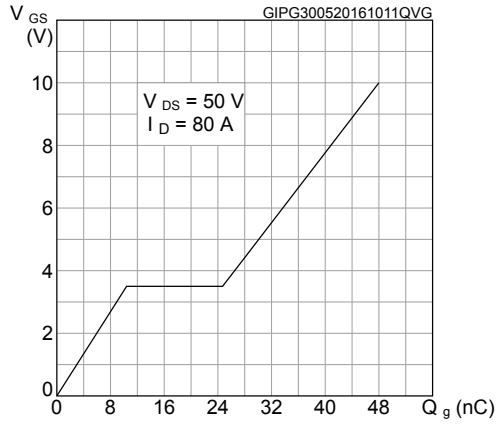


Figure 6. Static drain-source on-resistance

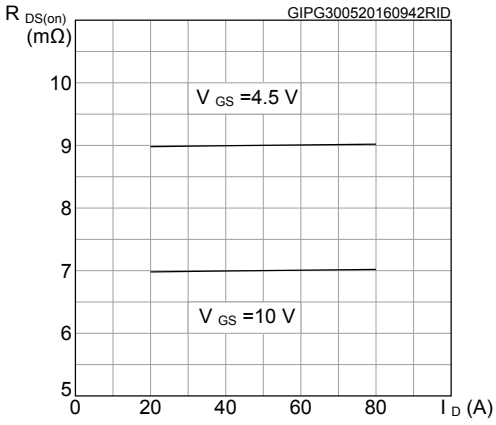


Figure 7. Capacitance variations

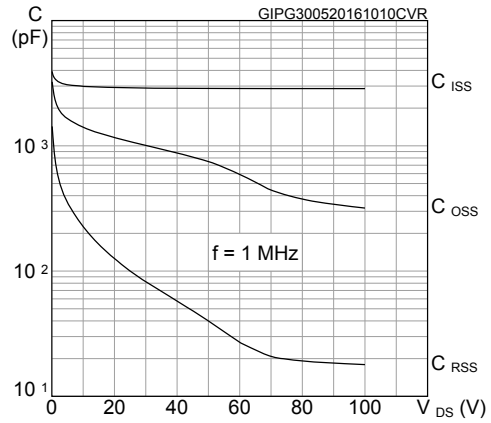


Figure 8. Normalized gate threshold voltage vs temperature

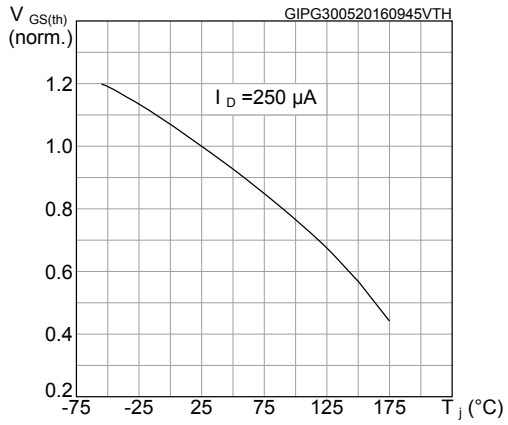


Figure 9. Normalized on-resistance vs temperature

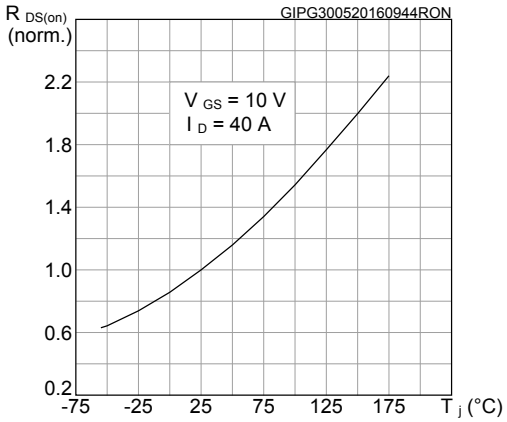


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

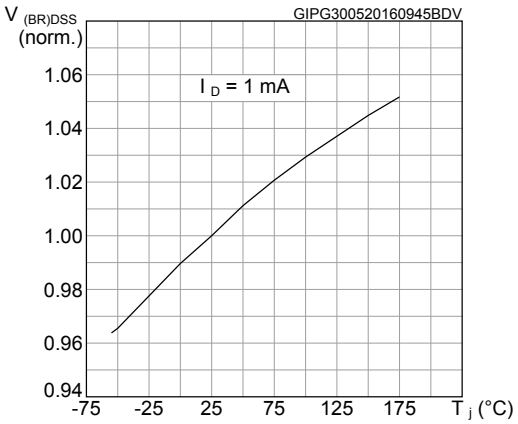
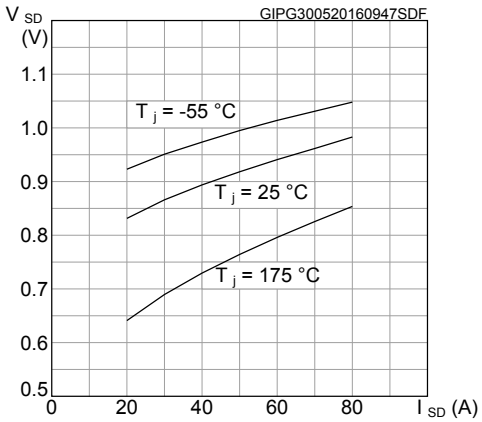


Figure 11. Source-drain diode forward characteristics



3 Test circuits

Figure 12. Test circuit for resistive load switching times

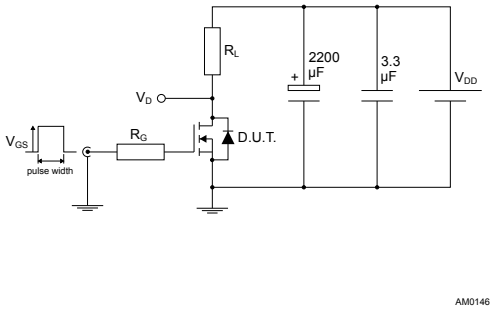


Figure 13. Test circuit for gate charge behavior

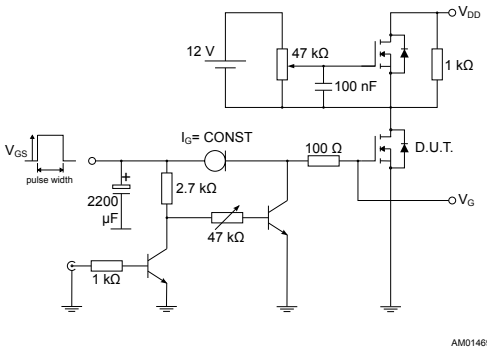


Figure 14. Test circuit for inductive load switching and diode recovery times

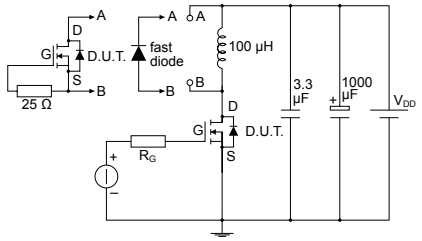


Figure 15. Unclamped inductive load test circuit

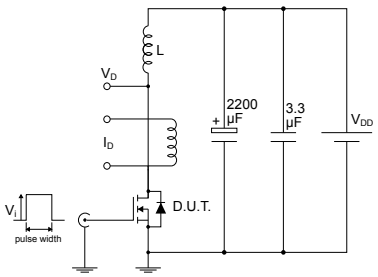


Figure 16. Unclamped inductive waveform

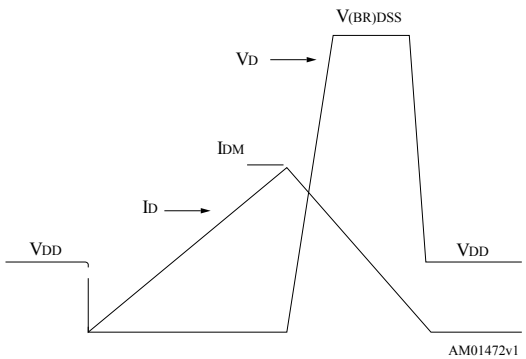
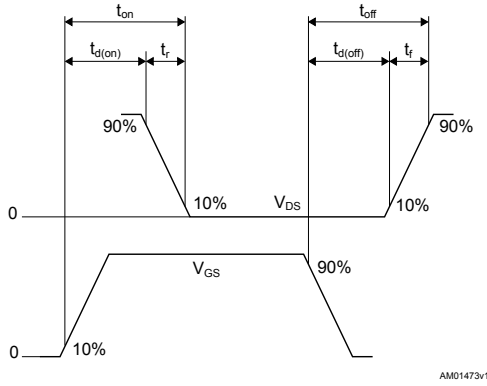


Figure 17. Switching time waveform



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 H²PAK-2 shallow gullwing package information

Figure 18. H²PAK-2 shallow gullwing package outline

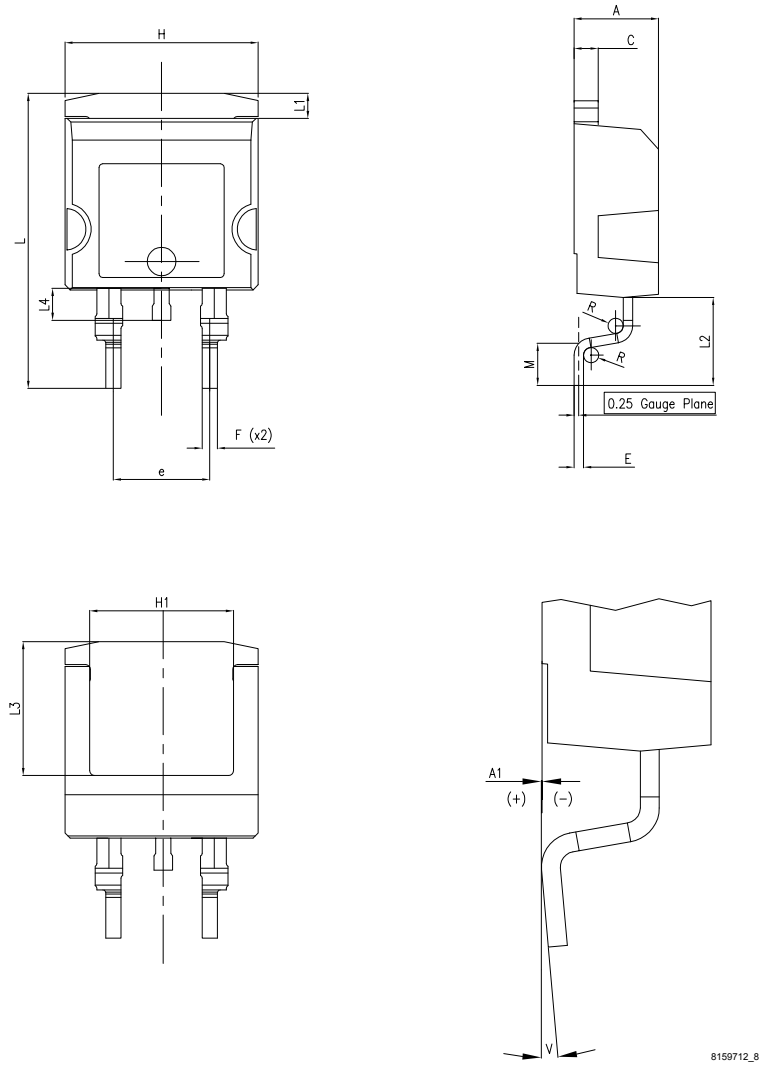
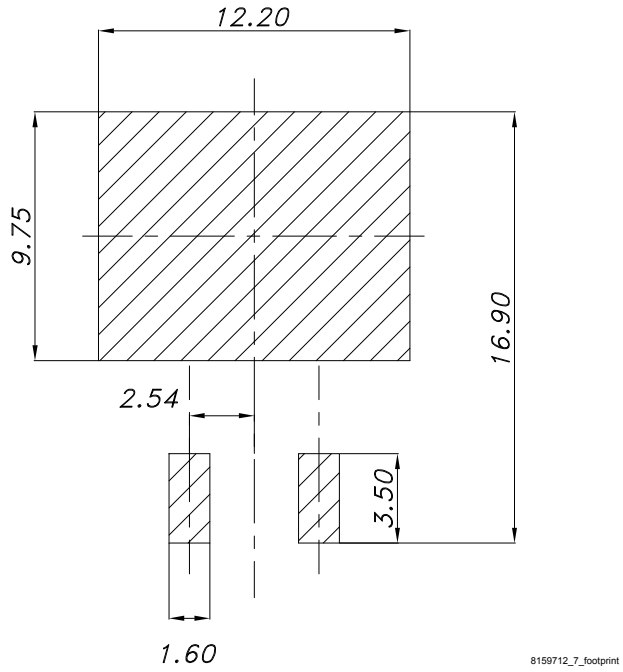


Table 7. **H²PAK-2 shallow gullwing mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.70
A1	-0.05	-	0.08
C	1.17	-	1.37
e	4.98	-	5.18
E	0.50	-	0.90
F	0.78	-	0.85
H	10.00	-	10.40
H1	7.40	-	7.80
L	15.30	-	15.80
L1	1.27	-	1.40
L2	4.93	-	5.23
L3	6.85	-	7.25
L4	1.50	-	1.70
M	2.60	-	2.90
R	0.20	-	0.60
V	0°	-	8°

Figure 19. **H²PAK-2 recommended footprint (dimensions are in mm)**



4.2 Packing information

Figure 20. **Tape outline**

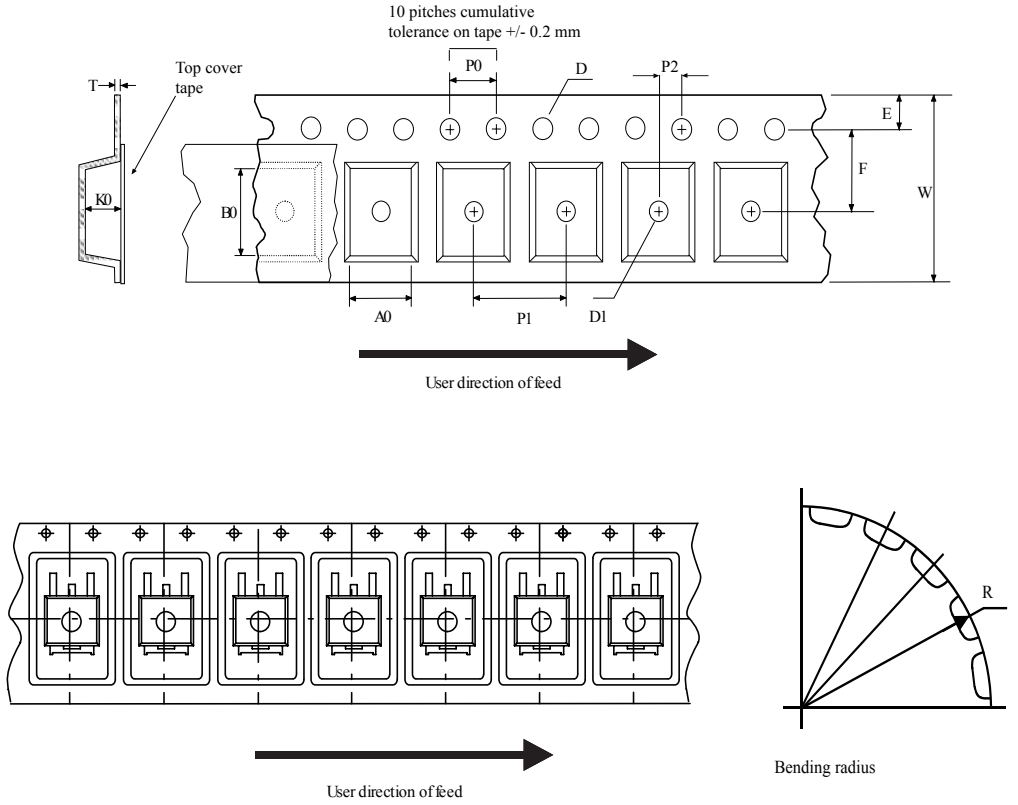


Figure 21. **Reel outline**

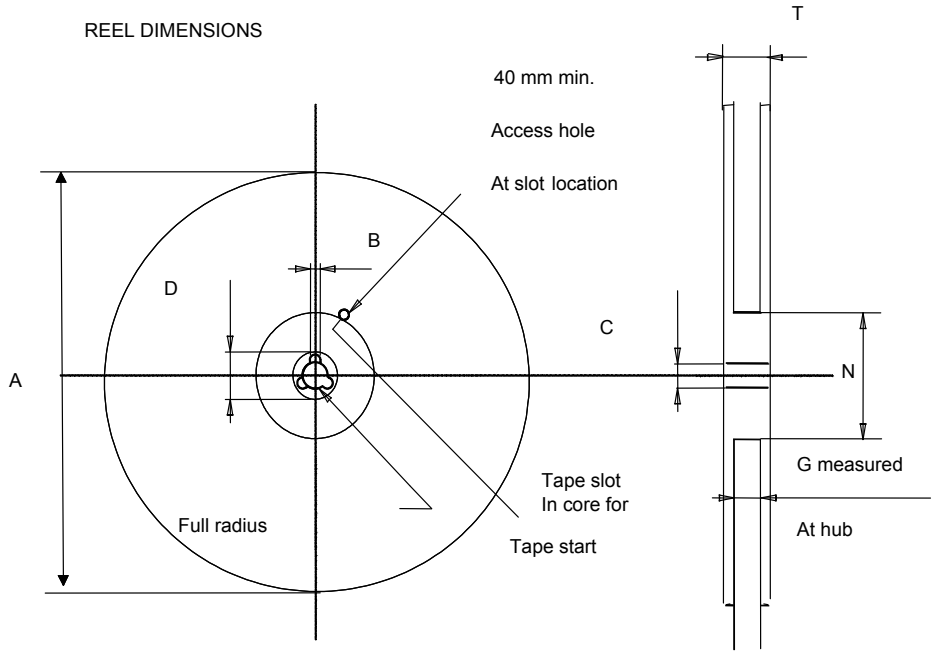


Table 8. **Tape and reel mechanical data**

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 quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Revision history

Table 9. **Document revision history**

Date	Version	Changes
13-Jun-2016	1	First release
14-Jan-2019	2	Updated description title and Section Features.

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