STH52N10LF3-2AG

Automotive-grade N-channel 100 V, 15 mΩ typ., 52 A STripFET™ F3 Power MOSFET in H²PAK-2 package

Datasheet - production data

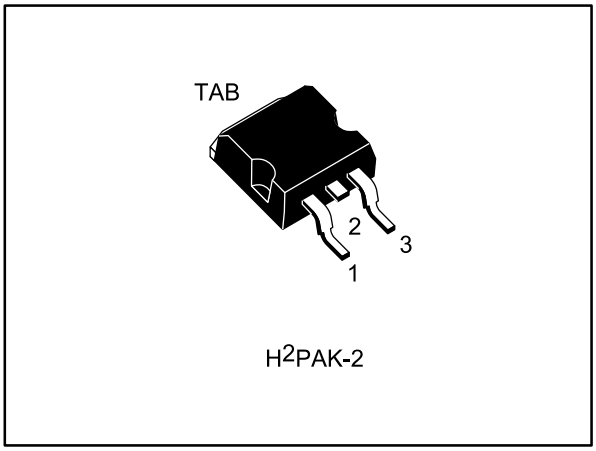
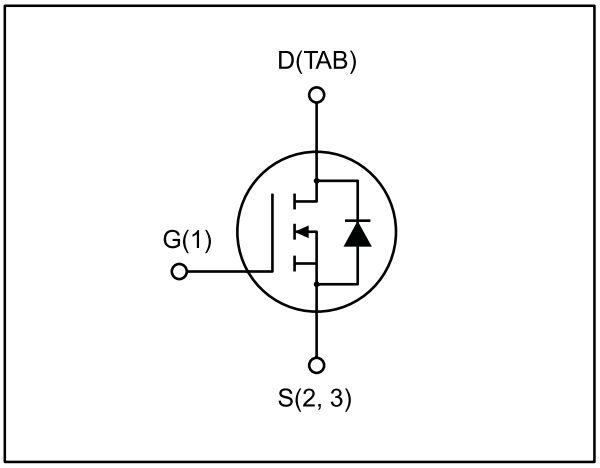


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STH52N10LF3-2AG	100 V	20 mΩ	52 A

- Designed for automotive applications and AEC-Q101 qualified
- Conduction losses reduced
- Low profile, very low parasitic inductance, high current package

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1: Device summary

Order code	Marking	Package	Packing
STH52N10LF3-2AG	52N10LF3	H²PAK-2	Tape and reel

Contents

1 Electrical ratings

Table 2: 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	52	A
	Drain current (continuous) at T_{case} = 100 °C	37	
I_{DM}(1)	Drain current (pulsed)	208	A
P_{TOT}	Total dissipation at T_{case} = 25 °C	110	W
E_{AS}(2)	Single pulse avalanche energy	250	mJ
T_{stg}	Storage temperature range	-55 to 175	°C
T_j	Operating junction temperature range		

Notes:

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

(2)$T_j \leq 25$ °C, I_D=10 A, V_{DD}= 40 V

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 board, 2oz Cu.

2 Electrical characteristics

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

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 250 µA	100			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 100 V			1	µA
		V_{GS} = 0 V, V_{DS} = 100 V T_j= 125 °C (1)			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 = 26 A		15	20	mΩ
		V_{GS} = 5 V, I_D = 26 A		17	26	

Notes:

(1)Defined by design, not subject to production test.

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	1900	-	pF
C_{oss}	Output capacitance		-	295	-	
C_{rss}	Reverse transfer capacitance		-	7.5	-	
Q_g	Total gate charge	V_{DD} = 80 V, I_D = 52 A, V_{GS} = 5 V (see *Figure 14: "Test circuit for gate charge behavior"*)	-	18.5	-	nC
Q_{gs}	Gate-source charge		-	9	-	
Q_{gd}	Gate-drain charge		-	7	-	

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 50 V, I_D = 26 A R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13: "Test circuit for resistive load switching times"*)	-	15	-	ns
t_r	Rise time		-	90	-	
$t_{d(off)}$	Turn-off delay time		-	100	-	
t_f	Fall time		-	95	-	

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		52	A
I_{SDM}(1)					208	A
V_{SD}(2)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 52 A	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 52 A, di/dt = 100 A/µs, V_{DD} = 48 V (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	45		ns
Q_{rr}	Reverse recovery charge		-	65		nC
I_{RRM}	Reverse recovery current		-	2.7		A

Notes:

(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 2: Safe operating area

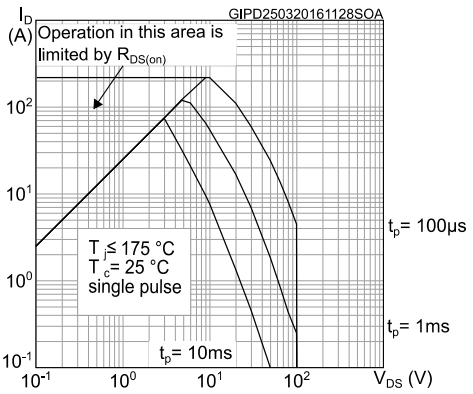


Figure 3: Thermal impedance

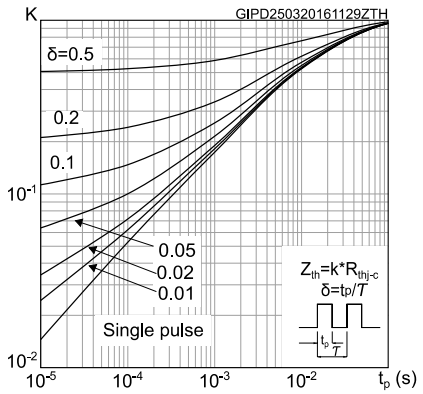


Figure 4: Output characteristics

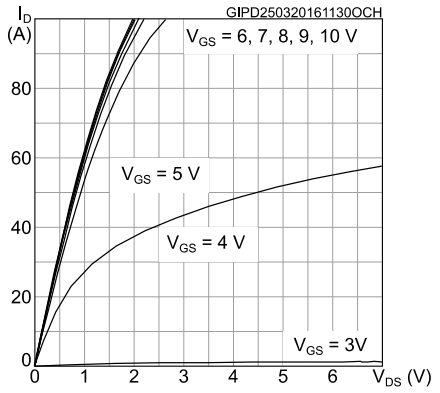


Figure 5: Transfer characteristics

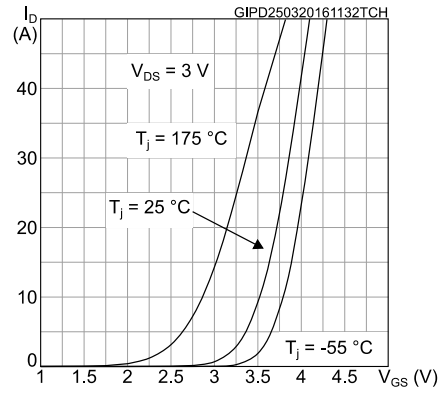


Figure 6: Gate charge vs gate-source voltage

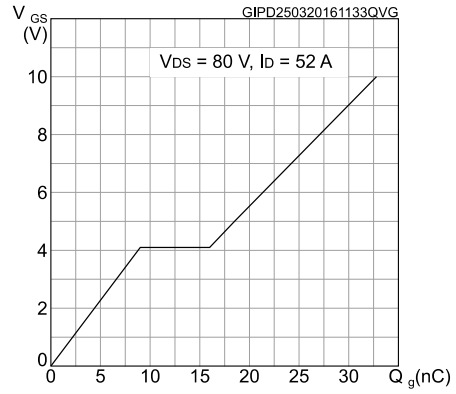


Figure 7: Static drain-source on-resistance

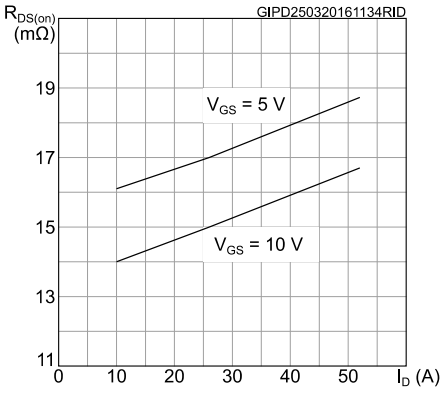


Figure 8: Capacitance variations

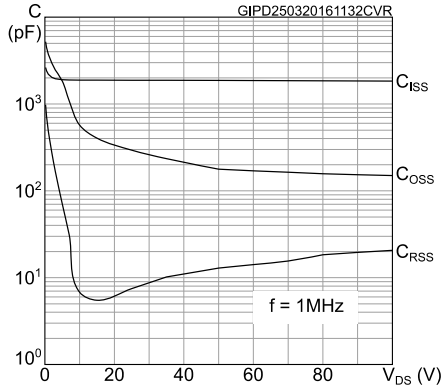


Figure 9: Normalized gate threshold voltage vs temperature

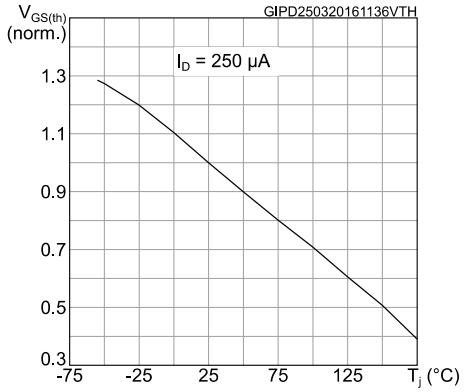


Figure 10: Normalized on-resistance vs temperature

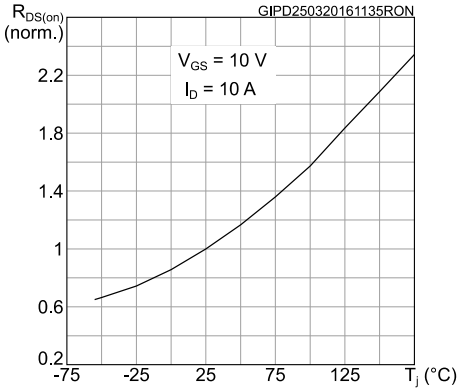


Figure 11: Normalized V(BR)DSS vs temperature

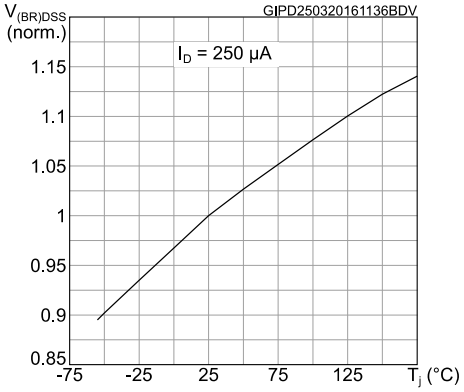
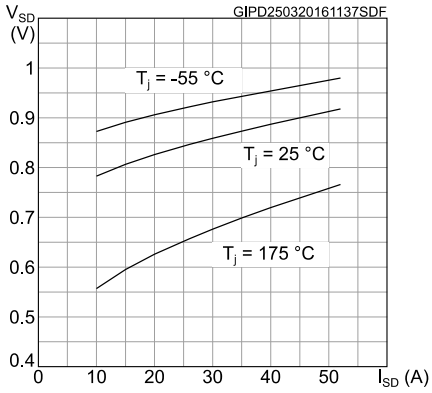


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

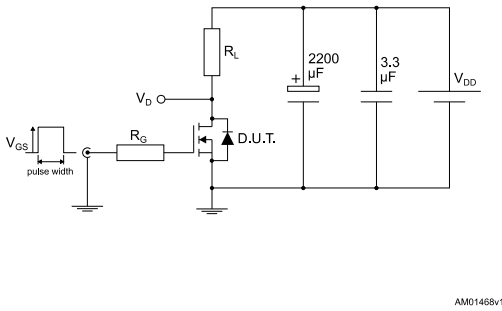


Figure 14: Test circuit for gate charge behavior

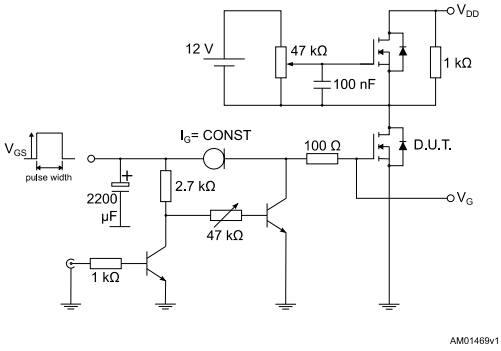


Figure 15: Test circuit for inductive load switching and diode recovery times

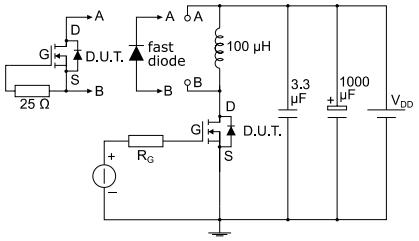


Figure 16: Unclamped inductive load test circuit

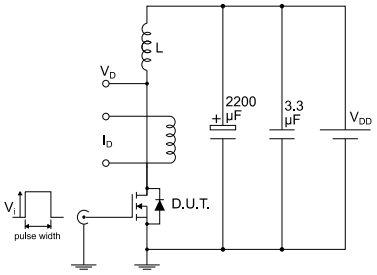


Figure 17: Unclamped inductive waveform

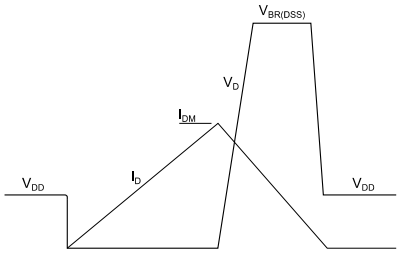
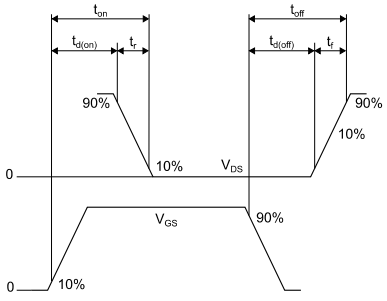


Figure 18: Switching time waveform



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 H²PAK-2 package mechanical data

Figure 19: H²PAK-2 package outline

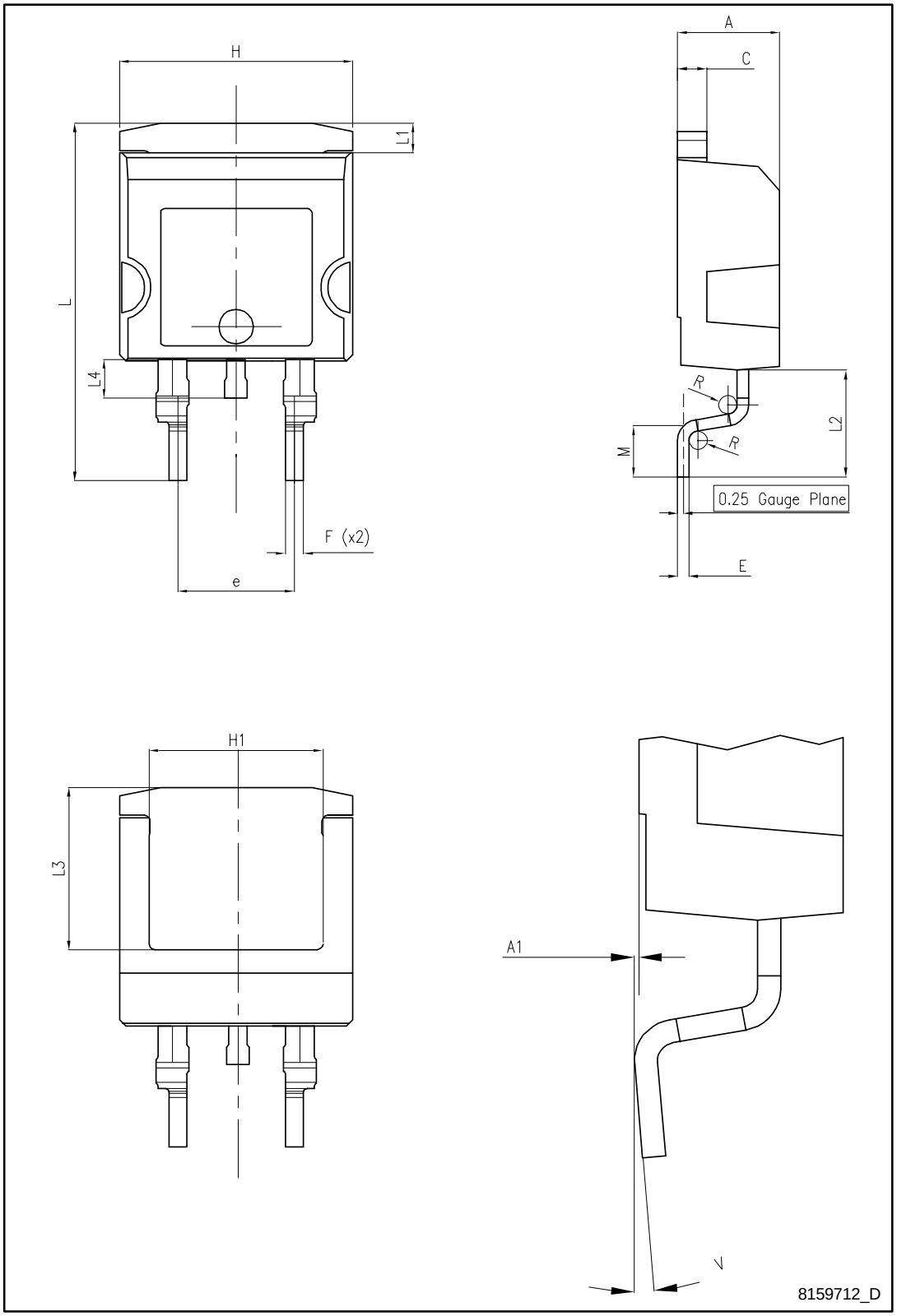
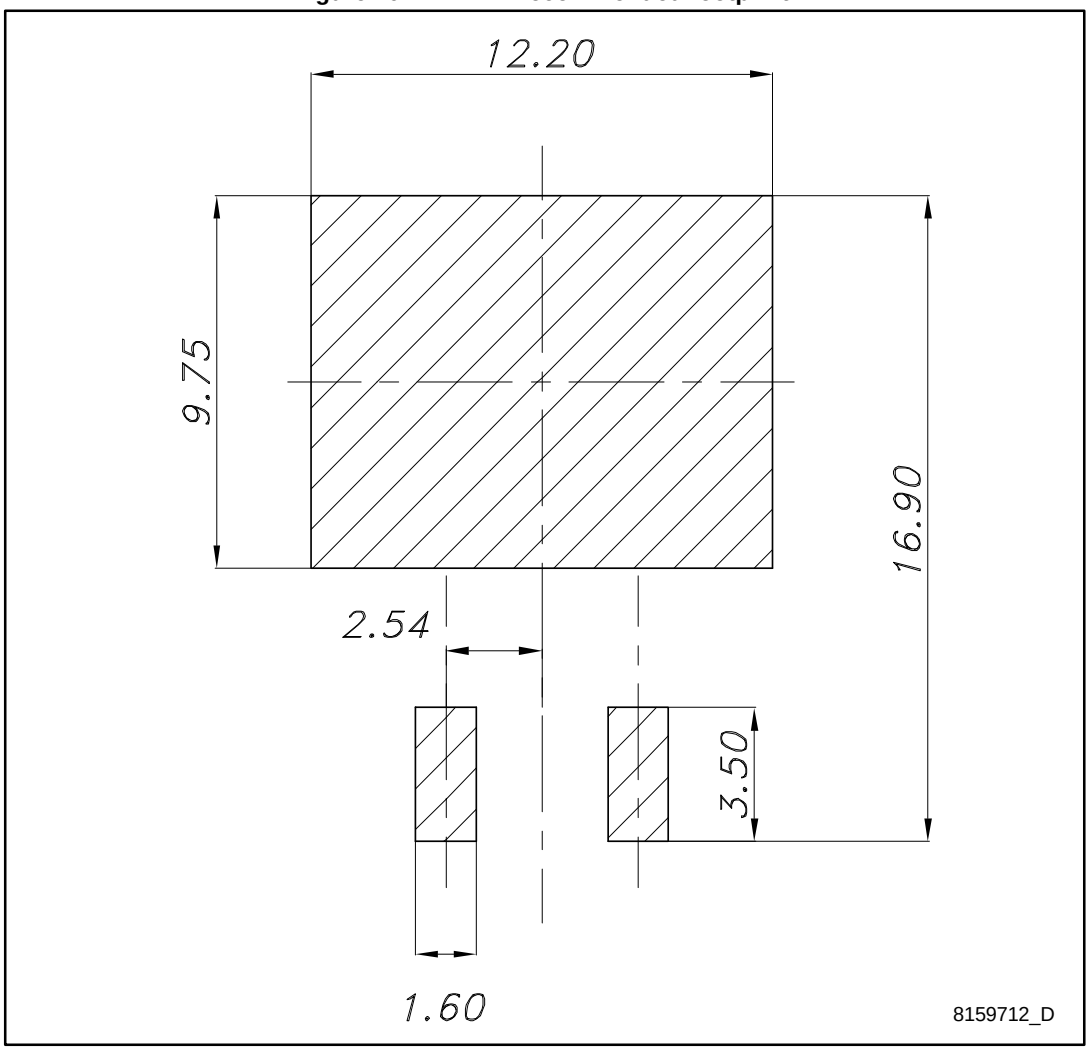


Table 8: H²PAK-2 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
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	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 20: H²PAK-2 recommended footprint



4.2 H²PAK-2 packing information

Figure 21: Tape outline

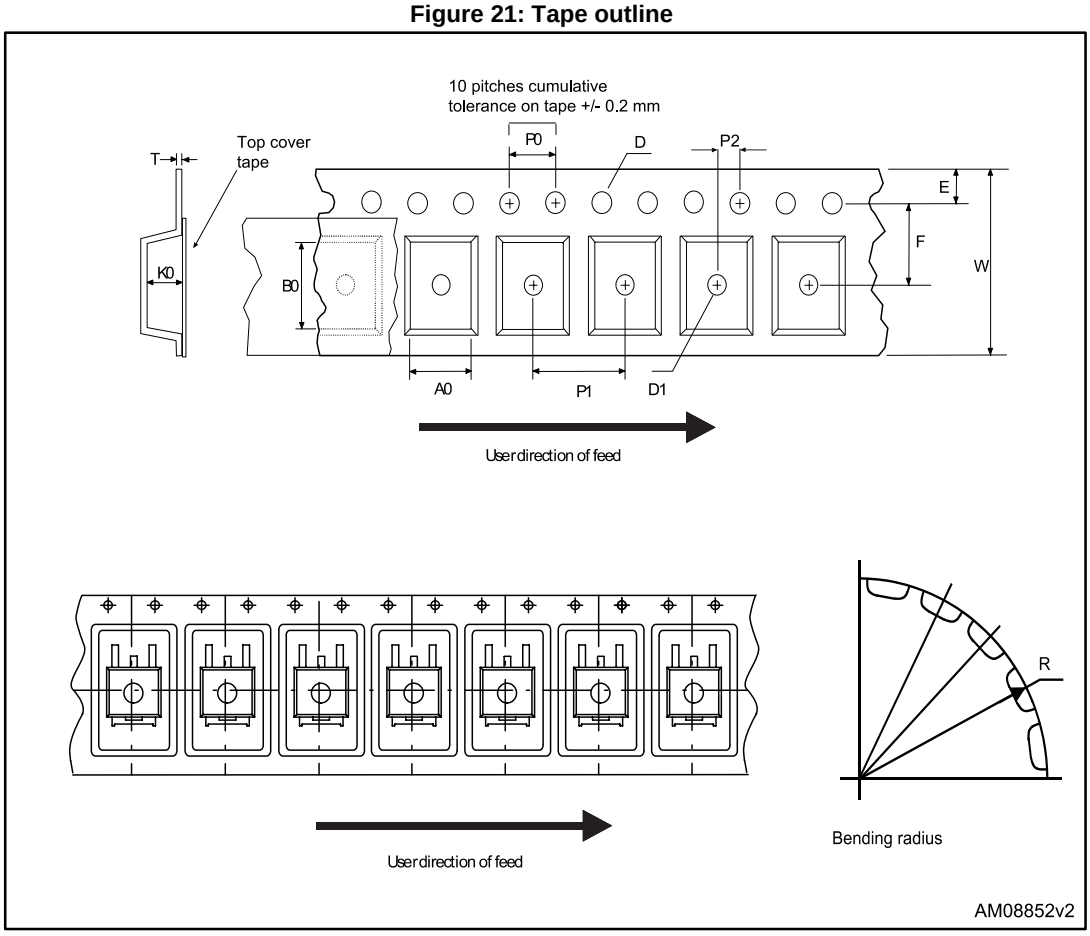


Figure 22: Reel outline

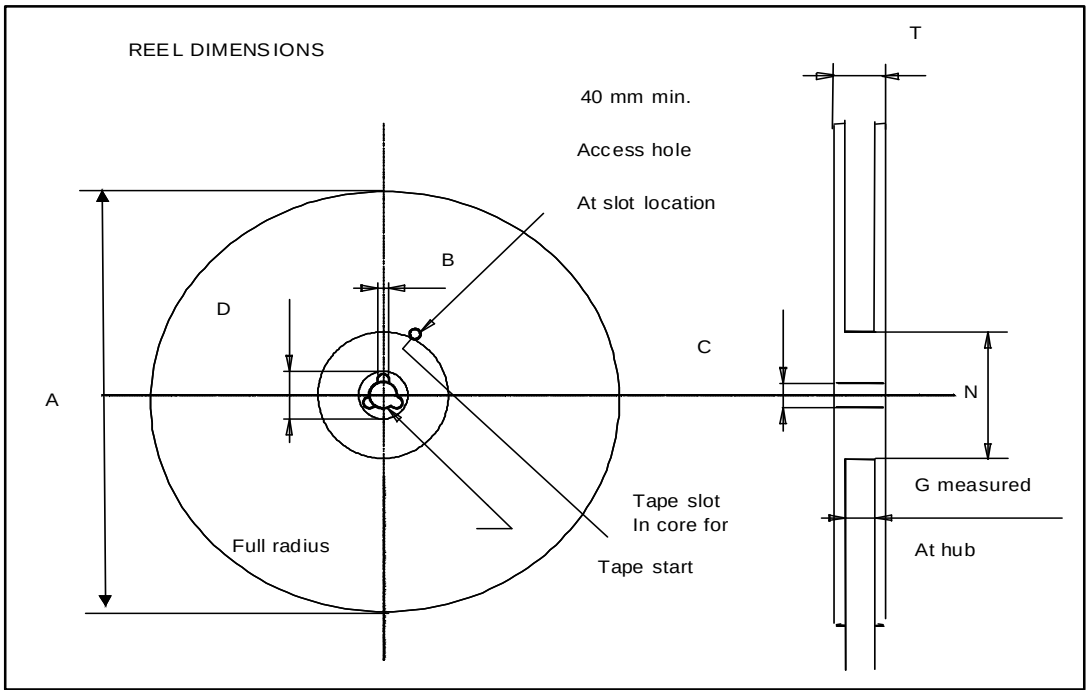


Table 9: Tape and reel mechanical data

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			

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
25-Mar-2016	1	First release.

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