STH400N4F6-2, STH400N4F6-6

N-channel 40 V, 180 A STripFET™ VI DeepGATE™ Power MOSFET in H²PAK-2 and H²PAK-6 packages

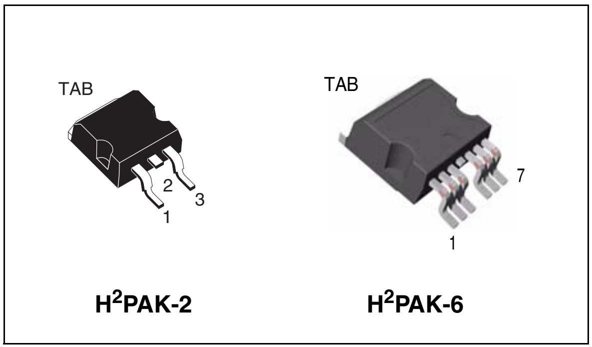
Datasheet — preliminary data

Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D
STH400N4F6-2	40 V	< 1.15 mΩ	180 A[(1)]
STH400N4F6-6			

1. Limited by package

- Low gate charge
- Very low on-resistance
- High avalanche ruggedness



Applications

- Switching applications

Description

These devices are N-channel Power MOSFETs developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFETs exhibits the lowest RDS(on) in all packages.

Figure 1. Internal schematic diagram

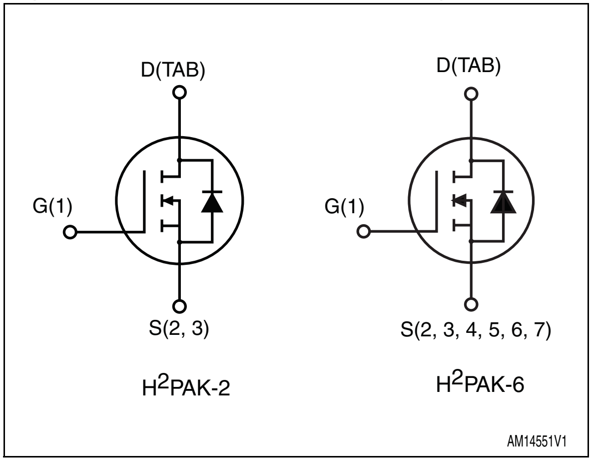


Table 1. Device summary

Order code	Marking	Package	Packaging
STH400N4F6-2	400N4F6	H²PAK-2	Tape and reel
STH400N4F6-6		H²PAK-6	

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	40	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25$ °C	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100$ °C	180	A
$I_{DM}^{(1)}$	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at $T_C = 25$ °C	300	W
	Derating factor	2	W/°C
T_{stg}	Storage temperature	- 55 to 175	°C
T_j	Operating junction temperature		

1. Current limited by package

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.5	°C/W
$R_{thj\text{-}pcb}^{(1)}$	Thermal resistance junction-pcb max	35	°C/W

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

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage (V_{GS} = 0)	I_D = 250 µA	40			V
I_{DSS}	Zero gate voltage Drain current (V_{GS} = 0)	V_{DS} = 40 V V_{DS} = 40 V, T_C=125 °C			1 100	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	3		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 60 A		TBD	1.15	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	20000 1740 1305	-	pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 20 V, I_D = 120 A, V_{GS} = 10 V	-	377 TBD TBD	-	nC nC nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 20 V, I_D = 60 A R_G = 4.7 Ω V_{GS} = 10 V	-	TBD	-	ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time		-	TBD	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}(1)	Source-drain current				180	A
I_{SDM}(1)	Source-drain current (pulsed)				720	A
V_{SD} (2)	Forward on voltage	I_{SD} = 180 A, V_{GS} = 0			1.1	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 120 A, V_{DD} = 32 V di/dt = 100 A/µs, T_j = 150 °C	-	TBD		ns nC A

1. Limited by package, current allowed by silicon 360 A
2. Pulsed: pulse duration = 300 µs, duty cycle 1.5%

3 Package mechanical data

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.

Table 8. H^{2}PAK-2 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 2. H^{2}PAK-2 drawing

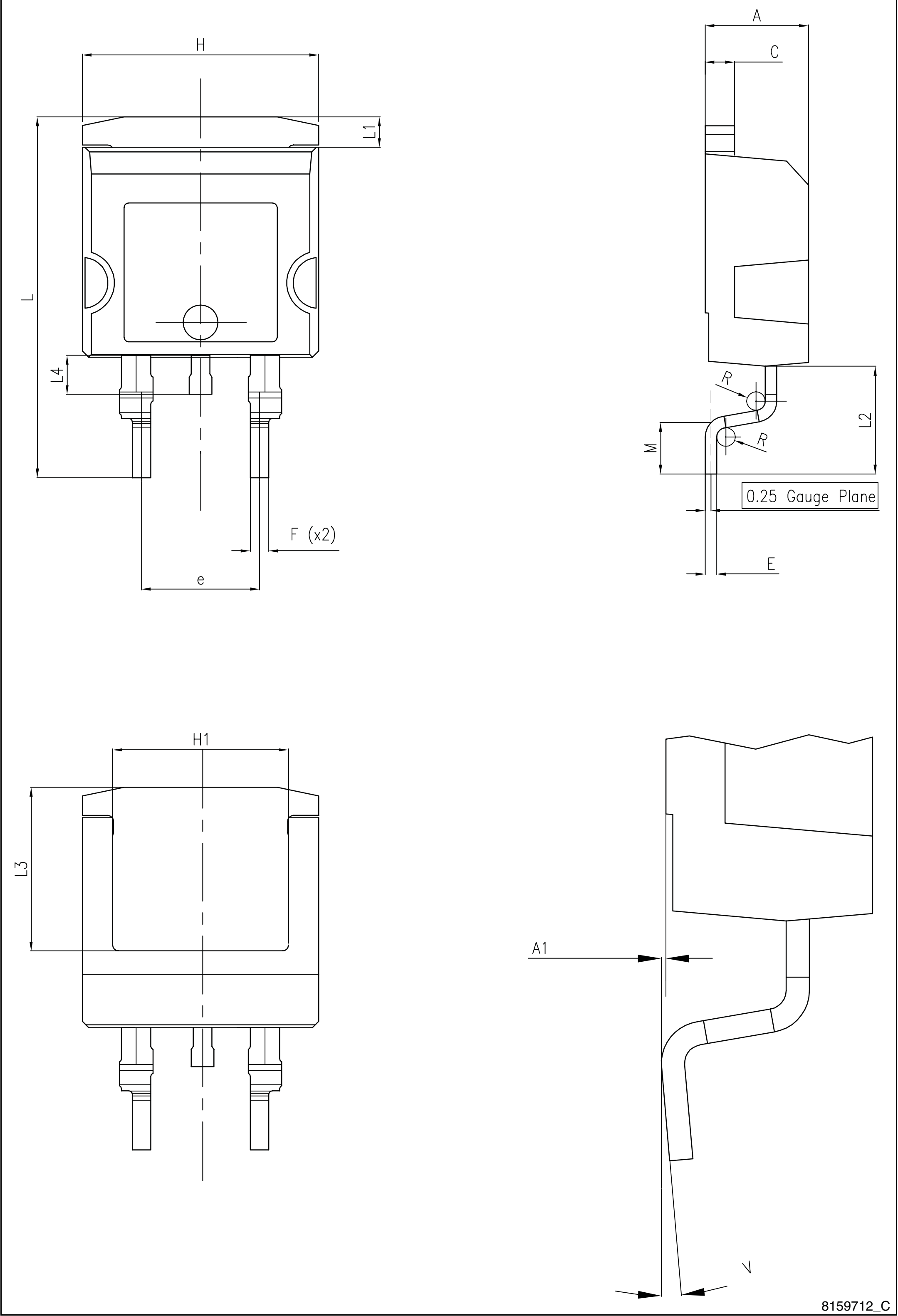


Figure 3. H²PAK-2 recommended footprint (dimensions in mm)

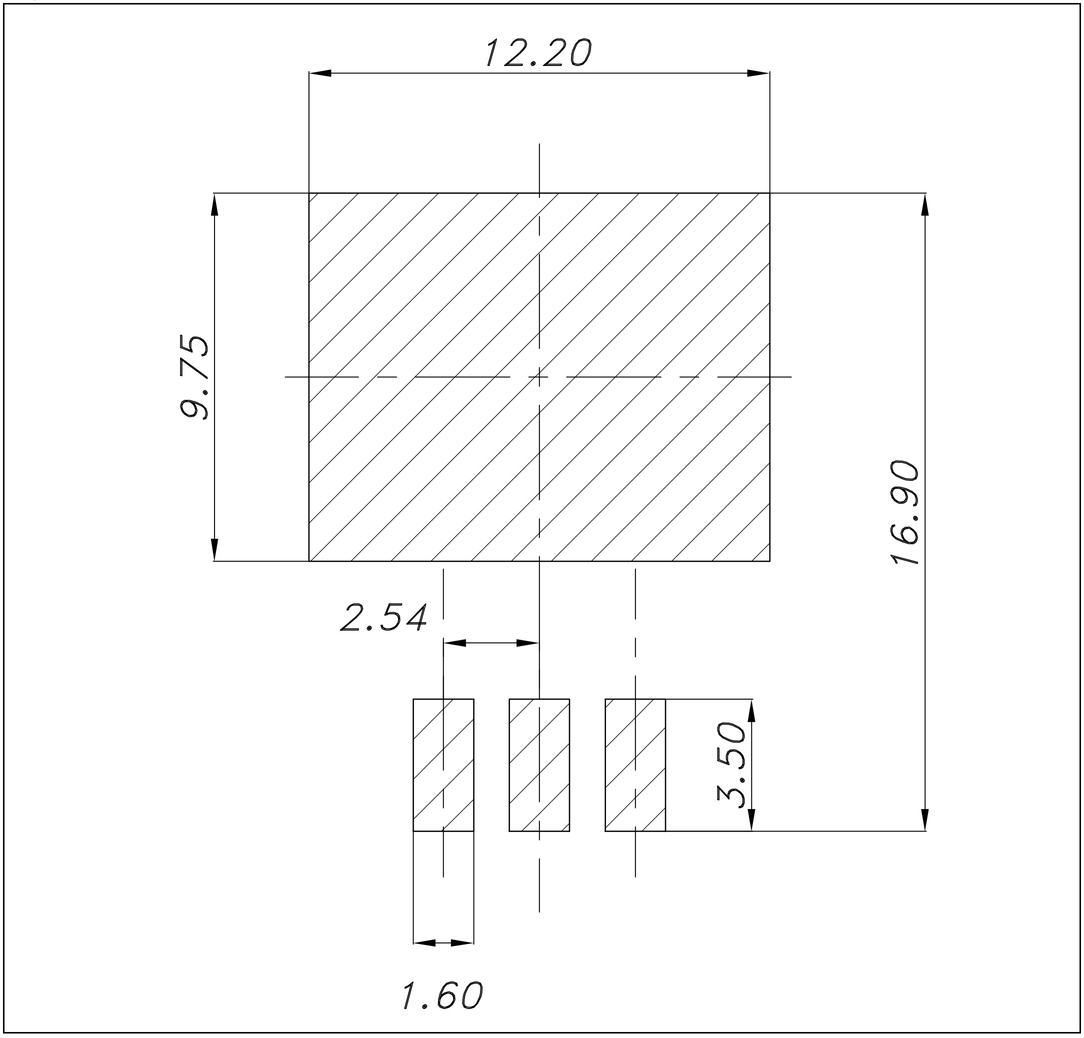


Table 9. H^{2}PAK-6 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	2.34		2.74
e1	4.88		5.28
e2	7.42		7.82
E	0.45		0.60
F	0.50		0.70
H	10.00		10.40
H1	7.40		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.5		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 4. **H^{2}PAK-6 drawing**

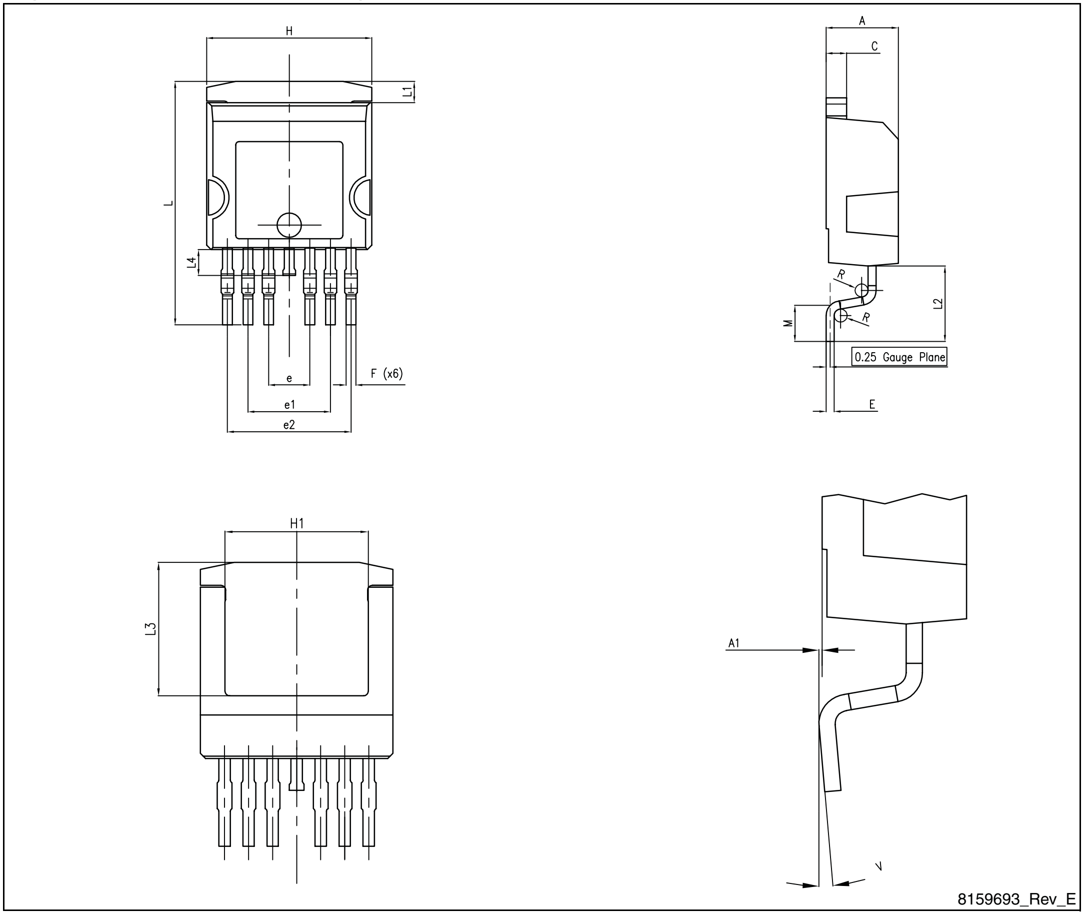
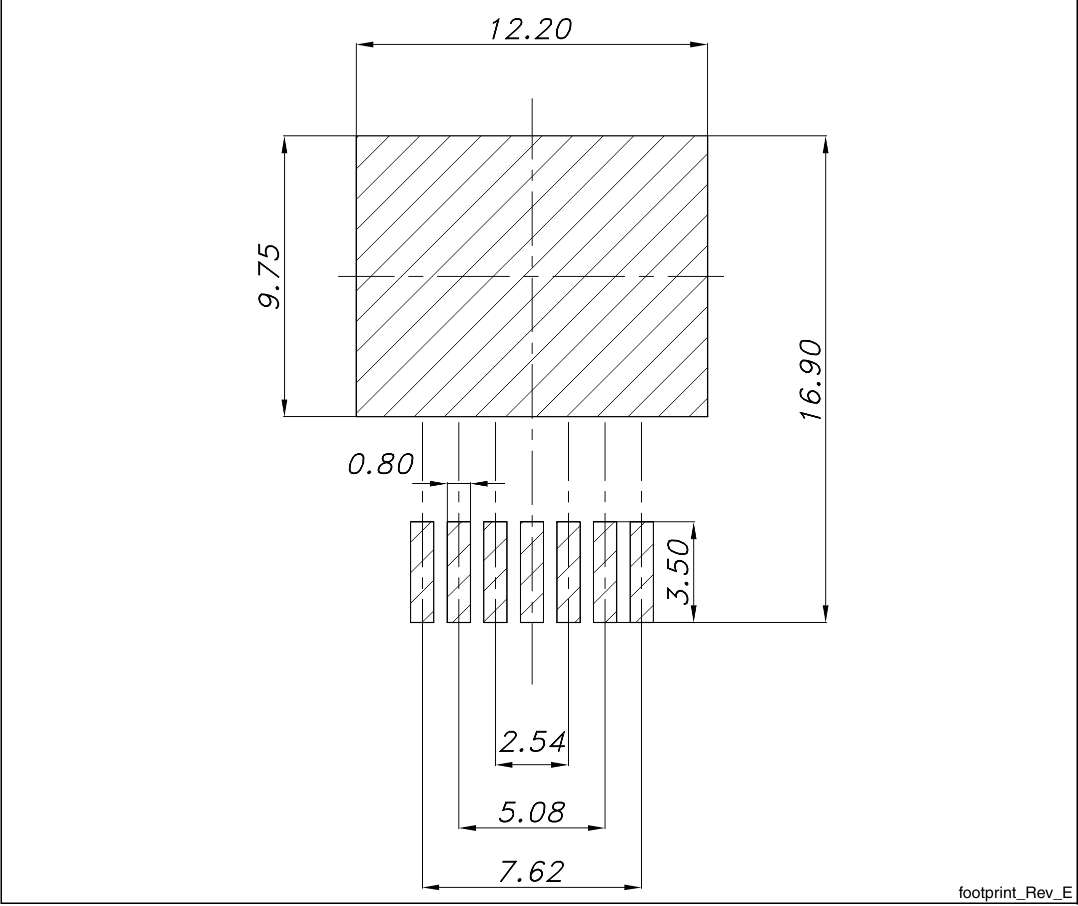


Figure 5. H²PAK-6 recommended footprint (dimensions in mm)



4 Packaging mechanical data

Table 10. H^{2}PAK-2 and H^{2}PAK-6 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			

Figure 6. Tape dimension

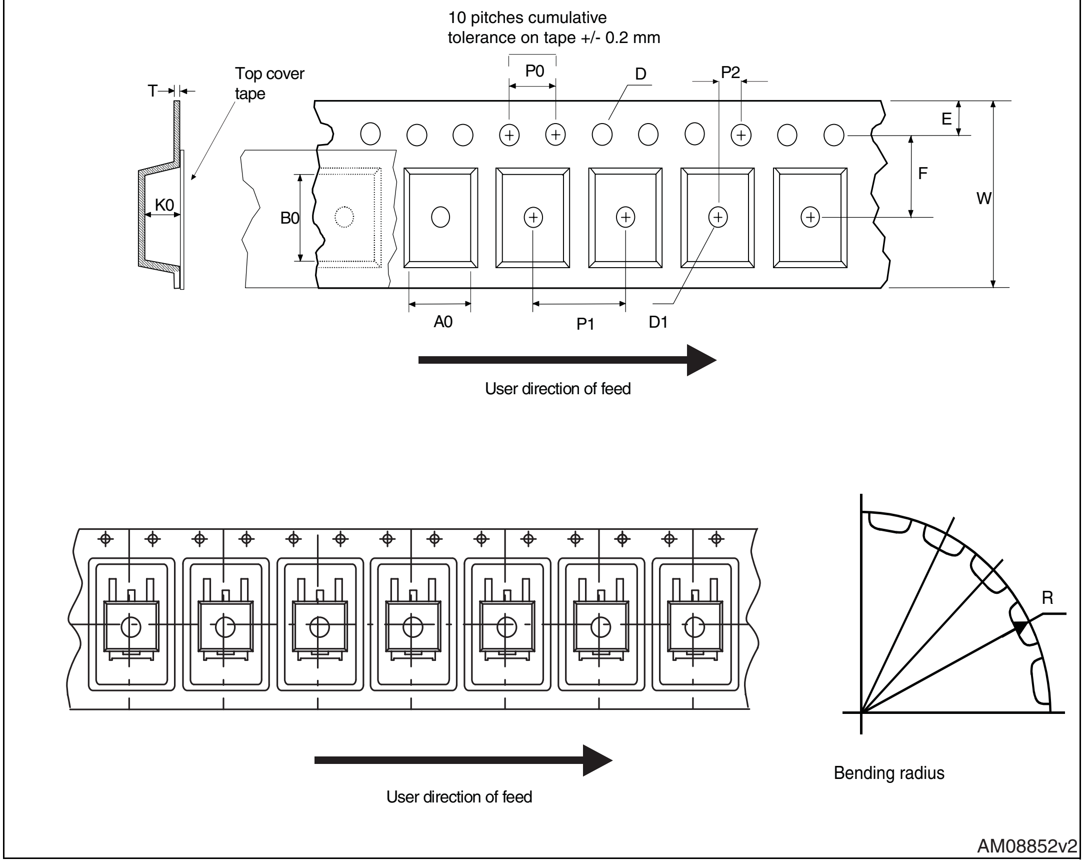
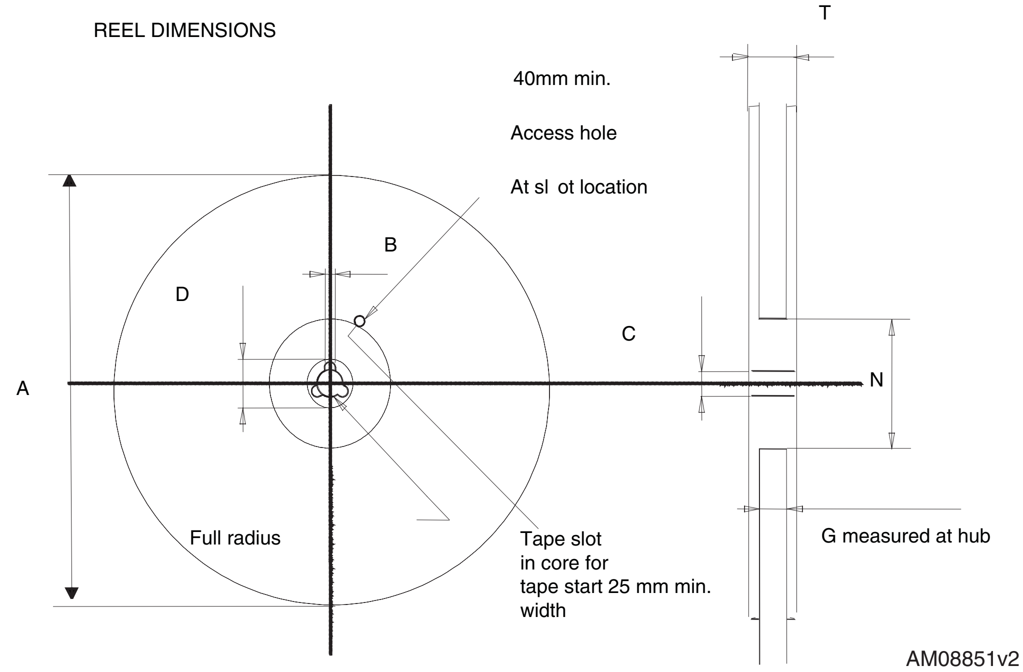


Figure 7. Reel dimension



5 Revision history

Table 11. Document revision history

Date	Revision	Changes
08-Aug-2012	1	First release.

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