

N-channel 60 V, 0.0025 Ω typ., 80 A, STripFET™ VII DeepGATE™ Power MOSFETs in TO-220FP, H²PAK-2 and TO-220 packages

Datasheet - target specification

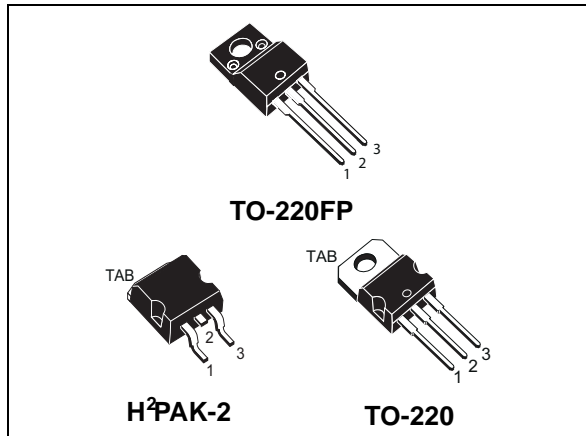
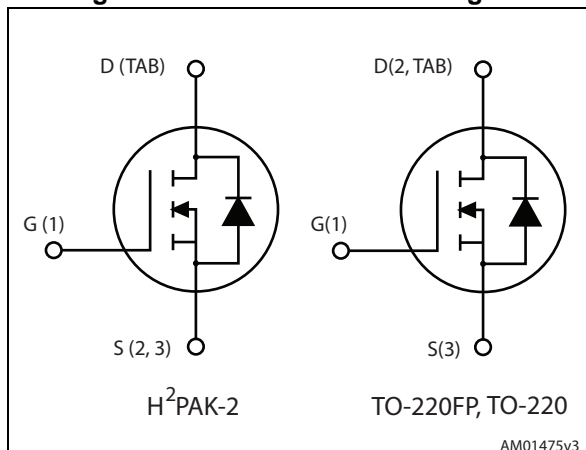


Figure 1. Internal schematic diagram



Features

Order codes	V _{DS}	R _{DS(on)max}	I _D	P _{TOT}
STF140N6F7	60 V	0.003 Ω	72 A	30 W
STH140N6F7-2			80 A	110 W
STP140N6F7				

- 100% avalanche tested
- Ultra low on-resistance

Applications

- Switching applications

Description

These devices utilize the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STF140N6F7	140N6F7	TO-220FP	Tube
STH140N6F7-2		H ² PAK-2	Tape and reel
STP140N6F7		TO-220	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
3	Test circuits	6
4	Package mechanical data	7
5	Packaging mechanical data	15
6	Revision history	17

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220FP	H ² PAK, TO-220	
V _{DS}	Drain-source voltage	60		V
V _{GS}	Gate- source voltage	±20		V
I _D ⁽¹⁾	Drain current (continuous)	72	80	A
I _D ⁽¹⁾	Drain current (continuous) at T _C = 100 °C	52	80	A
I _{DM} ⁽²⁾	Drain current (pulsed) T _C = 25 °C	288	320	A
P _{TOT}	Total dissipation at T _C = 25 °C	30	110	W
T _J	Operating junction temperature	-55 to 175	-55 to 175	°C
T _{stg}	Storage temperature			°C

1. Current limited by package.
2. Pulse width is limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value			Unit
		TO-220FP	H ² PAK	TO-220	
R _{thj-pcb} ⁽¹⁾	Thermal resistance junction-pcb max		35		°C/W
R _{thj-case}	Thermal resistance junction-case max	5	1.36		°C/W
R _{thj-amb}	Thermal resistance junction-ambient max	62.5		62.5	°C/W

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

2 Electrical characteristics

($T_C = 25\text{ °C}$ unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\ \mu A$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 60\ V$			1	μA
		$V_{GS} = 0, V_{DS} = 60\ V, T_C = 125\text{ °C}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0, V_{GS} = +20\ V$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ V, I_D = 40\ A$		0.0025	0.003	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ V, f = 1\ MHz, V_{GS} = 0$	-	2700	-	pF
C_{oss}	Output capacitance		-	650	-	pF
C_{riss}	Reverse transfer capacitance		-	25	-	pF
Q_g	Total gate charge	$V_{DD} = 30\ V, I_D = 80\ A, V_{GS} = 10\ V$ (see Figure 3)	-	40	-	nC
Q_{gs}	Gate-source charge		-	TBD	-	nC
Q_{gd}	Gate-drain charge		-	TBD	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\ V, I_D = 40\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see Figure 2)	-	TBD	-	ns
t_r	Rise time		-	TBD	-	ns
$t_{d(off)}$	Turn-off delay time		-	TBD	-	ns
t_f	Fall time		-	TBD	-	ns

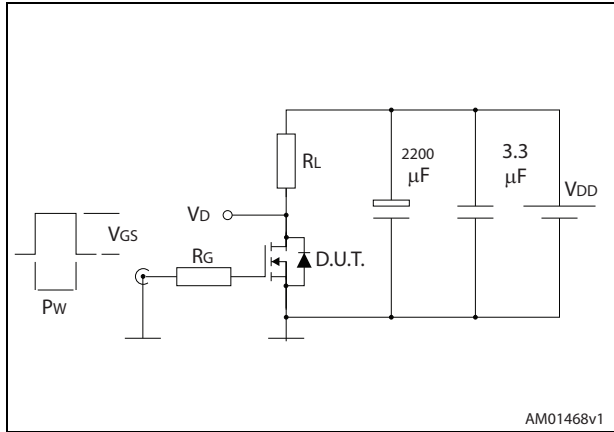
Table 7. Source drain diode

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	$I_{SD} = 80 \text{ A}$, $V_{GS} = 0$	-	-	TBD	V
t_{rr}	Reverse recovery time	$I_{SD} = 80 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 48 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$ (see Figure 4)	-	-		ns
Q_{rr}	Reverse recovery charge		-	-		nC
I_{RRM}	Reverse recovery current		-	-		A

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

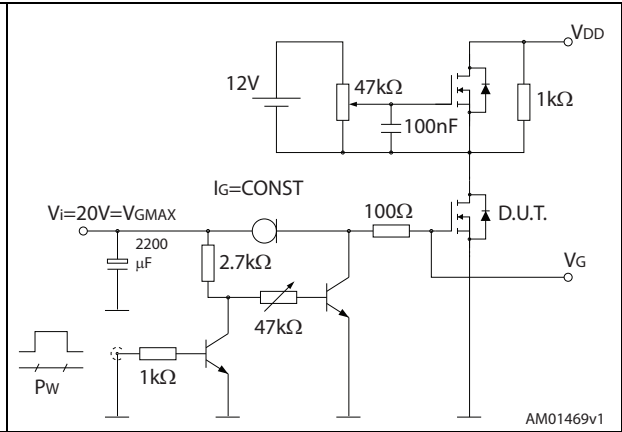
3 Test circuits

Figure 2. Switching times test circuit for resistive load



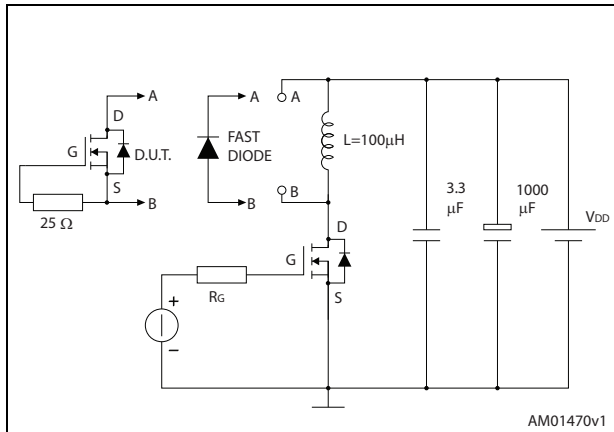
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Figure 3. Gate charge test circuit



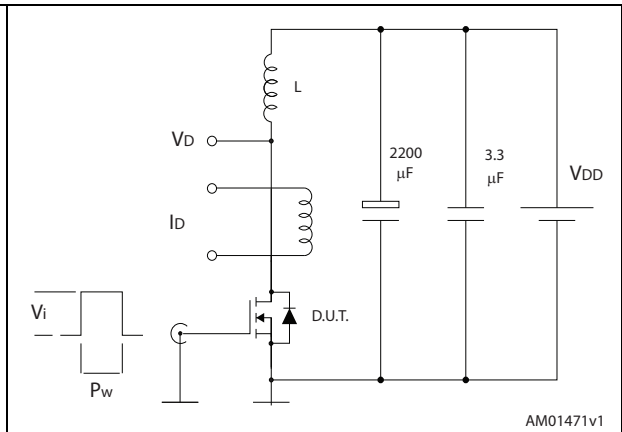
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Figure 4. Test circuit for inductive load switching and diode recovery times



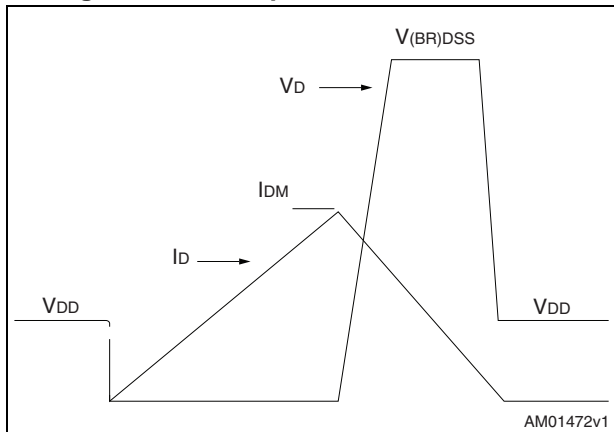
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Figure 5. Unclamped inductive load test circuit



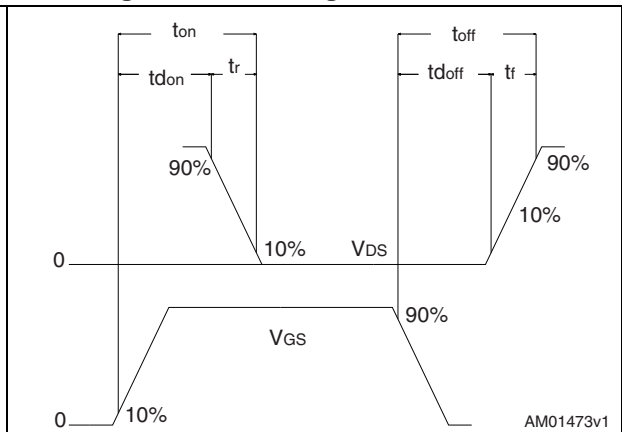
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Figure 6. Unclamped inductive waveform



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Figure 7. Switching time waveform



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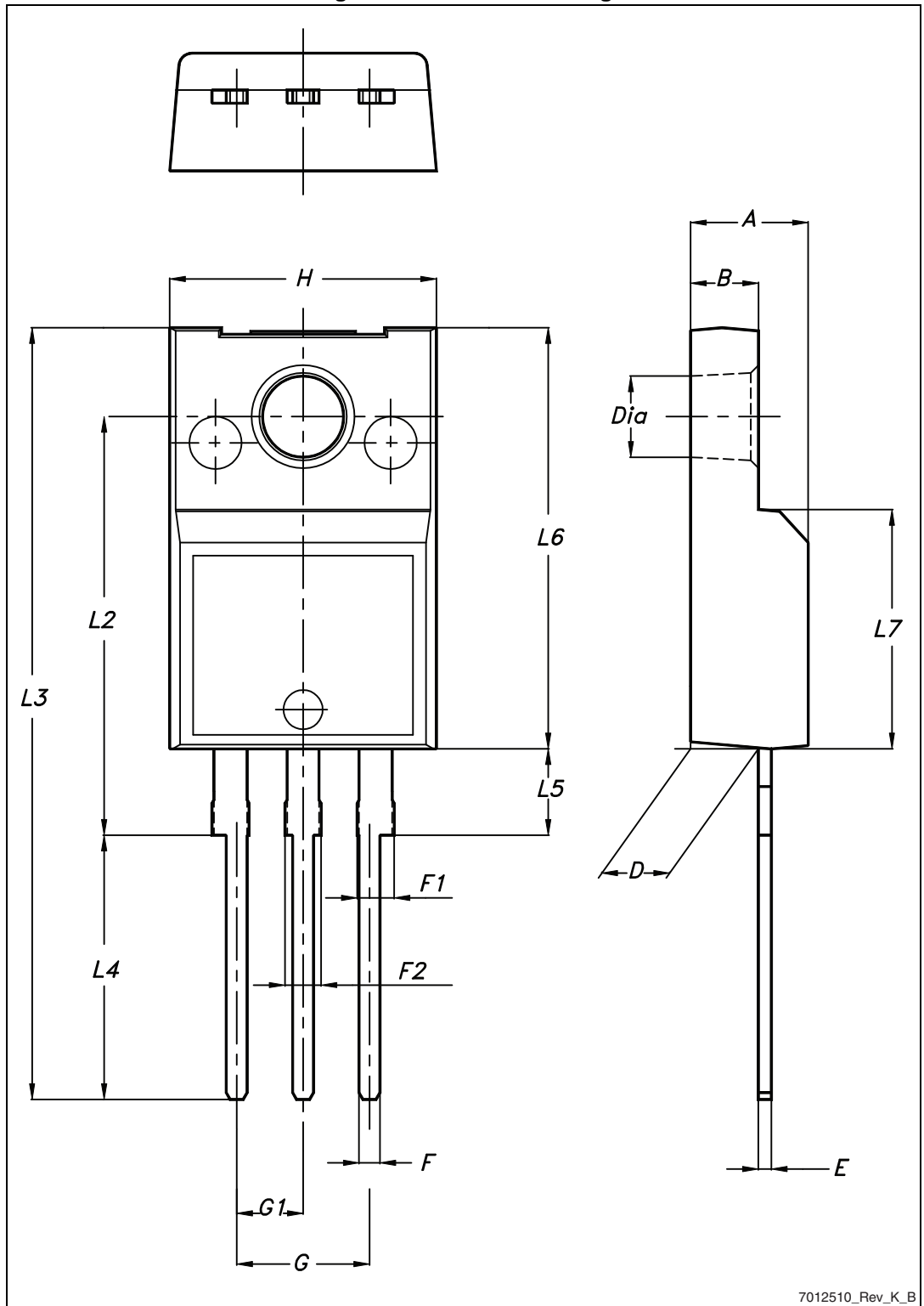
4 Package mechanical data

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. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 8. TO-220FP drawing



7012510_Rev_K_B

Table 9. H²PAK-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 9. H²PAK-2 drawing

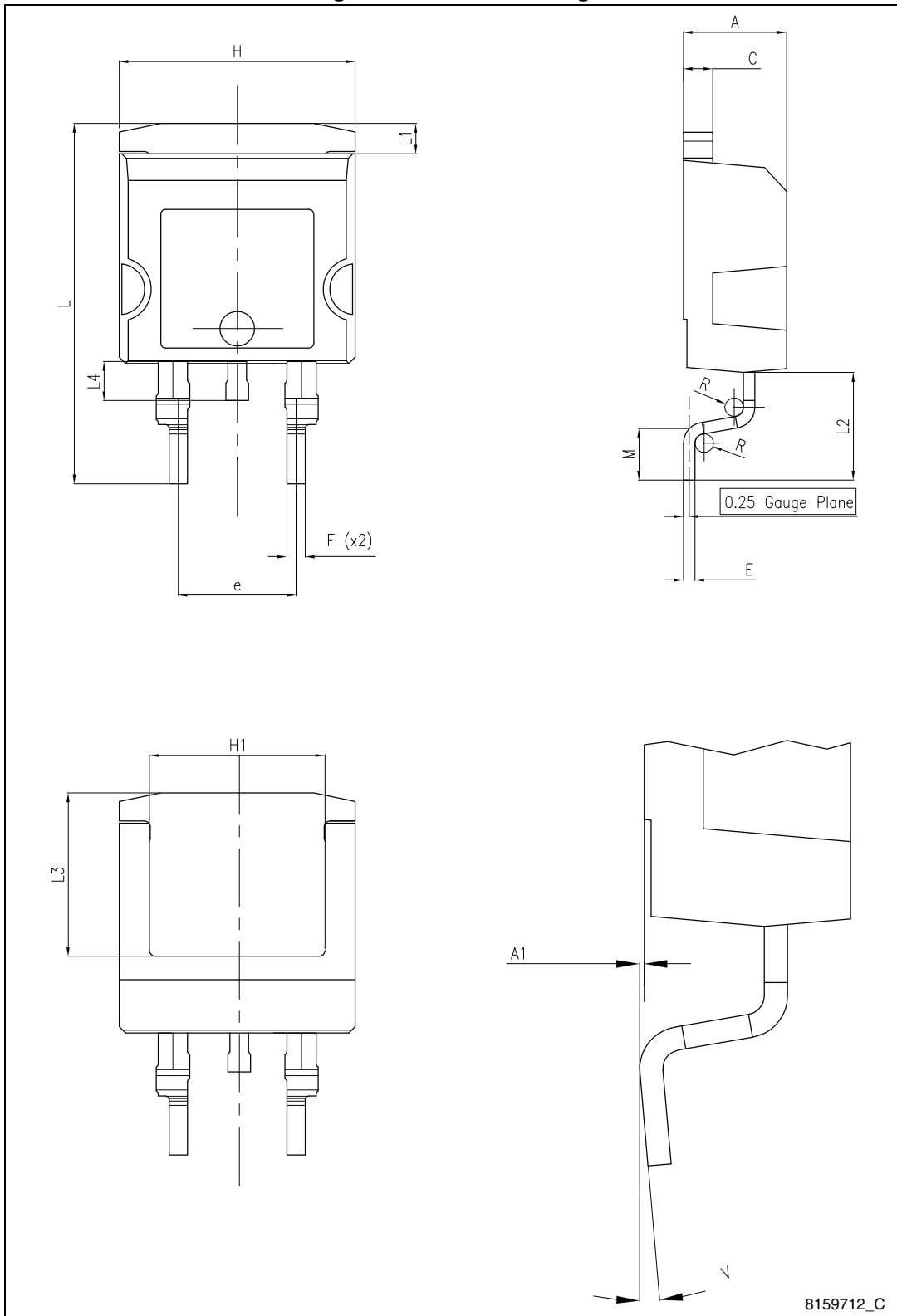
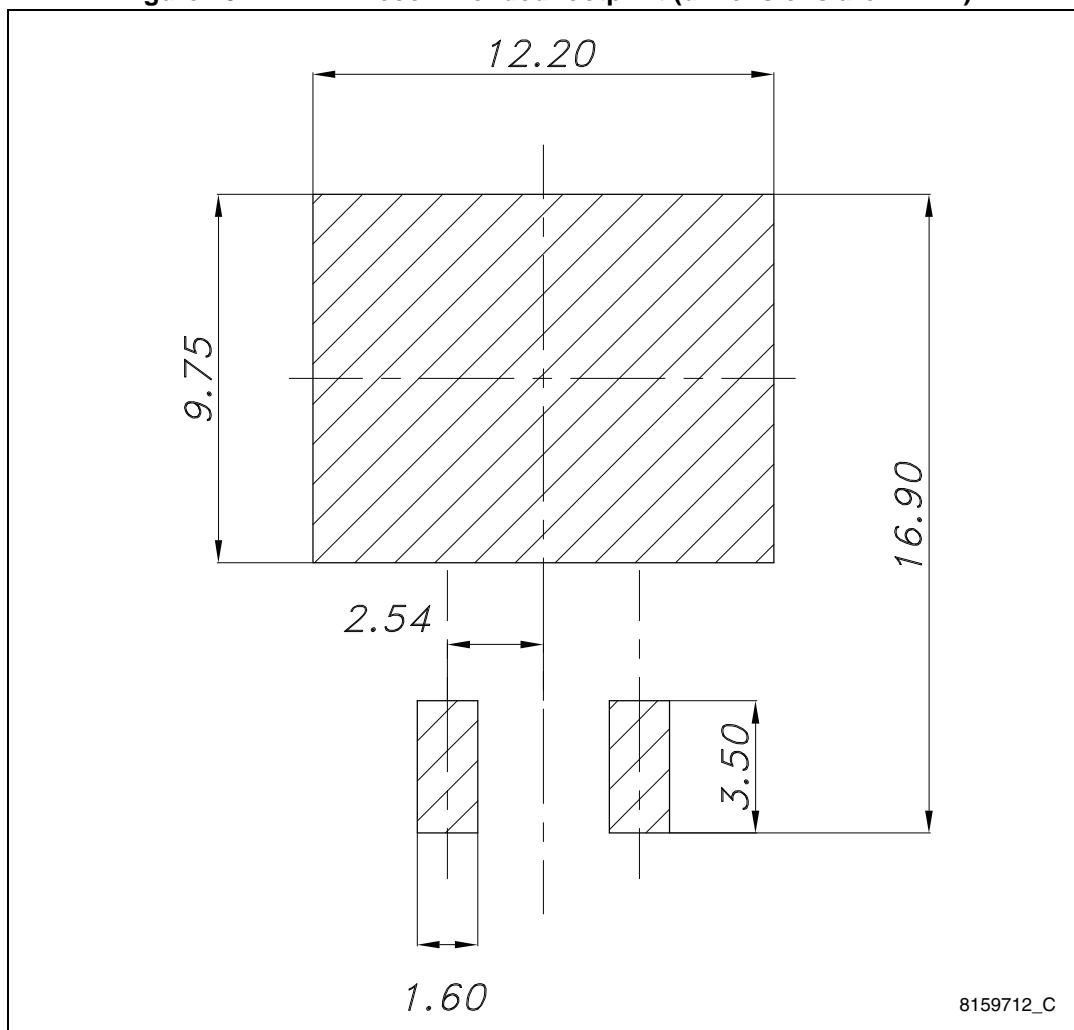


Figure 10. H²PAK-2 recommended footprint (dimensions are in mm)

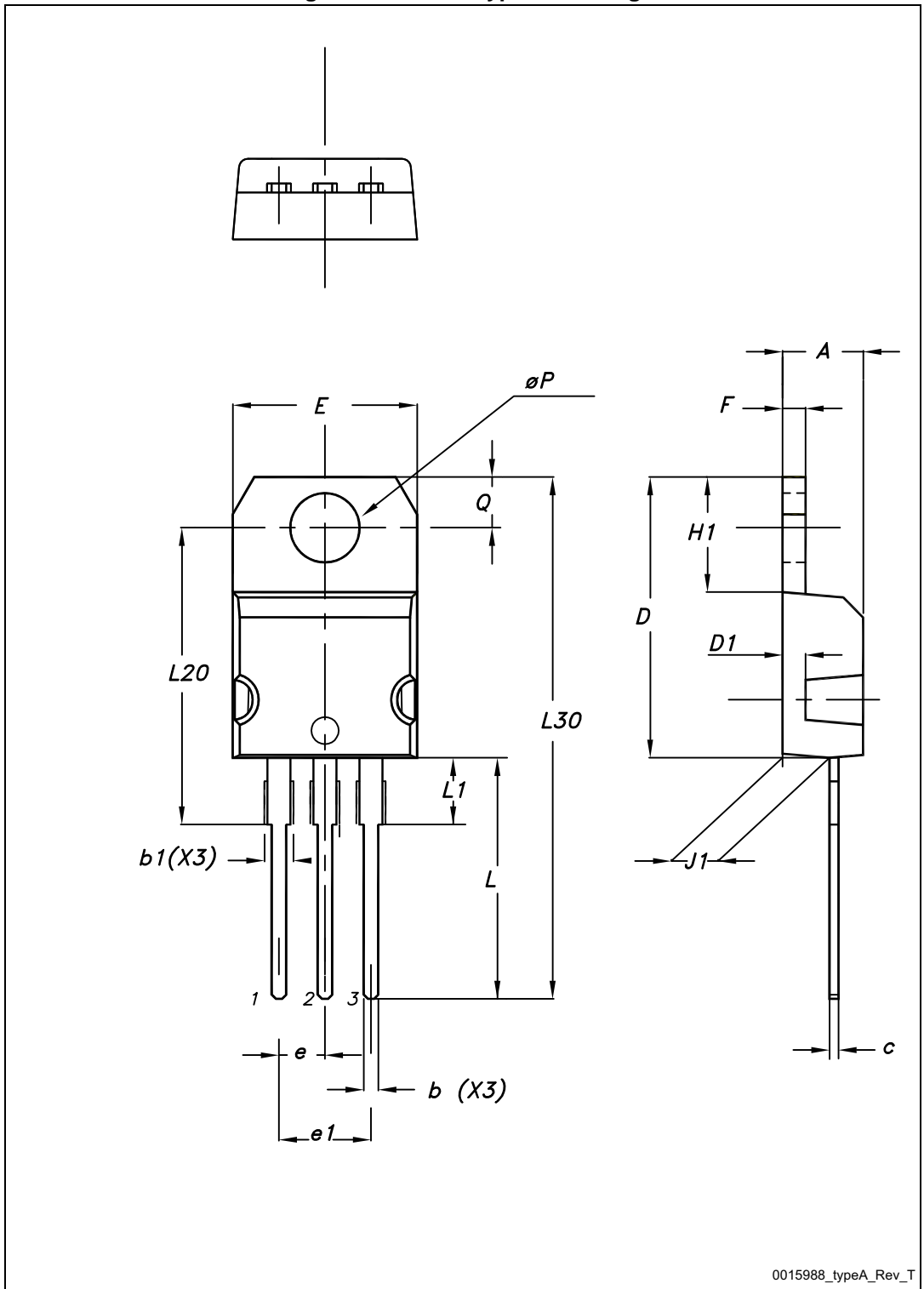


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Table 10. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
ØP	3.75		3.85
Q	2.65		2.95

Figure 11. TO-220 type A drawing



0015988_typeA_Rev_T

5 Packaging mechanical data

Table 11. H²PAK-2 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 12. Tape

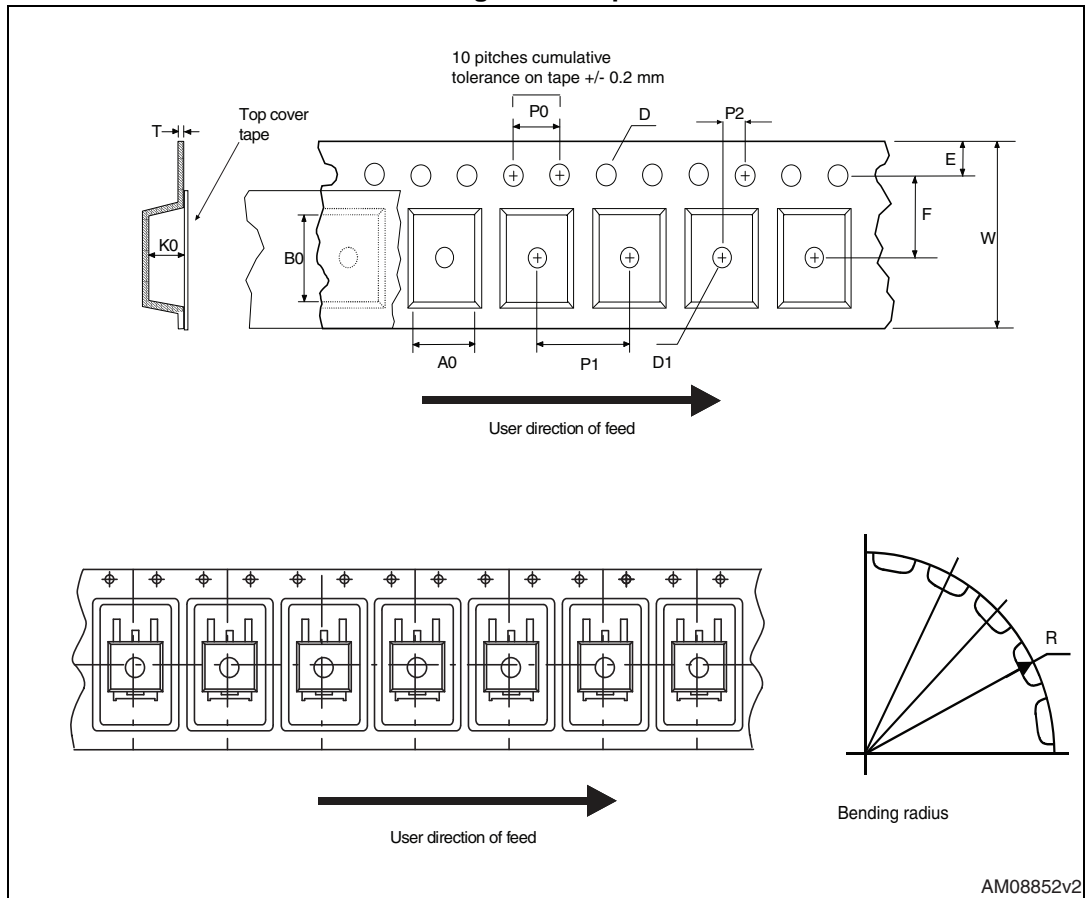
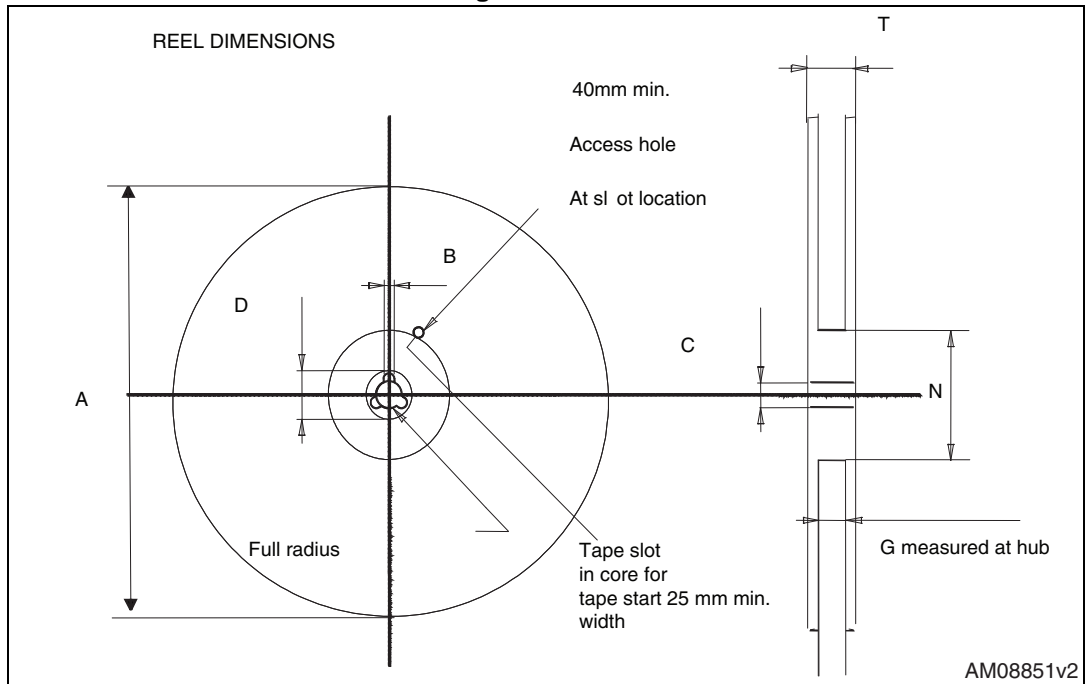


Figure 13. Reel



6 Revision history

Table 12. Document revision history

Date	Revision	Changes
02-Aug-2013	1	Initial release.

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