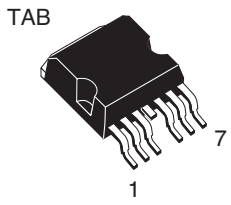
STH300NH02L-6

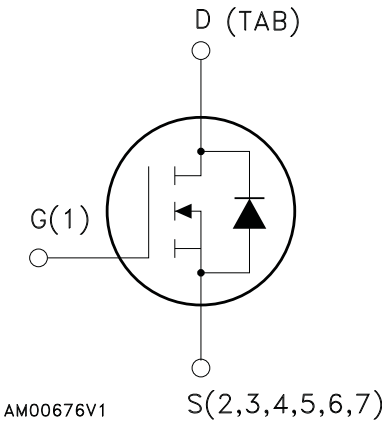
Automotive-grade N-channel 24 V, 0.95 mΩ typ., 180 A STripFET™ III Power MOSFET in a H²PAK-6 package

Datasheet – production data



H²PAK-6

Figure 1. Internal schematic diagram



Features

Order code	V_{DSS}	$R_{DS(on)}$ max.	I_D (1)
STH300NH02L-6	24 V	< 1.2 mΩ	180 A

1. Current limited by package.

- 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 enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Package	Packaging
STH300NH02L-6	300NH02L	H²PAK-6	Tape and reel

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	24	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} (2)	Drain current (pulsed)	720	A
P_{TOT} (3)	Total dissipation at T_C = 25 °C	300	W
	Derating factor	2	W/°C
E_{AS} (4)	Single pulse avalanche energy	1.6	J
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Operating junction temperature		

1. Current limited by package
2. Pulse width limited by safe operating area
3. This value is rated according to $R_{thj\text{-}c}$
4. Starting T_j = 25 °C, I_D = 60 A, V_{DD} = 20 V

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 1 inch2 FR-4 2 oz Cu.

2 Electrical characteristics

(Tcase = 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	24			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 24 V, V_{DS} = 24 V, T_C=125 °C			1 10	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	1			V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS}= 10 V, I_D= 80 A V_{GS}= 5 V, I_D= 40 A		0.95 1.15	1.2 1.5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 15 V, f = 1 MHz, V_{GS} =0	-	7050	-	pF
C_{oss}	Output capacitance		-	3250	-	pF
C_{rss}	Reverse transfer capacitance		-	307	-	pF
Q_g	Total gate charge	V_{DD}= 20 V, I_D= 120 A, V_{GS}= 10 V *(see Figure 14)*	-	109	-	nC
Q_{gs}	Gate-source charge		-	30	-	nC
Q_{gd}	Gate-drain charge		-	26	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 20 V, I_D = 80 A R_G= 4.7 Ω, V_{GS}= 10 V, *(see Figure 13)*	-	18	-	ns
t_r	Rise time		-	275	-	ns
$t_{d(off)}$	Turn-off delay time	V_{DD} = 20 V, I_D = 80 A R_G= 4.7 Ω, V_{GS}= 10 V, *(see Figure 13)*	-	138	-	ns
t_f	Fall time		-	94.4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} (1) I_{SD} (2)	Source-drain current Source-drain current (pulsed)		-		180 720	A A
V_{SD} (3)	Forward on voltage	I_{SD} = 180 A, V_{GS} = 0	-		1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 120 A,di/dt = 100 A/μs V_{DD} = 20 V, T_j = 150 °C *(see Figure 15)*	-	65		ns
Q_{rr}	Reverse recovery charg		-	90		nC
I_{RRM}	Reverse recovery current		-	2.8		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

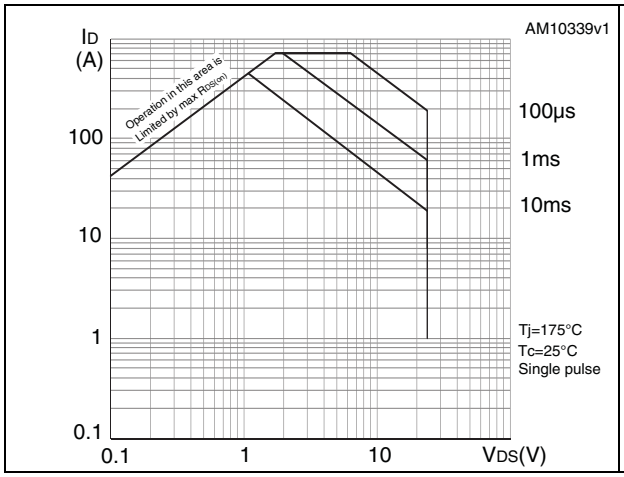


Figure 3. Thermal impedance

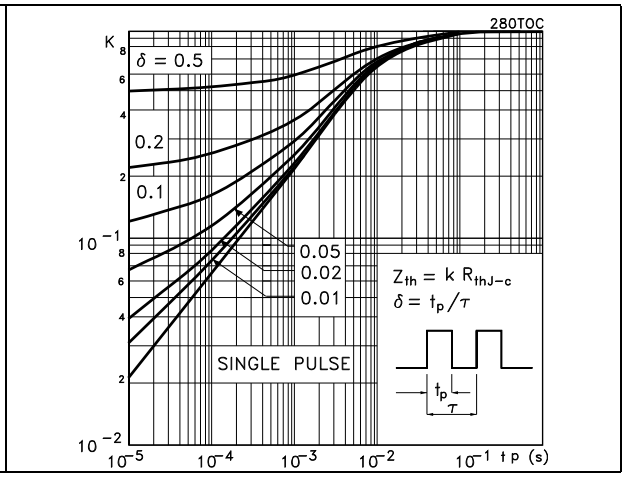


Figure 4. Output characteristics

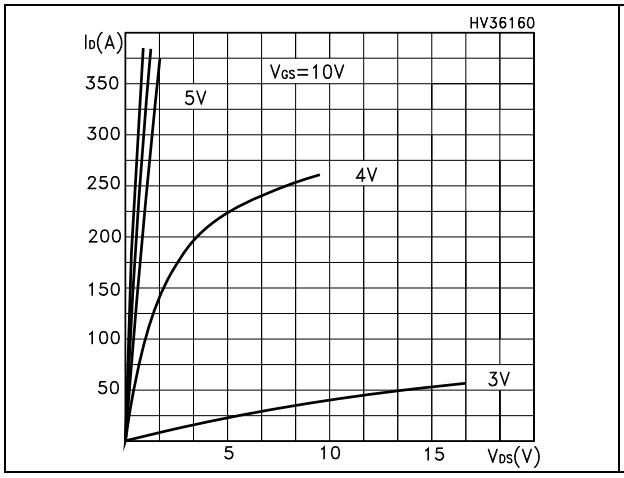


Figure 5. Transfer characteristics

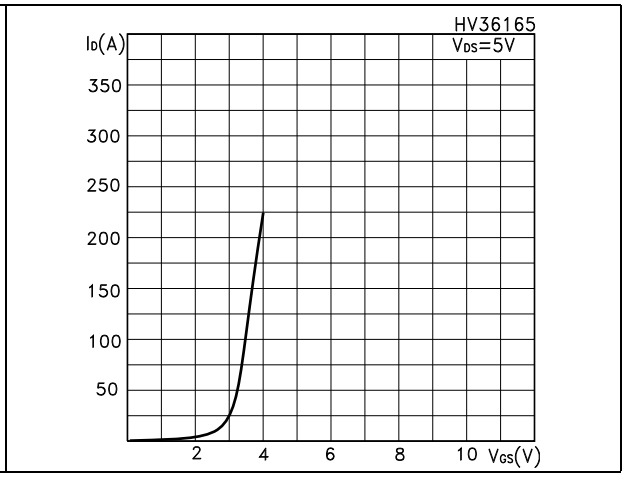


Figure 6. Normalized B_{VDSS} vs temperature

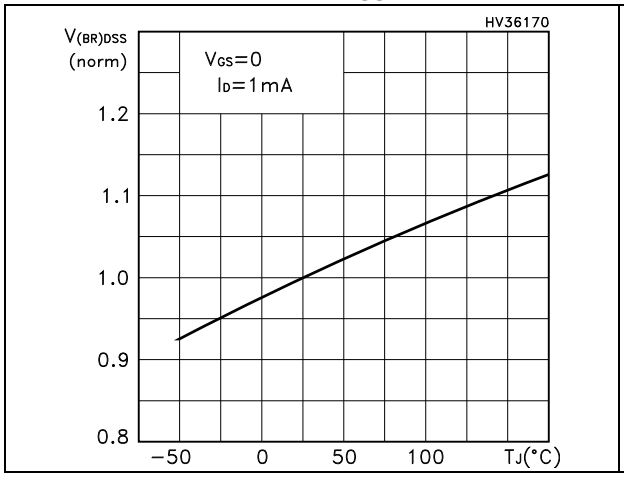


Figure 7. Static drain-source on-resistance

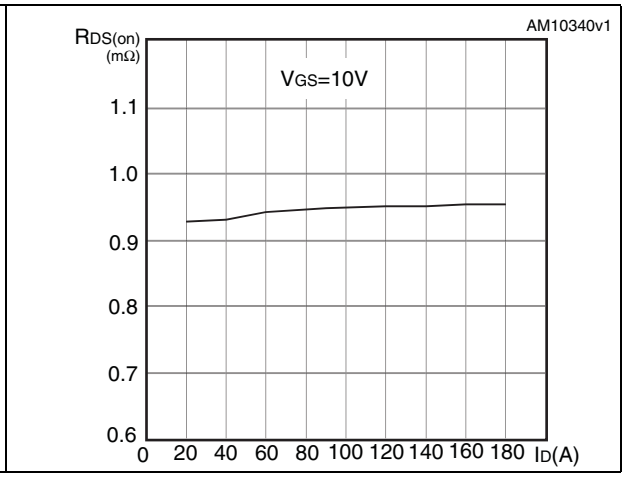


Figure 8. Gate charge vs gate-source voltage

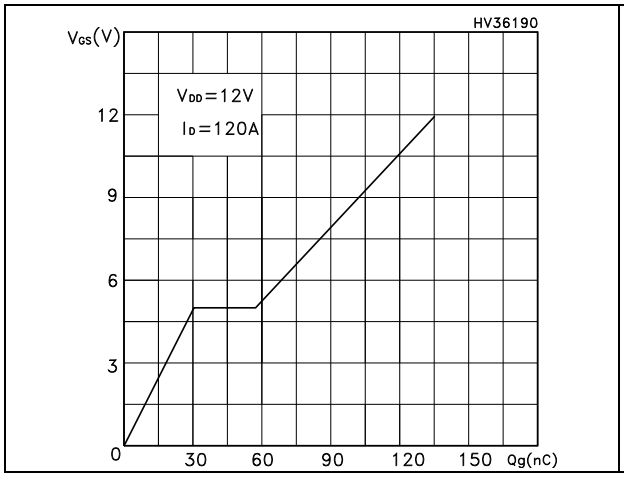


Figure 9. Capacitance variations

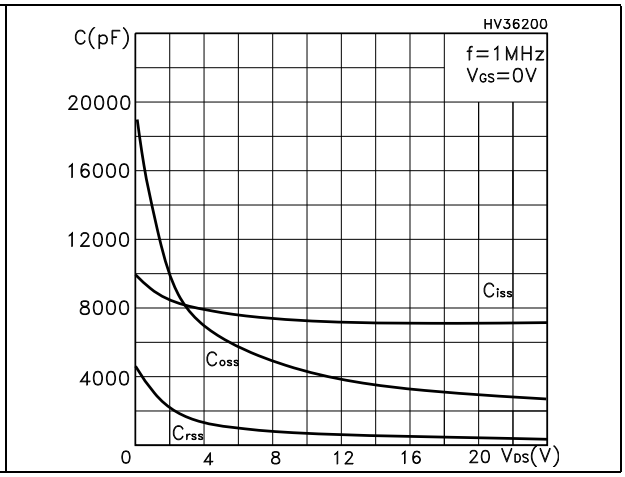


Figure 10. Normalized gate threshold voltage vs temperature

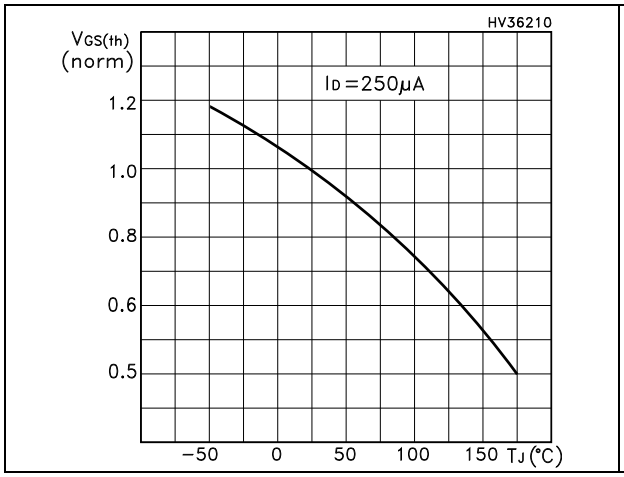


Figure 11. Normalized on resistance vs temperature

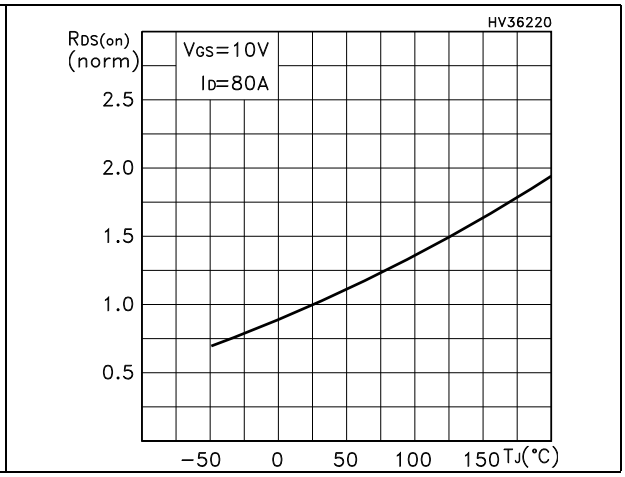
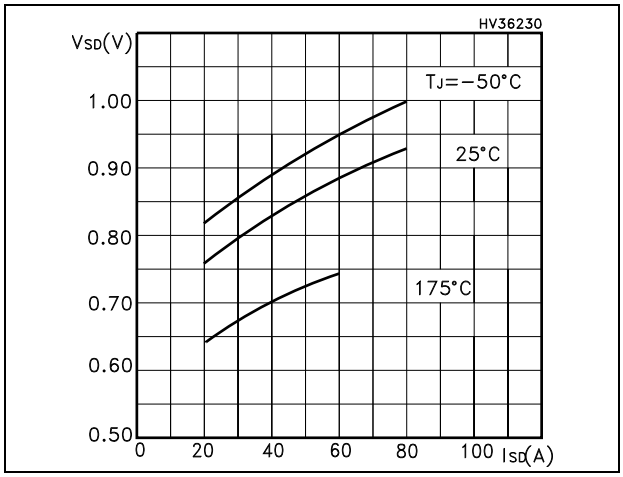


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

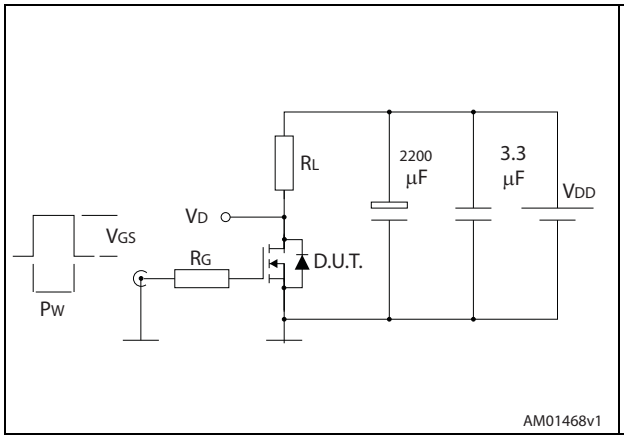


Figure 14. Gate charge test circuit

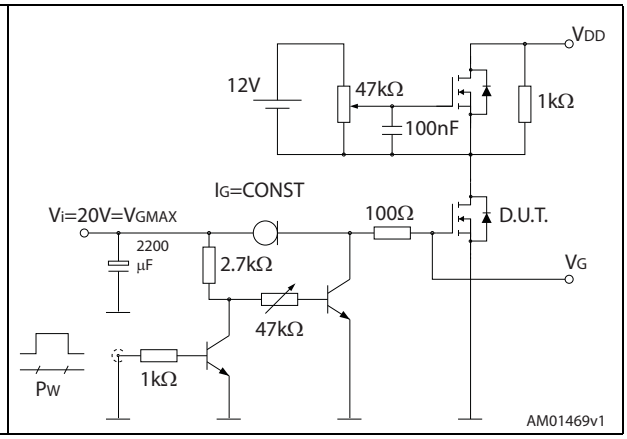


Figure 15. Test circuit for inductive load switching and diode recovery times

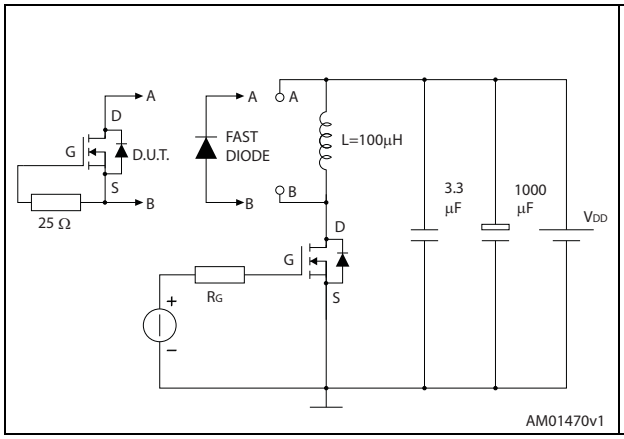


Figure 16. Unclamped inductive load test circuit

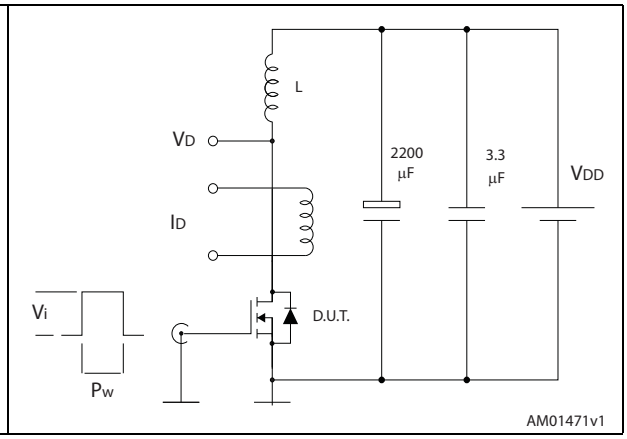


Figure 17. Unclamped inductive waveform

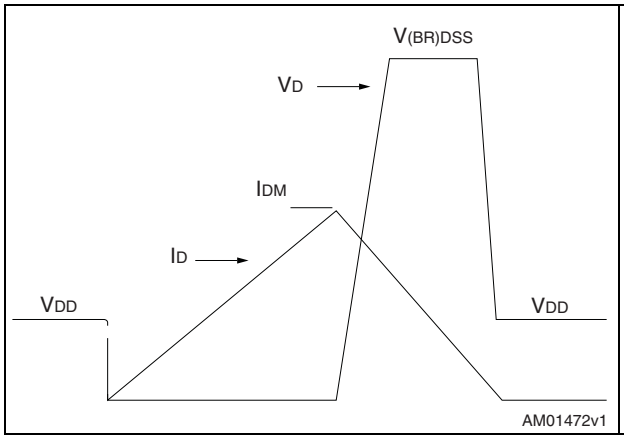
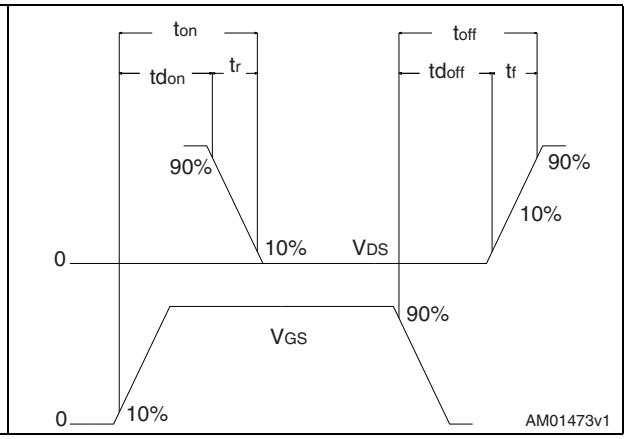


Figure 18. Switching time waveform



4 Package 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. H²PAK-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 19. H²PAK-6 drawing

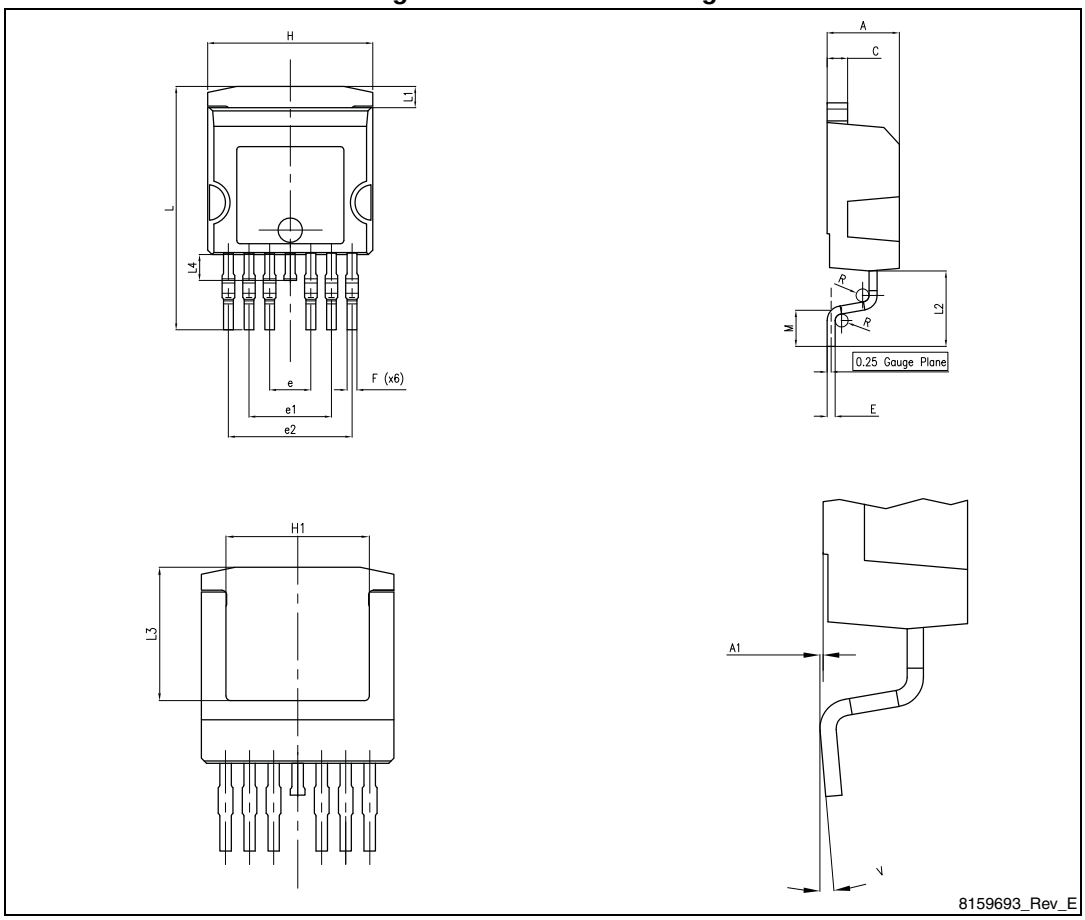
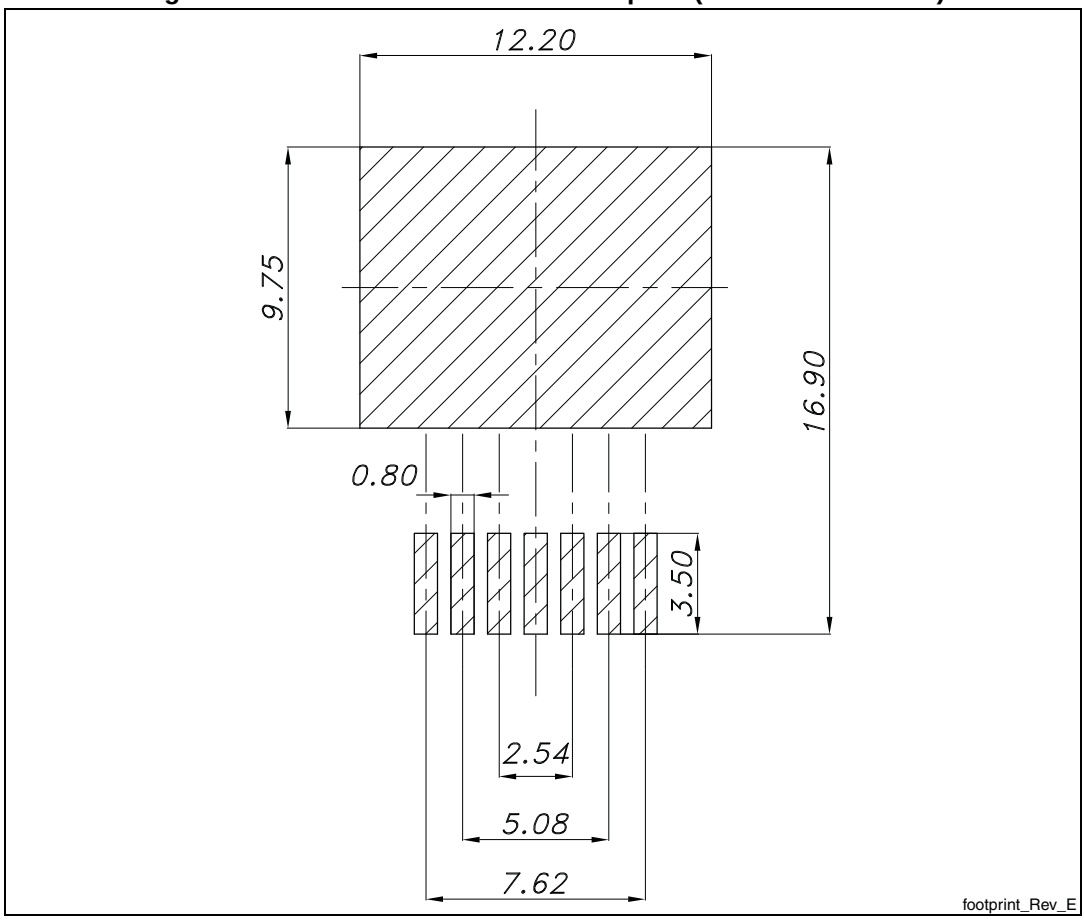


Figure 20. H²PAK-6 recommended footprint (dimensions in mm)



5 Packaging mechanical data

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

Figure 21. Tape

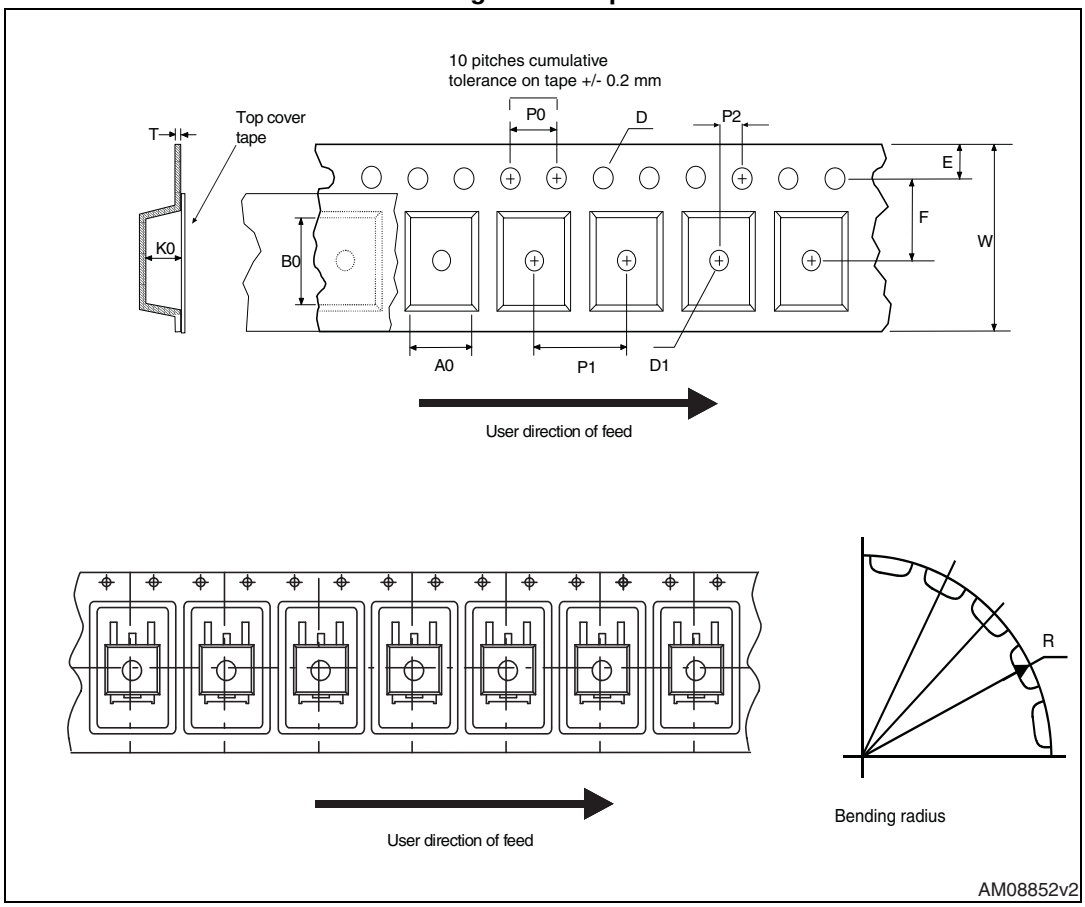
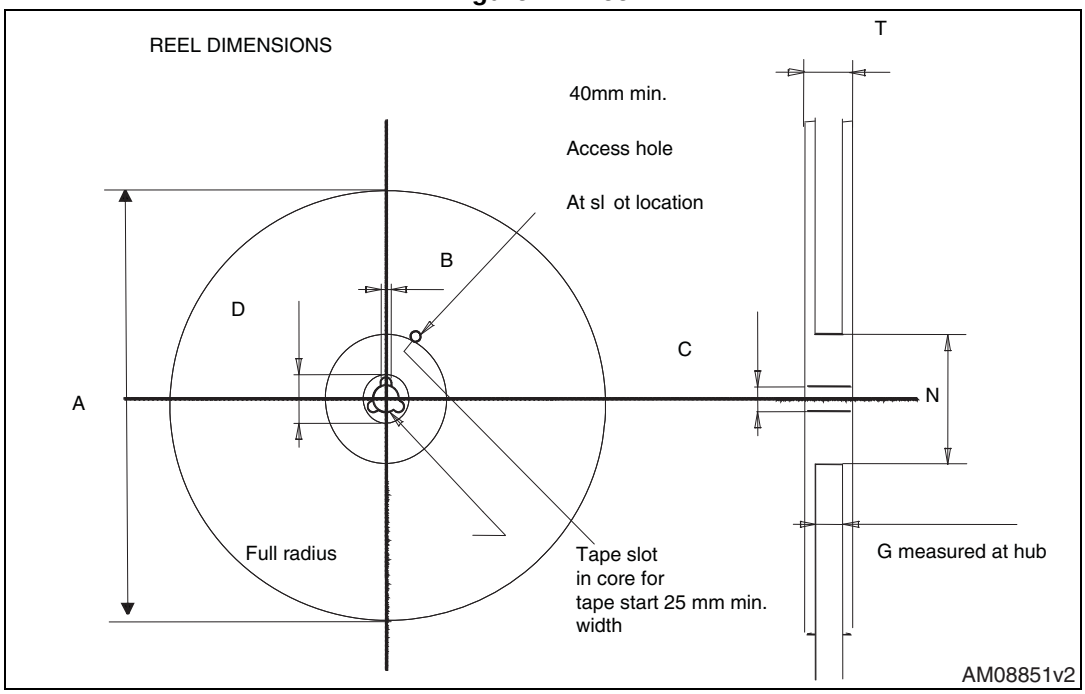


Figure 22. Reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
12-Jul-2011	1	initial release
24-Oct-2011	2	Updated test conditions in *Section Table 5.: Dynamic* and *Section Table 7.: Source drain diode*.
15-May-2013	3	– Updated: title, *Applications* and *Description* in cover page – Minor text changes
22-Jul-2013	4	– Updated title in cover page.

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