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STB230NH03L

N-channel 30 V, 2.3 mΩ, 80 A D²PAK
 STripFET™ Power MOSFET

Features

Order code	V _{DSS}	R _{DS(on)}	I _D
STB230NH03L	30V	< 3mΩ	80A ⁽¹⁾

- 1. This value is limited by package
- R_{DS(on)} Qg industry's benchmark
- Conduction losses reduced
- Switching losses reduced
- Low threshold device

Applications

- Switching applications
 - Specifically designed and optimized for high efficiency DC/DC converters
- OR-ing

Description

This N-channel enhancement mode Power MOSFET benefits from the latest refinement of STMicroelectronics' unique "single feature size" strip-based process, which decreases the critical alignment steps to offer exceptional manufacturing reproducibility. The result is a transistor with extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

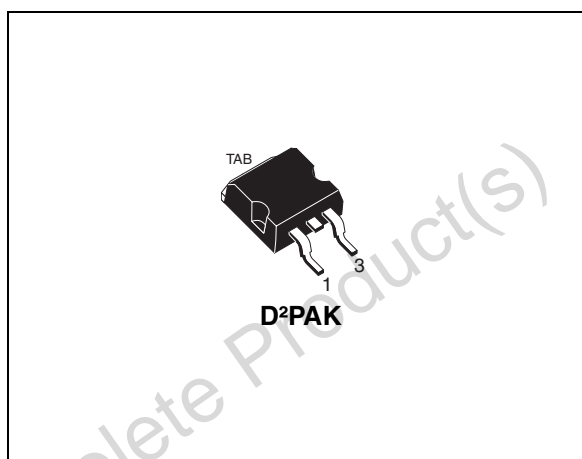
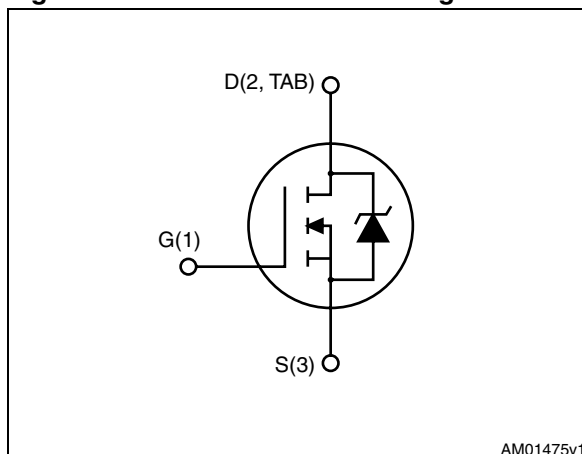


Figure 1. Internal schematic diagram



AM01475v1

Table 1. Device summary

Order code	Marking	Package	Packaging
STB230NH03L	B230NH03L	D ² PAK	Tape and reel

Contents

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Obsolete Product(s) - Obsolete Product(s)

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	30	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	178	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$

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

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max	0.5	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$

Table 4. Avalanche data

Symbol	Parameter	Value	Unit
I_{AS}	Avalanche current	60	A
$E_{AS}^{(1)}$	Single pulse avalanche energy	1150	mJ

1. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 24\text{ V}$.

Electrical characteristics

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2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage (V _{GS} = 0)	I _D = 1 mA	30			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = 30 V, V _{DS} = 30 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	1.5	2.5	V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10 V, I _D = 40 A		2.3	3	mΩ
		V _{GS} = 4.5 V, I _D = 40 A		2.75	3.4	mΩ

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 10 V, f = 1 MHz, V _{GS} = 0	-	4700	-	pF
C _{oss}	Output capacitance			1600		pF
C _{rss}	Reverse transfer capacitance			85		pF
Q _g	Total gate charge	V _{DD} = 15 V, I _D = 60 A	-	72	-	nC
Q _{gs}	Gate-source charge	V _{GS} = 10 V		15		nC
Q _{gd}	Gate-drain charge	(see Figure 15)		11		nC
R _G	Gate input resistance	f = 1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain	-	5.5	-	Ω

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Electrical characteristics
Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=15\text{ V}$, $I_D=60\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ <i>(see Figure 14)</i>	-	11	-	ns
t_r	Rise time		-	322	-	ns
$t_{d(off)}$	Turn-off delay time	$V_{DD}=15\text{ V}$, $I_D=60\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ <i>(see Figure 14)</i>	-	123	-	ns
t_f	Fall time		-	102	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current		-		250	A
$I_{SDM}^{(2)}$	Source-drain current (pulsed)				1000	A
$V_{SD}^{(3)}$	Forward on voltage	$I_{SD}=40\text{ A}$, $V_{GS}=0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD}=120\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=20\text{ V}$ <i>(see Figure 19)</i>	-	42		ns
Q_{rr}	Reverse recovery charge		-	34.7		nC
I_{RRM}	Reverse recovery current		-	1.6		A
t_{rr}	Reverse recovery time	$I_{SD}=120\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=20\text{ V}$, $T_j=150\text{ }^\circ\text{C}$ <i>(see Figure 19)</i>	-	47		ns
Q_{rr}	Reverse recovery charge		-	41.3		nC
I_{RRM}	Reverse recovery current		-	1.8		A

1. This value is silicon limited.
2. Pulse width limited by safe operating area.
3. Pulsed; pulse duration=300 μs , duty cycle 1.5%

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Thermal impedance

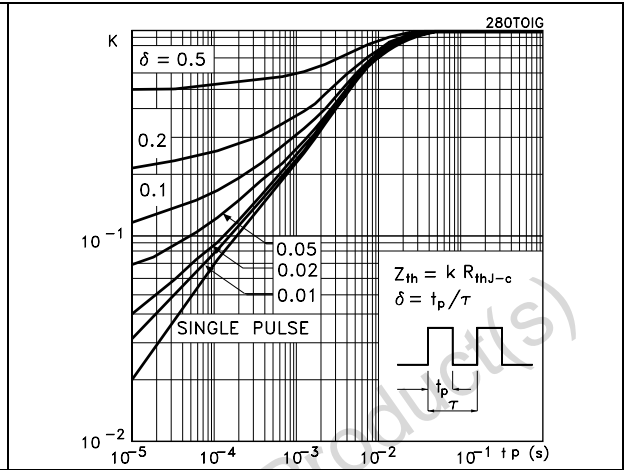
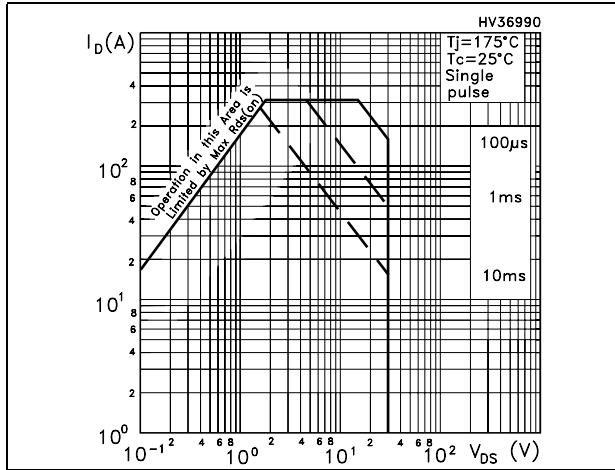


Figure 4. Output characteristics

Figure 5. Transfer characteristics

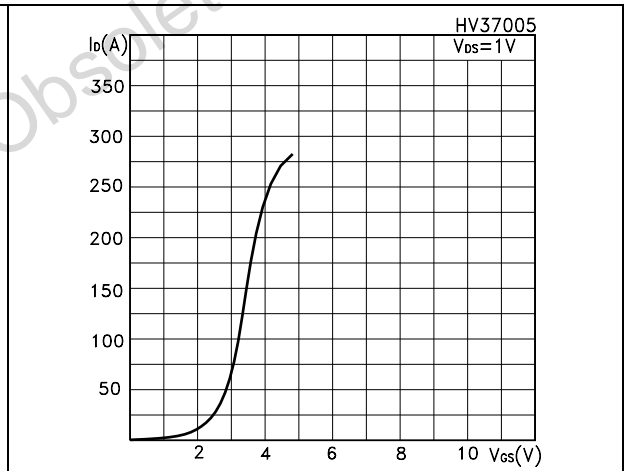
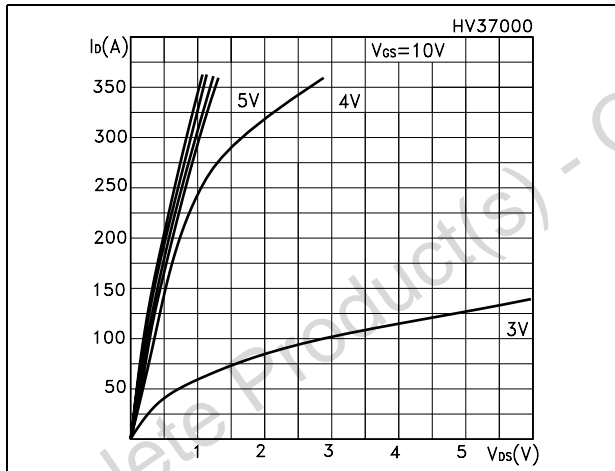
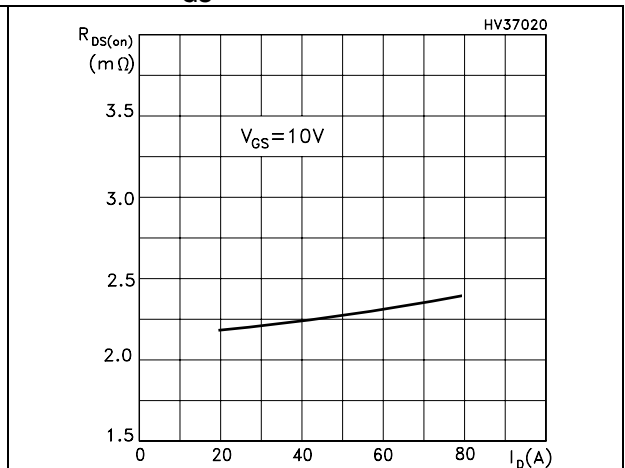
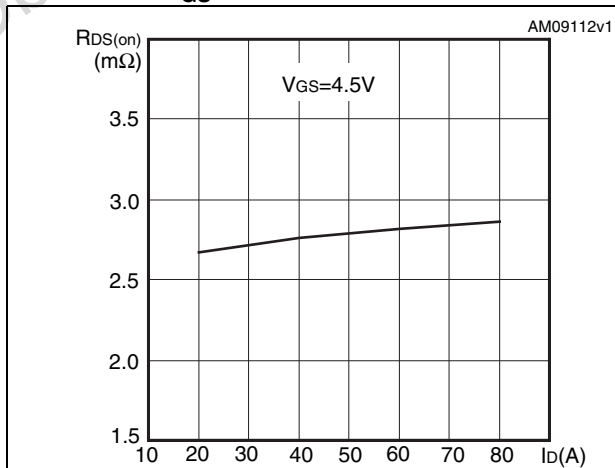


Figure 6. Static drain-source on resistance @ VGS = 4.5 V

Figure 7. Static drain-source on resistance @ VGS = 10 V



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Electrical characteristics

Figure 8. Gate charge vs gate-source voltage **Figure 9. Capacitance variations**

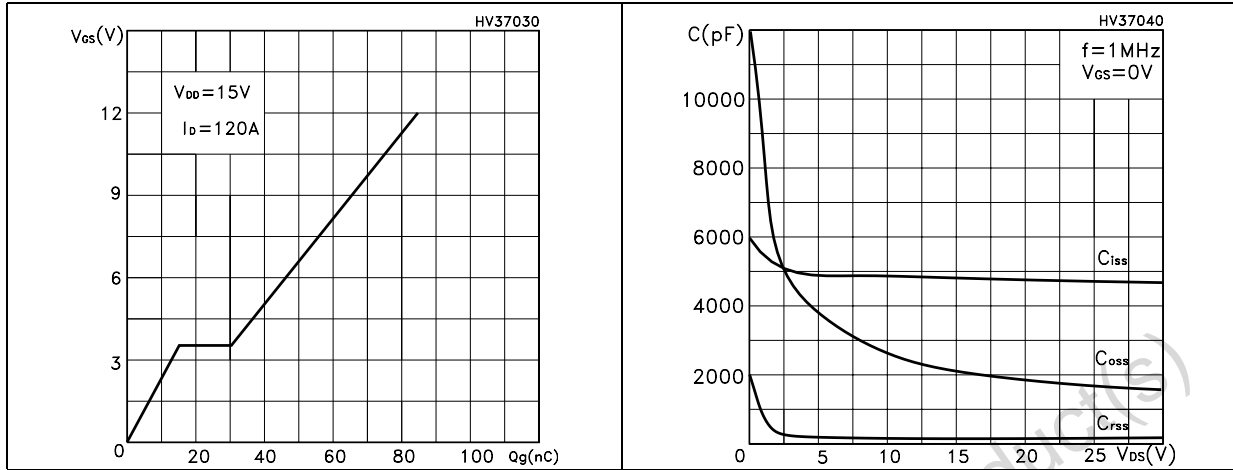


Figure 10. Normalized gate threshold voltage vs temperature **Figure 11. Normalized on resistance vs temperature**

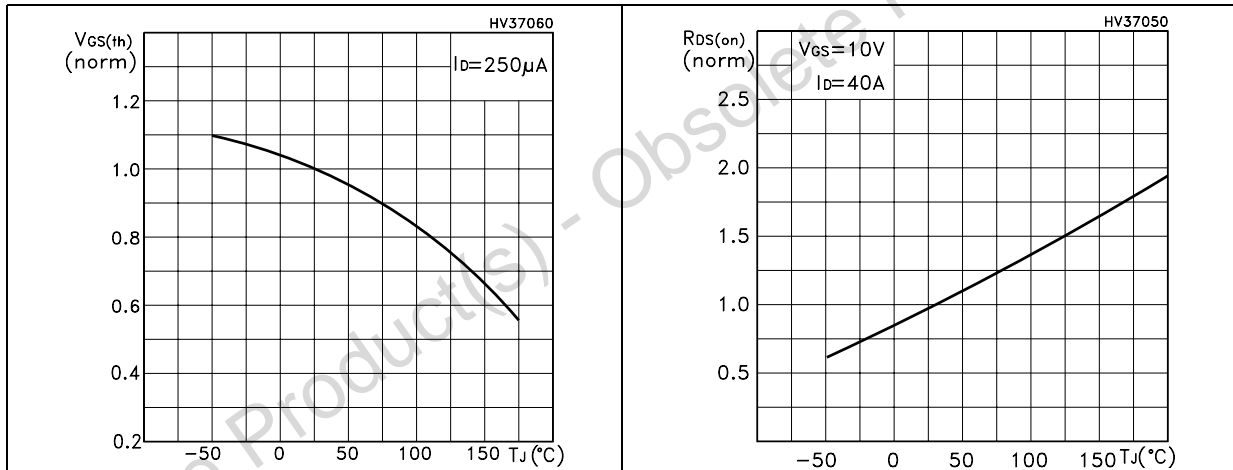
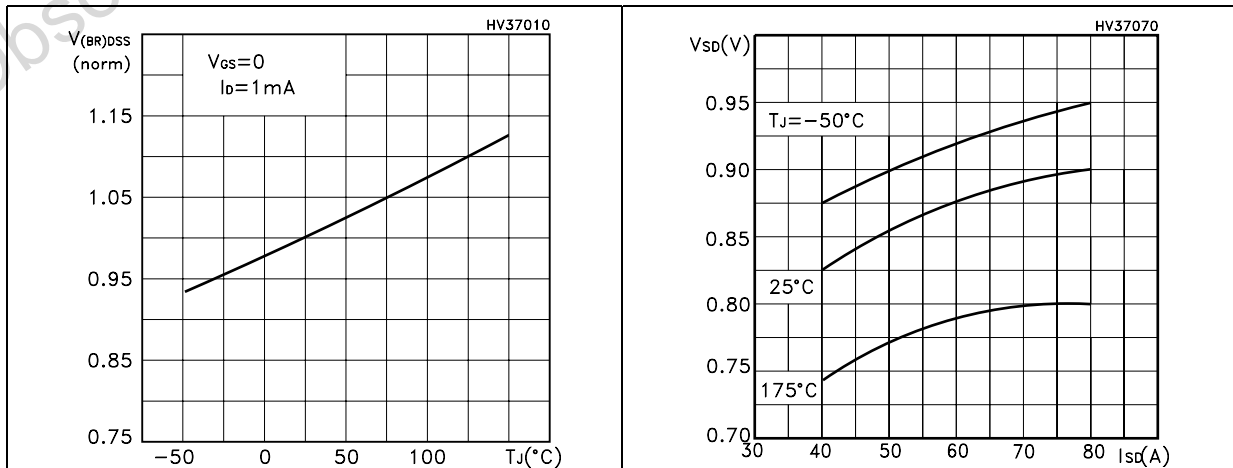


Figure 12. Normalized BV_{DSS} vs temperature **Figure 13. Source-drain diode forward characteristics**



Test circuit

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3 Test circuit

Figure 14. Switching times test circuit for resistive load

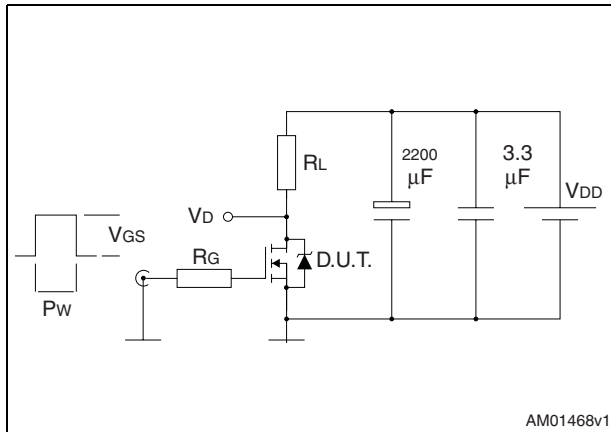


Figure 15. Gate charge test circuit

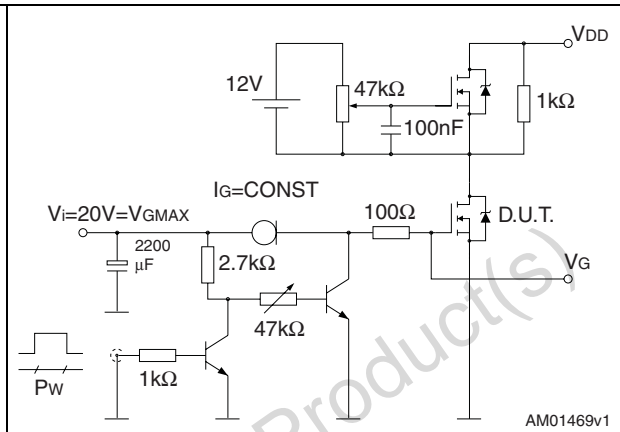


Figure 16. Test circuit for inductive load switching and diode recovery times

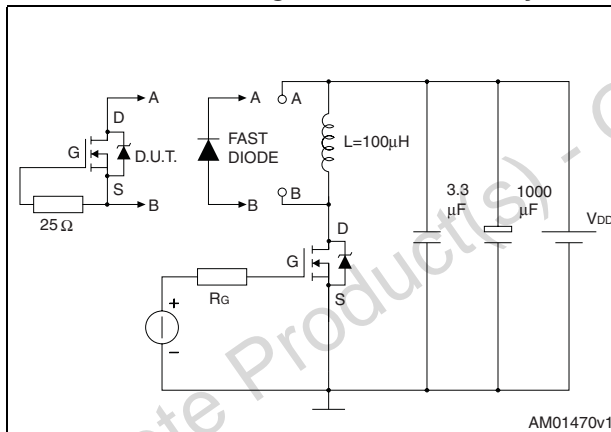


Figure 17. Unclamped Inductive load test circuit

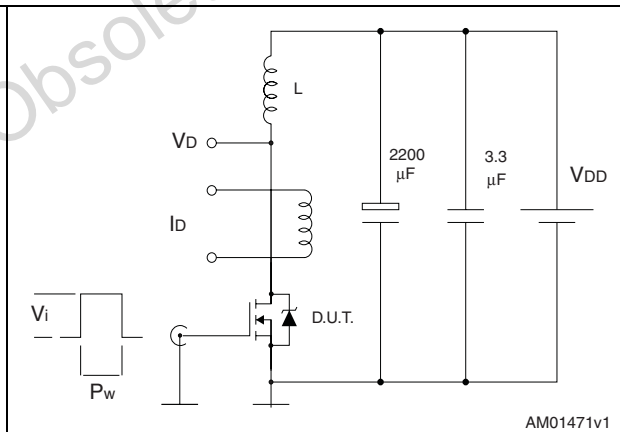


Figure 18. Unclamped inductive waveform

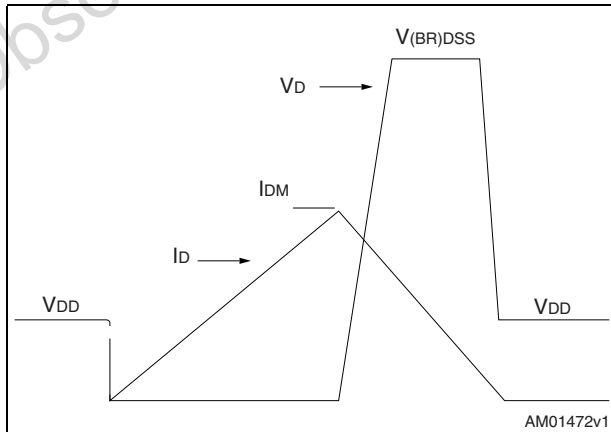
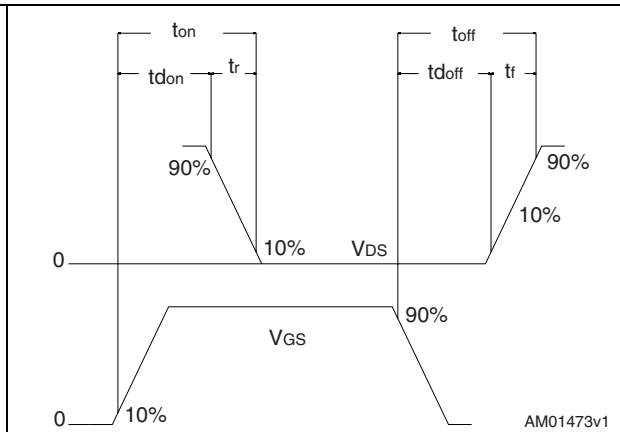


Figure 19. Switching time waveform



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.

Obsolete Product(s) - Obsolete Product(s)

Package mechanical data

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Table 9. D²PAK (TO-263) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

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Package mechanical data

Figure 20. D²PAK (TO-263) drawing

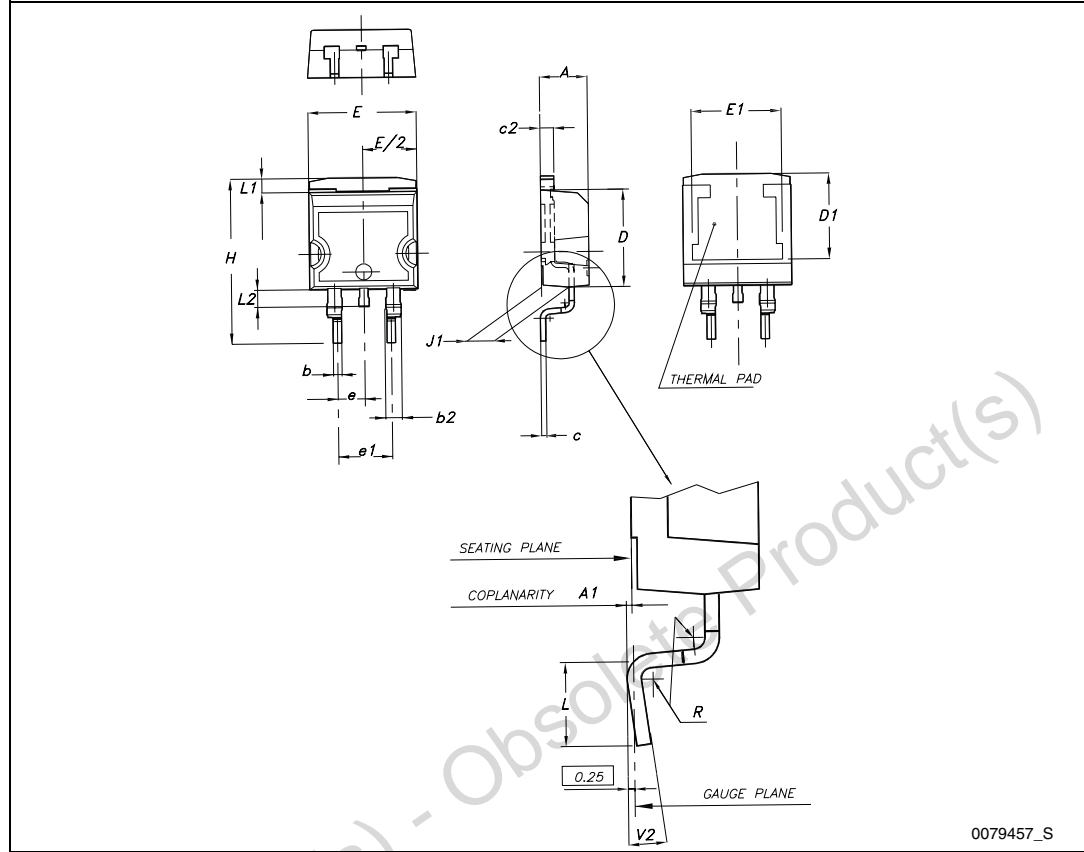
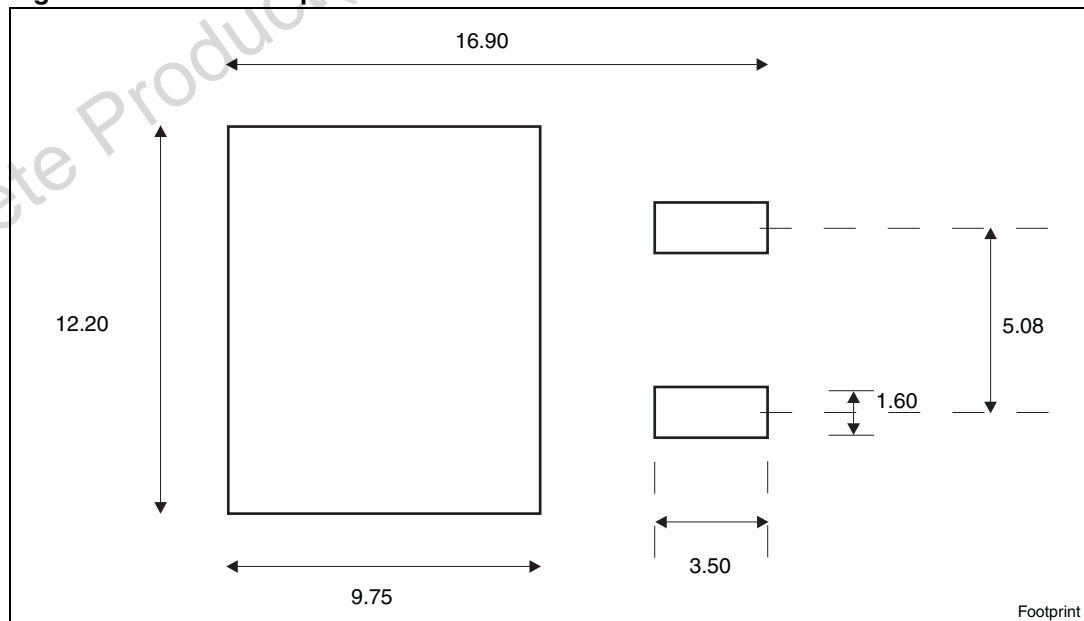


Figure 21. D²PAK footprint^(a)



a. All dimension are in millimeters

5 Packaging mechanical data

Table 10. D²PAK (TO-263) 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			

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Packaging mechanical data

Figure 22. Tape

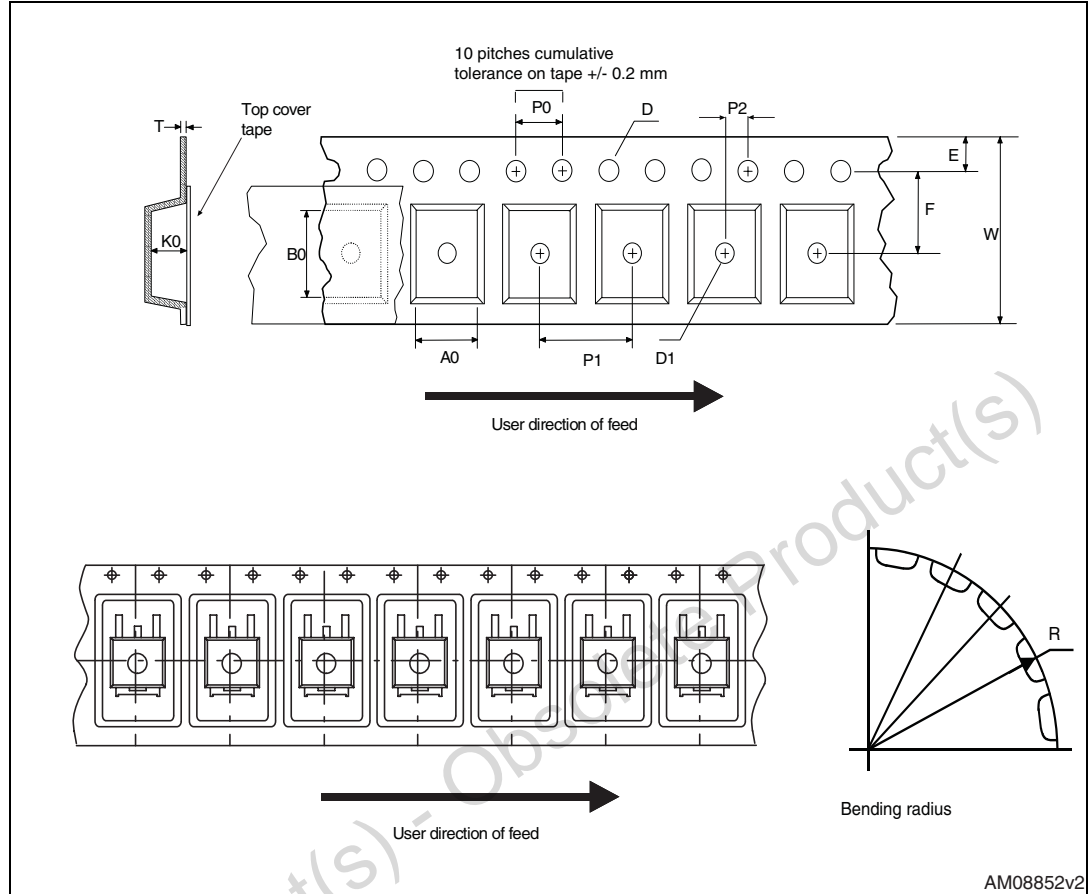
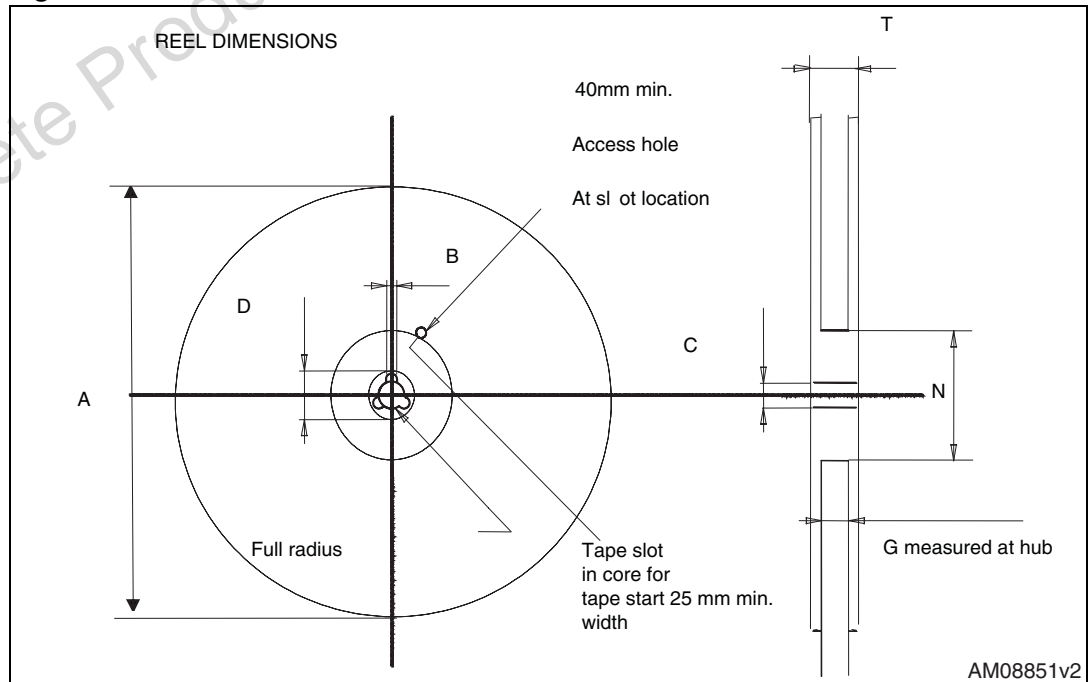


Figure 23. Reel



6 Revision history

Table 11. Revision history

Date	Revision	Changes
08-Jun-2007	1	Initial release.
27-Sep-2011	2	<ul style="list-style-type: none"> – <i>Figure 6: Static drain-source on resistance @ $V_{GS} = 4.5 V$</i> has been added. – Minor text change.

Obsolete Product(s) - Obsolete Product(s)

STB230NH03L

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