



STB230NH03L

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

Features

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

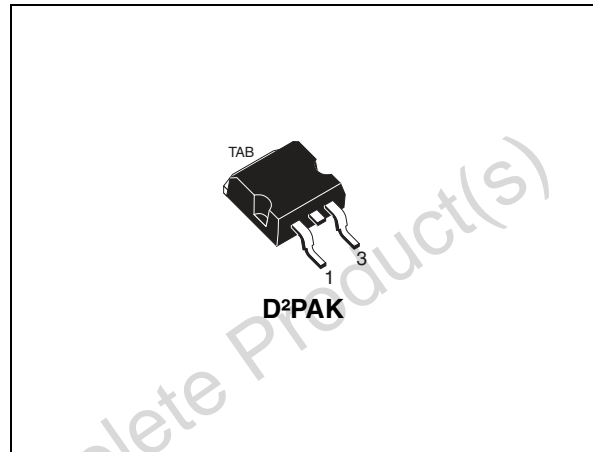


Figure 1. Internal schematic diagram

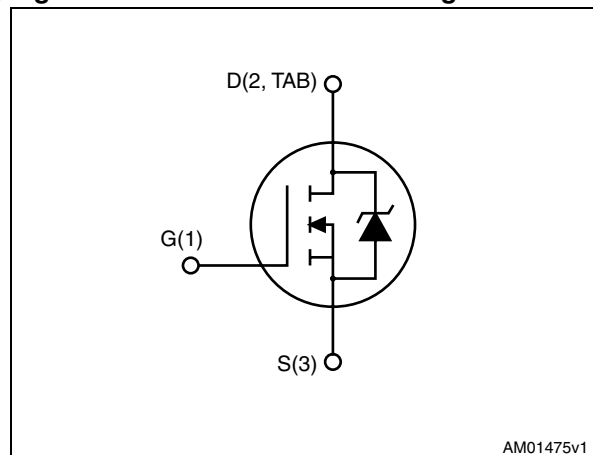


Table 1. Device summary

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

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

2 Electrical characteristics

($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ($V_{GS} = 0$)	$I_D = 1 \text{ mA}$	30			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 30 \text{ V}$, $V_{DS} = 30 \text{ V}, T_C = 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	1	1.5	2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$, $I_D = 40 \text{ A}$		2.3	3	$\text{m}\Omega$
		$V_{GS} = 4.5 \text{ V}$, $I_D = 40 \text{ A}$		2.75	3.4	$\text{m}\Omega$

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 10 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GS} = 0$		4700		pF
C_{oss}	Output capacitance		-	1600	-	pF
C_{rss}	Reverse transfer capacitance				85	
Q_g	Total gate charge	$V_{DD} = 15 \text{ V}$, $I_D = 60 \text{ A}$		72		nC
Q_{gs}	Gate-source charge	$V_{GS} = 10 \text{ V}$	-	15	-	nC
Q_{gd}	Gate-drain charge	(see Figure 15)		11		nC
R_G	Gate input resistance	$f = 1 \text{ MHz}$ Gate DC Bias = 0 Test signal level = 20 mV open drain	-	5.5	-	Ω

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		-	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%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

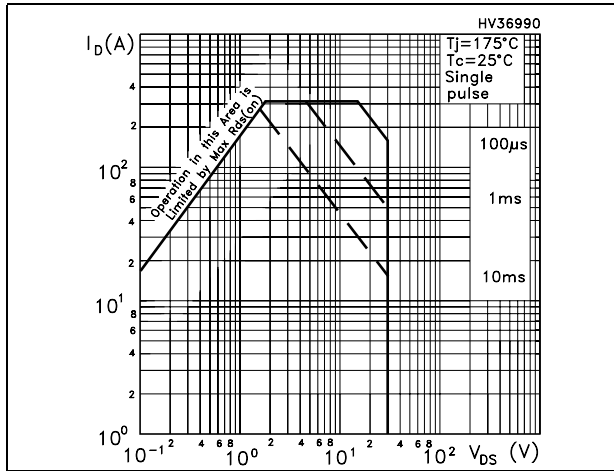


Figure 3. Thermal impedance

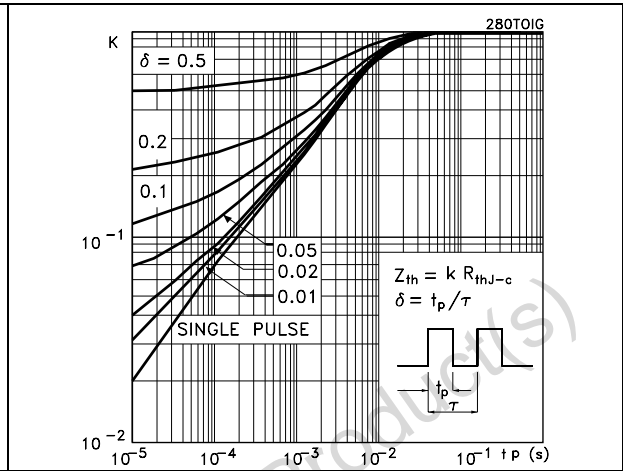


Figure 4. Output characteristics

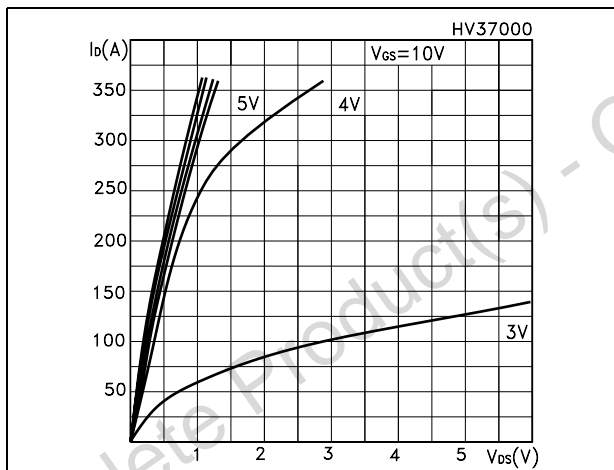


Figure 5. Transfer characteristics

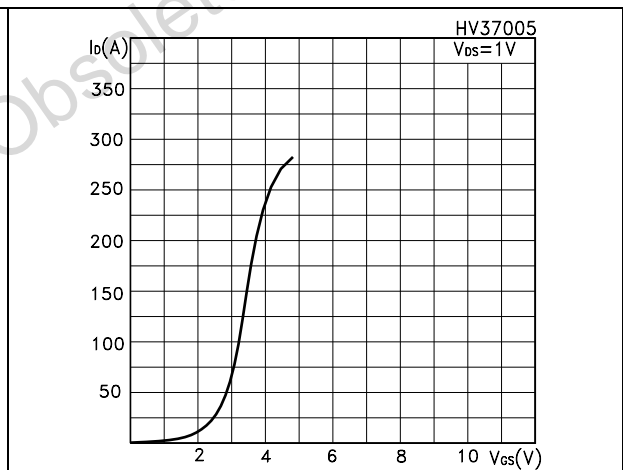


Figure 6. Static drain-source on resistance @ $V_{GS} = 4.5\text{V}$

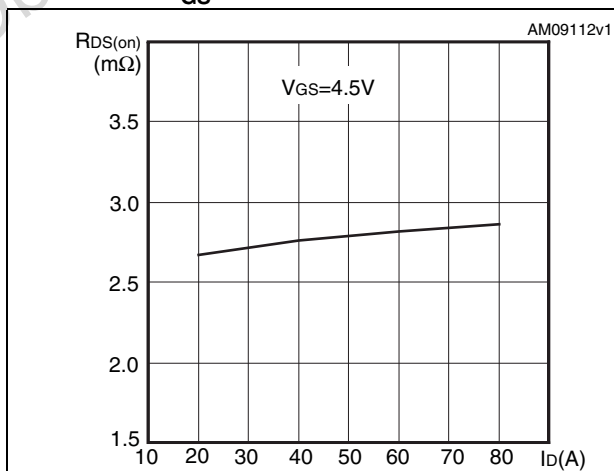


Figure 7. Static drain-source on resistance @ $V_{GS} = 10\text{V}$

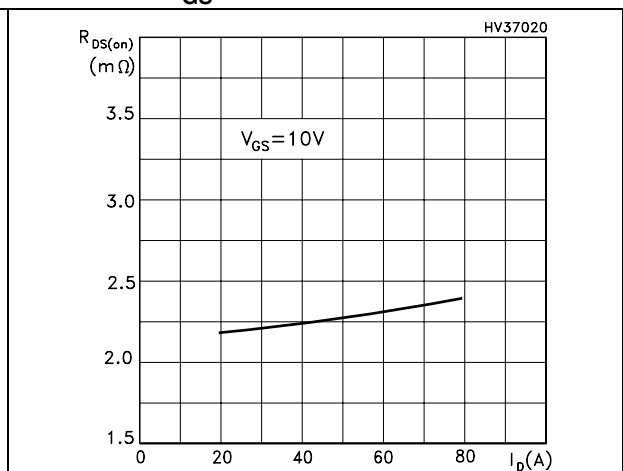


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

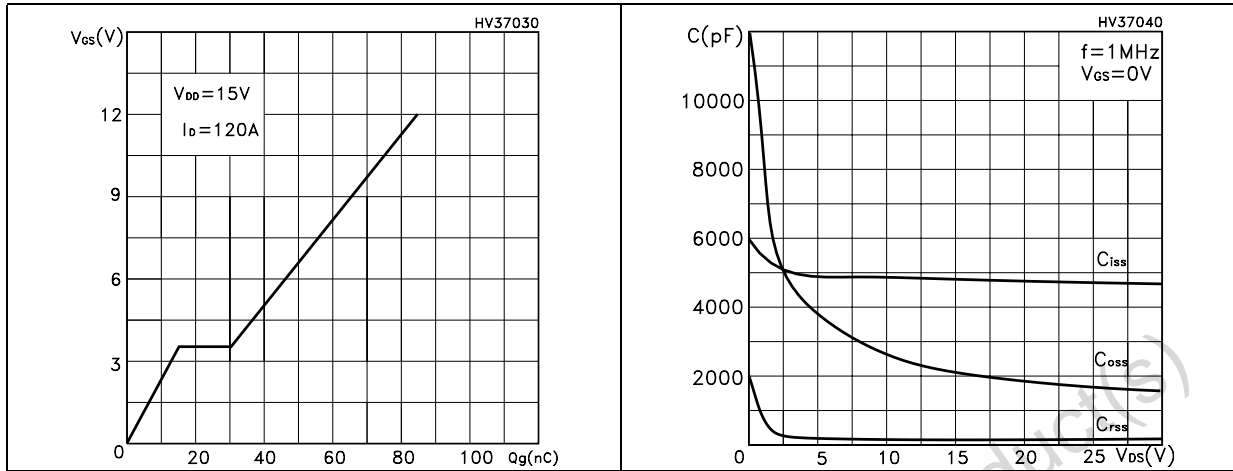


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

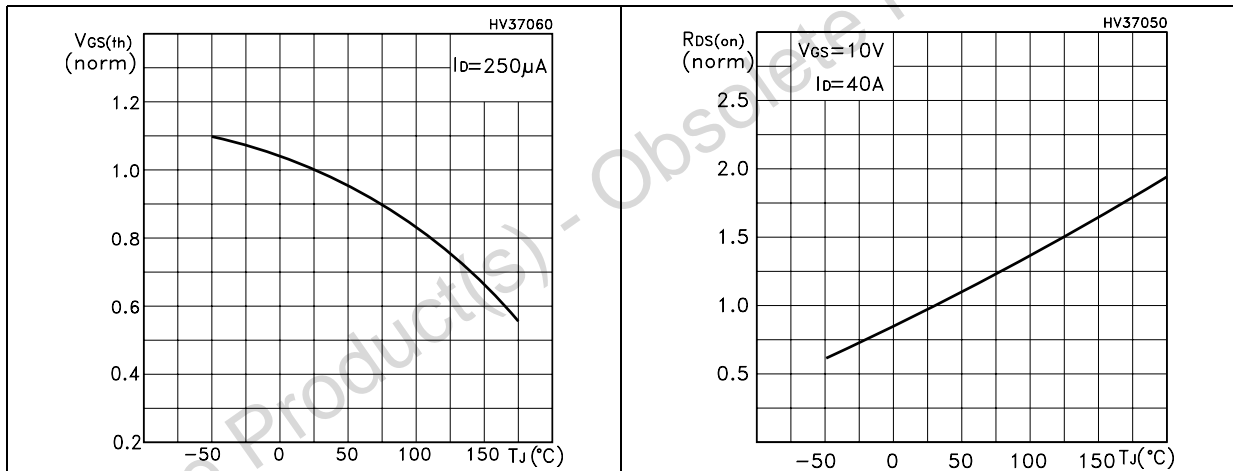
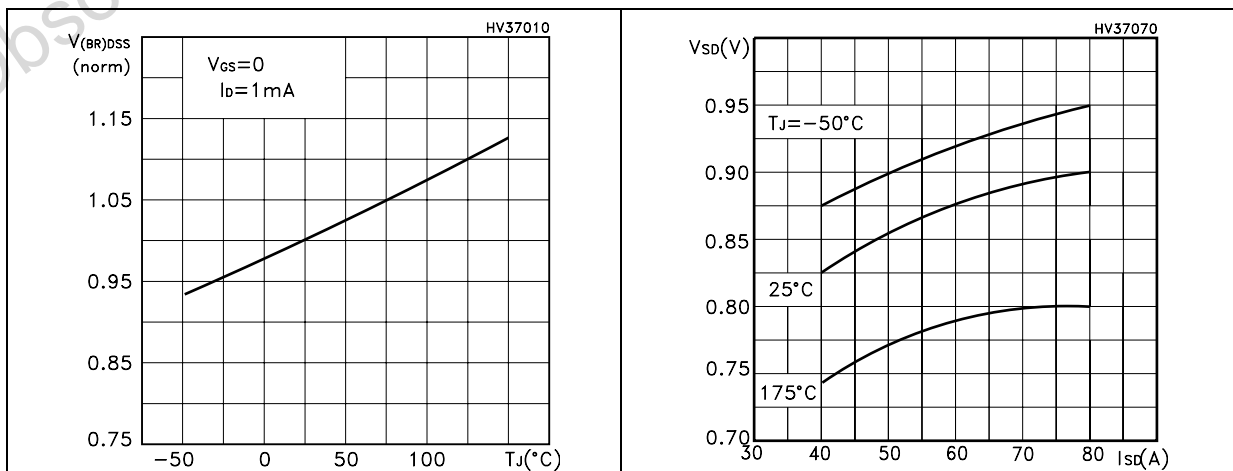
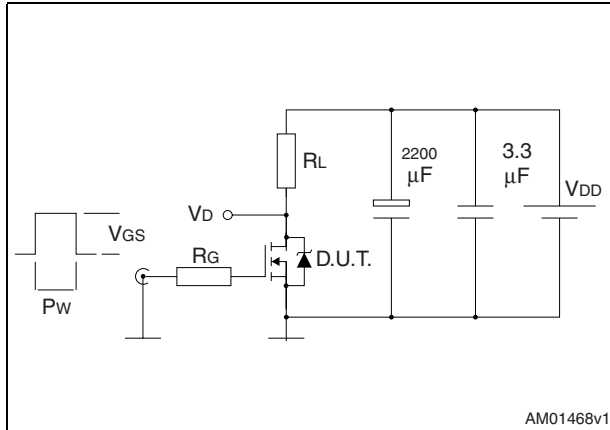


Figure 12. Normalized BV_{DSS} vs temperature Figure 13. Source-drain diode forward characteristics



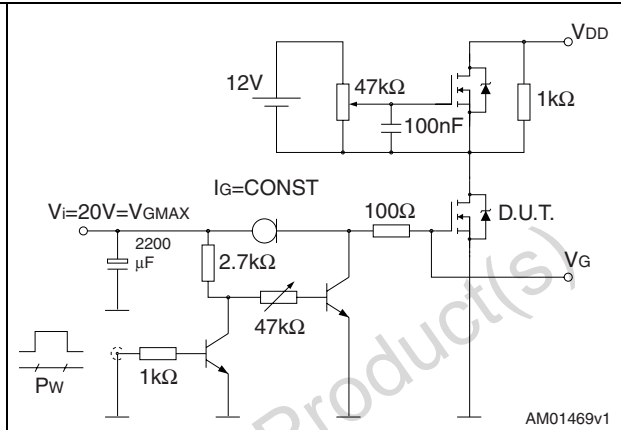
3 Test circuit

Figure 14. Switching times test circuit for resistive load



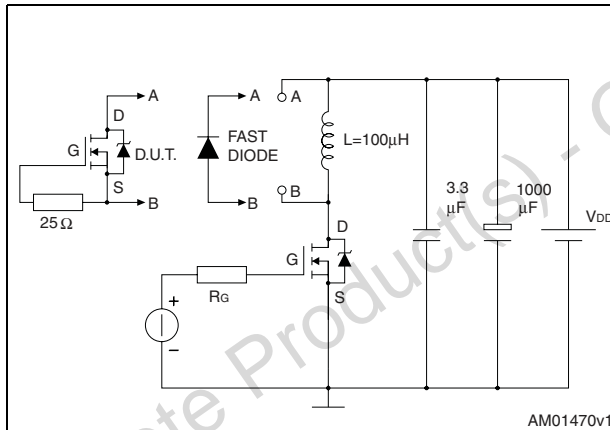
AM01468v1

Figure 15. Gate charge test circuit



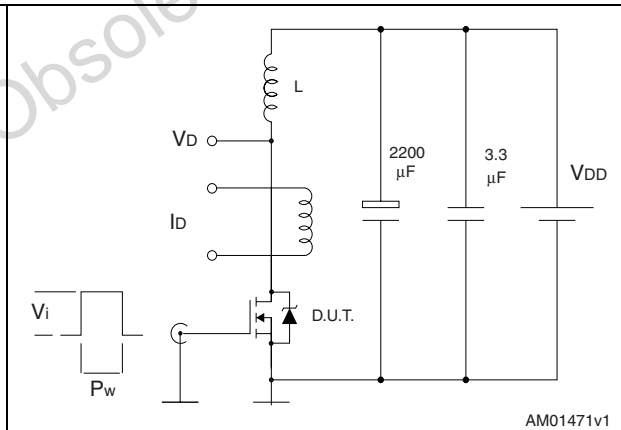
AM01469v1

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



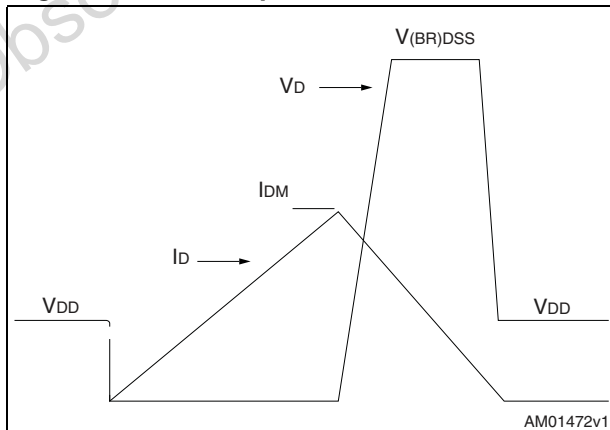
AM01470v1

Figure 17. Unclamped Inductive load test circuit



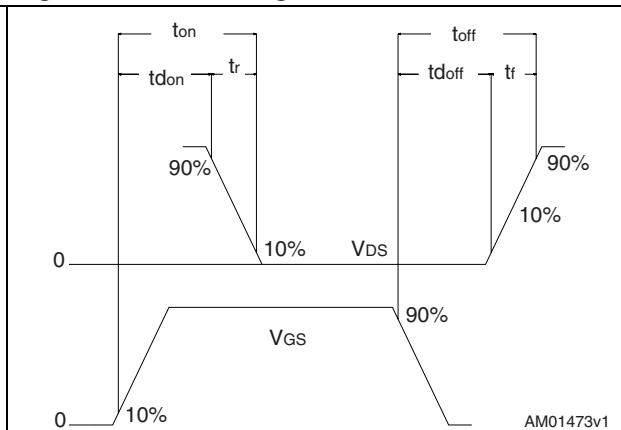
AM01471v1

Figure 18. Unclamped inductive waveform



AM01472v1

Figure 19. Switching time waveform



AM01473v1

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)

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°

Figure 20. D²PAK (TO-263) drawing

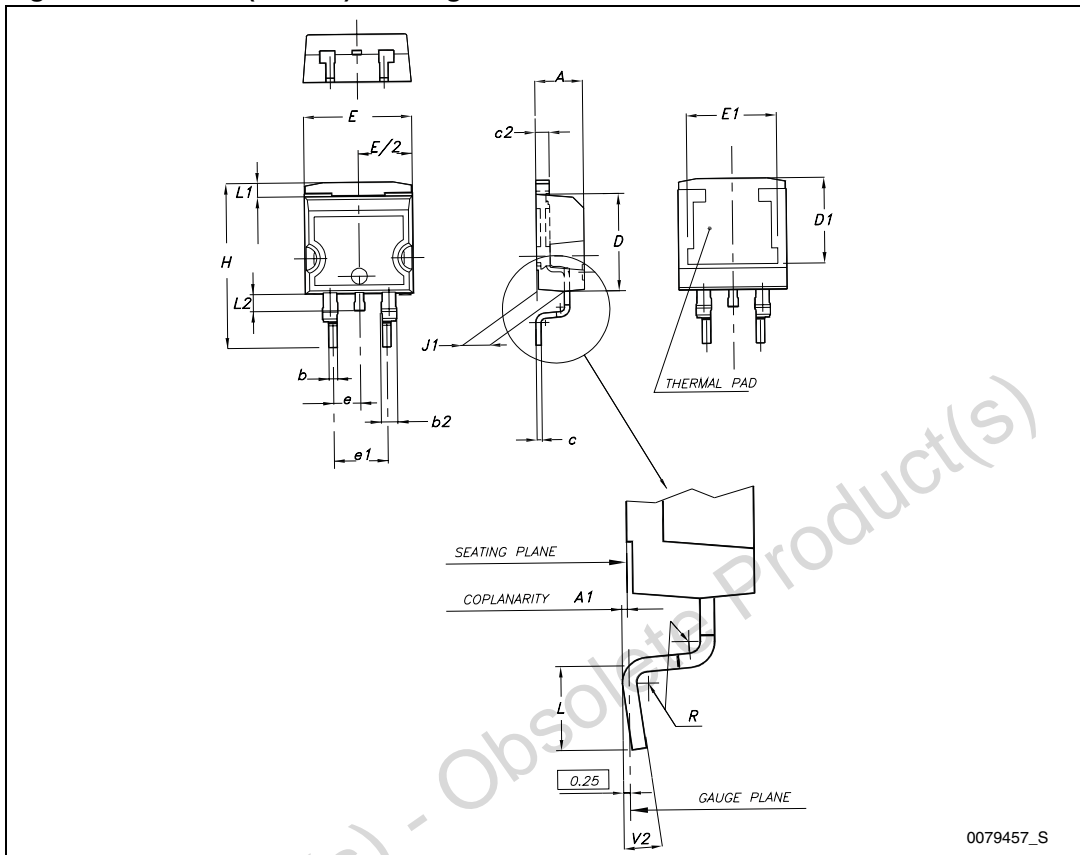
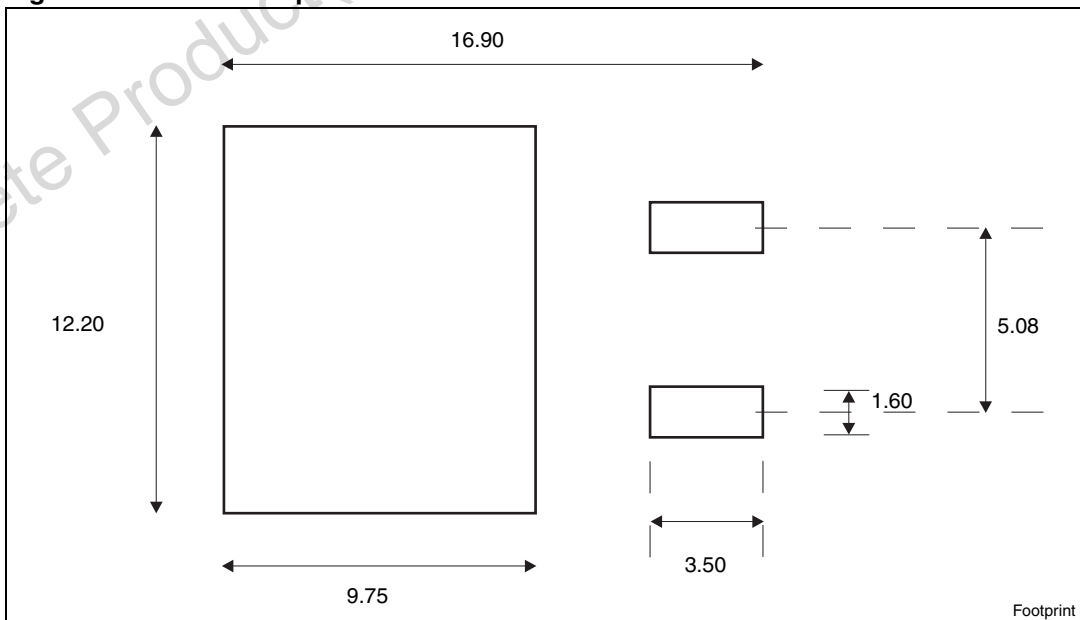


Figure 21. D²PAK footprint^(a)



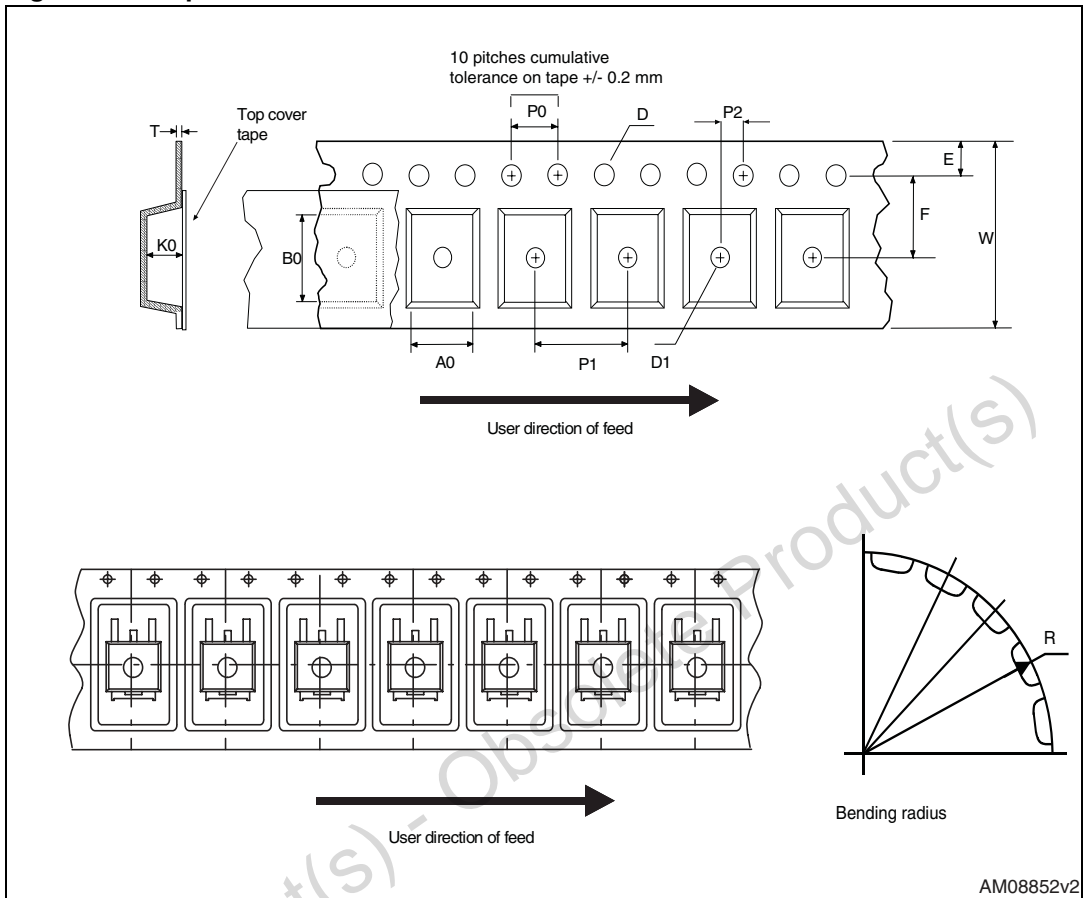
a. All dimension are in millimeters

5 Packaging mechanical data

Table 10. D²PAK (TO-263) tape and reel mechanical data

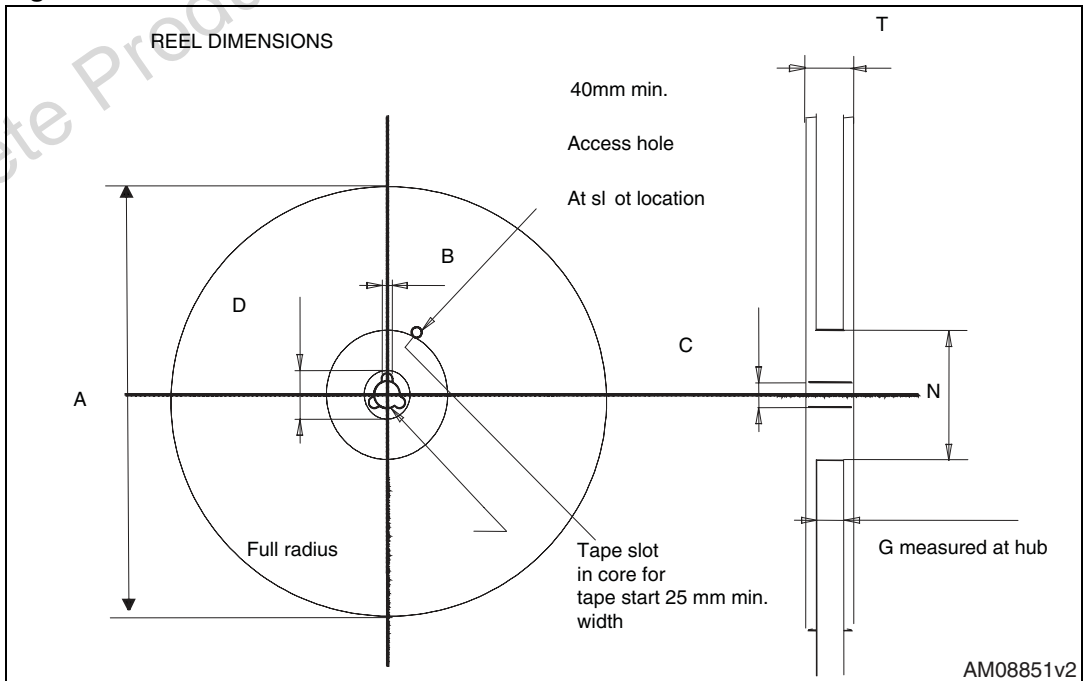
Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1		Base qty	1000
P2	1.9	2.1		Bulk qty	1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 22. Tape



AM08852v2

Figure 23. Reel



AM08851v2

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)

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