



STB95N4LF3 STD95N4LF3

N-channel 40 V, 5.0 mΩ, 80 A DPAK, D²PAK
STripFET™ III Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D	P _D
STD95N4LF3	40 V	< 6.0 mΩ	80 A ⁽¹⁾	110 W
STB95N4LF3 ⁽²⁾	40 V	< 6.0 mΩ	80 A	110 W

1. Value limited by wire bonding
2. All data which refers solely to the D²PAK package is preliminary

- 100% avalanche tested
- Logic level drive

Applications

- Switching application
 - Automotive

Description

This STripFET™ III Power MOSFET technology is among the latest improvements, which have been especially tailored to minimize on-state resistance providing superior switching performance.

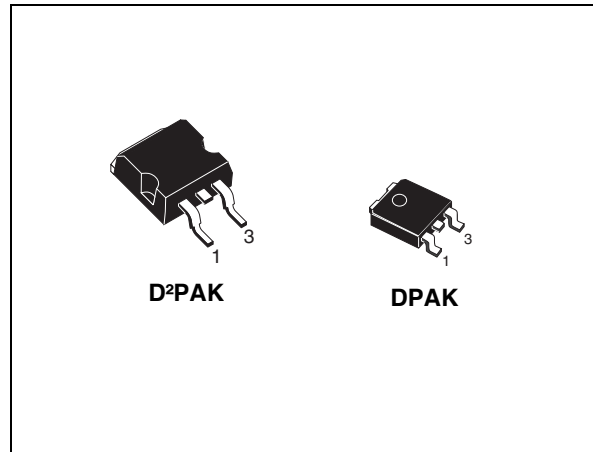


Figure 1. Internal schematic diagram

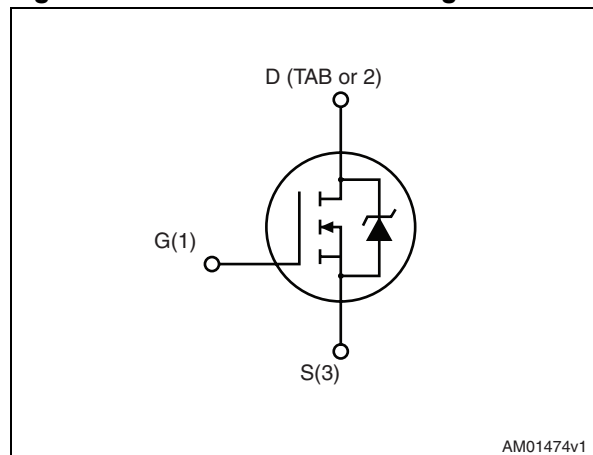


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD95N4LF3	95N4LF3	DPAK	Tape and reel
STB95N4LF3	95N4LF3	D ² PAK	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	40	V
V_{GS}	Gate-source voltage	± 16	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	65	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
	Derating factor	0.73	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	8	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	400	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Value limited by wire bonding
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 80\text{ A}$, $di/dt \leq 40\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$
4. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 40\text{ A}$, $V_{DD} = 35\text{ V}$ [Figure 16](#) and [Figure 17](#)

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.36	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	50	$^\circ\text{C}/\text{W}$

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

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	40			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{max rating}$ $V_{DS} = \text{max rating @ } 125\text{ }^{\circ}\text{C}$			10 100	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 16\text{ V}$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$ $V_{GS} = 5\text{ V}$, $I_D = 40\text{ A}$		5.0	6.0 9.0	$\text{m}\Omega$ $\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 25\text{ V}$, $I_D = 40\text{ A}$	-	150		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	2500 560 50		pF pF pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD} = 20\text{ V}$, $I_D = 40\text{ A}$ $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13 and Figure 18)	-	7.5 45 45 11		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 20\text{ V}$, $I_D = 80\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 14)	-	50 7 9.5	70	nC nC nC

1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%.

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		80 320	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_j = 150\text{ }^{\circ}\text{C}$ (see Figure 15 and Figure 19)	-	40 55 3		ns nC A

1. Pulse width limited by safe operating area.

2. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

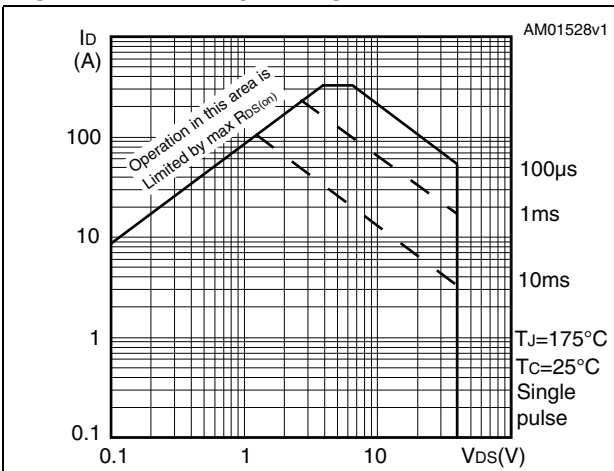


Figure 3. Thermal impedance

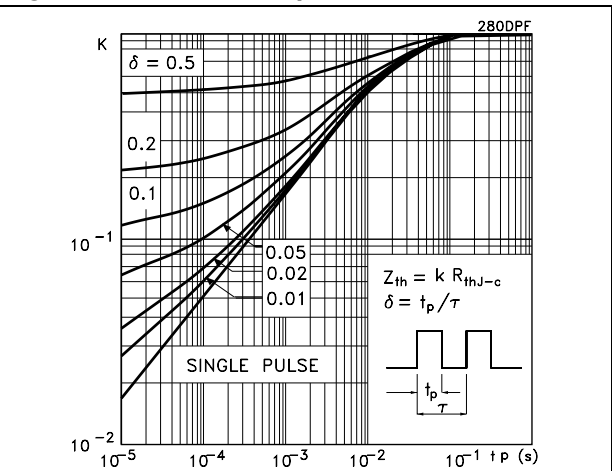


Figure 4. Output characteristics

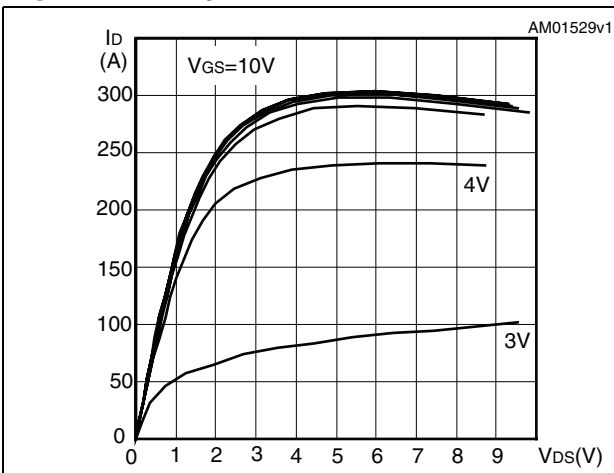


Figure 5. Transfer characteristics

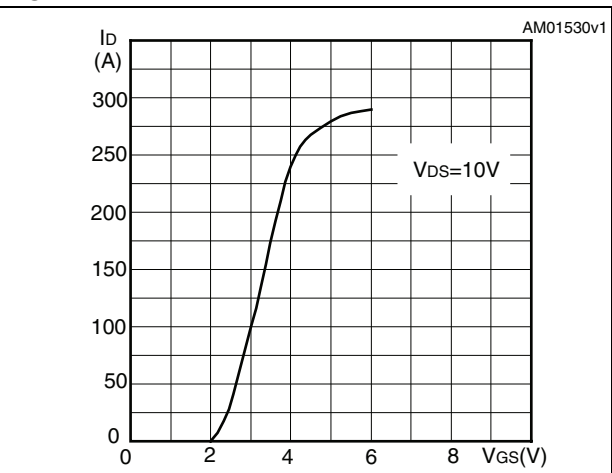


Figure 6. Static drain-source on resistance

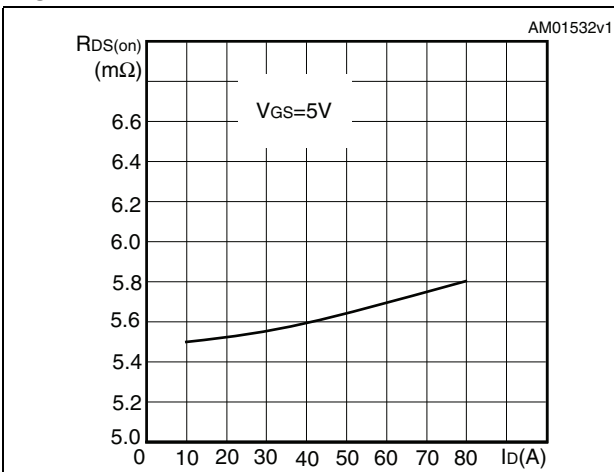


Figure 7. Normalized B_{VDSS} vs temperature

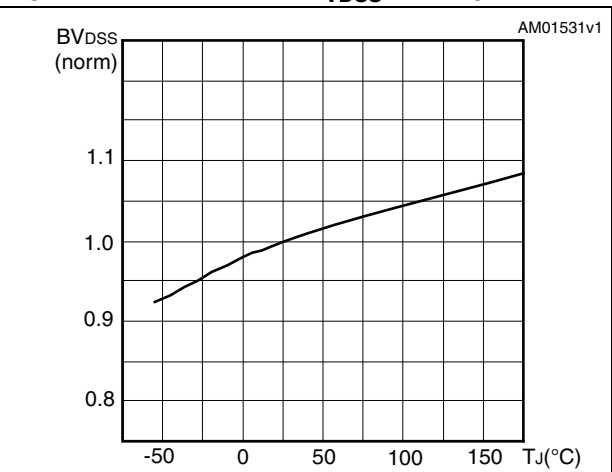


Figure 8. Gate charge vs gate-source voltage

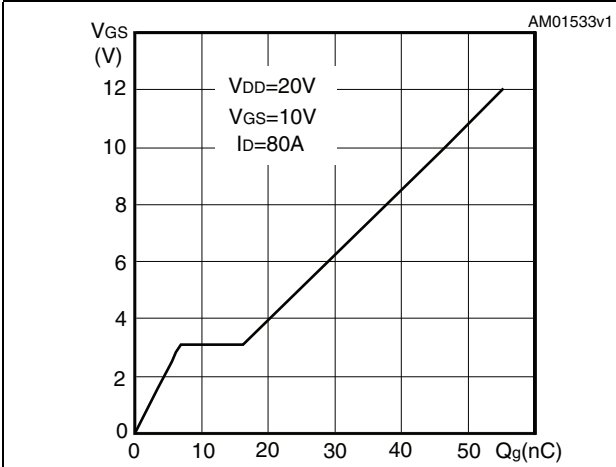


Figure 9. Capacitance variations

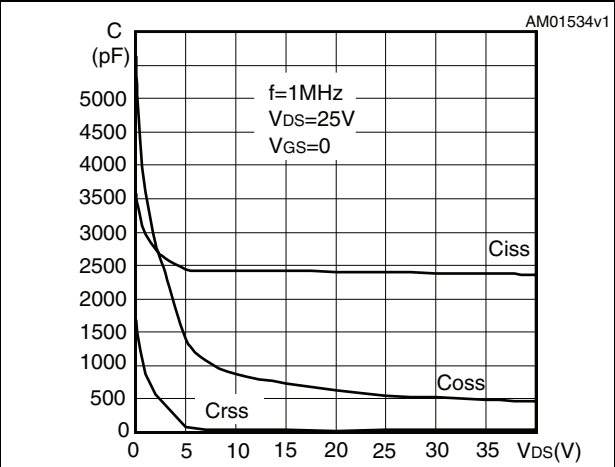


Figure 10. Normalized gate threshold voltage vs temperature

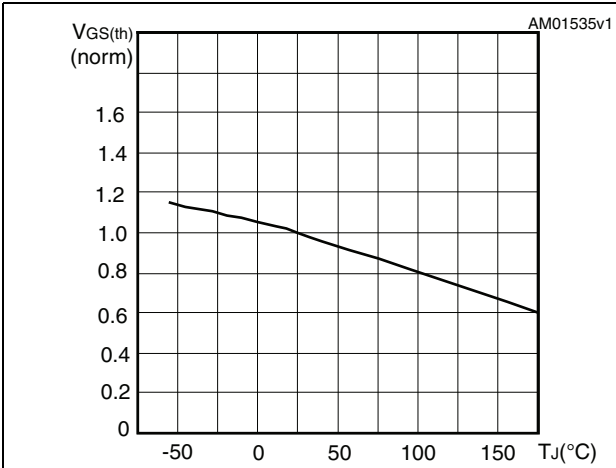


Figure 11. Normalized on resistance vs temperature

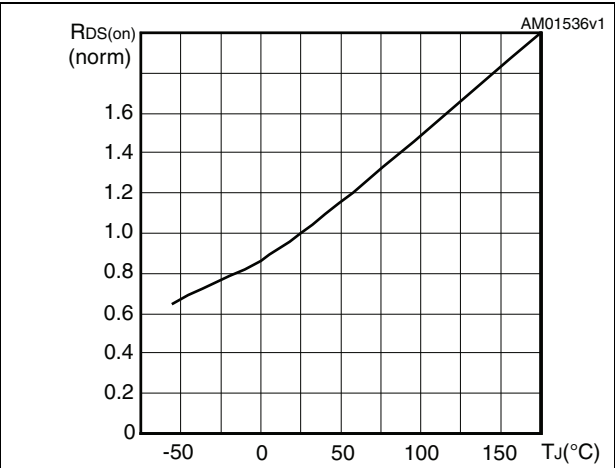
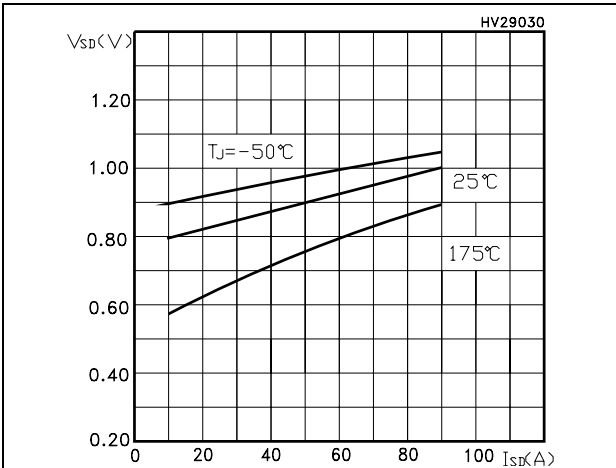


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

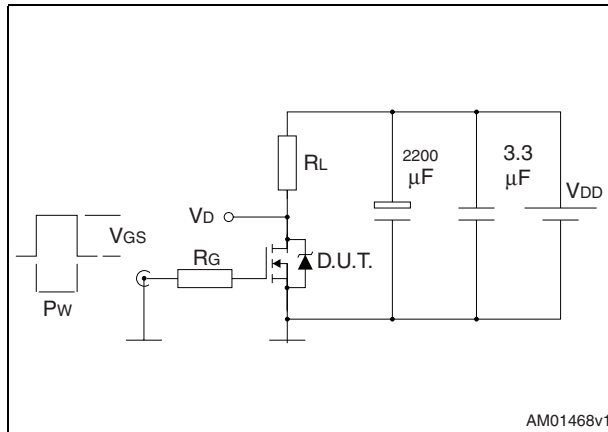


Figure 14. Gate charge test circuit

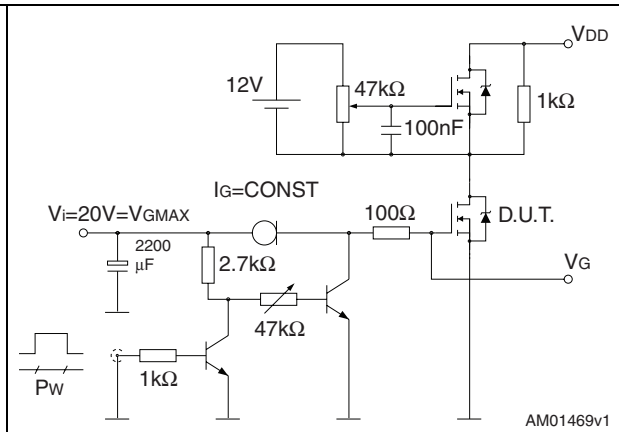


Figure 15. Test circuit for inductive load switching and diode recovery times

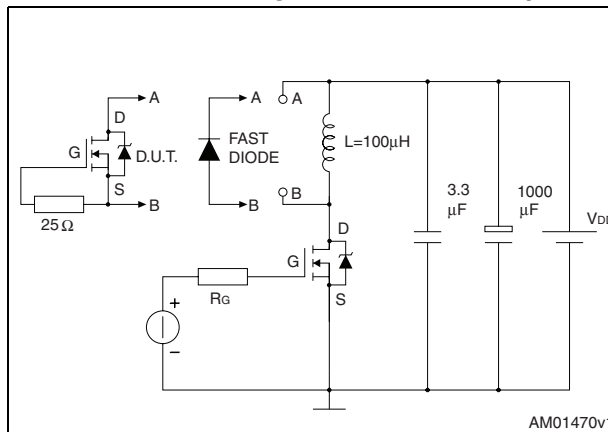


Figure 16. Unclamped inductive load test circuit

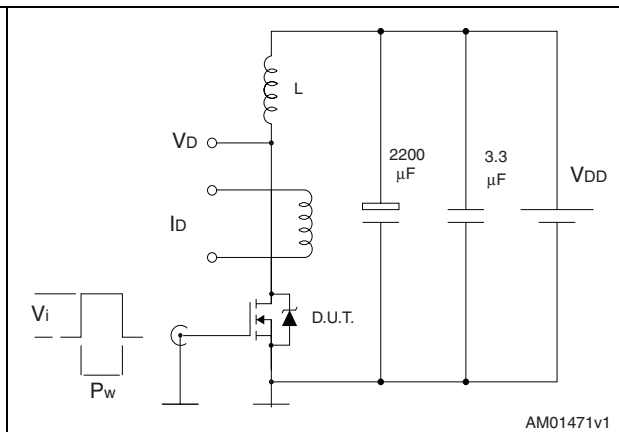


Figure 17. Unclamped inductive waveform

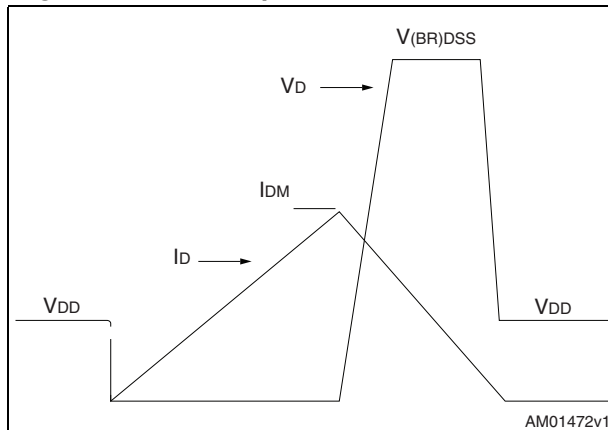


Figure 18. Switching time waveform

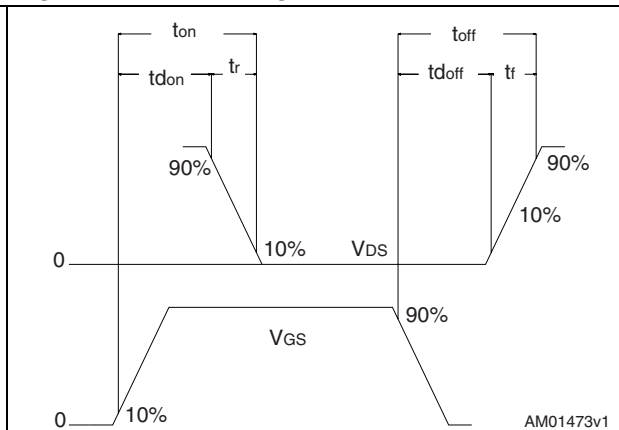
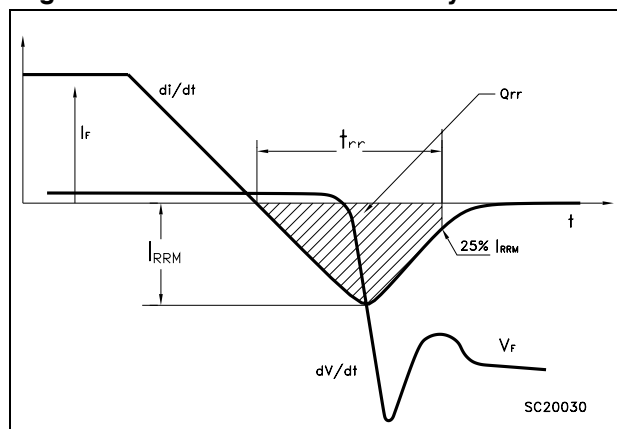


Figure 19. Diode reverse recovery waveform

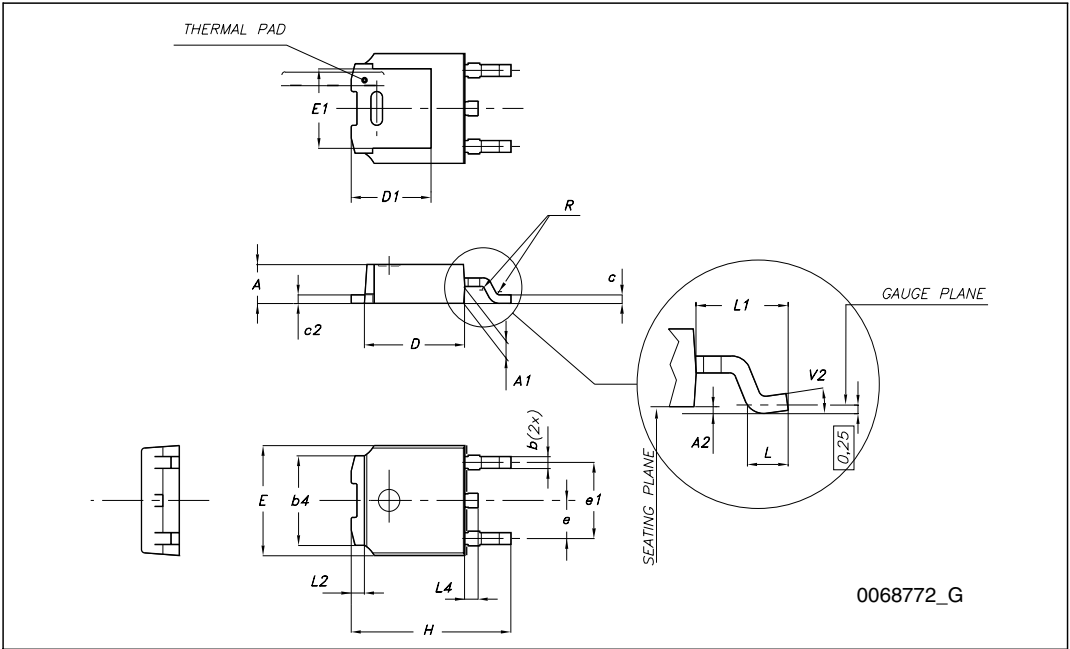


4 **Package mechanical data**

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.

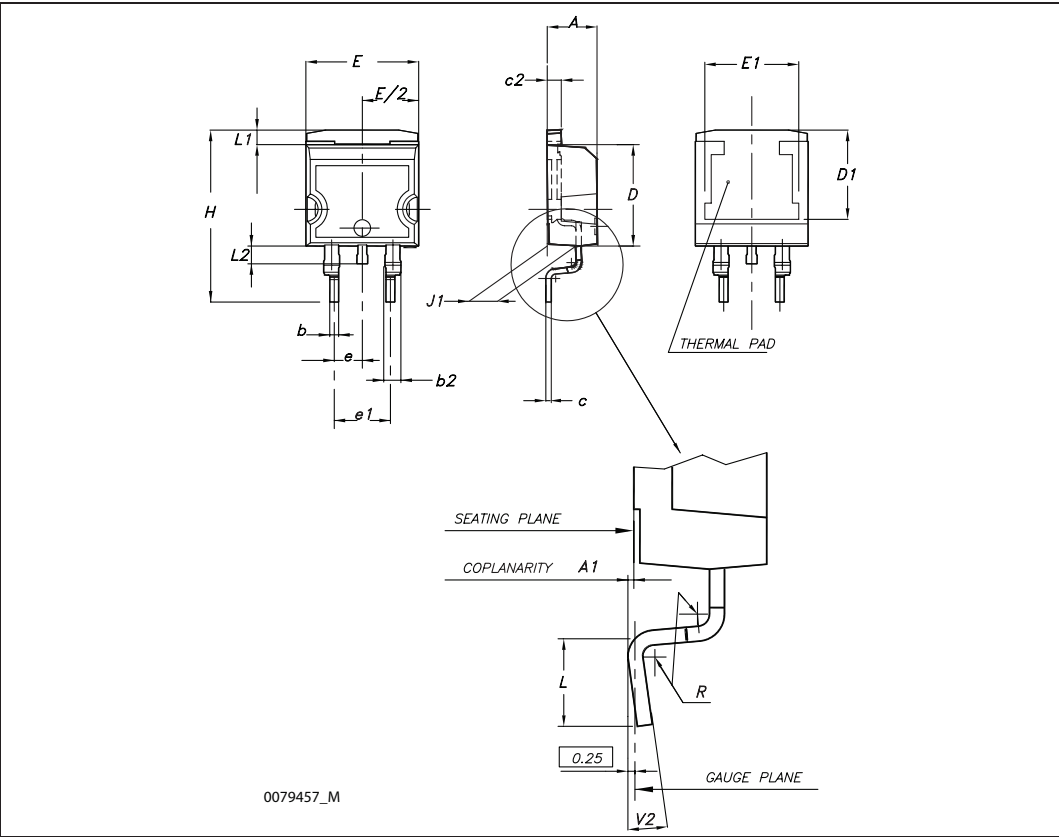
TO-252 (DPAK) mechanical data

DIM.	mm.		
	min.	typ	max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0 °		8 °



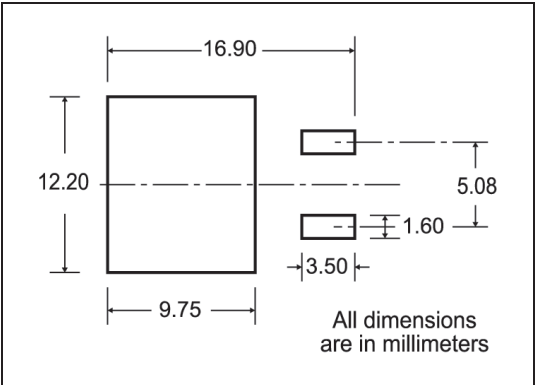
D²PAK (TO-263) mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.027		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.017		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50			0.295		
E	10		10.40	0.394		0.409
E1	8.50			0.334		
e		2.54			0.1	
e1	4.88		5.28	0.192		0.208
H	15		15.85	0.590		0.624
J1	2.49		2.69	0.099		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.05		0.055
L2	1.30		1.75	0.051		0.069
R		0.4			0.016	
V2	0°		8°	0°		8°

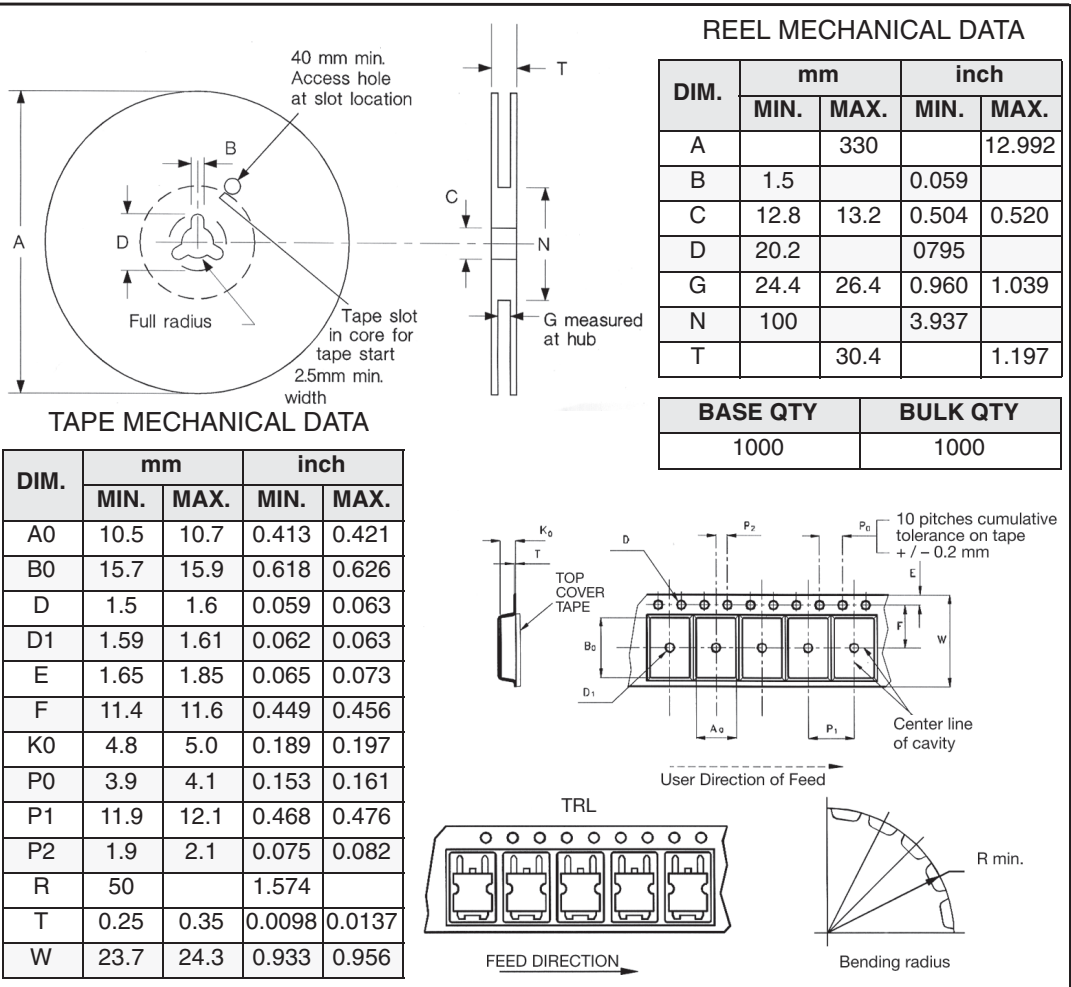


5 Packing mechanical data

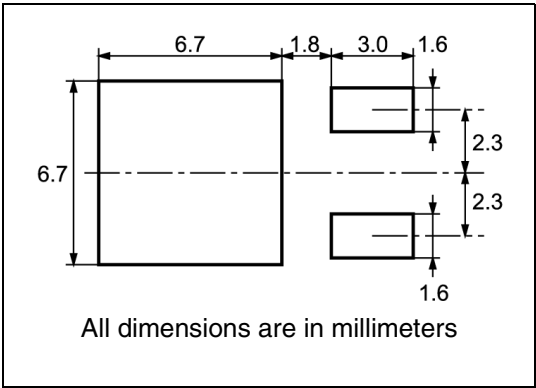
D²PAK FOOTPRINT



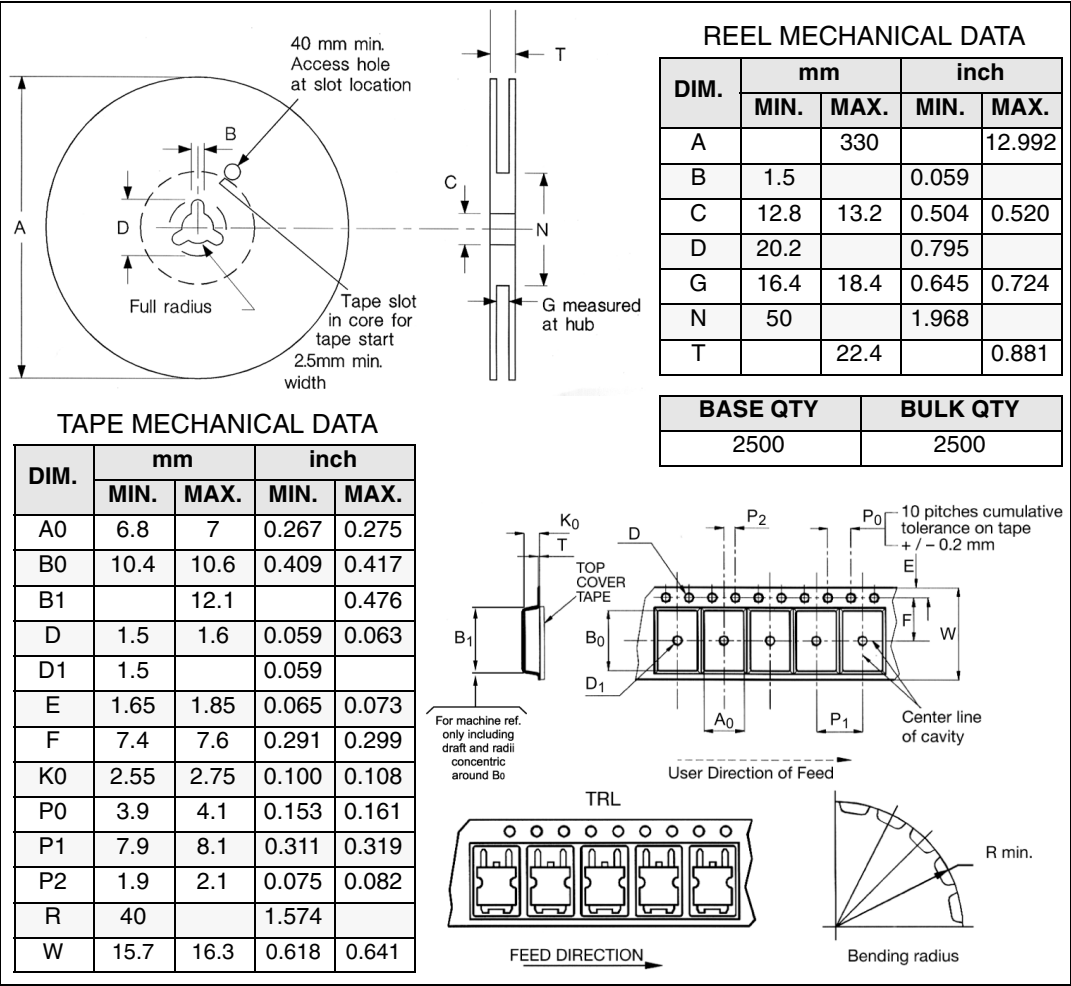
TAPE AND REEL SHIPMENT



DPAK FOOTPRINT



TAPE AND REEL SHIPMENT



6 Revision history

Table 7. Document revision history

Date	Revision	Changes
11-Feb-2009	1	First release
23-Jul-2009	2	Marking on device summary has been corrected.

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