



STD55N4F5

N-channel 40 V, 7.3 mΩ, 40 A, DPAK
STripFET™ V Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D	P _w
STD55N4F5	40 V	< 8.5 mΩ	55 A	60 W

- Standard threshold drive
- 100% avalanche tested
- Surface mounting DPAK (TO-252)

Applications

- Switching applications
 - Automotive

Description

The STD55N4F5 is a N-channel STripFET™ V. This Power MOSFET technology is among the latest improvements, which have been especially tailored to achieve very low on-state resistance providing also one of the best-in-class figure of merit (FOM).

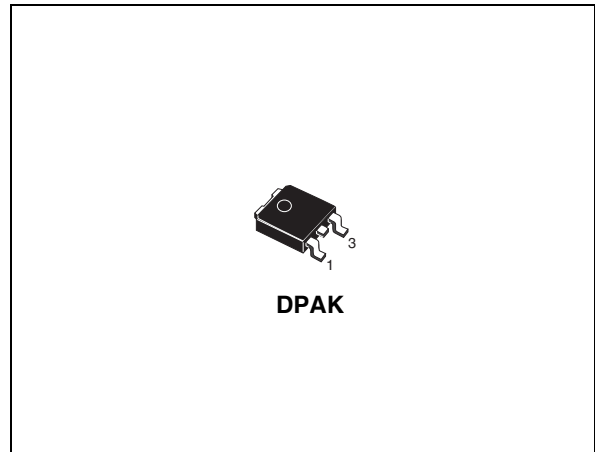


Figure 1. Internal schematic diagram

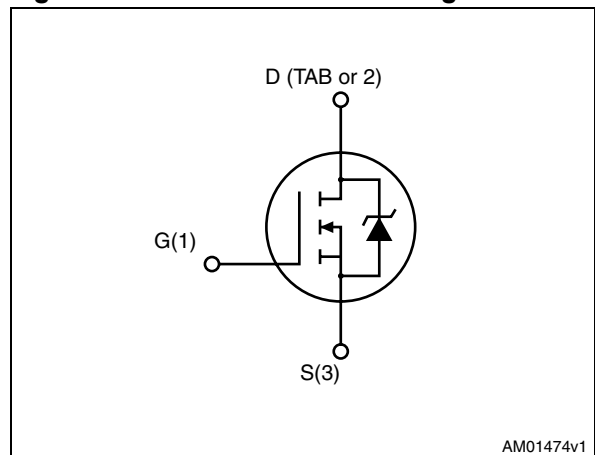


Table 1. Device summary

Order code	Marking	Package	Packaging
STD55N4F5	55N4F5	DPAK	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	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	55	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	39	A
$I_{DM}^{(2)}$	Drain current (pulsed)	220	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	60	W
	Derating factor	0.4	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	15	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	100	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	- 55 to 175	$^\circ\text{C}$

1. Current limited by package
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 55\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_j \leq T_{jmax}$
4. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 27.5\text{ A}$, $V_{DD} = 25\text{ V}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient max	50	$^\circ\text{C}/\text{W}$

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

2 Electrical characteristics

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

Table 4. Static

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 ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$, $V_{DS} = \text{Max rating}$, $T_c = 125\text{ °C}$			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	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 27.5\text{ A}$		7.3	8.5	$\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	1600	-	pF
C_{oss}	Output capacitance			230		pF
C_{rss}	Reverse transfer capacitance			30		pF
Q_g	Total gate charge	$V_{DD} = 20\text{ V}$, $I_D = 27.5\text{ A}$	-	25	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$		7		nC
Q_{gd}	Gate-drain charge	Figure 14		6		nC

Table 6. Switching on/off (resistive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD}=20\text{ V}$, $I_D=27.5\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ Figure 16	-	15 15	-	ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}=20\text{ V}$, $I_D=27.5\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ Figure 16	-	25 6	-	ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		55 220	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=55\text{ A}$, $V_{GS}=0$	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=55\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=32\text{ V}$, $T_j=150\text{ }^\circ\text{C}$ Figure 15	-	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

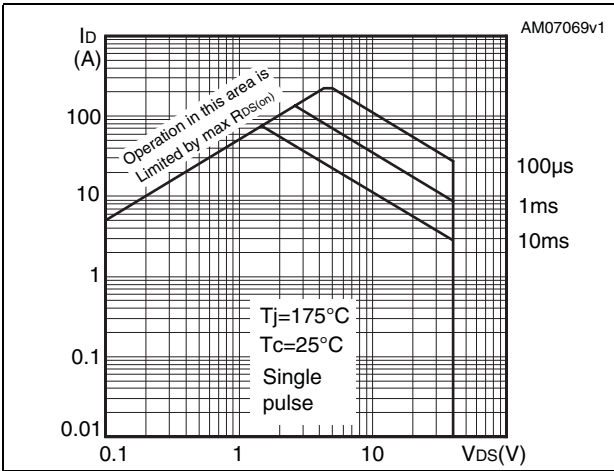


Figure 3. Thermal impedance

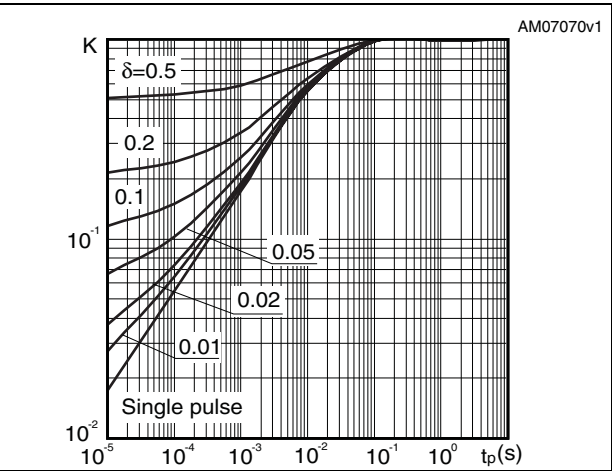


Figure 4. Output characteristics

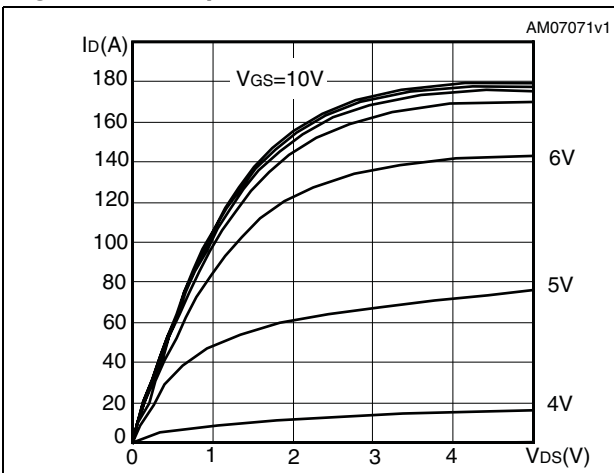


Figure 5. Transfer characteristics

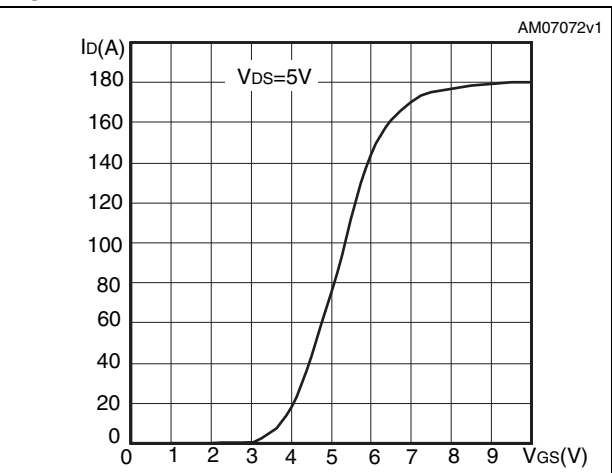


Figure 6. Normalized $B_{V_{DS}}$ vs temperature

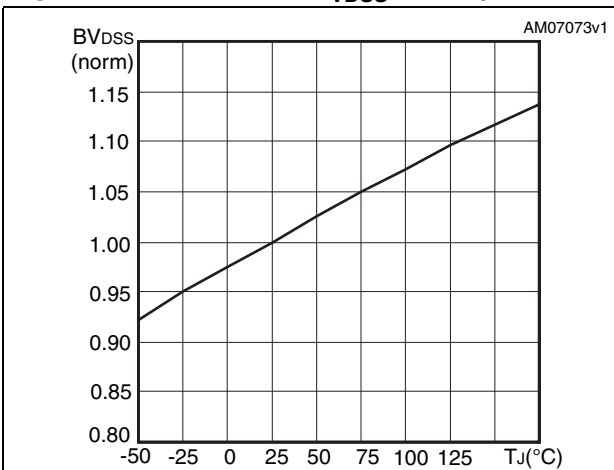


Figure 7. Static drain-source on resistance

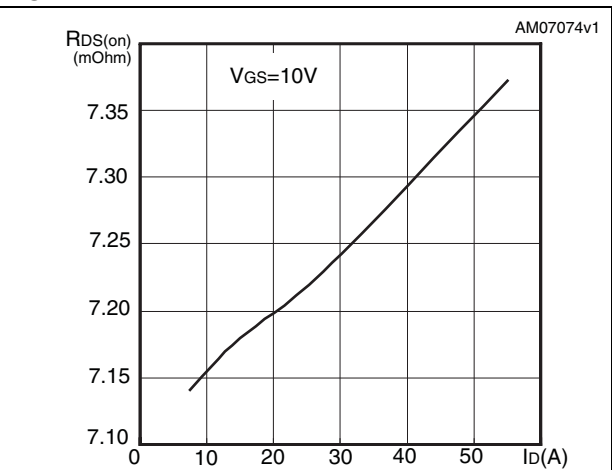


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

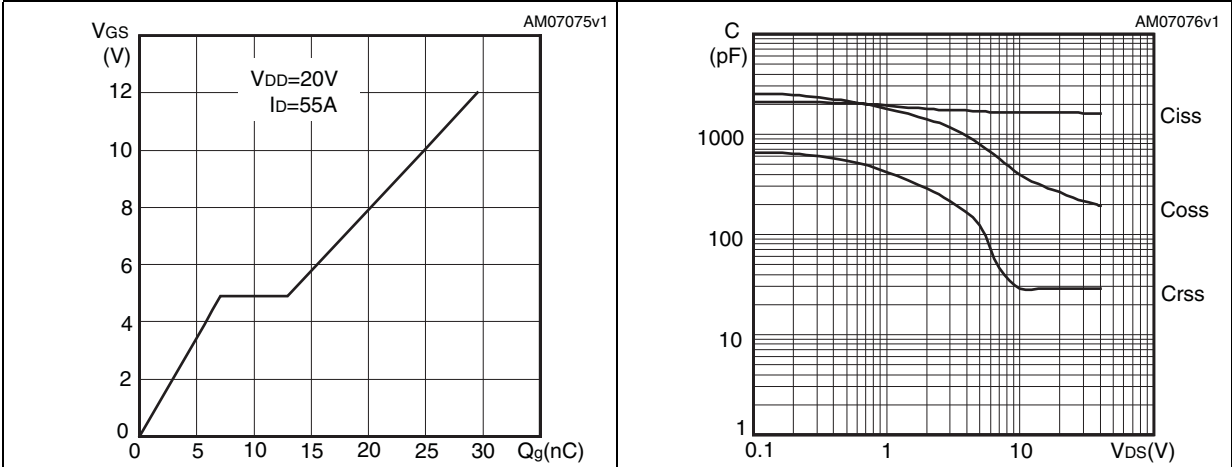


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

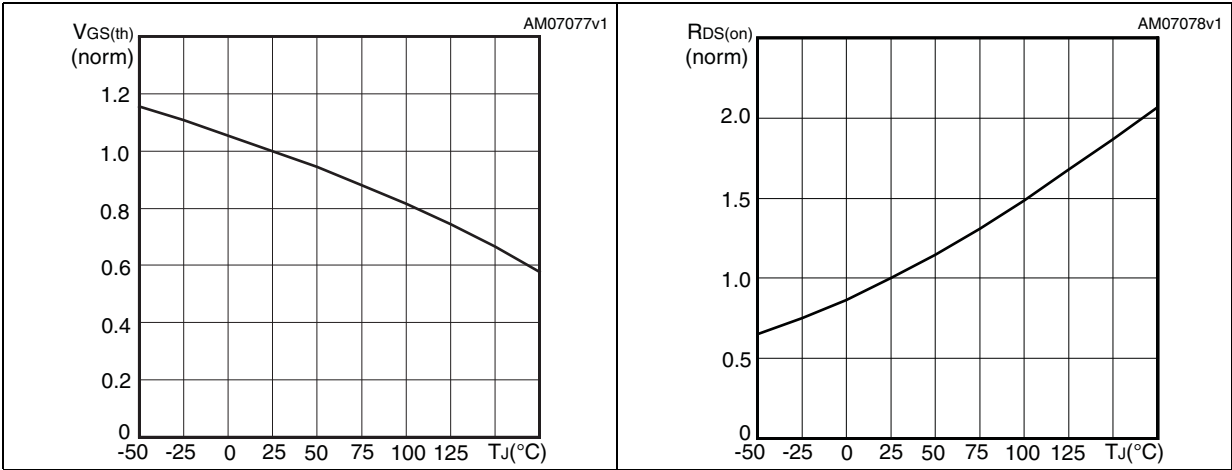
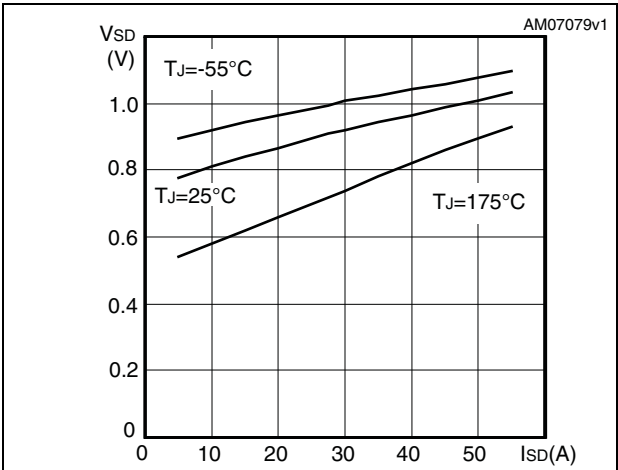


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

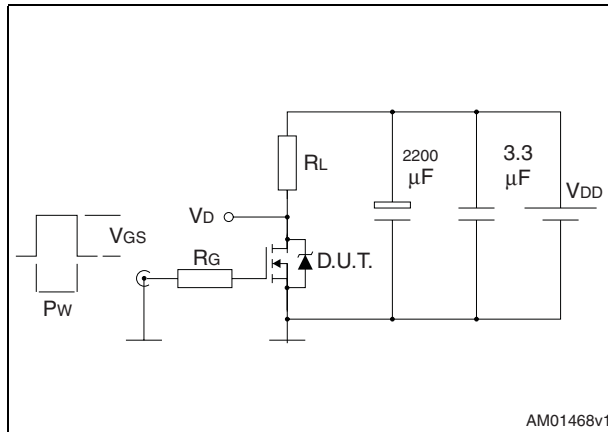


Figure 14. Gate charge test circuit

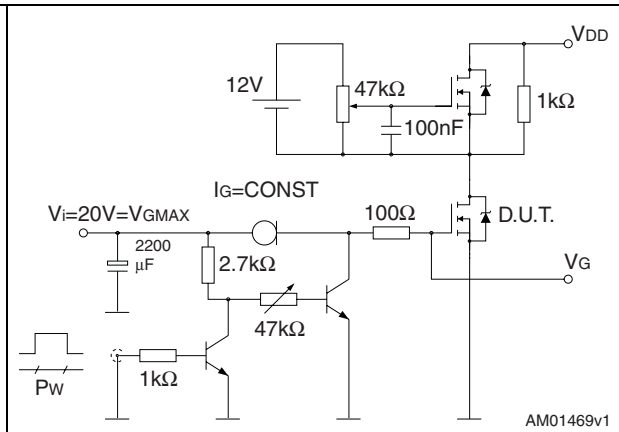


Figure 15. Test circuit for inductive load switching and diode recovery times

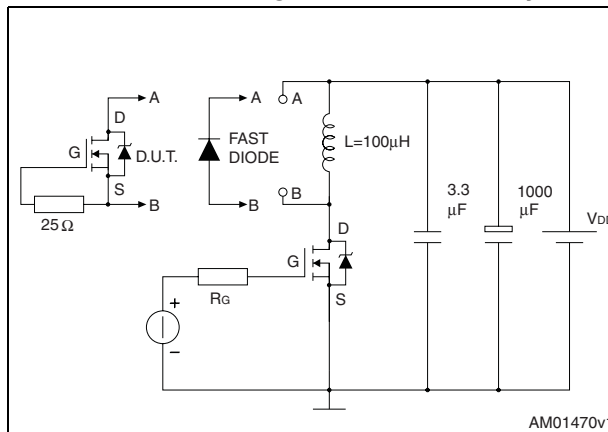


Figure 16. Unclamped inductive load test circuit

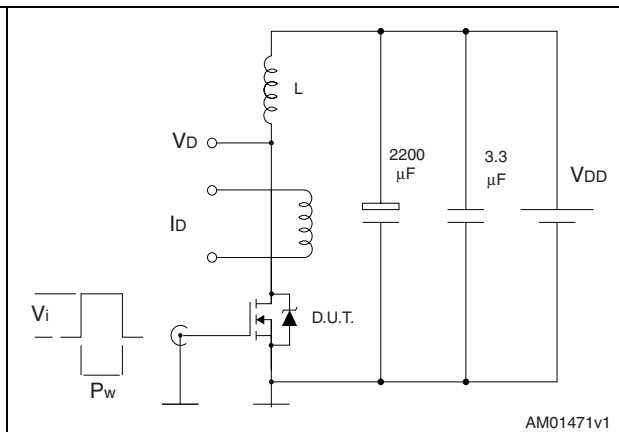


Figure 17. Unclamped inductive waveform

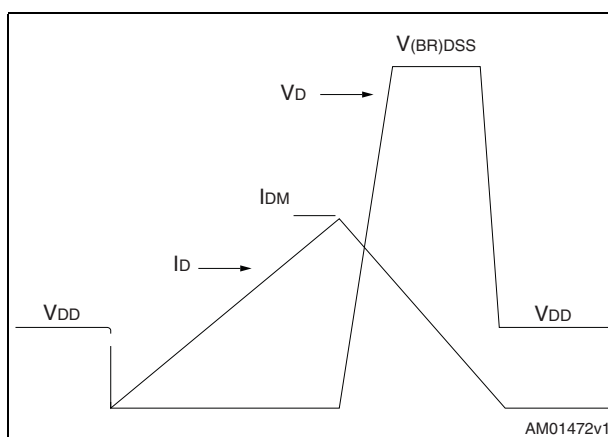
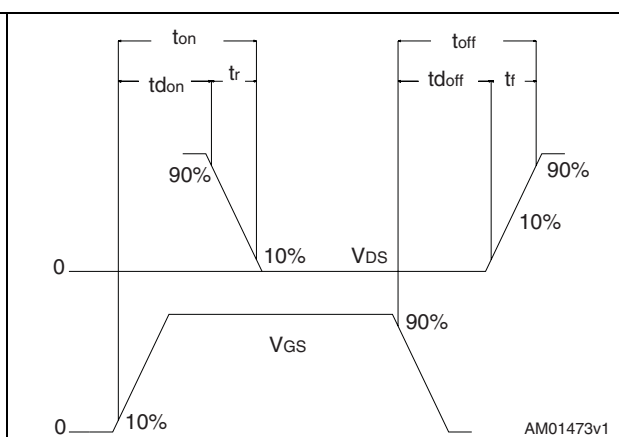


Figure 18. Switching time waveform

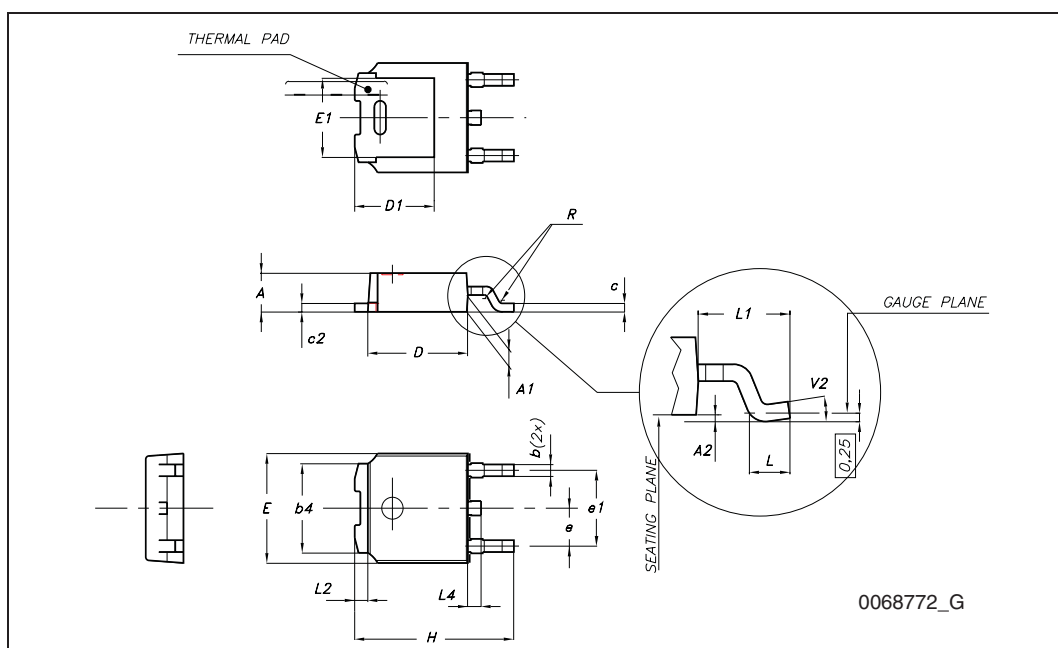


4 Package mechanical data

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.

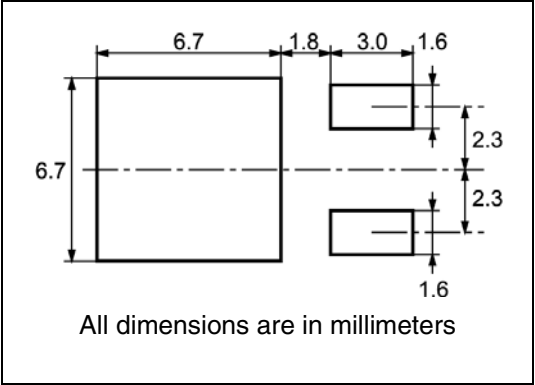
TO-252 (DPAK) mechanical data

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°

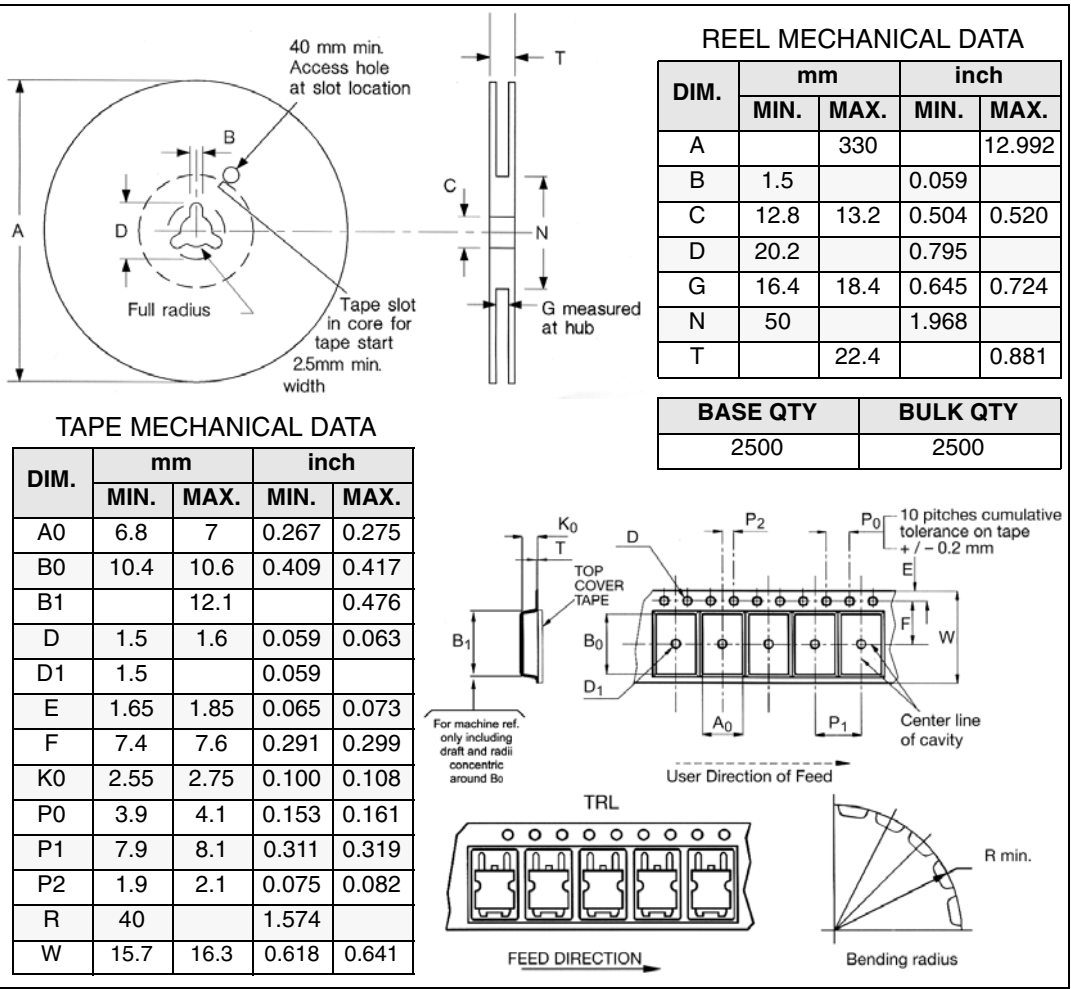


5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT



6 Revision history

Table 8. Document revision history

Date	Revision	Changes
06-May-2009	1	First release
10-Jul-2009	2	– Document status promoted from target specification to preliminary data – $R_{DS(on)}$ max value changed
22-Jun-2010	3	Document status promoted from preliminary data to datasheet

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