



THE DATASHEET OF STD100N3LF3





STD100N3LF3

N-channel 30 V, 0.0045 Ω , 80 A, DPAK
planar STripFET™ II Power MOSFET

Features

Type	V _{DSSS}	R _{DS(on)}	I _D	P _w
STD100N3LF3	30 V	<0.0055 Ω	80 A ⁽¹⁾	110 W

1. Current limited by package

- 100% avalanche tested
- Logic level threshold

Applications

- Switching application
 - Automotive

Description

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

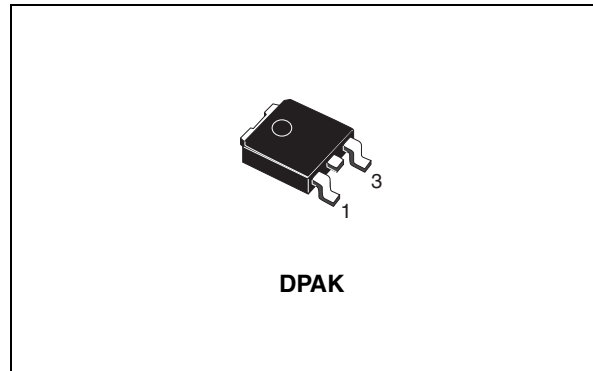


Figure 1. Internal schematic diagram

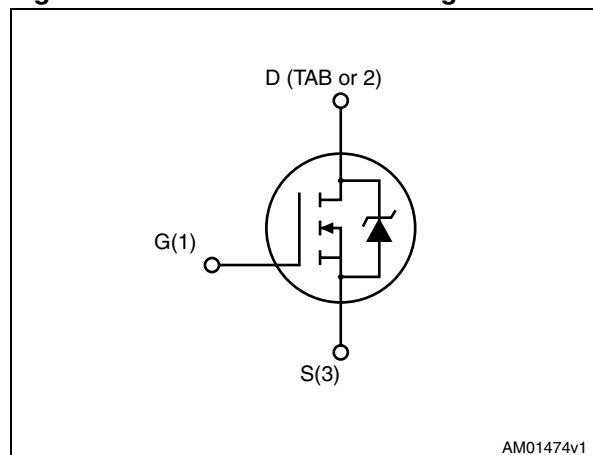


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD100N3LF3	100N3LF3	DPAK	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	6
3	Test circuits	9
4	Package mechanical data	10
5	Packaging mechanical data	13
6	Revision history	14

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	Drain current (continuous) at $T_C=100\text{ }^\circ\text{C}$	70	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	3.9	V/ns
T_{stg}	Storage temperature	-55 to 175	$^\circ\text{C}$
T_J	Max. operating junction temperature		

1. Current limited by package.
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 80\text{A}$, $di/dt \leq 360\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max	1.36	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance junction-ambient max	100	$^\circ\text{C}/\text{W}$
T_I	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Not-repetitive avalanche current (pulse width limited by T_J max)	40	A
E_{AS}	Single pulsed avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 24\text{ V}$)	500	mJ

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	$I_D = 250 \mu A, V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating @ } 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 V$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V, I_D = 40 A$		0.0045	0.0055	Ω
		$V_{GS} = 5 V, I_D = 20 A$		0.008	0.01	Ω
		$V_{GS} = 10 V,$ $I_D = 40 A @ 125^{\circ}C$		0.0068		Ω
		$V_{GS} = 5 V,$ $I_D = 20 A @ 125^{\circ}C$		0.0146		Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 10 V, I_D = 15 A$	-	31		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25 V, f = 1 \text{ MHz},$ $V_{GS} = 0$	-	2060 728 67		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 24 V, I_D = 80 A$ $V_{GS} = 5 V$ <i>Figure 16 on page 9</i>	-	20 7 7.5	27	nC nC nC
R_G	Gate input resistance	$f = 1 \text{ MHz gate DC Bias} = 0$ test signal level = 20 mV open drain	-	1.9		Ω

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

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ Figure 15 on page 9	-	9	-	ns
t_r	Rise time			205		ns
$t_{d(off)}$	Turn-off delay time			31		ns
t_f	Fall time			35		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current		-		80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 40\text{ A}$, $V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ Figure 17 on page 9	-	40		ns
Q_{rr}	Reverse recovery charge			40		μC
I_{RRM}	Reverse recovery current			2		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

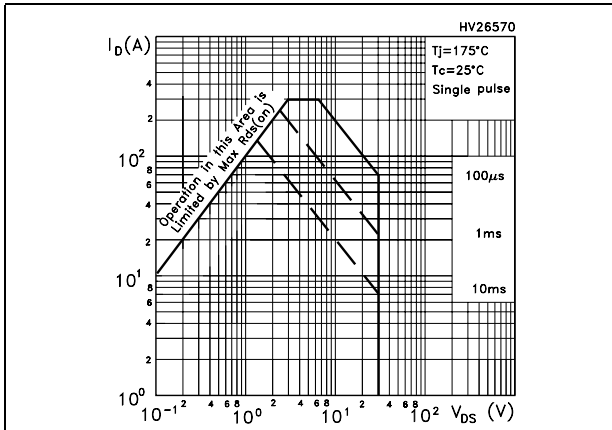


Figure 3. Thermal impedance

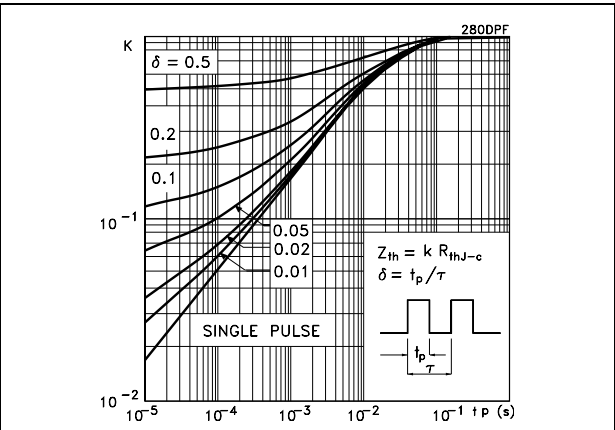


Figure 4. Output characteristics

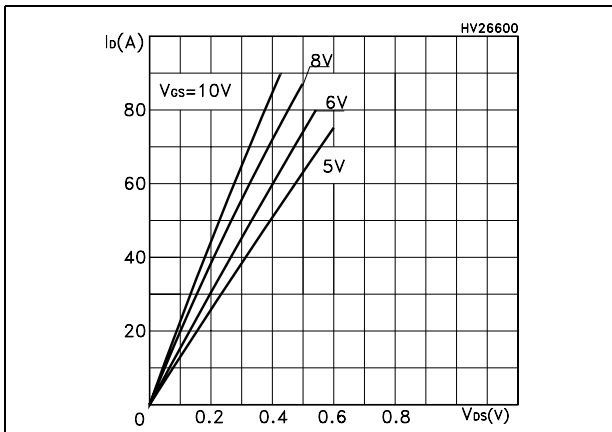


Figure 5. Transfer characteristics

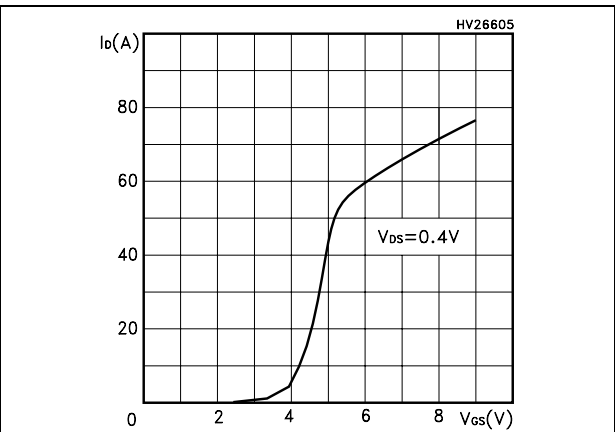


Figure 6. Transconductance

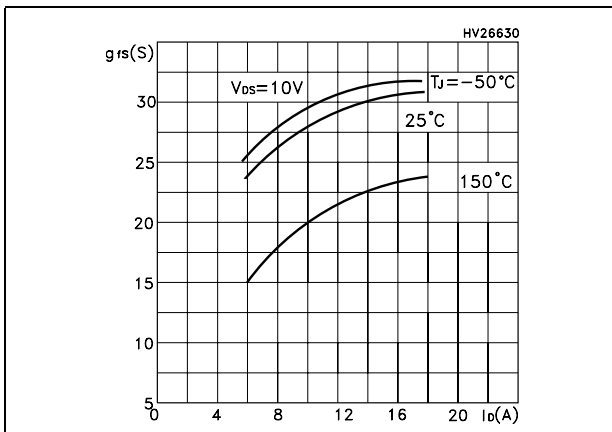


Figure 7. Static drain-source on resistance

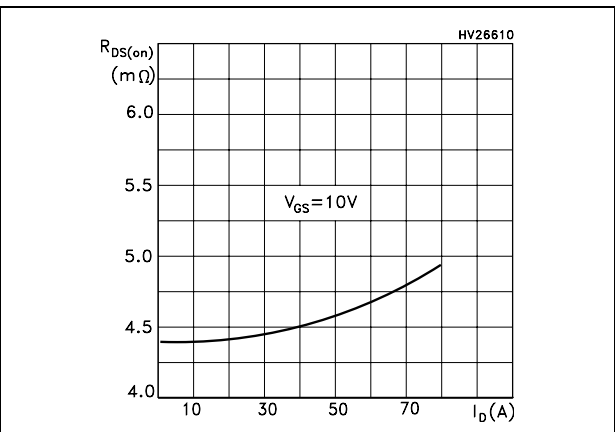


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

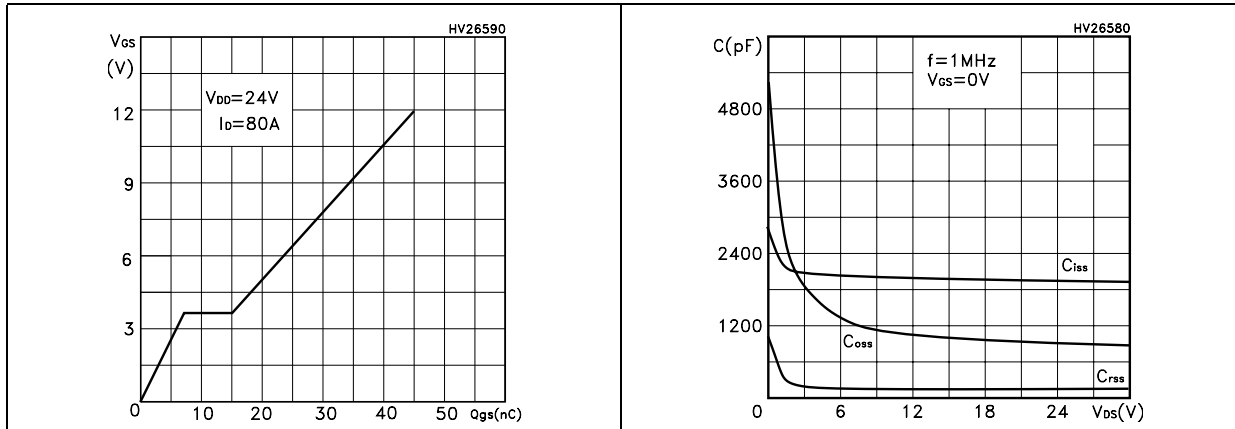


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized BV_{DSS} vs temperature

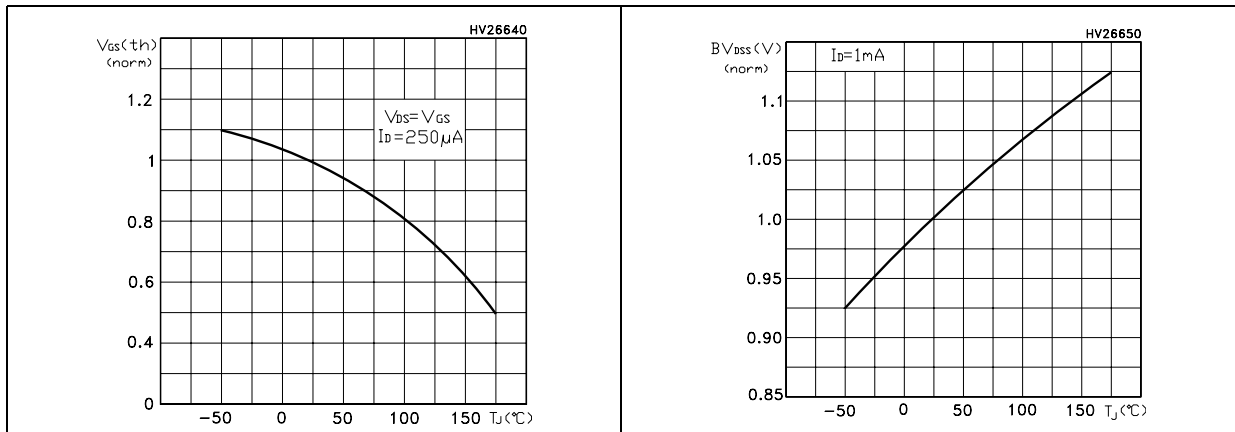


Figure 12. Normalized on resistance vs temperature Figure 13. Source-drain diode forward characteristics

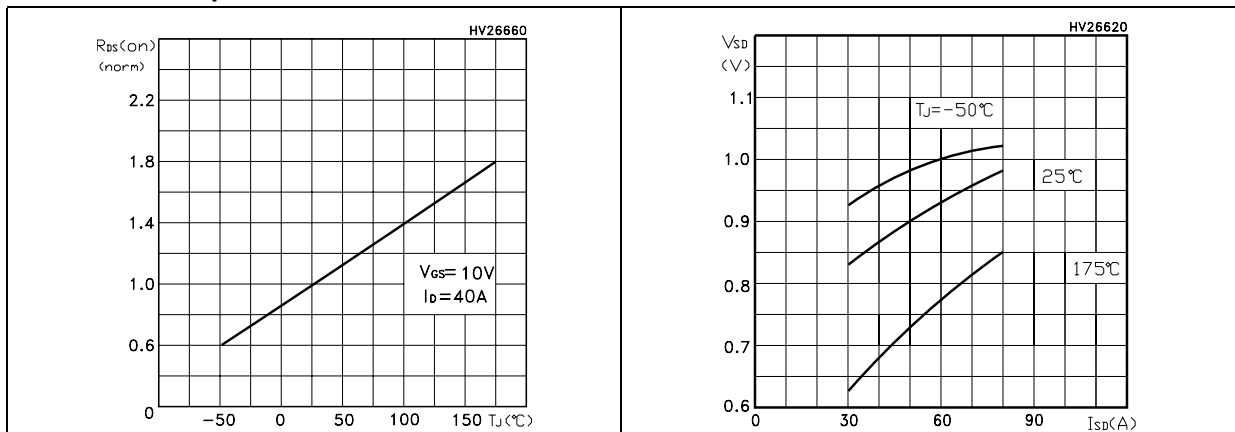
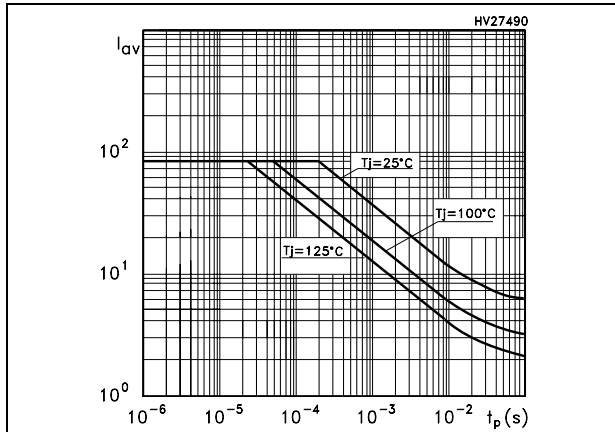


Figure 14. Allowable I_{AV} vs time in avalanche



The previous curve gives the single pulse safe operating area for unclamped inductive loads, under the following conditions:

$$P_{D(AVE)} = 0.5 * (1.3 * BV_{DSS} * I_{AV})$$

$$E_{AS(AR)} = P_{D(AVE)} * t_{AV}$$

Where:

I_{AV} is the allowable current in avalanche

$P_{D(AVE)}$ is the average power dissipation in avalanche (single pulse)

t_{AV} is the time in avalanche

3 Test circuits

Figure 15. Switching times test circuit for resistive load

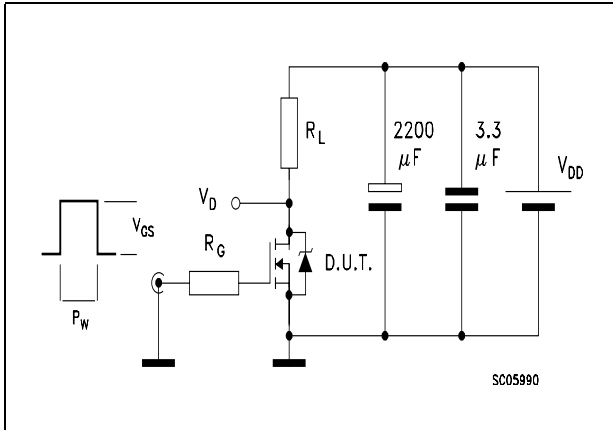


Figure 16. Gate charge test circuit

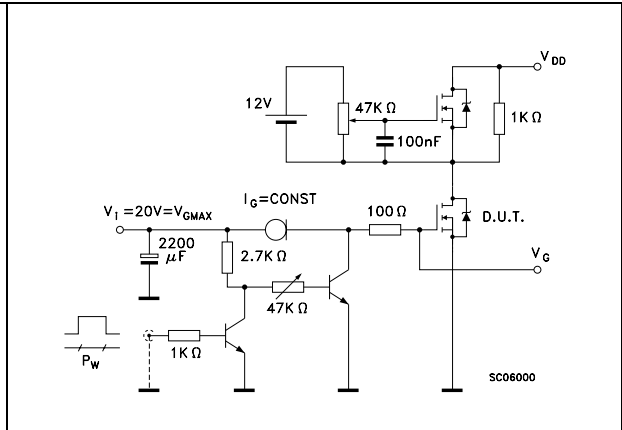
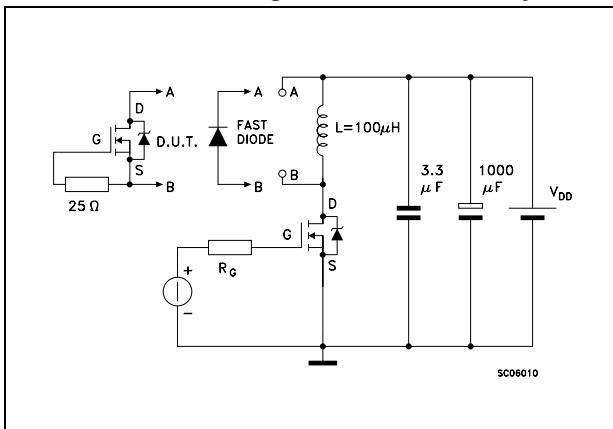


Figure 17. Test circuit for inductive load switching and diode recovery times

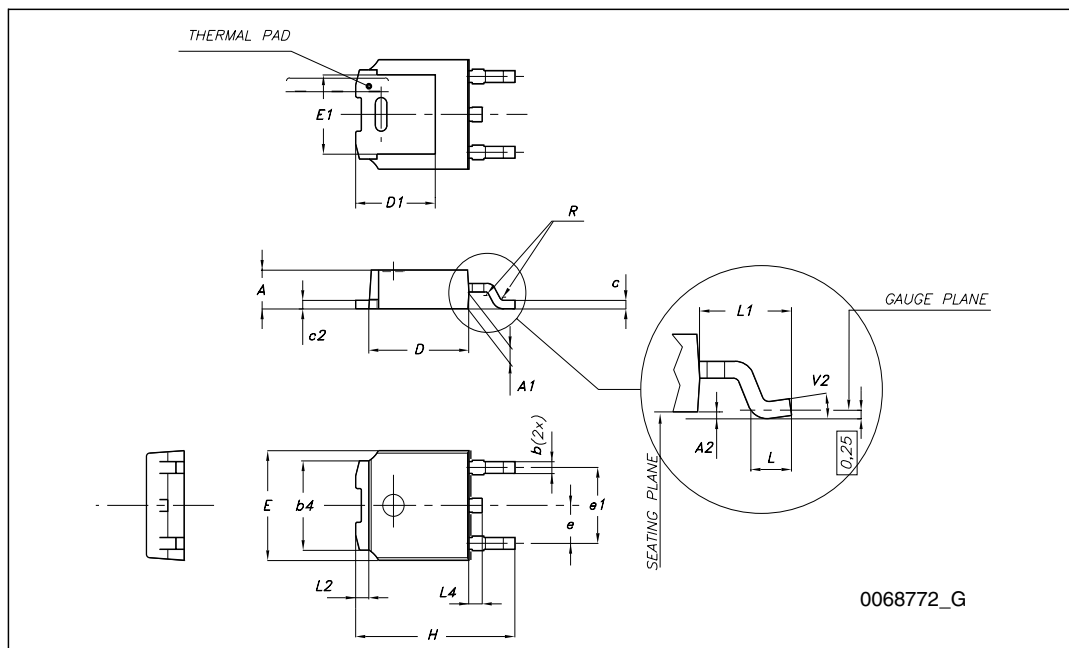


4 Package mechanical data

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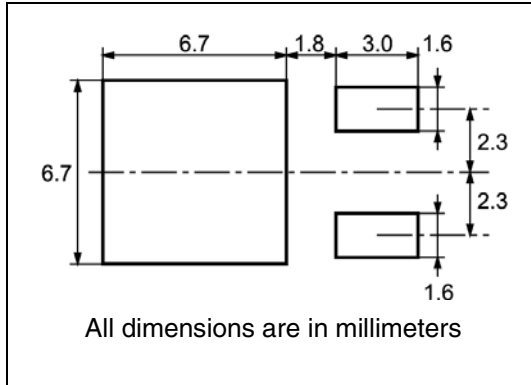
TO-252 (DPAK) mechanical data

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

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

6 Revision history

Table 9. Document revision history

Date	Revision	Changes
07-Feb-2006	1	Initial release.
07-May-2009	2	Added $V_{GS(th)}$ max value in Table 5: On/off states
09-Nov-2009	3	Added V_{GS} parameter in Table 2: Absolute maximum ratings

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