



STD40N2LH5 STU40N2LH5

N-channel 25 V, 0.01 Ω , 40 A, DPAK, IPAK
STripFET™ V Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D
STD40N2LH5	25 V	0.0118 Ω	40 A
STU40N2LH5	25 V	0.0124 Ω	40 A

- R_{DS(on)} * Q_G industry benchmark
- Extremely low on-resistance R_{DS(on)}
- Very low switching gate charge
- High avalanche ruggedness
- Low gate drive power losses

Application

- Switching applications

Description

This STripFET™ V 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).

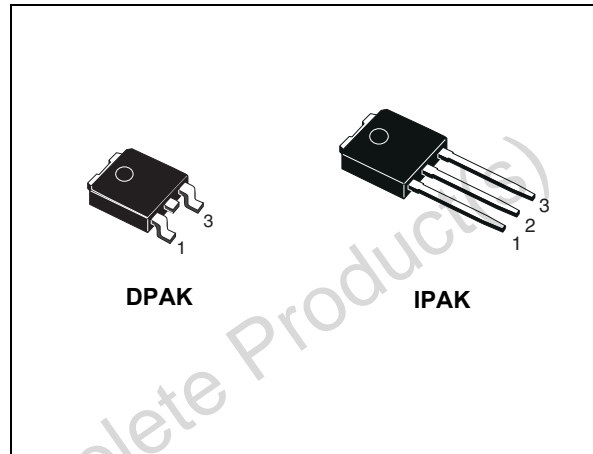


Figure 1. Internal schematic diagram

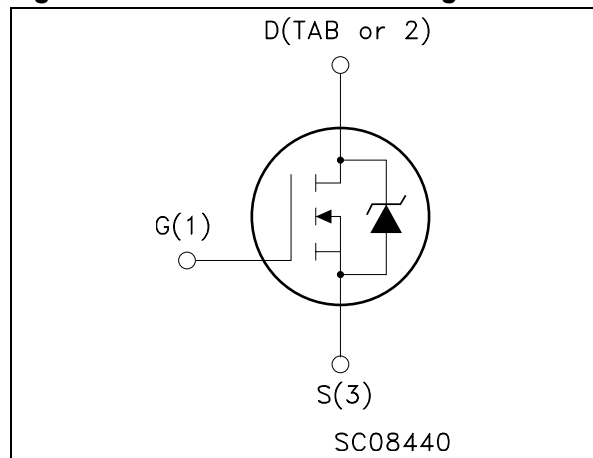


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD40N2LH5	40N2LH5	DPAK	Tape and reel
STU40N2LH5	40N2LH5	IPAK	Tube

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 ($V_{GS}=0$)	25	V
V_{GS}	Gate-Source voltage	± 22	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	40	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	28	A
$I_{DM}^{(1)}$	Drain current (pulsed)	160	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	35	W
	Derating factor	0.23	W/ $^\circ\text{C}$
$E_{AS}^{(2)}$	Single pulse avalanche energy	110	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Pulse width limited by safe operating area
2. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 24\text{ A}$, $V_{DD} = 12\text{ V}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	4.3	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-case max	100	$^\circ\text{C/W}$
T_l	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	25			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 25 V$ $V_{DS} = 25 V, T_C = 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 22 V$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V, I_D = 20 A$ SMD version		0.01	0.0118	Ω
		$V_{GS} = 10 V, I_D = 20 A$		0.0106	0.0124	Ω
		$V_{GS} = 5 V, I_D = 20 A$ SMD version		0.0135	0.0155	Ω
		$V_{GS} = 5 V, I_D = 20 A$		0.0141	0.0161	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 20 V, f = 1 MHz,$ $V_{GS} = 0$	-	700	-	pF
C_{oss}	Output capacitance			160		pF
C_{rss}	Reverse transfer capacitance			27		pF
Q_g	Total gate charge	$V_{DD} = 15 V, I_D = 40 A$	-	6.3	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 5 V$		2.4		nC
Q_{gd}	Gate-drain charge	(<i>Figure 14</i>)		2.7		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	$V_{DD} = 10 V, I_D = 20 A,$ $R_G = 4.7 \Omega, V_{GS} = 10 V$ (<i>Figure 13</i> and <i>Figure 18</i>)	-	4.8	-	ns
	Rise time			13.6		
$t_{d(off)}$ t_f	Turn-off delay time	$V_{DD} = 10 V, I_D = 20 A,$ $R_G = 4.7 \Omega, V_{GS} = 10 V$ (<i>Figure 13</i> and <i>Figure 18</i>)	-	17.6	-	ns
	Fall time			3.5		

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		40	A
I_{SDM}	Source-drain current (pulsed) ⁽¹⁾		-		160	A
V_{SD}	Forward on voltage	$I_{SD}= 20\text{ A}$, $V_{GS}=0$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD}= 40\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}= 20\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$ (<i>Figure 15</i>)	-	17.6		ns
Q_{rr}	Reverse recovery charge			9.2		nC
I_{RRM}	Reverse recovery current			1		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

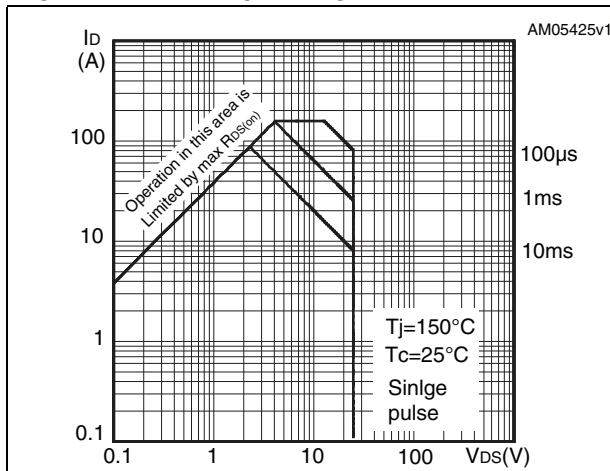


Figure 3. Thermal impedance

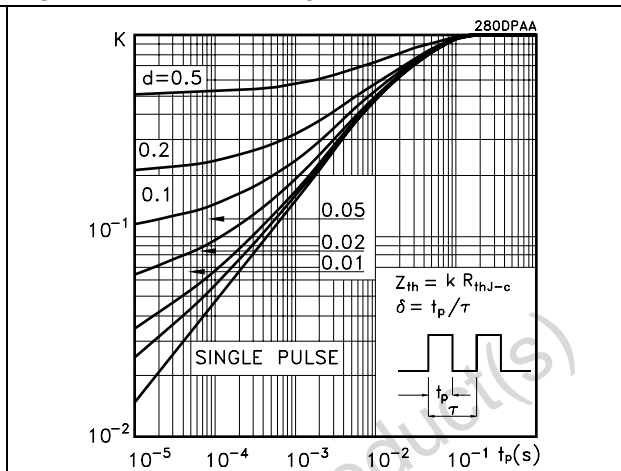


Figure 4. Output characteristics

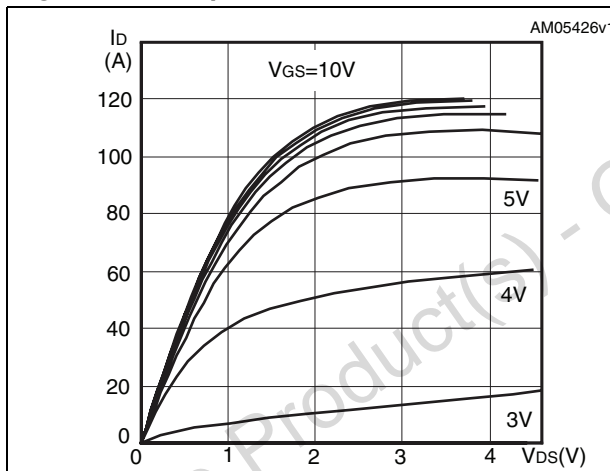


Figure 5. Transfer characteristics

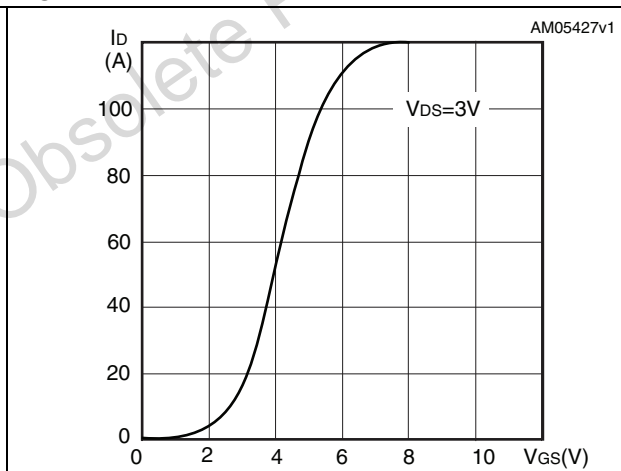


Figure 6. Normalized BV_{DSS} vs temperature

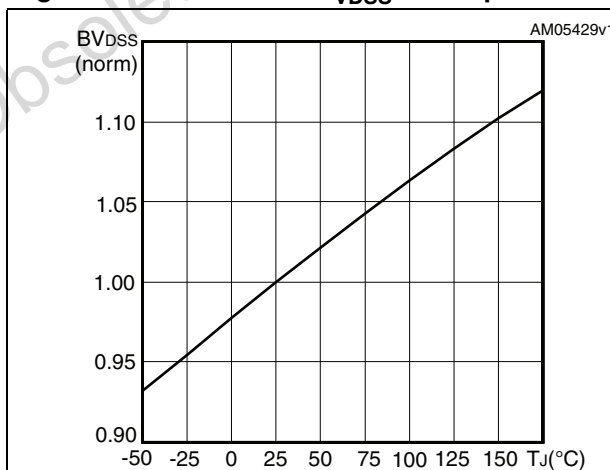


Figure 7. Static drain-source on resistance

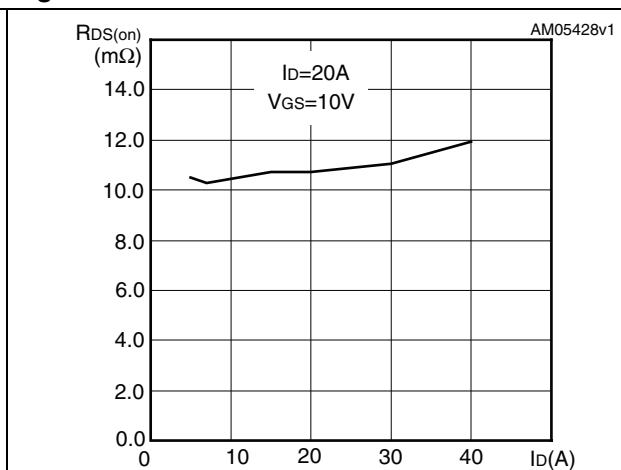


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

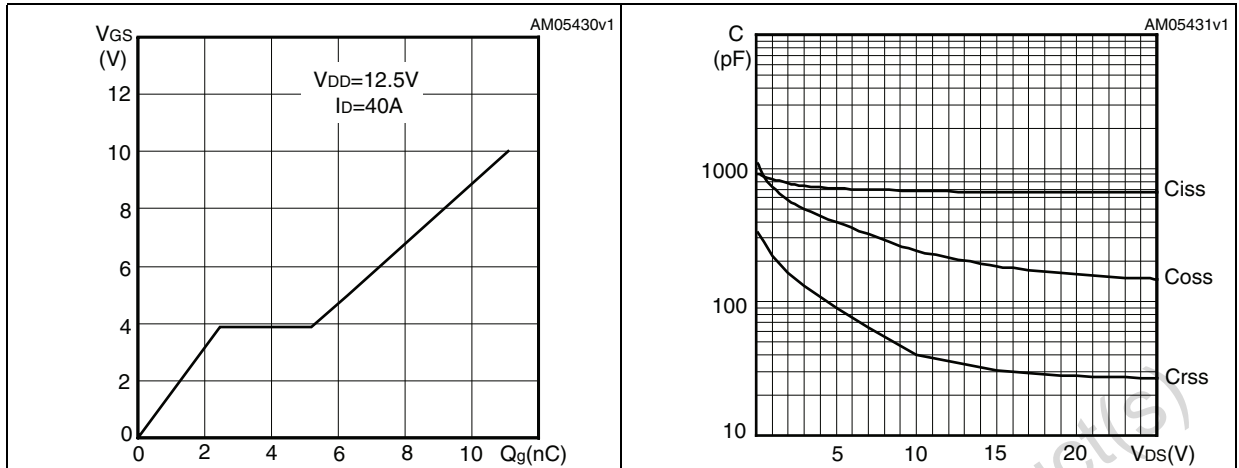


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

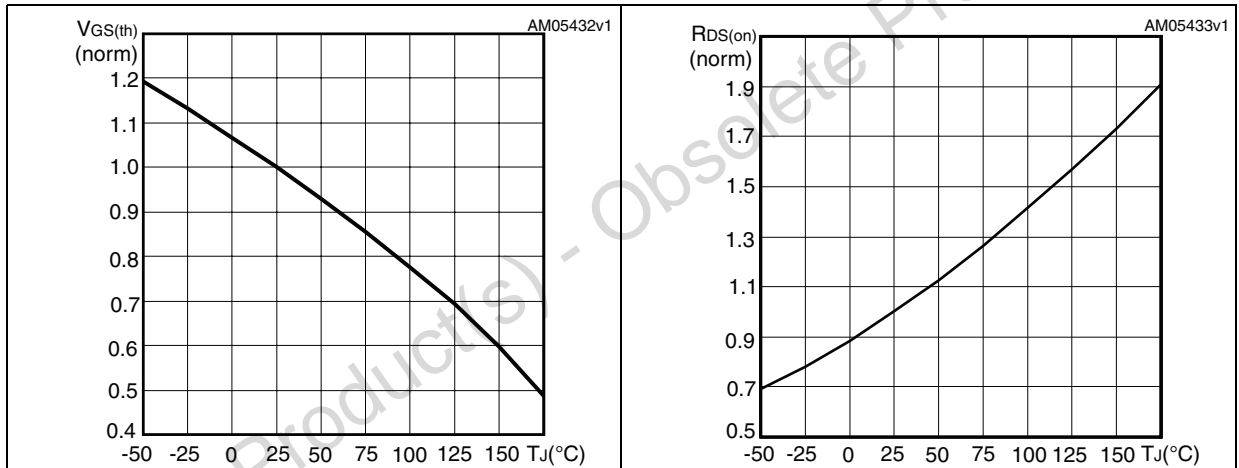
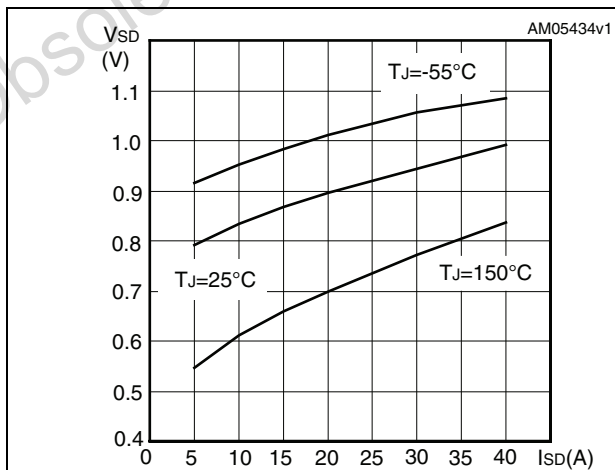
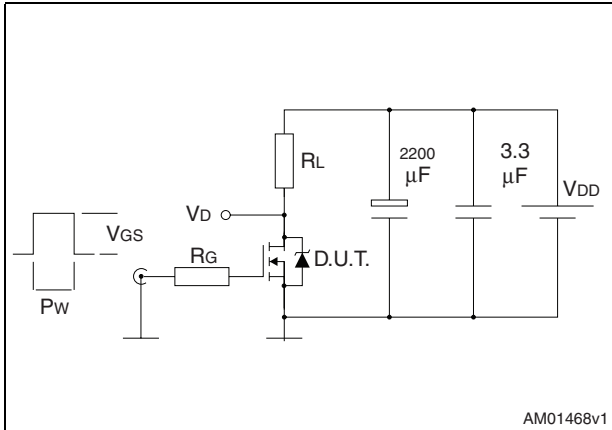


Figure 12. Source-drain diode forward characteristics



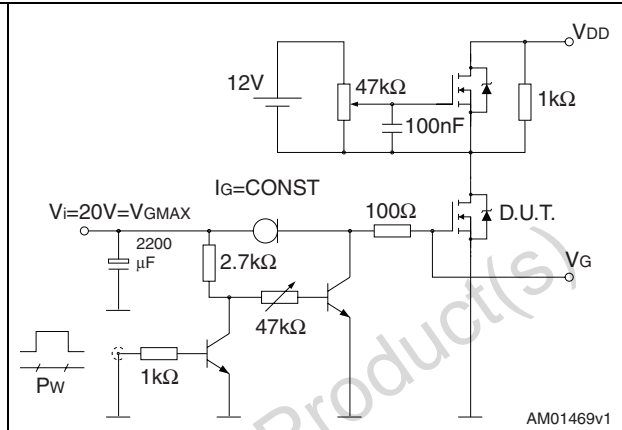
3 Test circuits

Figure 13. Switching times test circuit for resistive load



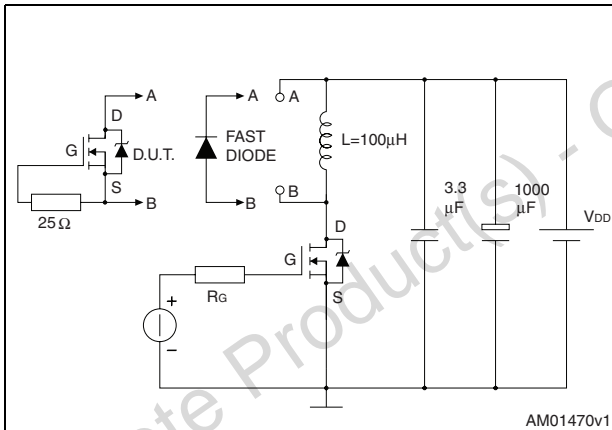
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Figure 14. Gate charge test circuit



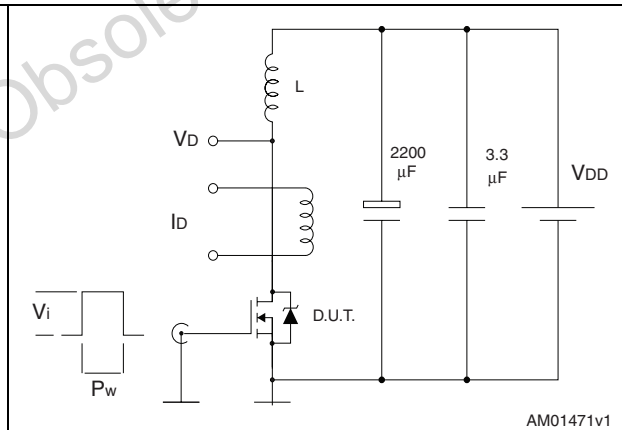
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Figure 15. Test circuit for inductive load switching and diode recovery times



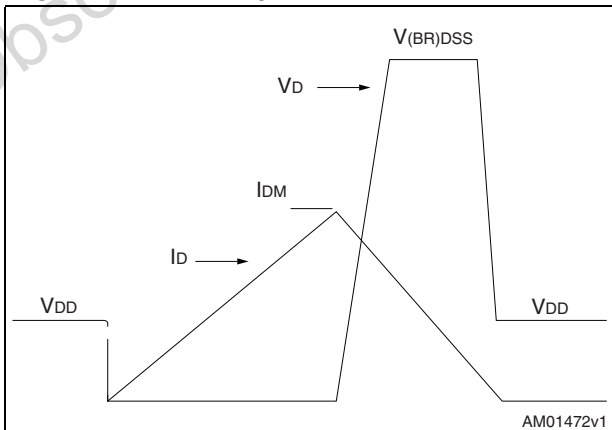
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Figure 16. Unclamped Inductive load test circuit



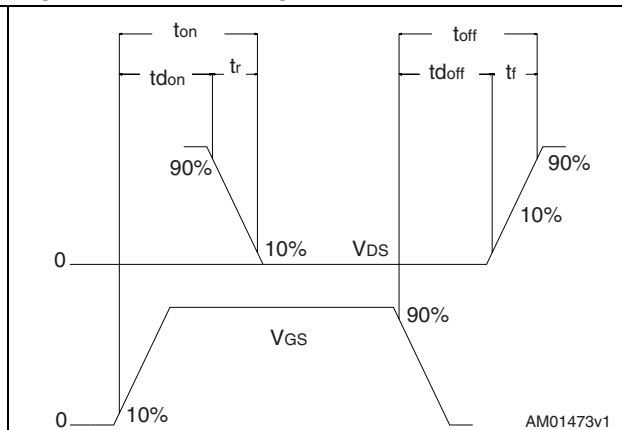
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Figure 17. Unclamped inductive waveform



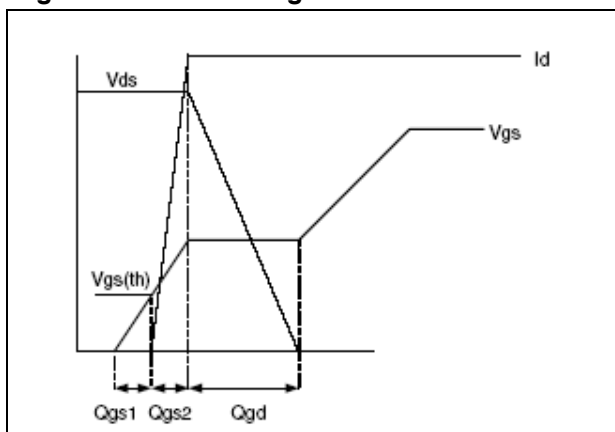
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Figure 18. Switching time waveform



AM01473v1

Figure 19. Gate charge waveform



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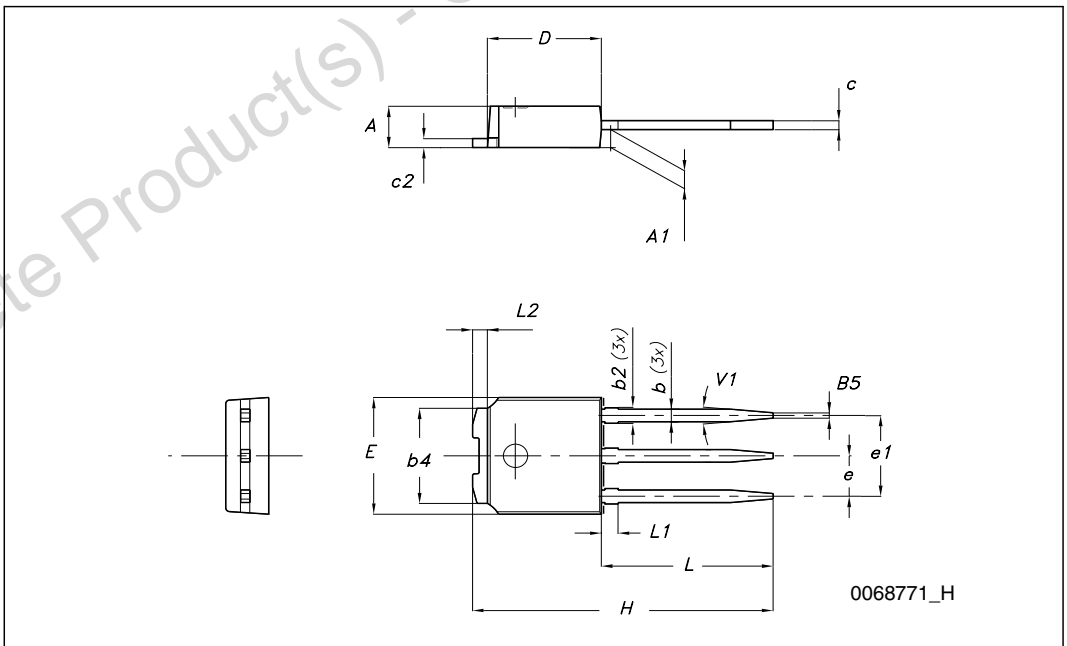
4 Package mechanical data

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.

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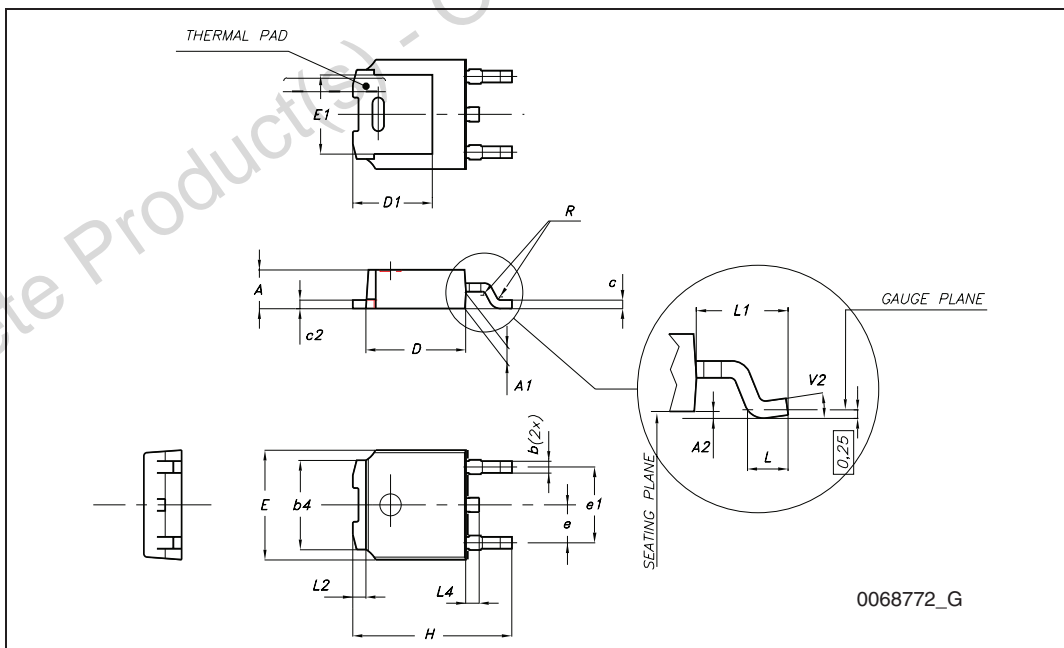
TO-251 (IPAK) mechanical data

DIM.	mm.		
	min.	typ	max.
A	2.20		2.40
A1	0.90		1.10
b	0.64		0.90
b2			0.95
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
E	6.40		6.60
e		2.28	
e1	4.40		4.60
H		16.10	
L	9.00		9.40
(L1)	0.80		1.20
L2		0.80	
V1		10°	



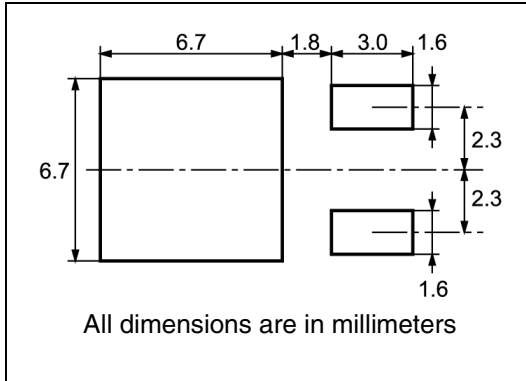
TO-252 (DPAK) mechanical data

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 8. Document revision history

Date	Revision	Changes
24-Jul-2008	1	Initial release
23-Sep-2008	2	V_{GS} value has been changed on Table 2 and Table 5
10-Sep-2009	3	Document status promoted from preliminary data to datasheet.

Obsolete Product(s) - Obsolete Product(s)

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