



STD40N2LH5 STU40N2LH5

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

Preliminary Data

Features

Type	V _{DSS}	R _{DS(on)} max	I _D
STD40N2LH5	25 V	0.012 Ω	40 A
STU40N2LH5	25 V	0.0126 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 product utilizes the 5th generation of design rules of ST's proprietary STripFET™ technology. The lowest available R_{DS(on)}*Q_g, in the standard packages, makes this device suitable for the most demanding DC-DC converter applications, where high power density is to be achieved.

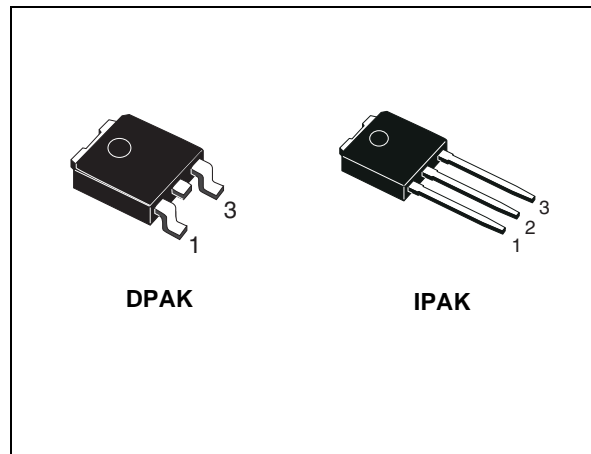


Figure 1. Internal schematic diagram

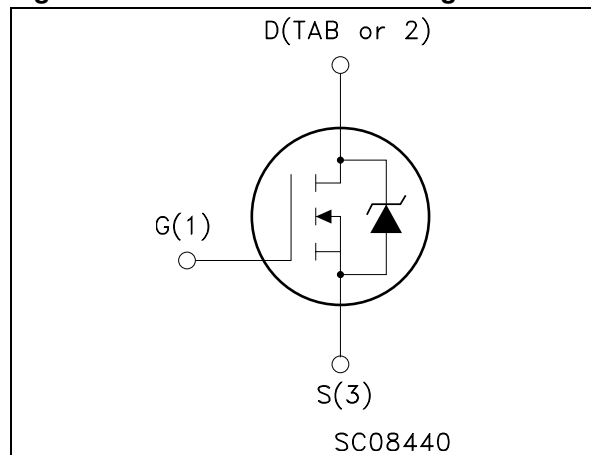


Table 1. Device summary

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

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	TBD	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
Rthj-case	Thermal resistance junction-case max	4.3	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal resistance junction-case max	100	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

2 Electrical characteristics

(T_{CASE} = 25°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 μA, 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 °C			1 10	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{GS} = ± 22 V			±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1			V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10 V, I _D = 20 A SMD version		0.01	0.012	Ω
		V _{GS} = 10 V, I _D = 20 A		0.0106	0.0126	Ω
		V _{GS} = 5 V, I _D = 20 A SMD version		0.0135	0.017	Ω
		V _{GS} = 5 V, I _D = 20 A		0.0141	0.0176	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 25 V, f=1 MHz, V _{GS} = 0		840		pF
C _{oss}	Output capacitance			180		pF
C _{rss}	Reverse transfer capacitance			29		pF
Q _g	Total gate charge	V _{DD} = 15 V, I _D = 40 A		8		nC
Q _{gs}	Gate-source charge	V _{GS} = 5 V		TBD		nC
Q _{gd}	Gate-drain charge	(Figure 3)		TBD		nC
Q _{gs1}	Pre V _{th} gate-to-source charge	V _{DD} = 15 V, I _D = 40 A		TBD		nC
Q _{gs2}	Post V _{th} gate-to-source charge	V _{GS} = 5 V (Figure 8)		TBD		nC
R _G	Gate input resistance	f=1 MHz gate bias Bias= 0 test signal level=20 mV open drain		1.1		Ω

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	$V_{DD}= 10\text{ V}$, $I_D= 20\text{ A}$, $R_G= 4.7\ \Omega$, $V_{GS}= 10\text{ V}$ <i>(Figure 2 and Figure 7)</i>		TBD TBD		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}= 10\text{ V}$, $I_D= 20\text{ A}$, $R_G= 4.7\ \Omega$, $V_{GS}= 10\text{ V}$ <i>(Figure 2 and Figure 7)</i>		TBD TBD		ns ns

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} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}= 40\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}= 20\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$ <i>(Figure 4)</i>		TBD TBD TBD		ns nC A

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

3 Test circuits

Figure 2. Switching times test circuit for resistive load

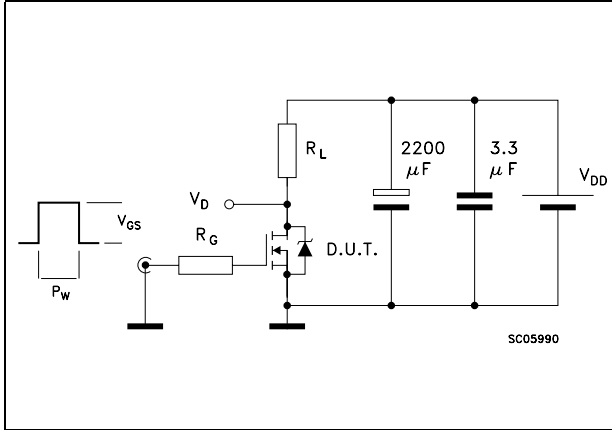


Figure 3. Gate charge test circuit

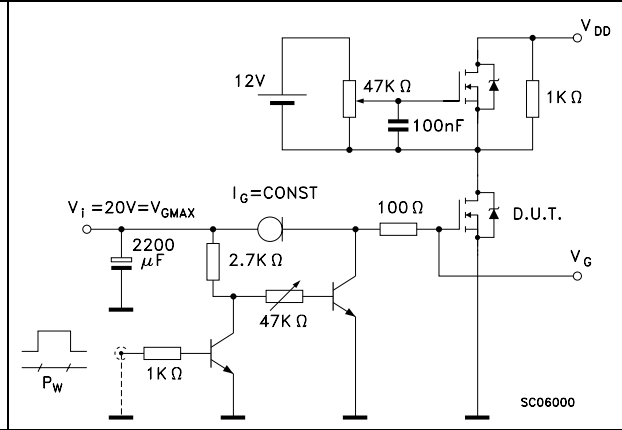


Figure 4. Test circuit for inductive load switching and diode recovery times

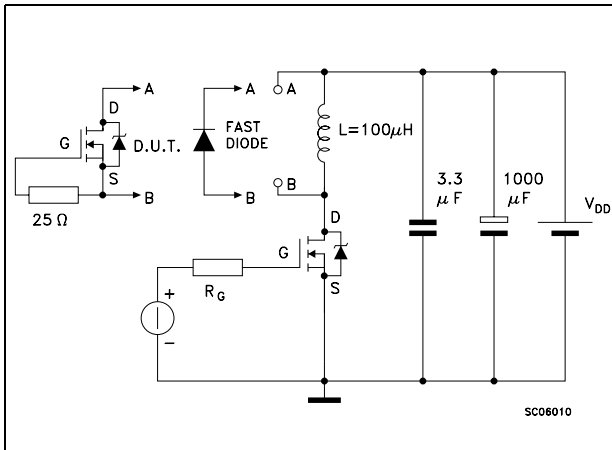


Figure 5. Unclamped Inductive load test circuit

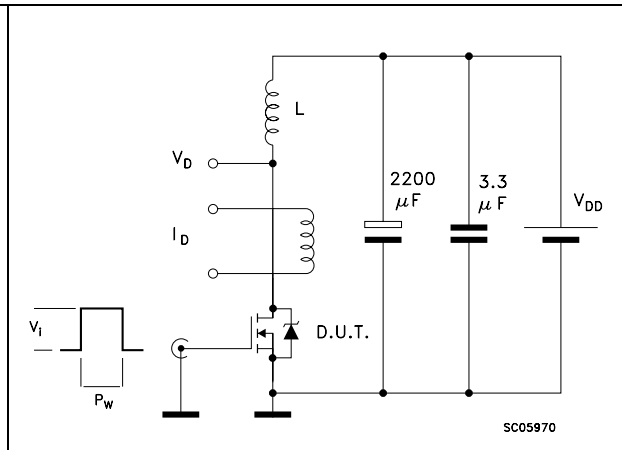


Figure 6. Unclamped inductive waveform

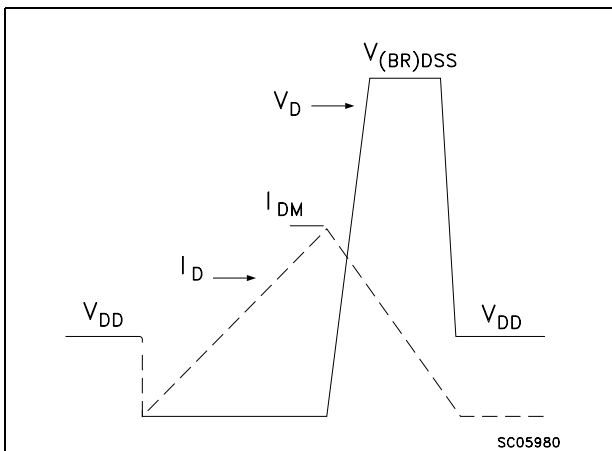


Figure 7. Switching time waveform

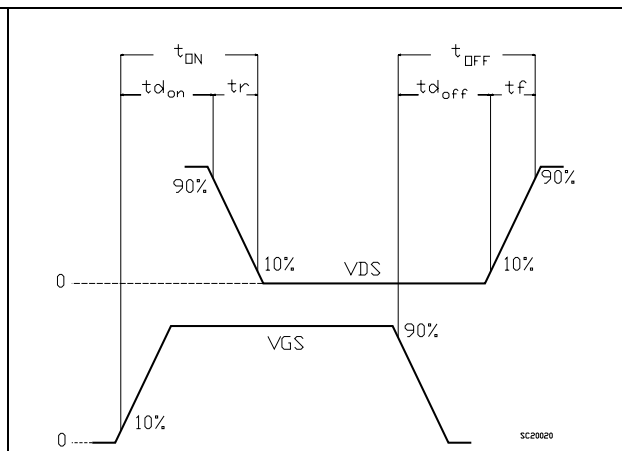
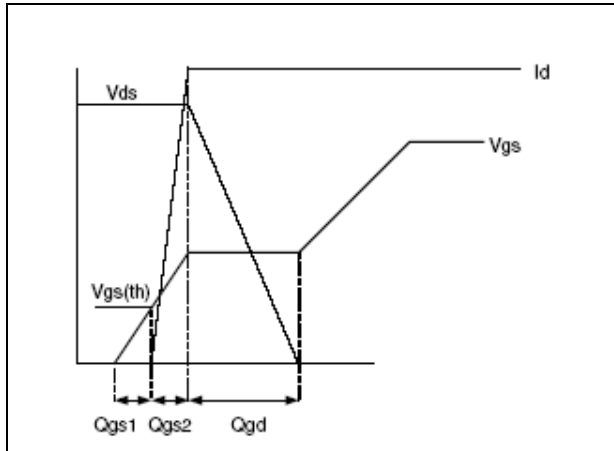


Figure 8. Gate charge waveform

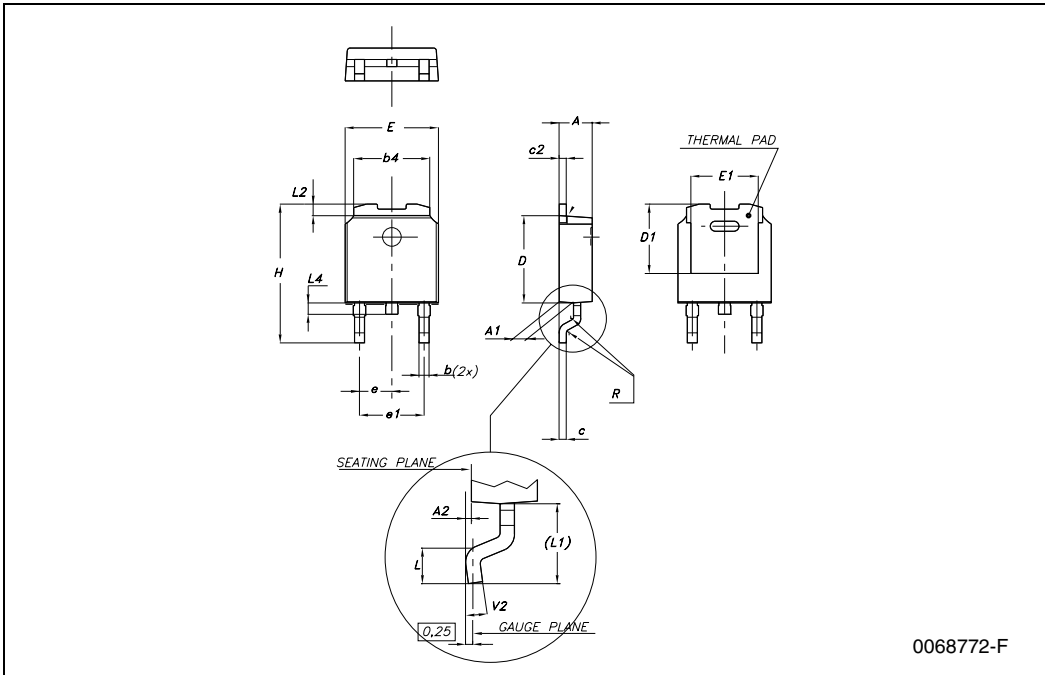


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

DPAK MECHANICAL DATA

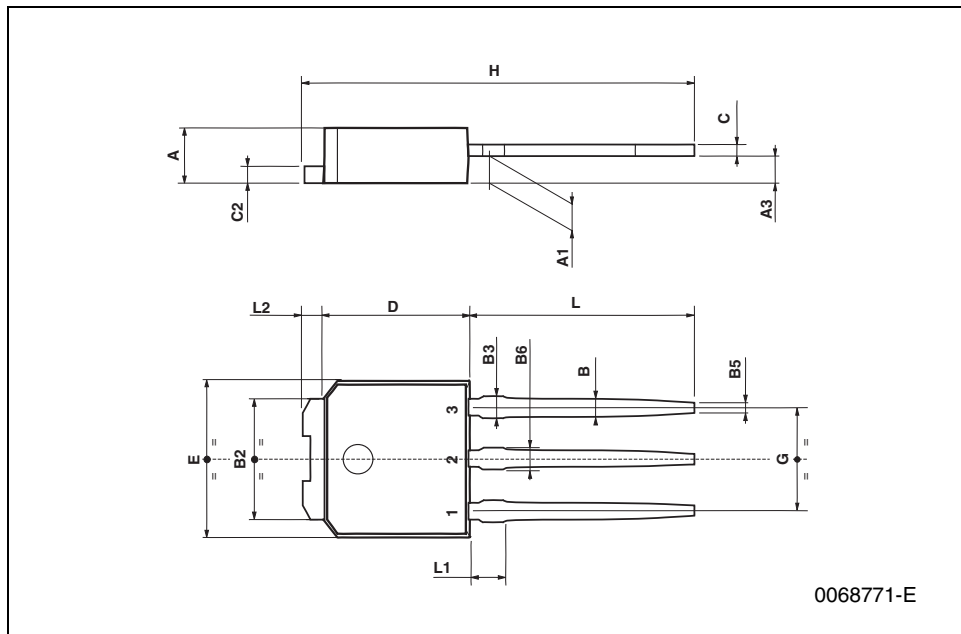
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



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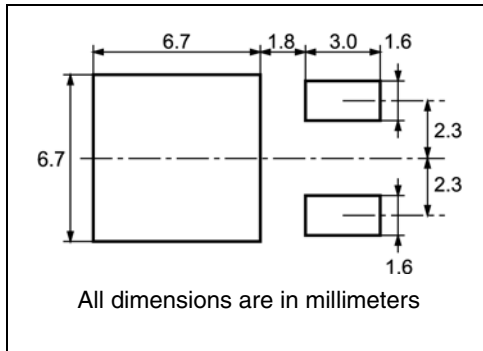
TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT

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

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

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

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