



# STP30NM30N

N-channel 300V - 0.078Ω - 30A - TO-220  
Ultra low gate charge MDmesh™ II Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP30NM30N	300V	<0.090Ω	30A

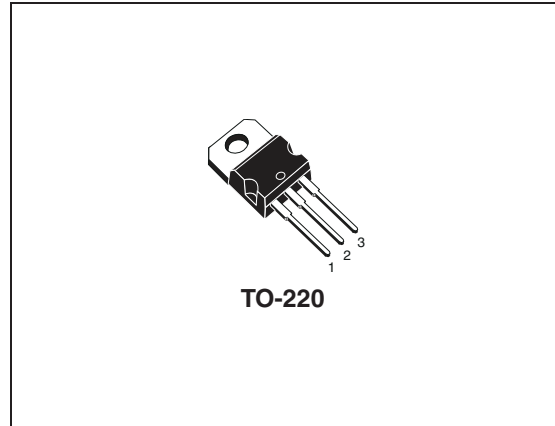
- Worldwide lowest gate charge
- High dv/dt avalanche capabilities
- Low input capacitance
- Low gate resistance

## Description

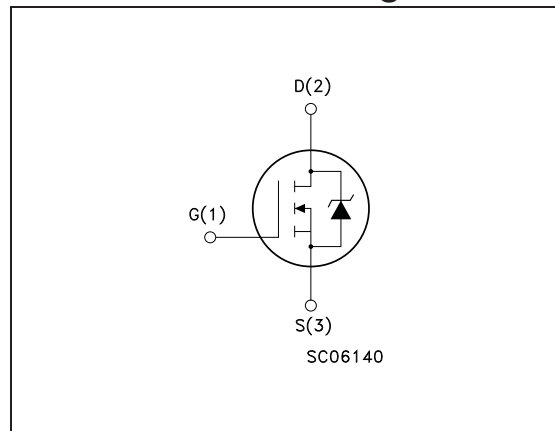
This 300V Power MOSFET with a new advanced layout brings all unique advantages of MDmesh™ technology to medium voltages. The device exhibits worldwide lowest gate charge for any given on-resistance. Its use is therefore ideal as primary side switch for DC-DC converters as well as for switch mode power supply allowing higher efficiencies and system miniaturization.

## Application

- Switching application



## Internal schematic diagram



## Order code

Part number	Marking	Package	Packaging
STP30NM30N	P30NM30N	TO-220	Tube

## Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	300	V
$V_{GS}$	Gate- source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	30	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	18.5	A
$I_{DM}^{(1)}$	Drain current (pulsed)	120	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	160	W
	Derating factor	1.28	W/°C
dv/dt	Peak diode recovery voltage slope	18	V/ns
$T_j$ $T_{stg}$	Operating junction temperature Storage temperature	-65 to 150	°C

1.  $I_{SD} \leq 30\text{A}$ ,  $di/dt \leq 400\text{A}/\mu\text{s}$ ,  $V_{DD} = 80\%V_{(BRDSS)}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.78	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5	°C/W

**Table 3. Avalanche characteristics**

Symbol	Parameter	Max value	Unit
$I_{AR}$	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_j$ max)	15	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{V}$ )	900	mJ

## 2 Electrical characteristics

(T<sub>case</sub> = 25°C unless otherwise specified)

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 1mA, V <sub>GS</sub> = 0	300			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating V <sub>DS</sub> = Max rating, T <sub>C</sub> =125°C			1 100	μA μA
I <sub>GSS</sub>	Gate-body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20V			100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2	3	4	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A		0.075	0.090	Ω

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> <sup>(1)</sup>	Forward transconductance	V <sub>DS</sub> = 15V, I <sub>D</sub> = 15A		9		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> = 50V, f = 1 MHz, V <sub>GS</sub> = 0		2500 500 70		pF pF pF
R <sub>g</sub>	Gate input resistance	f=1MHz Gate DC Bias=0 Test signal level=20mV open drain		1.7		Ω
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> = 240V, I <sub>D</sub> = 30A, V <sub>GS</sub> = 10V (see Figure 13)		75 15 40		nC nC nC

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

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 150V, I_D = 15A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ <i>(see Figure 12)</i>		25		ns
$t_r$	Rise time			25		ns
$t_{d(off)}$	Turn-off-delay time			65		ns
$t_f$	Fall time			25		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current				30	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				120	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 30A, V_{GS} = 0$			1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 30A, di/dt = 100A/\mu s$ $V_{DD} = 200V, T_j = 25^\circ C$ <i>(see Figure 17)</i>		350		ns
$Q_{rr}$	Reverse recovery charge			5		$\mu C$
$I_{RRM}$	Reverse recovery current			30		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

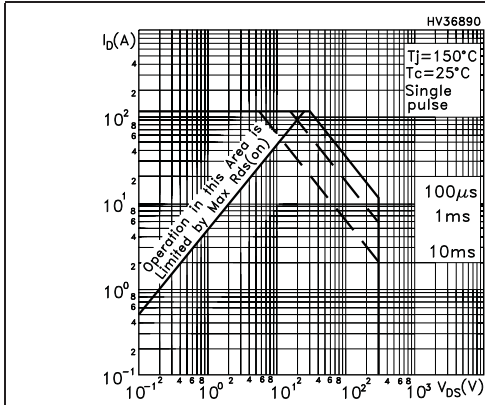


Figure 2. Thermal impedance

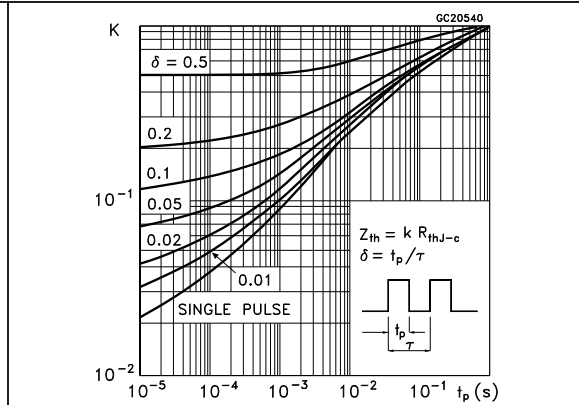


Figure 3. Output characteristics

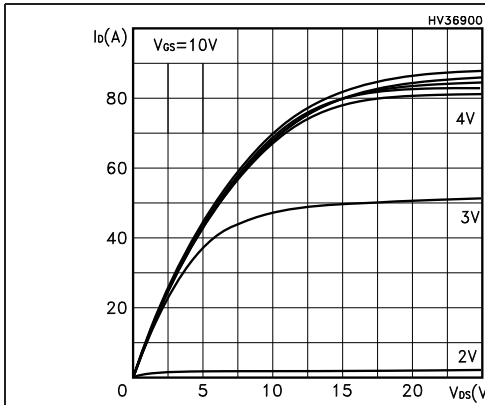


Figure 4. Transfer characteristics

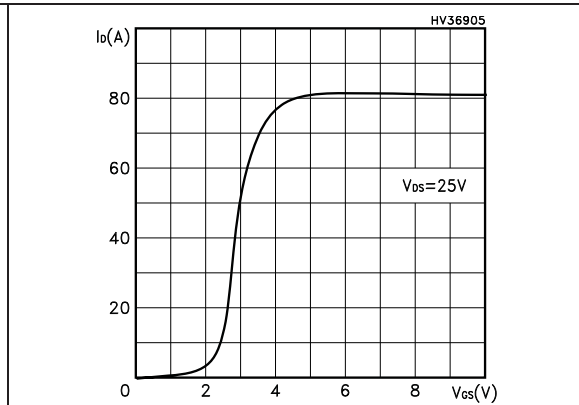


Figure 5. Normalized  $B_{V_{DS}}$  vs temperature

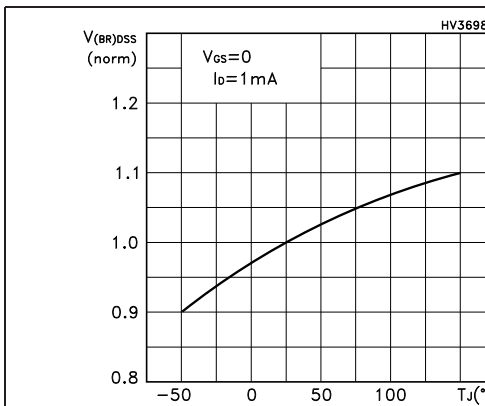


Figure 6. Static drain-source on resistance

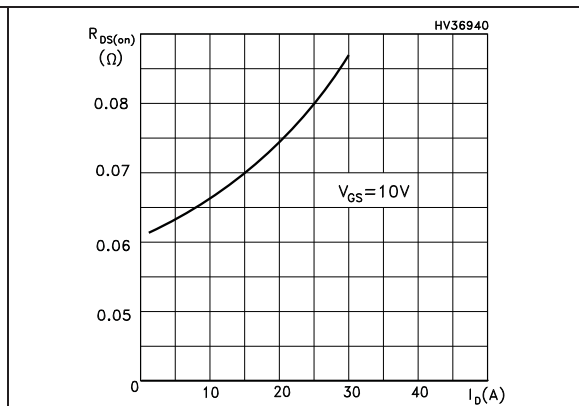


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

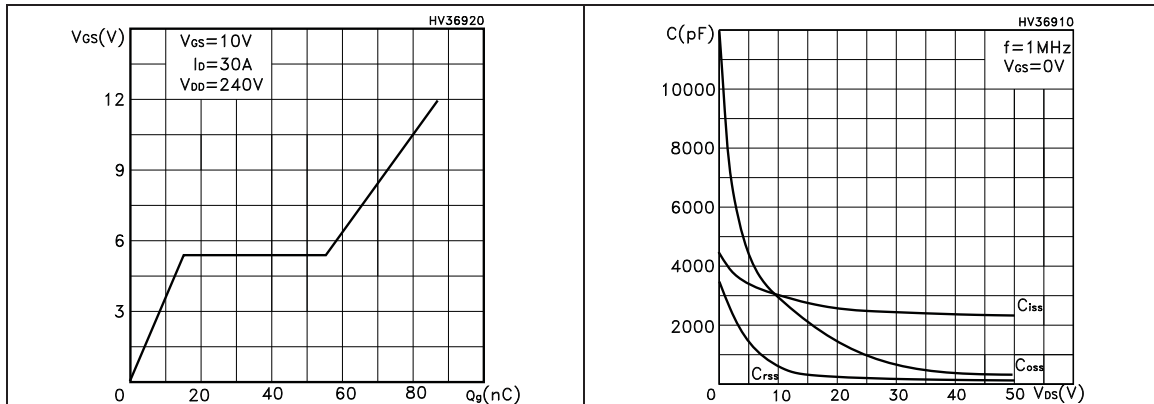


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

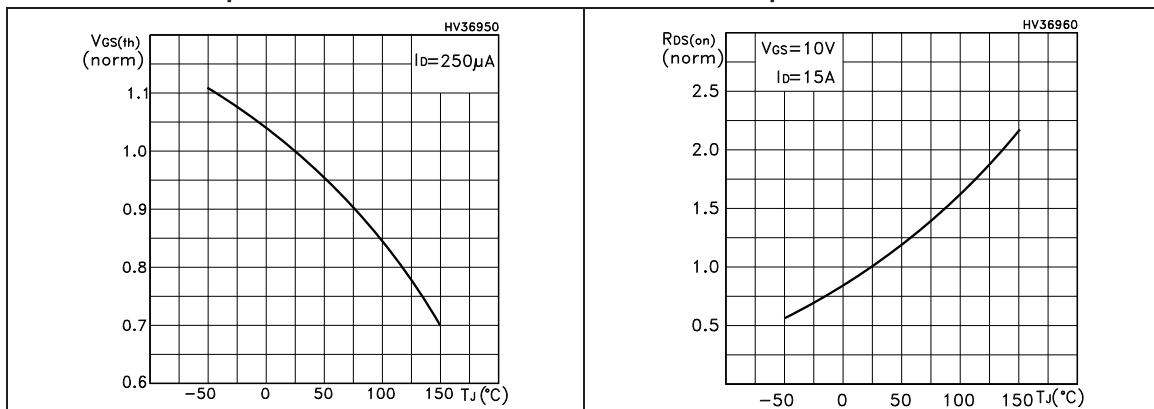
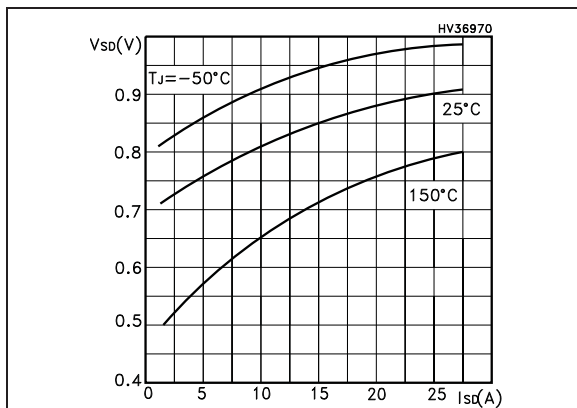


Figure 11. Source-drain diode forward characteristics



### 3 Test circuits

Figure 12. Switching times test circuit for resistive load

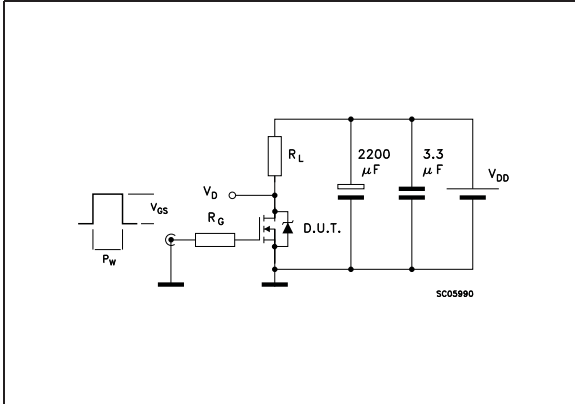


Figure 13. Gate charge test circuit

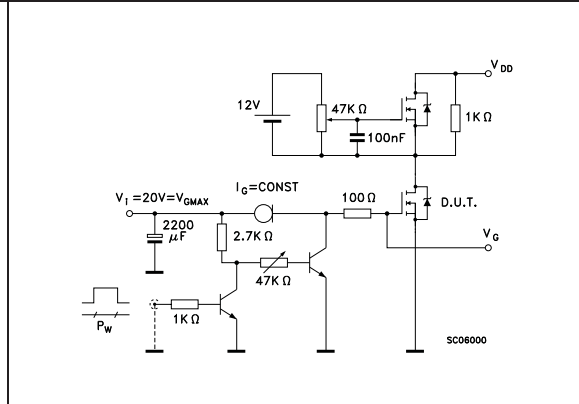


Figure 14. Test circuit for inductive load switching and diode recovery times

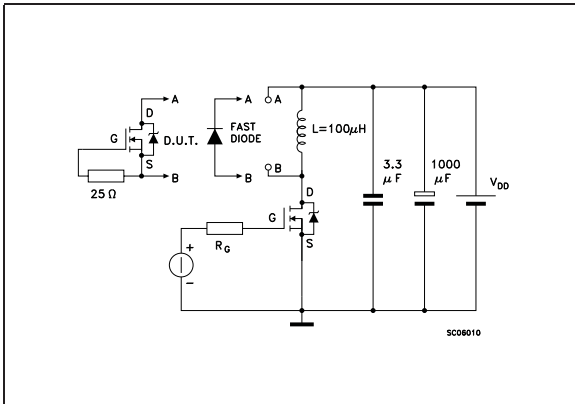


Figure 15. Unclamped inductive load test circuit

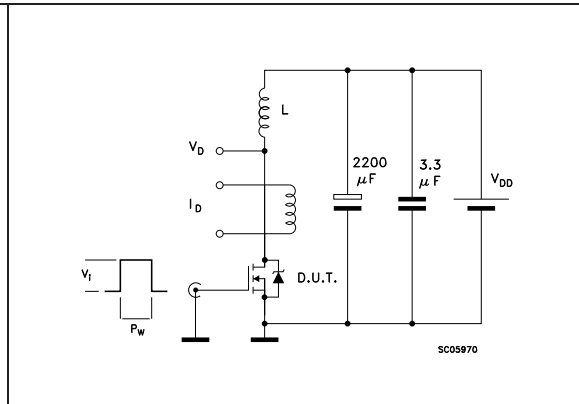


Figure 16. Unclamped inductive waveform

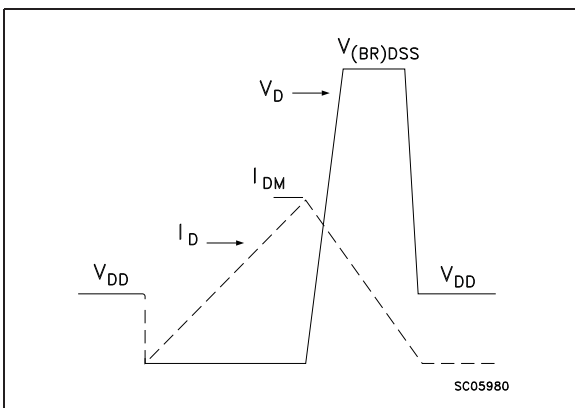
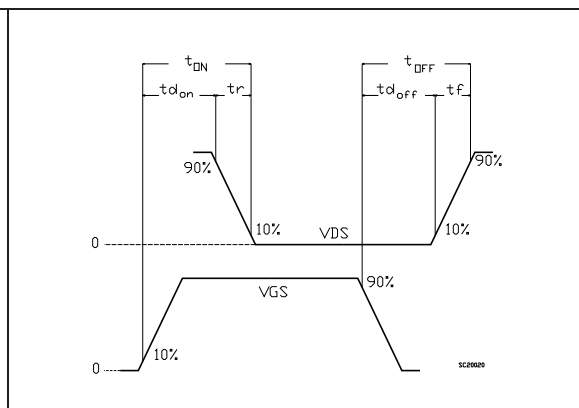


Figure 17. Switching time waveform



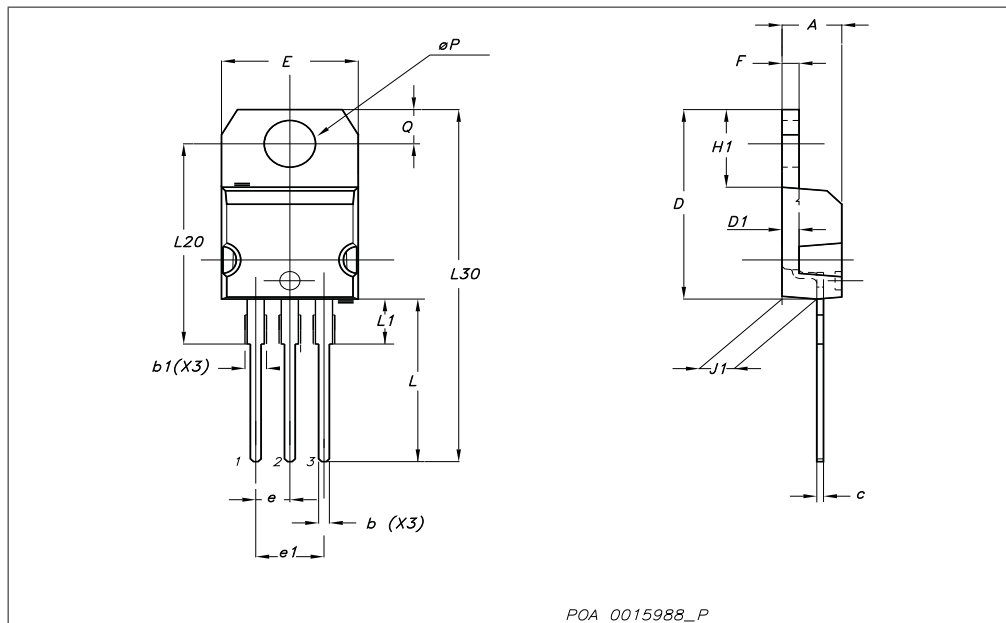


## 4 Package mechanical data

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](http://www.st.com)

TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



## 5 Revision history

Table 8. Revision history

Date	Revision	Changes
16-Apr-2007	1	First release

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