



# STP62NS04Z

## N-CHANNEL CLAMPED 12mΩ - 40A TO-220 FULLY PROTECTED MESH OVERLAY™ MOSFET

ADVANCED DATA

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP62NS04Z	CLAMPED	< 0.014 Ω	40 A (*)

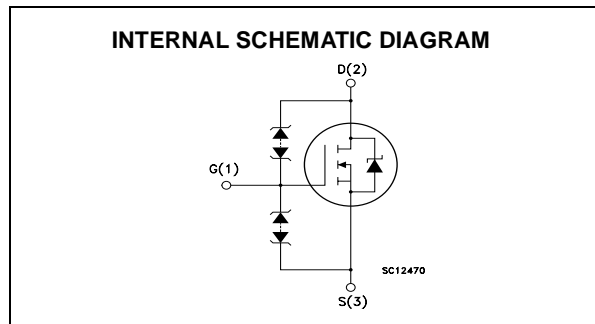
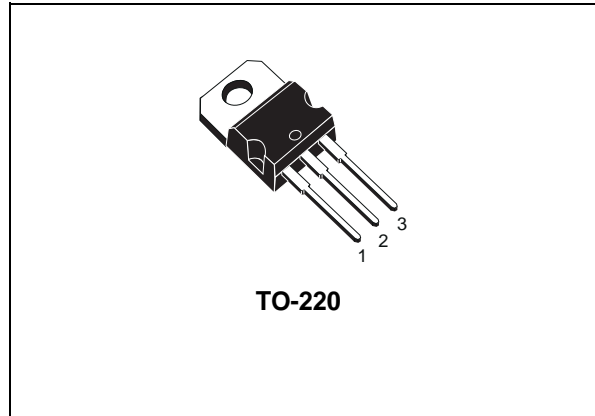
- TYPICAL R<sub>DS(on)</sub> = 0.012 Ω
- 100% AVALANCHE TESTED
- LOW CAPACITANCE AND GATE CHARGE
- 175°C MAXIMUM JUNCTION TEMPERATURE

### DESCRIPTION

This fully clamped MOSFET is produced by using the latest advanced Company's Mesh Overlay process which is based on a novel strip layout. The inherent benefits of the new technology coupled with the extra clamping capabilities make this product particularly suitable for the harshest operation conditions such as those encountered in the automotive environment. Any other application requiring extra ruggedness is also recommended.

### APPLICATIONS

- ABS, SOLENOID DRIVERS
- POWER TOOLS



### ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP62NS04Z	P62NS04Z	TO-220	TUBE

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## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	CLAMPED	V
V <sub>DG</sub>	Drain-gate Voltage	CLAMPED	V
V <sub>GS</sub>	Gate- source Voltage	CLAMPED	V
I <sub>D</sub> (*)	Drain Current (continuous) at T <sub>C</sub> = 25°C	40	A
I <sub>D</sub> (*)	Drain Current (continuous) at T <sub>C</sub> = 100°C	40	A
I <sub>DG</sub>	Drain Gate Current (continuous)	± 50	mA
I <sub>GS</sub>	Gate Source Current (continuous)	± 50	mA
I <sub>DM</sub> (•)	Drain Current (pulsed)	160	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	110	W
	Derating Factor	0.74	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	5	V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	500	mJ
V <sub>ESD</sub>	ESD(HBM-C=100 pF, R=1.5 KΩ)	8	kV
T <sub>stg</sub>	Storage Temperature	- 55 to 175	°C
T <sub>j</sub>	Operating Junction Temperature		

(•)Pulse width limited by safe operating area

(\*) Current Limited by Package

(1) I<sub>SD</sub> ≤ 40A, di/dt ≤ 100A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.

(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 20A, V<sub>DD</sub> = 20 V

## THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case Max	1.36	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient Max	62.5	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose (1.6mm from case, for 10sec)	300	°C

## ELECTRICAL CHARACTERISTICS (T<sub>CASE</sub> = 25°C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Clamped Voltage	I <sub>D</sub> = 1 mA, V <sub>GS</sub> = 0	33			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 16 V			TBD	μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±10 V			TBD	μA
V <sub>GSS</sub>	Gate-Source Breakdown Voltage	I <sub>GS</sub> = ±100 μA	18			V

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		12	14	mΩ

## ELECTRICAL CHARACTERISTICS (CONTINUED)

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (1)	Forward Transconductance	$V_{DS} = 15\text{ V}$ , $I_D = 18\text{ A}$		17.5		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$		1330		pF
$C_{oss}$	Output Capacitance			420		pF
$C_{rss}$	Reverse Transfer Capacitance			135		pF

## SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$Q_g$	Total Gate Charge	$V_{DD} = 20\text{ V}$ , $I_D = 40\text{ A}$ , $V_{GS} = 10\text{ V}$		34	47	nC
$Q_{gs}$	Gate-Source Charge			10		nC
$Q_{gd}$	Gate-Drain Charge			11.5		nC

## SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off Voltage Rise Time	$V_{CLAMP} = 30\text{ V}$ , $I_D = 40\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see test circuit, Figure 5)		30		ns
$t_f$	Fall Time			54		ns
$t_c$	Cross-over Time			90		ns
$t_d$	Turn Off Delay Time			36		ns

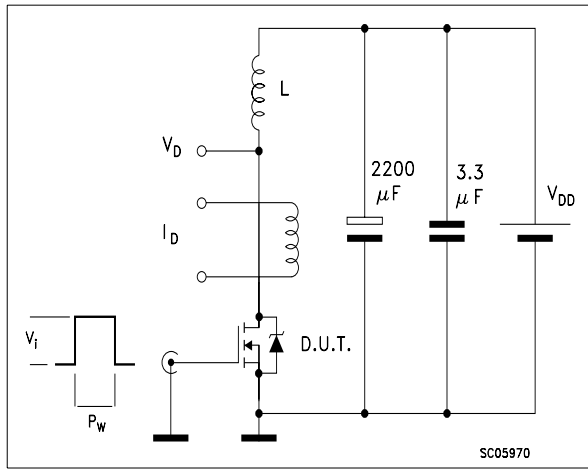
## SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				40	A
$I_{SDM}$ (2)	Source-drain Current (pulsed)				160	A
$V_{SD}$ (1)	Forward On Voltage	$I_{SD} = 40\text{ A}$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 40\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ , $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		45		ns
$Q_{rr}$	Reverse Recovery Charge			65		nC
$I_{RRM}$	Reverse Recovery Current			2.9		A

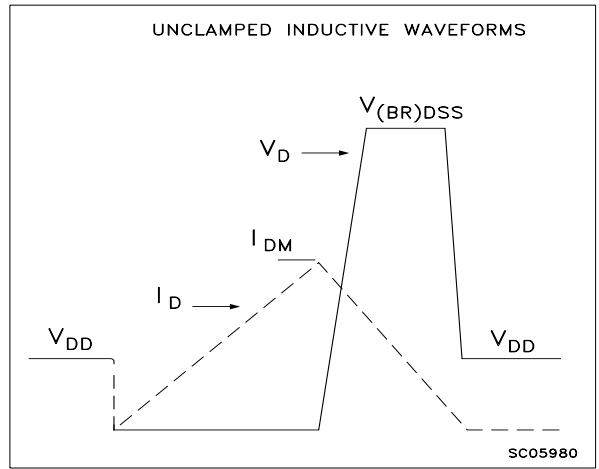
Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
2. Pulse width limited by safe operating area.

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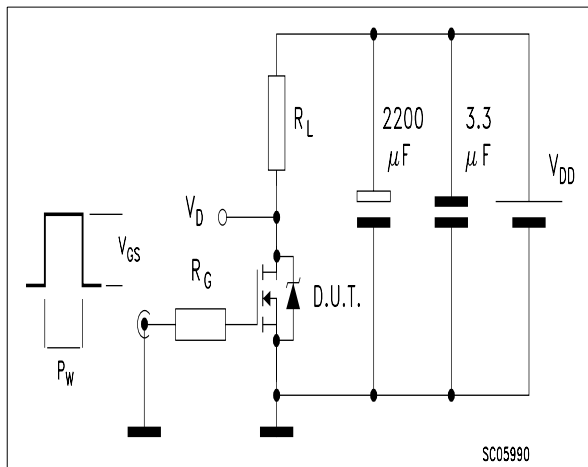
**Fig. 1: Unclamped Inductive Load Test Circuit**



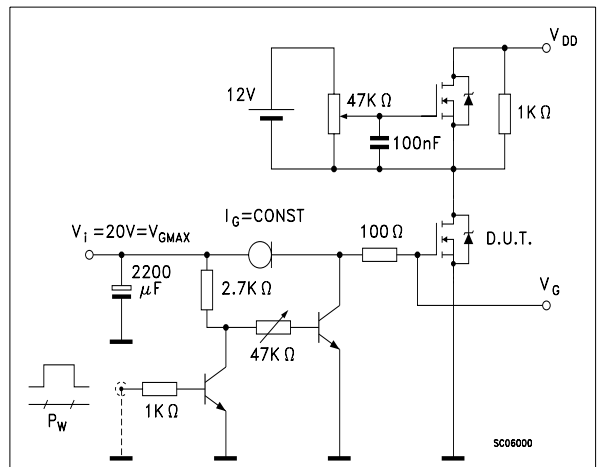
**Fig. 2: Unclamped Inductive Waveform**



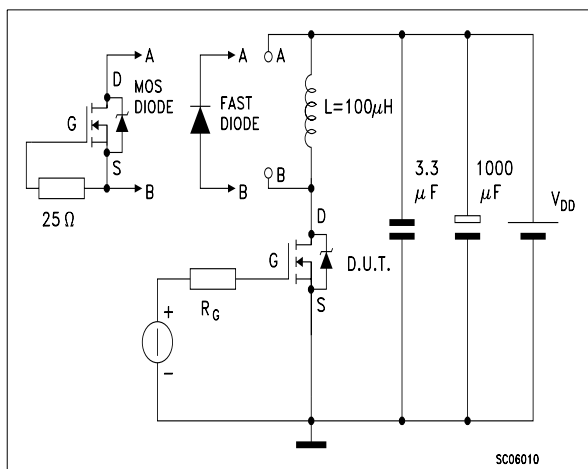
**Fig. 3: Switching Times Test Circuit For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

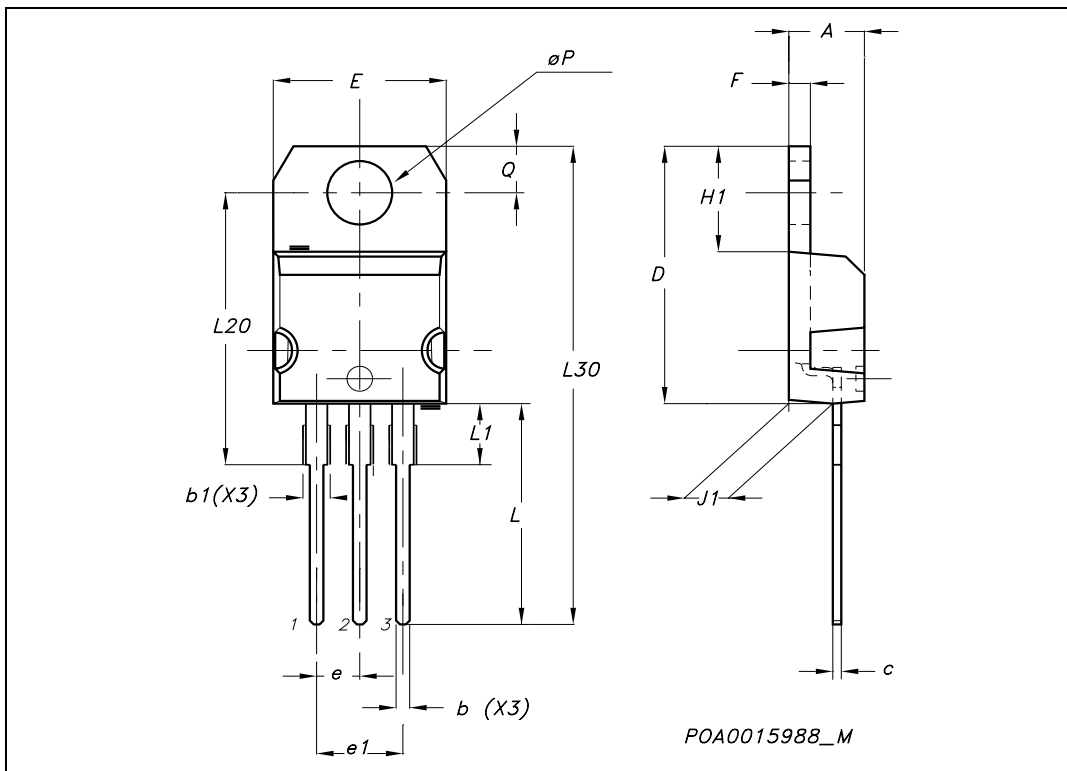


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



## 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	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
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		0.052
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	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



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