



STP130NS04ZB STW130NS04ZB

N-CHANNEL CLAMPED - 8mΩ - 80A TO-220/TO-247 FULLY PROTECTED MESH OVERLAY™ MOSFET

PRODUCT PREVIEW

Table 1: General Features

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP130NS04ZB	CLAMPED	< 0.009 Ω	80 A
STW130NS04ZB	CLAMPED	< 0.009 Ω	80 A

- TYPICAL R_{DS(on)} = 0.008 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

- HIGH SWITCHING CURRENT
- LINEAR APPLICATIONS

Figure 1: Package

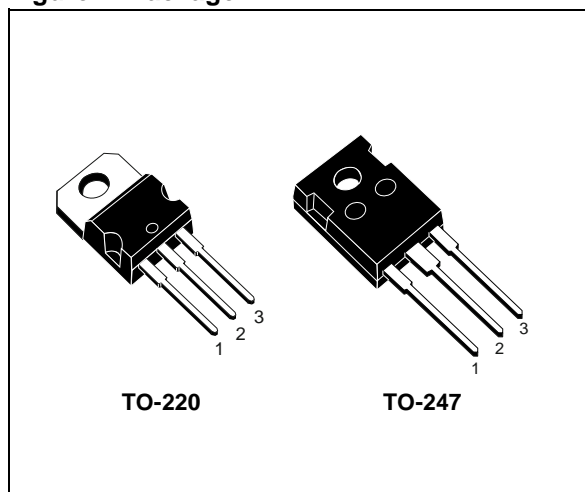


Figure 2: Internal Schematic Diagram

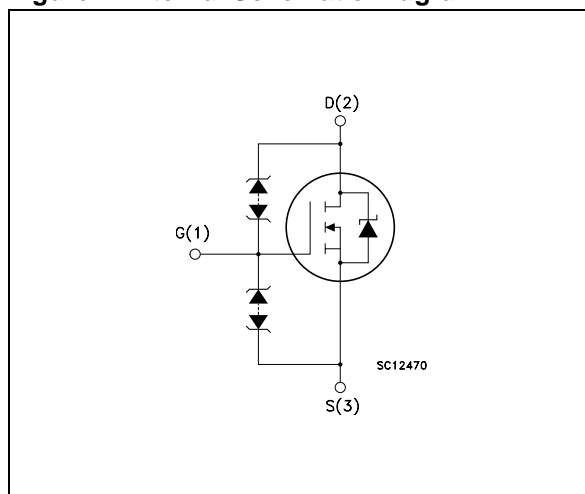


Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP130NS04ZB	P130NS04ZB	TO-220	TUBE
STW130NS04ZB	W130NS04ZB	TO-247	TUBE

Rev. 1

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	CLAMPED	V
V_{DG}	Drain-gate Voltage	CLAMPED	V
V_{GS}	Gate- source Voltage	CLAMPED	V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	80	A
I_D	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	80	A
I_{DG}	Drain Gate Current (continuous)	± 50	mA
I_{GS}	Gate Source Current (continuous)	± 50	mA
$I_{DM}(\bullet)$	Drain Current (pulsed)	320	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	300	W
	Derating Factor	2.0	W/ $^\circ\text{C}$
$V_{ESD(G-S)}$	Gate-Source ESD(HBM-C=100 pF, R=1.5 K Ω)	4	kV
$V_{ESD(G-D)}$	Gate-Drain ESD(HBM-C=100 pF, R=1.5 K Ω)	4	kV
$V_{ESD(D-S)}$	Drain-Source ESD(HBM-C=100 pF, R=1.5 K Ω)	4	kV
T_j T_{stg}	Operating Junction Temperature Storage Temperature	-55 to 175	$^\circ\text{C}$

(•) Pulse width limited by safe operating area

Table 4: Thermal Data

		TO-220	TO-247	Unit
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.50		$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5	50	$^\circ\text{C}/\text{W}$
T_l	Maximum Lead Temperature For Soldering Purpose (for 10 sec. 1,6 mm from case)	300		$^\circ\text{C}$

Table 5: Avalanche Characteristics

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	80	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 30\text{ V}$)	500	mJ

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

Table 6: Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Clamped Voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0$	33			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = 16\text{ V}$			10	μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 10\text{ V}$			10	μA
V_{GSS}	Gate-Source Breakdown Voltage	$I_{GS} = \pm 100\text{ }\mu\text{A}$	18			V

ELECTRICAL CHARACTERISTICS (CONTINUED)**Table 7: On**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10 V$, $I_D = 40 A$		8	9	m Ω

Table 8: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} = 15 V$, $I_D = 40 A$		50		S
C_{iss}	Input Capacitance	$V_{DS} = 25 V$, $f = 1 MHz$, $V_{GS} = 0$		2700		pF
C_{oss}	Output Capacitance			1275		pF
C_{rss}	Reverse Transfer Capacitance			285		pF

Table 9: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_f	Turn-on Delay Time Fall Time	$V_{DD} = 17.5 V$, $I_D = 40 A$, $R_G = 4.7 \Omega$, $V_{GS} = 10 V$ (see Figure 3)		40 220		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 20 V$, $I_D = 80 A$, $V_{GS} = 10 V$ (see Figure 5)		80 20 27	105	nC nC nC

Table 10: Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-off-Delay Time Fall Time	$V_{DD} = 17.5 V$, $I_D = 40 A$, $R_G = 4.7 \Omega$, $V_{GS} = 10 V$ (see Figure 3)		170 100		ns ns

Table 11: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				80 320	A A
V_{SD} (1)	Forward On Voltage	$I_{SD} = 80 A$, $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 80 A$, $di/dt = 100 A/\mu s$ $V_{DD} = 25 V$, $T_j = 150^\circ C$ (see Figure 4)		90 0.18 4		ns μC A

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

(2) Pulse width limited by safe operating area.

Figure 3: Switching Times Test Circuit For Resistive Load

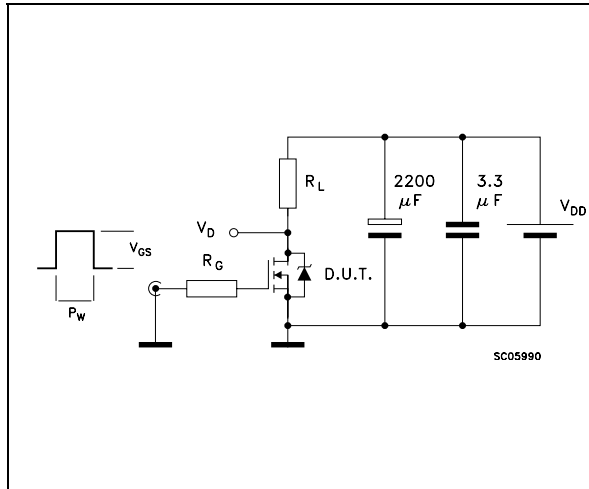


Figure 4: Test Circuit For Diode Recovery Behaviour

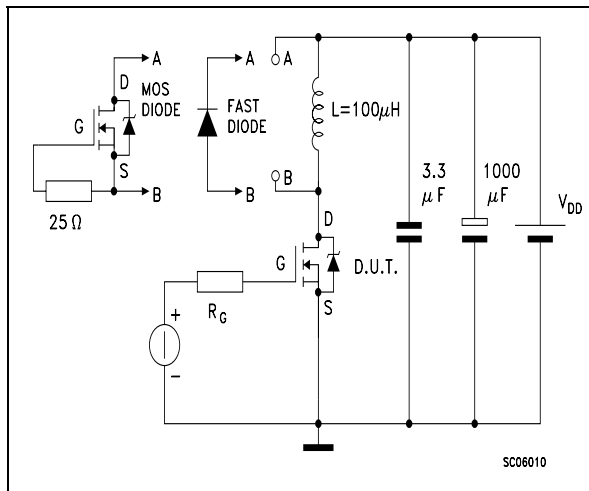
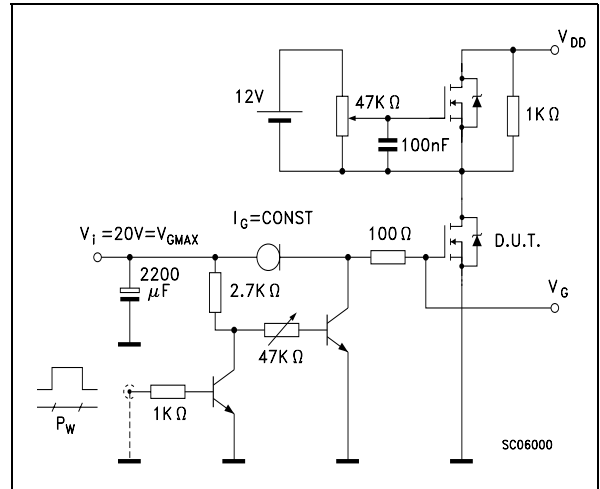
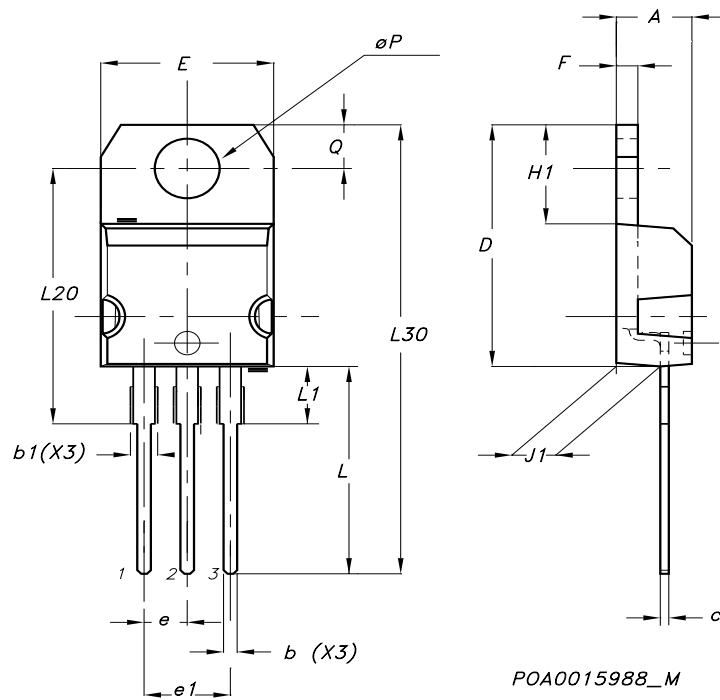


Figure 5: Gate Charge Test Circuit



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



TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	

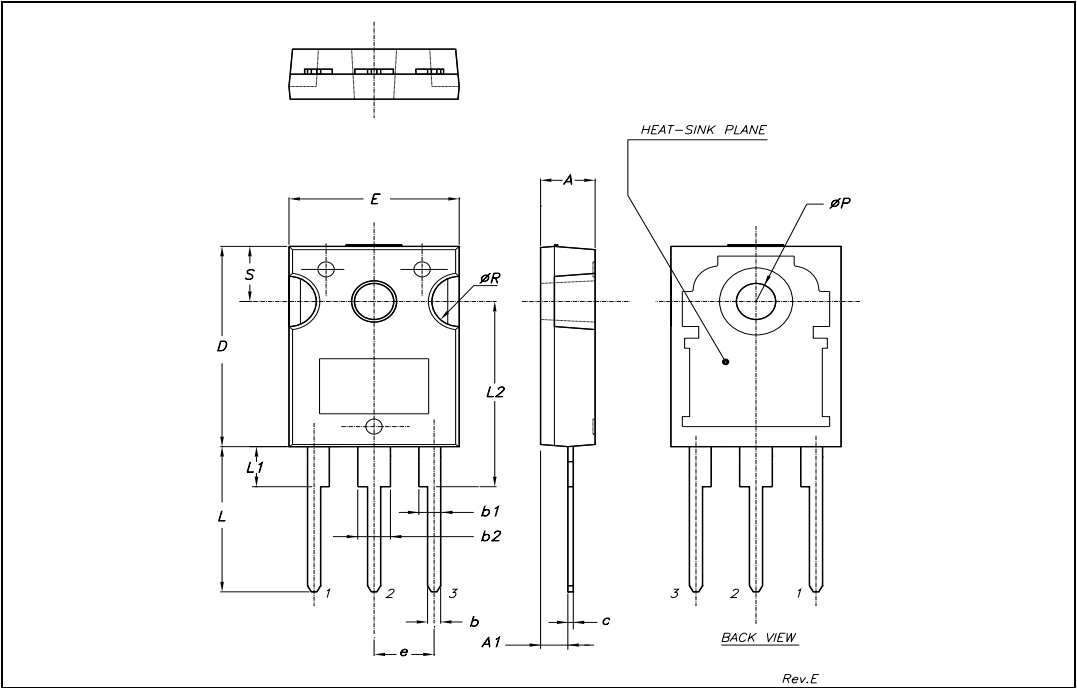


Table 12: Revision History

Date	Revision	Description of Changes
10-June-2004	1	First Release.

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