

STW9NC80Z

N-CHANNEL 800V - 0.82Ω - 9.4A TO-247 Zener-Protected PowerMESH™III MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STW9NC80Z	800 V	<0.9Ω	9.4 A

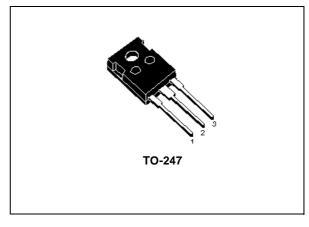
- TYPICAL $R_{DS}(on) = 0.82\Omega$
- EXTREMELY HIGH dv/dt CAPABILITY
- GATE-TO-SOURCE ZENER DIODES
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

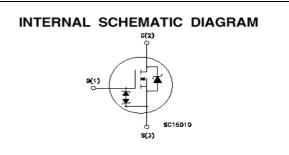


The third generation of MESH OVERLAY™ Power MOSFETs for very high voltage exhibits unsurpassed on-resistance per unit area while integrating back-to-back Zener diodes between gate and source. Such arrangement gives extra ESD capability with higher ruggedness performance as requested by a large variety of single-switch applications.



- SINGLE-ENDED SMPS IN MONITORS,
 COMPUTER AND INDUSTRIAL APPLICATION
- WELDING EQUIPMENT





ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	800	V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20 \text{ k}\Omega$)	800	V
V _{GS}	Gate- source Voltage	±25	V
I _D	Drain Current (continuous) at T _C = 25°C	9.4	Α
I _D	Drain Current (continuous) at T _C = 100°C	5.9	Α
I _{DM} (1)	Drain Current (pulsed)	38	Α
P _{TOT}	Total Dissipation at T _C = 25°C	190	W
	Derating Factor	1.52	W/°C
I_{GS}	Gate-source Current	±50	mA
V _{ESD(G-S)}	Gate source ESD(HBM-C=100pF, R=15KΩ)	4	KV
dv/dt(•)	Peak Diode Recovery voltage slope	3	V/ns
V _{ISO}	Insulation Winthstand Voltage (DC)		V
T _{stg}	Storage Temperature	-65 to 150	°C
Tj	Max. Operating Junction Temperature	150	°C

 (\bullet) Pulse width limited by safe operating area

(1) $I_{SD} \le 9.4A$, di/dt $\le 100A/\mu s$, $V_{DD} \le V_{(BR)DSS}$, $T_i \le T_{JMAX}$

September 2002

STW9NC80Z

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.66	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.1	°C/W
T _I	Maximum Lead Temperature For Soldering Purpose	300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	9.4	Α
E _{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	350	mJ

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED) OFF

Symbol	Parameter	Test Conditions N		Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0$	800			V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	I _D = 1 mA, V _{GS} = 0		1		V/°C
I _{DSS}	Zero Gate Voltage	V _{DS} = Max Rating			1	μA
	Drain Current (V _{GS} = 0)	V _{DS} = Max Rating, T _C = 125 °C			50	μΑ
IGSS	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ±20V			±10	μΑ

ON (1)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 4.7A		0.82	0.9	Ω
I _{D(on)}	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $V_{GS} = 10V$	9.4			А

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
9fs	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $I_{D} = 4.7A$		13		S
C _{iss}	Input Capacitance	$V_{DS} = 25V$, $f = 1$ MHz, $V_{GS} = 0$		3500		pF
Coss	Output Capacitance			230		pF
C _{rss}	Reverse Transfer Capacitance			25		pF

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ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON (RESISTIVE LOAD)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on Delay Time	V _{DD} = 400V, I _D = 4.5A		35		ns
t _r	Rise Time	$R_G = 4.7\Omega V_{GS} = 10V$ (see test circuit, Figure 3)		16		ns
Qg	Total Gate Charge	$V_{DD} = 640V, I_D = 9 A,$		72.2	101	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = 10V$		19.5		nC
Q_{gd}	Gate-Drain Charge			24.3		nC

SWITCHING OFF (INDUCTIVE LOAD)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 640V, I_{D} = 9 A,$		32		ns
t _f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 5)		42		ns
t _c	Cross-over Time	(See test sheart, Figure 5)		67		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain Current				9.4	Α
I _{SDM} (2)	Source-drain Current (pulsed)				38	Α
V _{SD} (1)	Forward On Voltage	I _{SD} = 9 A, V _{GS} = 0			1.6	V
t _{rr}	Reverse Recovery Time	$I_{SD} = 9 \text{ A, di/dt} = 100 \text{A/} \mu \text{s,}$		730		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 100V$, $T_j = 150$ °C (see test circuit, Figure 5)		7.2		μC
I_{RRM}	Reverse Recovery Current	(Soo tool on oait, 1 iguilo o)		19.5		Α

GATE-SOURCE ZENER DIODE

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
BV _{GSO}	Gate-Source Breakdown Voltage	Igs=± 1mA (Open Drain)	25			V
αΤ	Voltage Thermal Coefficient	T=25°C Note(3)		1.3		10 ⁻⁴ /°C
Rz	Dynamic Resistance	$I_{GS} = 50 \text{ mA}, V_{GS} = 0$		90		Ω

Note: 1. Pulsed: Pulse duration = $300 \mu s$, duty cycle 1.5 %.

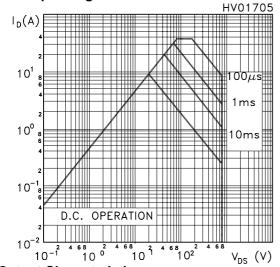
PROTECTION FEATURES OF GATE-TO-SOURCE ZENER DIODES

The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the 25V Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

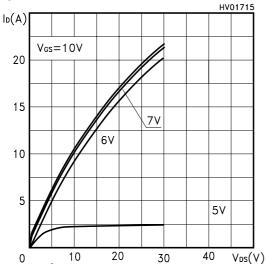
^{2.} Pulse width limited by safe operating area.

^{3.} $\Delta V_{BV} = \alpha T (25^{\circ}-T) BV_{GSO}(25^{\circ})$

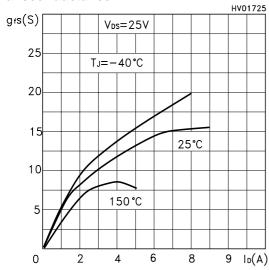
Safe Operating Area For TO-247



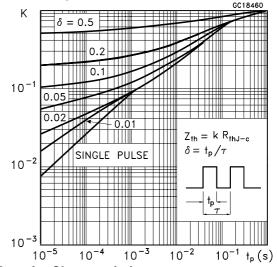
Output Characteristics



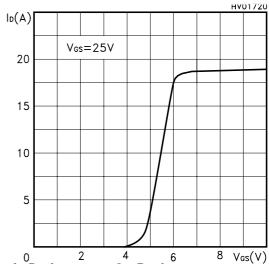
Transconductance



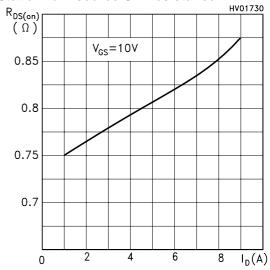
Thermal Impedance For TO-247



Transfer Characteristics

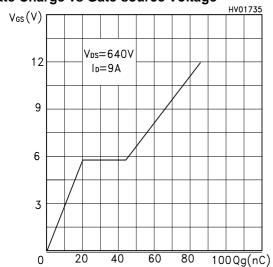


Static Drain-source On Resistance

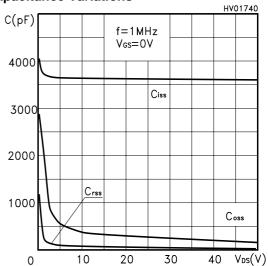


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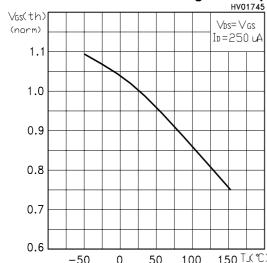
Gate Charge vs Gate-source Voltage



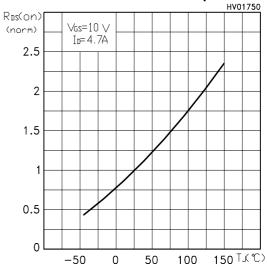
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp. HV01745



Normalized On Resistance vs Temperature



-50 0 50 100 150 T√°C) Source-drain Diode Forward Characteristics

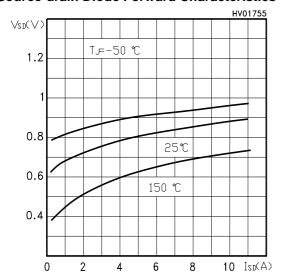


Fig. 1: Unclamped Inductive Load Test Circuit

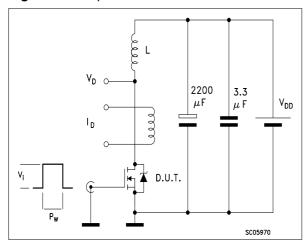


Fig. 3: Switching Times Test Circuit For Resistive Load

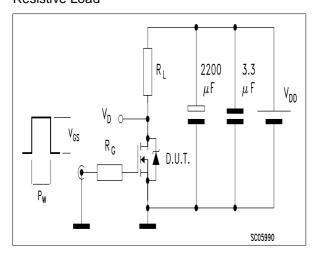


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

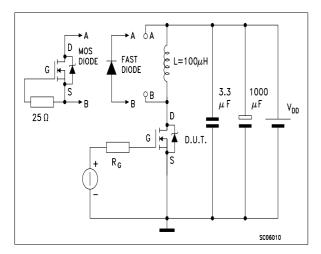


Fig. 2: Unclamped Inductive Waveform

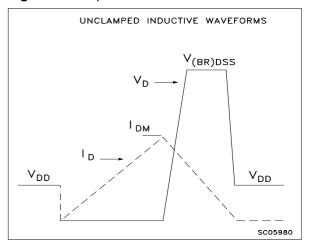
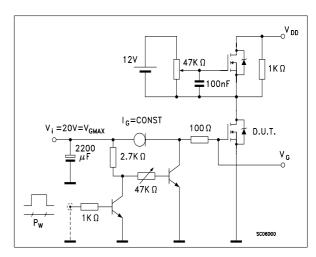


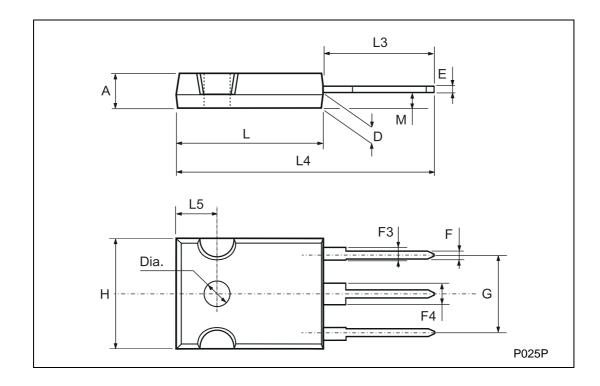
Fig. 4: Gate Charge test Circuit



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$T \cap 21$	7 6/6	:CU/		ΛІ	DATA
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DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
А	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
Е	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
Н	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559		0.582
L4		34.6			1.362	
L5		5.5			0.217	
М	2		3	0.079		0.118



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