



STW8NC80Z

N-CHANNEL 800V - 1.3 Ω - 6.7A TO-247
Zener-Protected PowerMESH™III MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STW8NC80Z	800 V	< 1.5 Ω	6.7 A

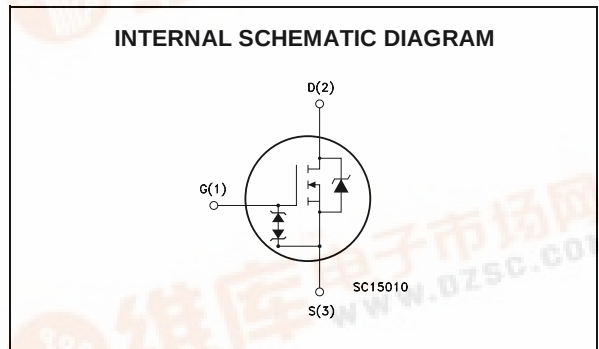
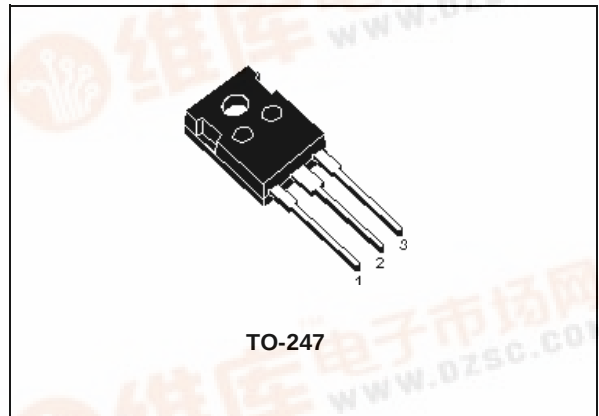
- TYPICAL R_{DS(on)} = 1.3 Ω
- EXTREMELY HIGH dv/dt CAPABILITY GATE-TO-SOURCE ZENER DIODES
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

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.

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 k Ω)	800	V
V _{GS}	Gate- source Voltage	±25	V
I _D	Drain Current (continuous) at T _C = 25°C	6.7	A
I _D	Drain Current (continuous) at T _C = 100°C	4.2	A
I _{DM} (•)	Drain Current (pulsed)	27	A
P _{TOT}	Total Dissipation at T _C = 25°C	160	W
	Derating Factor	1.28	W/°C
I _{GS}	Gate-source Current	±50	mA
V _{ESD(G-S)}	Gate source ESD(HBM-C=100pF, R=15K Ω)	3	KV
dv/dt (1)	Peak Diode Recovery voltage slope	3	V/ns
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•)Pulse width limited by safe operating area

(1)I_{SD} ≤ 6.7A, di/dt ≤ 100A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

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THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.78	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°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)	6.7	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	275	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED) OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 µA, V _{GS} = 0	800			V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	I _D = 1 mA, V _{GS} = 0		0.9		V/°C
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C			1 50	µA µA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ±20V			±10	µA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 µA	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V, I _D = 3.3 A		1.3	1.5	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)max} , I _D = 3.3 A		6		S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		2350		pF
C _{oss}	Output Capacitance			164		pF
C _{rss}	Reverse Transfer Capacitance			17		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON (RESISTIVE LOAD)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 400V$, $I_D = 3A$		33		ns
t_r	Rise Time	$R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 3)		12		ns
Q_g	Total Gate Charge	$V_{DD} = 640V$, $I_D = 6A$, $V_{GS} = 10V$		43	58	nC
Q_{gs}	Gate-Source Charge			12		nC
Q_{gd}	Gate-Drain Charge			15		nC

SWITCHING OFF (INDUCTIVE LOAD)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 640V$, $I_D = 6A$, $R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 5)		13		ns
t_f	Fall Time			13		ns
t_c	Cross-over Time			20		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				6.7	A
$I_{SDM}(2)$	Source-drain Current (pulsed)				24	A
$V_{SD}(1)$	Forward On Voltage	$I_{SD} = 6A$, $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 6A$, $di/dt = 100A/\mu s$, $V_{DD} = 100V$, $T_J = 150^\circ C$ (see test circuit, Figure 5)		680		ns
Q_{rr}	Reverse Recovery Charge			6		μC
I_{RRM}	Reverse Recovery Current			18		A

GATE-SOURCE ZENER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{GSO}	Gate-Source Breakdown Voltage	$I_{GS} = \pm 1mA$ (Open Drain)	25			V
αT	Voltage Thermal Coefficient	$T = 25^\circ C$ Note(3)		1.3		$10^{-4}/^\circ C$
R_z	Dynamic Resistance	$I_D = 20mA$, $V_{GS} = 0$		90		Ω

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

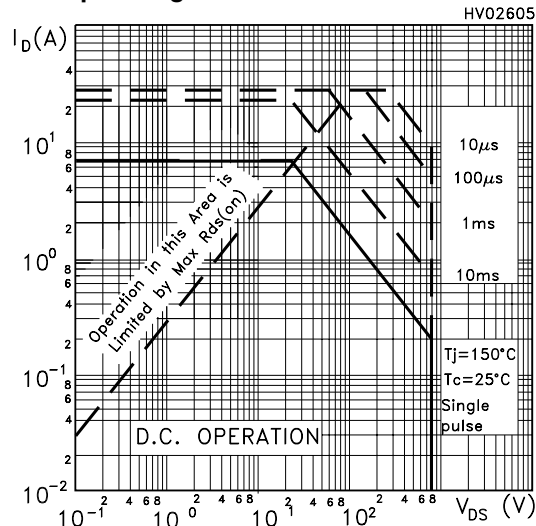
2. Pulse width limited by safe operating area.

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

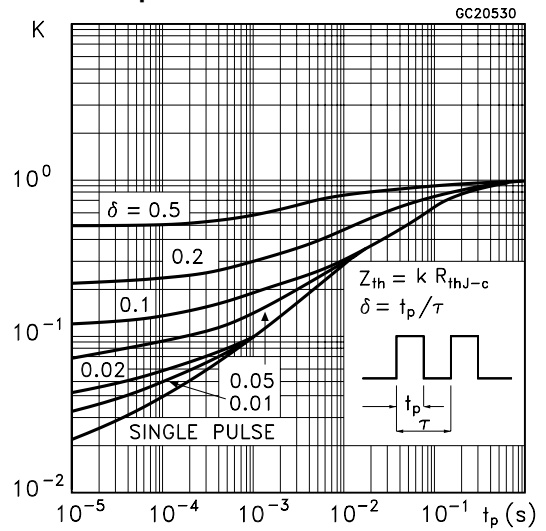
PROTECTION FEATURES OF GATE-TO-SOURCE ZENER DIODES

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.

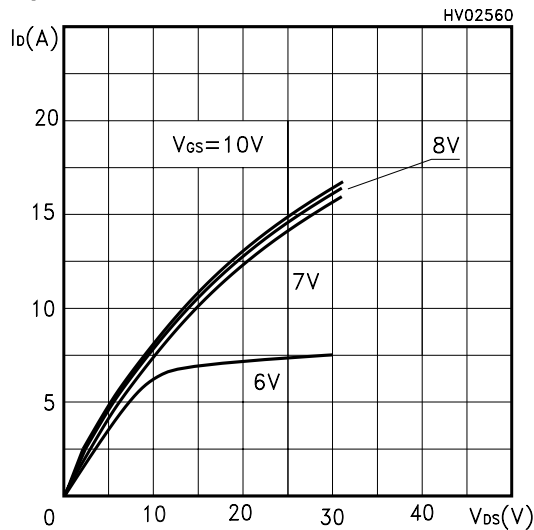
Safe Operating Area



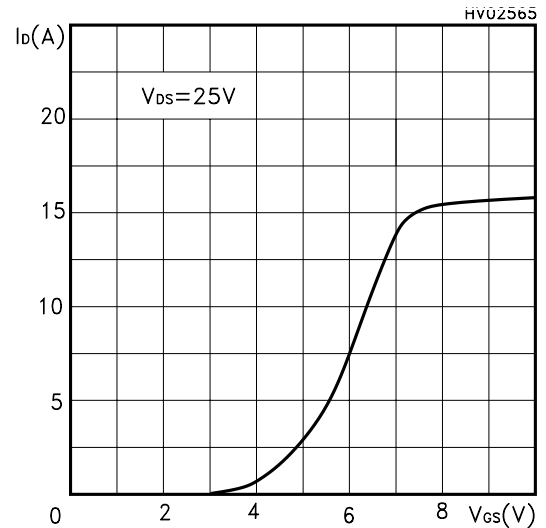
Thermal Impedance



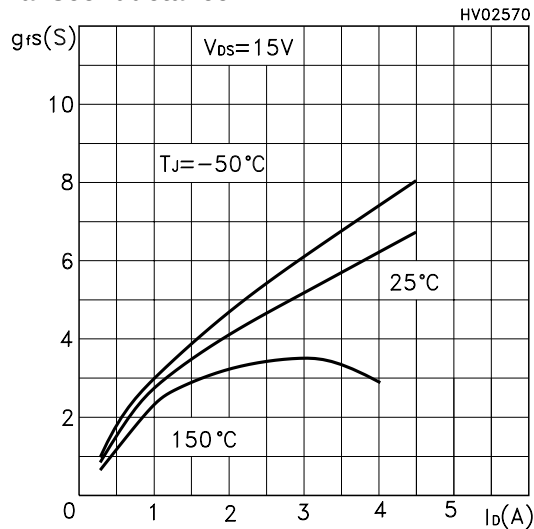
Output Characteristics



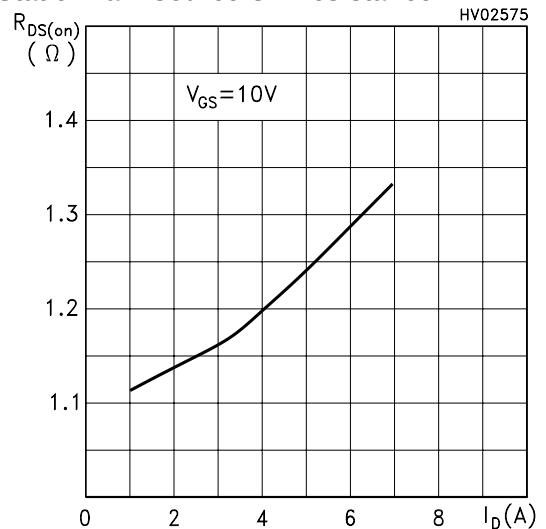
Transfer Characteristics



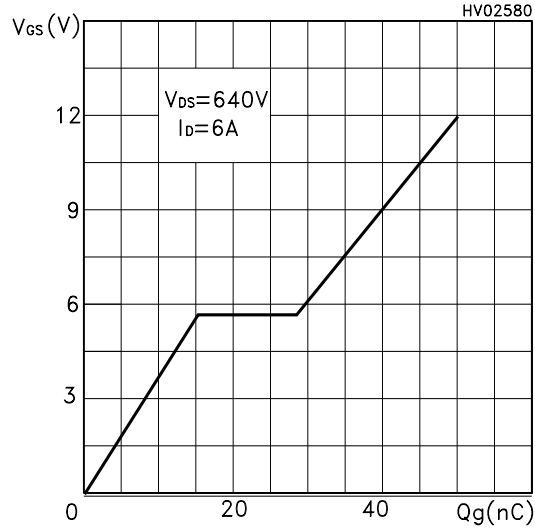
Transconductance



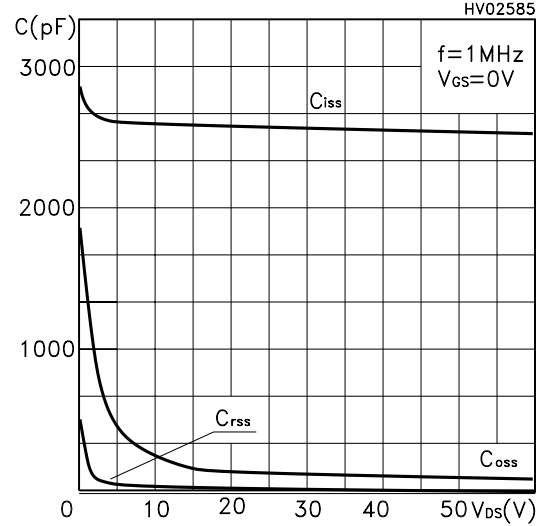
Static Drain-source On Resistance



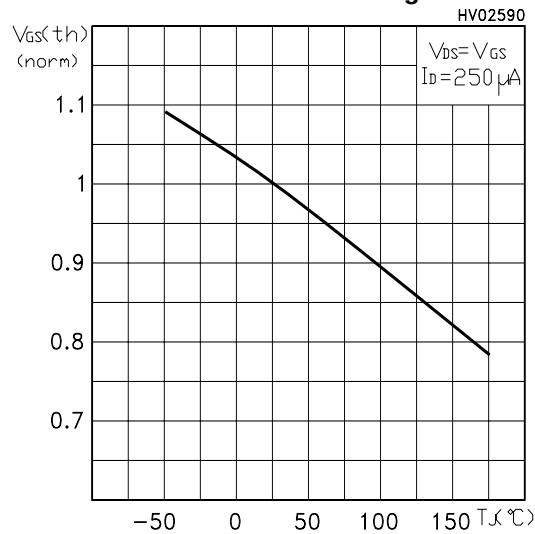
Gate Charge vs Gate-source Voltage



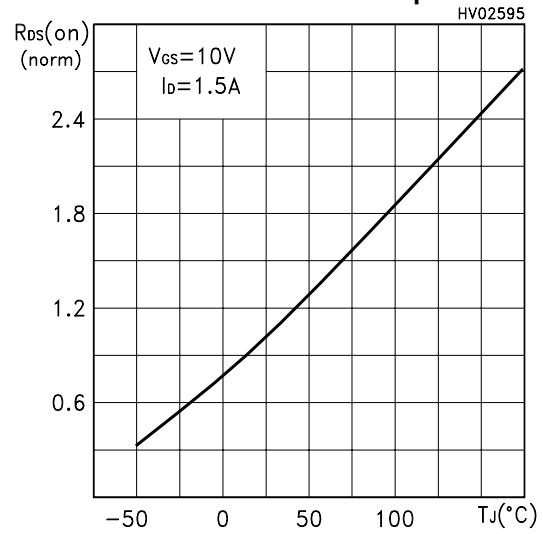
Capacitance Variations



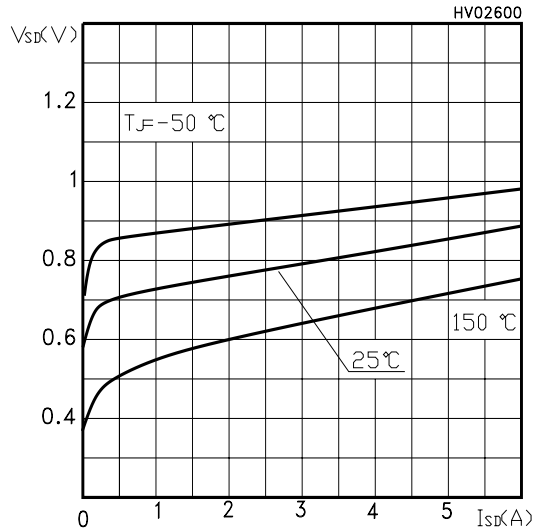
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



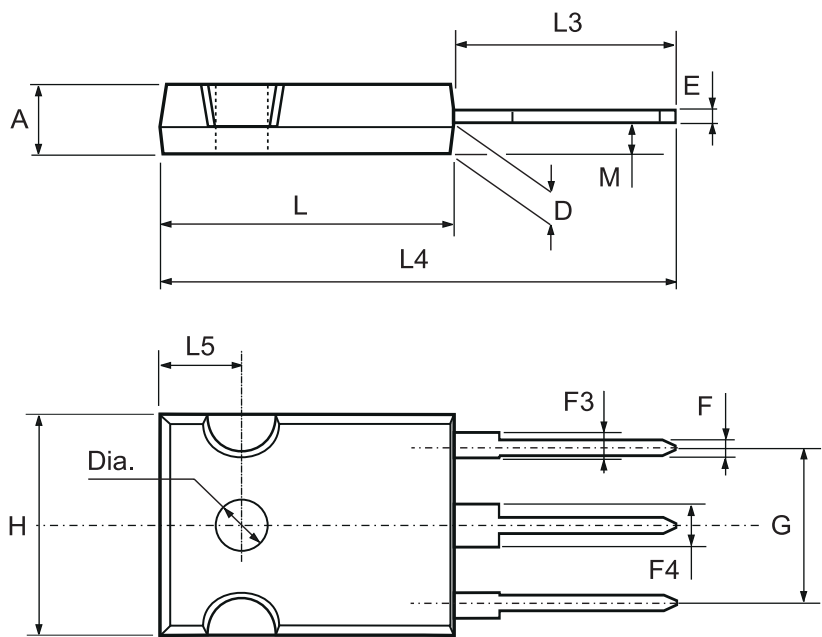
The graph illustrates the unclamped inductive waveforms for a MOSFET switching circuit. The horizontal axis represents time. The vertical axis represents voltage and current. The solid line represents the drain voltage V_D , which rises from 0 to $V_{(BR)DSS}$ during the switching transient. The dashed line represents the drain current I_D , which falls from I_{DM} to 0 during the same transient. The horizontal line at the top represents the supply voltage V_{DD} .

[illegible]

The diagram shows a MOSFET switching circuit. The MOSFET's source is grounded. Its gate is connected to a 25 Ω resistor. The drain is connected to a 25V DC source through a 25 Ω resistor. The drain is also connected to a 100 μ H inductor, which is in series with a 3.3 μ F capacitor. The inductor is also connected to a 1000 μ F capacitor and a V_{DD} source. The MOSFET is labeled 'D.U.T.' and the diode is labeled 'FAST DIODE'.

TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	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	
H	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	
M	2		3	0.079		0.118



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