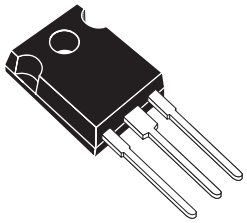
STW13NK100Z

N-channel 1000V - 0.56Ω - 13A - TO-247
Zener - Protected SuperMESH™ PowerMOSFET

General features

Type	V_{DSS} (@Tjmax)	$R_{DS(on)}$	I_D	P_W
STW13NK100Z	1000 V	< 0.70 Ω	13 A	350W

- Extremely high dv/dt capability
- 100% avalanche tested
- Gate charge minimized
- Very low intrinsic capacitances
- Very good manufacturing repeatibility



TO-247

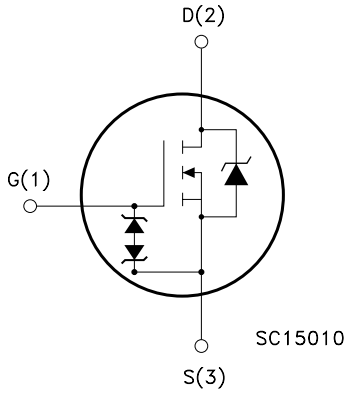
Description

The SuperMESH™ series is obtained through an extreme optimization of ST's well established strip-based PowerMESH™ layout. In addition to pushing on-resistance significantly down, special care is taken to ensure a very good dv/dt capability for the most demanding applications. Such series complements ST full range of high voltage MOSFETs including revolutionary MDmesh™ products.

Applications

- Switching application

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STW13NK100Z	W13NK100Z	TO-247	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	1000	V
V_{DGR}	Drain-gate voltage (R_{GS} = 20KΩ)	1000	V
V_{GS}	Gate-source voltage	± 30	V
I_D	Drain current (continuous) at T_C = 25°C	13	A
I_D	Drain current (continuous) at T_C=100°C	8.2	A
I_{DM}(1)	Drain current (pulsed)	52	A
P_{TOT}	Total dissipation at T_C = 25°C	350	W
	Derating Factor	2.7	W/°C
$V_{ESD\ (G-S)}$	Gate source ESD(HBM-C=100pF, R=1,5KΩ)	6000	V
dv/dt(2)	Peak diode recovery voltage slope	4	V/ns
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 150	°C

1. Pulse width limited by safe operating area
2. I_{SD} ≤8.3 A, di/dt ≤200A/µs, V_{DD} ≤$V_{(BR)DSS}$, T_j ≤T_{JMAX}

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case Max	0.36	°C/W
R_{thj-a}	Thermal resistance junction-ambient Max	50	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj Max)	13	A
E_{AS}	Single pulse avalanche energy (starting Tj=25°C, Id=Iar, Vdd=50V)	700	mJ

Table 4. Gate-source zener diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
BV_{GSO}	Gate-source breakdown voltage	Igs=± 1mA (Open Drain)	30			V

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1mA, V_{GS}= 0	1000			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating, Tc = 125°C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{GS} = 0)	V_{GS} = ± 20V			±10	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 150 µA	3	3.75	4.5	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 6.5 A		0.56	0.70	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} =15V, I_D = 6.5 A		14		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25V, f=1 MHz, V_{GS}=0		6000 455 100		pF pF pF
C_{osseq} (2).	Equivalent output capacitance	V_{GS}=0, V_{DS} =0V to 800V		227		pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Off-voltage rise time Fall time	V_{DD}=500 V, I_D= 7A, R_G=4.7Ω, V_{GS}=10V		45 35 145 45		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}=800V, I_D = 13A V_{GS} =10V		190 30 100	266	nC nC nC

1. Pulsed: pulse duration=300µs, duty cycle 1.5%
2. $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD} I_{SDM}(1)	Source-drain current Source-drain current (pulsed)				13 52	A A
V_{SD}(2)	Forward on voltage	I_{SD}=8.3A, V_{GS}=0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}=13 A, di/dt = 100A/µs, V_{DD}=100 V, Tj=25°C		820 12.7 31		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}=13 A, di/dt = 100A/µs, V_{DD}=100V, Tj=150°C		1050 17.8 34		ns µC A

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