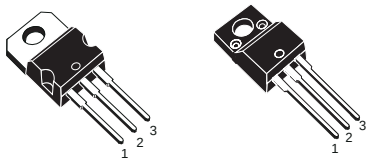
STF8NK100Z
STP8NK100Z

N-CHANNEL 1000V - 1.60Ω - 6.5A - TO-220 - TO-220FP
Zener-Protected SuperMESH™ MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D	Pw
STF8NK100Z	1000 V	<1.85Ω	6.5 A*Note* 1	40 W
STP8NK100Z	1000 V	<1.85Ω	6.5 A	160 W

- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE RATED
- IMPROVED ESD CAPABILITY
- VERY LOW INTRINSIC CAPACITANCE

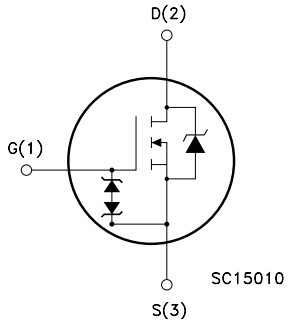


TO-220 TO-220FP

Description

The SuperMESH™ series is obtained through an extreme optimization of ST's well established stripbased 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.

Internal schematic diagram



Applications

- HIGH CURRENT,SWITCHING APPLICATION
- IDEAL FOR OFF-LINE POWER SUPPLIES

Order codes

Sales Type	Marking	Package	Packaging
STF8NK100Z	F8NK100Z	TO-220FP	TUBE
STP8NK100Z	P8NK100Z	TO-220	TUBE

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220	TO-220FP	
V_{DS}	Drain-source Voltage (V_{GS}=0)	1000		V
V_{DGR}	Drain-gate Voltage	1000		V
V_{GS}	Gate-Source Voltage	± 30		V
I_D *Note* 1	Drain Current (continuous) at T_C = 25°C	6.5	6.5	A
I_D	Drain Current (continuous) at T_C = 100°C	4.3	4.3	A
I_{DM} *Note* 2	Drain Current (pulsed)	16	16	A
P_{TOT}	Total Dissipation at T_C = 25°C	160	40	W
	Derating Factor	1.28	0.32	W/°C
$V_{ESD(G-S)}$	Gate source ESD (HBM-C=100pF, R=1.5KΩ)	4000		V
dv/dt *Note* 3	Peak Diode Recovery voltage slope	4.5		V/ns
V_{ISO}	Insulation Withstand Voltage (DC)	--	2500	V
T_j T_{stg}	Operating Junction Temperature Storage Temperature	-55 to 150		°C

Table 2. Thermal data

		TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	0.78	3.1	°C/W
Rthj-a	Thermal Resistance Junction-ambient Max	62.5		°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)	6.5	A
E_{AS}	Single Pulse Avalanche Energy (starting Tj= 25°C, I_D=I_{AR}, V_{DD}=50V)	320	mJ

2 Electrical characteristics

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

Table 4. 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 50	µA µA
I_{GSS}	Gate Body Leakage Current (V_{DS} = 0)	V_{GS} = ±20V			±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_D = 100 µA	3	3.75	4.5	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS}= 10 V, I_D= 3.15 A		1.60	1.85	Ω

Table 5. Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} *Note* 6	Forward Transconductance	V_{DS} =15V, I_D=3.15 A		7		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} =25V, f=1 MHz, V_{GS}=0		2180 174 36		pF pF pF
$C_{oss\ eq.}$ *Note* 5	Equivalent Output Capacitance	V_{GS}=0V, V_{DS}=0 to 800V		83		pF
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD}=800V, I_D = 6.3A V_{GS} =10V (see Figure 17)		73 12 40	102	nC nC nC

Table 6. Switching times

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	V_{DD}=500 V, I_D= 3.15 A, R_G=4.7Ω, V_{GS}=10V (see Figure 18)		28 19		ns ns
$t_{d(off)}$ t_f	Turn-off Delay Time FallTime	V_{DD}=500 V, I_D=3.15 A, R_G=4.7Ω, V_{GS}=10V (see Figure 18)		59 30		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} *Note* 3	Source-drain Current Source-drain Current (pulsed)				6.5 26	A A
V_{SD}*Note* 2	Forward on Voltage	I_{SD}=6.3A, V_{GS}=0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD}=6.3A, di/dt = 100A/µs, V_{DD}=50 V, Tj=25°C		620 5.3 17		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD}=6.3A, di/dt = 100A/µs, V_{DD}=50 V, Tj=150°C		840 7.5 18		ns µC A

Table 8. Gate-source zener diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{GSO} *Note* 4	Gate-Source Breakdown Voltage	Igs = ± 1mA (Open Drain)	30			V

(1) Limited only by maximum temperature allowed

(2)I_{SD} ≤ 6.5 A, di/dt ≤ 200A/µs, V_{DS} ≤ $V_{(BR)DSS}$, Tj≤ Tjmax

(3) Pulse width limited by safe operating area

(4) The built-in-back-to-back Zener diodes have specifically been designed to enanche not only the device's ESD capability, but also to make them safely absorb possible voltage is appropriate to archieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

(5) $C_{oss\ eq.}$ 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}

(6) Pulsed: pulse duartion = 300µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe Operating Area for TO-220

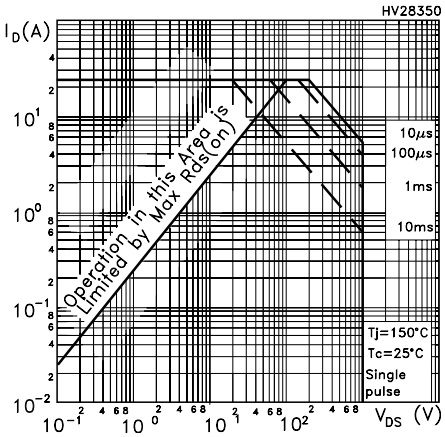


Figure 2. Thermal Impedance for TO-220

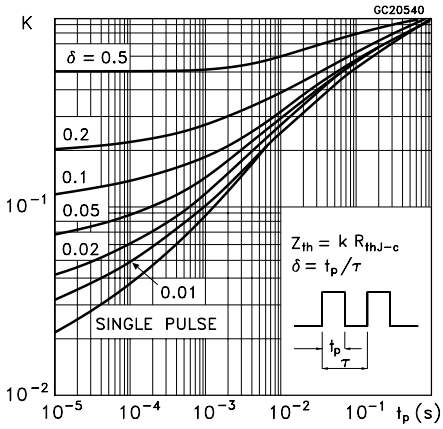


Figure 3. Safe Operating Area for TO-220FP

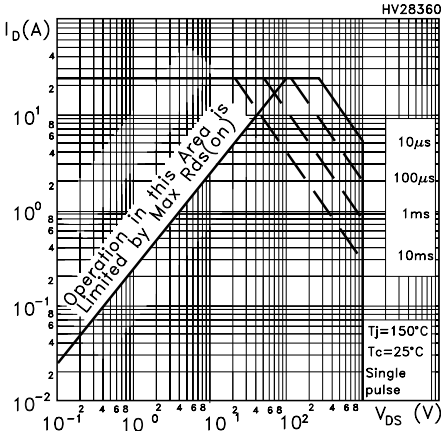


Figure 4. Thermal Impedance for TO-220FP

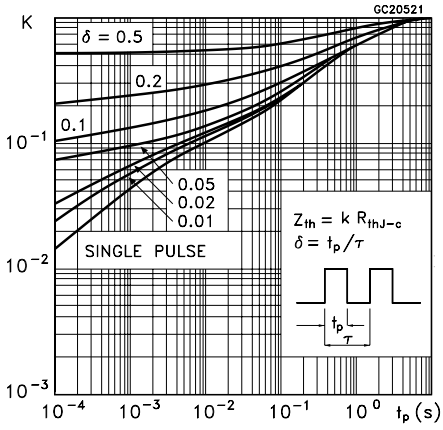


Figure 5. Output Characteristics

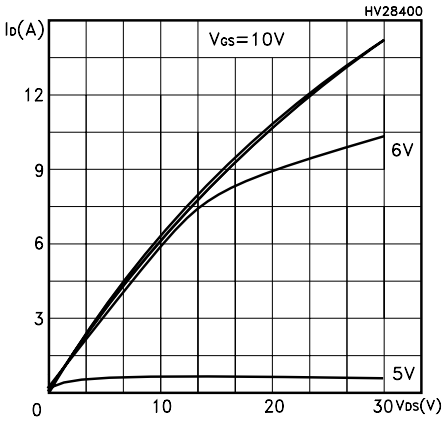


Figure 6. Transfer Characteristics