STD3LN62K3, STF3LN62K3
STP3LN62K3, STU3LN62K3

N-channel 620 V, 2.5 Ω, 2.5 A SuperMESH3™ Power MOSFET
DPAK, TO-220FP, TO-220, IPAK

Features

Order codes	V_{DSS}	$R_{DS(on)}$ max	I_D	P_D
STD3LN62K3	620 V	< 3 Ω	2.5 A	45 W
STF3LN62K3			2.5 A(1)	20 W
STP3LN62K3			2.5 A	45 W
STU3LN62K3			2.5 A	45 W

1. Limited by package

- 100% avalanche tested
- Extremely high dv/dt capability
- Very low intrinsic capacitance
- Improved diode reverse recovery characteristics
- Zener-protected

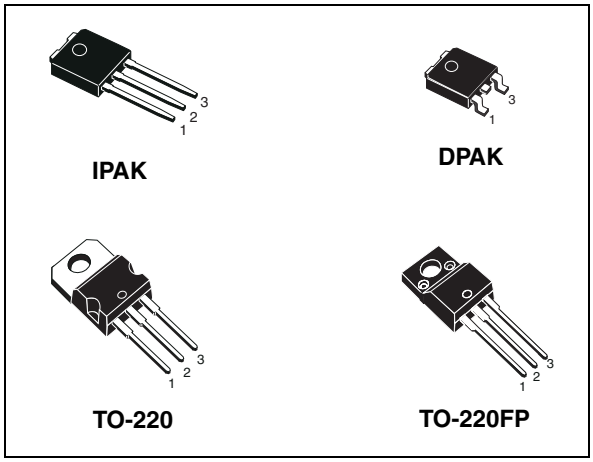
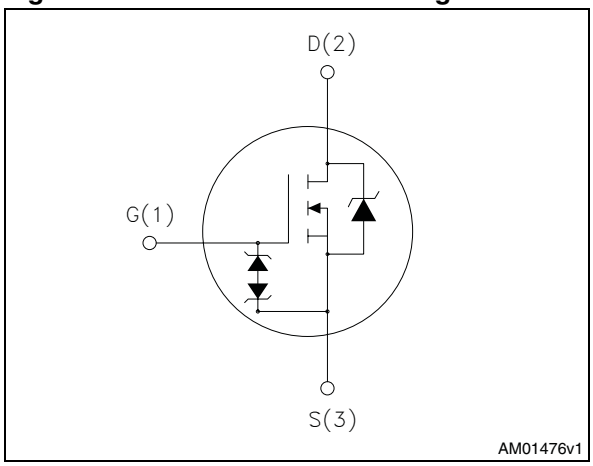


Figure 1. Internal schematic diagram



Application

Switching applications

Description

These devices are made using the SuperMESH3™ Power MOSFET technology that is obtained via improvements applied to STMicroelectronics' SuperMESH™ technology combined with a new optimized vertical structure. The resulting product has an extremely low on resistance, superior dynamic performance and high avalanche capability, making it especially suitable for the most demanding applications.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STD3LN62K3	3LN62K3	DPAK	Tape and reel
STF3LN62K3		TO-220FP	Tube
STP3LN62K3		TO-220	
STU3LN62K3		IPAK	

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value			Unit
		TO-220	DPAK IPAK	TO-220FP	
V_{DS}	Drain-source voltage (V_{GS} = 0)	620			V
V_{GS}	Gate- source voltage	± 30			V
I_D	Drain current (continuous) at T_C = 25 °C	2.5		2.5 (1)	A
I_D	Drain current (continuous) at T_C = 100 °C	1.6		1.6 (1)	A
I_{DM} (2)	Drain current (pulsed)	10		10(1)	A
P_{TOT}	Total dissipation at T_C = 25 °C	45		20	W
	Derating factor	0.36		0.16	W/°C
$V_{ESD(G-S)}$	Gate source ESD (HBM-C = 100 pF, R = 1.5 kΩ)	2500			V
dv/dt (3)	Peak diode recovery voltage slope	12			V/ns
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; Tc = 25 °C)			2500	V
T_{stg}	Storage temperature	-55 to 150			°C
T_j	Max. operating junction temperature	150			°C

1. Limited by package
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 2.5$ A, di/dt $\leq$ 400 A/µs, peak $V_{DS} < V_{(BR)DSS}$, V_{DD} = 80% $V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	TO-220	DPAK	IPAK	TO-220FP	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	2.78			6.25	°C/W
$R_{thj\text{-}pcb}$	Thermal resistance junction-pcb max		50			°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-amb max	62.5		100	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300		300		°C

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	2.5	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	90	mJ

2 Electrical characteristics

(T_C = 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 = 1 mA, V_{GS} = 0	620			V
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} = ± 20 V			± 10	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 50 µA	3	3.75	4.5	V
$R_{DS(on}$	Static drain-source on resistance	V_{GS} = 10 V, I_D = 1.25 A		2.5	3	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 50 V, f = 1 MHz, V_{GS} = 0	-	386 30 5	-	pF pF pF
$C_{o(tr)}$(1)	Eq. capacitance time related	V_{GS} = 0, V_{DS} = 0 to 496 V	-	20	-	pF
$C_{o(er)}$(2)	Eq. capacitance energy related		-	28	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz open drain	-	7	-	Ω
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 496 V, I_D = 2.5 A, V_{GS} = 10 V	-	17 2.7 10.7	-	nC nC nC

1. $C_{oss\ eq.}$ time related 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}
2. $C_{oss\ eq.}$ energy related is defined as a constant equivalent capacitance giving the same stored energy as C_{oss} when V_DS increases from 0 to 80% V_{DSS}

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 310 V, I_D =1.25 A, R_G = 4.7 Ω, V_{GS} = 10 V	-	9	-	ns
t_r	Rise time			7		ns
$t_{d(off)}$	Turn-off-delay time			30		ns
t_f	Fall time			27		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		2.5	A
I_{SDM} (1)	Source-drain current (pulsed)				10	A
V_{SD} (2)	Forward on voltage	I_{SD} = 2.5 A, V_{GS} = 0	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 2.5 A, di/dt = 100 A/µs, V_{DD} = 60 V (see)	-	240		ns
Q_{rr}	Reverse recovery charge			1200		nC
I_{RRM}	Reverse recovery current			10		A
t_{rr}	Reverse recovery time	I_{SD} = 2.5 A, di/dt = 100 A/µs, V_{DD} = 60 V, T_j = 150 °C	-	265		ns
Q_{rr}	Reverse recovery charge			1400		nC
I_{RRM}	Reverse recovery current			11		A

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

Table 9. Gate-source Zener diode

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

1. 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 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.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for TO-220

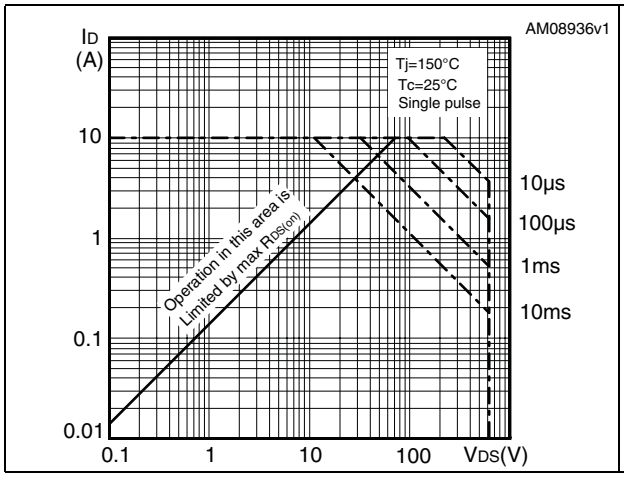


Figure 3. Thermal impedance for TO-220

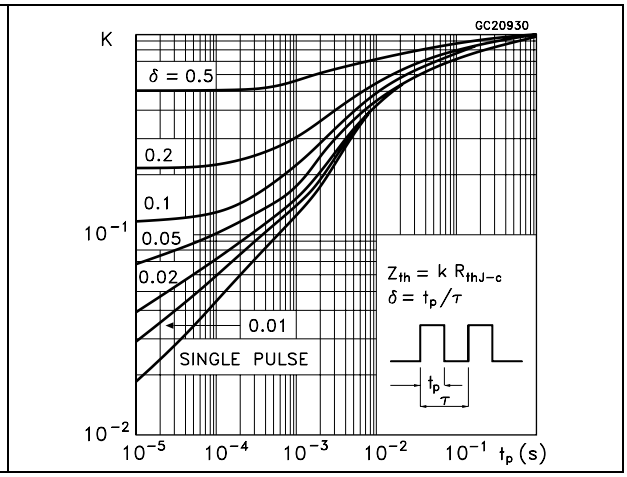


Figure 4. Safe operating area for TO-220FP

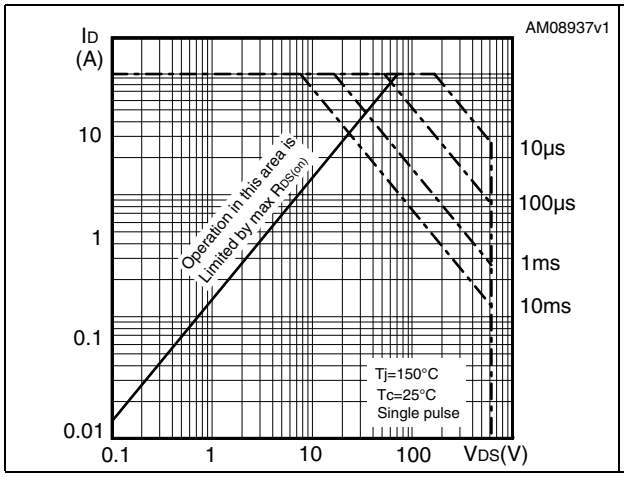


Figure 5. Thermal impedance for TO-220FP

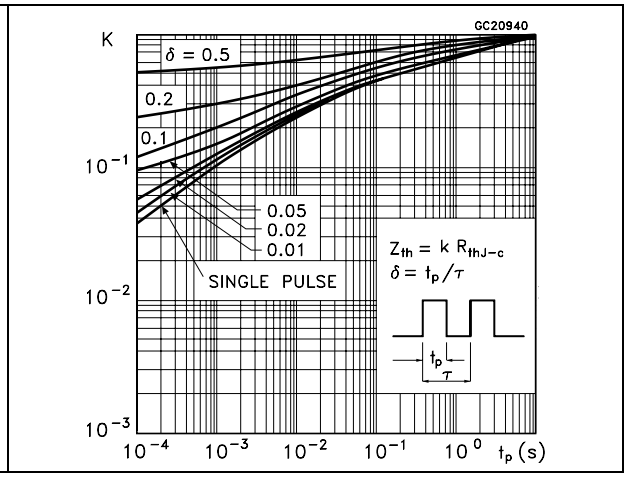


Figure 6. Safe operating area for DPAK, IPAK

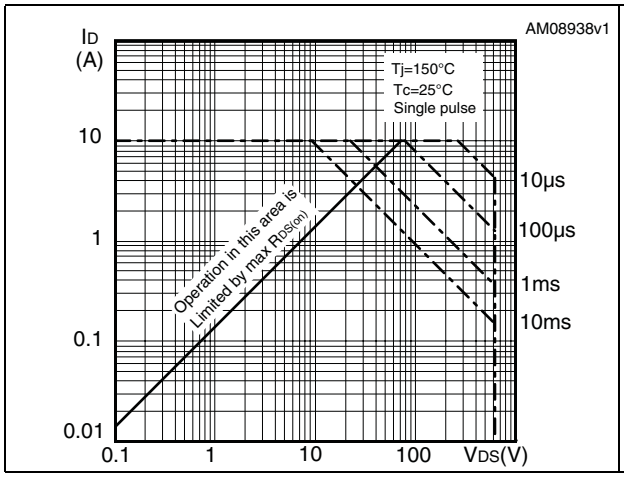
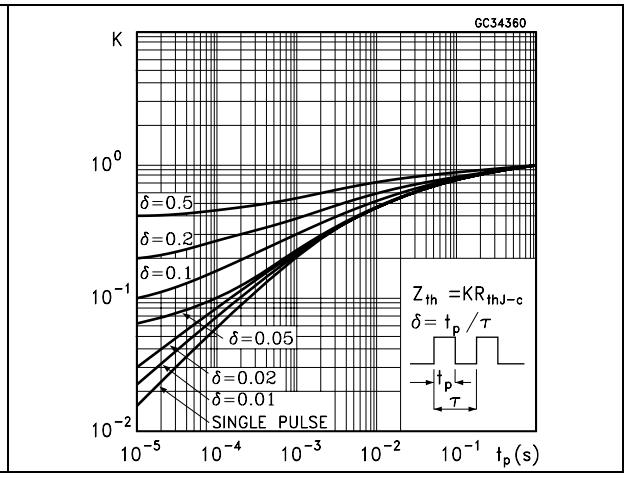



Figure 7. Thermal impedance for DPAK, IPAK