STB25NM50N/-1 - STF25NM50N
STP25NM50N - STW25NM50N

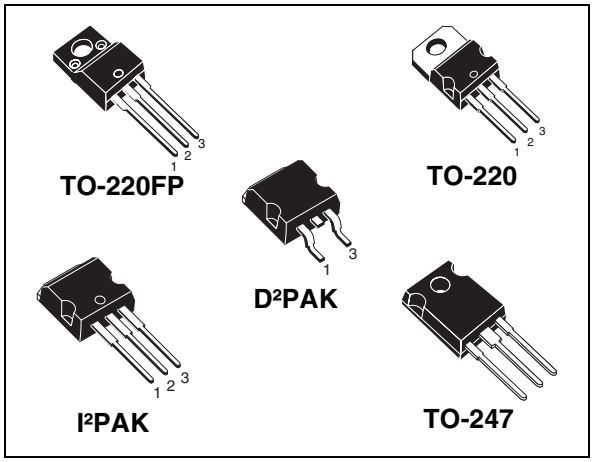
N-channel 500V - 0.11Ω - 22A - TO-220 /FP- I^2/D^2PAK - TO-247
Second generation MDmesh™ Power MOSFET

General features

Type	V_{DSS} (@Tjmax)	$R_{DS(on)}$	I_D
STB25NM50N	550V	<0.140Ω	22A
STB25NM50N-1	550V	<0.140Ω	22A
STF25NM50N	550V	<0.140Ω	22A(1)
STP25NM50N	550V	<0.140Ω	22A
STW25NM50N	550V	<0.140Ω	22A

1. Limited only by maximum temperature allowed

- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistancel



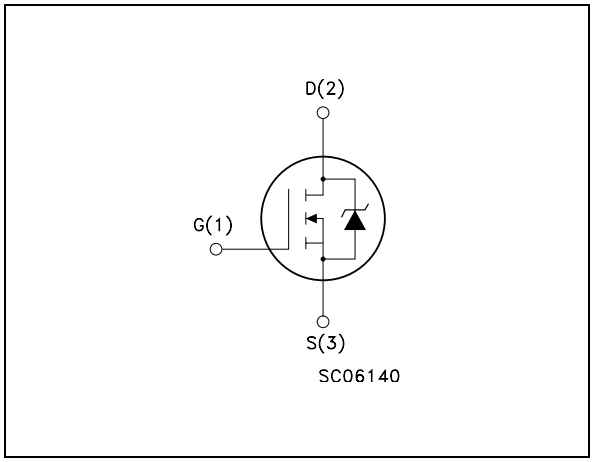
Description

This series of devices is realized with the second generation of MDmesh™ Technology. This revolutionary MOSFET associates a new vertical structure to the Company's strip layout to yield one of the world's lowest on-resistance and gate charge. It is therefore suitable for the most demanding high efficiency converters

Applications

- Switching application

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STB25NM50N	B25NM50N	D²PAK	Tape & reel
STB25NM50N-1	B25NM50N-1	I²PAK	Tube
STF25NM50N	F25NM50N	TO-220FP	Tube
STP25NM50N	P25NM50N	TO-220	Tube
STW25NM50N	W25NM50N	TO-247	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220 - I²PAK D²PAK - TO-247	TO-220FP	
V_{DS}	Drain-source voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain-gate voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate- source voltage	±25		V
I_D	Drain current (continuous) at T_C = 25°C	22	22 (1)	A
I_D	Drain current (continuous) at T_C = 100°C	14	14 (1)	A
I_{DM} (2)	Drain current (pulsed)	88	88 (1)	A
P_{TOT}	Total dissipation at T_C = 25°C	160	40	W
	Derating factor	1.28	0.32	W/°C
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1s;T_C=25°C)	--	2500	V
dv/dt (3)	Peak diode recovery voltage slope	15		V/ns
T_{stg}	Storage temperature	–55 to 150		°C
T_j	Max. operating junction temperature	150		°C

1. Limited only by maximum temperature allowed
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 22A$, di/dt $\leq$ 400 A/µs, V_{DD} =80% $V_{(BR)DSS}$

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		TO-220 - I²PAK D²PAK - TO-247	TO-220FP	
Rthj-case	Thermal resistance junction-case Max	0.78	3.1	°C/W
Rthj-amb	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)	10	A
E_{AS}	Single pulse avalanche energy (starting Tj=25°C, Id=Ias, Vdd=50V)	350	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	500			V
dv/dt (1)	Drain source voltage slope	Vdd=400V, Id=25A, Vgs=10V		44		V/ns
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating V_{DS} = Max rating, @125°C			1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 11A		0.110	0.140	Ω

1. Characteristic value at turn off on inductive load

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS}=15V, I_D =11A		19		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V, f = 1MHz, V_{GS} = 0		2565 511 77		pF pF pF
$C_{oss\ eq.}$ (2)	Equivalent output capacitance	V_{GS} = 0V, V_{DS} = 0V to 400V		315		pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 400V, I_D =22A, V_{GS} = 10V,		84 11 35		nC nC nC
R_g	Gate input resistance	f=1MHz Gate DC Bias=0 Test signal level=20mV open drain		1.6		Ω

1. Pulsed: Pulse duration = 300 µs, 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_{DS}

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} =250V, I_D = 11A R_G = 4.7Ω V_{GS} = 10V		23		ns
t_r	Rise time			23		ns
$t_{d(off)}$	Turn-off delay time			75		ns
t_f	Fall time			22		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				22	A
I_{SDM} (1)	Source-drain current (pulsed)				88	A
V_{SD} (2)	Forward on voltage	I_{SD} = 22A, V_{GS} = 0			1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 22A, di/dt = 100A/µs V_{DD} = 100V, T_j = 25°C		460		ns
Q_{rr}	Reverse recovery charge			6.9		µC
I_{RRM}	Reverse recovery current			30		A
t_{rr}	Reverse recovery time	I_{SD} = 22A, di/dt = 100A/µs V_{DD} = 100V, T_j = 150°C		532		ns
Q_{rr}	Reverse recovery charge			8.25		µC
I_{RRM}	Reverse recovery current			31		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220 / D²PAK / I²PAK

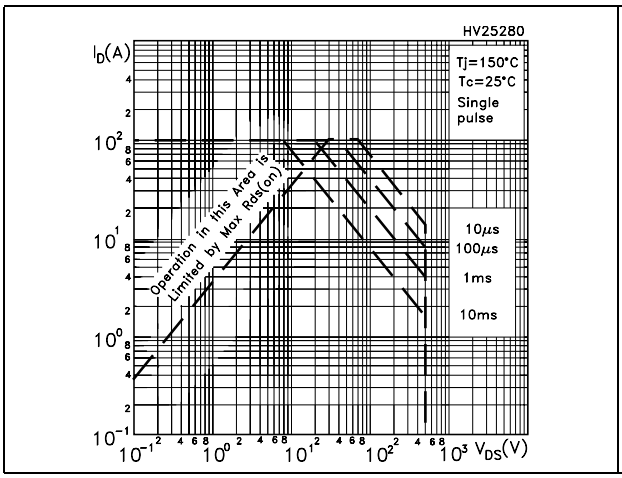


Figure 2. Thermal impedance for TO-220 / D²PAK / I²PAK

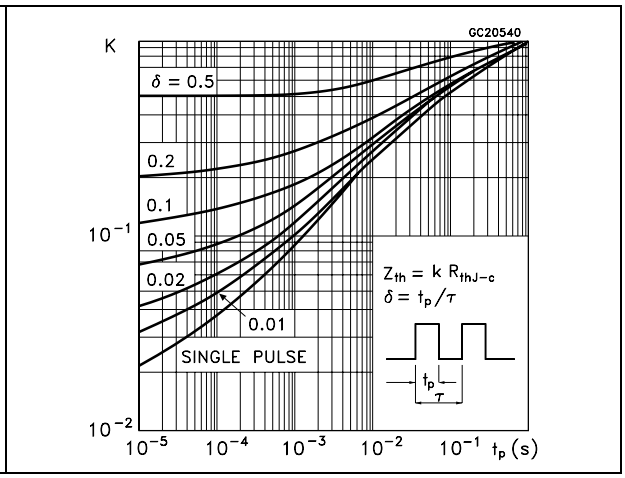


Figure 3. Safe operating area for TO-220FP

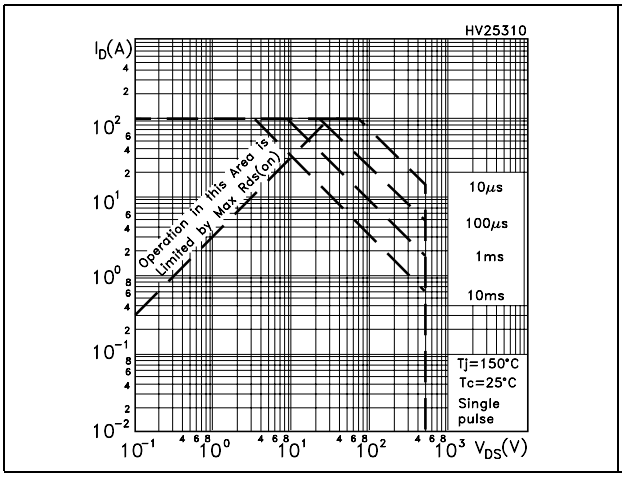


Figure 4. Thermal impedance for TO-220FP

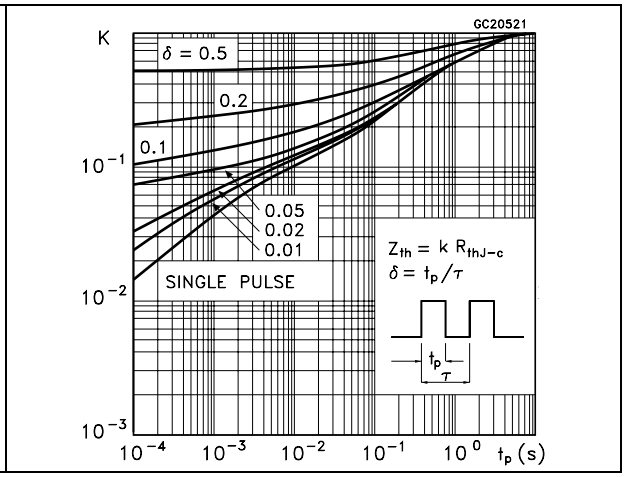


Figure 5. Safe operating area for TO-247

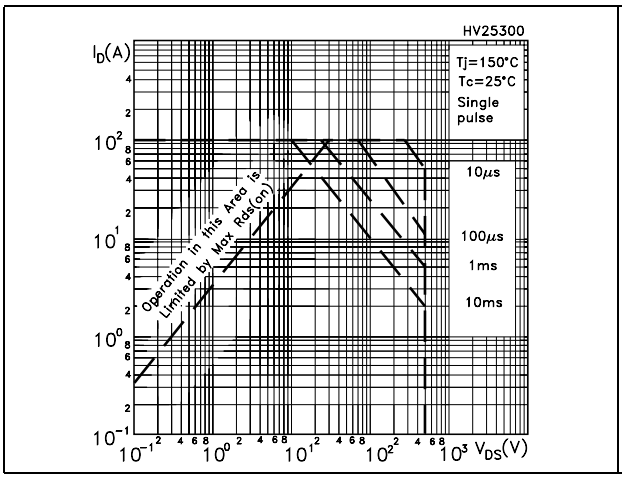


Figure 6. Thermal impedance for TO-247