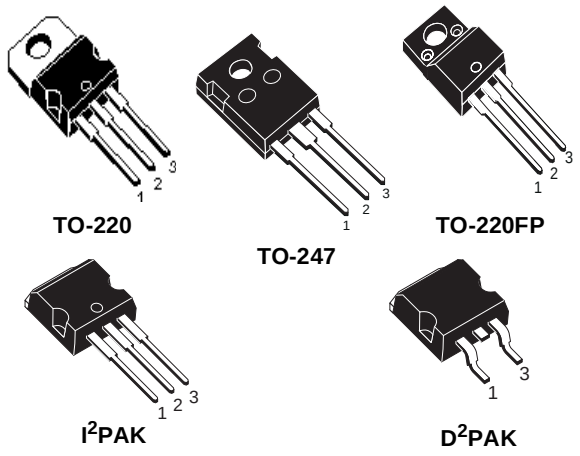
STP12NM50FD-STP12NM50FDFP-STW14NM50FD

STB12NM50FD - STB12NM50FD-1

N-CHANNEL500V-0.32Ω-12ATO-220/FP/D²PAK/I²PAK/TO-247 FDmesh™ Power MOSFET (with FAST DIODE)

TYPE	V_{DSS}	$R_{DS(on)}$	I_D	Pw
STP12NM50FD	500 V	< 0.4 Ω	12 A	160 W
STP12NM50FDFP	500 V	< 0.4 Ω	12 A	35 W
STB12NM50FD	500 V	< 0.4 Ω	12 A	160 W
STB12NM50FD-1	500 V	< 0.4 Ω	12 A	160 W
STW14NM50FD	500 V	< 0.4 Ω	14 A	175 W

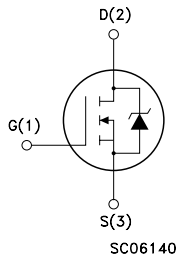
- TYPICAL R_{DS}(on) = 0.32 Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL AND HIGH MANUFACTURING YIELDS



DESCRIPTION

The FDmesh™ associates all advantages of reduced on-resistance and fast switching with an intrinsic fast-recovery body diode. It is therefore strongly recommended for bridge topologies, in particular ZVS phase-shift converters.

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- ZVS PHASE-SHIFT FULL BRIDGE CONVERTERS FOR SMPS AND WELDING EQUIPMENT

ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP12NM50FD	P12NM50FD	TO-220	TUBE
STP12NM50FDFP	P12NM50FDFP	TO-220FP	TUBE
STB12NM50FD	B12NM50FD	D²PAK	TUBE
STB12NM50FDT4	B12NM50FD	D²PAK	TAPE & REEL
STB12NM50FD-1	B12NM50FD	I²PAK	TUBE
STW14NM50FD	W14NM50FD	TO-247	TUBE

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value			Unit
		TO-220 / D^2PAK / I^2PAK	TO-220FP	TO-247	
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	± 30			V
I_D	Drain Current (continuous) at T_C = 25°C	12	12 (*)	14	A
I_D	Drain Current (continuous) at T_C = 100°C	7.5	7.5 (*)	8.8	A
I_{DM} (•)	Drain Current (pulsed)	48	48 (*)	56	A
P_{TOT}	Total Dissipation at T_C = 25°C	160	35	175	W
	Derating Factor	1.28	0.28	1.4	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	20			V/ns
V_{ISO}	Insulation Withstand Voltage (DC)	-	2500		V
T_j T_{stg}	Operating Junction Temperature Storage Temperature	- 65 to 150 - 65 to 150			°C °C

(•) Pulse width limited by safe operating area
(1) I_{SD} ≤12A, di/dt ≤ 400 µA, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ $T_{JMAX.}$
(*) Limited only by maximum temperature allowed

THERMAL DATA

		TO-220 I^2PAK	D^2PAK	TO-220FP	TO-247	
Rthj-case	Thermal Resistance Junction-case Max	0.78		3.57	0.715	°C/W
Rthj-pcb	Thermal Resistance Junction-pcb Max (When mounted on minimum Footprint)		30			°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5			30	°C/W
T_l	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	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	400	mJ

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

ON/OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating, T_C = 125 °C			1 10	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 6A		0.32	0.4	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} = 15 V, I_D = 6 A		9.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		1027 205 24		pF pF pF
R_G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		3.7		Ω

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	V_{DD} = 250 V, I_D = 6 A R_G = 4.7Ω V_{GS} = 10 V (Resistive Load see, Figure 3)		19 10		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400V, I_D = 12 A, V_{GS} = 10V		27.5 8 12	38.5	nC nC nC

SWITCHING OFF

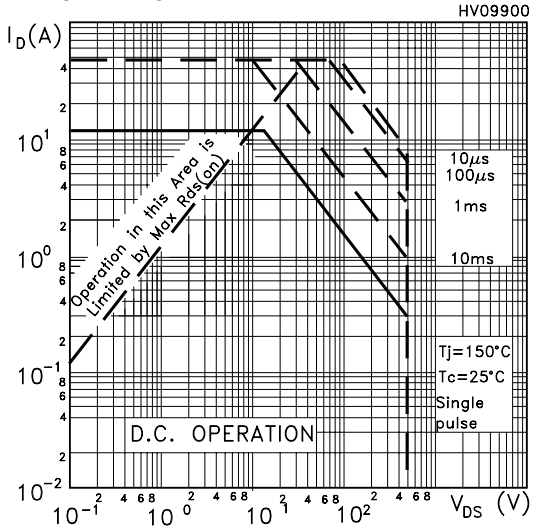
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V, I_D = 12 A, R_G = 4.7Ω, V_{GS} = 10V (Inductive Load see, Figure 5)		39 18 29		ns ns ns

SOURCE DRAIN DIODE

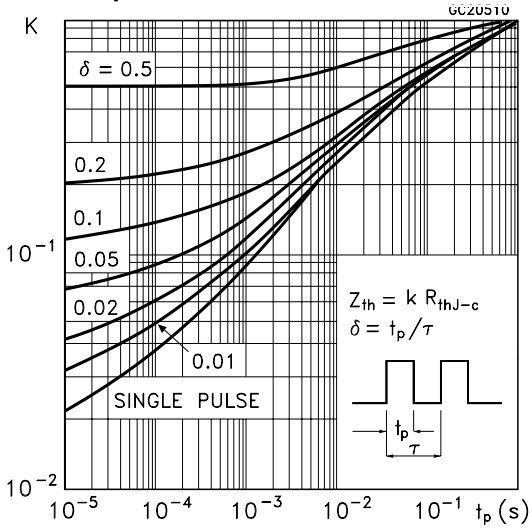
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				12 48	A A
V_{SD} (1)	Forward On Voltage	I_{SD} = 12 A, V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 12 A, di/dt = 100A/µs V_{DD} = 30V, T_j = 150°C (see test circuit, Figure 5)		224 1.3 12		ns µC A

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

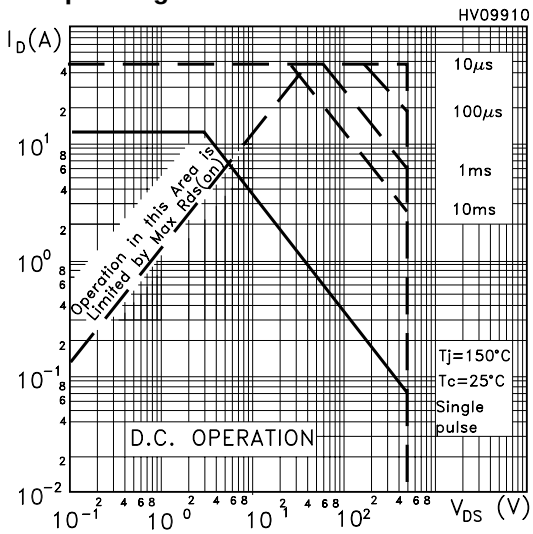
Safe Operating Area For TO-220/D2PAK/I2PAK



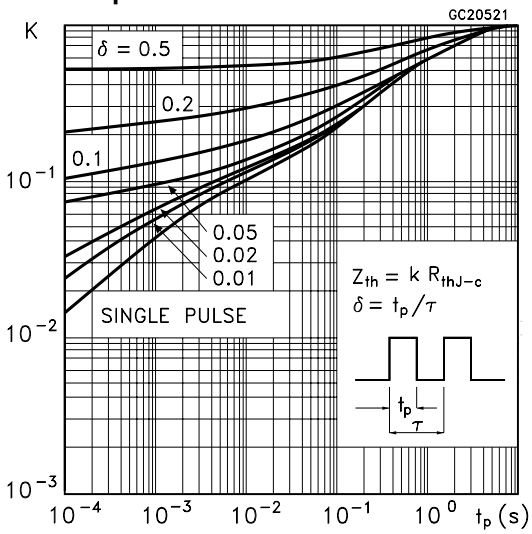
Thermal Impedance For TO-220/D2PAK/I2PAK



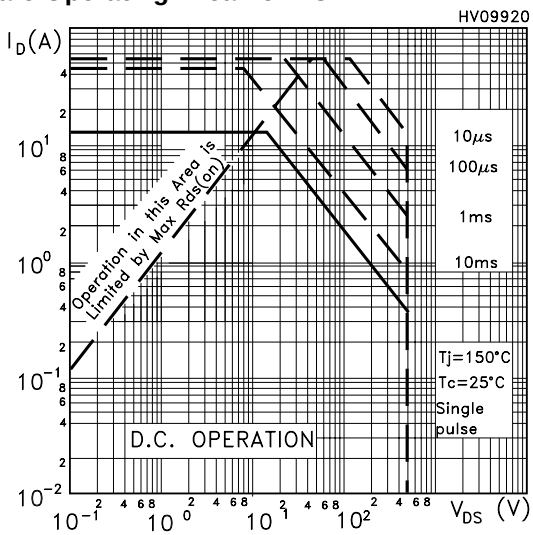
Safe Operating Area For TO-220FP



Thermal Impedance For TO-220FP



Safe Operating Area For TO-247



Thermal Impedance For TO-247