

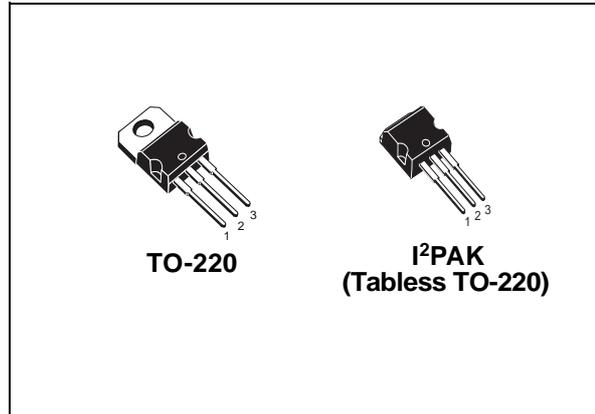


STP20NM50FD STB20NM50FD-1

N-CHANNEL 500V - 0.22Ω - 20A TO-220/I²PAK
FDmesh™ Power MOSFET (with FAST DIODE)

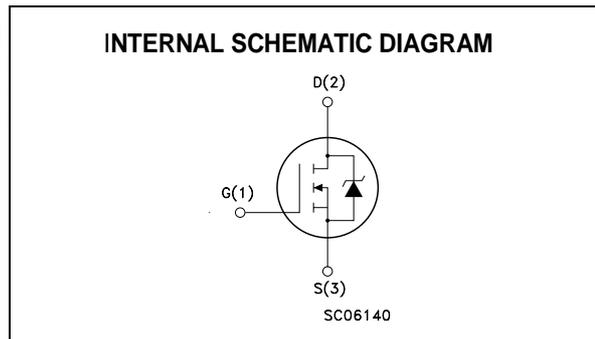
TYPE	V _{DSS}	R _{DS(on)}	R _{ds(on)} *Q _g	I _D
STP20NM50FD	500V	<0.25Ω	8.36 Ω*nC	20 A
STB20NM50FD-1	500V	<0.25Ω	8.36 Ω*nC	20 A

- TYPICAL R_{DS(on)} = 0.22Ω
- 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.



APPLICATIONS

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

ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP20NM50FD	P20NM50FD	TO-220	TUBE
STB20NM50FD-1	B20NM50FD-1	I ² PAK	TUBE

STP20NM50FD/STB20NM50FD-1

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
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	20	A
I _D	Drain Current (continuous) at T _C = 100°C	14	A
I _{DM} (●)	Drain Current (pulsed)	80	A
P _{TOT}	Total Dissipation at T _C = 25°C	192	W
	Derating Factor	1.2	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	20	V/ns
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(●) Pulse width limited by safe operating area

(1) I_{SD} ≤ 20A, di/dt ≤ 200 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	0.65	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5	°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)	10	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 35 V)	700	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 = 250 μA, 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 = 250 μA	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 10A		0.22	0.25	Ω

ELECTRICAL CHARACTERISTICS (CONTINUED)
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $I_D = 10A$		9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25V$, $f = 1$ MHz, $V_{GS} = 0$		1380 290 40		pF pF pF
C_{oss} eq. (2)	Equivalent Output Capacitance	$V_{GS} = 0V$, $V_{DS} = 0V$ to 400V		130		pF
R_g	Gate Input Resistance	$f=1$ MHz Gate DC Bias=0 Test Signal Level=20mV Open Drain		2.8		Ω

(1) Pulsed: Pulse duration = 300 μ s, 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} .

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 250V$, $I_D = 10$ A $R_G = 4.7\Omega$ $V_{GS} = 10V$ (see test circuit, Figure 3)		22 20		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 400V$, $I_D = 20A$, $V_{GS} = 10V$		38 18 10	53	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	$V_{DD} = 400V$, $I_D = 20$ A, $R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 5)		6 15 30		ns ns ns

SOURCE DRAIN DIODE

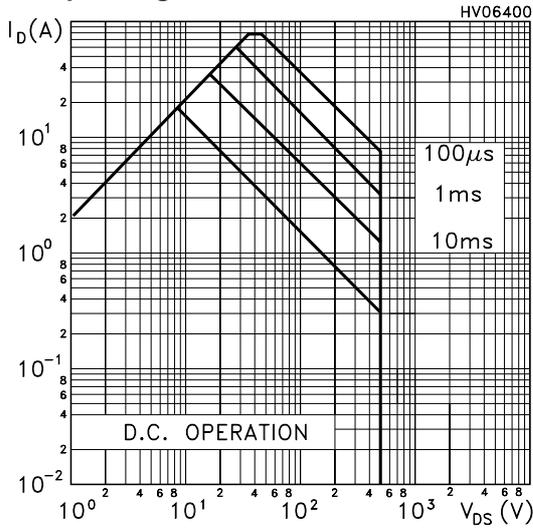
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				20 80	A A
V_{SD} (1)	Forward On Voltage	$I_{SD} = 20$ A, $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 20$ A, $di/dt = 100A/\mu$ s, $V_{DD} = 60V$, $T_j = 150^\circ$ C (see test circuit, Figure 5)		245 2 16		ns μ C A

Note: 1. Pulsed: Pulse duration = 300 μ s, duty cycle 1.5 %.

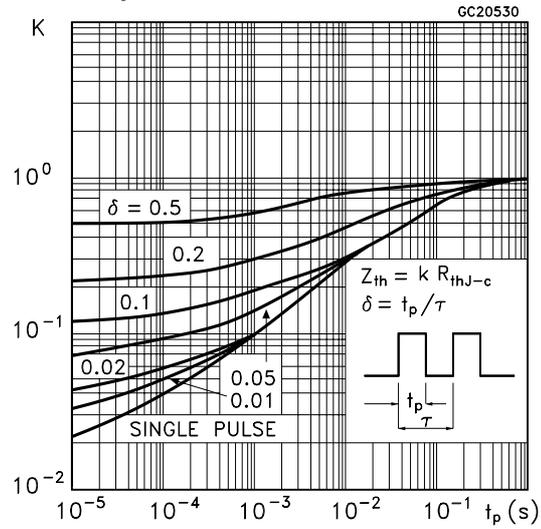
2. Pulse width limited by safe operating area.

STP20NM50FD/STB20NM50FD-1

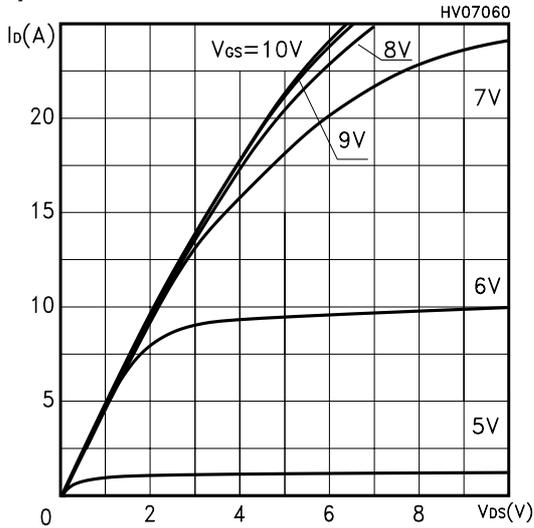
Safe Operating Area For TO-220 / I²PAK



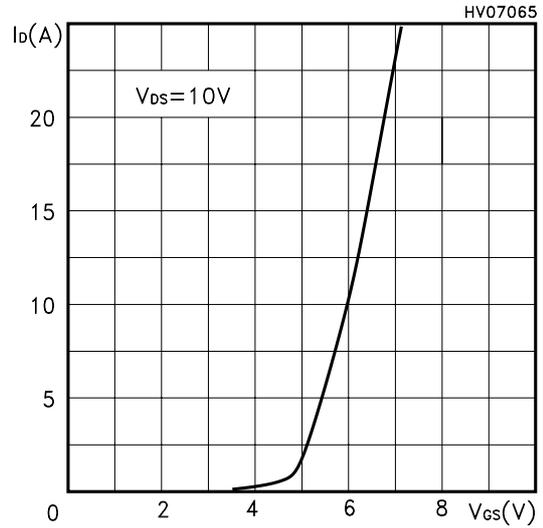
Thermal Impedance For TO-220 / I²PAK



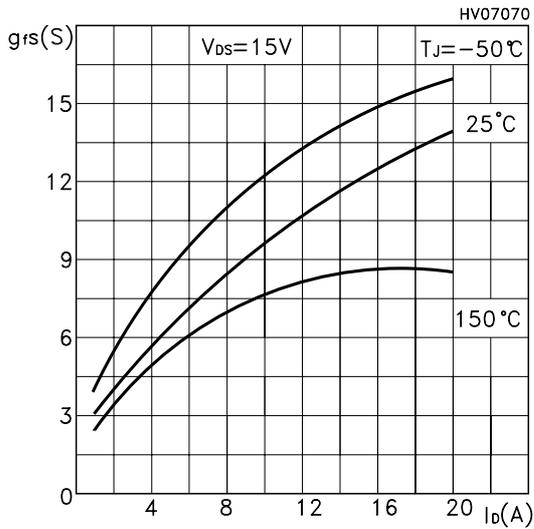
Output Characteristics



Transfer Characteristics



Transconductance



Static Drain-source On Resistance

