

STD20NF20 STF20NF20, STP20NF20

N-channel 200 V, 0.10 Ω, 18 A DPAK, TO-220, TO-220FP
low gate charge STripFET™ Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)}	I _D	P _W
STD20NF20	200 V	< 0.125 Ω	18 A	110 W
STF20NF20	200 V	< 0.125 Ω	18 A	30 W
STP20NF20	200 V	< 0.125 Ω	18 A	110 W

- Exceptional dv/dt capability
- Low gate charge
- 100% avalanche tested

Application

- Switching applications

Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters.

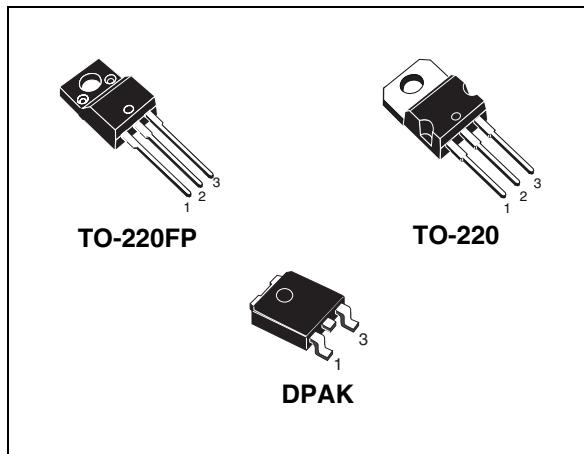


Figure 1. Internal schematic diagram

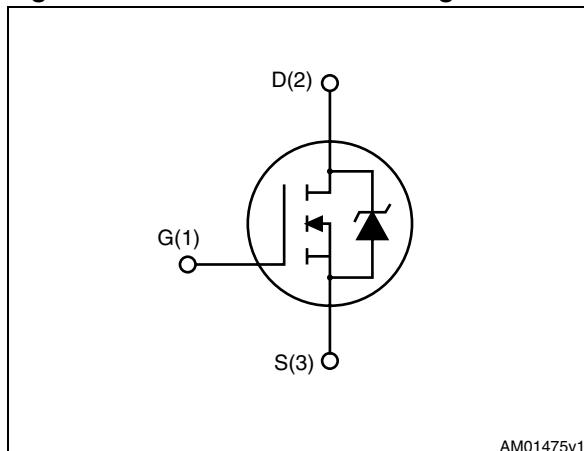


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD20NF20	20NF20	DPAK	Tape and reel
STF20NF20	20NF20	TO-220FP	Tube
STP20NF20	20NF20	TO-220	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220, DPAK	TO-220FP	
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	200		V
V_{GS}	Gate- source voltage	± 20		V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$	18		A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	11		A
$I_{DM}^{(1)}$	Drain current (pulsed)	72		A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	110	30	W
	Derating factor	0.72	0.2	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15		V/ns
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink ($t = 1 \text{ s}; T_c = 25^\circ\text{C}$)		2500	V
T_{stg}	Storage temperature	-55 to 175		$^\circ\text{C}$
T_j	Max. operating junction temperature			

1. Pulse width limited by safe operating area
 2. $I_{SD} \leq 18 \text{ A}$, $di/dt \leq 400 \text{ A}/\mu\text{s}$, $V_{DD} \leq V_{(\text{BR})DSS}$

Table 3. Thermal data

Symbol	Parameter	TO-220	DPAK	TO-220FP	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.38	1.38	5	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	50 ⁽¹⁾	62.5	$^\circ\text{C/W}$
T_I	Maximum lead temperature for soldering purpose			300	$^\circ\text{C}$

1. When mounted on 1inch² FR-4, 2 Oz copper board.

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	18	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50 \text{ V}$)	110	mJ

2 Electrical characteristics

($T_{CASE}=25^\circ\text{C}$ unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1 \text{ mA}, V_{GS} = 0$	200			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}, T_C = 125^\circ\text{C}$			1 10	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$			± 100	nA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2	3	4	V
$R_{DS(\text{on})}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$		0.10	0.125	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 25 \text{ V}, I_D = 10 \text{ A}$	-	13		s
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}, V_{GS} = 0$	-	940 197 30		pF pF pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD} = 100 \text{ V}, I_D = 10 \text{ A}, R_G = 4.7 \Omega, V_{GS} = 10 \text{ V}$	-	15 30 40 10		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 160 \text{ V}, I_D = 20 \text{ A}, V_{GS} = 10 \text{ V}$	-	28 5.6 14.5	39	nC nC nC

1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%.

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		18 72	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 20 \text{ A}, V_{GS} = 0$	-		1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 20 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 50 \text{ V}$	-	155 775 10		ns nC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 20 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 50 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	-	183 1061 11.6		ns nC A

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