

# HMS20N80F

## 800V N-Channel Super Junction MOSFET

### Features

- Very Low FOM ( $R_{DS(on)} \times Q_g$ )
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode

### Application

- Switch Mode Power Supply (SMPS)
- TV power & LED Lighting Power
- AC to DC Converters
- Telecom

### Key Parameters

Parameter	Value	Unit
$BV_{DSS} @T_{j,max}$	850	V
$I_D$	20	A
$R_{DS(on), max}$	0.25	$\Omega$
$Q_g, Typ$	13.7	nC

### Package & Internal Circuit

TO-220FS	SYMBOL
	

### Absolute Maximum Ratings

 $T_C=25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	800	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_C = 25^{\circ}\text{C}$ )	20 *	A
	Drain Current - Continuous ( $T_C = 100^{\circ}\text{C}$ )	14 *	A
$I_{DM}^{1)}$	Drain Current - Pulsed	60 *	A
$E_{AS}^{2)}$	Single Pulsed Avalanche Energy	56	mJ
$I_{AR}$	Avalanche Current	1.15	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0\ldots 400\text{V}$	50	V/ns
dv/dt	Reverse diode dv/dt, $V_{DS}=0\ldots 400\text{V}$ , $I_{DS}\leq I_D$	15	V/ns
$P_D$	Power Dissipation ( $T_C = 25^{\circ}\text{C}$ )	27	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=1.5K $\Omega$ )	2000	V
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^{\circ}\text{C}$

\* Drain current limited by maximum junction temperature

### Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	4.57	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	80	$^{\circ}\text{C/W}$

## Electrical Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
On Characteristics						
V <sub>GS</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 220 μA	2.0	-	4.0	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.6 A	-	0.22	0.25	Ω
Off Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1mA	800	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = 0	-	-	1	μA
		V <sub>DS</sub> = 800 V, T <sub>C</sub> = 150°C	-	-	100	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	-	-	±1	μA
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	-	564	-	pF
C <sub>oss</sub>	Output Capacitance		-	13.6	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	2.1	-	pF
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On Time	V <sub>DS</sub> = 400 V, I <sub>D</sub> = 2.8 A, R <sub>G</sub> = 25 Ω  (Note 3,4)	-	18	-	ns
t <sub>r</sub>	Turn-On Rise Time		-	16	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	72	-	ns
t <sub>f</sub>	Turn-Off Fall Time		-	13	-	ns
Q <sub>g(</sub>	Total Gate Charge	V <sub>DS</sub> = 640 V, I <sub>D</sub> = 2.8 A, V <sub>GS</sub> = 10 V  (Note 3,4)	-	13.7	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	2.5	-	nC
Q <sub>gd</sub>	Gate-Drain Charge		-	4.3	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		-	-	7.0	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-	-	21	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2.8 A	-	-	1.3	V
trr	Reverse Recovery Time	V <sub>R</sub> = 400 V, I <sub>F</sub> = 2.8 A di <sub>F</sub> /dt = 100 A/μs	-	230	-	ns
Qrr	Reverse Recovery Charge		-	1.7	-	μC

### Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $I_{AS}=1.15\text{A}$   $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
3. Pulse Test : Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
4. Essentially Independent of Operating Temperature

**Package Dimension**

**TO-220FS-FM(Full Mold)**

