

## Silicon N-Channel Super-Junction Power MOSFET

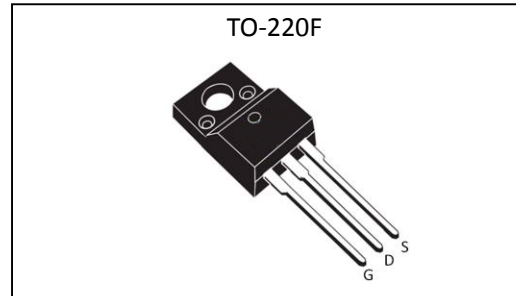
### General Description :

HMF20J60 the silicon N-channel Enhanced VDMOSFETS, is obtained by the self-aligned Superjunction Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-220F, which accords with the RoHS standard.

$V_{DSS}(T_C=150^{\circ}C)$	650	V
$V_{DSS}(T_C=25^{\circ}C)$	600	V
$I_D$	20	A
$P_D(T_C=25^{\circ}C)$	34	W
$R_{DS(ON)TYP}$	0.11	$\Omega$

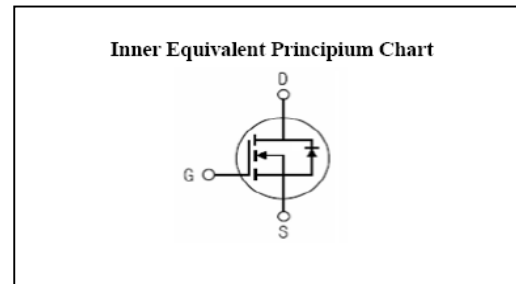
### Features :

- Fast Switching
- Low Gate Charge and Rdson
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test



### Applications :

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)



### Absolute ( $T_C= 25^{\circ}C$ unless otherwise specified) :

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	600	V
$I_D$	Continuous Drain Current	20	A
$I_{DM}^{a1}$	Pulsed Drain Current	60	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 30$	V
$E_{AS}^{a2}$	Single Pulse Avalanche Energy	560	mJ
$P_D$	Power Dissipation	34	W
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	150, -55 to 150	$^{\circ}C$
$T_L$	Maximum Temperature for Soldering	300	$^{\circ}C$

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

### Thermal Characteristics

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case	3.67	$^{\circ}C/W$
$R_{\theta JA}$	Junction-to-Ambient	100	$^{\circ}C/W$

**Electrical Characteristics** (  $T_c = 25^\circ\text{C}$  unless otherwise specified ) :

<b>OFF Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$V_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	600	--	--	V
$I_{DSS}$	Drain to Source Leakage Current	$V_{DS}=600V, V_{GS}=0V, T_a=25^\circ\text{C}$	--	--	1.0	$\mu A$
		$V_{DS}=480V, V_{GS}=0V, T_a=125^\circ\text{C}$	--	--	250	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS} = +30V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS} = -30V$	--	--	-100	nA

<b>ON Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}^{a3}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=10A$	--	0.11	0.14	$\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V

<b>Dynamic Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$g_{fs}^{a3}$	Forward Transconductance	$V_{DS}=10V, I_D=20A$	--	19	--	S
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_D=50V$ $f=1.0\text{MHz}$	--	1600	--	pF
$C_{oss}$	Output Capacitance		--	15	--	
$C_{rss}$	Reverse Transfer Capacitance		--	220	--	

<b>Resistive Switching Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=300V, I_D=20A,$ $V_{GS}=10V, R_g=25\Omega$	--	15	--	ns
$t_r$	Rise Time		--	15	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	95	--	
$t_f$	Fall Time		--	10	--	
$Q_g$	Total Gate Charge	$I_D=20A, V_{DD}=480V$ $V_{GS}=0$ to $10V$	--	40	--	nC
$Q_{gs}$	Gate to Source Charge		--	7.5	--	
$Q_{gd}$	Gate to Drain ( "Miller" )Charge		--	15	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_S$	Continuous Source Current(Body Diode)		--	--	20	A
$I_{SM}$	Maximum Pulsed Current(Body Diode)		--	--	60	A
$V_{SD}$	Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	--	0.95	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_R=480V, V_{GS}=0V$	--	450	--	ns
$Q_{rr}$	Reverse Recovery Charge	$I_S=I_F, di/dt=100A/us,$	--	8.0	--	uC
Pulse width $t_p \leq 380\mu s, \delta \leq 2\%$						

<sup>a1</sup> : Repetitive rating; pulse width limited by maximum junction temperature

<sup>a2</sup> :  $L=10mH, V_{DD}=50V$ , Starting  $T_J=25^\circ C$

<sup>a3</sup> : Pulse Test: Pulse width  $\leq 380us$ , Duty Cycle  $\leq 2\%$

## Typical Characteristics

Figure 1. Output Characteristics

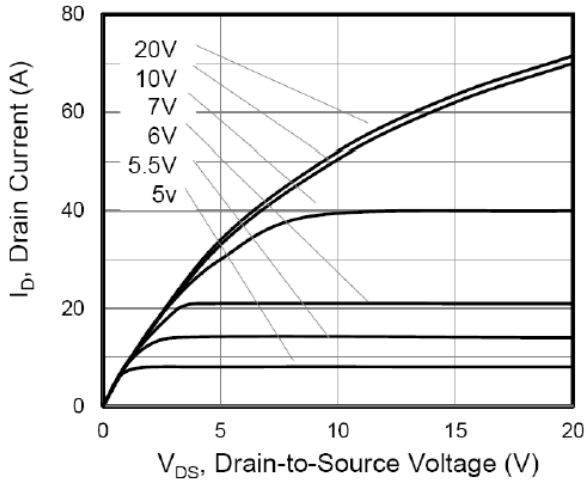


Figure 2. Transfer Characteristics

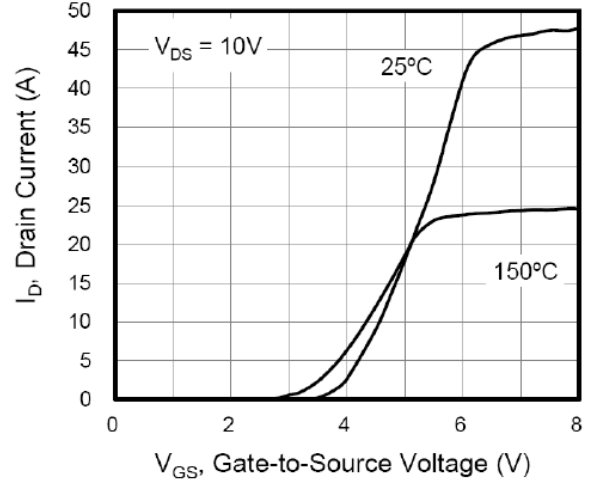


Figure 3. On-Resistance vs. Drain Current

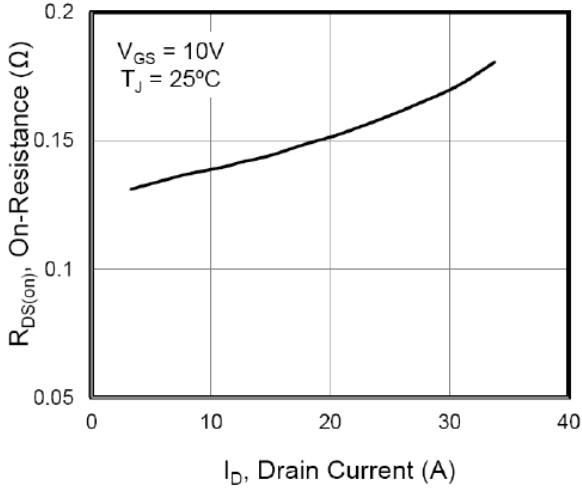


Figure 4. Capacitance

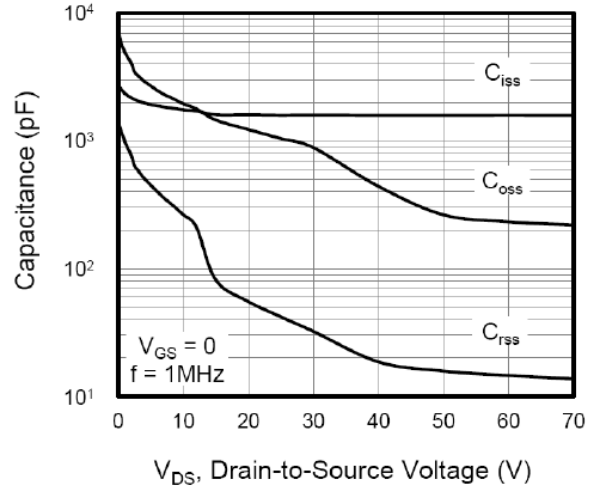


Figure 5. Gate Charge

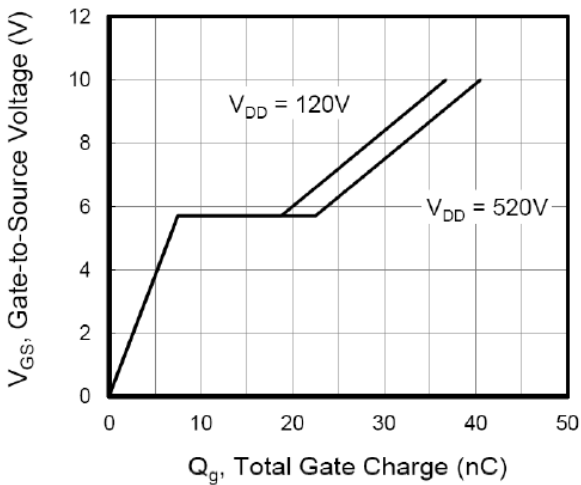
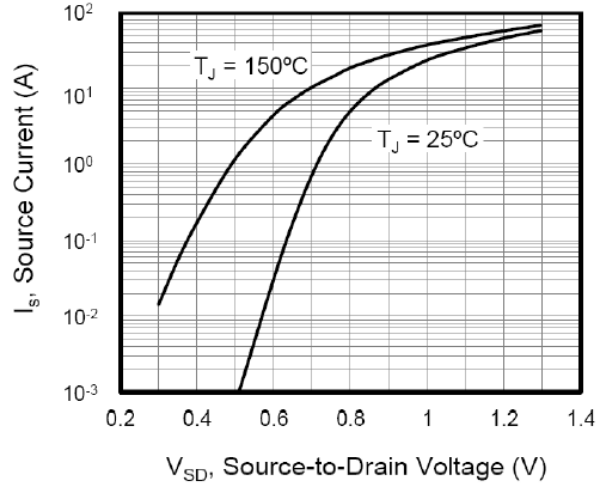
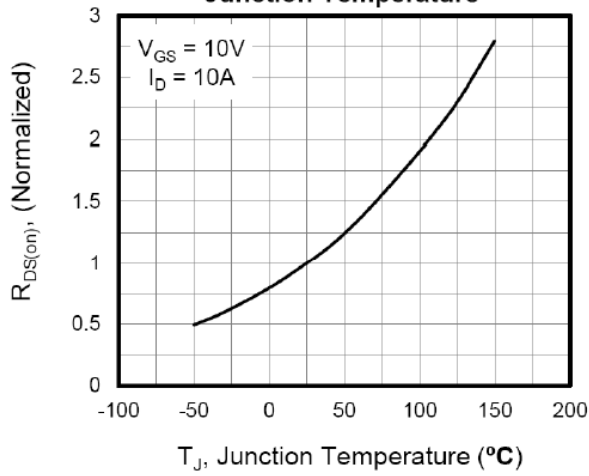


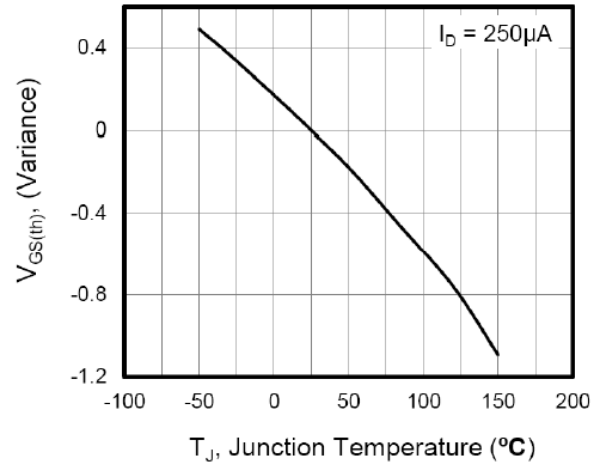
Figure 6. Body Diode Forward Voltage



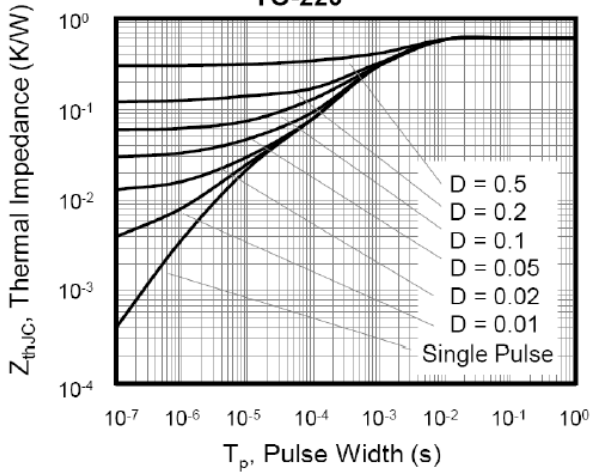
**Figure 7. On-Resistance vs. Junction Temperature**



**Figure 8. Threshold Voltage vs. Junction Temperature**



**Figure 9. Transient Thermal Impedance TO-220**



**Figure 10. Transient Thermal Impedance TO-220F**

