

## Features

- Low On-resistance and Low Conduction Loss
- Super Junction technology for High Voltage Application
- Soft Switching with Fast Reverse Recovery Diode
- Ultra Low Gate Charge Cause Lower Driving Requirement
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free."Green "Device<sup>(Note 1)</sup>
- Lead Free Finish/RoHS Compliant. "P" Suffix Designates RoHS Compliant. See Ordering Information

## Maximum Ratings

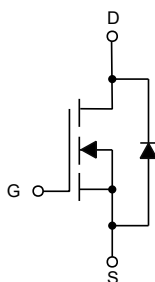
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance Junction to Ambient,Max<sup>(Note 2)</sup>: 60°C/W
- Thermal Resistance Junction to Case,Max : 2°C/W

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	600	V
Gate-Source Voltage	$V_{GS}$	±30	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	12.3
		$T_C=100^\circ\text{C}$	7.8
Pulsed Drain Current <sup>(Note 3)</sup>	$I_{DM}$	49	A
Total Power Dissipation, $T_C=25^\circ\text{C}$	$P_D$	62.5	W
Single Avalanche Energy <sup>(Note 4)</sup>	$E_{AS}$	160	mJ

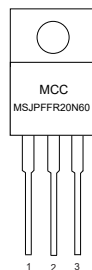
Note:

1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. Device in a still air environment with  $T_A=25^\circ\text{C}$ .
3. Repetitive rating; pulse width limited by max. junction temperature.
4. Starting  $T_J=25^\circ\text{C}$ ,  $V_{DD}=50\text{V}$ ,  $I_{AS}=4\text{A}$ .

## Internal Structure and Marking Code



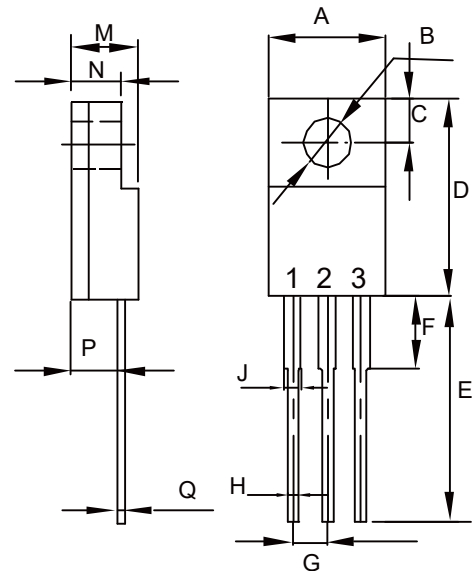
1. Gate
2. Drain
3. Source



Device Code: MSJPF20N60

# N-CHANNEL Super-Junction Power MOSFET

## TO-220F



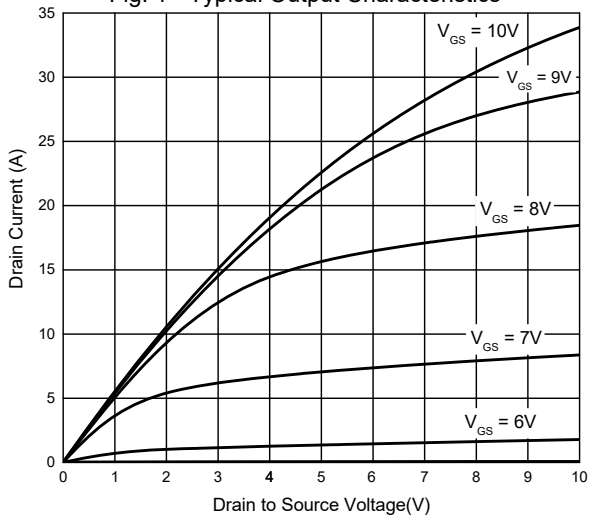
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.392	0.421	9.96	10.70	
B	0.138		3.50		Φ
C	0.106		2.70		TYP.
D	0.567	0.642	14.40	16.30	
E	0.520		13.20		TYP.
F	---	0.177	---	4.50	
G	0.100		2.54		TYP.
H	0.020	0.035	0.50	0.90	
J	0.043	0.053	1.10	1.35	
M	0.169	0.201	4.30	5.10	
N	---	0.140	---	3.56	
P	0.083	0.126	2.10	3.20	
Q	0.020	0.032	0.50	0.80	

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

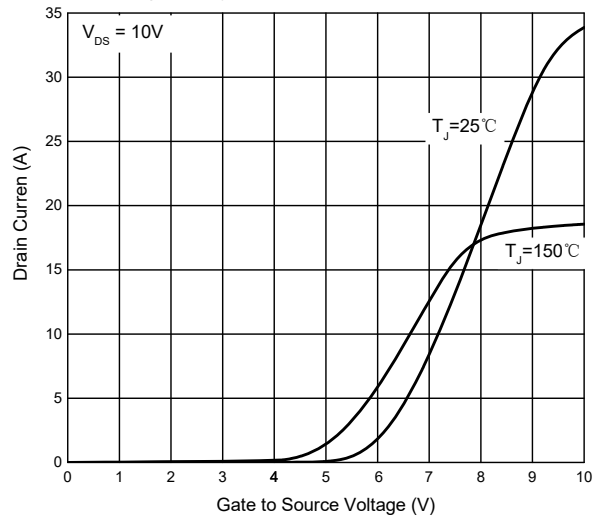
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=1mA$	600			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 30V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$			10	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=1.7mA$	3	4.0	5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=8.5A$		170	193	m $\Omega$
Gate Resistance	$R_g$	$f=1MHz, \text{open drain}$		1.3		$\Omega$
<b>Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=8.5A$			1.2	V
Reverse Recovery Time	$t_{rr}$	$V_R=300V, I_F=20A$ $di_F/dt=100A/\mu s$		110		ns
Reverse Recovery Charge	$Q_{rr}$			550		nC
Peak Reverse Recovery Current	$I_{rrm}$			10		A
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=100V, V_{GS}=0V, f=1MHz$		1240		pF
Output Capacitance	$C_{oss}$			60		
Output capacitance - energy related	$C_{o(er)}$	$V_{DS}=0 \text{ to } 400V, V_{GS}=0V$		55		
Output capacitance - time related	$C_{o(tr)}$			338		
Total Gate Charge	$Q_g$	$V_{DS}=300V, V_{GS}=10V, I_D=20A$		30		nC
Gate-Source Charge	$Q_{gs}$			9		
Gate-Drain Charge	$Q_{gd}$			15		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=300V, V_{GS}=10V$ $R_G=6\Omega, I_D=20A$		16		ns
Turn-On Rise Time	$t_r$			55		
Turn-Off Delay Time	$t_{d(off)}$			29		
Turn-Off Fall Time	$t_f$			16		

**Typical Characteristics** ( $T_J=25^\circ\text{C}$  unless otherwise specified)

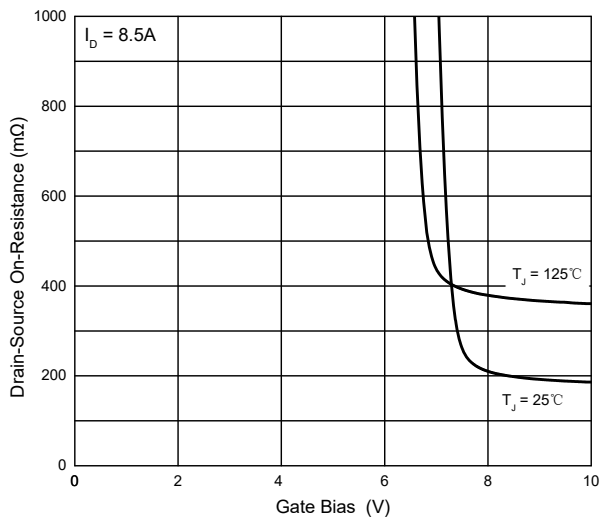
**Fig. 1 - Typical Output Characteristics**



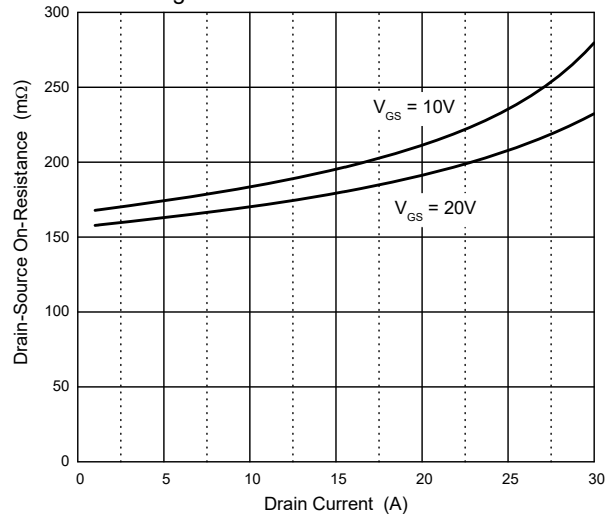
**Fig. 2 - Typical Transfer Characteristics**



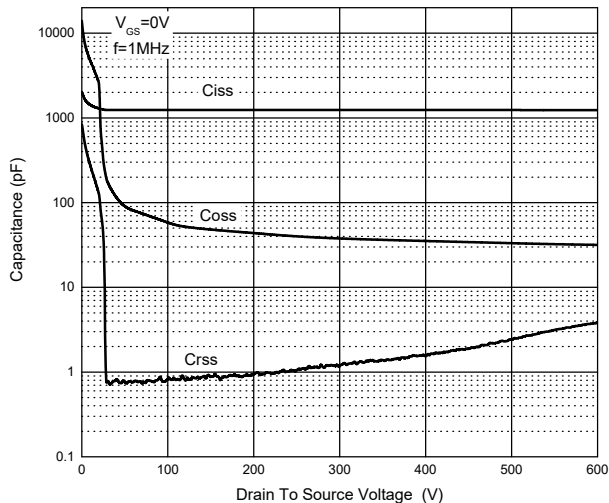
**Fig. 3 - On-Resistance vs Gate Bias**



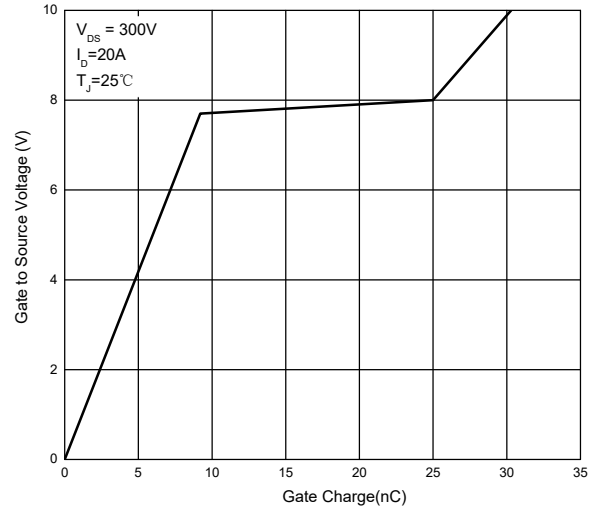
**Fig. 4 - On-Resistance vs Drain Current**



**Fig. 5 - Capacitance Characteristic**



**Fig. 6 - Typical Gate Charge**



Typical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise specified)

Fig. 7- Gate-Threshold Voltage vs Junction Temperature

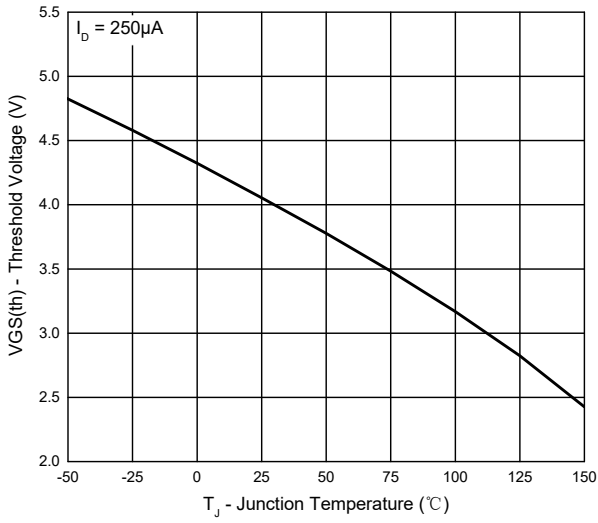


Fig. 8 - Normalized On-Resistance

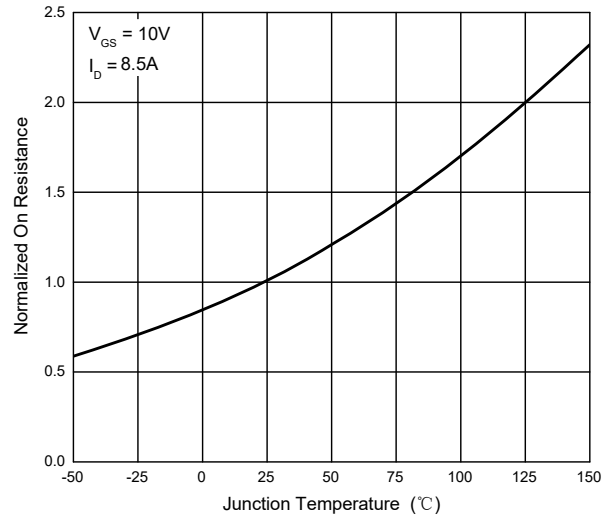


Fig. 9 - Forward Characteristics

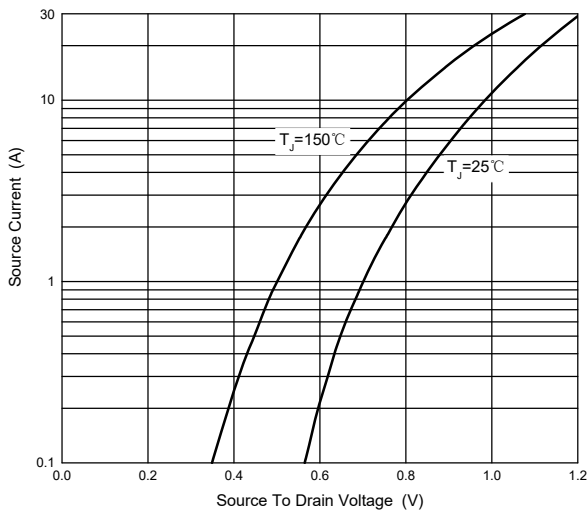


Fig. 10 - Drain Current

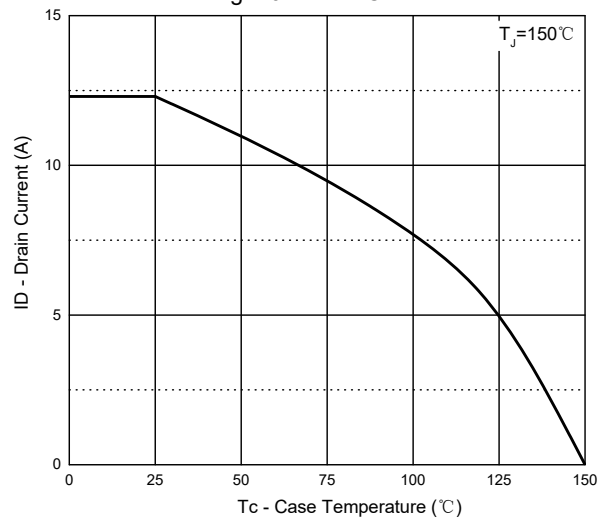


Fig. 11 - Power Dissipation

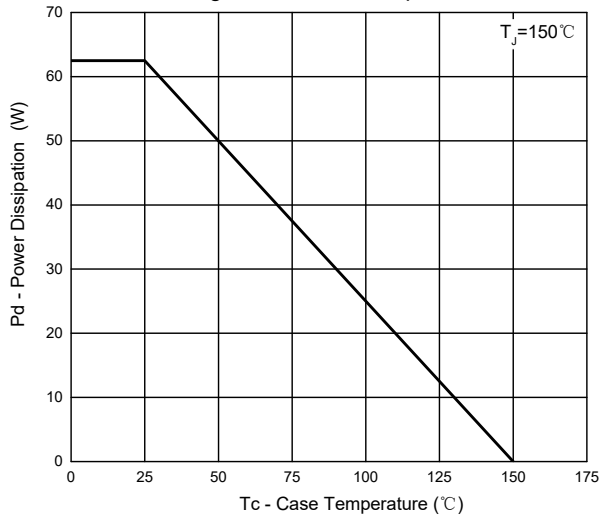
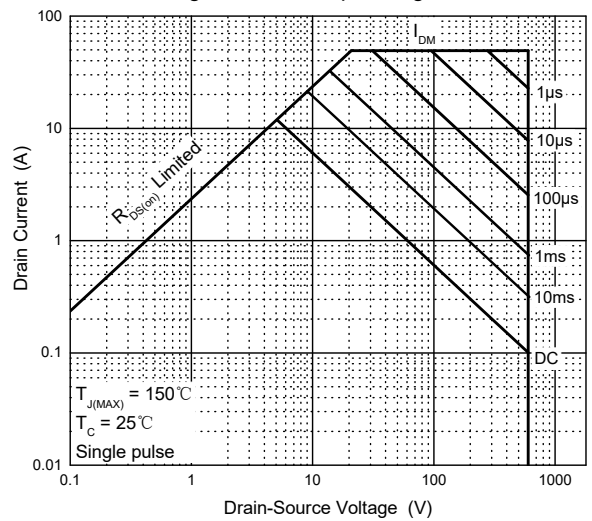
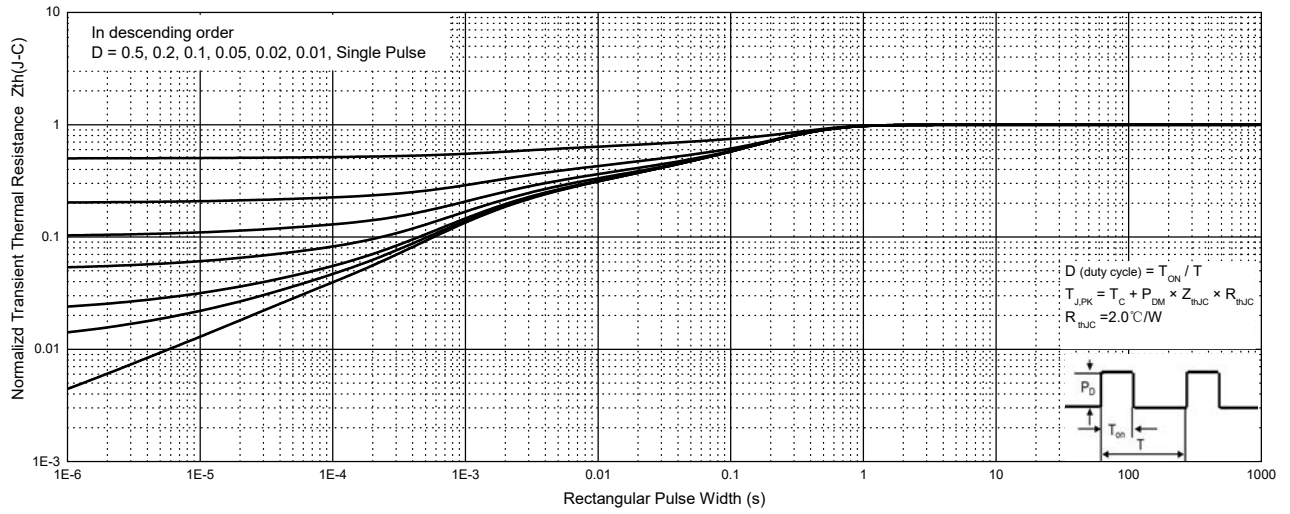


Fig. 12 - Safe Operating Area



Typical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise specified)

Fig.13 - Normalized Transient Thermal Impedance, Junction-Case



## Ordering Information

Device	Packing
Part Number-BP	Bulk: 50pcs/Tube; 1Kpcs/Box; 5Kpcs/Ctn

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