

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^(Note 1)
- Lead Free Finish/RoHS Compliant. "P" Suffix Designates RoHS Compliant. See Ordering Information

Maximum Ratings

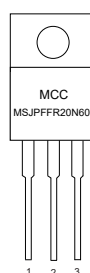
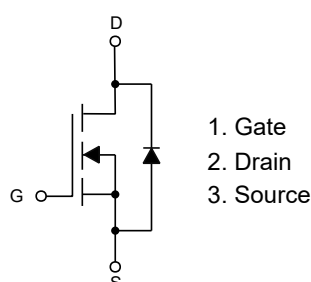
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance Junction to Ambient,Max^(Note 2): 60°C/W
- Thermal Resistance Junction to Case,Max : 2°C/W

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	A
		$T_C=100^\circ\text{C}$	
Pulsed Drain Current ^(Note 3)	I_{DM}	49	A
Total Power Dissipation, $T_C=25^\circ\text{C}$	P_D	62.5	W
Single Avalanche Energy ^(Note 4)	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 $T_J=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $I_{AS}=4\text{A}$.

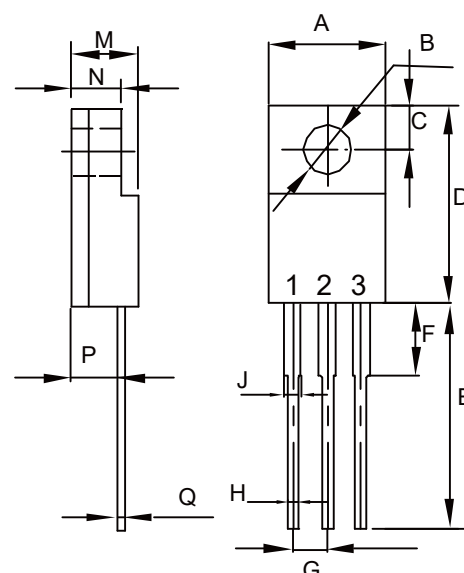
Internal Structure and Marking Code



Device Code: MSJPFFR20N60

N-CHANNEL Super-Junction Power MOSFET

TO-220F



DIMENSIONS					
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
Static Characteristics						
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} =±30V			±100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
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	mΩ
Gate Resistance	R _g	f=1MHz, open drain		1.3		Ω
Diode Characteristics						
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/μs		110		ns
Reverse Recovery Charge	Q _{rr}			550		nC
Peak Reverse Recovery Current	I _{rrm}			10		A
Dynamic Characteristics						
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 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 =6Ω, 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

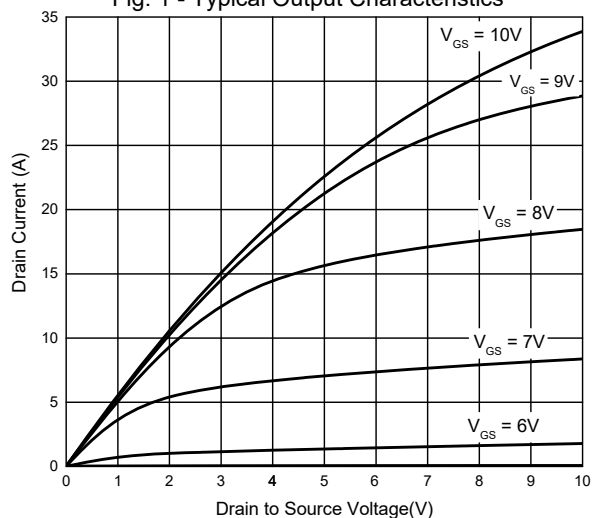


Fig. 2 - Typical Transfer Characteristics

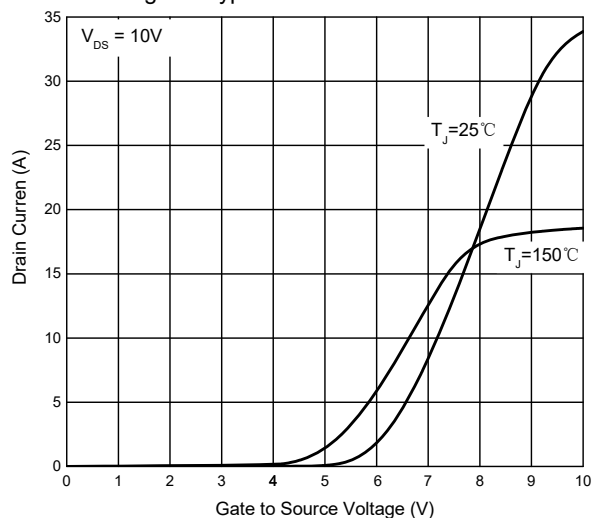


Fig. 3 - On-Resistance vs Gate Bias

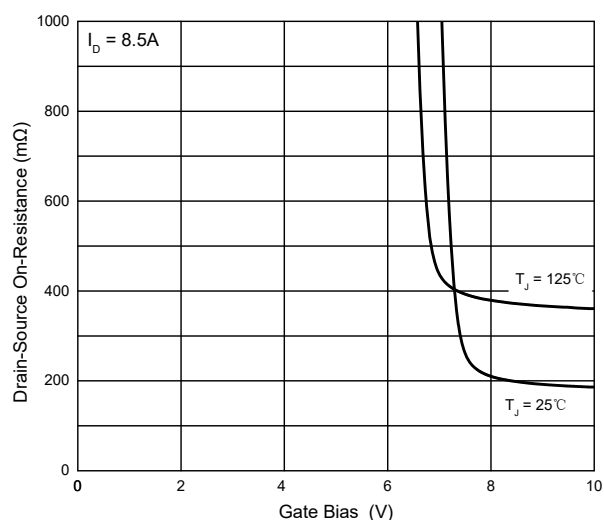


Fig. 4 - On-Resistance vs Drain Current

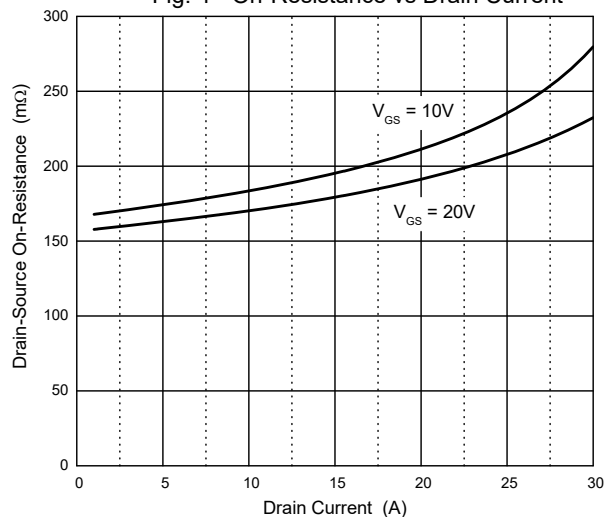


Fig. 5 - Capacitance Characteristic

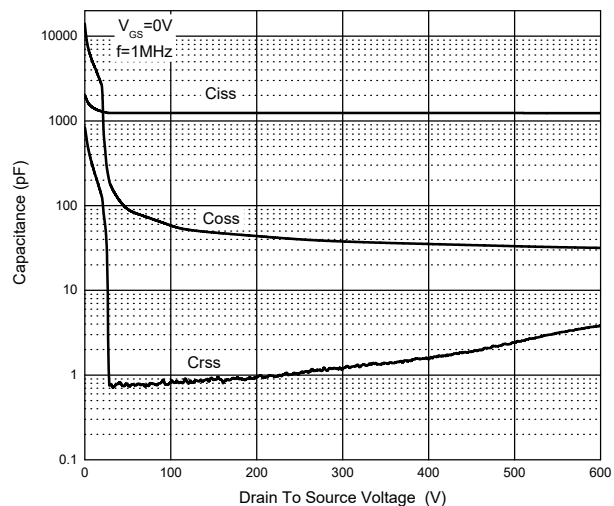
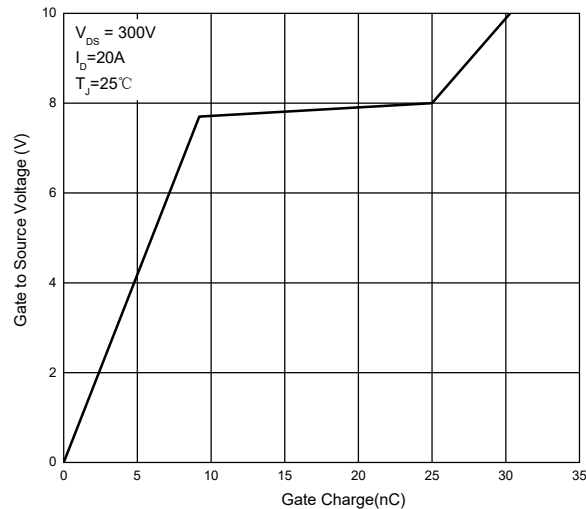


Fig. 6 - Typical Gate Charge



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

Fig. 7- Gate-Threshold Voltage vs Junction Temperature

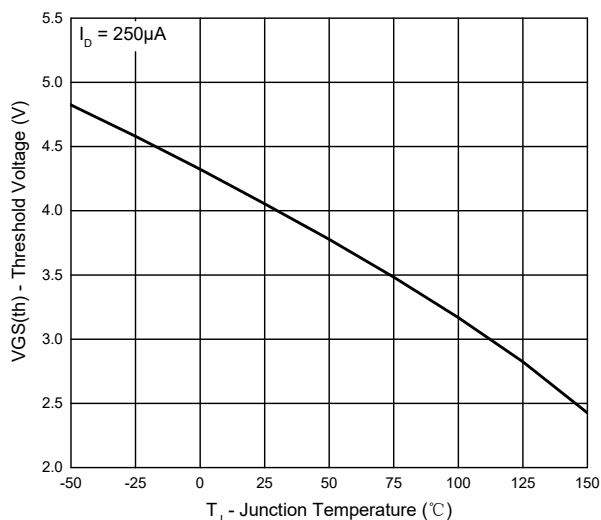


Fig. 8 - Normalized On-Resistance

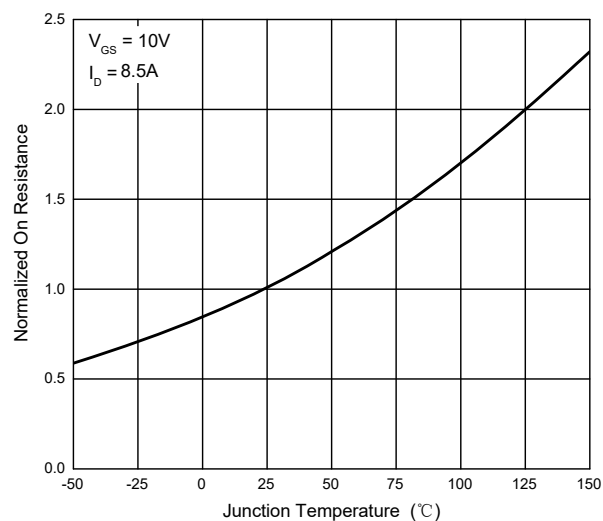


Fig. 9 - Forward Characteristics

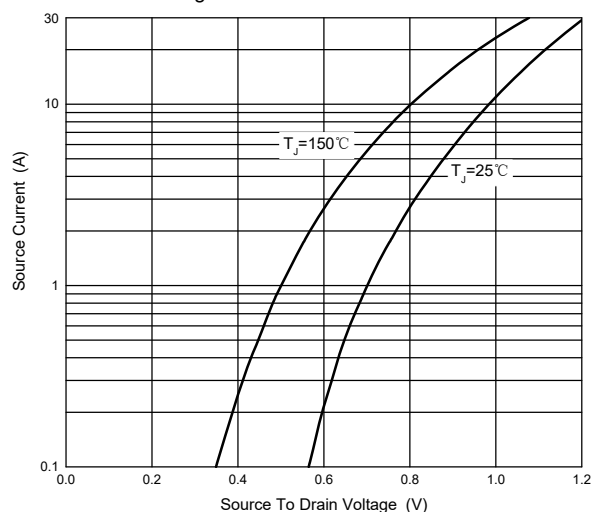


Fig. 10 - Drain Current

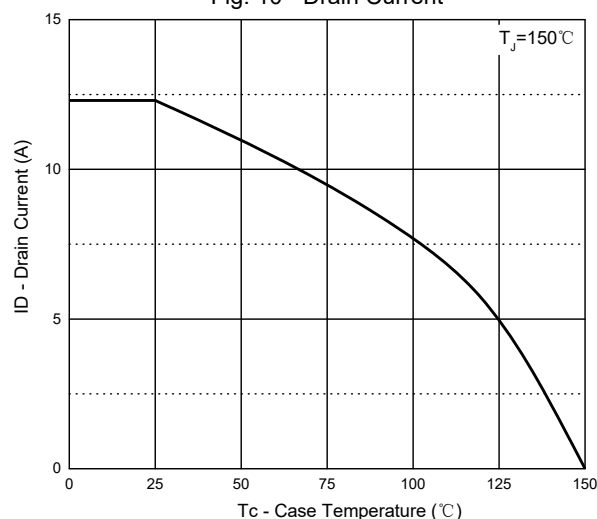


Fig. 11 - Power Dissipation

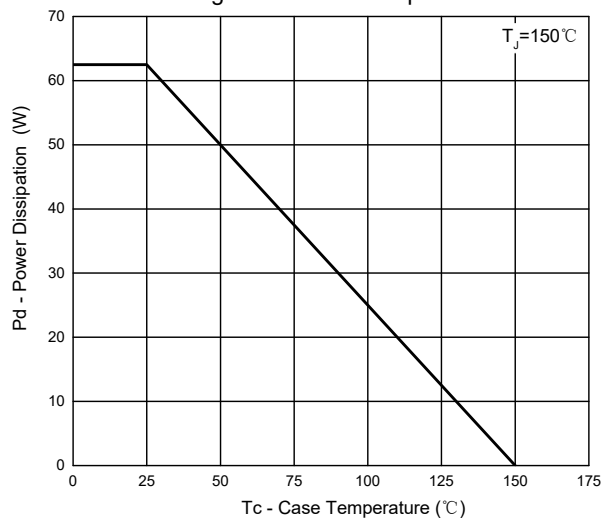
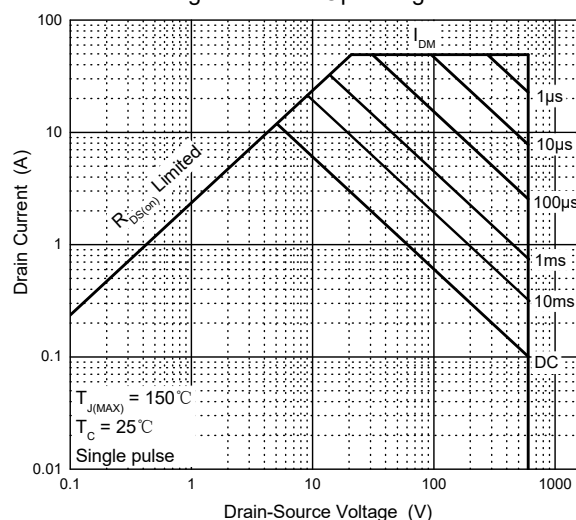
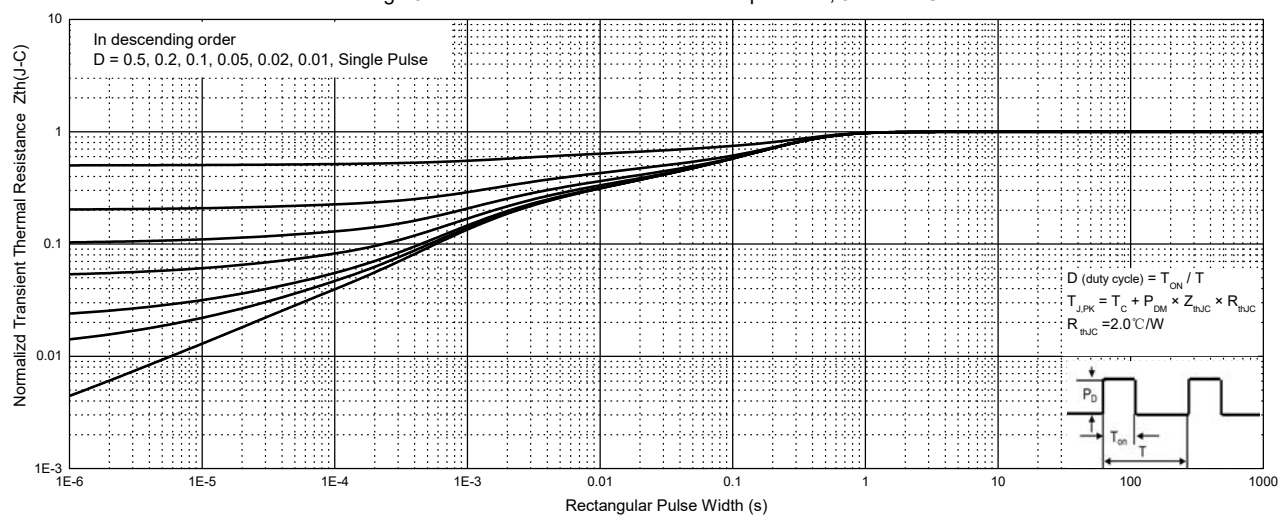


Fig. 12 - Safe Operating Area



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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