



**THE DATASHEET OF  
MSJPF20N65A-BP**



## Features

- Very Low FOM  $R_{DS(on)} \times Q_g$
- Halogen Free. "Green" Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

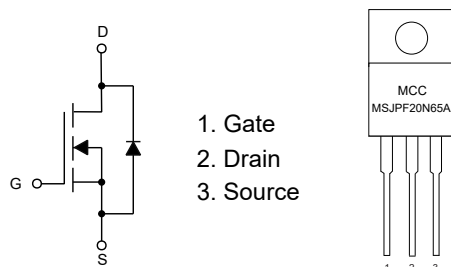
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 62.5°C/W Junction to Ambient(Notes 2)
- Thermal Resistance: 3.2°C/W Junction to Case

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	±30	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	20
		$T_C=100^\circ\text{C}$	13
Pulsed Drain Current (Note 3)	$I_{DM}$	80	A
Total Power Dissipation (Note 4)	$P_D$	39	W
Single Pulsed Avalanche Energy (Note 5)	$E_{AS}$	303	mJ

Note:

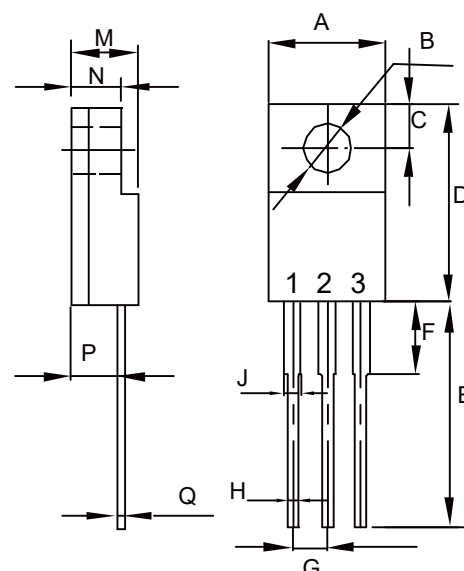
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ .
3. Repetitive rating; pulse width limited by max. junction temperature.
4.  $P_D$  is based on max. junction temperature, using junction-case thermal resistance.
5.  $T_J=25^\circ\text{C}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ ,  $L=30\text{mH}$ .

## Internal Structure and Marking Code



# N-CHANNEL Super-Junction Power MOSFET

## TO-220F



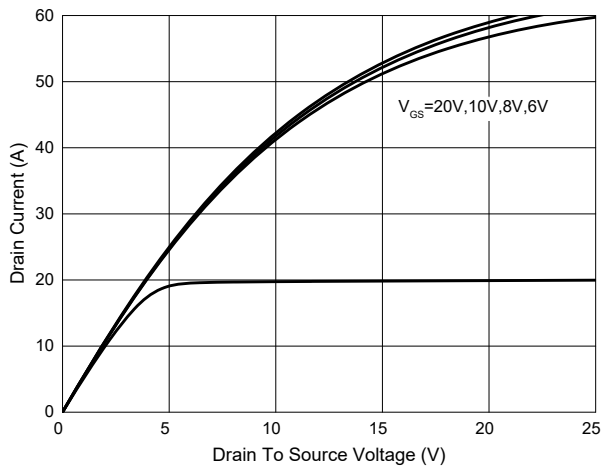
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.381	0.406	9.70	10.30	
B	0.118	0.138	3.00	3.50	Φ
C	0.124	0.139	3.15	3.55	
D	0.610	0.634	15.50	16.10	
E	0.496	0.535	12.60	13.60	
F	0.134	0.150	3.40	3.80	
G	0.092	0.108	2.34	2.74	
H	0.027	0.035	0.70	0.90	
J	0.044	0.056	1.12	1.42	
M	0.173	0.193	4.40	4.90	
N	0.098	0.114	2.50	2.90	
P	0.085	0.100	2.15	2.55	
Q	0.016	0.024	0.40	0.60	

**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

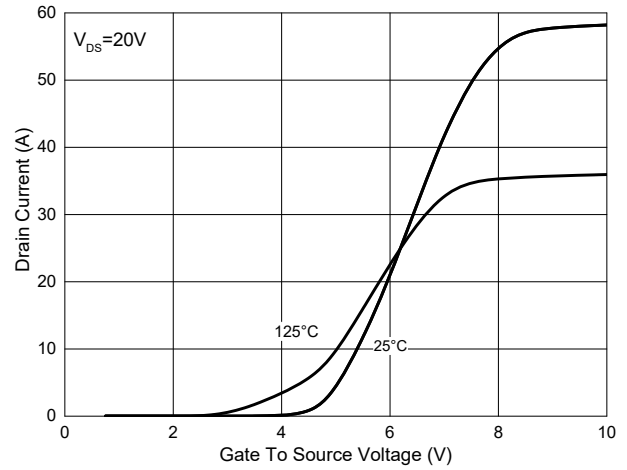
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 30V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V, T_C=25^\circ C$			1	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3.5	4	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$		167	190	m $\Omega$
Gate Resistance	$R_g$	$f = 1.0MHz, Open Drain$		2.2		$\Omega$
<b>Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$				20	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=20A$			1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F=20A, di_F/dt=100A/\mu s$		365		ns
Reverse Recovery Charge	$Q_{rr}$			6067		nC
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V, f=1MHz$		1750		pF
Output Capacitance	$C_{oss}$			583		
Reverse Transfer Capacitance	$C_{rss}$			16		
Total Gate Charge	$Q_g$	$V_{DS}=560V, V_{GS}=10V, I_D=20A$		55		nC
Gate-Source Charge	$Q_{gs}$			9.6		
Gate-Drain Charge	$Q_{gd}$			25		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=350V, V_{GEN}=10V, R_G=25\Omega, I_{DS}=20A$		32		ns
Turn-On Rise Time	$t_r$			61		
Turn-Off Delay Time	$t_{d(off)}$			174		
Turn-Off Fall Time	$t_f$			55		

**Curve Characteristics**

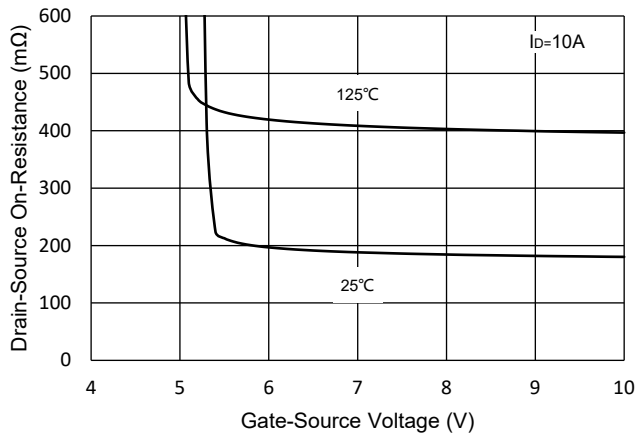
**Fig. 1 Typical Output Characteristics**



**Fig. 2 - Transfer Characteristics**



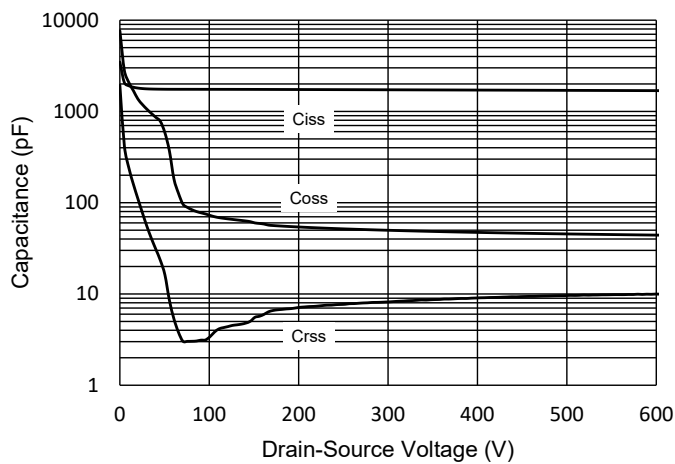
**Fig.3 Rds(on)-Vgs**



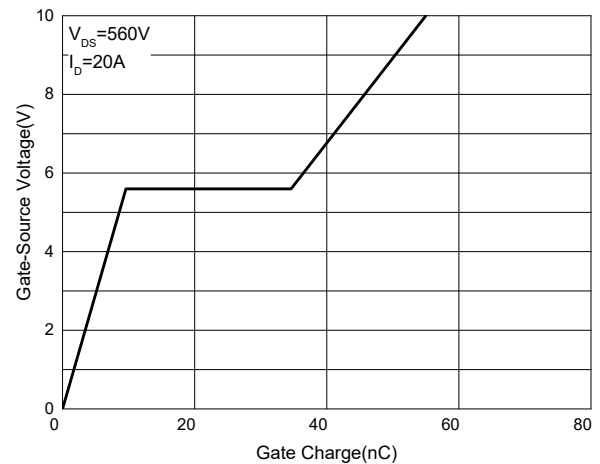
**Fig.4 Rds(on)-Id**



**Fig.5 Capacitance Characteristics**

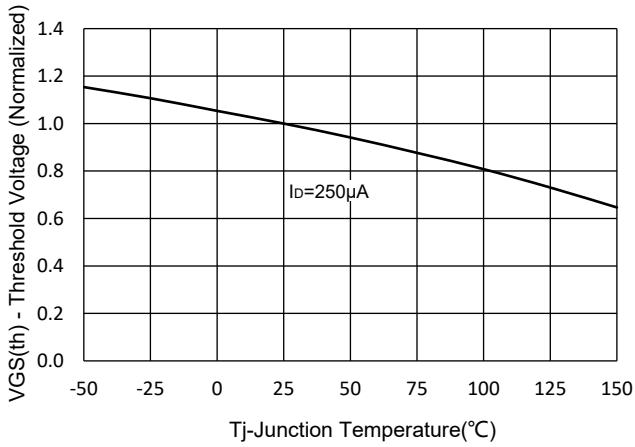


**Fig. 6 - Gate Charge**

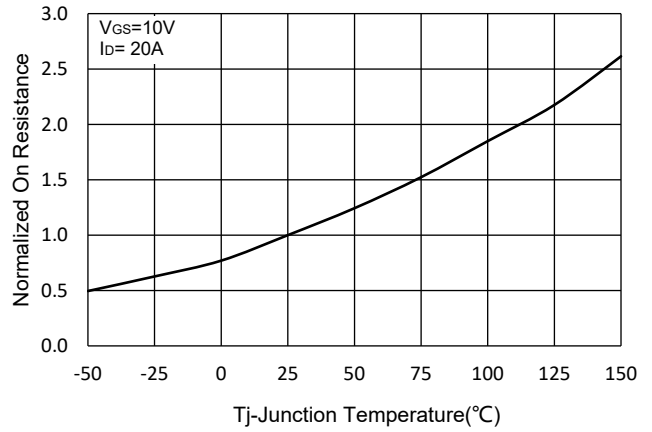


**Curve Characteristics**

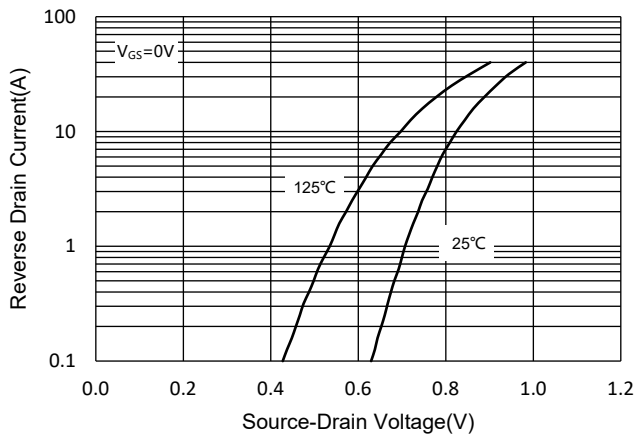
**Fig.7 Normalized Threshold Voltage**



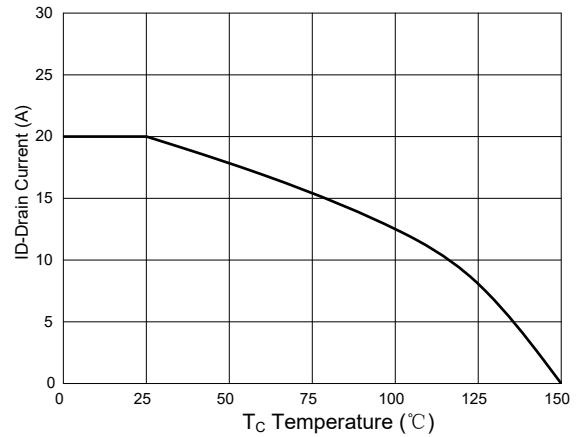
**Fig.8 Normalized On Resistance Characteristics**



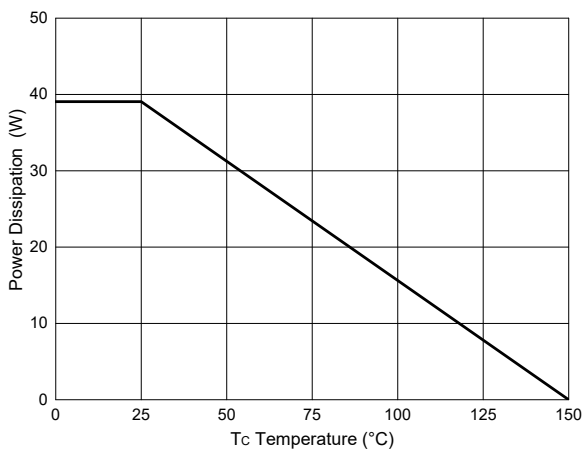
**Fig.9 IS-VSD**



**Fig. 10 - Drain Current**

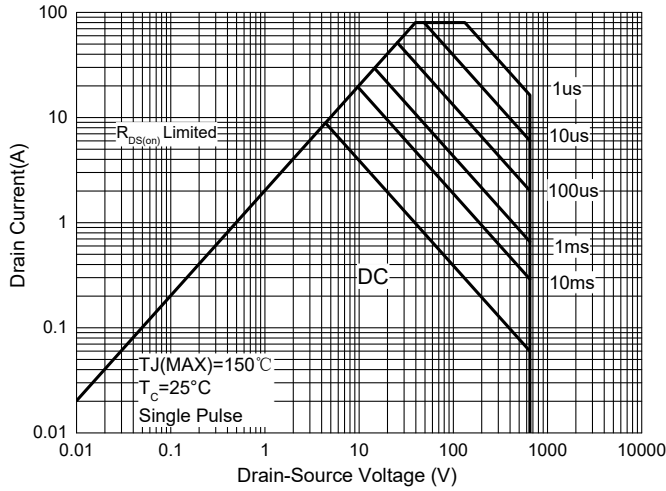


**Fig.11 Power Dissipation**

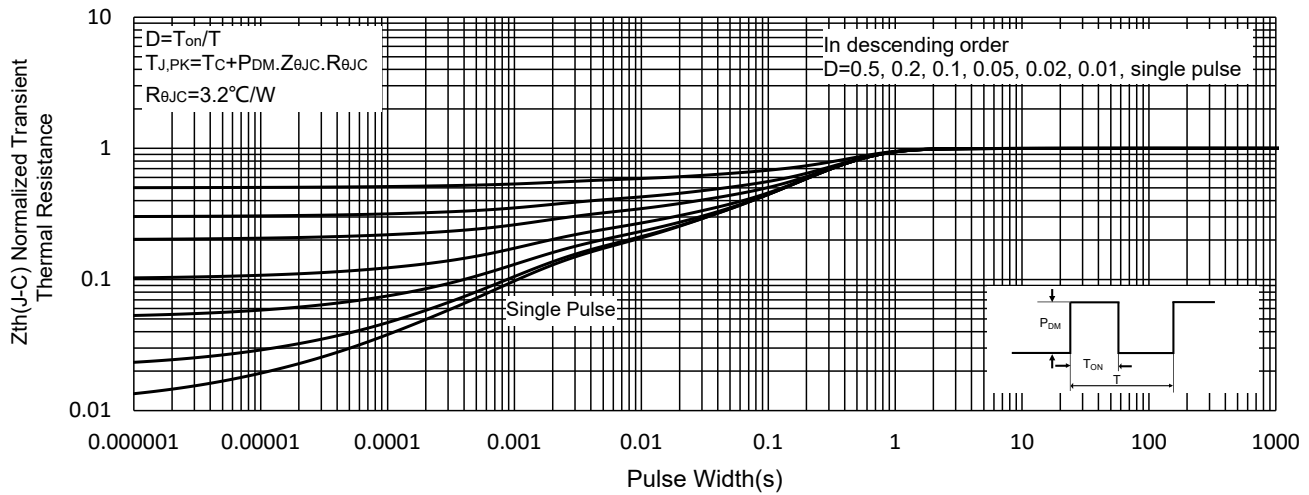


**Curve Characteristics**

**Fig. 12 - Safe Operation Area**



**Fig.13 Normalized Transient Thermal Impedance**



## Ordering Information

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

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