

## Features

- Excellent Stability and Uniformity
- Split Gate Trench Mosfet Technology
- Lower  $R_{DS(ON)}$
- 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: 1.5°C/W Junction to Case

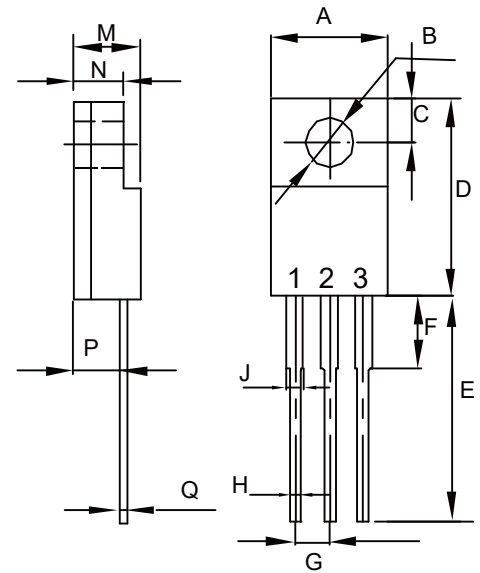
Parameter	Symbol	Rating	Unit
Drain -Source Voltage	$V_{DS}$	-60	V
Gate -Source Voltage	$V_{GS}$	±18	V
Drain Current-Continuous	$I_D$	$T_C=25^\circ\text{C}$	-80
		$T_C=100^\circ\text{C}$	-50
Drain Current-Pulse <sup>(Note2)</sup>	$I_{DM}$	-320	A
Power Dissipation	$P_D$	83	W
Single Pulsed Avalanche Energy <sup>(Note3)</sup>	$E_{AS}$	729	mJ

### Notes:

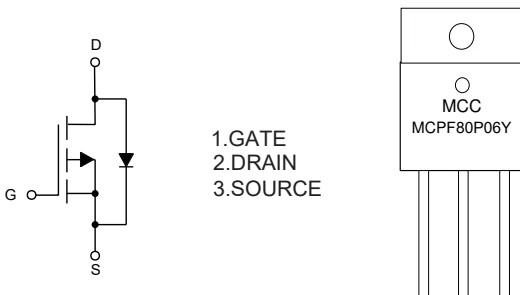
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. Pulse Width Limited by Maximum Junction Temperature.
3. EAS Condition:  $T_J=25^\circ\text{C}$ ,  $V_{DD}=-40\text{V}$ ,  $V_G=-10\text{V}$ ,  $R_g=25\Omega$ ,  $L=2\text{mH}$ ,  $I_{AS}=-27\text{A}$ .

# P-CHANNEL MOSFET

## TO-220F



## Internal Structure and Marking Code



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 @ 25°C (Unless Otherwise Noted)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-60			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 18V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V, T_J=25^\circ C$			-1	$\mu A$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-2.0	-2.7	-4	V
Drain-Source On-Resistance <sup>(Note4)</sup>	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-20A$		7	10	m $\Omega$
		$V_{GS}=-6V, I_D=-20A$		9	13	
Gate resistance	$R_G$	$V_{GS}=0V, f=1MHz$		8.3		$\Omega$
Body Diode Voltage	$V_{SD}$	$I_{SD}=-20A, V_{GS}=0V$			-1.2	V
<b>Dynamic Characteristics <sup>(Note 5)</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-30V, V_{GS}=0V, f=1MHz$		5810		pF
Output Capacitance	$C_{oss}$			935		
Reverse Transfer Capacitance	$C_{rss}$			79		
Total Gate Charge	$Q_g$	$V_{DS}=-30V, V_{GS}=-10V, I_D=-3A$		88		nC
Gate-Source Charge	$Q_{gs}$			25		
Gate-Drain Charge	$Q_{gd}$			15		
Reverse Recovery Charge	$Q_{rr}$	$I_F=-40A, di/dt=100A/\mu s$		84		
Reverse Recovery Time	$t_{rr}$			57		
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=-30V, I_D=-3A, V_{GS}=-10V, R_G=6\Omega$		12		ns
Turn-On Rise Time	$t_r$			24		
Turn-Off Delay Time	$t_{d(off)}$			174		
Turn-Off Fall Time	$t_f$			81		

 Note 4. Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

5. Guaranteed by Design, Not Subject to Production Testing.

Fig. 1 - Typical Output Characteristics

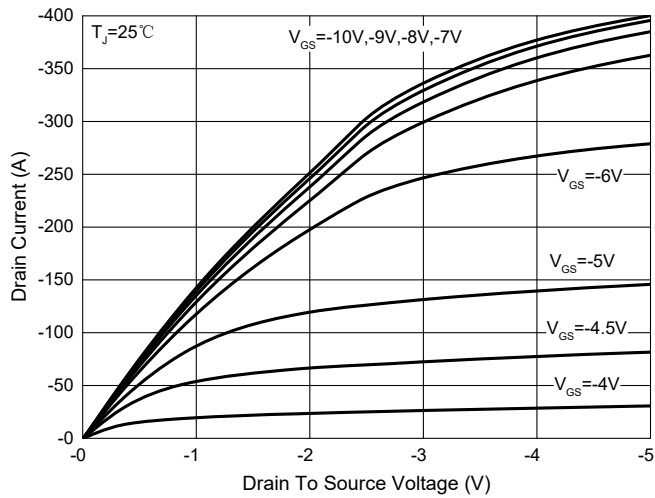


Fig. 2 - Transfer Characteristics

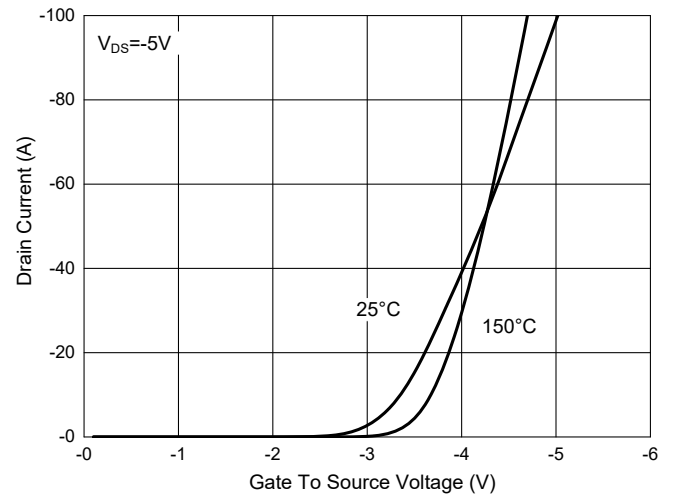


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

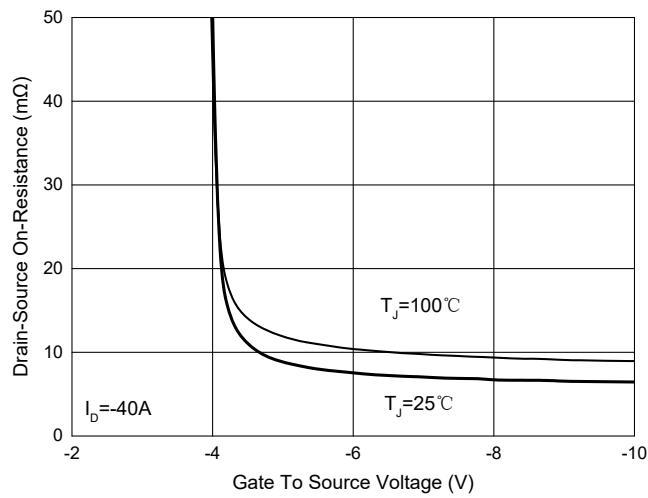


Fig. 4 - Normalized On Resistance Characteristics

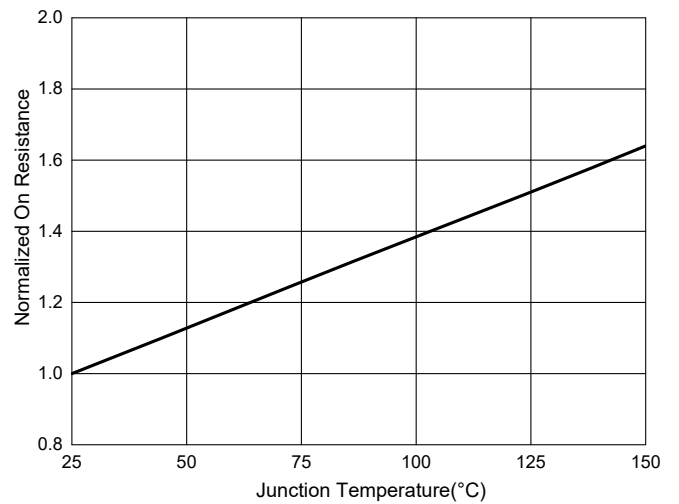


Fig. 5 - Capacitance Characteristics

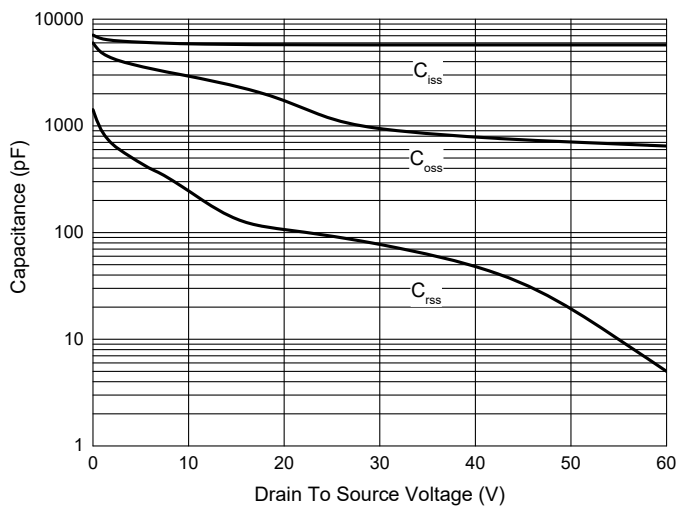


Fig. 6 -  $I_S - V_{SD}$

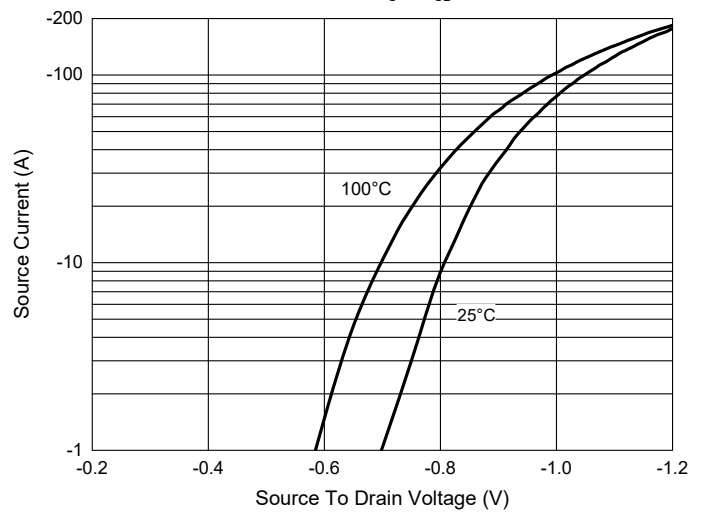


Fig. 7 - Gate Charge

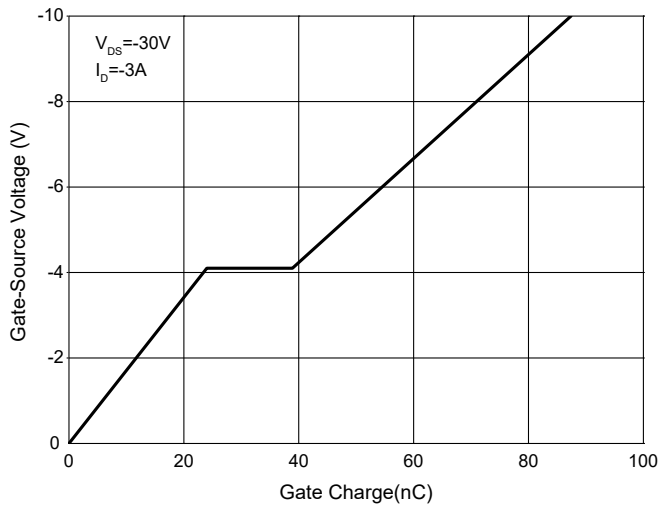


Fig. 8 - Safe Operation Area

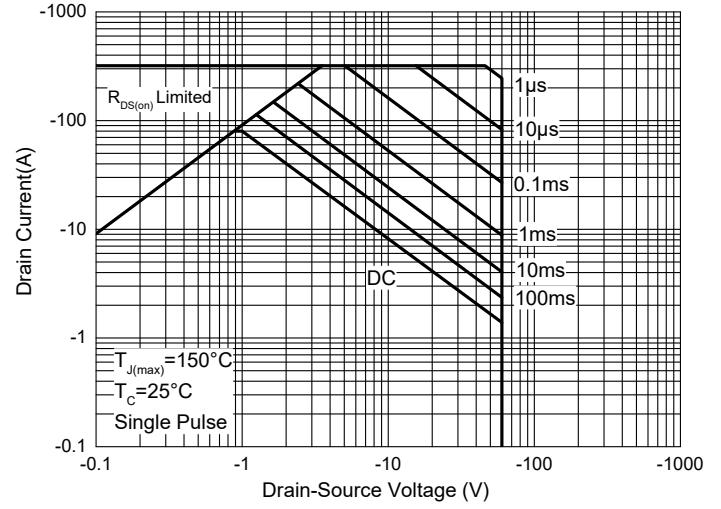
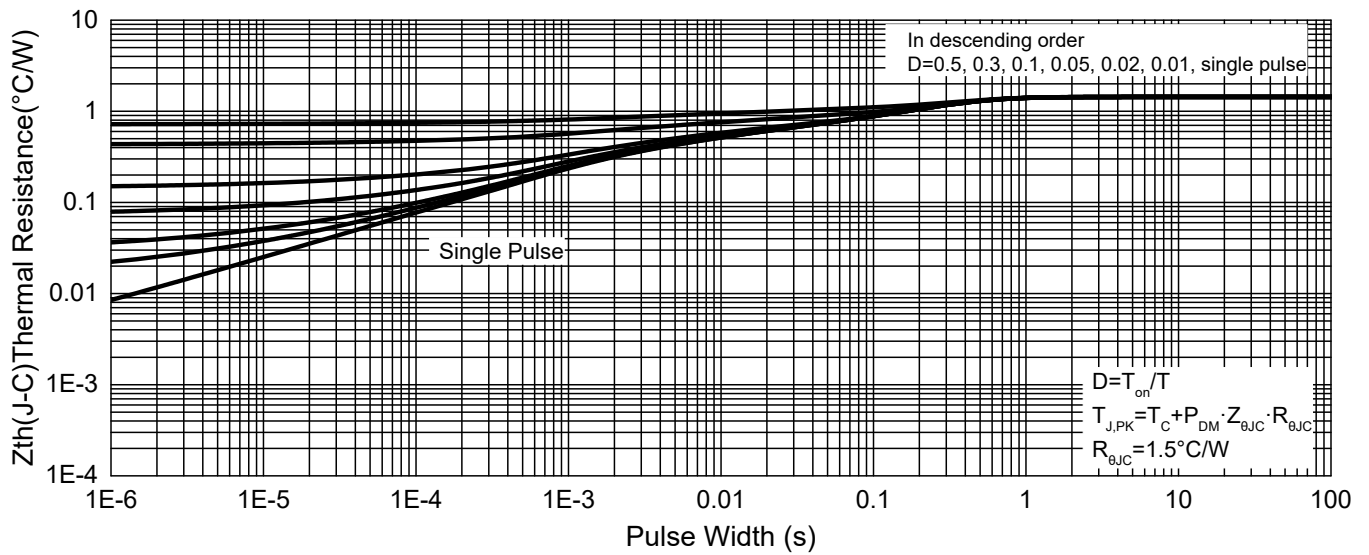


Fig. 9 - Maximum Transient Thermal Impedance



## Ordering Information

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

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