

### Features

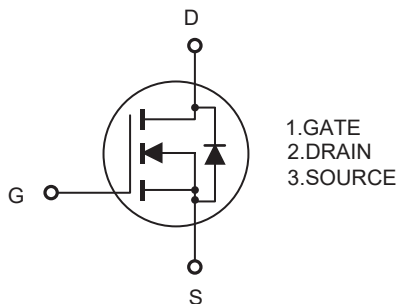
- High Current Rating
- Lower  $R_{DS(ON)}$
- Lower Capacitance
- Lower Total Gate Charge
- Tighter  $V_{SD}$  Specifications
- Avalanche Energy Specified
- Epoxy Meets UL 94 V-0 Flammability Rating
- Moisture Sensitivity Level 1
- Halogen Free Available Upon Request By Adding Suffix "-HF"

### Maximum Ratings

- Operating Junction Temperature Range:  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Storage Temperature Range:  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Thermal Resistance:  $62.5^{\circ}\text{C/W}$  Junction to Ambient

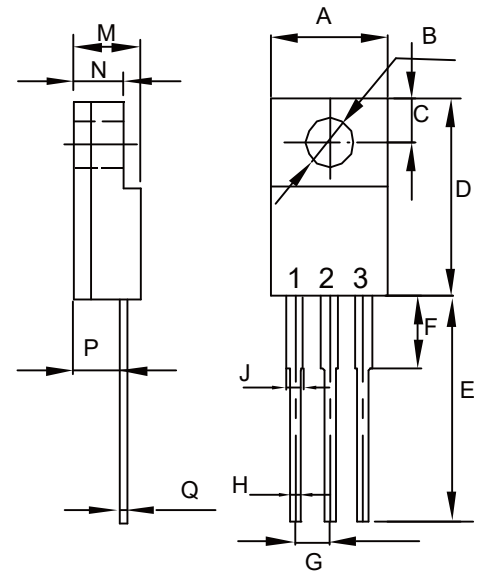
Parameter	Symbol	Rating	Unit
Drain -Source Voltage	$V_{DS}$	650	V
Gate -Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current-Continuous	$I_D$	12.0	A
Drain Current-Pulse <sup>(Note4)</sup>	$I_{DM}$	48	A
Power Dissipation	$P_D$	2.0	W
Single Pulsed Avalanche Energy <sup>(note 1)</sup>	$E_{AS}$	540	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 5 Seconds	$T_L$	260	$^{\circ}\text{C}$

### Internal Structure



## N-Channel Enhancement Mode Field Effect Transistor

### TO-220F



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.392	0.421	9.96	10.70	
B	0.138		3.50		$\Phi$
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>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Diode Forward Voltage <sup>(note2)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=12.0A$			1.4	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			1.0	$\mu A$
Gate-Body Leakage Current, Forward <sup>(note2)</sup>	$I_{GSSF}$	$V_{DS}=0V, V_{GS}=30V$			100	nA
Gate-Body Leakage Current, Reverse <sup>(note2)</sup>	$I_{GSSR}$	$V_{DS}=0V, V_{GS}=-30V$			-100	
<b>On Characteristics(note2)</b>						
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.5	4.0	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=6A$		0.7	0.85	$\Omega$
<b>Dynamic Characteristics(note 3)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		1800		pF
Output Capacitance	$C_{oss}$			200		
Reverse Transfer Capacitance	$C_{rss}$			25		
<b>Switching characteristics(note2,3,4)</b>						
Total Gate Charge	$Q_g$	$V_{DS}=520V, V_{GS}=10V, I_D=12A$		42	5	nC
Gate-Source Charge	$Q_{gs}$			8.6		
Gate-Drain Charge	$Q_{gd}$			21		
Turn-On Delay Time(note 3)	$t_{d(on)}$	$V_{DD}=325V, V_{GS}=10V, R_G=25\Omega, I_D=12.0A$		30		ns
Turn-On Rise Time(note 3)	$t_r$			90		
Turn-Off Delay Time(note 3)	$t_{d(off)}$			160		
Turn-Off Fall Time(note 3)	$t_f$			90		
<b>Drain-Source Diode Characteristics</b>						
Maximum Continuous Drain-source Diode Forward Current	$I_S$				12	A
Maximum Pulsed Drain-source Diode Forward Current	$I_{SM}$				48	A

**Notes:**

1.  $L=7.5mH, I_L=12A, V_{DD}=50V, R_G=25\Omega, \text{Starting } T_J=25^\circ C.$
2. Pulse Test : Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
3. These parameters have no way to verify.
4. Pulse width limited by maximum junction temperature

## Curve Characteristics

Fig. 1 - Output Characteristics

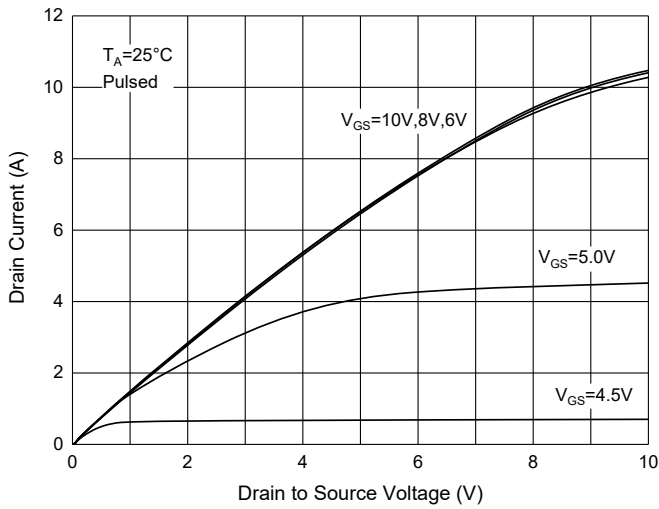


Fig. 2 - Transfer Characteristics

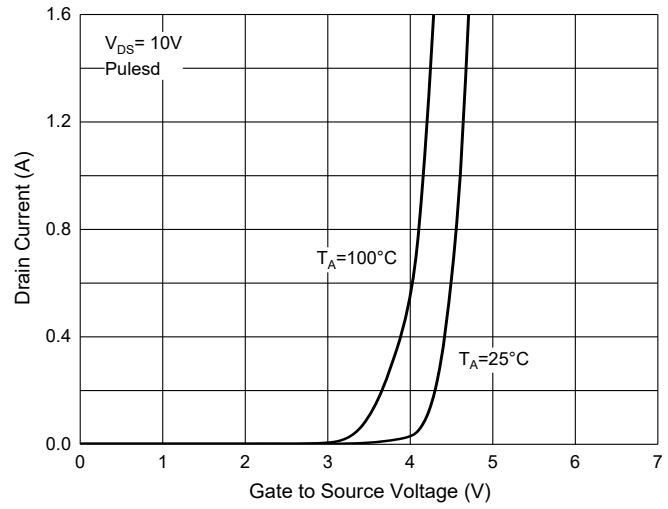


Fig. 3 -  $R_{DS(ON)} - I_D$

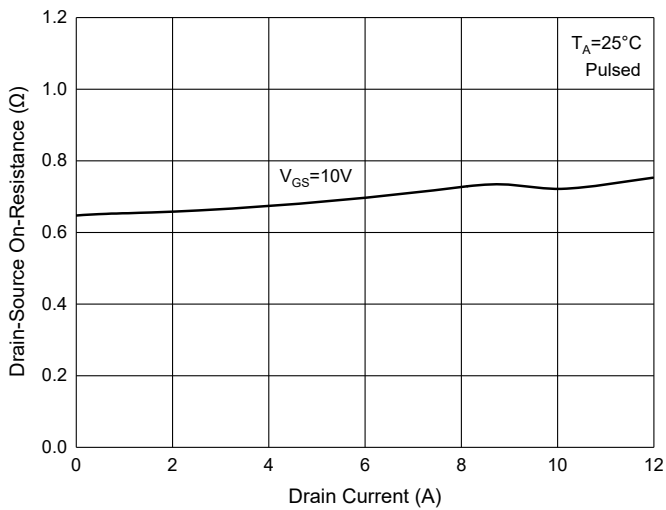


Fig. 4 -  $R_{DS(ON)} - V_{GS}$

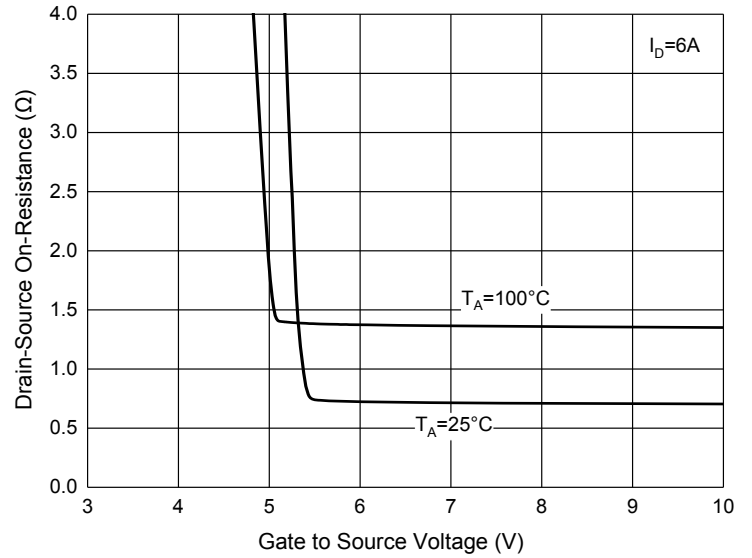


Fig. 5 -  $I_S - V_{SD}$

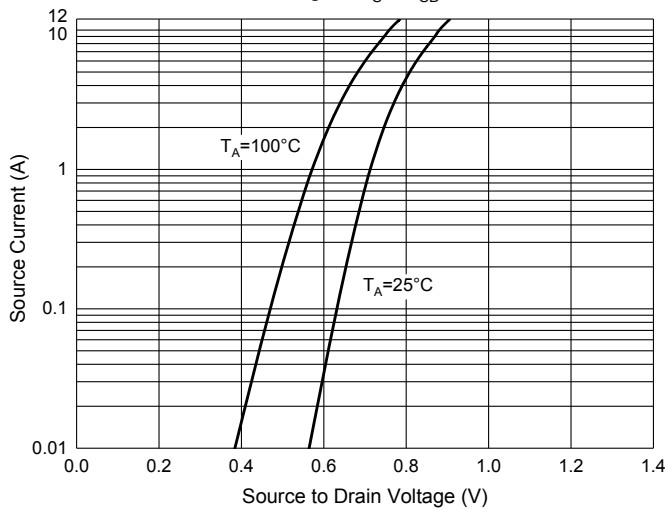
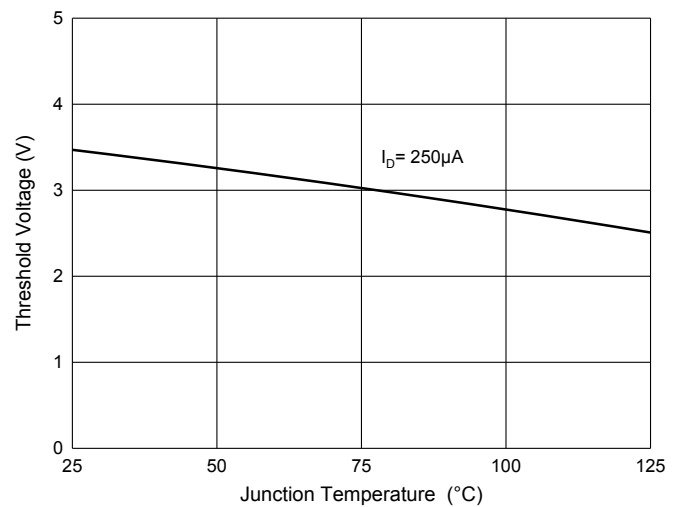


Fig. 6 - Threshold Voltage



## Ordering Information

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

Note : Adding "-HF" Suffix For Halogen Free, eg. Part Number-BP-HF

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