

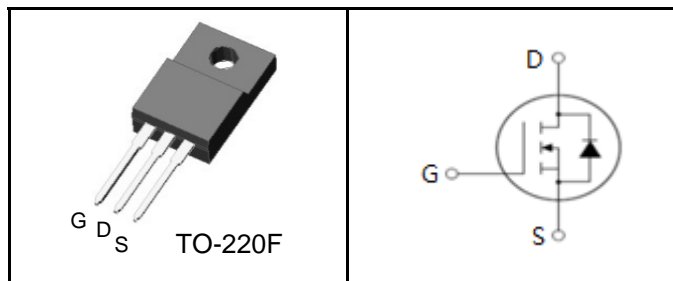
## 600V Super-Junction Power MOSFET

### FEATURES

- Very low FOM  $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- RoHS compliant
- Ultra-fast body diode
- Very high commutation ruggedness

### APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Resonant switching stages



### Device Marking and Package Information

Ordering Code	Package	Marking
MPSA60M250CFD	TO-220F	MP60M250CFD

### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS} = 0\text{V}$ )	$V_{DSS}$	600	V
Continuous Drain Current	$I_D$	15	A
Pulsed Drain Current (note1)	$I_{DM}$	45	A
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Single Pulse Avalanche Energy (note2)	$E_{AS}$	300	mJ
Avalanche Current (note1)	$I_{AR}$	2.4	A
Repetitive Avalanche Energy (note1)	$E_{AR}$	0.44	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400\text{V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\dots 400\text{V}$ , $I_{SD} \leq I_D$	dv/dt	15	V/ns
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	32	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55~+150	$^\circ\text{C}$

### Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{thJC}$	3.9	K/W
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	80	



Specifications $T_J = 25^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	600	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 600V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	2	$\mu A$
		$V_{DS} = 600V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	500	
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30V$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3	--	5	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 7.5A$	--	0.23	0.250	$\Omega$
Gate Resistance	$R_G$	$f = 1.0\text{MHz}$ , open drain	--	12	--	$\Omega$
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = 100V,$ $f = 1.0\text{MHz}$	--	1651	--	$\mu F$
Output Capacitance	$C_{oss}$		--	65	--	
Reverse Transfer Capacitance	$C_{rss}$		--	7	--	
Total Gate Charge	$Q_g$	$V_{DD} = 400V, I_D = 15A,$ $V_{GS} = 10V$	--	27	--	nC
Gate-Source Charge	$Q_{gs}$		--	6	--	
Gate-Drain Charge	$Q_{gd}$		--	10	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 15A,$ $V_{GS} = 10V, R_G = 25\Omega$	--	23	--	ns
Turn-on Rise Time	$t_r$		--	65	--	
Turn-off Delay Time	$t_{d(off)}$		--	105	--	
Turn-off Fall Time	$t_f$		--	50	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	15	A
Pulsed Diode Forward Current	$I_{SM}$		--	--	45	
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = 15A, V_{GS} = 0V$	--	0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$V_R = 400V, I_F = 15A,$ $di_F/dt = 100A/\mu s$	--	115	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	0.42	--	$\mu C$
Peak Reverse Recovery Current	$I_{rrm}$		--	7	--	A

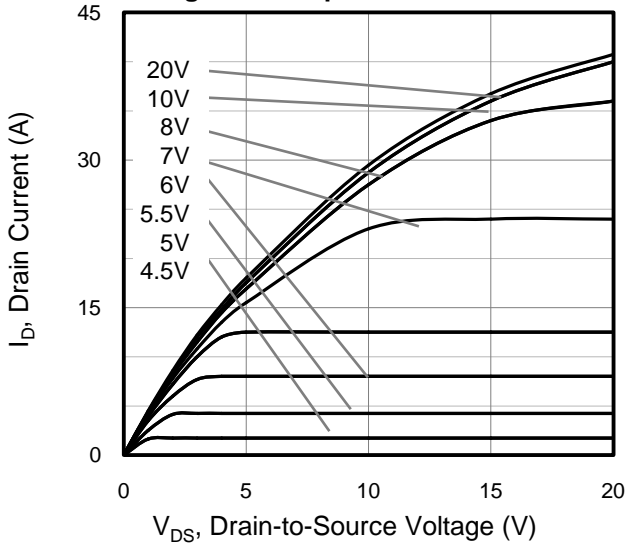
**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 2.5A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

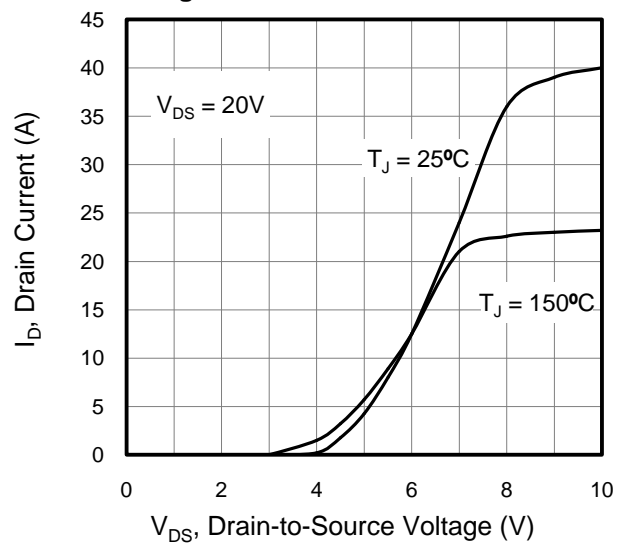


## Typical Characteristics $T_J = 25^\circ\text{C}$ , unless otherwise noted

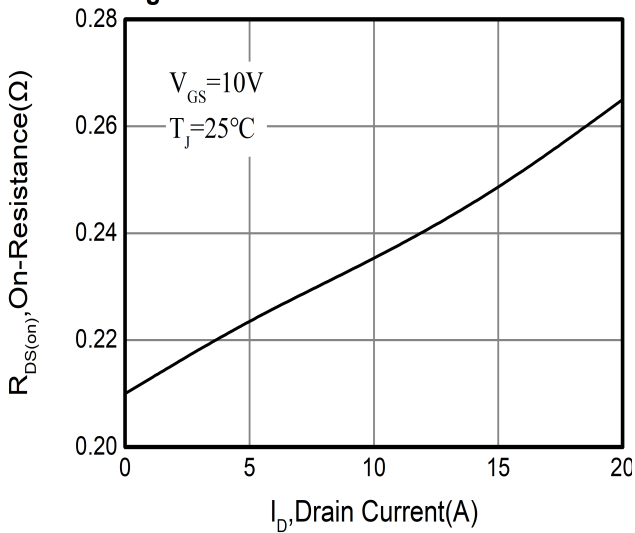
### Figure 1. Output Characteristics



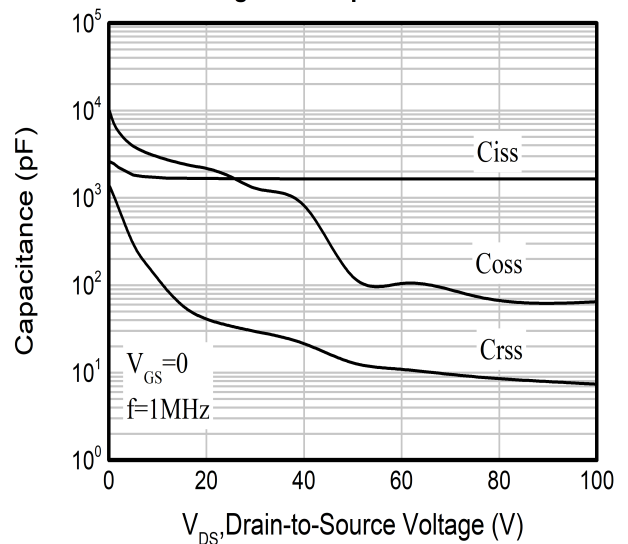
### Figure 2. Transfer Characteristics



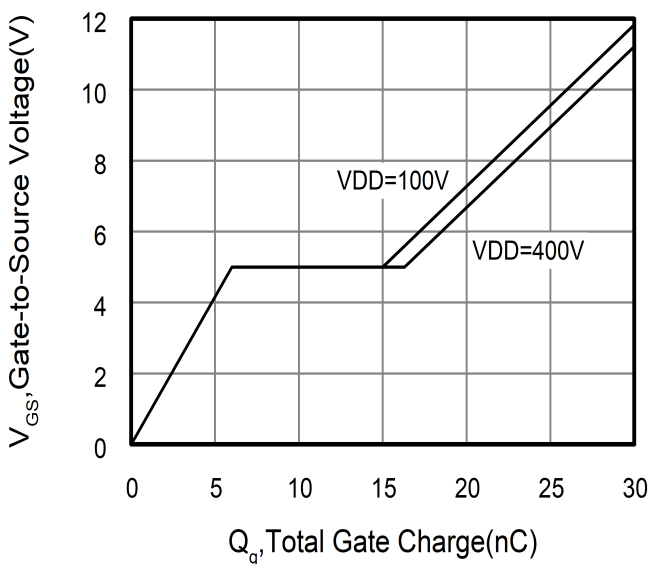
### Figure 3. On-Resistance vs Drain Current



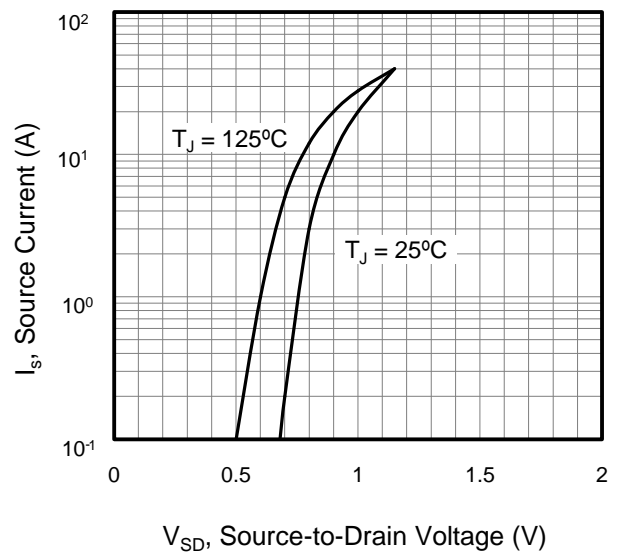
### Figure 4. Capacitance



### Figure 5. Gate Charge

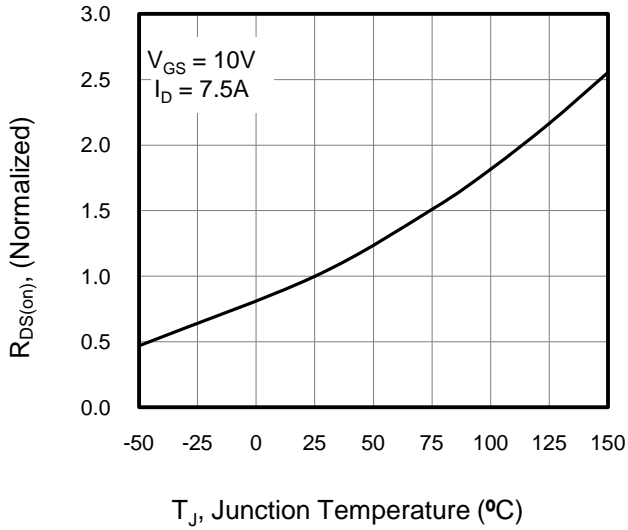


### Figure 6. Body Diode Forward Voltage

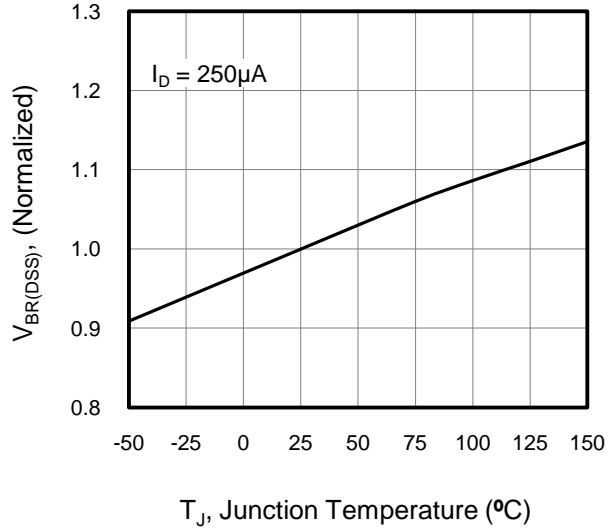


## Typical Characteristics $T_J = 25^\circ\text{C}$ , unless otherwise noted

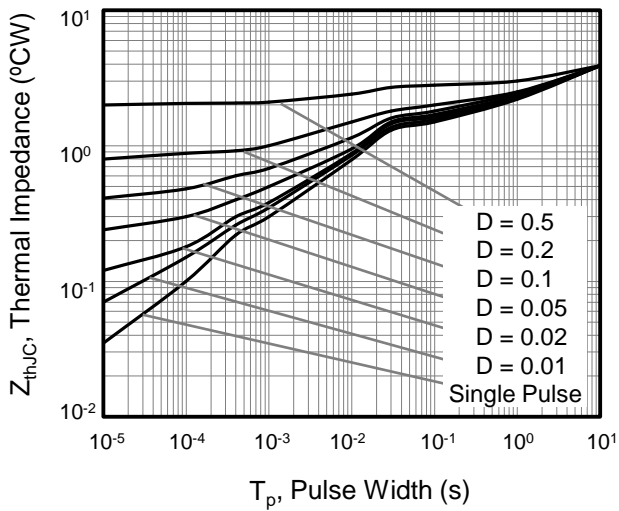
**Figure 7. On-Resistance vs. Junction Temperature**



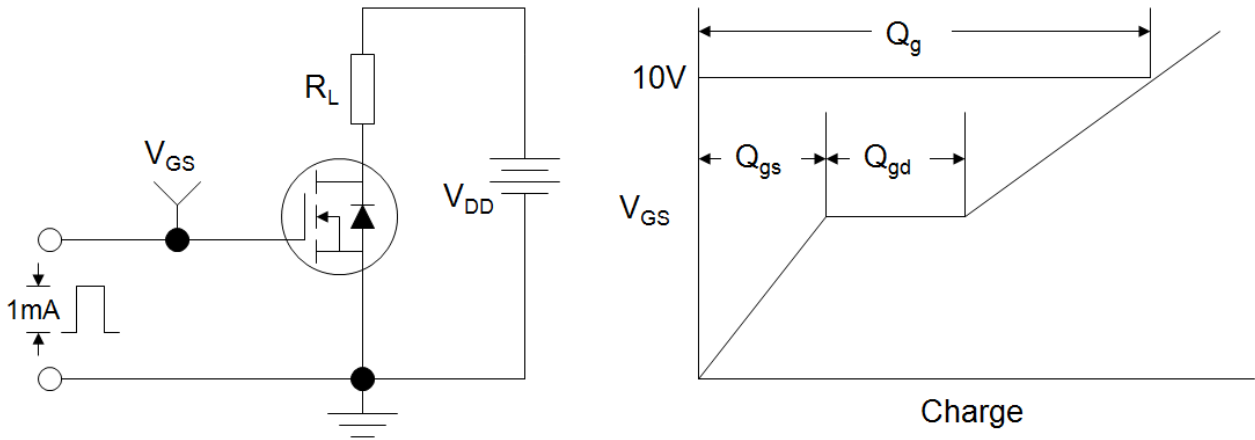
**Figure 8. Breakdown voltage vs. Junction Temperature**



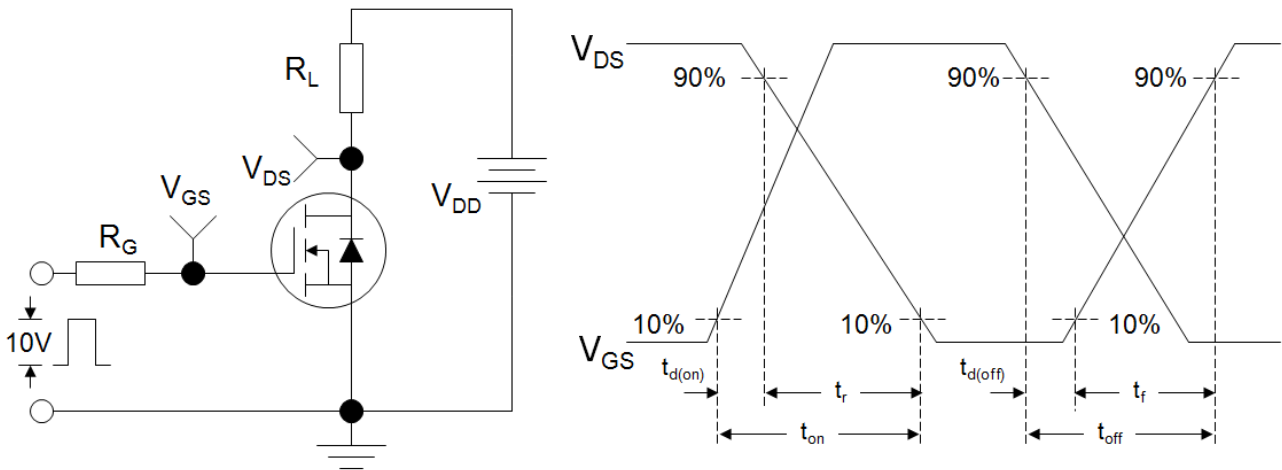
**Figure 10. Transient Thermal Impedance**



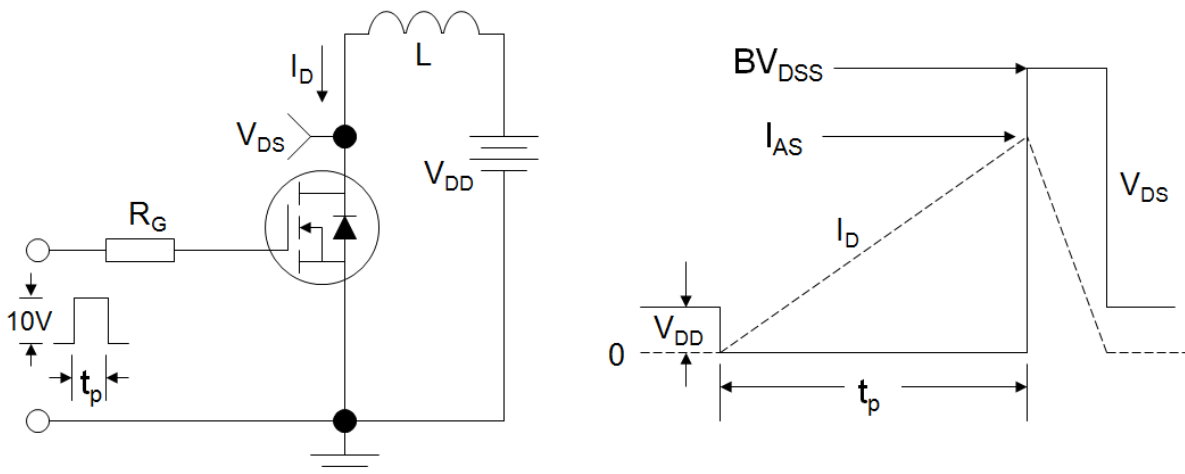
**Figure A: Gate Charge Test Circuit and Waveform**



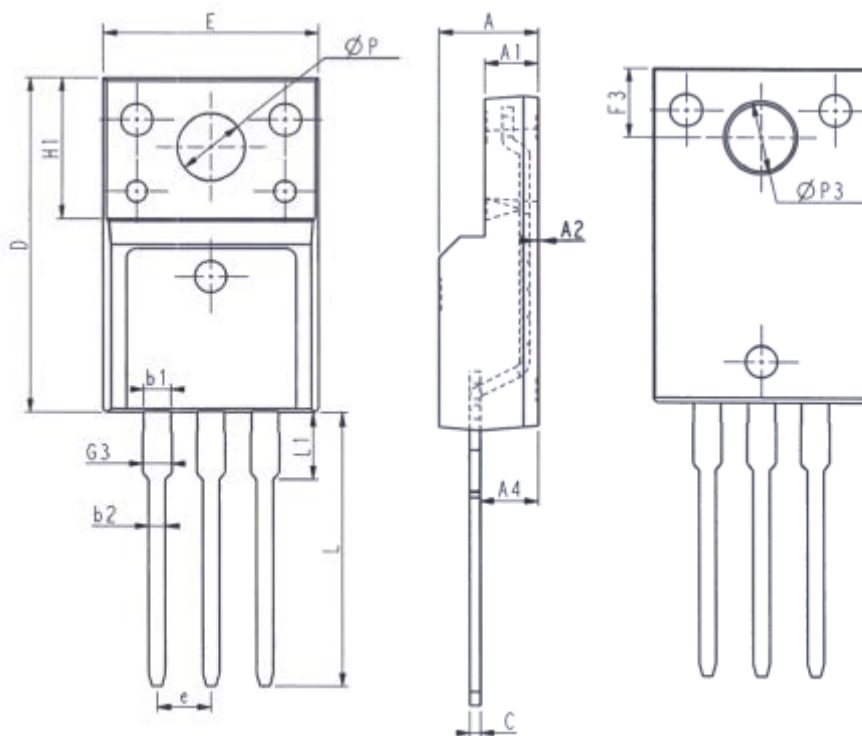
**Figure B: Resistive Switching Test Circuit and Waveform**



**Figure C: Unclamped Inductive Switching Test Circuit and Waveform**



TO-220F



Unit: mm			Unit: mm		
Symbol	Min.	Max.	Symbol	Min.	Max.
E	9.96	10.36	L	12.68	13.28
A	4.50	4.90	L1	2.93	3.13
A1	2.34	2.74	P	3.03	3.38
A2	0.30	0.60	P3	3.15	3.65
A4	2.56	2.96	F3	3.15	3.45
c	0.40	0.65	G3	1.25	1.55
D	15.57	16.17	b1	1.18	1.43
H1	6.70REF		b2	0.70	0.95
e	2.54BSC				