MPSA65M130B
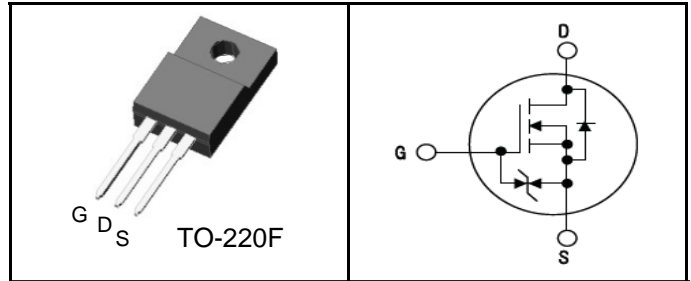
650V N-Channel Super Junction MOSFET

Features

- BV_{DSS}=650V, I_D=25A
- $R_{DS(on)}$:0.13Ω (Max) @ V_{GS}=10V
- Very Low FOM ($R_{DS(on)}$ X Q_g)
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode

Application

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- AC to DC Converters
- Telecom, Solar

G D S   TO-220F

RoHS

Device Marking and Package Information

Ordering code	Package	Marking
MPSA65M130B	TO-220F	MP65M130B

Absolute Maximum Ratings T_C=25℃ unless otherwise specified

Symbol	Parameter		Value	Unit
V_{DSS}	Drain-Source Voltage		650	V
V_{GS}	Gate-Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25℃)	25.0 *	A
	Drain Current	- Continuous (T_C = 100℃)	15.8 *	A
I_{DM}[1]	Drain Current	- Pulsed	75 *	A
E_{AS}[2]	Single Pulsed Avalanche Energy		454	mJ
I_{AR}	Avalanche Current		3.1	A
dv/dt	MOSFET dv/dt ruggedness, VDS=0…400V		50	V/ns
dv/dt	Reverse diode dv/dt, V_{DS}=0…400V, I_{DS}≤I_D		15	V/ns
P_D	Power Dissipation (T_C = 25℃)		34	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=1.5KΩ)		2000	V
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃

* Drain current limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.65	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient , Max.	80	℃/W

Electrical Characteristics T_J=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
On Characteristics						
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 1.1$ mA	2.0	-	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10$ V, $I_D = 10.2$ A	-	115	130	mΩ
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 1$mA	650			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650$ V, $V_{GS} = 0$	-	-	1	µA
		$V_{DS} = 650$ V, $T_C = 150℃$	-	-	100	µA
I_{GSS}	Gate-Body Leakage Current	$V_{GS} = \pm20$ V, $V_{DS} = 0$ V	-	-	±1	µA
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 400$ V, $V_{GS} = 0$ V, f = 1.0 MHz	-	2840	-	pF
C_{oss}	Output Capacitance		-	61	-	pF
C_{rss}	Reverse Transfer Capacitance		-	3.8	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 325$ V, $I_D = 14.3$ A, $R_G = 25$ Ω (Note 3,4)	-	56	-	ns
t_r	Turn-On Rise Time		-	31	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	250	-	ns
t_f	Turn-Off Fall Time		-	20	-	ns
$Q_{g(}$	Total Gate Charge	$V_{DS} = 520$ V, $I_D = 14.3$ A, $V_{GS} = 10$ V (Note 3,4)	-	65	-	nC
Q_{gs}	Gate-Source Charge		-	12	-	nC
Q_{gd}	Gate-Drain Charge		-	19	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	25	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	75	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0$ V, $I_S = 14.3$ A	-	-	1.3	V
trr	Reverse Recovery Time	$V_R = 400$ V, $I_F = 14.3$ A $di_F/dt = 100$ A/µs	-	450	-	ns
Qrr	Reverse Recovery Charge		-	7.8	-	µC

Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. I_{AS}=3.1A V_{DD}=100V, R_G=25Ω, Starting T_J =25°C
3. Pulse Test : Pulse Width ≤ 300µs, Duty Cycle ≤ 2%
4. Essentially Independent of Operating Temperature
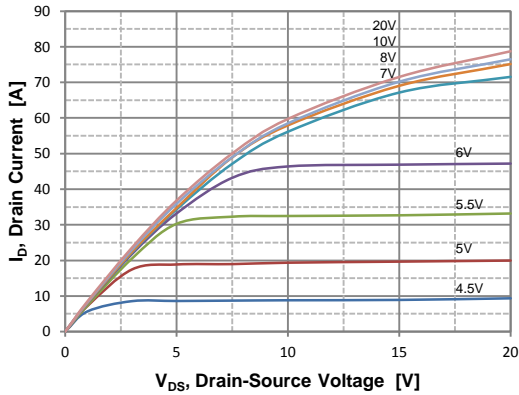
Typical Characteristics
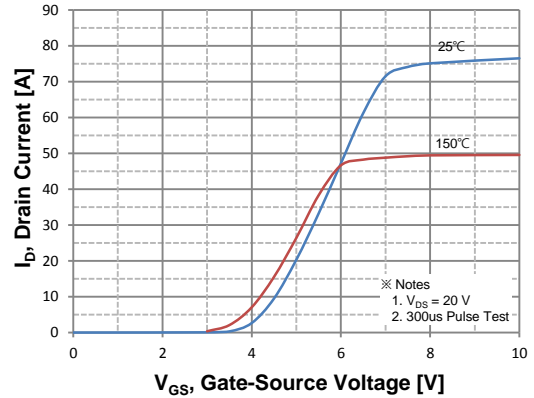

Figure 1. On Region Characteristics

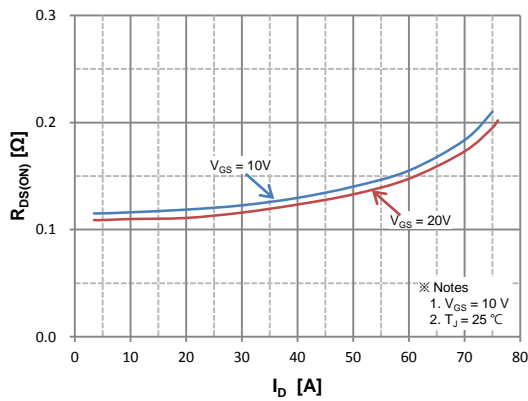**Figure 2. Transfer Characteristics**

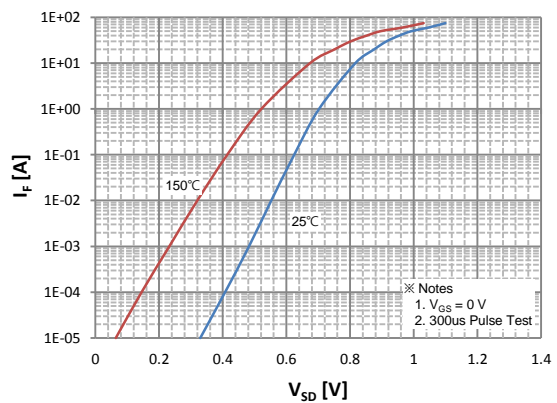**Figure 3. On Resistance Variation vs Drain Current and Gate Voltage**

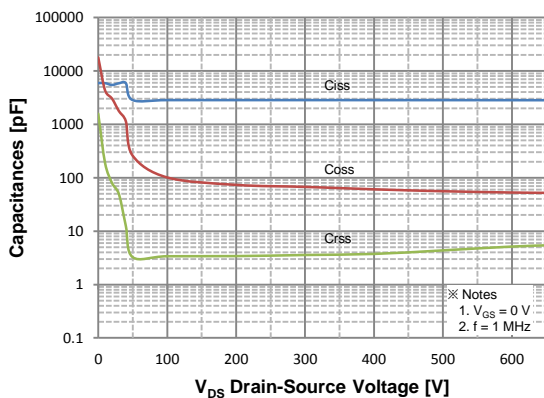**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**
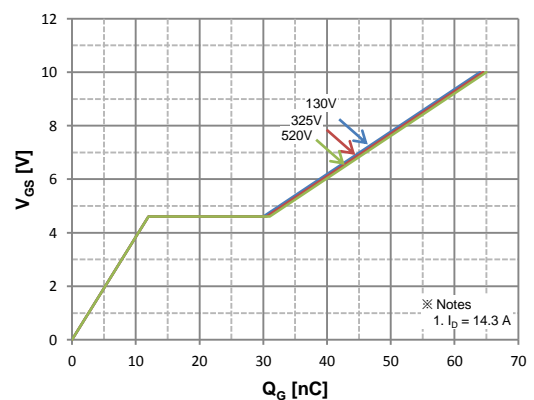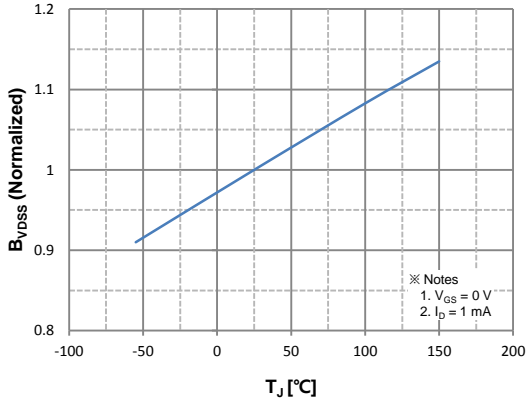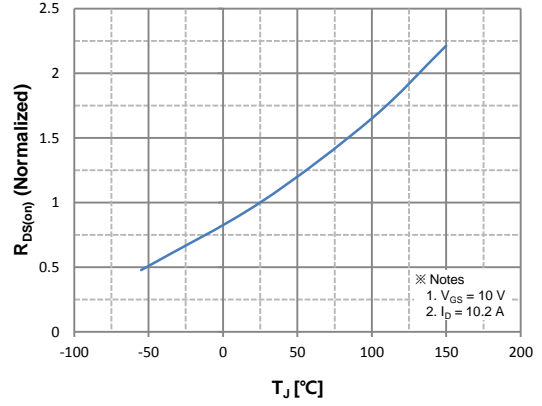

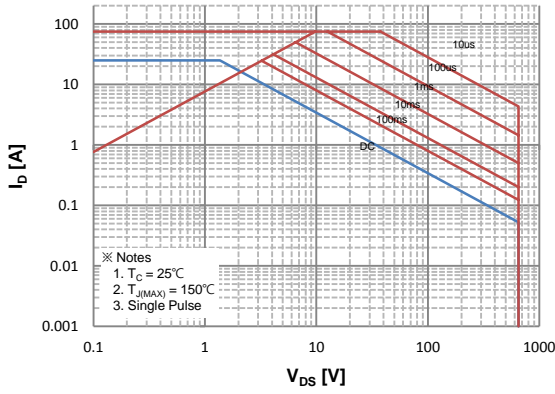**Figure 5. Capacitance Characteristics**

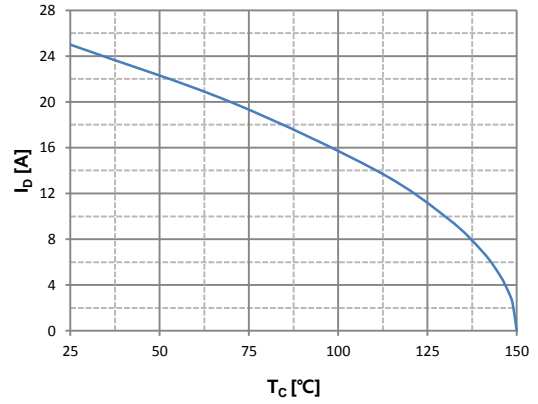**Figure 6. Gate Charge Characteristics**

Typical Characteristics

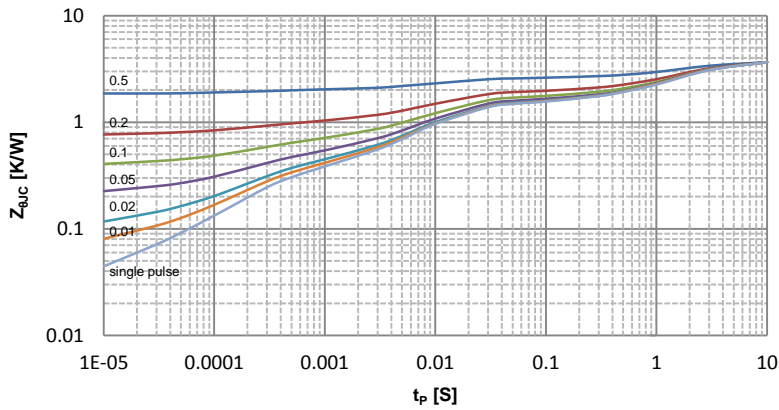

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature

Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

Figure 11. Transient Thermal Response Curve

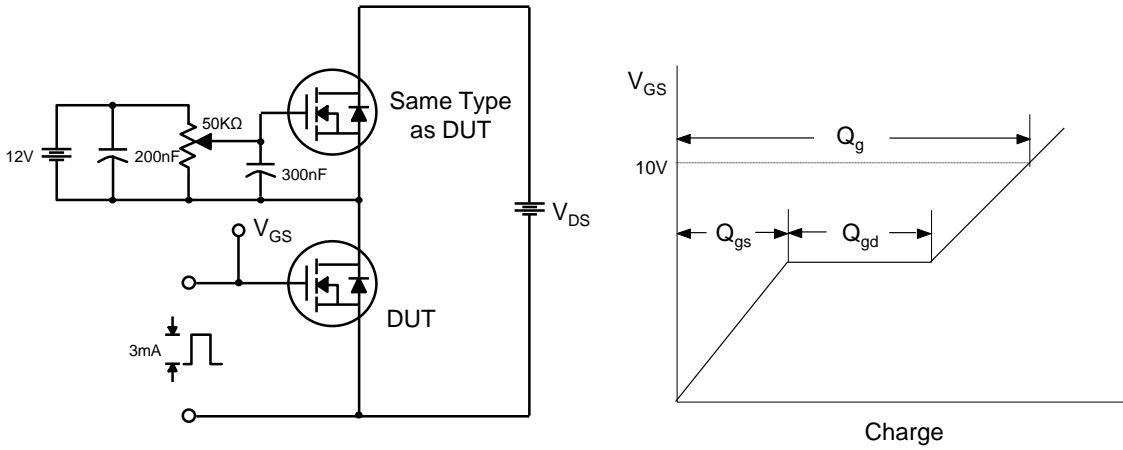**Fig 12. Gate Charge Test Circuit & Waveform**
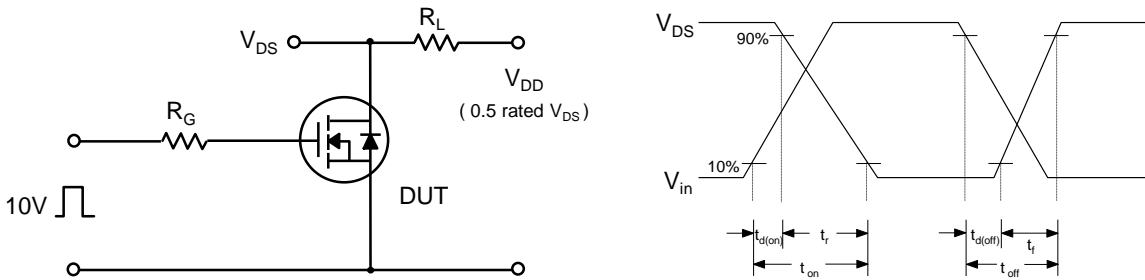

Fig 13. Resistive Switching Test Circuit & Waveforms
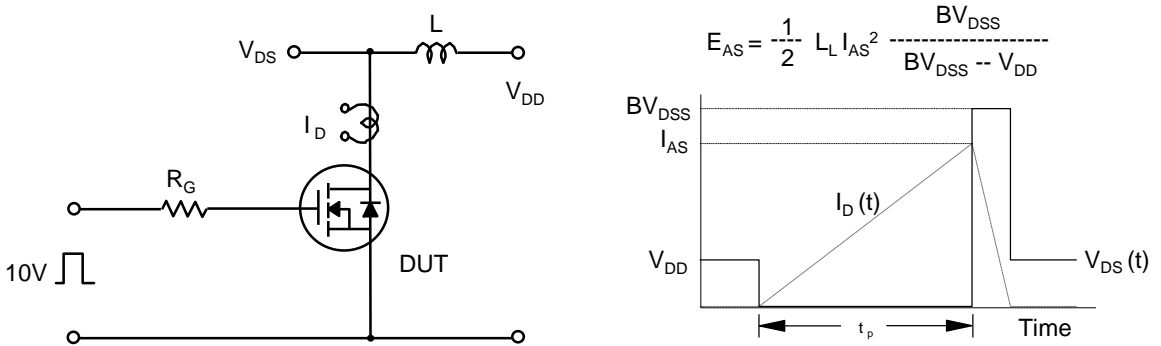

Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

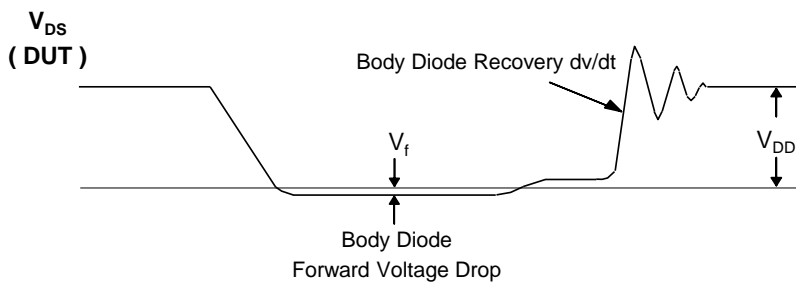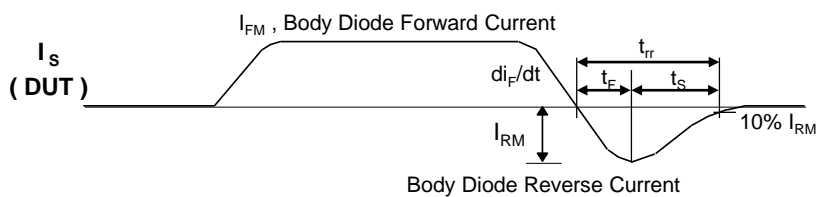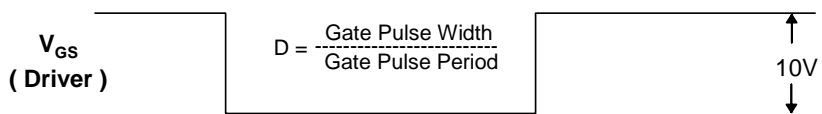$$E_{AS} = \frac{1}{2} L_L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

TO-220F

Unit: mm		
Symbol	Min.	Max.
E	9.96	10.36
A	4.50	4.90
A1	2.34	2.74
A2	0.30	0.60
A4	2.56	2.96
c	0.40	0.65
D	15.57	16.17
H1	6.70REF	
e	2.54BSC	

Unit: mm		
Symbol	Min.	Max.
L	12.68	13.28
L1	2.93	3.13
P	3.03	3.38
P3	3.15	3.65
F3	3.15	3.45
G3	1.25	1.55
b1	1.18	1.43
b2	0.70	0.95