

MOSFETs Silicon 650V N-Channel MOS
■ Applications

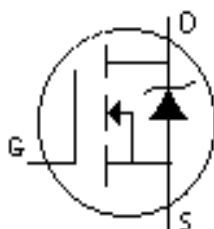
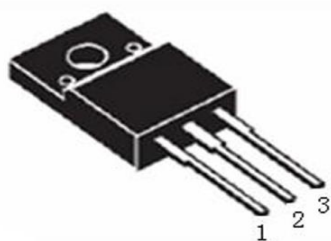
- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

■ Features

- Low $R_{DS(ON)}$
- Ultra Low Gate Charge
- RoHS Compliant
- 100% UIS and RG Tested

■ Product Summary

V_{DS}	650	V
I_D	12	A
$R_{DS(ON)}, Typ@10V$	0.63	Ω
Q_g	35	nC



Gate: 1
Drain: 2
Source: 3

TO-220F

Marking	Package	Packaging	Min. package quantity
MHFIRF12N65	TO-220F	Tube	1000



■ Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current (Note 1)	I_D	12	A
Drain Current-Pulsed (Note 1)	I_{DM}	48	A
Total Dissipation	P_D	56	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	-55-150	°C
Single Pulse Avalanche Energy (Note 2)	E_{AS}	820	mJ

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

■ Thermal Characteristics

Parameter	Symbol	Max	Unit
Maximum Junction-to-Case	$R_{\theta JC}$	2.23	°C/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	80	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD}=50V$, $T_{ch}=25^{\circ}C$ (initial), $I_{AS}=12A$, $R_g=25\Omega$.

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

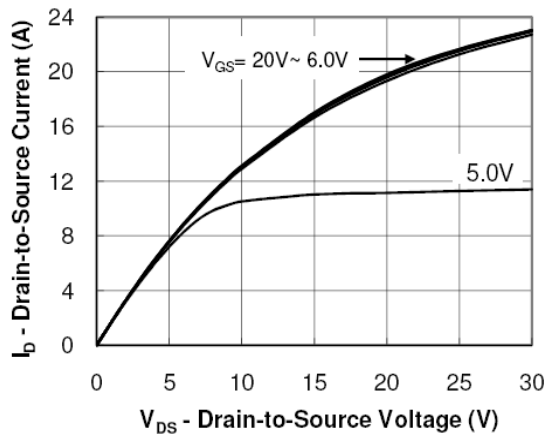


■ Electrical Characteristics (Tc=25°C unless otherwise noted)

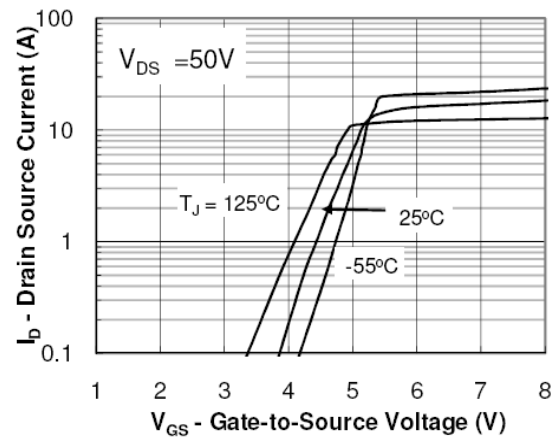
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Parameters						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2	3	4	V
Drain-Source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6A$	-	0.63	0.75	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$	-	1980	-	pF
Output Capacitance	C_{oss}		-	160	-	pF
Reverse Transfer Capacitance	C_{rss}		-	9.5	-	pF
Gate Resistance	R_g	$V_{DS}=0V, V_{GS}=0V, f=1.0MHz$	-	2.5	-	Ω
Switching Paramters						
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=325V, I_D=12A, V_{GS}=10V, R_G=25\Omega$	-	32	-	ns
Turn-On Rise Time	t_r		-	105	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	92	-	ns
Turn-Off Rise Time	t_f		-	85	-	ns
Total Gate Charge	Q_g	$V_{DS}=520V, I_D=12A, V_{GS}=10V$	-	35	-	nC
Gate-Source Charge	Q_{gs}		-	11	-	nC
Gate-Drain Charge	Q_{gd}		-	8.5	-	nC
Source-Drain Characteristics						
Max. Diode Forward Cuurent	I_S		-	-	12	A
Max. Pulsed Forward Cuurent	I_{SM}		-	-	48	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=12A$	-	0.88	1.5	V
Reverse Recovery Time	t_{rr}	$V_R=400V, I_F=12A, di/dt=100A/us$	-	385	-	ns
Reverse Recovery Charge	Q_{rr}		-	3	-	μC



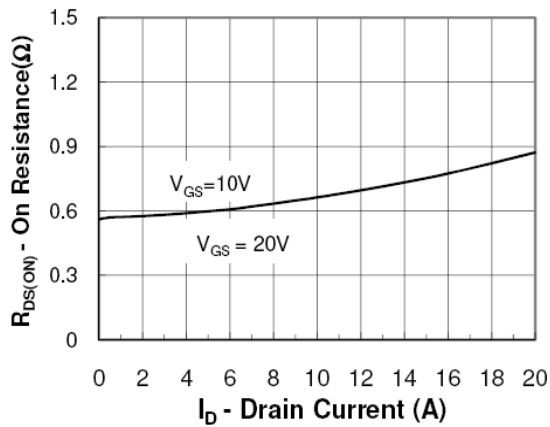
■ Characteristics Curves



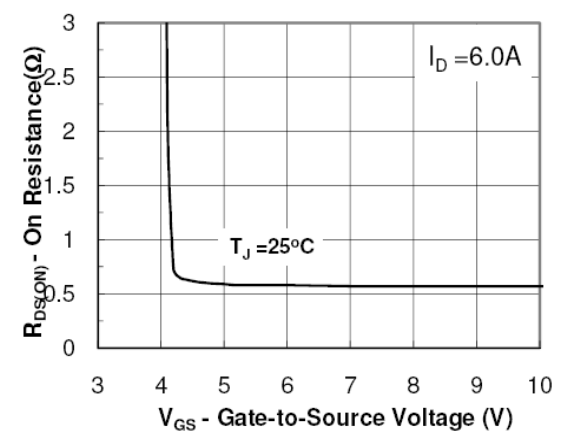
Output Characteristics



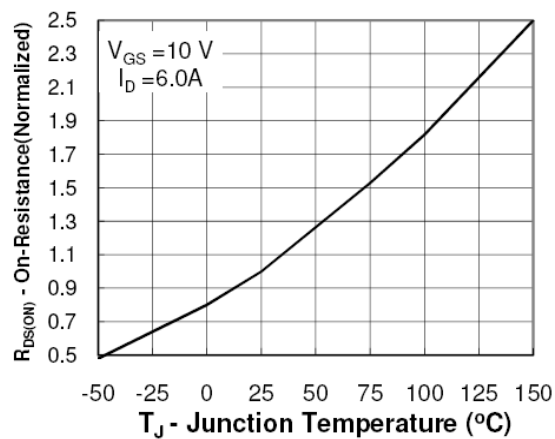
Transfer Characteristics



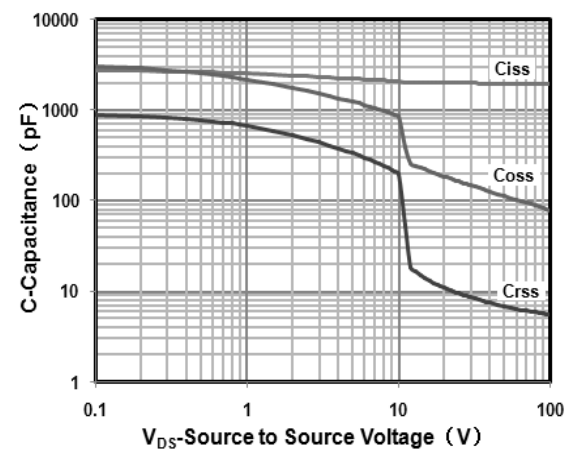
On Resistance Vs Drain Current



On Resistance Vs Gate Source Voltage

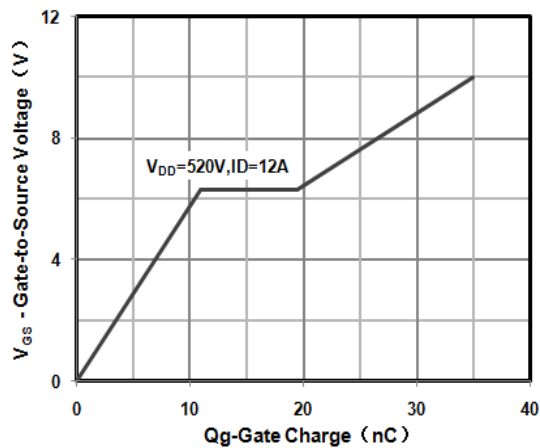


Rdson-JunctionTemperature

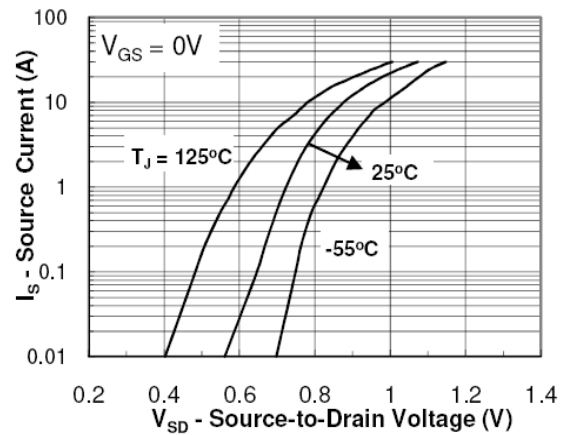


Capacitance

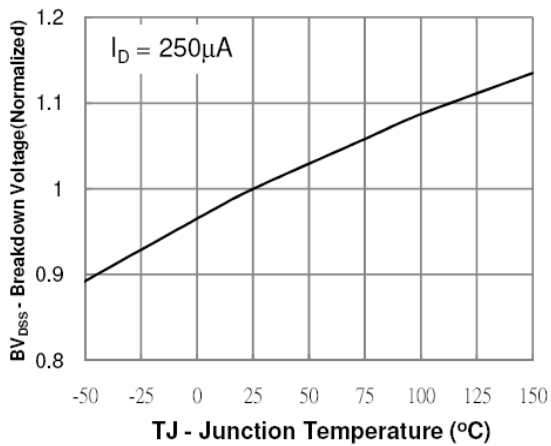




Gate Charge Waveform



Source-Drain Diode Forward Voltage



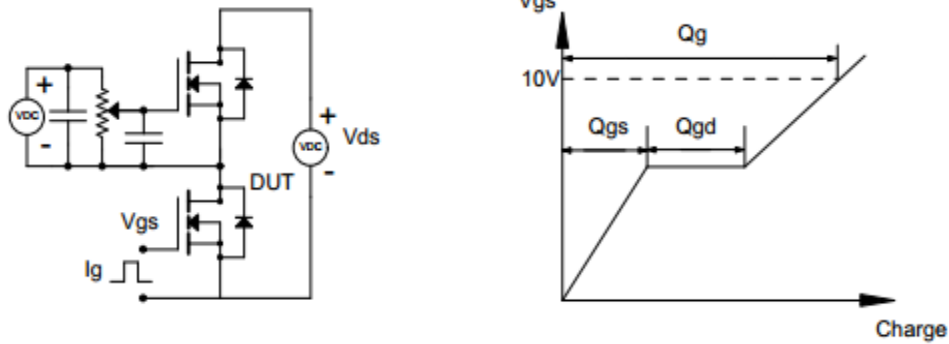
Breakdown Voltage Vs Junction Temperature

Note : The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

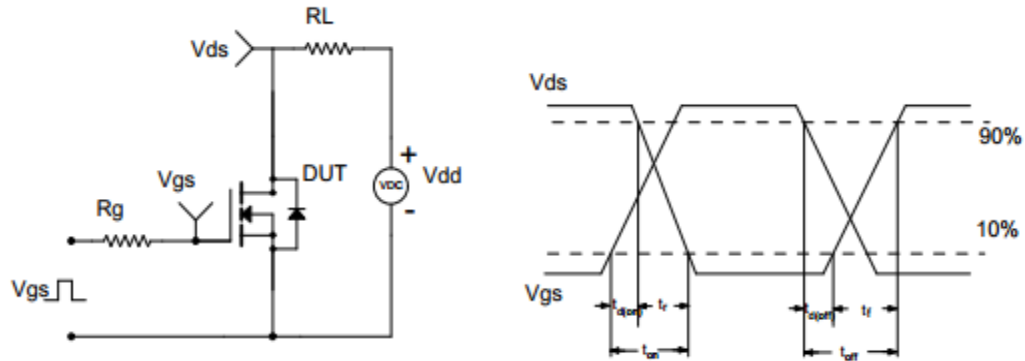


■ Test Circuit & Waveform

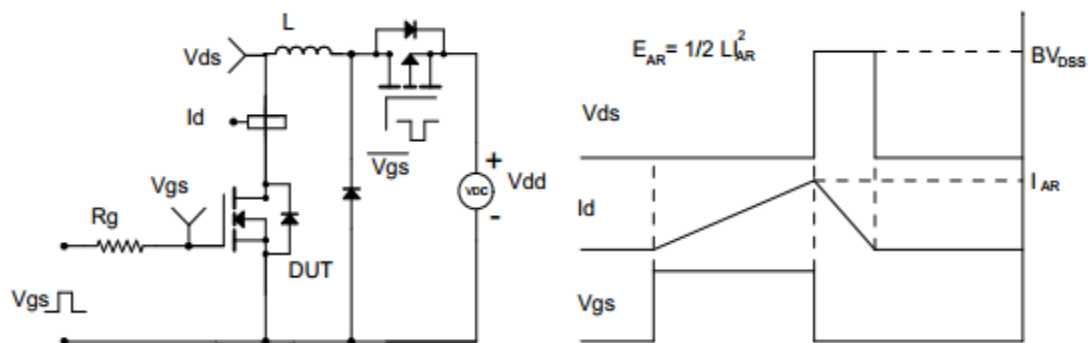
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform



■ TO-220F Package Dimensions

Unit: mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.5		4.9	E1	6.5	7	7.5
A1	2.3		2.9	e	2.44	2.54	2.64
b	0.65		0.9	L	12.5		14.3
b1	1.1		1.7	L1	9.45		10.05
b2	1.2		1.4	L2	15		16
c	0.35		0.65	L3	3.2		4.4
D	14.5		16.5	ΦP	3		3.3
D1	6.1		6.9	Q	2.5		2.9
E	9.6		10.3				

