

# N-Channel MOSFET

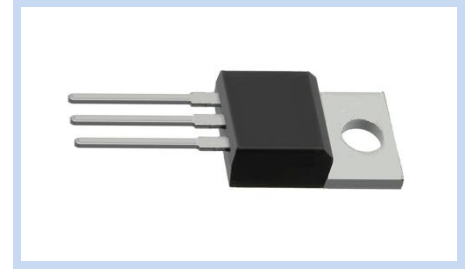
## 650V 39A 357W TO-220

MFT65N39T220

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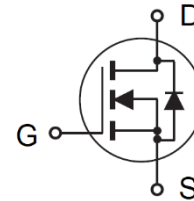
### FEATURE

- $R_{DS(ON)}=0.095\Omega$  at  $V_{GS}=10V$ ,  $I_D=39A$
- High Power and Current Handling Capability
- Super High Dense Cell Design for Extremely Low  $R_{DS(ON)}$



### MECHANICAL DATA

- Case: TO-220 Package
- Terminals: Solderable per MIL-STD-750, Method 2026

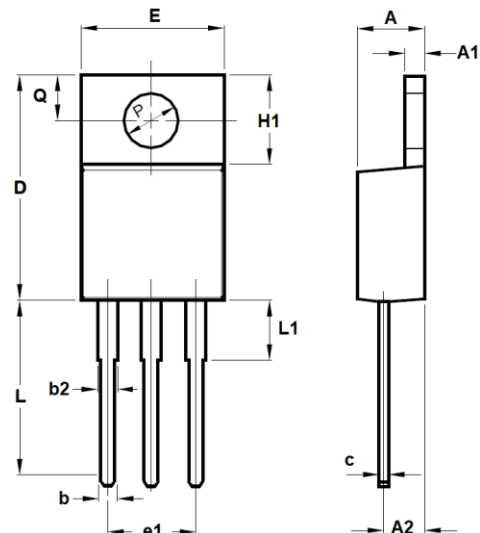


### MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current – Continuous	$I_D$	$T_C=25^\circ C$	39
		$T_C=100^\circ C$	24.5
Drain Current – Pulsed	$I_{DM}$	155.2	A
Power Dissipation	$P_D$	$T_C=25^\circ C$	357
		Derate above $25^\circ C$	2.9
Single Pulsed Avalanche Energy	$E_{AS}$	735	mJ
Single Pulsed Avalanche Current	$I_{AS}$	7	A
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ C/W$
Thermal Resistance Junction to Case	$R_{\theta JC}$	0.35	$^\circ C/W$
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to 150	$^\circ C$

### DIMENSIONS

Item	Min. (mm)	Max. (mm)
A	4.320	4.826
A1	1.220	1.397
A2	2.032	2.921
b	0.610	0.910
b2	1.143	1.778
c	0.356	0.530
D	14.224	16.510
E	9.652	10.668
e1	5.080	5.080
H1	5.842	6.858
L	12.700	14.732
L1	3.400	4.000
Q	2.540	3.429



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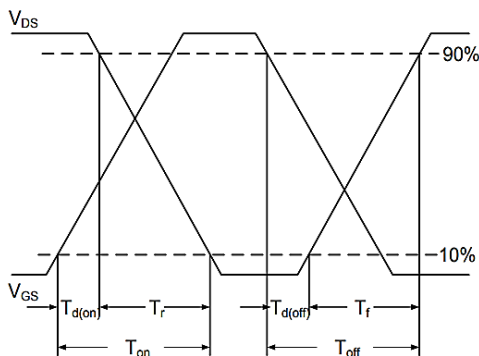
### ELECTRICAL CHARACTERISTICS

Off Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	$BV_{DSS}$	650	--	--	V
Drain-Source Leakage Current	$V_{DS}=650V, V_{GS}=0V$	$I_{bss}$	--	--	1	$\mu A$
Gate-Body Leakage Current, Forward	$V_{GS}=30V, V_{DS}=0V$	$I_{GSSF}$	--	--	100	nA
Gate-Body Leakage Current, Reverse	$V_{GS}=-30V, V_{DS}=0V$	$I_{GSSR}$	--	--	-100	
On Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=20A$	$R_{DS(ON)}$	--	0.08	0.095	$\Omega$
Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	$V_{GS(th)}$	2.5	--	4.5	V
Dynamic Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Total Gate Charge	$V_{DS}=520V, V_{GS}=10V, I_D=20A$	$Q_g$	--	69	--	nC
Gate-Source Charge		$Q_{gs}$	--	12	--	
Gate-Drain Charge		$Q_{gd}$	--	30	--	
Turn-On Delay Time	$V_{DD}=520V, V_{GS}=10V, R_G=6\Omega, I_D=20A$	$T_{d(on)}$	--	37	--	ns
Rise Time		$T_r$	--	17	--	
Turn-Off Delay Time		$T_{d(off)}$	--	95	--	
Fall Time		$T_f$	--	9	--	
Input Capacitance	$V_{DS}=150V, V_{GS}=0V, F=1MHz$	$C_{iss}$	--	1915	--	pF
Output Capacitance		$C_{oss}$	--	110	--	
Reverse Transfer Capacitance		$C_{rss}$	--	5	--	
Drain-Source Body Diode	Conditions	Symbol	Min	Typ.	Max	Unit
Drain-Source Diode Forward Current	--	$I_S$	--	--	39	A
Diode Forward Voltage	$V_{GS}=0V, I_S=20A, T_J=25^\circ C$	$V_{SD}$	--	--	1.5	V

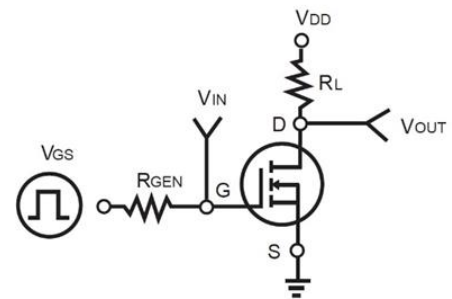
**Note:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$
3. Guaranteed by design, not subject to production testing.
4. Limited only by maximum temperature allowed.
5. Pulse Width Limited by safe operating area.
6. Full Package  $I_{S(MAX)}=19A$
7. Full Package  $V_{SD}$  test condition  $I_S = 19A$
8.  $L=30mH, I_{AS} = 7A, V_{DD}= 60V, R_G=25\Omega$ , Starting  $T_J=25^\circ C$

Switching Time Waveform



Switching Test Circuit



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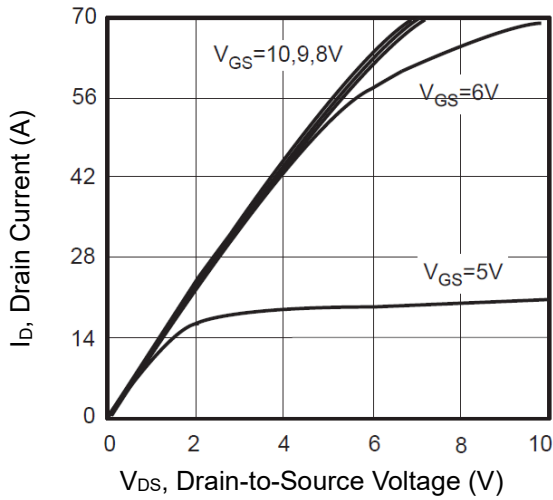
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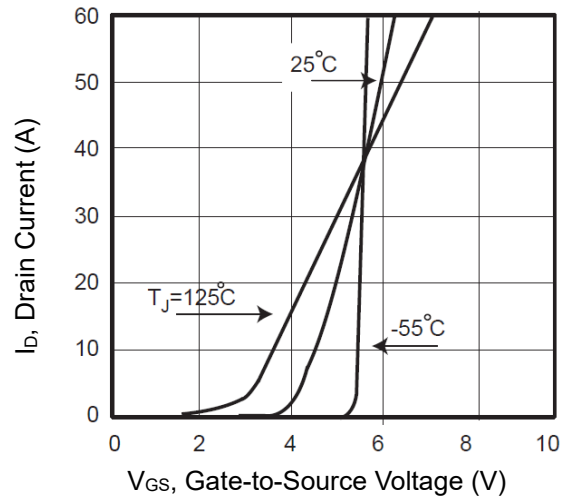
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### CHARACTERISTIC CURVES

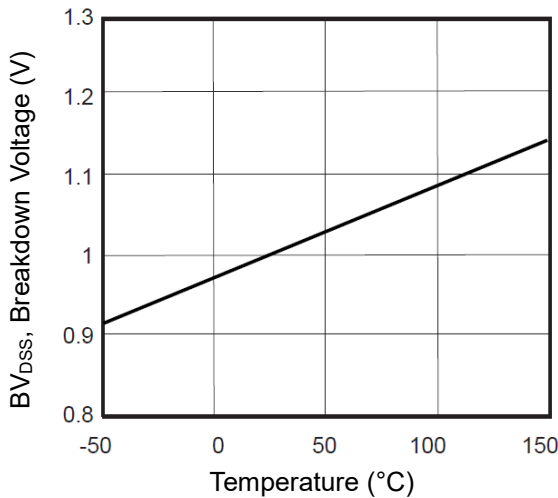
Output Characteristics



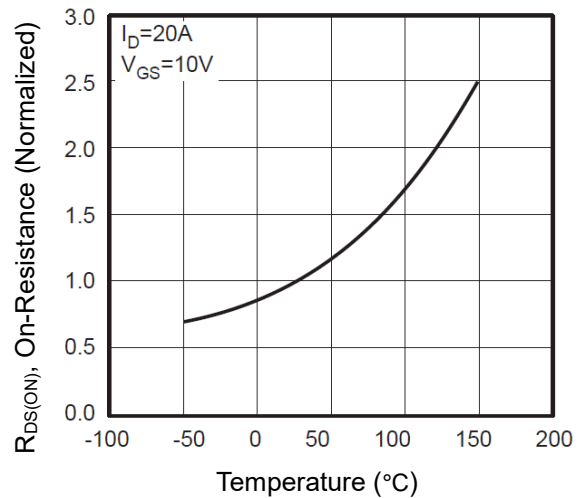
Transfer Characteristics



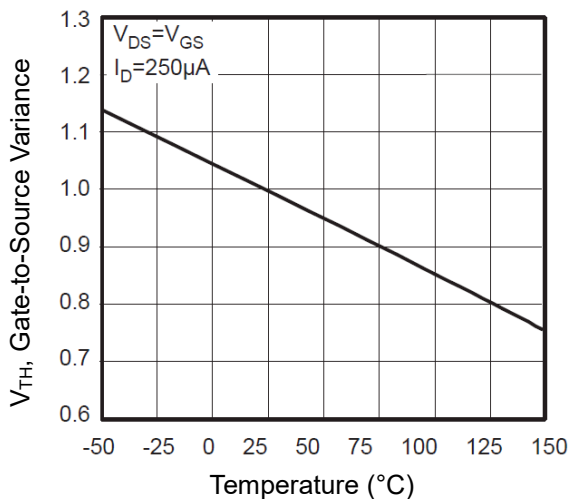
Breakdown Voltage vs. Temperature



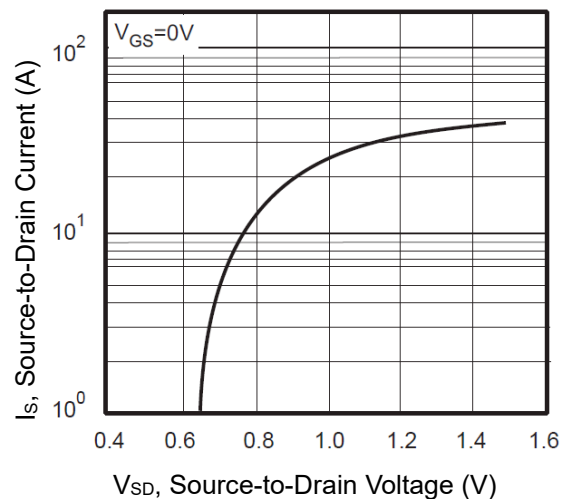
On-Resistance vs. Junction temperature



Threshold Voltage Variation with Temperature



Body Diode Characteristics



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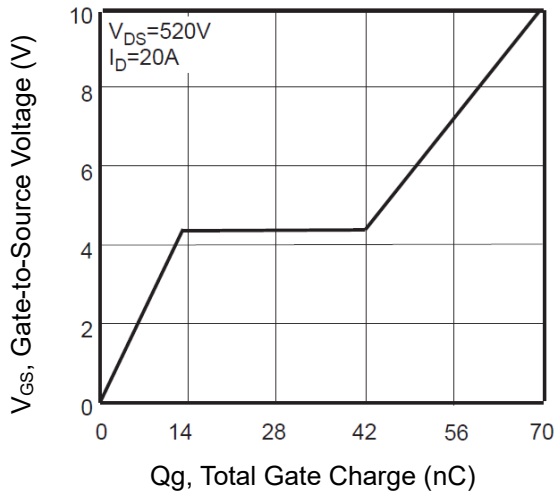
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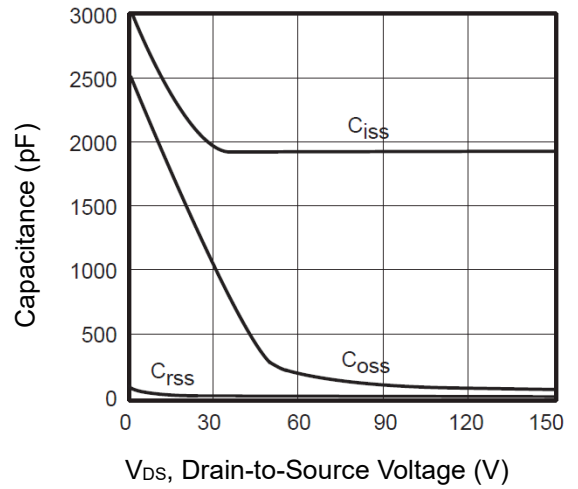
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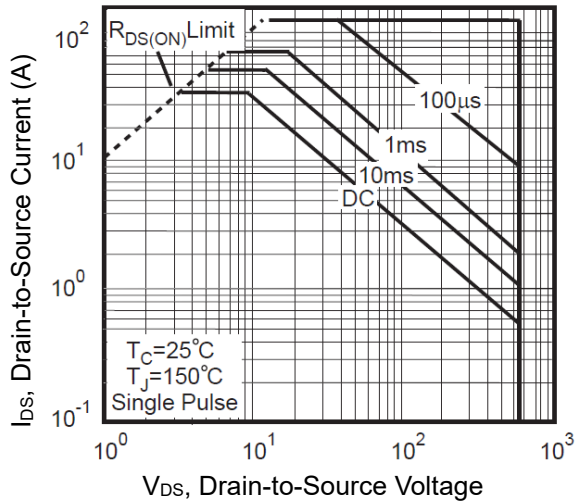
Gate-Charge Characteristics



Capacitance vs. Drain-Source Voltage



Maximum Safe Operating Area



Normalized Transient Thermal Impedance vs Pulse Width

