N-Channel MOSFET

Applications:

● Power Supply
● DC-DC Converters

V_{DSS}	$R_{DS(ON)}$(MAX)	$I_D{}^a$
60V	8mΩ	109A

Features:

● Lead Free
● Low $R_{DS(ON)}$ to Minimize Conductive Loss
● Low Gate Charge for Fast Switching Application
● Optimized B$_{VDSS}$ Capability

TO-220

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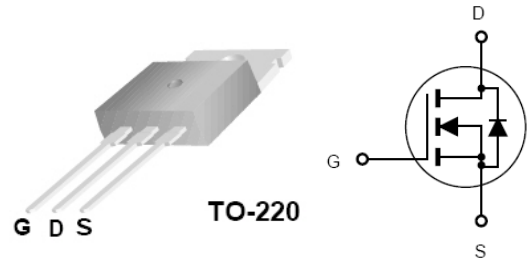
Ordering Information

Park Number	Package	Brand
MM109N06K	TO-220	MacMic

Absolute Maximum Ratings   T$_C$=25℃ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage	60	V
$I_D{}^a$	Continuous Drain Current	109	A
I_{DM}	Pulsed Drain Current @V_G=10V	436	
P_D	Power Dissipation	150	W
	Derating Factor above 25℃	1.00	W/℃
V_{GS}	Gate-to-Source Voltage	+/-20	V
E_{AS}	Single Pulse Avalanche Energy (L=1mH, I_{AS}=40A)	800	mJ
I_{AS}	Pulsed Avalanche Energy	Figure 7	A
T_J and T_{STG}	Operating Junction and Storage Temperature Range	-55 to 175	℃

Thermal Resistance

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
$R_{\theta JC}$	Junction-to-Case			1.00	℃/W	Water cooled heatsink, P_D adjusted for a peak junction Temperature of 175℃
$R_{\theta JA}$	Junction-to-Ambient			62		1 cubic foot chanber, free air

Note:

a: Calculated continuous current based upon maximum allowable junction temperature +175℃. Package limitation current is 80A.

OFF Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
B_{VDSS}	Drain-to-Source Breakdown Voltage	60			V	V_{GS}=0V, I_D=250uA
I_{DSS}	Drain-to-Source Leakage Current			1	uA	V_{DS}=48V, V_{GS}=0V
				100		V_{DS}=48V, V_{GS}=0V, T_J=125 ℃
I_{GSS}	Gate-to-Source Forward Leakage			100	nA	V_{GS}=+20V
	Gate-to-Source Reverse Leakage			100		V_{GS}= -20V

ON Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance		6.3	8	mΩ	V_{GS}=10V, I_D=24A
$V_{GS(TH)}$	Gate Threshold Voltage.	2		4	V	V_{GS}=V_{DS}, I_D=250uA

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Ciss	Input Capacitance		3395		pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
Coss	Output Capacitance		435			
Crss	Reverse Transfer Capacitance		150			
Qg	Total Gate Charge		50		nC	V_{DD}=30V, I_D=38A, V_{GS}=10V
Qgs	Gate-to-Source Charge		21			
Qgd	Gate-to-Drain ("Miller") Charge		14			
Td(on)	Turn-in Delay Time		14		nS	V_{DD}=30V, I_D=38A, V_G=10V, R_G=2.5Ω
Tr	Rise Time		43			
Td(off)	Turn-off Delay Time		31			
Tf	Fall Time		11			

Source-Drain Diode Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{SD}	Diode Forward Voltage			1.2	V	I_S=30A, V_{GS}=0V
trr	Reverse Recovery Time		52		ns	IF=38Amps, di/dt=100Amps/uS
Qrr	Reverse Recovery Change		74		nC	

Figure 1. Maximum Power Dissipation V.S Case Temperature

Y-axis: P_D, Power Dissipation(W) — 0, 20, 40, 60, 80, 100, 120, 140, 160

X-axis: T_C, Case Temperature($^{\circ}$C) — 0, 25, 50, 75, 100, 125, 150, 175
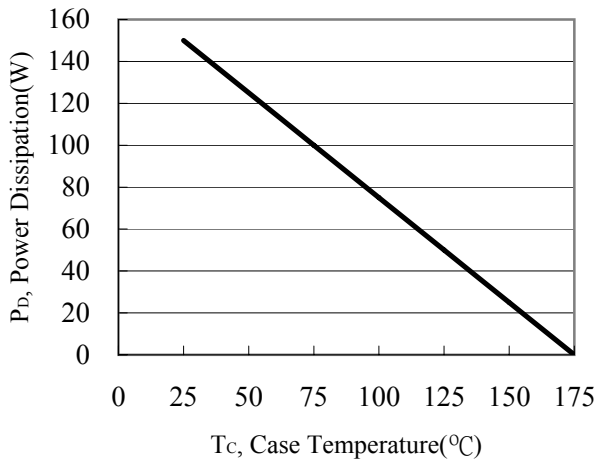
Figure 2. Maximum Continuous Drain Current V.S Case Temperature

Y-axis: I_D, Drain Current(A) — 0, 20, 40, 60, 80, 100, 120

X-axis: T_C, Case Temperature($^{\circ}$C) — 0, 25, 50, 75, 100, 125, 150, 175
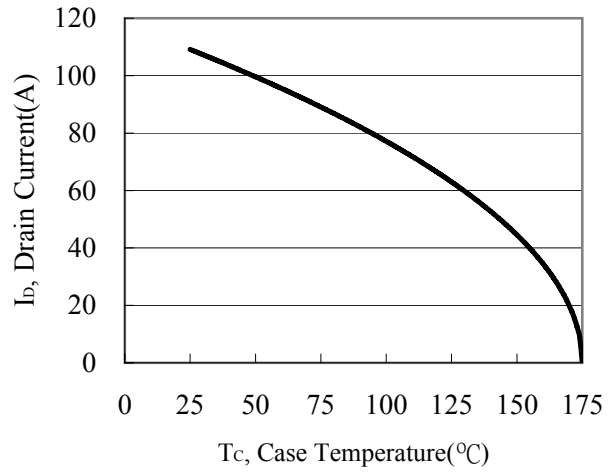
Figure 3. Typical Output Characteristics

Y-axis: I_D, Drain Current(A) — 0, 10, 20, 30, 40, 50, 60, 70, 80

X-axis: V_{DS}, Drain-to Source Voltage(A) — 0, 0.5, 1, 1.5, 2, 2.5, 3

V_{GS}=10, 9, 8, 7V

V_{GS}=6V

V_{GS}=5V
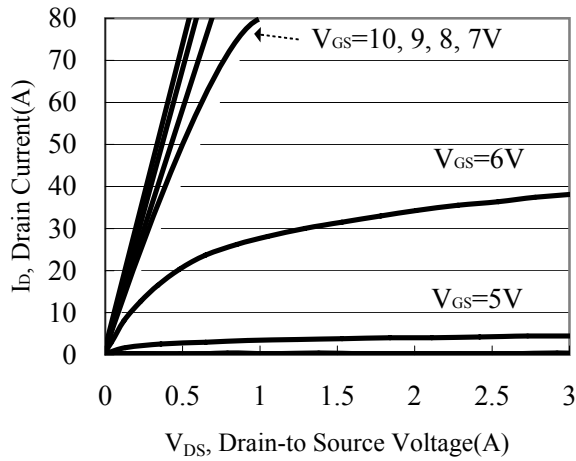
Figure 4. Breakdown Voltage V.S Junction Temperature

Y-axis: Drain-to-Source Breakdown Voltage (Normalized) — 0.88, 0.93, 0.98, 1.03, 1.08, 1.13, 1.18

X-axis: T_J, Junction Temperature($^{\circ}$C) — -75, -25, 25, 75, 125, 175
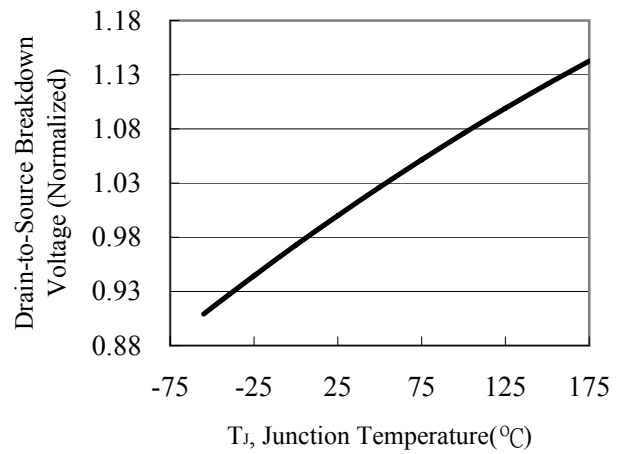
Figure 5. Threshold Voltage V.S Junction Temperature

Y-axis: V_{th}, Threshold Voltage (Normalized) — 0.00, 0.20, 0.40, 0.60, 0.80, 1.00, 1.20, 1.40

X-axis: T_J, Junction Temperature($^{\circ}$C) — -75, -25, 25, 75, 125, 175
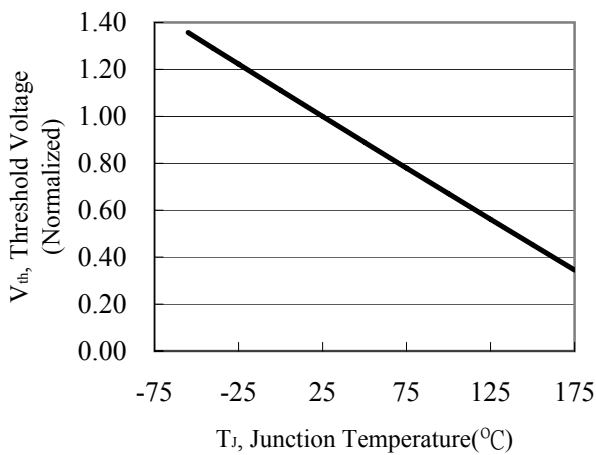
Figure 6. Drain-to-Source Resistance V.S Junction Temperature

Y-axis: $R_{DS(ON)}$, Drain-to-Source Resistance (Normalized) — 0.00, 0.50, 1.00, 1.50, 2.00, 2.50

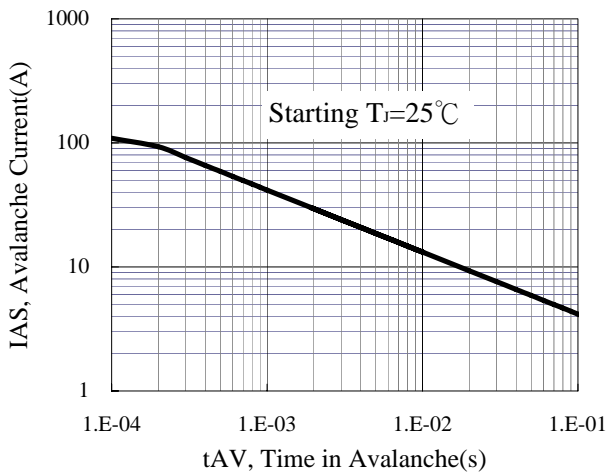X-axis: T_J, Junction Temperature($^{\circ}$C) — -75, -25, 25, 75, 125, 175
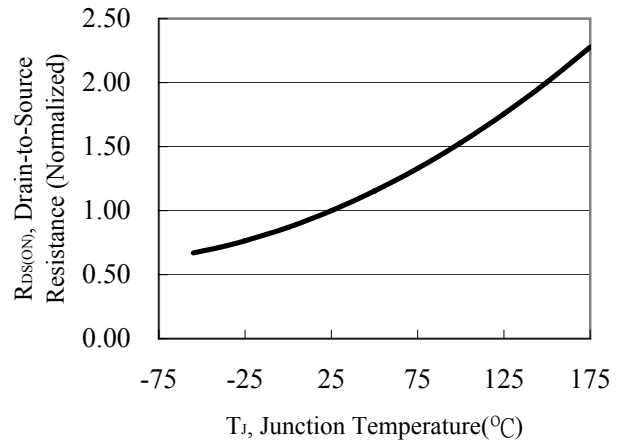
Figure 7. Typical Gate Charge vs. Gate-to-Source Voltage
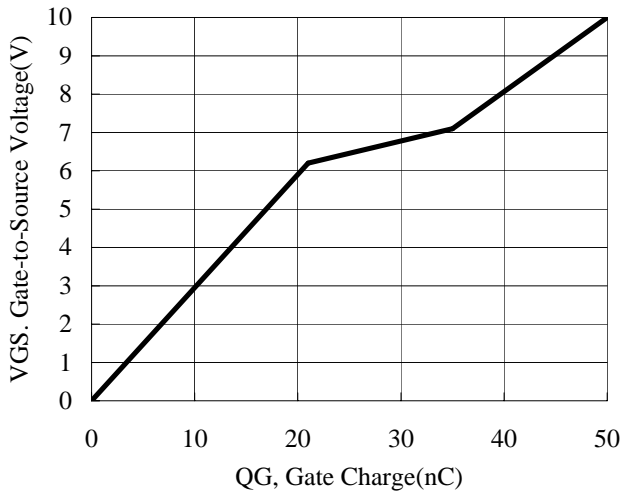
Figure 8. Typical Capacitance vs. Drain-to-Source Voltage
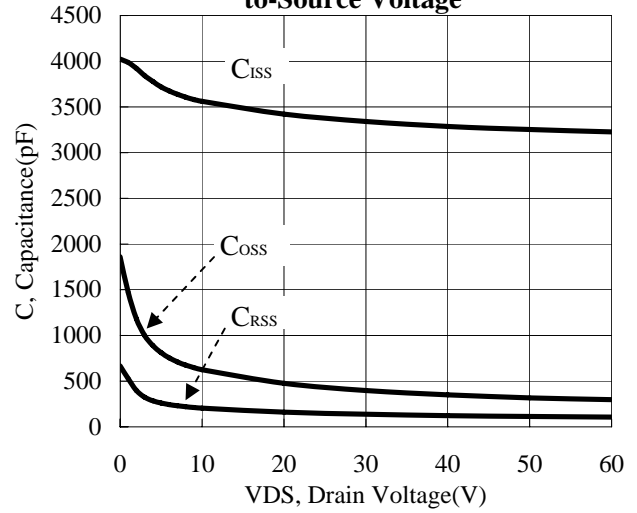
Figure 9. Unclamped Inductive Switching Capability

Figure 10. Source-Drain Diode Forward Voltage