



## N-Channel MOSFET

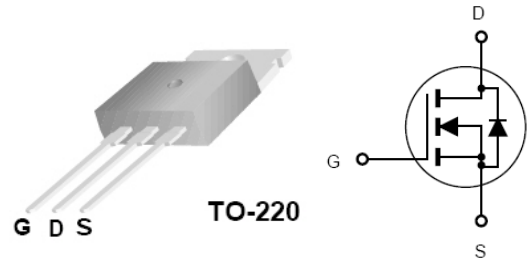
### Applications:

- Power Supply
- DC-DC Converters

$V_{DSS}$	$R_{DS(ON)}(MAX)$	$I_D^a$
40V	4m $\Omega$	137A

### Features:

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



### Ordering Information

Park Number	Package	Brand
MM137N04K	TO-220	MacMic

### Absolute Maximum Ratings

$T_c=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-to-Source Voltage	40	V
$I_D^a$	Continuous Drain Current	137	A
$I_{DM}$	Pulsed Drain Current @ $V_G=10V$	548	
$P_D$	Power Dissipation	150	W
	Derating Factor above $25^\circ\text{C}$	1.00	W/ $^\circ\text{C}$
$V_{GS}$	Gate-to-Source Voltage	+/-20	V
$E_{AS}$	Single Pulse Avalanche Energy ( $L=11.9\text{mH}$ , $I_{AS}=9A$ )	773	mJ
$I_{AS}$	Pulsed Avalanche Energy	Figure 7	A
$T_J$ and $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 175	$^\circ\text{C}$

### Thermal Resistance

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

Note:

a: Calculated continuous current based upon maximum allowable junction temperature  $+175^\circ\text{C}$ . Package limitation current is 80A.

**OFF Characteristics**T<sub>J</sub>=25°C unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
B <sub>VDSS</sub>	Drain-to-Source Breakdown Voltage	40			V	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA
I <sub>DSS</sub>	Drain-to-Source Leakage Current			1	uA	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V
				100		V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =125 °C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage			100	nA	V <sub>GS</sub> =+20V
	Gate-to-Source Reverse Leakage			100		V <sub>GS</sub> = -20V

**ON Characteristics**T<sub>J</sub>=25°C unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
R <sub>DS(ON)</sub>	Static Drain-to-Source On-Resistance			4	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =24A
V <sub>GS(TH)</sub>	Gate Threshold Voltage.	2		4	V	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA

**Dynamic Characteristics**

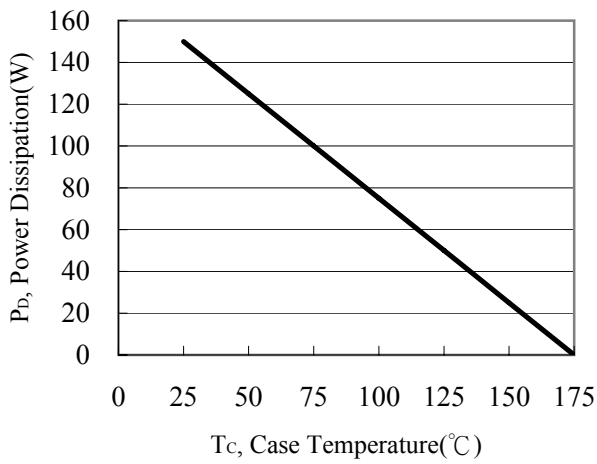
Essentially independent of operating temperature

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
C <sub>iss</sub>	Input Capacitance		4193		pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz
C <sub>oss</sub>	Output Capacitance		648			
C <sub>rss</sub>	Reverse Transfer Capacitance		236			
Q <sub>g</sub>	Total Gate Charge		64		nC	V <sub>DD</sub> =20V, I <sub>D</sub> =63A, V <sub>GS</sub> =10V
Q <sub>gs</sub>	Gate-to-Source Charge		21			
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge		19			
T <sub>d(on)</sub>	Turn-in Delay Time		17		nS	V <sub>DD</sub> =20V, I <sub>D</sub> =63A, V <sub>G</sub> =10V, R <sub>G</sub> =4.7Ω
T <sub>r</sub>	Rise Time		37			
T <sub>d(off)</sub>	Turn-off Delay Time		85			
T <sub>f</sub>	Fall Time		41			

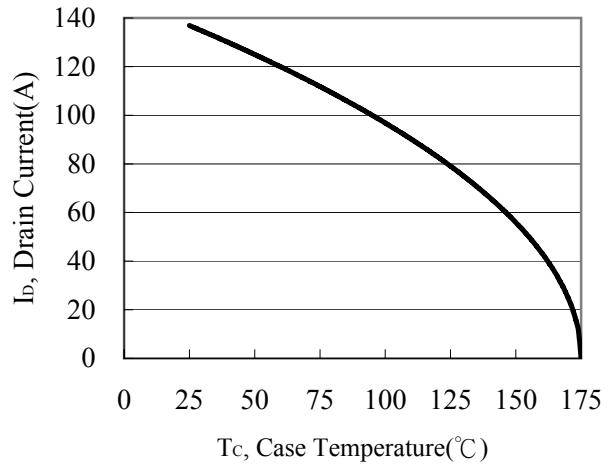
**Source-Drain Diode Characteristics**T<sub>J</sub>=25°C unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V <sub>SD</sub>	Diode Forward Voltage			1.2	V	I <sub>S</sub> =24A, V <sub>GS</sub> =0V
t <sub>rr</sub>	Reverse Recovery Time		59		ns	I <sub>F</sub> =38Amps, di/dt=100Amps/uS
Q <sub>rr</sub>	Reverse Recovery Charge		99		nC	

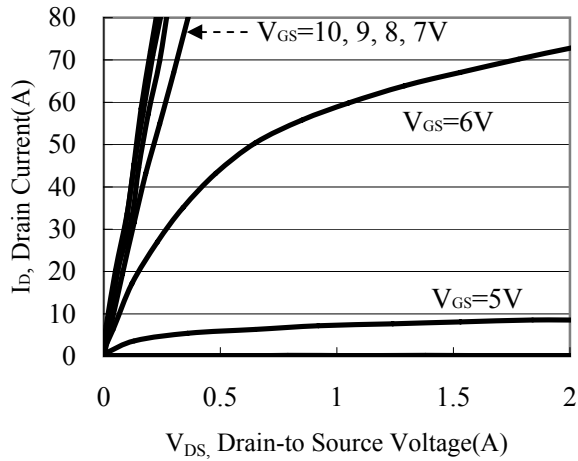
**Figure 1. Maximum Power Dissipation V.S Case Temperature**



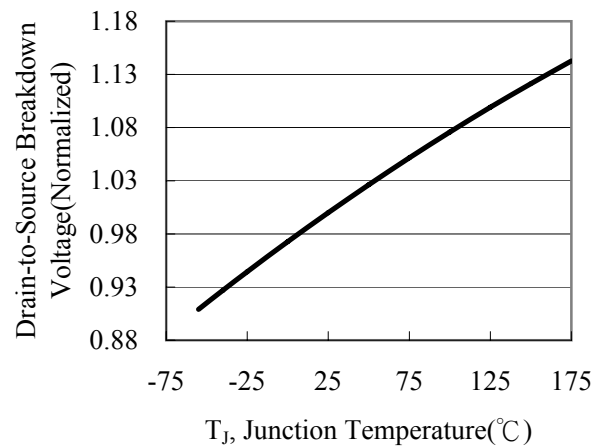
**Figure 2. Maximum Continuous Drain Current V.S Case Temperature**



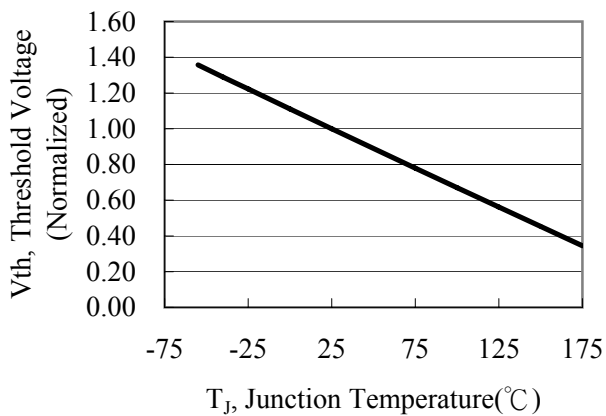
**Figure 3. Typical Output Characteristics**



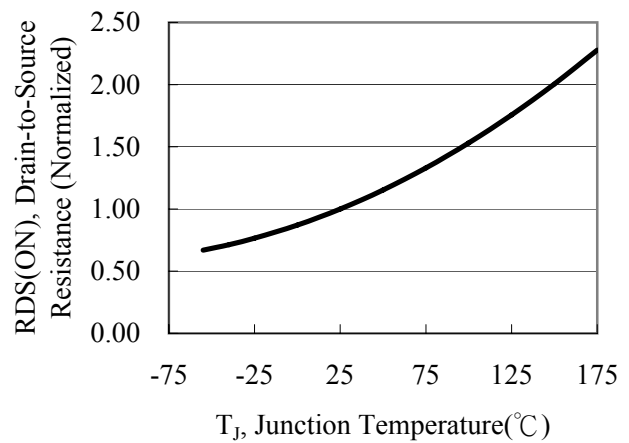
**Figure 4. Breakdown Voltage V.S Junction Temperature**



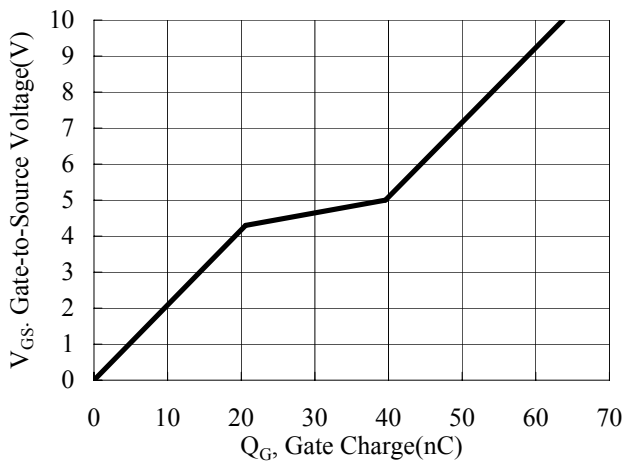
**Figure 5. Threshold Voltage V.S Junction Temperature**



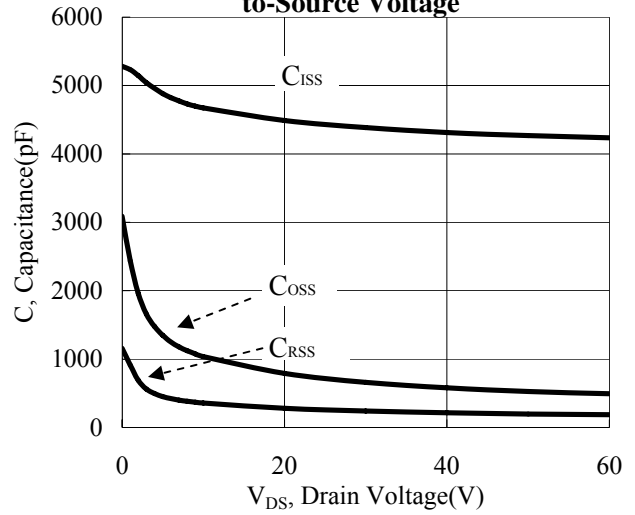
**Figure 6. Drain-to-Source Resistance V.S Junction Temperature**



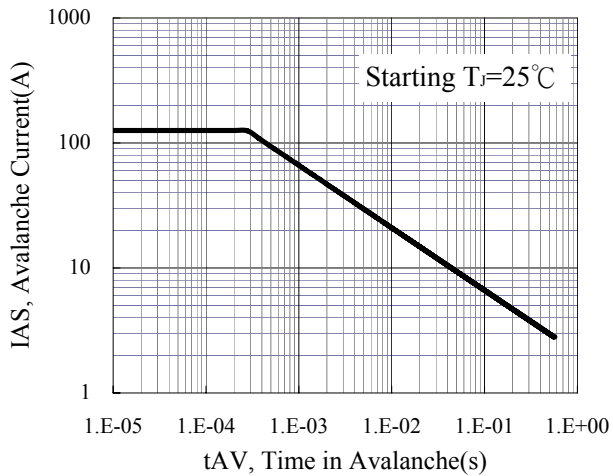
**Figure 7. Typical Gate Charge vs. Gate-to-Source Voltage**



**Figure 8. Typical Capacitance vs. Drain-to-Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Source-Drain Diode Forward Voltage**

