

PRODUCT FEATURES

- $R_{DS(ON),typ}=0.35m\Omega@V_{GS}=10V$
- 175°C operating temperature
- Low Gate Charge Minimize Switching Loss
- Fast Recovery body Diode
- 20K Ω Gate Protected Resistance Inside
- Inside the module, each MOSFET chip has a gate resistance: 2.2 Ω



APPLICATIONS

- High efficiency DC/DC Converters
- ISG EV Products
- UPS inverter

Type	V_{DS}	I_D	$R_{DS(ON),max} T_J=25^\circ C$	T_{Jmax}	Marking	Package
MMN400A006U1	60V	400A	0.75m Ω	175 $^\circ C$	MMN400A006U1	NA

ABSOLUTE MAXIMUM RATINGS ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Values	Unit
V_{DSS}	Drain - Source Voltage	$T_J=25^\circ C$	V
V_{GSS}	Gate - Source Voltage		
I_D	Continuous Drain Current	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	A
		$T_C=110^\circ C, T_{Jmax}=175^\circ C$	
I_{DM}	Pulsed Drain Current at $V_{GS}=10V$	Limited by T_{Jmax}	800
P_D	Maximum Power Dissipation	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	1000
E_{AS}	Single Pulse Avalanche Energy	$V_{DD}=50V, L=1mH$	TBD

THERMAL AND MODULE CHARACTERISTICS ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Values	Unit
R_{thJC}	Thermal resistance, junction to case Per MOSFET	0.15	K/W
T_{Jmax}	Max. Junction Temperature	175	$^\circ C$
T_{STG}	Storage Temperature Range	-40~125	
Torque	to heatsink	Recommended (M5)	Nm
	to terminal	Recommended (M5)	
Weight		110	g

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MMN400A006U1

MOSFET

ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit	
$V_{(BR)DSS}$	Drain Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	60			V	
$R_{DS(ON)}$	Drain Source ON Resistance	$V_{GS}=10V, I_D=400A$		0.35	0.75	m Ω	
I_{DSS}	Drain Source Leakage Current	$V_{DS}=60V, V_{GS}=0V$			2	mA	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=1mA$	2.0		4.0	V	
I_{GSS}	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-2		2	mA	
R_{gint}	Integrated Gate Resistor			1.05		Ω	
Q_g	Total Gate Charge	$V_{DD}=30V, I_D=200A, V_{GS}=10V$		675		nC	
Q_{gs}	Gate Source Charge			223		nC	
Q_{gd}	Gate Drain Charge			208		nC	
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		37		nF	
C_{oss}	Output Capacitance			5		nF	
C_{rss}	Reverse Transfer Capacitance			1.8		nF	
$t_{d(on)}$	Turn on Delay Time	$V_{DD}=30V, I_D=300A,$ $R_G=1.5\Omega,$ $V_{GS}=10V,$ Resistive Load	$T_J=25^\circ\text{C}$		170		ns
t_r	Rise Time				210		ns
$t_{d(off)}$	Turn off Delay Time				260		ns
t_f	Fall Time				80		ns

Source-Drain BODY-DIODE CHARACTERISTICS ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
I_{SD}	Continuous Source Drain Current				400	A
I_{SDM}	Pulse Source Drain Current	Limited by T_{Jmax}			800	A
V_{SD}	Forward Voltage	$I_S=400A, V_{GS}=0V$		0.85	1.2	V
t_{rr}	Reverse Recovery time	$I_F=100A, V_{GS}=0V$		140		ns
Q_{RR}	Reverse Recovery Charge	$di_F/dt=-100A/\mu s$		550		nC

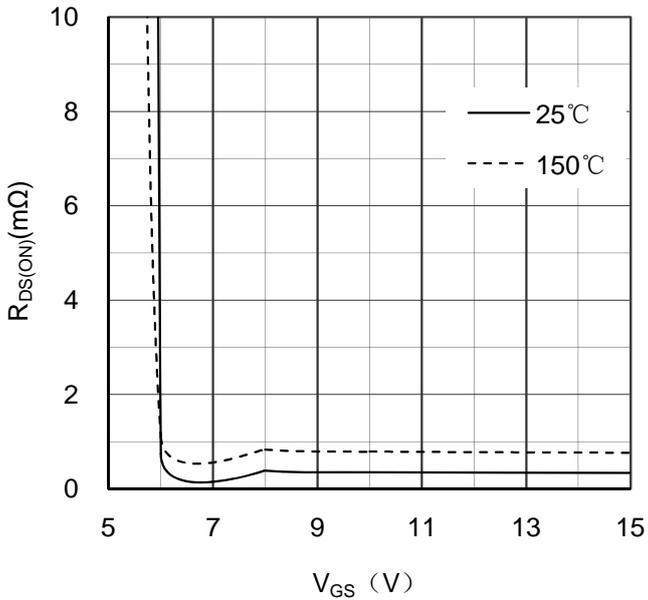


Figure 1. Typical $R_{DS(ON)}$ vs Gate Voltage

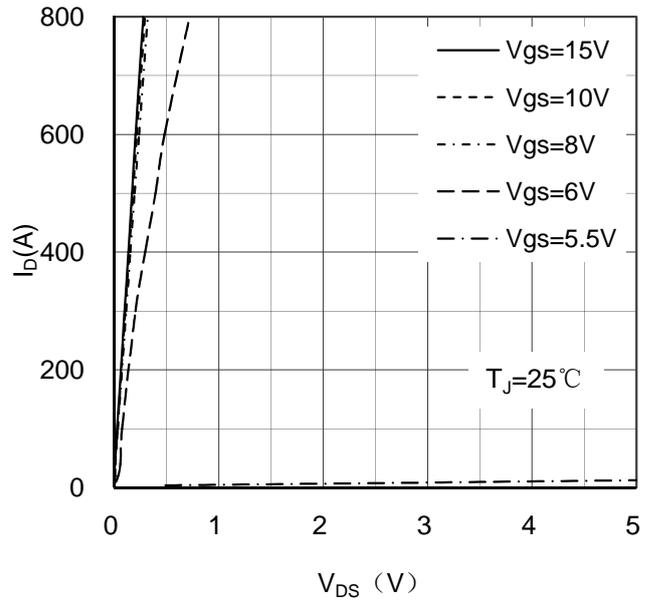


Figure 2. Typical Output Characteristics

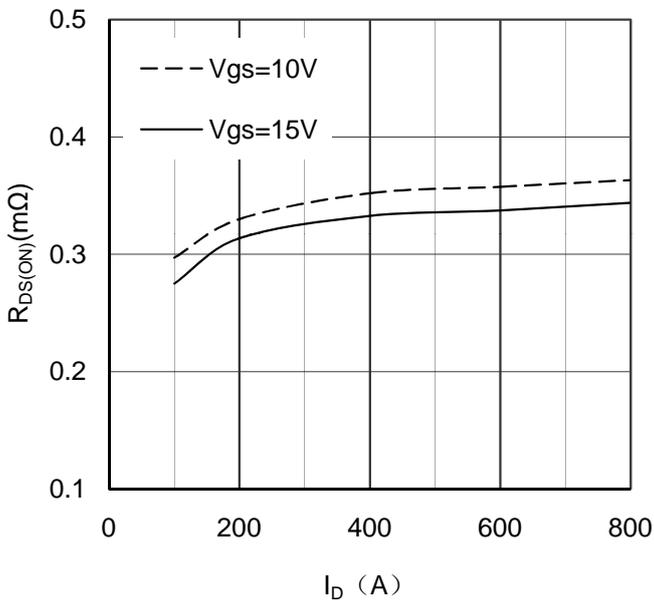


Figure 3. Drain-Source ON Resistance vs I_D

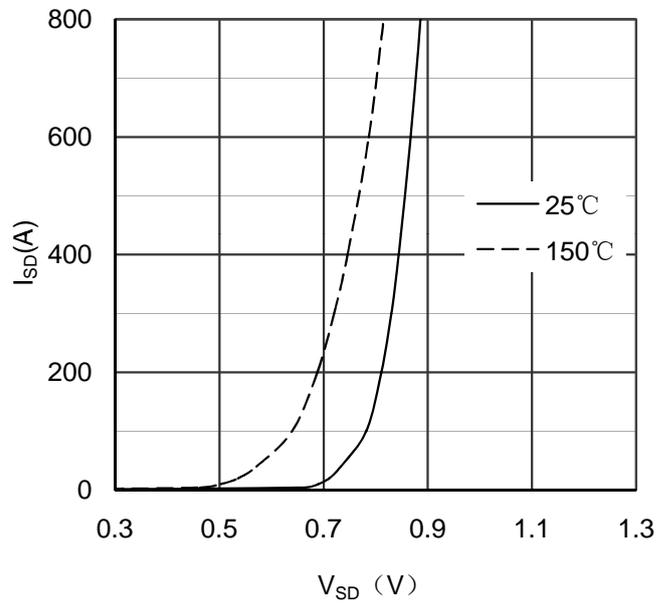


Figure 4. Source-Drain Voltage

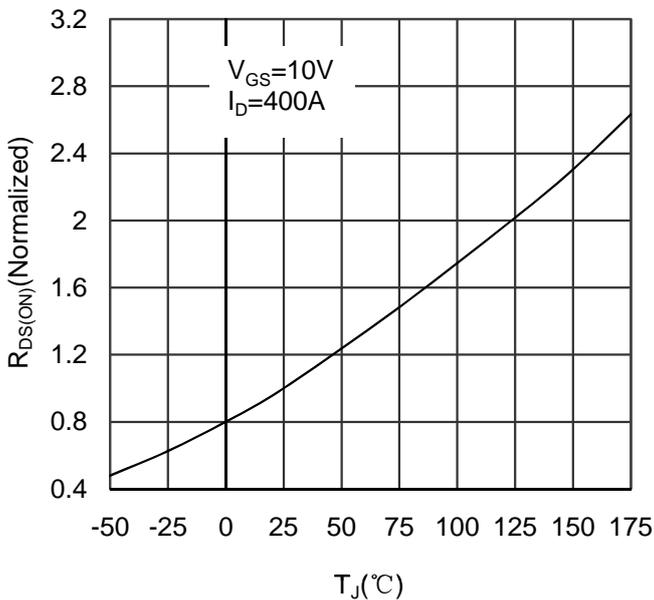


Figure 5. Drain-Source ON Resistance vs Junction Temperature

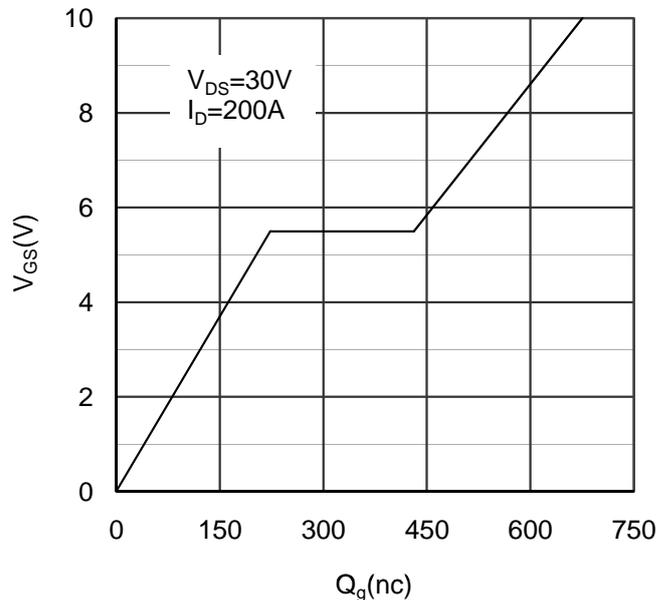


Figure 6. Gate Charge characteristics

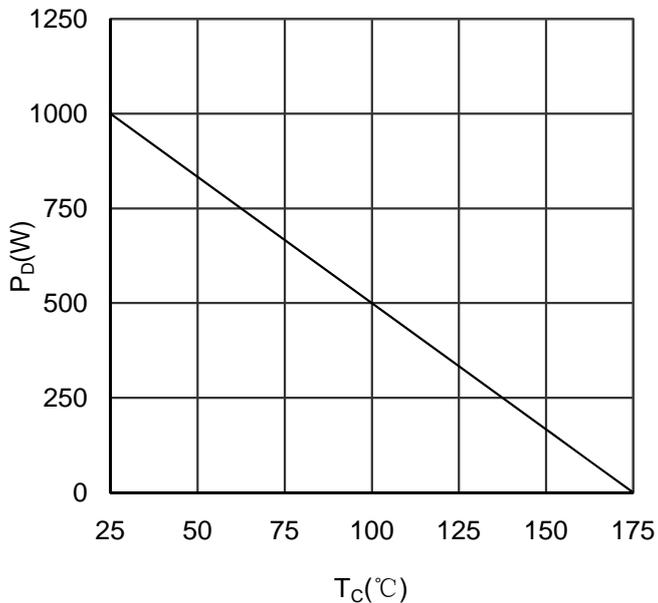


Figure 7. Maximum Power Dissipation vs Case Temperature

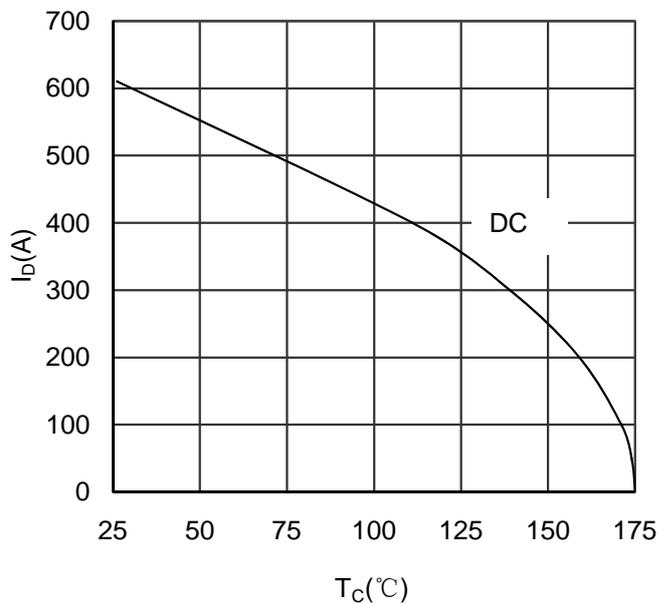


Figure 8. Maximum Continuous Drain Current vs Case Temperature

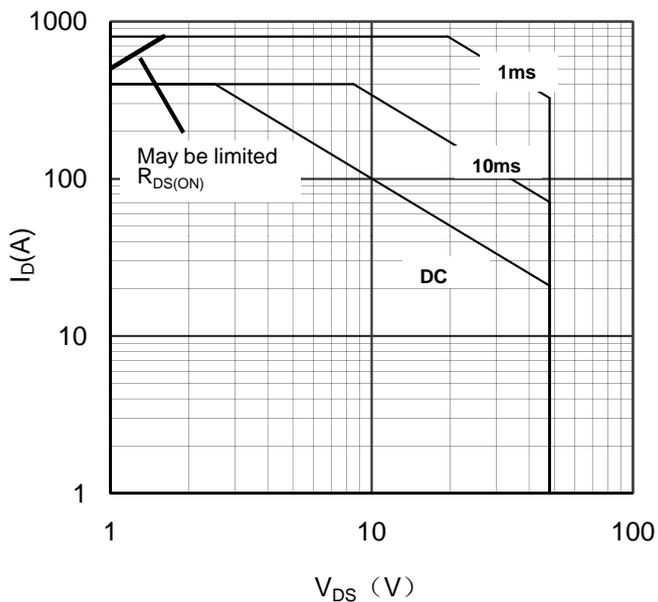


Figure 9. Maximum Forward Safe Operation Area

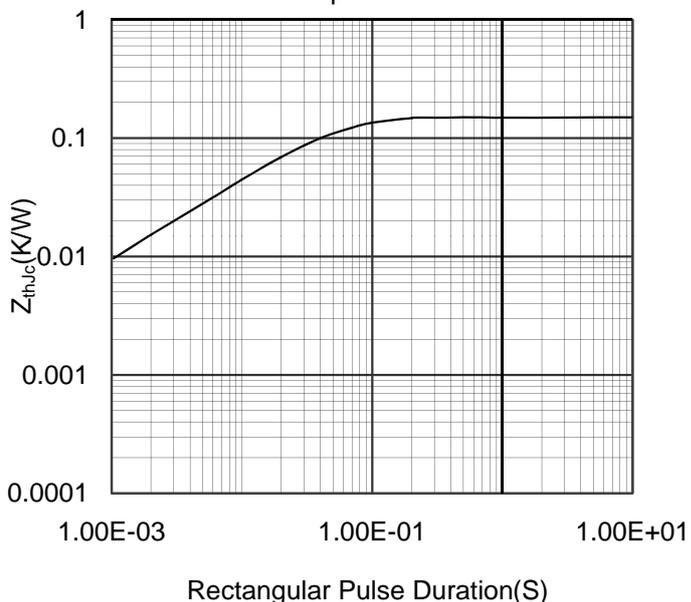


Figure 10. Transient Thermal Impedance

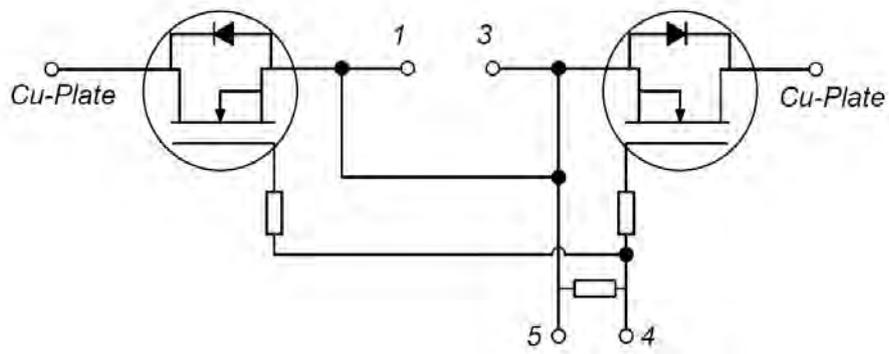
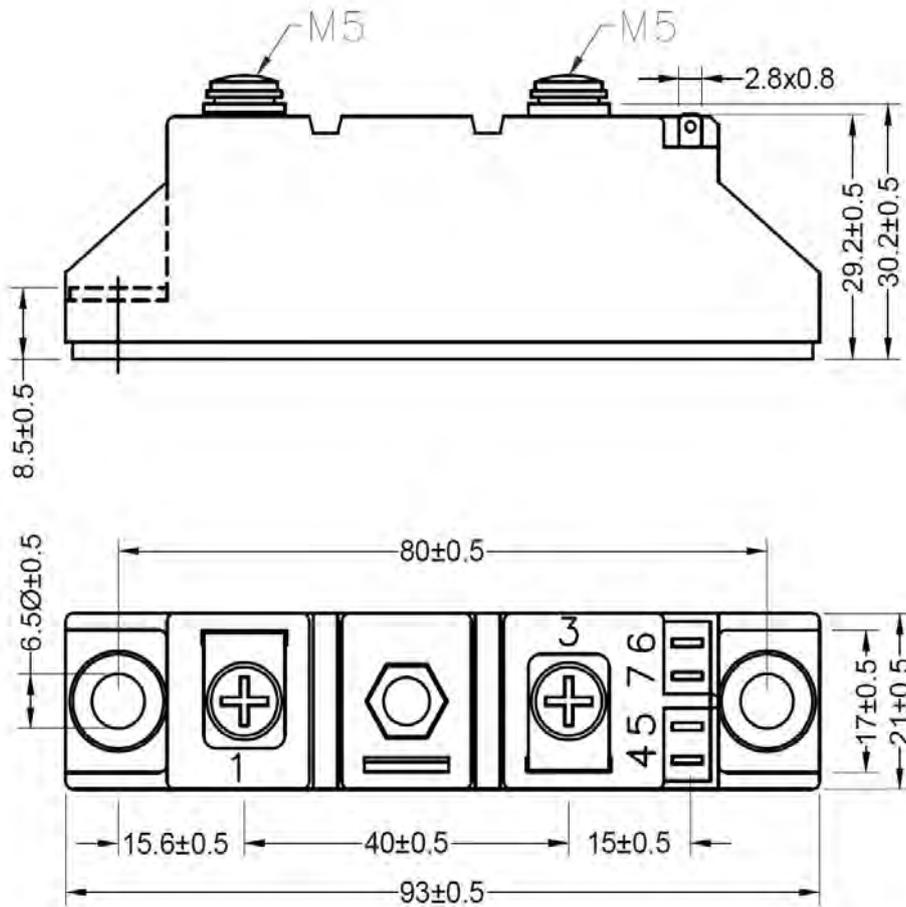


Figure 11. Circuit Diagram



Dimensions in (mm)

Figure 12. Package Outline