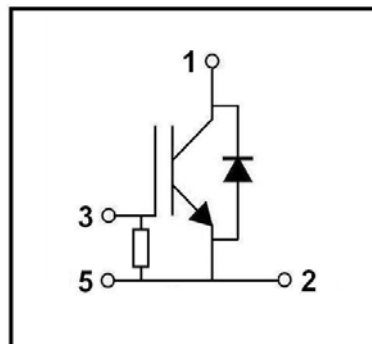


## FEATURES

- High short circuit capability, self limiting short circuit current
- IGBT CHIP (T4 Fast Trench+Field Stop technology)
- $V_{CE(sat)}$  with positive temperature coefficient
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses
- 5K  $\Omega$  Gate Protected Resistance Inside



## APPLICATIONS

- Inverter
- Converter
- Welder
- SMPS and UPS
- Induction Heating

## ABSOLUTE MAXIMUM RATINGS

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

Symbol	Parameter	Test Conditions	Values	Unit
<b>IGBT</b>				
$V_{CES}$	Collector - Emitter Voltage		1200	V
$V_{GES}$	Gate - Emitter Voltage		$\pm 20$	V
$I_C$	DC Collector Current	$T_C=25^\circ\text{C}$	400	A
		$T_C=75^\circ\text{C}$	300	A
$I_{Cpuls}$	Pulsed Collector Current	$T_C=25^\circ\text{C}, t_p=1\text{ms}$	800	A
		$T_C=75^\circ\text{C}, t_p=1\text{ms}$	600	A
$P_{tot}$	Power Dissipation Per IGBT		1650	W
$T_J$	Junction Temperature Range		-40 to +175	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range		-40 to +125	$^\circ\text{C}$
$V_{isol}$	Insulation Test Voltage	AC, $t=1\text{min}$	3000	V
<b>Free-Wheeling Diode</b>				
$V_{RRM}$	Repetitive Reverse Voltage		1200	V
$I_{F(AV)}$	Average Forward Current	$T_C=25^\circ\text{C}$	300	A
$I_{FRM}$	Repetitive Peak Forward Current	$t_p=1\text{ms}$	600	A
$I_{FSM}$	Non-Repetitive Surge Forward Current	$T_{vj}=45^\circ\text{C}, t=10\text{ms}, \text{Sine}$	1850	A
		$T_{vj}=45^\circ\text{C}, t=8.3\text{ms}, \text{Sine}$	2000	A

## MMG300K120U6HN

### ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>IGBT</b>						
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=12\text{mA}$	5.4	6	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=300\text{A}, V_{GE}=15\text{V}, T_{Vj}=125^\circ\text{C}$		2.1	2.5	V
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_{Vj}=125^\circ\text{C}$		2.5		V
$I_{CES}$	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{Vj}=25^\circ\text{C}$			5	mA
$I_{GES}$	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-400		400	nA
$R_{Gint}$	Integrated Gate Resistor			2.5		$\Omega$
$Q_g$	Gate Charge	$V_{CC}=600\text{V}, I_C=300\text{A}, V_{GE}=15\text{V}$		1.4		$\mu\text{C}$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		17.6		nF
$C_{res}$	Reverse Transfer Capacitance			0.97		nF
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}$ $R_G=2.5\ \Omega, V_{GE}=\pm 15\text{V}$ $T_{Vj}=25^\circ\text{C}$ Inductive Load		170		ns
$t_r$	Rise Time			75		ns
$t_{d(off)}$	Turn - off Delay Time			450		ns
$t_f$	Fall Time			45		ns
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}$ $R_G=2.5\ \Omega, V_{GE}=\pm 15\text{V}$ $T_{Vj}=125^\circ\text{C}$ Inductive Load		180		ns
$t_r$	Rise Time			85		ns
$t_{d(off)}$	Turn - off Delay Time			500		ns
$t_f$	Fall Time			65		ns
$E_{on}$	Turn - on Switching Energy	$V_{CC}=600\text{V}, I_C=300\text{A}, T_{Vj}=25^\circ\text{C}$		32		mJ
		$R_G=2.5\ \Omega, T_{Vj}=125^\circ\text{C}$		44		mJ
$E_{off}$	Turn - off Switching Energy	$V_{GE}=\pm 15\text{V}, T_{Vj}=25^\circ\text{C}$		12		mJ
		Inductive Load $T_{Vj}=125^\circ\text{C}$		18		mJ
<b>Free-Wheeling Diode</b>						
$V_F$	Forward Voltage	$I_F=300\text{A}, V_{GE}=0\text{V}, T_{Vj}=25^\circ\text{C}$		1.65	2.15	V
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_{Vj}=125^\circ\text{C}$		1.65		V
$t_{rr}$	Reverse Recovery Time	$I_F=300\text{A}, V_R=600\text{V}$		450		ns
$I_{RRM}$	Max. Reverse Recovery Current	$di_F/dt=-3000\text{A}/\mu\text{s}$		230		A
$E_{rec}$	Reverse Recovery Energy	$T_{Vj}=125^\circ\text{C}$		24		mJ

### THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{thJC}$	Junction-to-Case Thermal Resistance	Per IGBT			0.09	K /W
$R_{thJCD}$	Junction-to-Case Thermal Resistance	Per Inverse Diode			0.14	K /W
Torque	Module-to-Sink	Recommended (M6)	3		5	N · m
Torque	Module Electrodes	Recommended (M6)	2.5		5	N · m
Torque	Module Electrodes	Recommended (M4)	0.7		1.1	N · m
Weight				330		g

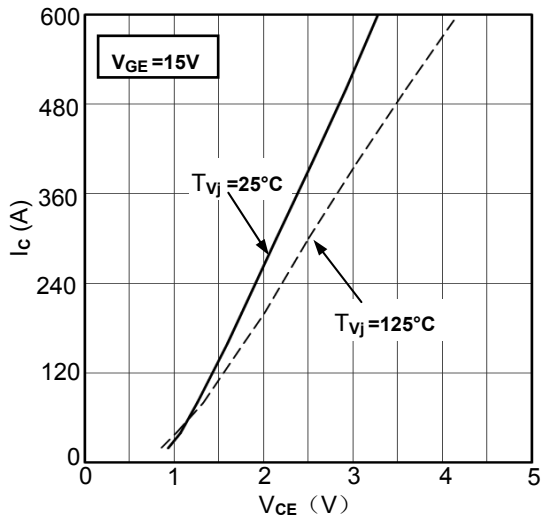


Figure1. Typical Output Characteristics

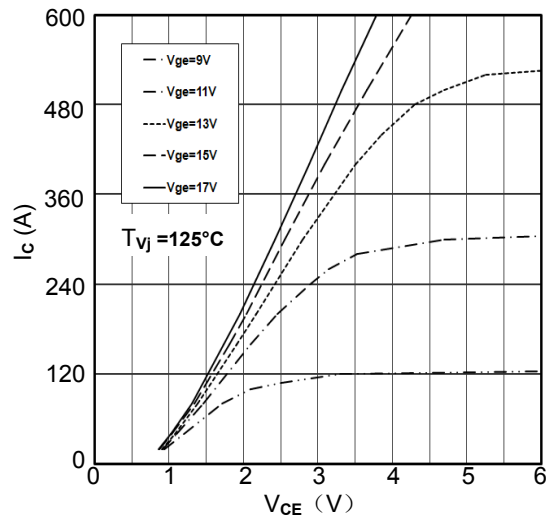


Figure2. Typical Output Characteristics

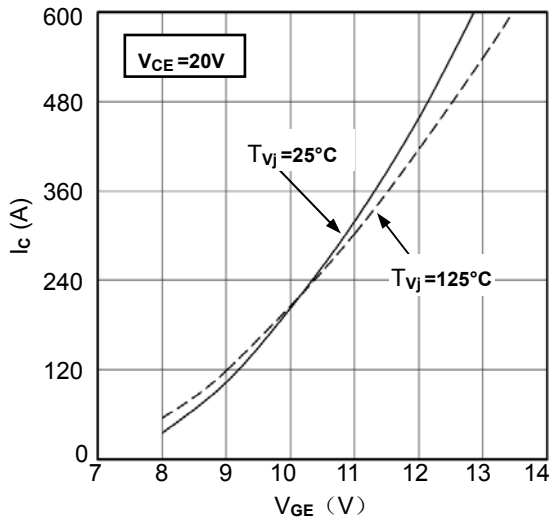


Figure3. Typical Transfer characteristics

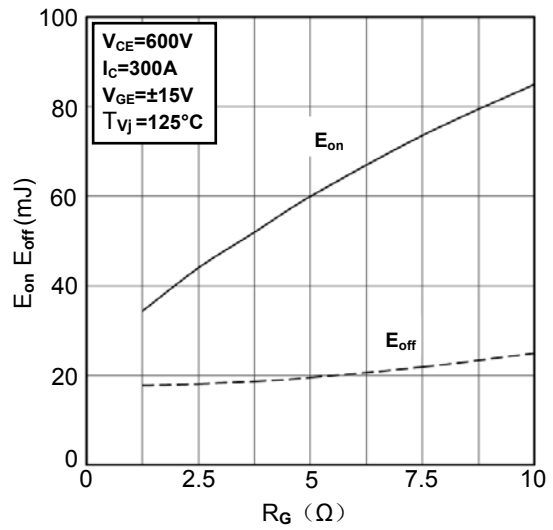


Figure4. Switching Energy vs. Gate Resistor

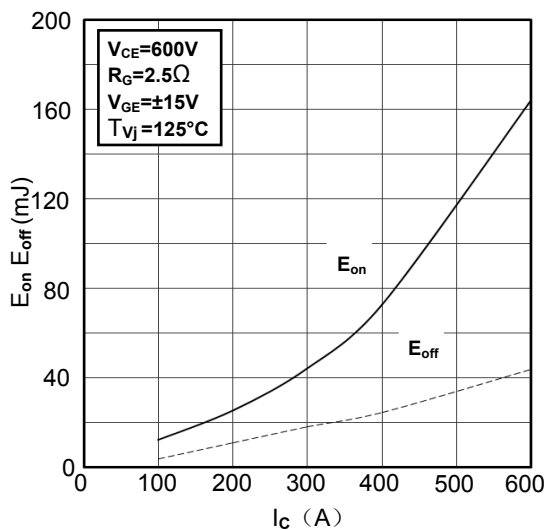


Figure5. Switching Energy vs. Collector Current

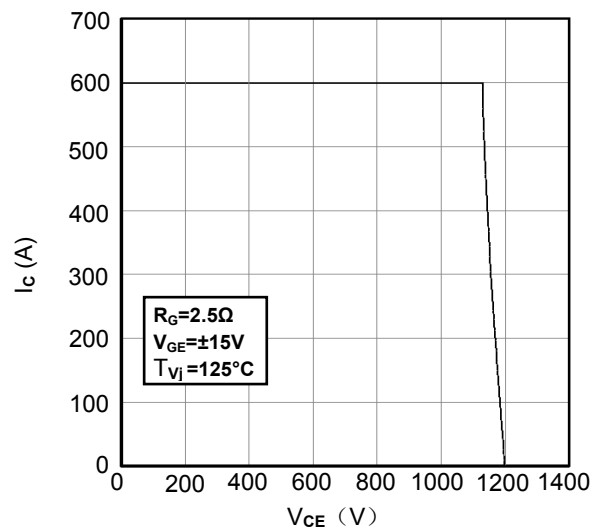


Figure6. Reverse Biased Safe Operating Area

# MMG300K120U6HN

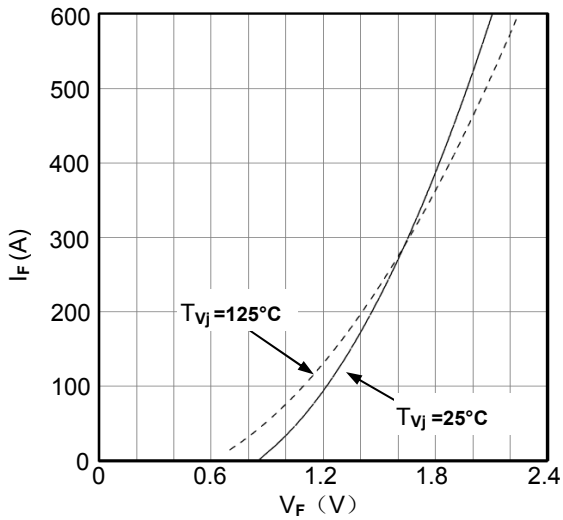


Figure 7. Diode Forward Characteristics

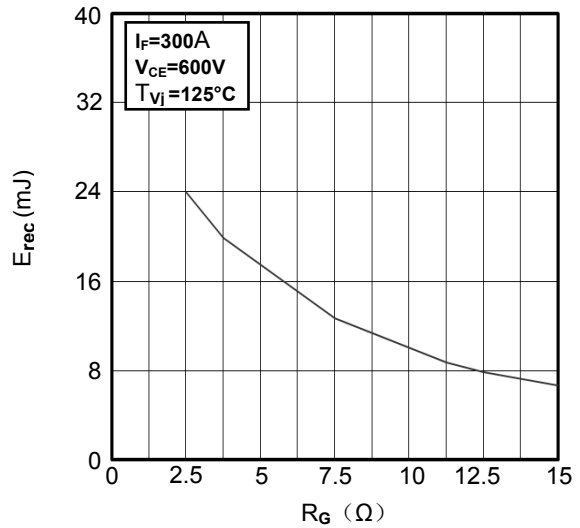


Figure 8. Switching Energy vs. Gate Resistor

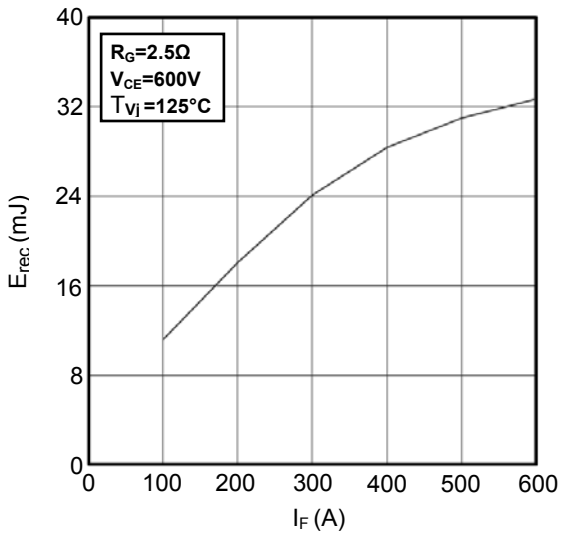


Figure 9. Switching Energy vs. Forward Current

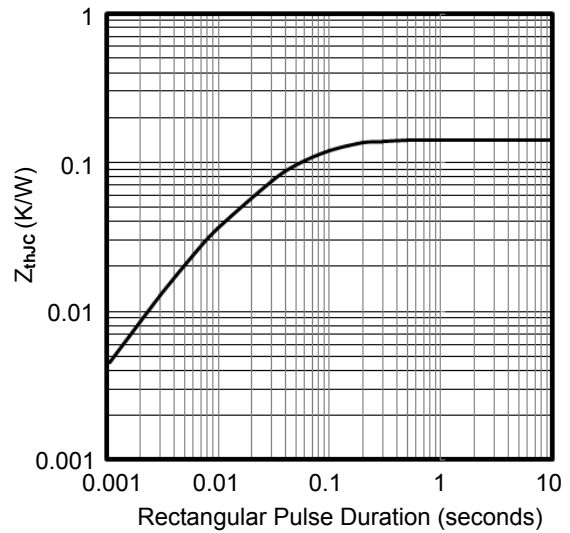


Figure 10. Transient Thermal Impedance of Diode

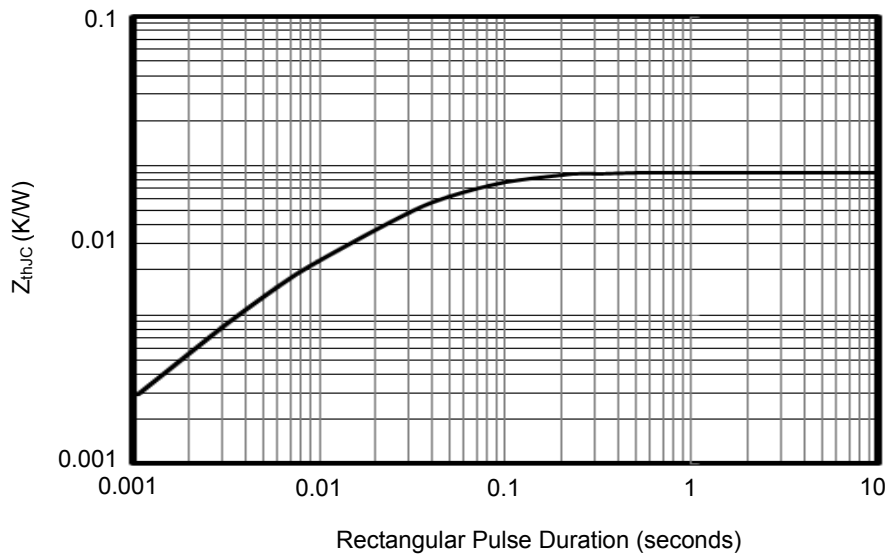


Figure 11. Transient Thermal Impedance of IGBT

