

FEATURES

- Ultra Low Loss
- High Ruggedness
- High Short Circuit Capability
- Positive Temperature Coefficient
- With Fast Free-Wheeling Diodes

APPLICATIONS

- Current Source Inverters
- Matrix Converters
- Bi-directional Switches
- Resonant Converters
- Induction Heating



ABSOLUTE MAXIMUM RATINGS

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

Symbol	Parameter	Test Conditions	Values	Unit
IGBT				
V_{CES}	Collector - Emitter Voltage		1200	V
V_{GES}	Gate - Emitter Voltage		± 20	V
I_C	DC Collector Current	$T_C=25^{\circ}\text{C}$	80	A
		$T_C=80^{\circ}\text{C}$	50	A
I_{Cpuls}	Pulsed Collector Current	$T_C=25^{\circ}\text{C}, t_p=1\text{ms}$	170	A
		$T_C=80^{\circ}\text{C}, t_p=1\text{ms}$	110	A
P_{tot}	Power Dissipation Per IGBT		500	W
T_J	Junction Temperature Range		-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range		-40 to +125	$^{\circ}\text{C}$
V_{isol}	Insulation Test Voltage	AC, $t=1\text{min}$	3000	V
Free-Wheeling Diode				
V_{RRM}	Repetitive Reverse Voltage		1200	V
$I_{F(AV)}$	Average Forward Current	$T_C=25^{\circ}\text{C}$	90	A
		$T_C=80^{\circ}\text{C}$	60	A
$I_{F(RMS)}$	RMS Forward Current		90	A
I_{FSM}	Non-Repetitive Surge	$T_J=45^{\circ}\text{C}, t=10\text{ms}, \text{Sine}$	430	A
	Forward Current	$T_J=45^{\circ}\text{C}, t=8.3\text{ms}, \text{Sine}$	450	A

MMG50SR120FZB

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
IGBT						
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=2\text{mA}$	5	6.2	7	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=25^{\circ}\text{C}$		1.8		V
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=125^{\circ}\text{C}$		2.0		V
I_{CES}	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^{\circ}\text{C}$			0.5	mA
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^{\circ}\text{C}$		2		mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-200		200	nA
Q_{ge}	Gate Charge	$V_{CC}=600\text{V}, I_C=50\text{A}, V_{GE}=\pm 15\text{V}$		611		nC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		4.29		nF
C_{oes}	Output Capacitance			0.30		nF
C_{res}	Reverse Transfer Capacitance			0.20		nF
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}$		270		ns
t_r	Rise Time	$R_G = 18 \Omega, V_{GE}=\pm 15\text{V}$		60		ns
$t_{d(off)}$	Turn - off Delay Time	$T_J=25^{\circ}\text{C}$		480		ns
t_f	Fall Time	Inductive Load		60		ns
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}$		290		ns
t_r	Rise Time	$R_G = 18 \Omega, V_{GE}=\pm 15\text{V}$		60		ns
$t_{d(off)}$	Turn - off Delay Time	$T_J=125^{\circ}\text{C}$		550		ns
t_f	Fall Time	Inductive Load		65		ns
E_{on}	Turn - on Switching Energy	$V_{CC}=600\text{V}, I_C=50\text{A}$ $T_J=25^{\circ}\text{C}$		6.0		mJ
		$R_G = 18 \Omega$ $T_J=125^{\circ}\text{C}$		8.4		mJ
E_{off}	Turn - off Switching Energy	$V_{GE}=\pm 15\text{V}$ $T_J=25^{\circ}\text{C}$		3.7		mJ
		Inductive Load $T_J=125^{\circ}\text{C}$		5.8		mJ
Free-Wheeling Diode						
V_F	Forward Voltage	$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=25^{\circ}\text{C}$		1.9	2.3	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=125^{\circ}\text{C}$		1.7	2.1	V
t_{rr}	Reverse Recovery Time	$I_F=50\text{A}, V_R=800\text{V}$		180		ns
I_{RRM}	Max. Reverse Recovery Current	$di_F/dt=-1000\text{A}/\mu\text{s}$		60		A
Q_{rr}	Reverse Recovery Charge	$T_J=125^{\circ}\text{C}$		7.1		μC

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case Thermal Resistance	Per IGBT			0.3	K / W
R_{thJCD}	Junction-to-Case Thermal Resistance	Per Inverse Diode			0.6	K / W
Torque	Module-to-Sink	Recommended (M6)	3		5	N · m
Torque	Module Electrodes	Recommended (M5)	2.5		5	N · m
Weight				150		g

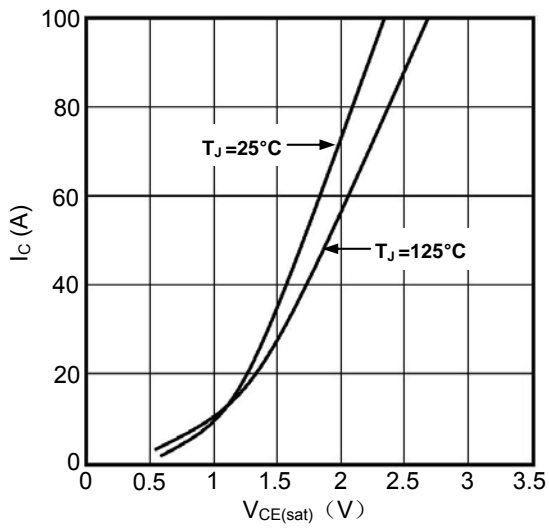


Figure1. Typical Output characteristics

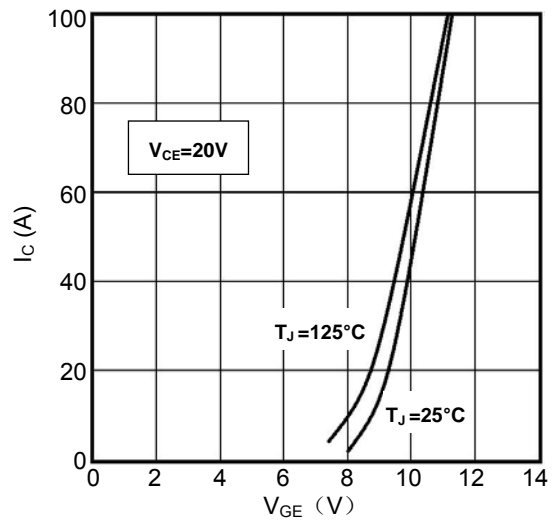


Figure2. Typical Transfer characteristics

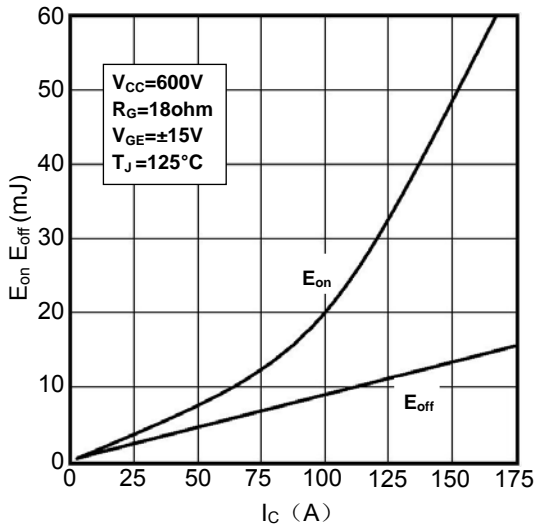


Figure3. Switching Energy vs. Collector Current

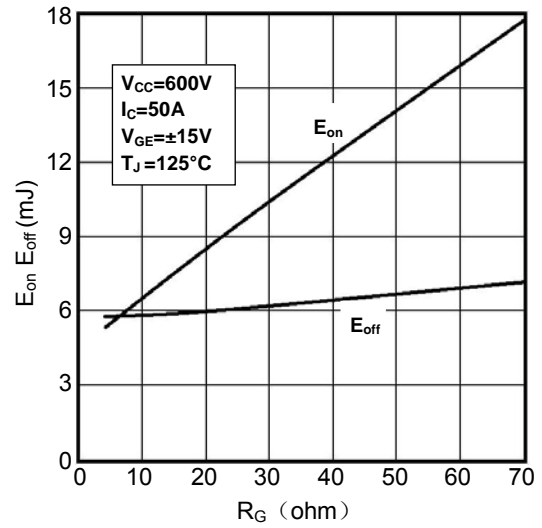


Figure4. Switching Energy vs. Gate Resistor

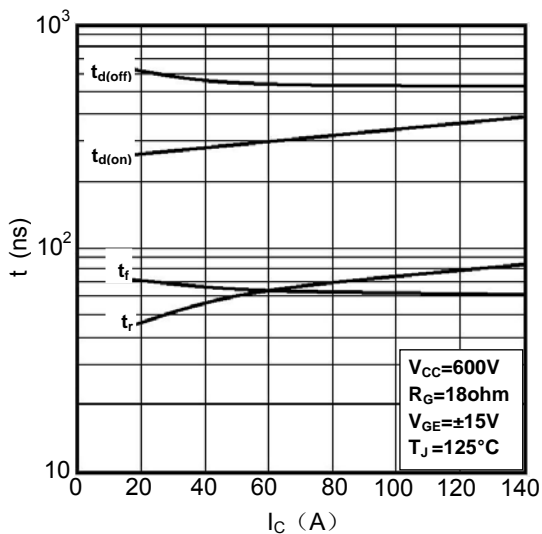


Figure5. Switching Times vs. Collector Current

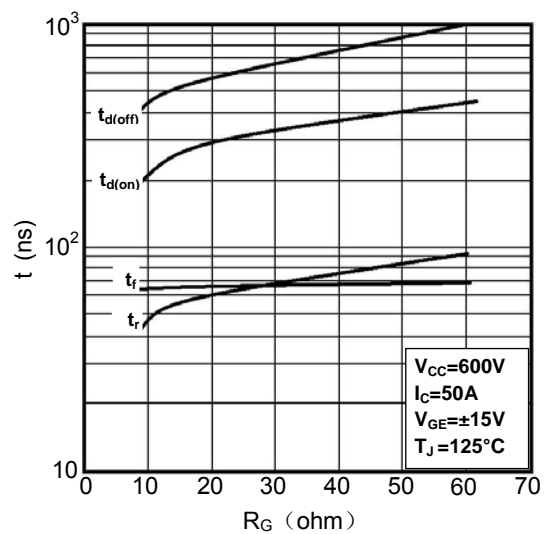


Figure6. Switching Times vs. Gate Resistor

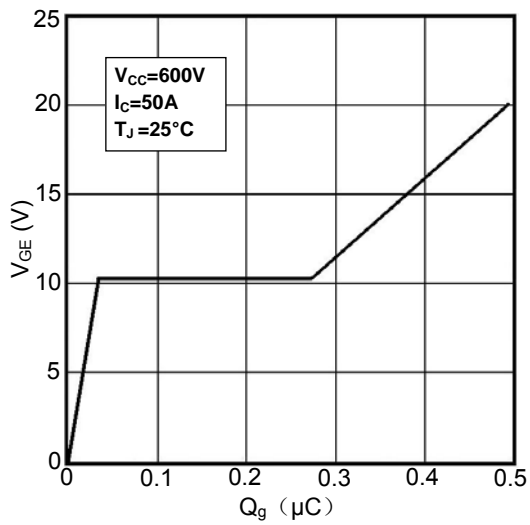


Figure7. Gate Charge characteristics

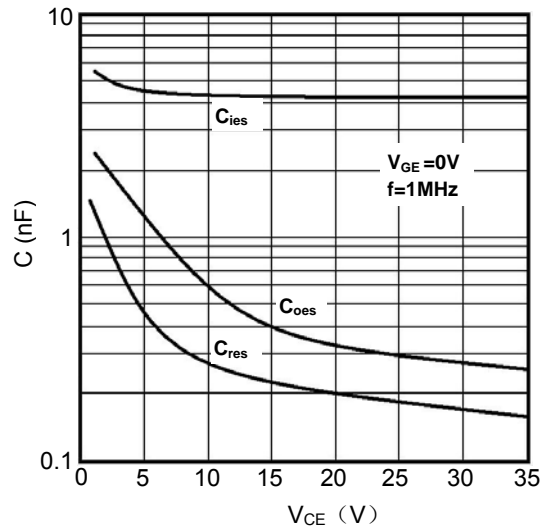


Figure8. Typical Capacitances vs. V_{CE}

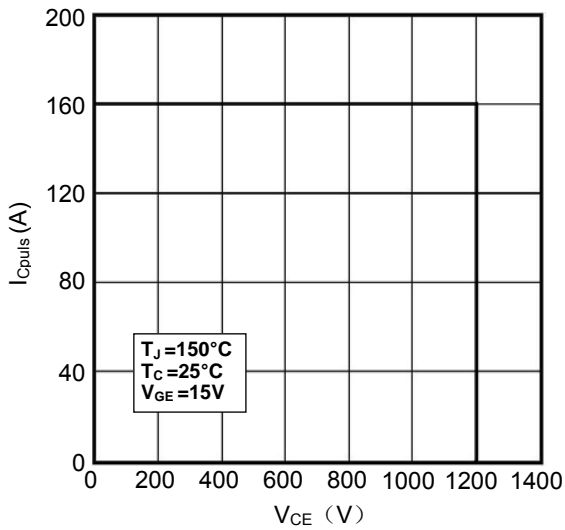


Figure9. Reverse Biased Safe Operating Area

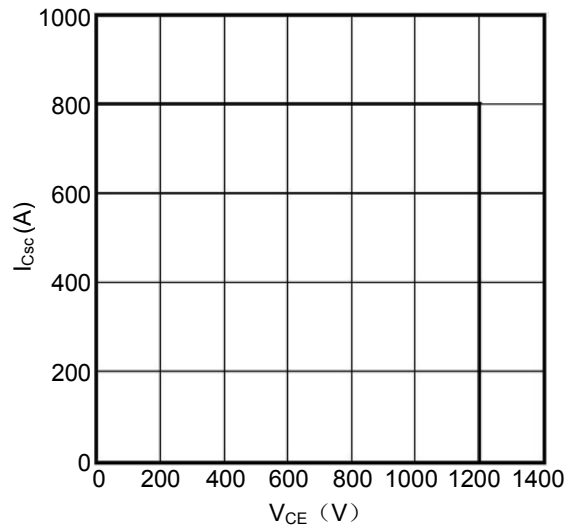


Figure10. Short Circuit Safe Operating Area

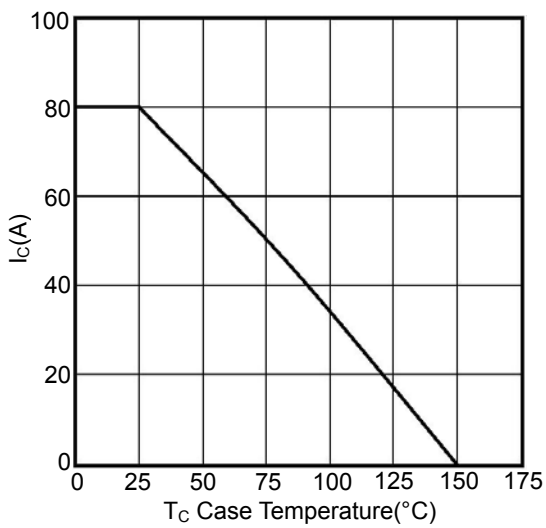


Figure11. Rated Current vs. T_C

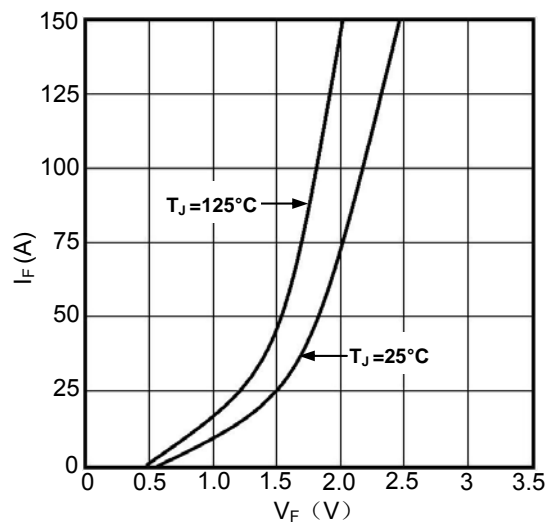


Figure12. Diode Forward Characteristics

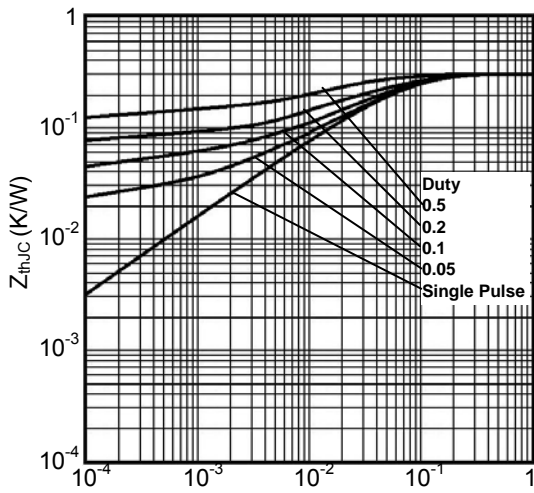


Figure13. Transient Thermal Impedance of IGBT

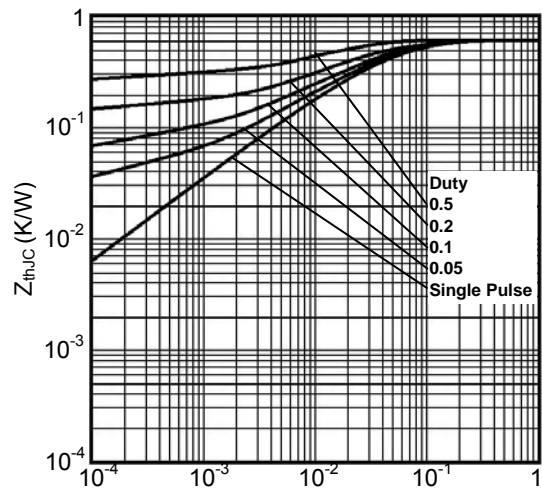


Figure14. Transient Thermal Impedance of Diode

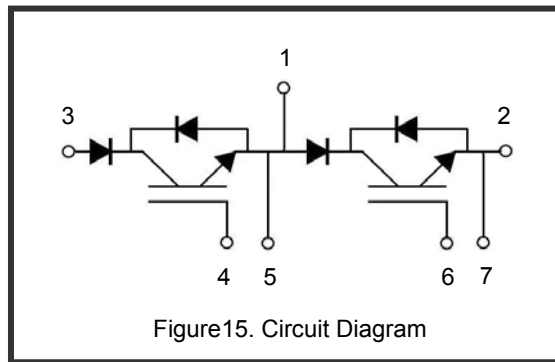


Figure15. Circuit Diagram

