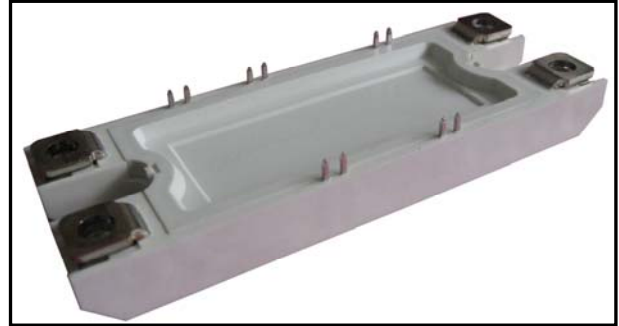


FEATURES

- High short circuit capability, self limiting short circuit current
- IGBT CHIP(T4 Fast Trench+Field Stop technology)
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses
- $T_{Vj\ max} = 175^{\circ}C$



APPLICATIONS

- High frequency switching application
- Medical applications
- Motion/servo control
- UPS systems

INVERTER SECTOR

ABSOLUTE MAXIMUM RATINGS

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

Symbol	Parameter	Test Conditions	Values	Unit
IGBT				
V_{CES}	Collector - Emitter Voltage	$T_{Vj}=25^{\circ}C$	1200	V
V_{GES}	Gate - Emitter Voltage		± 20	V
I_c	DC Collector Current	$T_C=25^{\circ}C$	60	A
		$T_C=80^{\circ}C$	40	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1ms$	80	A
P_{tot}	Power Dissipation Per IGBT		270	W
Diode				
V_{RRM}	Repetitive Reverse Voltage	$T_{Vj}=25^{\circ}C$	1200	V
$I_{F(AV)}$	Average Forward Current	$T_C=25^{\circ}C$	60	A
		$T_C=80^{\circ}C$	40	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1ms$	80	A
I^2t		$T_{Vj} = 125^{\circ}C, t=10ms, V_R=0V$	300	A^2s

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INVERTER SECTOR

ELECTRICAL AND THERMAL 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	$V_{CE}=V_{GE}, I_C=1.6\text{mA}$	5.4	6	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}, T_{VJ}=25^{\circ}\text{C}$		2.1	2.5	V
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_{VJ}=125^{\circ}\text{C}$		2.5		V
I_{CES}	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{VJ}=25^{\circ}\text{C}$			2	mA
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{VJ}=125^{\circ}\text{C}$			10	mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE} \pm 15\text{V}, T_{VJ}=125^{\circ}\text{C}$	-400		400	nA
R_{Gint}	Integrated Gate Resistor			--		Ω
Q_g	Gate Charge	$V_{CE}=600\text{V}, I_C=40\text{A}, V_{GE}=15\text{V}$		0.18		μC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.4		nF
C_{res}	Reverse Transfer Capacitance			0.13		nF
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A},$ $R_G = 15 \Omega,$ $V_{GE} = \pm 15\text{V},$	$T_{VJ} = 25^{\circ}\text{C}$	30		ns
			$T_{VJ} = 125^{\circ}\text{C}$	35		ns
			$T_{VJ} = 150^{\circ}\text{C}$	40		ns
t_r	Rise Time	Inductive Load	$T_{VJ} = 25^{\circ}\text{C}$	35		ns
			$T_{VJ} = 125^{\circ}\text{C}$	40		ns
			$T_{VJ} = 150^{\circ}\text{C}$	45		ns
$t_{d(off)}$	Turn - off Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A},$ $R_G = 15 \Omega,$ $V_{GE} = \pm 15\text{V},$	$T_{VJ} = 25^{\circ}\text{C}$	270		ns
			$T_{VJ} = 125^{\circ}\text{C}$	320		ns
			$T_{VJ} = 150^{\circ}\text{C}$	360		ns
t_f	Fall Time	Inductive Load	$T_{VJ} = 25^{\circ}\text{C}$	40		ns
			$T_{VJ} = 125^{\circ}\text{C}$	60		ns
			$T_{VJ} = 150^{\circ}\text{C}$	70		ns
E_{on}	Turn - on Energy	$V_{CC}=600\text{V}, I_C=40\text{A},$ $R_G = 15 \Omega,$ $V_{GE} = \pm 15\text{V},$ Inductive Load	$T_{VJ} = 125^{\circ}\text{C}$	4.0		mJ
	$T_{VJ} = 150^{\circ}\text{C}$		4.2		mJ	
E_{off}	Turn - off Energy		$T_{VJ} = 125^{\circ}\text{C}$	2.3		mJ
		$T_{VJ} = 150^{\circ}\text{C}$	2.4		mJ	
I_{sc}	Short Circuit Current	$t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_{VJ}=125^{\circ}\text{C}, V_{CC}=600\text{V}$		160		A
R_{thJC}	Junction-to-Case Thermal Resistance (Per IGBT)				0.55	K /W
Diode						
V_F	Forward Voltage	$I_F=40\text{A}, V_{GE}=0\text{V}, T_{VJ} = 25^{\circ}\text{C}$		1.75	2.2	V
		$I_F=40\text{A}, V_{GE}=0\text{V}, T_{VJ} = 125^{\circ}\text{C}$		1.7		V
t_{rr}	Reverse Recovery Time	$I_F=40\text{A}, V_R=600\text{V}$		350		ns
I_{RRM}	Max. Reverse Recovery Current	$di_F/dt=-900\text{A}/\mu\text{s}$		45		A
E_{rec}	Reverse Recovery Energy	$T_{VJ} = 125^{\circ}\text{C}$		3.0		mJ
R_{thJCD}	Junction-to-Case Thermal Resistance (Per Diode)				0.95	K /W

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NTC SECTOR

CHARACTERISTIC VALUES

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R ₂₅	Resistance	T _c = 25°C		5		KΩ
B _{25/50}				3375		K

MODULE CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
T _{vj max}	Max. Junction Temperature				175	°C
T _{vj op}	Operating Temperature		-40		150	°C
T _{stg}	Storage Temperature		-40		125	°C
V _{isol}	Insulation Test Voltage	AC, t=1min		3000		V
CTI	Comparative Tracking Index		250			
Torque	Module-to-Sink	Recommended (M6)	3		5	N · m
Torque	Module Electrodes	Recommended (M5)	2.5		5	N · m
Weight				200		g

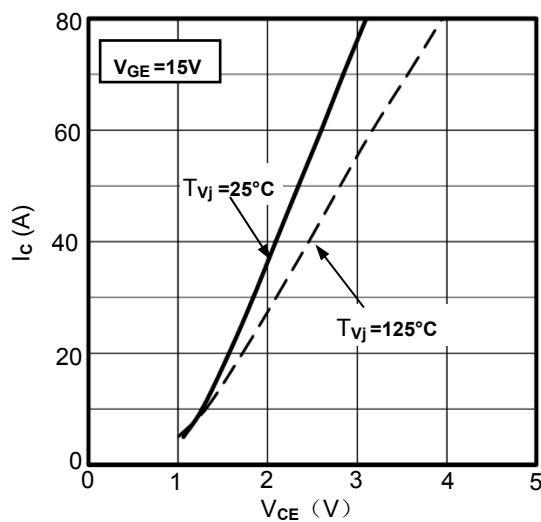


Figure1. Typical Output Characteristics
IGBT-inverter

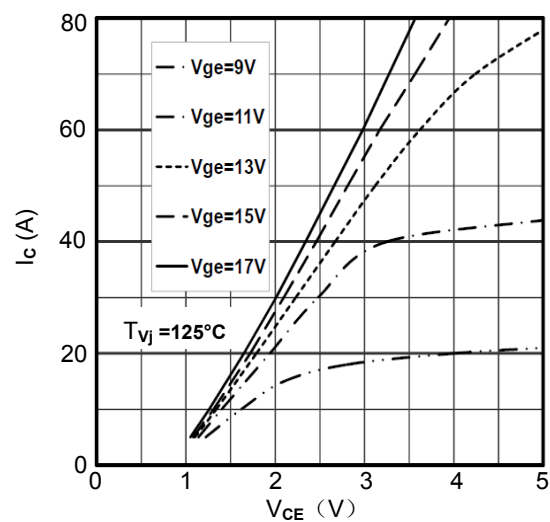


Figure2. Typical Output Characteristics
IGBT-inverter

MMG40HB120H6HN

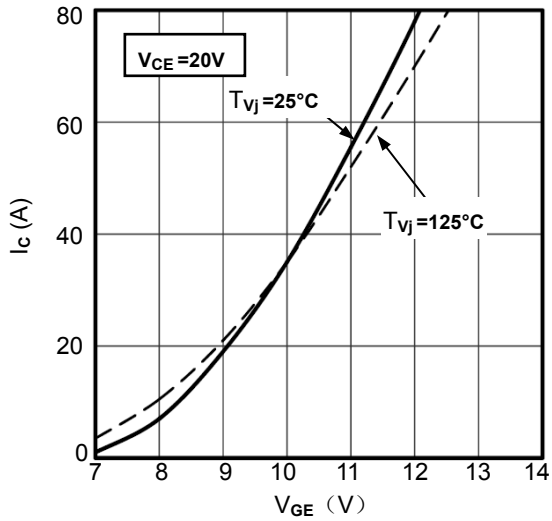


Figure3. Typical Transfer characteristics IGBT-inverter

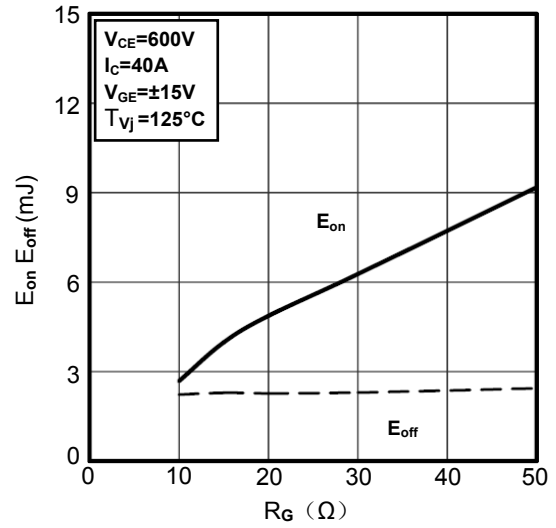


Figure4. Switching Energy vs. Gate Resistor IGBT-inverter

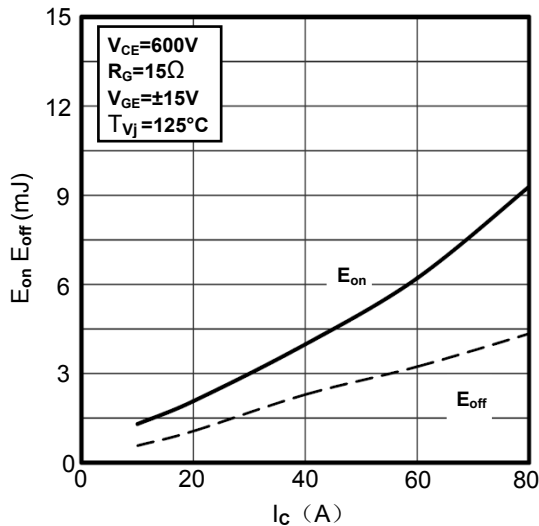


Figure5. Switching Energy vs. Collector Current IGBT-inverter

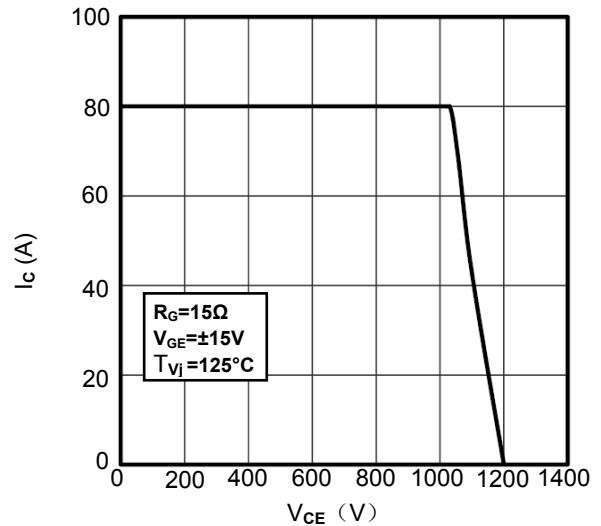


Figure6. Reverse Biased Safe Operating Area IGBT-inverter

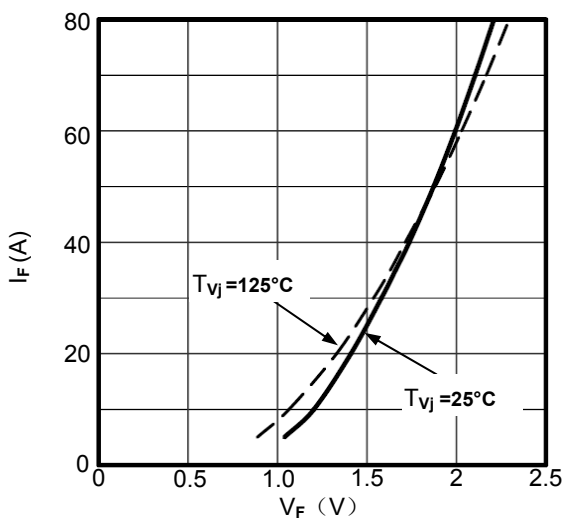


Figure7. Diode Forward Characteristics Diode-inverter

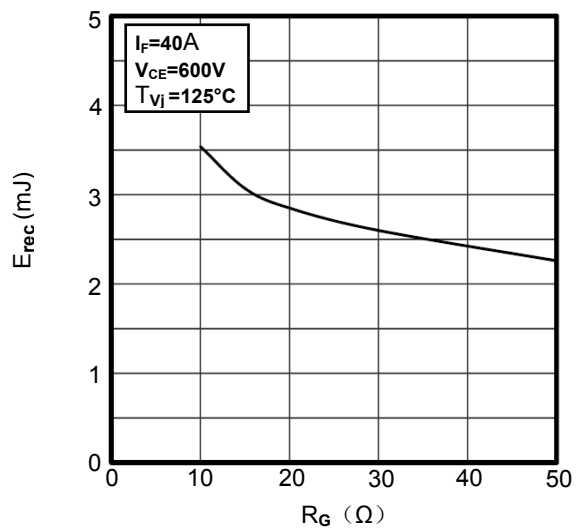


Figure8. Switching Energy vs. Gate Resistor Diode-inverter

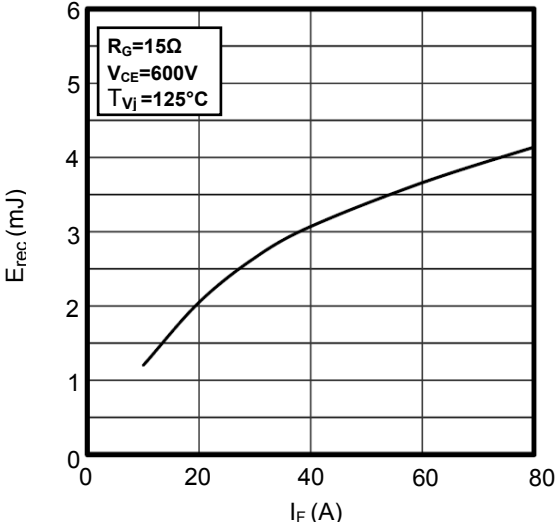


Figure9. Switching Energy vs. Forward Current Diode-inverter

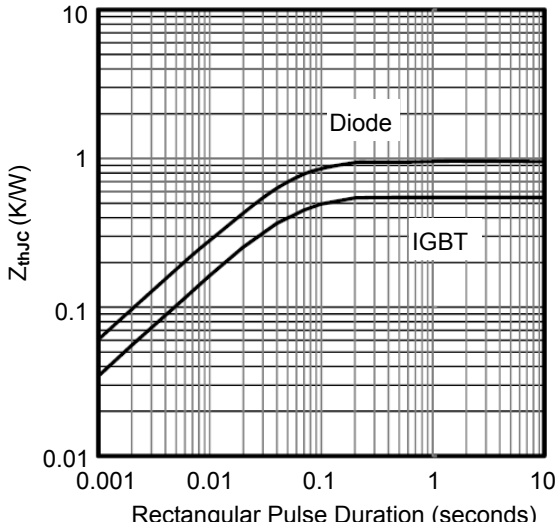


Figure10. Transient Thermal Impedance of Diode and IGBT-inverter

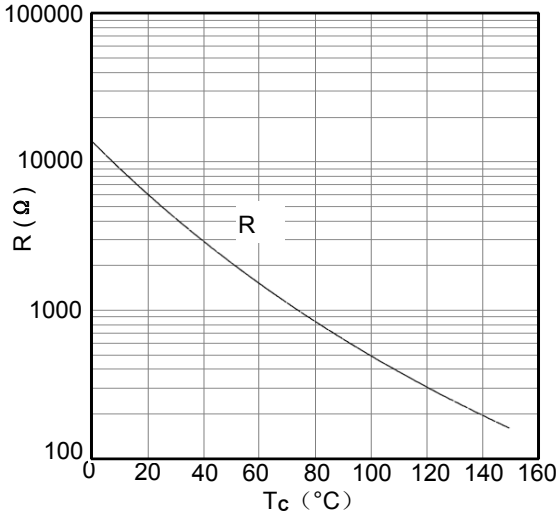


Figure11. NTC Characteristics

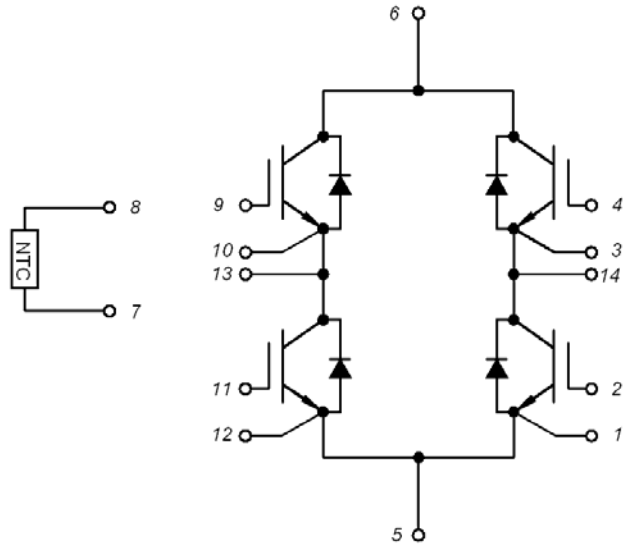
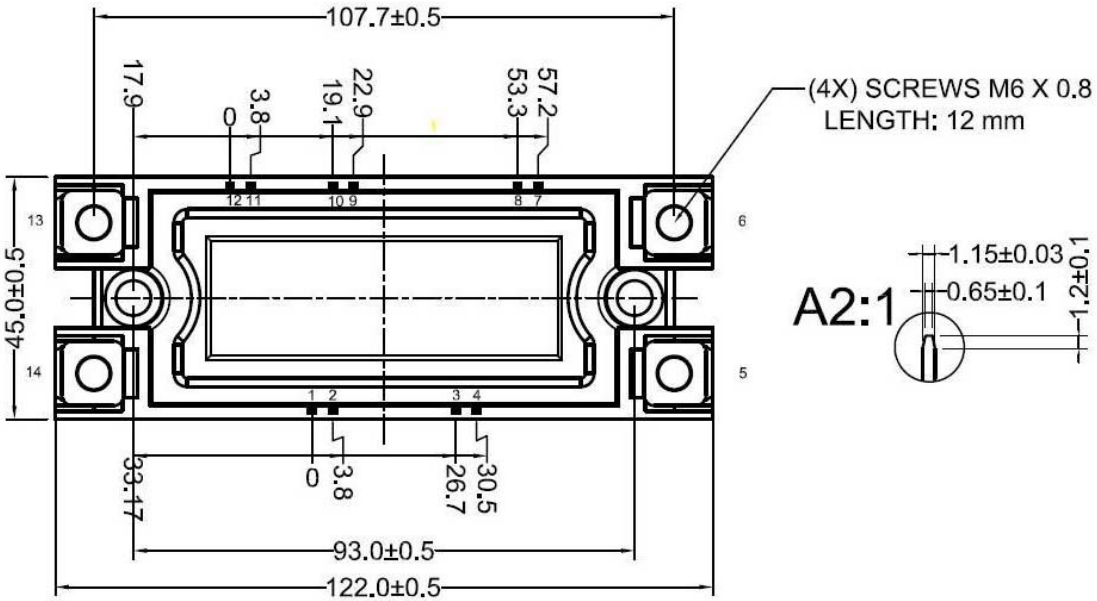
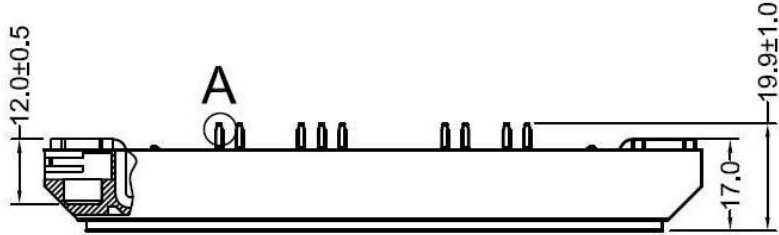


Figure12. Circuit Diagram



Dimensions (mm)
Figure13. Package Outline