

FEATURES

- High level of integration—only one power semiconductor module required for the whole drive
- Low saturation voltage and positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Industry standard package with insulated copper base plate and soldering pins for PCB mounting
- Temperature sense included

APPLICATIONS

- AC motor control
- Motion/servo control
- Inverter and power supplies



PIM Three Phase Input Rectifier

INVERTER SECTOR

ABSOLUTE MAXIMUM RATINGS

T_c=25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Values	Unit
IGBT				
V _{CES}	Collector - Emitter Voltage	T _{vj} =25°C	1200	V
V _{GES}	Gate - Emitter Voltage		±20	V
I _c	DC Collector Current	T _c =25°C	40	A
		T _c =80°C	25	A
I _{CM}	Repetitive Peak Collector Current	t _p =1ms	50	A
P _{tot}	Power Dissipation Per IGBT		147	W
Diode				
V _{RRM}	Repetitive Reverse Voltage	T _{vj} =25°C	1200	V
I _{F(AV)}	Average Forward Current	T _c =25°C	35	A
		T _c =80°C	25	A
I _{FRM}	Repetitive Peak Forward Current	t _p =1ms	50	A
I ² t		T _{vj} =125°C, t=10ms, V _R =0V	200	A ² s

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	$V_{CE}=V_{GE}, I_C=1\text{mA}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=25\text{A}, V_{GE}=15\text{V}, T_{VJ}=25^{\circ}\text{C}$		1.7		V
		$I_C=25\text{A}, V_{GE}=15\text{V}, T_{VJ}=125^{\circ}\text{C}$		1.9		V
I_{CES}	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{VJ}=25^{\circ}\text{C}$			0.1	mA
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{VJ}=125^{\circ}\text{C}$			1	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			8.0		Ω
Q_{ge}	Gate Charge	$V_{CE}=600\text{V}, I_C=25\text{A}, V_{GE} = \pm 15\text{V}$		0.24		μC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		1.81		nF
C_{res}	Reverse Transfer Capacitance				0.08	
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=25\text{A},$ $R_G = 36 \Omega,$	$T_{VJ} = 25^{\circ}\text{C}$	90		ns
			$T_{VJ} = 125^{\circ}\text{C}$	90		ns
t_r	Rise Time	$V_{GE} = \pm 15\text{V},$ Inductive Load	$T_{VJ} = 25^{\circ}\text{C}$	30		ns
			$T_{VJ} = 125^{\circ}\text{C}$	50		ns
$t_{d(off)}$	Turn - off Delay Time	$V_{CC}=600\text{V}, I_C=25\text{A},$ $R_G = 36 \Omega,$	$T_{VJ} = 25^{\circ}\text{C}$	420		ns
			$T_{VJ} = 125^{\circ}\text{C}$	520		ns
t_f	Fall Time	$V_{GE} = \pm 15\text{V},$ Inductive Load	$T_{VJ} = 25^{\circ}\text{C}$	70		ns
			$T_{VJ} = 125^{\circ}\text{C}$	90		ns
E_{on}	Turn - on Energy	$V_{CC}=600\text{V}, I_C=25\text{A},$ $R_G = 36 \Omega,$	$T_{VJ} = 25^{\circ}\text{C}$	2.4		mJ
			$T_{VJ} = 125^{\circ}\text{C}$	3.5		mJ
E_{off}	Turn - off Energy	$V_{GE} = \pm 15\text{V},$ Inductive Load	$T_{VJ} = 25^{\circ}\text{C}$	1.8		mJ
			$T_{VJ} = 125^{\circ}\text{C}$	2.1		mJ
I_{sc}	Short Circuit Current	$t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_{VJ}=125^{\circ}\text{C}, V_{CC}=900\text{V}$		100		A
R_{thJC}	Junction-to-Case Thermal Resistance (Per IGBT)				0.85	K /W
Diode						
V_F	Forward Voltage	$I_F=25\text{A}, V_{GE}=0\text{V}, T_{VJ} = 25^{\circ}\text{C}$		1.55		V
		$I_F=25\text{A}, V_{GE}=0\text{V}, T_{VJ} = 125^{\circ}\text{C}$		1.54		V
t_{rr}	Reverse Recovery Time	$I_F=25\text{A}, V_R=600\text{V}$		200		ns
I_{RRM}	Max. Reverse Recovery Current	$di_F/dt=-400\text{A}/\mu\text{s}$		20		A
E_{rec}	Reverse Recovery Energy	$T_{VJ} = 125^{\circ}\text{C}$		1.5		mJ
R_{thJCD}	Junction-to-Case Thermal Resistance (Per Diode)				1.4	K /W

MMG25H120XB6TN

DIODE-RECTIFIER SECTOR

ABSOLUTE MAXIMUM RATINGS

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

Symbol	Parameter	Test Conditions	Values	Unit
V_{RRM}	Repetitive Reverse Voltage	$T_{Vj}=25^{\circ}\text{C}$	1600	V
$I_{F(AV)}$	Average Forward Current	$T_C=80^{\circ}\text{C}$	25	A
I_{FSM}	Non-Repetitive Surge Forward Current	$T_{Vj}=45^{\circ}\text{C}$, $t=10\text{ms}$, 50Hz	250	A
		$T_{Vj}=45^{\circ}\text{C}$, $t=8.3\text{ms}$, 60Hz	300	A
I^2t		$T_{Vj}=45^{\circ}\text{C}$, $t=10\text{ms}$, 50Hz	312	A^2s
		$T_{Vj}=45^{\circ}\text{C}$, $t=8.3\text{ms}$, 60Hz	450	A^2s

DIODE-RECTIFIER SECTOR

ELECTRICAL AND THERMAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=25\text{A}$, $T_{Vj}=25^{\circ}\text{C}$		1.1		V
		$I_F=25\text{A}$, $T_{Vj}=125^{\circ}\text{C}$		1.00		V
I_R	Reverse Leakage Current	$V_R=1600\text{V}$, $T_{Vj}=25^{\circ}\text{C}$			50	μA
		$V_R=1600\text{V}$, $T_{Vj}=125^{\circ}\text{C}$			1	mA
R_{thJCD}	Junction-to-Case Thermal Resistance (Per Diode)				1.35	K/W

BRAKE-CHOPPER SECTOR

ABSOLUTE MAXIMUM RATINGS

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

Symbol	Parameter	Test Conditions	Values	Unit
IGBT				
V_{CES}	Collector - Emitter Voltage	$T_{Vj}=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate - Emitter Voltage		± 20	V
I_c	DC Collector Current	$T_C=25^{\circ}\text{C}$	25	A
		$T_C=80^{\circ}\text{C}$	15	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	30	A
P_{tot}	Power Dissipation Per IGBT		105	W
Diode				
V_{RRM}	Repetitive Reverse Voltage	$T_{Vj}=25^{\circ}\text{C}$	1200	V
$I_{F(AV)}$	Average Forward Current	$T_C=25^{\circ}\text{C}$	25	A
		$T_C=80^{\circ}\text{C}$	15	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	30	A
I^2t		$T_{Vj}=125^{\circ}\text{C}$, $t=10\text{ms}$, $V_R=0\text{V}$	60	A^2s

BRAKE-CHOPPER SECTOR

ELECTRICAL AND THERMAL CHARACTERISTICS *T_C=25°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 =0.6mA	5.0	5.8	6.5	V
V _{CE(sat)}	Collector - Emitter Saturation Voltage	I _C =15A, V _{GE} =15V, T _{VJ} =25°C		1.7		V
		I _C =15A, V _{GE} =15V, T _{VJ} =125°C		1.9		V
I _{CEs}	Collector Leakage Current	V _{CE} =1200V, V _{GE} =0V, T _{VJ} =25°C			50	μA
		V _{CE} =1200V, V _{GE} =0V, T _{VJ} =125°C			1	mA
I _{GES}	Gate Leakage Current	V _{CE} =0V, V _{GE} ± 15V, T _{VJ} =125°C	-400		400	nA
R _{Gint}	Integrated Gate Resistor			0		Ω
Q _{ge}	Gate Charge	V _{CE} =600V, I _C =15A, V _{GE} = ± 15V		0.15		μC
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f =1MHz		1.1		nF
C _{res}	Reverse Transfer Capacitance				0.05	
t _{d(on)}	Turn - on Delay Time	V _{CC} =600V, I _C =15A, T _{VJ} =25°C		90		ns
		R _G =62 Ω, T _{VJ} =125°C		90		ns
t _r	Rise Time	V _{GE} = ± 15V, T _{VJ} =25°C		25		ns
		Inductive Load T _{VJ} =125°C		30		ns
t _{d(off)}	Turn - off Delay Time	V _{CC} =600V, I _C =15A, T _{VJ} =25°C		420		ns
		R _G =62 Ω, T _{VJ} =125°C		520		ns
t _f	Fall Time	V _{GE} = ± 15V, T _{VJ} =25°C		90		ns
		Inductive Load T _{VJ} =125°C		120		ns
E _{on}	Turn - on Energy	V _{CC} =600V, I _C =15A, T _{VJ} =25°C		1.4		mJ
		R _G =62 Ω, T _{VJ} =125°C		2.0		mJ
E _{off}	Turn - off Energy	V _{GE} = ± 15V, T _{VJ} =25°C		1.0		mJ
		Inductive Load T _{VJ} =125°C		1.2		mJ
I _{sc}	Short Circuit Current	t _{psc} ≤10μS, V _{GE} =15V T _{VJ} =125°C, V _{CC} =900V		45		A
R _{thJC}	Junction-to-Case Thermal Resistance (Per IGBT)				1.2	K /W
Diode						
V _F	Forward Voltage	I _F =15A, V _{GE} =0V, T _{VJ} =25°C		1.65		V
		I _F =15A, V _{GE} =0V, T _{VJ} =125°C		1.75		V
t _{rr}	Reverse Recovery Time	I _F =15A, V _R =600V		150		ns
I _{RRM}	Max. Reverse Recovery Current	di _F /dt=-400A/μs		15		A
E _{rec}	Reverse Recovery Energy	T _{VJ} =125°C		0.6		mJ
R _{thJCD}	Junction-to-Case Thermal Resistance (Per Diode)				2.1	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				150	°C
T _{Vj op}	Operating Temperature		-40		125	°C
T _{stg}	Storage Temperature		-40		125	°C
V _{isol}	Insulation Test Voltage	AC, t=1min		3000		V
CTI	Comparative Tracking Index		250			
M _d	Mounting Torque	Recommended (M5)	2.5		5	N · m
Weight				180		g

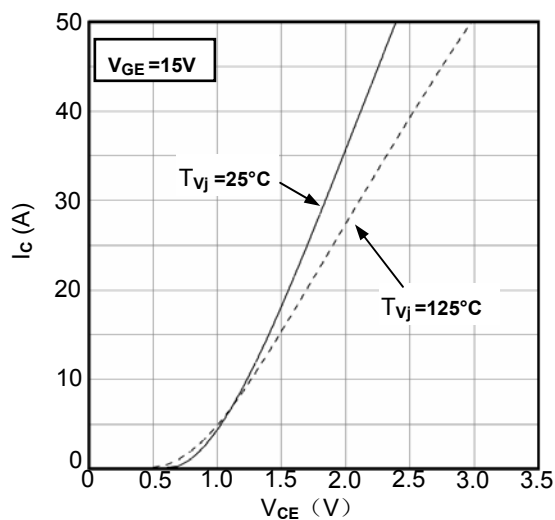


Figure1. Typical Output Characteristics IGBT-inverter

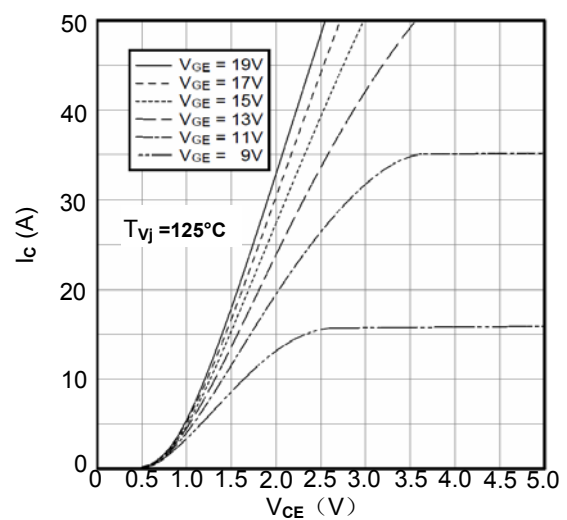


Figure2. Typical Output Characteristics IGBT-inverter

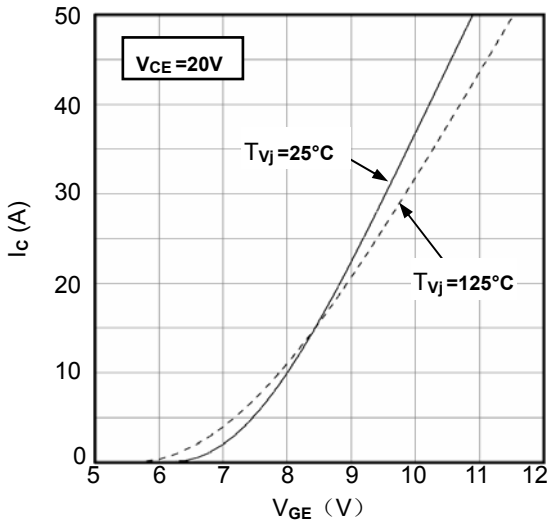


Figure3. Typical Transfer characteristics IGBT-inverter

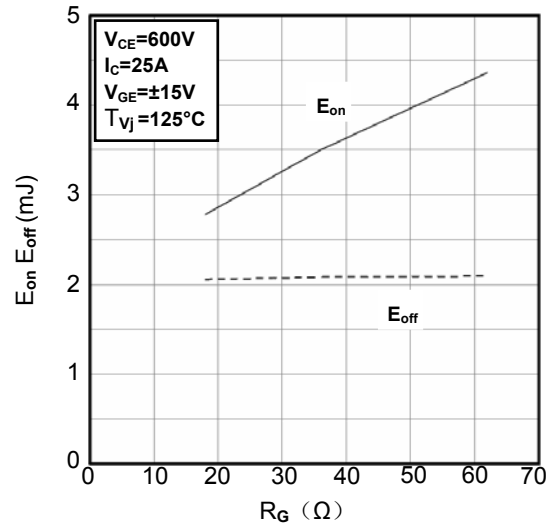


Figure4. Switching Energy vs. Gate Resistor IGBT-inverter

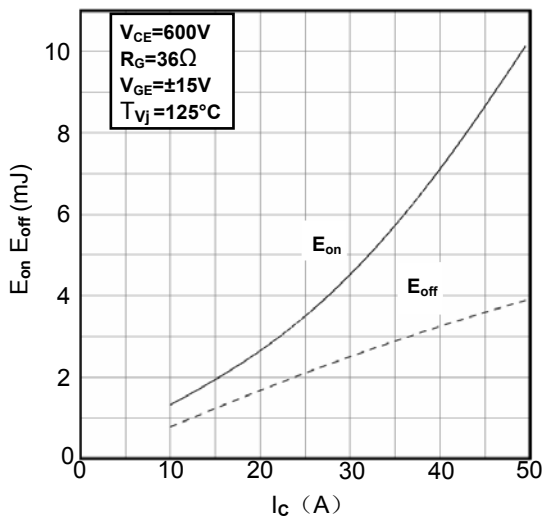


Figure5. Switching Energy vs. Collector Current IGBT-inverter

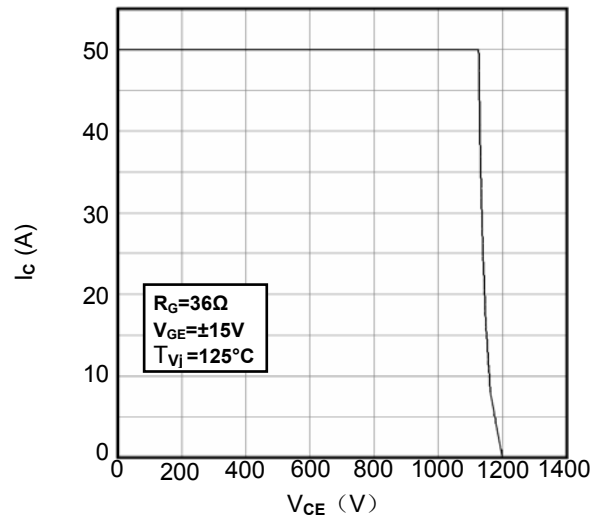


Figure6. Reverse Biased Safe Operating Area IGBT-inverter

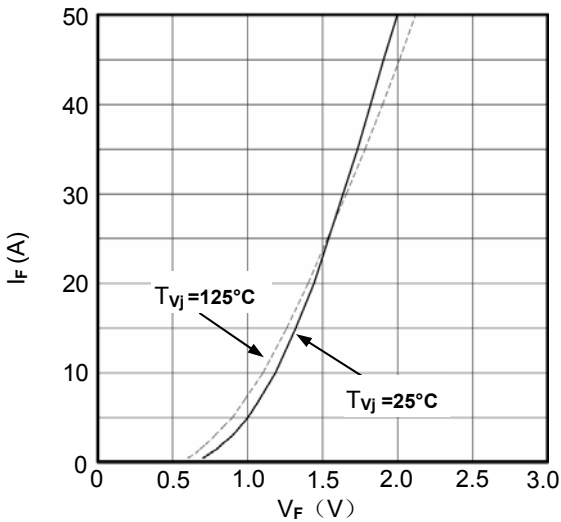


Figure7. Diode Forward Characteristics Diode -inverter

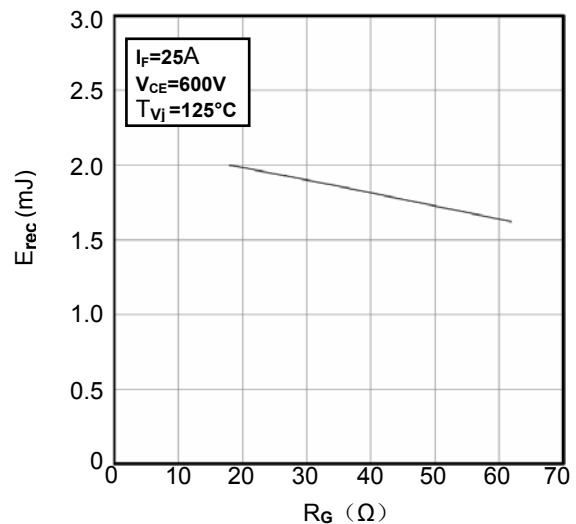


Figure8. Switching Energy vs. Gate Resistor Diode -inverter

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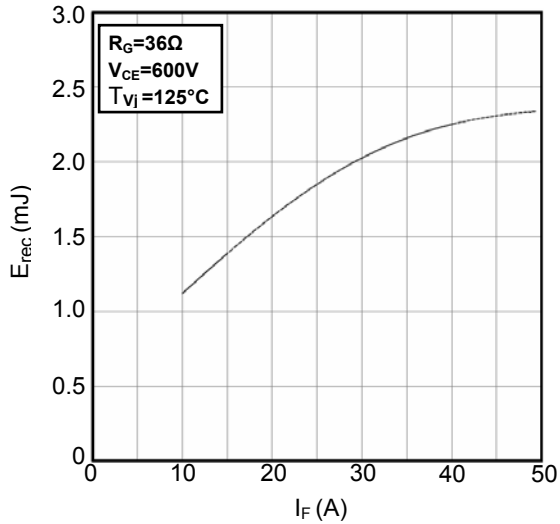


Figure9. Switching Energy vs. Forward Current Diode-inverter

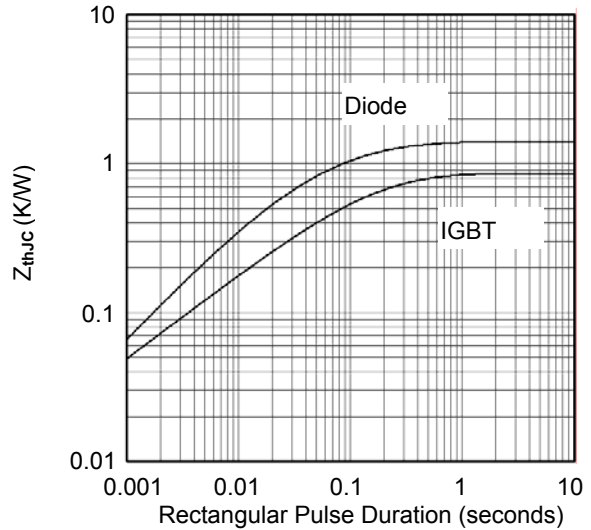


Figure10. Transient Thermal Impedance of Diode and IGBT-inverter

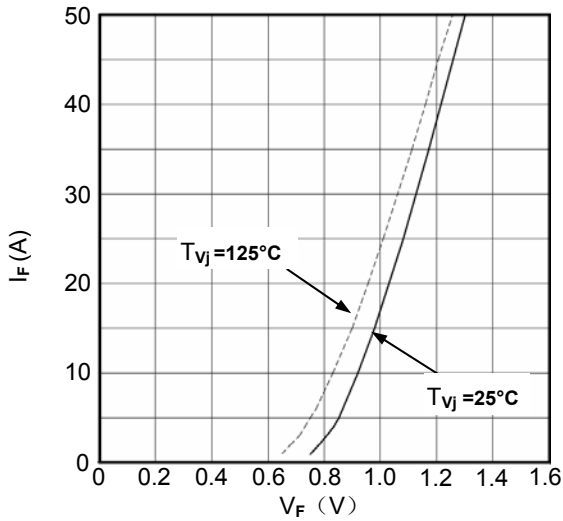


Figure11. Diode Forward Characteristics Diode- rectifier

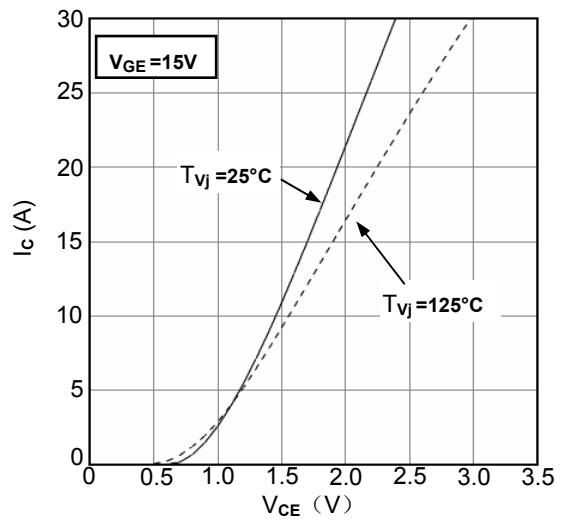


Figure12. Typical Output Characteristics IGBT- brake chopper

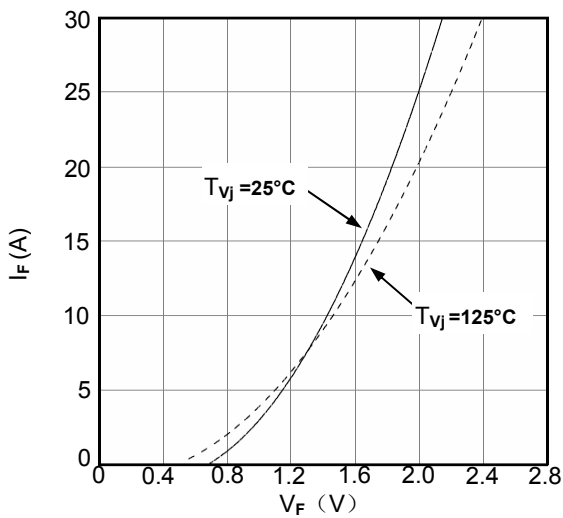


Figure13. Diode Forward Characteristics Diode - brake chopper

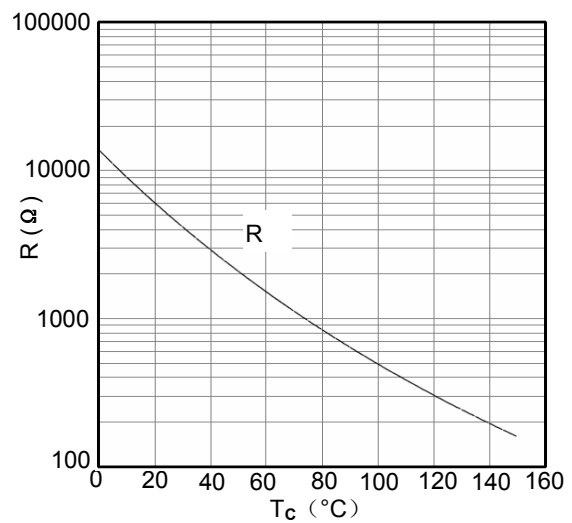


Figure14. NTC Characteristics

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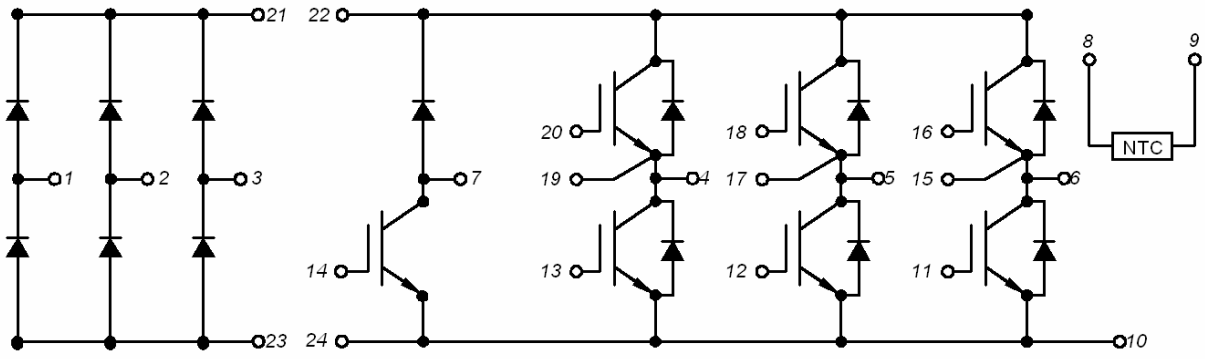
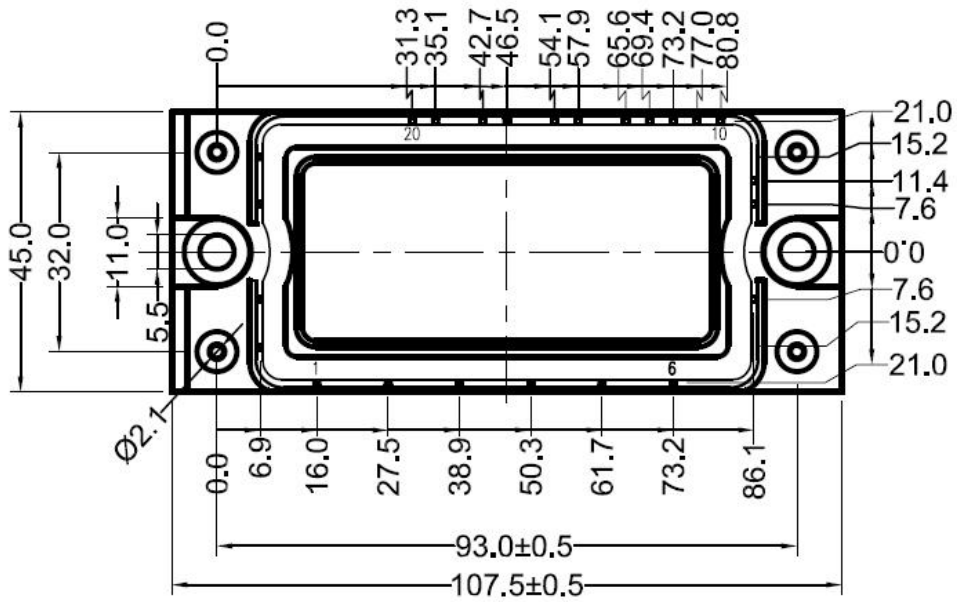
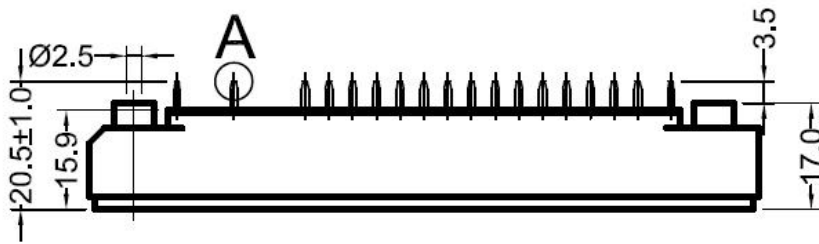


Figure15. Circuit Diagram



Dimensions (mm)

Figure16. Package Outline