

**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

**Module Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Parameters	Test Conditions	Min	Typ	Max	Unit
$T_{J(max)}$	Max. Junction Temperature				150	$^\circ\text{C}$
$T_{J(op)}$	Operating Temperature		-40		125	$^\circ\text{C}$
$T_{stg}$	Storage Temperature		-40		125	$^\circ\text{C}$
$V_{isol}$	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				300		g

**Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Parameters	Test Conditions	Values	Unit
<b>IGBT</b>				
$V_{CES}$	Collector - Emitter Voltage	$T_J=25^\circ\text{C}$	1200	V
$V_{GES}$	Gate - Emitter Voltage		$\pm 20$	V
$I_C$	DC Collector Current	$T_C=25^\circ\text{C}$	75	A
		$T_C=80^\circ\text{C}$	50	A
$I_{CM}$	Repetitive Peak Collector Current	$t_p=1\text{ms}$	100	A
$P_{tot}$	Power Dissipation Per IGBT		260	W
<b>Diode</b>				
$V_{RRM}$	Repetitive Reverse Voltage	$T_J=25^\circ\text{C}$	1200	V
$I_{F(AV)}$	Average Forward Current	$T_C=25^\circ\text{C}$	75	A
		$T_C=80^\circ\text{C}$	50	A
$I_{FRM}$	Repetitive Peak Forward Current	$t_p=1\text{ms}$	100	A
$I^2t$		$T_J=125^\circ\text{C}$ , t=10ms, $V_R=0\text{V}$	680	$\text{A}^2\text{s}$

### Electrical and Thermal Specifications ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Parameters	Test Conditions	Min	Typ	Max	Unit
<b>IGBT</b>						
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=2.0\text{mA}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector - Emitter	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.7		V
	Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		1.9		V
$I_{ICES}$	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			1	mA
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$			10	mA
$I_{GES}$	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=125^\circ\text{C}$	-400		400	nA
$R_{Gint}$	Integrated Gate Resistor			4.0		$\Omega$
$Q_{ge}$	Gate Charge	$V_{CE}=600\text{V}, I_C=50\text{A}, V_{GE}=\pm 15\text{V}$		0.47		$\mu\text{C}$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		3.6		nF
$C_{RES}$	Reverse Transfer Capacitance			0.16		nF
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}$ $I_C=50\text{A}$ $R_G=18\Omega$ $V_{GE}=\pm 15\text{V}$ Inductive Load	$T_J=25^\circ\text{C}$		90	ns
			$T_J=125^\circ\text{C}$		90	ns
$t_r$	Rise Time		$T_J=25^\circ\text{C}$		30	ns
			$T_J=125^\circ\text{C}$		50	ns
$t_{d(off)}$	Turn - off Delay Time		$T_J=25^\circ\text{C}$		420	ns
			$T_J=125^\circ\text{C}$		520	ns
$t_f$	Fall Time		$T_J=25^\circ\text{C}$		70	ns
			$T_J=125^\circ\text{C}$		90	ns
$E_{on}$	Turn - on Energy		$T_J=25^\circ\text{C}$		4.9	mJ
			$T_J=125^\circ\text{C}$		6.6	mJ
$E_{off}$	Turn - off Energy	$T_J=25^\circ\text{C}$		4.0	mJ	
		$T_J=125^\circ\text{C}$		4.9	mJ	
$I_{SC}$	Short Circuit Current	$t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}, V_{CC}=900\text{V}$		200		A
$R_{thJC}$	Junction-to-Case Thermal Resistance (Per IGBT)				0.48	K/W
<b>Diode</b>						
$V_F$	Forward Voltage	$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.65		V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.65		V
$t_{RR}$	Reverse Recovery Time	$I_F=50\text{A}, V_R=600\text{V}$ $di_p/dt=1200\text{A}/\mu\text{s}$ $T_J=125^\circ\text{C}$		275		ns
$I_{RRM}$	Max. Reverse Recovery Current			50		A
$E_{rec}$	Reverse Recovery Energy			4.4		mJ
$R_{thJD}$	Junction-to-Case Thermal Resistance (Per Diode)				0.78	K/W

**Diode-Rectifier Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Parameters	Test Conditions	Values	Unit
$V_{RRM}$	Repetitive Reverse Voltage	$T_J=25^\circ\text{C}$	1600	V
$I_{F(AV)}$	Average Forward Current	$T_C=80^\circ\text{C}$	50	A
$I_{FRM}$	Non-Repetitive Surge Forward Current	$T_J=45^\circ\text{C}$ , $t=10\text{ms}$ , 50Hz	350	A
		$T_J=45^\circ\text{C}$ , $t=8.3\text{ms}$ , 60Hz	385	
$I^2t$		$T_J=45^\circ\text{C}$ , $t=10\text{ms}$ , 50Hz	612	A <sup>2</sup> s
		$T_J=45^\circ\text{C}$ , $t=8.3\text{ms}$ , 60Hz	741	

**Diode-Rectifier Electrical and Thermal Specifications ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Parameters	Test Conditions	Min	Typ	Max	Unit
$V_F$	Forward Voltage	$I_F=50\text{A}$ , $T_J=25^\circ\text{C}$		1.1		V
		$I_F=50\text{A}$ , $T_J=125^\circ\text{C}$		1.05		V
$I_R$	Reverse Leakage Current	$V_R=1600\text{V}$ , $T_J=25^\circ\text{C}$			50	$\mu\text{A}$
		$V_R=1600\text{V}$ , $T_J=125^\circ\text{C}$			1	mA
$R_{thJCD}$	Junction-to-Case Thermal Resistance (Per Diode)				0.68	K/W

**Brake-Chopper Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Parameters	Test Conditions	Values	Unit
<b>IGBT</b>				
$V_{CES}$	Collector - Emitter Voltage	$T_J=25^\circ\text{C}$	1200	V
$V_{GES}$	Gate - Emitter Voltage		$\pm 20$	V
$I_C$	DC Collector Current	$T_C=25^\circ\text{C}$	55	A
		$T_C=80^\circ\text{C}$	40	A
$I_{CM}$	Repetitive Peak Collector Current	$t_p=1\text{ms}$	80	A
$P_{tot}$	Power Dissipation Per IGBT		195	W
<b>Diode</b>				
$V_{RRM}$	Repetitive Reverse Voltage	$T_J=25^\circ\text{C}$	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
$I^2t$		$T_J=125^\circ\text{C}$ , $t=10\text{ms}$ , $V_R=0\text{V}$	60	A <sup>2</sup> s

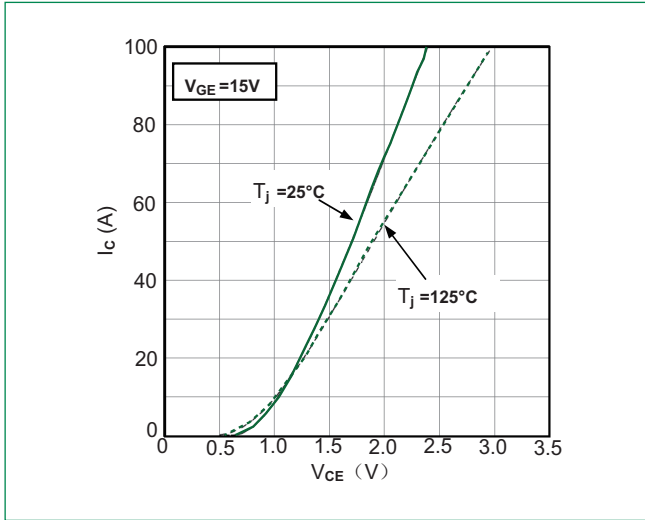
### Brake-Chopper Electrical and Thermal Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Parameters	Test Conditions	Min	Typ	Max	Unit
<b>IGBT</b>						
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=1.5\text{mA}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.8		V
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		2.05		V
$I_{ICES}$	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			0.25	$\mu\text{A}$
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$			2	mA
$I_{GES}$	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=125^\circ\text{C}$	-400		400	nA
$R_{Gint}$	Integrated Gate Resistor			6		$\Omega$
$Q_{ge}$	Gate Charge	$V_{CE}=600\text{V}, I_C=40\text{A}, V_{GE}=\pm 15\text{V}$		0.33		$\mu\text{C}$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.5		nF
$C_{RES}$	Reverse Transfer Capacitance			0.11		nF
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}$ $I_C=40\text{A}$ $R_G=27\Omega$ $V_{GE}=\pm 15\text{V}$ Inductive Load	$T_J=25^\circ\text{C}$	90		ns
			$T_J=125^\circ\text{C}$	90		ns
$t_r$	Rise Time		$T_J=25^\circ\text{C}$	30		ns
			$T_J=125^\circ\text{C}$	50		ns
$t_{d(off)}$	Turn - off Delay Time		$T_J=25^\circ\text{C}$	420		ns
			$T_J=125^\circ\text{C}$	520		ns
$t_f$	Fall Time		$T_J=25^\circ\text{C}$	70		ns
			$T_J=125^\circ\text{C}$	90		ns
$E_{on}$	Turn - on Energy		$T_J=25^\circ\text{C}$	4.1		mJ
			$T_J=125^\circ\text{C}$	6.0		mJ
$E_{off}$	Turn - off Energy	$T_J=25^\circ\text{C}$	3.1		mJ	
		$T_J=125^\circ\text{C}$	3.6		mJ	
$I_{SC}$	Short Circuit Current	$t_{psc}\leq 10\mu\text{s}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}, V_{CC}=900\text{V}$		160		A
$R_{thJC}$	Junction-to-Case Thermal Resistance (Per IGBT)				0.62	K/W
<b>Diode</b>						
$V_F$	Forward Voltage	$I_F=15\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.65		V
		$I_F=15\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.75		V
$t_{RR}$	Reverse Recovery Time	$I_F=15\text{A}, V_R=600\text{V}$ $di_f/dt=-400\text{A}/\mu\text{s}$ $T_J=125^\circ\text{C}$		150		ns
$I_{RRM}$	Max. Reverse Recovery Current			15		A
$E_{rec}$	Reverse Recovery Energy			1.15		mJ
$R_{thJCD}$	Junction-to-Case Thermal Resistance (Per Diode)				1.55	K/W

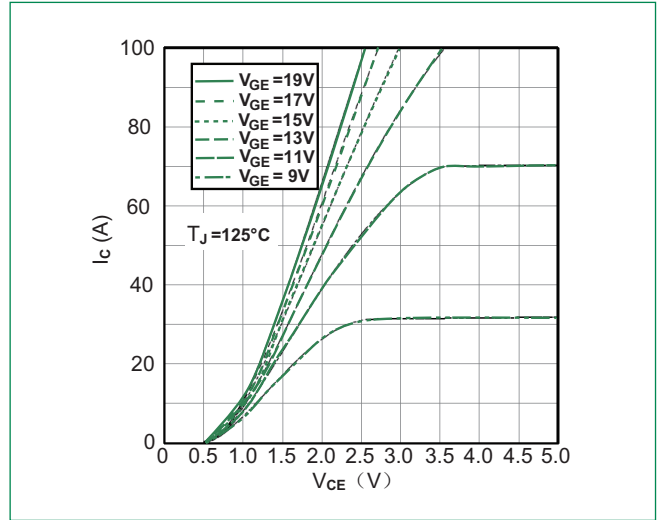
### NTC Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Parameters	Test Conditions	Min	Typ	Max	Unit
$R_{25}$	Resistance	$T_c=25^\circ\text{C}$		5		K $\Omega$
$B_{25/50}$				3375		K

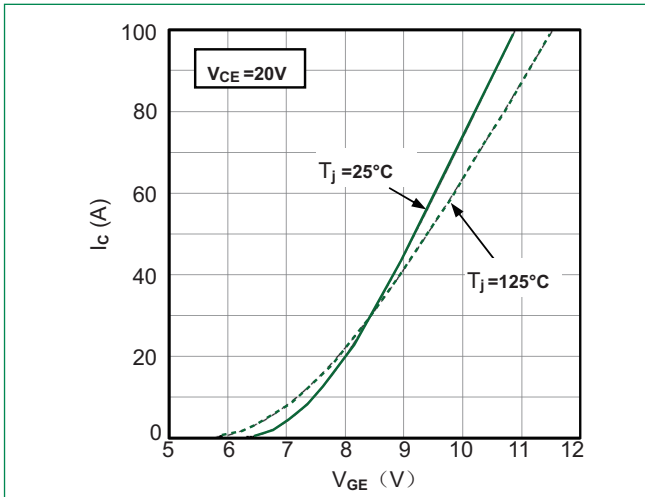
**Figure 1: Typical Output Characteristics for IGBT Inverter**



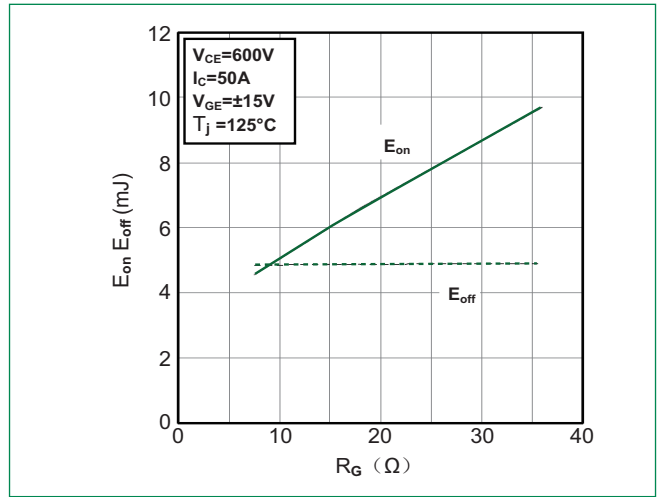
**Figure 2: Typical Output Characteristics for IGBT Inverter**



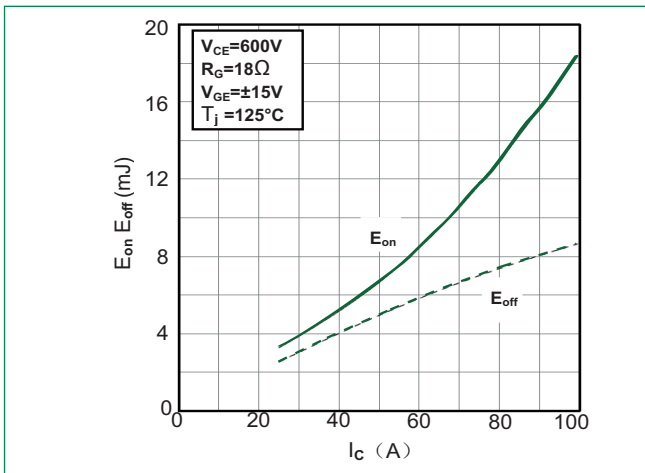
**Figure 3: Typical Transfer Characteristics for IGBT Inverter**



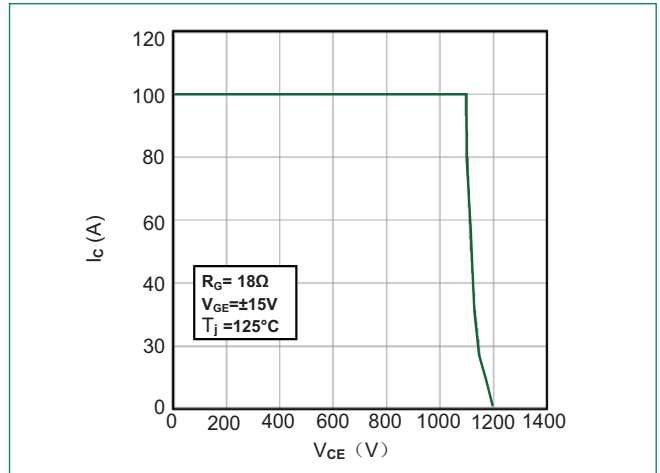
**Figure 4: Switching Energy vs. Gate Resistor for IGBT Inverter**



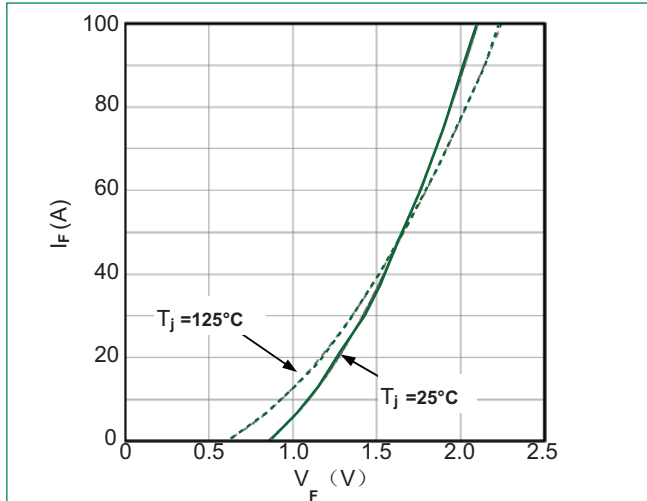
**Figure 5: Switching Energy vs. Collector Current for IGBT Inverter**



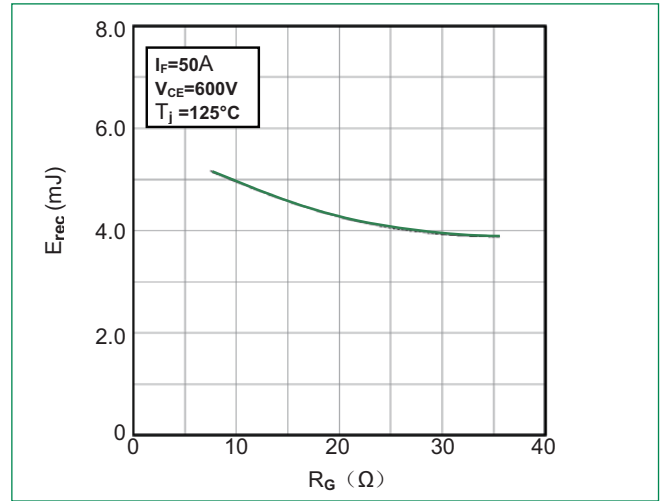
**Figure 6: Reverse Biased Safe Operating Area for IGBT Inverter**



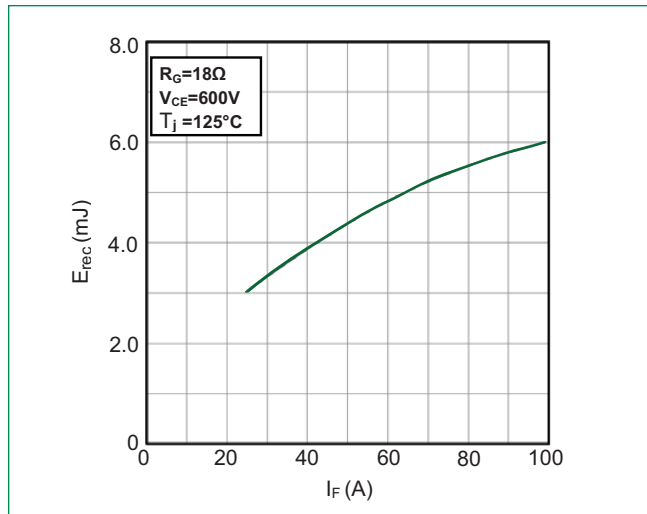
**Figure 7: Diode Forward Characteristics for Diode Inverter**



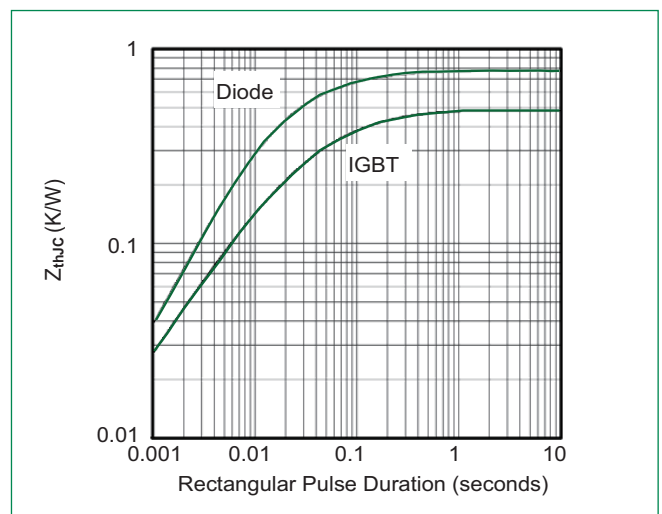
**Figure 8: Switching Energy vs. Gate Resistort for Diode Inverter**



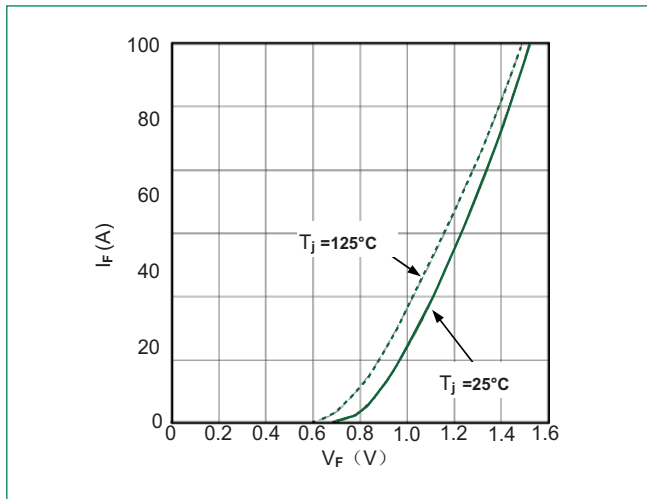
**Figure 9: Switching Energy vs. Forward Current for Diode Inverter**



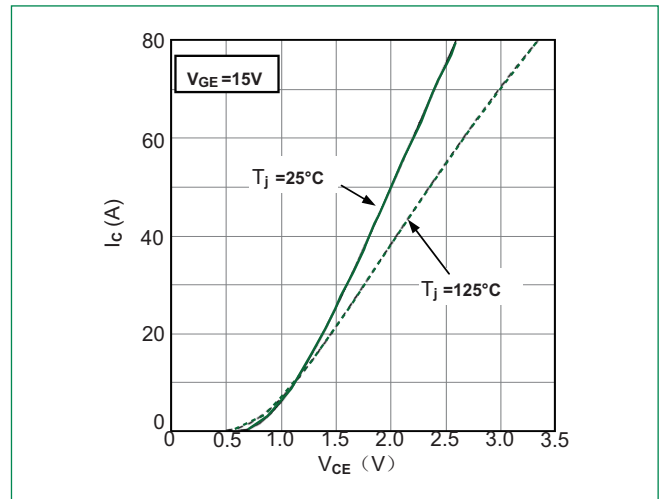
**Figure 10: Transient Thermal Impedance of Diode and IGBT Inverter**



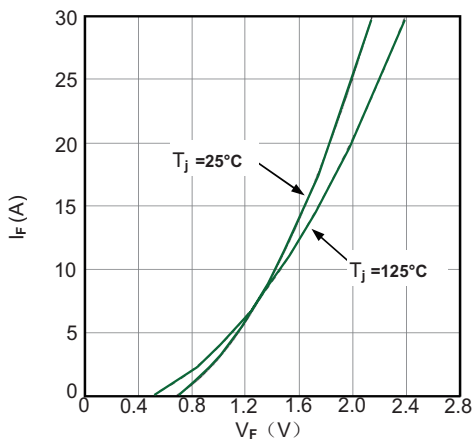
**Figure 11: Diode Forward Characteristics for IGBT Inverter**



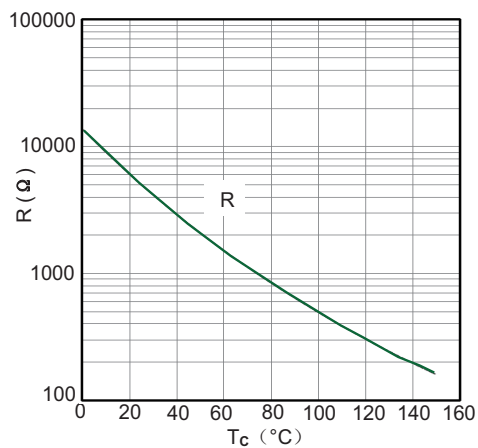
**Figure 12: Typical Output Characteristics for IGBT Brake Chopper**



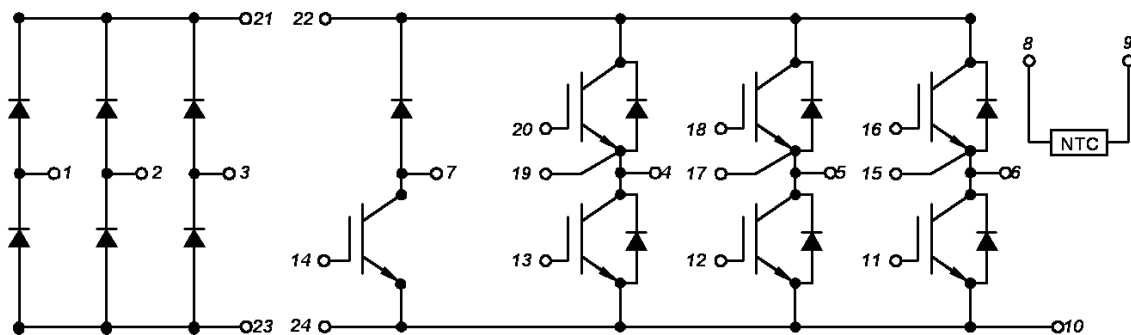
**Figure 13: Diode Forward Characteristics for Diode Brake Chopper**



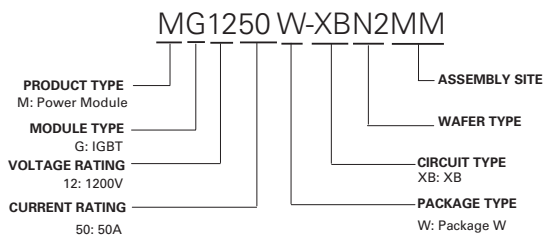
**Figure 14: NTC Characteristics**



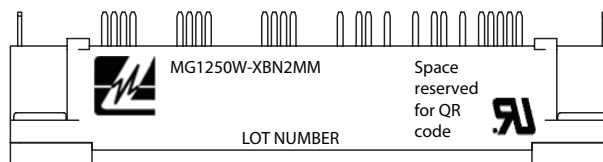
### Circuit Diagram



### Part Numbering System



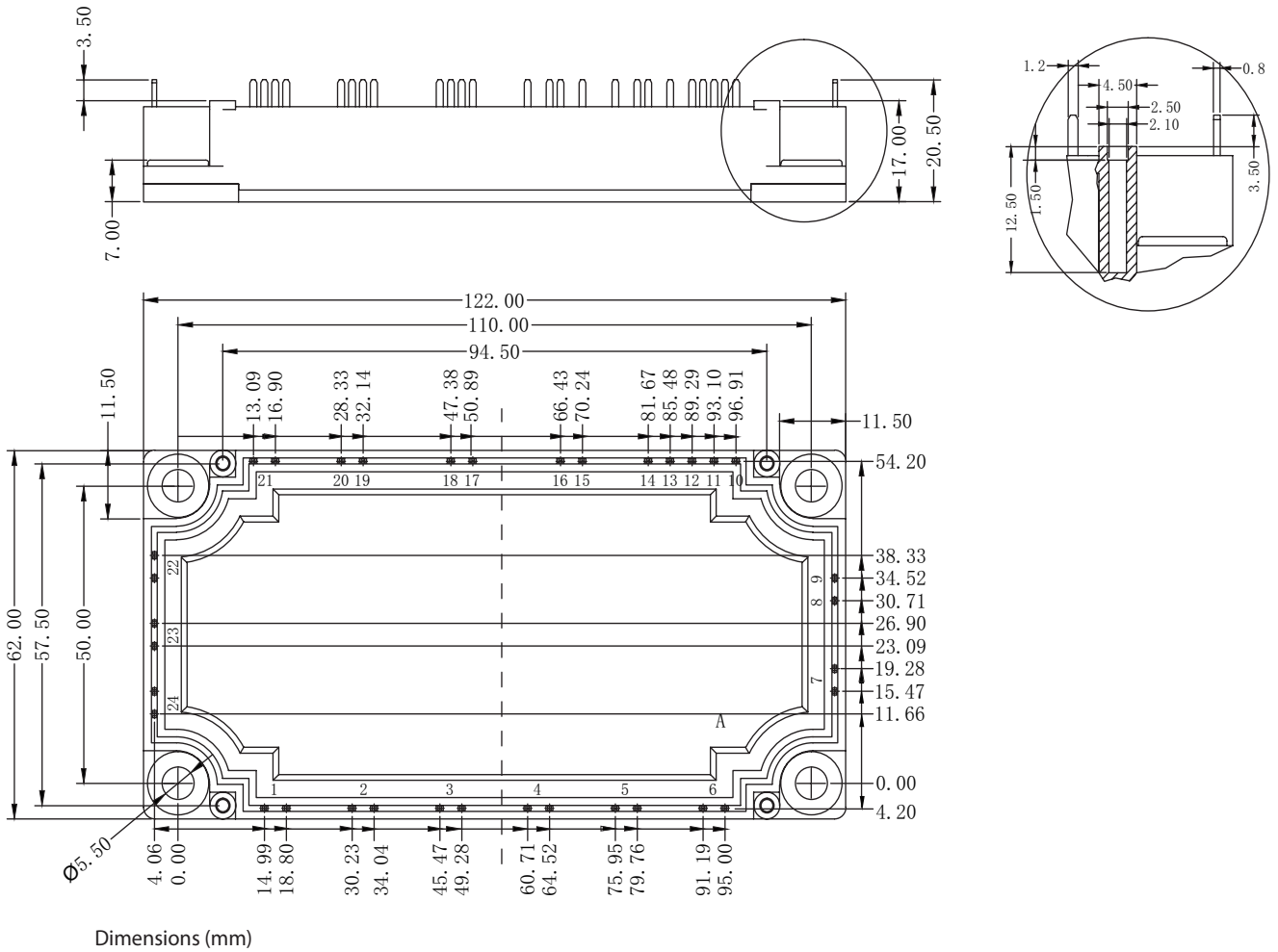
### Part Marking System



### Packing Options

Part Number	Marking	Weight	Packing Mode	M.O.Q
MG1250W-XBN2MM	MG1250W-XBN2MM	300g	Bulk Pack	20

### Dimensions-Package W





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