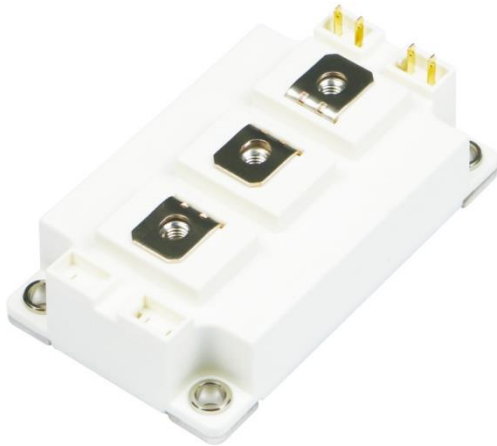


## IGBT Modules



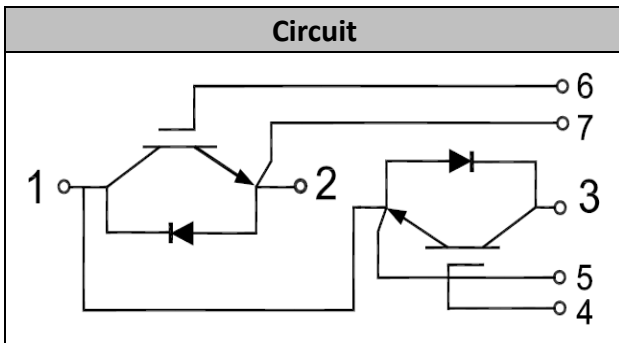
$V_{CES}$             1200V  
 $I_c$                 450A

## Applications

- Motion/sevo control
- High frequency switching application
- UPS (Uninterruptible Power Supplies)
- Welding machine

## Features

- Low  $V_{CE(sat)}$  with Trench technology
- Low switching losses especially Eoff
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability(10us)
- Including ultra fast & soft recovery anti-parallel FWD
- Low inductance package
- Maximum junction temperature 175°C



## ● IGBT

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	$V_{CES}$	$V_{GE}=0V, I_c=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	$I_c$	$T_c=100^{\circ}C$	450	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	900	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_c=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	2307	W

**Characteristic values**

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=12mA, T_{vj}=25^{\circ}C$	5.2	5.8	6.4	V	
Collector-Emitter Cut-off Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=450A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.20	V	
		$I_C=450A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15			
		$I_C=450A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25			
Gate Charge	$Q_G$			3.50		$\mu C$	
Internal Gate Resistance	$R_{Gint}$			1.67		$\Omega$	
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V,$		45.9		nF	
Reverse Transfer Capacitance	$C_{res}$	$f=1MHz, T_{vj}=25^{\circ}C$		1.1		nF	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=450A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.3\Omega$ $T_{vj}=25^{\circ}C$		145		ns	
Rise Time	$t_r$				78		ns
Turn-off Delay Time	$t_{d(off)}$				289		ns
Fall Time	$t_f$				169		ns
Energy Dissipation During Turn-on Time	$E_{on}$				46.1		mJ
Energy Dissipation During Turn-off Time	$E_{off}$				32.8		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=450A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.3\Omega$ $T_{vj}=150^{\circ}C$		165		ns	
Rise Time	$t_r$				92		ns
Turn-off Delay Time	$t_{d(off)}$				343		ns
Fall Time	$t_f$				231		ns
Energy Dissipation During Turn-on Time	$E_{on}$				64.2		mJ
Energy Dissipation During Turn-off Time	$E_{off}$				40.1		mJ
SC Data	$I_{sc}$	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_{vj}=150^{\circ}C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		2250		A	



## ● Diode

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^{\circ}\text{C}$	1200	V
Continuous DC Forward Current	$I_F$		450	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p=1\text{ms}$	900	A
$I^2t$ -value	$I^2t$	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	32000	A <sup>2</sup> s
		$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	30000	

### Characteristic values

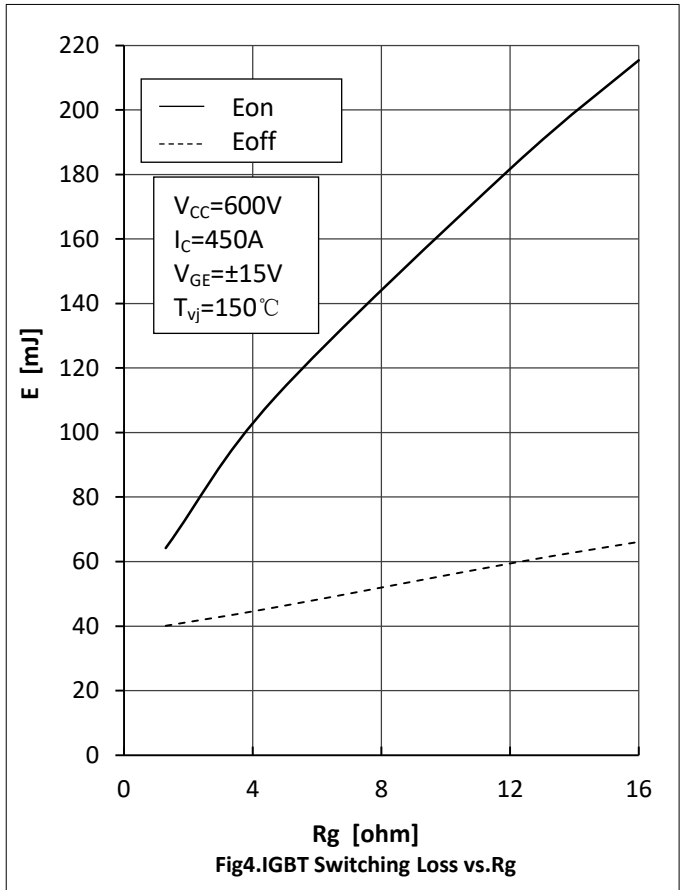
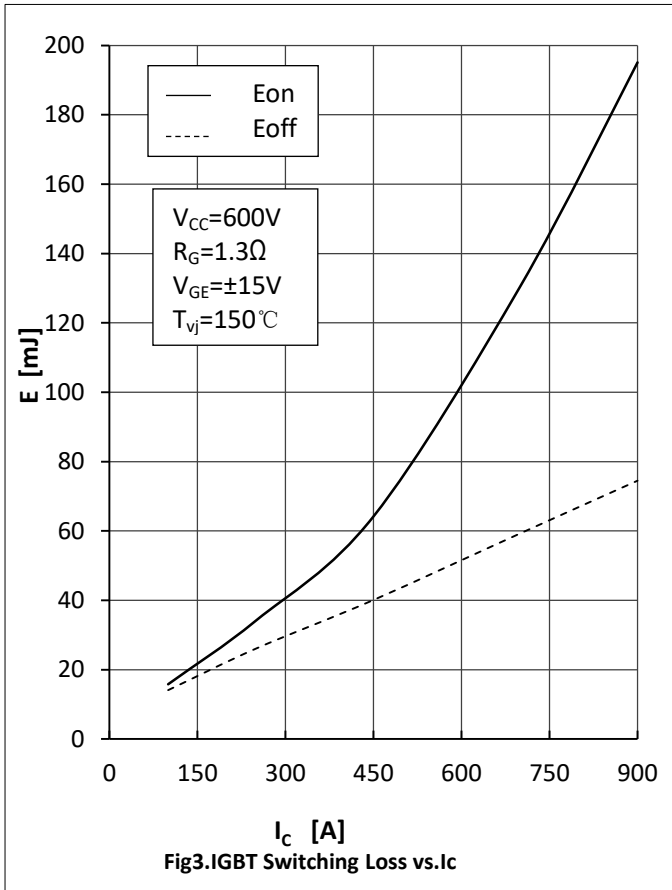
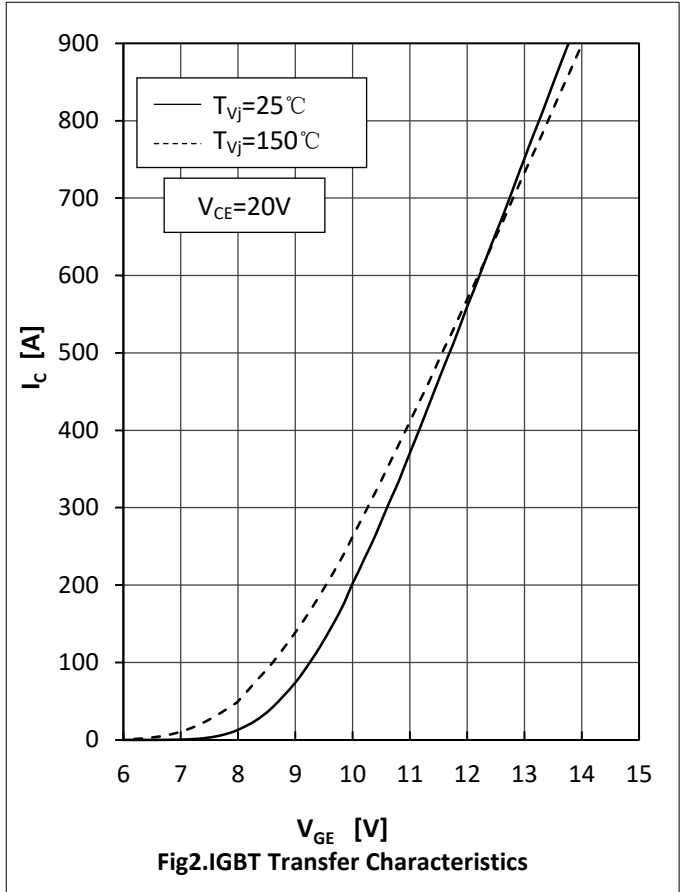
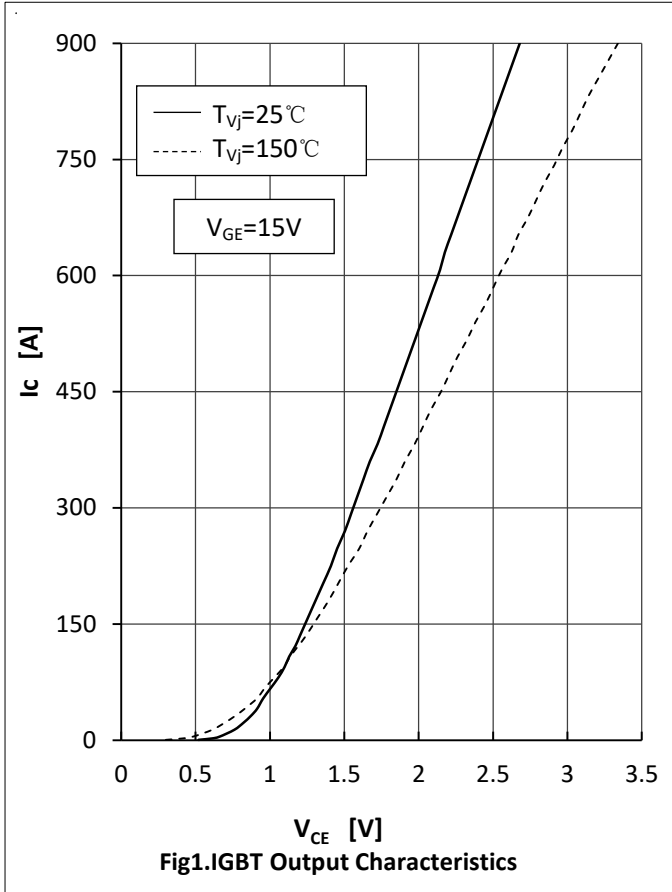
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	$V_F$	$I_F=450\text{A}, T_{vj}=25^{\circ}\text{C}$		1.95		V
		$I_F=450\text{A}, T_{vj}=125^{\circ}\text{C}$		1.80		
		$I_F=450\text{A}, T_{vj}=150^{\circ}\text{C}$		1.75		
Recovered Charge	$Q_{rr}$	$I_F=450\text{A}$		20.5		$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600\text{V}$ $-di_F/dt=3800\text{A}/\mu\text{s}$		155		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=25^{\circ}\text{C}$		6.48		mJ
Recovered Charge	$Q_{rr}$	$I_F=450\text{A}$		59.8		$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600\text{V}$ $-di_F/dt=3800\text{A}/\mu\text{s}$		245		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=150^{\circ}\text{C}$		20.8		mJ

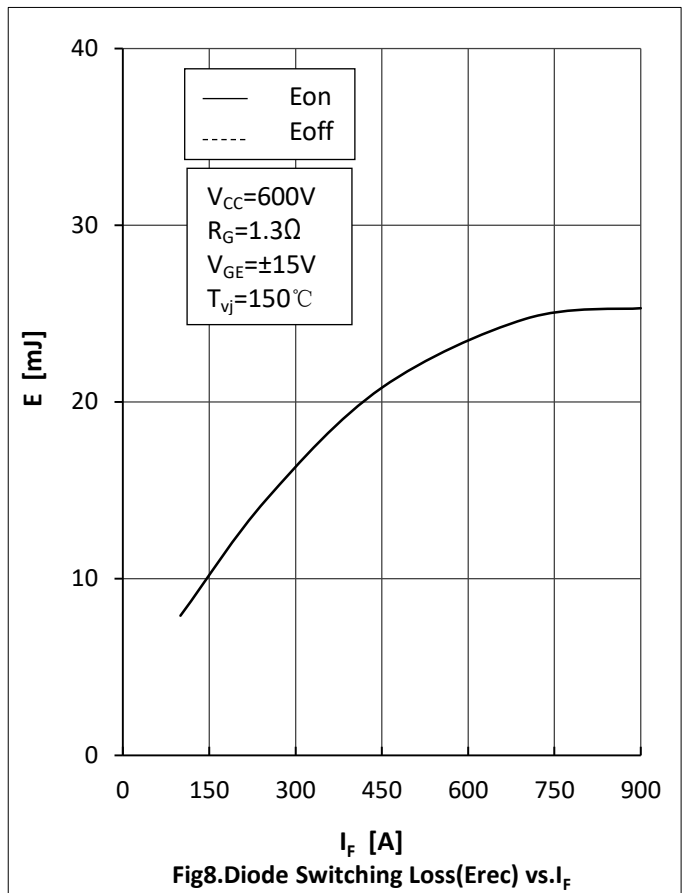
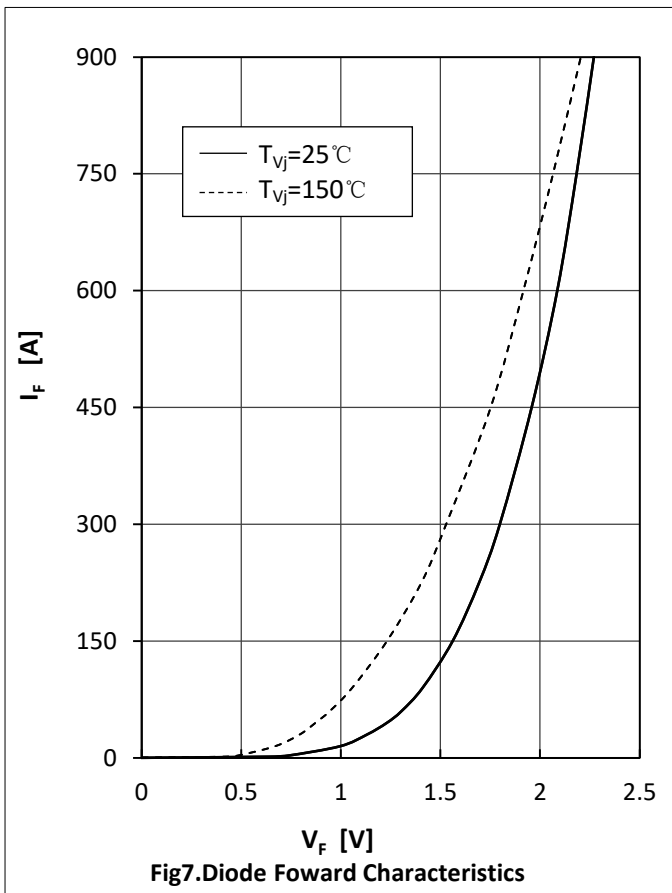
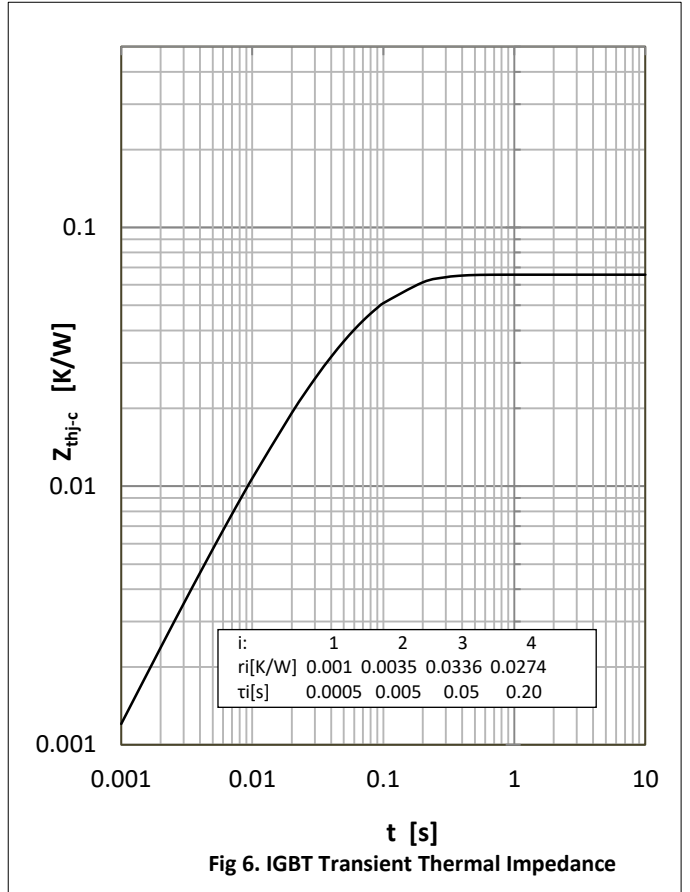
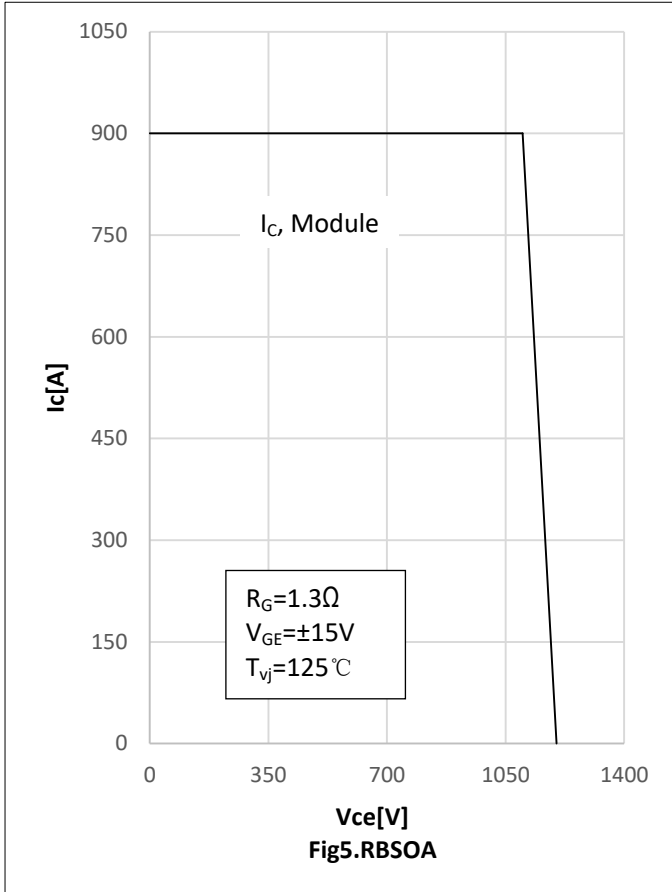


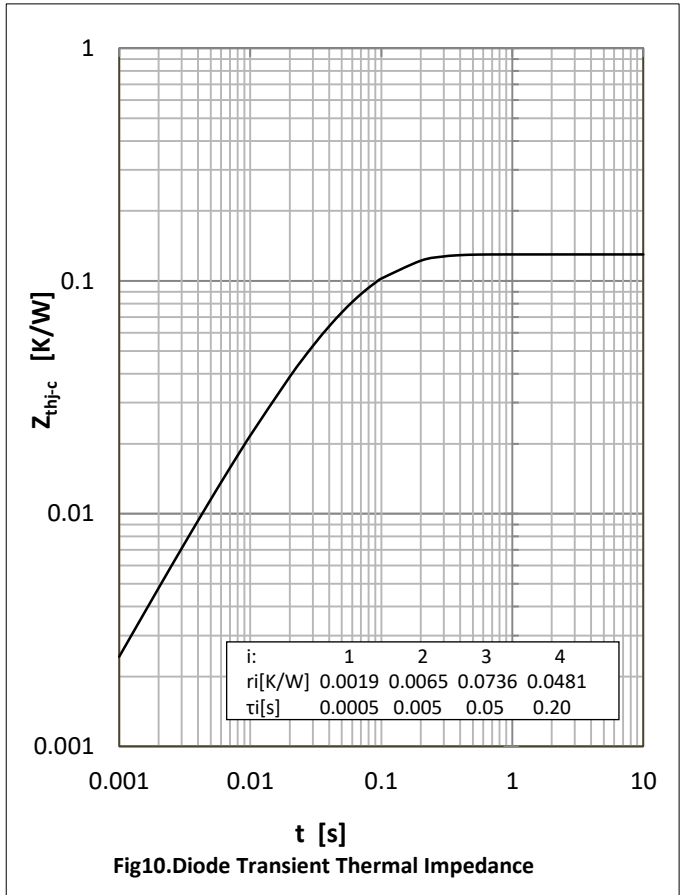
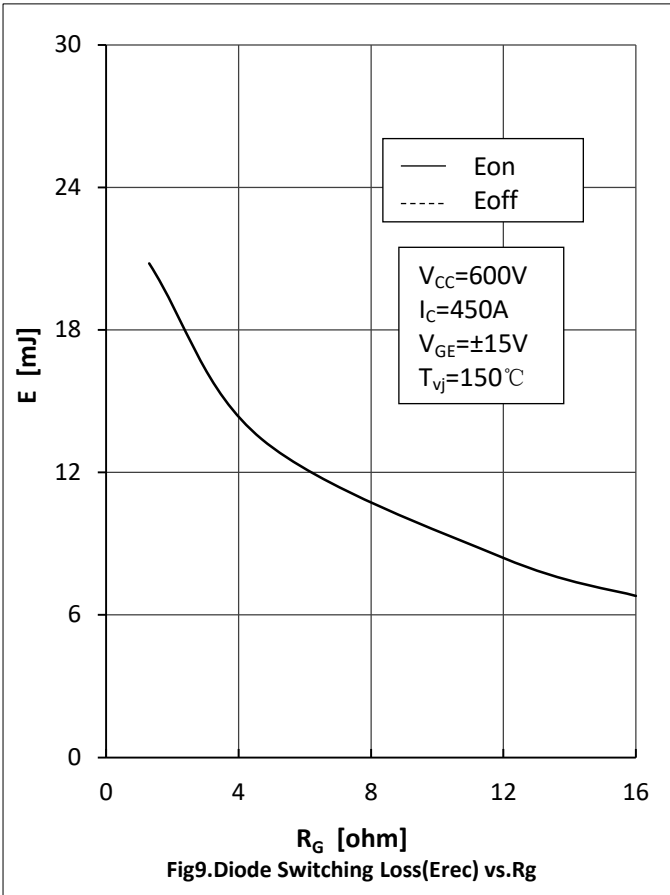
## ● Module Characteristics

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

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation voltage	$V_{\text{isol}}$	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	$T_{\text{jmax}}$				175	$^{\circ}\text{C}$
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Storage Temperature	$T_{\text{stg}}$		-40		125	$^{\circ}\text{C}$
Thermal Resistance Junction-to Case	$R_{\theta\text{JC}}$	per IGBT			0.065	K/W
		per Diode			0.13	
Thermal Resistance Case-to Sink	$R_{\theta\text{CS}}$	Conductive grease applied		0.012	0.035	K/W
Comparative Tracking Index	CTI		400			
Module Electrodes Torque	$M_t$	Recommended(M6)	3.0		5.0	N·m
Module-to-Sink Torque	$M_s$	Recommended(M6)	3.0		5.0	N·m
Weight of Module	G			315		g

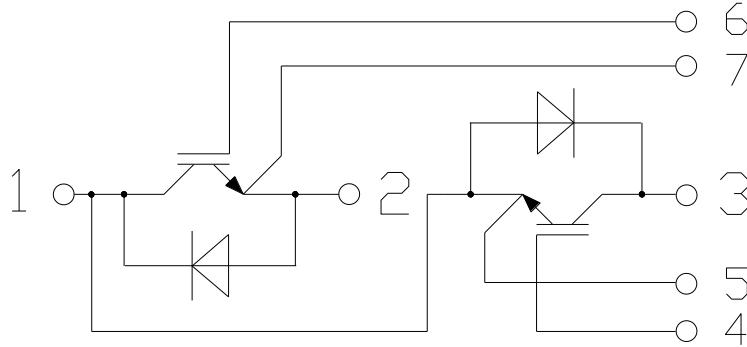






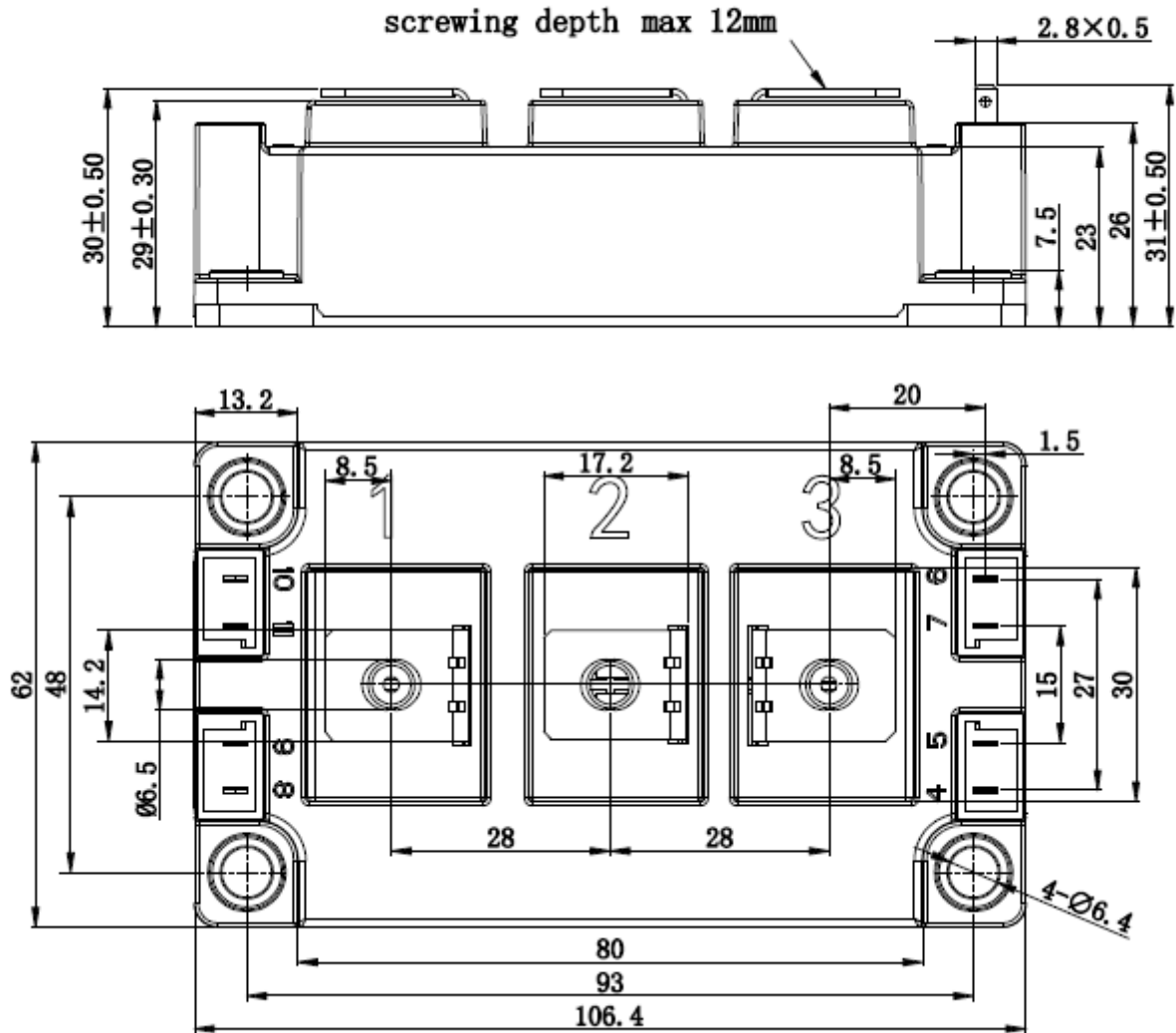


## ● Circuit Diagram



## ● Package Outline Information

### Dimensions in Millimeters







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