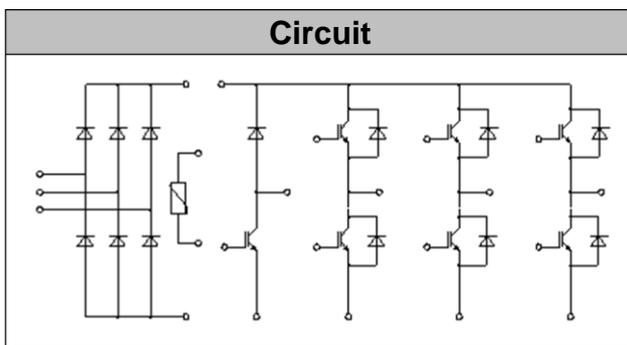


## IGBT Modules

$V_{CES}$	1200V
$I_c$	10A

## Applications

- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)



## Features

- Low switching losses
- Low  $V_{CE(sat)}$  with positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- Low inductance case
- High short circuit capability(10us)
- Isolated heatsink using DBC technology
- Maximum junction temperature 175°C

### ● IGBT- inverter

#### 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	$I_c$	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	10	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	20	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	120	W



## ● IGBT- inverter

### Characteristic values

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$ , $I_C=0.5mA$ , $T_{vj}=25^{\circ}C$	5.2	5.8	6.5	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	$V_{CE(sat)}$	$I_C=10A$ , $V_{GE}=15V$ , $T_{vj}=25^{\circ}C$		1.80		V	
		$I_C=10A$ , $V_{GE}=15V$ , $T_{vj}=125^{\circ}C$		1.95			
		$I_C=10A$ , $V_{GE}=15V$ , $T_{vj}=150^{\circ}C$		2.00			
Gate Charge	$Q_G$			0.13		uC	
Input Capacitance	$C_{ies}$	$V_{CE}=25V$ , $V_{GE}=0V$ , $f=1MHz$ , $T_{vj}=25^{\circ}C$		0.681		nF	
Reverse Transfer Capacitance	$C_{res}$			0.023		nF	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V$ , $V_{GE}=20V$ , $T_{vj}=25^{\circ}C$			400	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=25^{\circ}C$		76		ns	
Rise Time	$t_r$			31		ns	
Turn-off Delay Time	$t_{d(off)}$			100		ns	
Fall Time	$t_f$			337		ns	
Energy Dissipation During Turn-on Time	$E_{on}$			1.16		mJ	
Energy Dissipation During Turn-off Time	$E_{off}$			0.78		mJ	
Turn-on Delay Time	$t_{d(on)}$		$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=150^{\circ}C$		74		ns
Rise Time	$t_r$				34		ns
Turn-off Delay Time	$t_{d(off)}$				104		ns
Fall Time	$t_f$				406		ns
Energy Dissipation During Turn-on Time	$E_{on}$			1.35		mJ	
Energy Dissipation During Turn-off Time	$E_{off}$			0.91		mJ	
SC Data	$I_{SC}$	$t_p \leq 10\mu s$ , $V_{GE}=15V$ , $T_{vj}=150^{\circ}C$ , $V_{CC}=900V$ , $V_{CEM} \leq 1200V$			40		A



## ● Diode-inverter

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^{\circ}C$	1200	V
Continuous DC Forward Current	$I_F$		10	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p=1ms$	20	A
$I^2t$ -value	$I^2t$	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	16.0	A <sup>2</sup> s
		$V_R=0V, t_p=10ms, T_{vj}=150^{\circ}C$	14.0	

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	$V_F$	$I_F=10A, T_{vj}=25^{\circ}C$		2.00		V
		$I_F=10A, T_{vj}=125^{\circ}C$		1.85		
		$I_F=10A, T_{vj}=150^{\circ}C$		1.80		
Recovered Charge	$Q_{rr}$	$I_F=10A$		0.261		uC
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600V$ $-di_F/dt=600A/us$		11		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=25^{\circ}C$		0.28		mJ
Recovered Charge	$Q_{rr}$	$I_F=10A$		0.367		uC
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600V$ $-di_F/dt=600A/us$		12		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=150^{\circ}C$		0.65		mJ



## ● IGBT-brake-chopper

### 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	$I_C$	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	10	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	20	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	120	W

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=0.5mA, T_{vj}=25^{\circ}C$	5.2	5.8	6.5	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	$V_{CE(sat)}$	$I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.80		V
		$I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$		1.95		
		$I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.00		
Gate Charge	$Q_G$			0.13		uC
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V$		0.681		nF
Reverse Transfer Capacitance	$C_{res}$	$f=1MHz, T_{vj}=25^{\circ}C$		0.023		nF
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=25^{\circ}C$		76		ns
Rise Time	$t_r$			31		ns
Turn-off Delay Time	$t_{d(off)}$			100		ns
Fall Time	$t_f$			337		ns
Energy Dissipation During Turn-on Time	$E_{on}$			1.16		mJ
Energy Dissipation During Turn-off Time	$E_{off}$			0.78		mJ



Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=150^\circ C$	74	ns
Rise Time	$t_r$		34	ns
Turn-off Delay Time	$t_{d(off)}$		104	ns
Fall Time	$t_f$		406	ns
Energy Dissipation During Turn-on Time	$E_{on}$		1.35	mJ
Energy Dissipation During Turn-off Time	$E_{off}$		0.91	mJ
SC Data	$I_{sc}$		$t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^\circ C$ $V_{CC}=900V, V_{CEM} \leq 1200V$	40

## ● Diode-brake-chopper

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^\circ C$	1200	V
Continuous DC Forward Current	$I_F$		10	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p=1ms$	20	A
$I^2t$ -value	$I^2t$	$V_R=0V, t_p=10ms, T_{vj}=125^\circ C$	16.0	A <sup>2</sup> s
		$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$	14.0	

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	$V_F$	$I_F=10A, T_{vj}=25^\circ C$		2.00		V
		$I_F=10A, T_{vj}=125^\circ C$		1.85		
		$I_F=10A, T_{vj}=150^\circ C$		1.80		
Recovered Charge	$Q_{rr}$	$I_F=10A$		0.261		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600V$ $-di_F/dt=500A/\mu s$		11		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=25^\circ C$		0.28		mJ
Recovered Charge	$Q_{rr}$	$I_F=10A$		0.367		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600V$ $-di_F/dt=600A/\mu s$		12		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=150^\circ C$		0.65		mJ



## ● Diode-rectifier

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^{\circ}C$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_C=100^{\circ}C$	10	A
Maximum RMS Current at Rectifier Output	$I_{RMSM}$	$T_C=100^{\circ}C$	10	A
Surge Forward Current	$I_{FSM}$	$V_R=0V, t_p=10ms, T_{vj}=25^{\circ}C$	290	A
		$V_R=0V, t_p=10ms, T_{vj}=150^{\circ}C$	230	A
$I^2t$ -value	$I^2t$	$V_R=0V, t_p=10ms, T_{vj}=25^{\circ}C$	400	$A^2s$
		$V_R=0V, t_p=10ms, T_{vj}=150^{\circ}C$	260	$A^2s$

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	$V_F$	$I_F=10A, T_{vj}=150^{\circ}C$		1.00		V
Reverse Current	$I_R$	$T_{vj}=150^{\circ}C, V_R=1600V$			1.0	mA

## ● NTC Thermistor

### Characteristic Values

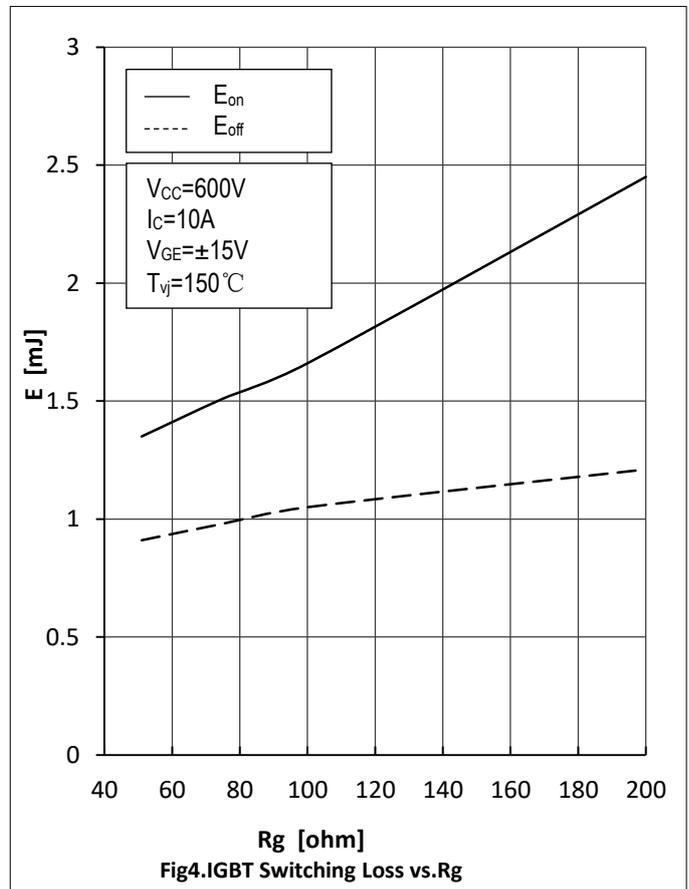
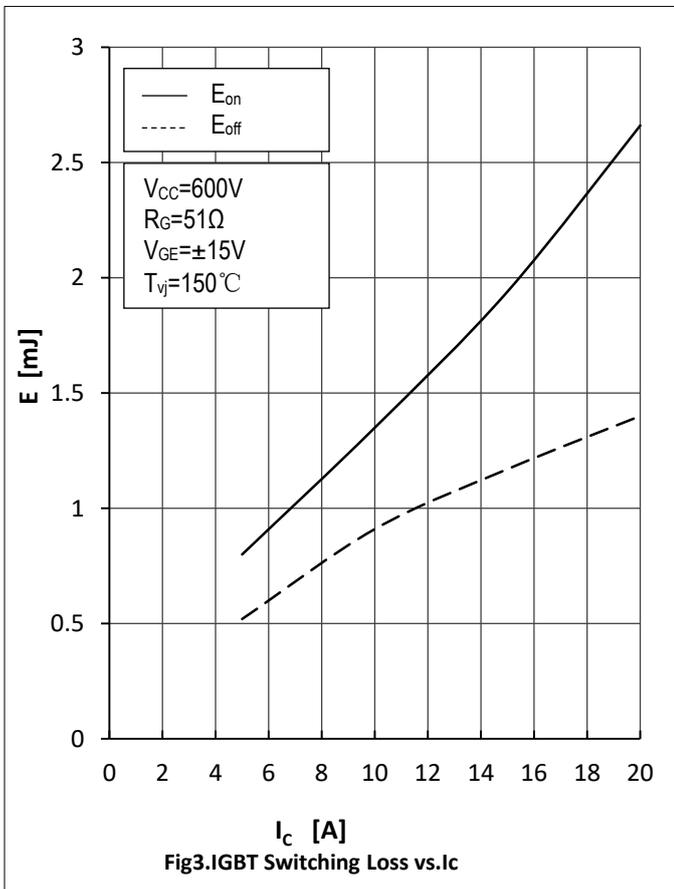
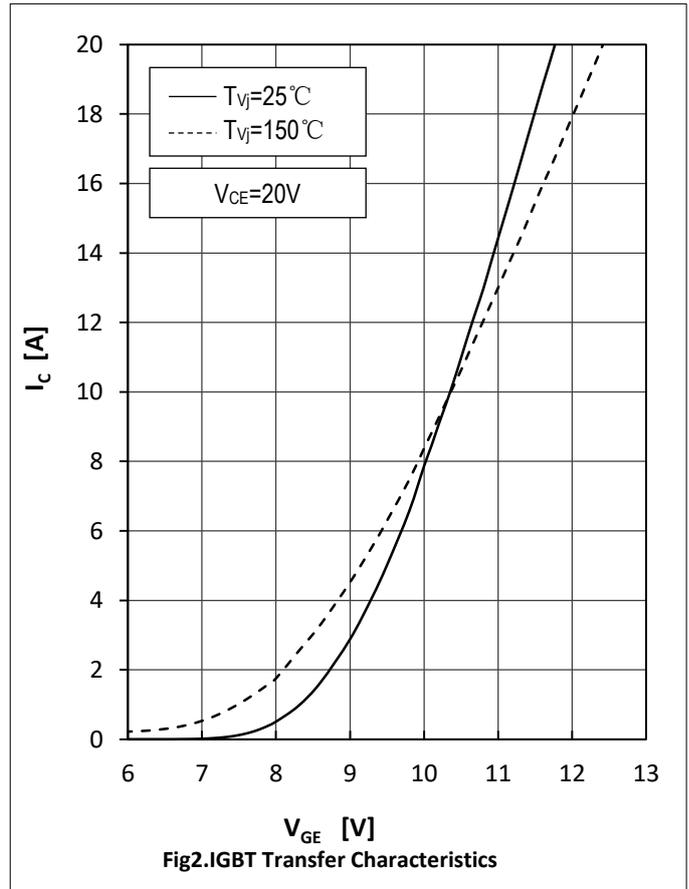
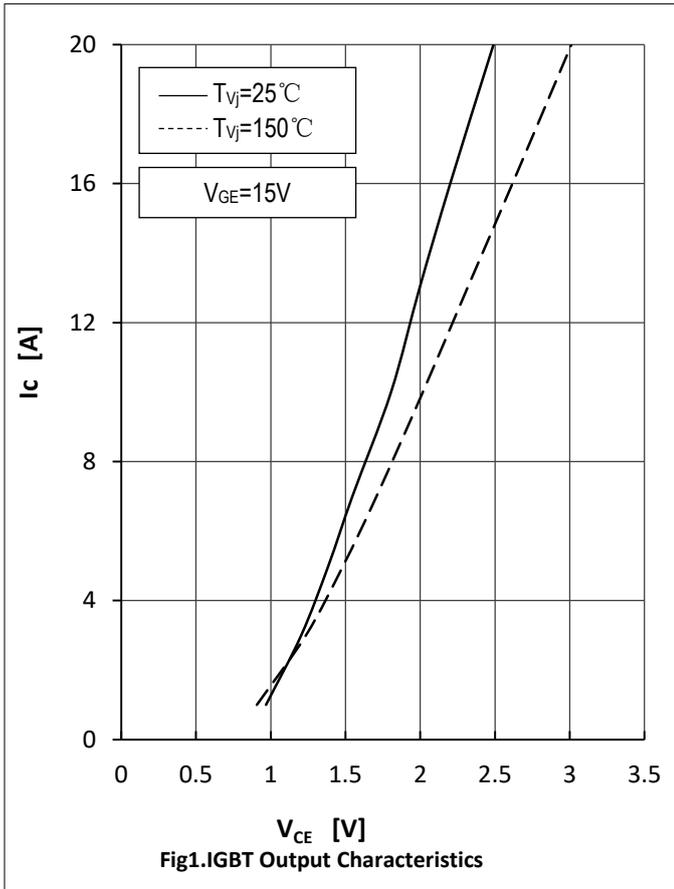
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	$R_{25}$			5.0		k $\Omega$
Deviation of R100	$\Delta R/R$	$T_C=100^{\circ}C, R_{100}=493.3\Omega$	-5		5	%
Power Dissipation	$P_{25}$				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15 K))]$		3375		K

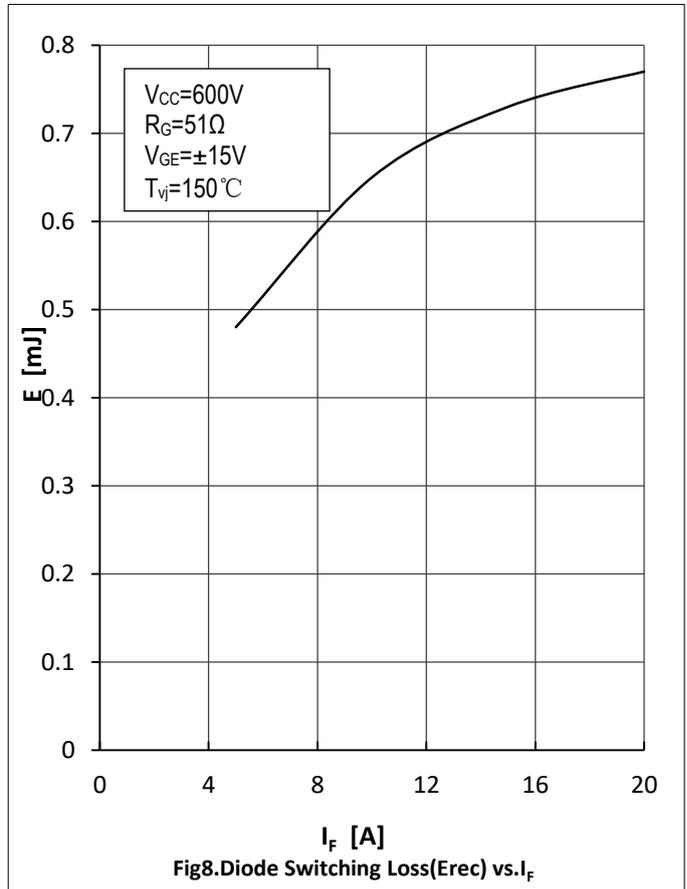
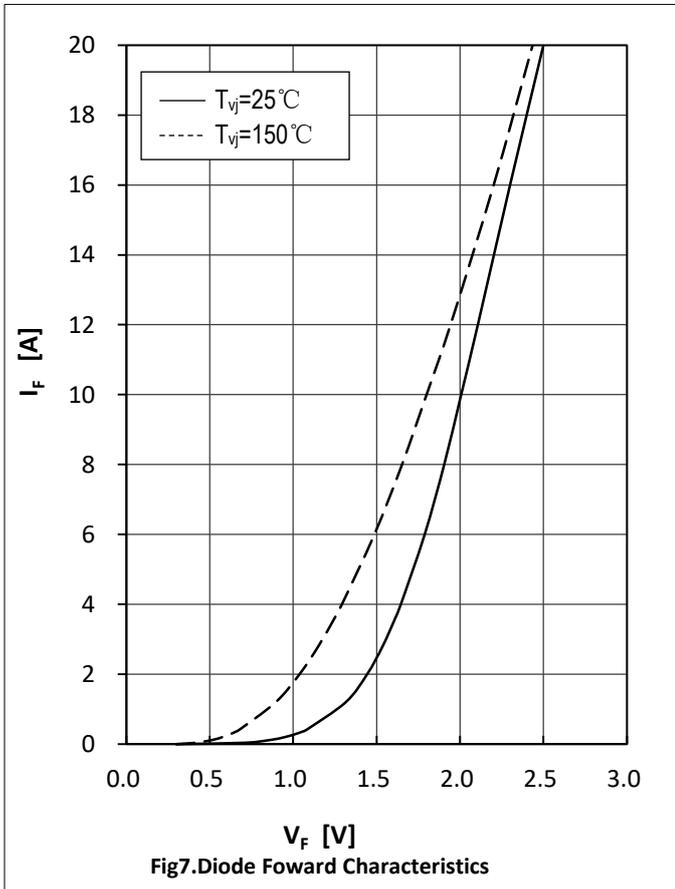
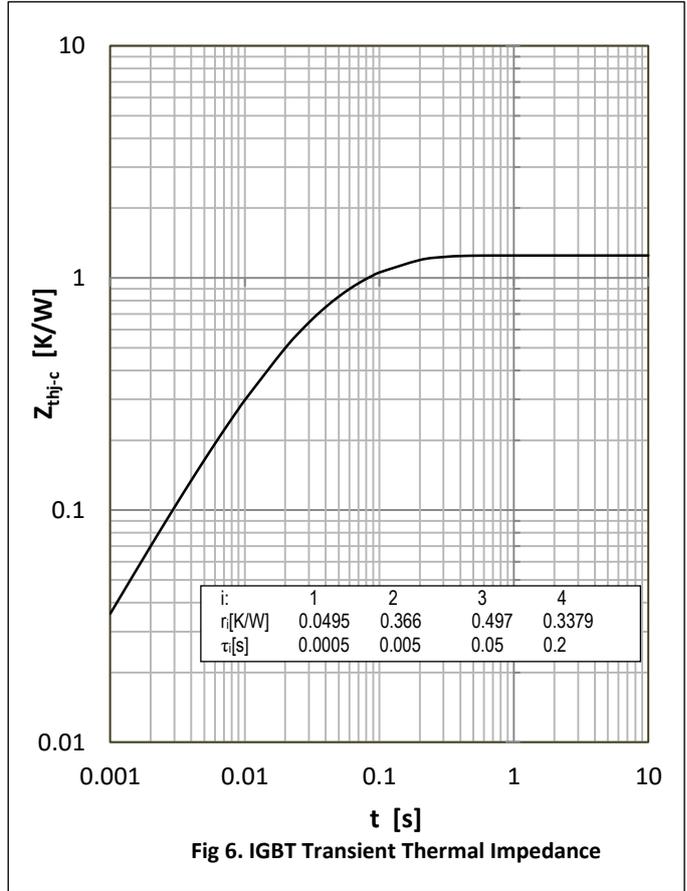
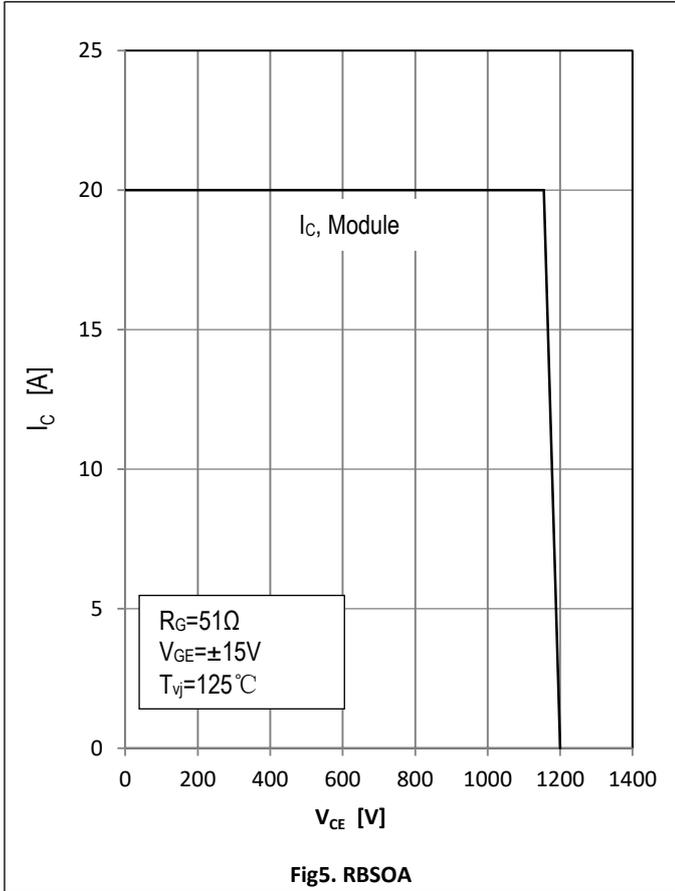


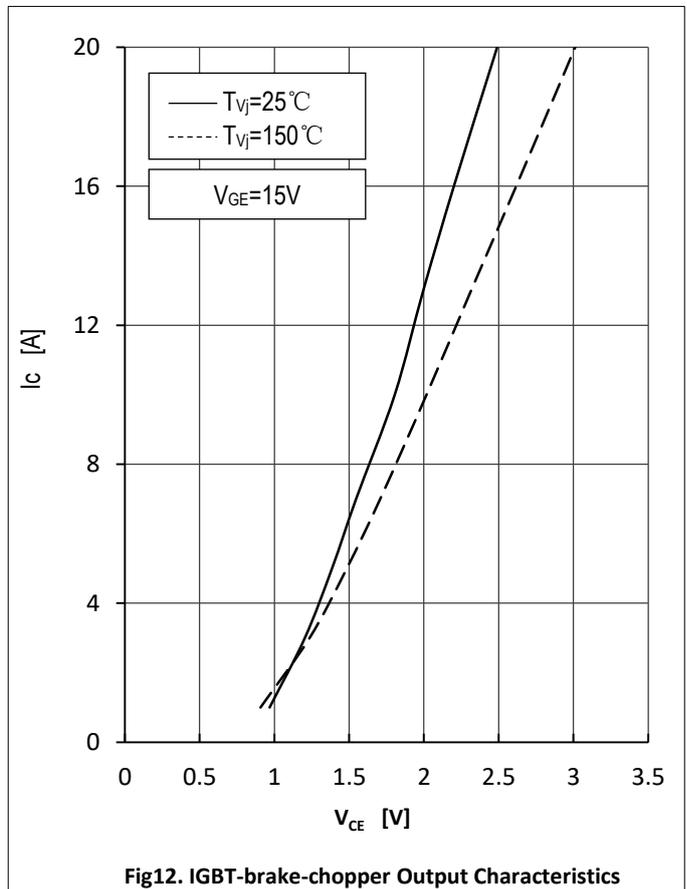
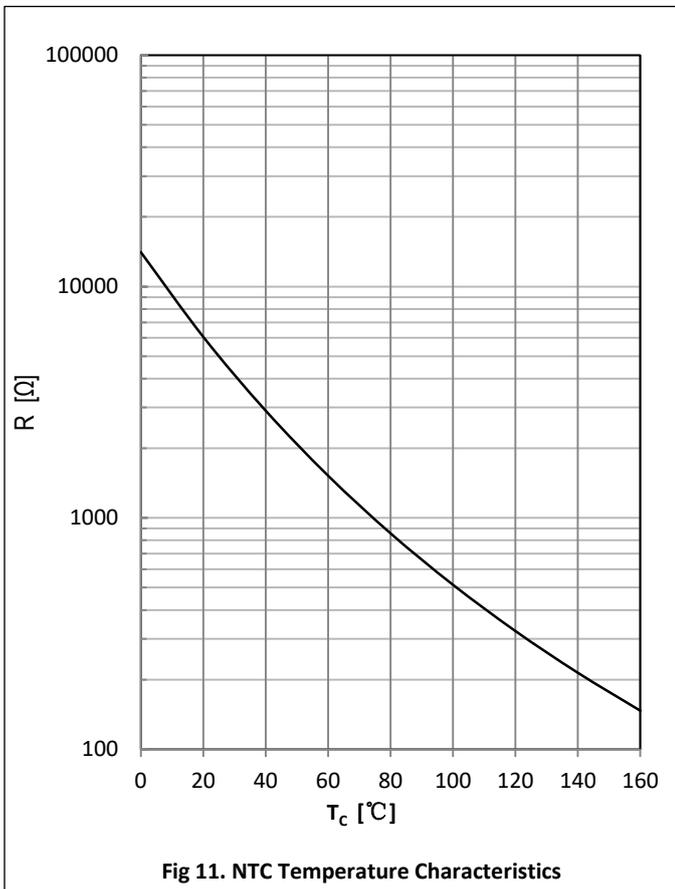
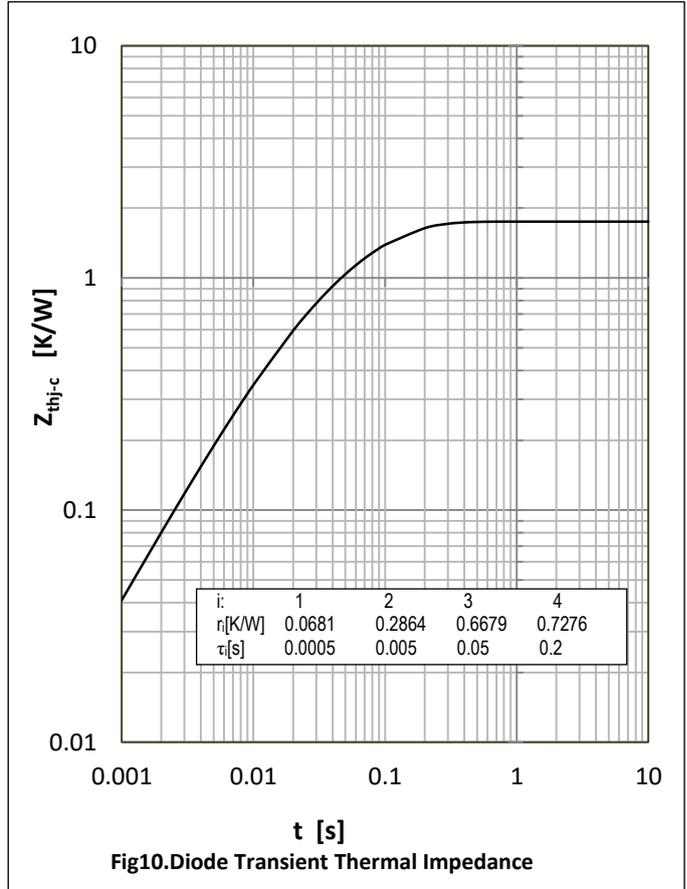
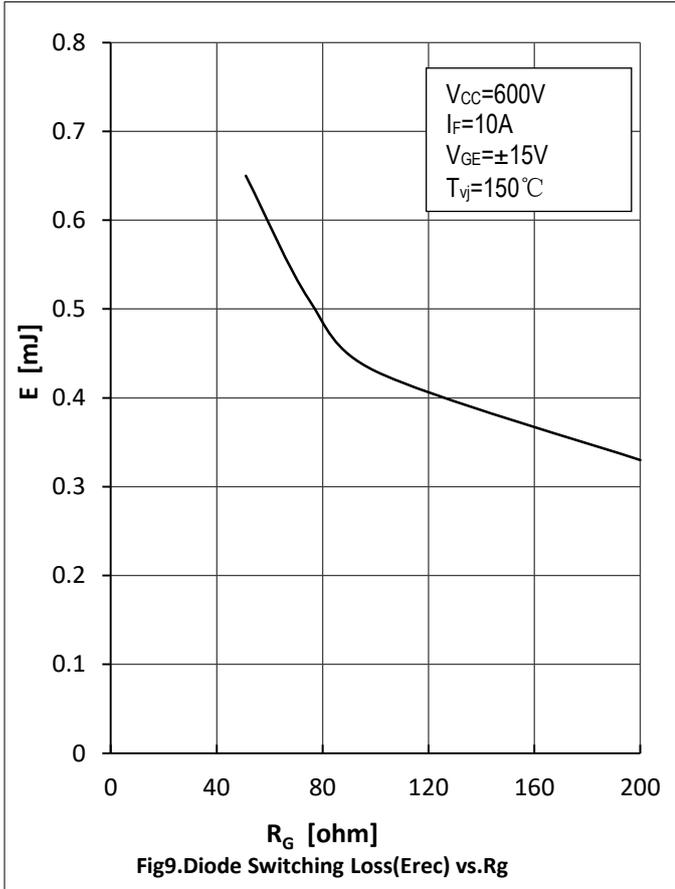
## ● Module Characteristics

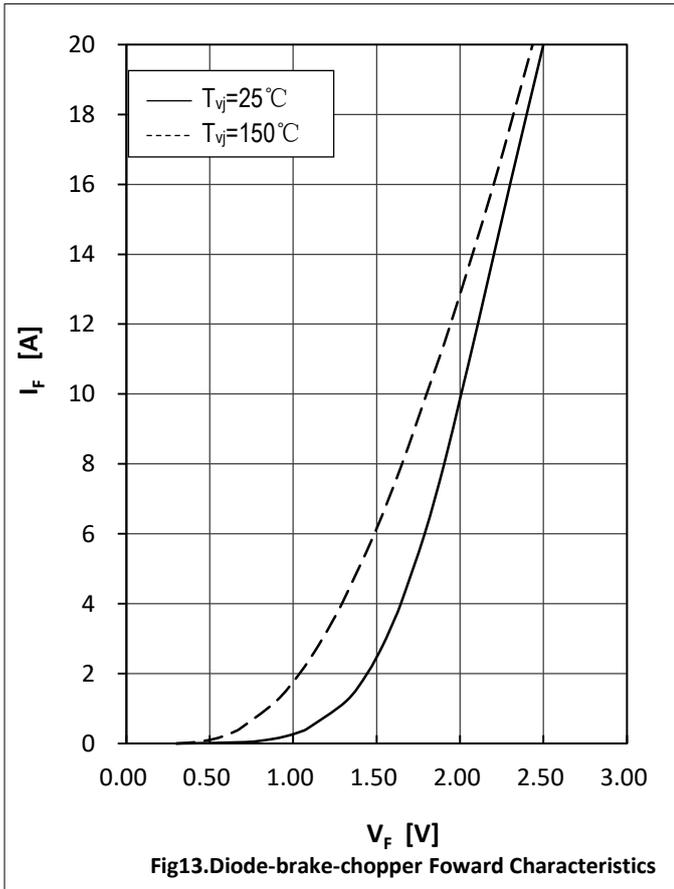
$T_c=25^{\circ}\text{C}$  unless otherwise specified

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	$^{\circ}\text{C}$
Stray-inductance-module	$L_{\text{SCE}}$			30		nH
Module lead resistance, terminals-chip	$R_{\text{CC}'+\text{EE}'}$	$T_c=25^{\circ}\text{C}$ , per switch		8.00		m $\Omega$
	$R_{\text{AA}'+\text{CC}'}$			6.00		
Thermal Resistance Junction-to-Case	$R_{\theta\text{JC}}$	per IGBT-inverter		1.25		K/W
		per Diode-inverter		1.75		
		per IGBT-brake-chopper		1.25		
		per Diode-chopper		1.75		
		per Diode-rectifier		2.05		
Thermal Resistance Case-to-Sink	$R_{\theta\text{CS}}$	per IGBT-inverter		1.15		K/W
		per Diode-inverter		1.30		
		per IGBT-brake-chopper		1.15		
		per Diode-chopper		1.30		
		per Diode-rectifier		1.25		
		per Module		0.058		
Mounting Force Per Clamp	F		20		50	N
Weight of Module	G			25		g

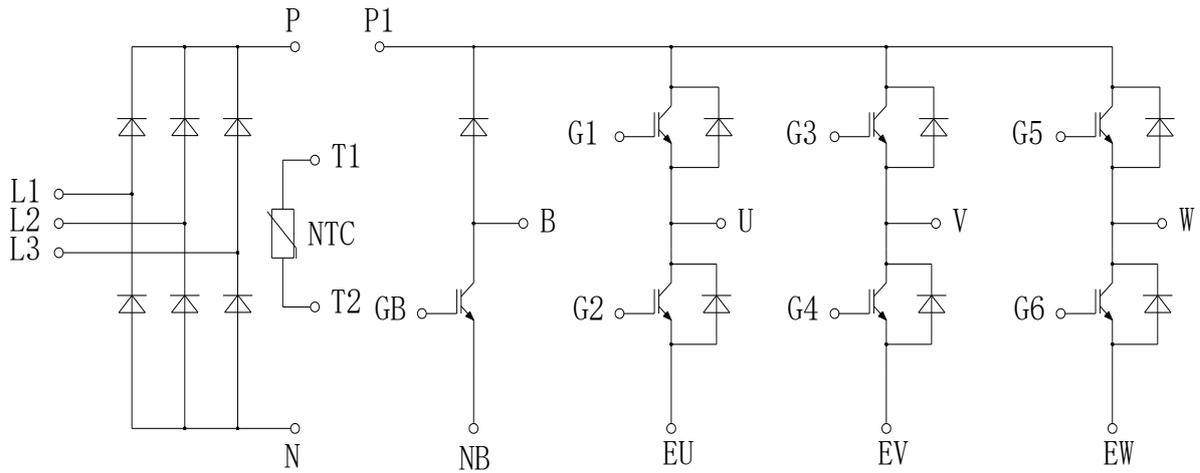




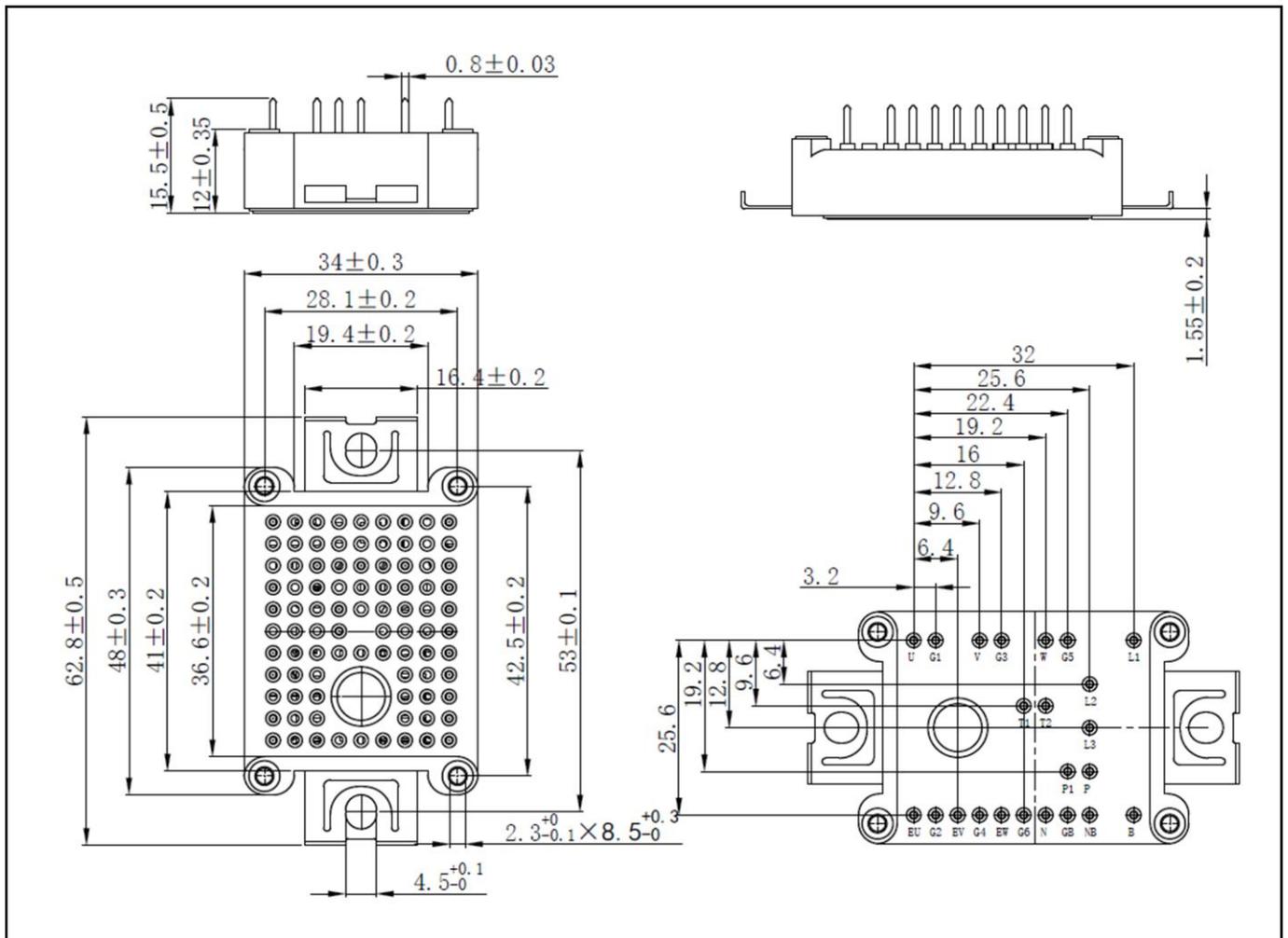




## Circuit Diagram



## ● Package Dimensions





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