

## IGBT Modules

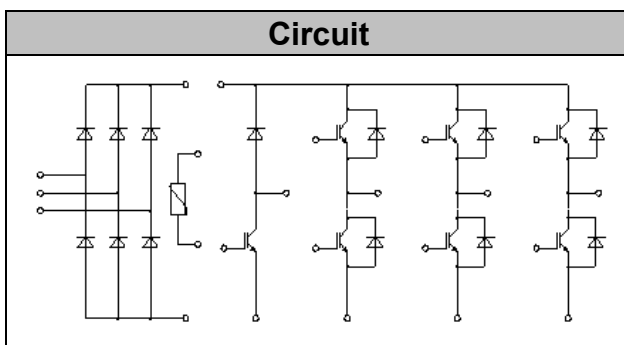
<b>V<sub>CES</sub></b>	1200V
<b>I<sub>C</sub></b>	15A

### 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	$I_C$	$T_c=100^{\circ}C, T_{vjmax}=175^{\circ}C$	15	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	30	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_c=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	155	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	6.0	6.8	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	$V_{CE(sat)}$	$I_C=15A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.80	2.20	V	
		$I_C=15A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.10			
		$I_C=15A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.20			
Gate Charge	$Q_G$			0.15		uC	
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V,$		1.1		nF	
Reverse Transfer Capacitance	$C_{res}$	$f=1MHz, T_{vj}=25^{\circ}C$		0.04		nF	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=15A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=39\Omega$ $T_{vj}=25^{\circ}C$		90		ns	
Rise Time	$t_r$			64		ns	
Turn-off Delay Time	$t_{d(off)}$			180		ns	
Fall Time	$t_f$			135		ns	
Energy Dissipation During Turn-on Time	$E_{on}$			1.42		mJ	
Energy Dissipation During Turn-off Time	$E_{off}$			0.78		mJ	
Turn-on Delay Time	$t_{d(on)}$		$I_C=15A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=39\Omega$ $T_{vj}=125^{\circ}C$		95		ns
Rise Time	$t_r$				70		ns
Turn-off Delay Time	$t_{d(off)}$				260		ns
Fall Time	$t_f$				180		ns
Energy Dissipation During Turn-on Time	$E_{on}$			1.85		mJ	
Energy Dissipation During Turn-off Time	$E_{off}$			1.13		mJ	
SC Data	$I_{sc}$	$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{cc}=900V, V_{CEM} \leq 1200V$			90		A



## Diode-inverter 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	$I_F$		15	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p=1\text{ms}$	30	A
$I^2t$ -value	$I^2t$	$V_R=0, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	16.0	$\text{A}^2\text{s}$
		$V_R=0, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	14.0	

## Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	$V_F$	$I_F=15\text{A}, T_{vj}=25^{\circ}\text{C}$		2.00	2.65	V
		$I_F=15\text{A}, T_{vj}=125^{\circ}\text{C}$		2.10		
		$I_F=15\text{A}, T_{vj}=150^{\circ}\text{C}$		2.10		
Recovered Charge	$Q_{rr}$	$I_F=15\text{A}$		1.20		$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600\text{V}$ $-di_F/dt=600\text{A}/\mu\text{s}$		13.0		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=25^{\circ}\text{C}$		0.37		mJ
Recovered Charge	$Q_{rr}$	$I_F=15\text{A}$		2.05		$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600\text{V}$ $-di_F/dt=600\text{A}/\mu\text{s}$		12.0		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=125^{\circ}\text{C}$		0.68		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	$I_C$	$T_c=100^{\circ}C, T_{vjmax}=175^{\circ}C$	15	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	30	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_c=25^{\circ}C, T_{vjmax}=175^{\circ}C$	155	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	6.0	6.8	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	$V_{CE(sat)}$	$I_C=15A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.25	V
		$I_C=15A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15		
		$I_C=15A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25		
Gate Charge	$Q_G$			0.09		$\mu C$
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V,$		1.35		nF
Reverse Transfer Capacitance	$C_{res}$	$f=1MHz, T_{vj}=25^{\circ}C$		0.08		nF
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=15A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=39\Omega$ $T_{vj}=25^{\circ}C$		46		ns
Rise Time	$t_r$			45		ns
Turn-off Delay Time	$t_{d(off)}$			182		ns
Fall Time	$t_f$			168		ns
Energy Dissipation During Turn-on Time	$E_{on}$			0.92		mJ
Energy Dissipation During Turn-off Time	$E_{off}$			0.56		mJ



Turn-on Delay Time	$t_{d(on)}$	$I_C = 15A$ $V_{CE} = 600 V$ $V_{GE} = \pm 15V$ $R_G = 39\Omega$ $T_{vj} = 125^\circ C$		46		ns
Rise Time	$t_r$			63		ns
Turn-off Delay Time	$t_{d(off)}$			248		ns
Fall Time	$t_f$			220		ns
Energy Dissipation During Turn-on Time	$E_{on}$			1.37		mJ
Energy Dissipation During Turn-off Time	$E_{off}$			0.81		mJ
SC Data	$I_{sc}$	$T_p \leq 10\mu s, V_{GE} = 15V, T_{vj} = 150^\circ C,$ $V_{ec} = 900V, V_{CEM} \leq 1200V$		90		A

## Diode-Brake-Chopper

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_j = 25^\circ C$	1200	V
Continuous DC Forward Current	$I_F$		10	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p = 1ms$	20	A
$I^2t$ -value	$I^2t$	$V_R = 0, t_p = 10ms, T_j = 125^\circ C$	16.0	A <sup>2</sup> s
		$V_R = 0, t_p = 10ms, T_j = 150^\circ C$	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	2.50	V
		$I_F = 10A, T_{vj} = 125^\circ C$		2.10		
		$I_F = 10A, T_{vj} = 150^\circ C$		2.10		
Recovered Charge	$Q_{rr}$	$I_F = 10 A$		0.90		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$	$V_R = 600V$ $-di_F/dt = 500A/\mu s$		12.5		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj} = 25^\circ C$		0.25		mJ
Recovered Charge	$Q_{rr}$	$I_F = 10 A$		1.70		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$	$V_R = 600V$ $-di_F/dt = 500A/\mu s$		10.4		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj} = 125^\circ C$		0.50		mJ



## Diode-Rectifier Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_j=25^{\circ}\text{C}$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_c=100^{\circ}\text{C}$	20	A
Maximum RMS Current at Rectifier Output	$I_{RMSM}$	$T_c=100^{\circ}\text{C}$	40	A
Surge Forward Current	$I_{FSM}$	$V_R=0, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	270	A
$I^2t$ -value	$I^2t$	$V_R=0, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	360	$\text{A}^2\text{s}$

## Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	$V_F$	$I_F=15\text{A}, T_j=150^{\circ}\text{C}$		0.96		V
Reverse Current	$I_R$	$T_j=150^{\circ}\text{C}, V_R=1600\text{V}$			1.0	mA

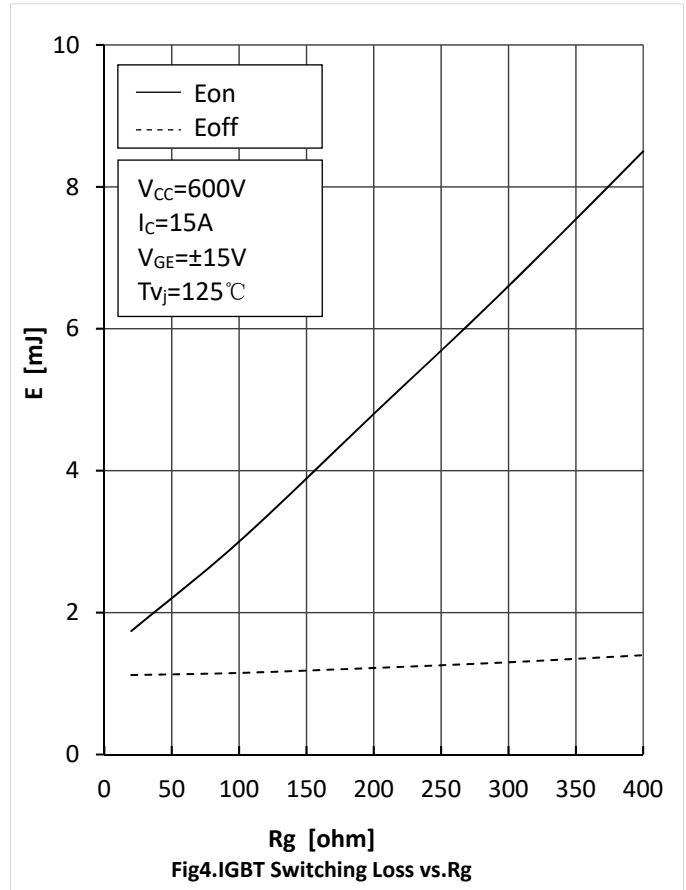
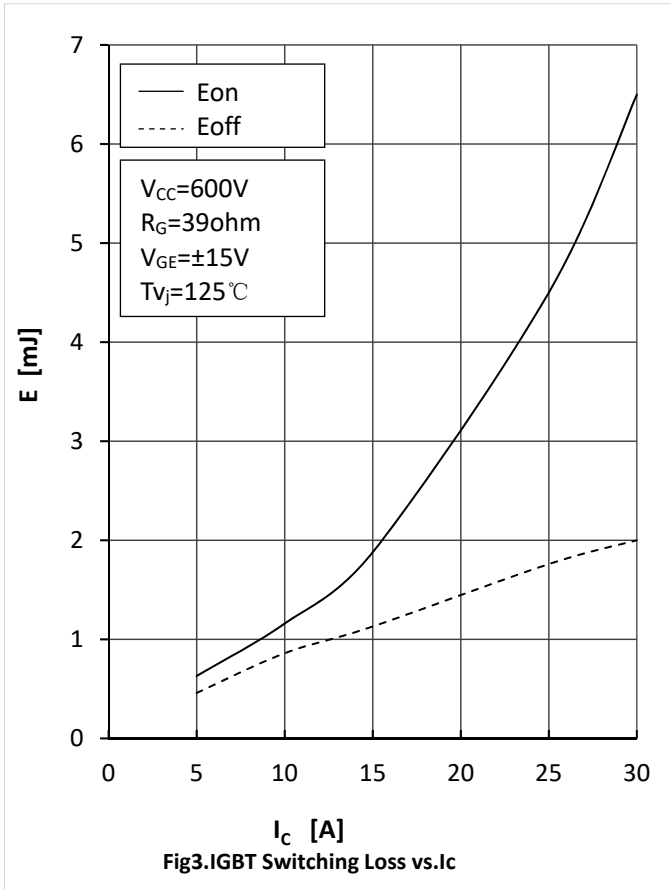
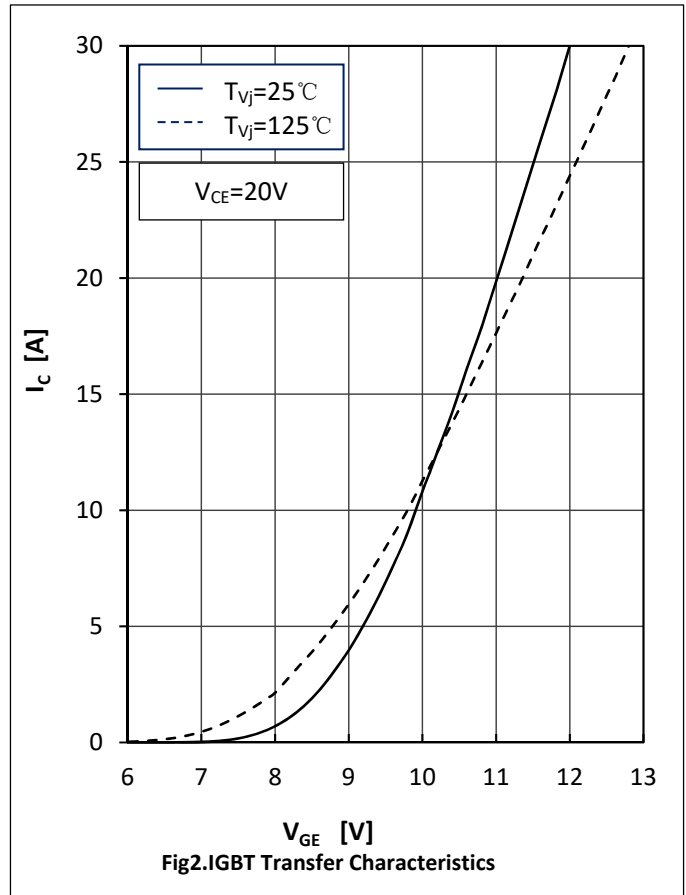
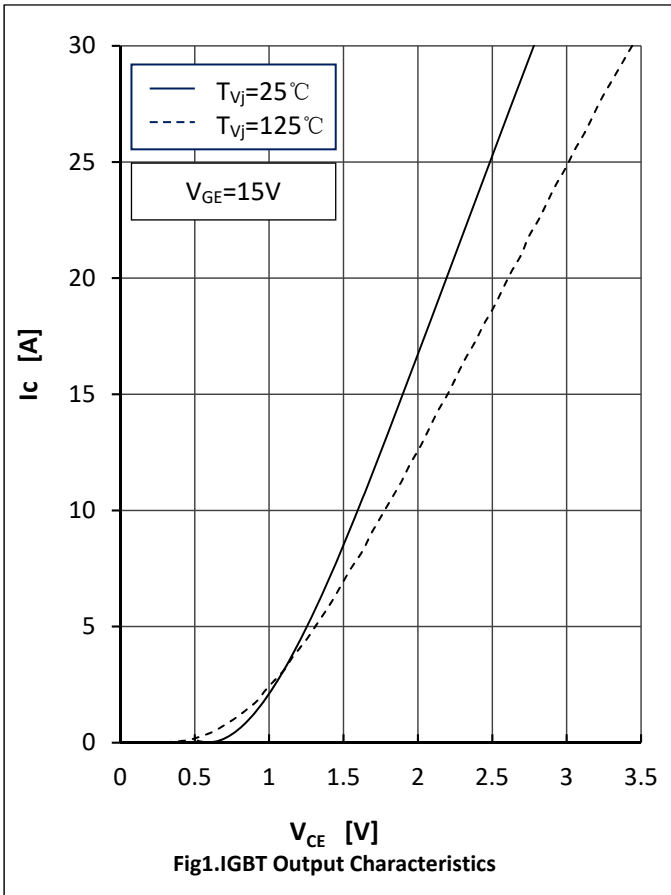
## NTC-Thermistor Characteristic values

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

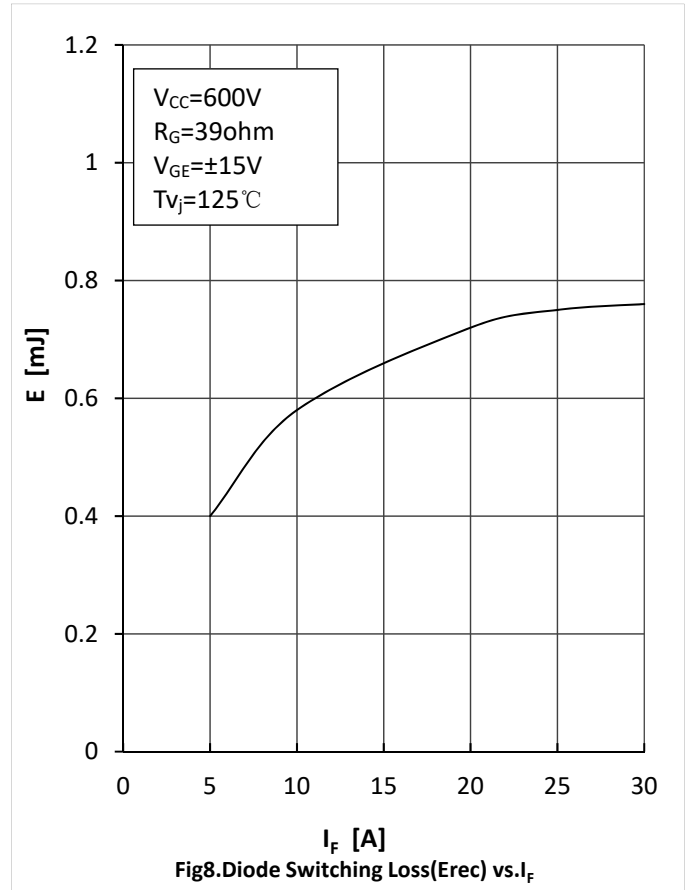
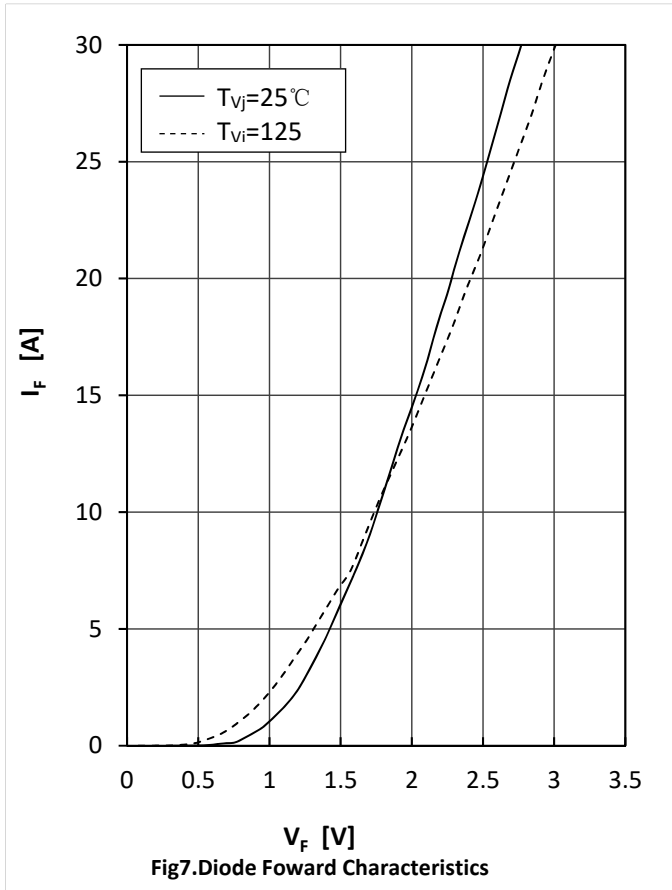
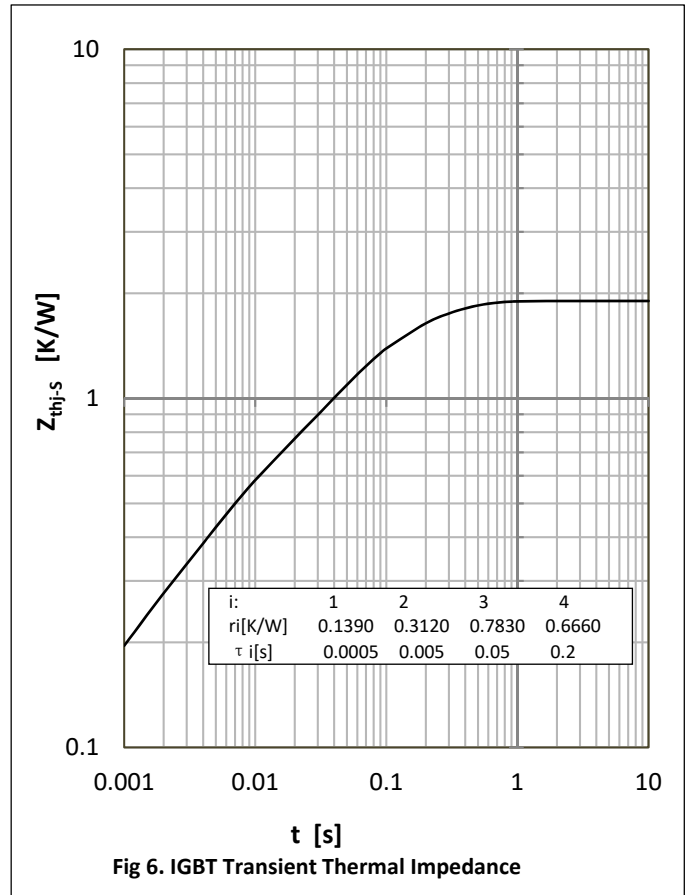
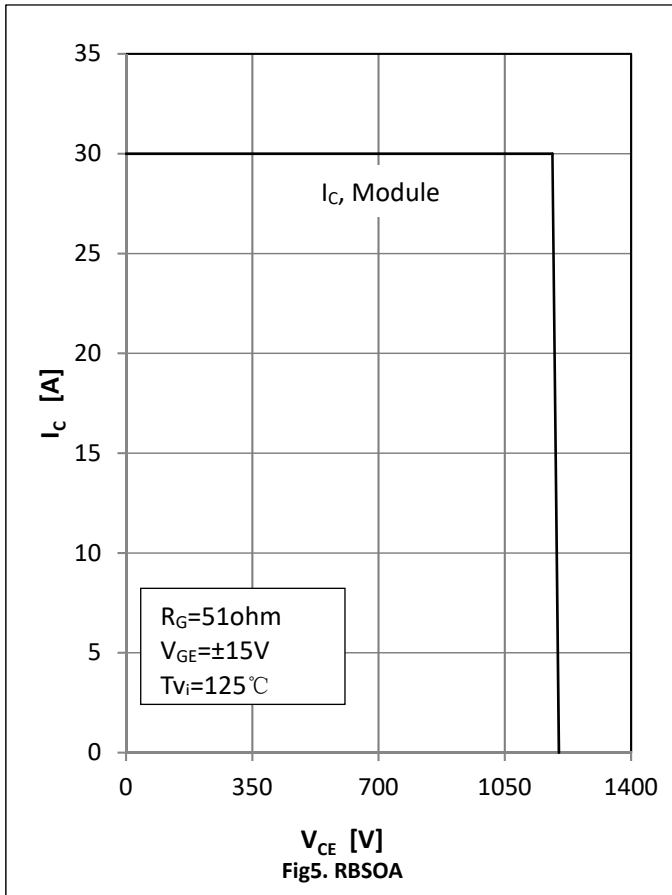


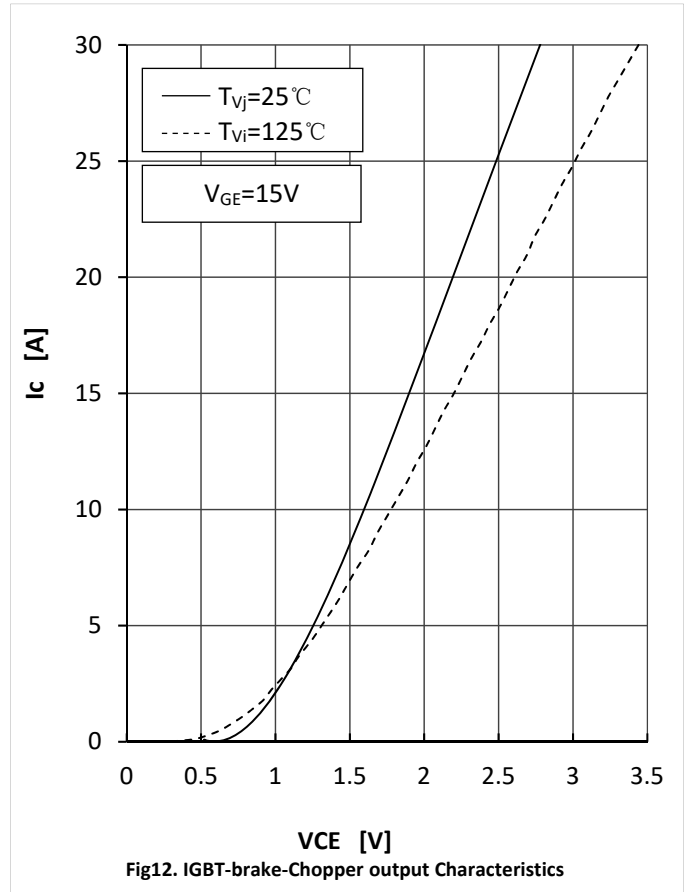
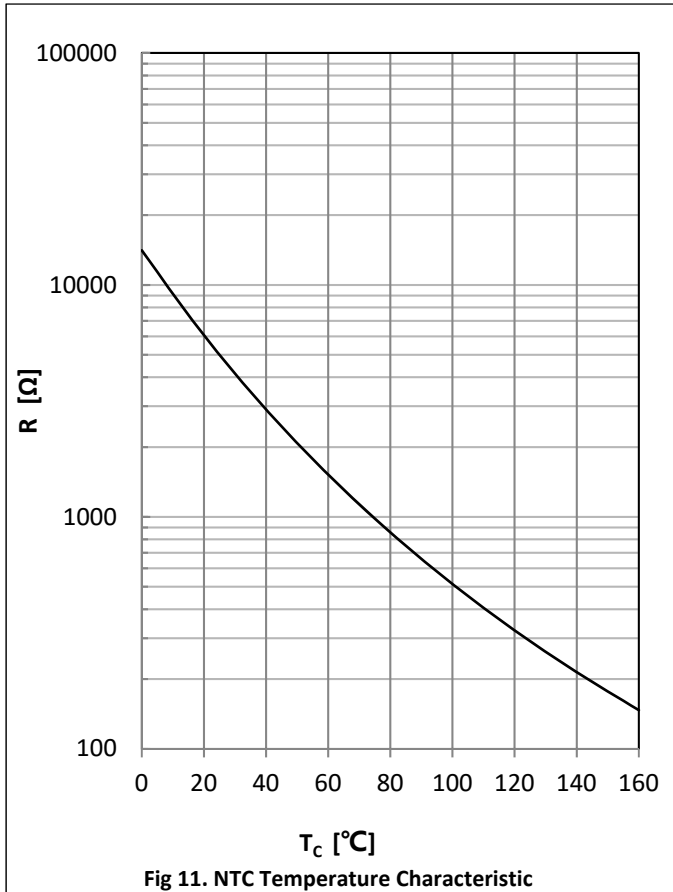
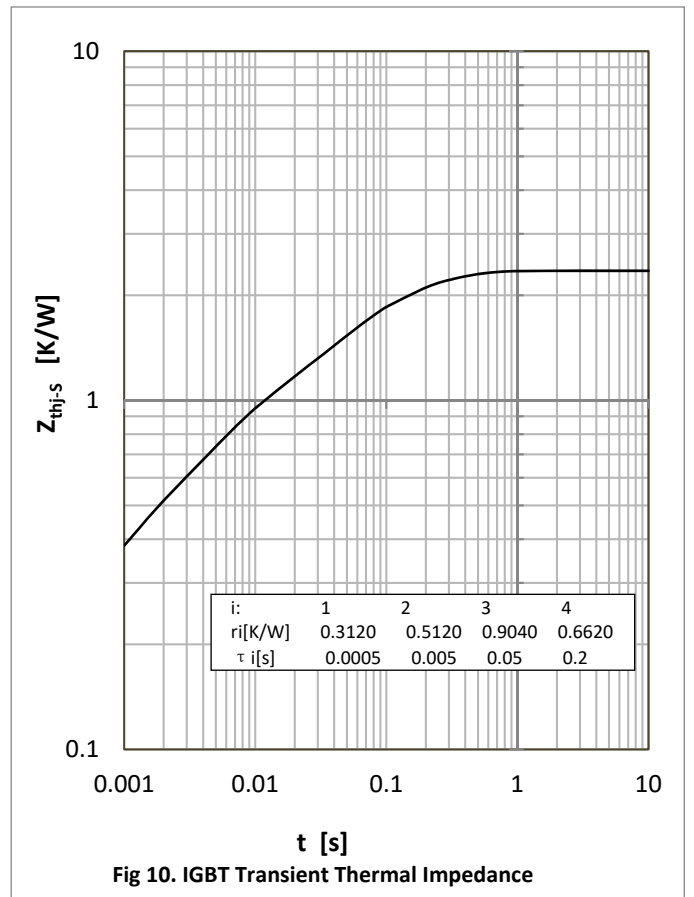
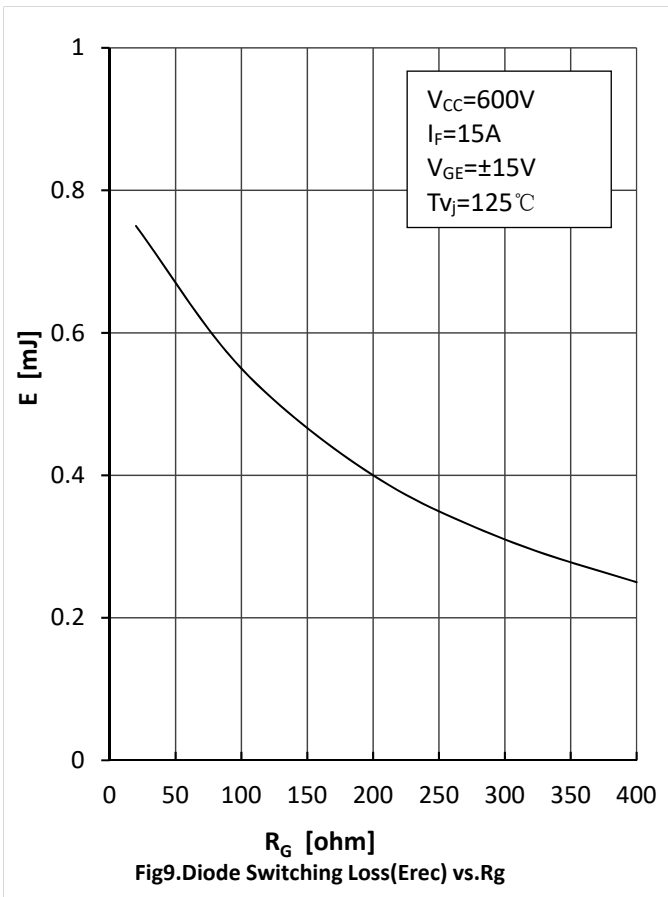
## Module Characteristics (T<sub>C</sub>=25°C unless otherwise specified)

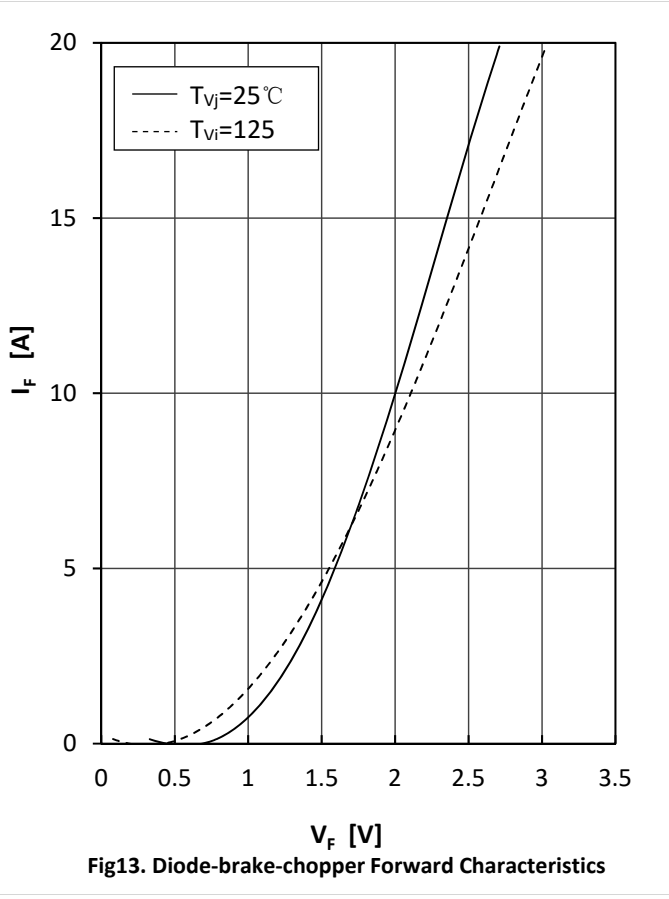
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation voltage	V <sub>isol</sub>	t=1min, f=50Hz	2500			V
Maximum Junction Temperature	T <sub>Jmax</sub>				175	°C
Operating Junction Temperature	T <sub>vj op</sub>		-40		150	°C
Storage Temperature	T <sub>stg</sub>		-40		125	°C
Stray-inductance-module	L <sub>SCE</sub>			30		nH
Module lead resistance, terminals-chip	R <sub>CC+EE'</sub>	T <sub>C</sub> =25°C, per switch		8.00		mΩ
	R <sub>AA+CC'</sub>			6.00		
Thermal Resistance Junction-to Case	R <sub>θJC</sub>	per IGBT-inverter		0.95	1.05	K/W
		per Diode-inverter		1.30	1.45	
		per IGBT-brake-copper		0.95	1.05	
		per Diode-chopper		1.75	1.90	
		per Diode-rectifier		1.03	1.13	
Thermal Resistance Case-to Sink	R <sub>θCS</sub>	per IGBT-inverter		0.95		K/W
		per Diode-inverter		1.05		
		per IGBT-brake-copper		0.95		
		per Diode-chopper		1.30		
		per Diode-rectifier		1.17		
		per Module		0.058		
Mounting Force Per Clamp	F		20		50	N
Weight of Module	G			25		g





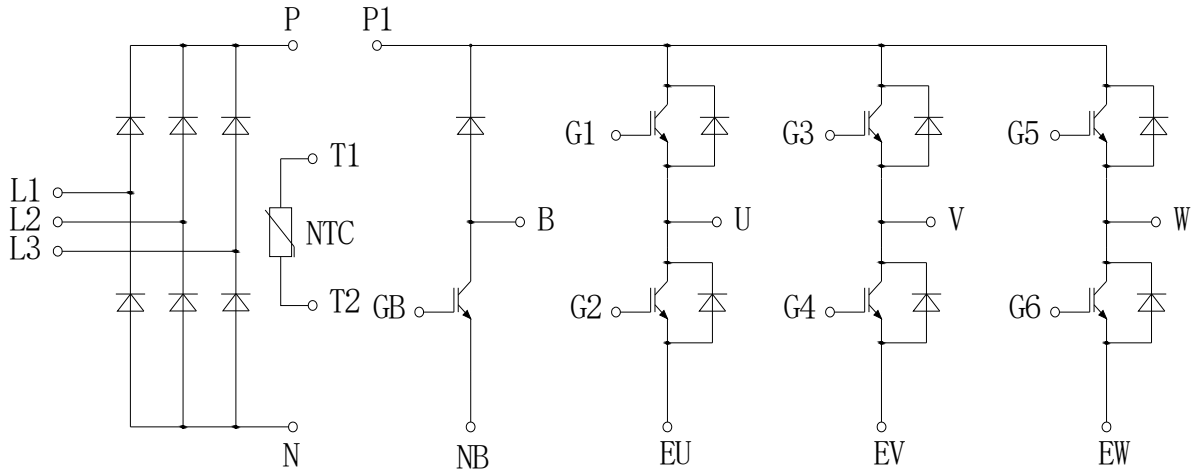








## Circuit Diagram



## Package Dimensions

