

IGBT Modules

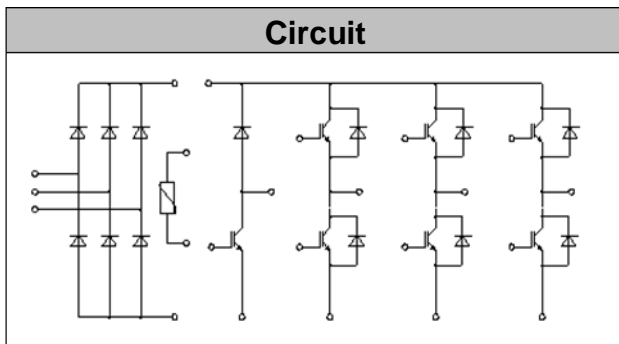
V_{CES}	1200V
I_C	10A

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}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	140	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	6.4	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	$V_{CE(sat)}$	$I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.20	V
		$I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15		
		$I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25		
Gate Charge	Q_G			0.13		uC
Internal Gate Resistor	R_{Gint}			0.0		Ω
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		1.0		nF
Reverse Transfer Capacitance	C_{res}			0.03		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=25^{\circ}C$		87		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$				262	ns
Fall Time	t_f				145	ns
Energy Dissipation During Turn-on Time	E_{on}				1.02	mJ
Energy Dissipation During Turn-off Time	E_{off}				0.52	mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=125^{\circ}C$		92		ns
Rise Time	t_r			58		ns
Turn-off Delay Time	$t_{d(off)}$				283	ns
Fall Time	t_f				153	ns
Energy Dissipation During Turn-on Time	E_{on}				1.38	mJ
Energy Dissipation During Turn-off Time	E_{off}				0.96	mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=150^{\circ}C$		98		ns
Rise Time	t_r			61		ns
Turn-off Delay Time	$t_{d(off)}$				285	ns
Fall Time	t_f				155	ns
Energy Dissipation During Turn-on Time	E_{on}				1.41	mJ
Energy Dissipation During Turn-off Time	E_{off}				1.02	mJ
SC Data	I_{SC}	$t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{CC}=900V, V_{CEM} \leq 1200V$		70		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		10	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1\text{ms}$	20	A
I^2t -value	I^2t	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	16.0	A ² s
		$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	14.0	

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=10\text{A}, T_{vj}=25^{\circ}\text{C}$		2.0		V
		$I_F=10\text{A}, T_{vj}=125^{\circ}\text{C}$		2.1		
		$I_F=10\text{A}, T_{vj}=150^{\circ}\text{C}$		2.15		
Recovered Charge	Q_{rr}	$I_F=10\text{A}$		1.0		uC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt=600\text{A/us}$		12.5		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^{\circ}\text{C}$		0.26		mJ
Recovered Charge	Q_{rr}	$I_F=10\text{A}$		1.70		uC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt=600\text{A/us}$		10.6		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=125^{\circ}\text{C}$		0.53		mJ
Recovered Charge	Q_{rr}	$I_F=10\text{A}$		1.86		uC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt=600\text{A/us}$		12.0		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^{\circ}\text{C}$		0.61		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}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	140	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	6.4	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	$V_{CE(sat)}$	$I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.25	V	
		$I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15			
		$I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25			
Gate Charge	Q_G			0.09		uC	
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		1.0		nF	
Reverse Transfer Capacitance	C_{res}			0.03		nF	
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_{vj}=25^{\circ}C$		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



MG10P12P3

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Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_V=125^\circ C$		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
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=51\Omega$ $T_V=150^\circ C$		48		ns
Rise Time	t_r			68		ns
Turn-off Delay Time	$t_{d(off)}$			252		ns
Fall Time	t_f			223		ns
Energy Dissipation During Turn-on Time	E_{on}			1.60		mJ
Energy Dissipation During Turn-off Time	E_{off}			0.89		mJ
SC Data	I_{sc}	$t_p \leq 10\mu s, V_{GE}=15V, T_V=150^\circ C,$ $V_{CC}=900V, V_{CEM} \leq 1200V$		70		A



● 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 ² 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	$I_F=10A, T_{vj}=25^{\circ}C$		2.0	2.5	V
		$I_F=10A, T_{vj}=125^{\circ}C$		2.1		
		$I_F=10A, T_{vj}=150^{\circ}C$		2.15		
Recovered Charge	Q_{rr}	$I_F=10A$		0.88		μC
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}	$I_F=10A$		1.71		μC
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
Recovered Charge	Q_{rr}	$I_F=10A$		1.92		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt=500A/\mu s$		10.4		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^{\circ}C$		0.58		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}	$T_C=100^{\circ}C$	20	A
Surge Forward Current	I_{FSM}	$V_R=0V, t_p=10ms, T_{vj}=45^{\circ}C$	150	A
I^2t -value	I^2t	$V_R=0V, t_p=10ms, T_{vj}=45^{\circ}C$	110	A ² s

Characteristic Values

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

● NTC-Thermistor

Characteristic values

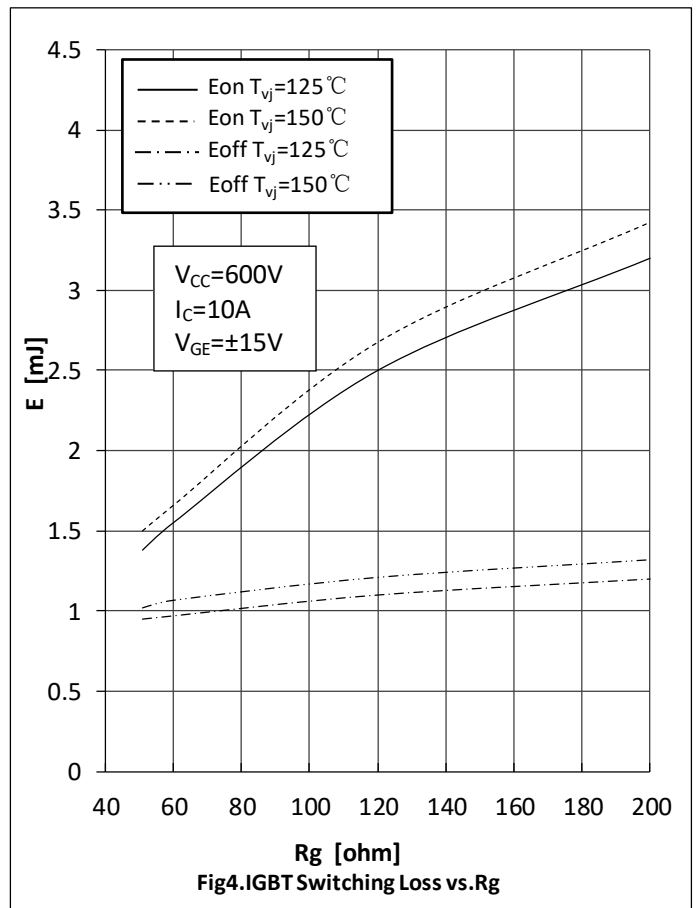
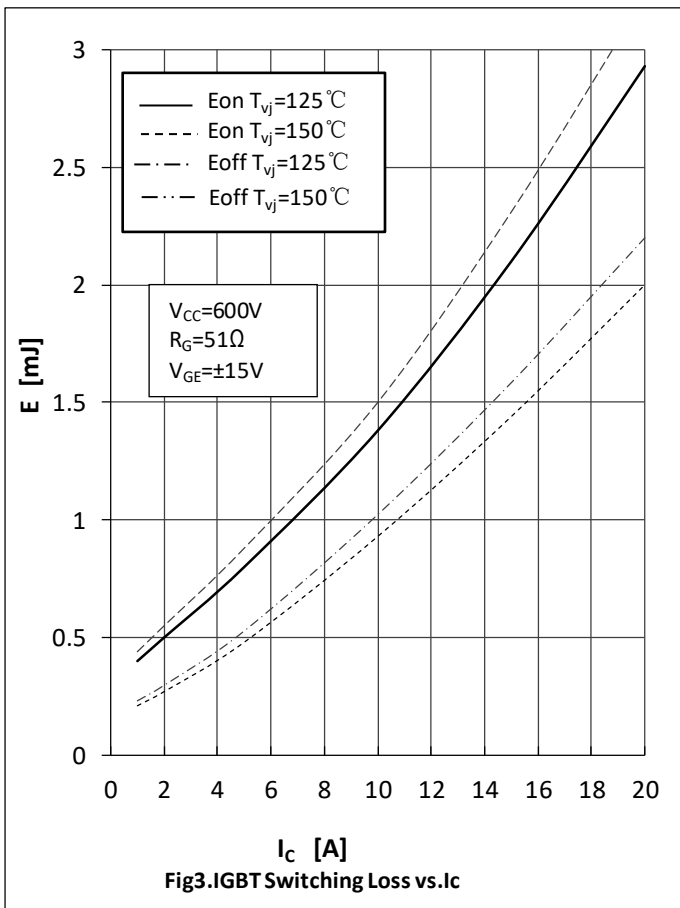
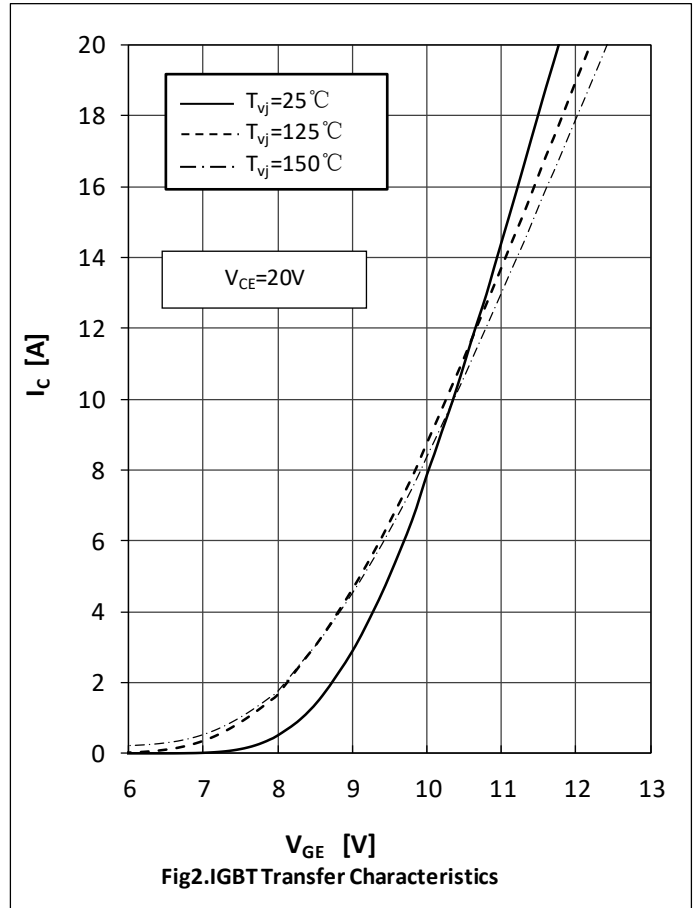
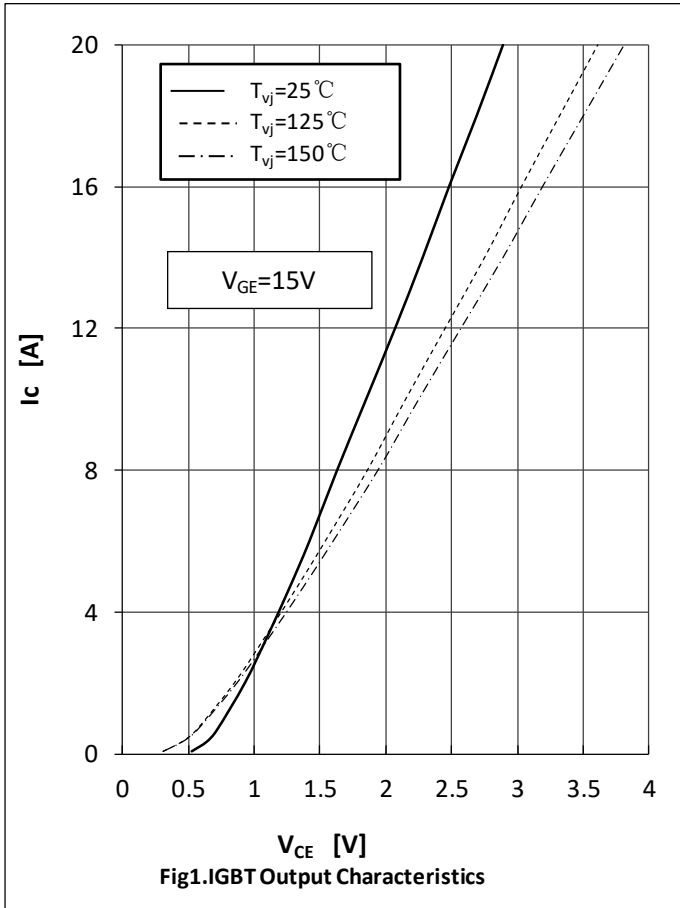
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R_{25}			5.0		k Ω
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3 \Omega$	-5		5	%
Power Dissipation	P_{25}				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

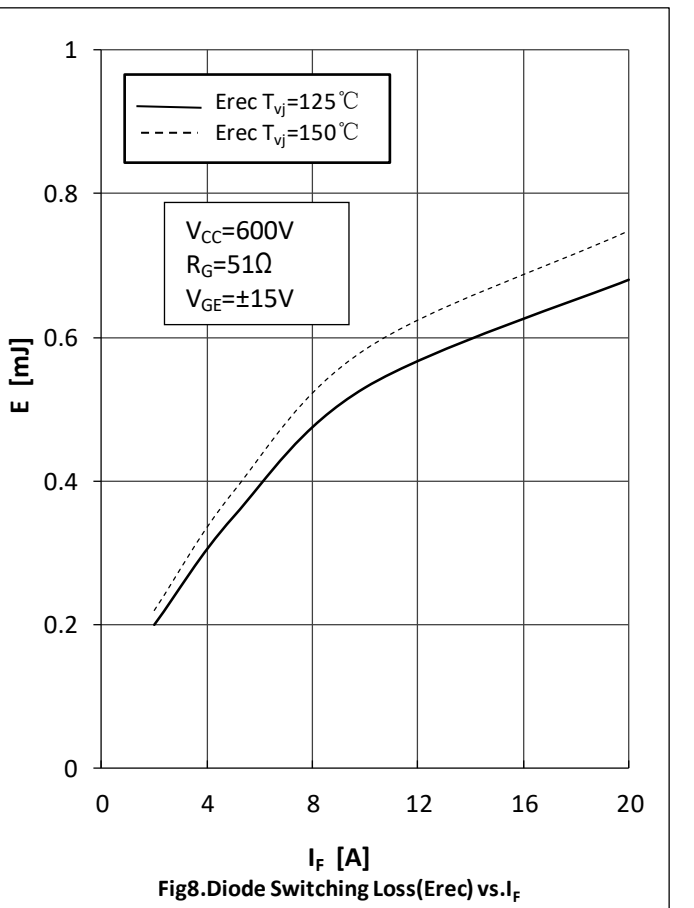
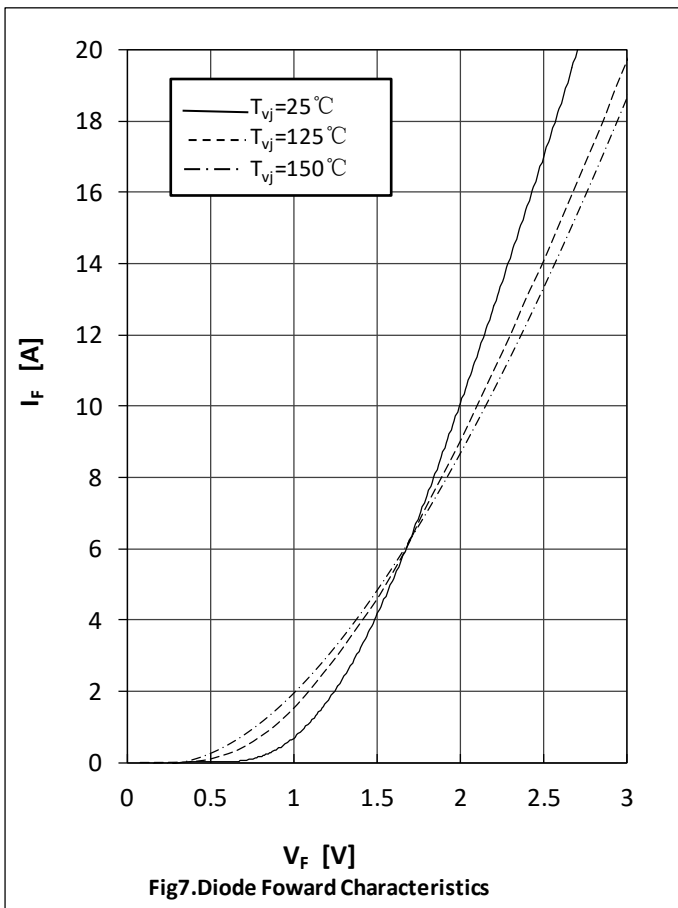
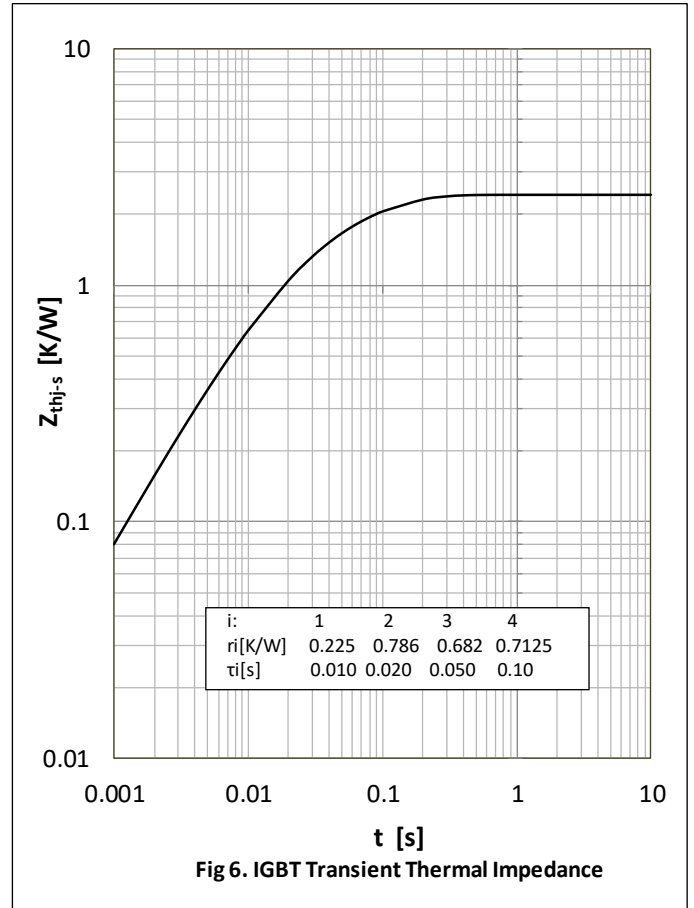
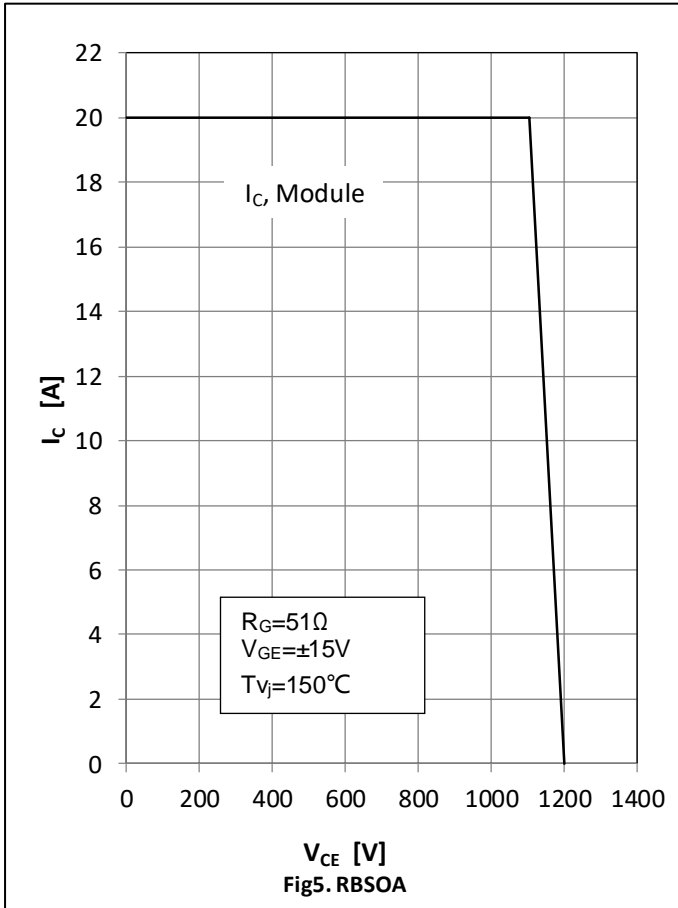


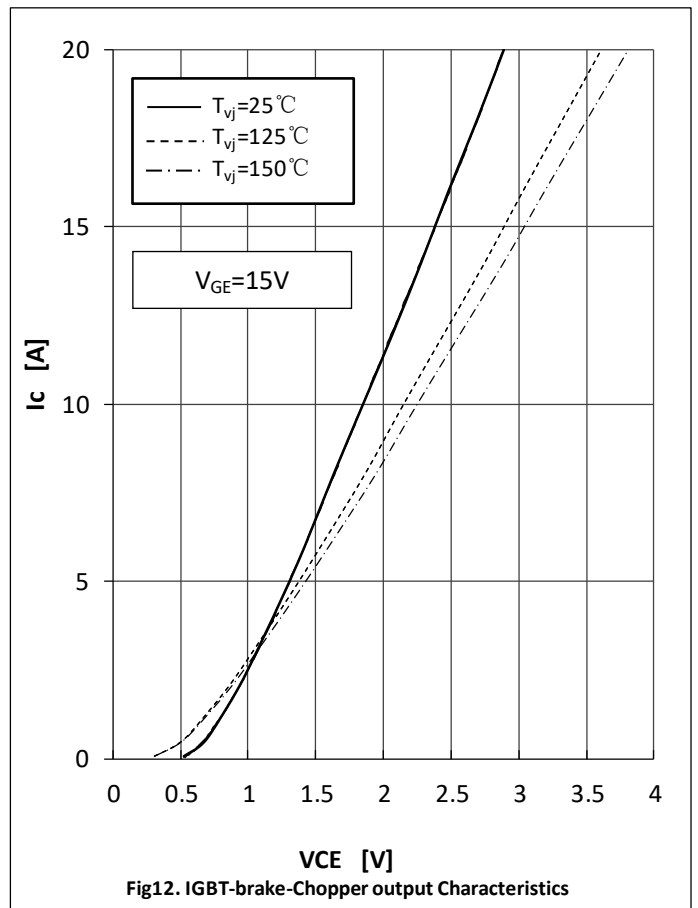
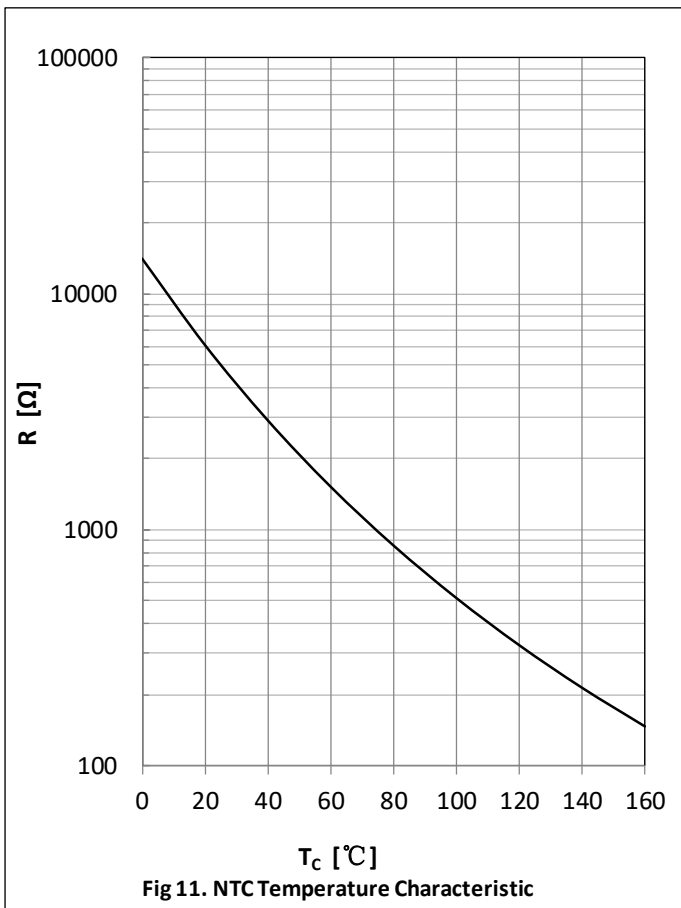
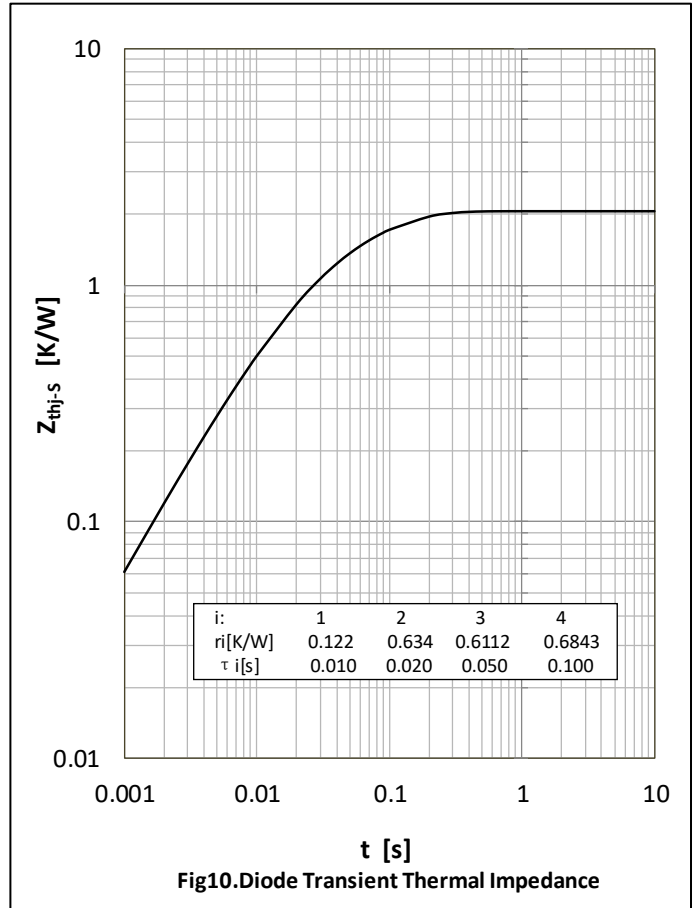
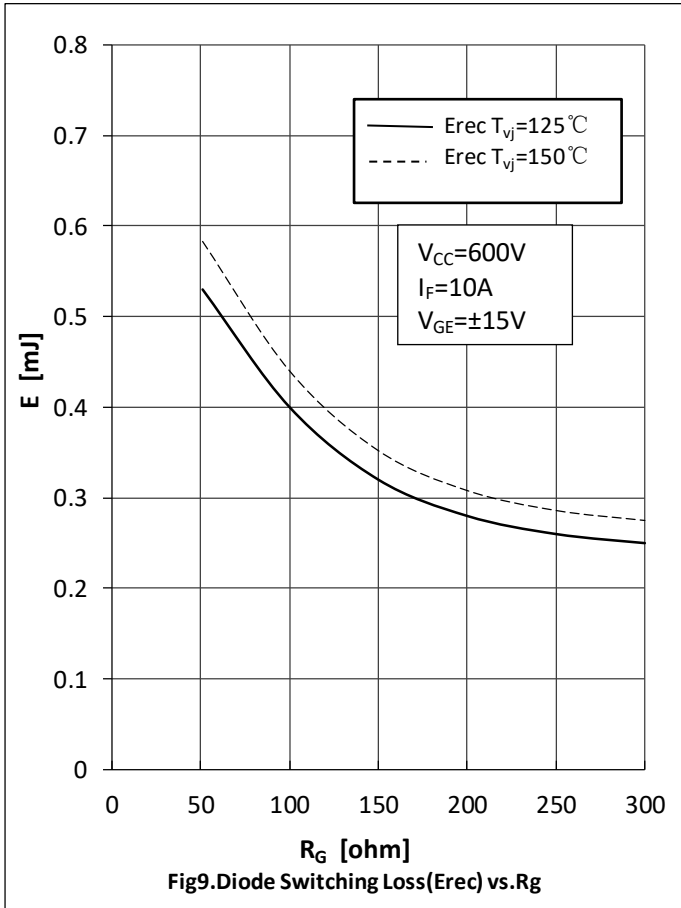
● Module Characteristics

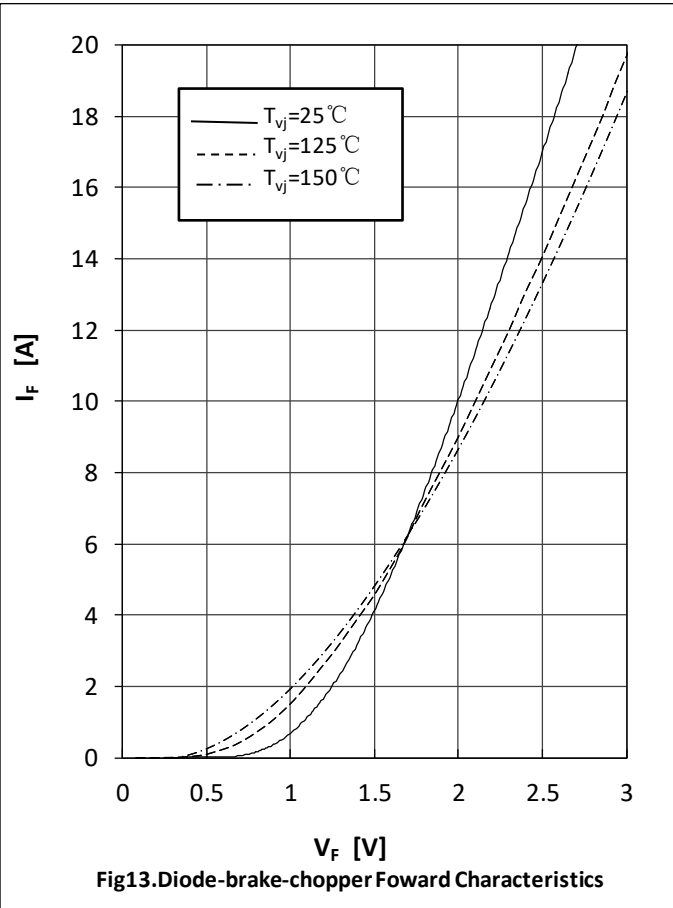
$T_C=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation voltage	V_{isol}	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	T_{jmax}				175	$^{\circ}\text{C}$
Operating Junction Temperature	T_{jop}		-40		150	$^{\circ}\text{C}$
Storage Temperature	T_{stg}		-40		125	$^{\circ}\text{C}$
Stray-inductance-module	L_{SCE}			30		nH
Comparative Tracking Index	CTI			>200		
Module lead resistance, terminals-chip	R_{CC+EE}	$T_C=25^{\circ}\text{C}$, per switch		5.00		m Ω
	R_{AA+CC}			6.00		
Thermal Resistance Junction-to Case	$R_{\theta JC}$	per IGBT-inverter		1.25	1.40	K/W
		per Diode-inverter		1.75	1.90	
		per IGBT-brake-chopper		1.25	1.40	
		per Diode-chopper		1.75	1.90	
		per Diode-rectifier		2.05	2.10	
Thermal Resistance Case-to Sink	$R_{\theta CS}$	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		0.05		
Mounting Force Per Clamp	F		30		80	N
Weight of Module	G			45		g



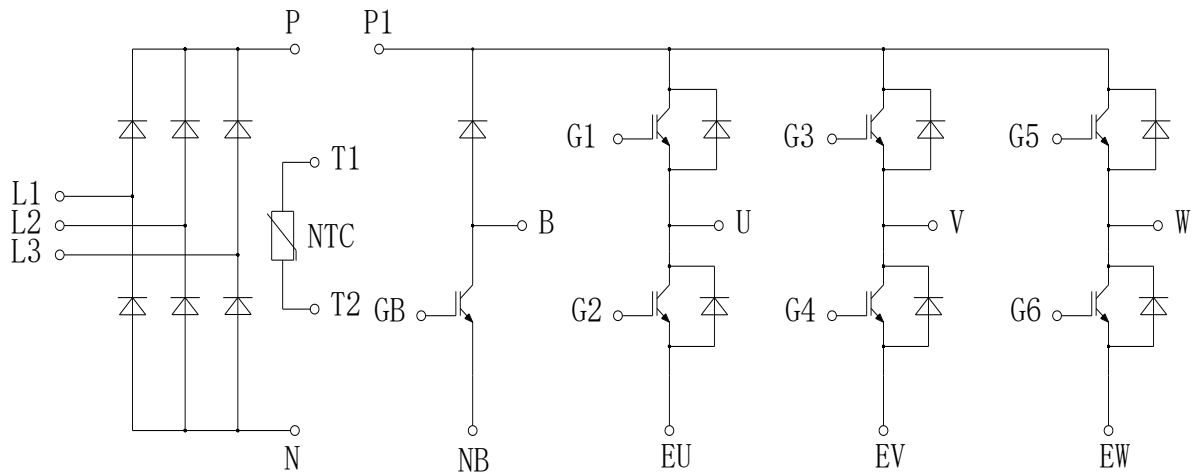




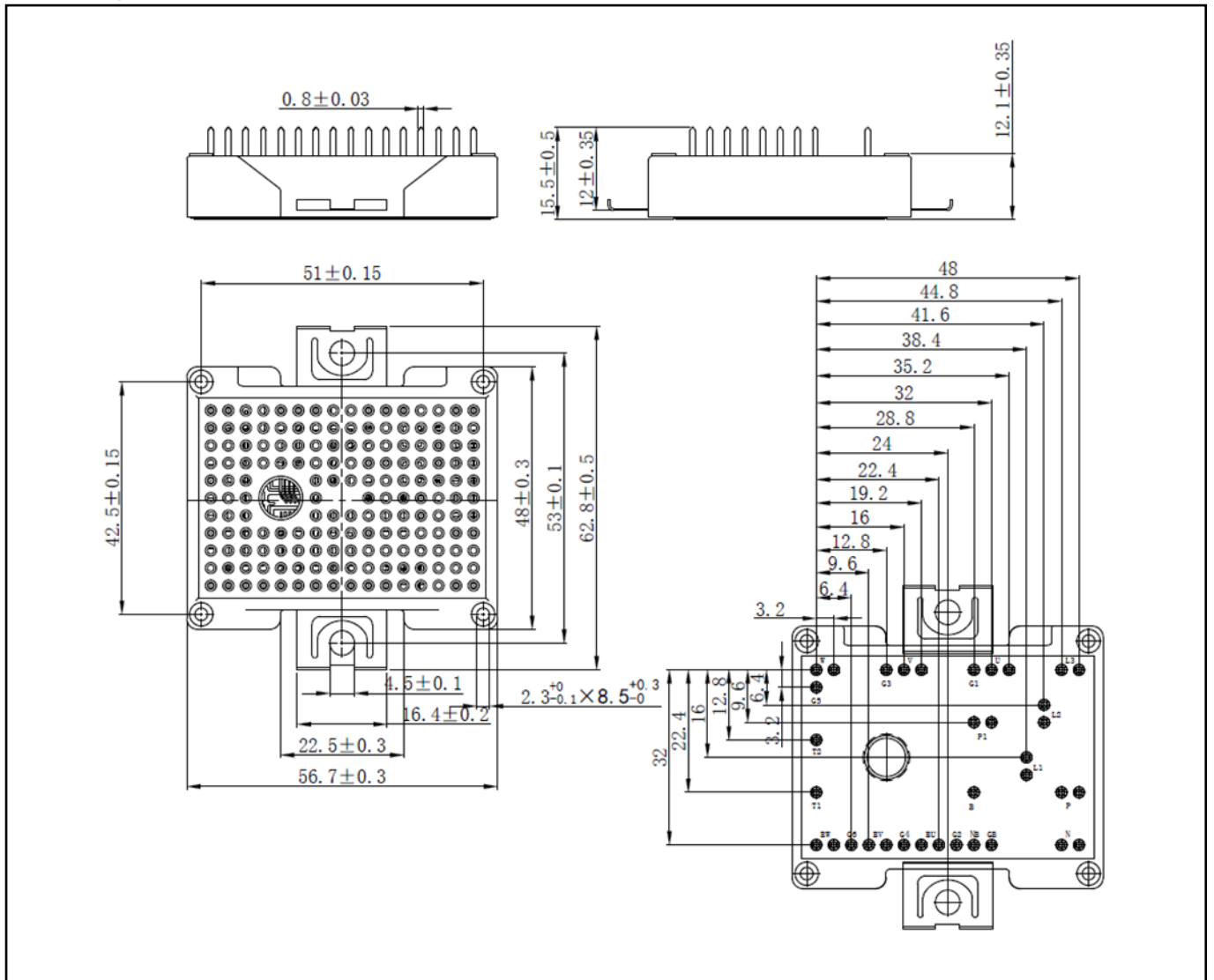




Circuit Diagram



• Package Dimensions





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