



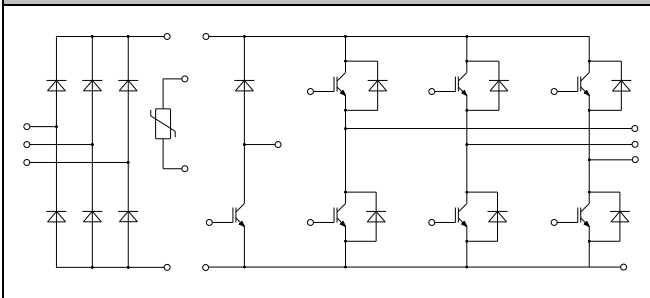
IGBT Modules

V_{CES}	1200V
I_C	25A

Applications

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

Circuit



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(8us)
- 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	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	25	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	50	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	154	W



● IGBT- inverter

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$	5.2	5.9	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	$V_{CE(sat)}$	$I_C=25A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.6		V
		$I_C=25A, V_{GE}=15V, T_{vj}=125^{\circ}C$		1.8		
		$I_C=25A, V_{GE}=15V, T_{vj}=150^{\circ}C$		1.9		
Gate Charge	Q_G			0.19		uC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		2.83		nF
Reverse Transfer Capacitance	C_{res}			0.036		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=25A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=6.2\Omega$ $T_{vj}=25^{\circ}C$		42		ns
Rise Time	t_r			15		ns
Turn-off Delay Time	$t_{d(off)}$			159		ns
Fall Time	t_f			215		ns
Energy Dissipation During Turn-on Time	E_{on}			1.83		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.65		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=25A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=6.2\Omega$ $T_{vj}=150^{\circ}C$		15		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$			192		ns
Fall Time	t_f			346		ns
Energy Dissipation During Turn-on Time	E_{on}			2.6		mJ
Energy Dissipation During Turn-off Time	E_{off}			2.3		mJ
SC Data	I_{SC}	$t_p \leq 8\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{CC}=600V, V_{CEM} \leq 1200V$		100		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		25	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	50	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=25A, T_{vj}=25^{\circ}C$		1.80		V
		$I_F=25A, T_{vj}=125^{\circ}C$		1.70		
		$I_F=25A, T_{vj}=150^{\circ}C$		1.65		
Recovered Charge	Q_{rr}	$I_F=25A$		2.22		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 900A/\mu s$		15		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^{\circ}C$		0.92		mJ
Recovered Charge	Q_{rr}	$I_F=25A$		3.79		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 900A/\mu s$		26		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^{\circ}C$		1.7		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}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	119	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	5.9	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	$V_{CE(sat)}$	$I_C=15A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.6		V
		$I_C=15A, V_{GE}=15V, T_{vj}=125^{\circ}C$		1.8		
		$I_C=15A, V_{GE}=15V, T_{vj}=150^{\circ}C$		1.9		
Gate Charge	Q_G			0.14		uC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		1.72		nF
Reverse Transfer Capacitance	C_{res}			0.02		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=15A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=7.5\Omega$ $T_{vj}=25^{\circ}C$		8		ns
Rise Time	t_r			9		ns
Turn-off Delay Time	$t_{d(off)}$			107		ns
Fall Time	t_f			268		ns
Energy Dissipation During Turn-on Time	E_{on}			0.76		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.16		mJ



Turn-on Delay Time	$t_{d(on)}$	$I_C=15A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=7.5\Omega$ $T_{vj}=150^\circ C$		9		ns
Rise Time	t_r			10		ns
Turn-off Delay Time	$t_{d(off)}$			157		ns
Fall Time	t_f			393		ns
Energy Dissipation During Turn-on Time	E_{on}			0.96		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.38		mJ
SC Data	I_{SC}	$t_p \leq 8\mu s, V_{GE}=15V, T_{vj}=150^\circ C,$ $V_{CC}=600V, V_{CEM} \leq 1200V$		48		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		15	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	30	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=15A, T_{vj}=25^\circ C$		1.85	2.80	V
		$I_F=15A, T_{vj}=125^\circ C$		1.65		
		$I_F=15A, T_{vj}=150^\circ C$		1.55		
Recovered Charge	Q_{rr}	$I_F=15A$		1.25		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 1000A/\mu s$		13		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^\circ C$		0.44		mJ
Recovered Charge	Q_{rr}	$I_F=15A$		2.58		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 1000A/\mu s$		21		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^\circ C$		0.98		mJ



● Diode-rectifier

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}\text{C}$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_C=100^{\circ}\text{C}$	35	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_C=100^{\circ}\text{C}$	60	A
Surge Forward Current	I_{FSM}	$V_R=0V, t_p=10\text{ms}, T_{vj}=25^{\circ}\text{C}$	370	A
		$V_R=0V, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	300	A
I^2t -value	I^2t	$V_R=0V, t_p=10\text{ms}, T_{vj}=25^{\circ}\text{C}$	680	A^2s
		$V_R=0V, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	430	A^2s

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	$I_F=25\text{A}, T_{vj}=150^{\circ}\text{C}$		1.1		V
Reverse Current	I_R	$T_{vj}=150^{\circ}\text{C}, V_R=1600\text{V}$			2.0	mA

● NTC-Thermistor

Characteristic Values

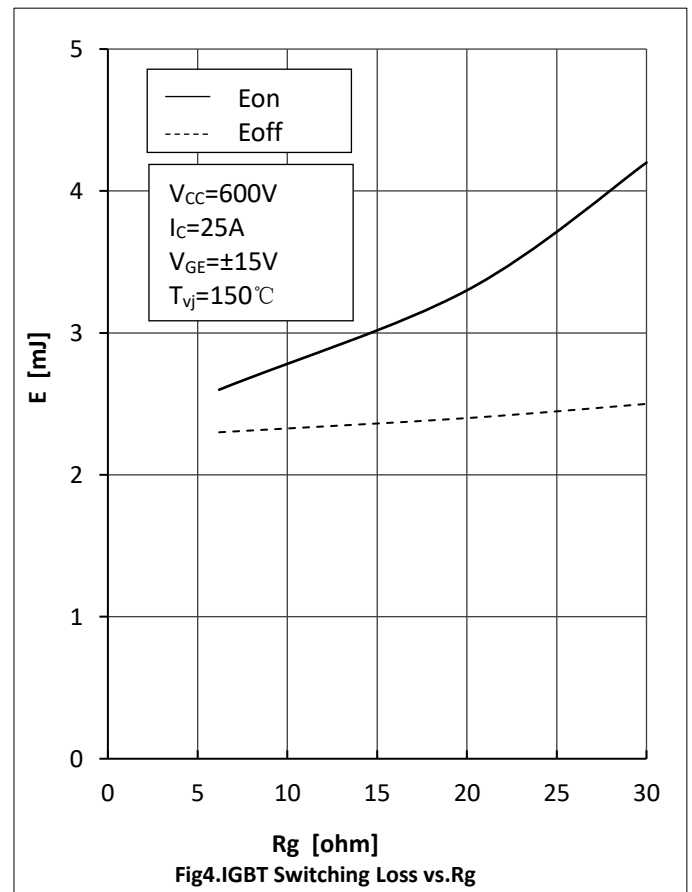
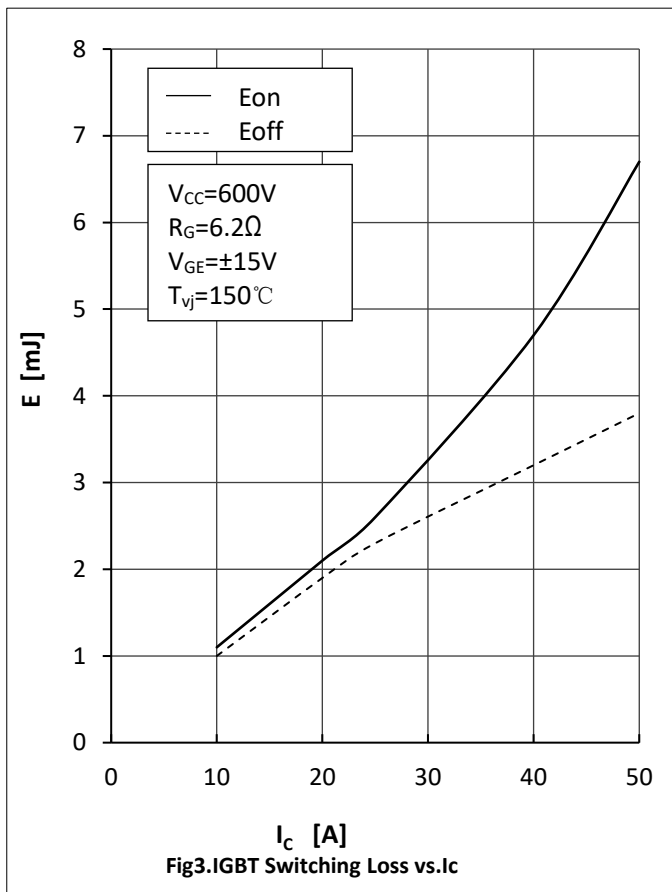
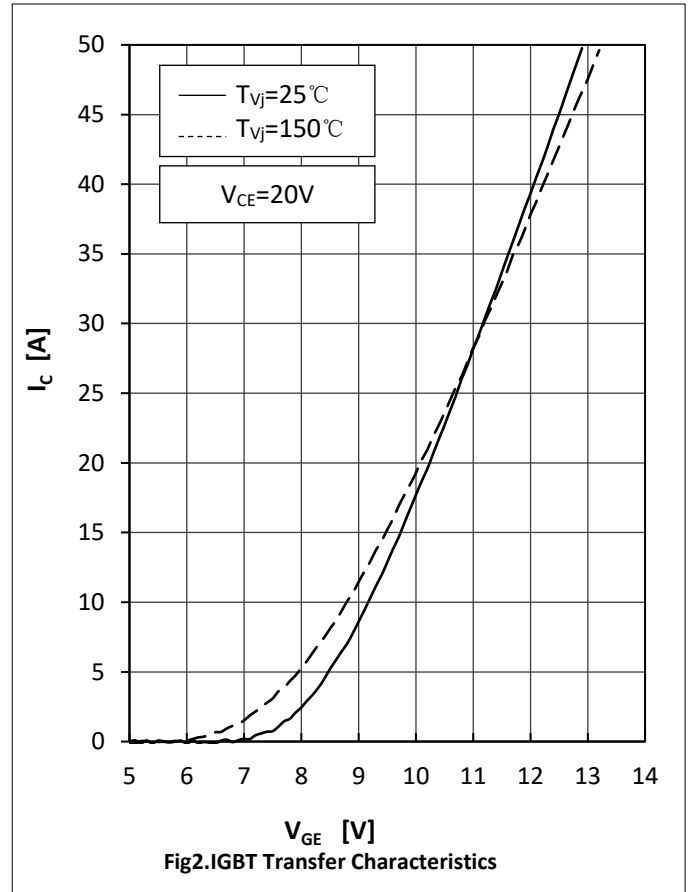
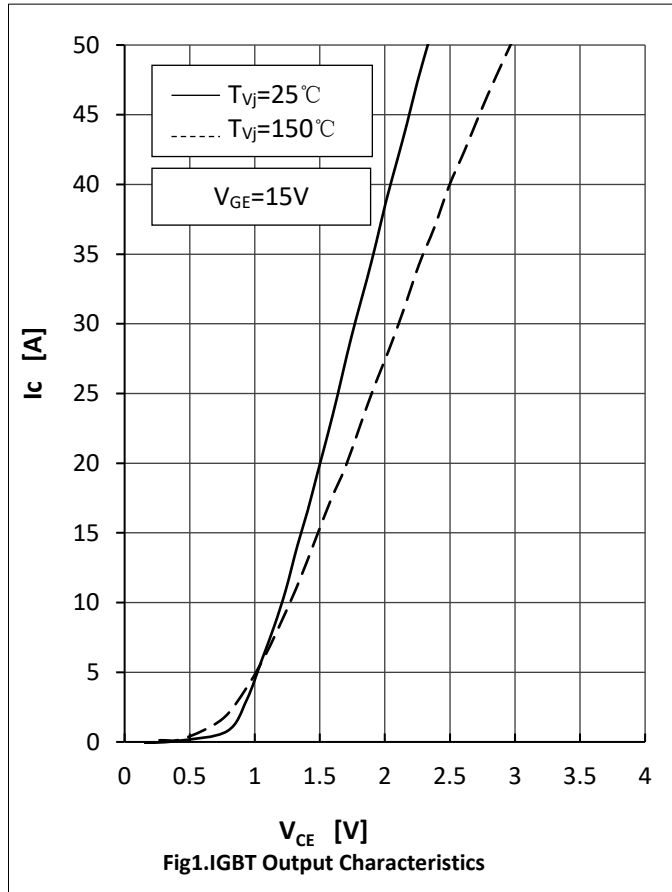
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R_{25}			5.0		k Ω
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3\Omega$	-5		5	%
Power Dissipation	P_{25}				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

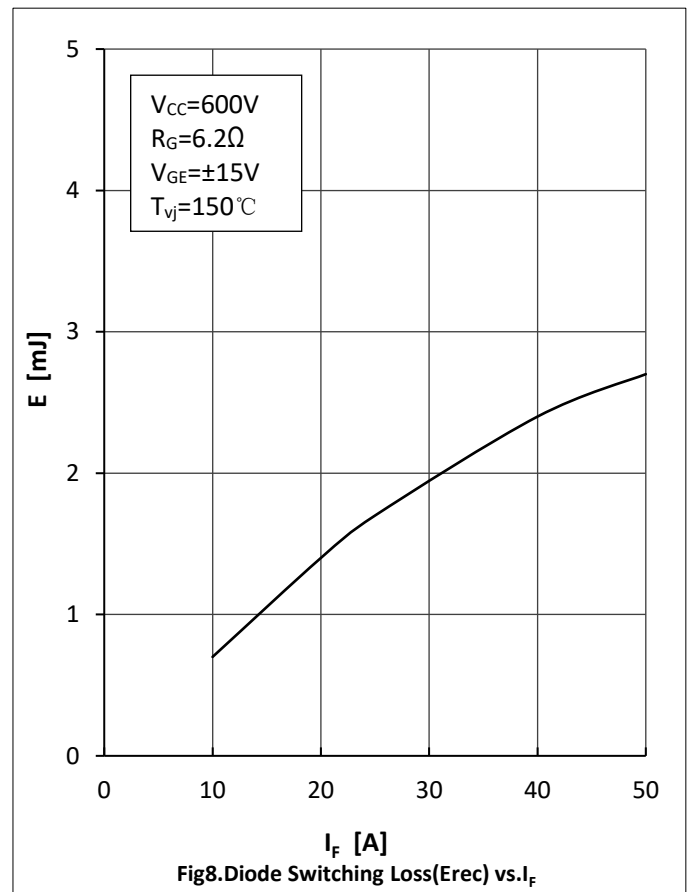
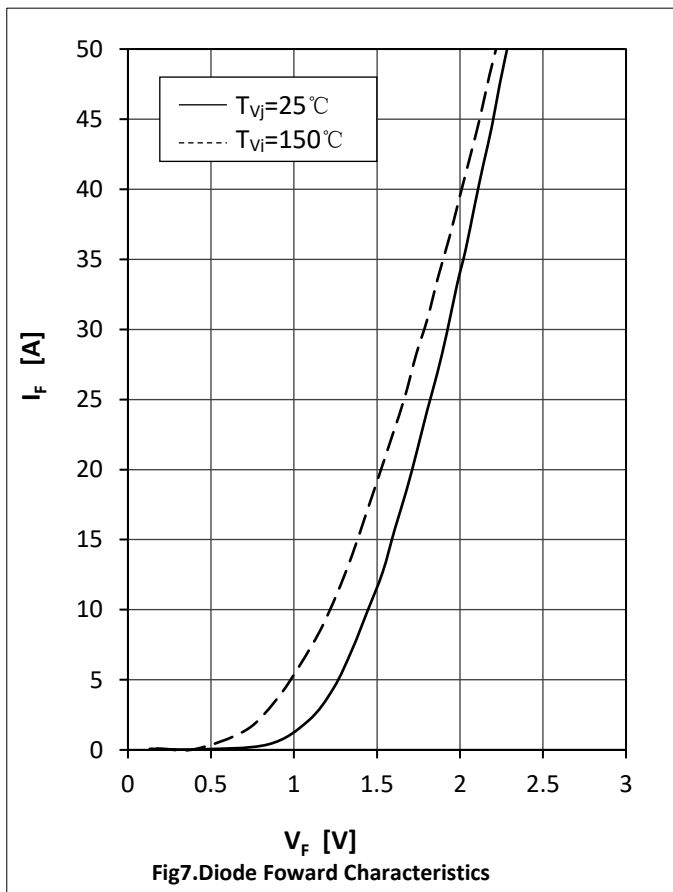
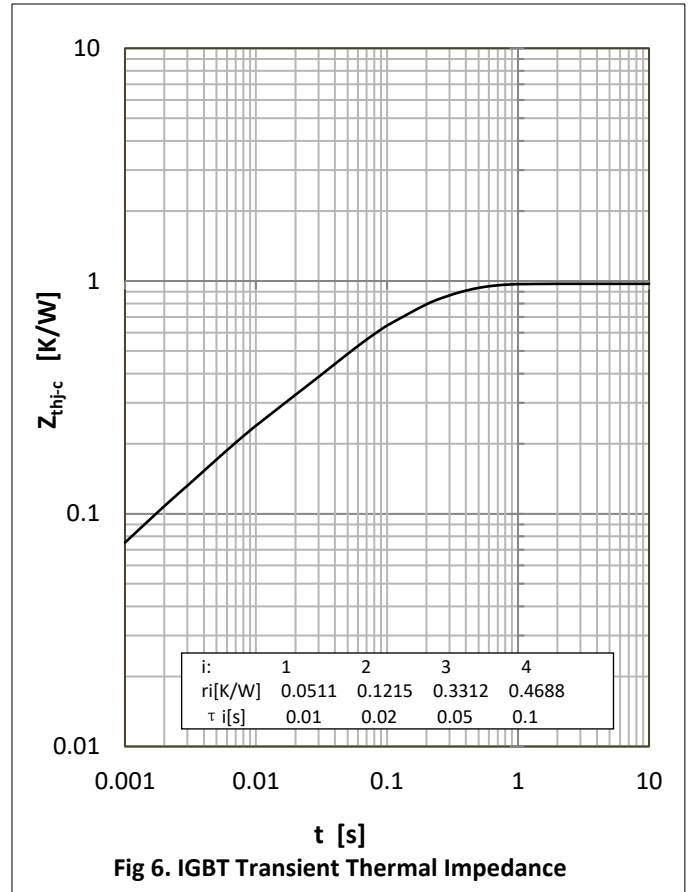
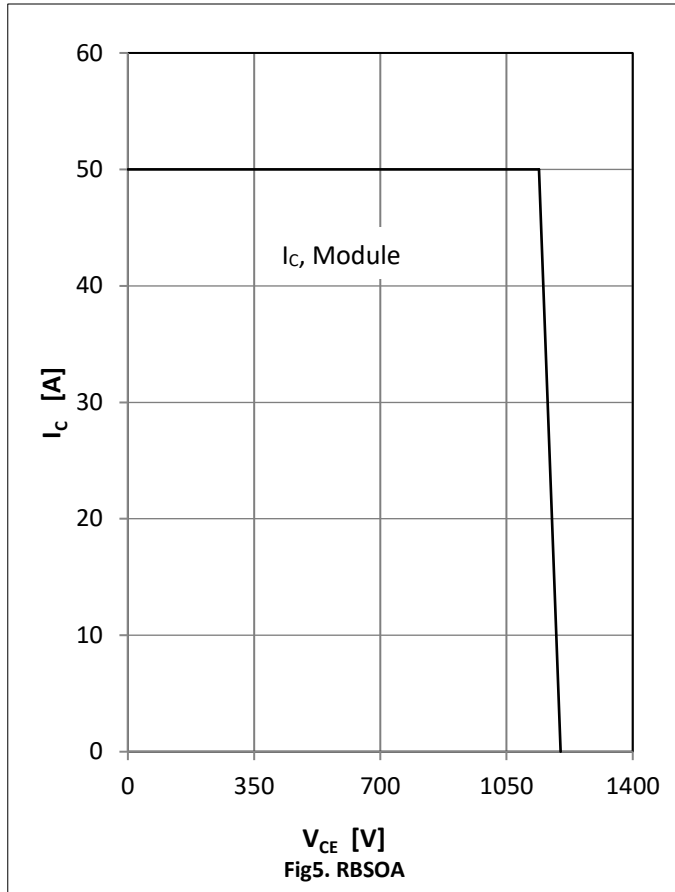


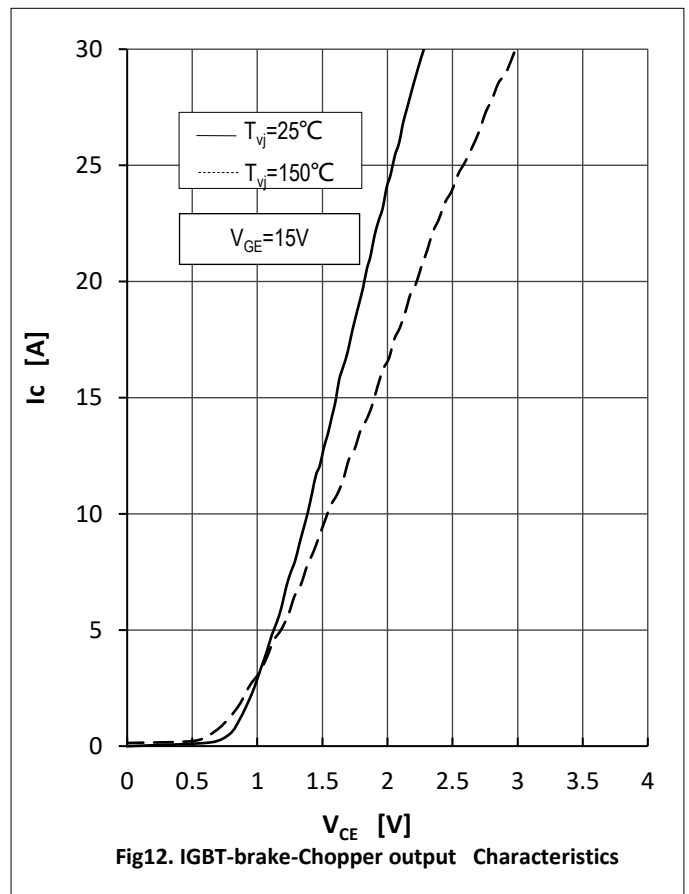
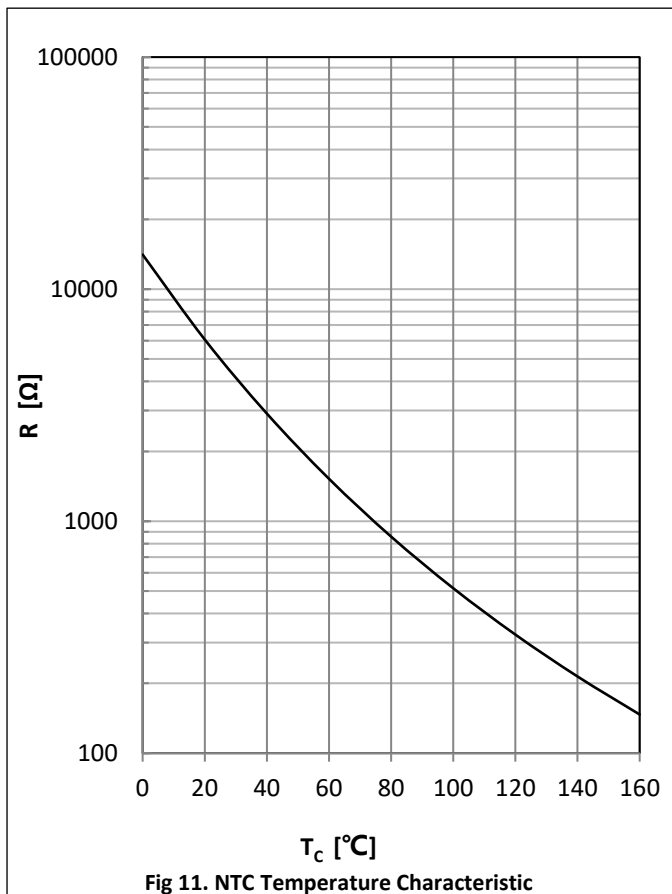
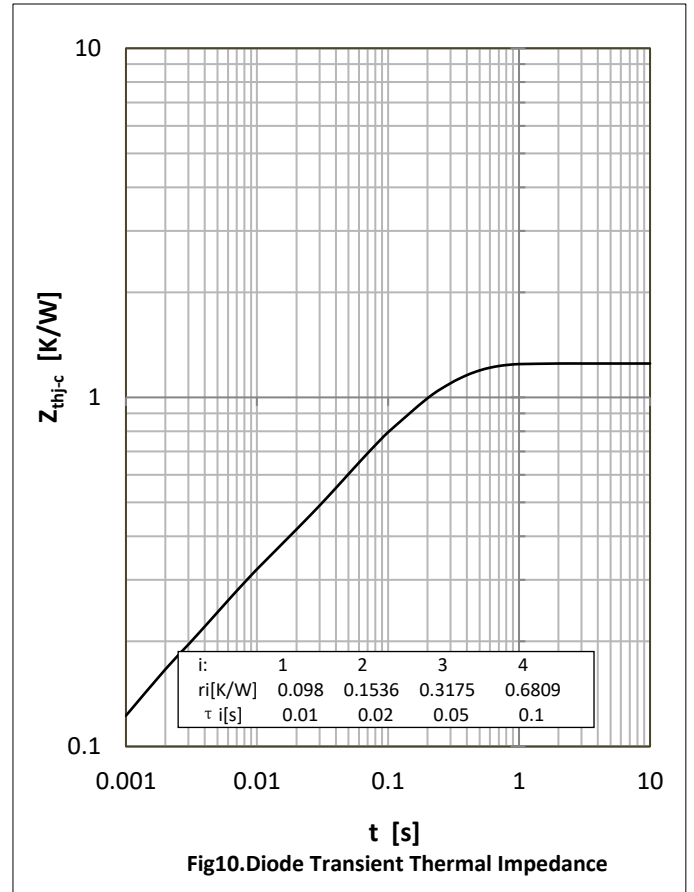
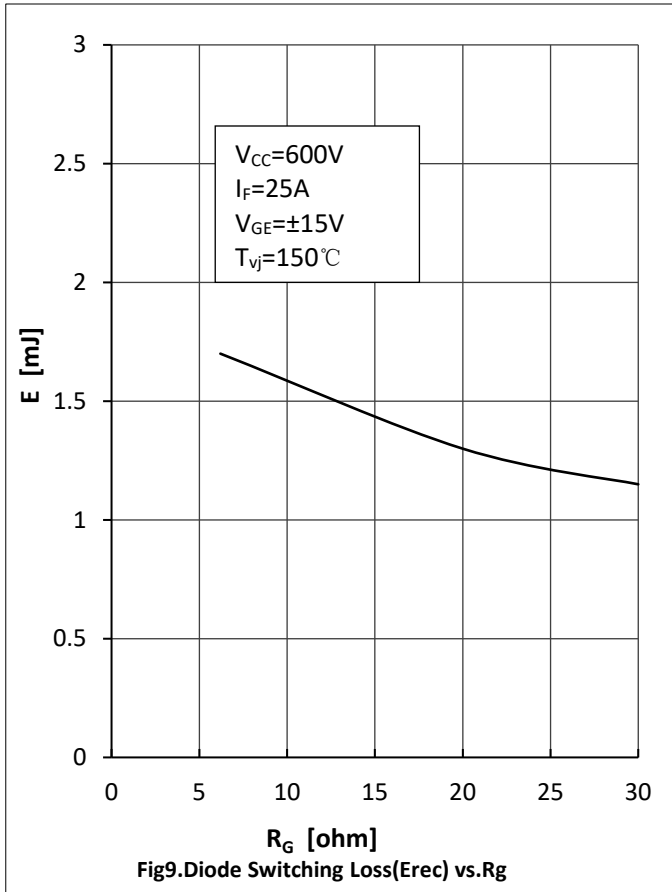
● Module Characteristics

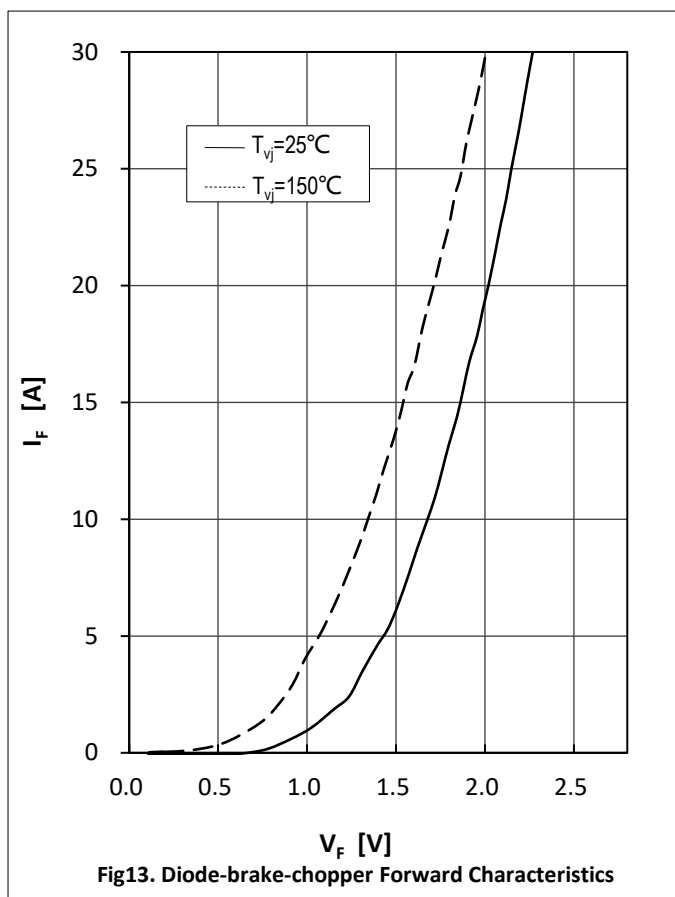
 $T_C=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation Voltage	V_{isol}	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	T_{jmax}				175	$^{\circ}\text{C}$
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Storage Temperature	T_{stg}		-40		125	$^{\circ}\text{C}$
Stray-inductance-module	L_{SCE}			60		nH
Module Lead Resistance, terminals-chip	$R_{\text{CC}'+\text{EE}'}$	$T_C=25^{\circ}\text{C}$, per switch		4.0		m Ω
	$R_{\text{AA}'+\text{CC}'}$			3.0		
Thermal Resistance Junction to Case	$R_{\theta\text{JC}}$	per IGBT-inverter			0.97	K/W
		per Diode-inverter			1.25	
		per IGBT-brake-chopper			1.26	
		per Diode-chopper			1.27	
		per Diode-rectifier			0.87	
Thermal Resistance Case to Sink	$R_{\theta\text{CS}}$	per Module		0.02		K/W
Module-to-Sink Torque	M_s		3.0		6.0	N·m
Weight of Module	G			180		g



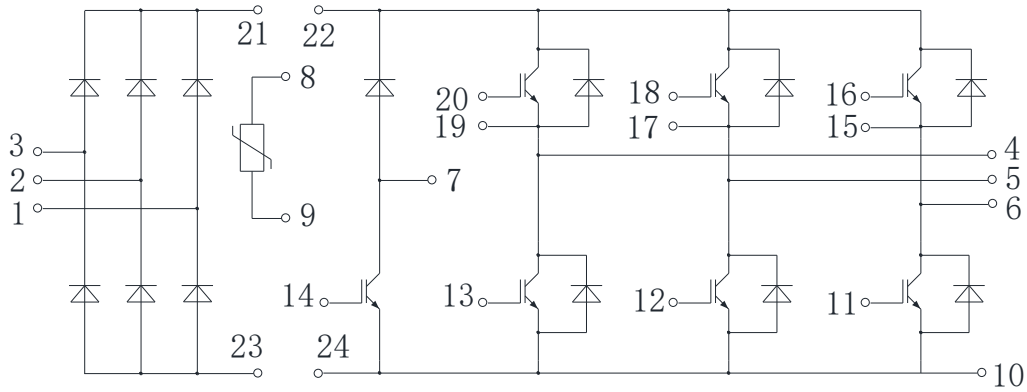




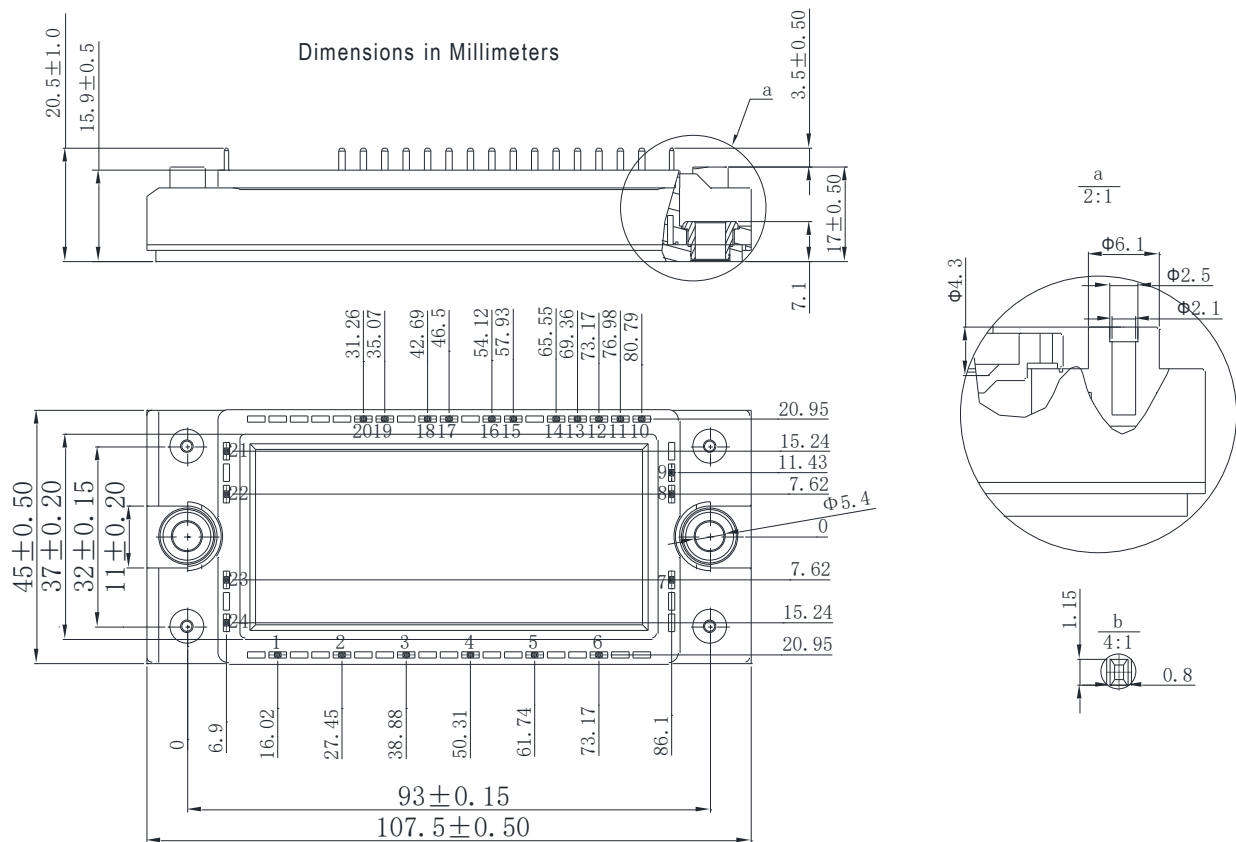




● Circuit Diagram



● Package Outline Information





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