



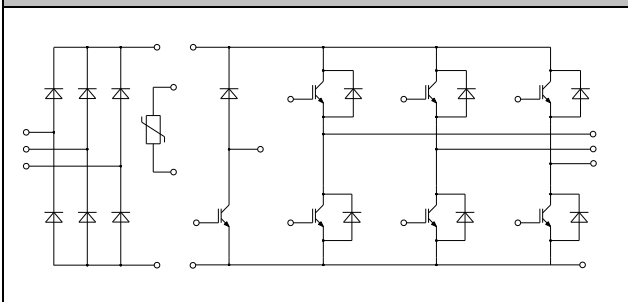
IGBT Modules

V_{CES}	1200V
I_C	75A

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	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	75	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	150	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	319	W



● IGBT- inverter

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=2.8mA, T_{vj}=25^{\circ}C$	5.0	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	$V_{CE(sat)}$	$I_C=75A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.60		V
		$I_C=75A, V_{GE}=15V, T_{vj}=125^{\circ}C$		1.85		
		$I_C=75A, V_{GE}=15V, T_{vj}=150^{\circ}C$		1.90		
Gate Charge	Q_G			0.79		uC
Internal Gate Resistance	R_{gint}			2.73		Ω
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		9.9		nF
Reverse Transfer Capacitance	C_{res}			0.1		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=75A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.6\Omega$ $T_{vj}=25^{\circ}C$		95		ns
Rise Time	t_r			31		ns
Turn-off Delay Time	$t_{d(off)}$			240		ns
Fall Time	t_f			255		ns
Energy Dissipation During Turn-on Time	E_{on}			3.4		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.8		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=75A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.6\Omega$ $T_{vj}=150^{\circ}C$		102		ns
Rise Time	t_r			36		ns
Turn-off Delay Time	$t_{d(off)}$			289		ns
Fall Time	t_f			423		ns
Energy Dissipation During Turn-on Time	E_{on}			5.7		mJ
Energy Dissipation During Turn-off Time	E_{off}			8.4		mJ
SC Data	I_{SC}	$t_p \leq 8\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{CC}=600V, V_{CEM} \leq 1200V$		300		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		75	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	150	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=75A, T_{vj}=25^{\circ}C$		2.25	2.80	V
		$I_F=75A, T_{vj}=125^{\circ}C$		1.90		
		$I_F=75A, T_{vj}=150^{\circ}C$		1.80		
Recovered Charge	Q_{rr}	$I_F=75A$ $V_R=600V$ $-di_F/dt = 1800A/us$ $T_{vj}=25^{\circ}C$		2.99		μC
Peak Reverse Recovery Current	I_{rr}			43		A
Reverse Recovery Energy	E_{rec}			0.97		mJ
Recovered Charge	Q_{rr}	$I_F=75A$ $V_R=600V$ $-di_F/dt = 1800A/us$ $T_{vj}=150^{\circ}C$		8.07		μC
Peak Reverse Recovery Current	I_{rr}			65		A
Reverse Recovery Energy	E_{rec}			2.8		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	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	50	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	100	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	250	W

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.7mA, T_{vj}=25^{\circ}C$	5.0	5.7	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	$V_{CE(sat)}$	$I_C=50A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.75		V
		$I_C=50A, V_{GE}=15V, T_{vj}=125^{\circ}C$		1.90		
		$I_C=50A, V_{GE}=15V, T_{vj}=150^{\circ}C$		1.95		
Gate Charge	Q_G			0.47		μC
Internal Gate Resistance	R_{gint}			2.2		Ω
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		6.1		nF
Reverse Transfer Capacitance	C_{res}			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	$t_{d(on)}$	$I_C=50A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.8\Omega$ $T_{vj}=25^{\circ}C$		38		ns
Rise Time	t_r			61		ns
Turn-off Delay Time	$t_{d(off)}$			132		ns
Fall Time	t_f			269		ns
Energy Dissipation During Turn-on Time	E_{on}			3.4		mJ
Energy Dissipation During Turn-off Time	E_{off}			3.3		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=50A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.8\Omega$ $T_{vj}=150^{\circ}C$		37		ns
Rise Time	t_r			58		ns
Turn-off Delay Time	$t_{d(off)}$			166		ns
Fall Time	t_f			435		ns
Energy Dissipation During Turn-on Time	E_{on}			5.0		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.1		mJ
SC Data	I_{SC}	$t_p \leq 8\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{CC}=600V, V_{CEM} \leq 1200V$		220		A



● Diode-brake-chopper

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		25	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1\text{ms}$	50	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max	
Forward Voltage	V_F	$I_F=25\text{A}, T_{vj}=25^{\circ}\text{C}$		1.85	2.80	V
		$I_F=25\text{A}, T_{vj}=125^{\circ}\text{C}$		1.65		
		$I_F=25\text{A}, T_{vj}=150^{\circ}\text{C}$		1.60		
Recovered Charge	Q_{rr}	$I_F=25\text{A}$		0.65		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt = 1600\text{A}/\mu\text{s}$		20		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^{\circ}\text{C}$		0.71		mJ
Recovered Charge	Q_{rr}	$I_F=25\text{A}$		2.98		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt = 1600\text{A}/\mu\text{s}$		21		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^{\circ}\text{C}$		1.25		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	$I_{F(AV)}$	$T_C=100^{\circ}\text{C}$	75	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_C=100^{\circ}\text{C}$	115	A
Surge Forward Current	I_{FSM}	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=25^{\circ}\text{C}$	780	A
		$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	650	A
I^2t -value	I^2t	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=25^{\circ}\text{C}$	3000	A^2s
		$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	2100	A^2s

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	$I_F=75\text{A}, T_{vj}=150^{\circ}\text{C}$		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

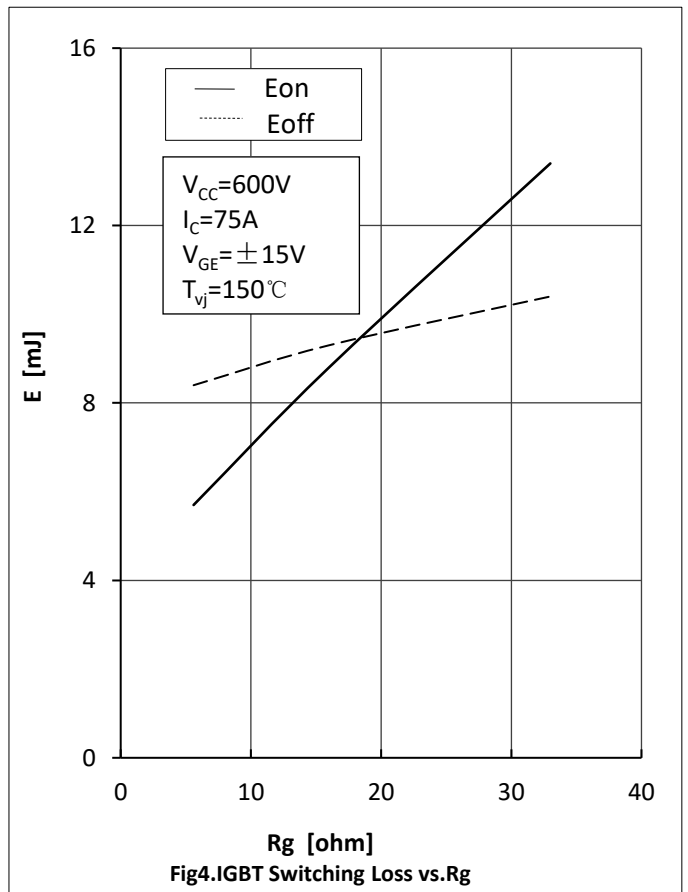
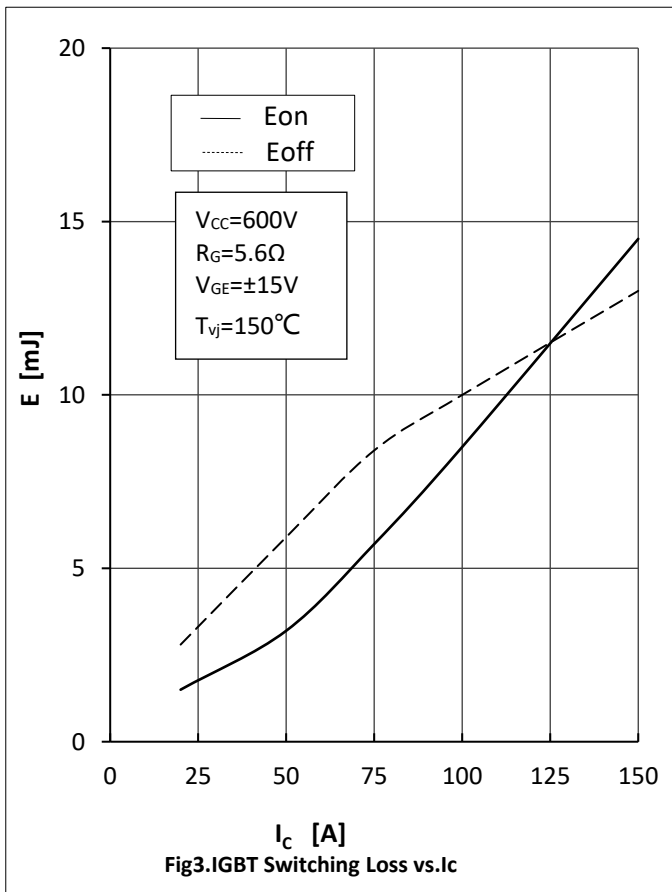
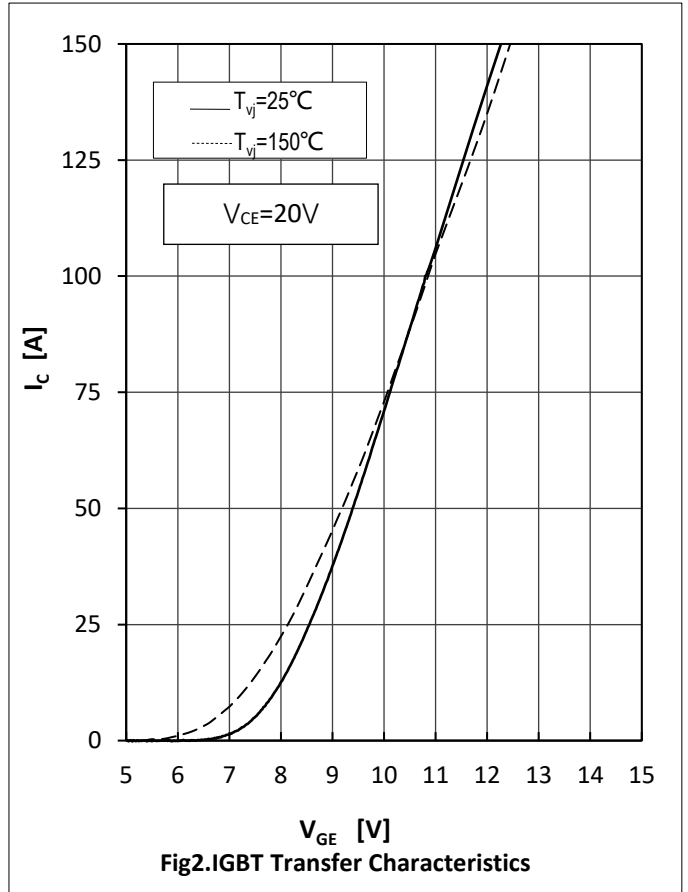
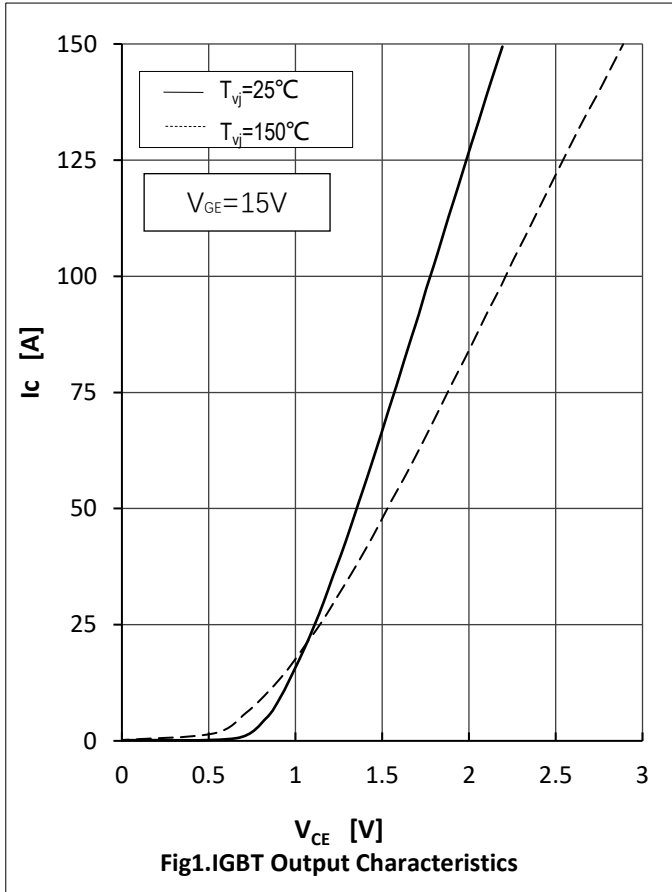
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			Min.	Typ.	Max.	
Rated Resistance	R_{25}			5.0		k Ω
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3\Omega$	-5		5	%
Power Dissipation	P_{25}				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

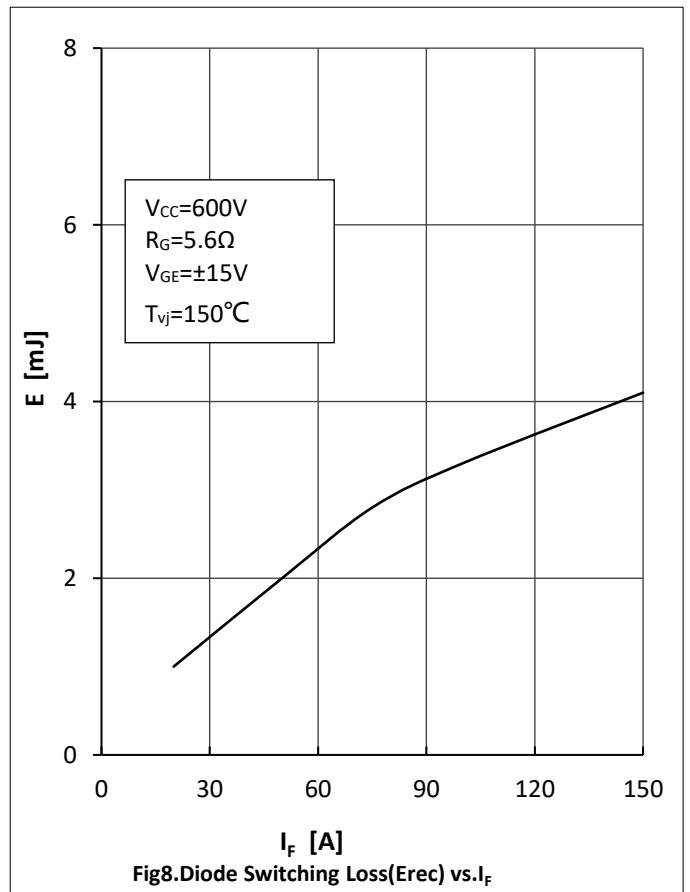
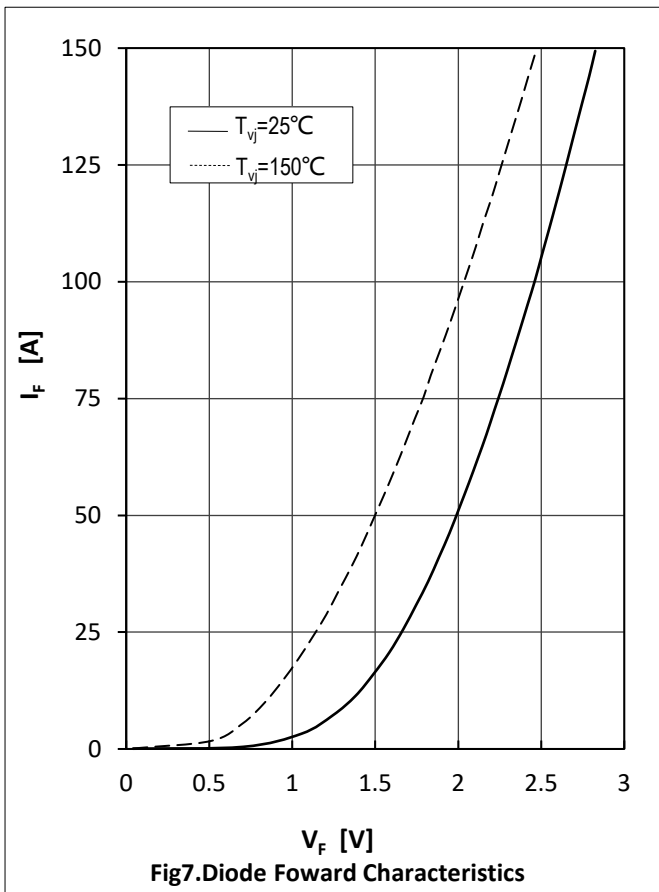
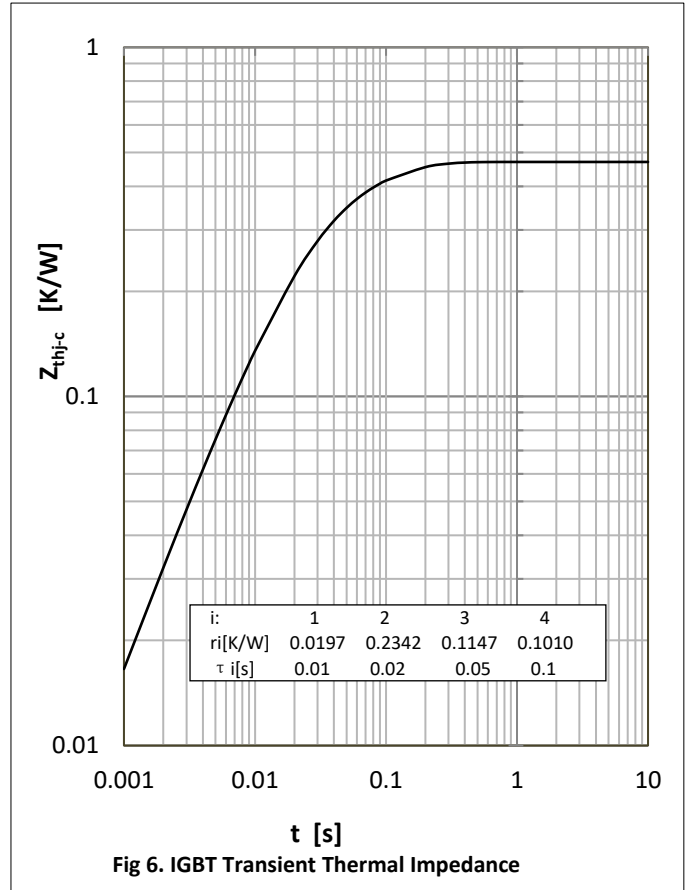
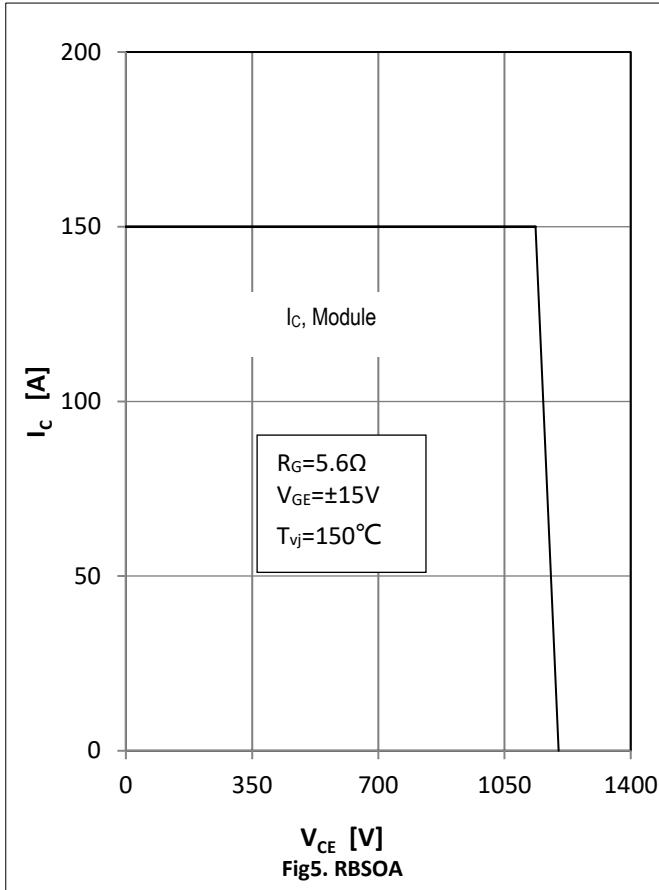


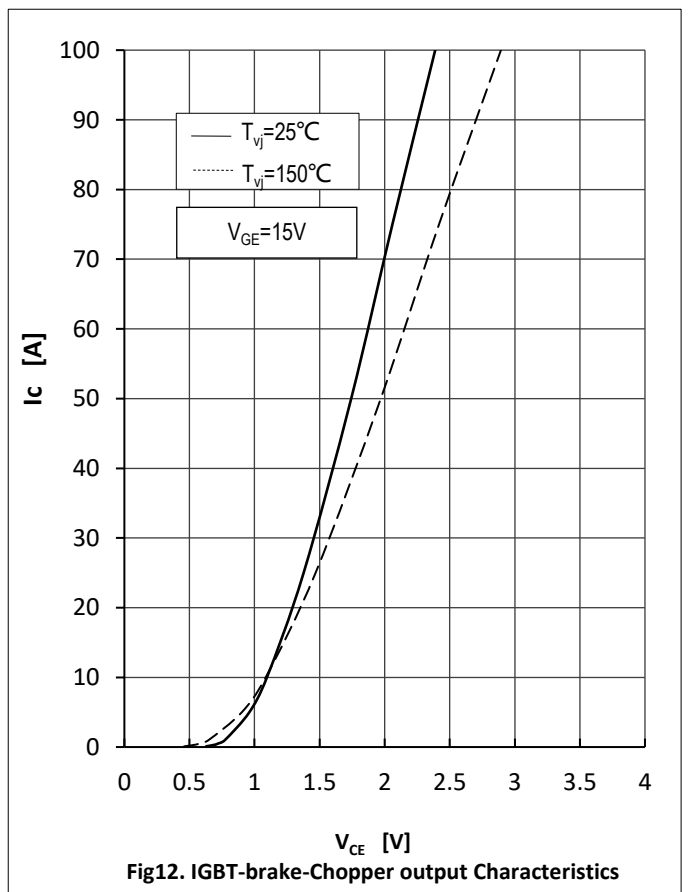
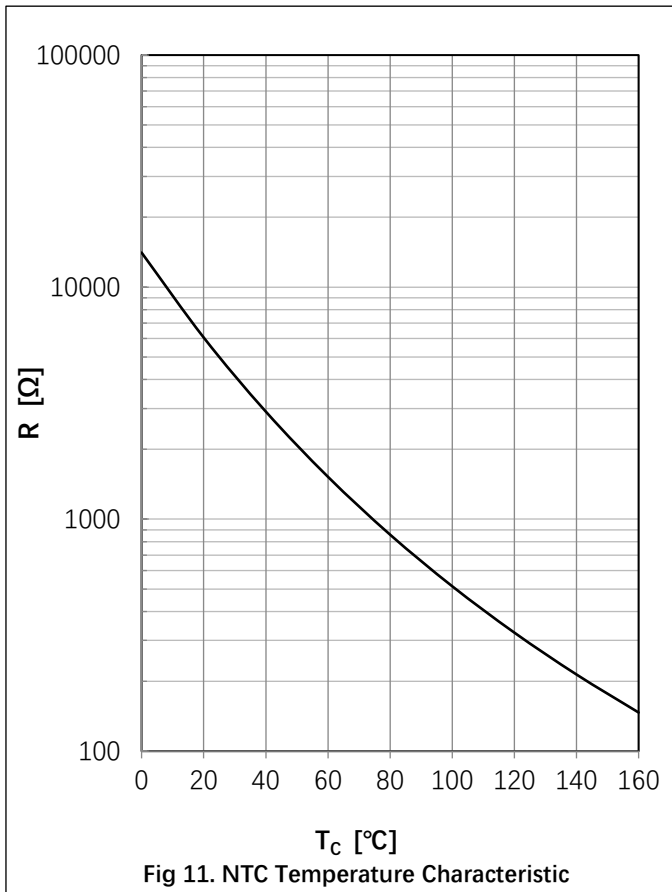
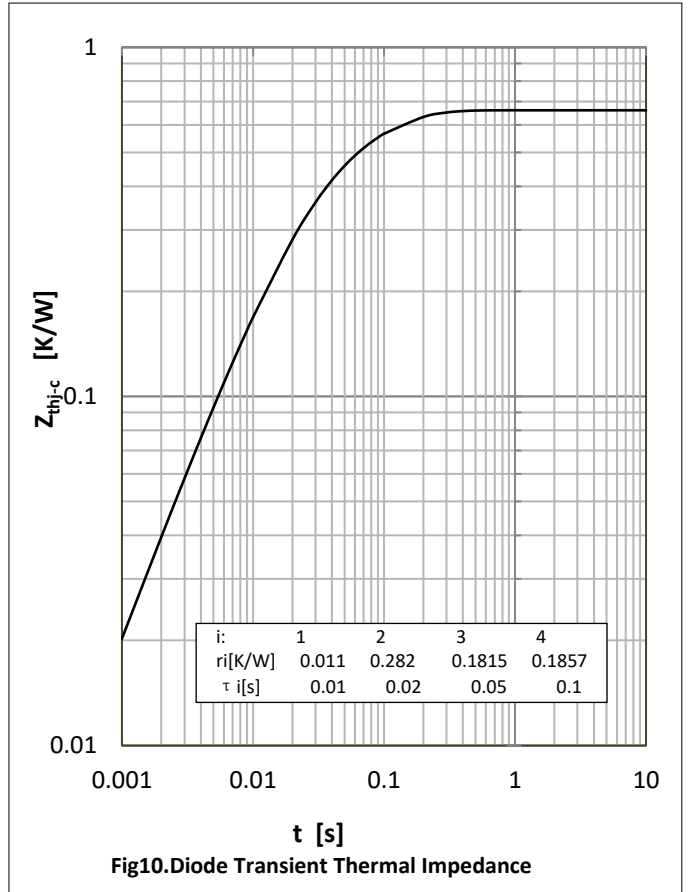
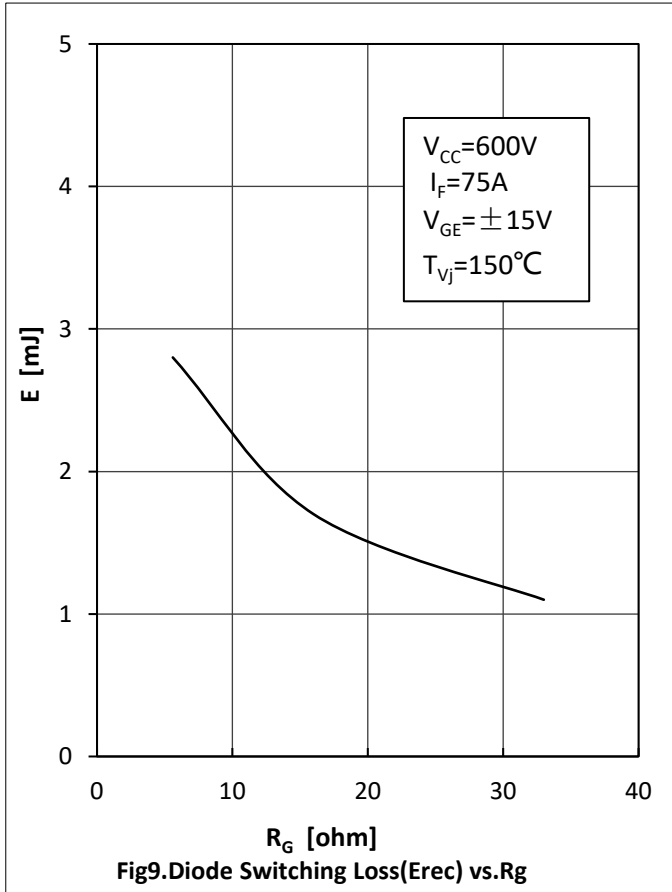
● Module Characteristics

 $T_C=25^{\circ}\text{C}$ 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
Comparative Tracking Index	CTI		200			
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			0.47	K/W
		per Diode-inverter			0.67	
		per IGBT-brake-chopper			0.60	
		per Diode-brake-chopper			1.2	
		per Diode-rectifier			0.6	
Thermal Resistance Case to Sink	$R_{\theta\text{CS}}$	per Module		0.009		K/W
Module-to-Sink Torque	M_s		3.0		6.0	N·m
Weight of Module	G			300		g







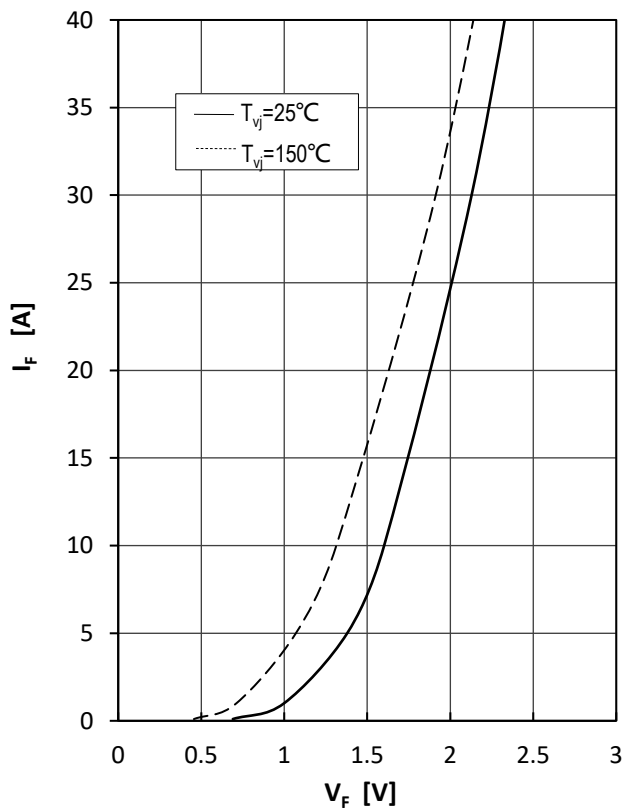


Fig13.Diode-brake-chopper Forward Characteristics

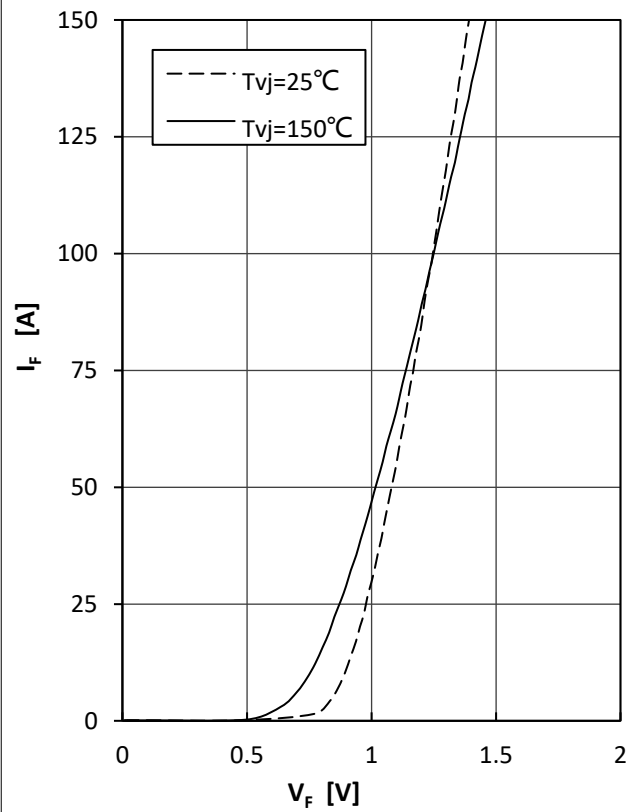
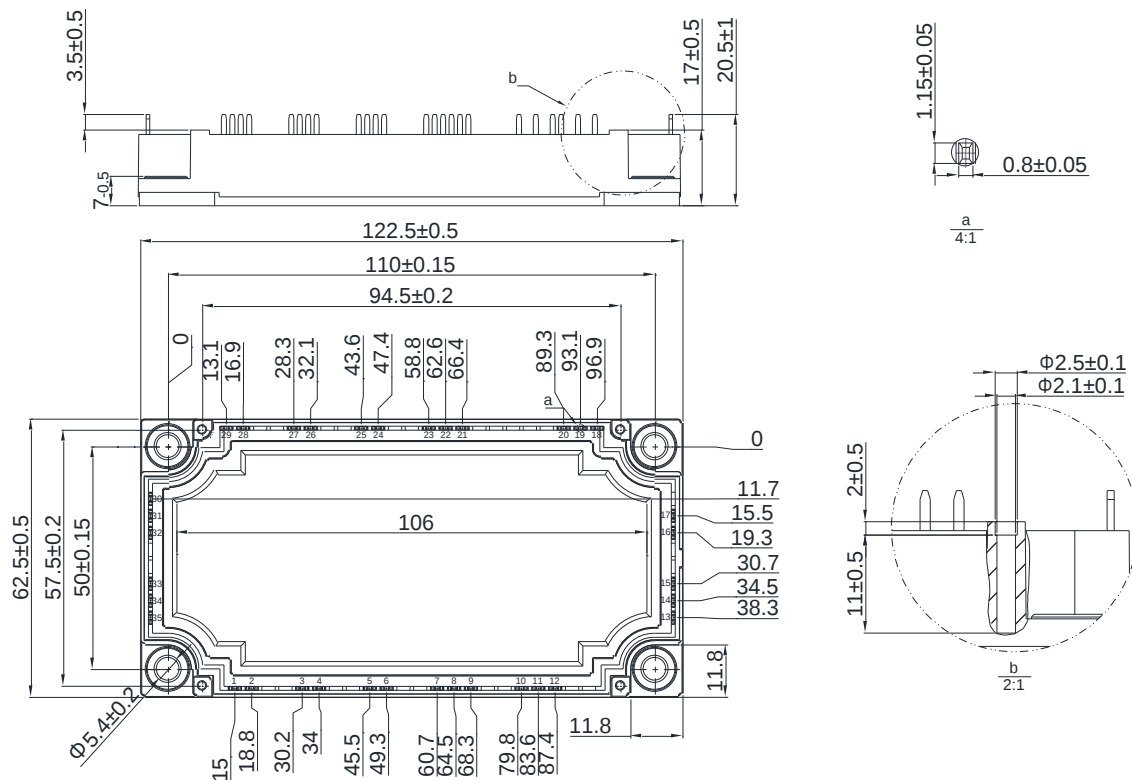
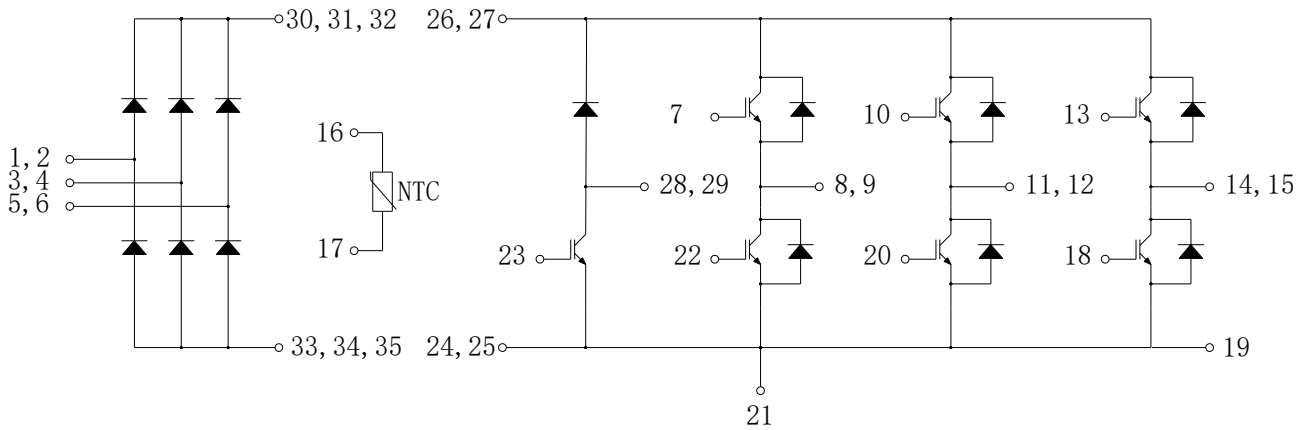


Fig14.Diode-Rectifier Forward Characteristics





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