



E502650

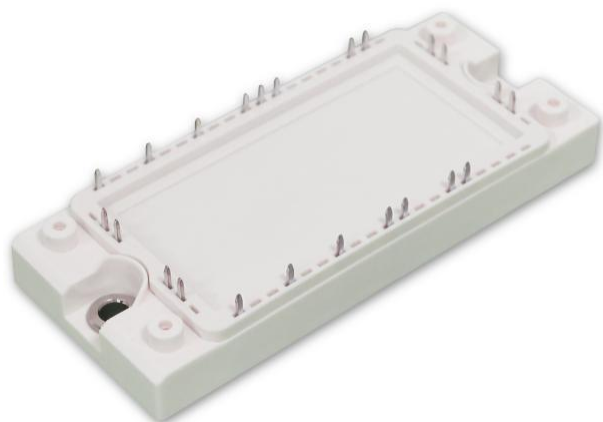
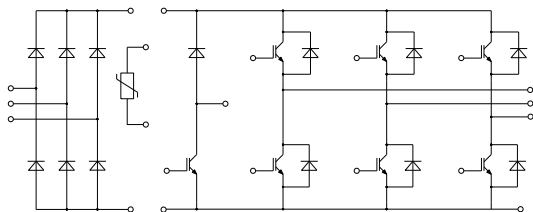
Features

- 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(10 μ s)
- Maximum Junction Temperature 175°C

Applications

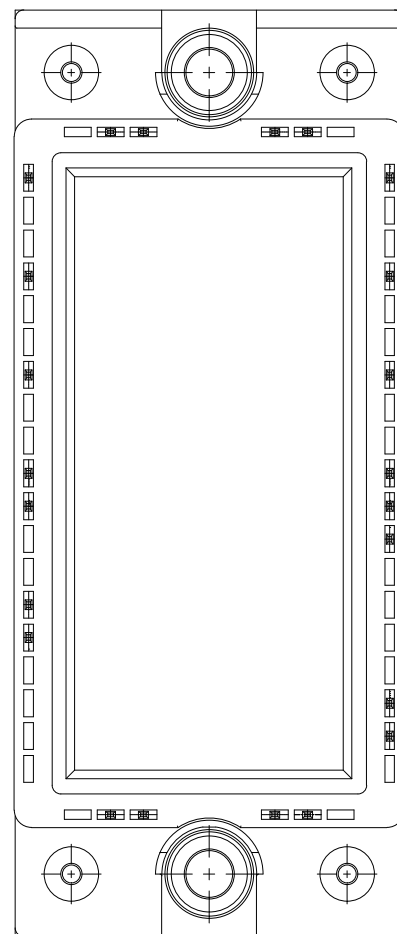
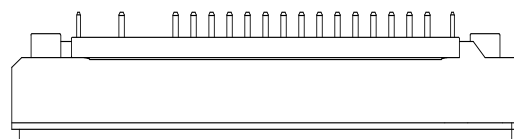
- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

Circuit Diagram



IGBT Modules 1200V 35A

E1A



● IGBT- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	35	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	70	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	227	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$	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	mA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=35A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.3	V	
		$I_C=35A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15			
		$I_C=35A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25			
Gate Charge	Q_g			0.35		μC	
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		2.25		nF	
Reverse Transfer Capacitance	C_{res}			0.1			
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=35A, V_{GE}=\pm 15V, R_G=13\Omega, T_{vj}=25^{\circ}C$		185		ns	
Rise Time	t_r			24			
Turn-Off Delay Time	$t_{d(off)}$			340			
Fall Time	t_f			70			
Turn-on Time	E_{on}			3.48			mJ
Turn-off Time	E_{off}			1.65			
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=35A, V_{GE}=\pm 15V, R_G=13\Omega, T_{vj}=125^{\circ}C$		212		ns	
Rise Time	t_r			28			
Turn-Off Delay Time	$t_{d(off)}$			450			
Fall Time	t_f			85			
Turn-On Energy	E_{on}			5.12			mJ
Turn-Off Energy	E_{off}			2.54			
SC Data	I_{SC}	$t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$		180		A	

● Diode- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1200	V
Continuous DC Forward Current	I_F		35	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	70	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$	240	A^2s
		$V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$	220	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	$I_F=35A, T_{vj}=25^{\circ}C$		1.95		V
		$I_F=35A, T_{vj}=125^{\circ}C$		1.75		
		$I_F=35A, T_{vj}=150^{\circ}C$		1.71		
Recovered Charge	Q_{rr}	$I_F=35A, V_R=600V,$ $-di_F/dt=1200A/\mu s,$ $T_{vj}=25^{\circ}C$		3.75		μC
Peak Reverse Recovery Current	I_{rr}			30		A
Reverse Recovery Energy	E_{rec}			1.3		mJ
Recovered Charge	Q_{rr}	$I_F=35A, V_R=600V,$ $-di_F/dt=1200A/\mu s,$ $T_{vj}=125^{\circ}C$		6.54		μC
Peak Reverse Recovery Current	I_{rr}			32		A
Reverse Recovery Energy	E_{rec}			2.2		mJ

● IGBT- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	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}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	166	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$	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	mA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=25A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.9	2.3	V	
		$I_C=25A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.2			
		$I_C=25A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.3			
Gate Charge	Q_g			0.24		μC	
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		1.6		nF	
Reverse Transfer Capacitance	C_{res}			0.07			
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			100	nA	
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=25A, V_{GE}=\pm 15V, R_G=18\Omega, T_{vj}=25^{\circ}C$		175		ns	
Rise Time	t_r			38			
Turn-Off Delay Time	$t_{d(off)}$			420			
Fall Time	t_f			65			
Turn-On Energy	E_{on}			1.95			mJ
Turn-Off Energy	E_{off}		1.2				
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=25A, V_{GE}=\pm 15V, R_G=18\Omega, T_{vj}=125^{\circ}C$		185		ns	
Rise Time	t_r			43			
Turn-Off Delay Time	$t_{d(off)}$			510			
Fall Time	t_f			120			
Turn-On Energy	E_{on}			2.6			mJ
Turn-Off Energy	E_{off}			2			
SC Data	I_{SC}		$t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$		135		

● Diode- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	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
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$	48	A^2s
		$V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$	42	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	$I_F=15A, T_{vj}=25^{\circ}C$		2.0		V
		$I_F=15A, T_{vj}=125^{\circ}C$		1.76		
		$I_F=15A, T_{vj}=150^{\circ}C$		1.72		
Recovered Charge	Q_{rr}	$I_F=15A, V_R=600V,$ $-di_F/dt=550A/\mu s, T_{vj}=25^{\circ}C$		1.1		μC
Peak Reverse Recovery Current	I_{rr}			12.0		A
Reverse Recovery Energy	E_{rec}			0.3		mJ
Recovered Charge	Q_{rr}	$I_F=15A, V_R=600V,$ $-di_F/dt=550A/\mu s, T_{vj}=125^{\circ}C$		1.9		μC
Peak Reverse Recovery Current	I_{rr}			14		A
Reverse Recovery Energy	E_{rec}			0.6		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_j=25^{\circ}\text{C}$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_c=100^{\circ}\text{C}$	50	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_c=100^{\circ}\text{C}$	60	A
Surge Forward Current	I_{FSM}	$V_R=0, t_p=10\text{ms}, T_{vj}=45^{\circ}\text{C}$	320	A
I^2t -value	I^2t	$V_R=0, t_p=10\text{ms}, T_{vj}=45^{\circ}\text{C}$	510	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F=35\text{A}, T_j=125^{\circ}\text{C}$		1.12		V
Reverse Current	I_R	$T_j=125^{\circ}\text{C}, V_R=1600\text{V}$			2	mA

● NTC-Thermistor

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}			5		k Ω
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3\Omega$	-5		5	%
Power Dissipation	P_{25}				20	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	Test Conditions	Min	Typ	Max	Unit
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		m Ω
	$R_{\text{AA}'+\text{CC}'}$			3		
Thermal Resistance Junction to Case	$R_{\theta\text{JC}}$	per IGBT-inverter			0.66	K/W
		per Diode-inverter			1	
		per IGBT-brake-copper			0.9	
		per Diode-chopper			1.5	
		per Diode-rectifier			0.75	
Thermal Resistance Case-to Sink	$R_{\theta\text{CS}}$	per IGBT-inverter		0.31		K/W
		per Diode-inverter		0.48		
		per IGBT-brake-copper		0.33		
		per Diode-chopper		0.70		
		per Diode-rectifier		0.36		
		per Module		0.02		
Mounting Force Per Clamp	F		3		6	N
Weight of Module	G			180		g

Curve Characteristics

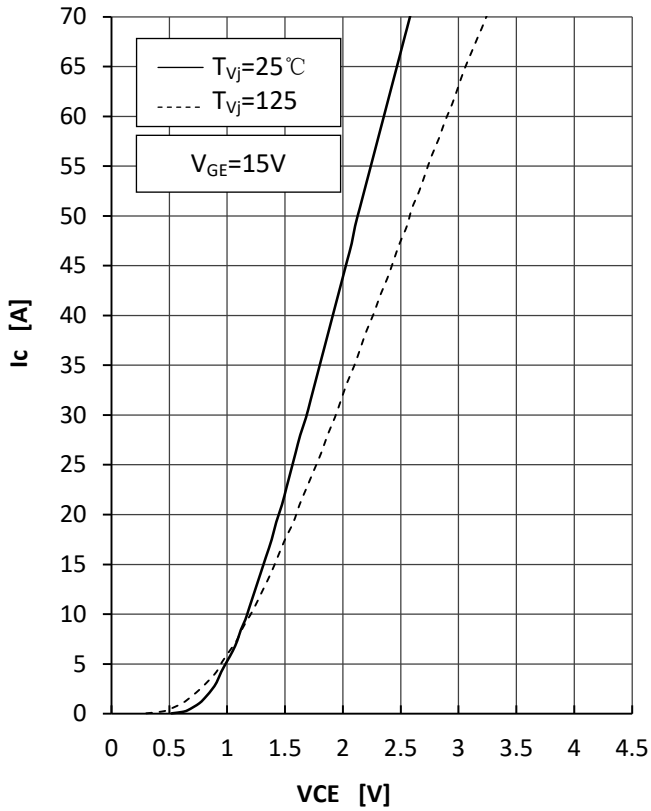


Fig1.IGBT Output Characteristics

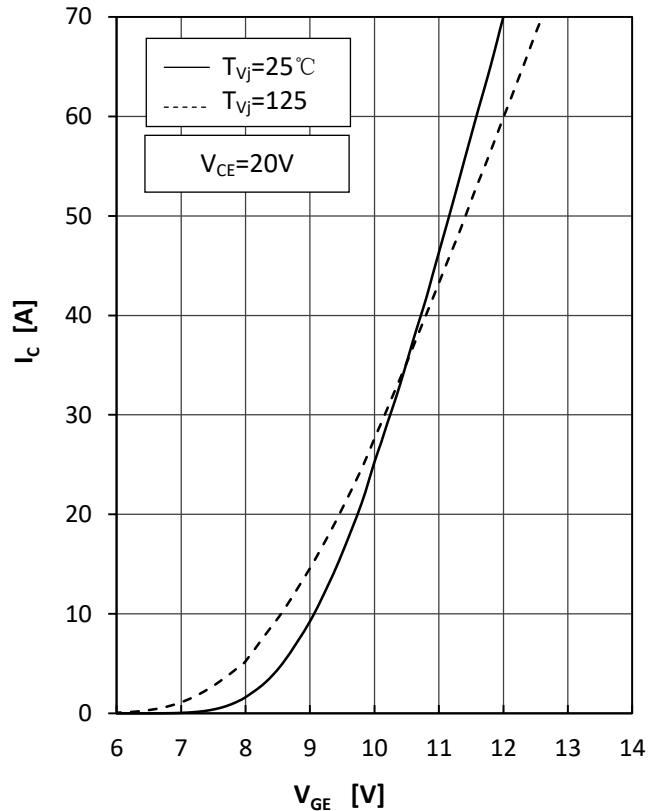


Fig2.IGBT Transfer Characteristics

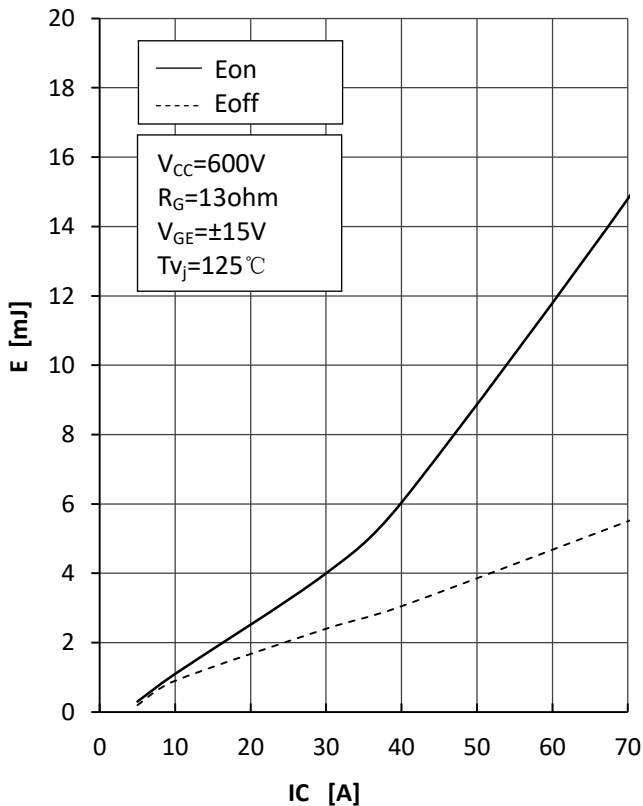


Fig3.IGBT Switching Loss vs.Ic

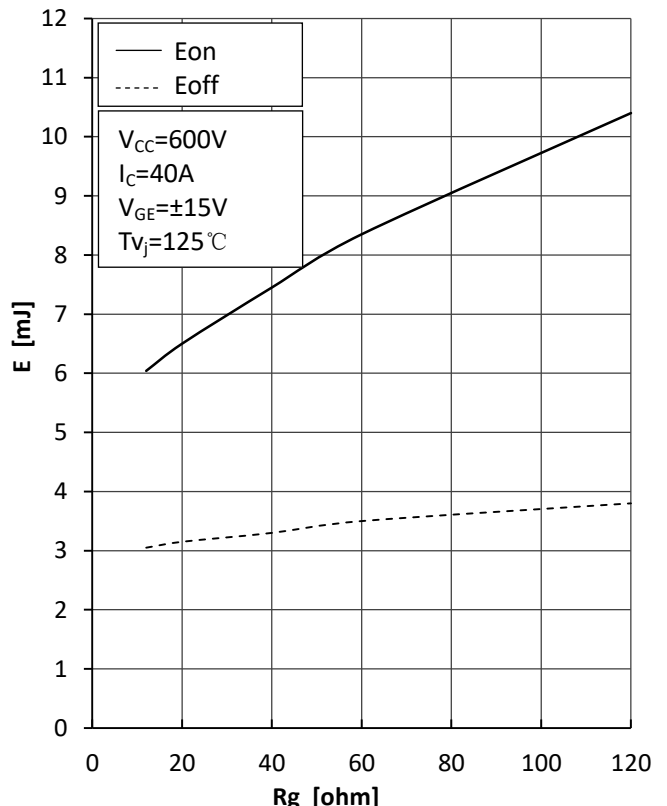


Fig4.IGBT Switching Loss vs.Rg

Curve Characteristics

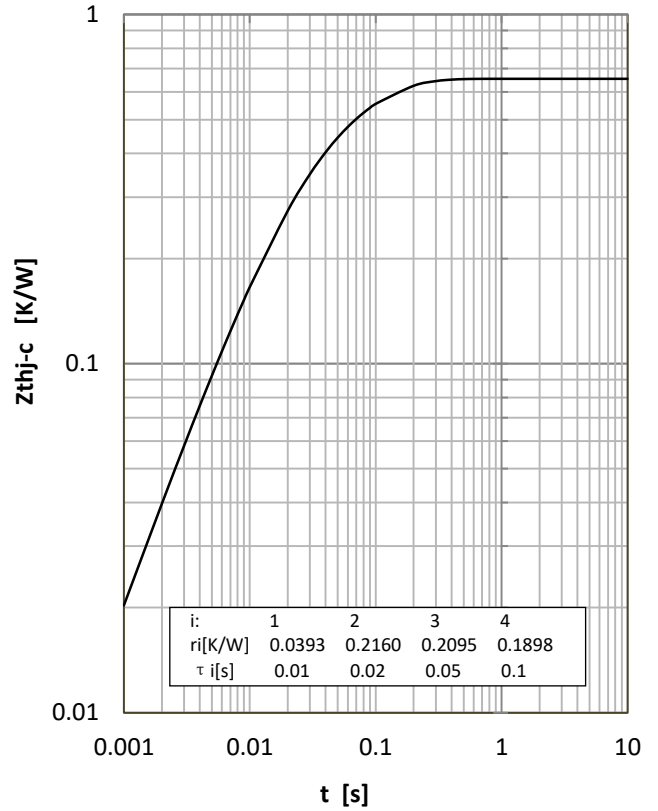
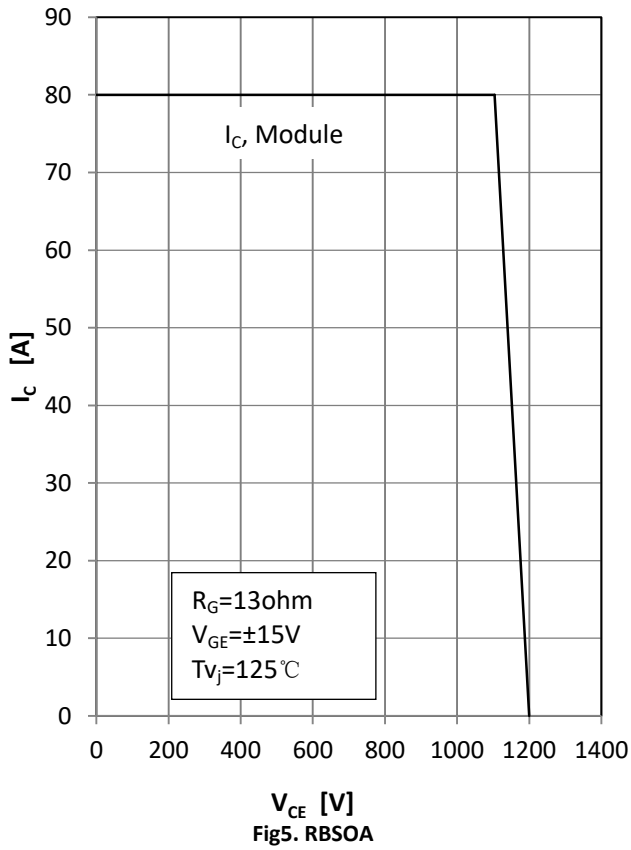


Fig 6. IGBT Transient Thermal Impedance

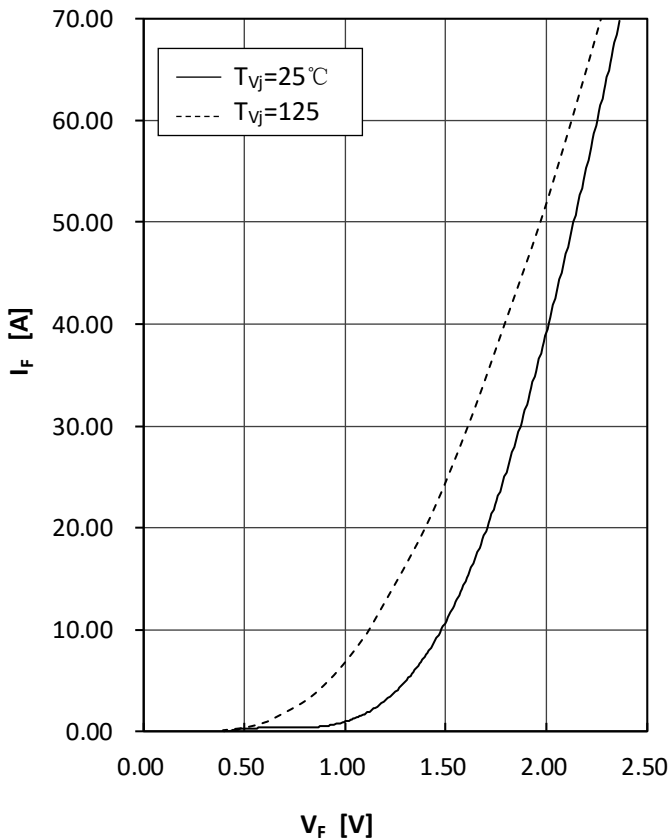


Fig7. Diode Foward Characteristics

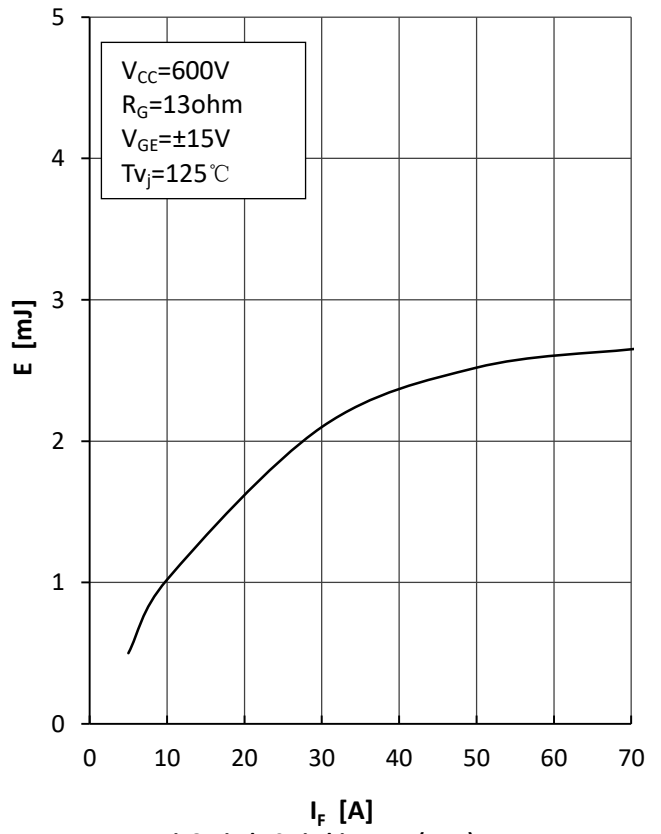


Fig8. Diode Switching Loss(Erec) vs I_F

Curve Characteristics

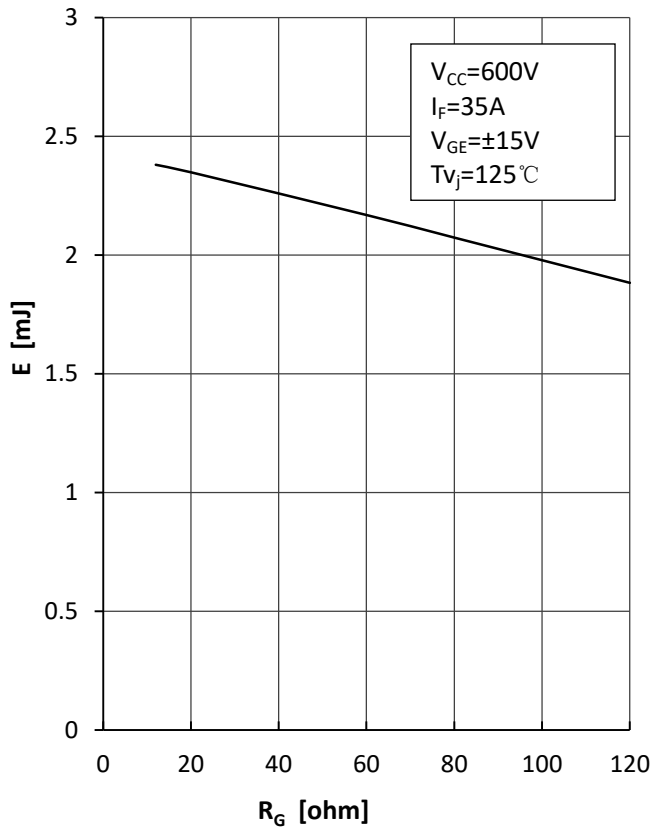


Fig9.Diode Switching Loss(Erec) vs.Rg

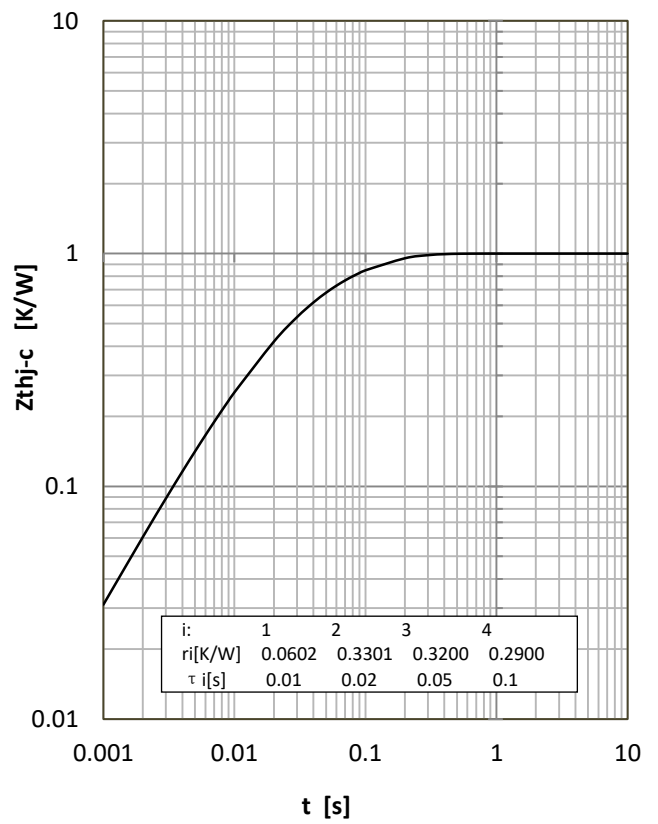


Fig10.Diode Transient Thermal Impedance

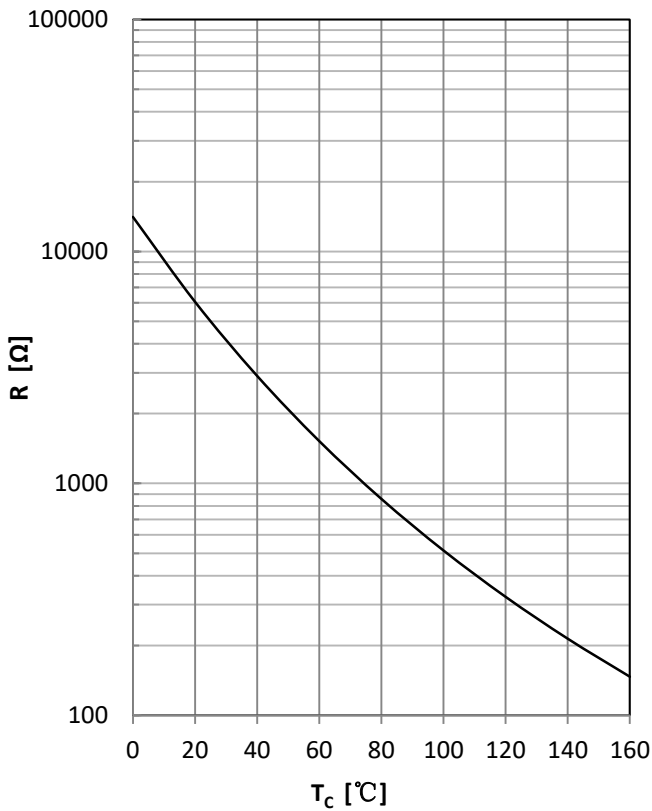


Fig 11. NTC Temperature Characteristic

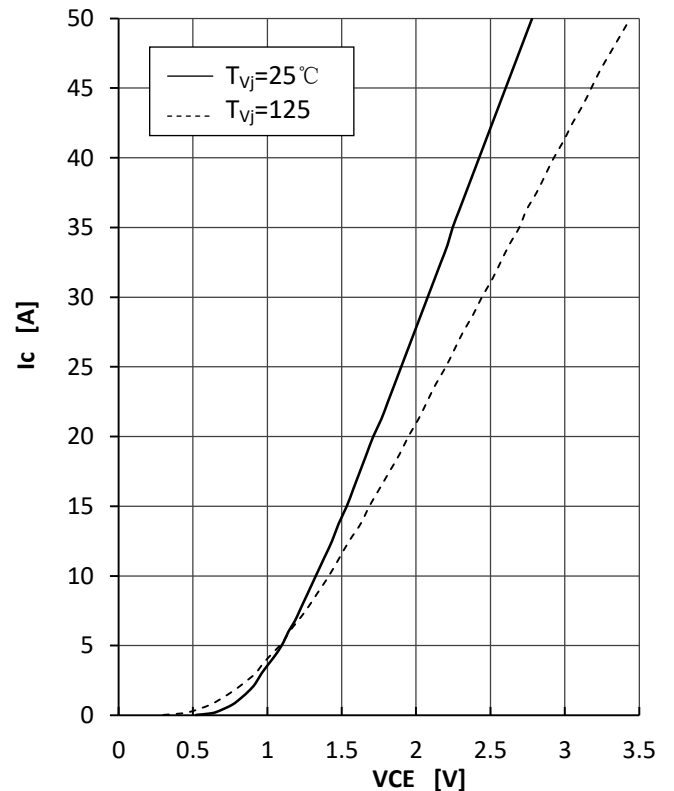


Fig12. IGBT-brake-Chopper Output Characteristics

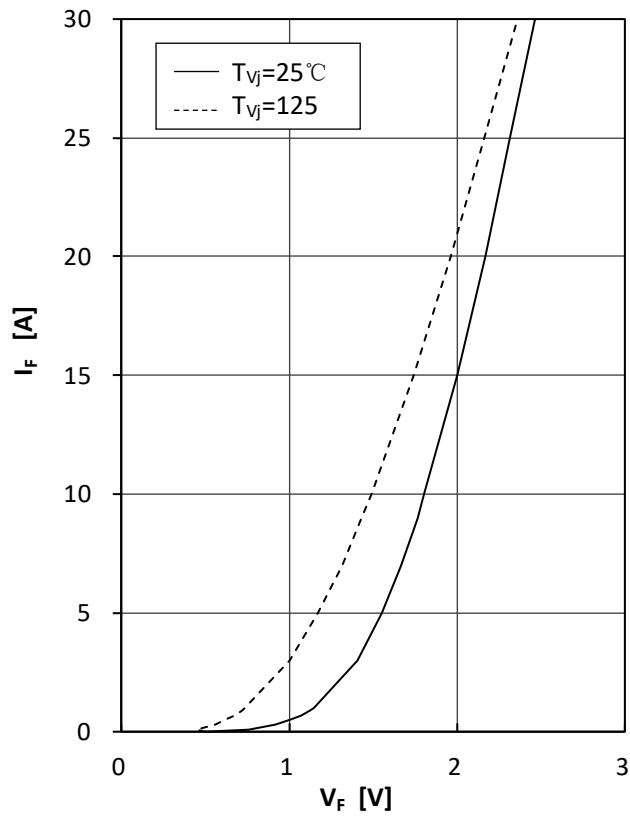
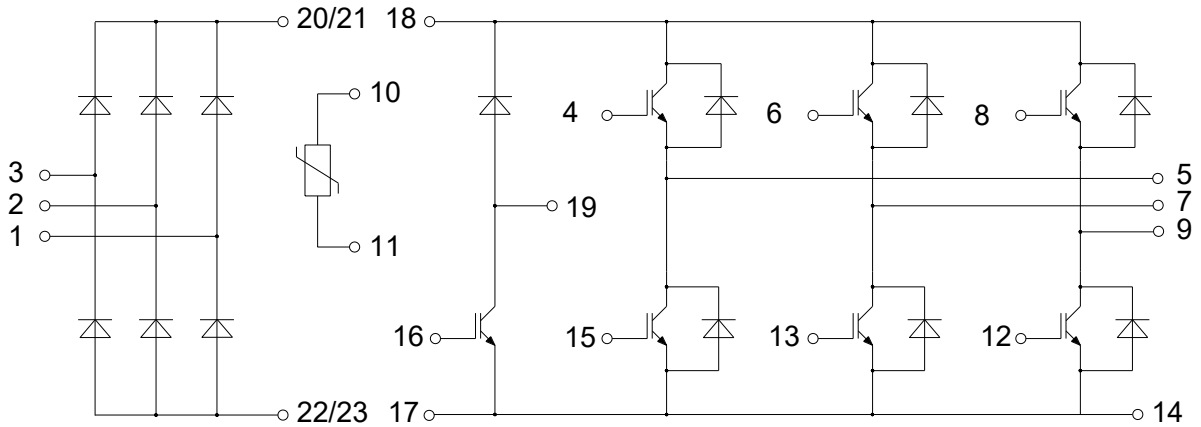


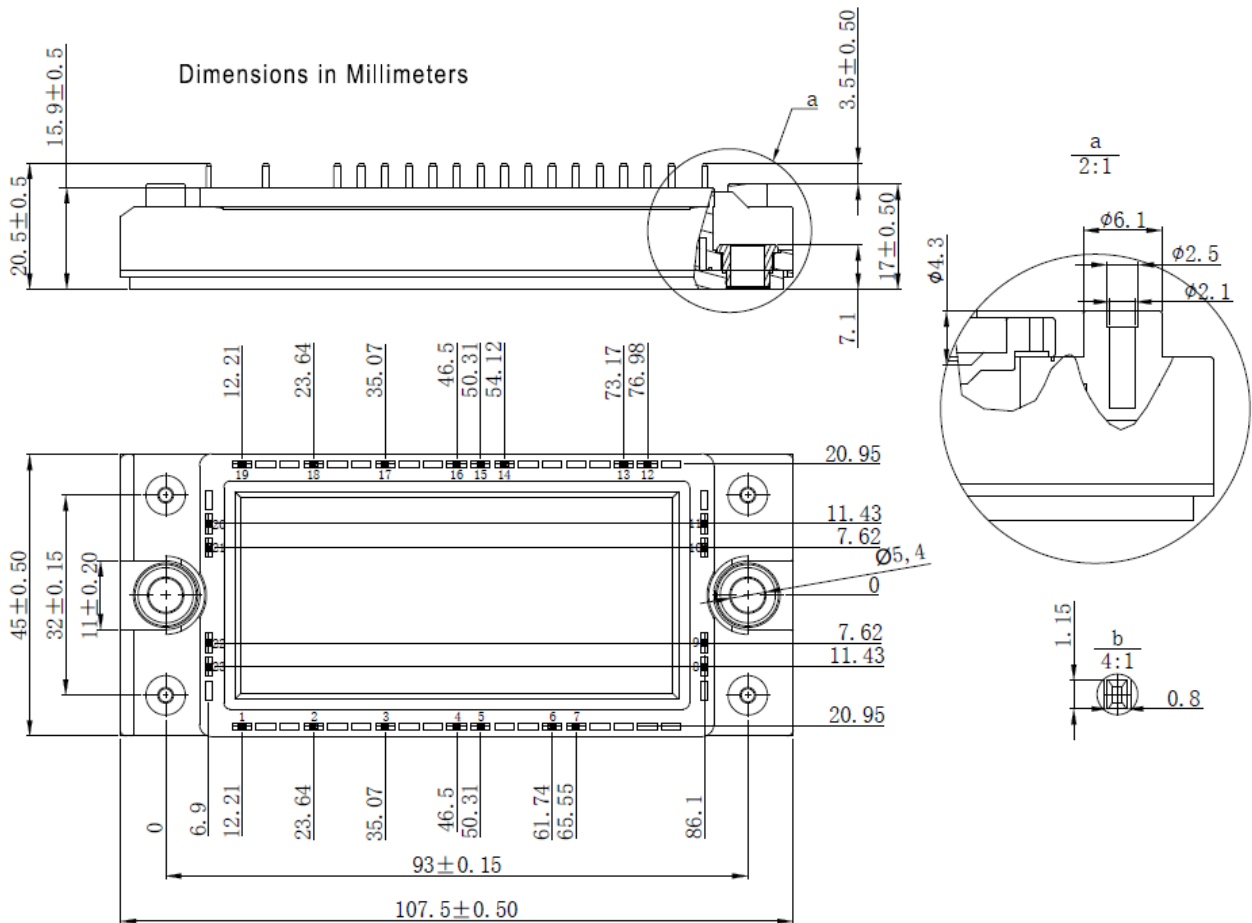
Fig13.Diode-brake-chopper Forward Characteristics

Circuit Diagram



Package Dimensions

E1A



Ordering Information

Device	Packing
Part Number-BP	Bulk: 8pcs/Box ; 48pcs/Ctn

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