	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(10μs)
- Maximum Junction Temperature 175°C
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

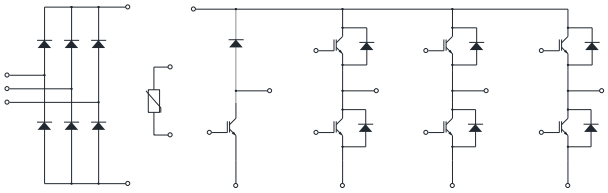
IGBT Modules
1200V 35A

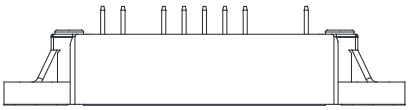
Applications

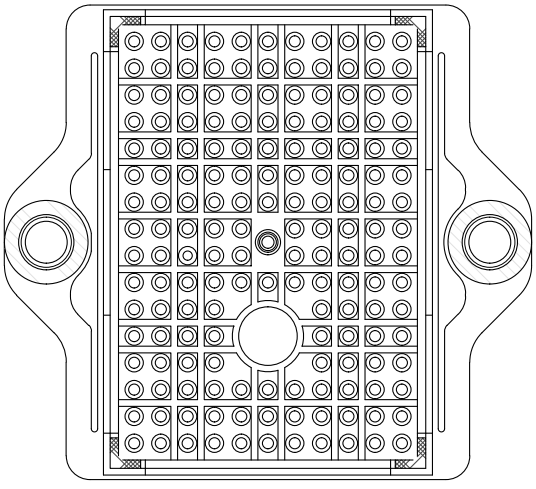
- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

P3S

Circuit Diagram







● IGBT- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	V_{GE}=0V, I_C=1mA, T_{vj}=25°C	1200	V
Continuous Collector Current	I_C	T_C=100°C, T_{vjmax}=175°C	35	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	70	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25°C	±20	V
Total Power Dissipation	P_{tot}	T_C=25°C, T_{vjmax}=175°C	150	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1.4mA,T_{vj}=25°C	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, Tvj=25°C			1	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=35A,V_{GE}=15V, T_{vj}=25°C		1.82		V
		I_C=35A,V_{GE}=15V, T_{vj}=125°C		2.00		V
		I_C=35A,V_{GE}=15V, T_{vj}=150°C		2.10		V
Gate Charge	Q_G			0.27		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V, f=1MHz, T_{vj}=25°C		2.5		nF
Reverse Transfer Capacitance	C_{res}			0.087		
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25°C			400	nA
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=35A, V_{GE}=± 15V, R_G=20Ω, T_{vj}=25°C		20		ns
Rise Time	t_r			42		
Turn-Off Delay Time	$t_{d(off)}$			141		
Fall Time	t_f			250		
Turn-On Energy	E_{on}			4.45		mJ
Turn-Off Energy	E_{off}			1.95		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=35A, V_{GE}=± 15V, R_G=20Ω, T_{vj}=150°C		18		ns
Rise Time	t_r			46		
Turn-Off Delay Time	$t_{d(off)}$			155		
Fall Time	t_f			275		
Turn-On Energy	E_{on}			5.28		mJ
Turn-Off Energy	E_{off}			2.27		
SC Data	I_{SC}	t_p≤10μs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=900V,V_{CEM}≤1200V		140		A

● Diode- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°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°C	240	A^2s
		V_R=0,t_p=10ms,T_{vj}=150°C	220	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=35A, T_{vj}=25°C		2.10		V
		I_F=35A, T_{vj}=125°C		1.95		V
		I_F=35A, T_{vj}=150°C		1.85		V
Recovered Charge	Q_{rr}	I_F=35A, V_R=600V, -di_F/dt=900A/μs, T_{vj}=25°C		0.85		μC
Peak Reverse Recovery Current	I_{rr}			23		A
Reverse Recovery Energy	E_{rec}			0.95		mJ
Recovered Charge	Q_{rr}	I_F=35A, V_R=600V, -di_F/dt=900A/μs, T_{vj}=150°C		4.75		μC
Peak Reverse Recovery Current	I_{rr}			25.0		A
Reverse Recovery Energy	E_{rec}			1.66		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°C	1200	V
Continuous Collector Current	I_C	T_C=100°C, T_{vjmax}=175°C	35	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	70	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25°C	±20	V
Total Power Dissipation	P_{tot}	T_C=25°C, T_{vjmax}=175°C	215	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1.4mA,T_{vj}=25°C	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, Tvj=25°C			1	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=35A,V_{GE}=15V, T_{vj}=25°C		1.82		V
		I_C=35A,V_{GE}=15V, T_{vj}=125°C		2.00		V
		I_C=35A,V_{GE}=15V, T_{vj}=150°C		2.10		V
Gate Charge	Q_g			0.27		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz, T_{vj}=25℃		2.5		nF
Reverse Transfer Capacitance	C_{res}			0.087		
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25°C			400	nA
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=35A, V_{GE}=± 15V, R_G=20Ω, T_{vj}=25°C		20		ns
Rise Time	t_r			42		
Turn-Off Delay Time	$t_{d(off)}$			141		
Fall Time	t_f			250		
Turn-On Energy	E_{on}			4.45		mJ
Turn-Off Energy	E_{off}			1.95		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=35A, V_{GE}=± 15V, R_G=20Ω, T_{vj}=150°C		18		ns
Rise Time	t_r			46		
Turn-Off Delay Time	$t_{d(off)}$			155		
Fall Time	t_f			275		
Turn-On Energy	E_{on}			5.28		mJ
Turn-Off Energy	E_{off}			2.27		
SC Data	I_{SC}	T_p≤10μs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=900V,V_{CEM}≤1200V		140		A

● Diode- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°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°C	16	A^2s
		V_R=0,t_p=10ms,T_{vj}=150°C	14	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=15A, T_{vj}=25°C		2.0		V
		I_F=15A, T_{vj}=125°C		1.80		V
		I_F=15A, T_{vj}=150°C		1.75		V
Recovered Charge	Q_{rr}	I_F=15A, V_R=600V, -di_F/dt=600A/µs, T_{vj}=25°C		0.45		µC
Peak Reverse Recovery Current	I_{rr}			13		A
Reverse Recovery Energy	E_{rec}			0.49		mJ
Recovered Charge	Q_{rr}	I_F=15A, V_R=600V, -di_F/dt=600A/µs, T_{vj}=150°C		0.54		µC
Peak Reverse Recovery Current	I_{rr}			14.0		A
Reverse Recovery Energy	E_{rec}			0.68		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°C	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	T_c=100°C	35	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	T_c=100°C	60	A
Surge Forward Current	I_{FSM}	V_R=0, t_p=10ms,T_{vj}=25°C	420	A
		V_R=0, t_p=10ms,T_{vj}=150°C	350	
I^2t-value	I^2t	V_R=0, t_p=10ms,T_{vj}= 25°C	880	A^2s
		V_R=0, t_p=10ms,T_{vj}= 150°C	610	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	I_F=10A,T_{vj}=150°C		1.02		V
Reverse Current	I_R	T_{vj}=150°C,V_R=1600V			2	mA

● NTC-Thermistor

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}			5		kΩ
Deviation of R100	ΔR/R	T_C=100,R_{100}=493.3Ω	-5		5	%
Power Dissipation	P_{25}				20	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

● Module Characteristics(T_C=25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Isolation voltage	V_{isol}	t=1min,f=50Hz	2500			V
Maximum Junction Temperature	T_{jmax}				175	°C
Operating Junction Temperature	$T_{vj\ op}$		-40		150	°C
Storage Temperature	T_{stg}		-40		125	°C
Stray-Inductance-module	L_{SCE}			30		nH
Module Lead Resistance , Terminal to Chip	$R_{cc'+EE'}$	TC=25°C, per switch		5		mΩ
	$R_{AA'+CC'}$			6		
Thermal Resistance Junction to Case	$R_{\theta jc}$	per IGBT-inverter		0.55		K/W
		per Diode-inverter		1.10		
		per IGBT-brake-chopper		1.0		
		per Diode-chopper		1.7		
		per Diode-rectifier		1.9		
Thermal Resistance Case to Sink	$R_{\theta CS}$	per IGBT-inverter		0.60		K/W
		per Diode-inverter		0.75		
		per IGBT-brake-chopper		0.60		
		per Diode-chopper		1.05		
		per Diode-rectifier		0.95		
		per Module		0.037		
Mounting Force Per Clamp	F		30		80	N
Weight of Module	G			40		g

Curve Characteristics

Fig1.IGBT Output Characteristics

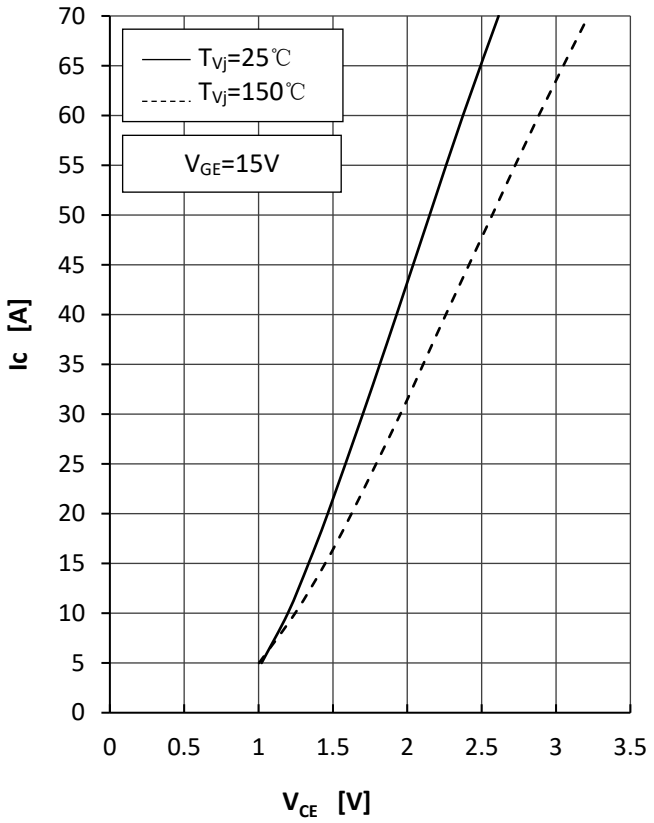


Fig2.IGBT Transfer Characteristics

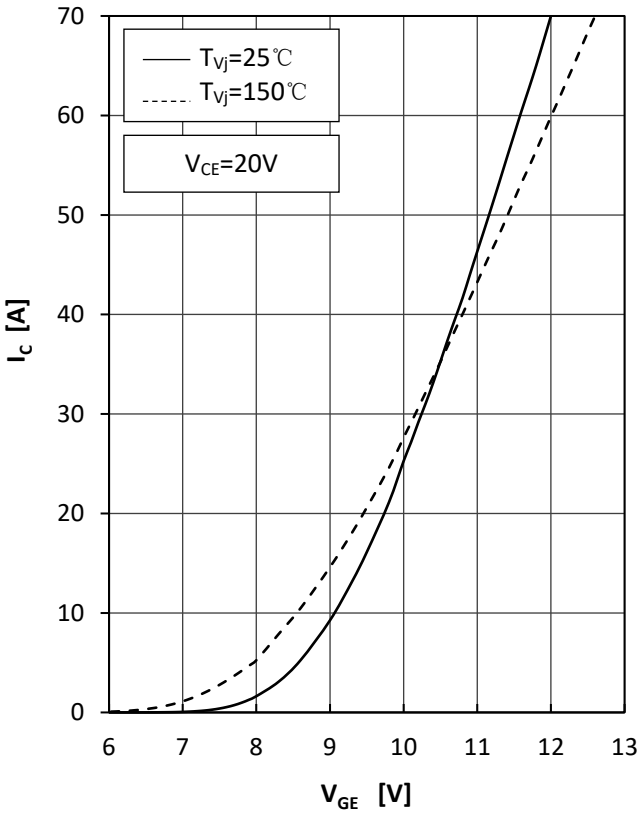


Fig3.IGBT Switching Loss vs.Ic

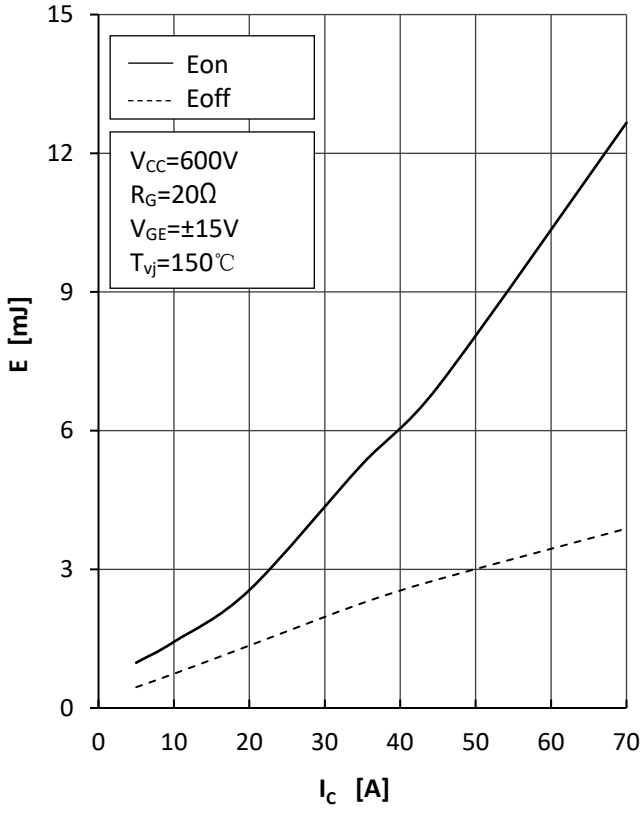
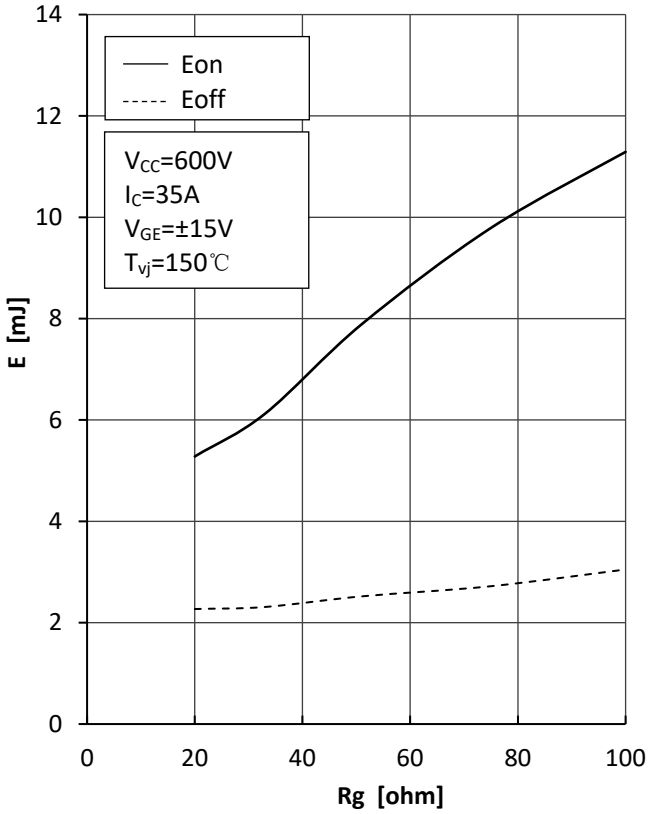


Fig4.IGBT Switching Loss vs.Rg



Curve Characteristics

Fig5. RBSOA

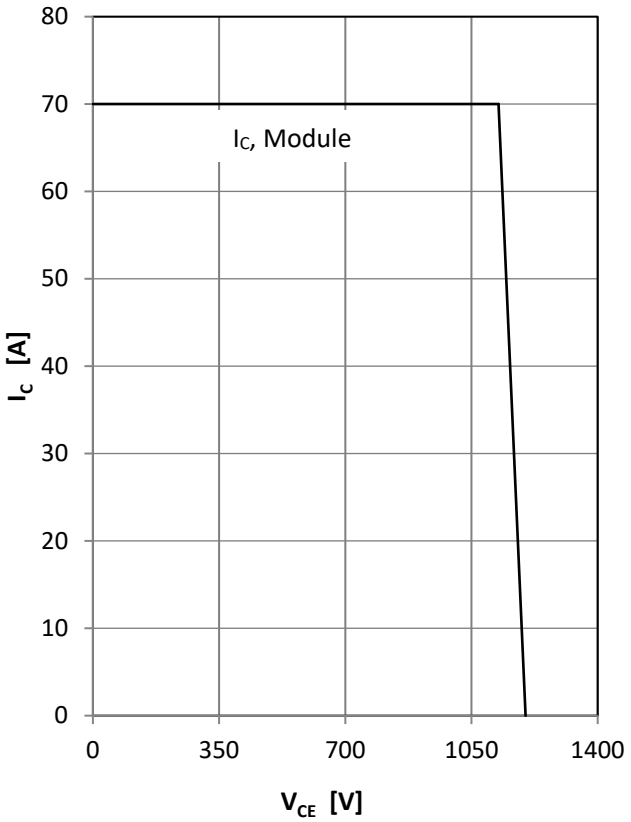


Fig 6. IGBT Transient Thermal Impedance

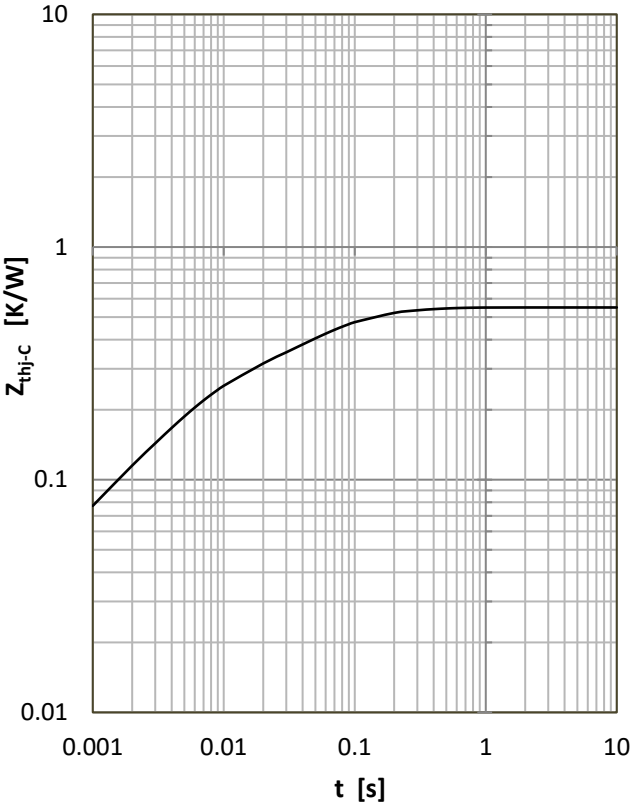


Fig7.Diode Foward Characteristics

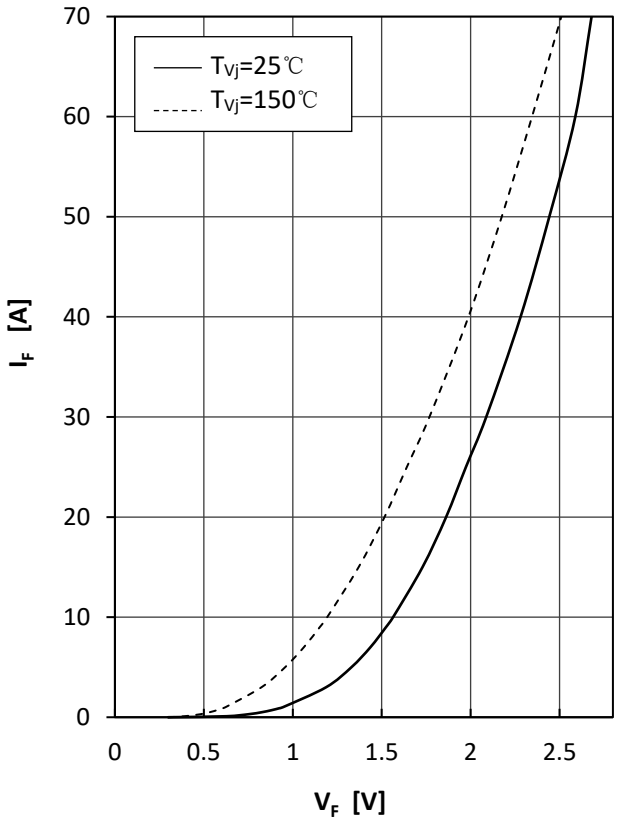
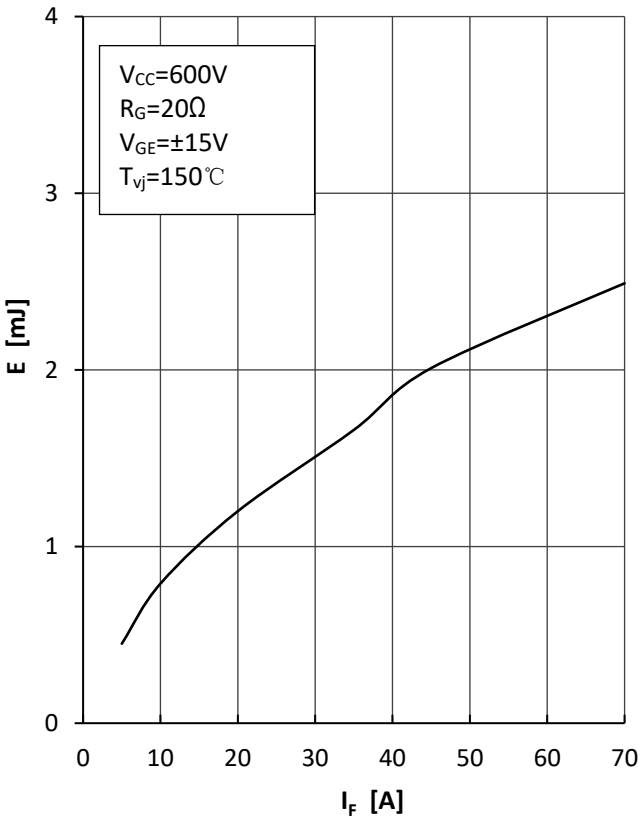


Fig8.Diode Switching Loss(Erec) vs.I_F



Curve Characteristics

Fig9.Diode Switching Loss(Erec) vs.Rg

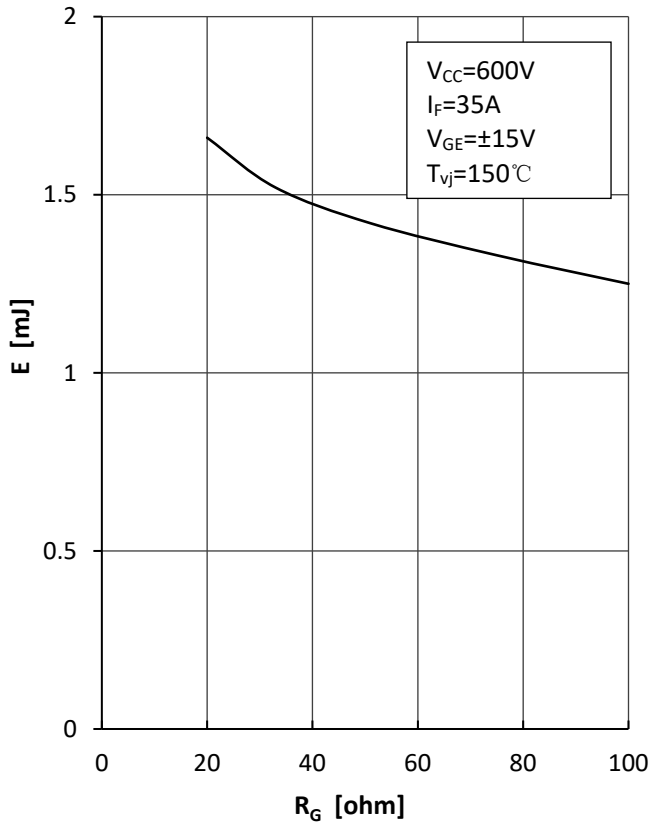


Fig10.Diode Transient Thermal Impedance

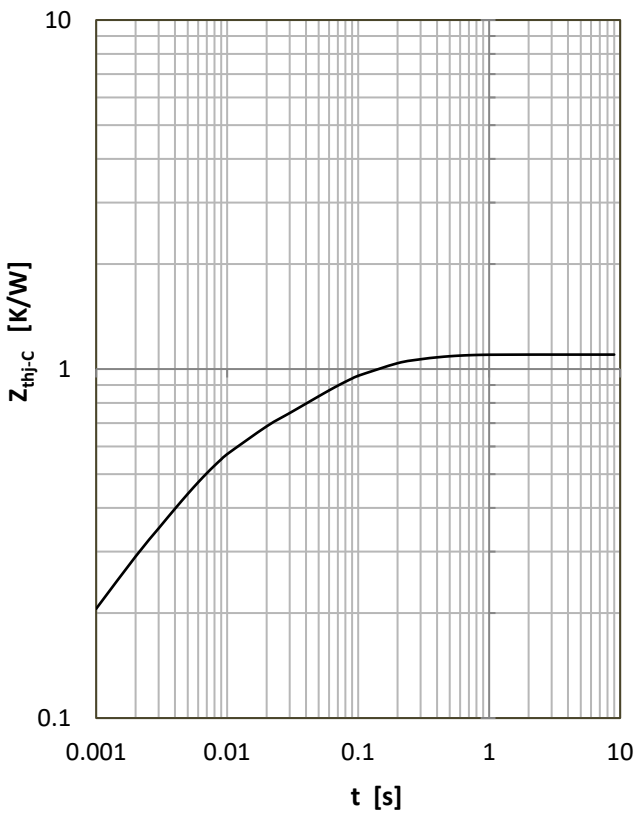


Fig 11. NTC Temperature Characteristic

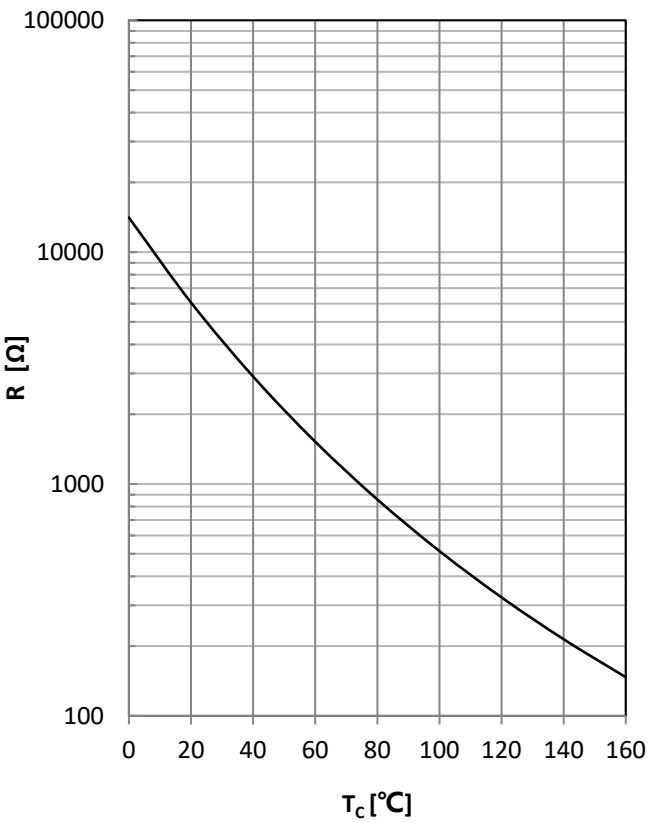
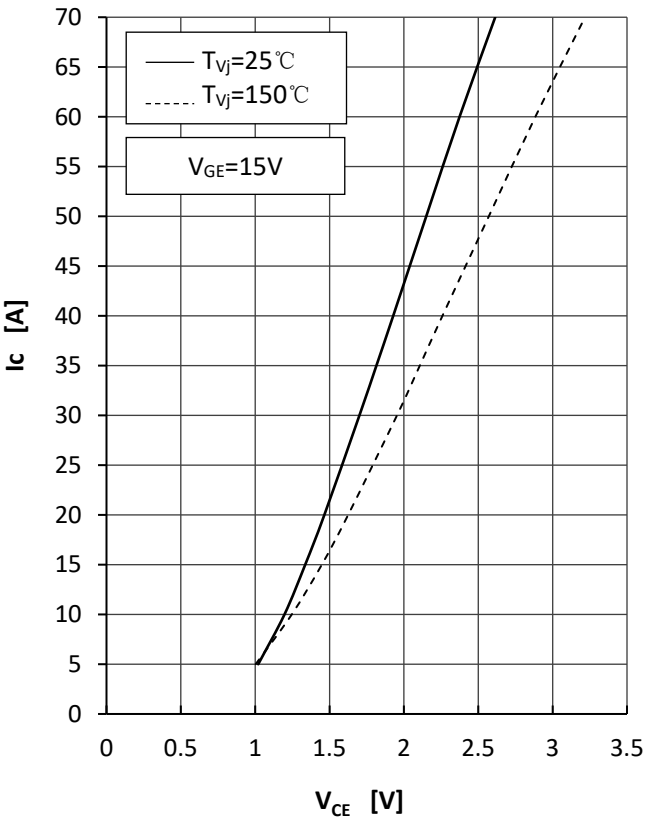
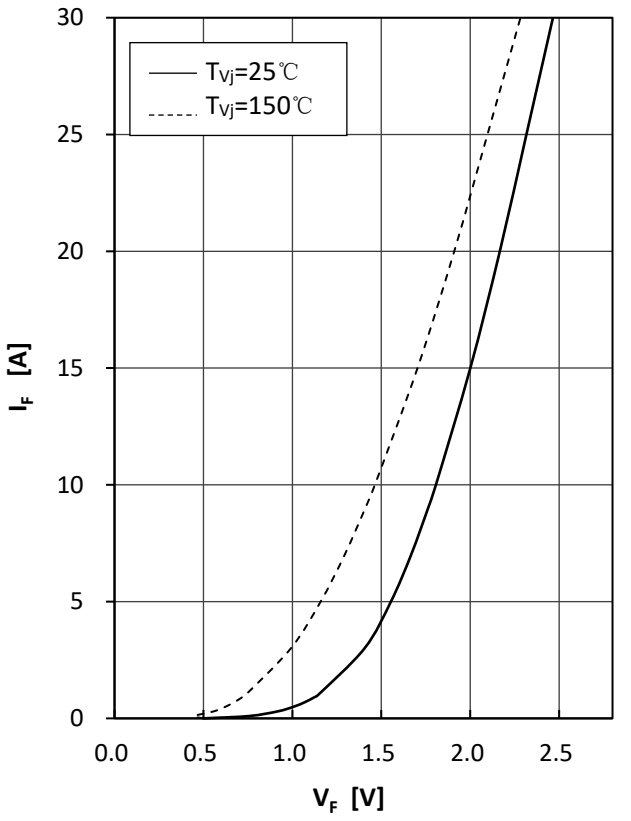


Fig12. IGBT-brake-Chopper output Characteristics

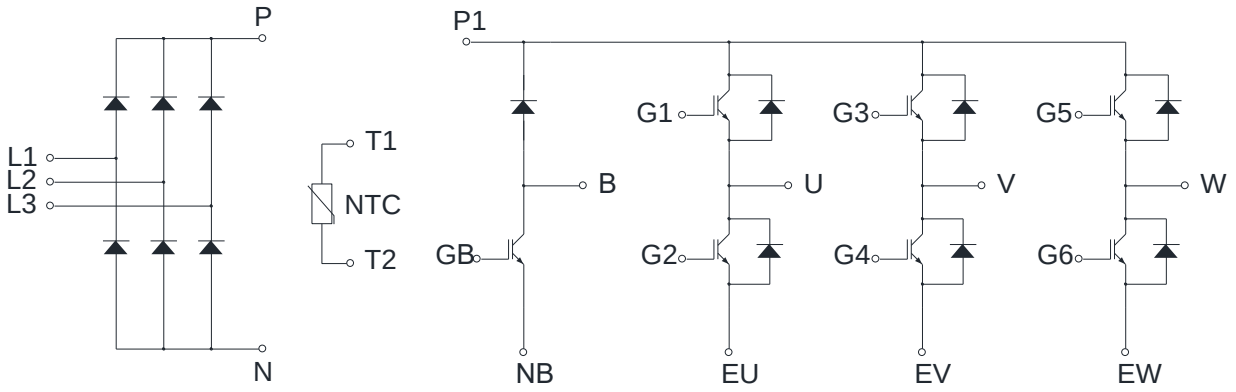


Curve Characteristics

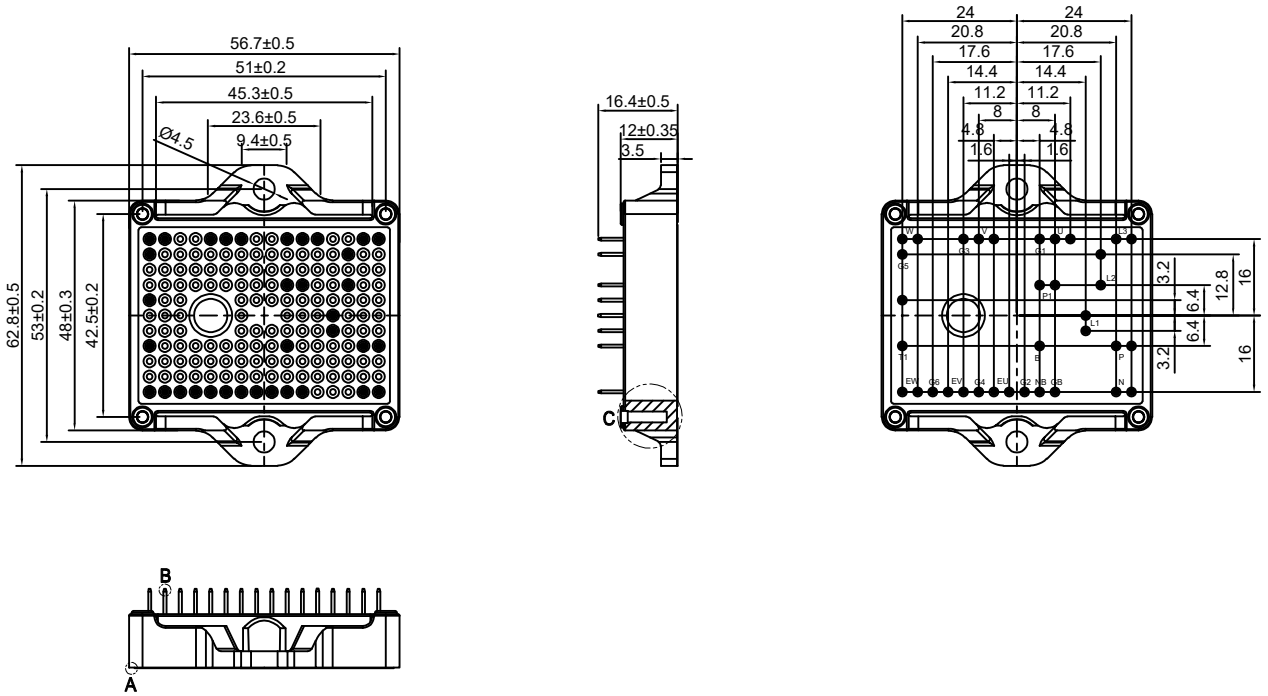
Fig13. Diode-brake-chopper Forward Characteristics



Circuit Diagram



Package Dimensions



View A
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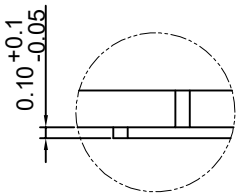

View B
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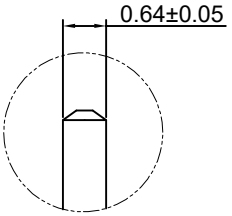

View C
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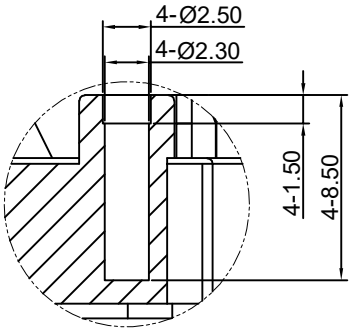

Ordering Information

Device	Packing
Part Number-BP	Bulk: 16pcs/Box ; 160pcs/Ctn

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