	E502650

IGBT Modules
1200V 40A

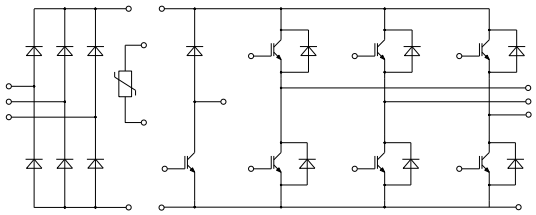
Features

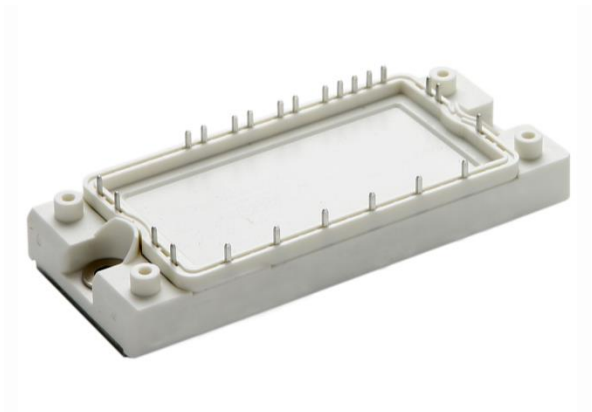
- Low Switching Losses
- Low $V_{ce(sat)}$ with Positive Temperature Coefficient
- Including Fast & Soft Recovery Anti-parallel FWD
- Low Inductance Case
- High Short Circuit Capability(10μs)
- Maximum Junction Temperature 175℃
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

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

Circuit Diagram





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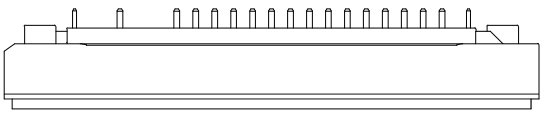
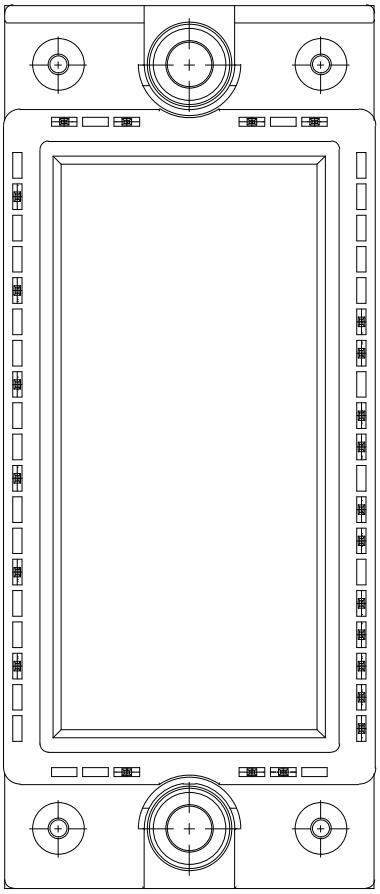




● IGBT- Inverter

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	40	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	80	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	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°C	5.2	5.9	6.5	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=40A,V_{GE}=15V, T_{vj}=25°C		2.05		V
		I_C=40A,V_{GE}=15V, T_{vj}=125°C		2.20		V
		I_C=40A,V_{GE}=15V, T_{vj}=150°C		2.40		V
Gate Charge	Q_g			0.35		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz		2.25		nF
Reverse Transfer Capacitance	C_{res}			0.10		
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=40A, V_{GE}=± 15V, R_G=27Ω, T_{vj}=25°C		31		ns
Rise Time	t_r			44		
Turn-Off Delay Time	$t_{d(off)}$			151		
Fall Time	t_f			245		
Turn-On Energy	E_{on}			3.97		mJ
Turn-Off Energy	E_{off}			2.64		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=40A, V_{GE}=± 15V, R_G=27Ω, T_{vj}=150°C		34		ns
Rise Time	t_r			50		
Turn-Off Delay Time	$t_{d(off)}$			163		
Fall Time	t_f			319		
Turn-On Energy	E_{on}			5.01		mJ
Turn-Off Energy	E_{off}			2.95		
SC Data	I_{SC}	T_p≤10μs,V_{GE}=15V,T_{vj}=150℃, V_{CC}=900V,V_{CEM}≤1200V		200		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		40	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	80	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=40A, T_{vj}=25°C		2.00		V
		I_F=40A, T_{vj}=125°C		1.80		V
		I_F=40A, T_{vj}=150°C		1.72		V
Recovered Charge	Q_{rr}	I_F=40A, V_R=600V, -di_F/dt=1000A/μs, T_{vj}=25°C		2.35		μC
Peak Reverse Recovery Current	I_{rr}			21		A
Reverse Recovery Energy	E_{rec}			0.67		mJ
Recovered Charge	Q_{rr}	I_F=40A, V_R=600V, -di_F/dt=1000A/μs, T_{vj}=150°C		4.26		μC
Peak Reverse Recovery Current	I_{rr}			23		A
Reverse Recovery Energy	E_{rec}			1.16		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	40	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	80	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	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°C	5.2	5.9	6.5	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=40A,V_{GE}=15V, T_{vj}=25°C		2.05		V
		I_C=40A,V_{GE}=15V, T_{vj}=125°C		2.20		V
		I_C=40A,V_{GE}=15V, T_{vj}=150°C		2.40		V
Gate Charge	Q_g			0.35		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz, T_{vj}=25℃		2.25		nF
Reverse Transfer Capacitance	C_{res}			0.10		
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=40A, V_{GE}=± 15V, R_G=27Ω, T_{vj}=25°C		31		ns
Rise Time	t_r			44		
Turn-Off Delay Time	$t_{d(off)}$			151		
Fall Time	t_f			245		
Turn-On Energy	E_{on}			3.97		mJ
Turn-Off Energy	E_{off}			2.64		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=40A, V_{GE}=± 15V, R_G=27Ω, T_{vj}=150°C		34		ns
Rise Time	t_r			50		
Turn-Off Delay Time	$t_{d(off)}$			163		
Fall Time	t_f			319		
Turn-On Energy	E_{on}			5.01		mJ
Turn-Off Energy	E_{off}			2.95		
SC Data	I_{SC}	T_p≤10μs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=900V,V_{CEM}≤1200V		200		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	48	A^2s
		V_R=0,t_p=10ms,T_{vj}=150°C	42	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=15A, T_{vj}=25°C		2.00		V
		I_F=15A, T_{vj}=125°C		1.80		V
		I_F=15A, T_{vj}=150°C		1.70		V
Recovered Charge	Q_{rr}	I_F=15A, V_R=600V, -di_F/dt=550A/µs, T_{vj}=25°C		1.2		µC
Peak Reverse Recovery Current	I_{rr}			10		A
Reverse Recovery Energy	E_{rec}			0.35		mJ
Recovered Charge	Q_{rr}	I_F=15A, V_R=600V, -di_F/dt=550A/µs, T_{vj}=150°C		1.60		µC
Peak Reverse Recovery Current	I_{rr}			15.0		A
Reverse Recovery Energy	E_{rec}			1.20		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_j=25°C	1600	V
Average On-state Current 50/60Hz, sine wave	$I_{F(AV)}$	T_C=100°C	50	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_j=45°C	320	A
I^2t-value	I^2t	V_R=0,t_p=10ms,T_j=45°C	510	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	I_F=40A,T_j=125°C		1.12		V
Reverse Current	I_r	T_j=125°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
Operating Junction Temperature	T_{stg}		-40		125	°C
Stray Inductance	L_{CE}			60		nH
Module Lead Resistance , Terminal to Chip	$R_{cc'+EE'}$	TC=25°C, per switch		4		mΩ
	$R_{AA'+CC'}$			3		
Thermal Resistance Junction to Case	$R_{\theta jc}$	per IGBT-inverter		0.66		K/W
		per Diode-inverter		1		
		per IGBT-brake-chopper		0.66		
		per Diode-chopper		1.5		
		per Diode-rectifier		0.75		
Thermal Resistance Case to Sink	$R_{\theta CS}$	per IGBT-inverter		0.31		K/W
		per Diode-inverter		0.48		
		per IGBT-brake-chopper		0.31		
		per Diode-chopper		0.7		
		per Diode-rectifier		0.36		
		per Module		0.02		
Module-to-Sink Torque	M_S		3		6	N·m
Weight of Module	G			180		g

Curve Characteristics

Fig1.IGBT Output Characteristics

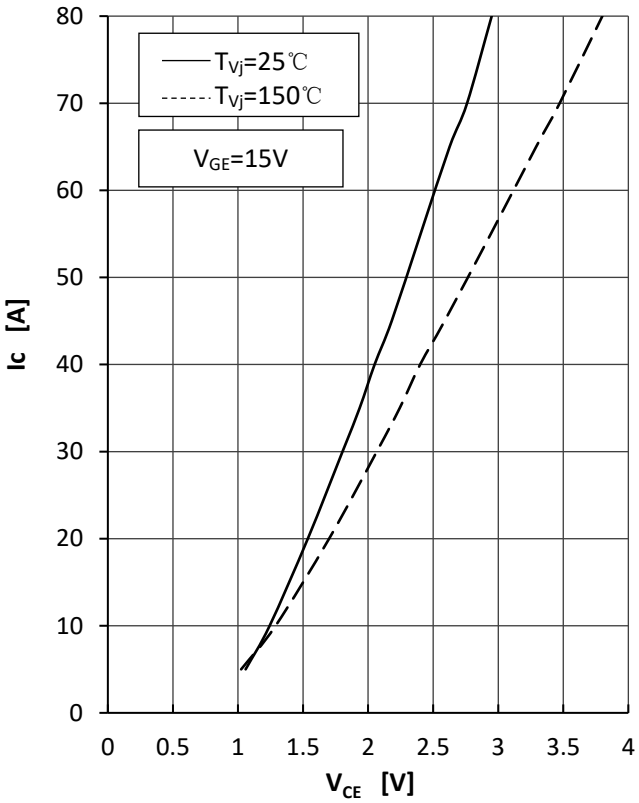


Fig2.IGBT Transfer Characteristics

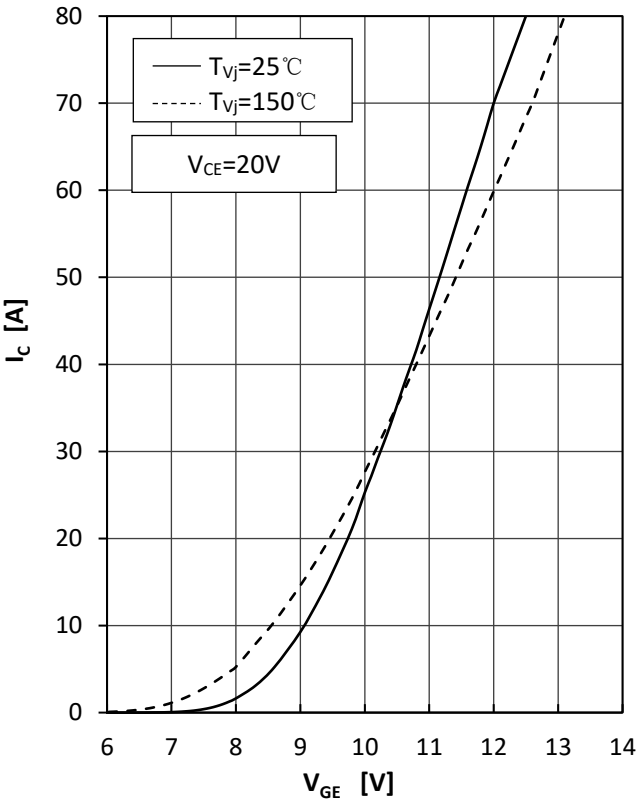


Fig3.IGBT Switching Loss vs.Ic

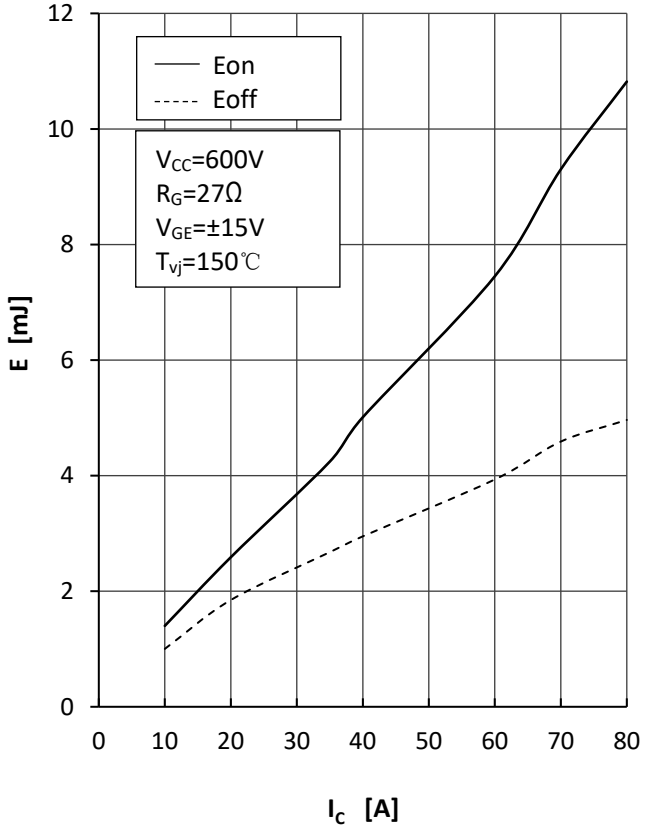
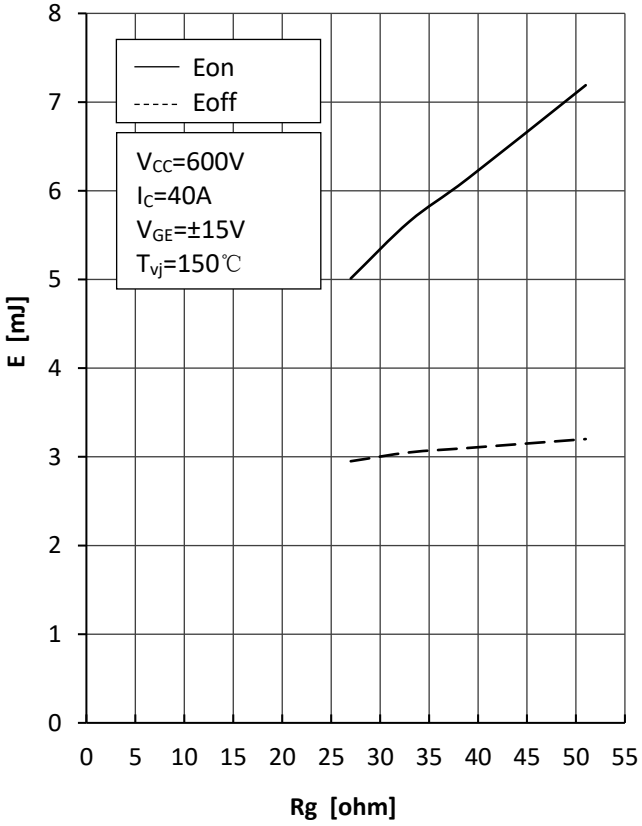


Fig4.IGBT Switching Loss vs.Rg



Curve Characteristics

Fig5. RBSOA

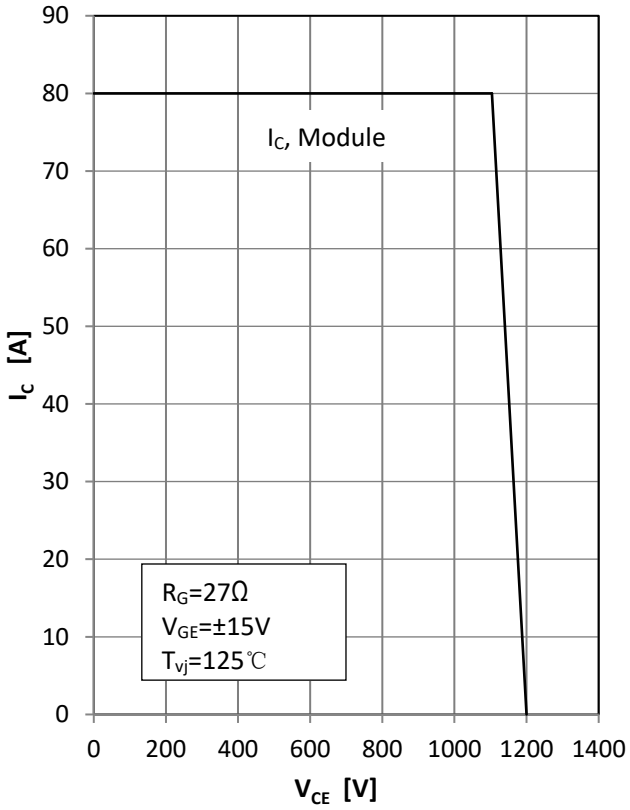


Fig 6. IGBT Transient Thermal Impedance

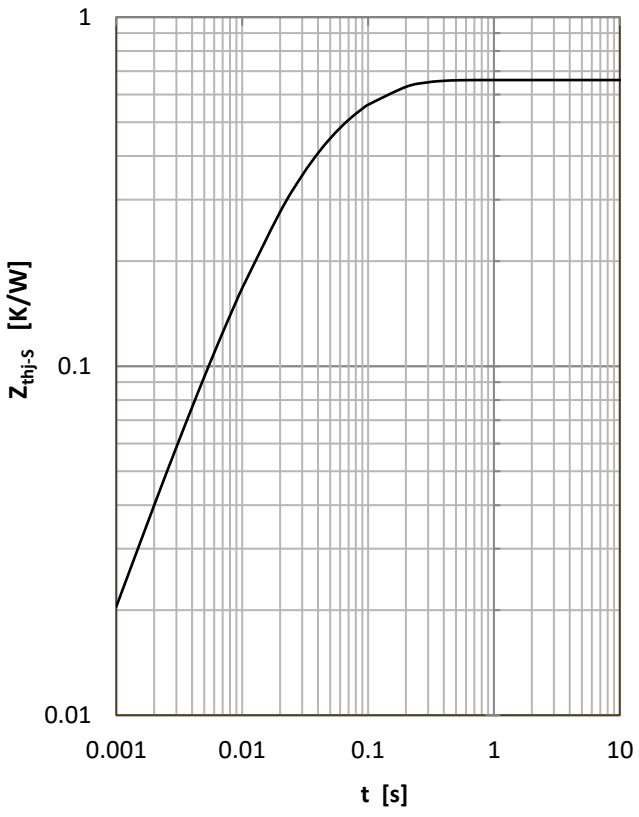


Fig7.Diode Foward Characteristics

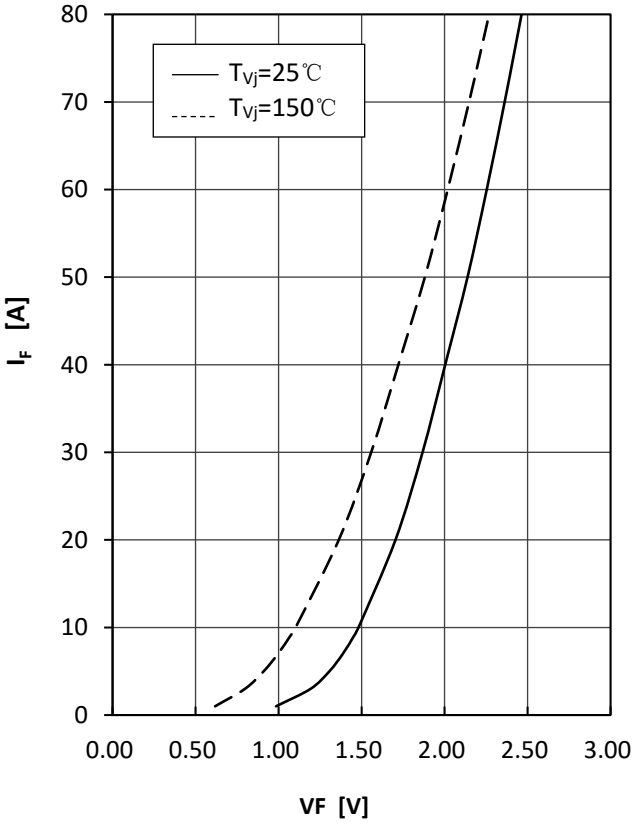
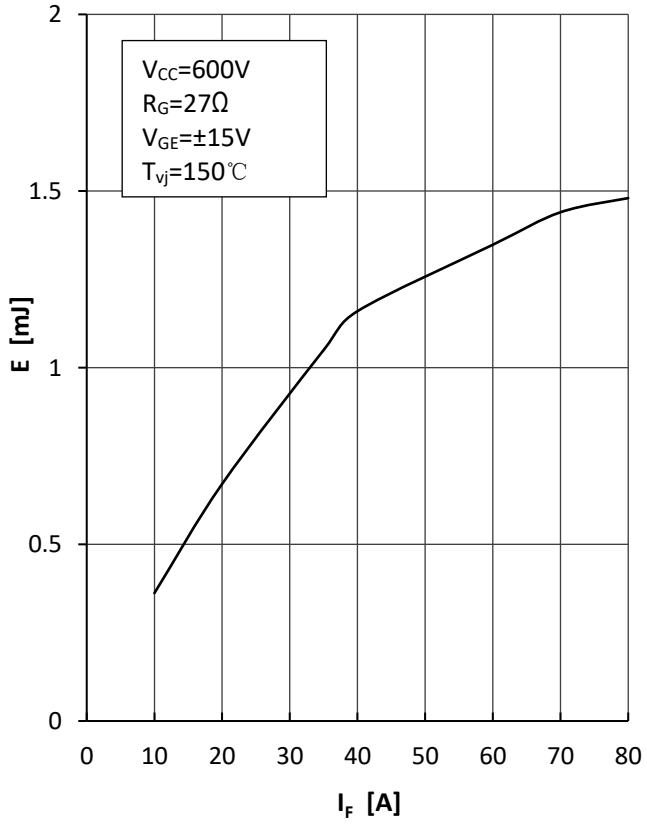


Fig8.Diode Switching Loss(Erec) vs.I_F



Curve Characteristics

Fig9.Diode Switching Loss(Erec) vs.Rg

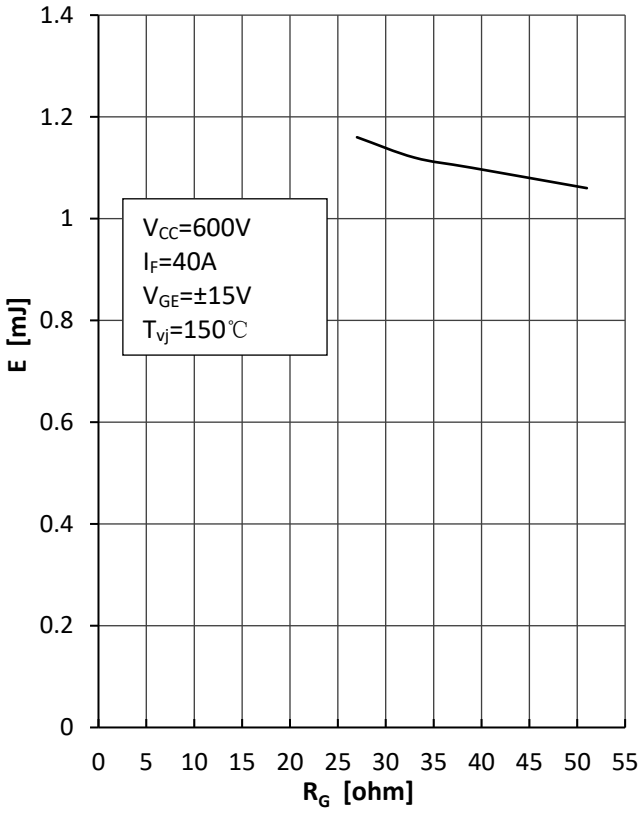


Fig10.Diode Transient Thermal Impedance

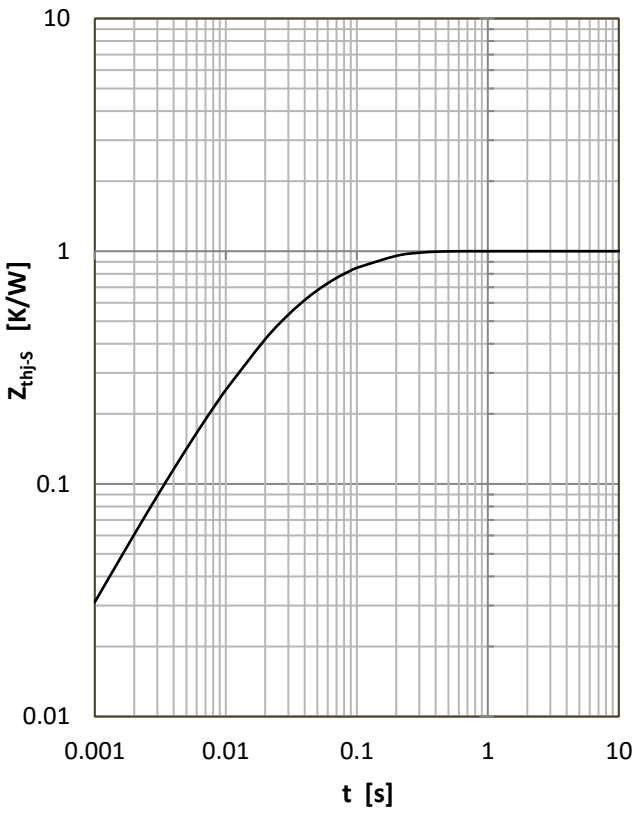


Fig 11. NTC Temperature Characteristic

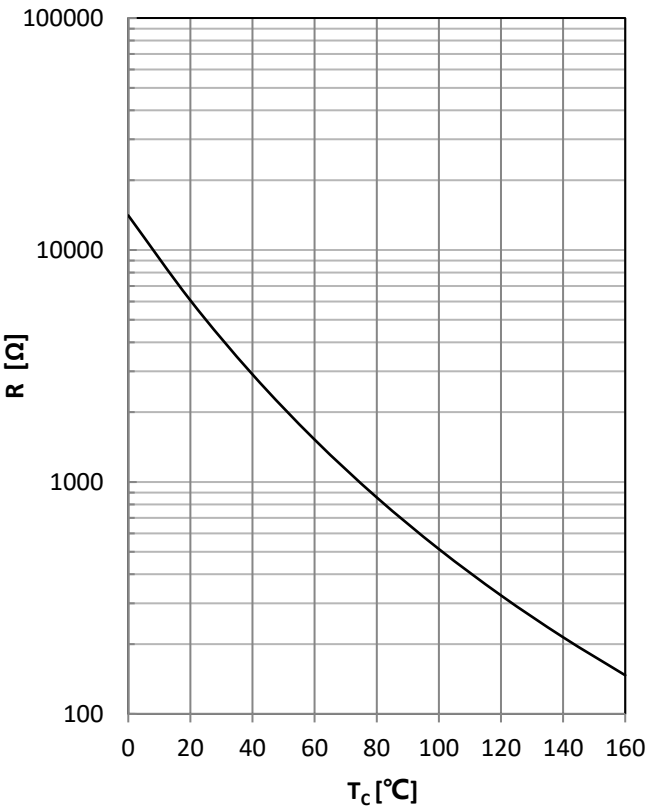
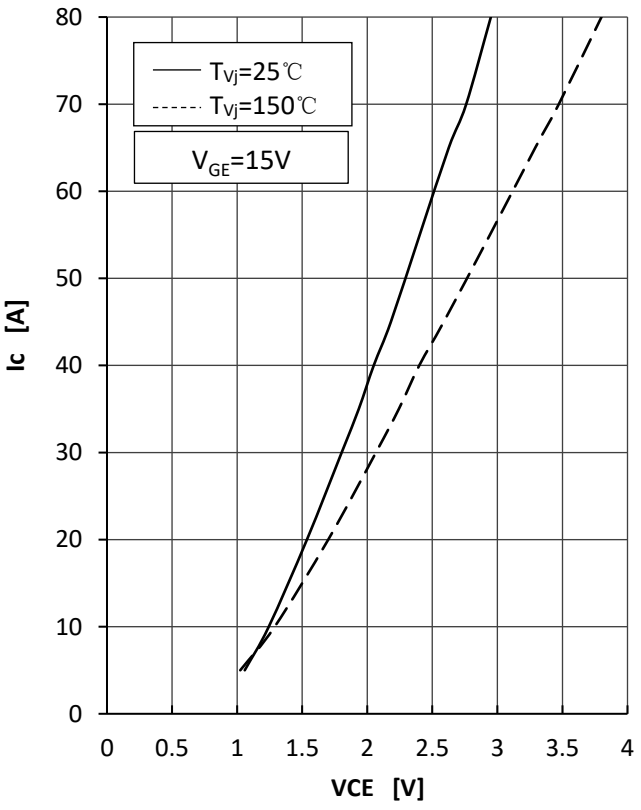
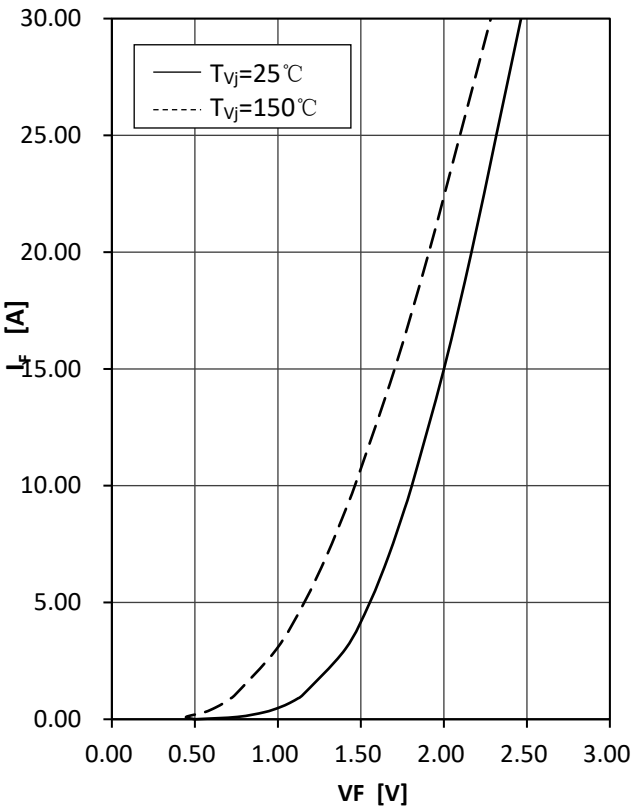


Fig12. IGBT-brake-Chopper Output Characteristics

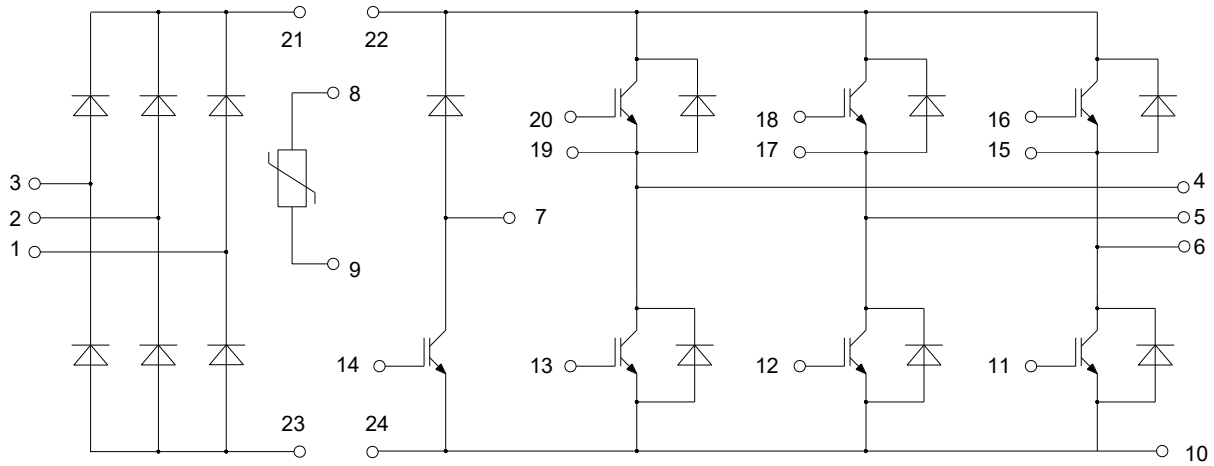


Curve Characteristics

Fig13. Diode-brake-chopper Forward Characteristics

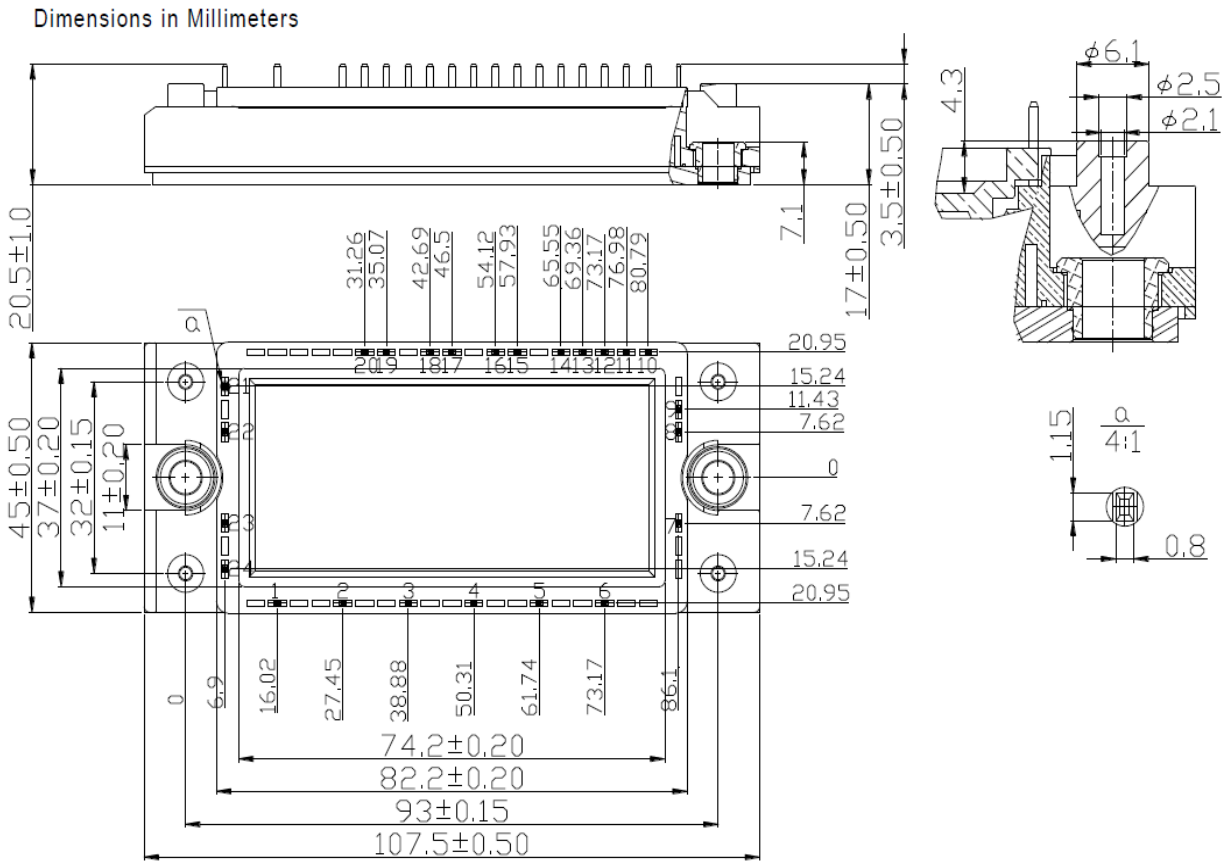


Circuit Diagram



Package Dimensions

E1



Ordering Information

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