Features

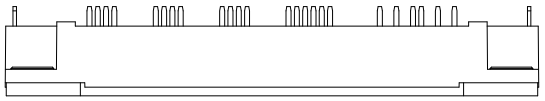
- Low Switching Losses
- Low $V_{ce(sat)}$ with Positive Temperature Coefficient
- Including Fast & Soft Recovery Anti-parallel FWD
- Low Inductance Case
- High Short Circuit Capability(10μs)
- Maximum Junction Temperature 175°C
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant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

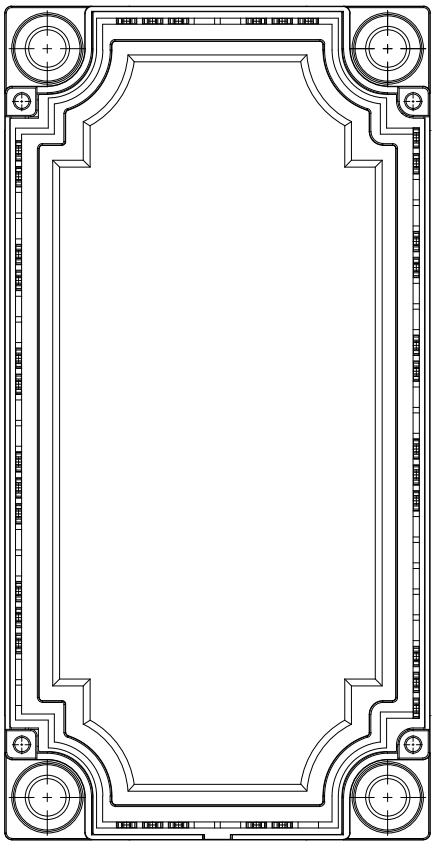
IGBT Modules
1200V 50A

Applications

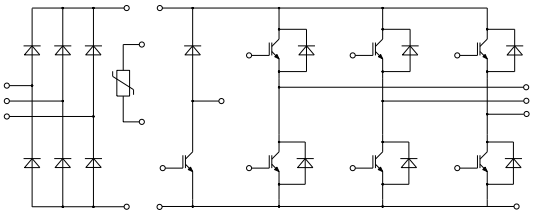
- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

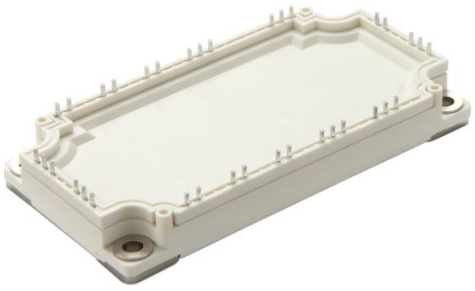
E2





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=80°C, T_{vjmax}=150°C	50	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	100	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25°C	±20	V
Total Power Dissipation	P_{tot}	T_C=25°C, T_{vjmax}=150°C	368	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=2mA,T_{vj}=25°C	5.0	5.8	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=50A,V_{GE}=15V, T_{vj}=25°C		1.95	2.25	V
		I_C=50A,V_{GE}=15V, T_{vj}=125°C		2.15		V
		I_C=50A,V_{GE}=15V, T_{vj}=150°C		2.2		V
Gate Charge	Q_g			0.6		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz		3.8		nF
Reverse Transfer Capacitance	C_{res}			0.26		
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=50A, V_{GE}=± 15V, R_G=15Ω, T_{vj}=25°C		40		ns
Rise Time	t_r			65		
Turn-Off Delay Time	$t_{d(off)}$			390		
Fall Time	t_f			36		
Turn-On Energy	E_{on}			6.05		mJ
Turn-Off Energy	E_{off}			3.3		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=50A, V_{GE}=± 15V, R_G=15Ω, T_{vj}=125°C		45		ns
Rise Time	t_r			70		
Turn-Off Delay Time	$t_{d(off)}$			440		
Fall Time	t_f			41		
Turn-On Energy	E_{on}			8		mJ
Turn-Off Energy	E_{off}			5.5		
SC Data	I_{SC}	T_p≤10μs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=900V,V_{CEM}≤1200V		320		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		50	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	80	A

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=50A, T_{vj}=25°C		1.95	2.25	V
		I_F=50A, T_{vj}=125°C		2.05		V
		I_F=50A, T_{vj}=150°C		2.1		V
Recovered Charge	Q_{rr}	I_F=50A, V_R=600V, -di_F/dt=900A/μs, T_{vj}=25°C		3.5		μC
Peak Reverse Recovery Current	I_{rr}			40		A
Reverse Recovery Energy	E_{rec}			1.35		mJ
Recovered Charge	Q_{rr}	I_F=50A, V_R=600V, -di_F/dt=900A/μs, T_{vj}=125°C		6.5		μC
Peak Reverse Recovery Current	I_{rr}			50		A
Reverse Recovery Energy	E_{rec}			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°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	300	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	5.8	6.7	7.2	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		1.95	2.35	V
		I_C=40A,V_{GE}=15V, T_{vj}=125°C		2.3		V
		I_C=40A,V_{GE}=15V, T_{vj}=150°C		2.4		V
Gate Charge	Q_g			0.27		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz		2		nF
Reverse Transfer Capacitance	C_{res}			0.07		
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=12Ω, T_{vj}=25°C		28		ns
Rise Time	t_r			16		
Turn-Off Delay Time	$t_{d(off)}$			26		
Fall Time	t_f			125		
Turn-On Energy	E_{on}			2.4		mJ
Turn-Off Energy	E_{off}			2.25		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=40A, V_{GE}=± 15V, R_G=12Ω, T_{vj}=125°C		28		ns
Rise Time	t_r			18		
Turn-Off Delay Time	$t_{d(off)}$			310		
Fall Time	t_f			190		
Turn-On Energy	E_{on}			3.6		mJ
Turn-Off Energy	E_{off}			3.2		
SC Data	I_{SC}	T_p≤10μs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=900V,V_{CEM}≤1200V		130		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		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		1.75	2.25	V
		I_F=40A, T_{vj}=125°C		1.75		V
		I_F=40A, T_{vj}=150°C		1.75		V
Recovered Charge	Q_{rr}	I_F=40A, V_R=600V, -di_F/dt=1600A/µs, T_{vj}=25°C		4.15		µC
Peak Reverse Recovery Current	I_{rr}			42		A
Reverse Recovery Energy	E_{rec}			1.3		mJ
Recovered Charge	Q_{rr}	I_F=40A, V_R=600V, -di_F/dt=1600A/µs, T_{vj}=125°C		8		µC
Peak Reverse Recovery Current	I_{rr}			46		A
Reverse Recovery Energy	E_{rec}			2.38		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	65	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	T_C=100°C	110	A
Surge Forward Current	I_{FSM}	V_R=0,t_p=10ms,T_j=45°C	850	A
I^2t-value	I^2t	V_R=0,t_p=10ms,T_j=45°C	3610	A^2S

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	I_F=50A,T_j=150°C		1		V
Reverse Current	I_r	T_j=125°C,V_R=1600V			1.5	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}	Inverter, brake			175	°C
		rectifier			150	
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
	$R_{AA'+CC'}$			2		
Thermal Resistance Junction to Case	$R_{\theta jc}$	per IGBT-inverter			0.339	K/W
		per Diode-inverter			0.619	
		per IGBT-brake-chopper			0.5	
		per Diode-chopper			1.266	
		per Diode-rectifier			0.635	
Thermal Resistance Case to Sink	$R_{\theta CS}$	per IGBT-inverter		0.121		K/W
		per Diode-inverter		0.221		
		per IGBT-brake-chopper		0.18		
		per Diode-chopper		0.452		
		per Diode-rectifier		0.227		
		per Module		0.009		
Module-to-Sink Torque	M_S		3		6	N·m
Weight of Module	G			300		g

Curve Characteristics

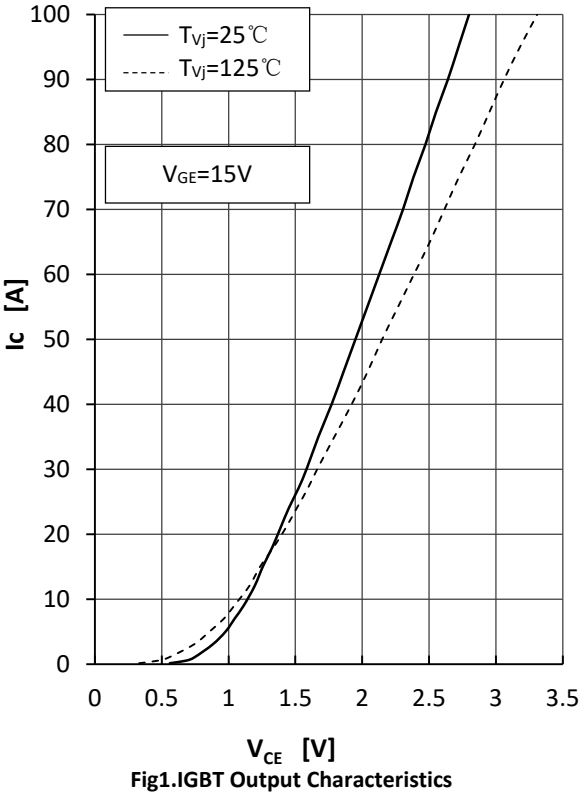


Fig1.IGBT Output Characteristics

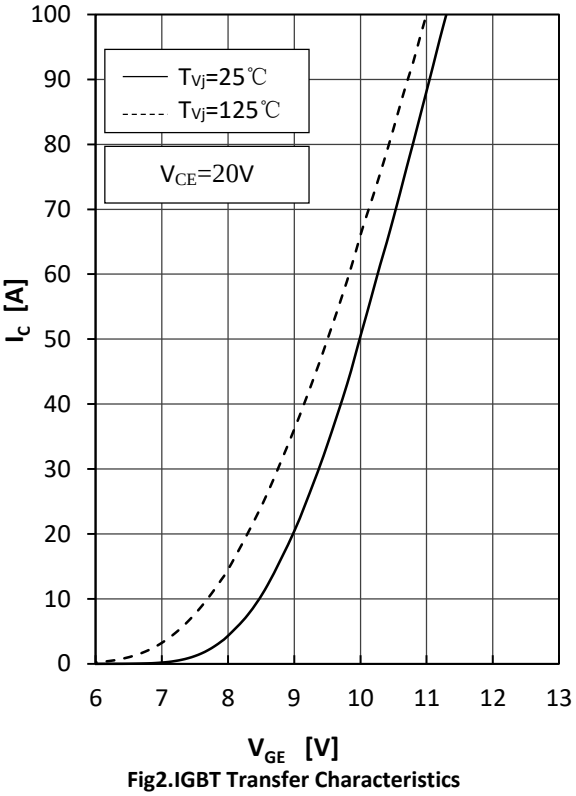


Fig2.IGBT Transfer Characteristics

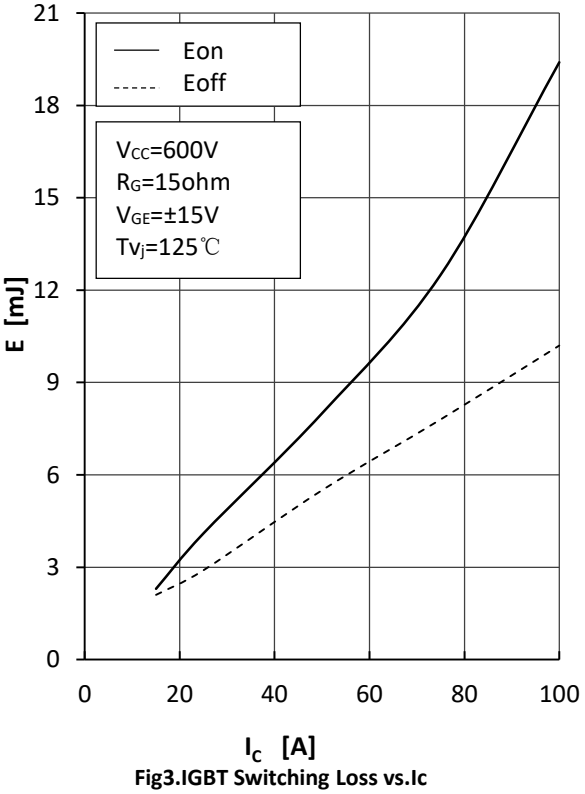


Fig3.IGBT Switching Loss vs.Ic

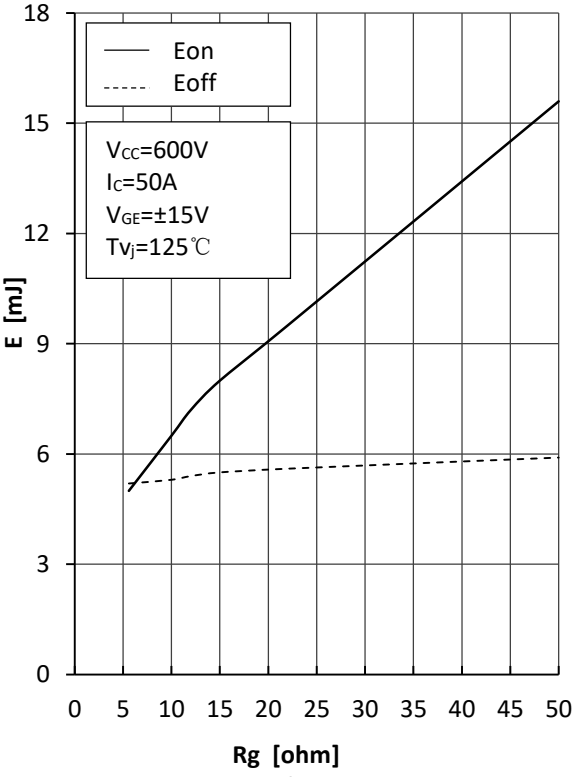


Fig4.IGBT Switching Loss vs.Rg

Curve Characteristics

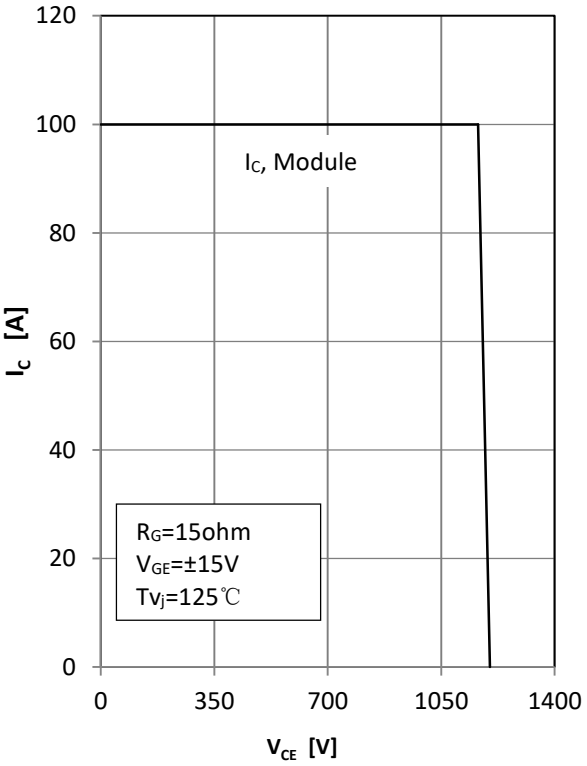


Fig5. RBSOA

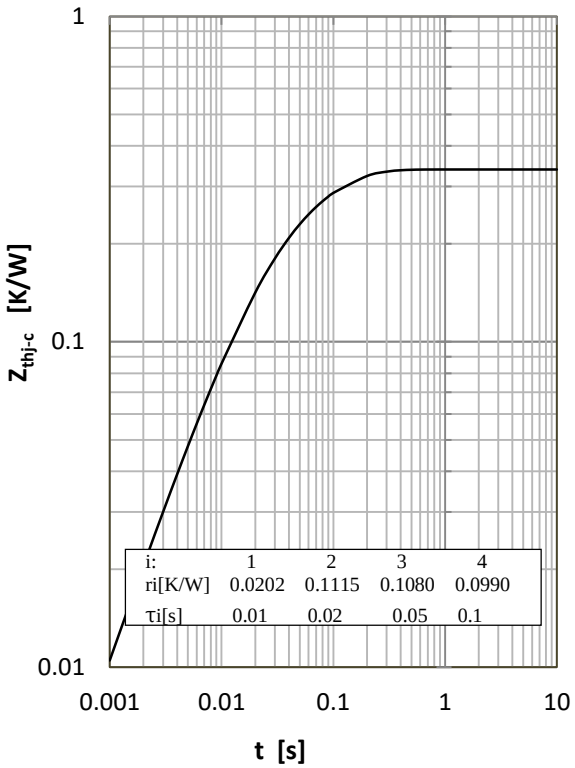


Fig 6. IGBT Transient Thermal Impedance

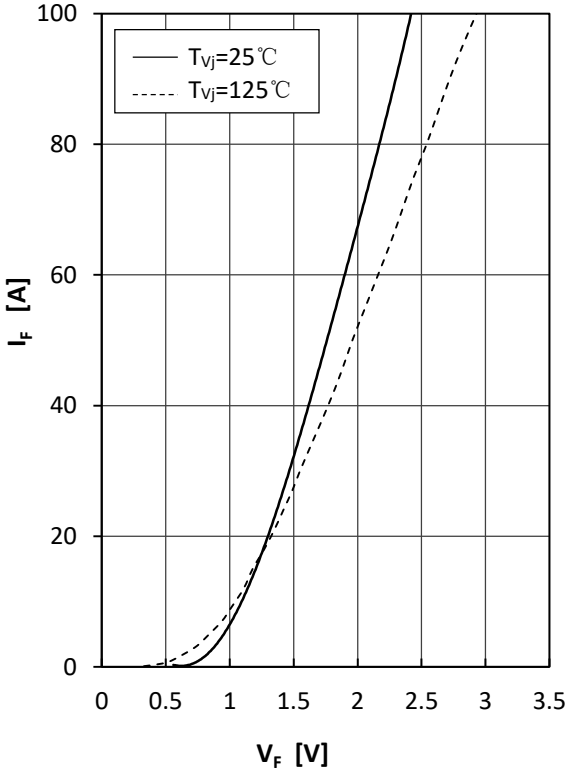


Fig7.Diode Foward Characteristics

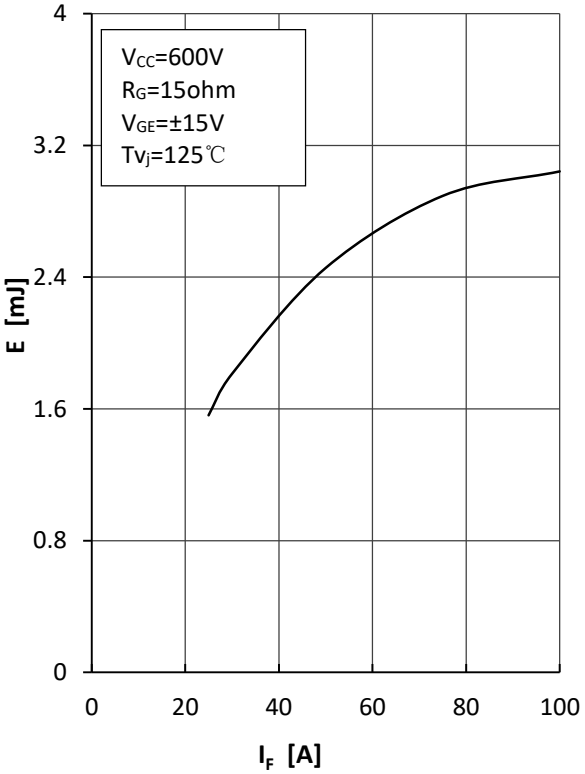


Fig8.Diode Switching Loss vs.I_F

Curve Characteristics

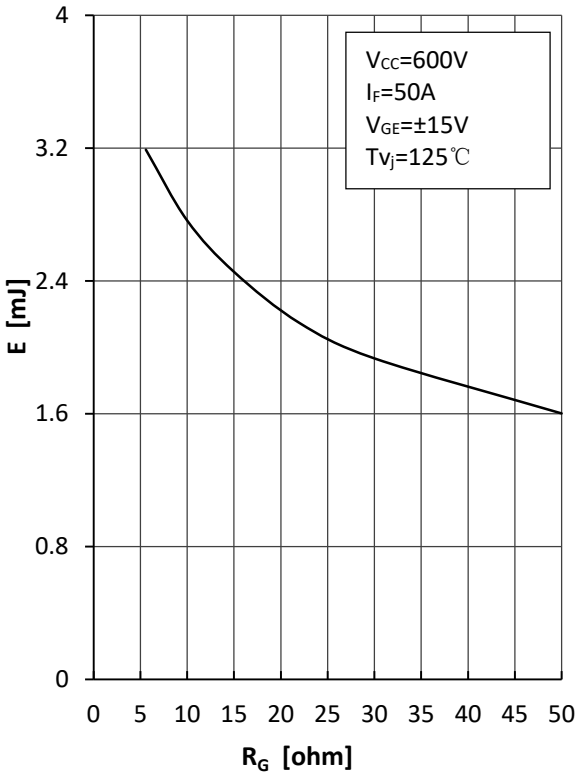


Fig9.Diode Switching Loss vs.Rg

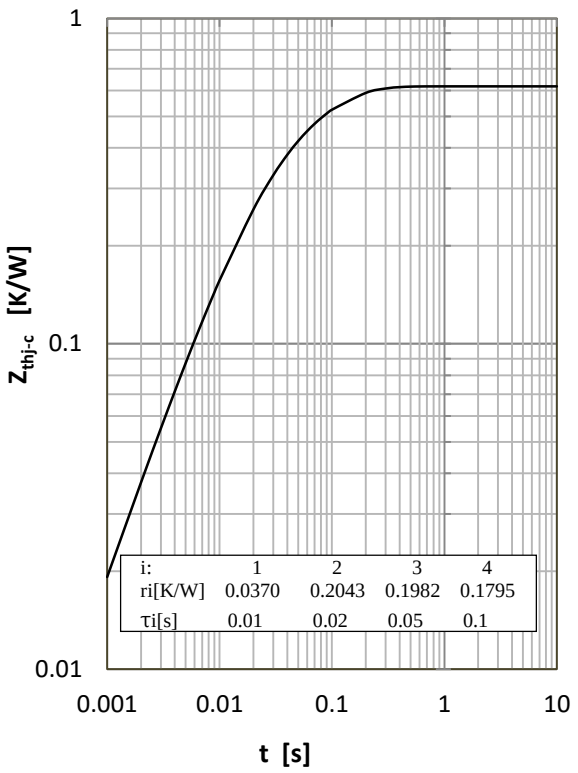


Fig10.Diode Transient Thermal Impedance

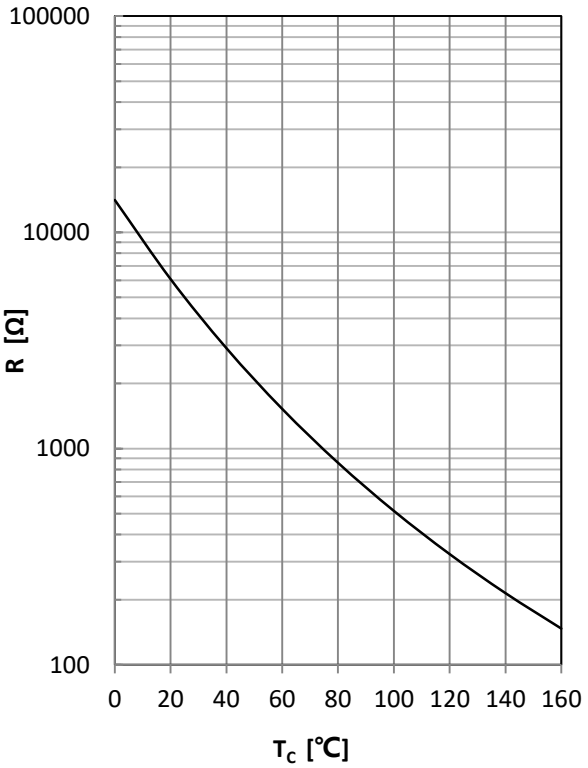


Fig 11. NTC Temperature Characteristic

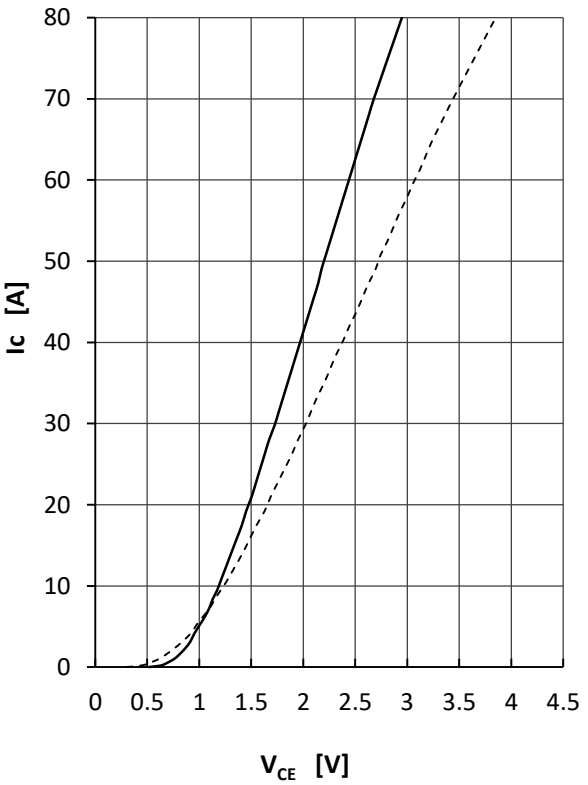


Fig12. IGBT-brake-chopper Output Characteristics

Curve Characteristics

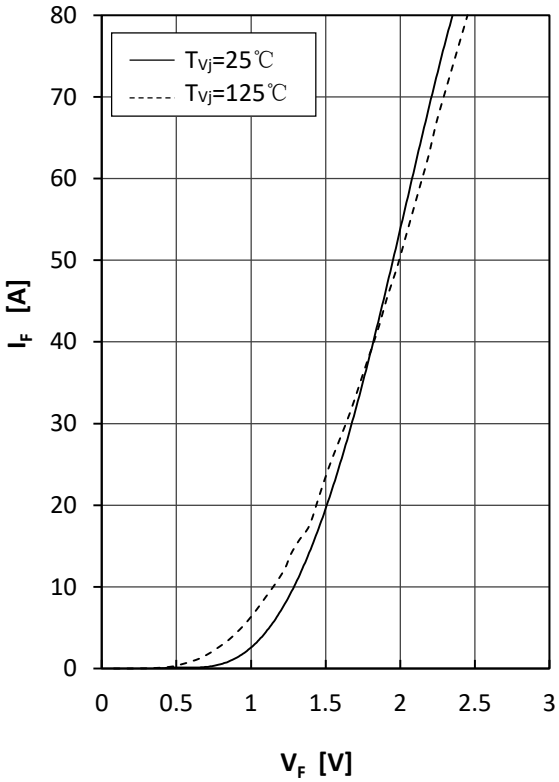
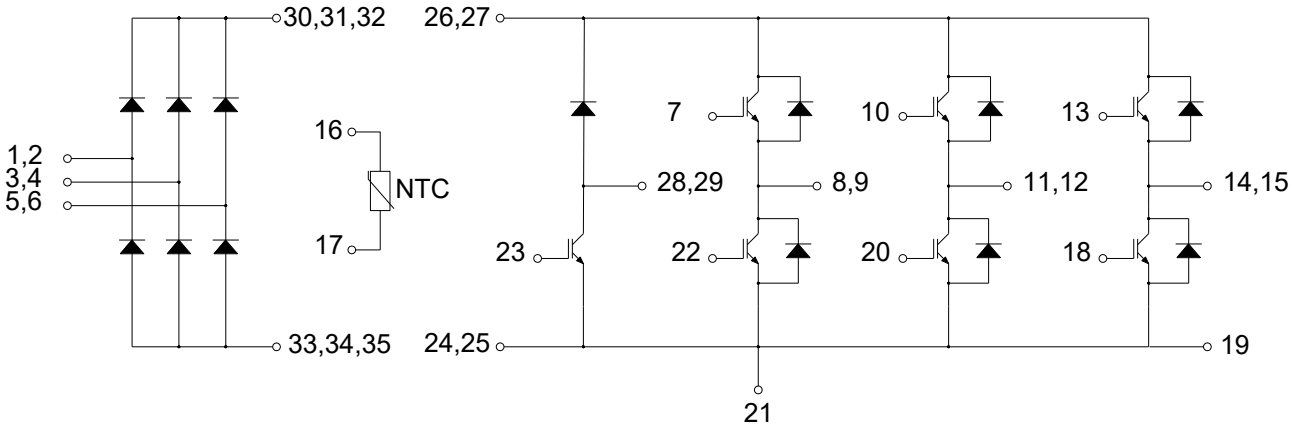


Fig13. Diode-brake-chopper Forward Characteristics

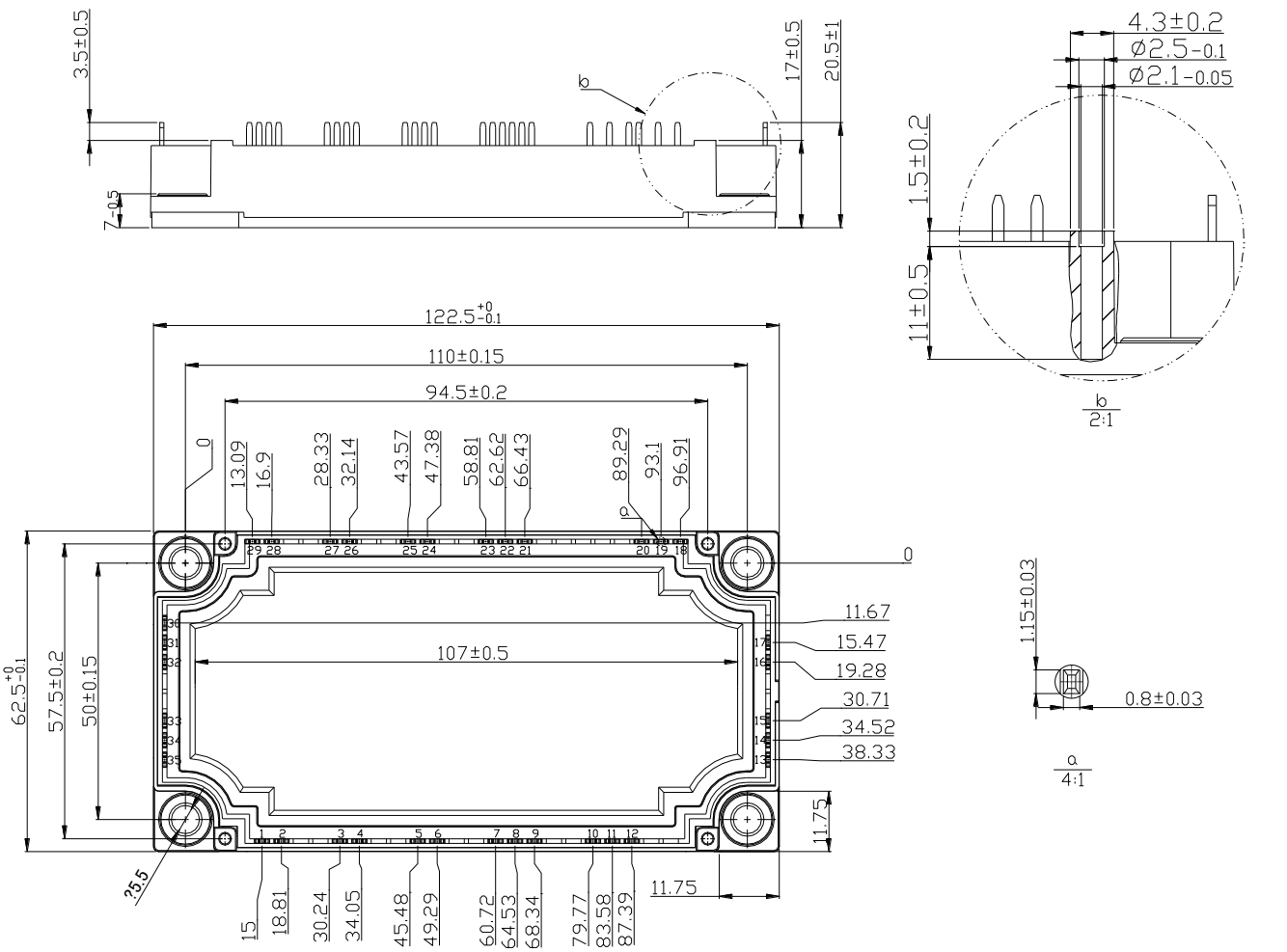
Circuit Diagram



Package Dimensions

Dimensions in mm

E2



Ordering Information

Device	Packing
Part Number-BP	Bulk: 6pcs/Box ; 42pcs/Ctn