

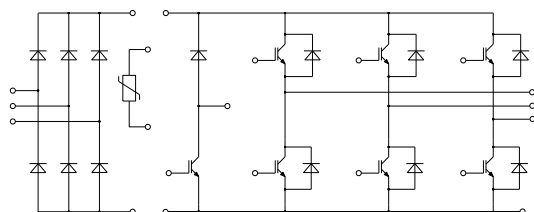
Features

- 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
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

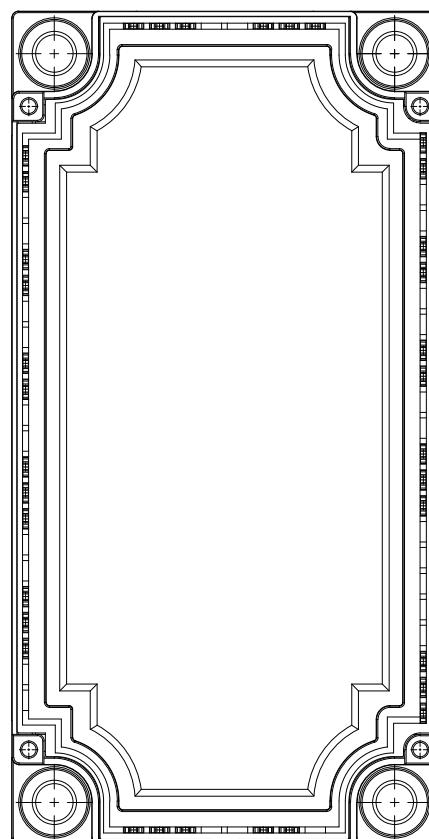
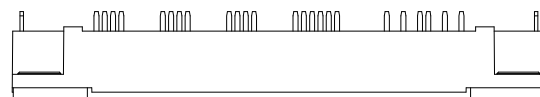
- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

Circuit Diagram



IGBT Modules 1200V 50A

E2



● 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	$T_C=80^{\circ}C, T_{vjmax}=150^{\circ}C$	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}	$T_C=25^{\circ}C, T_{vjmax}=150^{\circ}C$	368	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=2mA, T_{vj}=25^{\circ}C$	5.0	5.8	6.5	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	$V_{CE(sat)}$	$I_C=50A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.95	2.25	V
		$I_C=50A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15		V
		$I_C=50A, V_{GE}=15V, T_{vj}=150^{\circ}C$		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}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_{vj}=25^{\circ}C$		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	$t_{d(on)}$	$V_{CE}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_{vj}=125^{\circ}C$		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}	$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$		320		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		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	$I_F=50A, T_{vj}=25^{\circ}C$		1.95	2.25	V
		$I_F=50A, T_{vj}=125^{\circ}C$		2.05		V
		$I_F=50A, T_{vj}=150^{\circ}C$		2.1		V
Recovered Charge	Q_{rr}	$I_F=50A, V_R=600V,$ $-di_F/dt=900A/\mu s, T_{vj}=25^{\circ}C$		3.5		μC
Peak Reverse Recovery Current	I_{rr}			40		A
Reverse Recovery Energy	E_{rec}			1.35		mJ
Recovered Charge	Q_{rr}	$I_F=50A, V_R=600V,$ $-di_F/dt=900A/\mu s, T_{vj}=125^{\circ}C$		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}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	40	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	80	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	300	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$	5.8	6.7	7.2	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	$V_{CE(sat)}$	$I_C=40A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.95	2.35	V
		$I_C=40A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.3		V
		$I_C=40A, V_{GE}=15V, T_{vj}=150^{\circ}C$		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}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=40A,$ $V_{GE}=\pm 15V, R_G=12\Omega,$ $T_{vj}=25^{\circ}C$		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	$t_{d(on)}$	$V_{CE}=600V, I_C=40A,$ $V_{GE}=\pm 15V, R_G=12\Omega,$ $T_{vj}=125^{\circ}C$		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}	$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{CC}=900V, V_{CEM} \leq 1200V$		130		A

● 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		40	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	80	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$	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	$I_F=40A, T_{vj}=25^{\circ}C$		1.75	2.25	V
		$I_F=40A, T_{vj}=125^{\circ}C$		1.75		V
		$I_F=40A, T_{vj}=150^{\circ}C$		1.75		V
Recovered Charge	Q_{rr}	$I_F=40A, V_R=600V,$ $-di_F/dt=1600A/\mu s, T_{vj}=25^{\circ}C$		4.15		μC
Peak Reverse Recovery Current	I_{rr}			42		A
Reverse Recovery Energy	E_{rec}			1.3		mJ
Recovered Charge	Q_{rr}	$I_F=40A, V_R=600V,$ $-di_F/dt=1600A/\mu s, T_{vj}=125^{\circ}C$		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}	$T_j=25^{\circ}\text{C}$	1600	V
Average On-state Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_C=100^{\circ}\text{C}$	65	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_C=100^{\circ}\text{C}$	110	A
Surge Forward Current	I_{FSM}	$V_R=0, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	850	A
I^2t -value	I^2t	$V_R=0, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	3610	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F=50\text{A}, T_j=150^{\circ}\text{C}$		1		V
Reverse Current	I_r	$T_j=125^{\circ}\text{C}, V_R=1600\text{V}$			1.5	mA

● NTC-Thermistor

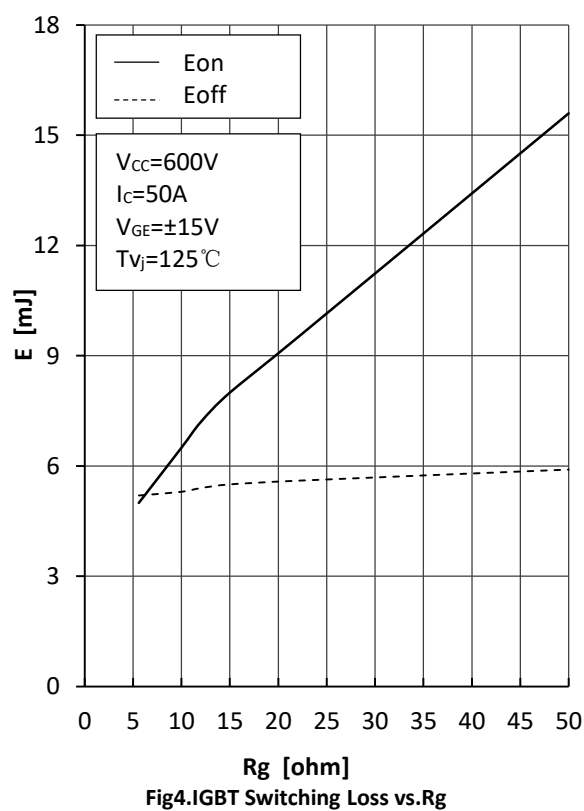
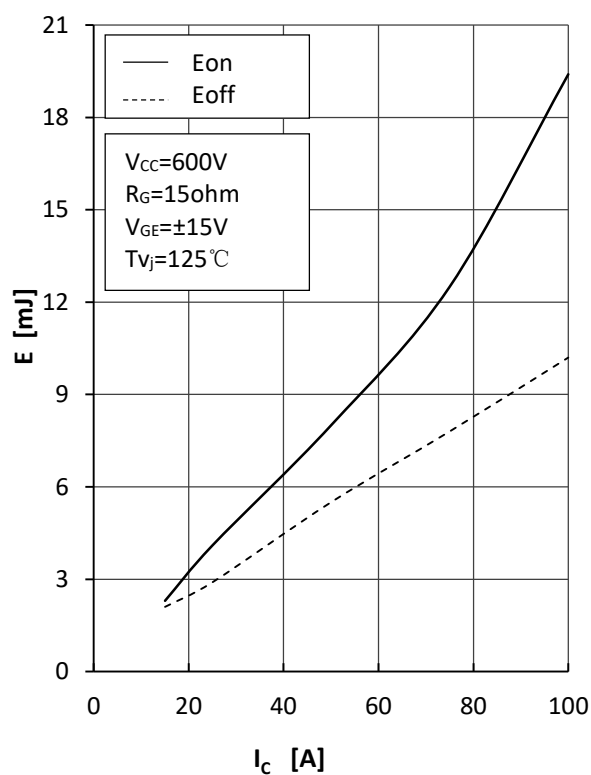
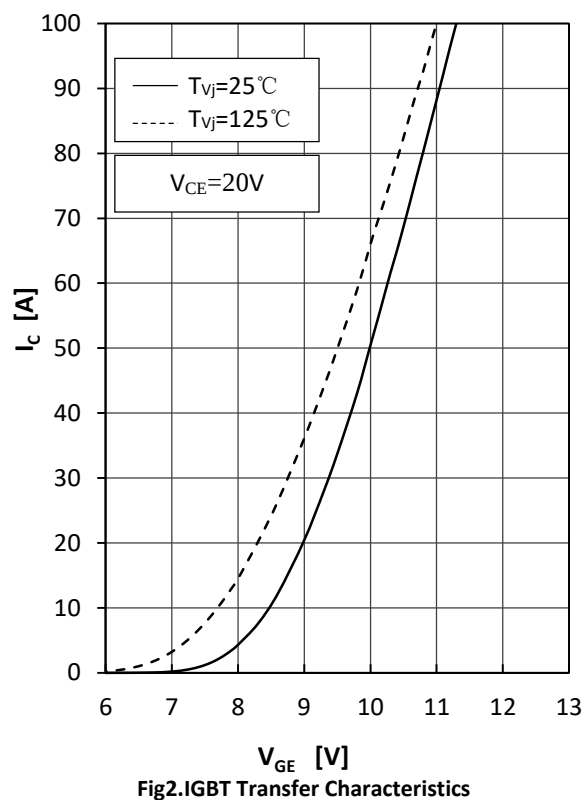
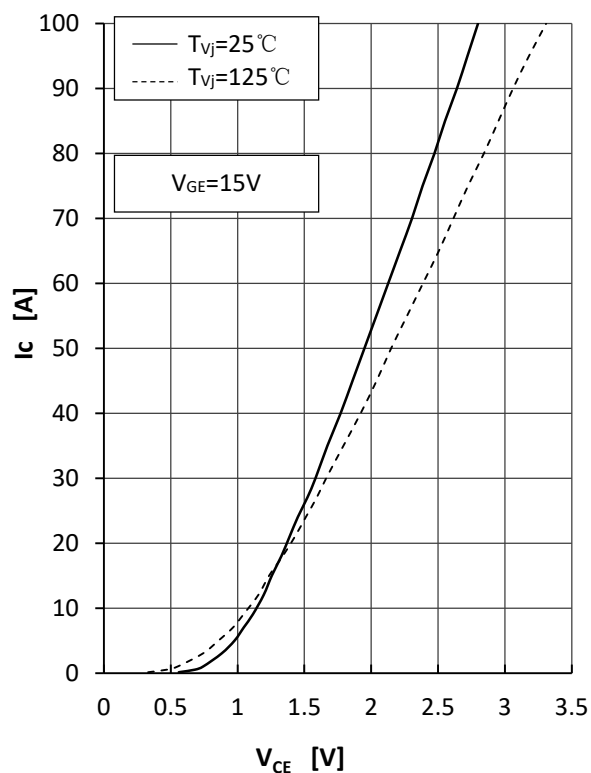
Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}			5		$\text{k}\Omega$
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

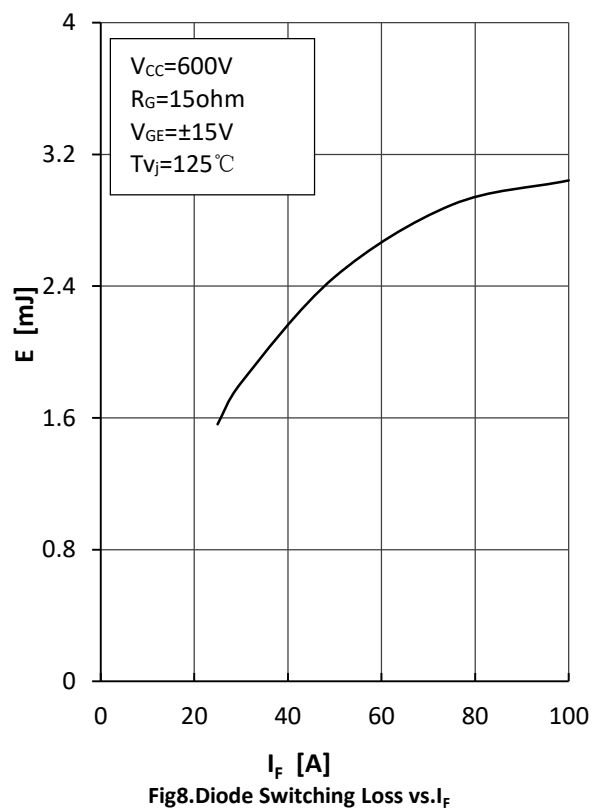
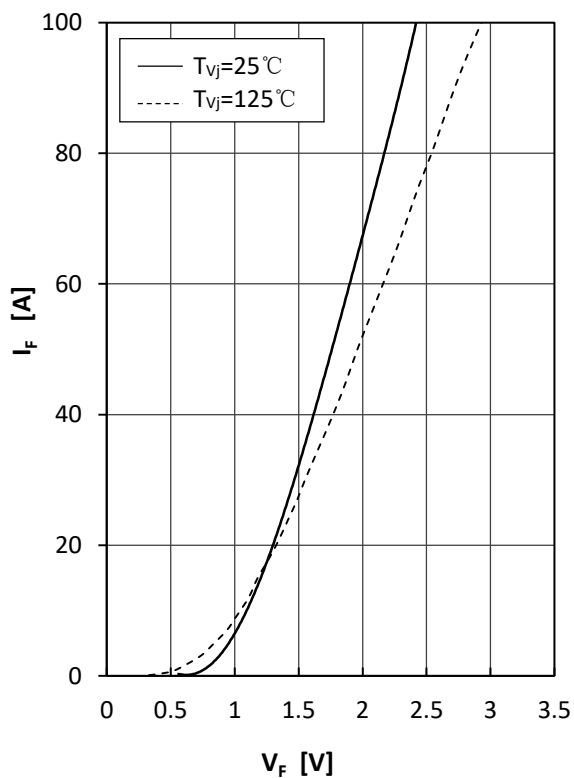
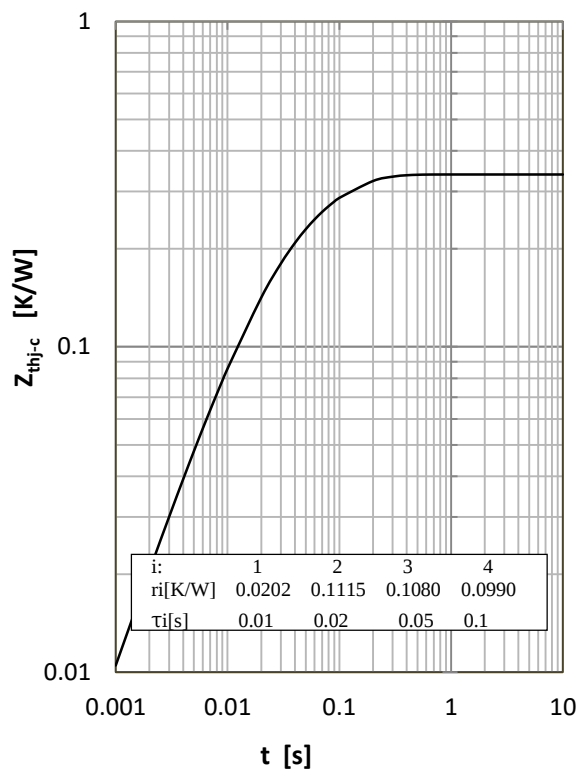
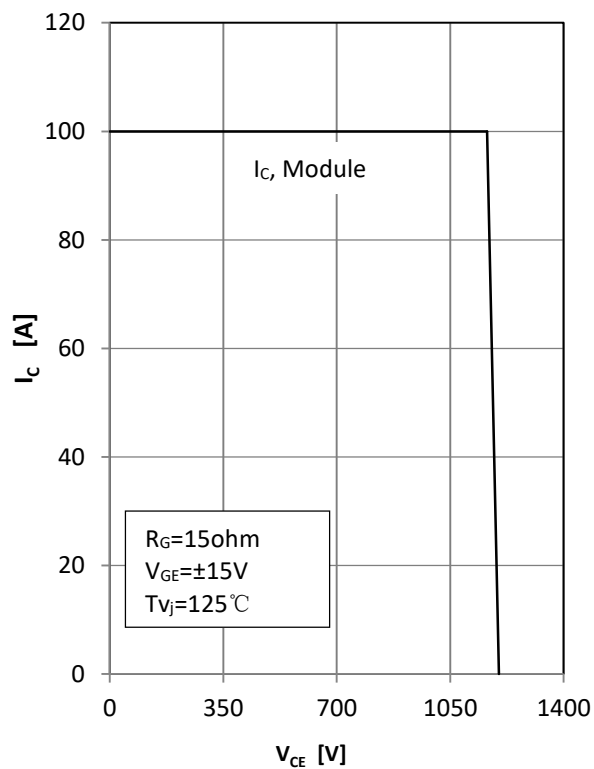
● Module Characteristics($T_c=25^{\circ}\text{C}$ unless otherwise specified)

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}	Inverter, brake			175	$^{\circ}\text{C}$
		rectifier			150	
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Operating Junction Temperature	T_{stg}		-40		125	$^{\circ}\text{C}$
Stray Inductance	L_{CE}			60		nH
Module Lead Resistance , Terminal to Chip	$R_{\text{cc'+EE'}}$	TC=25 $^{\circ}\text{C}$, per switch		4		m Ω
	$R_{\text{AA'+CC'}}$			2		
Thermal Resistance Junction to Case	$R_{\theta\text{j c}}$	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	$R_{\theta\text{cs}}$	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



Curve Characteristics



Curve Characteristics

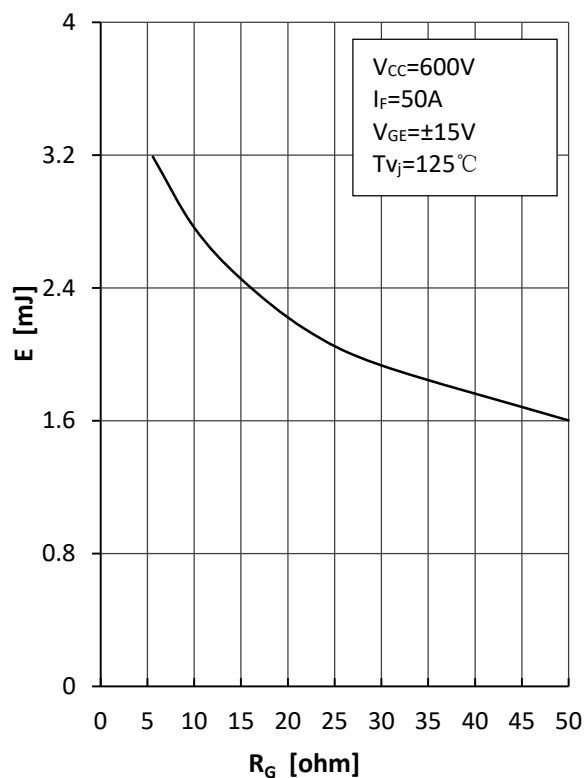


Fig9.Diode Switching Loss vs.Rg

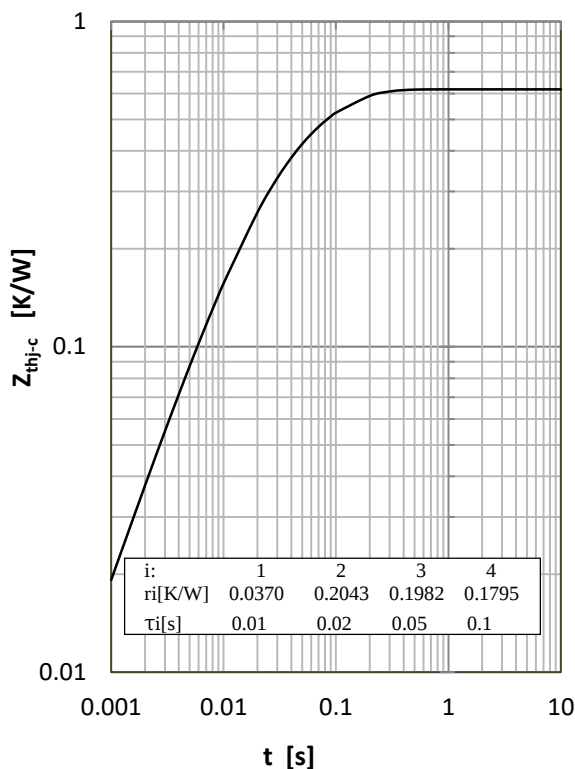


Fig10.Diode Transient Thermal Impedance

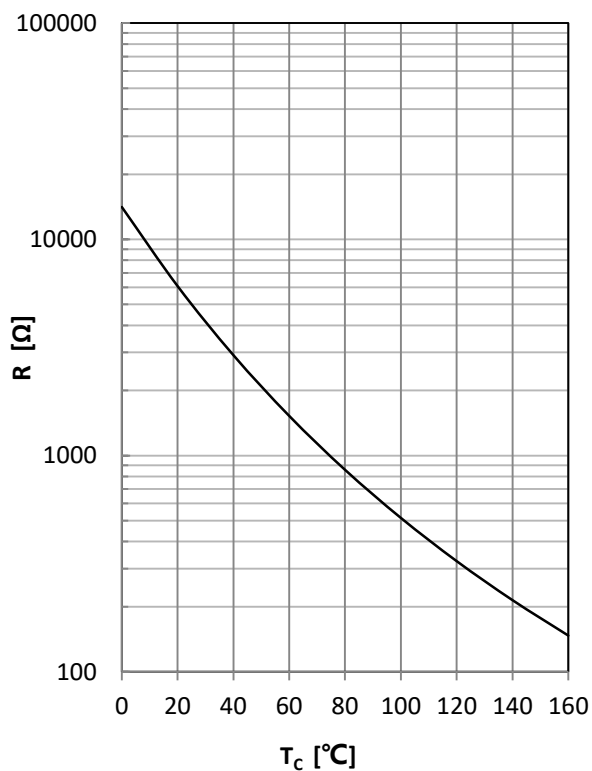


Fig 11. NTC Temperature Characteristic

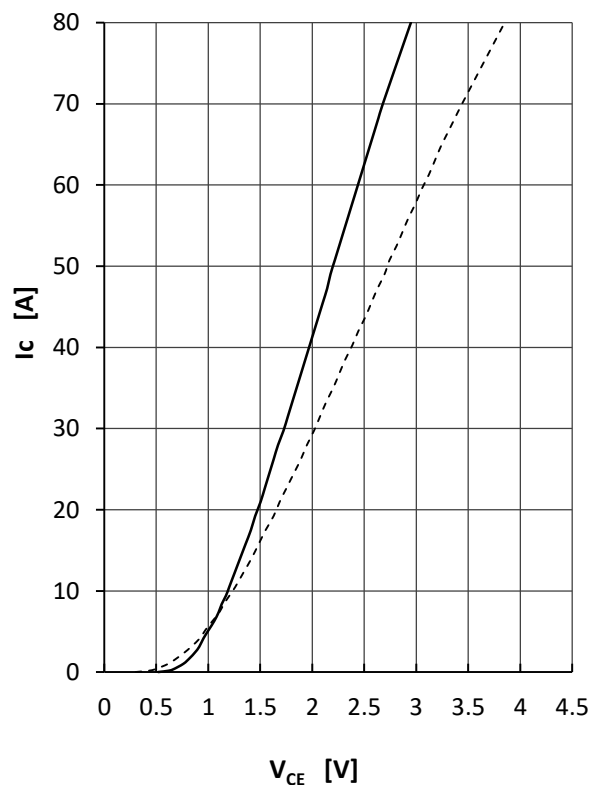


Fig12. IGBT-brake-chopper Output Characteristics

Curve Characteristics

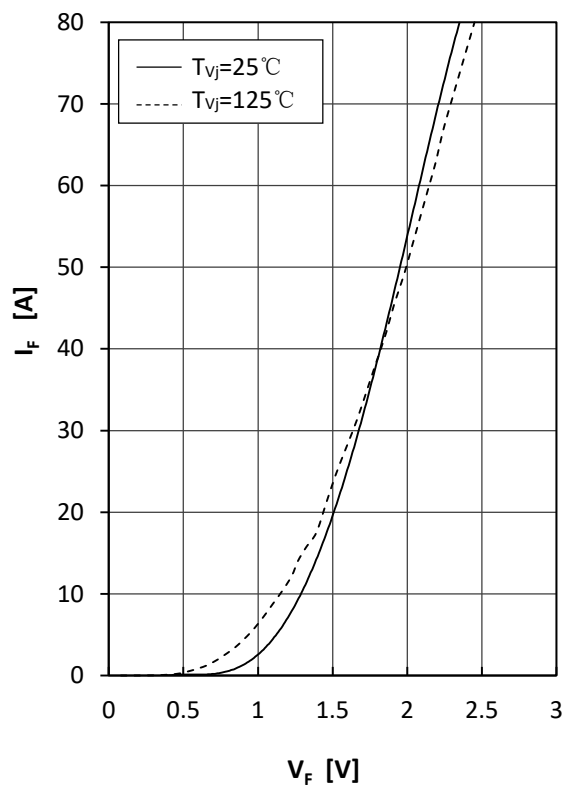
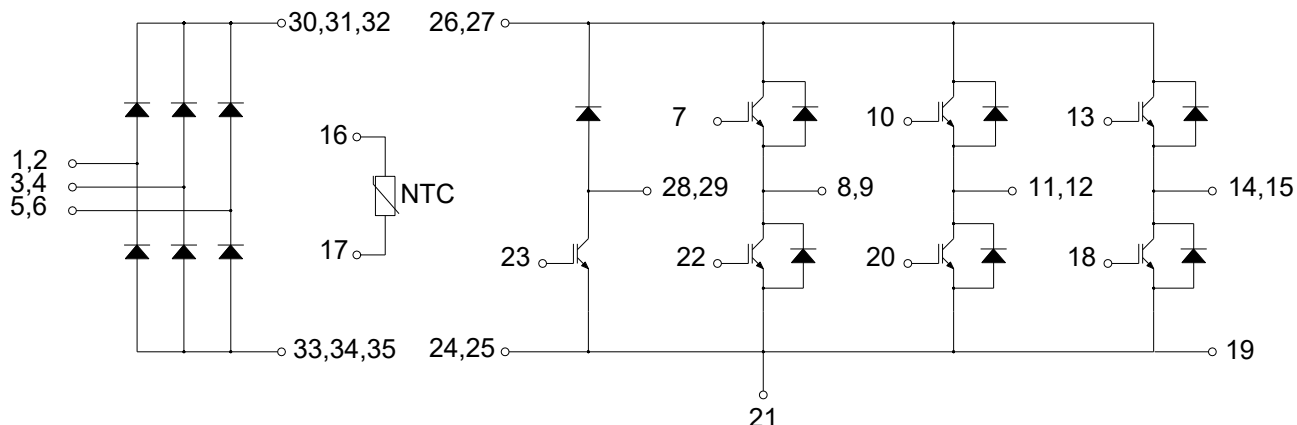


Fig13. Diode-brake-chopper Forward Characteristics

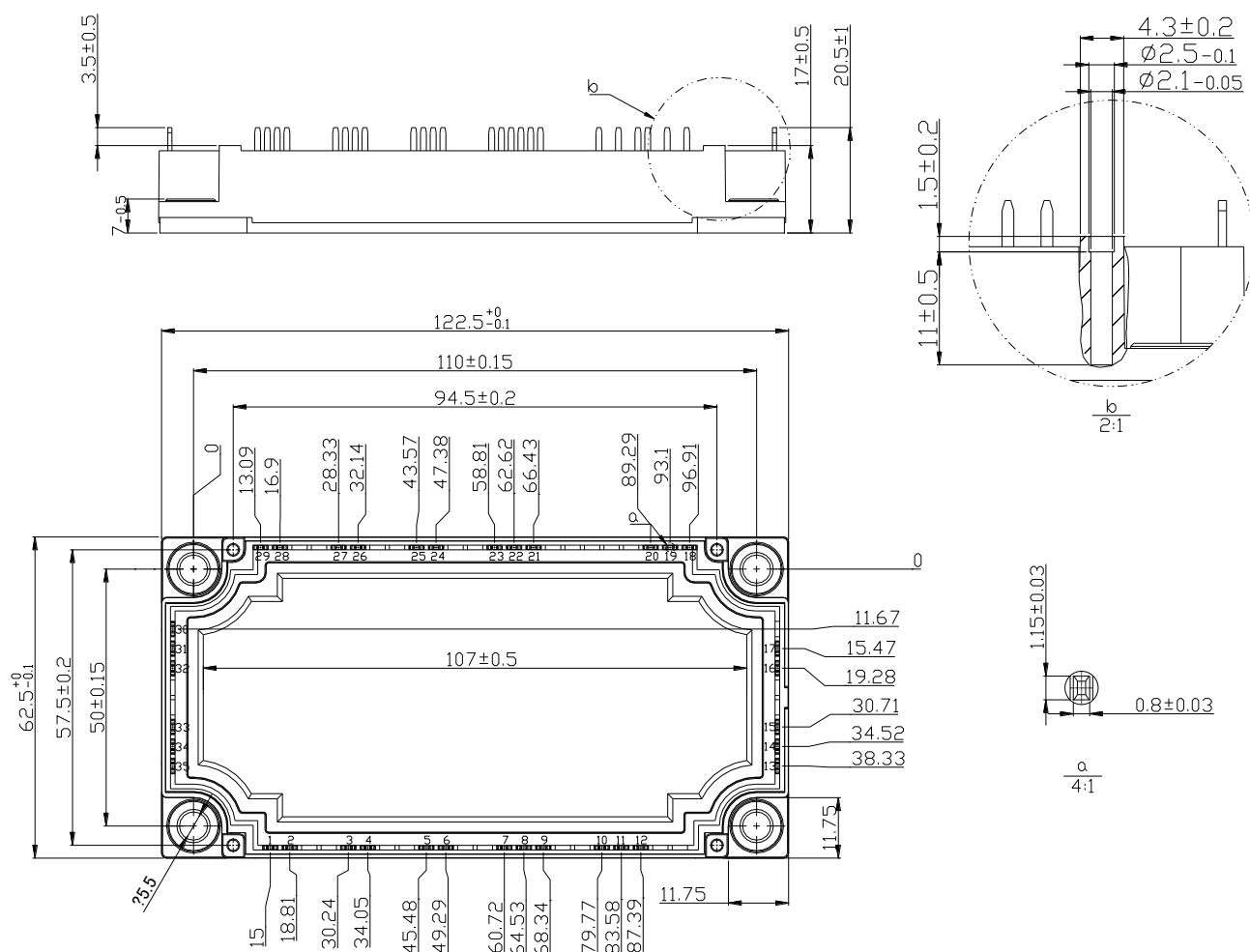
Circuit Diagram



Package Dimensions

Dimensions in mm

E2



Ordering Information

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

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