



E502650

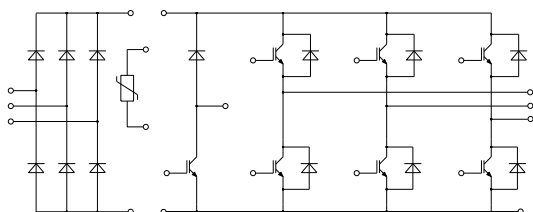
Features

- 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
- Halogen Free. "Green" Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note 2)("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

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

Circuit Diagram



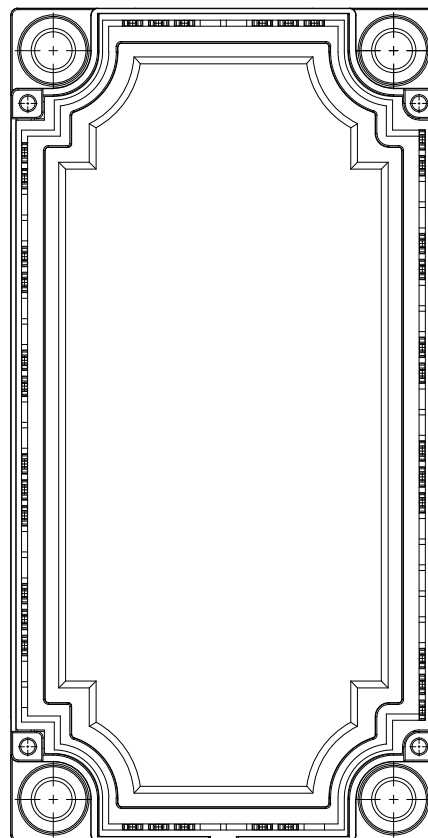
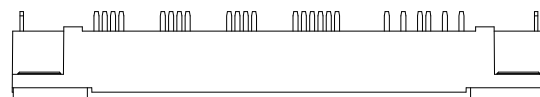
Note:

1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.



IGBT Modules 1200V 100A

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	$T_C=80^{\circ}C, T_{vjmax}=175^{\circ}C$	100	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	200	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	555	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=100A, T_J=25^{\circ}C$		1.85	2.25	V
		$V_{GE}=15V, I_C=100A, T_J=125^{\circ}C$		2.15		
		$V_{GE}=15V, I_C=100A, T_J=150^{\circ}C$		2.25		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=3.3mA, V_{CE}=V_{GE}$	5.0	5.8	6.5	V
C-E Leakage Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$			1.0	mA
G-E Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			400	nA
Internal Gate Resistance	R_g			7.5		Ω
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		6.80		nF
Reverse Transfer Capacitance	C_{res}			0.32		
Gate Charge	Q_g	$V_{GE}=\pm 15V$		0.78		μC
Turn-On Delay Time	$td_{(on)}$	$V_{CC}=600V, I_C=100A,$ $V_{GE}=\pm 15V, R_G=5.6\Omega,$ $L_s=35nH, T_J=25^{\circ}C$ Inductive Load		160		ns
Rise Time	t_r			45		
Turn-Off Delay Time	$td_{(off)}$			215		
Fall Time	t_f			54		
Turn-On Energy	E_{on}			9.2		mJ
Turn-Off Energy	E_{off}			5.8		
Turn-On Delay Time	$td_{(on)}$	$V_{CC}=600V, I_C=100A,$ $V_{GE}=\pm 15V, R_G=5.6\Omega,$ $L_s=35nH, T_J=125^{\circ}C$ Inductive Load		180		ns
Rise Time	t_r			52		
Turn-Off Delay Time	$td_{(off)}$			360		
Fall Time	t_f			63		
Turn-On Energy	E_{on}			13.2		mJ
Turn-Off Energy	E_{off}			9.4		
Turn-On Delay Time	$td_{(on)}$	$V_{CC}=600V, I_C=100A,$ $V_{GE}=\pm 15V, R_G=5.6\Omega,$ $L_s=35nH, T_J=150^{\circ}C$ Inductive Load		198		ns
Rise Time	t_r			64		
Turn-Off Delay Time	$td_{(off)}$			375		
Fall Time	t_f			72		
Turn-On Energy	E_{on}			14.5		mJ
Turn-Off Energy	E_{off}			10.5		
SC Data	I_{sc}	$T_P \leq 10\mu s, V_{GE}=15V, V_{CC}=900V,$ $V_{CEM} \leq 1200V, T_{vj}=150^{\circ}C$		500		A

● Diode- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1200	V
Continuous DC Forward Current	I_F		100	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	200	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$	1550	A^2s
		$V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$	1500	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$V_{GE}=0V, I_F=100A, T_J=25^{\circ}C$		1.86	2.40	V
		$V_{GE}=0V, I_F=100A, T_J=125^{\circ}C$		1.70		
		$V_{GE}=0V, I_F=100A, T_J=150^{\circ}C$		1.69		
Reverse Recovery Current	I_{rr}	$V_R=600V, I_F=100A,$ $di_F/dt=-3500A/\mu s, T_J=25^{\circ}C$		105		A
Reverse Recovery Charge	Q_{rr}			8.8		μC
Reverse Recovery Energy	E_{rec}			3.2		mJ
Reverse Recovery Current	I_{rr}	$V_R=600V, I_F=100A,$ $di_F/dt=-3500A/\mu s, T_J=125^{\circ}C$		115		A
Reverse Recovery Charge	Q_{rr}			16.2		μC
Reverse Recovery Energy	E_{rec}			5.4		mJ
Reverse Recovery Current	I_{rr}	$V_R=600V, I_F=100A,$ $di_F/dt=-3500A/\mu s, T_J=150^{\circ}C$		127		A
Reverse Recovery Charge	Q_{rr}			19.4		μC
Reverse Recovery Energy	E_{rec}			6.3		mJ

● IGBT- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_J=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	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}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	442	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=50A, T_J=25^{\circ}C$		1.90	2.35	V
		$V_{GE}=15V, I_C=50A, T_J=125^{\circ}C$		2.25		
		$V_{GE}=15V, I_C=50A, T_J=150^{\circ}C$		2.35		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=1.7mA, V_{CE}=V_{GE}$	5.0	5.7	6.5	V
C-E Leakage Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$			1.0	mA
G-E Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			400	nA
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		2.60		nF
Reverse Transfer Capacitance	C_{res}			0.10		
Gate Charge	Q_g	$V_{GE}=\pm 15V$		0.35		μC
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_J=25^{\circ}C$		168		ns
Rise Time	t_r			34		
Turn-Off Delay Time	$t_{d(off)}$			320		
Fall Time	t_f			78		
Turn-On Energy	E_{on}	$V_{CC}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_J=125^{\circ}C$		5.42		mJ
Turn-Off Energy	E_{off}			5.15		
Turn-On Delay Time	$t_{d(on)}$			175		ns
Rise Time	t_r			42		
Turn-Off Delay Time	$t_{d(off)}$			426		
Fall Time	t_f			148		
Turn-On Energy	E_{on}	$V_{CC}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_J=150^{\circ}C$		7.26		mJ
Turn-Off Energy	E_{off}			5.8		
Turn-On Delay Time	$t_{d(on)}$			179		ns
Rise Time	t_r			48		
Turn-Off Delay Time	$t_{d(off)}$			506		
Fall Time	t_f			154		
Turn-On Energy	E_{on}	$T_P \leq 10\mu s, V_{GE}=15V, V_{CC}=900V, V_{CEM} \leq 1200V, T_{Vj}=150^{\circ}C$		7.84		mJ
Turn-Off Energy	E_{off}			6.15		
SC Data	I_{sc}	$T_P \leq 10\mu s, V_{GE}=15V, V_{CC}=900V, V_{CEM} \leq 1200V, T_{Vj}=150^{\circ}C$		260		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		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
Diode Forward Voltage	V_F	$V_{GE}=0V, I_F=35A, T_{vj}=25^{\circ}C$		1.95		V
		$V_{GE}=0V, I_F=35A, T_{vj}=125^{\circ}C$		1.86		
		$V_{GE}=0V, I_F=35A, T_{vj}=150^{\circ}C$		1.85		
Reverse Recovery Current	I_{rr}	$V_R=600V, I_F=35A, di_F/dt=-1600A/\mu s, T_{vj}=25^{\circ}C$		42		A
Reverse Recovery Charge	Q_{rr}			4.15		μC
Reverse Recovery Energy	E_{rec}			1.3		mJ
Reverse Recovery Current	I_{rr}	$V_R=600V, I_F=35A, di_F/dt=-1600A/\mu s, T_{vj}=125^{\circ}C$		46		A
Reverse Recovery Charge	Q_{rr}			8.0		μC
Reverse Recovery Energy	E_{rec}			2.38		mJ
Reverse Recovery Current	I_{rr}	$V_R=600V, I_F=35A, di_F/dt=-1600A/\mu s, T_{vj}=150^{\circ}C$		52		A
Reverse Recovery Charge	Q_{rr}			9.58		μC
Reverse Recovery Energy	E_{rec}			2.86		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_J=25^{\circ}C$	1600	V
Average Output Current 50/60Hz, Sine Wave	$I_{F(AV)}$	$T_C=100^{\circ}C$	80	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_C=100^{\circ}C$	120	A
Surge Forward Current	I_{FSM}	$V_R=0, t_p=10ms, T_J=45^{\circ}C$	1100	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_J=45^{\circ}C$	6050	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F=50A, T_J=125^{\circ}C$		0.98		V
Reverse Current	I_R	$V_R=1600V, T_J=125^{\circ}C$			2.0	mA

● NTC-Thermistor

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}			5.0		$K\Omega$
Deviation of R_{100}	R/R	$R_{100}=493.3\Omega, T_C=125^{\circ}C$	-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($T_C=25^{\circ}\text{C}$ 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
Comparative Tracking Index	CTI			>200		
Module Lead Resistance, Terminals-Chip	$R_{\text{CC}'+\text{EE}}$	$T_C=25^{\circ}\text{C}$, per Switch		4.0		m Ω
	$R_{\text{AA}'+\text{CC}}$			3.0		
Thermal Resistance Junction to Case	$R_{\theta\text{JC}}$	per IGBT-inverter			0.27	K/W
		per Diode-inverter			0.50	
		per IGBT-brake-copper			0.34	
		per Diode-chopper			1.20	
		per Diode-rectifier			0.43	
Thermal Resistance Junction to Sink	$R_{\theta\text{CS}}$	per IGBT-inverter		0.12		K/W
		per Diode-inverter		0.22		
		per IGBT-brake-copper		0.14		
		per Diode-chopper		0.56		
		per Diode-rectifier		0.19		
		per Module		0.009		
Mounting Force Per Clamp	F		3		6	N
Weight of Module	G			300		g

Curve Characteristics

Fig. 1 - IGBT Output Characteristics

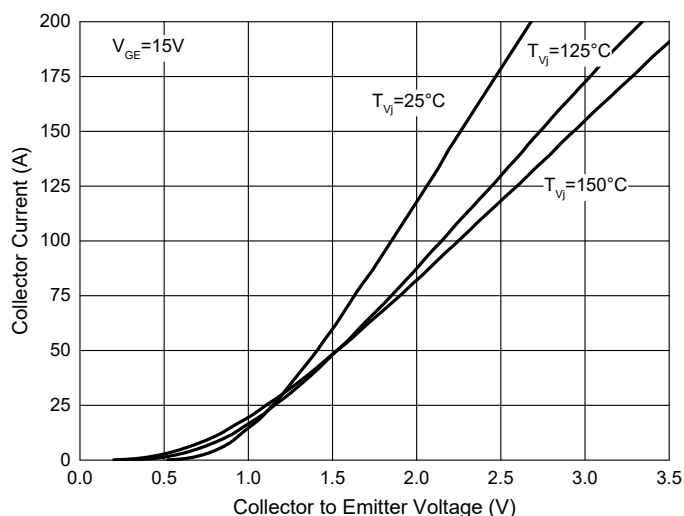


Fig. 2 - IGBT Transfer Characteristics

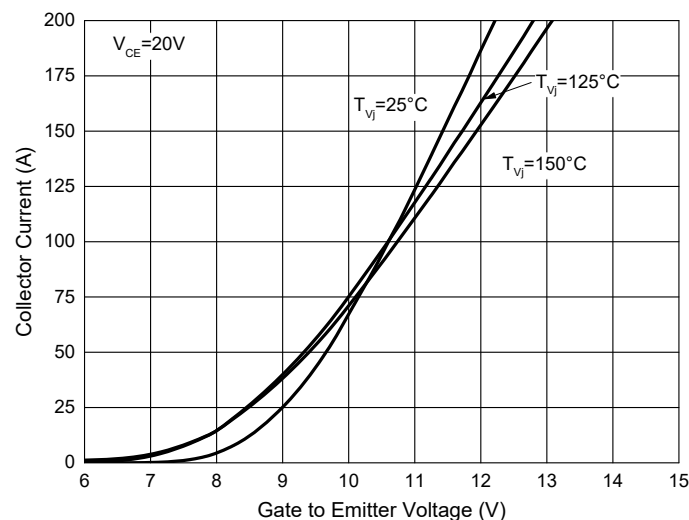


Fig. 3 - IGBT Switching Loss vs Collector Current

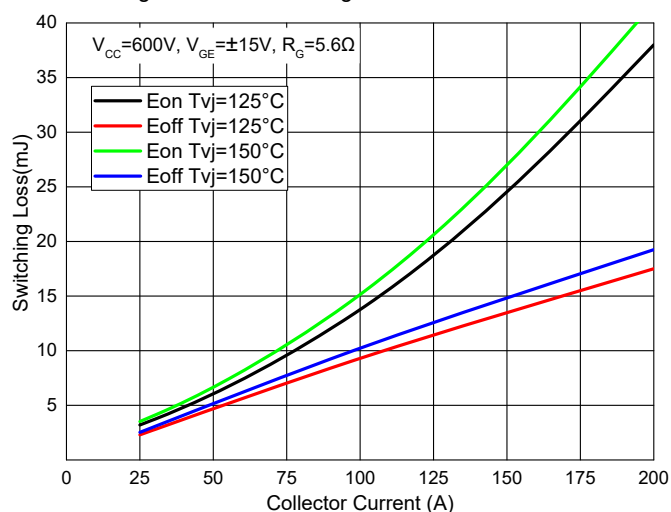


Fig. 4 - Switching Loss vs Gate Resistance

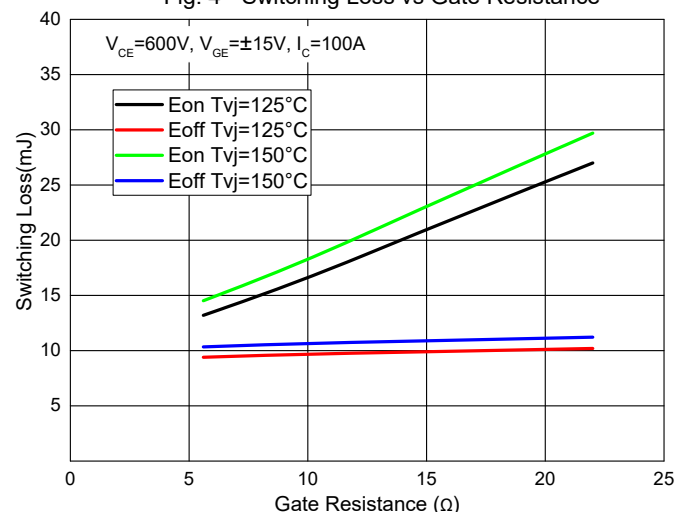


Fig. 5 - RBSOA

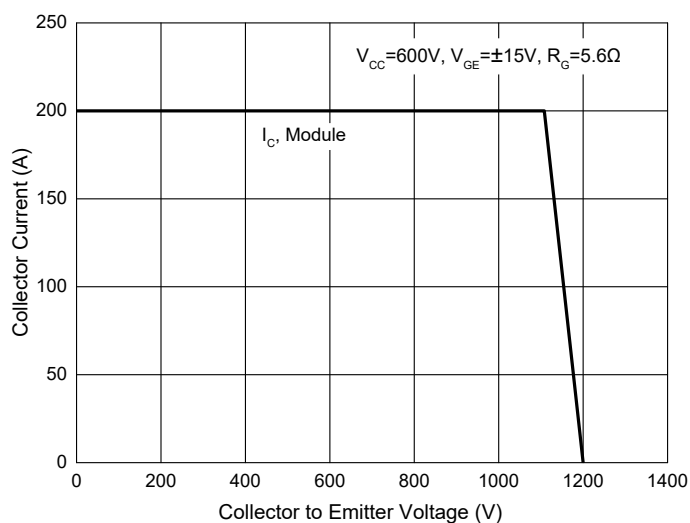
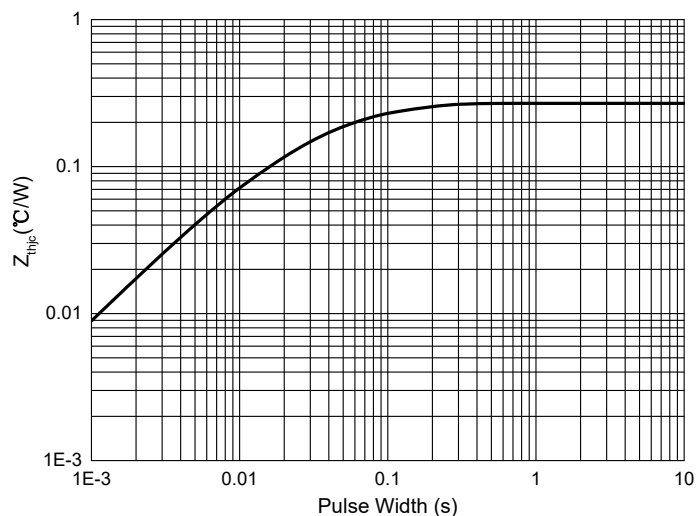


Fig. 6 - IGBT Transient Thermal Impedance



Curve Characteristics

Fig. 7 - Diode Forward Characteristics

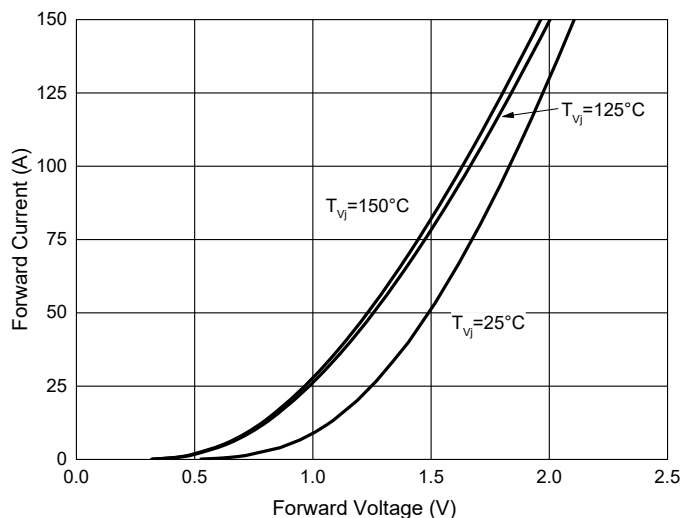


Fig. 8 - Diode Switching Loss (E_{rec}) vs IF

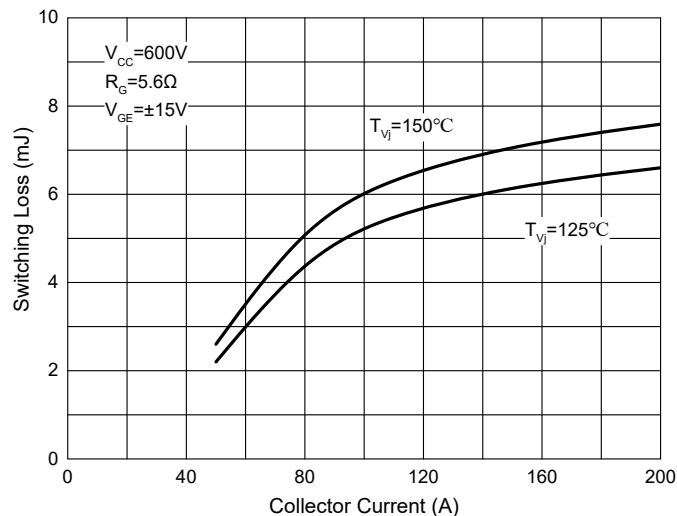


Fig. 9 - Diode Switching Loss vs RG

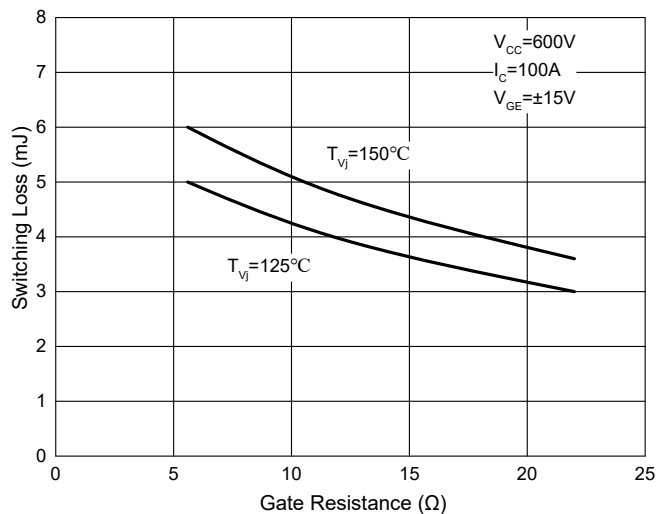


Fig. 10 - Diode Transient Thermal Impedance

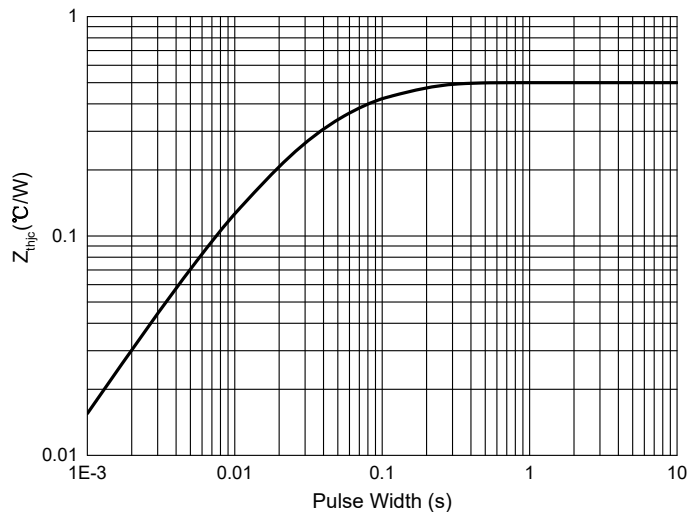


Fig. 11 - NTC Temperature Characteristic

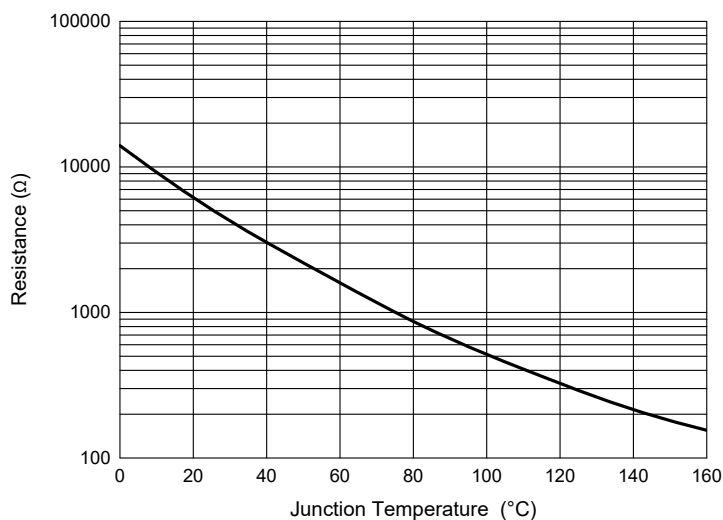
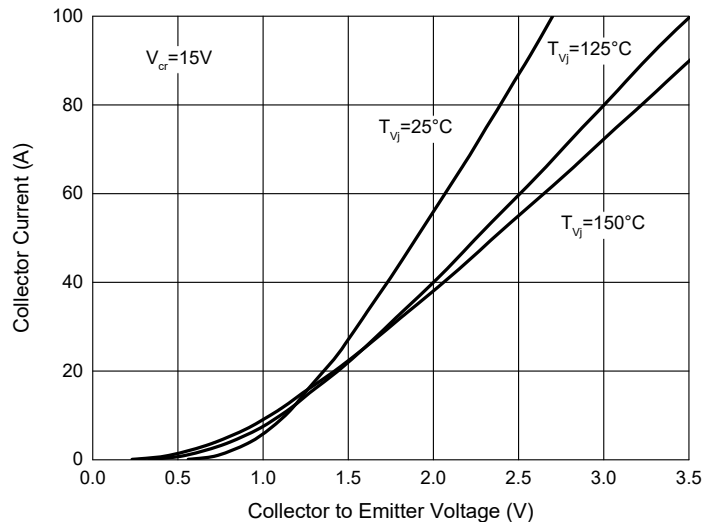
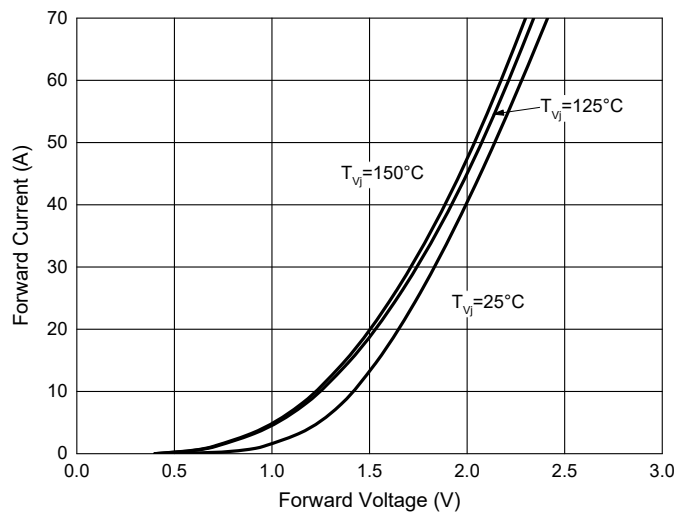


Fig. 12 - IGBT-brake-Chopper Output Characteristics

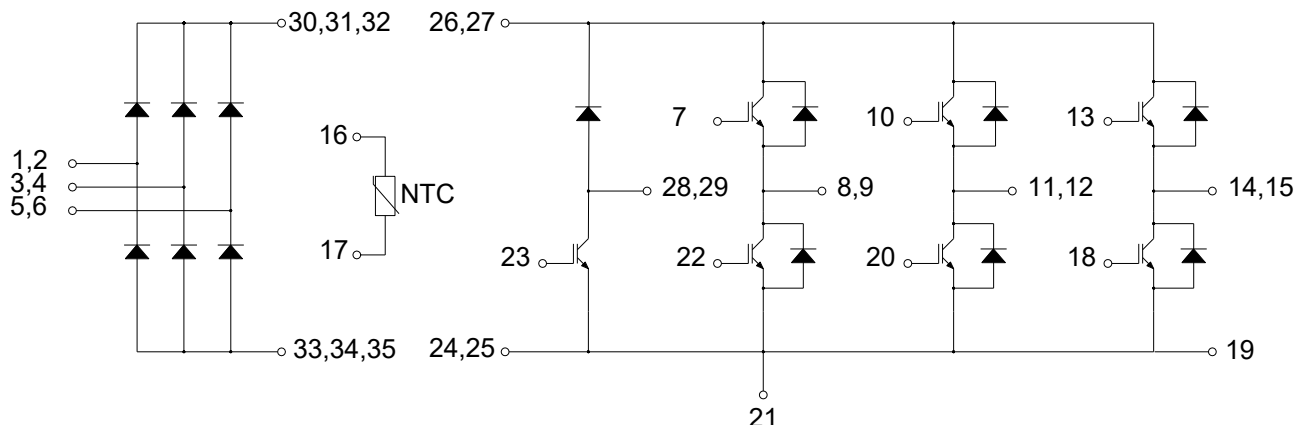


Curve Characteristics

Fig. 13 - Diode Foward Characteristics



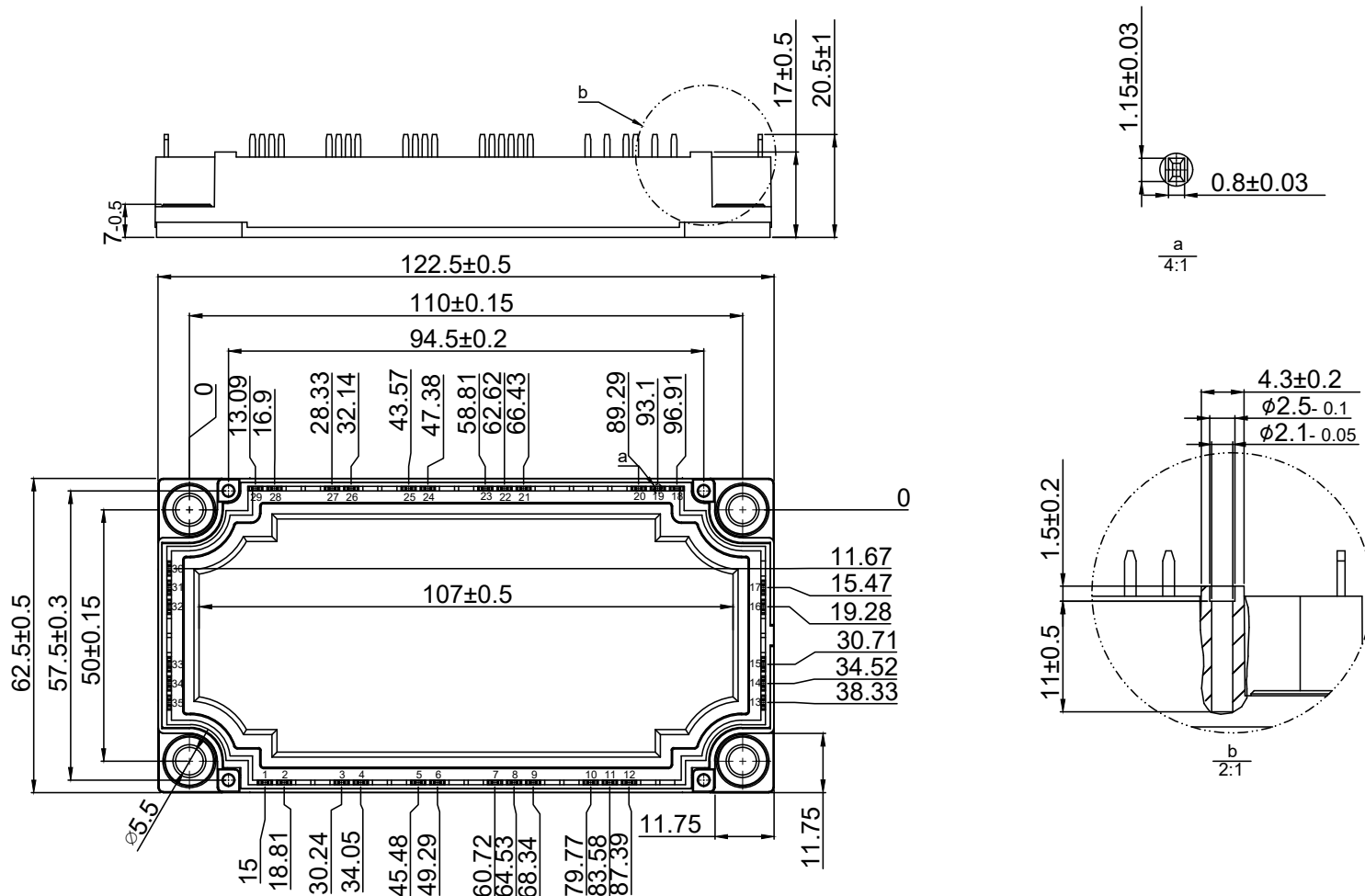
Circuit Diagram



Package Dimensions

Dimensions in mm

E2



Ordering Information

Device	Packing
Part Number-BP	Bulk: 6pcs/Box ; 36pcs/Ctn

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