

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(8us)
- Maximum junction temperature 175°C
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note 1)("P" Suffix Designates RoHS Compliant. See Ordering Information)

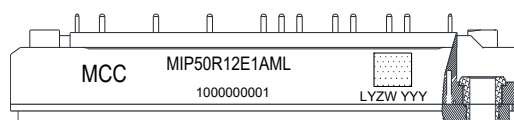
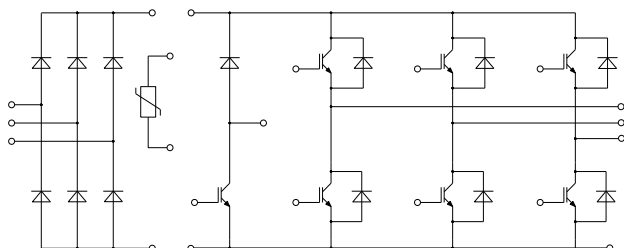
Applications

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

Note:

1. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

Circuit Diagram



Marking Code Contents:

Logo: MCC

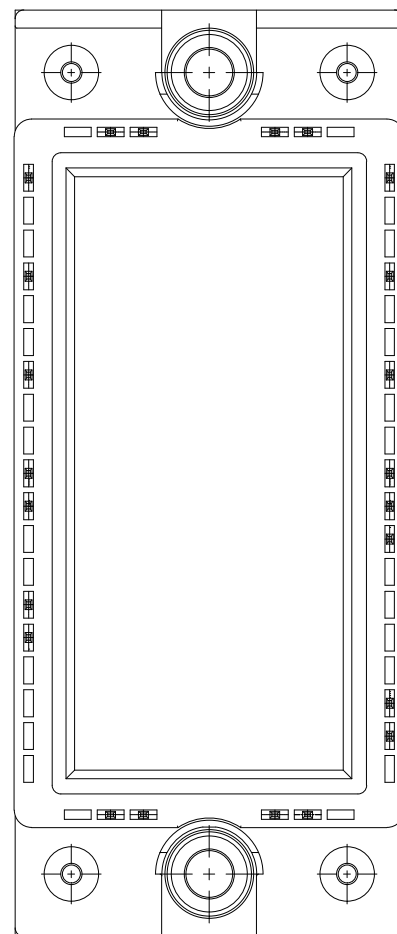
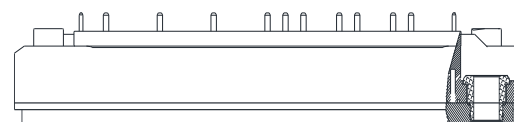
Product Number: MIP50R12E1AML

Trace Code: 10 Digits

2D Code format: Data Matrix

IGBT Modules 1200V 50A

E1A



● 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	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	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}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	240	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.7mA, T_{vj}=25^{\circ}C$	5.2	5.8	6.4	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	$V_{CE(sat)}$	$I_C=50A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.70		V
		$I_C=50A, V_{GE}=15V, T_{vj}=125^{\circ}C$		1.95		
		$I_C=50A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.05		
Gate Charge	Q_G			0.57		μC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		7.29		nF
Reverse Transfer Capacitance	C_{res}			0.09		
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_{vj}=25^{\circ}C$		112		ns
Rise Time	t_r			134		
Turn-Off Delay Time	$t_{d(off)}$			207		
Fall Time	t_f			230		
Turn-on Time	E_{on}			5.5		mJ
Turn-off Time	E_{off}			3.4		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=50A, V_{GE}=\pm 15V, R_G=15\Omega, T_{vj}=150^{\circ}C$		99		ns
Rise Time	t_r			138		
Turn-Off Delay Time	$t_{d(off)}$			241		
Fall Time	t_f			293		
Turn-On Energy	E_{on}			7.4		mJ
Turn-Off Energy	E_{off}			4.5		
SC Data	I_{SC}	$t_p \leq 8\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=600V, V_{CEM} \leq 1200V$		200		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}	$t_p=1ms$	100	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	2.80	V
		$I_F=50A, T_{vj}=125^{\circ}C$		1.85		
		$I_F=50A, T_{vj}=150^{\circ}C$		1.80		
Recovered Charge	Q_{rr}	$I_F=50A, V_R=600V,$ $-di_F/dt=280A/\mu s,$ $T_{vj}=25^{\circ}C$		2.9		μC
Peak Reverse Recovery Current	I_{rr}			20		A
Reverse Recovery Energy	E_{rec}			0.95		mJ
Recovered Charge	Q_{rr}	$I_F=50A, V_R=600V,$ $-di_F/dt=280A/\mu s,$ $T_{vj}=150^{\circ}C$		6.2		μC
Peak Reverse Recovery Current	I_{rr}			28		A
Reverse Recovery Energy	E_{rec}			2.2		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	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	25	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	50	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	165	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$	5.2	5.8	6.4	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	$V_{CE(sat)}$	$I_C=25A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.95	2.50	V
		$I_C=25A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15		
		$I_C=25A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25		
Gate Charge	Q_G			0.20		μC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		1.67		nF
Reverse Transfer Capacitance	C_{res}			0.056		
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=25A, V_{GE}=\pm 15V, R_G=20\Omega, T_{vj}=25^{\circ}C$		10		ns
Rise Time	t_r			26		
Turn-Off Delay Time	$t_{d(off)}$			82		
Fall Time	t_f			222		
Turn-On Energy	E_{on}			2.59		mJ
Turn-Off Energy	E_{off}			1.13		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=25A, V_{GE}=\pm 15V, R_G=20\Omega, T_{vj}=150^{\circ}C$		18		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$t_{d(off)}$			89		
Fall Time	t_f			262		
Turn-On Energy	E_{on}			2.92		mJ
Turn-Off Energy	E_{off}			1.43		
SC Data	I_{SC}	$t_p \leq 8\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=600V, V_{CEM} \leq 1200V$		100		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		20	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	40	A

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	$I_F=20A, T_{vj}=25^{\circ}C$		2.1	2.80	V
		$I_F=20A, T_{vj}=125^{\circ}C$		1.95		
		$I_F=20A, T_{vj}=150^{\circ}C$		1.85		
Recovered Charge	Q_{rr}	$I_F=20A, V_R=600V,$ $-di_F/dt=1500A/\mu s,$ $T_{vj}=25^{\circ}C$		0.65		μC
Peak Reverse Recovery Current	I_{rr}			20.0		A
Reverse Recovery Energy	E_{rec}			0.71		mJ
Recovered Charge	Q_{rr}	$I_F=20A, V_R=600V,$ $-di_F/dt=1500A/\mu s,$ $T_{vj}=150^{\circ}C$		2.98		μC
Peak Reverse Recovery Current	I_{rr}			21		A
Reverse Recovery Energy	E_{rec}			1.25		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1600	V
Average Output Current 50/60Hz, Sine Wave	$I_{F(AV)}$	$T_C=100^{\circ}C$	50	A
Surge Forward Current	I_{FSM}	$V_R=0, t_p=10ms, T_{vj}=25^{\circ}C$	520	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_{vj}=25^{\circ}C$	1300	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F=50A, T_j=150^{\circ}C$		1.15		V
Reverse Current	I_R	$T_j=150^{\circ}C, V_R=1600V$			1.5	mA

● NTC-Thermistor

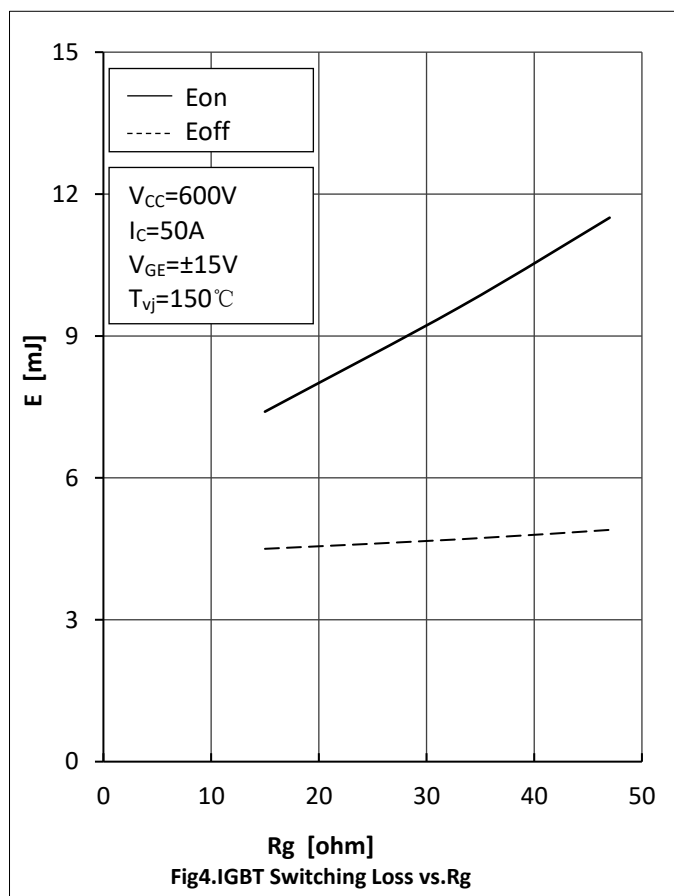
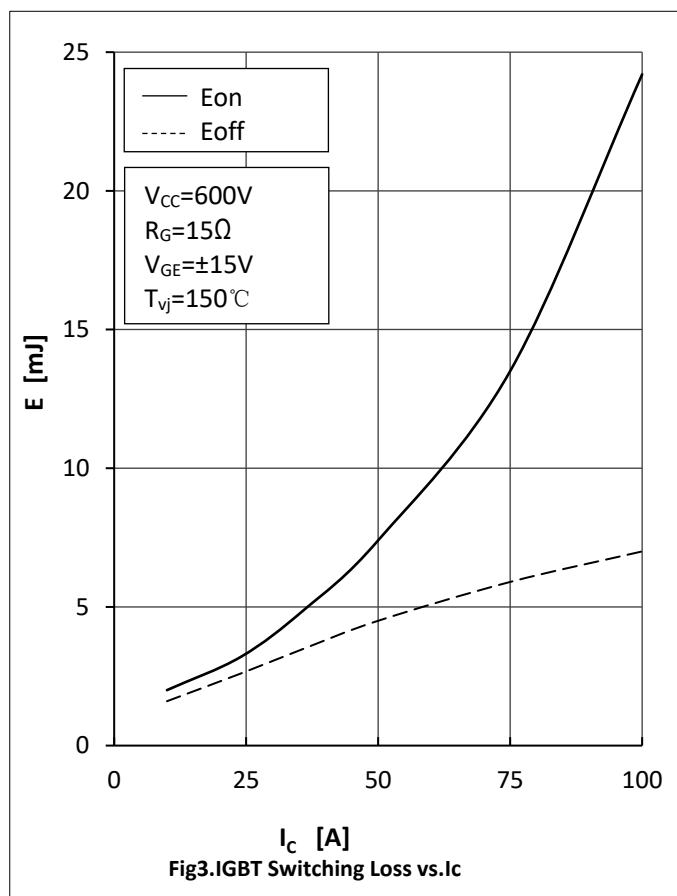
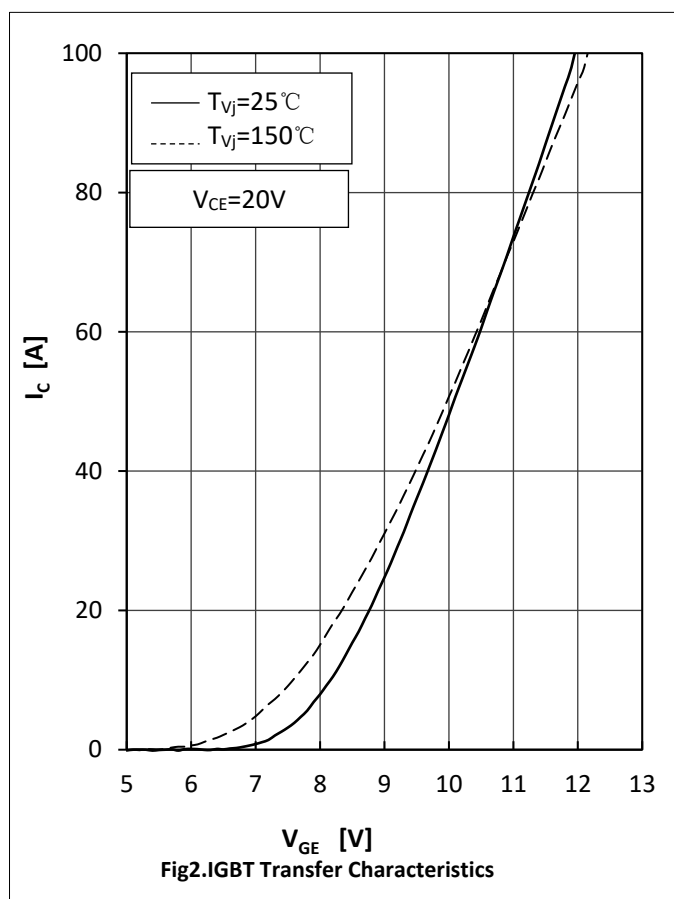
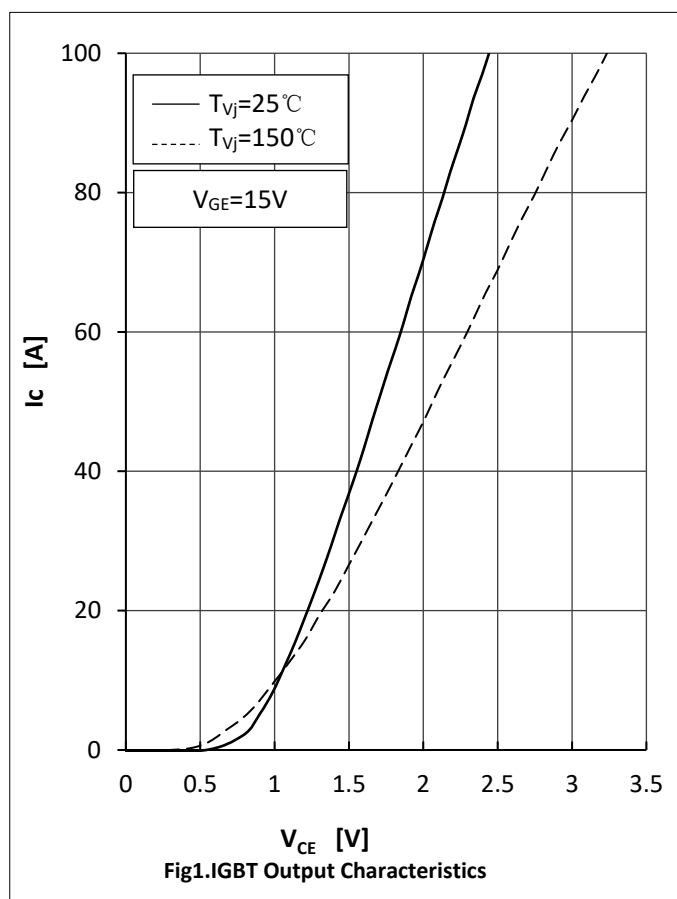
Electrical Characteristics

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

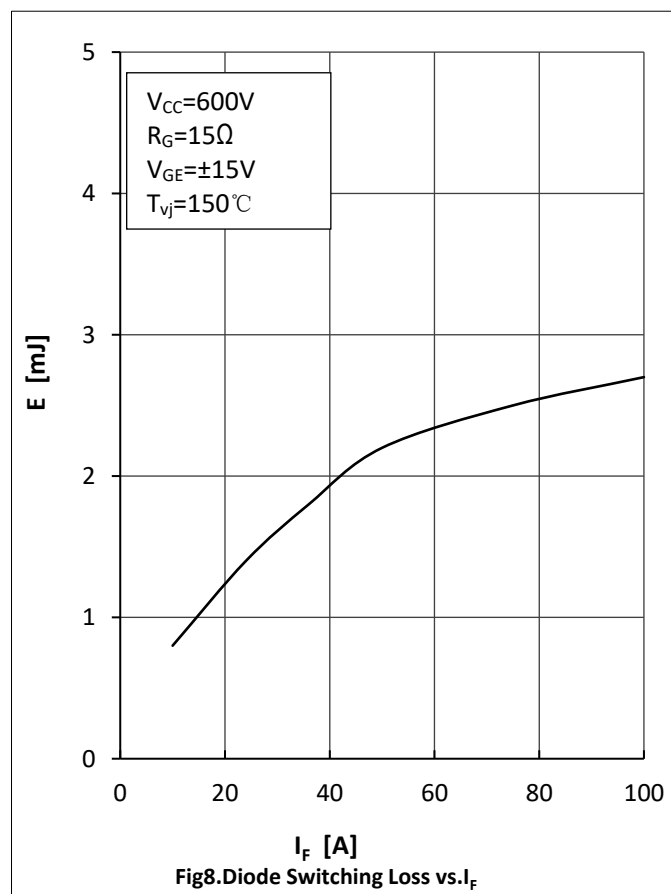
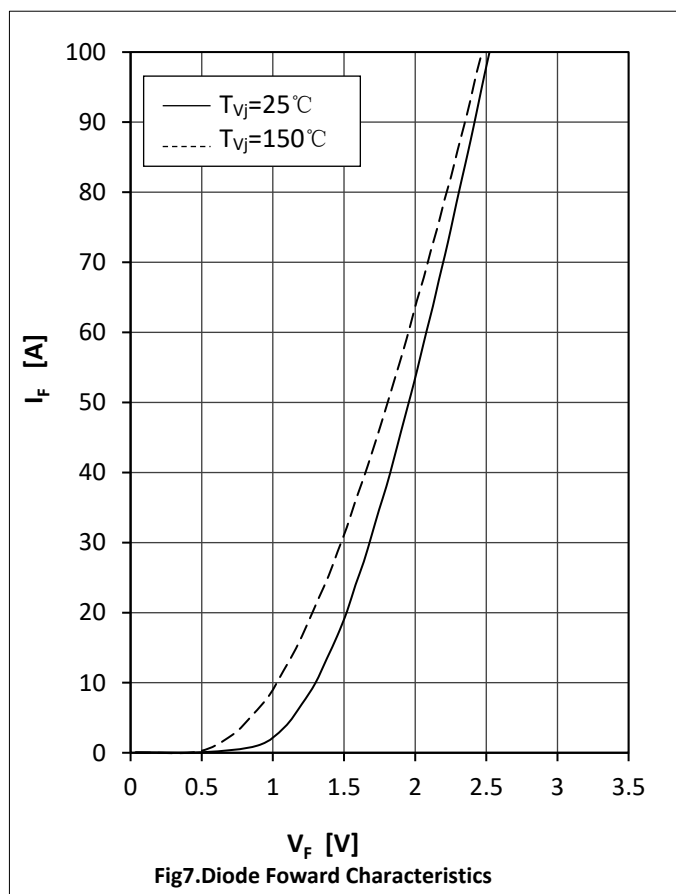
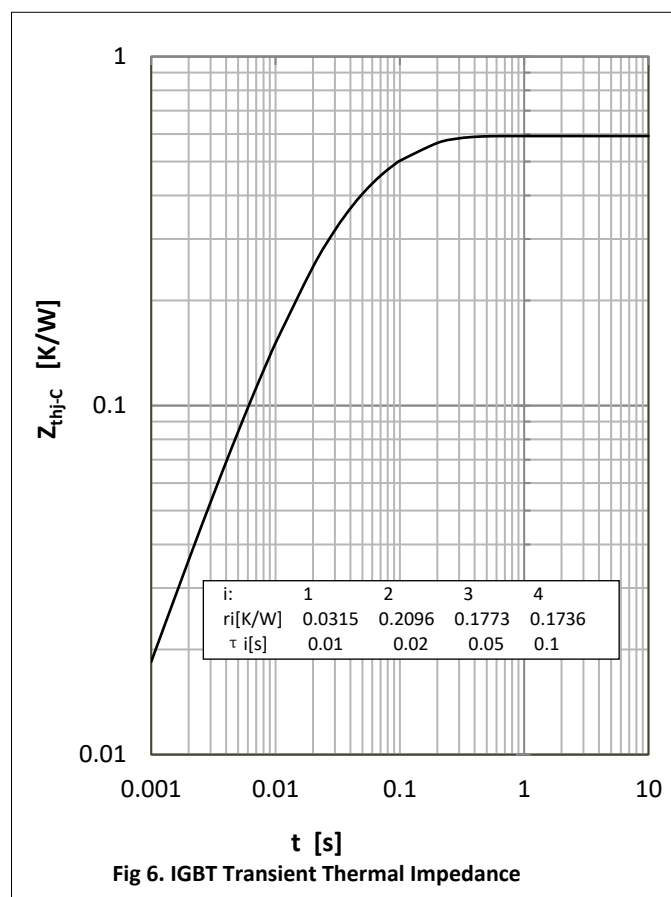
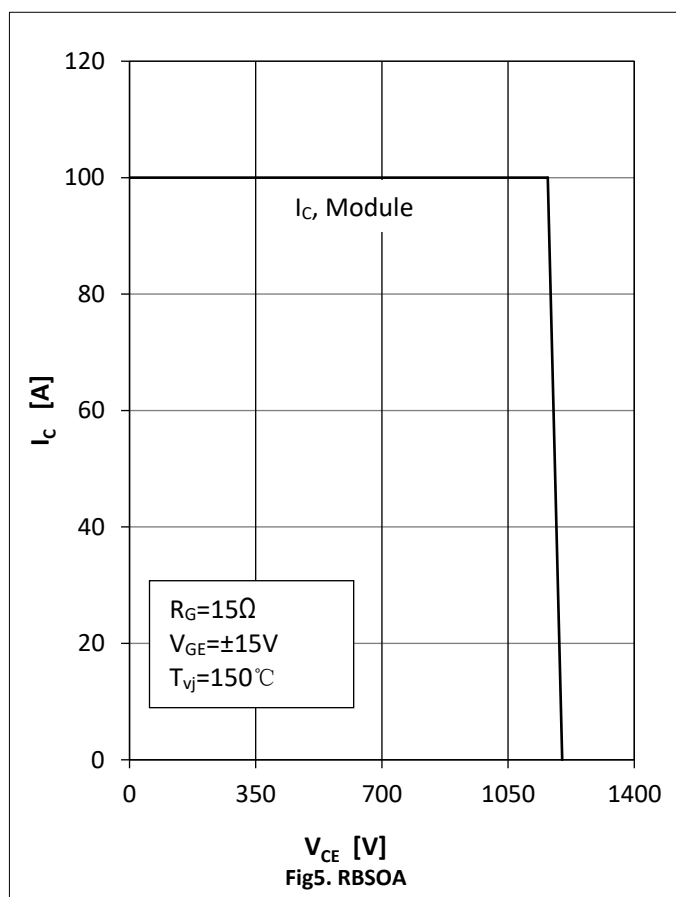
● **Module Characteristics**($T_C=25^{\circ}\text{C}$ unless otherwise specified)

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}			40		nH
Module lead resistance, terminals-chip	$R_{\text{cc'+EE'}}$	$T_C=25^{\circ}\text{C}$, per switch		4		m Ω
	$R_{\text{AA'+CC'}}$			3		
Thermal Resistance Junction to Case	$R_{\theta\text{JC}}$	per IGBT-inverter			0.59	K/W
		per Diode-inverter			0.97	
		per IGBT-brake-copper			1.16	
		per Diode-chopper			0.71	
		per Diode-rectifier			0.80	
Thermal Resistance Case-to Sink	$R_{\theta\text{CS}}$	per Module		0.009		K/W
Module-to-Sink Torque	M_s		3		6	N·m
Weight of Module	G			180		g

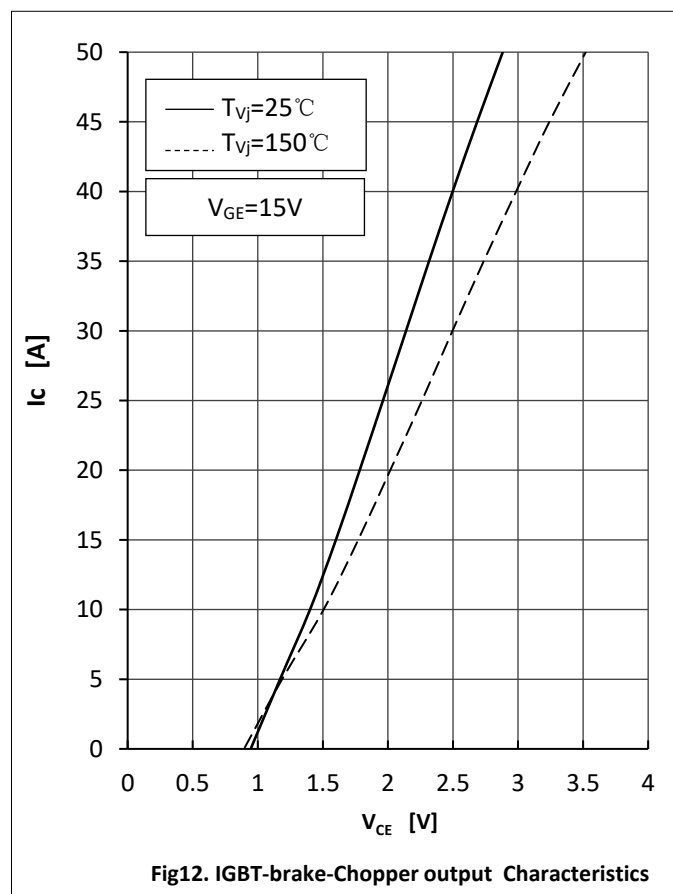
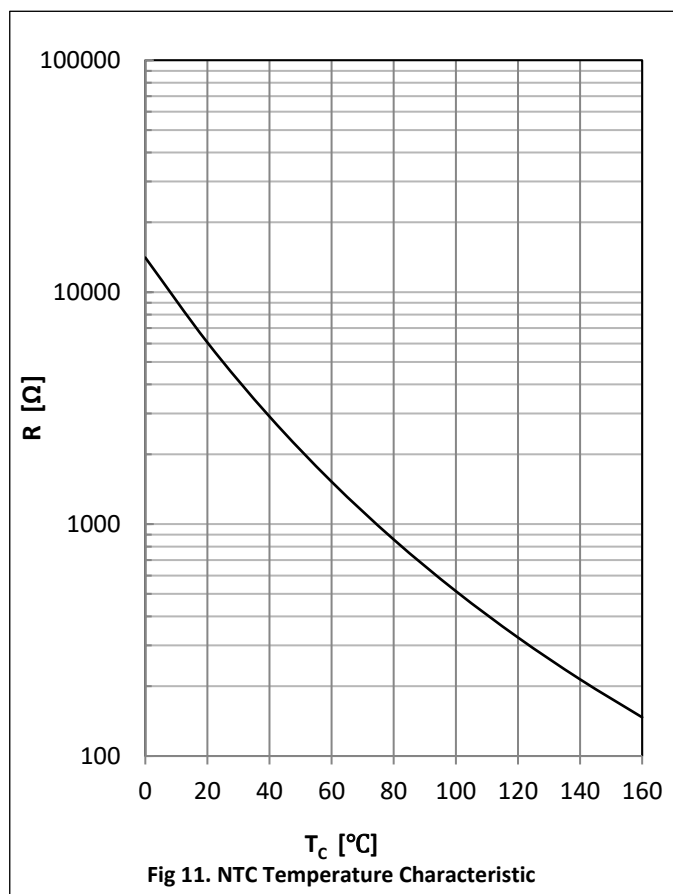
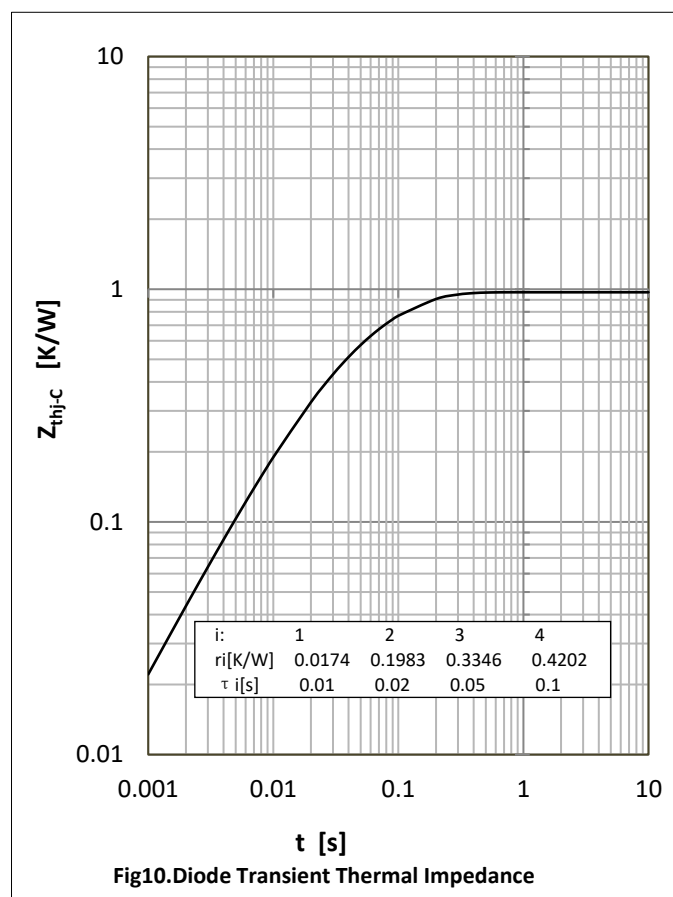
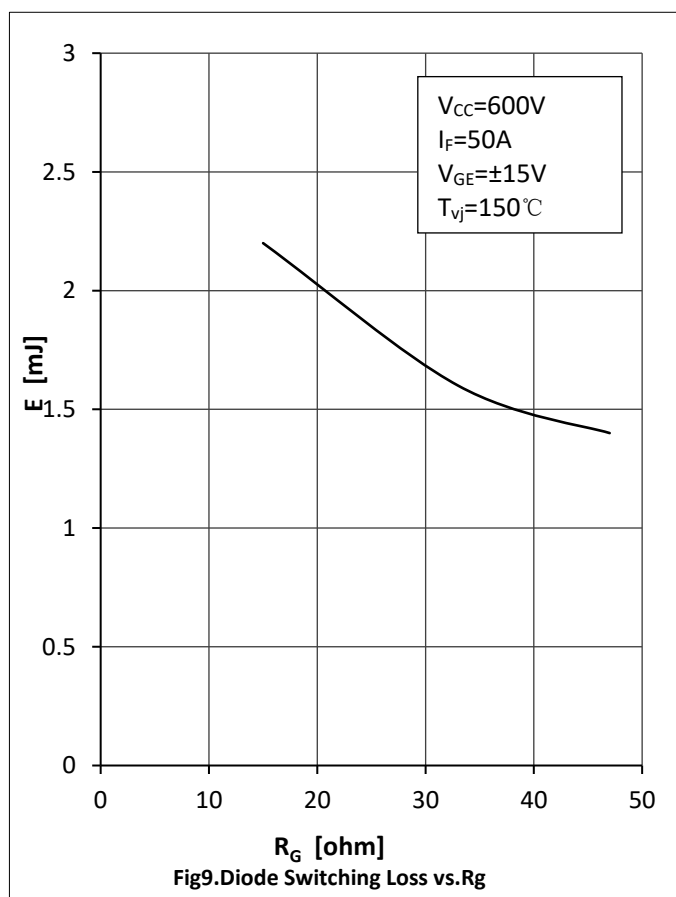
Curve Characteristics



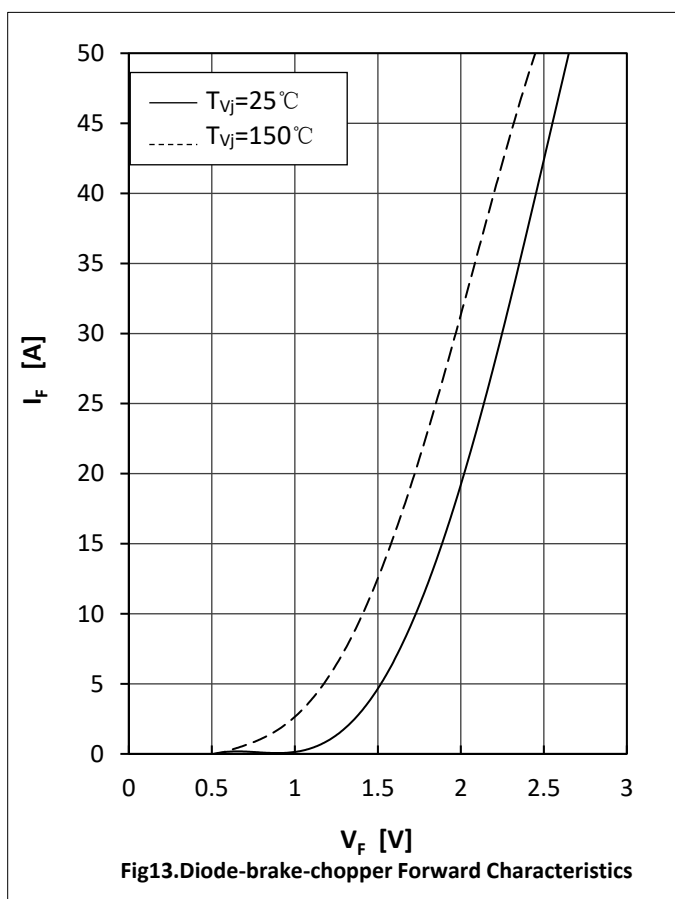
Curve Characteristics



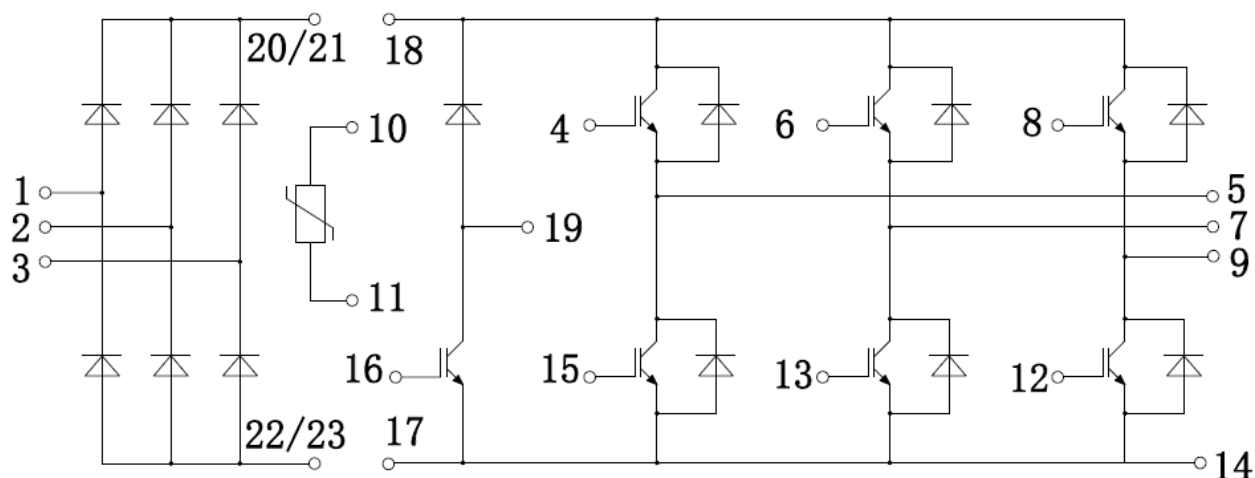
Curve Characteristics



Curve Characteristics

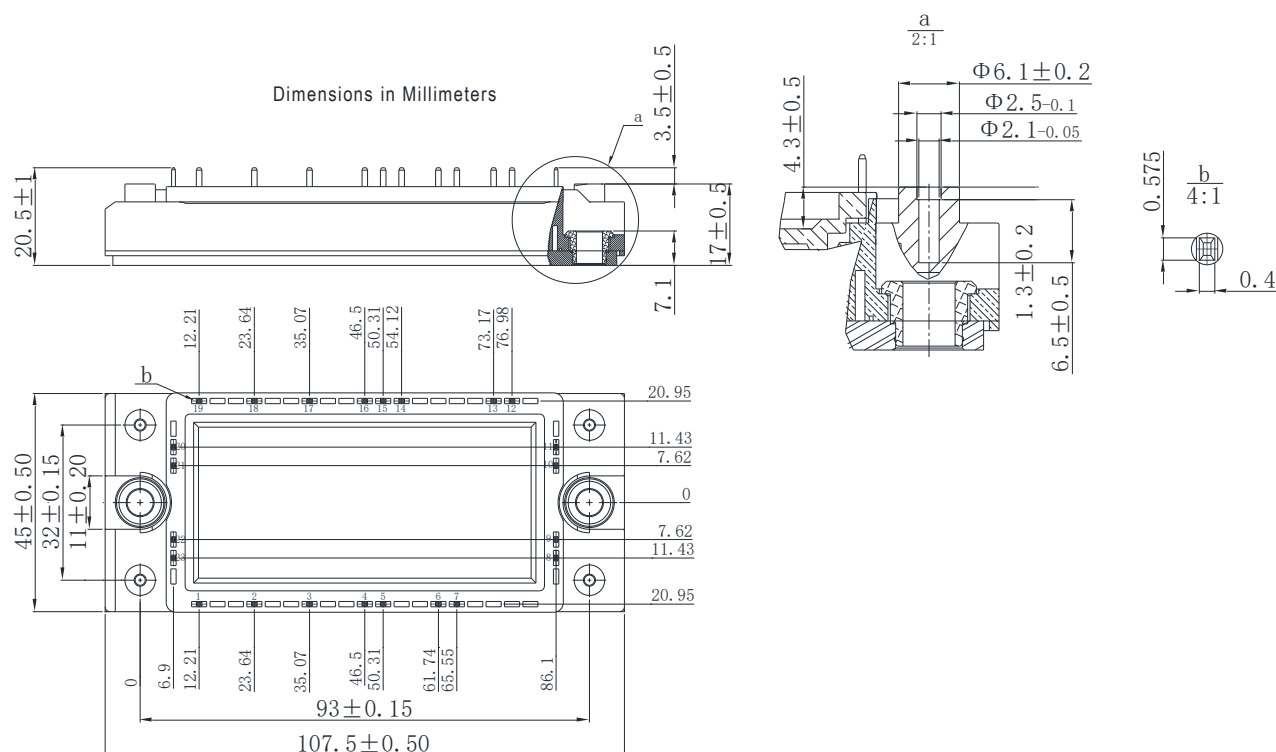


Circuit Diagram



Package Dimensions

E1A



Ordering Information

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

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