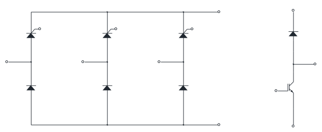
MG160TB16E1

RoHS COMPLIANT

Rectifier/ Brake-chopper Modules

V_{CES}	1600V
I_F	150A

Circuit



Applications

- Active Rectifier
- Half Controlled B6-bridge

Features

- Copper Base Plate
- Al_2O_3 Substrate with Low Thermal Resistance
- High Power Density
- High mechanical robustness

Thyristor-rectifier

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	V_{GE}=0V, I_C =1mA, T_{vj}=25℃	1600	V
Maximum RMS forward current per chip	I_{FRMSM}	T_C=80℃	160	A
Surge forward current	I_{FSM}	V_R=0V,t_p=10ms,T_{vj}=25℃	1550	A
		V_R=0V,t_p=10ms,T_{vj}=125℃	1300	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=25℃	12000	A^2s
		V_R=0V,t_p=10ms,T_{vj}=125℃	8450	A^2s
Critical rate of rise of on-state current	di/dt	f=50Hz,iG=0.6A, di_G/dt=0.6A/μs	100	A/us
Critical rate of rise of on-state voltage	dv/dt	T_{vj}=125℃,V_D=0.67V_{DRM}	1000	V/us

Thyristor-rectifier

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	T_{vj}=125℃,I_F=150A		1.15		V
Threshold voltage	$V_{(TO)}$	T_{vj}=125℃		0.85		V
Reverse current	I_{RRM}/I_{DRM}	T_{vj}=125℃		5		mA
Slope resistance	r_T	T_{vj} =125℃		3.2		mΩ
Gate trigger voltage	V_{GT}	T_{vj}=25℃,V_D=6V			2.0	V
Gate trigger current	I_{GT}	T_{vj}=25℃,V_D=6V			100	mA
Gate non-trigger voltage	V_{GD}	T_{vj} =125℃,V_D=0.5V_{DRM}			0.3	V
Gate non-trigger current	I_{GD}	T_{vj} =125℃,V_D=0.5V_{DRM}			3.0	mA
Latching current	I_L	T_{vj} =25℃,RG=33Ω			550	mA
Holding current	I_H	T_{vj} =25℃,V_D=6V			220	mA
Gate controlled delay time	t_{gd}	T_{vj} =25℃, I_G=0.6A, di_G/dt=0.6A/us			1.2	us
Circuit commutated turn-off time	t_q	T_{vj}=125℃		150		us

Diode-Rectifier

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	T_C=100℃	150	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	T_C=100℃	180	A
Surge Forward Current	I_{FSM}	V_R=0V,t_p=10ms,T_{vj}=25℃	1600	A
		V_R=0V,t_p=10ms,T_{vj}=125℃	1400	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=25℃	13000	A^2s
		V_R=0V,t_p=10ms,T_{vj}=125℃	9500	A^2s

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	I_F=150A,T_{vj}=125℃		1.2		V
Reverse Current	I_R	T_{vj}=125℃,V_R=1600V			2.0	mA

IGBT-brake-chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	V_{GE}=0V, I_C =1mA, T_{vj}=25℃	1200	V
Continuous Collector Current	I_C	T_C=100℃, T_{vjmax}=175℃	100	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	200	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_C=25℃ T_{vjmax}=175℃	515	W

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=3.3mA,T_{vj}=25℃	5.0	5.8	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=100A,V_{GE}=15V, T_{vj}=25℃		1.85		V
		I_C=100A,V_{GE}=15V, T_{vj}=125℃		2.15		
		I_C=100A,V_{GE}=15V, T_{vj}=150℃		2.25		
Gate Charge	Q_G			0.78		uC
Internal Gate Resistance	R_{gint}			7.5		Ω
Input Capacitance	C_{ies}	V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25℃		6.8		nF
Reverse Transfer Capacitance	C_{res}			0.32		nF
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V,T_{vj}=25℃			400	nA
Turn-on Delay Time	$t_{d(on)}$	I_C=100A V_{CE}=600V V_{GE} = ±15V R_G=5.6Ω T_{vj}=25℃		160		ns
Rise Time	t_r			45		ns
Turn-off Delay Time	$t_{d(off)}$			215		ns
Fall Time	t_f			54		ns
Energy Dissipation During Turn-on Time	E_{on}			9.2		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.8		mJ

Turn-on Delay Time	$t_{d(on)}$	I_C=100A V_{CE}=600V V_{GE}=±15V R_G=5.6Ω T_{vj}=150℃		198		ns
Rise Time	t_r			64		ns
Turn-off Delay Time	$t_{d(off)}$			375		ns
Fall Time	t_f			72		ns
Energy Dissipation During Turn-on Time	E_{on}			14.5		mJ
Energy Dissipation During Turn-off Time	E_{off}			10.5		mJ
SC Data	I_{sc}	t_p≤10us,V_{GE}=15V,T_{vj}=150℃, V_{CC}=900V,V_{CEM}≤1200V		500		A

- ## Diode-Brake-Chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	1200	V
Continuous DC Forward Current	I_F		60	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	120	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=60A,T_{vj}=25℃		1.85		V
		I_F=60A,T_{vj}=125℃		1.70		
		I_F=60A,T_{vj}=150℃		1.60		
Recovered Charge	Q_{rr}	I_F=60A V_R=600V $-di_F/dt$ =900A/us T_{vj}=25℃		4.39		uC
Peak Reverse Recovery Current	I_{rr}			31		A
Reverse Recovery Energy	E_{rec}			1.35		mJ
Recovered Charge	Q_{rr}	I_F=60A V_R=600V $-di_F/dt$ =900A/us T_{vj}=150℃		6.65		uC
Peak Reverse Recovery Current	I_{rr}			33		A
Reverse Recovery Energy	E_{rec}			2.10		mJ

Module Characteristics

T_C=25°C unless otherwise specified

Parameter	Symbol	Conditions	Value Min.	Value Typ.	Value Max.	Unit
Isolation Voltage	V_{isol}	t=1min,f=50Hz	2500			V
Maximum Junction Temperature	T_{jmax}	inverter,brake-chopper			175	℃
		rectifier			125	℃
Operating Junction Temperature	$T_{vj\ op}$	inverter,brake-chopper	-40		150	℃
		rectifier	-40		125	℃
Storage Temperature	T_{stg}		-40		125	℃
Stray-inductance-module	L_{SCE}			50		nH
Thermal Resistance Junction to Case	$R_{\theta JC}$	per Thyristor-rectifier			0.30	K/W
		per Diode-rectifier			0.35	K/W
		per IGBT-brake-chopper			0.29	K/W
		per Diode-brake-chopper			0.85	K/W
Thermal Resistance Case to Sink	$R_{\theta CS}$	per Module		0.02		K/W
Module-to-Sink Torque	Ms		3.0		6.0	N·m
Weight of Module	G			175		g

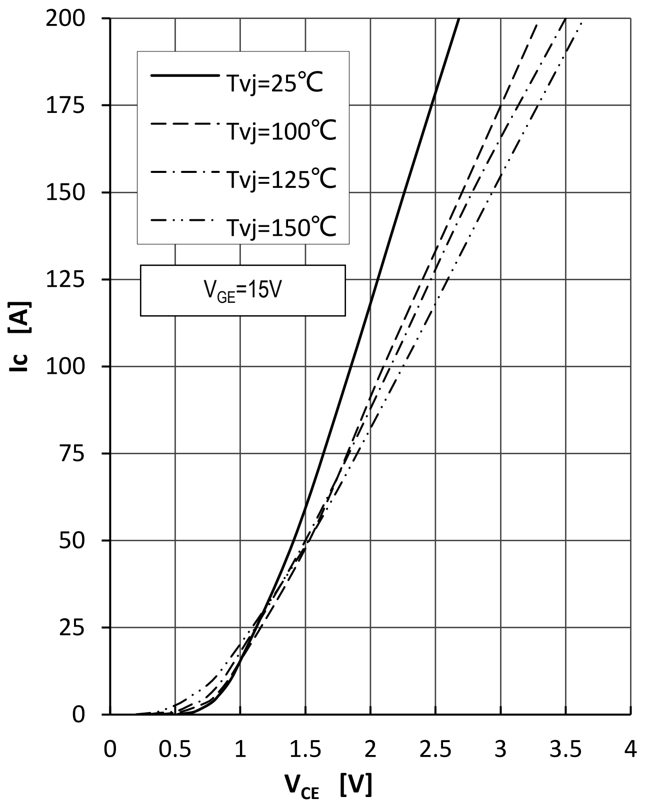


Fig1.IGBT-brake-chopper Output Characteristics

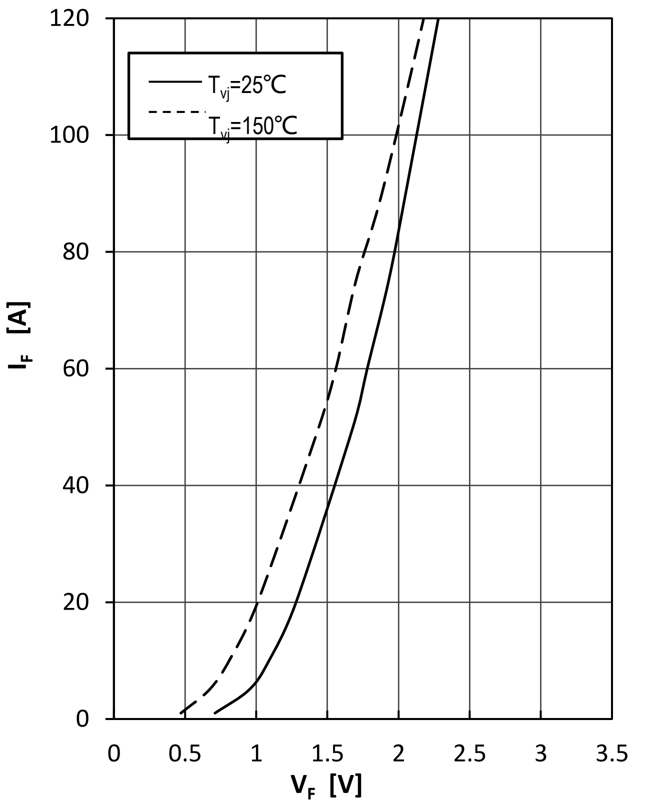


Fig2.Diode-brake-chopper Foward Characteristics

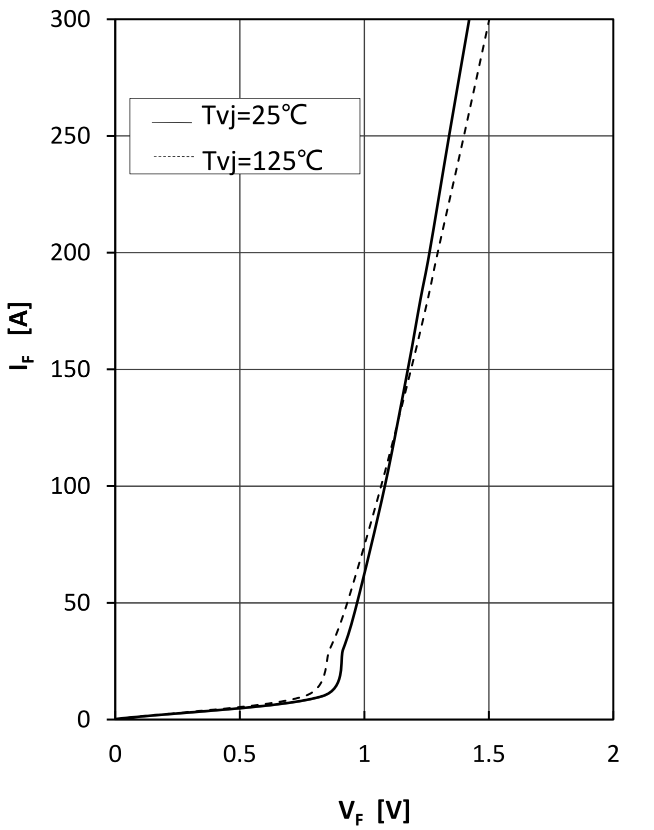
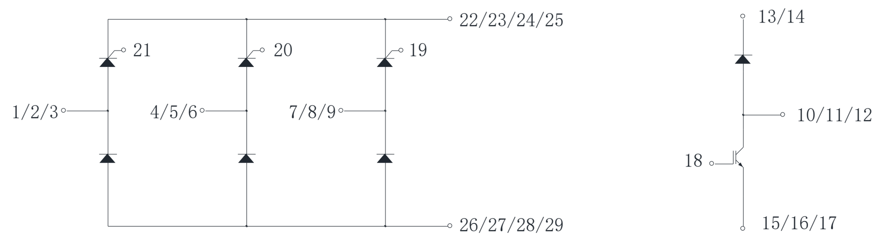
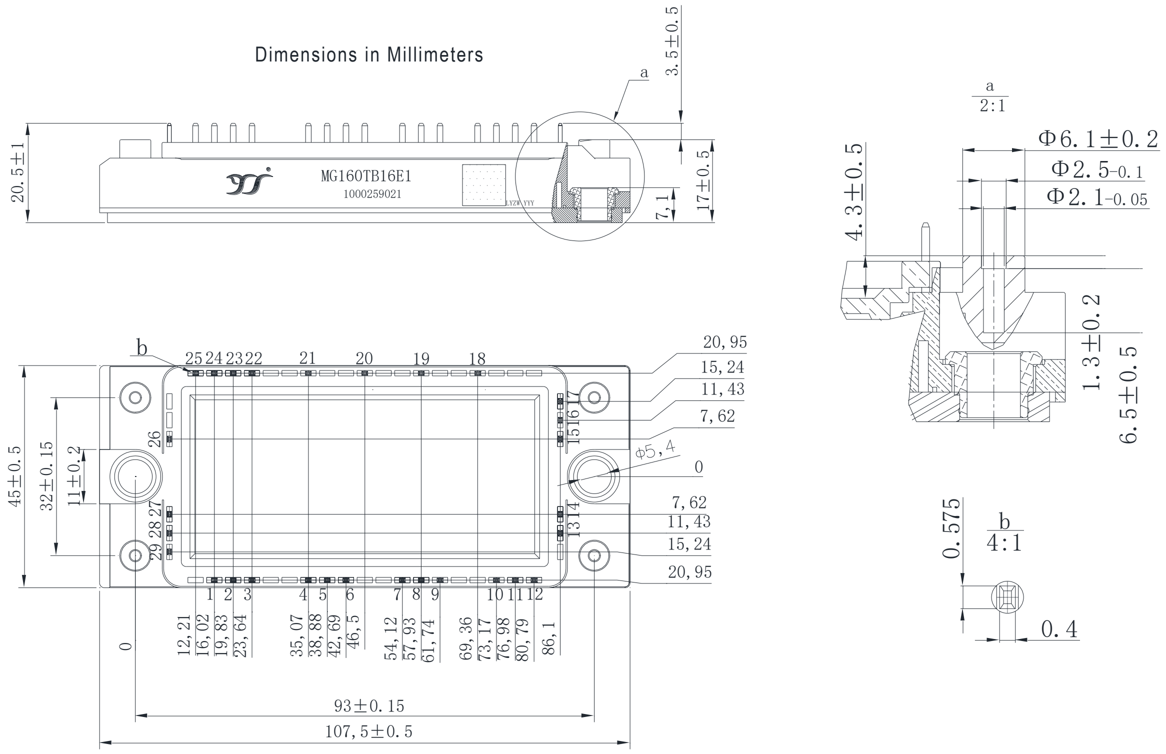


Fig3.Diode-rectifier Foward Characteristics

- **Circuit Diagram**



- **Package Outline Information**



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IGBTs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.

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