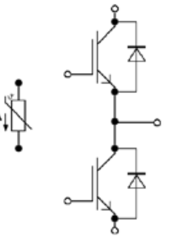
1200V 600A IGBT Power Module

Description

The IGBT Module devices are optimized to reduce losses and switching noise in high frequency power conditioning electrical systems.

These IGBT Module series are ideally suited for High Power Converters, Motor Drivers, AC and DC servo drive amplifier, UPS where switching losses are significant portion of the total losses and Wind Turbines.



Equivalent Circuit

Features

- Low Vce(sat)
- Vce(sat) with positive temperature coefficient
- Maximum junction temperature 150℃
- High Power Density
- Isolated Base Plate
- Standard Housing

Applications

- High Power Converters
- Motor Drivers
- AC and DC servo drive amplifier
- UPS (Uninterruptible Power Supplies)
- Wind Turbines

IGBT- inverter

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
V_{CES}	Collector to Emitter Voltage	V_{GE}=0V, I_C=1mA, T_{vj}=25℃	1200	V
I_C	Continuous Collector Current	T_C=25℃, T_{vjmax}=175℃	990	A
I_{CRM}	Repetitive Peak Collector Current	t_p=1ms	1200	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	±20	V
P_{tot}	Total Power Dissipation	T_C=25℃,T_{vjmax}=175℃	4050	W

Characteristic values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	V_{GE}=V_{CE}, I_C =1mA,T_{vj}=25℃	4.8	5.34	6.0	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25℃			3.0	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=600A,V_{GE}=15V, T_{vj}=25℃		1.81	2.20	V
		I_C=600A,V_{GE}=15V, T_{vj}=125℃		2.05		
		I_C=600A,V_{GE}=15V, T_{vj}=150℃		2.10		
Q_G	Gate Charge	V_{CE}=-15V…+15V		4.62		uC
C_{ies}	Input Capacitance	V_{CE}=25V,V_{GE} =0V, f=1MHz, T_{vj}=25℃		37.5		nF
C_{res}	Reverse Transfer Capacitance			2.10		nF
R_{gint}	Internal Gate Resistance	T_{vj}=25℃		1.4		Ω
I_{GES}	Gate-Emitter leakage current	V_{CE}=0 V, V_{GE}=20 V, T_{vj} = 25℃			400	nA
$t_{d(on)}$	Turn-on Delay Time	I_C =600 A V_{CE} = 600 V V_{GE} = ±15V R_G =1.5Ω T_{vj}=25℃		157		ns
t_r	Rise Time			94		ns
$t_{d(off)}$	Turn-off Delay Time			475		ns
t_f	Fall Time			68		ns
E_{on}	Energy Dissipation During Turn-on Time			61.8		mJ
E_{off}	Energy Dissipation During Turn-off Time			47.3		mJ
$t_{d(on)}$	Turn-on Delay Time	I_C =600 A V_{CE} = 600 V V_{GE} = ±15V R_G =1.5Ω T_{vj}=125℃		214		ns
t_r	Rise Time			98		ns
$t_{d(off)}$	Turn-off Delay Time			606		ns
t_f	Fall Time			101		ns
E_{on}	Energy Dissipation During Turn-on Time			83.5		mJ
E_{off}	Energy Dissipation During Turn-off Time			71.7		mJ
I_{sc}	SC Data	T_p≤10us,V_{GE}=15V,T_{vj}=150℃, V_{cc}=800V,V_{CEM}≤1200V		2400		A

Diode- inverter

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	T_{vj}=25℃	1200	V
I_F	Continuous DC Forward Current		600	A
I_{FRM}	Repetitive Peak Forward Current	t_p=1ms	1200	A

Characteristic values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage	I_F=600A,T_{vj}=25℃		2.0	2.40	V
		I_F=600A,T_{vj}=125℃		1.85		
		I_F=600A,T_{vj}=150℃		1.85		
Q_{rr}	Recovered Charge	I_F =600A V_R=600V $-di_F/d_t$ =5000A/us T_{vj}=25℃		58		uC
I_{rr}	Peak Reverse Recovery Current			298		A
E_{rec}	Reverse Recovery Energy			20.0		mJ
Q_{rr}	Recovered Charge	I_F =600A V_R=600V $-di_F/d_t$ =5000A/us T_{vj}=125℃		112		uC
I_{rr}	Peak Reverse Recovery Current			427		A
E_{rec}	Reverse Recovery Energy			43.4		mJ

NTC- Thermistor

Characteristic values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	T_C=25℃		5.0		kΩ
△R/R	Deviation of R_{100}	T_C=100℃, R_{100}=493Ω	-5		5	%
P_{25}	Power dissipation	T_C=25℃			18.0	mW
$B_{25/50}$	B-Value	$R_2= R_{25}exp[B_{25/50}(1/T_2-1/(298, 15K))]$		3369		K
$B_{25/80}$		$R_2= R_{25}exp[B_{25/80}(1/T_2-1/(298, 15K))]$		3417		
$B_{25/100}$		$R_2= R_{25}exp[B_{25/100}(1/T_2-1/(298, 15K))]$		3442		

Module Characteristics T_C=25℃ unless otherwise specified

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{jmax}	Maximum Junction Temperature	Inverter			175	℃
$T_{vj\ op}$	Operating Junction Temperature		-40		150	℃
T_{stg}	Storage Temperature		-40		125	℃
L_{CE}	Stray Inductance			21		nH
$R_{cc'+EE'}$	Module Lead Resistance, Terminal to Chip	T_C=25℃, per switch		1.3		mΩ
$R_{AA'+CC'}$				3.0		
$R_{\theta jc}$	Thermal Resistance Junction to Case	per IGBT-inverter			0.039	K/W
		per Diode-inverter			0.068	
$R_{\theta CS}$	Thermal Resistance Case to Sink	per IGBT-inverter		0.033		K/W
		per Diode-inverter		0.042		
		per Module		0.009		
M_s	Module-to-Sink Torque		3.0		6.0	N·m
G	Weight of Module			345		g

Typical Performance Characteristics

Fig. 1. Typical Output Characteristics

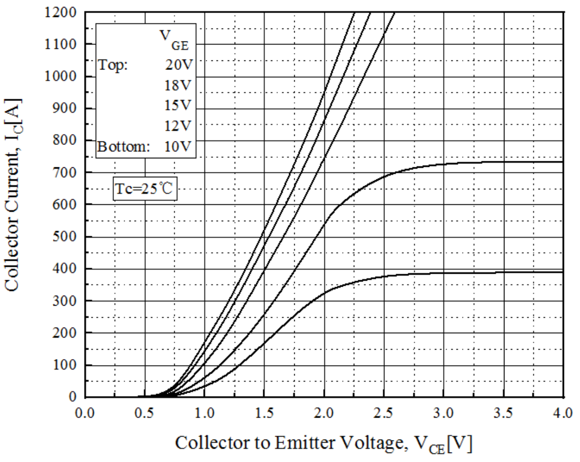


Fig. 2. Typical Output Characteristics

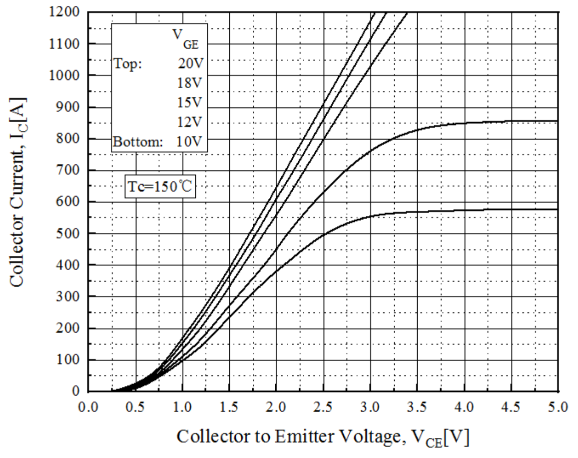


Fig. 3. Typical Saturation Voltage Characteristics

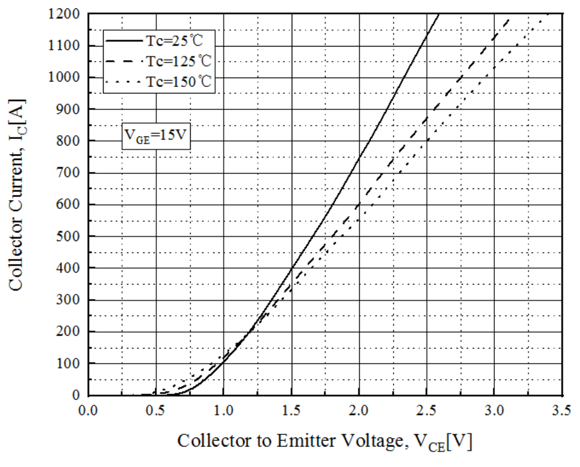


Fig. 4. Typical Transfer Characteristics

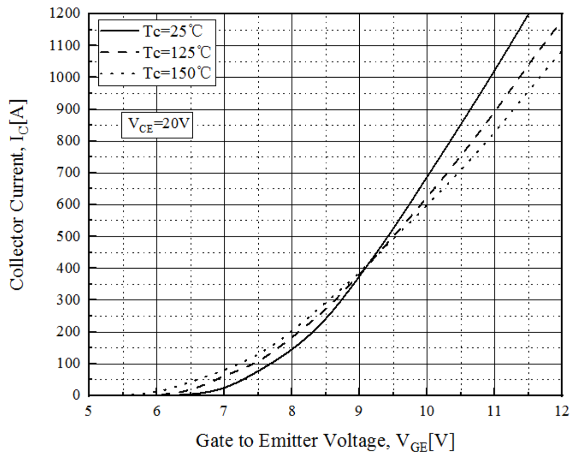


Fig. 5. Switching Characteristics vs. R_G

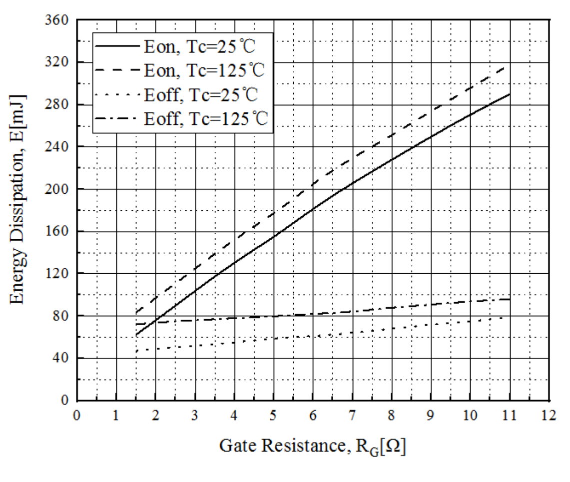
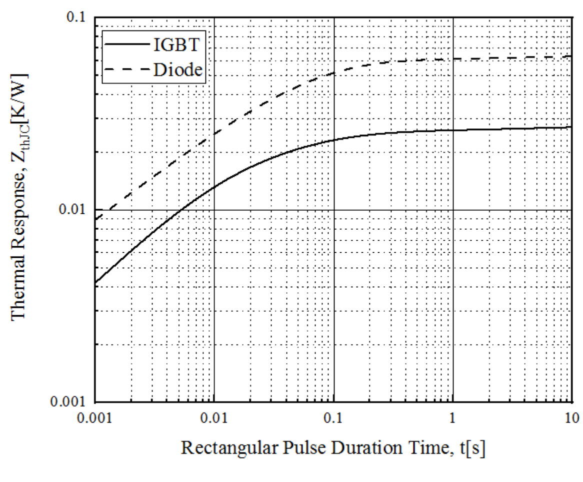


Fig. 6. Transient Thermal Impedance



Typical Performance Characteristics

Fig. 7. Forward Characteristics of Diode

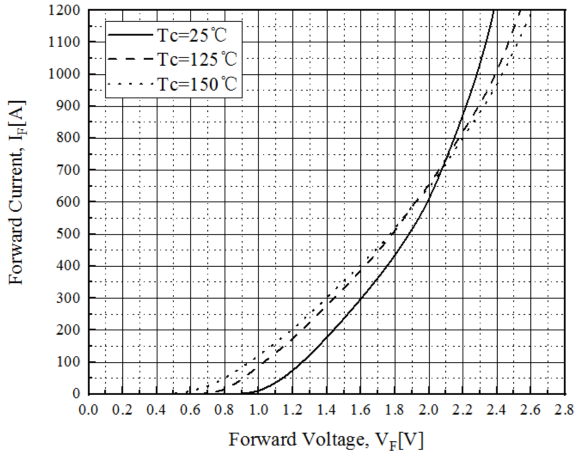


Fig. 8. Reverse Recovery Loss Characteristics vs. R_G

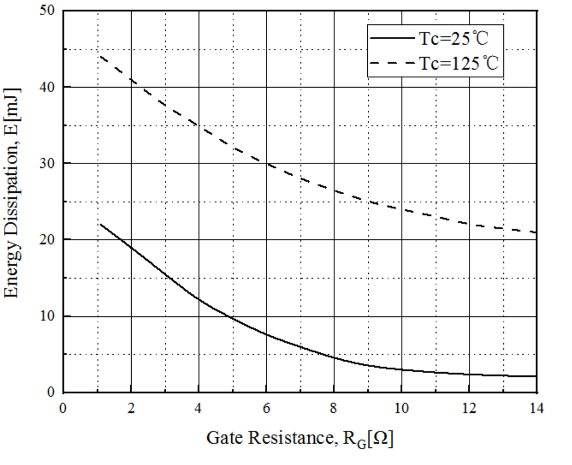


Fig. 9. Reverse Bias Safe Operating Area

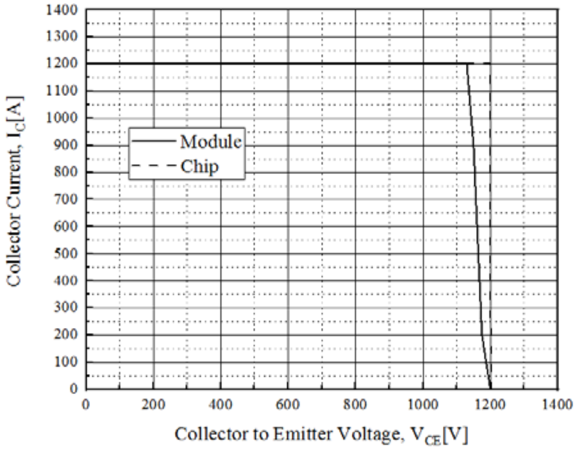
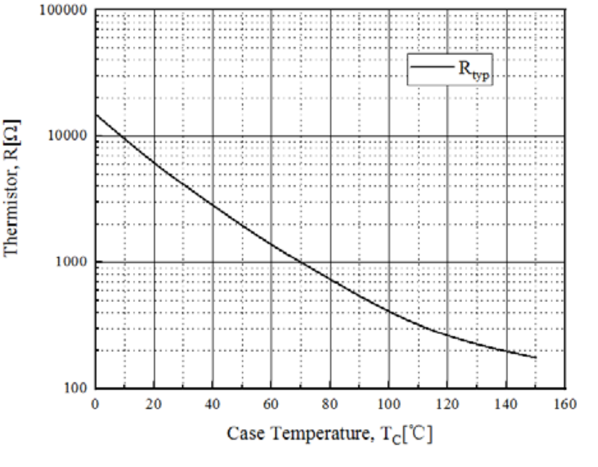
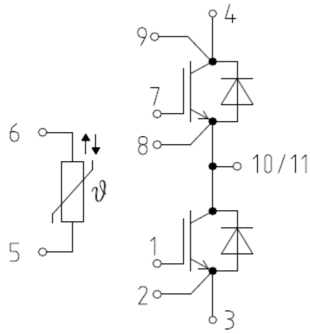


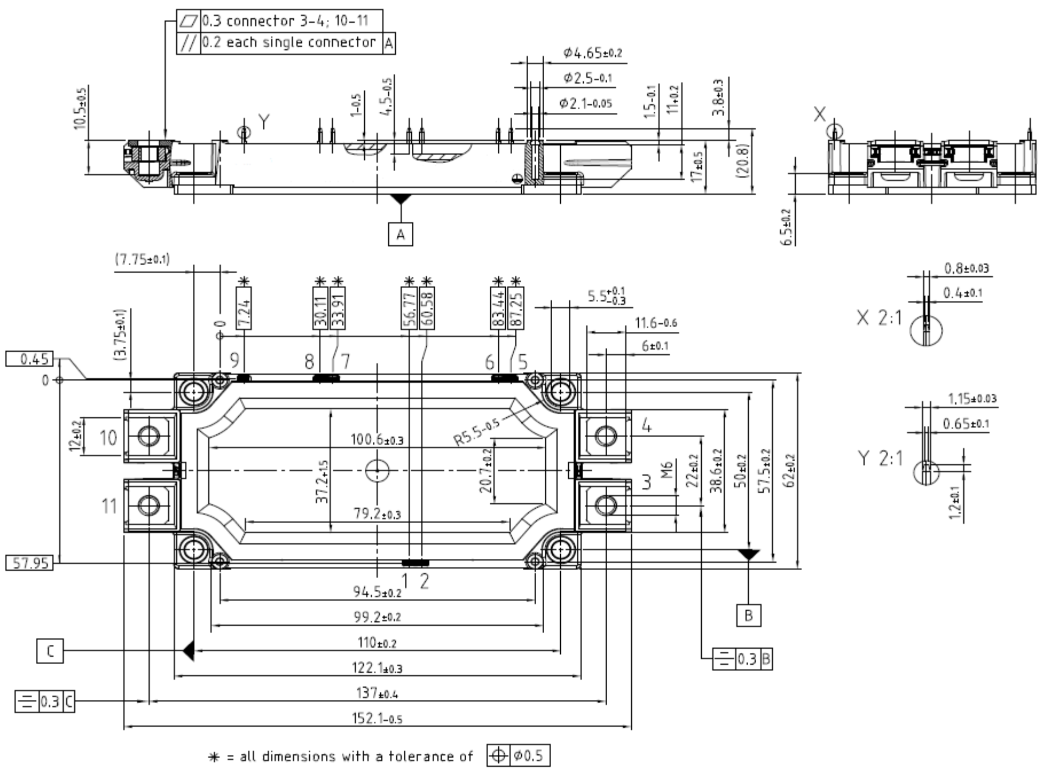
Fig. 10. NTC-Thermistor-temperature characteristic



Circuit Diagram



Package Dimensions



✱ = all dimensions with a tolerance of ⌖ Φ0.5
dimensions valid in mounted condition