

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.

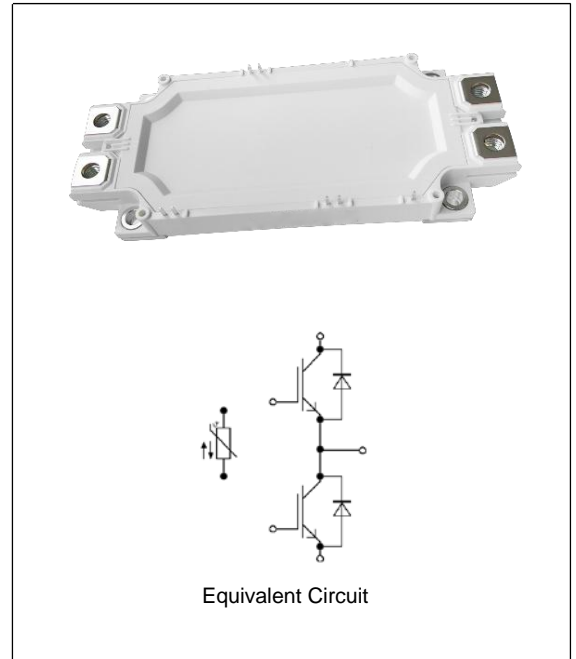
These IGBT Module series are ideally suited for High Power Converters, Motor Drivers, AC and DC servo drive amplifier, UPS where switching losses are significant portion of the total losses and Wind Turbines.

Features

- Low $V_{ce(sat)}$
- $V_{ce(sat)}$ with positive temperature coefficient
- Maximum junction temperature 150°C
- 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	$V_{GE}=0V, I_C=1mA, T_{vj}=25^\circ C$	1200	V
I_C	Continuous Collector Current	$T_C=25^\circ C, T_{vjmax}=175^\circ C$	990	A
I_{CRM}	Repetitive Peak Collector Current	$t_p=1ms$	1200	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^\circ C$	± 20	V
P_{tot}	Total Power Dissipation	$T_C=25^\circ C, T_{vjmax}=175^\circ C$	4050	W

Characteristic values

Symbol	Parameter	Conditions	Value			Unit	
			Min.	Typ.	Max.		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$V_{GE}=V_{CE}, I_C=1mA, T_{vj}=25^{\circ}C$	4.8	5.34	6.0	V	
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			3.0	mA	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=600A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.81	2.20	V	
		$I_C=600A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.05			
		$I_C=600A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.10			
Q_G	Gate Charge	$V_{CE}=-15V...+15V$		4.62		uC	
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		37.5		nF	
C_{res}	Reverse Transfer Capacitance			2.10		nF	
R_{gint}	Internal Gate Resistance	$T_{vj}=25^{\circ}C$		1.4		Ω	
I_{GES}	Gate-Emitter leakage current	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
$t_{d(on)}$	Turn-on Delay Time	$I_C=600A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.5\Omega$ $T_{vj}=25^{\circ}C$		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		$I_C=600A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.5\Omega$ $T_{vj}=125^{\circ}C$		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	$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{cc}=800V, V_{CEM} \leq 1200V$			2400		A

Diode- inverter

Absolute Maximum Ratings

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

Characteristic values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage	$I_F=600\text{A}, T_{vj}=25^{\circ}\text{C}$		2.0	2.40	V
		$I_F=600\text{A}, T_{vj}=125^{\circ}\text{C}$		1.85		
		$I_F=600\text{A}, T_{vj}=150^{\circ}\text{C}$		1.85		
Q_{rr}	Recovered Charge	$I_F=600\text{A}$ $V_R=600\text{V}$ $-di_F/dt=5000\text{A/us}$ $T_{vj}=25^{\circ}\text{C}$		58		uC
I_{rr}	Peak Reverse Recovery Current			298		A
E_{rec}	Reverse Recovery Energy			20.0		mJ
Q_{rr}	Recovered Charge	$I_F=600\text{A}$ $V_R=600\text{V}$ $-di_F/dt=5000\text{A/us}$ $T_{vj}=125^{\circ}\text{C}$		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	$T_C=25^{\circ}\text{C}$		5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493\Omega$	-5		5	%
P_{25}	Power dissipation	$T_C=25^{\circ}\text{C}$			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 $T_c=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{isol}	Isolation voltage	$t=1\text{min}, f=50\text{Hz}$	2500			V
T_{jmax}	Maximum Junction Temperature	Inverter			175	$^\circ\text{C}$
$T_{\text{vj op}}$	Operating Junction Temperature		-40		150	$^\circ\text{C}$
T_{stg}	Storage Temperature		-40		125	$^\circ\text{C}$
L_{CE}	Stray Inductance			21		nH
$R_{\text{cc'+EE'}}$	Module Lead Resistance, Terminal to Chip	$T_c=25^\circ\text{C}$, per switch		1.3		m Ω
$R_{\text{AA'+CC'}}$				3.0		
$R_{\theta\text{jC}}$	Thermal Resistance Junction to Case	per IGBT-inverter			0.039	K/W
		per Diode-inverter			0.068	
$R_{\theta\text{CS}}$	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

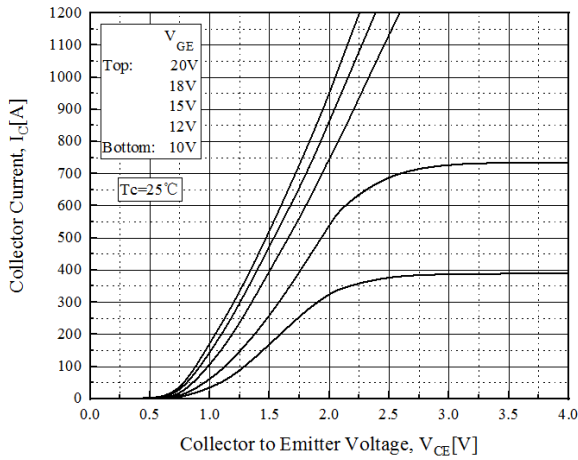


Fig. 2. Typical Output Characteristics

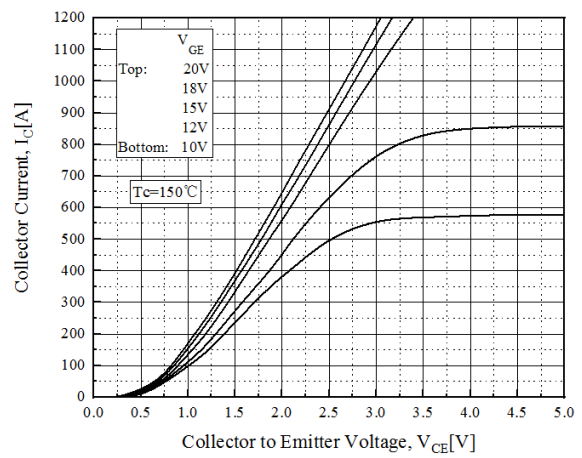


Fig. 3. Typical Saturation Voltage Characteristics

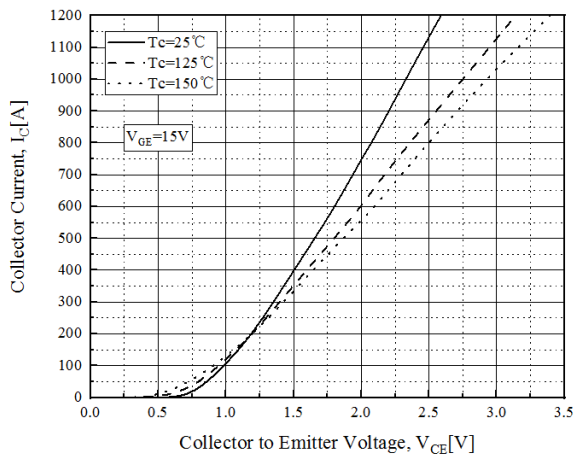


Fig. 4. Typical Transfer Characteristics

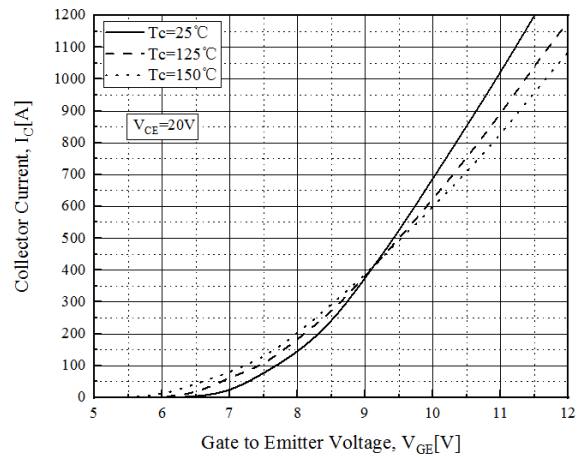


Fig. 5. Switching Characteristics vs. R_G

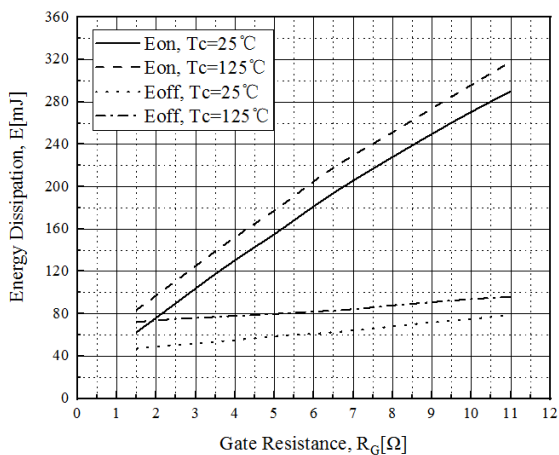
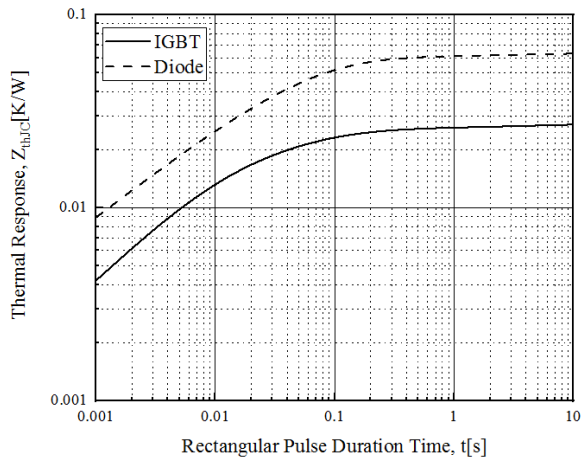


Fig. 6. Transient Thermal Impedance



Typical Performance Characteristics

Fig. 7. Forward Characteristics of Diode

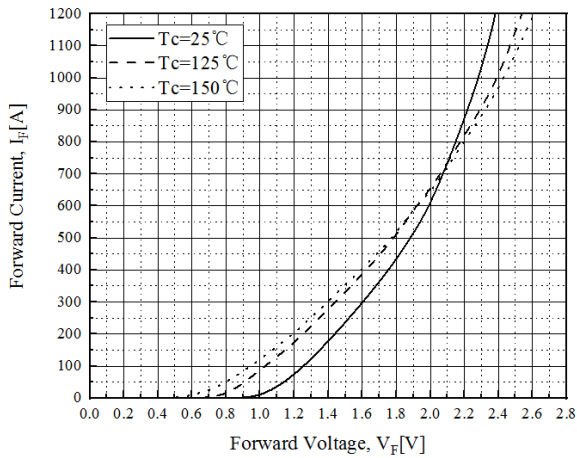


Fig. 8. Reverse Recovery Loss Characteristics vs. R_G

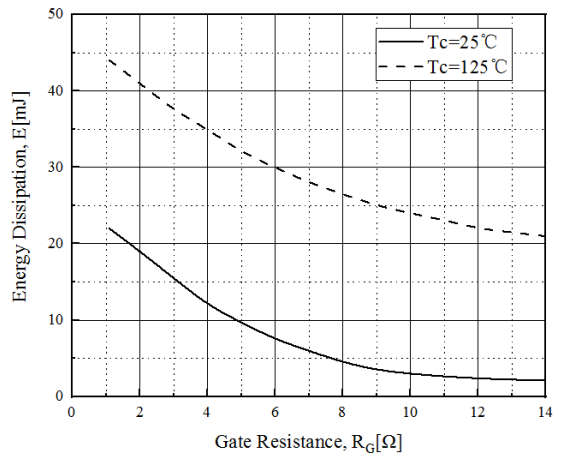


Fig. 9. Reverse Bias Safe Operating Area

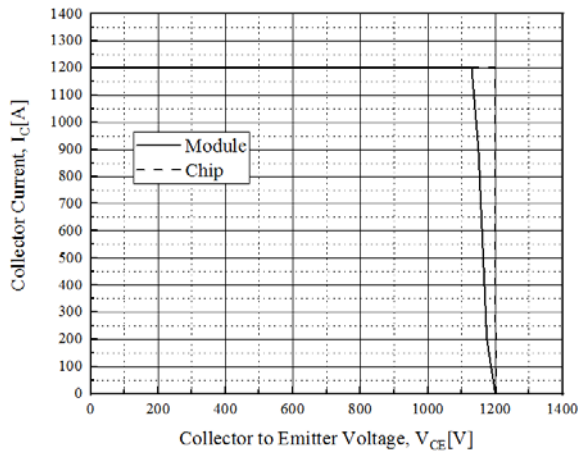
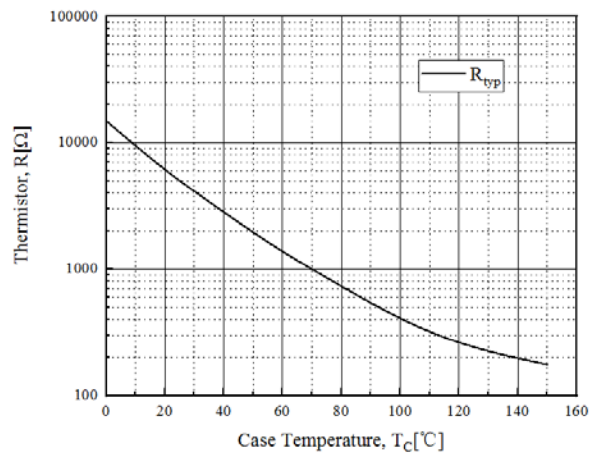
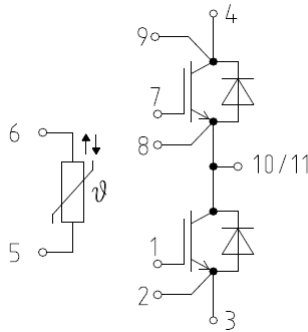


Fig. 10. NTC-Thermistor-temperature characteristic



Circuit Diagram



Package Dimensions

