



IGBT Power Module 1200V/100A

Features

- ◆ 34mm Fast Switching Trench / Field Stop IGBT Technology
- ◆ Low Switching Losses
- ◆ Super Fast Diodes
- ◆ High Short Circuit Capability

Preliminary

Applications

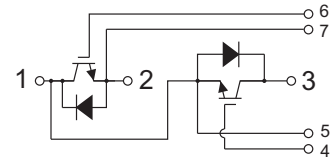
- ◆ Welder / Power Supply
- ◆ UPS / Inverter
- ◆ Industrial Motor Drive



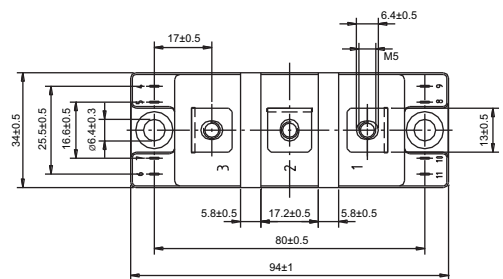
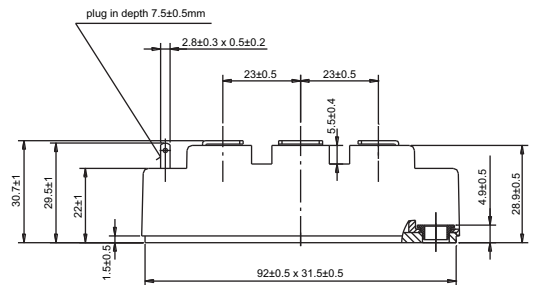
Maximum Ratings (T_c = 25°C)

Item	Symbol	Rated Value	Unit
Collector-Emitter Voltage	T _{VJ} = 25°C V _{CES}	1200	V
Gate-Emitter Peak Voltage	V _{GES}	±20	V
Continuous DC Collector Current	T _c = 100°C I _{C,nom.}	100	A
Repetitive Peak Collector Current	t _p = 1ms I _{CRM}	200	A
Total Power Dissipation	P _{tot}	555	W
Isolation Voltage	RMS, f=50Hz, t=1min V _{iso}	3000	V
Continuous DC Forward Current	I _F	100	A
Repetitive Peak Forward Current	t _p = 1ms I _{FRM}	200	A
Temperature under switching conditions	T _{VJ op}	-40 ~ +150	°C
Storage Temperature	T _{stg}	-40 ~ +125	°C
Mounting Torque	Module Base to Heatsink (M6)	3~5	N.m
	Busbar to Terminal (M5)	2.5~5	

Circuit Diagram Headline



Package Outlines



Dimensions in mm (1 mm = 0.0394")



■ Electrical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 100A, V_{GE} = 15V$ $T_{vj} = 25^\circ C$		1.75	2.15	V
		$I_C = 100A, V_{GE} = 15V$ $T_{vj} = 125^\circ C$		2.05		
		$I_C = 100A, V_{GE} = 15V$ $T_{vj} = 150^\circ C$		2.1		
Gate threshold voltage	V_{GEth}	$I_C = 3.8mA, V_{CE} = V_{GE}, T_{vj} = 25^\circ C$	5.2	5.8	6.4	V
Gate charge	Q_G	$V_{GE} = -15V \dots +15V$		1.084		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25^\circ C$		6		Ω
Input capacitance	C_{ies}	$f = 1MHz, T_{vj} = 25^\circ C, V_{CE} = 25V, V_{GE} = 0V$		14.4		nF
Output capacitance	C_{oes}	$f = 1MHz, T_{vj} = 25^\circ C, V_{CE} = 25V, V_{GE} = 0V$		0.381		nF
Reverse transfer capacitance	C_{res}	$f = 1MHz, T_{vj} = 25^\circ C, V_{CE} = 25V, V_{GE} = 0V$		0.18		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 25^\circ C$			1	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25^\circ C$			100	nA
Turn-on delay time, inductive load	$t_{d\ on}$	$I_C = 100A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.24		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.26		
		$R_{Gon} = 2.2\Omega$ $T_{vj} = 150^\circ C$		0.26		
Rise time, inductive load	t_r	$I_C = 100A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.06		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.07		
		$R_{Gon} = 2.2\Omega$ $T_{vj} = 150^\circ C$		0.075		
Turn-off delay time, inductive load	$t_{d\ off}$	$I_C = 100A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.37		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.45		
		$R_{Goff} = 2.2\Omega$ $T_{vj} = 150^\circ C$		0.47		
Fall time, inductive load	t_f	$I_C = 100A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.076		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.111		
		$R_{Goff} = 2.2\Omega$ $T_{vj} = 150^\circ C$		0.121		
Turn-on energy loss per pulse	E_{on}	$I_C = 100A, V_{CE} = 600V, L_S = 30nH$ $T_{vj} = 25^\circ C$		3.9		mJ
		$V_{GE} = \pm 15V, di/dt = 2800A/\mu s (T_{vj} = 150^\circ C)$ $T_{vj} = 125^\circ C$		6.9		
		$R_{Gon} = 2.2\Omega$ $T_{vj} = 150^\circ C$		7.9		
Turn-off energy loss per pulse	E_{off}	$I_C = 100A, V_{CE} = 600V, L_S = 30nH$ $T_{vj} = 25^\circ C$		6		mJ
		$V_{GE} = \pm 15V, du/dt = 3600V/\mu s (T_{vj} = 150^\circ C)$ $T_{vj} = 125^\circ C$		9		
		$R_{Goff} = 2.2\Omega$ $T_{vj} = 150^\circ C$		10		
SC data	I_{SC}	$V_{GE} \leq 15V, V_{CC} = 800V$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$ $T_{vj} = 150^\circ C$	$t_p \leq 10\mu s$	400		A
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.27	$^\circ C/W$
Thermal resistance, case to heatsink	R_{thCH}	per IGBT		0.078		$^\circ C/W$
External gate resistance	R_{Gext}	$T_{vj} = 25^\circ C$	1.1		20	Ω



■ **Diode Ratings & Characteristics**

Characteristics	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	$V_R = 0V, t_p = 10ms, T_{vj} = 125^{\circ}C$	1900	A^2s
		$V_R = 0V, t_p = 10ms, T_{vj} = 150^{\circ}C$	1800	

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward voltage	V_F	$I_F = 100A, V_{GE} = 0V$ $T_{vj} = 25^{\circ}C$		2	2.15	V
		$I_F = 100A, V_{GE} = 0V$ $T_{vj} = 125^{\circ}C$		1.9		
		$I_F = 100A, V_{GE} = 0V$ $T_{vj} = 150^{\circ}C$		1.9		
Peak reverse recovery current	I_{RM}	$I_F = 100A, -di_F/dt = 2800A/\mu s (T_{vj} = 150^{\circ}C)$ $T_{vj} = 25^{\circ}C$		77		A
		$V_R = 600V$ $T_{vj} = 125^{\circ}C$		82		
		$V_{GE} = -15V$ $T_{vj} = 150^{\circ}C$		87		
Recovered charge	Q_r	$I_F = 100A, -di_F/dt = 2800A/\mu s (T_{vj} = 150^{\circ}C)$ $T_{vj} = 25^{\circ}C$		6		μC
		$V_R = 600V$ $T_{vj} = 125^{\circ}C$		13		
		$V_{GE} = -15V$ $T_{vj} = 150^{\circ}C$		15		
Reverse recovery energy	Erec	$I_F = 100A, -di_F/dt = 2800A/\mu s (T_{vj} = 150^{\circ}C)$ $T_{vj} = 25^{\circ}C$		3.5		mJ
		$V_R = 600V$ $T_{vj} = 125^{\circ}C$		6		
		$V_{GE} = -15V$ $T_{vj} = 150^{\circ}C$		7		
Reverse Recovery Time	T_{rr}	$I_F = 100A, -di_F/dt = 2800A/\mu s, V_R = 600V, V_{GE} = -15V, T_{vj} = 25^{\circ}C$		146		ns
Thermal resistance, junction to case	R_{thJC}	per diode			0.48	$^{\circ}C/W$
Thermal resistance, case to heatsink	R_{thCH}	per diode		0.14		$^{\circ}C/W$
Temperature under switching conditions	$T_{vj op}$		-40		150	$^{\circ}C$

■ **Module Ratings & Characteristics**

Characteristics	Symbol	Test Conditions	Value	Unit
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance		terminal to heatsink	17	mm
		terminal to terminal	20	
Clearance		terminal to heatsink	17	mm
		terminal to terminal	9.5	
Comperative tracking index	CTI		>200	



Typical Characteristics

Preliminary Data

Fig.1 Output characteristic IGBT, Inverter (typical)

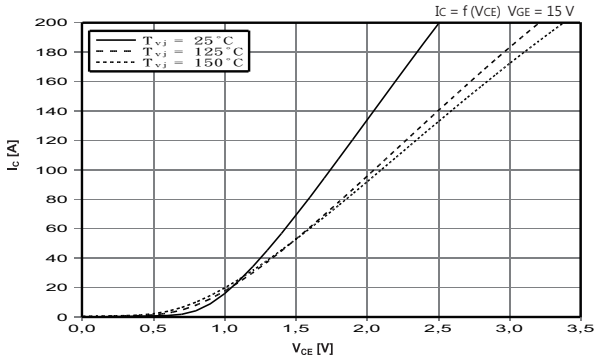


Fig.2 Output characteristic IGBT, Inverter (typical)

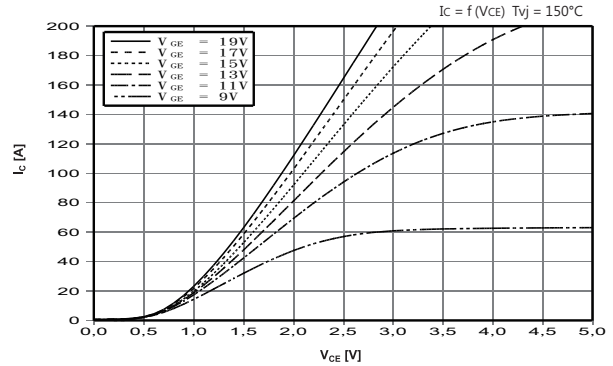


Fig.3 Transfer characteristic IGBT, Inverter (typical)

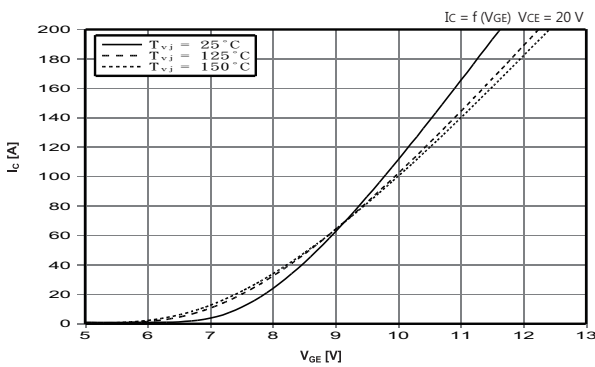


Fig.4 Switching losses IGBT, Inverter (typical)

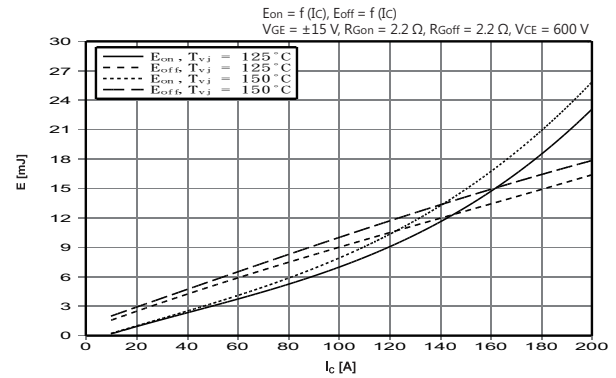


Fig.5 Switching losses IGBT, Inverter (typical)

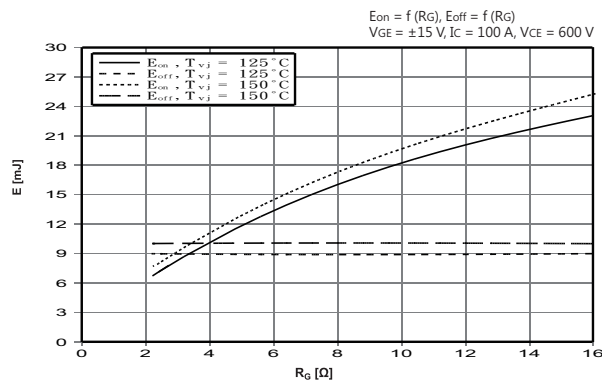


Fig.6 Transient thermal impedance IGBT, Inverter

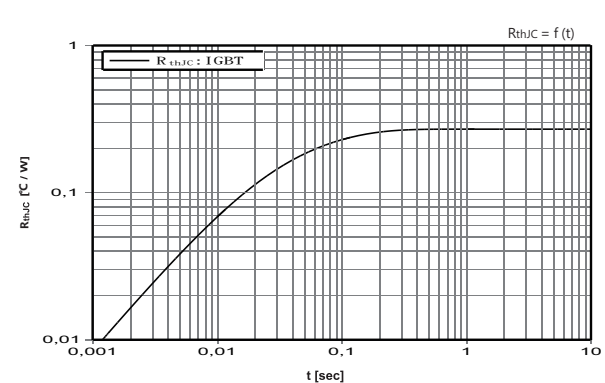


Fig.7 Reverse bias safe operating area IGBT, Inverter (RBSOA)

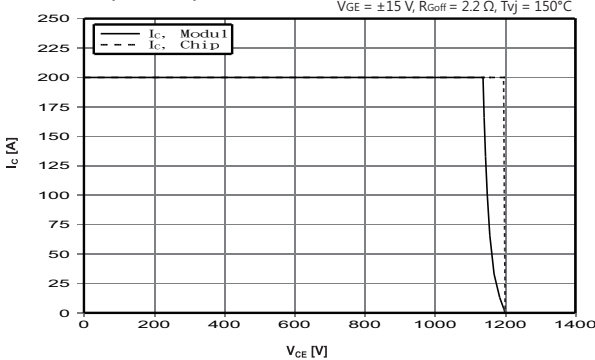
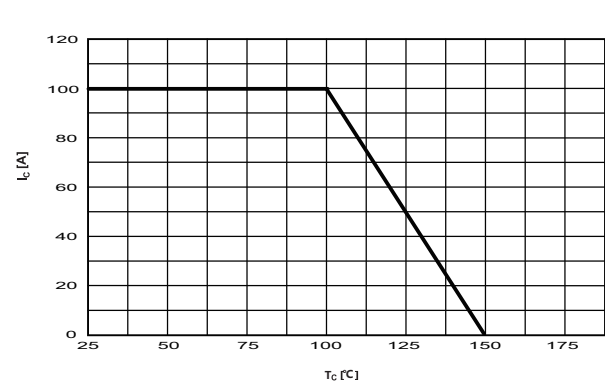


Fig.8 Output characteristic IGBT, Inverter (typical)





Typical Characteristics

Preliminary Data

Fig.9 Switching losses Diode, Inverter (typical)

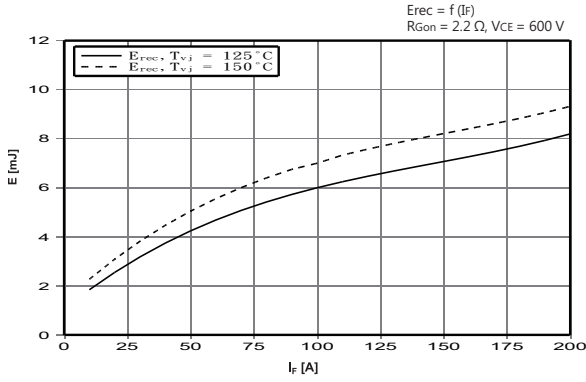


Fig.10 Switching losses Diode, Inverter (typical)

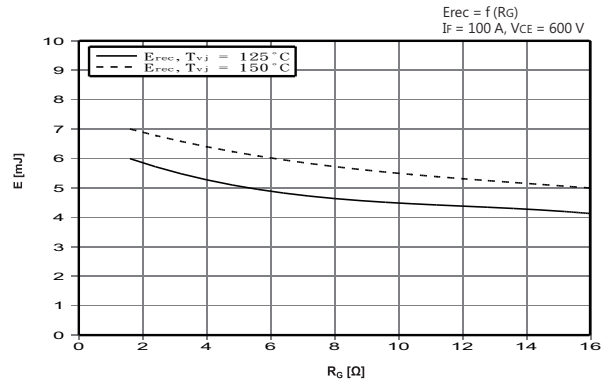


Fig.11 Transient thermal impedance Diode, Inverter

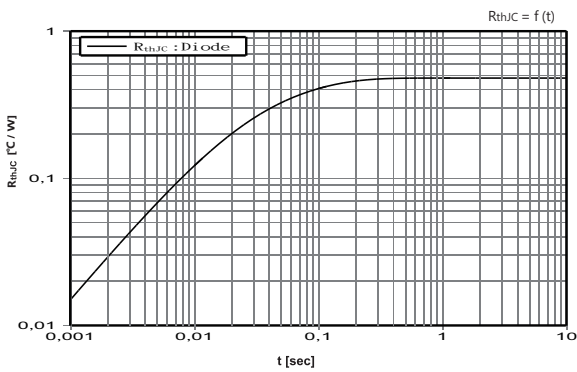
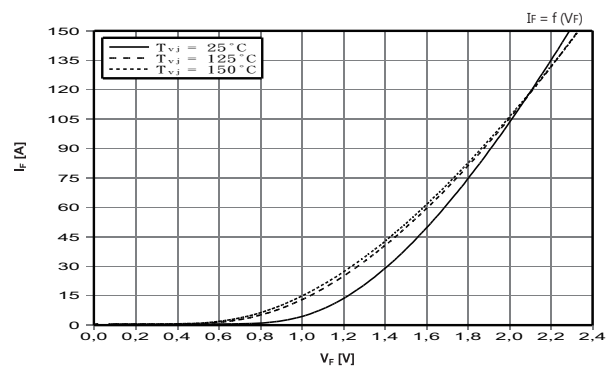


Fig.12 Forward characteristic of Diode, Inverter (typical)





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