



IGBT Power Module
1200V / 225A

Preliminary

Features

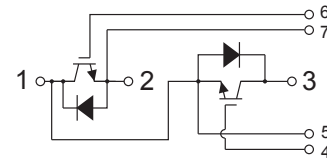
- ◆ 62mm Fast Switching IGBT Trench Technology
- ◆ Low Switching Losses
- ◆ Super Fast Diodes
- ◆ High Short Circuit Capability

Applications

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



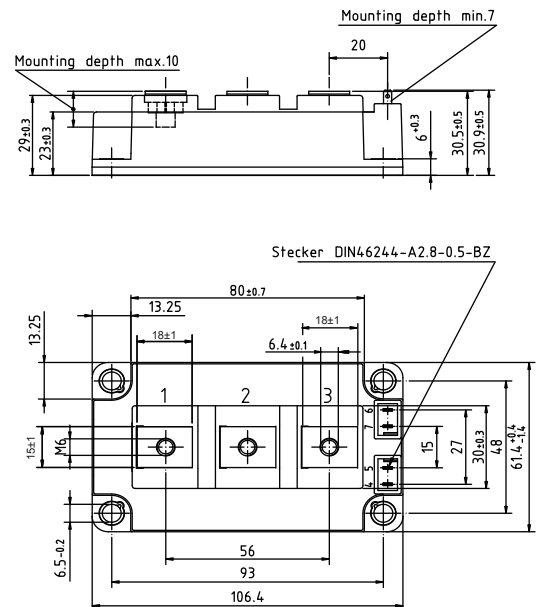
Circuit Diagram Headline



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 = 95°C T _c = 25°C I _{C,nom.} IC	225 320	A
Repetitive Peak Collector Current	t _p = 1ms I _{CRM}	450	A
Total Power Dissipation	P _{tot}	1050	W
Isolation Voltage	RMS, f=50Hz, t=1min V _{iso}	3000	V
Continuous DC Forward Current	I _F	225	A
Repetitive Peak Forward Current	t _p = 1ms I _{FRM}	450	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)	3~6	N.m
	Busbar to Terminal (M6)	2.5~5	

Package Outlines



Dimensions in mm (1 mm = 0.0394")



■ Electrical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	$V_{CE\text{sat}}$	$I_C = 225A, V_{GE} = 15V$ $T_{vj} = 25^\circ C$		1.85	2.15	V
		$I_C = 225A, V_{GE} = 15V$ $T_{vj} = 125^\circ C$		2.1		
		$I_C = 225A, V_{GE} = 15V$ $T_{vj} = 150^\circ C$		2.15		
Gate threshold voltage	$V_{GE\text{th}}$	$I_C = 7.8mA, V_{CE} = V_{GE}, T_{vj} = 25^\circ C$	5.2	5.8	6.4	V
Gate charge	Q_G	$V_{GE} = -15V \dots +15V$		1.55		μC
Internal gate resistor	$R_{G\text{int}}$	$T_{vj} = 25^\circ C$		1.3		Ω
Input capacitance	C_{ies}	$f = 1MHz, T_{vj} = 25^\circ C, V_{CE} = 25V, V_{GE} = 0V$		42.9		nF
Output Capacitance	C_{oes}	$f = 1MHz, T_{vj} = 25^\circ C, V_{CE} = 25V, V_{GE} = 0V$		1.594		nF
Reverse transfer capacitance	C_{res}	$f = 1MHz, T_{vj} = 25^\circ C, V_{CE} = 25V, V_{GE} = 0V$		0.878		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 25^\circ C$			3	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25^\circ C$			400	nA
Turn-on delay time, inductive load	$t_{d\text{on}}$	$I_C = 225A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.25		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.26		
		$R_{G\text{on}} = 1\Omega$ $T_{vj} = 150^\circ C$		0.27		
Rise time, inductive load	t_r	$I_C = 225A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.05		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.05		
		$R_{G\text{on}} = 1\Omega$ $T_{vj} = 150^\circ C$		0.05		
Turn-off delay time, inductive load	$t_{d\text{off}}$	$I_C = 225A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.322		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.412		
		$R_{G\text{off}} = 1\Omega$ $T_{vj} = 150^\circ C$		0.442		
Fall time, inductive load	t_f	$I_C = 225A, V_{CE} = 600V$ $T_{vj} = 25^\circ C$		0.06		μs
		$V_{GE} = \pm 15V$ $T_{vj} = 125^\circ C$		0.08		
		$R_{G\text{off}} = 1\Omega$ $T_{vj} = 150^\circ C$		0.09		
Turn-on energy loss per pulse	E_{on}	$I_C = 225A, V_{CE} = 600V, L_S = 80nH$ $T_{vj} = 25^\circ C$		1.28		mJ
		$V_{GE} = \pm 15V, di/dt = 5750A/\mu s (T_{vj} = 150^\circ C)$ $T_{vj} = 125^\circ C$		6.98		
		$R_{G\text{on}} = 1\Omega$ $T_{vj} = 150^\circ C$		9.48		
Turn-off energy loss per pulse	E_{off}	$I_C = 225A, V_{CE} = 600V, L_S = 80nH$ $T_{vj} = 25^\circ C$		14.41		mJ
		$V_{GE} = \pm 15V, du/dt = 3400V/\mu s (T_{vj} = 150^\circ C)$ $T_{vj} = 125^\circ C$		23.91		
		$R_{G\text{off}} = 1\Omega$ $T_{vj} = 150^\circ C$		26.91		
SC data	I_{SC}	$V_{GE} \leq 15V, V_{CC} = 800V$ $V_{CE\text{max}} = V_{CES} - L_{sCE} \cdot di/dt$ $t_p \leq 10\mu s,$ $T_{vj} = 150^\circ C$		900		A
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.14	$^\circ C/W$
Thermal resistance, case to heatsink	R_{thCH}	per IGBT		0.031		$^\circ C/W$



■ 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		225	A
Repetitive peak forward current	I_{FRM}	$t_p = 1ms$	450	A
P _t - value	P _t	$V_R = 0V, t_p = 10ms, T_{vj} = 125^{\circ}C$	10000	A ² s
		$V_R = 0V, t_p = 10ms, T_{vj} = 150^{\circ}C$	8100	

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward voltage	V_F	$I_F = 225A, V_{GE} = 0V, T_{vj} = 25^{\circ}C$		2	2.5	V
		$I_F = 225A, V_{GE} = 0V, T_{vj} = 125^{\circ}C$		2		
		$I_F = 225A, V_{GE} = 0V, T_{vj} = 150^{\circ}C$		2		
Peak reverse recovery current	I_{RM}	$I_F = 225A, -di_F/dt = 5750A/\mu s (T_{vj} = 150^{\circ}C)$	$T_{vj} = 25^{\circ}C$	142		A
		$V_R = 600V, T_{vj} = 125^{\circ}C$		162		
		$V_{GE} = -15V, T_{vj} = 150^{\circ}C$		182		
Recovered charge	Q _r	$I_F = 225A, -di_F/dt = 5750A/\mu s (T_{vj} = 150^{\circ}C)$	$T_{vj} = 25^{\circ}C$	16.9		μC
		$V_R = 600V, T_{vj} = 125^{\circ}C$		37.4		
		$V_{GE} = -15V, T_{vj} = 150^{\circ}C$		43.9		
Reverse recovery energy	E _{rec}	$I_F = 225A, -di_F/dt = 5750A/\mu s (T_{vj} = 150^{\circ}C)$	$T_{vj} = 25^{\circ}C$	11.3		mJ
		$V_R = 600V, T_{vj} = 125^{\circ}C$		21.3		
		$V_{GE} = -15V, T_{vj} = 150^{\circ}C$		24.3		
Reverse Recovery Time	T _{rr}	$I_F = 225A, -di_F/dt = 5750A/\mu s, V_R = 600V, V_{GE} = -15V, T_{vj} = 25^{\circ}C$		158		ns
Thermal resistance, junction to case	R _{thJC}	per diode			0.19	$^{\circ}C/W$
Thermal resistance, case to heatsink	R _{thCH}	per diode		0.042		$^{\circ}C/W$
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 ₂ O ₃	
Creepage distance		terminal to heatsink	29	mm
		terminal to terminal	23	
Clearance		terminal to heatsink	23	mm
		terminal to terminal	11	
Comperative tracking index	CTI		>400	



Typical Characteristics

Preliminary Data

Fig.1 Output characteristic IGBT, Inverter (typical)

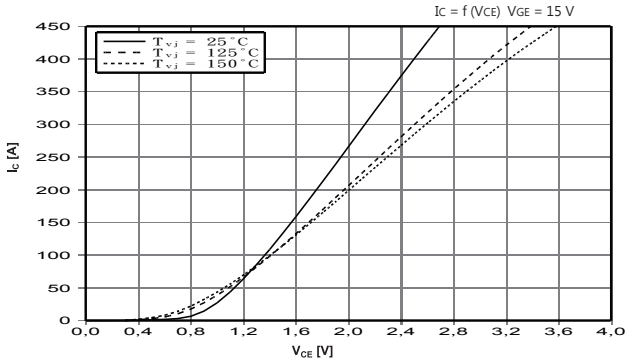


Fig.2 Output characteristic IGBT, Inverter (typical)

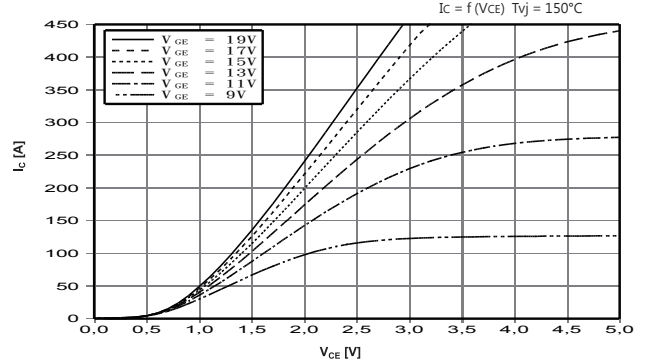


Fig.3 Transfer characteristic IGBT, Inverter (typical)

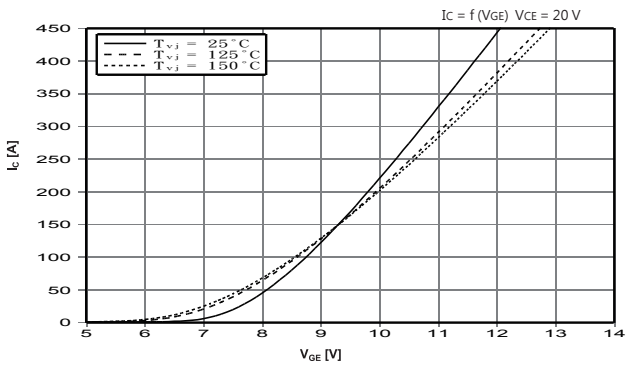


Fig.4 Switching losses IGBT, Inverter (typical)

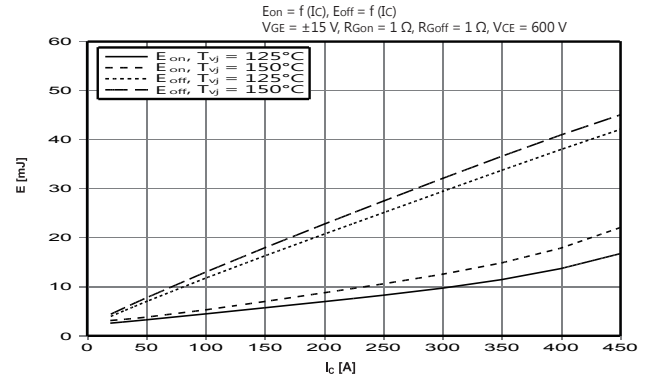


Fig.5 Switching losses IGBT, Inverter (typical)

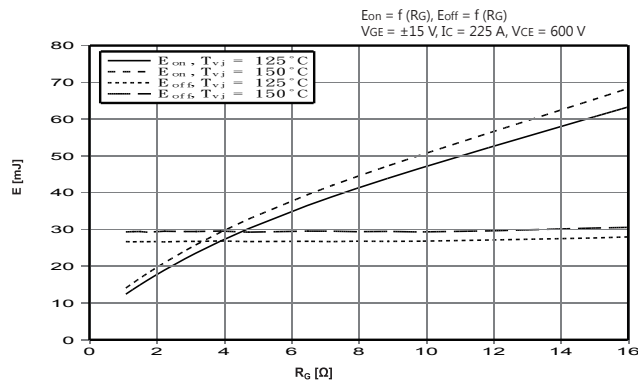


Fig.6 Transient thermal impedance IGBT, Inverter

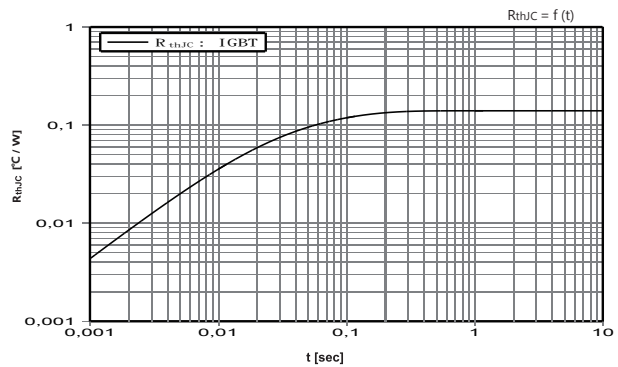


Fig.7 Reverse bias safe operating area IGBT, Inverter (RBSOA)

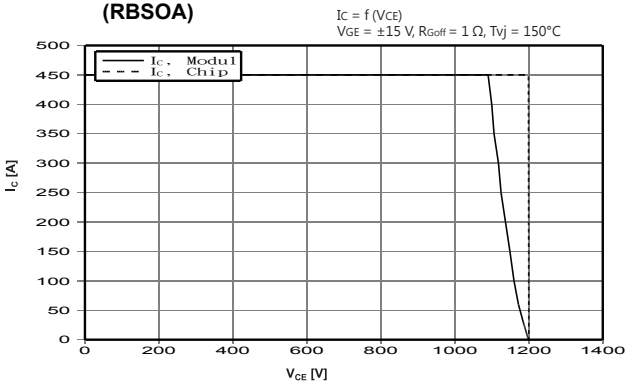
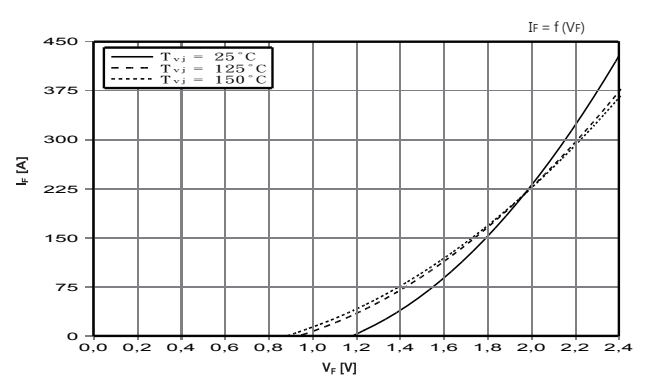


Fig.8 Forward characteristic of Diode, Inverter (typical)





Typical Characteristics

Preliminary Data

Fig.9 Switching losses Diode, Inverter (typical)

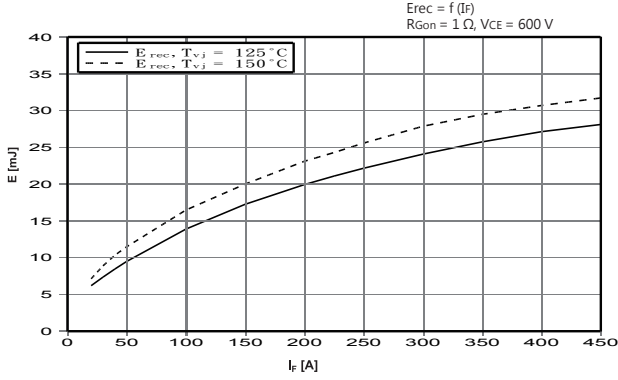


Fig.10 Switching losses Diode, Inverter (typical)

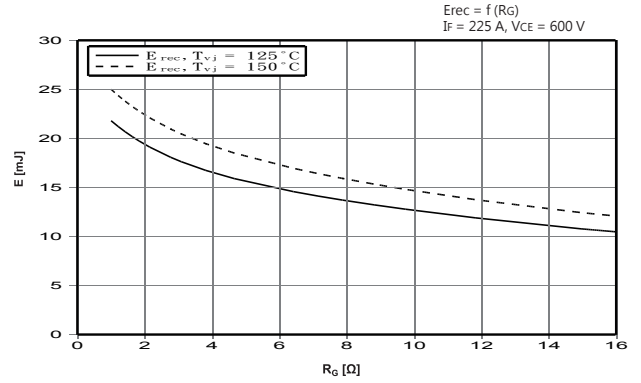
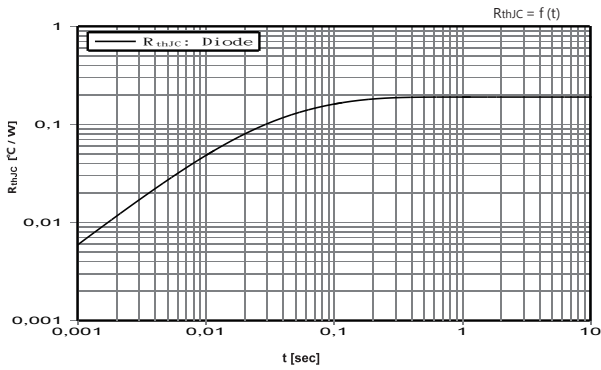


Fig.11 Transient thermal impedance Diode, Inverter





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