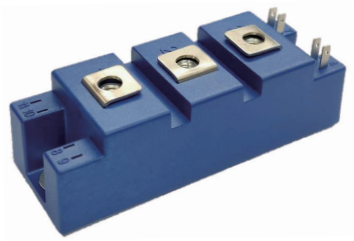
IGBT Power Module
600V/150A

Preliminary

HD-9434



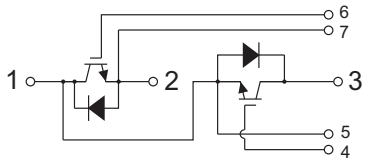
Features

- 34mm Fast Switching IGBT Trench Technology
- Low Switching Loss
- Super Fast Diodes
- High Short Circuit Capability

Applications

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

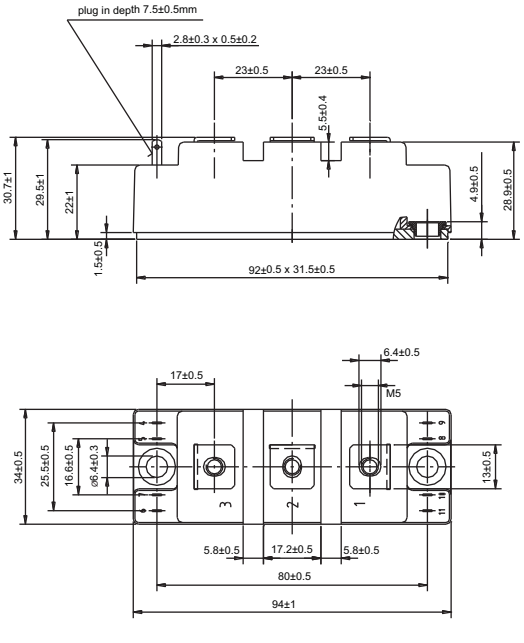
Circuit Diagram Headline



Maximum Ratings (Tc= 25℃)

Item		Symbol	Rated Value	Unit
Collector-Emitter Voltage		V_{CES}	600	V
Gate-Emitter Voltage		V_{GES}	±20	V
DC-Collector Current	T_C = 60℃	$I_{C,nom.}$	150	A
Repetitive Peak Collector Current	tp =1ms	I_{CRM}	300	A
Total Power Dissipation		P_{tot}	595	W
Isolation Voltage	RMS, f=50Hz, t=1min	V_{iso}	3000	V
DC Forward Current		I_F	150	A
Repetitive Peak Forward Current	tp =1ms	I_{FRM}	300	A
Temperature under switching conditions		$T_{vj\ op}$	−40～+150	℃
Storage Temperature Range		T_{stg}	−40～+125	℃
Mounting Torque	Module Base to Heatsink		3～5	N.m
	Busbar to Terminal		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	$V_{CE\ sat}$	I_C =150A, V_{GE} =15V T_{vj} =25°C		1.95	2.45	V
		I_C =150A, V_{GE} =15V T_{vj} =125°C		2.2		
Gate threshold voltage	V_{GEth}	I_C =3mA, V_{CE} =V_{GE}, T_{vj} =25°C	4.5	5.5	6.5	V
Gate charge	Q_G	V_{GE}= -15 V... +15 V		0.871		µC
Internal gate resistor	R_{Gint}	T_{vj} =25°C		0		Ω
Input capacitance	C_{ies}	f = 1MHz, T_{vj} =25°C, V_{CE} =25V, V_{GE} =0V		14.8		nF
Output capacitance	C_{oes}	f = 1MHz, T_{vj} =25°C, V_{CE} =25V, V_{GE} =0V		1.053		nF
Reverse transfer capacitance	C_{res}	f = 1MHz, T_{vj} =25°C, V_{CE} =25V, V_{GE} =0V		0.45		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} =600V, V_{GE} =0V, T_{vj} =25°C		1	500	µA
Gate-emitter leakage current	I_{GES}	V_{CE} =0V, V_{GE} =20V, T_{vj} =25°C			400	nA
Turn-on delay time, inductive load	$t_{d\ on}$	I_C =150A, V_{CE} =300V T_{vj} =25°C		80		ns
		V_{GE} = ±15V, R_{Gon} =4.7Ω T_{vj} =125°C		90		
Rise time, inductive load	t_r	I_C =150A, V_{CE} =300V T_{vj} =25°C		110		ns
		V_{GE} = ±15V, R_{Gon} =4.7Ω T_{vj} =125°C		112		
Turn-off delay time, inductive load	$t_{d\ off}$	I_C =150A, V_{CE} =300V T_{vj} =25°C		199		ns
		V_{GE} = ±15V, R_{Goff} =4.7Ω T_{vj} =125°C		224		
Fall time, inductive load	t_f	I_C =150A, V_{CE} =300V T_{vj} =25°C		66		ns
		V_{GE} = ±15V, R_{Goff} =4.7Ω T_{vj} =125°C		76		
Turn-on energy loss per pulse	E_{on}	I_C =150A, V_{CE} =300V, L_S =15nH T_{vj} =25°C		4.2		mJ
		V_{GE} = 15V, R_{Gon} =4.7Ω				
Turn-off energy loss per pulse	E_{off}	I_C =150A, V_{CE} =300V, L_S =15nH T_{vj} =25°C		6.6		mJ
		V_{GE} = 15V, R_{Goff} =4.7Ω				
SC data	I_{SC}	V_{GE} ≤15V, V_{CC} =360V t_P ≤10µs,		675		A
		V_{CEmax} =V_{CES} - L_{sCE} ·di/dt T_{vj} ≤ 125°C				
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.21	°C/W
Thermal resistance, case to heatsink	R_{thCH}	per IGBT		0.08		°C/W
External gate resistance	R_{Gext}	T_{vj} =25°C	2.2		20	Ω

■ Diode Ratings & Characteristics

Characteristics	Symbol	Test Conditions	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj} =25°C	600	V
Continuous DC forward current	I_F		150	A
Repetitive peak forward current	I_{FRM}	t_P =1ms	300	A
I²t - value	I²t	V_R =0V, t_P =10ms, T_{vj} =125°C	2300	A²s

Characteristics	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Forward voltage	V_F	I_F =150A, V_{GE} =0V	T_{vj} =25°C		1.8	2.3	V
		I_F =150A, V_{GE} =0V	T_{vj} =125°C		1.75		
Peak reverse recovery current	I_{RM}	I_F =150A, R_G =4.7Ω	T_{vj} =25°C		20		A
		V_R =300V, V_{GE} = -10V	T_{vj} =125°C		55		
Recovered charge	Qr	I_F =150A, R_G =4.7Ω	T_{vj} =25°C		2.8		µC
		V_R =300V, V_{GE} = -10V	T_{vj} =125°C		10.8		
Reverse recovery energy	Erec	I_F =150A, R_G =4.7Ω	T_{vj} =25°C		0.55		mJ
		V_R =300V, V_{GE} = -10V	T_{vj} =125°C		1.2		
Reverse Recovery Time	Trr	I_F =150A, R_G =4.7Ω, V_R =300V, V_{GE} = -10V, T_{vj}=25°C			130		ns
Thermal resistance, junction to case	R_{thJC}	per diode				0.4	°C/W
Thermal resistance, case to heatsink	R_{thCH}	per diode			0.13		°C/W
Temperature under switching conditions	$T_{vj\ op}$			-40		150	°C

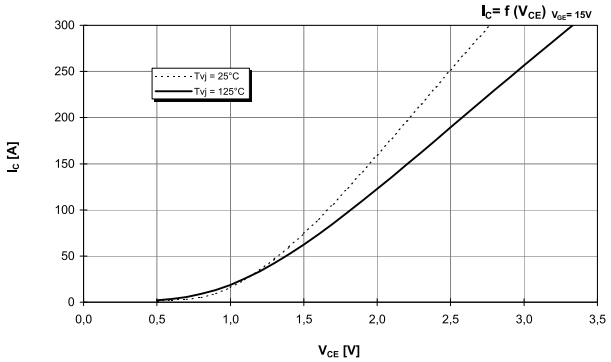
■ Module Ratings & Characteristics

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 (Typical)



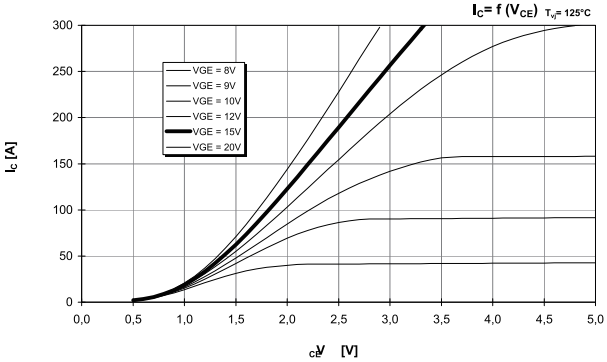


Fig.2 Transfer characteristic (Typical)

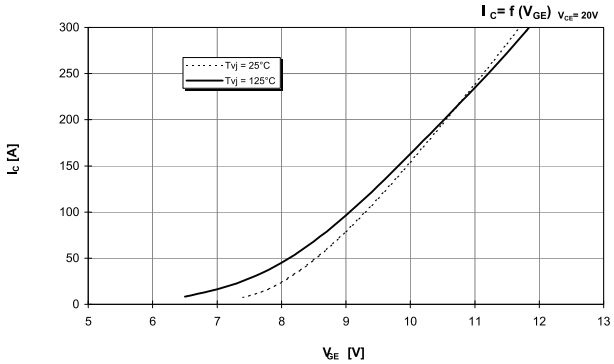


Fig.3 Forward characteristic of inverse diode (typical)

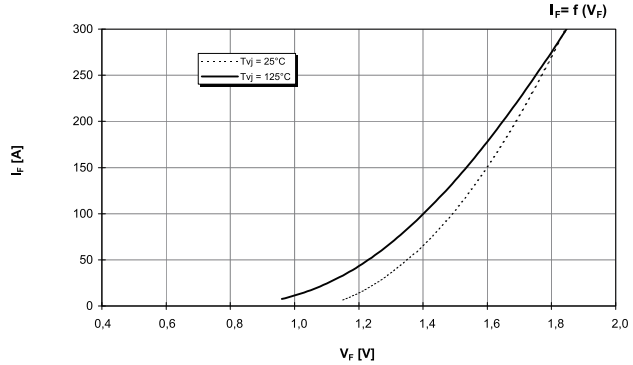
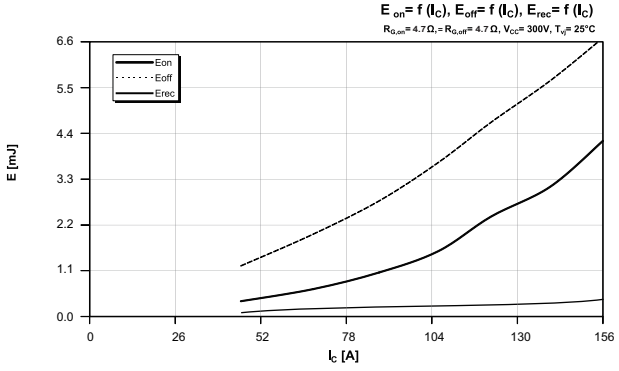


Fig.4 Switching losses (Typical)



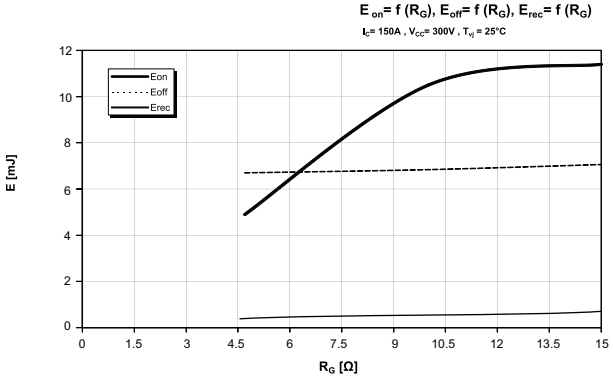
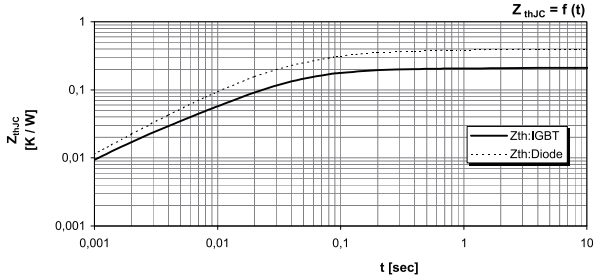
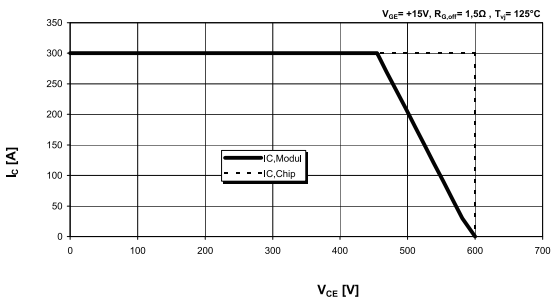


Fig.5 Transient thermal impedance



i	1	2	3	4
r_i [K/kW] : IGBT	8,9	110,0	74,0	17,0
τ_i [sec] : IGBT	0,0018	0,0240	0,0651	0,6626
r_i [K/kW] : Diode	141,0	135,2	84,9	38,9
τ_i [sec] : Diode	0,0487	0,0169	0,1069	0,9115

Fig.6 Reverse bias safe operation area (RBSOA)



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