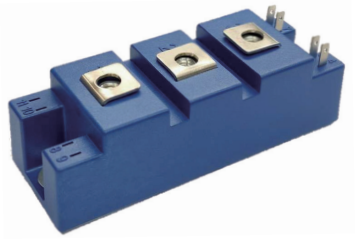
IGBT Power Module
600V/300A

Preliminary

HD-9434



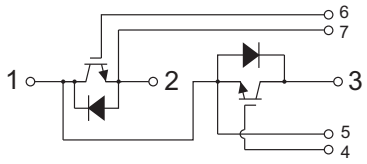
Features

- 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

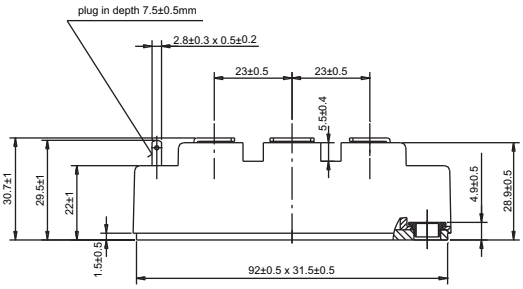
Circuit Diagram Headline

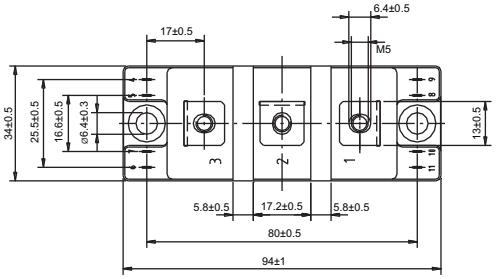


Maximum Ratings (T_C= 25℃)

Item		Symbol	Rated Value	Unit
Collector-Emitter Voltage		V_{CES}	600	V
Gate-Emitter Voltage		V_{GES}	±20	V
DC-Collector Current	T_C = 80℃	$I_{C,nom.}$	300	A
Repetitive Peak Collector Current	tp =1ms	I_{CRM}	600	A
Total Power Dissipation		P_{tot}	1250	W
Isolation Voltage	RMS, f=50Hz, t=1min	V_{iso}	3000	V
DC Forward Current		I_F	300	A
Repetitive Peak Forward Current	tp =1ms	I_{FRM}	600	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")

Preliminary Data

■ Electrical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	$V_{CE\ sat}$	I_C =300A, V_{GE} =15V T_{vj} =25℃		1.95	2.45	V
		I_C =300A, V_{GE} =15V T_{vj} =125℃		2.2		
Gate threshold voltage	V_{GEth}	I_C =6mA, V_{CE} =V_{GE}, T_{vj} =25℃	4.5	5.5	6.5	V
Gate charge	Q_G	V_{GE}= -15 V... +15 V		1.642		µC
Internal gate resistor	R_{Gint}	T_{vj} =25℃		0		Ω
Input capacitance	C_{ies}	f = 1MHz, T_{vj} =25℃, V_{CE} =25V, V_{GE} =0V		29		nF
Output capacitance	C_{oes}	f = 1MHz, T_{vj} =25℃, V_{CE} =25V, V_{GE} =0V		1.84		nF
Reverse transfer capacitance	C_{res}	f = 1MHz, T_{vj} =25℃, V_{CE} =25V, V_{GE} =0V		0.9		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} =600V, V_{GE} =0V, T_{vj} =25℃		2	1000	µA
Gate-emitter leakage current	I_{GES}	V_{CE} =0V, V_{GE} =20V, T_{vj} =25℃			400	nA
Turn-on delay time, inductive load	$t_{d\ on}$	I_C =300A, V_{CE} =300V T_{vj} =25℃		90		µs
		V_{GE} = ±15V, R_{Gon} =2.2Ω T_{vj} =125℃		100		
Rise time, inductive load	t_r	I_C =300A, V_{CE} =300V T_{vj} =25℃		128		µs
		V_{GE} = ±15V, R_{Gon} =2.2Ω T_{vj} =125℃		130		
Turn-off delay time, inductive load	$t_{d\ off}$	I_C =300A, V_{CE} =300V T_{vj} =25℃		230		µs
		V_{GE} = ±15V, R_{Goff} =2.2Ω T_{vj} =125℃		265		
Fall time, inductive load	t_f	I_C =300A, V_{CE} =300V T_{vj} =25℃		109		µs
		V_{GE} = ±15V, R_{Goff} =2.2Ω T_{vj} =125℃		114		
Turn-on energy loss per pulse	E_{on}	I_C =300A, V_{CE} =300V, L_S =15nH T_{vj} =125℃		1.9		mJ
		V_{GE} = 15V, R_{Gon} =2.2Ω				
Turn-off energy loss per pulse	E_{off}	I_C =300A, V_{CE} =300V, L_S =15nH T_{vj} =125℃		17.7		mJ
		V_{GE} = 15V, R_{Goff} =2.2Ω				
SC data	I_{SC}	V_{GE} ≤15V, V_{CC} =360V t_P ≤10µs,		1350		A
		V_{CEmax} =V_{CES} - L_{sCE} ·di/dt T_{vj} ≤ 125℃				
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.1	℃/W
Thermal resistance, case to heatsink	R_{thCH}	per IGBT		0.08		℃/W
External gate resistance	R_{Gext}	T_{vj} =25℃	1		10	Ω

Preliminary Data

■ 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		300	A
Repetitive peak forward current	I_{FRM}	t_P =1ms	600	A
I²t - value	I²t	V_R =0V, t_P =10ms, T_{vj} =125°C	19200	A²s

Characteristics	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Forward voltage	V_F	I_F =300A, V_{GE} =0V	T_{vj} =25°C		1.8	2.3	V
		I_F =300A, V_{GE} =0V	T_{vj} =125°C		1.75		
Peak reverse recovery current	I_{RM}	I_F =300A, R_G =2.2Ω	T_{vj} =25°C		104		A
		V_R =300V, V_{GE} = -10V	T_{vj} =125°C		155		
Recovered charge	Qr	I_F =300A, R_G =2.2Ω	T_{vj} =25°C		10		µC
		V_R =300V, V_{GE} = -10V	T_{vj} =125°C		25		
Reverse recovery energy	Erec	I_F =300A, R_G =2.2Ω	T_{vj} =25°C		3.7		mJ
		V_R =300V, V_{GE} = -10V	T_{vj} =125°C		-		
Reverse Recovery Time	Trr	I_F =300A, R_G =2.2Ω, V_R =300V, V_{GE} = -10V, T_{vj}=25°C			180		ns
Thermal resistance, junction to case	R_{thJC}	per diode				0.21	°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

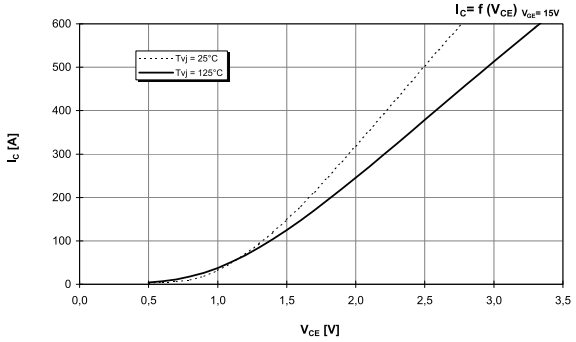
■ Module Ratings & Characteristics

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)



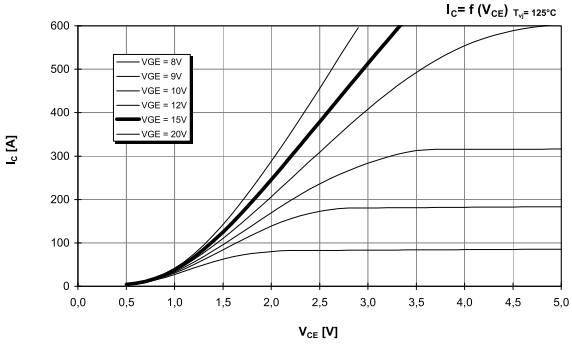


Fig.2 Transfer characteristic (Typical)

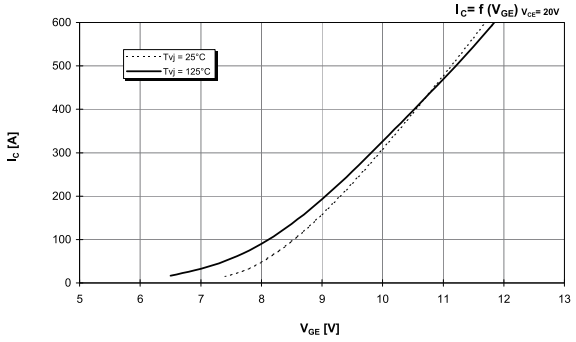


Fig.3 Forward characteristic of inverse diode (typical)

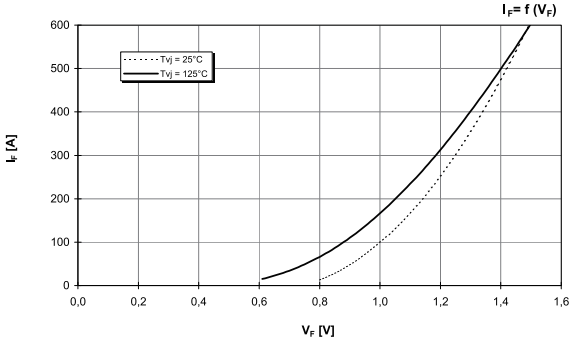
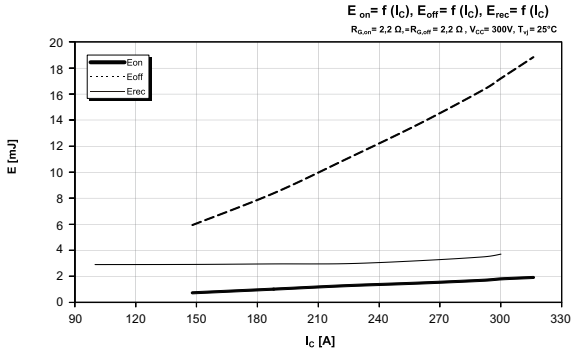


Fig.4 Switching losses (Typical)



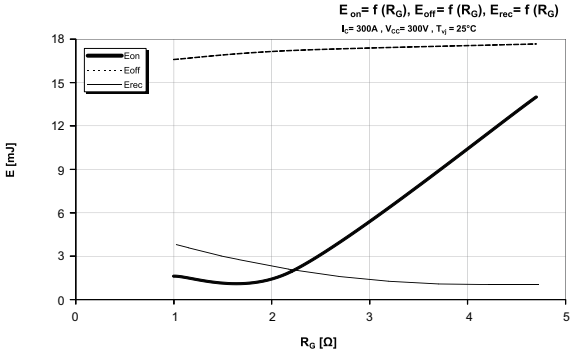
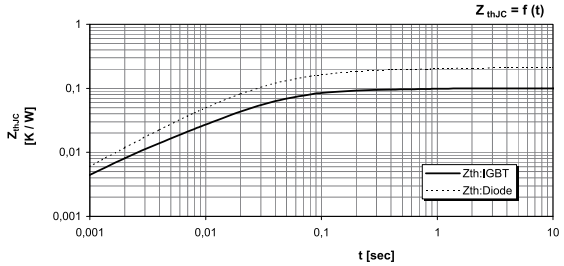
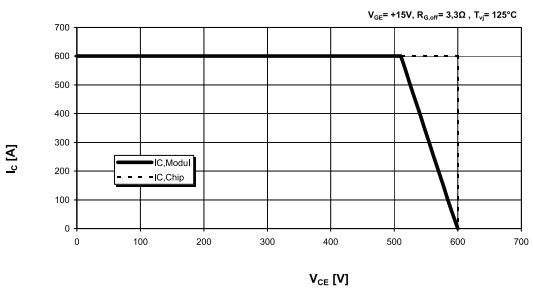


Fig.5 Transient thermal impedance



i	1	2	3	4
r_i [K/kW] : IGBT	4,2	52,4	35,2	8,1
τ_i [sec] : IGBT	0,0018	0,0240	0,0651	0,6626
r_i [K/kW] : Diode	74,0	71,0	44,6	20,4
τ_i [sec] : Diode	0,0487	0,0169	0,1069	0,9115

Fig.6 Reverse bias safe operation area (RBSOA)



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