

## 62mm Half Bridge IGBT Module

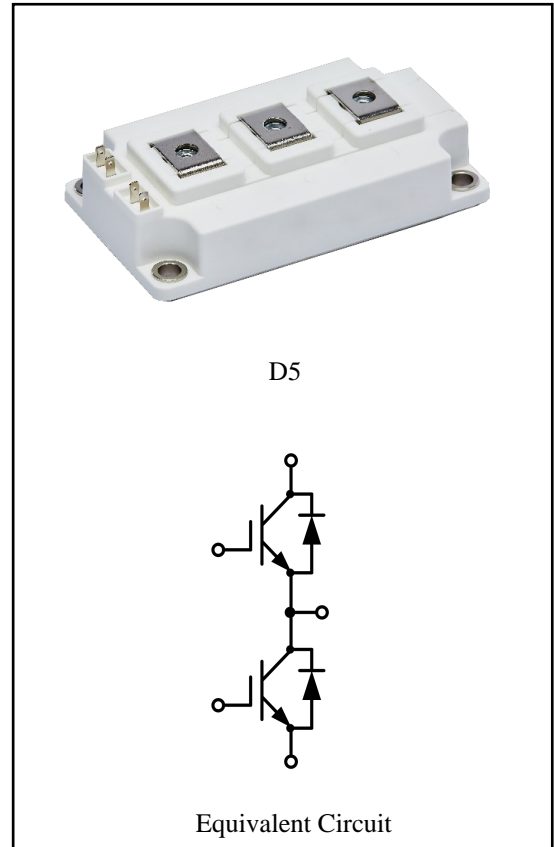
$V_{CES} = 1200V$ ,  $I_{C\text{nom}} = 450A / I_{CRM} = 900A$

### Features :

- 1200V Trench /Field Stop process
- Low switching losses
- $V_{cesat}$  has a positive temperature coefficient

### Applications:

- Variable Frequency Drive
- UPS
- Servo drive
- inverter



## IGBT, Inverter

### Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter voltage	$T_{vj} = 25^{\circ}C$	$V_{CES}$	1200	V
Continuous DC collector current	$T_C = 100^{\circ}C$ , $T_{vj\text{max}} = 175^{\circ}C$	$I_{C\text{nom}}$	450	A
Repetitive peak collector current	$t_p = 1\text{ ms}$	$I_{CRM}$	900	A
Total power dissipation	$T_C = 25^{\circ}C$ , $T_{vj\text{max}} = 175^{\circ}C$	$P_{tot}$	2500	W
Gate emitter voltage		$V_{GE}$	$\pm 20$	V

**Characteristic Values**

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter saturation voltage	$V_{GE}=15V, I_C=450A$ $V_{GE}=15V, I_C=450A$ $V_{GE}=15V, I_C=450A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$V_{CEsat}$	1.85 2.13 2.19	2.20	V
Gate-Emitter threshold voltage	$I_C=17mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.3	5.9	6.5
Gate charge	$V_{GE}=-15V...+15V$		$Q_G$	3.10		$\mu C$
Internal gate resistor	$T_{vj}=25^{\circ}C$		$R_{Gint}$	1.84		$\Omega$
Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	$C_{ies}$	34.62		nF
Reverse transfer capacitance			$C_{res}$	1.37		nF
Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	$I_{CES}$		1	mA
Gate-emitter leakage current	$V_{CE}=0V, V_{GE}=20V$	$T_{vj}=25^{\circ}C$	$I_{GES}$		200	nA
Turn-on delay time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{don}$	217 228 230		ns
Rise time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_r$	83 89 92		
Turn-off delay time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{doff}$	380 425 439		
Fall time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_f$	102 109 109		
Turn-on energy loss per pulse	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=1\Omega$ $di/dt = 4000 A/\mu s (T_{vj} = 150^{\circ}C)$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{on}$	26.38 36.60 41.24		
Turn-off energy loss per pulse	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=1\Omega$ $dv/dt = 4900V/\mu s (T_{vj} = 150^{\circ}C)$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{off}$	35.87 40.24 41.81		mJ
SC data	$V_{GE}\leq 15V, V_{ce}=800V$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt \quad t_p\leq 10\mu s, T_{vj}=150^{\circ}C$		$I_{sc}$	3074		A
Thermal resistance, junction to case	per IGBT		$R_{thJC}$		0.06	K/W
Temperature under switching conditions			$T_{vj op}$	-40	150	$^{\circ}C$

## Diode, Inverter

### Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$	$V_{RRM}$	1200	V
Continuous DC forward current		$I_F$	450	A
Repetitive peak forward current	$t_p=1\text{ms}$	$I_{FRM}$	900	A
$I^2t$ -value	$t_p=10\text{ms}$ , $\sin 180^{\circ}$ , $T_j=125^{\circ}\text{C}$	$I^2t$	40271	$\text{A}^2\text{S}$

### Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Forward voltage	$I_F=450\text{A}$ , $V_{GE}=0\text{V}$ $I_F=450\text{A}$ , $V_{GE}=0\text{V}$ $I_F=450\text{A}$ , $V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$V_F$	2.30 2.46 2.38	2.80	V
Peak reverse recovery current	$I_F=450\text{A}$ , $-di_F/dt=4000\text{A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$I_{RM}$	250 288 307		A
Recovered charge	$I_F=450\text{A}$ , $-di_F/dt=4000\text{A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$Q_r$	34 51 61		$\mu\text{C}$
Reverse recovered energy	$I_F=450\text{A}$ , $-di_F/dt=4000\text{A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$E_{rec}$	14.53 21.06 25.04		mJ
Thermal resistance, junction to case	per diode		$R_{thJC}$		0.16	K/W
Temperature under switching conditions			$T_{vj\text{op}}$	-40	150	$^{\circ}\text{C}$

## Module

Parameter	Conditions	Symbol	Value			Unit
Isolation test voltage	RMS, f=50Hz, t=1min	V <sub>ISOL</sub>	4000			V
Internal isolation			Al <sub>2</sub> O <sub>3</sub>			
Storage temperature		T <sub>stg</sub>	-40		125	°C
Mounting torque for modul mounting		M	3.0		6.0	Nm
Terminal Connection Torque		M	2.5		5.0	Nm
Weight		W		324		g

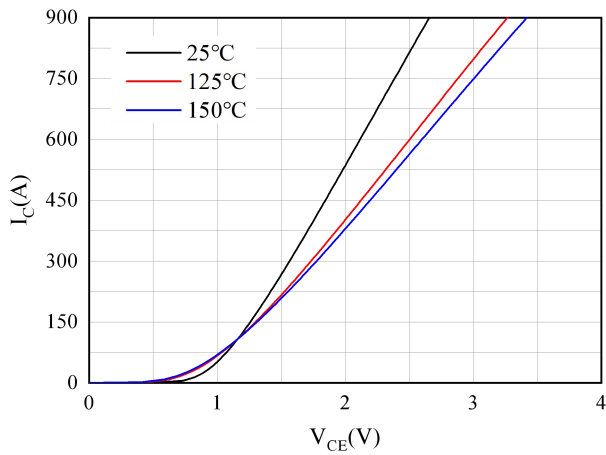


Fig 1. Typical output characteristics ( $V_{GE}=15V$ )

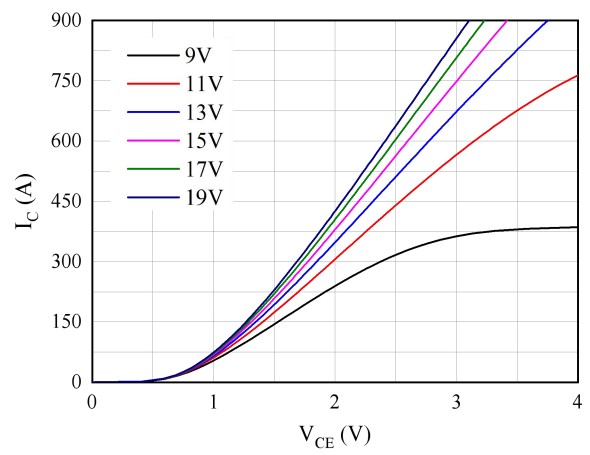


Fig 2. Typical output characteristics ( $T_{vj}=150^{\circ}C$ )

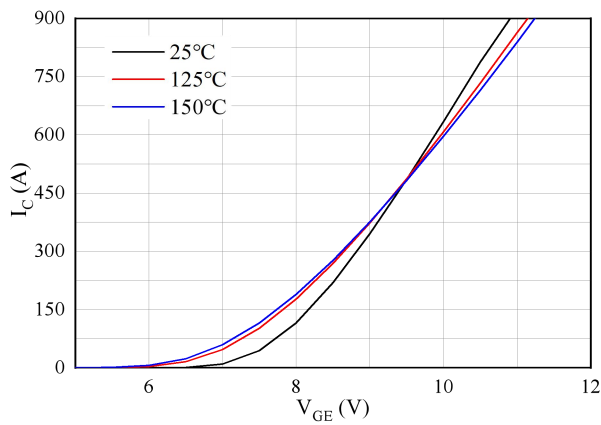


Fig 3. Typical transfer characteristic ( $V_{CE}=20V$ )

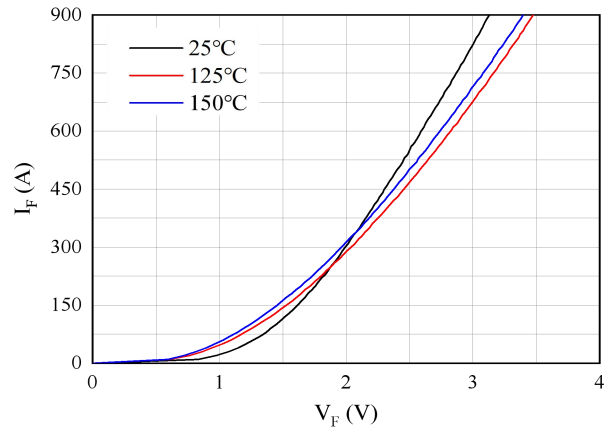


Fig 4. Forward characteristic of Diode

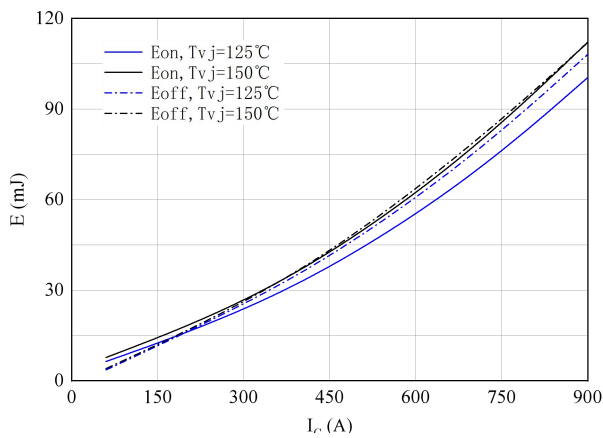


Fig5. Switching losses of IGBT  
 $V_{GE}=\pm 15V, R_{Gon}=1\Omega, R_{Goff}=1\Omega, V_{CE}=600V$

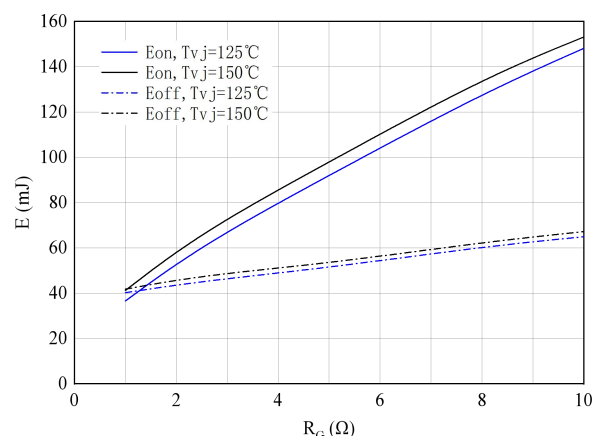


Fig 6. Switching losses of IGBT  
 $V_{GE}=\pm 15V, I_C=450A, V_{CE}=600V$

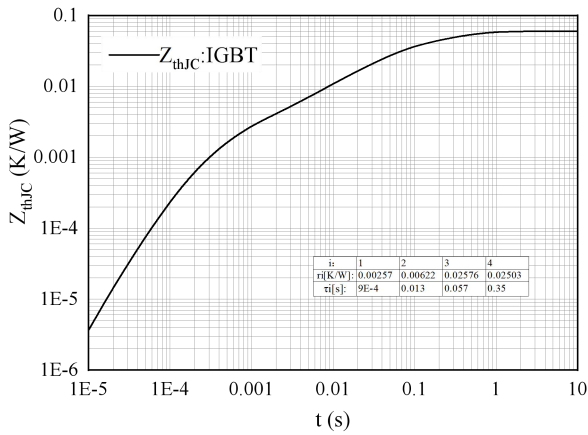


Fig 7. Transient thermal impedance IGBT,Inverter

$$Z_{thJC}=f(t)$$

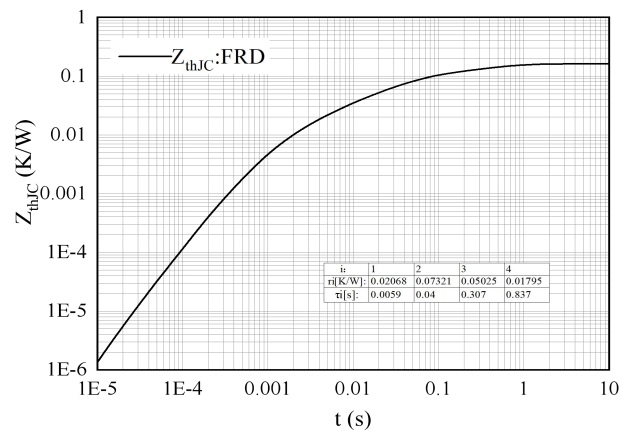


Fig 8. Transient thermal impedance FRD,Inverter

$$Z_{thJC}=f(t)$$

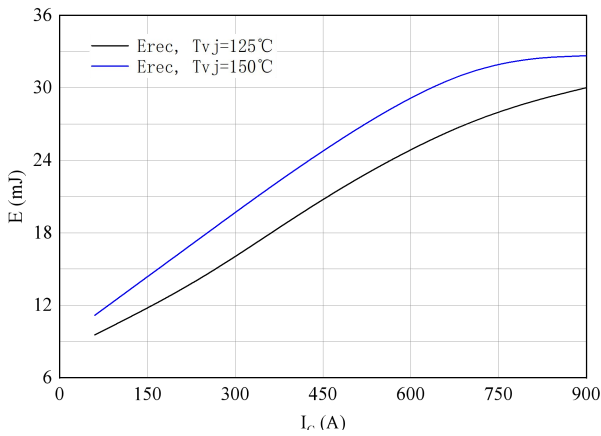


Fig 9. Switching losses of Diode

$R_{Gon}=1\Omega, V_{CE}=600V$

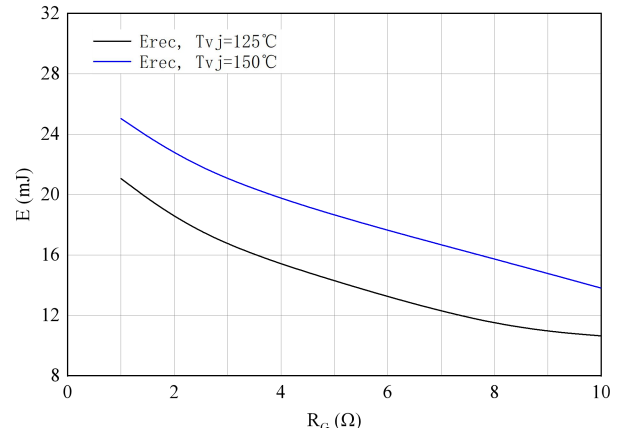


Fig 10. Switching losses of Diode

$I_F=450A, V_{CE}=600V$

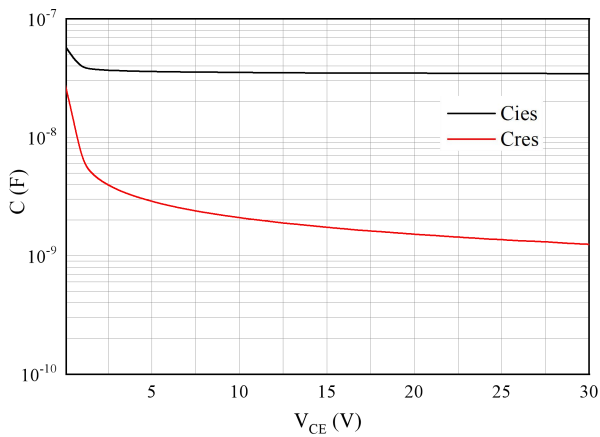
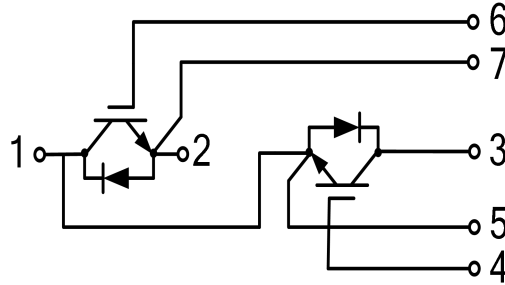


Fig 11. Capacitance characteristic

**Circuit diagram**



**Package outlines**

