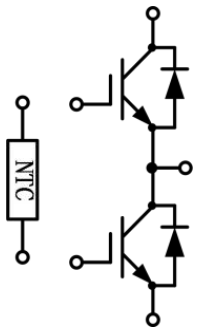
Econodual3 Half Bridge IGBT Module

V_{CES}= 1700V, I_C= 450A, $V_{CE(sat)}$= 1.67V

Features

- 1700V Trench Gate/Field Termination Process
- Low Switching Losses
- $V_{CE(Sat)}$ With Positive Temperature Coefficient
- Integrated NTC Temperature Sensor



Applications

- Power Conversion System
- Wind Turbines
- Motor Drives

IGBT, Inverter

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Collector-emitter voltage	V_{CES}	T_{vj}=25℃, V_{GE}=0V	1700	V
Continuous collector current	$I_{C\,nom}$	T_C=100℃, $T_{vj\,max}$=175℃	450	A
Repetitive peak collector current	I_{CRM}	t_P=1ms	900	A
Gate-emitter peak voltage	V_{GES}	T_{vj}=25℃	±20	V

Characteristics Values

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C=450A, V_{GE}=15V	T_{vj}=25℃		1.67	2.07	V
			T_{vj}=125℃		1.96		V
			T_{vj}=150℃		2.04		V
			T_{vj}=175℃		2.12		V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=9.1mA, V_{CE}=V_{GE}	T_{vj}=25℃	5.9	6.5	7.1	V
Gate charge	Q_G	V_{GE}=-15V...+15V			4.1		μC
Integrated gate resistor	$R_{G\,int}$	T_{vj}=25℃			0.51		Ω
Input capacitance	C_{ies}	f=100KHz, V_{CE}=25V, V_{GE}=0V	T_{vj}=25℃		63.37		nF
Reverse transfer capacitance	C_{res}	f=100KHz, V_{CE}=25V, V_{GE}=0V	T_{vj}=25℃		0.24		nF
Collector-emitter cut-off current	I_{CES}	V_{CE}=1700V, V_{GE}=0V	T_{vj}=25℃			2	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	T_{vj}=25℃			200	nA

Turn-on delay time	$t_{d\ on}$	I_C=450A, V_{CE}=900V, V_{GE}=-15V/+15V, R_G=5Ω, Inductive Load	T_{vj}=25℃		264		ns
			T_{vj}=125℃		244		ns
			T_{vj}=150℃		238		ns
			T_{vj}=175℃		227		ns
Rise time	t_r	I_C=450A, V_{CE}=900V, V_{GE}=-15V/+15V, R_G=5Ω, Inductive Load	T_{vj}=25℃		97		ns
			T_{vj}=125℃		110		ns
			T_{vj}=150℃		114		ns
			T_{vj}=175℃		119		ns
Turn-off delay time	$t_{d\ off}$	I_C=450A, V_{CE}=900V, V_{GE}=-15V/+15V, R_G=5Ω, Inductive Load	T_{vj}=25℃		555		ns
			T_{vj}=125℃		612		ns
			T_{vj}=150℃		626		ns
			T_{vj}=175℃		643		ns
Fall time	t_f	I_C=450A, V_{CE}=900V, V_{GE}=-15V/+15V, R_G=5Ω, Inductive Load	T_{vj}=25℃		510		ns
			T_{vj}=125℃		691		ns
			T_{vj}=150℃		744		ns
			T_{vj}=175℃		797		ns
Turn-on energy loss per pulse	E_{on}	I_C=450A, V_{CE}=900V, V_{GE}=-15V/+15V, R_G=5Ω, di/dt=3007A/μs (T_{vj}=150℃) Inductive Load	T_{vj}=25℃		140		mJ
			T_{vj}=125℃		172		mJ
			T_{vj}=150℃		184		mJ
			T_{vj}=175℃		194		mJ
Turn-off energy loss per pulse	E_{off}	I_C=450A, V_{CE}=900V, V_{GE}=-15V/+15V, R_G=5Ω, du/dt=4155V/μs (T_{vj}=150℃) Inductive Load	T_{vj}=25℃		110		mJ
			T_{vj}=125℃		140		mJ
			T_{vj}=150℃		148		mJ
			T_{vj}=175℃		156		mJ
SC data	I_{SC}	V_{GE}≤15V, V_{CE}=1000V V_{CEmax}=V_{CES}-L_{sCE}*di/dt, t_P≤8μs,	T_{vj}=150℃		2092		A
		V_{GE}≤15V, V_{CE}=1000V V_{CEmax}=V_{CES}-L_{sCE}*di/dt, t_P≤6μs,	T_{vj}=175℃		1970		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.082	K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		175	℃

Note:$T_{vj\ op}$>150℃ is only allowed for operation at temporary overload conditions.

Diode, Inverter
Maximum Ratings

Parameter	Symbol	Conditions		Value	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃		1700	V
Continuous forward current	I_F			450	A
Repetitive peak forward current	I_{FRM}	t_P= 1ms		900	A
I^2t-value	I^2t	t_P=10ms, sin180°	T_{vj}=125℃	22050	A^2s

Characteristics Values

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=450A, V_{GE}=0V	T_{vj}=25℃		2.00	2.4	V
			T_{vj}=125℃		2.26		V
			T_{vj}=150℃		2.33		V
			T_{vj}=175℃		2.36		V
Peak reverse recovery current	I_{rr}	I_F=450A, V_R=900V, V_{GE}=-15V, R_G=5Ω, -diF/dt=3181A/μs (T_{vj}=175℃)	T_{vj}=25℃		263		A
			T_{vj}=125℃		280		A
			T_{vj}=150℃		285		A
			T_{vj}=175℃		287		A
Recovered charge	Q_{rr}		T_{vj}=25℃		116		μC
			T_{vj}=125℃		166		μC
			T_{vj}=150℃		183		μC
			T_{vj}=175℃		200		μC
Reverse recovery energy	E_{rec}		T_{vj}=25℃		65		mJ
			T_{vj}=125℃		98		mJ
			T_{vj}=150℃		109		mJ
			T_{vj}=175℃		120		mJ
Thermal resistance, junction to case	R_{thJC}	per FRD				0.132	K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		175	℃

Note:$T_{vj\ op}$>150℃ is only allowed for operation at temporary overload conditions.

NTC-Thermistor
Characteristics Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	T_C=25℃, ±5%		5.0		kΩ
B-value	$B_{25/50}$	±2%		3375		K
	$B_{25/100}$	±2%		3443		K

Module
Characteristics Values

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Isolation test voltage	V_{ISOL}	RMS, f=50Hz, t=1min		4		kV
Internal isolation	-			Al_2O_3		-
Storage temperature	T_{stg}		-40		125	℃
Mounting torque for module mounting	M		3	-	6	N·m
Terminal connection torque	M		3	-	6	N·m
Weight	G			344		g

Typical Characteristics

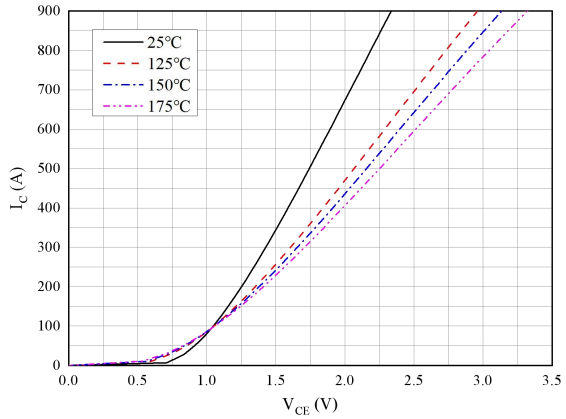


Fig 1. Typical output characteristics (V_{GE}=15V)

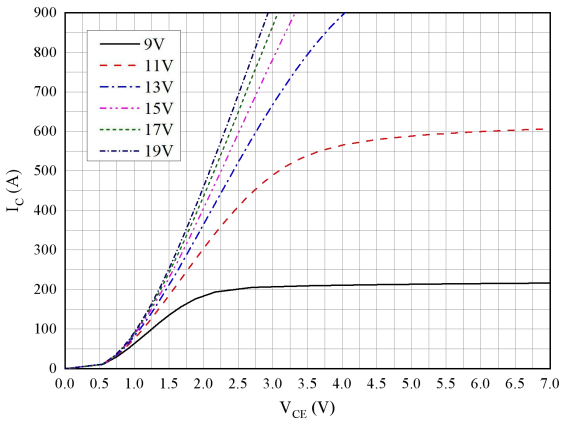


Fig 2. Typical output characteristics (T_{vj}=150℃)

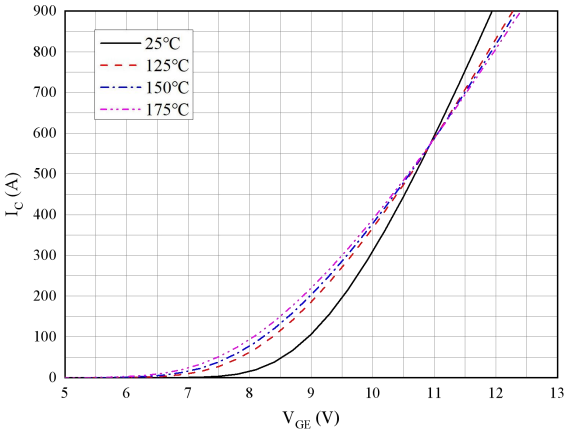


Fig 3. Typical transfer characteristics (V_{CE}=20V)

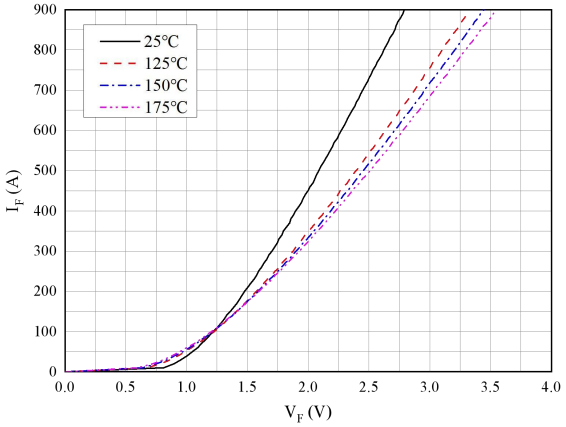


Fig 4. Forward characteristics of Diode

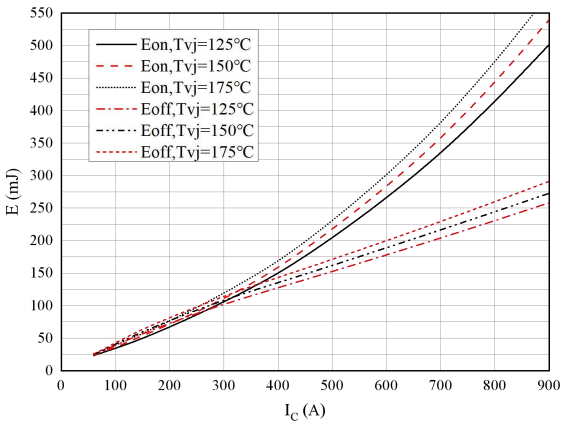


Fig 5. Switching losses of IGBT, Inverter
V_{GE}=±15V, R_{Gon}=R_{Goff}=5Ω, V_{CE}=900V

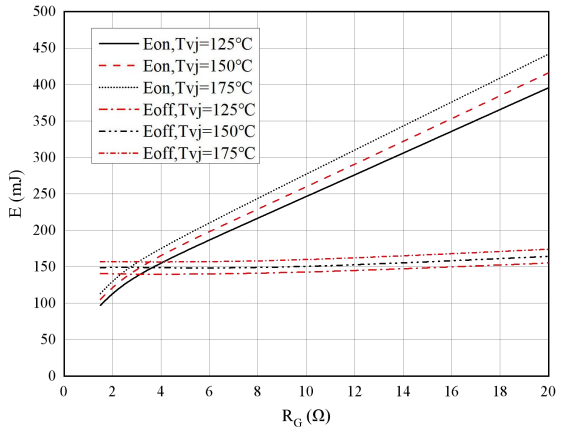


Fig 6. Switching losses of IGBT, Inverter
V_{GE}=±15V, I_C=450A, V_{CE}=900V

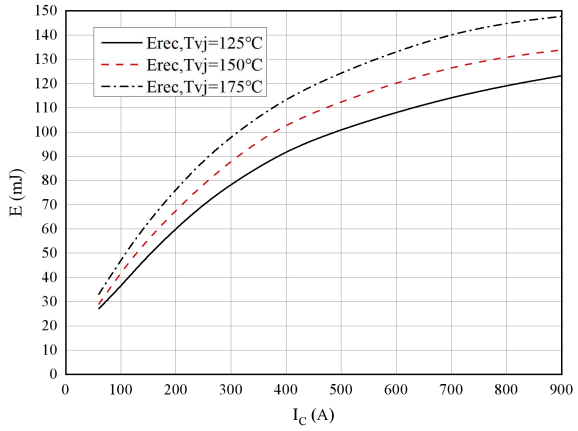


Fig 7. Switching losses of Diode
$R_{Gon}=R_{Goff}=5\Omega$, $V_{CE}=900V$

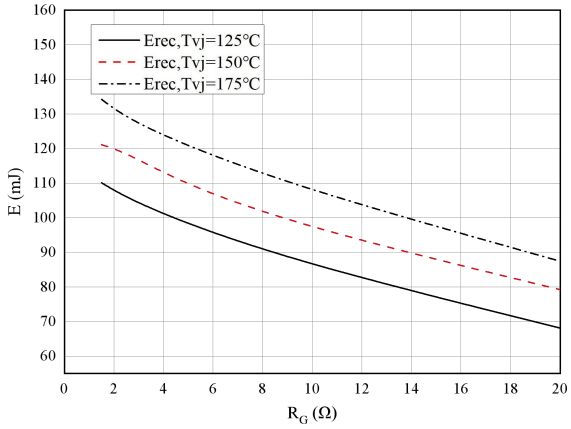


Fig 8. Switching losses of Diode
$I_F=450A$, $V_{CE}=900V$

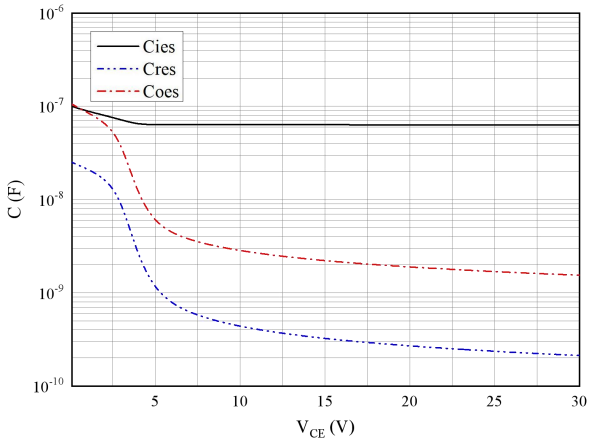


Fig 9. Capacitance characteristics

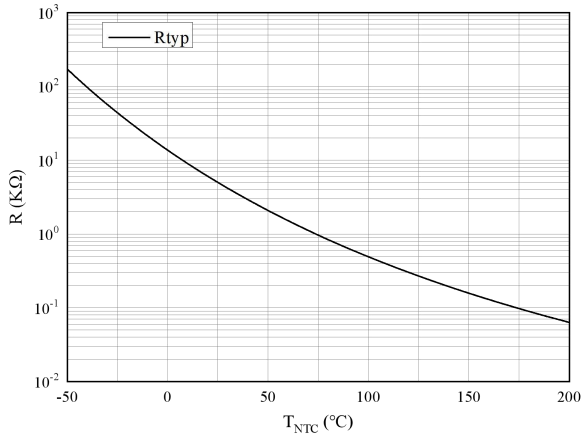


Fig 10. NTC-Themistor-temperature characteristic

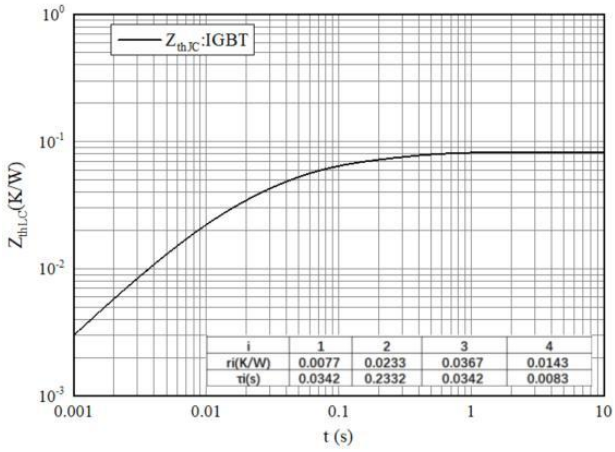


Fig 11. Transient thermal impedance IGBT,
Inverter $Z_{thJC}=f(t)$

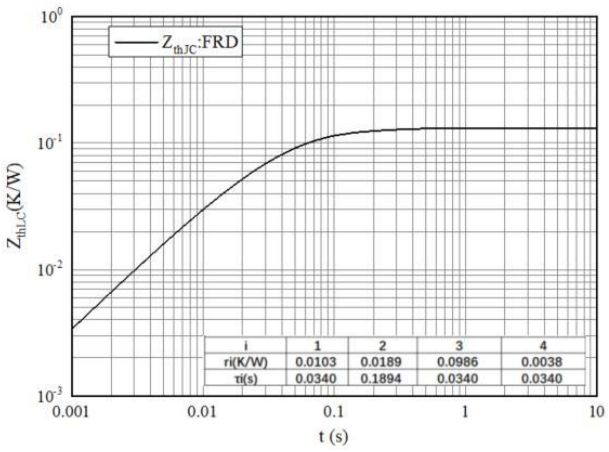
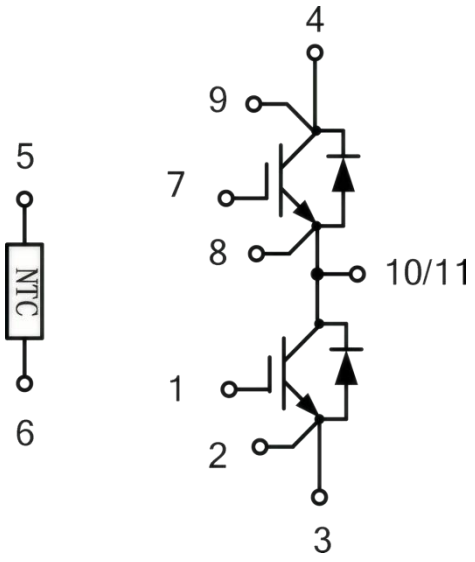
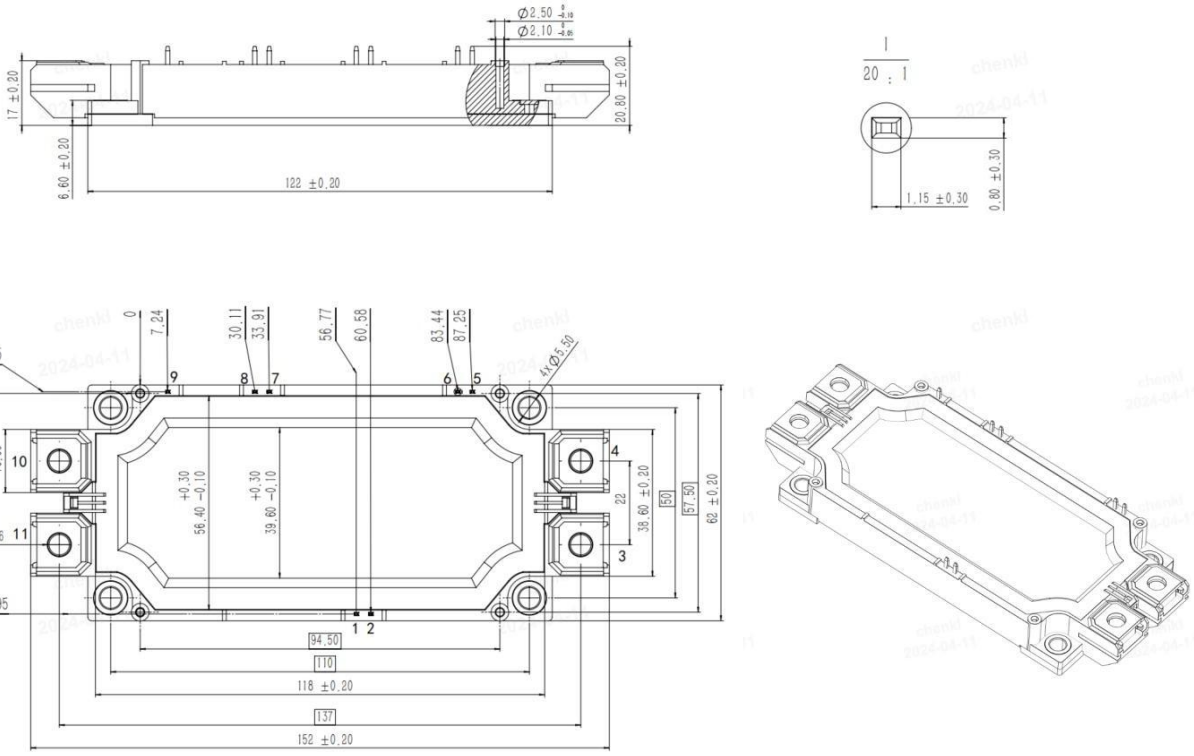


Fig 12. Transient thermal impedance FRD,
Inverter $Z_{thJC}=f(t)$

Circuit Diagram



Package Outlines (Unit:mm)



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