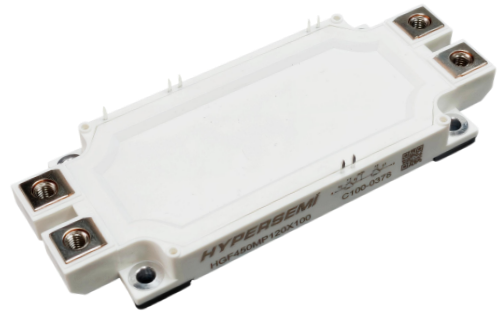


Econodual3 Half Bridge IGBT Module

$V_{CES} = 1200V$, $I_C = 450A$, $V_{CE(sat)} = 1.60V$

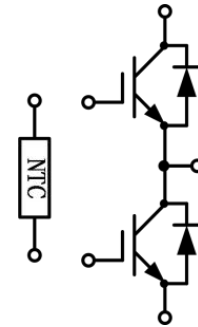
Features

- 1200V Trench Gate/Field Termination Process
- Low Switching Losses
- $V_{CE(sat)}$ With Positive Temperature Coefficient
- Integrated NTC Temperature Sensor



Applications

- Power Conversion System
- Inverter
- Servo Drives
- UPS Systems



IGBT, Inverter Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Collector-emitter voltage	V_{CES}	$T_{vj}=25^{\circ}C$, $V_{GE}=0V$	1200	V
Continuous collector current	$I_{C\ nom}$	$T_C=100^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	450	A
Repetitive peak collector current	I_{CRM}	$t_p=1ms$	900	A
Gate-emitter peak voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total power dissipation	P_{tot}	$T_C=25^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	2500	W

Characteristics Values

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=450A$, $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	1.60	2.07	V	
			$T_{vj}=125^{\circ}C$	1.80		V	
			$T_{vj}=150^{\circ}C$	1.90		V	
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C=17mA$, $V_{CE}=V_{GE}$	$T_{vj}=25^{\circ}C$	5.40	6.0	6.60	V
Gate charge	Q_G	$V_{GE}=-15V...+15V$		2.09		μC	
Integrated gate resistor	$R_{G\ int}$	$T_{vj}=25^{\circ}C$		0.36		Ω	
Input capacitance	C_{ies}	$f=100KHz$, $V_{CE}=25V$, $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	71.80		nF	
Reverse transfer capacitance	C_{res}	$f=100KHz$, $V_{CE}=25V$, $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	0.62		nF	
Collector-emitter cut-off current	I_{CES}	$V_{CE}=1200V$, $V_{GE}=0V$	$T_{vj}=25^{\circ}C$			2	mA

Gate-emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	$T_{vj}=25^{\circ}C$		200	nA	
Turn-on delay time	$t_{d\ on}$	$I_C=450A,$ $V_{CE}=600V,$ $V_{GE}=-15V/+15V,$ $R_G=1.5\Omega,$ Inductive Load	$T_{vj}=25^{\circ}C$		281	ns	
			$T_{vj}=125^{\circ}C$		284	ns	
			$T_{vj}=150^{\circ}C$		282	ns	
Rise time	t_r		$T_{vj}=25^{\circ}C$		69	ns	
			$T_{vj}=125^{\circ}C$		71	ns	
			$T_{vj}=150^{\circ}C$		74	ns	
Turn-off delay time	$t_{d\ off}$		$T_{vj}=25^{\circ}C$		375	ns	
			$T_{vj}=125^{\circ}C$		422	ns	
			$T_{vj}=150^{\circ}C$		430	ns	
Fall time	t_f	$T_{vj}=25^{\circ}C$		133	ns		
		$T_{vj}=125^{\circ}C$		217	ns		
		$T_{vj}=150^{\circ}C$		240	ns		
Turn-on energy loss per pulse	E_{on}	$I_C=450A, V_{CE}=600V,$ $V_{GE}=-15V/+15V, R_G=1.5\Omega,$ $di/dt=2500A/\mu s (T_{vj}=150^{\circ}C)$ Inductive Load	$T_{vj}=25^{\circ}C$		20.00	mJ	
			$T_{vj}=125^{\circ}C$		46.77	mJ	
			$T_{vj}=150^{\circ}C$		56.15	mJ	
Turn-off energy loss per pulse	E_{off}		$T_{vj}=25^{\circ}C$		36.20	mJ	
			$T_{vj}=125^{\circ}C$		46.48	mJ	
			$T_{vj}=150^{\circ}C$		48.20	mJ	
SC data	I_{SC}		$V_{GE}\leq 15V, V_{CE}=800V$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt,$ $t_p\leq 10\mu s,$	$T_{vj}=150^{\circ}C$		1700	A
Thermal resistance, junction to case	R_{thJC}		per IGBT			0.06	K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		150	$^{\circ}C$

Diode, Inverter Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1200	V
Continuous forward current	I_F		450	A
Repetitive peak forward current	I_{FRM}	$t_p=1ms$	900	A
I^2t -value	I^2t	$t_p=10ms, \sin 180^{\circ}$	$T_{vj}=125^{\circ}C$ 38000	A^2s

Characteristics Values

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F=450A, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	1.99	2.4	V
			$T_{vj}=125^{\circ}C$	1.75		V
			$T_{vj}=150^{\circ}C$	1.70		V

Peak reverse recovery current	I_{rr}	$I_F=450A,$ $V_R=600V,$ $V_{GE}=-15V,$ $-diF/dt=4900A/\mu s$ ($T_{vj}=150^\circ C$)	$T_{vj}=25^\circ C$		336		A
			$T_{vj}=125^\circ C$		461		A
			$T_{vj}=150^\circ C$		499		A
Recovered charge	Q_{rr}		$T_{vj}=25^\circ C$		36.95		μC
			$T_{vj}=125^\circ C$		85.31		μC
			$T_{vj}=150^\circ C$		104.57		μC
Reverse recovery energy	E_{rec}		$T_{vj}=25^\circ C$		15.77		mJ
			$T_{vj}=125^\circ C$		31.55		mJ
			$T_{vj}=150^\circ C$		38.33		mJ
Thermal resistance, junction to case	R_{thJC}	per FRD				0.07	K/W
Temperature under switching conditions	$T_{vj op}$			-40		150	$^\circ C$

NTC-Thermistor Characteristics Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_C=25^\circ C, \pm 5\%$		5.0		k Ω
B-value	$B_{25/50}$	$\pm 2\%$		3375		K

Module Characteristics Values

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Isolation test voltage	V_{ISOL}	RMS, $f=50Hz, t=1min$		2.5		kV
Internal isolation	-		Al ₂ O ₃			-
Storage temperature	T_{stg}		-40		125	$^\circ C$
Mounting torque for module mounting	M		3	-	6	N·m
Terminal connection torque	M		3	-	6	N·m
Weight	G			342		g

Typical Characteristics

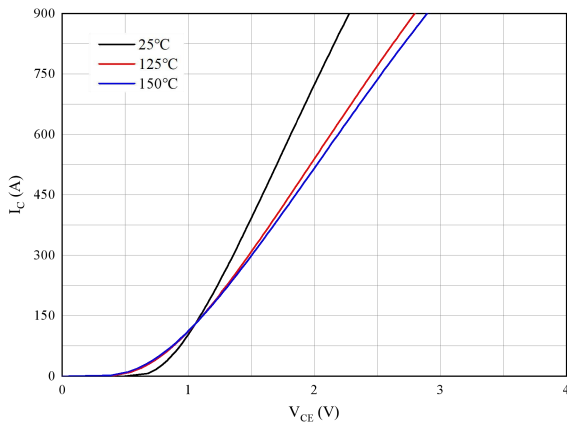


Fig 1. Typical output characteristics ($V_{GE}=15V$)

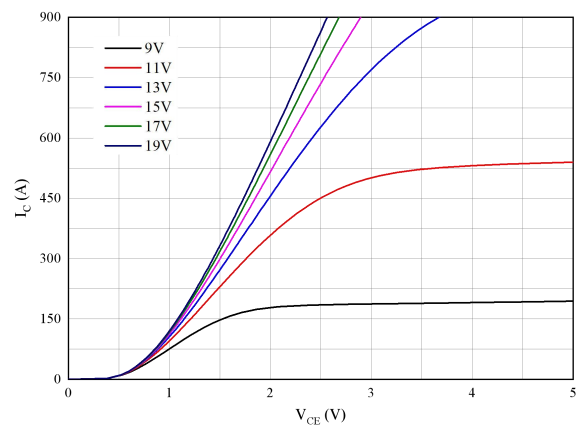


Fig 2. Typical output characteristics ($T_{vj}=150^{\circ}C$)

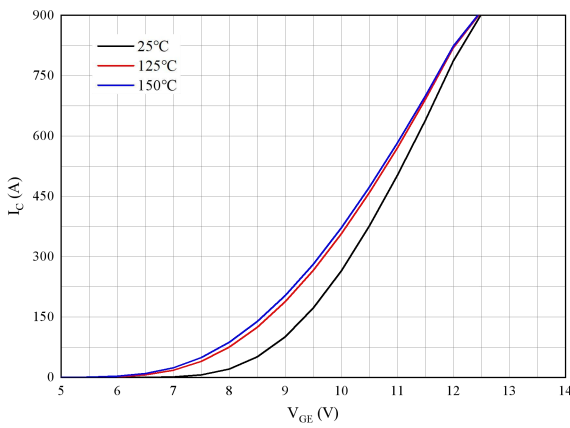


Fig 3. Typical transfer characteristics ($V_{CE}=20V$)

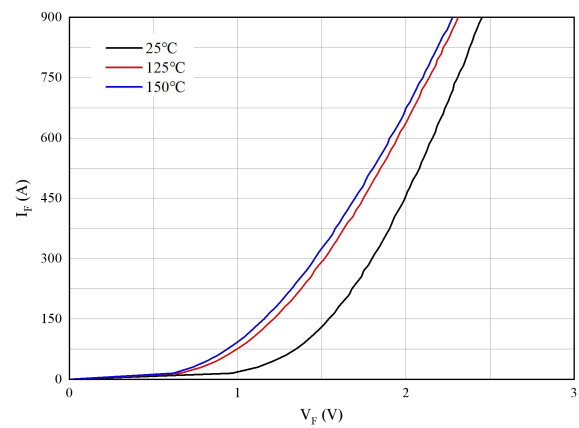


Fig 4. Forward characteristics of Diode

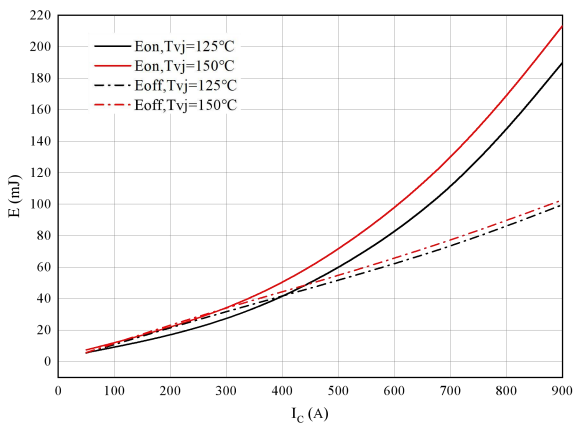


Fig 5. Switching losses of IGBT, Inverter
 $V_{GE}=\pm 15V$, $R_{Gon}=R_{Goff}=1.5\Omega$, $V_{CE}=600V$

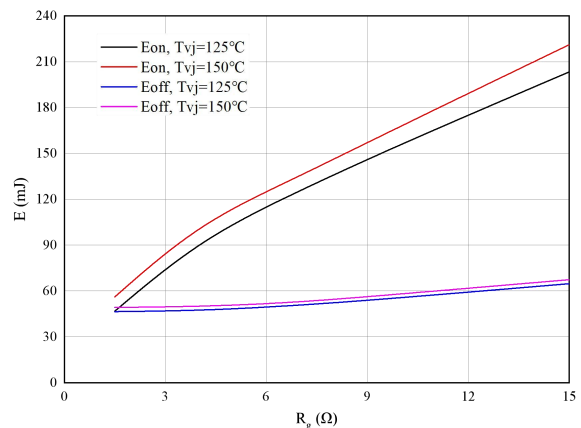


Fig 6. Switching losses of IGBT, Inverter
 $V_{GE}=\pm 15V$, $I_C=450A$, $V_{CE}=600V$

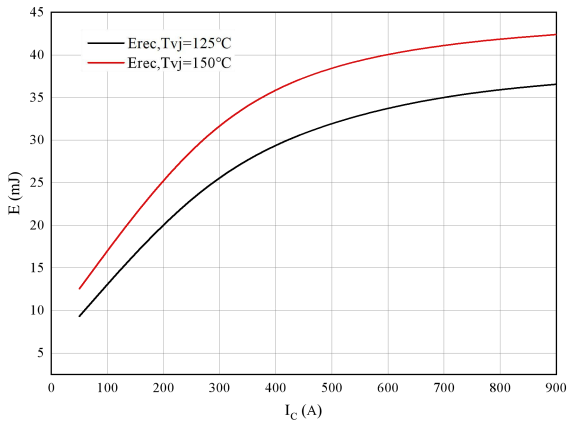


Fig 7. Switching losses of Diode
 $R_{Gon}=R_{Goff}=1.5\Omega$, $V_{CE}=600V$

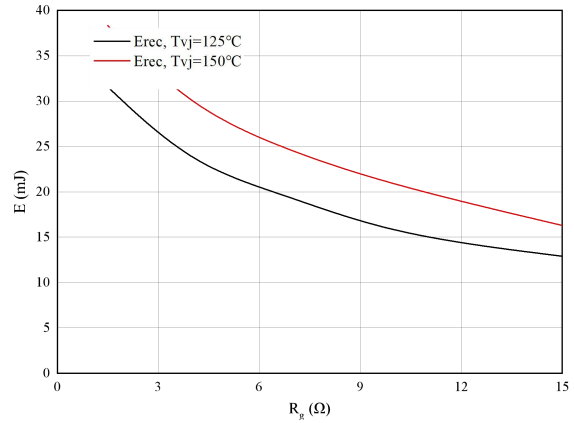


Fig 8. Switching losses of Diode
 $I_F=450A$, $V_{CE}=600V$

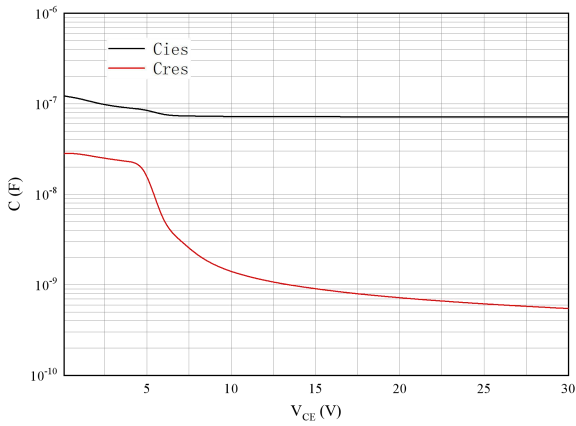


Fig 9. Capacitance characteristics

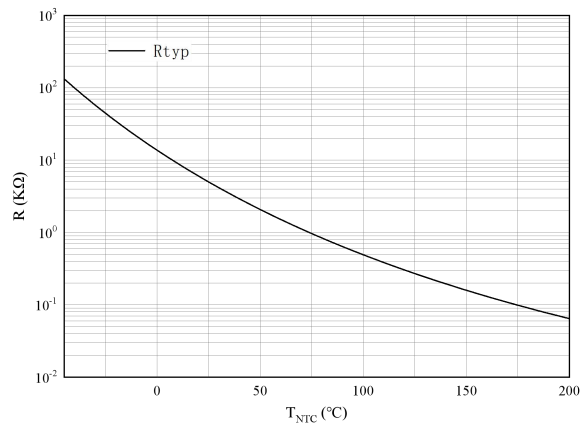


Fig 10. NTC-Themistor-temperature characteristic

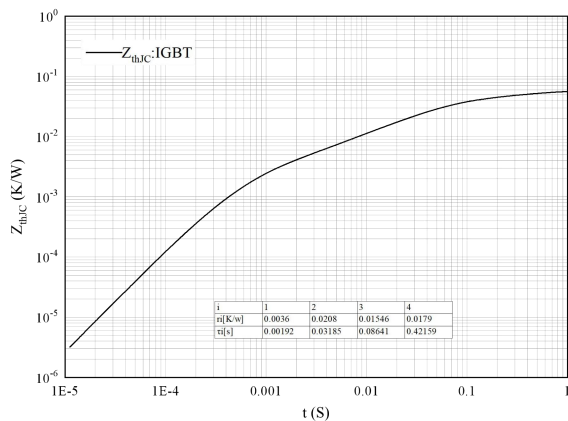


Fig 11. Transient thermal impedance IGBT,
Inverter $Z_{thJC}=f(t)$

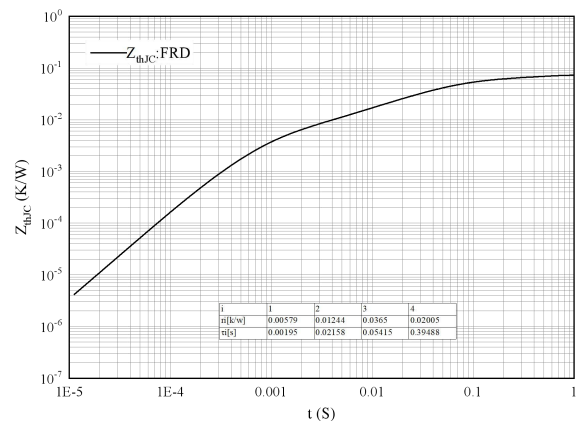
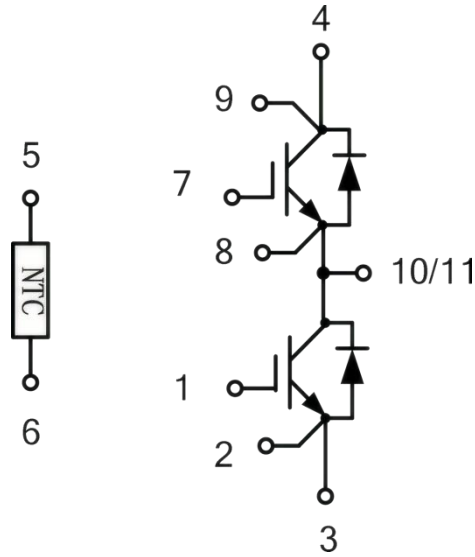
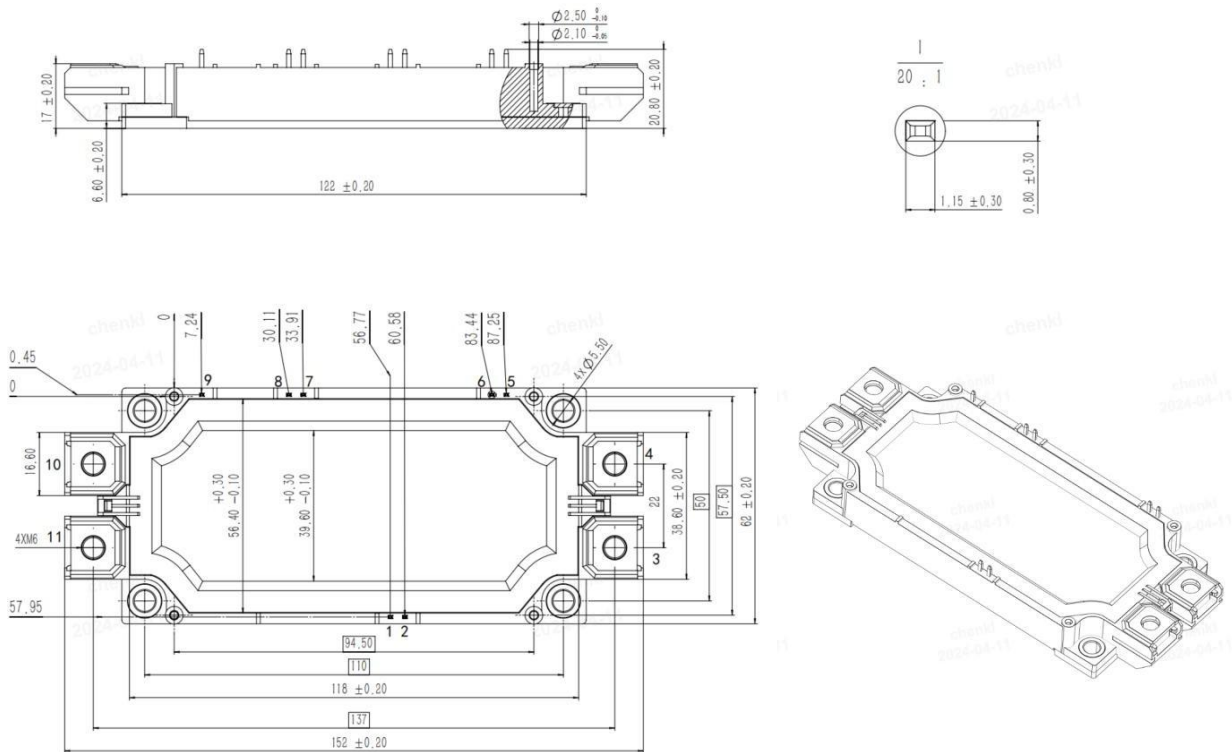


Fig 12. Transient thermal impedance FRD,
Inverter $Z_{thJC}=f(t)$

Circuit Diagram



Package Outlines (Unit:mm)



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