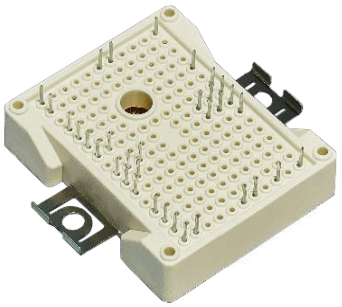
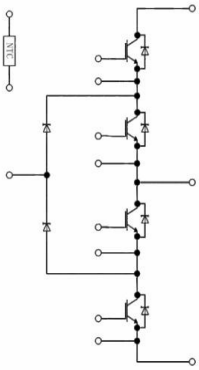
Easy2B 3-Level IGBT Module

V_{CES}= 650V, I_C= 150A, $V_{CE(sat)}$= 1.57V





Features

- 650V Trench Gate/Field Termination Process
- Low Switching Losses
- $V_{CE(Sat)}$ With Positive Temperature Coefficient
- Integrated NTC Temperature Sensor

Applications

- 3-level-Applications.
- Solar Applications
- UPS

IGBT, Inverter

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Collector-emitter voltage	V_{CES}	T_{vj}=25°C, V_{GE}=0V	650	V
Continuous collector current	$I_{C\ nom}$	T_C=100° C, $T_{vj\ max}$=175℃	150	A
Repetitive peak collector current	I_{CRM}	t_P=1ms, T_{vj}=25℃	300	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=150A, V_{GE}=15V	T_{vj}=25℃		1.57	1.95	V
			T_{vj}=125℃		1.82		V
			T_{vj}=150℃		1.86		V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=2.4mA, V_{CE}=V_{GE}	T_{vj}=25℃	4.7	5.3	5.9	V
Gate charge	Q_G	V_{GE}=-15V...+15V			1.54		μC
Integrated gate resistor	$R_{G\ int}$	T_{vj}=25℃			None		Ω
Input capacitance	C_{ies}	f=1MHz, V_{CE}=25V, V_{GE}=0V	T_{vj}=25℃		16.47		nF
Reverse transfer capacitance	C_{res}	f=1MHz, V_{CE}=25V, V_{GE}=0V	T_{vj}=25℃		0.27		nF
Collector-emitter cut-off current	I_{CES}	V_{CE}=650V, V_{GE}=0V	T_{vj}=25℃			1	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	T_{vj}=25℃			400	nA

Turn-on delay time	$t_{d\ on}$	I_C=150A, V_{CE}=300V, V_{GE}=-15V/+15V, R_G=3.3Ω, Inductive Load	T_{vj}=25℃		12		ns
			T_{vj}=125℃		12		ns
			T_{vj}=150℃		14		ns
Rise time	t_r		T_{vj}=25℃		28		ns
			T_{vj}=125℃		29		ns
			T_{vj}=150℃		31		ns
Turn-off delay time	$t_{d\ off}$		T_{vj}=25℃		167		ns
			T_{vj}=125℃		180		ns
			T_{vj}=150℃		182		ns
Fall time	t_f		T_{vj}=25℃		54		ns
			T_{vj}=125℃		59		ns
			T_{vj}=150℃		63		ns
Turn-on energy loss per pulse	E_{on}	I_C=150A, V_{CE}=300V, V_{GE}=-15V/+15V, R_G=3.3Ω, Inductive Load	T_{vj}=25℃		0.66		mJ
			T_{vj}=125℃		0.83		mJ
			T_{vj}=150℃		0.91		mJ
Turn-off energy loss per pulse	E_{off}		T_{vj}=25℃		1.28		mJ
			T_{vj}=125℃		1.66		mJ
			T_{vj}=150℃		1.80		mJ
Thermal resistance, junction to case	R_{thJC}				0.206		K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		150	℃

Diode, Inverter

Maximum Ratings

Parameter	Symbol	Conditions		Value	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃		650	V
Continuous forward current	I_F	T_C=100℃, T_{vj} max=175℃		150	A
Repetitive peak forward current	I_{FRM}	t_P= 1ms		300	A
I^2t-value	I^2t	t_P=10ms, sin180°	T_{vj}=125℃	1200	A^2s

Characteristics Values

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=150A, V_{GE}=0V	T_{vj}=25℃		1.62	2.0	V
			T_{vj}=125℃		1.71		V
			T_{vj}=150℃		1.69		V
Peak reverse recovery current	I_{rr}	I_F=150A, V_R=300V, V_{GE}=-15V, -diF/dt=4281A/μs	T_{vj}=25℃		83		A
			T_{vj}=125℃		102		A
			T_{vj}=150℃		112		A

Recovered charge	Q_{rr}	(T_{vj}=150℃)	T_{vj}=25℃		3.05		μC
			T_{vj}=125℃		5.32		μC
			T_{vj}=150℃		6.17		μC
Reverse recovery energy	E_{rec}		T_{vj}=25℃		0.69		mJ
			T_{vj}=125℃		1.28		mJ
			T_{vj}=150℃		1.49		mJ
Thermal resistance, junction to case	R_{thJC}				0.303		K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		150	℃

Diode, D5-D6
Maximum Ratings

Parameter	Symbol	Conditions		Value	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃		650	V
Continuous forward current	I_F			150	A
Repetitive peak forward current	I_{FRM}	t_P= 1ms		300	A
I^2t-value	I^2t	t_P=10ms, sin180°	T_{vj}=125℃	1200	A^2s

Characteristics Values

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=150A, V_{GE}=0V	T_{vj}=25℃		1.65	2.0	V
			T_{vj}=125℃		1.76		V
			T_{vj}=150℃		1.73		V
Peak reverse recovery current	I_{rr}	I_F=150A, V_R=300V, V_{GE}=-15V, -diF/dt=4281A/μs (T_{vj}=150℃)	T_{vj}=25℃		83		A
			T_{vj}=125℃		102		A
			T_{vj}=150℃		112		A
Recovered charge	Q_{rr}		T_{vj}=25℃		3.05		μC
			T_{vj}=125℃		5.32		μC
			T_{vj}=150℃		6.17		μC
Reverse recovery energy	E_{rec}		T_{vj}=25℃		0.69		mJ
			T_{vj}=125℃		1.28		mJ
			T_{vj}=150℃		1.49		mJ
Thermal resistance, junction to case	R_{thJC}				0.303		K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		150	℃

NTC-Thermistor
Characteristics Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	T_C=25℃		5.0		kΩ
B-value	$B_{25/50}$	±1%		3380		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_2O_3		-
Storage temperature	T_{stg}		-40		125	℃
Mounting torque for module mounting	M		3	-	6	N·m
Weight	G			41		g

Typical Characteristics

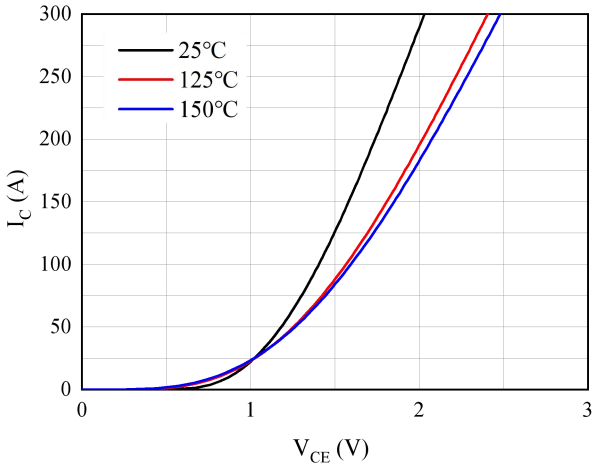


Fig 1. Typical output characteristics (V_{GE}=15V)

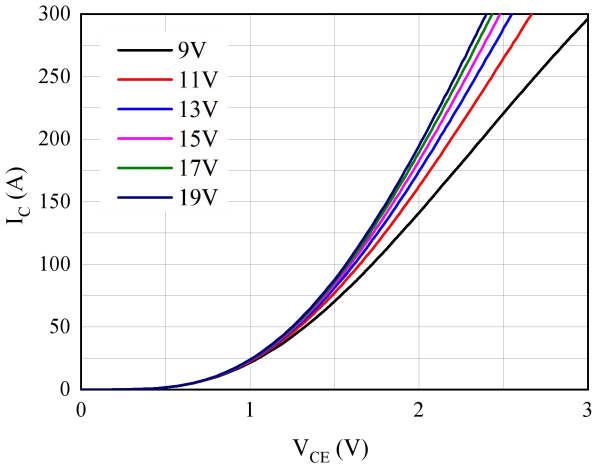


Fig 2. Typical output characteristics (T_{vj}=150℃)

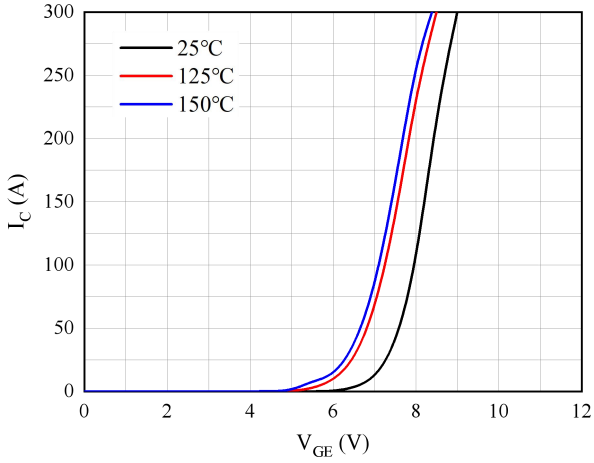


Fig 3. Typical transfer characteristics (V_{CE}=20V)

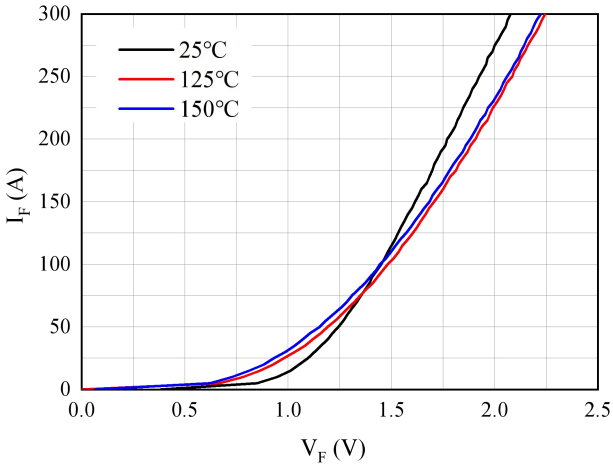


Fig 4. Forward characteristics of Diode

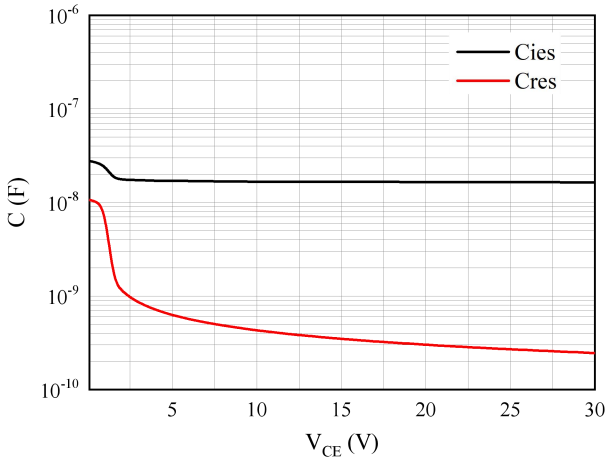


Fig5. Capacitance characteristic

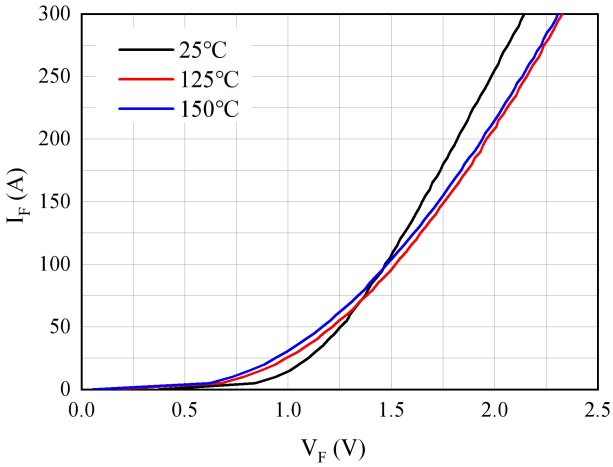


Fig6. Forward characteristic of Diode,D5-D6

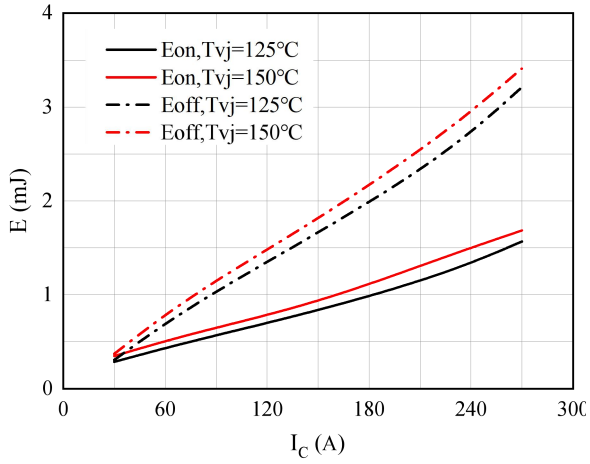


Fig 7. Switching losses of IGBT, Inverter
V_{GE}=±15V, R_{Gon}=R_{Goff}=3.3Ω, V_{CE}=300V

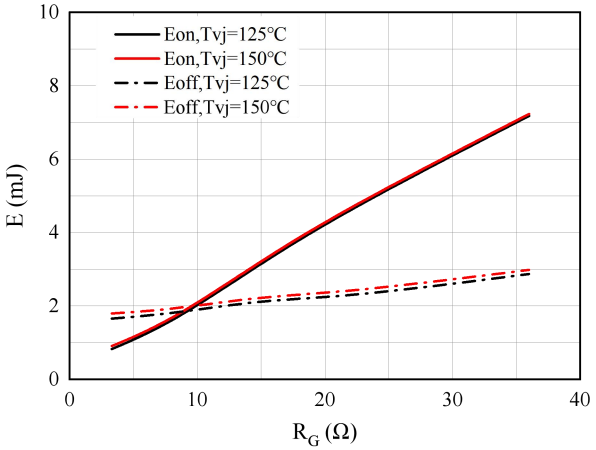


Fig 8. Switching losses of IGBT, Inverter
V_{GE}=±15V, I_C=150A, V_{CE}=300V

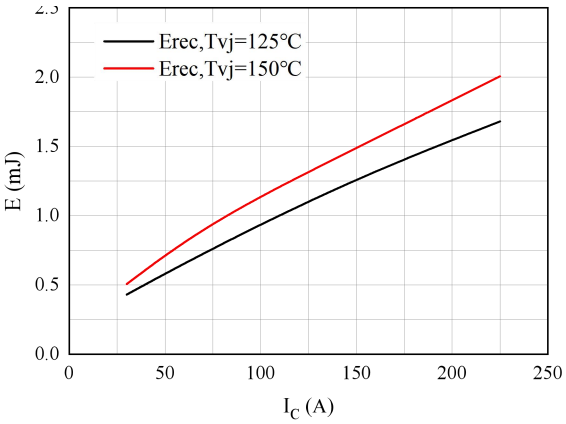


Fig 9. Switching losses of Diode
R_{Gon}=R_{Goff}=3.3Ω, V_{CE}=300V

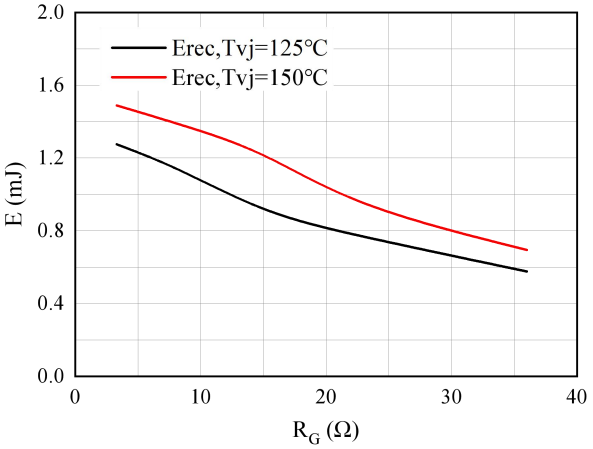


Fig 10. Switching losses of Diode
I_F=150A, V_{CE}=300V

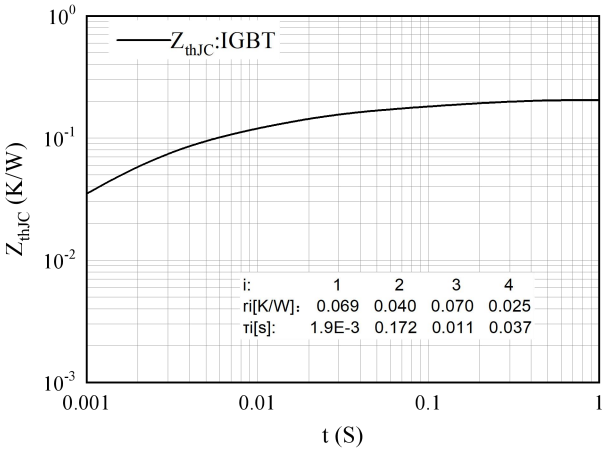


Fig 11. Transient thermal impedance IGBT,
Z_{thJC}=f(t)

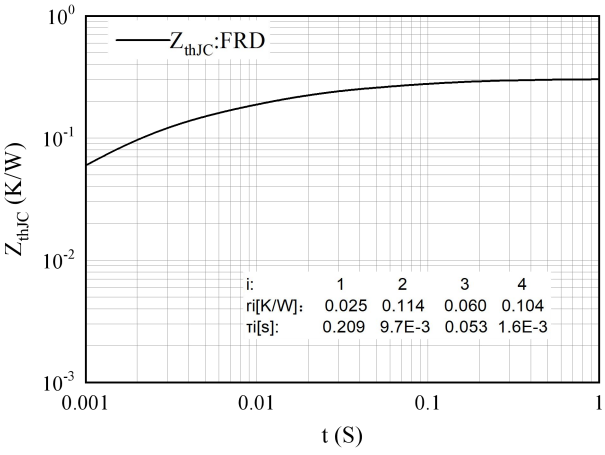


Fig 12. Transient thermal impedance FRD,
Z_{thJC}=f(t)

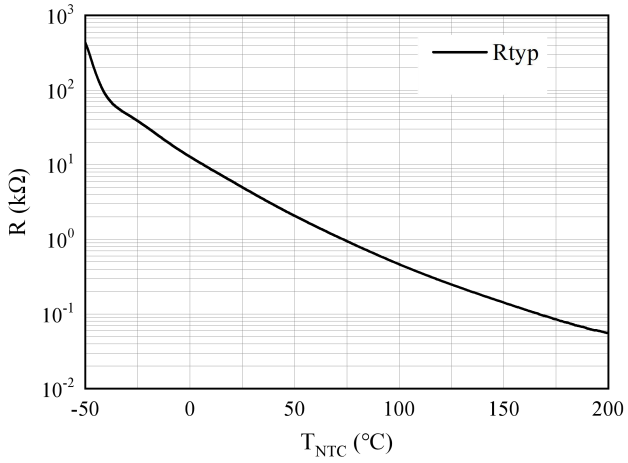
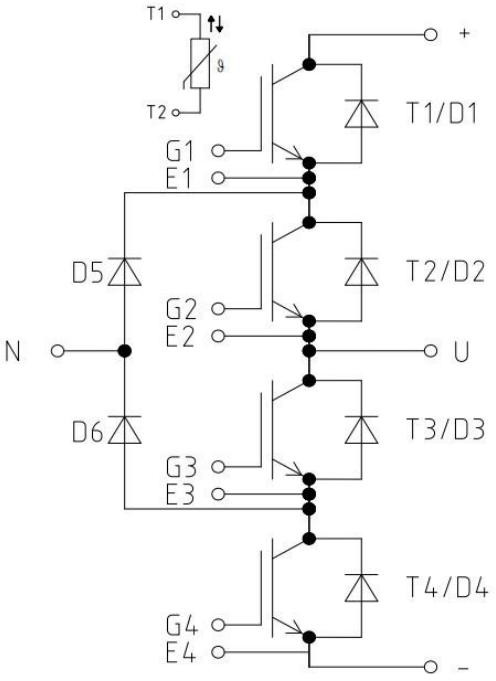
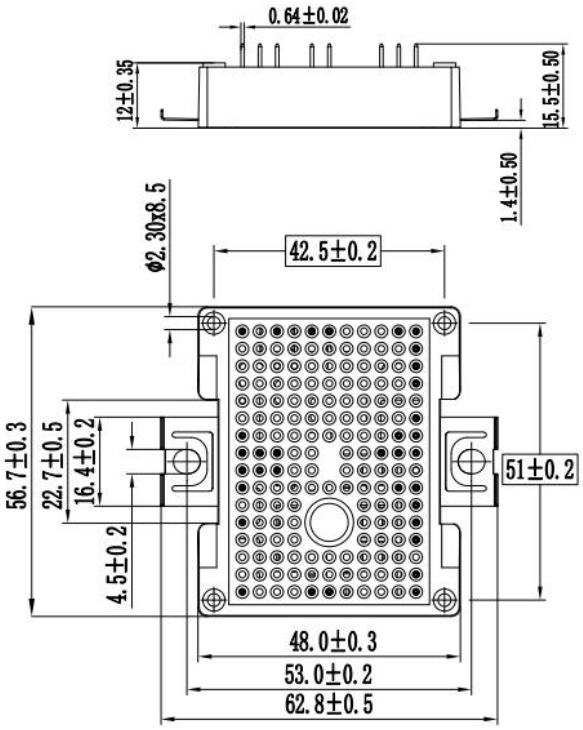


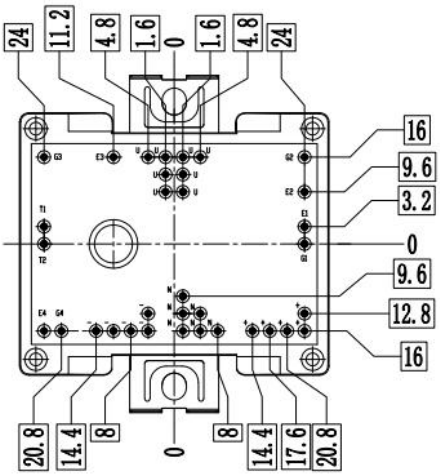
Fig 13. NTC-Themistor-temperature characteristic

Circuit Diagram



Package Outlines (Unit:mm)





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