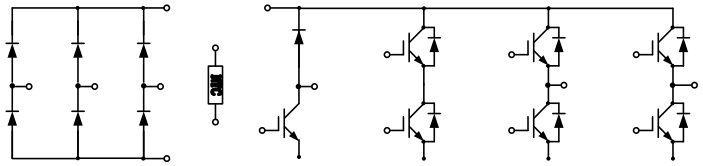
Easy1B PIM IGBT Module

V_{CES}=1200V,I_C=15A,$V_{CE(sat)}$=1.95V



Features

- 1200V Trench Gate / Field Stop technology
- Low switching loss
- Positive temperature coefficient



Applications

- Inverter
- Servo Drives
- Frequency converter

IGBT, Inverter

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Collector-emitter voltage	V_{CES}	T_{vj}=25℃	1200	V
Continuous DC collector current	$I_{C\ nom}$	T_C=100℃, $T_{vj\ max}$=175℃	15	A
Repetitive peak collector current	I_{CRM}	t_P=1ms	30	A
Total power dissipation	P_{tot}	T_C=25℃, $T_{vj\ max}$=175℃	130	W
Gate-emitter peak voltage	V_{GES}		±20	V

Characteristics Values

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C=15A, V_{GE}=15V	T_{vj}=25℃		1.95	2.4	V
			T_{vj}=125℃		2.46		
			T_{vj}=150℃		2.54		
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=0.48mA, V_{CE}=V_{GE}	T_{vj}=25℃	5.1	5.7	6.3	V
Gate charge	Q_G	V_{GE}=-15V...+15V			0.1		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℃		0.88		nF
Reverse transfer capacitance	C_{res}	f=1MHz, V_{CE}=25V, V_{GE}=0V	T_{vj}=25℃		0.04		
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V, V_{GE}=0V	T_{vj}=25℃			1	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	T_{vj}=25℃			100	nA

Turn-on delay time	$t_{d\ on}$	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		46		ns
			T_{vj}=125℃		42		
			T_{vj}=150℃		44		
Rise time	t_r	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		38		
			T_{vj}=125℃		41		
			T_{vj}=150℃		39		
Turn-off delay time	$t_{d\ off}$	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		215		
			T_{vj}=125℃		249		
			T_{vj}=150℃		259		
Fall time	t_f	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		196		
			T_{vj}=125℃		221		
			T_{vj}=150℃		203		
Turn-on energy loss per pulse	E_{on}	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		1.57		mJ
			T_{vj}=125℃		2.12		
			Tvj=150℃		2.25		
Turn-off energy loss per pulse	E_{off}	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		0.89		
			T_{vj}=125℃		1.07		
			T_{vj}=150℃		1.16		
SC data	I_{SC}	V_{GE}≤15V, V_{CC}=800V V_{CEmax}=V_{CES}-L_{sCE}*di/dt, t_P≤8μs,	T_{vj}=25℃		71		A
Thermal resistance, junction to case	R_{thJC}	IGBT / per IGBT			1.05	1.15	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℃		1200	V
Continuous forward current	I_{FN}			15	A
Repetitive peak forward current	I_{FRM}	t_P= 1ms		30	A
I^2t-value	I^2t	t_P=10ms, sin180°	T_{vj}=125℃	136	A^2s

Characteristics Values

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=15A, V_{GE}=0V	T_{vj}=25℃		1.60	2.10	V
			T_{vj}=125℃		1.75		V
			T_{vj}=150℃		1.78		V
Peak reverse recovery current	I_{RM}	I_F=15A, -diF/dt=251A/μs(T_{vj}=150℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃		13		A
			T_{vj}=125℃		15		A
			T_{vj}=150℃		17		A
Recovered charge	Q_r	I_F=15A, -diF/dt=251A/μs(T_{vj}=150℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃		1.87		μC
			T_{vj}=125℃		3.33		μC
			T_{vj}=150℃		3.82		μC
Reverse recovery energy	E_{rec}	I_F=15A, -diF/dt=251A/μs(T_{vj}=150℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃		0.70		mJ
			T_{vj}=125℃		1.28		mJ
			T_{vj}=150℃		1.45		mJ
Thermal resistance, junction to case	R_{thJC}	Diode / per diode			1.75	1.9	K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		150	℃

Diode, Rectifier

Maximum Ratings

Parameter	Symbol	Conditions		Value	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃		1600	V
Non-Repetitive peak reverse voltage	V_{RSM}	T_{vj}=25℃		1800	V
Maximum average forward current	$I_{F(AV)}$			16	A
Surge forward current	I_{FSM}	t_P=10ms, sin180°	T_{vj}=25℃	190	A
I^2t-value	I^2t	t_P=10ms, sin180°	T_{vj}=25℃	381	A^2s

Characteristics Values

Parameter	Symbol	Conditions		Value			Units
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=16A	T_{vj}=25℃		0.95		V
Reverse current	I_R	V_R=V_{RRM}	T_{vj}=25℃			5	uA
Temperature under switching conditions	$T_{vj\ op}$			-40		150	℃

IGBT, Brake-Chopper

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Collector-emitter voltage	V_{CES}	T_{vj}=25℃,	1200	V
Continuous DC collector current	$I_{C\ nom}$	T_C=100℃, $T_{vj\ max}$=175℃	15	A
Repetitive peak collector current	I_{CRM}	t_P=1ms	30	A
Total power dissipation	P_{tot}	T_C=25℃, $T_{vj\ max}$=175℃	130	W
Gate-emitter peak voltage	V_{GE}	T_C=25℃, $T_{vj\ max}$=175℃	±20	V

Characteristics Values

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C=15A, V_{GE}=15V	T_{vj}=25℃		2.08	2.5	V
			T_{vj}=125℃		2.37		
			T_{vj}=150℃		2.45		
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=0.48mA, V_{CE}=V_{GE}	T_{vj}=25℃	5.1	5.7	6.3	V
Gate charge	Q_G	V_{GE}=-15V...+15V			0.11		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℃		0.86		nF
Reverse transfer capacitance	C_{res}	f=1MHz, V_{CE}=25V, V_{GE}=0V	T_{vj}=25℃		0.02		
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V, V_{GE}=0V	T_{vj}=25℃			1	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	T_{vj}=25℃			100	nA
Turn-on delay time	$t_{d\ on}$	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		51		ns
			T_{vj}=125℃		47		
			T_{vj}=150℃		40		
Rise time	t_r	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		44		
			T_{vj}=125℃		48		
			T_{vj}=150℃		56		
Turn-off delay time	$t_{d\ off}$	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		216		
			T_{vj}=125℃		254		
			T_{vj}=150℃		262		
Fall time	t_f	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		194		
			T_{vj}=125℃		213		
			T_{vj}=150℃		219		
Turn-on energy loss per pulse	E_{on}	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		0.92		mJ
			T_{vj}=125℃		1.21		
			Tvj=150℃		1.31		
Turn-off energy loss per pulse	E_{off}	I_C=15A, V_{CE}=600V, V_{GE}=±15V,R_G=40Ω, Inductive Load	T_{vj}=25℃		0.88		
			T_{vj}=125℃		1.11		
			T_{vj}=150℃		1.15		
Thermal resistance, junction to case	R_{thJC}	IGBT / per IGBT			1.05	1.15	K/W

Temperature under switching conditions	$T_{vj\ op}$			-40		150	℃

Diode, Brake-Chopper

Maximum Ratings

Parameter	Symbol	Conditions		Value	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃		1200	V
Continuous forward current	I_{FN}			8	A
Repetitive peak forward current	I_{FRM}	t_P= 1ms		16	A
I^2t-value	I^2t	t_P=10ms, sin180°	T_{vj}=125℃	25	A^2s

Characteristics Values

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=8A, V_{GE}=0V	T_{vj}=25℃		1.88	2.4	V
			T_{vj}=125℃		1.96		
			T_{vj}=150℃		1.90		
Peak reverse recovery current	I_{RM}	I_F=8A, -diF/dt=203A/μs(T_{vj}=150℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃		6		A
			T_{vj}=125℃		7		
			T_{vj}=150℃		8		
Recovered charge	Q_r	I_F=8A, -diF/dt=203A/μs(T_{vj}=150℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃		0.68		μC
			T_{vj}=125℃		1.22		
			T_{vj}=150℃		1.32		
Reverse recovery energy	E_{rec}		T_{vj}=25℃		0.27		mJ
			T_{vj}=125℃		0.49		
			T_{vj}=150℃		0.53		
Thermal resistance, junction to case	R_{thJC}	Diode / per diode			1.75	1.9	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%		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			23		g

Typical Characteristics

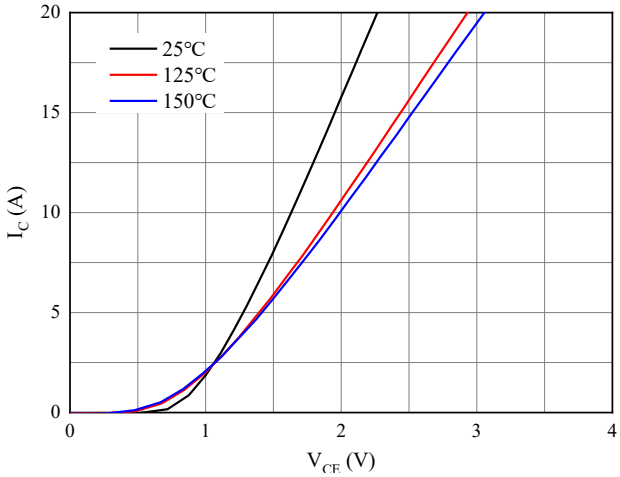


Figure 1. Typical output characteristics (V_{GE}=15V)

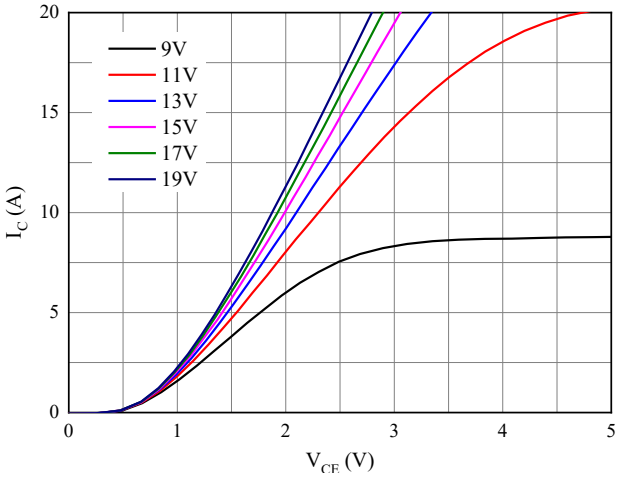


Figure 2. Typical output characteristics (T_{vj}=150℃)

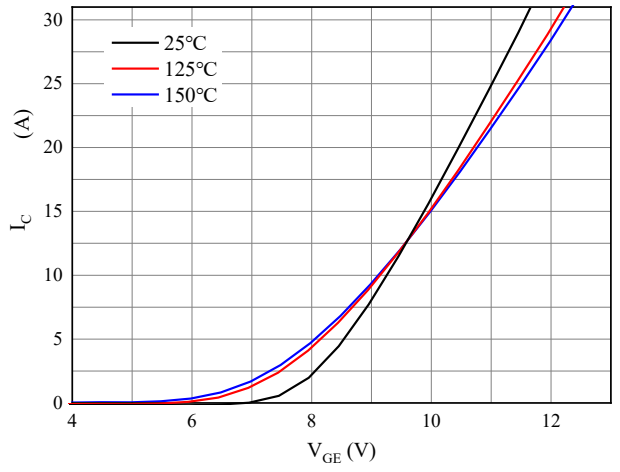


Figure 3. Typical transfer characteristic(V_{CE}=20V)

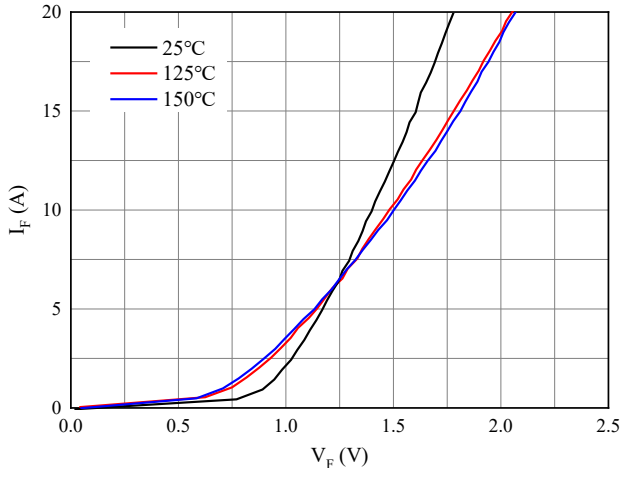


Figure 4. Forward characteristic of Diode

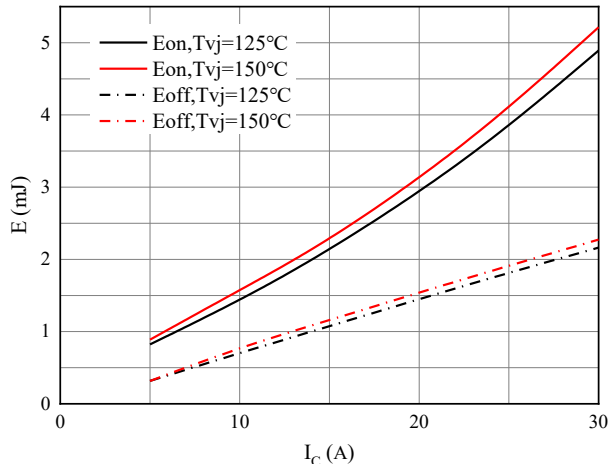


Figure 5. Switching losses of IGBT

VGE=±15V, RGon=40Ω, RGoff=40Ω, VCE=600V

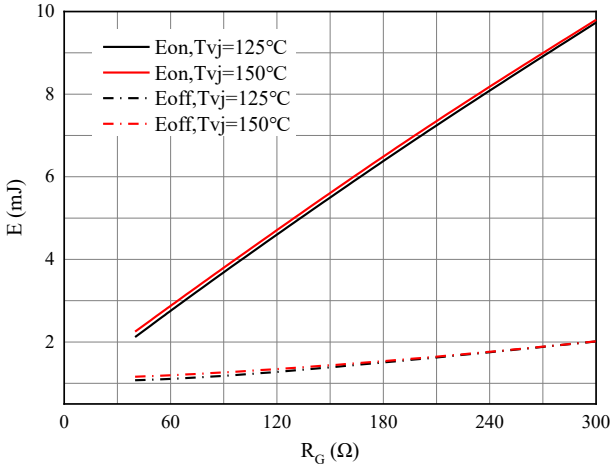


Figure 6. Switching losses of IGBT

VGE=±15V, IC=15A, VCE=600V

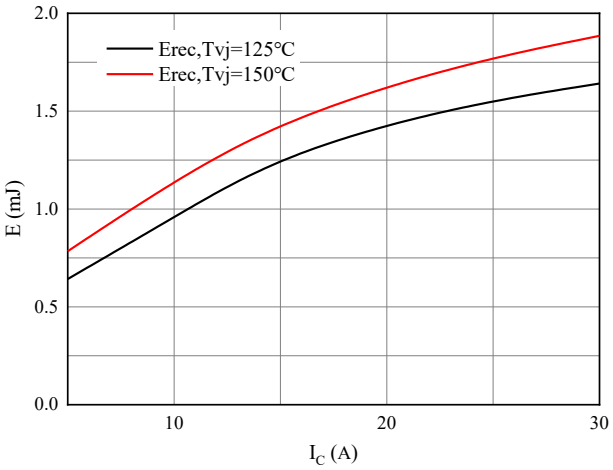


Figure 7. Switching losses of Diode

RGon=40Ω, VCE=600V

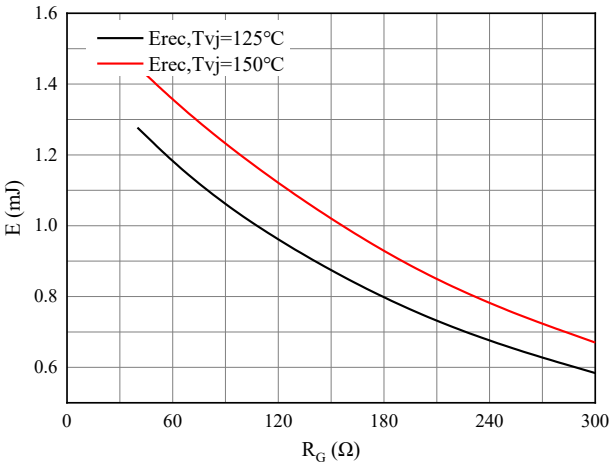


Figure 8. Switching losses of Diode

IF=15A, VCE=600V

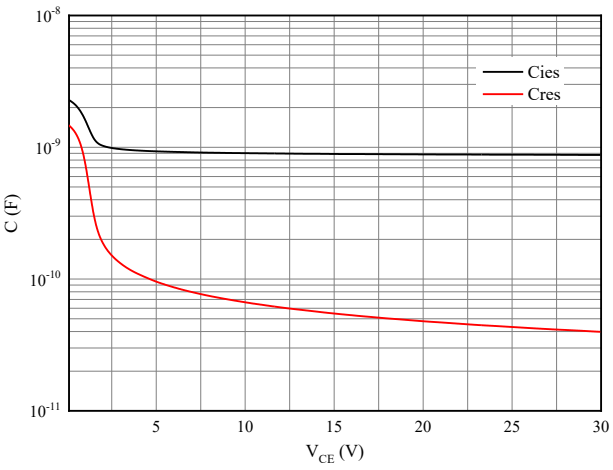


Figure 9. Capacitance characteristic

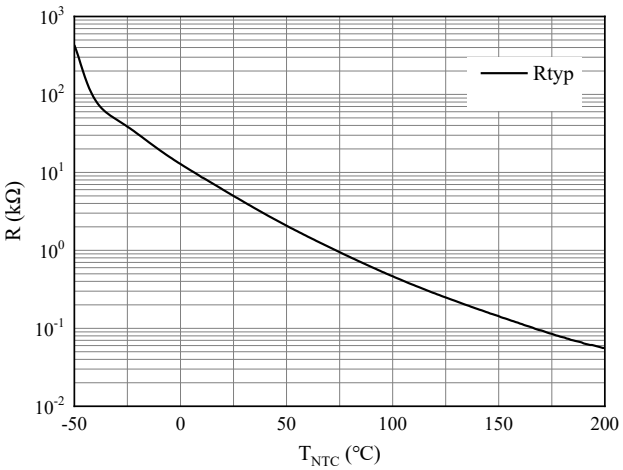
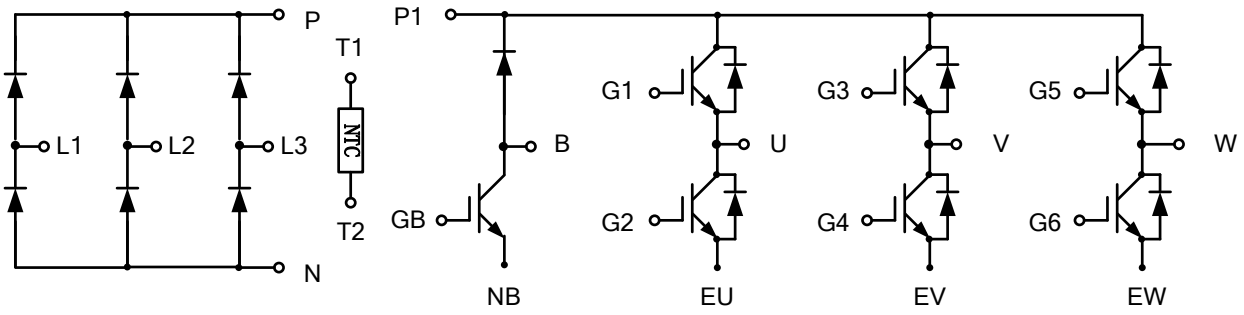
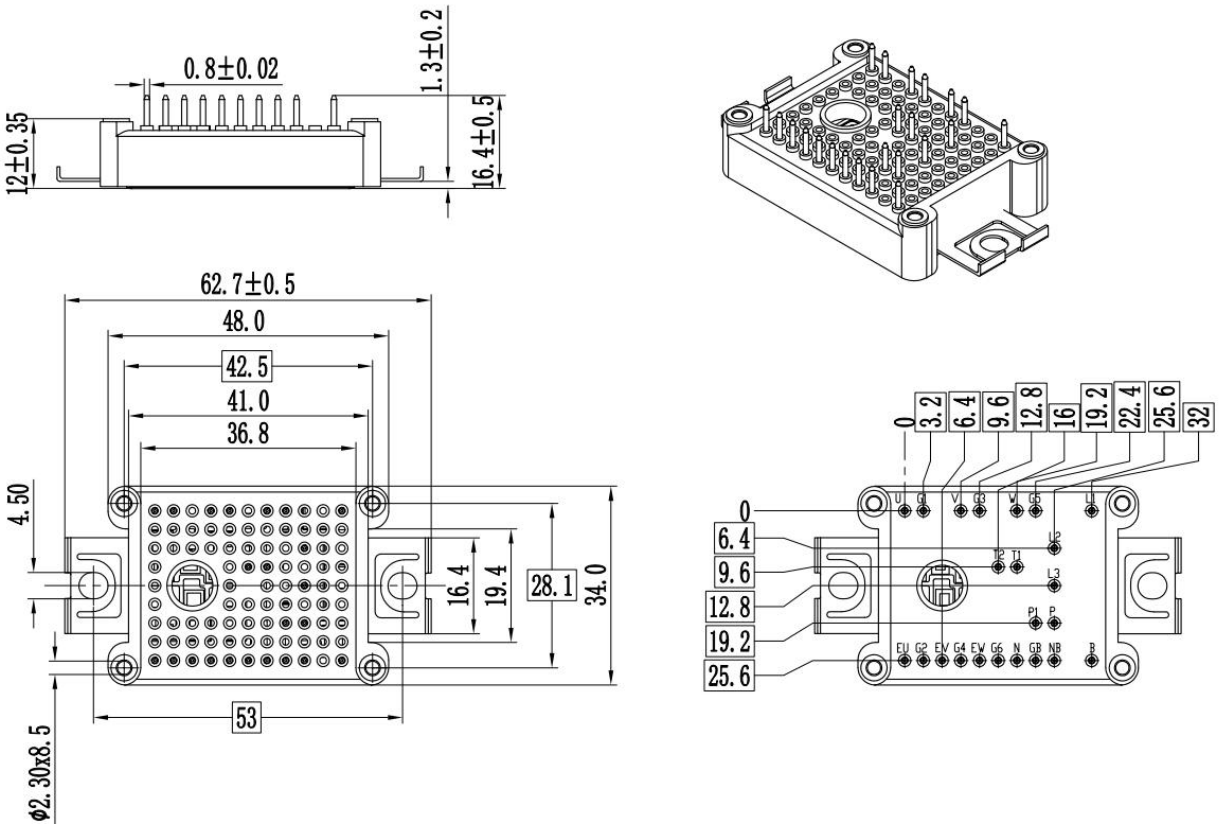


Figure 10. NTC-Themistor-temperature characteristic

Circuit Diagram



Package Outline (Unit:mm)



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