

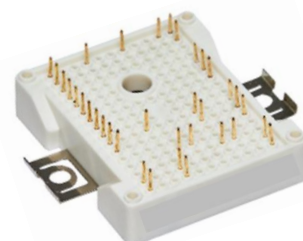
PIM IGBT Module

DESCRIPTION :

- 1200V Trench / Field Stop Technology
- Low Switching Power Loss
- Positive Temperature Coefficient

TYPICAL APPLICATIONS :

- Frequency converts
- Servo
- Inverter



$V_{CES}=1200V$, $I_{C\ nom}=25A$ / $I_{CRM}=50A$

IGBT, Inverter

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Collector- Emitter Voltage	$T_{vj}=25^{\circ}C$	V_{CES}	1200	V
Continuous DC collector current	$T_c=100^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	$I_{C\ nom}$	25	A
Repetitive peak collector current	$t_p=1ms$	I_{CRM}	50	A
Total power dissipation	$T_c=25^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	P_{tot}	175	W
Gate emitter voltage		V_{GE}	± 20	V

ELECTRICAL CHARATERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-Emitter saturation voltage $V_{GE}=15V$, $I_C=25A$ $T_{vj}=25^{\circ}C$ $V_{GE}=15V$, $I_C=25A$ $T_{vj}=125^{\circ}C$ $V_{GE}=15V$, $I_C=25A$ $T_{vj}=150^{\circ}C$	$V_{CE(SAT)}$		1.65 1.95 2.00	2.00	V
Gate-Emitter threshold voltage $I_C=0.8mA$, $V_{GE}=V_{CE}$ $T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.2	5.85	6.4	V
Internal gate resistor ($T_{vj} = 25^{\circ}C$)	R_{Gint}		None		Ω
Input capacitance $f=1\ MHz$, $V_{CE}=25V$, $V_{GE}=0V$ $T_{vj}=25^{\circ}C$	C_{ies}		1.67		nF

Reverse transfer capacitance $f=1\text{ MHz}$, $V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	C_{res}		0.08		nF
Collector-emitter cut-off current $V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	I_{CES}			1	mA
Gate-emitter leakage current $V_{CE}=0\text{V}$, $V_{GE}=20\text{V}$ $T_{vj}=25^\circ\text{C}$	I_{GES}			100	nA
Turn-on delay time $I_C=25\text{A}$, $V_{CE}=600\text{ V}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=\pm 15\text{ V}$, $R_G=40\Omega$ $T_{vj}=125^\circ\text{C}$ (inductive load) $T_{vj}=150^\circ\text{C}$	$t_{d(ON)}$		63 58 54		ns
Rise time $I_C=25\text{A}$, $V_{CE}=600\text{ V}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=\pm 15\text{ V}$, $R_G=40\Omega$ $T_{vj}=125^\circ\text{C}$ (inductive load) $T_{vj}=150^\circ\text{C}$	t_r		48 55 56		ns
Turn-off delay time $I_C=25\text{A}$, $V_{CE}=600\text{ V}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=\pm 15\text{ V}$, $R_G=40\Omega$ $T_{vj}=125^\circ\text{C}$ (inductive load) $T_{vj}=150^\circ\text{C}$	$t_{d(OFF)}$		314 351 362		ns
Fall time $I_C=25\text{A}$, $V_{CE}=600\text{ V}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=\pm 15\text{ V}$, $R_G=40\Omega$ $T_{vj}=125^\circ\text{C}$ (inductive load) $T_{vj}=150^\circ\text{C}$	t_f		191 301 313		ns
Turn-on energy loss per pulse $I_C=25\text{A}$, $V_{CE}=600\text{ V}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=\pm 15\text{ V}$, $R_G=40\Omega$ $T_{vj}=125^\circ\text{C}$ (inductive load) $T_{vj}=150^\circ\text{C}$	$E_{(ON)}$		2.88 4.44 4.74		mJ
Turn-off energy loss per pulse $I_C=25\text{A}$, $V_{CE}=600\text{ V}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=\pm 15\text{ V}$, $R_G=40\Omega$ $T_{vj}=125^\circ\text{C}$ (inductive load) $T_{vj}=150^\circ\text{C}$	$E_{(OFF)}$		1.66 2.14 2.31		mJ
Short circuit (SC) data $V_{GE} \leq 15\text{ V}$, $V_{CE}=800\text{ V}$ $V_{CEmax}=V_{CES}-L_{sCE} \cdot di/dt$ $t_p \leq 8\mu\text{s}$, $T_{vj}=150^\circ\text{C}$	I_{SC}		117		A
Thermal resistance, junction to case (per IGBT)	R_{thJC}			0.85	K/W
Temperature under switching conditions	$T_{vj op}$	-40		150	$^\circ\text{C}$

Diode, Inverter

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25°C	V _{RRM}	1200	V
Continuous DC forward current		I _F	25	A
Repetitive peak forward current	t _P =1ms	I _{FRM}	50	A
I ² t -value	t _P =10ms, sin180°, Tvj=125°C	I ² t	500	A ² s

ELECTRICAL CHARATERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=25A, VGE=0 V Tvj=25°C IF=25A, VGE=0 V Tvj=125°C IF=25A, VGE=0 V Tvj=150°C	V _F		1.77 1.48 1.41	2.30	V
Peak reverse recovery current IF=25 A, Tvj=25°C -diF/dt =333A/μs(Tvj=150°C) Tvj=125°C VR=600 V ,VGE= -15 V Tvj=150°C	I _{RM}		15 24 26		A
Recovered charge IF=25 A, Tvj=25°C -diF/dt =333A/μs(Tvj=150°C) Tvj=125°C VR=600 V ,VGE= -15 V Tvj=150°C	Q _r		1.97 5.28 6.32		uC
Reverse recovered energy IF=25 A, Tvj=25°C -diF/dt =333A/μs(Tvj=150°C) Tvj=125°C VR=600 V ,VGE= -15 V Tvj=150°C	E _{rec}		0.64 1.75 2.12		mJ
Temperature under switching conditions	Tvj op	-40		150	°C

Diode, Rectifier

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25°C	V _{RRM}	1600	V
Non-Repetitive peak reverse voltage	Tvj=25°C	V _{RRM}	1800	V

Maximum Average Forward Current		$I_{F(AV)}$	25	A
Surge forward current	$t_p=10\text{ms}$, $\sin 180^\circ$, $T_{vj}=125^\circ\text{C}$	I_{FSM}	320	A
I^2t -value	$t_p=10\text{ms}$, $\sin 180^\circ$, $T_{vj}=125^\circ\text{C}$	I^2t	850	A^2s

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage $I_F=25\text{A}$, $T_{vj}=25^\circ\text{C}$	V_F			1.1	V
Recovery current $V_R = V_{RRM}$, $T_{vj}=25^\circ\text{C}$	I_R			5.0	μA

IGBT, Brake-Chopper

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Collector- Emitter Voltage	$T_{vj}=25^\circ\text{C}$	V_{CES}	1200	V
Continuous DC collector current	$T_c=100^\circ\text{C}$, $T_{vj} \text{ max}=175^\circ\text{C}$	$I_{C \text{ nom}}$	25	A
Repetitive peak collector current	$t_p=1\text{ms}$	I_{CRM}	50	A
Total power dissipation	$T_c=25^\circ\text{C}$, $T_{vj} \text{ max}=175^\circ\text{C}$	P_{tot}	125	W
Gate emitter voltage		V_{GE}	± 20	V

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-Emitter saturation voltage $V_{GE}=15\text{V}$, $I_C=25\text{A}$ $T_{vj}=25^\circ\text{C}$ $V_{GE}=15\text{V}$, $I_C=25\text{A}$ $T_{vj}=125^\circ\text{C}$ $V_{GE}=15\text{V}$, $I_C=25\text{A}$ $T_{vj}=150^\circ\text{C}$	$V_{CE(SAT)}$		1.80 2.08 2.15	2.20	V
Gate-Emitter threshold voltage $I_C=1\text{mA}$, $V_{GE} = V_{CE}$ $T_{vj}=25^\circ\text{C}$	$V_{GE(th)}$	5.2	5.85	6.4	V
Internal gate resistor ($T_{vj} = 25^\circ\text{C}$)	R_{Gint}		None		Ω
Input capacitance $f=1\text{MHz}$, $V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	C_{ies}		1.66		nF

Reverse transfer capacitance f=1 MHz, VCE=25V, VGE=0V Tvj=25°C	C _{res}		0.08		nF
Collector-emitter cut-off current VCE=1200V, VGE=0V Tvj=25°C	I _{CES}			1	mA
Gate-emitter leakage current VCE=0V, VGE=20V Tvj=25°C	I _{GES}			100	nA
Turn-on delay time IC=25A, VCE=600 V Tvj=25°C VGE=±15 V, RG=40Ω Tvj=125°C (inductive load) Tvj=150°C	td (ON)		65 60 56		ns
Rise time IC=25A, VCE=600 V Tvj=25°C VGE=±15 V, RG=40Ω Tvj=125°C (inductive load) Tvj=150°C	tr		87 90 92		ns
Turn-off delay time IC=25A, VCE=600 V Tvj=25°C VGE=±15 V, RG=40Ω Tvj=125°C (inductive load) Tvj=150°C	td (OFF)		301 350 355		ns
Fall time IC=25A, VCE=600 V Tvj=25°C VGE=±15 V, RG=40Ω Tvj=125°C (inductive load) Tvj=150°C	tf		231 302 290		ns
Turn-on energy loss per pulse IC=25A, VCE=600 V Tvj=25°C VGE=±15 V, RG=40Ω Tvj=125°C (inductive load) Tvj=150°C	E _(ON)		2.34 2.73 2.90		mJ
Turn-off energy loss per pulse IC=25A, VCE=600 V Tvj=25°C VGE=±15 V, RG=40Ω Tvj=125°C (inductive load) Tvj=150°C	E _(OFF)		1.66 2.16 2.30		mJ
Thermal resistance, junction to case (per IGBT)	R _{thJC}			1.2	K/W
Temperature under switching conditions	Tvj op	-40		150	°C

Diode, Brake-Chopper

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25°C	V _{RRM}	1200	V

Continuous DC forward current		I_F	8	A
Repetitive peak forward current	$t_P=1\text{ms}$	I_{FRM}	16	A
I^2t -value	$V_R=0\text{V}$, $t_P=10\text{ms}$, $T_{vj}=125^\circ\text{C}$	I^2t	30	A^2s

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage $I_F=8\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$ $I_F=8\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=125^\circ\text{C}$ $I_F=8\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=150^\circ\text{C}$	V_F		2.03 1.70 1.63	2.50	V
Peak reverse recovery current $I_F=8\text{A}$, $T_{vj}=25^\circ\text{C}$ $-di_F/dt = 217\text{A}/\mu\text{s}$ ($T_{vj}=150^\circ\text{C}$) $T_{vj}=125^\circ\text{C}$ $V_R=600\text{V}$, $V_{GE} = -15\text{V}$ $T_{vj}=150^\circ\text{C}$	I_{RM}		8 10 11		A
Recovered charge $I_F=8\text{A}$, $T_{vj}=25^\circ\text{C}$ $-di_F/dt = 217\text{A}/\mu\text{s}$ ($T_{vj}=150^\circ\text{C}$) $T_{vj}=125^\circ\text{C}$ $V_R=600\text{V}$, $V_{GE} = -15\text{V}$ $T_{vj}=150^\circ\text{C}$	Q_r		0.74 1.33 1.61		μC
Reverse recovered energy $I_F=8\text{A}$, $T_{vj}=25^\circ\text{C}$ $-di_F/dt = 217\text{A}/\mu\text{s}$ ($T_{vj}=150^\circ\text{C}$) $T_{vj}=125^\circ\text{C}$ $V_R=600\text{V}$, $V_{GE} = -15\text{V}$ $T_{vj}=150^\circ\text{C}$	E_{rec}		0.27 0.45 0.56		mJ
Temperature under switching conditions	$T_{vj\text{ op}}$	-40		150	$^\circ\text{C}$

Negative temperature coefficient Thermistor (NTC-Thermistor)
ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Rated resistances $T_c=25^\circ\text{C}$, $\pm 5\%$	R_{25}		5		$\text{k}\Omega$
B-value $\pm 1\%$	$B_{25/50}$		3380		K

Module

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Isolation test voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	V_{ISOL}		2500		V

Internal isolation		AL ₂ O ₃			
Storage temperature	T _{STG}	-40		125	°C
Mounting torque for modul mounting	M	3		6	Nm
Weight	W		170		g

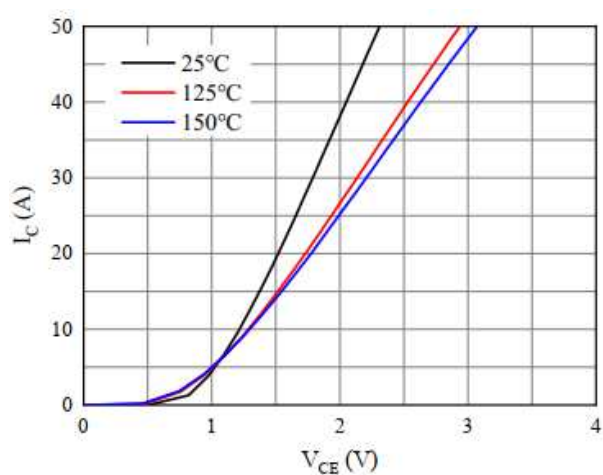


Figure 1. Typical output characteristics (VGE=15V)

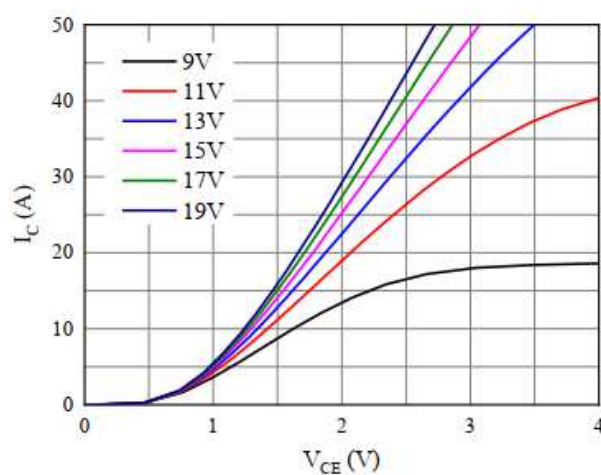


Figure 2. Typical output characteristics (Tvj=150°C)

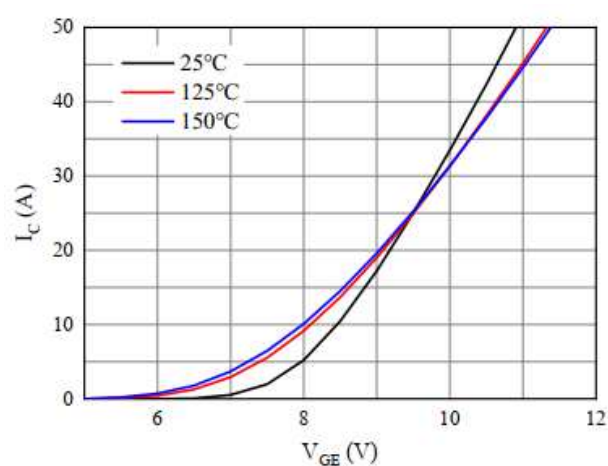


Figure 3. Typical transfer characteristic(VCE=20V)

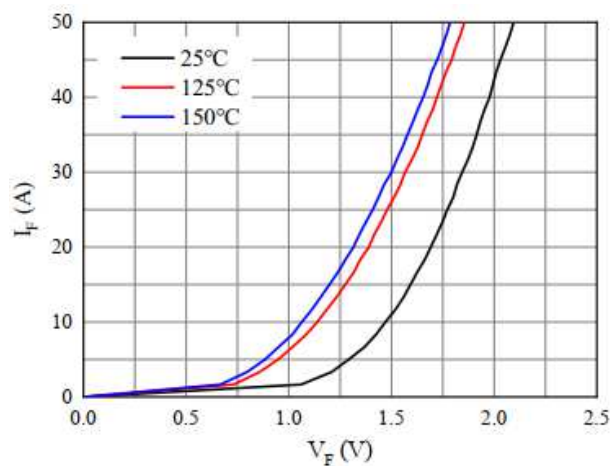


Figure 4. Forward characteristic of Diode

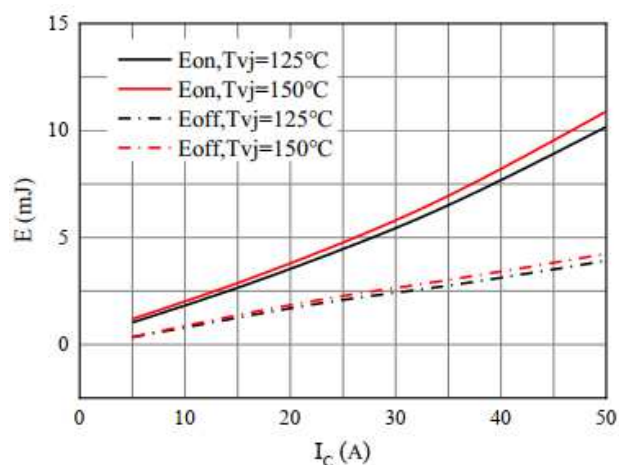


Figure 5. Switching losses of IGBT
VGE=± 15V, RGon=40Ω, RGoff=40Ω, VCE=600V

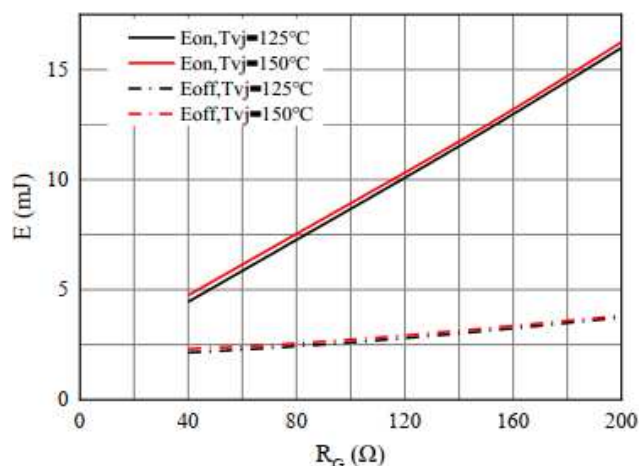


Figure 6. Switching losses of IGBT
VGE=± 15V, IC=25A, VCE=600V

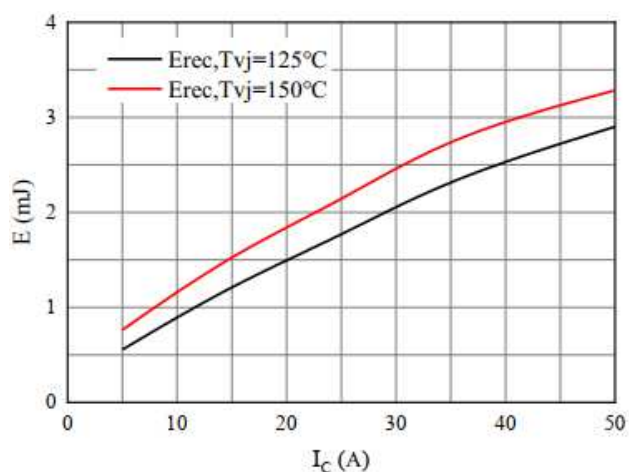


Figure 7. Switching losses of Diode
RGon=40Ω, VCE=600V

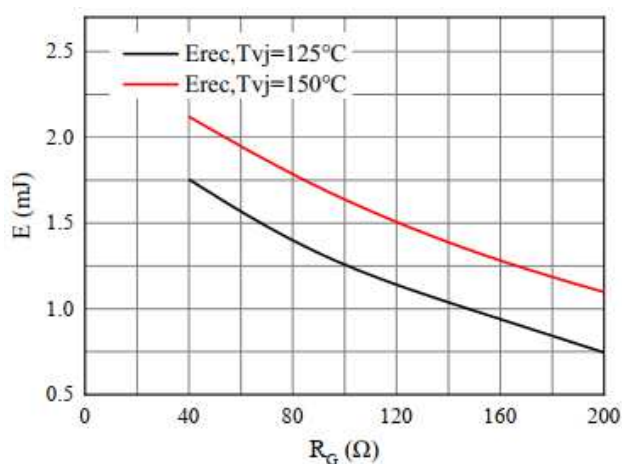


Figure 8. Switching losses of Diode
IF=25A, VCE=600V

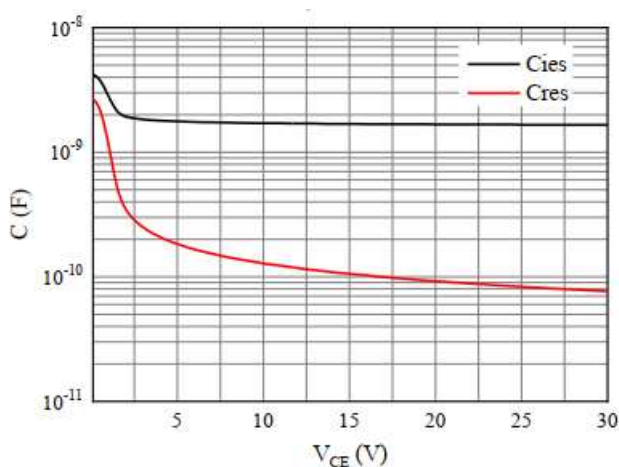


Figure 9. Capacitance characteristic

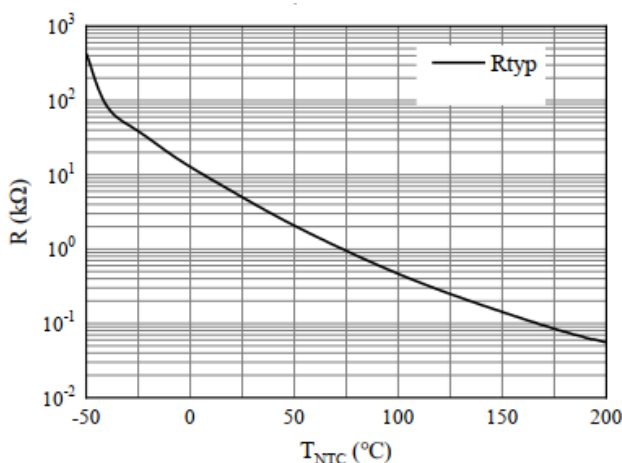
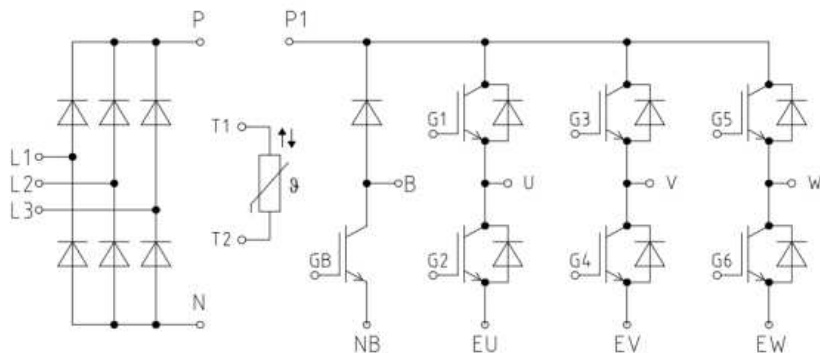
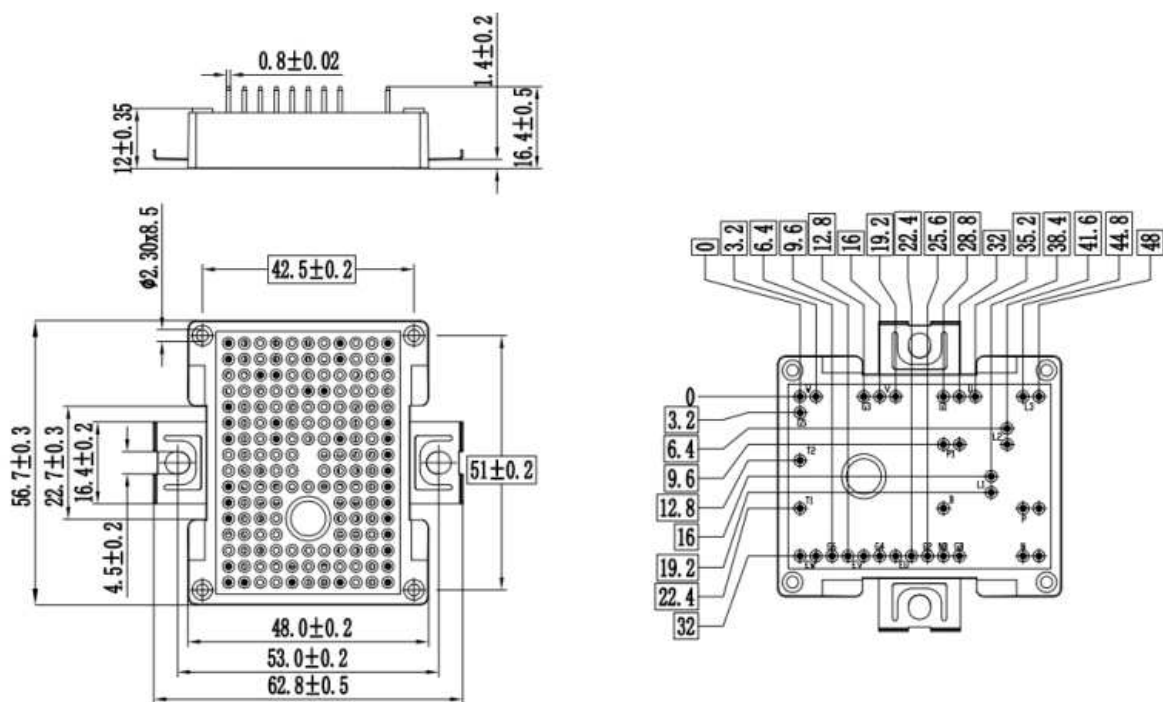


Figure 10. NTC-Themistor-temperature characteristic

• Circuit diagram



• Package outlines : Dimensions in (mm)



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