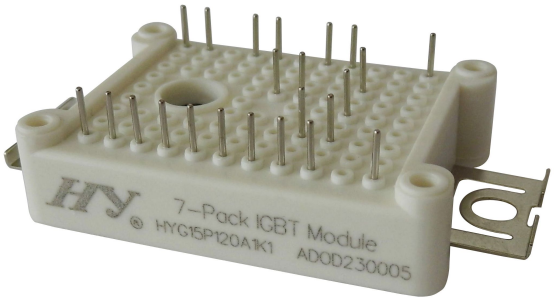
IGBT Module

Features

- Low VCE（sat）trench IGBT
- Low switching losses
- 10us short circuit capability
- Fast & soft reverse recovery FRD
- Maximum junction temperature 175℃
- Temperature sense included
- Industry standard package with soldering pins for PCB mounting



Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

IGBT-inverter **Tc=25℃ unless otherwise noted**

Maximum Rated Values

Symbol	Description	HYG15P120A1K1	Units
V_{CES}	Collector-Emitter Voltage Tj=25℃	1200	V
V_{GES}	Gate-Emitter Voltage Tj=25℃	±20	V
I_C	Collector Current	20	A
	Collector Current TC=80℃	15	
I_{CM}	Pulsed Collector Current tp=1ms	30	A
P_{tot}	Tatal Power Dissipation Tj=175℃	156	W

Characteristics Values

Symbol	Parameter		Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	Tj=25℃	1200			V
I_{CES}	Collector Cut- Off Current	VCE=VCES, VGE=0V, Tj=25℃			0.1	mA
I_{GES}	Gate-Emitter Leakage Current	VGE=VGES, VCE=0V, Tj=25℃	-400		400	nA
$V_{GE(th)}$	Gate to Emitter Threshold Voltage	IC=1.2mA, VGE=VCE, Tj=25℃	4.6	5.2	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	IC=15A, VGE=15V, Tj=25℃		2.1	2.5	V
		IC=15A, VGE=15V, Tj=125℃		2.4		
R_{Gint}	Integrated Gate Resistor			0		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=15A , V_{GE}=15V		0.1		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz		1.38		nF
C_{res}	Reverse Transfer Capacitance			0.03		nF
$t_{d(on)}$	Turn - on Delay Time	V_{CC}=600V,I_C=15A, R_G =30Ω , V_{GE}=±15V, Inductive Load	T_{vj} =25°C	35		ns
			T_{vj} =125°C	40		ns
t_r	Rise Time		T_{vj} =25°C	40		ns
			T_{vj} =125°C	45		ns
$t_{d(off)}$	Turn - off Delay Time	V_{CC}=600V,I_C=15A, R_G =30Ω , V_{GE}=±15V, Inductive Load	T_{vj} =25°C	240		ns
			T_{vj} =125°C	270		ns
t_f	Fall Time		T_{vj} =25°C	100		ns
			T_{vj} =125°C	130		ns
E_{on}	Turn - on Energy	V_{CC}=600V,I_C=15A, R_G =30Ω , V_{GE}=±15V, Inductive Load	T_{vj} =25°C	0.7		mJ
			T_{vj} =125°C	1.0		mJ
E_{off}	Turn - off Energy		T_{vj} =25°C	1.0		mJ
			T_{vj} =125°C	1.2		mJ
I_{sc}	Short Circuit Current	t_{psc}≤10μS , V_{GE}=15V T_{vj}=125°C,V_{CC}=600V		75		A
R_{thJC}	Junction-to-Case Thermal Resistance （ **Per IGBT**）				0.8	K /W

DIODE-inverter **Tc=25℃ unless otherwise noted**

Maximum Rated Values

Symbol	Description	HYG15P120A1K1	Units
V_{RRM}	Repetitive Peak Reverse Voltage Tj=25℃	1200	V
I_F	DC Forward Current Tc=80℃	15	A
I_{FRM}	Repetitive Peak Forward Current	30	A

Characteristics Values

Symbol	Parameter		Min.	Typ.	Max.	Units
V_F	Forward Voltage	IF=15A , VGE=0V, T_{vj} =25°C IF=15A , VGE=0V, T_{vj} =125°C		2.2 2.4	2.6	V
t_{rr}	Reverse Recovery Time	IF=15A , VR=600V		150		ns
I_{RRM}	Max. Reverse Recovery Current	diF/dt=-400A/μs		23		A
E_{rec}	Reverse Recovery Charge	T_{vj} =125°C		0.8		mJ
R_{thJC}	Junction-to-Case Thermal Resistance （ **Per DIODE**）				1.8	K /W

DIODE-rectifier **Tc=25℃ unless otherwise noted**

Maximum Rated Values

Symbol	Description	HYG15P120A1K1	Units
V_{RRM}	Repetitive Peak Reverse Voltage Tj=25℃	1600	V
$I_{F(AV)}$	Average On-state Current per Diode Tc=80℃	20	A
I_{RMSM}	Maximum RMS Current at rectifier Output	tdb	A
I^2t	VR=0V,tp=10ms, Tj=45℃	360	A^2t
I_{FsM}	Surge Forward Current VR=0V,tp=10ms, Tj=45℃	270	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	IF=15A	Tj=25℃			1.29	V
			Tj=125℃			1.31	
I_R	Reverse Current	VR=1600V	Tj=25℃			10	uA
			Tj=125℃			1	mA
R_{thJC}	Junction-to-Case Thermal Resistance （ **Per DIODE**）					1.9	K /W

IGBT-brake-chopper **Tc=25℃ unless otherwise noted**

Maximum Rated Values

Symbol	Description	HYG15P120A1K1	Units
V_{CES}	Collector-Emitter Voltage Tj=25℃	1200	V
V_{GES}	Gate-Emitter Voltage Tj=25℃	±20	V
I_C	Collector Current	20	A
	Collector Current TC=80℃	15	
I_{CM}	Pulsed Collector Current tp=1ms	30	A
P_{tot}	Tatal Power Dissipation Tj=175℃	156	W

Characteristics Values

Symbol	Parameter		Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	Tj=25℃	1200			V
I_{CES}	Collector Cut- Off Current	VCE=VCES, VGE=0V, Tj=25℃			5	mA
I_{GES}	Gate-Emitter Leakage Current	VGE=VGES, VCE=0V, Tj=25℃	-500		500	nA
$V_{GE(th)}$	Gate to Emitter Threshold Voltage	IC=1.2mA, VGE=VCE, Tj=25℃	5	5.8	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	IC=15A, VGE=15V, Tj=25℃		1.9	2.3	V
		IC=15A, VGE=15V, Tj=125℃		2.3		
R_{Gint}	Integrated Gate Resistor			0		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=15A , V_{GE}=15V		0.09		μC
C_{ies}	Input Capacitance	V_{CE}=30V, V_{GE}=0V, f =0.1MHz		1.39		nF
C_{res}	Reverse Transfer Capacitance			0.06		nF
$t_{d(on)}$	Turn - on Delay Time	V_{CC}=600V,I_C=15A, R_G =56Ω , V_{GE}=±15V, Inductive Load	T_{vj} =25°C	60		ns
			T_{vj} =125°C	70		ns
t_r	Rise Time		T_{vj} =25°C	30		ns
			T_{vj} =125°C	40		ns
$t_{d(off)}$	Turn - off Delay Time	V_{CC}=600V,I_C=15A, R_G =56Ω , V_{GE}=±15V, Inductive Load	T_{vj} =25°C	220		ns
			T_{vj} =125°C	250		ns
t_f	Fall Time		T_{vj} =25°C	80		ns
			T_{vj} =125°C	100		ns
E_{on}	Turn - on Energy	V_{CC}=600V,I_C=15A, R_G =56Ω , V_{GE}=±15V, Inductive Load	T_{vj} =25°C	1.2		mJ
			T_{vj} =125°C	1.55		mJ
E_{off}	Turn - off Energy		T_{vj} =25°C	1.4		mJ
			T_{vj} =125°C	1.7		mJ
I_{SC}	Short Circuit Current	t_{psc}≤10μS , V_{GE}=15V T_{Vj}=125°C,V_{CC}=900V		60		A
R_{thJC}	Junction-to-Case Thermal Resistance （ **Per IGBT**）				1.8	K /W

DIODE-brake-chopper **Tc=25℃ unless otherwise noted**

Maximum Rated Values

Symbol	Description	HYG15P120A1K1	Units
V_{RRM}	Repetitive Peak Reverse Voltage Tj=25℃	1200	V
I_F	DC Forward Current Tc=80℃	10	A
I_{FRM}	Repetitive Peak Forward Current	15	A

Characteristics Values

Symbol	Parameter		Min.	Typ.	Max.	Units
V_F	Forward Voltage	IF=5A , VGE=0V, T_{vj} =25°C IF=5A , VGE=0V, T_{vj} =125°C		2.0 1.95	2.2	V
t_{rr}	Reverse Recovery Time	IF=5A , VR=600V		350		ns
I_{RRM}	Max. Reverse Recovery Current	diF/dt=-200A/μs		6		A
E_{rec}	Reverse Recovery Charge	T_{vj} =125°C		0.15		mJ
R_{thJC}	Junction-to-Case Thermal Resistance （ **Per DIODE**）				2.5	K /W

Electrical Characteristics of NTC **Tc=25℃ unless otherwise noted**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R25	Rated Resistance	Tc=25℃		5.0		kΩ
ΔR/R	Deviation of R100	Tc=100℃, R100=493Ω	-5		5	
P25	Power Dissipation	Tc=25℃			20	mW
B25/50	B value			3375		K

Module Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min		2500		V
T_{VJmax}	Maximum Junction Temperature			150	℃
T_{VJop}	Operating Temperature	-40		125	℃
Md	Mounting Screw:M4	3		5	N·m
T_{STG}	Storage Temperature range	-40		125	℃
Weight				23.5	g

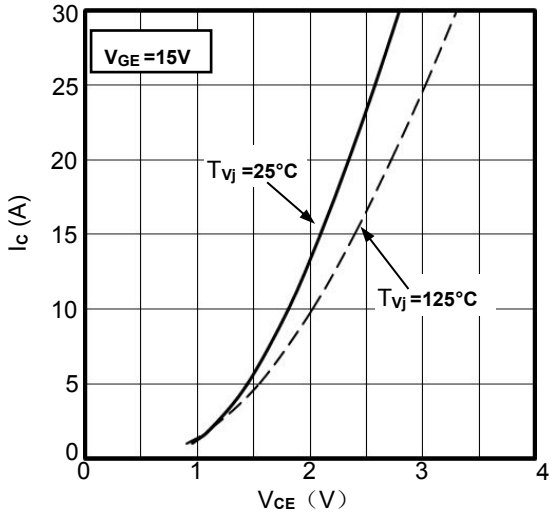


Figure1. Typical Output Characteristics

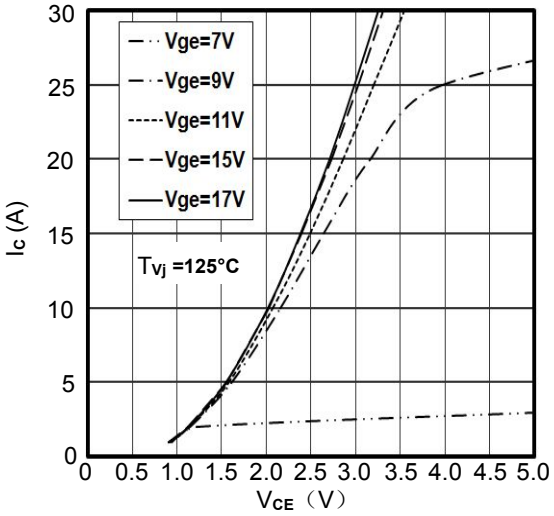


Figure2. Typical Output Characteristics

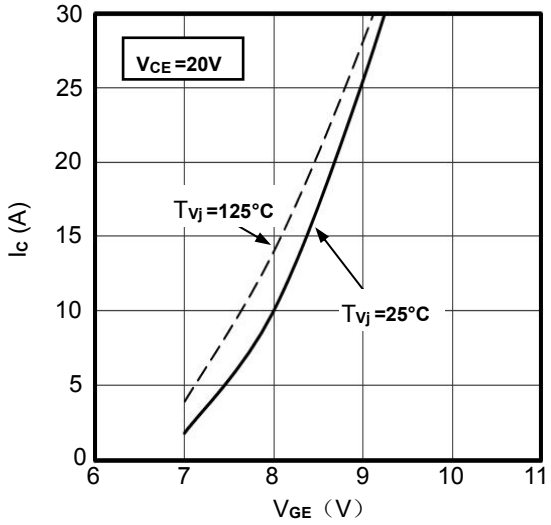


Figure3. Typical Transfer characteristics

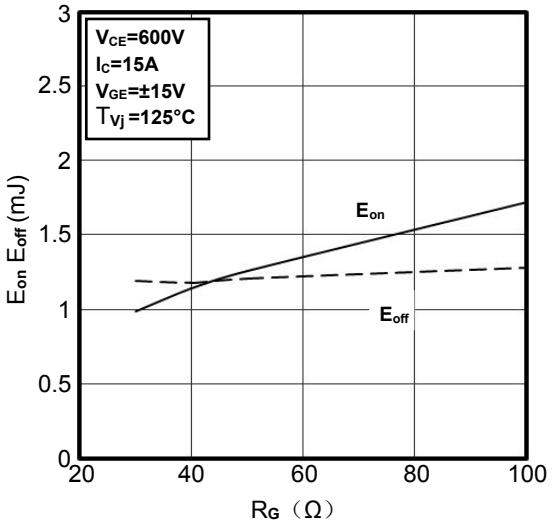


Figure4. Switching Energy vs. Gate Resistor

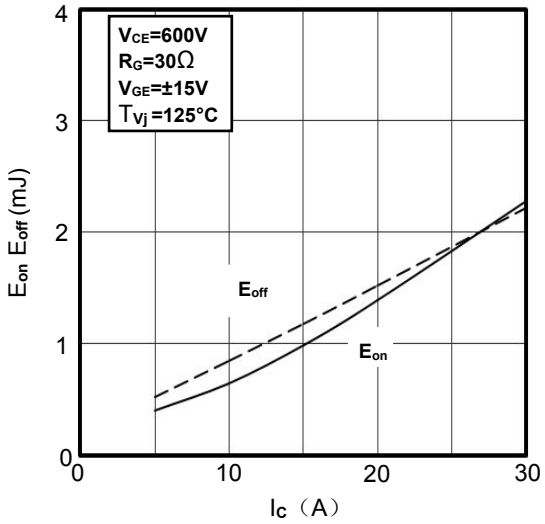


Figure5. Switching Energy vs. Collector Current

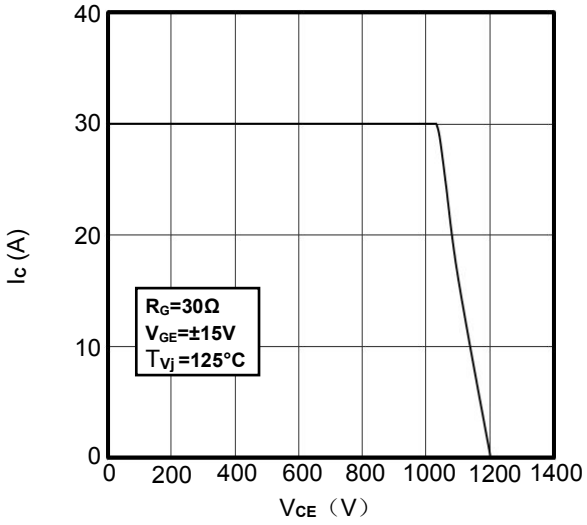


Figure6. Reverse Biased Safe Operating Area

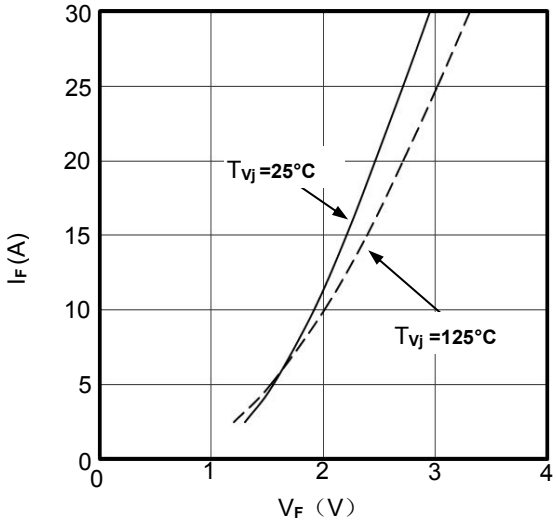


Figure7. Diode Forward Characteristics

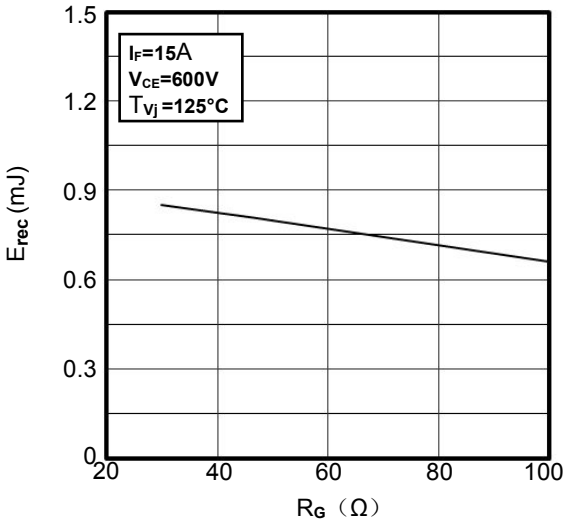


Figure8. Switching Energy vs. Gate Resistor

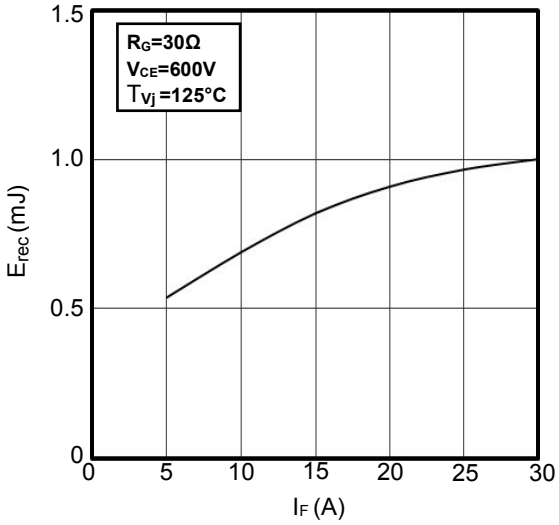


Figure9. Switching Energy vs. Forward Current

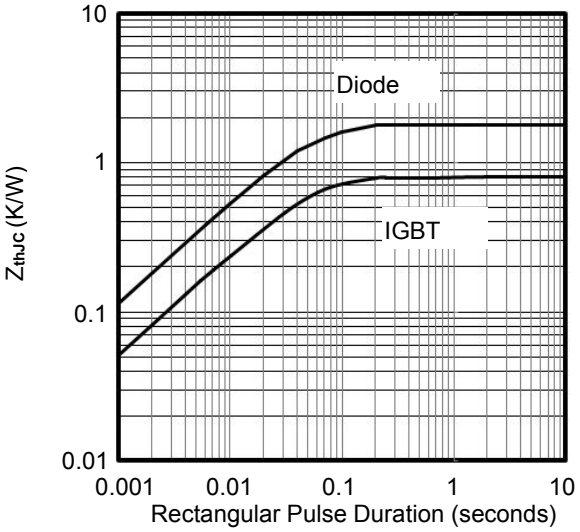


Figure10. Transient Thermal Impedance

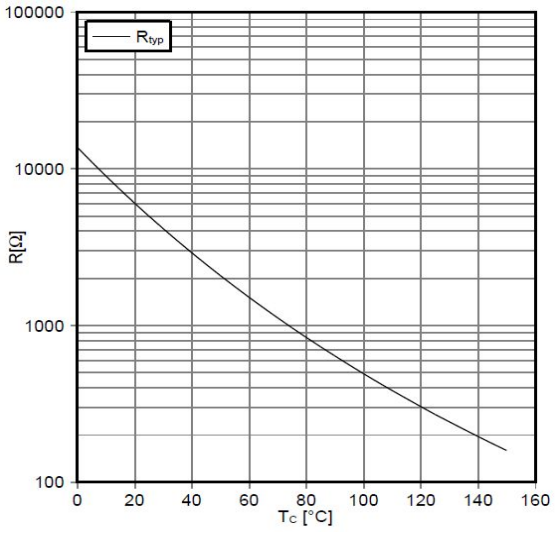


Figure11. NTC-Thermistor-temperature characteristic

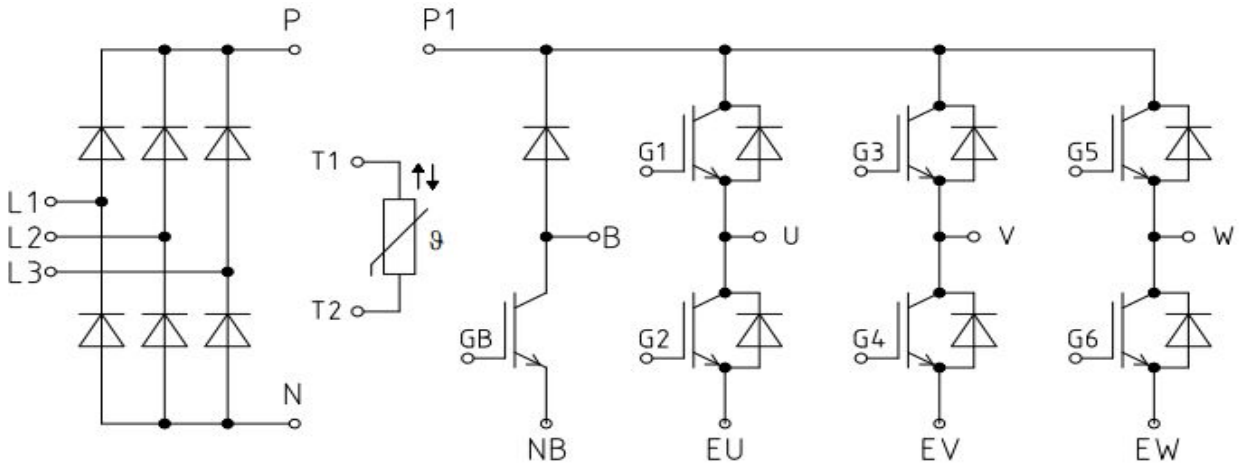


Figure11. Circuit Diagram

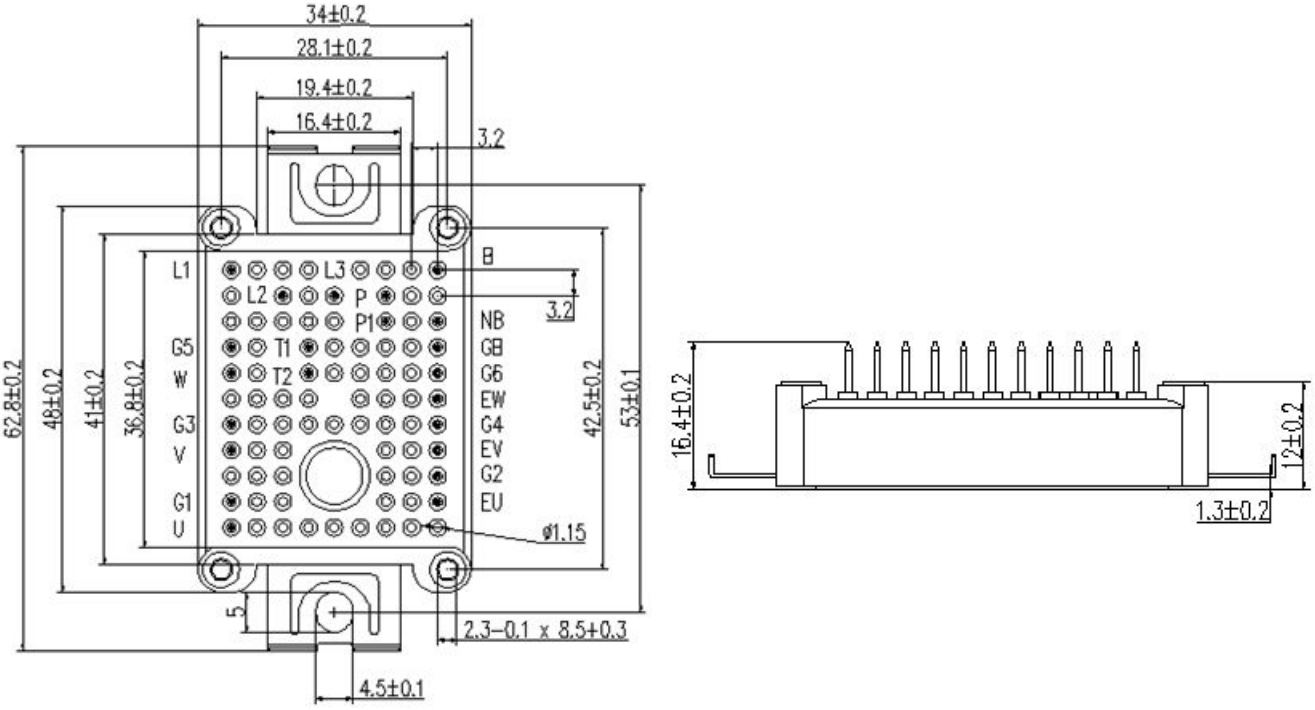


Figure12. Package Dimensions (mm)