62mm Module
1200V,450A
QX450HB12C1

General Description

kunsemi IGBT power Module provides ultra low conduction loss as well as short circuit ruggedness.They are designed for the applications such as general inverters and UPS.Additionally, IGBT and copacked soft diode deliver a low power loss operation and soft switching simultaneously,which helps to improve overall system efficiency in applications.

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10us short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low Inductive Design
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterrupible power supply
- Wind Turbines

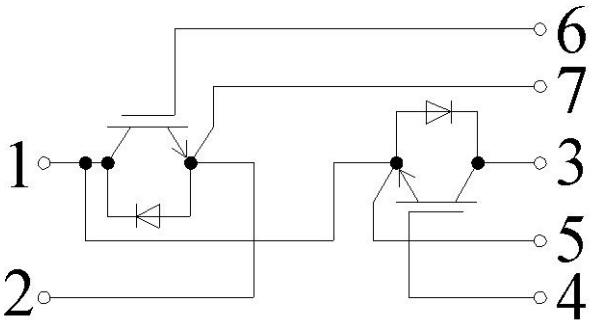


Figure 1. Schematic

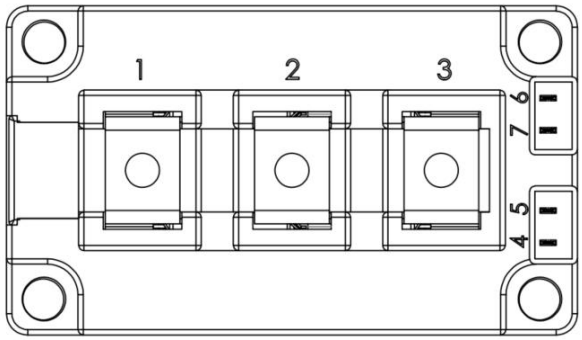


Figure 2. Package

ORDERING INFORMATION

Device	Package
QX450HB12C1	62mm

PIN DESCRIPTION

Pin	Name	Description
1	U	Center Point
2	N	DC Negative Bus Connection
3	P	DC Positive Bus Connection
4	G1	G1 Gate
5	E1	E1 Emitter
6	G2	G2 Gate
7	E2	E2 Emitter

IGBT,Inverter

Parameter	Test Conditions	Symbol	Value	Unit

Maximum Rated Values

Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	1200	V
Implemented collector current		I_{CN}	450	A
Repetitive peak collector current	t_p = 1ms	I_{CRM}	900	A
Total power dissipation	T_F = 25°C,$T_{vj\,max}$ = 175°C	P_{tot}	2400	W
Gate-emitter peak voltage		V_{GES}	±20	V

ELECTRICAL CHARACTERISTICS (T_{vj} = 25°C unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 450A	T_{vj} = 25°C	V_{CEsat}	-	1.82	2.02	V
	V_{GE} = 15V, I_C = 450A	T_{vj} = 125°C		-	2.14	-	
	V_{GE} = 15V, I_C = 450A	T_{vj} = 150°C		-	2.24	-	
Gate−Source Threshold Voltage	V_{GE} = V_{CE}, I_C = 17mA	T_{vj} = 25°C	V_{GEth}		5.74		V
Gate charge	V_{GE} = -15V...15V, V_{CE} = 30V		Q_G	-	3.9	-	uC
Gate Resistance	V_{GS} = 0V, f = 100KHz	T_{vj} = 25°C	R_{Gint}	-	1.28	-	Ω
Input Capacitance	f = 1MHz,V_{CE} = 25V, V_{GE} = 0V	T_{vj} = 25°C	C_{ies}	-	58.1	-	nF
Output Capacitance			C_{oes}	-	2.85	-	nF
Reverse Transfer Capacitance			C_{res}	-	1.38	-	nF
Collector-emitter cut-off current	V_{CE} = 1200V,V_{GE} = 0V	T_{vj} = 25°C	I_{CES}	-	-	5	mA
	V_{CE} = 1200V,V_{GE} = 0V	T_{vj} = 150°C		-	-	5	
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V	T_{vj} = 25°C	I_{GES}	-	-	400	nA
Turn-on delay time, inductive load	V_{CE} = 600V, I_C = 450A, V_{GE} = ±15V, R_G = 1Ω, Ls = 7uH	T_{vj} = 25°C	$T_{d(on)}$	-	200.9	-	ns
		T_{vj} = 125°C		-	213.1	-	ns
		T_{vj} = 150°C		-	224.9	-	ns
Rise time, inductive load	V_{CE} = 600V, I_C = 450A, V_{GE} = ±15V, R_G = 1Ω, Ls = 7uH	T_{vj} = 25°C	t_r	-	52.4	-	ns
		T_{vj} = 125°C		-	56.9	-	ns
		T_{vj} = 150°C		-	59.2	-	ns
Turn-off delay time, inductive load	V_{CE} = 600V, I_C = 450A, V_{GE} = ±15V, R_G = 1Ω, Ls = 7uH	T_{vj} = 25°C	$T_{d(off)}$	-	328.1	-	ns
		T_{vj} = 125°C		-	362.2	-	ns
		T_{vj} = 150°C		-	375.0	-	ns
Fall time, inductive load	V_{CE} = 600V, I_C = 450A, V_{GE} = ±15V, R_G = 1Ω, Ls = 7uH	T_{vj} = 25°C	t_f	-	239.0	-	ns
		T_{vj} = 125°C		-	316.4	-	ns
		T_{vj} = 150°C		-	343.3	-	ns
Turn-on energy loss per pulse	V_{CE} = 600V, I_C = 450A, V_{GE} = ±15V, R_G = 1Ω, Ls = 7uH	T_{vj} = 25°C	E_{on}	-	30.6	-	mJ
		T_{vj} = 125°C		-	46.4	-	mJ
		T_{vj} = 150°C		-	51.6	-	mJ
Turn-off energy loss per pulse	V_{CE} = 600V, I_C = 450A, V_{GE} = ±15V, R_G = 1Ω, Ls = 7uH	T_{vj} = 25°C	E_{off}	-	36.7	-	mJ
		T_{vj} = 125°C		-	43.7	-	mJ
		T_{vj} = 150°C		-	45.5	-	mJ
SC data	V_{GE} ≤ 15V,V_{CC} = 600V, R_G = 10Ω, t_p ≤ 10us	T_{vj} = 150°C	I_{SC}	-	2000	-	A
Thermal resistance, junction to cooling fluid	per IGBT; ΔV/Δt = 10 dm³/min, T_F = 75°C		R_{thJF}	-	0.063	-	K/W

Diode,Inverter

Parameter	Test Conditions	Symbol	Value	Unit

Maximum Rated Values

Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Implemented forward current		I_{FN}	450	A
Repetitive peak forward current	t_p = 1ms	I_{FRM}	900	A

ELECTRICAL CHARACTERISTICS (T_{vj} = 25°C unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Forward voltage	V_{GE} = 0V, I_C = 450A	T_{vj} = 25°C	V_F	-	1.59	1.79	V
	V_{GE} = 0V, I_C = 450A	T_{vj} = 125°C		-	1.48	-	
	V_{GE} = 0V, I_C = 450A	T_{vj} = 150°C		-	1.45	-	
Peak reverse recovery current	V_R = 600V, I_R = 300A, V_{GE} = −15V, R_G = 1Ω, Ls = 7uH, -di/dt = 4370A/us(T_{vj} = 150°C)	T_{vj} = 25°C	I_{RM}	-	338.8	-	A
		T_{vj} = 125°C		-	415.9	-	
		T_{vj} = 150°C		-	438.2	-	
Recovered charge	V_R = 600V, I_R = 300A, V_{GE} = −15V, R_G = 1Ω, Ls = 7uH, -di/dt = 4370A/us(T_{vj} = 150°C)	T_{vj} = 25°C	Q_r	-	65.0	-	uC
		T_{vj} = 125°C		-	111.4	-	
		T_{vj} = 150°C		-	126.7	-	
Reverse recovery energy	V_R = 600V, I_R = 300A, V_{GE} = −15V, R_G = 1Ω, Ls = 7uH, -di/dt = 4370A/us(T_{vj} = 150°C)	T_{vj} = 25°C	E_{rec}	-	29.8	-	mJ
		T_{vj} = 125°C		-	49.7	-	
		T_{vj} = 150°C		-	55.9	-	
Thermal resistance, junction to cooling fluid	per diode; ΔV/Δt = 10 dm^3/min, T_F = 75°C		R_{thJF}	-	0.081	-	K/W

MODULE

Storage Temperature Range	T_{stg}	−40 to 125	°C
Module Operating Junction Temperature	T_{vj}	−40 to 150	°C
Isolation Test Voltage, t = 1 s, 50 Hz	V_{iso}	2500	V_{RMS}
Terminal Connection Torque:Screw M6 Mounting Torque:Screw M6	M	2.5~5.0	N.m
	M	3.0~6.0	N.m
Stray Inductance	L_{sCE}	15	nH
Weight of Module	G	310	g

TYPICAL CHARACTERISTIC

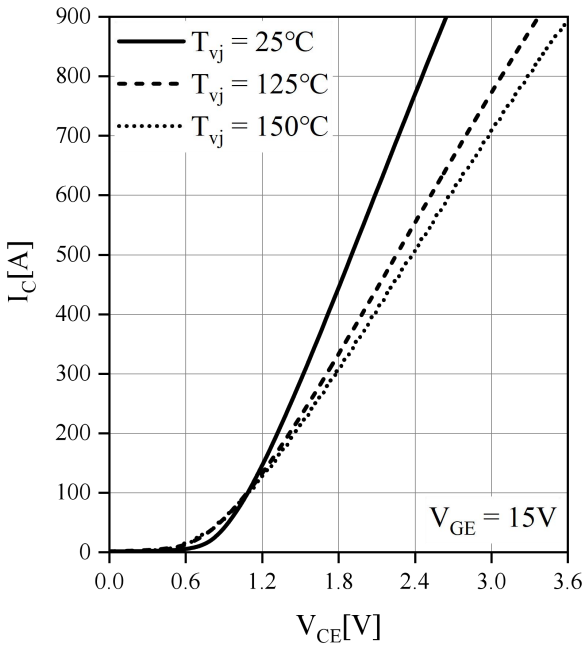


Figure 3. IGBT Typical Output Characteristic

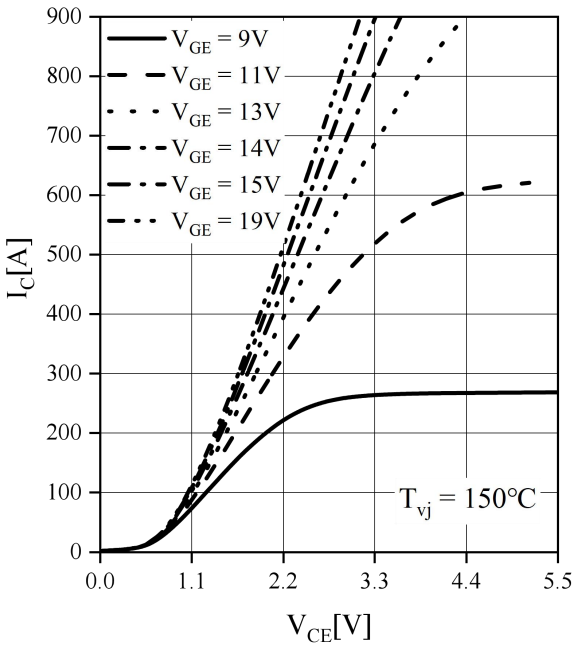


Figure 4. IGBT Typical Output Characteristic

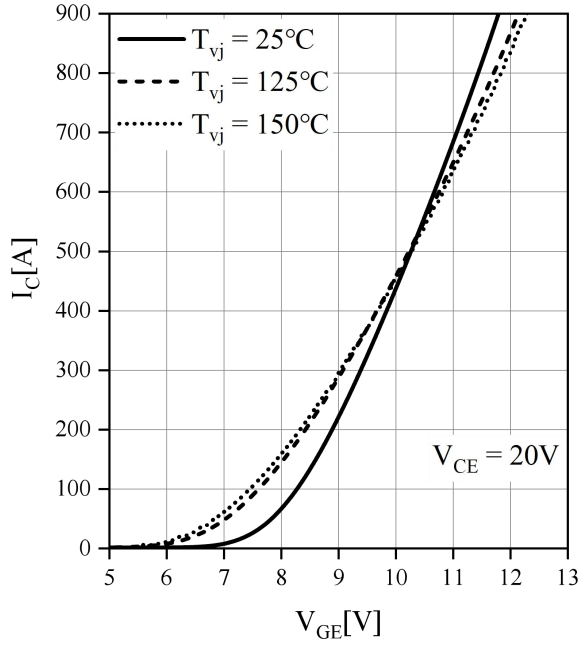


Figure 5. IGBT Typical Transfer Characteristic

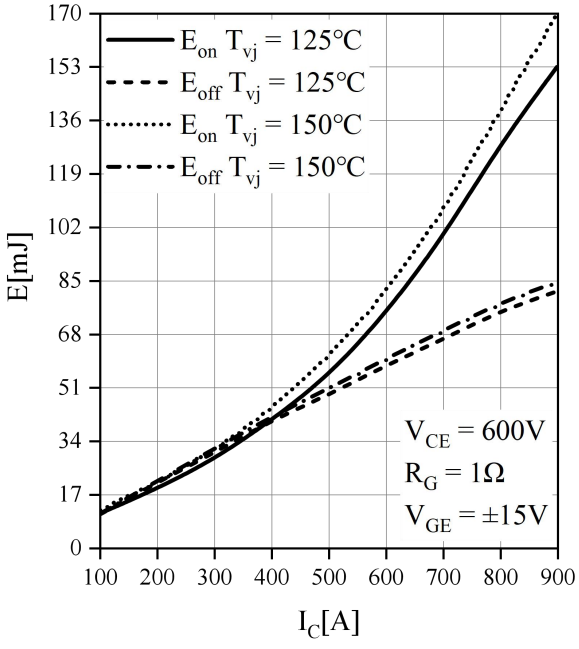


Figure 6. IGBT Switching losses vs. I_C

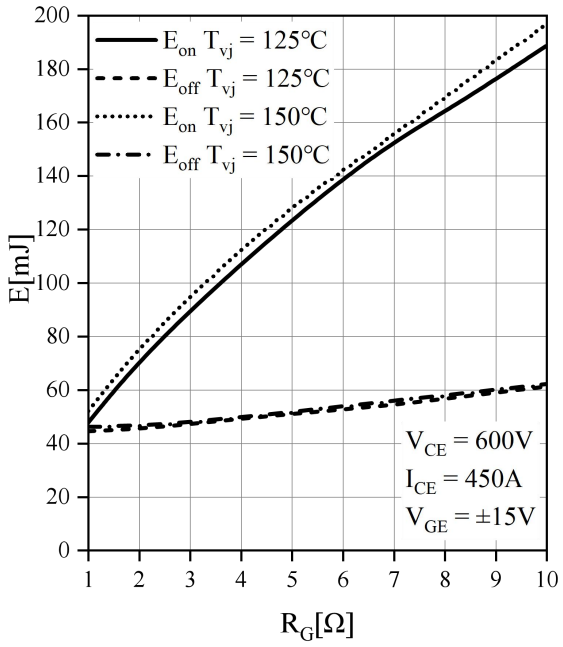


Figure 7. IGBT Switching losses vs. R_G

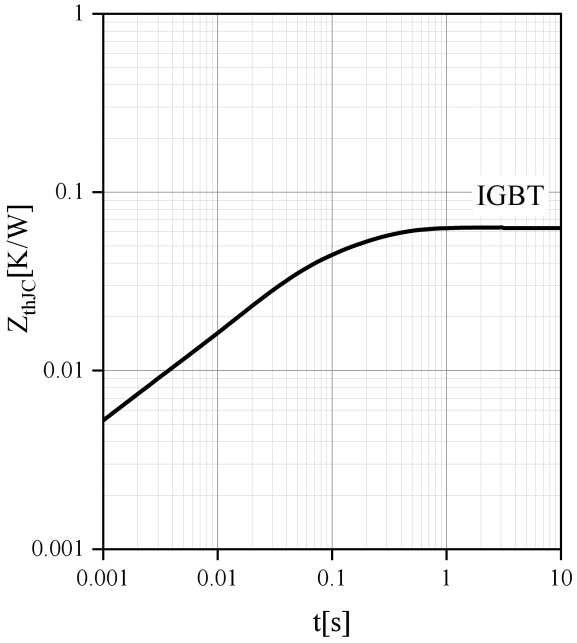


Figure 8. IGBT transient thermal impedance

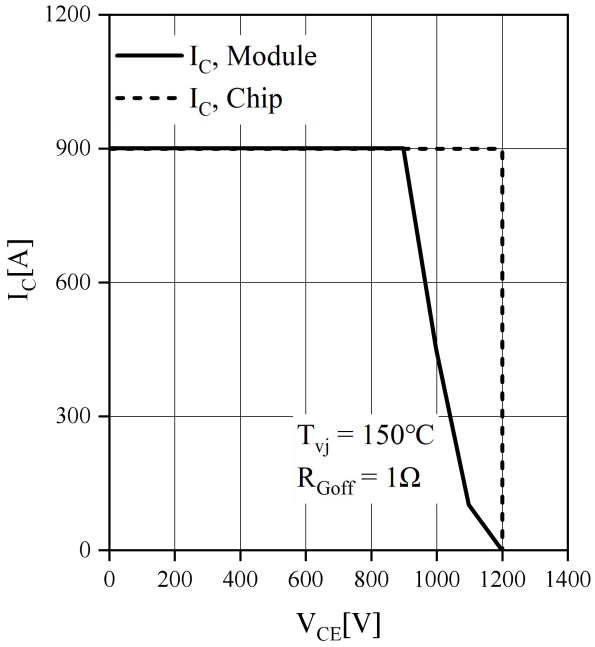


Figure 9. IGBT reverse bias safe operating area

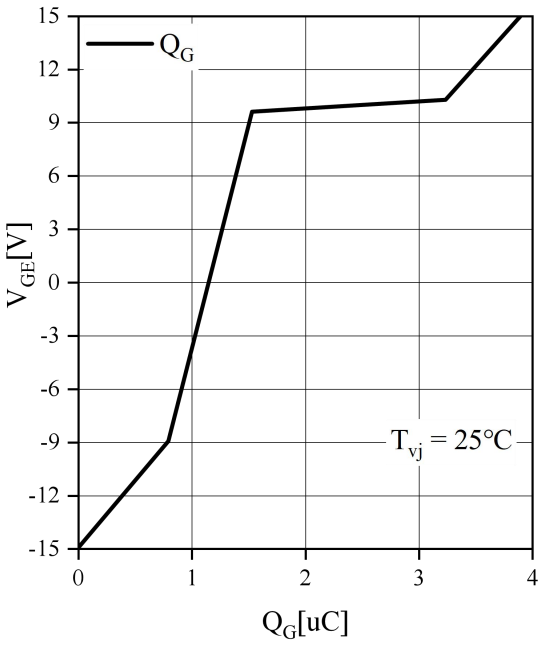


Figure 10. IGBT gate charge characteristic

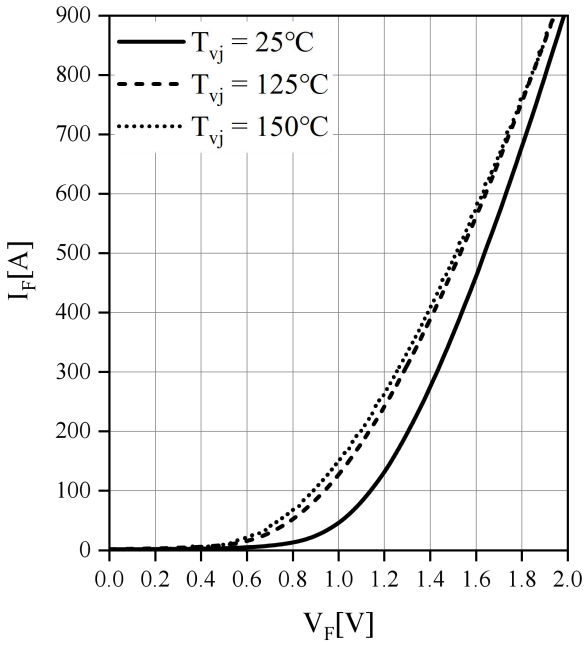


Figure 11. IDiode forward characteristic

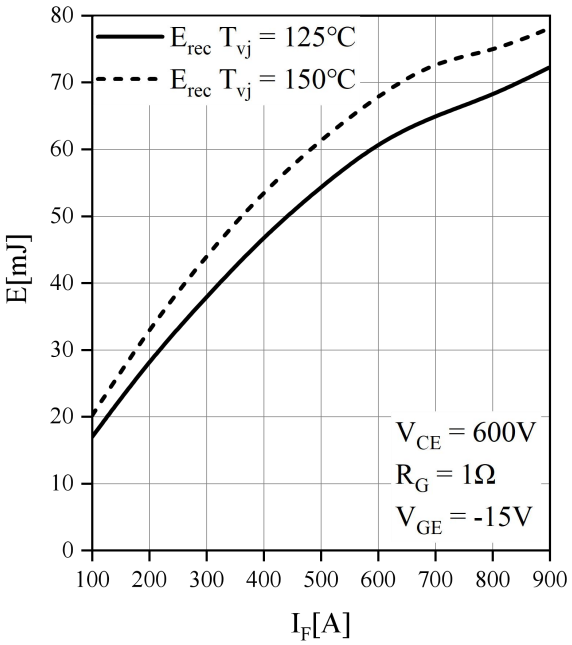


Figure 12. Diode switching losses vs. I_F

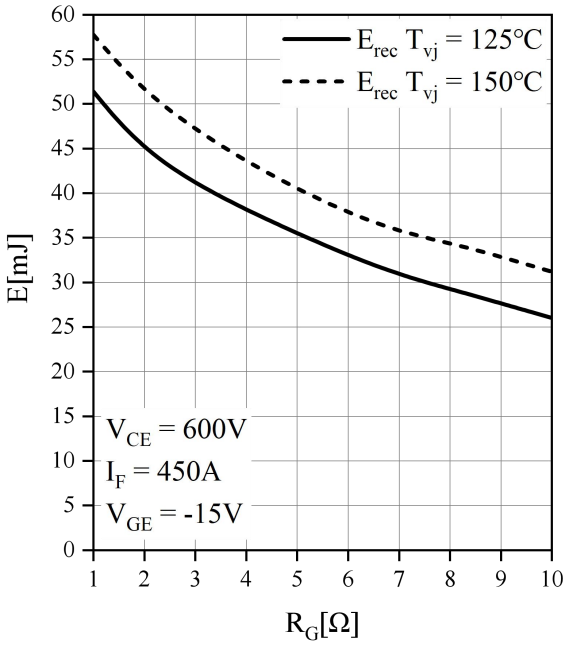


Figure 13. Diode switching losses vs. R_G

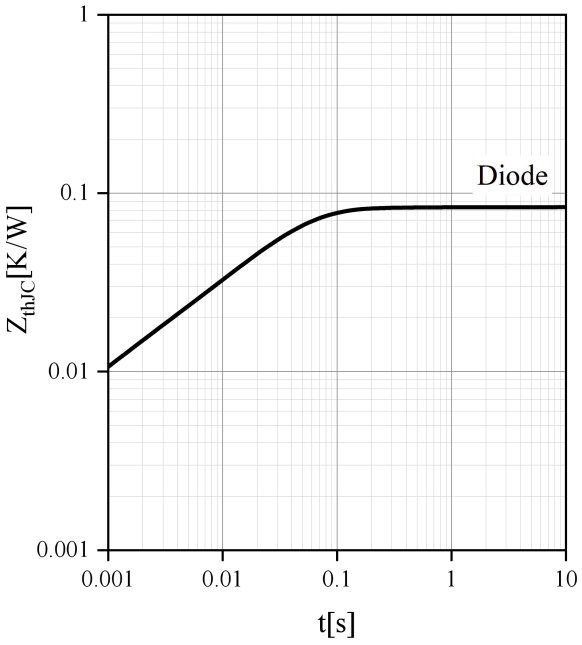
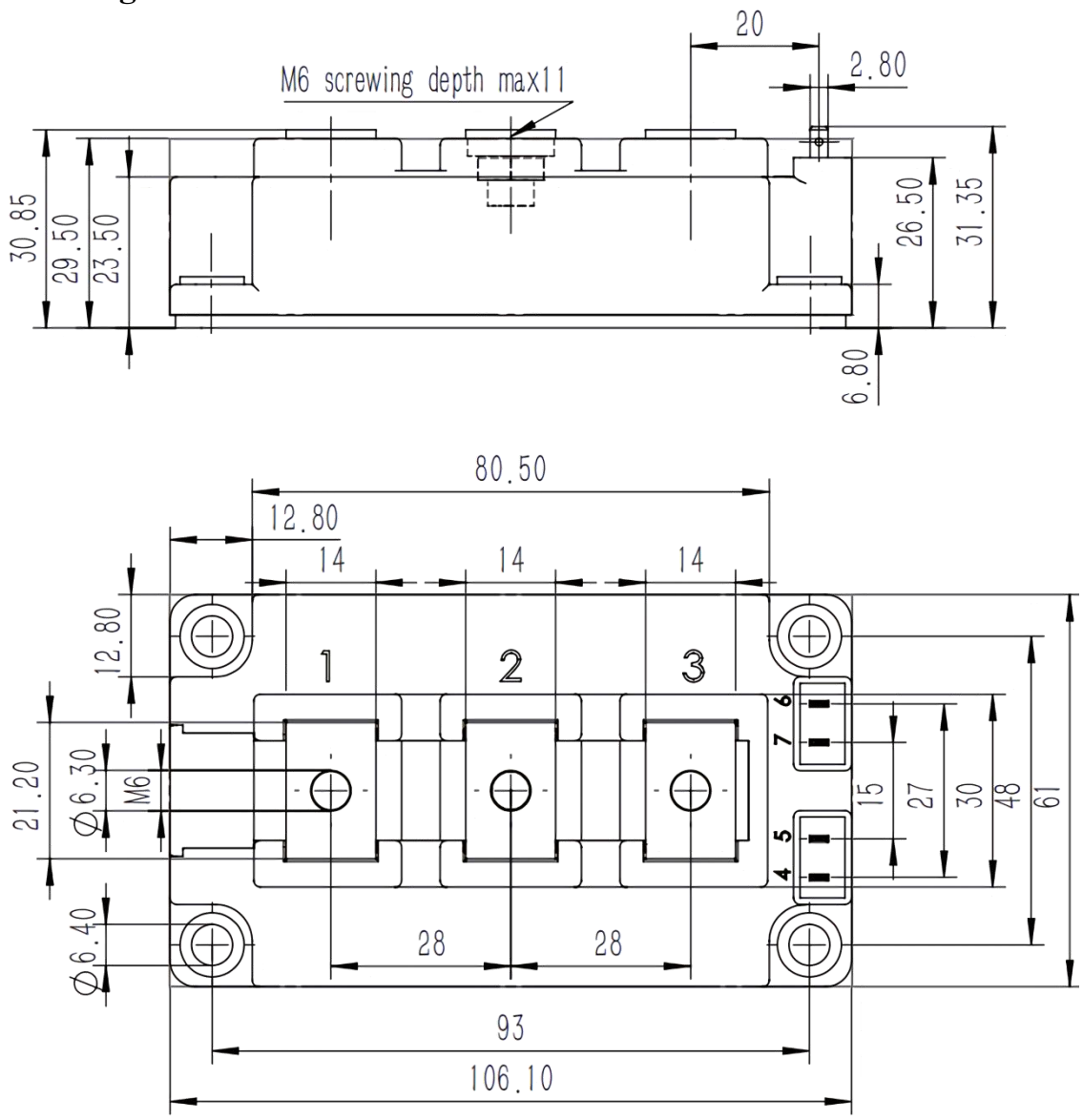


Figure 14. Diode transient thermal impedance

Package Drawing



UNIT:mm