STARPOWER

SEMICONDUCTOR™

IGBT

GD1600SGL120C3S

Preliminary

Molding Type Module

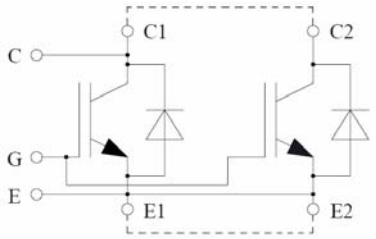
1200V/1600A 1 in one-package

General Description

STARPOWER 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.

Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



External Connection(to be done)

Equivalent Circuit Schematic

Typical Applications

- AC inverter drives
- Switching mode power supplies
- Electronic welders

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD1600SGL120C3S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	2500	A
	@ T_C=80℃	1600	
$I_{CM(1)}$	Pulsed Collector Current t_p= 1ms	3200	A
I_F	Diode Continuous Forward Current	1600	A
I_{FM}	Diode Maximum Forward Current	3200	A
P_D	Maximum power Dissipation @ T_j=150℃	8.3	kW
T_{SC}	Short Circuit Withstand Time @ T_j=125℃	10	μs
T_j	Maximum Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
I^2t-value, Diode	V_R=0V,t=10ms,T_j=125℃	300	kA^2s
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V
Mounting Torque	Power Terminal Screw:M4	1.8 to 2.1	N.m
	Power Terminal Screw:M8	8.0 to 10	
	Mounting Screw:M6	4.25 to 5.75	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=64mA,V_{CE}=V_{GE}, T_j=25℃	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=1600A,V_{GE}=15V, T_j=25℃		1.8		V
		I_C=1600A,V_{GE}=15V, T_j=125℃		2.0		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_{ge}	Gate charge	V_{GE}=-15…+15V		16.8		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=1600A, R_G=0.82Ω, V_{GE}=±15V,T_j=25℃		225		ns
t_r	Rise Time			105		ns
$t_{d(off)}$	Turn-Off Delay Time			1100		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			148		mJ
E_{off}	Turn-Off Switching Loss			186		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=1600A, R_G=0.82Ω, V_{GE}=±15V,T_j=125℃		235		ns
t_r	Rise Time			105		ns
$t_{d(off)}$	Turn-Off Delay Time			1160		ns
t_f	Fall Time			105		ns
E_{on}	Turn-On Switching Loss			206		mJ
E_{off}	Turn-Off Switching Loss			239		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		119		nF
C_{oes}	Output Capacitance			8.32		nF
C_{res}	Reverse Transfer Capacitance			5.44		nF
I_{SC}	SC Data	t_{SC}≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		7000		A
R_{Gint}	Internal Gate Resistance			0.1		Ω
L_{CE}	Stray Inductance			12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	T_C=25℃		0.19		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=1600A	T_j=25℃		2.1		V
			T_j=125℃		2.2		
Q_r	Recovered Charge	I_F=1600A, V_R=600V, di/dt=-7500A/μs, V_{GE}=-15V	T_j=25℃		73		μC
			T_j=125℃		175		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		510		A
			T_j=125℃		790		
E_{rec}	Reverse Recovery Energy		T_j=25℃		17		mJ
			T_j=125℃		46		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per Module)		15	K/kW
$R_{\theta JC}$	Junction-to-Case (Diode Part, per Module)		26	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	6		K/kW
Weight	Weight of Module	1500		g

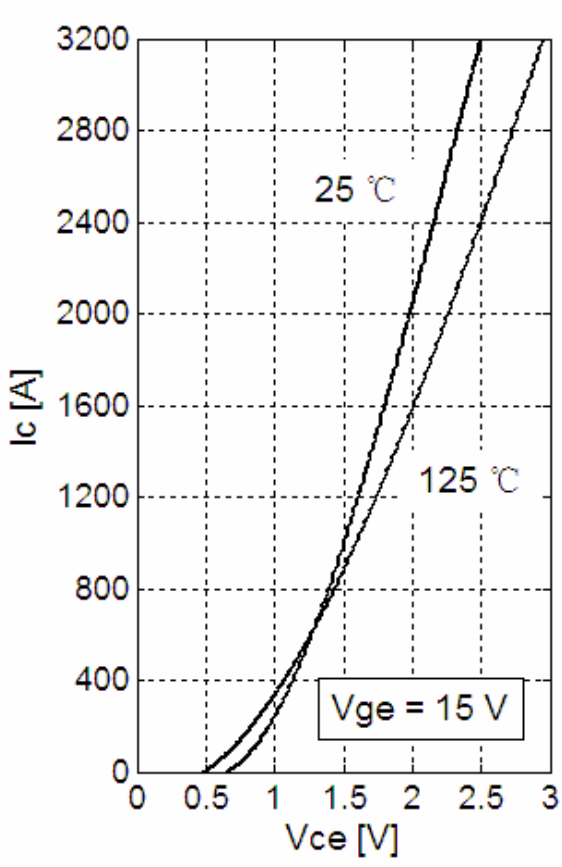


Fig 1. Typical IGBT Output Characteristics

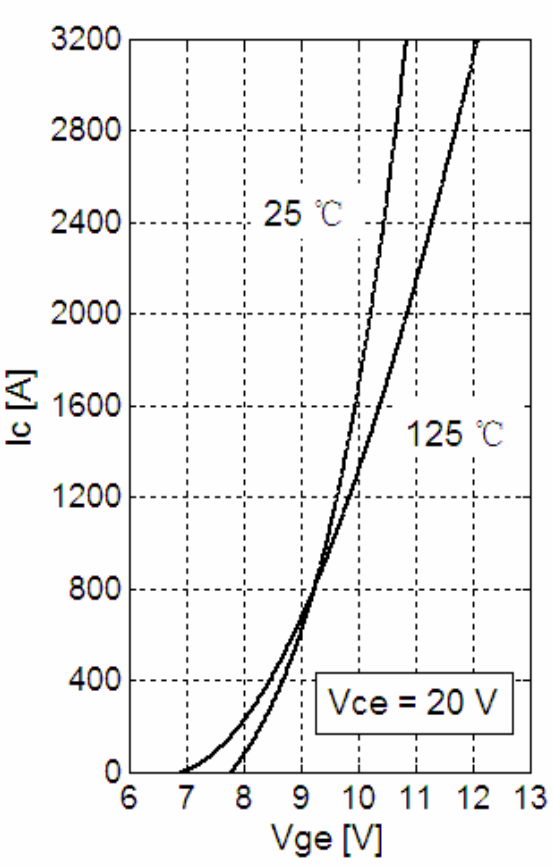


Fig 2. Typical IGBT Transfer Characteristics

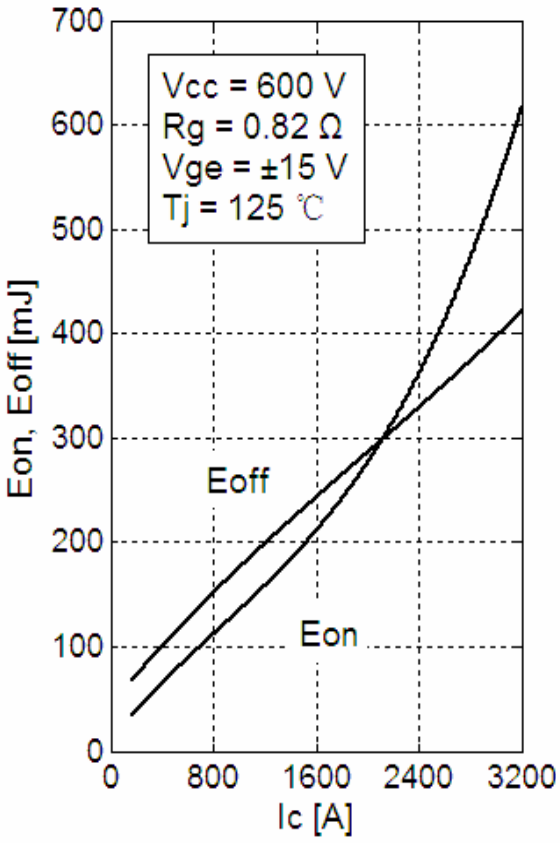


Fig 3. IGBT Switching Loss vs. I_C

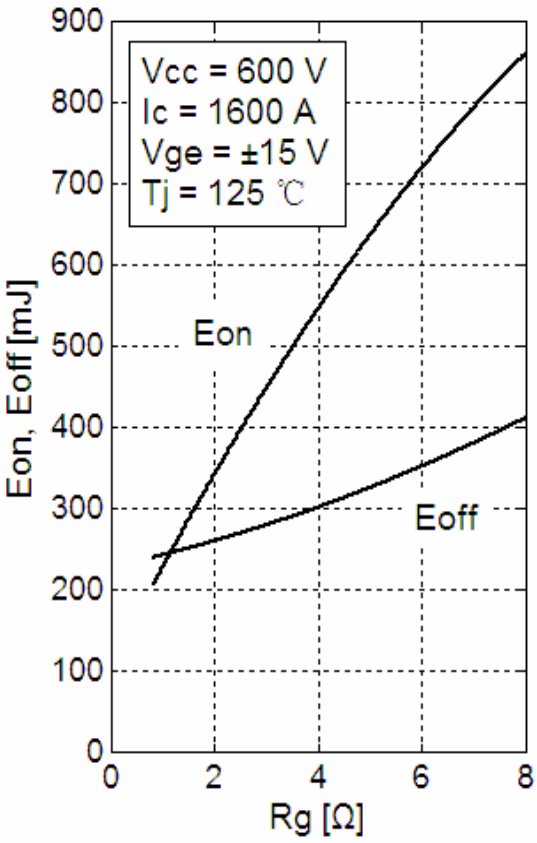


Fig 4. IGBT Switching Loss vs. R_G

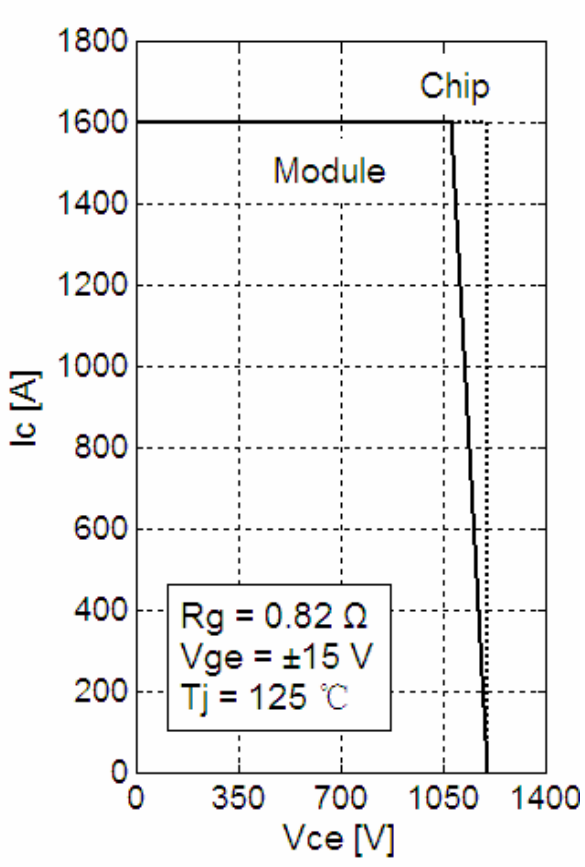


Fig 5. RBSOA

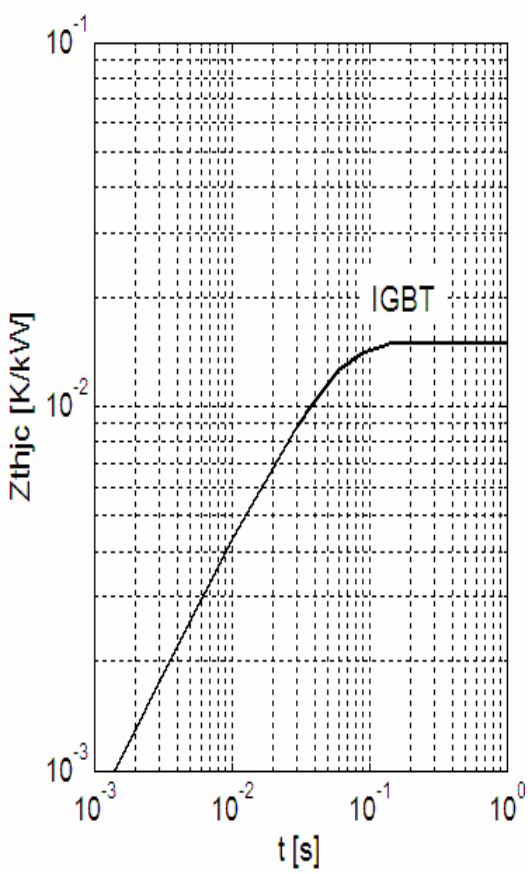


Fig 6. IGBT Transient Thermal Impedance

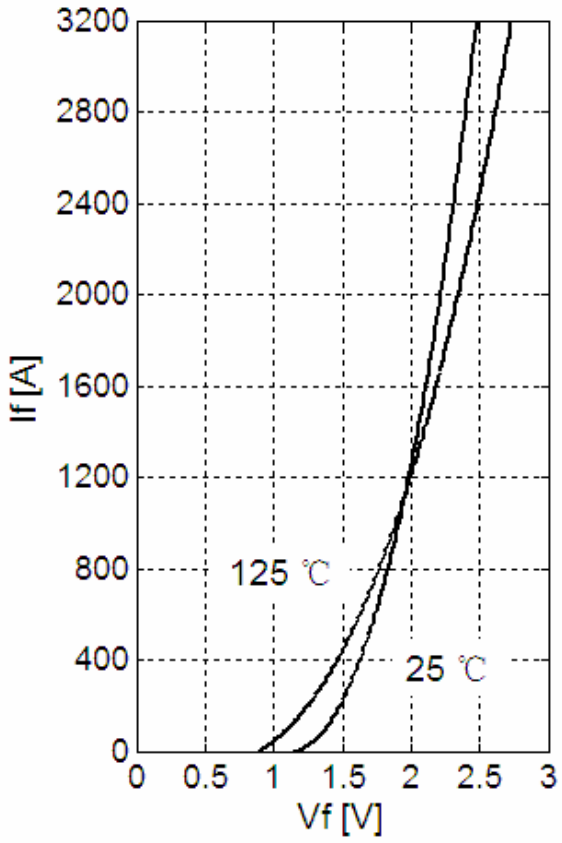


Fig 7. Diode Forward Characteristics

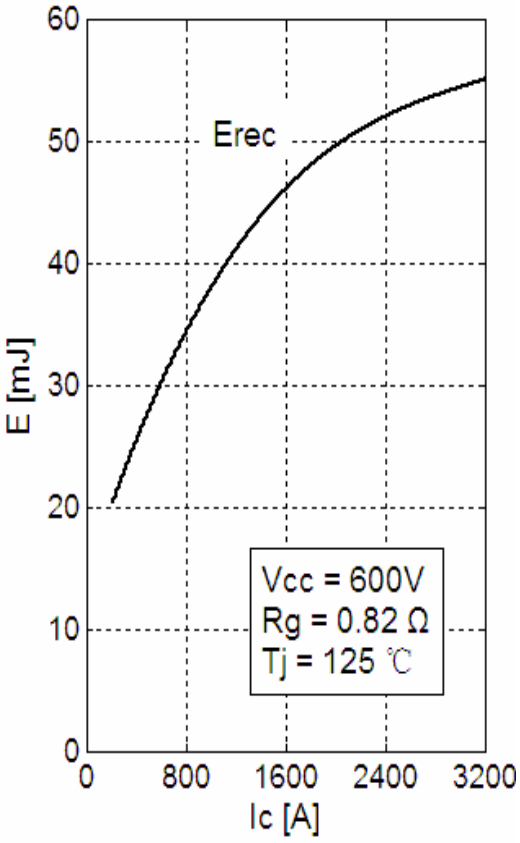


Fig 8. Diode Switching Loss vs. I_F

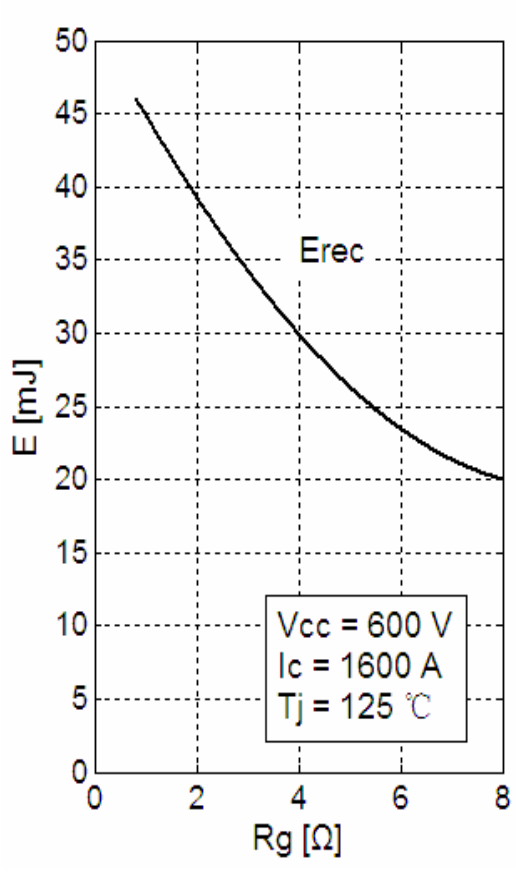


Fig 9. Diode Switching Loss vs. R_G

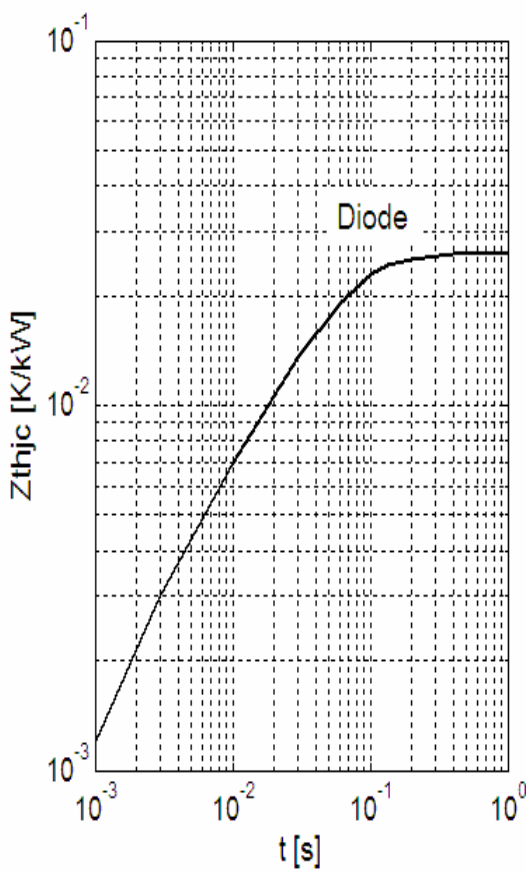
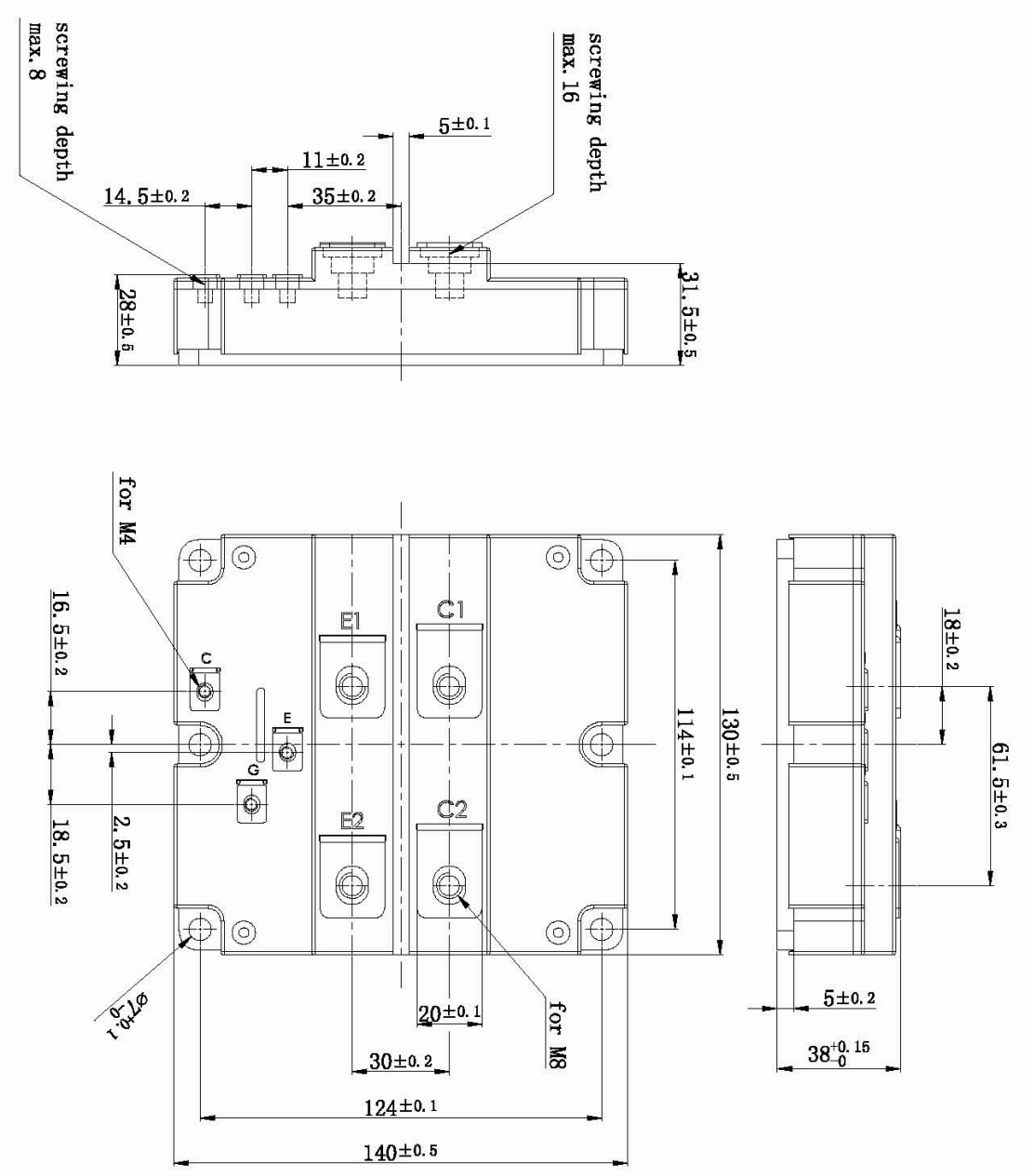


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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