STARPOWER

SEMICONDUCTOR™

IGBT

GD2400SGT120C3S Preliminary

Molding Type Module

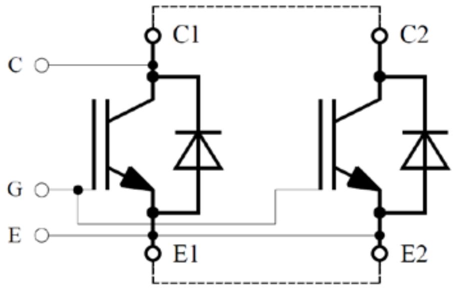
1200V/2400A 1 in one-package

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 high power converters.

Features

- Low $V_{CE(sat)}$ Trench 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
- Uninterruptible Power Supply
- Wind Turbines

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD2400SGT120C3S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	3400	A
	@ T_C=80℃	2400	
$I_{CM(1)}$	Pulsed Collector Current t_p= 1ms	4800	A
I_F	Diode Continuous Forward Current	2400	A
I_{FM}	Diode Maximum Forward Current	4800	A
P_D	Maximum power Dissipation @ T_j=150℃	9.6	kW
T_j	Maximum Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V
Mounting Torque	Signal 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	

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
$V_{(BR)CES}$	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=96mA,V_{CE}=V_{GE}, T_j=25℃	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=2400A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=2400A,V_{GE}=15V, T_j=125℃		2.00	2.45	

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	V_{GE}=-15…+15V		23.0		μC
R_{Gint}	Internal Gate Resistor	T_j=25℃		0.8		Ω
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=2400A, R_{Gon}=1.2Ω, R_{Goff}=0.3Ω V_{GE}=±15V,T_j=25℃		600		ns
t_r	Rise Time			215		ns
$t_{d(off)}$	Turn-Off Delay Time			815		ns
t_f	Fall Time			155		ns
E_{on}	Turn-On Switching Loss			/		mJ
E_{off}	Turn-Off Switching Loss			/		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=2400A, R_{Gon}=1.2Ω, R_{Goff}=0.3Ω V_{GE}=±15V,T_j=125℃		665		ns
t_r	Rise Time			235		ns
$t_{d(off)}$	Turn-Off Delay Time			970		ns
t_f	Fall Time			185		ns
E_{on}	Turn-On Switching Loss			491		mJ
E_{off}	Turn-Off Switching Loss			379		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		172		nF
C_{oes}	Output Capacitance			9.01		nF
C_{res}	Reverse Transfer Capacitance			7.81		nF
I_{SC}	SC Data	t_{SC}≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		9600		A
L_{CE}	Stray Inductance			12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			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=2400A	T_j=25℃		1.65	2.15	V
			T_j=125℃		1.65	2.15	
Q_r	Recovered Charge	I_F=2400A, V_R=600V, R_{Gon}=1.2Ω, V_{GE}=-15V	T_j=25℃		240		μC
			T_j=125℃		450		
I_{RM}	Reverse Recovery Current		T_j=25℃		1600		A
			T_j=125℃		2200		
E_{rec}	Reverse Recovery Energy		T_j=25℃		65		mJ
			T_j=125℃		120		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		13	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		23	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	6		K/kW
Weight	Weight of Module	1500		g

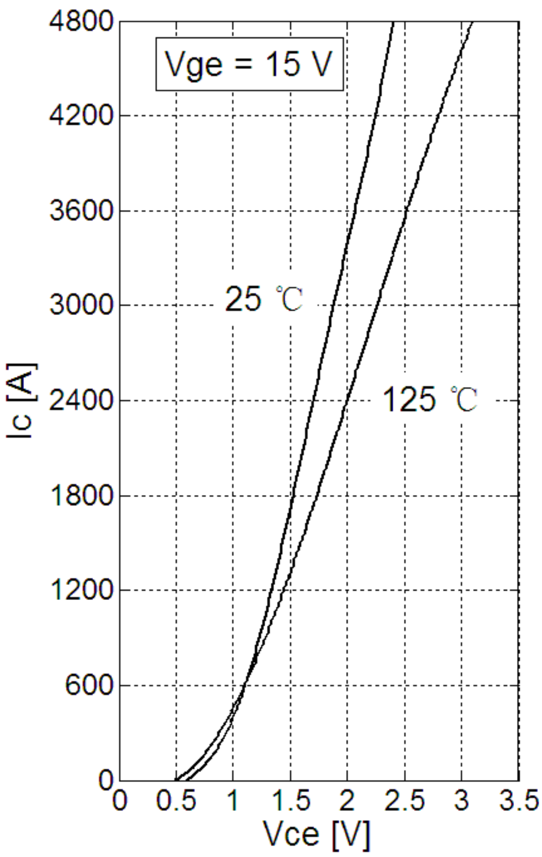


Fig 1. IGBT Typical Output Characteristics

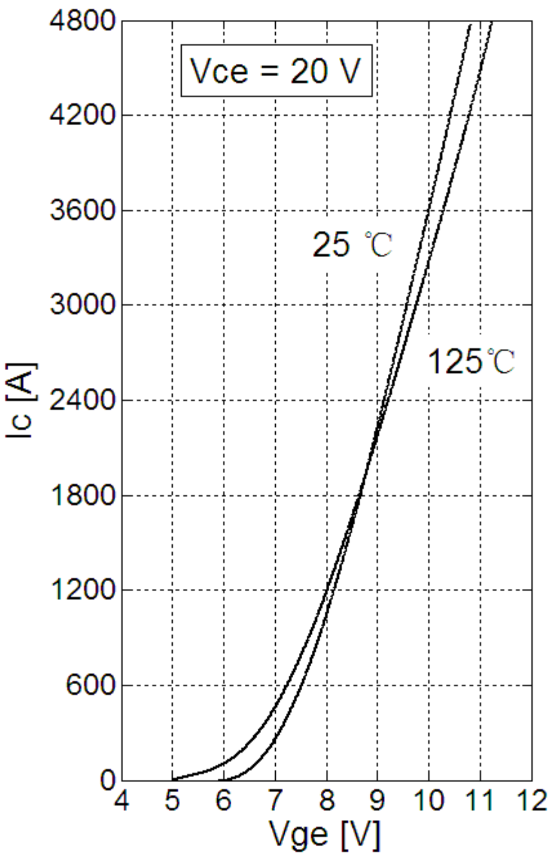


Fig 2. IGBT Typical Transfer Characteristics

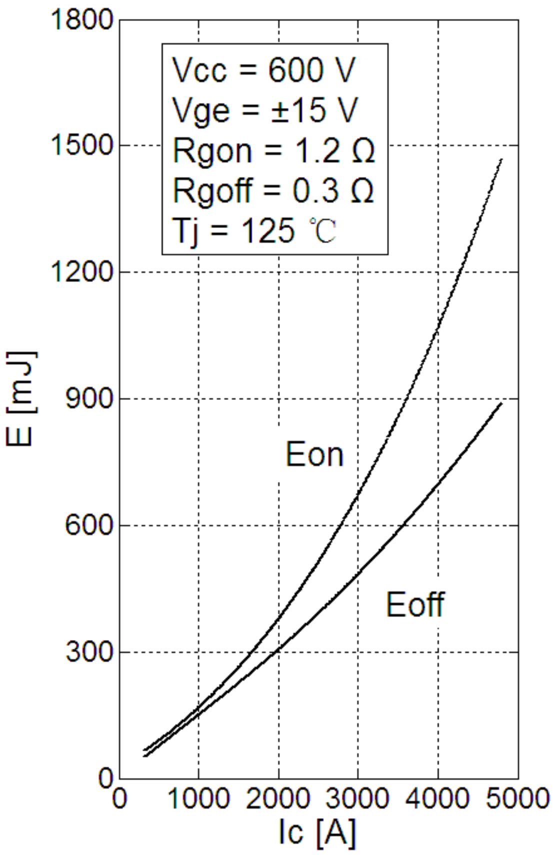


Fig 3. IGBT Switching Loss vs. I_C

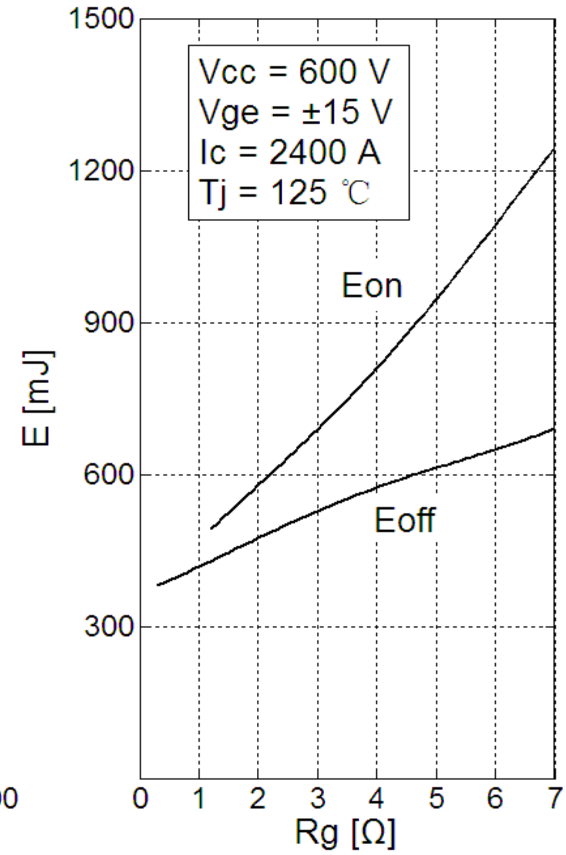


Fig 4. IGBT Switching Loss vs. R_G

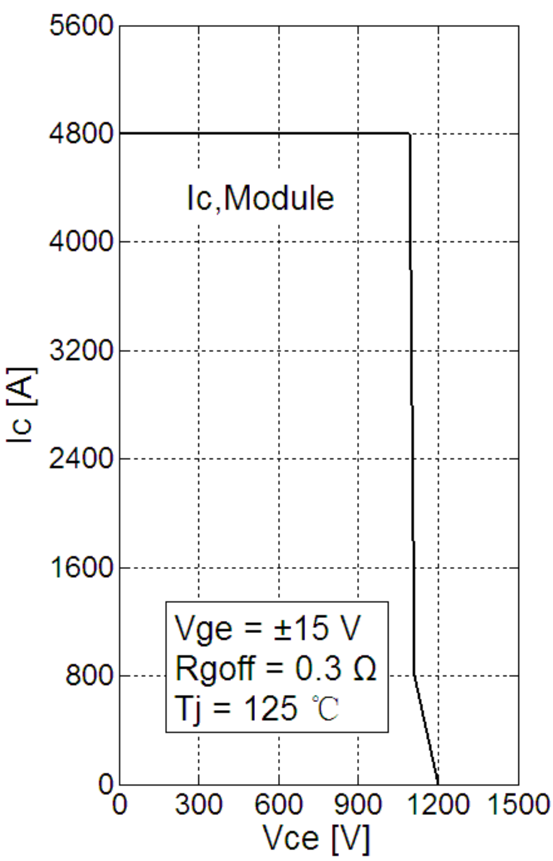


Fig 5. RBSOA

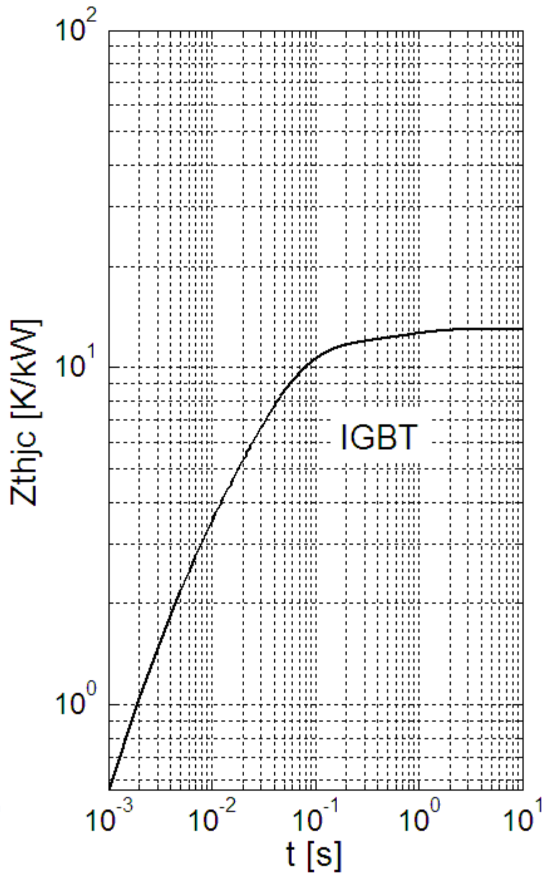


Fig 6. IGBT Transient Thermal Impedance

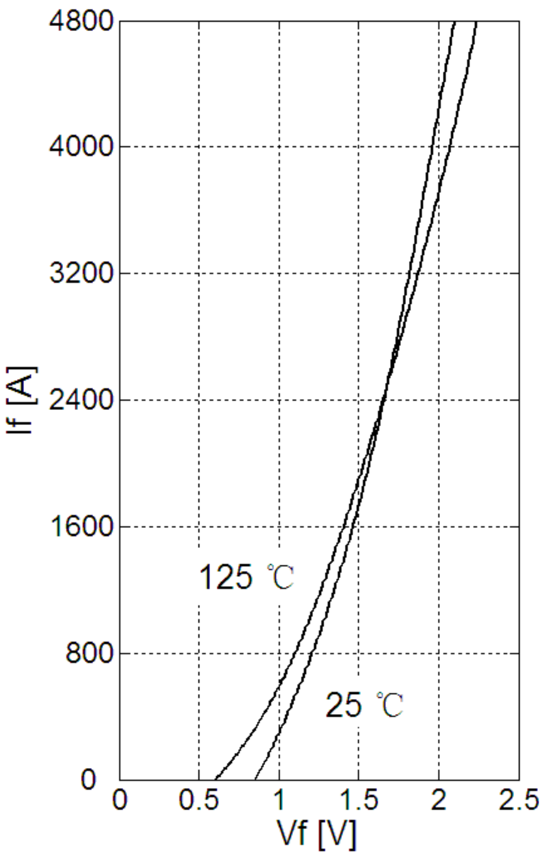


Fig 7. Diode Typical Forward Characteristics

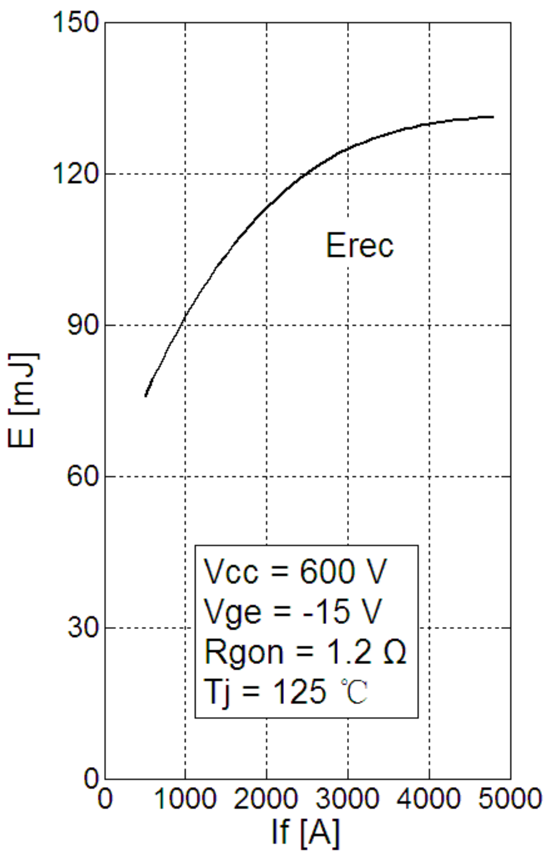


Fig 8. Diode Switching Loss vs. I_F

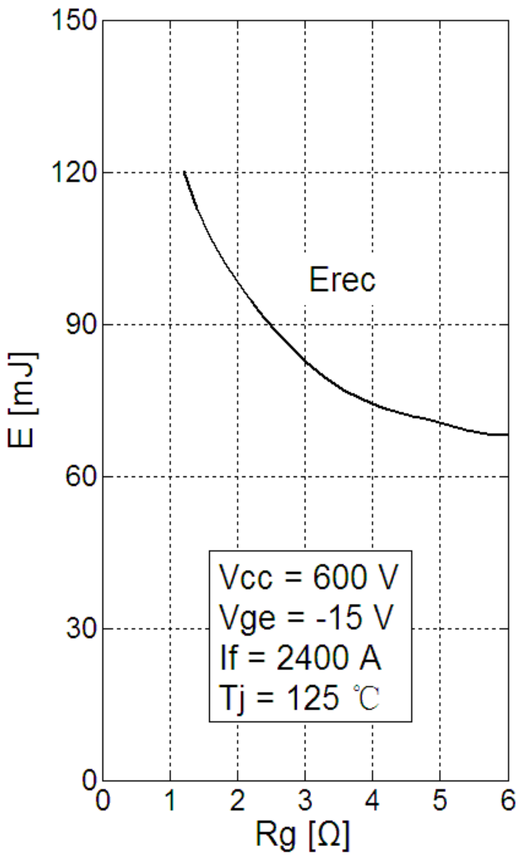


Fig 9. Diode Switching Loss vs. R_G

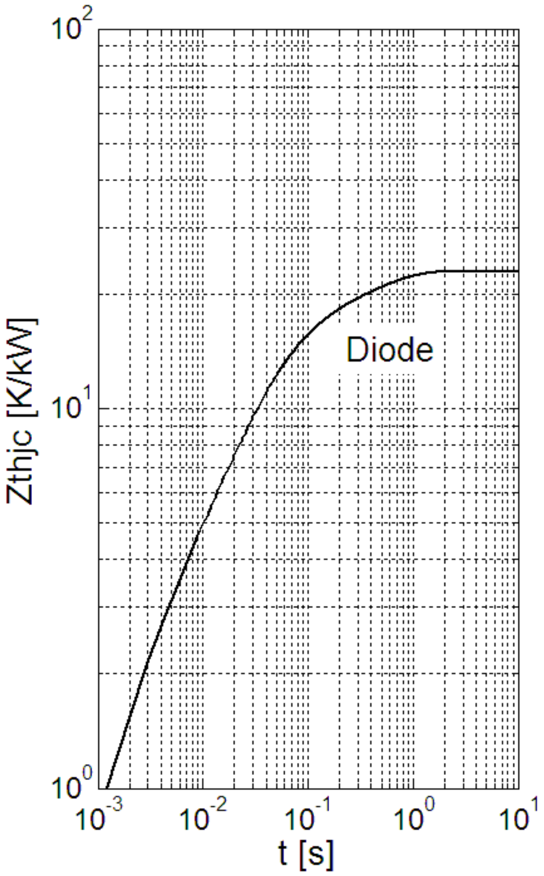
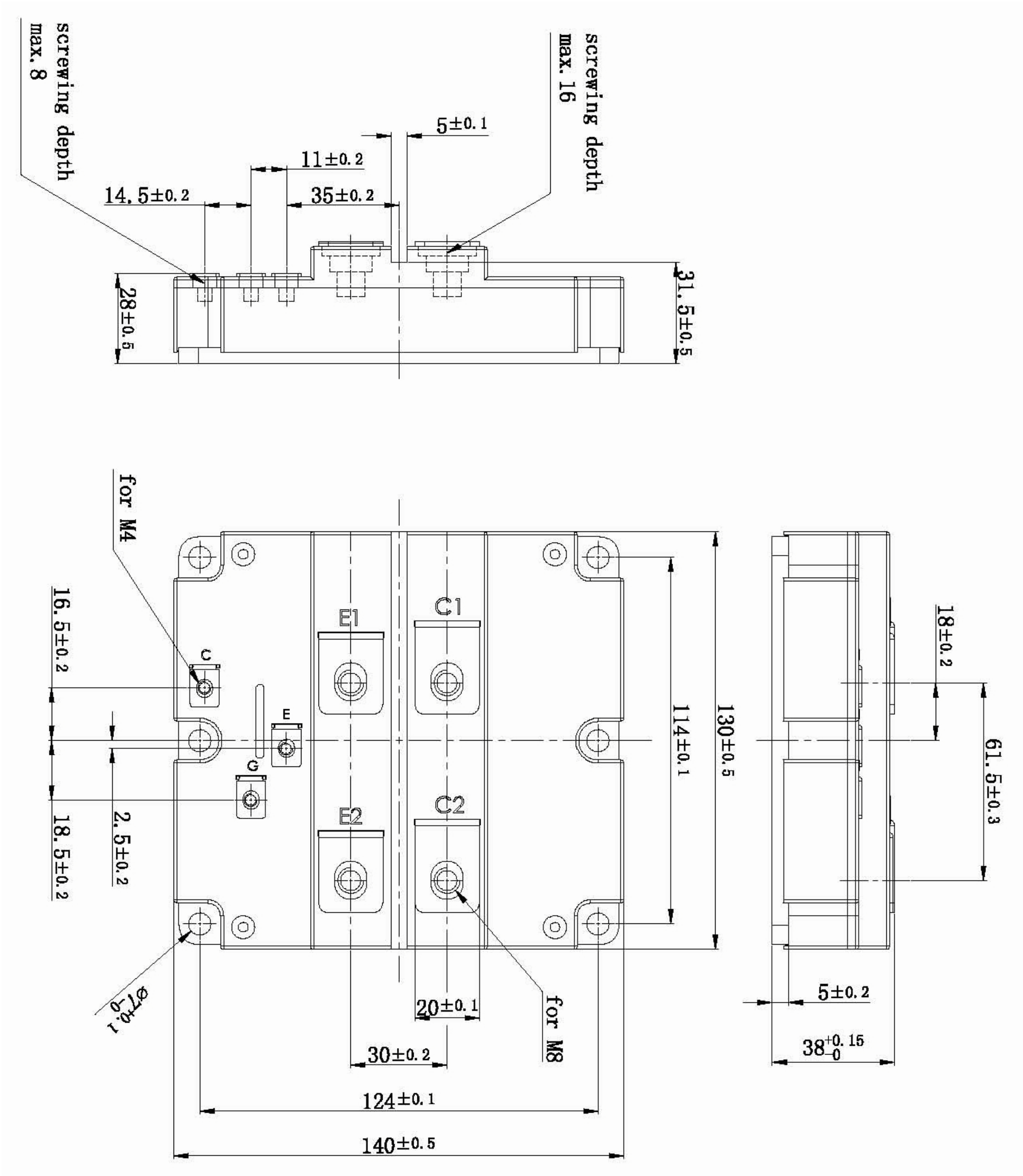


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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