

STARPOWER

SEMICONDUCTOR™

IGBT

GD1600SGT120C3S

Molding Type Module

1200V/1600A 1 in one-package

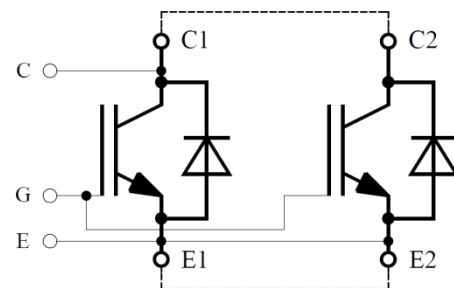
General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as high power converters.



Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s 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



Equivalent Circuit Schematic

Typical Applications

- High Power Converters
- Motor Drivers
- Wind Turbines

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Description	GD1600SGT120C3S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=80^\circ\text{C}$	2600 1600	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	3200	A
I_F	Diode Continuous Forward Current @ $T_C=80^\circ\text{C}$	1600	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	3200	A
P_D	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	8.43	kW
T_{jmax}	Maximum Junction Temperature	175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	4000	V
Mounting Torque	Signal Terminal Screw:M4 Power Terminal Screw:M8 Mounting Screw:M6	1.8 to 2.1 8.0 to 10 4.25 to 5.75	N.m

Electrical Characteristics of IGBT $T_C=25^\circ\text{C}$ unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}$, $V_{GE}=0\text{V}$, $T_j=25^\circ\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}$, $V_{CE}=0\text{V}$, $T_j=25^\circ\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=64\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^\circ\text{C}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=1600\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^\circ\text{C}$		1.70	2.15	V
		$I_C=1600\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$		2.00		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=1600A,$ $R_{Gon}=1.6\Omega, R_{Goff}=0.2\Omega,$ $V_{GE}=\pm 15V, T_j=25^\circ C$		601		ns
t_r	Rise Time			225		ns
$t_{d(off)}$	Turn-Off Delay Time			830		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	$V_{CC}=600V, I_C=1600A,$ $R_{Gon}=1.6\Omega, R_{Goff}=0.2\Omega,$ $V_{GE}=\pm 15V, T_j=125^\circ C$		665		ns
t_r	Rise Time			225		ns
$t_{d(off)}$	Turn-Off Delay Time			970		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			326		mJ
E_{off}	Turn-Off Switching Loss			251		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		115		nF
C_{oes}	Output Capacitance			6.03		nF
C_{res}	Reverse Transfer Capacitance			5.23		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		6400		A
R_{Gint}	Internal Gate Resistance			1.6		Ω
L_{CE}	Stray Inductance			15		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.10		m Ω

Electrical Characteristics of DIODE $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=1600A$	$T_j=25^\circ C$	1.65	2.05	V
			$T_j=125^\circ C$	1.65		
Q_r	Recovered Charge	$I_F=1600A,$	$T_j=25^\circ C$	160		μC
			$T_j=125^\circ C$	300		
I_{RM}	Peak Reverse Recovery Current	$V_R=600V,$ $R_G=0.45\Omega,$	$T_j=25^\circ C$	1100		A
			$T_j=125^\circ C$	1400		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	72		mJ
			$T_j=125^\circ C$	136		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		17.8	K/kW
$R_{\theta JC}$	Junction-to-Case (per DIODE)		31.0	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	6		K/kW
Weight	Weight of Module	1500		g

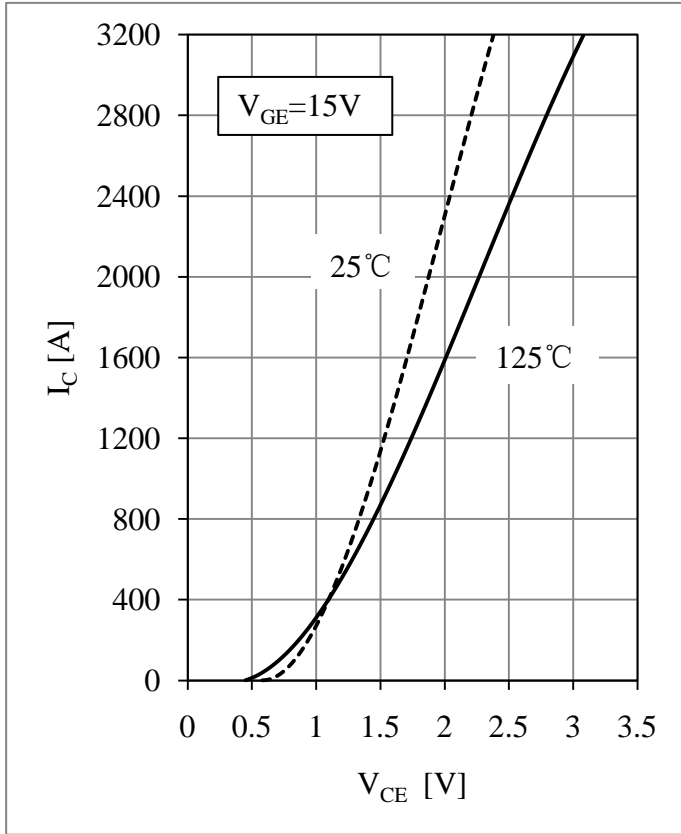


Fig 1. IGBT Output Characteristics

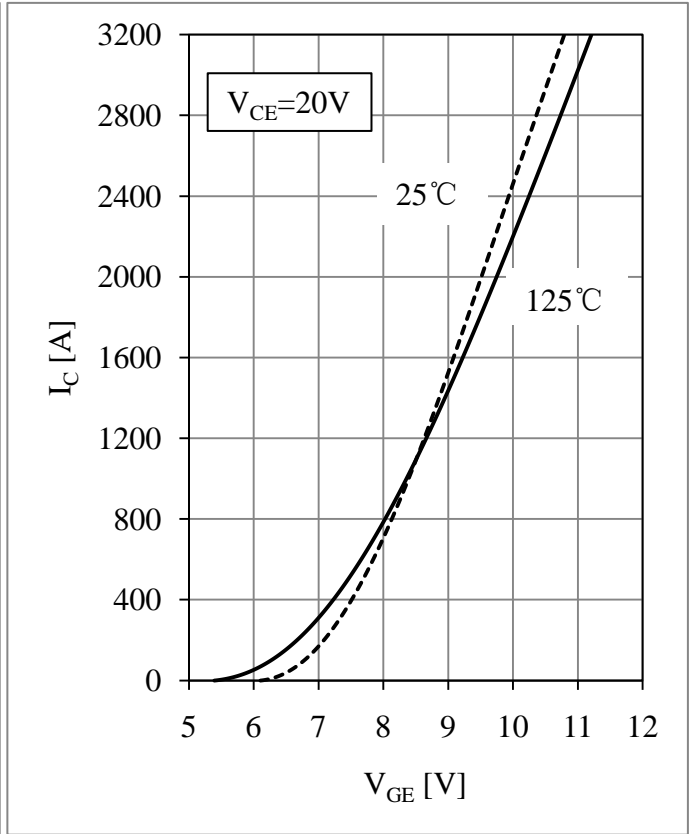


Fig 2. IGBT Transfer Characteristics

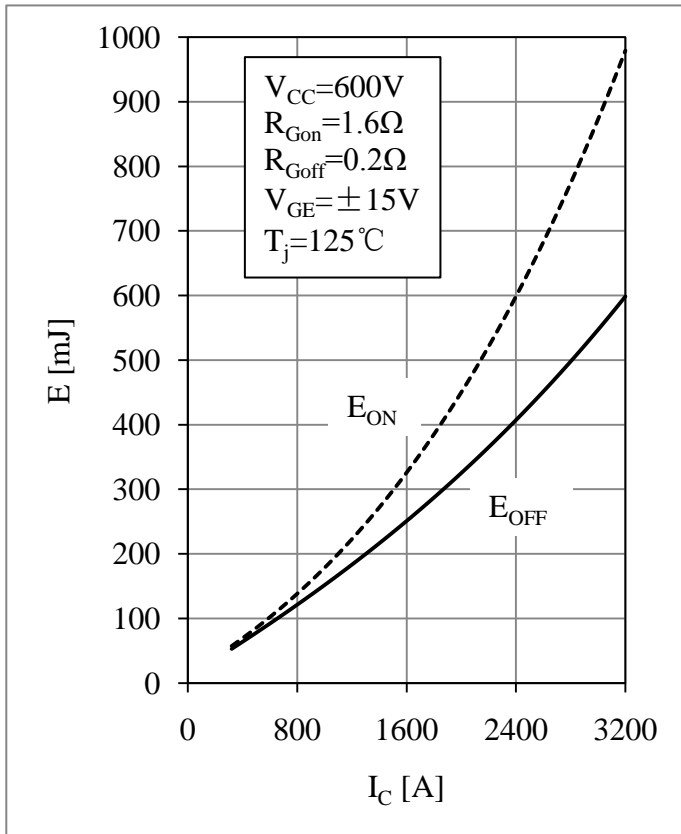


Fig 3. IGBT Switching Loss vs. I_C

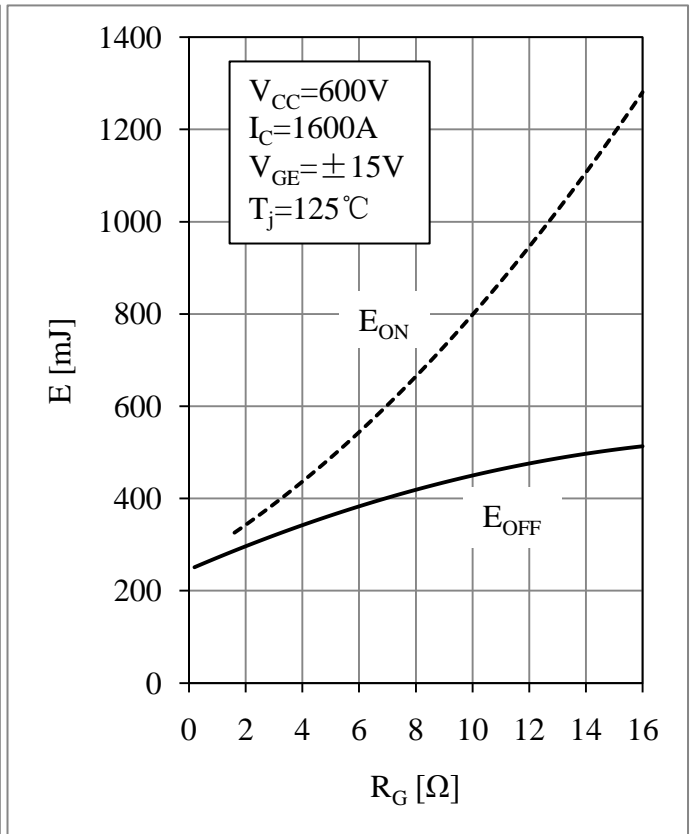


Fig 4. IGBT Switching Loss vs. R_G

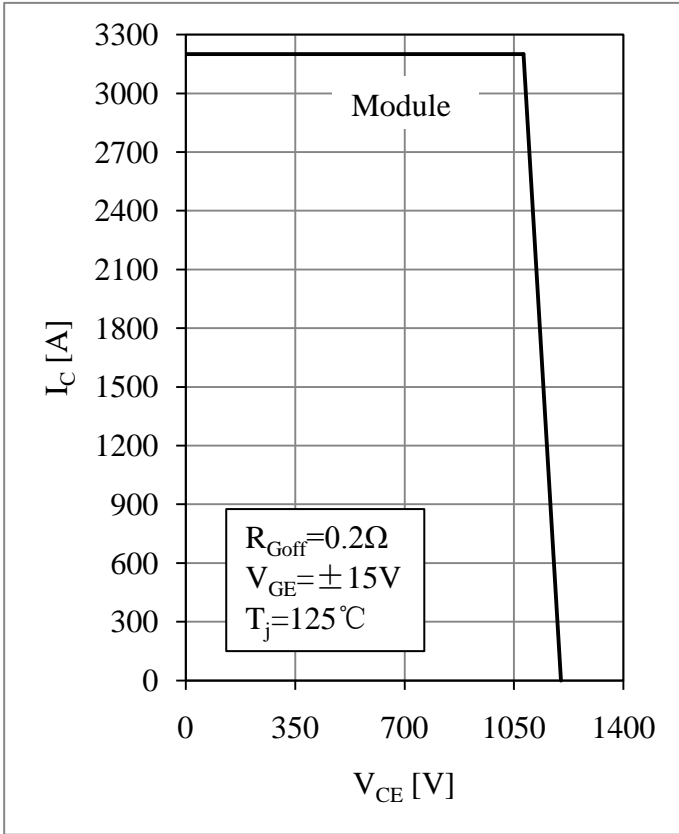


Fig 5. RBSOA

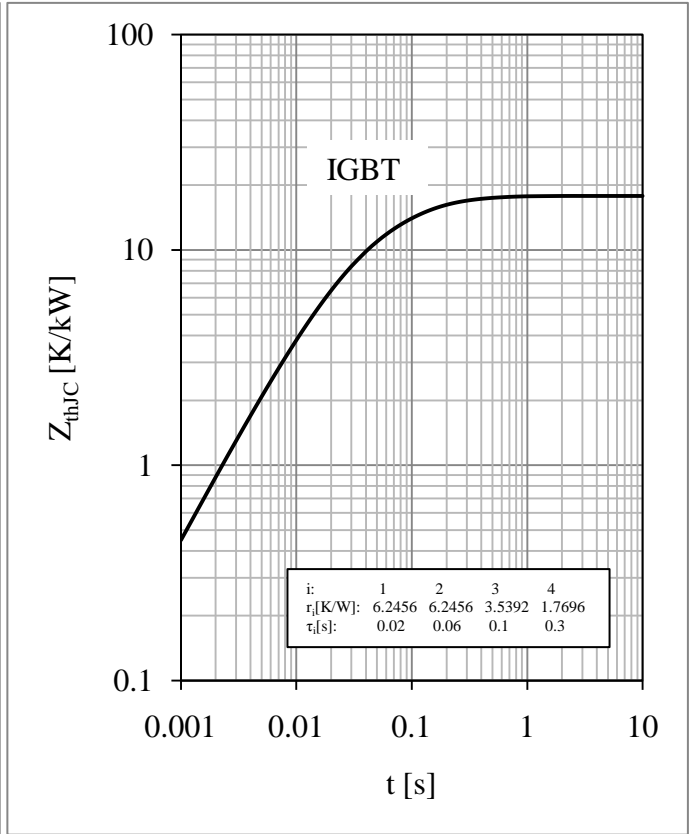


Fig 6. IGBT Transient Thermal Impedance

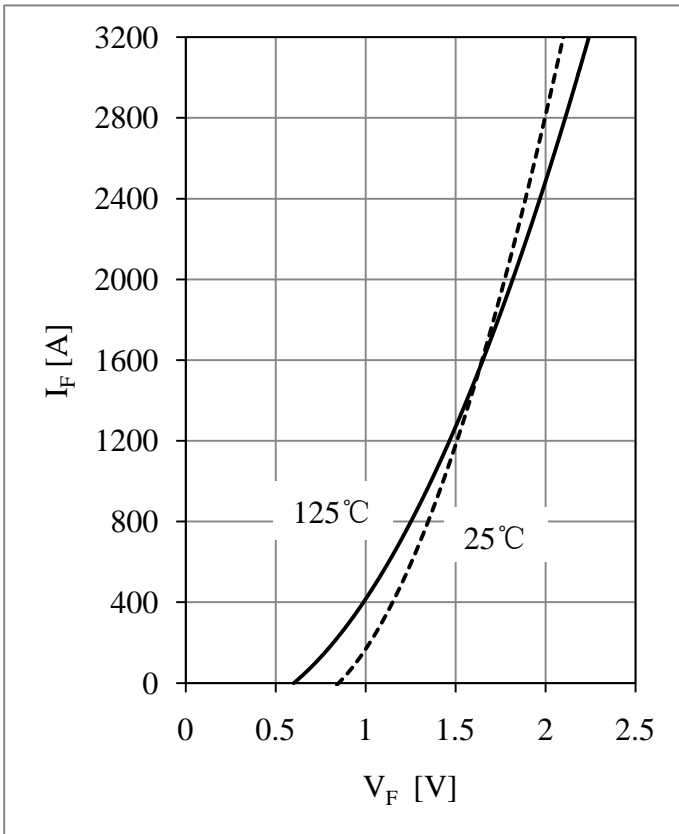


Fig 7. Diode Forward Characteristics

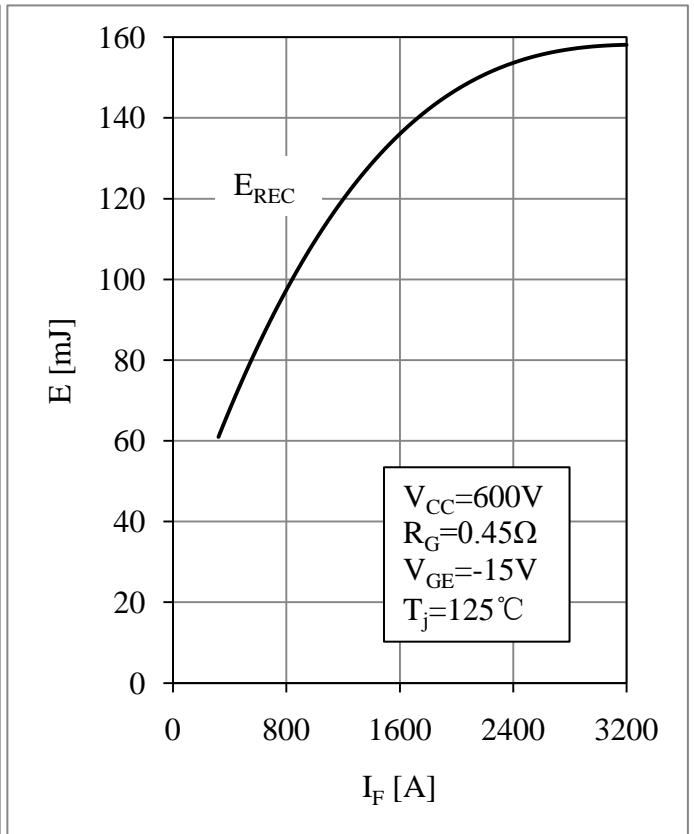


Fig 8. Diode Switching Loss vs. I_F

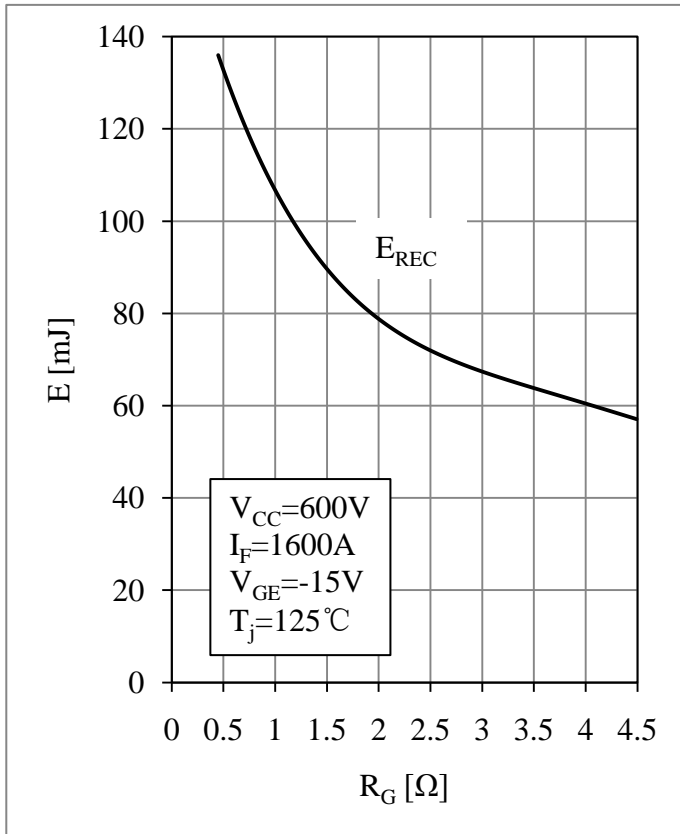


Fig 9. Diode Switching Loss vs. R_G

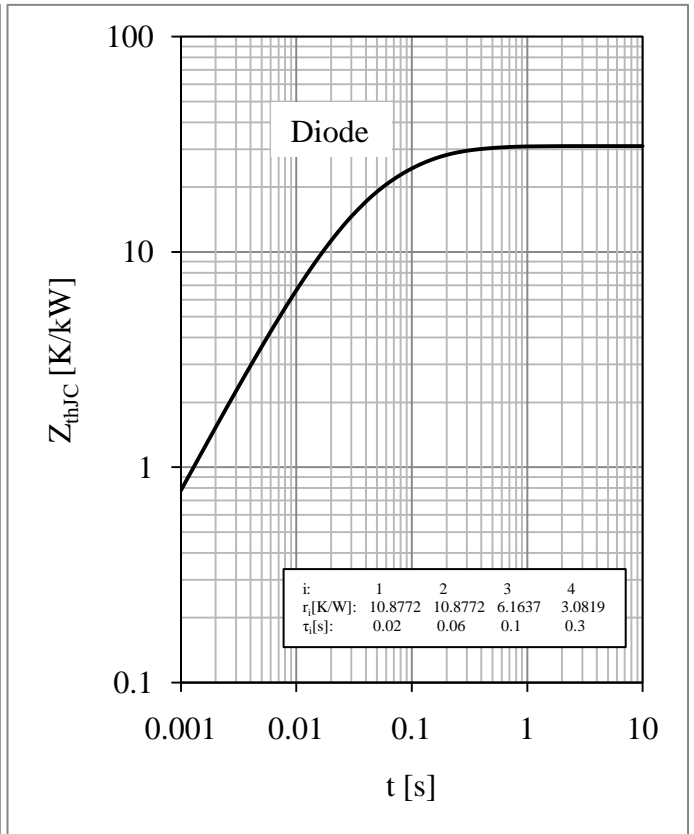
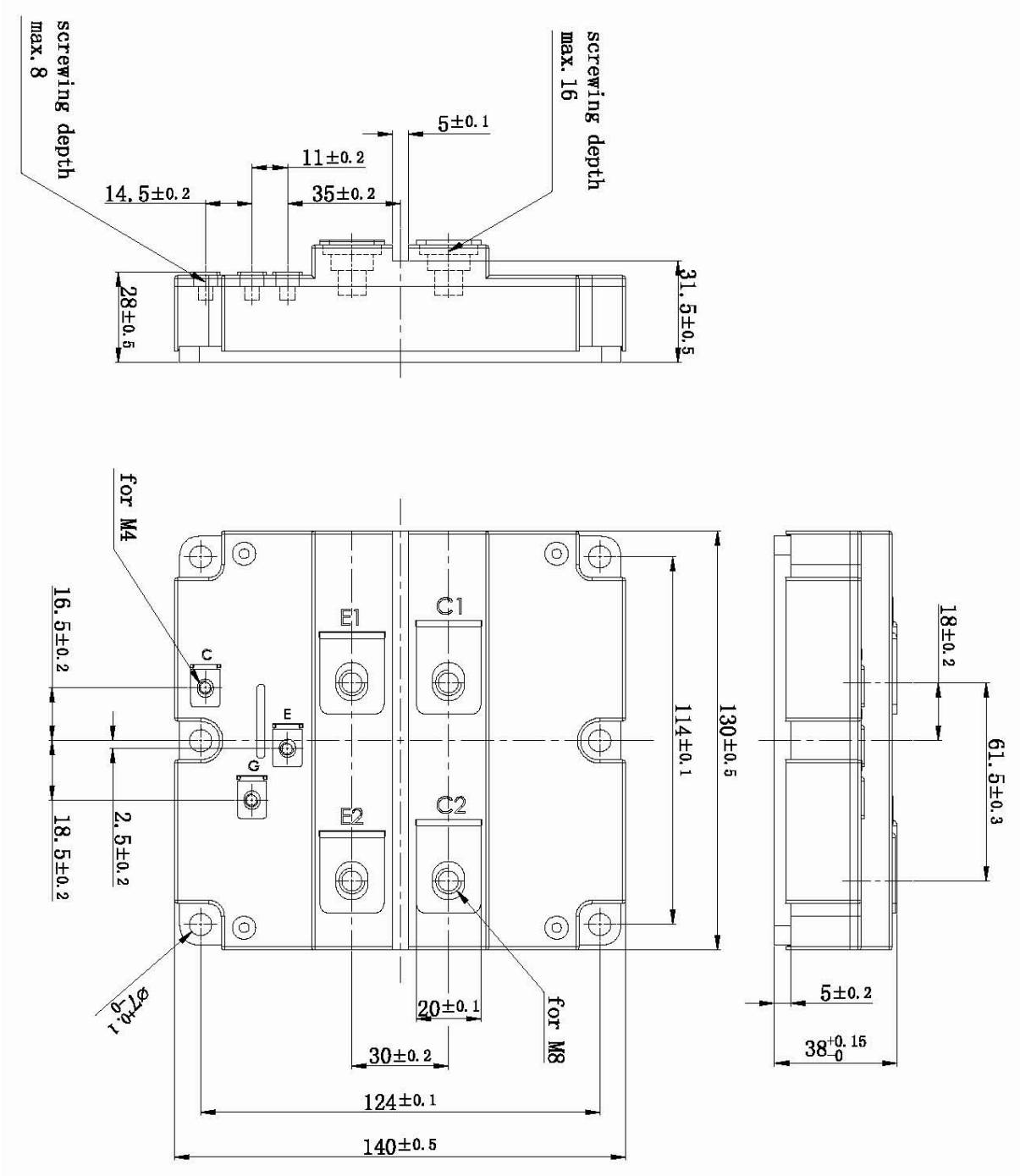


Fig 10. Diode Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



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