STARPOWER

SEMICONDUCTOR **IGBT**

GD1600SGX170C3S

1700V/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.

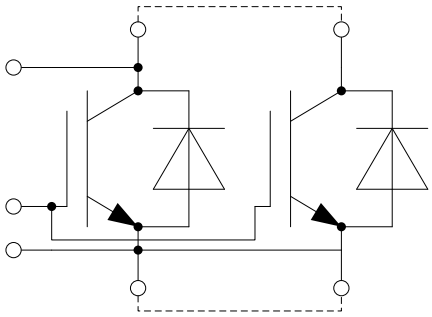
Features

- Low $V_{CE(sat)}$ 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

Typical Applications

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

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=90°C	2331 1600	A
I_{CM}	Pulsed Collector Current t_p=1ms	3200	A
P_D	Maximum Power Dissipation @ T_j=175°C	8.02	KW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	1600	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	3200	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

IGBT Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=1600A,V_{GE}=15V, T_j=25°C		1.85	2.20	V
		I_C=1600A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=1600A,V_{GE}=15V, T_j=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=64.0mA,V_{CE}=V_{GE}, T_j=25°C	5.6	6.2	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			1.0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		193		nF
C_{res}	Reverse Transfer Capacitance			4.68		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		15.1		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1600A, R_{Gon}=0.8Ω, R_{Goff}=0.6Ω, V_{GE}=±15V,T_j=25°C		417		ns
t_r	Rise Time			122		ns
$t_{d(off)}$	Turn-Off Delay Time			848		ns
t_f	Fall Time			150		ns
E_{on}	Turn-On Switching Loss			285		mJ
E_{off}	Turn-Off Switching Loss			252		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1600A, R_{Gon}=0.8Ω, R_{Goff}=0.6Ω, V_{GE}=±15V,T_j=125°C		478		ns
t_r	Rise Time			133		ns
$t_{d(off)}$	Turn-Off Delay Time			899		ns
t_f	Fall Time			226		ns
E_{on}	Turn-On Switching Loss			430		mJ
E_{off}	Turn-Off Switching Loss			428		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1600A, R_{Gon}=0.8Ω, R_{Goff}=0.6Ω, V_{GE}=±15V,T_j=150°C		493		ns
t_r	Rise Time			136		ns
$t_{d(off)}$	Turn-Off Delay Time			912		ns
t_f	Fall Time			245		ns
E_{on}	Turn-On Switching Loss			466		mJ
E_{off}	Turn-Off Switching Loss			473		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		6400		A

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=1600A,V_{GE}=0V, T_j=25°C		1.80	2.25	V
		I_F=1600A,V_{GE}=0V, T_j=125°C		1.90		
		I_F=1600A,V_{GE}=0V, T_j=150°C		1.95		
Q_r	Recovered Charge	V_{CC}=900V,I_F=1600A, -di/dt=10700A/μs, V_{GE}=±15V, T_j=25°C		429		μC
I_{RM}	Peak Reverse Recovery Current			1815		A
E_{rec}	Reverse Recovery Energy			270		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=1600A, -di/dt=10700A/μs, V_{GE}=±15V, T_j=125°C		748		μC
I_{RM}	Peak Reverse Recovery Current			1900		A
E_{rec}	Reverse Recovery Energy			517		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=1600A, -di/dt=10700A/μs, V_{GE}=±15V, T_j=150°C		842		μC
I_{RM}	Peak Reverse Recovery Current			1950		A
E_{rec}	Reverse Recovery Energy			600		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.19		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			18.7 31.0	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		9.6 15.9 6.0		K/kW
M	Power Terminal Screw:M4 Power Terminal Screw:M8 Mounting Screw:M6	1.8 8.0 4.25		2.1 10.0 5.75	N.m
G	Weight of Module		1500		g

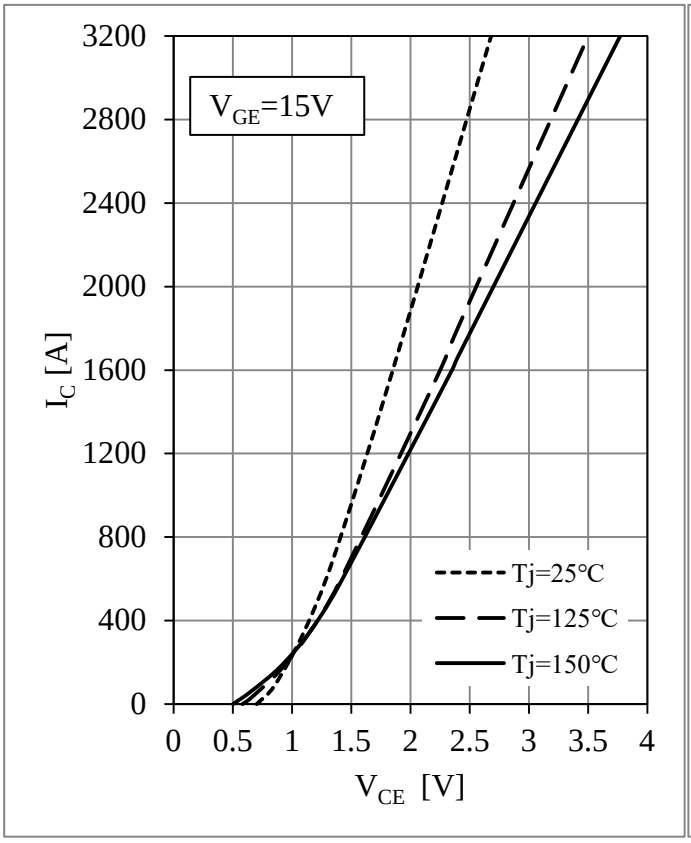


Fig 1. IGBT Output Characteristics

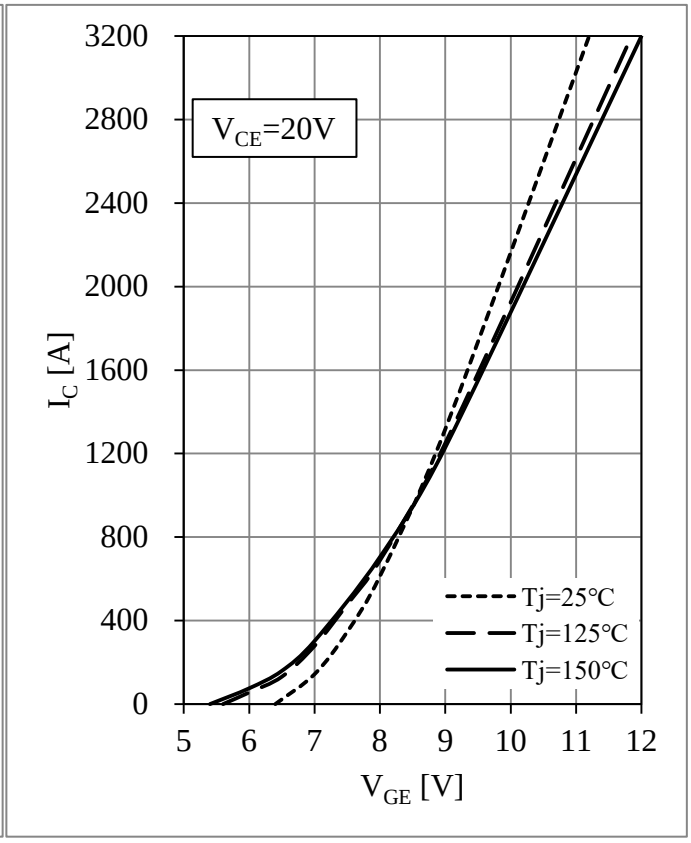


Fig 2. IGBT Transfer Characteristics

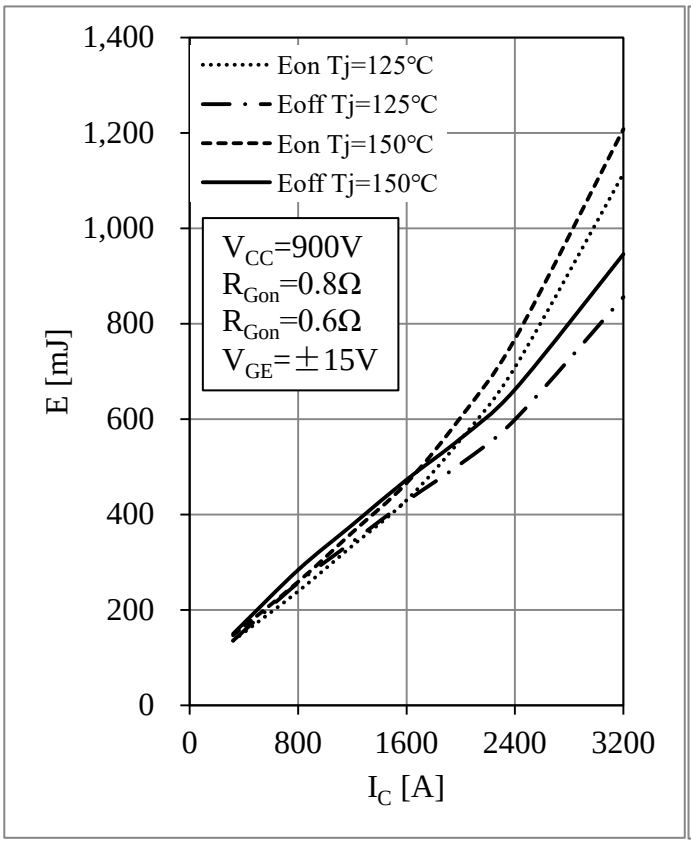


Fig 3. IGBT Switching Loss vs. I_C

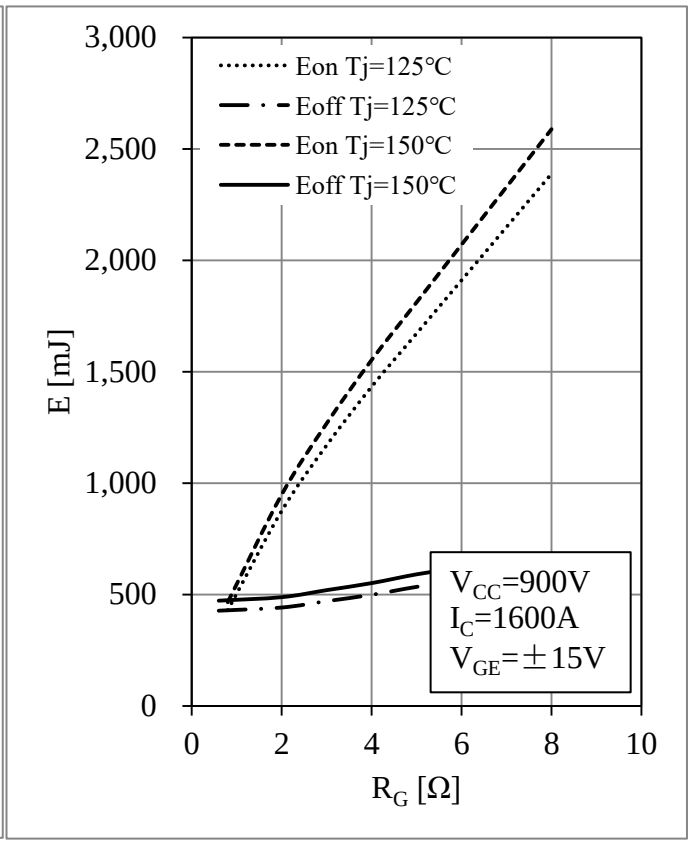


Fig 4. IGBT Switching Loss vs. R_G

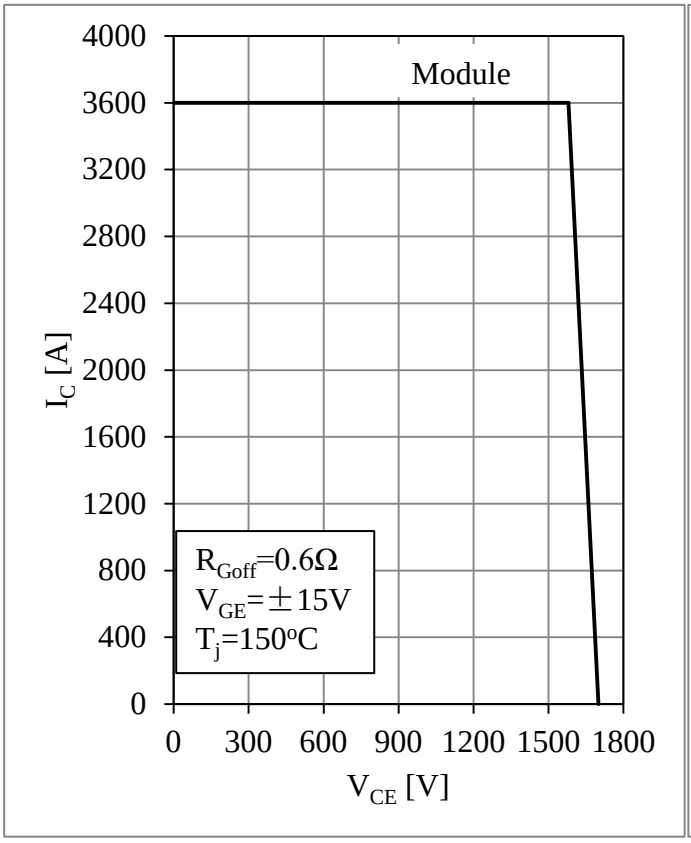


Fig 5. RBSOA

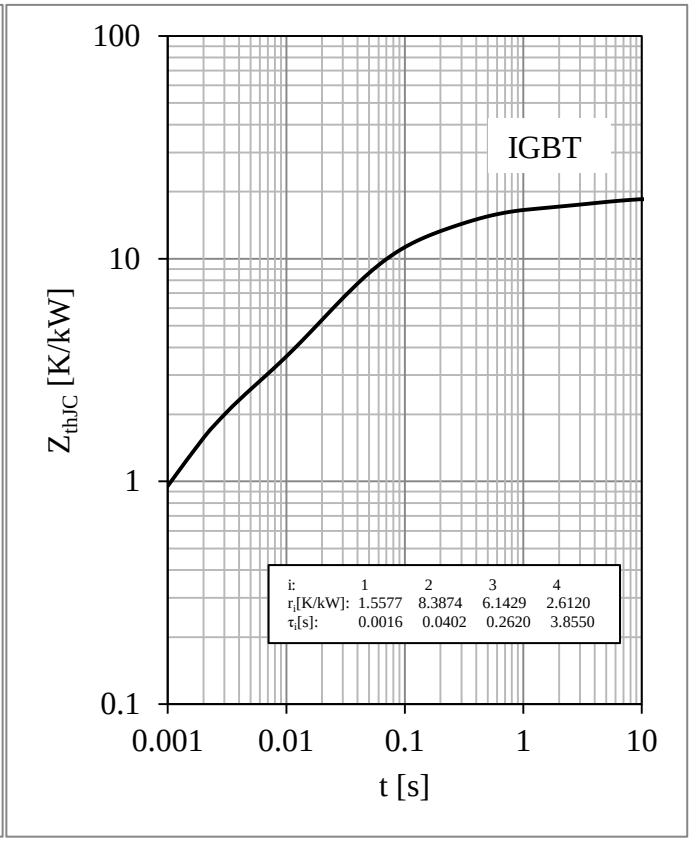


Fig 6. IGBT Transient Thermal Impedance

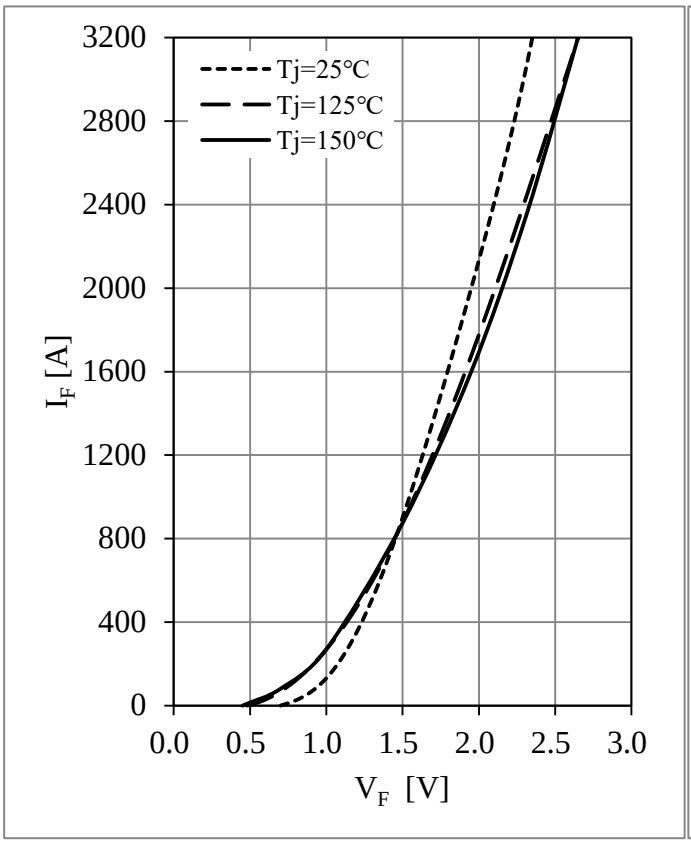


Fig 7. Diode Forward Characteristics

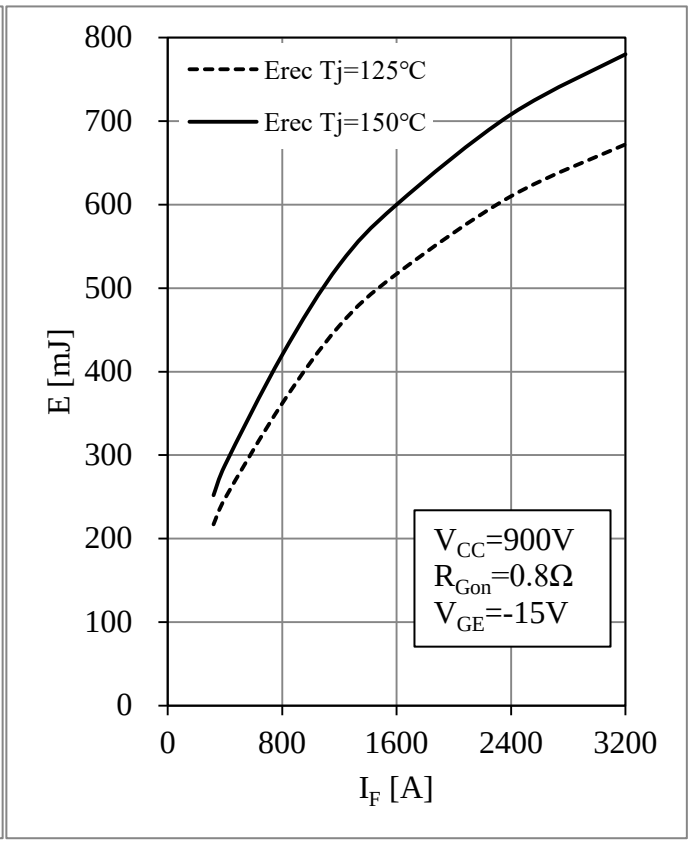


Fig 8. Diode Switching Loss vs. I_F

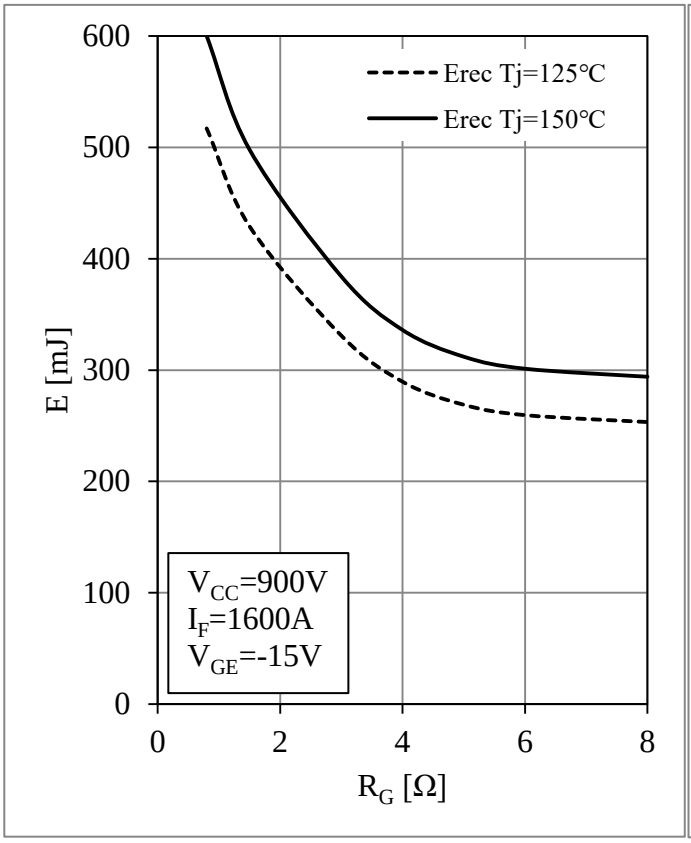


Fig 9. Diode Switching Loss vs. R_G

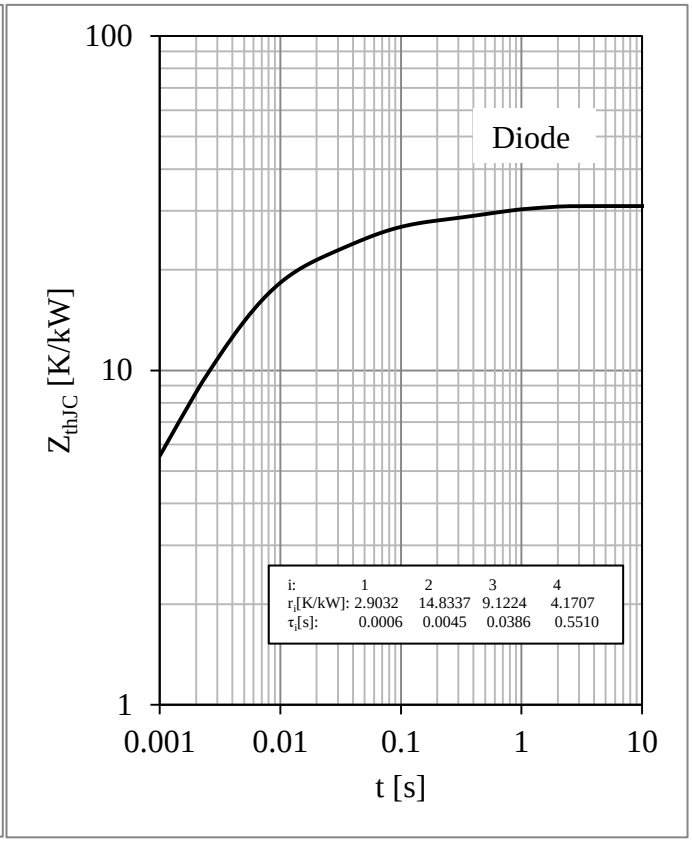
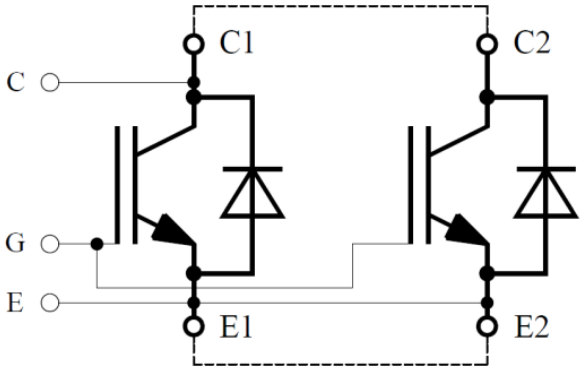


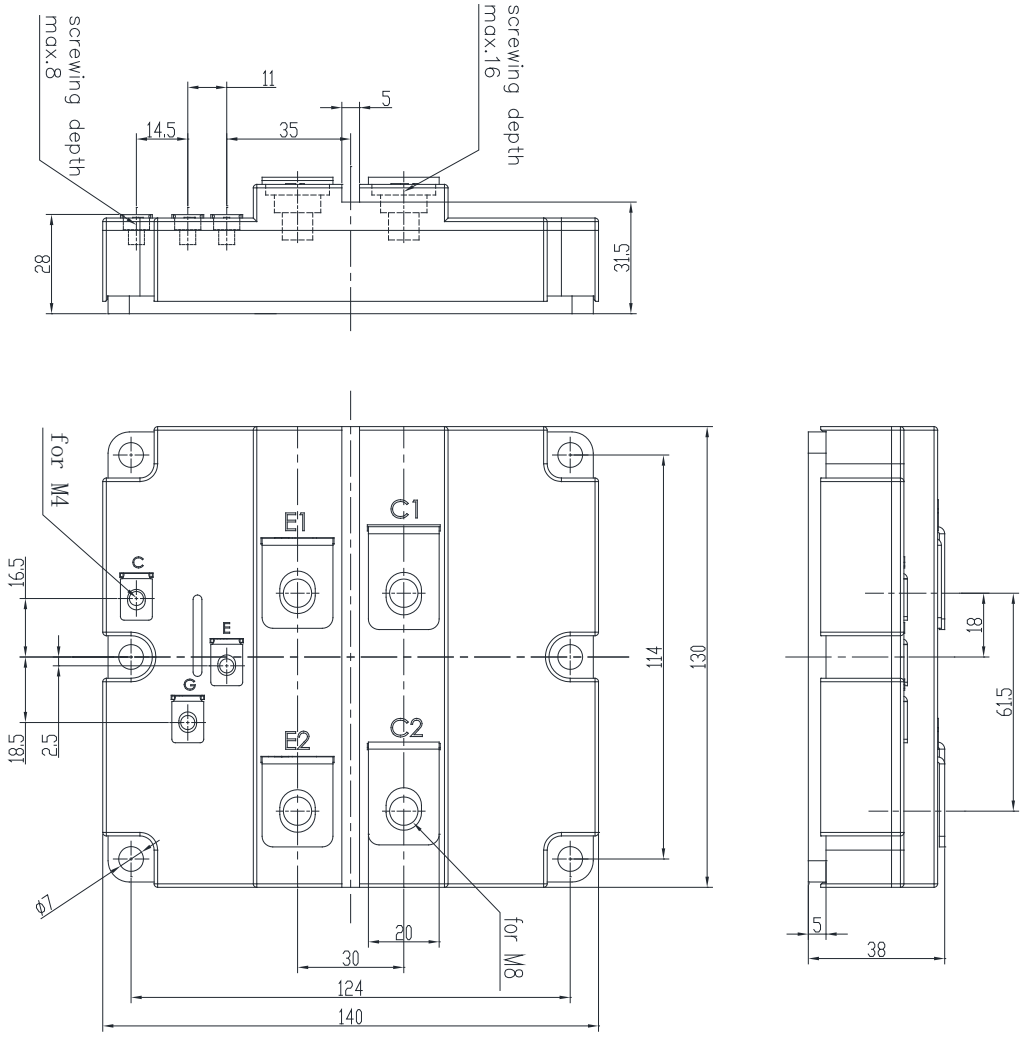
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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