STARPOWER

SEMICONDUCTOR **IGBT**

GD1200SGX170A3S

1700V/1200A 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.

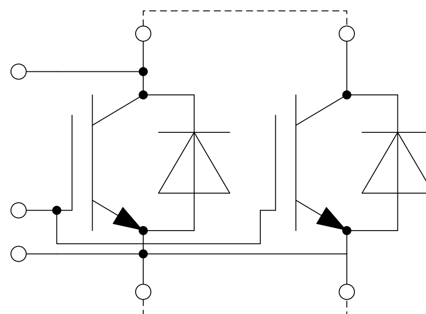
Features

- 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
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance

Typical Applications

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

Equivalent Circuit Schematic



©2021 STARPOWER Semiconductor Ltd.

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=100°C	2206 1200	A
I_{CM}	Pulsed Collector Current t_p=1ms	2400	A
P_D	Maximum Power Dissipation @ T_j=175°C	8.77	KW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	1200	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	2400	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=1200A,V_{GE}=15V, T_j=25°C		1.85	2.20	V
		I_C=1200A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=1200A,V_{GE}=15V, T_j=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=48.0mA,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		145		nF
C_{res}	Reverse Transfer Capacitance			3.51		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		11.3		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1200A, R_G=1.0Ω, V_{GE}=-9/+15V, L_S=65nH,T_j=25°C		440		ns
t_r	Rise Time			112		ns
$t_{d(off)}$	Turn-Off Delay Time			1200		ns
t_f	Fall Time			317		ns
E_{on}	Turn-On Switching Loss			271		mJ
E_{off}	Turn-Off Switching Loss			295		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1200A, R_G=1.0Ω, V_{GE}=-9/+15V, L_S=65nH,T_j=125°C		542		ns
t_r	Rise Time			153		ns
$t_{d(off)}$	Turn-Off Delay Time			1657		ns
t_f	Fall Time			385		ns
E_{on}	Turn-On Switching Loss			513		mJ
E_{off}	Turn-Off Switching Loss			347		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1200A, R_G=1.0Ω, V_{GE}=-9/+15V, L_S=65nH,T_j=150°C		547		ns
t_r	Rise Time			165		ns
$t_{d(off)}$	Turn-Off Delay Time			1695		ns
t_f	Fall Time			407		ns
E_{on}	Turn-On Switching Loss			573		mJ
E_{off}	Turn-Off Switching Loss			389		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		4800		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=1200A,V_{GE}=0V, T_j=25°C		1.80	2.25	V
		I_F=1200A,V_{GE}=0V, T_j=125°C		1.90		
		I_F=1200A,V_{GE}=0V, T_j=150°C		1.95		
Q_r	Recovered Charge	V_{CC}=900V,I_F=1200A, -di/dt=10500A/μs,V_{GE}=-9V, L_S=65nH,T_j=25°C		190		μC
I_{RM}	Peak Reverse Recovery Current			844		A
E_{rec}	Reverse Recovery Energy			192		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=1200A, -di/dt=7050A/μs,V_{GE}=-9V, L_S=65nH,T_j=125°C		327		μC
I_{RM}	Peak Reverse Recovery Current			1094		A
E_{rec}	Reverse Recovery Energy			263		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=1200A, -di/dt=6330A/μs,V_{GE}=-9V, L_S=65nH,T_j=150°C		368		μC
I_{RM}	Peak Reverse Recovery Current			1111		A
E_{rec}	Reverse Recovery Energy			275		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)			17.1 26.2	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		9.9 15.2 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		1050		g

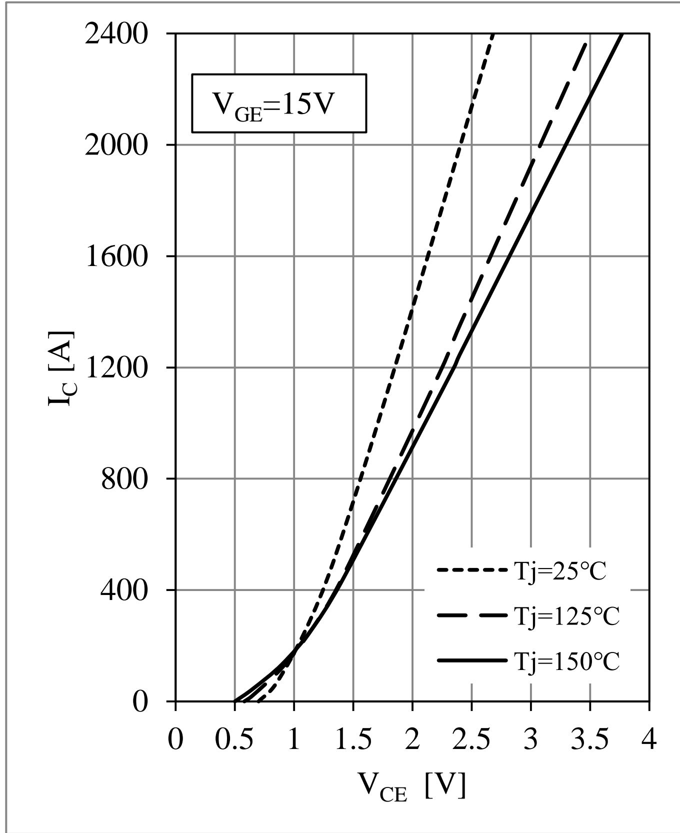


Fig 1. IGBT Output Characteristics

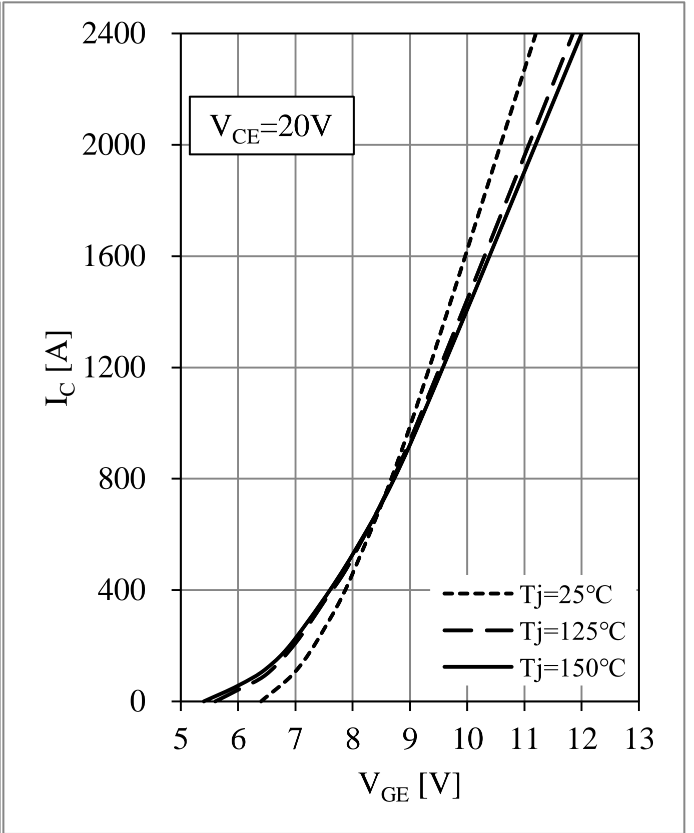


Fig 2. IGBT Transfer Characteristics

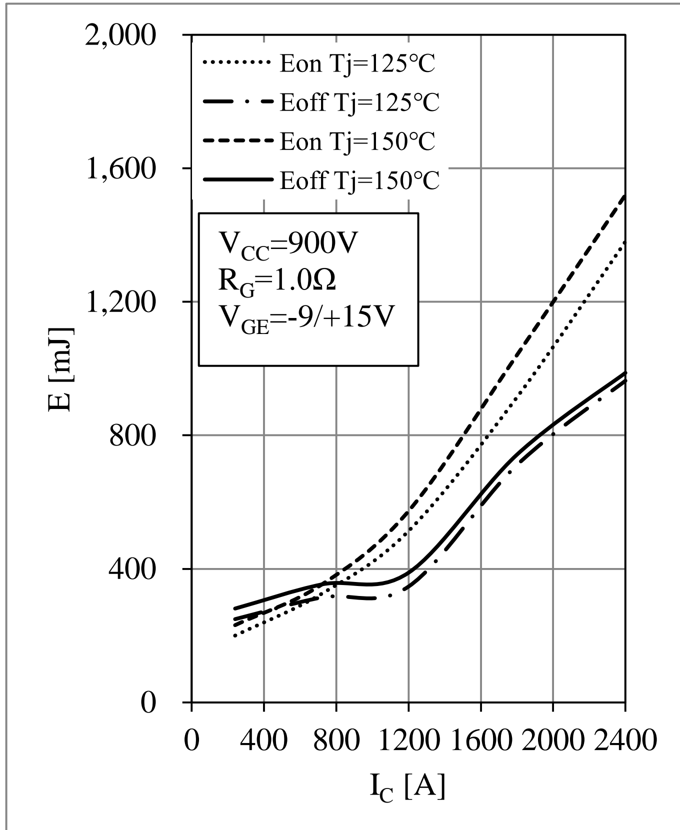


Fig 3. IGBT Switching Loss vs. I_C

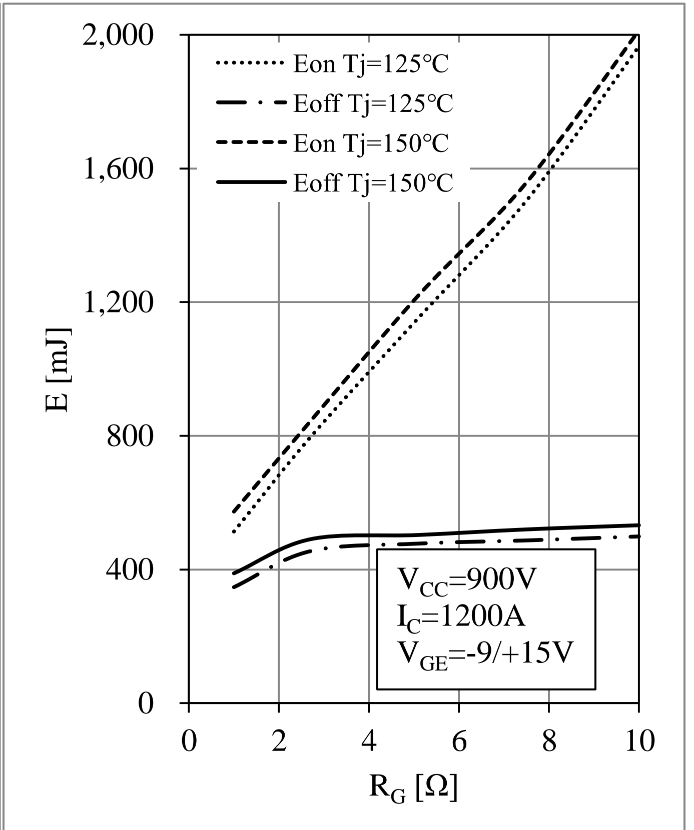


Fig 4. IGBT Switching Loss vs. R_G

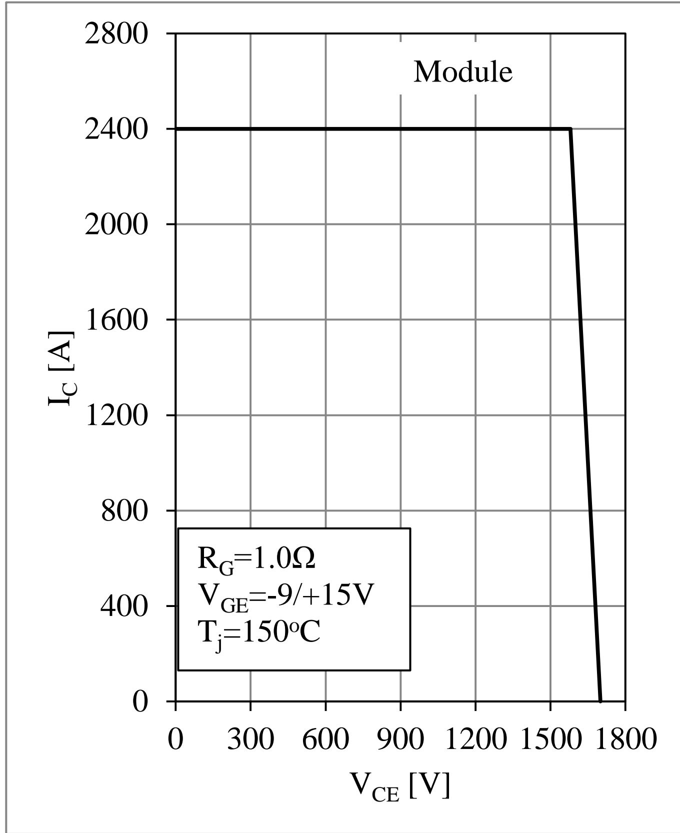


Fig 5. RBSOA

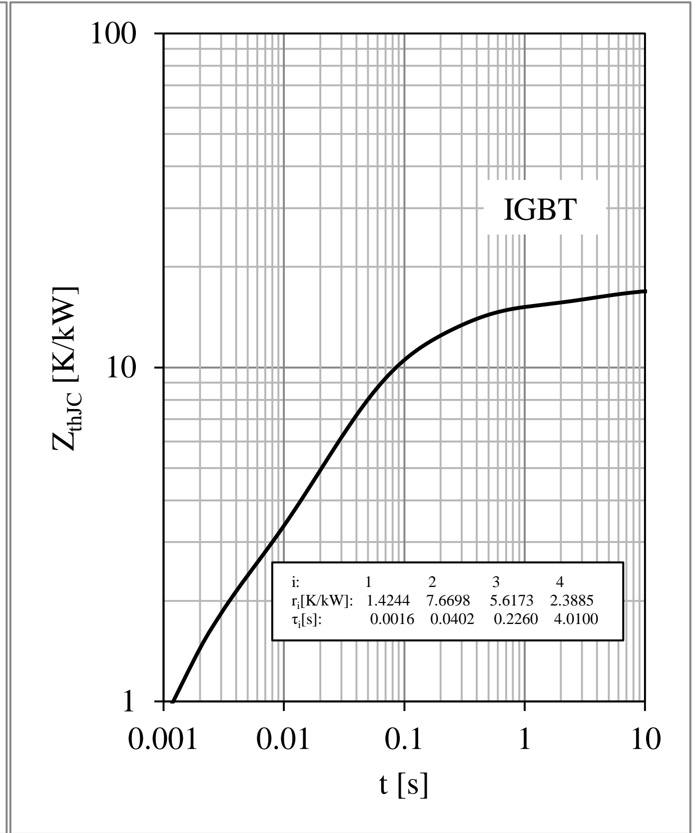


Fig 6. IGBT Transient Thermal Impedance

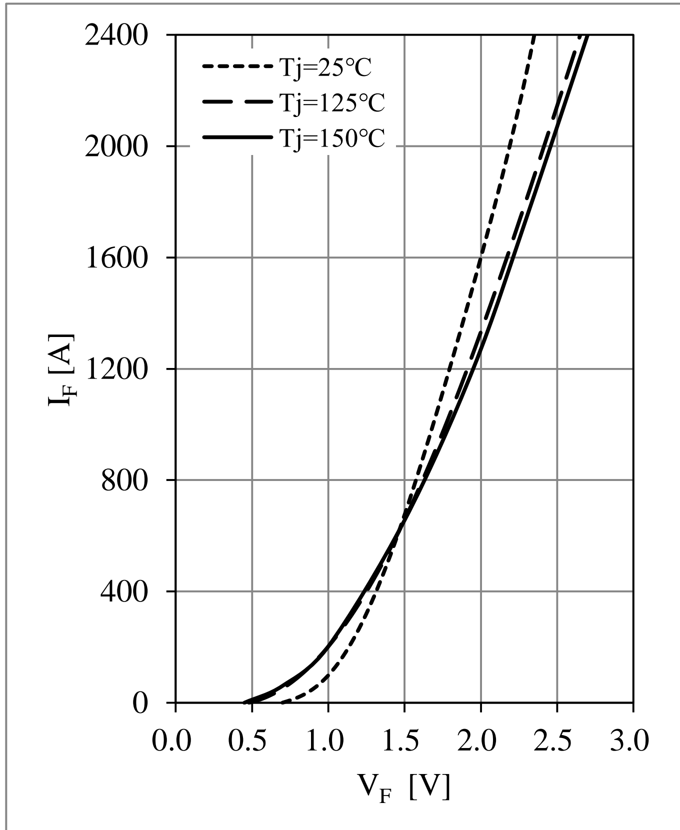


Fig 7. Diode Forward Characteristics

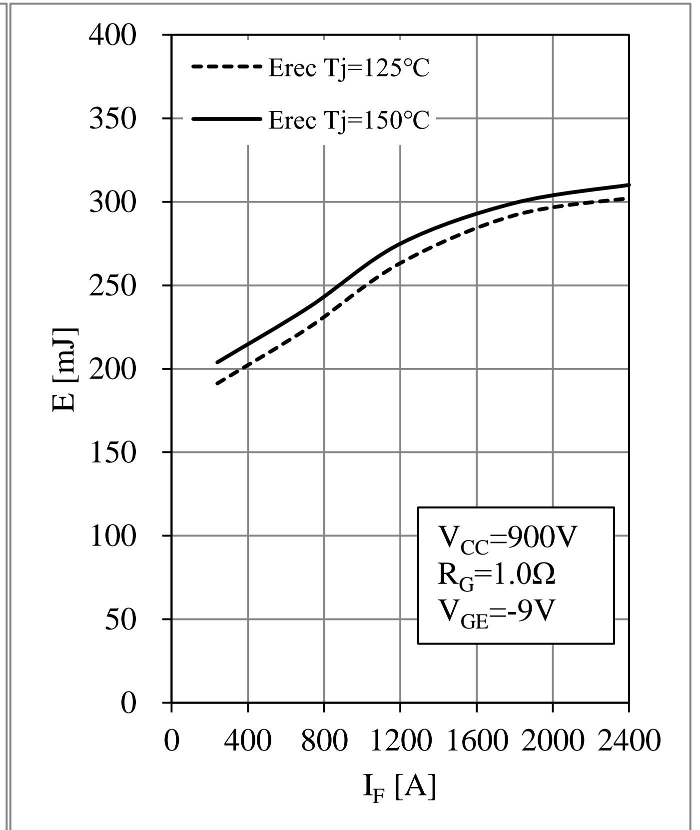


Fig 8. Diode Switching Loss vs. I_F

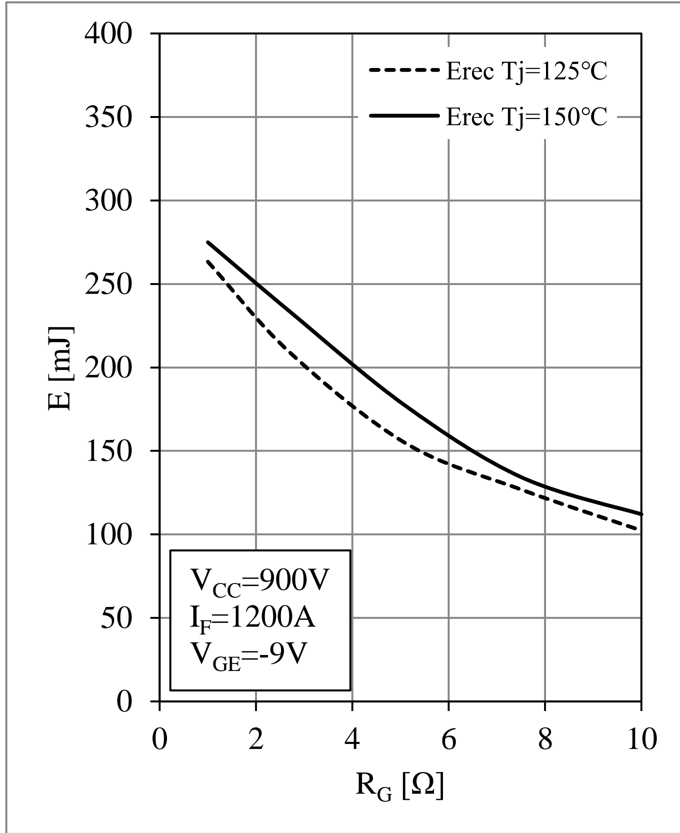


Fig 9. Diode Switching Loss vs. R_G

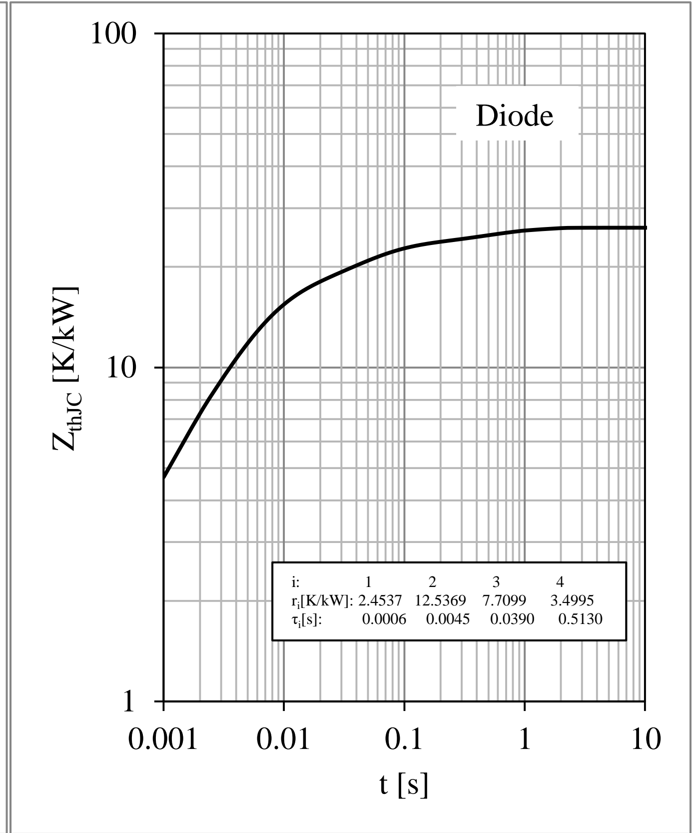
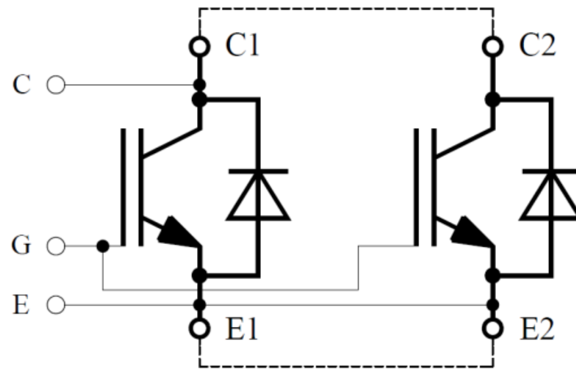


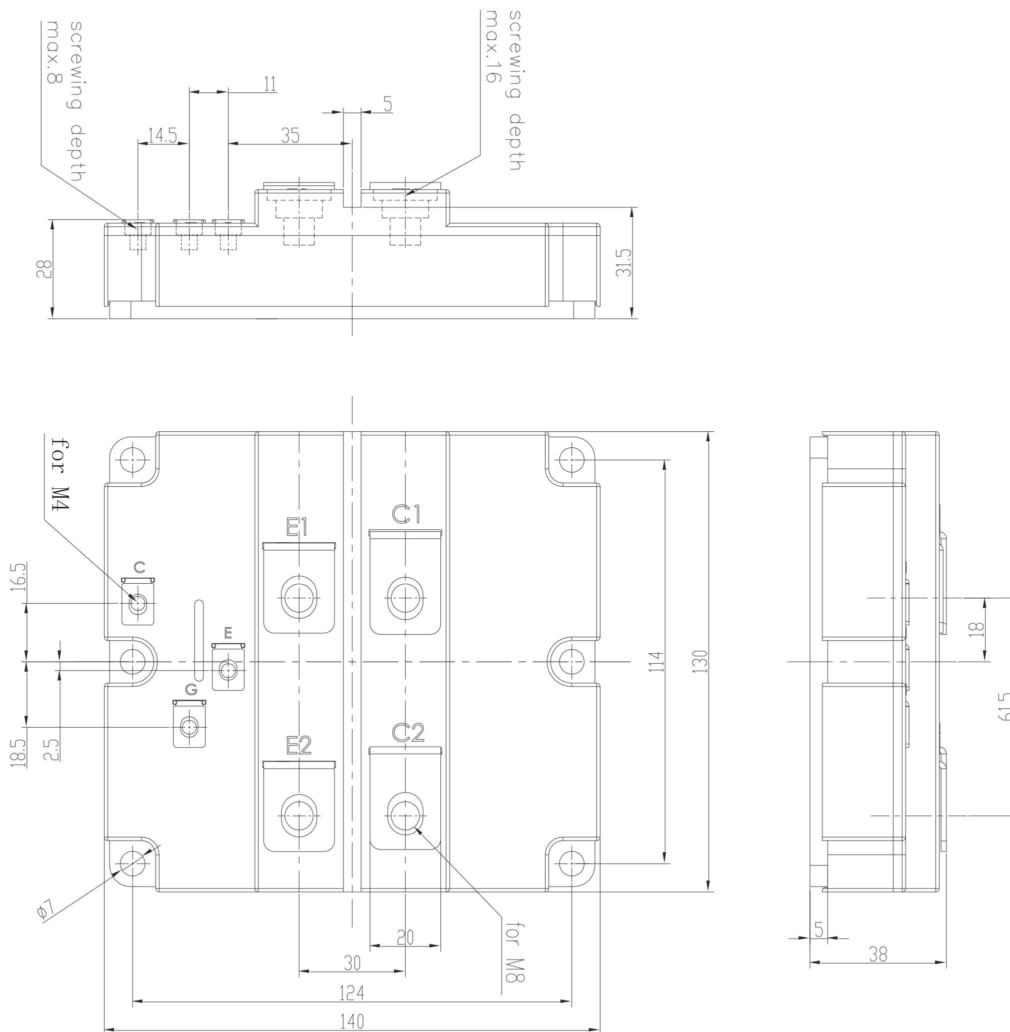
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.