

# STARPOWER

SEMICONDUCTOR

# IGBT

## GD2400SGT170C3SN

Molding Type Module

1700V/2400A 1 in one-package

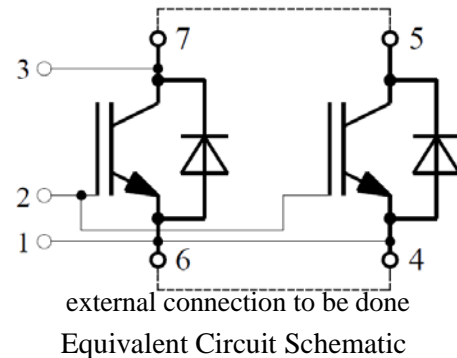
### General Description

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
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



### Typical Applications

- High Power Converters
- Motor Drivers
- AC Inverter Drives

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

Symbol	Description	GD2400SGT170C3SN	Units
$V_{CES}$	Collector-Emitter Voltage	1700	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=100^\circ\text{C}$	3400 2400	A
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	4800	A
$I_F$	Diode Continuous Forward Current	2400	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	4800	A
$P_D$	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	12.9	kW
$T_{jmax}$	Maximum Junction Temperature	175	$^\circ\text{C}$
$T_{jop}$	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
$T_{STG}$	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
Weight	Weight of Module	1500	g

**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	$T_j=25^\circ\text{C}$	1700			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	$I_C=96\text{mA}, V_{CE}=V_{GE},$ $T_j=25^\circ\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=2400\text{A}, V_{GE}=15\text{V},$ $T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=2400\text{A}, V_{GE}=15\text{V},$ $T_j=125^\circ\text{C}$		2.40		

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=2400A,$ $R_{Gon}=0.6\Omega,$ $R_{Goff}=0.8\Omega,$ $V_{GE}=\pm 15V, T_j=25^\circ C$		608		ns
$t_r$	Rise Time			181		ns
$t_{d(off)}$	Turn-Off Delay Time			1390		ns
$t_f$	Fall Time			161		ns
$E_{on}$	Turn-On Switching Loss			391		mJ
$E_{off}$	Turn-Off Switching Loss			682		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=2400A,$ $R_{Gon}=0.6\Omega,$ $R_{Goff}=0.8\Omega,$ $V_{GE}=\pm 15V, T_j=125^\circ C$		662		ns
$t_r$	Rise Time			188		ns
$t_{d(off)}$	Turn-Off Delay Time			1580		ns
$t_f$	Fall Time			290		ns
$E_{on}$	Turn-On Switching Loss			588		mJ
$E_{off}$	Turn-Off Switching Loss			907		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		211		nF
$C_{oes}$	Output Capacitance			8.78		nF
$C_{res}$	Reverse Transfer Capacitance			7.01		nF
$I_{SC}$	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM} \leq 1700V$		9100		A
$Q_G$	Gate Charge	$V_{CC}=900V, I_C=2400A,$ $V_{GE}=-15 \dots +15V$		28.1		$\mu C$
$R_{Gint}$	Internal Gate Resistance			0.94		$\Omega$
$L_{CE}$	Stray Inductance			12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.19		m $\Omega$

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Vd tage	$I_F=2400A$	$T_j=25^\circ C$	1.80	2.20	V
			$T_j=125^\circ C$	1.90		
$Q_r$	Recovered Charge	$I_F=2400A,$	$T_j=25^\circ C$	566		$\mu C$
			$T_j=125^\circ C$	992		
$I_{RM}$	Peak Reverse Recovery Current	$V_R=900V,$ $R_G=0.6\Omega,$	$T_j=25^\circ C$	2055		A
			$T_j=125^\circ C$	2460		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	391		mJ
			$T_j=125^\circ C$	692		

**Thermal Characteristics**

<b>Symbol</b>	<b>Parameter</b>	<b>Typ.</b>	<b>Max.</b>	<b>Units</b>
$R_{\theta JC}$	Junction-to-Case (per IGBT)		11.6	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		22.8	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	6		K/kW

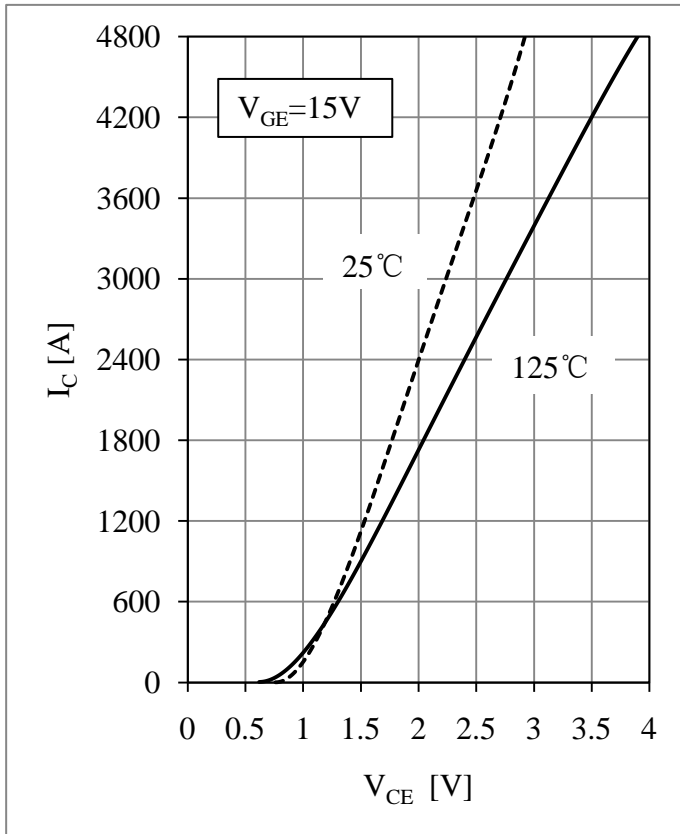


Fig 1. IGBT Output Characteristics

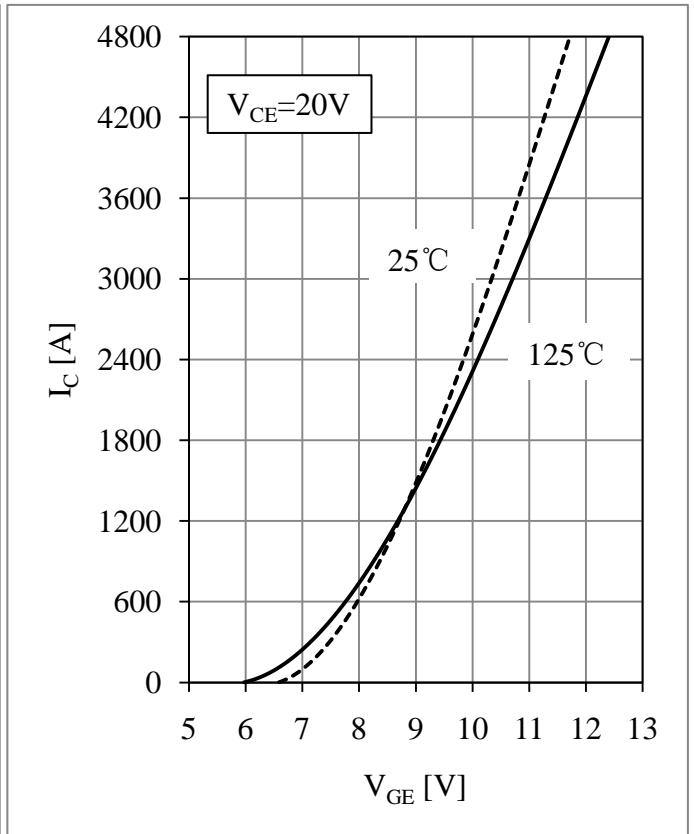


Fig 2. IGBT Transfer Characteristics

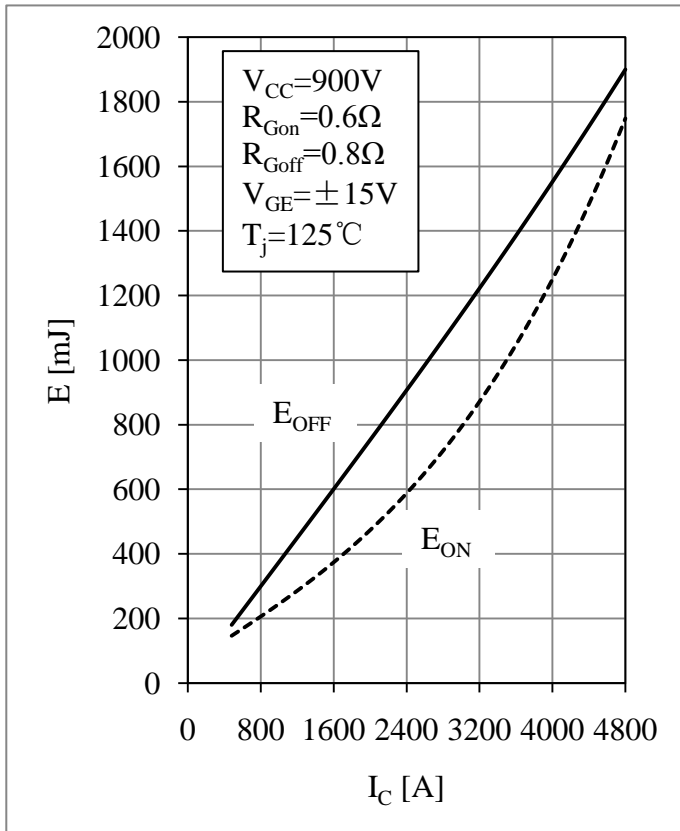


Fig 3. IGBT Switching Loss vs.  $I_C$

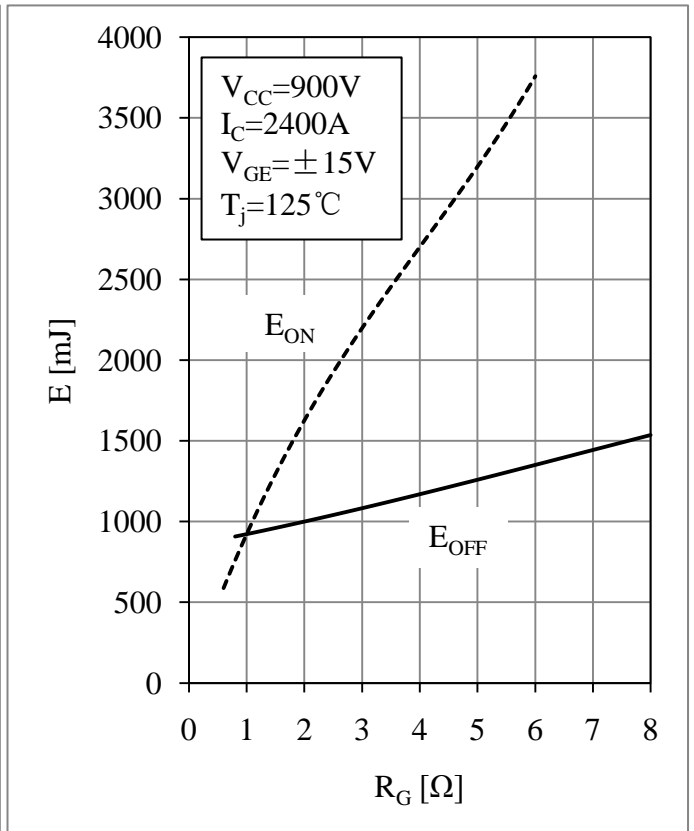


Fig 4. IGBT Switching Loss vs.  $R_G$

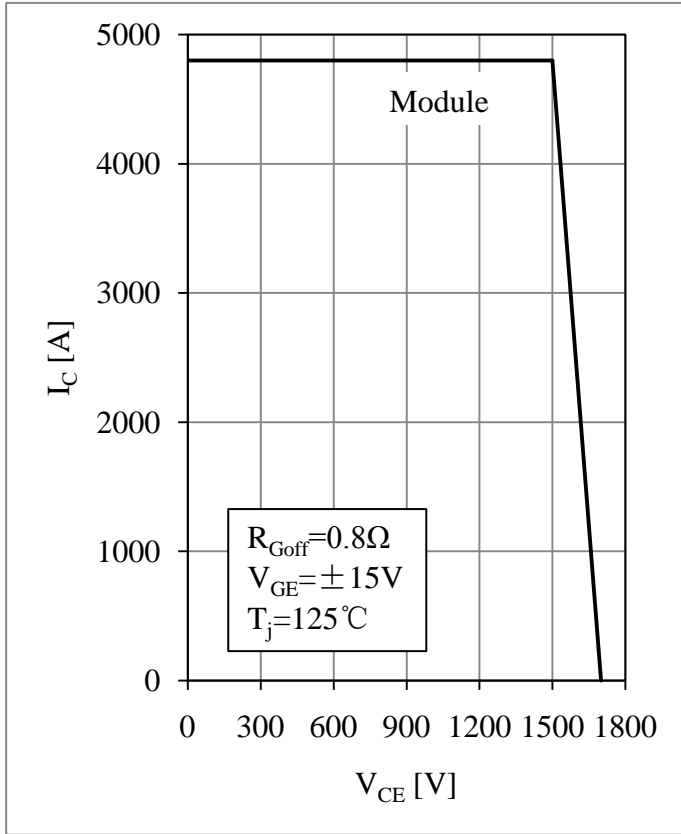


Fig 5. RBSOA

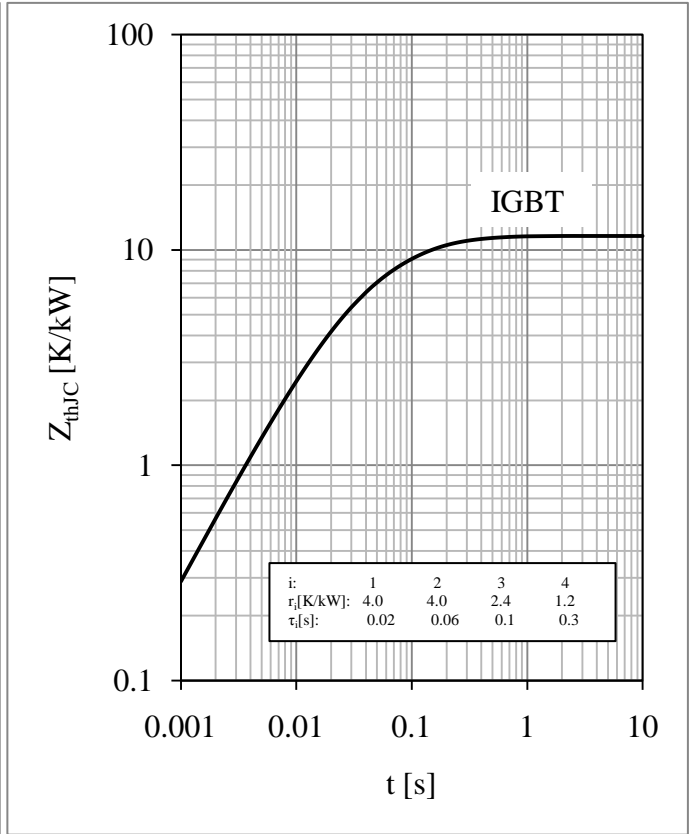


Fig 6. IGBT Transient Thermal Impedance

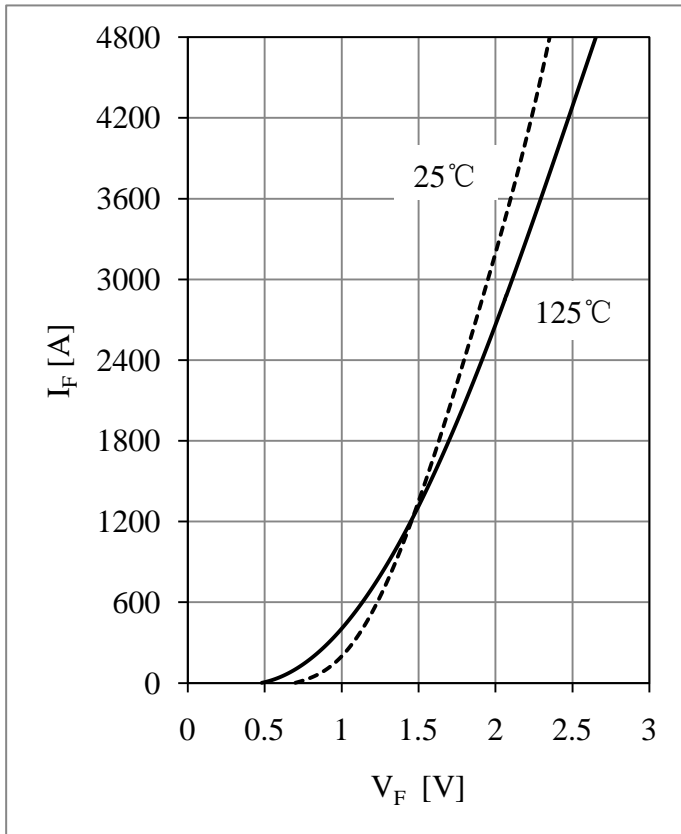


Fig 7. Diode Forward Characteristics

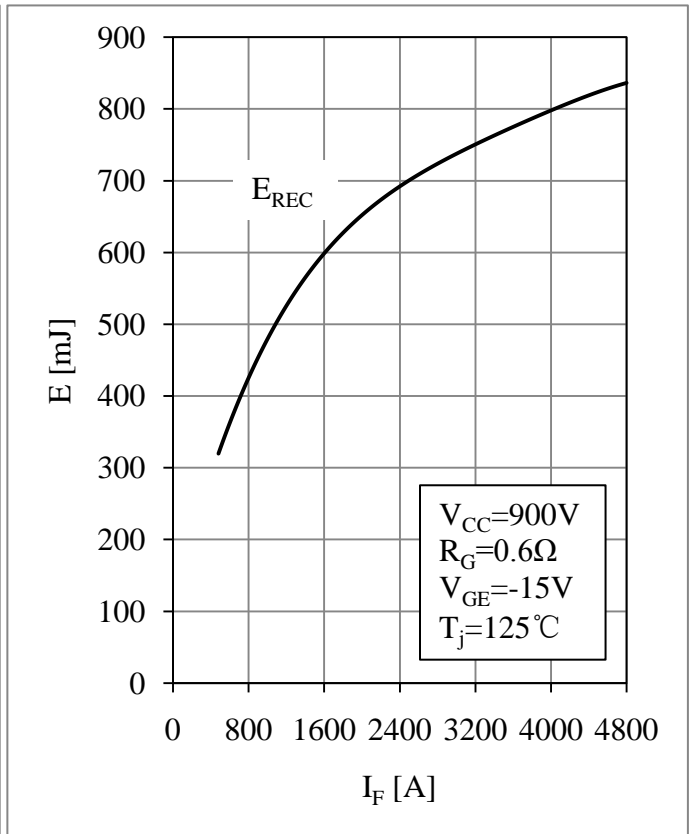


Fig 8. Diode Switching Loss vs.  $I_F$

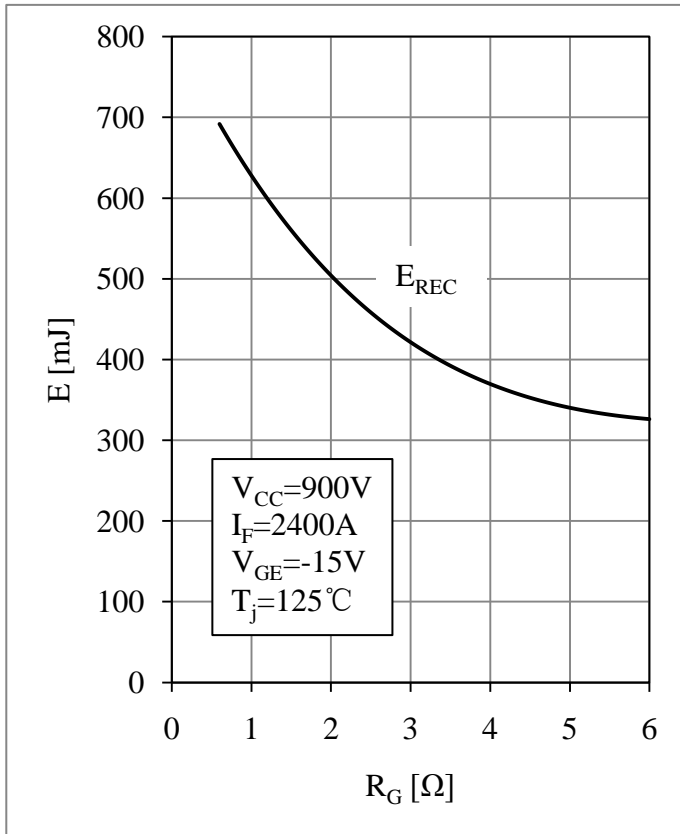


Fig 9. Diode Switching Loss vs.  $R_G$

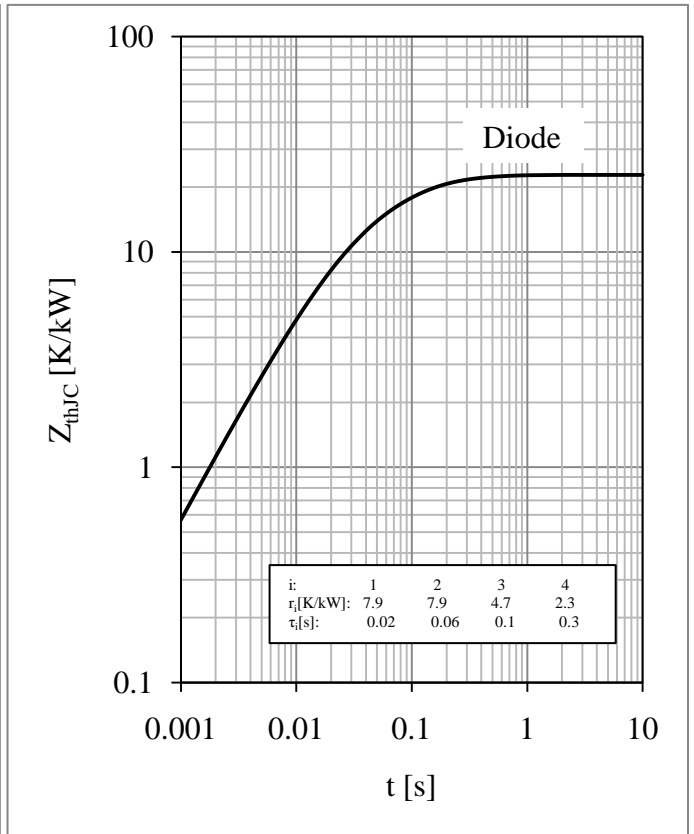
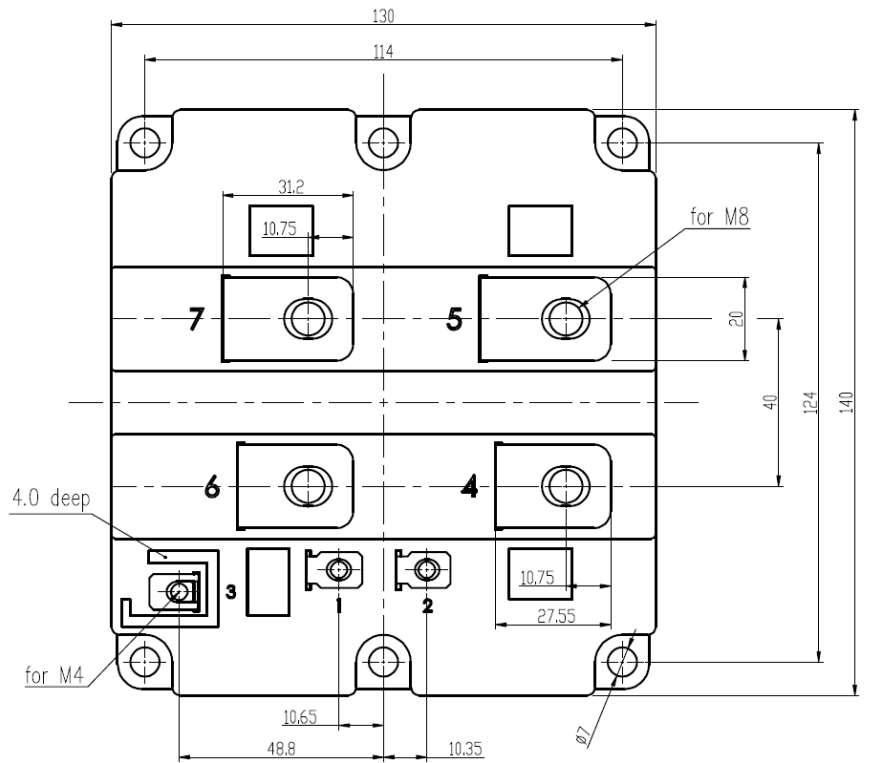
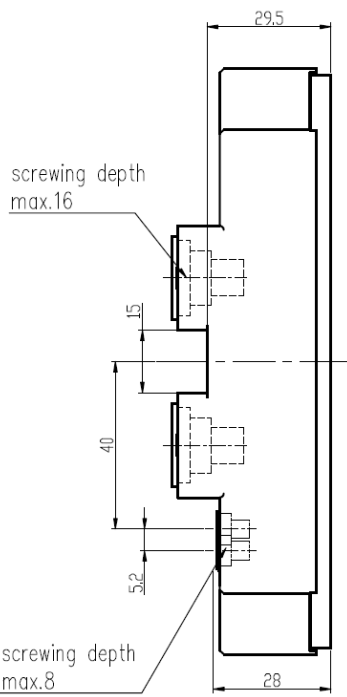
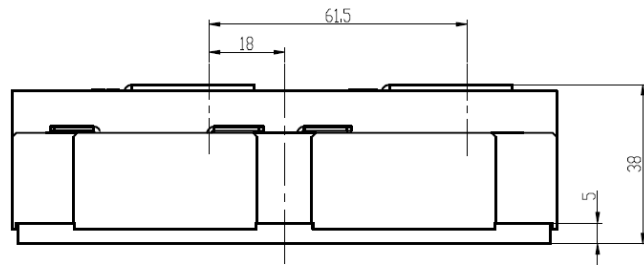


Fig 10. Diode Transient Thermal Impedance

### Package Dimensions

Dimensions in Millimeters





## 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](http://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.