

# STARPOWER

SEMICONDUCTOR

**IGBT**

## GD900SGT120C3SN\_T4F

**1200V/900A 1 in one-package**

### General Description

STARPOWER IGBT Power Module provides ultrafast switching speed as well as short circuit ruggedness. It's designed for the applications such as electronic welder and inductive heating.

### Features

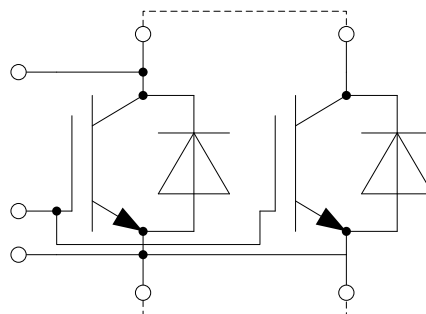
- Low  $V_{CE(sat)}$  Trench IGBT technology
- Low switching losses
- 10 $\mu$ s short circuit capability
- Low inductance case
- $V_{CE(sat)}$  with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



### Typical Applications

- Switching mode power supply
- Inductive heating
- Electronic welder

### Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$	1450	A
	@ $T_C=100^{\circ}\text{C}$	900	A
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	1800	A
$P_D$	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	6.22	kW

**Diode**

Symbol	Description	Value	Unit
$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current	900	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	1800	A

**Module**

Symbol	Description	Value	Unit
$T_{jmax}$	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

**IGBT Characteristics**  $T_c=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=800\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=800\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.30		
		$I_C=800\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=30.4\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.1	5.8	6.4	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
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		49.2		nF
$C_{res}$	Reverse Transfer Capacitance				2.76	
$Q_G$	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		7.40		$\mu\text{C}$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=800\text{A}, R_G=1.3\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		88		ns
$t_r$	Rise Time			92		ns
$t_{d(off)}$	Turn-Off Delay Time			510		ns
$t_f$	Fall Time			70		ns
$E_{on}$	Turn-On Switching Loss				32.8	
$E_{off}$	Turn-Off Switching Loss			28.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=800\text{A}, R_G=1.3\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		114		ns
$t_r$	Rise Time			101		ns
$t_{d(off)}$	Turn-Off Delay Time			580		ns
$t_f$	Fall Time			80		ns
$E_{on}$	Turn-On Switching Loss				82.4	
$E_{off}$	Turn-Off Switching Loss			70.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=800\text{A}, R_G=1.3\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		120		ns
$t_r$	Rise Time			105		ns
$t_{d(off)}$	Turn-Off Delay Time			602		ns
$t_f$	Fall Time			86		ns
$E_{on}$	Turn-On Switching Loss				90.5	
$E_{off}$	Turn-Off Switching Loss			77.0		mJ
$I_{SC}$	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		3200		A

**Diode Characteristics**  $T_c=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_F$	Diode Forward Voltage	$I_F=800\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.95	2.40	V
		$I_F=800\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.95		
		$I_F=800\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.95		
$Q_r$	Recovered Charge			50		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current	$V_{CC}=900\text{V}, I_F=800\text{A},$ $-di/dt=6500\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=25^\circ\text{C}$		430		A
$E_{rec}$	Reverse Recovery Energy			33.4		mJ
$Q_r$	Recovered Charge			134		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current	$V_{CC}=900\text{V}, I_F=800\text{A},$ $-di/dt=6500\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=125^\circ\text{C}$		810		A
$E_{rec}$	Reverse Recovery Energy			65.0		mJ
$Q_r$	Recovered Charge			146		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current	$V_{CC}=900\text{V}, I_F=800\text{A},$ $-di/dt=6500\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=150^\circ\text{C}$		851		A
$E_{rec}$	Reverse Recovery Energy			71.5		mJ

**Module Characteristics**  $T_c=25^\circ\text{C}$  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		m $\Omega$
$R_{\theta JC}$	Junction-to-Case (per IGBT)			24.1	K/kW
	Junction-to-Case (per Diode)			26.2	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		23.0		K/kW
	Case-to-Sink (per Diode)		25.0		
$R_{\theta CS}$	Case-to-Sink		6.0		K/kW
M	Terminal Connection Torque, Screw M4	1.8		2.1	N.m
	Terminal Connection Torque, Screw M8	8.0		10	
	Mounting Torque, Screw M6	4.25		5.75	
G	Weight of Module		1500		g

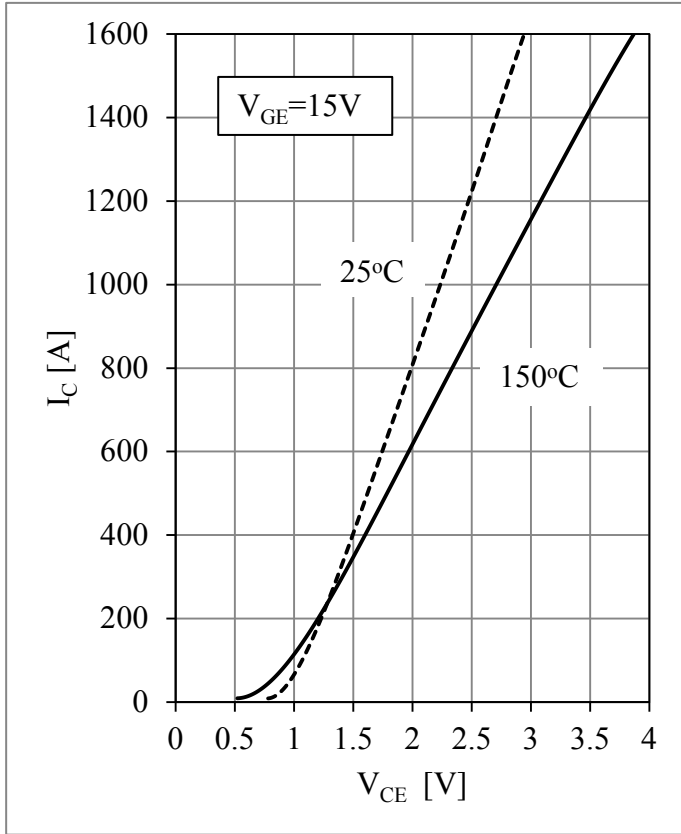


Fig 1. IGBT Output Characteristics

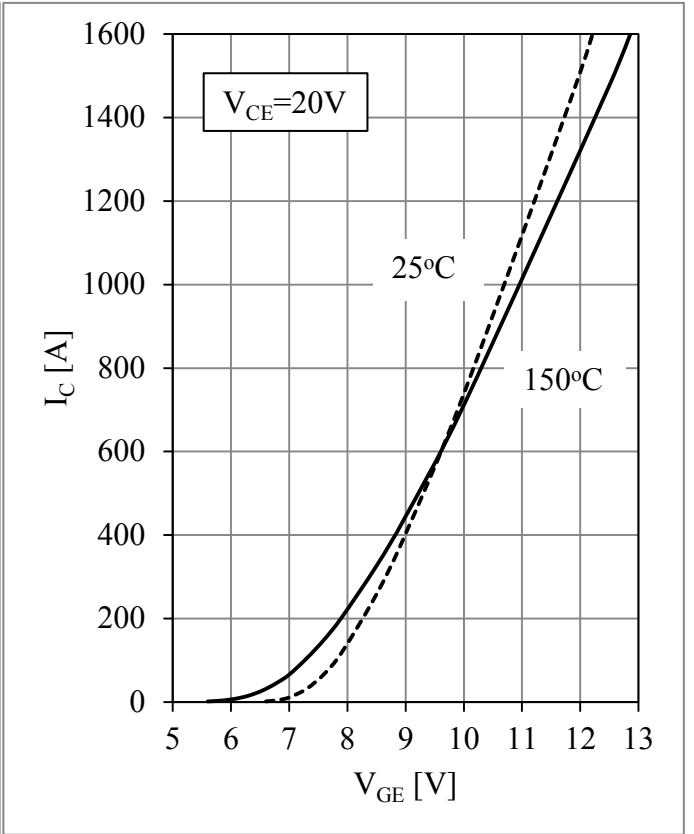


Fig 2. IGBT Transfer Characteristics

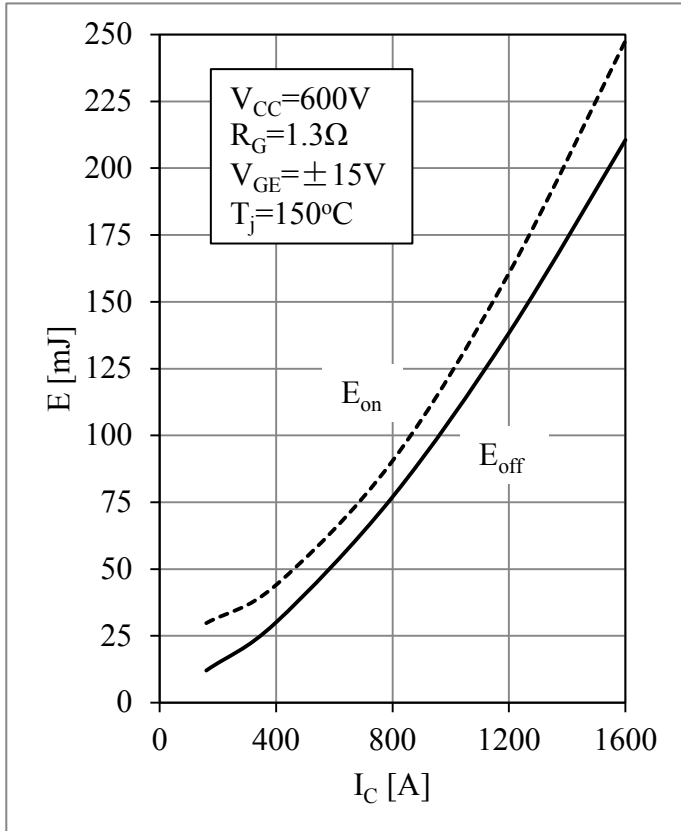


Fig 3. IGBT Switching Loss vs.  $I_C$

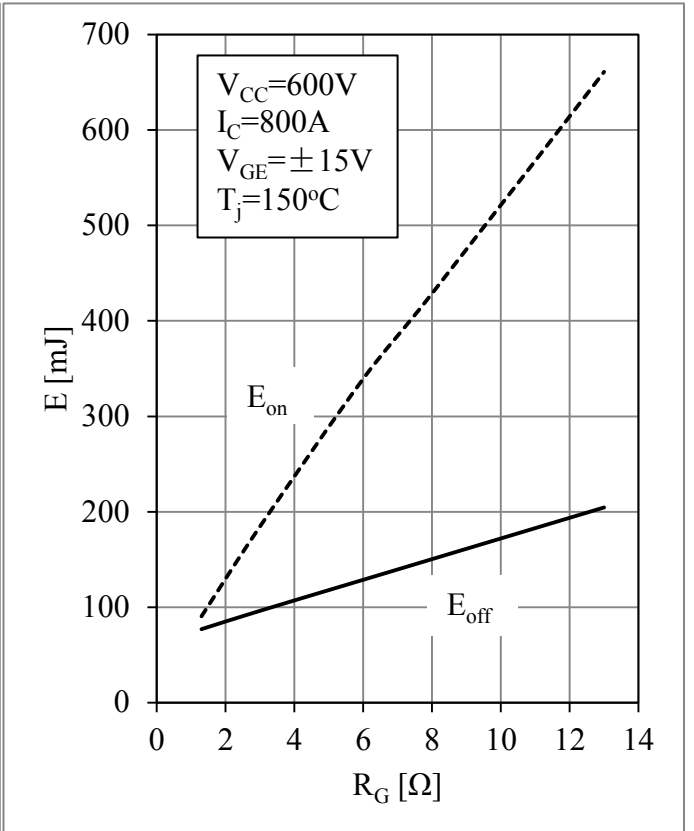


Fig 4. IGBT Switching Loss vs.  $R_G$

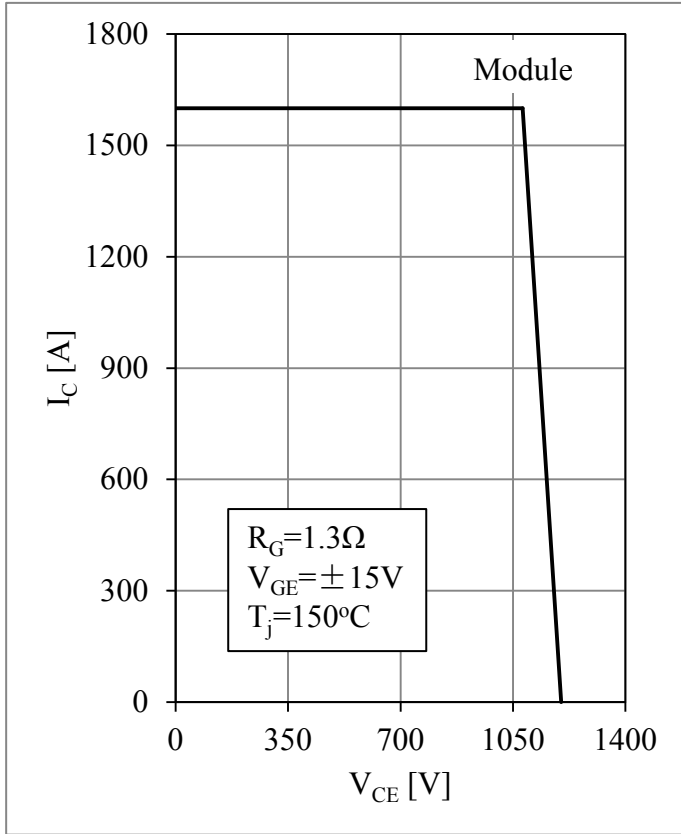


Fig 5. RBSOA

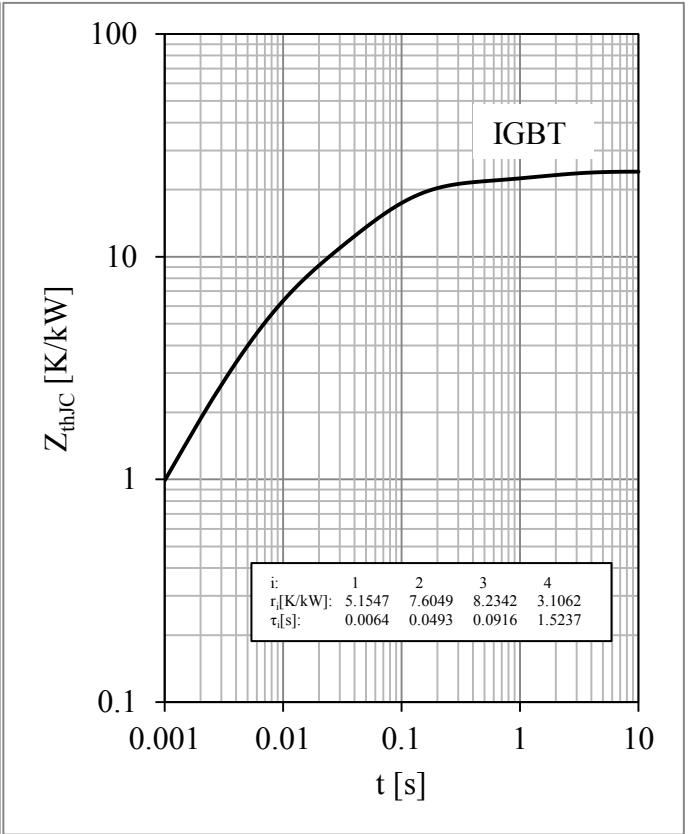


Fig 6. IGBT Transient Thermal Impedance

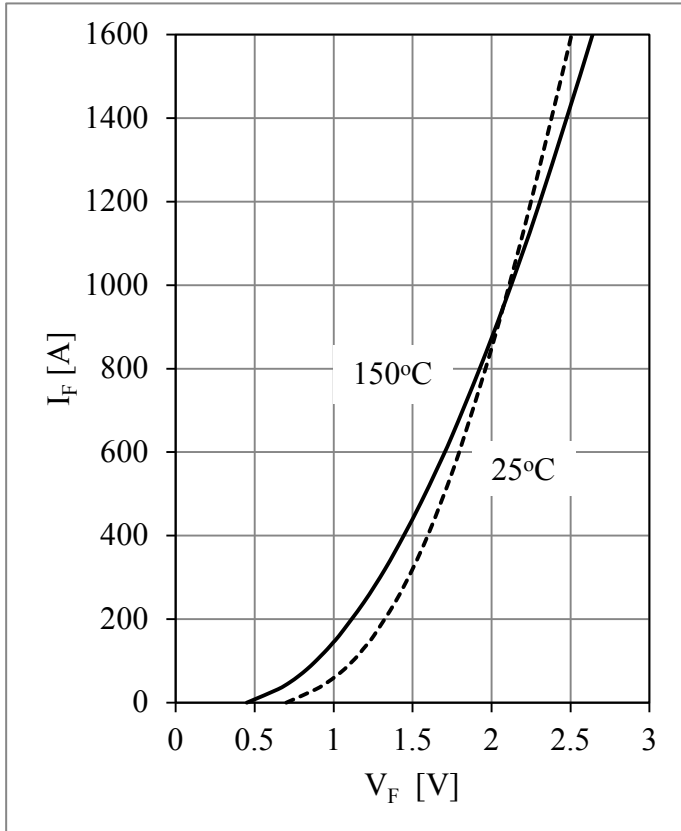


Fig 7. Diode Forward Characteristics

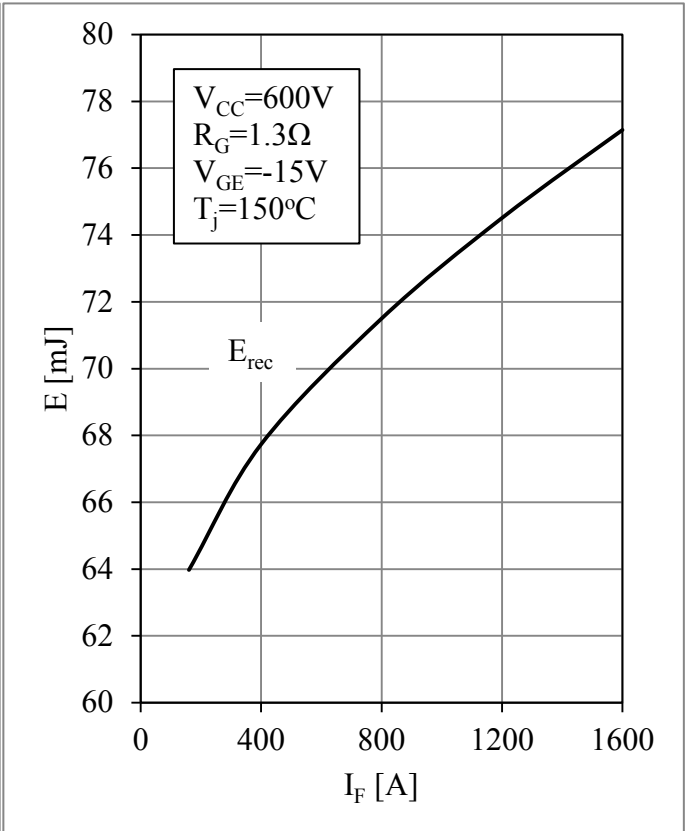


Fig 8. Diode Switching Loss vs.  $I_F$

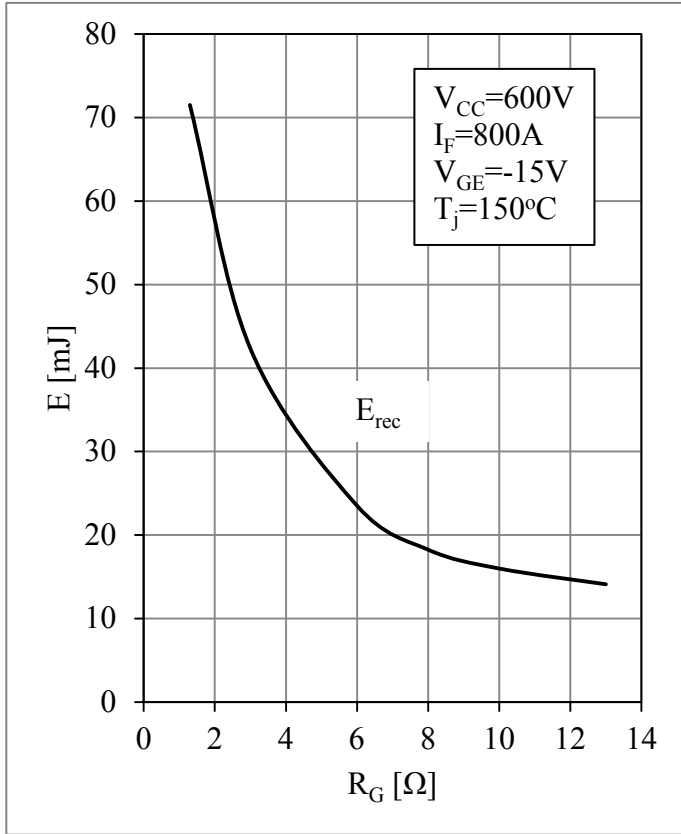


Fig 9. Diode Switching Loss vs.  $R_G$

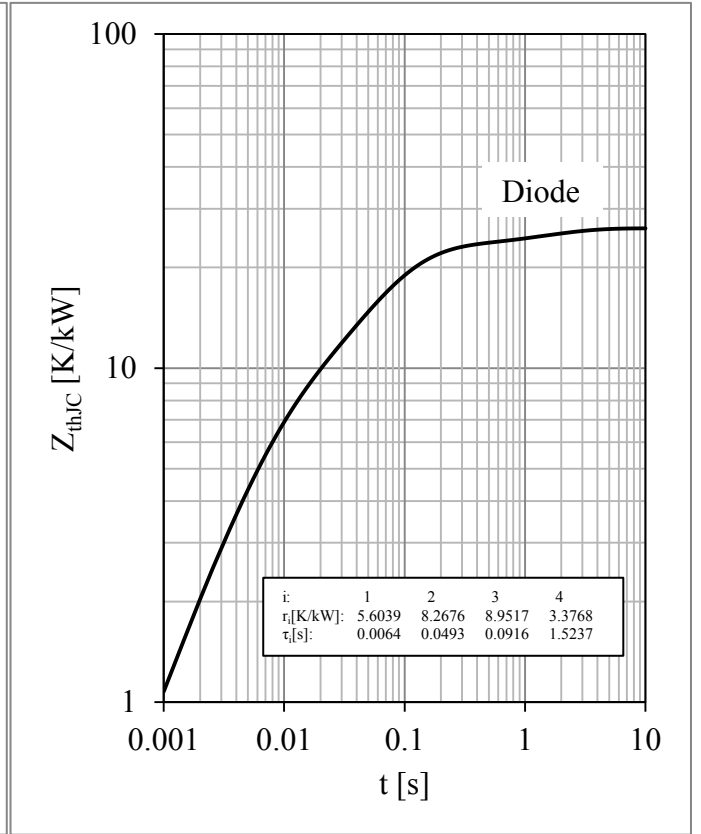
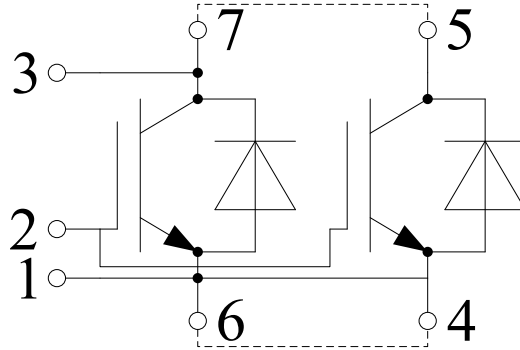


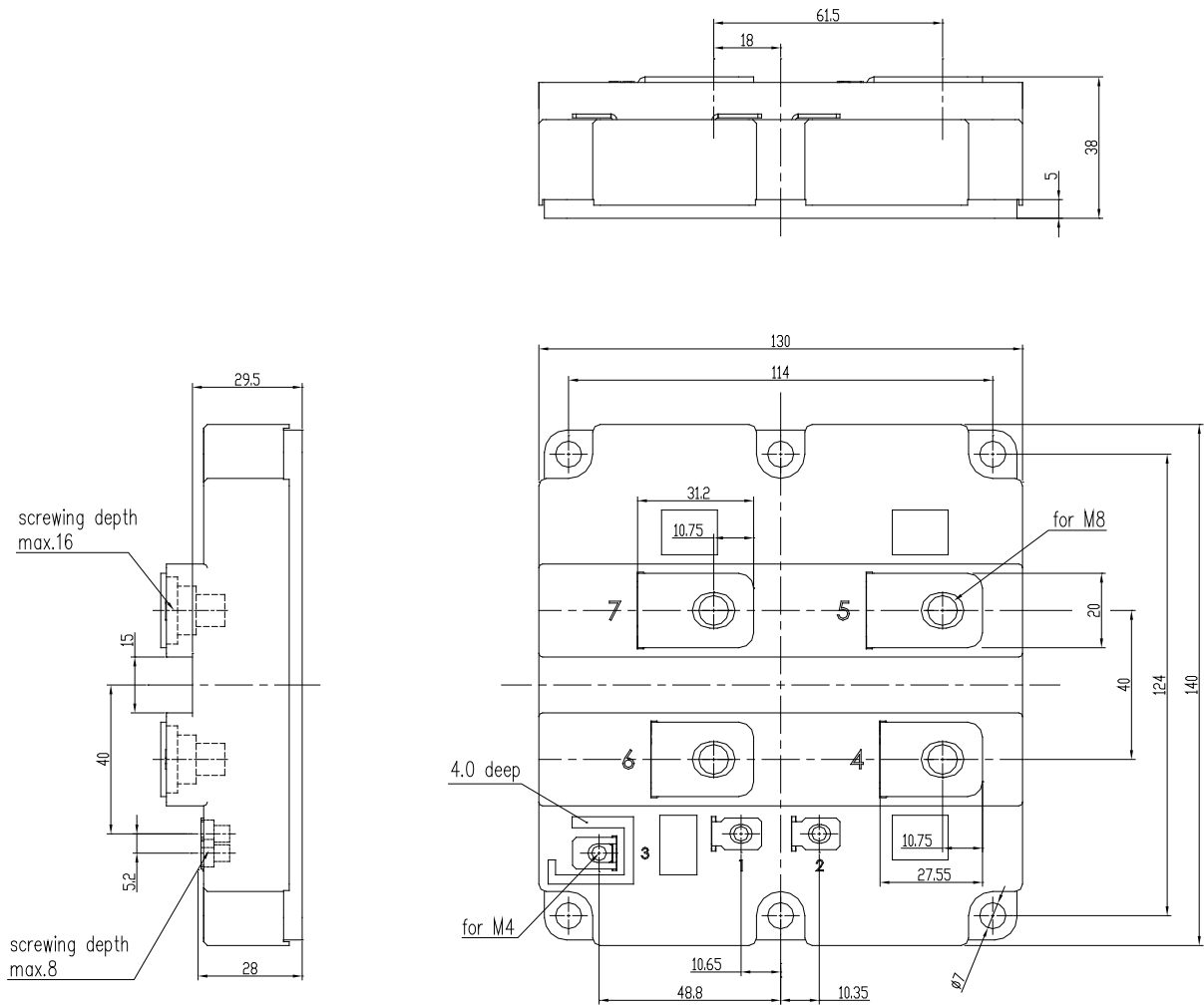
Fig 10. Diode Transient Thermal Impedance

**Circuit Schematic**



**Package Dimensions**

Dimensions in Millimeters





## 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.