STARPOWER

SEMICONDUCTOR **IGBT**

GD900SGF120A3SN

1200V/900A 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.

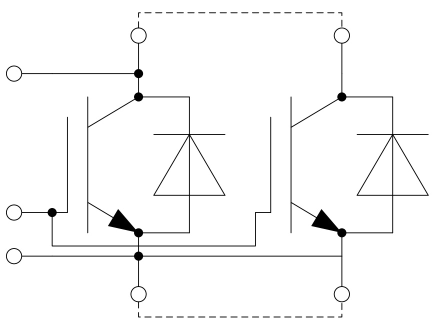
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Low inductance case
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	1466 900	A
I_{CM}	Pulsed Collector Current t_p=1ms	1800	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	5.34	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=1ms	1800	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	175	°C
T_{vjop}	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=900A, V_{GE}=15V, T_{vj}=25°C		2.00	2.45	V
		I_C=900A, V_{GE}=15V, T_{vj}=125°C		2.50		
		I_C=900A, V_{GE}=15V, T_{vj}=150°C		2.65		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=32.0mA, V_{CE}=V_{GE}, T_{vj}=25°C	5.2	6.0	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES}, V_{GE}=0V, T_{vj}=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES}, V_{CE}=0V, T_{vj}=25°C			400	nA
R_{Gint}	Internal Gate Resistance			1.44		Ω
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V, I_C=900A, R_{Gon}=1Ω, R_{Goff}=2Ω, Ls=50nH, V_{GE}=-10/+15V, T_{vj}=25°C		520		ns
t_r	Rise Time			127		ns
$t_{d(off)}$	Turn-Off Delay Time			493		ns
t_f	Fall Time			72		ns
E_{on}	Turn-On Switching Loss			76.0		mJ
E_{off}	Turn-Off Switching Loss			85.0		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V, I_C=900A, R_{Gon}=1Ω, R_{Goff}=2Ω, Ls=50nH, V_{GE}=-10/+15V, T_{vj}=125°C		580		ns
t_r	Rise Time			168		ns
$t_{d(off)}$	Turn-Off Delay Time			644		ns
t_f	Fall Time			89		ns
E_{on}	Turn-On Switching Loss			127		mJ
E_{off}	Turn-Off Switching Loss			98.5		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V, I_C=900A, R_{Gon}=1Ω, R_{Goff}=2Ω, Ls=50nH, V_{GE}=-10/+15V, T_{vj}=150°C		629		ns
t_r	Rise Time			176		ns
$t_{d(off)}$	Turn-Off Delay Time			676		ns
t_f	Fall Time			96		ns
E_{on}	Turn-On Switching Loss			134		mJ
E_{off}	Turn-Off Switching Loss			99.0		mJ

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=900A,V_{GE}=0V,T_{vj}=25°C		1.95	2.40	V
		I_F=900A,V_{GE}=0V,T_{vj}=125°C		2.00		
		I_F=900A,V_{GE}=0V,T_{vj}=150°C		2.05		
Q_r	Recovered Charge	V_R=600V,I_F=900A, -di/dt=7100A/μs, Ls=50nH, V_{GE}=-10V, T_{vj}=25°C		80		μC
I_{RM}	Peak Reverse Recovery Current			486		A
E_{rec}	Reverse Recovery Energy			35.0		mJ
Q_r	Recovered Charge	V_R=600V,I_F=900A, -di/dt=5180A/μs, Ls=50nH, V_{GE}=-10V, T_{vj}=125°C		153		μC
I_{RM}	Peak Reverse Recovery Current			510		A
E_{rec}	Reverse Recovery Energy			64.0		mJ
Q_r	Recovered Charge	V_R=600V,I_F=900A, -di/dt=4990A/μs, Ls=50nH, V_{GE}=-10V, T_{vj}=150°C		158		μC
I_{RM}	Peak Reverse Recovery Current			513		A
E_{rec}	Reverse Recovery Energy			74.0		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)			28.1 44.1	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		9.82 15.4 6.0		K/kW
M	Terminal Connection Torque, Screw M4 Terminal Connection Torque, Screw M8 Mounting Torque, Screw M6	1.8 8.0 4.25		2.1 10 5.75	N.m
G	Weight of Module		1050		g

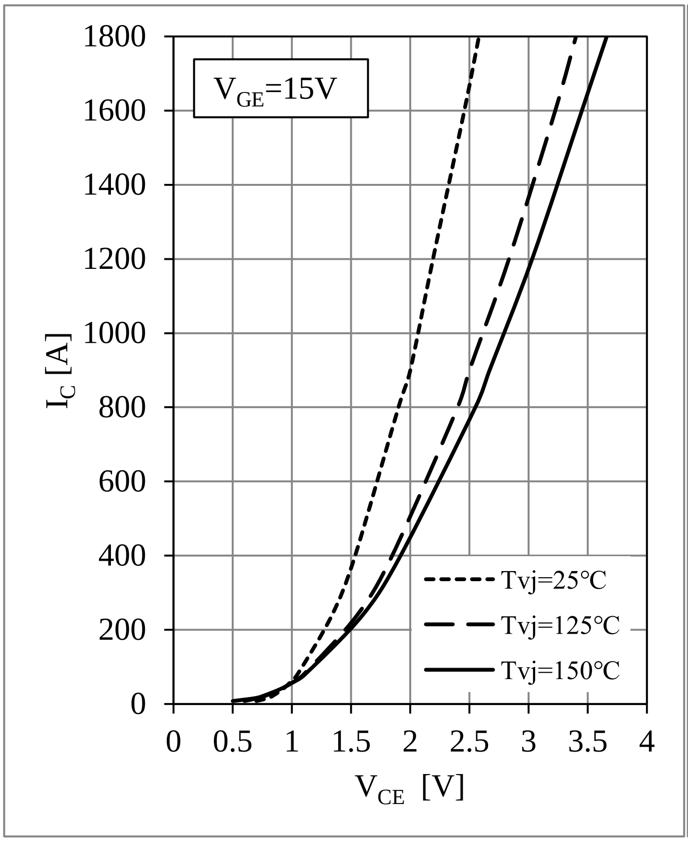


Fig 1. IGBT Output Characteristics

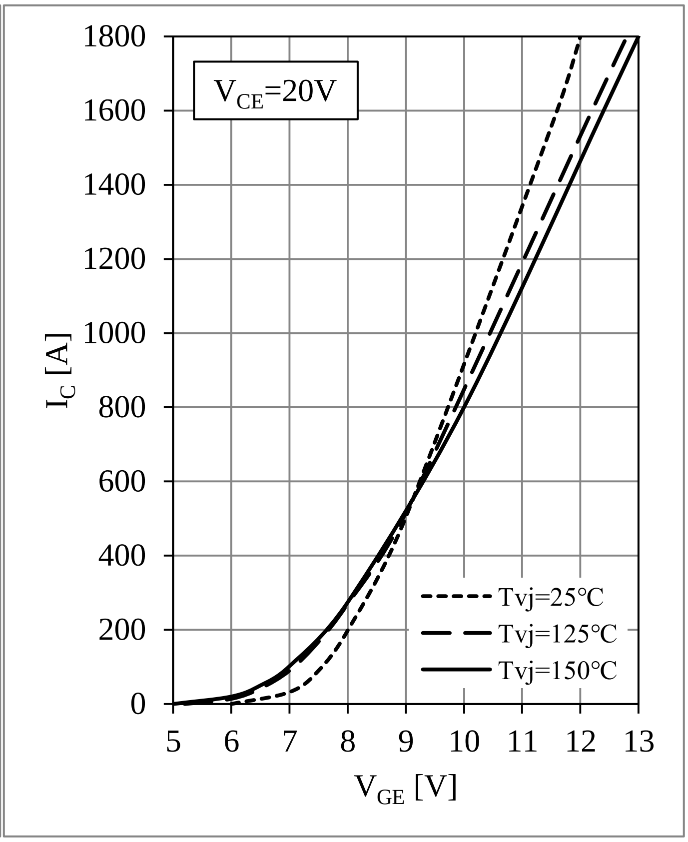


Fig 2. IGBT Transfer Characteristics

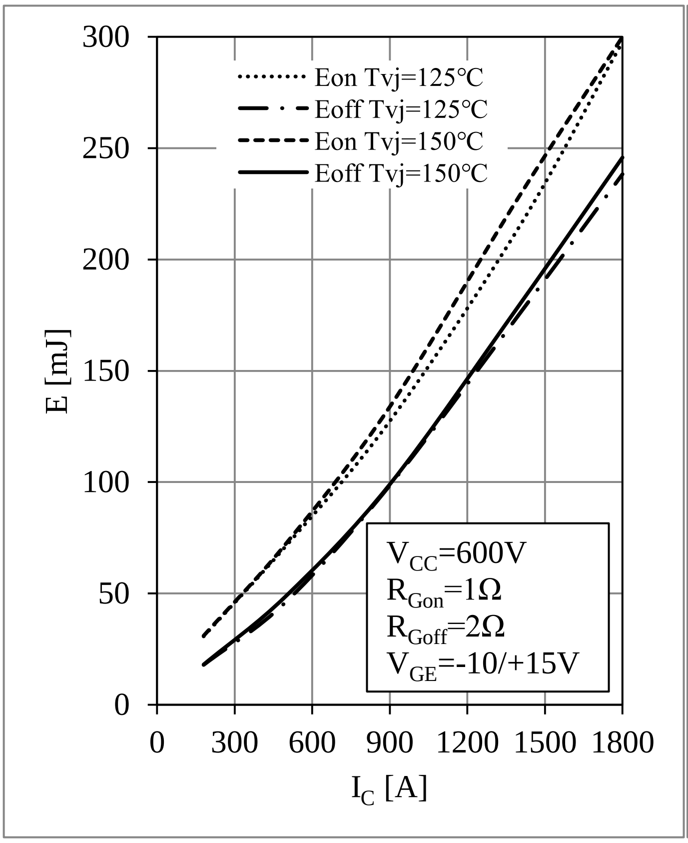


Fig 3. IGBT Switching Loss vs. I_C

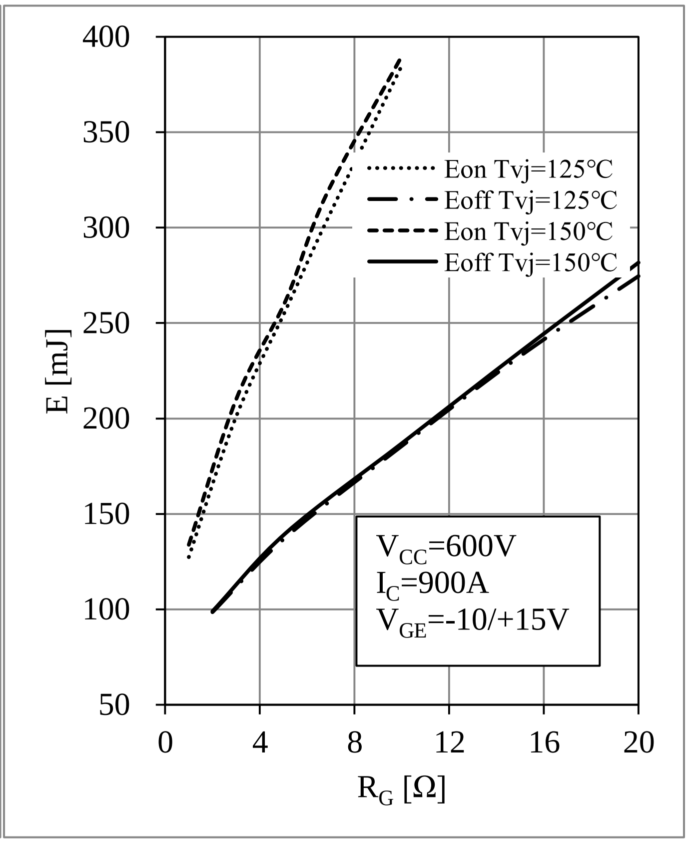


Fig 4. IGBT Switching Loss vs. R_G

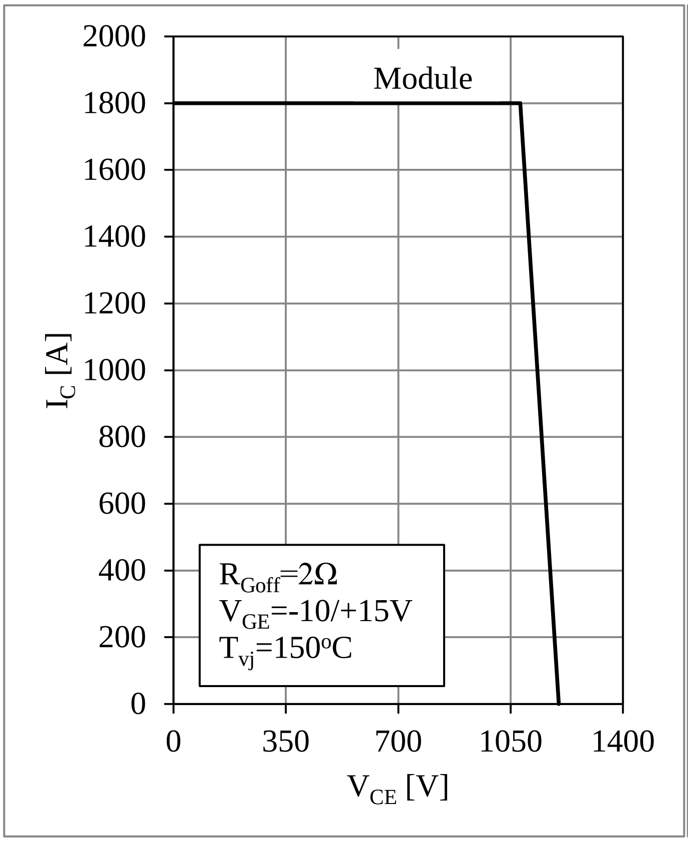


Fig 5. RBSOA

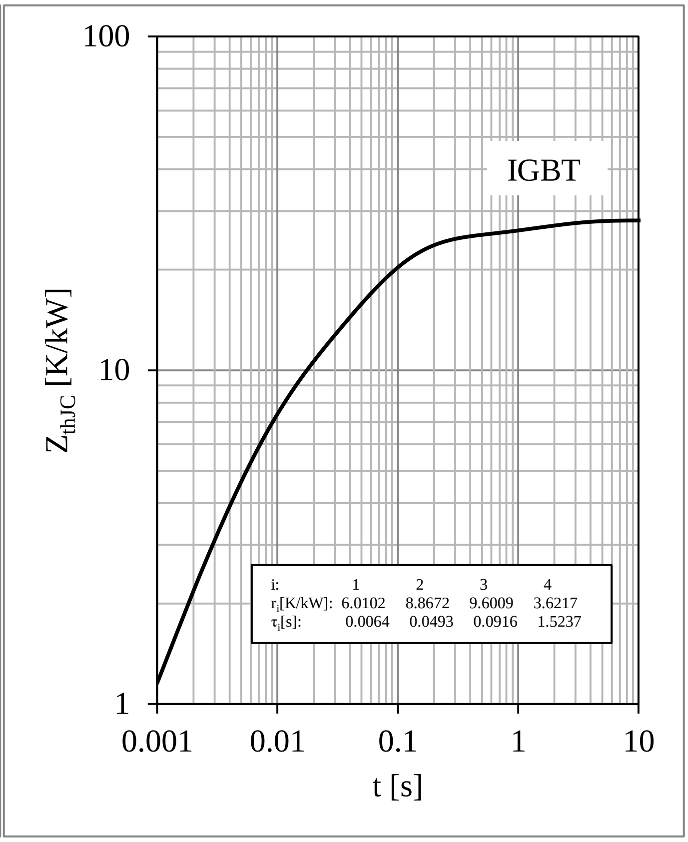


Fig 6. IGBT Transient Thermal Impedance

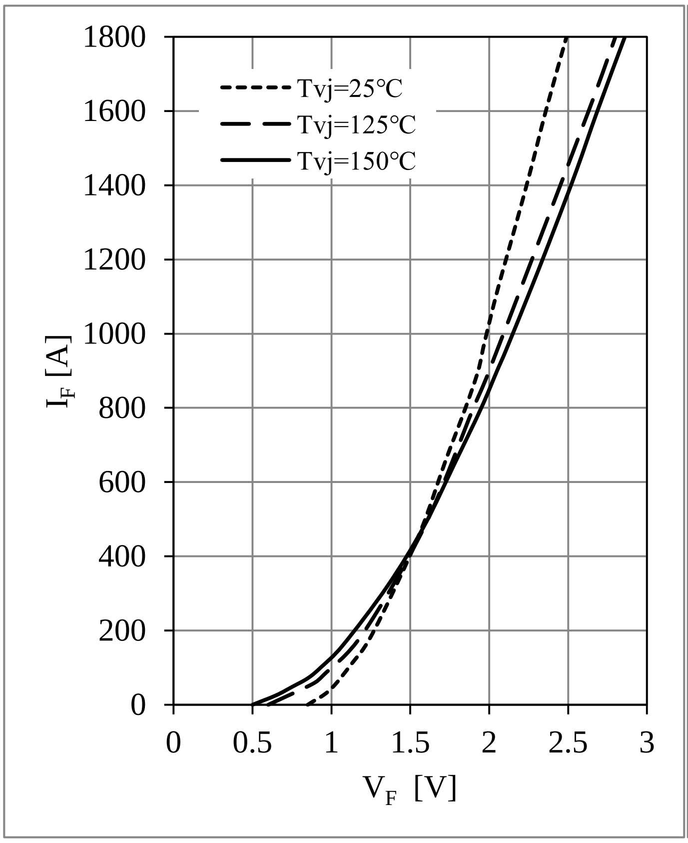


Fig 7. Diode Forward Characteristics

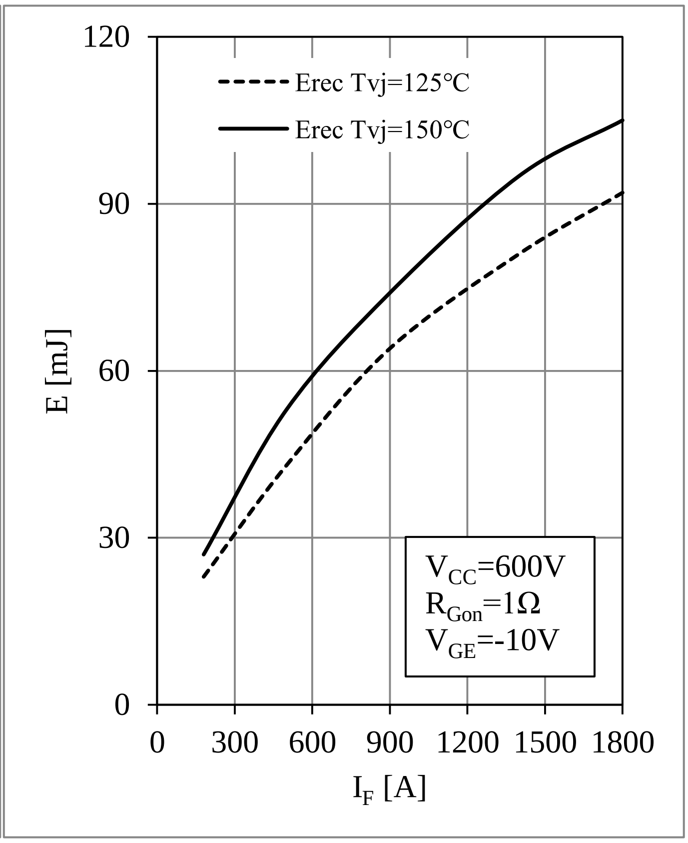


Fig 8. Diode Switching Loss vs. I_F

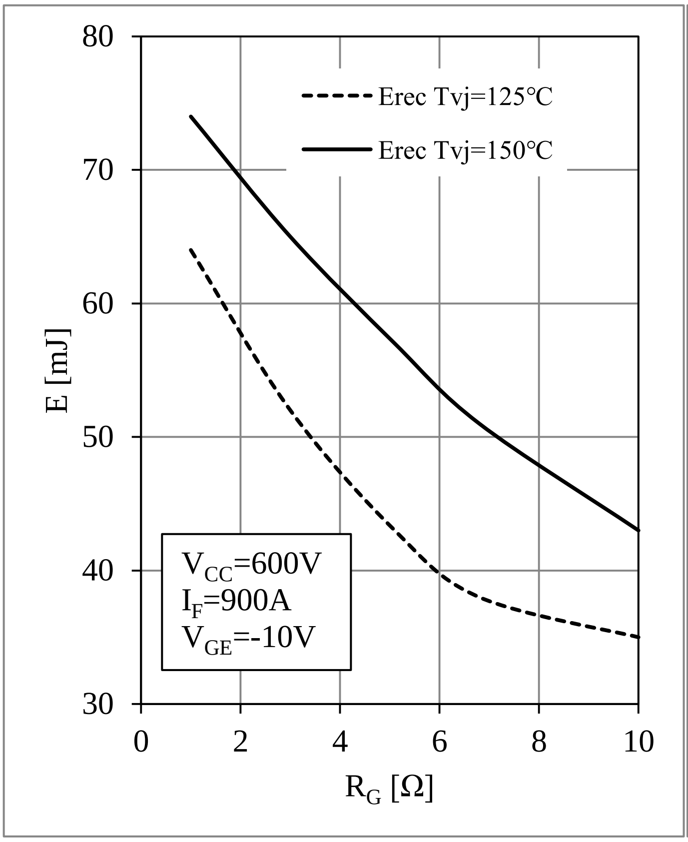


Fig 9. Diode Switching Loss vs. R_G

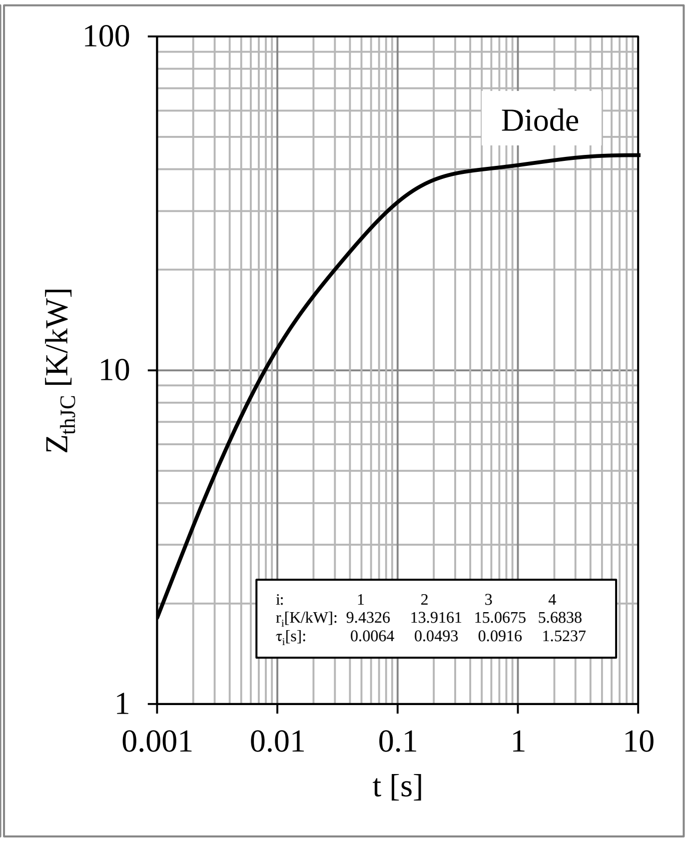
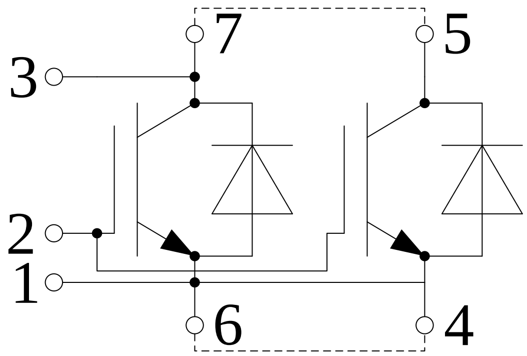


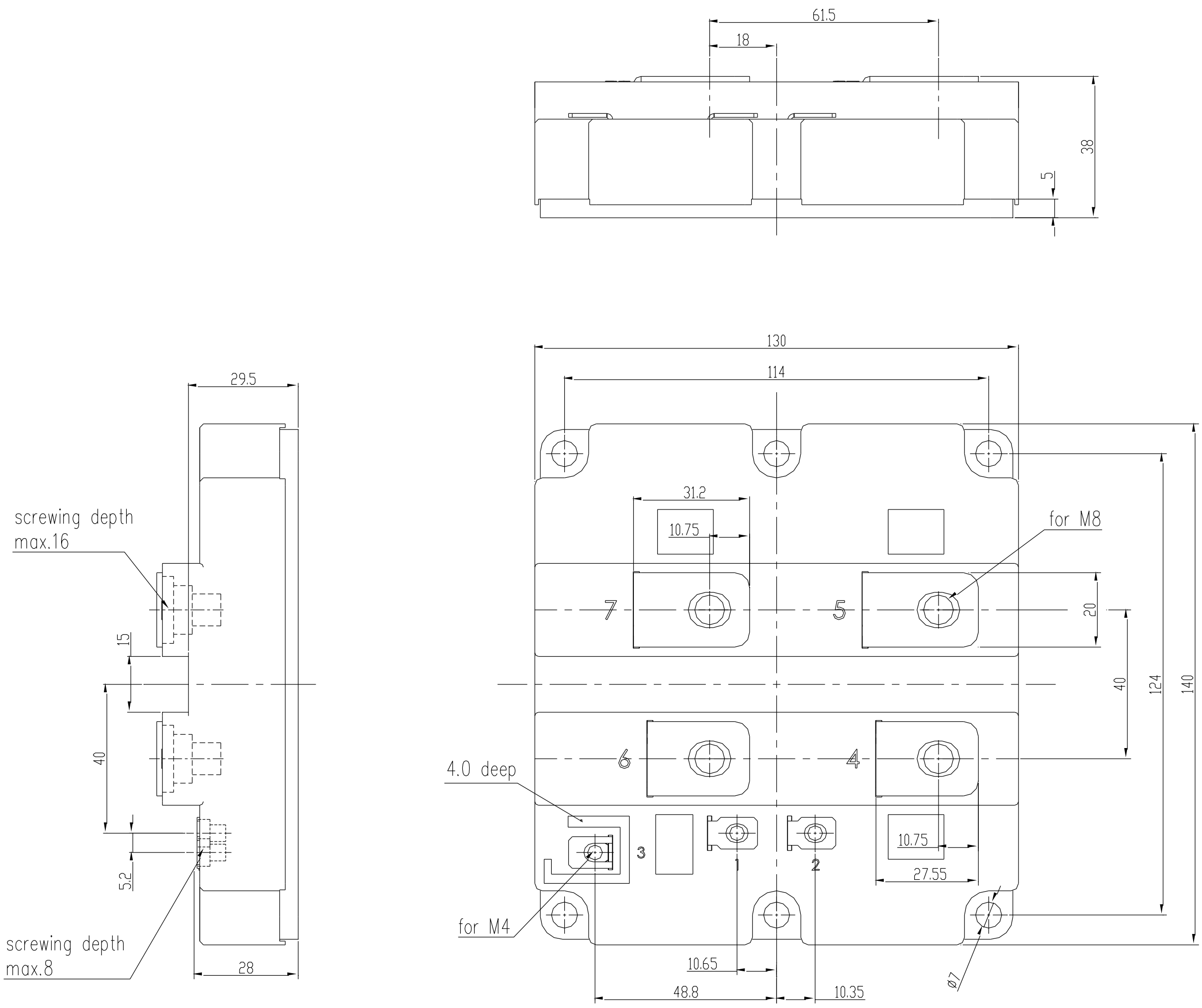
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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