STARPOWER

SEMICONDUCTOR **IGBT**

GD2400SGY120C4S

1200V/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 general inverters and UPS.

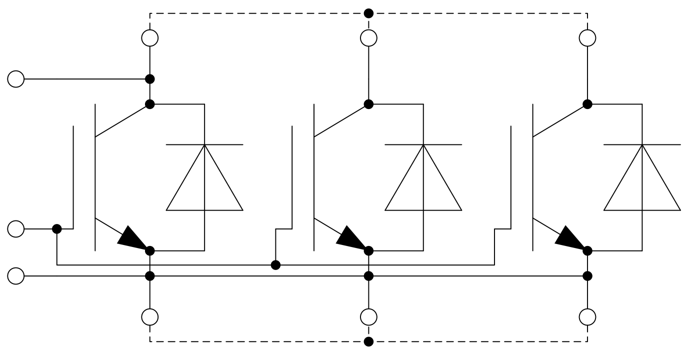
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs 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

- 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=95°C	3480 2400	A
I_{CM}	Pulsed Collector Current t_p=1ms	4800	A
P_D	Maximum Power Dissipation @ T_j=175°C	11.80	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	2400	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	4800	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=2400A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=2400A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=2400A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=60.0mA,V_{CE}=V_{GE}, T_j=25°C	5.2	6.0	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	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			0.73		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		248		nF
C_{res}	Reverse Transfer Capacitance			6.96		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		18.6		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=2400A, R_{Gon}=1.5Ω, R_{Goff}=0.22Ω, V_{GE}=±15V,T_j=25°C		535		ns
t_r	Rise Time			353		ns
$t_{d(off)}$	Turn-Off Delay Time			1030		ns
t_f	Fall Time			247		ns
E_{on}	Turn-On Switching Loss			391		mJ
E_{off}	Turn-Off Switching Loss			443		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=2400A, R_{Gon}=1.5Ω, R_{Goff}=0.22Ω, V_{GE}=±15V,T_j=125°C		578		ns
t_r	Rise Time			353		ns
$t_{d(off)}$	Turn-Off Delay Time			1185		ns
t_f	Fall Time			165		ns
E_{on}	Turn-On Switching Loss			492		mJ
E_{off}	Turn-Off Switching Loss			469		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=2400A, R_{Gon}=1.5Ω, R_{Goff}=0.22Ω, V_{GE}=±15V,T_j=150°C		589		ns
t_r	Rise Time			353		ns
$t_{d(off)}$	Turn-Off Delay Time			1185		ns
t_f	Fall Time			175		ns
E_{on}	Turn-On Switching Loss			540		mJ
E_{off}	Turn-Off Switching Loss			494		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=800V, V_{CEM}≤1200V		9600		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=2400A,V_{GE}=0V,T_j=25°C		1.70	2.15	V
		I_F=2400A,V_{GE}=0V,T_j=125°C		1.65		
		I_F=2400A,V_{GE}=0V,T_j=150°C		1.65		
Q_r	Recovered Charge	V_{CC}=600V,I_F=2400A, -di/dt=5938A/μs,V_{GE}=±15V, T_j=25°C		233		μC
I_{RM}	Peak Reverse Recovery Current			765		A
E_{rec}	Reverse Recovery Energy			99.8		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=2400A, -di/dt=5938A/μs,V_{GE}=±15V, T_j=125°C		409		μC
I_{RM}	Peak Reverse Recovery Current			1093		A
E_{rec}	Reverse Recovery Energy			176		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=2400A, -di/dt=5938A/μs,V_{GE}=±15V, T_j=150°C		466		μC
I_{RM}	Peak Reverse Recovery Current			1140		A
E_{rec}	Reverse Recovery Energy			200		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		6.0		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.12		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			13.9 21.1	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		6.6 10.1 4.0		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		2300		g

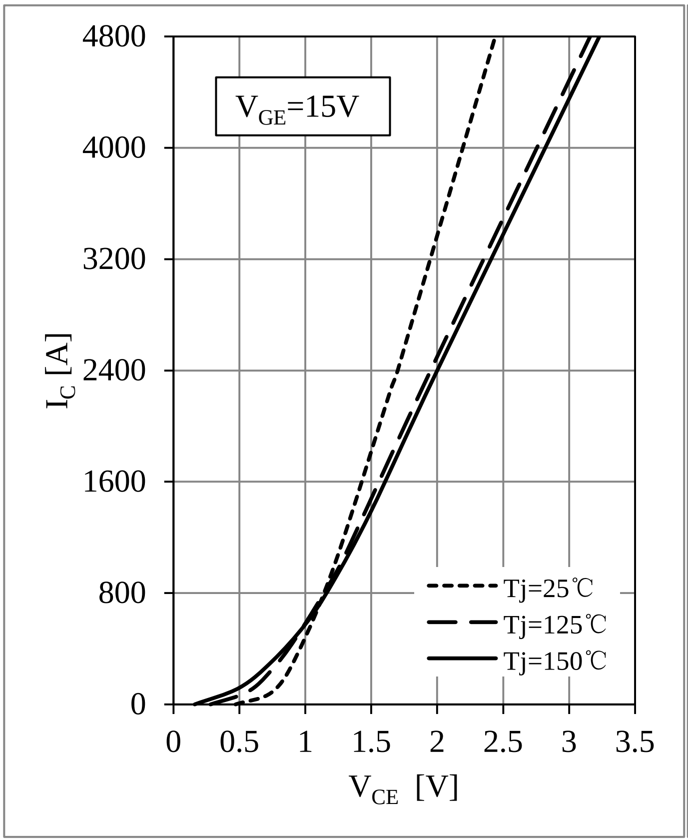


Fig 1. IGBT Output Characteristics

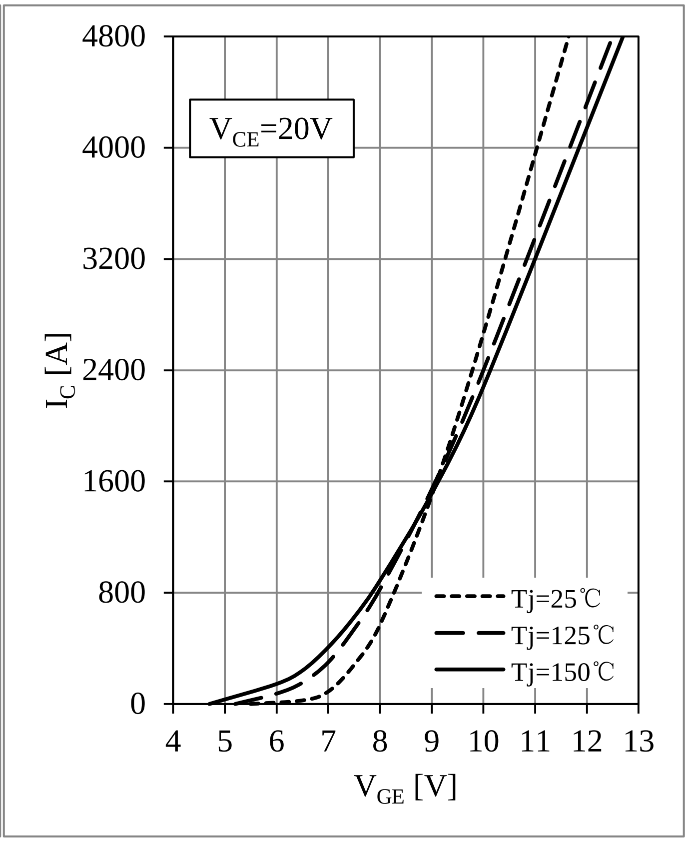


Fig 2. IGBT Transfer Characteristics

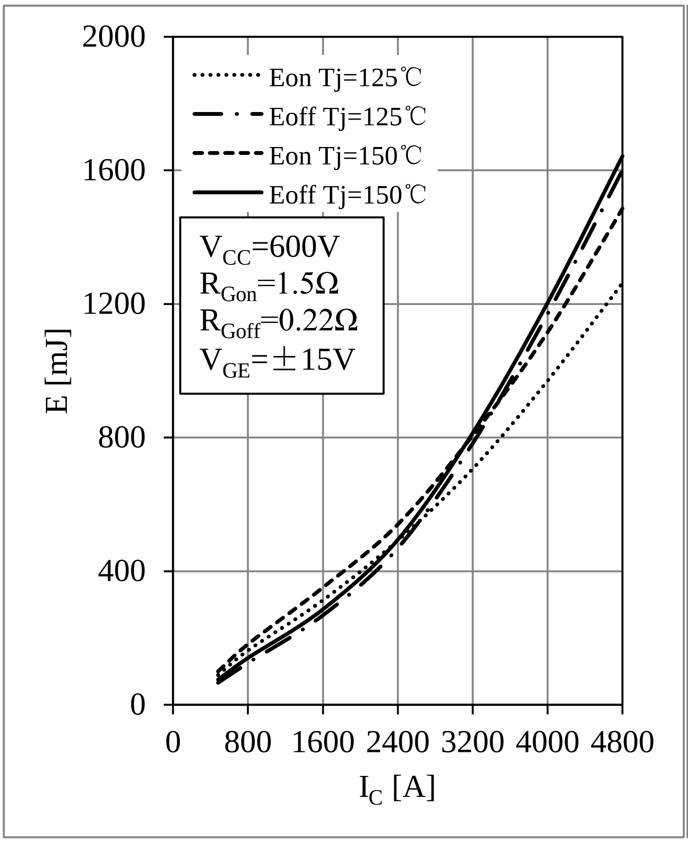


Fig 3. IGBT Switching Loss vs. I_C

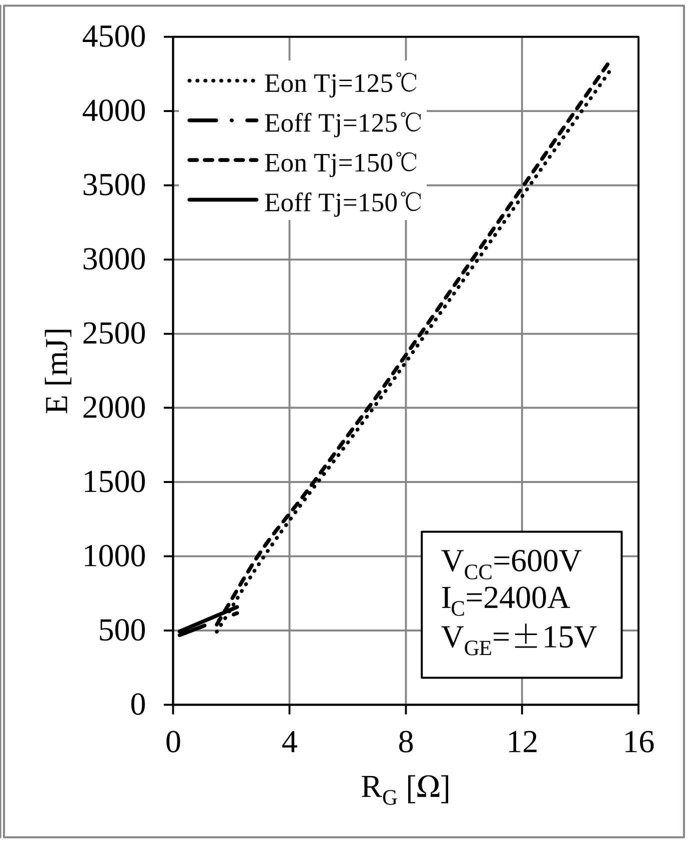


Fig 4. IGBT Switching Loss vs. R_G

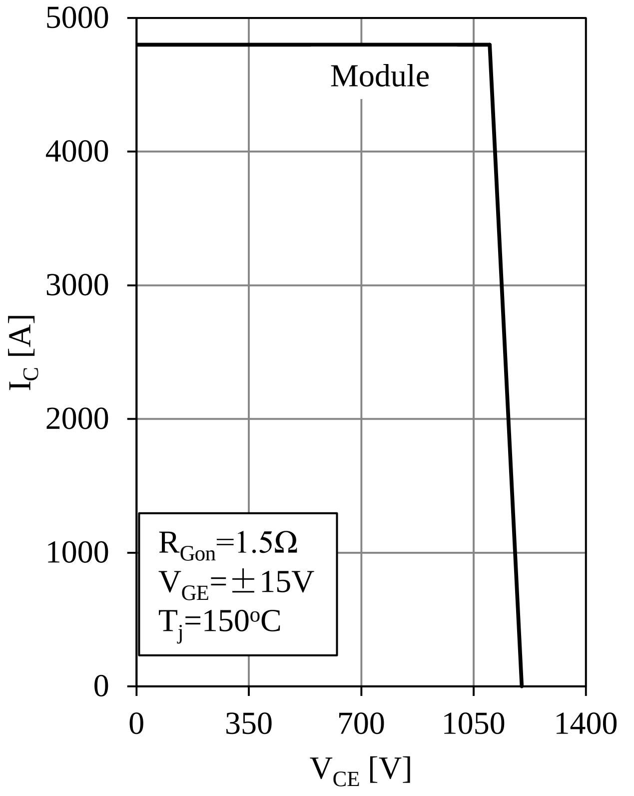


Fig 5. RBSOA

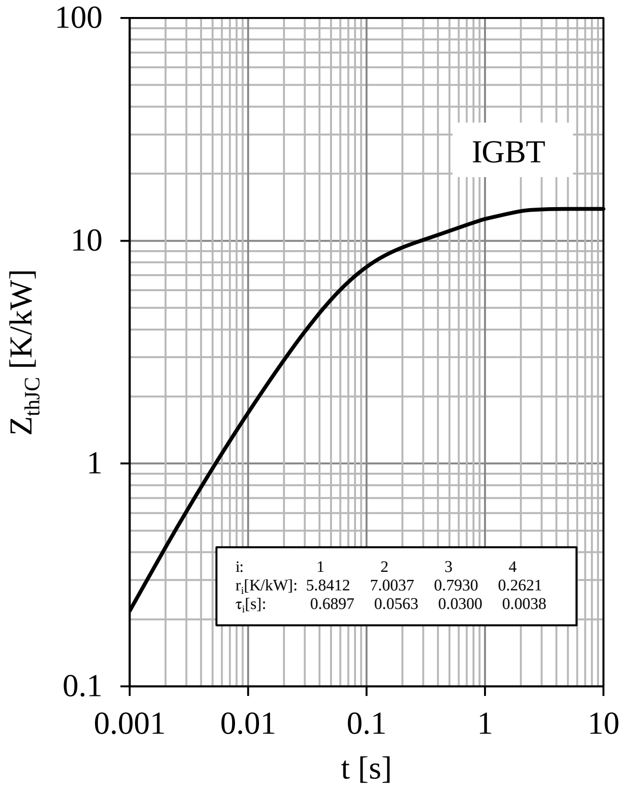


Fig 6. IGBT Transient Thermal Impedance

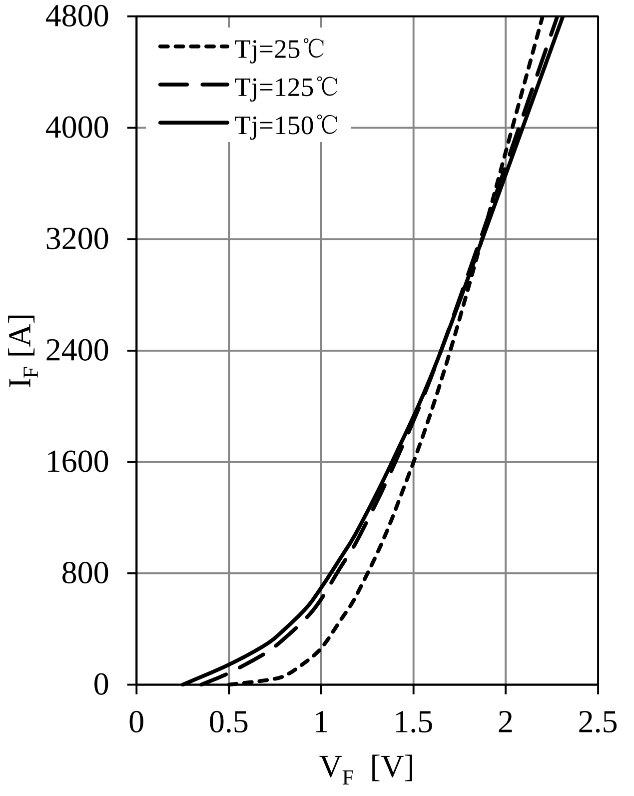


Fig 7. Diode Forward Characteristics

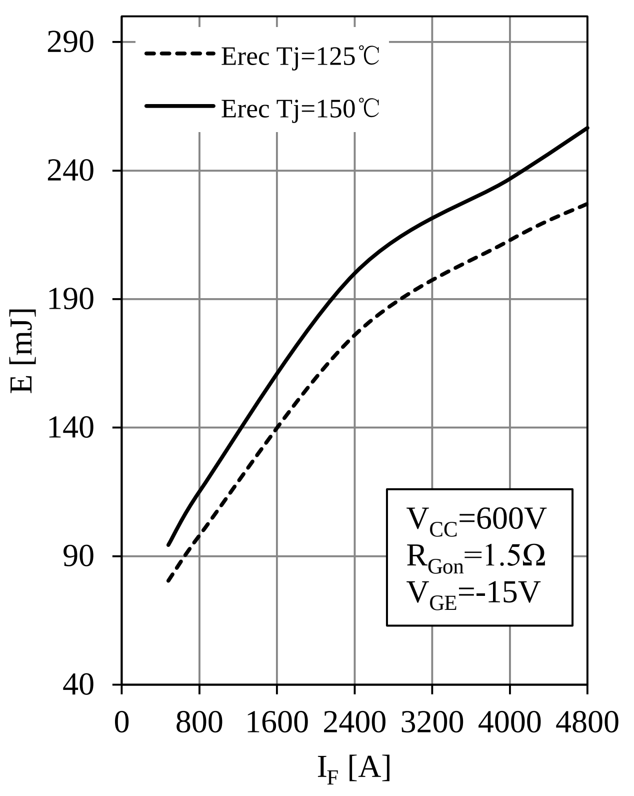


Fig 8. Diode Switching Loss vs. I_F

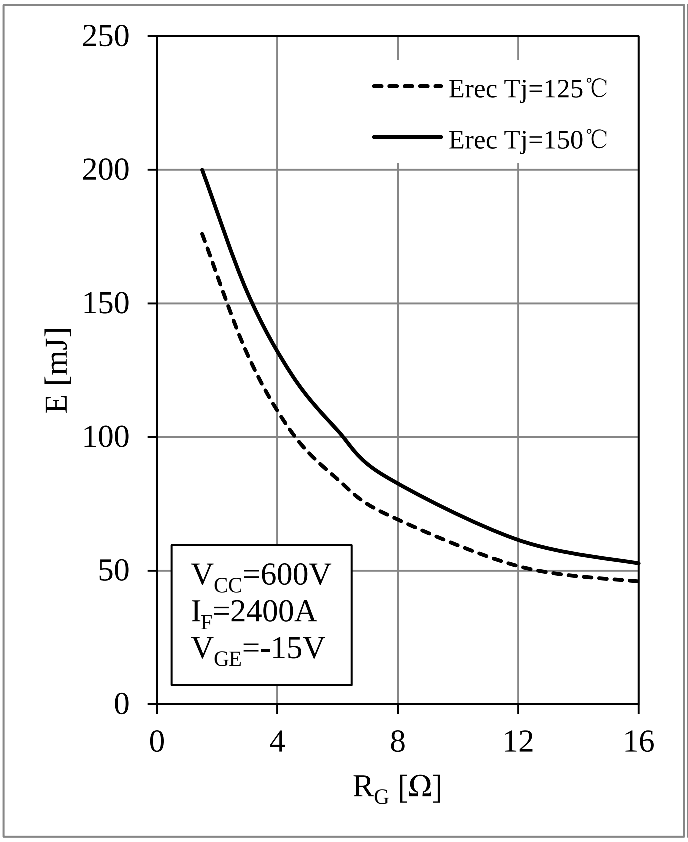


Fig 9. Diode Switching Loss vs. R_G

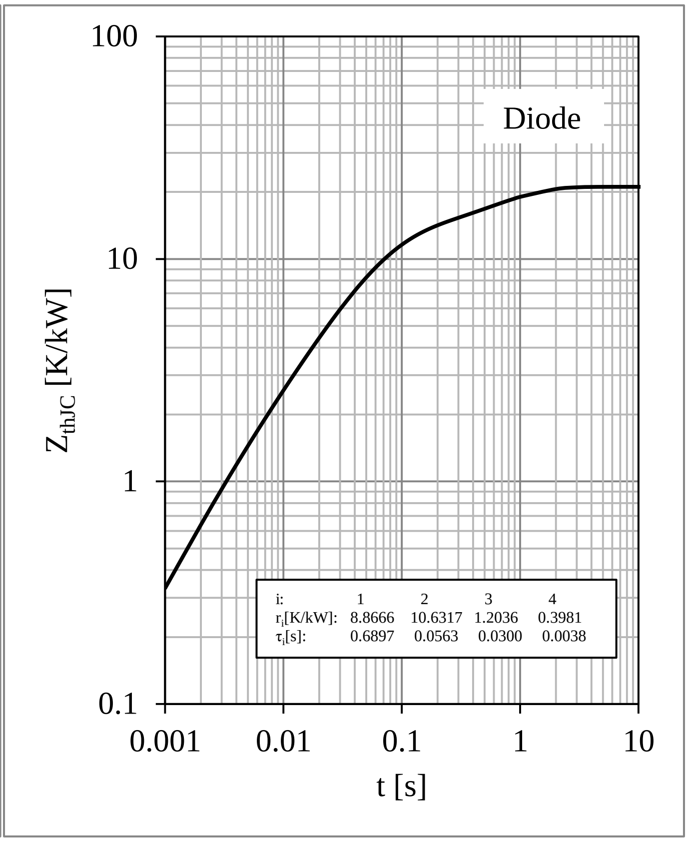
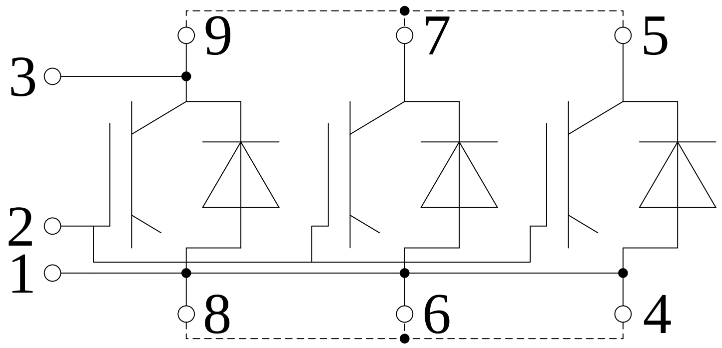


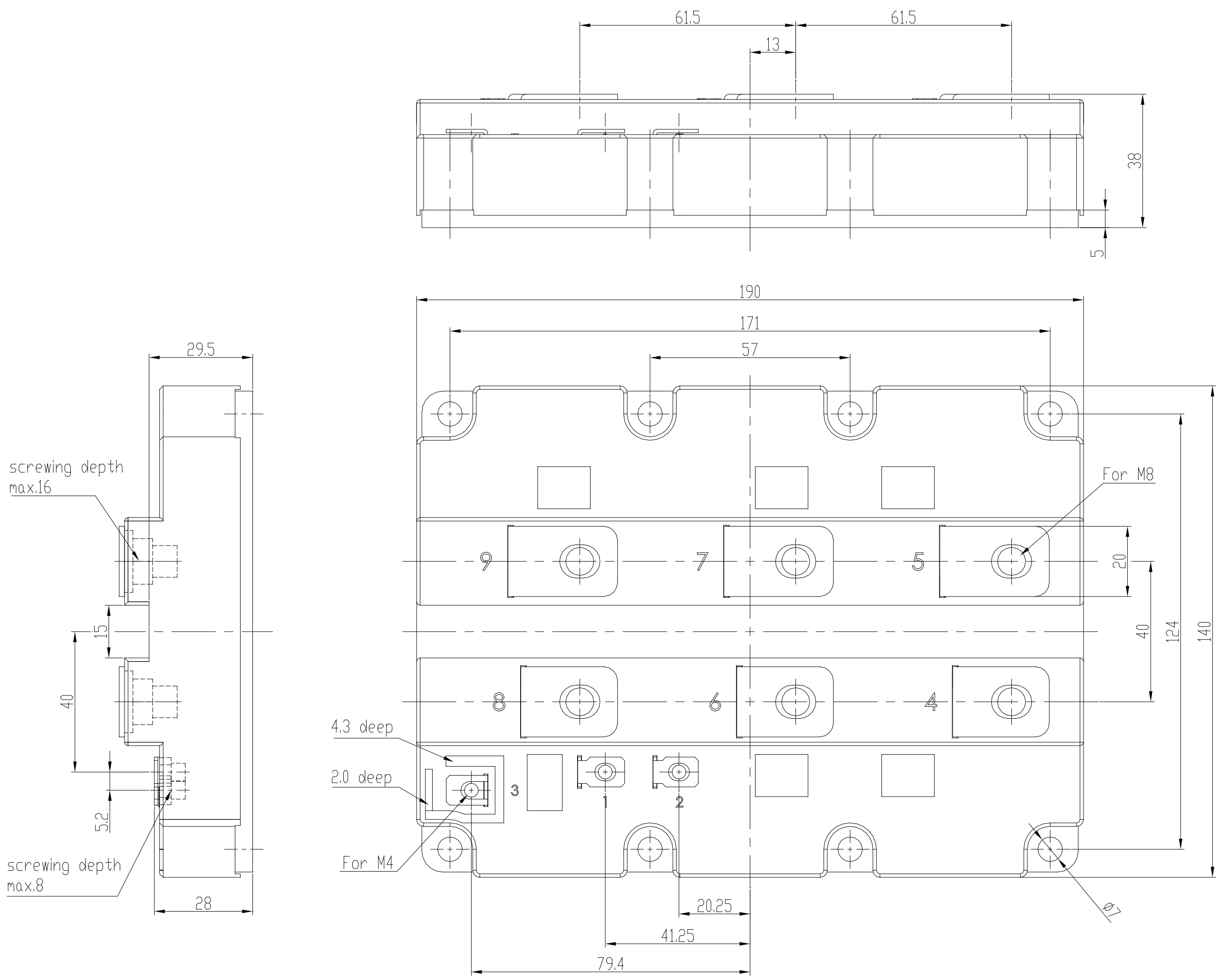
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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