STARPOWER

SEMICONDUCTOR **IGBT**

GD1500SGL330A4S

3300V/1500A 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.

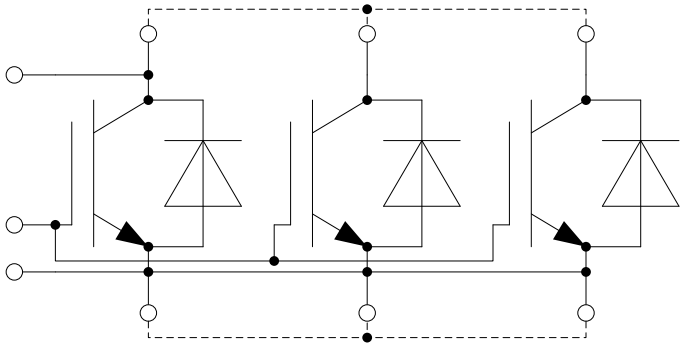
Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- Low switching losses
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance
- High reliability package

Typical Applications

- High Power Converter
- Wind Power
- Traction Drive

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	3300	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	3000 1500	A
I_{CM}	Pulsed Collector Current t_p=1ms	3000	A
P_D	Maximum Power Dissipation @ T_j=175°C	17.65	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	3300	V
I_F	Diode Continuous Forward Current	1500	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	3000	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	6000	V
V_{ISO}	Partial Discharge Extinction Voltage IEC1287,RMS,f=50Hz,Q_{PD}≤10pC	2600	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=1500A,V_{GE}=15V, T_j=25°C		2.50	2.90	V
		I_C=1500A,V_{GE}=15V, T_j=125°C		3.10		
		I_C=1500A,V_{GE}=15V, T_j=150°C		3.25		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=240mA,V_{CE}=V_{GE}, T_j=25°C	5.0		7.0	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			500	nA
R_{Gint}	Internal Gate Resistance			0.6		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		151		nF
C_{res}	Reverse Transfer Capacitance			3.85		nF
Q_G	Gate Charge	V_{CE}=1800V, V_{GE}=-15…+15V		11.0		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=1800V,I_C=1500A, R_{Gon}=1.0Ω, R_{Goff}=1.5Ω, C_{GE}=330nF, V_{GE}=±15V,T_j=25°C		600		ns
t_r	Rise Time			240		ns
$t_{d(off)}$	Turn-Off Delay Time			1600		ns
t_f	Fall Time			390		ns
E_{on}	Turn-On Switching Loss			1600		mJ
E_{off}	Turn-Off Switching Loss			2100		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=1800V,I_C=1500A, R_{Gon}=1.0Ω, R_{Goff}=1.5Ω, C_{GE}=330nF, V_{GE}=±15V,T_j=125°C		610		ns
t_r	Rise Time			270		ns
$t_{d(off)}$	Turn-Off Delay Time			1760		ns
t_f	Fall Time			445		ns
E_{on}	Turn-On Switching Loss			2150		mJ
E_{off}	Turn-Off Switching Loss			2800		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=1800V,I_C=1500A, R_{Gon}=1.0Ω, R_{Goff}=1.5Ω, C_{GE}=330nF, V_{GE}=±15V,T_j=150°C		610		ns
t_r	Rise Time			280		ns
$t_{d(off)}$	Turn-Off Delay Time			1800		ns
t_f	Fall Time			470		ns
E_{on}	Turn-On Switching Loss			2350		mJ
E_{off}	Turn-Off Switching Loss			3000		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=2500V, V_{CEM}≤3300V		6400		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=1500A,V_{GE}=0V,T_j=25°C		2.05	2.50	V
		I_F=1500A,V_{GE}=0V,T_j=125°C		2.25		
		I_F=1500A,V_{GE}=0V,T_j=150°C		2.20		
Q_r	Recovered Charge	V_R=1800V,I_F=1500A, -di/dt=6000A/µs,C_{GE}=330nF, V_{GE}=-15V,T_j=25°C		950		µC
I_{RM}	Peak Reverse Recovery Current			1700		A
E_{rec}	Reverse Recovery Energy			1150		mJ
Q_r	Recovered Charge	V_R=1800V,I_F=1500A, -di/dt=6000A/µs,C_{GE}=330nF, V_{GE}=-15V,T_j=125°C		1550		µC
I_{RM}	Peak Reverse Recovery Current			1850		A
E_{rec}	Reverse Recovery Energy			1900		mJ
Q_r	Recovered Charge	V_R=1800V,I_F=1500A, -di/dt=6000A/µs,C_{GE}=330nF, V_{GE}=-15V,T_j=150°C		1800		µC
I_{RM}	Peak Reverse Recovery Current			1900		A
E_{rec}	Reverse Recovery Energy			2250		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		6		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.12		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			8.50 17.0	K/kW
$R_{\theta CS}$	Case-to-Sink (per IGBT) Case-to-Sink (per Diode)		9.00 18.0		K/kW
$R_{\theta CS}$	Case-to-Sink		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		1200		g

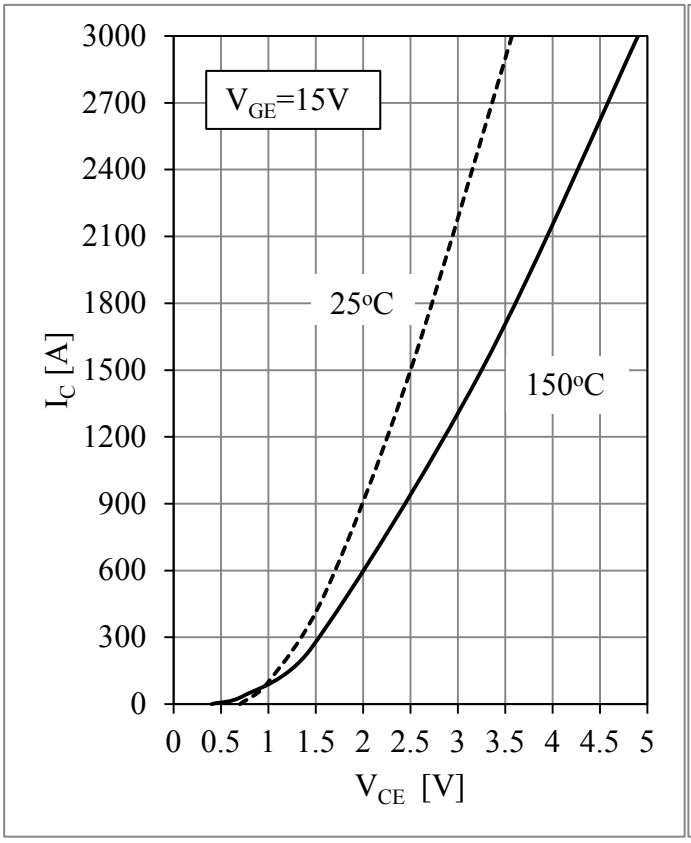


Fig 1. IGBT Output Characteristics

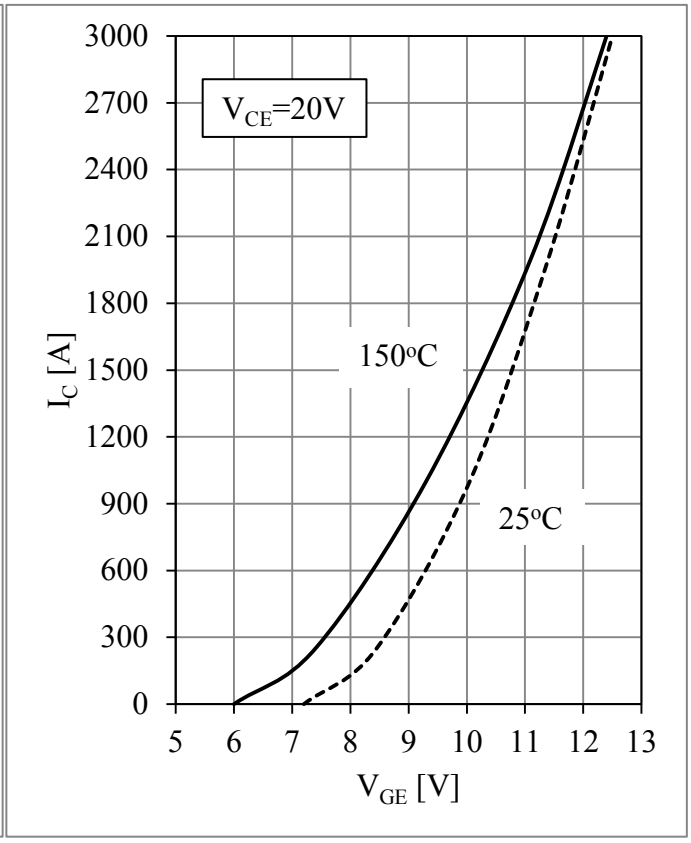


Fig 2. IGBT Transfer Characteristics

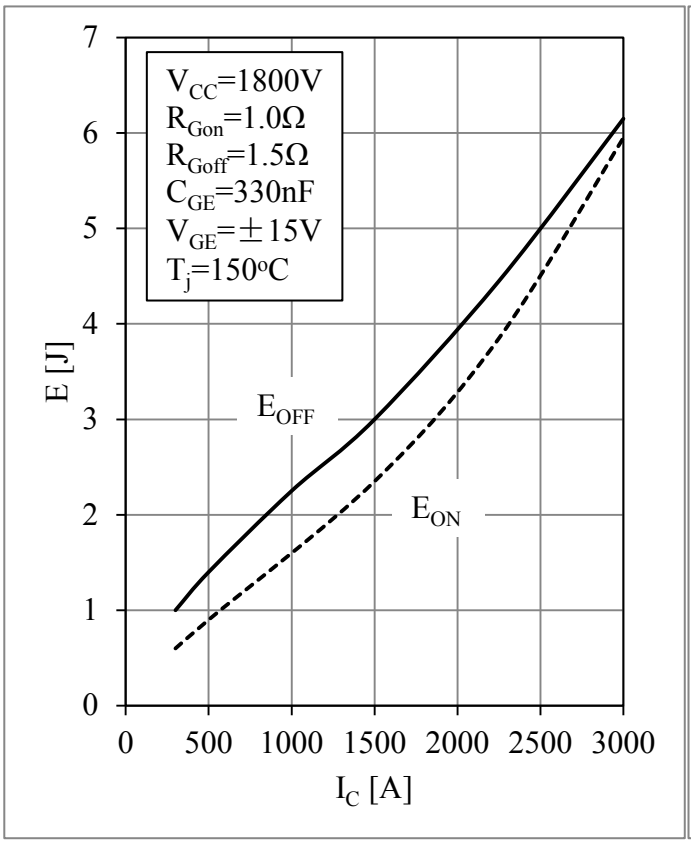


Fig 3. IGBT Switching Loss vs. I_C

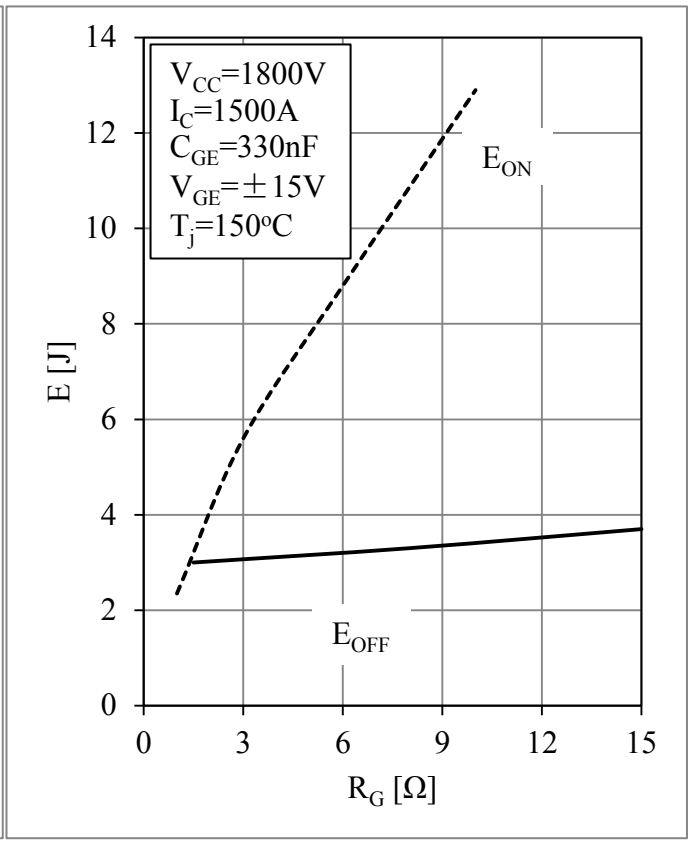


Fig 4. IGBT Switching Loss vs. R_G

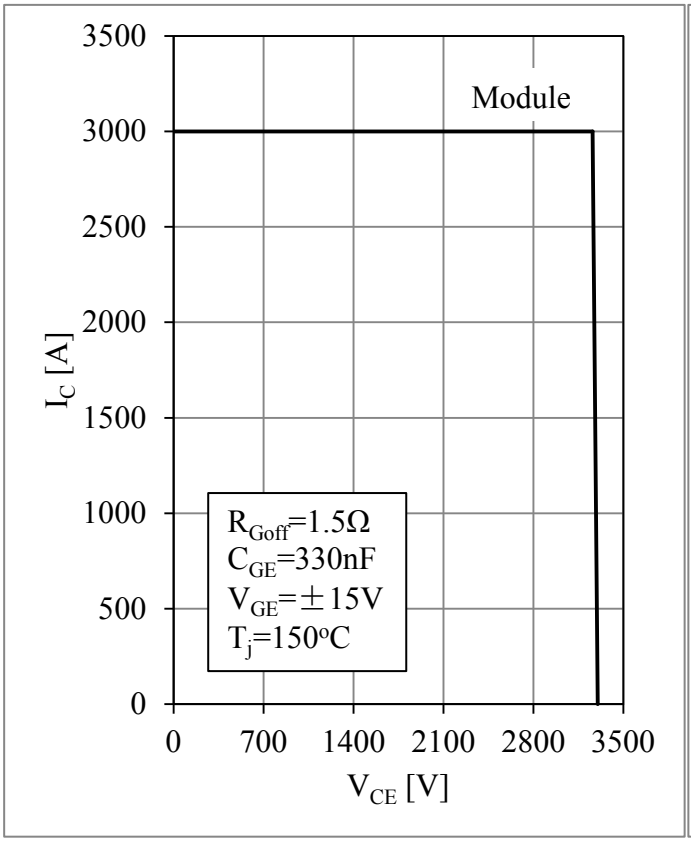


Fig 5. RBSOA

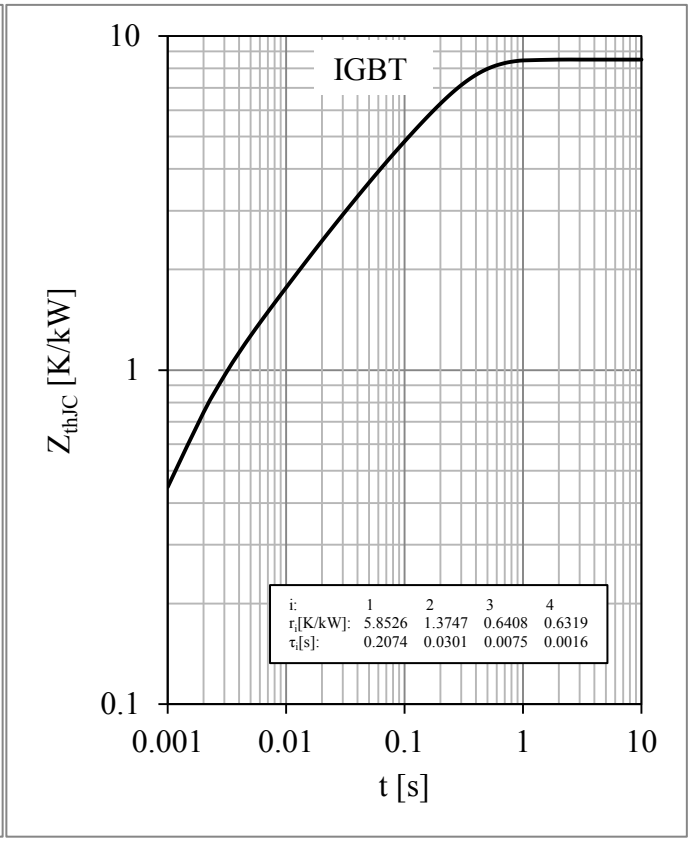


Fig 6. IGBT Transient Thermal Impedance

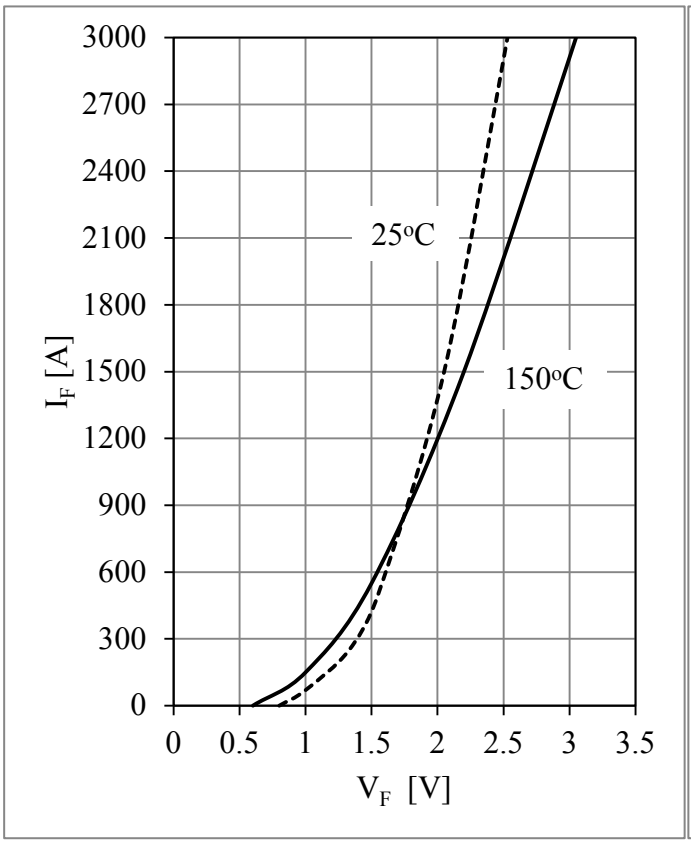


Fig 7. Diode Forward Characteristics

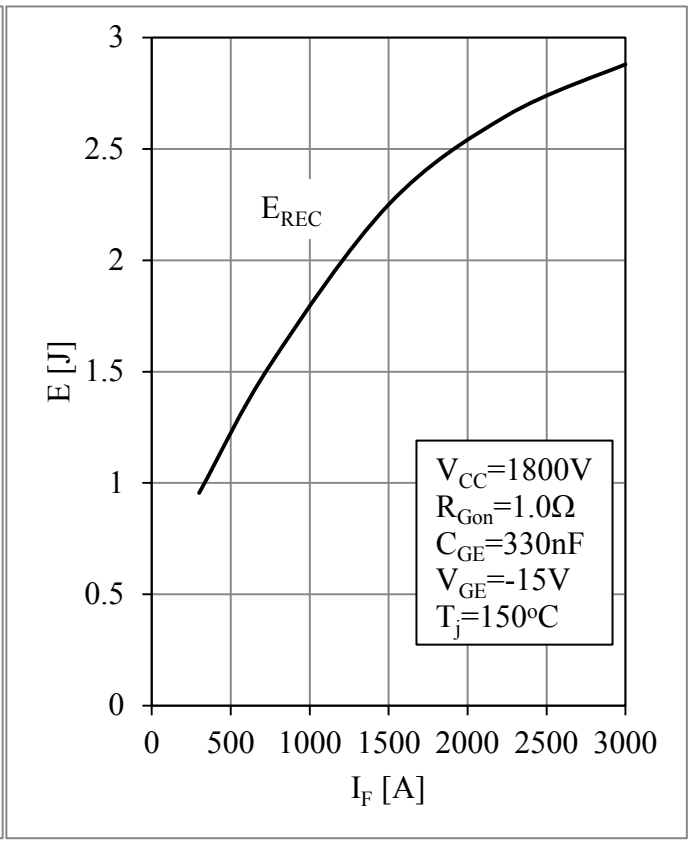


Fig 8. Diode Switching Loss vs. I_F

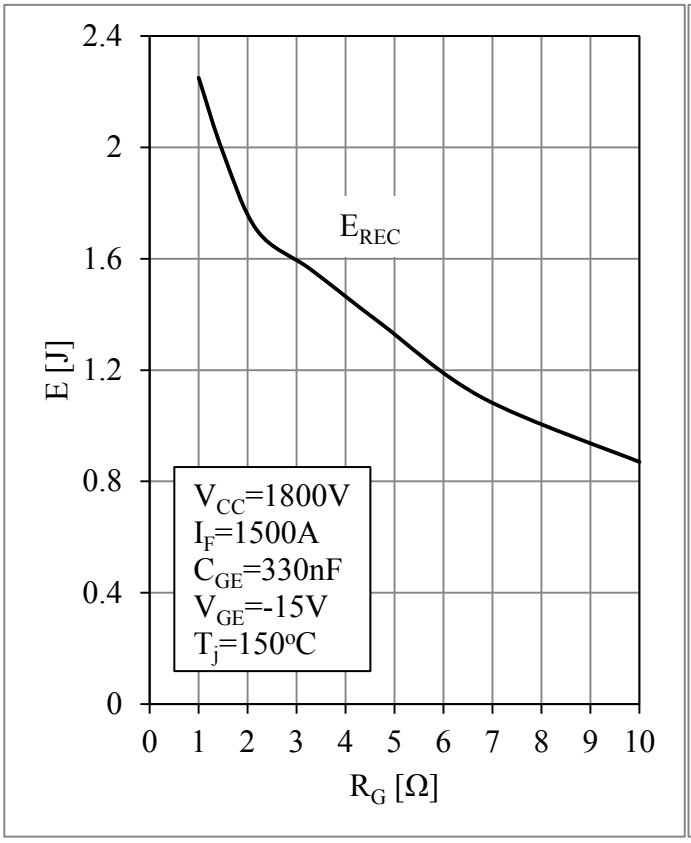


Fig 9. Diode Switching Loss vs. R_G

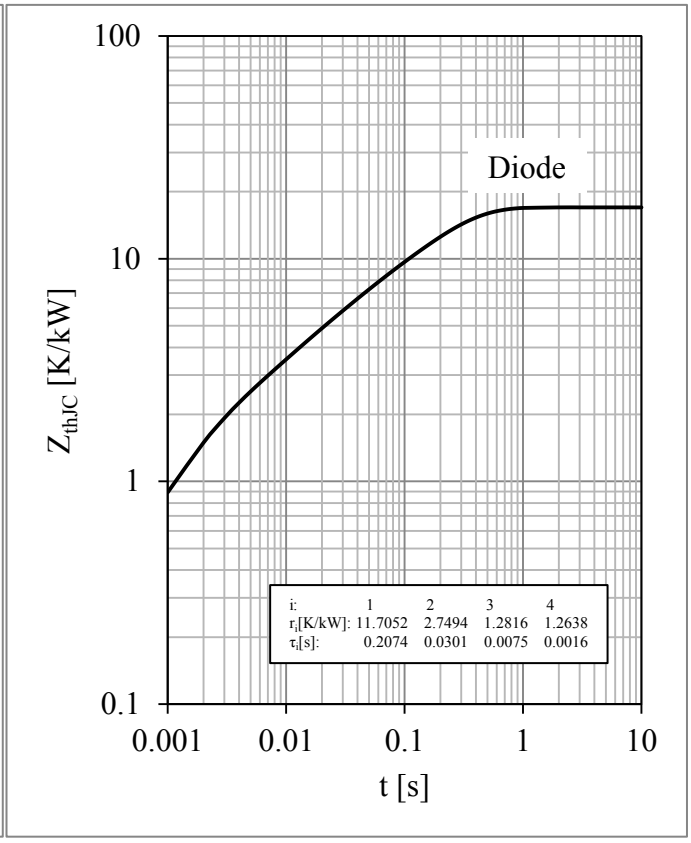
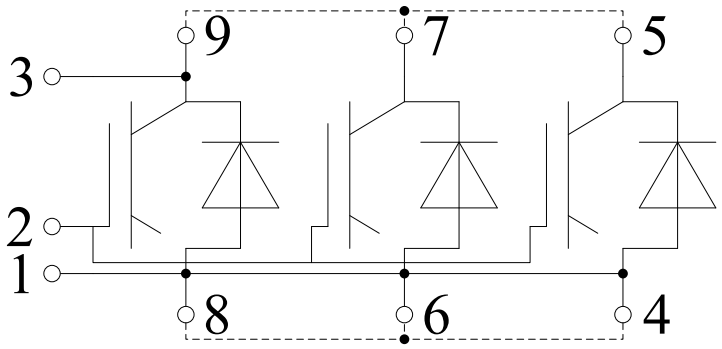


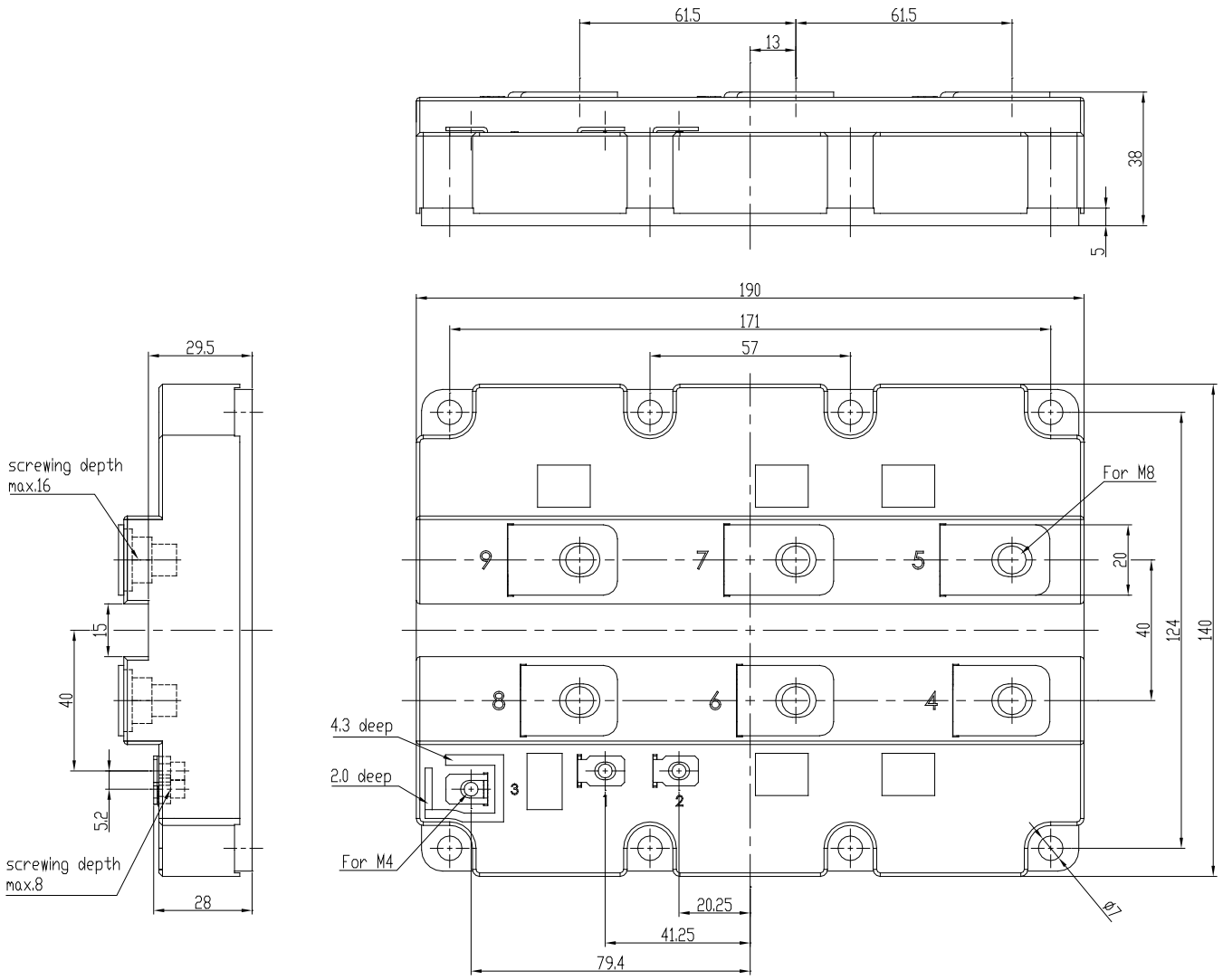
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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