STARPOWER

SEMICONDUCTOR **IGBT**

GD800HFY120C3S

1200V/800A 2 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.

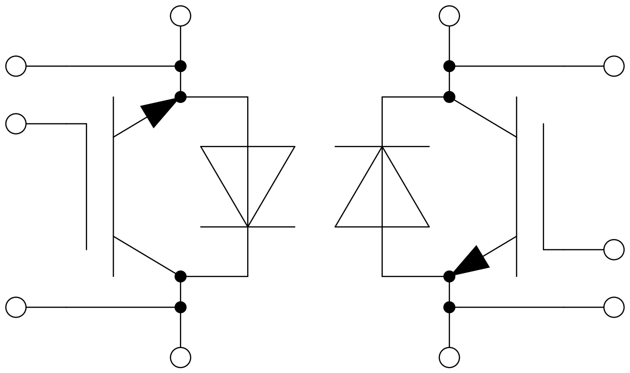
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175^{o}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

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	1203 800	A
I_{CM}	Pulsed Collector Current t_p=1ms	1600	A
P_D	Maximum Power Dissipation @ T_j=175°C	3836	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	800	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	1600	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=800A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=800A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=800A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=20.0mA,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			1.25		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		56.0		nF
C_{res}	Reverse Transfer Capacitance			3.20		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		7.4		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=0.9Ω,V_{GE}=±15V, T_j=25°C		257		ns
t_r	Rise Time			96		ns
$t_{d(off)}$	Turn-Off Delay Time			628		ns
t_f	Fall Time			103		ns
E_{on}	Turn-On Switching Loss			47		mJ
E_{off}	Turn-Off Switching Loss			68		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=0.9Ω,V_{GE}=±15V, T_j=125°C		268		ns
t_r	Rise Time			107		ns
$t_{d(off)}$	Turn-Off Delay Time			659		ns
t_f	Fall Time			144		ns
E_{on}	Turn-On Switching Loss			71		mJ
E_{off}	Turn-Off Switching Loss			103		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=0.9Ω,V_{GE}=±15V, T_j=150°C		278		ns
t_r	Rise Time			118		ns
$t_{d(off)}$	Turn-Off Delay Time			680		ns
t_f	Fall Time			155		ns
E_{on}	Turn-On Switching Loss			77		mJ
E_{off}	Turn-Off Switching Loss			113		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=800V, V_{CEM}≤1200V		3200		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=800A,V_{GE}=0V,T_j=25°C		1.70	2.15	V
		I_F=800A,V_{GE}=0V,T_j=125°C		1.65		
		I_F=800A,V_{GE}=0V,T_j=150°C		1.65		
Q_r	Recovered Charge	V_{CC}=600V,I_F=800A, -di/dt=9500A/μs,V_{GE}=±15V, T_j=25°C		76		μC
I_{RM}	Peak Reverse Recovery Current			570		A
E_{rec}	Reverse Recovery Energy			38.0		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=800A, -di/dt=9500A/μs,V_{GE}=±15V, T_j=125°C		133		μC
I_{RM}	Peak Reverse Recovery Current			760		A
E_{rec}	Reverse Recovery Energy			73.2		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=800A, -di/dt=9500A/μs,V_{GE}=±15V, T_j=150°C		152		μC
I_{RM}	Peak Reverse Recovery Current			798		A
E_{rec}	Reverse Recovery Energy			83.6		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.18		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			39.1 64.7	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		19.3 31.9 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		1500		g

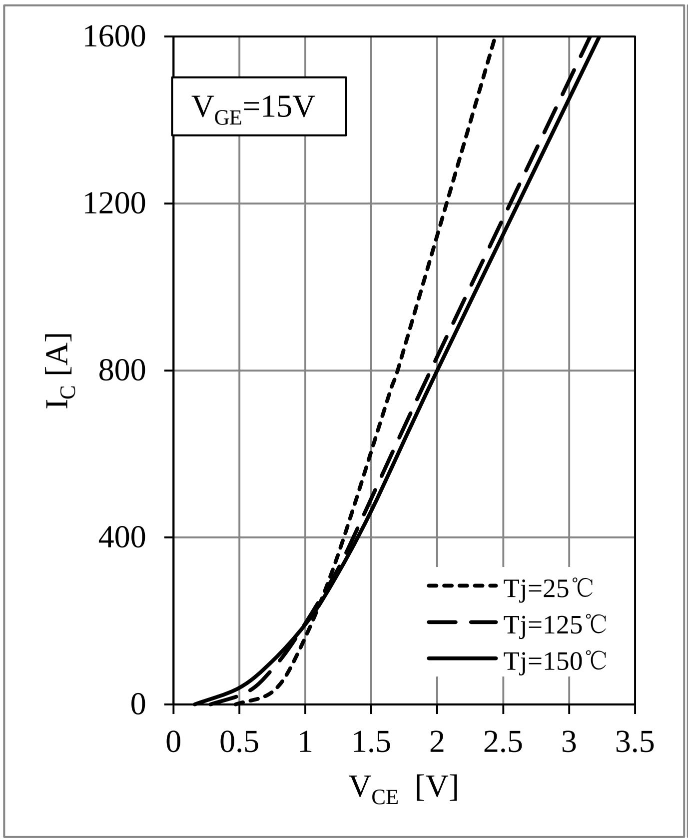


Fig 1. IGBT Output Characteristics

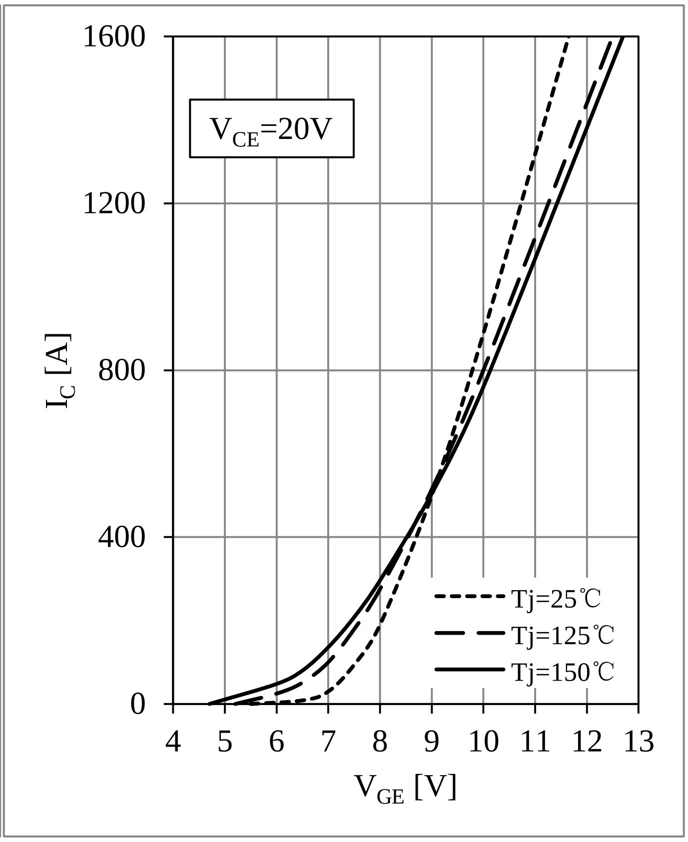


Fig 2. IGBT Transfer Characteristics

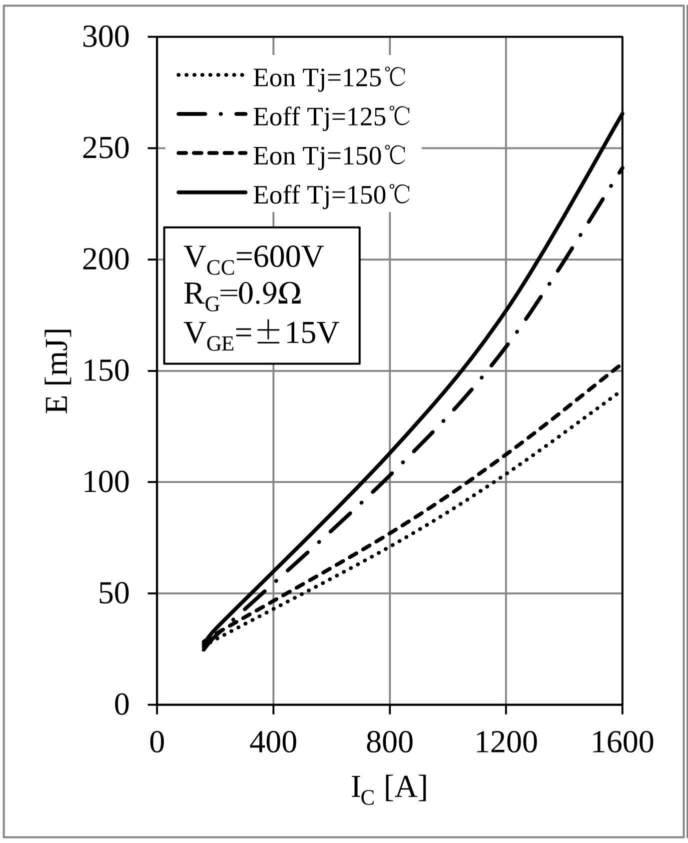


Fig 3. IGBT Switching Loss vs. I_C

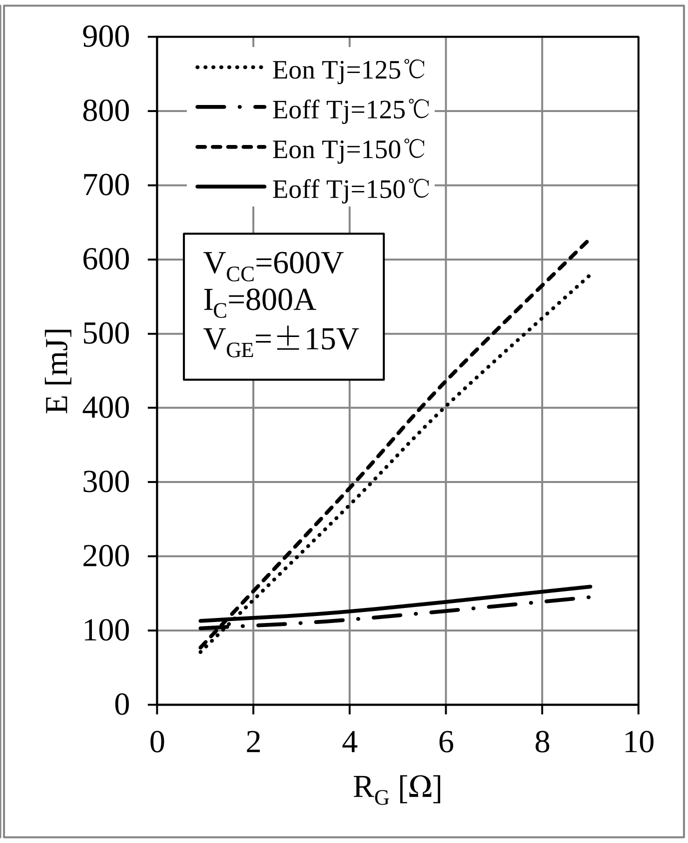


Fig 4. IGBT Switching Loss vs. R_G

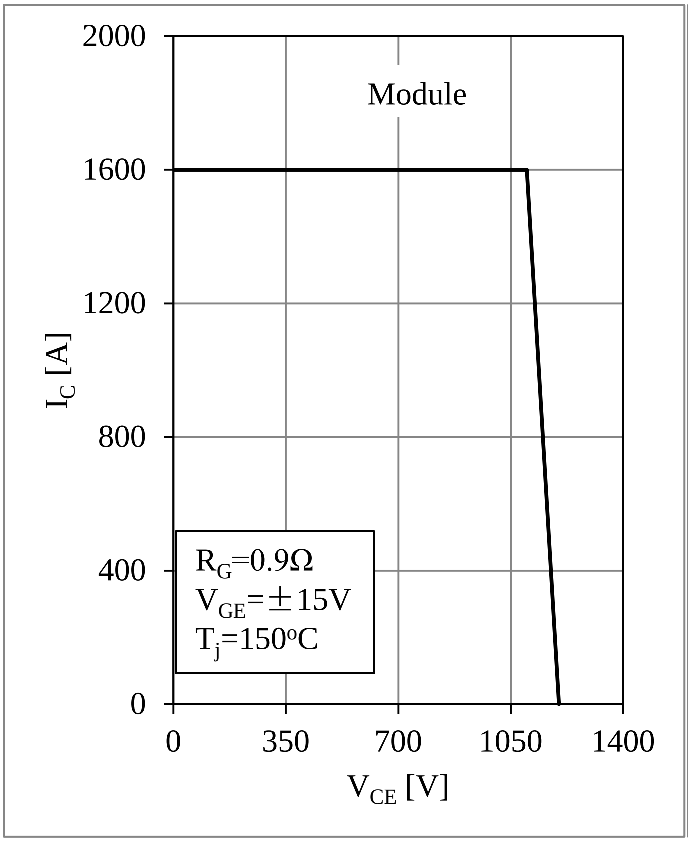


Fig 5. RBSOA

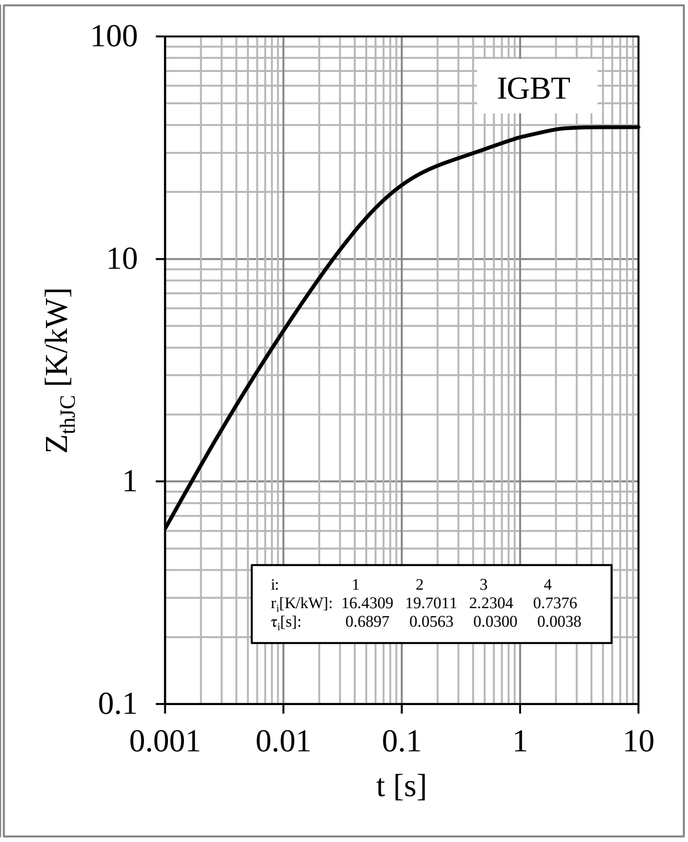


Fig 6. IGBT Transient Thermal Impedance

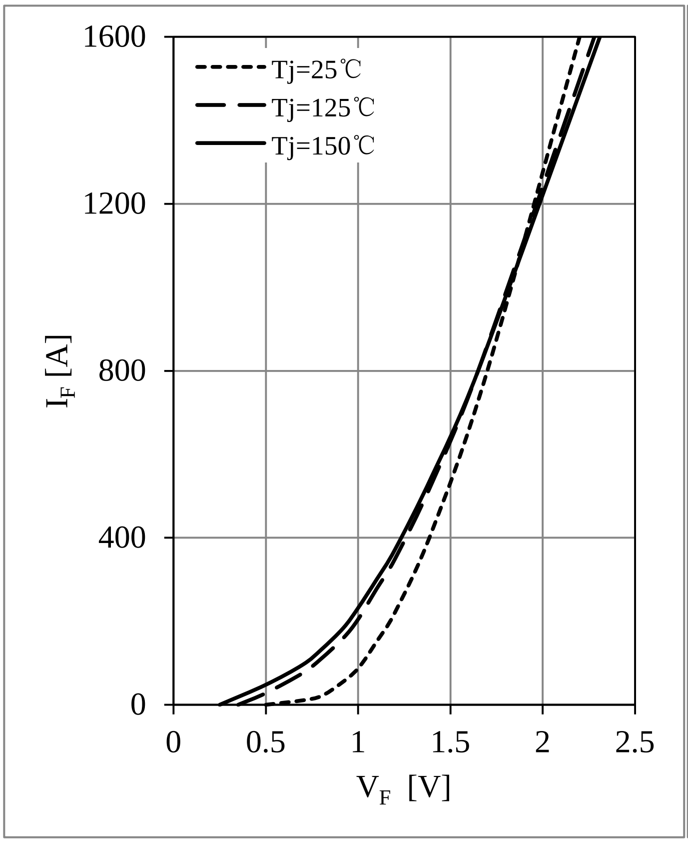


Fig 7. Diode Forward Characteristics

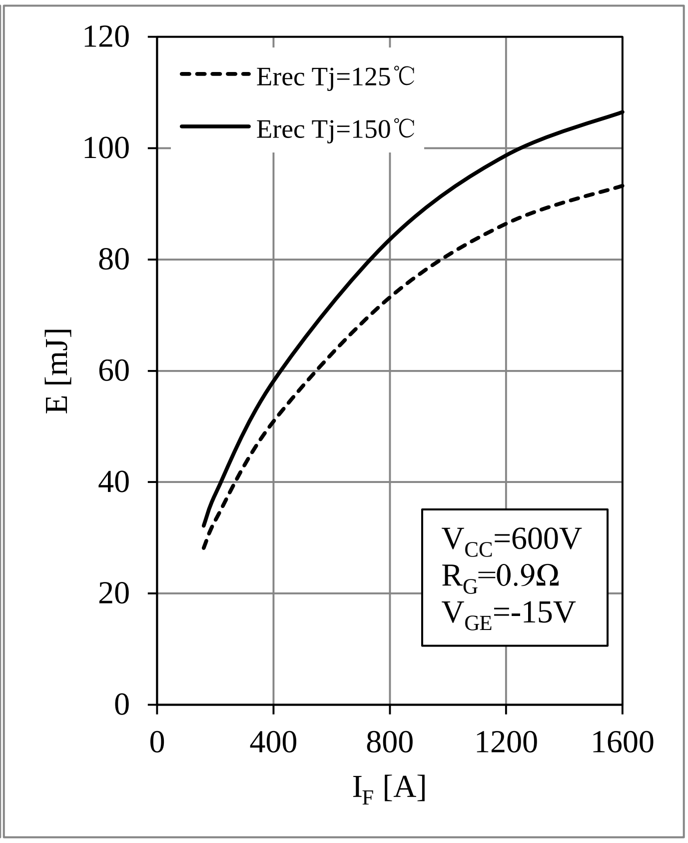


Fig 8. Diode Switching Loss vs. I_F

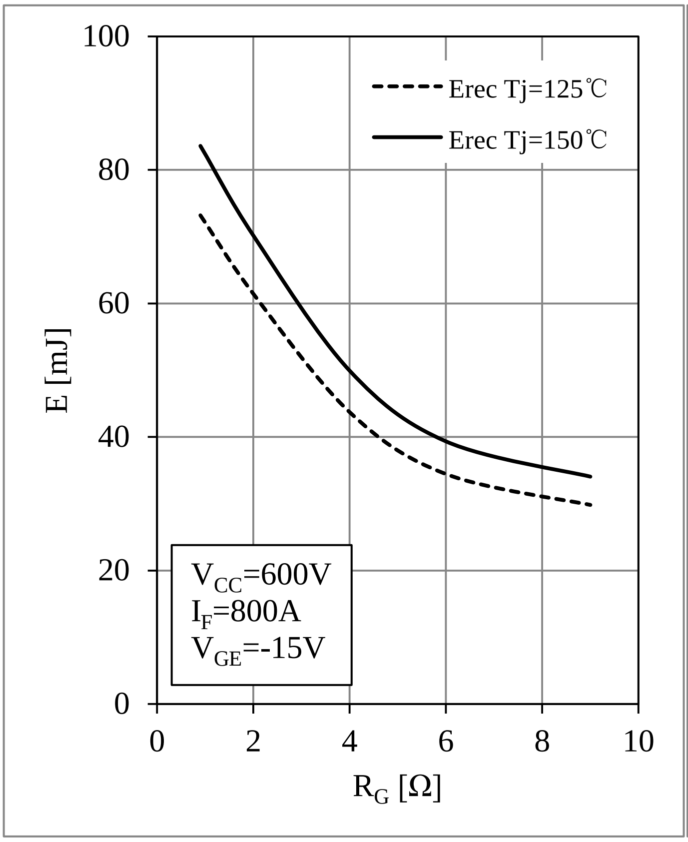


Fig 9. Diode Switching Loss vs. R_G

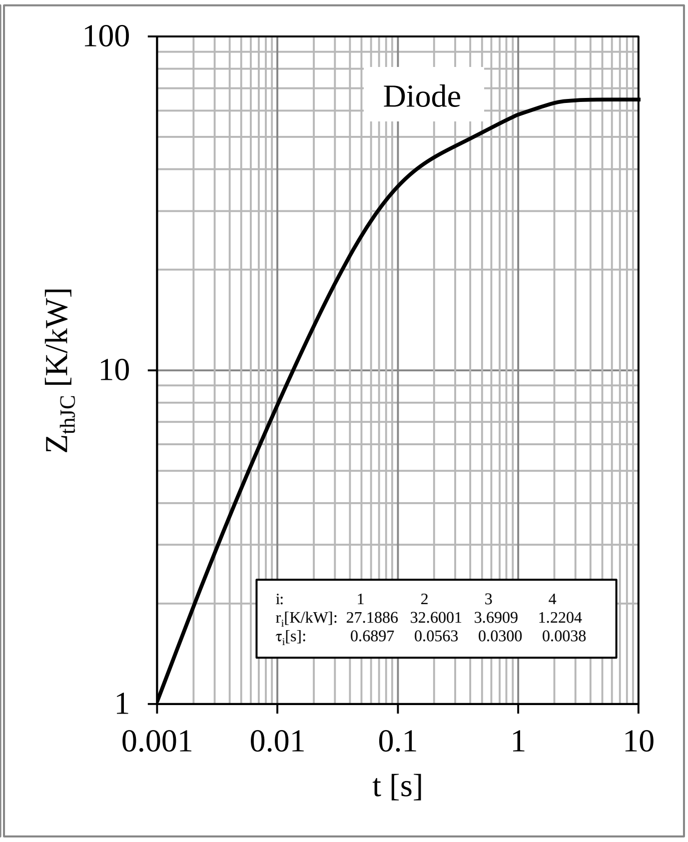
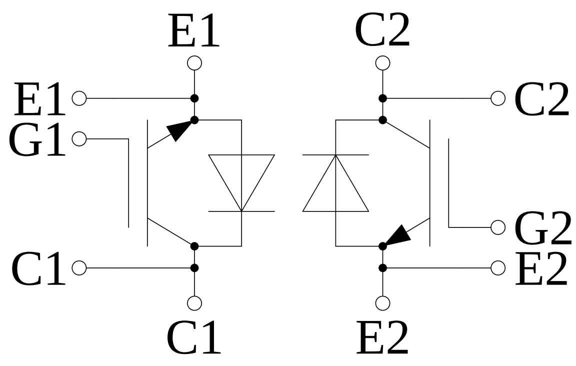


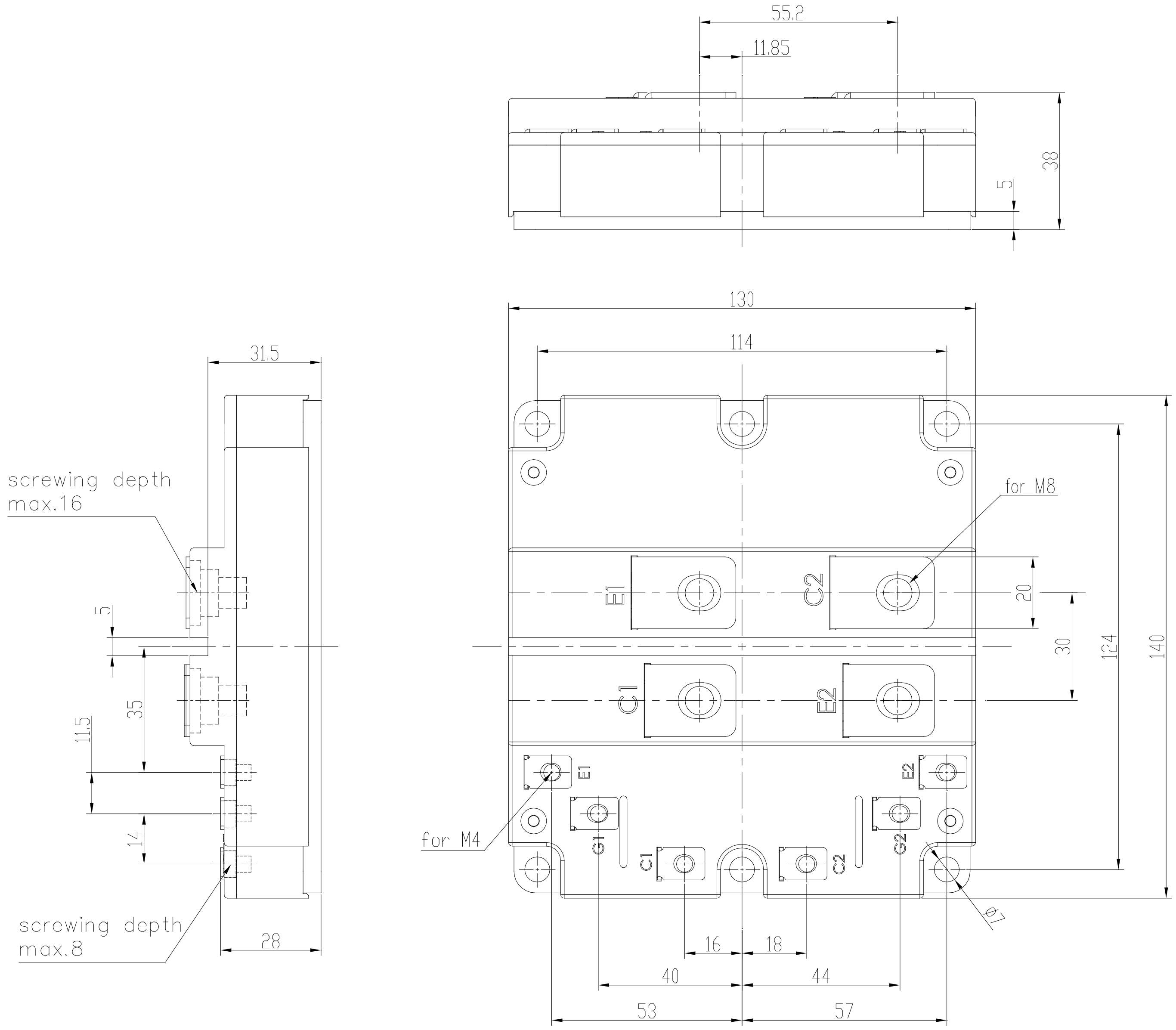
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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