STARPOWER

SEMICONDUCTOR **IGBT**

GD100HFQ120C1SD

1200V/100A 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 electronic welder and inductive heating.

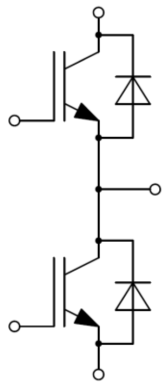
Features

- 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

- Switching mode power supply
- Inductive heating
- Electronic welder

Equivalent Circuit Schematic



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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	162 100	A
I_{CM}	Pulsed Collector Current t_p=1ms	200	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	595	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	200	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	2500	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=100A,V_{GE}=15V, T_{vj}=25°C		1.85	2.30	V
		I_C=100A,V_{GE}=15V, T_{vj}=125°C		2.25		
		I_C=100A,V_{GE}=15V, T_{vj}=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=4.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.6	6.2	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			7.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		10.8		nF
C_{res}	Reverse Transfer Capacitance			0.30		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.84		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=100A, R_G=5.1Ω,V_{GE}=±15V, L_S=45nH,T_{vj}=25°C		59		ns
t_r	Rise Time			38		ns
$t_{d(off)}$	Turn-Off Delay Time			209		ns
t_f	Fall Time			71		ns
E_{on}	Turn-On Switching Loss			11.2		mJ
E_{off}	Turn-Off Switching Loss			3.15		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=100A, R_G=5.1Ω, V_{GE}=±15V, L_S=45nH,T_{vj}=125°C		68		ns
t_r	Rise Time			44		ns
$t_{d(off)}$	Turn-Off Delay Time			243		ns
t_f	Fall Time			104		ns
E_{on}	Turn-On Switching Loss			14.5		mJ
E_{off}	Turn-Off Switching Loss			4.36		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=100A, R_G=5.1Ω, V_{GE}=±15V, L_S=45nH,T_{vj}=150°C		71		ns
t_r	Rise Time			46		ns
$t_{d(off)}$	Turn-Off Delay Time			251		ns
t_f	Fall Time			105		ns
E_{on}	Turn-On Switching Loss			15.9		mJ
E_{off}	Turn-Off Switching Loss			4.63		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_{vj}=150°C,V_{CC}=800V, V_{CEM}≤1200V		400		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=100A,V_{GE}=0V,T_{vj}=25°C		1.85	2.30	V
		I_F=100A,V_{GE}=0V,T_{vj}=125°C		1.90		
		I_F=100A,V_{GE}=0V,T_{vj}=150°C		1.95		
Q_r	Recovered Charge	V_R=600V,I_F=100A, -di/dt=961A/µs,V_{GE}=-15V L_S=45nH,T_{vj}=25°C		7.92		µC
I_{RM}	Peak Reverse Recovery Current			46.4		A
E_{rec}	Reverse Recovery Energy			2.25		mJ
Q_r	Recovered Charge	V_R=600V,I_F=100A, -di/dt=871A/µs,V_{GE}=-15V L_S=45nH,T_{vj}=125°C		15.0		µC
I_{RM}	Peak Reverse Recovery Current			54.5		A
E_{rec}	Reverse Recovery Energy			5.08		mJ
Q_r	Recovered Charge	V_R=600V,I_F=100A, -di/dt=853A/µs,V_{GE}=-15V L_S=45nH,T_{vj}=150°C		18.8		µC
I_{RM}	Peak Reverse Recovery Current			58.9		A
E_{rec}	Reverse Recovery Energy			6.67		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.75		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.252 0.446	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.157 0.277 0.050		K/W
M	Terminal Connection Torque, Screw M5 Mounting Torque, Screw M6	2.5 3.0		5.0 5.0	N.m
G	Weight of Module		150		g

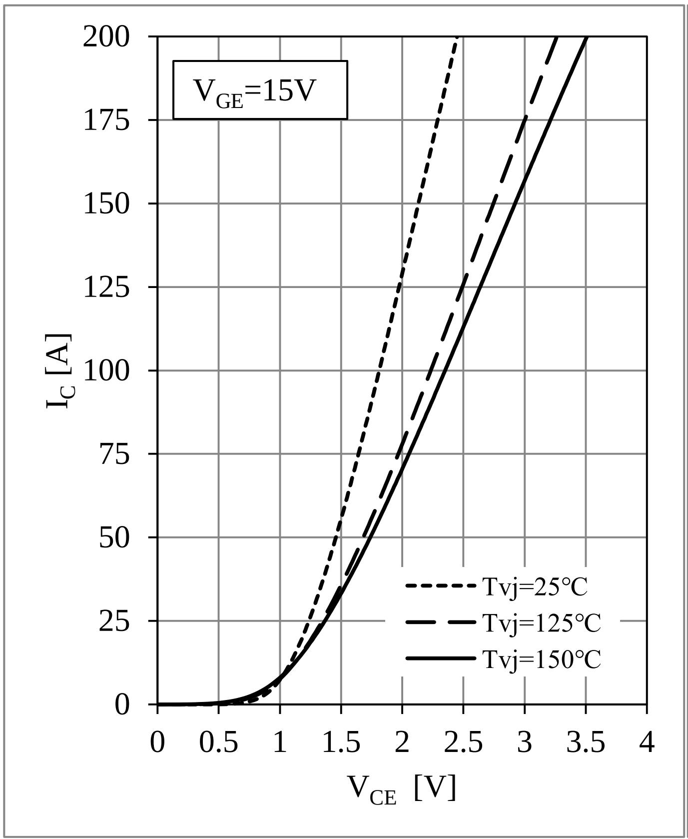


Fig 1. IGBT Output Characteristics

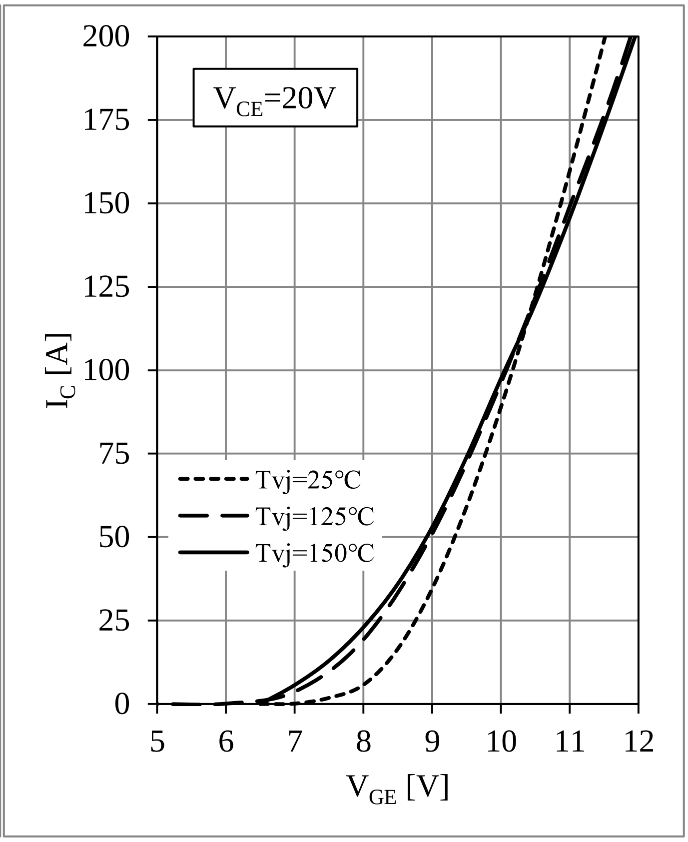


Fig 2. IGBT Transfer Characteristics

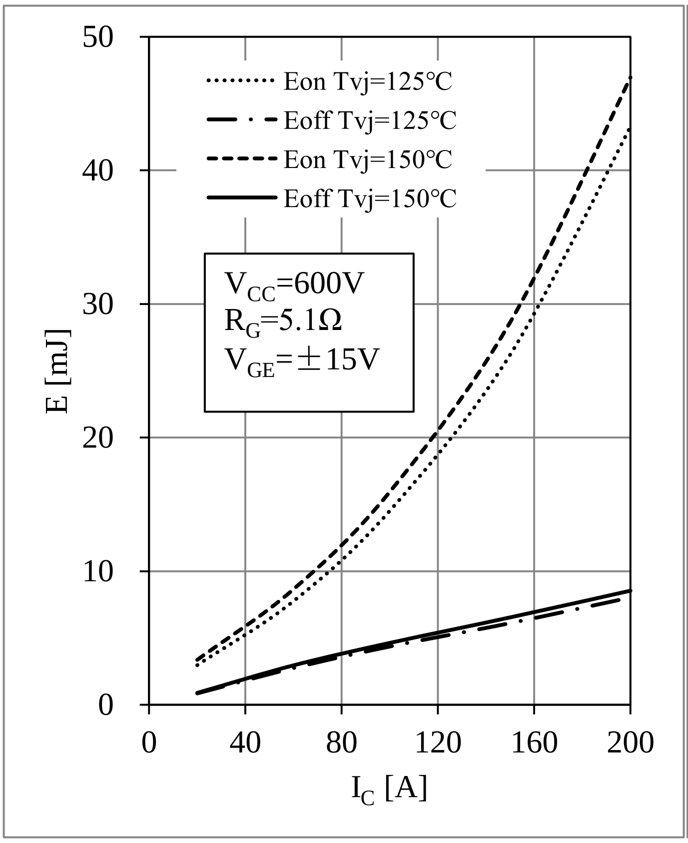


Fig 3. IGBT Switching Loss vs. I_C

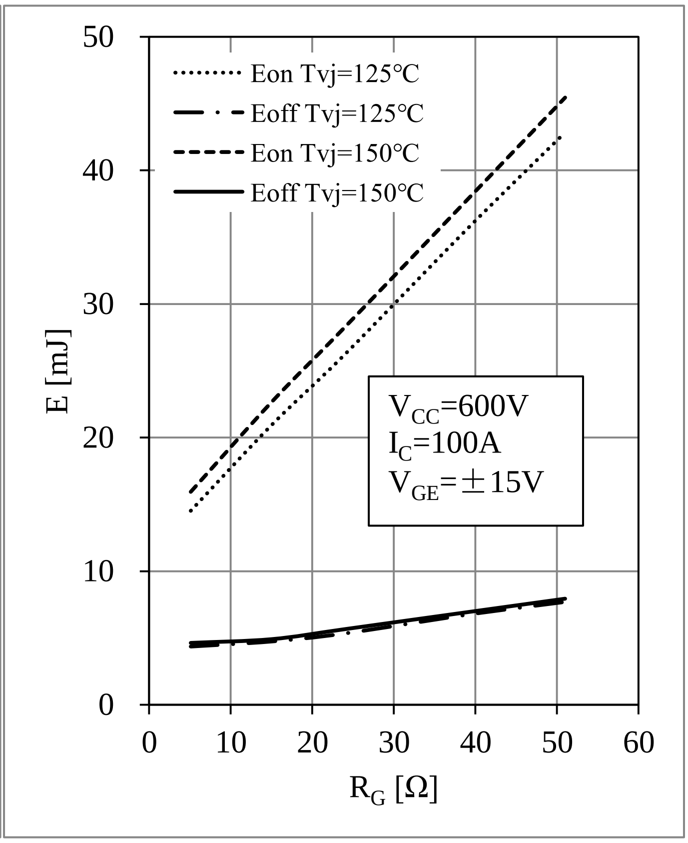


Fig 4. IGBT Switching Loss vs. R_G

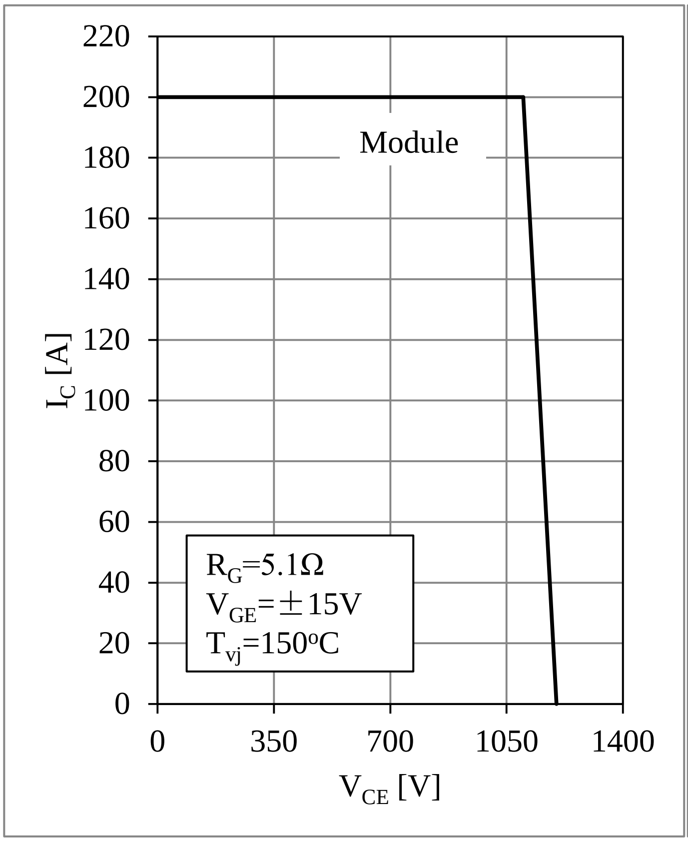


Fig 5. RBSOA

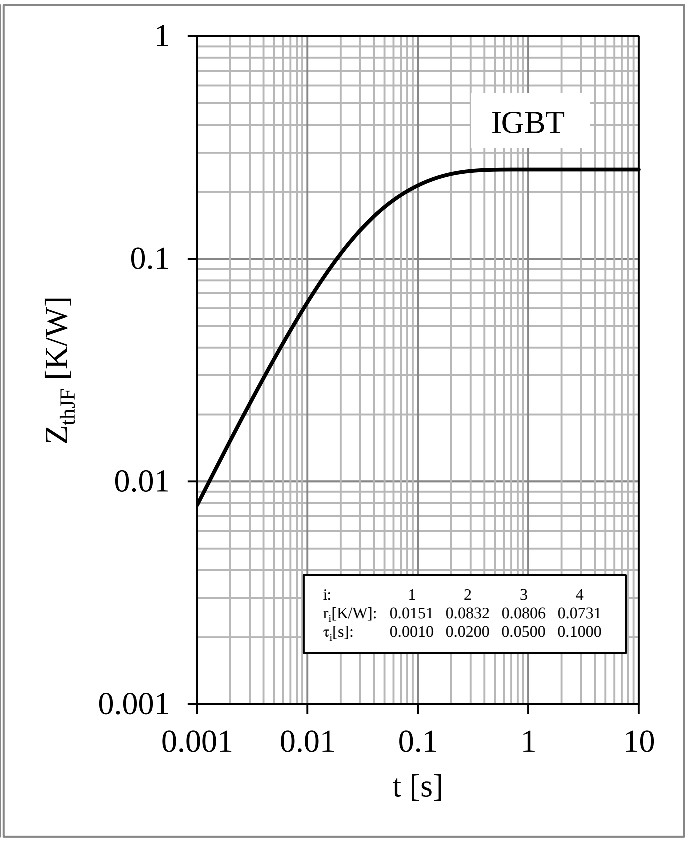


Fig 6. IGBT Transient Thermal Impedance

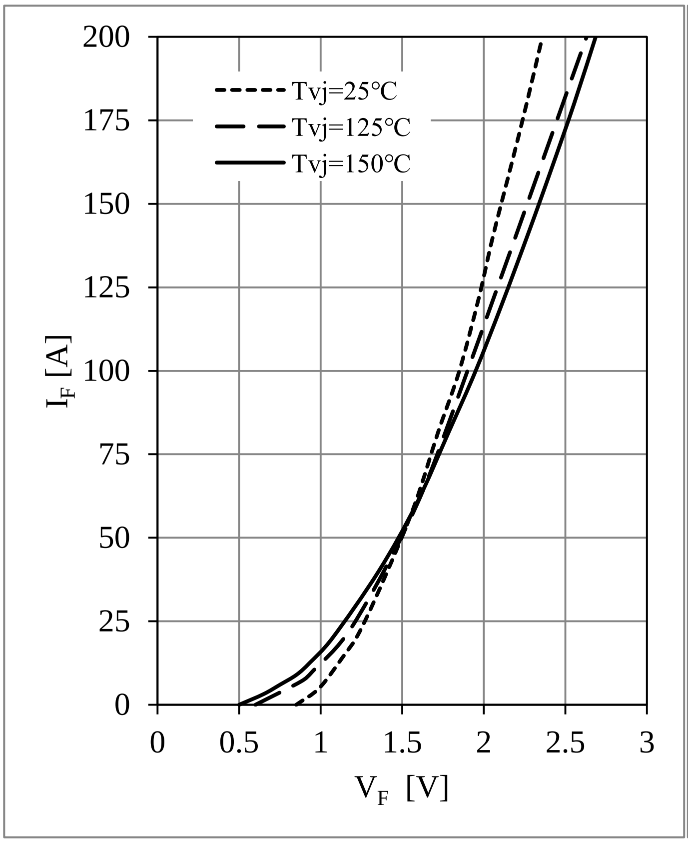


Fig 7. Diode Forward Characteristics

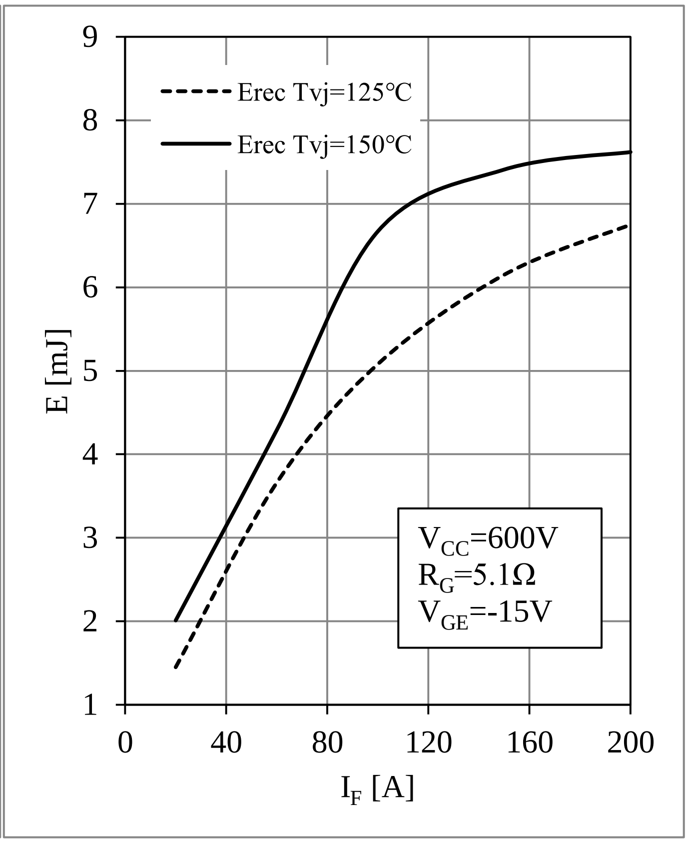


Fig 8. Diode Switching Loss vs. I_F

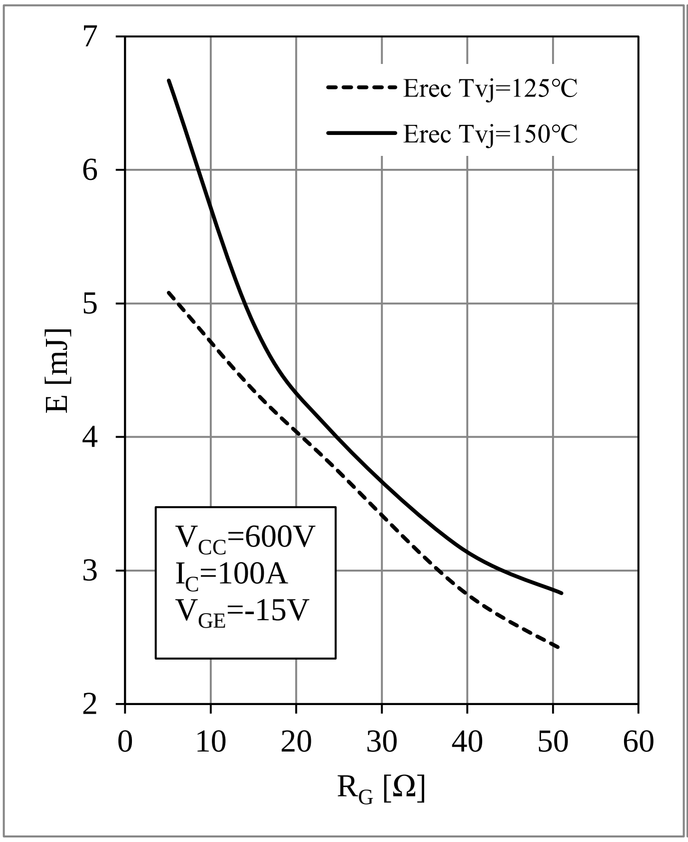


Fig 9. Diode Switching Loss vs. R_G

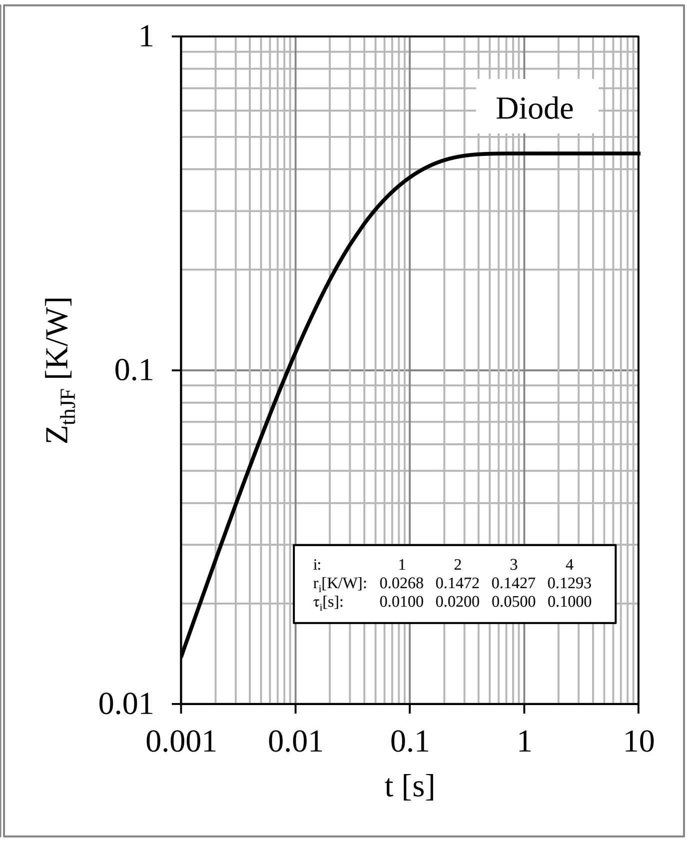
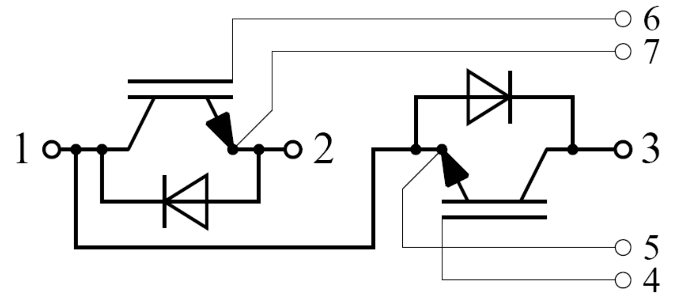


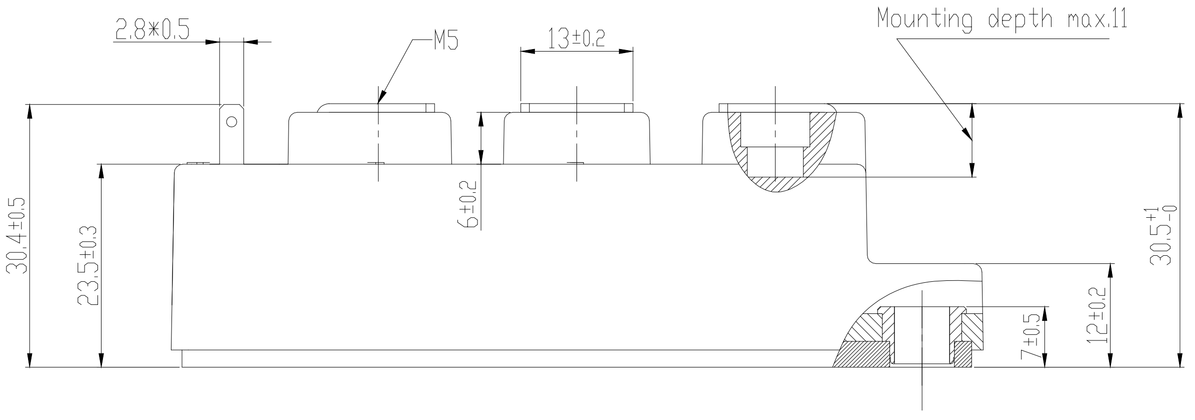
Fig 10. Diode Transient Thermal Impedance

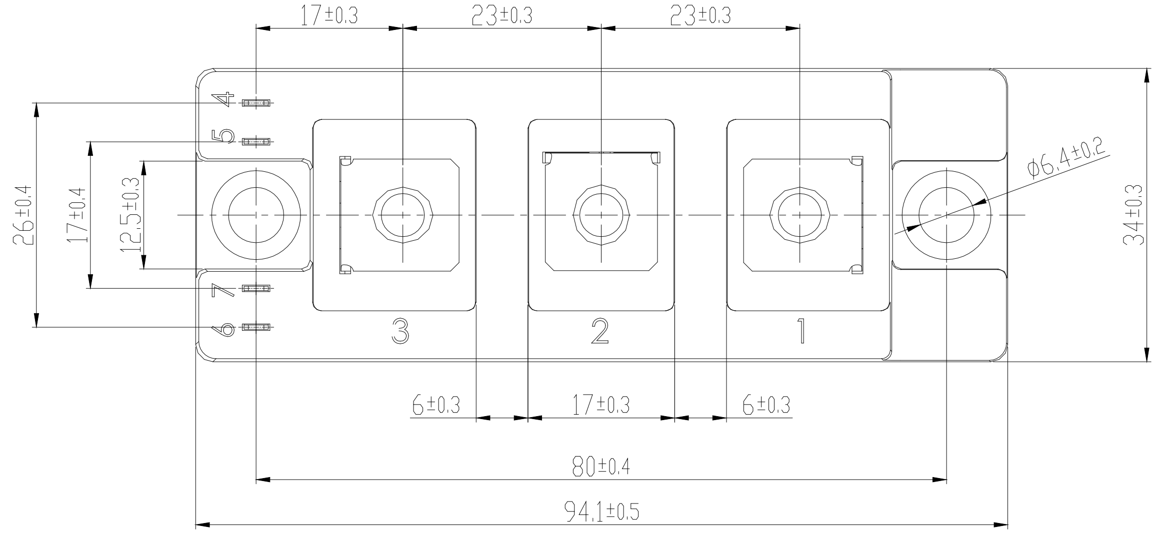
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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