STARPOWER

SEMICONDUCTOR **IGBT**

GD50FFL120C5SP

1200V/50A 6 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.

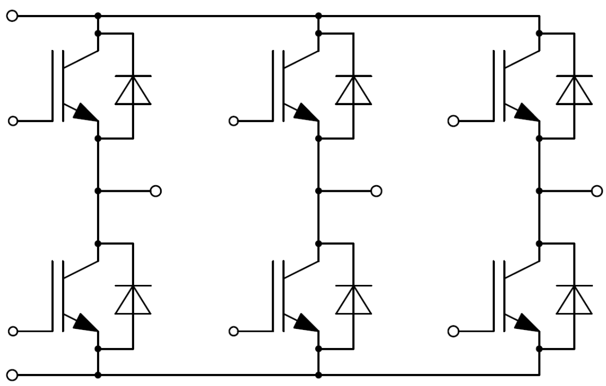
Features

- Low $V_{CE(sat)}$ SPT+ 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=100°C	100 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
P_D	Maximum Power Dissipation @ T_j=175°C	368	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	100	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	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=50A,V_{GE}=15V, T_j=25°C		1.85	2.30	V
		I_C=50A,V_{GE}=15V, T_j=125°C		2.00		
		I_C=50A,V_{GE}=15V, T_j=150°C		2.05		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2.0mA,V_{CE}=V_{GE}, T_j=25°C	5.0	5.9	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			400	nA
R_{Gint}	Internal Gate Resistance			10		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		4.29		nF
C_{res}	Reverse Transfer Capacitance			0.20		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.54		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=18Ω,V_G=±15V, T_j=25°C		278		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			454		ns
t_f	Fall Time			51		ns
E_{on}	Turn-On Switching Loss			6.68		mJ
E_{off}	Turn-Off Switching Loss			3.28		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=18Ω,V_{GE}=±15V, T_j=125°C		300		ns
t_r	Rise Time			61		ns
$t_{d(off)}$	Turn-Off Delay Time			524		ns
t_f	Fall Time			66		ns
E_{on}	Turn-On Switching Loss			8.76		mJ
E_{off}	Turn-Off Switching Loss			5.43		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=18Ω,V_{GE}=±15V, T_j=150°C		302		ns
t_r	Rise Time			69		ns
$t_{d(off)}$	Turn-Off Delay Time			550		ns
t_f	Fall Time			68		ns
E_{on}	Turn-On Switching Loss			9.25		mJ
E_{off}	Turn-Off Switching Loss			5.90		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		270		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=50A,V_{GE}=0V,T_j=25°C		1.80	2.25	V
		I_F=50A,V_{GE}=0V,T_j=125°C		1.85		
		I_F=50A,V_{GE}=0V,T_j=150°C		1.85		
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1000A/μs,V_{GE}=-15V T_j=25°C		6.5		μC
I_{RM}	Peak Reverse Recovery Current			45		A
E_{rec}	Reverse Recovery Energy			2.40		mJ
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1000A/μs,V_{GE}=-15V T_j=125°C		12.7		μC
I_{RM}	Peak Reverse Recovery Current			55		A
E_{rec}	Reverse Recovery Energy			5.00		mJ
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1000A/μs,V_{GE}=-15V T_j=150°C		14.0		μC
I_{RM}	Peak Reverse Recovery Current			57		A
E_{rec}	Reverse Recovery Energy			5.50		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		60		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip		4.40		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.340 0.665	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.181 0.355 0.020		K/W
M	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		200		g

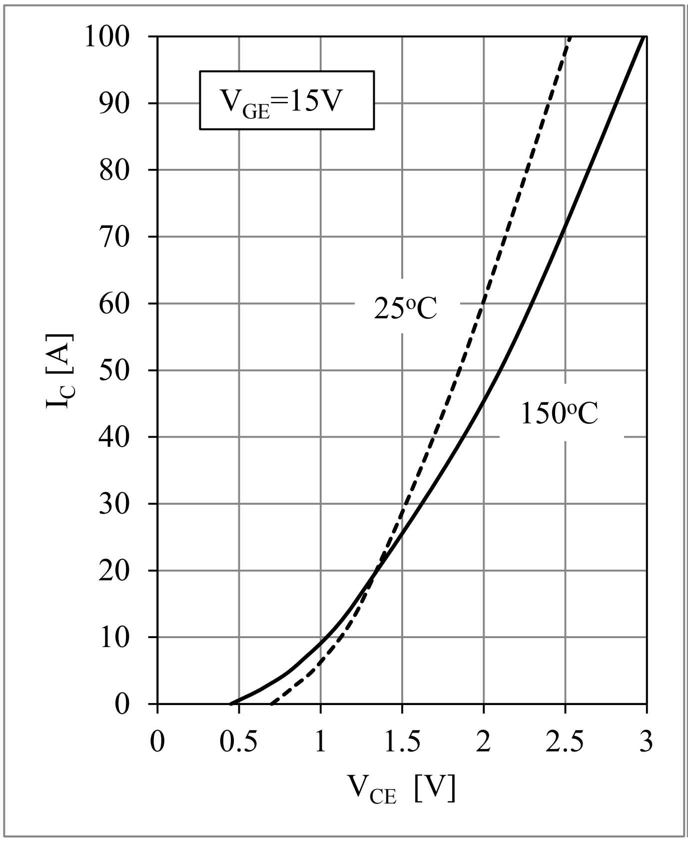


Fig 1. IGBT Output Characteristics

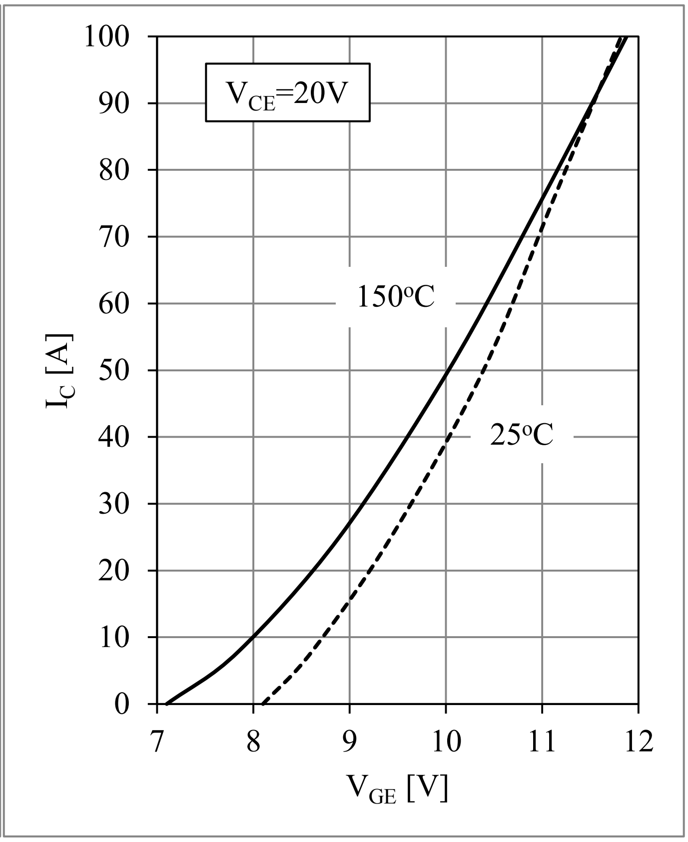


Fig 2. IGBT Transfer Characteristics

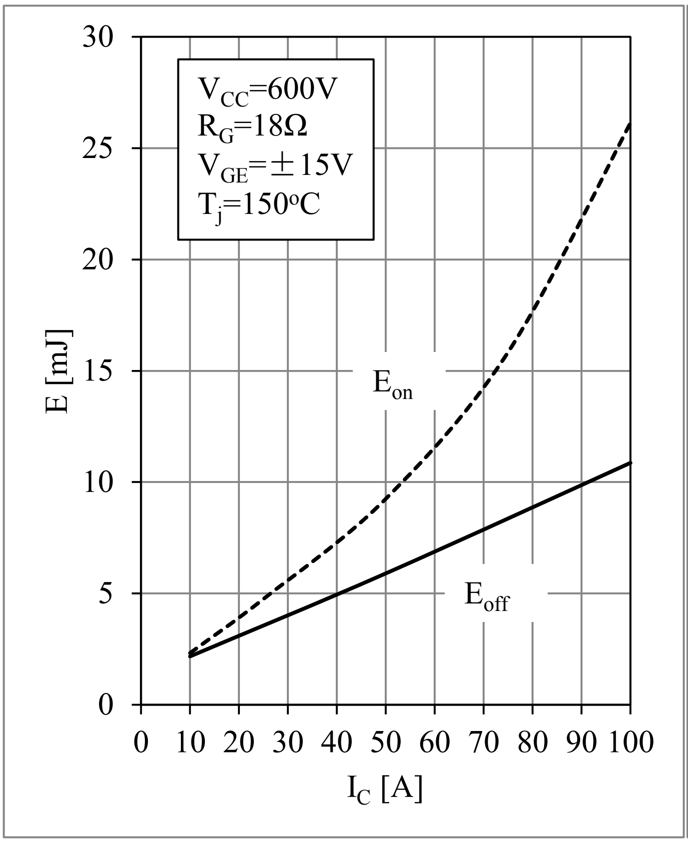


Fig 3. IGBT Switching Loss vs. I_C

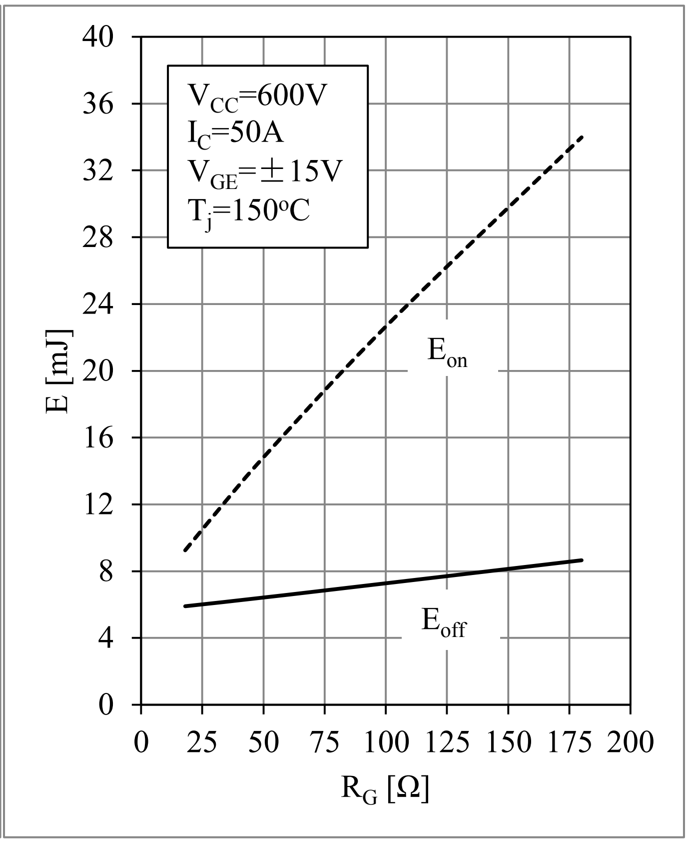


Fig 4. IGBT Switching Loss vs. R_G

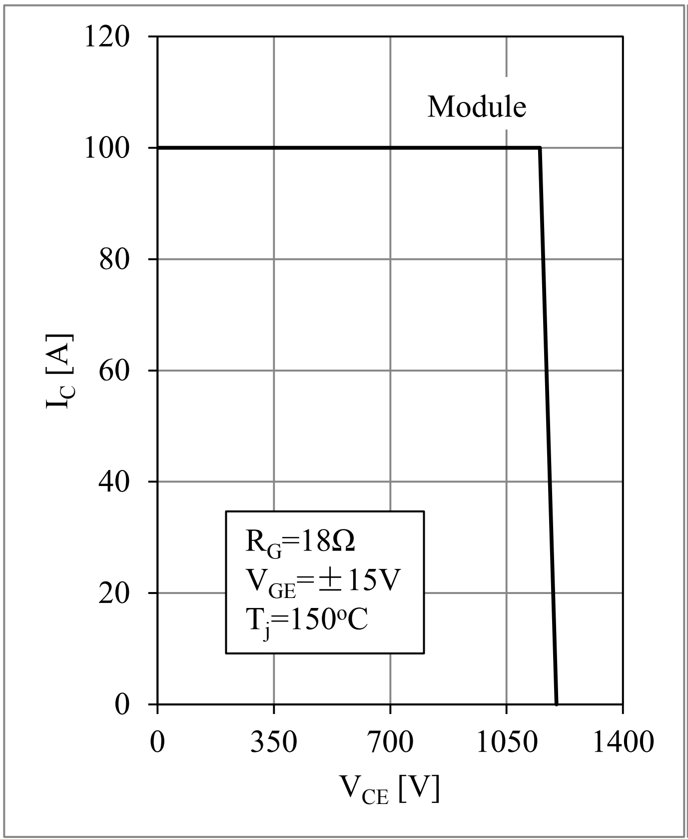


Fig 5. IGBT RBSOA

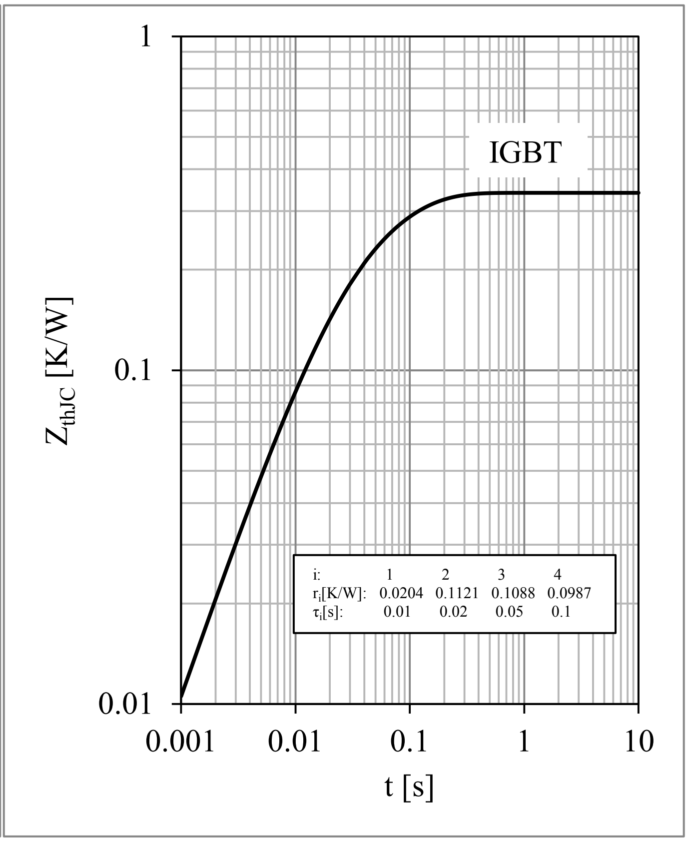


Fig 6. IGBT Transient Thermal Impedance

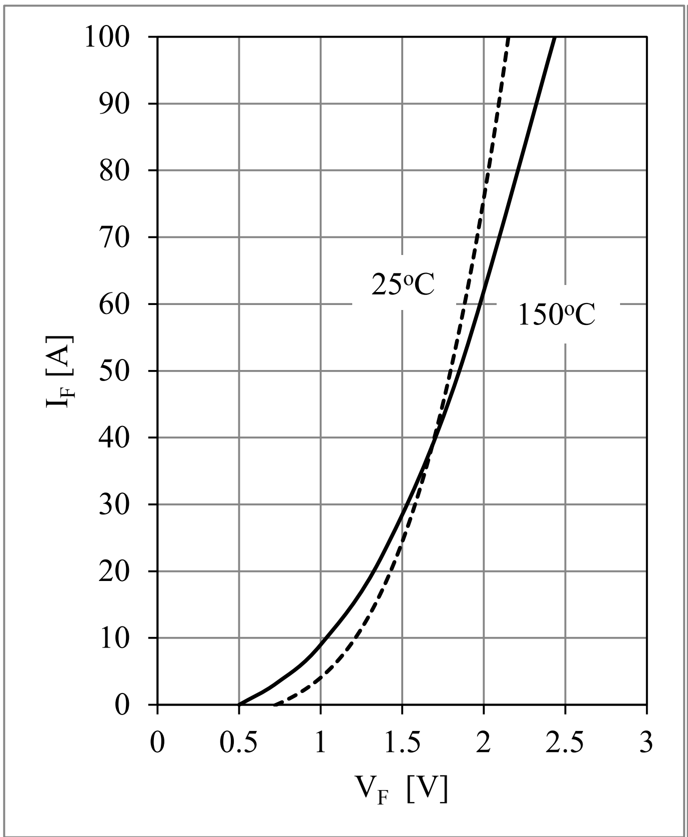


Fig 7. Diode Forward Characteristics

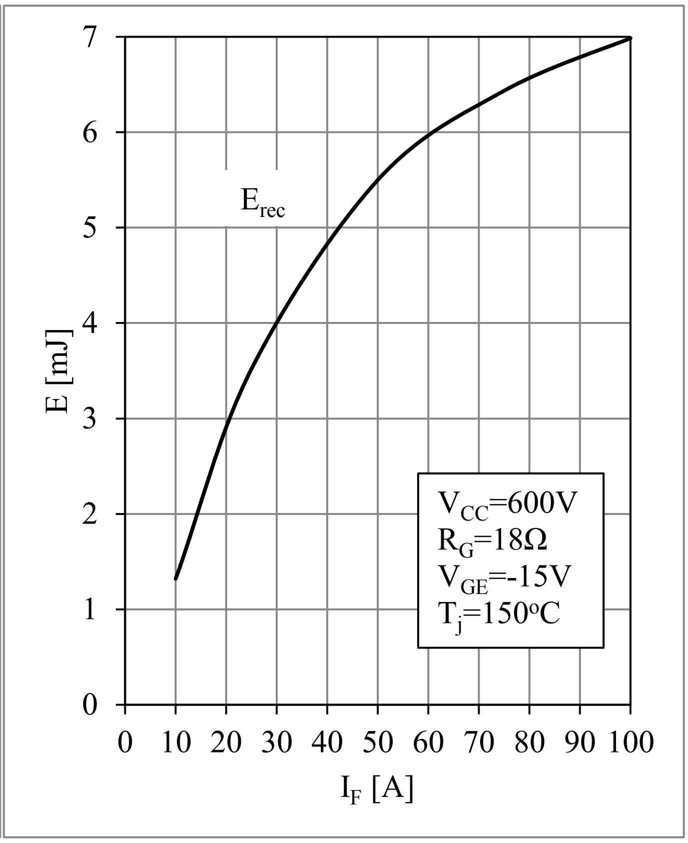


Fig 8. Diode Switching Loss vs. I_F

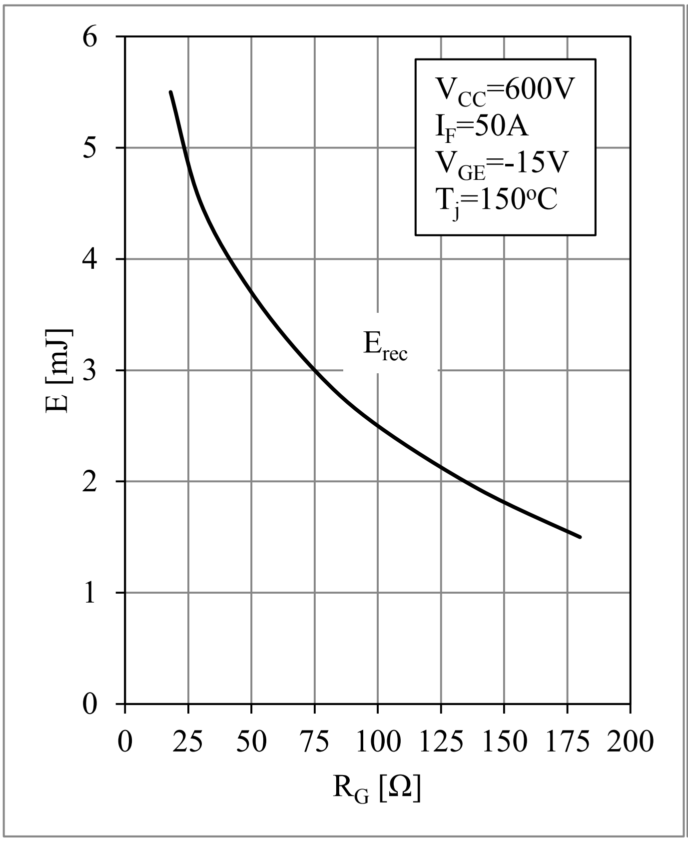


Fig 9. Diode Switching Loss vs. R_G

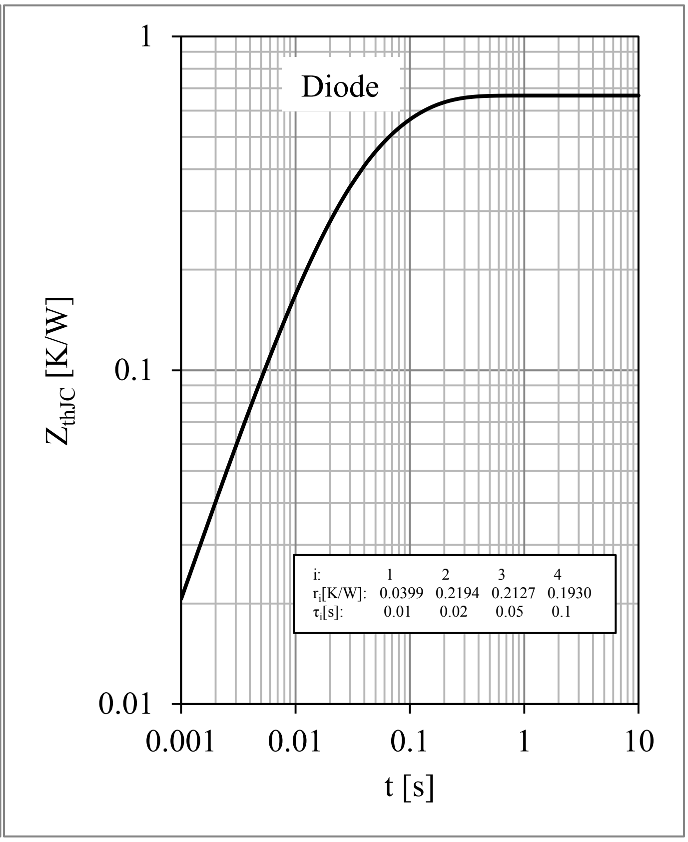
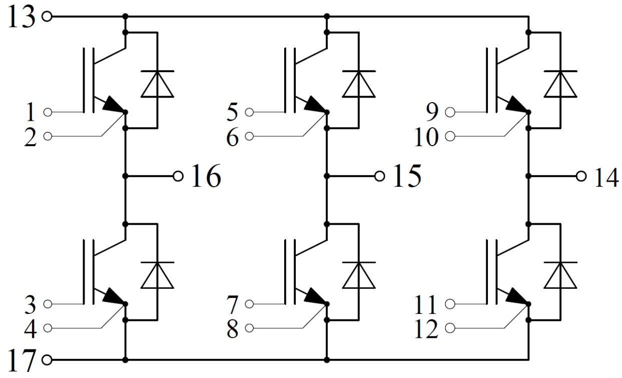


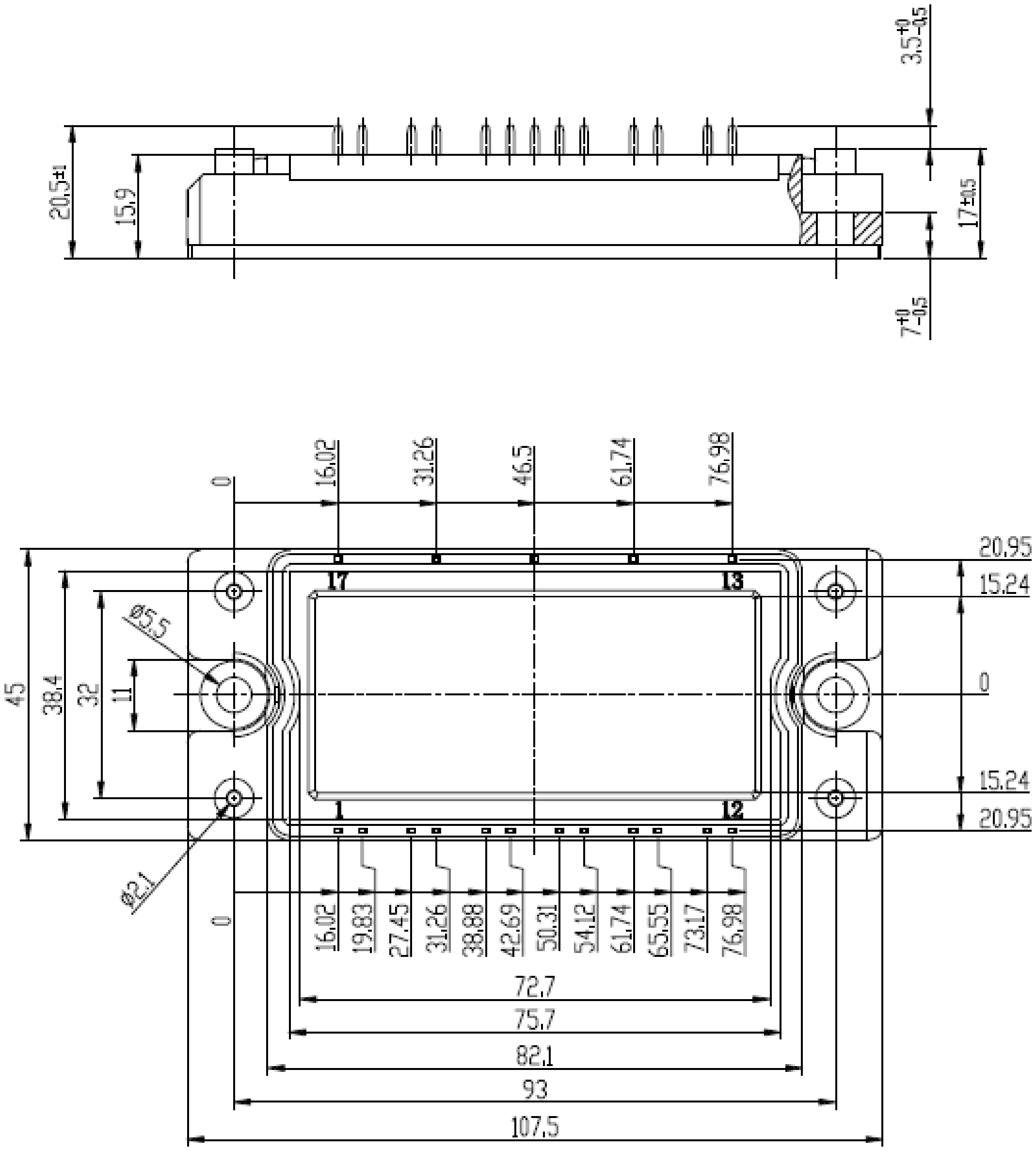
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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