STARPOWER

SEMICONDUCTOR™

IGBT

GD50FFT60C5S

Molding Type Module

600V/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 UPS and SMPS.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 5μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- 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

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD50FFT60C5S	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	80 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
I_F	Diode Continuous Forward Current @ T_C=80℃	50	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	100	A
P_D	Maximum Power Dissipation @ T_j=175℃	200	W
T_{jmax}	Maximum Junction Temperature	175	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V
Mounting Torque	Mounting Screw:M5	3.0 to 6.0	N.m

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	600			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.4mA,V_{CE}=V_{GE}, T_j=25℃	4.0	4.9	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		1.65	2.10	V
		I_C=50A,V_{GE}=15V, T_j=175℃		2.05		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=50A, R_G=3.3Ω,V_{GE}=±15V, T_j=25℃		58		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			80		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			0.41		mJ
E_{off}	Turn-Off Switching Loss			0.42		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=50A, R_G=3.3Ω,V_{GE}=±15V, T_j=125℃		64		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			90		ns
t_f	Fall Time			117		ns
E_{on}	Turn-On Switching Loss			0.69		mJ
E_{off}	Turn-Off Switching Loss			0.69		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		3.03		nF
C_{oes}	Output Capacitance			0.25		nF
C_{res}	Reverse Transfer Capacitance			0.09		nF
I_{SC}	SC Data	t_P≤5μs,V_{GE}=15V, T_j=125℃,V_{CC}=360V, V_{CEM}≤600V		450		A
L_{CE}	Stray Inductance			60		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			4.4		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=50A	T_j=25℃		1.35	1.75	V
			T_j=125℃		1.37		
Q_r	Recovered Charge	I_F=50A, V_R=300V, R_G=3.3Ω, V_{GE}=-15V	T_j=25℃		2.3		μC
			T_j=125℃		4.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		33		A
			T_j=125℃		58		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.56		mJ
			T_j=125℃		1.11		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.751	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		1.037	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.02		K/W
Weight	Weight of Module	200		g

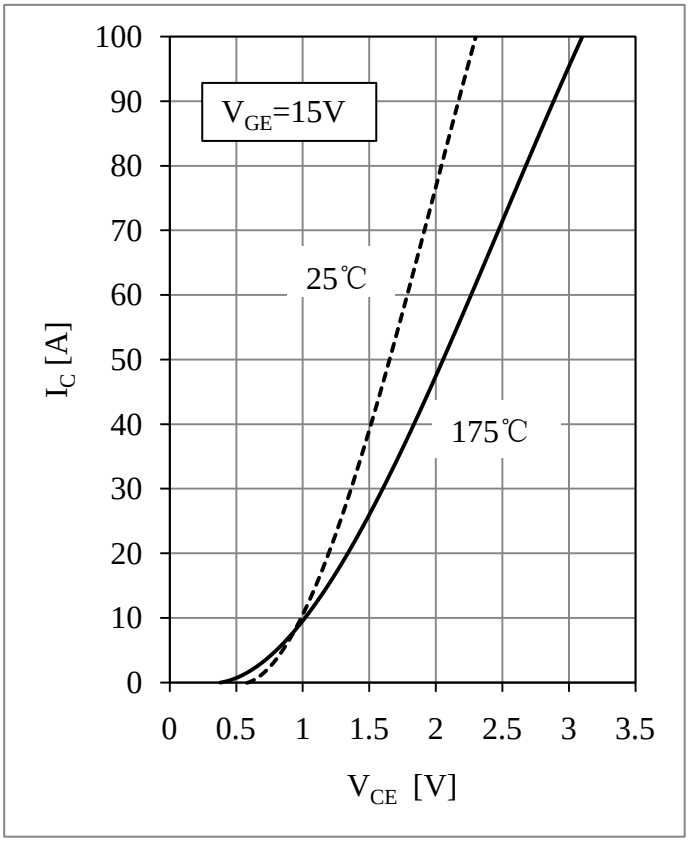


Fig 1. IGBT Output Characteristic

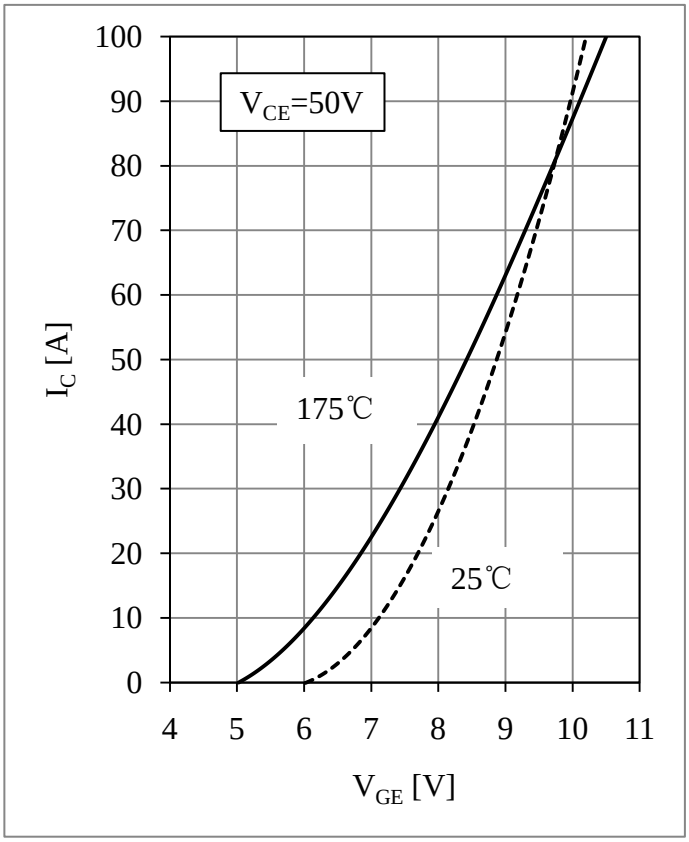


Fig 2. IGBT Transfer Characteristic

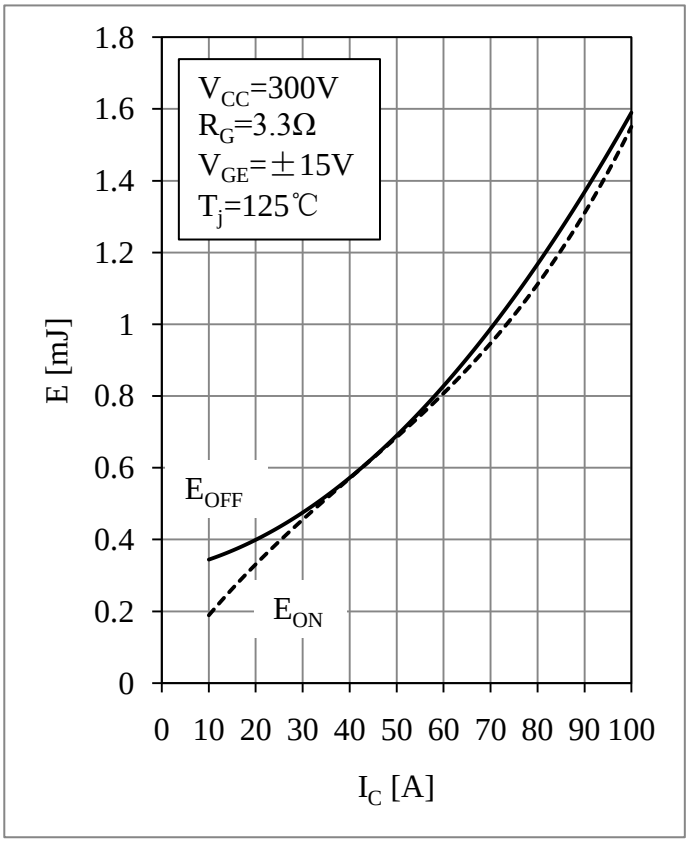


Fig 3. IGBT Switching Loss vs. I_C

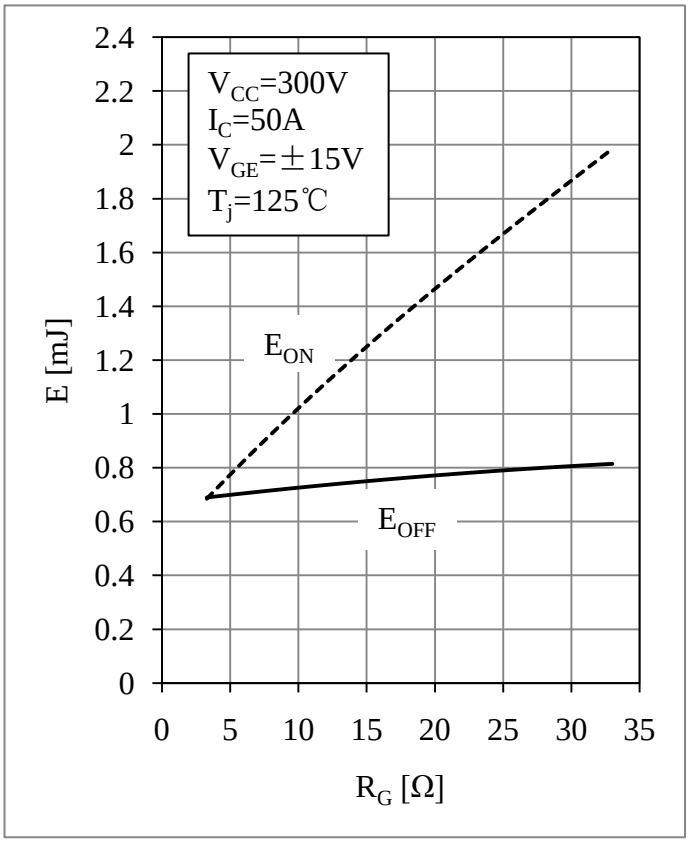


Fig 4. IGBT Switching Loss vs. R_G

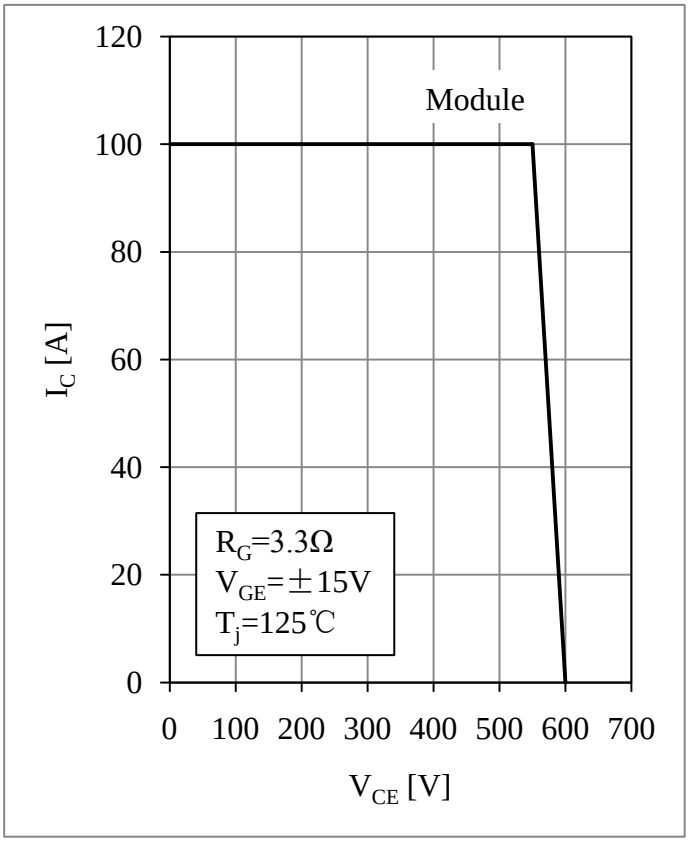


Fig 5. RBSOA

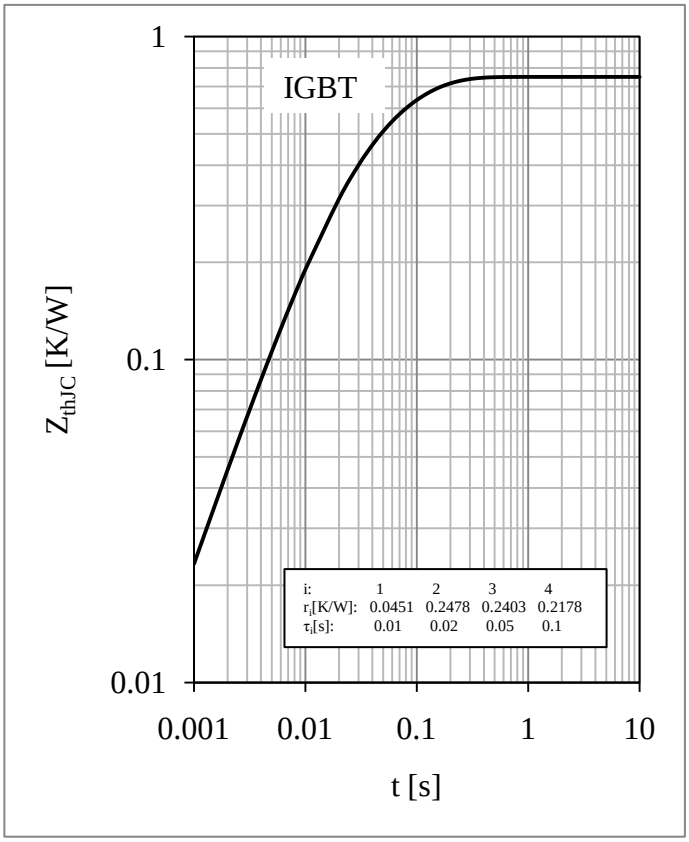


Fig 6. IGBT Transient Thermal Impedance

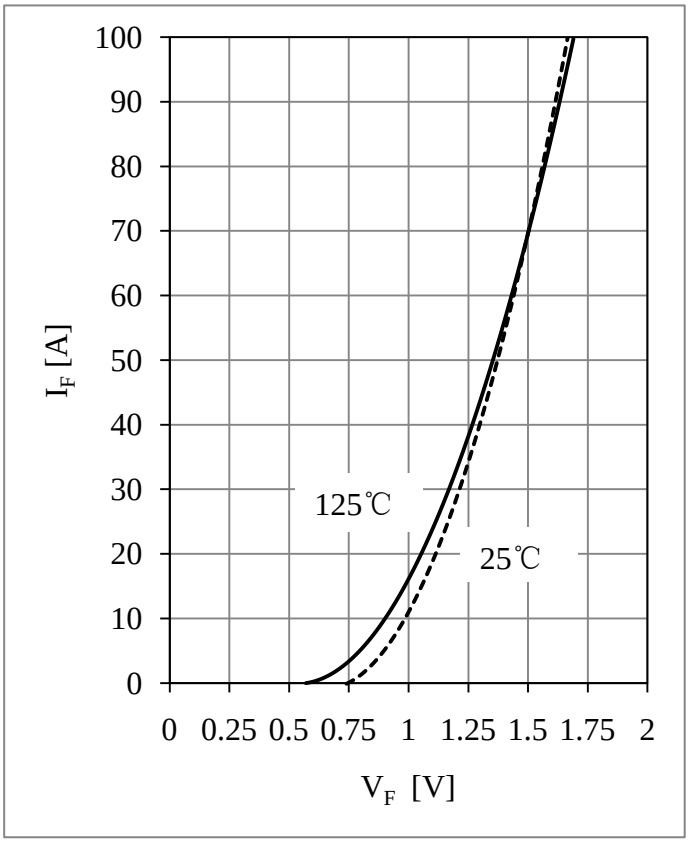


Fig 7. Diode Forward Characteristic

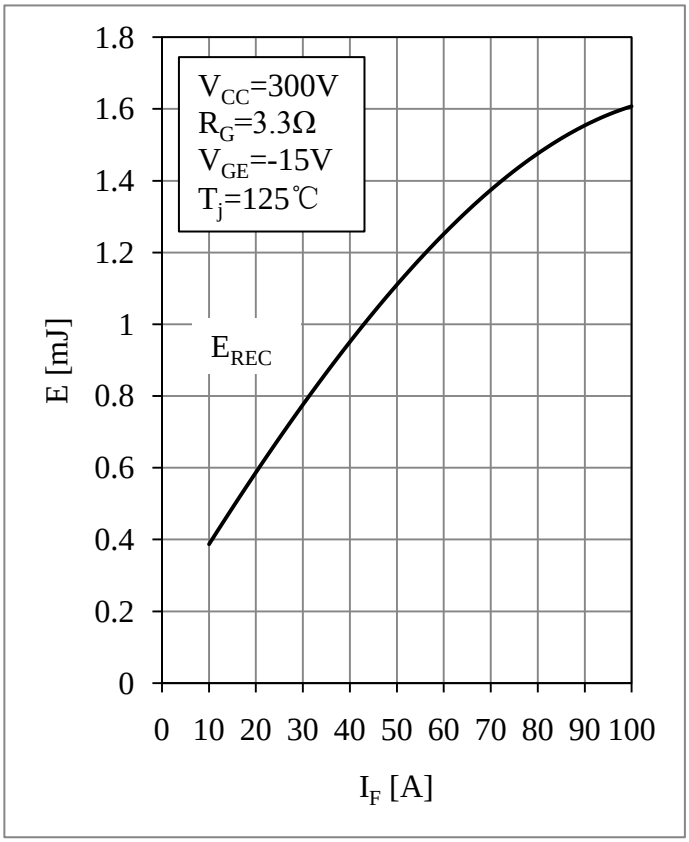


Fig 8. Diode Switching Loss vs. I_F

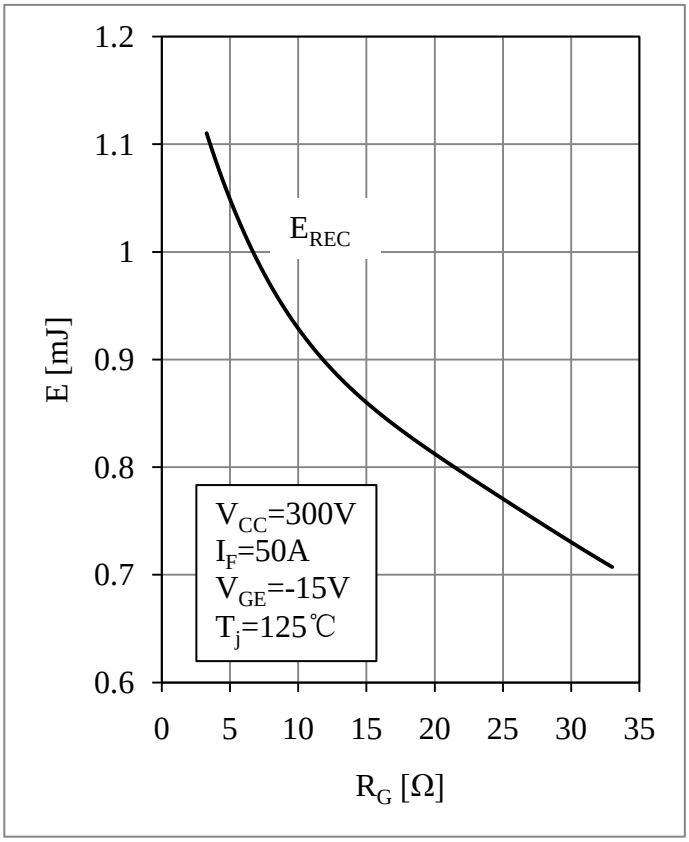


Fig 9. Diode Switching Loss vs. R_G

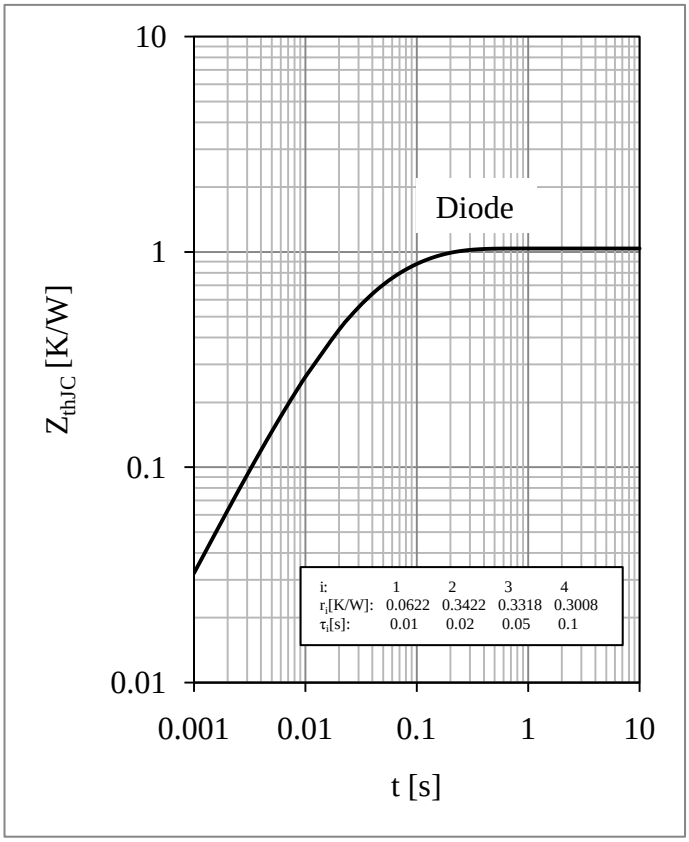
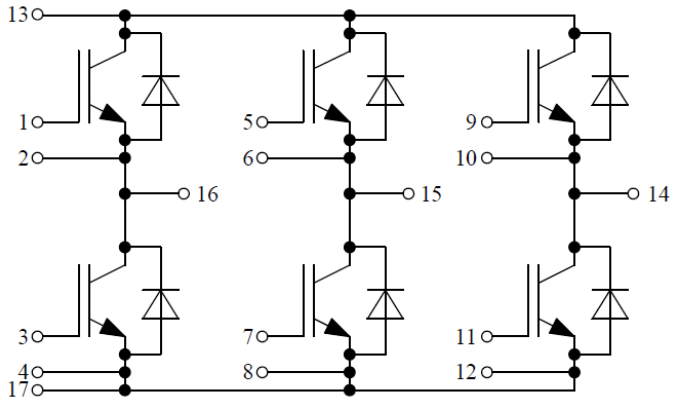


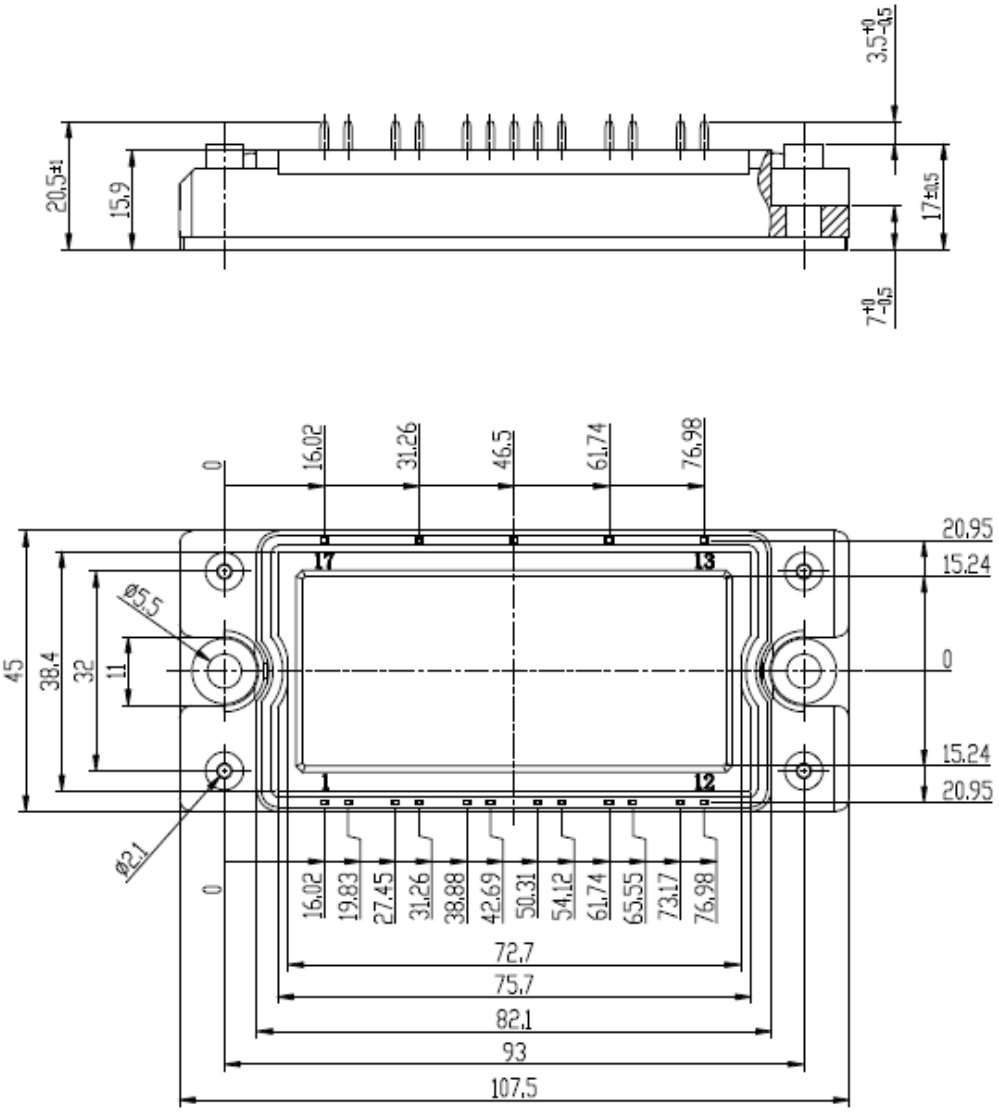
Fig 10. Diode Transient Thermal Impedance

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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