STARPOWER

SEMICONDUCTOR **IGBT**

GD1200HFA120V6S

1200V/1200A 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 Motor drives and High-power converters.

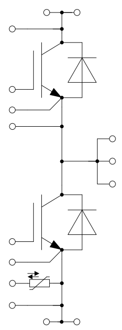
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- High-power converters
- Motor drives
- Traction 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=90°C	1836 1200	A
I_{CRM}	Repetitive Peak Collector Current t_p=1ms	2400	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	4477	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	1200	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	2400	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	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=1200A,V_{GE}=15V, T_{vj}=25°C		1.30	1.75	V
		I_C=1200A,V_{GE}=15V, T_{vj}=125°C		1.45		
		I_C=1200A,V_{GE}=15V, T_{vj}=150°C		1.50		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=48.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.5	6.1	7.0	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			5.0	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			0.25		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		234		nF
C_{res}	Reverse Transfer Capacitance			1.65		nF
Q_G	Gate Charge	V_{GE}=-8…+15V		15.5		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=1200A, R_{Gon}=1.0Ω,R_{Goff}=3.3Ω, Ls=50nH, V_{GE}=-10/+15V, T_{vj}=25°C		757		ns
t_r	Rise Time			216		ns
$t_{d(off)}$	Turn-Off Delay Time			2424		ns
t_f	Fall Time			179		ns
E_{on}	Turn-On Switching Loss			195		mJ
E_{off}	Turn-Off Switching Loss			231		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=1200A, R_{Gon}=1.0Ω,R_{Goff}=3.3Ω, Ls=50nH, V_{GE}=-10/+15V, T_{vj}=125°C		1031		ns
t_r	Rise Time			300		ns
$t_{d(off)}$	Turn-Off Delay Time			3058		ns
t_f	Fall Time			189		ns
E_{on}	Turn-On Switching Loss			377		mJ
E_{off}	Turn-Off Switching Loss			275		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=1200A, R_{Gon}=1.0Ω,R_{Goff}=3.3Ω, Ls=50nH, V_{GE}=-10/+15V, T_{vj}=150°C		1100		ns
t_r	Rise Time			316		ns
$t_{d(off)}$	Turn-Off Delay Time			3213		ns
t_f	Fall Time			191		ns
E_{on}	Turn-On Switching Loss			416		mJ
E_{off}	Turn-Off Switching Loss			286		mJ
I_{SC}	SC Data	t_P≤8μs,V_{GE}=15V, T_{vj}=150°C,V_{CC}=800V V_{CEM}≤1200V		4800		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=1200A,V_{GE}=0V,T_{vj}=25°C		1.80	2.25	V
		I_F=1200A,V_{GE}=0V,T_{vj}=125°C		1.90		
		I_F=1200A,V_{GE}=0V,T_{vj}=150°C		1.95		
Q_r	Recovered Charge	V_R=600V,I_F=1200A, -di/dt=4870A/μs,Ls=50nH, V_{GE}=-10V,T_{vj}=25°C		104		μC
I_{RM}	Peak Reverse Recovery Current			529		A
E_{rec}	Reverse Recovery Energy			25.9		mJ
Q_r	Recovered Charge	V_R=600V,I_F=1200A, -di/dt=3360A/μs,Ls=50nH, V_{GE}=-10V,T_{vj}=125°C		207		μC
I_{RM}	Peak Reverse Recovery Current			527		A
E_{rec}	Reverse Recovery Energy			53.2		mJ
Q_r	Recovered Charge	V_R=600V,I_F=1200A, -di/dt=3100A/μs,Ls=50nH, V_{GE}=-10V,T_{vj}=150°C		229		μC
I_{RM}	Peak Reverse Recovery Current			522		A
E_{rec}	Reverse Recovery Energy			59.2		mJ

NTC Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100 °C,R_{100}=493.3Ω	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K
$B_{25/80}$	B-value	$R_2=R_{25}exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		10		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.35		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			33.5 46.1	K/kW
M	Terminal Connection Torque, Screw M3 Terminal Connection Torque, Screw M8 Mounting Torque, Screw M6	0.9 8.0 3.0		1.1 10.0 6.0	N.m
G	Weight of Module		1030		g

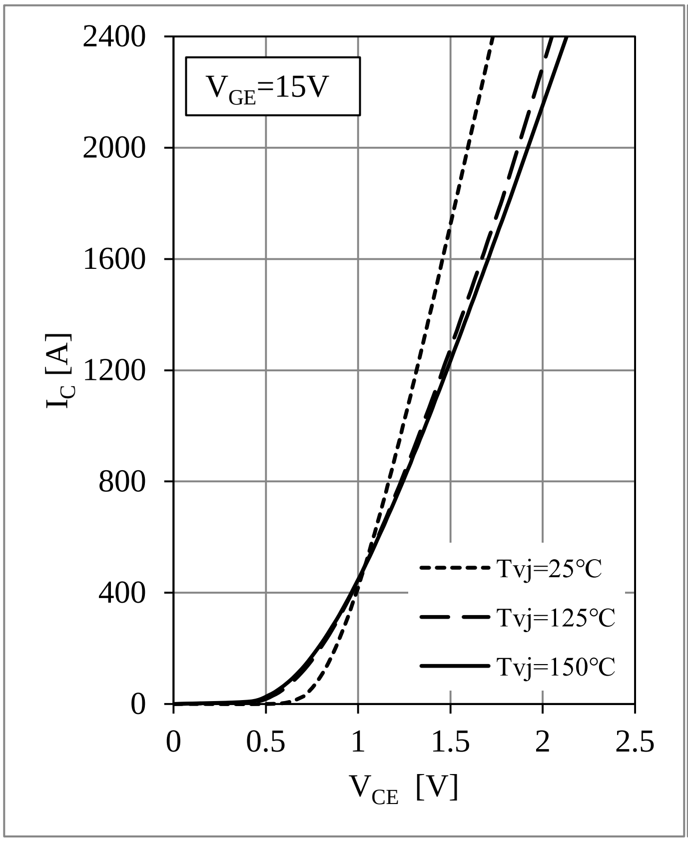


Fig 1. IGBT Output Characteristics

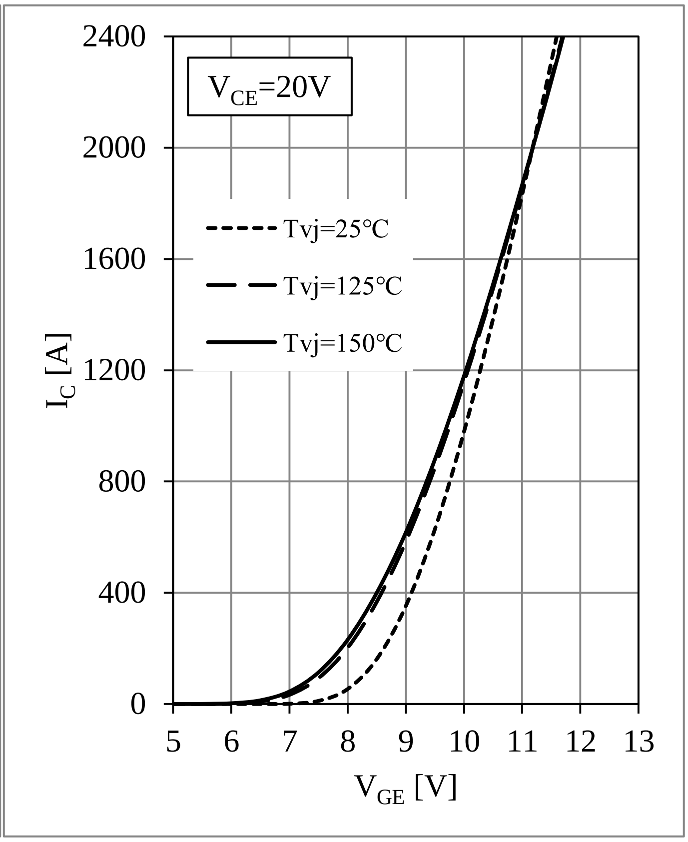


Fig 2. IGBT Transfer Characteristics

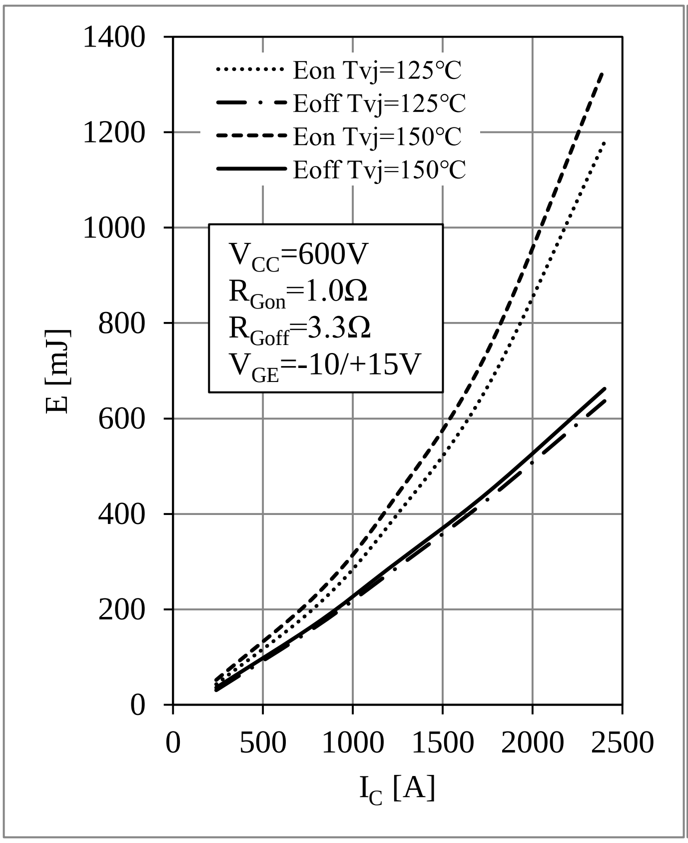


Fig 3. IGBT Switching Loss vs. I_C

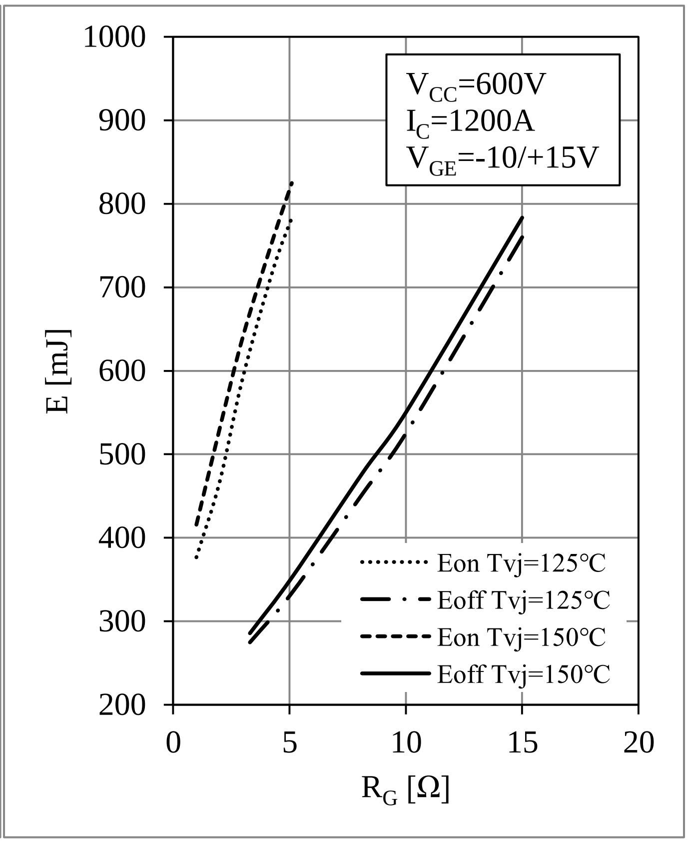
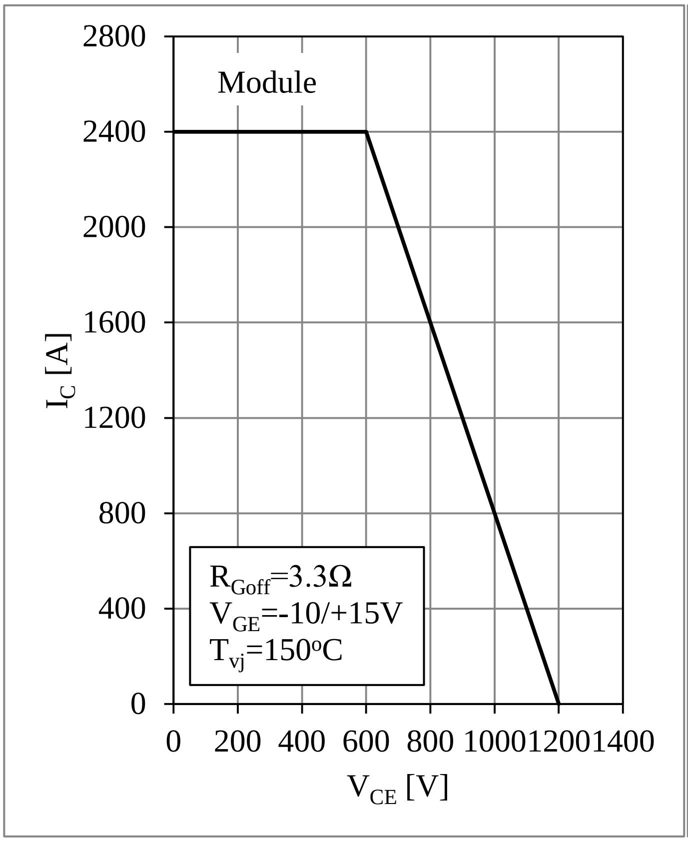


Fig 4. IGBT Switching Loss vs. R_G



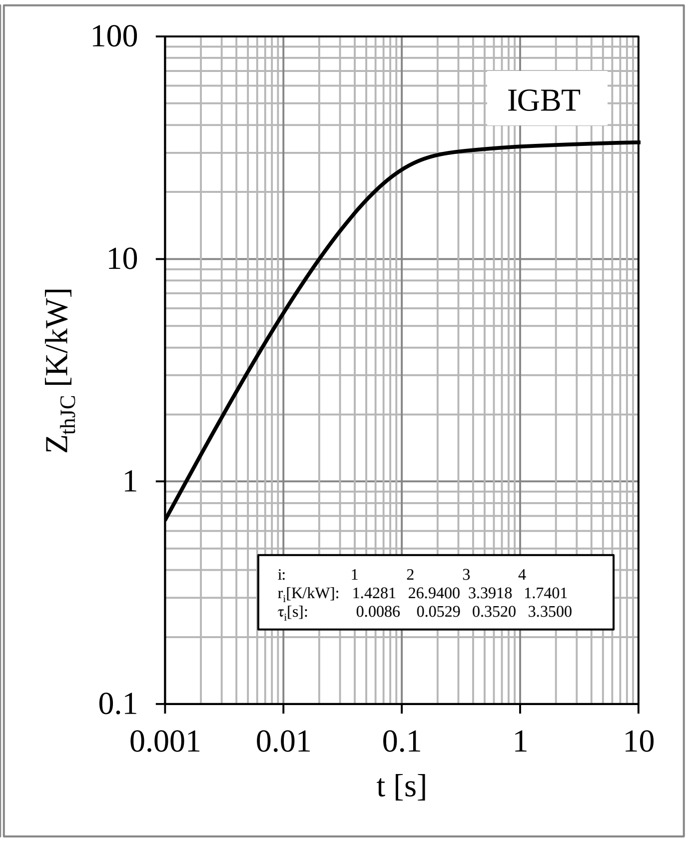
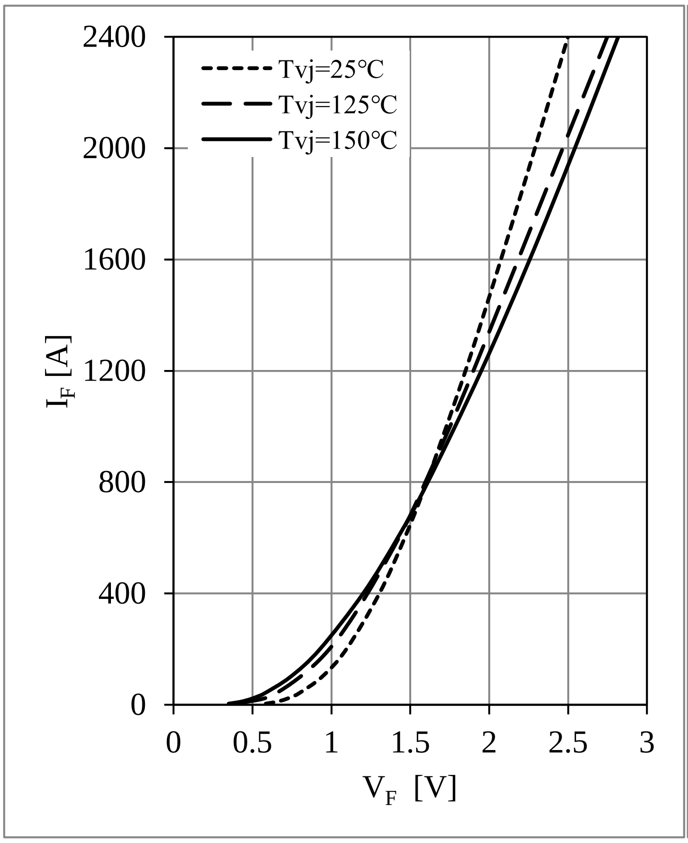


Fig 5. RBSOA

Fig 6. IGBT Transient Thermal Impedance



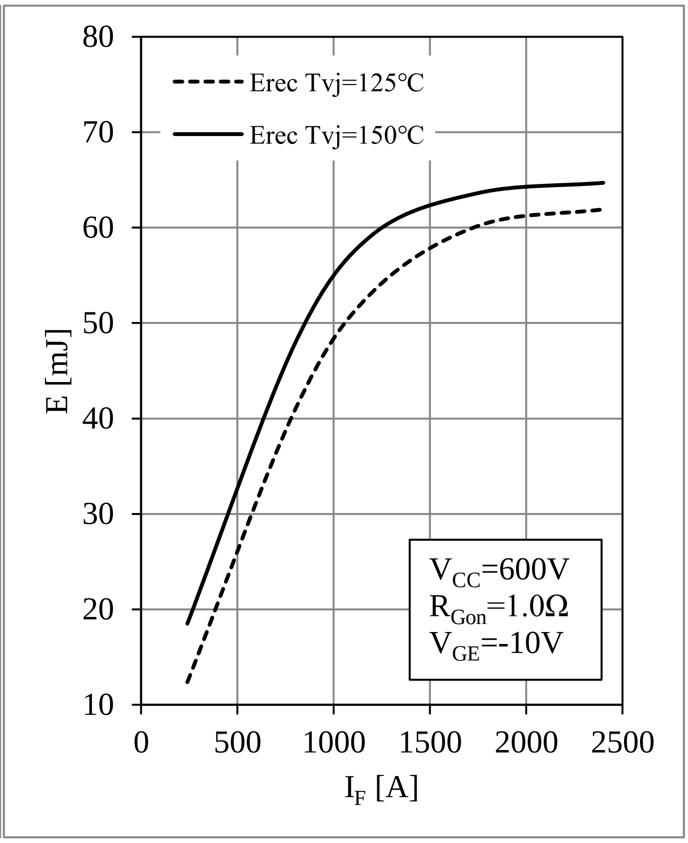


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

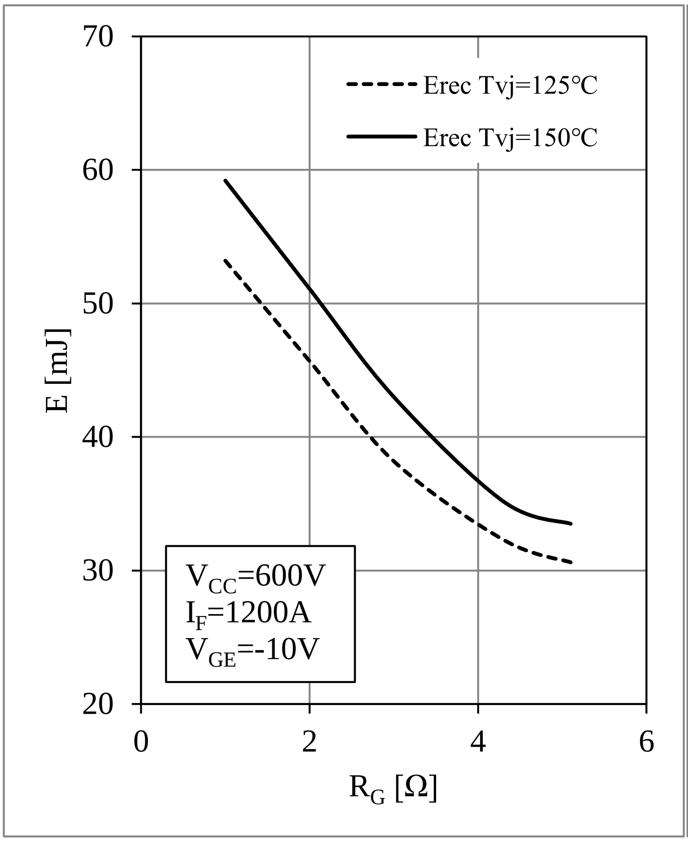


Fig 9. Diode Switching Loss vs. R_G

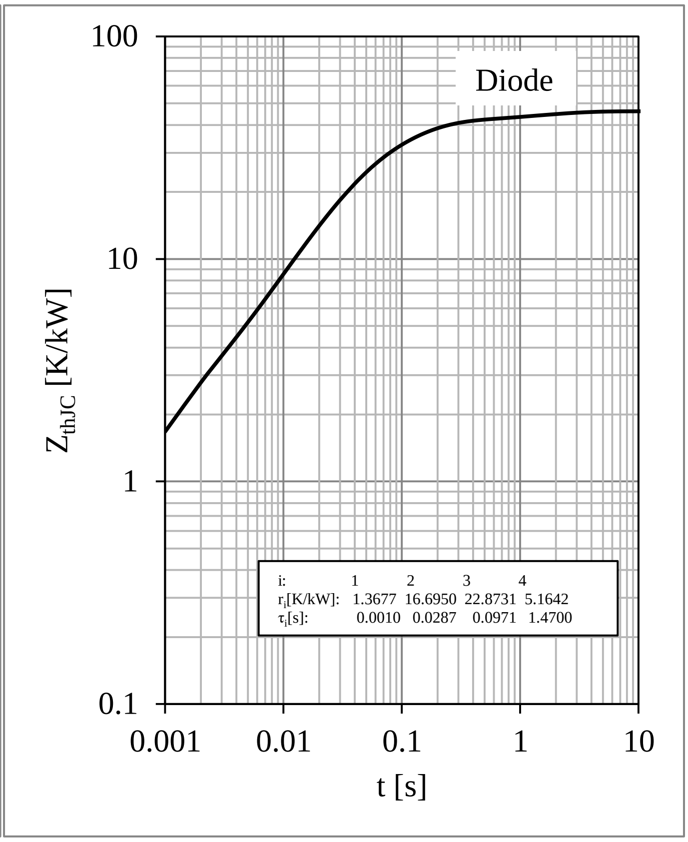
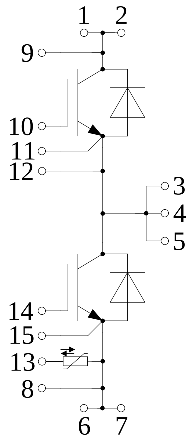


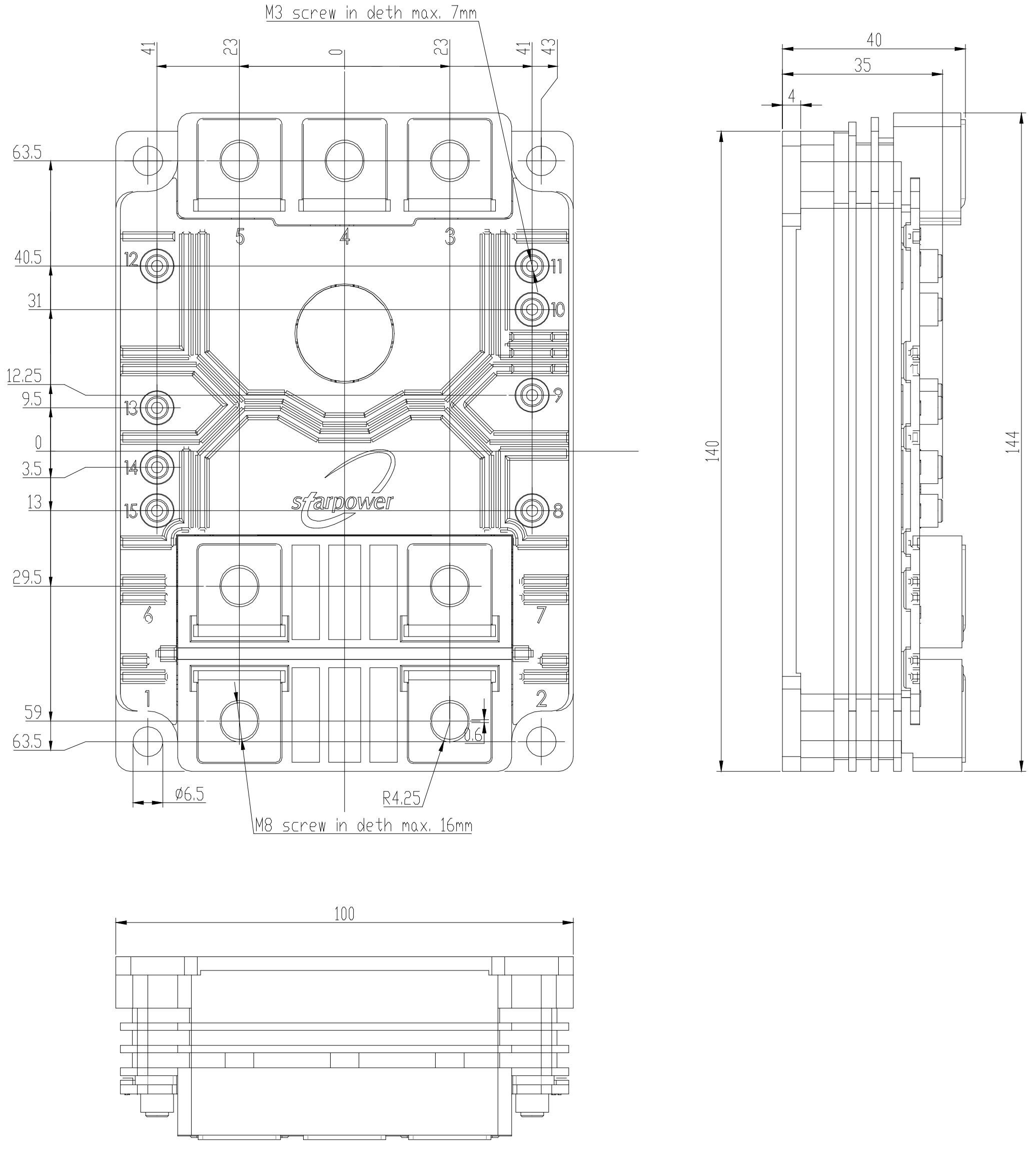
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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