STARPOWER

SEMICONDUCTOR **IGBT**

GD1800HFA170V6S

1700V/1800A 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.

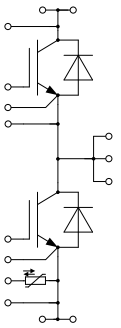
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 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	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=55°C	2133 1800	A
I_{CRM}	Repetitive Peak Collector Current t_p=1ms	3600	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	5660	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	1800	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	3600	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=1800A,V_{GE}=15V, T_{vj}=25°C		1.55	2.00	V
		I_C=1800A,V_{GE}=15V, T_{vj}=125°C		1.85		
		I_C=1800A,V_{GE}=15V, T_{vj}=150°C		1.95		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=36.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.2	6.0	6.8	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			0.56		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		183		nF
C_{oes}	Output Capacitance			5.1		nF
C_{res}	Reverse Transfer Capacitance			1.02		nF
Q_G	Gate Charge	V_{GE}=-8…+15V		12.8		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1800A, R_{Gon}=1.5Ω,R_{Goff}=3.0Ω, Ls=30nH, V_{GE}=-10/+15V, T_{vj}=25°C		571		ns
t_r	Rise Time			178		ns
$t_{d(off)}$	Turn-Off Delay Time			1452		ns
t_f	Fall Time			437		ns
E_{on}	Turn-On Switching Loss			372		mJ
E_{off}	Turn-Off Switching Loss			499		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1800A, R_{Gon}=1.5Ω,R_{Goff}=3.0Ω, Ls=30nH, V_{GE}=-10/+15V, T_{vj}=125°C		662		ns
t_r	Rise Time			201		ns
$t_{d(off)}$	Turn-Off Delay Time			1692		ns
t_f	Fall Time			597		ns
E_{on}	Turn-On Switching Loss			484		mJ
E_{off}	Turn-Off Switching Loss			646		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1800A, R_{Gon}=1.5Ω,R_{Goff}=3.0Ω, Ls=30nH, V_{GE}=-10/+15V, T_{vj}=150°C		668		ns
t_r	Rise Time			205		ns
$t_{d(off)}$	Turn-Off Delay Time			1749		ns
t_f	Fall Time			676		ns
E_{on}	Turn-On Switching Loss			508		mJ
E_{off}	Turn-Off Switching Loss			668		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_{vj}=150°C,V_{CC}=1000V V_{CEM}≤1700V		7200		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=1800A,V_{GE}=0V,T_{vj}=25°C		2.10	2.55	V
		I_F=1800A,V_{GE}=0V,T_{vj}=150°C		2.35		
		I_F=1800A,V_{GE}=0V,T_{vj}=150°C		2.35		
Q_r	Recovered Charge	V_R=900V,I_F=1800A, -di/dt=9660A/μs,Ls=30nH, V_{GE}=-10V,T_{vj}=25°C		258		μC
I_{RM}	Peak Reverse Recovery Current			1262		A
E_{rec}	Reverse Recovery Energy			102		mJ
Q_r	Recovered Charge	V_R=900V,I_F=1800A, -di/dt=8970A/μs,Ls=30nH, V_{GE}=-10V,T_{vj}=125°C		410		μC
I_{RM}	Peak Reverse Recovery Current			1478		A
E_{rec}	Reverse Recovery Energy			190		mJ
Q_r	Recovered Charge	V_R=900V,I_F=1800A, -di/dt=8940A/μs,Ls=30nH, V_{GE}=-10V,T_{vj}=150°C		436		μC
I_{RM}	Peak Reverse Recovery Current			1506		A
E_{rec}	Reverse Recovery Energy			203		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)			26.5 44.6	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

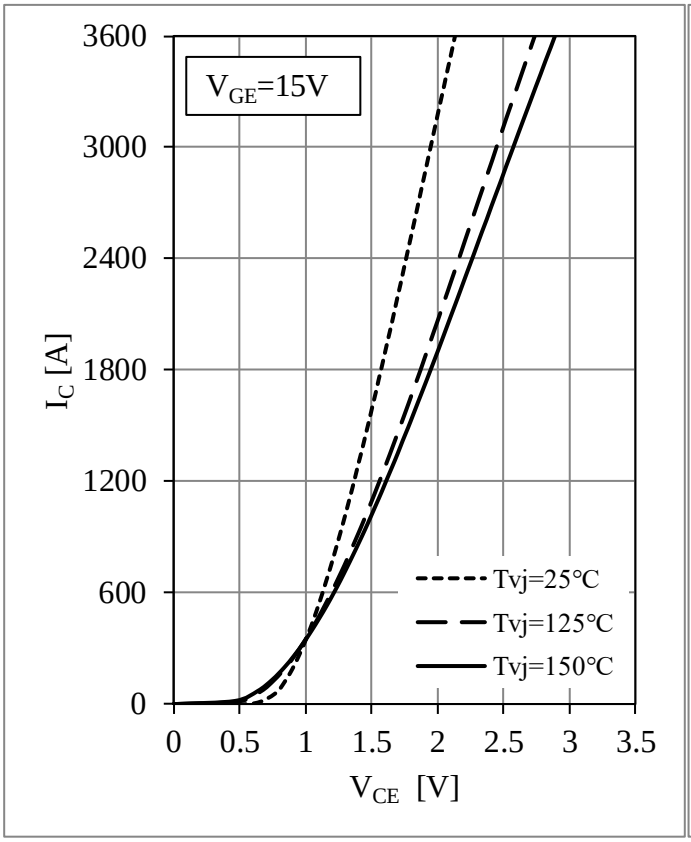


Fig 1. IGBT Output Characteristics

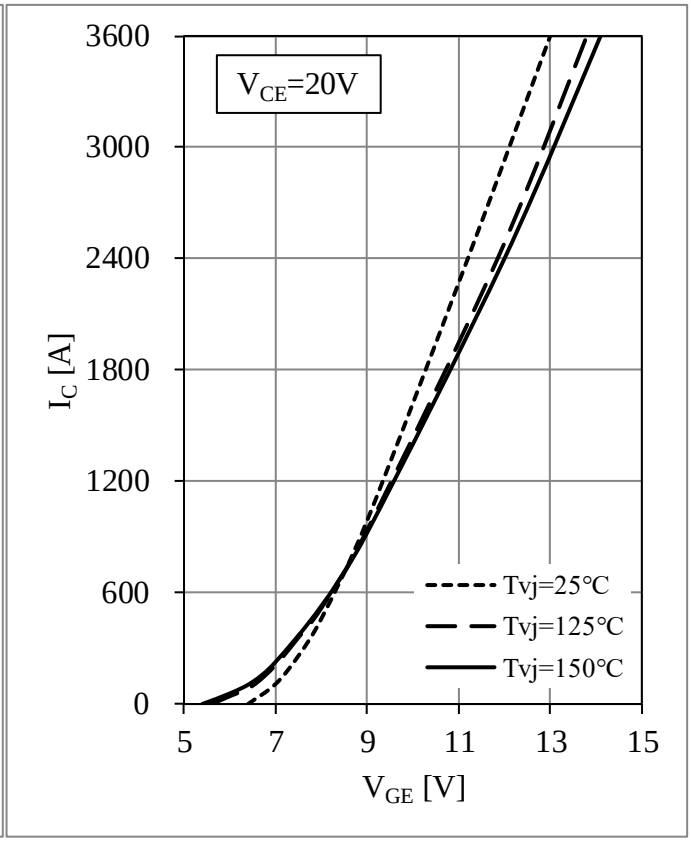


Fig 2. IGBT Transfer Characteristics

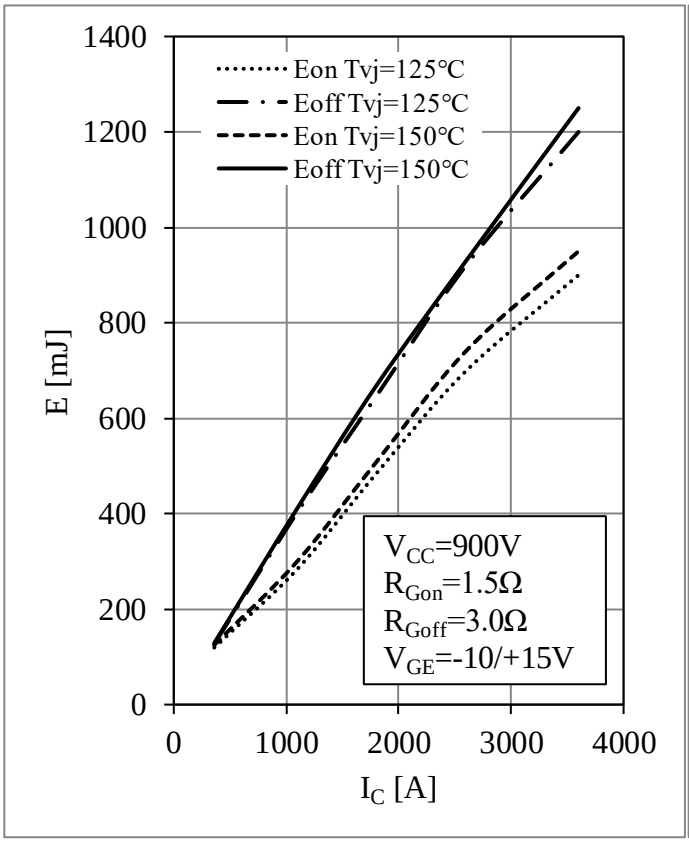


Fig 3. IGBT Switching Loss vs. I_C

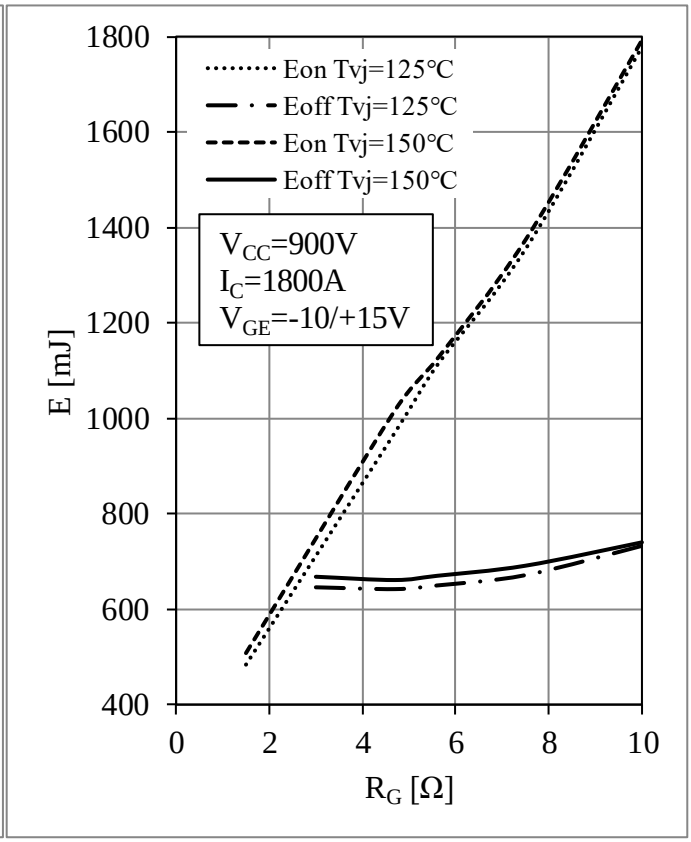


Fig 4. IGBT Switching Loss vs. R_G

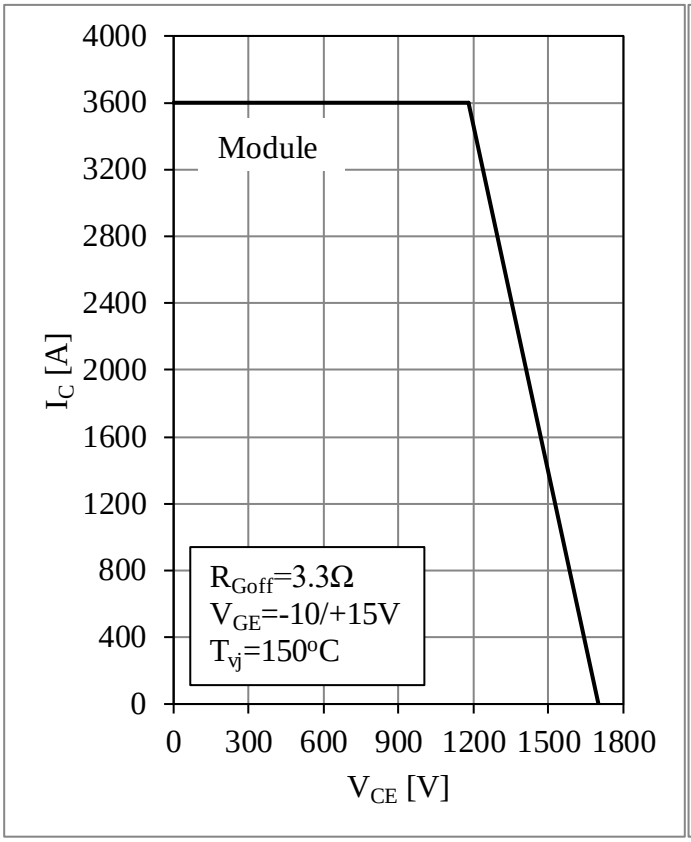


Fig 5. RBSOA

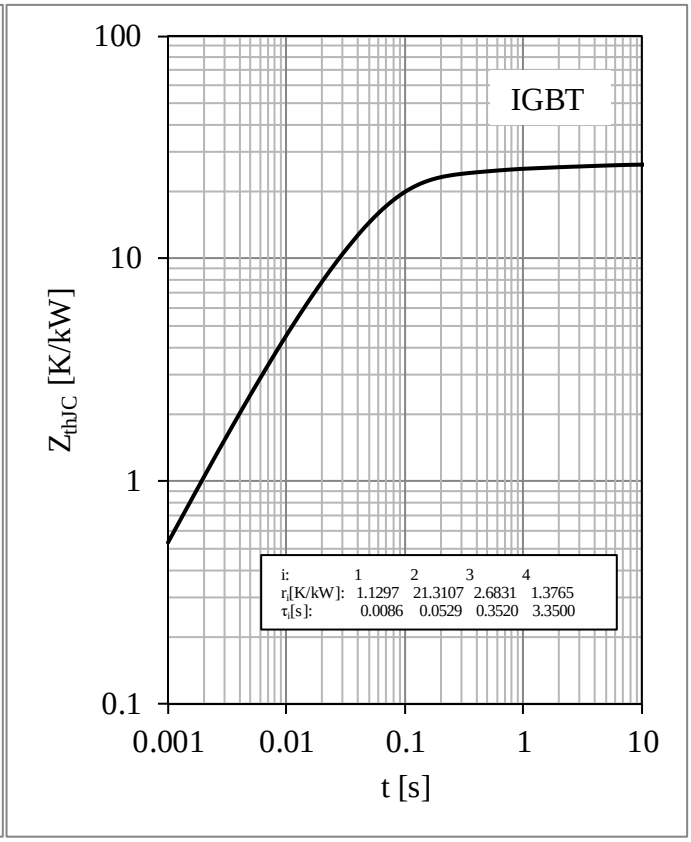


Fig 6. IGBT Transient Thermal Impedance

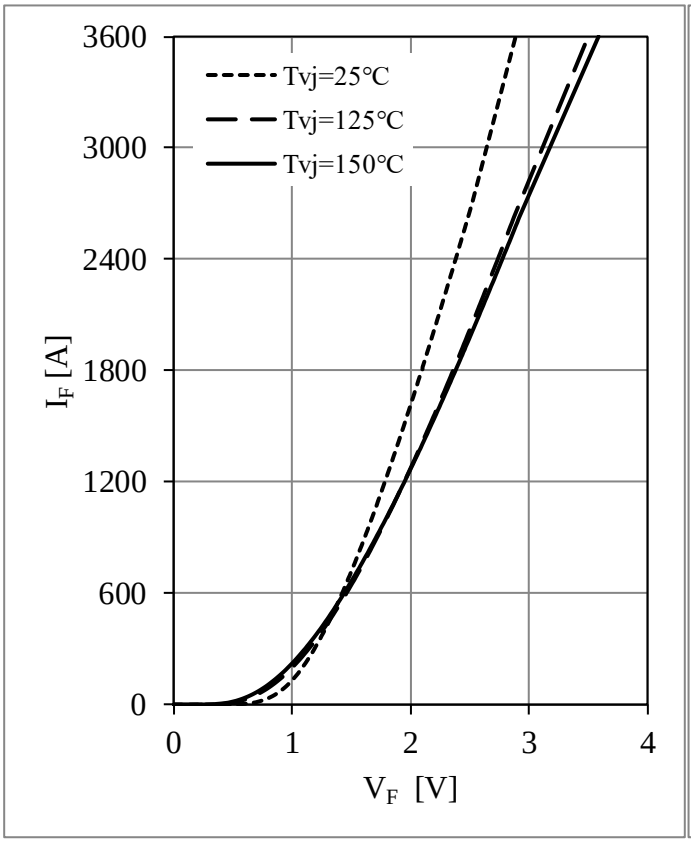


Fig 7. Diode Forward Characteristics

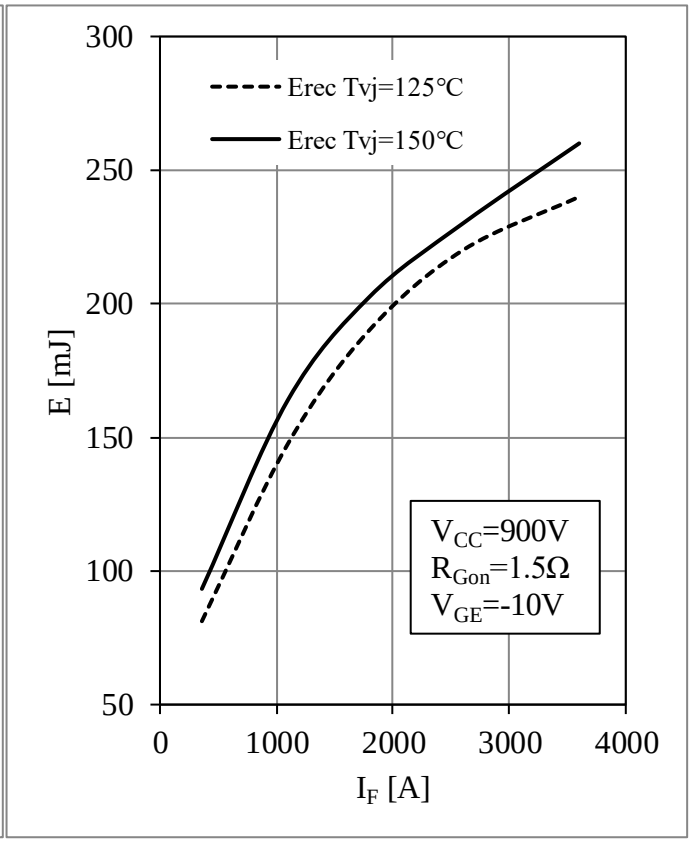


Fig 8. Diode Switching Loss vs. I_F

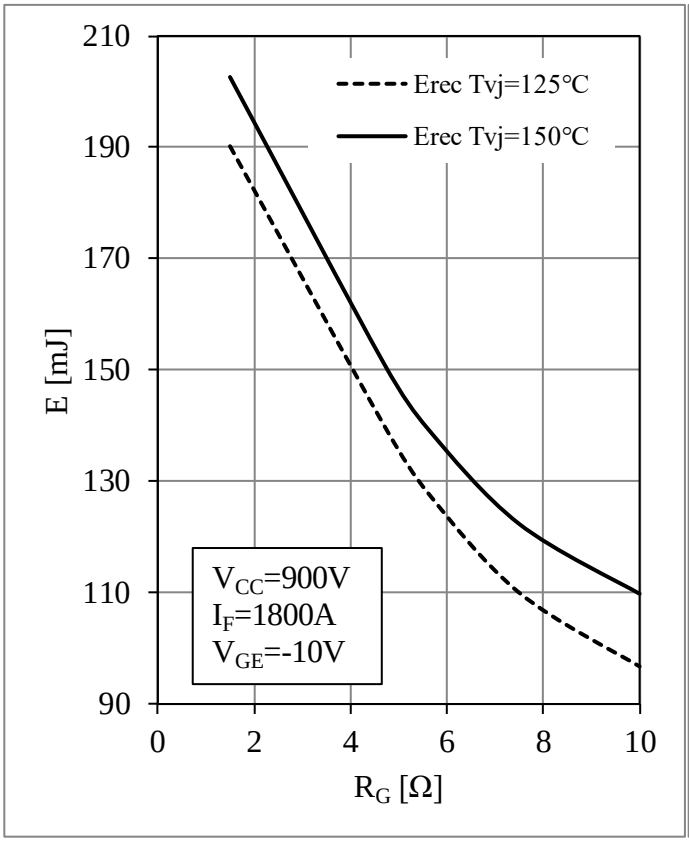


Fig 9. Diode Switching Loss vs. R_G

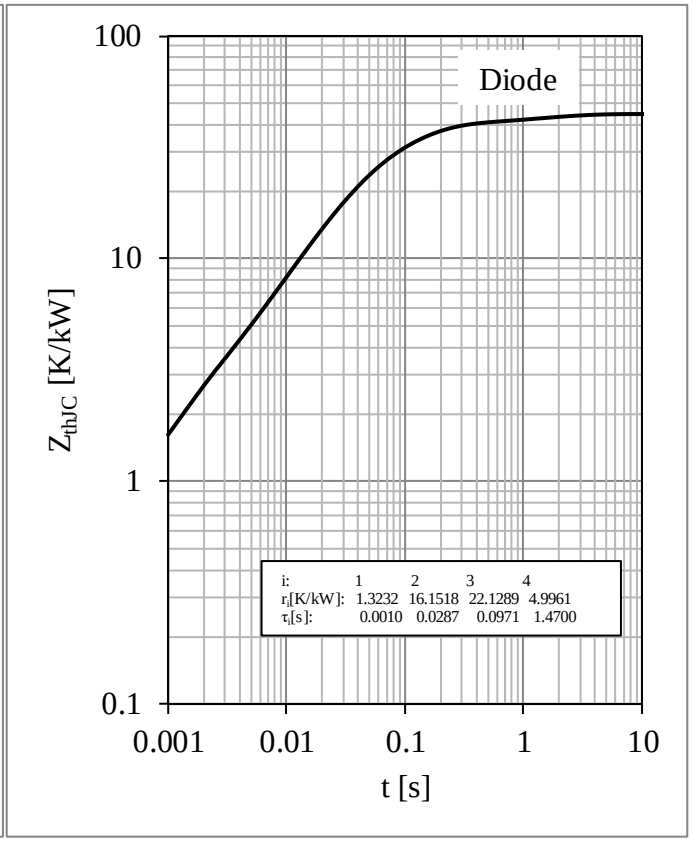
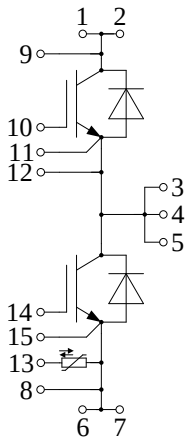


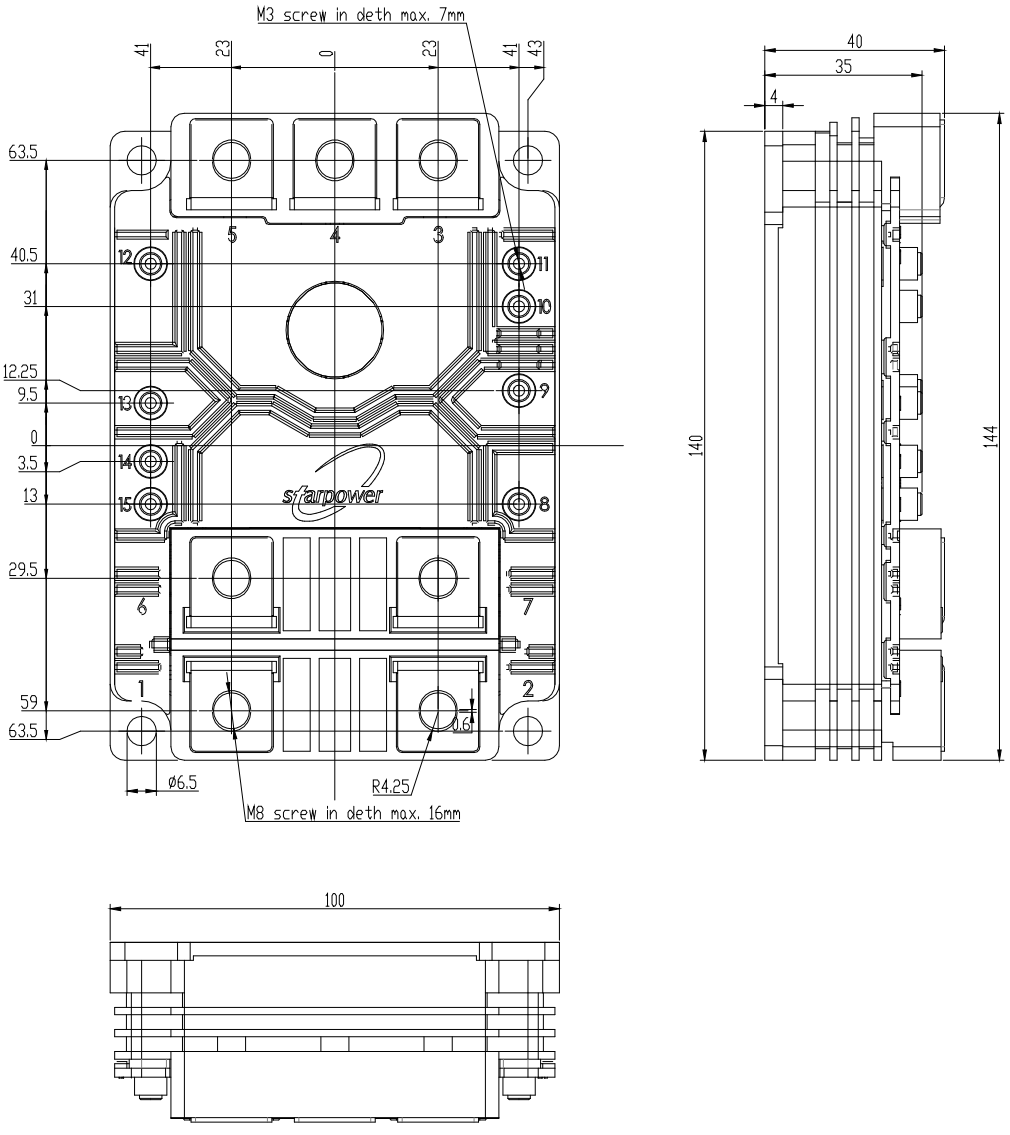
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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