STARPOWER

SEMICONDUCTOR **IGBT**

GD800HTY65P4S

650V/800A 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 hybrid and electric vehicle.

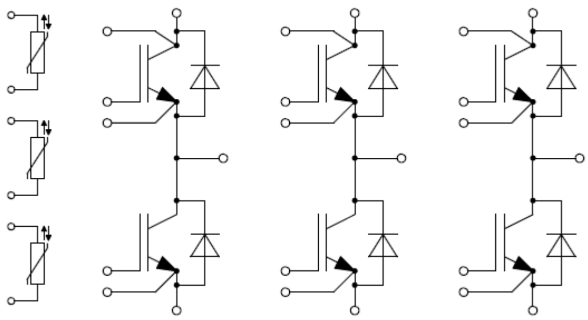
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching losses
- 6μs 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 pinfin baseplate using DBC technology

Typical Applications

- Hybrid and electric vehicle
- Inverter for motor drive
- Uninterruptible power supply

Equivalent Circuit Schematic



Absolute Maximum Ratings T_F=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_{CN}	Implemented Collector Current	800	A
I_C	Collector Current @ T_F=25°C @ T_F=75°C	700 550	A
I_{CM}	Pulsed Collector Current t_p=1ms	1600	A
P_D	Maximum Power Dissipation @ T_j=175°C	1500	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_{FN}	Implemented Forward Current	800	A
I_F	Diode Continuous Forward Current	550	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	1600	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_F=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=550A,V_{GE}=15V, T_j=25°C		1.30	1.60	V
		I_C=550A,V_{GE}=15V, T_j=125°C		1.35		
		I_C=550A,V_{GE}=15V, T_j=150°C		1.40		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=13.0mA,V_{CE}=V_{GE}, T_j=25°C	4.9	5.8	6.5	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
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=550A, R_{Gon}=1.8Ω, R_{Goff}=0.75Ω, V_{GE}=±15V,T_j=25°C		88		ns
t_r	Rise Time			64		ns
$t_{d(off)}$	Turn-Off Delay Time			436		ns
t_f	Fall Time			55		ns
E_{on}	Turn-On Switching Loss			6.5		mJ
E_{off}	Turn-Off Switching Loss			16.5		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=550A, R_{Gon}=1.8Ω, R_{Goff}=0.75Ω, V_{GE}=±15V,T_j=125°C		88		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-Off Delay Time			458		ns
t_f	Fall Time			79		ns
E_{on}	Turn-On Switching Loss			7.5		mJ
E_{off}	Turn-Off Switching Loss			19.7		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=550A, R_{Gon}=1.8Ω, R_{Goff}=0.75Ω, V_{GE}=±15V,T_j=150°C		95		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-Off Delay Time			466		ns
t_f	Fall Time			89		ns
E_{on}	Turn-On Switching Loss			8.2		mJ
E_{off}	Turn-Off Switching Loss			20.5		mJ
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150°C,V_{CC}=360V, V_{CEM}≤650V		4000		A

Diode Characteristics $T_F=25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=550A,V_{GE}=0V,$T_j=25^oC$		1.40	1.75	V
		I_F=550A,V_{GE}=0V,$T_j=125^oC$		1.35		
		I_F=550A,V_{GE}=0V,$T_j=150^oC$		1.30		
Q_r	Recovered Charge	V_R=300V,I_F=550A, -di/dt=6400A/μs,V_{GE}=-15V $T_j=25^oC$		25.1		μC
I_{RM}	Peak Reverse Recovery Current			339		A
E_{rec}	Reverse Recovery Energy			7.17		mJ
Q_r	Recovered Charge	V_R=300V,I_F=550A, -di/dt=6400A/μs,V_{GE}=-15V $T_j=125^oC$		50.4		μC
I_{RM}	Peak Reverse Recovery Current			460		A
E_{rec}	Reverse Recovery Energy			13.8		mJ
Q_r	Recovered Charge	V_R=300V,I_F=550A, -di/dt=6400/μs,V_{GE}=-15V $T_j=150^oC$		57.8		μC
I_{RM}	Peak Reverse Recovery Current			486		A
E_{rec}	Reverse Recovery Energy			15.8		mJ

NTC Characteristics $T_F=25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	$T_C=100\,^oC$,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_F=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
Δp	Pressure Drop Cooling Circuit $\Delta V/\Delta t$=10.0dm³/min;T_F=25°C;Cooling Fluid=50% Water/50% Ethylene Glycol		100		mbar
p	Maximum Pressure In Cooling Circuit			2.5	bar
L_{CE}	Stray Inductance		14		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.80		mΩ
R_{thJF}	Junction-to-Cooling Fluid (per IGBT) Junction-to-Cooling Fluid (per Diode)			0.100 0.130	K/W
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M6	2.5 3.0		5.0 6.0	N.m
G	Weight of Module		1250		g

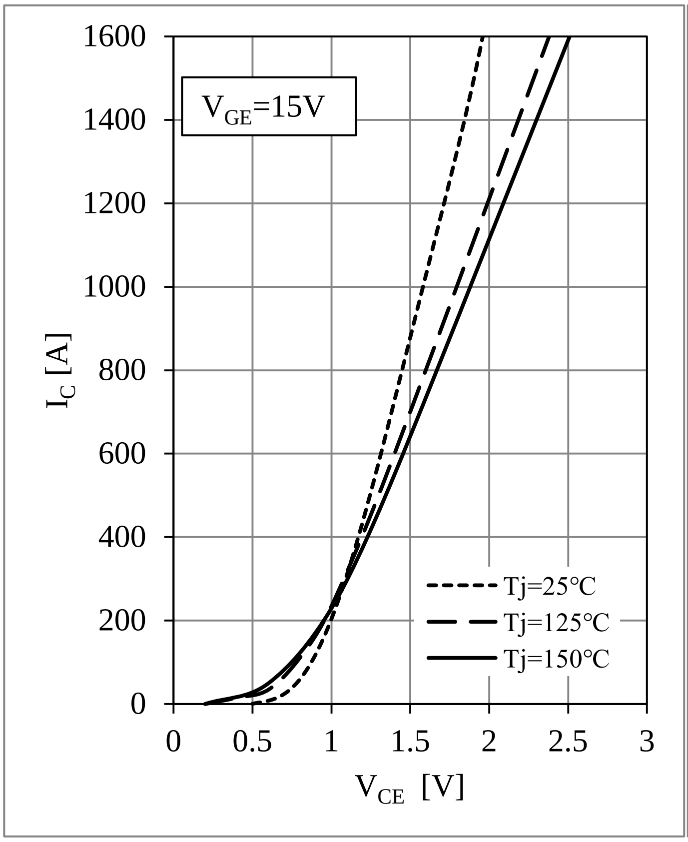


Fig 1. IGBT Output Characteristics

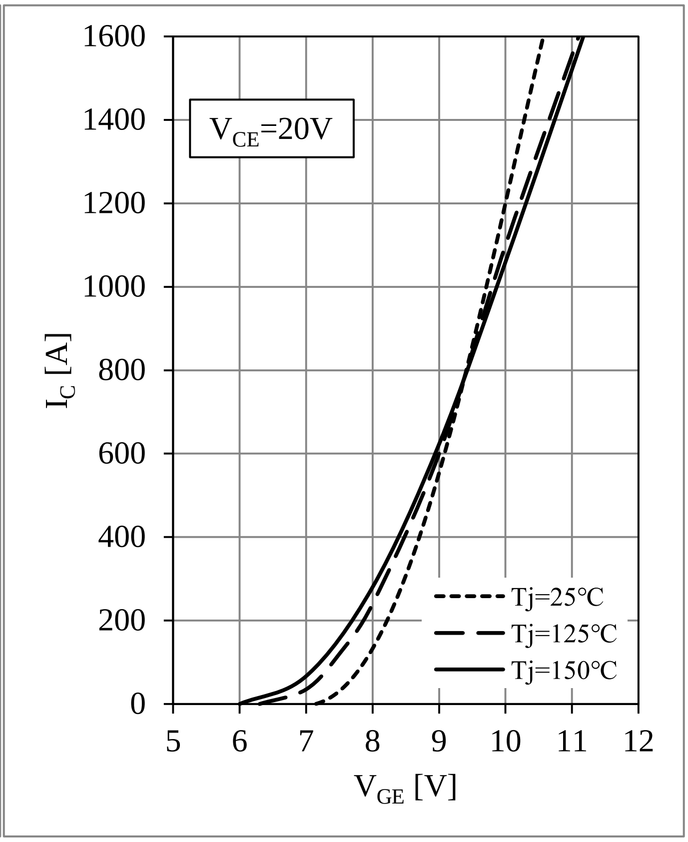


Fig 2. IGBT Transfer Characteristics

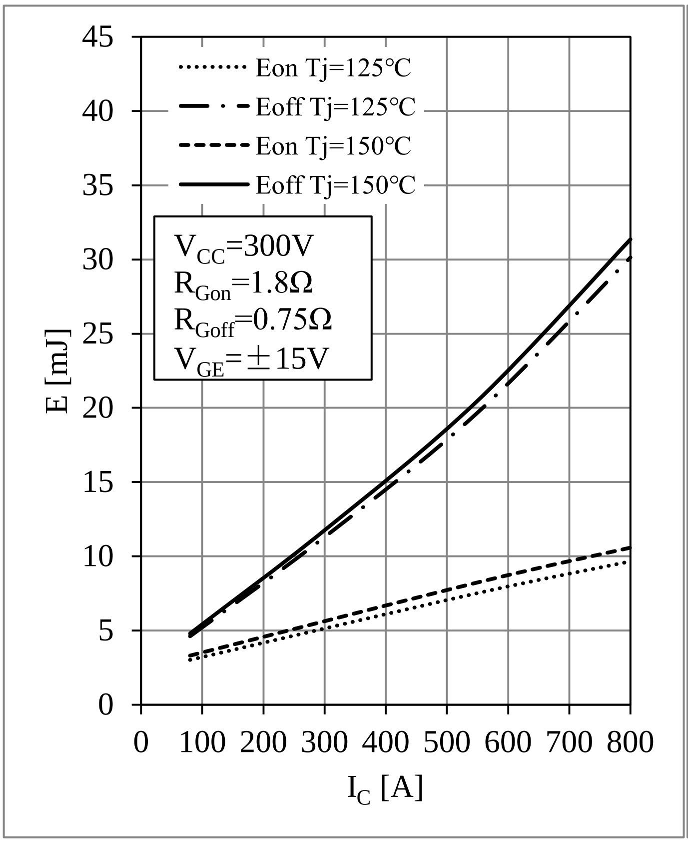


Fig 3. IGBT Switching Loss vs. I_C

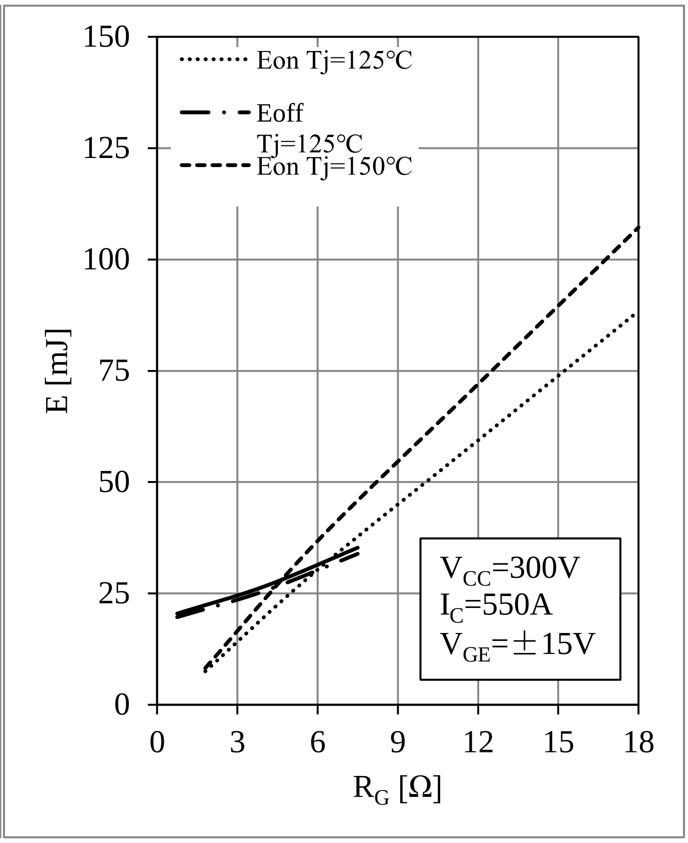


Fig 4. IGBT Switching Loss vs. R_G

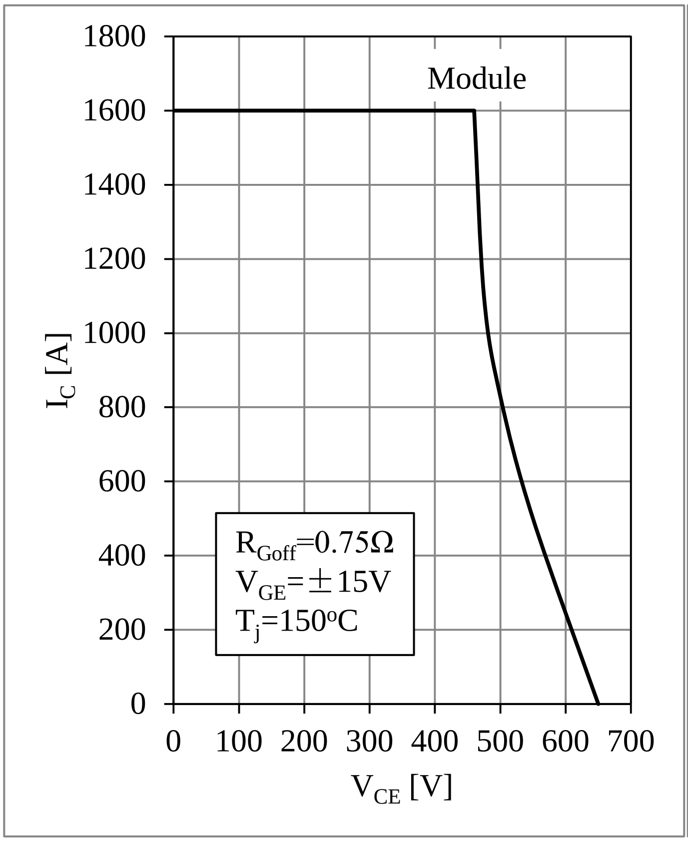


Fig 5. RBSOA

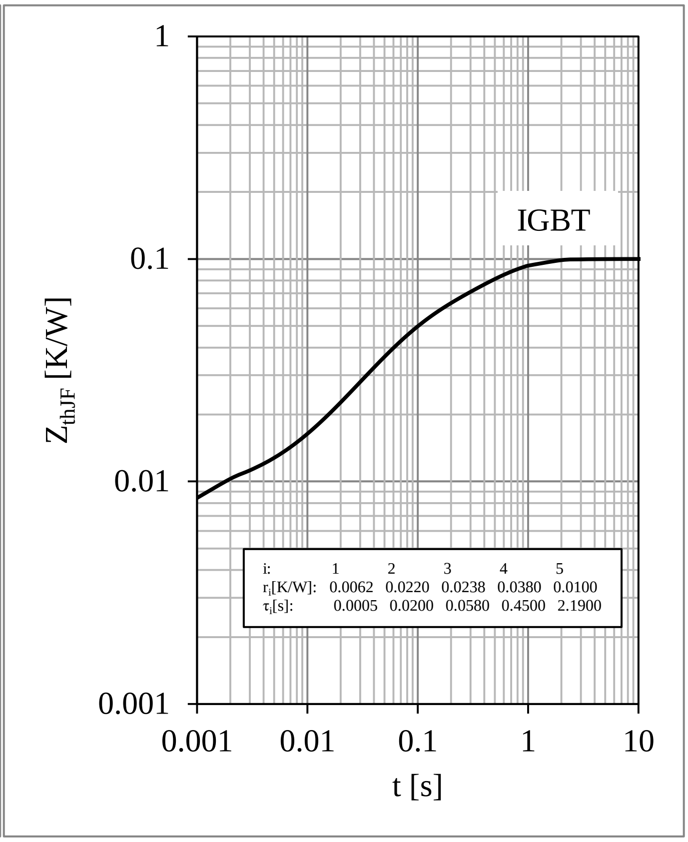


Fig 6. IGBT Transient Thermal Impedance

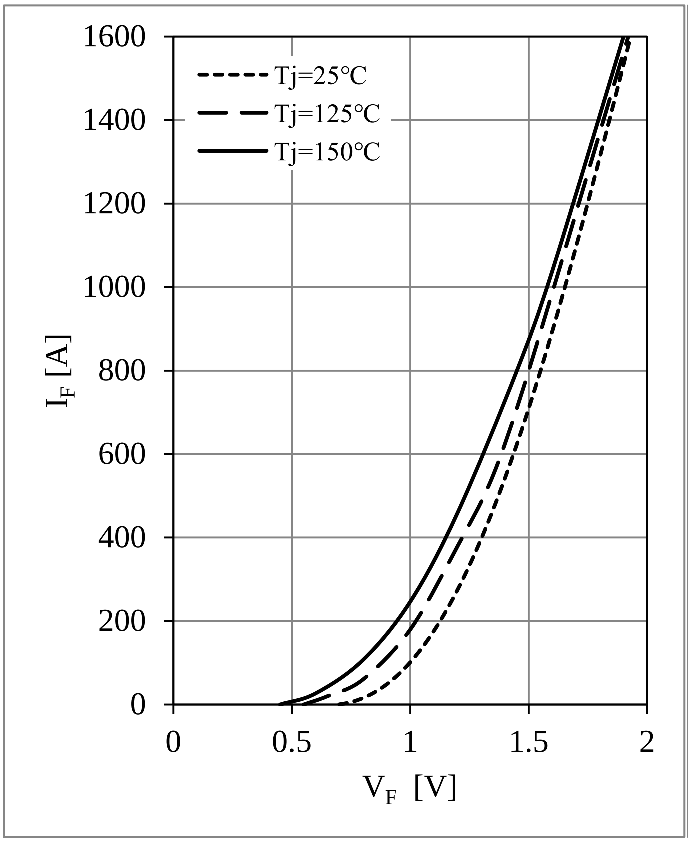


Fig 7. Diode Forward Characteristics

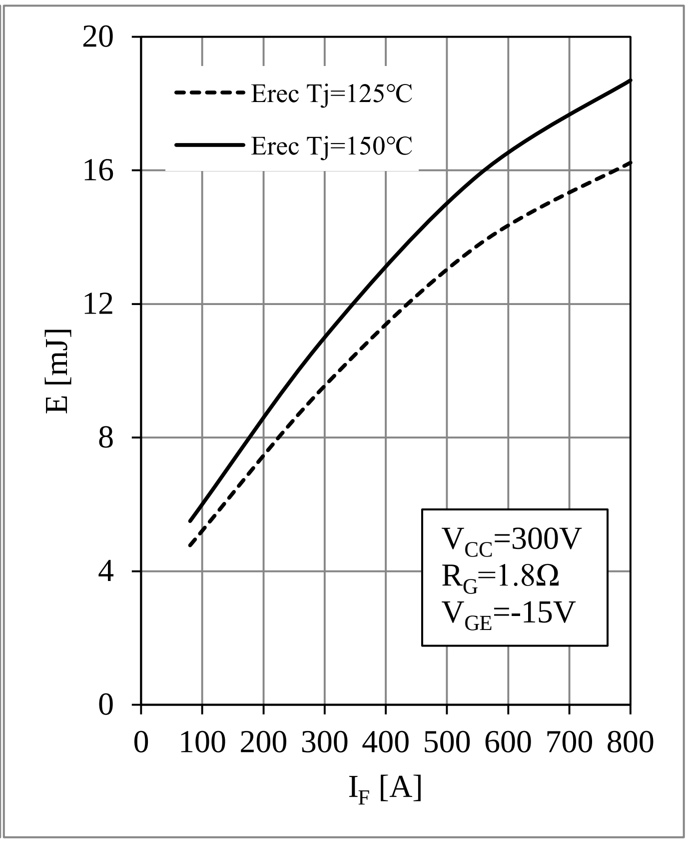


Fig 8. Diode Switching Loss vs. I_F

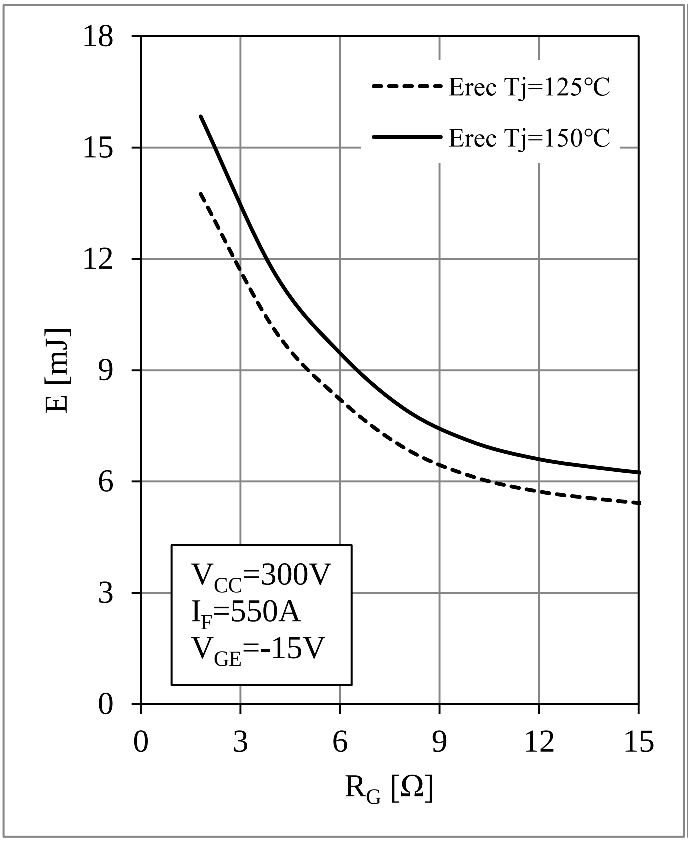


Fig 9. Diode Switching Loss vs. R_G

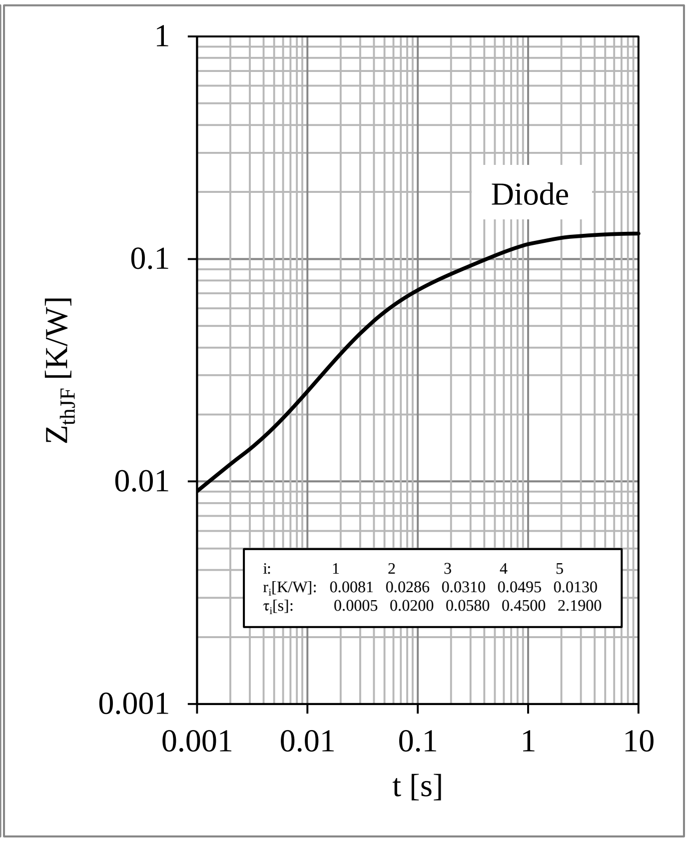


Fig 10. Diode Transient Thermal Impedance

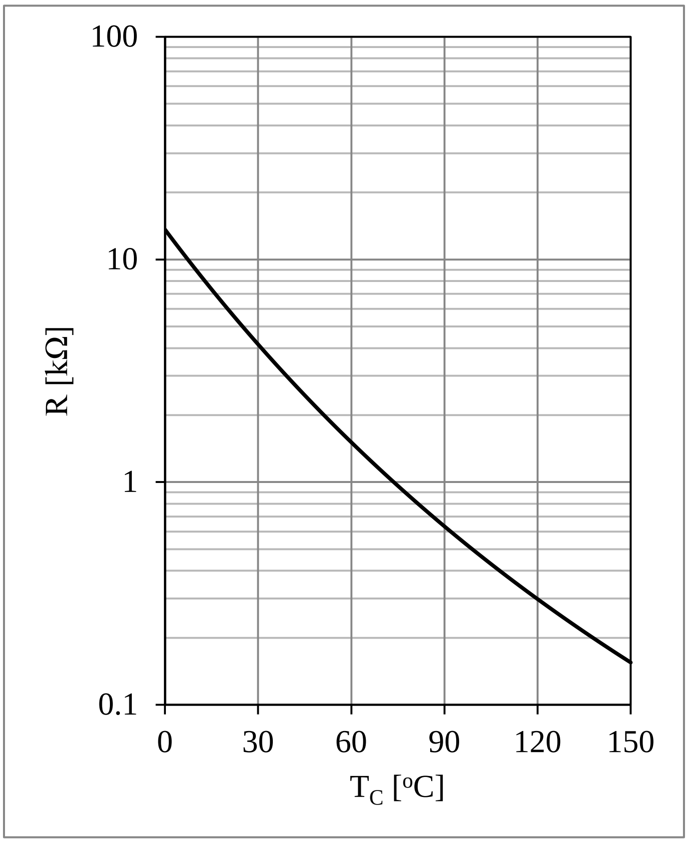
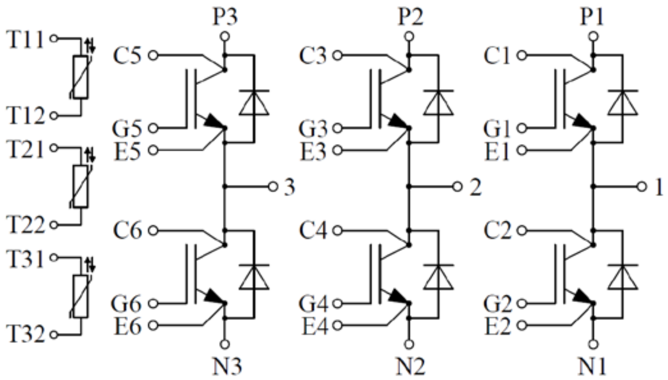


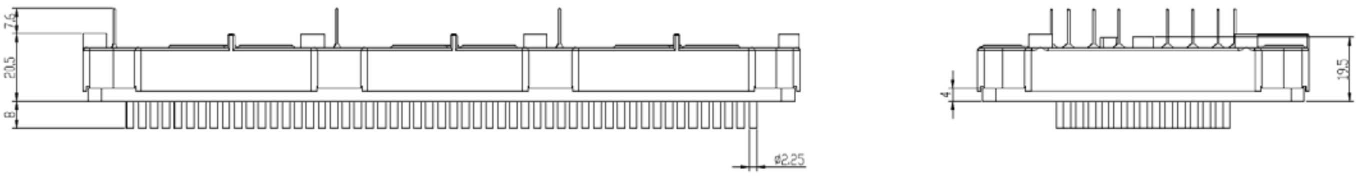
Fig 11. NTC Temperature Characteristic

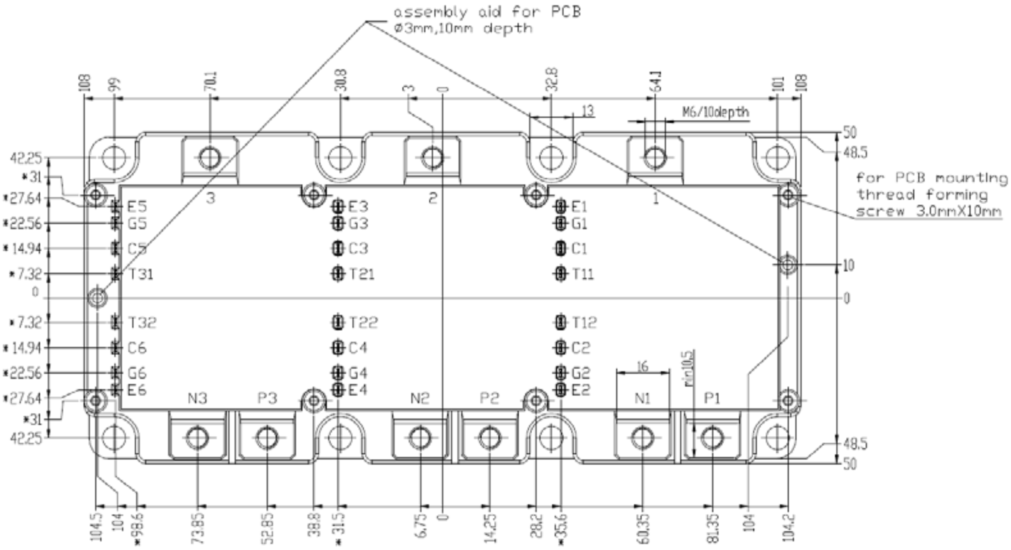
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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