STARPOWER

SEMICONDUCTOR **IGBT**

GD50FSA120L2SMF

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.

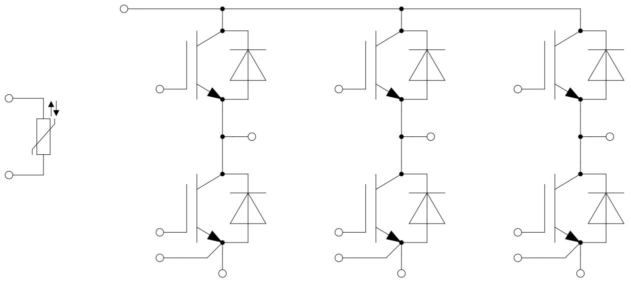
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 8μs 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 heatsink using DBC technology
- PressFIT contact technology
- Pre-applied phase change material

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Equivalent Circuit Schematic



Absolute Maximum Ratings T_H=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_H=60°C	50	A
I_{CRM}	Repetitive Peak Collector Current tp limited by T_{vjop}	100	A

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Repetitive Peak Forward Current tp limited by T_{vjop}	100	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	2500	V

Note: T_{vjop} > 150°C is allowed for operation at overload conditions.

IGBT Characteristics T_H=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_{vj}=25°C		1.50	1.95	V
		I_C=50A,V_{GE}=15V, T_{vj}=125°C		1.70		
		I_C=50A,V_{GE}=15V, T_{vj}=150°C		1.80		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.00mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.4	6.2	7.0	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			50	uA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_{vj}=25°C			100	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		4.42		nF
C_{res}	Reverse Transfer Capacitance			0.04		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.32		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=18Ω,L_S=35nH, V_{GE}=±15V,T_{vj}=25°C		85		ns
t_r	Rise Time			45		ns
$t_{d(off)}$	Turn-Off Delay Time			330		ns
t_f	Fall Time			193		ns
E_{on}	Turn-On Switching Loss			4.66		mJ
E_{off}	Turn-Off Switching Loss			4.51		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=18Ω,L_S=35nH, V_{GE}=±15V,T_{vj}=125°C		86		ns
t_r	Rise Time			49		ns
$t_{d(off)}$	Turn-Off Delay Time			385		ns
t_f	Fall Time			302		ns
E_{on}	Turn-On Switching Loss			5.99		mJ
E_{off}	Turn-Off Switching Loss			6.00		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=18Ω,L_S=35nH, V_{GE}=±15V,T_{vj}=150°C		91		ns
t_r	Rise Time			49		ns
$t_{d(off)}$	Turn-Off Delay Time			400		ns
t_f	Fall Time			331		ns
E_{on}	Turn-On Switching Loss			6.30		mJ
E_{off}	Turn-Off Switching Loss			6.31		mJ
I_{SC}	SC Data	t_P≤8μs,V_{GE}=15V, T_{vj}=150°C,V_{CC}=600V, V_{CEM}≤1200V		150		A

Diode Characteristics T_H=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_{vj}=25°C		1.60	2.05	V
		I_F=50A,V_{GE}=0V,T_{vj}=125°C		1.65		
		I_F=50A,V_{GE}=0V,T_{vj}=150°C		1.65		
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1166A/μs,L_S=35nH, V_{GE}=-15V,T_{vj}=25°C		4.96		μC
I_{RM}	Peak Reverse Recovery Current			41		A
E_{rec}	Reverse Recovery Energy			1.67		mJ
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1032A/μs,L_S=35nH, V_{GE}=-15V,T_{vj}=125°C		8.66		μC
I_{RM}	Peak Reverse Recovery Current			45		A
E_{rec}	Reverse Recovery Energy			3.24		mJ
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1014A/μs,L_S=35nH, V_{GE}=-15V,T_{vj}=150°C		9.21		μC
I_{RM}	Peak Reverse Recovery Current			45		A
E_{rec}	Reverse Recovery Energy			3.46		mJ

NTC Characteristics T_H=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_H=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		25		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip		4.50		mΩ
R_{thJH}	Junction-to-Heatsink (per IGBT) Junction-to-Heatsink (per Diode)		1.050 1.600		K/W
F	Mounting Force Per Clamp	20		50	N
G	Weight of Module		24		g

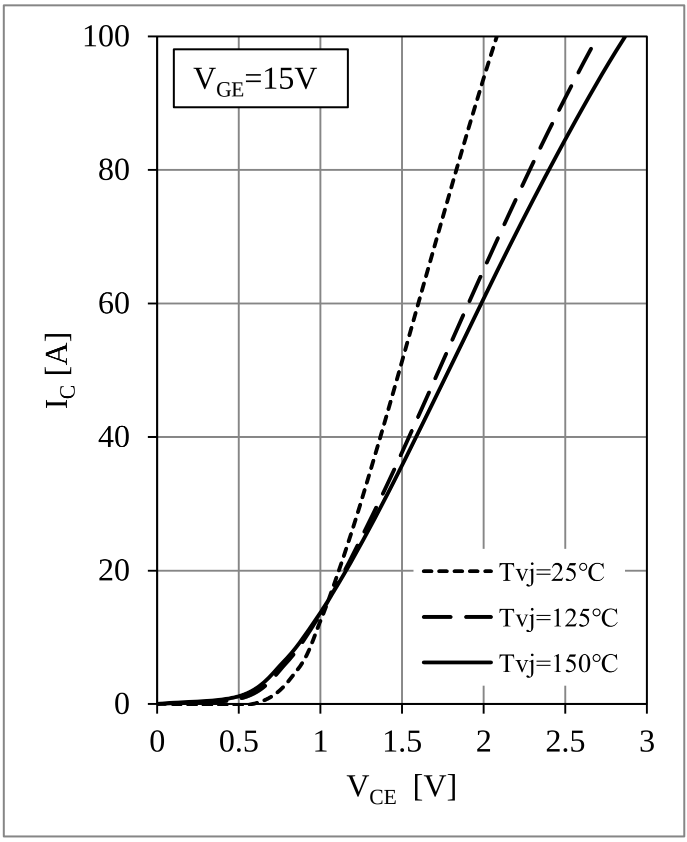


Fig 1. IGBT Output Characteristics

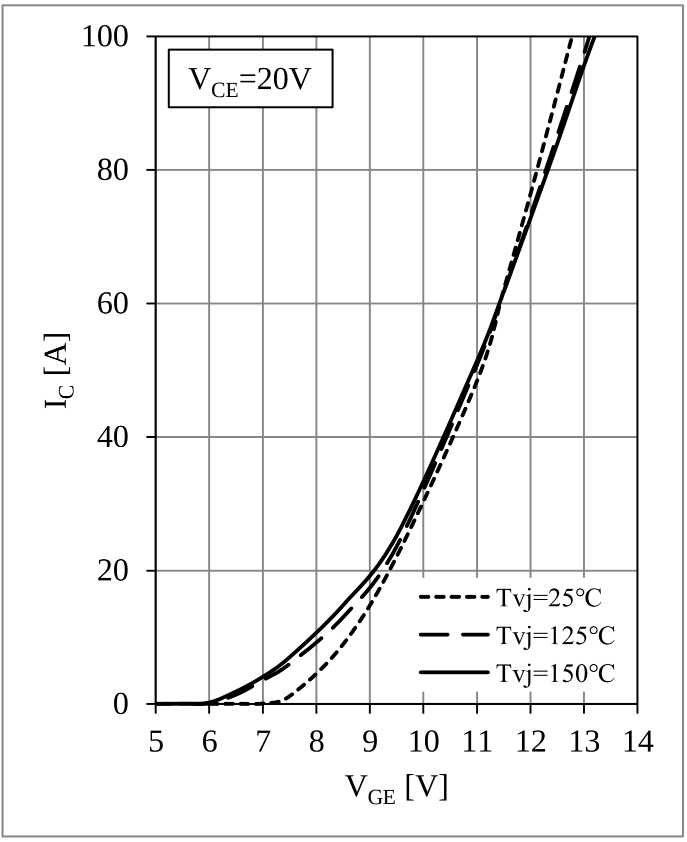


Fig 2. IGBT Transfer Characteristics

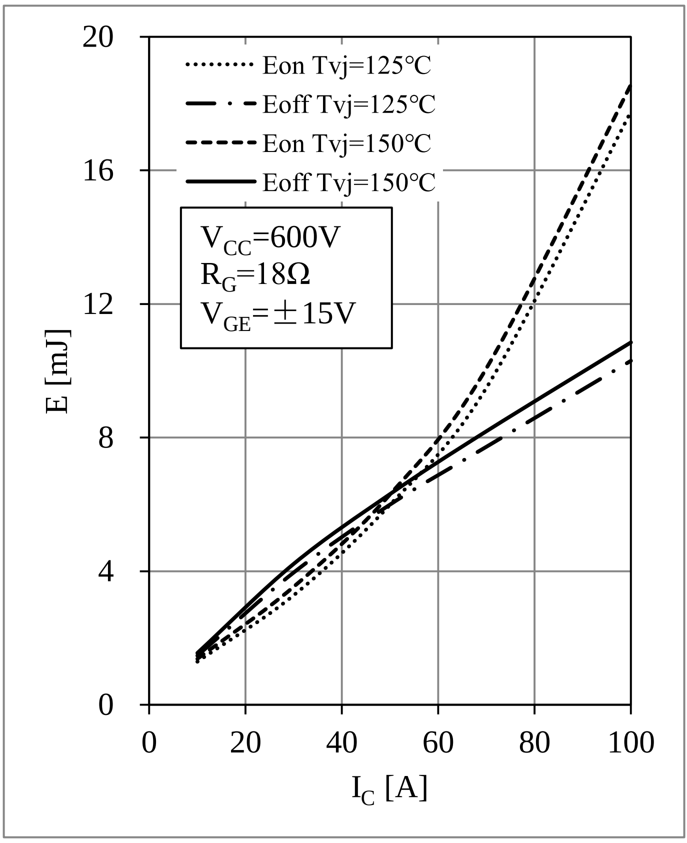


Fig 3. IGBT Switching Loss vs. I_C

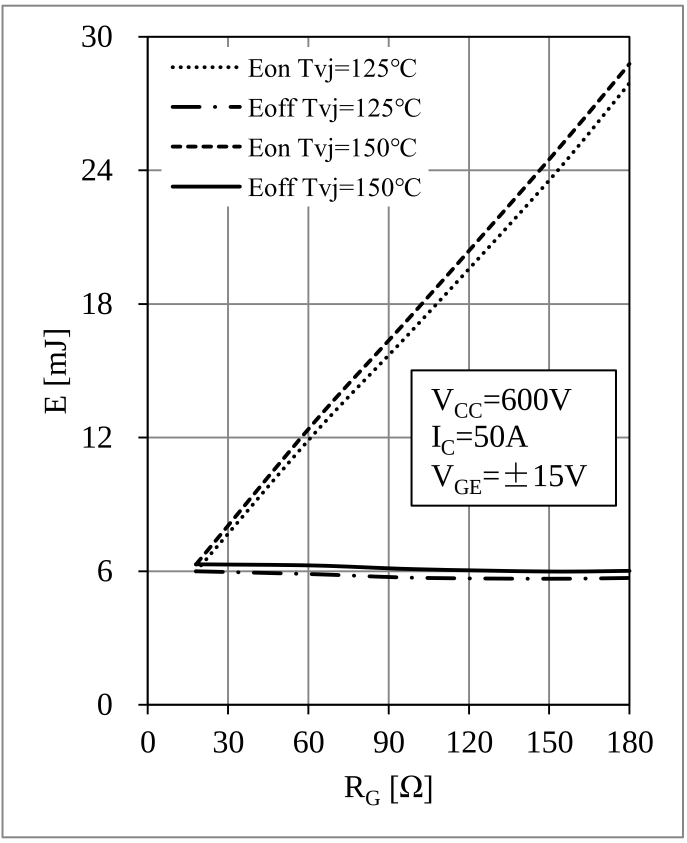


Fig 4. IGBT Switching Loss vs. R_G

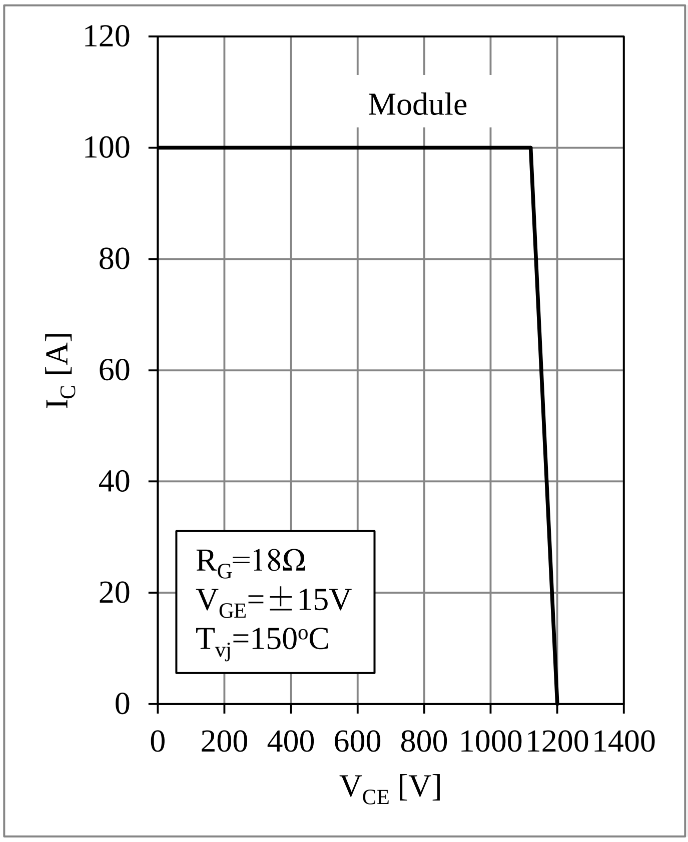


Fig 5. RBSOA

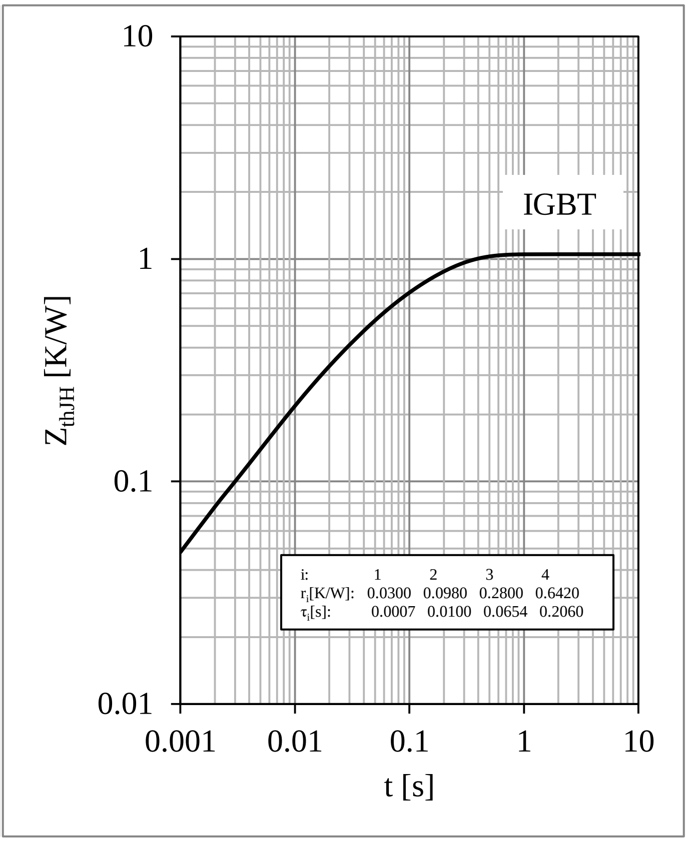


Fig 6. IGBT Transient Thermal Impedance

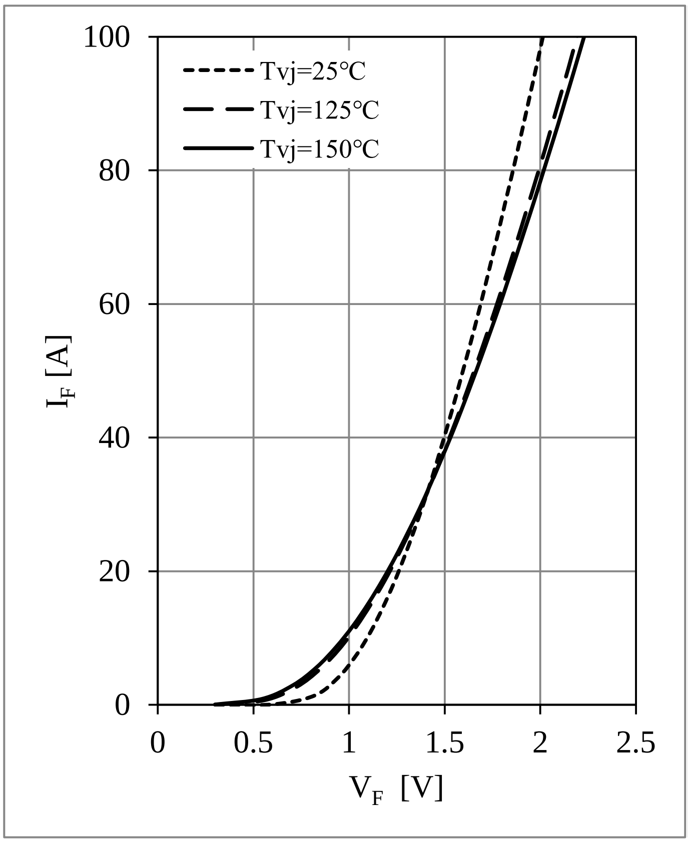


Fig 7. Diode Forward Characteristics

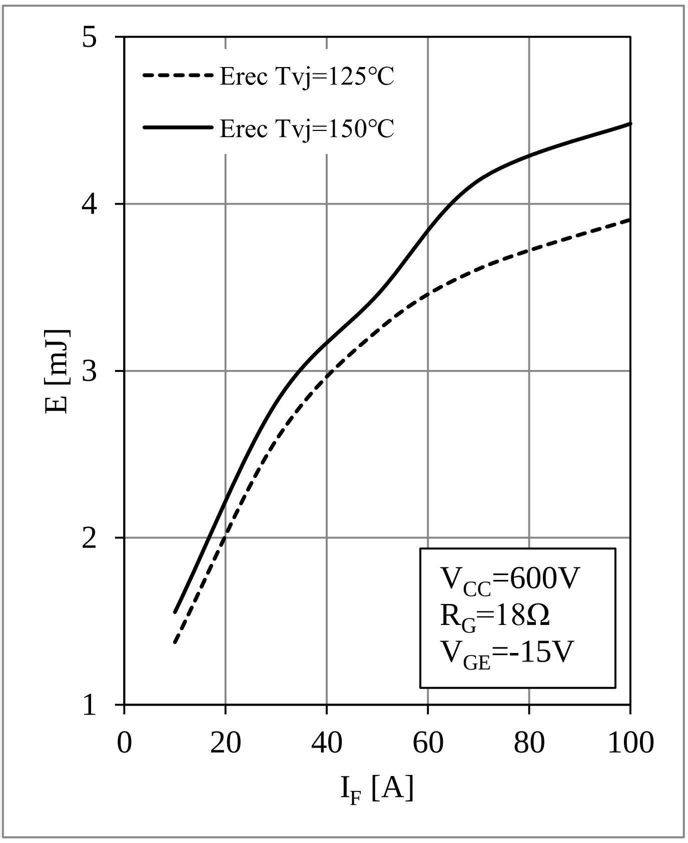


Fig 8. Diode Switching Loss vs.I_F

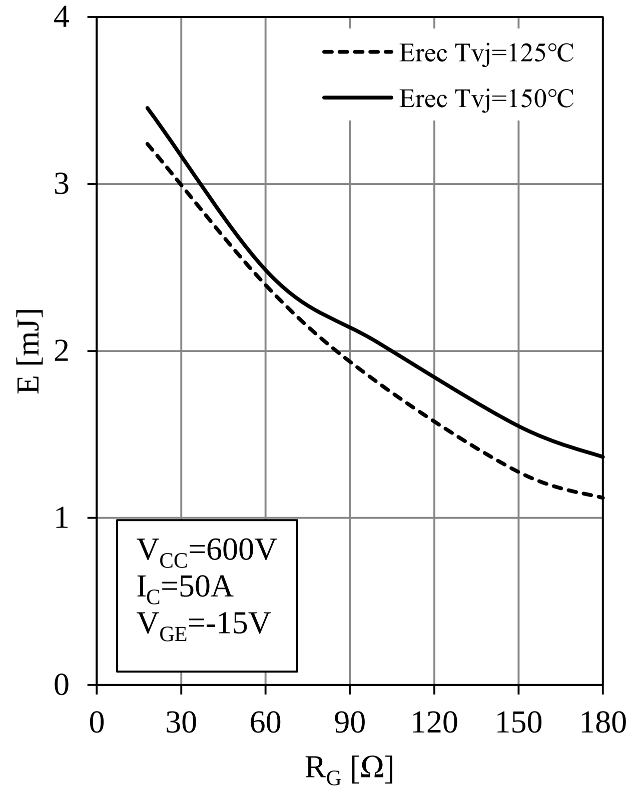


Fig 9. Diode Switching Loss vs. R_G

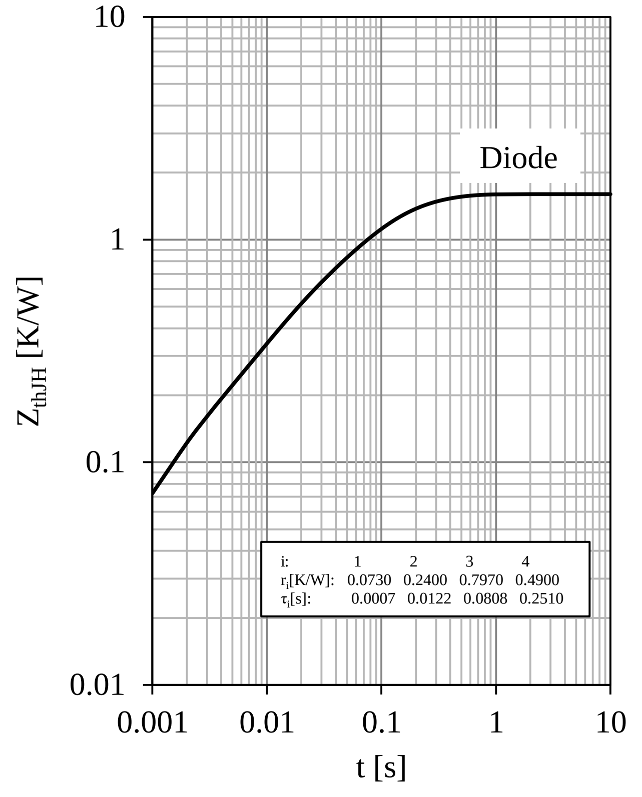


Fig 10. Diode Transient Thermal Impedance

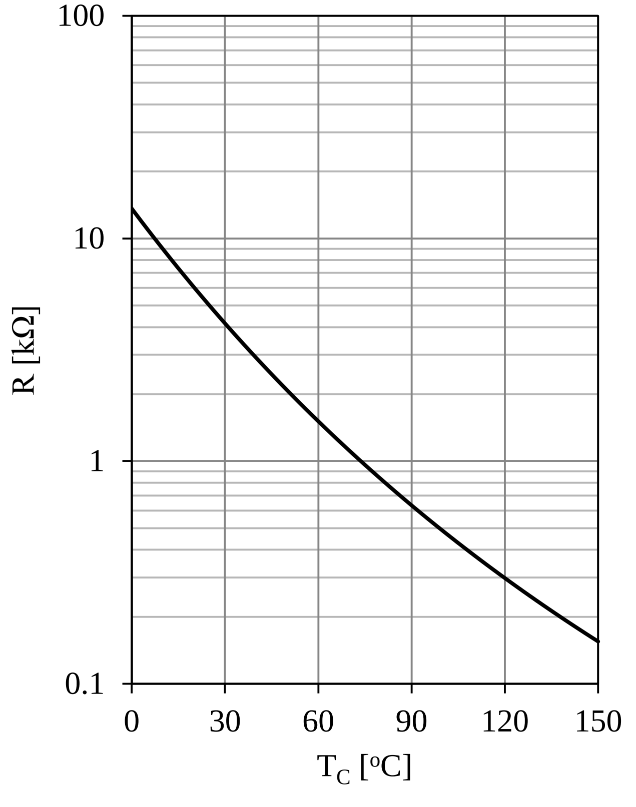
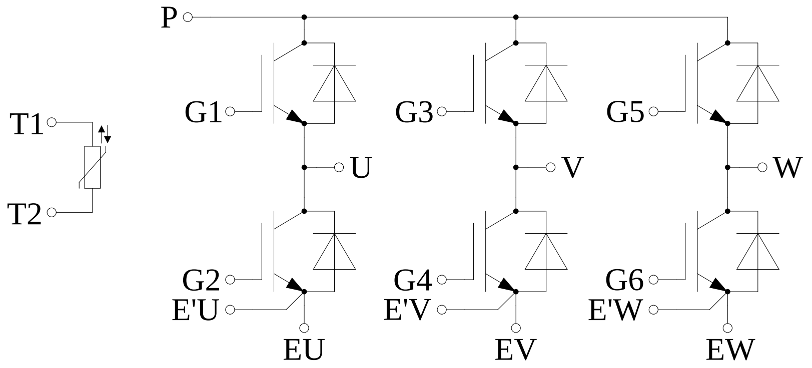


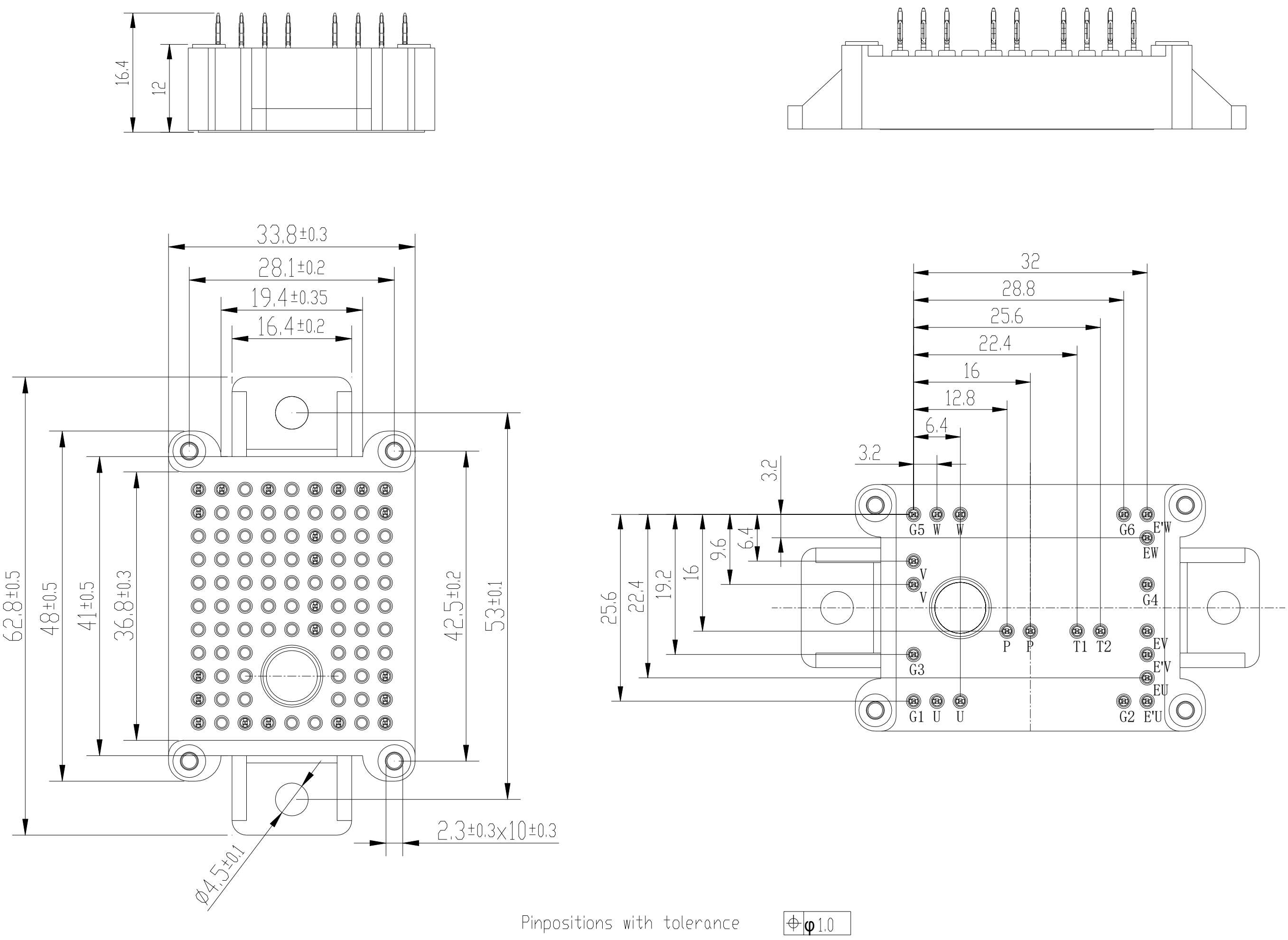
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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