STARPOWER

SEMICONDUCTOR

IGBT

GD900CUY120P1S

1200V/900A chopper 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 electric vehicle and solar power.

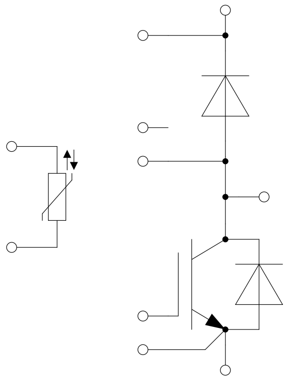
Features

- 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
- Isolated copper baseplate using DBC technology
- High power and thermal cycling capability

Typical Applications

- High Power Converter
- Solar Power
- Hybrid and Electric Vehicle

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25^{o}C unless otherwise noted

IGBT

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25^{o}C @ T_C=100^{o}C	1522 900	A
I_{CM}	Pulsed Collector Current t_p=1ms	1800	A
P_D	Maximum Power Dissipation @ T_j=175^{o}C	5.24	kW

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	900	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	1800	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	^{o}C
T_{jop}	Operating Junction Temperature	-40 to +150	^{o}C
T_{STG}	Storage Temperature Range	-40 to +125	^{o}C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	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=900A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=900A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=900A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=22.5mA,V_{CE}=V_{GE}, T_j=25°C	5.2	6.0	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	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}=600V,I_C=900A, R_G=1.6Ω,V_{GE}=±15V, T_j=25°C		214		ns
t_r	Rise Time			150		ns
$t_{d(off)}$	Turn-Off Delay Time			721		ns
t_f	Fall Time			206		ns
E_{on}	Turn-On Switching Loss			76		mJ
E_{off}	Turn-Off Switching Loss			128		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=900A, R_G=1.6Ω,V_{GE}=±15V, T_j=125°C		235		ns
t_r	Rise Time			161		ns
$t_{d(off)}$	Turn-Off Delay Time			824		ns
t_f	Fall Time			412		ns
E_{on}	Turn-On Switching Loss			107		mJ
E_{off}	Turn-Off Switching Loss			165		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=900A, R_G=1.6Ω,V_{GE}=±15V, T_j=150°C		235		ns
t_r	Rise Time			161		ns
$t_{d(off)}$	Turn-Off Delay Time			876		ns
t_f	Fall Time			464		ns
E_{on}	Turn-On Switching Loss			112		mJ
E_{off}	Turn-Off Switching Loss			180		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		3600		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=900A,V_{GE}=0V,T_j=25°C		1.90	2.25	V
		I_F=900A,V_{GE}=0V,T_j=125°C		1.85		
		I_F=900A,V_{GE}=0V,T_j=150°C		1.80		
Q_r	Recovered Charge	V_R=600V,I_F=900A, -di/dt=4800A/μs,V_{GE}=-15V T_j=25°C		86		μC
I_{RM}	Peak Reverse Recovery Current			475		A
E_{rec}	Reverse Recovery Energy			36.1		mJ
Q_r	Recovered Charge	V_R=600V,I_F=900A, -di/dt=4800A/μs,V_{GE}=-15V T_j=125°C		143		μC
I_{RM}	Peak Reverse Recovery Current			618		A
E_{rec}	Reverse Recovery Energy			71.3		mJ
Q_r	Recovered Charge	V_R=600V,I_F=900A, -di/dt=4800A/μs,V_{GE}=-15V T_j=150°C		185		μC
I_{RM}	Peak Reverse Recovery Current			665		A
E_{rec}	Reverse Recovery Energy			75.1		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		18		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.30		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			28.6 51.9	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		9.5 17.2 4.5		K/kW
M	Terminal Connection Torque, Screw M4 Terminal Connection Torque, Screw M8 Mounting Torque, Screw M5	1.8 8.0 3.0		2.1 10 6.0	N.m
G	Weight of Module		825		g

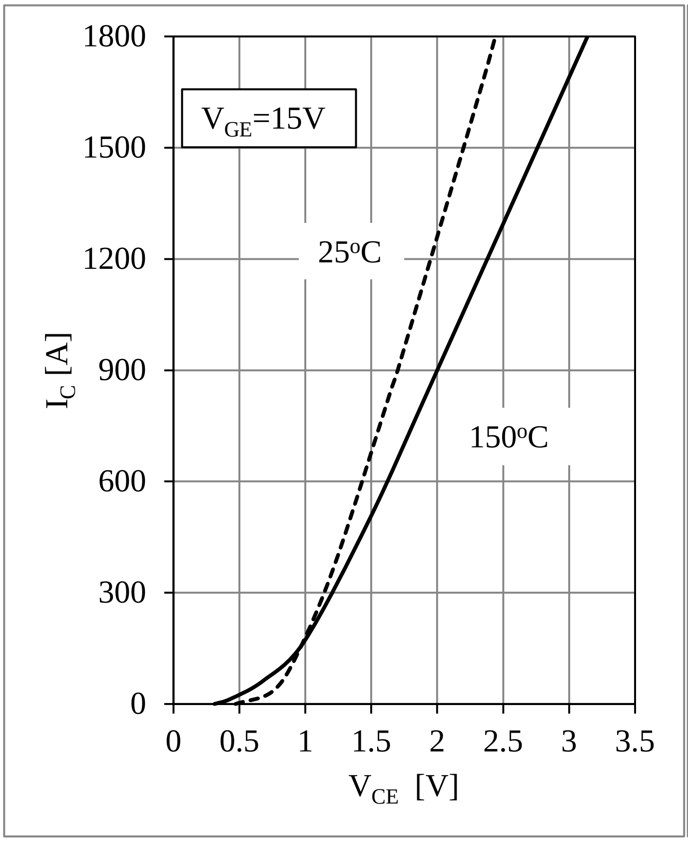


Fig 1. IGBT Output Characteristics

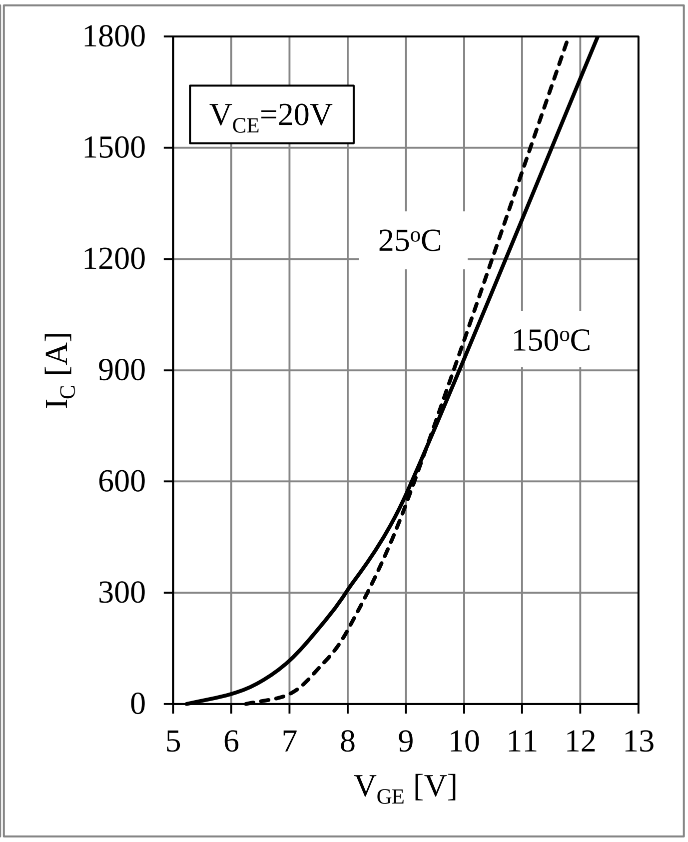


Fig 2. IGBT Transfer Characteristics

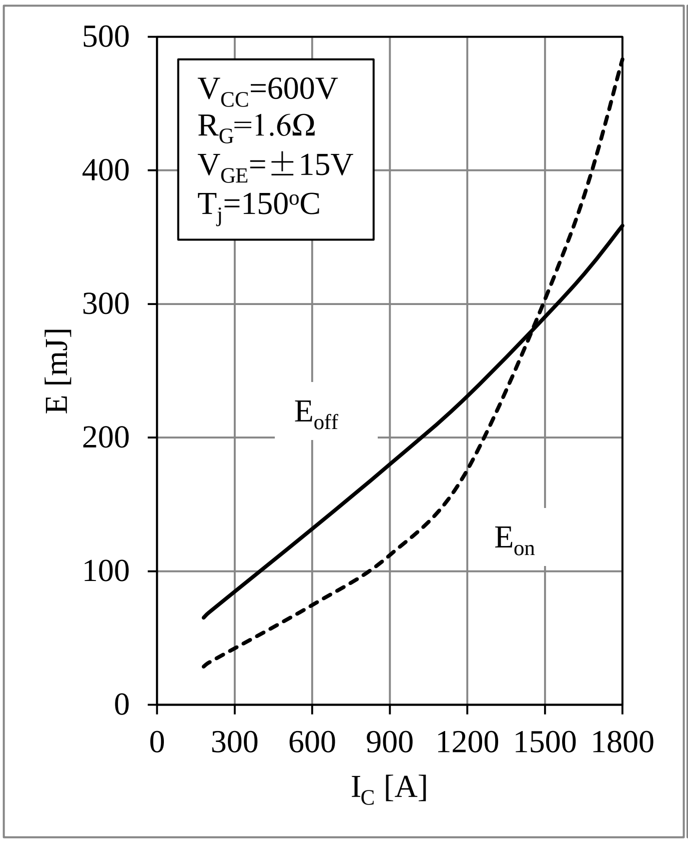


Fig 3. IGBT Switching Loss vs. I_C

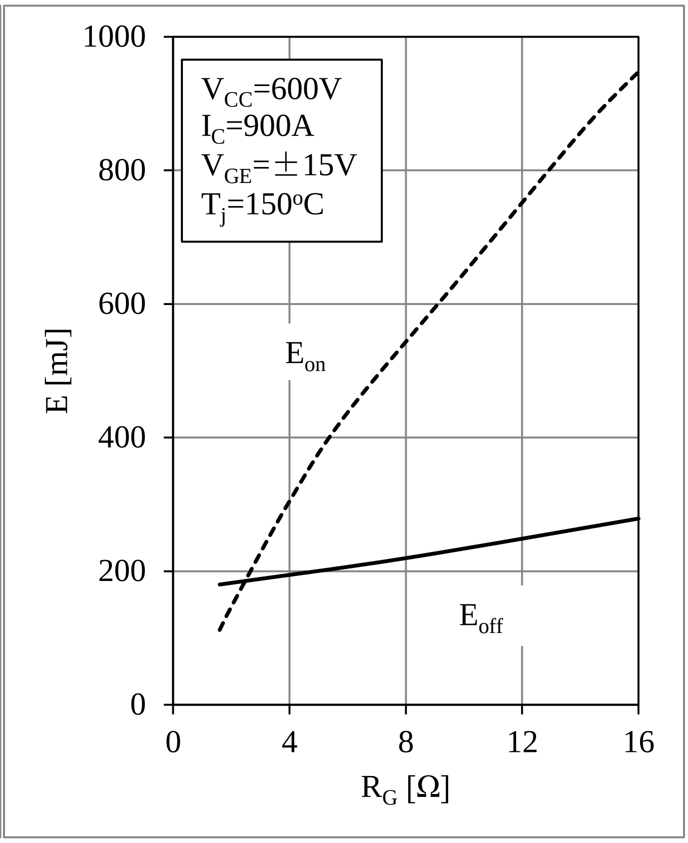


Fig 4. IGBT Switching Loss vs. R_G

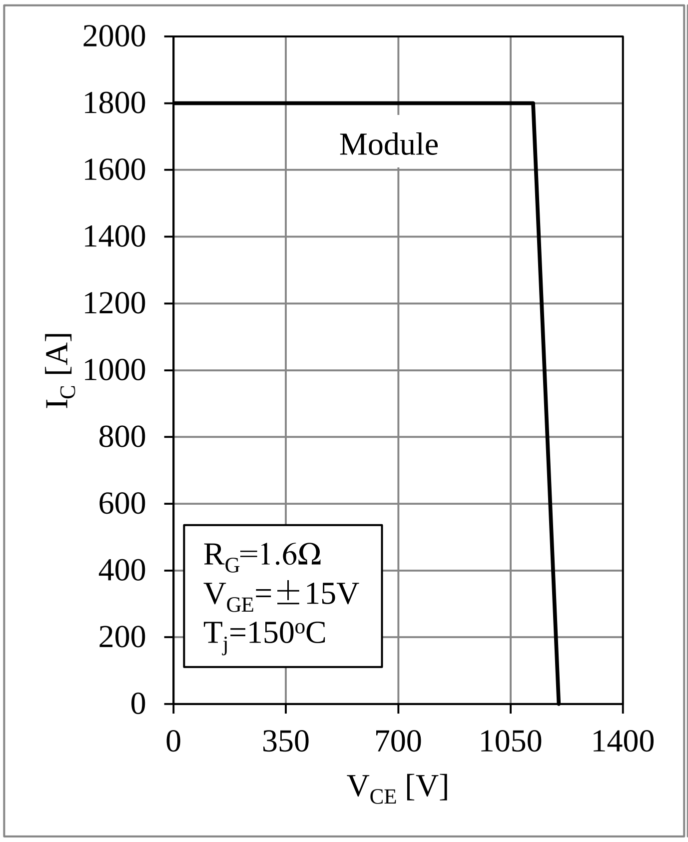


Fig 5. RBSOA

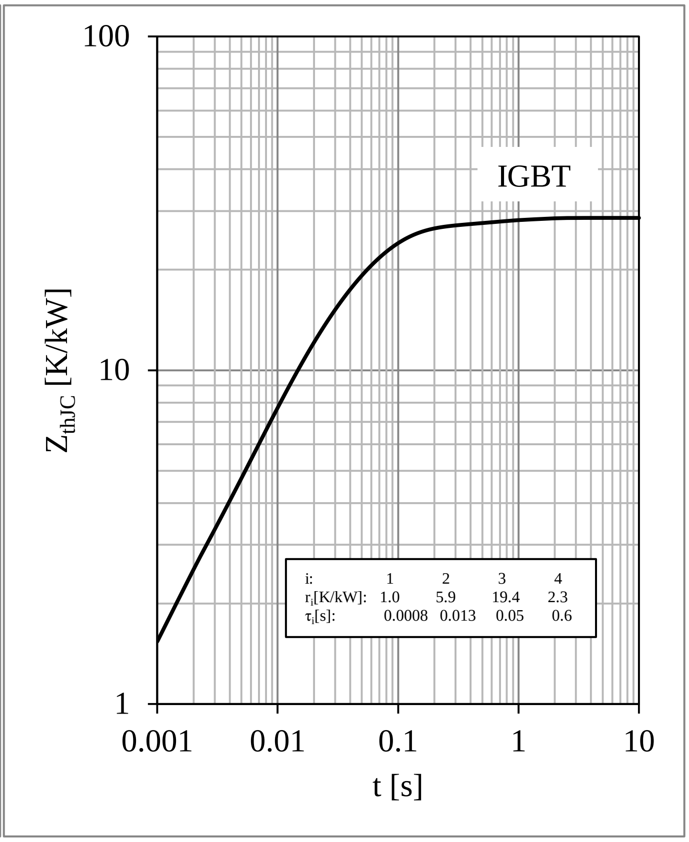


Fig 6. IGBT Transient Thermal Impedance

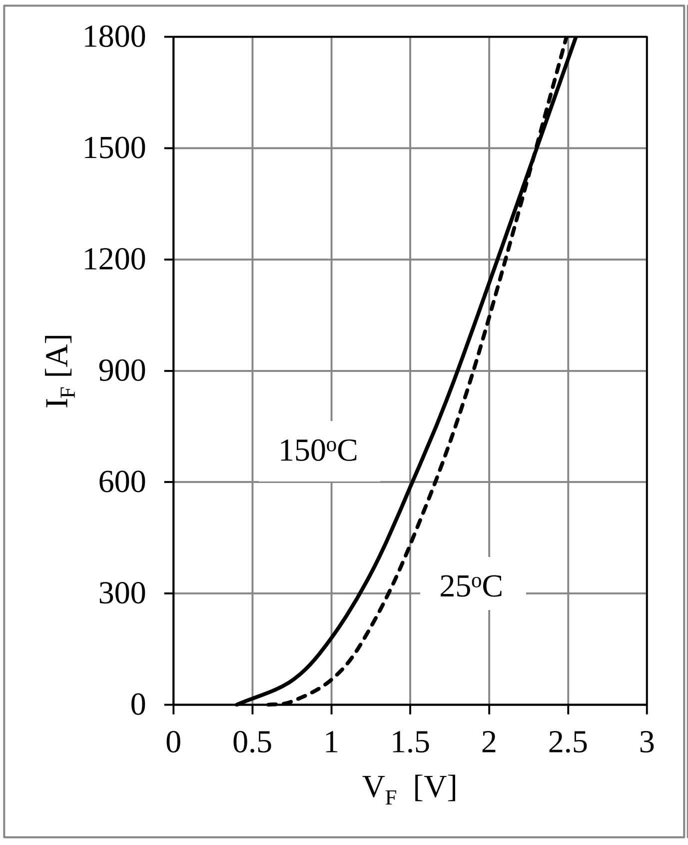


Fig 7. Diode Forward Characteristics

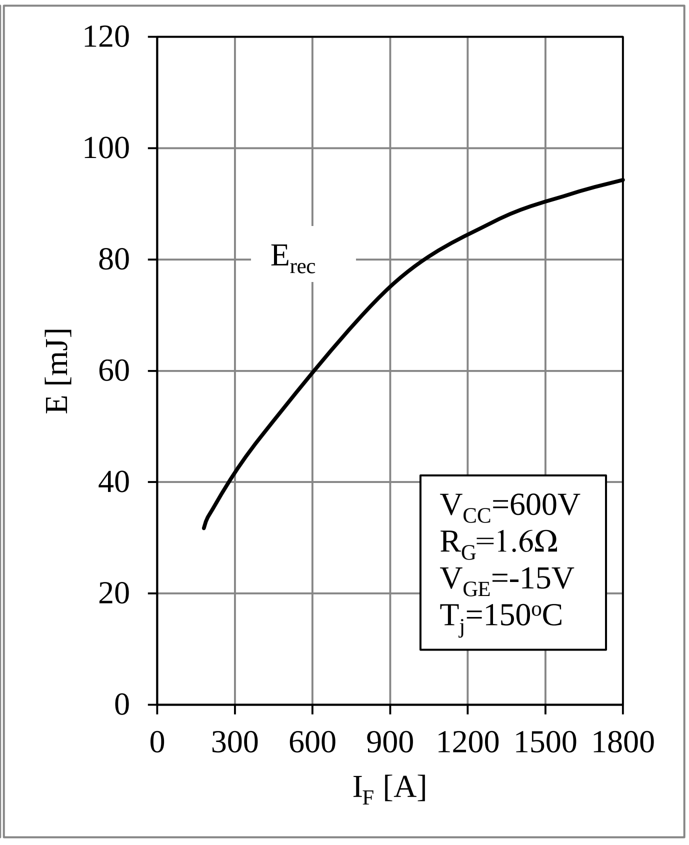


Fig 8. Diode Switching Loss vs. I_F

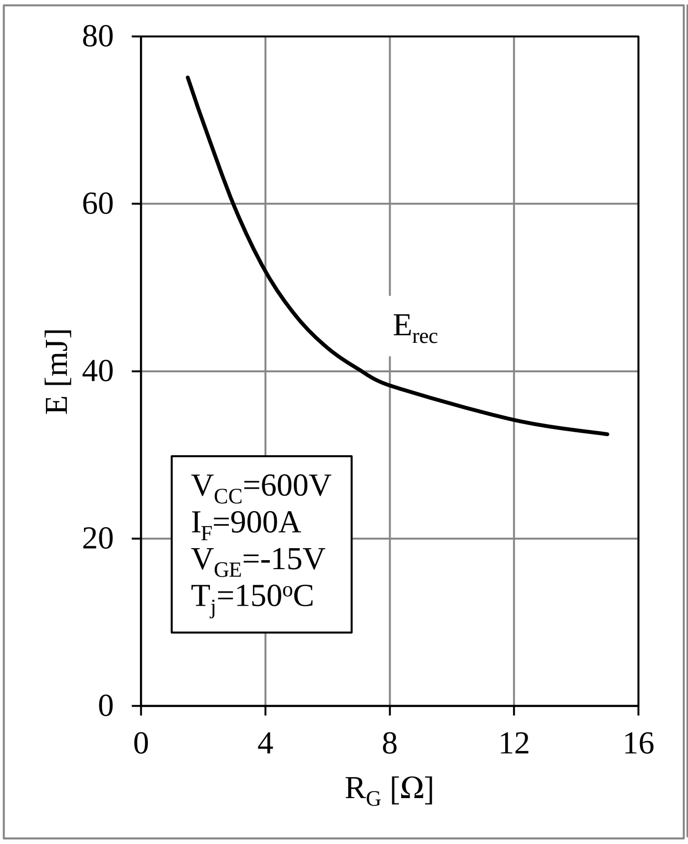


Fig 9. Diode Switching Loss vs. R_G

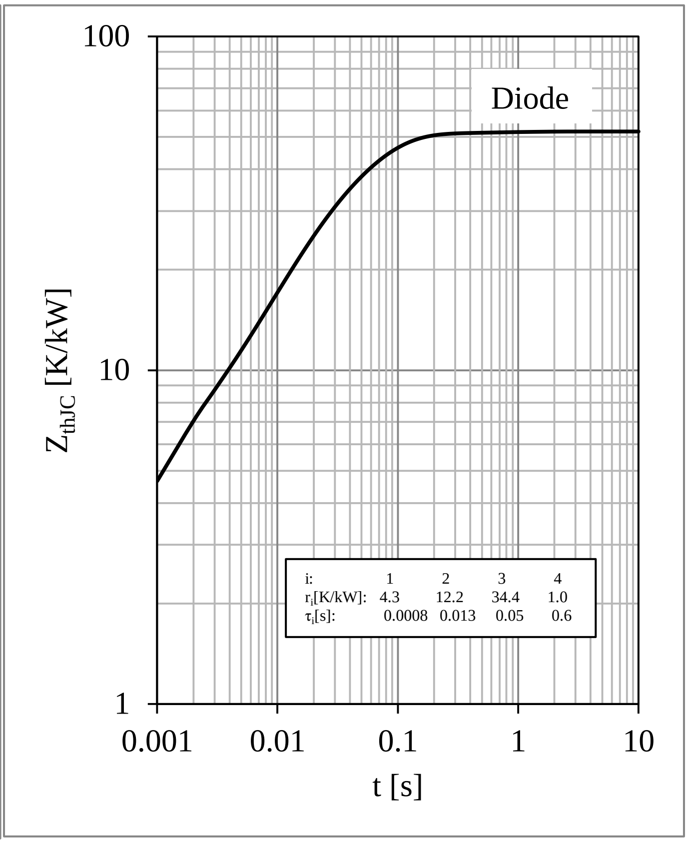


Fig 10. Diode Transient Thermal Impedance

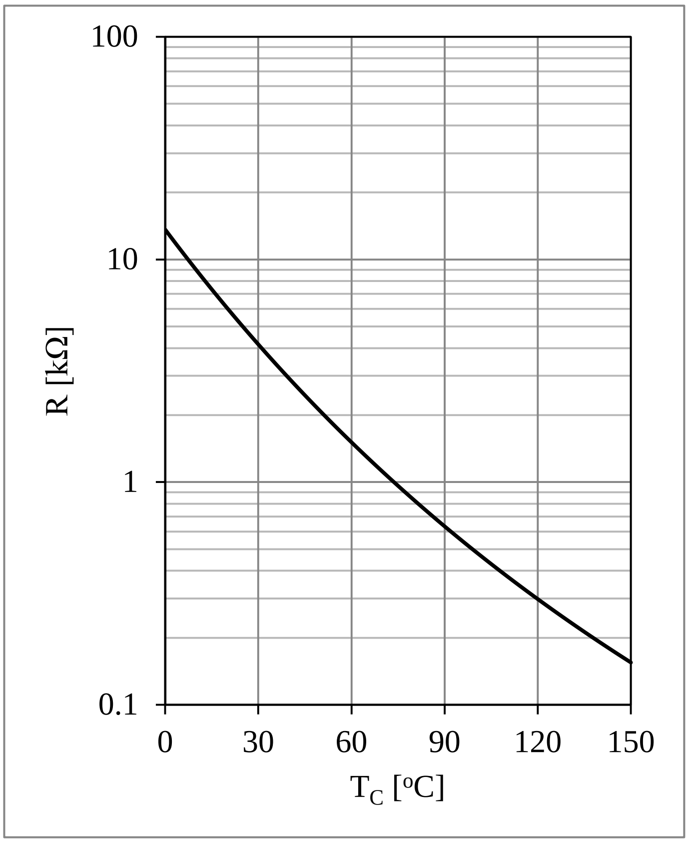
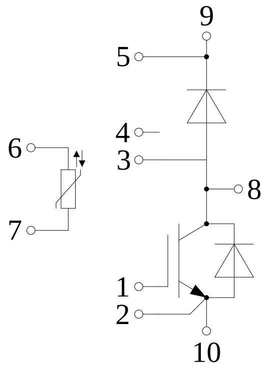


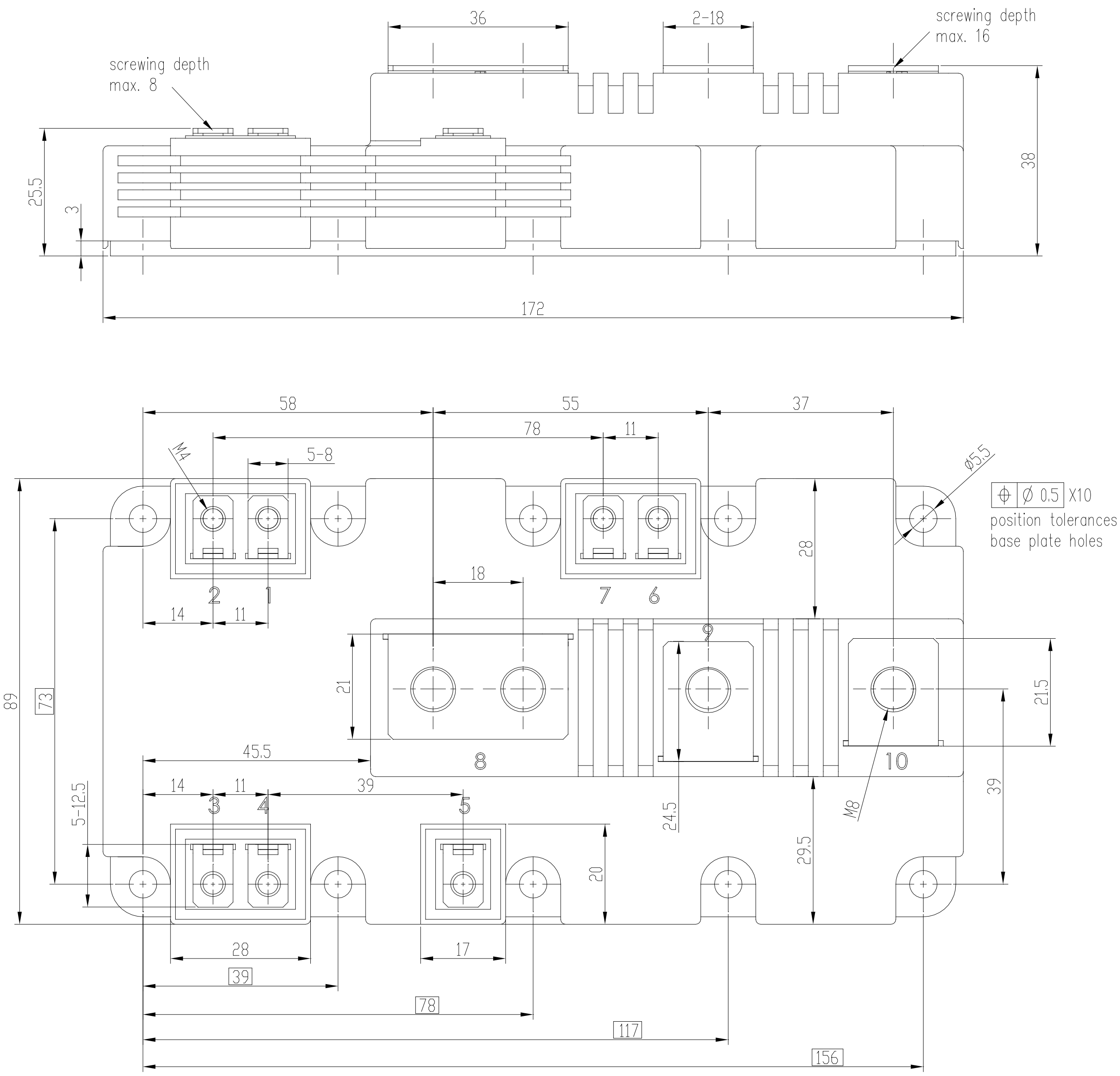
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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