STARPOWER

SEMICONDUCTOR **IGBT**

GD450HTL170C7S

1700V/450A 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.

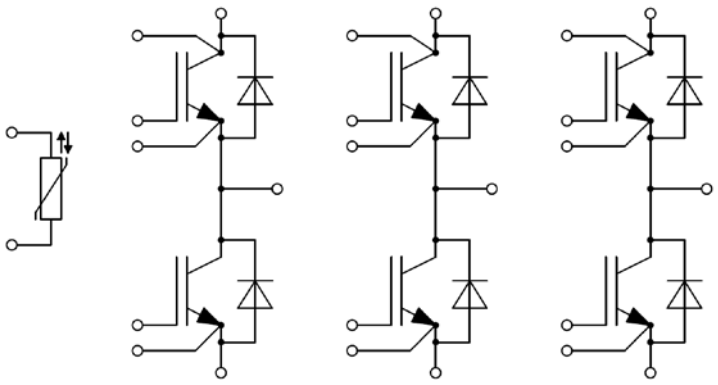
Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- Low switching loss
- 10μs short circuit capability
- Low inductance case
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

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

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25℃ unless otherwise noted

IGBT

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	600 450	A
I_{CM}	Pulsed Collector Current t_p=1ms	900	A
P_D	Maximum Power Dissipation @ T_j=175℃	2679	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	450	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	900	A

Module

Symbol	Description	Values	Unit
T_{jmax}	Maximum Junction Temperature	175	℃
T_{jop}	Operating Junction Temperature	-40 to +150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M6	3.0 to 6.0 3.0 to 6.0	N.m

IGBT Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=450A,V_{GE}=15V, T_j=25℃		2.50	2.95	V
		I_C=450A,V_{GE}=15V, T_j=125℃		3.00		
		I_C=450A,V_{GE}=15V, T_j=150℃		3.10		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=18.0mA,V_{CE}=V_{GE}, T_j=25℃	5.4	6.2	7.4	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA
R_{Gint}	Internal Gate Resistance			0.7		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		30.0		nF
C_{res}	Reverse Transfer Capacitance			1.08		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		2.70		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=450A, R_G=2.7Ω,V_{GE}=±15V, T_j=25℃		234		ns
t_r	Rise Time			108		ns
$t_{d(off)}$	Turn-Off Delay Time			395		ns
t_f	Fall Time			146		ns
E_{on}	Turn-On Switching Loss			123		mJ
E_{off}	Turn-Off Switching Loss			87.0		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=450A, R_G=2.7Ω,V_{GE}=±15V, T_j=125℃		250		ns
t_r	Rise Time			122		ns
$t_{d(off)}$	Turn-Off Delay Time			480		ns
t_f	Fall Time			153		ns
E_{on}	Turn-On Switching Loss			159		mJ
E_{off}	Turn-Off Switching Loss			132		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=450A, R_G=2.7Ω,V_{GE}=±15V, T_j=150℃		254		ns
t_r	Rise Time			125		ns
$t_{d(off)}$	Turn-Off Delay Time			510		ns
t_f	Fall Time			165		ns
E_{on}	Turn-On Switching Loss			177		mJ
E_{off}	Turn-Off Switching Loss			144		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150℃,V_{CC}=1300V, V_{CEM}≤1700V		1440		A

Diode Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_C=450A,V_{GE}=0V,T_j=25℃		1.80	2.25	V
		I_C=450A,V_{GE}=0V,T_j=125℃		1.90		
		I_C=450A,V_{GE}=0V,T_j=150℃		1.93		
Q_r	Recovered Charge	V_R=900V,I_F=450A, R_G=2.7Ω,V_{GE}=-15V T_j=25℃		120		μC
I_{RM}	Peak Reverse Recovery Current			549		A
E_{rec}	Reverse Recovery Energy			63.5		mJ
Q_r	Recovered Charge	V_R=900V,I_F=450A, R_G=2.7Ω,V_{GE}=-15V T_j=125℃		204		μC
I_{RM}	Peak Reverse Recovery Current			596		A
E_{rec}	Reverse Recovery Energy			115		mJ
Q_r	Recovered Charge	V_R=900V,I_F=450A, R_G=2.7Ω,V_{GE}=-15V T_j=150℃		225		μC
I_{RM}	Peak Reverse Recovery Current			608		A
E_{rec}	Reverse Recovery Energy			128		mJ

NTC Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100℃,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

Module Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip		1.10		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.056 0.113	K/W
$R_{\theta CS}$	Case-to-Sink (per IGBT) Case-to-Sink (per Diode)		0.045 0.091		K/W
$R_{\theta CS}$	Case-to-Sink		0.005		K/W
G	Weight of Module		910		g

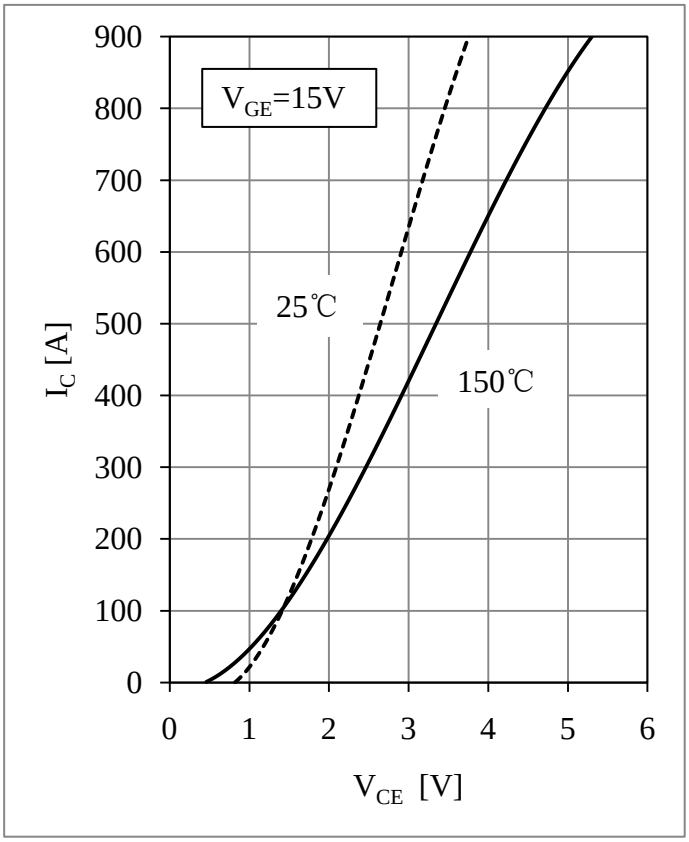


Fig 1. IGBT Output Characteristics

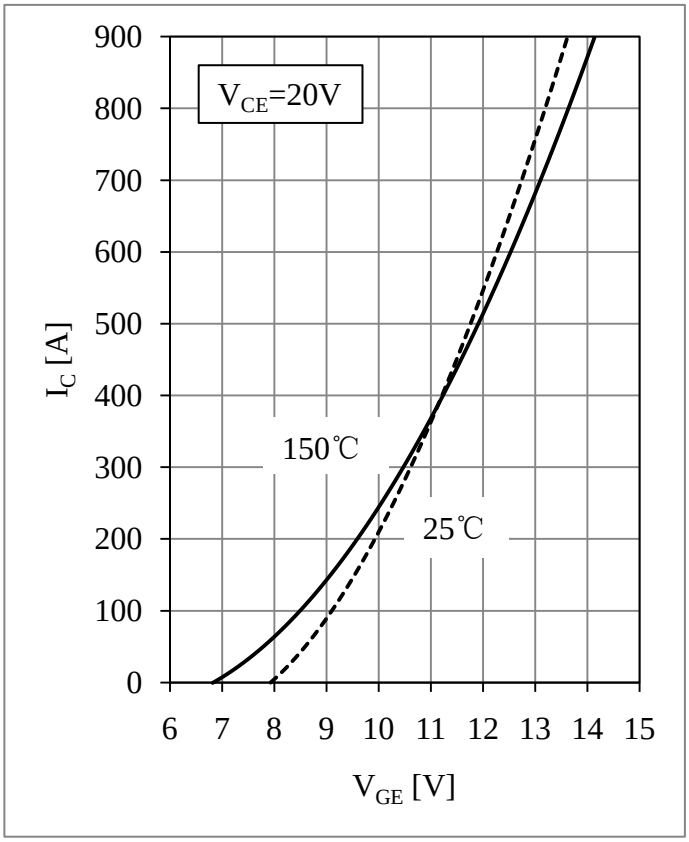


Fig 2. IGBT Transfer Characteristics

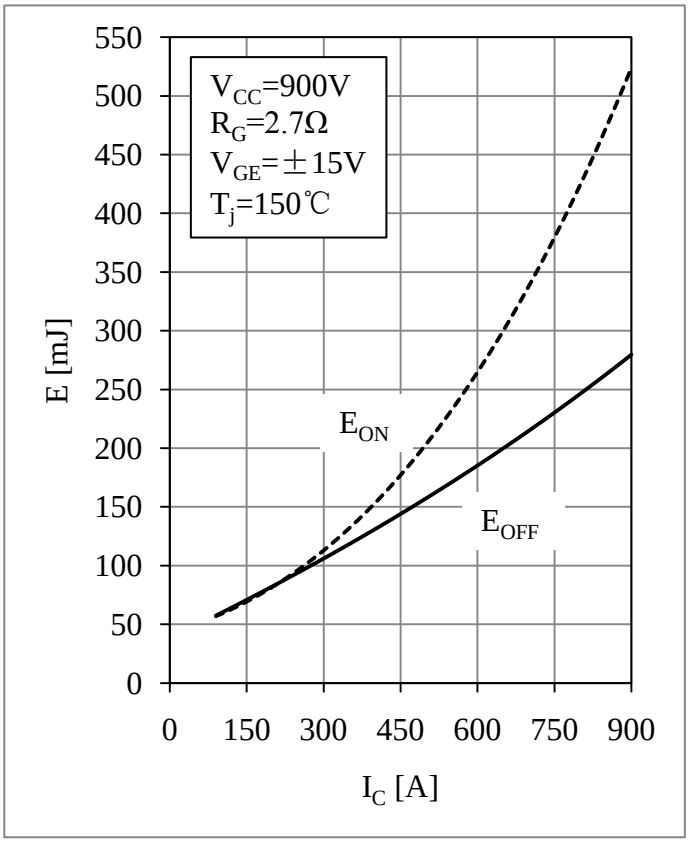


Fig 3. IGBT Switching Loss vs. I_C

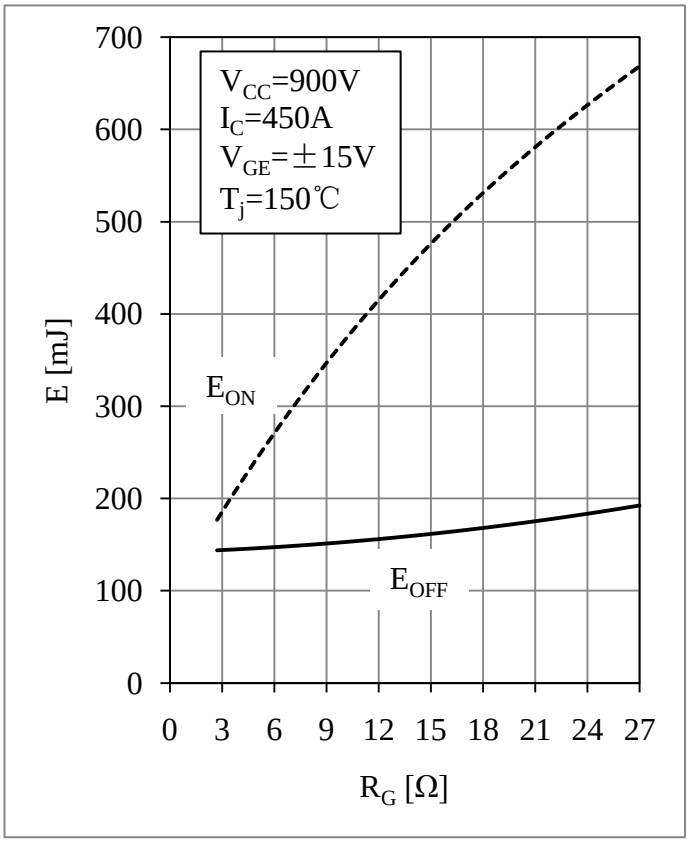


Fig 4. IGBT Switching Loss vs. R_G

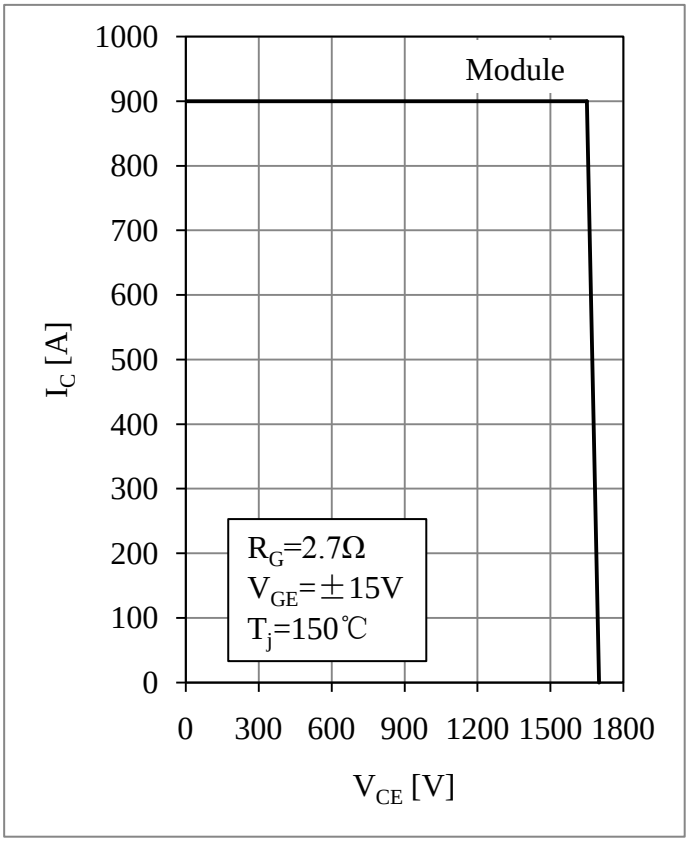


Fig 5. RBSOA

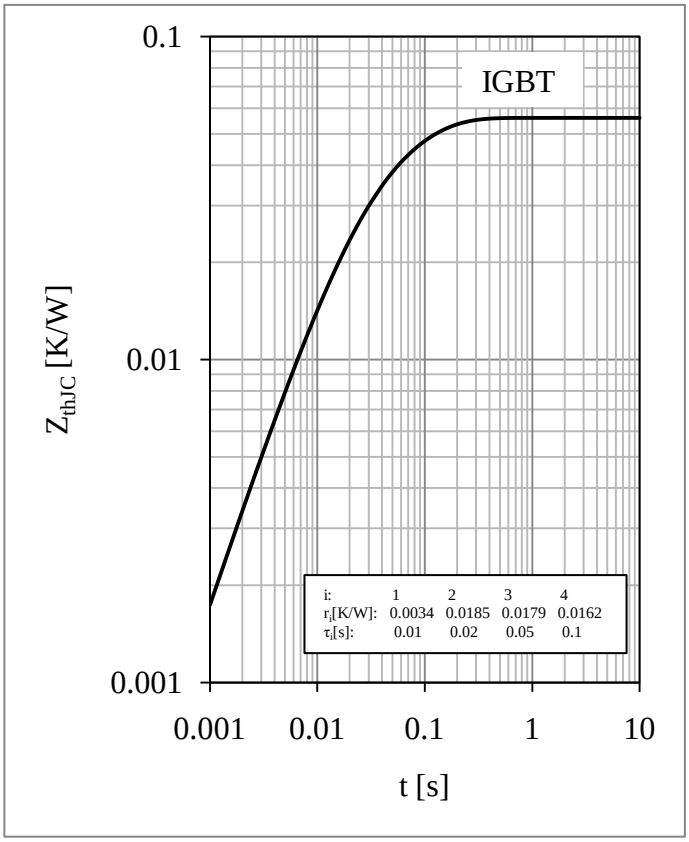


Fig 6. IGBT Transient Thermal Impedance

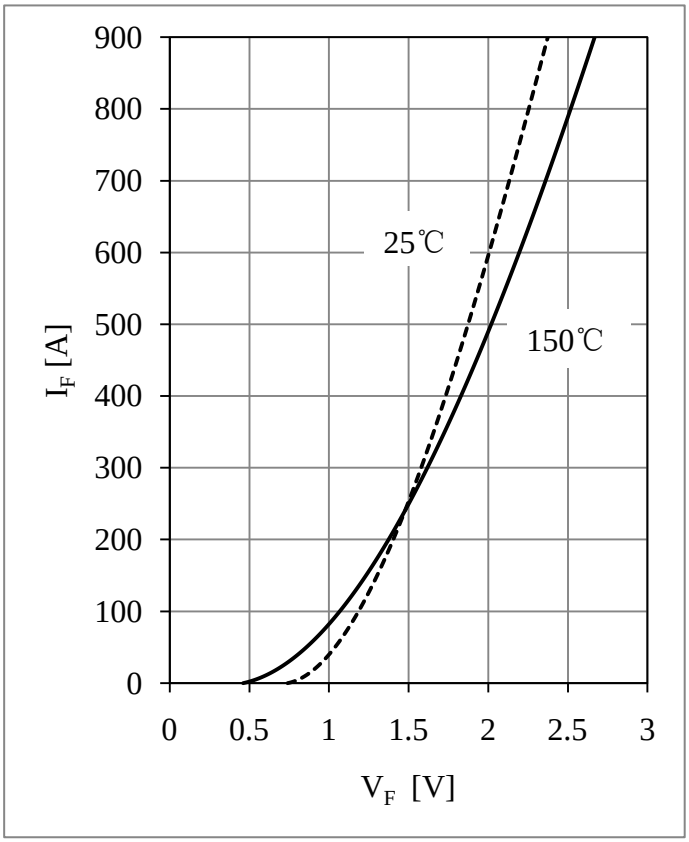


Fig 7. Diode Forward Characteristics

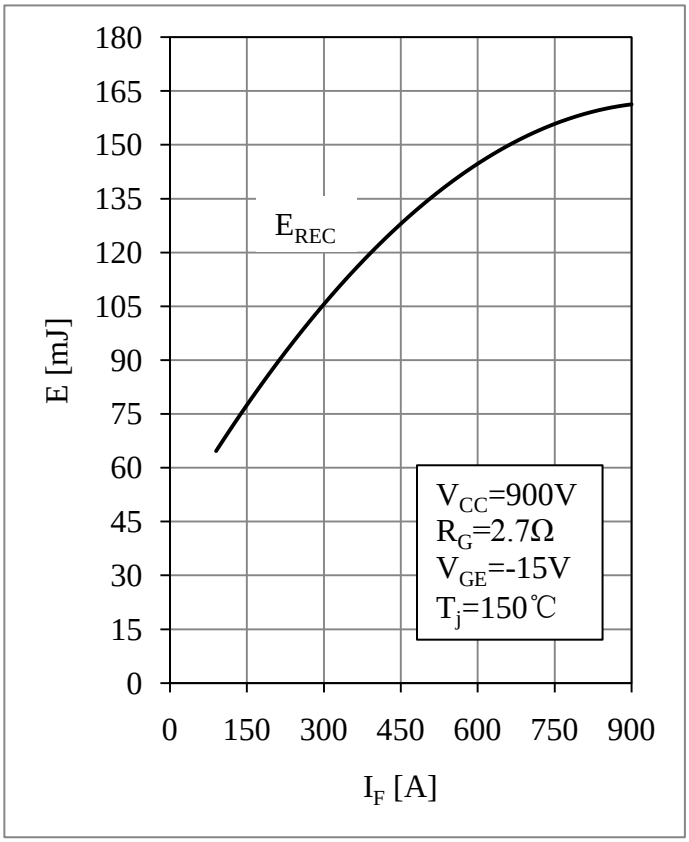


Fig 8. Diode Switching Loss vs. I_F

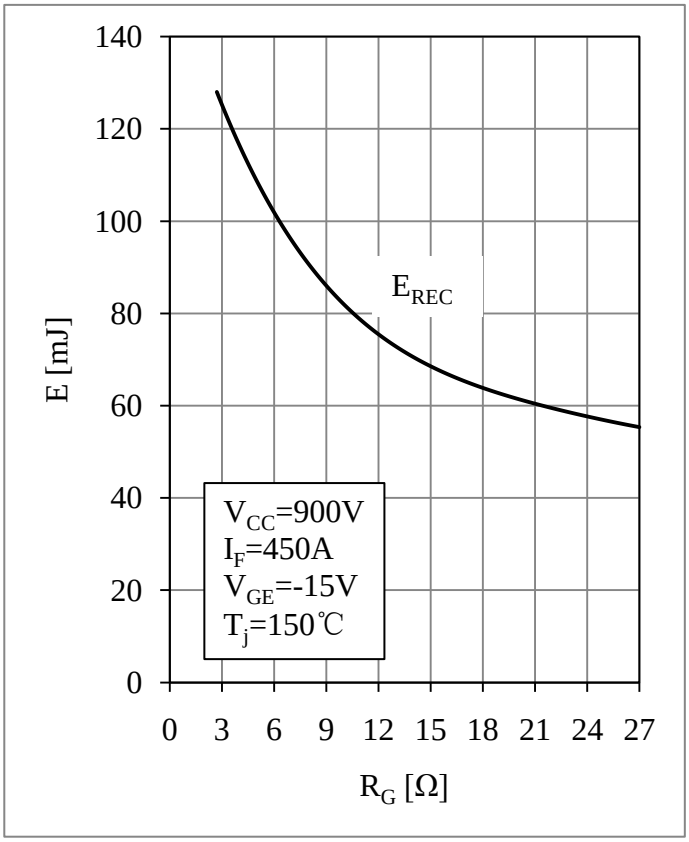


Fig 9. Diode Switching Loss vs. R_G

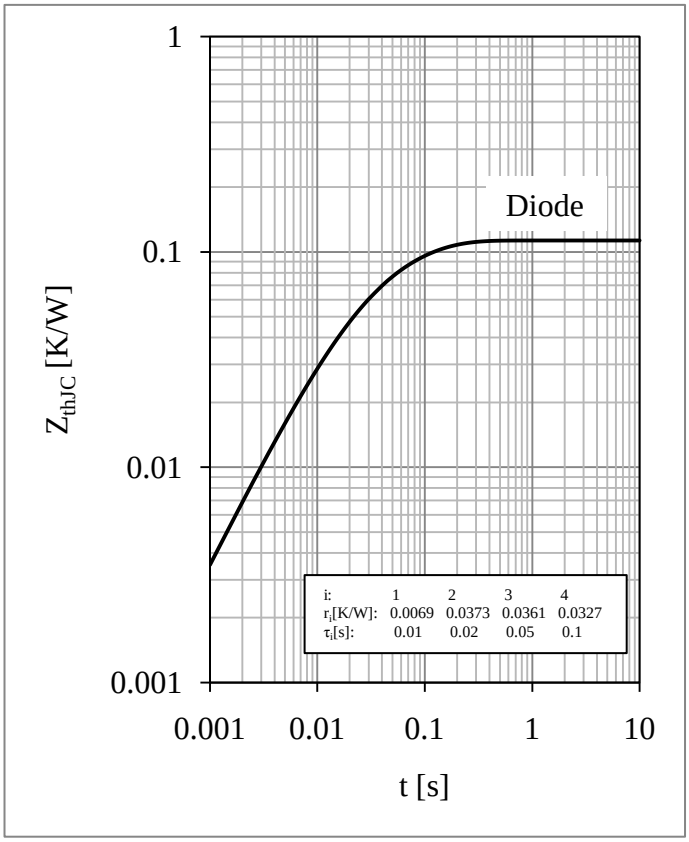


Fig 10. Diode Transient Thermal Impedance

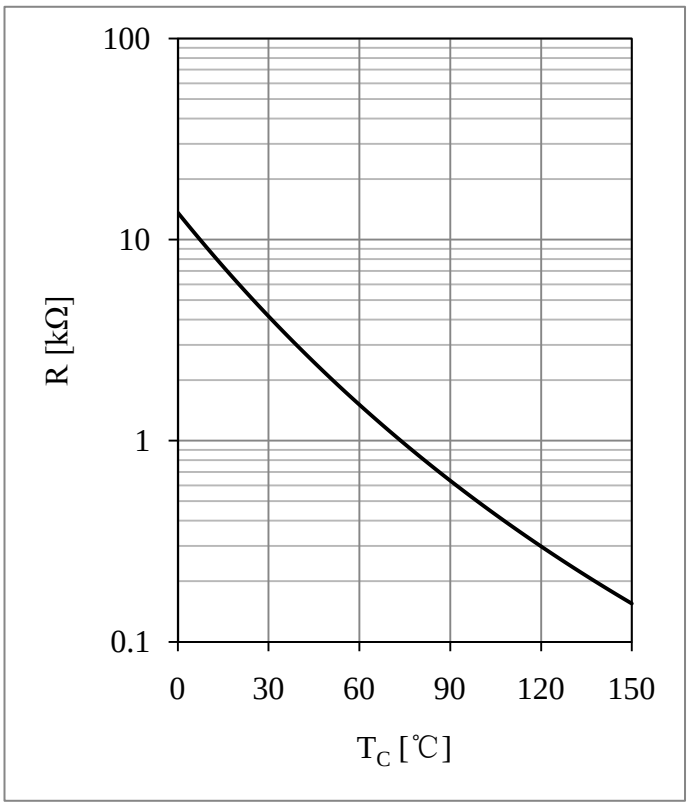
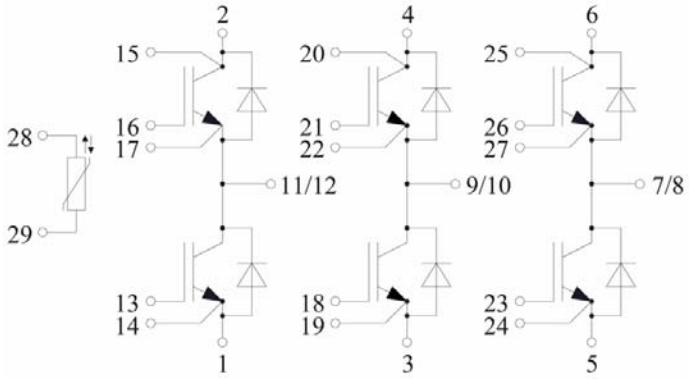


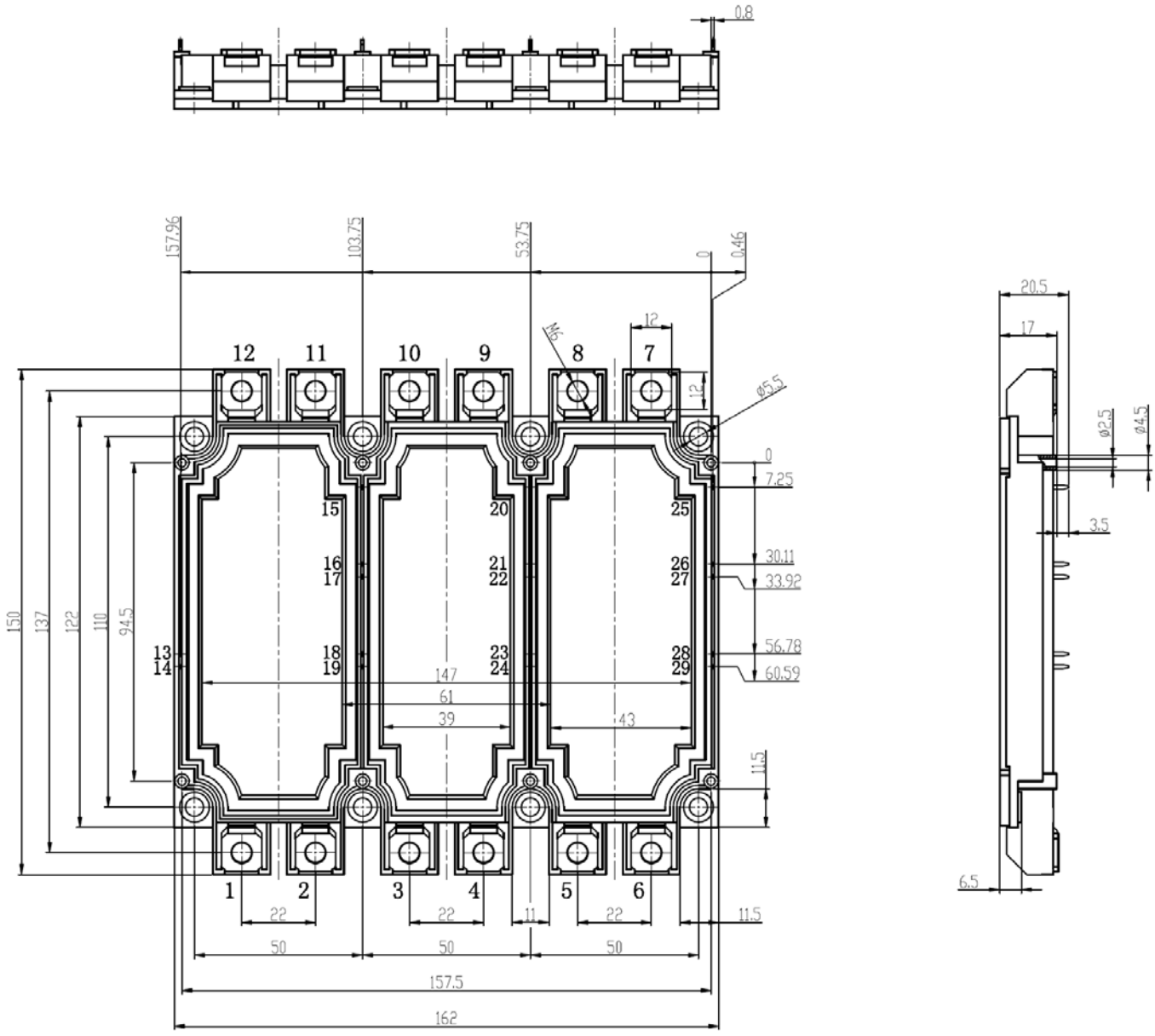
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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