

STARPOWER

SEMICONDUCTOR

IGBT

GD300HTL170C7S

1700V/300A 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.



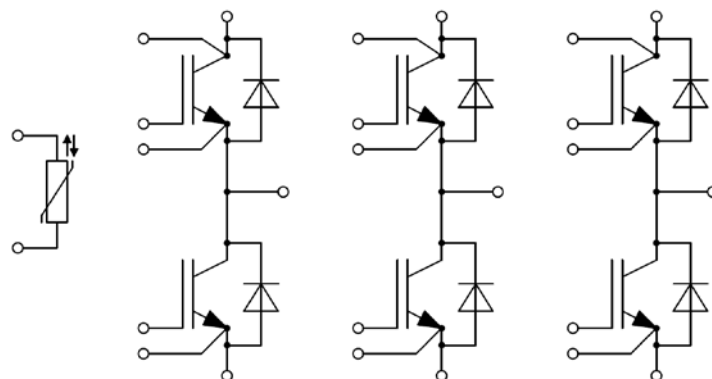
Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10 μ s 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

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

Equivalent Circuit Schematic



Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ 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 @ $T_C=25^{\circ}\text{C}$	490	A
	@ $T_C=100^{\circ}\text{C}$	300	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	600	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	2027	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	600	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	4000	V

IGBT Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.40	2.85	V
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.80		
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.90		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=12.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.4	6.2	7.4	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		20.3		nF
C_{res}	Reverse Transfer Capacitance				0.69	
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		2.31		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=300\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		200		ns
t_r	Rise Time			97		ns
$t_{d(off)}$	Turn-Off Delay Time			410		ns
t_f	Fall Time			370		ns
E_{on}	Turn-On Switching Loss			82.0		mJ
E_{off}	Turn-Off Switching Loss			60.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=300\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		250		ns
t_r	Rise Time			99		ns
$t_{d(off)}$	Turn-Off Delay Time			630		ns
t_f	Fall Time			580		ns
E_{on}	Turn-On Switching Loss			115		mJ
E_{off}	Turn-Off Switching Loss			90.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=300\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		260		ns
t_r	Rise Time			105		ns
$t_{d(off)}$	Turn-Off Delay Time			670		ns
t_f	Fall Time			640		ns
E_{on}	Turn-On Switching Loss			125		mJ
E_{off}	Turn-Off Switching Loss			100		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=1000\text{V}, V_{CEM} \leq 1700\text{V}$		1200		A

Diode Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.80	2.25	V
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.95		
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.90		
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=300\text{A},$ $-di/dt=2800\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		90.0		μC
I_{RM}	Peak Reverse Recovery Current			270		A
E_{rec}	Reverse Recovery Energy			45.0		mJ
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=300\text{A},$ $-di/dt=2800\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		135		μC
I_{RM}	Peak Reverse Recovery Current			315		A
E_{rec}	Reverse Recovery Energy			75.5		mJ
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=300\text{A},$ $-di/dt=2800\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		160		μC
I_{RM}	Peak Reverse Recovery Current			330		A
E_{rec}	Reverse Recovery Energy			84.0		mJ

NTC Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C=100^\circ\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

Module Characteristics $T_C=25^\circ\text{C}$ 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		$\text{m}\Omega$
$R_{\theta JC}$	Junction-to-Case (per IGBT)			0.074	K/W
	Junction-to-Case (per Diode)			0.121	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		0.048		K/W
	Case-to-Sink (per Diode)		0.079		
$R_{\theta CS}$	Case-to-Sink		0.005		K/W
M	Terminal Connection Torque, Screw M6	3.0		6.0	N.m
	Mounting Torque, Screw M6	3.0		6.0	
G	Weight of Module		910		g

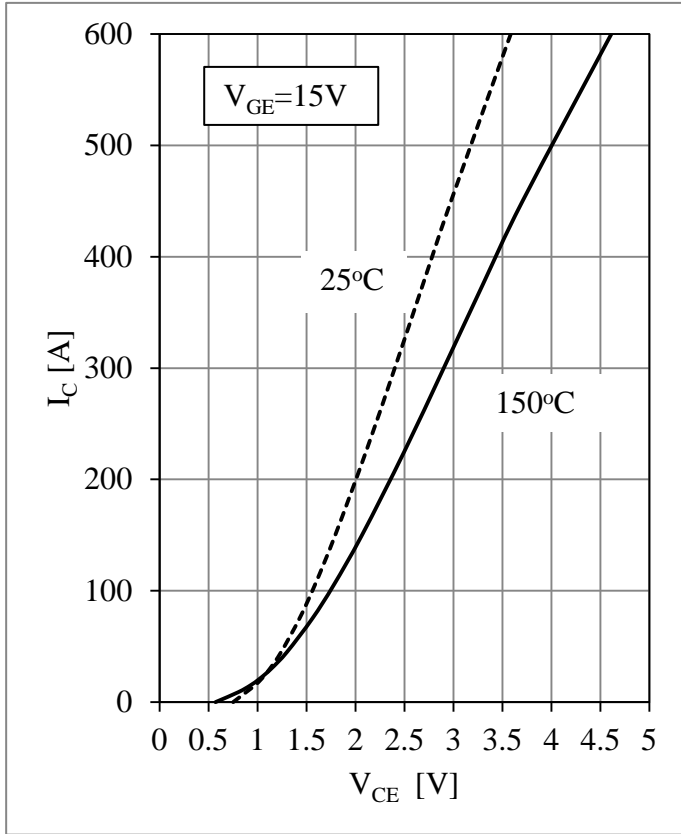


Fig 1. IGBT Output Characteristics

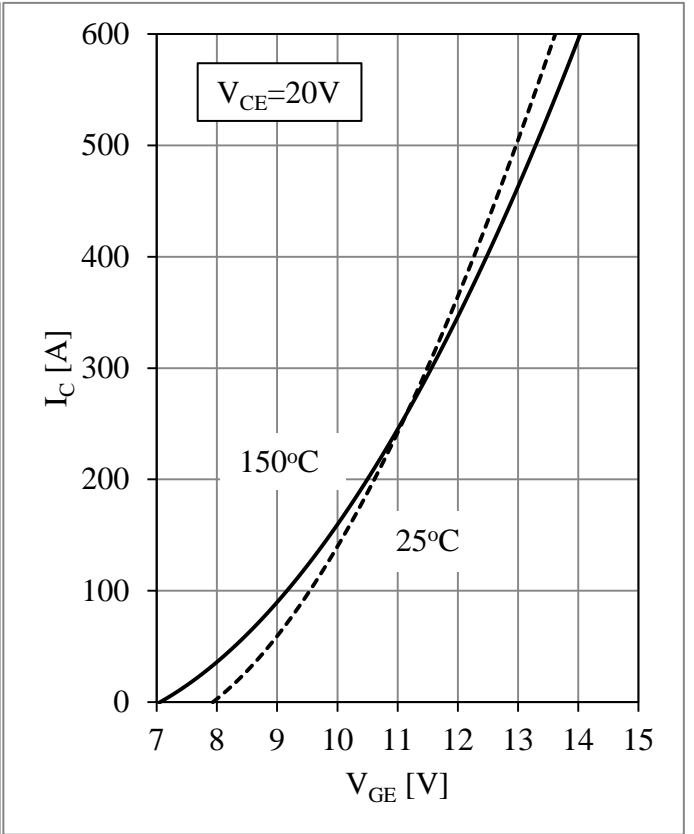


Fig 2. IGBT Transfer Characteristics

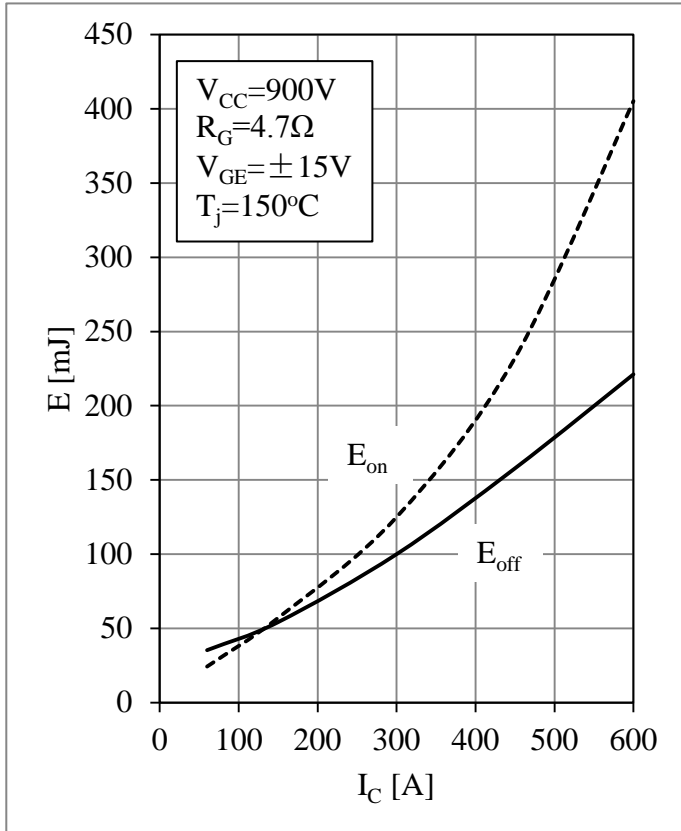


Fig 3. IGBT Switching Loss vs. I_C

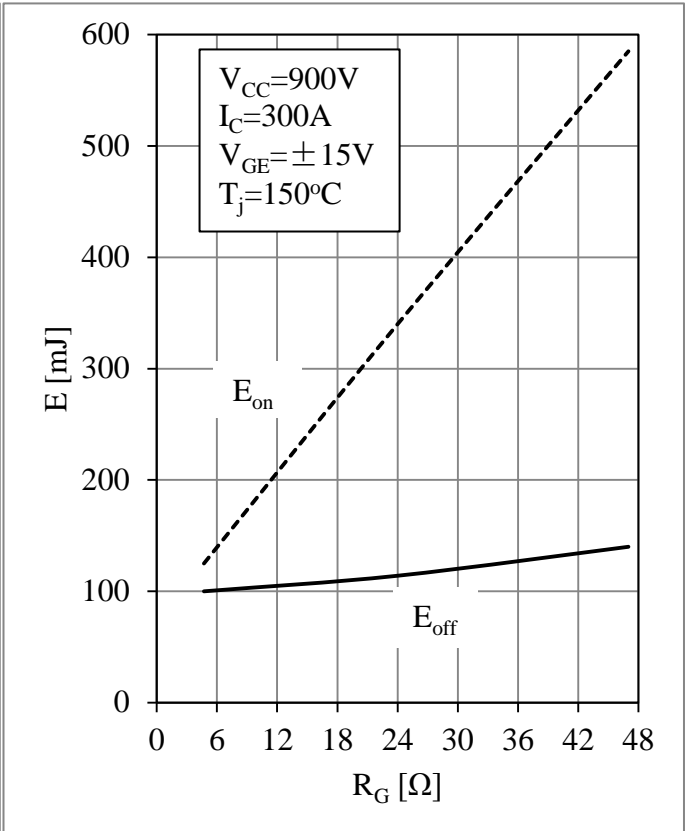


Fig 4. IGBT Switching Loss vs. R_G

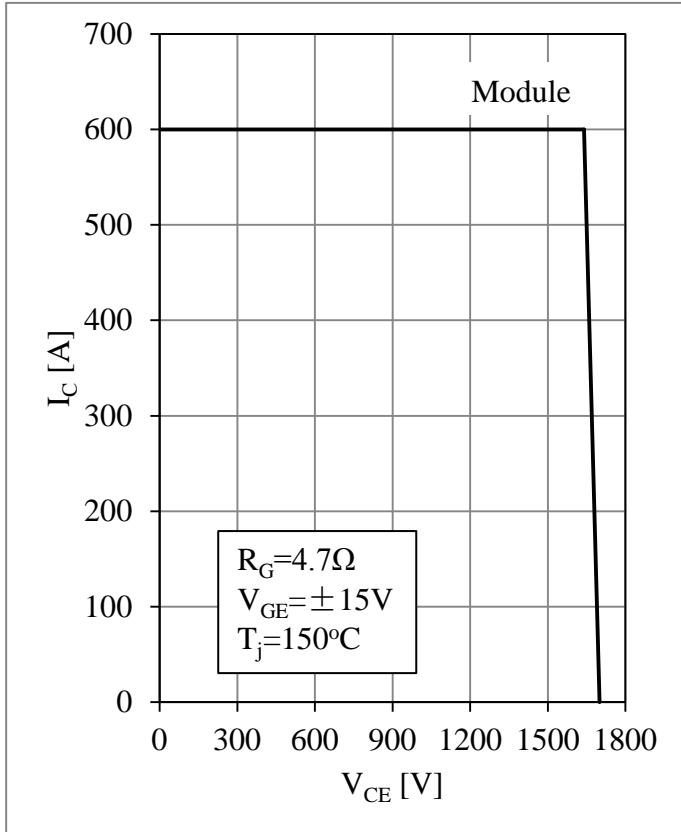


Fig 5. RBSOA

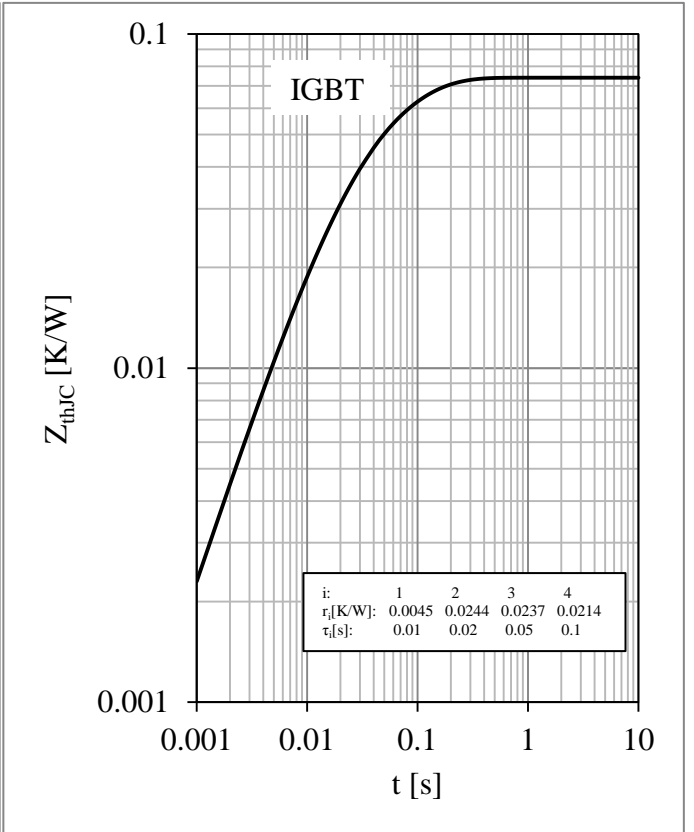


Fig 6. IGBT Transient Thermal Impedance

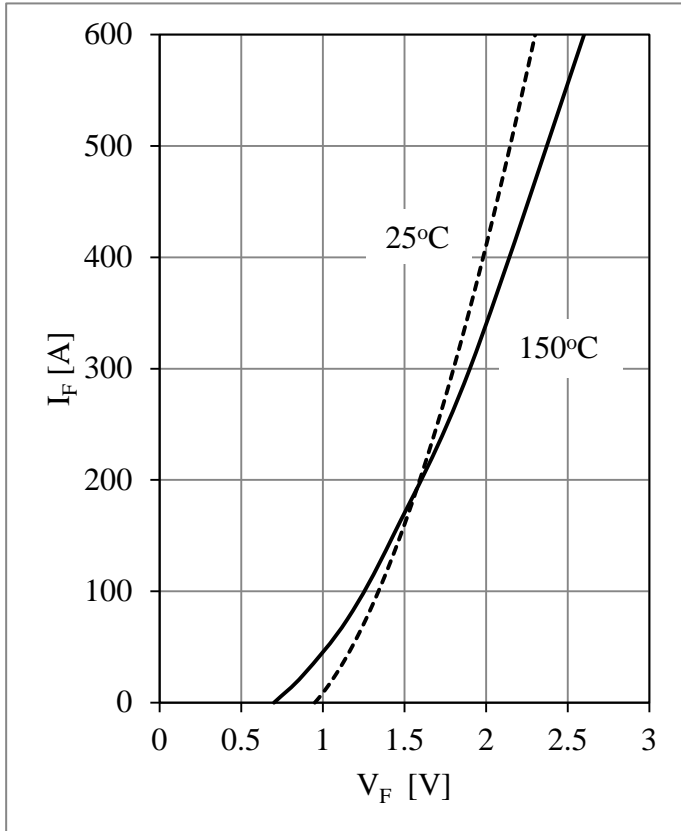


Fig 7. Diode Forward Characteristics

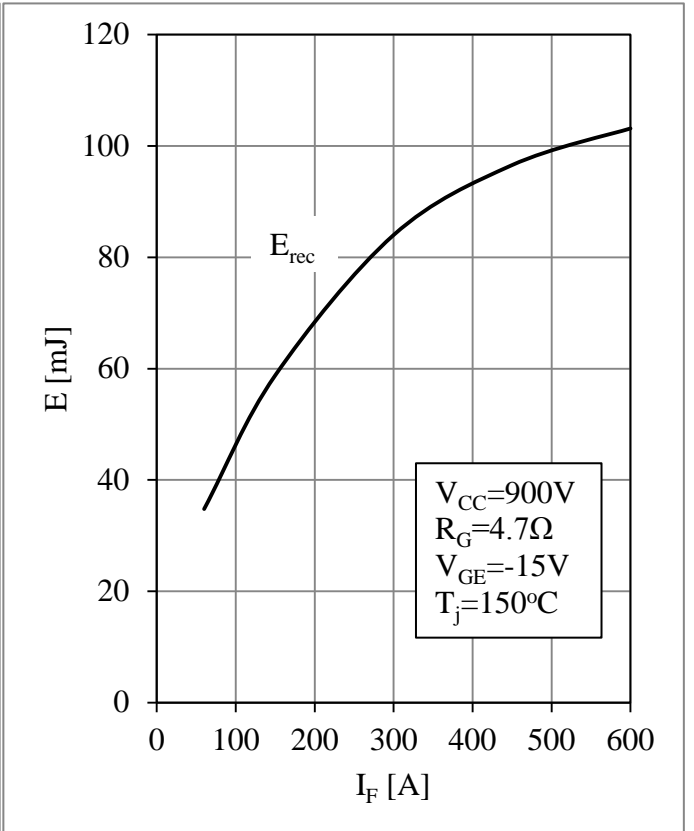


Fig 8. Diode Switching Loss vs. I_F

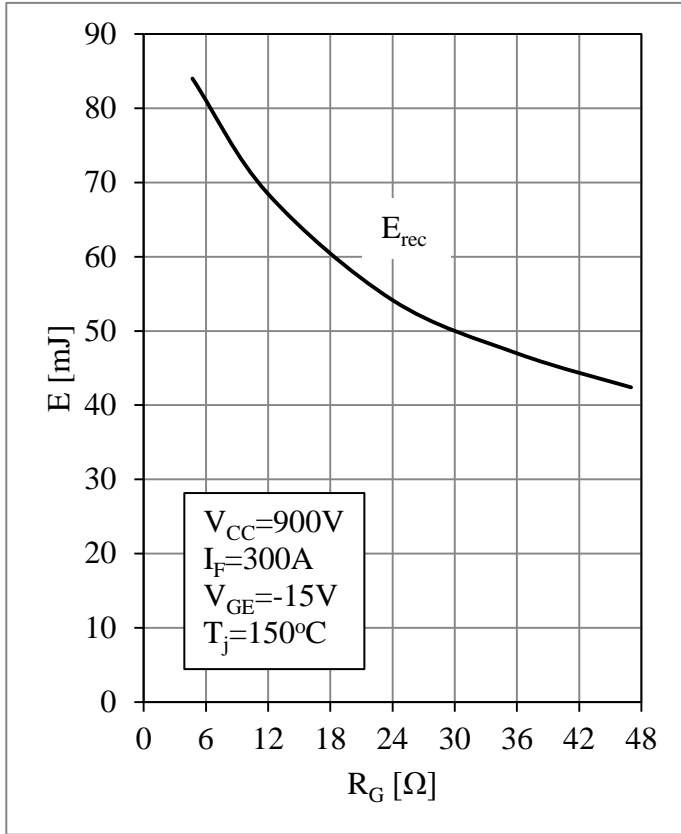


Fig 9. Diode Switching Loss vs. R_G

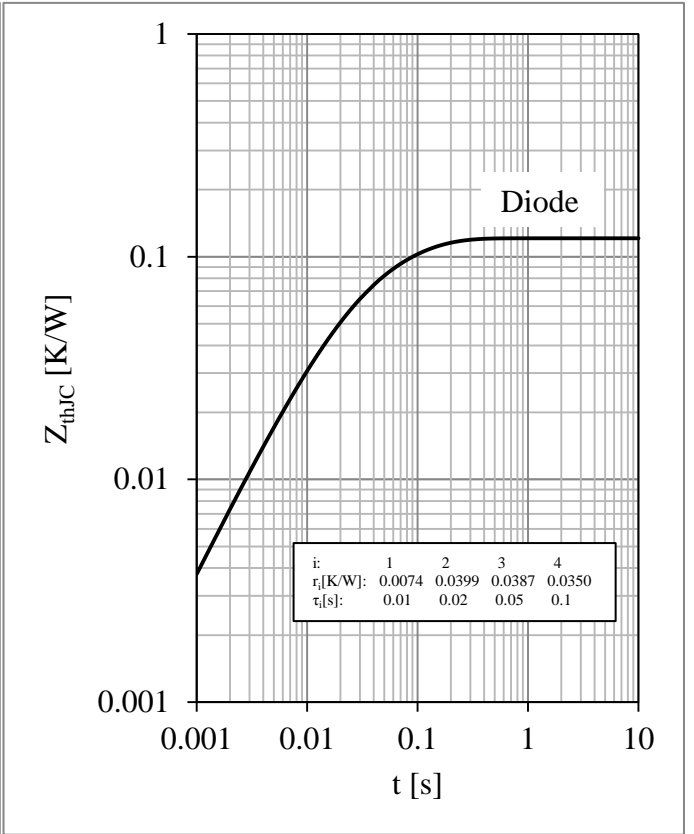


Fig 10. Diode Transient Thermal Impedance

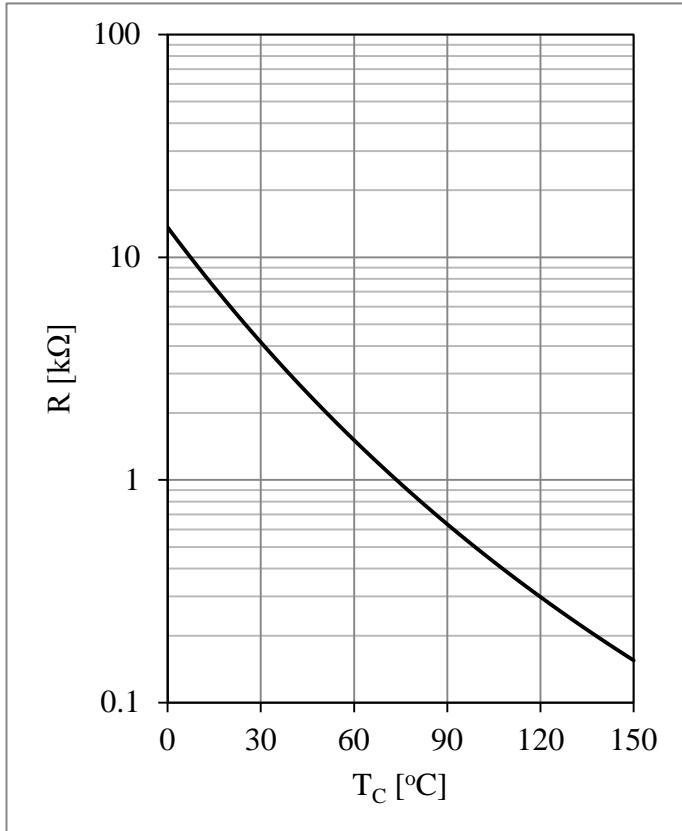
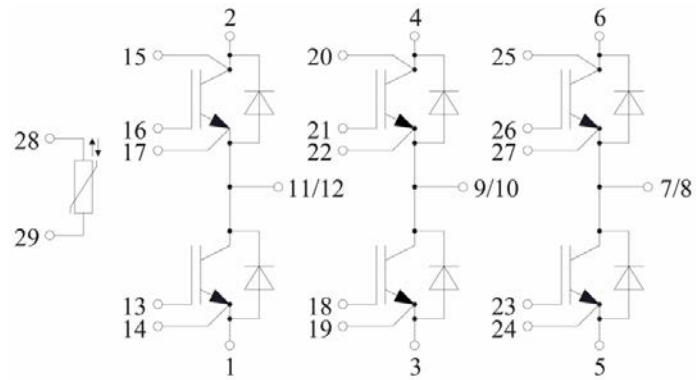


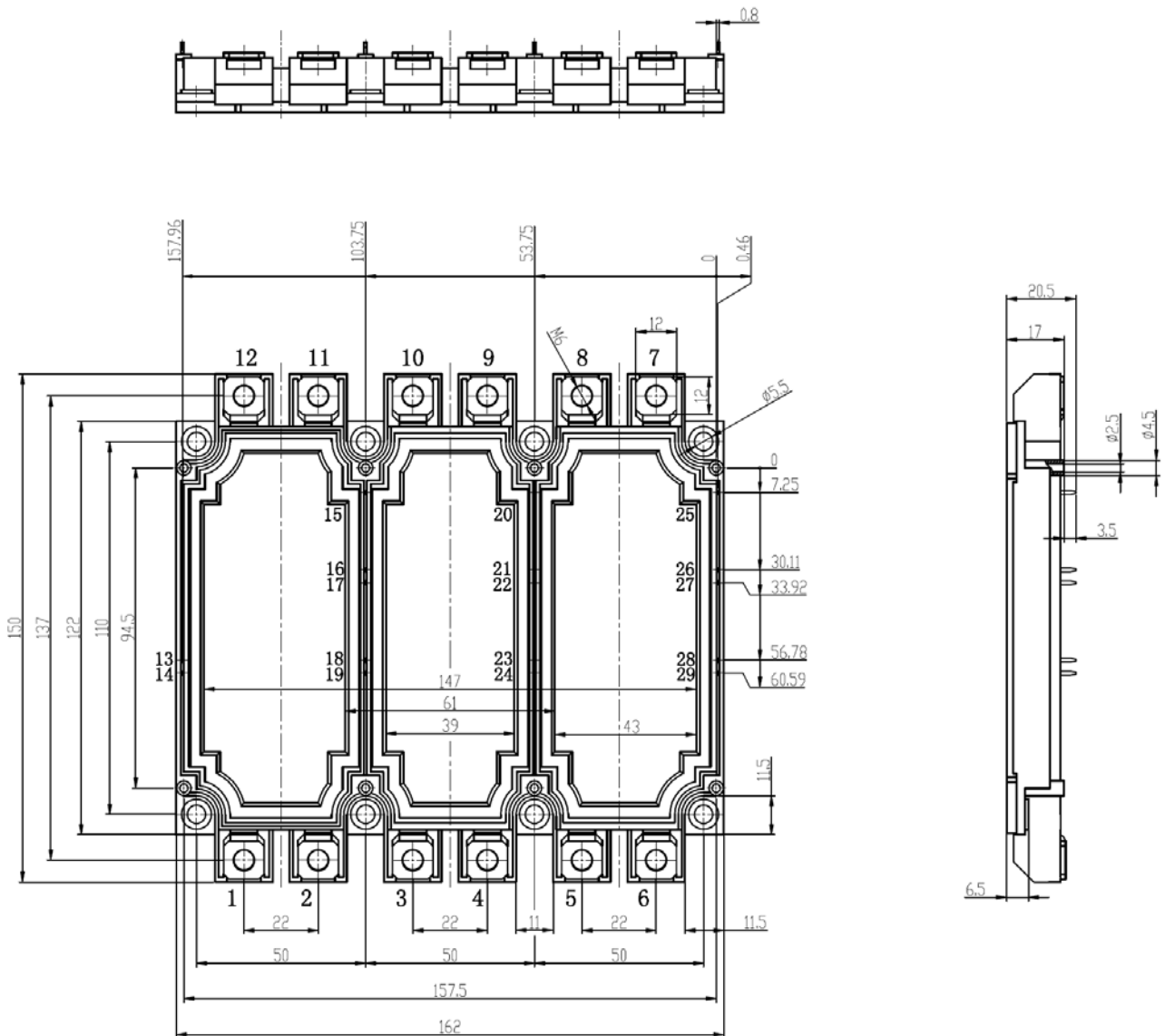
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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