

STARPOWER

SEMICONDUCTOR

IGBT

GD225HTT170C7S

Molding Type Module

1700V/225A 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
- Low switching losses
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- 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

IGBT-inverter $T_C=25^\circ\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD225HTT170C7S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^\circ\text{C}$	1700	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^\circ\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	400	A
	@ $T_C=80^\circ\text{C}$	225	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	450	A
P_{tot}	Total Power Dissipation @ $T_j=175^\circ\text{C}$	1648	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1700			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=9.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=225\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=225\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=225A,$ $R_G=6.2\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		280		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			810		ns
t_f	Fall Time			185		ns
E_{on}	Turn-On Switching Loss			49.3		mJ
E_{off}	Turn-Off Switching Loss			48.1		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=225A,$ $R_G=6.2\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		305		ns
t_r	Rise Time			75		ns
$t_{d(off)}$	Turn-Off Delay Time			995		ns
t_f	Fall Time			300		ns
E_{on}	Turn-On Switching Loss			71.5		mJ
E_{off}	Turn-Off Switching Loss			70.6		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1Mhz,$ $V_{GE}=0V$		19.9		nF
C_{oes}	Output Capacitance			0.83		nF
C_{res}	Reverse Transfer Capacitance			0.66		nF
Q_G	Gate Charge	$V_{CC}=900V, I_C=225A,$ $V_{GE}=-15 \dots +15V$		2.60		μC
R_{Gint}	Internal Gate Resister			2.8		Ω
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM} \leq 1700V$		900		A

Diode-inverter $T_C=25^\circ C$ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD225HTT170C7S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ C$	1700	V
I_F	DC Forward Current @ $T_C=80^\circ C$	225	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	450	A

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=225A,$ $V_{GE}=0V$	$T_j=25^\circ C$	1.80	2.25	V
			$T_j=125^\circ C$	1.90		
Q_r	Recovered Charge	$I_F=225A,$ $V_R=900V,$ $R_G=6.2\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	59		μC
			$T_j=125^\circ C$	98		
I_{RM}	Peak Reverse Recovery Current	$V_R=900V,$ $R_G=6.2\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	260		A
			$T_j=125^\circ C$	286		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	29.5		mJ
			$T_j=125^\circ C$	54.1		

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

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

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	4000			V
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip @ $T_C=25^\circ\text{C}$		1.10		$m\Omega$
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter)			0.091 0.160	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.005		K/W
T_{jmax}	Maximum Junction Temperature			175	$^\circ\text{C}$
T_{jop}	Operating Junction Temperature	-40		150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-40		125	$^\circ\text{C}$
Mounting Torque	Power Terminal Screw:M6 Mounting Screw:M5	3.0 3.0		6.0 6.0	N.m
G	Weight of Module		910		g

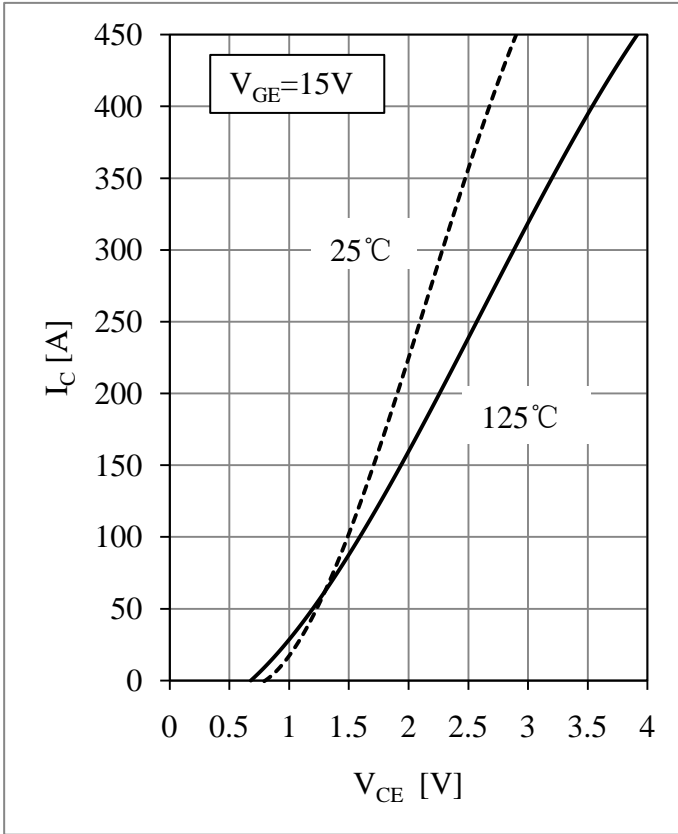


Fig 1. IGBT-inverter Output Characteristic

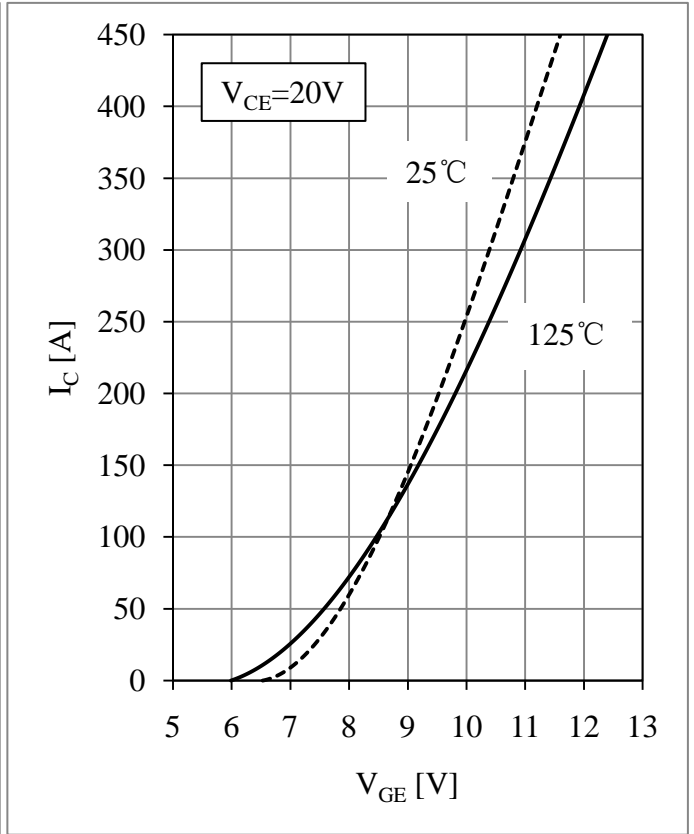


Fig 2. IGBT-inverter Transfer Characteristic

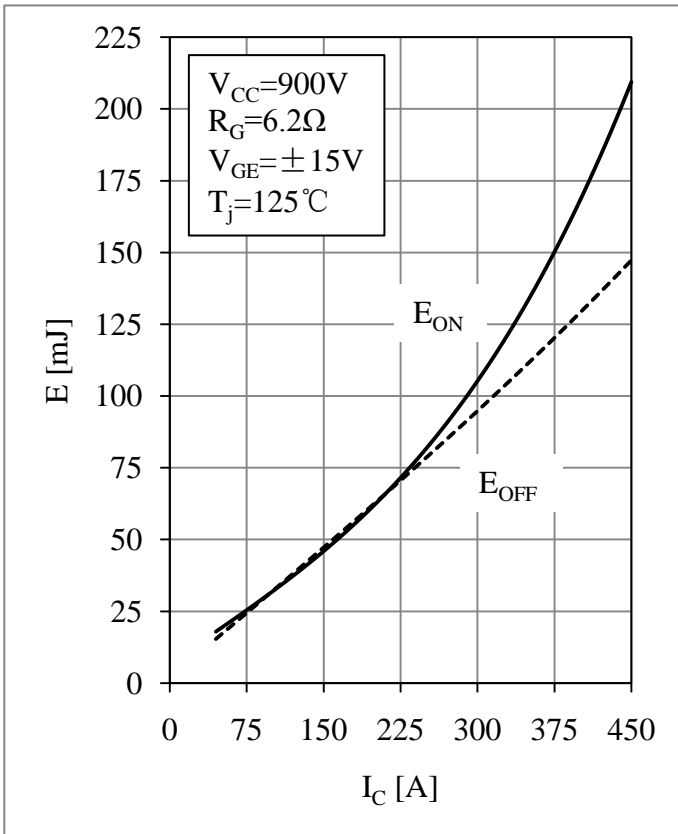


Fig 3. IGBT-inverter Switching Loss vs. I_C

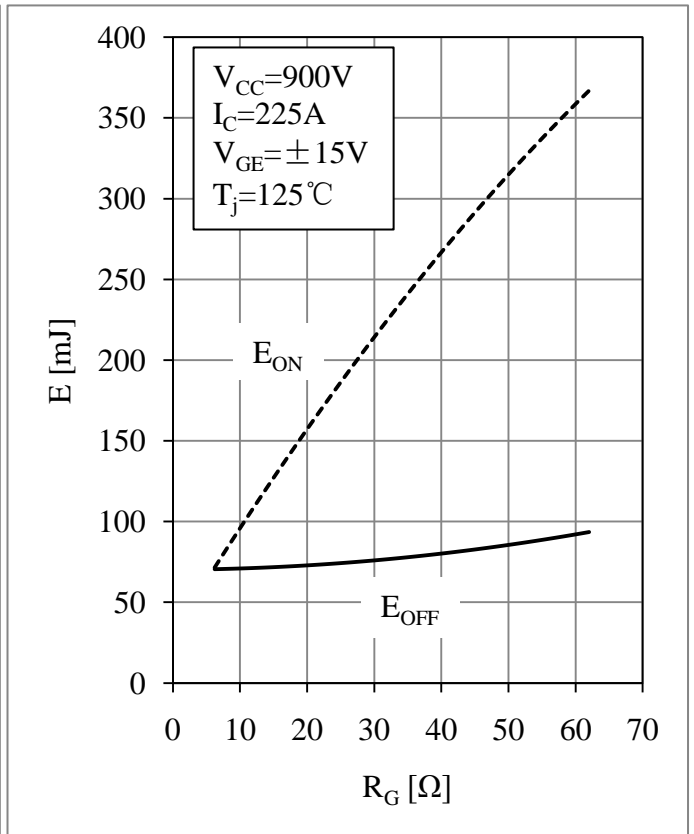


Fig 4. IGBT-inverter Switching Loss vs. R_G

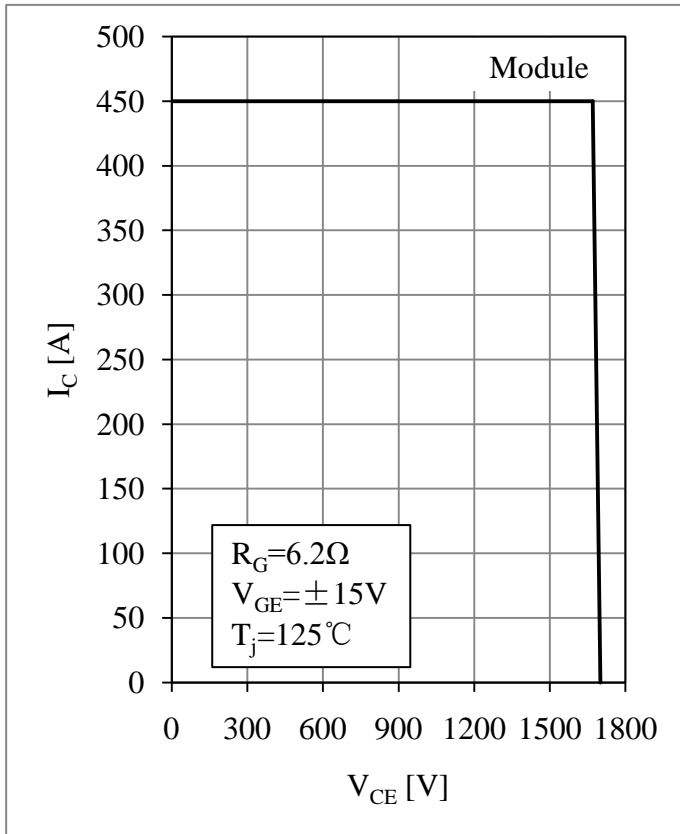


Fig 5. IGBT-inverter RBSOA

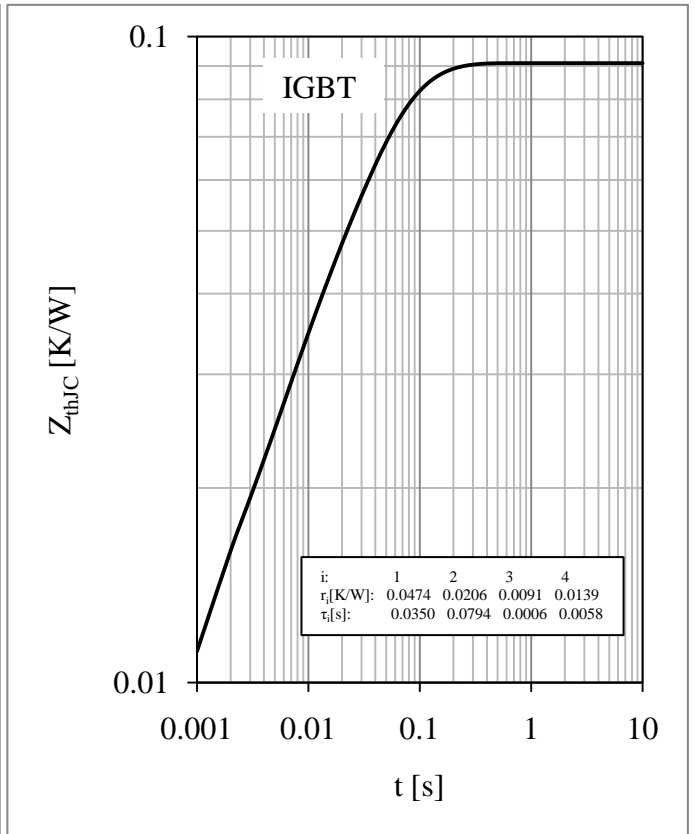


Fig 6. IGBT-inverter Transient Thermal Impedance

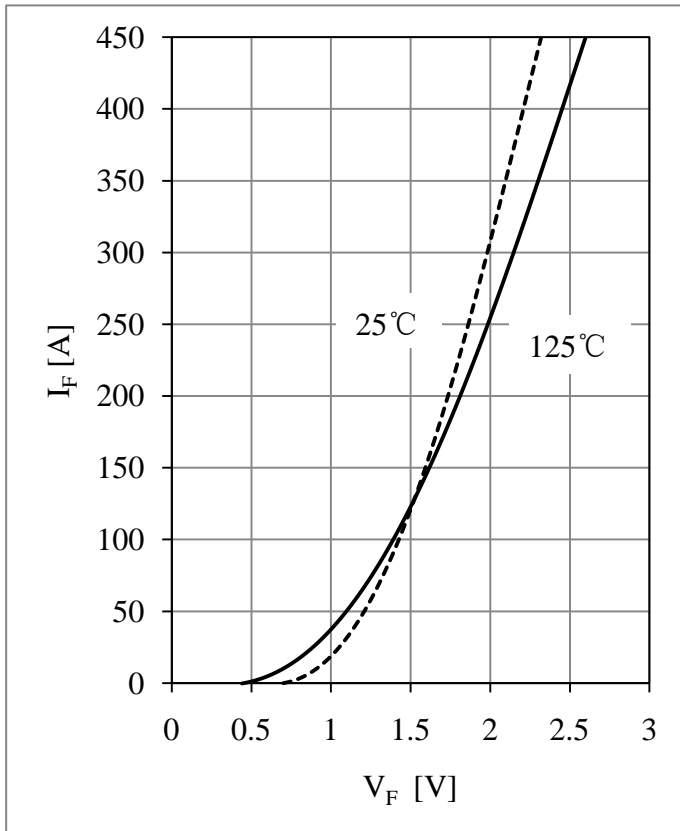


Fig 7. Diode-inverter Forward Characteristic

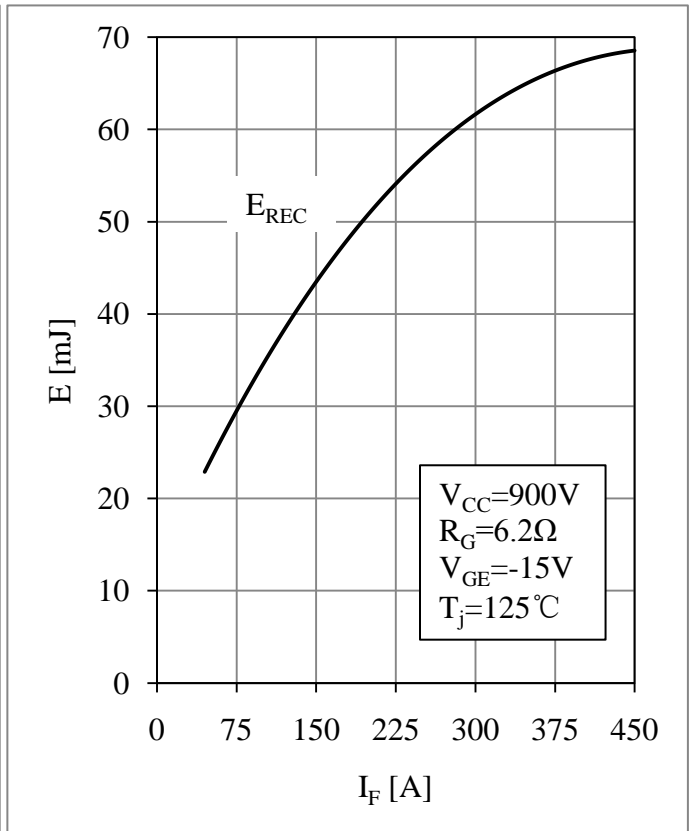


Fig 8. Diode-inverter Switching Loss vs. I_F

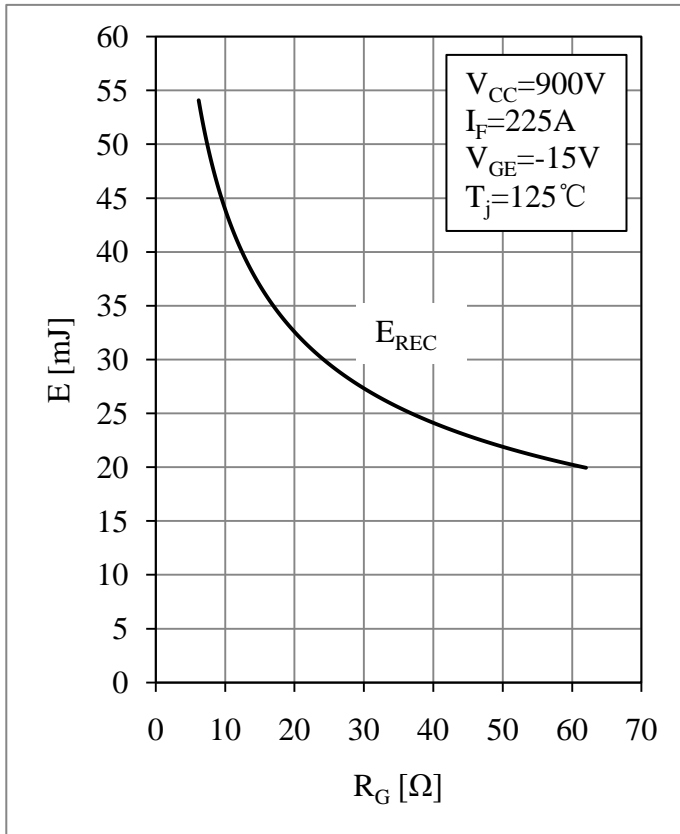


Fig 9. Diode-inverter Switching Loss vs. R_G

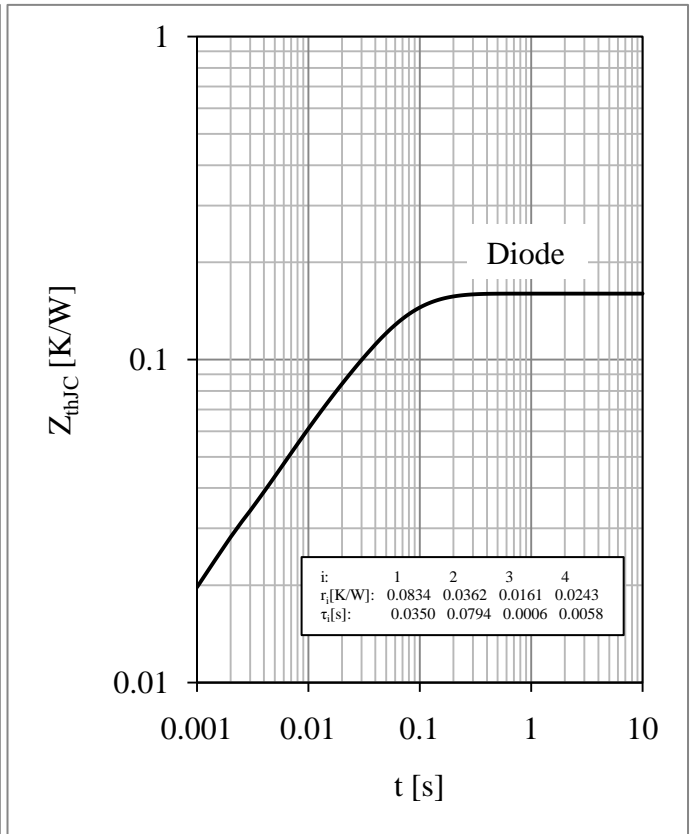


Fig 10. Diode-inverter Transient Thermal Impedance

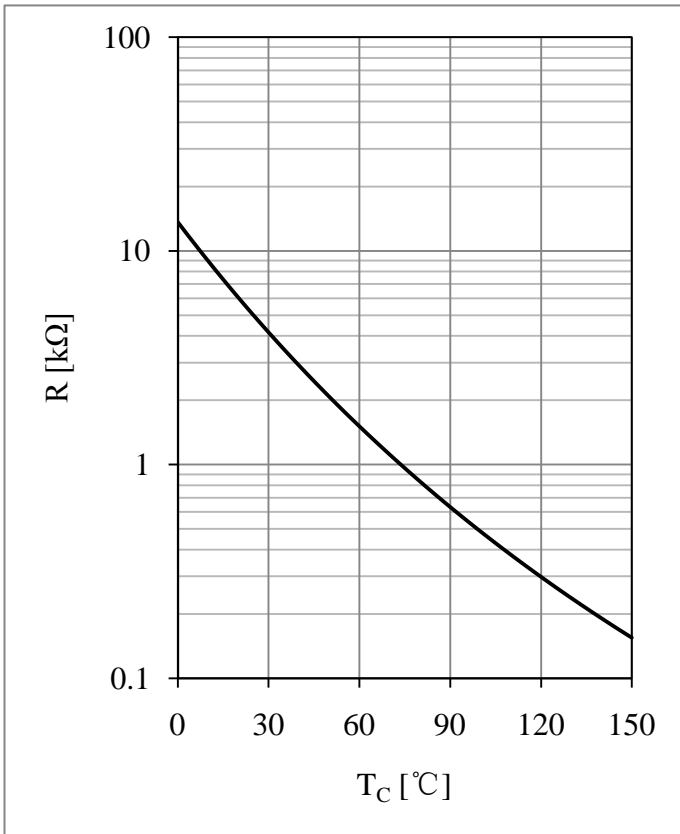
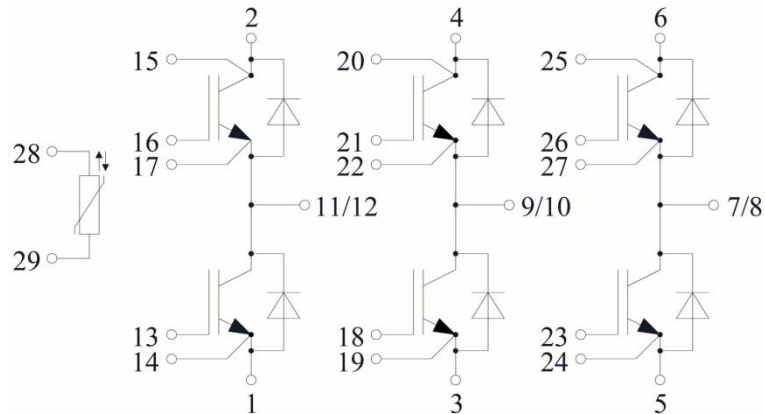


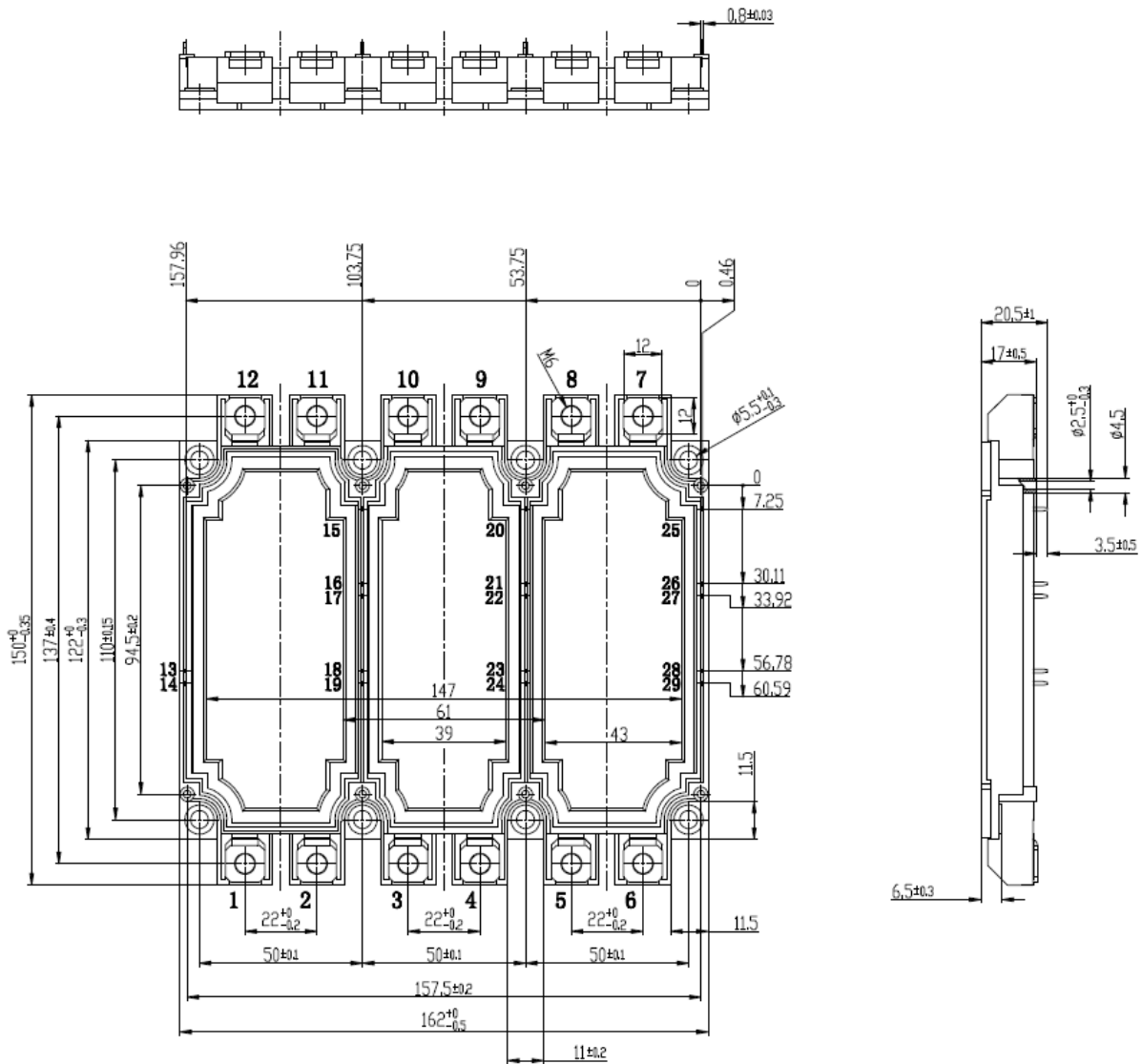
Fig 11. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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