STARPOWER

SEMICONDUCTOR **IGBT**

GD800HTT65P4S

Molding Type Module

650V/800A 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 hybrid and electric vehicles.

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching losses
- 6μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper pinfin baseplate using DBC technology

Typical Applications

- Hybrid and electric vehicles
- Inverter for motor drive
- Uninterruptible power supply

IGBT-inverter T_F=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD800HTT65P4S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	650	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_{CN}	Implemented Collector Current	800	A
I_C	Collector Current @ T_F=25℃ @ T_F=75℃	700 550	A
I_{CM}	Pulsed Collector Current t_p=1ms	1600	A
P_{tot}	Total Power Dissipation @ T_j=175℃	1500	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	650			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			600	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.2mA,V_{CE}=V_{GE}, T_j=25℃	5.1	5.6	6.4	V
$V_{CE(sat)}$ (chip)	Collector to Emitter Saturation Voltage	I_C=550A,V_{GE}=15V, T_j=25℃		1.30	1.60	V
		I_C=550A,V_{GE}=15V, T_j=150℃		1.40		
$V_{CE(sat)}$ (terminal)	Collector to Emitter Saturation Voltage	I_C=800A,V_{GE}=15V, T_j=25℃		1.62	1.90	V

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=550A, R_{Gon}=1.8Ω,R_{Goff}=0.75Ω, V_{GE}=±15V,T_j=25℃		122		ns
t_r	Rise Time			89		ns
$t_{d(off)}$	Turn-Off Delay Time			545		ns
t_f	Fall Time			69		ns
E_{on}	Turn-On Switching Loss			8.95		mJ
E_{off}	Turn-Off Switching Loss			20.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=550A, R_{Gon}=1.8Ω,R_{Goff}=0.75Ω, V_{GE}=±15V,T_j=150℃		132		ns
t_r	Rise Time			100		ns
$t_{d(off)}$	Turn-Off Delay Time			582		ns
t_f	Fall Time			111		ns
E_{on}	Turn-On Switching Loss			11.4		mJ
E_{off}	Turn-Off Switching Loss			25.6		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		49.3		nF
C_{res}	Reverse Transfer Capacitance			1.46		nF
Q_G	Gate Charge	V_{CC}=400V,I_C=800A, V_{GE}=-15---+15V		8.60		μC
R_{Gint}	Internal Gate Resister			0.5		Ω
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150℃,V_{CC}=360V, V_{CEM}≤650V		4000		A

Diode-inverter T_F=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD800HTT65P4S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	650	V
I_{FN}	Implemented Forward Current	800	A
I_F	DC Forward Current	550	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	1600	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F (chip)	Diode Forward Voltage	I_F=550A, V_{GE}=0V	T_j=25℃		1.40	1.75	V
			T_j=150℃		1.30		
V_F (terminal)	Diode Forward Voltage	I_F=800A, V_{GE}=0V	T_j=25℃		1.87	2.20	V
Q_r	Recovered Charge	I_F=550A, V_R=300V, R_G=1.8Ω, V_{GE}=-15V	T_j=25℃		22.8		μC
			T_j=150℃		52.5		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		308		A
			T_j=150℃		442		
E_{rec}	Reverse Recovery Energy		T_j=25℃		6.52		mJ
			T_j=150℃		14.4		

Electrical Characteristics of NTC 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}	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

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000			V
Δp	Pressure Drop Cooling Circuit $\Delta V/\Delta t=10.0dm^3/min$;$T_F$=25℃;Cooling Fluid=50% Water/50% Ethylene Glycol		100		mbar
p	Maximum Pressure In Cooling Circuit			2.5	bar
L_{CE}	Stray Inductance		14		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip @ T_F=25℃		0.80		mΩ
$R_{\theta JF}$	Junction-to-Cooling Fluid (per IGBT) Junction-to-Cooling Fluid (per Diode)			0.100 0.130	K/W
T_{jmax}	Maximum Junction Temperature			175	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{stg}	Storage Temperature Range	-40		125	℃
Mounting Torque	Power Terminal Screw:M6 Mounting Screw:M6	3.0 2.5		6.0 5.0	N.m
G	Weight of Module		1250		g

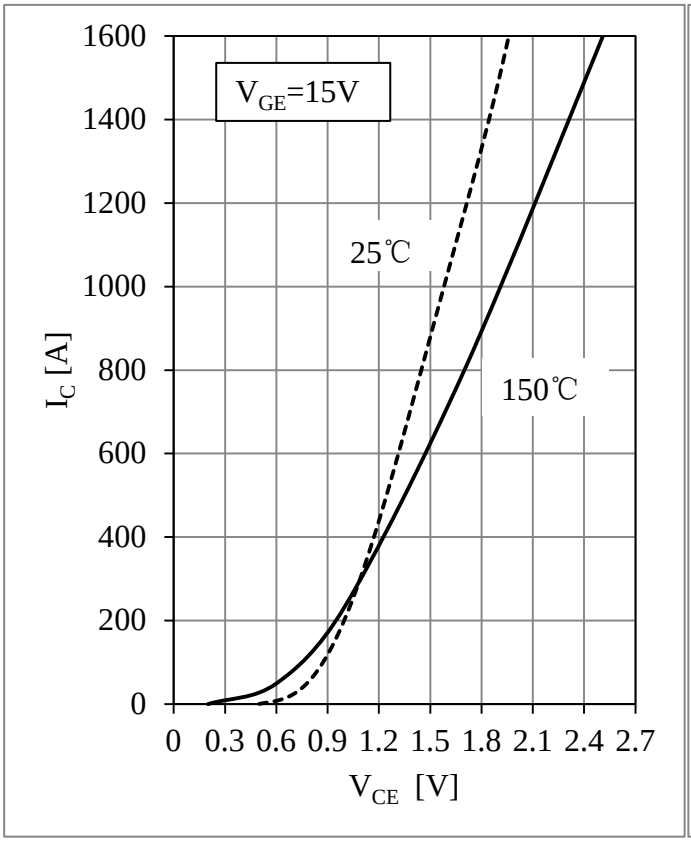


Fig 1. IGBT-inverter Output Characteristics

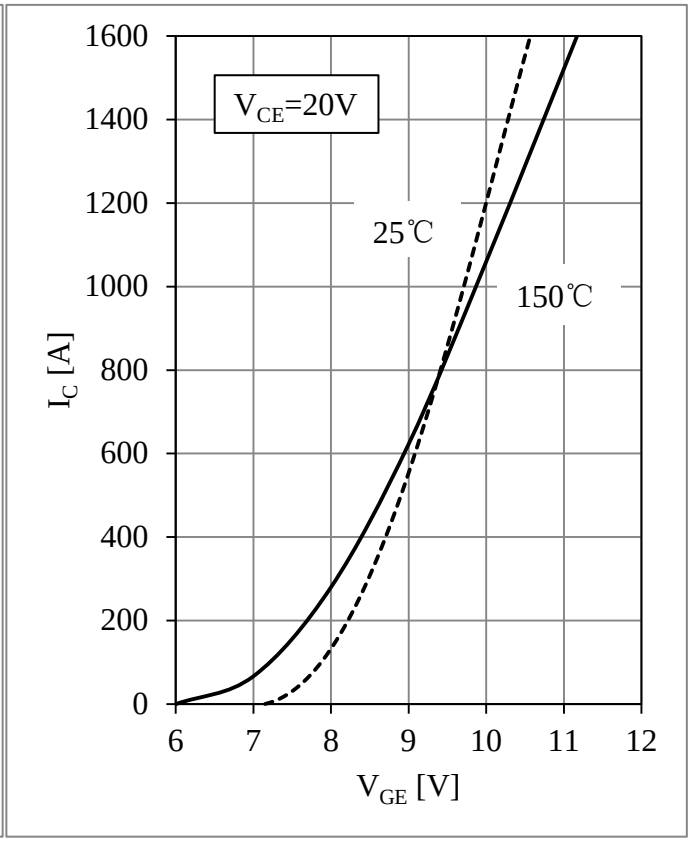


Fig 2. IGBT-inverter Transfer Characteristics

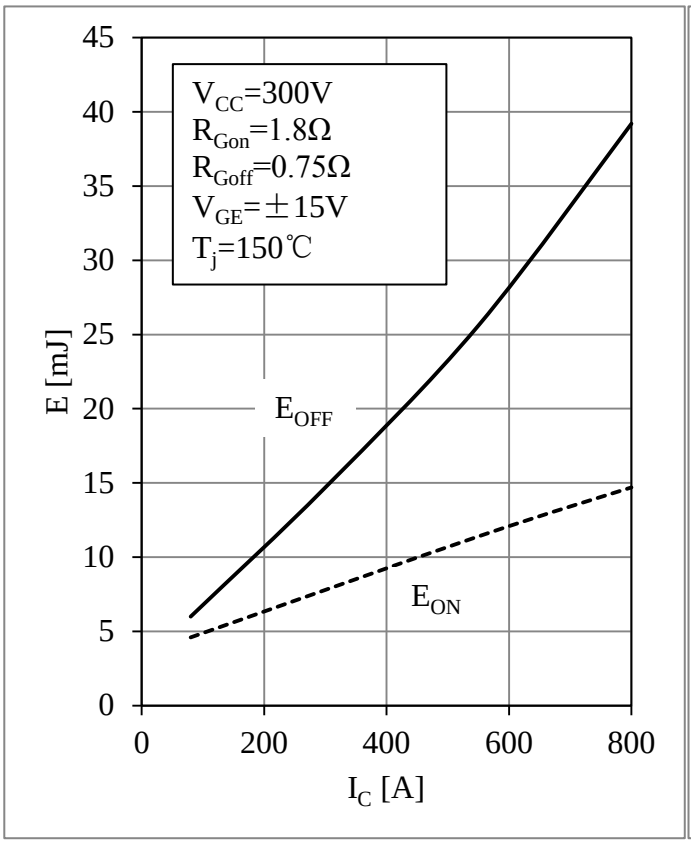


Fig 3. IGBT-inverter Switching Loss vs. I_C

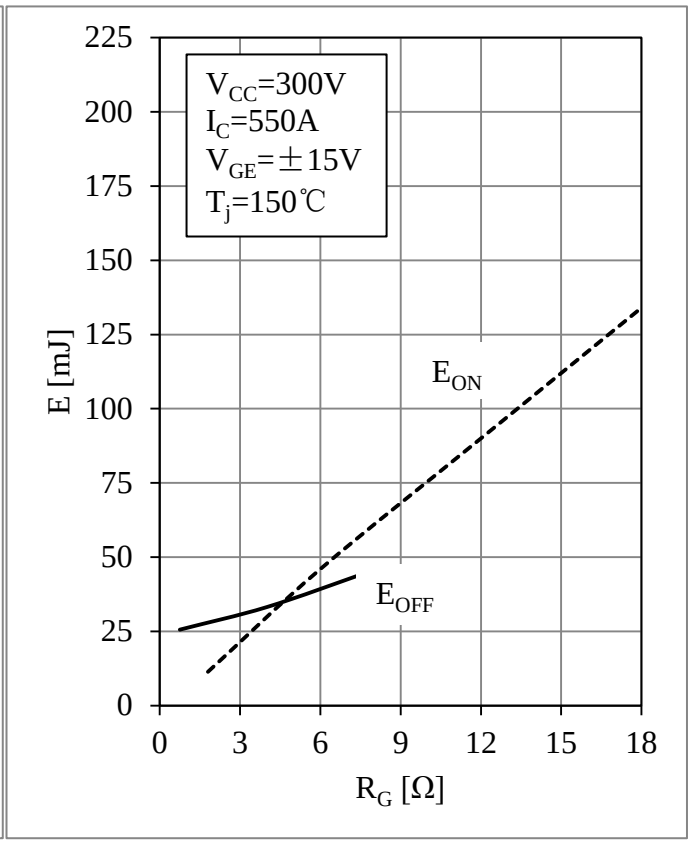


Fig 4. IGBT-inverter Switching Loss vs. R_G

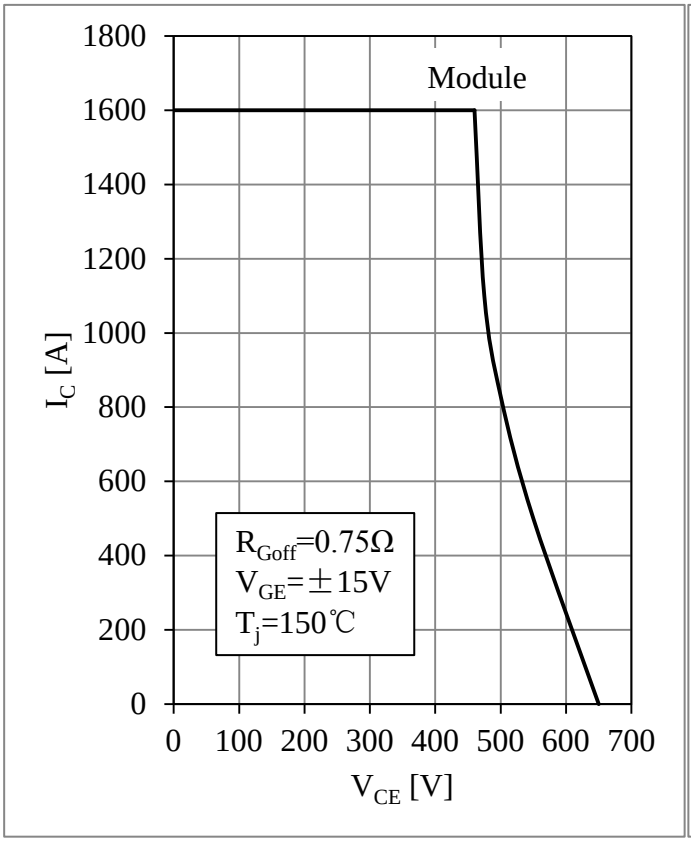


Fig 5. IGBT-inverter RBSOA

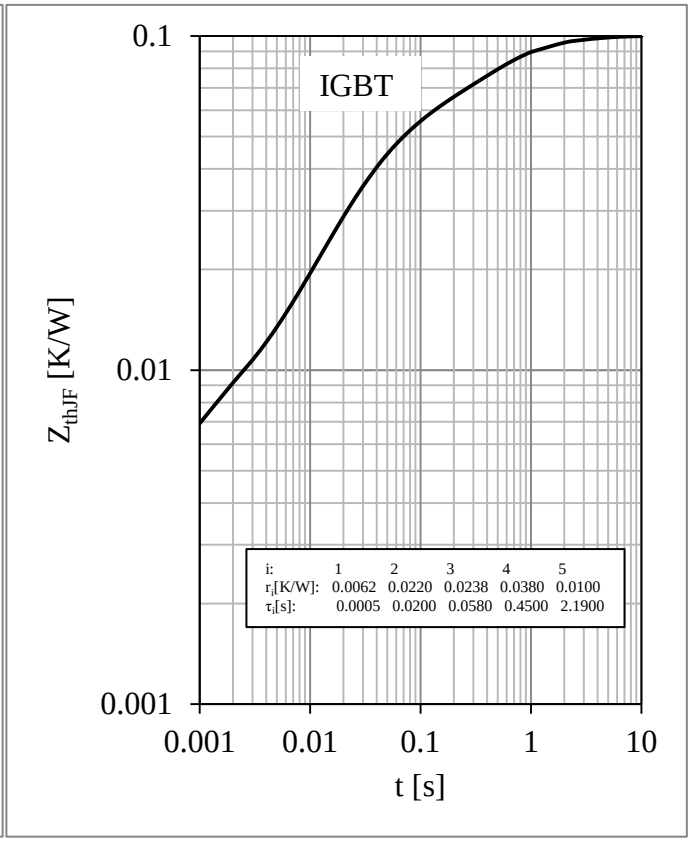


Fig 6. IGBT-inverter Transient Thermal Impedance

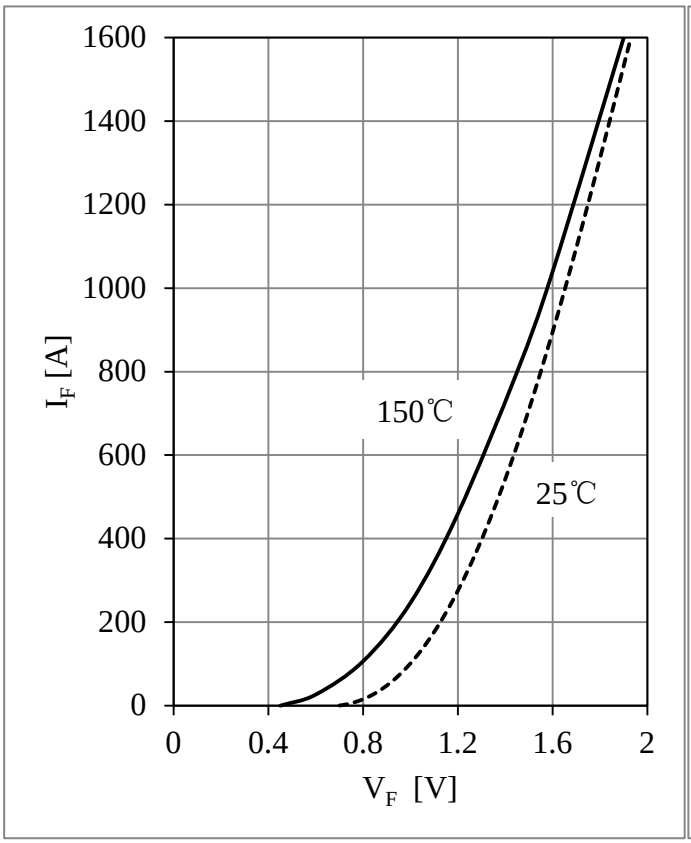


Fig 7. Diode-inverter Forward Characteristics

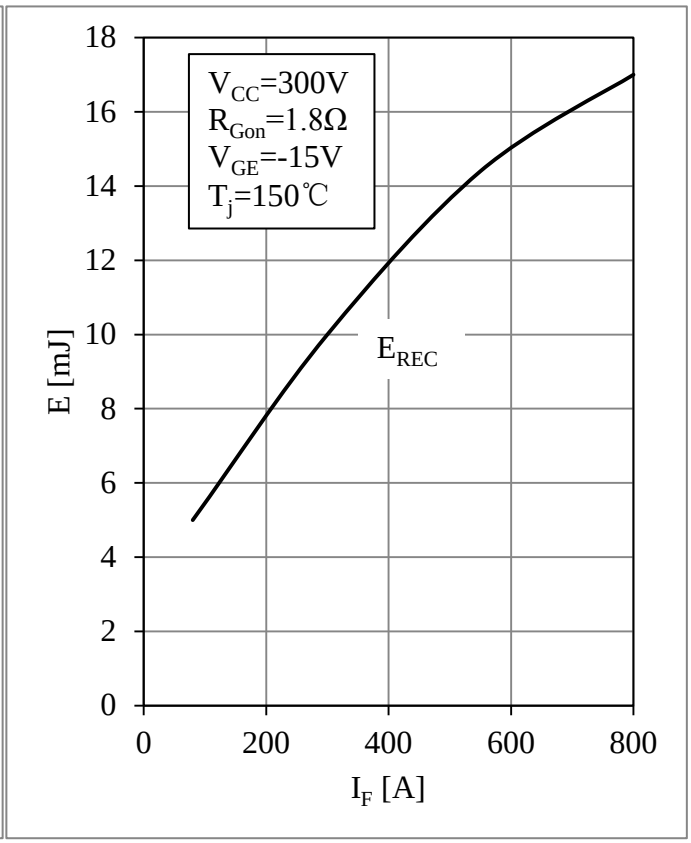


Fig 8. Diode-inverter Switching Loss vs. I_F

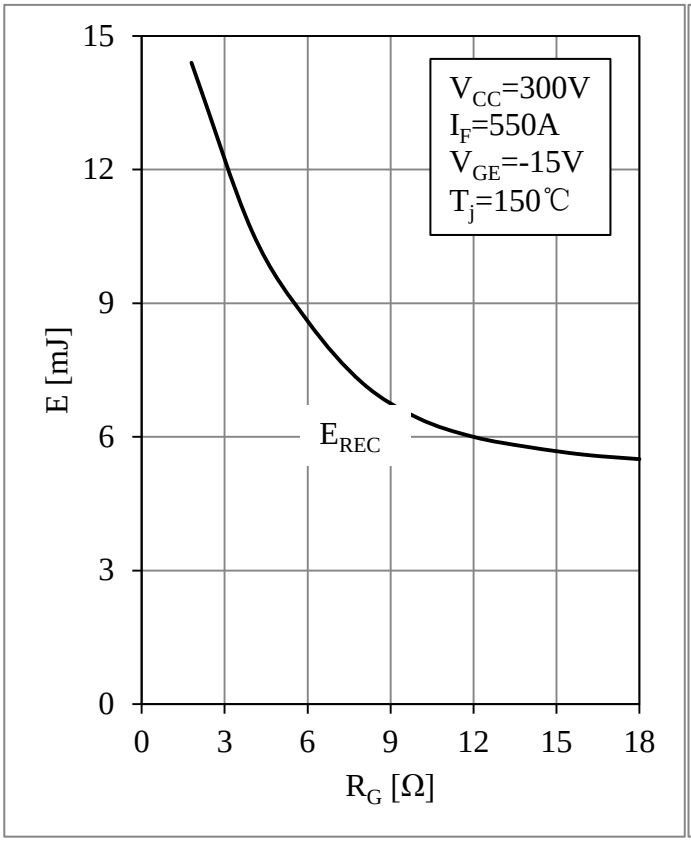


Fig 9. Diode-inverter Switching Loss vs. R_G

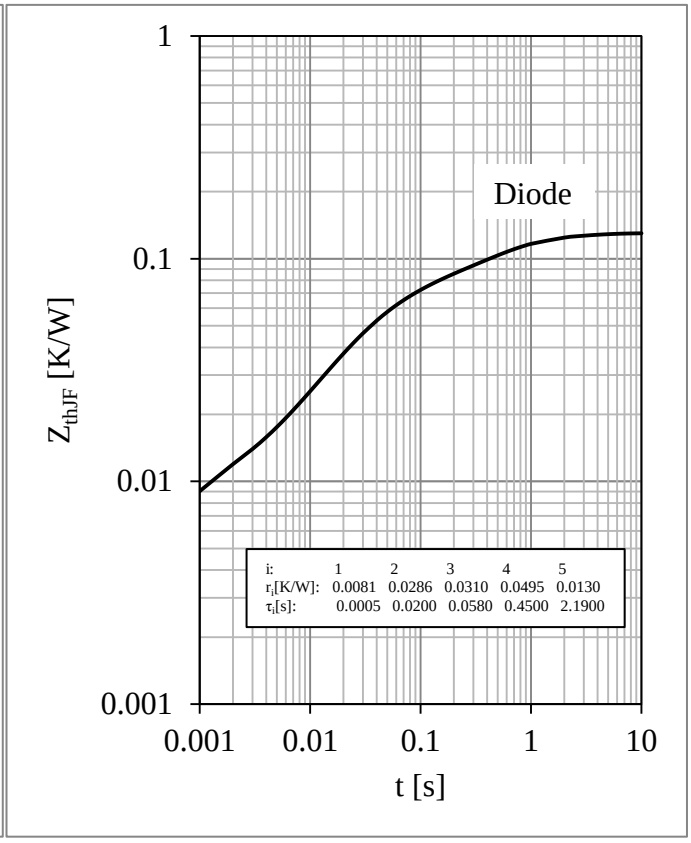


Fig 10. Diode-inverter Transient Thermal Impedance

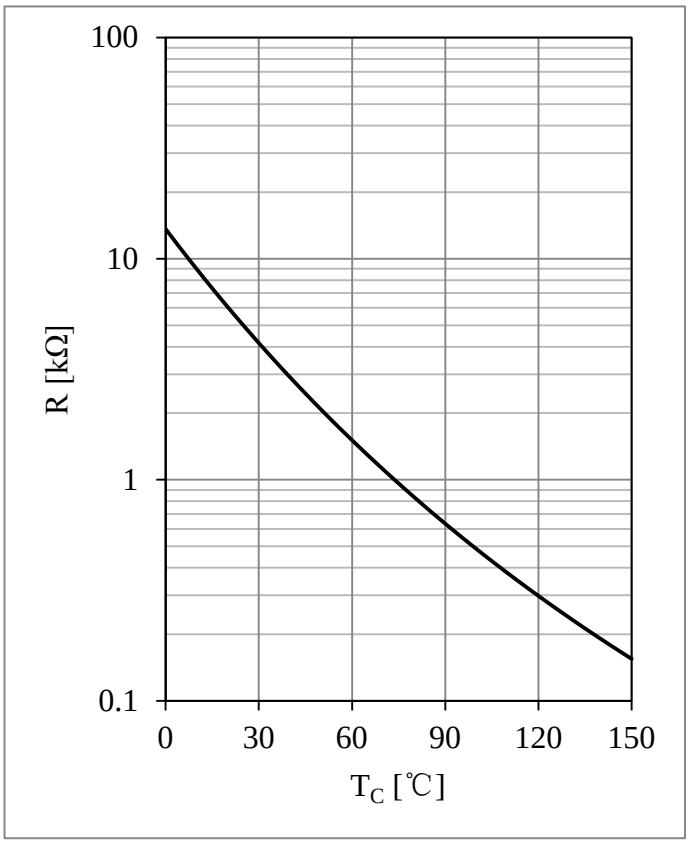
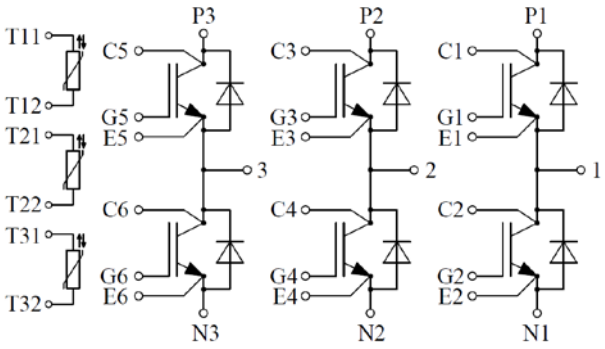


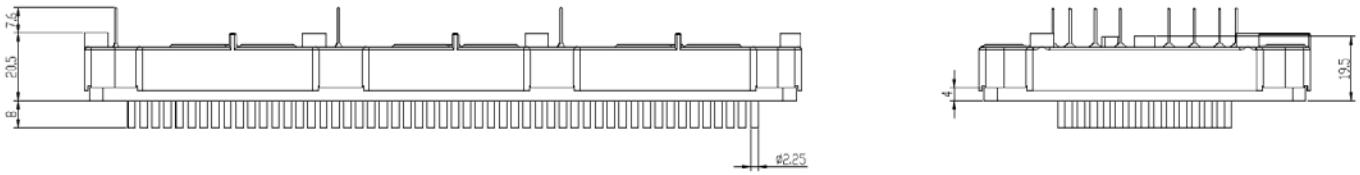
Fig 11. NTC Temperature Characteristic

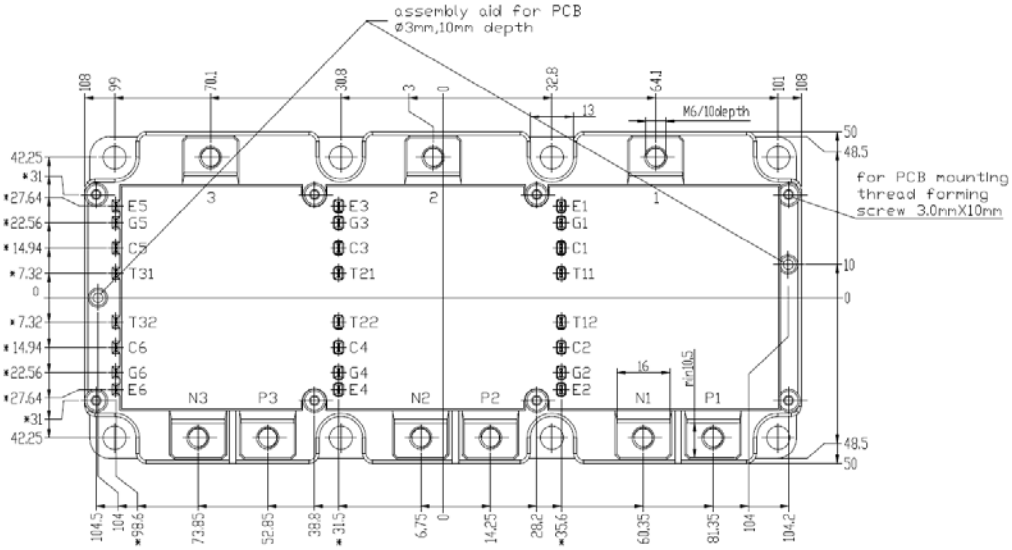
Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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