

STARPOWER

SEMICONDUCTOR

IGBT

GD200TFS100F6S

1000V/200A 3-level 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 3-level-application.

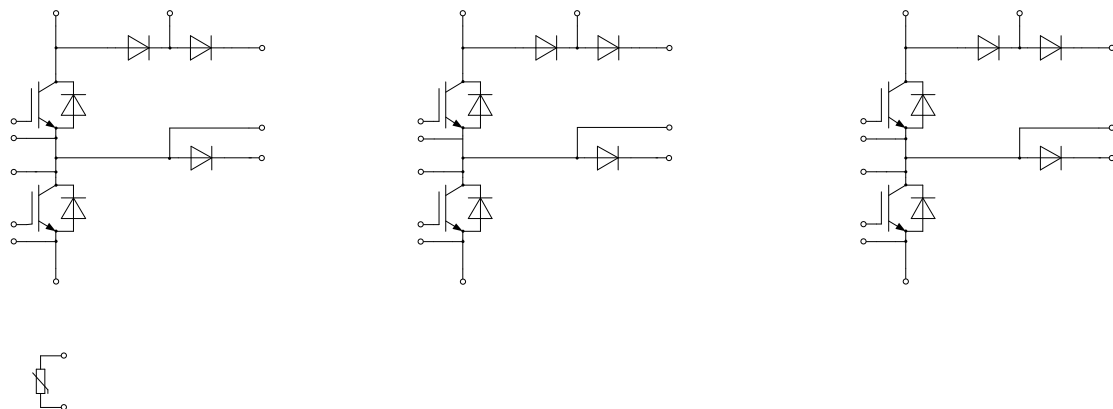
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Solar power
- 3-level-application
- UPS systems

Equivalent Circuit Schematic



Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted**Boost IGBT(T11,T12,T21,T22,T31,T32)**

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1000	V
V_{GES}	Gate-Emitter Voltage Transient Gate-Emitter Voltage	± 23 ± 30	V
I_C	Collector Current @ $T_C=75^{\circ}\text{C}$	125	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	400	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	508	W

Inverse Diode(D11,D12,D21,D22,D31,D32)

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1000	V
I_F	Diode Continuous Forward Current	35	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	70	A

Bosst Diode(D13,D14,D23,D24,D33,D34)

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	60	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	120	A

Start-up Diode(D15,D25,D35)

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	25	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	50	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, $f=50\text{Hz}$, $t=1\text{min}$	3200	V
CTI	Comperative tracking index	≥ 600	
RTI	RTI Elec, housing	130	$^{\circ}\text{C}$

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$ (Chip)	Collector to Emitter Saturation Voltage	$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.95	2.40	V
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.40		
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.55		
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.00	2.45	
$V_{CE(sat)}$ (Signal Terminal)						
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4.00\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	3.3	4.0	4.7	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
R_{Gint}	Internal Gate Resistance			1.5		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=100\text{kHz}, V_{GE}=0\text{V}$		16.4		nF
C_{oes}	Onput Capacitance			0.44		nF
C_{res}	Reverse Transfer Capacitance			0.25		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		1.19		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=650\text{V}, I_C=120\text{A}, R_{Gon}=5.1\Omega, R_{Goff}=10\Omega, V_{GE}=-8\text{V}/+15\text{V}, T_j=25^\circ\text{C}$		73		ns
t_r	Rise Time			27		ns
$t_{d(off)}$	Turn-Off Delay Time			515		ns
t_f	Fall Time			27		ns
E_{on}	Turn-On Switching Loss			2.43		mJ
E_{off}	Turn-Off Switching Loss			3.30		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=650\text{V}, I_C=120\text{A}, R_{Gon}=5.1\Omega, R_{Goff}=10\Omega, V_{GE}=-8\text{V}/+15\text{V}, T_j=125^\circ\text{C}$		76		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			554		ns
t_f	Fall Time			58		ns
E_{on}	Turn-On Switching Loss			2.94		mJ
E_{off}	Turn-Off Switching Loss			4.69		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=650\text{V}, I_C=120\text{A}, R_{Gon}=5.1\Omega, R_{Goff}=10\Omega, V_{GE}=-8\text{V}/+15\text{V}, T_j=150^\circ\text{C}$		77		ns
t_r	Rise Time			33		ns
$t_{d(off)}$	Turn-Off Delay Time			568		ns
t_f	Fall Time			58		ns
E_{on}	Turn-On Switching Loss			3.09		mJ
E_{off}	Turn-Off Switching Loss			4.96		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F (Chip)	Diode Forward Voltage	$I_F=35\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.85	2.30	V
		$I_F=35\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.90		
		$I_F=35\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.95		
V_F (Signal Terminal)		$I_F=35\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.90	2.35	

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F (Chip)	Diode Forward Voltage	$I_F=60\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.35	1.80	V
		$I_F=60\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.70		
		$I_F=60\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.80		
V_F (Signal Terminal)		$I_F=60\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.40	1.85	

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F (Chip)	Diode Forward Voltage	$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.85	2.30	V
		$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.90		
		$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.95		
V_F (Signal Terminal)		$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.90	2.35	

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			22.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C=100^\circ\text{C}, R_{100}=1486.1\Omega$	-5		5	%
P_{25}	Power Dissipation				200	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		4000		K

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per Boost IGBT)			0.295	K/W
	Junction-to-Case (per Inverse Diode)			0.821	
	Junction-to-Case (per Bosst Diode)			0.532	
	Junction-to-Case (per Start-up Diode)			1.193	
R_{thCH}	Case-to-Heatsink (per Boost IGBT)		0.046		K/W
	Case-to-Heatsink (per Inverse Diode)		0.135		
	Case-to-Heatsink (per Bosst Diode)		0.051		
	Case-to-Heatsink (per Start-up Diode)		0.041		
M	Mounting Torque, Screw:M5	3.0		5.0	N.m
G	Weight of Module		180		g

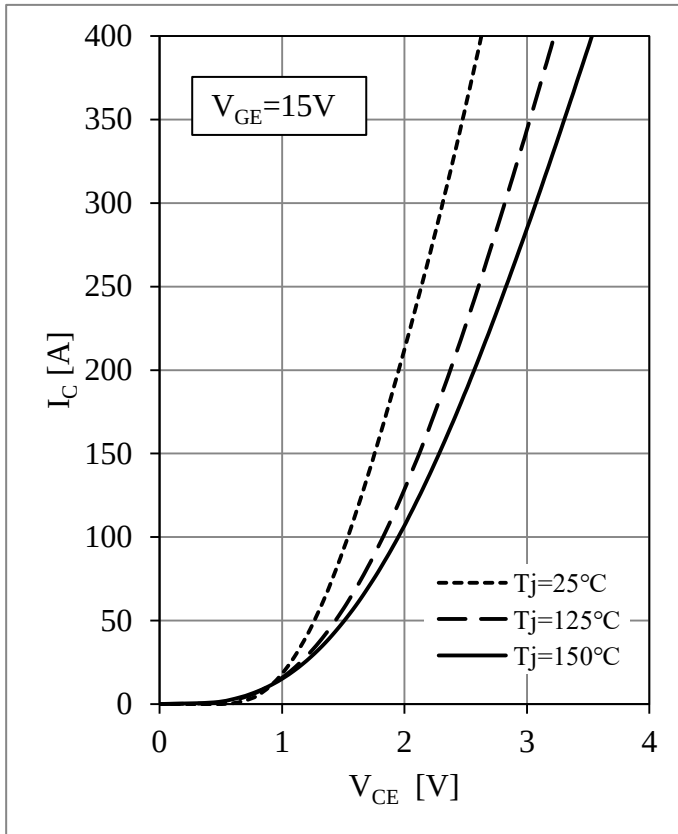


Fig 1. Boost IGBT Output Characteristics

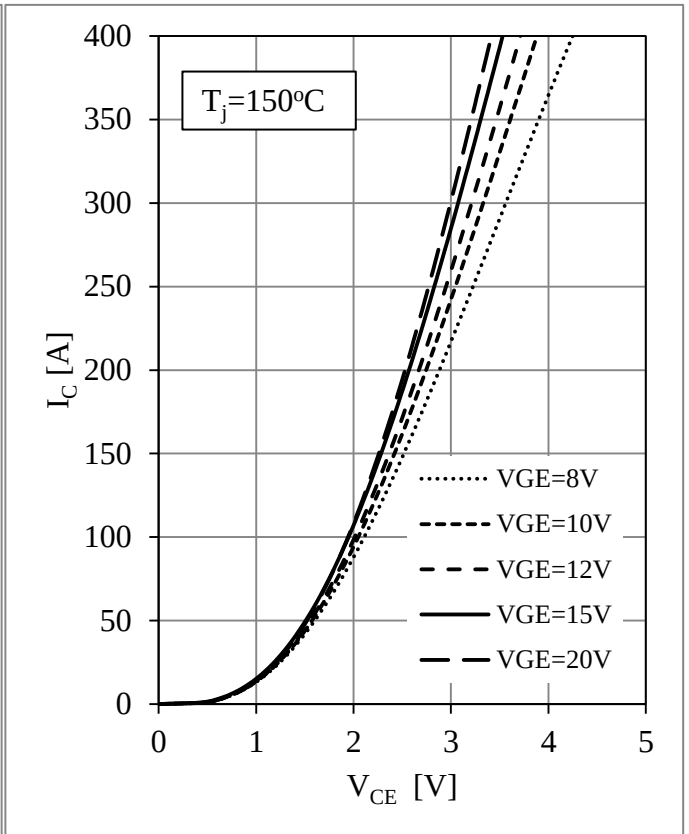


Fig 2. Boost IGBT Output Characteristics

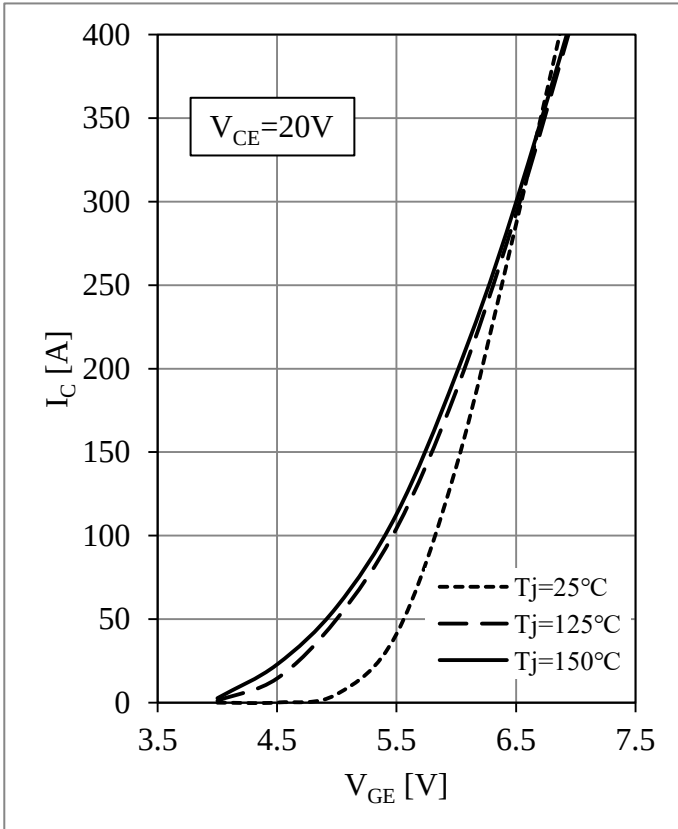
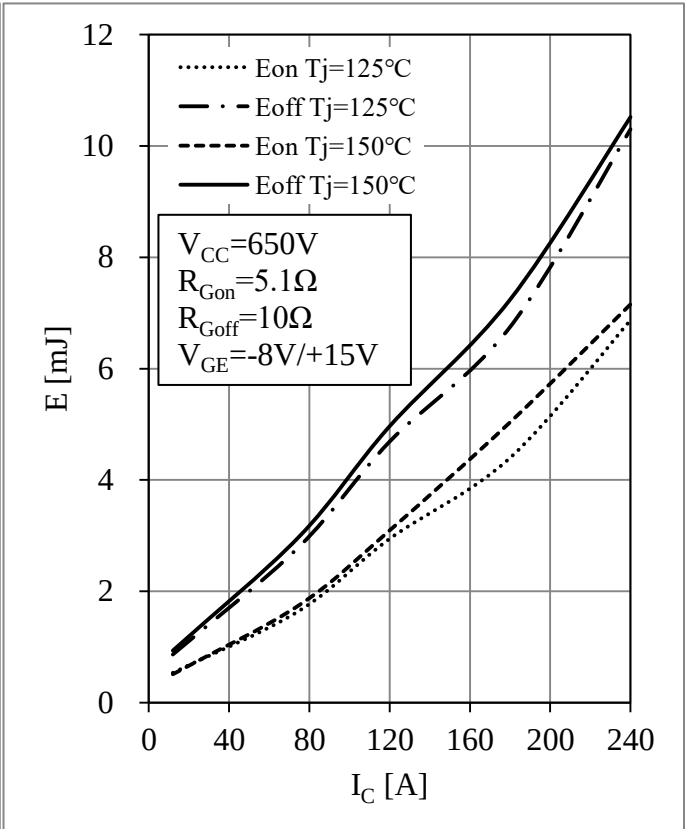


Fig 3. Boost IGBT Transfer Characteristics

Fig 4. Boost IGBT Switching Loss vs. I_C

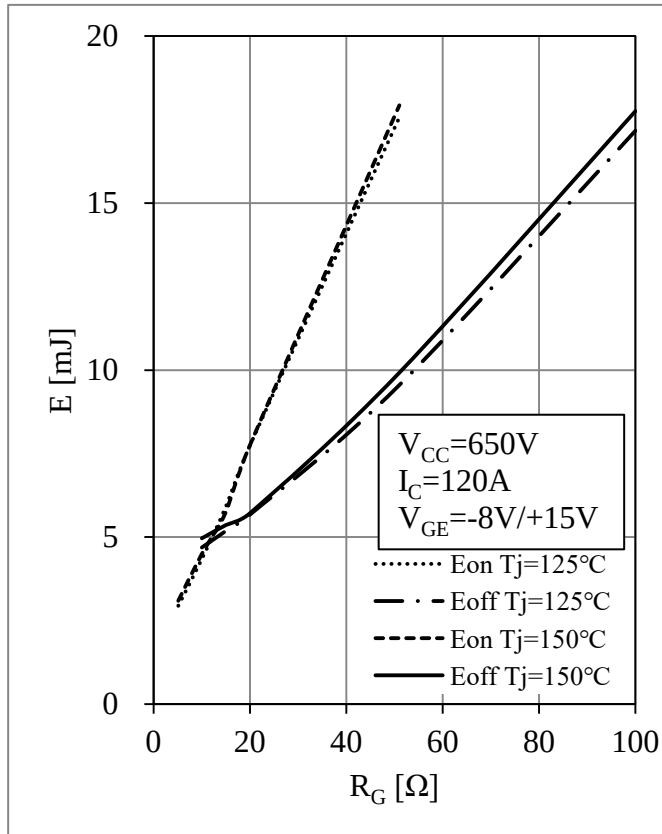
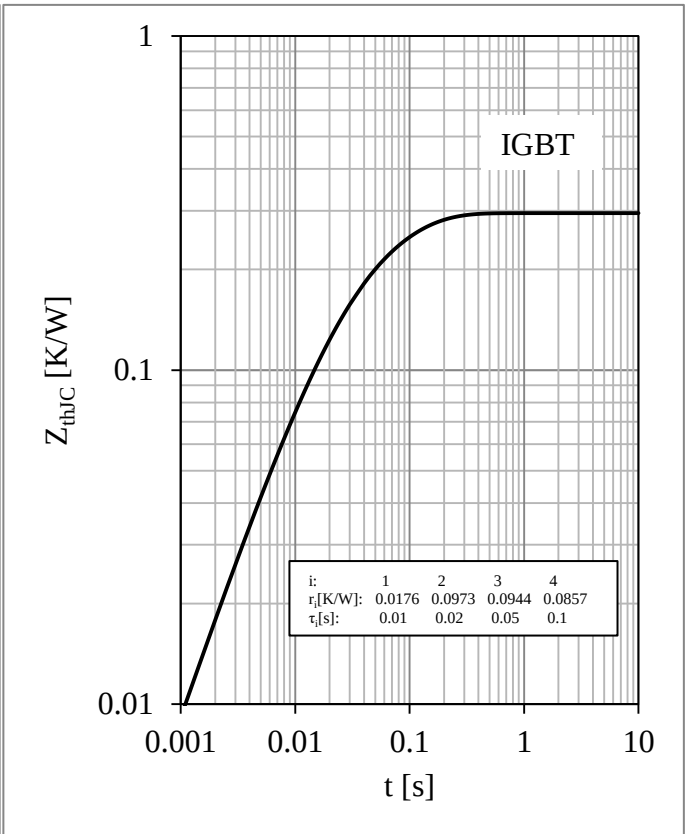
Fig 5. Boost IGBT Switching Loss vs. R_G 

Fig 6. Boost IGBT Transient Thermal Impedance

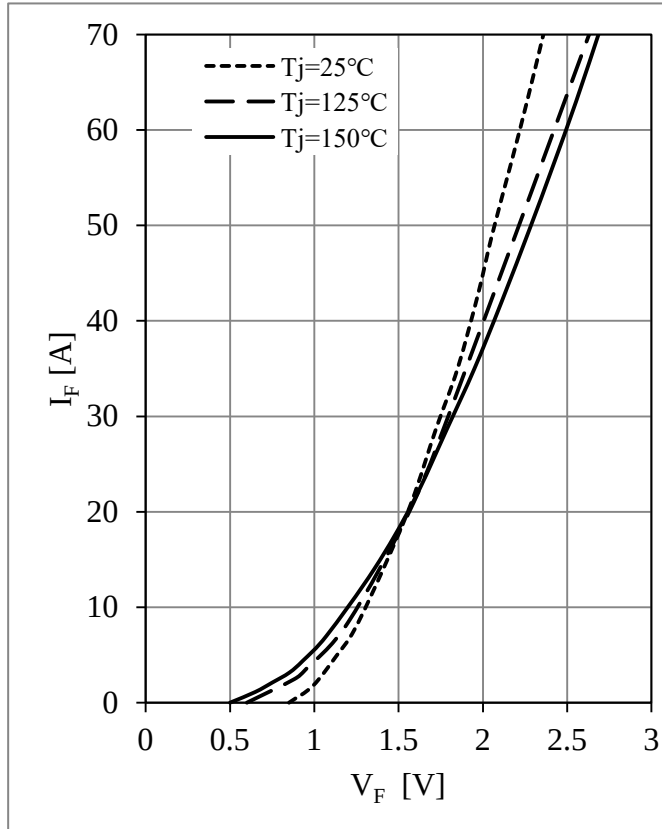


Fig 7. Inverse Diode Forward Characteristics

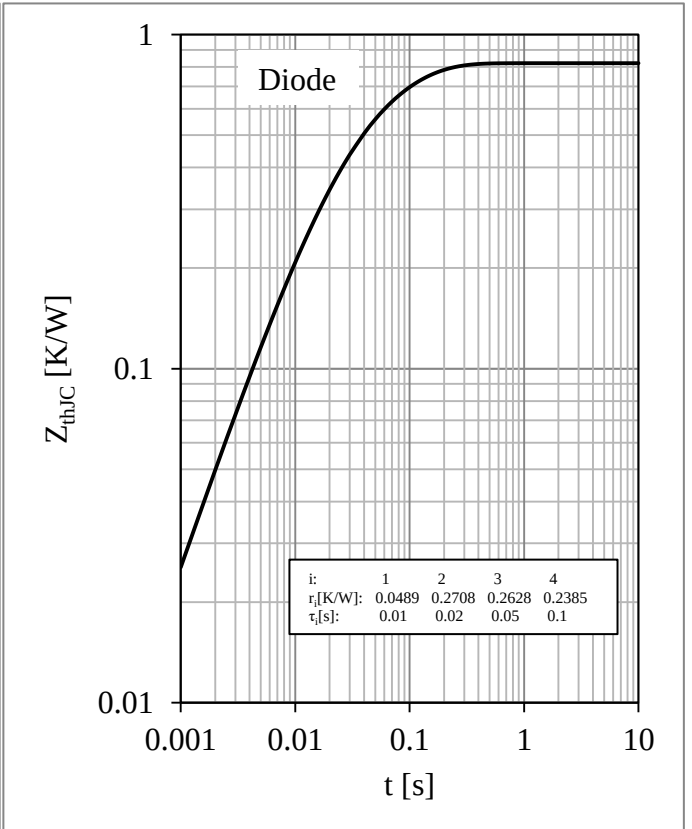


Fig 8. Inverse Diode Transient Thermal Impedance

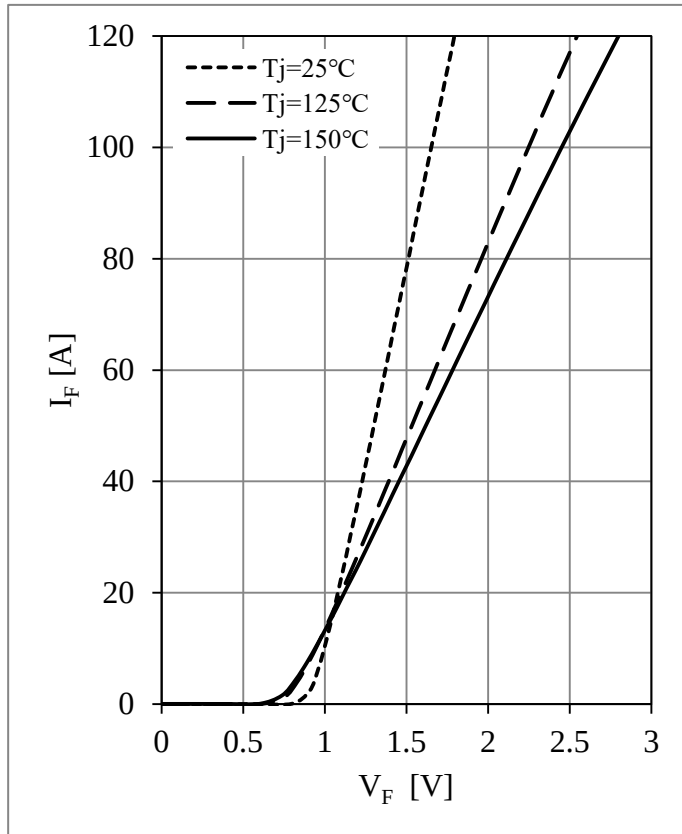


Fig 9. Boost Diode Forward Characteristics

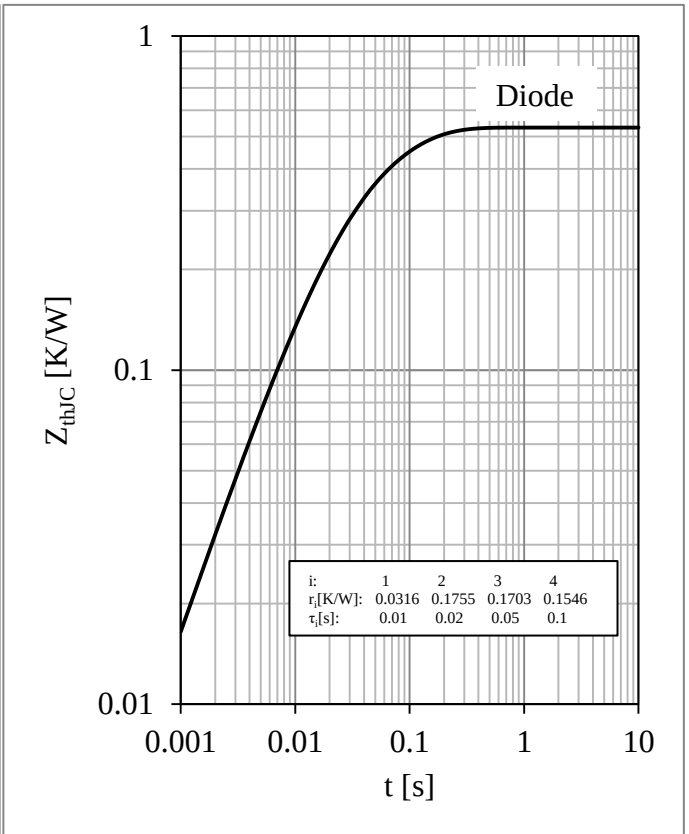


Fig 10. Boost Diode Transient Thermal Impedance

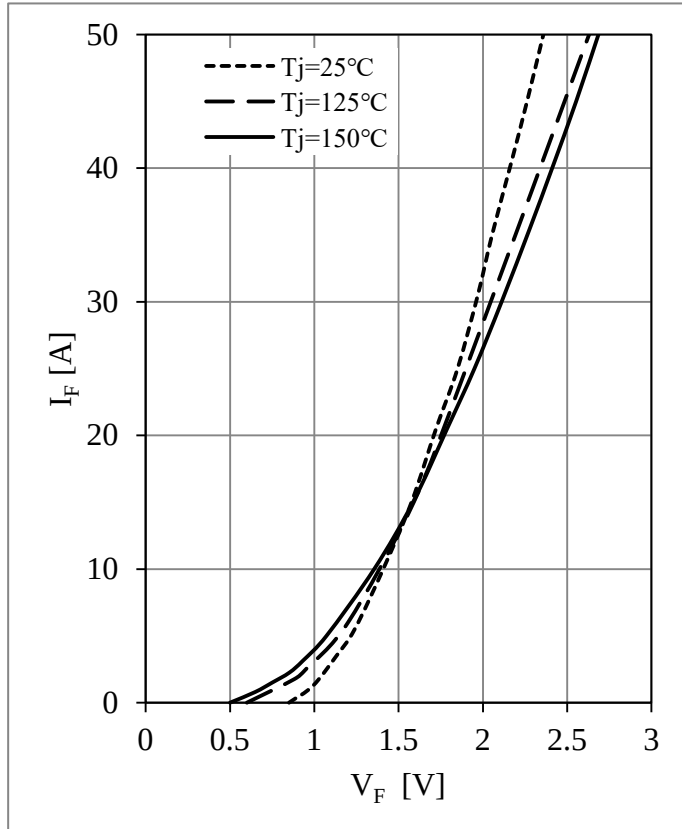


Fig 11. Start-up Diode Forward Characteristics

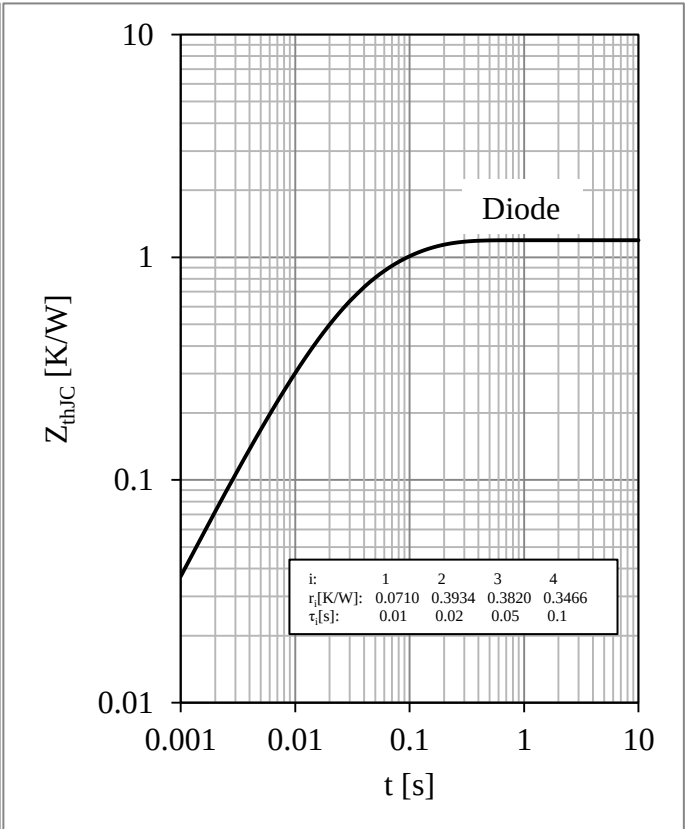


Fig 12. Start-up Diode Transient Thermal Impedance

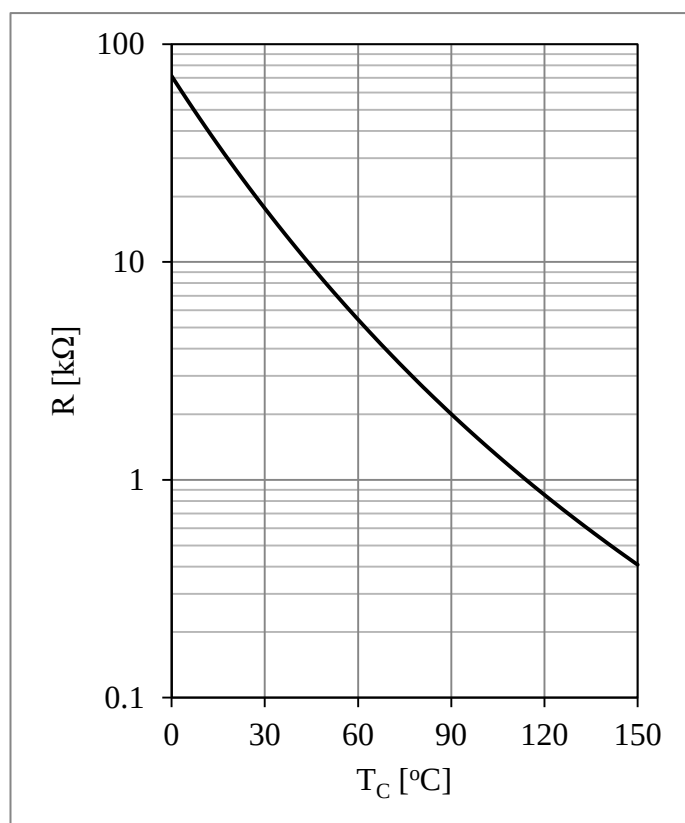
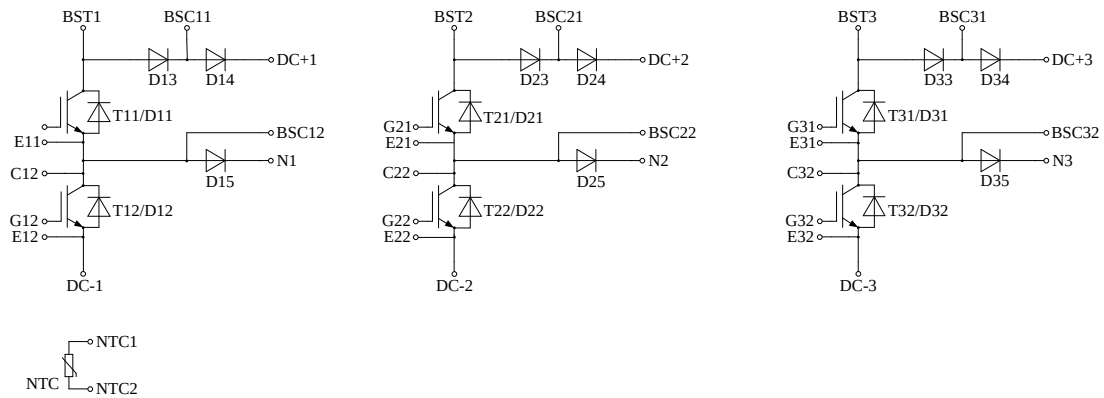


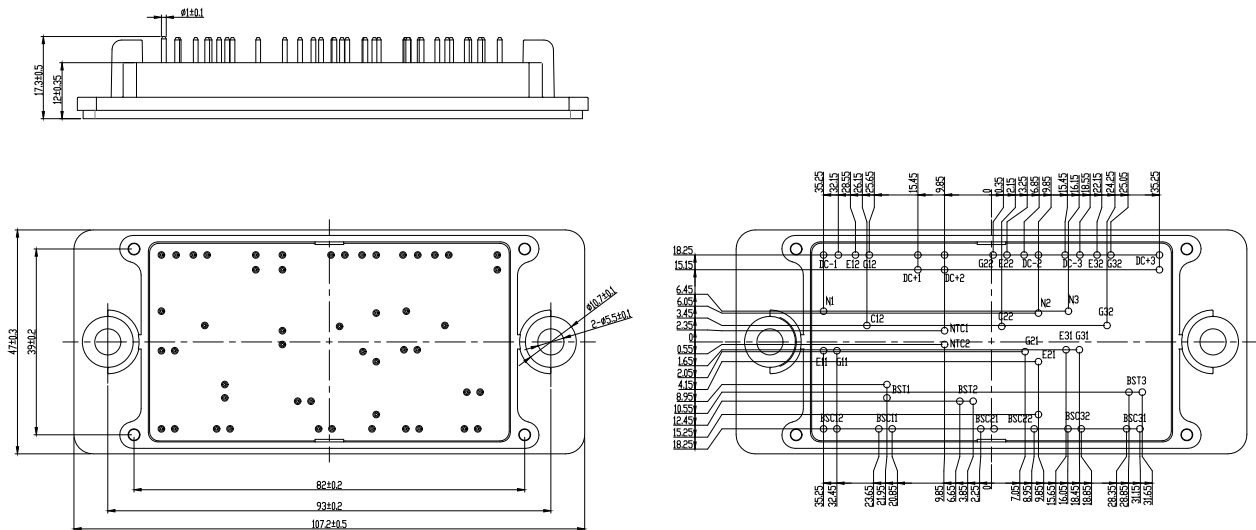
Fig 13. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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