

STARPOWER

SEMICONDUCTOR

IGBT

GD200TSS100L6S

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.

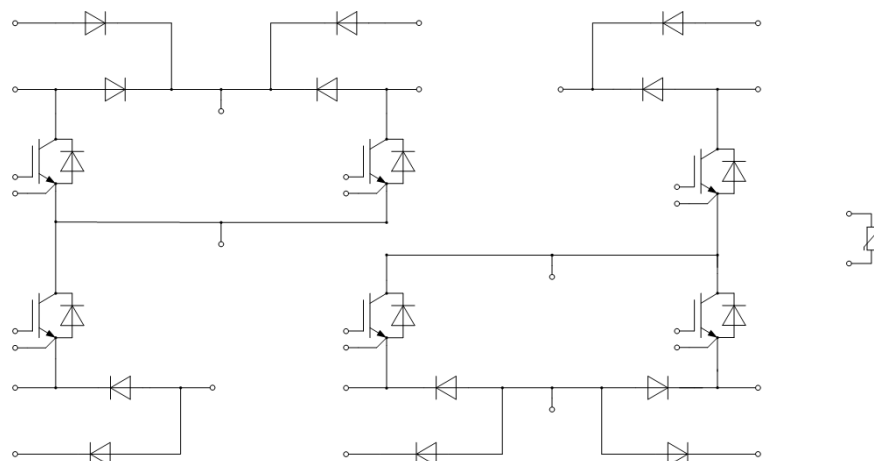
Features

- 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**IGBT Boost**

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1000	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_{CN}	Implemented Collector Current	100	A
I_C	Collector Current @ $T_C=100^{\circ}\text{C}$	65	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	200	A

Diode Boost

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1000	V
I_{FN}	Implemented Forward Current	30	A
I_F	Diode Continuous Forward Current	25	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	60	A

Bypass-Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	45	A
I_{FSM}	Surge Forward Current $t_p=10\text{ms}$ @ $T_j=25^{\circ}\text{C}$ @ $T_j=150^{\circ}\text{C}$	1150 880	A
I^2t	I^2t -value, $t_p=10\text{ms}$ @ $T_j=25^{\circ}\text{C}$ @ $T_j=150^{\circ}\text{C}$	6600 3850	A^2s

Diode Inverse-polarity protection diode A

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	15	A
I_{FSM}	Surge Forward Current $t_p=10\text{ms}$ @ $T_j=25^{\circ}\text{C}$ @ $T_j=150^{\circ}\text{C}$	300 245	A
I^2t	I^2t -value, $t_p=10\text{ms}$ @ $T_j=25^{\circ}\text{C}$ @ $T_j=150^{\circ}\text{C}$	450 300	A^2s

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

IGBT Boost 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	$I_C=25\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.40	2.55	V
		$I_C=25\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		1.55		
		$I_C=25\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		1.55		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.20\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	3.0	4.0	5.0	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			3.0		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=100\text{kHz}, V_{GE}=0\text{V}$		9.40		nF
C_{res}	Reverse Transfer Capacitance			0.30		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.14		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=500\text{V}, I_C=25\text{A}, R_G=10\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		36		ns
t_r	Rise Time			23		ns
$t_{d(off)}$	Turn-Off Delay Time			216		ns
t_f	Fall Time			38		ns
E_{on}	Turn-On Switching Loss			0.57		mJ
E_{off}	Turn-Off Switching Loss			0.29		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=500\text{V}, I_C=25\text{A}, R_G=10\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		36		ns
t_r	Rise Time			25		ns
$t_{d(off)}$	Turn-Off Delay Time			261		ns
t_f	Fall Time			92		ns
E_{on}	Turn-On Switching Loss			0.61		mJ
E_{off}	Turn-Off Switching Loss			0.59		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=500\text{V}, I_C=25\text{A}, R_G=10\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		34		ns
t_r	Rise Time			26		ns
$t_{d(off)}$	Turn-Off Delay Time			274		ns
t_f	Fall Time			95		ns
E_{on}	Turn-On Switching Loss			0.64		mJ
E_{off}	Turn-Off Switching Loss			0.70		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.18	1.63	V
		$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.34		
		$I_F=25\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.37		

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=45\text{A}, T_j=150^{\circ}\text{C}$		0.85		V
I_R	Reverse Current	$T_j=150^{\circ}\text{C}, V_R=1600\text{V}$			1.0	mA

Diode Inverse-polarity protection diode A Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=15\text{A}, T_j=150^{\circ}\text{C}$		0.85		V
I_R	Reverse Current	$T_j=150^{\circ}\text{C}, V_R=1600\text{V}$			1.0	mA

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		k Ω
$\Delta R/R$	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
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3433		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_{thJC}	Junction-to-Case (per IGBT Boost)			0.456	K/W
	Junction-to-Case (per Diode Boost)			0.705	
	Junction-to-Case (per Bypass-Diode)			0.454	
	Junction-to-Case (per Diode Inverse-polarity protection diode A)			0.971	
R_{thCH}	Case-to-Heatsink (per IGBT Boost)		0.187		K/W
	Case-to-Heatsink (per Diode Boost)		0.289		
	Case-to-Heatsink (per Bypass-Diode)		0.186		
	Case-to-Heatsink (per Diode Inverse-polarity protection diode A)		0.399		
	Case-to-Heatsink (per Module)		0.010		
M	Mounting Torque, Screw:M5	3.0		5.0	N.m
G	Weight of Module		250		g

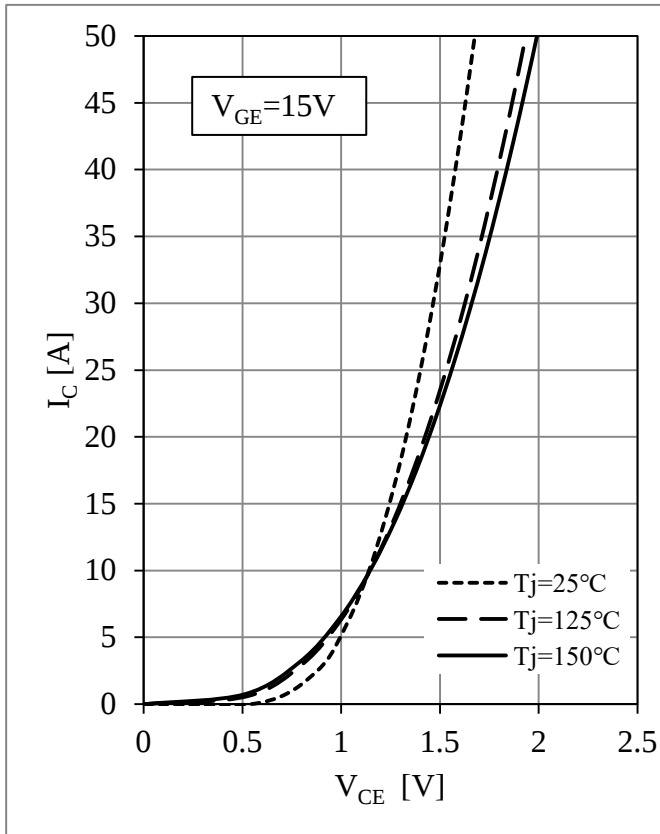


Fig 1. IGBT Output Characteristics

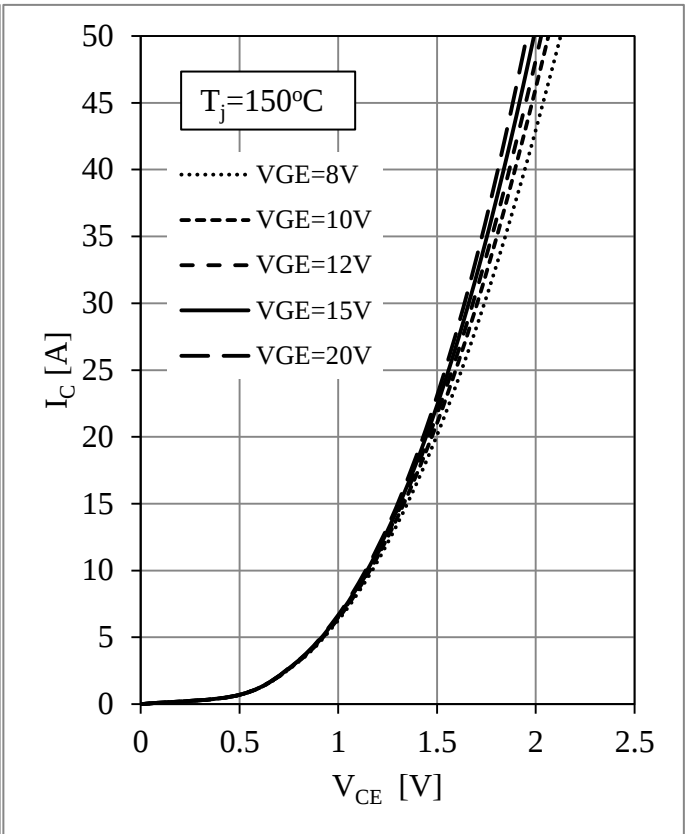


Fig 2. IGBT Output Characteristics

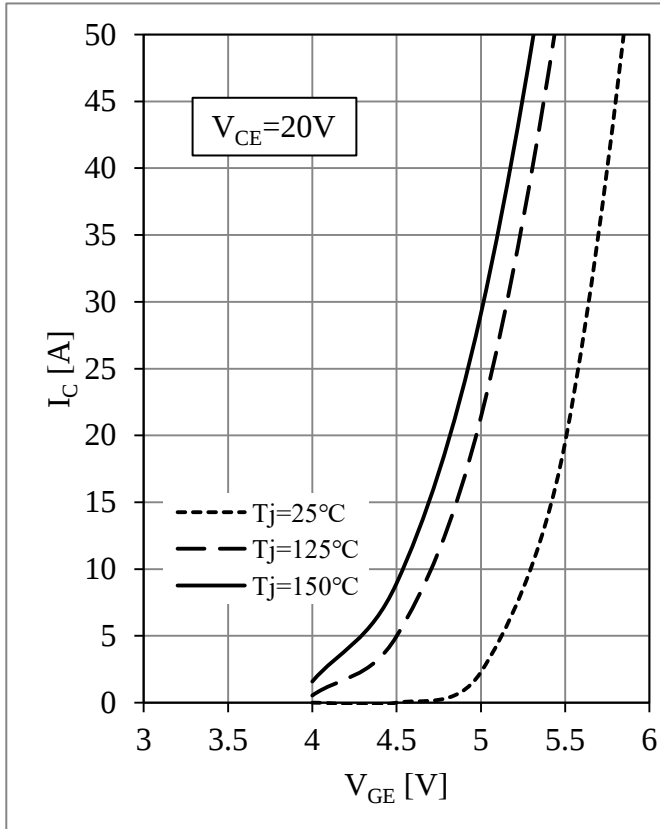
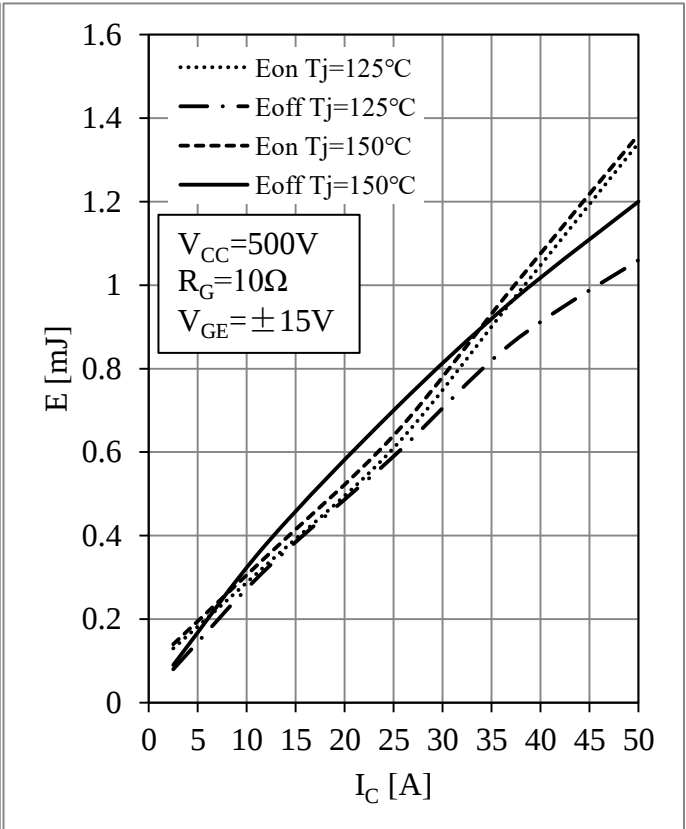


Fig 3. IGBT Transfer Characteristics

Fig 4. IGBT Switching Loss vs. I_C

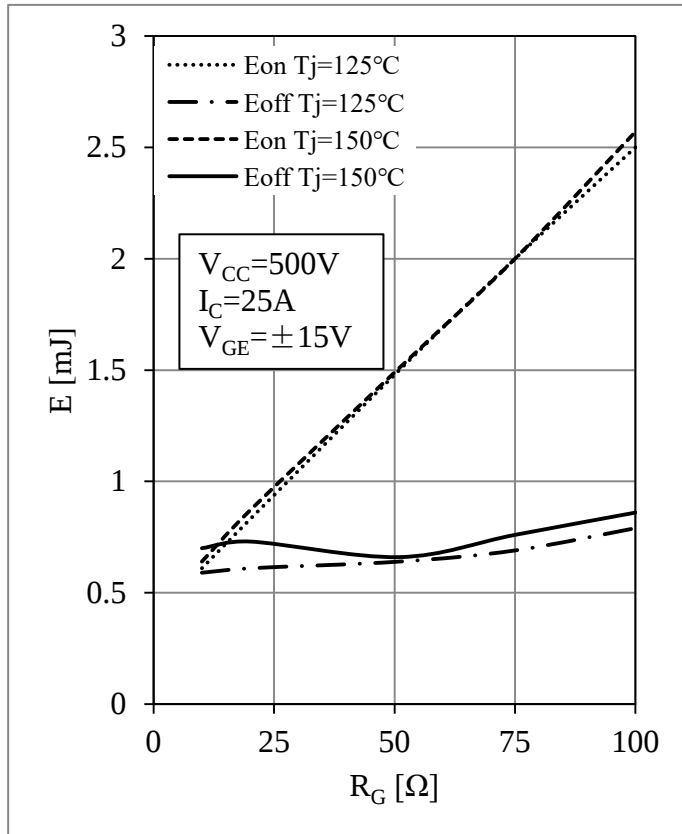
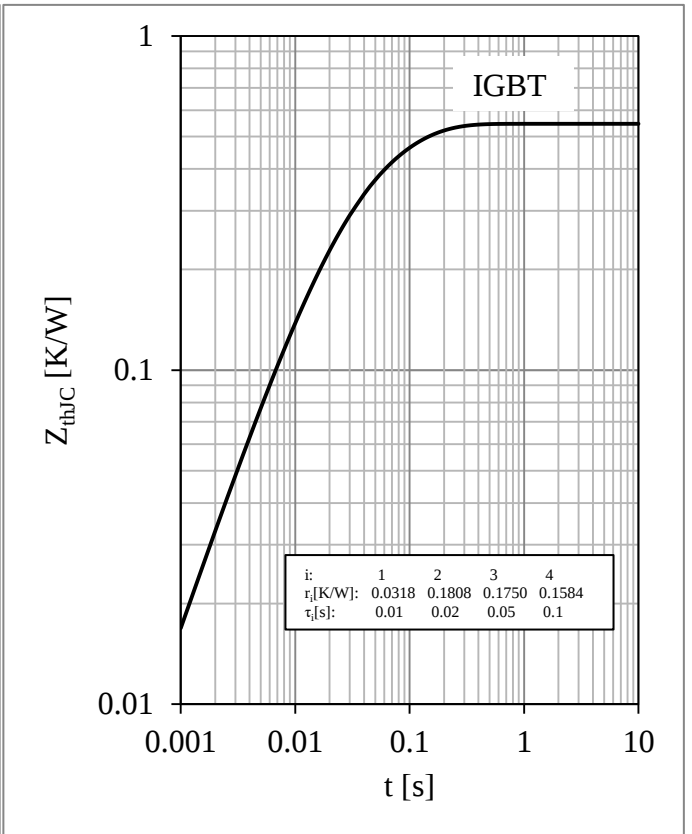
Fig 5. IGBT Switching Loss vs. R_G 

Fig 6. IGBT Transient Thermal Impedance

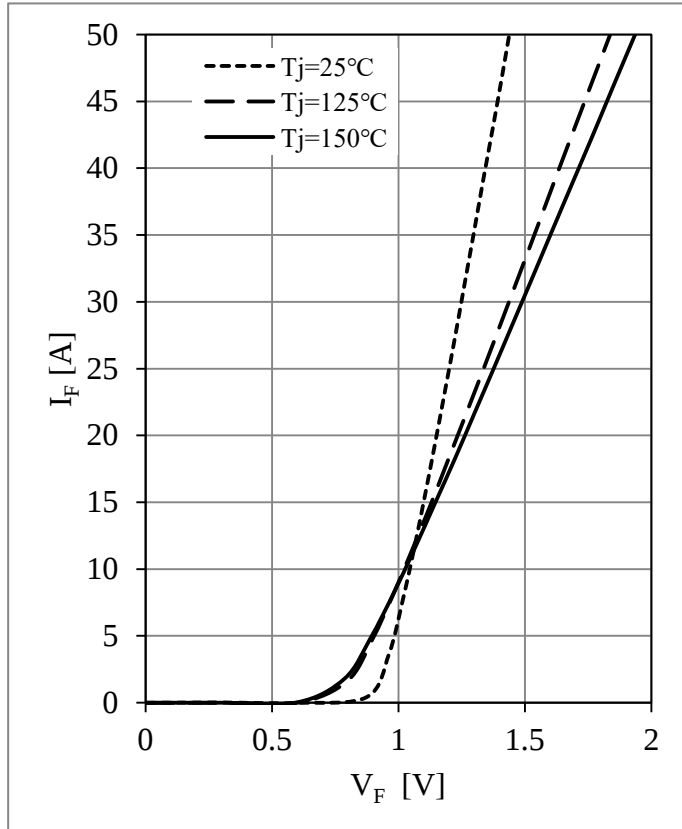


Fig 7. Diode Boost Forward Characteristics

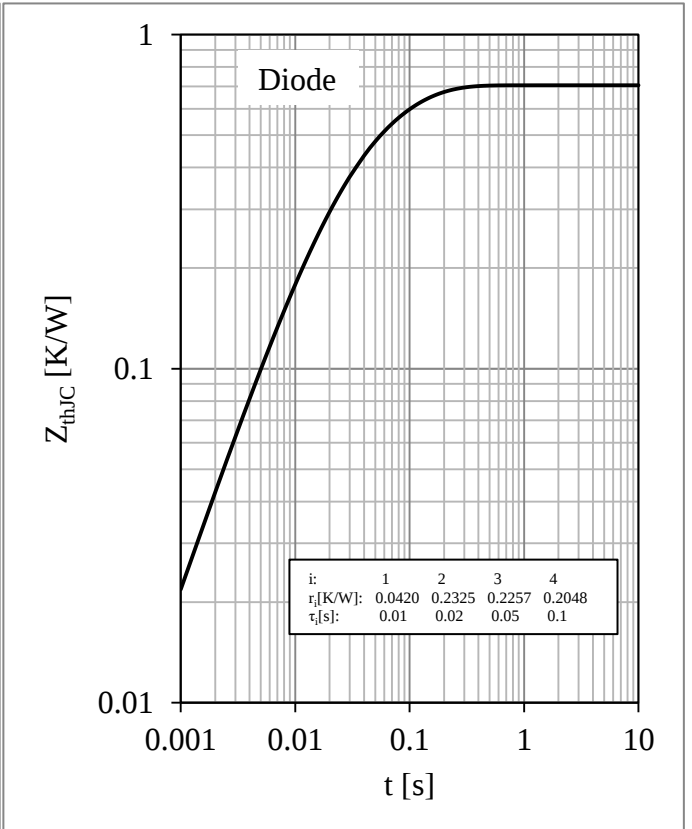


Fig 8. Diode Boost Transient Thermal Impedance

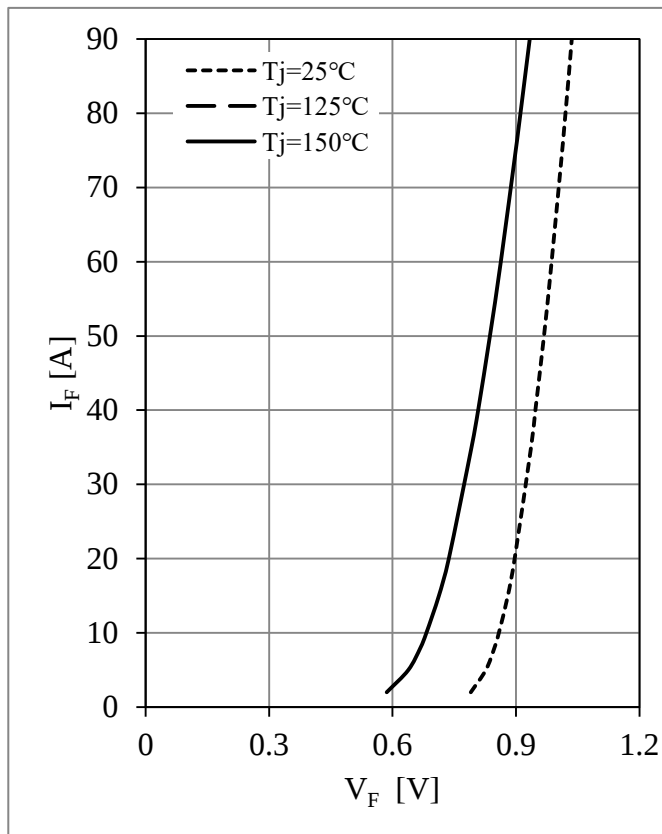


Fig 9. Bypass-Diode Forward Characteristics

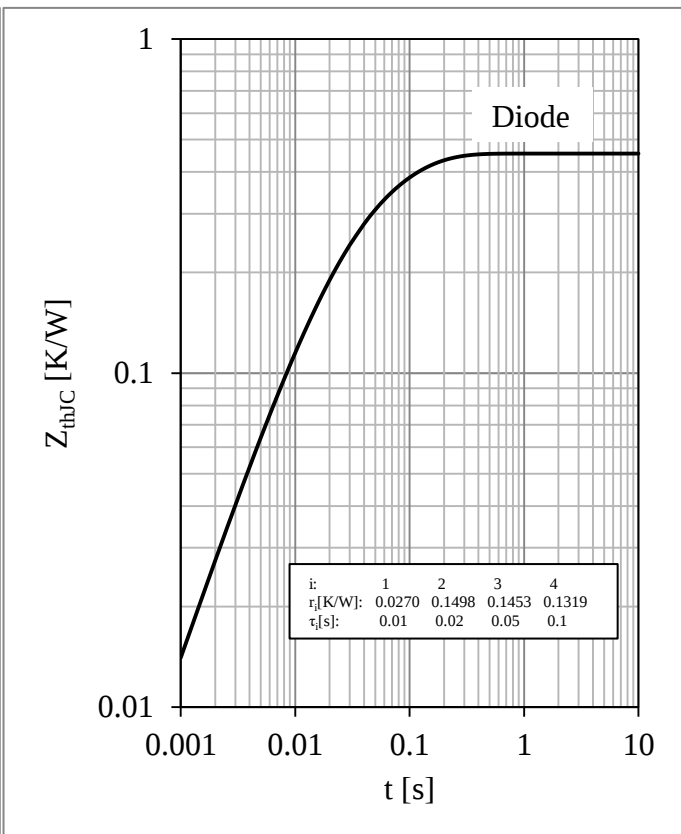


Fig 10. Bypass-Diode Transient Thermal Impedance

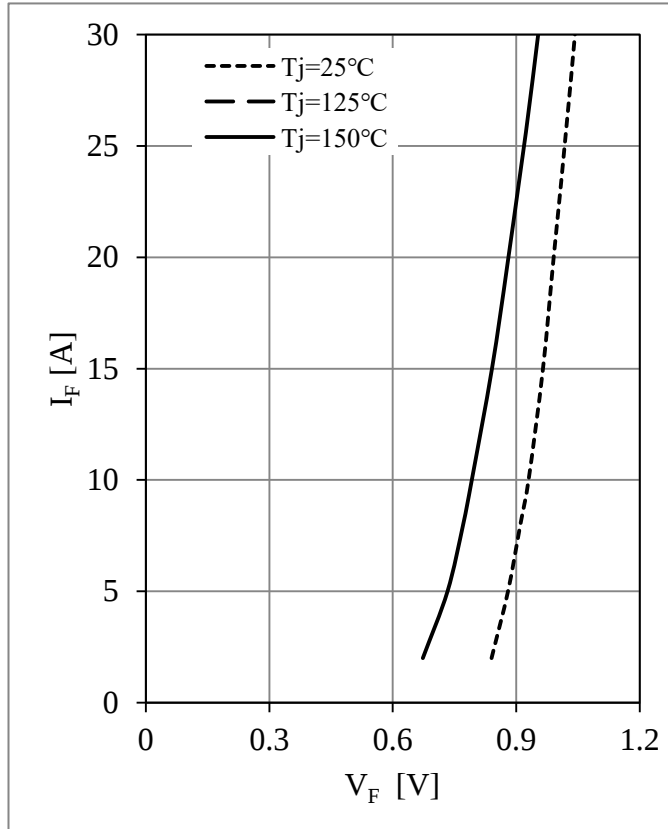


Fig 11. Diode A Forward Characteristics

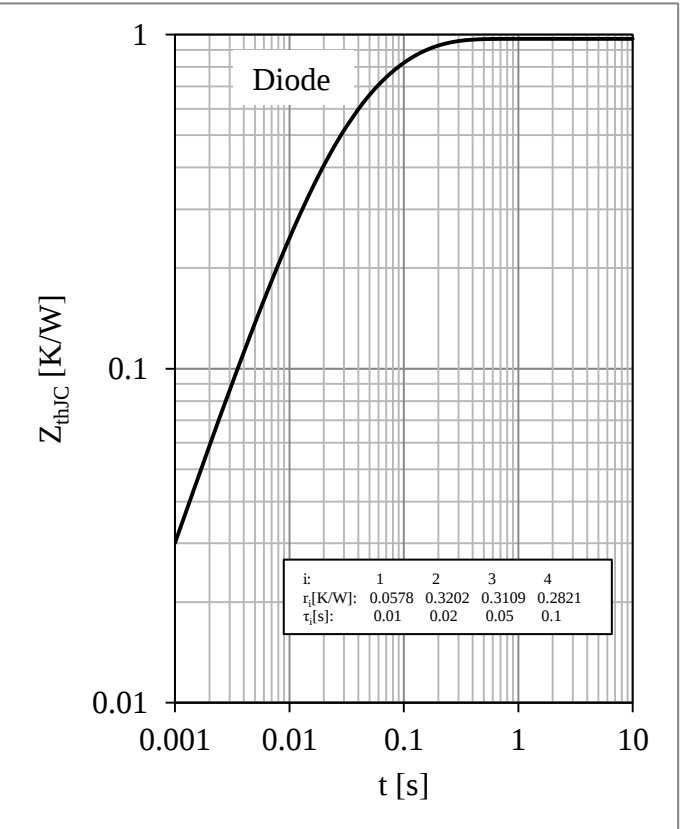


Fig 12. Diode A Transient Thermal Impedance

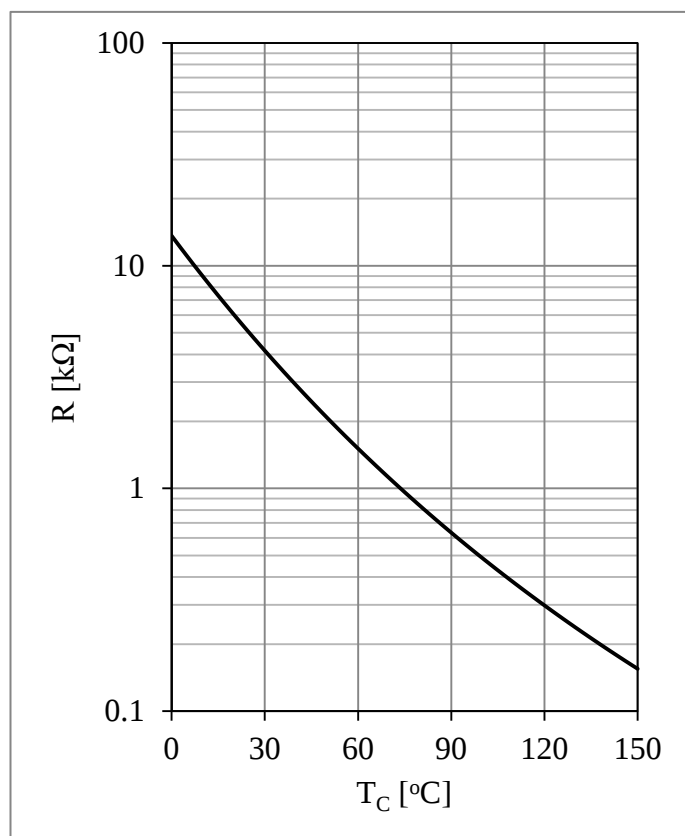
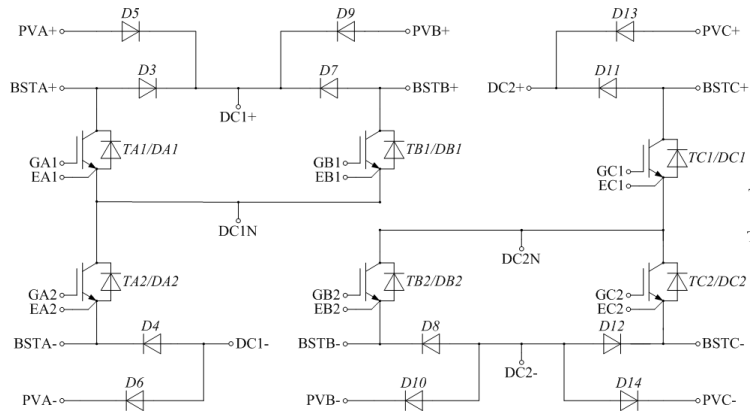


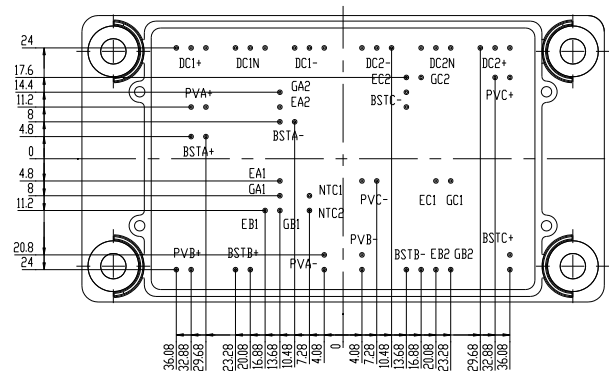
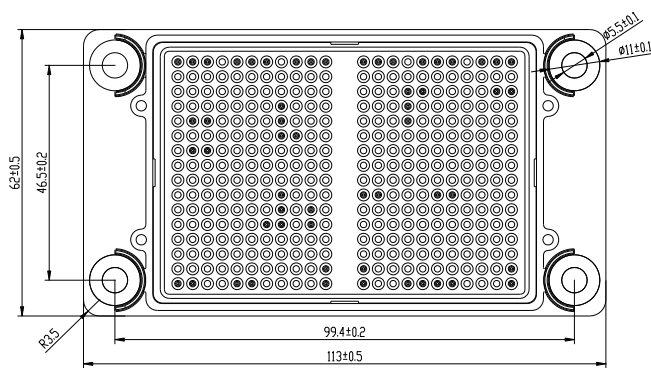
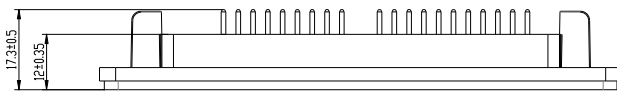
Fig 13. Diode A Forward Characteristics

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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