STARPOWER

SEMICONDUCTOR **IGBT**

GD30FSX65L2S

650V/30A 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.

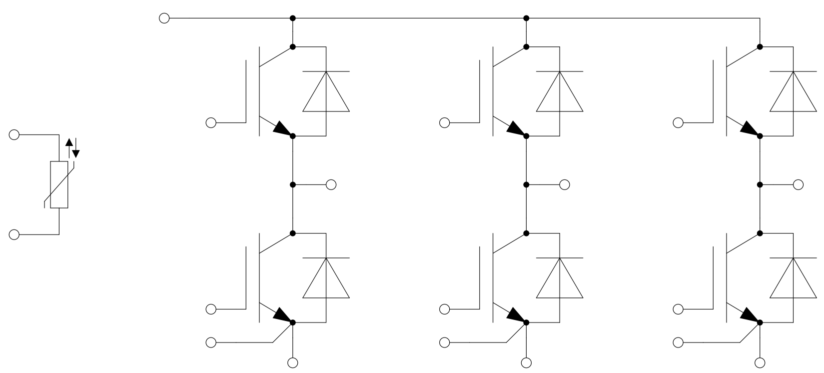
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 6μs 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 heatsink 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°C unless otherwise noted

IGBT-inverter

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	55 30	A
I_{CM}	Pulsed Collector Current t_p=1ms	60	A
P_D	Maximum Power Dissipation @ T_j=175°C	163	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	30	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	60	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V

IGBT-inverter Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=30A,V_{GE}=15V, T_j=25°C		1.45	1.90	V
		I_C=30A,V_{GE}=15V, T_j=125°C		1.60		
		I_C=30A,V_{GE}=15V, T_j=150°C		1.70		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.48mA,V_{CE}=V_{GE}, T_j=25°C	5.1	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		3.48		nF
C_{res}	Reverse Transfer Capacitance			0.07		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.21		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=30A, R_G=15Ω,V_{GE}=±15V, T_j=25°C		20		ns
t_r	Rise Time			16		ns
$t_{d(off)}$	Turn-Off Delay Time			112		ns
t_f	Fall Time			36		ns
E_{on}	Turn-On Switching Loss			0.50		mJ
E_{off}	Turn-Off Switching Loss			0.50		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=30A, R_G=15Ω,V_{GE}=±15V, T_j=125°C		20		ns
t_r	Rise Time			21		ns
$t_{d(off)}$	Turn-Off Delay Time			128		ns
t_f	Fall Time			48		ns
E_{on}	Turn-On Switching Loss			0.65		mJ
E_{off}	Turn-Off Switching Loss			0.60		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=30A, R_G=15Ω,V_{GE}=±15V, T_j=150°C		20		ns
t_r	Rise Time			22		ns
$t_{d(off)}$	Turn-Off Delay Time			144		ns
t_f	Fall Time			52		ns
E_{on}	Turn-On Switching Loss			0.75		mJ
E_{off}	Turn-Off Switching Loss			0.64		mJ
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150°C,V_{CC}=360V, V_{CEM}≤650V		150		A

Diode-inverter Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_C=30A,V_{GE}=0V,T_j=25°C		1.60	2.05	V
		I_C=30A,V_{GE}=0V,T_j=125°C		1.55		
		I_C=30A,V_{GE}=0V,T_j=150°C		1.50		
Q_r	Recovered Charge	V_R=300V,I_F=30A, -di/dt=2100A/μs,V_{GE}=-15V T_j=25°C		1.3		μC
I_{RM}	Peak Reverse Recovery Current			44		A
E_{rec}	Reverse Recovery Energy			0.35		mJ
Q_r	Recovered Charge	V_R=300V,I_F=30A, -di/dt=2100A/μs,V_{GE}=-15V T_j=125°C		2.3		μC
I_{RM}	Peak Reverse Recovery Current			48		A
E_{rec}	Reverse Recovery Energy			0.55		mJ
Q_r	Recovered Charge	V_R=300V,I_F=30A, -di/dt=2100A/μs,V_{GE}=-15V T_j=150°C		2.7		μC
I_{RM}	Peak Reverse Recovery Current			49		A
E_{rec}	Reverse Recovery Energy			0.65		mJ

NTC Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100 °C,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
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		25		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip		4.50		mΩ
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter)		0.835 1.387	0.919 1.526	K/W
R_{thCH}	Case-to-Heatsink (per IGBT-inverter) Case-to-Heatsink (per Diode-inverter) Case-to-Heatsink (per Module)		0.558 0.926 0.058		K/W
F	Mounting Force Per Clamp	20		50	N
G	Weight of Module		24		g

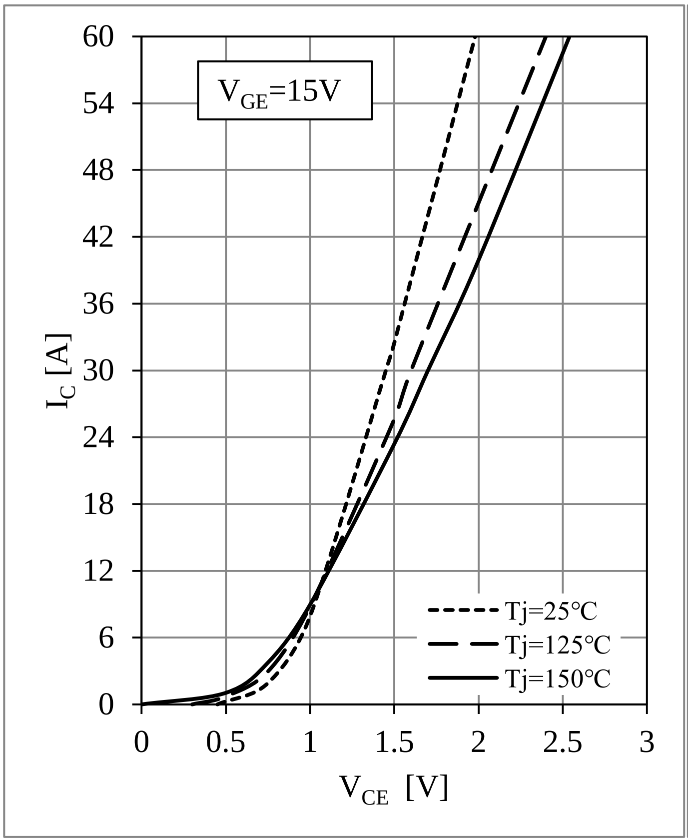


Fig 1. IGBT-inverter Output Characteristics

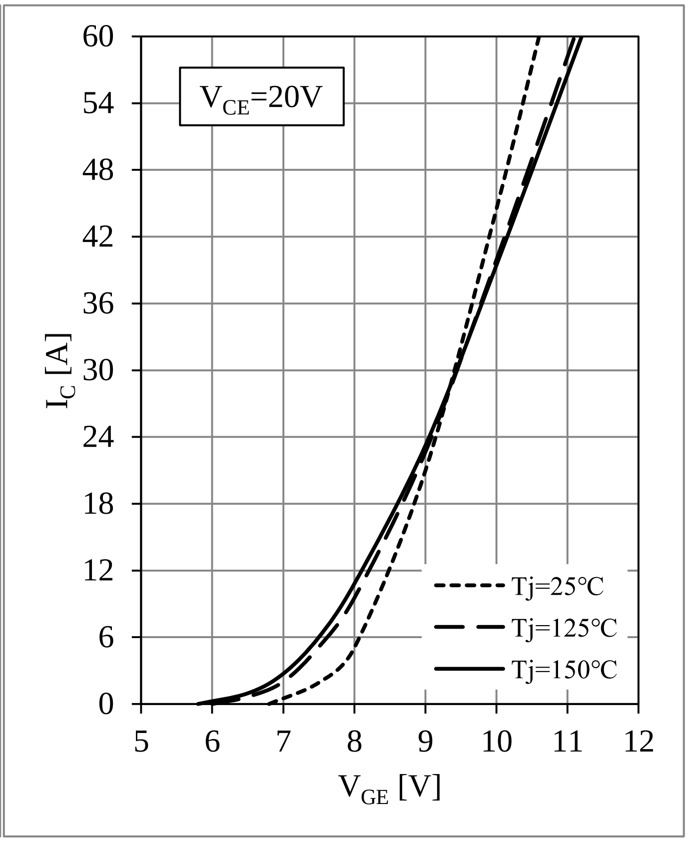


Fig 2. IGBT-inverter Transfer Characteristics

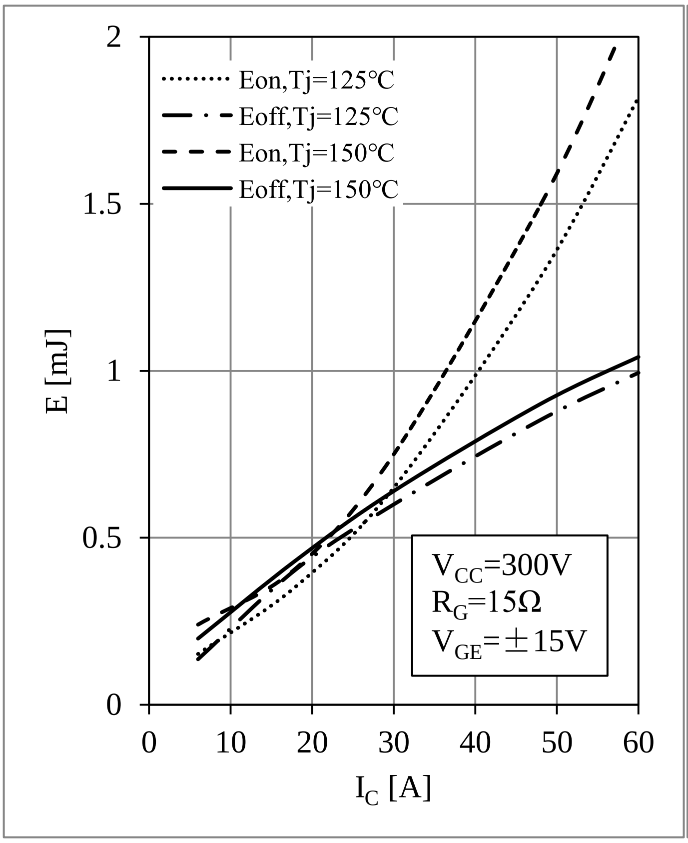


Fig 3. IGBT-inverter Switching Loss vs. I_C

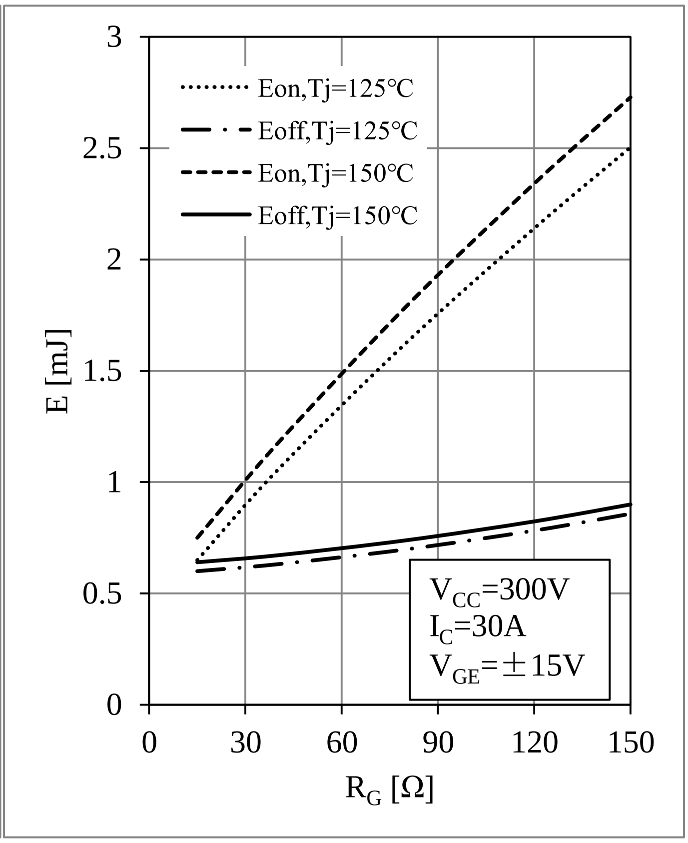


Fig 4. IGBT-inverter Switching Loss vs. R_G

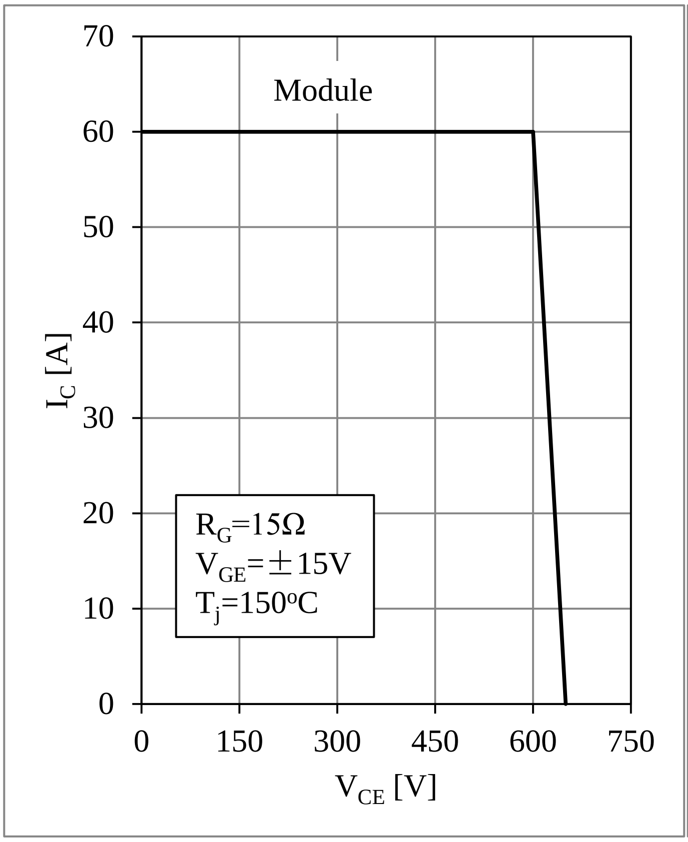


Fig 5. IGBT-inverter RBSOA

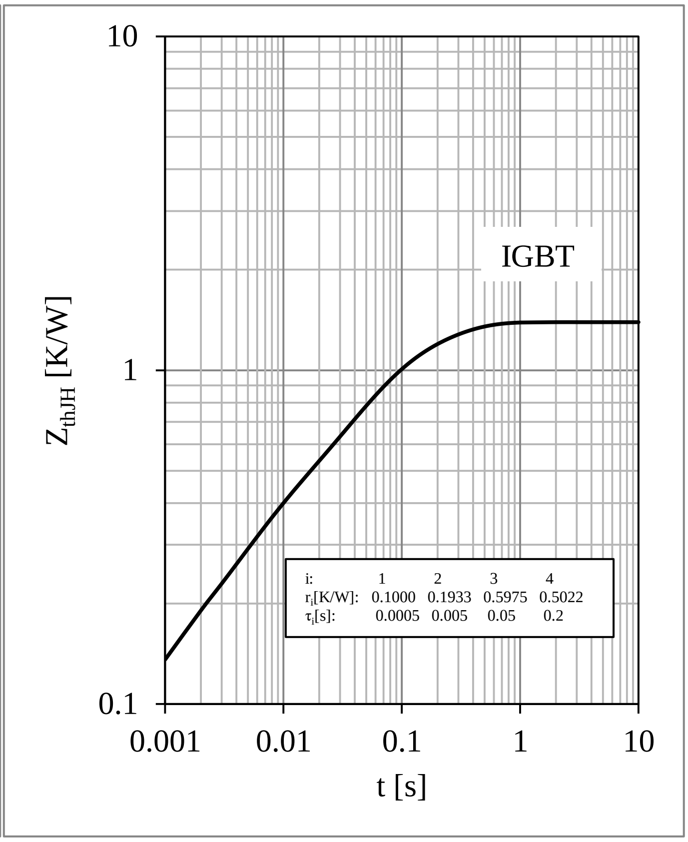


Fig 6. IGBT-inverter Transient Thermal Impedance

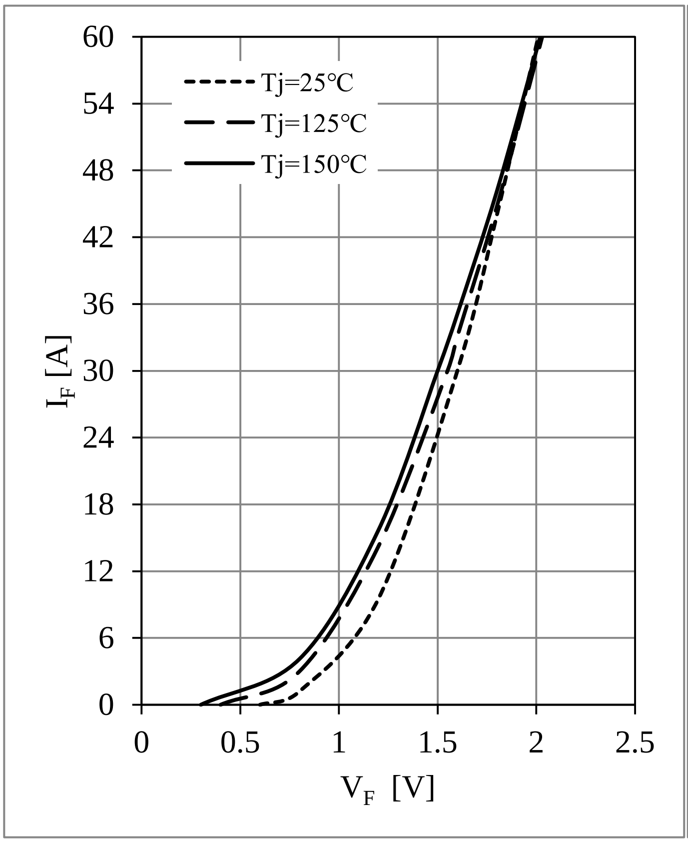


Fig 7. Diode-inverter Forward Characteristics

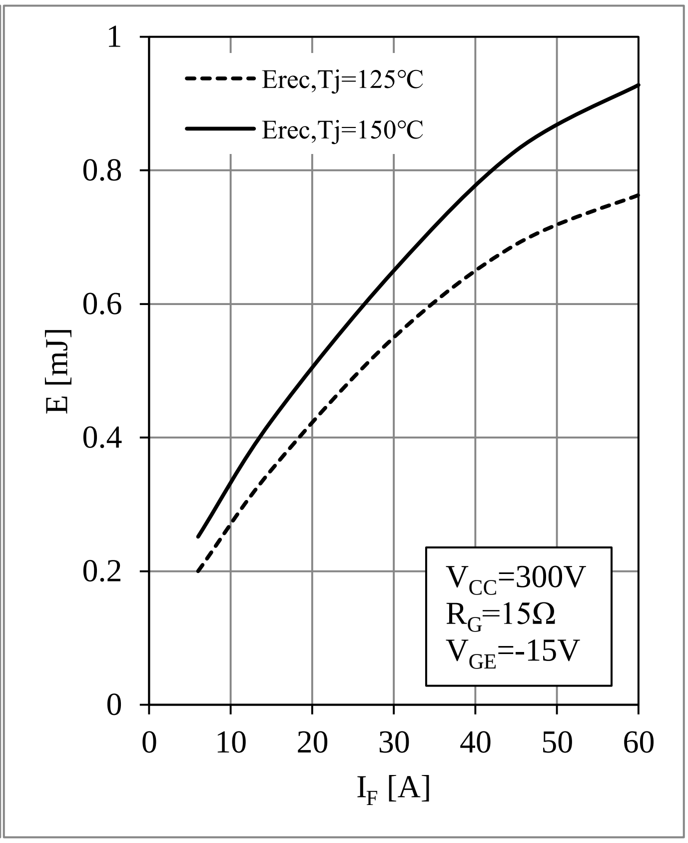


Fig 8. Diode-inverter Switching Loss vs. I_F

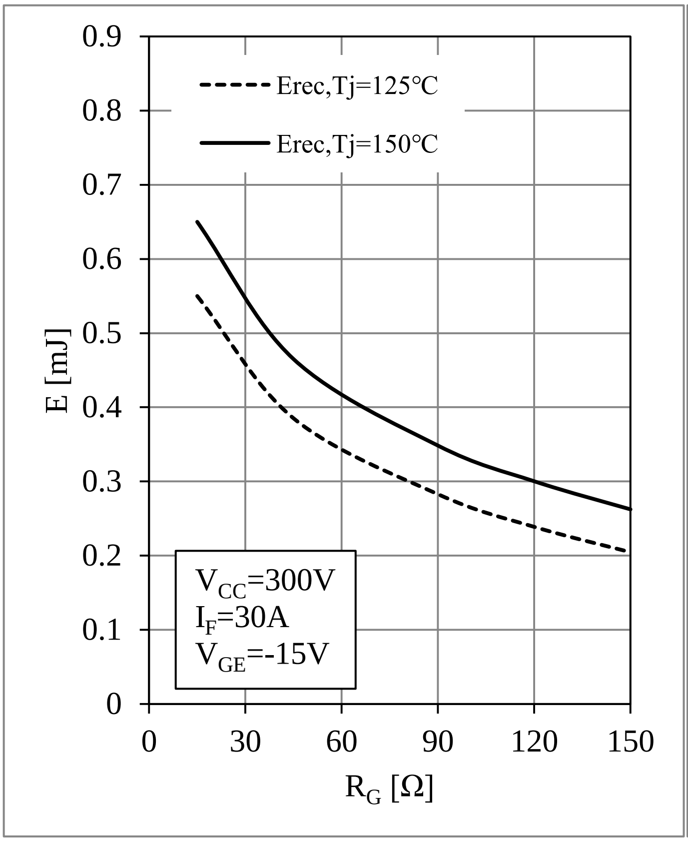


Fig 9. Diode-inverter Switching Loss vs. R_G

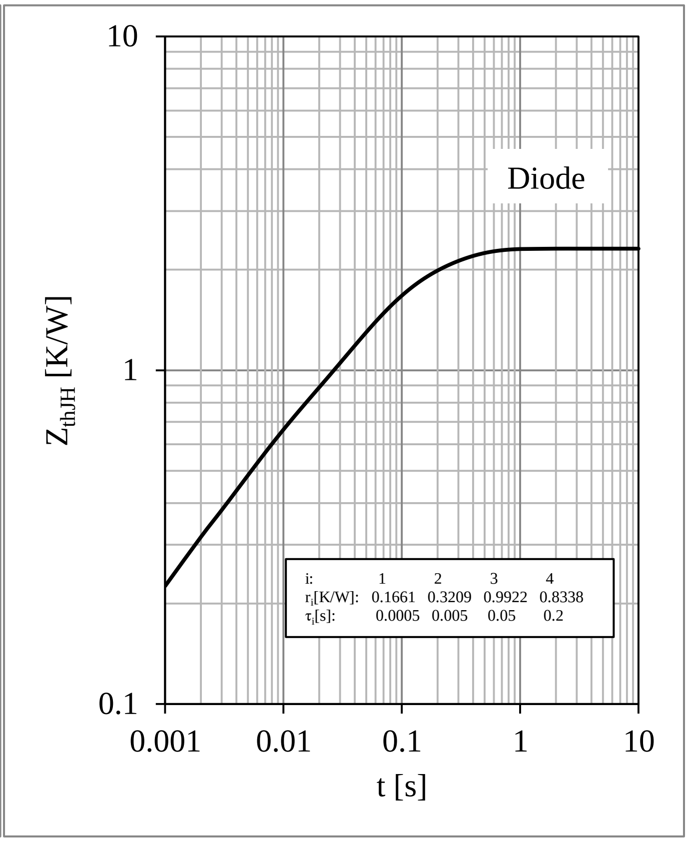


Fig 10. Diode-inverter Transient Thermal Impedance

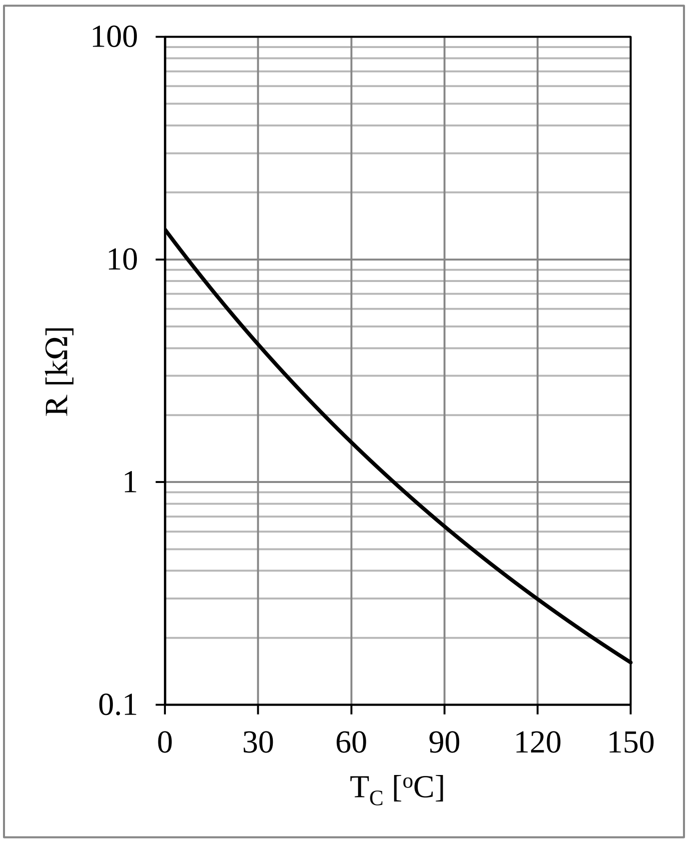
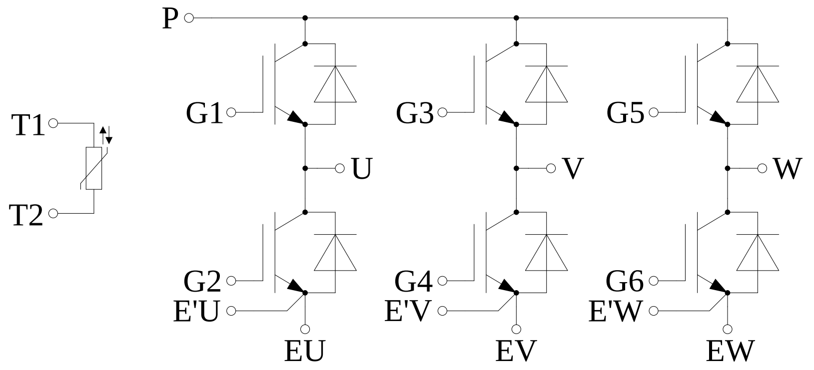


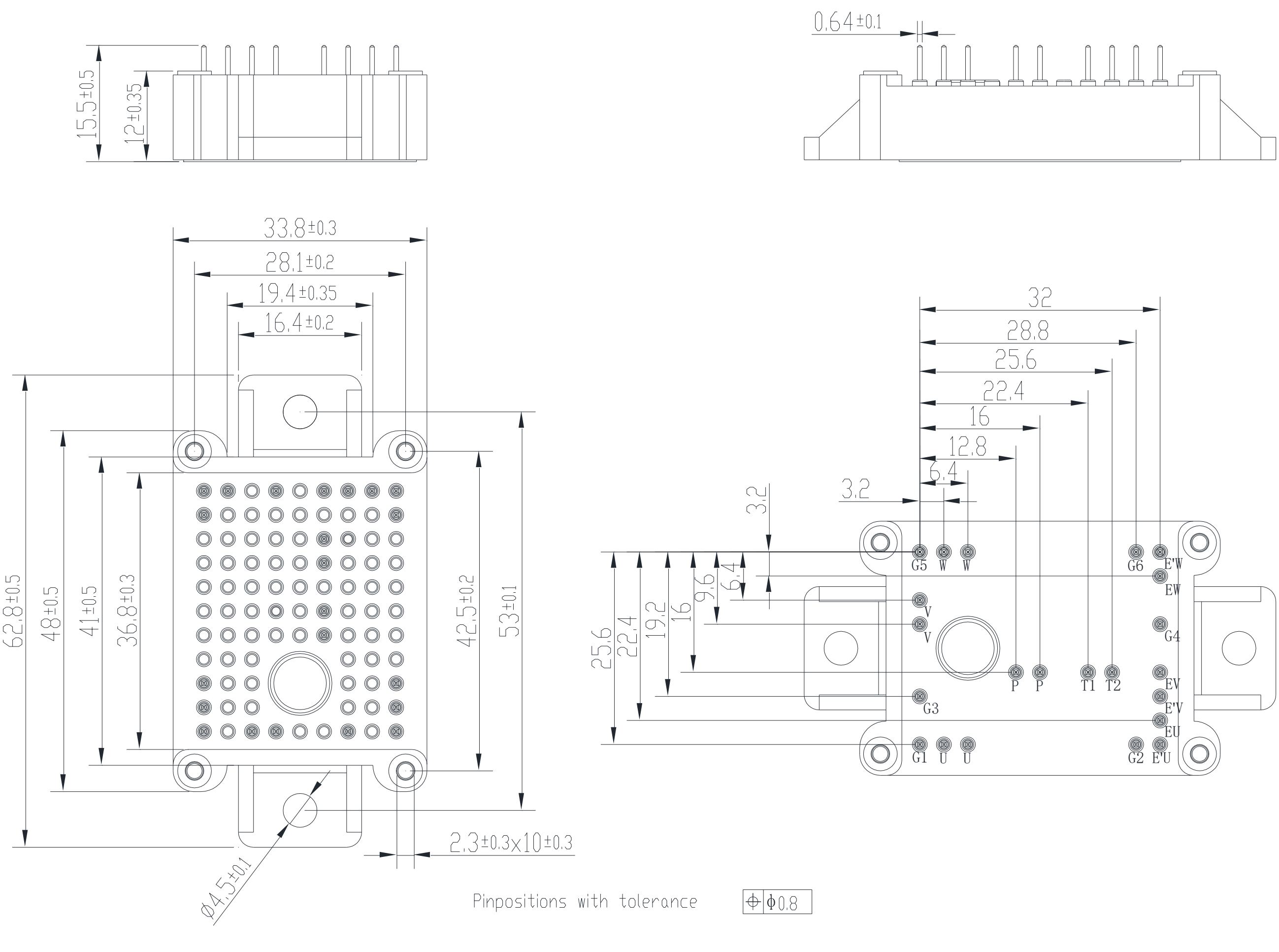
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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