STARPOWER

SEMICONDUCTOR **IGBT**

GD15FSX65L4SN

650V/15A 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.

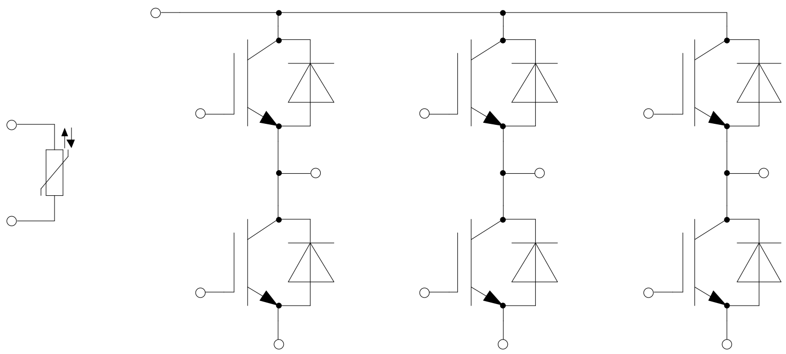
Features

- 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

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	30 15	A
I_{CM}	Pulsed Collector Current t_p=1ms	30	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	98	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	30	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	175	°C
T_{vjop}	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 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=15A,V_{GE}=15V, T_{vj}=25°C		1.45	1.90	V
		I_C=15A,V_{GE}=15V, T_{vj}=125°C		1.60		
		I_C=15A,V_{GE}=15V, T_{vj}=150°C		1.70		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.24mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.1	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_{vj}=25°C			400	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		1.74		nF
C_{res}	Reverse Transfer Capacitance			0.03		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.10		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=15A, R_G=22Ω,V_{GE}=±15V, Ls=45nH,T_{vj}=25°C		17		ns
t_r	Rise Time			16		ns
$t_{d(off)}$	Turn-Off Delay Time			67		ns
t_f	Fall Time			149		ns
E_{on}	Turn-On Switching Loss			0.22		mJ
E_{off}	Turn-Off Switching Loss			0.25		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=15A, R_G=22Ω,V_{GE}=±15V, Ls=45nH,T_{vj}=125°C		15		ns
t_r	Rise Time			17		ns
$t_{d(off)}$	Turn-Off Delay Time			79		ns
t_f	Fall Time			153		ns
E_{on}	Turn-On Switching Loss			0.28		mJ
E_{off}	Turn-Off Switching Loss			0.33		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=15A, R_G=22Ω,V_{GE}=±15V, Ls=45nH,T_{vj}=150°C		15		ns
t_r	Rise Time			18		ns
$t_{d(off)}$	Turn-Off Delay Time			81		ns
t_f	Fall Time			185		ns
E_{on}	Turn-On Switching Loss			0.30		mJ
E_{off}	Turn-Off Switching Loss			0.34		mJ
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_{vj}=150°C,V_{CC}=360V, V_{CEM}≤650V		75		A

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_C=15A,V_{GE}=0V,T_{vj}=25°C		1.60	2.05	V
		I_C=15A,V_{GE}=0V,T_{vj}=125°C		1.65		
		I_C=15A,V_{GE}=0V,T_{vj}=150°C		1.65		
Q_r	Recovered Charge	V_R=300V,I_F=15A, -di/dt=1000A/μs,V_{GE}=-15V Ls=45nH,T_{vj}=25°C		0.37		μC
I_{RM}	Peak Reverse Recovery Current			13		A
E_{rec}	Reverse Recovery Energy			0.05		mJ
Q_r	Recovered Charge	V_R=300V,I_F=15A, -di/dt=900A/μs,V_{GE}=-15V Ls=45nH,T_{vj}=125°C		0.67		μC
I_{RM}	Peak Reverse Recovery Current			14		A
E_{rec}	Reverse Recovery Energy			0.11		mJ
Q_r	Recovered Charge	V_R=300V,I_F=15A, -di/dt=860A/μs,V_{GE}=-15V Ls=45nH,T_{vj}=150°C		0.73		μC
I_{RM}	Peak Reverse Recovery Current			14		A
E_{rec}	Reverse Recovery Energy			0.12		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		9.50		mΩ
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter)		1.383 2.221	1.521 2.443	K/W
R_{thCH}	Case-to-Heatsink (per IGBT-inverter) Case-to-Heatsink (per Diode-inverter) Case-to-Heatsink (per Module)		0.750 1.204 0.077		K/W
F	Mounting Force Per Clamp	30		50	N
G	Weight of Module		10		g

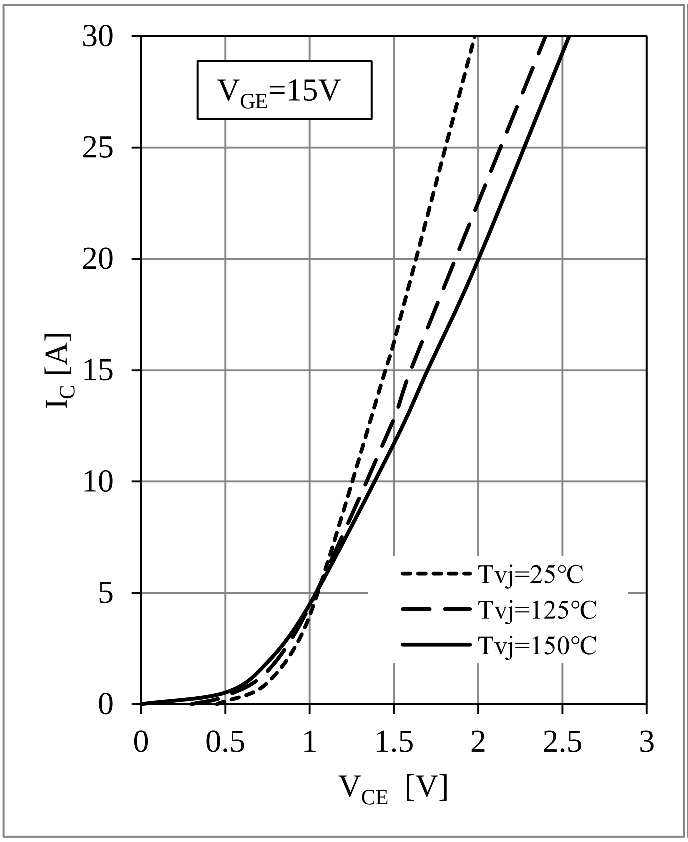


Fig 1. IGBT Output Characteristics

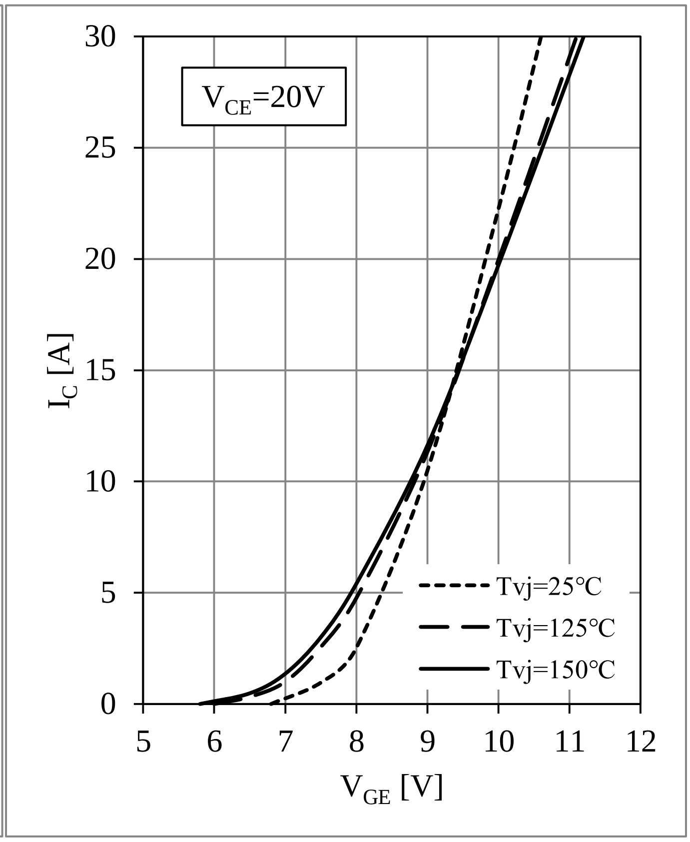


Fig 2. IGBT Transfer Characteristics

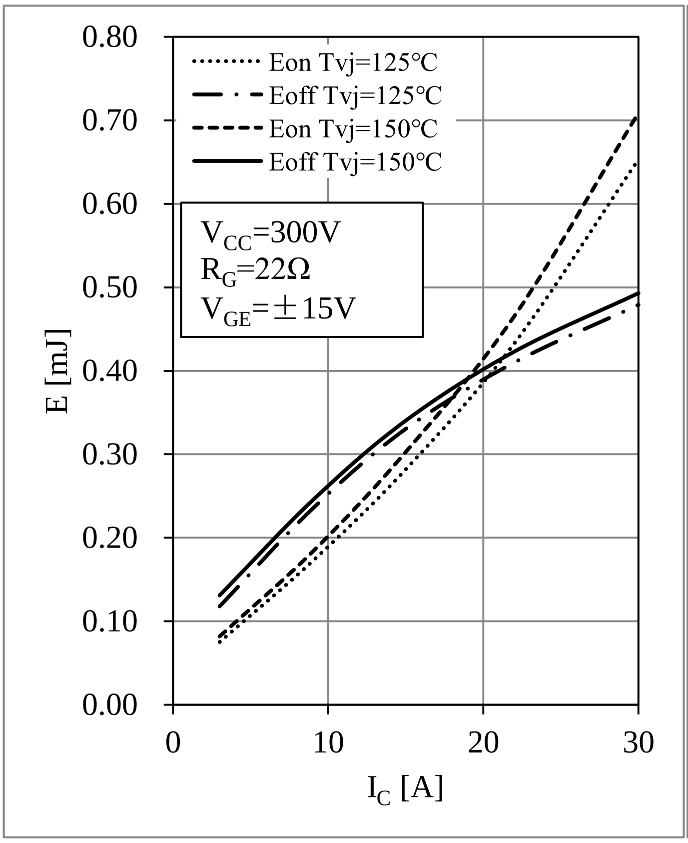


Fig 3. IGBT Switching Loss vs. I_C

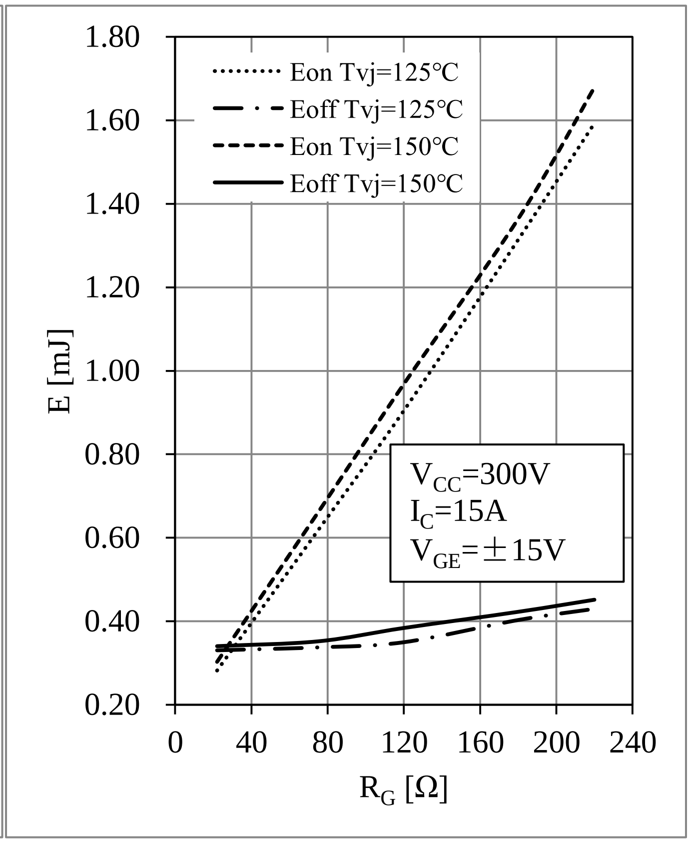


Fig 4. IGBT Switching Loss vs. R_G

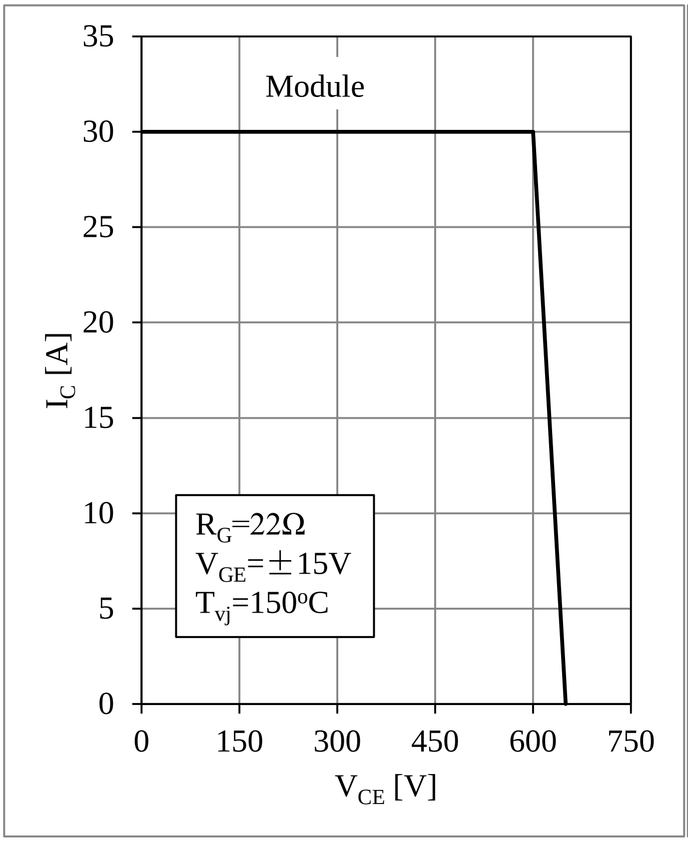


Fig 5. RBSOA

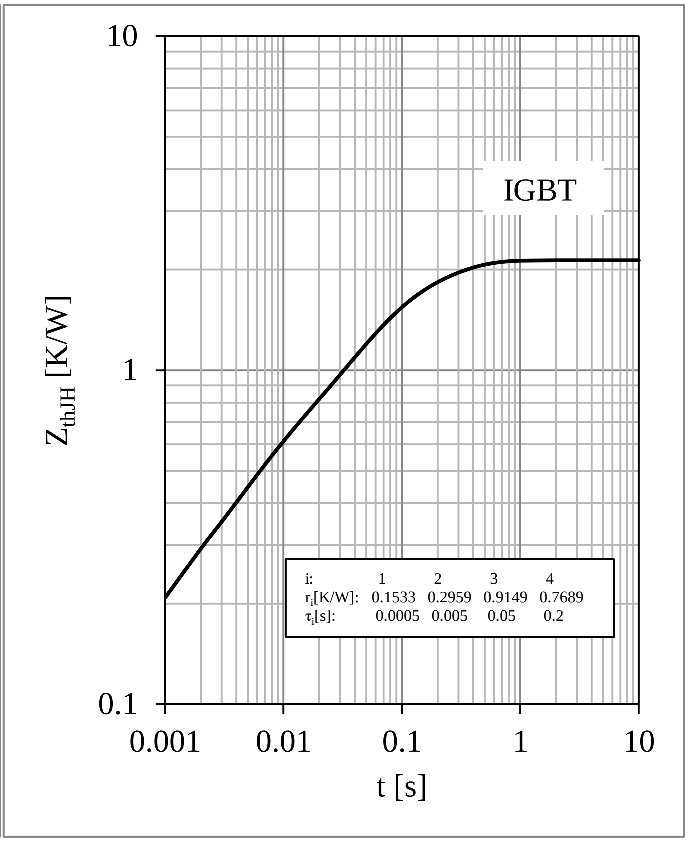


Fig 6. IGBT Transient Thermal Impedance

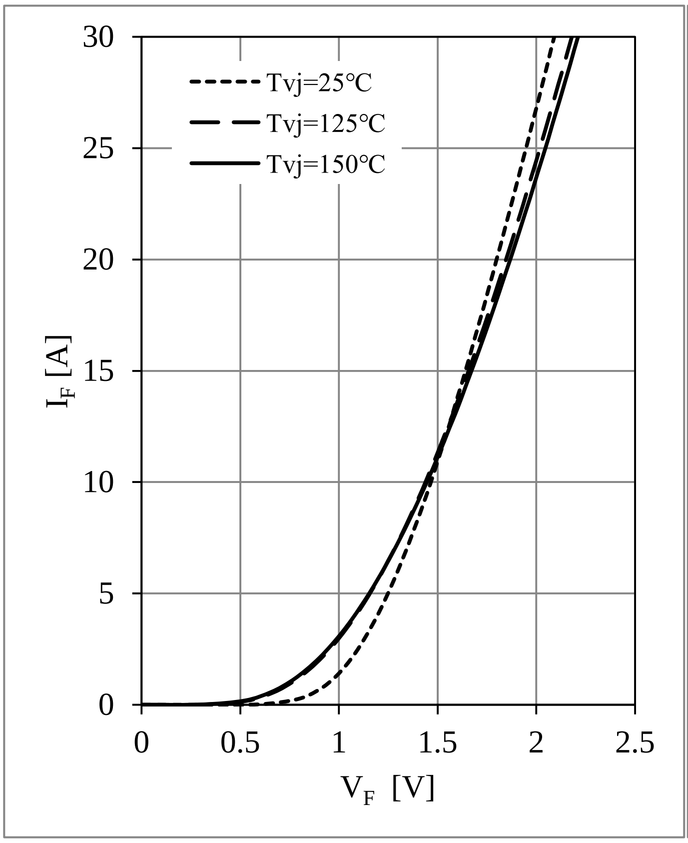


Fig 7. Diode Forward Characteristics

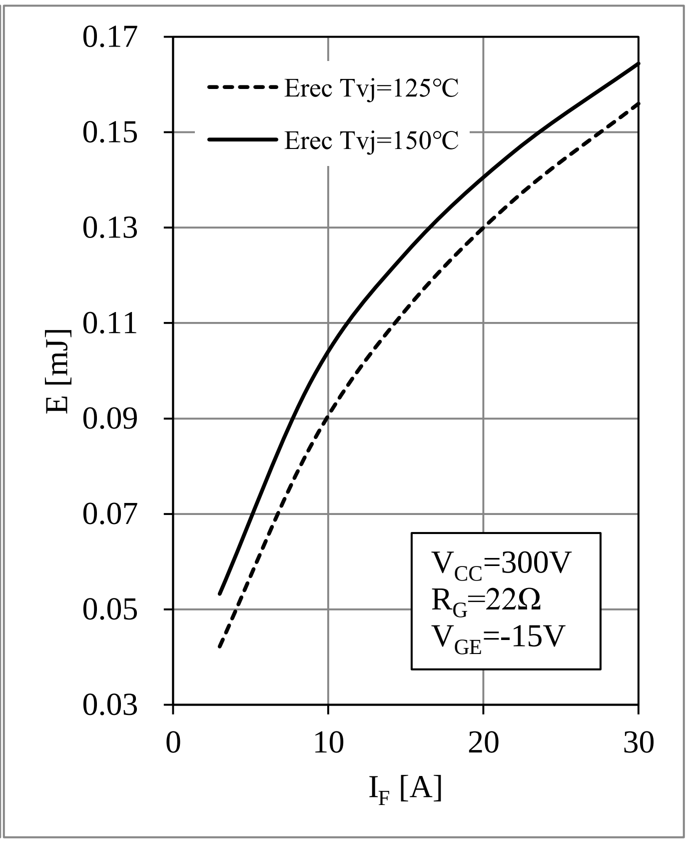


Fig 8. Diode Switching Loss vs.I_F

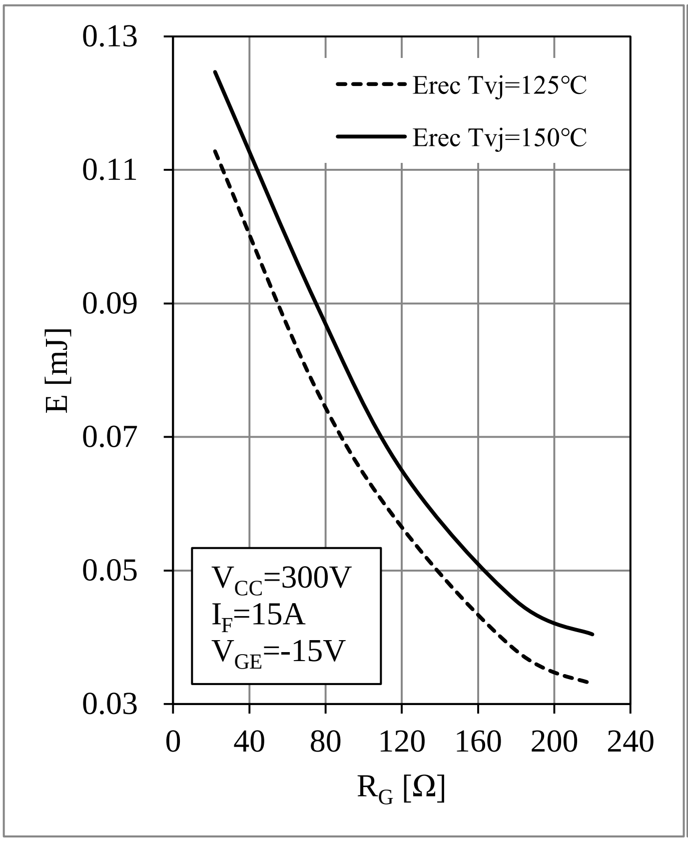


Fig 9. Diode Switching Loss vs. R_G

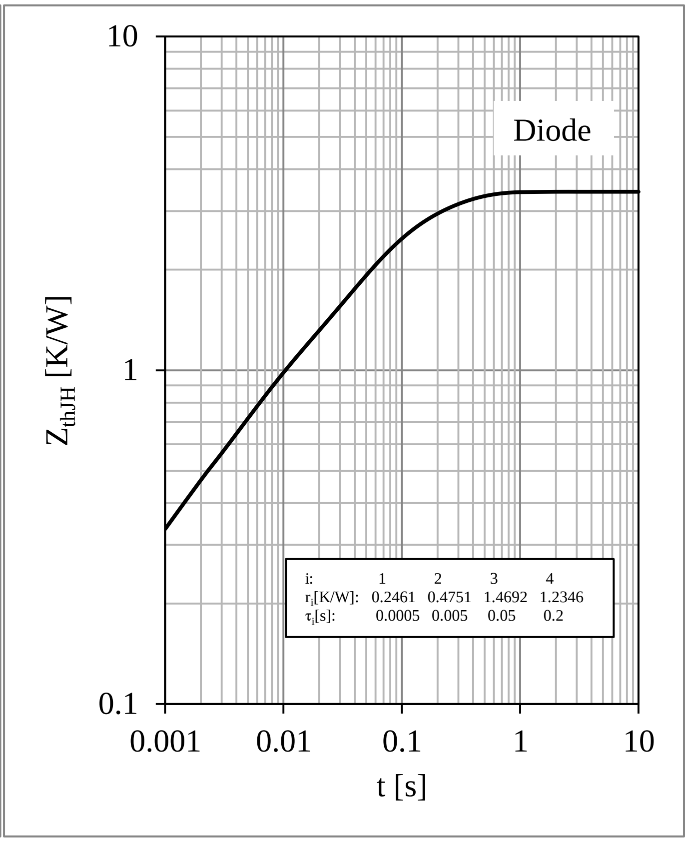


Fig 10. Diode Transient Thermal Impedance

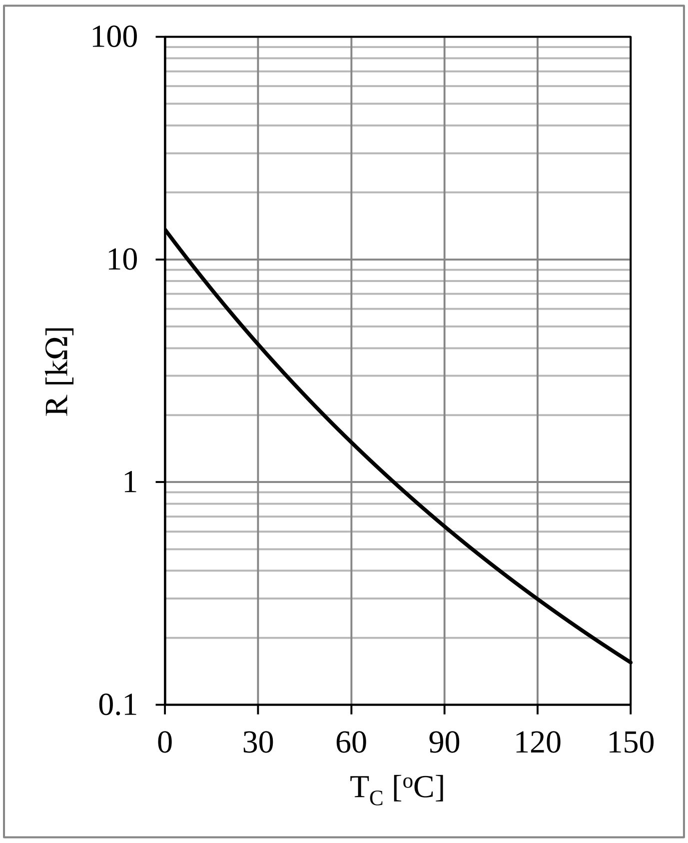
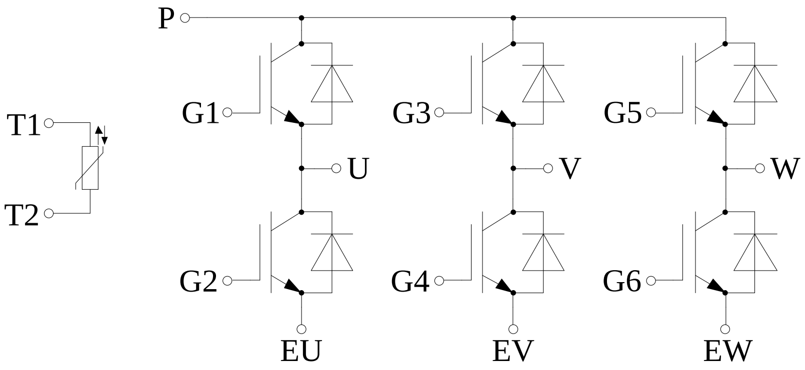


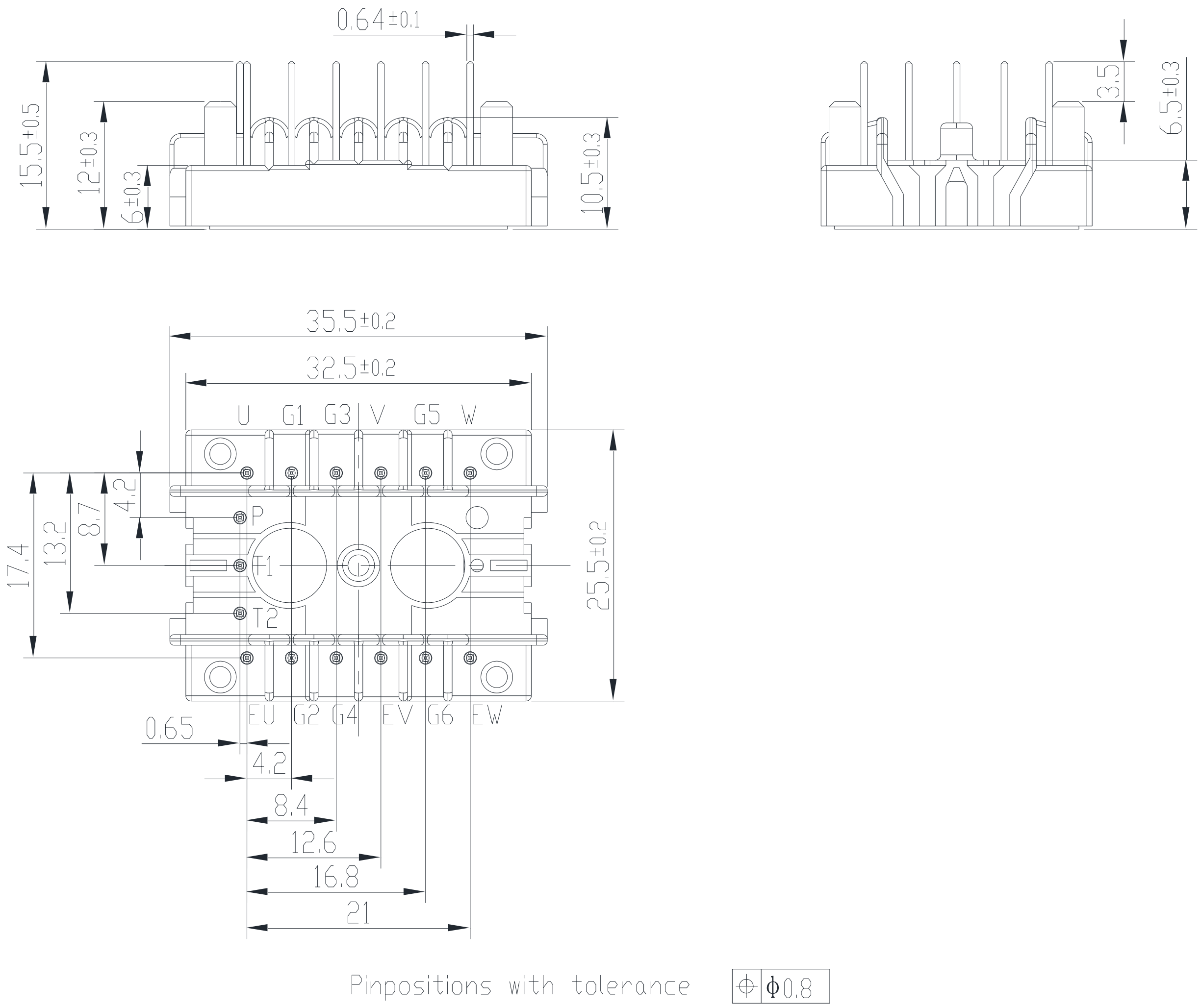
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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