STARPOWER

SEMICONDUCTOR **IGBT**

GD300MNY120C6S

1200V/300A 2 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-applications.

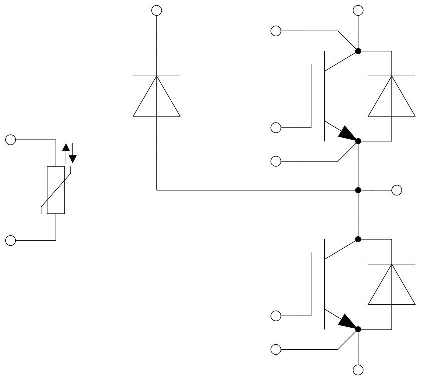
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs 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 copper baseplate using DBC technology

Typical Applications

- Solar power
- UPS
- 3-level-applications

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT-inverter

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	480 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_D	Maximum Power Dissipation @ T_j=175°C	1613	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	600	A

Diode-3-level

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	600	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=300A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=300A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=300A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=7.50mA,V_{CE}=V_{GE}, T_j=25°C	5.2	6.0	6.8	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			2.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		21.0		nF
C_{res}	Reverse Transfer Capacitance			1.20		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		2.60		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=1.5Ω,V_{GE}=±15V, T_j=25°C		313		ns
t_r	Rise Time			57		ns
$t_{d(off)}$	Turn-Off Delay Time			464		ns
t_f	Fall Time			206		ns
E_{on}	Turn-On Switching Loss			9.97		mJ
E_{off}	Turn-Off Switching Loss			28.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=1.5Ω,V_{GE}=±15V, T_j=125°C		336		ns
t_r	Rise Time			66		ns
$t_{d(off)}$	Turn-Off Delay Time			528		ns
t_f	Fall Time			299		ns
E_{on}	Turn-On Switching Loss			21.1		mJ
E_{off}	Turn-Off Switching Loss			36.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=1.5Ω,V_{GE}=±15V, T_j=150°C		345		ns
t_r	Rise Time			68		ns
$t_{d(off)}$	Turn-Off Delay Time			539		ns
t_f	Fall Time			309		ns
E_{on}	Turn-On Switching Loss			25.6		mJ
E_{off}	Turn-Off Switching Loss			37.8		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		1200		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=300A,V_{GE}=0V,T_j=25°C		1.90	2.35	V
		I_F=300A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=300A,V_{GE}=0V,T_j=150°C		1.90		
Q_r	Recovered Charge	V_{CC}=600V,I_F=300A, -di/dt=6050A/μs,V_{GE}=-15V, T_j=25°C		15.5		μC
I_{RM}	Peak Reverse Recovery Current			223		A
E_{rec}	Reverse Recovery Energy			8.0		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=300A, -di/dt=6050A/μs,V_{GE}=-15V, T_j=125°C		31.5		μC
I_{RM}	Peak Reverse Recovery Current			290		A
E_{rec}	Reverse Recovery Energy			13.6		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=300A, -di/dt=6050A/μs,V_{GE}=-15V, T_j=150°C		41.2		μC
I_{RM}	Peak Reverse Recovery Current			305		A
E_{rec}	Reverse Recovery Energy			17.2		mJ

Diode-3-level Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=300A,V_{GE}=0V,T_j=25°C		1.90	2.35	V
		I_F=300A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=300A,V_{GE}=0V,T_j=150°C		1.90		
Q_r	Recovered Charge	V_{CC}=600V,I_F=300A, -di/dt=6050A/μs,V_{GE}=-15V, T_j=25°C		15.5		μC
I_{RM}	Peak Reverse Recovery Current			223		A
E_{rec}	Reverse Recovery Energy			8.0		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=300A, -di/dt=6050A/μs,V_{GE}=-15V, T_j=125°C		31.5		μC
I_{RM}	Peak Reverse Recovery Current			290		A
E_{rec}	Reverse Recovery Energy			13.6		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=300A, -di/dt=6050A/μs,V_{GE}=-15V, T_j=150°C		41.2		μC
I_{RM}	Peak Reverse Recovery Current			305		A
E_{rec}	Reverse Recovery Energy			17.2		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

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		35		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		1.45		mΩ
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-3-level)			0.093 0.135 0.135	K/W
R_{thCH}	Case-to-Sink (per IGBT-inverter) Case-to-Sink (per Diode-inverter) Case-to-Sink (per Diode-3-level) Case-to-Heatsink (per Module)		0.037 0.053 0.053 0.009		K/W
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M5	3.0 3.0		6.0 6.0	N.m
G	Weight of Module		350		g

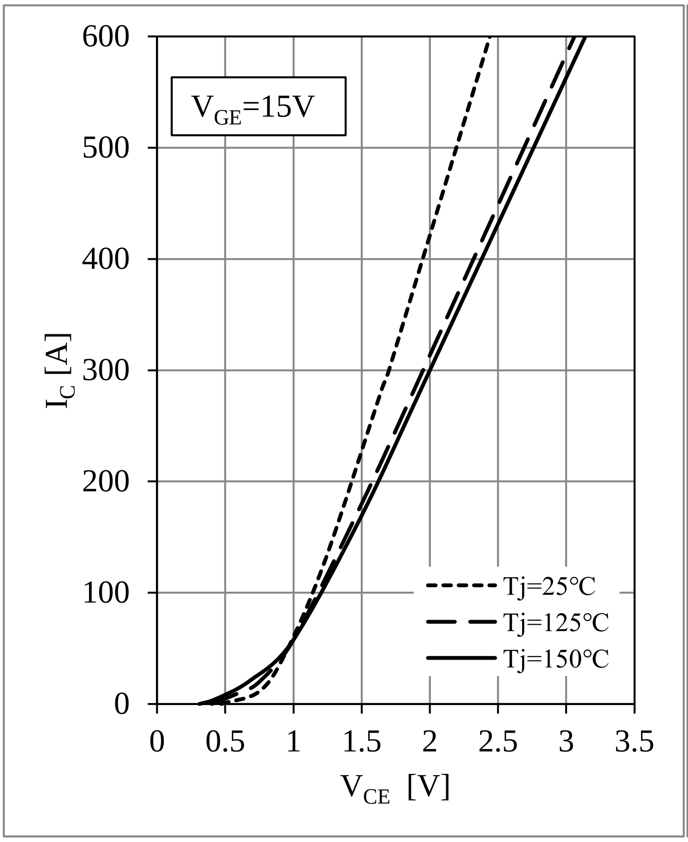


Fig 1. IGBT-inverter Output Characteristics

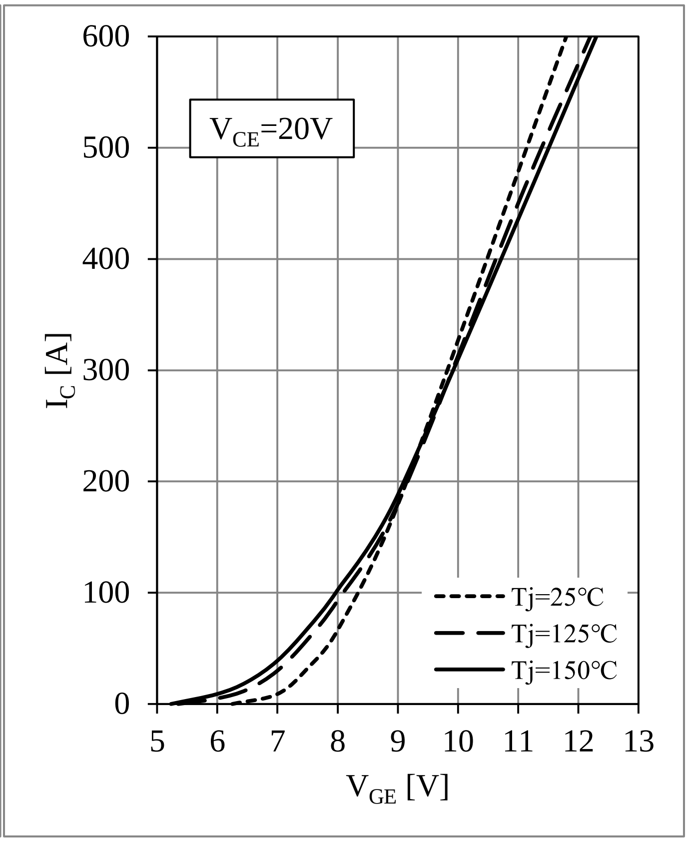


Fig 2. IGBT-inverter Transfer Characteristics

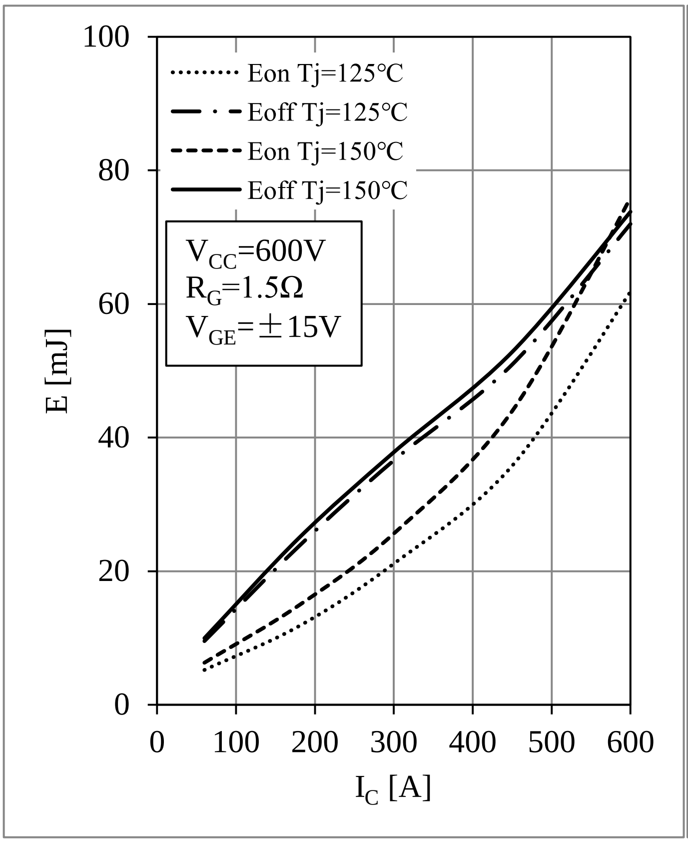


Fig 3. IGBT-inverter Switching Loss vs. I_C

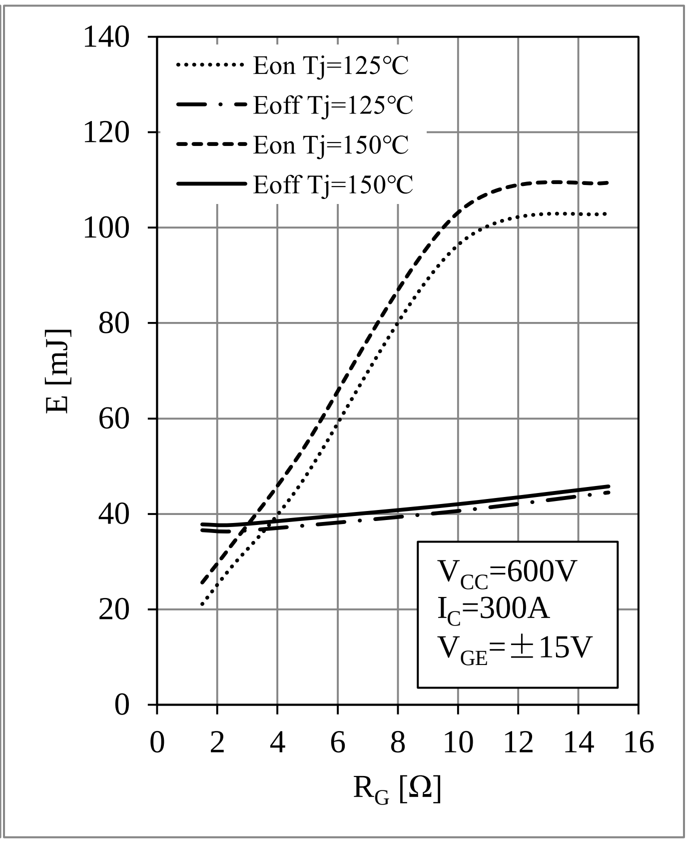


Fig 4. IGBT-inverter Switching Loss vs. R_G

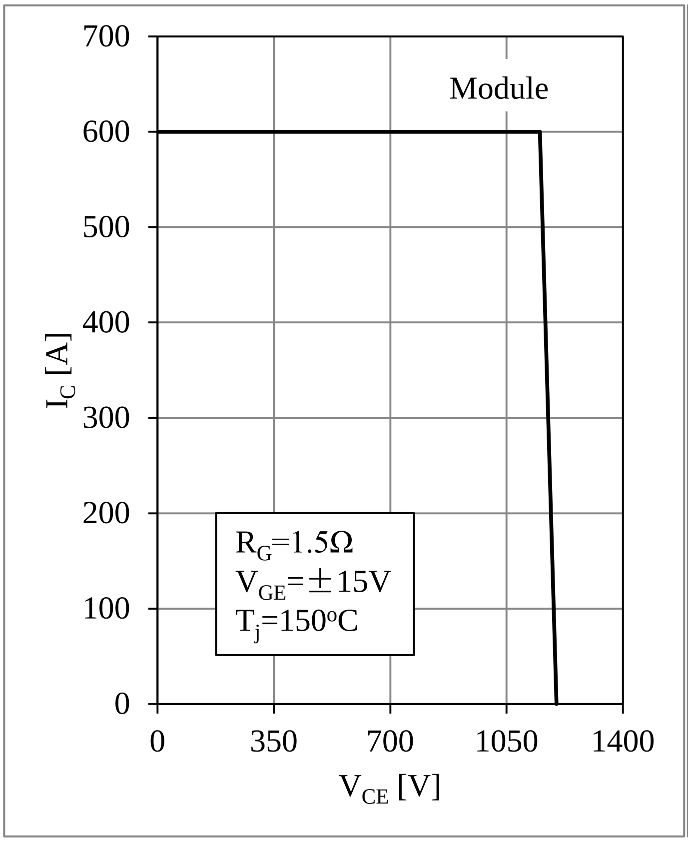


Fig 5. IGBT-inverter RBSOA

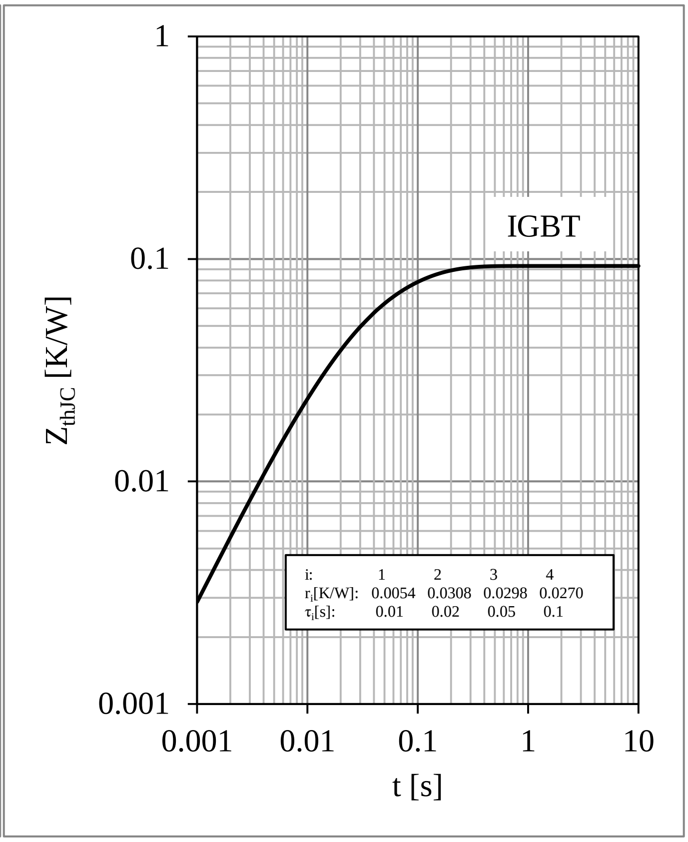


Fig 6. IGBT-inverter Transient Thermal Impedance

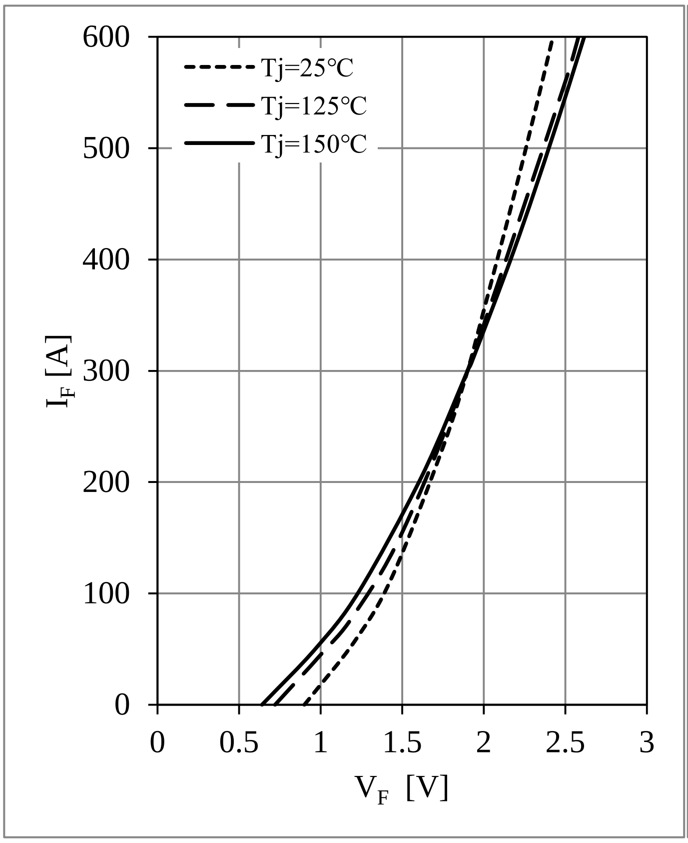


Fig 7. Diode-inverter Forward Characteristics

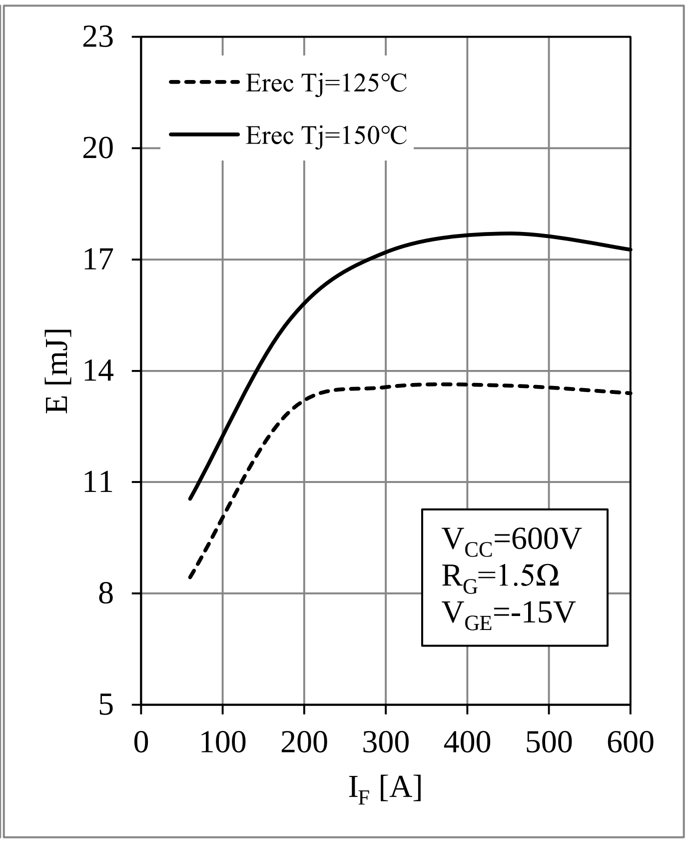


Fig 8. Diode-inverter Switching Loss vs. I_F

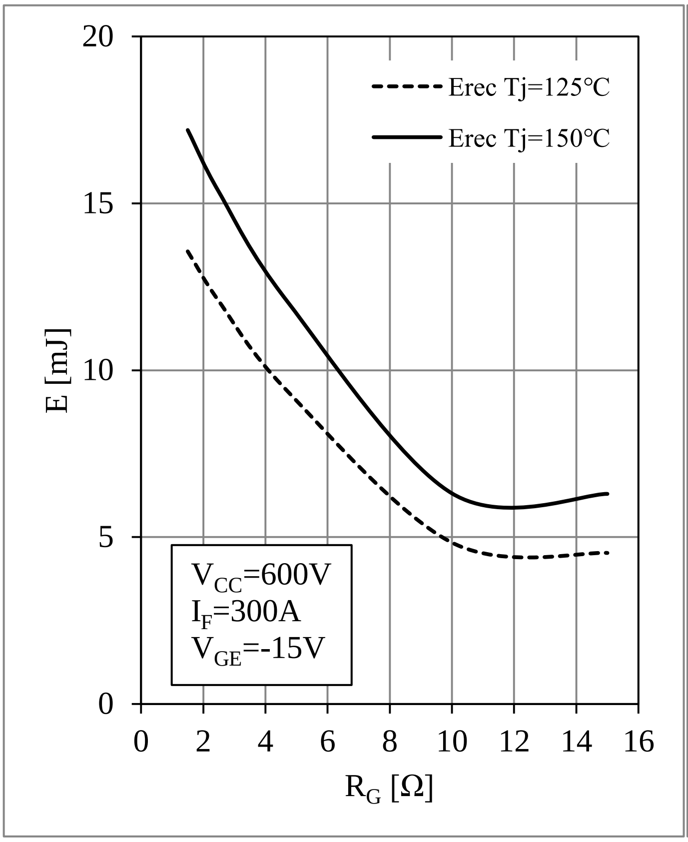


Fig 9. Diode-inverter Switching Loss vs. R_G

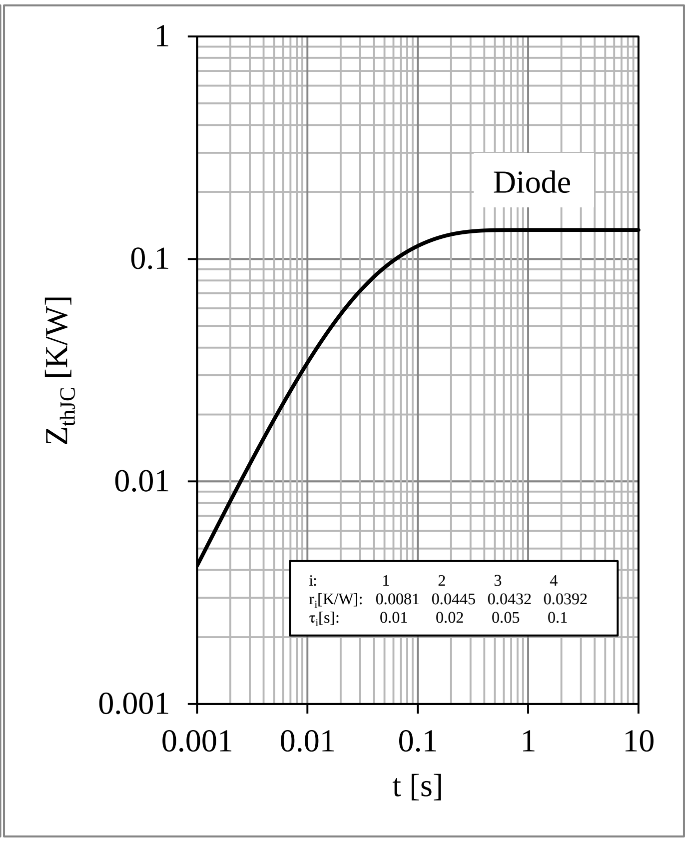


Fig 10. Diode-inverter Transient Thermal Impedance

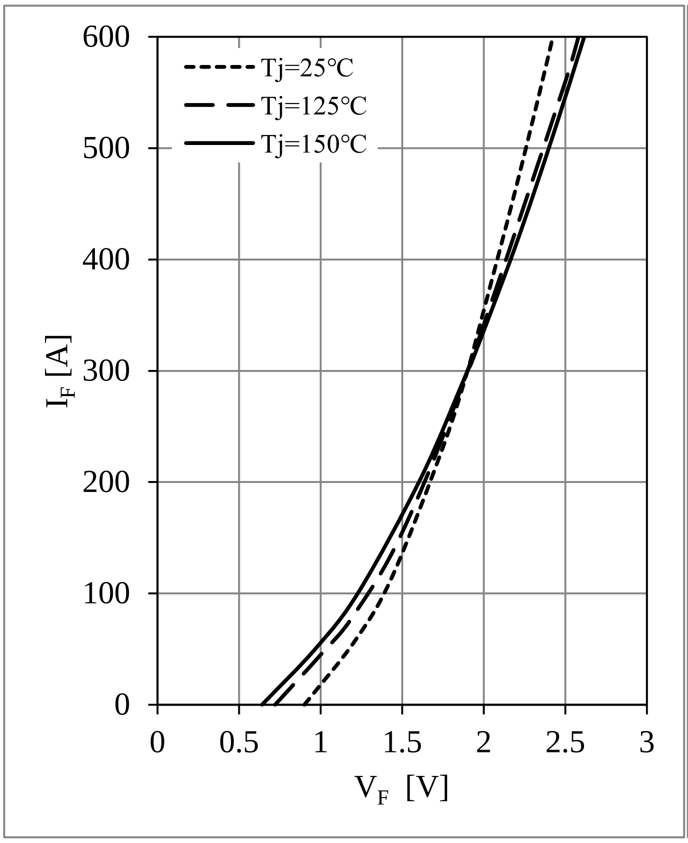


Fig 11. Diode-3-level Forward Characteristics

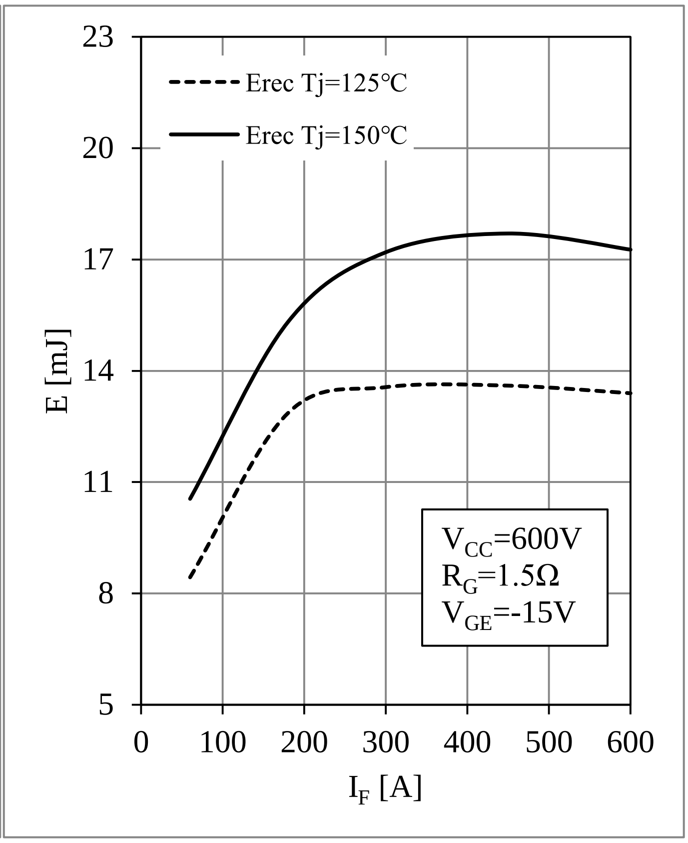


Fig 12. Diode-3-level Switching Loss vs. I_F

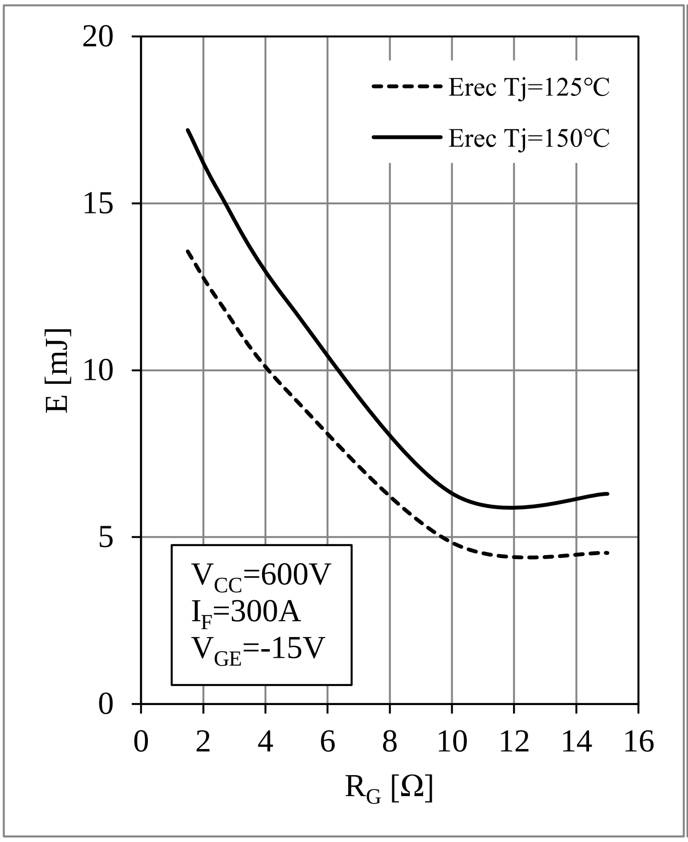


Fig 13. Diode-3-level Switching Loss vs. R_G

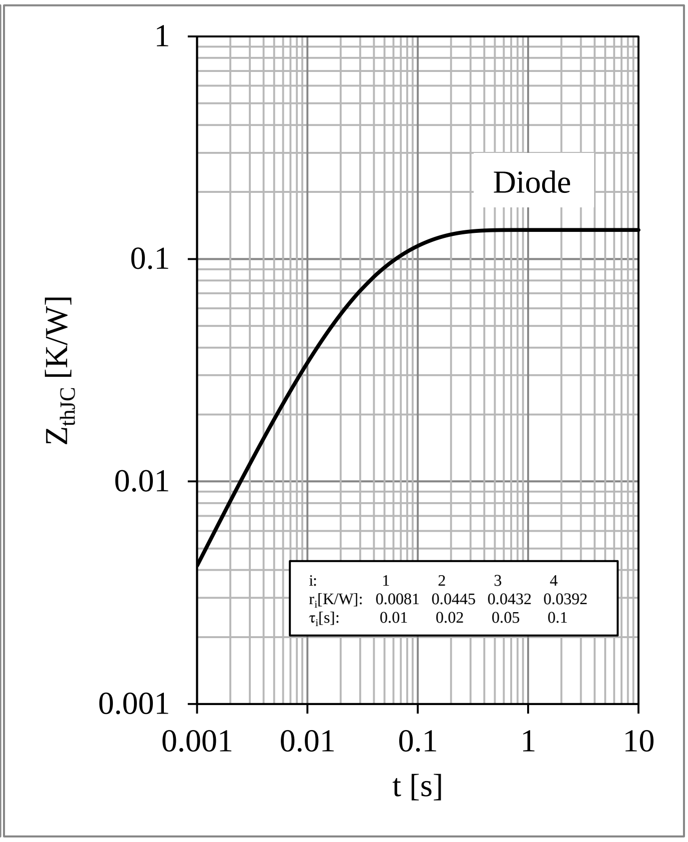


Fig 14. Diode-3-level Transient Thermal Impedance

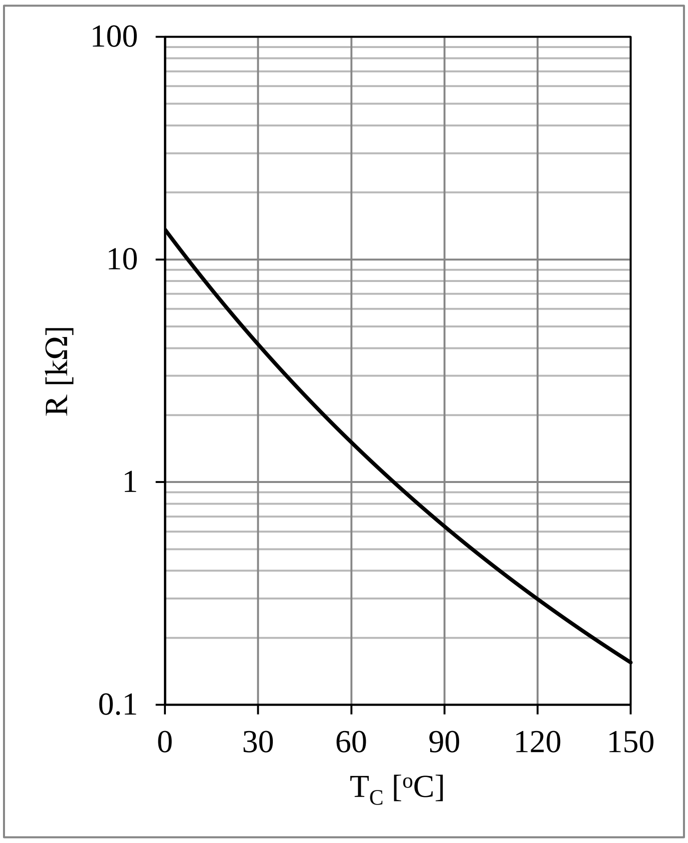
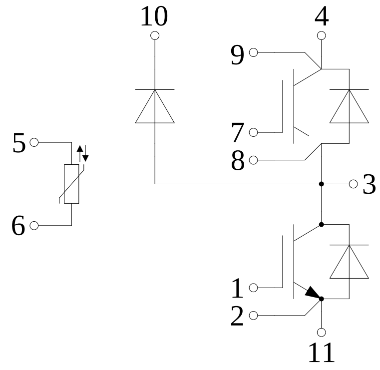


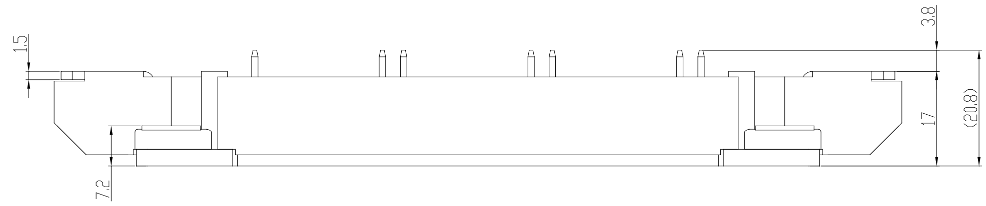
Fig 15. NTC Temperature Characteristic

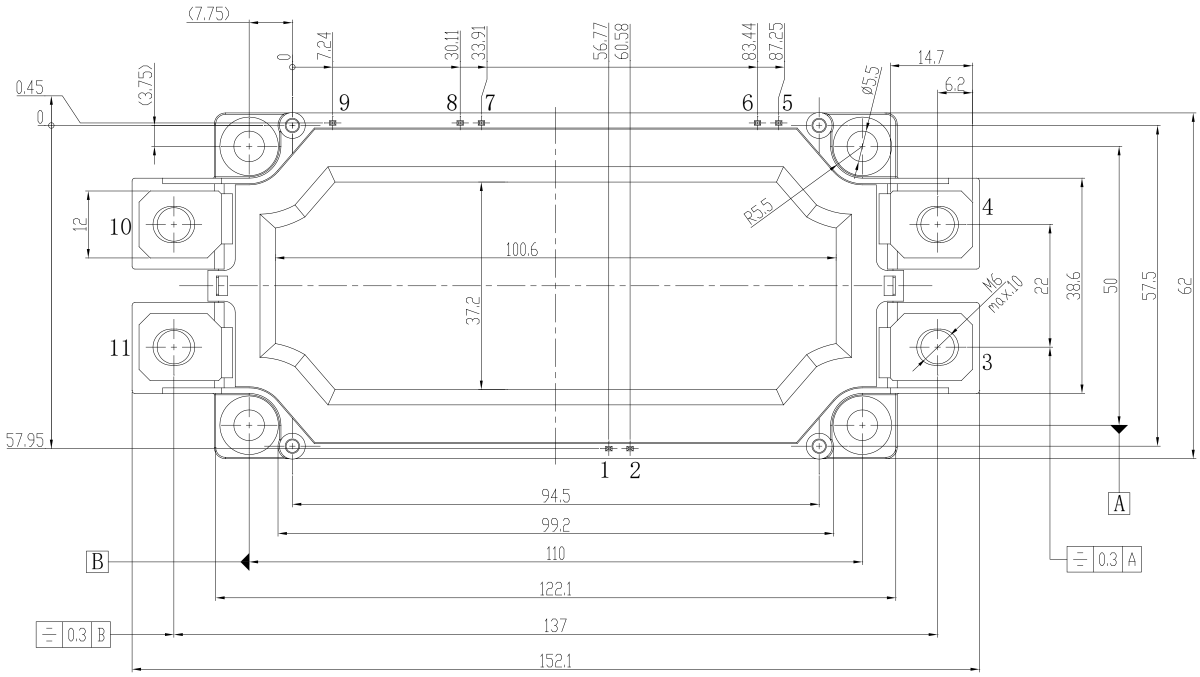
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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