STARPOWER

SEMICONDUCTOR **IGBT**

GD150CKY120C2S

1200V/150A 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 general inverter and UPS.

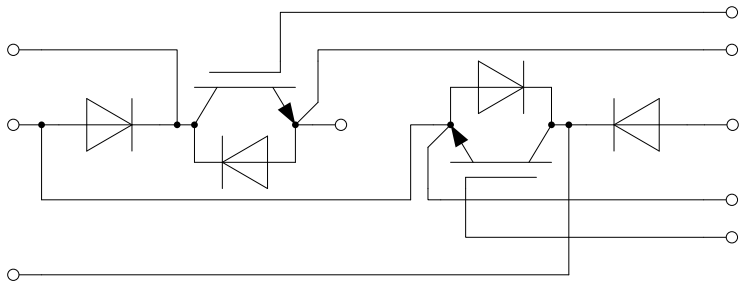
Features

- 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

- 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	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	291 150	A
I_{CM}	Pulsed Collector Current t_p=1ms	300	A
P_D	Maximum Power Dissipation @ T_j=175°C	1102	W

Diode-parallel

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	30	A

Diode-series

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	200	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	400	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	4000	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=150A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=150A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=150A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.75mA,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		15.5		nF
C_{res}	Reverse Transfer Capacitance			0.44		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		1.17		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=1.1Ω,V_{GE}=±15V, T_j=25°C		123		ns
t_r	Rise Time			27		ns
$t_{d(off)}$	Turn-Off Delay Time			407		ns
t_f	Fall Time			66		ns
E_{on}	Turn-On Switching Loss			5.35		mJ
E_{off}	Turn-Off Switching Loss			11.0		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=1.1Ω,V_{GE}=±15V, T_j=125°C		139		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn-Off Delay Time			495		ns
t_f	Fall Time			116		ns
E_{on}	Turn-On Switching Loss			9.63		mJ
E_{off}	Turn-Off Switching Loss			16.5		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=1.1Ω,V_{GE}=±15V, T_j=150°C		144		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn-Off Delay Time			528		ns
t_f	Fall Time			138		ns
E_{on}	Turn-On Switching Loss			10.7		mJ
E_{off}	Turn-Off Switching Loss			17.6		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		600		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=15A,V_{GE}=0V,T_j=25°C		1.90	2.35	V
		I_F=15A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=15A,V_{GE}=0V,T_j=150°C		1.90		
Q_r	Recovered Charge	V_{CC}=600V,I_F=15A, -di/dt=250A/μs,V_{GE}=-15V, T_j=25°C		0.6		μC
I_{RM}	Peak Reverse Recovery Current			9.0		A
E_{rec}	Reverse Recovery Energy			0.15		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=15A, -di/dt=250A/μs,V_{GE}=-15V, T_j=125°C		1.3		μC
I_{RM}	Peak Reverse Recovery Current			10.5		A
E_{rec}	Reverse Recovery Energy			0.35		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=15A, -di/dt=250A/μs,V_{GE}=-15V, T_j=150°C		1.35		μC
I_{RM}	Peak Reverse Recovery Current			12.1		A
E_{rec}	Reverse Recovery Energy			0.39		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=200A,V_{GE}=0V,T_j=25°C		1.90	2.25	V
		I_F=200A,V_{GE}=0V,T_j=125°C		1.85		
		I_F=200A,V_{GE}=0V,T_j=150°C		1.80		
Q_r	Recovered Charge	V_{CC}=600V,I_F=200A, -di/dt=4000A/μs,V_{GE}=-15V, T_j=25°C		20.0		μC
I_{RM}	Peak Reverse Recovery Current			230		A
E_{rec}	Reverse Recovery Energy			9.0		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=200A, -di/dt=4000A/μs,V_{GE}=-15V, T_j=125°C		32.0		μC
I_{RM}	Peak Reverse Recovery Current			250		A
E_{rec}	Reverse Recovery Energy			16.0		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=200A, -di/dt=4000A/μs,V_{GE}=-15V, T_j=150°C		45.0		μC
I_{RM}	Peak Reverse Recovery Current			260		A
E_{rec}	Reverse Recovery Energy			17.5		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode-parallel) Junction-to-Case (per Diode-series)			0.136 1.860 0.237	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode-parallel) Case-to-Heatsink (per Diode-series) Case-to-Heatsink (per Module)		0.033 0.450 0.057 0.010		K/W
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M6	2.5 3.0		5.0 5.0	N.m
G	Weight of Module		300		g

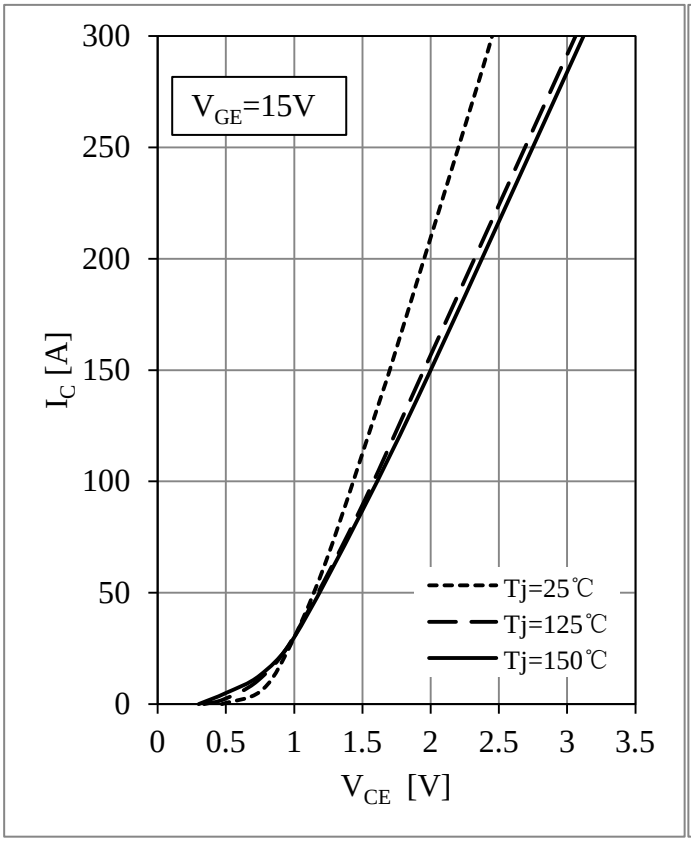


Fig 1. IGBT Output Characteristics

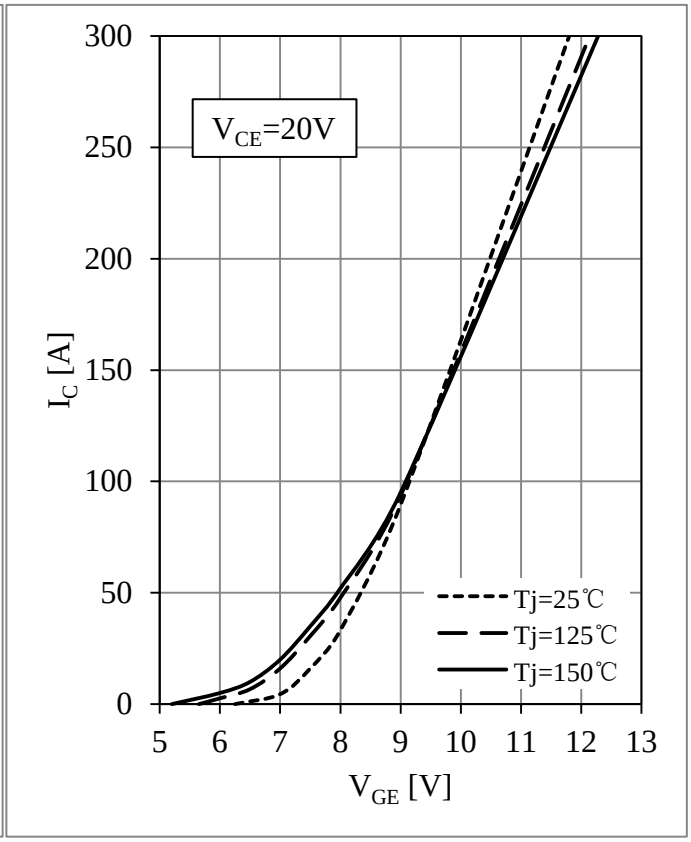


Fig 2. IGBT Transfer Characteristics

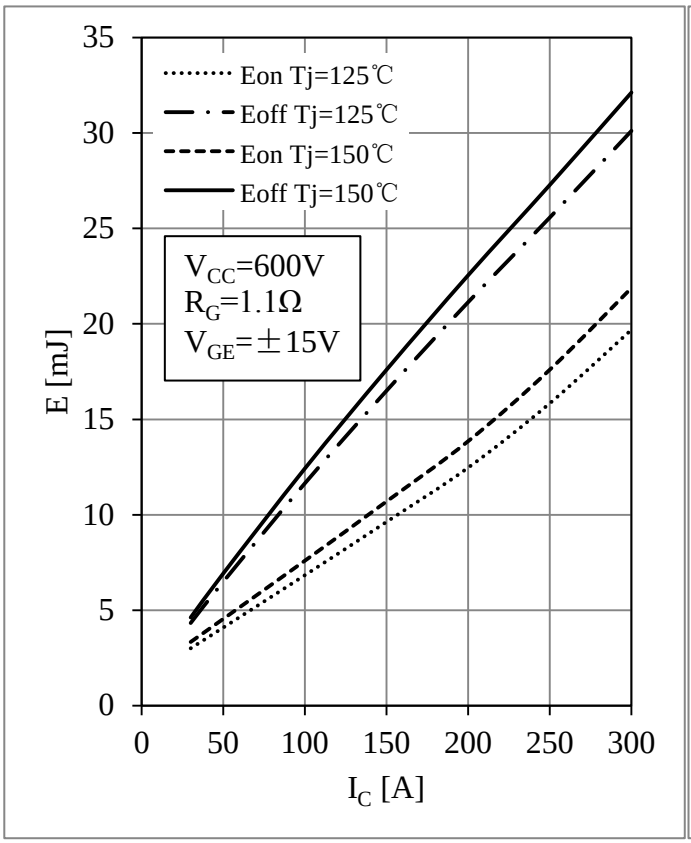


Fig 3. IGBT Switching Loss vs. I_C

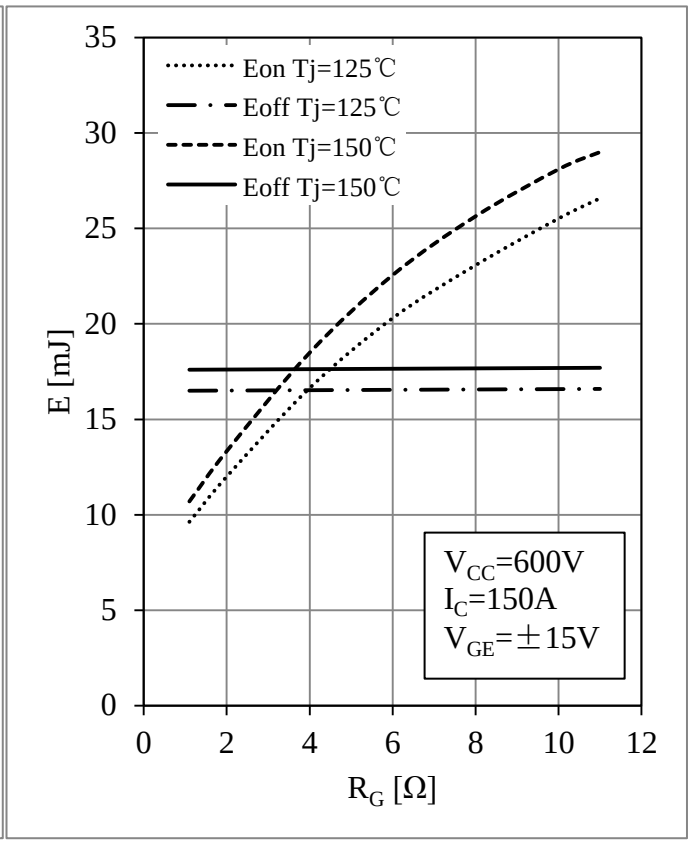


Fig 4. IGBT Switching Loss vs. R_G

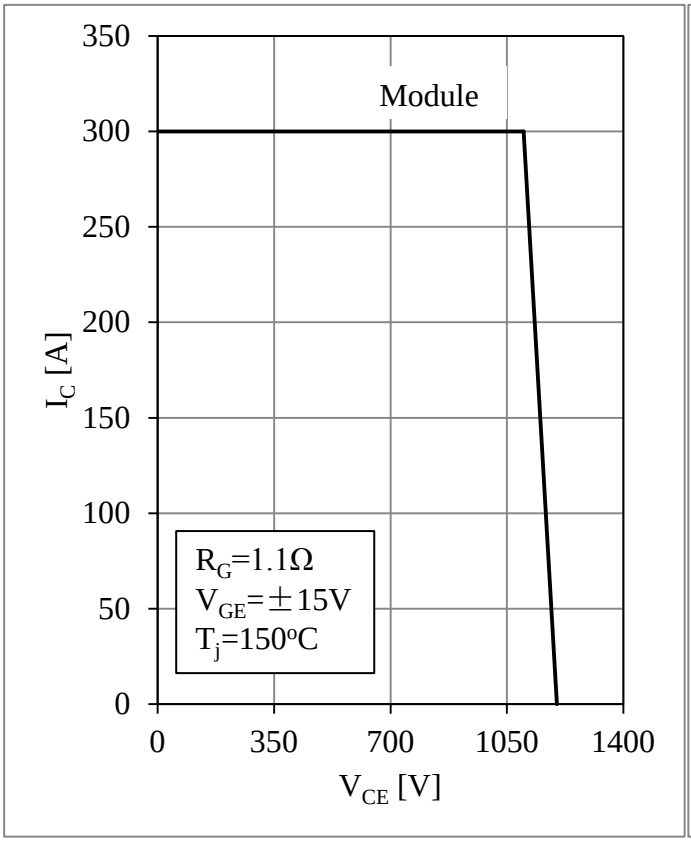


Fig 5. IGBT RBSOA

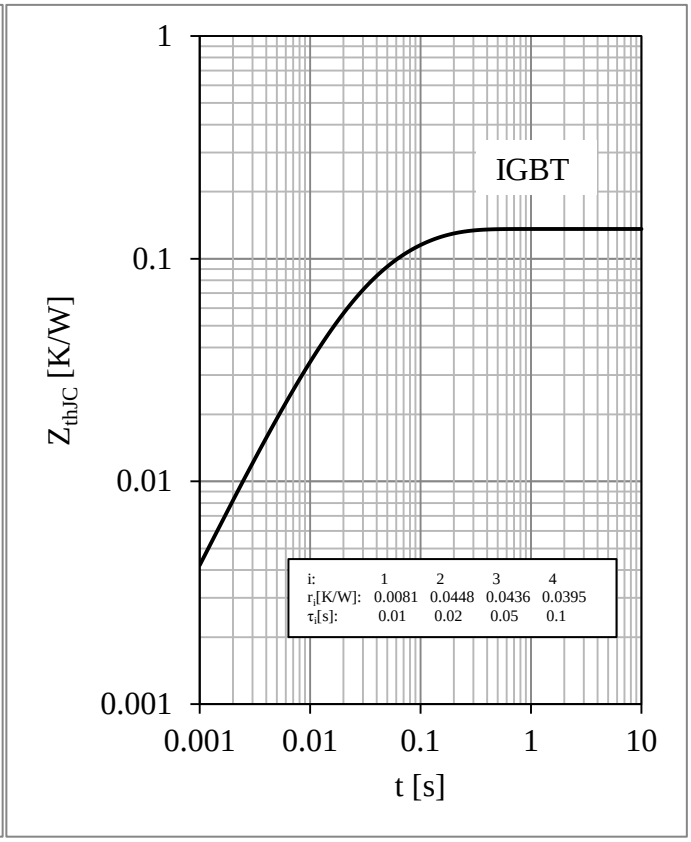


Fig 6. IGBT Transient Thermal Impedance

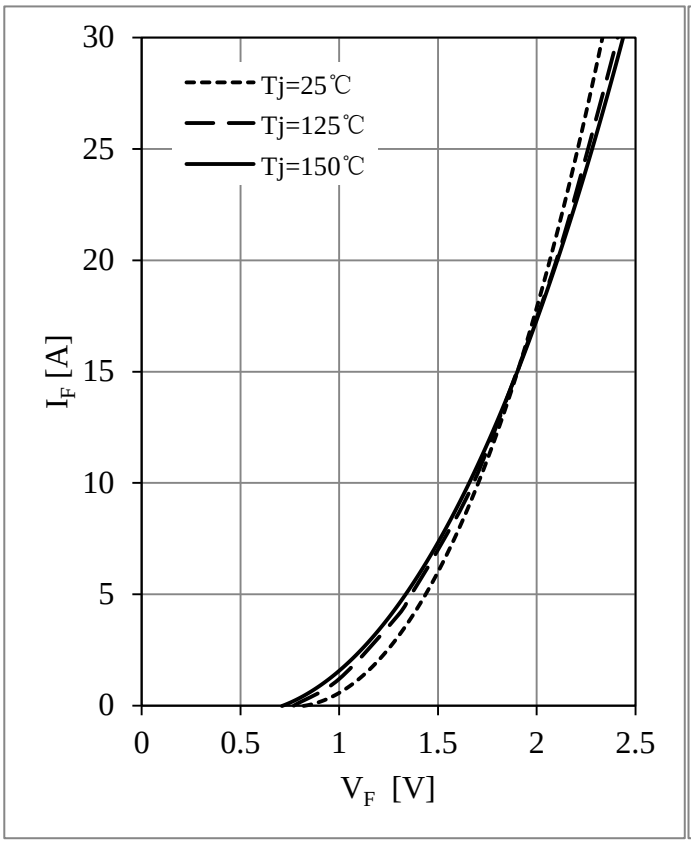


Fig 7. Diode-parallel Switching Loss vs. R_G

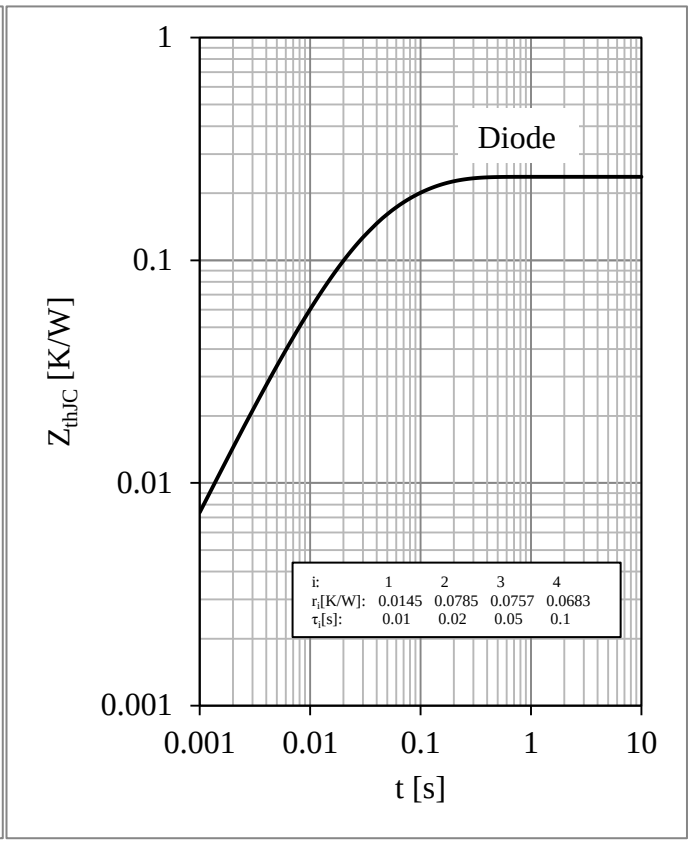


Fig 8. Diode-parallel Transient Thermal Impedance

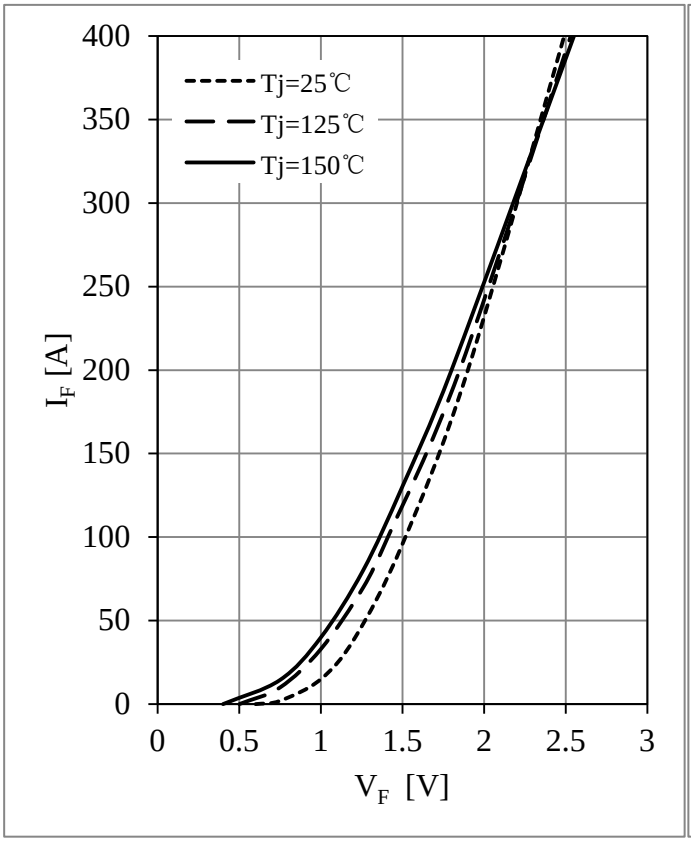


Fig 9. Diode-series Forward Characteristics

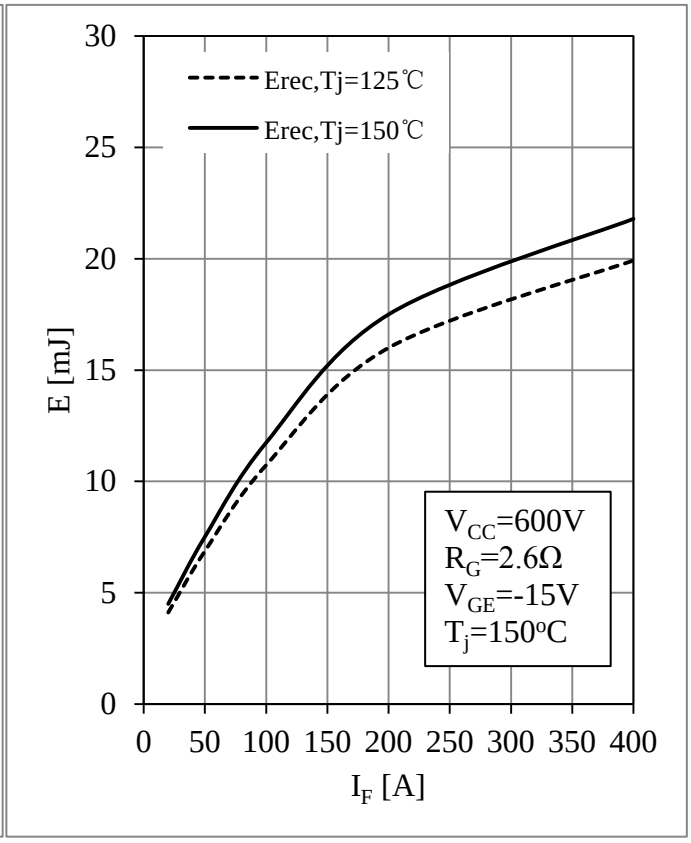


Fig 10. Diode-series Switching Loss vs. I_F

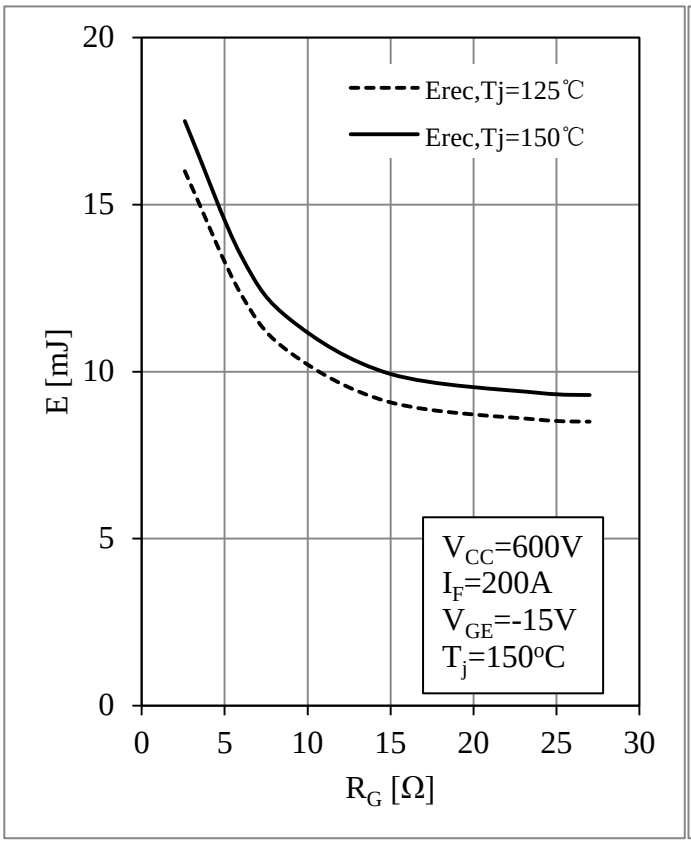


Fig 11. Diode-series Switching Loss vs. R_G

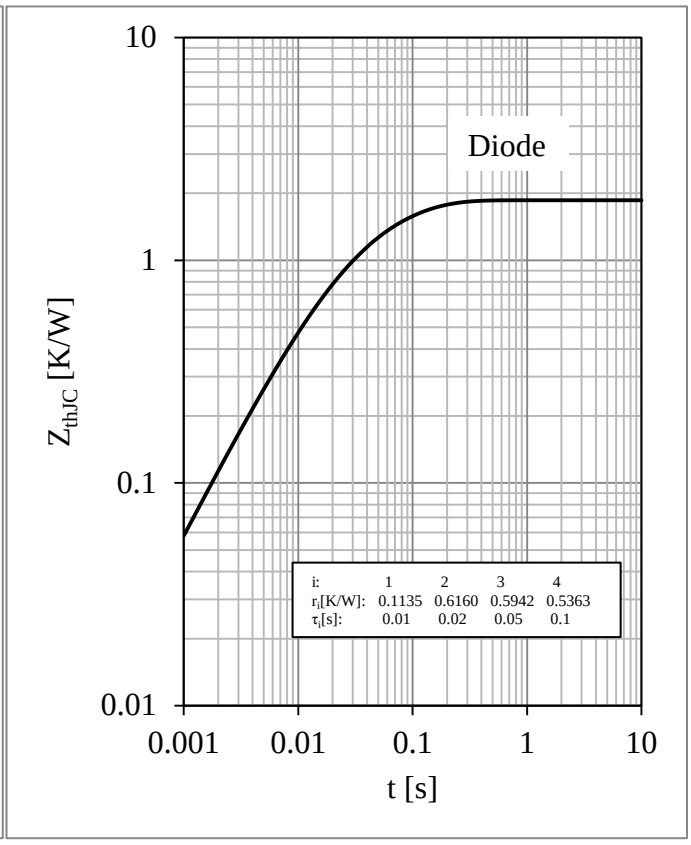
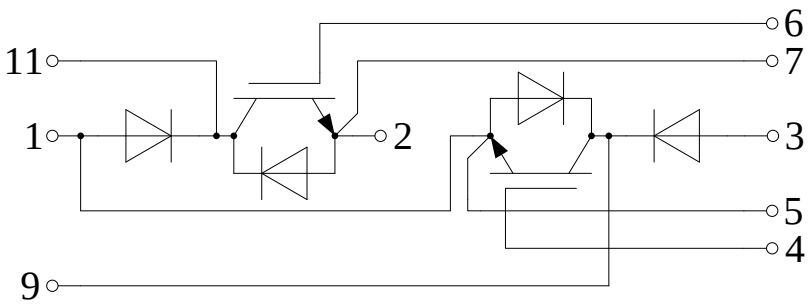


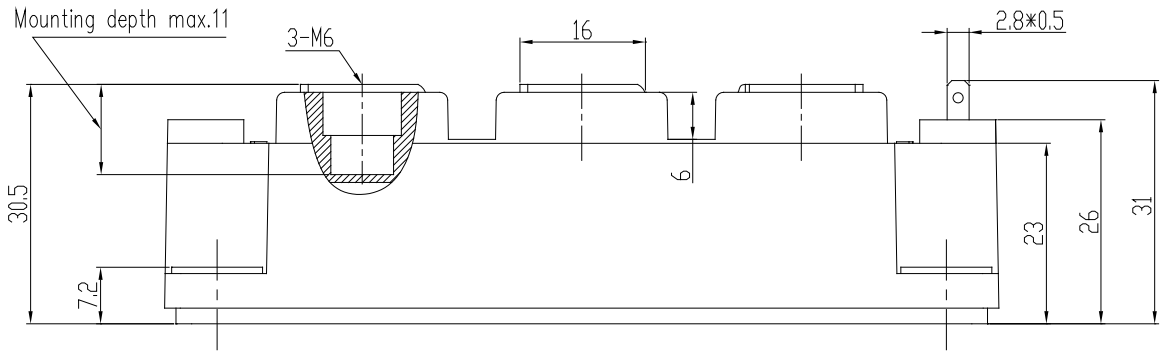
Fig 12. Diode-series Transient Thermal Impedance

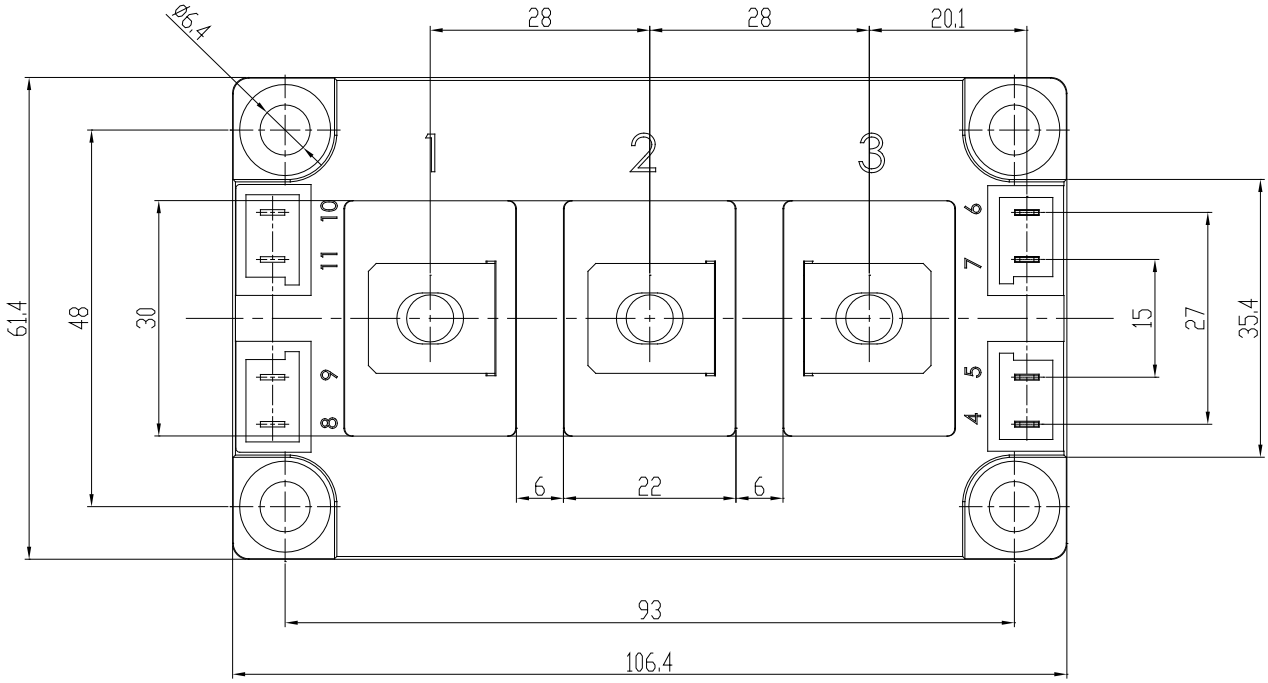
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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