

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.

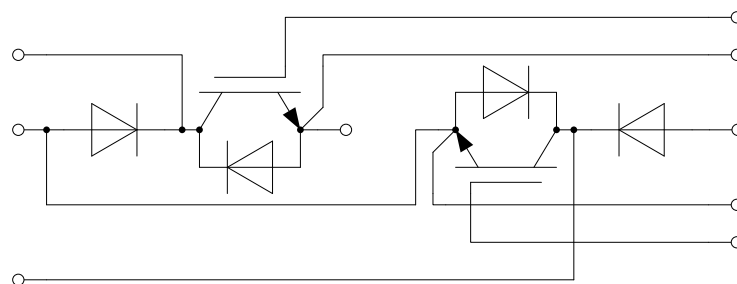
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s 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 $T_C=25^{\circ}\text{C}$ 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 @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	291 150	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	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 $t_p=1\text{ms}$	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 $t_p=1\text{ms}$	400	A

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, $f=50\text{Hz}$, $t=1\text{min}$	4000	V

IGBT 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	$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.70	2.15	V
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		1.95		
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.75\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.2	6.0	6.8	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			2.5		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		15.5		nF
C_{res}	Reverse Transfer Capacitance			0.44		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		1.17		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		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	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		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	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		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	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		600		A

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

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

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

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

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

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

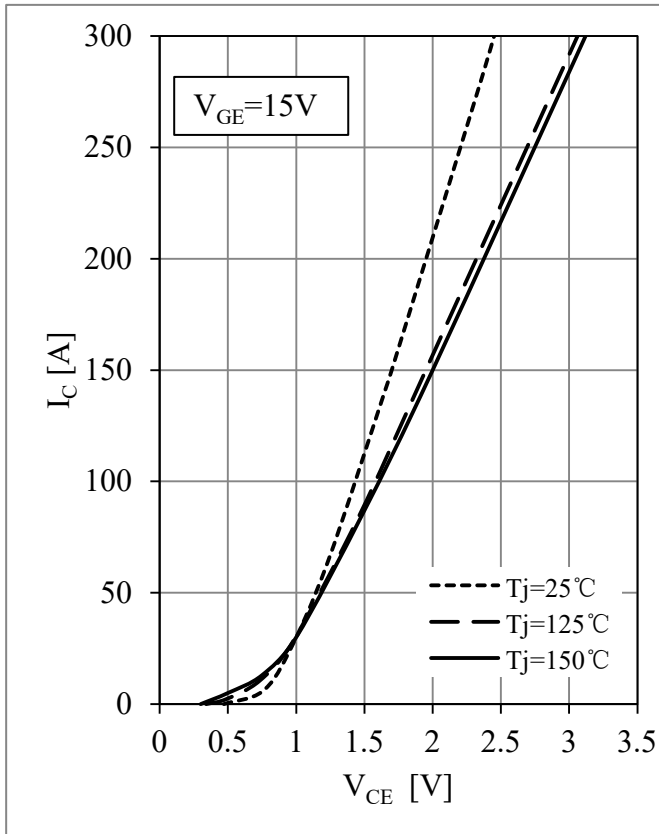


Fig 1. IGBT Output Characteristics

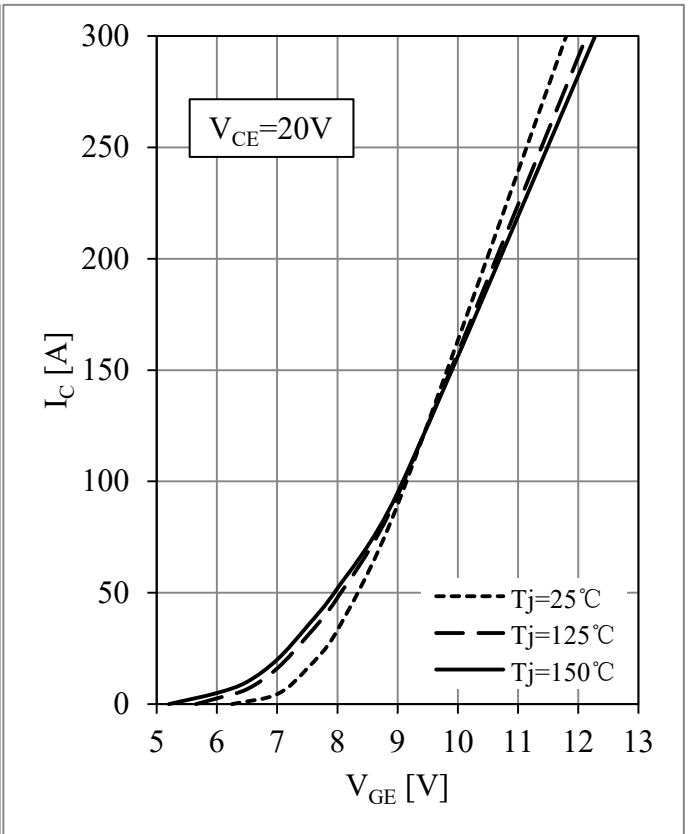
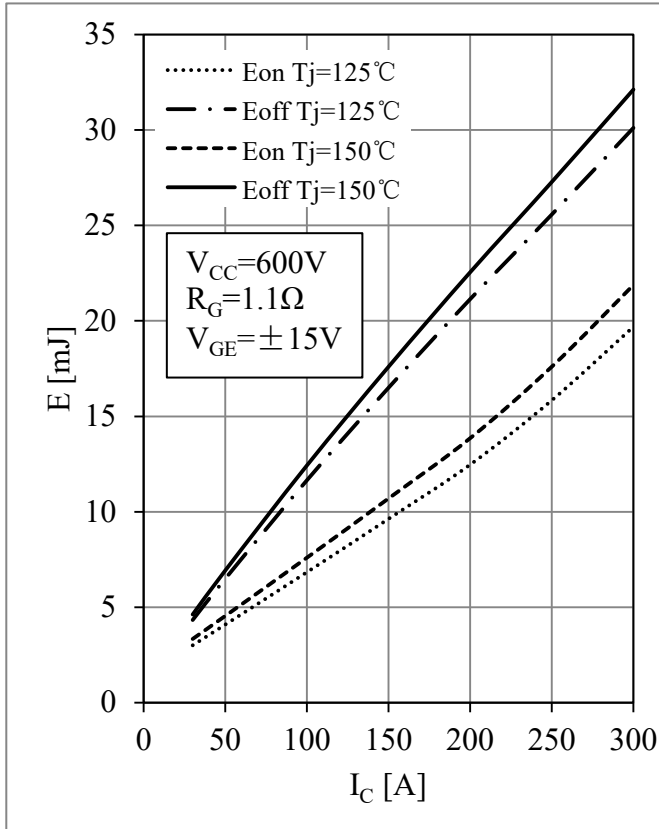
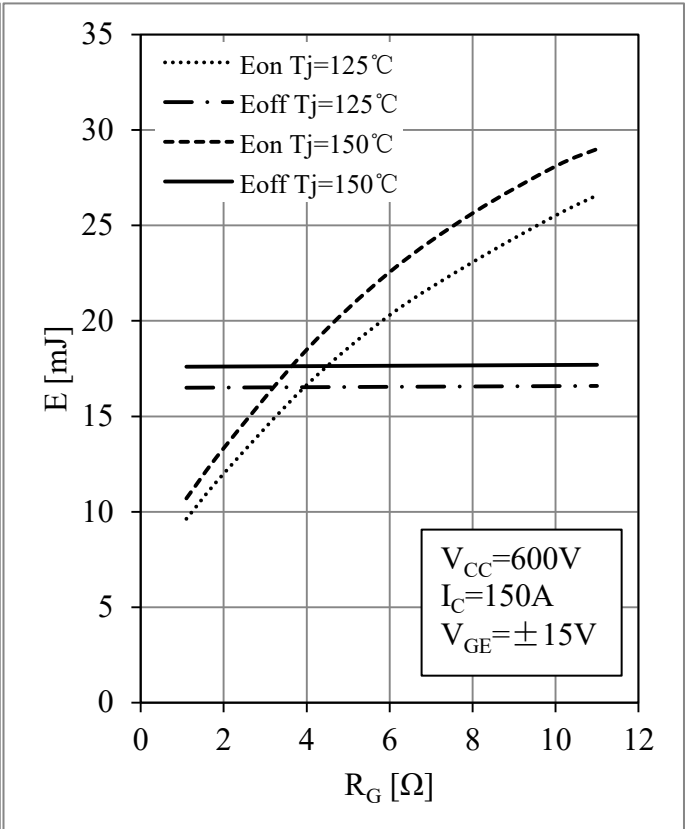


Fig 2. IGBT Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_C Fig 4. IGBT Switching Loss vs. R_G

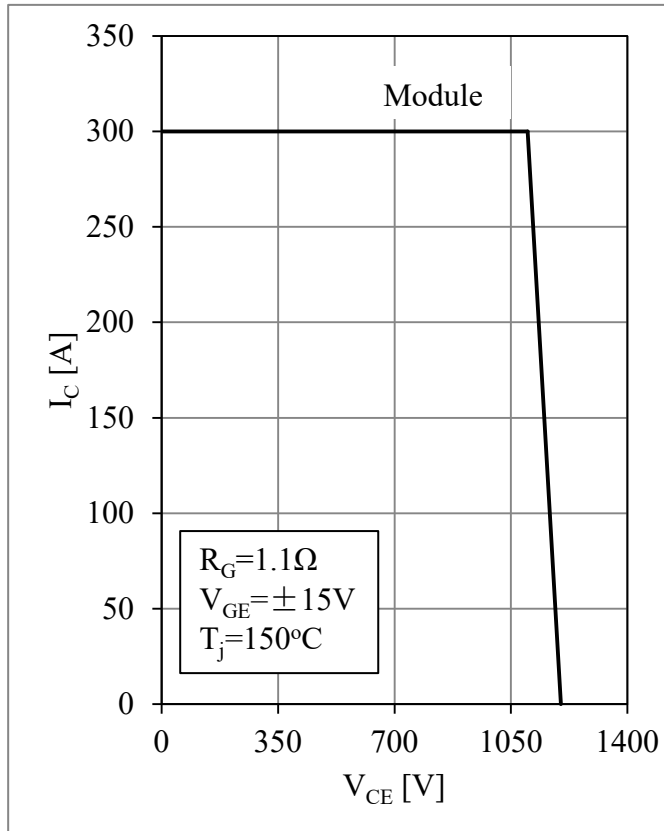


Fig 5. IGBT RBSOA

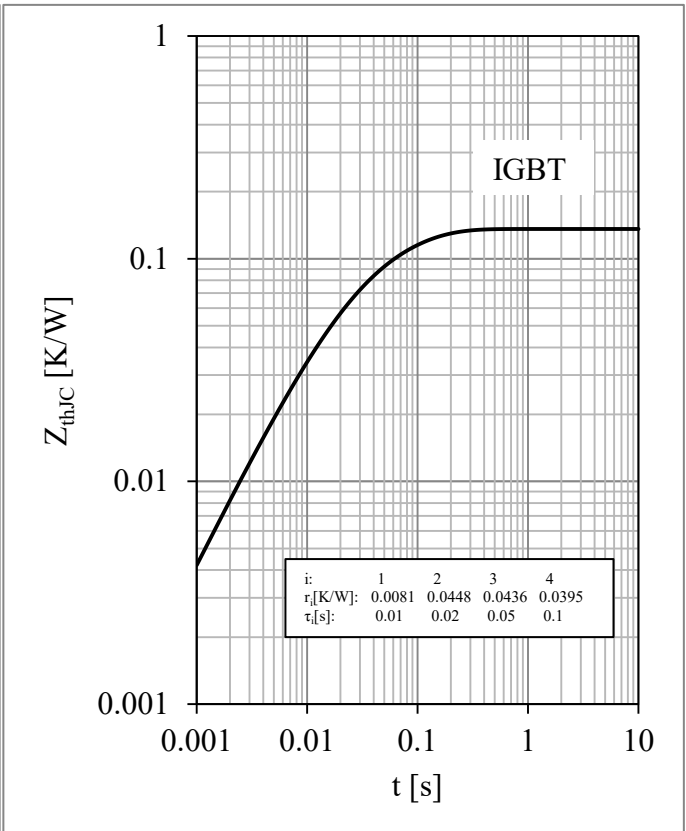


Fig 6. IGBT Transient Thermal Impedance

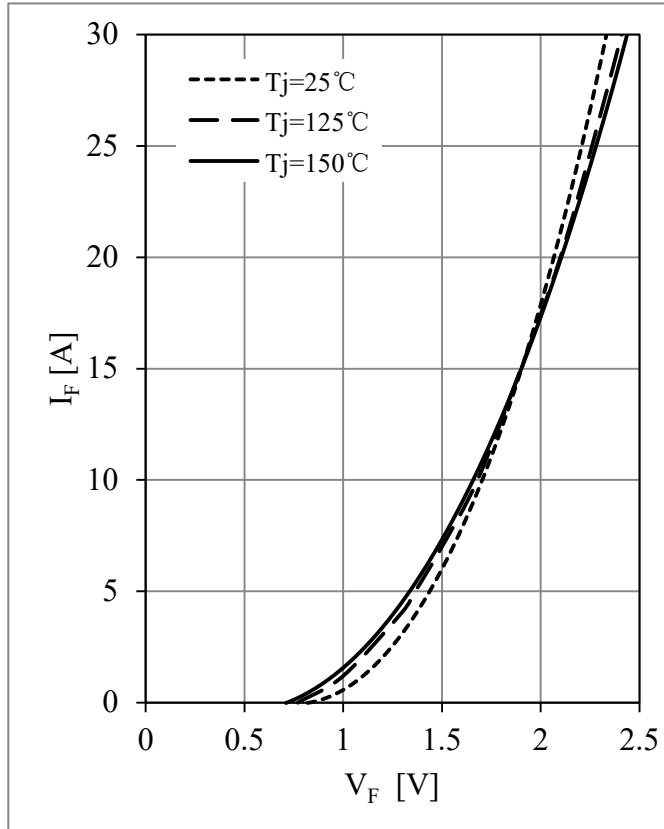
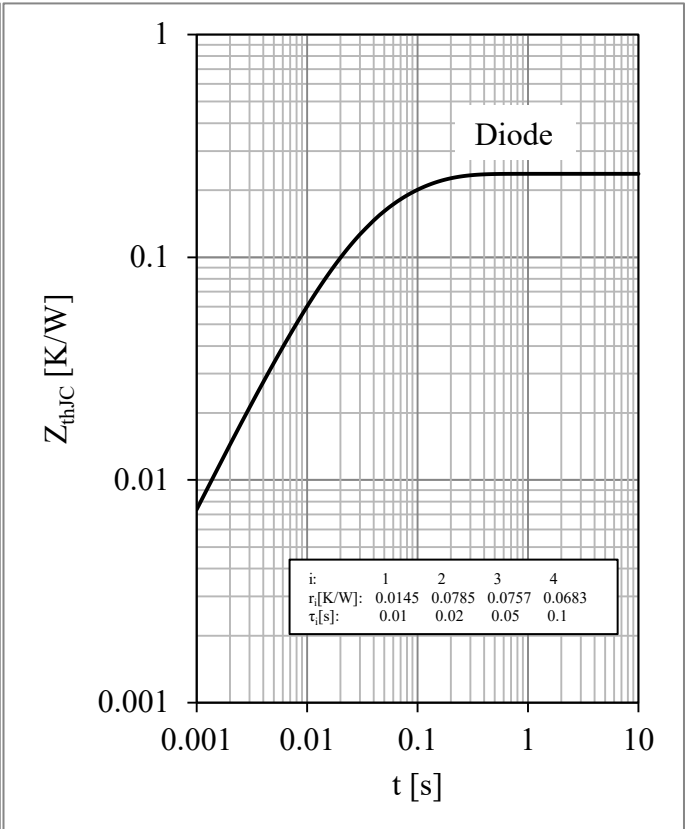
Fig 7. Diode-parallel Switching Loss vs. R_G 

Fig 8. Diode-parallel Transient Thermal Impedance

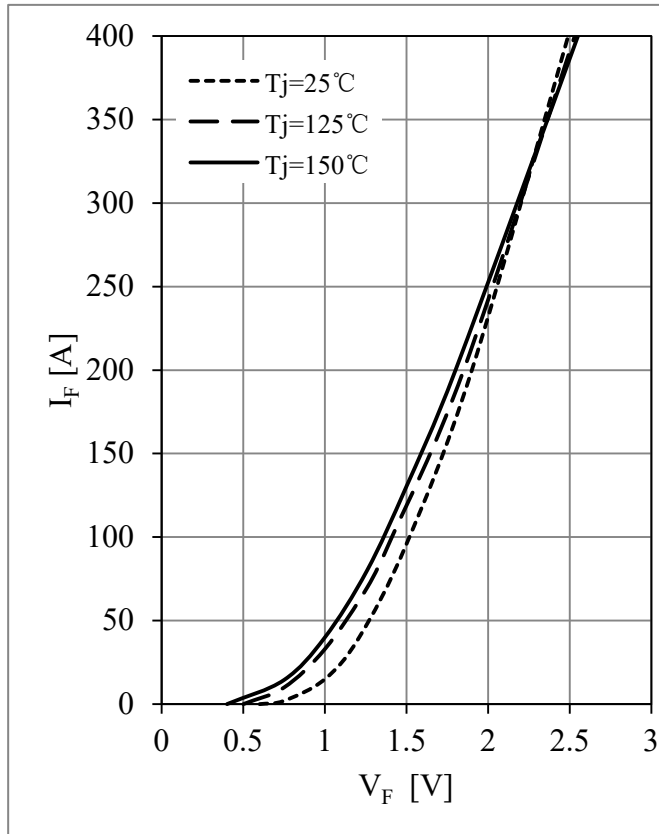


Fig 9. Diode-series Forward Characteristics

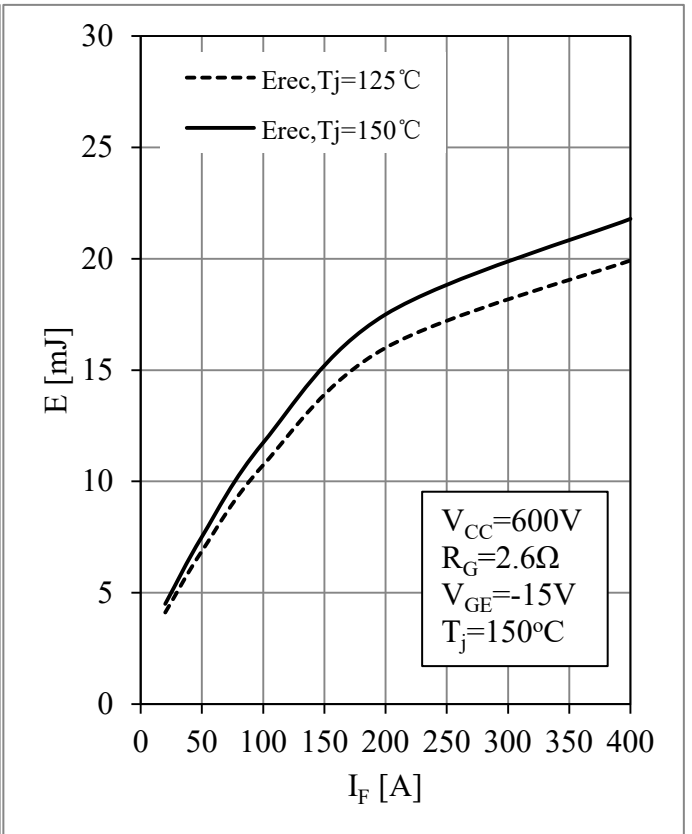
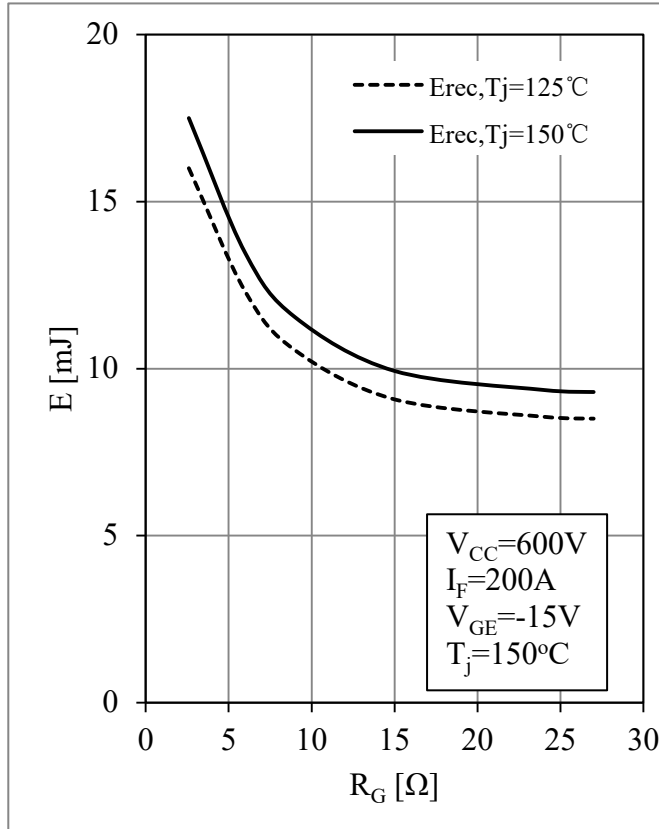
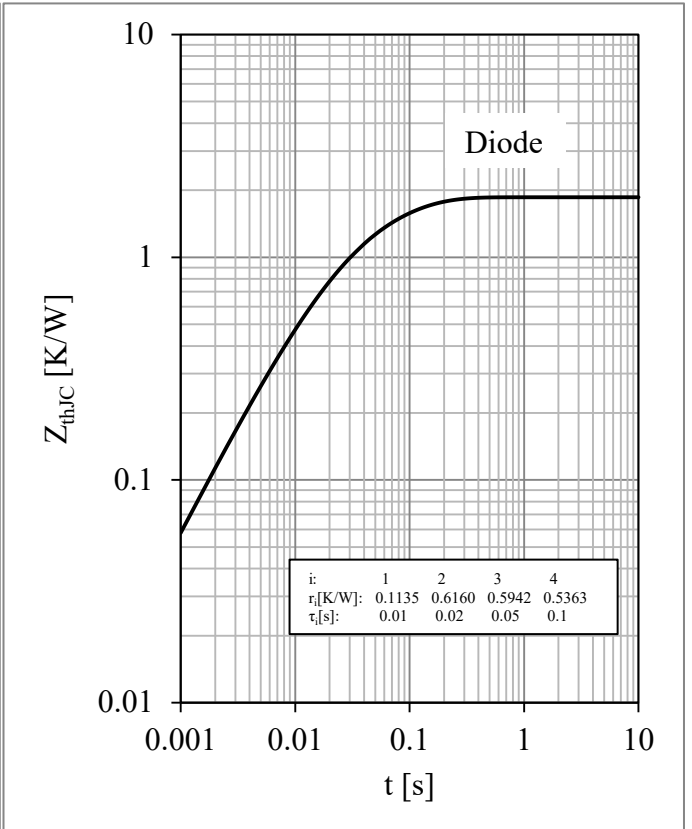
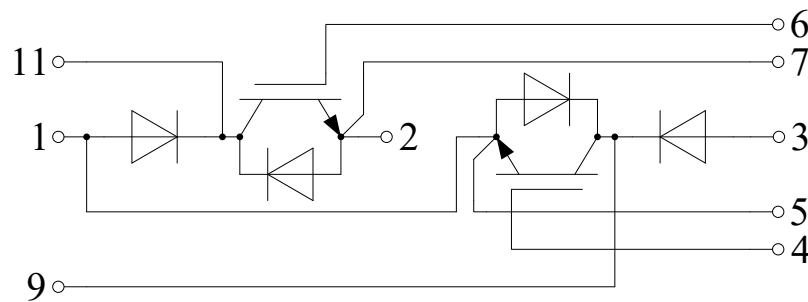
Fig 10. Diode-series Switching Loss vs. I_F Fig 11. Diode-series Switching Loss vs. R_G 

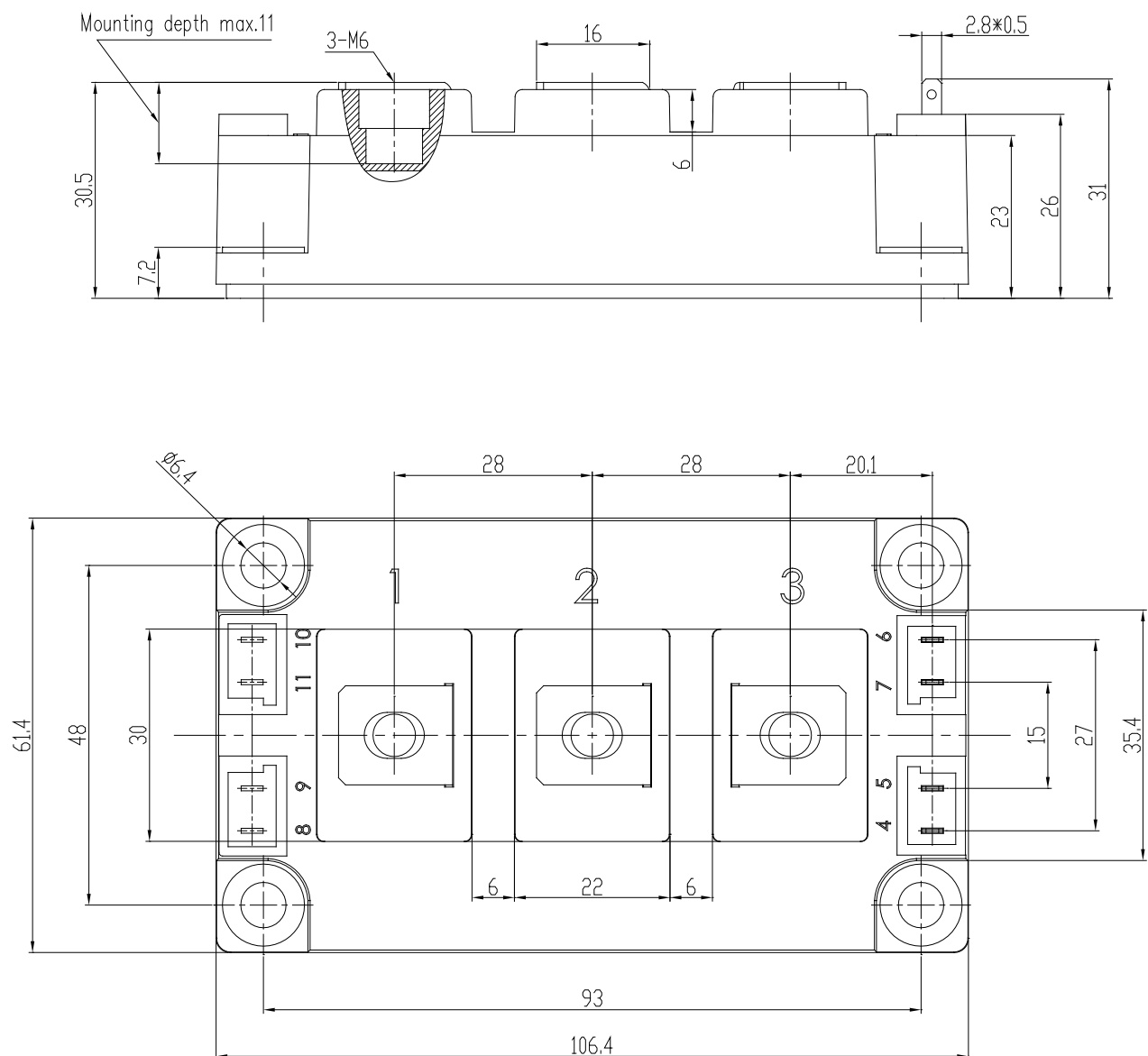
Fig 12. Diode-series Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.