STARPOWER

SEMICONDUCTOR **IGBT**

GD300TLL120C2S

Molding Type Module

1200V/300A 3-level 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 UPS.

Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Solar power
- UPS

TI,T2 IGBT T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300TLL120C2S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	490 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_{tot}	Total Power Dissipation @ T_j=175℃	1875	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=12.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=300A,V_{GE}=15V, T_j=25℃		2.00	2.45	V
		I_C=300A,V_{GE}=15V, T_j=125℃		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=4.7Ω,V_{GE}=±15V, T_j=25℃		574		ns
t_r	Rise Time			133		ns
$t_{d(off)}$	Turn-Off Delay Time			563		ns
t_f	Fall Time			120		ns
E_{on}	Turn-On Switching Loss			23.9		mJ
E_{off}	Turn-Off Switching Loss			25.3		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=4.7Ω,V_{GE}=±15V, T_j=125℃		604		ns
t_r	Rise Time			137		ns
$t_{d(off)}$	Turn-Off Delay Time			629		ns
t_f	Fall Time			167		ns
E_{on}	Turn-On Switching Loss			31.5		mJ
E_{off}	Turn-Off Switching Loss			35.9		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		21.2		nF
C_{res}	Reverse Transfer Capacitance			0.94		nF
Q_G	Gate Charge	V_{CC}=600V,I_C=300A, V_{GE}=-15…+15V		3.1		nC
R_{Gint}	Internal Gate Resister			1.0		Ω
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		1300		A

TI,T2 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300TLL120C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	300	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	600	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=300A, V_{GE}=0V	T_j=25℃		1.65	2.15	V
			T_j=125℃		1.65		
Q_r	Recovered Charge	I_F=300A, V_R=600V, R_G=2.4Ω, V_{GE}=-15V	T_j=25℃		30		μC
			T_j=125℃		55		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		210		A
			T_j=125℃		270		
E_{rec}	Reverse Recovery Energy		T_j=25℃		13.9		mJ
			T_j=125℃		26.1		

T3,T4 IGBT T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300TLL120C2S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	650	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	480 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_{tot}	Total Power Dissipation @ T_j=175℃	1071	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	650			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=13.2mA,V_{CE}=V_{GE}, T_j=25℃	5.5		7.7	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=300A,V_{GE}=15V, T_j=25℃		1.50	1.95	V
		I_C=300A,V_{GE}=15V, T_j=175℃		1.80		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=300A, R_G=2.5Ω,V_{GE}=±15V, T_j=25℃		125		ns
t_r	Rise Time			320		ns
$t_{d(off)}$	Turn-Off Delay Time			270		ns
t_f	Fall Time			135		ns
E_{on}	Turn-On Switching Loss			3.20		mJ
E_{off}	Turn-Off Switching Loss			12.2		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=300A, R_G=2.5Ω,V_{GE}=±15V, T_j=125℃		110		ns
t_r	Rise Time			320		ns
$t_{d(off)}$	Turn-Off Delay Time			320		ns
t_f	Fall Time			145		ns
E_{on}	Turn-On Switching Loss			3.50		mJ
E_{off}	Turn-Off Switching Loss			12.8		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		25.9		nF
C_{res}	Reverse Transfer Capacitance			0.68		nF
Q_G	Gate Charge	V_{CC}=300V,I_C=300A, V_{GE}=15V		590		nC
R_{Gint}	Internal Gate Resister			1.0		Ω
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=125℃,V_{CC}=360V, V_{CEM}≤650V		3600		A

T3,T4 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300TLL120C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	650	V
I_F	DC Forward Current	300	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	600	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=300A, V_{GE}=0V	T_j=25℃		1.40	1.80	V
			T_j=125℃		1.40		
Q_r	Recovered Charge	I_F=300A, V_R=300V, R_G=4.7Ω, V_{GE}=-15V	T_j=25℃		12.0		μC
			T_j=125℃		21.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		153		A
			T_j=125℃		185		
E_{rec}	Reverse Recovery Energy		T_j=25℃		2.65		mJ
			T_j=125℃		5.12		

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000			V
$R_{\theta JC}$	Junction-to-Case (per T1,T2 IGBT) Junction-to-Case (per T1,T2 Diode) Junction-to-Case (per T3,T4 IGBT) Junction-to-Case (per T3,T4 Diode)			0.080 0.158 0.137 0.236	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.035		K/W
T_{jmax}	Maximum Junction Temperature			175	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{STG}	Storage Temperature Range	-40		125	℃
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M6	2.5 3.0		5.0 5.0	N.m
G	Weight of Module		340		g

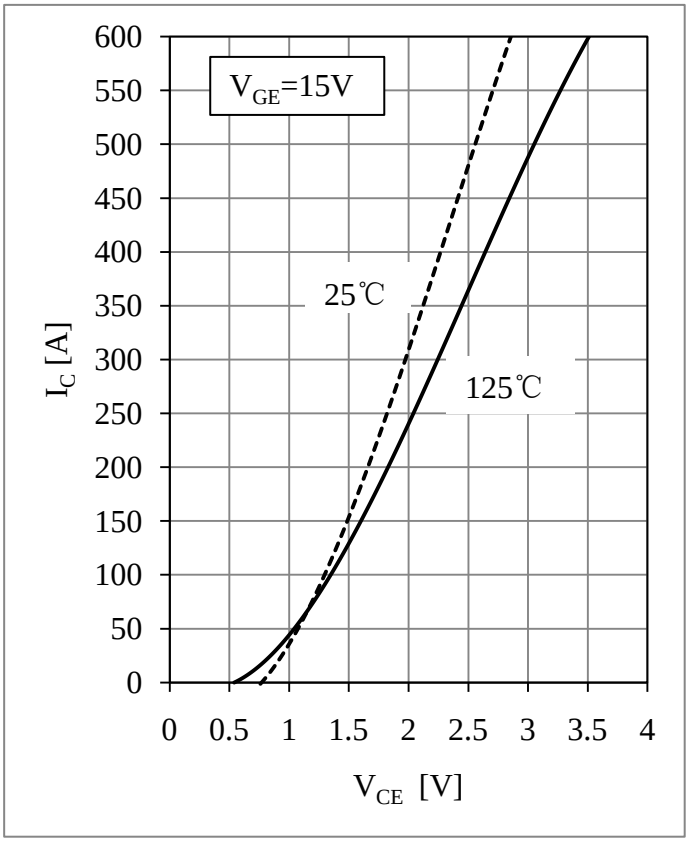


Fig 1. IGBT Output Characteristics (T1,T2)

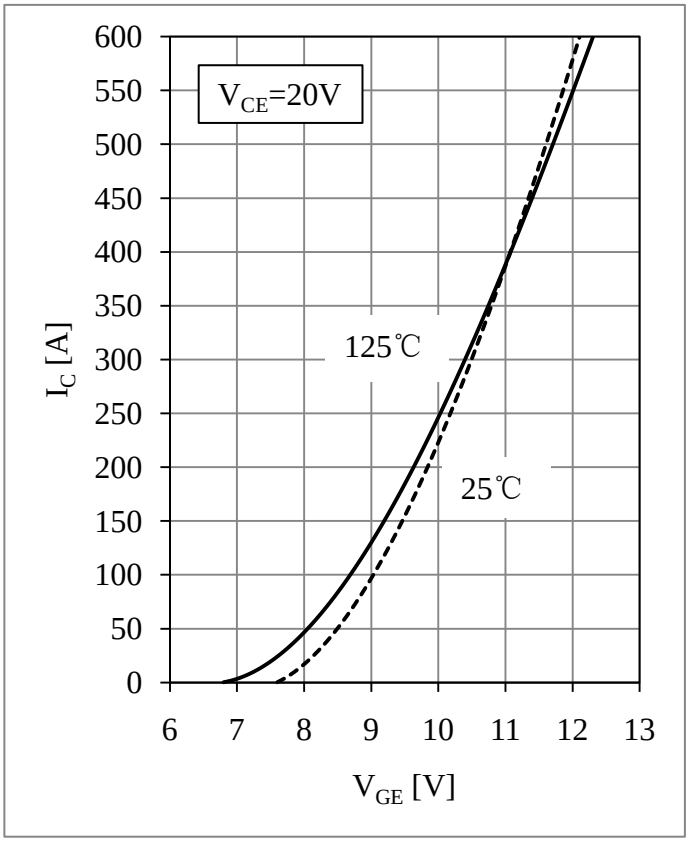


Fig 2. IGBT Transfer Characteristics (T1,T2)

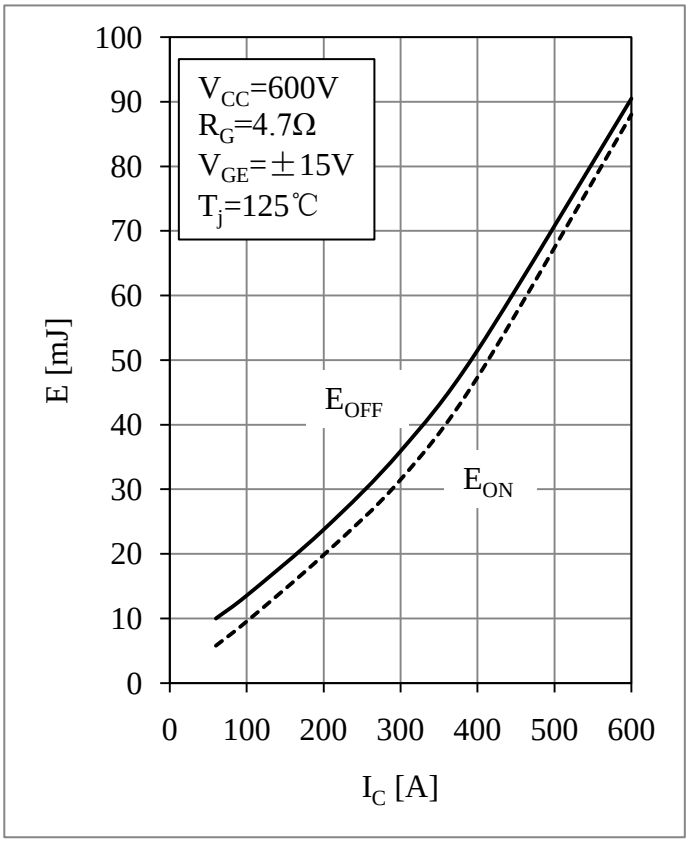


Fig 3. IGBT Switching Loss vs. I_C (T1,T2)

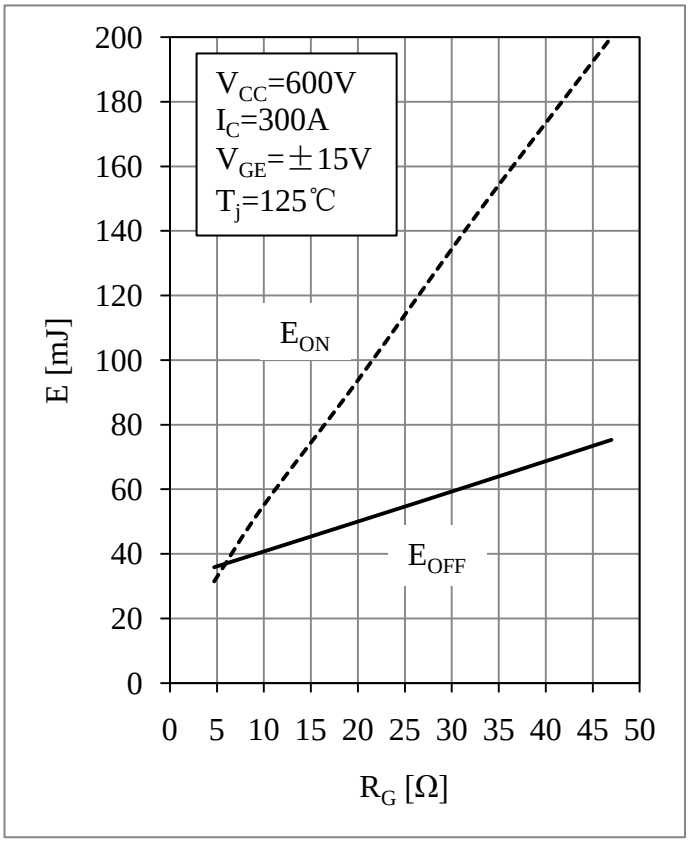


Fig 4. IGBT Switching Loss vs. R_G (T1,T2)

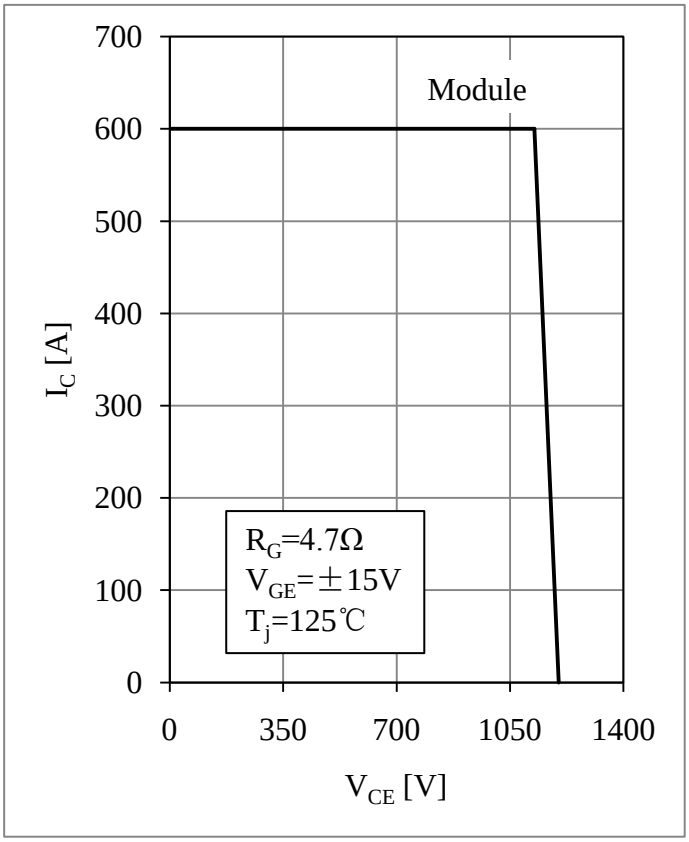


Fig 5. RBSOA (T1,T2)

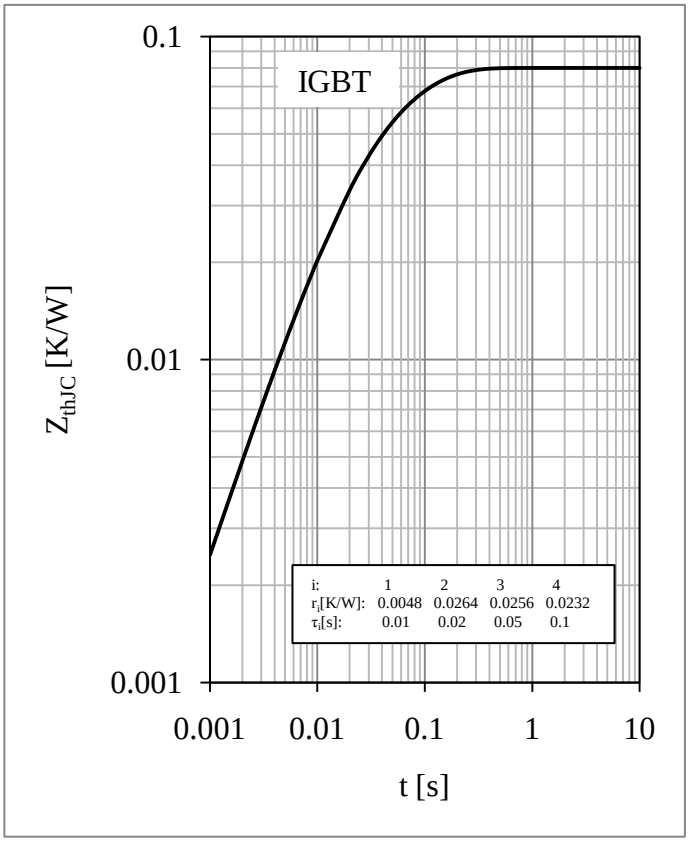


Fig 6. IGBT Transient Thermal Impedance (T1,T2)

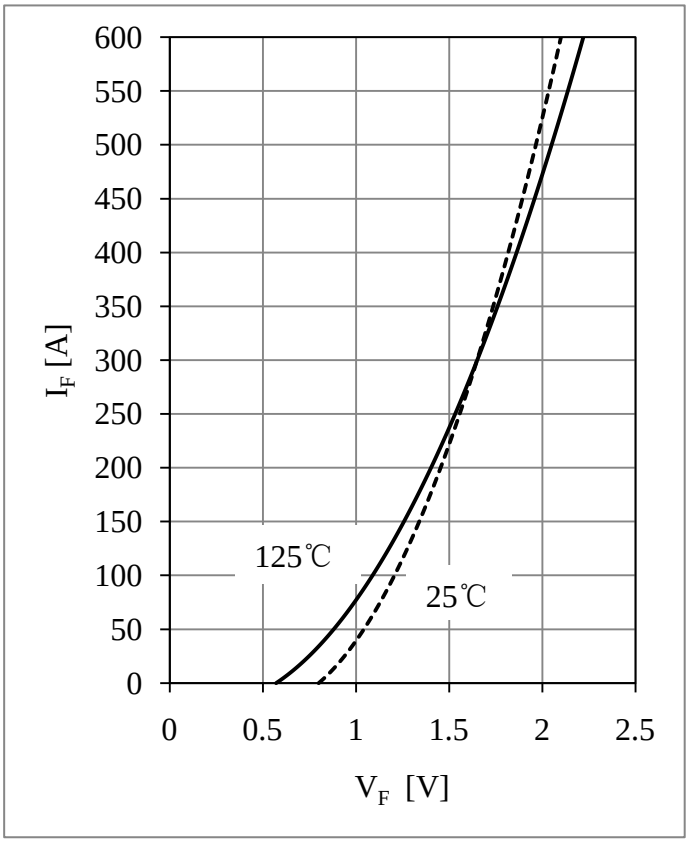


Fig 7. Diode Forward Characteristics (T1,T2)

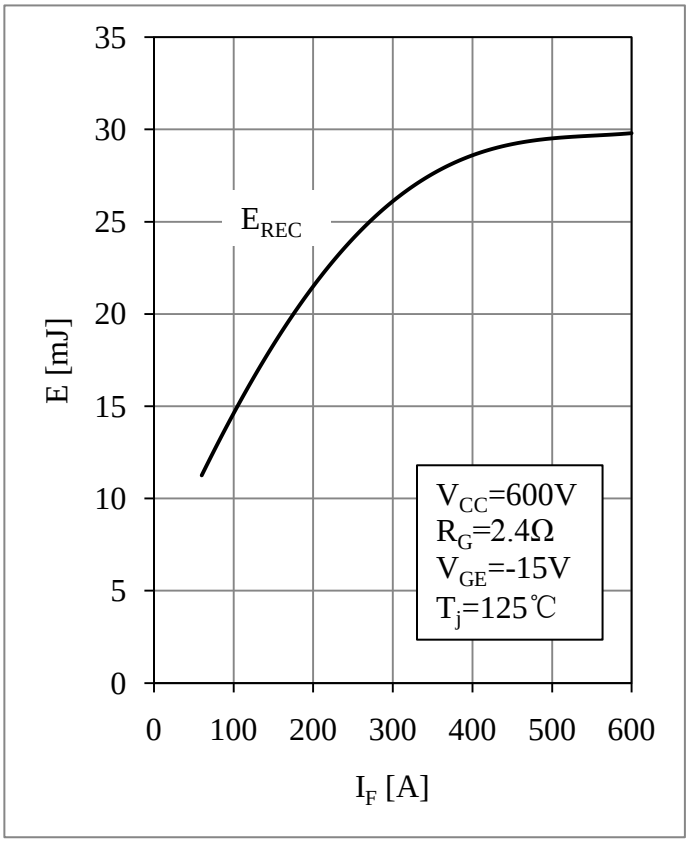


Fig 8. Diode Switching Loss vs. I_F (T1,T2)

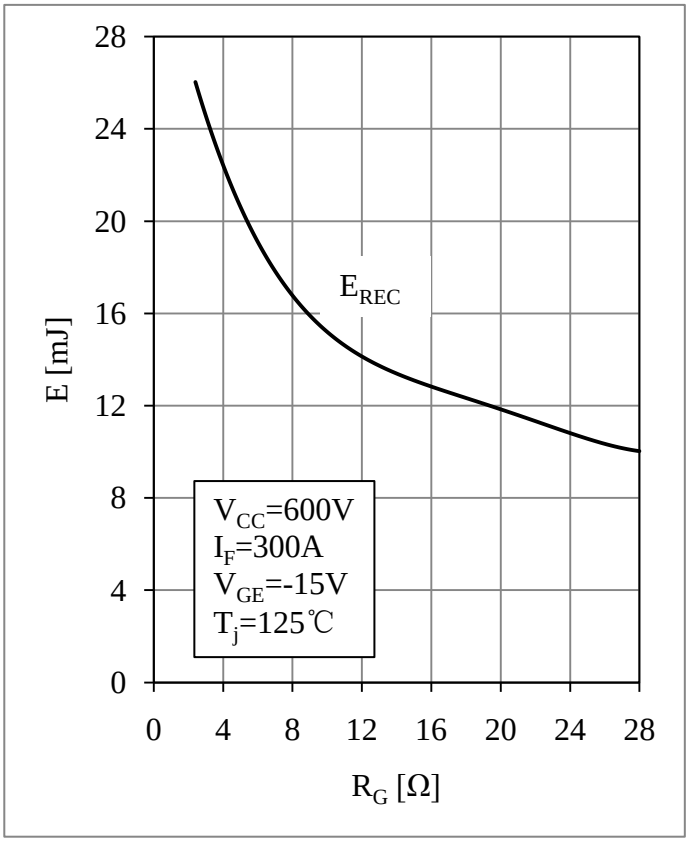


Fig 9. Diode Switching Loss vs. R_G (T1,T2)

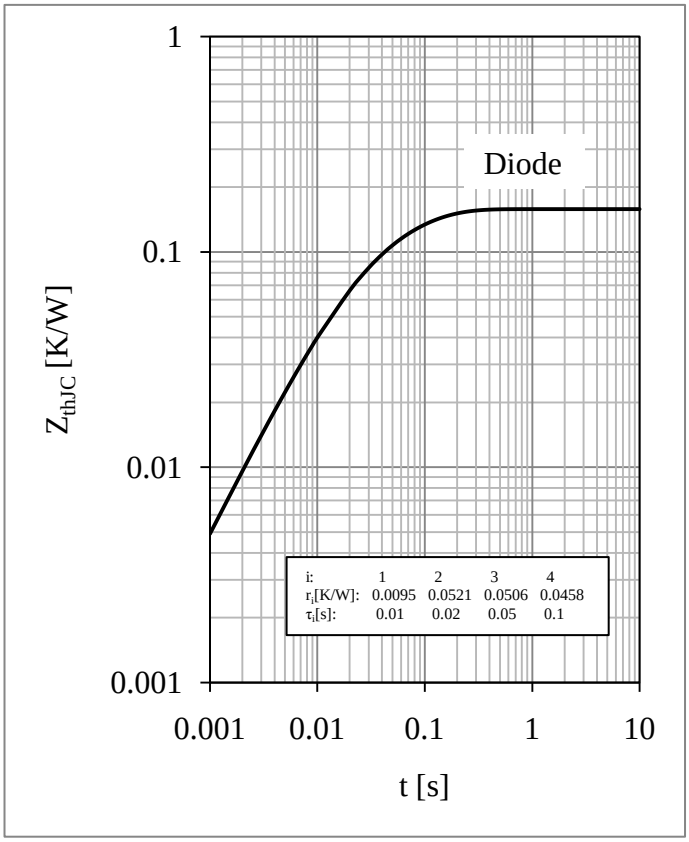


Fig 10. Diode Transient Thermal Impedance (T1,T2)

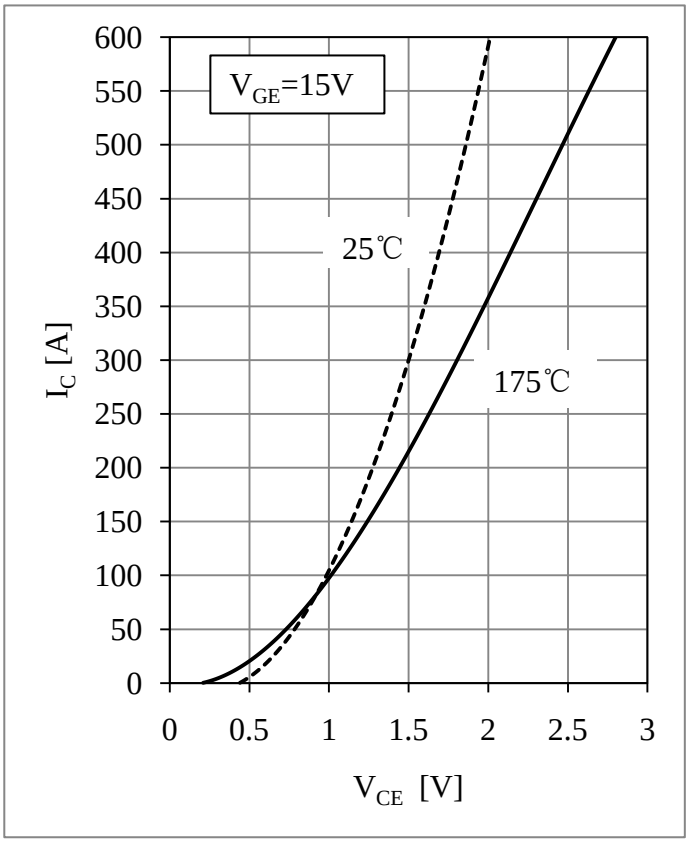


Fig 11. IGBT Output Characteristics (T3,T4)

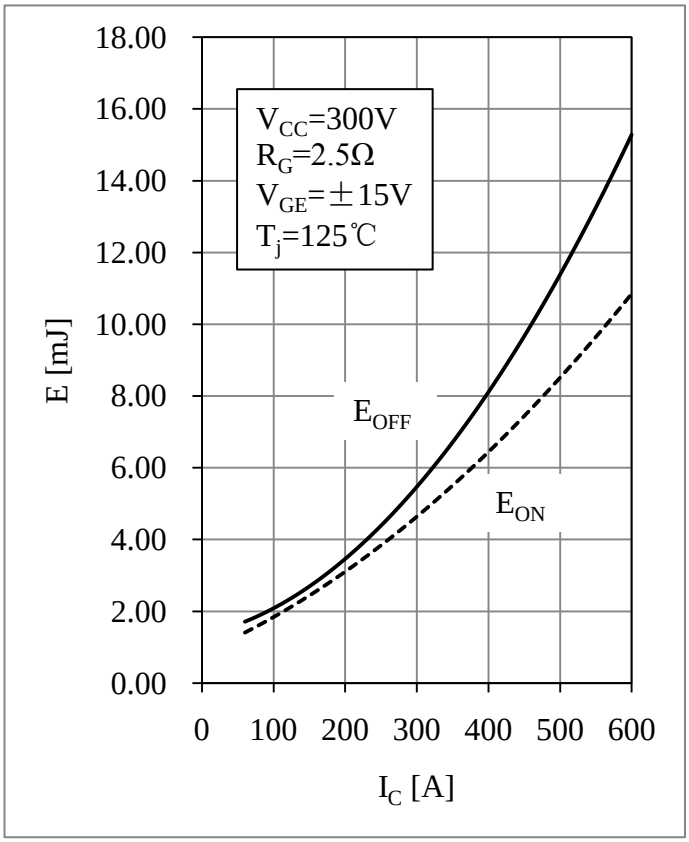


Fig 12. IGBT Switching Loss vs. I_C (T3,T4)

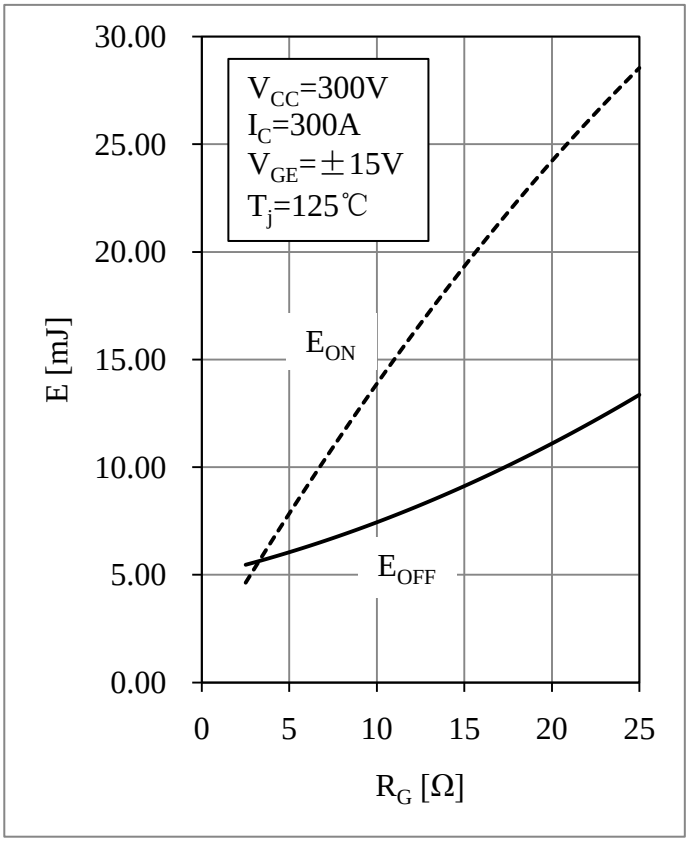


Fig 13. IGBT Switching Loss vs. R_G (T3,T4)

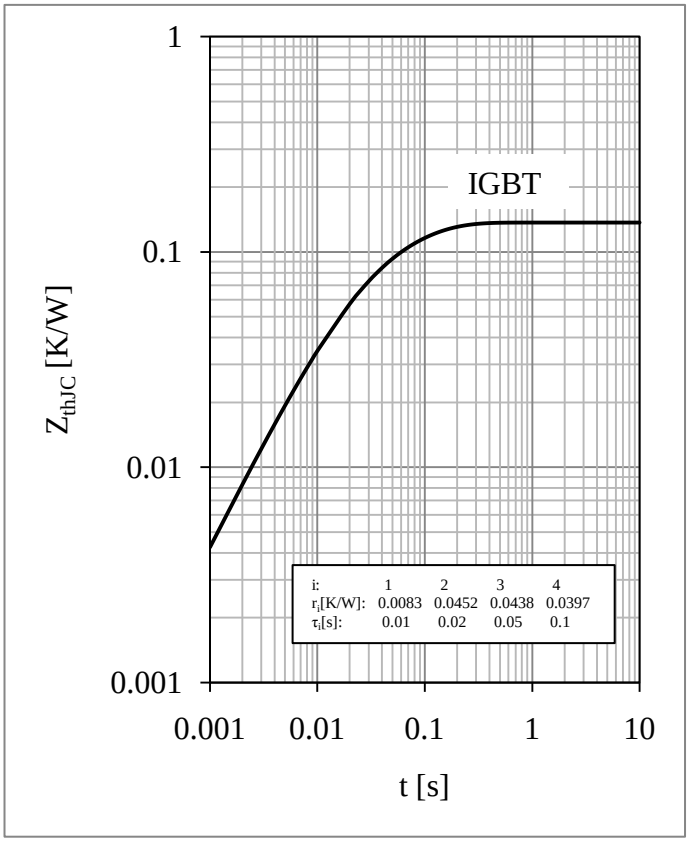


Fig 14. IGBT Transient Thermal Impedance (T3,T4)

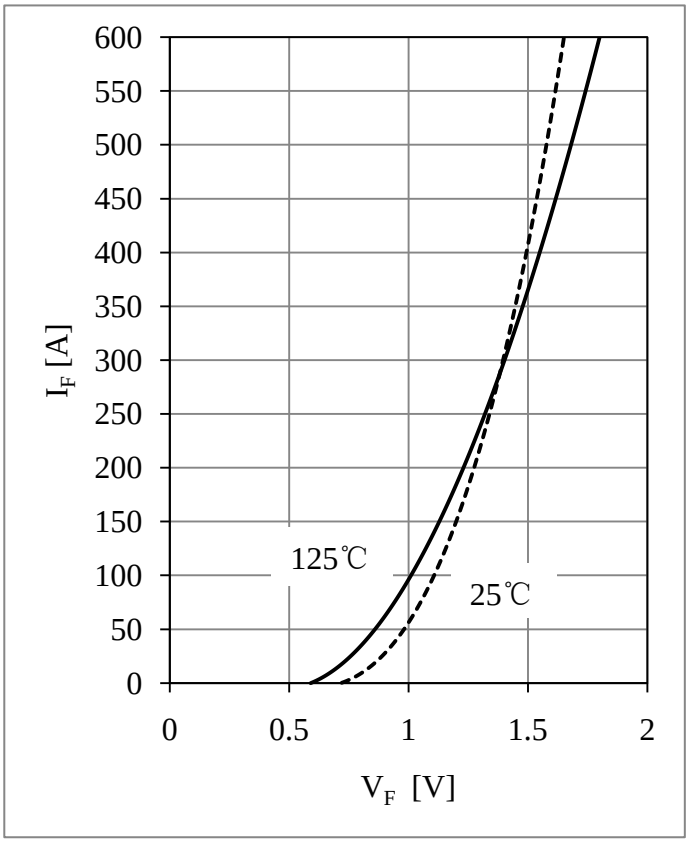


Fig 15. Diode Forward Characteristics (T3,T4)

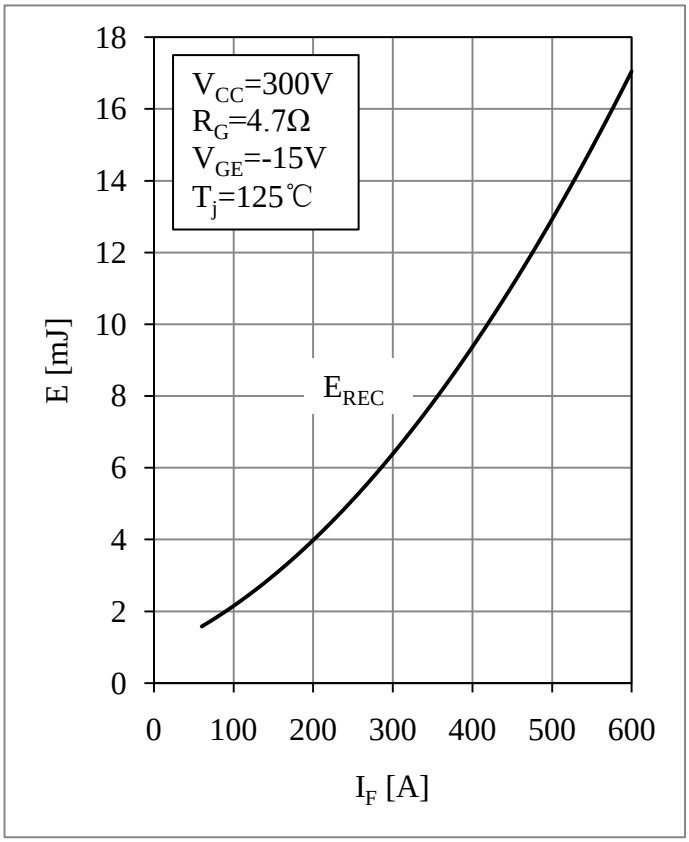


Fig 16. Diode Switching Loss vs. I_F (T3,T4)

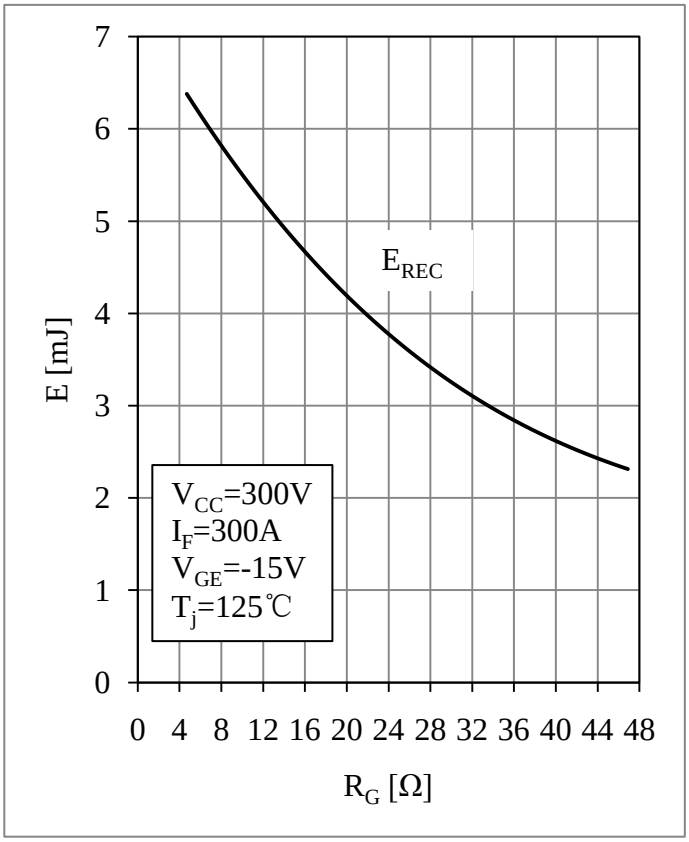


Fig 17. Diode Switching Loss vs. R_G (T3,T4)

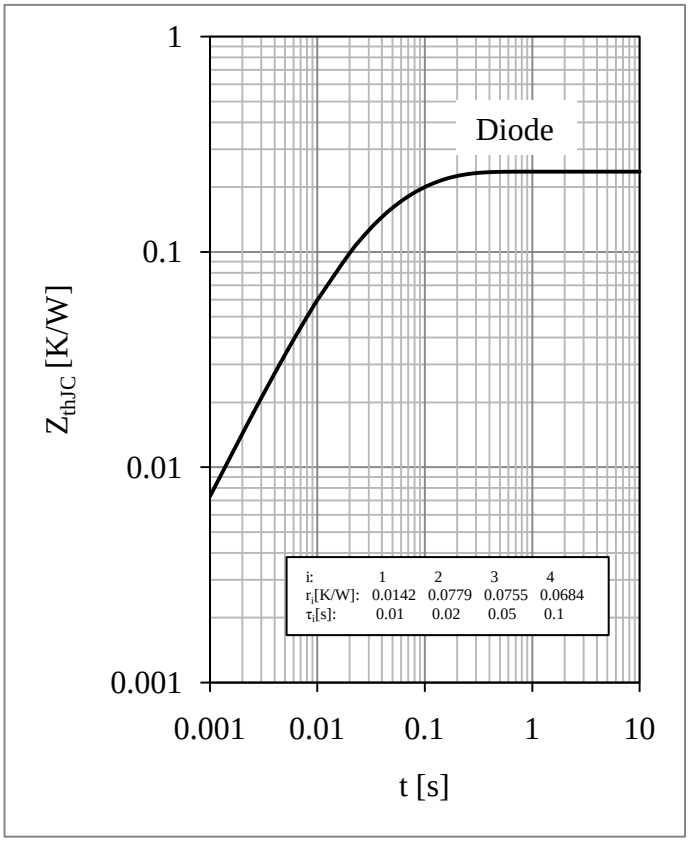
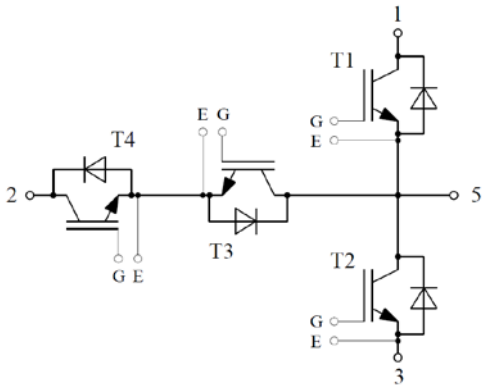


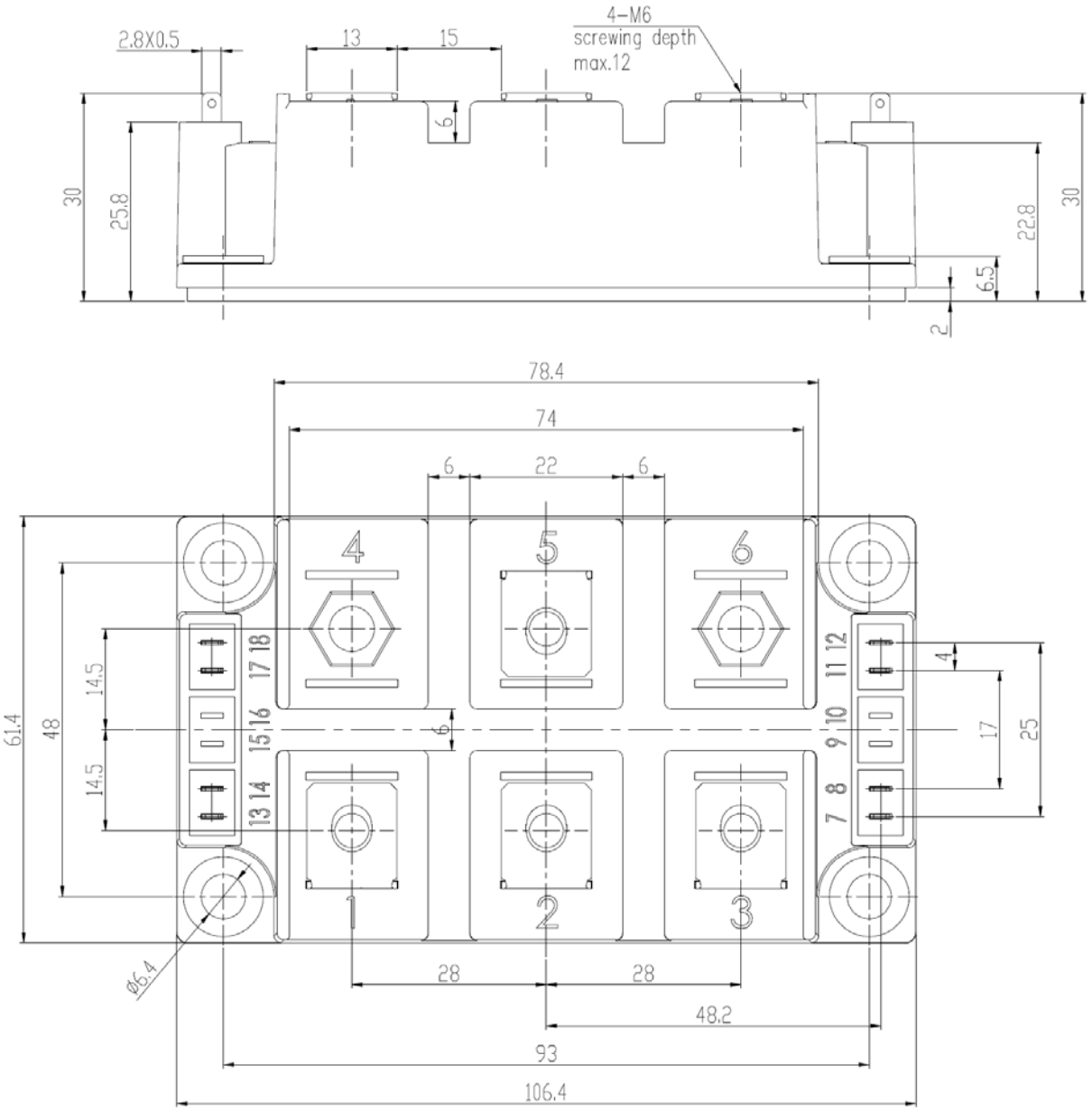
Fig 18. Diode Transient Thermal Impedance (T3,T4)

Equivalent Circuit Schematic



Package Dimension

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.