STARPOWER

SEMICONDUCTOR **IGBT**

GD300TLT120C2S

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 $V_{CE(sat)}$ Trench 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	GD300TLT120C2S	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℃	480 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_{tot}	Total Power Dissipation @ T_j=175℃	1630	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	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=300A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=300A,V_{GE}=15V, T_j=125℃		2.00		

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=2.4Ω,V_{GE}=±15V, T_j=25℃		250		ns
t_r	Rise Time			90		ns
$t_{d(off)}$	Turn-Off Delay Time			550		ns
t_f	Fall Time			130		ns
E_{on}	Turn-On Switching Loss			16.9		mJ
E_{off}	Turn-Off Switching Loss			29.4		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=2.4Ω,V_{GE}=±15V, T_j=125℃		300		ns
t_r	Rise Time			100		ns
$t_{d(off)}$	Turn-Off Delay Time			650		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			25.1		mJ
E_{off}	Turn-Off Switching Loss			43.9		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		21.5		nF
C_{res}	Reverse Transfer Capacitance			0.98		nF
Q_G	Gate Charge	V_{CC}=600V,I_C=300A, V_{GE}=-15…+15V		2.8		nC
R_{Gint}	Internal Gate Resister			2.5		Ω
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		1200		A

TI,T2 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300TLT120C2S	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	GD300TLT120C2S	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	GD300TLT120C2S	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)			0.092 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

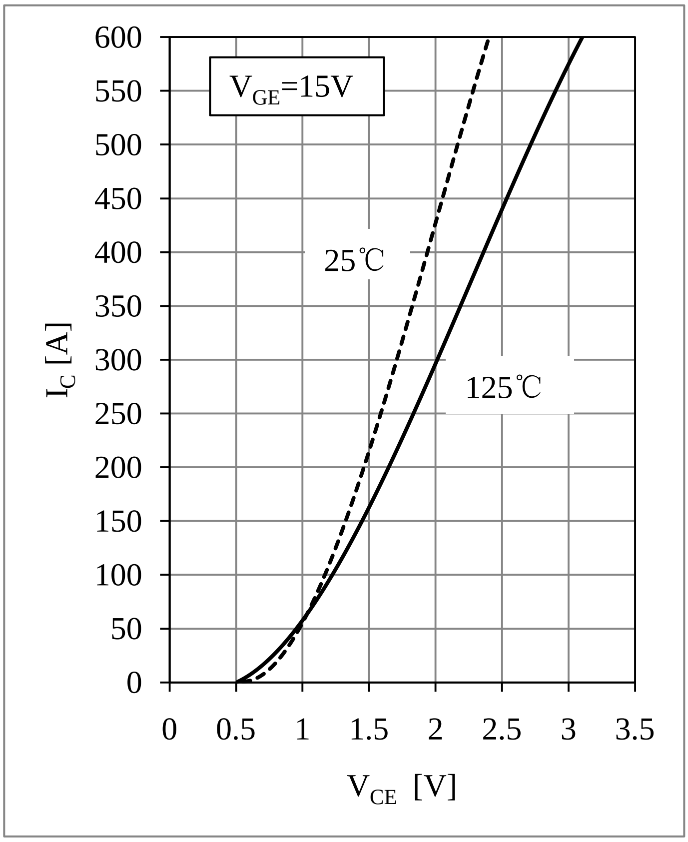


Fig 1. IGBT Output Characteristics (T1,T2)

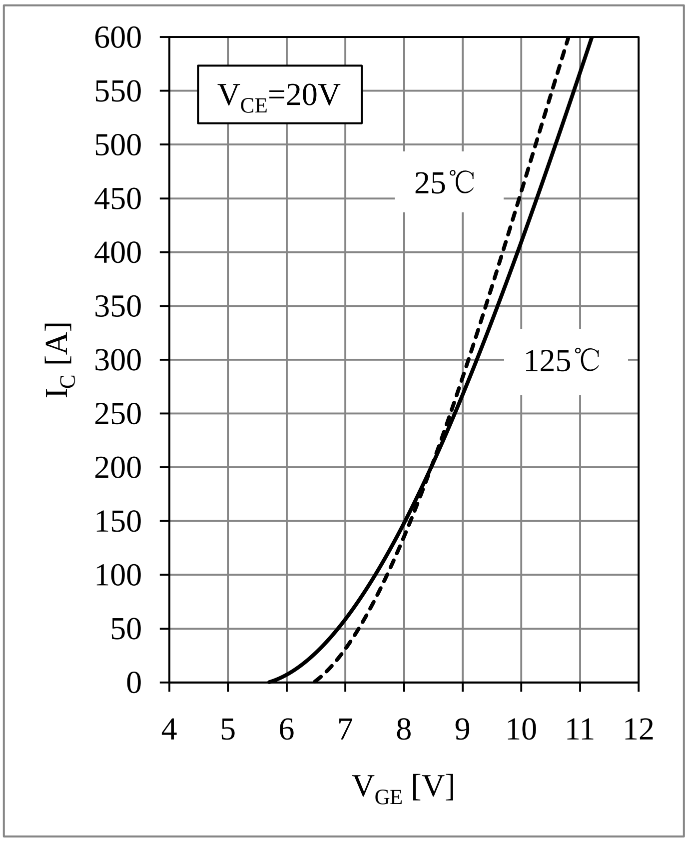


Fig 2. IGBT Transfer Characteristics (T1,T2)

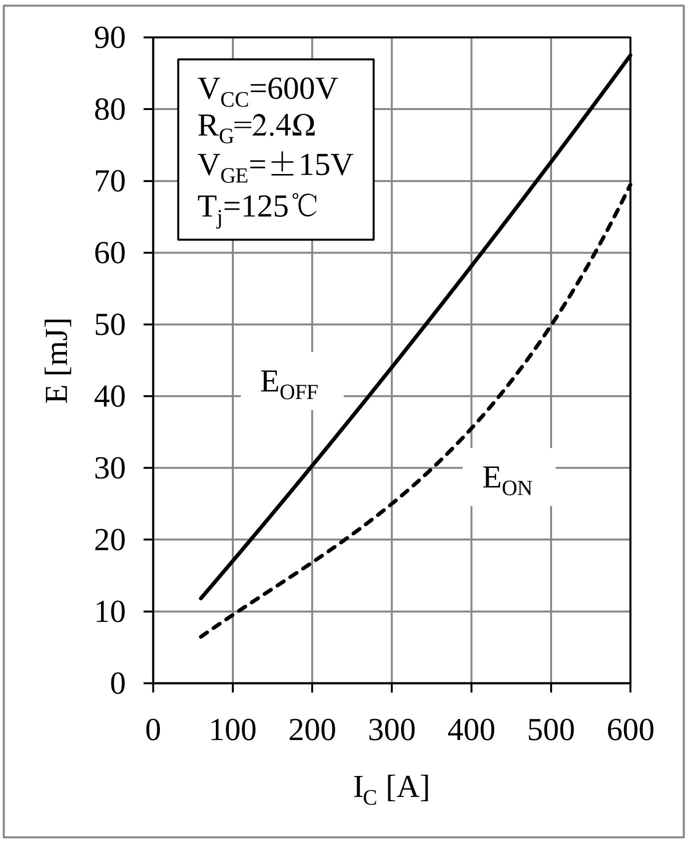


Fig 3. IGBT Switching Loss vs. I_C (T1,T2)

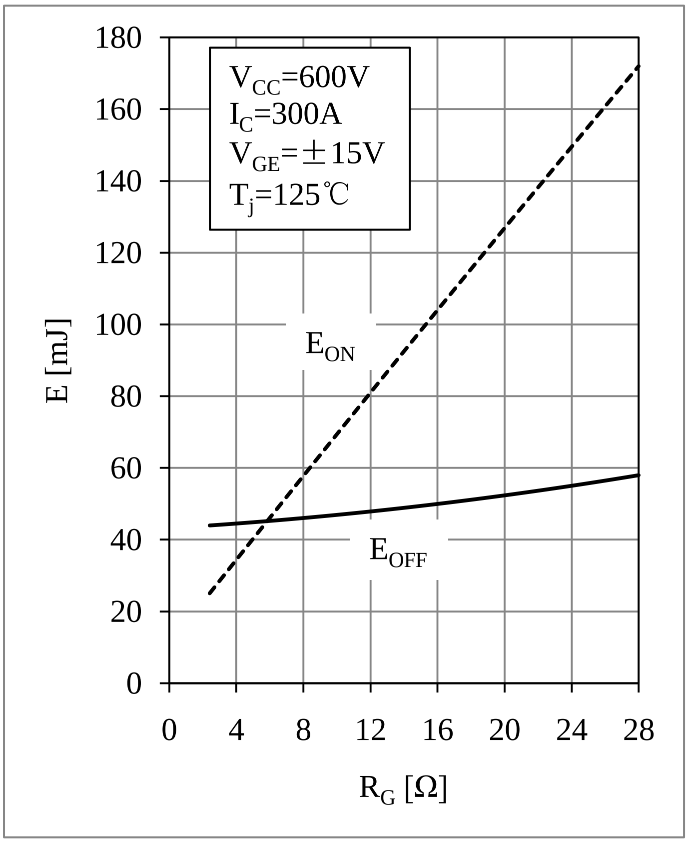


Fig 4. IGBT Switching Loss vs. R_G (T1,T2)

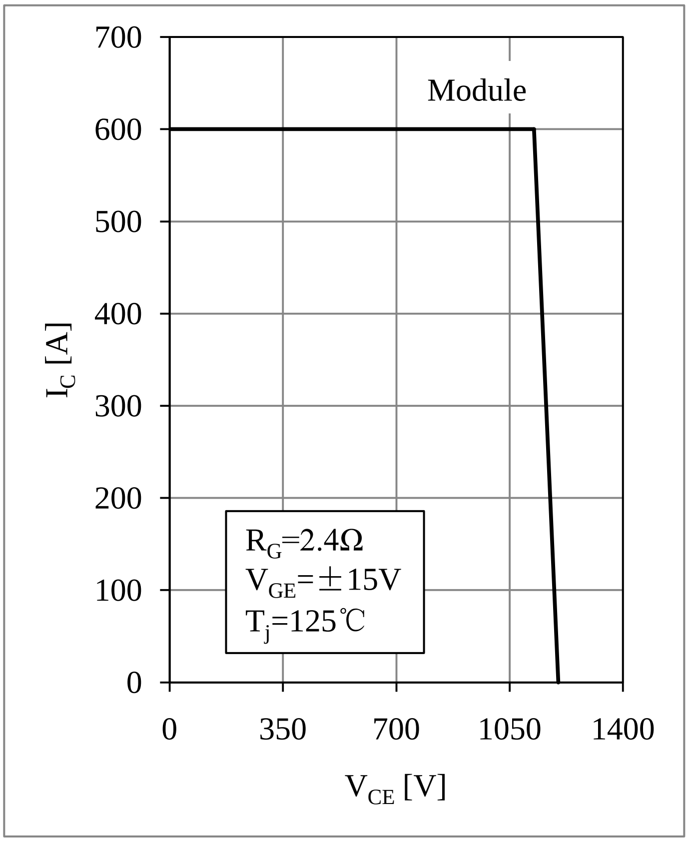


Fig 5. RBSOA (T1,T2)

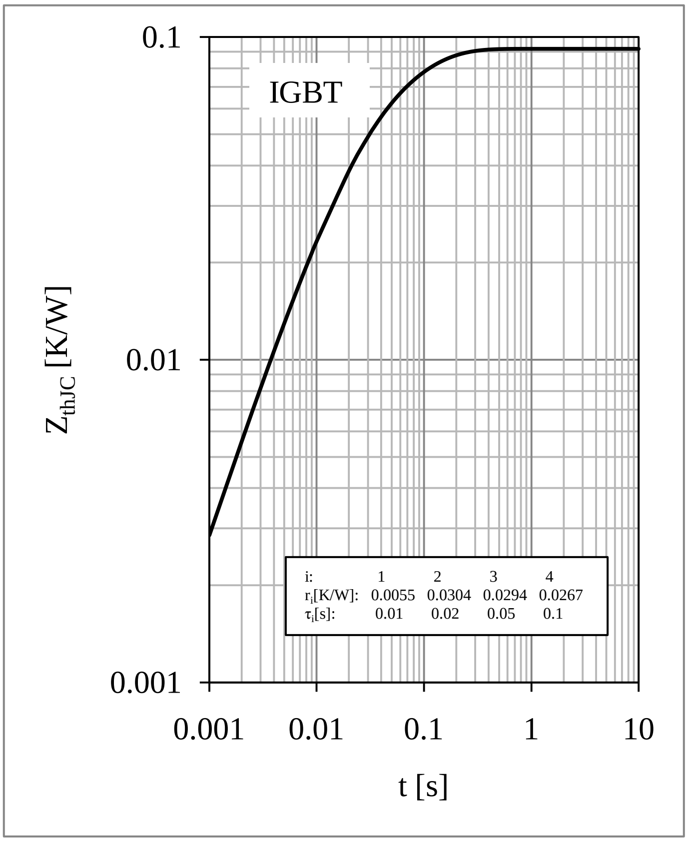


Fig 6. IGBT Transient Thermal Impedance (T1,T2)

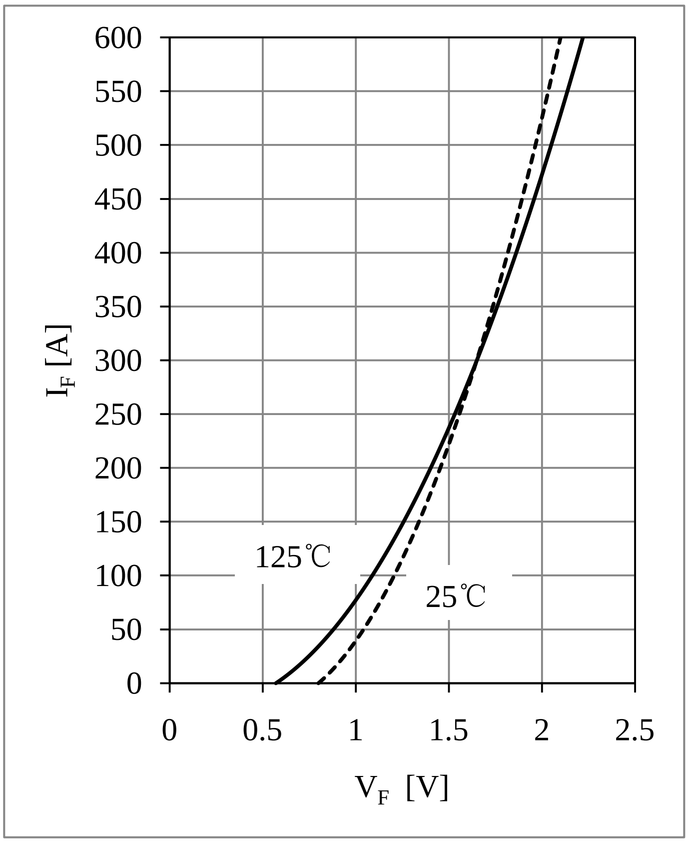


Fig 7. Diode Forward Characteristics (T1,T2)

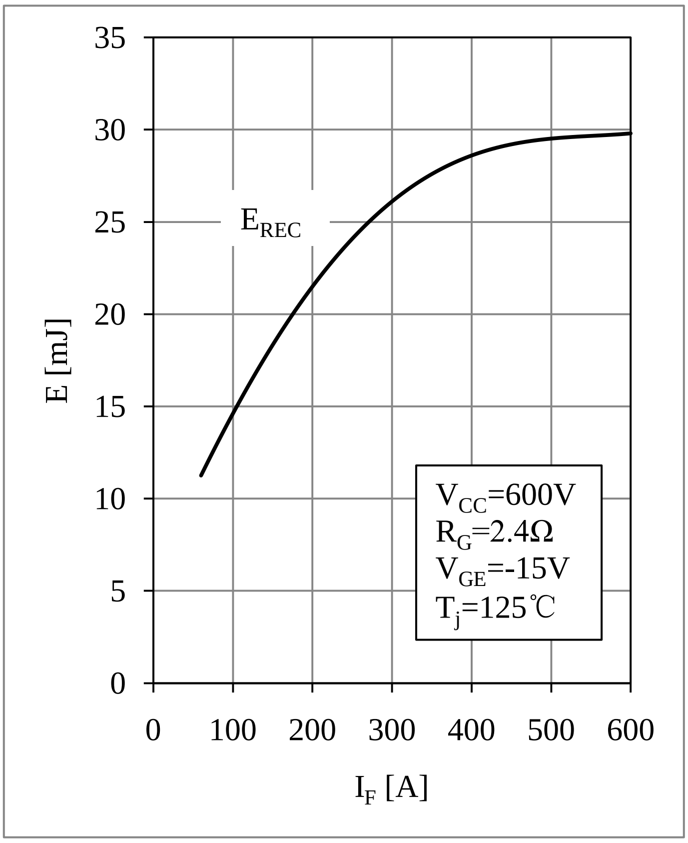


Fig 8. Diode Switching Loss vs. I_F (T1,T2)

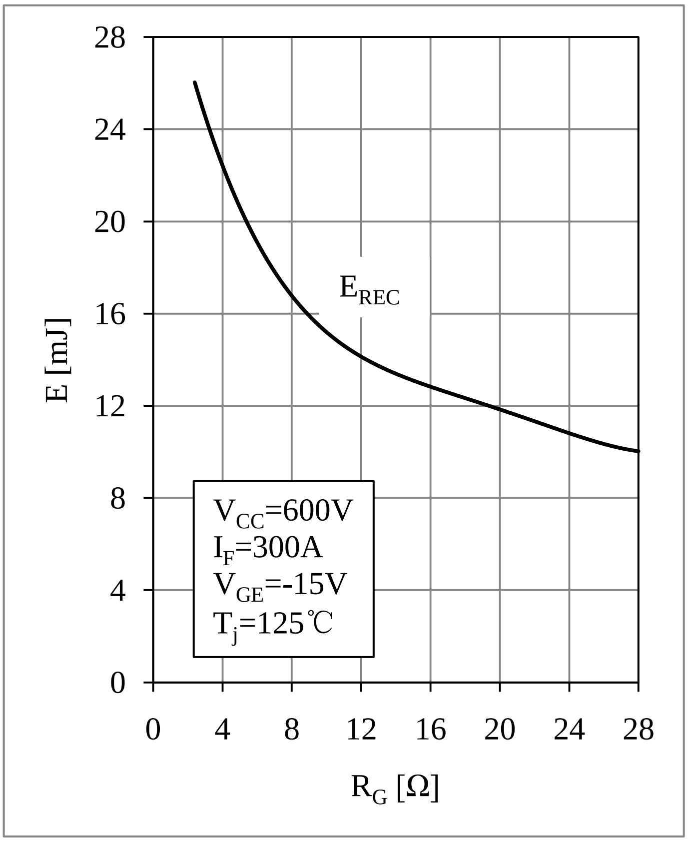


Fig 9. Diode Switching Loss vs. R_G (T1,T2)

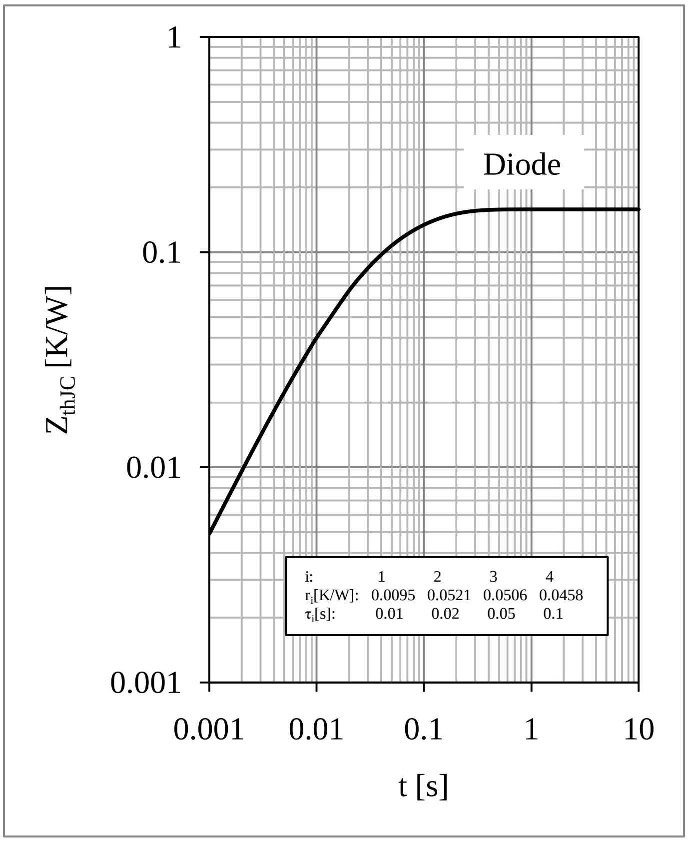


Fig 10. Diode Transient Thermal Impedance (T1,T2)

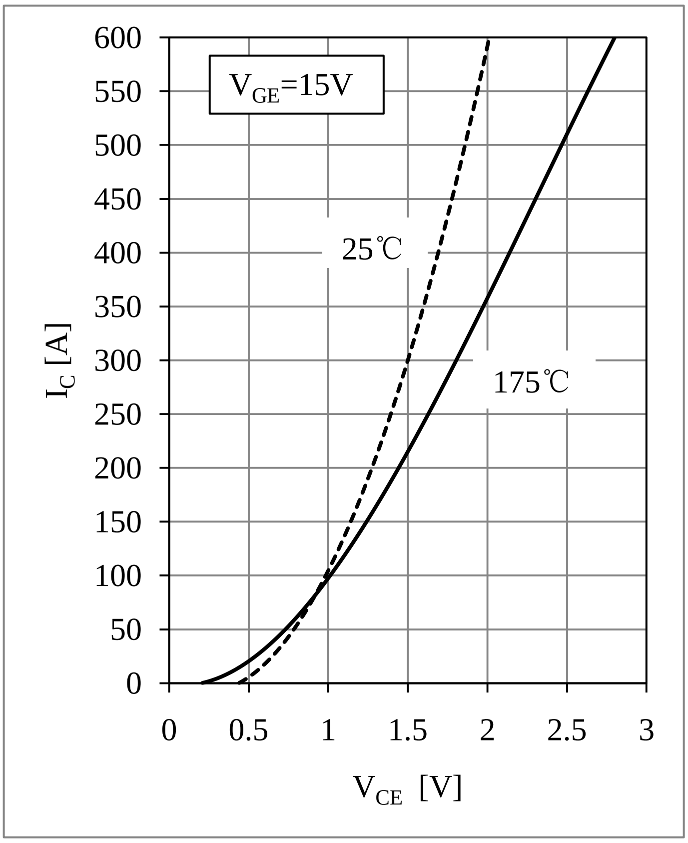


Fig 11. IGBT Output Characteristics (T3,T4)

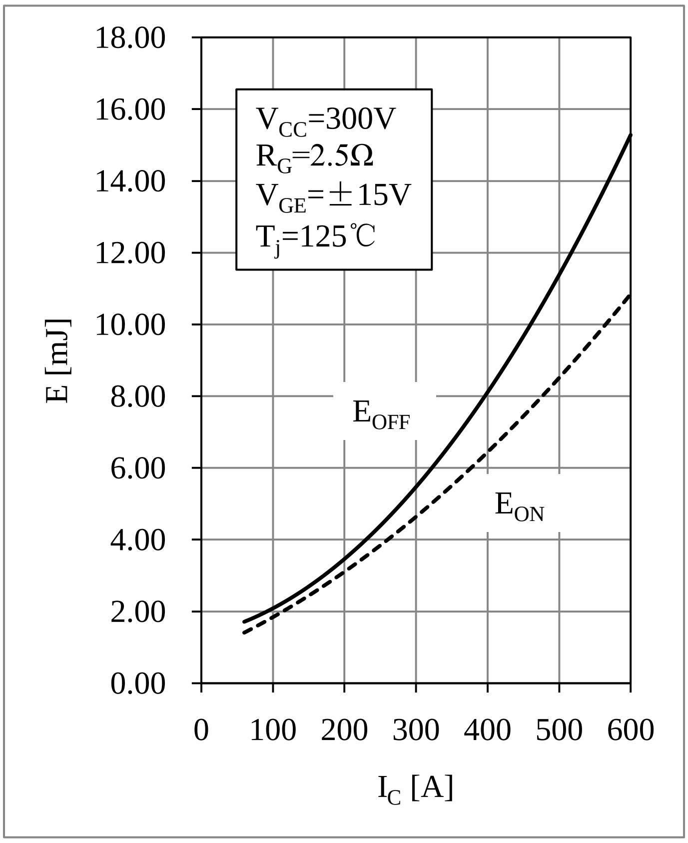


Fig 12. IGBT Switching Loss vs. I_C (T3,T4)

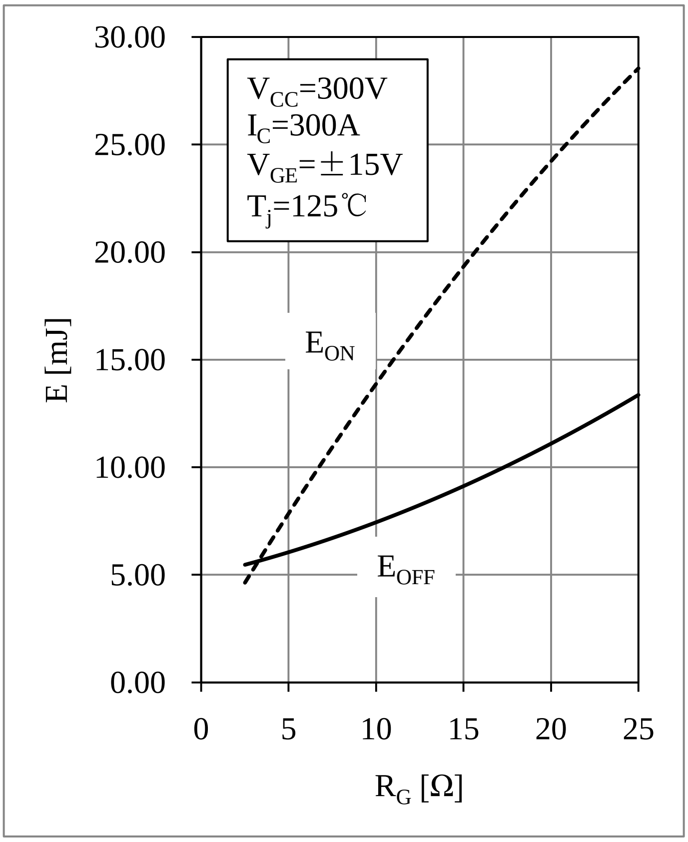


Fig 13. IGBT Switching Loss vs. R_G (T3,T4)

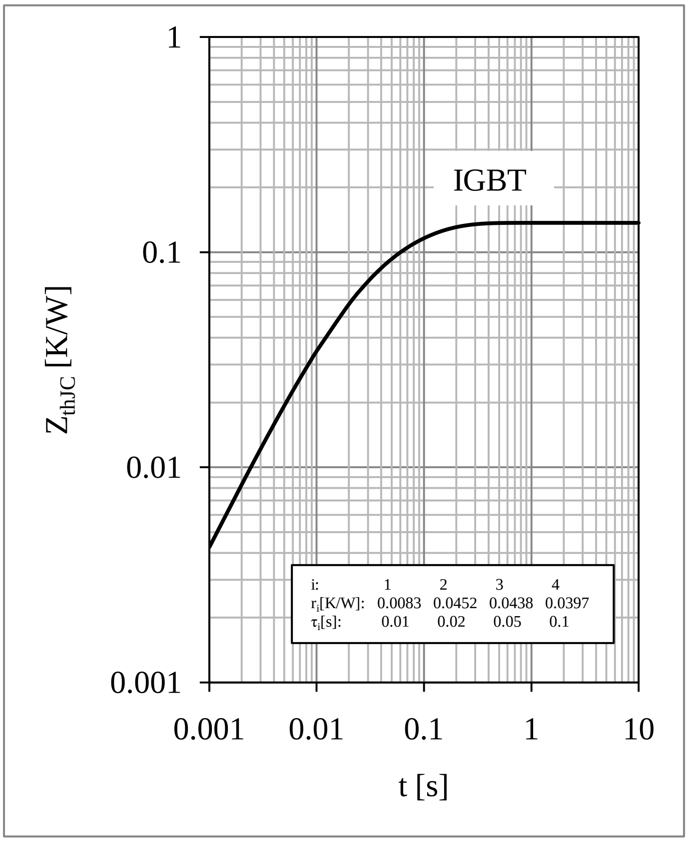


Fig 14. IGBT Transient Thermal Impedance (T3,T4)

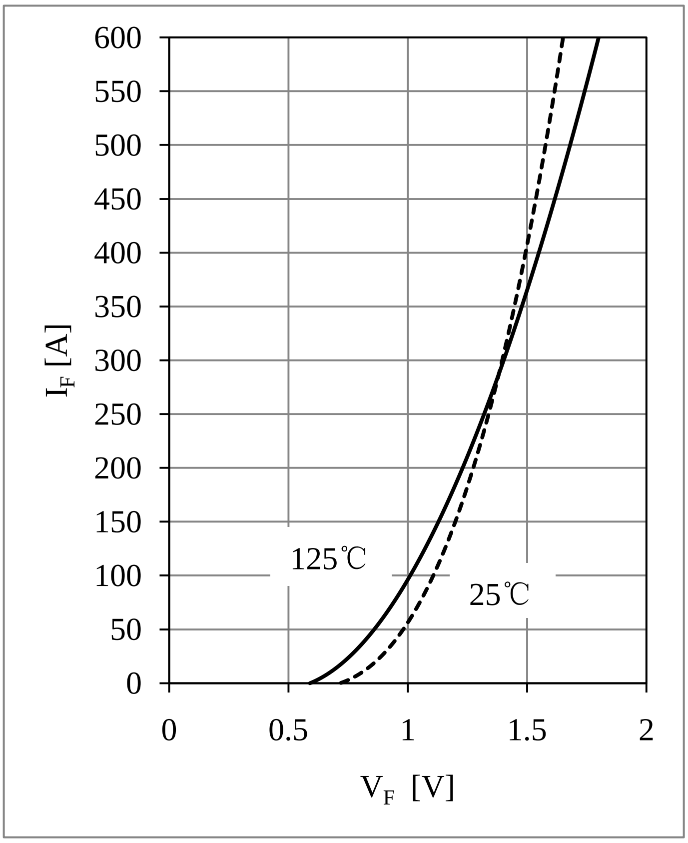


Fig 15. Diode Forward Characteristics (T3,T4)

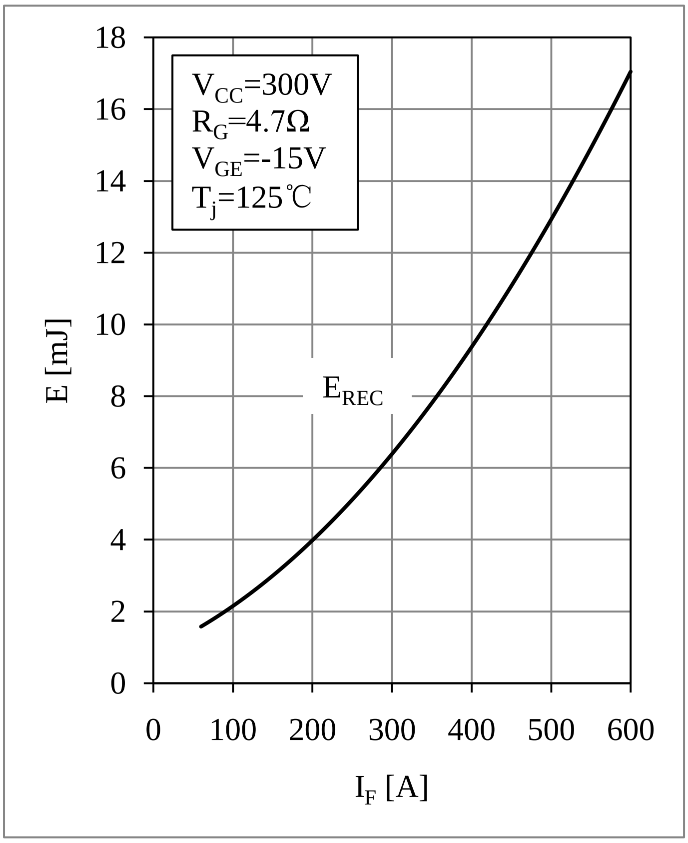


Fig 16. Diode Switching Loss vs. I_F (T3,T4)

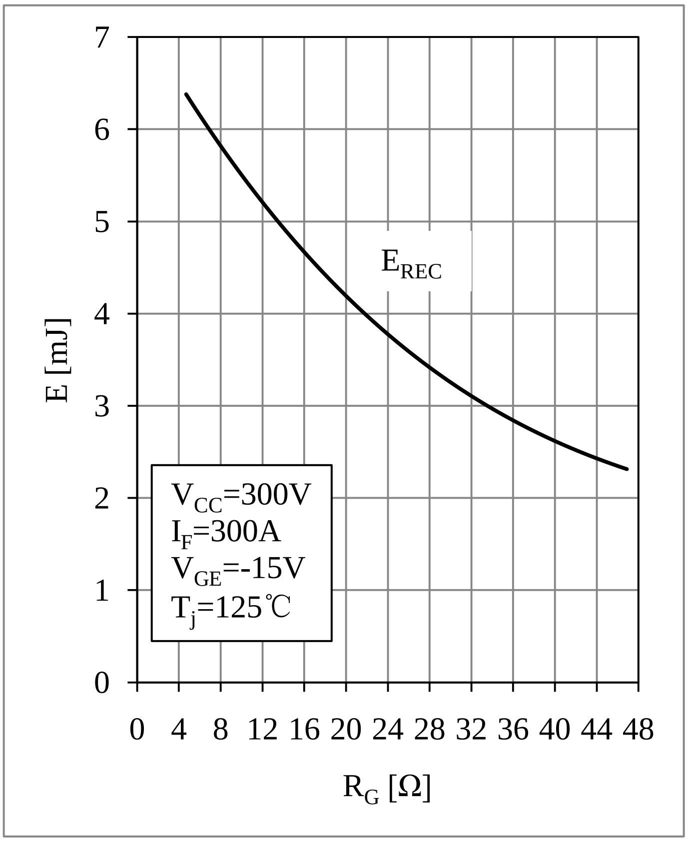


Fig 17. Diode Switching Loss vs. R_G (T3,T4)

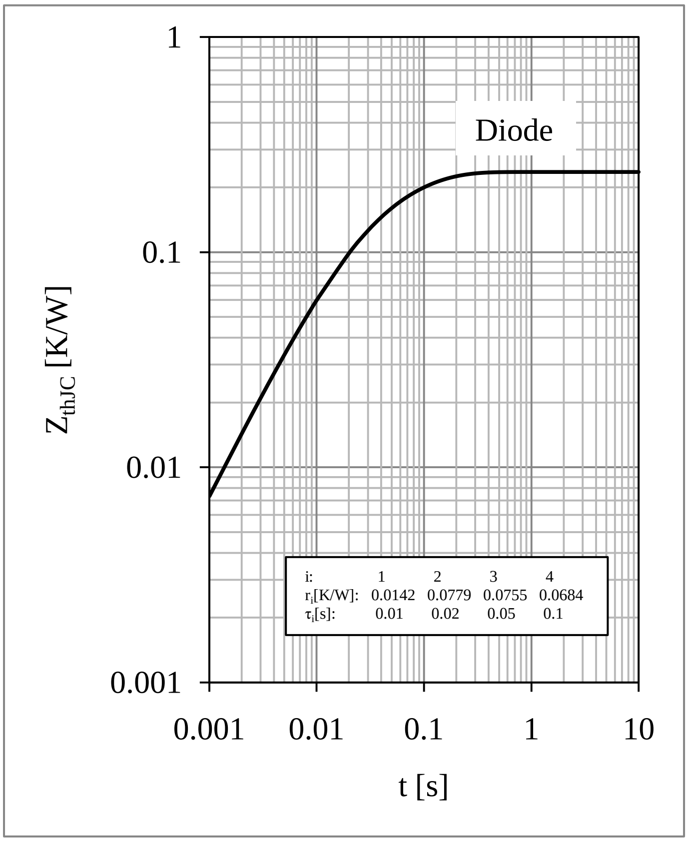
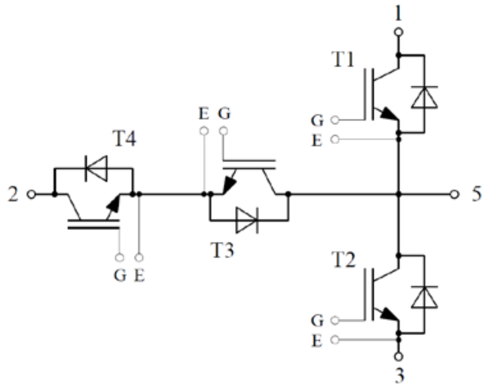


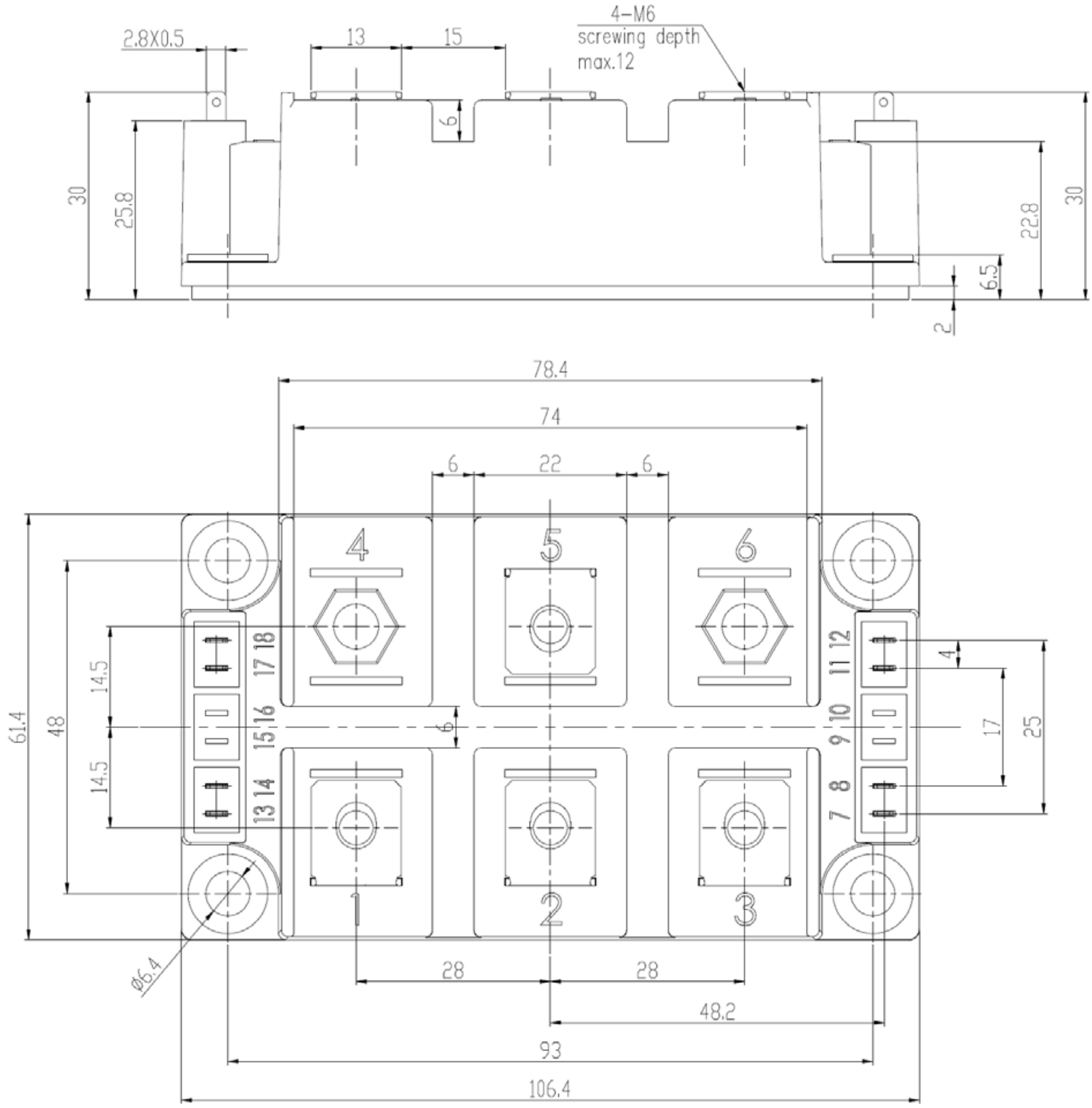
Fig 18. Diode Transient Thermal Impedance (T3,T4)

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters



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