STARPOWER

SEMICONDUCTOR™

IGBT

GD300MLT60C2S

Molding Type Module

600V/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 3-level-applications.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 5μs 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
- 3-Level-Applications

IGBT T1 T2 T3 T4 T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300MLT60C2S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	600	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	400 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_{tot}	Total Power Dissipation @ T_j=175℃	974	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	600			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=3.0mA,V_{CE}=V_{GE}, T_j=25℃	4.0	4.4	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=300A,V_{GE}=15V, T_j=25℃		1.65	2.10	V
		I_C=300A,V_{GE}=15V, T_j=175℃		2.00		

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=2.2Ω,V_{GE}=±15V, T_j=25℃		164		ns
t_r	Rise Time			64		ns
$t_{d(off)}$	Turn-Off Delay Time			139		ns
t_f	Fall Time			88		ns
E_{on}	Turn-On Switching Loss			3.61		mJ
E_{off}	Turn-Off Switching Loss			3.17		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=300A, R_G=2.2Ω,V_{GE}=±15V, T_j=125℃		175		ns
t_r	Rise Time			82		ns
$t_{d(off)}$	Turn-Off Delay Time			170		ns
t_f	Fall Time			112		ns
E_{on}	Turn-On Switching Loss			6.30		mJ
E_{off}	Turn-Off Switching Loss			5.76		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		23.1		nF
C_{oes}	Output Capacitance			1.59		nF
C_{res}	Reverse Transfer Capacitance			0.69		nF
Q_G	Gate Charge	V_{CC}=400V,I_C=300A, V_{GE}=15V		625		nC
R_{Gint}	Internal Gate Resister			1.7		Ω
I_{SC}	SC Data	t_P≤5μs,V_{GE}=15V, T_j=125℃, V_{CC}=360V, V_{CEM}≤600V		2700		A

DIODE D1 D2 D3 D4 T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300MLT60C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current T_C=80℃	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=2.2Ω, V_{GE}=-15V	T_j=25℃		13.6		μC
			T_j=125℃		18.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		170		A
			T_j=125℃		219		
E_{rec}	Reverse Recovery Energy		T_j=25℃		2.65		mJ
			T_j=125℃		5.00		

DIODE D5 D6 T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300MLT60C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current T_C=80℃	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=2.2Ω, V_{GE}=-15V	T_j=25℃		13.6		μC
			T_j=125℃		18.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		170		A
			T_j=125℃		219		
E_{rec}	Reverse Recovery Energy		T_j=25℃		2.65		mJ
			T_j=125℃		5.00		

NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100℃,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

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min		2500		V
$R_{\theta JC}$	Junction-to-Case (per IGBT T1 T2 T3 T4) Junction-to-Case (per DIODE D1 D2 D3 D4) Junction-to-Case (per DIODE D5 D6)			0.154 0.240 0.269	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.035		K/W
T_{jmax}	Maximum Junction Temperature			175	℃
T_{STG}	Storage Temperature Range	-40		125	℃
Mounting Torque	Power Terminal Screw:M6 Mounting Screw:M6	2.5 3.0		5.0 5.0	N.m
Weight	Weight of Module		340		g

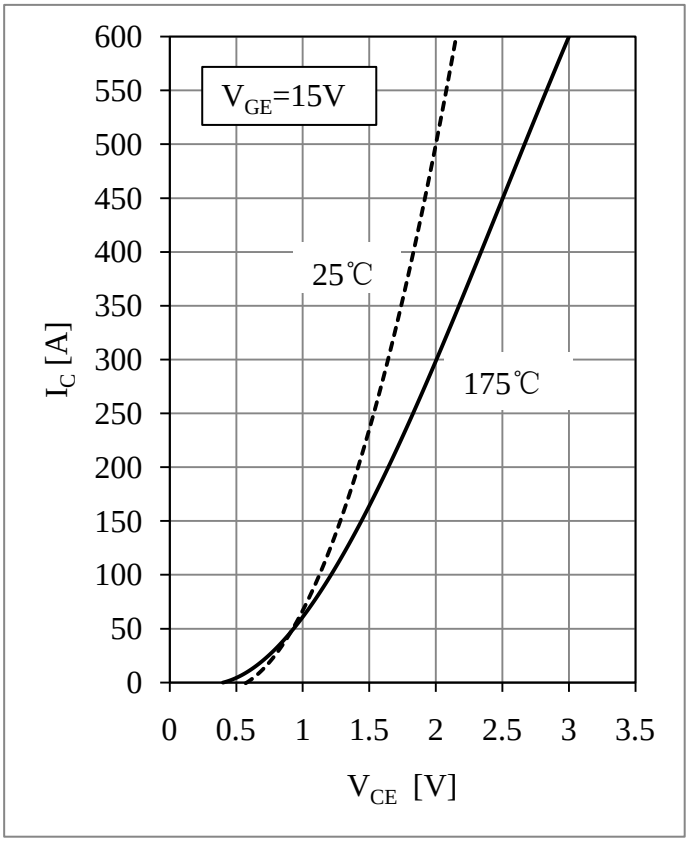


Fig 1. IGBT T1-T4 Output Characteristic

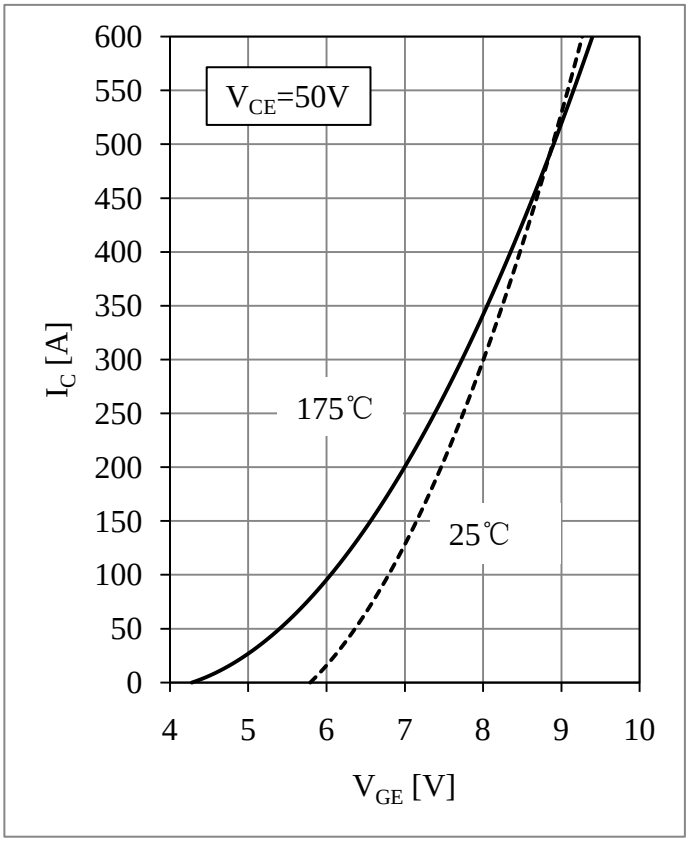


Fig 2. IGBT T1-T4 Transfer Characteristic

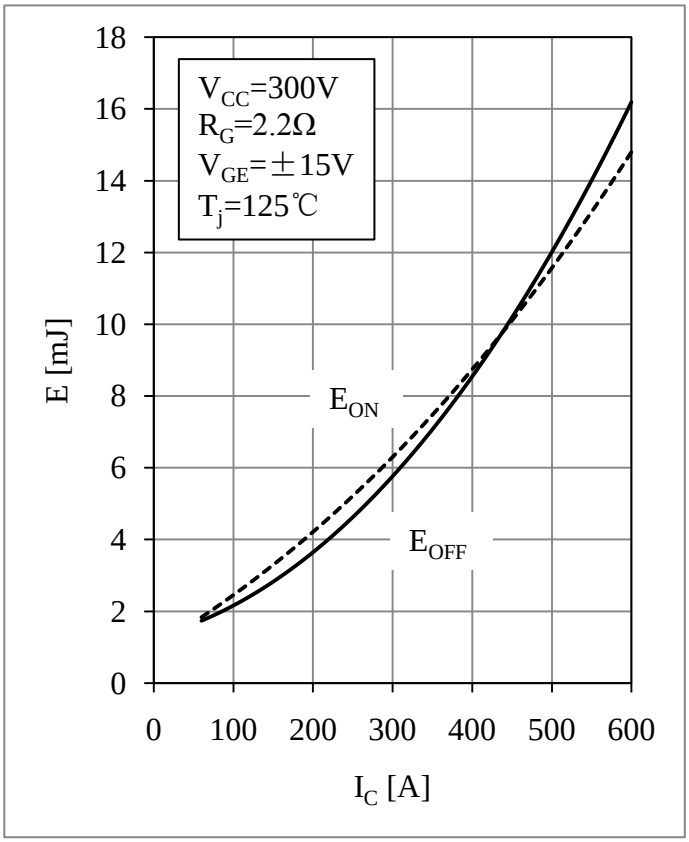


Fig 3. IGBT T1-T4 Switching Loss vs. I_C

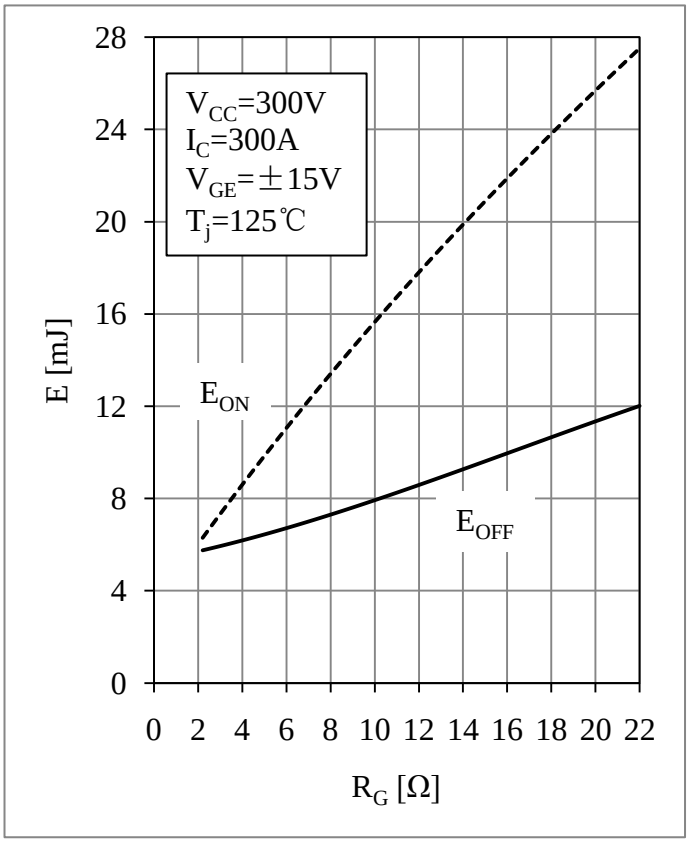


Fig 4. IGBT T1-T4 Switching Loss vs. R_G

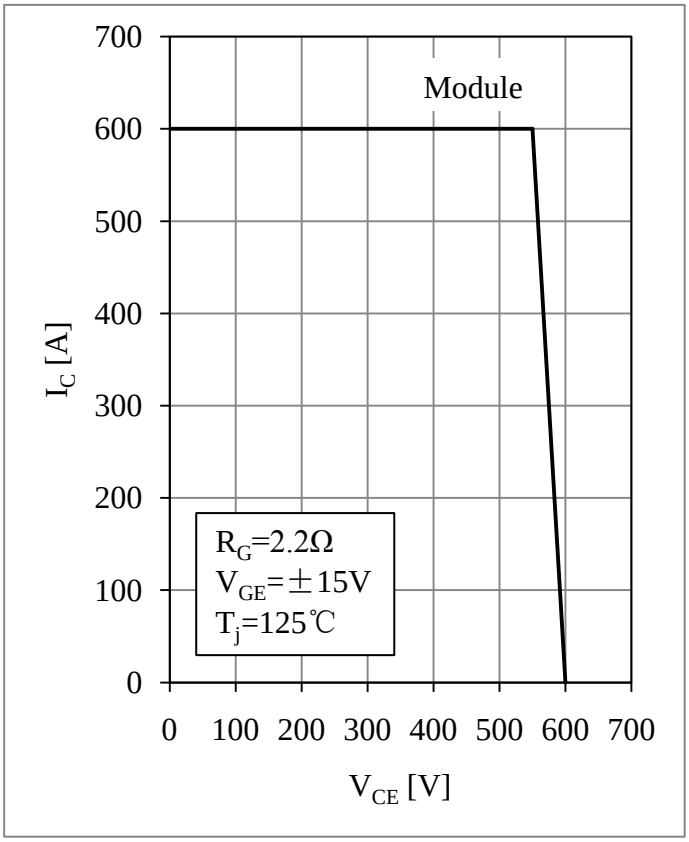


Fig 5. IGBT T1-T4 RBSOA

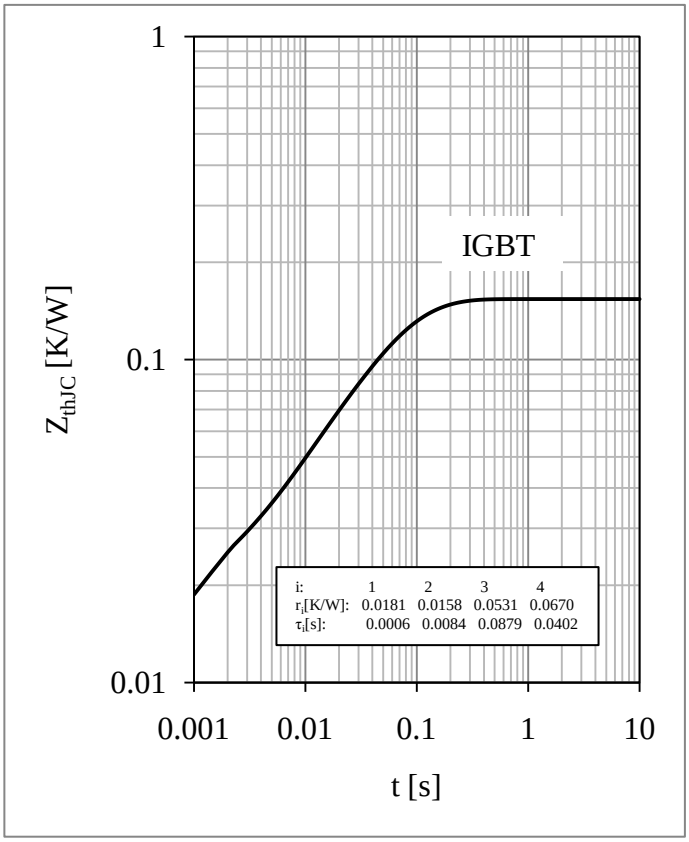


Fig 6. IGBT T1-T4 Transient Thermal Impedance

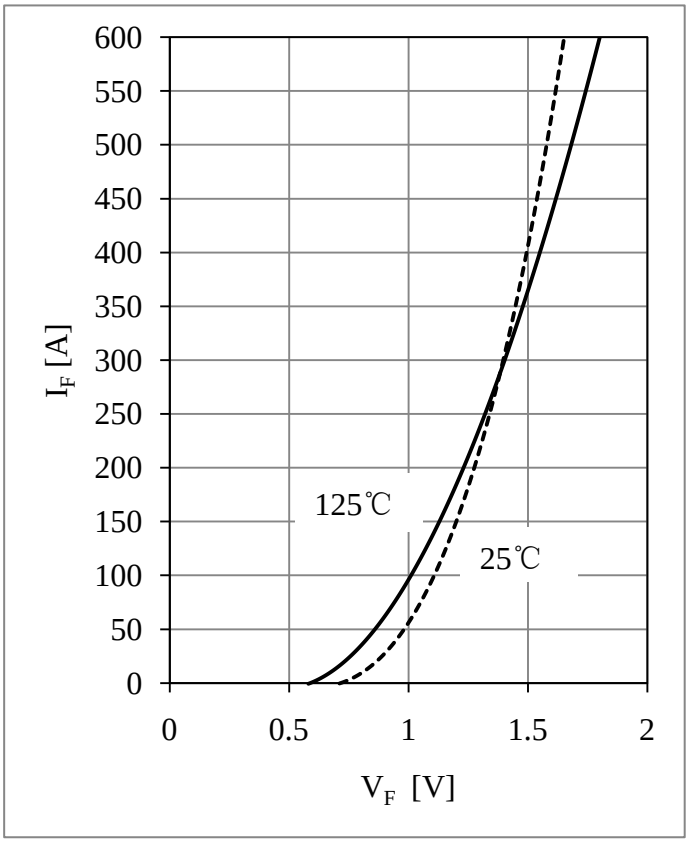


Fig 7. Diode D1-D4 Forward Characteristic

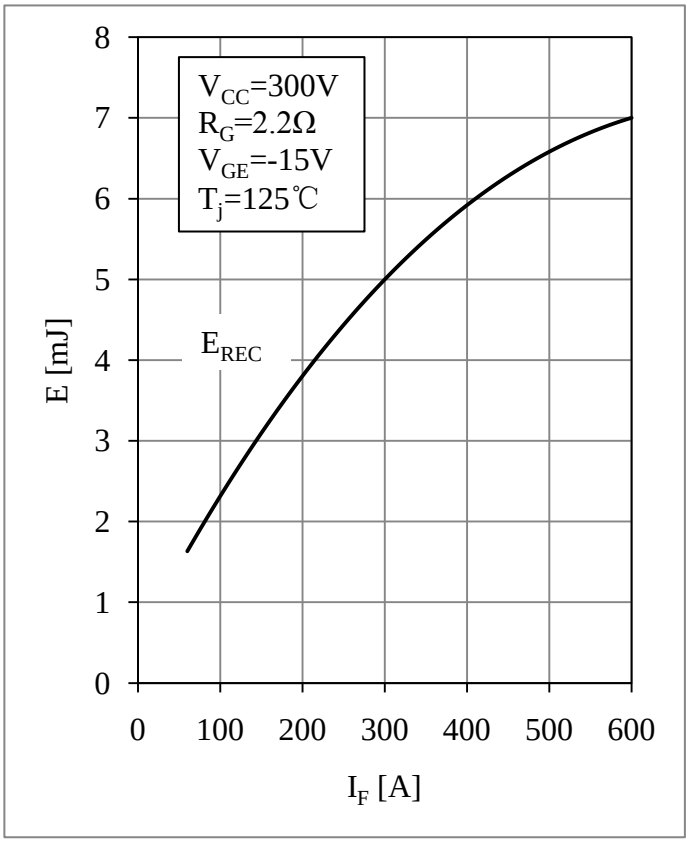


Fig 8. Diode D1-D4 Switching Loss vs. I_F

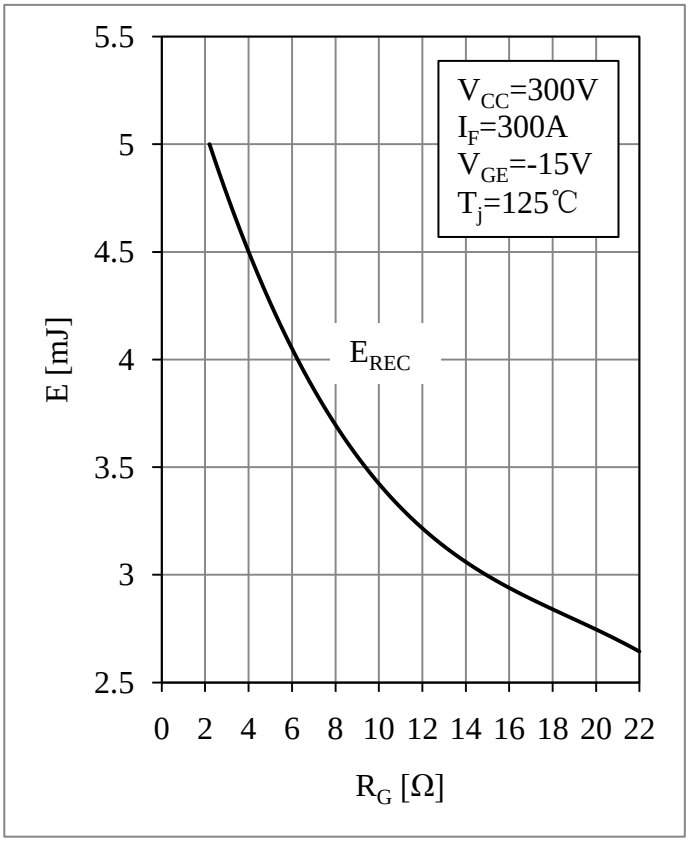


Fig 9. Diode D1-D4 Switching Loss vs. R_G

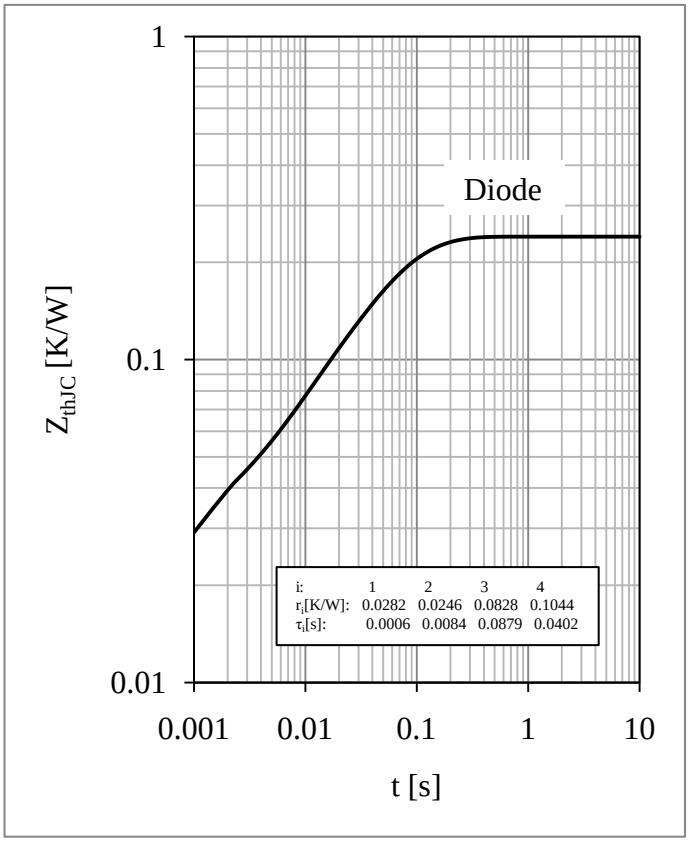


Fig 10. Diode D1-D4 Transient Thermal Impedance

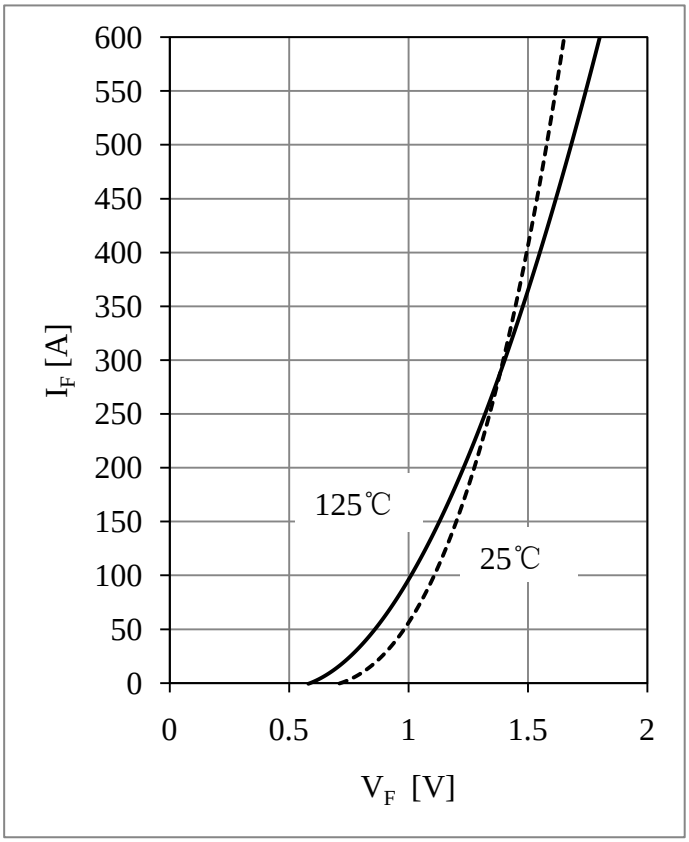


Fig 11. Diode D5-D6 Forward Characteristic

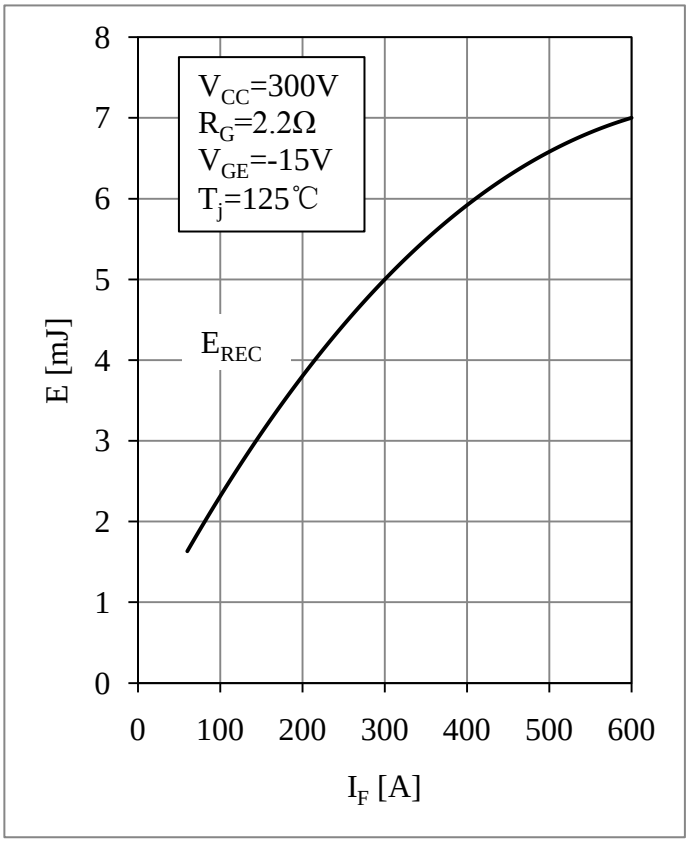


Fig 12. Diode D5-D6 Switching Loss vs. I_F

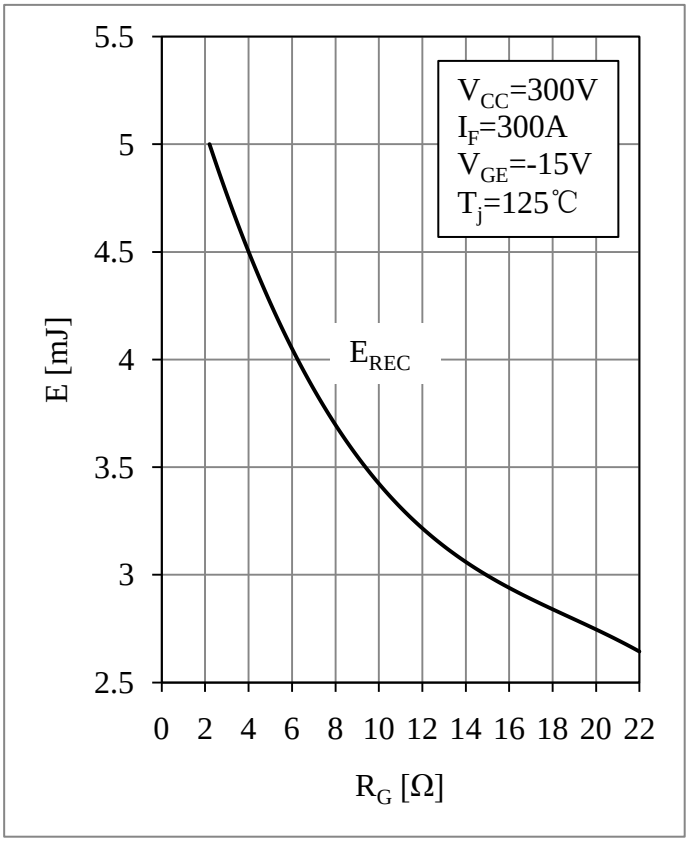


Fig 13. Diode D5-D6 Switching Loss vs. R_G

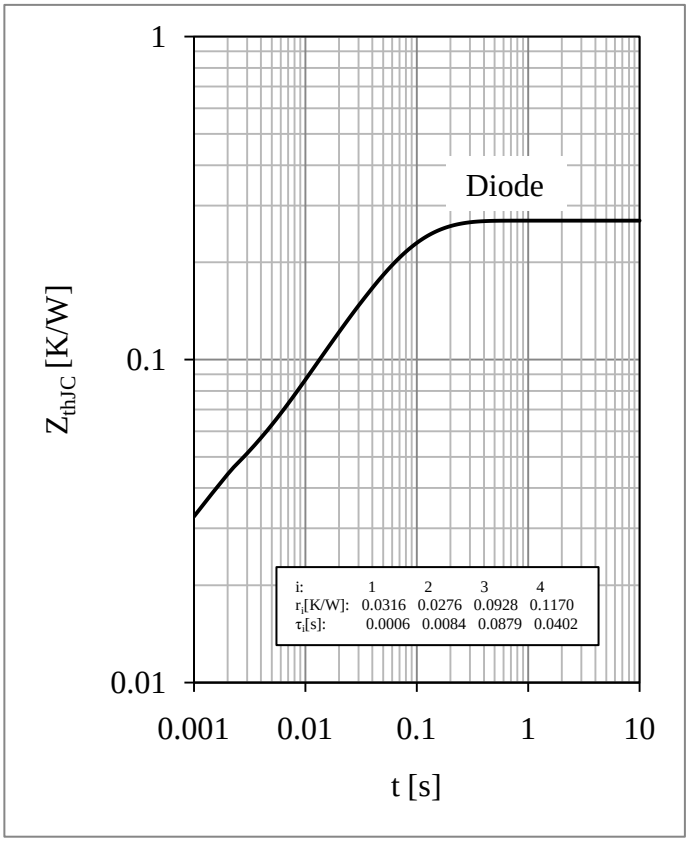


Fig 14. Diode D5-D6 Transient Thermal Impedance

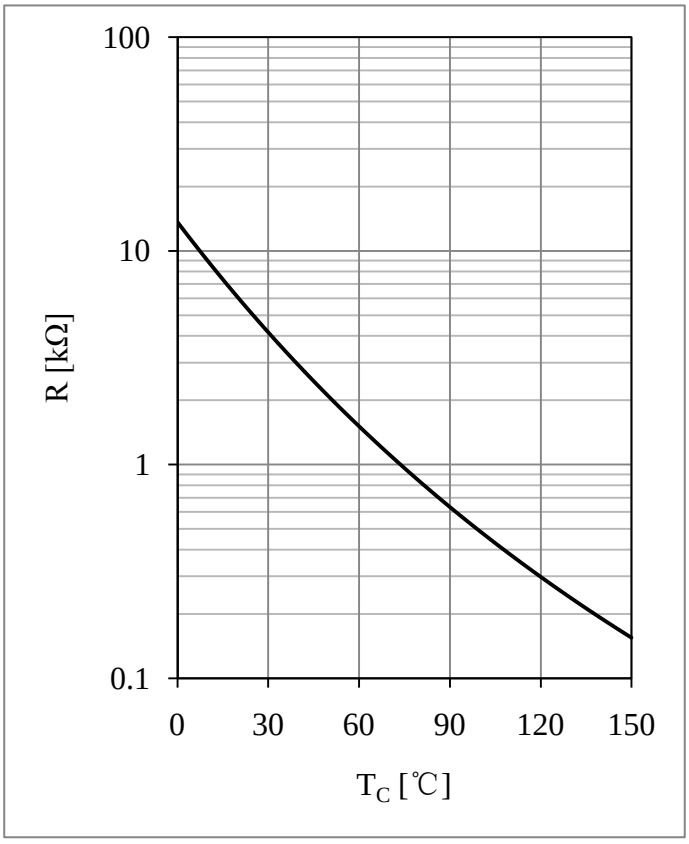
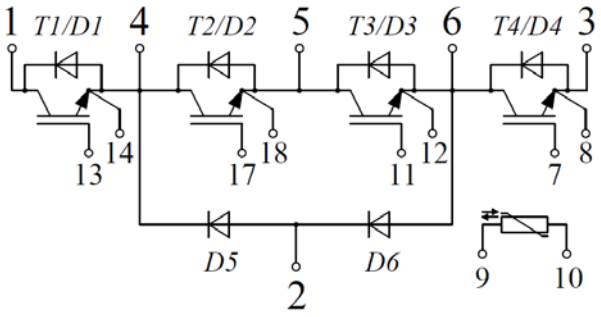


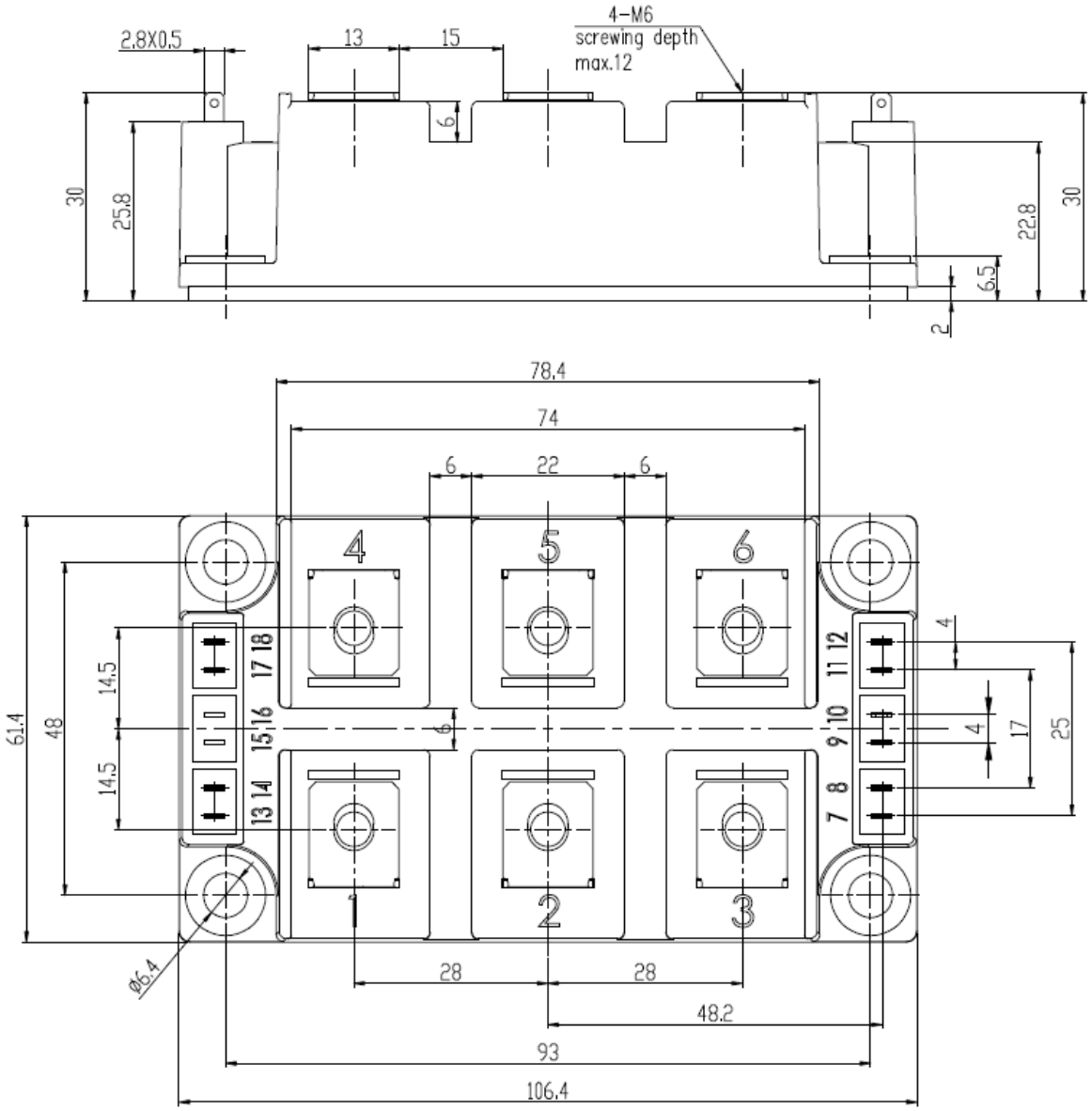
Fig 15. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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