STARPOWER

SEMICONDUCTOR **IGBT**

GD300MLT60B3S

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
- 6μs 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	GD300MLT60B3S	Unit
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=70℃	400 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_{tot}	Total Power Dissipation @ T_j=175℃	847	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	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.	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=4.8mA,V_{CE}=V_{GE}, T_j=25℃	5.1	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=300A,V_{GE}=15V, T_j=25℃		1.45	1.90	V
		I_C=300A,V_{GE}=15V, T_j=125℃		1.60		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=300A, R_G=2.4Ω,V_{GE}=±15V, T_j=25℃		108		ns
t_r	Rise Time			49		ns
$t_{d(off)}$	Turn-Off Delay Time			492		ns
t_f	Fall Time			49		ns
E_{on}	Turn-On Switching Loss			2.13		mJ
E_{off}	Turn-Off Switching Loss			9.83		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=300A, R_G=2.4Ω,V_{GE}=±15V, T_j=125℃		121		ns
t_r	Rise Time			59		ns
$t_{d(off)}$	Turn-Off Delay Time			520		ns
t_f	Fall Time			71		ns
E_{on}	Turn-On Switching Loss			3.08		mJ
E_{off}	Turn-Off Switching Loss			12.1		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		18.5		nF
C_{oes}	Output Capacitance			1.15		nF
C_{res}	Reverse Transfer Capacitance			0.55		nF
Q_G	Gate Charge	V_{CC}=300V,I_C=300A, V_{GE}=-15___+15V		3.22		nC
R_{Gint}	Internal Gate Resister			1.0		Ω
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150℃,V_{CC}=360V, V_{CEM}≤600V		1500		A

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

Maximum Rated Values

Symbol	Description	GD300MLT60B3S	Unit
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	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.	Unit
V_F	Diode Forward Voltage	I_F=300A V_{GE}=0V	T_j=25℃		1.55	1.95	V
			T_j=125℃		1.50		
Q_r	Recovered Charge	I_F=300A, V_R=300V, R_G=2.4Ω, V_{GE}=-15V	T_j=25℃		13.2		μC
			T_j=125℃		23.8		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		192		A
			T_j=125℃		240		
E_{rec}	Reverse Recovery Energy		T_j=25℃		3.42		mJ
			T_j=125℃		6.18		

Diode D5 D6 T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD300MLT60B3S	Unit
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	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.	Unit
V_F	Diode Forward Voltage	I_F=300A V_{GE}=0V	T_j=25℃		1.55	1.95	V
			T_j=125℃		1.50		
Q_r	Recovered Charge	I_F=300A, V_R=300V, R_G=2.4Ω, V_{GE}=-15V	T_j=25℃		13.2		μC
			T_j=125℃		23.8		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		192		A
			T_j=125℃		240		
E_{rec}	Reverse Recovery Energy		T_j=25℃		3.42		mJ
			T_j=125℃		6.18		

NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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.	Unit
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)			0.177 0.288 0.299	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	℃
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

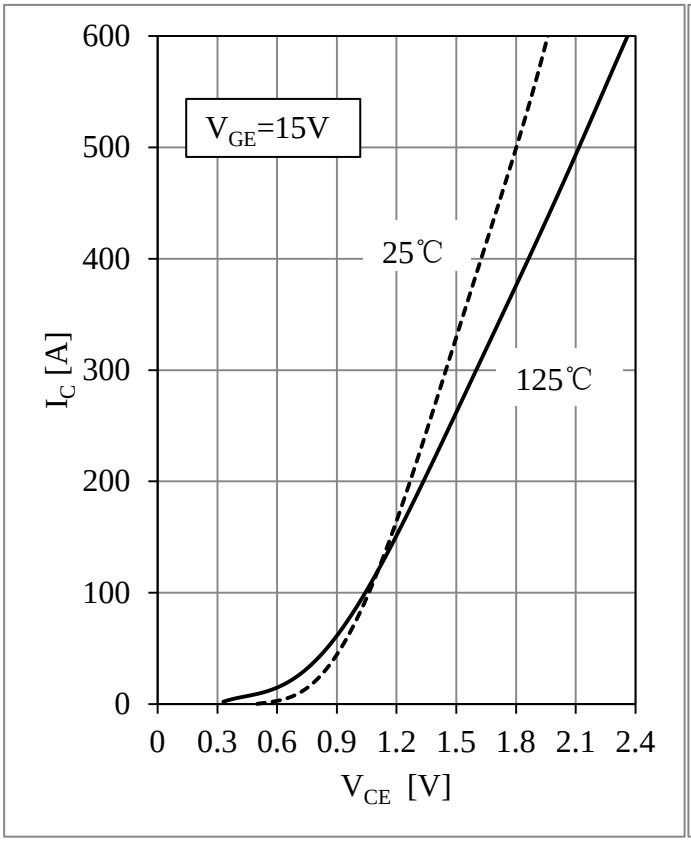


Fig 1. IGBT T1-T4 Output Characteristic

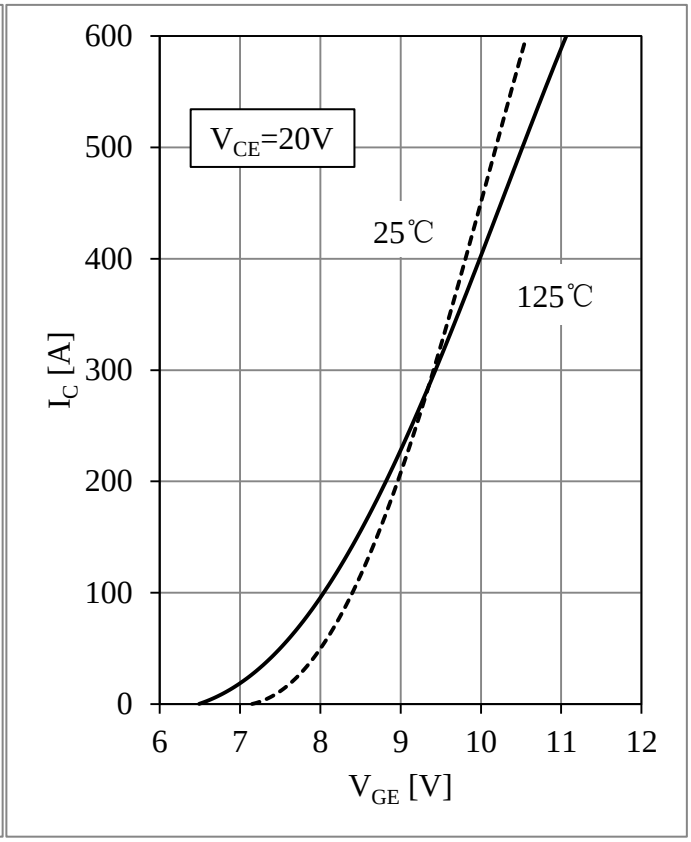


Fig 2. IGBT T1-T4 Transfer Characteristic

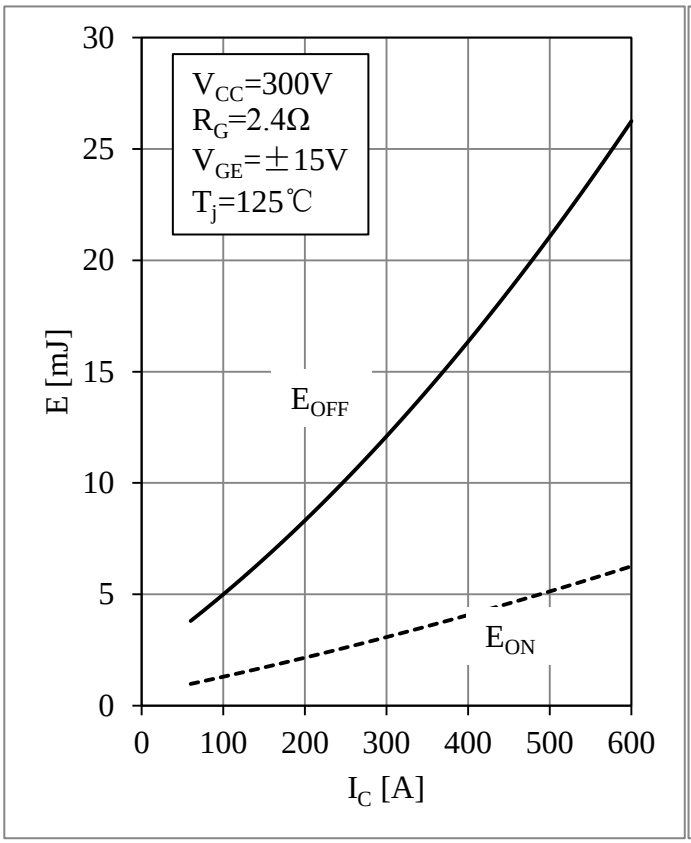


Fig 3. IGBT T1-T4 Switching Loss vs. I_C

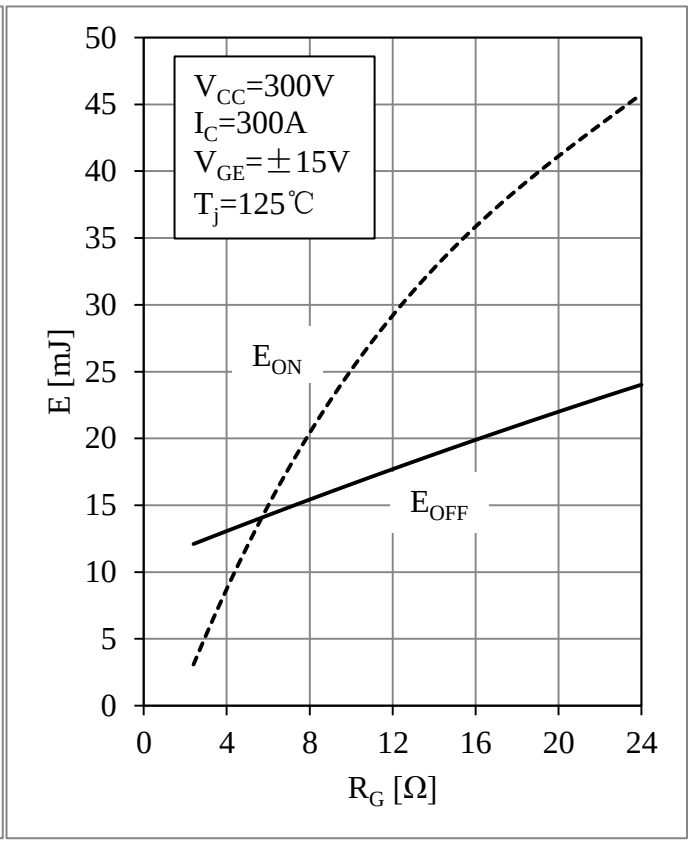


Fig 4. IGBT T1-T4 Switching Loss vs. R_G

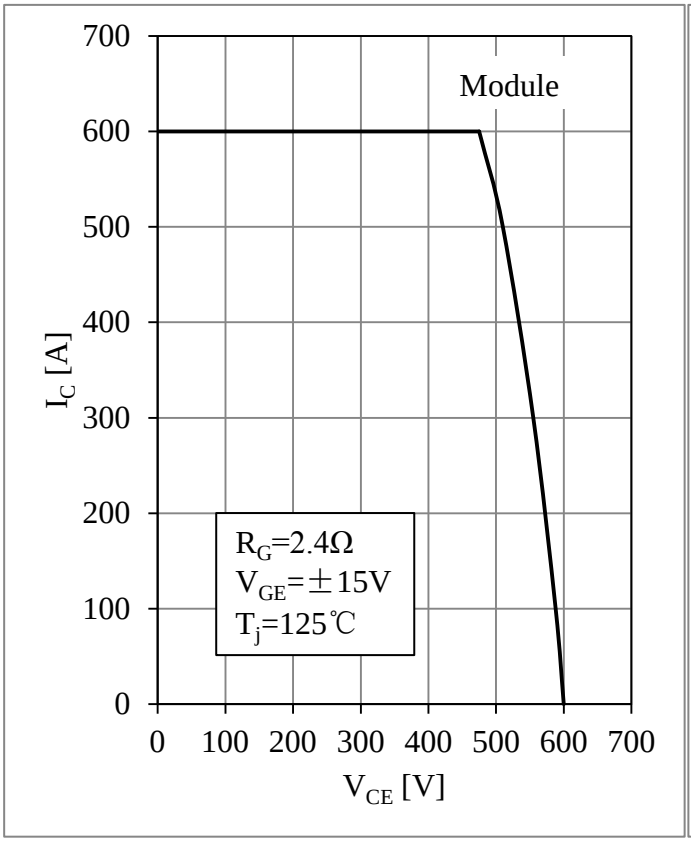


Fig 5. IGBT T1-T4 RBSOA

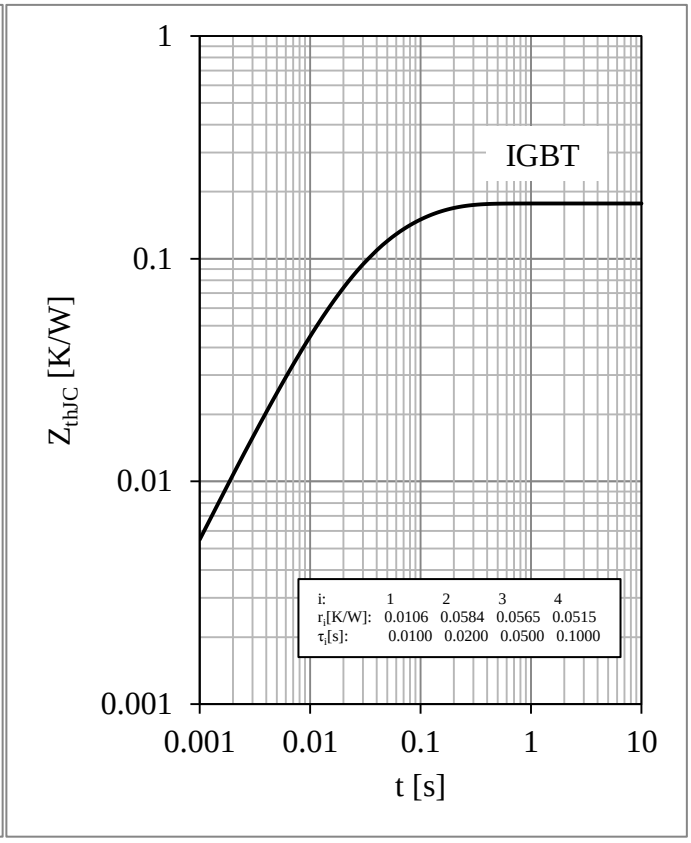


Fig 6. IGBT T1-T4 Transient Thermal Impedance

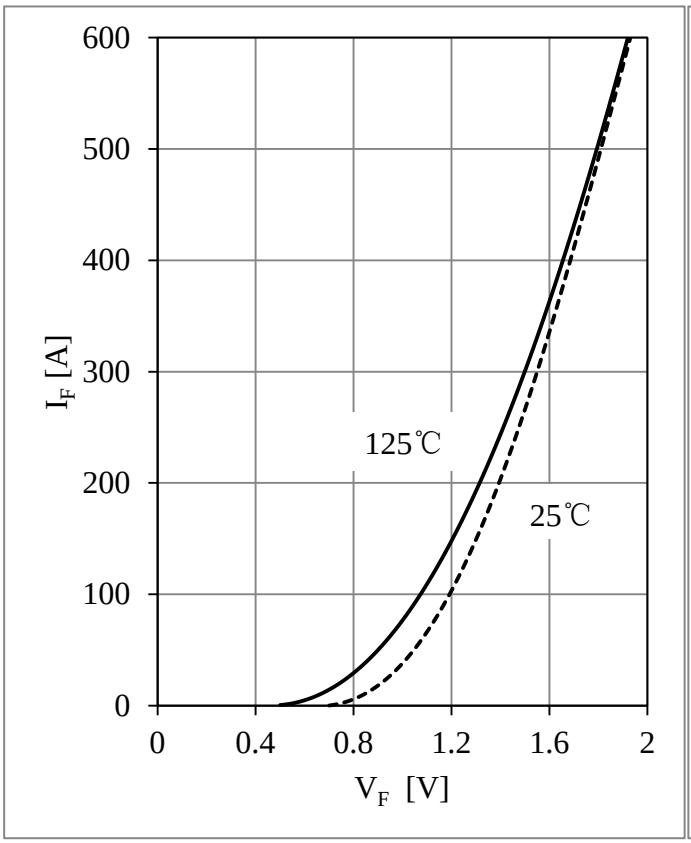


Fig 7. Diode D1-D4 Forward Characteristic

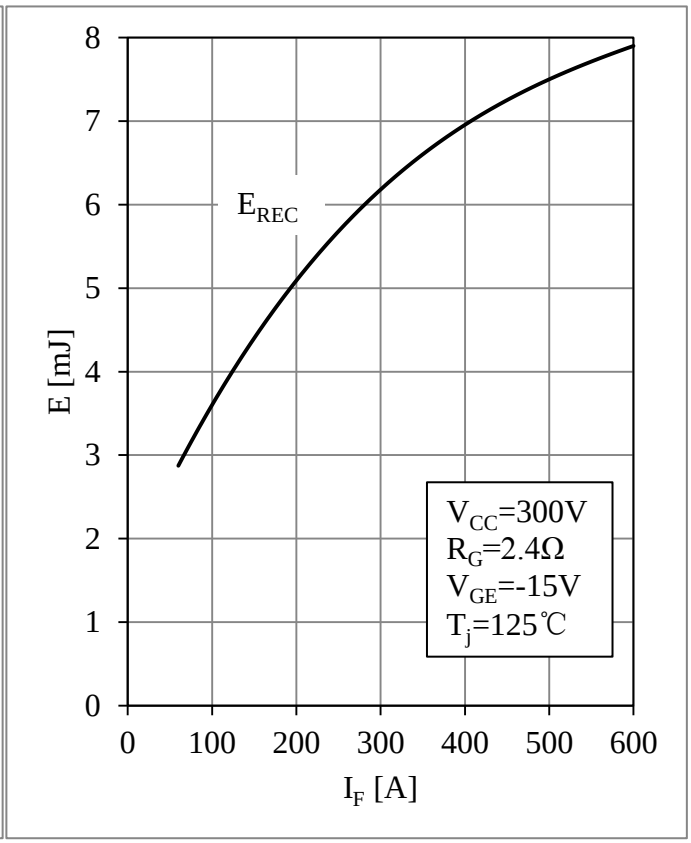


Fig 8. Diode D1-D4 Switching Loss vs. I_F

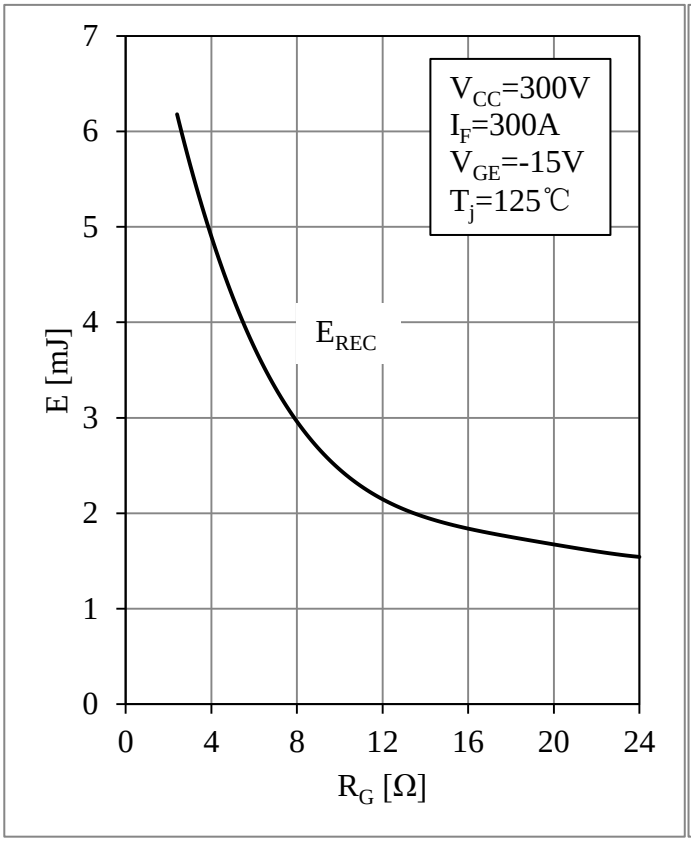


Fig 9. Diode D1-D4 Switching Loss vs. R_G

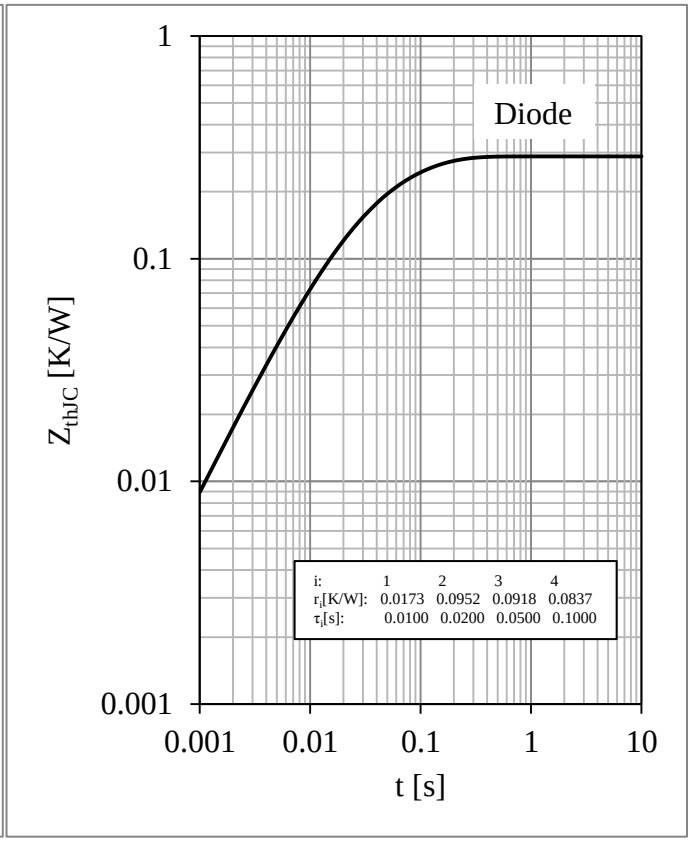


Fig 10. Diode D1-D4 Transient Thermal Impedance

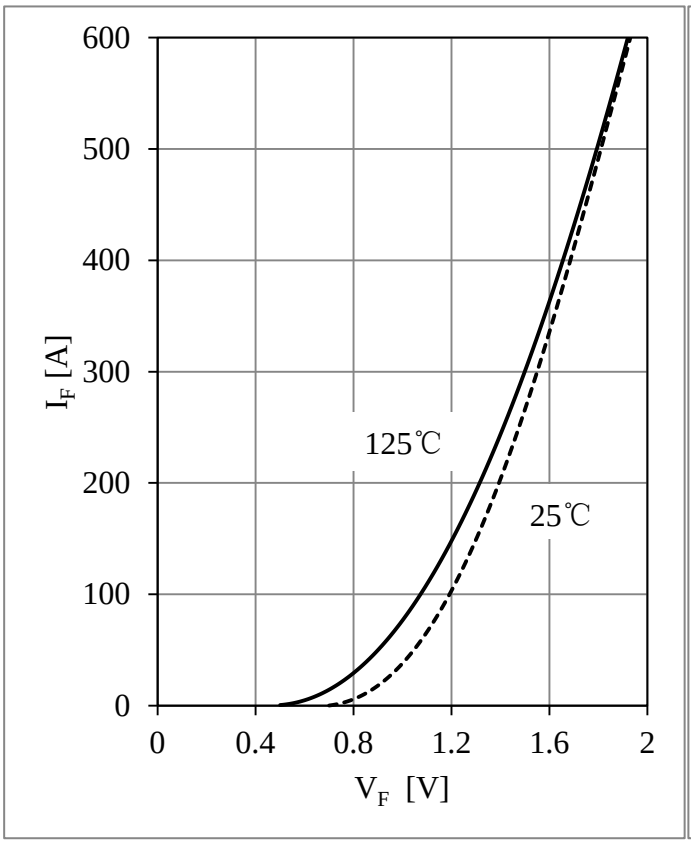


Fig 11. Diode D5-D6 Forward Characteristic

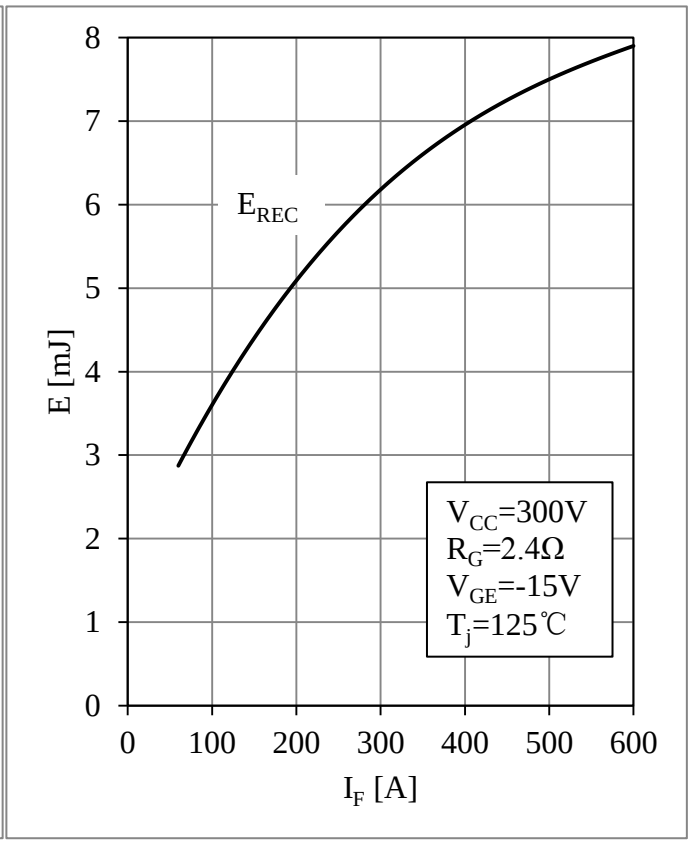


Fig 12. Diode D5-D6 Switching Loss vs. I_F

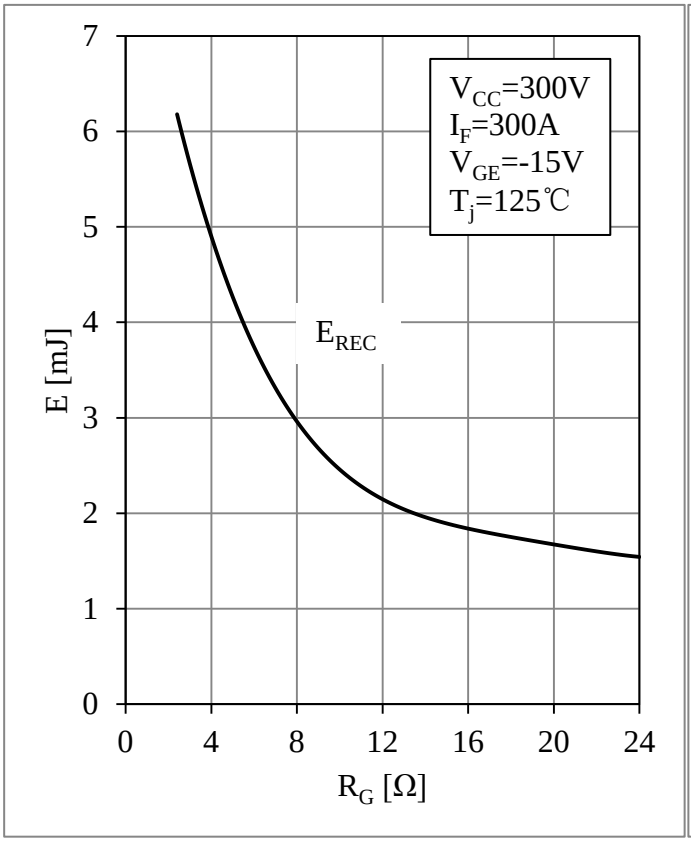


Fig 13. Diode D5-D6 Switching Loss vs. R_G

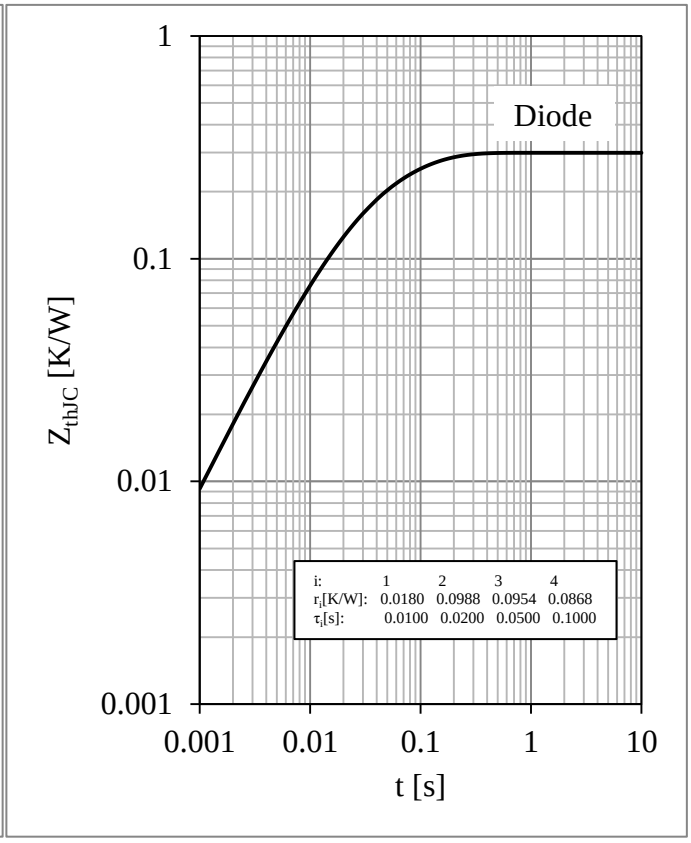


Fig 14. Diode D5-D6 Transient Thermal Impedance

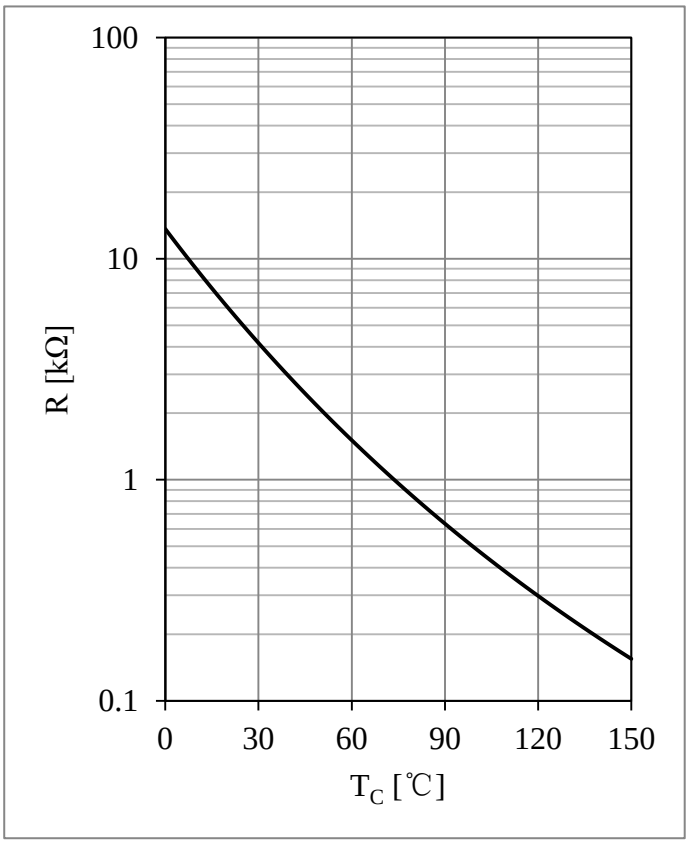
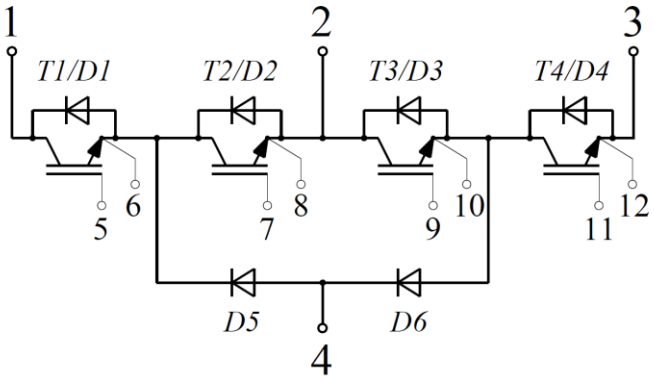


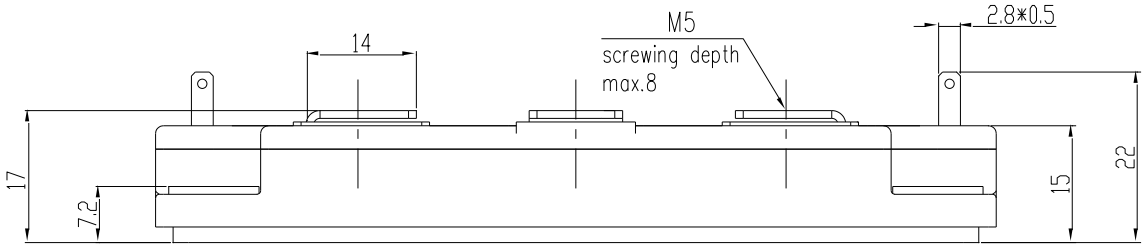
Fig 15. NTC Temperature Characteristic

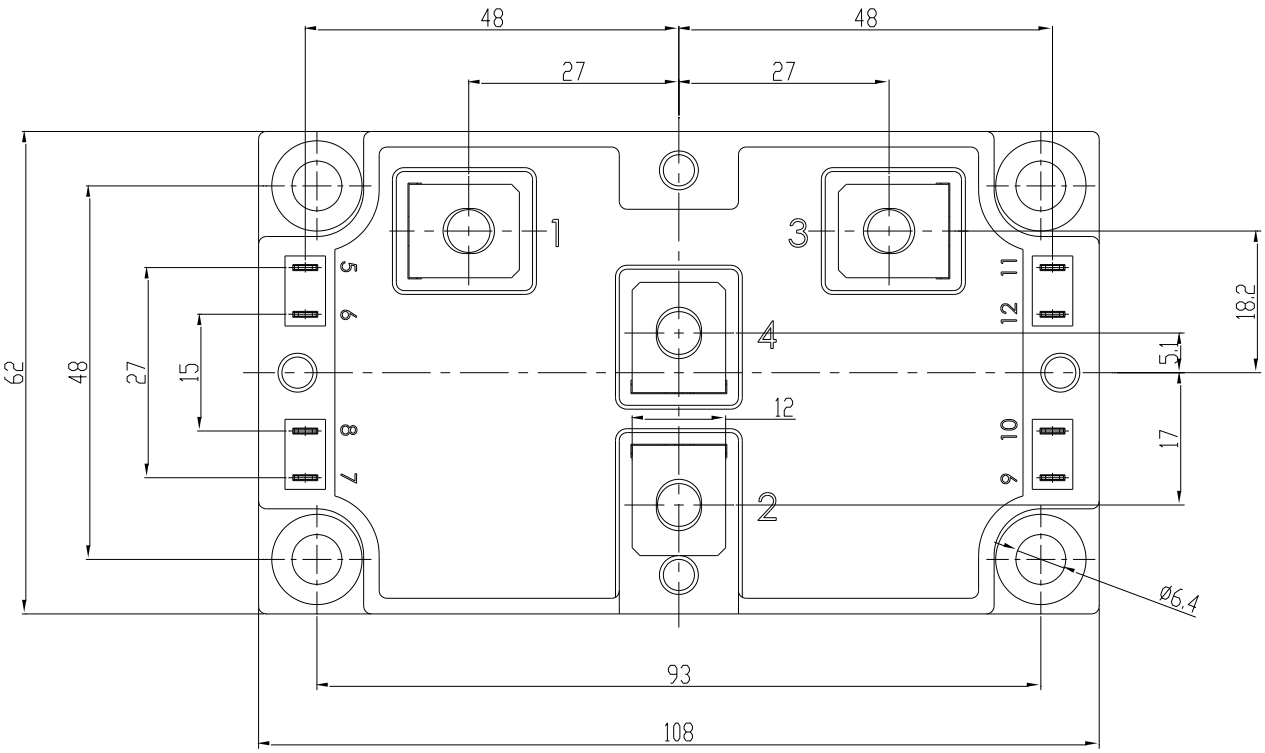
Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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