STARPOWER

SEMICONDUCTOR™

IGBT

GD200MLT60C2S

Molding Type Module

600V/200A 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	GD200MLT60C2S	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℃	265 200	A
I_{CM}	Pulsed Collector Current t_p=1ms	400	A
P_{tot}	Total Power Dissipation @ T_j=175℃	644	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=2.0mA,V_{CE}=V_{GE}, T_j=25℃	4.0	4.4	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=200A,V_{GE}=15V, T_j=25℃		1.65	2.10	V
		I_C=200A,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=200A, R_G=2.4Ω,V_{GE}=±15V, T_j=25℃		136		ns
t_r	Rise Time			54		ns
$t_{d(off)}$	Turn-Off Delay Time			122		ns
t_f	Fall Time			87		ns
E_{on}	Turn-On Switching Loss			1.79		mJ
E_{off}	Turn-Off Switching Loss			1.99		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=200A, R_G=2.4Ω,V_{GE}=±15V, T_j=125℃		145		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			170		ns
t_f	Fall Time			112		ns
E_{on}	Turn-On Switching Loss			3.06		mJ
E_{off}	Turn-Off Switching Loss			3.62		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		15.4		nF
C_{oes}	Output Capacitance			1.06		nF
C_{res}	Reverse Transfer Capacitance			0.46		nF
Q_G	Gate Charge	V_{CC}=400V,I_C=200A, V_{GE}=15V		417		nC
R_{Gint}	Internal Gate Resister			2.5		Ω
I_{SC}	SC Data	t_P≤5μs,V_{GE}=15V, T_j=125℃, V_{CC}=360V, V_{CEM}≤600V		1800		A

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

Maximum Rated Values

Symbol	Description	GD200MLT60C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current T_C=80℃	200	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	400	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=200A, V_{GE}=0V	T_j=25℃		1.40	1.80	V
			T_j=125℃		1.40		
Q_r	Recovered Charge	I_F=200A, V_R=300V, R_G=2.4Ω, V_{GE}=-15V	T_j=25℃		9.6		μC
			T_j=125℃		13.0		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		120		A
			T_j=125℃		157		
E_{rec}	Reverse Recovery Energy		T_j=25℃		1.88		mJ
			T_j=125℃		3.62		

DIODE D5 D6 T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD200MLT60C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current T_C=80℃	200	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	400	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=200A, V_{GE}=0V	T_j=25℃		1.40	1.80	V
			T_j=125℃		1.40		
Q_r	Recovered Charge	I_F=200A, V_R=300V, R_G=2.4Ω, V_{GE}=-15V	T_j=25℃		9.6		μC
			T_j=125℃		13.0		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		120		A
			T_j=125℃		157		
E_{rec}	Reverse Recovery Energy		T_j=25℃		1.88		mJ
			T_j=125℃		3.62		

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)			0.233 0.366 0.406	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

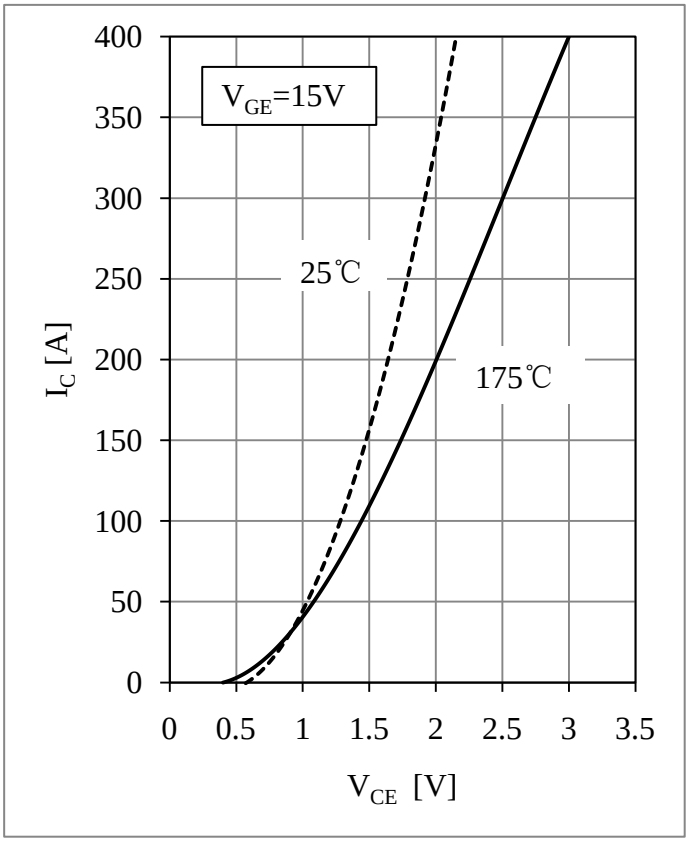


Fig 1. IGBT T1-T4 Output Characteristic

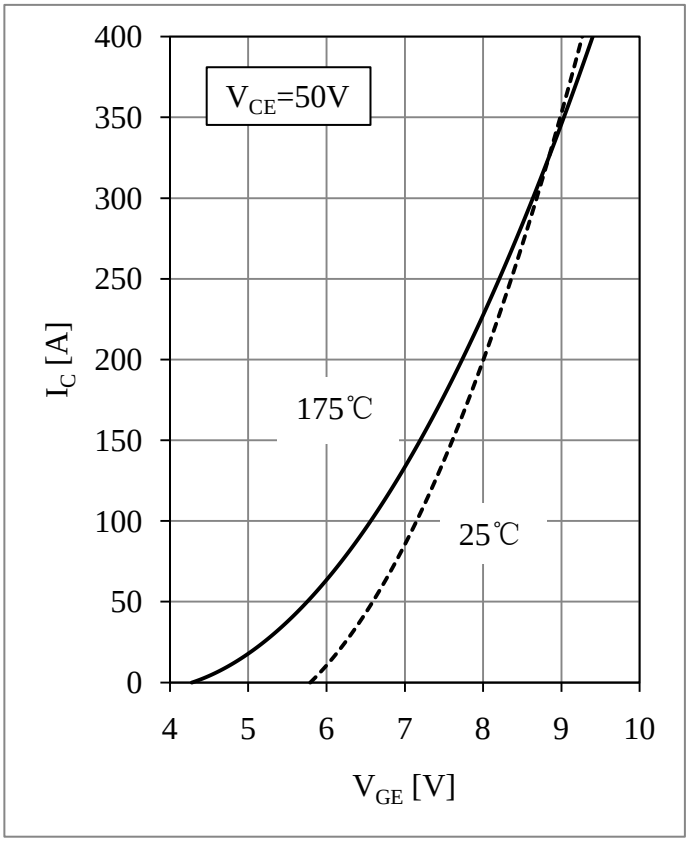


Fig 2. IGBT T1-T4 Transfer Characteristic

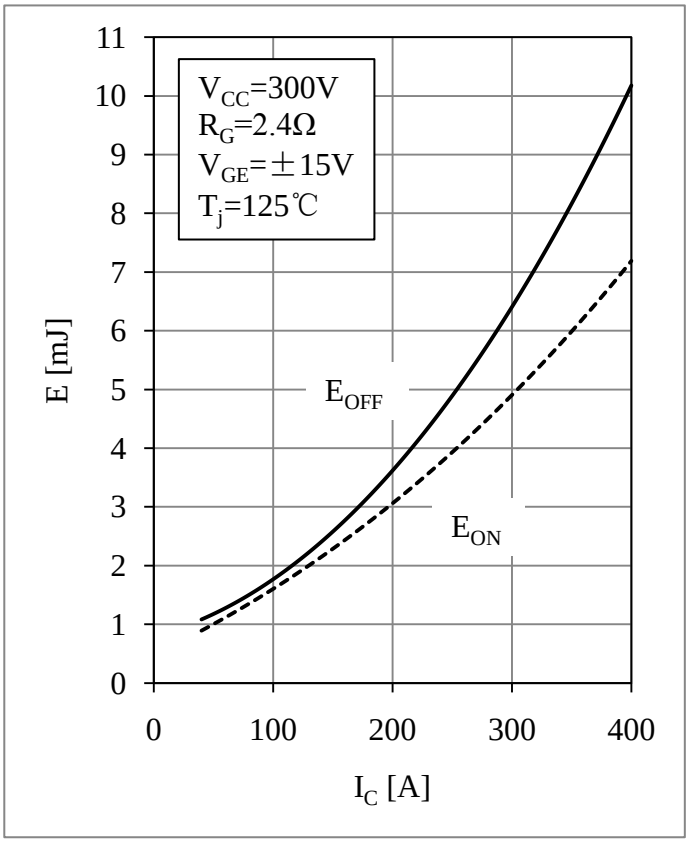


Fig 3. IGBT T1-T4 Switching Loss vs. I_C

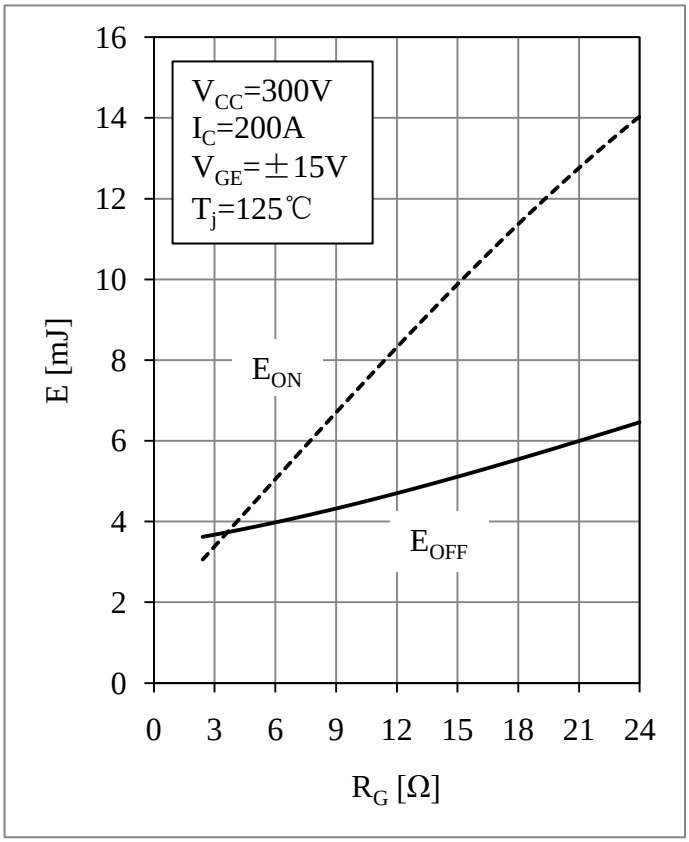


Fig 4. IGBT T1-T4 Switching Loss vs. R_G

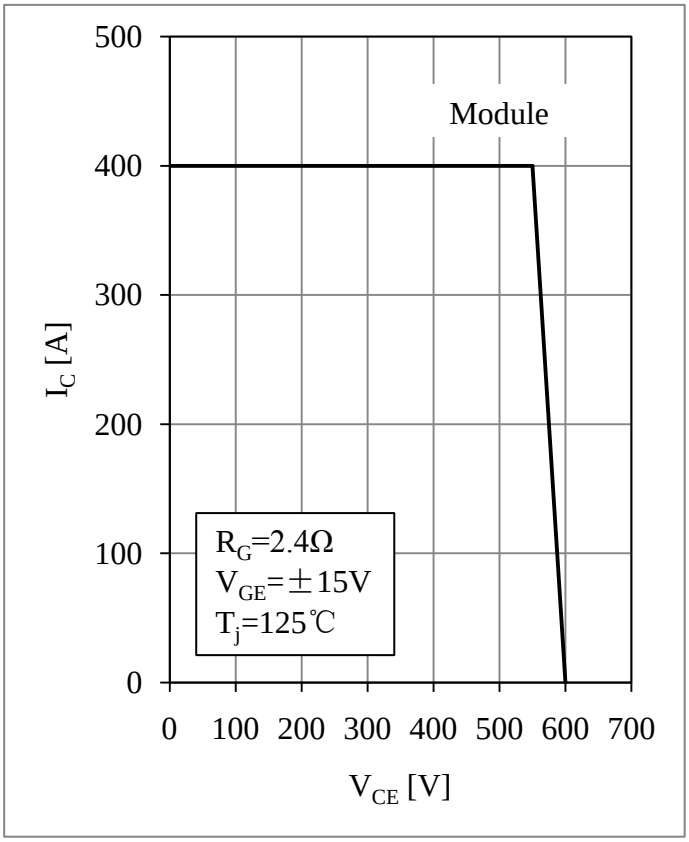


Fig 5. IGBT T1-T4 RBSOA

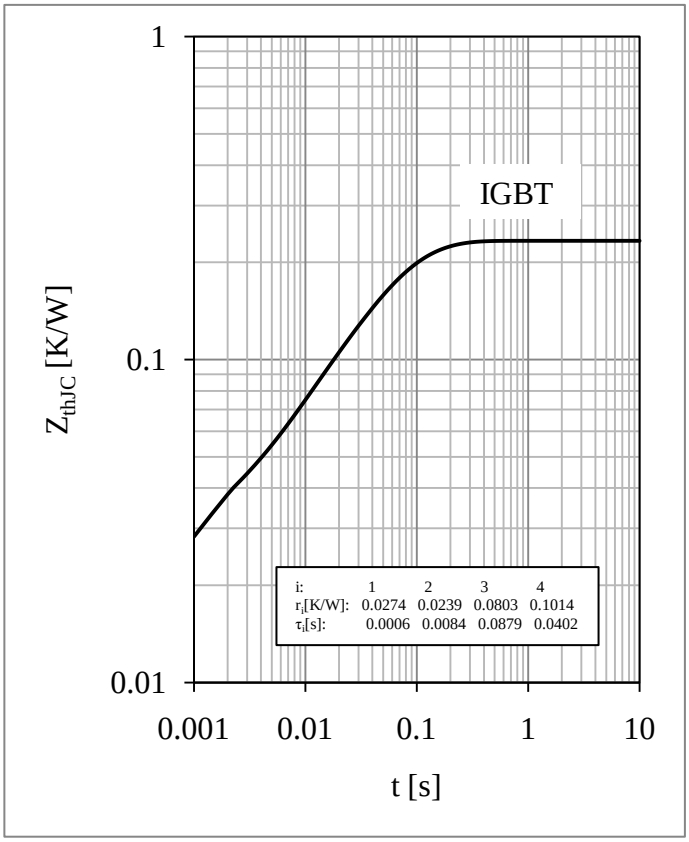


Fig 6. IGBT T1-T4 Transient Thermal Impedance

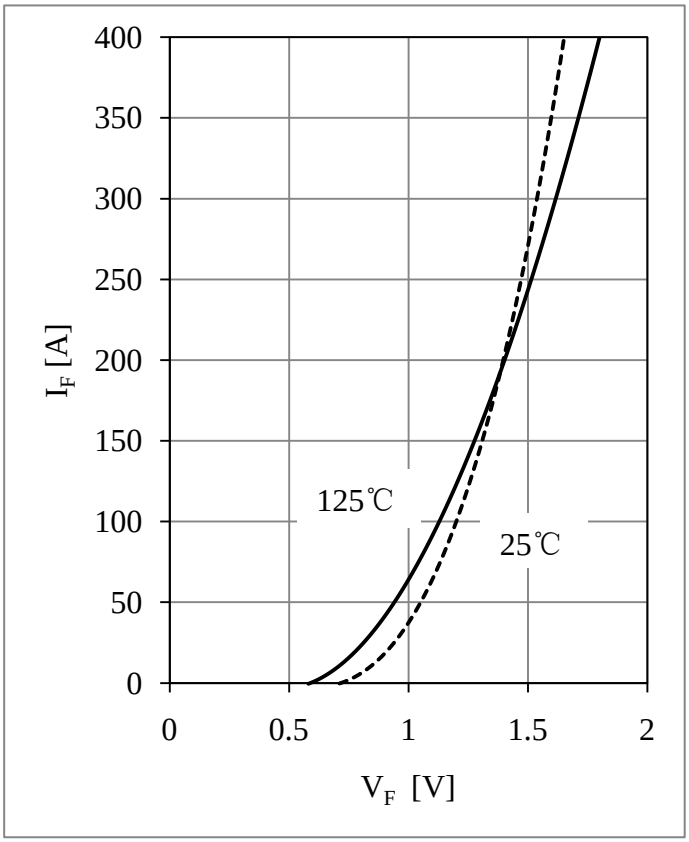


Fig 7. Diode D1-D4 Forward Characteristic

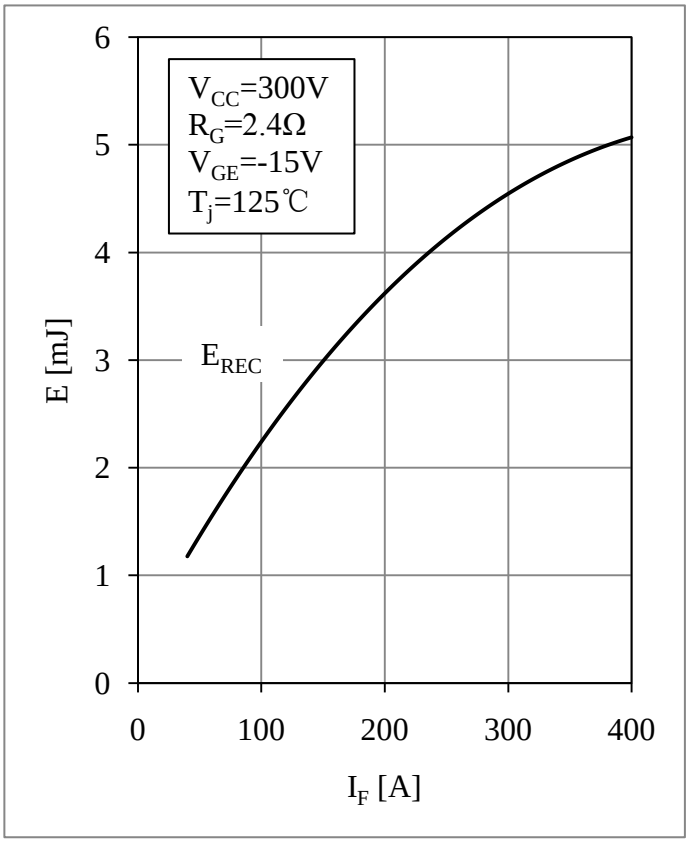


Fig 8. Diode D1-D4 Switching Loss vs. I_F

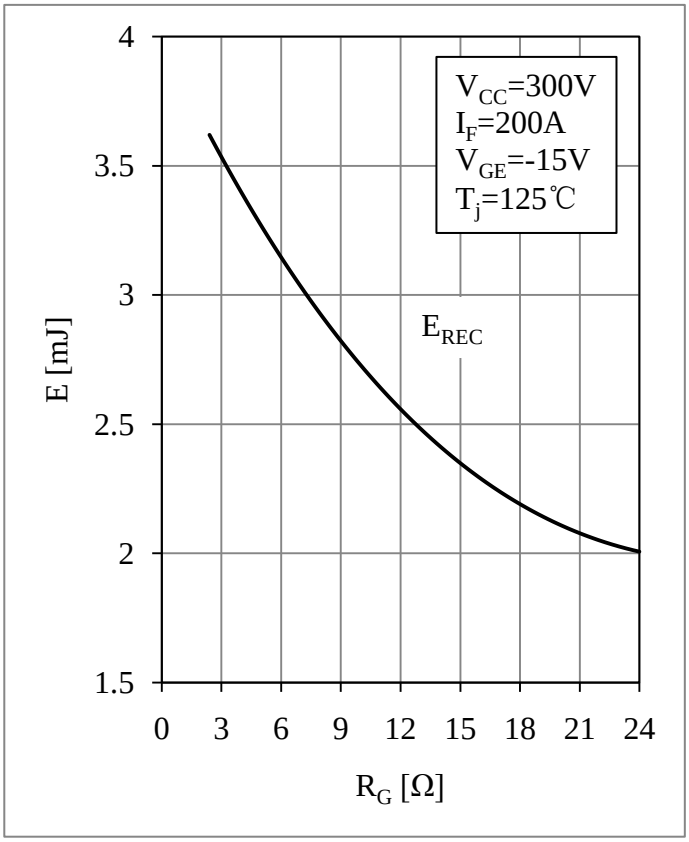


Fig 9. Diode D1-D4 Switching Loss vs. R_G

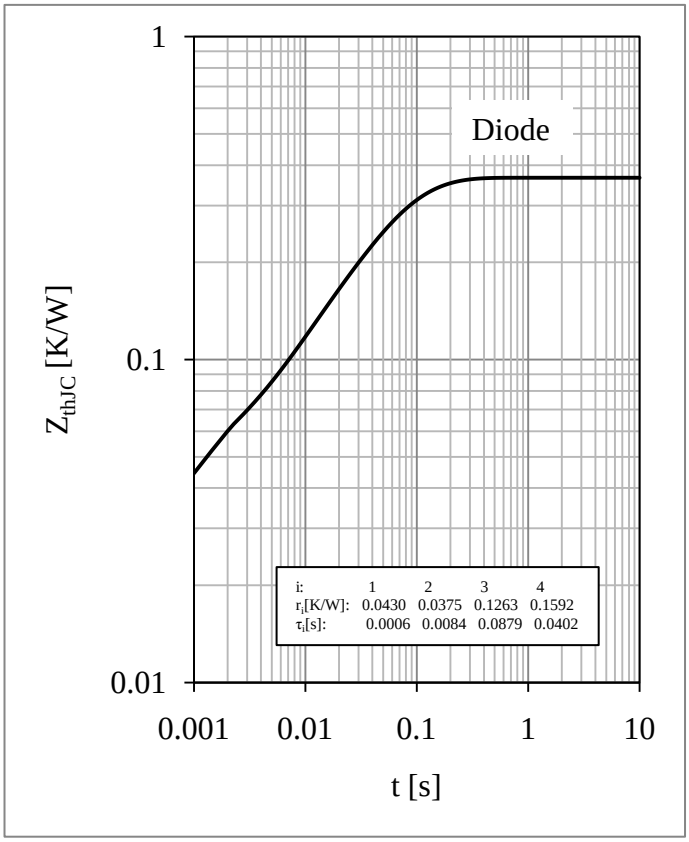


Fig 10. Diode D1-D4 Transient Thermal Impedance

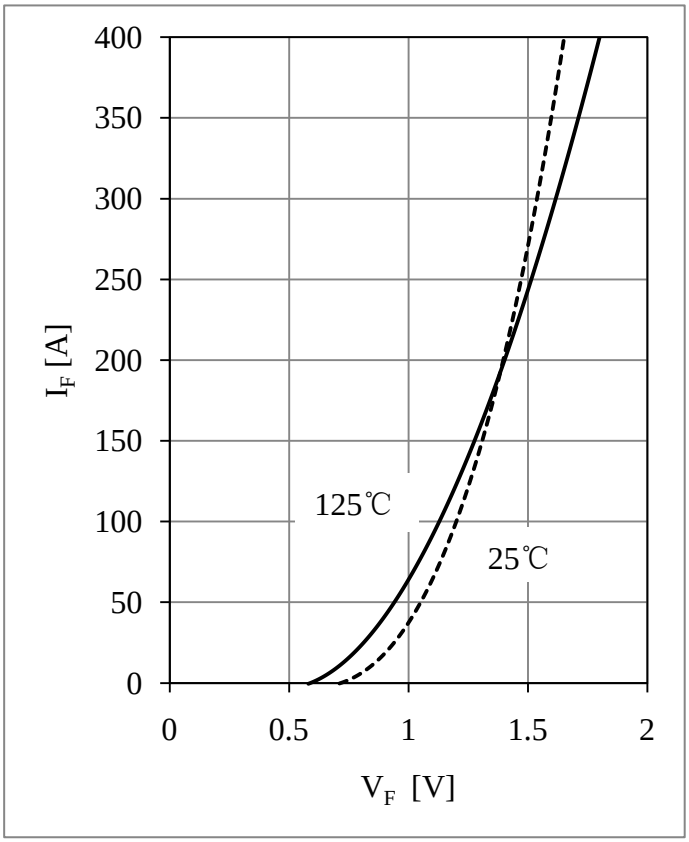


Fig 11. Diode D5-D6 Forward Characteristic

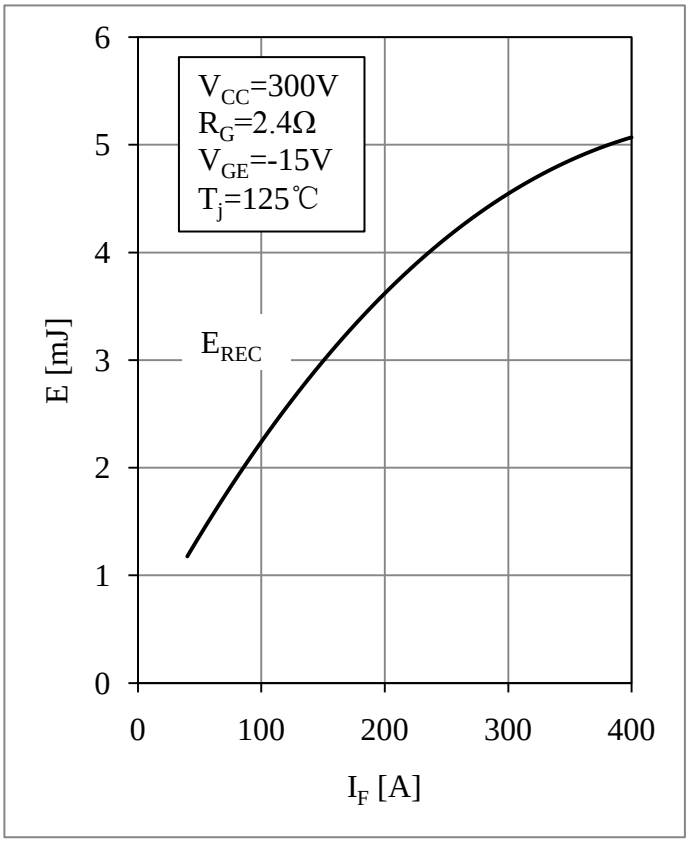


Fig 12. Diode D5-D6 Switching Loss vs. I_F

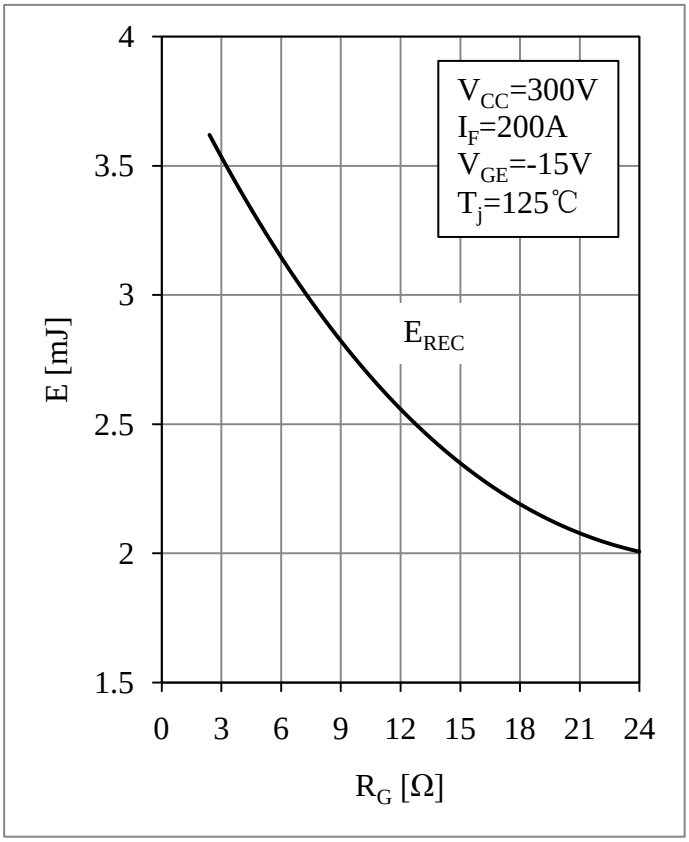


Fig 13. Diode D5-D6 Switching Loss vs. R_G

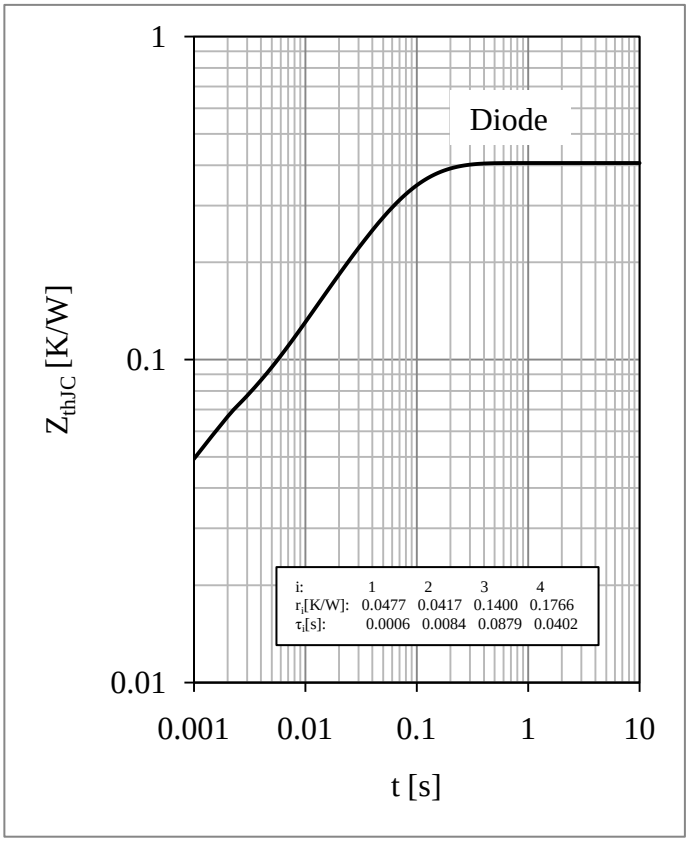


Fig 14. Diode D5-D6 Transient Thermal Impedance

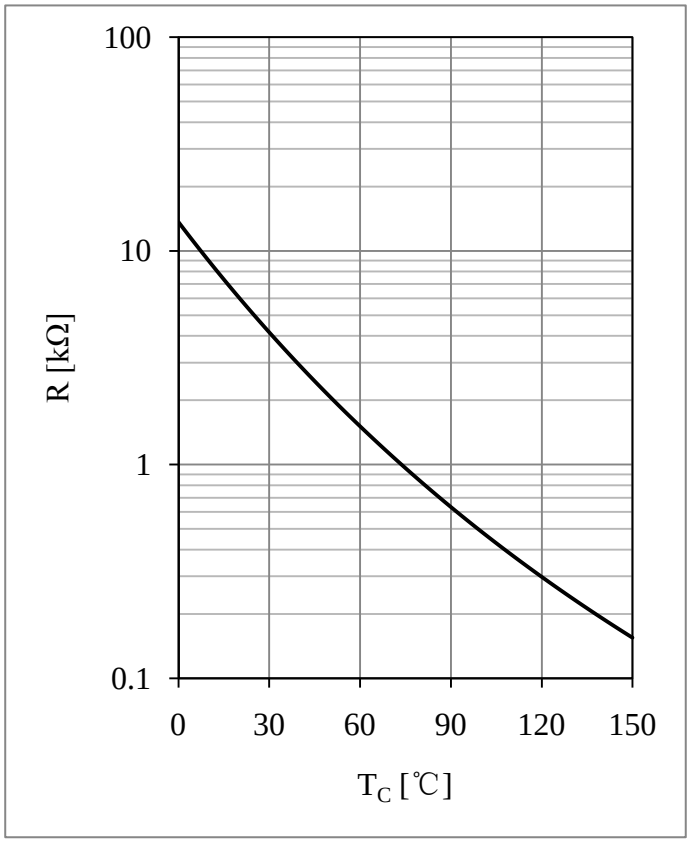
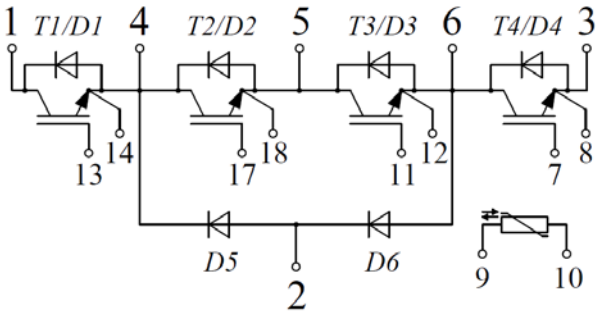


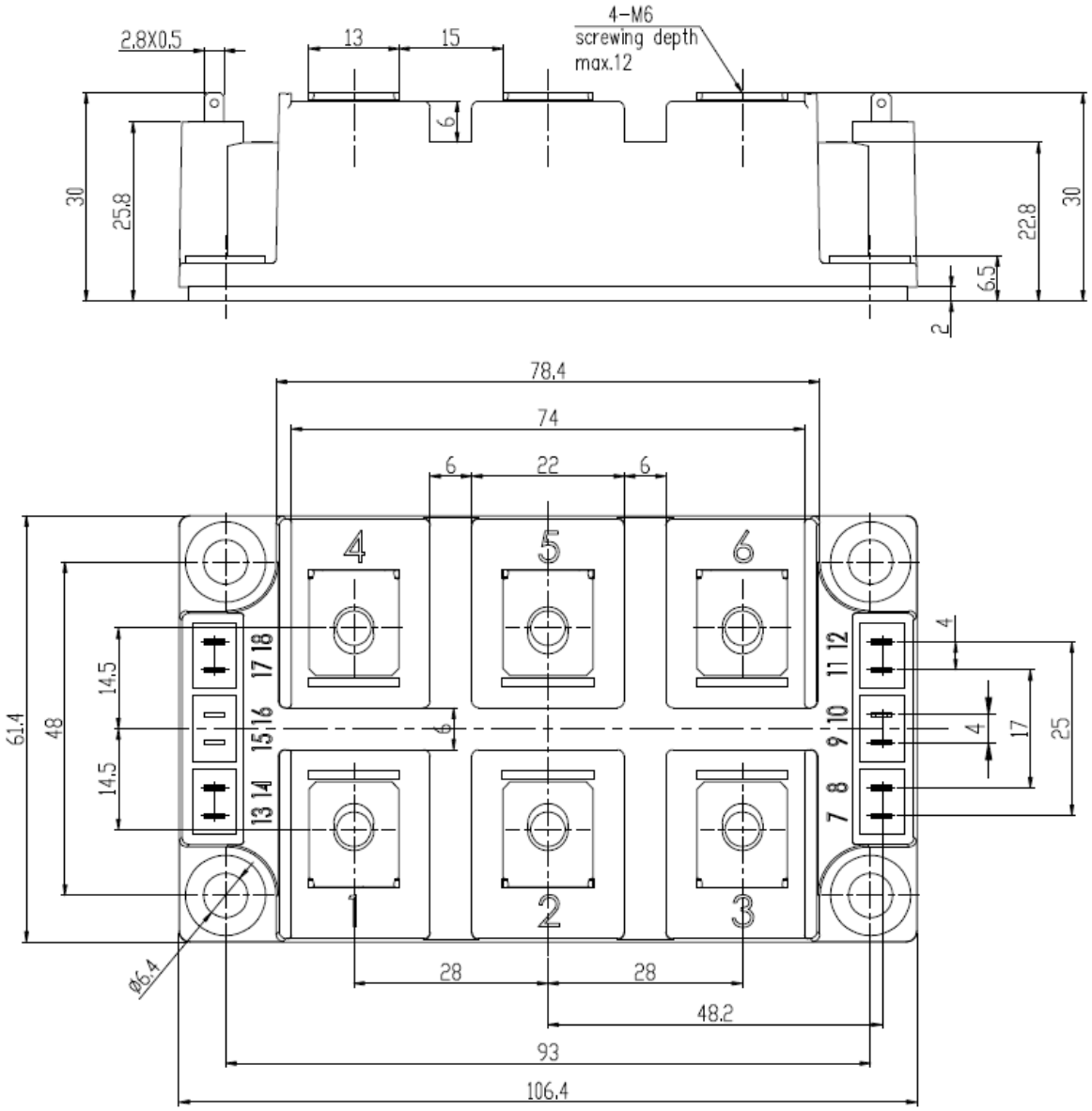
Fig 15. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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.