STARPOWER

SEMICONDUCTOR™

IGBT

GD100MLT60L3S

Molding Type Module

600V/100A 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℃
- Fast & soft reverse recovery anti-parallel FWD

Typical Applications

- Solar power
- UPS
- 3-Level Applications.

IGBT-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD100MLT60L3S	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℃	138 100	A
I_{CM}	Pulsed Collector Current t_p=1ms	200	A
P_{tot}	Total Power Dissipation @ T_j=175℃	337	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=1.0mA,V_{CE}=V_{GE}, T_j=25℃	4.0	4.4	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=100A,V_{GE}=15V, T_j=25℃		1.65	2.10	V
		I_C=100A,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=100A, R_G=2.2Ω,V_{GE}=±15V, T_j=25℃		106		ns
t_r	Rise Time			49		ns
$t_{d(off)}$	Turn-Off Delay Time			102		ns
t_f	Fall Time			85		ns
E_{on}	Turn-On Switching Loss			0.46		mJ
E_{off}	Turn-Off Switching Loss			0.95		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=100A, R_G=2.2Ω,V_{GE}=±15V, T_j=125℃		112		ns
t_r	Rise Time			62		ns
$t_{d(off)}$	Turn-Off Delay Time			126		ns
t_f	Fall Time			109		ns
E_{on}	Turn-On Switching Loss			0.78		mJ
E_{off}	Turn-Off Switching Loss			1.73		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		7.71		nF
C_{oes}	Output Capacitance			0.53		nF
C_{res}	Reverse Transfer Capacitance			0.23		nF
Q_G	Gate Charge	V_{CC}=400V,I_C=120A, V_{GE}=15V		250		nC
I_{SC}	SC Data	t_P≤5μs,V_{GE}=15V, T_j=125℃,V_{CC}=360V, V_{CEM}≤600V		900		A

Diode-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD100MLT60L3S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current @ T_C=80℃	100	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	200	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=100A, V_{GE}=0V	T_j=25℃		1.40	1.80	V
			T_j=125℃		1.40		
Q_r	Recovered Charge	I_F=100A, V_R=300V, R_G=2.2Ω, V_{GE}=-15V	T_j=25℃		5.5		μC
			T_j=125℃		7.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		68		A
			T_j=125℃		88		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.89		mJ
			T_j=125℃		1.71		

Diode D5-D6 T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD100MLT60L3S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current @ T_C=80℃	100	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	200	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=100A, V_{GE}=0V	T_j=25℃		1.40	1.80	V
			T_j=125℃		1.40		
Q_r	Recovered Charge	I_F=100A, V_R=300V, R_G=2.2Ω, V_{GE}=-15V	T_j=25℃		5.5		μC
			T_j=125℃		7.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		68		A
			T_j=125℃		88		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.89		mJ
			T_j=125℃		1.71		

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
L_{CE}	Stray Inductance		15		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		2.00		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT T1-T4) Junction-to-Case (per diode D1-D4) Junction-to-Case (per diode D5-D6)			0.445 0.756 0.756	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.04		K/W
T_{jmax}	Maximum Junction Temperature			175	℃
T_{STG}	Storage Temperature Range	-40		125	℃
F	Mounting Force Per Clamp	40		80	N
G	Weight of Module		39		g

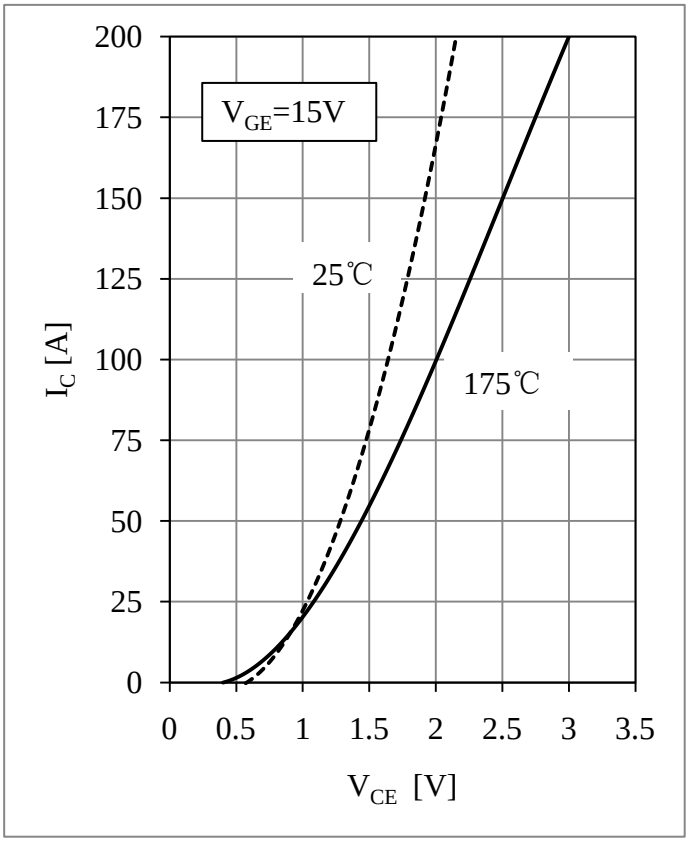


Fig 1. IGBT-inverter Output Characteristic

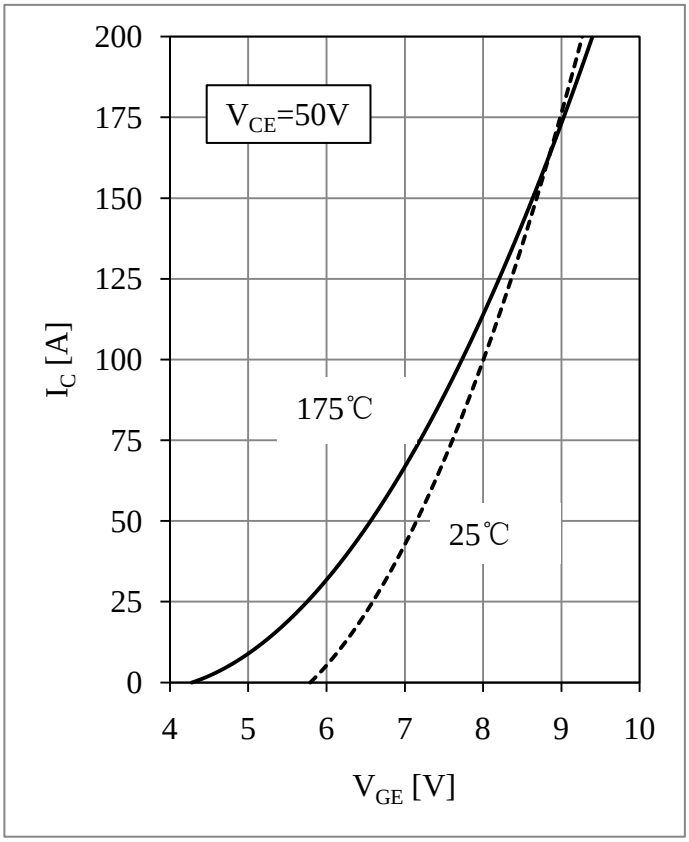


Fig 2. IGBT-inverter Transfer Characteristic

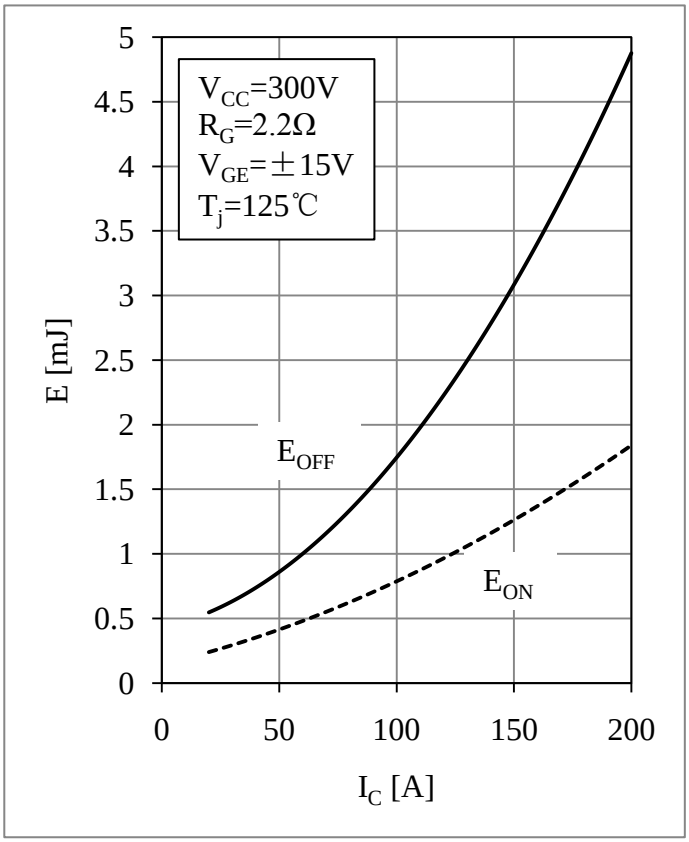


Fig 3. IGBT-inverter Switching Loss vs. I_C

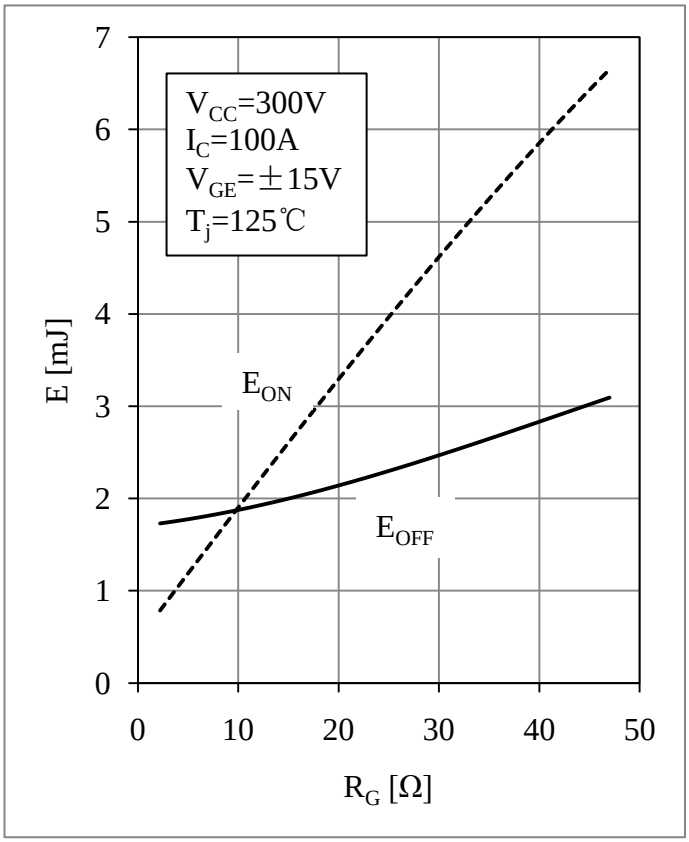


Fig 4. IGBT-inverter Switching Loss vs. R_G

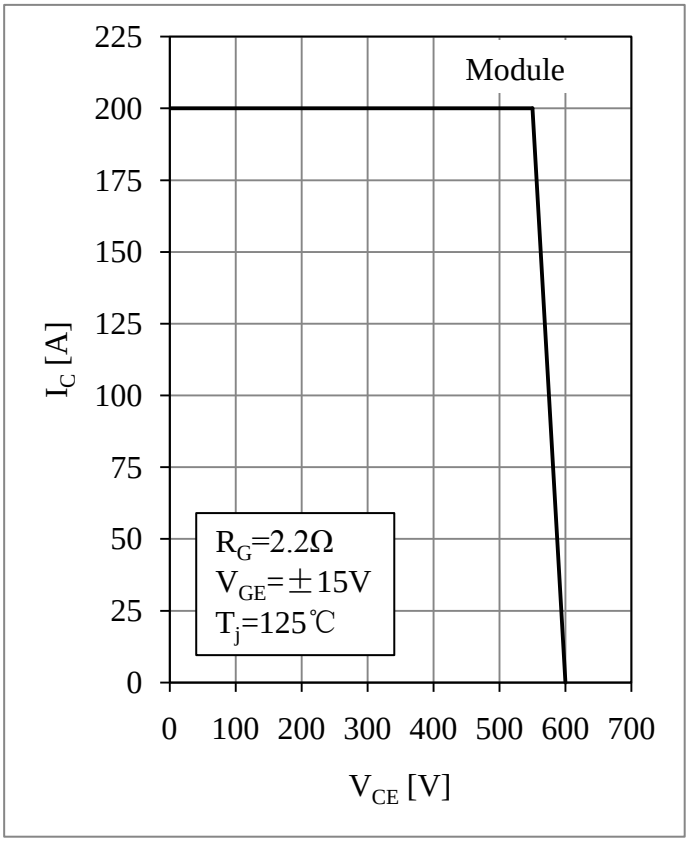


Fig 5. IGBT-inverter RBSOA

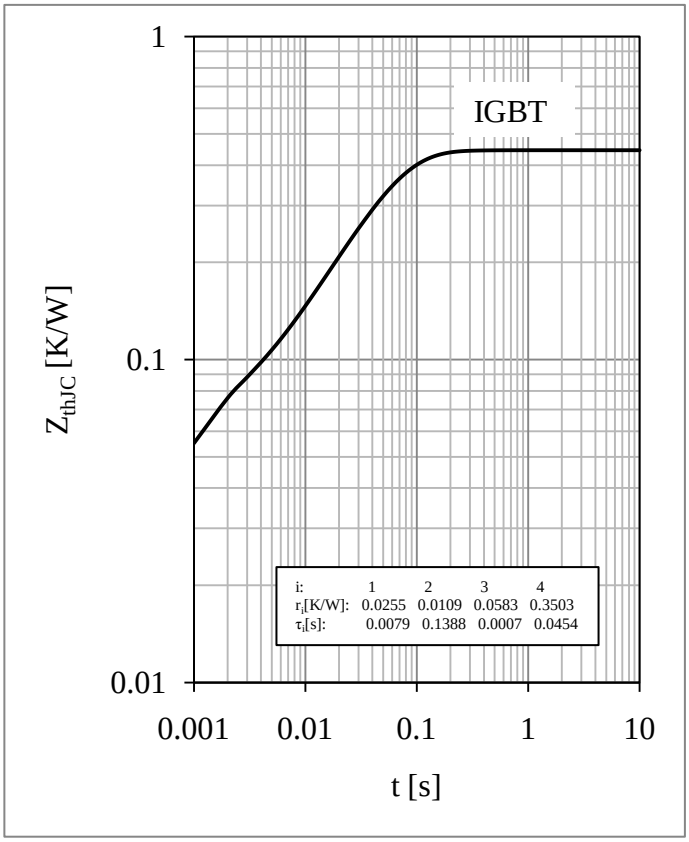


Fig 6. IGBT-inverter Transient Thermal Impedance

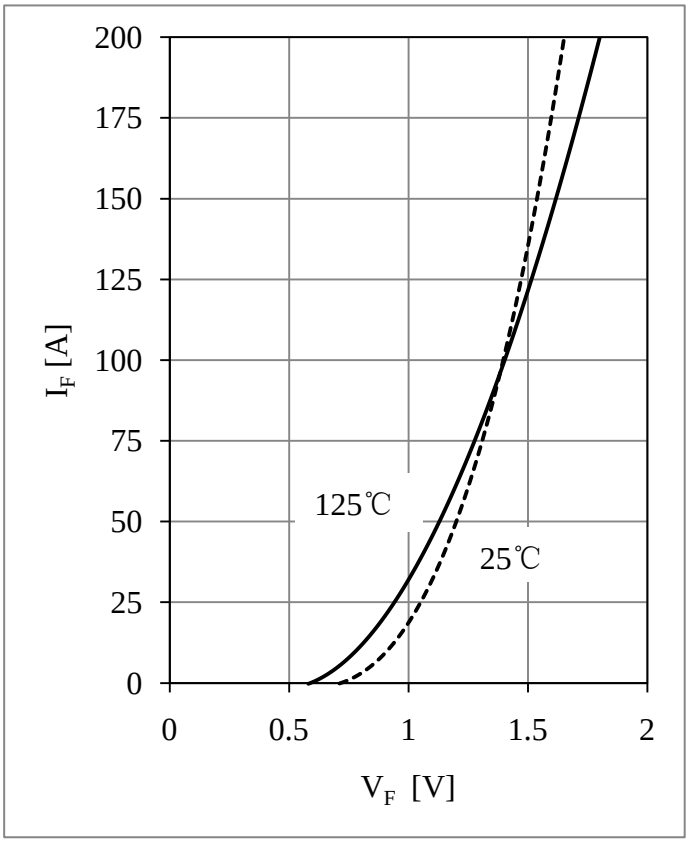


Fig 7. Diode-inverter Forward Characteristic

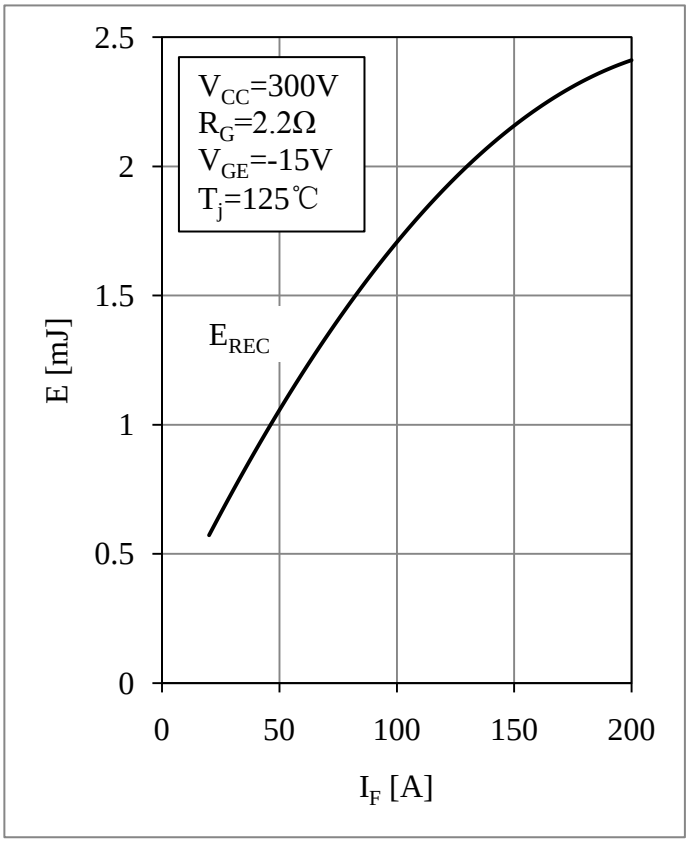


Fig 8. Diode-inverter Switching Loss vs. I_F

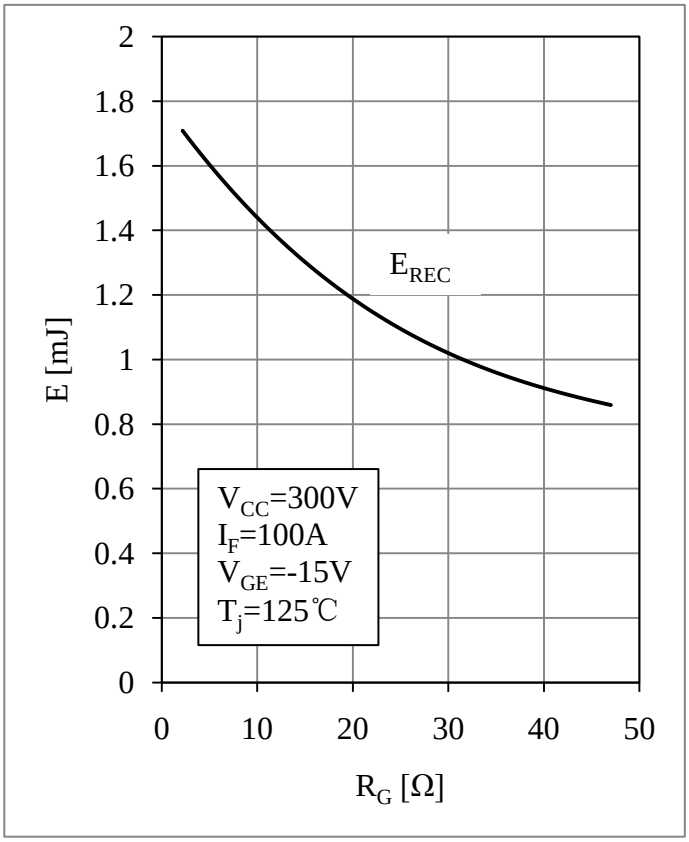


Fig 9. Diode-inverter Switching Loss vs. R_G

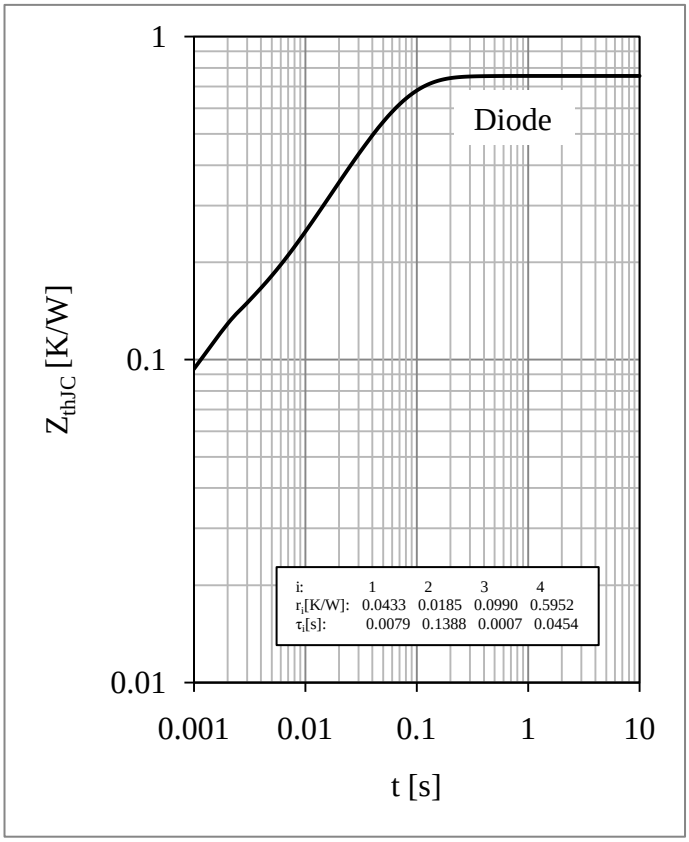


Fig 10. Diode-inverter Transient Thermal Impedance

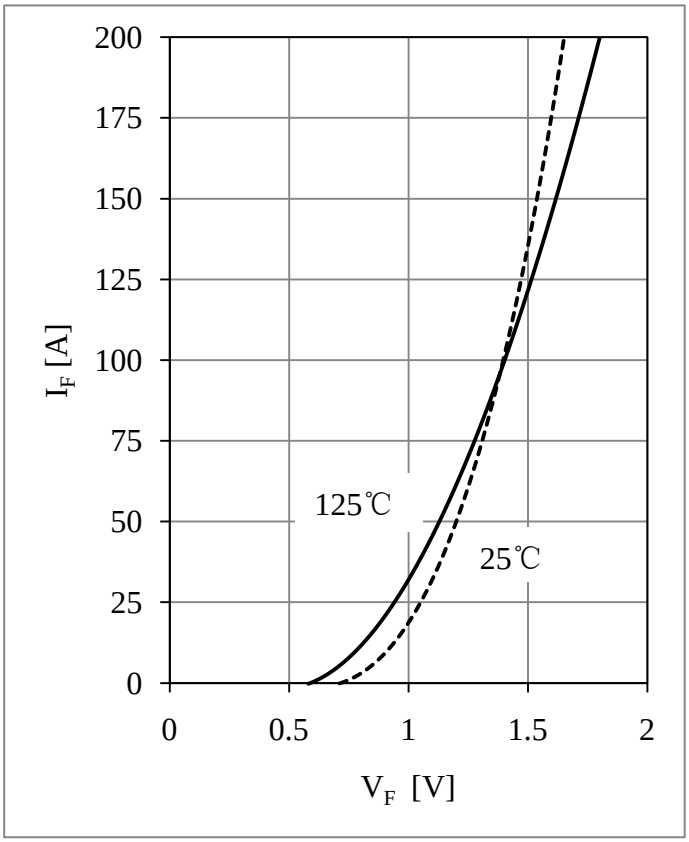


Fig 11. Diode D5-D6 Forward Characteristic

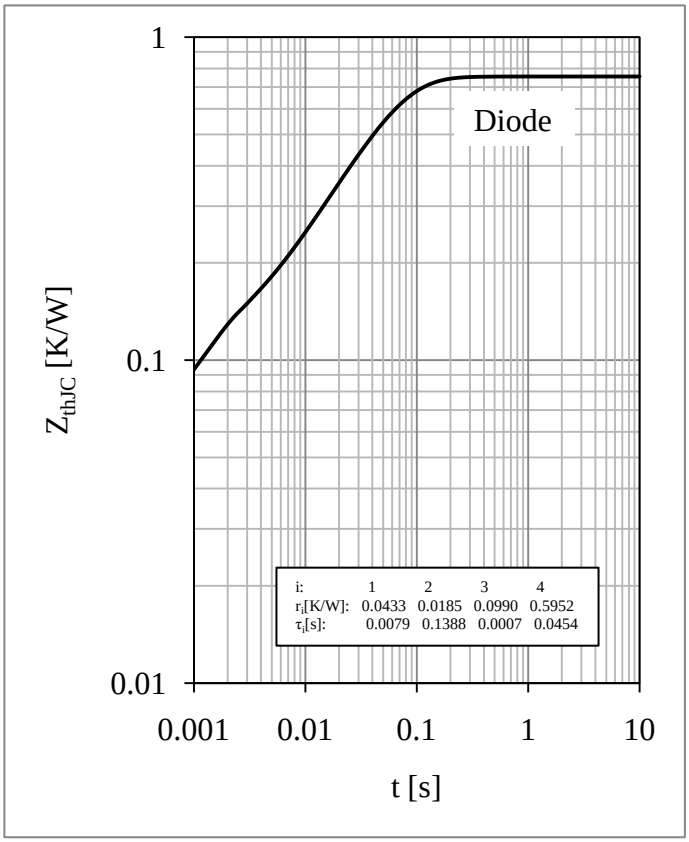


Fig 12. Diode D5-D6 Transient Thermal Impedance

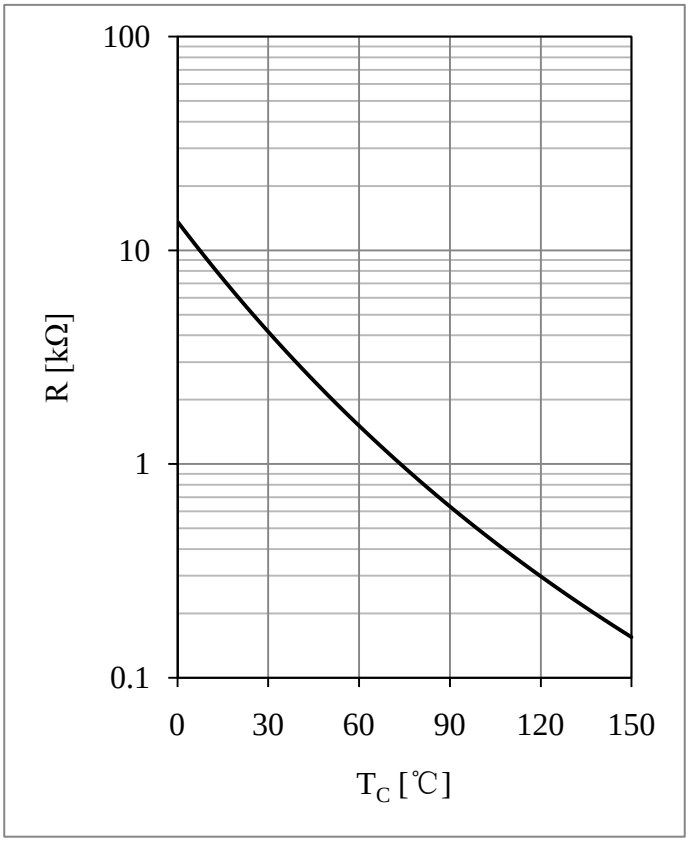
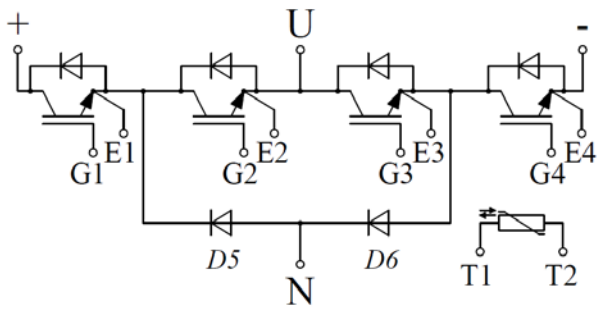


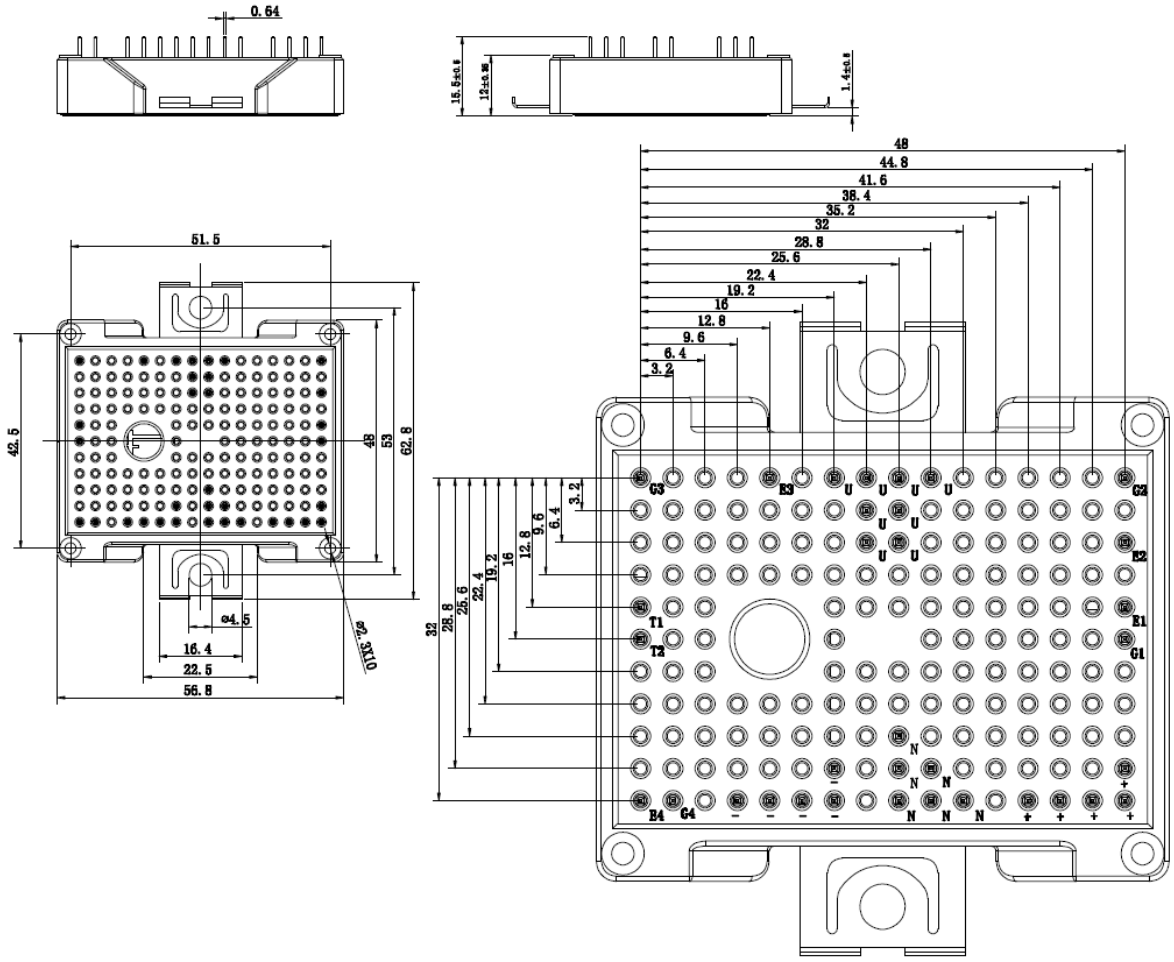
Fig 13. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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