STARPOWER

SEMICONDUCTOR **IGBT**

GD100MLX65L3S

650V/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-application.

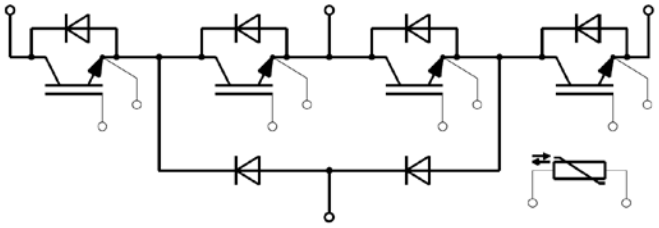
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 6μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 ^{o}C
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Solar power
- UPS
- 3-level-application

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

T1-T4 IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	160 100	A
I_{CM}	Pulsed Collector Current t_p=1ms	200	A
P_D	Maximum Power Dissipation @ T_j=175°C	451	W

D1-D4 Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	200	A

D5,D6 Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	200	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V

T1-T4 IGBT Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=100A,V_{GE}=15V, T_j=25°C		1.45	1.90	V
		I_C=100A,V_{GE}=15V, T_j=125°C		1.60		
		I_C=100A,V_{GE}=15V, T_j=150°C		1.70		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.60mA,V_{CE}=V_{GE}, T_j=25°C	5.1	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			2.0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		11.6		nF
C_{res}	Reverse Transfer Capacitance			0.23		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.69		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=100A, R_G=3.3Ω,V_{GE}=±15V, T_j=25°C		40		ns
t_r	Rise Time			20		ns
$t_{d(off)}$	Turn-Off Delay Time			192		ns
t_f	Fall Time			40		ns
E_{on}	Turn-On Switching Loss			0.44		mJ
E_{off}	Turn-Off Switching Loss			2.00		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=100A, R_G=3.3Ω,V_{GE}=±15V, T_j=125°C		48		ns
t_r	Rise Time			24		ns
$t_{d(off)}$	Turn-Off Delay Time			208		ns
t_f	Fall Time			52		ns
E_{on}	Turn-On Switching Loss			0.68		mJ
E_{off}	Turn-Off Switching Loss			2.68		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=100A, R_G=3.3Ω,V_{GE}=±15V, T_j=150°C		52		ns
t_r	Rise Time			24		ns
$t_{d(off)}$	Turn-Off Delay Time			216		ns
t_f	Fall Time			60		ns
E_{on}	Turn-On Switching Loss			0.78		mJ
E_{off}	Turn-Off Switching Loss			2.80		mJ
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150°C,V_{CC}=360V, V_{CEM}≤650V		500		A

D1-D4 Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=100A,V_{GE}=0V,T_j=25°C		1.55	2.00	V
		I_F=100A,V_{GE}=0V,T_j=125°C		1.50		
		I_F=100A,V_{GE}=0V,T_j=150°C		1.45		
Q_r	Recovered Charge	V_R=300V,I_F=100A, -di/dt=3520A/μs,V_{GE}=-15V T_j=25°C		4.6		μC
I_{RM}	Peak Reverse Recovery Current			99		A
E_{rec}	Reverse Recovery Energy			1.32		mJ
Q_r	Recovered Charge	V_R=300V,I_F=100A, -di/dt=3520A/μs,V_{GE}=-15V T_j=125°C		8.6		μC
I_{RM}	Peak Reverse Recovery Current			121		A
E_{rec}	Reverse Recovery Energy			2.37		mJ
Q_r	Recovered Charge	V_R=300V,I_F=100A, -di/dt=3520A/μs,V_{GE}=-15V T_j=150°C		9.9		μC
I_{RM}	Peak Reverse Recovery Current			127		A
E_{rec}	Reverse Recovery Energy			2.64		mJ

D5,D6 Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=100A,V_{GE}=0V,T_j=25°C		1.55	2.00	V
		I_F=100A,V_{GE}=0V,T_j=125°C		1.50		
		I_F=100A,V_{GE}=0V,T_j=150°C		1.45		
Q_r	Recovered Charge	V_R=300V,I_F=100A, -di/dt=3520A/μs,V_{GE}=-15V T_j=25°C		4.6		μC
I_{RM}	Peak Reverse Recovery Current			99		A
E_{rec}	Reverse Recovery Energy			1.32		mJ
Q_r	Recovered Charge	V_R=300V,I_F=100A, -di/dt=3520A/μs,V_{GE}=-15V T_j=125°C		8.6		μC
I_{RM}	Peak Reverse Recovery Current			121		A
E_{rec}	Reverse Recovery Energy			2.37		mJ
Q_r	Recovered Charge	V_R=300V,I_F=100A, -di/dt=3520A/μs,V_{GE}=-15V T_j=150°C		9.9		μC
I_{RM}	Peak Reverse Recovery Current			127		A
E_{rec}	Reverse Recovery Energy			2.64		mJ

NTC Characteristics T_C=25°C 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°C,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
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		15		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip		2.00		mΩ
R_{thJC}	Junction-to-Case (per T1-T4 IGBT) Junction-to-Case (per D1-D4 Diode) Junction-to-Case (per D5,D6 Diode)		0.302 0.538 0.425	0.332 0.592 0.468	K/W
R_{thCH}	Case-to-Sink (per T1-T4 IGBT) Case-to-Sink (per D1-D4 Diode) Case-to-Sink (per D5,D6 Diode) Case-to-Sink (per Module)		0.283 0.506 0.400 0.037		K/W
F	Mounting Force Per Clamp	40		80	K/W
G	Weight of Module		39		g

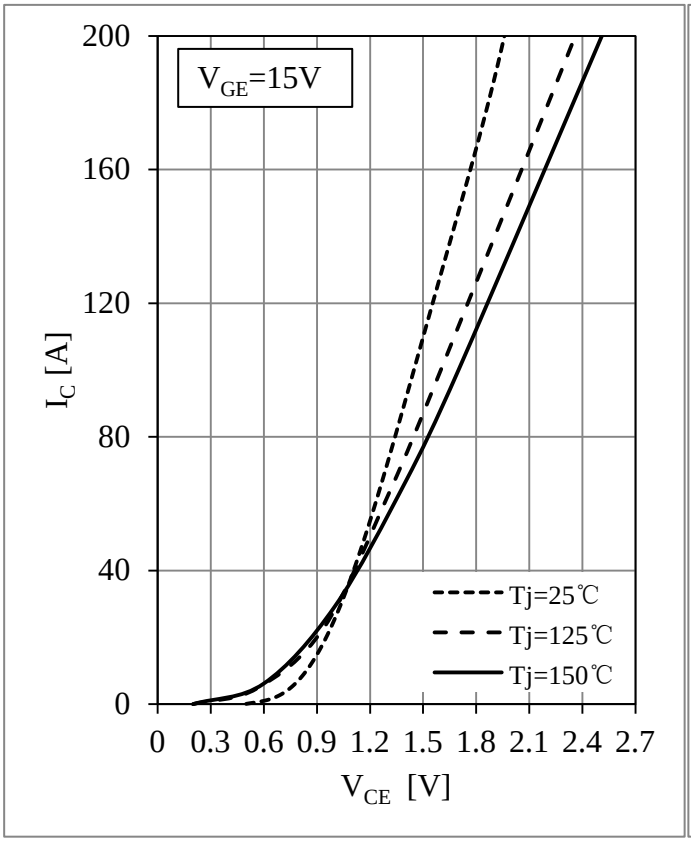


Fig 1. T1-T4 IGBT Output Characteristics

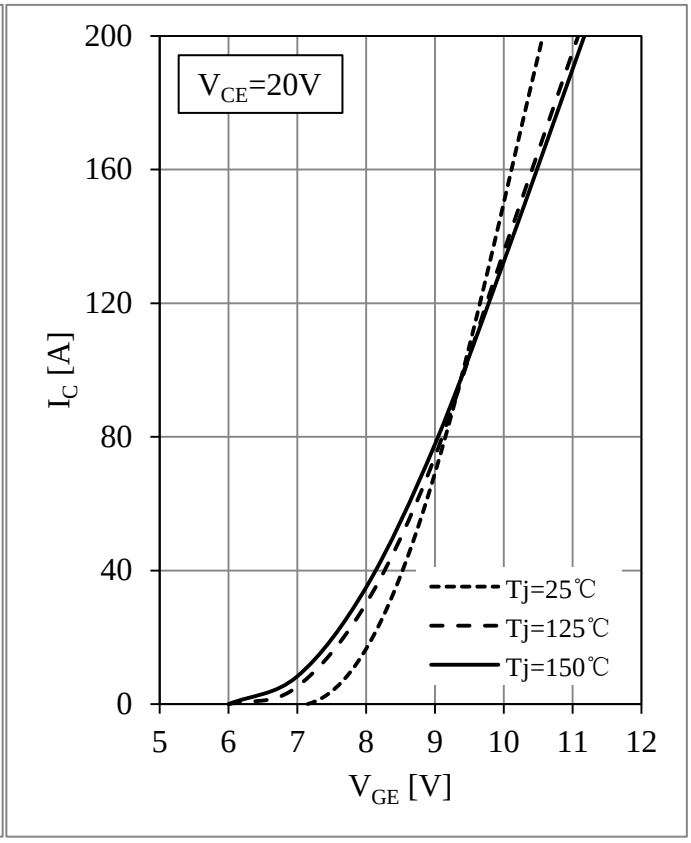


Fig 2. T1-T4 IGBT Transfer Characteristics

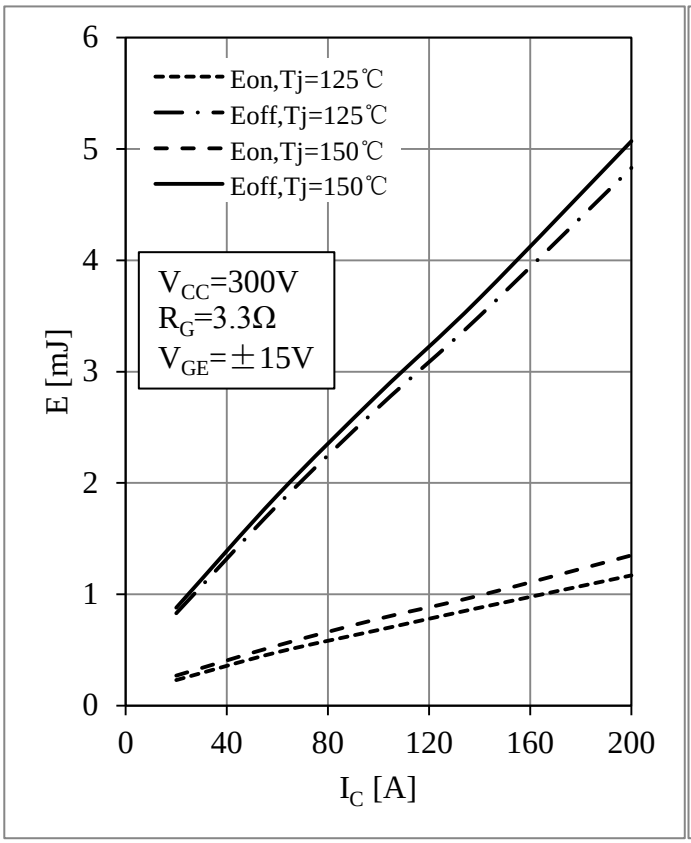


Fig 3. T1-T4 IGBT Switching Loss vs. I_C

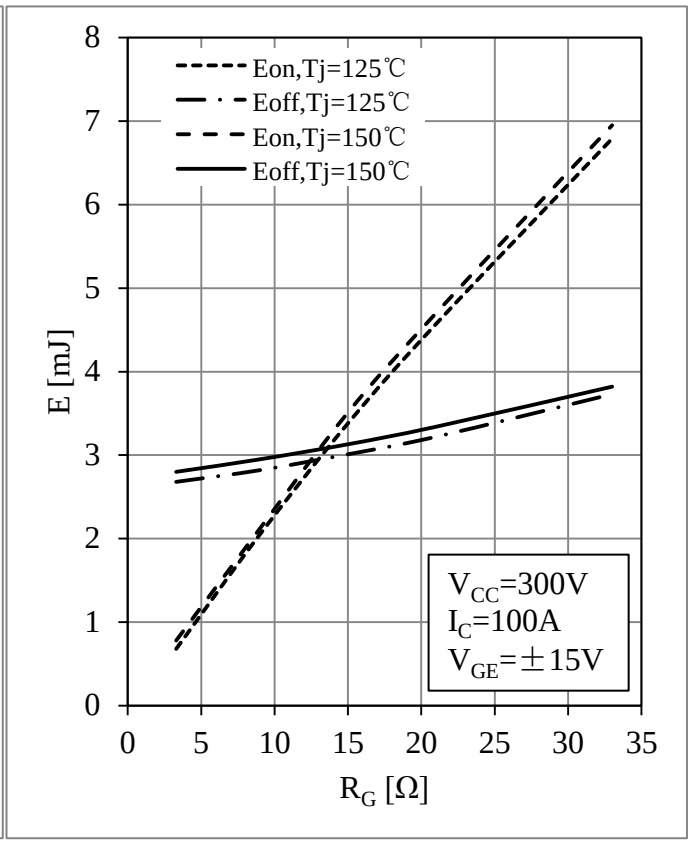


Fig 4. T1-T4 IGBT Switching Loss vs. R_G

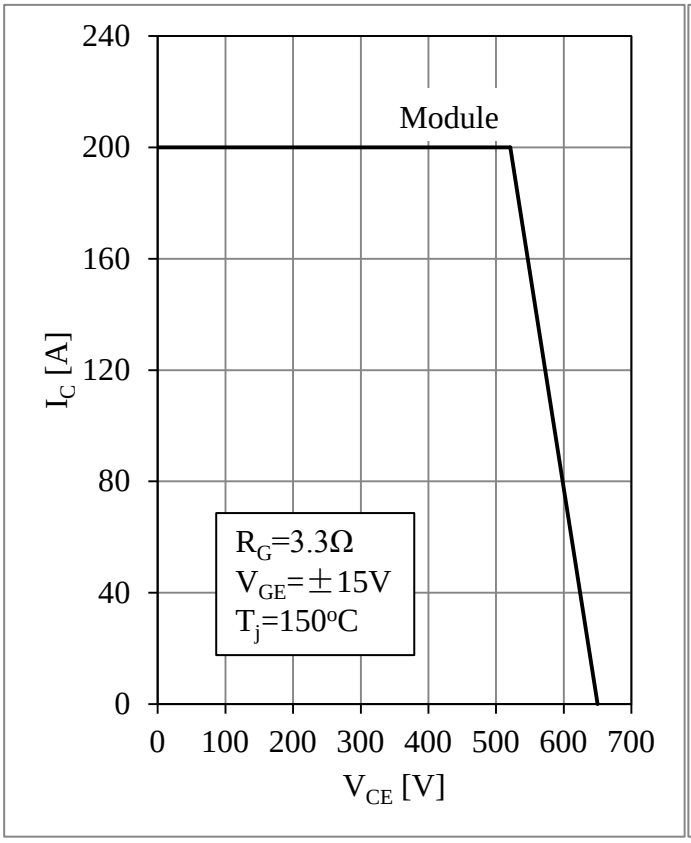


Fig 5. T1-T4 RBSOA

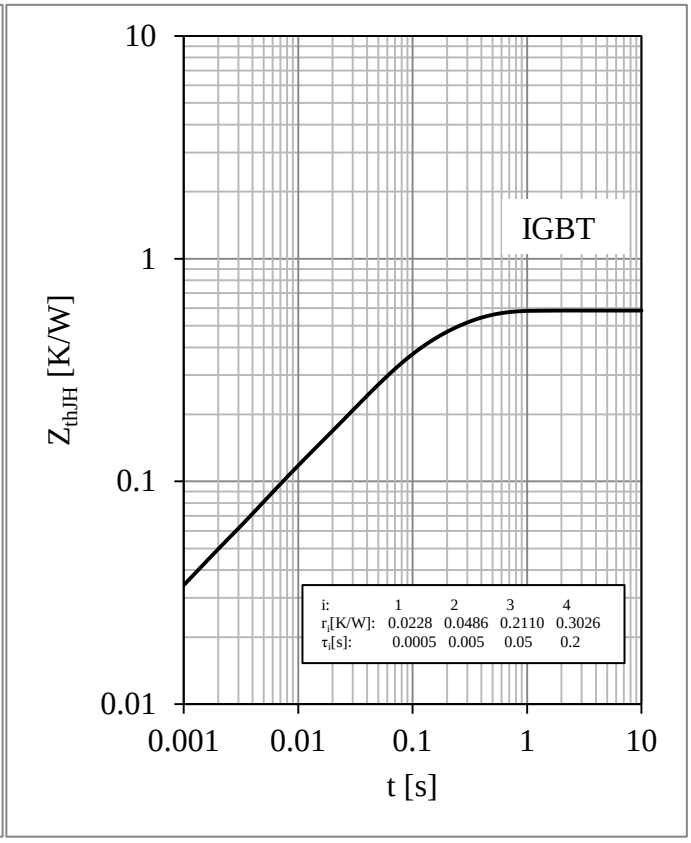


Fig 6. T1-T4 IGBT Transient Thermal Impedance

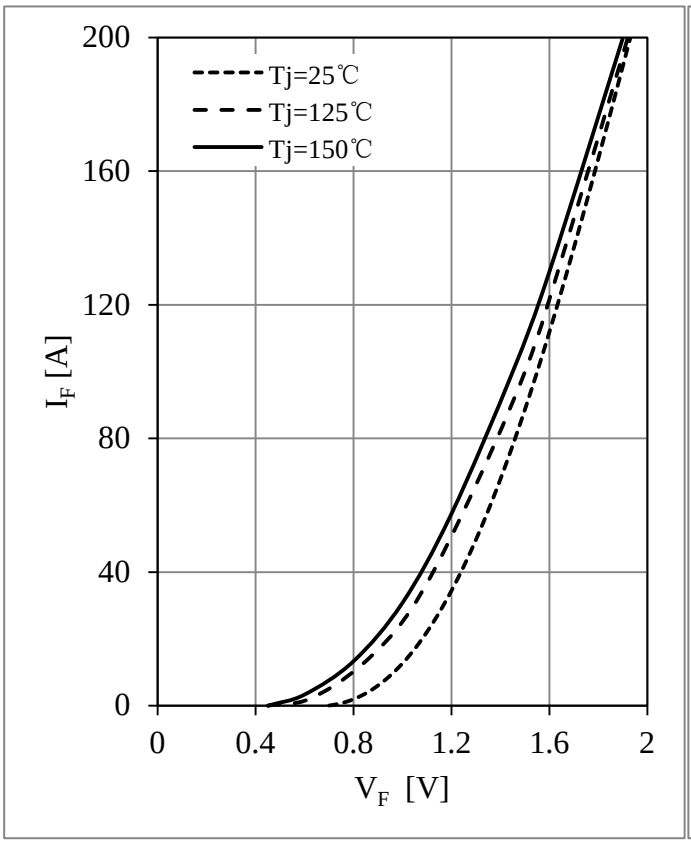


Fig 7. D1-D4 Diode Forward Characteristics

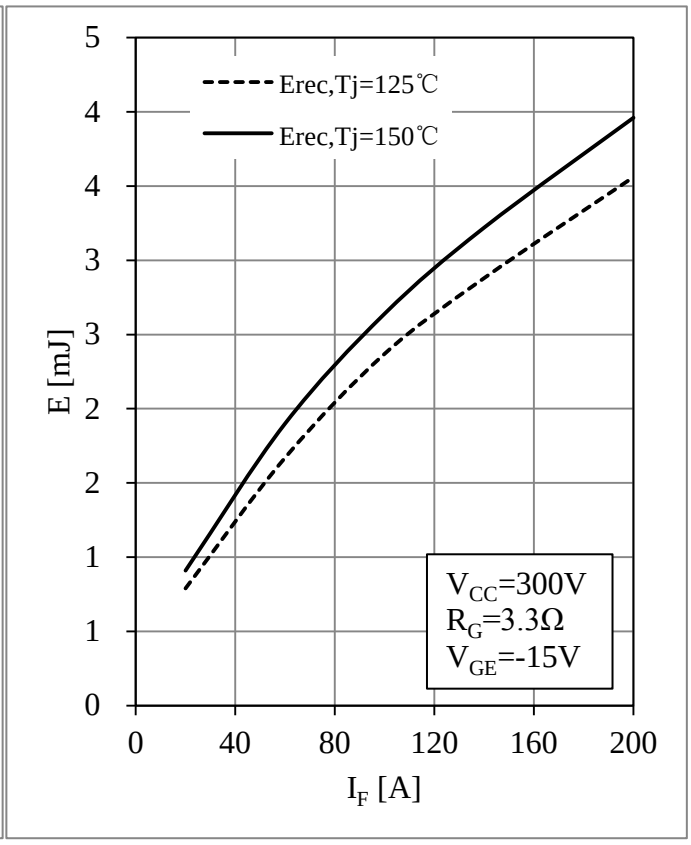


Fig 8. D1-D4 Diode Switching Loss vs. I_F

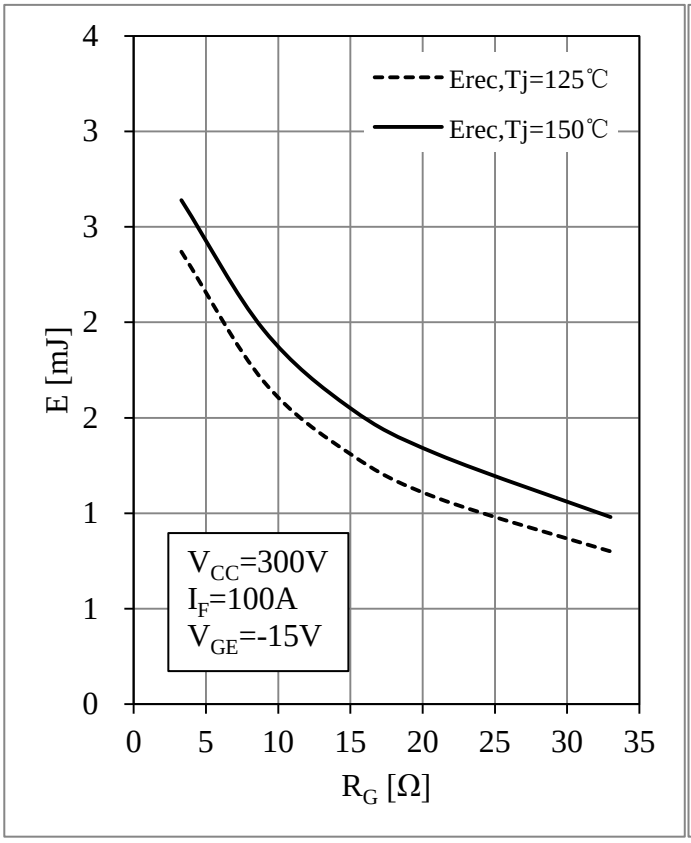


Fig 9. D1-D4 Diode Switching Loss vs. R_G

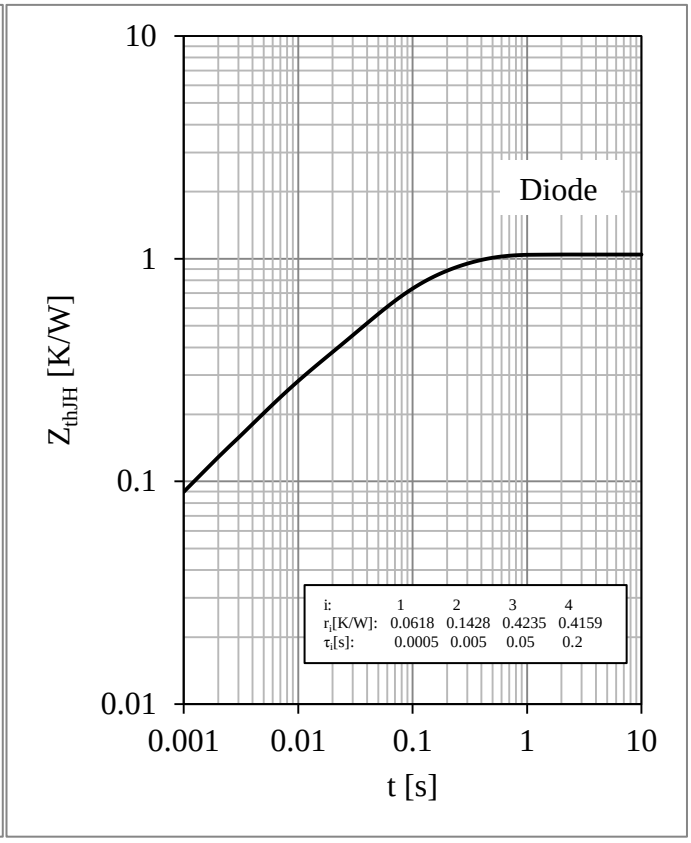


Fig 10. D1-D4 Diode Transient Thermal Impedance

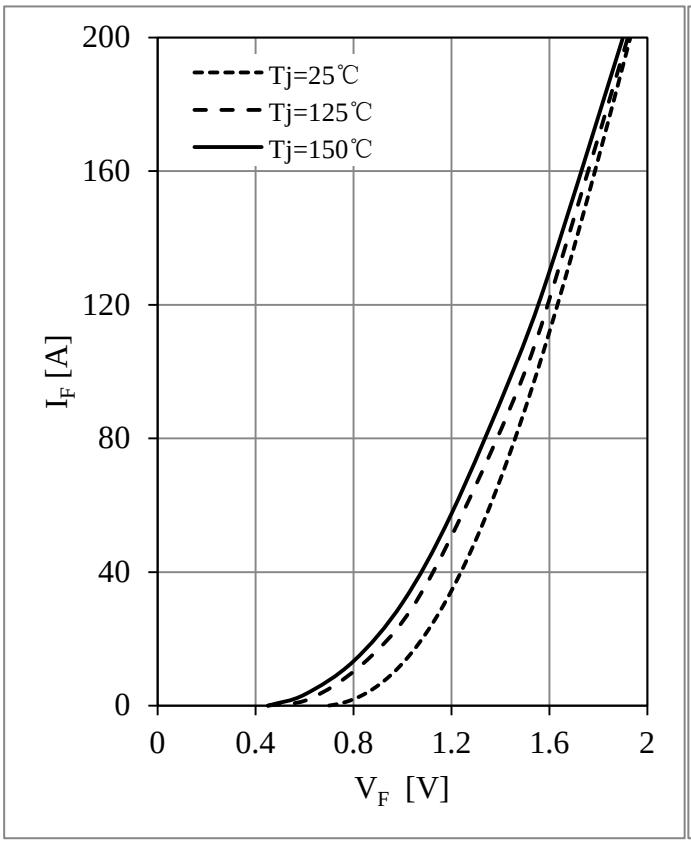


Fig 11. D5,D6 Diode Forward Characteristics

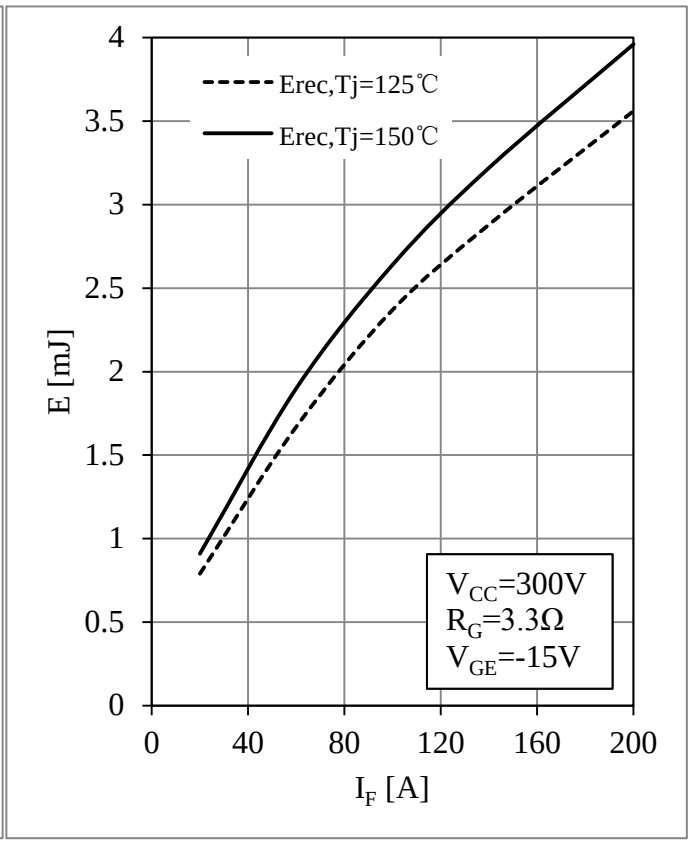


Fig 12. D5,D6 Diode Switching Loss vs. I_F

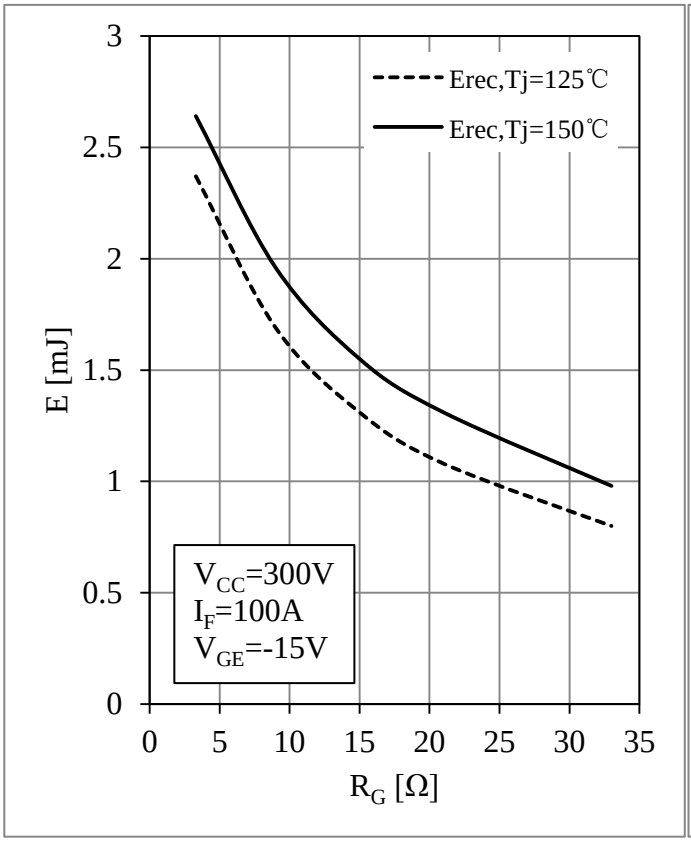


Fig 13. D5,D6 Diode Switching Loss vs. R_G

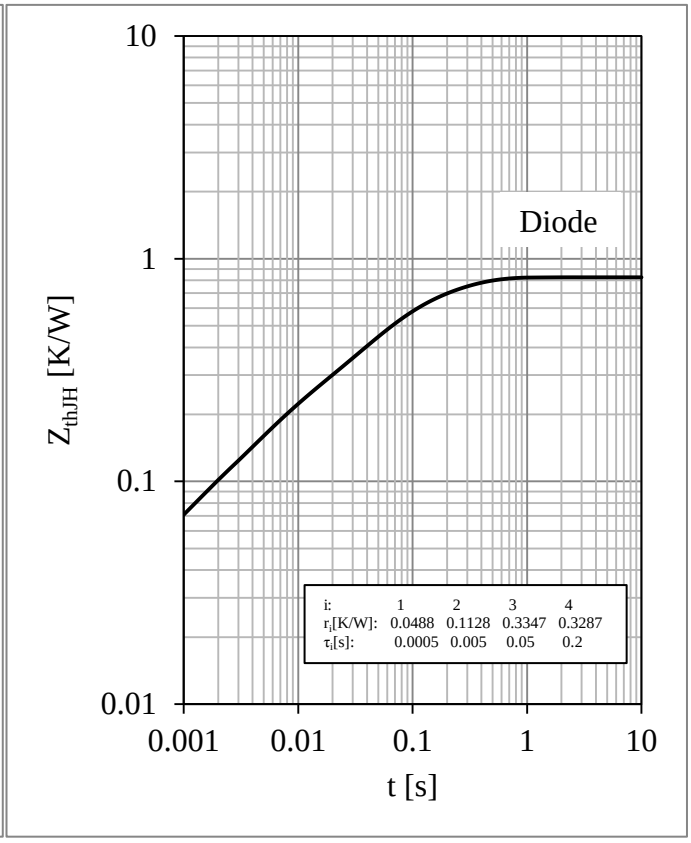


Fig 14. D5,D6 Diode Transient Thermal Impedance

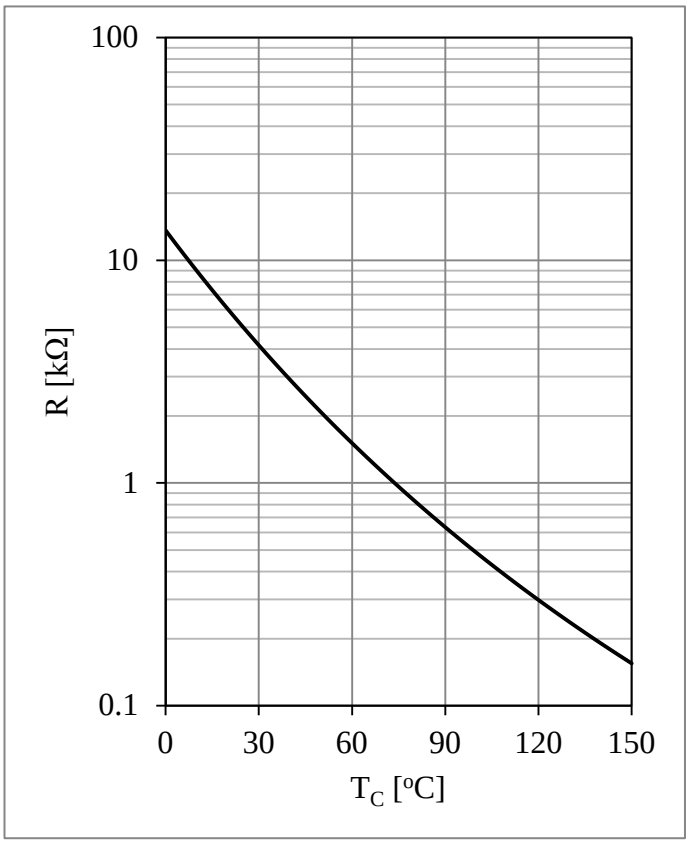
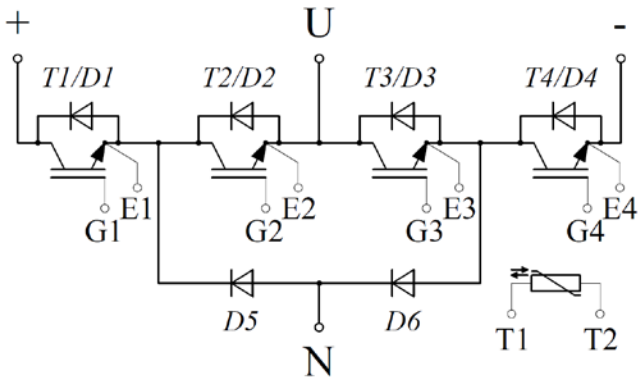


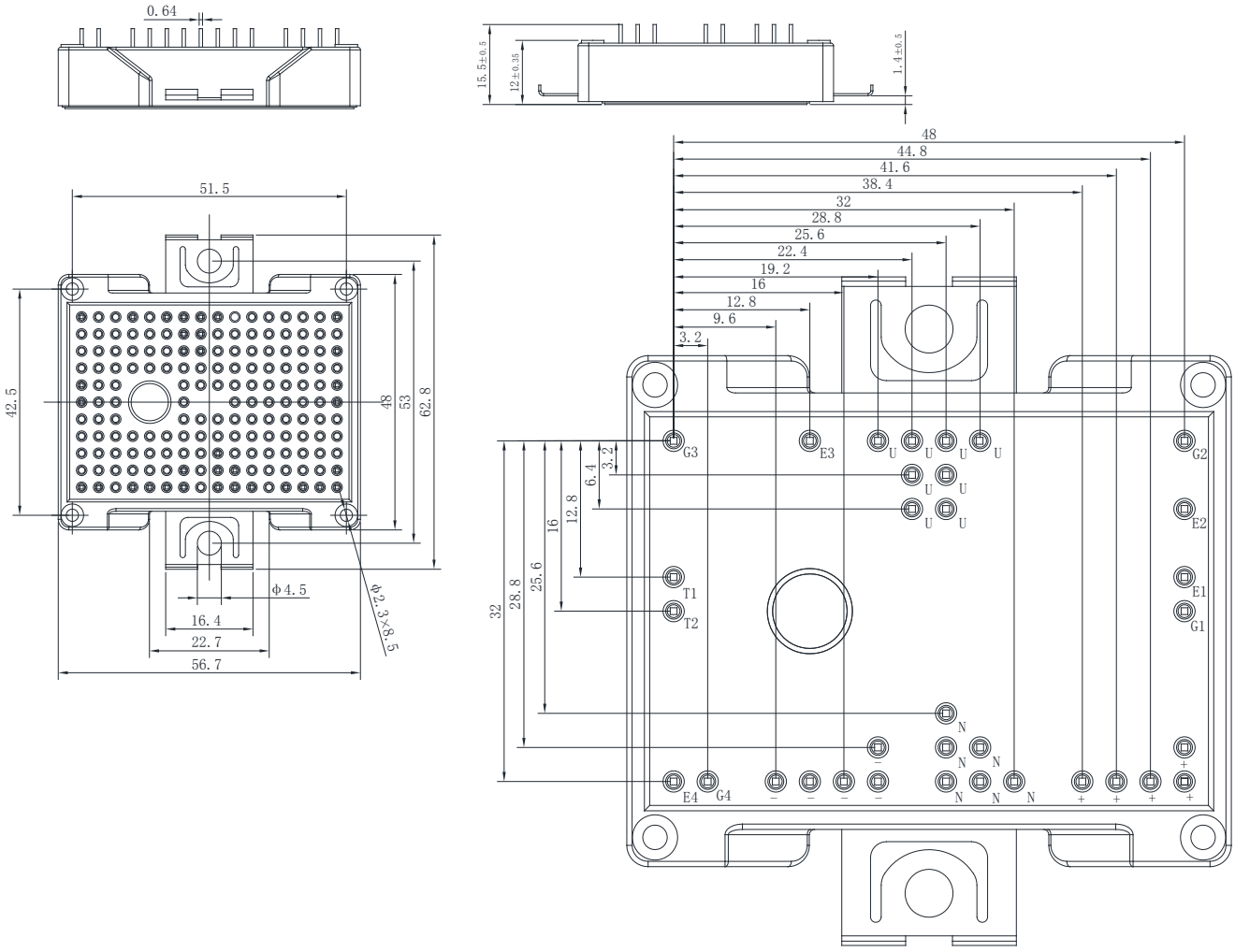
Fig 15. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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