STARPOWER

SEMICONDUCTOR **IGBT**

GD600MJS100L6S

1000V/600A 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.

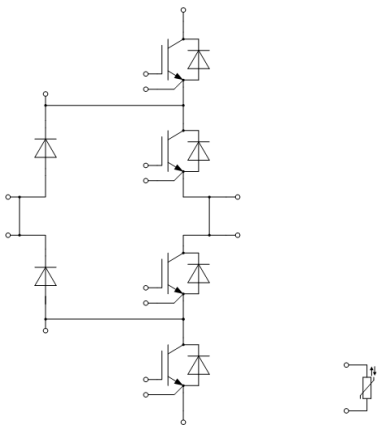
Features

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

Typical Applications

- Solar power
- 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	1000	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_{CN}	Implemented Collector Current	600	A
I_C	Collector Current @ T_C=65°C	395	A
I_{CM}	Pulsed Collector Current t_p=1ms	1200	A

D1-D4 Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1000	V
I_{FN}	Implemented Forward Current	300	A
I_F	Diode Continuous Forward Current@ T_C=65°C	190	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	600	A

D5,D6 Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1000	V
I_{FN}	Implemented Forward Current	400	A
I_F	Diode Continuous Forward Current@ T_C=65°C	240	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	800	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	3200	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=600A,V_{GE}=15V, T_j=25°C		1.90	2.35	V
		I_C=600A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=600A,V_{GE}=15V, T_j=150°C		2.30		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=9.00mA,V_{CE}=V_{GE}, T_j=25°C	3.25	4.0	4.75	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			0.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		51.0		nF
C_{oes}	Onput Capacitance			1.44		nF
C_{res}	Reverse Transfer Capacitance			0.81		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		3.42		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=650V,I_C=320A, R_{Gon}=5.1Ω,R_{Goff}=10Ω, L_S=24nH, V_{GE}=-8V/+15V, T_{vj}=25°C		110		ns
t_r	Rise Time			96		ns
$t_{d(off)}$	Turn-Off Delay Time			1211		ns
t_f	Fall Time			50		ns
E_{on}	Turn-On Switching Loss			27.8		mJ
E_{off}	Turn-Off Switching Loss			11.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=650V,I_C=320A, R_{Gon}=5.1Ω,R_{Goff}=10Ω, L_S=24nH, V_{GE}=-8V/+15V, T_{vj}=125°C		98		ns
t_r	Rise Time			110		ns
$t_{d(off)}$	Turn-Off Delay Time			1300		ns
t_f	Fall Time			37		ns
E_{on}	Turn-On Switching Loss			34.3		mJ
E_{off}	Turn-Off Switching Loss			14.8		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=650V,I_C=320A, R_{Gon}=5.1Ω,R_{Goff}=10Ω, L_S=24nH, V_{GE}=-8V/+15V, T_{vj}=150°C		99		ns
t_r	Rise Time			112		ns
$t_{d(off)}$	Turn-Off Delay Time			1291		ns
t_f	Fall Time			42		ns
E_{on}	Turn-On Switching Loss			35.7		mJ
E_{off}	Turn-Off Switching Loss			15.4		mJ

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=300A,V_{GE}=0V,T_j=25°C		2.15	2.60	V
		I_F=300A,V_{GE}=0V,T_j=125°C		2.20		
		I_F=300A,V_{GE}=0V,T_j=150°C		2.20		
Q_r	Recovered Charge	V_R=650V,I_F=320A, -di/dt=5930A/μs,V_{GE}=-8V L_S=34nH,T_j=25°C		12		μC
I_{RM}	Peak Reverse Recovery Current			202		A
E_{rec}	Reverse Recovery Energy			2.7		mJ
Q_r	Recovered Charge	V_R=650V,I_F=320A, -di/dt=5190A/μs,V_{GE}=-8V L_S=34nH,T_j=125°C		22		μC
I_{RM}	Peak Reverse Recovery Current			237		A
E_{rec}	Reverse Recovery Energy			6.87		mJ
Q_r	Recovered Charge	V_R=650V,I_F=320A, -di/dt=5900A/μs,V_{GE}=-8V L_S=34nH,T_j=150°C		25		μC
I_{RM}	Peak Reverse Recovery Current			243		A
E_{rec}	Reverse Recovery Energy			7.68		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=400A,V_{GE}=0V,T_j=25°C		2.15	2.60	V
		I_F=400A,V_{GE}=0V,T_j=125°C		2.20		
		I_F=400A,V_{GE}=0V,T_j=150°C		2.20		
Q_r	Recovered Charge	V_R=650V,I_F=320A, -di/dt=4930A/μs,V_{GE}=-8V L_S=24nH,T_j=25°C		12.4		μC
I_{RM}	Peak Reverse Recovery Current			180		A
E_{rec}	Reverse Recovery Energy			3.53		mJ
Q_r	Recovered Charge	V_R=650V,I_F=320A, -di/dt=4850A/μs,V_{GE}=-8V L_S=24nH,T_j=125°C		23.3		μC
I_{RM}	Peak Reverse Recovery Current			223		A
E_{rec}	Reverse Recovery Energy			7.91		mJ
Q_r	Recovered Charge	V_R=650V,I_F=320A, -di/dt=4510A/μs,V_{GE}=-8V L_S=24nH,T_j=150°C		27.5		μC
I_{RM}	Peak Reverse Recovery Current			230		A
E_{rec}	Reverse Recovery Energy			9.39		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_{thJC}	Junction-to-Case (per T1-T4 IGBT) Junction-to-Case (per D1-D4 Diode) Junction-to-Case (per D5,D6 Diode)			0.103 0.238 0.189	K/W
M	Mounting Torque, Screw:M5	3.0		5.0	N.m
G	Weight of Module		250		g

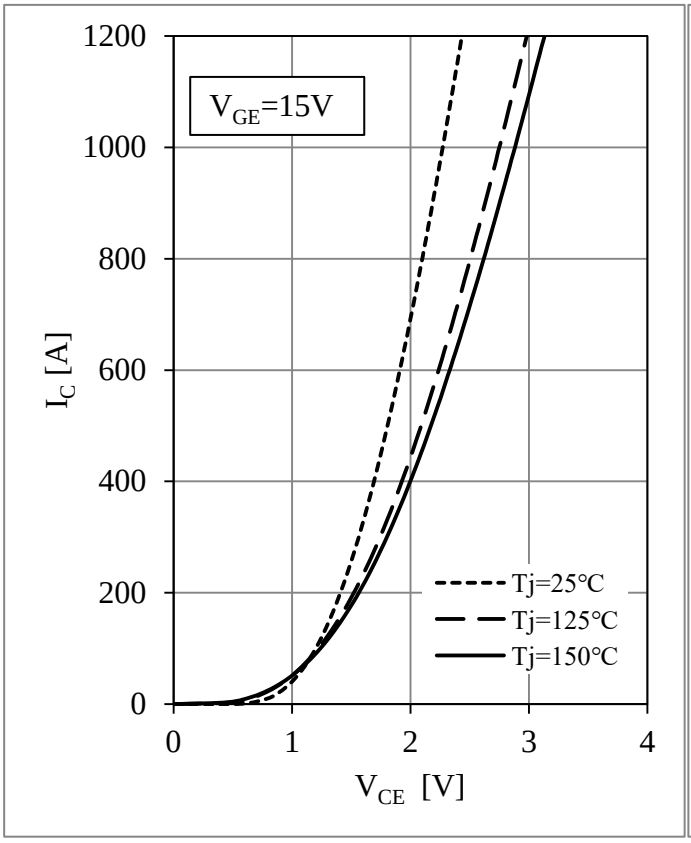


Fig 1. T1-T4 IGBT Output Characteristics

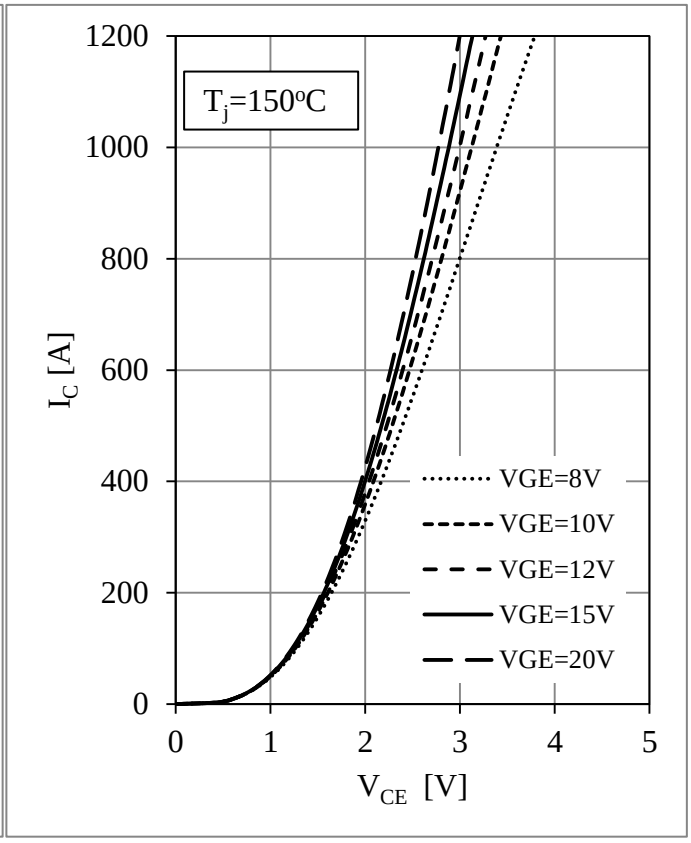


Fig 2. T1-T4 IGBT Output Characteristics

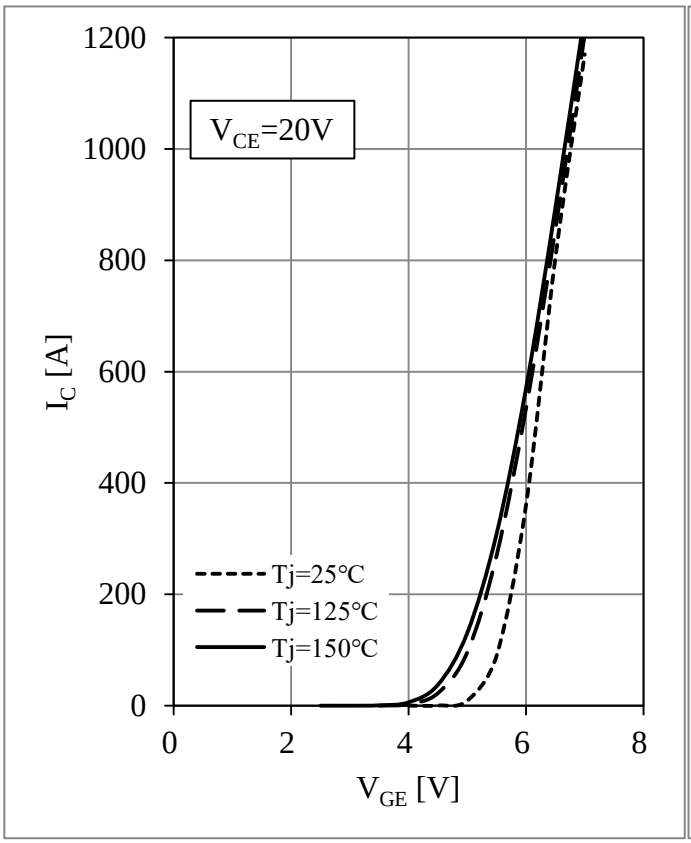


Fig 3. T1-T4 IGBT Transfer Characteristics

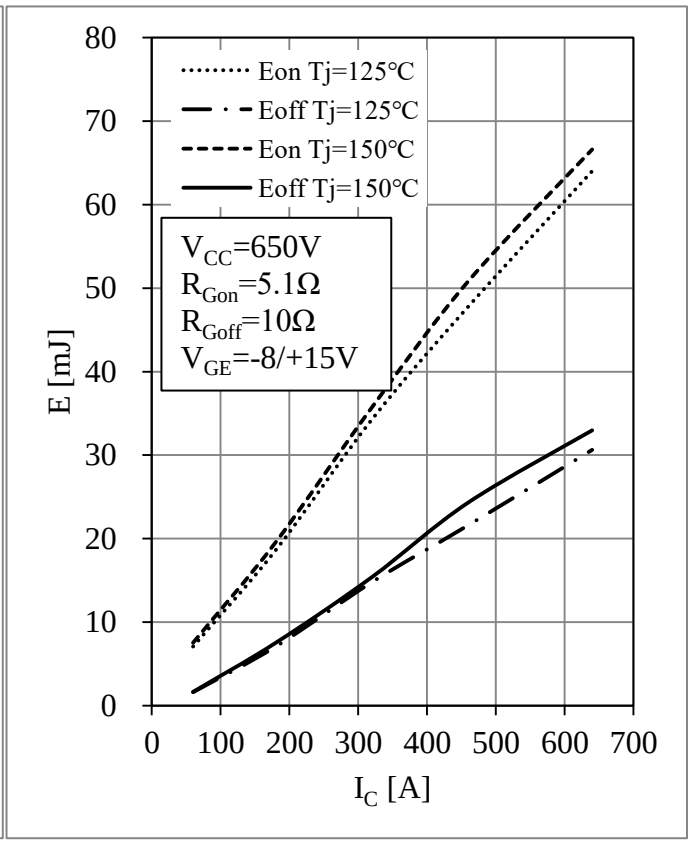


Fig 4. T1-T4 IGBT Switching Loss vs. I_C

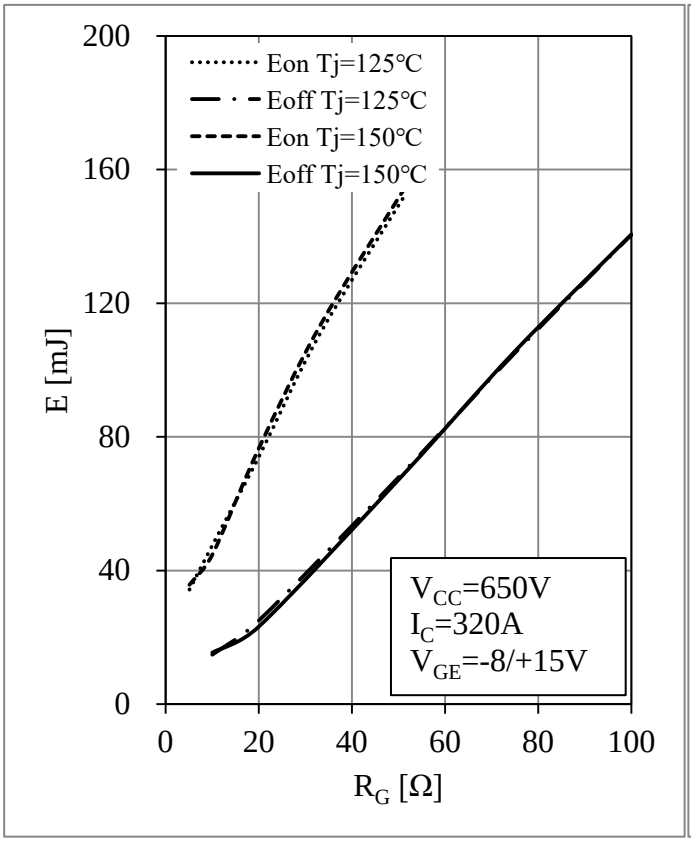


Fig 5. T1-T4 IGBT Switching Loss vs. R_G

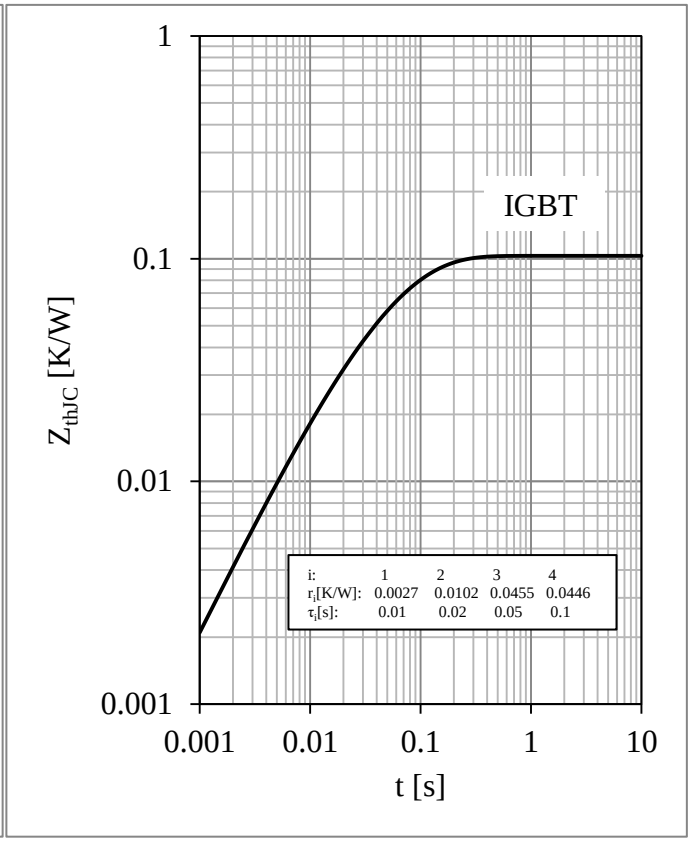


Fig 6. T1-T4 IGBT Transient Thermal Impedance

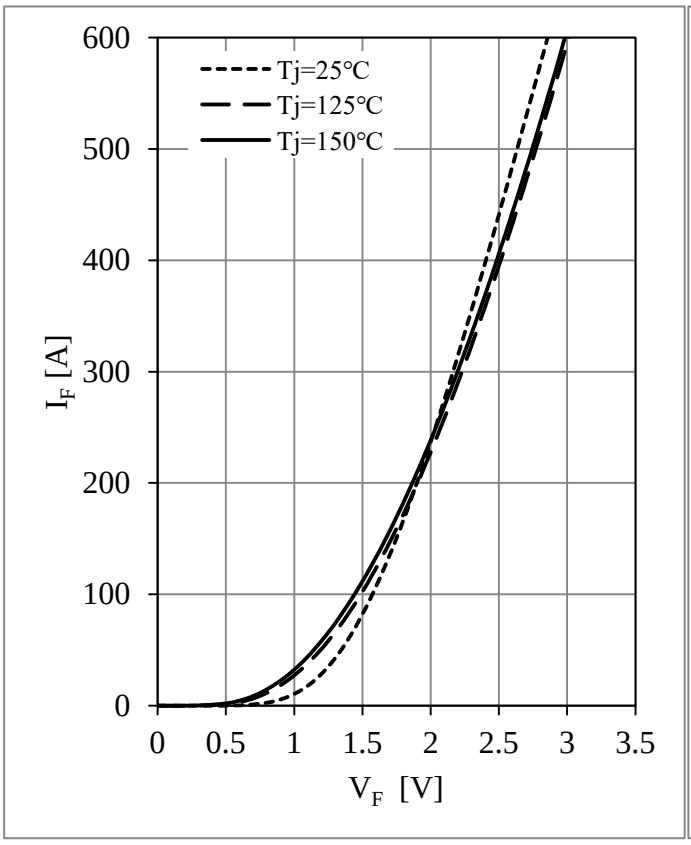


Fig 7. D1-D4 Diode Forward Characteristics

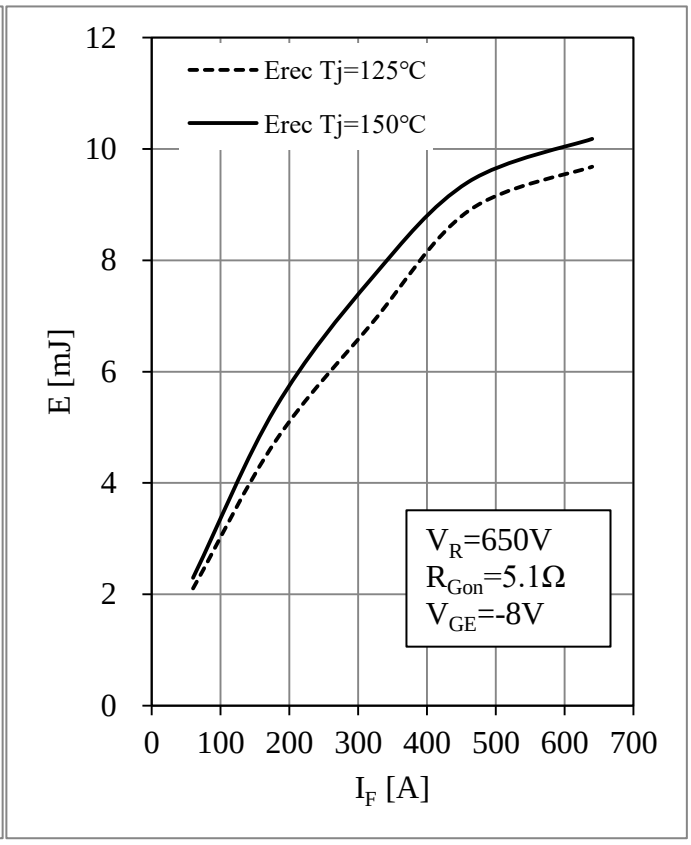


Fig 8. D1-D4 Diode Switching Loss vs. I_F

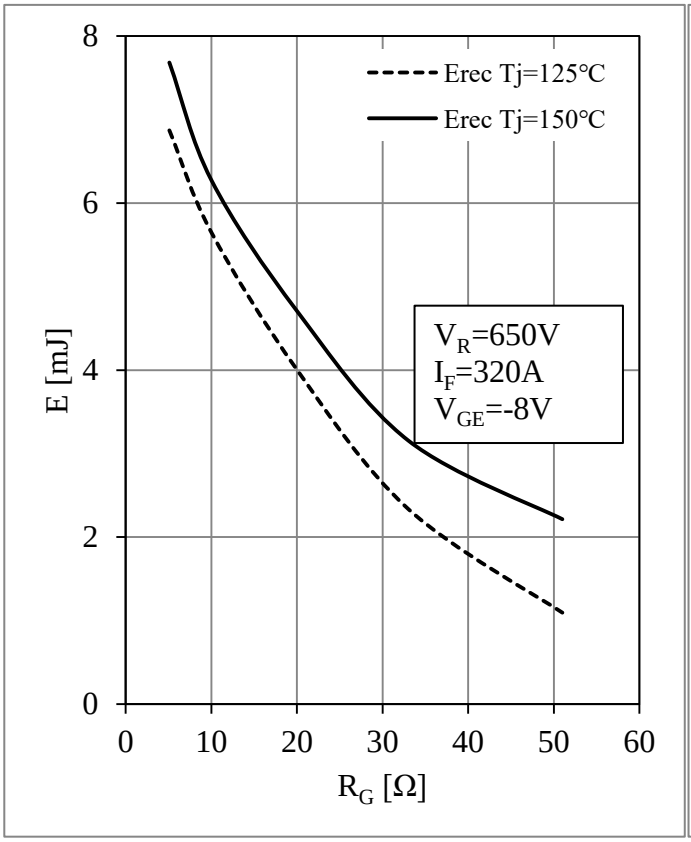


Fig 9. D1-D4 Diode Switching Loss vs. R_G

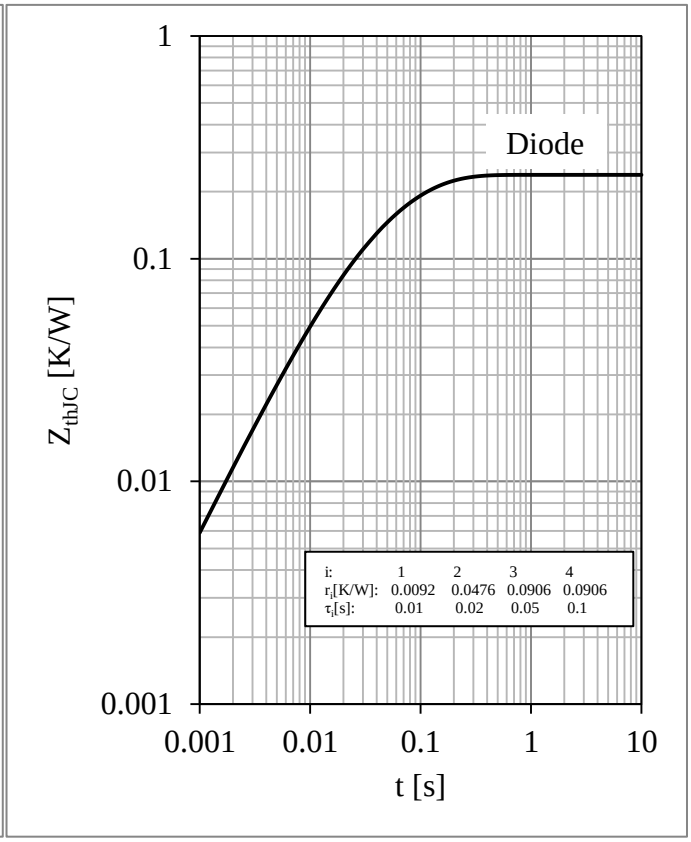


Fig 10. D1-D4 Diode Transient Thermal Impedance

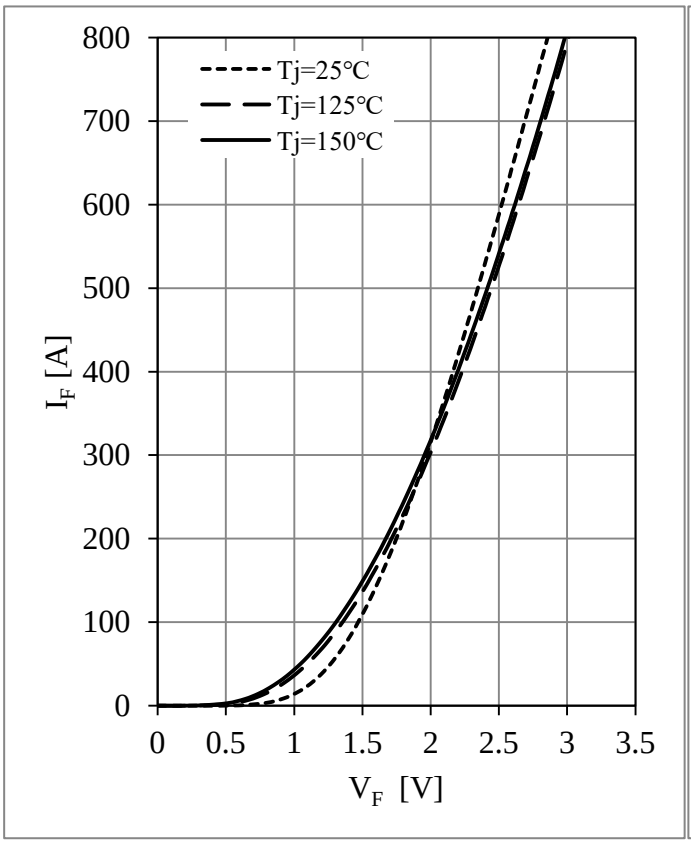


Fig 11. D5,D6 Diode Forward Characteristics

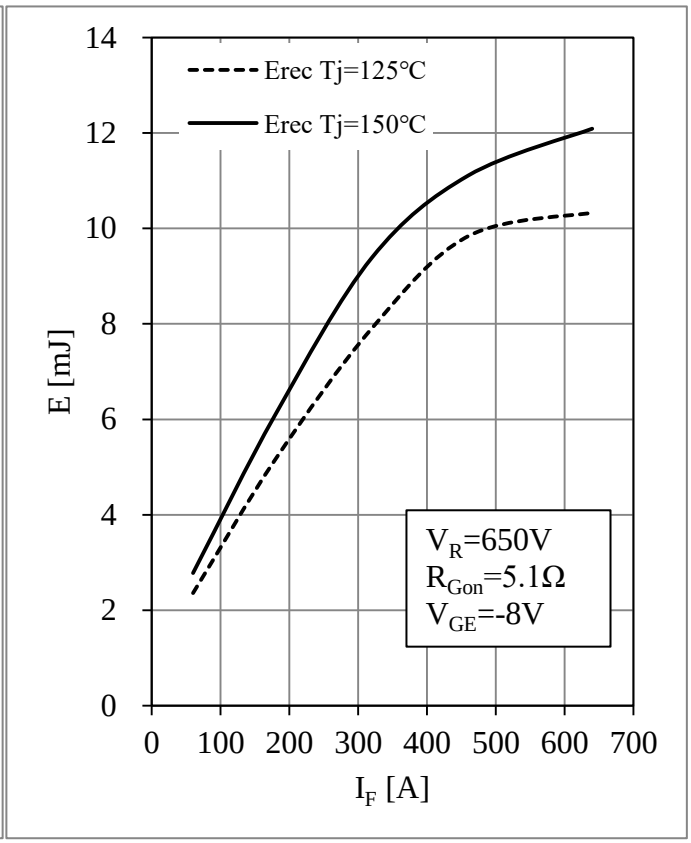


Fig 12. D5,D6 Diode Switching Loss vs. I_F

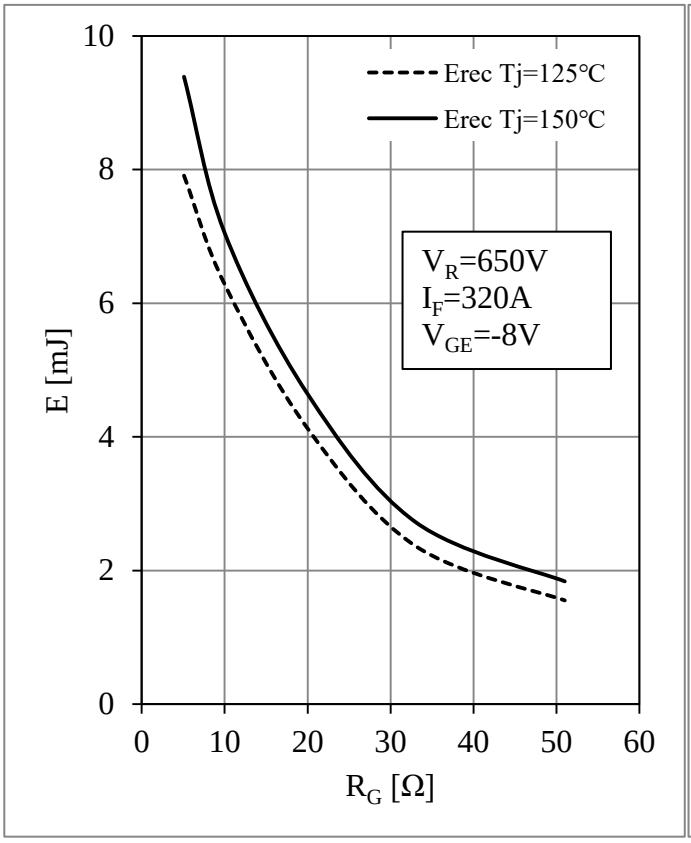


Fig 13. D5,D6 Diode Switching Loss vs. R_G

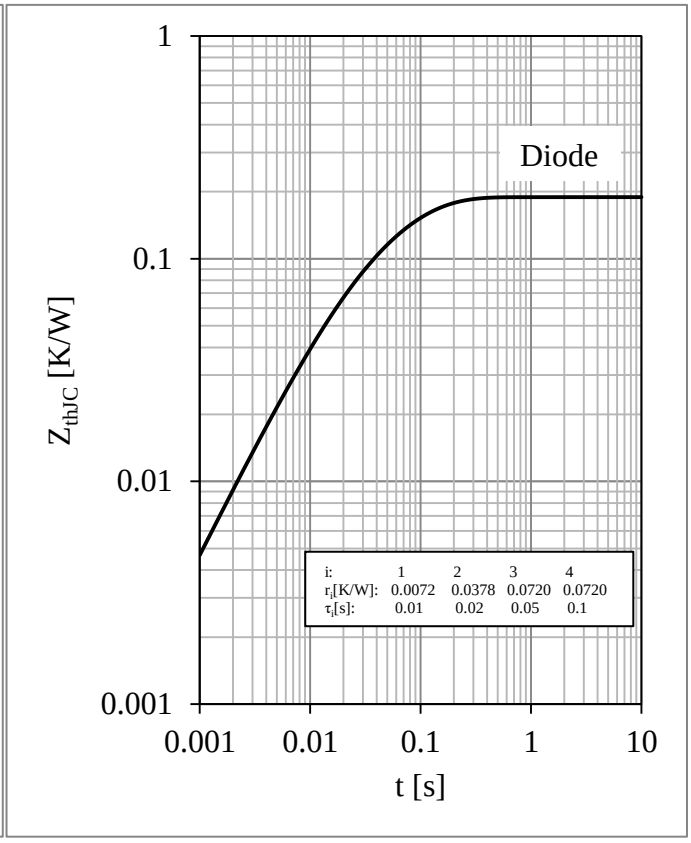
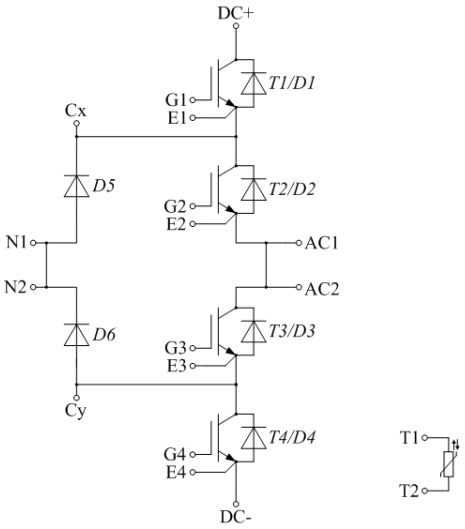


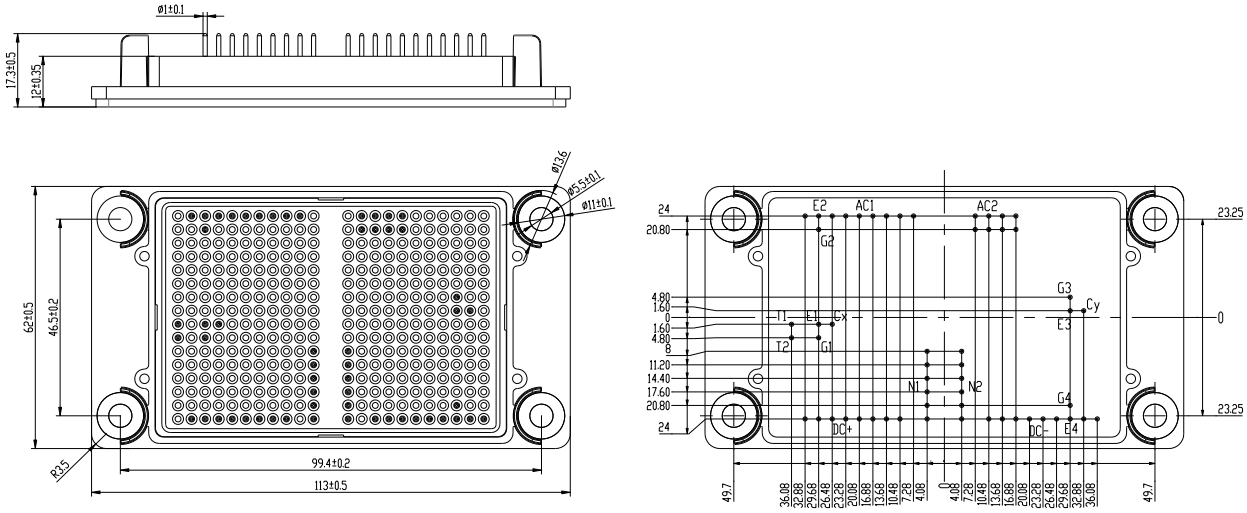
Fig 14. D5,D6 Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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