DOSEMI

IGBT

DG40F07TAFM

650V/40A IGBT with Diode

General Description

DOSEMI IGBT Power Discrete provides ultra low conduction loss as well as low switching loss. They are designed for the applications such as solar power.

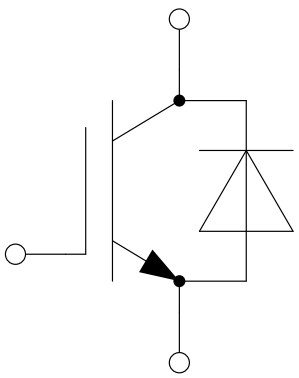
Features

- Low $V_{CE(sat)}$ Fast IGBT technology
- Low switching loss
- Maximum junction temperature 175°C
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD

Typical Applications

- Solar power
- UPS
- 3-level-application

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
VCES	Collector-Emitter Voltage	650	V
VGES	Gate-Emitter Voltage Transient Gate-Emitter Voltage	±20 -25/+30	V
IC	Collector Current @ T_C=25°C @ T_C=100°C	80(1) 40	A
ICM	Pulsed Collector Current t_p limited by T_{vjmax}	120	A
PD	Maximum Power Dissipation @ T_{vj}=175°C	305	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current @ T_C=25°C @ T_C=100°C	78(1) 40	A
I_{FM}	Diode Maximum Forward Current t_p limited by T_{vjmax}	120	A

Discrete

Symbol	Description	Values	Unit
T_{vjop}	Operating Junction Temperature	-40 to +175	°C
T_{STG}	Storage Temperature Range	-55 to +150	°C
T_S	Soldering Temperature,1.6mm from case for 10s	260	°C
M	Mounting Torque, Screw M3	0.6	N.m

(1) limited by bondwire

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=40A,V_{GE}=15V, T_{vj}=25°C		1.60	2.05	V
		I_C=40A,V_{GE}=15V, T_{vj}=150°C		2.05		
		I_C=40A,V_{GE}=15V, T_{vj}=175°C		2.10		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=640uA,V_{CE}=V_{GE}, T_{vj}=25°C	5.0	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			200	μA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_{vj}=25°C			100	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		2.82		nF
C_{res}	Reverse Transfer Capacitance			0.19		nF
C_{oes}	Output Capacitance			0.07		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.18		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=40A, R_G=8.2Ω,V_{GE}=±15V, Ls=40nH,T_{vj}=25°C		10		ns
t_r	Rise Time			51		ns
$t_{d(off)}$	Turn-Off Delay Time			47		ns
t_f	Fall Time			57		ns
E_{on}	Turn-On Switching Loss			1.41		mJ
E_{off}	Turn-Off Switching Loss			0.18		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=40A, R_G=8.2Ω,V_{GE}=±15V, Ls=40nH,T_{vj}=150°C		12		ns
t_r	Rise Time			59		ns
$t_{d(off)}$	Turn-Off Delay Time			50		ns
t_f	Fall Time			88		ns
E_{on}	Turn-On Switching Loss			1.59		mJ
E_{off}	Turn-Off Switching Loss			0.25		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=40A, R_G=8.2Ω,V_{GE}=±15V, Ls=40nH,T_{vj}=175°C		13		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			52		ns
t_f	Fall Time			90		ns
E_{on}	Turn-On Switching Loss			1.70		mJ
E_{off}	Turn-Off Switching Loss			0.27		mJ

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=40A,V_{GE}=0V,T_{vj}=25°C		1.55	2.00	V
		I_F=40A,V_{GE}=0V,T_{vj}=150°C		1.55		
		I_F=40A,V_{GE}=0V,T_{vj}=175°C		1.50		
Q_r	Recovered Charge	V_R=300V,I_F=40A, -di/dt=560A/μs,V_{GE}=-15V Ls=40nH,T_{vj}=25°C		1.20		μC
t_{rr}	Recovered Time			121		ns
I_{RM}	Peak Reverse Recovery Current			17		A
E_{rec}	Reverse Recovery Energy			0.12		mJ
Q_r	Recovered Charge	V_R=300V,I_F=40A, -di/dt=510A/μs,V_{GE}=-15V Ls=40nH,T_{vj}=150°C		2.53		μC
t_{rr}	Recovered Time			175		ns
I_{RM}	Peak Reverse Recovery Current			22		A
E_{rec}	Reverse Recovery Energy			0.36		mJ
Q_r	Recovered Charge	V_R=300V,I_F=40A, -di/dt=500A/μs,V_{GE}=-15V Ls=40nH,T_{vj}=175°C		2.84		μC
t_{rr}	Recovered Time			177		ns
I_{RM}	Peak Reverse Recovery Current			24		A
E_{rec}	Reverse Recovery Energy			0.41		mJ

Discrete Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.491 0.785	K/W
R_{thJA}	Junction-to-Ambient		40		K/W

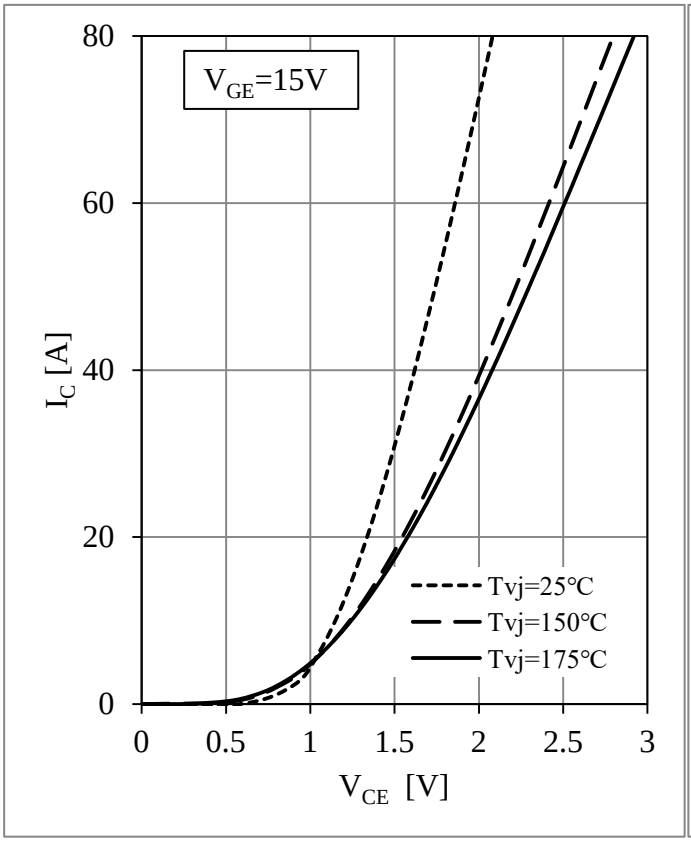


Fig 1. IGBT-inverter Output Characteristics

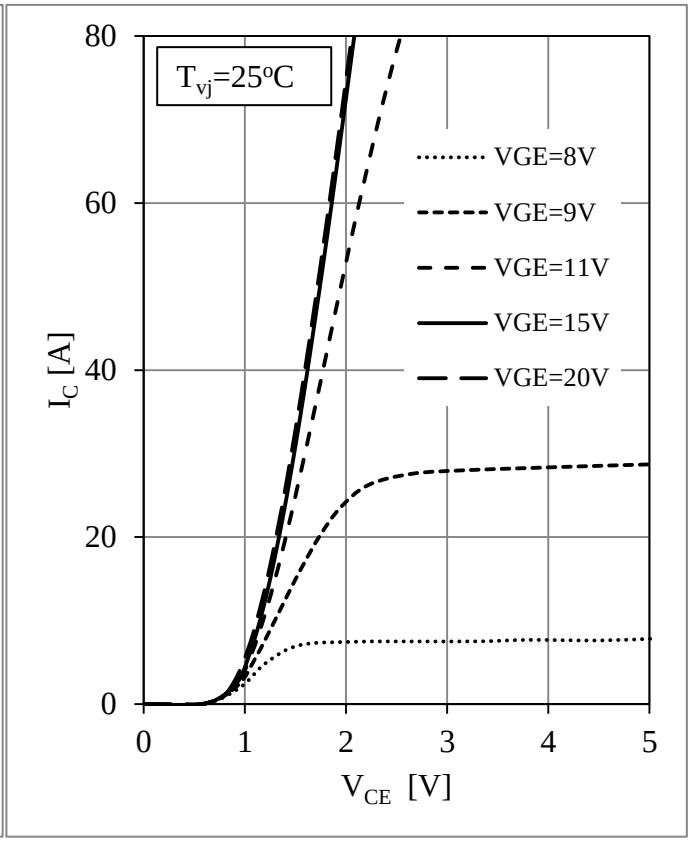


Fig 2. IGBT Output Characteristics

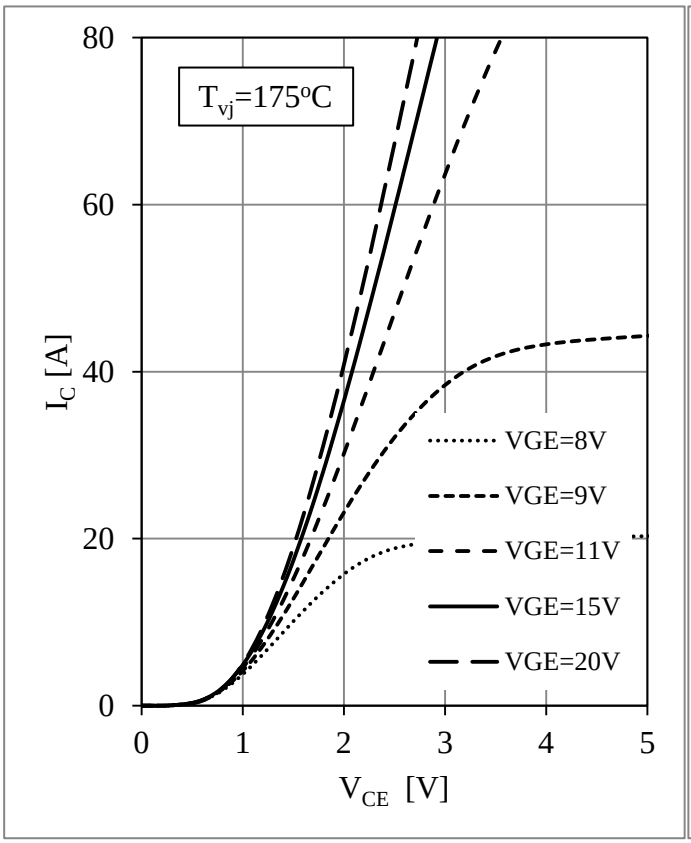


Fig 3. IGBT Output Characteristics

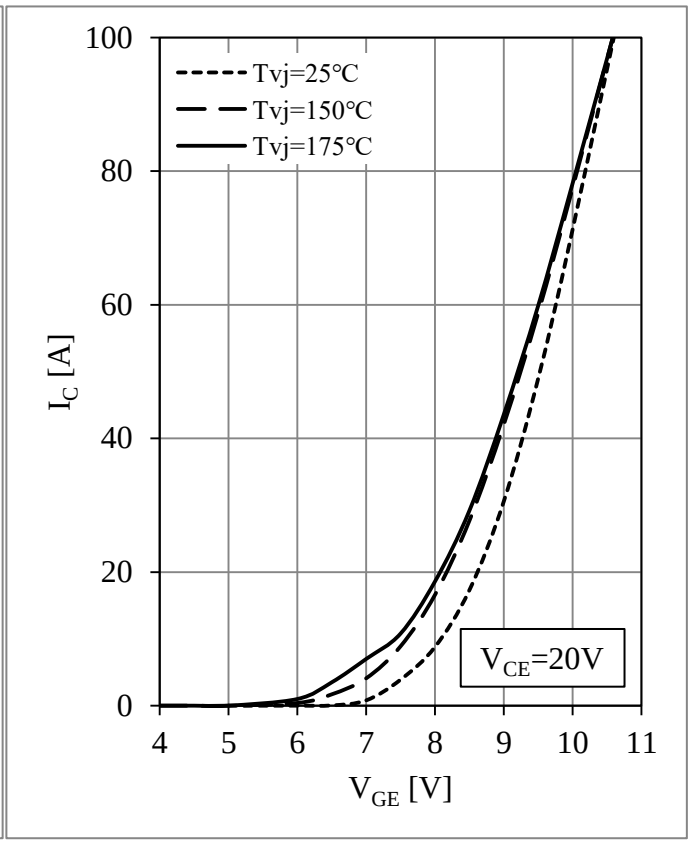


Fig 4. IGBT Transfer Characteristics

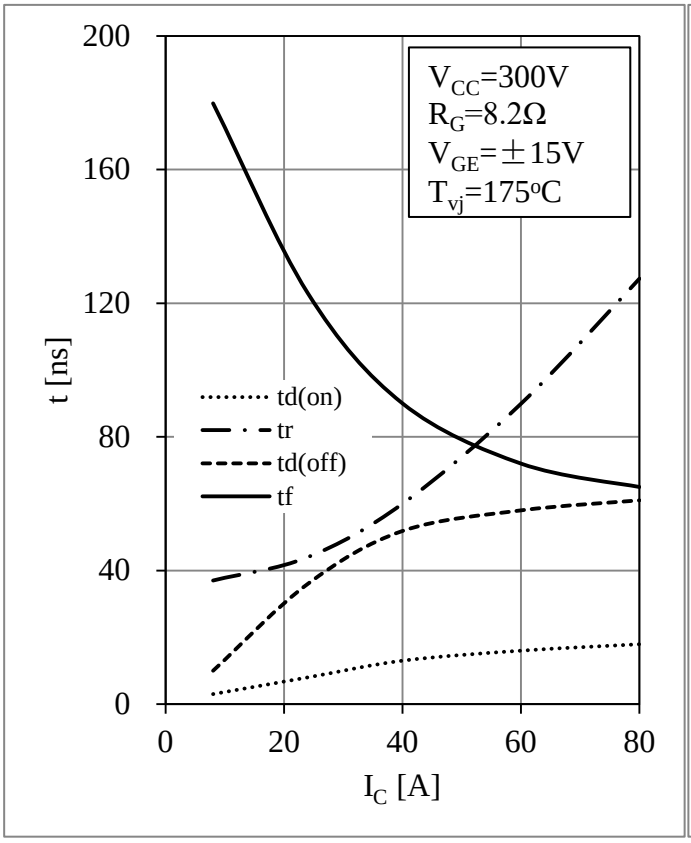


Fig 5. IGBT Switching Times as.I_C

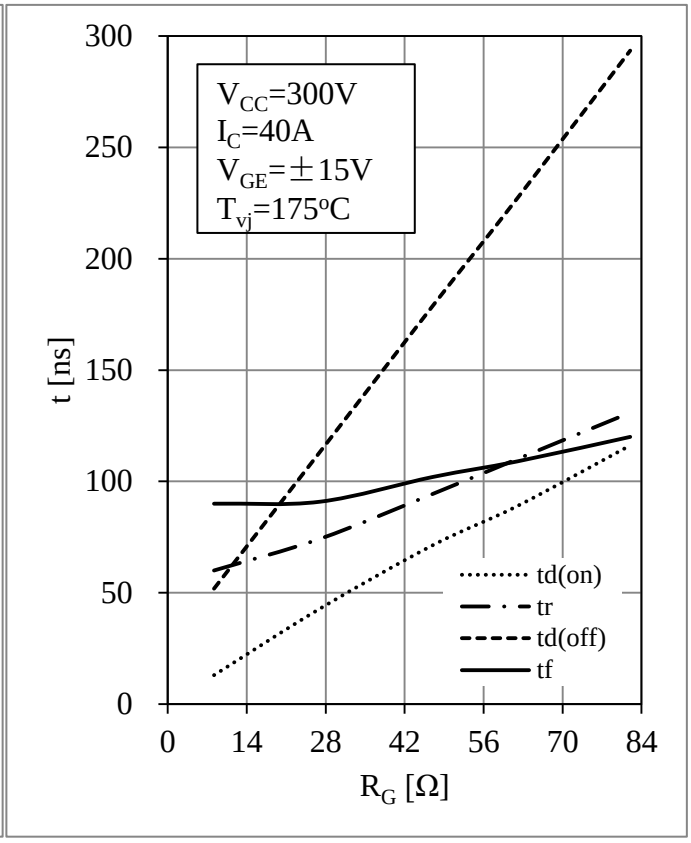


Fig 6. IGBT Switching Times as. R_G

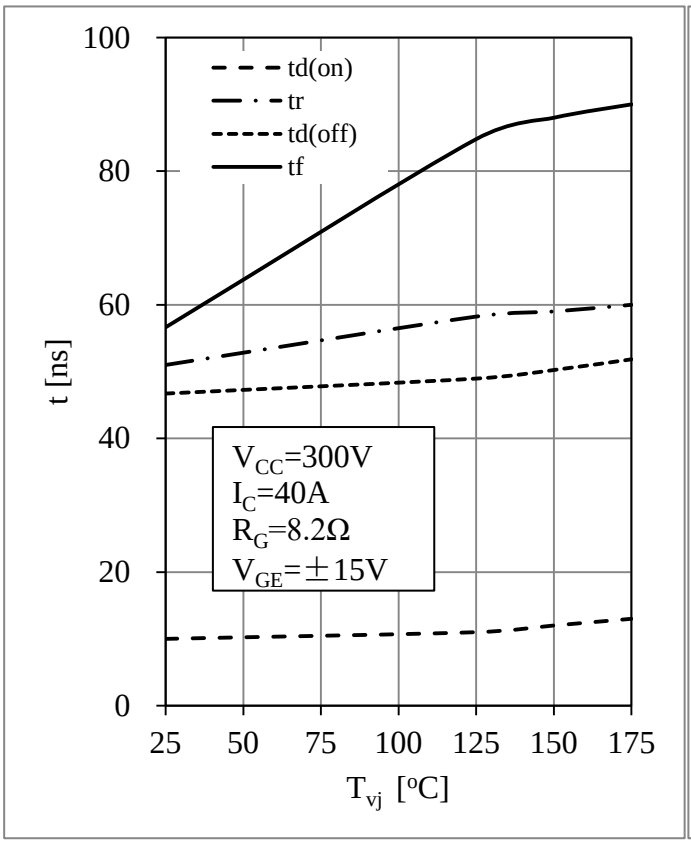


Fig 7. IGBT Switching Times vs. T_{vj}

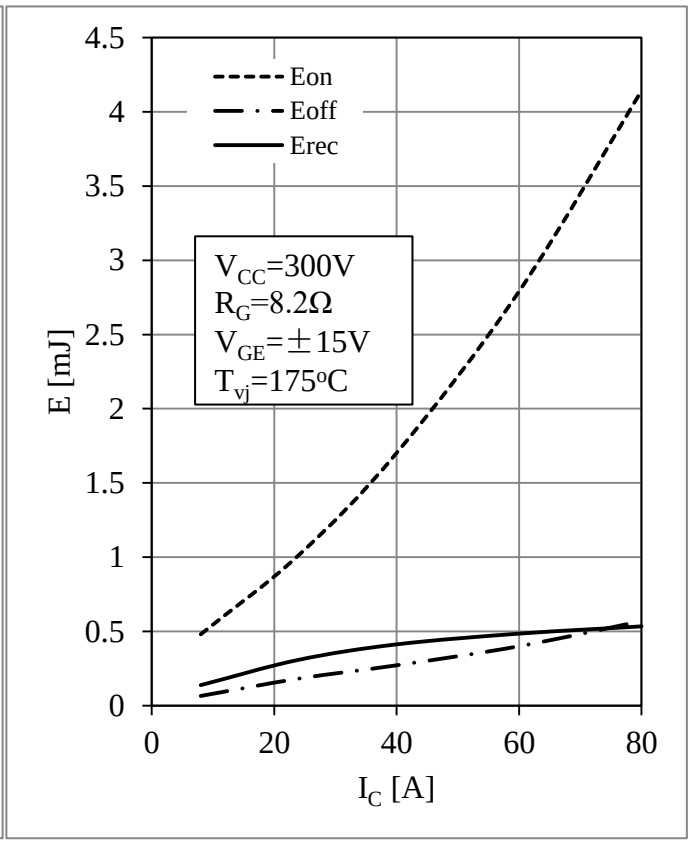


Fig 8. Switching Energy Loss vs. I_C

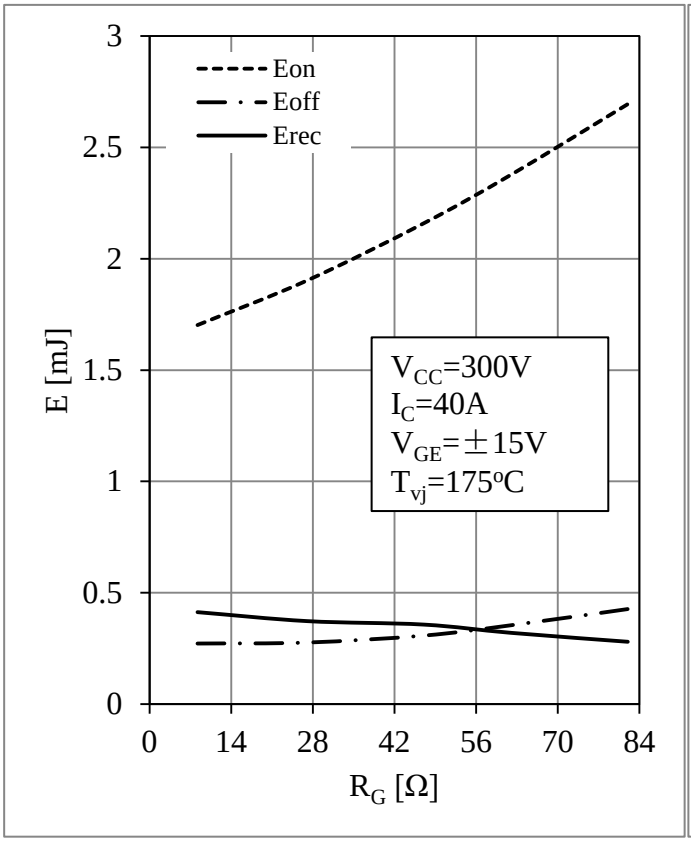


Fig 9. Switching Energy Loss vs. R_G

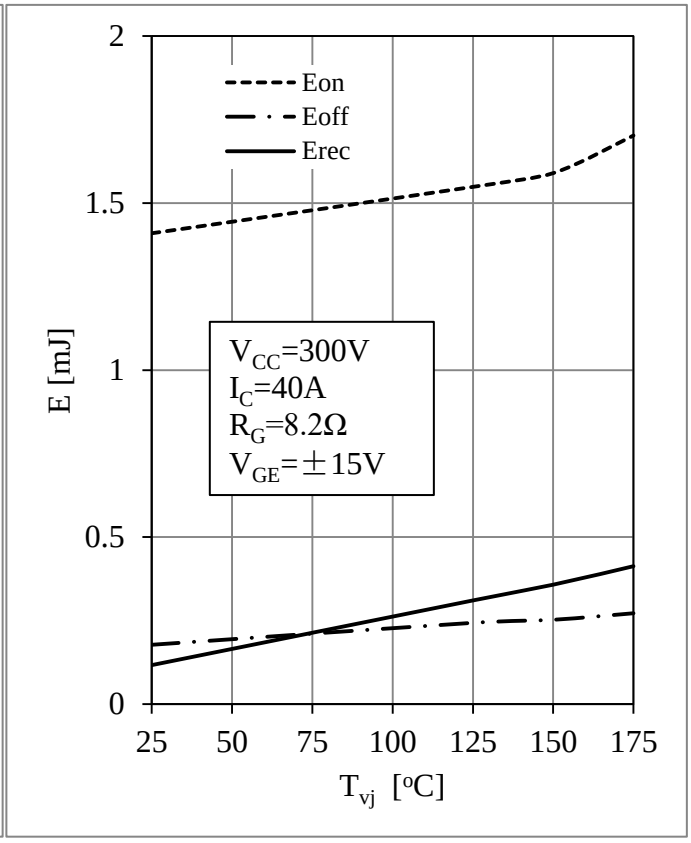


Fig 10. Switching Energy Loss vs. T_{vj}

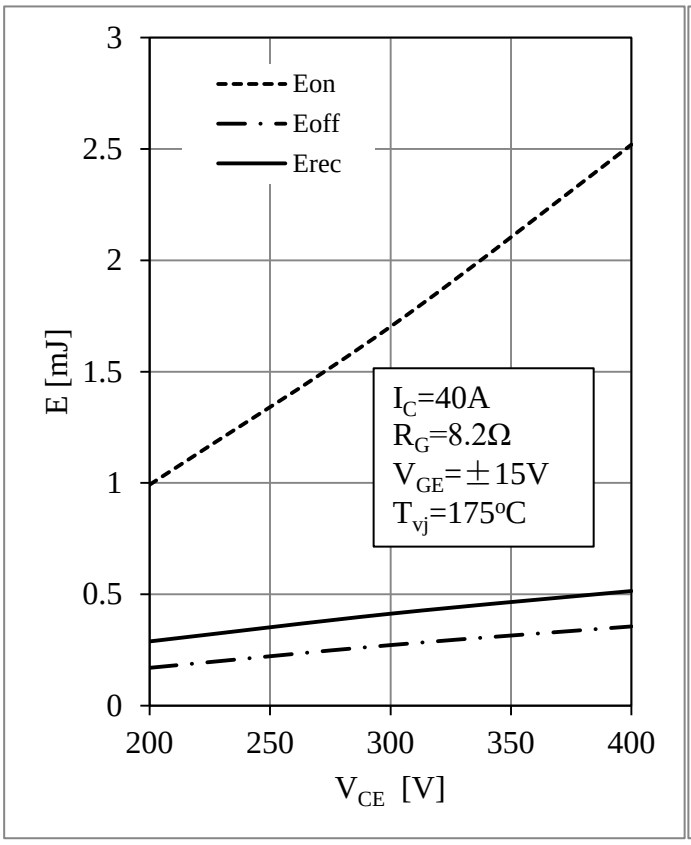


Fig 11. Switching Energy Loss vs. V_{CE}

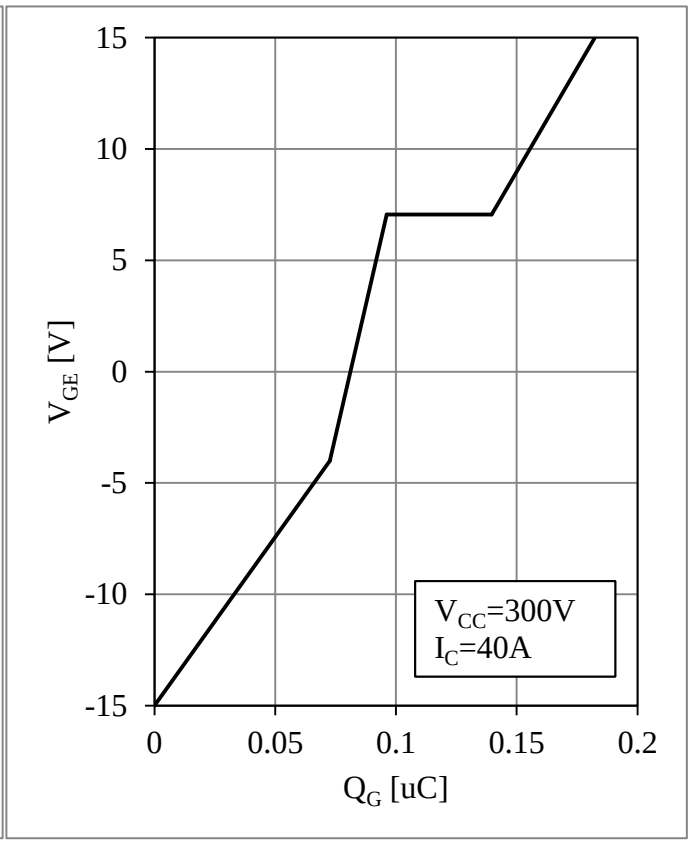


Fig 12 . IGBT Gate Charge vs. V_{CE}

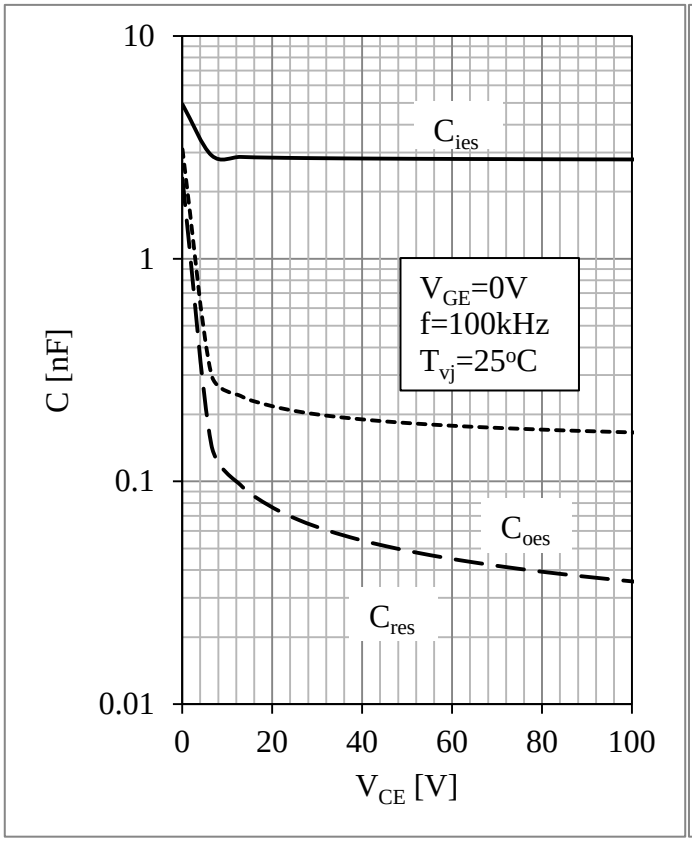


Fig 13. IGBT Capacity Charcteristic

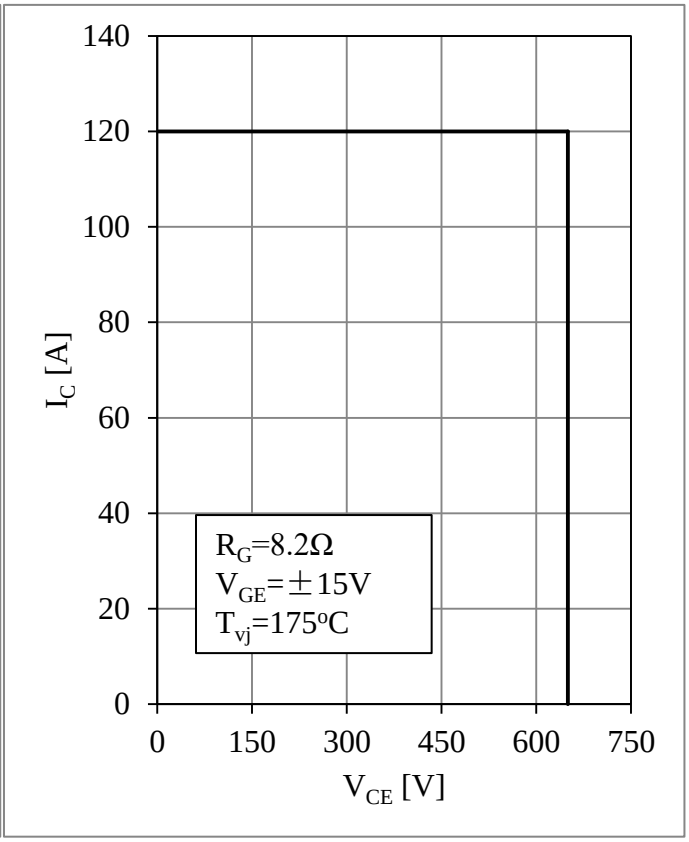


Fig 14 . RBSOA

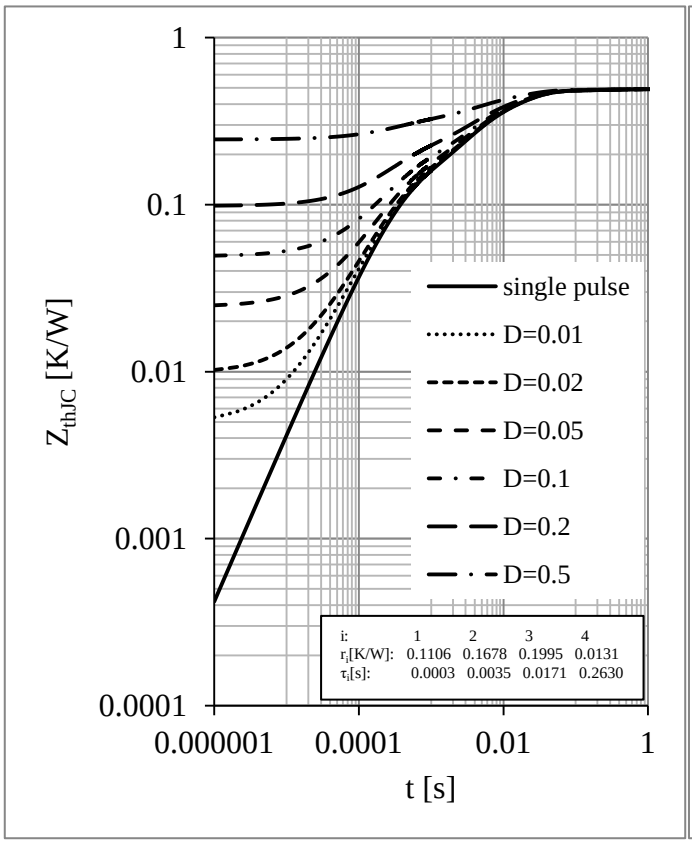


Fig 15. IGBT Transient Thermal Impedance

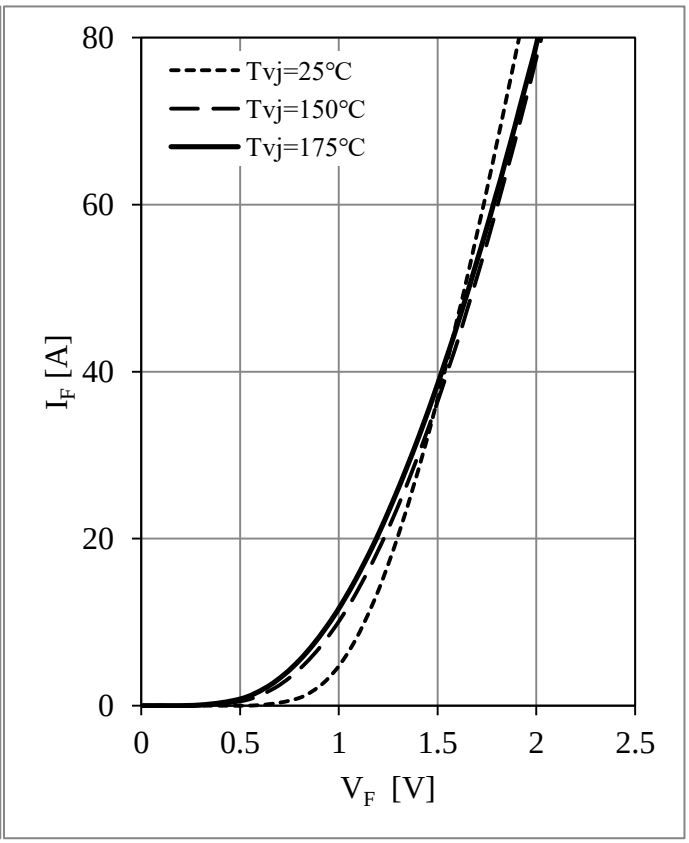


Fig 16. Diode Forward Characteristics

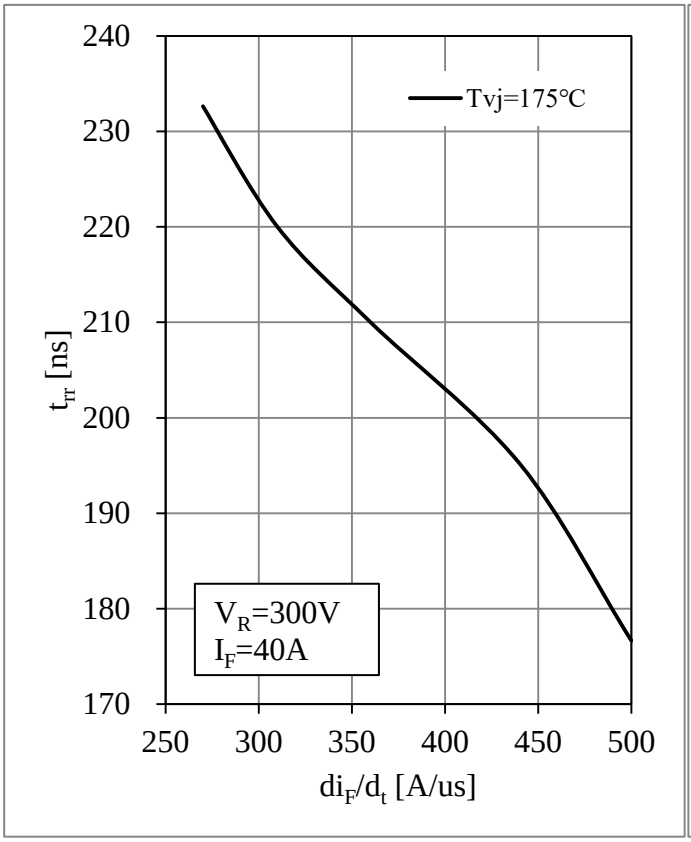


Fig 17. Reverse Recovery Time vs. di_F/d_t

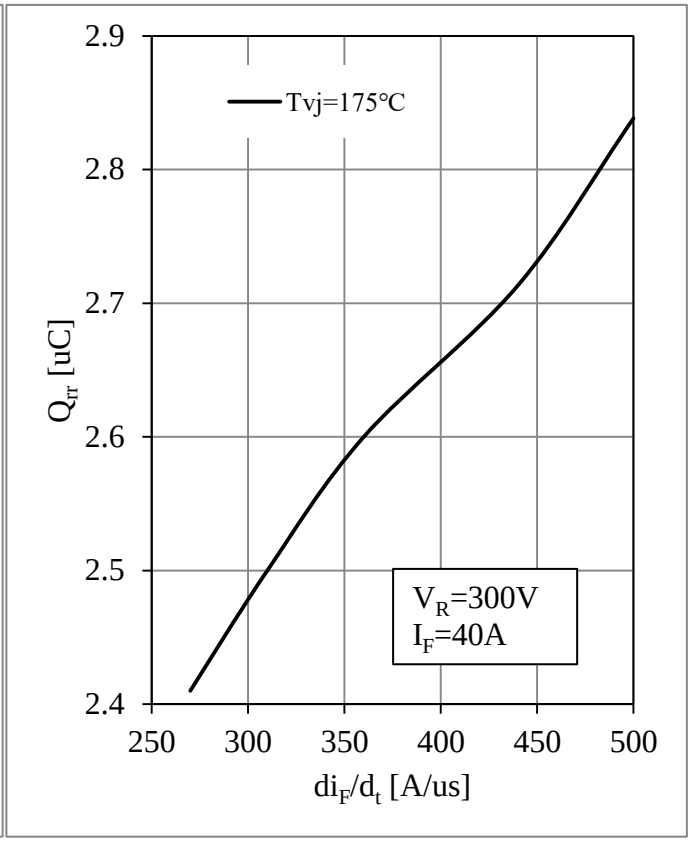


Fig 18. Reverse Recovery Charge vs. di_F/d_t

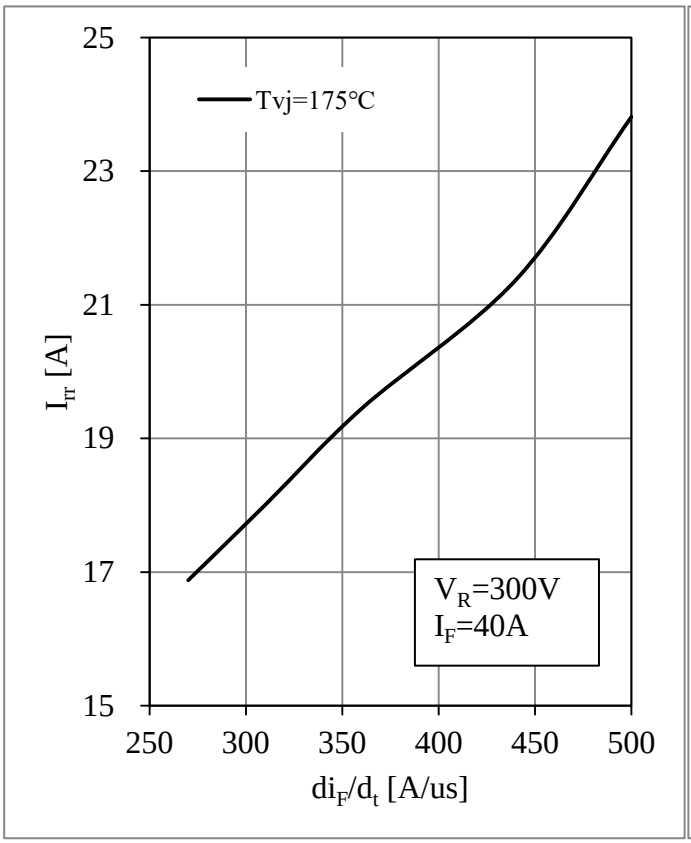


Fig 19. Reverse Recovery Current vs. di_F/d_t

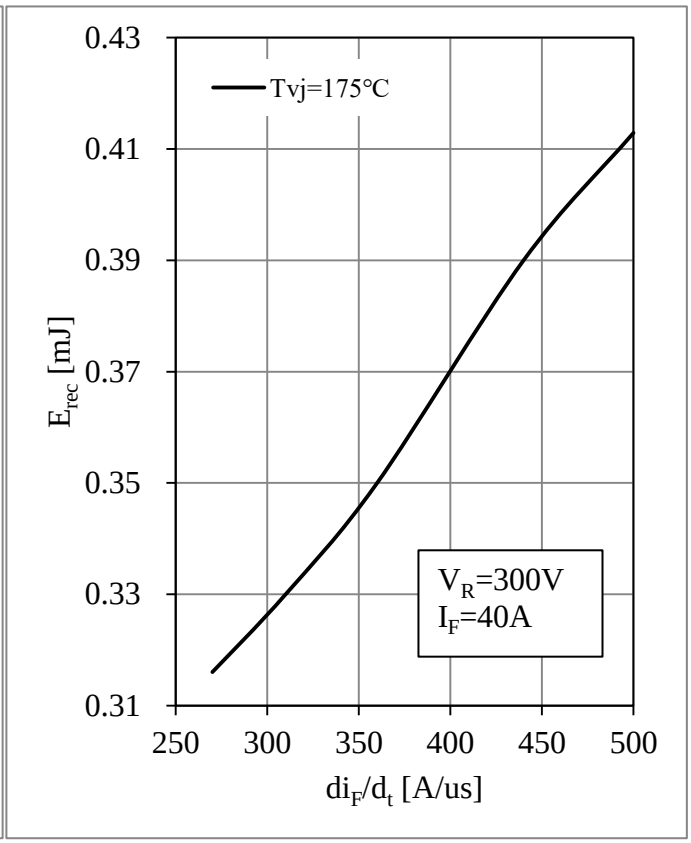


Fig 20. Reverse Energy Losses vs. di_F/d_t

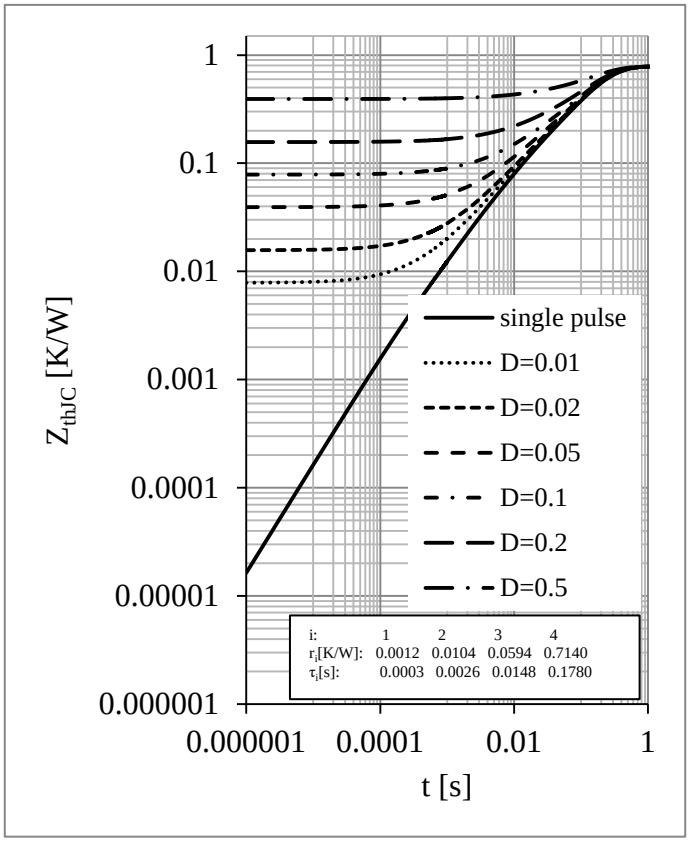
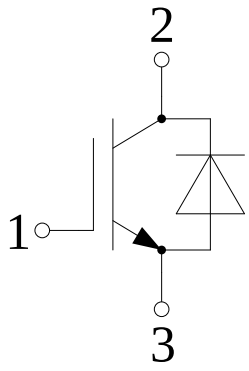


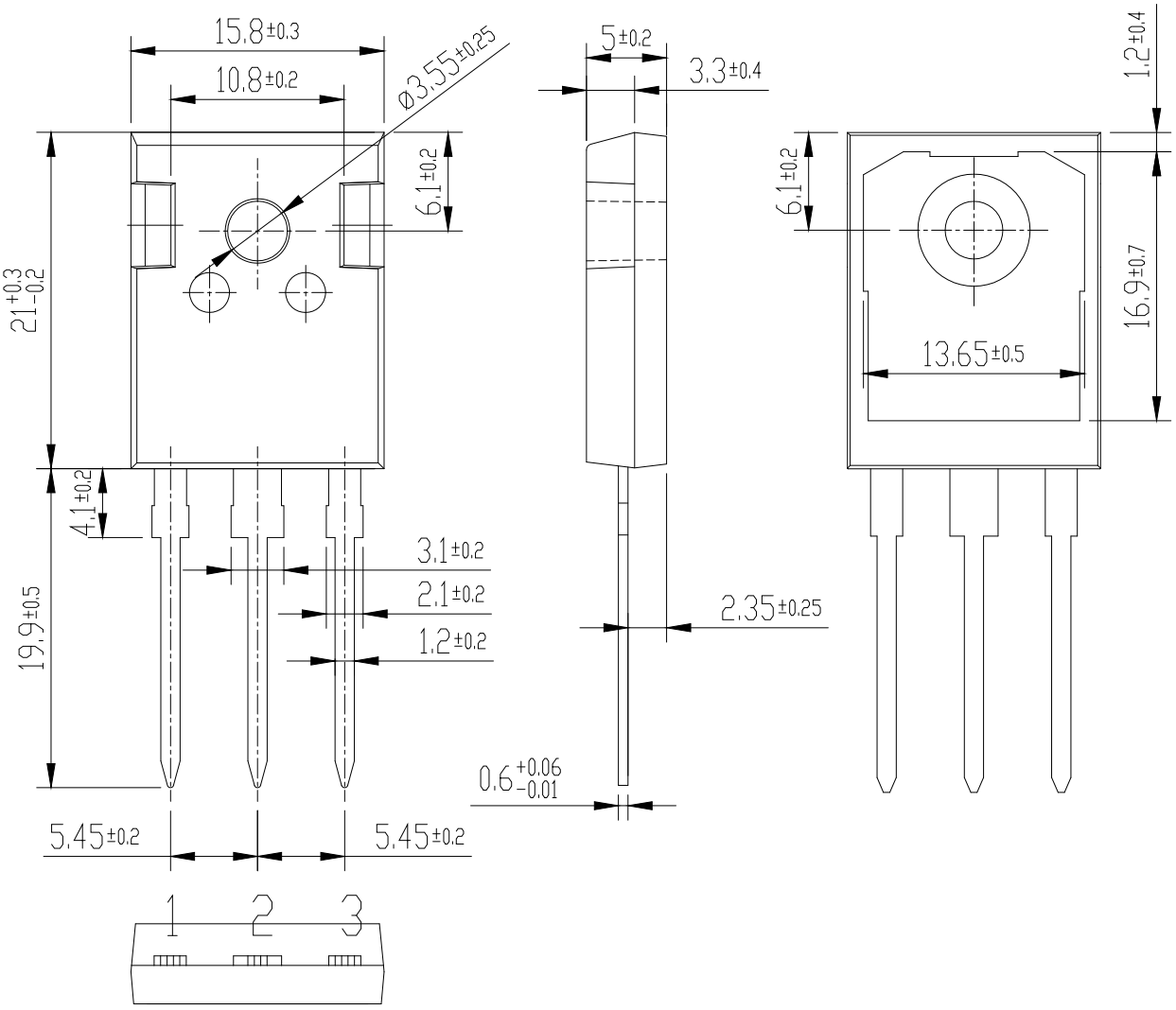
Fig 21. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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