

DOSEMI

IGBT

DG50X07T2

650V/50A 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 general inverters and UPS.

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

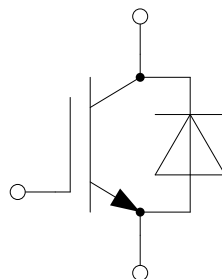
Typical Applications

- Inverter for motor drive
- UPS
- EV Air Conditioner

Validation

- Qualified according to AEC-Q101
- Qualified for Automotive application

Equivalent Circuit Schematic



Type	Package	Marking	Shipping
DG50X07T2	TO-247-3L	DG50X07T2	30Units/Tube

Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted**IGBT**

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=125^{\circ}\text{C}$	100 ⁽¹⁾ 50	A
I_{CM}	Pulsed Collector Current t_p limited by T_{vjmax}	150	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	453	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=90^{\circ}\text{C}$	76 ⁽¹⁾ 50	A
I_{FM}	Diode Maximum Forward Current t_p limited by T_{vjmax}	150	A

Discrete

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

(1) limited by bondwire

IGBT Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.45	1.90	V
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		1.70		
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=175^{\circ}\text{C}$		1.75		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.8\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.0	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			200	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			100	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=100\text{kHz}, V_{GE}=0\text{V}$		5.80		nF
C_{oes}	Output Capacitance			0.26		nF
C_{res}	Reverse Transfer Capacitance			0.11		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.35		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, L_S=40\text{nH}, T_{vj}=25^{\circ}\text{C}$		27		ns
t_r	Rise Time			95		ns
$t_{d(off)}$	Turn-Off Delay Time			64		ns
t_f	Fall Time			164		ns
E_{on}	Turn-On Switching Loss			1.86		mJ
E_{off}	Turn-Off Switching Loss			0.89		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, L_S=40\text{nH}, T_{vj}=150^{\circ}\text{C}$		30		ns
t_r	Rise Time			110		ns
$t_{d(off)}$	Turn-Off Delay Time			69		ns
t_f	Fall Time			215		ns
E_{on}	Turn-On Switching Loss			2.22		mJ
E_{off}	Turn-Off Switching Loss			1.19		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, L_S=40\text{nH}, T_{vj}=175^{\circ}\text{C}$		31		ns
t_r	Rise Time			125		ns
$t_{d(off)}$	Turn-Off Delay Time			71		ns
t_f	Fall Time			222		ns
E_{on}	Turn-On Switching Loss			2.29		mJ
E_{off}	Turn-Off Switching Loss			1.23		mJ
I_{SC}	SC Data	$t_p \leq 6\mu\text{s}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}, V_{CC}=300\text{V}, V_{CEM} \leq 650\text{V}$		250		A

Diode Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.65	2.10	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.65		
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=175^{\circ}\text{C}$		1.65		
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=50\text{A},$ $-di/dt=390\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_s=40\text{nH}, T_{vj}=25^{\circ}\text{C}$		1.25		μC
t_{rr}	Recovered Time			139		ns
I_{RM}	Peak Reverse Recovery Current			15		A
E_{rec}	Reverse Recovery Energy			0.31		mJ
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=50\text{A},$ $-di/dt=380\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_s=40\text{nH}, T_{vj}=150^{\circ}\text{C}$		2.55		μC
t_{rr}	Recovered Time			204		ns
I_{RM}	Peak Reverse Recovery Current			19		A
E_{rec}	Reverse Recovery Energy			0.62		mJ
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=50\text{A},$ $-di/dt=380\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_s=40\text{nH}, T_{vj}=175^{\circ}\text{C}$		2.96		μC
t_{rr}	Recovered Time			215		ns
I_{RM}	Peak Reverse Recovery Current			21		A
E_{rec}	Reverse Recovery Energy			0.71		mJ

Discrete Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT)			0.331	K/W
	Junction-to-Case (per Diode)			0.800	
R_{thJA}	Junction-to-Ambient		40		K/W

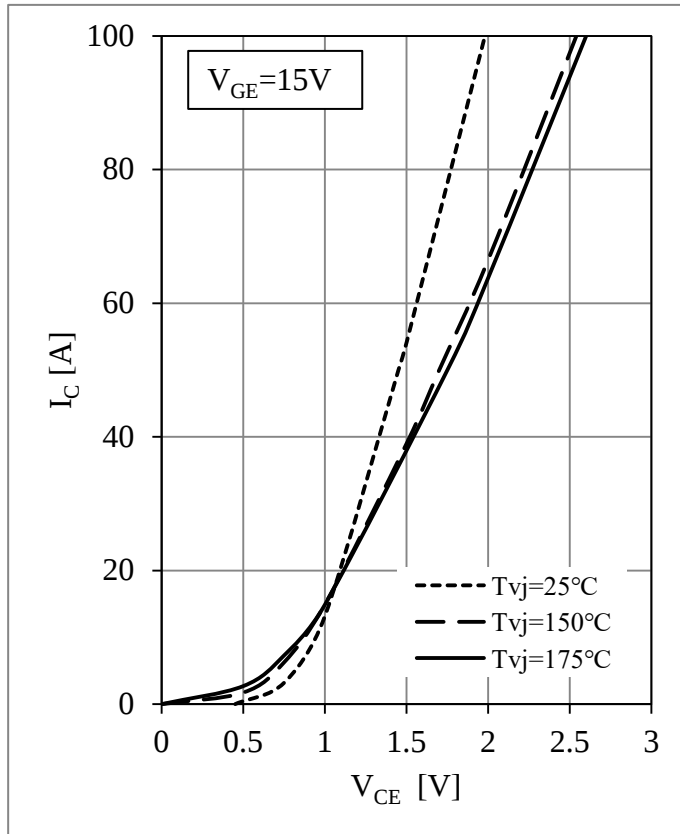


Fig 1. IGBT-inverter Output Characteristics

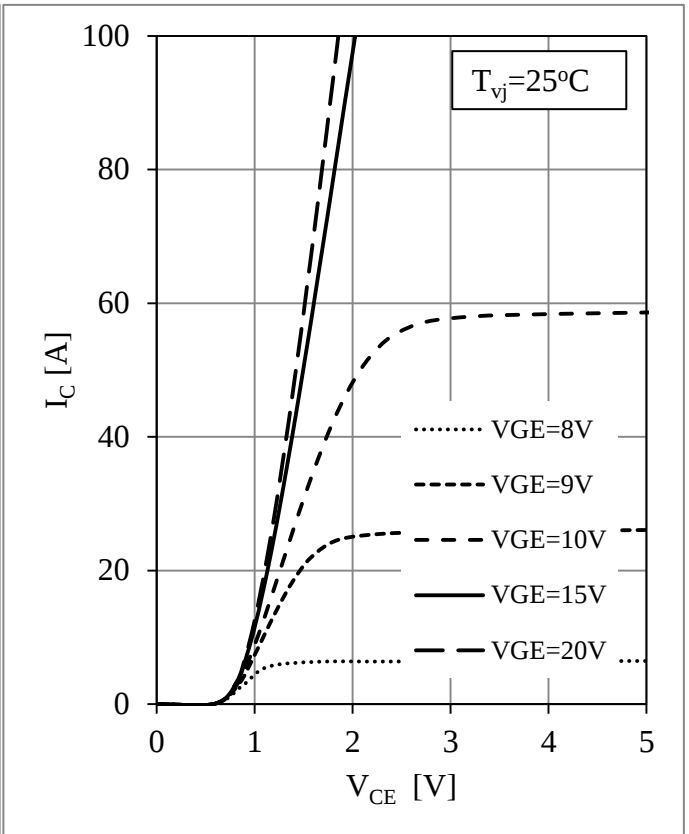


Fig 2. IGBT Output Characteristics

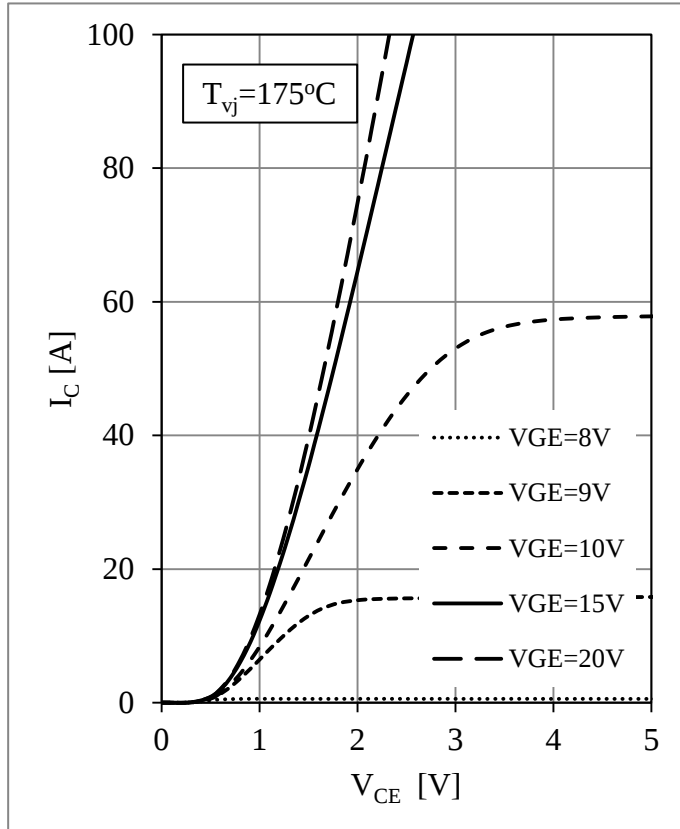


Fig 3. IGBT Output Characteristics

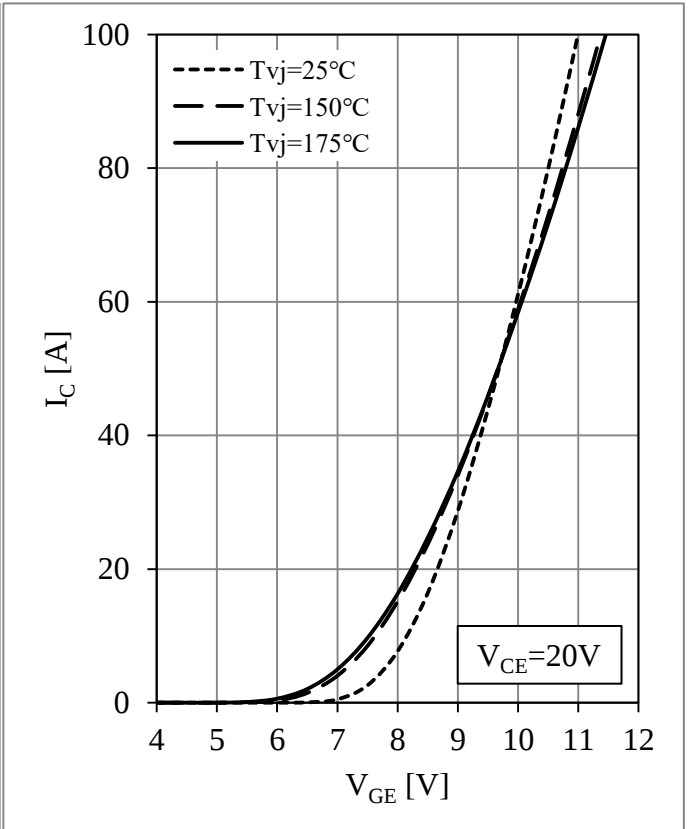
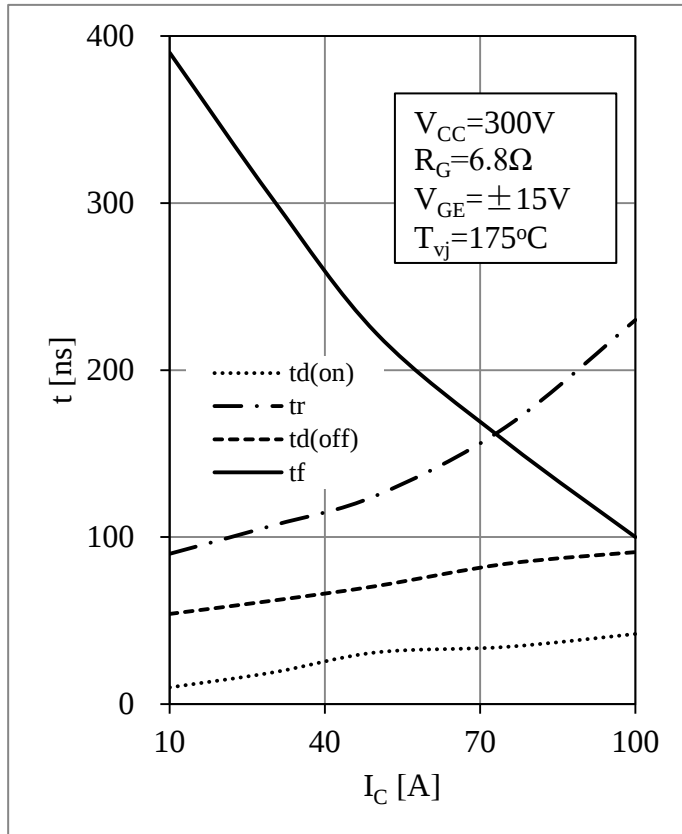
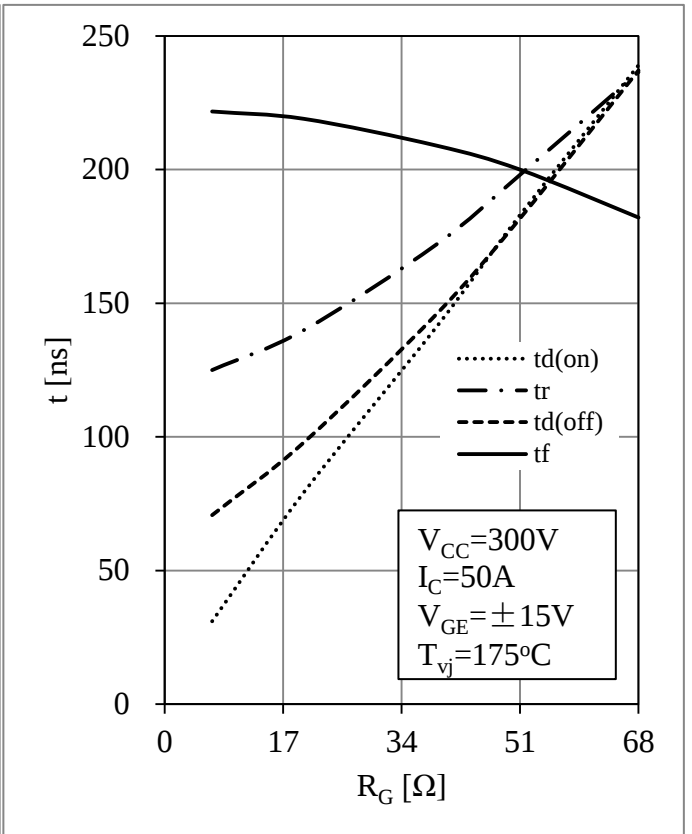
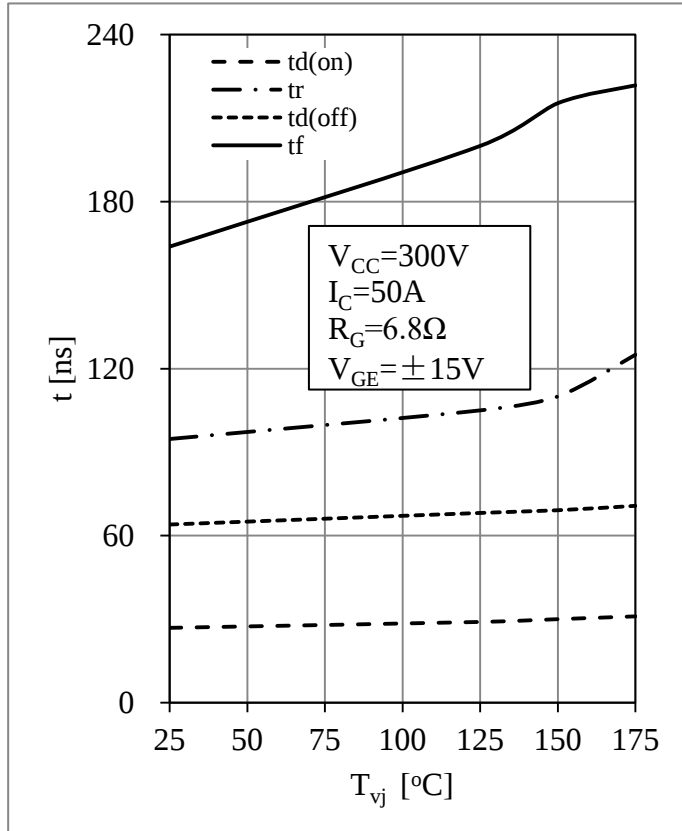
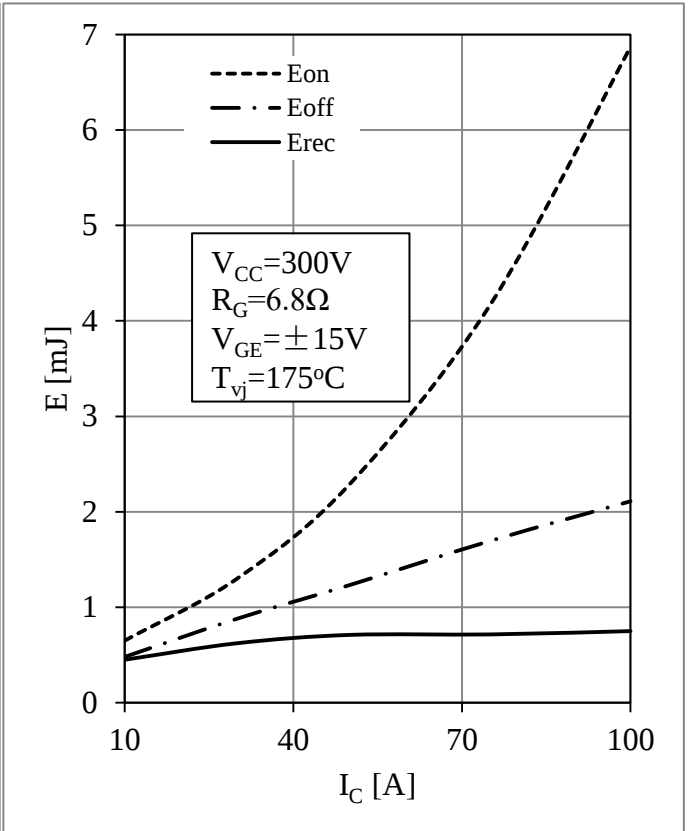
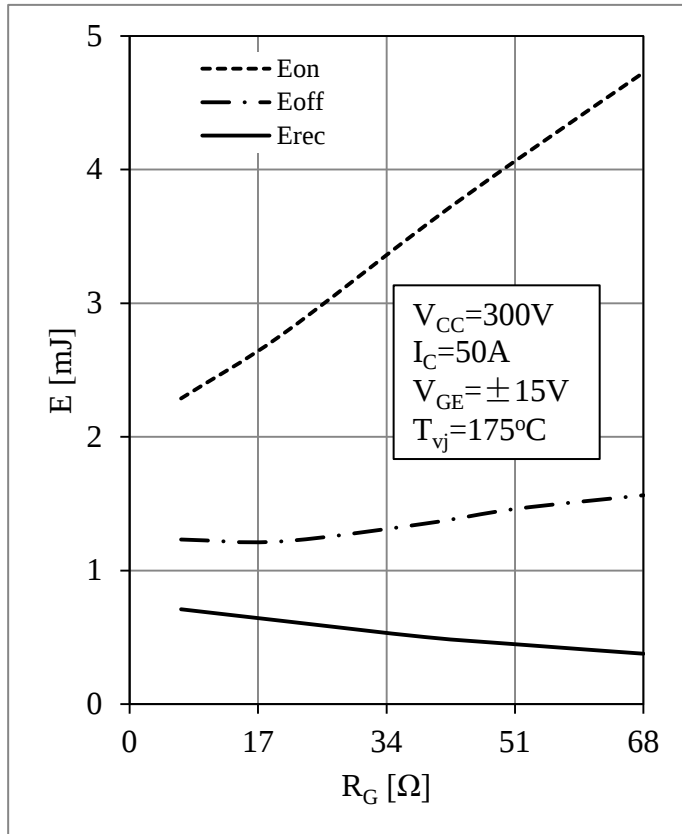
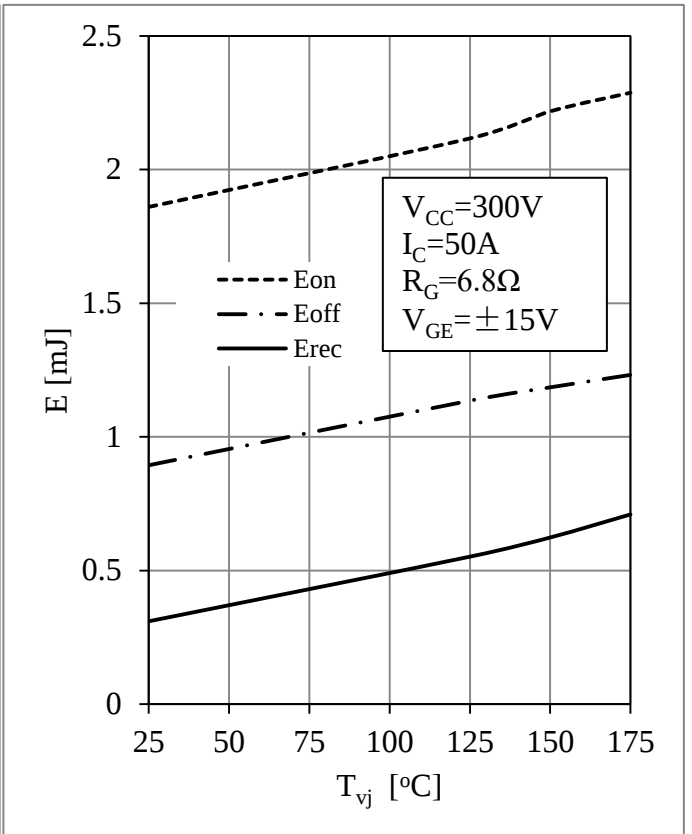
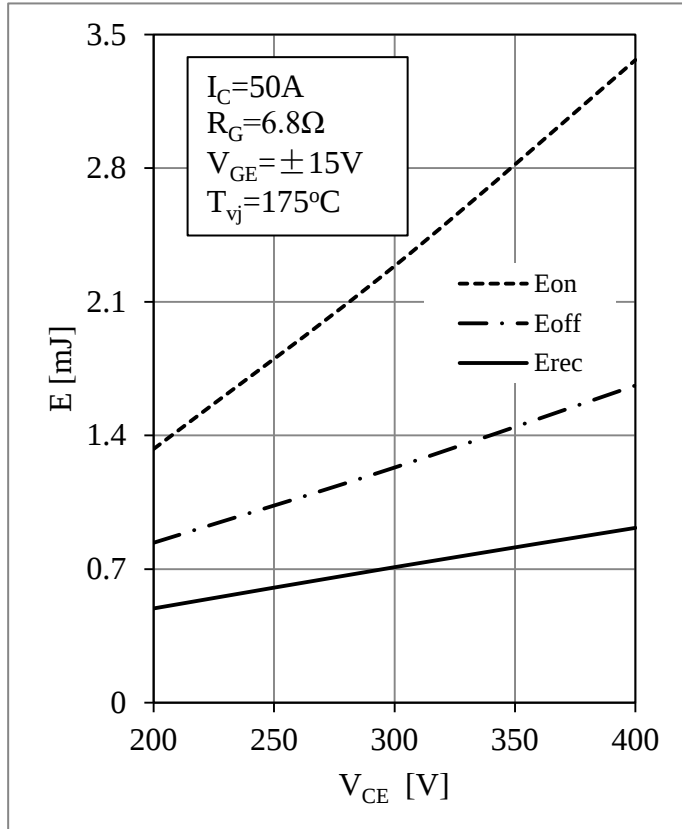
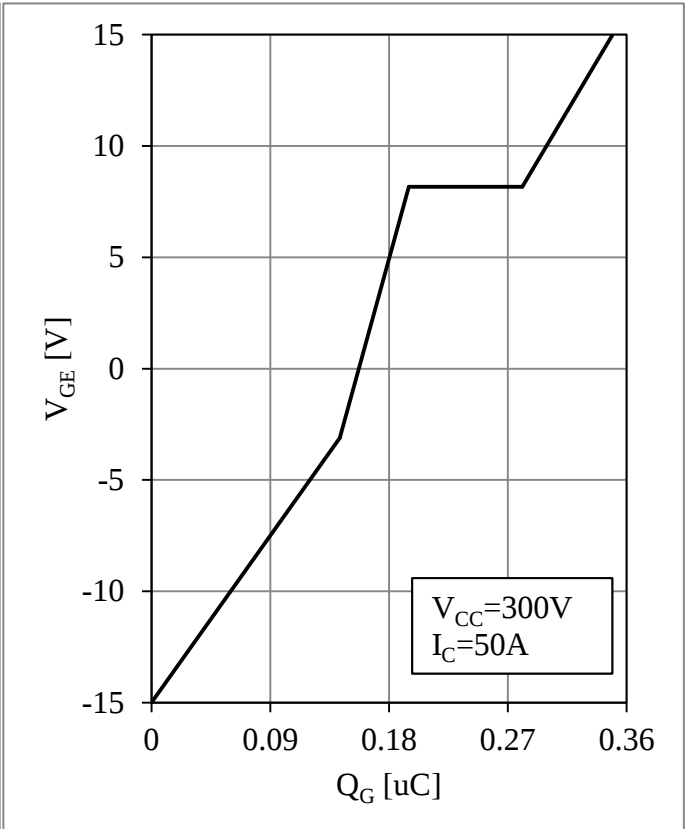
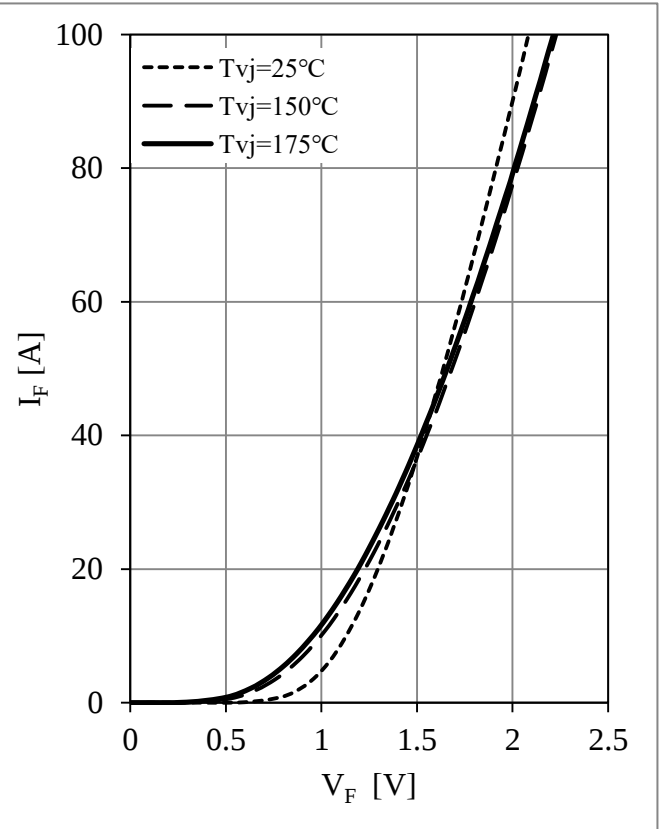
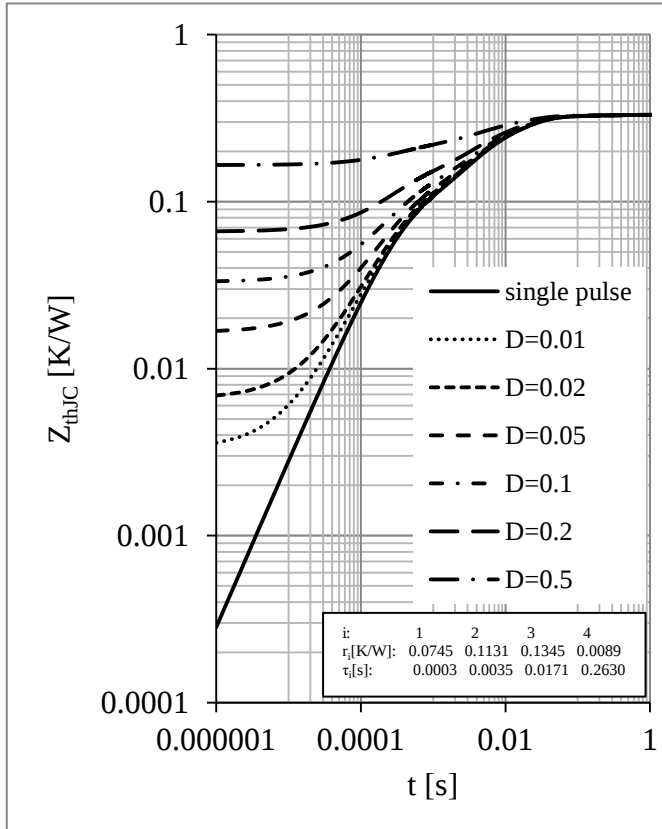
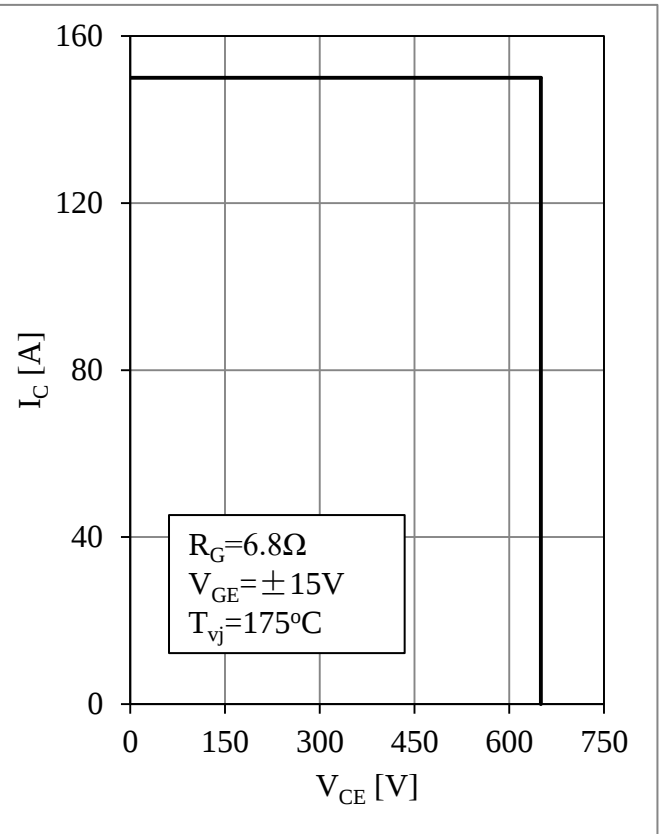
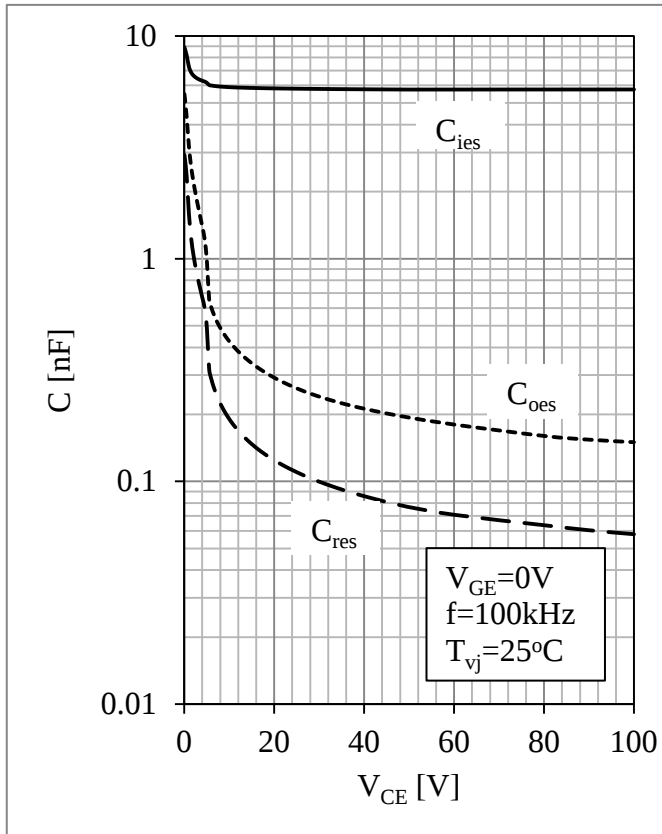
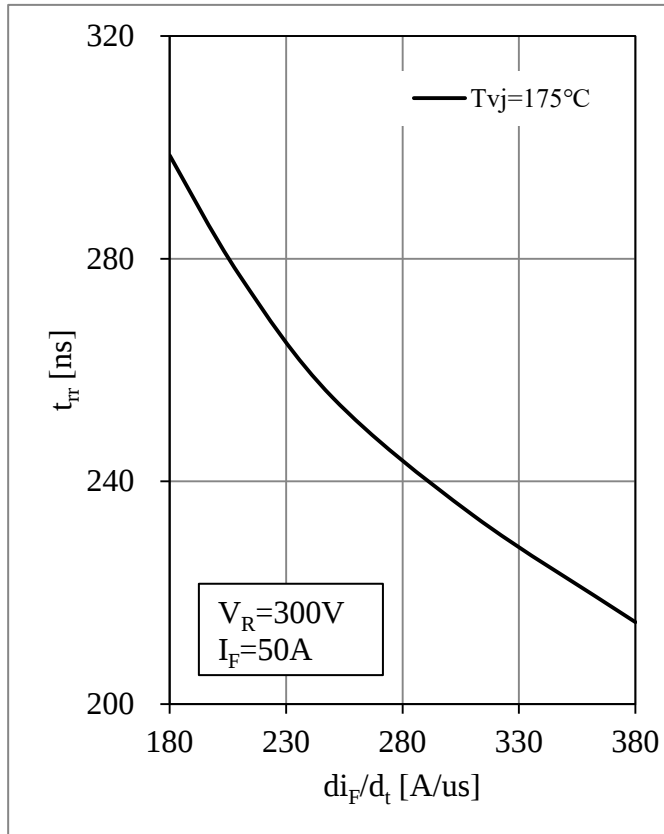
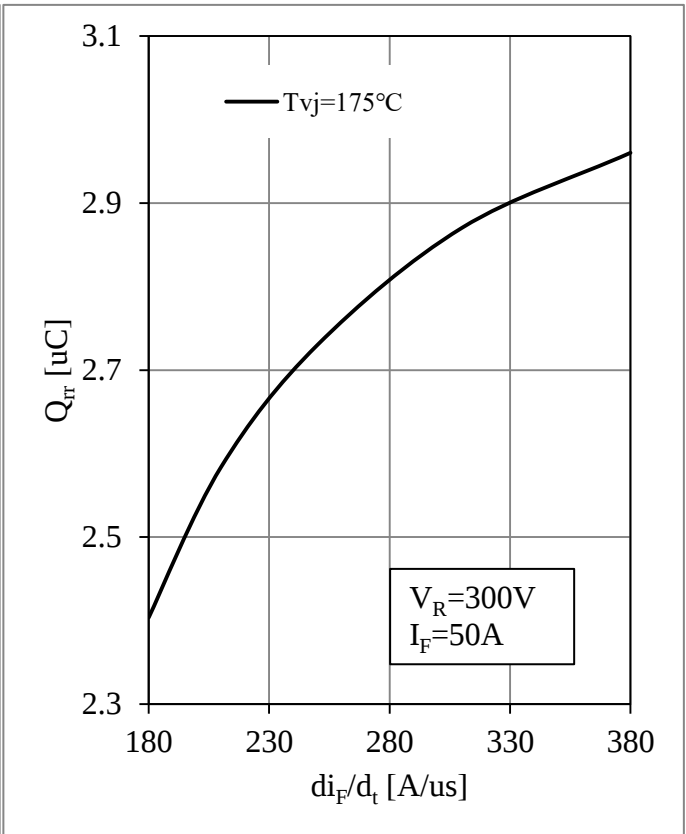
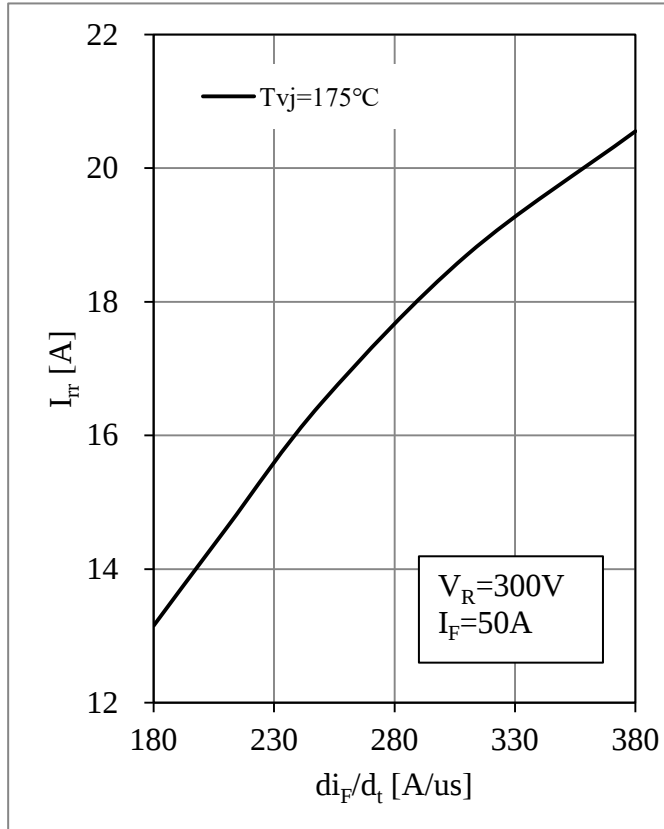
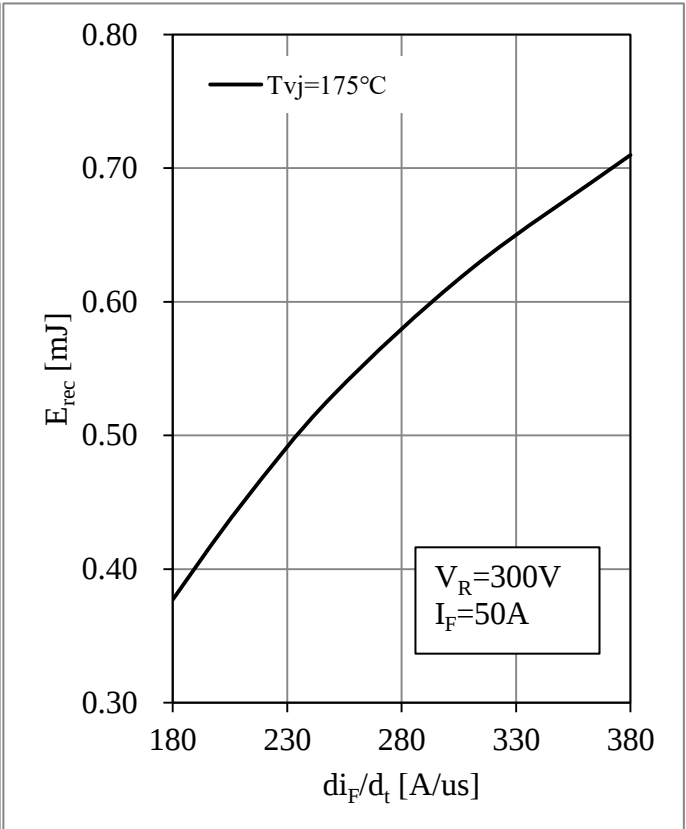


Fig 4. IGBT Transfer Characteristics

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 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

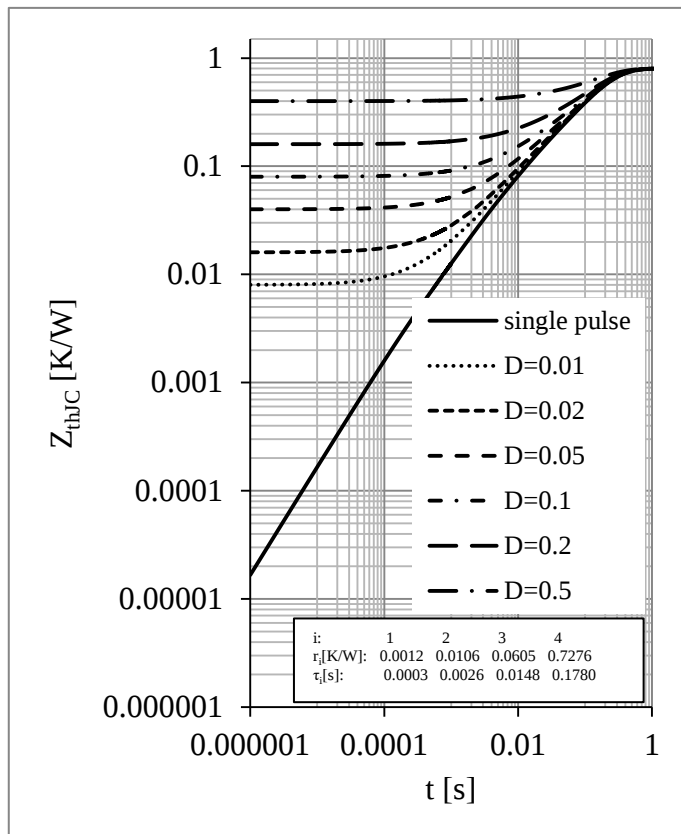
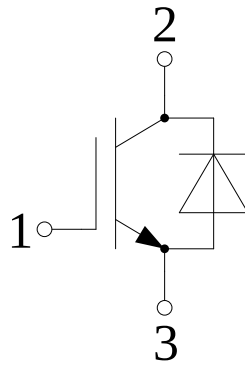


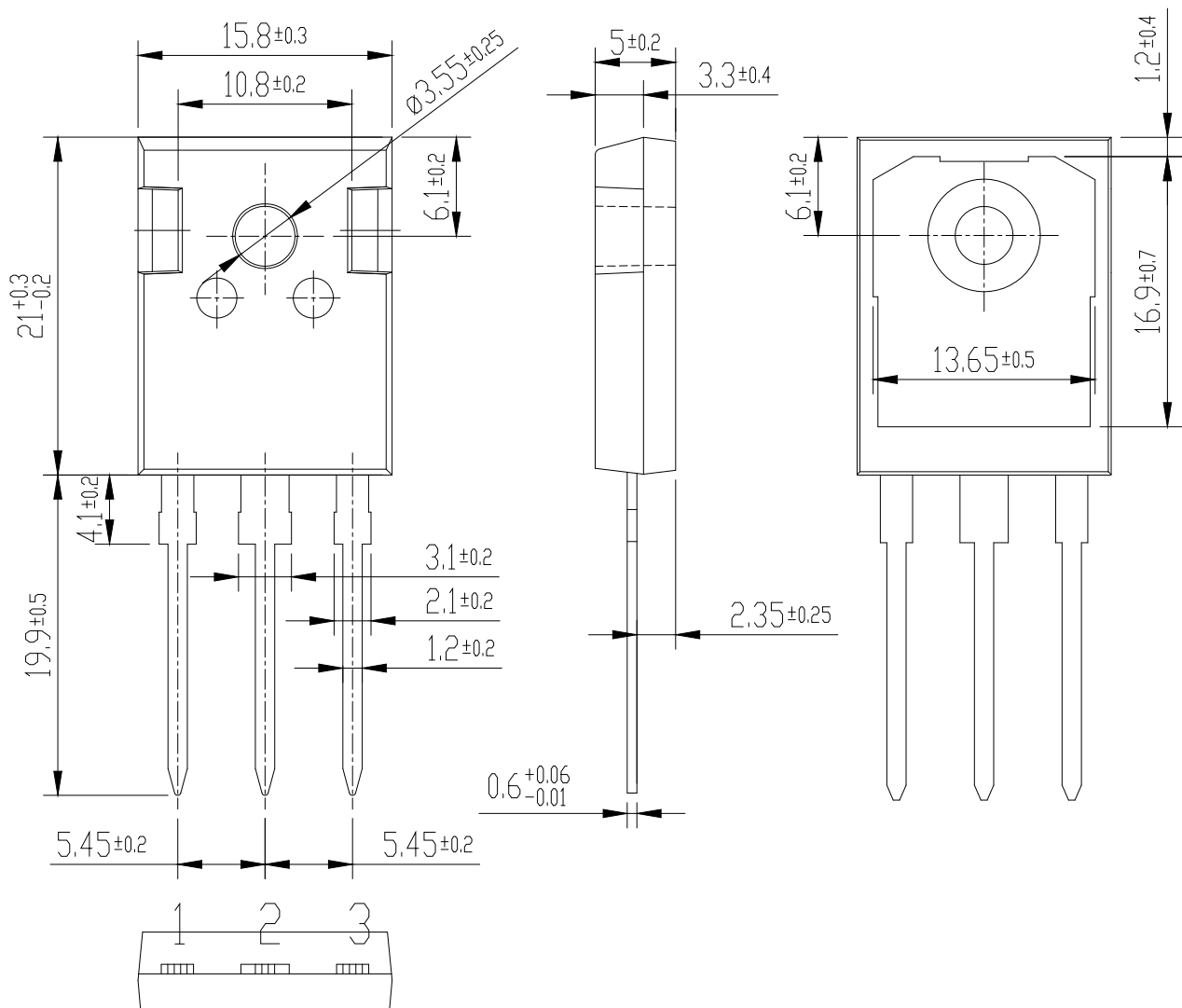
Fig 21. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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