

DOSEMI

IGBT

DG50X12T2

1200V/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.

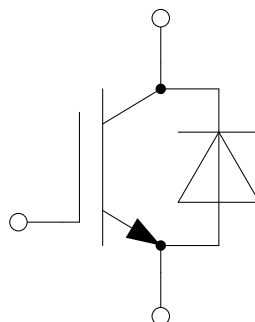
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- Low switching loss
- Maximum junction temperature 175°C
- Low inductance case
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	100	A
	@ $T_C=100^{\circ}\text{C}$	50	A
I_{CM}	Pulsed Collector Current t_p limited by T_{vjmax}	150	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	592	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current @ $T_C=25^{\circ}\text{C}$	88	A
	@ $T_C=100^{\circ}\text{C}$	50	A
I_{FM}	Pulsed Collector 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	$^{\circ}\text{C}$

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	$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.75	2.20	V
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		2.00		
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=175^{\circ}\text{C}$		2.30		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.00\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.0	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			400	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			600	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		4.66		nF
C_{oes}	Output Capacitance			0.27		
C_{res}	Reverse Transfer Capacitance			0.13		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.36		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}, R_G=15\Omega, V_{GE}=\pm 15\text{V}, L_S=40\mu\text{H}, T_{vj}=25^{\circ}\text{C}$		43		ns
t_r	Rise Time			96		ns
$t_{d(off)}$	Turn-Off Delay Time			113		ns
t_f	Fall Time			250		ns
E_{on}	Turn-On Switching Loss			6.9		mJ
E_{off}	Turn-Off Switching Loss			2.7		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}, R_G=15\Omega, V_{GE}=\pm 15\text{V}, L_S=40\mu\text{H}, T_{vj}=150^{\circ}\text{C}$		45		ns
t_r	Rise Time			100		ns
$t_{d(off)}$	Turn-Off Delay Time			172		ns
t_f	Fall Time			372		ns
E_{on}	Turn-On Switching Loss			9.5		mJ
E_{off}	Turn-Off Switching Loss			4.5		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}, R_G=15\Omega, V_{GE}=\pm 15\text{V}, L_S=40\mu\text{H}, T_{vj}=175^{\circ}\text{C}$		47		ns
t_r	Rise Time			103		ns
$t_{d(off)}$	Turn-Off Delay Time			191		ns
t_f	Fall Time			391		ns
E_{on}	Turn-On Switching Loss			10.6		mJ
E_{off}	Turn-Off Switching Loss			4.9		mJ
I_{SC}	SC Data	$t_P \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		200		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	$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.95	2.40	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		2.00		
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		2.00		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=360\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $L_S=40\mu\text{H},$ $T_{vj}=25^{\circ}\text{C}$		3.9		μC
I_{RM}	Peak Reverse Recovery Current			20		A
E_{rec}	Reverse Recovery Energy			0.29		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=340\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $L_S=40\mu\text{H},$ $T_{vj}=150^{\circ}\text{C}$		9.7		μC
I_{RM}	Peak Reverse Recovery Current			24		A
E_{rec}	Reverse Recovery Energy			3.6		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=320\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $L_S=40\mu\text{H},$ $T_{vj}=175^{\circ}\text{C}$		10.4		μC
I_{RM}	Peak Reverse Recovery Current			24		A
E_{rec}	Reverse Recovery Energy			3.7		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)			0.253	K/W
	Junction-to-Case (per Diode)			0.523	
R_{thJA}	Junction-to-Ambient		40		K/W

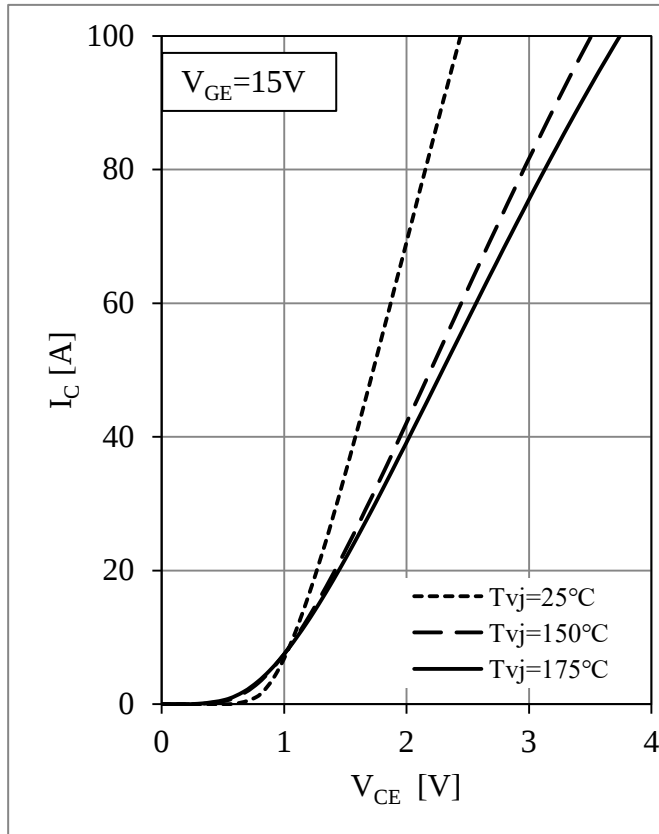


Fig 1. IGBT-inverter Output Characteristics

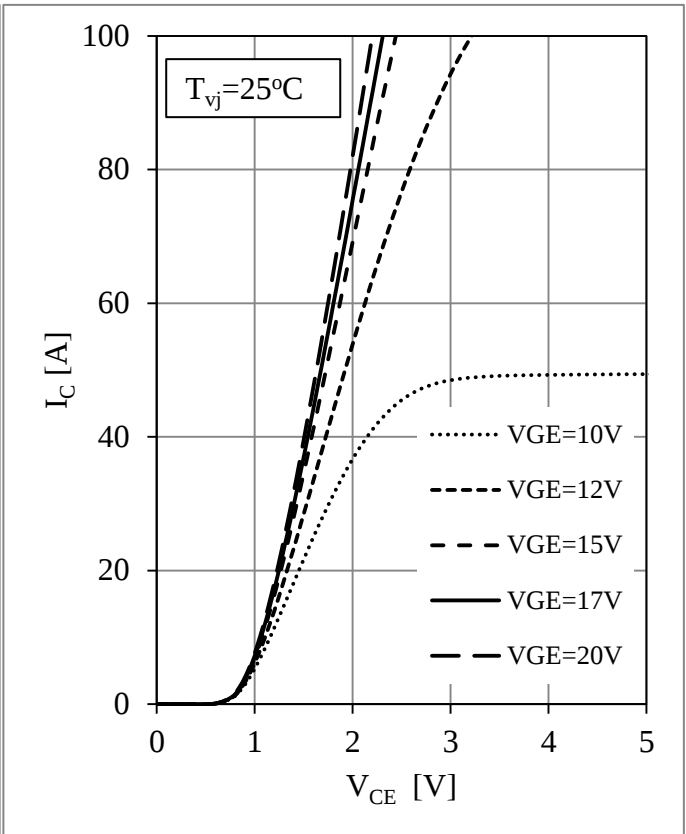


Fig 2. IGBT Output Characteristics

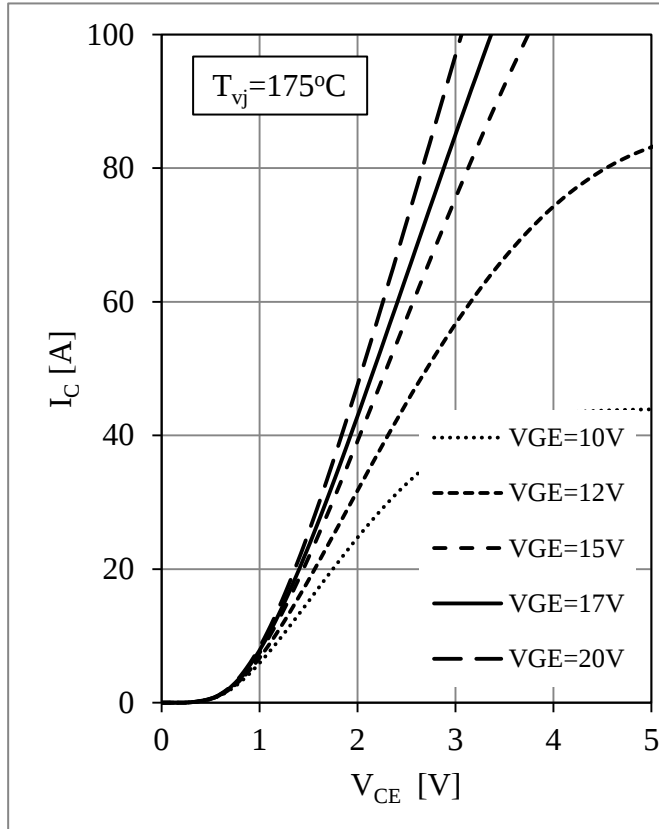


Fig 3. IGBT Output Characterist

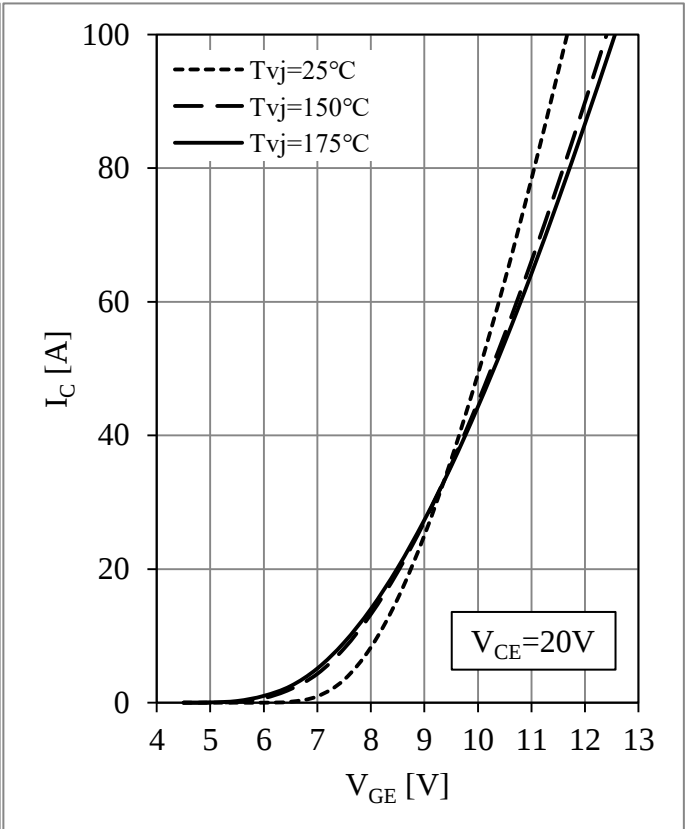
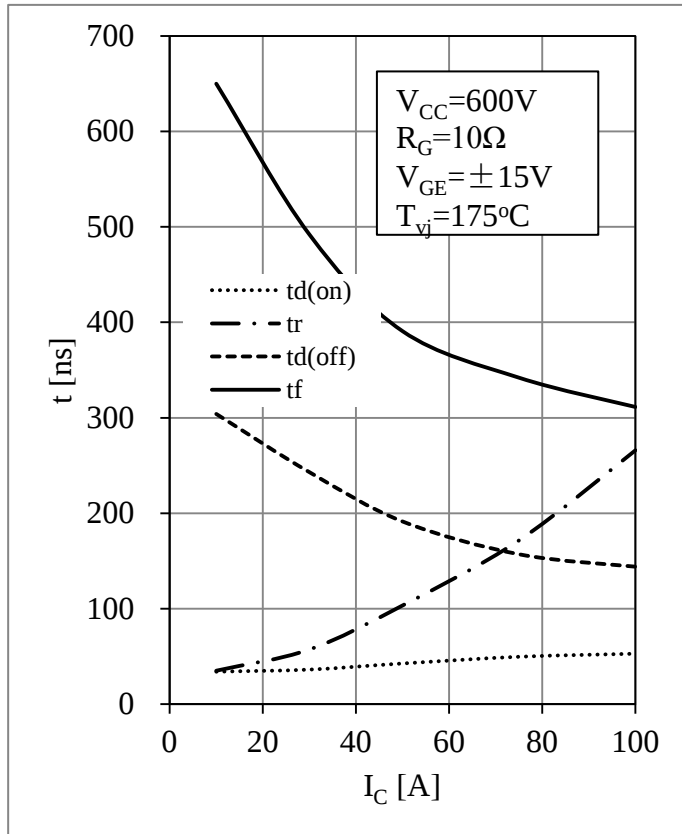
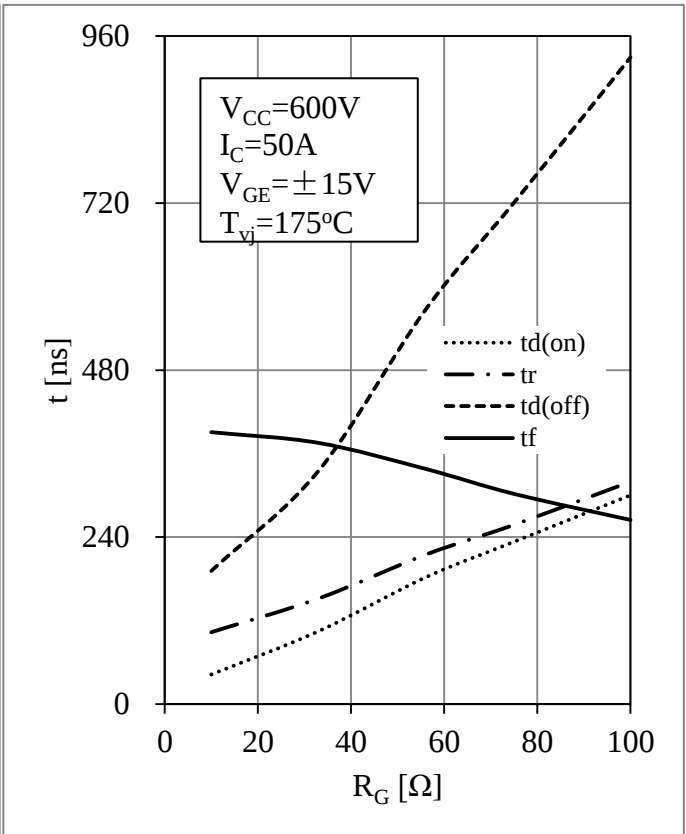
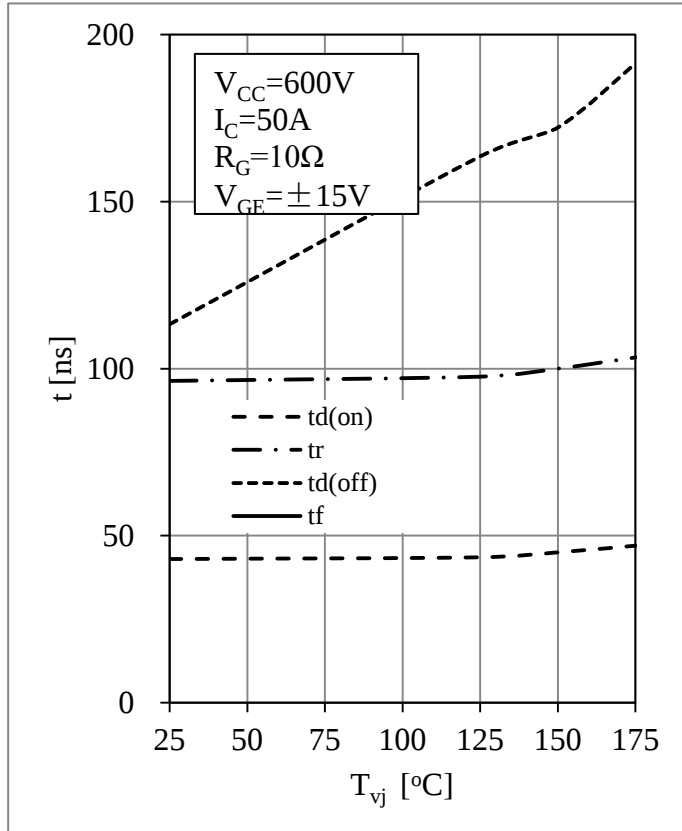
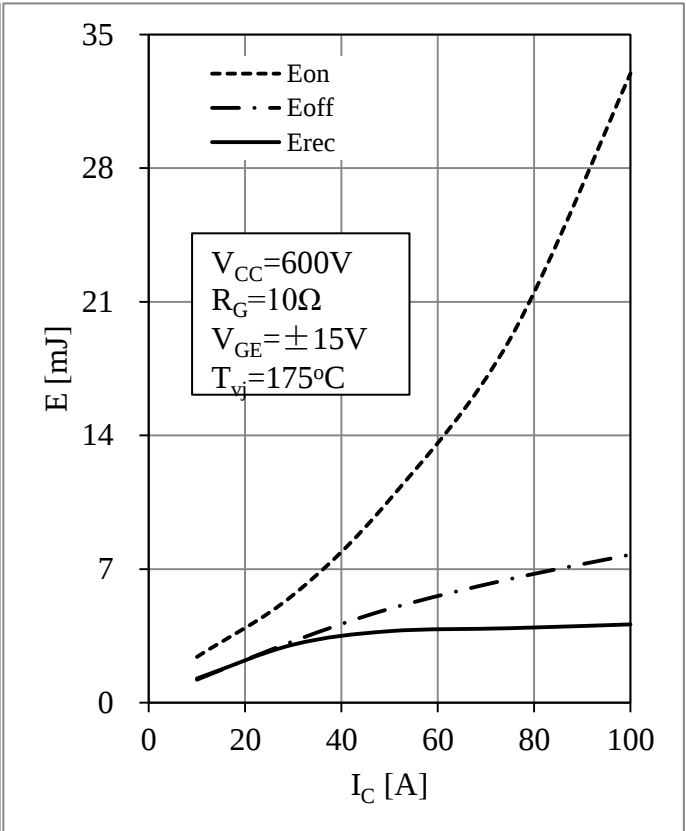
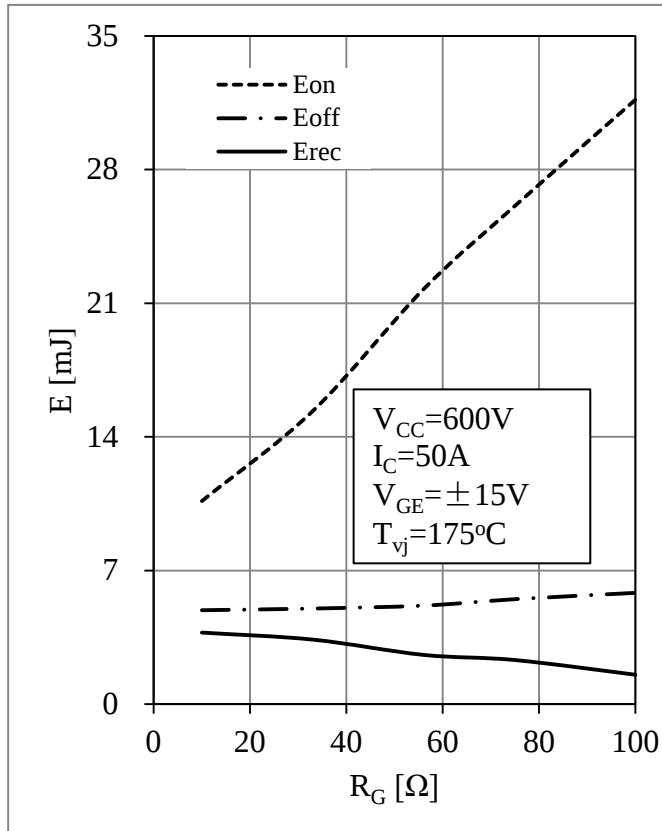
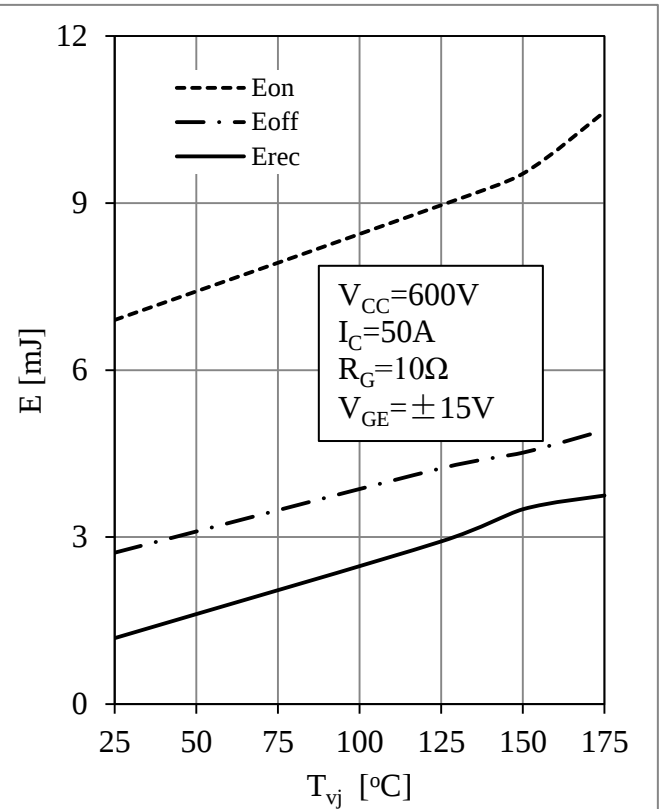
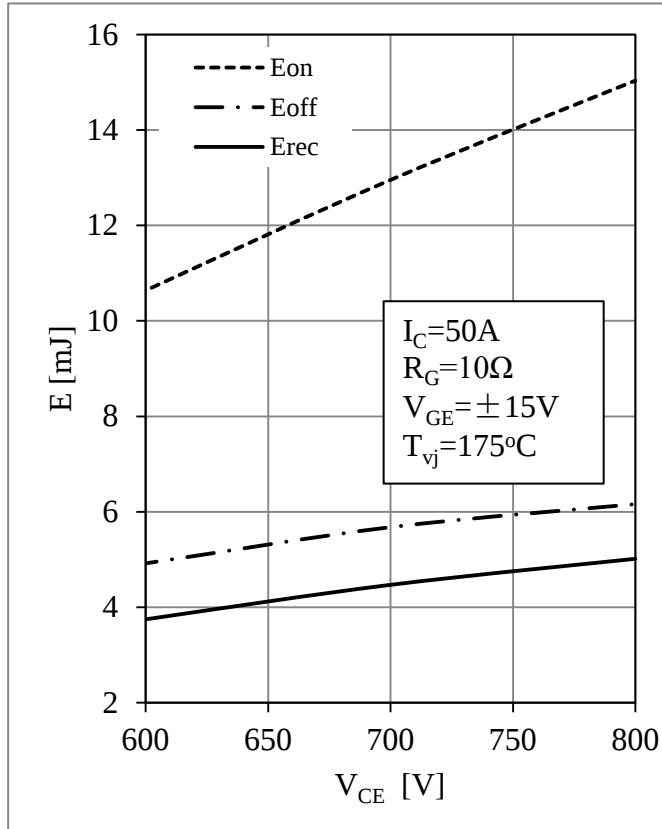
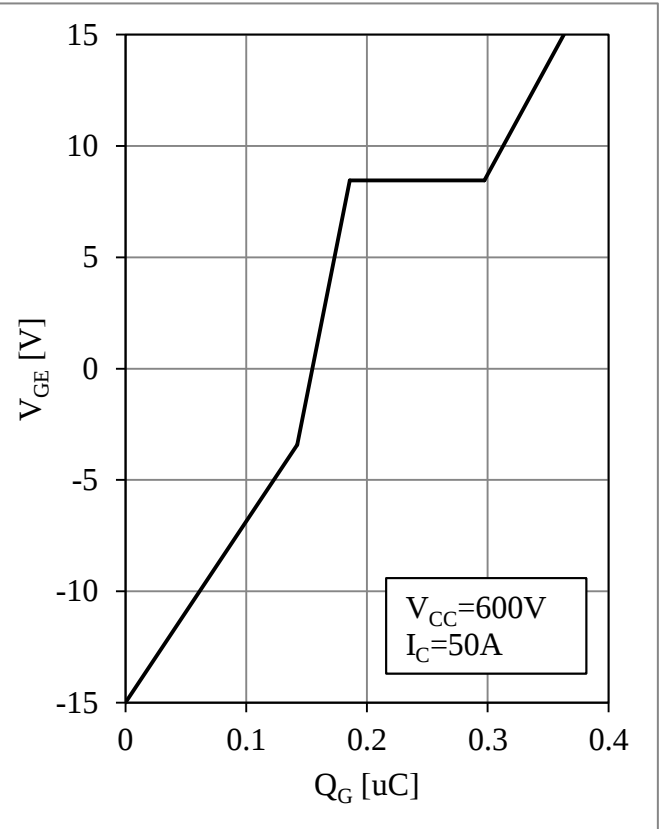
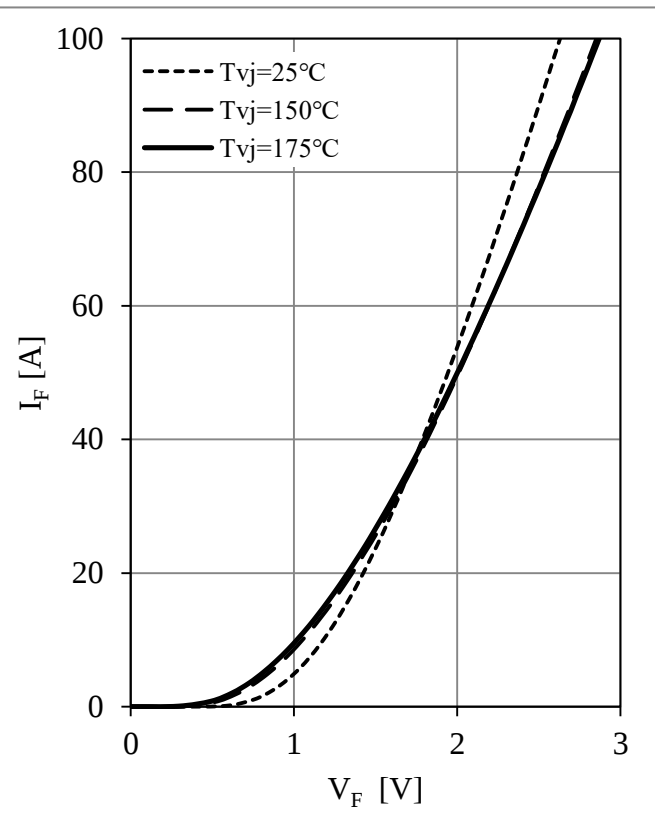
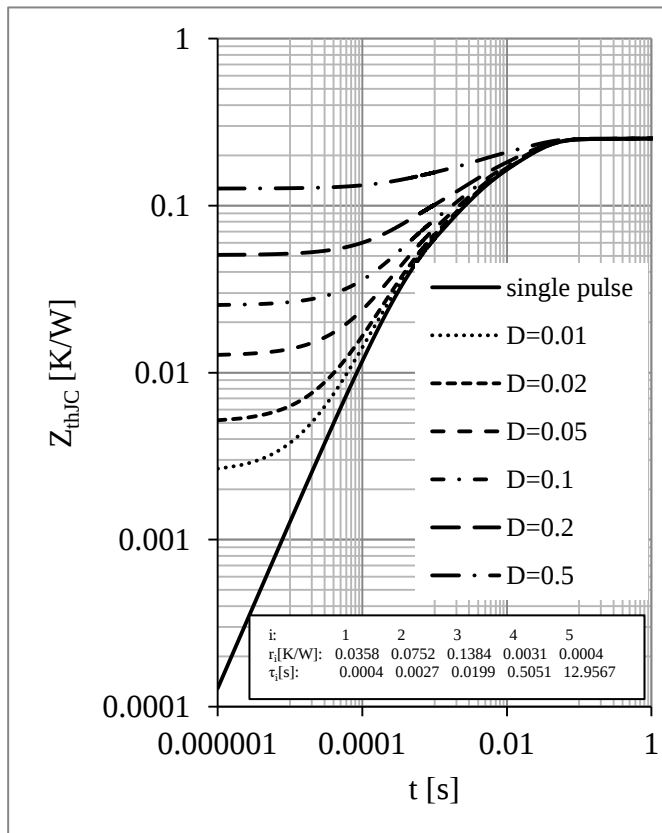
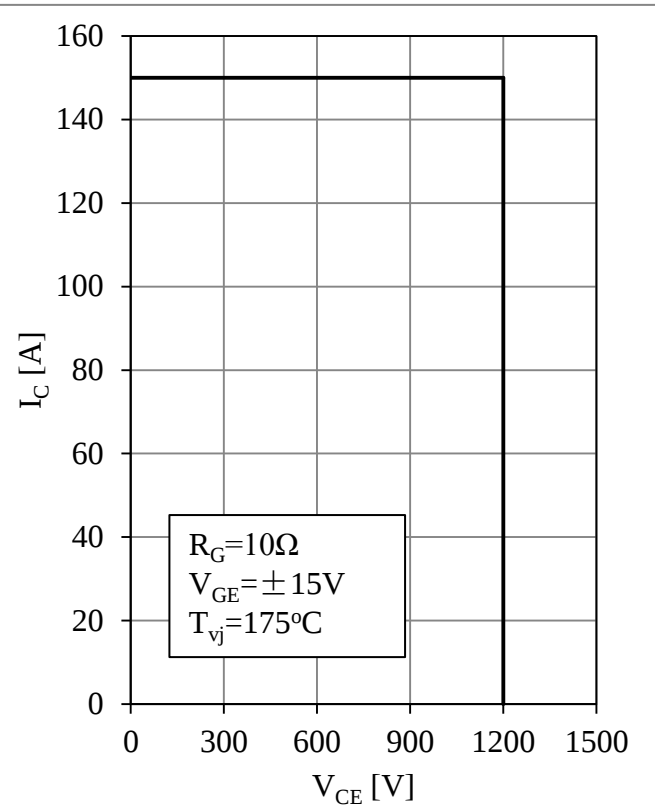
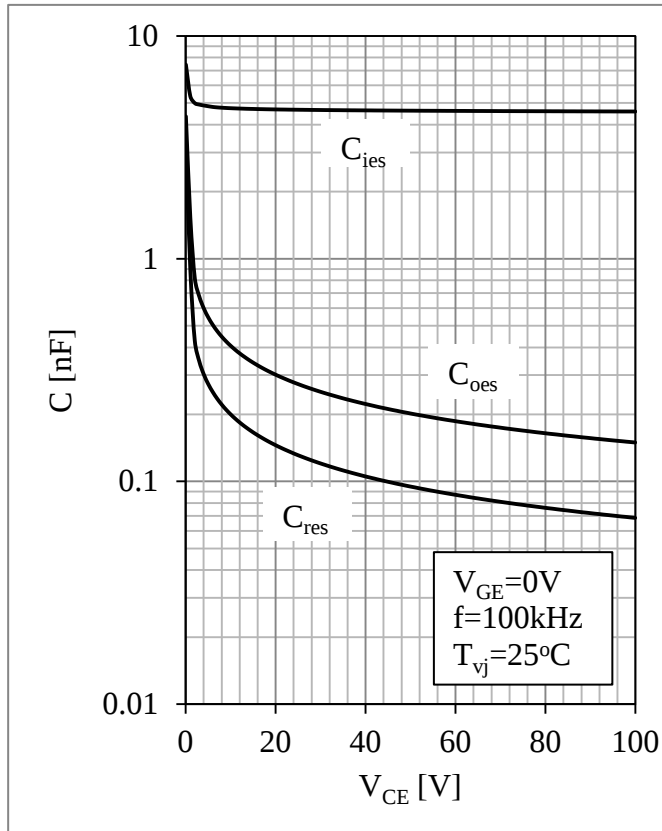
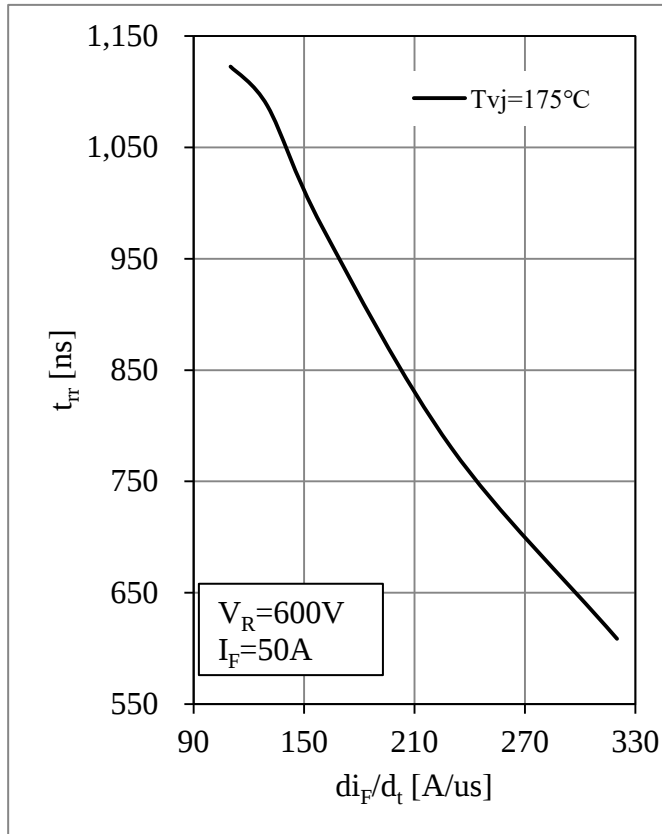
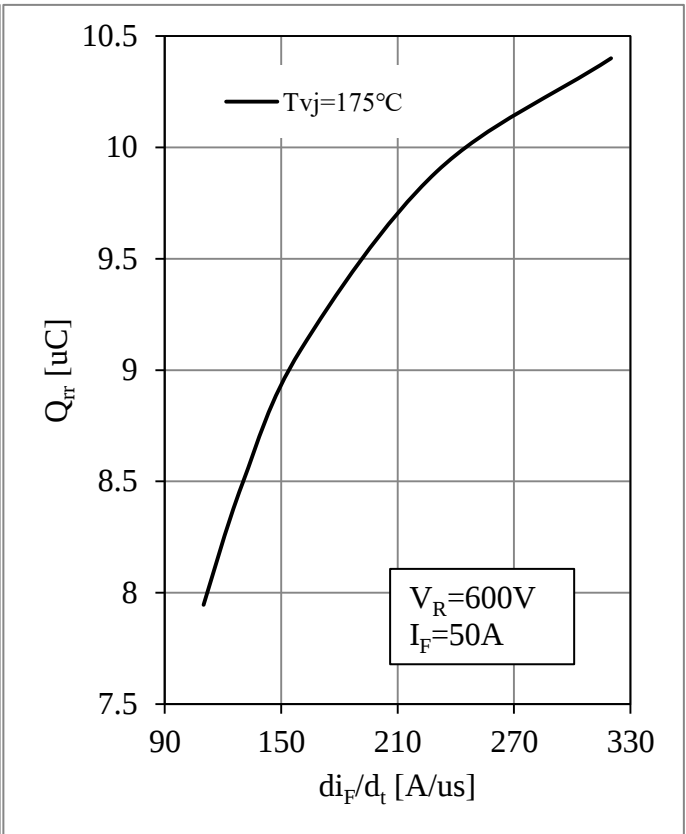
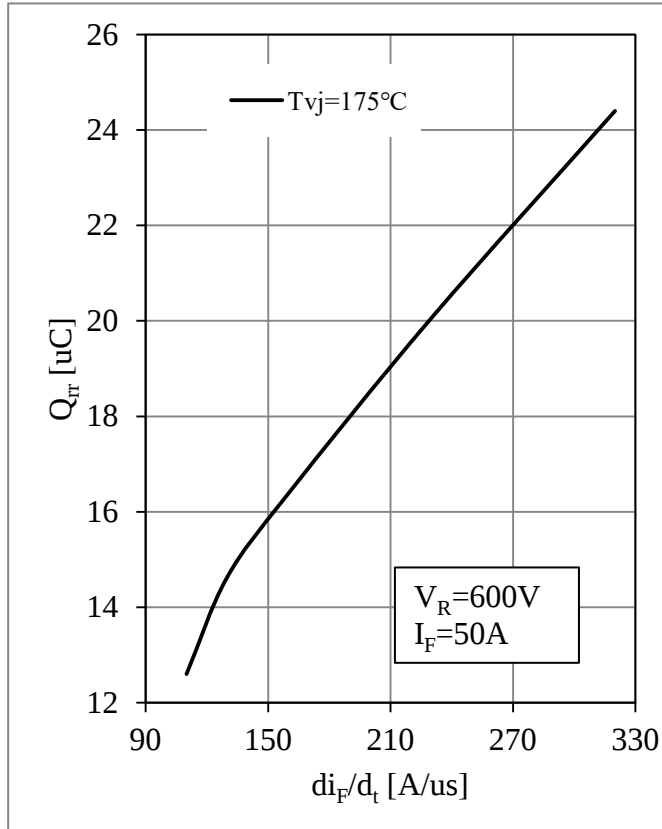
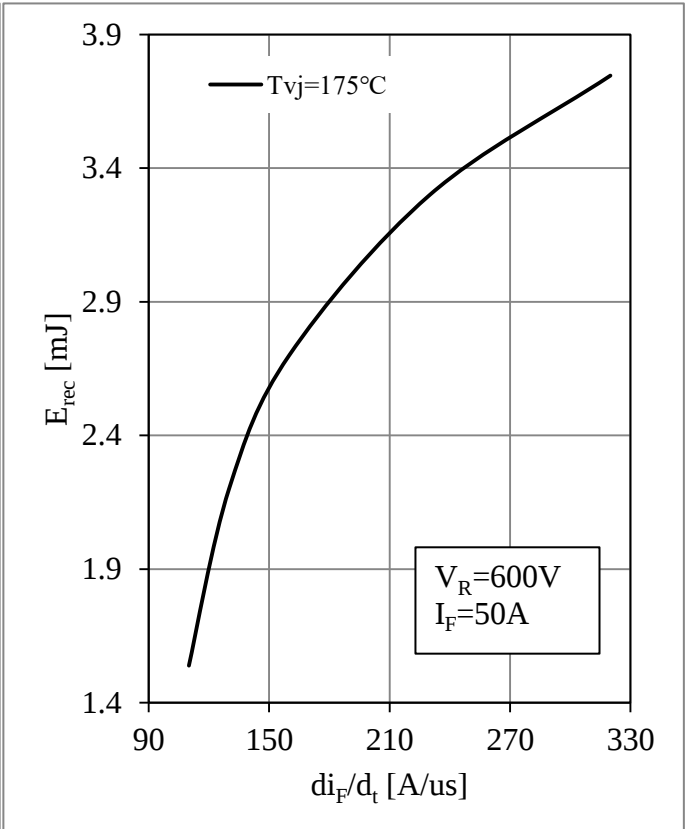


Fig 4. IGBT Transfer Characteristics

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_{GE}



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

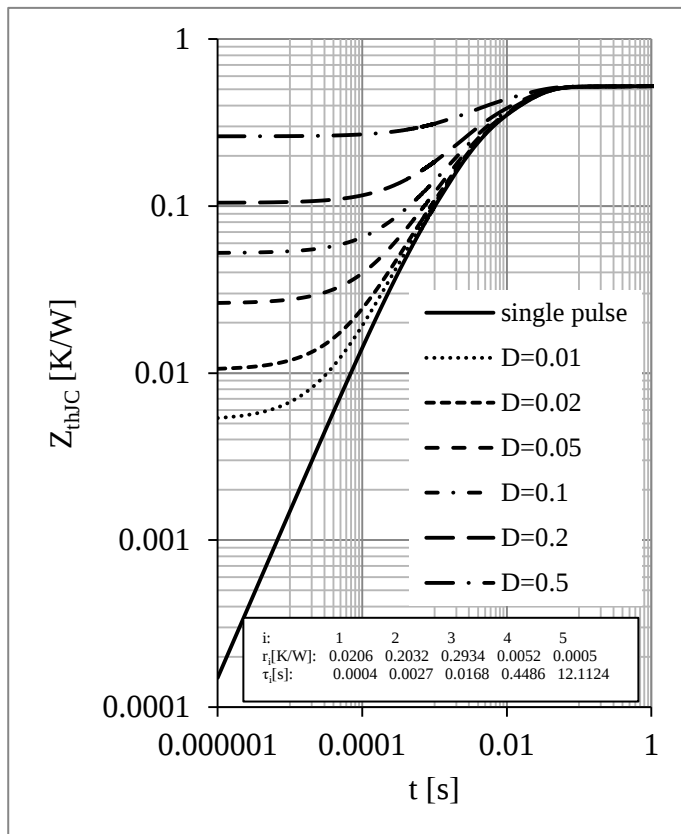
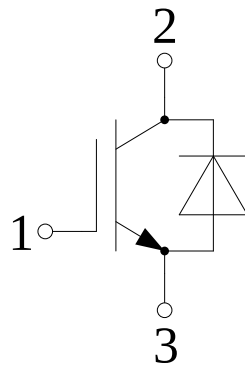


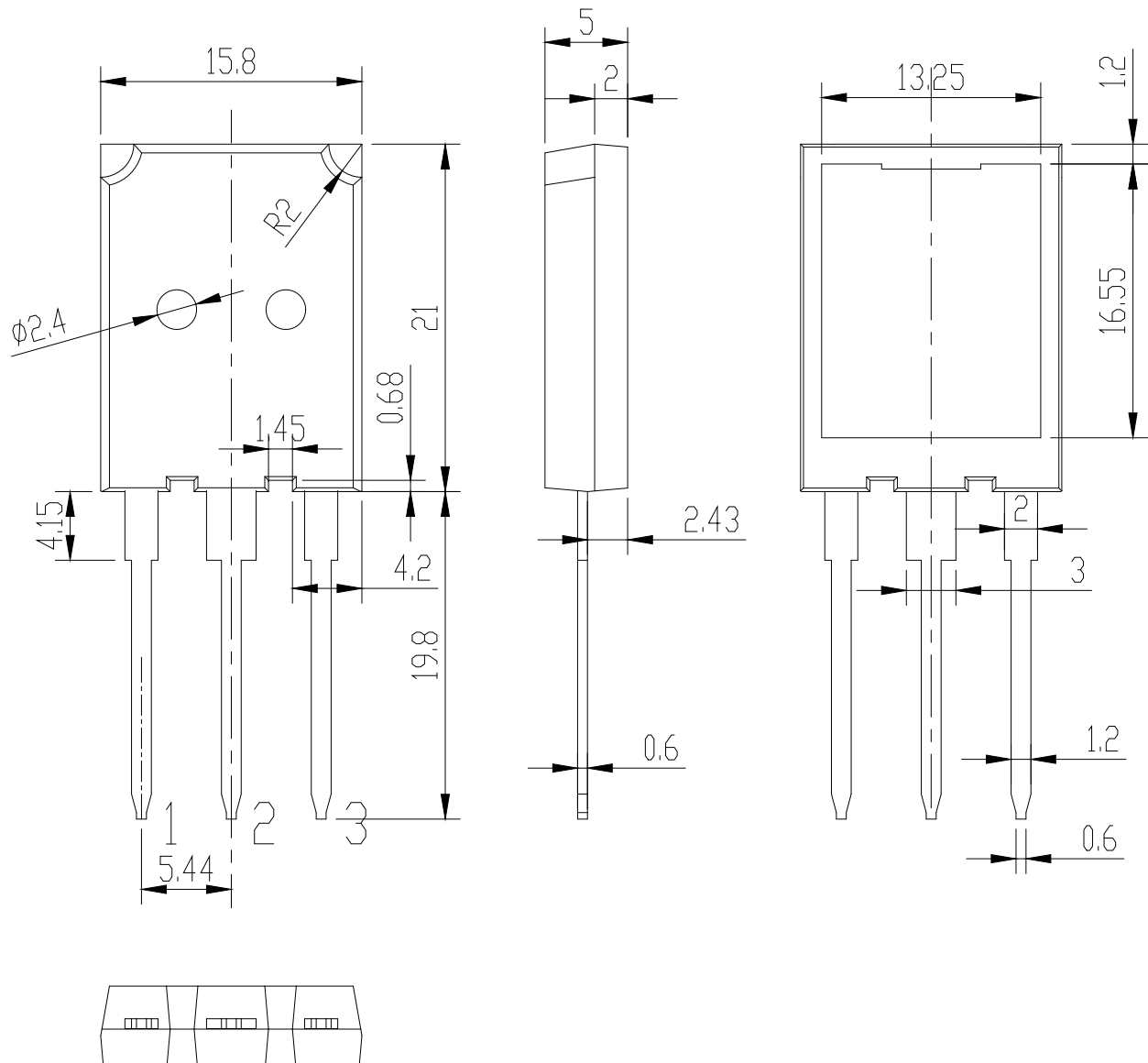
Fig 21. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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