

DOSEMI**IGBT****DG40A12TAFS****1200V/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.

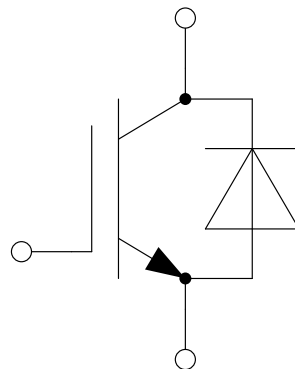
Features

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

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage Transient Gate-Emitter Voltage	± 20 ± 30	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	80 40	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	120	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	454	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	71 40	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	120	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

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	$I_C=40\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.65	2.10	V
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		2.20		
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_{vj}=175^{\circ}\text{C}$		2.25		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.60\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	4.0	4.8	5.5	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	$V_{CE}=25\text{V}, f=100\text{kHz}, V_{GE}=0\text{V}$		4.46		nF
C_{oes}	Output Capacitance			0.11		nF
C_{res}	Reverse Transfer Capacitance			0.03		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.31		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A}, R_G=8.2\Omega, V_{GE}=\pm 15\text{V}, L_S=40\text{nH}, T_{vj}=25^{\circ}\text{C}$		20		ns
t_r	Rise Time			56		ns
$t_{d(off)}$	Turn-Off Delay Time			78		ns
t_f	Fall Time			153		ns
E_{on}	Turn-On Switching Loss			3.17		mJ
E_{off}	Turn-Off Switching Loss			1.24		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A}, R_G=8.2\Omega, V_{GE}=\pm 15\text{V}, L_S=40\text{nH}, T_{vj}=150^{\circ}\text{C}$		22		ns
t_r	Rise Time			58		ns
$t_{d(off)}$	Turn-Off Delay Time			119		ns
t_f	Fall Time			201		ns
E_{on}	Turn-On Switching Loss			4.24		mJ
E_{off}	Turn-Off Switching Loss			1.88		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A}, R_G=8.2\Omega, V_{GE}=\pm 15\text{V}, L_S=40\text{nH}, T_j=175^{\circ}\text{C}$		23		ns
t_r	Rise Time			58		ns
$t_{d(off)}$	Turn-Off Delay Time			124		ns
t_f	Fall Time			201		ns
E_{on}	Turn-On Switching Loss			4.35		mJ
E_{off}	Turn-Off Switching Loss			1.98		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_C=40\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		2.35	2.80	V
		$I_C=40\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		2.30		
		$I_C=40\text{A}, V_{GE}=0\text{V}, T_{vj}=175^{\circ}\text{C}$		2.25		
t_{rr}	Diode Reverse Recovery Time	$V_R=600\text{V}, I_F=40\text{A},$ $-di/dt=560\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $L_s=40\text{nH}, T_{vj}=25^{\circ}\text{C}$		142		ns
Q_r	Recovered Charge			1.90		μC
I_{RM}	Peak Reverse Recovery Current			22		A
E_{rec}	Reverse Recovery Energy			0.46		mJ
t_{rr}	Diode Reverse Recovery Time	$V_R=600\text{V}, I_F=40\text{A},$ $-di/dt=560\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $L_s=40\text{nH}, T_{vj}=150^{\circ}\text{C}$		240		ns
Q_r	Recovered Charge			3.92		μC
I_{RM}	Peak Reverse Recovery Current			27		A
E_{rec}	Reverse Recovery Energy			1.24		mJ
t_{rr}	Diode Reverse Recovery Time	$V_R=600\text{V}, I_F=40\text{A},$ $-di/dt=560\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $L_s=40\text{nH}, T_{vj}=175^{\circ}\text{C}$		253		ns
Q_r	Recovered Charge			4.38		μC
I_{RM}	Peak Reverse Recovery Current			28		A
E_{rec}	Reverse Recovery Energy			1.41		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)			0.330	K/W
	Junction-to-Case (per Diode)			0.610	
R_{thJA}	Junction-to-Ambient		40		K/W

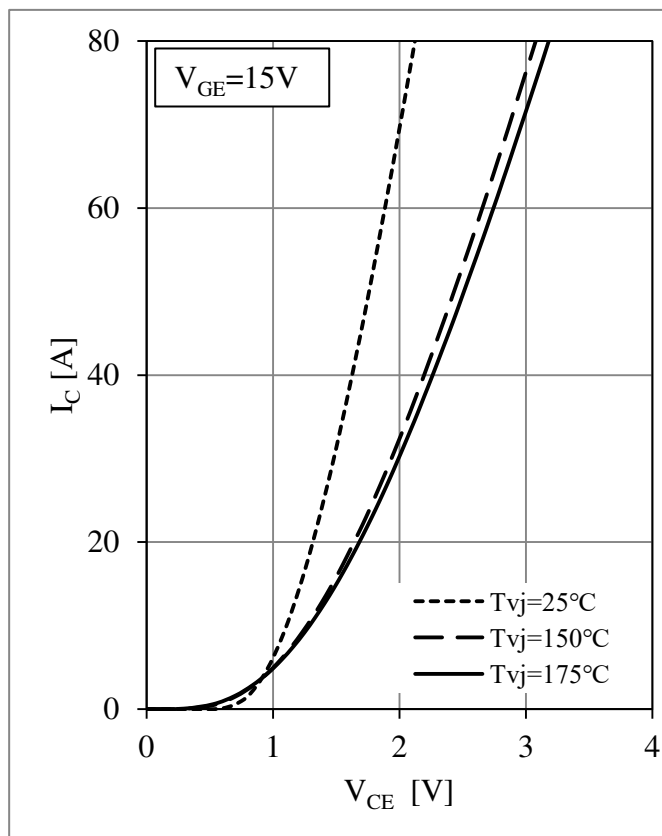


Fig 1. IGBT-inverter Output Characteristics

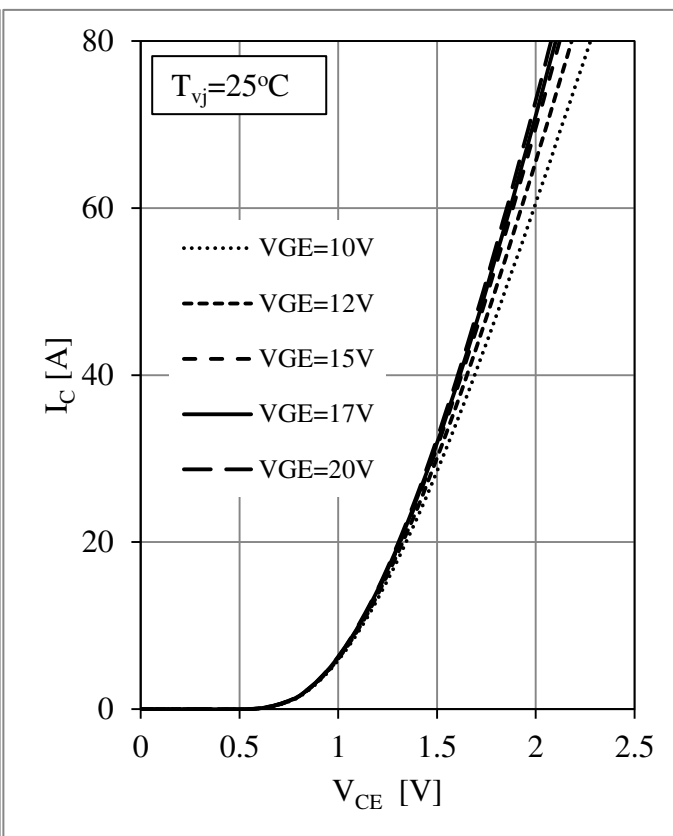


Fig 2. IGBT Output Characteristics

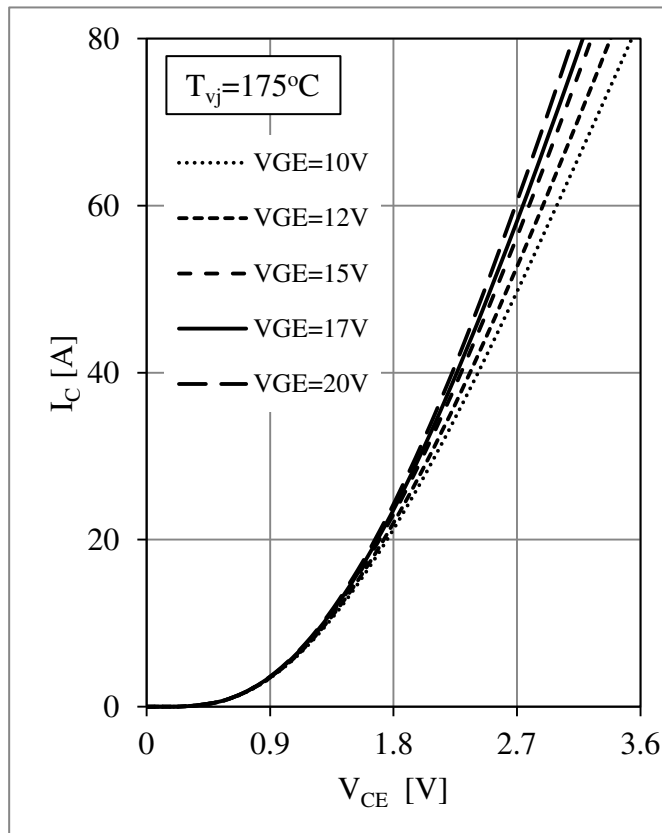


Fig 3. IGBT Output Characterist

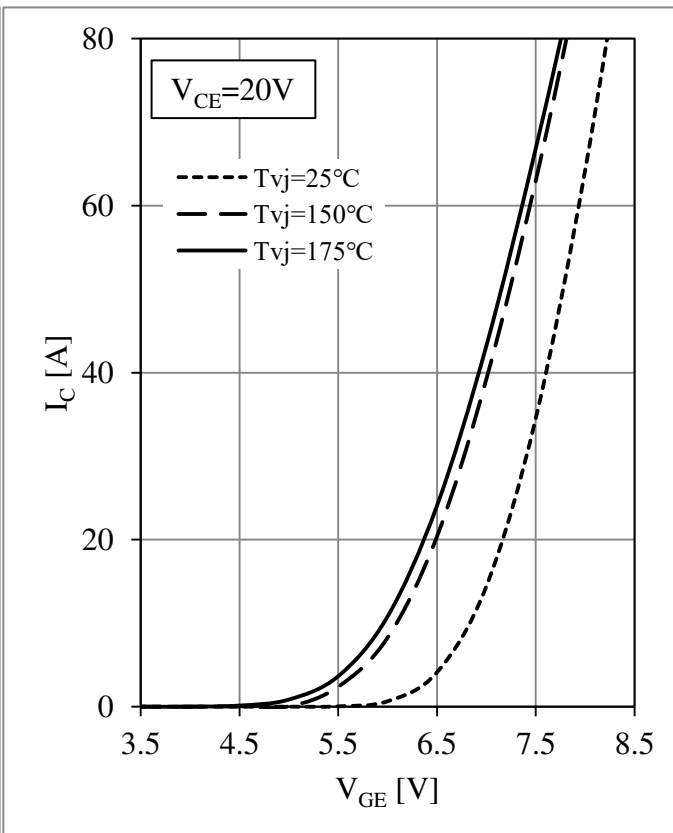
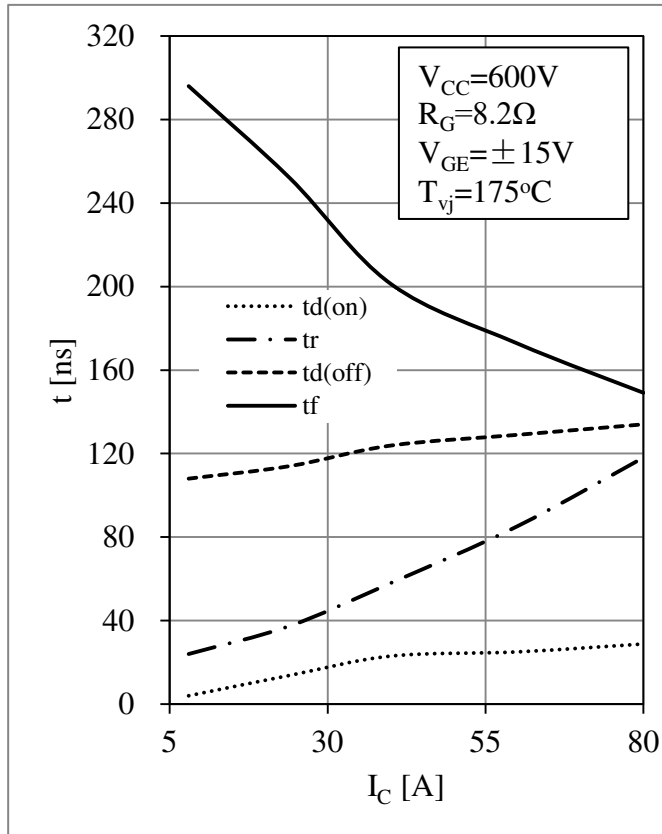
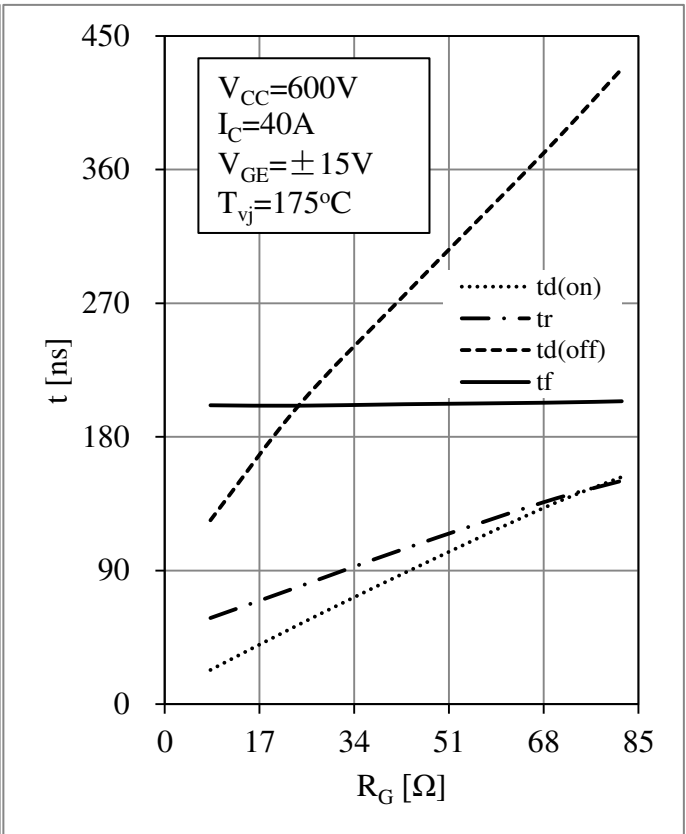
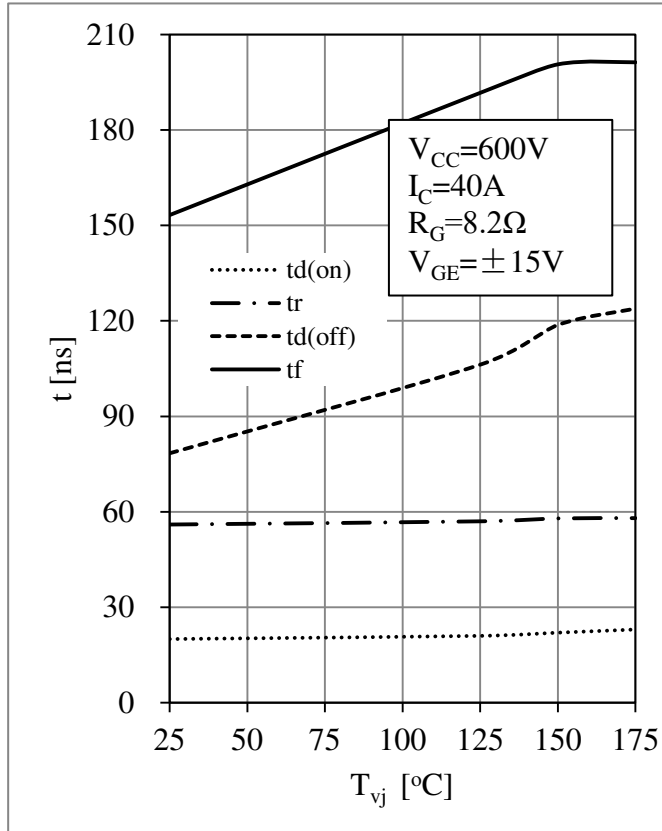
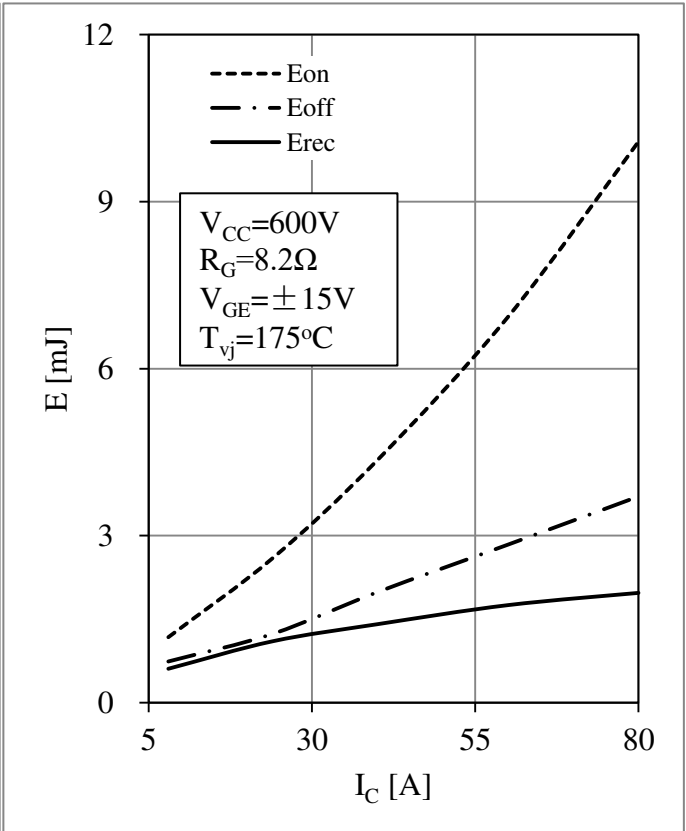
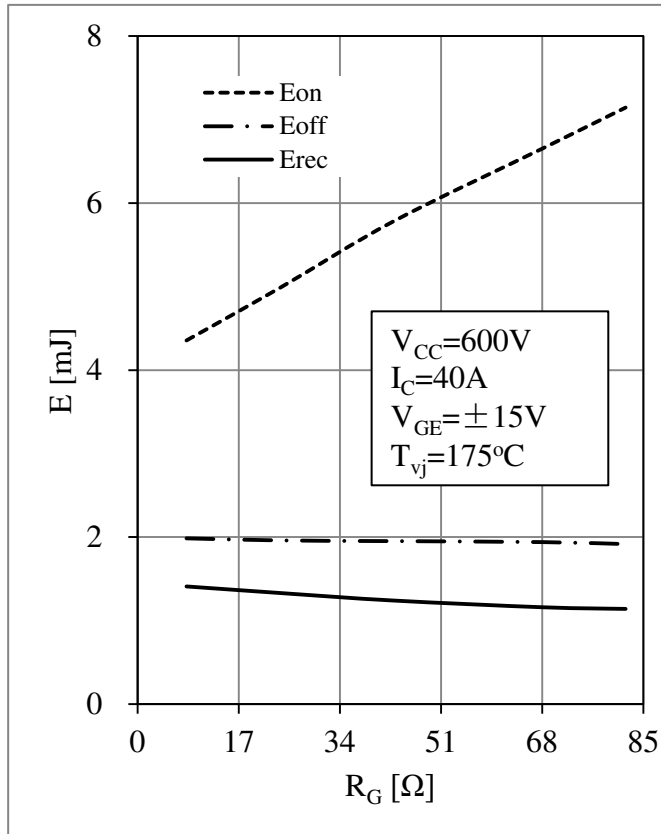
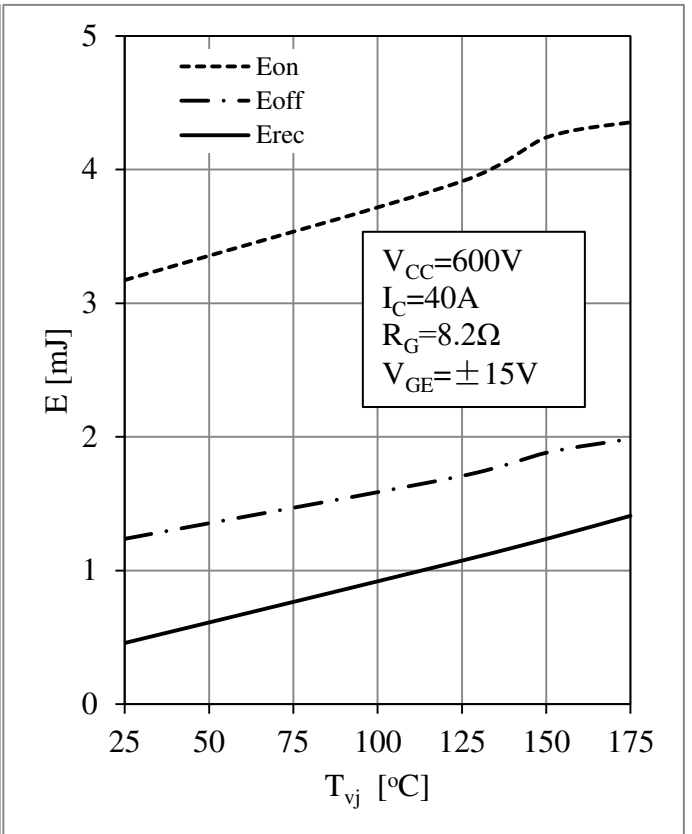
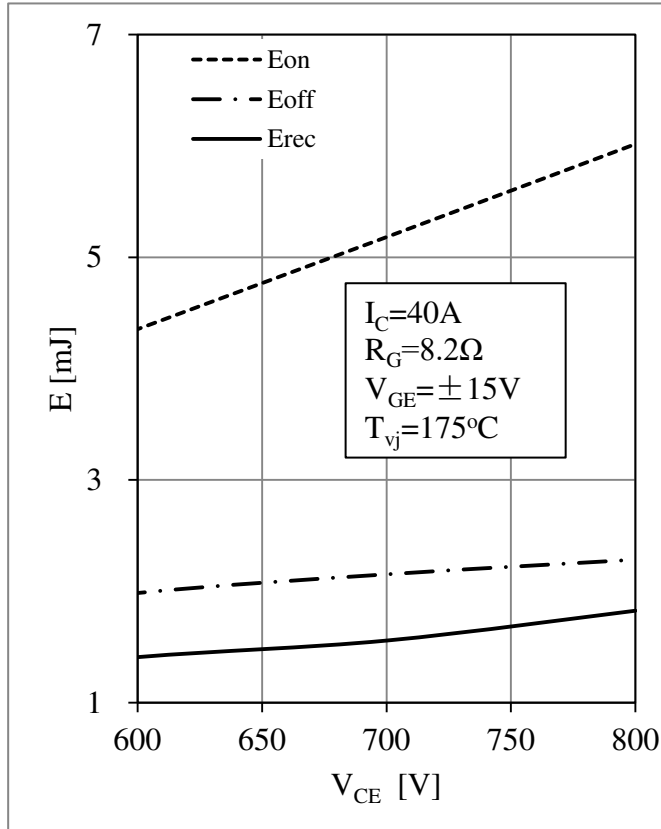
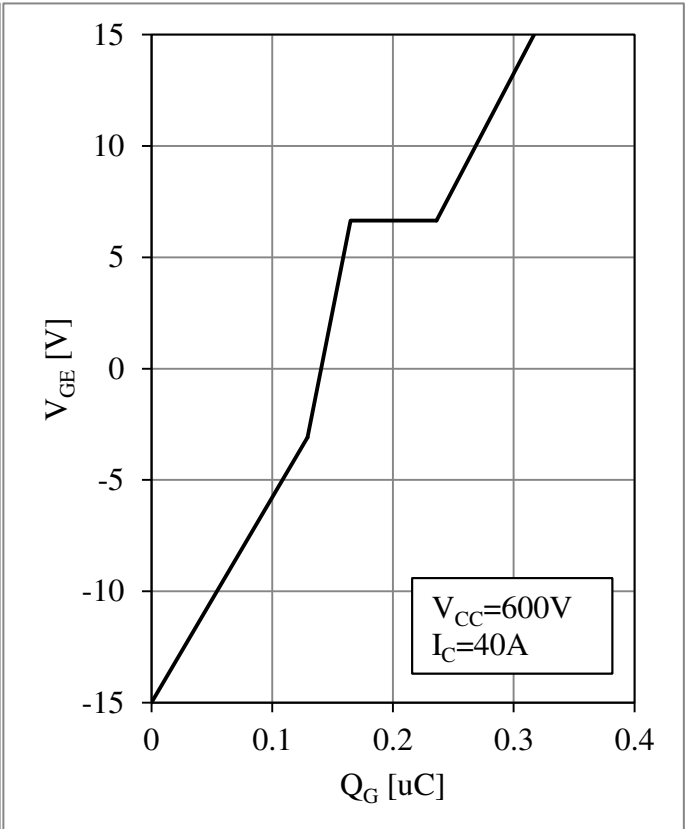


Fig 4. IGBT Transfer Characteristics

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}

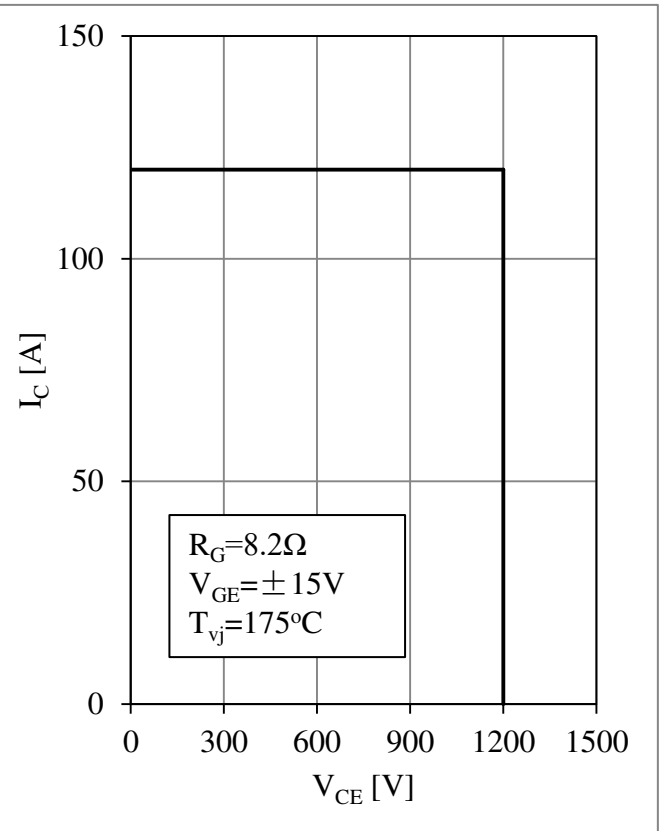
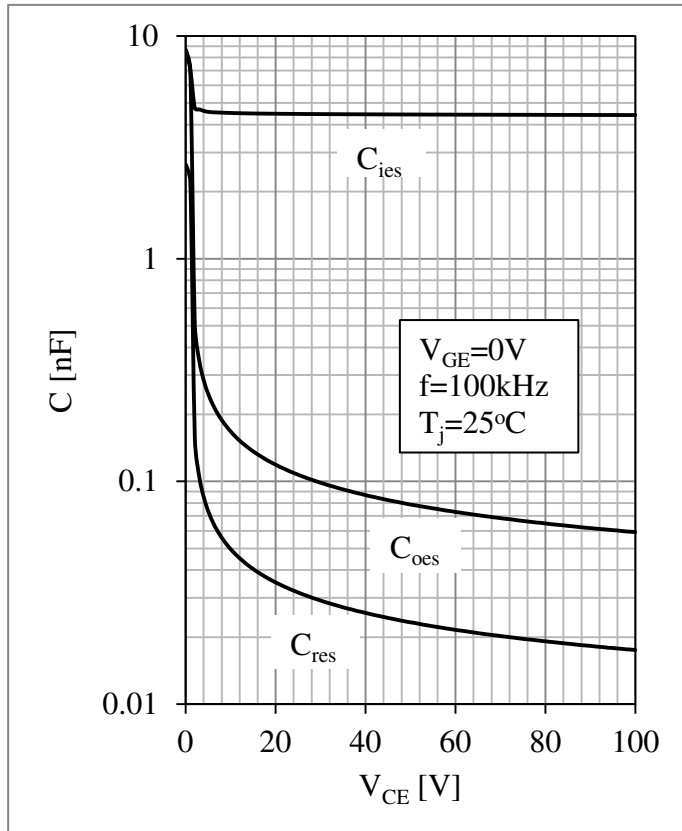


Fig 13. IGBT Capacity Characteristic

Fig 14. RBSOA

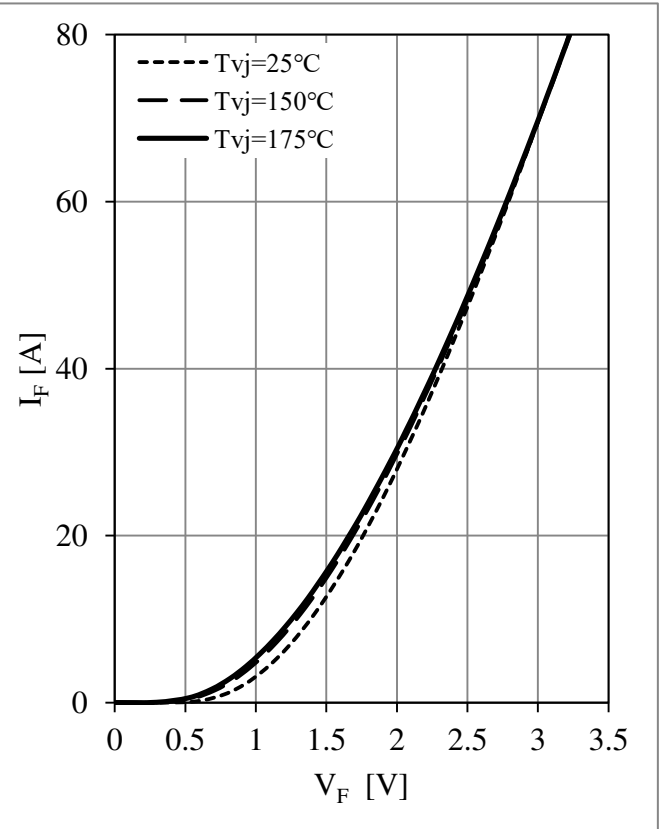
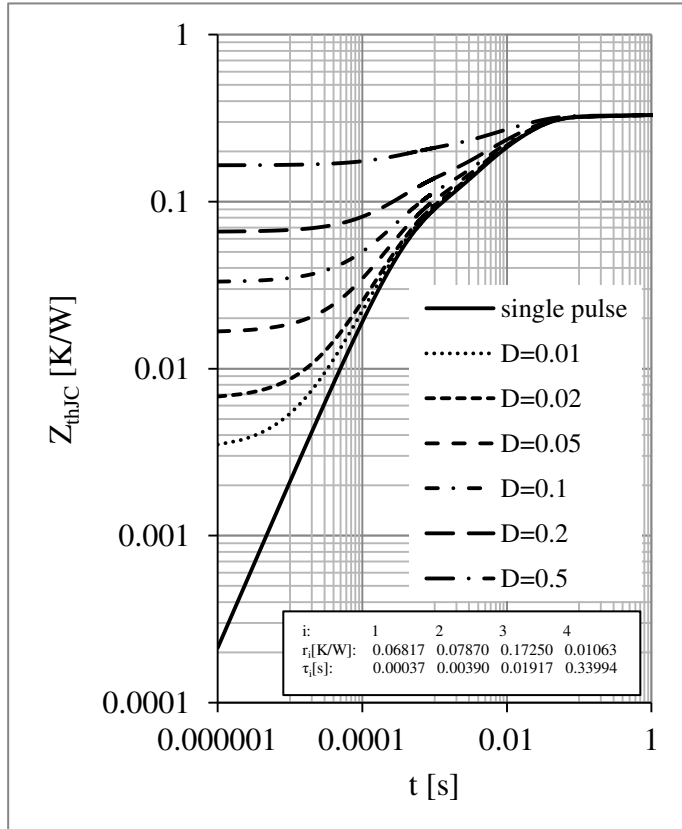
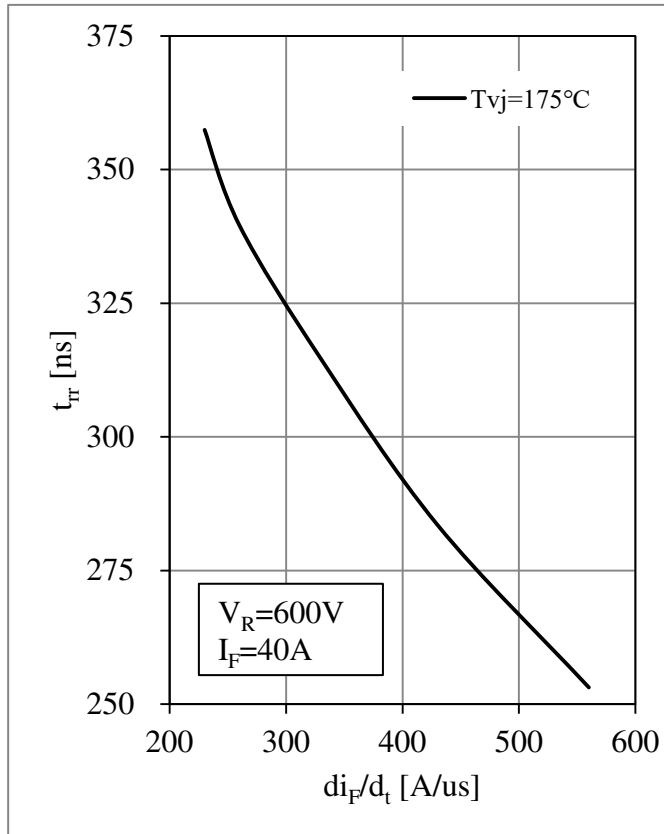
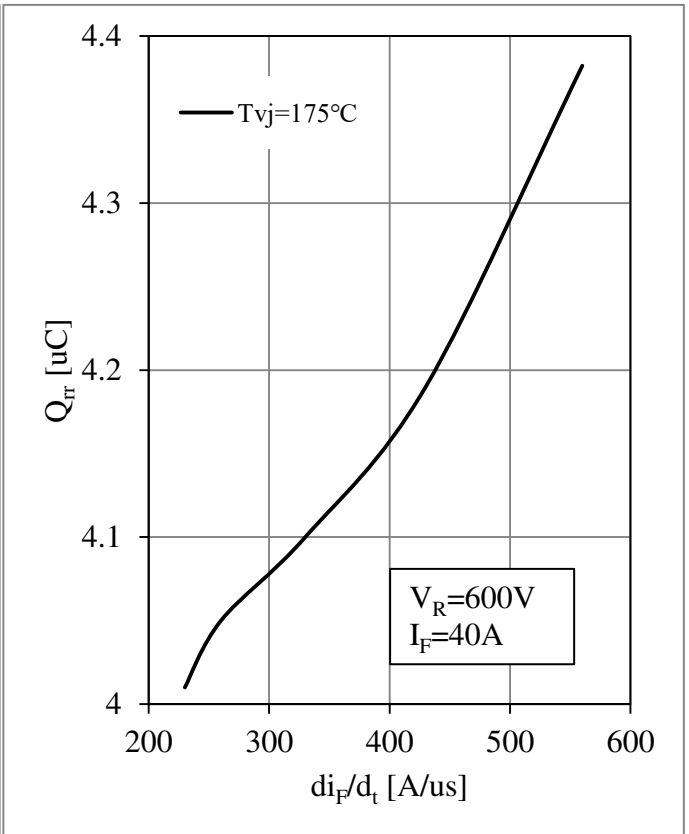
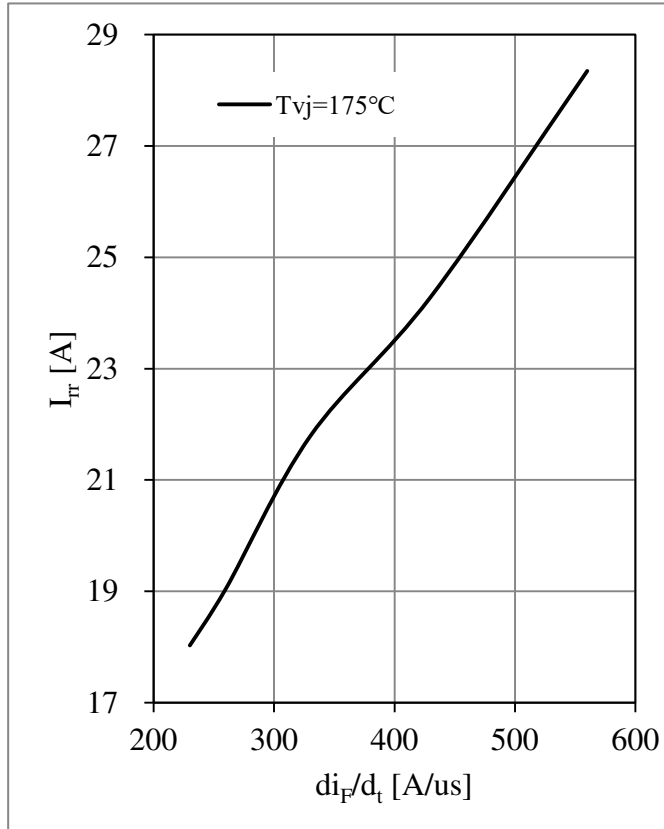
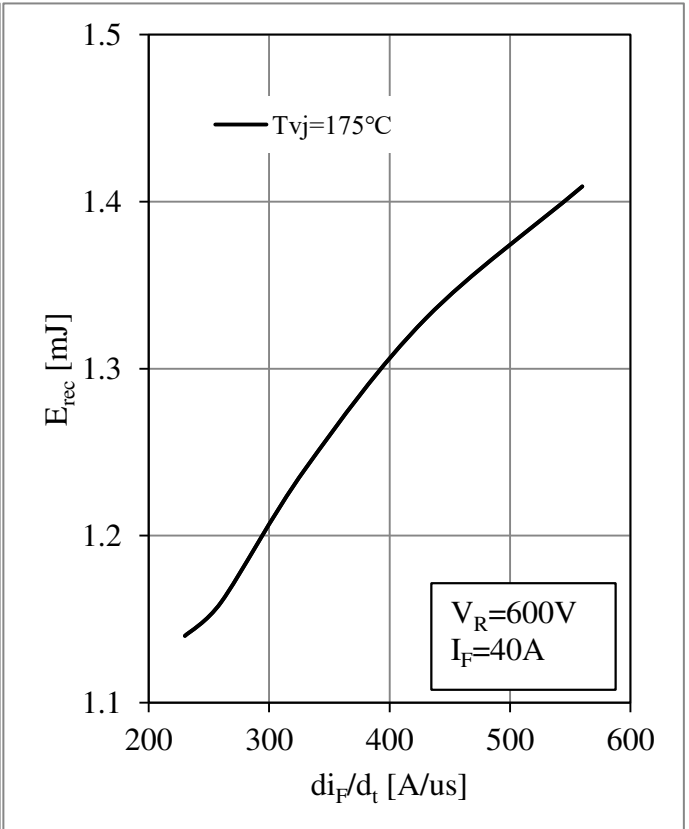


Fig 15. IGBT Transient Thermal Impedance

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

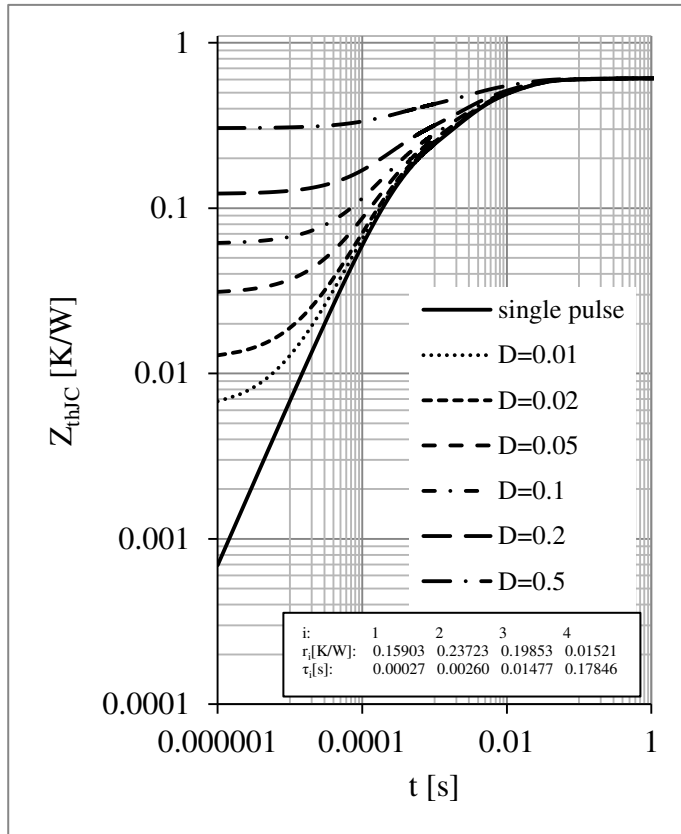
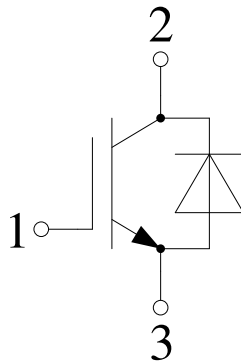
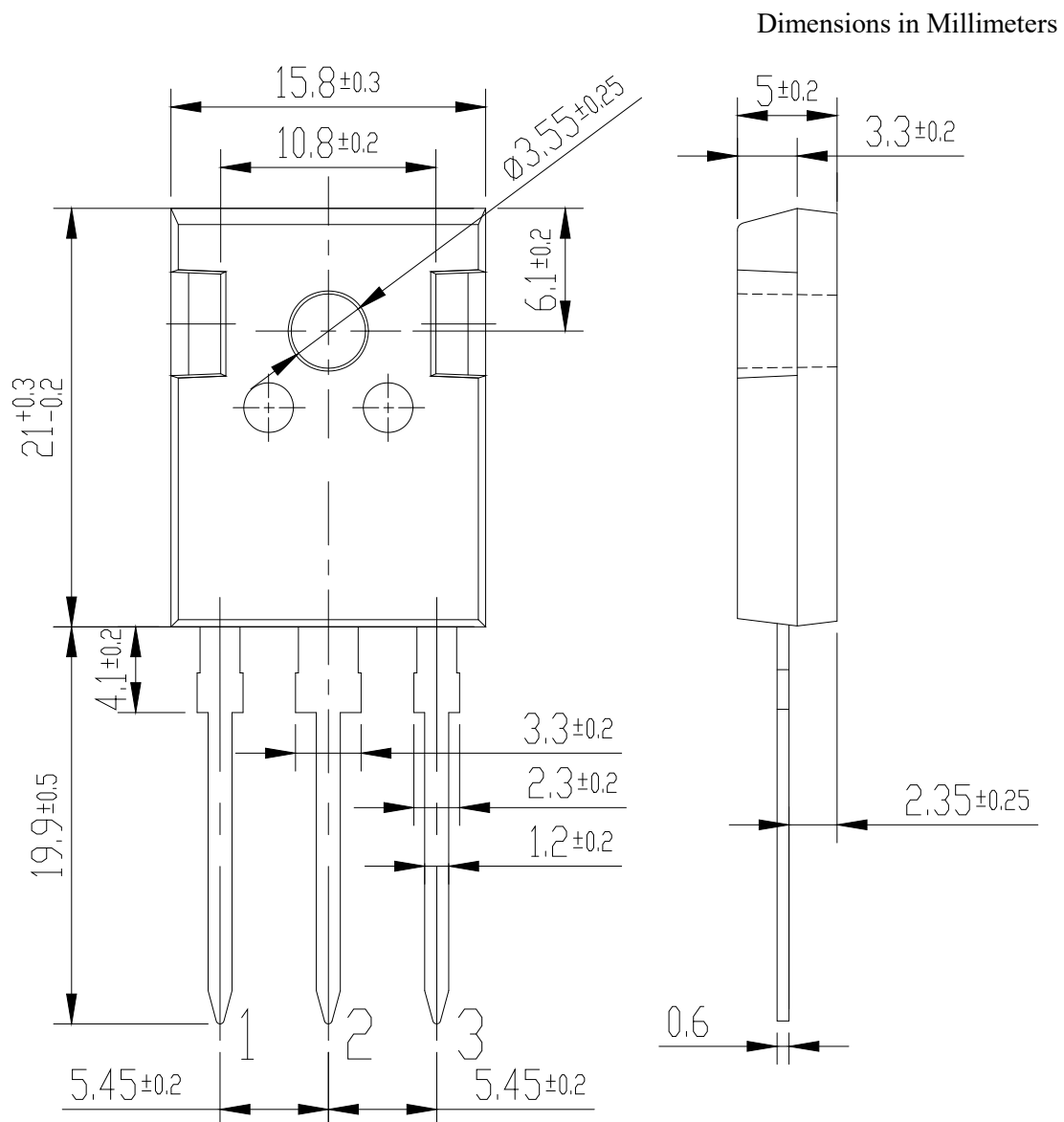


Fig 21. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions



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