

DOSEMI

IGBT

DG140A12TCFS

1200V/140A 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.

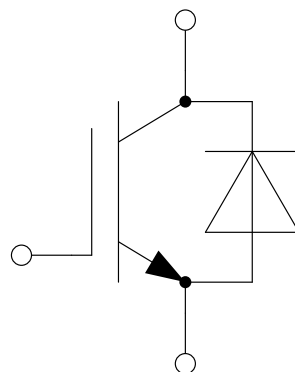
Features

- 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	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	175 ⁽¹⁾ 140	A
I_{CM}	Pulsed Collector Current t_p limited by T_{vjmax}	560	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	937	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	175 ⁽¹⁾ 140	A
I_{FM}	Diode Maximum Forward Current t_p limited by T_{vjmax}	560	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	$I_C=140\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.75	2.20	V
		$I_C=140\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		2.00		
		$I_C=140\text{A}, V_{GE}=15\text{V}, T_{vj}=175^{\circ}\text{C}$		2.05		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.8\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	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	$V_{CE}=25\text{V}, f=100\text{kHz}, V_{GE}=0\text{V}$		11.0		nF
C_{res}	Reverse Transfer Capacitance			0.43		nF
C_{oes}	Output Capacitance			0.23		nF
Q_G	Gate Charge	$V_{GE}=-8\dots+15\text{V}$		0.48		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=140\text{A}, R_{GON}=5.1\Omega, R_{GOFF}=1.0\Omega, V_{GE}=-8/+15\text{V}, L_S=40\text{nH}, T_{vj}=25^{\circ}\text{C}$		28		ns
t_r	Rise Time			145		ns
$t_{d(off)}$	Turn-Off Delay Time			76		ns
t_f	Fall Time			95		ns
E_{on}	Turn-On Switching Loss			17.9		mJ
E_{off}	Turn-Off Switching Loss			5.4		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=140\text{A}, R_{GON}=5.1\Omega, R_{GOFF}=1.0\Omega, V_{GE}=-8/+15\text{V}, L_S=40\text{nH}, T_{vj}=150^{\circ}\text{C}$		30		ns
t_r	Rise Time			150		ns
$t_{d(off)}$	Turn-Off Delay Time			124		ns
t_f	Fall Time			98		ns
E_{on}	Turn-On Switching Loss			21.9		mJ
E_{off}	Turn-Off Switching Loss			7.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=140\text{A}, R_{GON}=5.1\Omega, R_{GOFF}=1.0\Omega, V_{GE}=-8/+15\text{V}, L_S=40\text{nH}, T_{vj}=175^{\circ}\text{C}$		31		ns
t_r	Rise Time			155		ns
$t_{d(off)}$	Turn-Off Delay Time			132		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			22.8		mJ
E_{off}	Turn-Off Switching Loss			7.9		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=140\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.70	2.15	V
		$I_F=140\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.70		
		$I_F=140\text{A}, V_{GE}=0\text{V}, T_{vj}=175^{\circ}\text{C}$		1.65		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=140\text{A},$ $-di/dt=650\text{A}/\mu\text{s}, V_{GE}=-8\text{V}$ $L_s=40\text{nH}, T_{vj}=25^{\circ}\text{C}$		8.6		μC
t_{rr}	Recovered Time			261		ns
I_{RM}	Peak Reverse Recovery Current			49		A
E_{rec}	Reverse Recovery Energy			2.8		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=140\text{A},$ $-di/dt=640\text{A}/\mu\text{s}, V_{GE}=-8\text{V}$ $L_s=40\text{nH}, T_{vj}=150^{\circ}\text{C}$		18.3		μC
t_{rr}	Recovered Time			364		ns
I_{RM}	Peak Reverse Recovery Current			81		A
E_{rec}	Reverse Recovery Energy			6.3		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=140\text{A},$ $-di/dt=630\text{A}/\mu\text{s}, V_{GE}=-8\text{V}$ $L_s=40\text{nH}, T_{vj}=175^{\circ}\text{C}$		19.5		μC
t_{rr}	Recovered Time			379		ns
I_{RM}	Peak Reverse Recovery Current			84		A
E_{rec}	Reverse Recovery Energy			6.7		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)			0.160	K/W
	Junction-to-Case (per Diode)			0.200	
R_{thJA}	Junction-to-Ambient		40		K/W

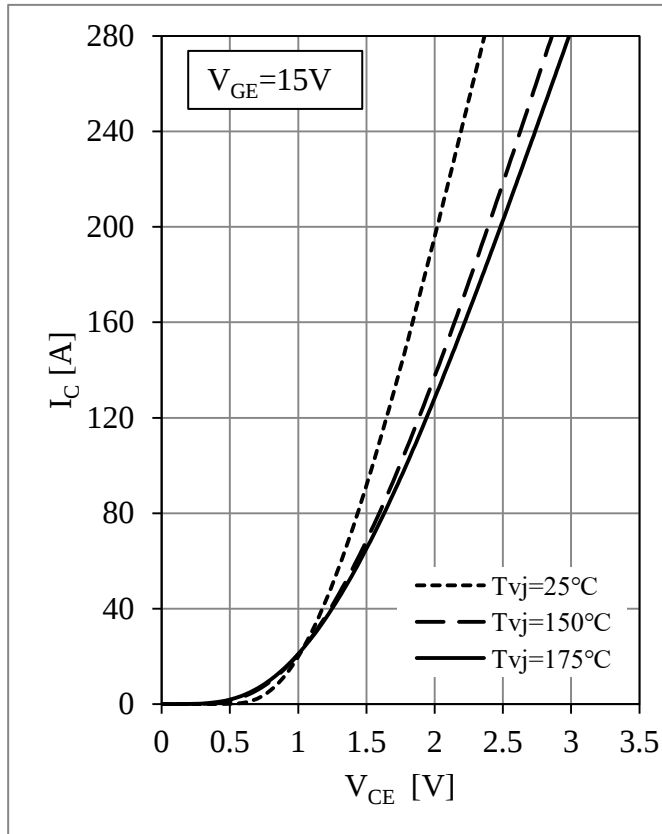


Fig 1. IGBT-inverter Output Characteristics

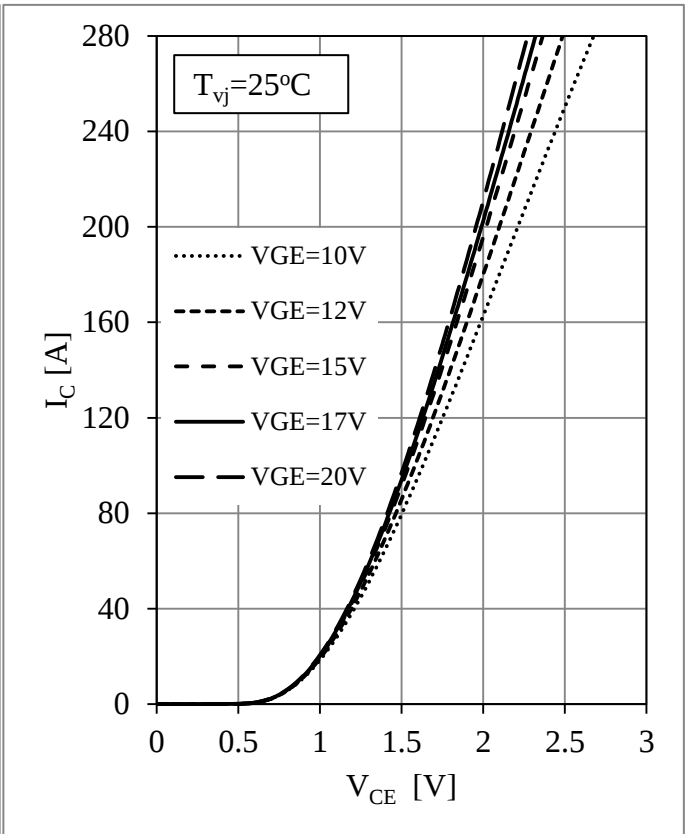


Fig 2. IGBT Output Characteristics

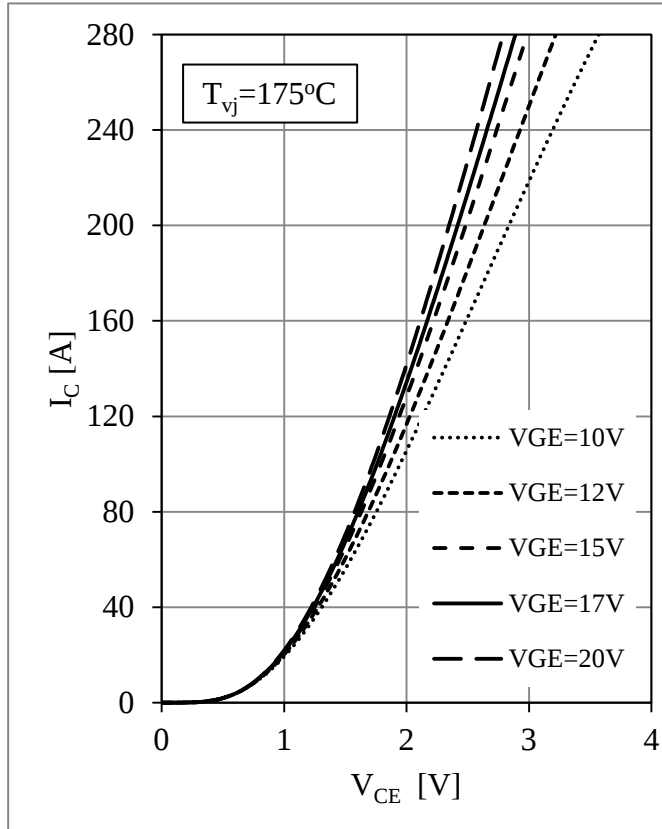


Fig 3. IGBT Output Characteristics

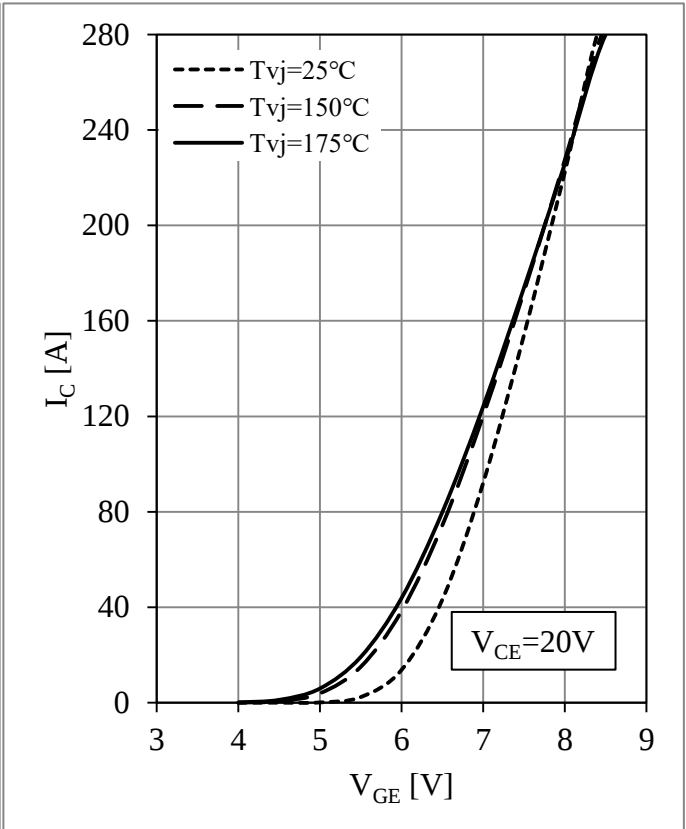
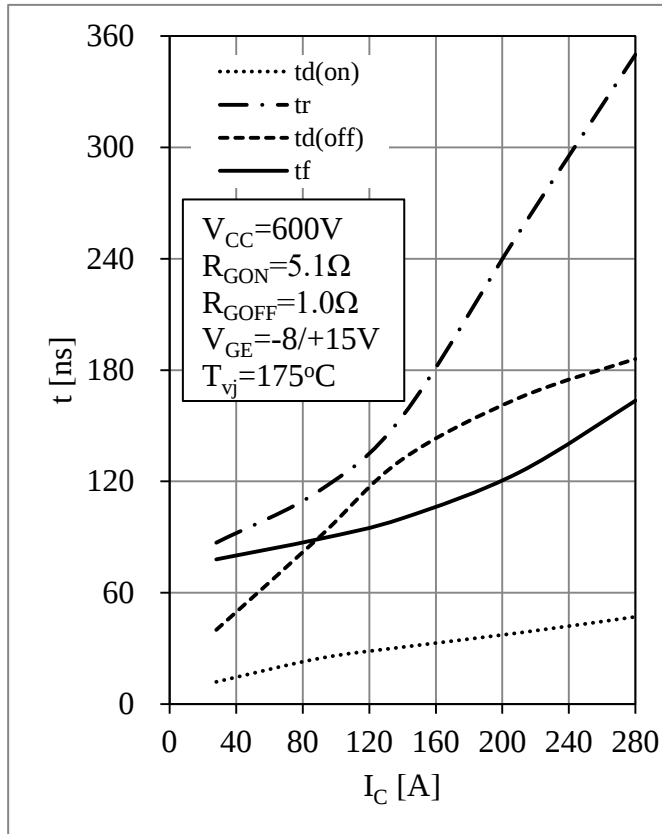
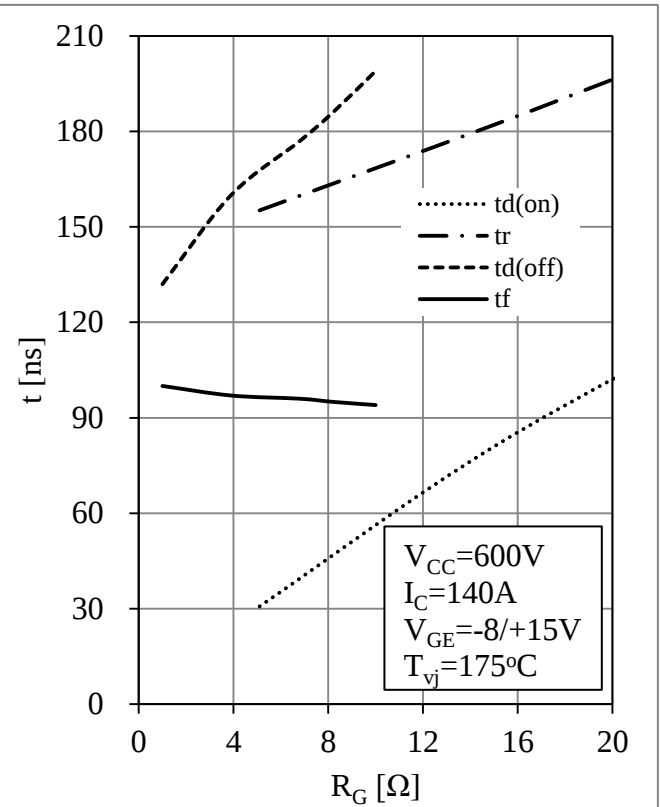
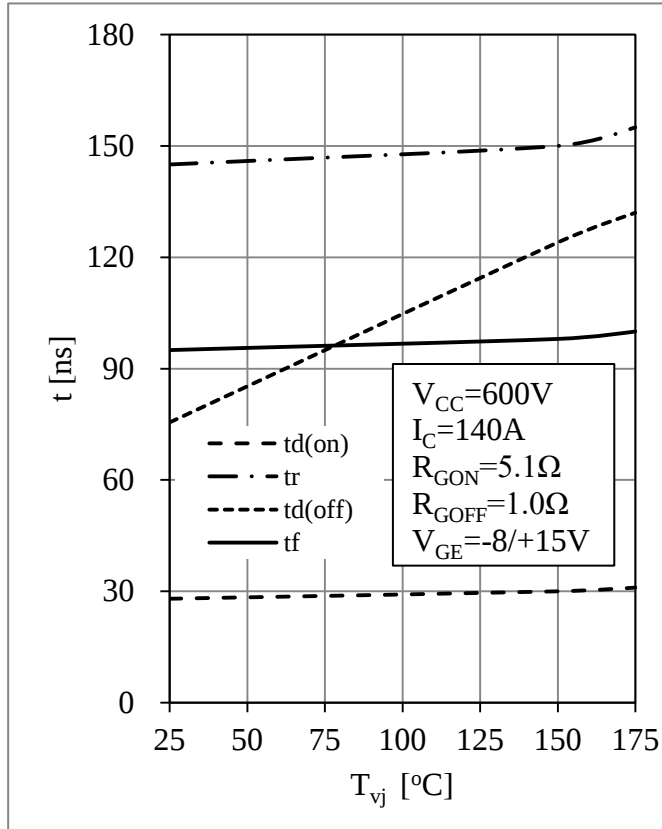
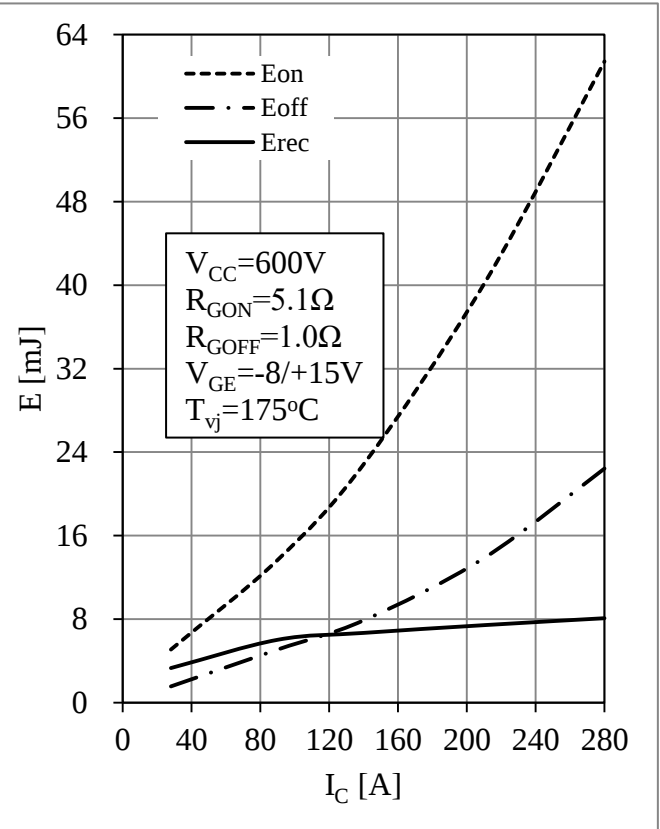
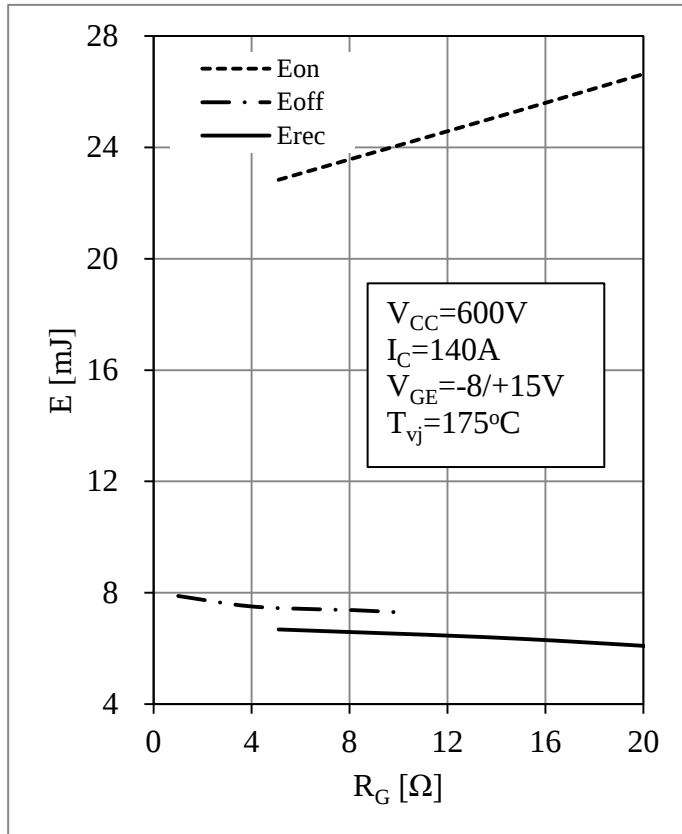
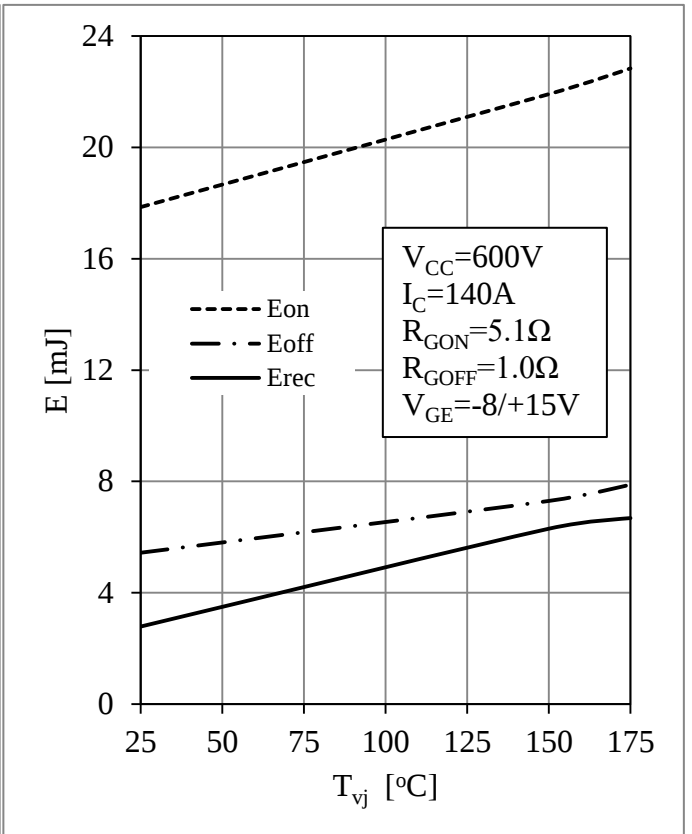
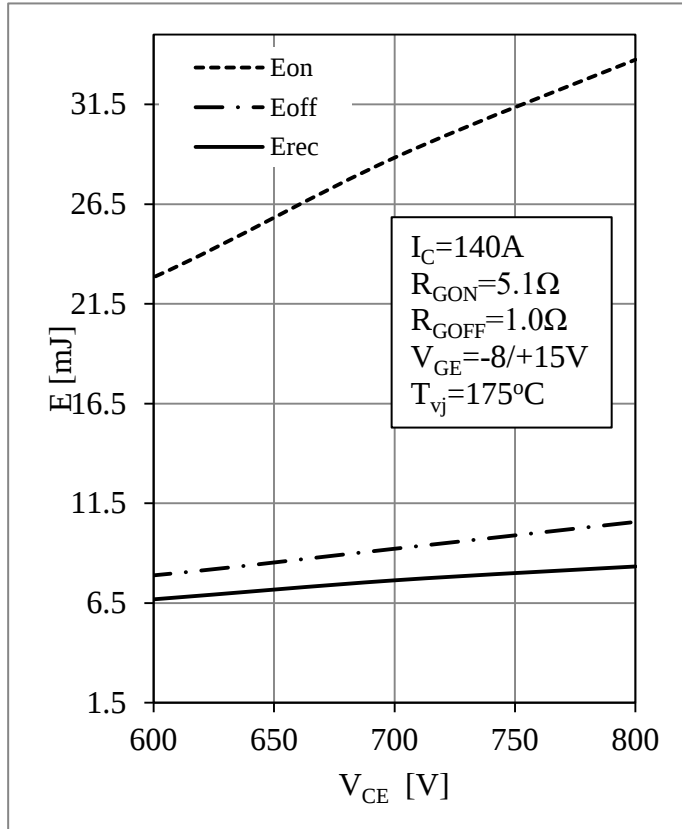
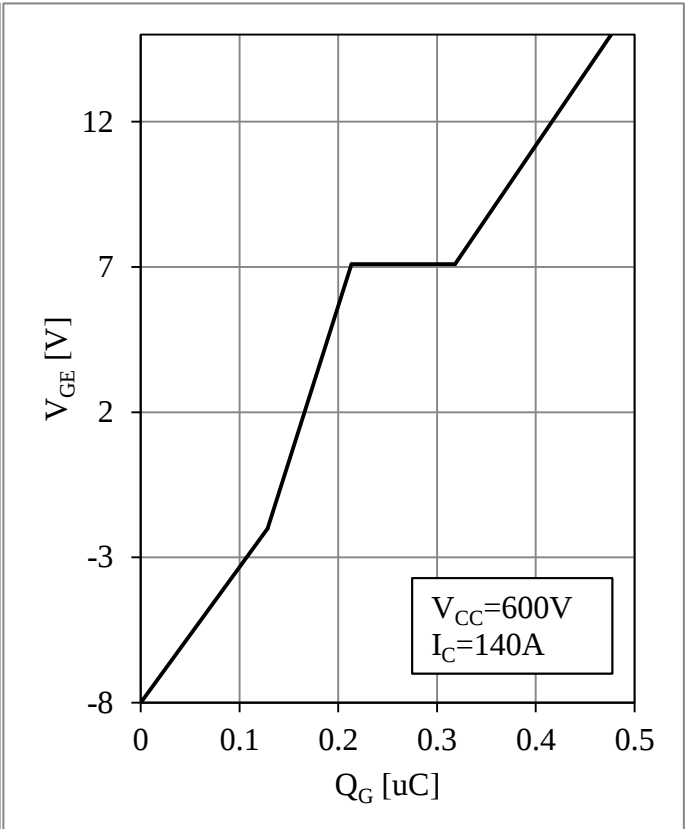


Fig 4. IGBT Transfer Characteristics

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}

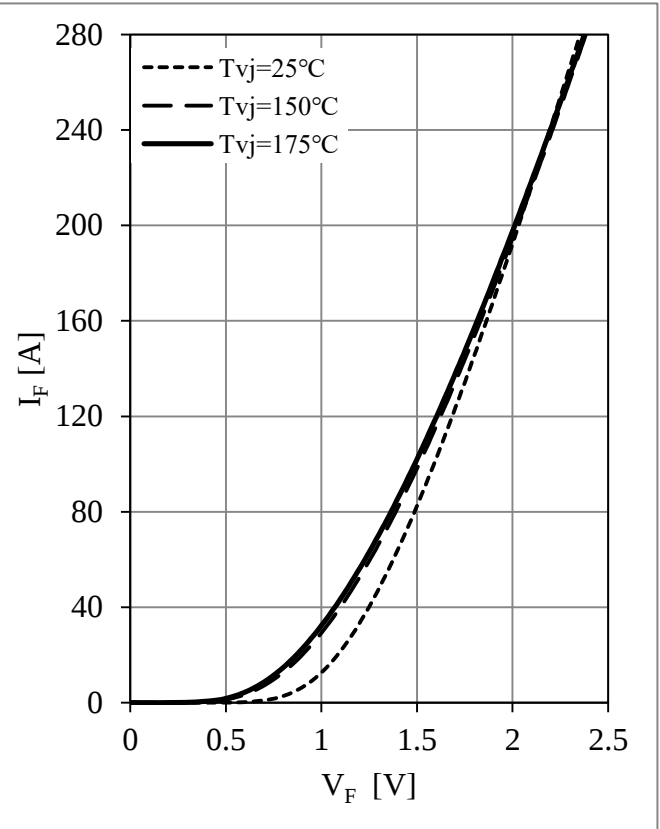
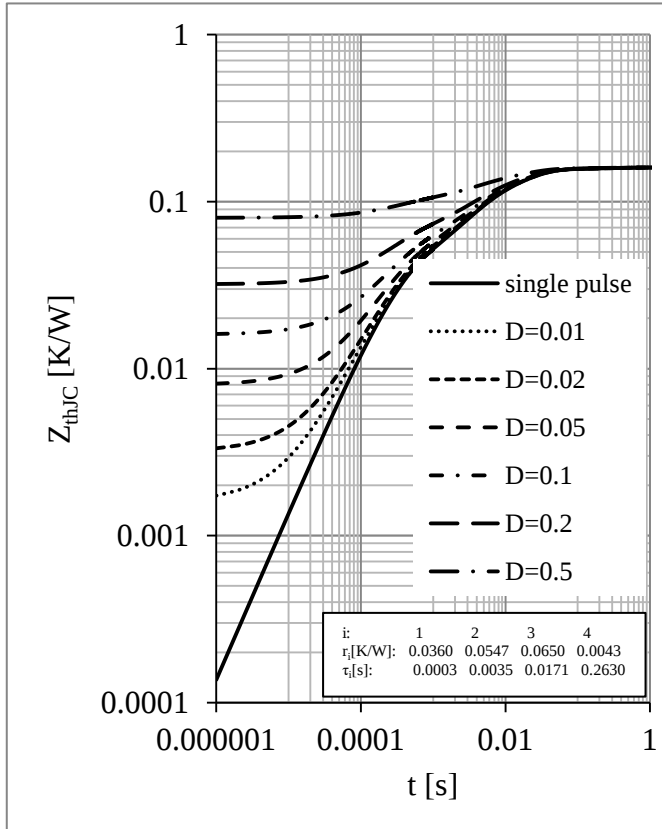
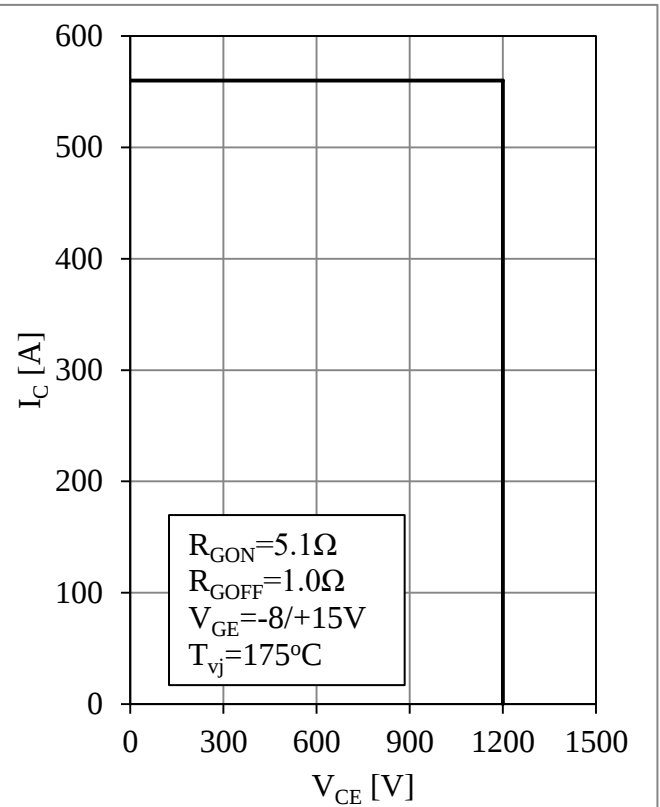
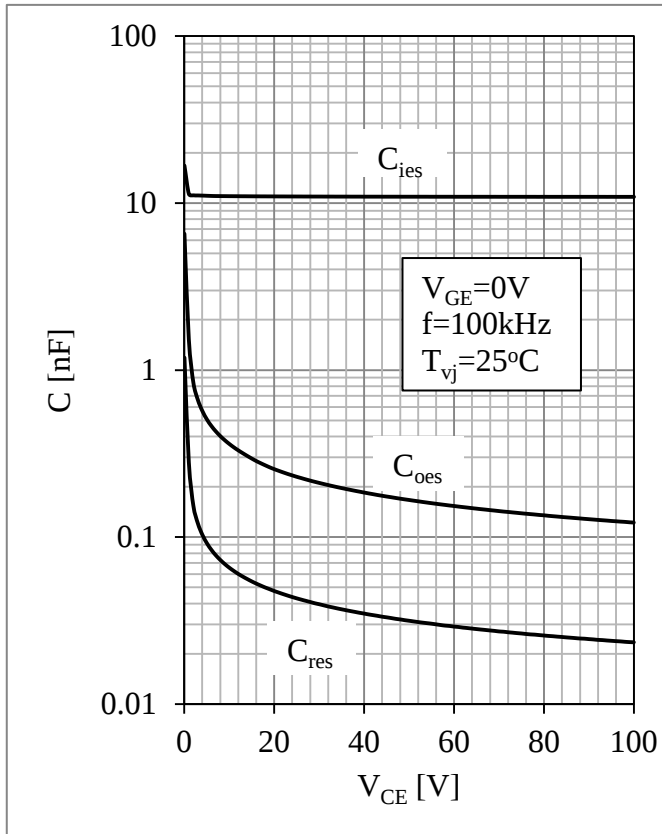
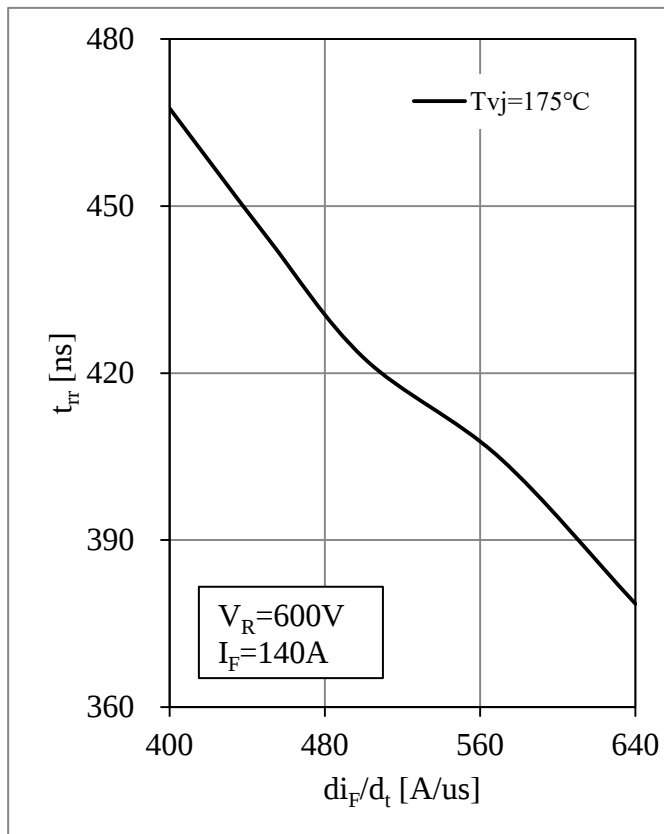
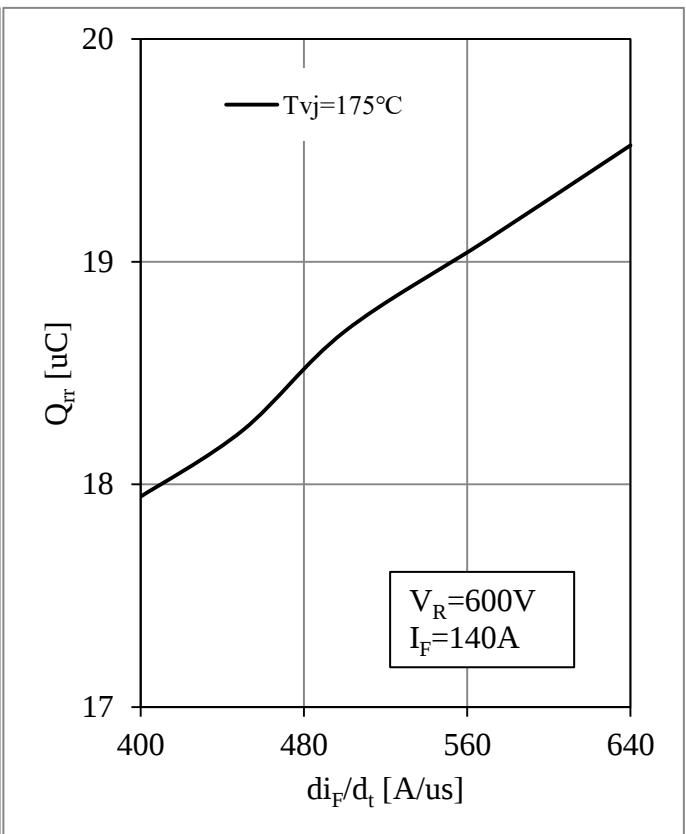
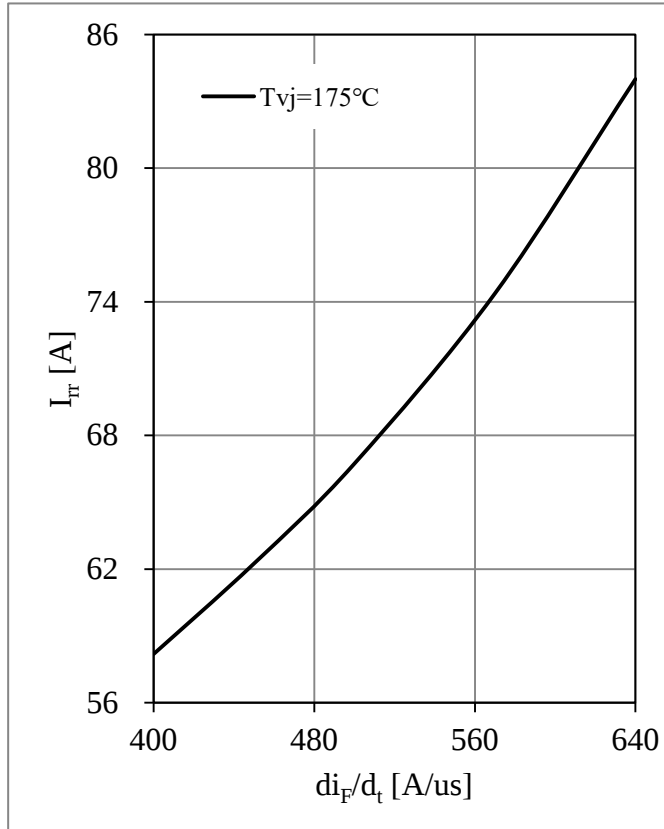
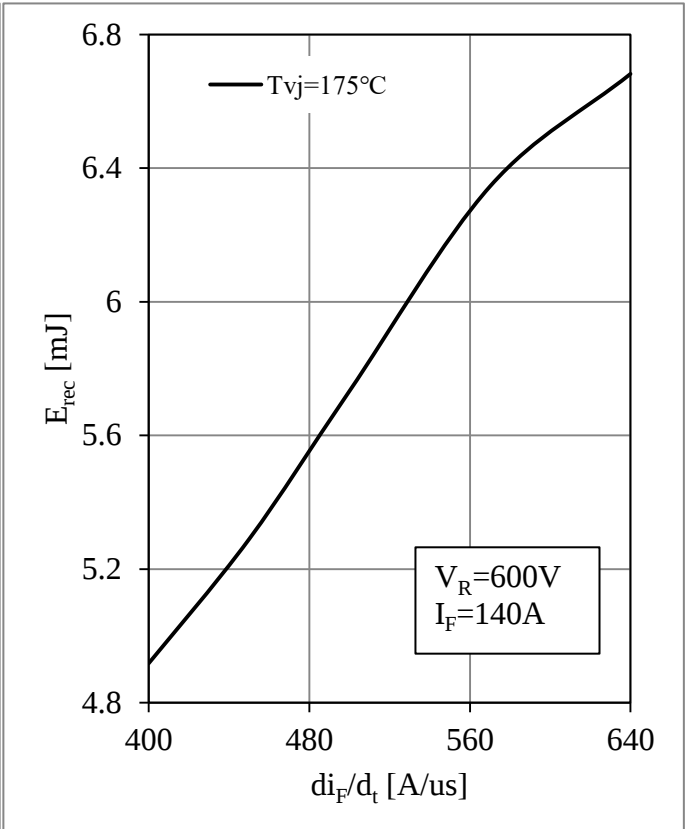


Fig 15. IGBT Transient Thermal Impedance

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

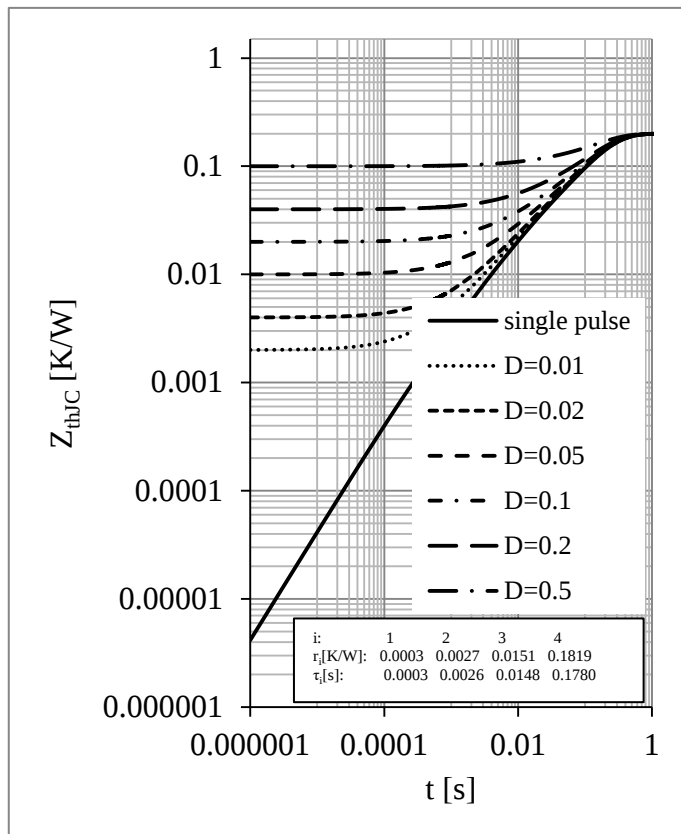
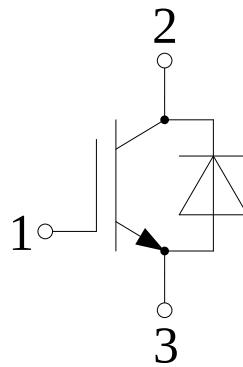


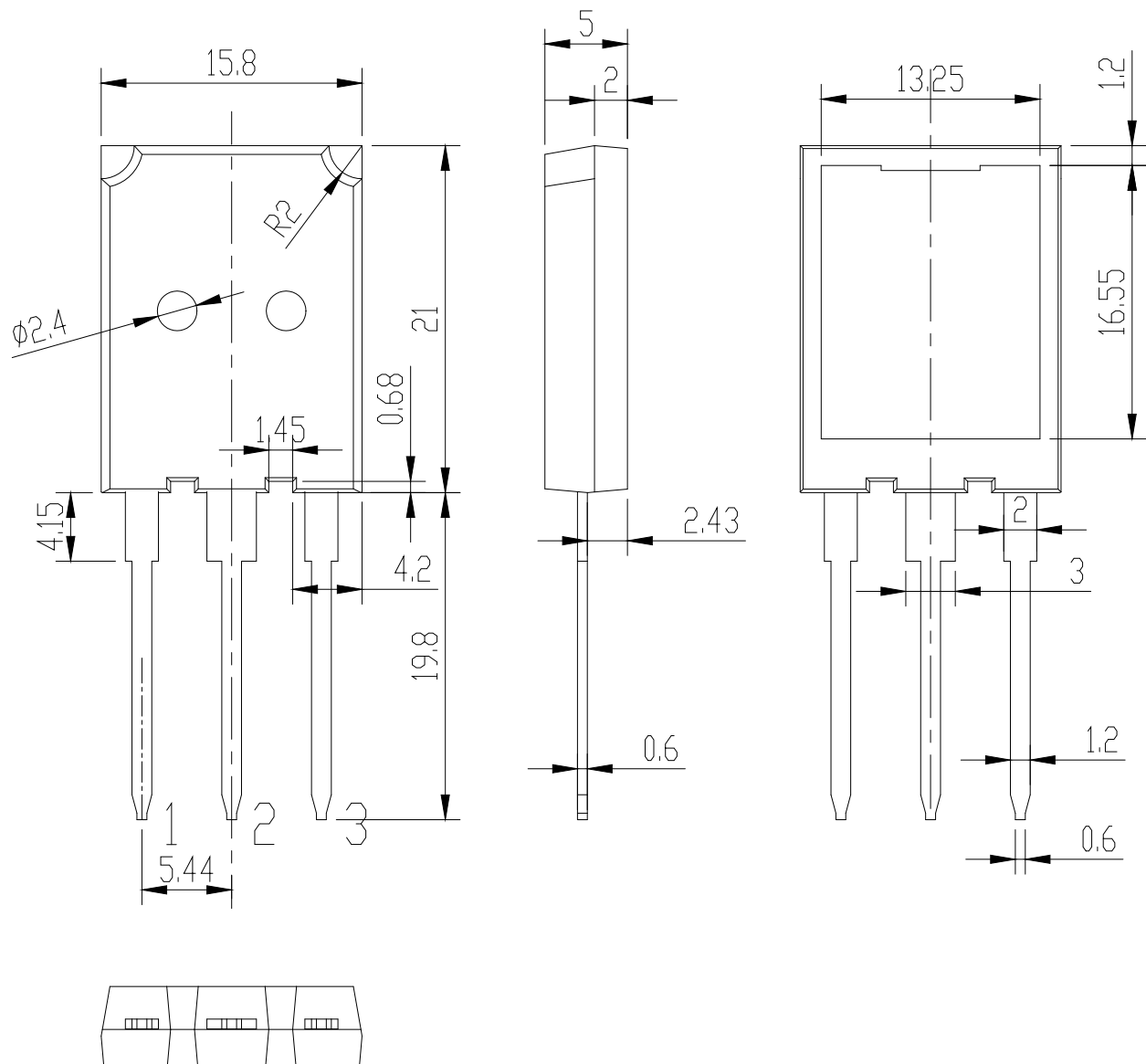
Fig 21. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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