DOSEMI

IGBT

DG50H12T2Z

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.

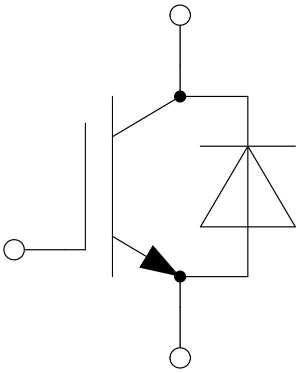
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching loss
- Maximum junction temperature 175°C
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Qualified according to AEC-Q101

Typical Applications

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

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage Transient Gate-Emitter Voltage	±20 -25/+30	V
IC	Collector Current @ TC=25°C @ T_C=100°C	100 50	A
I_{CM}	Pulsed Collector Current t_p limited by T_{jmax}	150	A
P_D	Maximum Power Dissipation @ T_j=175°C	672	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current @ T_C=25°C @ T_C=100°C	85 50	A
I_{FM}	Diode Maximum Forward Current t_p limited by T_{jmax}	150	A

Discrete

Symbol	Description	Values	Unit
T_{jop}	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

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=50A,V_{GE}=15V, T_j=25°C		1.85	2.30	V
		I_C=50A,V_{GE}=15V, T_j=150°C		2.45		
		I_C=50A,V_{GE}=15V, T_j=175°C		2.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2.00mA,V_{CE}=V_{GE}, T_j=25°C	5.0	5.8	6.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			200	uA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			100	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		8.90		nF
C_{oes}	Output Capacitance			0.27		nF
C_{res}	Reverse Transfer Capacitance			0.15		nF
Q_G	Gate Charge	V_{GE}=-8…+15V		0.44		uC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=10Ω, V_{GE}=-10/+15V, L_S=40nH,T_j=25°C		50		ns
t_r	Rise Time			140		ns
$t_{d(off)}$	Turn-Off Delay Time			149		ns
t_f	Fall Time			125		ns
E_{on}	Turn-On Switching Loss			5.02		mJ
E_{off}	Turn-Off Switching Loss			1.26		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=10Ω, V_{GE}=-10/+15V, L_S=40nH,T_j=150°C		54		ns
t_r	Rise Time			160		ns
$t_{d(off)}$	Turn-Off Delay Time			165		ns
t_f	Fall Time			204		ns
E_{on}	Turn-On Switching Loss			7.26		mJ
E_{off}	Turn-Off Switching Loss			1.73		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=10Ω, V_{GE}=-10/+15V, L_S=40nH,T_j=175°C		55		ns
t_r	Rise Time			171		ns
$t_{d(off)}$	Turn-Off Delay Time			168		ns
t_f	Fall Time			221		ns
E_{on}	Turn-On Switching Loss			7.51		mJ
E_{off}	Turn-Off Switching Loss			2.33		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=50A,V_{GE}=0V,T_j=25°C		2.55	3.10	V
		I_F=50A,V_{GE}=0V,T_j=150°C		2.40		
		I_F=50A,V_{GE}=0V,T_j=175°C		2.35		
t_{rr}	Diode Reverse Recovery Time	V_R=600V,I_F=50A, -di/dt=445A/µs,V_{GE}=-10V L_S=40nH,T_j=25°C		280		ns
Q_r	Recovered Charge			2.46		µC
I_{RM}	Peak Reverse Recovery Current			16		A
E_{rec}	Reverse Recovery Energy			1.31		mJ
t_{rr}	Diode Reverse Recovery Time	V_R=600V,I_F=50A, -di/dt=420A/µs,V_{GE}=-10V L_S=40nH,T_j=150°C		443		ns
Q_r	Recovered Charge			7.31		µC
I_{RM}	Peak Reverse Recovery Current			34		A
E_{rec}	Reverse Recovery Energy			4.23		mJ
t_{rr}	Diode Reverse Recovery Time	V_R=600V,I_F=50A, -di/dt=410A/µs,V_{GE}=-10V L_S=40nH,T_j=175°C		516		ns
Q_r	Recovered Charge			7.69		µC
I_{RM}	Peak Reverse Recovery Current			34		A
E_{rec}	Reverse Recovery Energy			4.32		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)			0.223 0.523	K/W
R_{thJA}	Junction-to-Ambient		40		K/W

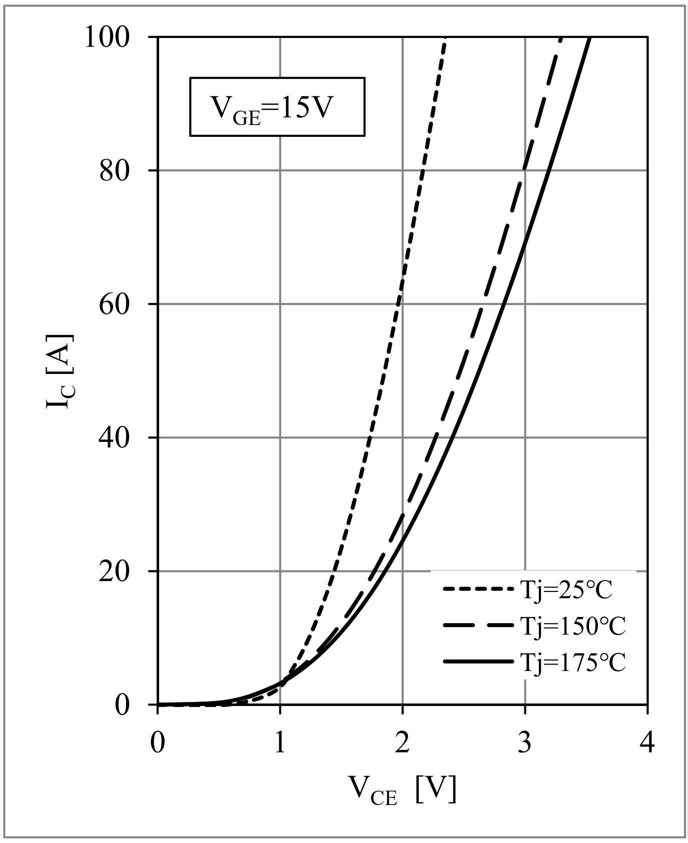


Fig 1. IGBT-inverter Output Characteristics

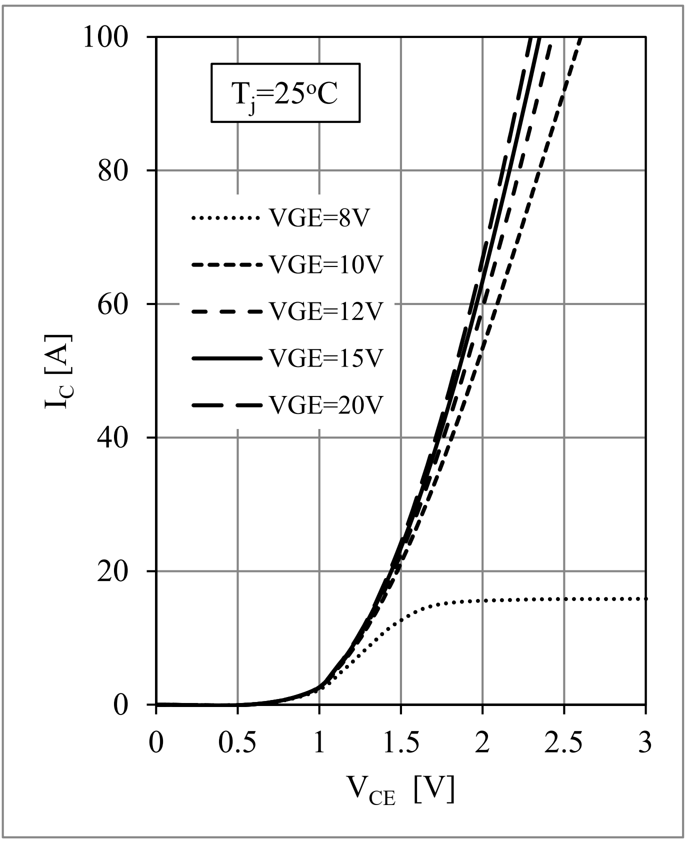


Fig 2. IGBT Output Characteristics

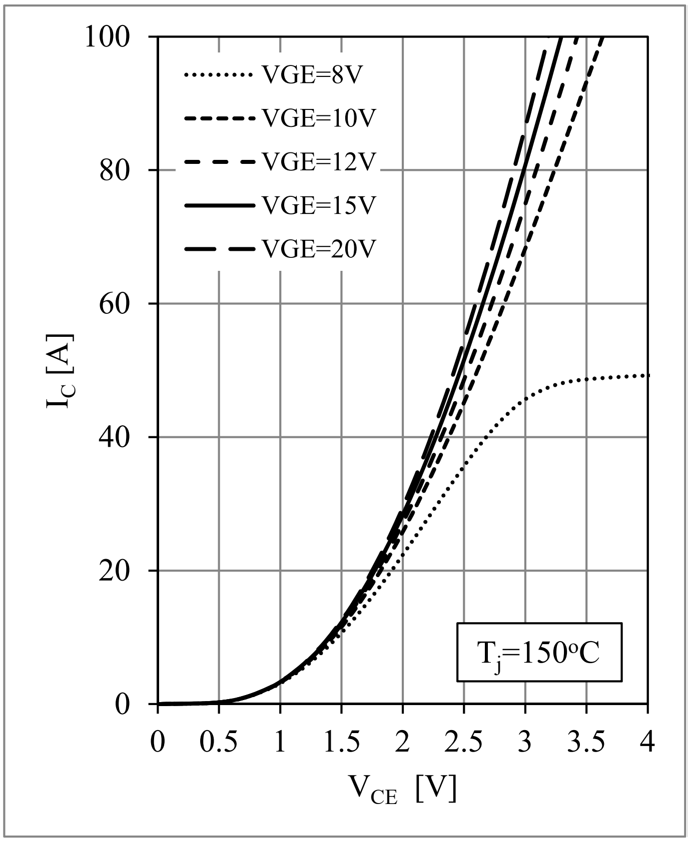


Fig 3. IGBT Output Characteristics

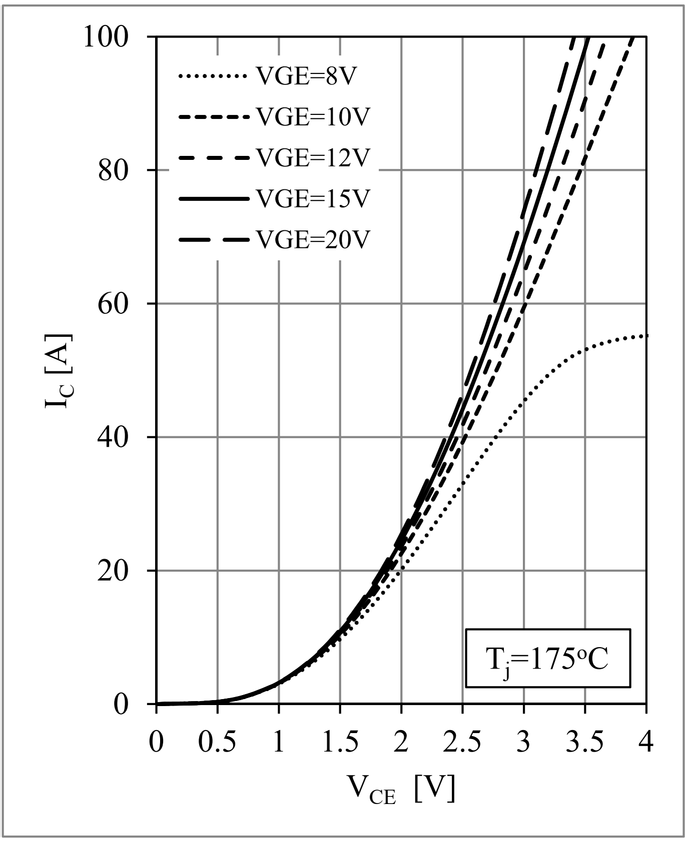
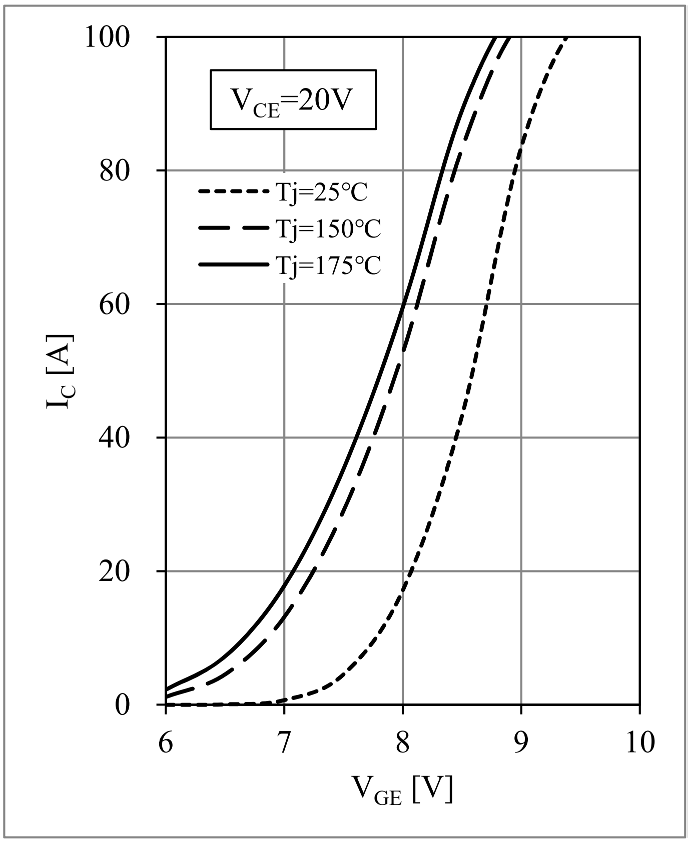


Fig 4. IGBT Output Characteristics



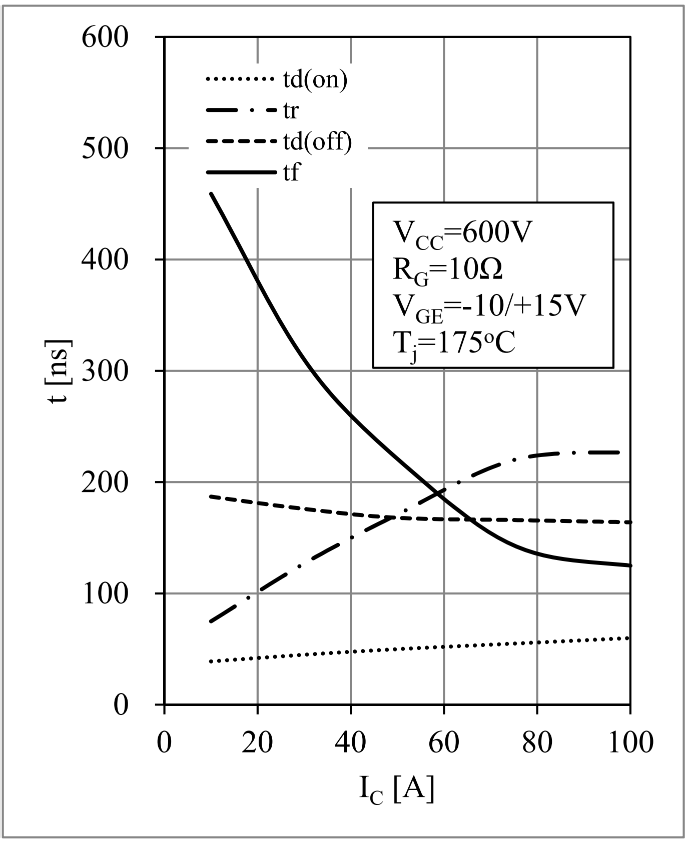
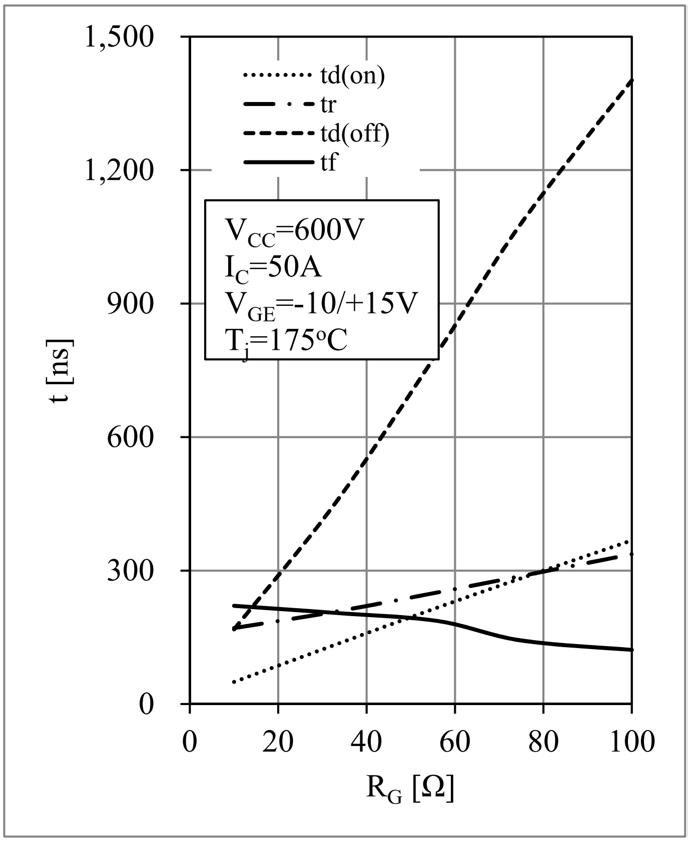


Fig 5. IGBT Transfer Characteristics

Fig 6. IGBT Switching Times as.Ic



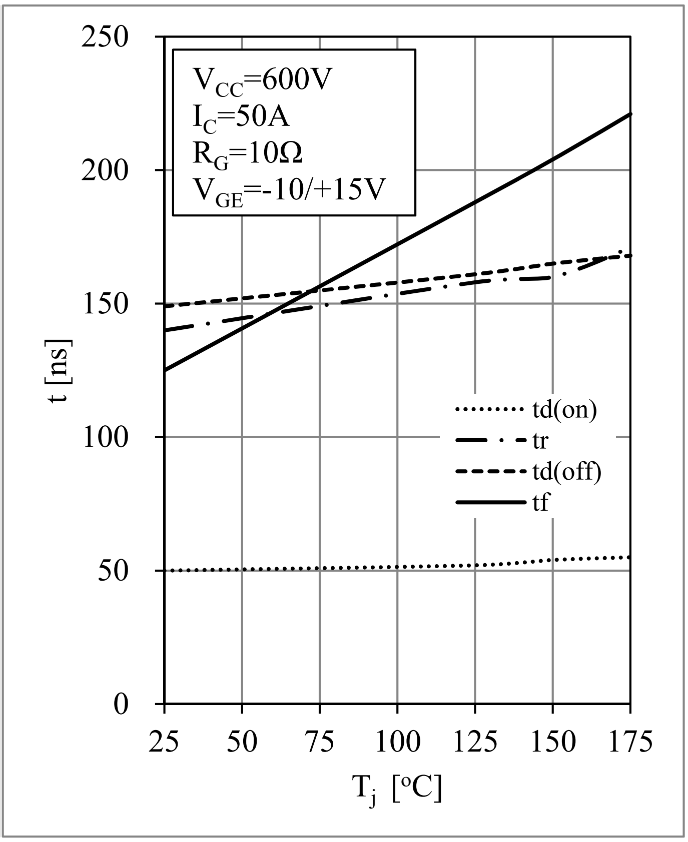


Fig 7. IGBT Switching Times as. RG

Fig 8. IGBT Switching Times vs. T_j

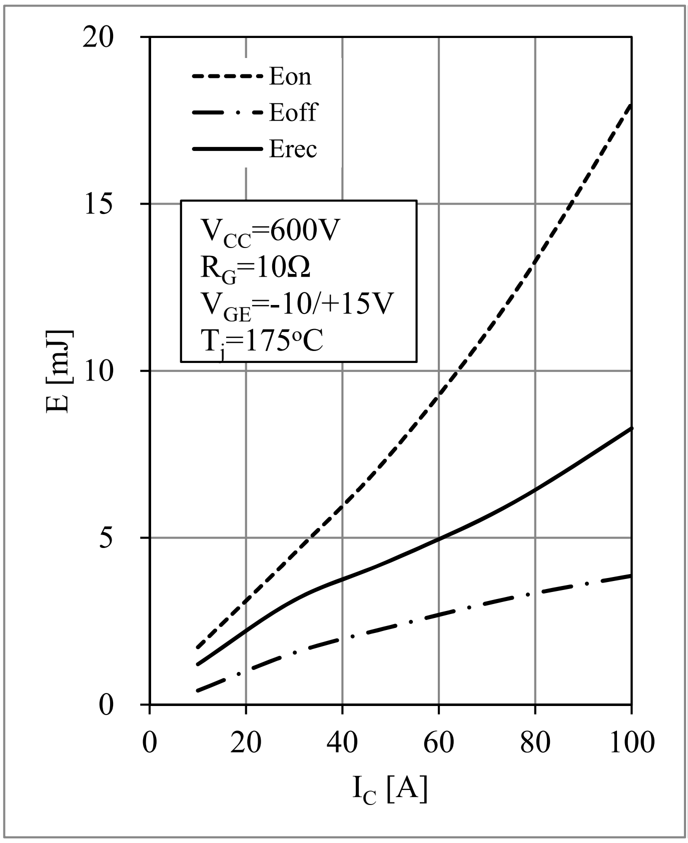


Fig 9. Switching Energy Loss vs. I_C

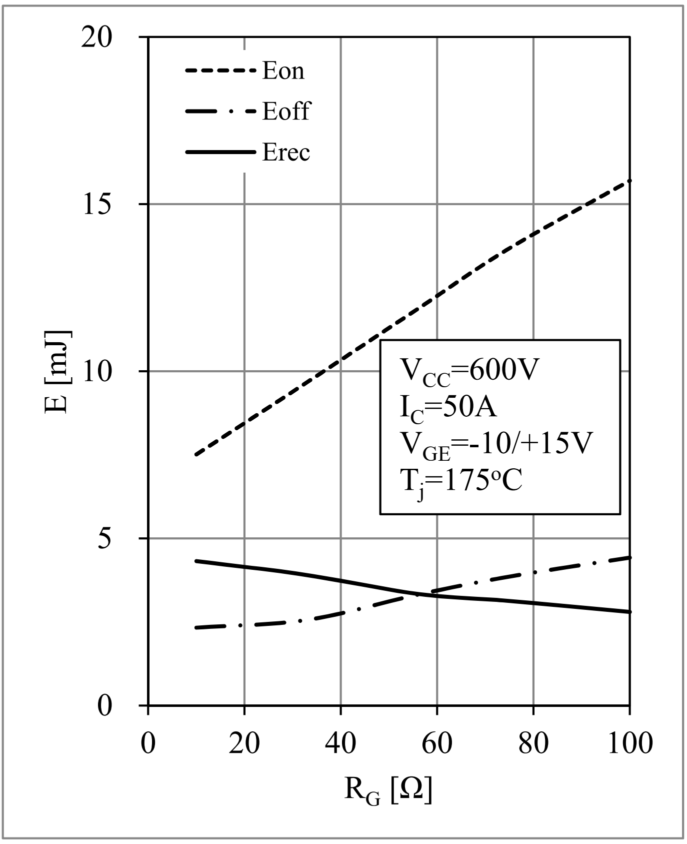


Fig 10. Switching Energy Loss vs. R_G

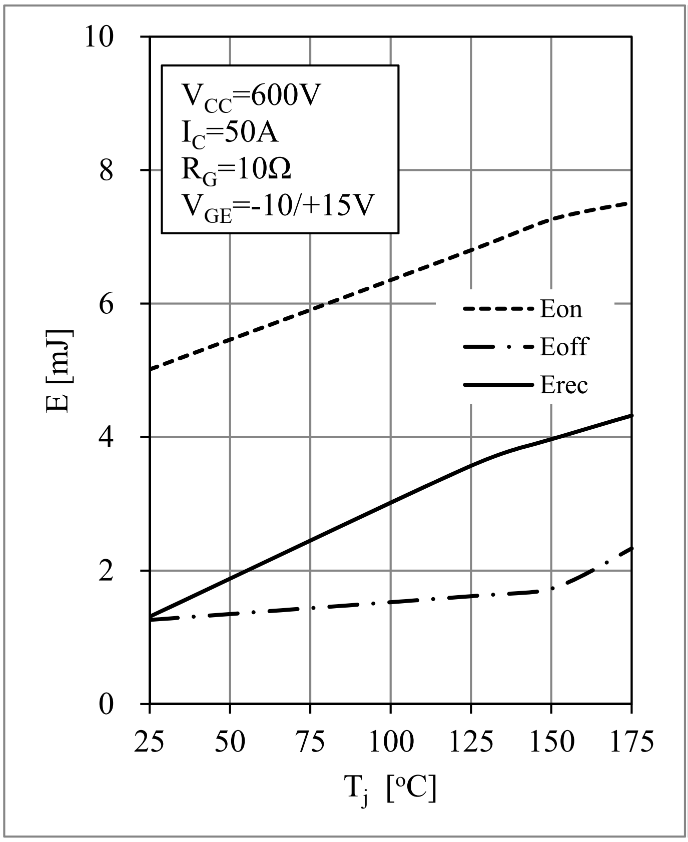


Fig 11. Switching Energy Loss vs. T_j

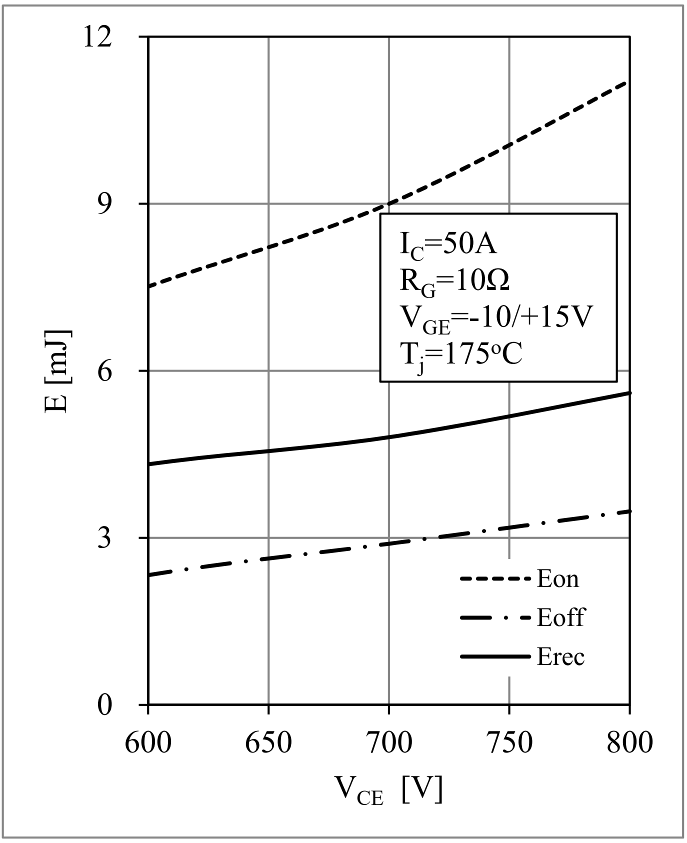
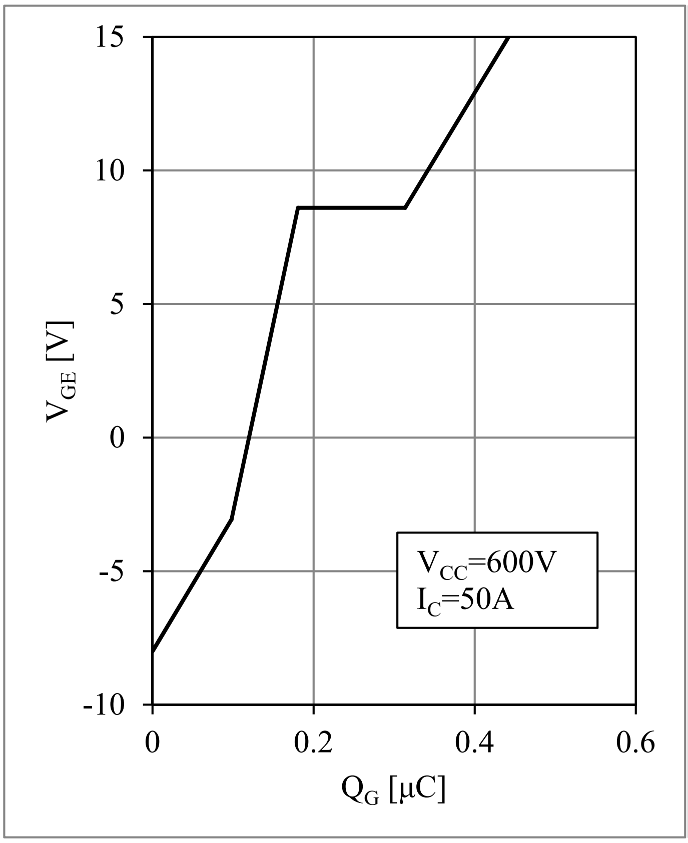


Fig 12. Switching Energy Loss vs.V_{CE}



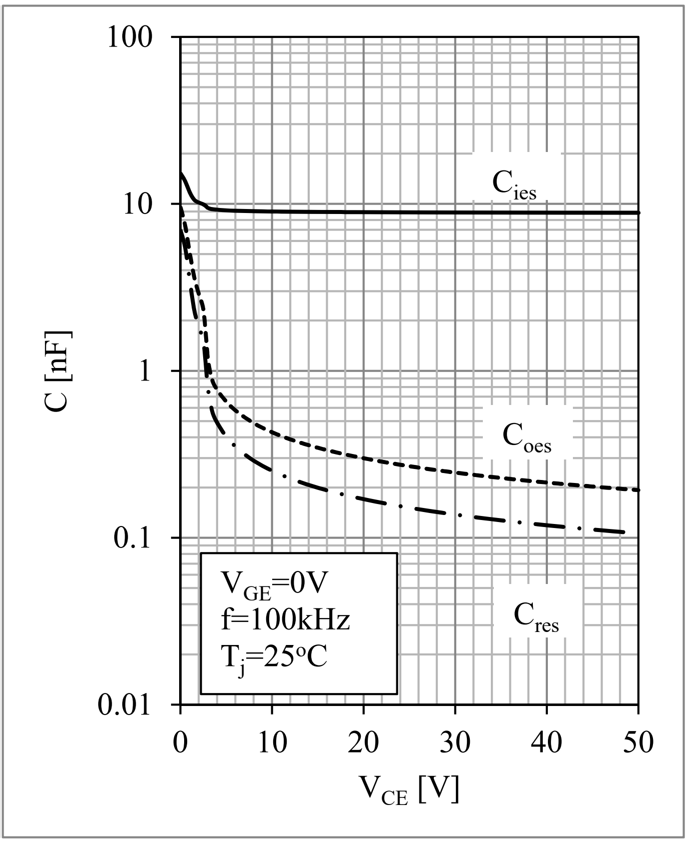
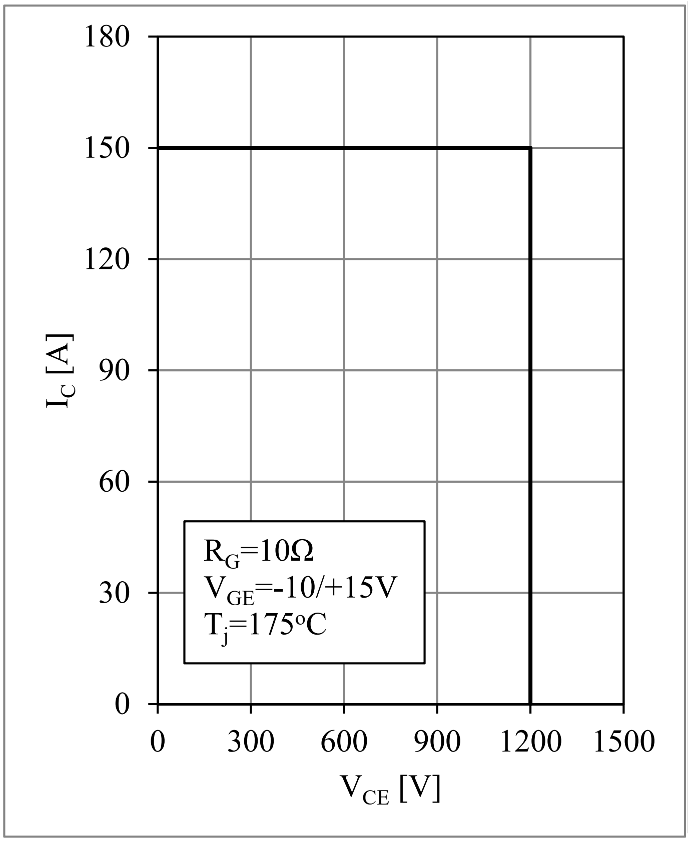
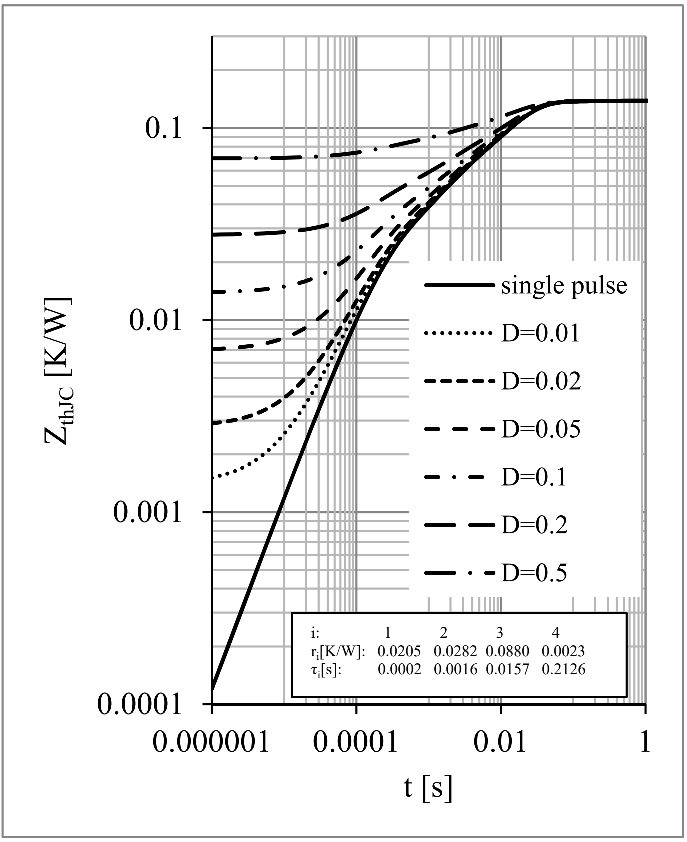


Fig 13. IGBT Capacity Charcteristic

Fig 14.IGBT Capacity Charcteristic





i:	1	2	3	4
r_i[K/W]:	0.0205	0.0282	0.0880	0.0023
τ_i[s]:	0.0002	0.0016	0.0157	0.2126

Fig 15. RBSOA

Fig 16. Diode Forward Characteristics

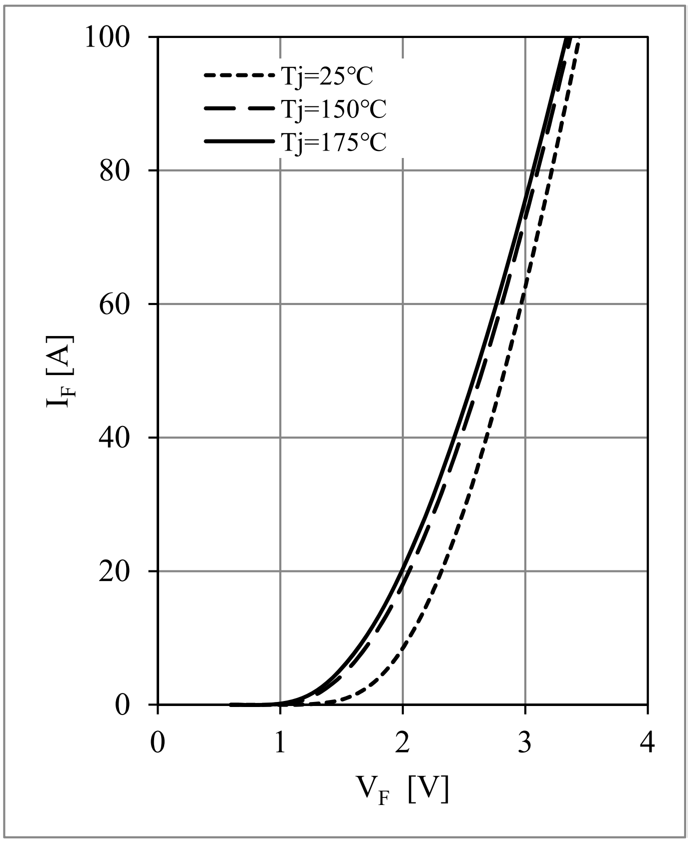


Fig 17. Reverse Recovery Time vs. diF/dt

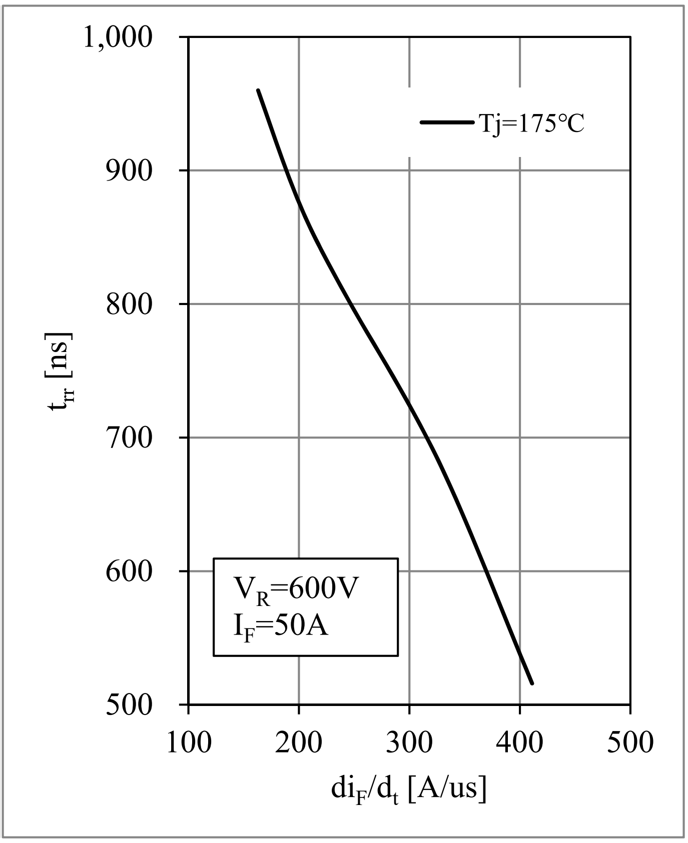


Fig 18. Reverse Recovery Time vs. diF/dt

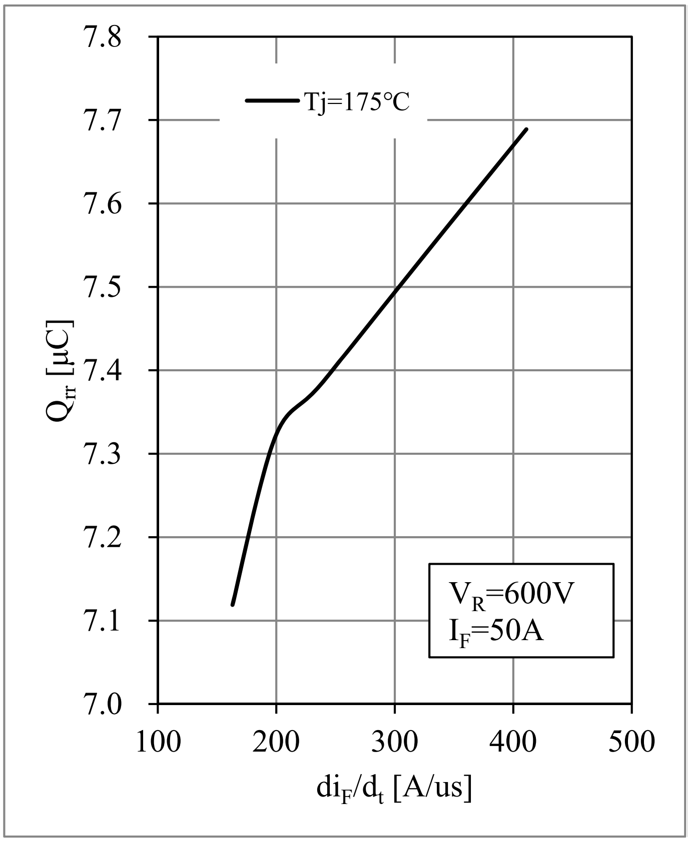


Fig 19. Reverse Recovery Charge vs. diF/dt

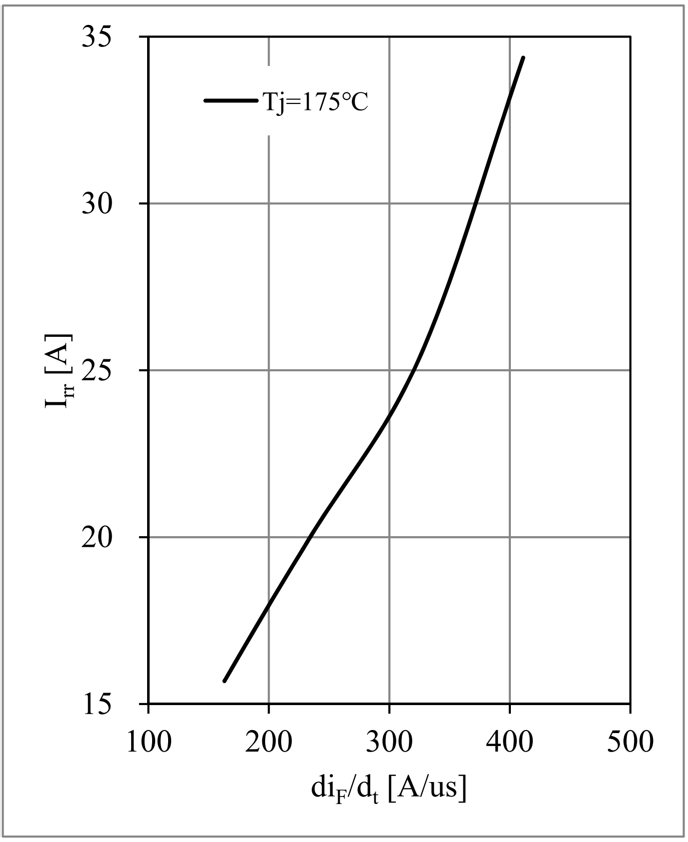


Fig 20. Reverse Recovery Current vs. diF/dt

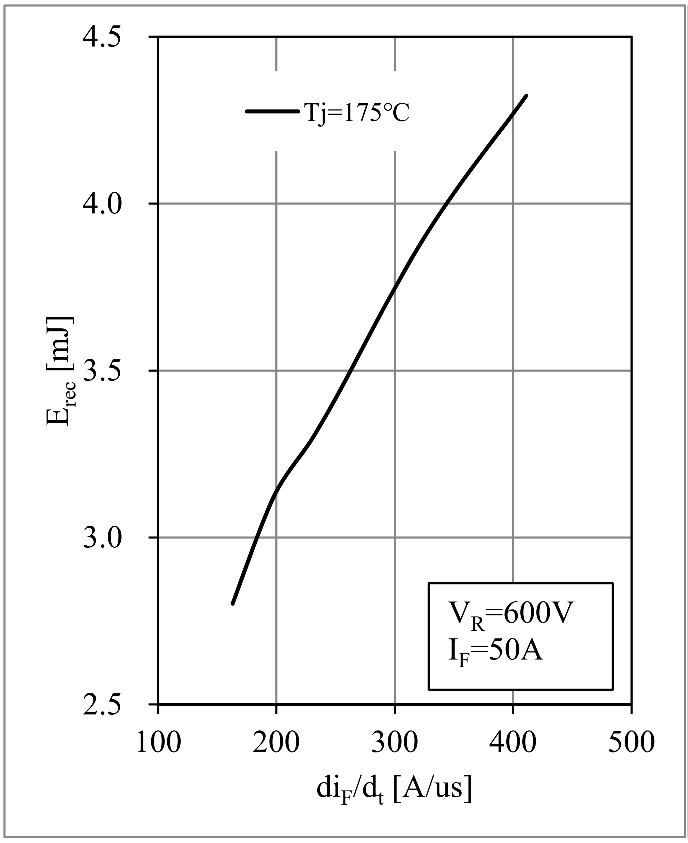


Fig 21. Reverse Energy Losses vs. diF/dt

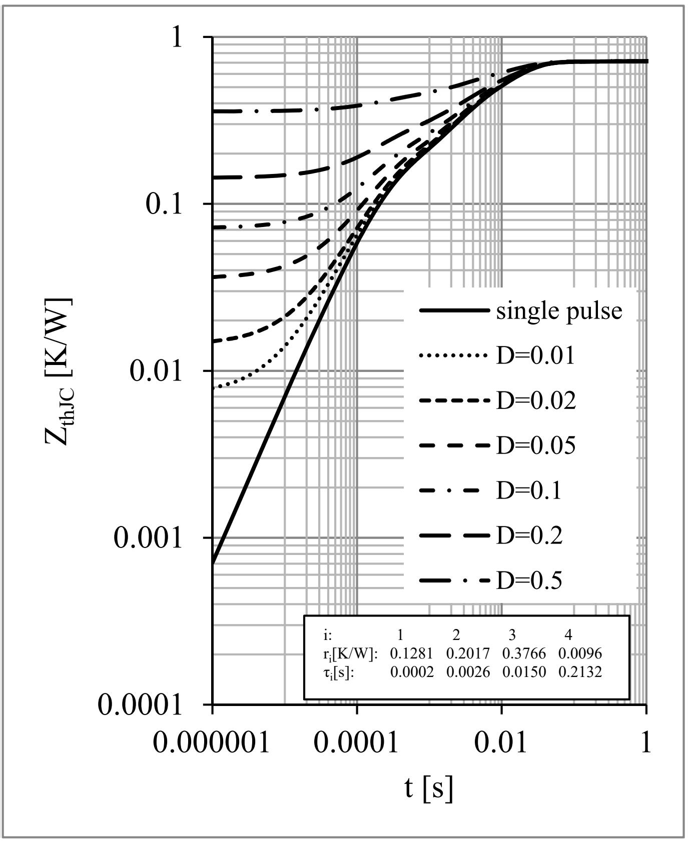
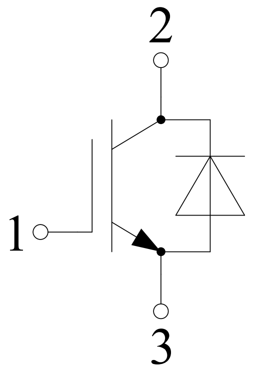


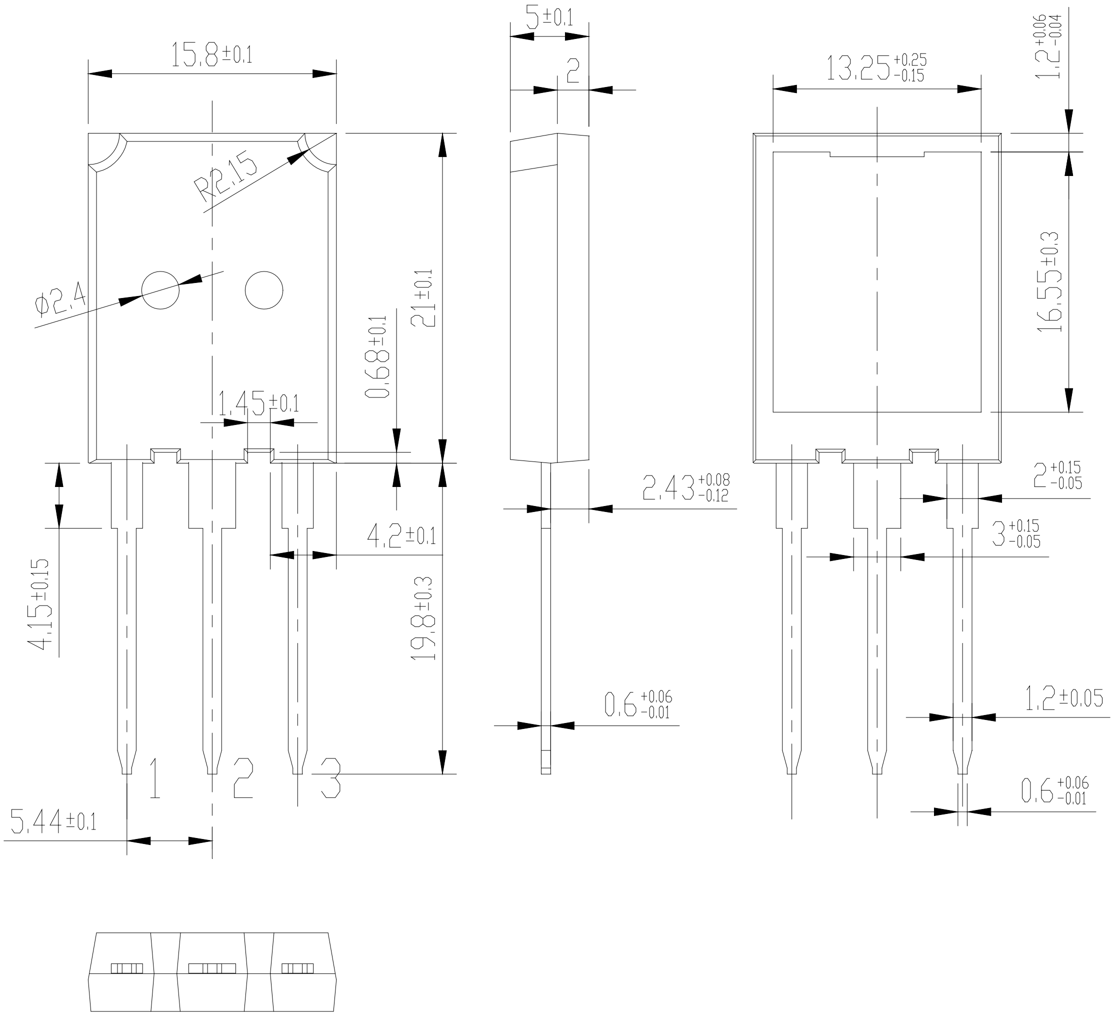
Fig 22. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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