DOSEMI

IGBT

DG50A07EBFS

750V/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 hybrid and electric vehicle.

Features

- Low $V_{CE(sat)}$ Fast IGBT technology
- Low switching loss
- Maximum junction temperature 175°C
- $V_{CE(sat)}$ with positive temperature coefficient

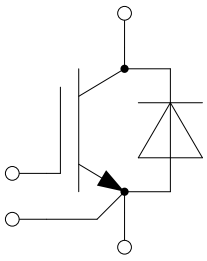
Typical Applications

- DC/DC converter
- On board charger (OBC)
- Inductive charger systems

Validation

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

Equivalent Circuit Schematic



Type	Package	Marking	Shipping
DG50A07EBFS	TO-263-7L	DG50A07EBFS	30Units/Tube

Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	750	V
V_{GES}	Gate-Emitter Voltage Transient Gate-Emitter Voltage	±20 ±30	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	85 50	A
I_{CM}	Pulsed Collector Current t_p limited by T_{vjmax}	150	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	272	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	750	V
I_F	Diode Continuous Forward Current @ T_C=25°C @ T_C=100°C	85 50	A
I_{FM}	Diode Pulsed Current t_p limited by T_{vjmax}	150	A

Discrete

Symbol	Description	Values	Unit
T_{vjop}	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
M	Mounting Torque, Screw M3	0.6	N.m

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_{vj}=25°C		1.55	2.00	V
		I_C=50A,V_{GE}=15V, T_{vj}=150°C		1.90		
		I_C=50A,V_{GE}=15V, T_{vj}=175°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	3.5	4.0	4.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			200	uA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_{vj}=25°C			100	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		1.94		nF
C_{oes}	Output Capacitance			0.06		nF
C_{res}	Reverse Transfer Capacitance			0.01		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.12		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=400V,I_C=50A, R_G=8.2Ω,L_S=40nH, V_{GE}=±15V,T_{vj}=25 °C		15		ns
t_r	Rise Time			46		ns
$t_{d(off)}$	Turn-Off Delay Time			75		ns
t_f	Fall Time			20		ns
E_{on}	Turn-On Switching Loss			1.76		mJ
E_{off}	Turn-Off Switching Loss			0.59		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=400V,I_C=50A, R_G=8.2Ω,L_S=40nH, V_{GE}=±15V,T_{vj}=150 °C		16		ns
t_r	Rise Time			46		ns
$t_{d(off)}$	Turn-Off Delay Time			95		ns
t_f	Fall Time			24		ns
E_{on}	Turn-On Switching Loss			2.27		mJ
E_{off}	Turn-Off Switching Loss			0.78		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=400V,I_C=50A, R_G=8.2Ω,L_S=40nH, V_{GE}=±15V,T_{vj}=175 °C		17		ns
t_r	Rise Time			45		ns
$t_{d(off)}$	Turn-Off Delay Time			99		ns
t_f	Fall Time			27		ns
E_{on}	Turn-On Switching Loss			2.44		mJ
E_{off}	Turn-Off Switching Loss			0.92		mJ

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_C=50A,V_{GE}=0V,T_{vj}=25°C		1.80	2.25	V
		I_C=50A,V_{GE}=0V,T_{vj}=150°C		1.75		
		I_C=50A,V_{GE}=0V,T_{vj}=175°C		1.70		
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_F=50A, -di/dt=1300A/µs,Ls=40nH, V_{GE}=-15V,T_{vj}=25°C		74		ns
Q_r	Recovered Charge			1.22		µC
I_{RM}	Peak Reverse Recovery Current			24		A
E_{rec}	Reverse Recovery Energy			0.18		mJ
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_F=50A, -di/dt=840A/µs,Ls=40nH, V_{GE}=-15V,T_{vj}=150°C		138		ns
Q_r	Recovered Charge			2.52		µC
I_{RM}	Peak Reverse Recovery Current			31		A
E_{rec}	Reverse Recovery Energy			0.50		mJ
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_F=50A, -di/dt=840A/µs,Ls=40nH, V_{GE}=-15V,T_{vj}=175°C		153		ns
Q_r	Recovered Charge			2.89		µC
I_{RM}	Peak Reverse Recovery Current			33		A
E_{rec}	Reverse Recovery Energy			0.59		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)			0.550 0.657	K/W
R_{thJA}	Junction-to-Ambient		40		K/W

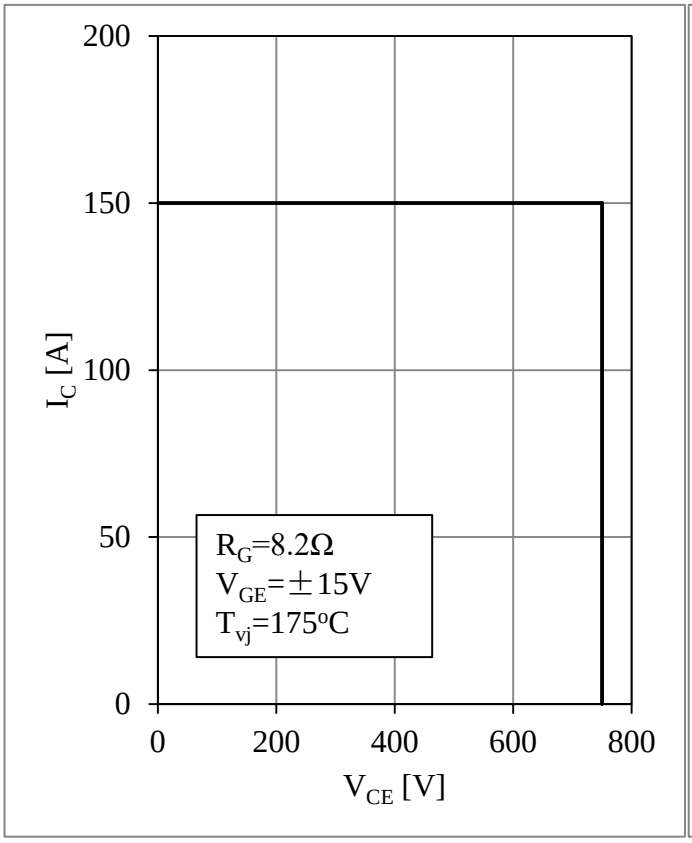


Fig 1. RBSOA

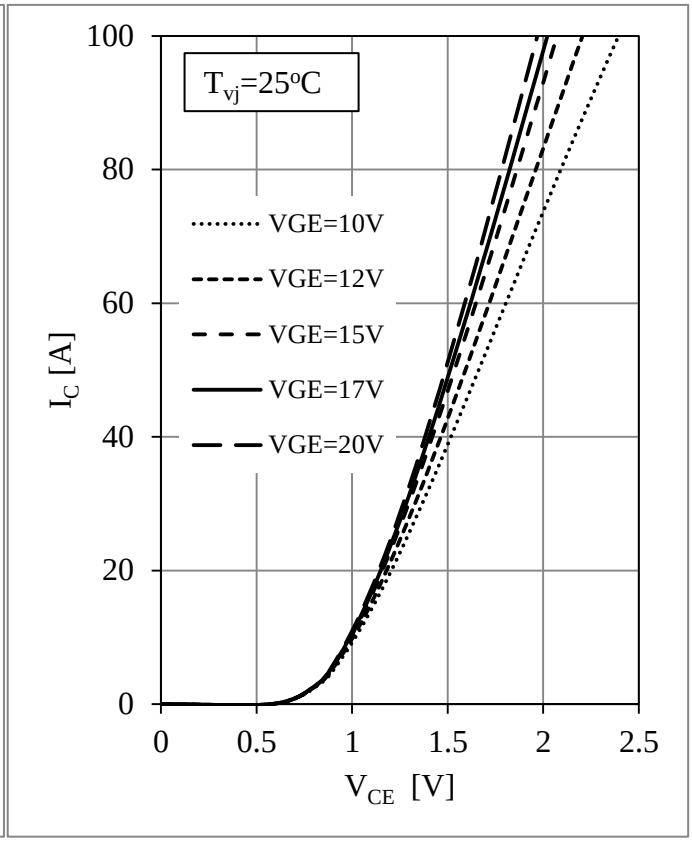


Fig 2. IGBT Output Characteristics

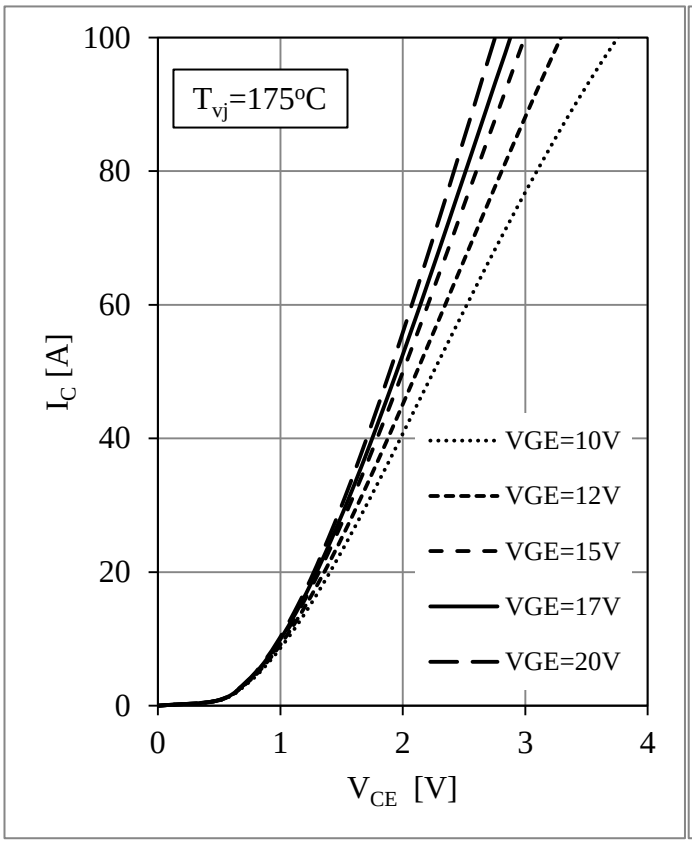


Fig 3. IGBT Output Characteristics

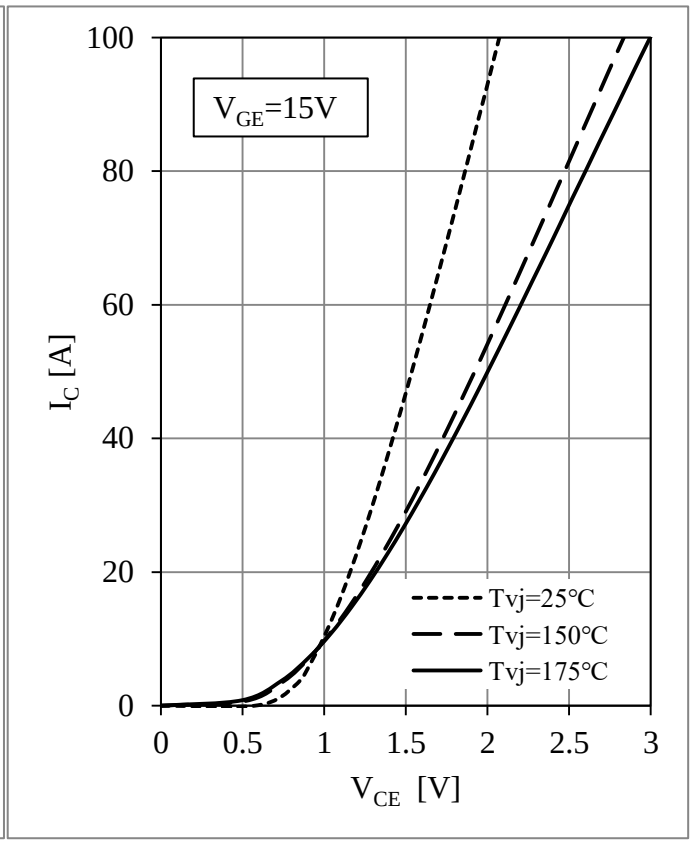


Fig 4. IGBT Output Characteristics

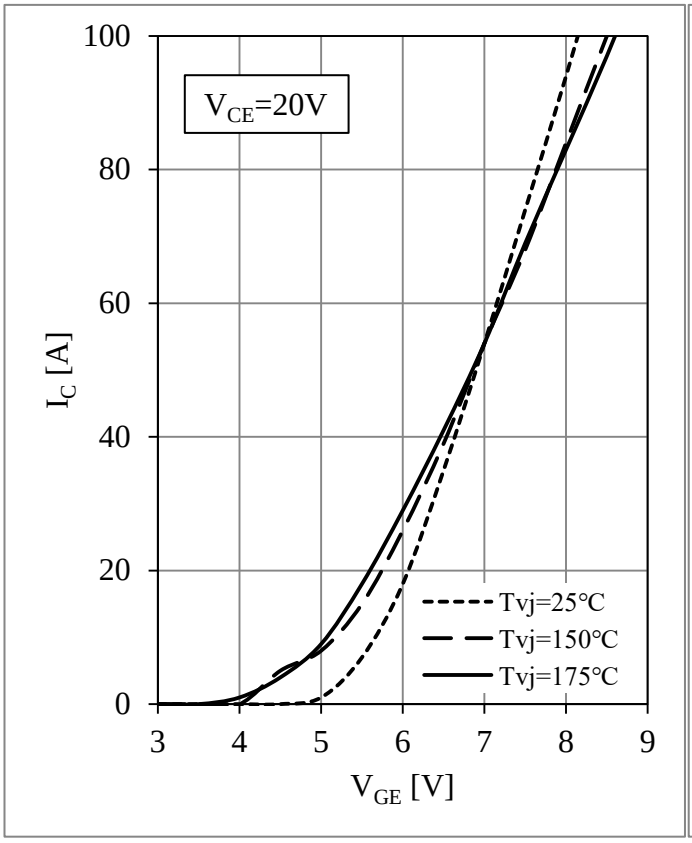


Fig 5. IGBT Transfer Characteristics

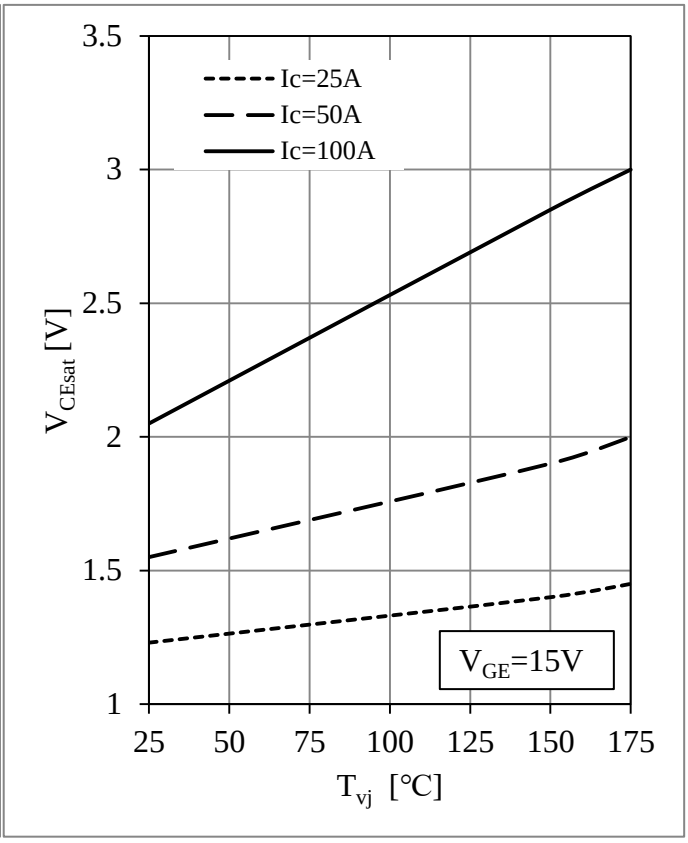


Fig 6. Collector-emitter saturation voltage vs. T_{vj}

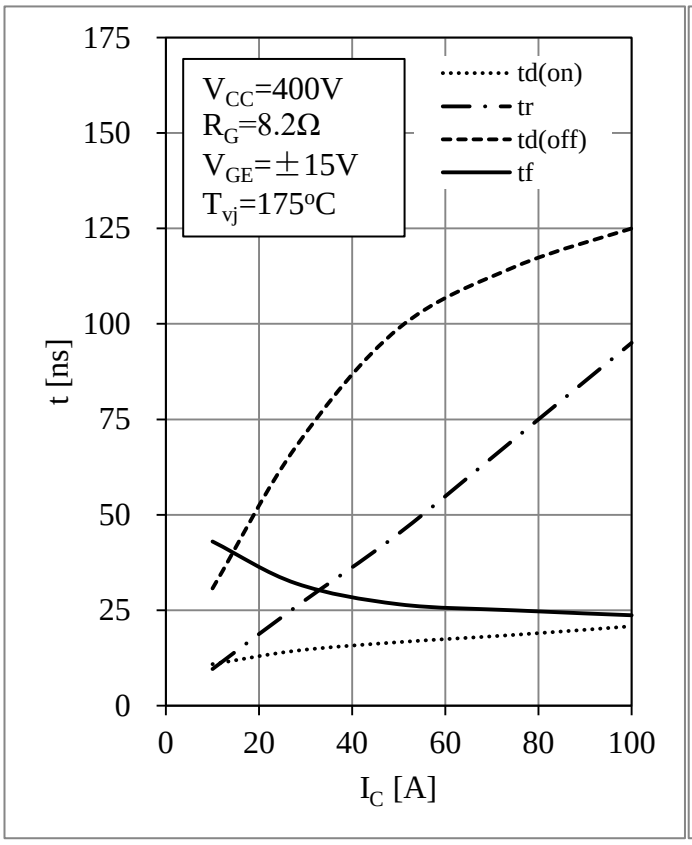


Fig 7. IGBT Switching Times vs. I_C

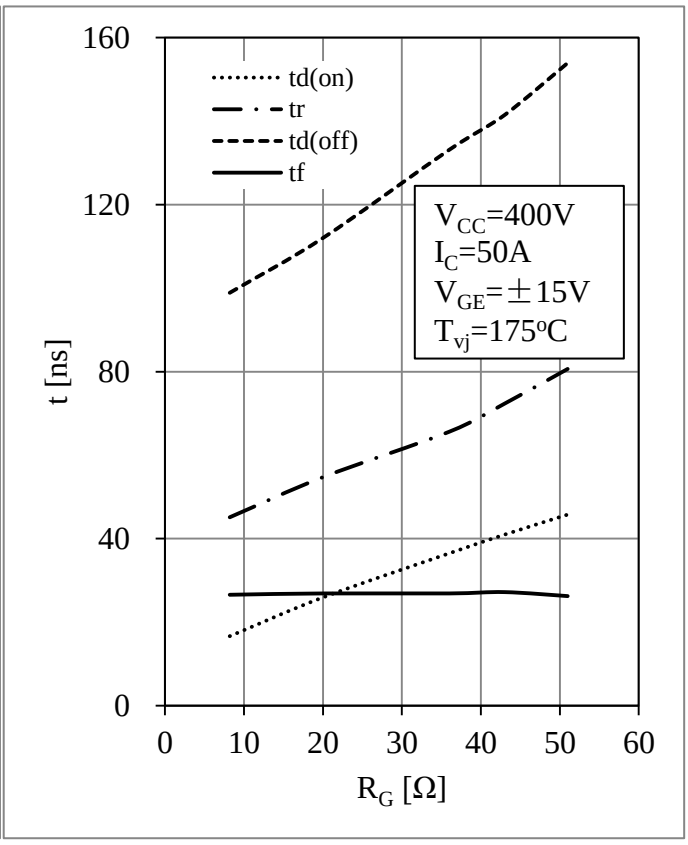


Fig 8. IGBT Switching Times vs. R_G

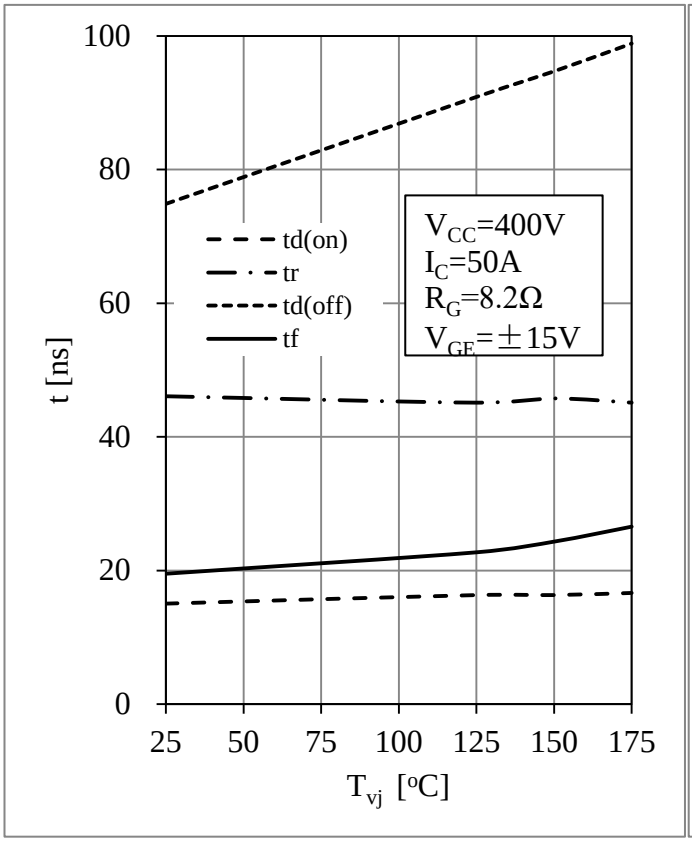


Fig 9. IGBT Switching Times vs. T_{vj}

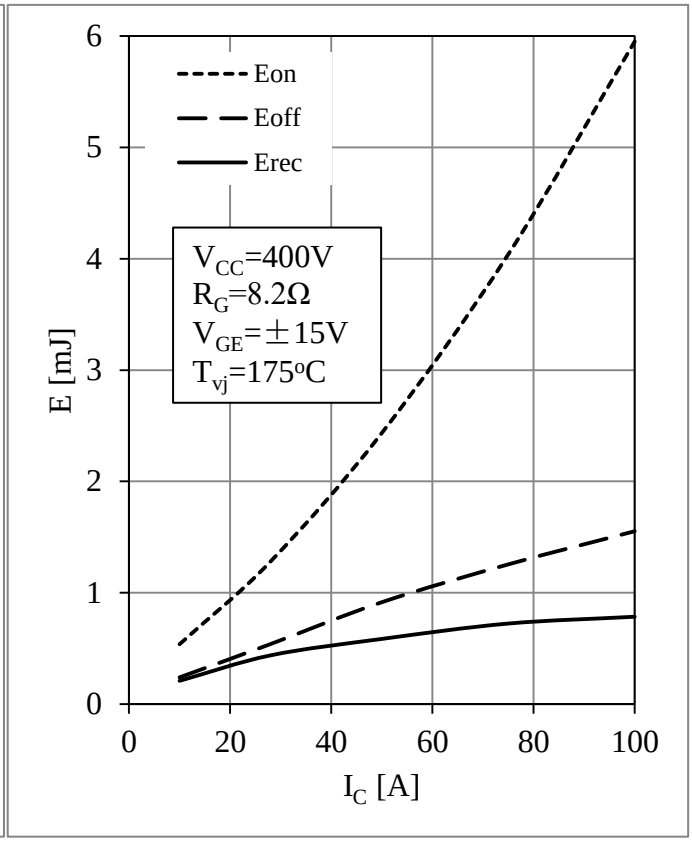


Fig 10. Switching Energy Loss vs. I_C

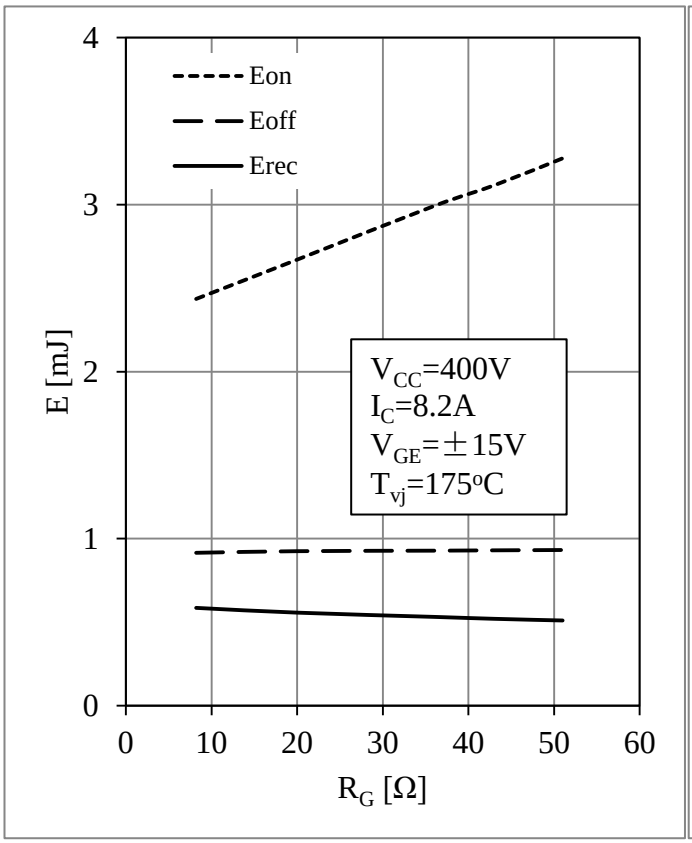


Fig 11. Switching Energy Loss vs. R_G

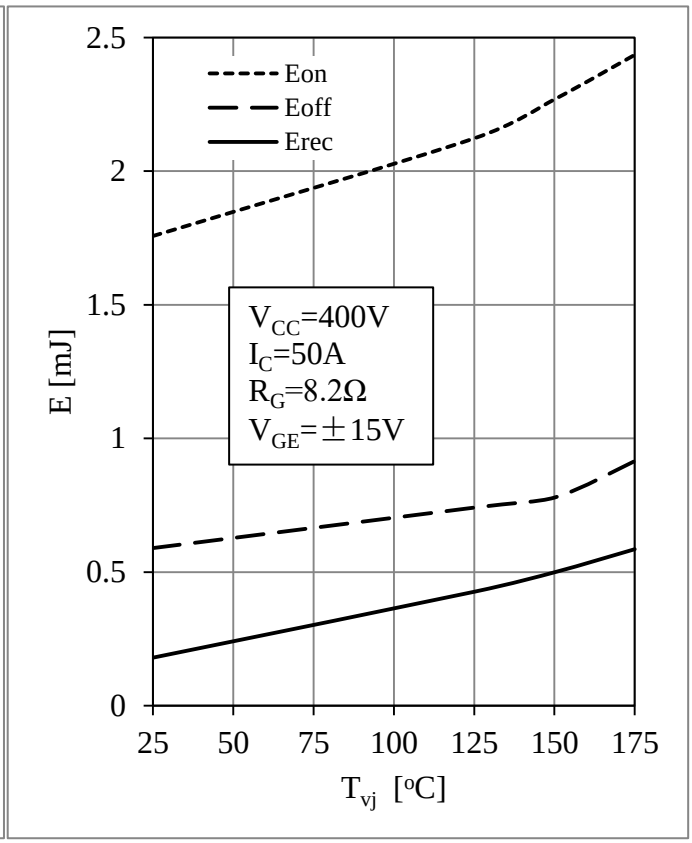


Fig 12. Switching Energy Loss vs. T_{vj}

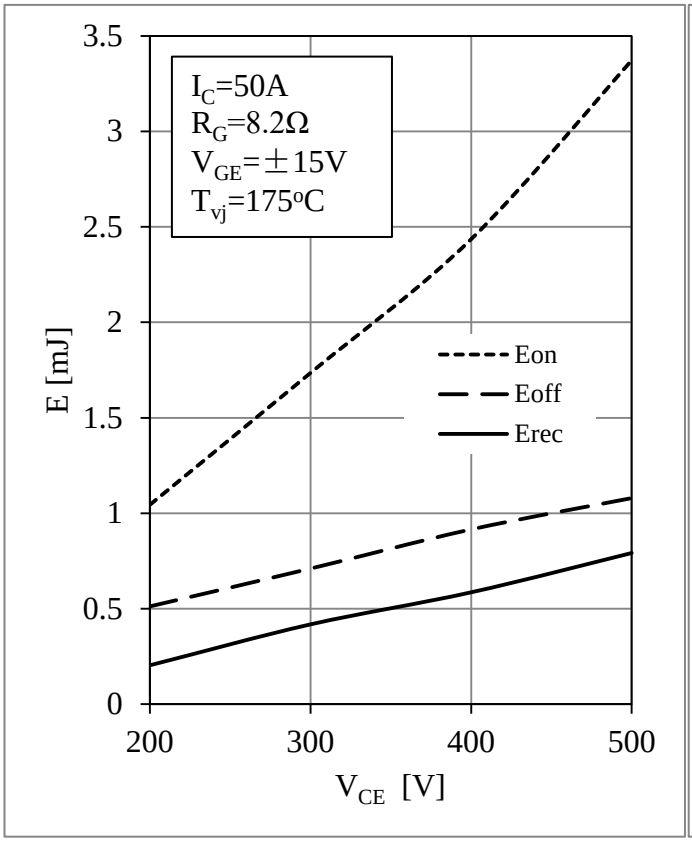


Fig 13. Switching Energy Loss vs. V_{CE}

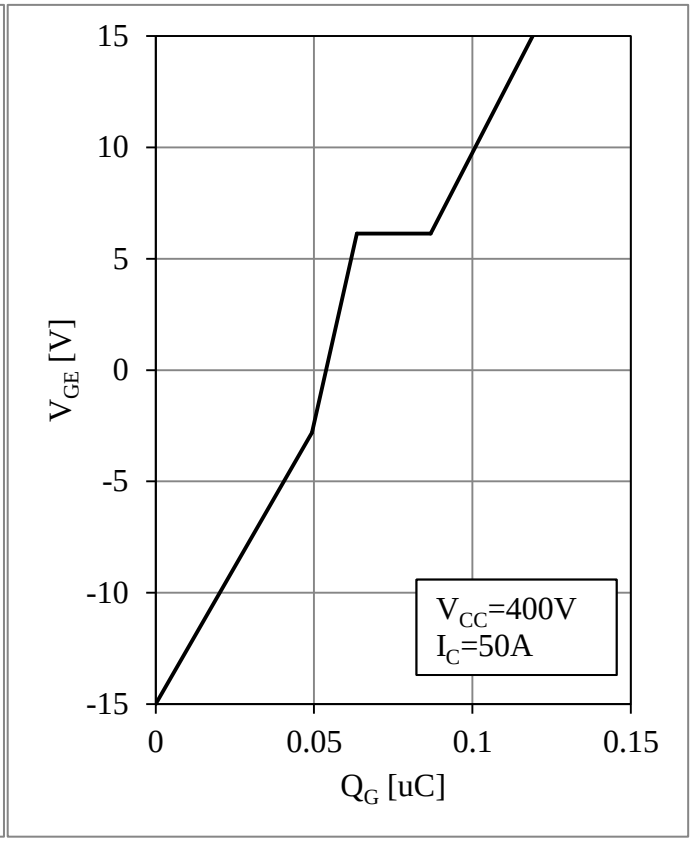


Fig 14. IGBT Gate Charge Characteristic

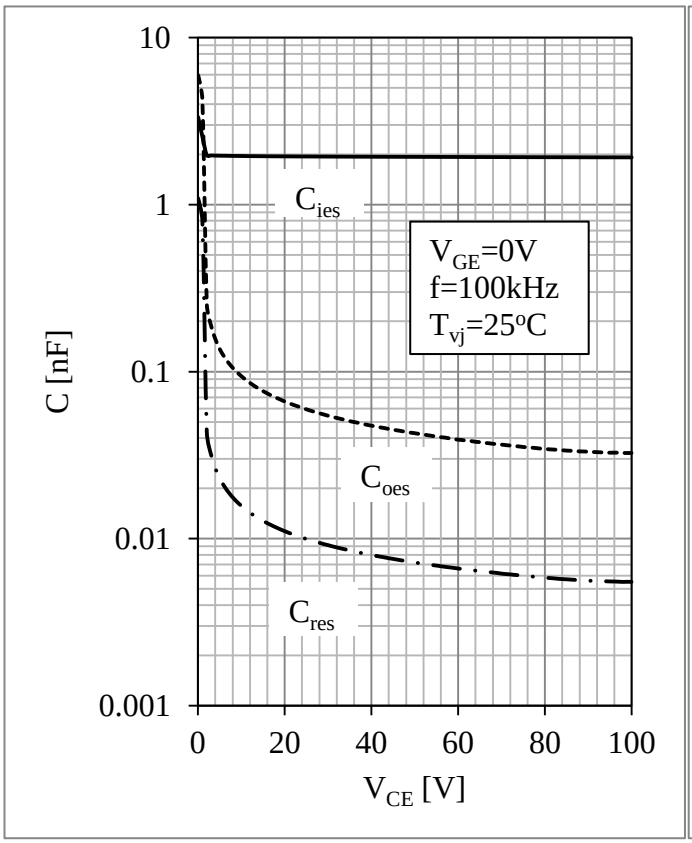


Fig 15. IGBT Capacity Charcteristic

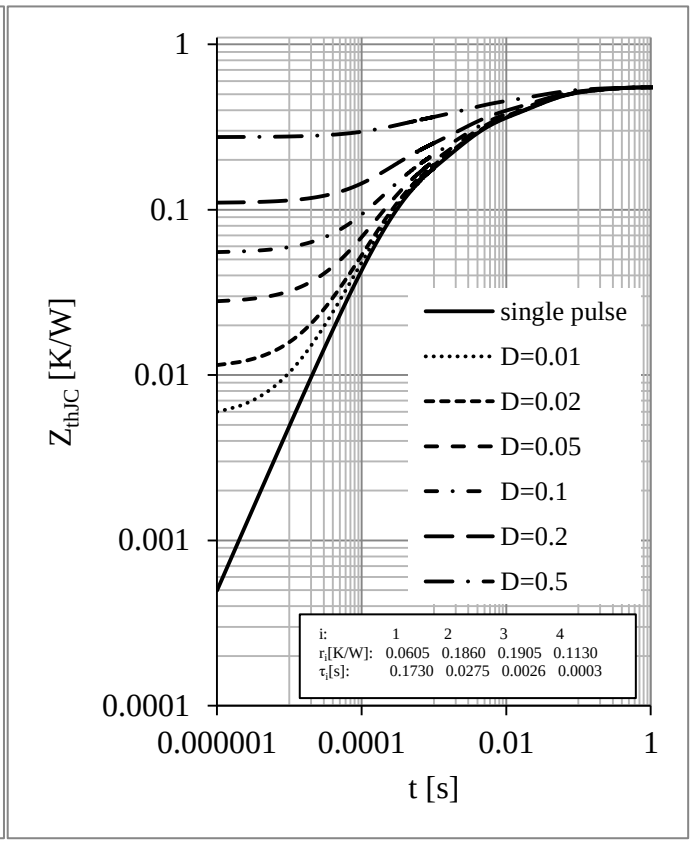


Fig 16. IGBT Transient Thermal Impedance

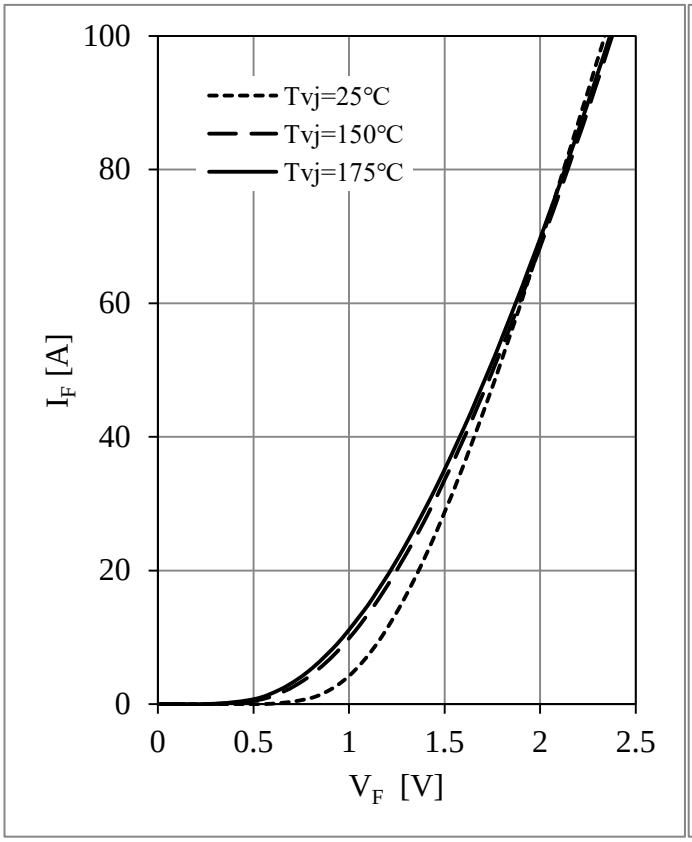


Fig 17. Diode Forward Characteristics

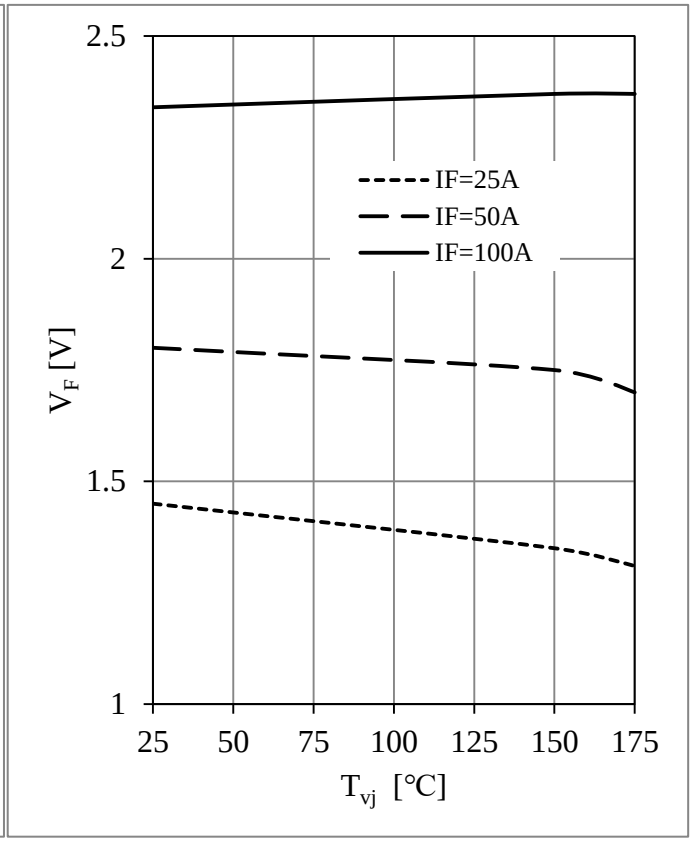


Fig 18. Diode Forward Voltage vs. T_{vj}

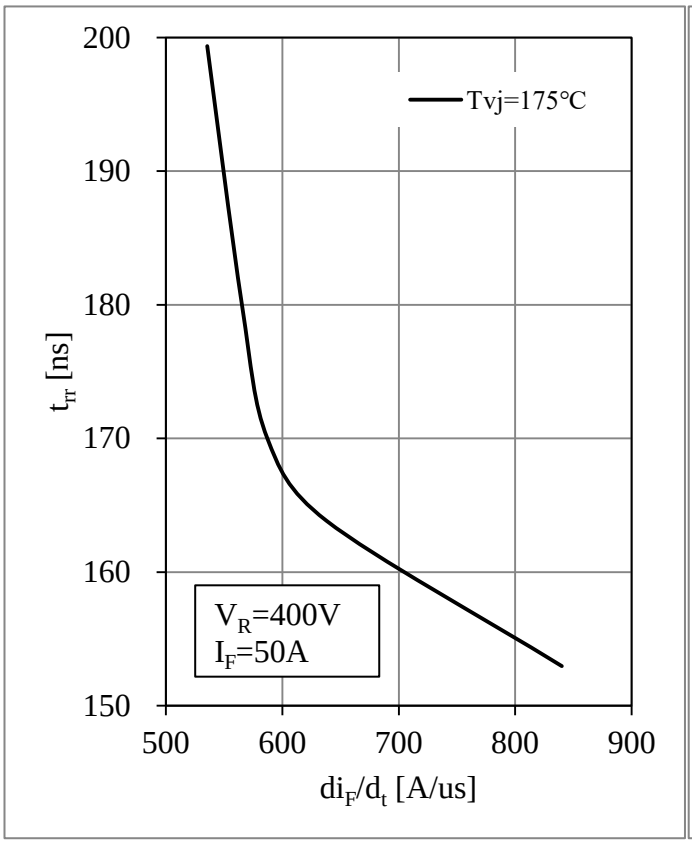


Fig 19. Reverse Recovery Time vs. di_F/d_t

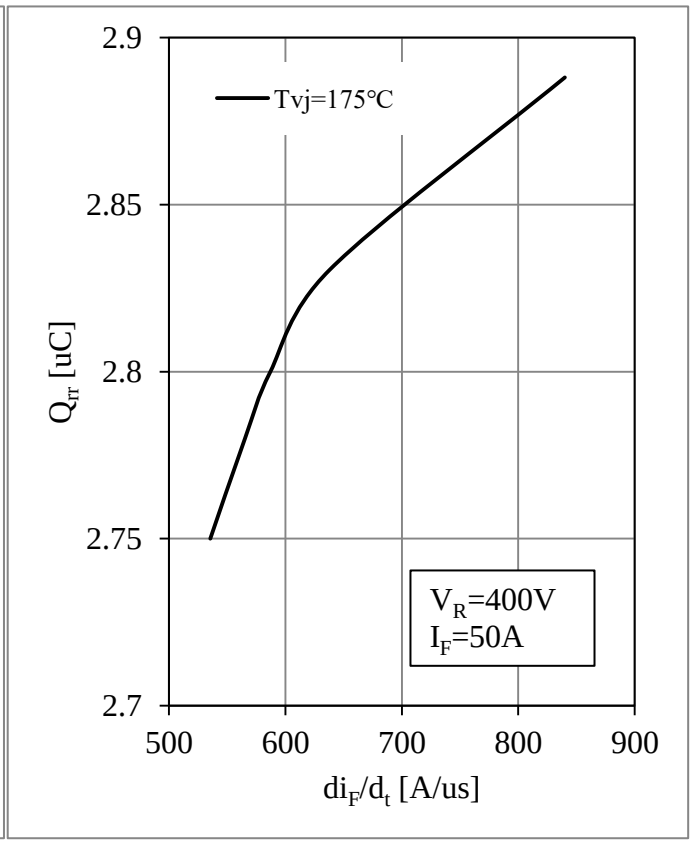


Fig 20. Reverse Recovery Charge vs. di_F/d_t

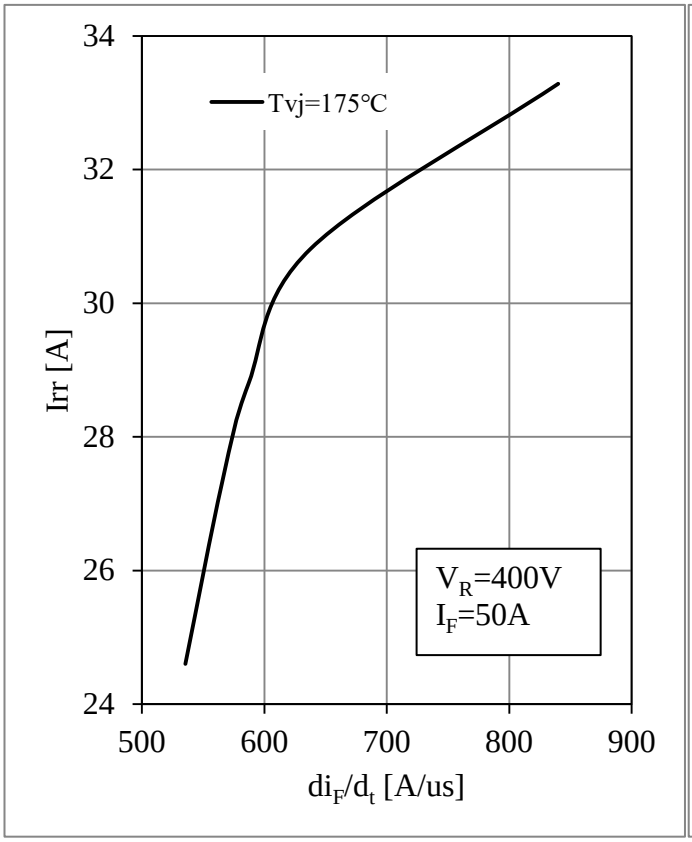


Fig 21. Reverse Recovery Current vs. di_F/d_t

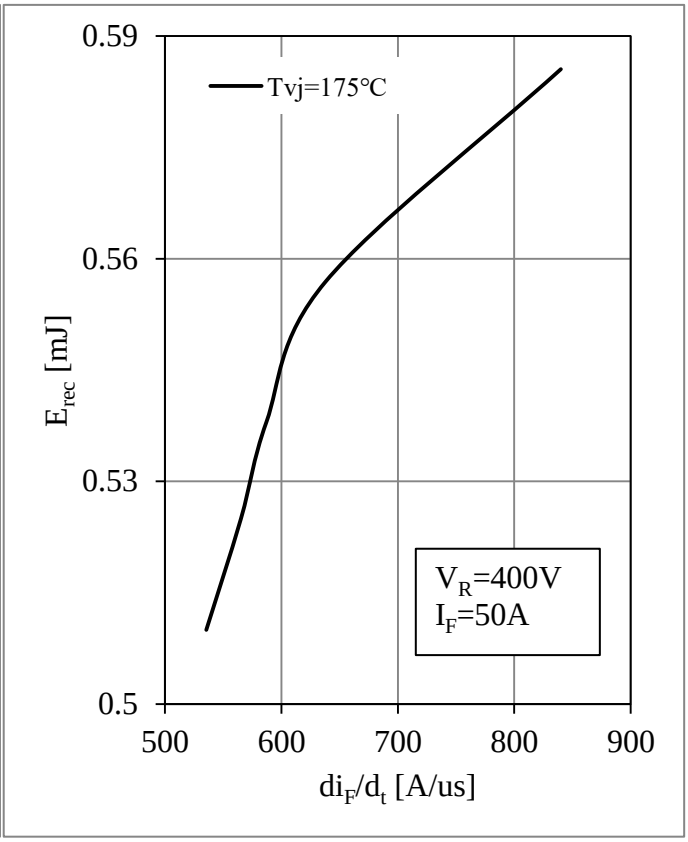


Fig 22. Reverse Energy Losses vs. di_F/d_t

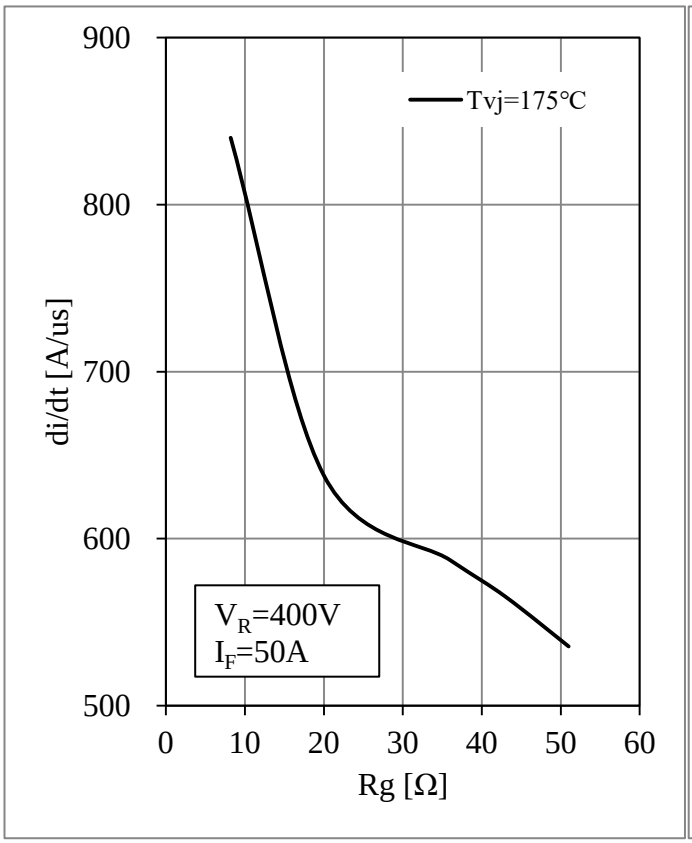


Fig 23. di_F/d_t vs. R_G

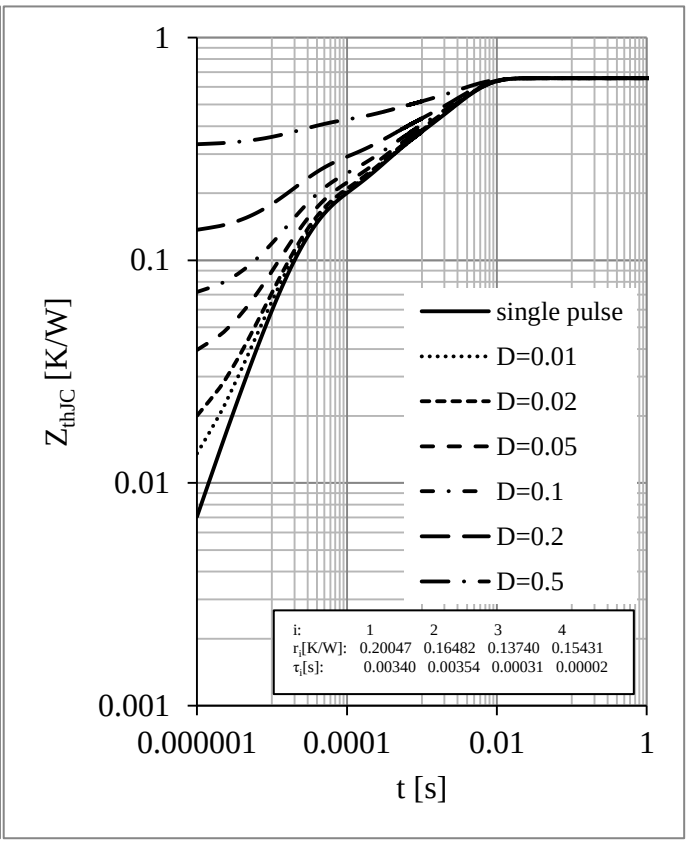
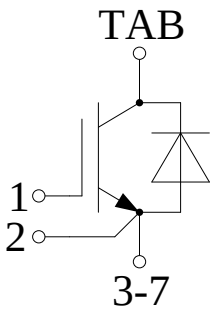


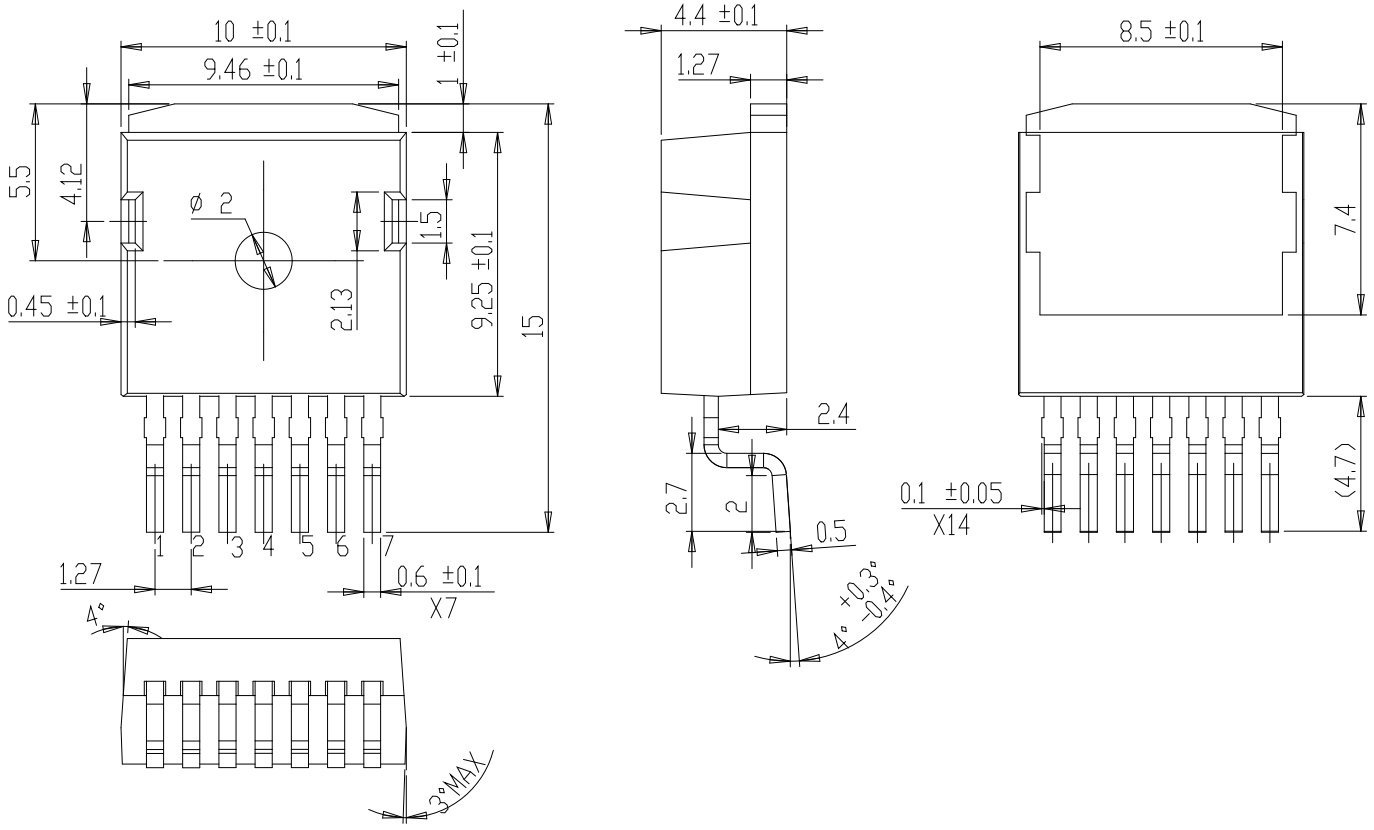
Fig 24. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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