DOSEMI

IGBT

DG160X07T2

650V/160A 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.

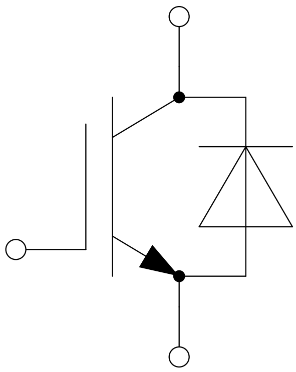
Features

- 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

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	650	V
V_{GES}	Gate-Emitter Voltage Transient Gate-Emitter Voltage	±20 -25/+30	V
I_C	Collector Current @ T_C=25°C Value limited by bondwire @ T_C=100°C	200(1) 160	A
I_{CM}	Pulsed Collector Current t_p limited by T_{jmax}	480	A
P_D	Maximum Power Dissipation @ T_j=175°C	1079	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current @ T_C=25°C Value limited by bondwire @ T_C=90°C	200(1) 160	A
I_{FM}	Diode Maximum Forward Current t_p limited by T_{jmax}	480	A

Discrete

Symbol	Description	Values	Unit
T_{jop}	Operating Junction Temperature(IGBT) Operating Junction Temperature(Doide)	-40 to +175 -40 to +150	°C
T_{STG}	Storage Temperature Range	-55 to +150	°C
T_S	Soldering Temperature,1.6mm from case for 10s	260	°C

(1) Value limited by bondwire

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=160A,V_{GE}=15V, T_j=25°C		1.55	2.00	V
		I_C=160A,V_{GE}=15V, T_j=150°C		1.80		
		I_C=160A,V_{GE}=15V, T_j=175°C		1.90		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2.56mA,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		17.2		nF
C_{oes}	Output Capacitance			0.79		nF
C_{res}	Reverse Transfer Capacitance			0.47		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.89		uC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=400V,I_C=160A, R_G=5Ω,V_{GE}=-8/+15V, L_S=40nH,T_j=25°C		60		ns
t_r	Rise Time			297		ns
$t_{d(off)}$	Turn-Off Delay Time			214		ns
t_f	Fall Time			84		ns
E_{on}	Turn-On Switching Loss			17.1		mJ
E_{off}	Turn-Off Switching Loss			4.06		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=400V,I_C=160A, R_G=5Ω, V_{GE}=-8/+15V, L_S=40nH,T_j=150°C		64		ns
t_r	Rise Time			324		ns
$t_{d(off)}$	Turn-Off Delay Time			239		ns
t_f	Fall Time			126		ns
E_{on}	Turn-On Switching Loss			20.1		mJ
E_{off}	Turn-Off Switching Loss			5.21		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=400V,I_C=160A, R_G=5Ω, V_{GE}=-8/+15V, L_S=40nH,T_j=175°C		65		ns
t_r	Rise Time			328		ns
$t_{d(off)}$	Turn-Off Delay Time			245		ns
t_f	Fall Time			145		ns
E_{on}	Turn-On Switching Loss			21.3		mJ
E_{off}	Turn-Off Switching Loss			5.82		mJ
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150 °C,V_{CC}=400V, V_{CEM}≤650V		800		A

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=160A,V_{GE}=0V,T_j=25°C		1.70	2.15	V
		I_F=160A,V_{GE}=0V,T_j=150°C		1.65		
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_F=160A, -di/dt=480A/μs,V_{GE}=-8V L_S=40nH,T_j=25°C		122		ns
Q_r	Recovered Charge			1.63		μC
I_{RM}	Peak Reverse Recovery Current			23.3		A
E_{rec}	Reverse Recovery Energy			0.53		mJ
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_F=160A, -di/dt=470A/μs,V_{GE}=-8V L_S=40nH,T_j=150°C		146		ns
Q_r	Recovered Charge			4.72		μC
I_{RM}	Peak Reverse Recovery Current			37.1		A
E_{rec}	Reverse Recovery Energy			1.29		mJ

Discrete Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT)			0.139	K/W
	Junction-to-Case (per Diode)			0.252	
R_{thJA}	Junction-to-Ambient		40		K/W

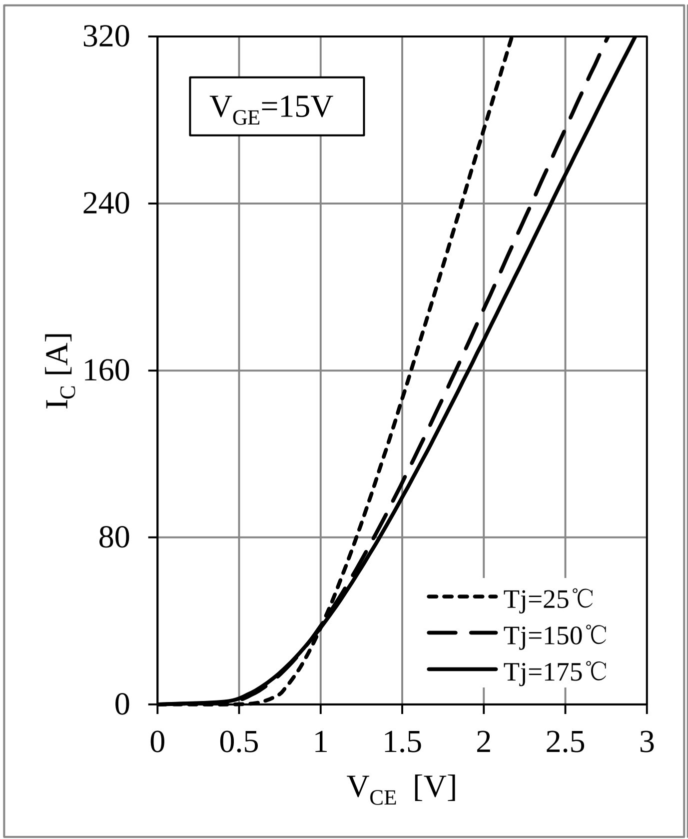


Fig 1. IGBT-inverter Output Characteristics

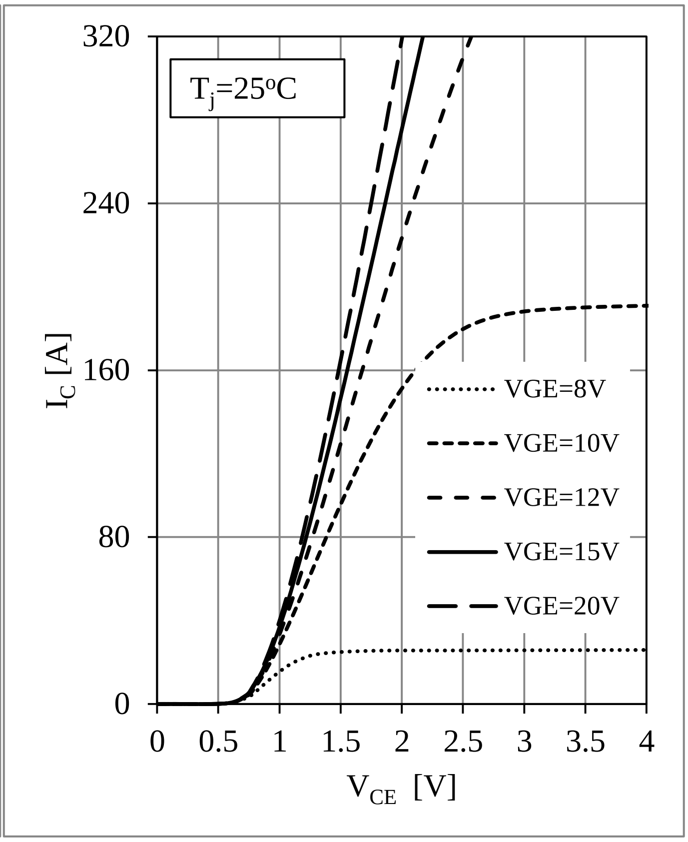


Fig 2. IGBT Output Characteristics

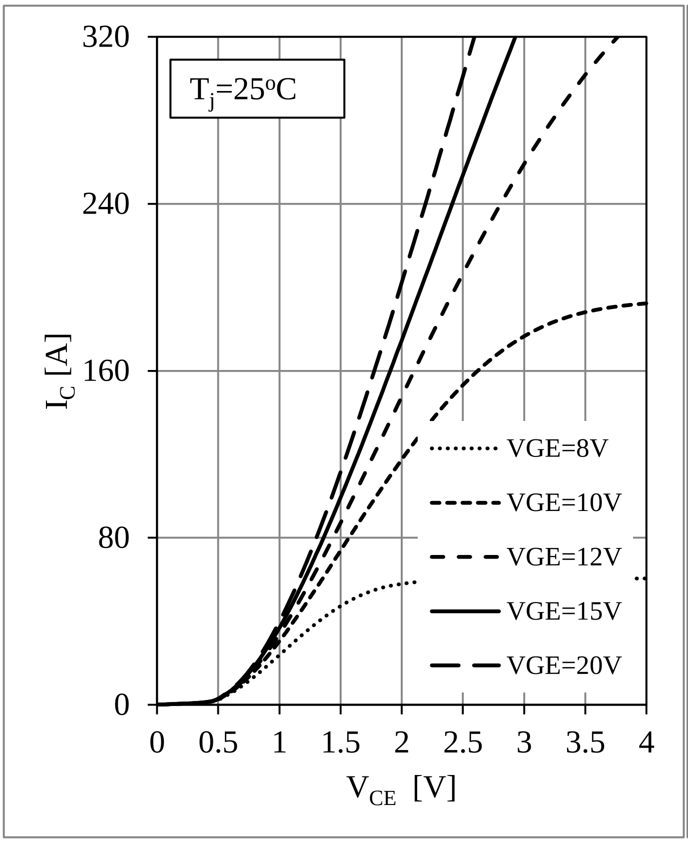


Fig 3. IGBT Output Characteristics

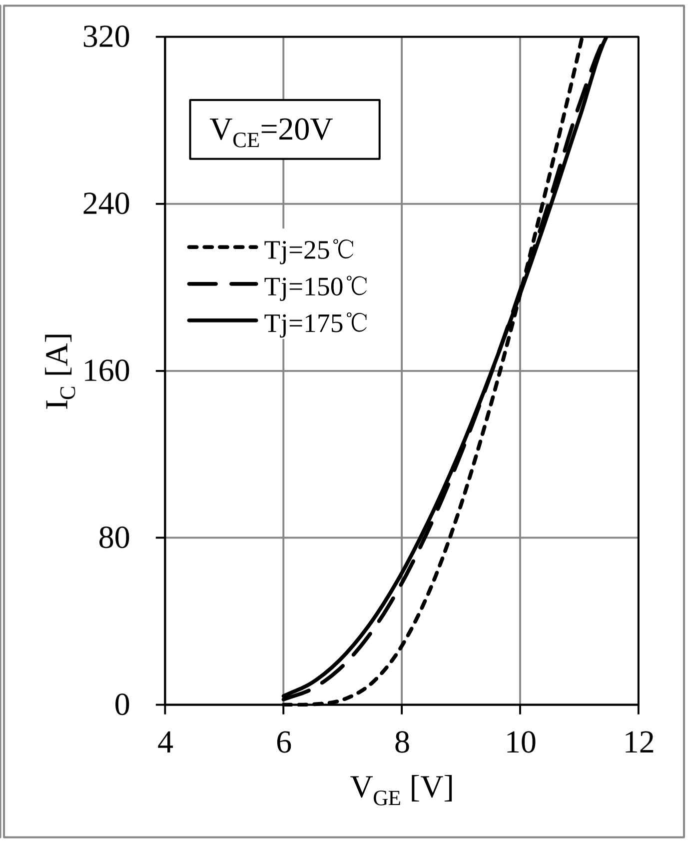


Fig 4. IGBT Transfer Characteristics

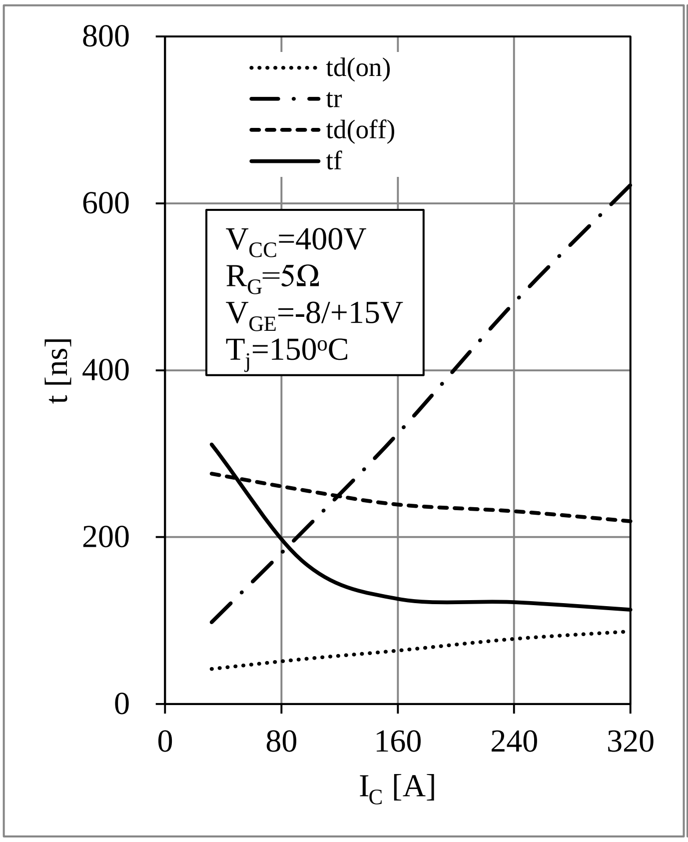


Fig 5. IGBT Switching Times as.I_C

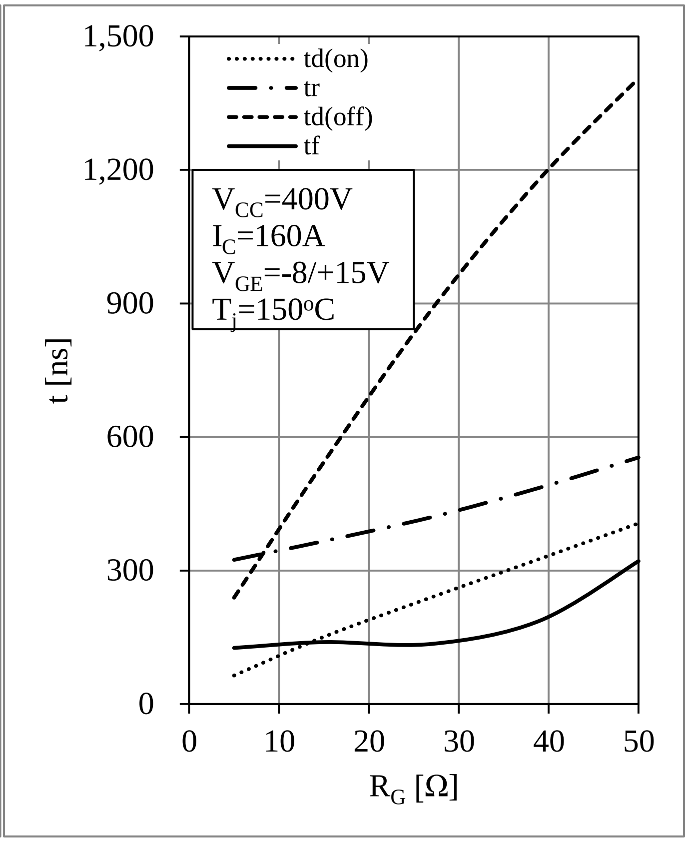


Fig 6. IGBT Switching Times as. R_G

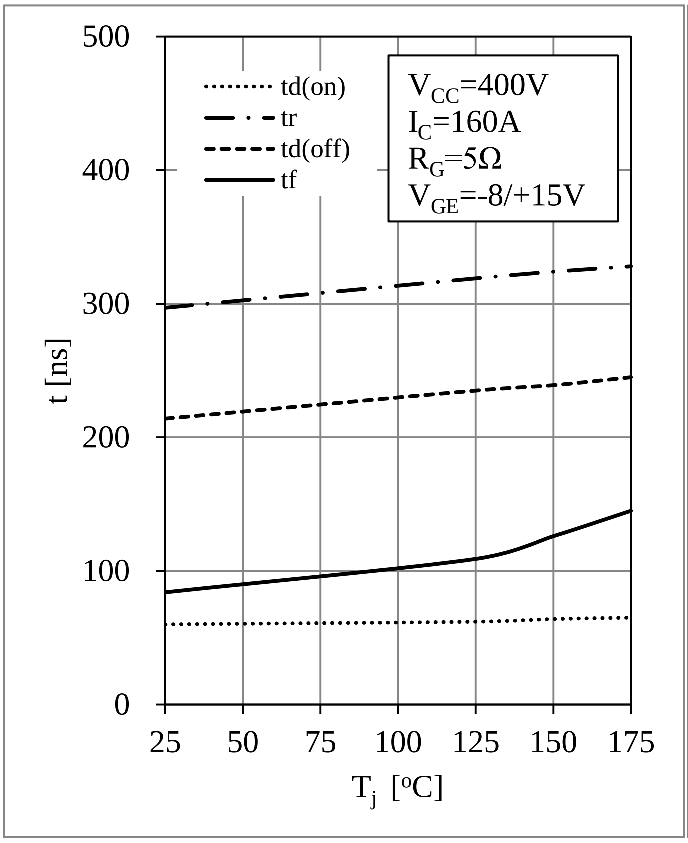


Fig 7. IGBT Switching Times vs. T_j

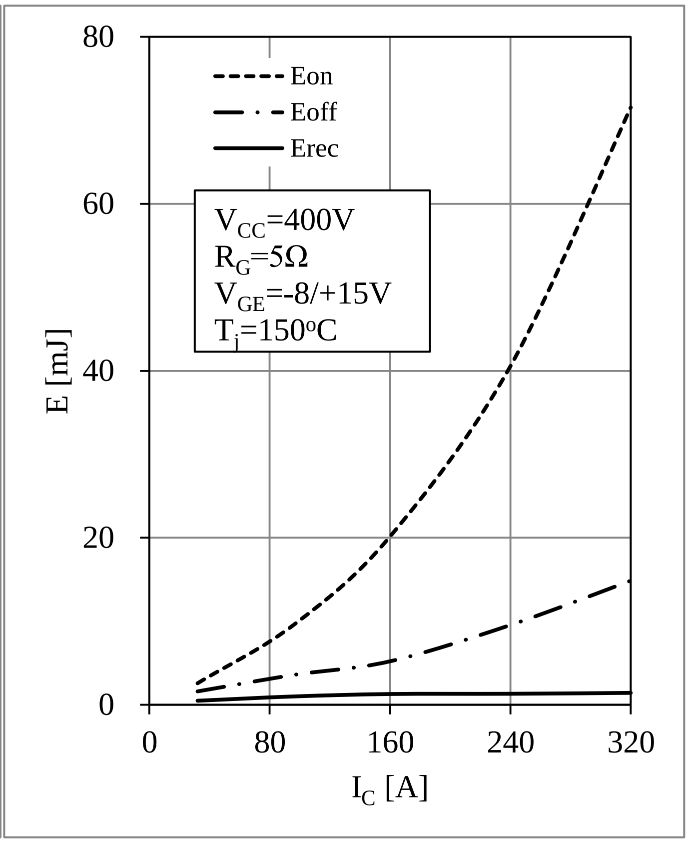


Fig 8. Switching Energy Loss vs. I_C

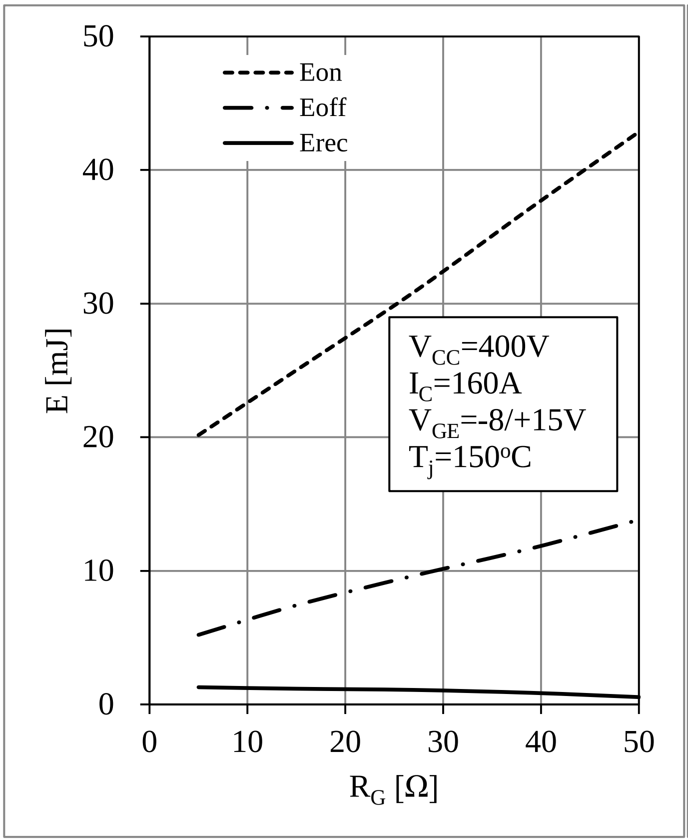


Fig 9. Switching Energy Loss vs. R_G

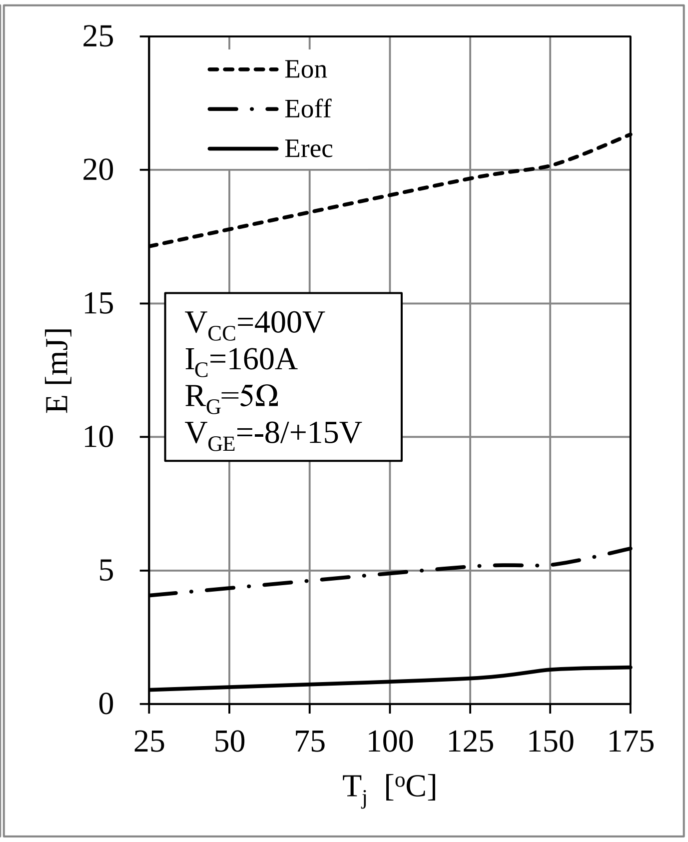


Fig 10. Switching Energy Loss vs. T_j

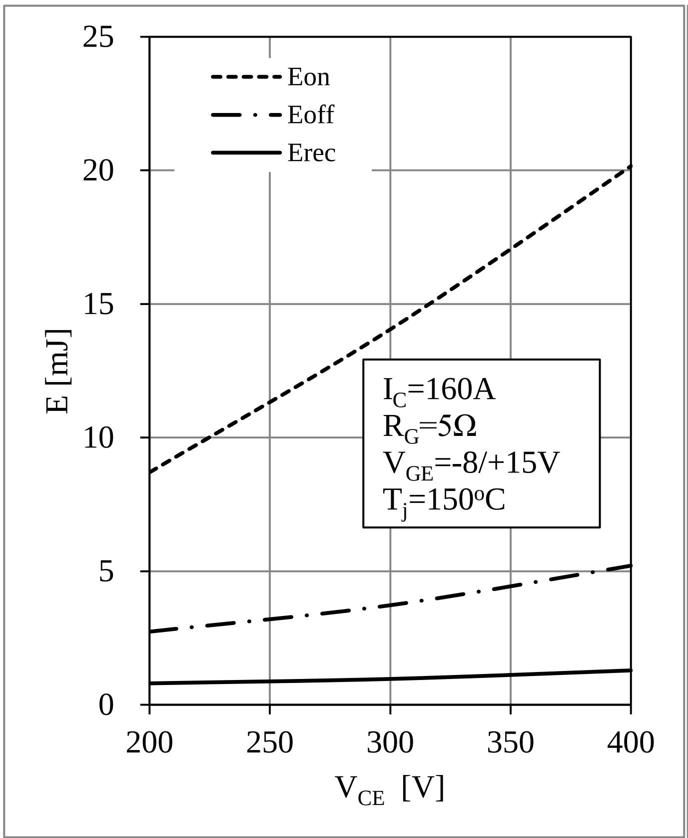


Fig 11. Switching Energy Loss vs.V_{CE}

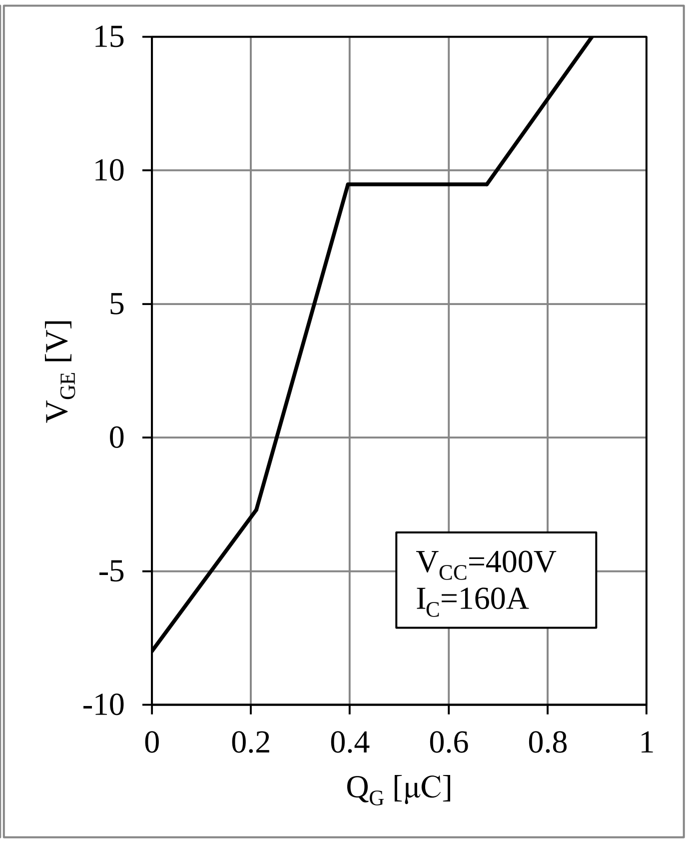


Fig 12. IGBT Gate Charge Characteristic

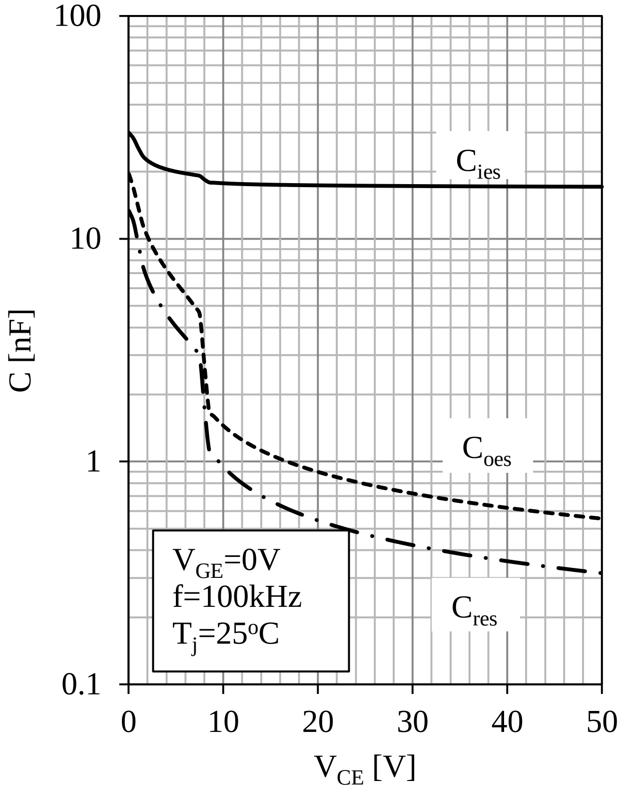


Fig 13. IGBT Capacity Charcteristic

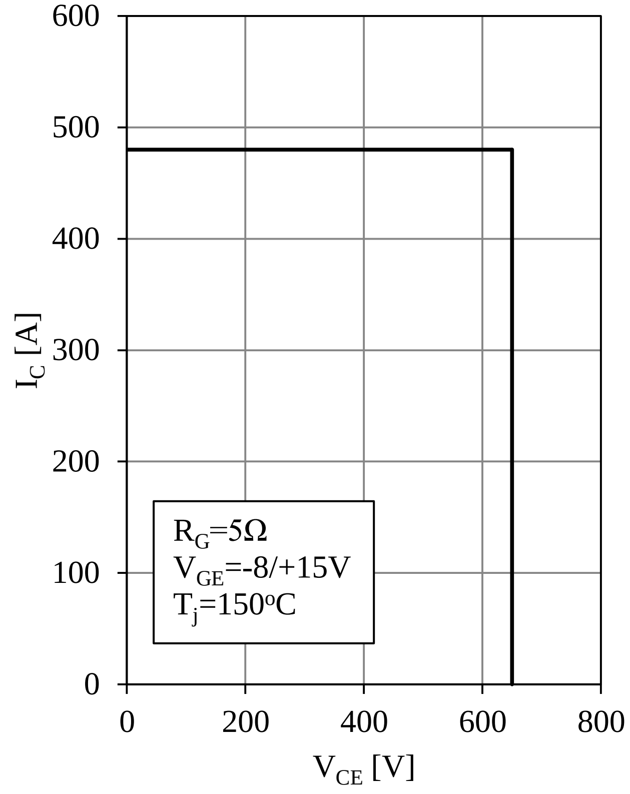


Fig 14. RBSOA

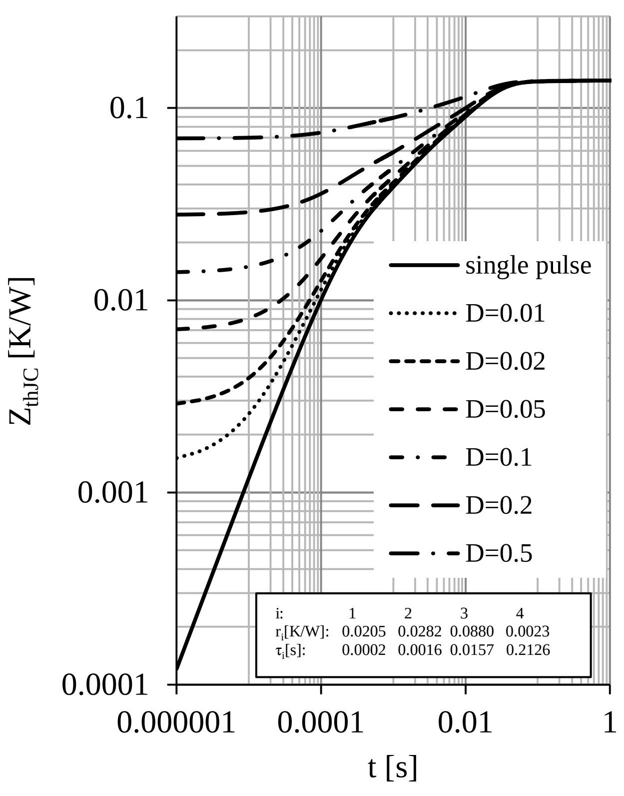


Fig 15. IGBT Transient Thermal Impedance

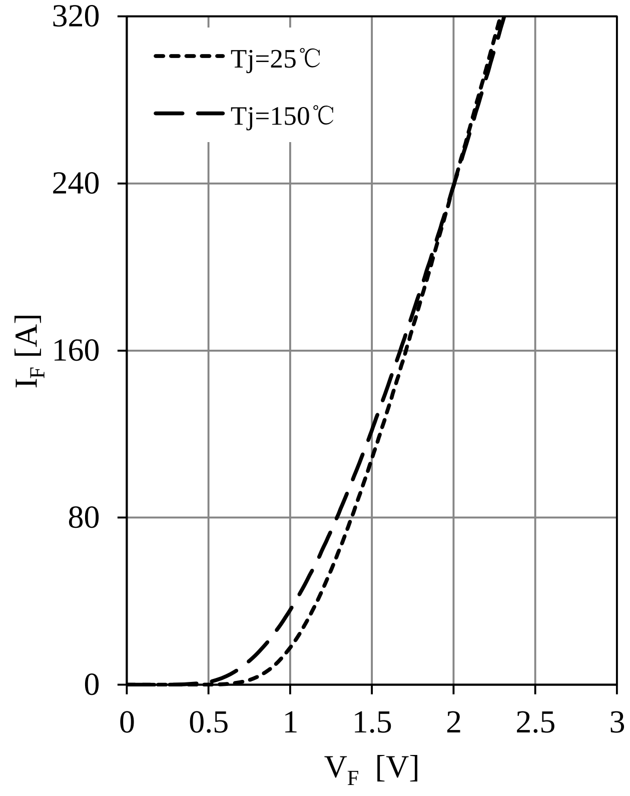


Fig 16. Diode Forward Characteristics

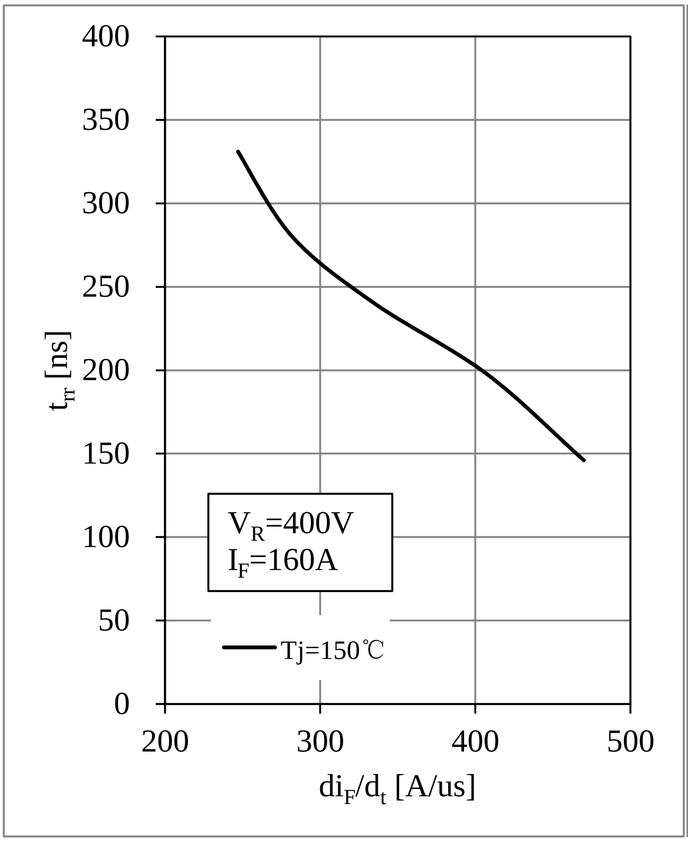


Fig 17. Reverse Recovery Time vs. di_F/d_t

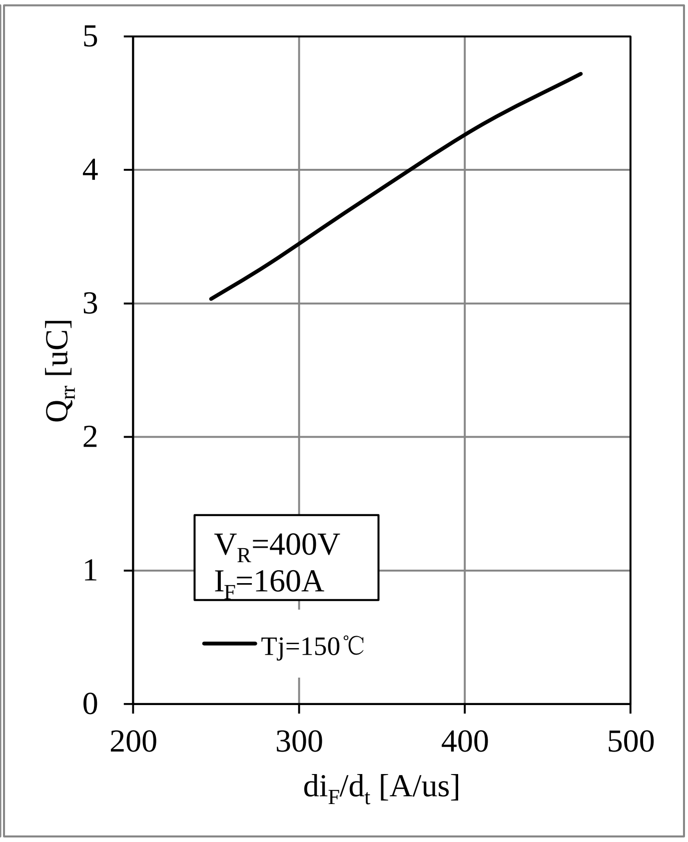


Fig 18. Reverse Recovery Charge vs. di_F/d_t

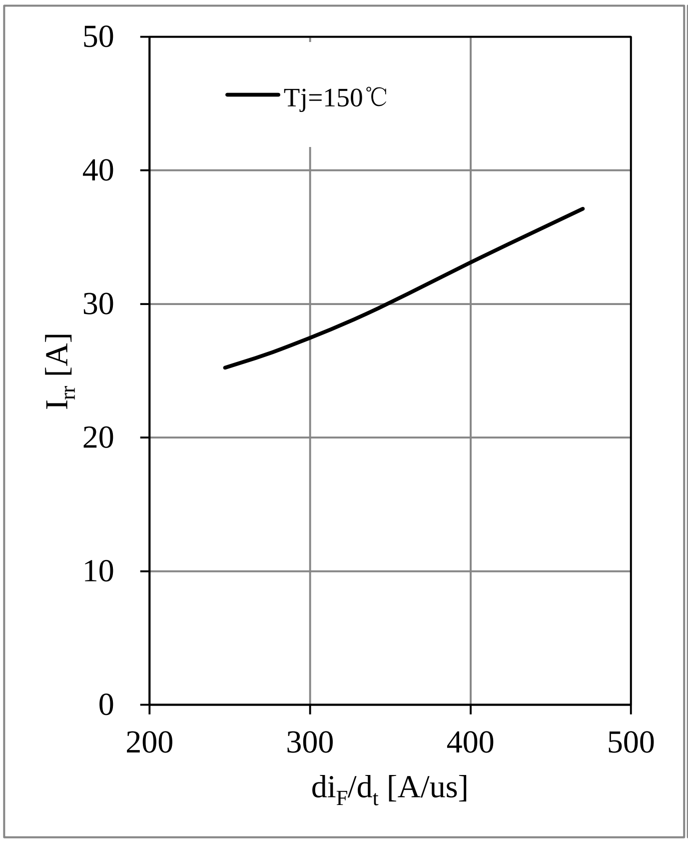


Fig 19. Reverse Recovery Current vs. di_F/d_t

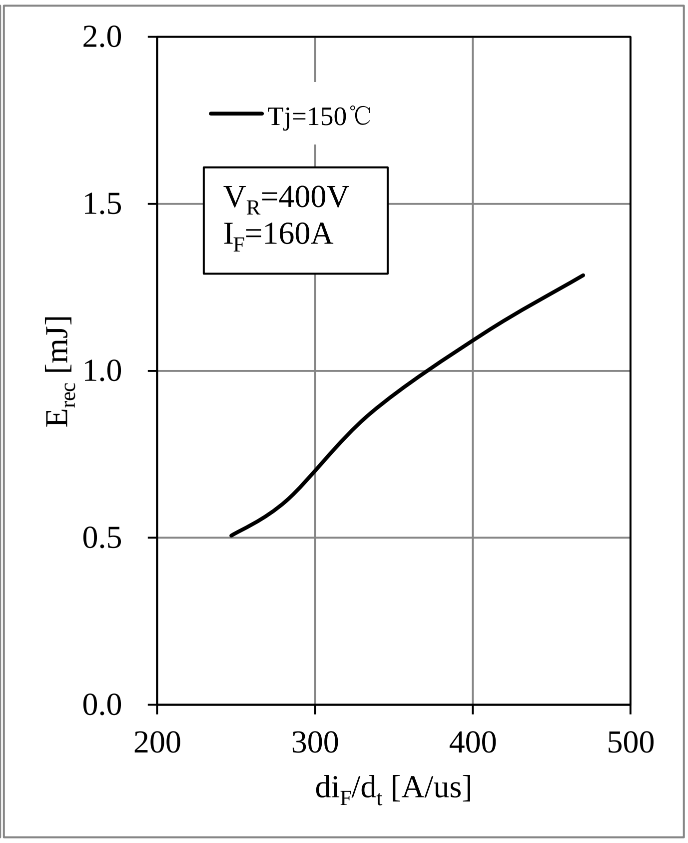


Fig 20. Reverse Energy Losses vs. di_F/d_t

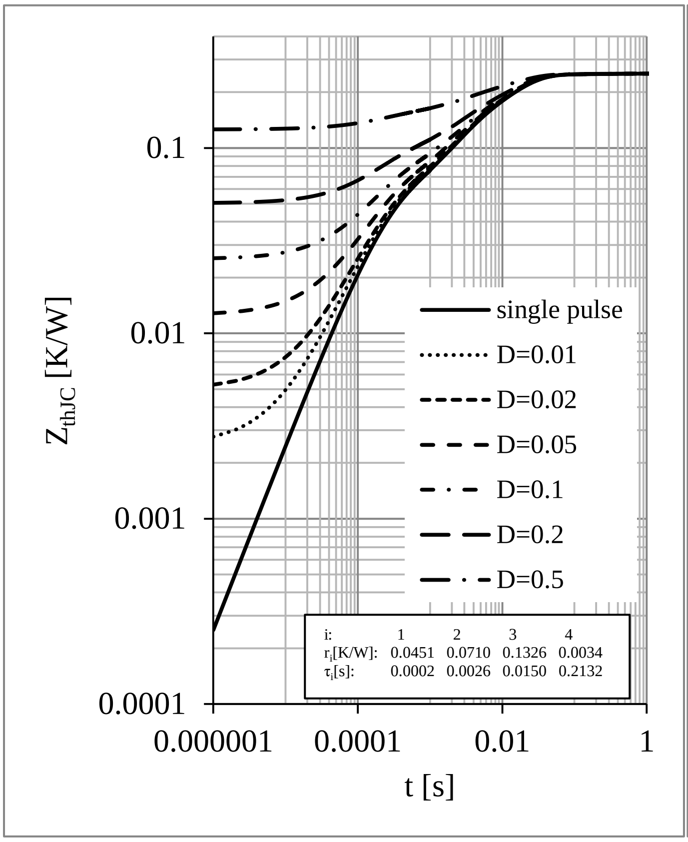


Fig 21. Diode Transient Thermal Impedance

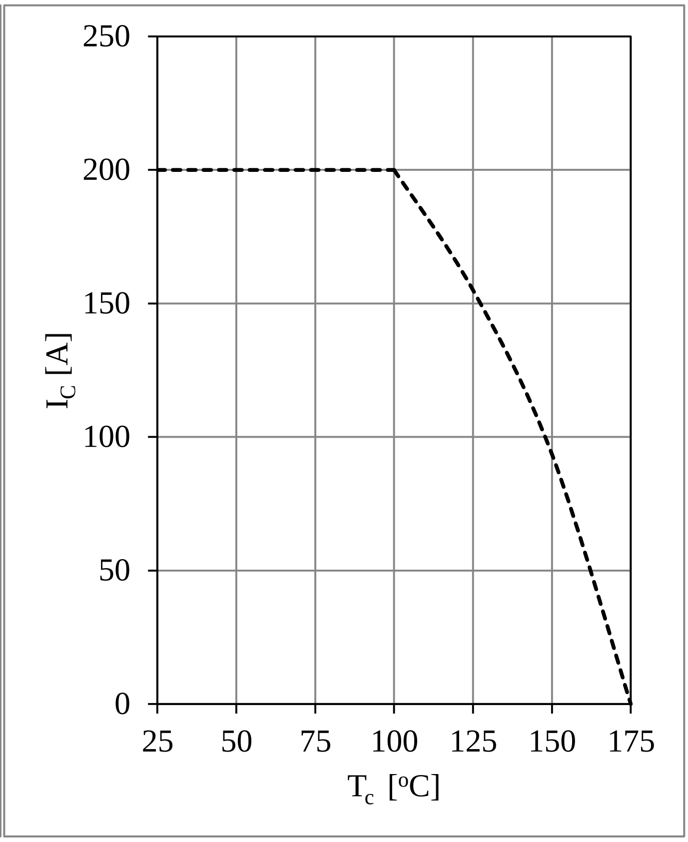
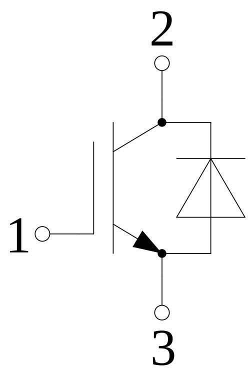


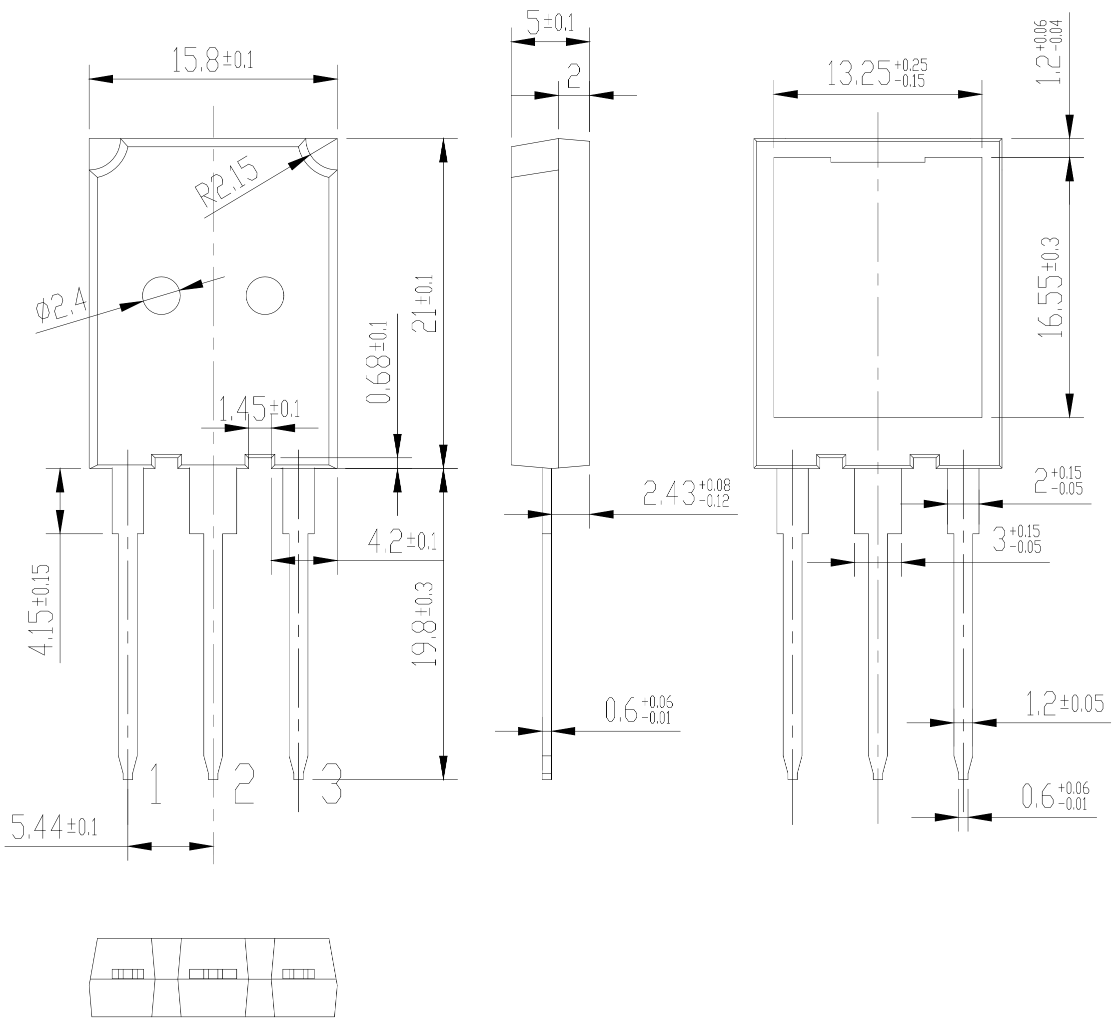
Fig 22. Collector Current vs. Tc

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.