DOSEMI

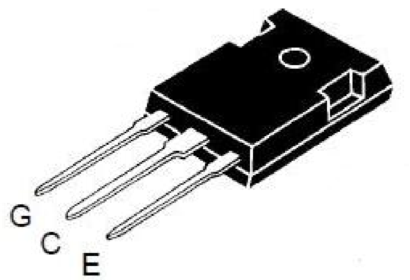
IGBT

DG40X12T2

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 electronic welder.



TO-247

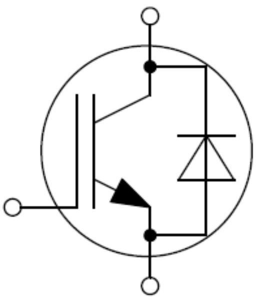
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching loss
- Maximum junction temperature 175^oC
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Lead free package

Typical Applications

- Electronic welder

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	80 40	A
I_{CM}	Pulsed Collector Current t_p=1ms	80	A
P_D	Maximum Power Dissipation @ T_j=175°C	487	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	40	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	80	A

Discrete

Symbol	Description	Values	Unit
T_{jmax}	Maximum Junction Temperature(inverter,brake)	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 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=40A,V_{GE}=15V, T_j=25°C		1.75	2.20	V
		I_C=40A,V_{GE}=15V, T_j=125°C		2.10		
		I_C=40A,V_{GE}=15V, T_j=150°C		2.15		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.40mA,V_{CE}=V_{GE}, T_j=25°C	4.5	5.5	6.5	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			/		Ω
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		6.05		nF
C_{res}	Reverse Transfer Capacitance			0.11		nF
Q_G	Gate Charge	V_{GE}=15V		0.32		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=10Ω,V_{GE}=±15V, T_j=25°C		57		ns
t_r	Rise Time			48		ns
$t_{d(off)}$	Turn-Off Delay Time			320		ns
t_f	Fall Time			80		ns
E_{on}	Turn-On Switching Loss			1.63		mJ
E_{off}	Turn-Off Switching Loss			1.39		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=10Ω,V_{GE}=±15V, T_j=125°C		70		ns
t_r	Rise Time			65		ns
$t_{d(off)}$	Turn-Off Delay Time			370		ns
t_f	Fall Time			153		ns
E_{on}	Turn-On Switching Loss			1.95		mJ
E_{off}	Turn-Off Switching Loss			1.74		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=10Ω,V_{GE}=±15V, T_j=150°C		75		ns
t_r	Rise Time			65		ns
$t_{d(off)}$	Turn-Off Delay Time			385		ns
t_f	Fall Time			183		ns
E_{on}	Turn-On Switching Loss			2.14		mJ
E_{off}	Turn-Off Switching Loss			1.91		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=40A,V_{GE}=0V,T_j=25°C		2.50	2.95	V
		I_C=40A,V_{GE}=0V,T_j=125°C		2.70		
		I_C=40A,V_{GE}=0V,T_j=150°C		2.75		
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=1000A/μs,V_{GE}=-15V T_j=25°C		1.6		μC
I_{RM}	Peak Reverse Recovery Current			39		A
E_{rec}	Reverse Recovery Energy			0.85		mJ
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=1000A/μs,V_{GE}=-15V T_j=125°C		2.7		μC
I_{RM}	Peak Reverse Recovery Current			48		A
E_{rec}	Reverse Recovery Energy			1.83		mJ
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=1000A/μs,V_{GE}=-15V T_j=150°C		3.0		μC
I_{RM}	Peak Reverse Recovery Current			50		A
E_{rec}	Reverse Recovery Energy			2.4		mJ

Discrete Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.308 0.801	K/W
$R_{\theta JA}$	Junction-to-Ambient		40		K/W

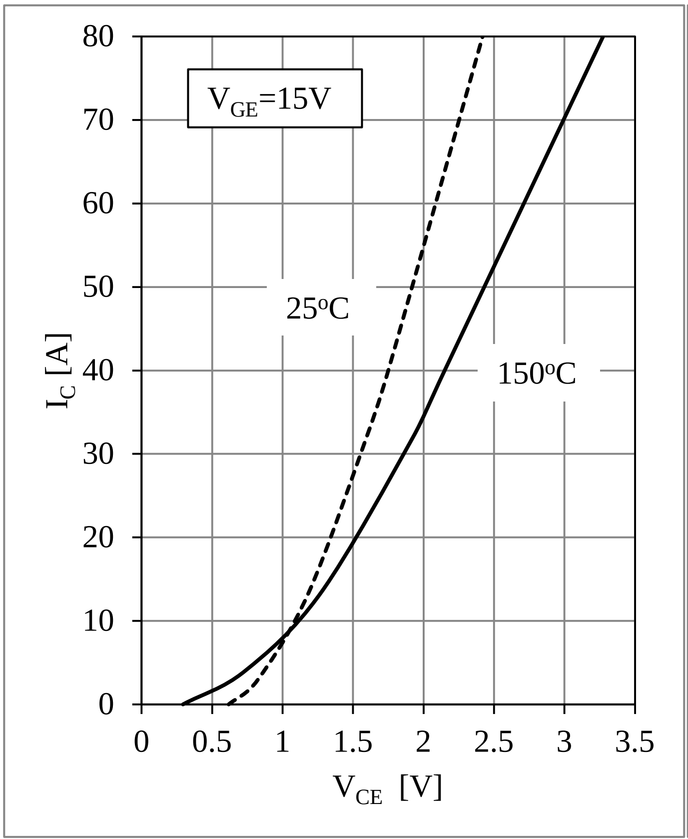


Fig 1. IGBT-inverter Output Characteristics

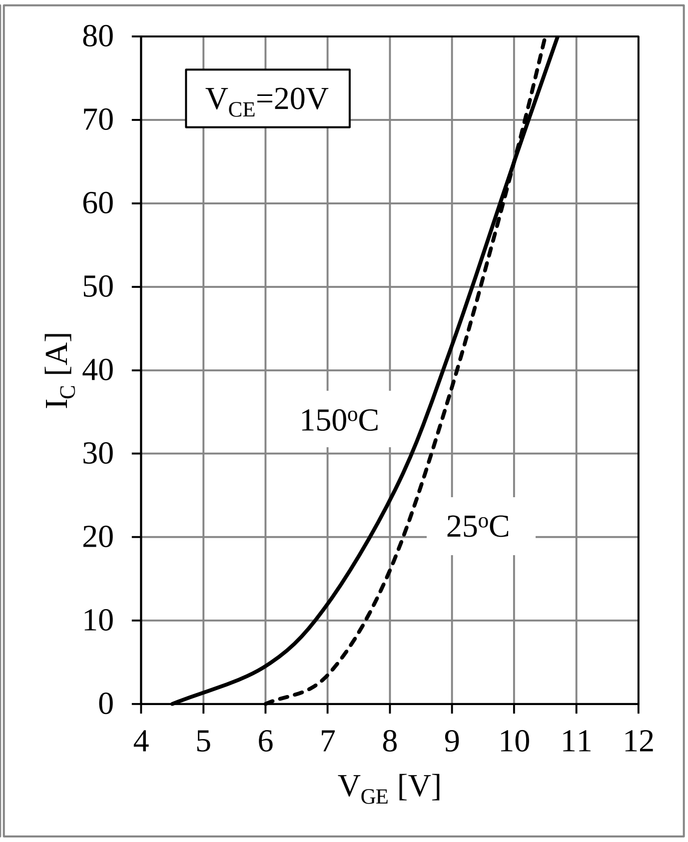


Fig 2. IGBT-inverter Transfer Characteristics

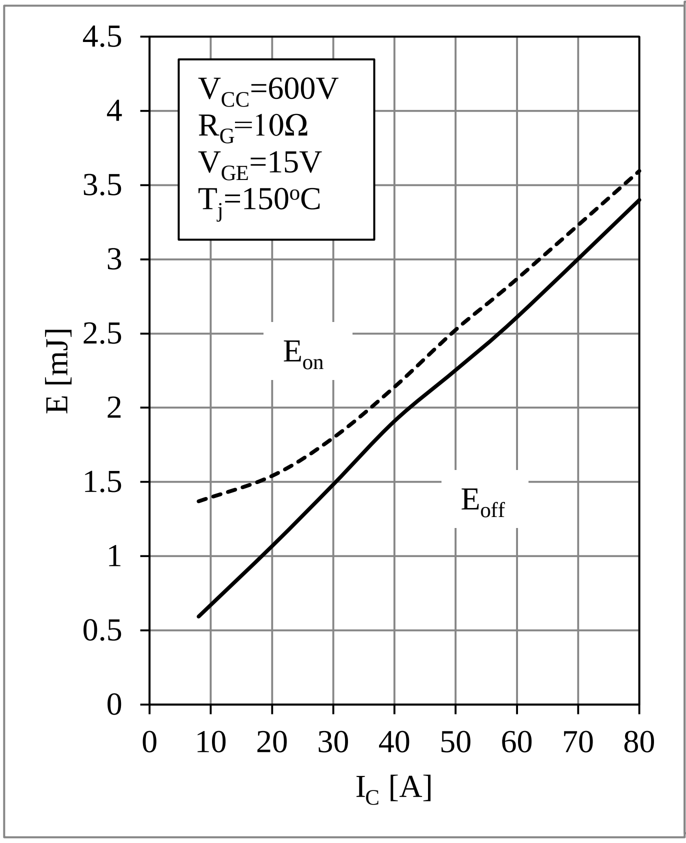


Fig 3. IGBT-inverter Switching Loss vs. I_C

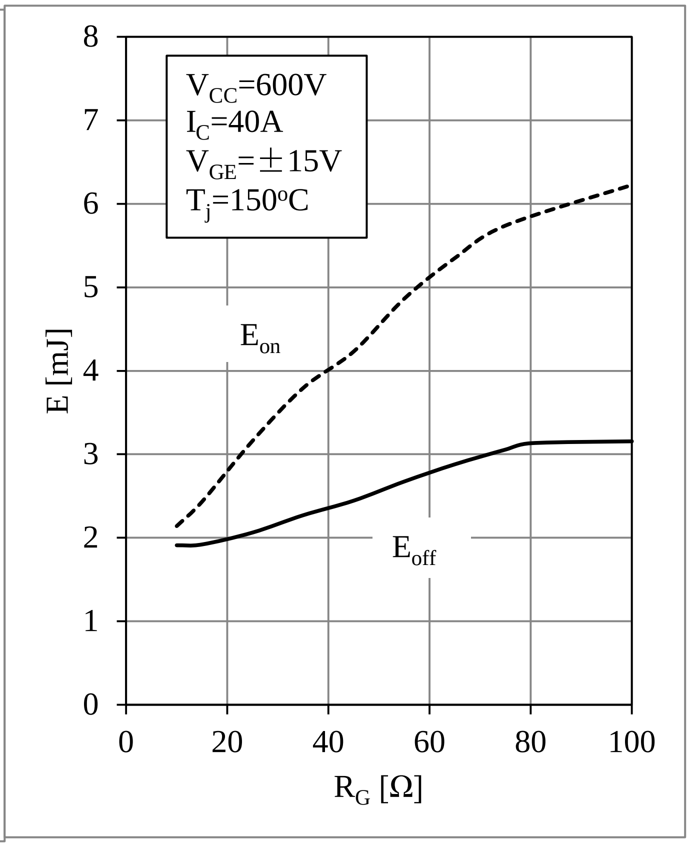


Fig 4. IGBT-inverter Switching Loss vs. R_G

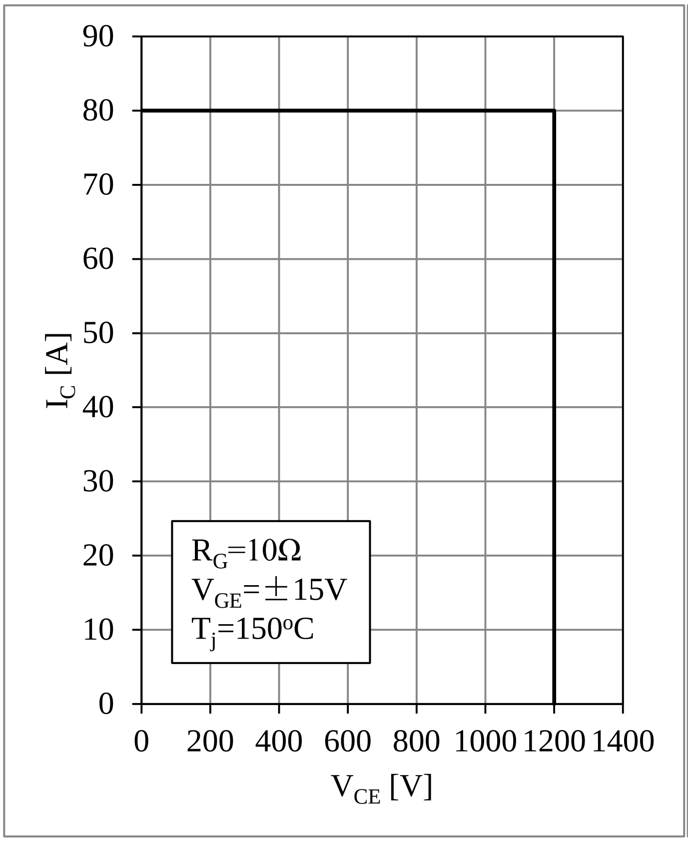


Fig 5. IGBT-inverter RBSOA

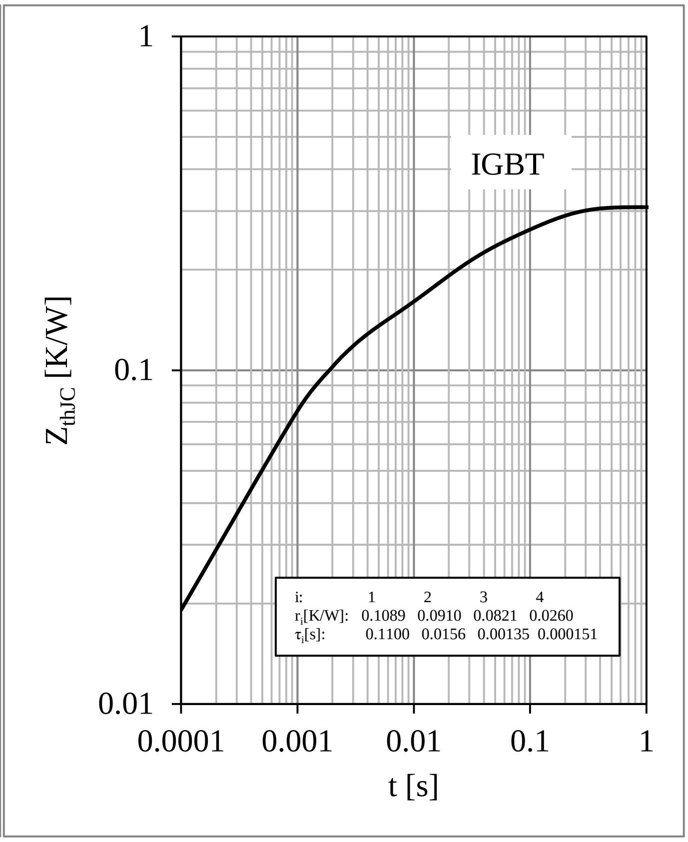


Fig 6. IGBT-inverter Transient Thermal Impedance

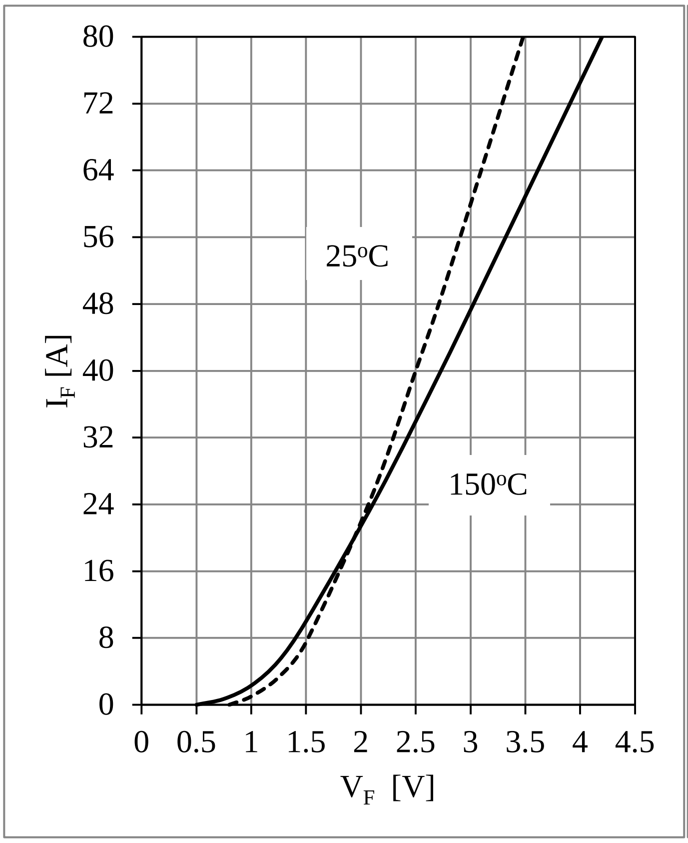


Fig 7. Diode-inverter Forward Characteristics

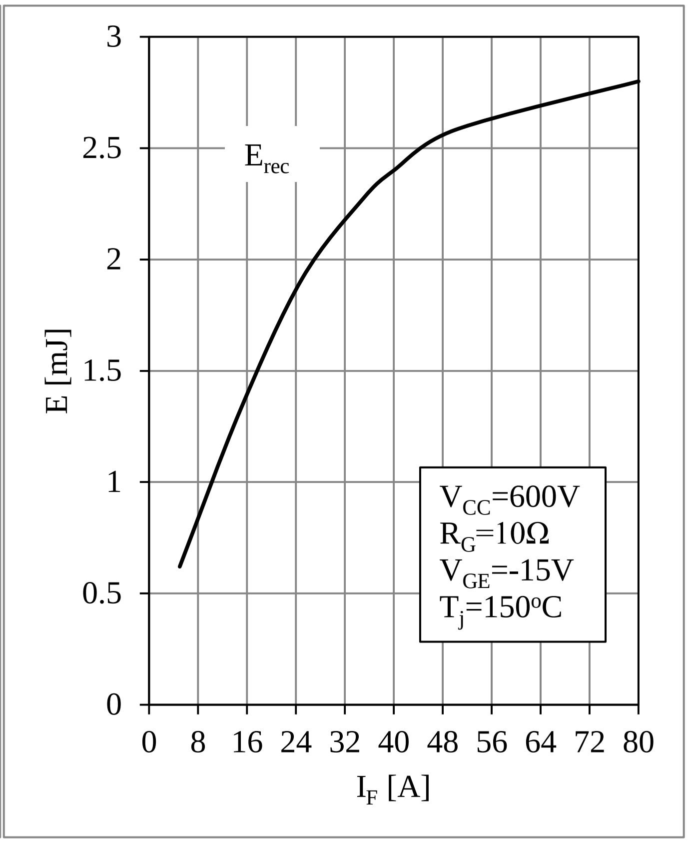


Fig 8. Diode-inverter Switching Loss vs. I_F

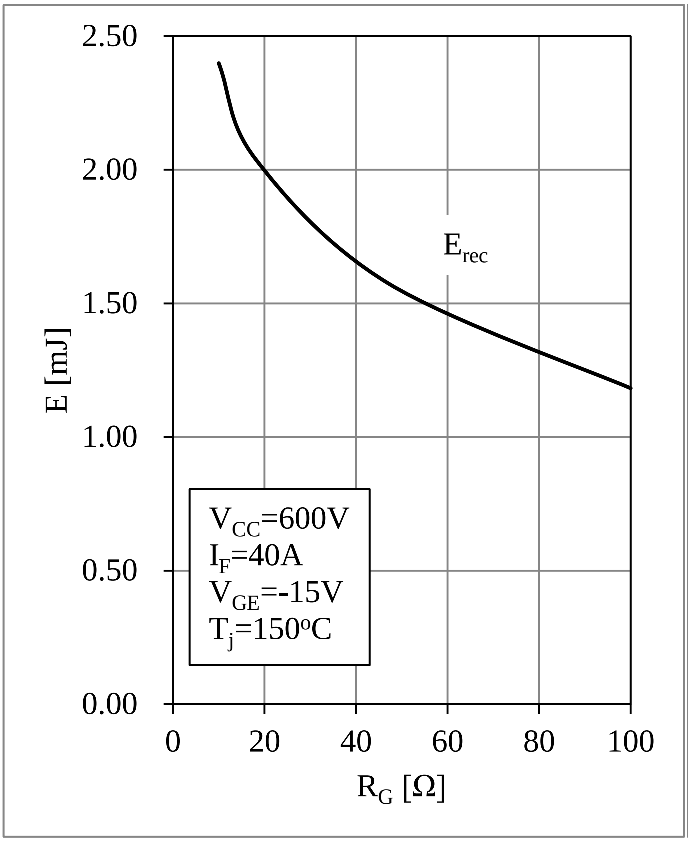


Fig 9. Diode-inverter Switching Loss vs. R_G

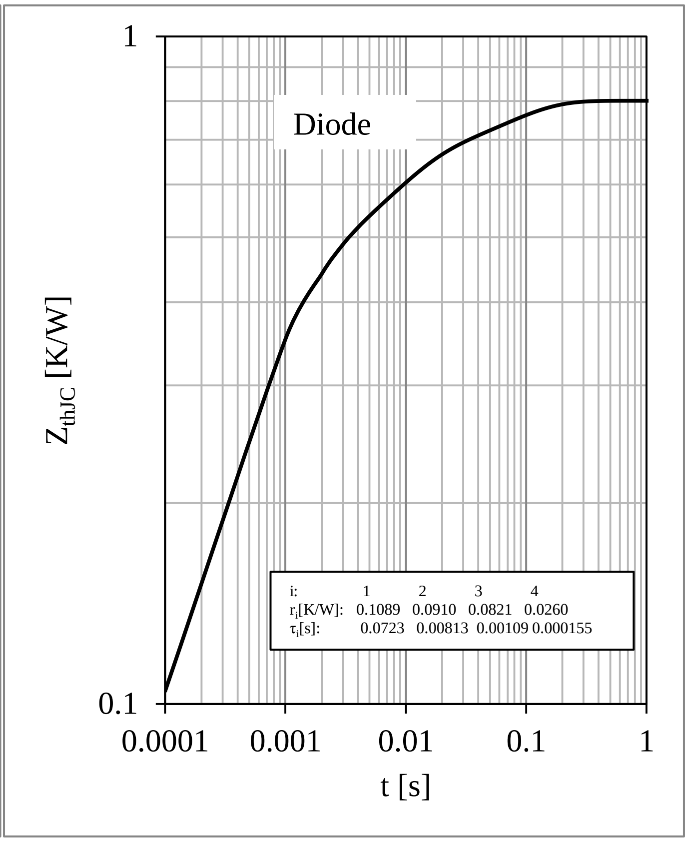
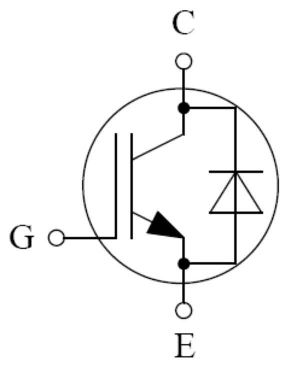


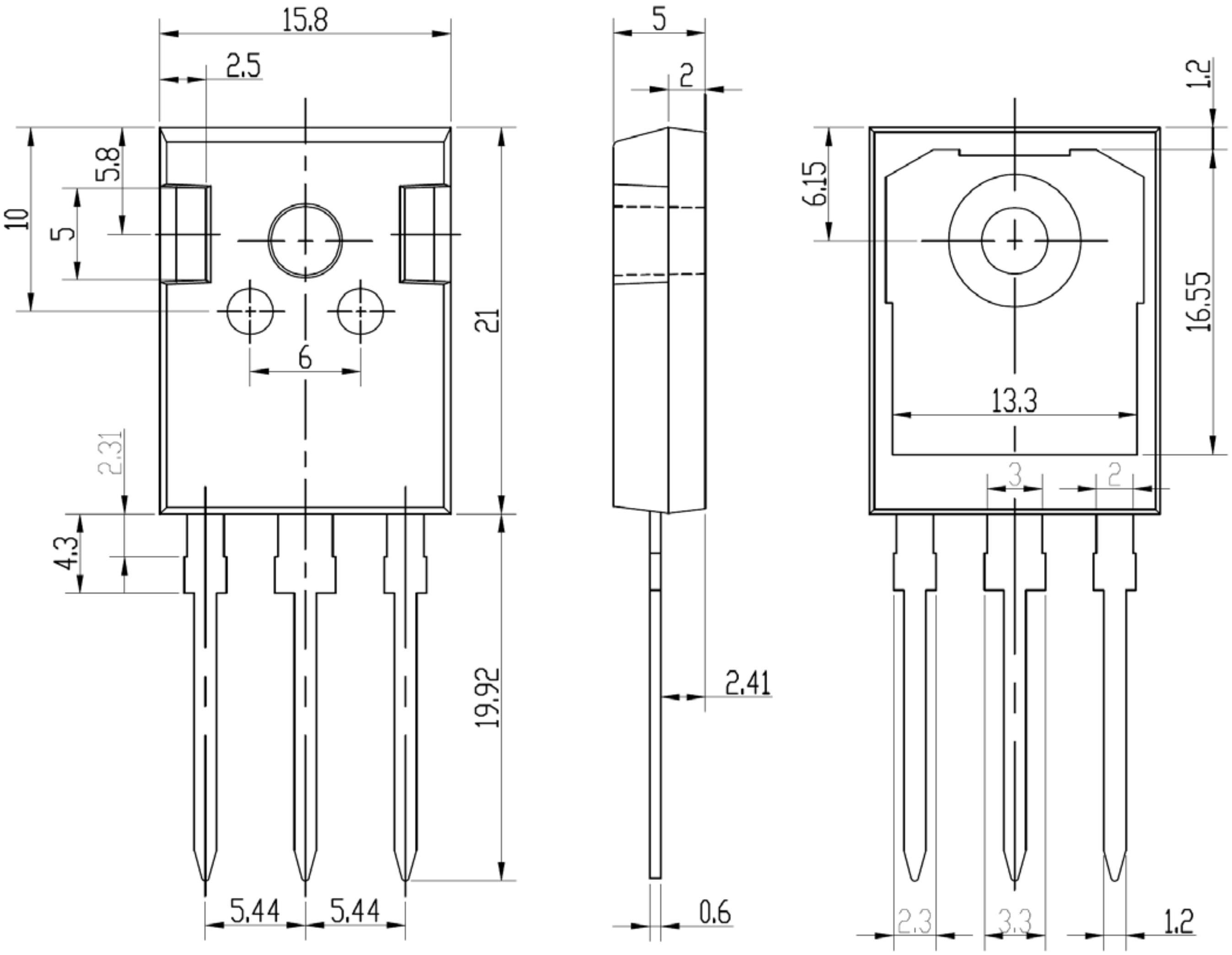
Fig 10. Diode-inverter Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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