

# DOSEMI

# IGBT

## DG10X06T1

### 600V/10A 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.

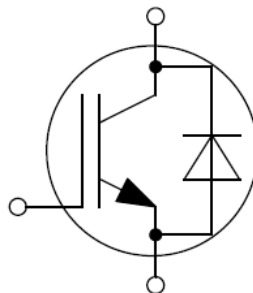
### Features

- Low  $V_{CE(sat)}$  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
- Lead free package

### Typical Applications

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

### 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	600	V
$V_{GES}$	Gate-Emitter Voltage	+20	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$	25	A
	@ $T_C=100^{\circ}\text{C}$	19	A
$I_{CM}$	Pulsed Collector Current $t_p$ limited by $T_{jmax}$	30	A
$P_D$	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	196	W

**Diode**

Symbol	Description	Value	Unit
$V_{RRM}$	Repetitive Peak Reverse Voltage	600	V
$I_F$	Diode Continuous Forward Current	25	A
$I_{FM}$	Diode Maximum Forward Current $t_p$ limited by $T_{jmax}$	30	A

**Discrete**

Symbol	Description	Values	Unit
$T_{jop}$	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

**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	$I_C=10\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.45	1.90	V
		$I_C=10\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.60		
		$I_C=10\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		1.70		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.16\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	5.8	6.5	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA
$R_{Gint}$	Internal Gate Resistance			0		$\Omega$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		1.16		nF
$C_{res}$	Reverse Transfer Capacitance				0.02	
$Q_G$	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.07		$\mu\text{C}$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=10\text{A}, R_G=27\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		10		ns
$t_r$	Rise Time			7		ns
$t_{d(off)}$	Turn-Off Delay Time			80		ns
$t_f$	Fall Time			68		ns
$E_{on}$	Turn-On Switching Loss			0.11		mJ
$E_{off}$	Turn-Off Switching Loss			0.19		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=10\text{A}, R_G=27\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		10		ns
$t_r$	Rise Time			10		ns
$t_{d(off)}$	Turn-Off Delay Time			96		ns
$t_f$	Fall Time			104		ns
$E_{on}$	Turn-On Switching Loss			0.16		mJ
$E_{off}$	Turn-Off Switching Loss			0.24		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=10\text{A}, R_G=27\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		10		ns
$t_r$	Rise Time			11		ns
$t_{d(off)}$	Turn-Off Delay Time			100		ns
$t_f$	Fall Time			108		ns
$E_{on}$	Turn-On Switching Loss			0.18		mJ
$E_{off}$	Turn-Off Switching Loss			0.26		mJ
$I_{SC}$	SC Data	$t_p \leq 6\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=360\text{V}, V_{CEM} \leq 600\text{V}$		50		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_C=10\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.20	1.65	V
		$I_C=10\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.10		
		$I_C=10\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.10		
$Q_r$	Recovered Charge	$V_R=300\text{V}, I_F=10\text{A},$ $-di/dt=1600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		0.55		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current			19.8		A
$E_{rec}$	Reverse Recovery Energy			0.12		mJ
$Q_r$	Recovered Charge	$V_R=300\text{V}, I_F=10\text{A},$ $-di/dt=1600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		0.84		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current			20.9		A
$E_{rec}$	Reverse Recovery Energy			0.22		mJ
$Q_r$	Recovered Charge	$V_R=300\text{V}, I_F=10\text{A},$ $-di/dt=1600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		1.21		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current			23.1		A
$E_{rec}$	Reverse Recovery Energy			0.29		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)			0.766	K/W
	Junction-to-Case (per Diode)			1.340	
$R_{thJA}$	Junction-to-Ambient		62		K/W

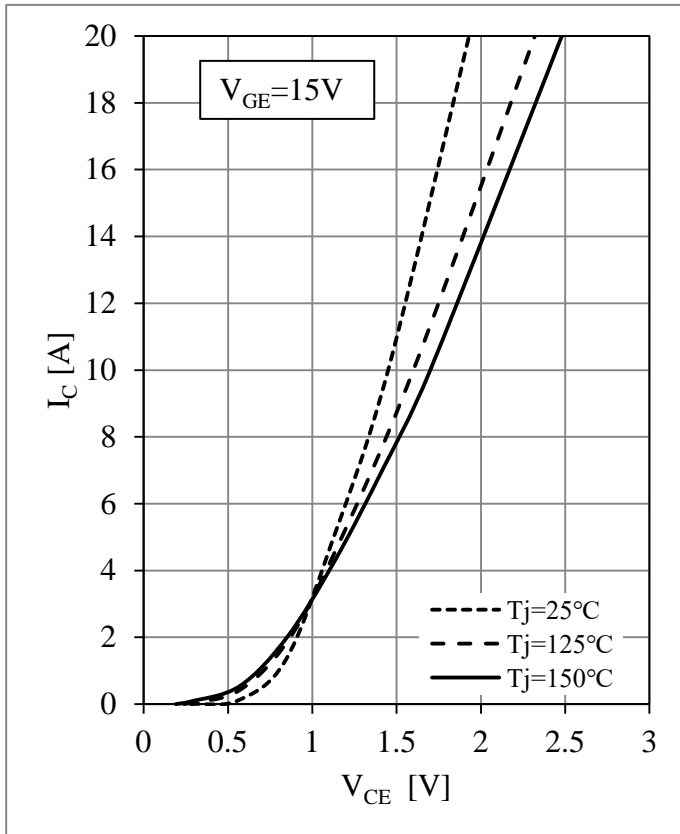


Fig 1. IGBT-inverter Output Characteristics

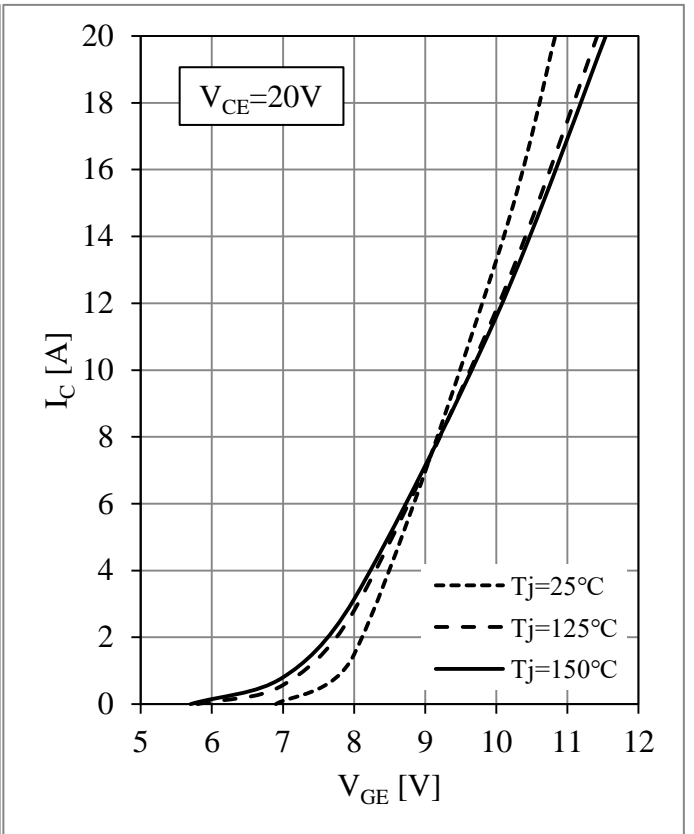


Fig 2. IGBT-inverter Transfer Characteristics

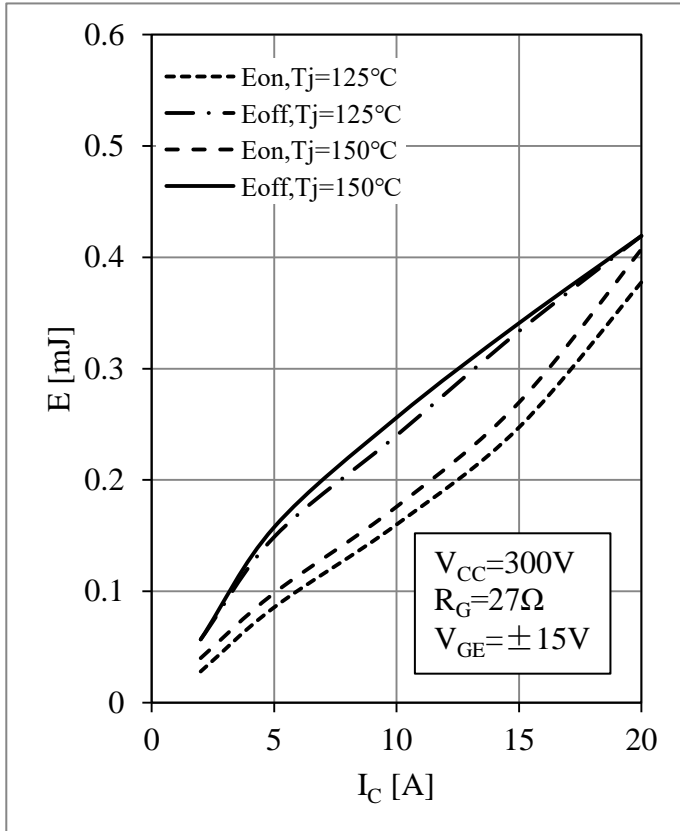


Fig 3. IGBT-inverter Switching Loss vs.  $I_C$

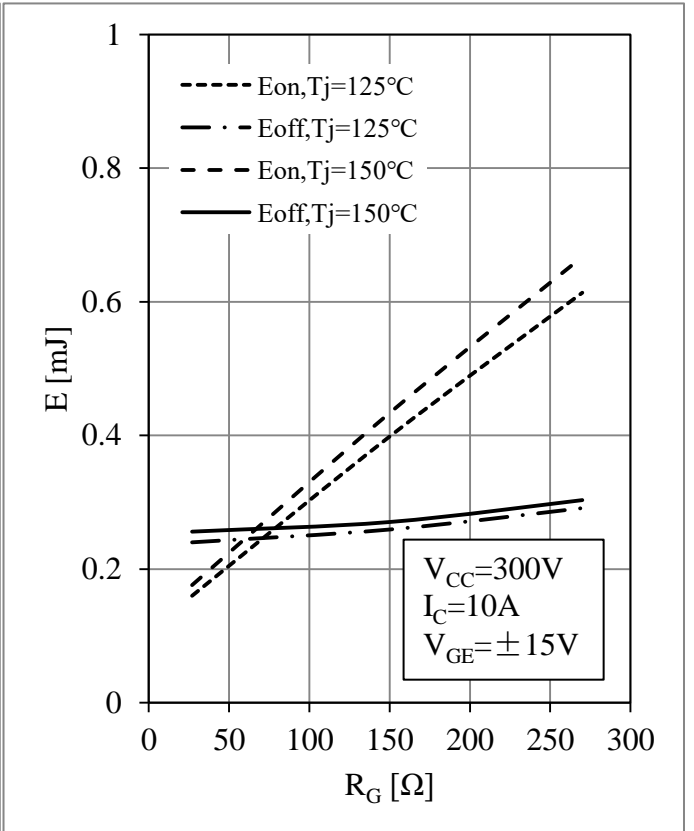


Fig 4. IGBT-inverter Switching Loss vs.  $R_G$

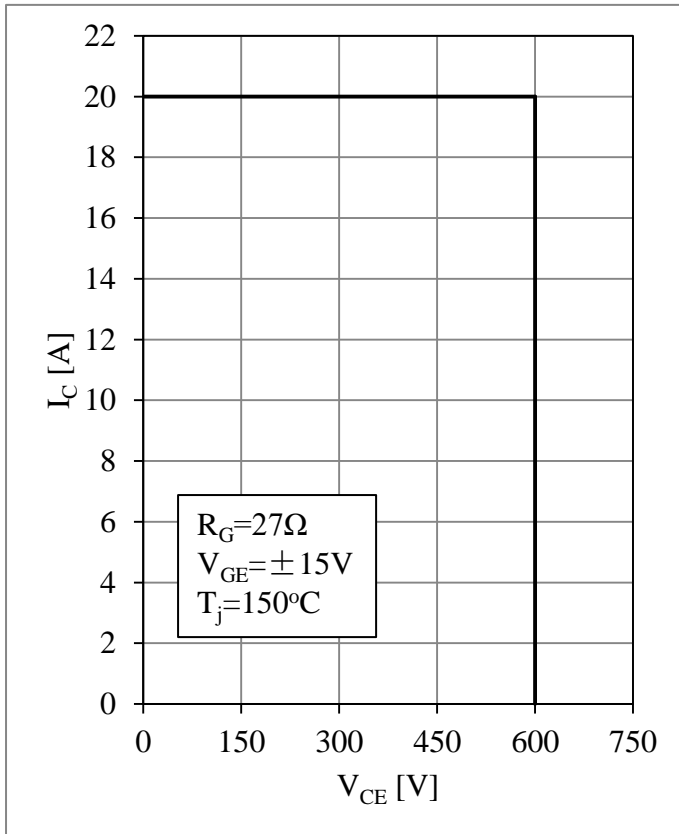


Fig 5. IGBT-inverter RBSOA

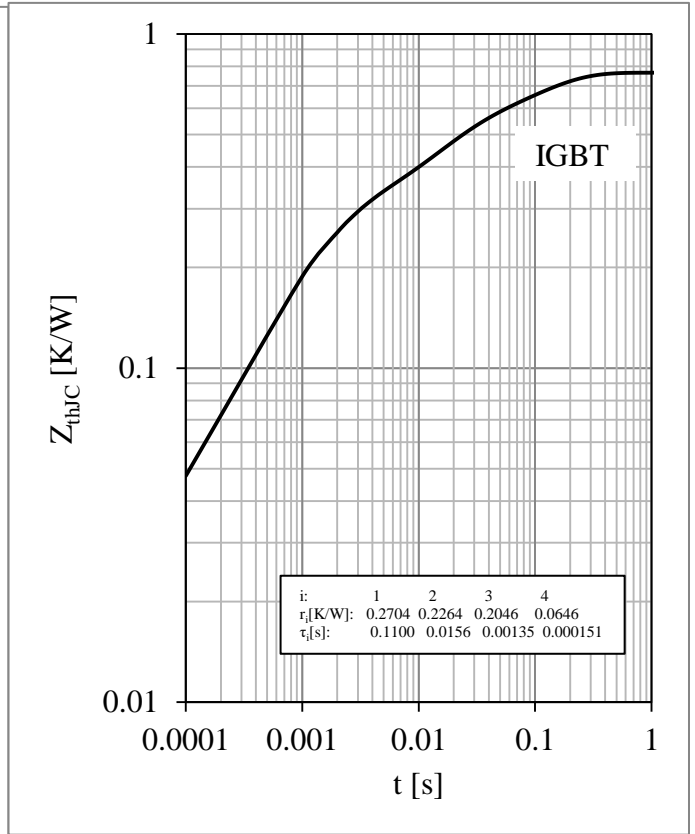


Fig 6. IGBT-inverter Transient Thermal Impedance

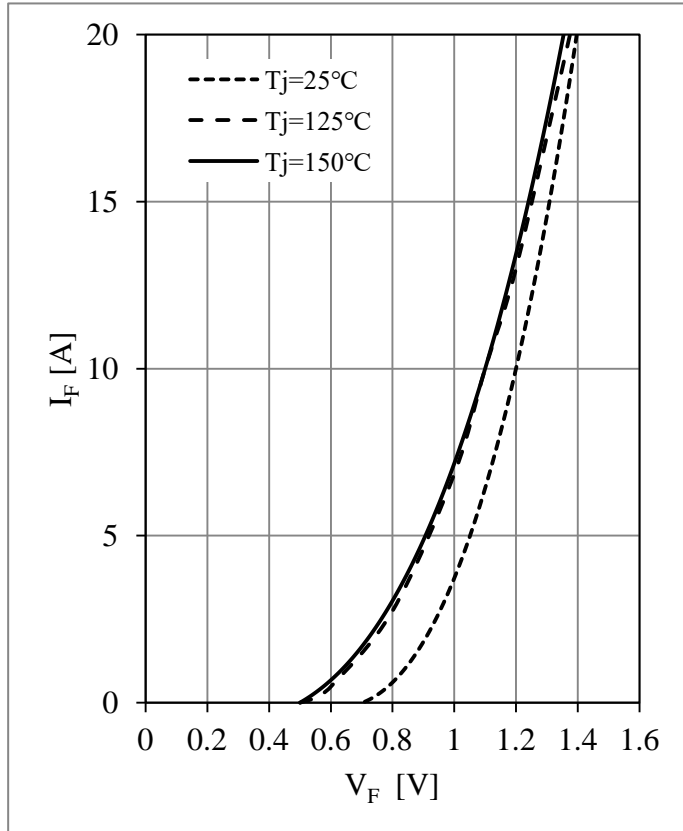


Fig 7. Diode-inverter Forward Characteristics

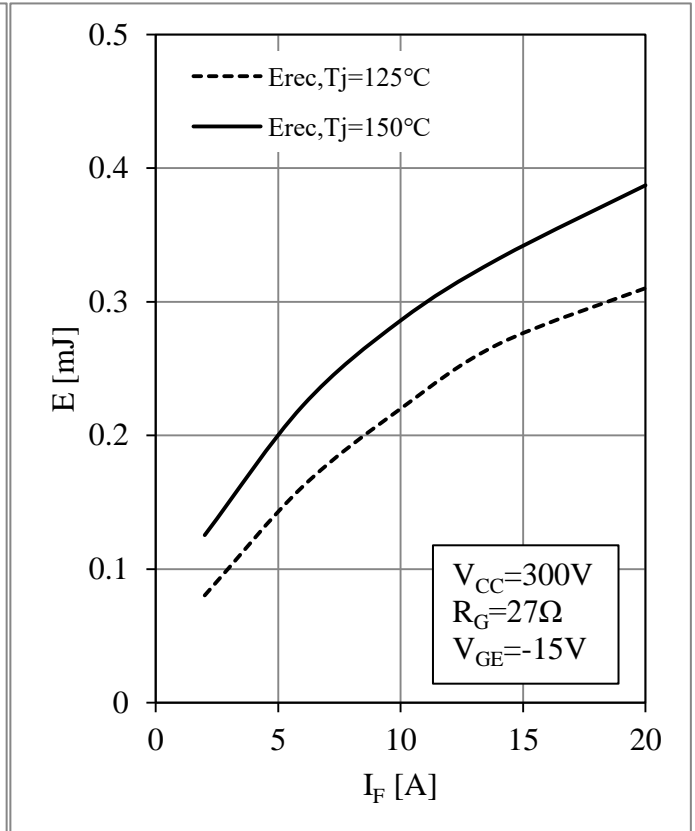


Fig 8. Diode-inverter Switching Loss vs.  $I_F$

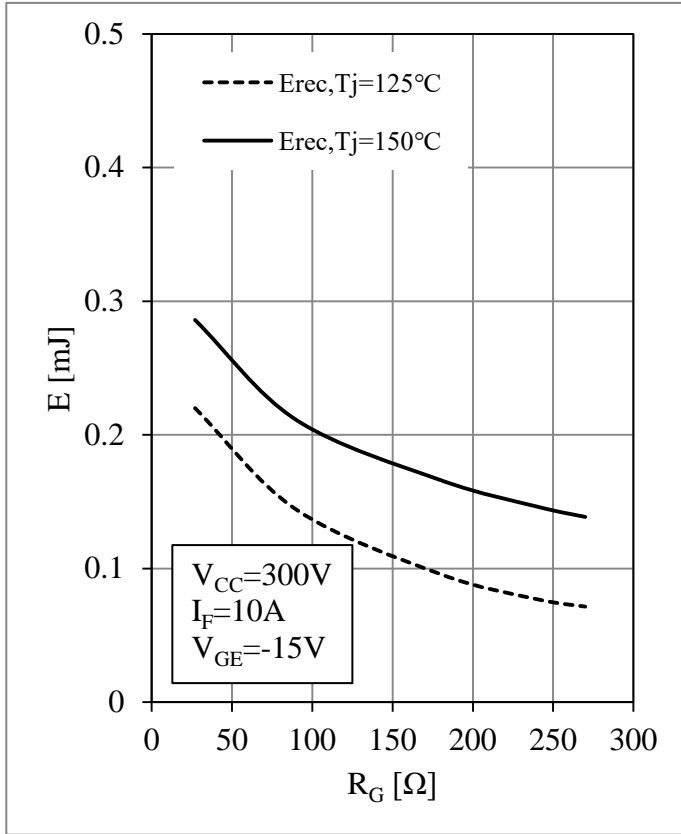


Fig 9. Diode-inverter Switching Loss vs.  $R_G$

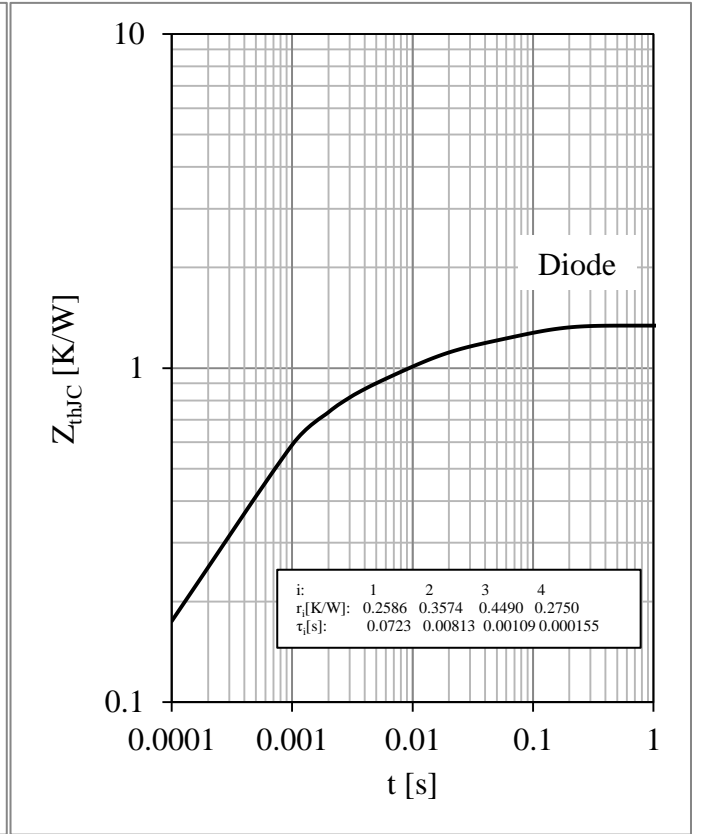
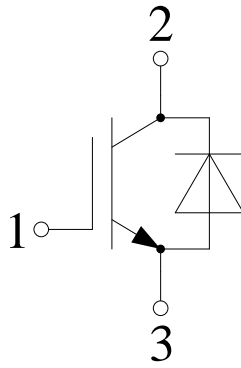


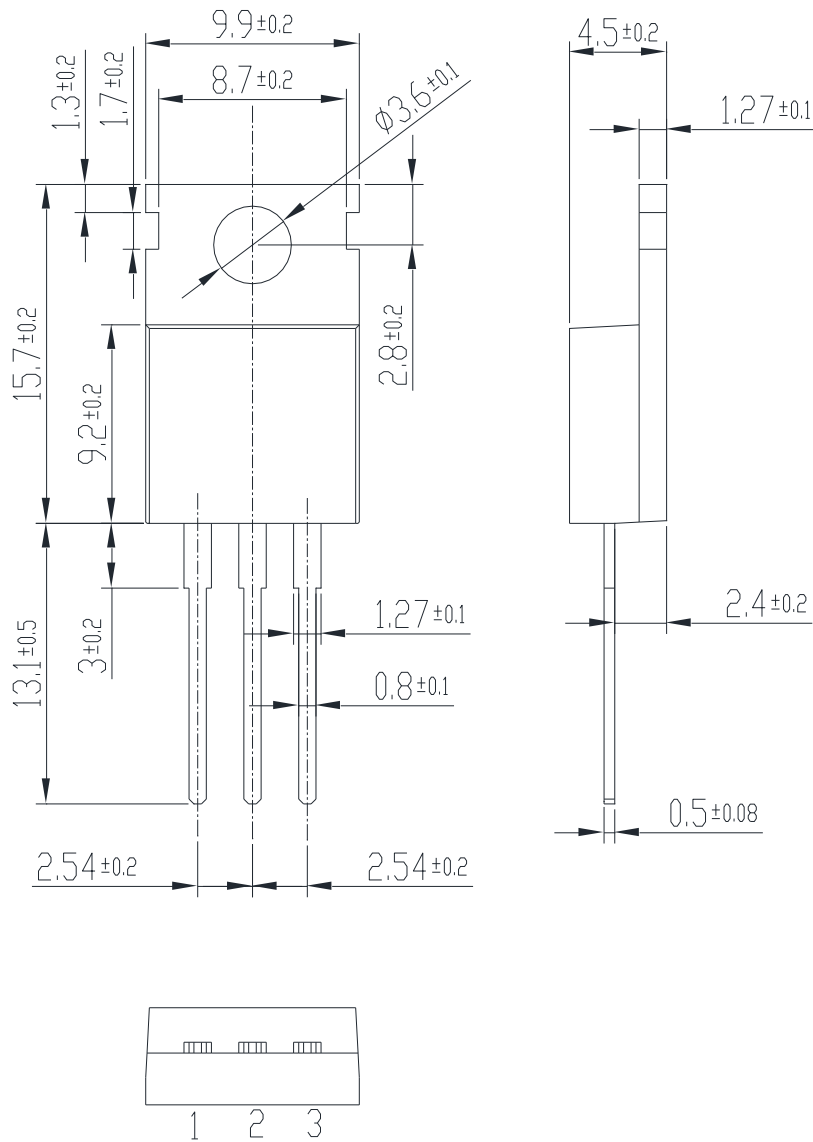
Fig 10. Diode-inverter Transient Thermal Impedance

**Circuit Schematic**



**Package Dimensions**

Dimensions in Millimeters





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