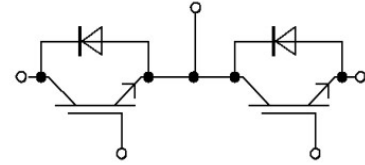


R package: 1200V 50A IGBT module



Equivalent Circuit Schematic

Features:

- 1200V 50A, $V_{CE(sat)} = 2.50V$
- IGBT chip in trench FS-technology
- High RBSOA capability
- Low turn-off losses

产品特性:

- 1200V 50A, $V_{CE(sat)} = 2.50V$
- 沟槽 FS 技术 IGBT 芯片
- 高 RBSOA 性能
- 低关断损耗

Typical Applications:

- Welding
- Inductive Heating
- High Frequency Switching Application

典型应用:

- 电焊机
- 感应加热
- 高频开关应用

IGBT, Inverter / IGBT, 逆变部分

Maximum Rated Values / 最大标称参数

| | | | | |
|---|---|--------------------|----------|---|
| Collector-emitter Voltage 集电极-发射极电压 | $T_{vj}=25^{\circ}\text{C}$ | V_{CES} | 1200 | V |
| Continuous DC collector current 集电极连续直流电流 | | $I_{c\text{ nom}}$ | 50 | A |
| | $T_C=80^{\circ}\text{C}, T_{vj\text{ max}}=150^{\circ}\text{C}$ | I_c | 60 | A |
| Repetitive Peak collector current 集电极可重复峰值电流 | $I_{CRM}=2 \times I_{c\text{ nom}}$ | I_{CRM} | 100 | A |
| Total power dissipation 总功率损耗 | $T_C=25^{\circ}\text{C}, T_{vj\text{ max}}=150^{\circ}\text{C}$ | P_{tot} | 357 | W |
| Gate-emitter peak voltage 门极-发射极峰值电压 | | V_{GES} | ± 20 | V |

Characteristic Values / 性能参数

| | | | min. | typ. | max. | |
|---|---|-------------|------|------|-----------|---------------|
| Collector-emitter saturation Voltage 集电极-发射极饱和压降 | $I_c=50\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$ | V_{CESat} | | 2.50 | 3.00 | V |
| | $I_c=50\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 3.00 | | |
| | $I_c=50\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$ | | | 3.10 | | |
| Gate Threshold Voltage 门极阈值电压 | $V_{CE}=V_{GE}, I_c=1\text{mA}, T_{vj}=25^{\circ}\text{C}$ | V_{GEth} | 4.5 | 5.8 | 6.5 | V |
| Gate Charge 门极电荷 | $V_{GE} = -15\text{V} \dots +15\text{V}$ | Q_G | | 0.33 | | μC |
| Internal Gate Resistor 内置门极电阻 | $T_{vj}=25^{\circ}\text{C}$ | R_{Gint} | | 10 | | Ω |
| Input Capacitance 输入电容 | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$ $f = 1\text{MHz}$ | C_{ies} | | 4.60 | | nF |
| Reverse Transfer Capacitance 反向传输电容 | | C_{res} | | 0.30 | | nF |
| Collector-emitter Cutoff Current 集电极-发射极关断漏电流 | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$ | I_{CES} | | | 1 | mA |
| Gate-emitter Leakage Current 门极-发射极漏电流 | $V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_{vj}=25^{\circ}\text{C}$ | I_{GES} | | | ± 200 | nA |
| Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载 | $I_c=50\text{A}, V_{CE}=600\text{V}, T_{vj}=25^{\circ}\text{C}$ | t_{don} | | 75 | | ns |
| | $V_{GE} = \pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 78 | | |
| | $R_{Gon}=6.8\Omega, T_{vj}=150^{\circ}\text{C}$ | | | 78 | | |
| Rise Time, Inductive Load 上升时间, 感性负载 | $I_c=50\text{A}, V_{CE}=600\text{V}, T_{vj}=25^{\circ}\text{C}$ | t_r | | 42 | | ns |
| | $V_{GE} = \pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 50 | | |
| | $R_{Gon}=6.8\Omega, T_{vj}=150^{\circ}\text{C}$ | | | 52 | | |
| Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载 | $I_c=50\text{A}, V_{CE}=600\text{V}, T_{vj}=25^{\circ}\text{C}$ | t_{doff} | | 220 | | ns |
| | $V_{GE} = \pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 260 | | |
| | $R_{Goff}=6.8\Omega, T_{vj}=150^{\circ}\text{C}$ | | | 270 | | |
| Fall Time, Inductive Load 下降时间, 感性负载 | $I_c=50\text{A}, V_{CE}=600\text{V}, T_{vj}=25^{\circ}\text{C}$ | t_f | | 60 | | ns |
| | $V_{GE} = \pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 180 | | |
| | $R_{Goff}=6.8\Omega, T_{vj}=150^{\circ}\text{C}$ | | | 180 | | |
| Turn-on energy loss per pulse 开通损耗 | $I_c=50\text{A}, V_{CE}=600\text{V}, T_{vj}=25^{\circ}\text{C}$ | E_{on} | | 3.4 | | mJ |
| | $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 5.3 | | |
| | $V_{GE} = \pm 15\text{V}, R_{Gon}=6.8\Omega, T_{vj}=150^{\circ}\text{C}$ | | | 5.6 | | |
| Turn-off energy loss per pulse 关断损耗 | $I_c=50\text{A}, V_{CE}=600\text{V}, T_{vj}=25^{\circ}\text{C}$ | E_{off} | | 1.5 | | mJ |
| | $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$ | | | 2.8 | | |
| | $V_{GE} = \pm 15\text{V}, R_{Goff}=6.8\Omega, T_{vj}=150^{\circ}\text{C}$ | | | 2.9 | | |

| | | | | | | |
|---|------------------|--------------|-----|------|-----|-----|
| Thermal Resistance, Junction to Case 结-壳热阻 | Per IGBT/单个 IGBT | R_{thJC} | | 0.35 | | K/W |
| Temperature under switching conditions 工作温度 | | $T_{vj\ op}$ | -40 | | 175 | °C |

Diode, Inverter / 二极管, 逆变部分

Maximum Rated Values / 最大标称参数

| | | | | | | |
|---|-----------------------------|-----------|--|------|--|---|
| Repetitive peak reverse voltage 可重复反向峰值电压 | $T_{vj}=25^{\circ}C$ | V_{RRM} | | 1200 | | V |
| Continuous DC Forward Current 可连续正向直流电流 | | I_F | | 50 | | A |
| Repetitive Peak Forward Current 可重复正向峰值电流 | $I_{CRM}=2 \times I_{Fnom}$ | I_{FRM} | | 100 | | A |

Characteristic Values / 性能参数

| | | | | min. | typ. | max. | |
|---|--|--|-----------|------|----------------------|------|-----|
| Forward Voltage 正向通态压降 | $I_F=50A, V_{GE}=0V$ $I_F=50A, V_{GE}=0V$ $I_F=50A, V_{GE}=0V$ | $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$ | V_F | | 2.40 2.40 2.40 | 2.90 | V |
| Peak Reverse Recovery Current 反向恢复峰值电流 | $I_F=50A, V_R=600V$ $-di_F/dt=900A/us$ $V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$ | I_{RM} | | 29 33 33 | | A |
| Recovery Charge 反向恢复电荷 | $I_F=50A, V_R=600V$ $-di_F/dt=900A/us$ $V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$ | Q_R | | 1.5 5.0 5.2 | | uC |
| Reverse Recovery Energy 反向恢复损耗 | $I_F=50A, V_R=600V$ $-di_F/dt=900A/us$ $V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$ | E_{rec} | | 0.8 2.1 2.2 | | mJ |
| Thermal Resistance, Junction to Case 结-壳热阻 | Per Diode / 单个 Diode | R_{thJC} | | | 0.61 | | K/W |
| Temperature under switching conditions 工作温度 | | $T_{vj\ op}$ | -40 | | | 150 | °C |

Module / 模块

| | | | | |
|--|--|-------------------|--------------------------------|----|
| Isolation Test Voltage 绝缘测试电压 | RMS, f=50Hz, t=1min | V _{ISOL} | 3.0 | KV |
| Material of Module Baseplate 模块底板材料 | | | Cu | |
| Internal Isolation 内部绝缘 | 基本绝缘 (class 1, IEC 61140) Basic insulation (class1,IEC 61140) | | Al ₂ O ₃ | |
| Creepage Distance 爬电距离 | 端子-散热片 terminal to heatsink 端子-端子 terminal to terminal | | 17.0 20.0 | mm |
| Clearance 电气间隙 | 端子-散热片 terminal to heatsink 端子-端子 terminal to terminal | | 17.0 9.5 | mm |
| Comparative Tracking Index 相对漏电起痕指数 | | CTI | >200 | |

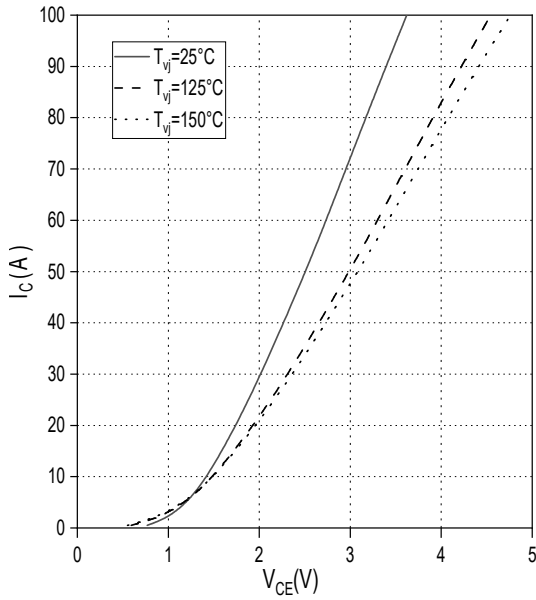
| | | min. typ. max. | | | |
|---|---|-----------------------|-----|------|-----|
| Thermal resistance, case to heatsink 外壳-散热器热阻 | 每个模块/per module $\lambda_{\text{Paste}} = 1W/(m \cdot K) / \lambda_{\text{grease}} = 1W/(m \cdot K)$ | R _{thCH} | | 0.05 | K/W |
| Stray Inductance Module 模块杂散电感 | | L _{sCE} | | 30 | nH |
| Module Lead Resistance, Terminals-Chip 模块引脚电阻, 端子-芯片 | T _C =25°C,每个开关 per switch | R _{CC'+EE''} | | 0.65 | mΩ |
| Storage Temperature 贮存温度 | | T _{stg} | -40 | 125 | °C |
| Modul Mounting torque 模块安装扭距 | M6 | M | 3.0 | 5.0 | Nm |
| Terminal Mounting torque 端子安装扭距 | M5 | M | 2.5 | 6.0 | Nm |
| Weight 重量 | | G | | 145 | g |

输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

$I_C = f(V_{CE})$,

$V_{GE} = 15V$

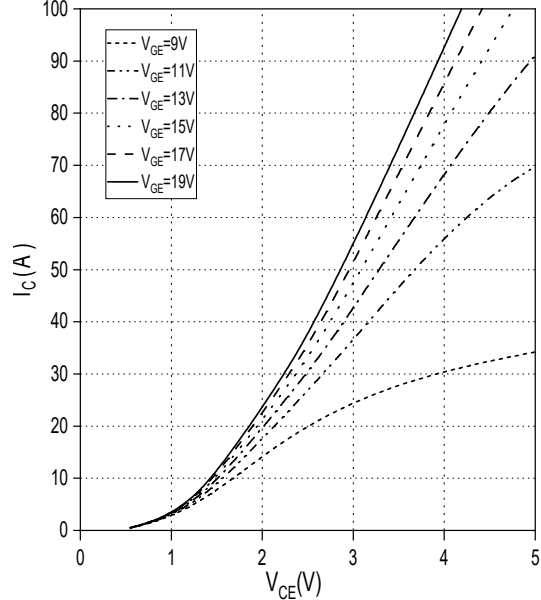


输出特性 IGBT, 逆变器(典型值)

output characteristic IGBT Inverter (typical)

$I_C = f(V_{CE})$,

$T_{vj} = 150^{\circ}C$

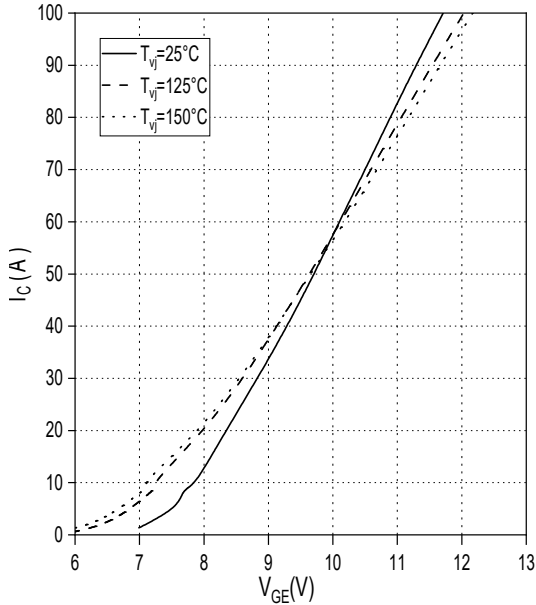


传输特性 IGBT, 逆变器 (典型值)

Transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$,

$V_{CE} = 20V$

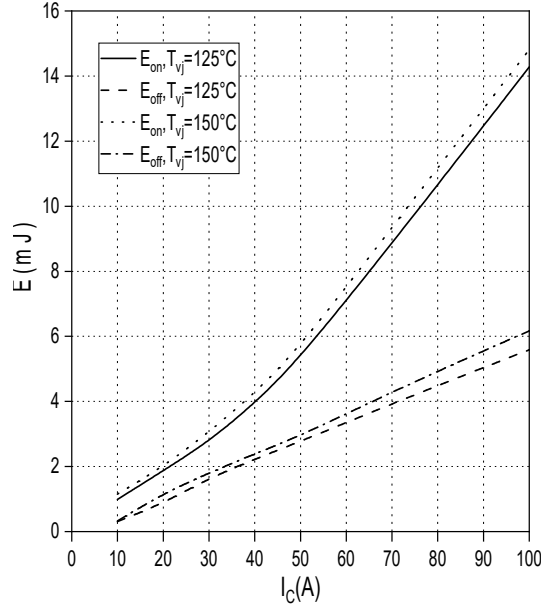


开关损耗 IGBT, 逆变器 (典型值)

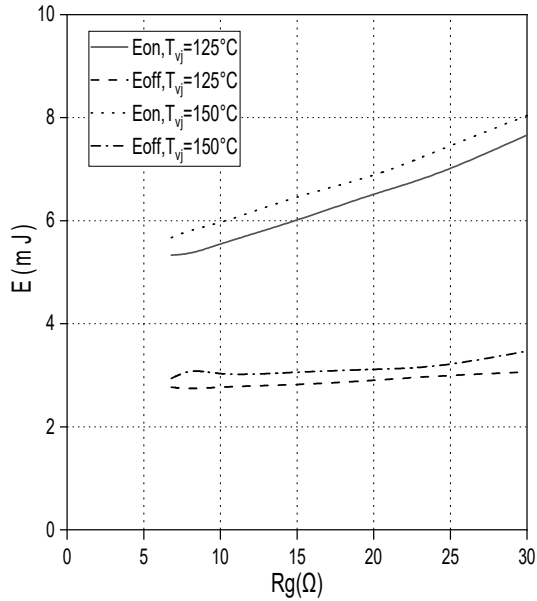
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C), E_{off} = f(I_C), V_{GE} = \pm 15V$,

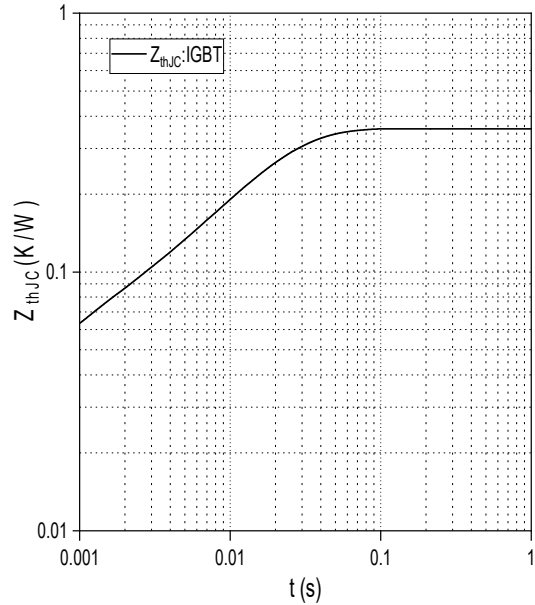
$R_{Gon} = 6.8\Omega, R_{Goff} = 6.8\Omega, V_{CE} = 600V$



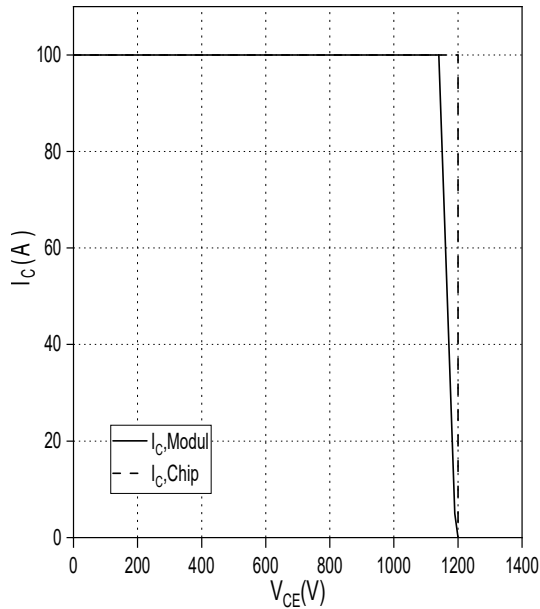
开关损耗 IGBT, 逆变器 (典型值)
Switching losses IGBT, Inverter (typical)
 $V_{GE} = \pm 15V, I_C = 50A, V_{CE} = 600V$



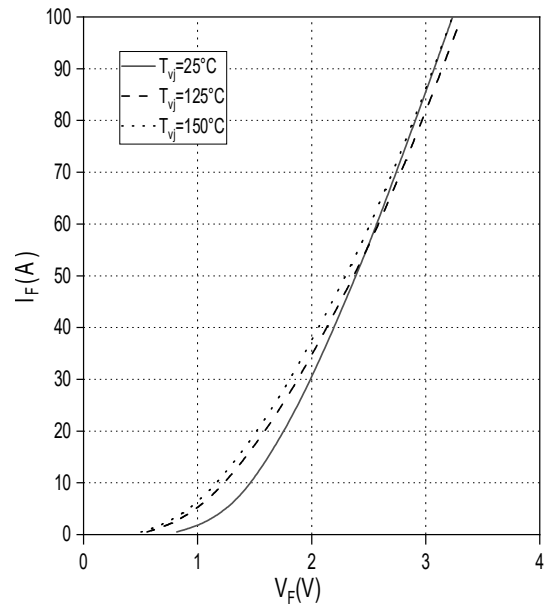
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$



反偏安全工作区 IGBT, 逆变器 (RBSOA)
Reverse bias safe operating area IGBT, Inverter (RBSOA) $I_C = f(V_{CE})$
 $V_{GE} = \pm 15V, R_{Goff} = 6.8\Omega, T_{vj} = 150^\circ C$



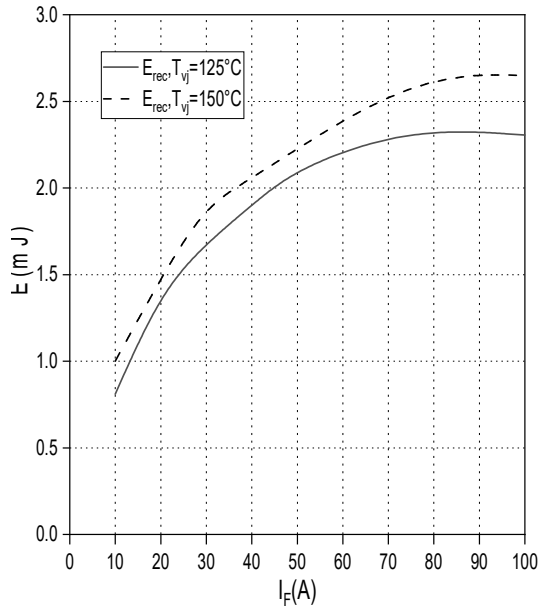
正向偏压特性二极管, 逆变器 (典型值)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



开关损耗二极管,逆变器 开关损耗 (典型值)
Switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

$R_{Gon} = 6.8\Omega, V_{CE} = 600V$

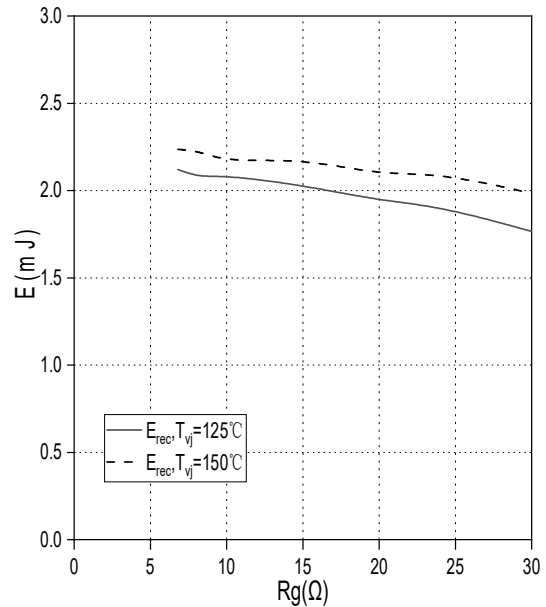


二极管,逆变器 (典型值)

switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

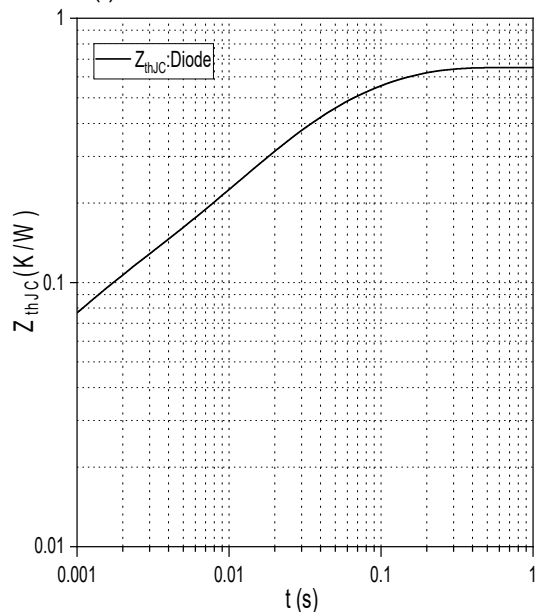
$I_F = 50A, V_{CE} = 600V$



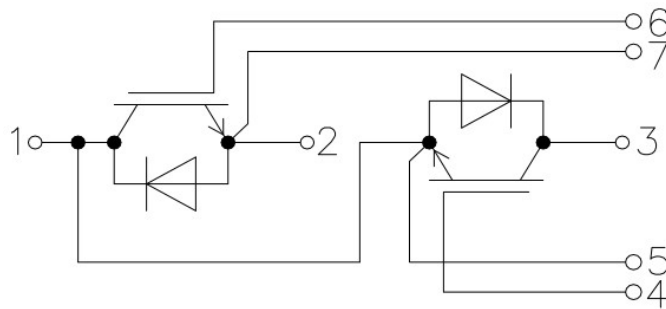
瞬态热阻抗二极管,逆变器

transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



Internal Circuit:



**Package Dimension
Dimensions in Millimeters**

