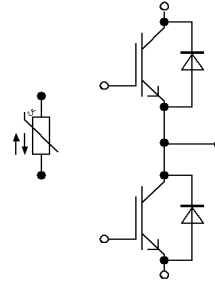
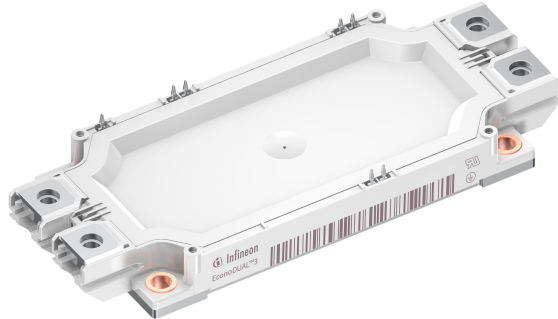


EconoDUAL™3 模块 采用第七代沟槽栅/场终止IGBT7和第七代发射极控制二极管 带有温度检测NTC和预涂导热介质

EconoDUAL™3 module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and NTC / pre-applied Thermal Interface Material

初步数据 / Preliminary Data



$V_{CES} = 1200V$

$I_{C\ nom} = 900A / I_{CRM} = 1800A$

#### 潜在应用

- UPS系统
- 伺服驱动器
- 商业性农用车辆
- 大功率变流器
- 电机传动

#### 电气特性

- $V_{CESat}$  带正温度系数
- 沟槽栅IGBT7
- 集成温度传感器

#### 机械特性

- PressFIT 压接技术
- 标准封装
- 绝缘的基板
- 预涂导热介质
- 高功率密度

#### Potential Applications

- UPS systems
- Servo drives
- Commercial Agriculture Vehicles
- High power converters
- Motor drives

#### Electrical Features

- $V_{CESat}$  with positive temperature coefficient
- Trenchstop™ IGBT7
- Integrated temperature sensor

#### Mechanical Features

- PressFIT contact technology
- Standard housing
- Isolated base plate
- Pre-applied Thermal Interface Material
- High power density

### Module Label Code

Barcode Code 128



0000012345600000000000

DMX - Code



#### Content of the Code

Content of the Code	Digit
Module Serial Number	1 - 5
Module Material Number	6 - 11
Production Order Number	12 - 19
Datecode (Production Year)	20 - 21
Datecode (Production Week)	22 - 23

初步数据  
Preliminary Data

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Rated Values

集电极 - 发射极电压 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	1200	V
集电极电流 Implemented collector current		$I_{CN}$	900	A
连续集电极直流电流 Continuous DC collector current	$T_H = 45^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{CDC}$	875	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	1800	A
栅极 - 发射极峰值电压 Gate-emitter peak voltage		$V_{GES}$	+/-20	V

特征值 / Characteristic Values

			min.	typ.	max.	
集电极 - 发射极饱和电压 Collector-emitter saturation voltage	$I_C = 900\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,50 1,65 1,75	1,80	V V V
栅极阈值电压 Gate threshold voltage	$I_C = 18,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{Geth}$	5,15	5,80	6,45 V
栅极电荷 Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		$Q_G$	14,3		$\mu\text{C}$
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	0,5		$\Omega$
输入电容 Input capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	122		nF
反向传输电容 Reverse transfer capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,72		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$I_{CES}$		0,1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$		$I_{GES}$		100	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_{don}$	0,41 0,46 0,49		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
上升时间(电感负载) Rise time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_r$	0,10 0,11 0,12		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_{doff}$	0,55 0,63 0,69		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
下降时间(电感负载) Fall time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_f$	0,11 0,23 0,33		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}, L_{\sigma} = 25\text{ nH}$ $di/dt = 6200\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$E_{on}$	89,0 138 170		mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}, L_{\sigma} = 25\text{ nH}$ $du/dt = 3000\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$E_{off}$	89,0 130 158		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P \leq 8\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ $t_P \leq 6\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	$I_{SC}$	3200 3000		A A
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个 IGBT / per IGBT valid with IFX pre-applied thermal interface material		$R_{thJH}$		0,0716	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	175	$^{\circ}\text{C}$

初步数据  
Preliminary Data

二极管, 逆变器 / Diode, Inverter

最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	1200	V
连续正向直流电流 Continuous DC forward current		$I_F$	900	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	$I_{FRM}$	1800	A
$I_{2t}$ -值 $I_{2t}$ - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 175^{\circ}\text{C}$	$I_{2t}$	35000 30000	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 900\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_F$	1,80 1,70 1,65	2,05	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 900\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$I_{RM}$	389 511 578		A A A
恢复电荷 Recovered charge	$I_F = 900\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$Q_r$	65,0 127 171		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 900\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$E_{rec}$	29,0 52,0 68,0		mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode valid with IFX pre-applied thermal interface material		$R_{thJH}$		0,126	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	175	$^{\circ}\text{C}$

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

			min.	typ.	max.	
额定电阻值 Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	$R_{25}$		5,00		k $\Omega$
R100 偏差 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$	$\Delta R/R$	-5		5	%
耗散功率 Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	$P_{25}$			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/100}$		3433		K

根据应用手册标定

Specification according to the valid application note.

初步数据  
Preliminary Data

模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V <sub>ISOL</sub>	3,4	kV
模块基板材料 Material of module baseplate			Cu	
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al <sub>2</sub> O <sub>3</sub>	
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		15,0 13,0	mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		12,5 10,0	mm
相对电痕指数 Comperative tracking index		CTI	> 200	
相对温度指数 (电) RTI Elec.	住房 housing	RTI	140	°C
min. typ. max.				
杂散电感,模块 Stray inductance module		L <sub>sCE</sub>	20	nH
模块引线电阻,端子-芯片 Module lead resistance, terminals - chip	T <sub>H</sub> = 25°C, 每个开关 / per switch	R <sub>CC'+EE'</sub>	0,80	mΩ
储存温度 Storage temperature		T <sub>stg</sub>	-40	125 °C
最高基板工作温度 Maximum baseplate operation temperature		T <sub>BPmax</sub>		125 °C
模块安装的安装扭矩 Mounting torque for modul mounting	螺丝 M5 根据相应的应用手册进行安装 Screw M5 - Mounting according to valid application note	M	3,00	6,00 Nm
端子联接扭矩 Terminal connection torque	螺丝 M6 根据相应的应用手册进行安装 Screw M6 - Mounting according to valid application note	M	3,0	6,0 Nm
重量 Weight		G	345	g

T<sub>vjop</sub> > 150 °C ist nur im Überlastbetrieb zulässig. Detaillierte Angaben sind AN 2018-14 zu entnehmen.

T<sub>vjop</sub> > 150 °C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

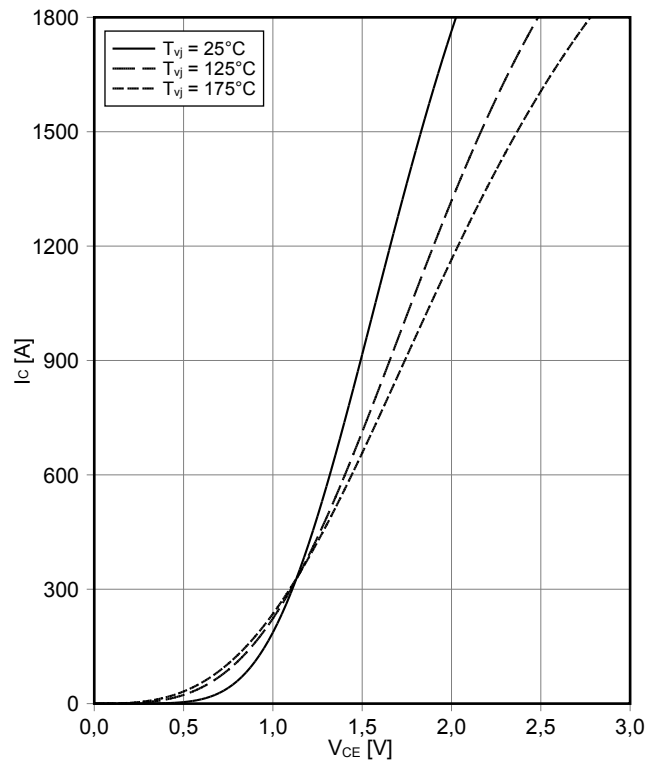
Lagerung und Transport von Modulen mit TIM => siehe AN2012-07

Storage and shipment of modules with TIM => see AN2012-07

# 初步数据 Preliminary Data

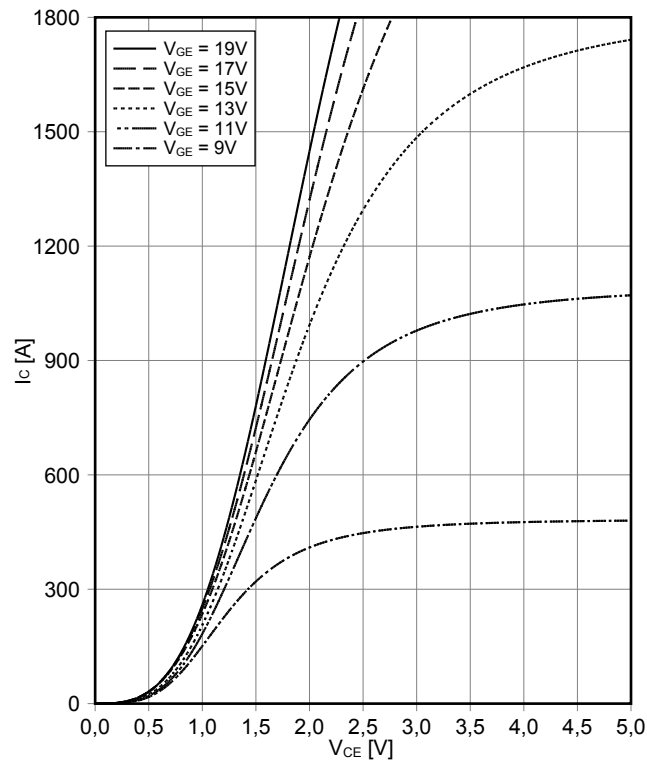
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$   
 $V_{GE} = 15\text{ V}$



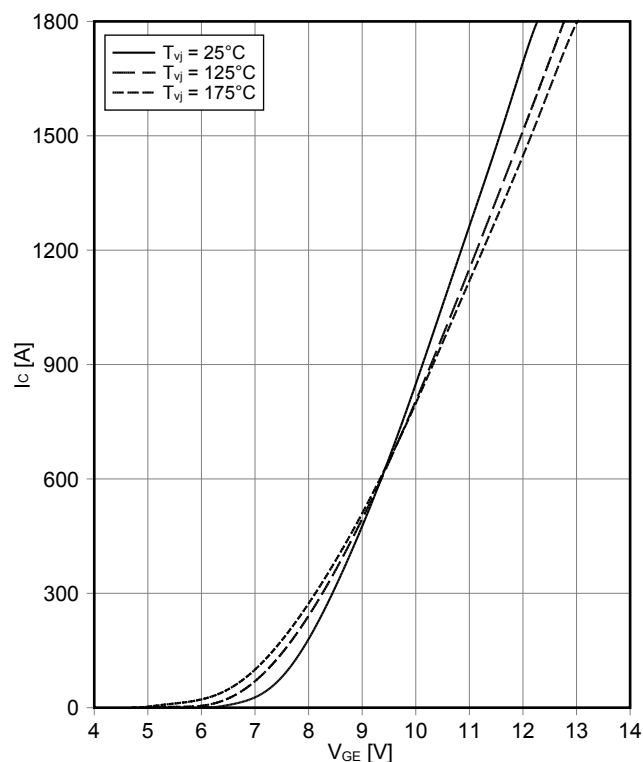
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$   
 $T_{vj} = 175^\circ\text{C}$



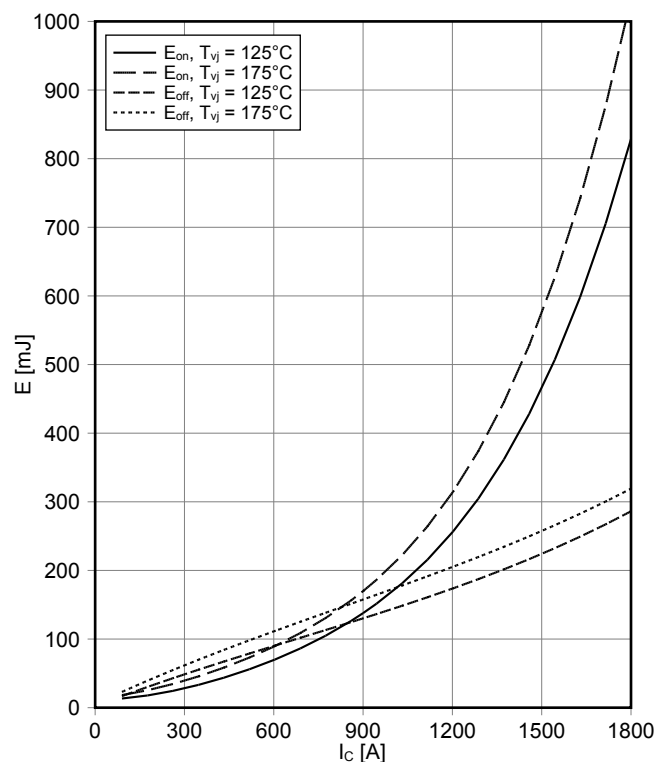
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$   
 $V_{CE} = 20\text{ V}$



开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

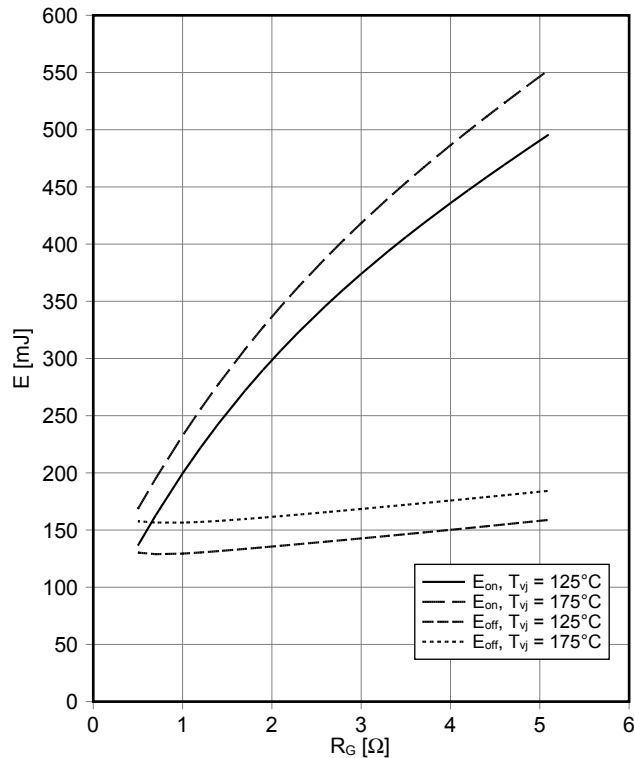
$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 0.51\ \Omega$ ,  $R_{Goff} = 0.51\ \Omega$ ,  $V_{CE} = 600\text{ V}$



# 初步数据 Preliminary Data

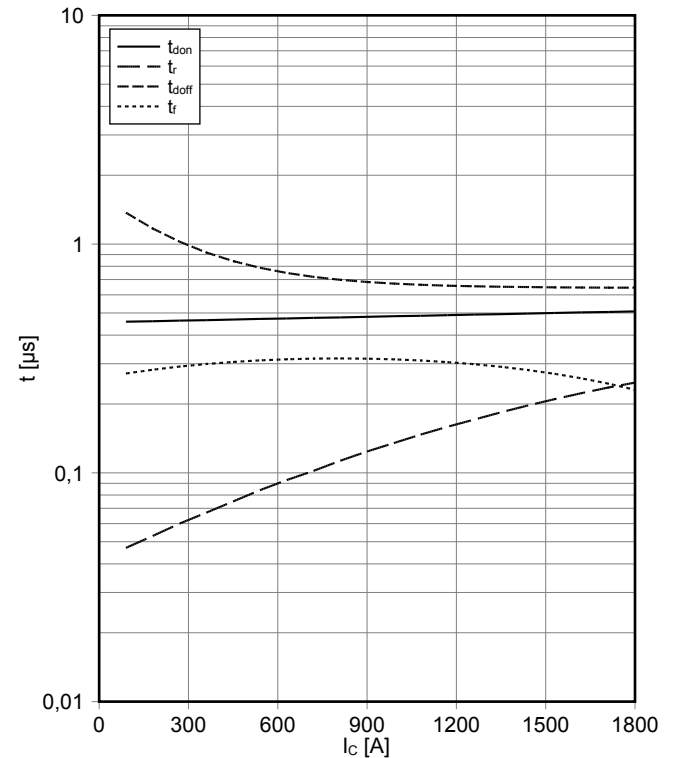
## 开关损耗 IGBT, 逆变器 (典型) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 900\text{ A}$ ,  $V_{CE} = 600\text{ V}$



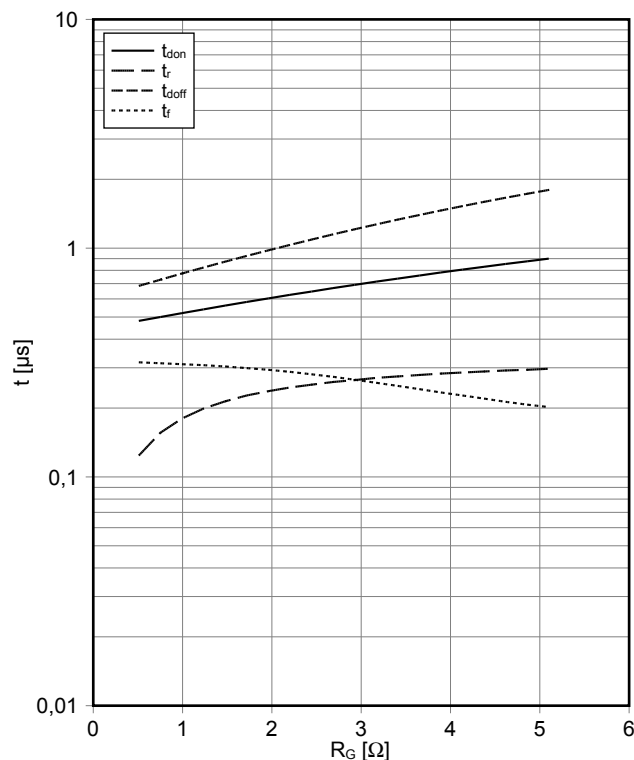
## ??? IGBT, 逆变器 (典型) switching times IGBT, Inverter (typical)

$t_{don} = f(I_C)$ ,  $t_r = f(I_C)$ ,  $t_{doff} = f(I_C)$ ,  $t_f = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 0.51\text{ Ω}$ ,  $R_{Goff} = 0.51\text{ Ω}$ ,  $V_{CE} = 600\text{ V}$



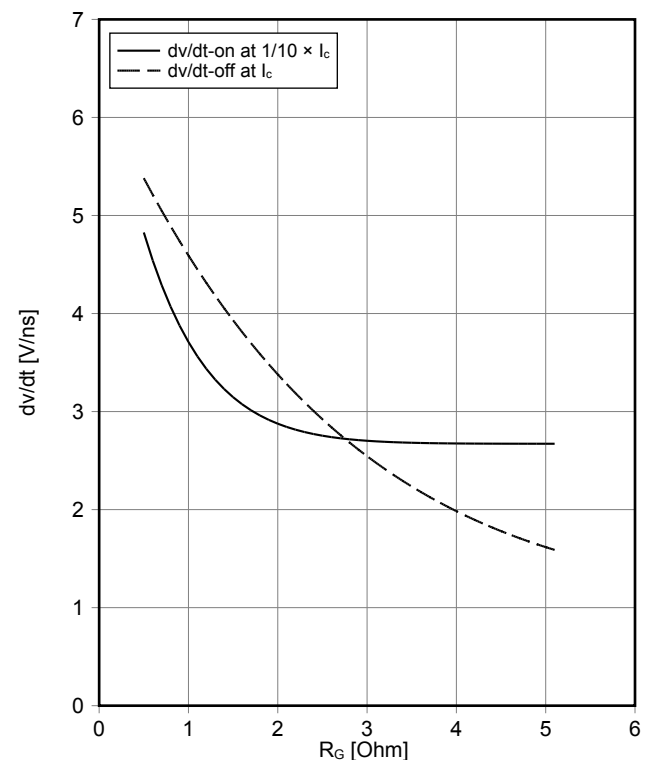
## ??? IGBT, 逆变器 (典型) switching times IGBT, Inverter (typical)

$t_{don} = f(R_G)$ ,  $t_r = f(R_G)$ ,  $t_{doff} = f(R_G)$ ,  $t_f = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 900\text{ A}$ ,  $V_{CE} = 600\text{ V}$



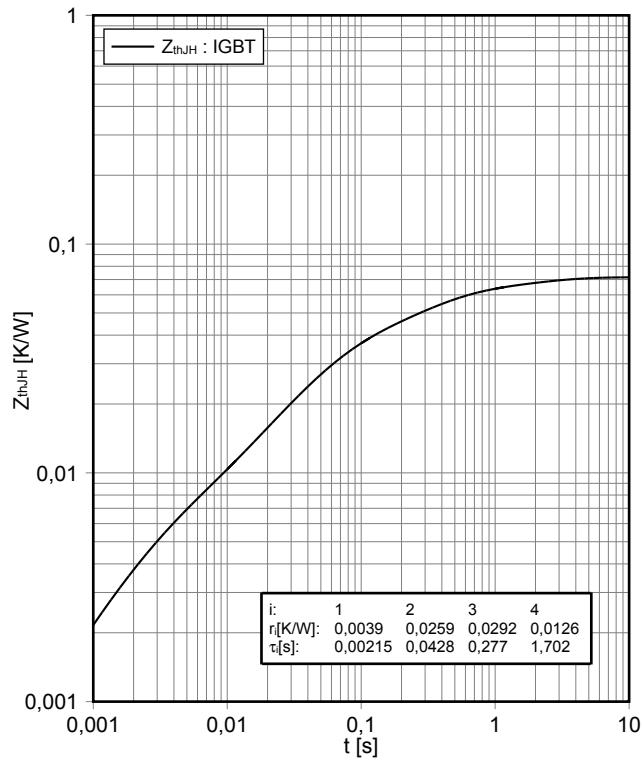
## dv/dt IGBT, 逆变器 (典型) dv/dt IGBT, Inverter (typical)

$dv/dt = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 900\text{ A}$ ,  $V_{CE} = 600\text{ V}$ ,  $T_{vj} = 25^\circ\text{C}$

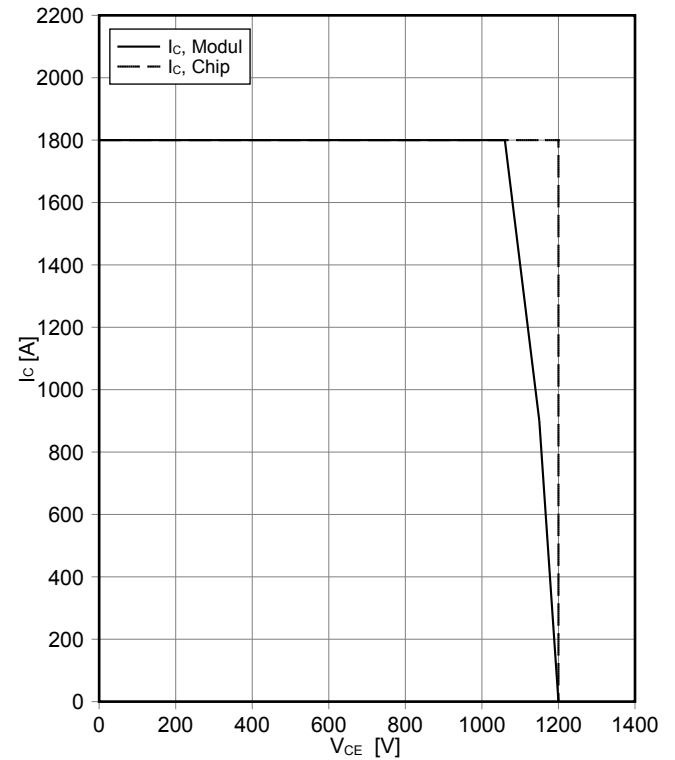


## 初步数据 Preliminary Data

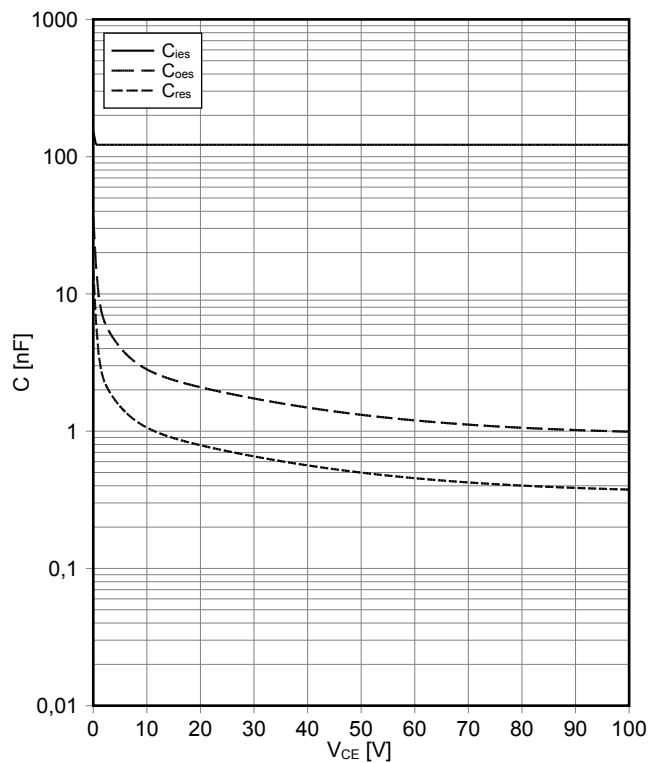
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter  
 $Z_{thJH} = f(t)$



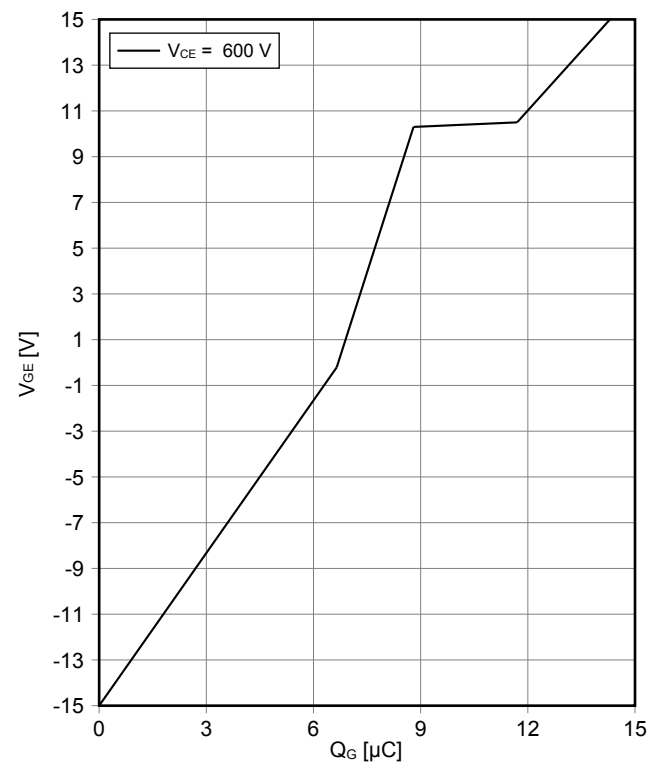
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)  
 $I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 0.51 \Omega$ ,  $T_{vj} = 175^\circ\text{C}$



电容特性 IGBT, 逆变器 (典型)  
capacity characteristic IGBT, Inverter (typical)  
 $C = f(V_{CE})$   
 $V_{GE} = 0 \text{ V}$ ,  $T_{vj} = 25^\circ\text{C}$ ,  $f = 100\text{kHz}$

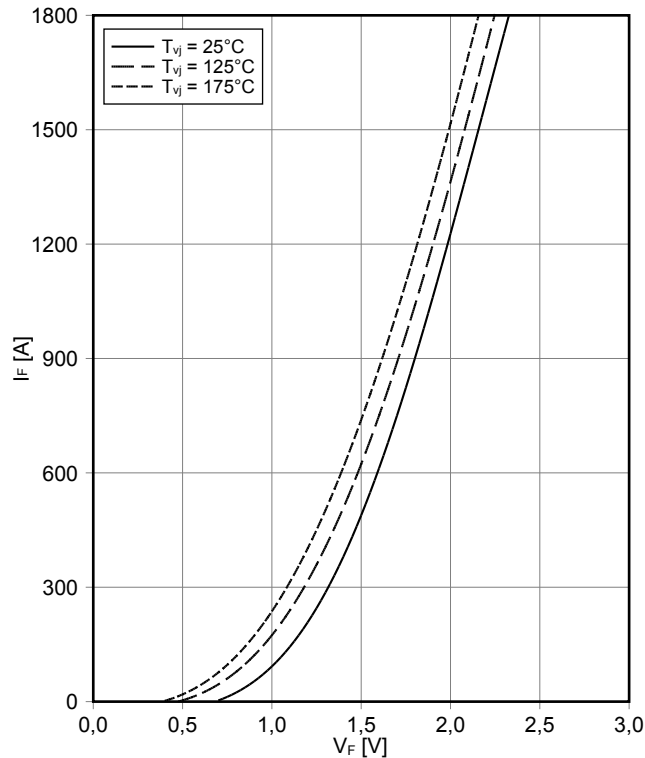


栅极电荷特性 IGBT, 逆变器 (典型)  
gate charge characteristic IGBT, Inverter (typical)  
 $V_{GE} = f(Q_G)$   
 $I_C = 900 \text{ A}$ ,  $T_{vj} = 25^\circ\text{C}$

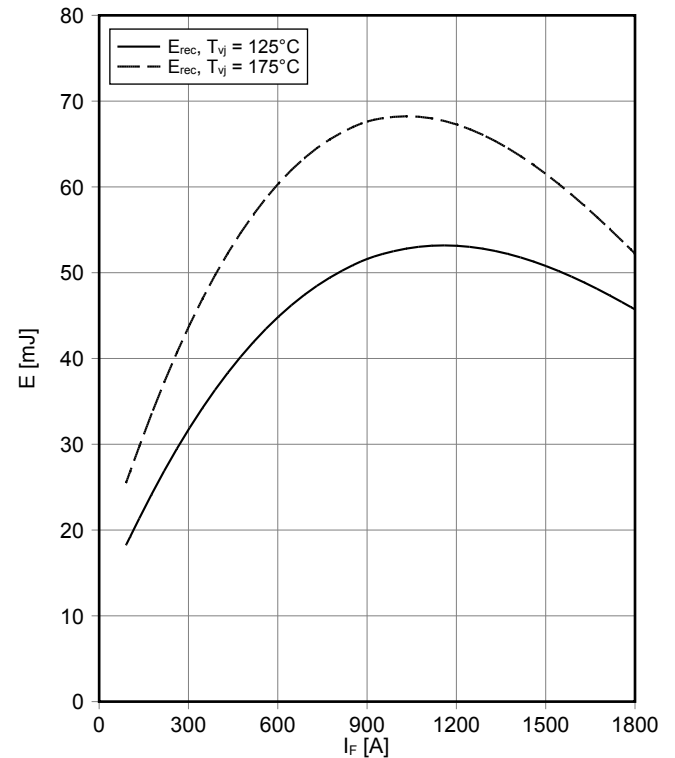


## 初步数据 Preliminary Data

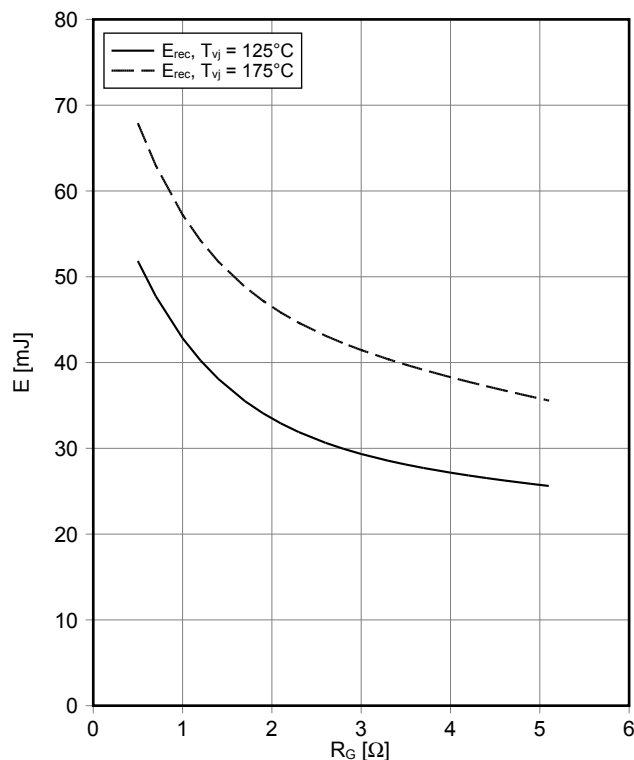
正向偏压特性 二极管,逆变器 (典型)  
forward characteristic of Diode, Inverter (typical)  
 $I_F = f(V_F)$



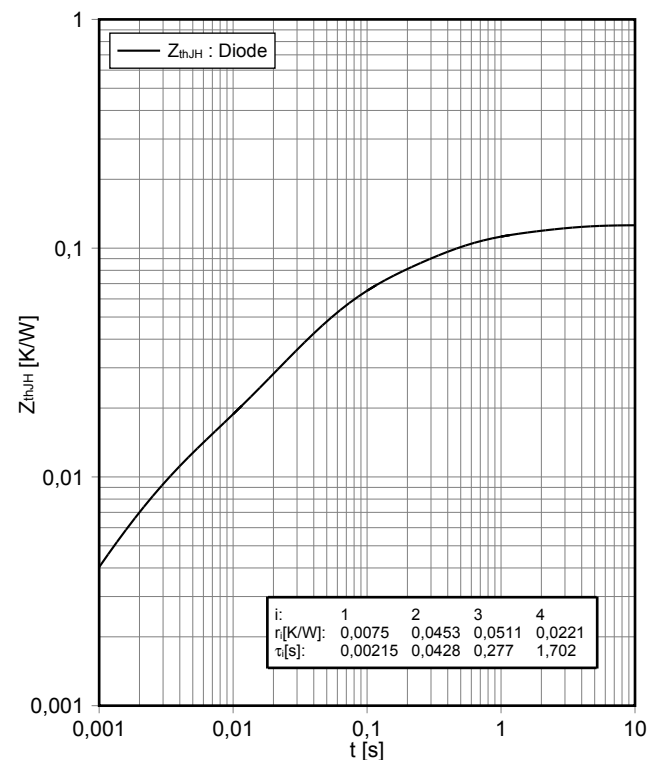
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)  
 $E_{rec} = f(I_F)$   
 $R_{Gon} = 0.51 \Omega$ ,  $V_{CE} = 600 \text{ V}$



开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)  
 $E_{rec} = f(R_G)$   
 $I_F = 900 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$

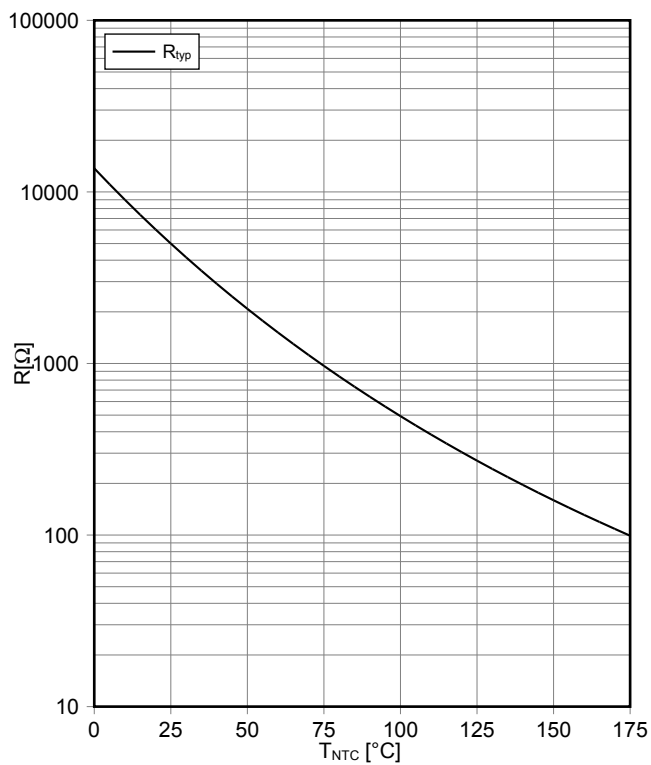


瞬态热阻抗 二极管,逆变器  
transient thermal impedance Diode, Inverter  
 $Z_{thJH} = f(t)$

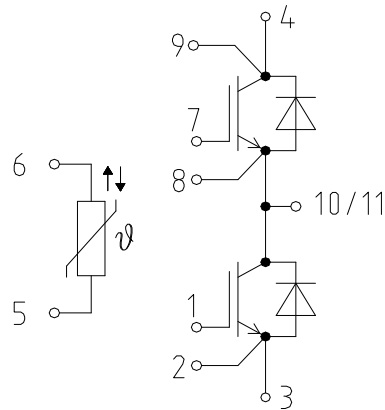


负温度系数热敏电阻 温度特性

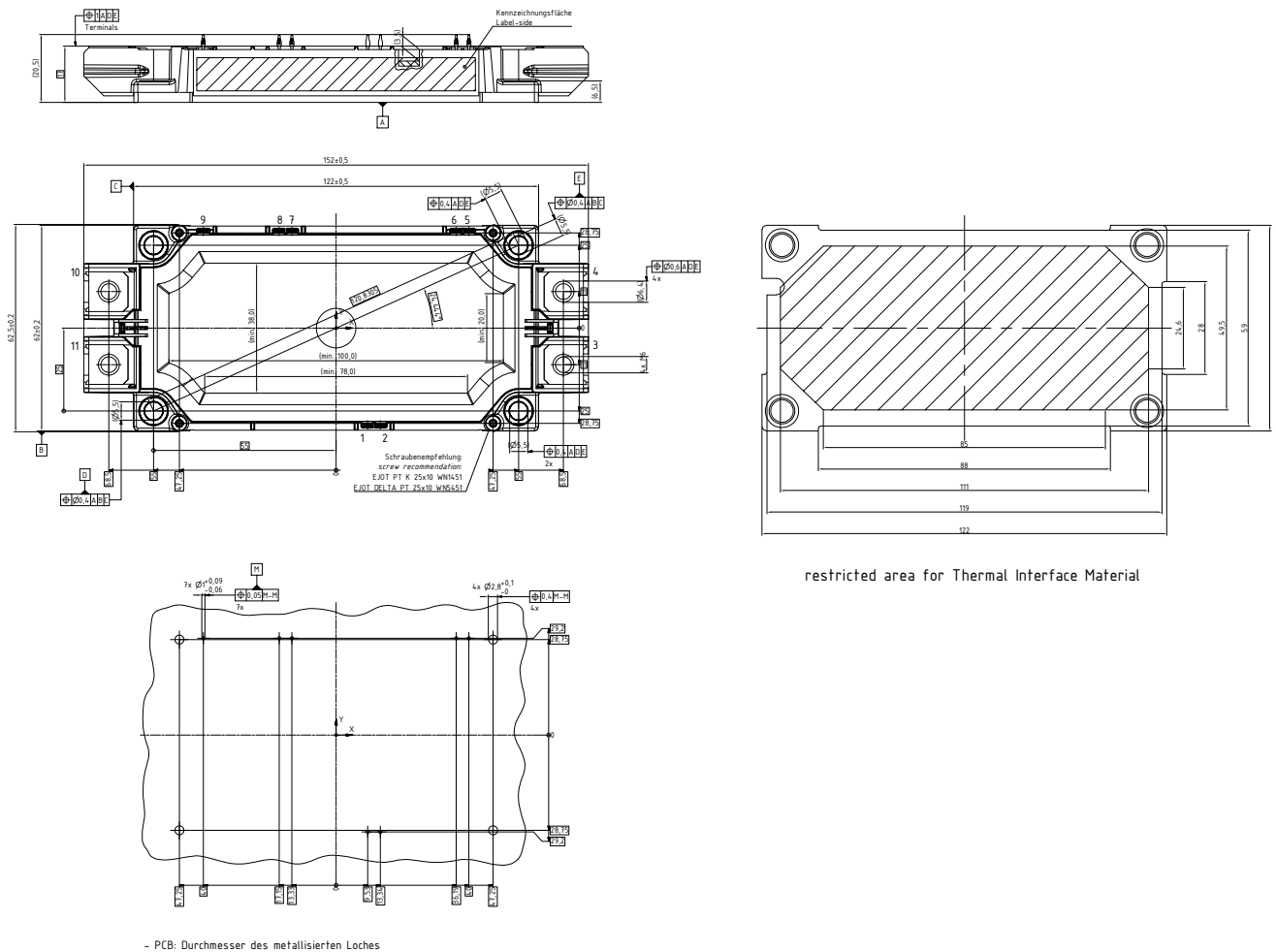
NTC-Thermistor-temperature characteristic (typical)

 $R = f(T_{NTC})$ 

## 接线图 / Circuit diagram



## 封装尺寸 / Package outlines



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