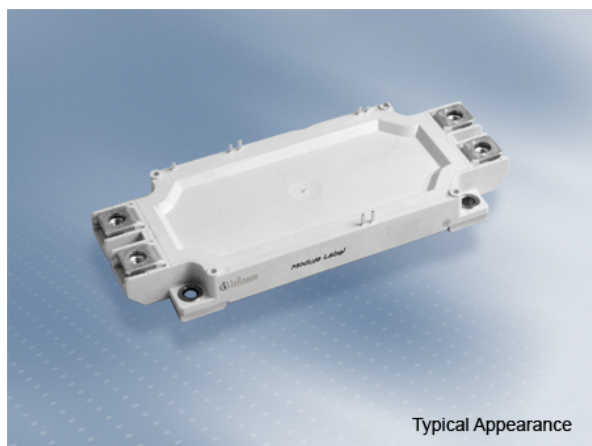


EconoDUAL™3 模块 采用第四代沟槽栅/场终止IGBT4和发射极控制二极管 带有温度检测NTC 和预涂导热介质
EconoDUAL™3 module with Trench/Fieldstop IGBT4 and Emitter Controlled diode and NTC / pre-applied Thermal Interface Material



典型应用

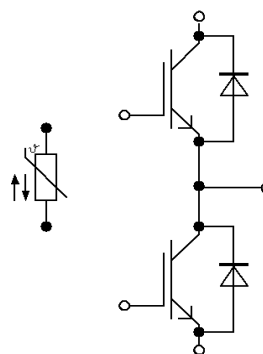
- 电机传动
- 伺服驱动器
- UPS系统
- 风力发电机

电气特性

- 低 V_{CEsat}
- $T_{vj\,op} = 150^{\circ}C$

机械特性

- 标准封装
- 预涂导热介质



$$V_{CES} = 1700V$$

$$I_{C\,nom} = 225A / I_{CRM} = 450A$$

Typical Applications

- Motor drives
- Servo drives
- UPS systems
- Wind turbines

Electrical Features

- Low V_{CEsat}
- $T_{vj\,op} = 150^{\circ}C$

Mechanical Features

- Standard housing
- Pre-applied Thermal Interface Material

Module Label Code

Barcode Code 128



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

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}	1700	V
连续集电极直流电流 Continuous DC collector current	$T_H = 70^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	225	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	450	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	$I_C = 225\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 225\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 225\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,95 2,35 2,45	2,30	V V V
栅极阈值电压 Gate threshold voltage	$I_C = 9,00\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,20	5,80	6,40 V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		Q_G	2,35		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	2,8		Ω
输入电容 Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	18,5		nF
反向传输电容 Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	0,60		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{CES}		3,0	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}		400	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 225\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,22 0,25 0,26		μs μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 225\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,08 0,085 0,09		μs μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 225\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,69 0,84 0,88		μs μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 225\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,28 0,54 0,62		μs μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 225\text{ A}, V_{CE} = 900\text{ V}, L_S = 35\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 3100\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	51,0 67,5 72,0		mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 225\text{ A}, V_{CE} = 900\text{ V}, L_S = 35\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3000\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	45,5 73,5 83,5		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 1000\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	1100		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}		0,151	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	150	$^{\circ}\text{C}$

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}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	225	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	450	A
I^2t -值 I^2t - value	$V_R = 0\text{ V}$, $t_P = 10\text{ ms}$, $T_{vj} = 125^{\circ}\text{C}$	I^2t	8300	A^2s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 225\text{ A}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$ $I_F = 225\text{ A}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $I_F = 225\text{ A}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 150^{\circ}\text{C}$	V_F		1,80 1,90 1,95	2,20	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 225\text{ A}$, $-di_F/dt = 3100\text{ A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $T_{vj} = 25^{\circ}\text{C}$ $V_R = 900\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $V_{GE} = -15\text{ V}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}		320 375 385		A A A
恢复电荷 Recovered charge	$I_F = 225\text{ A}$, $-di_F/dt = 3100\text{ A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $T_{vj} = 25^{\circ}\text{C}$ $V_R = 900\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $V_{GE} = -15\text{ V}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r		57,0 97,0 110		μC μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 225\text{ A}$, $-di_F/dt = 3100\text{ A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $T_{vj} = 25^{\circ}\text{C}$ $V_R = 900\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $V_{GE} = -15\text{ V}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}		32,5 60,5 69,0		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}			0,222	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

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 Ω
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.

模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	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 ₂ O ₃	
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		14,5 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	
min. typ. max.				
杂散电感, 模块 Stray inductance module		L _{sCE}		20 nH
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	T _H = 25°C, 每个开关 / per switch	R _{CC'+EE'}		1,10 mΩ
储存温度 Storage temperature		T _{stg}	-40	125 °C
最高基板工作温度 Maximum baseplate operation temperature		T _{BPmax}		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

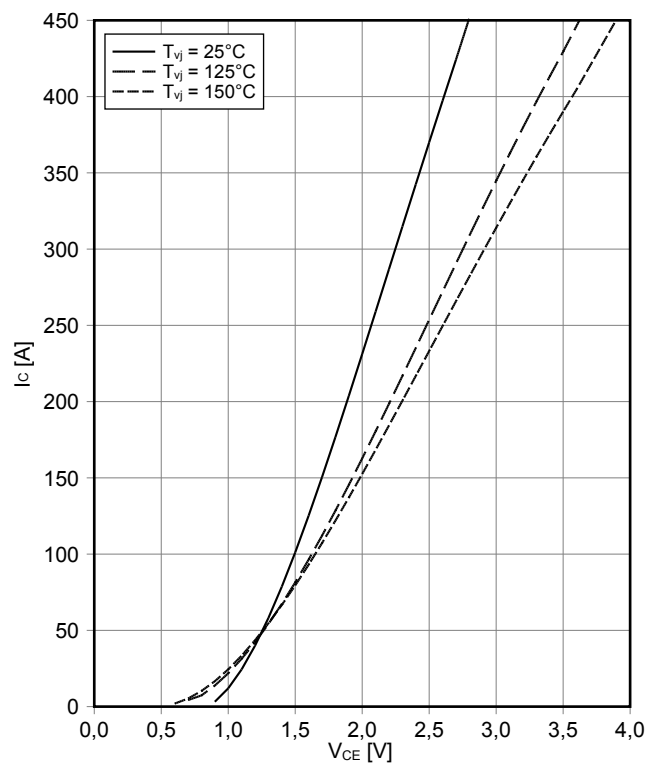
Lagerung und Transport von Modulen mit TIM => siehe AN2012-07
Storage and shipment of modules with TIM => see AN2012-07

输出特性 IGBT, 逆变器 (典型)

output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

$V_{GE} = 15\text{ V}$

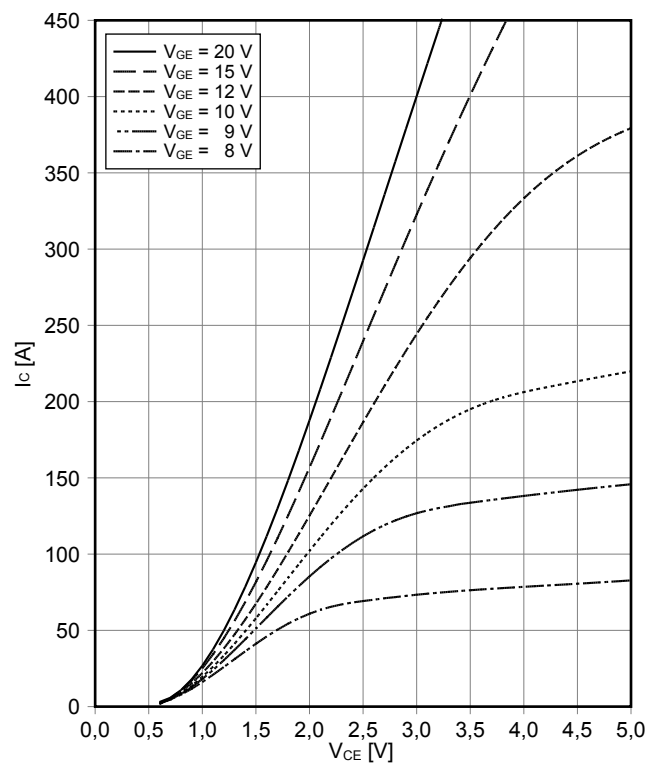


输出特性 IGBT, 逆变器 (典型)

output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

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

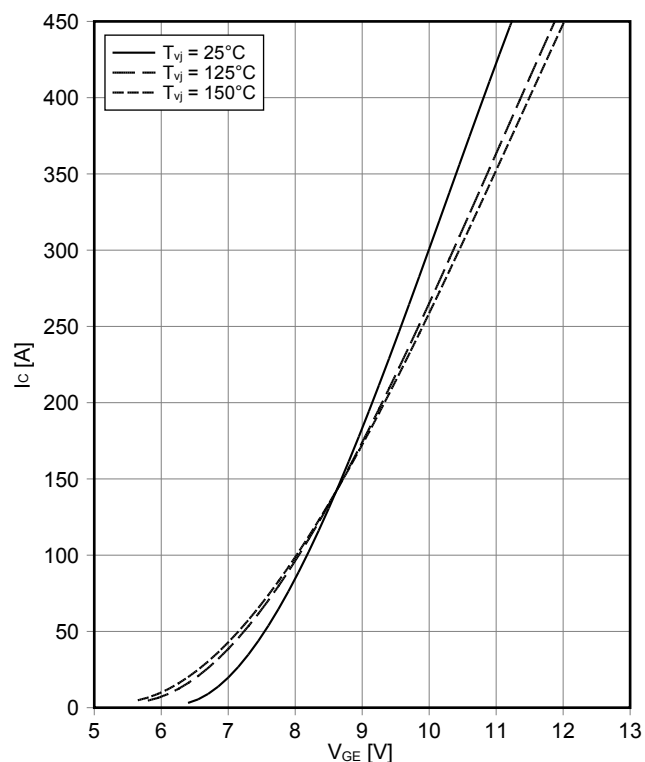


传输特性 IGBT, 逆变器 (典型)

transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$

$V_{CE} = 20\text{ V}$

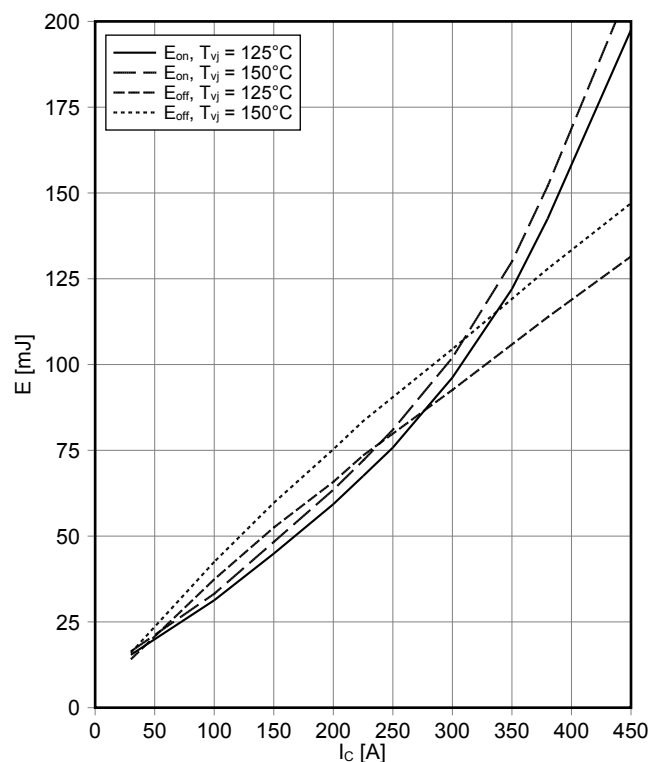


开关损耗 IGBT, 逆变器 (典型)

switching losses IGBT, Inverter (typical)

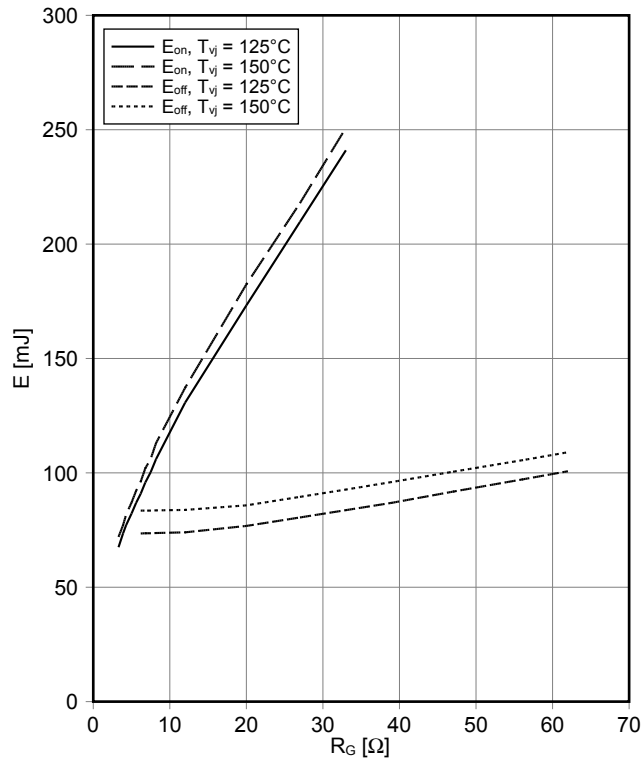
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$

$V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 3.3\ \Omega$, $R_{Goff} = 6.2\ \Omega$, $V_{CE} = 900\text{ V}$



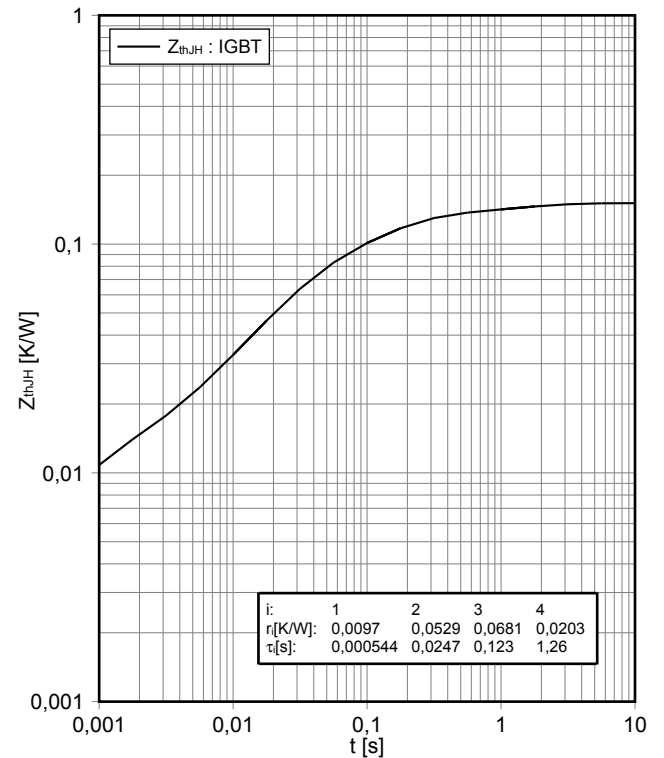
开关损耗 IGBT, 逆变器 (典型) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 225 \text{ A}$, $V_{CE} = 900 \text{ V}$



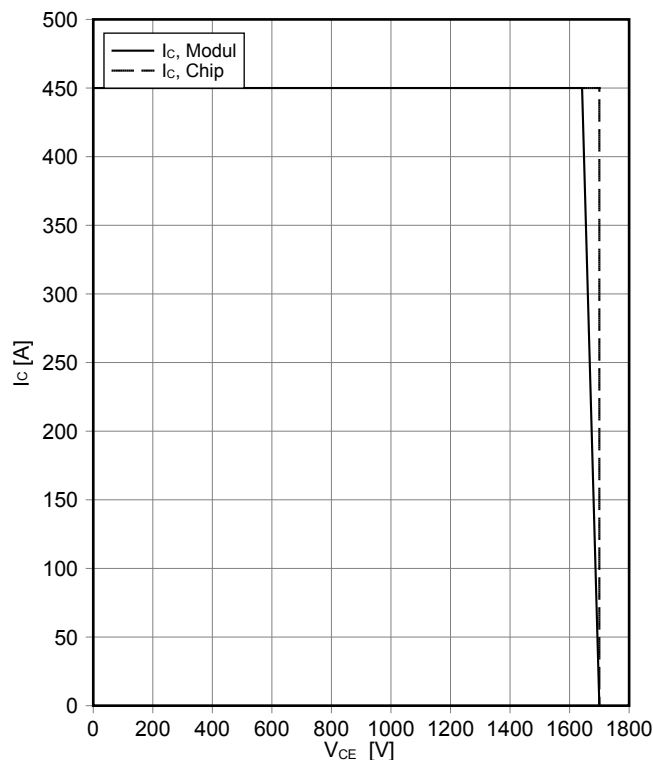
瞬态热阻抗 IGBT, 逆变器 transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



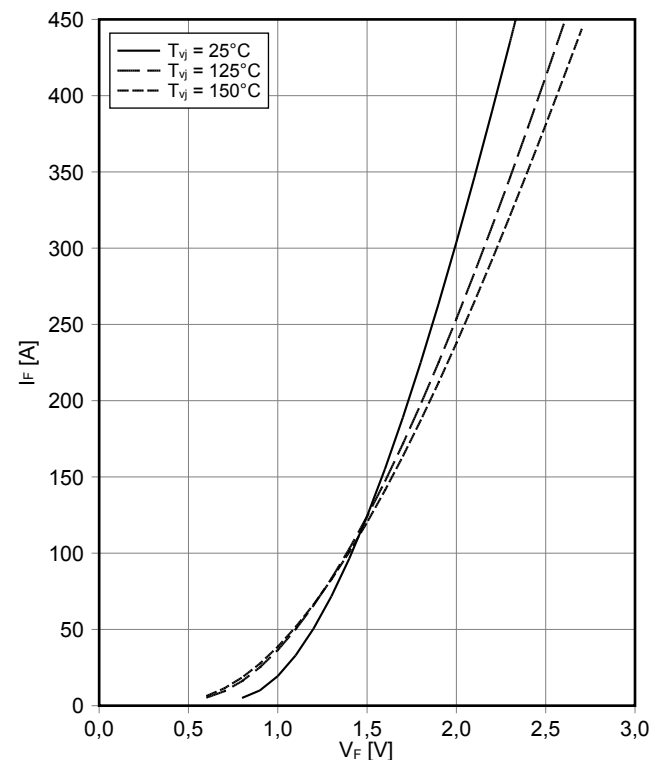
反偏安全工作区 IGBT, 逆变器 (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 6.2 \Omega$, $T_{vj} = 150^\circ\text{C}$



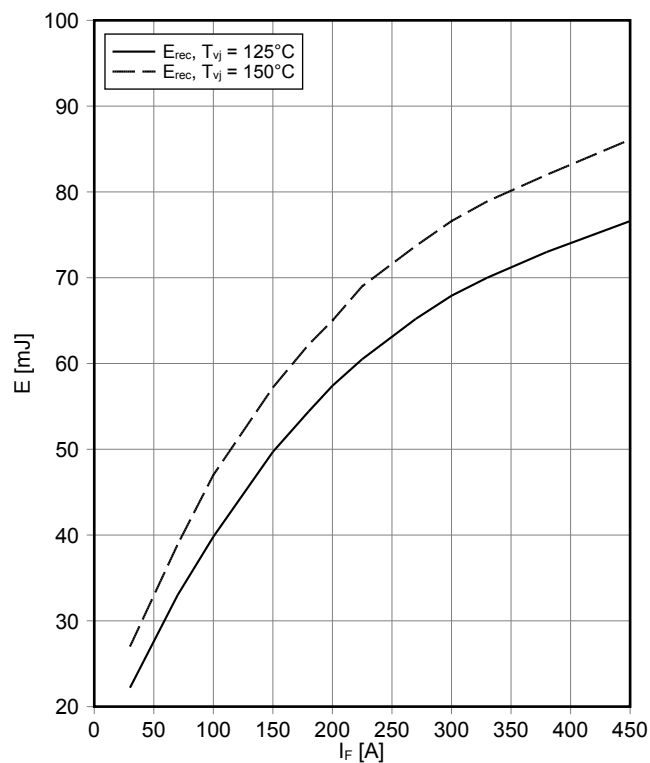
正向偏压特性 二极管, 逆变器 (典型) forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



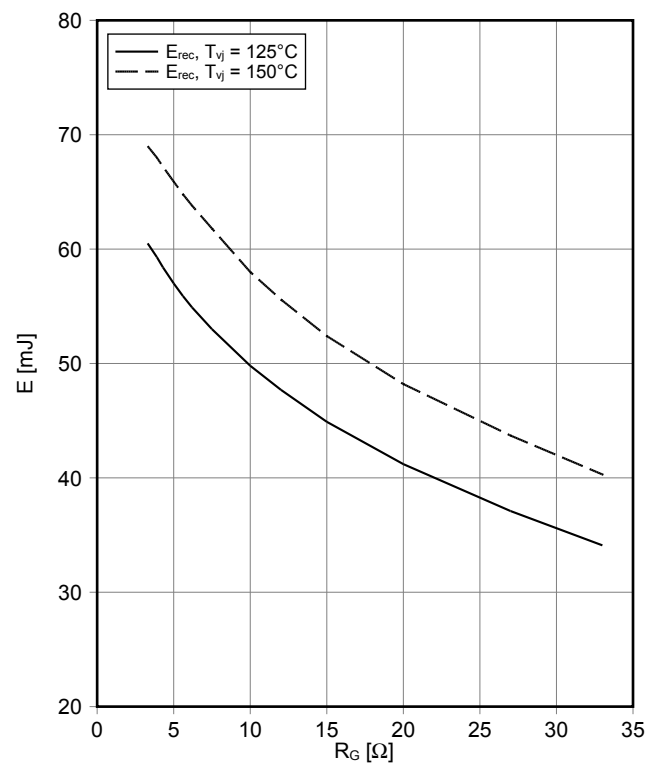
开关损耗 二极管,逆变器 (典型)

switching losses Diode, Inverter (typical)

 $E_{rec} = f(I_F)$ $R_{Gon} = 3.3 \Omega$, $V_{CE} = 900 V$ 

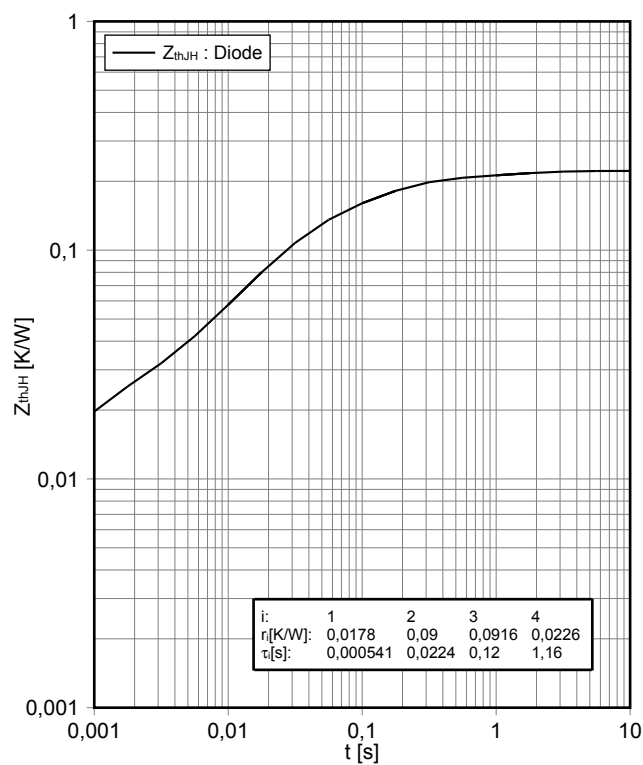
开关损耗 二极管,逆变器 (典型)

switching losses Diode, Inverter (typical)

 $E_{rec} = f(R_G)$ $I_F = 225 A$, $V_{CE} = 900 V$ 

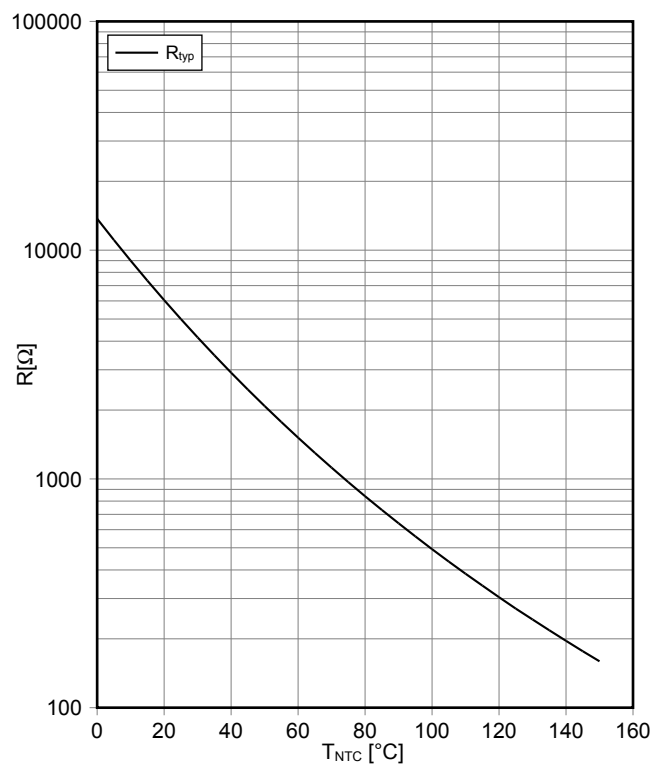
瞬态热阻抗 二极管,逆变器

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)

 $R = f(T)$ 

Technical drawing of the GJJWW module, showing dimensions and tolerances in millimeters.

Top View:

- Overall dimensions: 152.1-0.5 (width) x 62-0.2 (height).
- Internal dimensions: 137±0.4, 122.1±0.3, 110±0.2, 99.2±0.2, 94.5±0.2, 79.2±0.3, 100.6±0.3, 37.2±0.15, 20.7±0.2, 22±0.2, 38.6±0.2, 50±0.2, 57.5±0.2, 62±0.2.
- Mounting holes: 4 holes with diameter $\varnothing 4.65 \pm 0.2$ and 4 holes with diameter $\varnothing 2.5 \pm 0.1$.
- Other features: 11.6-0.6, 6±0.1, 5.5^{+0.1}_{-0.3}, 11.6-0.6, 6±0.1, 4, 3, M6, 22±0.2, 38.6±0.2, 50±0.2, 57.5±0.2, 62±0.2.
- Section lines: 0.3 connector 3-4; 10-11, 0.2 each single connector.
- Material: Infineon EconoDUAL™.

Side View:

- Overall dimensions: 17±0.5 (width) x 6.5±0.2 (height).
- Internal dimensions: 15±0.1, 11±0.2, 3.8±0.3, (20.8).

Detail Views:

- X 2:1:** 0.8±0.03, 0.4±0.1.
- Y 2:1:** 1.15±0.03, 0.65±0.1, 1.2±0.1.

Restricted Area for Thermal Interface Material:

- Dimensions: 49.5, 24.6, 85, 111, 119, 122, 59, 62.

Legend:

- * = all dimensions with a tolerance of ± 0.5
- dimensions valid in mounted condition

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