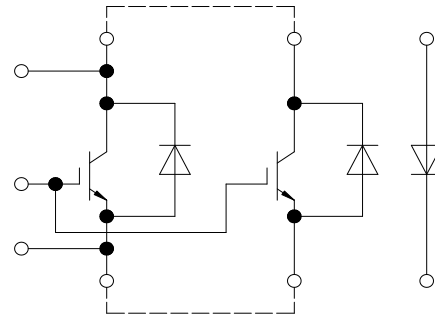


IHM-B 模块 采用第三代高速沟槽栅/场终止IGBT和第三代发射极控制二极管  
IHM-B module with fast Trench/Fieldstop IGBT3 and Emitter Controlled 3 diode



$V_{CES} = 3300V$   
 $I_{C\ nom} = 1000A / I_{CRM} = 2000A$

**典型应用**

- 斩波应用
- 中压变流器
- 电机传动
- 牵引变流器
- UPS系统
- 风力发电机

**Typical Applications**

- Chopper Applications
- Medium Voltage Converters
- Motor Drives
- Traction Drives
- UPS Systems
- Wind Turbines

**电气特性**

- 高直流电压稳定性
- 高短路能力，自限制短路电流
- 低开关损耗
- 低  $V_{CEsat}$
- $T_{vj\ op} = 150^{\circ}C$
- $V_{CEsat}$  带正温度系数

**Electrical Features**

- High DC Stability
- High Short Circuit Capability, Self Limiting Short Circuit Current
- Low Switching Losses
- LOW  $V_{CEsat}$
- $T_{vj\ op} = 150^{\circ}C$
- $V_{CEsat}$  with positive Temperature Coefficient

**机械特性**

- 碳化硅铝 ( AlSiC ) 基板提供更高的温度循环能力
- 封装的 CTI > 600
- IHM B 封装
- 绝缘的基板

**Mechanical Features**

- AlSiC Base Plate for increased Thermal Cycling Capability
- Package with CTI > 600
- IHM B Housing
- Isolated Base Plate

**Module Label Code**

Barcode Code 128



DMX - 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

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**IGBT, 制动-斩波器 / IGBT, Brake-Chopper**

**最大额定值 / Maximum Rated Values**

集电极 - 发射极电压 Collector-emitter voltage	$T_{vj} = -40^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CES}$	3300 3300	V
连续集电极直流电流 Continuous DC collector current	$T_C = 95^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$	1000	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ms}$	$I_{CRM}$	2000	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$P_{\text{tot}}$	11,5	kW
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	$I_C = 1000\text{A}, V_{GE} = 15\text{V}$ $I_C = 1000\text{A}, V_{GE} = 15\text{V}$ $I_C = 1000\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	2,55 3,00 3,15	3,10 3,45	V V V	
栅极阈值电压 Gate threshold voltage	$I_C = 48,0\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{GEth}$	5,2	5,8	6,4	V
栅极电荷 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}, V_{CE} = 1800\text{V}$		$Q_G$	28,0			$\mu\text{C}$
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	0,63			$\Omega$
输入电容 Input capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		$C_{ies}$	190			nF
反向传输电容 Reverse transfer capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		$C_{res}$	4,00			nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 3300\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$			5,0	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	$I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,5\Omega, C_{GE} = 220\text{nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,60 0,60 0,60			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
上升时间(电感负载) Rise time, inductive load	$I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,5\Omega, C_{GE} = 220\text{nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,55 0,55 0,55			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 2,3\Omega, C_{GE} = 220\text{nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	3,00 3,20 3,20			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
下降时间(电感负载) Fall time, inductive load	$I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 2,3\Omega, C_{GE} = 220\text{nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,30 0,35 0,35			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 1000\text{A}, V_{CE} = 1800\text{V}, L_S = 85\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 3000\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 0,71\Omega, C_{GE} = 220\text{nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	1250 1700 1950			mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 1000\text{A}, V_{CE} = 1800\text{V}, L_S = 85\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 2100\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 2,3\Omega, C_{GE} = 220\text{nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	1050 1400 1550			mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 2500\text{V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		$I_{SC}$	4300			A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		$R_{thJC}$		11,0		K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	14,5			K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	150		$^{\circ}\text{C}$

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**二极管，制动-斩波器 / Diode, Brake-Chopper**  
**最大额定值 / Maximum Rated Values**

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = -40^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{RRM}$	3300 3300	V
连续正向直流电流 Continuous DC forward current		$I_F$	1000	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	$I_{FRM}$	2000	A
$I^2t$ -值 $I^2t$ - value	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	260 245	$\text{kA}^2\text{s}$ $\text{kA}^2\text{s}$
最大损耗功率 Maximum power dissipation	$T_{vj} = 125^{\circ}\text{C}$	$P_{RQM}$	1600	kW
最小开通时间 Minimum turn-on time		$t_{on \text{ min}}$	10,0	$\mu\text{s}$

**特征值 / Characteristic Values**

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_F$	3,10 2,75 2,65	3,85 3,25	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$I_{RM}$	1000 1200 1250		A A A
恢复电荷 Recovered charge	$I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$Q_r$	450 900 1050		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{rec}$	450 1100 1300		mJ mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		$R_{thJC}$		20,0	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	16,5		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj \text{ op}}$	-40	150	$^{\circ}\text{C}$

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反向二极管 / Diode, Reverse

最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = -40^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{RRM}$	3300 3300	V
连续正向直流电流 Continuous DC forward current		$I_F$	1000	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	$I_{FRM}$	2000	A
$I^2t$ -值 $I^2t$ - value	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	260 245	$\text{kA}^2\text{s}$ $\text{kA}^2\text{s}$
最大损耗功率 Maximum power dissipation	$T_{vj} = 125^{\circ}\text{C}$	$P_{RQM}$	1600	kW
最小开通时间 Minimum turn-on time		$t_{on \text{ min}}$	10,0	$\mu\text{s}$

特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	$I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_F$		3,10 2,75 2,65	3,85 3,25	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$I_{RM}$		1000 1200 1250		A A A
恢复电荷 Recovered charge	$I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$Q_r$		450 900 1050		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{rec}$		450 1100 1300		mJ mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		$R_{thJC}$			21,5	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$		16,5		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj \text{ op}}$	-40		150	$^{\circ}\text{C}$

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**模块 / Module**

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V <sub>ISOL</sub>	6,0		kV
局部放电停止电压 Partial discharge extinction voltage	RMS, f = 50 Hz, Q <sub>PD</sub> ≤ 10 pC (acc. to IEC 1287)	V <sub>ISOL</sub>	2,6		kV
DC 稳定性 DC stability	T <sub>vj</sub> = 25°C, 100 fit	V <sub>CE D</sub>	2100		V
模块基板材料 Material of module baseplate			AISiC		
爬电距离 Creepage distance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal		32,2		mm
电气间隙 Clearance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal		19,1		mm
相对电痕指数 Comperative tracking index		CTI	> 600		
			min.	typ.	max.
杂散电感,模块 Stray inductance module		L <sub>sCE</sub>	9,0		nH
模块引线电阻,端子-芯片 Module lead resistance, terminals - chip	T <sub>C</sub> = 25°C, 每个开关 / per switch	R <sub>CC'+EE'</sub> R <sub>AA'+CC'</sub>	0,19 0,28		mΩ
储存温度 Storage temperature		T <sub>stg</sub>	-40	150	°C
模块安装的安装扭矩 Mounting torque for modul mounting	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	4,25	-	5,75 Nm
端子联接扭矩 Terminal connection torque	螺丝 M4 根据相应的应用手册进行安装 Screw M4 - Mounting according to valid application note 螺丝 M8 根据相应的应用手册进行安装 Screw M8 - Mounting according to valid application note	M	1,8 8,0	-	2,1 10 Nm
重量 Weight		G	1200		g

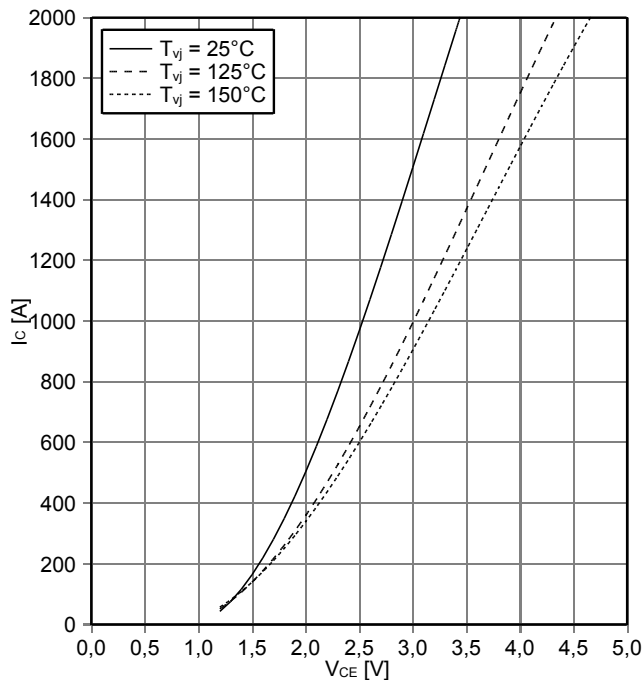
Modulinduktivität: IGBT (Zweig 1+2 parallel): 9nH; Diode (Zweig 3): 18nH  
stray inductance module: IGBT (arm 1+2 parallel): 9nH; diode (arm 3): 18nH

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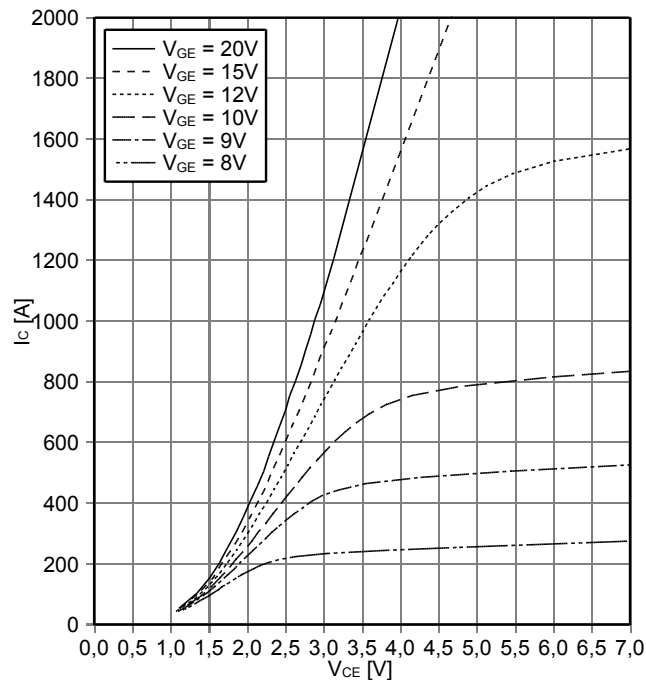
输出特性 IGBT, 制动-斩波器 (典型)  
output characteristic IGBT, Brake-Chopper (typical)

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



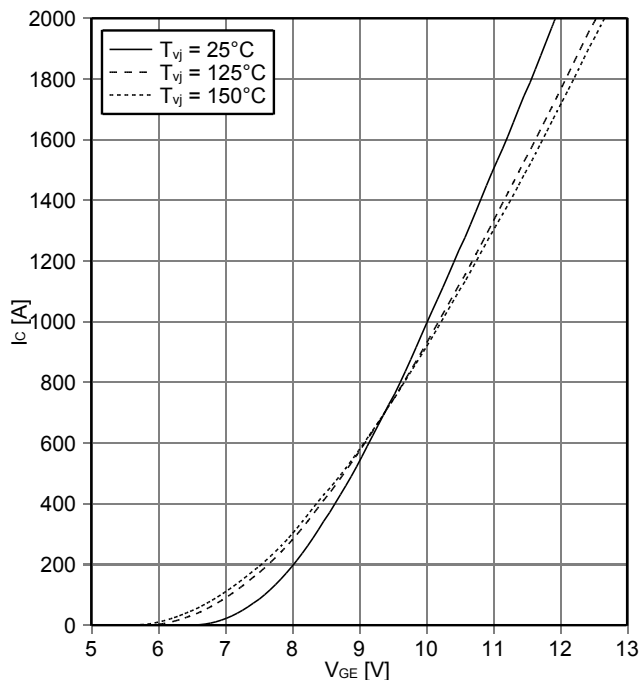
输出特性 IGBT, 制动-斩波器 (典型)  
output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$   
 $T_{vj} = 150^\circ\text{C}$



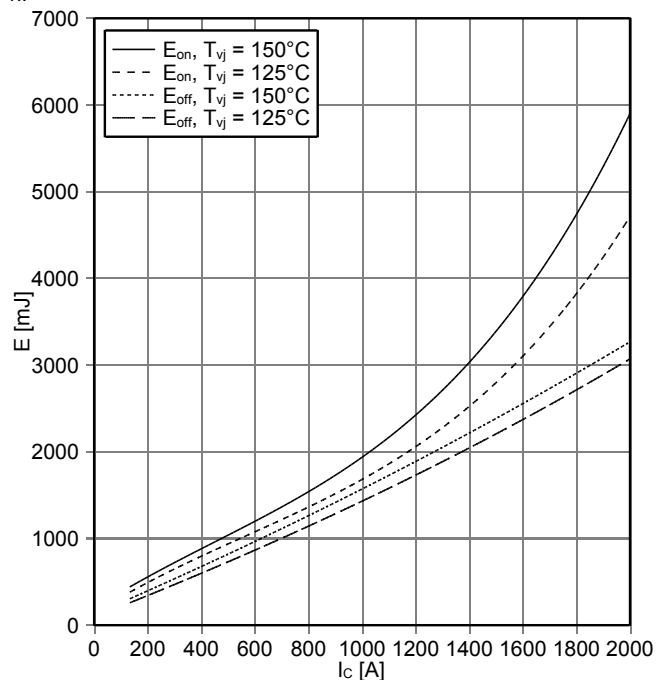
传输特性 IGBT, 制动-斩波器 (典型)  
transfer characteristic IGBT, Brake-Chopper (typical)

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



开关损耗 IGBT, 制动-斩波器 (典型)  
switching losses IGBT, Brake-Chopper (typical)

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 0.71\ \Omega$ ,  $R_{Goff} = 2.3\ \Omega$ ,  $V_{CE} = 1800\text{ V}$ ,  $C_{GE} = 220\text{ nF}$

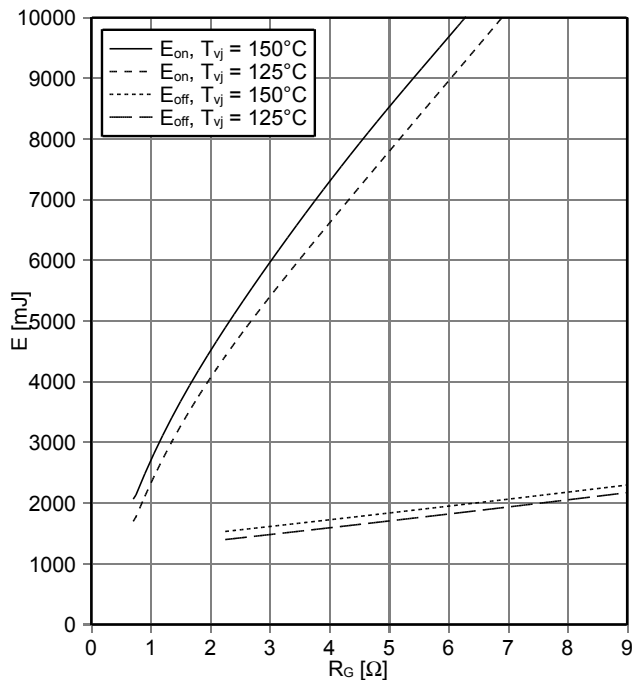


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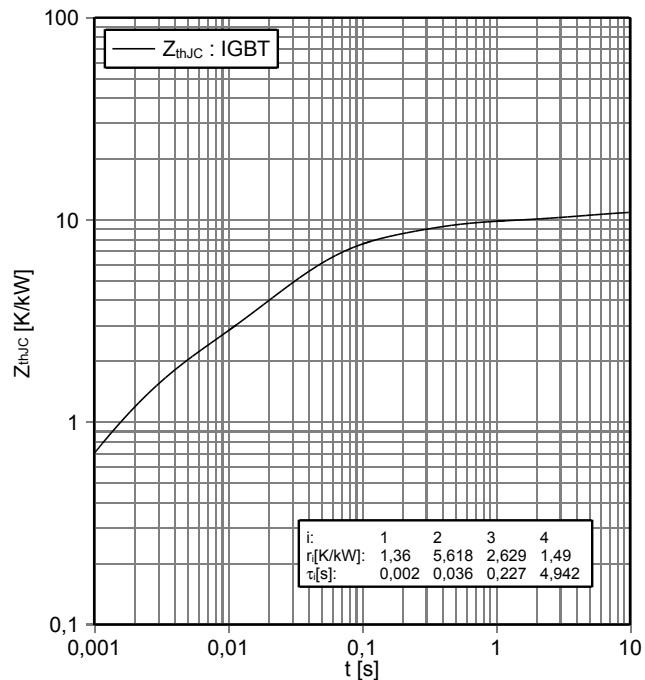
开关损耗 IGBT, 制动-斩波器 (典型)  
switching losses IGBT, Brake-Chopper (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 1000\text{ A}$ ,  $V_{CE} = 1800\text{ V}$ ,  $C_{GE} = 220\text{ nF}$



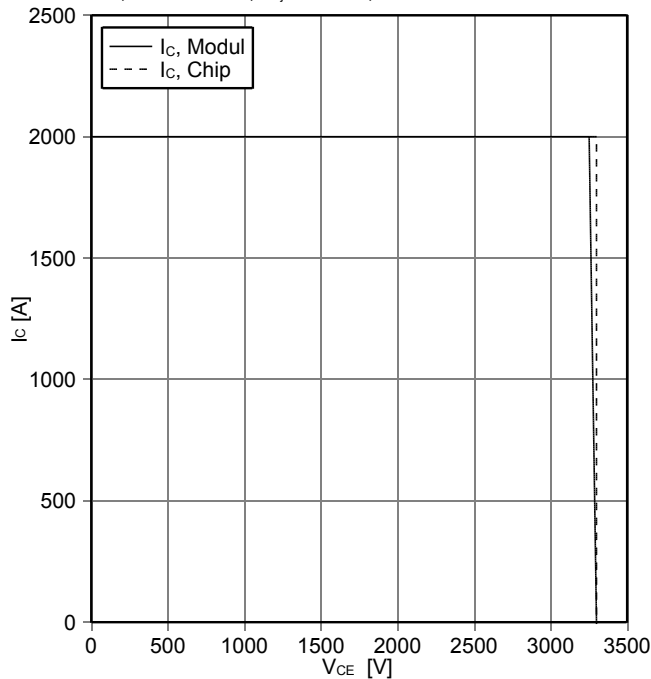
瞬态热阻抗 IGBT, 制动-斩波器  
transient thermal impedance IGBT, Brake-Chopper

$Z_{thJC} = f(t)$



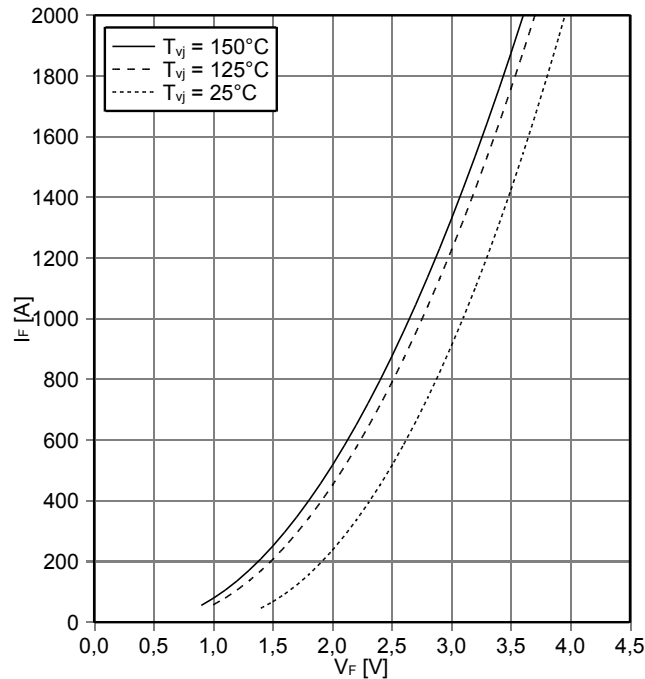
反偏安全工作区 IGBT, 制动-斩波器 (RBSOA)  
reverse bias safe operating area IGBT, Brake-Chopper (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 2.3\ \Omega$ ,  $T_{vj} = 150^\circ\text{C}$ ,  $C_{GE} = 220\text{ nF}$



正向偏压特性 二极管, 制动-斩波器 (典型)  
forward characteristic of Diode, Brake-Chopper (typical)

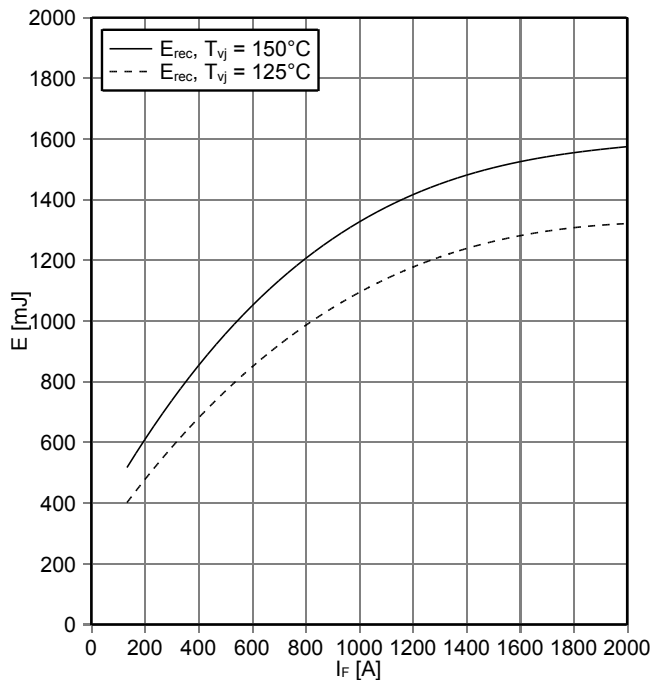
$I_F = f(V_F)$



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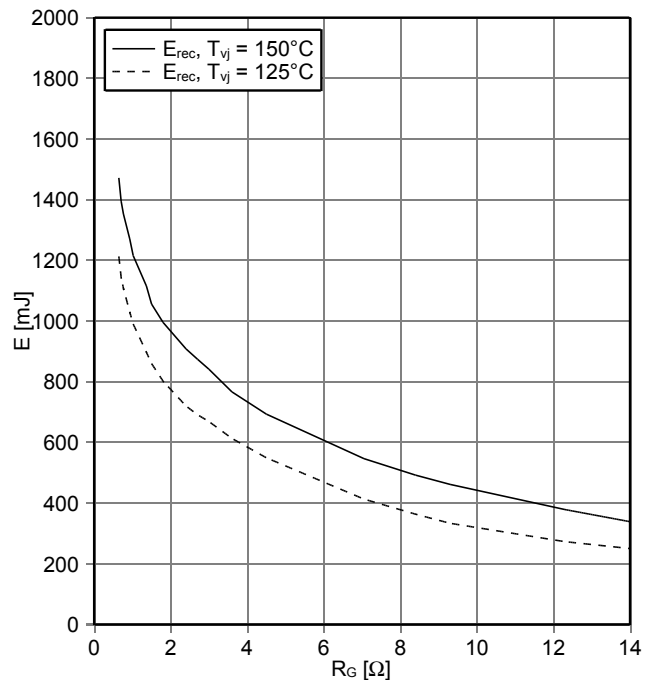
开关损耗 二极管，制动-斩波器 (典型)  
switching losses Diode, Brake-Chopper (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 0.71 \Omega, V_{CE} = 1800 V$



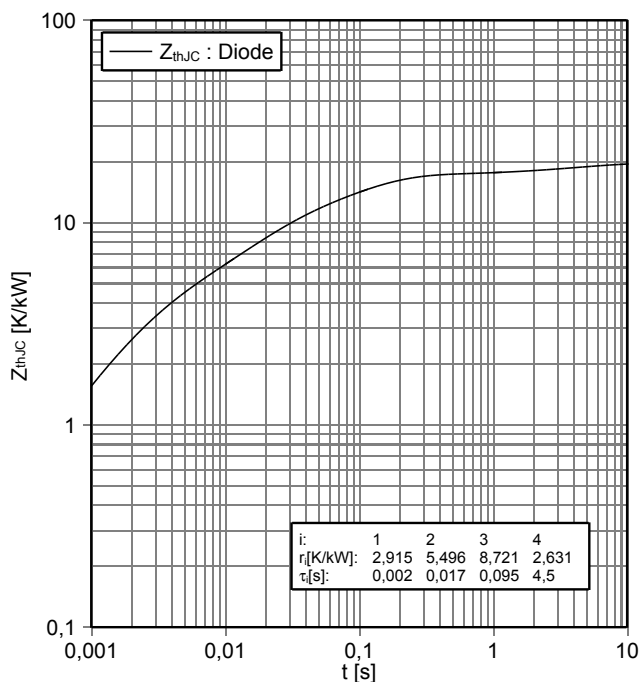
开关损耗 二极管，制动-斩波器 (典型)  
switching losses Diode, Brake-Chopper (typical)

$E_{rec} = f(R_G)$   
 $I_F = 1000 A, V_{CE} = 1800 V$



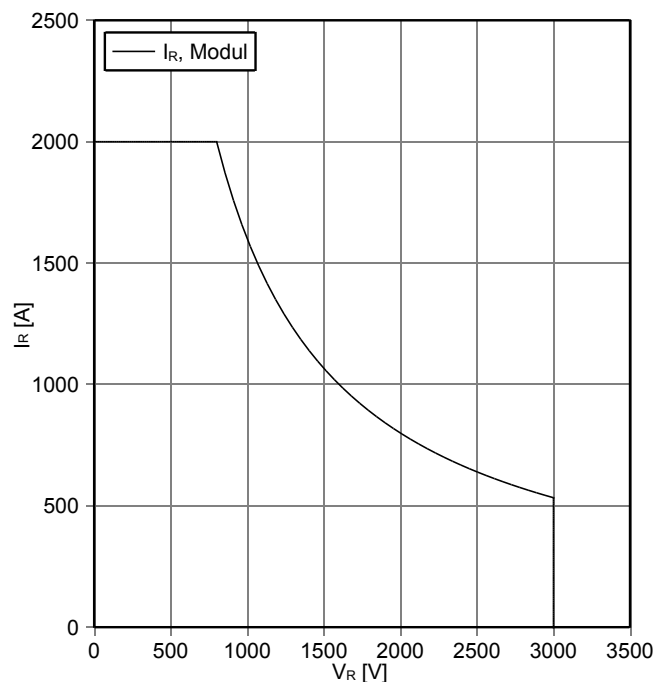
瞬态热阻抗 二极管，制动-斩波器  
transient thermal impedance Diode, Brake-Chopper

$Z_{thJC} = f(t)$



安全工作区 二极管，制动-斩波器 (SOA)  
safe operation area Diode, Brake-Chopper (SOA)

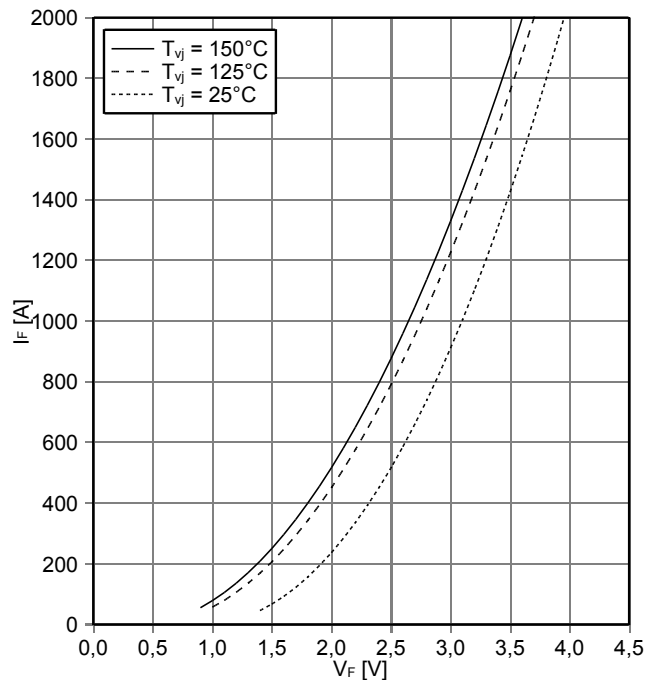
$I_R = f(V_R)$   
 $T_{vj} = 150^\circ C$



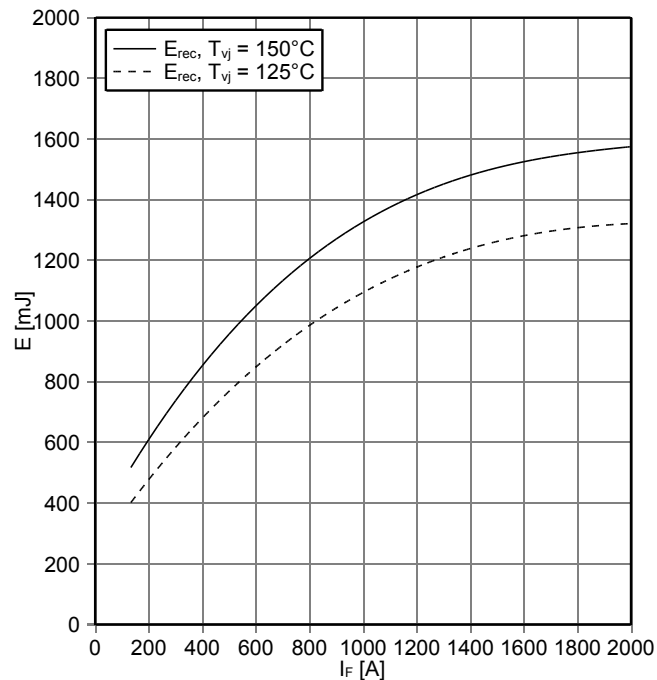
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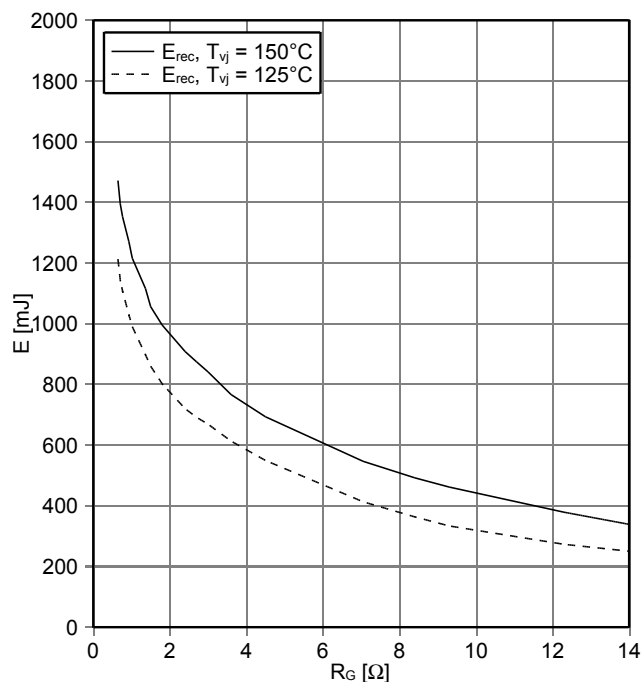
正向偏压特性 反向二极管 (典型)  
forward characteristic of Diode, Reverse (typical)  
 $I_F = f(V_F)$



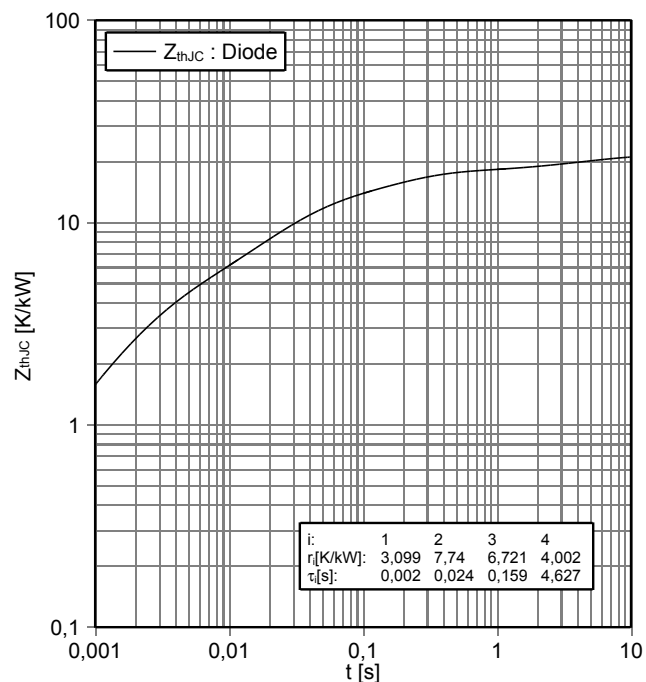
开关损耗 反向二极管 (典型)  
switching losses Diode, Reverse (typical)  
 $E_{rec} = f(I_F)$   
 $R_{Gon} = 0.71 \Omega, V_{CE} = 1800 V$



开关损耗 反向二极管 (典型)  
switching losses Diode, Reverse (typical)  
 $E_{rec} = f(R_G)$   
 $I_F = 1000 A, V_{CE} = 1800 V$



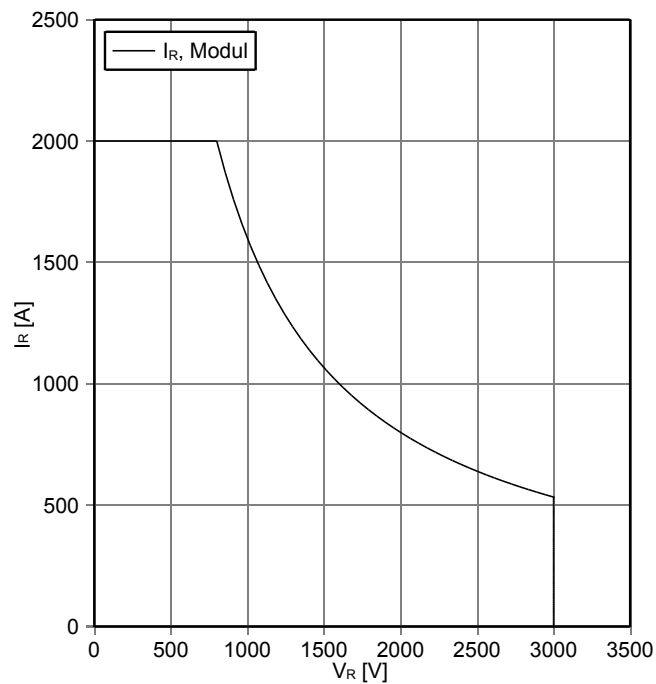
瞬态热阻抗 反向二极管  
transient thermal impedance Diode, Reverse  
 $Z_{thJC} = f(t)$



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安全工作区 反向二极管 (SOA)  
safe operation area Diode, Reverse (SOA)

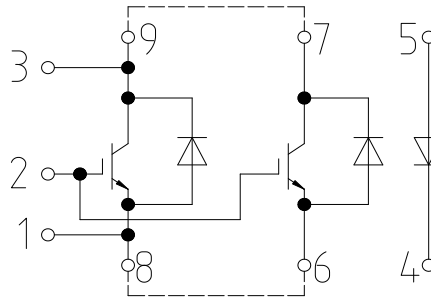
$I_R = f(V_R)$   
 $T_{vj} = 150^\circ\text{C}$



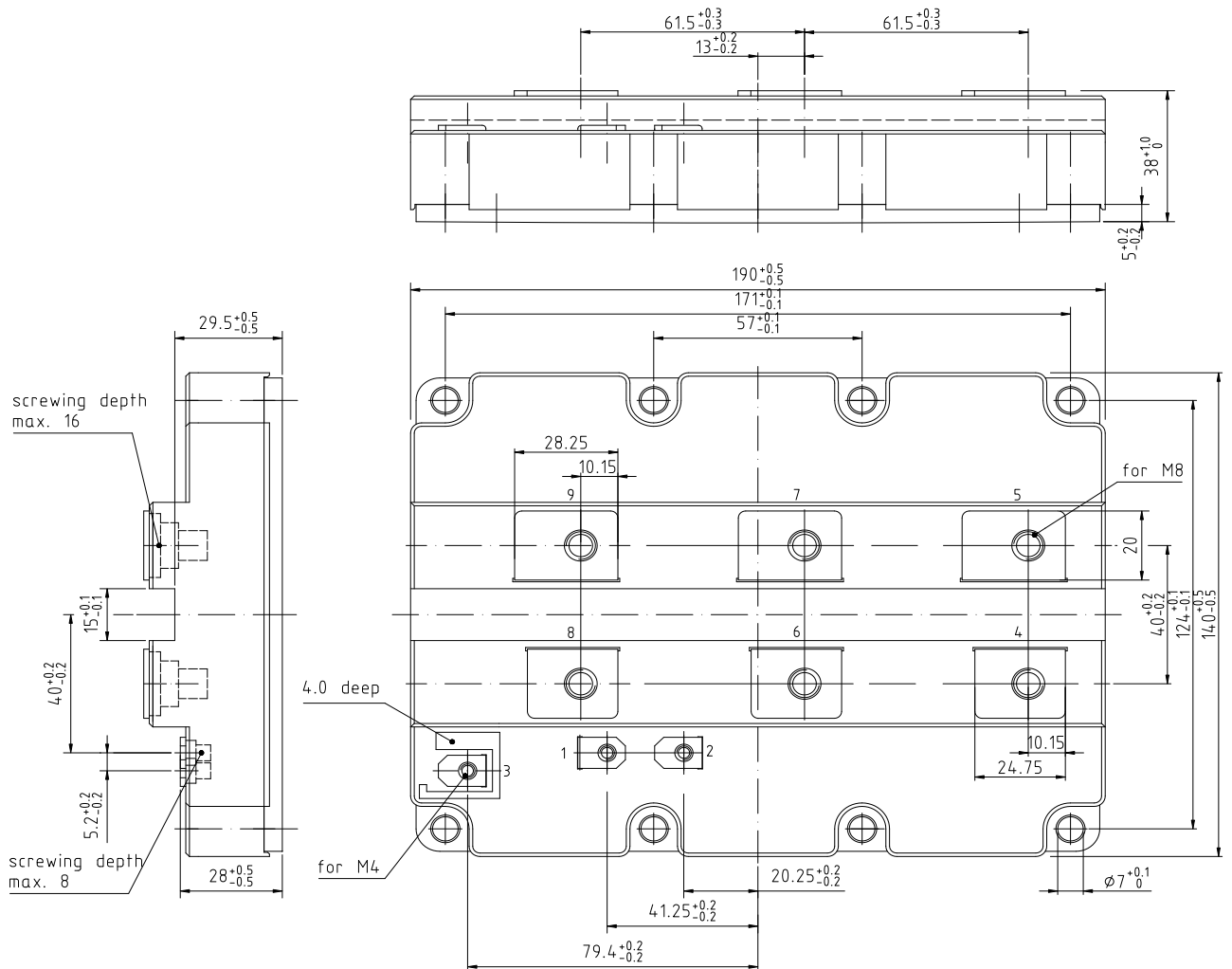
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接线图 / circuit\_diagram\_headline

FD...-K



封装尺寸 / package outlines



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