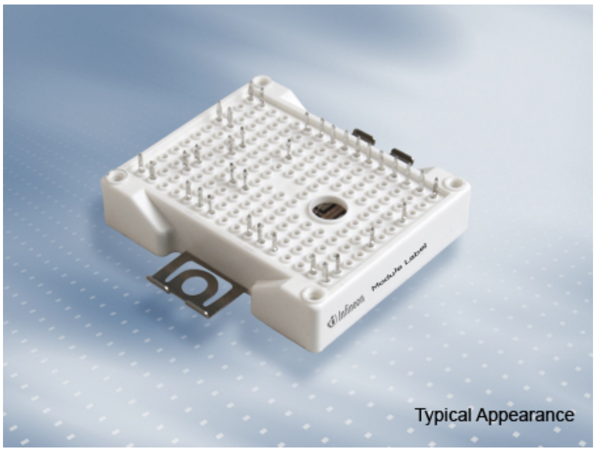
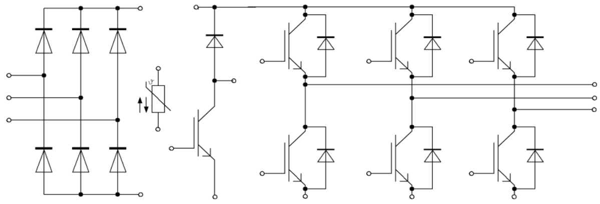
FP35R12W2T4P_B11

EasyPIM™ 模块 采用第四代沟槽栅/场终止IGBT4和第四代发射极控制二极管 带有pressfit预涂导热材料
EasyPIM™ module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and PressFIT / pre-applied Thermal Interface Material



Typical Appearance



V_{CES} = 1200V
$I_{C\ nom}$ = 35A / I_{CRM} = 70A

典型应用
- 辅助逆变器
- 空调
- 电机传动

Typical Applications
- Auxiliary inverters
- Air conditioning
- Motor drives

电气特性
- 低开关损耗
- 低 V_{CEsat}
- 沟槽栅IGBT4
- V_{CEsat} 带正温度系数

Electrical Features
- Low switching losses
- Low V_{CEsat}
- Trench IGBT 4
- V_{CEsat} with positive temperature coefficient

机械特性
- 低热阻的三氧化二铝（ Al_2O_3 衬底
- 紧凑型设计
- PressFIT 压接技术
- 集成的安装夹使安装坚固
- 预涂导热介质

Mechanical Features
- Al_2O_3 substrate with low thermal resistance
- Compact design
- PressFIT contact technology
- Rugged mounting due to integrated mounting clamps
- Pre-applied Thermal Interface Material

Module Label Code

Barcode Code 128

Sample
00000123456000000000000

DMX - Code

Sample

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°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_H = 80°C, $T_{vj\,max}$ = 175°C	$I_{C\,nom}$	35	A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}	70	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 = 35 A, V_{GE} = 15 V I_C = 35 A, V_{GE} = 15 V I_C = 35 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,85 2,15 2,25	2,25	V V V
栅极阈值电压 Gate threshold voltage	I_C = 1,20 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,20	5,80	6,40	V
栅极电荷 Gate charge	V_{GE} = -15 V ... +15 V		Q_G		0,27		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,0		Ω
输入电容 Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		2,00		nF
反向传输电容 Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,07		nF
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			1,0	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			100	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 12 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,025 0,025 0,025		µs µs µs
上升时间(电感负载) Rise time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 12 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,013 0,016 0,018		µs µs µs
关断延迟时间(电感负载) Turn-off delay time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 12 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,24 0,295 0,31		µs µs µs
下降时间(电感负载) Fall time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 12 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,115 0,17 0,20		µs µs µs
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	I_C = 35 A, V_{CE} = 600 V, L_S = 35 nH V_{GE} = ±15 V, di/dt = 2500 A/µs (T_{vj} = 150°C) R_{Gon} = 12 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		1,90 2,90 3,15		mJ mJ mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	I_C = 35 A, V_{CE} = 600 V, L_S = 35 nH V_{GE} = ±15 V, du/dt = 3600 V/µs (T_{vj} = 150°C) R_{Goff} = 12 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		2,00 2,90 3,20		mJ mJ mJ
短路数据 SC data	V_{GE} ≤ 15 V, V_{CC} = 800 V V_{CEmax} = V_{CES} $-L_{sCE}$ ·di/dt	t_P ≤ 10 µs, T_{vj} = 150°C	I_{SC}		130		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}			1,00	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-40		150	°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°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	35	A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	70	A
I2t-值 I^2t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I^2t	240 220	A^2s A^2s

特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	I_F = 35 A, V_{GE} = 0 V I_F = 35 A, V_{GE} = 0 V I_F = 35 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		1,65 1,65 1,65	2,15	V V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 35 A, - di_F/dt = 2500 A/µs (T_{vj}=150°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		81,0 85,0 88,0		A A A
恢复电荷 Recovered charge	I_F = 35 A, - di_F/dt = 2500 A/µs (T_{vj}=150°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		3,95 6,80 7,50		µC µC µC
反向恢复损耗(每脉冲) Reverse recovery energy	I_F = 35 A, - di_F/dt = 2500 A/µs (T_{vj}=150°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		1,50 2,70 2,95		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}			1,29	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

二极管,整流器 / Diode, Rectifier
最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1600	V
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	T_H = 80°C	I_{FRMSM}	50	A
最大整流器输出均方根电流 Maximum RMS current at rectifier output	T_H = 80°C	I_{RMSM}	50	A
正向浪涌电流 Surge forward current	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I_{FSM}	450 370	A A
I2t-值 I^2t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I^2t	1000 685	A^2s A^2s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	T_{vj} = 150°C, I_F = 35 A	V_F		0,95		V
反向电流 Reverse current	T_{vj} = 150°C, V_R = 1600 V	I_R		1,00		mA
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}			1,42	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

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} = 25°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_H = 80°C, $T_{vj\,max}$ = 175°C	$I_{C\,nom}$	35	A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}	70	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 = 35 A, V_{GE} = 15 V I_C = 35 A, V_{GE} = 15 V I_C = 35 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,85 2,15 2,25	2,25	V V V
栅极阈值电压 Gate threshold voltage	I_C = 1,20 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,20	5,80	6,40	V
栅极电荷 Gate charge	V_{GE} = -15 V ... +15 V		Q_G		0,27		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,0		Ω
输入电容 Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		2,00		nF
反向传输电容 Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,07		nF
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			1,0	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			100	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,07 0,07 0,07		µs µs µs
上升时间(电感负载) Rise time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,045 0,05 0,057		µs µs µs
关断延迟时间(电感负载) Turn-off delay time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,28 0,44 0,45		µs µs µs
下降时间(电感负载) Fall time, inductive load	I_C = 35 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,115 0,175 0,205		µs µs µs
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	I_C = 35 A, V_{CE} = 600 V, L_S = 35 nH V_{GE} = ±15 V, di/dt = 350 A/µs (T_{vj} = 150°C) R_{Gon} = 47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		5,00 6,50 7,00		mJ mJ mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	I_C = 35 A, V_{CE} = 600 V, L_S = 35 nH V_{GE} = ±15 V, du/dt = 3500 V/µs (T_{vj} = 150°C) R_{Goff} = 47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		2,10 3,05 3,35		mJ mJ mJ
短路数据 SC data	$V_{GE} \le$ 15 V, V_{CC} = 800 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	$t_P \le$ 10 µs, T_{vj} = 150°C	I_{SC}		130		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}			1,00	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

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} = 25°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	10	A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	20	A
I2t-值 I^2t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I^2t	16,0 14,0	A^2s A^2s

特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	I_F = 10 A, V_{GE} = 0 V I_F = 10 A, V_{GE} = 0 V I_F = 10 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		1,75 1,75 1,75	2,25	V V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 10 A, - di_F/dt = 350 A/µs (T_{vj}=150°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		12,0 10,0 8,00		A A A
恢复电荷 Recovered charge	I_F = 10 A, - di_F/dt = 350 A/µs (T_{vj}=150°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		0,90 1,70 1,90		µC µC µC
反向恢复损耗（每脉冲） Reverse recovery energy	I_F = 10 A, - di_F/dt = 350 A/µs (T_{vj}=150°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,24 0,52 0,59		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}			2,69	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		150	°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°C	R_{25}		5,00		kΩ
R100 偏差 Deviation of R100	T_{NTC} = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
耗散功率 Power dissipation	T_{NTC} = 25°C	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\ K))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\ K))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\ K))]$	$B_{25/100}$		3433		K

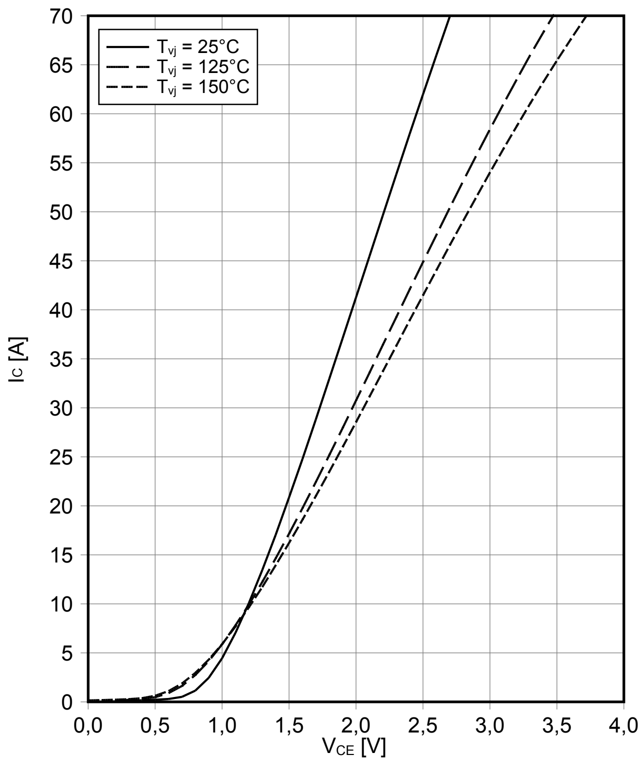
根据应用手册标定
Specification according to the valid application note.

模块 / Module

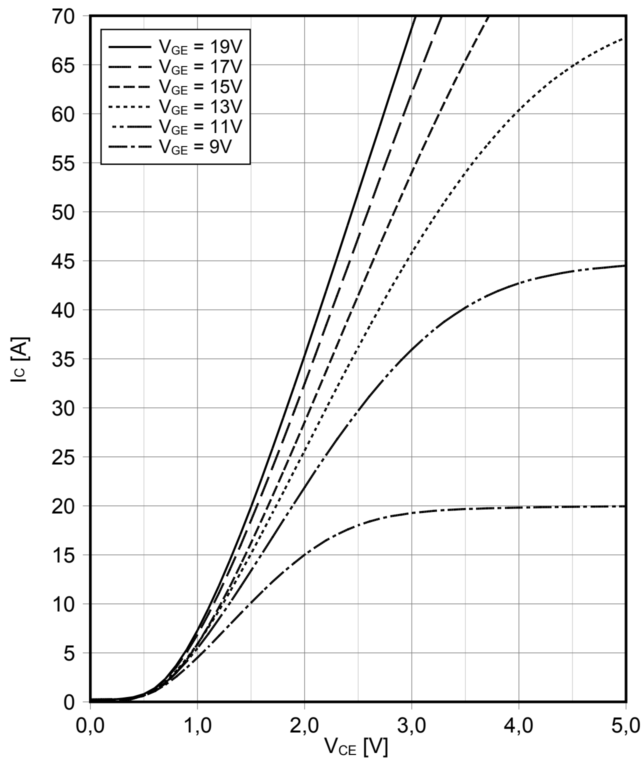
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	2,5			kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al_2O_3			
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		11,5 6,3			mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		10,0 5,0			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}		30		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	$R_{CC'+EE'}$ $R_{AA'+CC'}$		5,00 6,00		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
Anpresskraft für mech. Bef. pro Feder mountig force per clamp		F	40	-	80	N
重量 Weight		G		39		g

Der Strom im Dauerbetrieb ist auf 25A effektiv pro Anschlusspin begrenzt.
The current under continuous operation is limited to 25A rms per connector pin.
Lagerung und Transport von Modulen mit TIM => siehe AN2012-07
Storage and shipment of modules with TIM => see AN2012-07

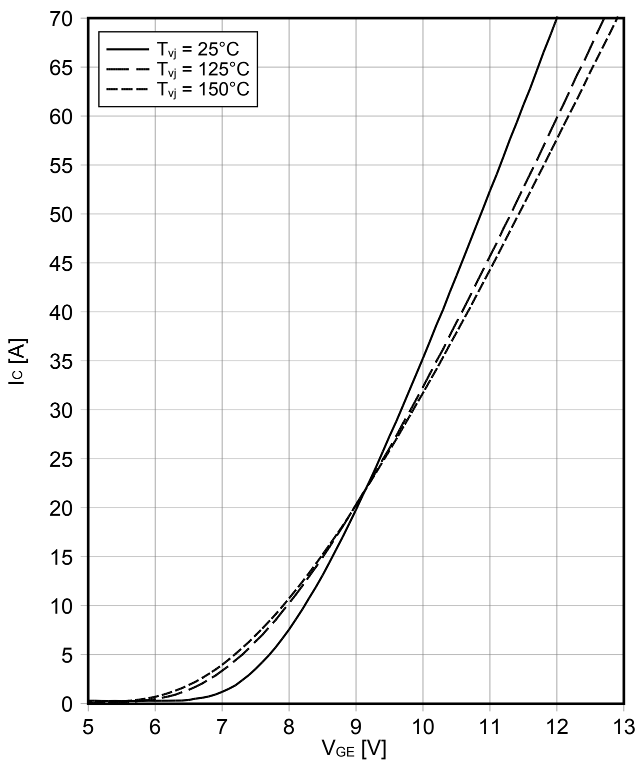
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$V_{GE} = 15$ V



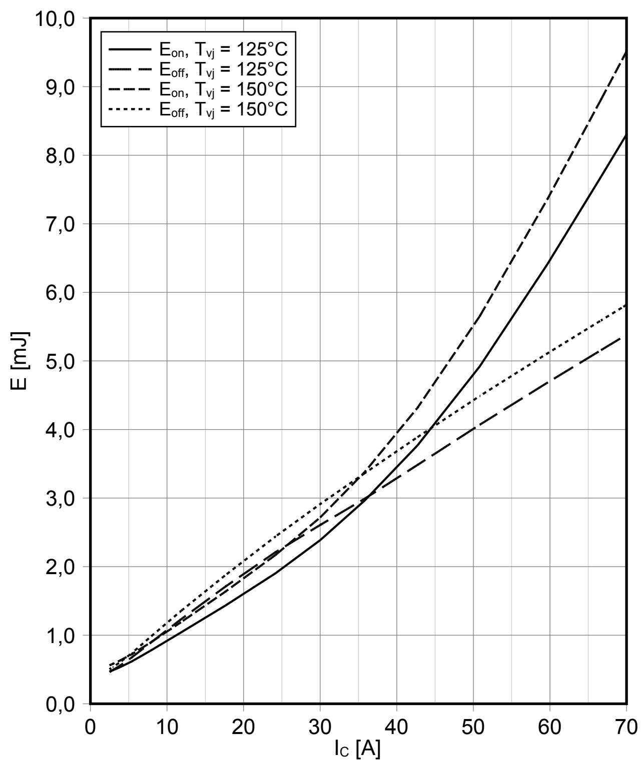
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$T_{vj} = 150$°C



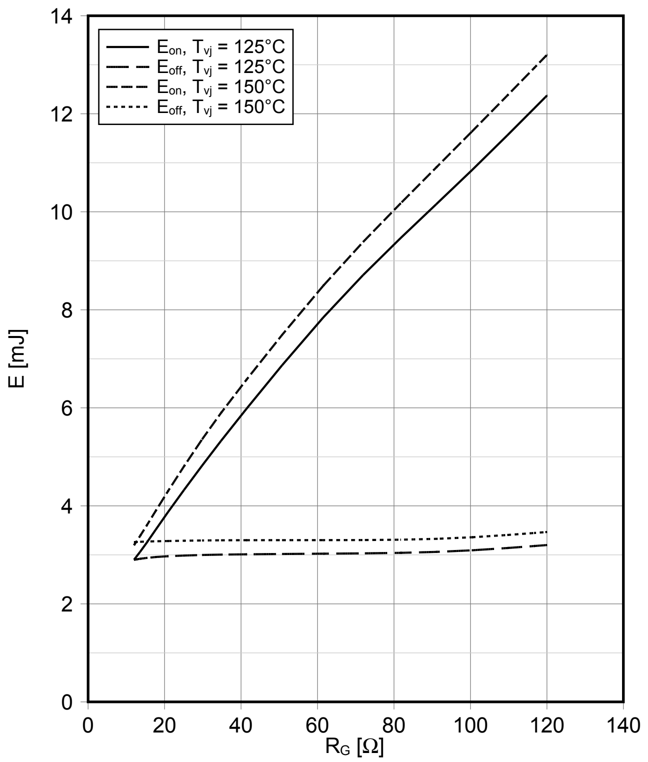
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT,Inverter (typical)
$I_C = f(V_{GE})$
$V_{CE} = 20$ V



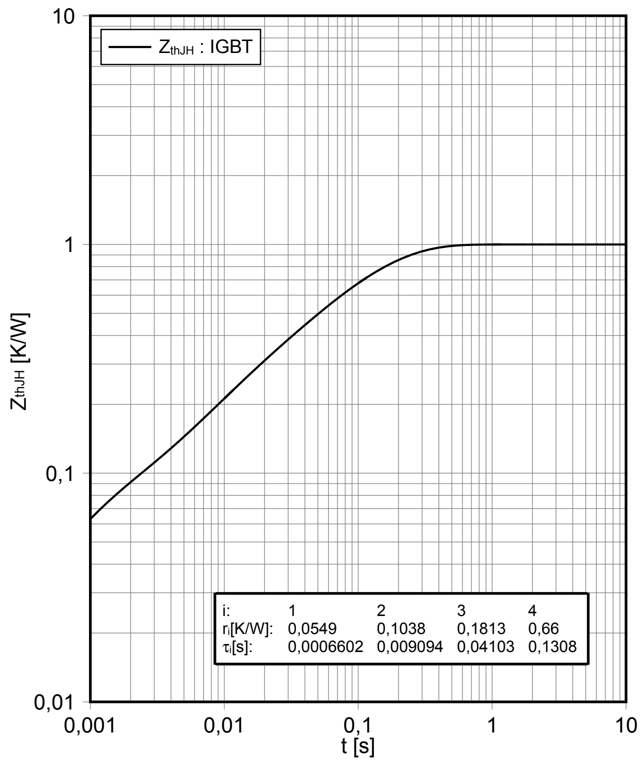
开关损耗 IGBT, 逆变器 （典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$V_{GE} = \pm15$ V, $R_{Gon} = 12\ \Omega$, $R_{Goff} = 12\ \Omega$, $V_{CE} = 600$ V



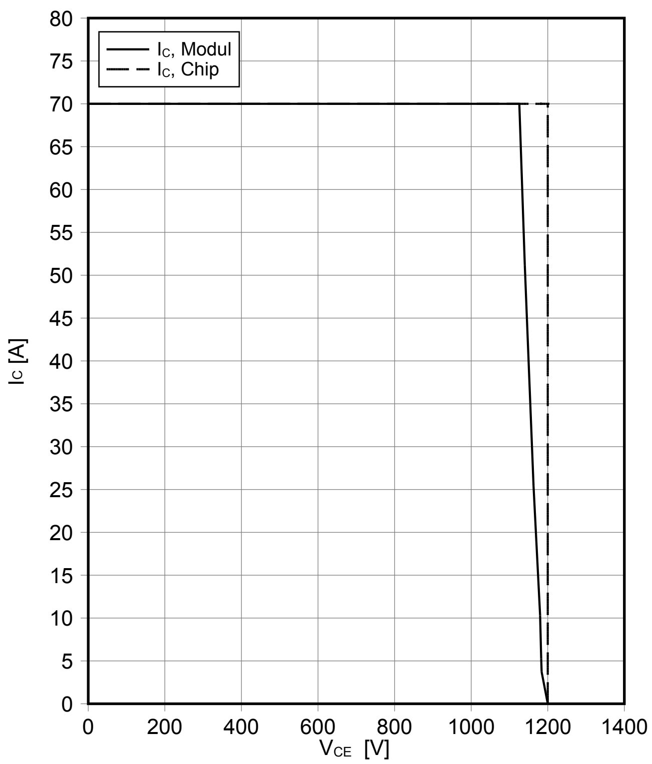
开关损耗 IGBT, 逆变器 （典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 35$ A, $V_{CE} = 600$ V



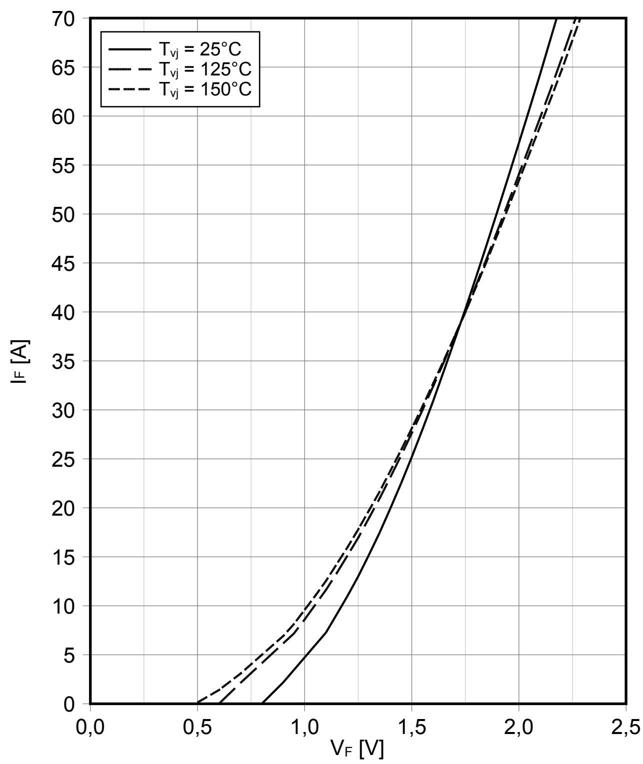
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT,Inverter
$Z_{thJH} = f(t)$



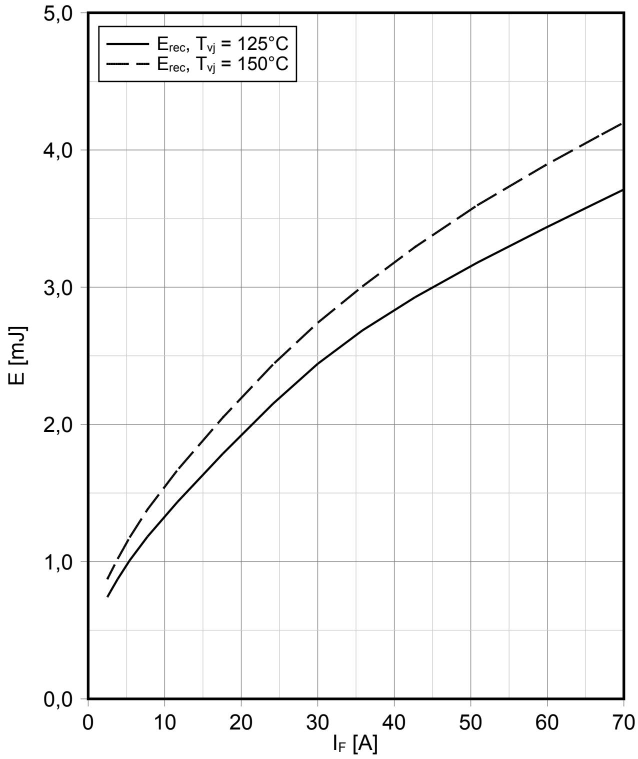
反偏安全工作区 IGBT, 逆变器 （RBSOA）
reverse bias safe operating area IGBT,Inverter (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 12$ Ω, $T_{vj} = 150$°C



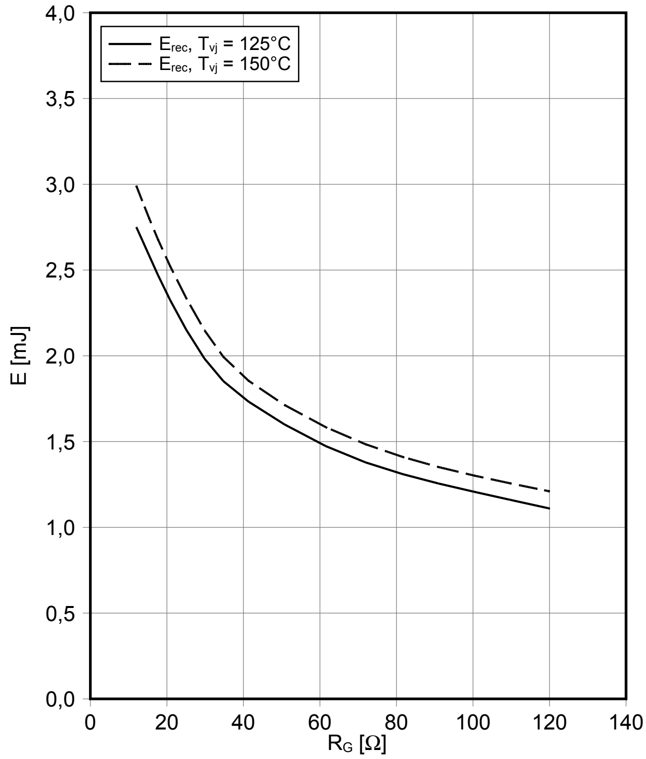
正向偏压特性 二极管,逆变器 （典型)
forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



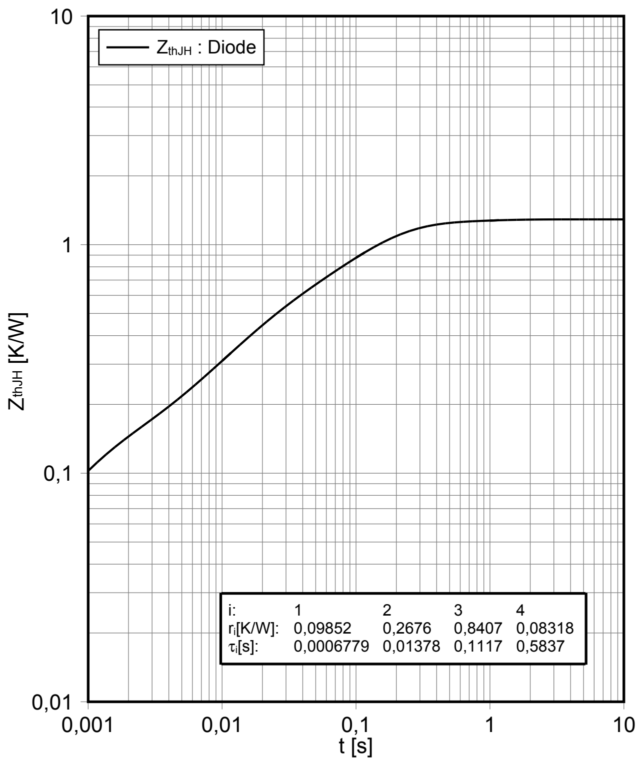
开关损耗 二极管,逆变器 （典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 12\ \Omega$, $V_{CE} = 600$ V



开关损耗 二极管,逆变器 （典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 35$ A, $V_{CE} = 600$ V

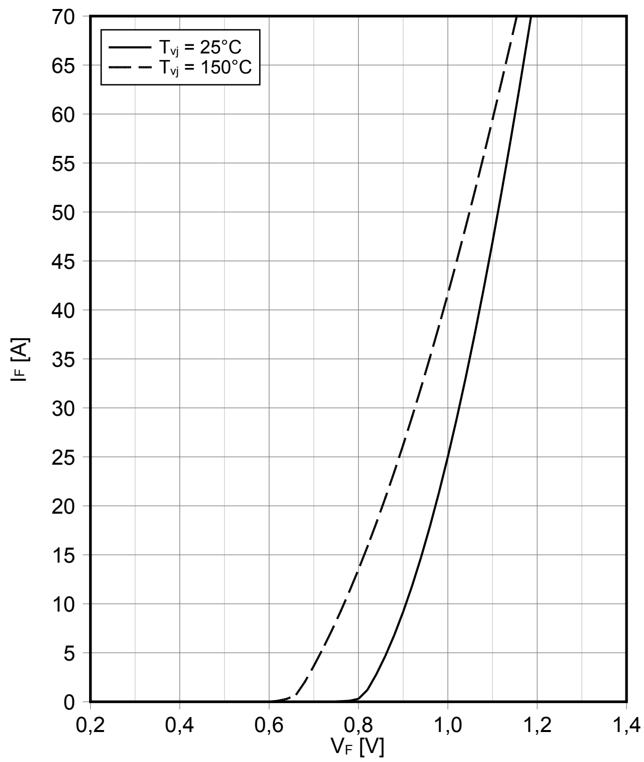


瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter
$Z_{thJH} = f(t)$

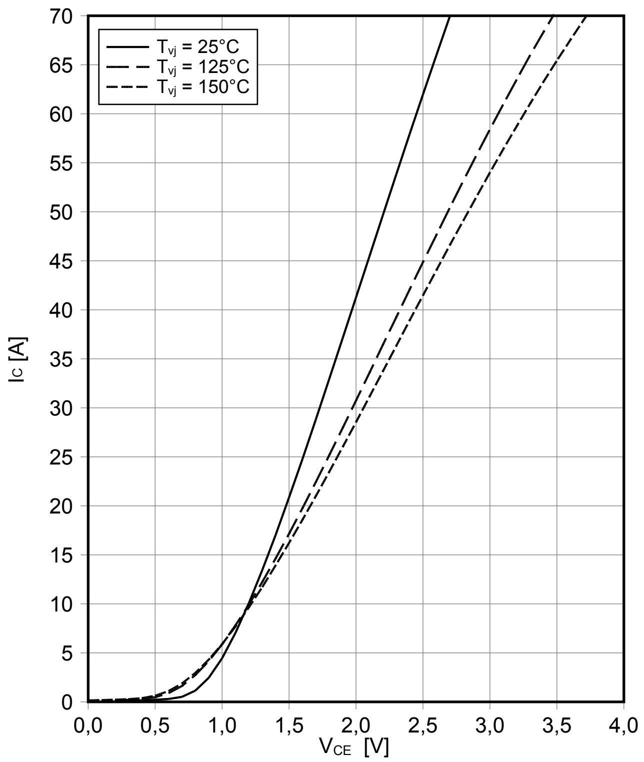


i:	1	2	3	4
r_i[K/W]:	0,09852	0,2676	0,8407	0,08318
τ_i[s]:	0,0006779	0,01378	0,1117	0,5837

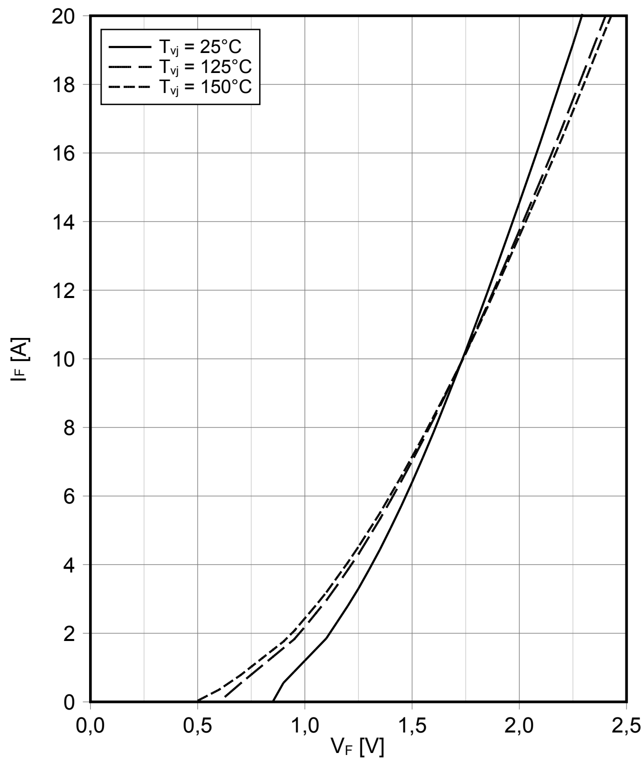
正向偏压特性 二极管,整流器 （典型)
forward characteristic of Diode, Rectifier (typical)
$I_F = f(V_F)$



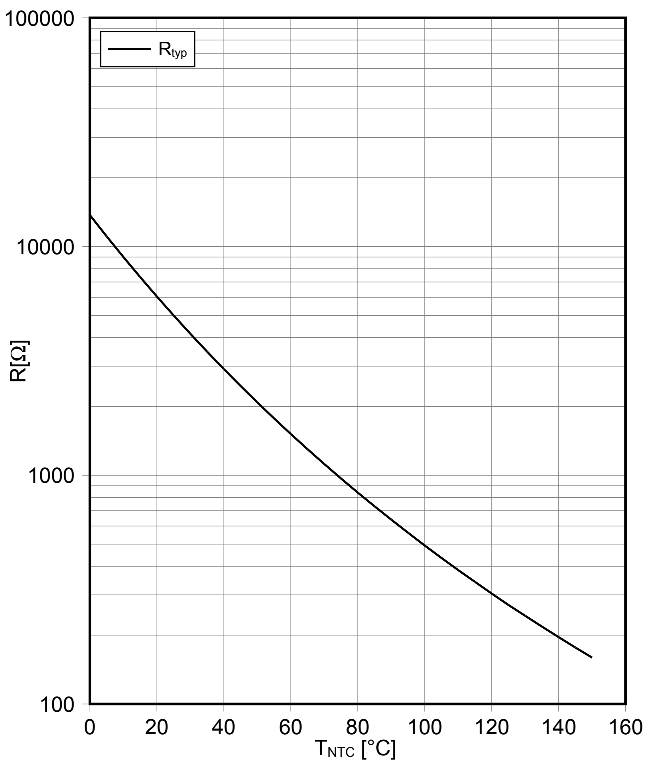
输出特性 IGBT, 制动-斩波器 (典型)
output characteristic IGBT, Brake-Chopper (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



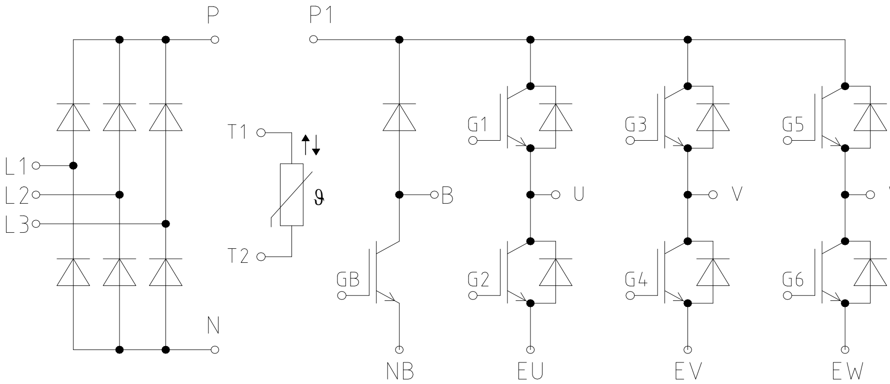
正向偏压特性 二极管，制动-斩波器 (典型)
forward characteristic of Diode, Brake-Chopper (typical)
$I_F = f(V_F)$



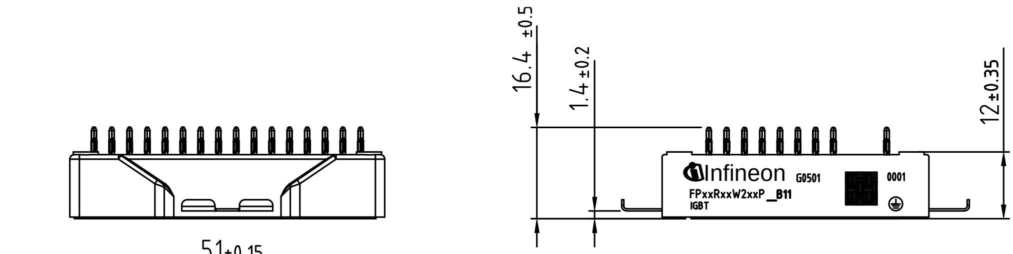
负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
R = f (T)

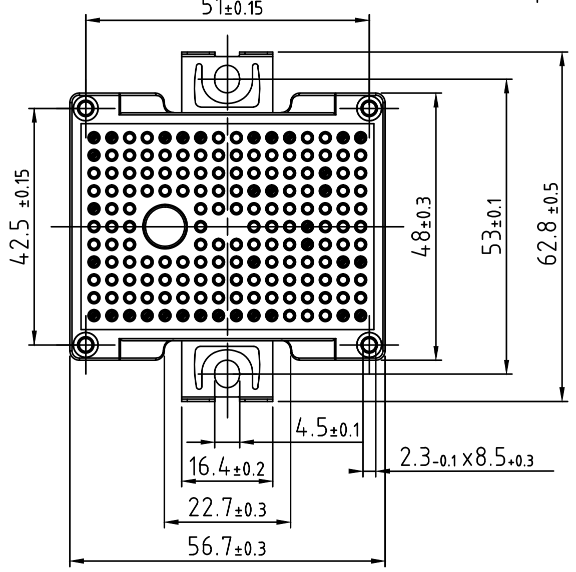


接线图 / Circuit diagram



封装尺寸 / Package outlines

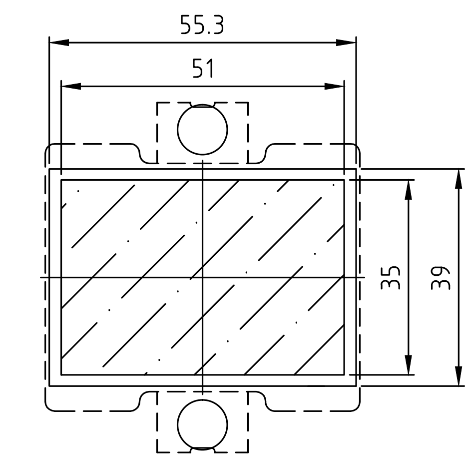




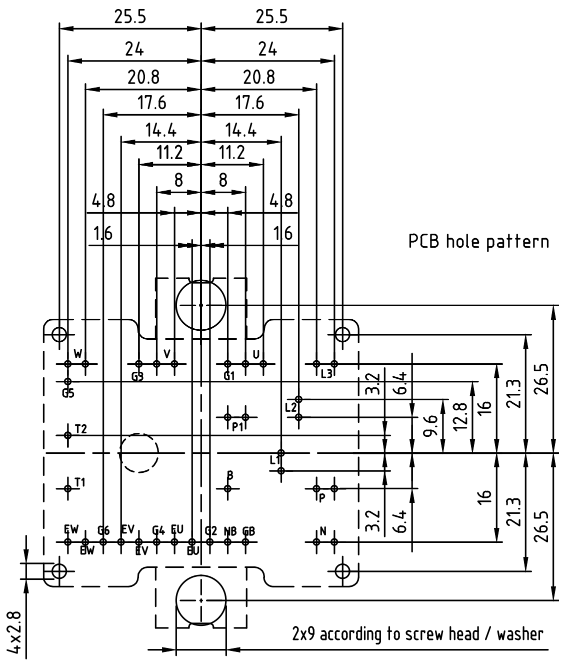
- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern ⌖ ⌀0.1
- Hole specification for contacts see AN 2009-01:

Diameters of drill Ø 1.15mm

and copper thickness in hole 25-50μm



restricted area for Thermal Interface Material



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