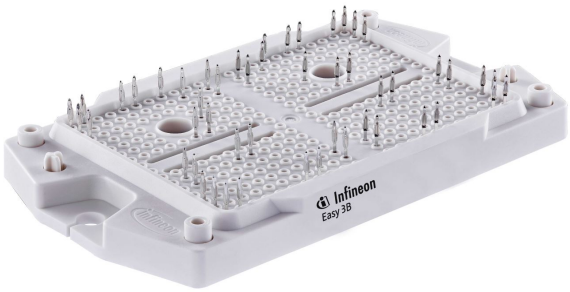
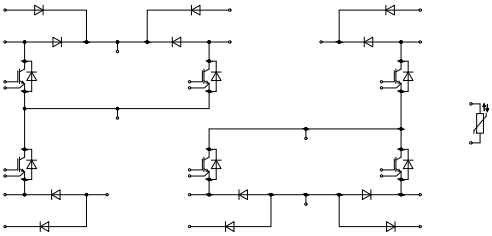
EasyPACK™ 模块 采用第七代沟槽栅/场终止IGBT7和碳化硅二极管 带有pressfit压接管脚和温度检测NTC
EasyPACK™ module with TRENCHSTOP™ IGBT7 and CoolSiC™ Schottky diode and PressFIT / NTC





V_{CES} = 950V
$I_{C\ nom}$ = 100A / I_{CRM} = 200A

潜在应用
- UPS系统
- 三电平应用
- 太阳能应用

Potential Applications
- UPS systems
- 3-level-applications
- Solar applications

电气特性
- CoolSiC™ 碳化硅肖特基二极管第5代
- 低开关损耗
- 沟槽栅IGBT7

Electrical Features
- CoolSiC™ Schottky diode gen 5
- Low switching losses
- Trenchstop™ IGBT7

机械特性
- PressFIT 压接技术
- 低热阻的三氧化二铝 Al_2O_3 衬底
- 紧凑型设计
- 集成NTC温度传感器

Mechanical Features
- PressFIT contact technology
- Al_2O_3 substrate with low thermal resistance
- Compact design
- Integrated NTC temperature sensor

Module Label Code

Barcode Code 128

Sample
00000123456000000000000

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

IGBT, 提升 / IGBT, Boost

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}	950	V
集电极电流 Implemented collector current		I_{CN}	100	A
连续集电极直流电流 Continuous DC collector current	T_H = 65°C, $T_{vj\,max}$ = 175°C	I_{CDC}	70	A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}	200	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 = 25 A, V_{GE} = 15 V	$V_{CE\,sat}$		1,27 1,33 1,33	1,55	V V V
	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C					
栅极阈值电压 Gate threshold voltage	I_C = 1,67 mA, V_{CE} = V_{GE}, T_{vj} = 25°C	V_{GEth}	4,35	5,10	5,85	V
栅极电荷 Gate charge	V_{GE} = -15 / 15 V, V_{CE} = 600 V	Q_G		0,23		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C	R_{Gint}		1,5		Ω
输入电容 Input capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{ies}		6,48		nF
反向传输电容 Reverse transfer capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{res}		0,02		nF
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE} = 950 V, V_{GE} = 0 V, T_{vj} = 25°C	I_{CES}			0,031	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 = 25 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 10 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,074 0,071 0,062		µs µs µs
上升时间(电感负载) Rise time, inductive load	I_C = 25 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 10 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,013 0,015 0,015		µs µs µs
关断延迟时间(电感负载) Turn-off delay time, inductive load	I_C = 25 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 10 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,178 0,275 0,308		µs µs µs
下降时间(电感负载) Fall time, inductive load	I_C = 25 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 10 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,107 0,139 0,161		µs µs µs
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	I_C = 25 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 880 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 10 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		0,575 0,589 0,596		mJ mJ mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	I_C = 25 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 2700 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 10 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		1,05 1,62 1,79		mJ mJ mJ
短路数据 SC data	V_{GE} ≤ 15 V, V_{CC} = 600 V, V_{CEmax} = V_{CES} -L_{sCE} ·di/dt, t_P ≤ 0 µs, T_{vj} = 150°C	I_{SC}		300		A
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个 IGBT / per IGBT	R_{thJH}		0,673		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

Diode, 轉換器 / Diode, Boost

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
正向电流 Implemented forward current		I_{FN}	30	A
连续正向直流电流 Continuous DC forward current		I_F	25	A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	60	A
I2t-值 I²t - 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	I²t	88,4 66,0	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	I_F = 25 A, V_{GE} = 0 V I_F = 25 A, V_{GE} = 0 V I_F = 25 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		1,32 1,55 1,70	1,85	V V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 25 A, - di_F/dt = 880 A/µs (T_{vj}=150°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		16,4 16,4 16,4		A A A
恢复电荷 Recovered charge	I_F = 25 A, - di_F/dt = 880 A/µs (T_{vj}=150°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		0,74 0,74 0,74		µC µC µC
反向恢复损耗（每脉冲） Reverse recovery energy	I_F = 25 A, - di_F/dt = 880 A/µs (T_{vj}=150°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,249 0,249 0,249		mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode		R_{thJH}		0,894		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

旁路二极管 / Bypass-Diode

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
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	T_H = 75°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 = 75°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} = 110°C	I_{FSM}	1070 957	A A
I2t-值 I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 110°C	I²t	5770 4580	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	T_{vj} = 150°C, I_F = 45 A	V_F		0,85		V
反向电流 Reverse current	T_{vj} = 150°C, V_R = 1200 V	I_R		1,00		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		0,870		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		110	°C

反极性保护二极管 A / Inverse-polarity protection diode A

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
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	T_H = 70°C	I_{FRMSM}	30	A
最大整流器输出均方根电流 Maximum RMS current at rectifier output	T_H = 70°C	I_{RMSM}	30	A
正向浪涌电流 Surge forward current	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 110°C	I_{FSM}	378 326	A A
I2t-值 I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 110°C	I²t	714 531	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	T_{vj} = 150°C, I_F = 15 A	V_F		0,89		V
反向电流 Reverse current	T_{vj} = 150°C, V_R = 1200 V	I_R		1,00		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,31		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		110	°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

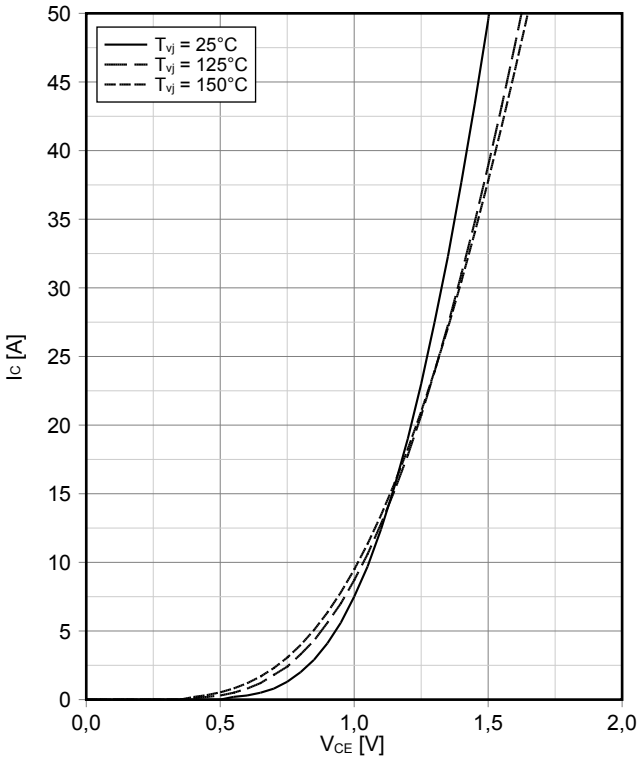
根据应用手册标定
Specification according to the valid application note.

模块 / Module

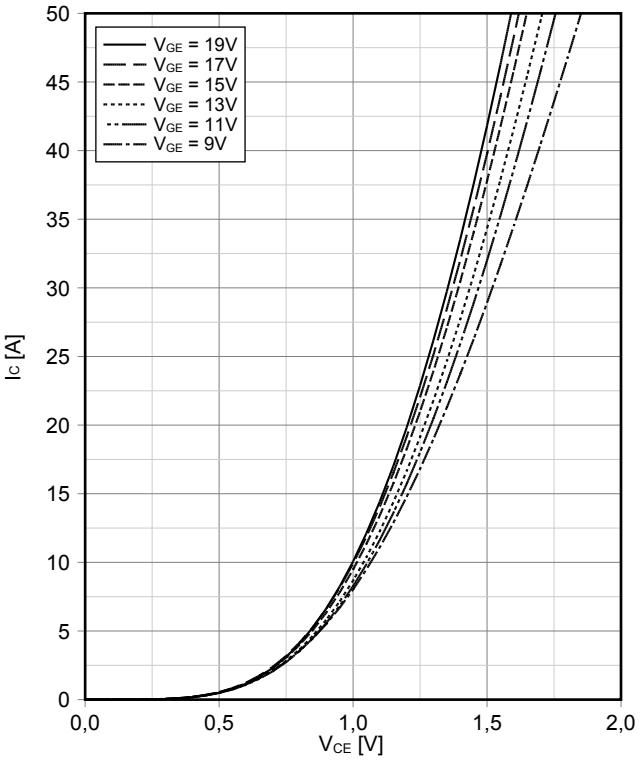
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		3,2		kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)			Al_2O_3		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			11,2 6,8		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			9,4 5,5		mm
相对电痕指数 Comperative tracking index		CTI		> 400		
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_{sCE}		20		nH
储存温度 Storage temperature		T_{stg}	-40		125	°C
模块安装的安装扭距 Mounting torque for modul mounting	螺丝 根据相应的应用手册进行安装 Screw - Mounting according to valid application note	M	1,30		1,50	Nm
重量 Weight		G		78		g

IGBT- and diode- RthJH parameters measured with thermal grease of λ_{Paste} = 3.3 W/(m·K)
The current under continuous operation is limited to 25 A rms per connector pin.

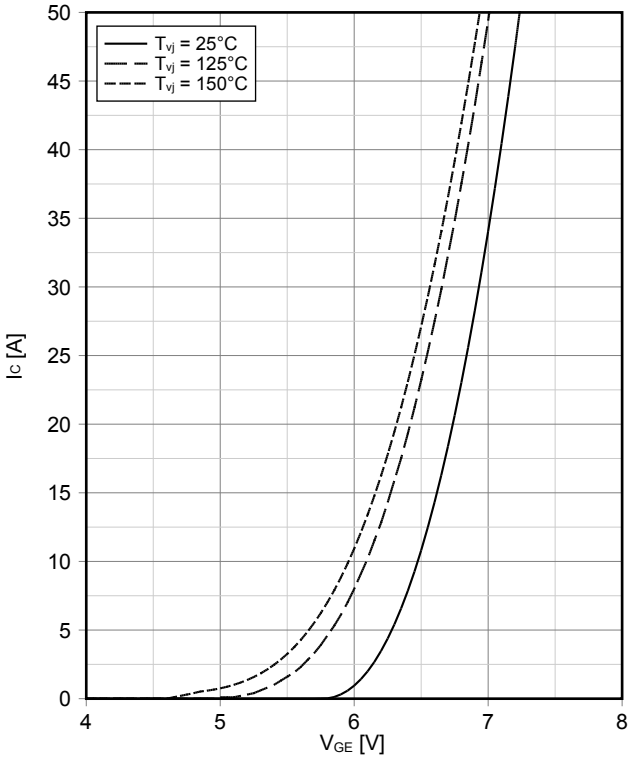
输出特性 IGBT, 提升 （典型）
output characteristic IGBT, Boost (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



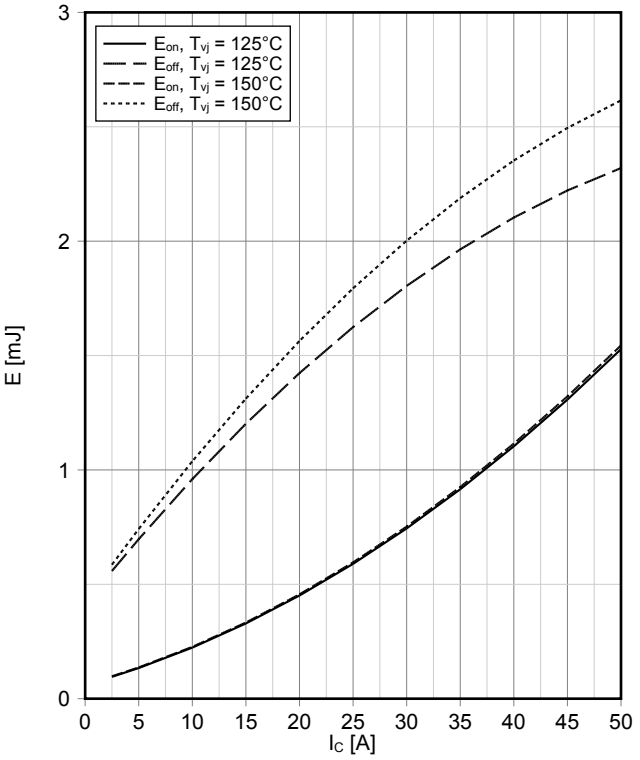
输出特性 IGBT, 提升 （典型）
output characteristic IGBT, Boost (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C



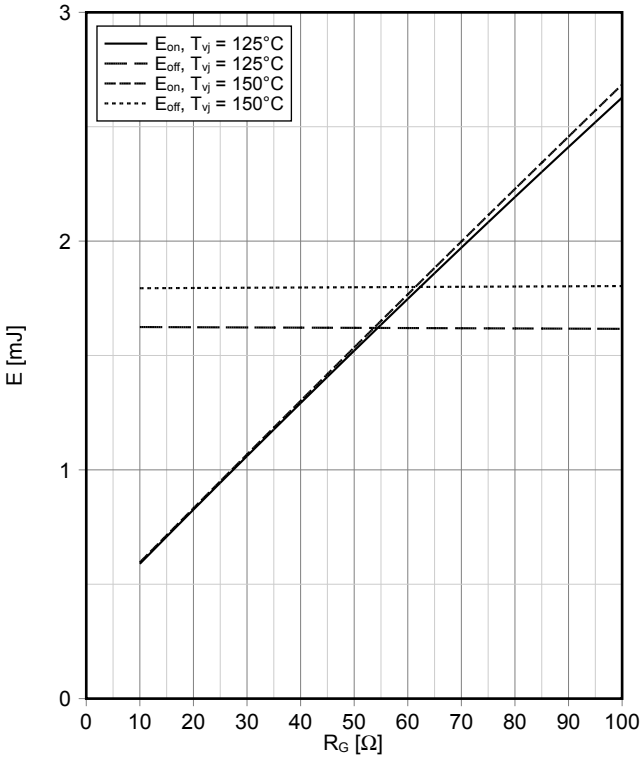
传输特性 IGBT, 提升 (典型)
transfer characteristic IGBT, Boost (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V



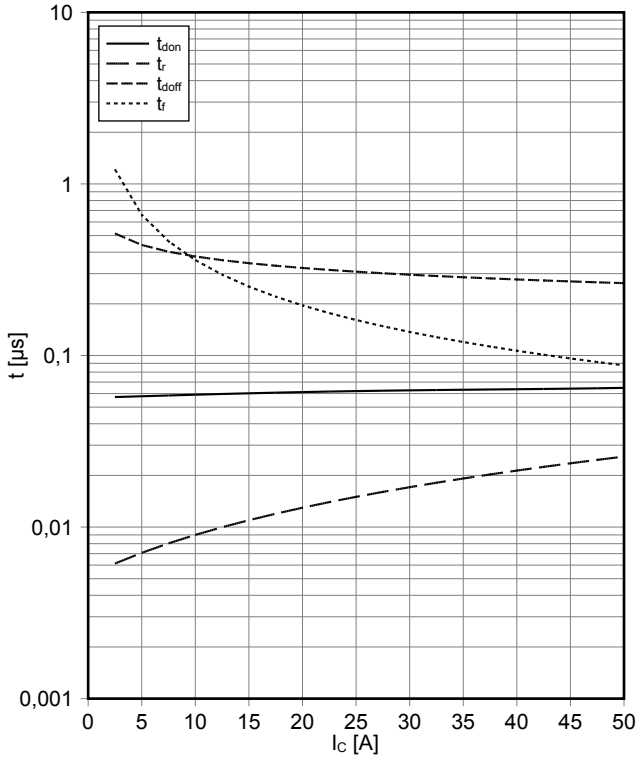
开关损耗 IGBT, 提升 （典型）
switching losses IGBT, Boost (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 10 Ω, R_{Goff} = 10 Ω, V_{CE} = 500 V



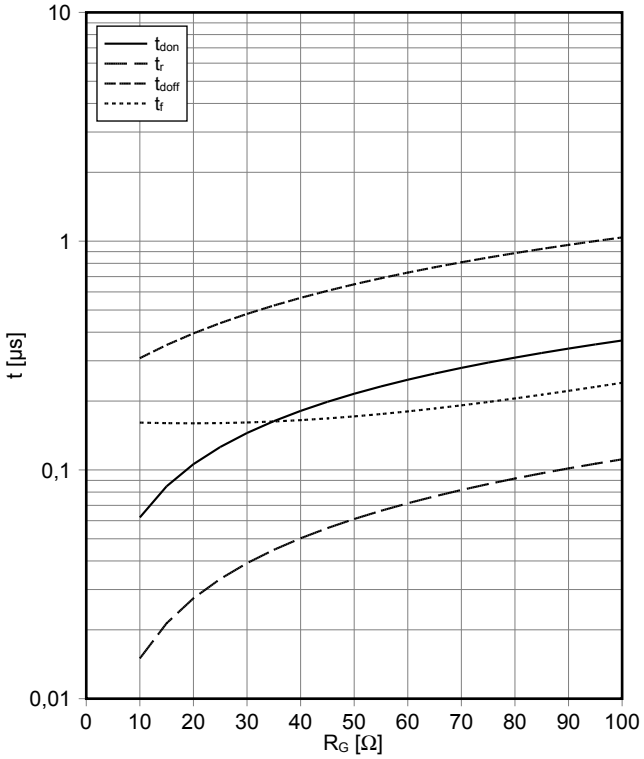
开关损耗 IGBT, 提升 （典型）
switching losses IGBT, Boost (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15 V, V_{CE} = 500 V, I_C = 25 A



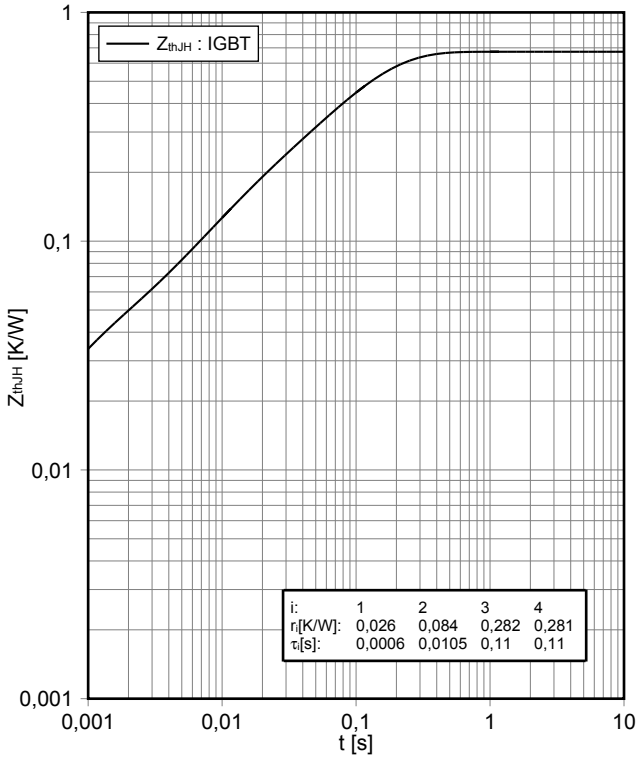
??? IGBT, 提升 （典型）
switching times IGBT, Boost (typical)
$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 10 Ω, R_{Goff} = 10 Ω, V_{CE} = 500 V, T_{vj} = 150°C



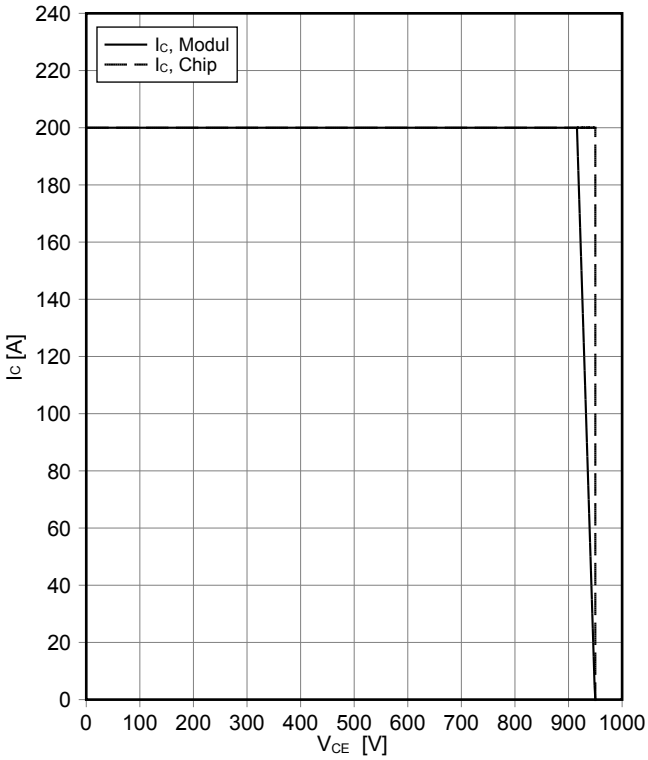
??? IGBT, 提升 （典型）
switching times IGBT, Boost (typical)
$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
V_{GE} = ±15 V, R_{Gon} = 10 Ω, R_{Goff} = 10 Ω, V_{CE} = 500 V, I_C = 25 A, T_{vj} = 150°C



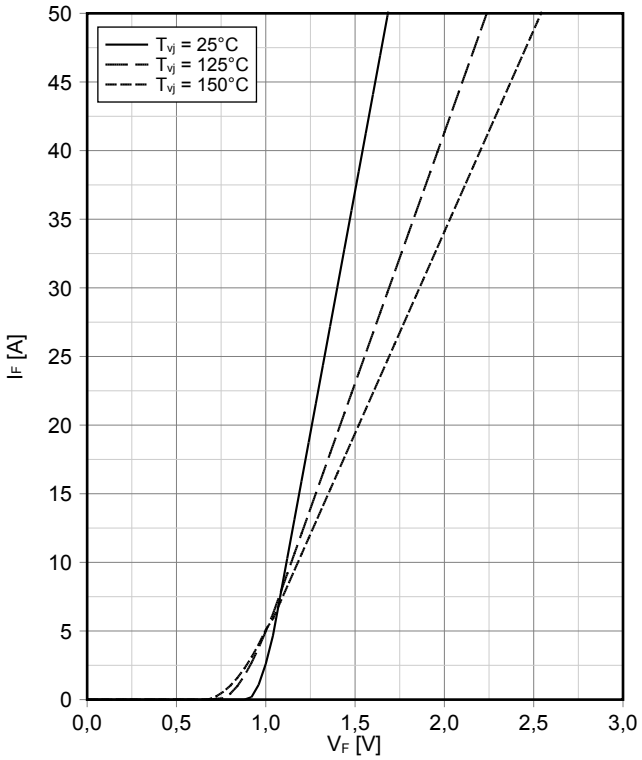
瞬态热阻抗 IGBT, 提升
transient thermal impedance IGBT, Boost
$Z_{thJH} = f(t)$



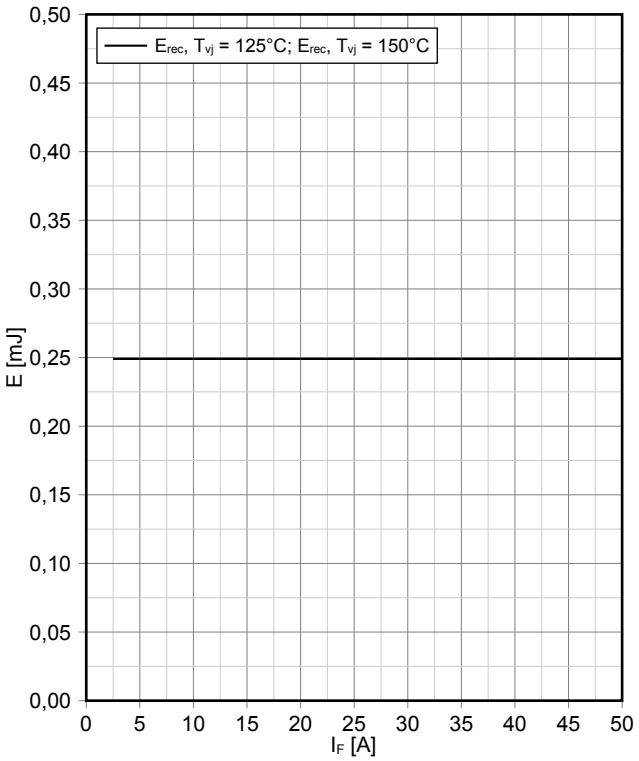
反偏安全工作区 IGBT, 提升 （ RBSOA ）
reverse bias safe operating area IGBT, Boost (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 10\ \Omega$, $T_{vj} = 150°C$



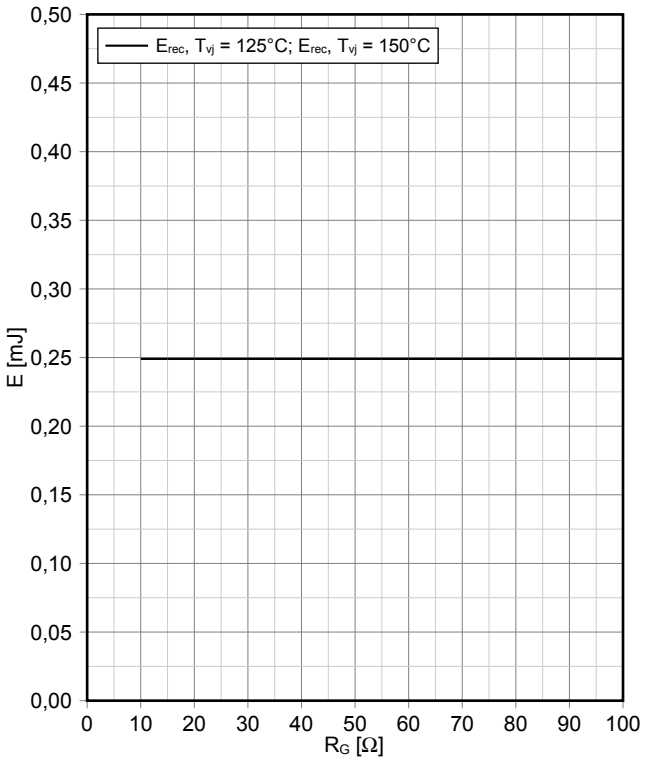
正向偏压特性 Diode, 轉換器 （ 典型）
forward characteristic of Diode, Boost (typical)
$I_F = f(V_F)$



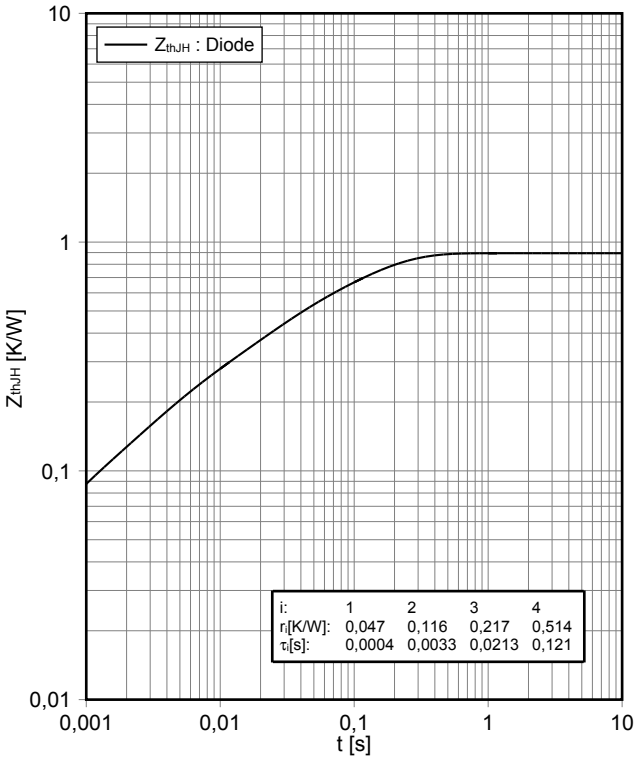
开关损耗 Diode, 轉換器 （ 典型）
switching losses Diode, Boost (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 10\ \Omega$, $V_{CE} = 600$ V



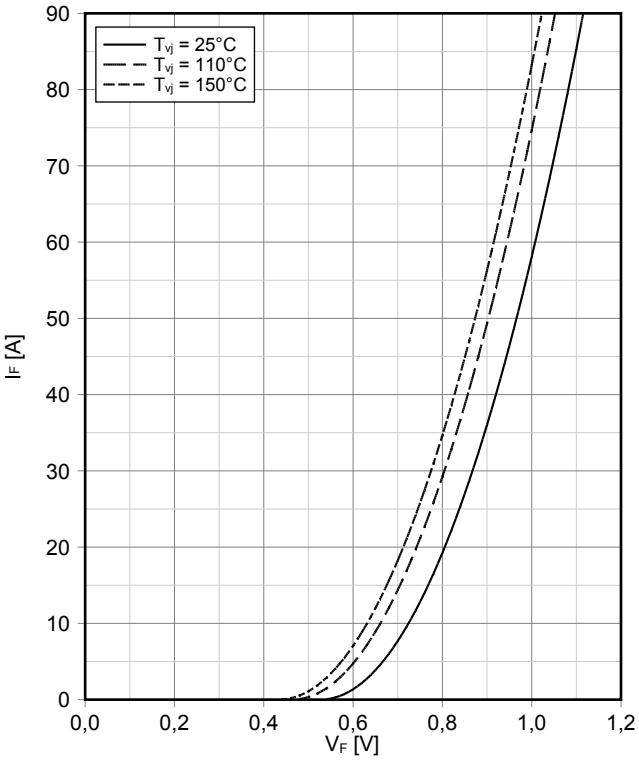
开关损耗 Diode, 轉換器 （ 典型）
switching losses Diode, Boost (typical)
$E_{rec} = f(R_G)$
$I_F = 25$ A, $V_{CE} = 600$ V



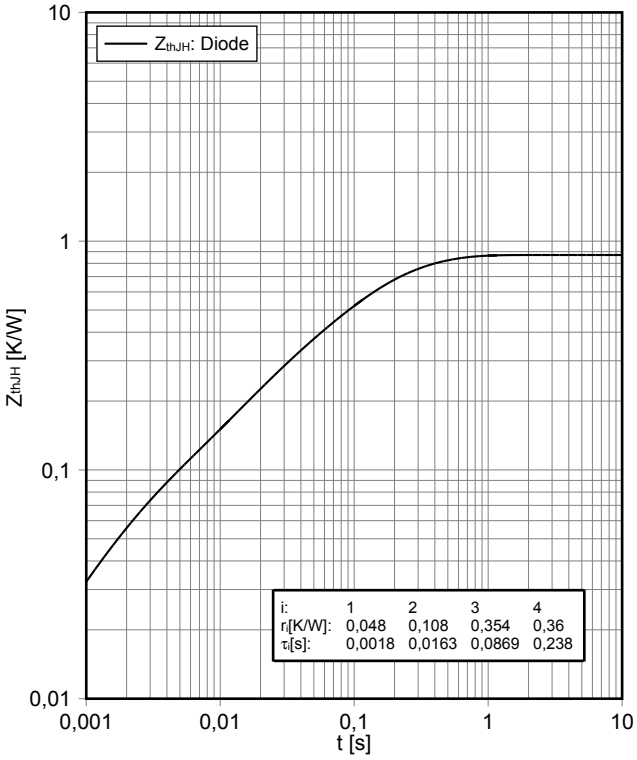
瞬态热阻抗 Diode, 轉換器
transient thermal impedance Diode, Boost
$Z_{thJH} = f(t)$



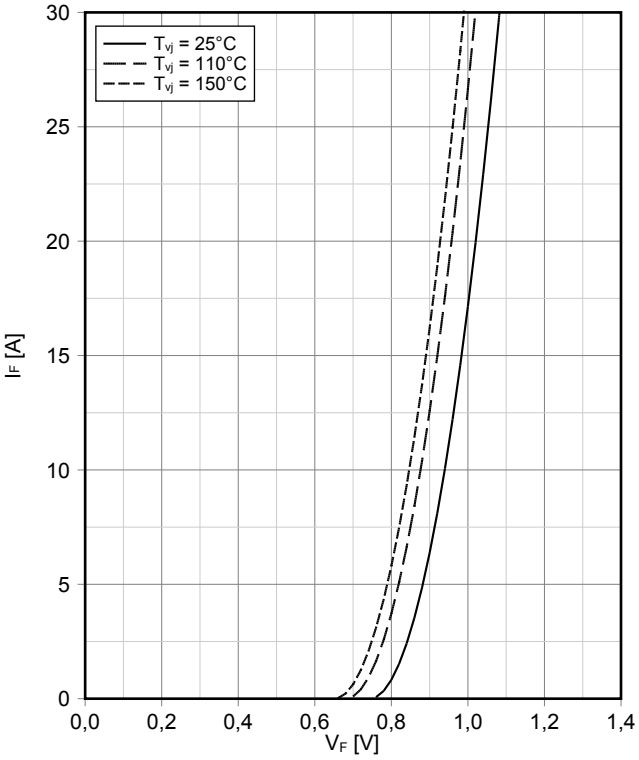
正向偏压特性 旁路二极管（典型）
forward characteristic of Bypass-Diode (typical)
$I_F = f(V_F)$



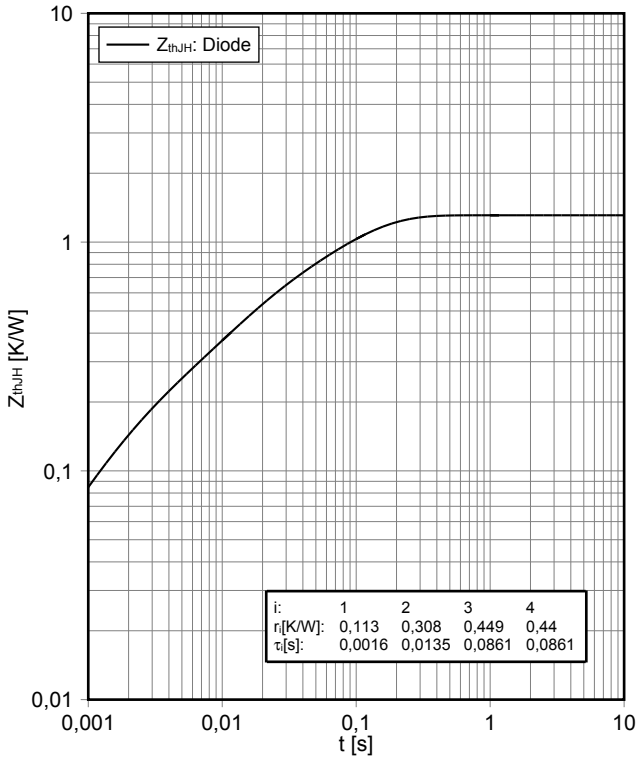
瞬态热阻抗 旁路二极管
transient thermal impedance Bypass-Diode
$Z_{thJH} = f(t)$



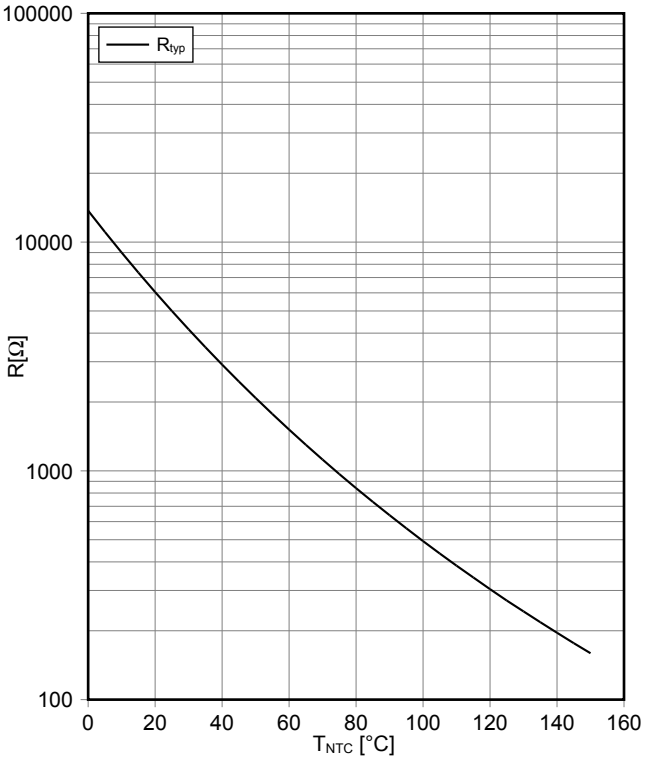
正向偏压特性 反极性保护二极管 A（典型）
forward characteristic of Inverse-polarity protection diode A (typical)
$I_F = f(V_F)$



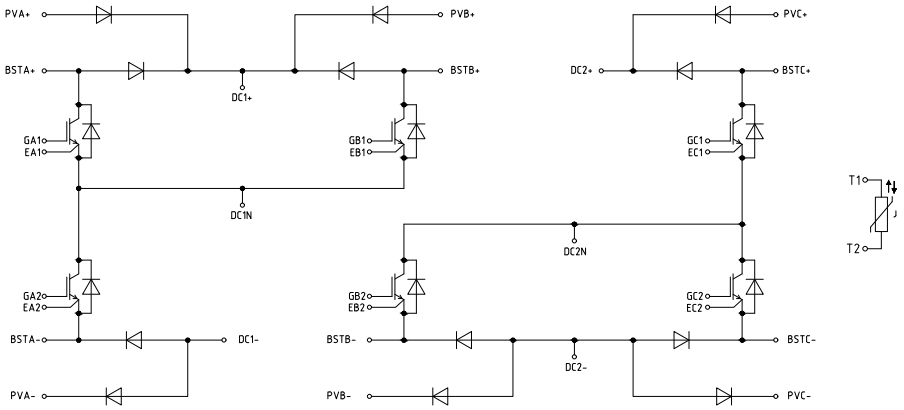
瞬态热阻抗 反极性保护二极管 A
transient thermal impedance Inverse-polarity protection diode A
$Z_{thJH} = f(t)$



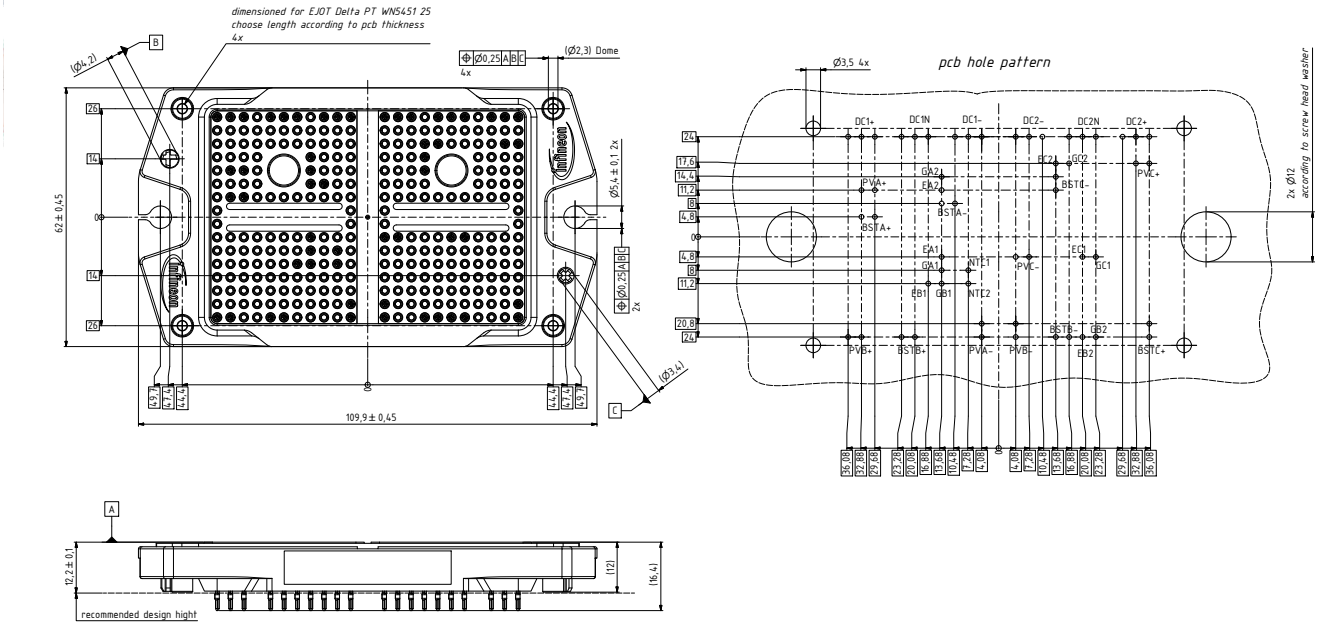
负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
$R = f(T)$



接线图 / Circuit diagram



封装尺寸 / Package outlines



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