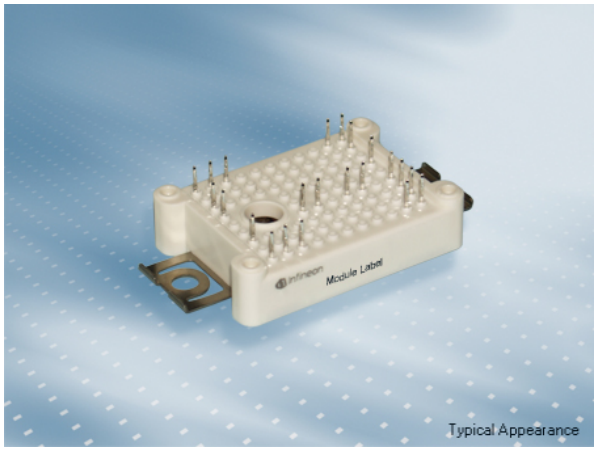
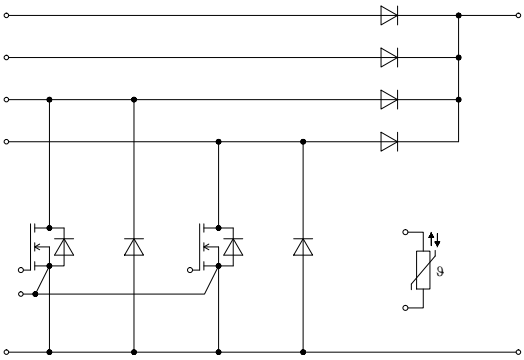
EasyPACK™ 模块 采用 CoolSiC™ Trench MOSFET 带有pressfit压接管脚和温度检测NTC
EasyPACK™ module with CoolSiC™ Trench MOSFET and PressFIT / NTC

初步数据 / Preliminary Data





V_{DSS} = 1200V
$I_{D\ nom}$ = 50A / I_{DRM} = 100A

典型应用
- 太阳能应用

Typical Applications
- Solar applications

电气特性
- 高电流密度
- 低电感设计

Electrical Features
- High current density
- Low inductive design

机械特性
- 集成NTC温度传感器
- PressFIT 压接技术
- 集成的安装夹使安装坚固

Mechanical Features
- Integrated NTC temperature sensor
- PressFIT contact technology
- Rugged mounting due to integrated mounting clamps

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

初步数据
Preliminary Data

MOSFET / MOSFET

最大额定值 / Maximum Rated Values

漏源击穿电压 Drain-source breakdown voltage	T_{vj} = 25°C	V_{DSS}	1200	V
直流漏极电流 DC drain current	T_H = 65°C T_H = 25°C	$I_{D\,nom}$ I_D	50 55	A A
脉冲漏极电流，tp由Tjmax限定 Pulsed drain current, tp limited by Tjmax		$I_{D\,puls}$	100	A
栅源峰值电压 Gate-source peak voltage		V_{GSS}	-10/20	V

特征值 / Characteristic Values

			min.	typ.	max.	
漏源通态电阻 Drain-source on resistance	I_D = 50 A, V_{GS} = -5V / 15 V, T_{vj} = 25°C	$R_{DS\,on}$		23,0		mΩ
栅极阈值电压 Gate threshold voltage	I_D = 20,0 mA, V_{DS} = V_{GS}, T_{vj} = 25°C (tested after I_{GSS} at V_{GS} = +20V as precondition)	$V_{GS(th)}$	3,50	4,50	5,50	V
栅极电荷 Gate charge	V_{GS} = -5V / 15 V, V_{DD} = 800 V	Q_G		0,125		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C	R_{Gint}		2,3		Ω
输入电容 Input capacitance	f = 1,00 MHz, T_{vj} = 25°C, V_{DS} = 800 V, V_{GS} = 0 V	C_{iss}		3,95		nF
输出电容 Output capacitance	f = 1,00 MHz, T_{vj} = 25°C, V_{DS} = 800 V, V_{GS} = 0 V	C_{oss}		0,235		nF
反向传输电容 Reverse transfer capacitance	f = 1,00 MHz, T_{vj} = 25°C, V_{DS} = 800 V, V_{GS} = 0 V	C_{rss}		0,026		nF
零栅电压漏极电流 Zero gate voltage drain current	V_{DS} = 1200 V, V_{GS} = 0 V, T_{vj} = 25°C	I_{DSS}			21,5	µA
栅极漏电流 Gate-source leakage current	V_{DS} = 0 V, V_{GS} = 20 V, T_{vj} = 25°C	I_{GSS}			240	nA
开通延迟时间(电感负载) Turn on delay time, inductive load	I_D = 50 A, V_{DS} = 600 V, V_{GS} = -5V / 15 V, R_G = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		10,0 10,0 10,0		ns
上升时间(电感负载) Rise time, inductive load	I_D = 50 A, V_{DS} = 600 V, V_{GS} = -5V / 15 V, R_G = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		9,60 9,60 9,60		ns
关断延迟时间(电感负载) Turn off delay time, inductive load	I_D = 50 A, V_{DS} = 600 V, V_{GS} = -5V / 15 V, R_G = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		43,5 43,5 43,5		ns
下降时间(电感负载) Fall time, inductive load	I_D = 50 A, V_{DS} = 600 V, V_{GS} = -5V / 15 V, R_G = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		12,0 12,0 12,0		ns
开通损耗 (每脉冲) Turn-on energy loss per pulse	I_D = 50 A, V_{DS} = 600 V, Lσ = 35 nH, V_{GS} = -5V / 15 V, di/dt = 11000 A/µs (T_{vj} = 150°C), R_G = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		0,385 0,385 0,385		mJ
关断损耗 (每脉冲) Turn-off energy loss per pulse	I_D = 50 A, V_{DS} = 600 V, Lσ = 35 nH, V_{GS} = -5V / 15 V, du/dt = 55000 V/µs (T_{vj} = 150°C), R_G = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		0,09 0,09 0,09		mJ
短路数据 SC data	V_{GS} = -5V / 15 V, V_{DD} = 800 V, V_{DSmax} = V_{DSS} -L_{sDS} ·di/dt, R_G = 10,0 Ω t_P ≤ 3 µs, T_{vj} ≤ 25°C t_P ≤ 3 µs, T_{vj} ≤ 150°C	I_{SC}		650 550		A A
结 - 散热器热阻 Thermal resistance, junction to heatsink	pro MOS-FET / per MOS-FET	R_{thJH}		1,12		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

Revers-Diode / reverse-diode

			min.	typ.	max.	
正向电压 Forward voltage	I_S = 50 A, V_{GS} = -5 V, I_S = 50 A, V_{GS} = -5 V, I_S = 50 A, V_{GS} = -5 V T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_{SD}		4,00 3,80 3,75	5,65	V

初步数据
Preliminary Data

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
连续正向直流电流 Continuous DC forward current		I_F		30	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		315 295	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	I_F = 30 A, V_{GE} = 0 V, T_{vj} = 25°C I_F = 30 A, V_{GE} = 0 V, T_{vj} = 125°C I_F = 30 A, V_{GE} = 0 V, T_{vj} = 150°C	V_F		1,40 1,70 1,85	1,85	V V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 30 A, - di_F/dt = 10500 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 600 V, T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		40,0 40,0 40,0		A A A
恢复电荷 Recovered charge	I_F = 30 A, - di_F/dt = 10500 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 600 V, T_{vj} = 125°C T_{vj} = 150°C	Q_r		0,048 0,048 0,048		µC µC µC
反向恢复损耗（每脉冲） Reverse recovery energy	I_F = 30 A, - di_F/dt = 10500 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 600 V, T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,026 0,026 0,026		mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,25		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 = 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}		450 360	A A
I2t-值 I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I²t		1000 650	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	T_{vj} = 150°C, I_F = 30 A	V_F		0,95		V
反向电流 Reverse current	T_{vj} = 150°C, V_R = 1200 V	I_R		0,10		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,37		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

初步数据
Preliminary Data

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 = 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}	450 360	A A
I2t-值 I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I²t	1000 650	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	T_{vj} = 150°C, I_F = 30 A	V_F		0,95		V
反向电流 Reverse current	T_{vj} = 150°C, V_R = 1200 V	I_R		0,10		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,37		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

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

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 = 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}	450 360	A A
I2t-值 I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I²t	1000 650	A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	T_{vj} = 150°C, I_F = 30 A	V_F		0,95		V
反向电流 Reverse current	T_{vj} = 150°C, V_R = 1200 V	I_R		0,10		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,37		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

初步数据
Preliminary Data

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

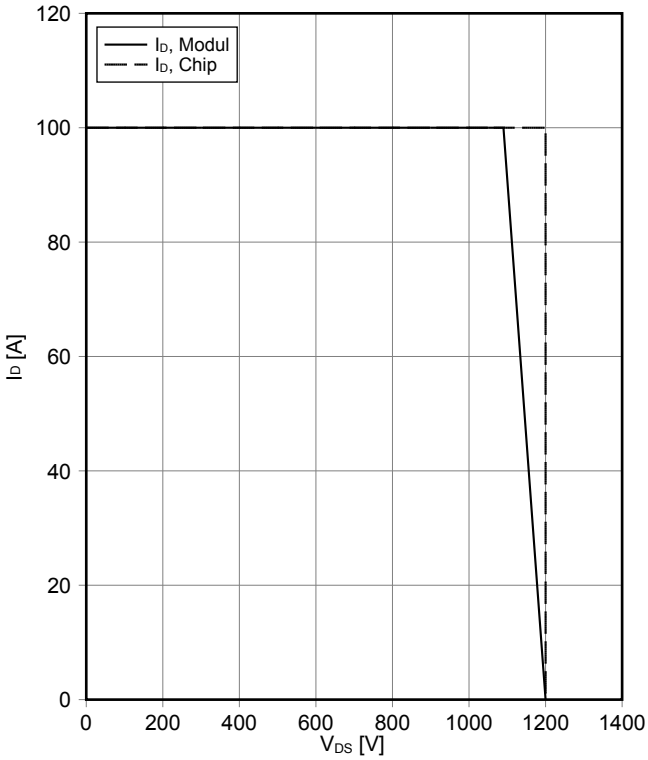
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	2,5		kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al_2O_3		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		11,5 6,3		mm
电气间隙 Clearance	端子至散热器 / terminal 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}		10		nH
储存温度 Storage temperature		T_{stg}	-40		125	°C
Anpresskraft für mech. Bef. pro Feder mountig force per clamp		F	20	-	50	N
重量 Weight		G		24		g

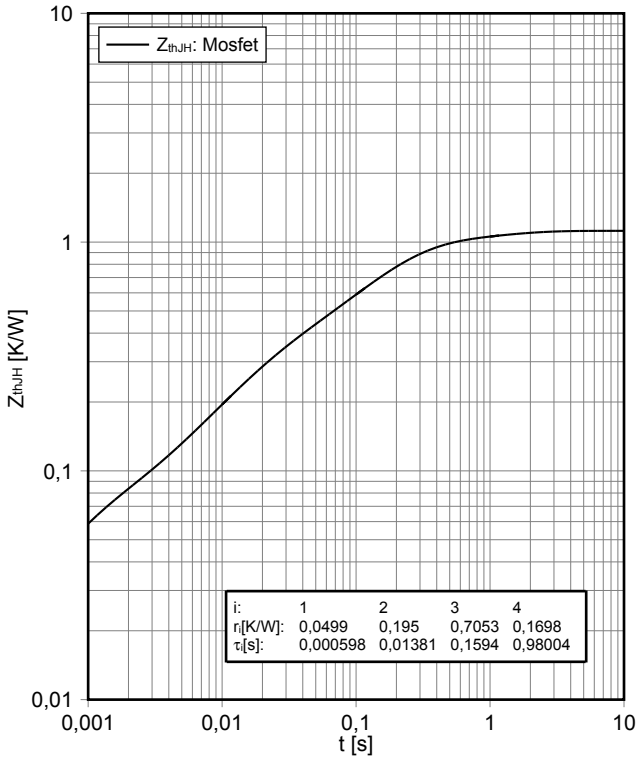
Der Strom im Dauerbetrieb ist auf 30 A effektiv pro Anschlusspin begrenzt.
The current under continuous operation is limited to 30 A rms per connector pin.

初步数据
Preliminary Data

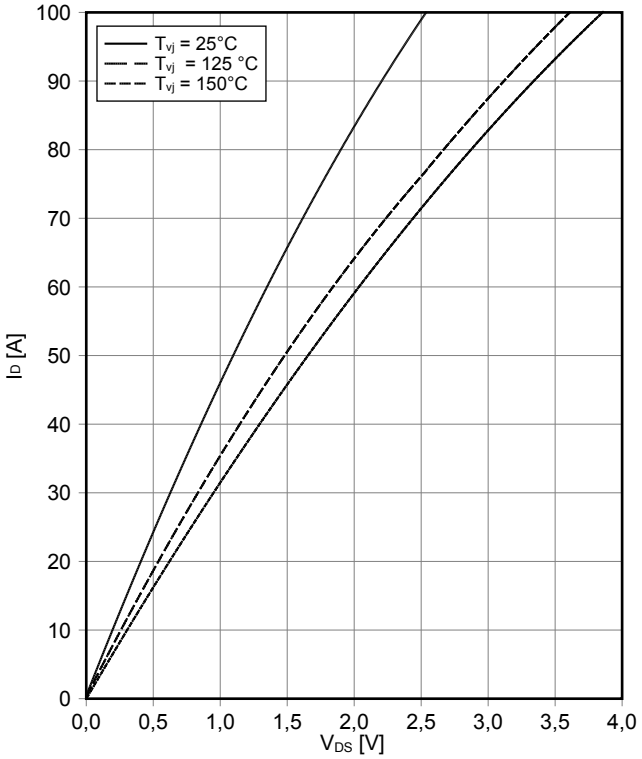
安全工作区 MOSFET (SOA)
safe operating area MOSFET (SOA)
$I_D = f(V_{DS})$
V_{GS} = - 5 V / 15 V, R_G = 1 Ω, T_{vj} = 150°C



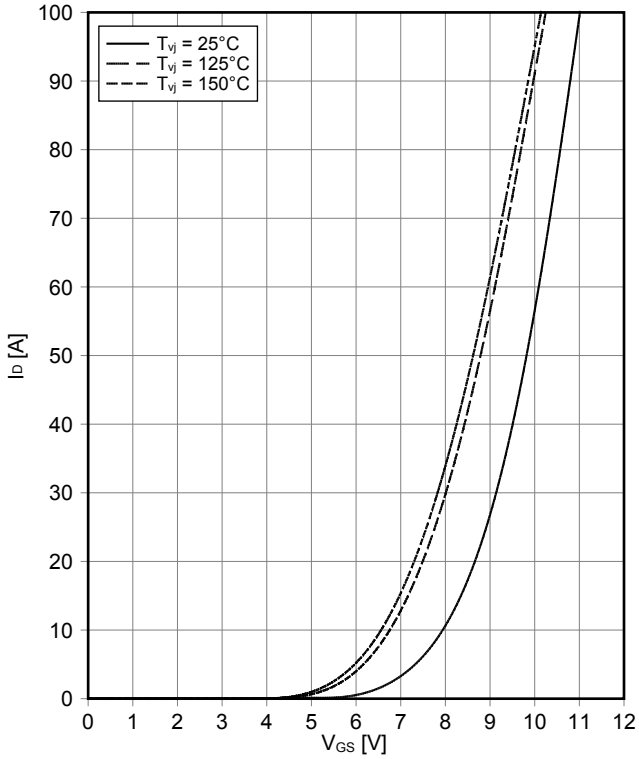
瞬态热阻抗 MOSFET
transient thermal impedance MOSFET
$Z_{thJH} = f(t)$



输出特性 MOSFET （典型）
output characteristic MOSFET (typical)
$I_D = f(V_{DS})$
V_{GS} = 15 V

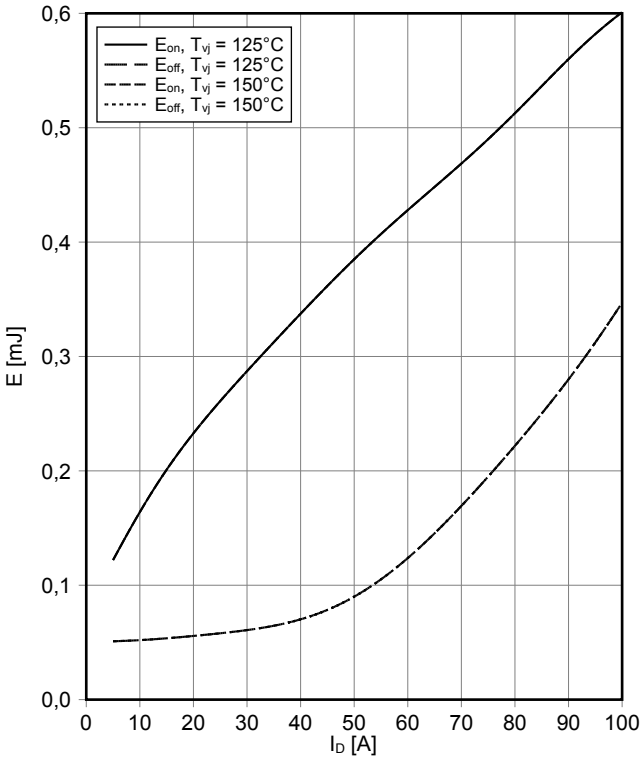


传输特性 MOSFET （典型）
transfer characteristic MOSFET (typical)
$I_D = f(V_{GS})$
V_{DS} = 20 V

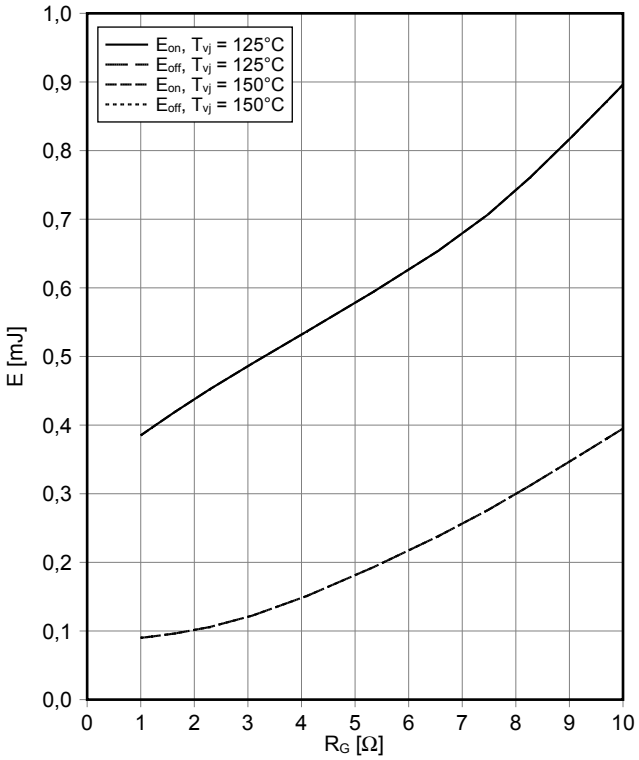


初步数据
Preliminary Data

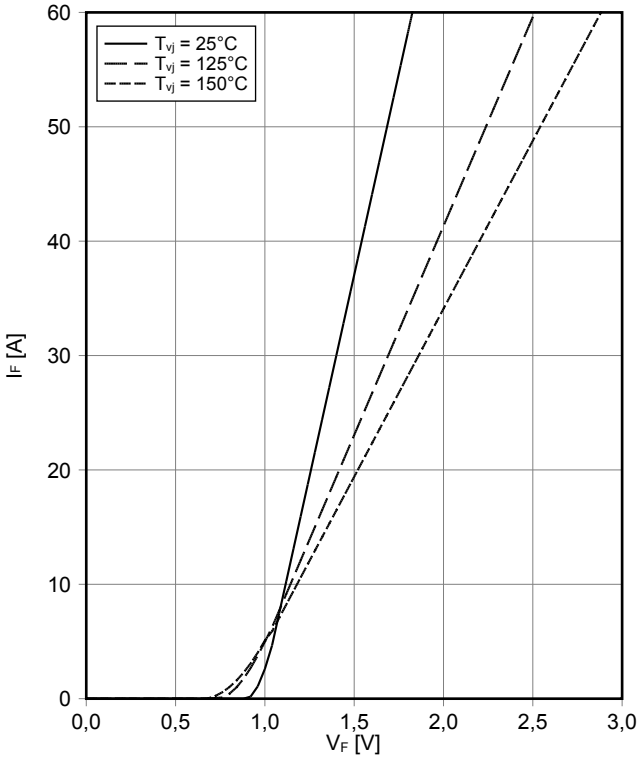
开关损耗 MOSFET （典型）
switching losses MOSFET (typical)
$E_{on} = f(I_D)$, $E_{off} = f(I_D)$
V_{GS} = - 5 V / 15 V, R_{Gon} = 1,0 Ω, R_{Goff} = 1,0 Ω, V_{DS} = 600 V



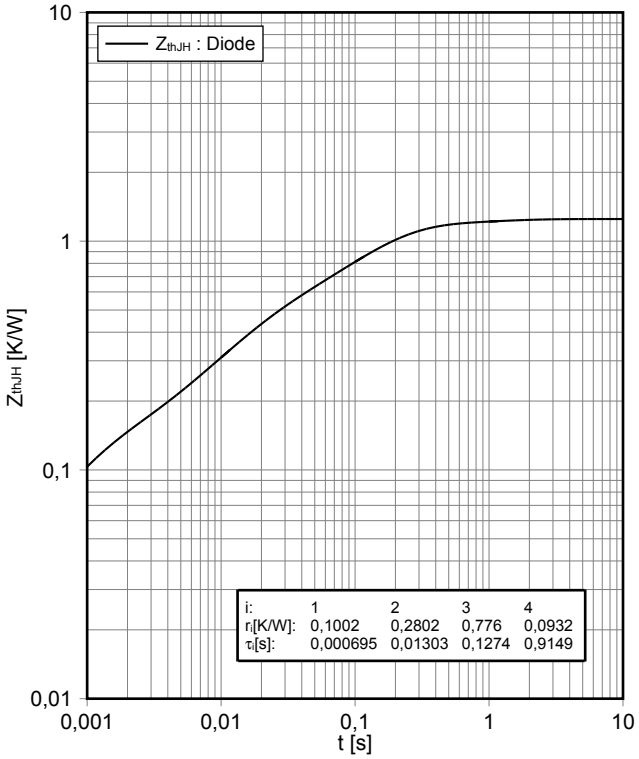
开关损耗 MOSFET （典型）
switching losses MOSFET (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GS} = - 5 V / 15 V , I_D = 50 A, V_{DS} = 600 V



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

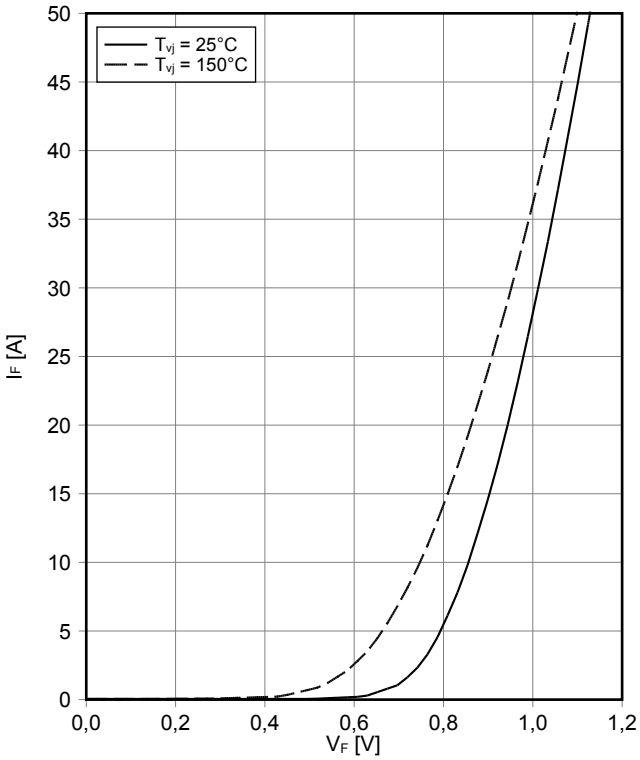


瞬态热阻抗 Diode, 轉換器
transient thermal impedance Diode, Boost
$Z_{thJH} = f(t)$

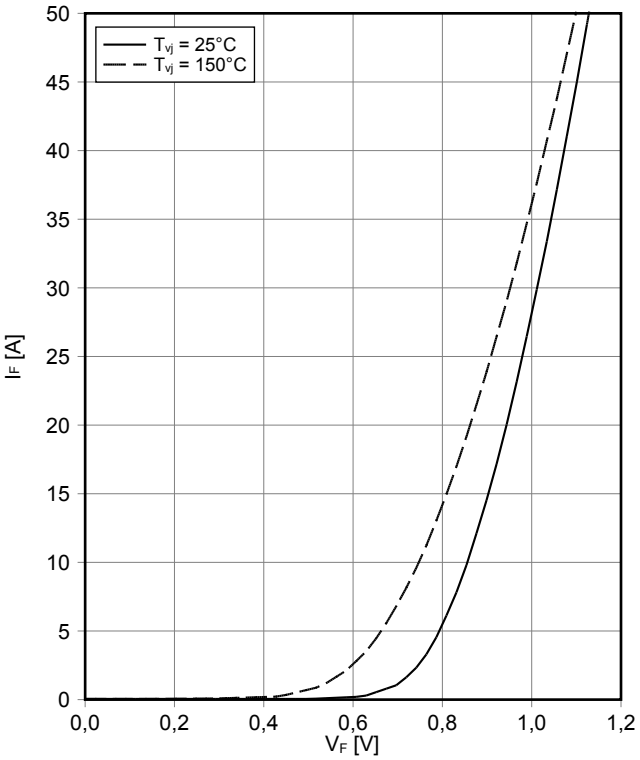


初步数据
Preliminary Data

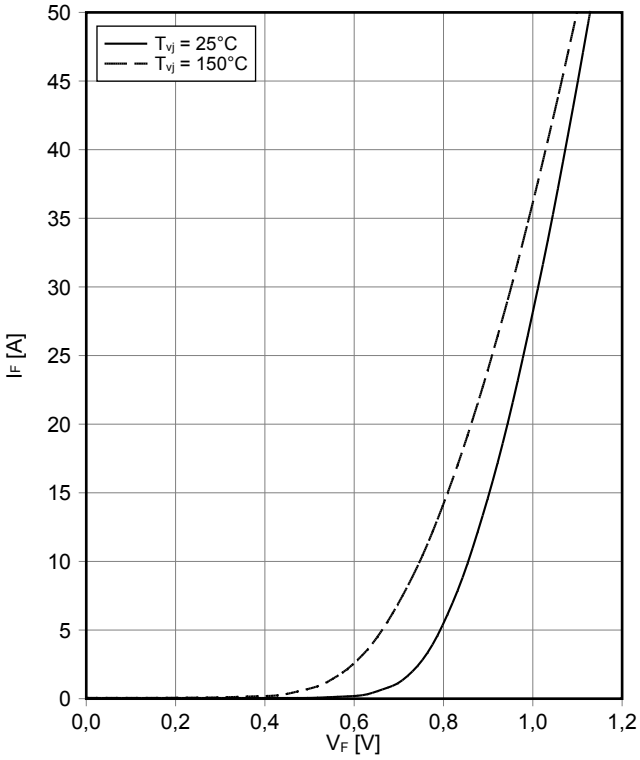
正向偏压特性 旁路二极管 （典型）
forward characteristic of Bypass-Diode (typical)
$I_F = f(V_F)$



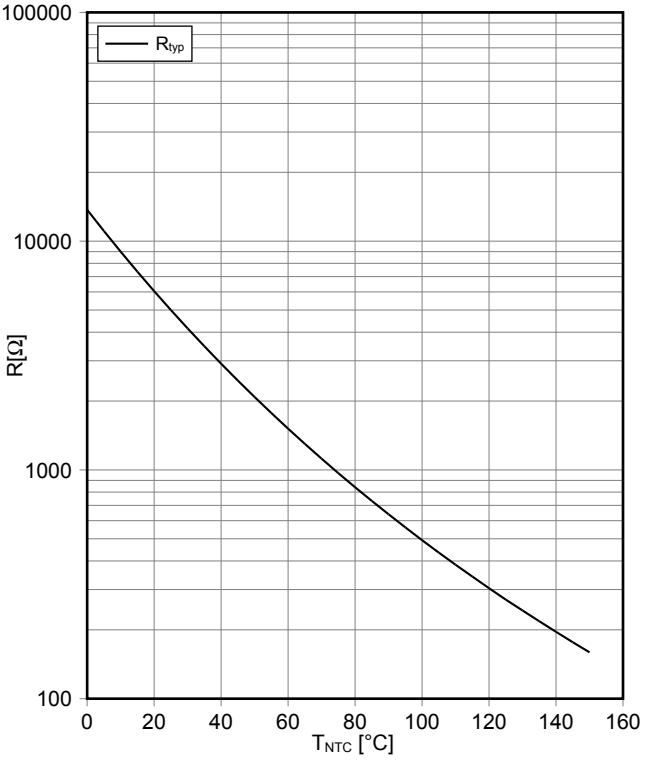
正向偏压特性 反极性保护二极管A （典型）
forward characteristic of Inverse-polarity protection diode A (typical)
$I_F = f(V_F)$



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

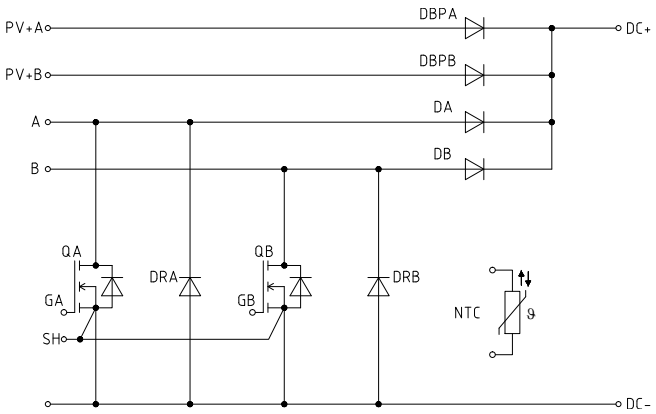


负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
R = f (T)

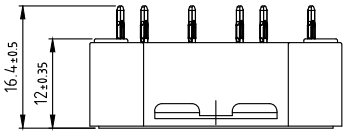


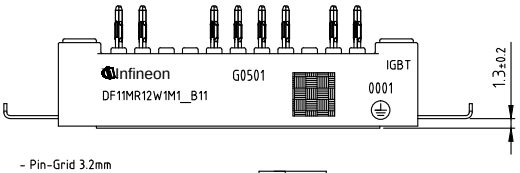
初步数据
Preliminary Data

接线图 / Circuit diagram

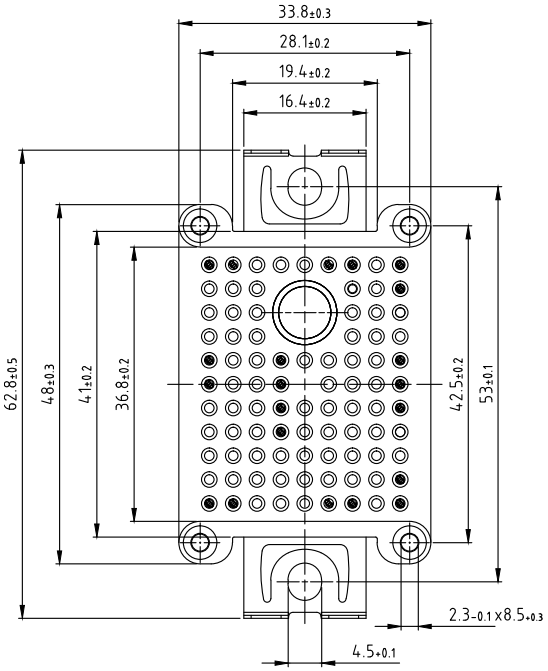


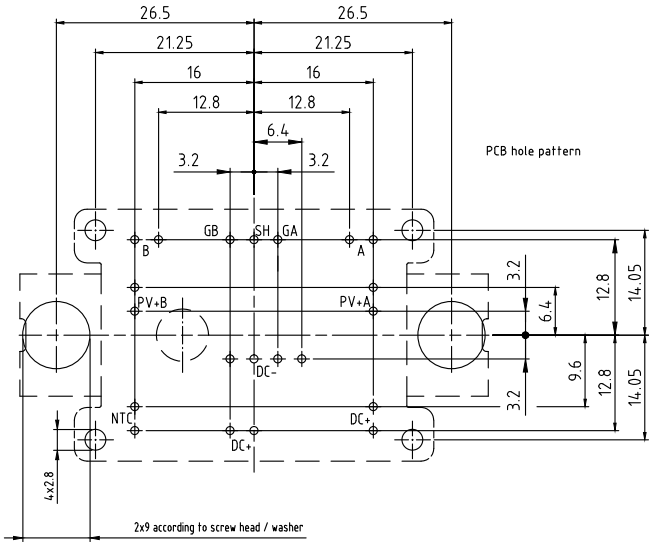
封装尺寸 / Package outlines





- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern ⌖ Ø0.1
- Hole specification for contacts see AN 2009-01:
  Diameters of drill Ø 1.15mm
  and copper thickness in hole 25-50µm





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