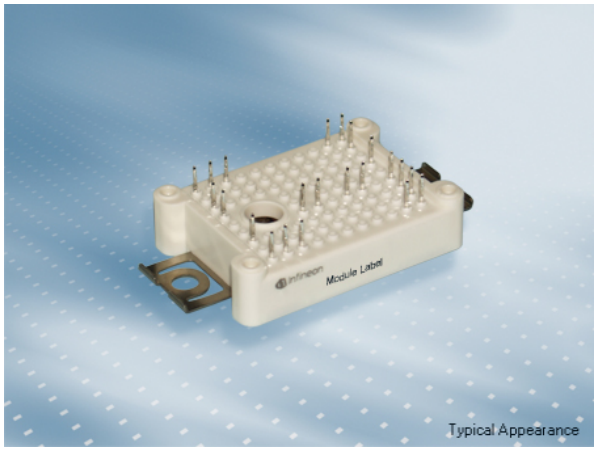
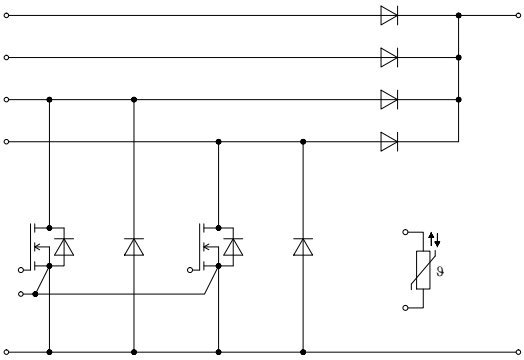
EasyPACK™ 模块 采用 CoolSiC™ Trench MOSFET 带有pressfit压接管脚和温度检测NTC / TIM
EasyPACK™ module with CoolSiC™ Trench MOSFET and PressFIT / NTC / TIM

初步数据 / Preliminary Data





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

潜在应用
- 太阳能应用

Potential Applications
- Solar applications

电气特性
- 低电感设计
- 高电流密度

Electrical Features
- Low inductive design
- High current density

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

Mechanical Features
- PressFIT contact technology
- Integrated NTC temperature sensor
- Rugged mounting due to integrated mounting clamps
- Pre-applied Thermal Interface Material

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

初步数据
Preliminary Data

MOSFET / MOSFET

最大额定值 / Maximum Rated Values

漏源极电压 Drain-source voltage	T_{vj} = 25°C	V_{DSS}	1200		V
直流漏极电流 DC drain current	T_{vj} = 175°C, V_{GS} = 15 V, T_H = 65°C	$I_{D\ nom}$	50		A
脉冲漏极电流 Pulsed drain current	经设计验证，tp由Tvjmax限定 verified by design, t_p limited by T_{vjmax}	$I_{D\ pulse}$	100		A
栅源峰值电压 Gate-source 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} = 15 V T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$R_{DS\ on}$		22,5 29,5 33,0		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 1ms pulse at V_{GS} = +20 V)	$V_{GS(th)}$	3,45	4,50	5,55	V
总的栅极电荷 Total gate charge	V_{GS} = -5 V / 15 V, V_{DS} = 800 V	Q_G		0,124		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C	R_{Gint}		2,0		Ω
输入电容 Input capacitance	f = 1 MHz, T_{vj} = 25°C V_{DS} = 800 V, V_{GS} = 0 V, V_{AC} = 25 mV	C_{iss}		3,68		nF
输出电容 Output capacitance	f = 1 MHz, T_{vj} = 25°C V_{DS} = 800 V, V_{GS} = 0 V, V_{AC} = 25 mV	C_{oss}		0,22		nF
反向传输电容 Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C V_{DS} = 800 V, V_{GS} = 0 V, V_{AC} = 25 mV	C_{rss}		0,028		nF
C_{OSS} stored energy	T_{vj} = 25°C V_{DS} = 800 V, V_{GS} = -5 V / 15 V	E_{oss}		88,0		µJ
零栅电压漏极电流 Zero gate voltage drain current	V_{DS} = 1200 V, V_{GS} = -5 V, T_{vj} = 25°C	I_{DSS}		0,20	210	µA
栅极漏电流 Gate-source leakage current	V_{DS} = 0 V, T_{vj} = 25°C V_{GS} = 20 V V_{GS} = -10 V	I_{GSS}			400	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} = -5 V / 15 V, R_{Gon} = 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} = -5 V / 15 V, R_{Gon} = 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} = -5 V / 15 V, R_{Goff} = 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} = -5 V / 15 V, R_{Goff} = 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, di/dt = 11,0 kA/µs (T_{vj} = 150°C), V_{GS} = -5 V / 15 V, R_{Gon} = 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, du/dt = 55,0 kV/µs (T_{vj} = 150°C), V_{GS} = -5 V / 15 V, R_{Goff} = 1,00 Ω T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		0,10 0,10 0,10		mJ
短路数据 SC data	V_{GS} = -5 V / 15 V, V_{DD} = 800 V, V_{DSmax} = V_{DSS} -L_{sDS} ·di/dt, R_G = 10,0 Ω t_P ≤ 2 µs, T_{vj} = 25°C t_P ≤ 2 µs, T_{vj} = 150°C	I_{SC}		420 410		A A
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个MOSFET / per MOSFET	R_{thJH}			0,830	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

Body diode

最大额定值 / Maximum Rated Values

DC body diode forward current	T_{vj} = 175°C, V_{GS} = -5 V, T_H = 65°C	I_{SD}	16		A

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	I_{SD} = 50 A, V_{GS} = -5 V I_{SD} = 50 A, V_{GS} = -5 V I_{SD} = 50 A, V_{GS} = -5 V T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_{SD}		4,60 4,35 4,30	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	40		A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	80		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	320 295		A²s A²s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	I_F = 40 A, V_{GE} = 0 V, T_{vj} = 25°C I_F = 40 A, V_{GE} = 0 V, T_{vj} = 125°C I_F = 40 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 = 40 A, - di_F/dt = 9500 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 600 V, T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		60,0 57,0 57,0		A A A
恢复电荷 Recovered charge	I_F = 40 A, - di_F/dt = 9500 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 600 V, T_{vj} = 125°C T_{vj} = 150°C	Q_r		0,523 0,531 0,531		µC µC µC
反向恢复损耗（每脉冲） Reverse recovery energy	I_F = 40 A, - di_F/dt = 9500 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 600 V, T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,089 0,096 0,096		mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}			1,03	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	1010 648		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}			1,18	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	1010 648	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}			0,990	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	1010 648	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}			0,990	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

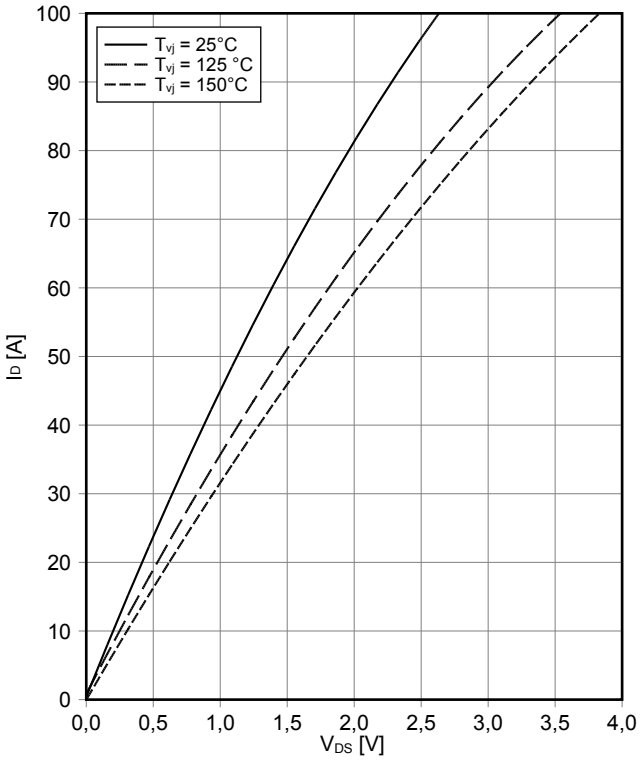
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	3,0		kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al_2O_3		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		11,5 6,3		mm
电气间隙 Clearance	端子至散热器 / terminal 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		
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}		10		nH
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	20	-	50	N
重量 Weight		G		24		g

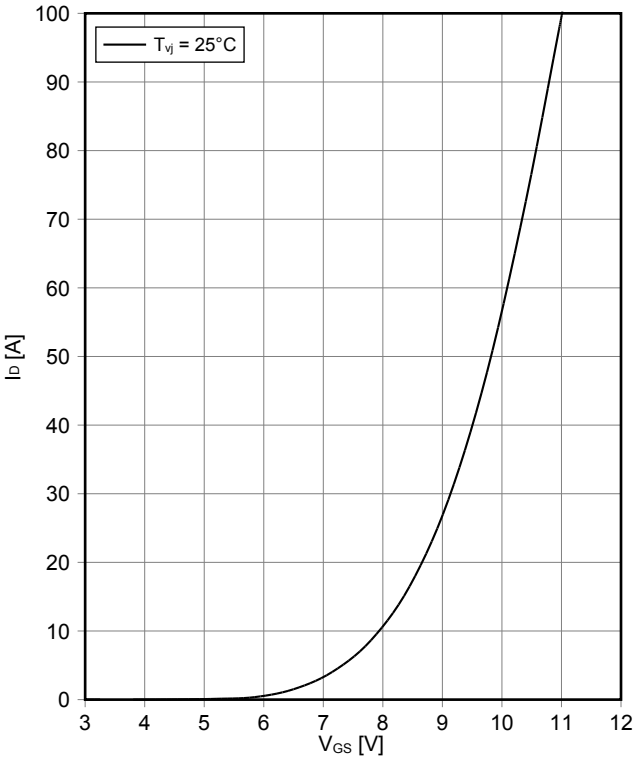
The current under continuous operation is limited to 25 A rms per connector pin.
Important note: The selection of positive and negative gate-source voltages impacts the long-term behavior of the device. The design guidelines described in Application Note AN 2018-09 must be considered to ensure sound operation of the device over the planned lifetime.
Storage and Shipment of modules with TIM => see AN2012-07

初步数据
Preliminary Data

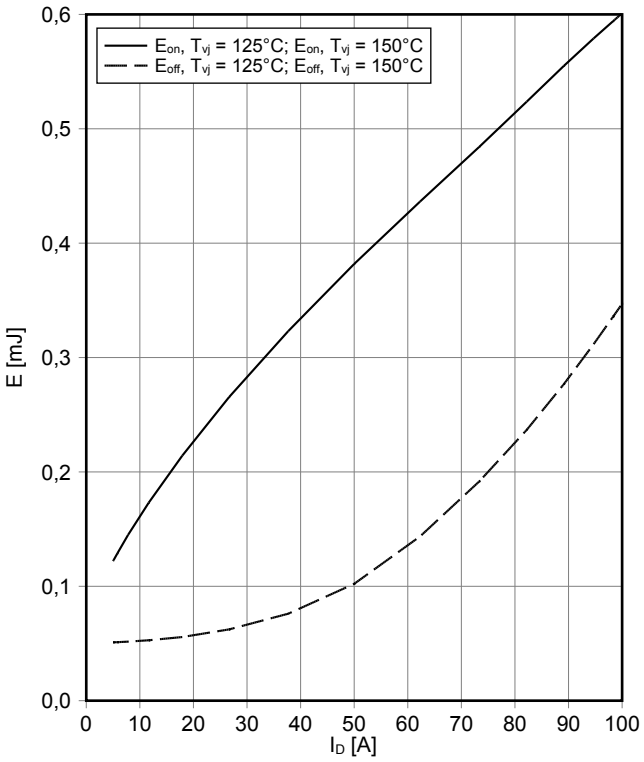
输出特性 MOSFET （典型）
output characteristic MOSFET (typical)
$I_D = f(V_{DS})$
V_{GS} = 15 V



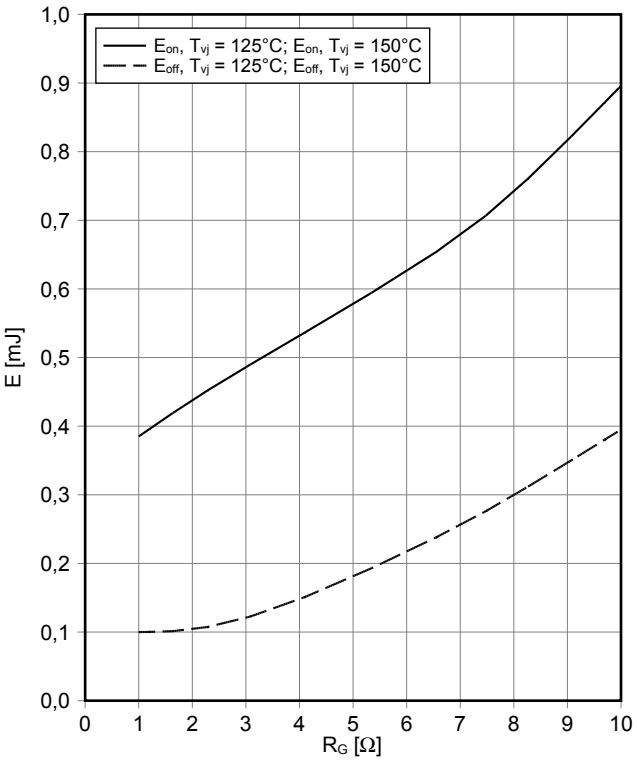
传输特性 MOSFET （典型）
transfer characteristic MOSFET (typical)
$I_D = f(V_{GS})$
V_{DS} = 20 V



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

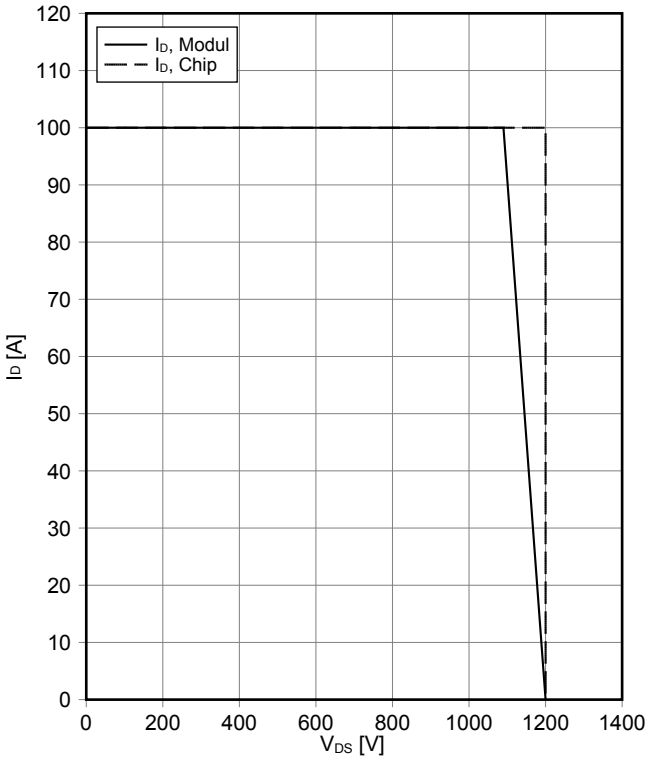


开关损耗 MOSFET （典型）
switching losses MOSFET (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GS} = - 5 V / 15 V , I_D = 50 A, V_{DS} = 600 V

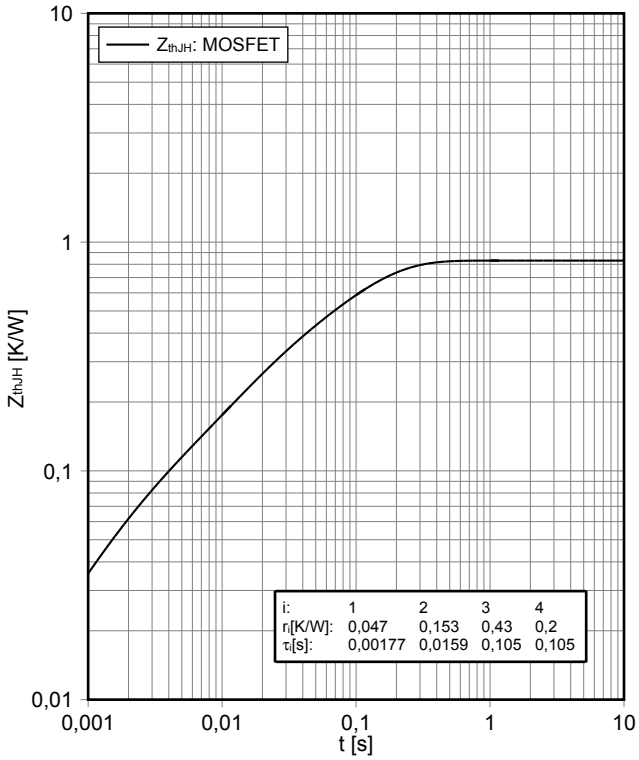


初步数据
Preliminary Data

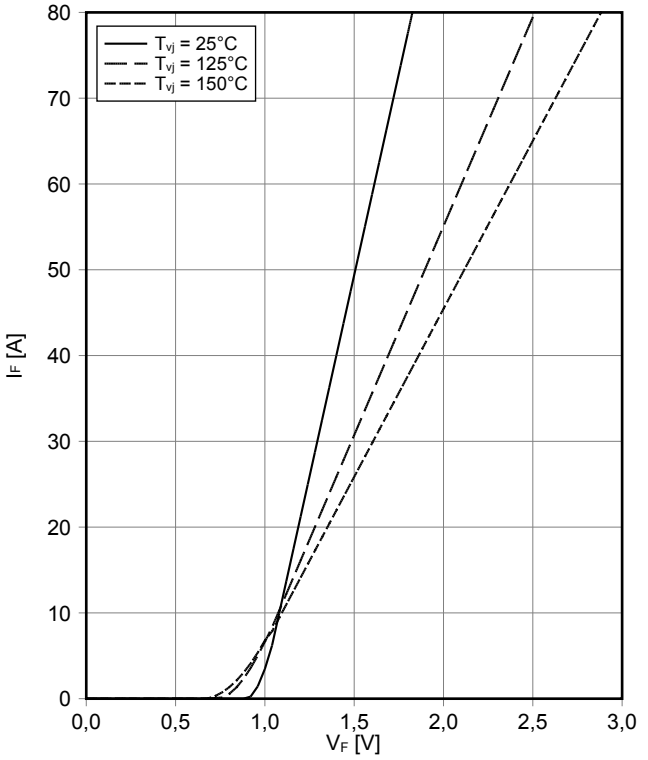
反偏安全工作区 MOSFET (RBSOA)
reverse bias safe operating area MOSFET (RBSOA)
$I_D = f(V_{DS})$
V_{GS} = -5 V / 15 V, R_G = 1 Ω, T_{vj} = 150°C



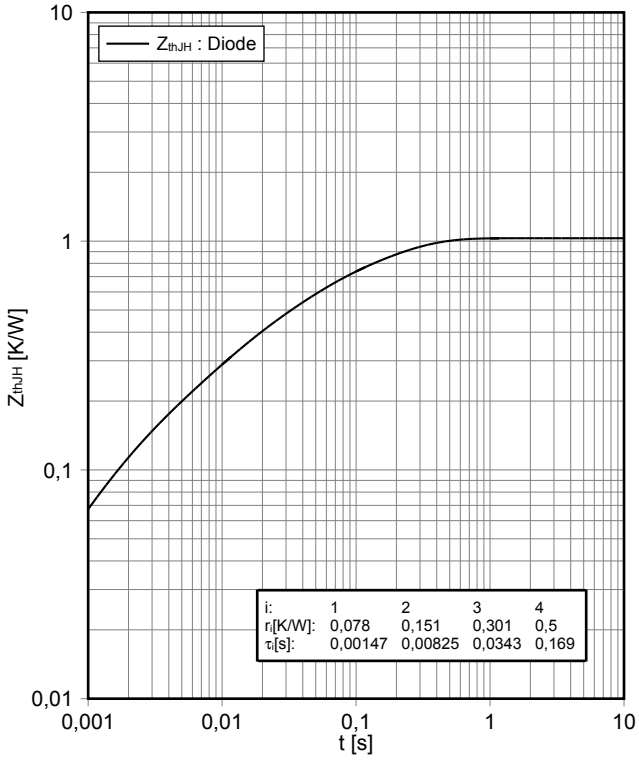
瞬态热阻抗 MOSFET
transient thermal impedance MOSFET
$Z_{thJH} = f(t)$



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

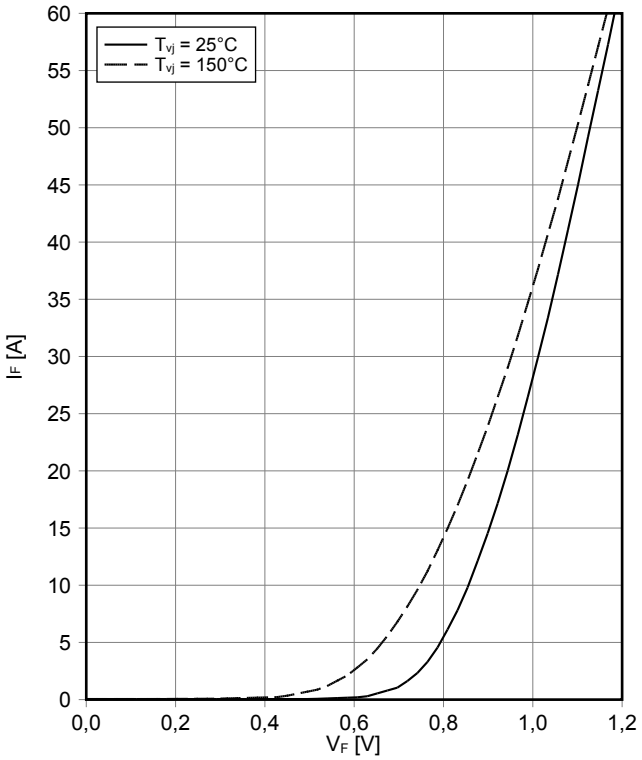


瞬态热阻抗 Diode, 轉換器
transient thermal impedance Diode, Boost
$Z_{thJH} = f(t)$

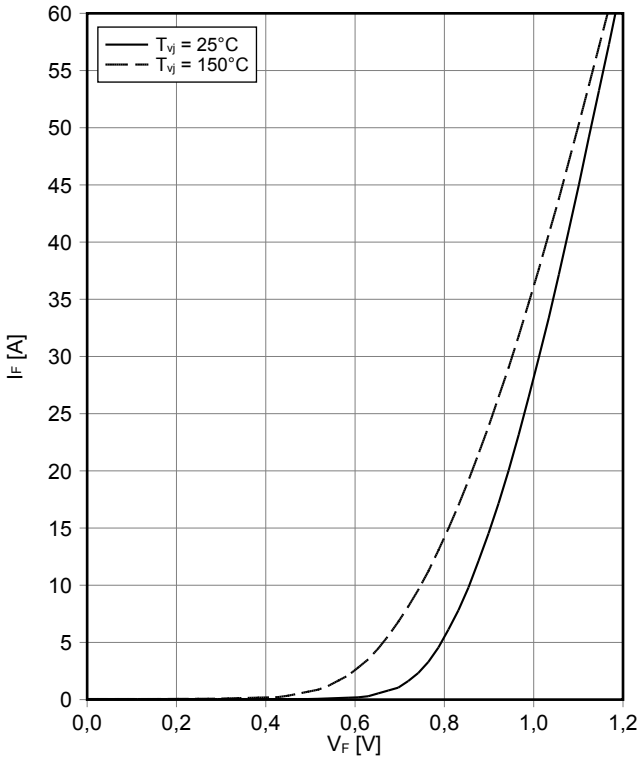


初步数据
Preliminary Data

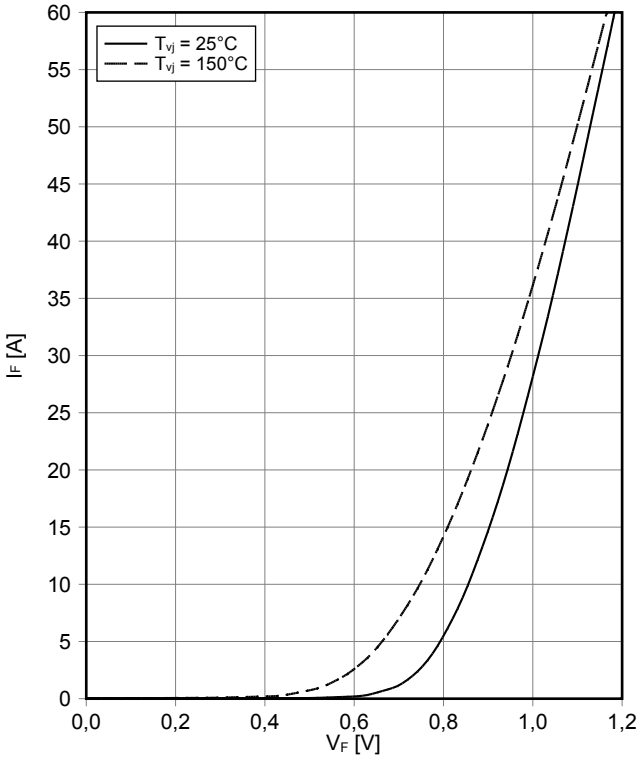
正向偏压特性 旁路二极管 （典型）
forward characteristic of Bypass-Diode (typical)
$I_F = f(V_F)$



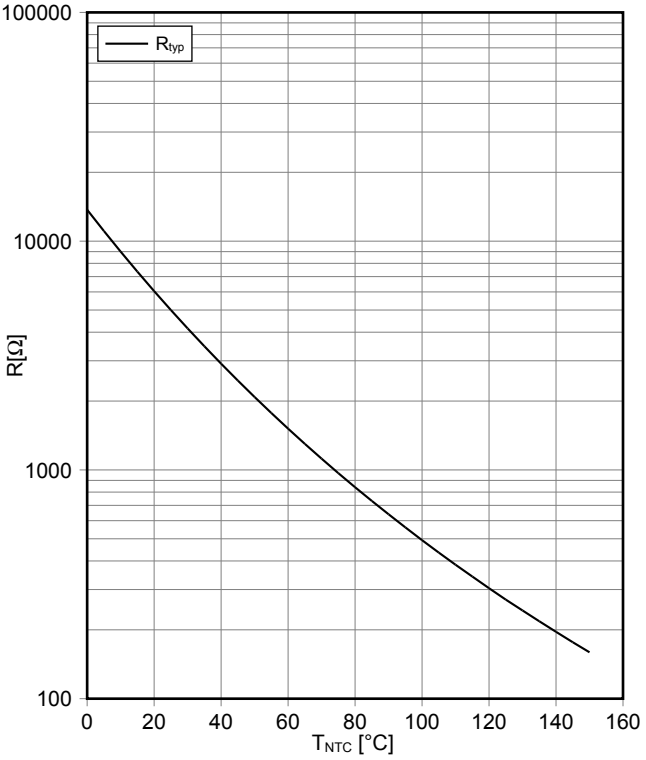
正向偏压特性 反极性保护二极管 A （典型）
forward characteristic of Inverse-polarity protection diode A (typical)
$I_F = f(V_F)$



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)
$I_F = f(V_F)$

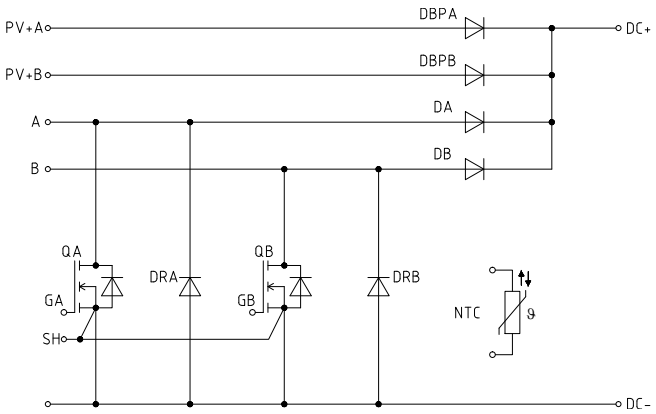


负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
$R = f(T_{NTC})$

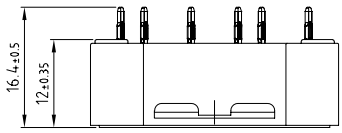


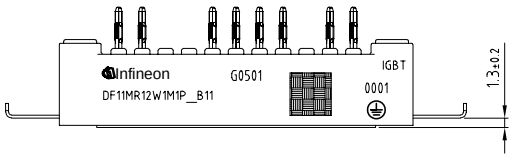
初步数据
Preliminary Data

接线图 / Circuit diagram

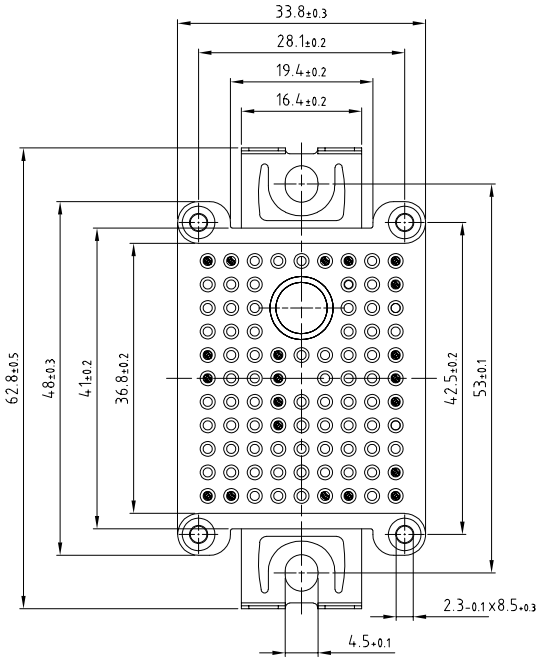


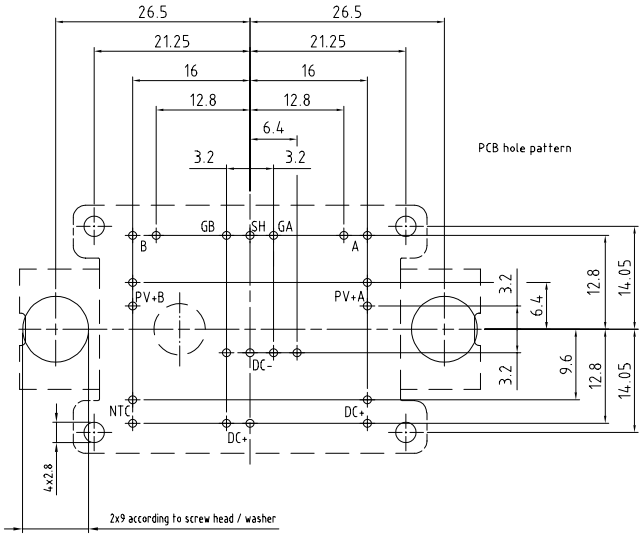
封装尺寸 / Package outlines

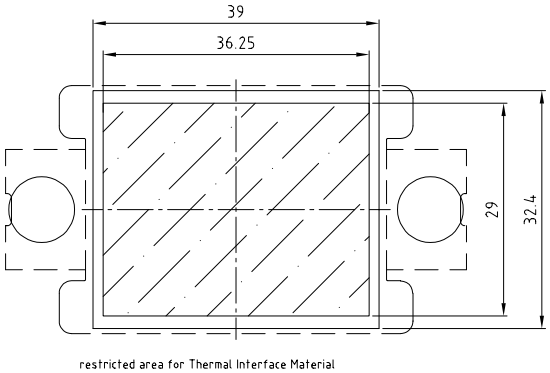




- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern ⌖ ⌀0.1
- Hole specification for contacts see AN 2009-01:
  Diameters of drill Ø 1.15mm
  and copper thickness in hole 25-50µm







Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

Edition 2020-02-27

Published by
Infineon Technologies AG
81726 München, Germany

© 2020 Infineon Technologies AG.
All Rights Reserved.

Do you have a question about this document?
Email: erratum@infineon.com

重要提示

本文档所提供的任何信息绝不应当被视为针对任何条件或者品质而做出的保证（质量保证）。英飞凌对于本文档中所提及的任何事例、提示或者任何特定数值及/或任何关于产品应用方面的信息均在此明确声明其不承担任何保证或者责任，包括但不限于其不侵犯任何第三方知识产权的保证均在此排除。
此外，本文档所提供的任何信息均取决于客户履行本文档所载明的义务和客户遵守适用于客户产品以及与客户对于英飞凌产品的应用所相关的任何法律要求、规范和标准。
本文档所含的数据仅供经过专业技术培训的人员使用。客户自身的技术部门有义务对于产品是否适宜于其预期的应用和针对该等应用而言本文档中所提供的信息是否充分自行予以评估。
如需产品、技术、交付条款和条件以及价格等进一步信息，请向离您最近的英飞凌科技办公室接洽（www.infineon.com）。

警告事项

由于技术所需产品可能含有危险物质。如需了解该等物质的类型，请向离您最近的英飞凌科技办公室接洽。
除非由经英飞凌科技授权代表签署的书面文件中做出另行明确批准的情况外，英飞凌科技的产品不应当被用于任何一项一旦产品失效或者产品使用的后果可被合理地预料到可能导致人身伤害的任何应用领域。

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”). With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of Infineon Technologies in customer’s applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies’ products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.