

Be smart. Prototype online.

# 在线设计和仿真工具 入门指南



Infineon Online Engineering & Tools  
2019年6月7日



# Agenda

1

英飞凌在线设计和仿真工具概览

2

参数搜索产品选型工具

3

应用方案查找器

4

Infineon Designer在线时域仿真入门指南及其新特性

5

在线系统效率和热仿真：IPOSIM & PLECS

6

总结和技术支持

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# 在线设计和仿真工具 自助服务：便捷 – 快速 – 可扩展

1

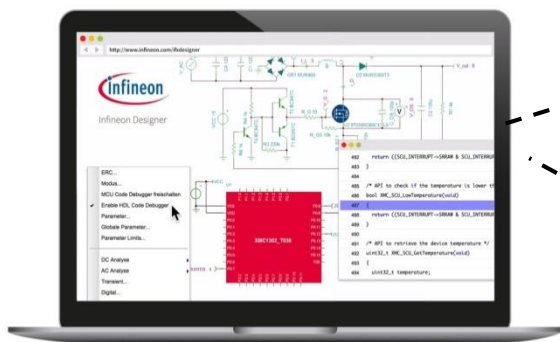
选择 – 比较 – 购买  
(在线)

2

原型设计和开发  
(离线)

3

批量采购和量产



- › 给所需应用选择合适的产品
- › 比较性能和效率
- › 购买合适的评估板或样片

- › 客户使用已有的离线开发设计工具
- › 缩短原型设计时间

- › 最快实现量产
- › 给终端客户最有性价比

- › [www.infineon.com/tools](http://www.infineon.com/tools) 基于产品级、应用级和系统级的选型工具
- › [www.infineon.com/ifxdesigner](http://www.infineon.com/ifxdesigner) 460多个用于电机控制、照明、射频前端、开关电源等的应用电路仿真
- › [www.infineon.com/solutionfinder](http://www.infineon.com/solutionfinder) 应用方案查找器，涵盖电机控制，开关电源，照明，DC-DC分布式供电
- › [www.infineon.com/iposim](http://www.infineon.com/iposim) 高功率模块和盘片在线仿真工具：功率损耗，热表现等

意识  
(兴趣)

选择  
(学习)

比较  
(评估)

购买样片  
(测试)

设计  
(决定)

批量购买和量产  
(使用)

售后  
(获得帮助)



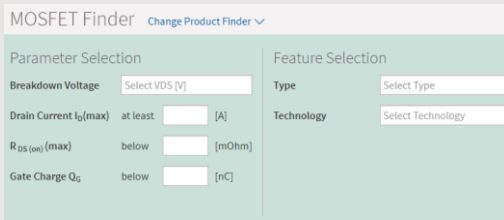
## 在线工具 (无需安装)

[www.infineon.com/tools](http://www.infineon.com/tools)

## Infineon Toolbox (离线为主)

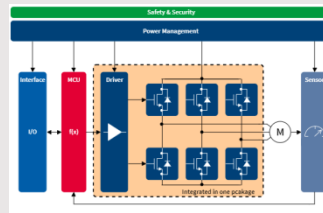
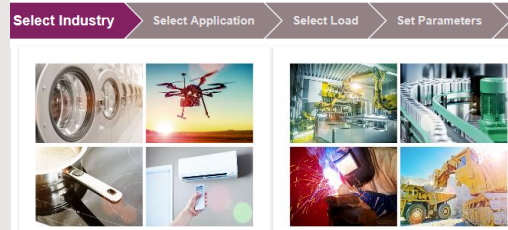
[www.infineon.com/toolbox](http://www.infineon.com/toolbox)

### 如何选择合适产品?



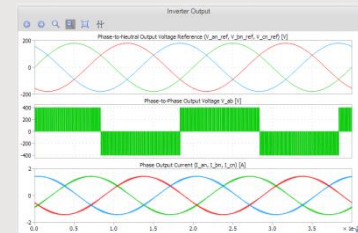
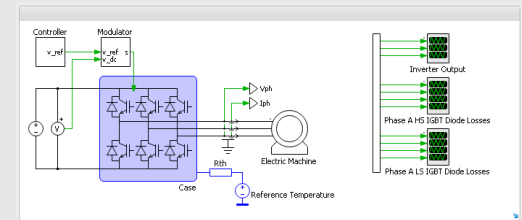
使用我们的产品查找工具  
(比如: [IGBT](#), [MOSFET](#), [IPM](#),  
[Gate Driver](#), [仿真模型](#)等)

### 如何选择应用解决方案?



使用[应用方案查找器](#)  
(比如: 电机控制, 开关电源, LED  
照明, DC-DC PoL分布式供电)

### 如何用仿真检测性能?



使用在线仿真工具  
(比如: [IPOSIM](#), [Infineon Designer](#), [XENSIV](#))

下载资料: 规格书, 仿真模型, BOM, 电路图, 评估版

# 基于参数搜索的产品查找工具 – 例：MOSFET查找器

> [www.infineon.com/cms/en/tools/solution-finder/product-finder/mosfet-finder/](http://www.infineon.com/cms/en/tools/solution-finder/product-finder/mosfet-finder/)

MOSFET Finder [Change Product Finder](#) > [Cross Reference](#)

**Parameter Selection**

Breakdown Voltage:

Drain Current  $I_D(\max)$ : at least  [A]

$R_{DS(on)}$  (max): below  [mOhm]

Gate Charge  $Q_G$ : below  [nC]

**Feature Selection**

Type:

Technology:

**Availability**

Automotive  Industrial  Any

Package:

Product Status:

> [Reset all](#)

Configure table
 Compare
 Share
 Download
8 Results

Product	OPN	Product Status	Order online	Package	Online Simulation	Budgetary Price €/1k	Type
> BSC026N08NS5	BSC026N08NS5ATMA1	active and preferred	Buy Online	SuperSO8	Simulate Online	1.03	N
> BSC030N08NS5	BSC030N08NS5ATMA1	active and preferred	Buy Online	SuperSO8	Simulate Online	0.77	N
> BSC037N08NS5	BSC037N08NS5ATMA1	active and preferred	Buy Online	SuperSO8	Simulate Online	0.76	N
> BSC040N08NS5	BSC040N08NS5ATMA1	active and preferred	Buy Online	SuperSO8	Simulate Online	0.62	N
> BSC047N08NS3 G	BSC047N08NS3GATMA1	active and preferred	Buy Online	SuperSO8	Simulate Online	0.79	N
> BSC057N08NS3 G	BSC057N08NS3GATMA1	active and preferred	Buy Online	SuperSO8	Simulate Online	0.55	N
> BSC036NE7NS3 G	BSC036NE7NS3GATM...	active and preferred	Buy Online	SuperSO8	Simulate Online	1.07	N
> BSC042NE7NS3 G	BSC042NE7NS3GATM...	active and preferred	Buy Online	SuperSO8	Simulate Online	0.78	N

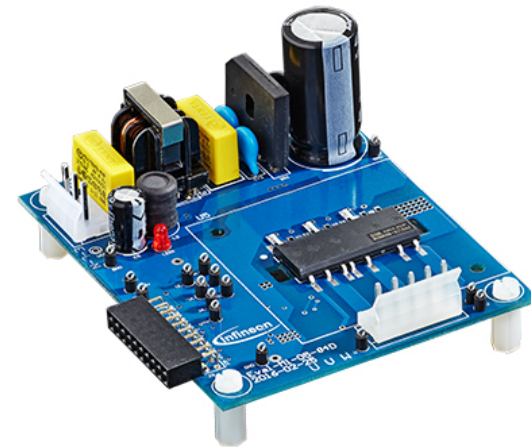
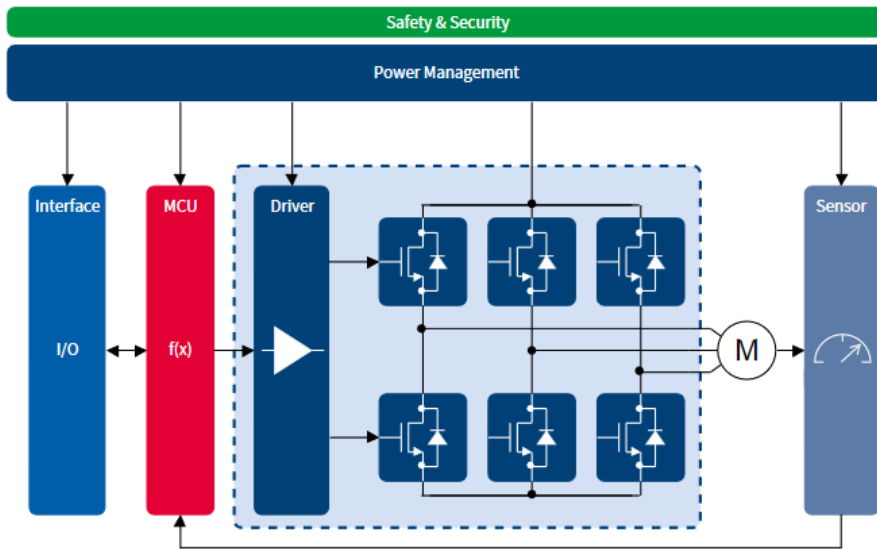
## Solution Finder

Select Industry > Select Application > Select Load > Set Parameters > Compare Solutions > Check Solutions > Buy Solution

Previous Next

Integration Level	Products	Chip Count	Footprint [mm <sup>2</sup> ]	Design Target	Price	Action
Integrated driver/power stage	Controller: 1 x IRMCK099M IPM: 1 x IRSM505-084DA	2	373	Easy to design	\$\$\$	<a href="#">Thermal</a> <a href="#">Electrical</a> <a href="#">Partner Network</a> <a href="#">Buy</a>

Rollover the block diagram for detailed product information and links.



Typical appearance

Previous Next

- 强大的服务器配置：16核CPU内核，支持100个用户同时仿真
- 超过150个用于电机控制、照明、射频前端、开关电源等的应用电路

The screenshot displays the Infineon Designer web application interface. The main window shows a detailed circuit diagram for a power MOSFET driver. The circuit includes an AC input (V.AC:1), a bridge rectifier (GR1 MUR460), a filter capacitor (C1 1200), a MOSFET (M1 IRF540), a gate driver (U3 IPD50R380C), and a load (LD). Various components like resistors (R2 20k, R3 220k, R4 10k, R5 10k, R6 1k, R7 10k, R8 10k, R9 10k, R10 10k, R11 10k, R12 10k, R13 10k, R14 10k, R15 10k, R16 10k, R17 10k, R18 10k, R19 10k, R20 10k, R21 10k, R22 10k, R23 10k, R24 10k, R25 10k, R26 10k, R27 10k, R28 10k, R29 10k, R30 10k, R31 10k, R32 10k, R33 10k, R34 10k, R35 10k, R36 10k, R37 10k, R38 10k, R39 10k, R40 10k, R41 10k, R42 10k, R43 10k, R44 10k, R45 10k, R46 10k, R47 10k, R48 10k, R49 10k, R50 10k) and capacitors (C2 100n, C3 100n, C4 100n, C5 100n, C6 100n, C7 100n, C8 100n, C9 100n, C10 100n, C11 100n, C12 100n, C13 100n, C14 100n, C15 100n, C16 100n, C17 100n, C18 100n, C19 100n, C20 100n, C21 100n, C22 100n, C23 100n, C24 100n, C25 100n, C26 100n, C27 100n, C28 100n, C29 100n, C30 100n, C31 100n, C32 100n, C33 100n, C34 100n, C35 100n, C36 100n, C37 100n, C38 100n, C39 100n, C40 100n, C41 100n, C42 100n, C43 100n, C44 100n, C45 100n, C46 100n, C47 100n, C48 100n, C49 100n, C50 100n) are also present. The circuit is connected to an MCU (XMC1302\_T038). The interface includes a menu bar (File, Edit, View, Favorites, Tools, Help), a toolbar, and a status bar. The main window is divided into several panes: a circuit diagram, an Analog Scope showing waveforms for V.AC and V.G, and a Digital Debugger showing code and register values. The Analog Scope shows a square wave for V.AC and a pulse for V.G. The Digital Debugger shows the following code:

```
61 int main(void)
62 {
63     //-----CLOCK-SETUP-----
64     XMC_SCU_CLOCK_Init(&Clock_conf1g);
65     //-----MOSFET-SWITCHING-----
66     /* Ensure that fccu reaches CCU40 */
67     XMC_CCU4_SetModuTeClock(CCU40, XMC_CCU4_CLOCK_SCU);
68     XMC_CCU4_Init(CCU40, XMC_CCU4_SLICE_MODS_ACTION_TRANSFER_PR_CR);
69 }
```

Register	Value	Address	Value
R0	00F42400	00000020	00000000
R1	00000100	00000024	00000000
R2	D1E84800		
R3	20003FFC		
R4	00000000		

The interface also includes a footer with links for Usage of this website, Imprint, Contact, Privacy Policy, and Glossary.

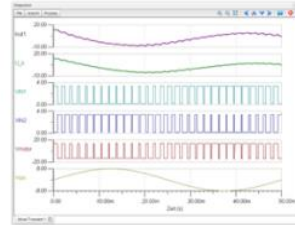
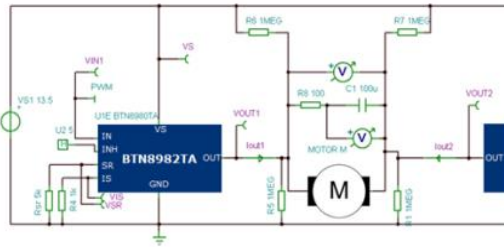




## 绝佳的用户体验

- › **全新全能电路编辑器!**
- › 多浏览器支持 (Chrome, Edge, Firefox, Safari等等)
- › 无需安装
- › 无限免费仿真授权
- › 支持在线快速仿真

powered by...

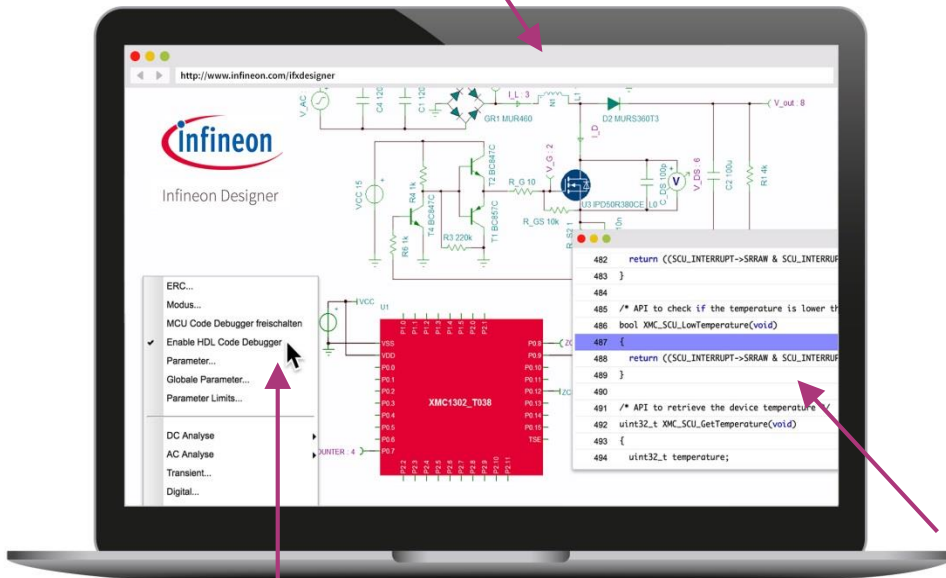


## 特性

- › 精准的时域信号仿真+系统能效仿真
- › 快速参数设置
- › 数字/模拟交互仿真
- › 已发布超过460个应用电路

# Infineon Designer 使用案例: 数字/模拟交互仿真和在线代码调试

## 1 选择 XMC1200电路

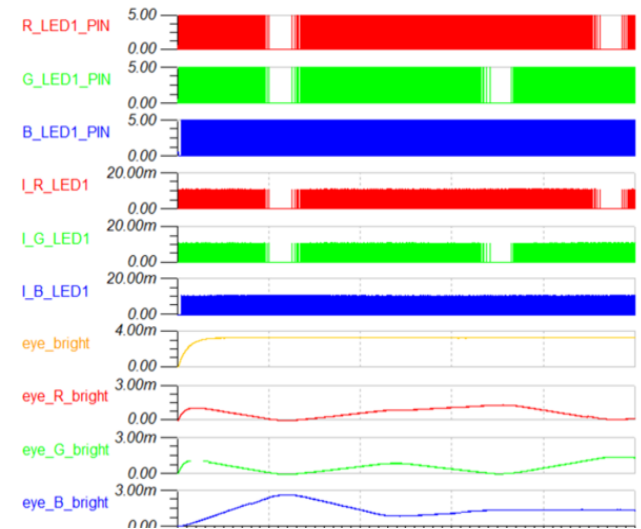


## 2 选择仿真模式

3

## 交互仿真处理器控制代码和 模拟电路

样例电路: [32-bit MCU XMC1200 controlling the RGB color walk with constant brightness](#)

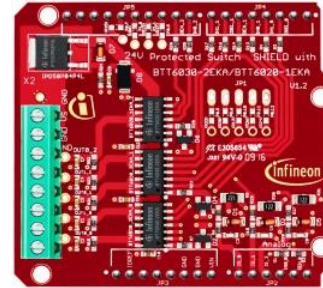


# Infineon Designer 使用案例：汽车级在线设计 24V Arduino Shield PROFET™ + 24V Family

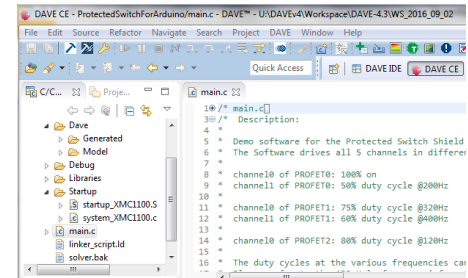


- 独特的附加价值
  - 通过点击鼠标在线探索评估板特性，无需阅读冗长的规格书和应用手册
  - 根据应用需求，在购买样片前，直接在线快速配置硬件和软件参数，熟悉评估板性能
- 在线仿真全套硬件和软件设计
  - 硬件：Arduino Shield
  - 软件：DAVE
  - 在线仿真：Infineon Designer (Spice)
  - 仿真引擎：DesignSoft

## 硬件



## 软件



## 在线仿真：结果快速可视化

1 代码调试器

2 硬件模拟信号示波器

# Agenda

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# 参数搜索产品选型工具

## 超过7000款英飞凌产品

> [www.infineon.com/cms/cn/tools/](http://www.infineon.com/cms/cn/tools/)

### 参数搜索选型工具

#### 功率器件



IGBT  
分立器件 模块



MOSFETs



IPM



双极型盘片  
双极型模块



双极型三极管



二极管 (整流器)

#### 混合信号&微控制器



栅极驱动器



智能开关



电压调节器



微控制器 (MCU)



收发机

#### 安全&芯片卡



安全及智能卡方案

#### 射频&传感器



ESD 保护



磁传感器



其他产品

# 参数搜索产品选型工具

## 实例：智能功率模块IPM选型工具

> [www.infineon.com/cms/en/tools/solution-finder/product-finder/ipm-finder/](http://www.infineon.com/cms/en/tools/solution-finder/product-finder/ipm-finder/)

1 其他选型工具

IPM Finder Change Product Finder > Cross Reference

2 IPM类型选择

3 IPM参数筛选

4 其他特性选择

5 比较特定产品

Configure table Compare Share Download Reset all 2 Results

Product	Configuration	Switch Type	$P_{mot}$ 10kHz	Voltage Class	Motor Current (Arms)	$R_{DS(on)}$ 25C max	Built in NTC	Online Simulation
> IRSM506-076DA	3 Phase Open Source	IGBT	105 W	600 V	0.5 A		Yes	<a href="#">Simulate Online</a>
> IRSM506-076PA	3 Phase Open Source	IGBT	105 W	600 V	0.5 A		Yes	<a href="#">Simulate Online</a>

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# 应用方案查找器 – 电机控制半导体解决方案 教程：概览和选择工业领域

> [www.infineon.com/solutionfinder](http://www.infineon.com/solutionfinder)

The screenshot shows the Infineon Solution Finder interface. At the top left is the Infineon logo. Below it is the text "Solution Finder". A navigation bar contains several steps: "Select Industry", "Select Application", "Select Load", "Set Parameters", "Compare Solutions", "Check Solutions", and "Buy Solution". The "Select Industry" step is highlighted. Below the navigation bar, it says "In total: 764 solutions" and "Please choose your Industry by clicking on the respective picture". There are four industry categories shown as grids of images with labels and solution counts: "Consumer (340 solutions)", "Industrial / Commercial (48 solutions)", "Automotive (50 solutions)", and "Data Processing (326 solutions)". At the top right, there is a search bar with "Search Your Feedback", "Technical Support", "About", "English", and a search icon. Below the industry grids, there are "Previous" and "Next" navigation buttons. Four numbered annotations in orange boxes point to specific features: 1. "选择流程向导栏" (Select process navigation bar) points to the navigation bar. 2. "选择工业领域" (Select industry) points to the industry category grids. 3. "导航键" (Navigation key) points to the "Previous" and "Next" buttons. 4. "搜索框和技术支持" (Search box and technical support) points to the search bar and navigation links.



# 应用方案查找器 – 电机控制半导体解决方案

## 教程：选择应用

### Solution Finder

Select Industry **Select Application** Select Load Set Parameters Compare Solutions Check Solutions Buy Solution

Previous Next

« Your Selection  
Consumer

Filtered: 565 solutions  
Please choose your application by clicking on the respective picture

 Home Appliance Home appliances (522 solutions)	 Robotic vacuum cleaner (64 solutions)	 E-bikes & E-Scooters (8 solutions)
 Power tools (7 solutions)	 Multicopter (22 solutions)	 Low speed EV (6 solutions)

1 您的选择历史

2 选择应用

Previous Next

# 应用方案查找器 – 电机控制半导体解决方案

## 教程：选择负载类型

Select Industry > Select Application > **Select Load** > Set Parameters > Compare Solutions > Check Solutions > Buy Solution

« Your Selection  
Consumer  
└─ Robotic vacuum cleaner

**1 选择电机类型**

Motor control and drives	Power Supply	Lighting	PoL
<b>PMSM/BLDC Motor</b> 16 solutions			
<b>Brushed DC</b> 24 solutions			
<b>Permanent Magnet Stepper</b> 24 solutions			

**2 电机类型描述**

PMSM/BLDC Motor	Brushed DC	Permanent Magnet Stepper
<p>PMSM/BLDC Motor</p> <p>Permanent Magnet Synchronous Motor can be divided into two types, the non-salient and the salient type machine. Similar to DC machines, synchronous machines can produce torque when a rotating electromagnetic field and a constant field are standing still relative to each other.</p> <p>In Brushless DC motor the rotor consists of permanent magnets, while the stator is wound with a specific number of poles. It is essentially a PMSM motor with concentrated windings. Commonly it is also known as a PMSM with surface mounted magnets and concentrated windings.</p>	<p>Brushed DC</p> <p>A brushed DC motor converts DC electrical energy into mechanical energy. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.</p>	<p>Permanent Magnet Stepper</p> <p>A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The rotor in the permanent magnet (PM) stepper motor has no teeth as with the VR motor. Instead, the rotor is magnetized with alternating north and south poles. These magnetized rotor poles provide an increased magnetic flux due to the permanent magnets. Because of this, the PM motor exhibits improved torque characteristics when compared with the Variable Reluctance Stepper Motor. The step angle is between the VR type and the hybrid stepper motor. It is often used in computer printers to advance paper.</p>

Previous Next

# 应用方案查找器 – 电机控制半导体解决方案

## 教程： 设置参数

Select Industry > Select Application > Select Load > **Set Parameters** > Compare Solutions > Check Solutions > Buy Solution

Previous Next

« Your Selection

- Consumer
  - Robotic vacuum cleaner
    - PMSM/BLDC Motor
      - Nominal link voltage [V]: 14.8
      - Electric power [W]: 22.5
      - Sensing: without sensor
- Solution
  - Integrated driver/power stage
  - Chip Count: 4
  - Controller: IRMCK099M

Please type in the known motor parameters and click Next:

Nominal link voltage [V]	Electric power [W]	Sensing
14.8	22.5	without sensor

Rollover the block diagram for descriptions.

1 设置参数

2 参数设置解释框图

Previous Next

# 应用方案查找器 – 电机控制半导体解决方案

## 教程：比较推荐方案

Select Industry > Select Application > Select Load > Set Parameters > **Compare Solutions** > Check Solutions > Buy Solution

**4 各种操作**

**1 推荐方案列表**

**2 方案集成度**

**3 权衡评级**

**5 合适产品列表**

Your Selection

- Consumer
- Robotic vacuum cleaner
- PMSM/BLDC Motor
- Supply Voltage [V]: 14.8
- Supply Voltage [V]: 22.5
- Temperature sensor
- Integrated driver/power stage
- Chip Count: 4
- Controller: IRMCK099M
- IPM: IRSM005-800MH

Integration Level	Products	Chip Count	Footprint [mm <sup>2</sup> ]	Design Target	Price	Action
<input checked="" type="radio"/> Integrated driver/power stage	Controller: 1 x IRMCK099M IPM: 3 x IRSM005-800MH	4	193	Easy to design	\$\$\$	Thermal Electrical Partner Network Buy
<input type="radio"/> Discrete	Controller: 1 x IRMCK099M Gate Driver: 3 x IRS2008S MOSFET: 3 x BSC150N03LD G	7	176.155	Easy to design	\$	Thermal Electrical Partner Network Buy

**Controller** Intelligent Power Modules

Show All Parameters

Product	OPN	Product Status	Green	Moisture Sensitivity Level	Package	Integration Level	Control Option	
<input checked="" type="checkbox"/>	IRMCK099M	IRMCK099M IRMCK099MTR	active and preferred active and preferred	yes yes	2	QFN32	MCE	1 motor
<input type="checkbox"/>	IRMCF143	IRMCF143TR IRMCF143TY	active active	yes yes	3	LQFP64	MCE+MCU	1 motor, Servo
<input type="checkbox"/>	IRMCK143	IRMCK143TY IRMCK143TR	active active	yes yes	3	QFP64	MCE+MCU	1 motor, Servo
<input type="checkbox"/>	IRMCF171	IRMCF171TY IRMCF171TR	active and preferred active and preferred	yes yes	3	LQFP48	MCE+MCU	1 motor
<input type="checkbox"/>	IRMCK171	IRMCK171TR IRMCK171TY	active active	yes yes	3	LQFP48	MCE+MCU	1 motor
<input type="checkbox"/>	IRMCK341	IRMCK341TY IRMCK341TR	active active	yes yes	3	QFP64	MCE+MCU	1 motor

Products per page: 15 1-15 of 22

# 应用方案查找器 – 电机控制半导体解决方案

## 教程：评估方案

Select Industry > Select Application > Select Load > Set Parameters > Compare Solutions > **Check Solutions** > Buy Solution

Previous Next

**1 系统仿真**

**2 电路框图**

Family and Package:  
 Full-bridges  
 Micro DIP23  
 Micro DIP23A

Your Selected:  
 IRSM05-024DA  
 IRSM05-024PA  
 IRSM15-024DA  
 IRSM15-024PA  
 IRSM05-044DA  
 IRSM05-044PA  
 IRSM15-044DA  
 IRSM15-044PA

System Frequency: 50 Hz  
 PWM Frequency: 10 kHz  
 Modulation Scheme: Sine PWM  
 DC Bus Voltage: 14.8 V  
 Voltage to motor, line to line: 9.06 Vrms  
 Motor Drive Phase Current RMS: 1.52 A  
 Power Factor: 0.8 [-1, 1]  
 Thermal Interface Material: Yes  
 Thermal Interface Resistance: 0.1 °C/W  
 Mounting Option: Mounted heatsink  
 Ambient Temperature: 100 °C  
 Heatsink Thermal Resistance: 2 °C/W

Get result Hold result

**4 仿真结果**

System Probes/Inverter Output

Inverter Losses			
Part Name	Total	Efficiency	
Switch	IRSM005-800MH	0.24 W	
Diode	IRSM005-800MH	0.54 W	
Inverter	IRSM005-800MH	0.78 W	95.89 %

Phase A High Side Device Losses and Junction Temperatures							
Part Name	EOn	EOff	Total Switching	Cond.	Avg. Junction Temp.	Max Junction Temp.	
Switch	IRSM005-800MH	0.01 W	0.01 W	0.02 W	0.02 W	101.9 °C	102.0 °C
Diode	IRSM005-800MH	0.01 W	0.01 W	0.08 W	101.9 °C	102.0 °C	

Phase A Low Side Device Losses and Junction Temperatures						
Part Name	EOn	EOff	Total Switching	Cond.	Avg. Junction Temp.	Max Junction Temp.
Switch	IRSM005-800MH	0.01 W	0.01 W	0.02 W	101.9 °C	102.0 °C
Diode	IRSM005-800MH	0.01 W	0.01 W	0.08 W	101.9 °C	102.0 °C

**3 参数**

**5 已选和可供仿真产品列表**

Product	OPN	Product Status	Green	Package	Product Group	Voltage Class	Pmot (10kHz)	Rated Current	RDS (on) (25	
<input checked="" type="checkbox"/>	IRSM005-800MH	IRSM005-800MHTR	active and preferred	yes	PQFN 7x8	CIPOS™ Nano	40.0 V	165.0 W	-	0.005 Ω

Products per page: 15 1-1 of 1

Previous Next

# 应用方案查找器 – 电机控制半导体解决方案

## 教程：购买方案

1

Industry
Select Application
Select Load
Set Parameters
Compare Solutions
Check Solution

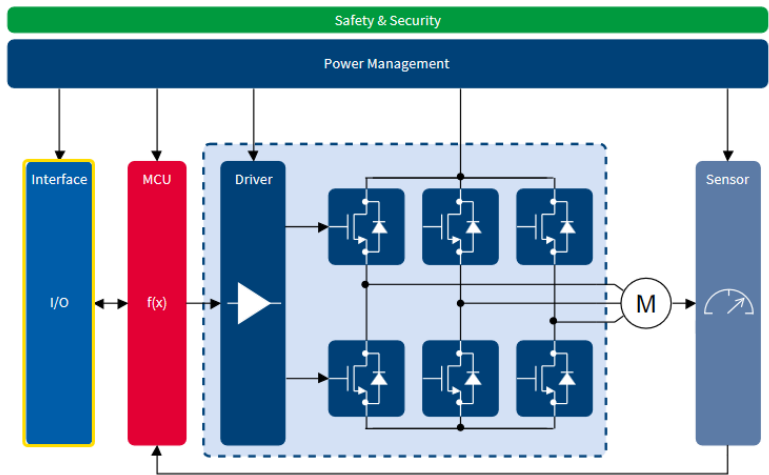
2

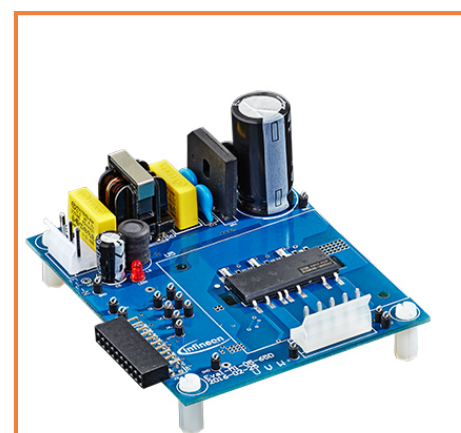
报告、合作伙伴、在线购买

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Integration Level	Products	Chip Count	Footprint [mm <sup>2</sup> ]	Design Target	Price	Action
Integrated driver/power stage	Controller: 1 x IRMCK099M IPM: 1 x IRSM505-065DA	2	373	Easy to design	\$\$\$	<div style="display: flex; flex-wrap: wrap; gap: 5px;"> <div style="border: 1px solid #ccc; padding: 2px;">Thermal</div> <div style="border: 1px solid #ccc; padding: 2px;">Electrical</div> <div style="border: 1px solid #ccc; padding: 2px;">Partner Network</div> <div style="border: 1px solid #ccc; padding: 2px;">Buy</div> </div>

Rollover the block diagram for detailed product information and links.





Typical appearance

3

方案结构框图

4

评估板 (方案详情)

Previous
Next

# Agenda

1

英飞凌在线设计和仿真工具概览

2

参数搜索产品选型工具

3

应用方案查找器

4

Infineon Designer在线时域仿真入门指南及其新特性

5

在线系统效率和热仿真：IPOSIM & PLECS

6

总结和技术支持

# Infineon Designer 全新亮点: 开放全能电路编辑器

IR38064\_digital\_12Vin\_1.0Vo\_607KHz\_35A\_singleOut\_intLDO\_integrated\_POL\_TR\_V3.TSC - Infineon Designer powered by TINACloud

File Edit View Analysis Tools Help

1 myInfineon 登录 Welcome JiananShen!

TOP SO

Infinion Basic Switches Meters Sources Semiconductors Optoelectronic Gates Flip-flops Logic ICs-MCUs ADDA-555 RF Analog Control Special

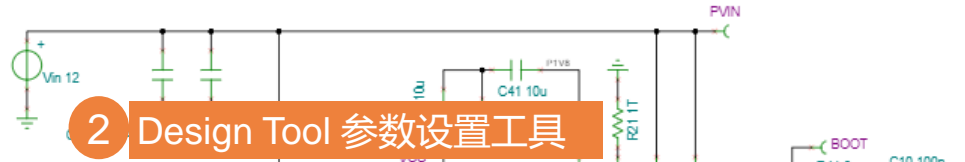
2 电路查看和编辑界面

- › 登录myInfineon账户
- › 建立全新电路或修改英飞凌提供的样例电路



# Infineon Designer 全新亮点: Design Tool - 电路参数设置和自动计算

1. Wanna try it out? Click on analysis
2. Double click on green window to design
3. If you like what you see, buy online
4. Enjoy other circuits



## 2 Design Tool 参数设置工具

Transient Analysis - fast

### 1 参数显示窗口

```
{ Please double click here to enter design criteria }  
  
{ Input voltage }  
V_in := 12;  
{ Target output voltage - fixed due to Config file }  
V_out := 1;  
{ Maximum output current }  
I_out := 35;  
{ Target Switching Frequency - fixed due to Config file }  
F_sw := 607k;  
{ Derated (DC & AC) value for a single output capacitor }  
C_out := 52.29u;  
{ Number of output capacitors with value C_out }  
C_out_Nr := 15;  
{ Target Vout ripple }  
Vout_ripple := 10m;  
{ Compensation capacitor. Default is 2.2nF }  
C8_Cc := 2.2n;  
{ L_ripple vs Iout percentage }  
L_ripple_percentage := 35;  
{ Load step current }  
I_step := 10.5;
```

[Reset circuit](#)

Design

Please double click here to enter design criteria

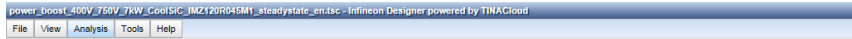
Parameter	Value
V_in [5,21]	12
V_out [1.0,1.0]	1
I_out [0,35]	35
F_sw [600k,650k]	607k
C_out [1n,1000u]	52.29u
C_out_Nr [2,100]	15
Vout_ripple [0,V_out*0.1]	10m
C8_Cc [1n,4.7n]	2.2n
L_ripple_percentage [20,50]	35
I_step [0,I_out-0.01]	10.5

Run Cancel Properties

[config file](#)  
loaded according to the Data file changed or deleted, click on the

- › Design Tool 参数设置工具
  - 更简洁的参数设置
  - 更具自定义公式，快速自动计算和赋值电路参数和器件值

## 应用电路：可自由配置参数



1. Wanna try it out? Click on "Simulate Transient"
2. Set application parameters below or directly change any component

[1. click here to set application parameters]  
[2. click on "Run" to calculate components]  
[3. click on "OK" and Simulate Transient.]

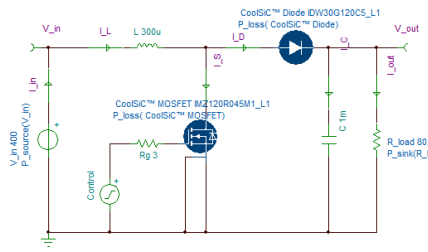
[Input voltage [V]]  
V\_in= 400 (use 5... 1000)  
[Output voltage [V]]  
V\_out= 750 (use higher than V\_in)  
[Output current [A]]  
I\_out= 9.3 (<= 20)  
R\_load= V\_out/I\_out  
R\_load=[80.6452]

[Set inductance L [H]]  
L=300u  
[Set capacitance C [F]]  
C=1000u  
[Set gate resistance Rg [Ohm]]  
Rg=3

[== Control settings: change with care! ==]  
[Switching frequency [Hz]]  
fs= 100k (use 10k ... 200k)  
Duty= 1-(V\_in/(V\_out+offset))  
Duty=[473.6842m]  
L\_INIT= L\_out/(1-Duty) (inductor initial value)  
C\_INIT= V\_out (capacitor initial value)  
T=1µs  
T\_on= Duty\*T  
T\_off=T-T\_on  
ControlT2=T\_on  
ControlT5=T\_off

Simulate Transient [Reset circuit](#)

[Click to select startup circuit](#)  
[Click to select steady-state circuit](#)



## 进阶MCU代码调试功能

```

87 Profet2.channel0 = (ProfetChannel){FALSE, 0}; //PROFET 2 is a one channel...
88 Profet2.k11is = 2950;
89
90 /* Placeholder for user application code. The while loop below can be re...
91 DIGITAL_IO_SetOutputHigh(&INO_P0); //channel 0 of PROFET 0 is switched o...
92 Profet0.channel0.on = TRUE;
93
94 ADC_MEASUREMENT_StartConversion(&SENSE_MEASUREMENT); //since the ADC is ...
95
96 while(1U)
97 {
98 }
99 }
    
```

Register	Value	Address	Value
R0	00000000	00000020	00000000
R1	10002900	00000024	00000000
R2	00000000		
R3	00000000		
R4	00000000		

## 功率损耗和效率计算

Compare with: Power dissipation 1  Zoom in synchron

Efficiency: 98.92% Total Input: 7.05k W Total Output: 6.97k W

Component	Power type	Power dissip...	Percentage (...)	Pass/Fail
V_in	Source	7.05k	100	Pass
R_load	Sink	6.97k	98.92	Pass
CoolSiC™ MOSFET	Loss	31.31	0.44	Pass
CoolSiC™ Diode	Loss	13.67	0.19	Pass

## 信号处理，比如：纹波

Compare with: Ripple 1  Zoom in synchron

Signal Label	Absolute Ripple	Relative Ripple
V_out	44.20m	0.01%
I_out	548.10u	0.01%

## › 入门电路

- 学习Infineon Designer仿真基础知识
- 仿真首个简单的样例电路：反向逆变降压电路
- 修改器件、电路参数并编辑电路

## › 利用升压电路学习Infineon Designer进阶特性

- 用CoolMOS P7和CoolSiC二极管仿真升压电路
- 查看电路启动特性和稳态仿真，同时查看简介特性
- 用Design Tool设置参数重新配置电路
- 操作：建立第一个Infineon Designer电路

## › 用XMC/DAVE™程序控制电机

- 探索真实评估板的功能
- 在线交互仿真模拟电路和配套软件
- 添加代码断点并在线调试代码
- 安装DAVE™程序开发套件，修改代码并上传新代码仿真

## › 如何导入SPICE模型

# Infineon Designer案例

## 入门电路 (1/2: 电路仿真)

### Infineon Designer: Getting Started

Infineon Designer is based on the easy to use multi-language TinaCloud environment. This is the online version of the popular TINA circuit simulation software now running in your browser without installation, on multiple platforms (PC, laptop, mobile, tablets, etc.). Analog circuits are modeled in Spice and can be co-simulated with digital systems using hardware description languages such as VHDL and Verilog.

#### How to select a device?

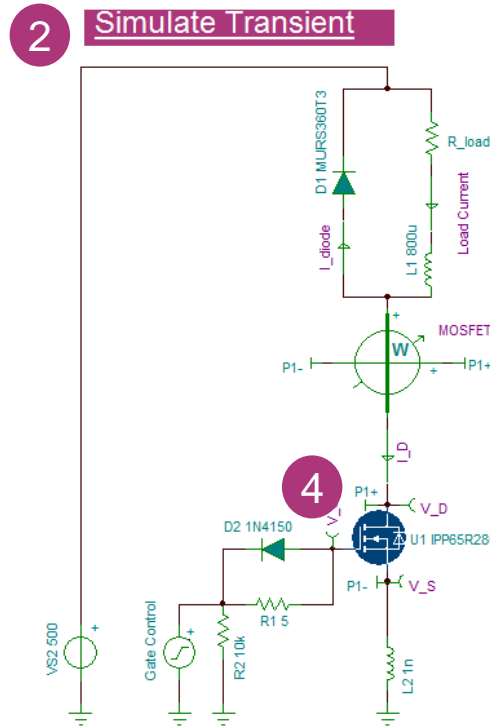
- 1) type Strg/CTRL-F and search for e.g. "U1"
- 2) the MOSFET device will turn red
- 3) click on the red symbol and open properties
- 4) click on "SubCkt-Type" to change the part
- 5) type the name into search or
- 6) use the pull-down to select a technology
- 7) click on OK and the part will change (may take a while)

#### How to search and display signals?

- 1) click on "Simulate Transient"
- 2) search with "Strg/CTRL-F" for "V\_G" voltage pin turning red
- 3) click on the voltage pin and open properties
- 4) change the "IO state" to "Output" for display
- 5) Label "V\_G:2" will be displayed as signal number 2
- 6) now simulate again and the signal will be displayed

#### How to save & share circuits?

- 1) click on login in the menu above
- 2) File -> Open -> Infineon Examples
- 3) change the circuit and click on File -> Save as
- 4) the circuit will be saved in the "My Circuits" folder
- 5) File -> Share and copy the link -or-
- 6) send an Email to share your circuit



eMail Address

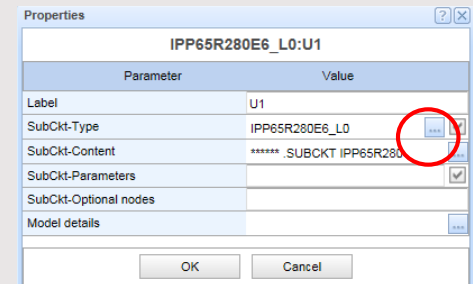
Password

Logon

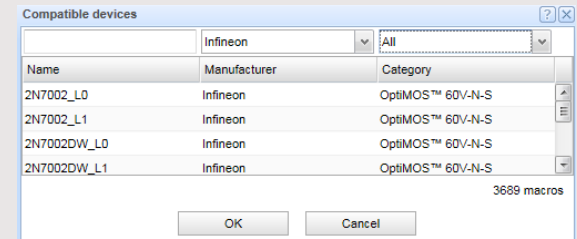
6

Log in to save, share, download circuits:

1. 点击打开电路 [入门电路](#)
2. 点击启动仿真
3. 通过电路图了解应用电路功能和信号
4. 点击MOSFET图标后选择"SubCkt-type"项产品型号后的"..."



5. 在列表中重新选择一款别的 MOSFET (下拉菜单过滤)



6. 通过MyInfineon账户登录, 保存或分享您配置的电路

# Infinite Designer案例

## 入门电路 (2/2: 电路编辑)

1

2

3

4

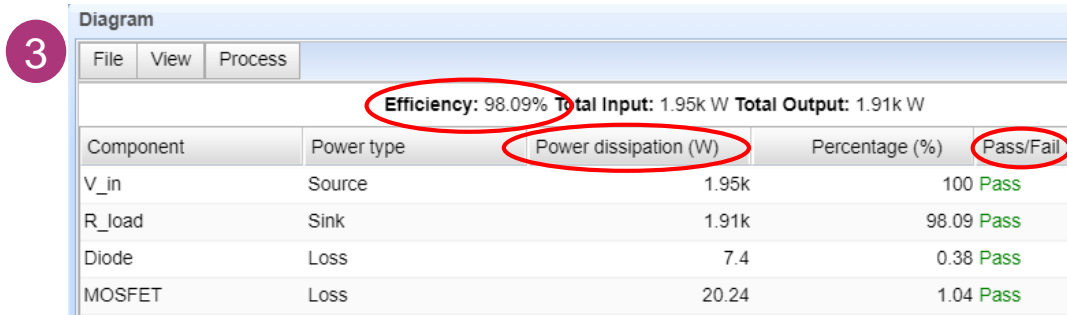
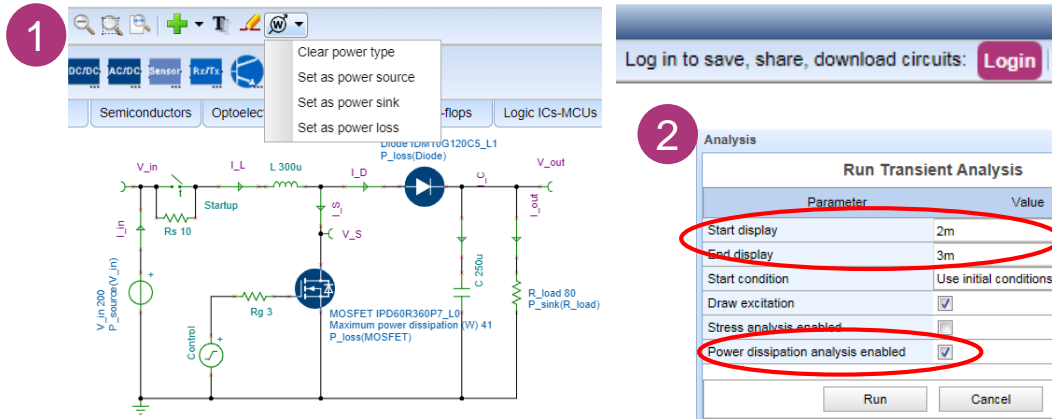
5

6

1. 点击打开电路入门电路并用myInfineon账户登录
  2. 点击不同的菜单选项并从“Infineon”选择所需器件。其他选项：如“基本”（电阻，电感，电容），仪表，发生源，半导体，等等。
  3. 点击“基本”并添加一个电容器到当前电路
  4. 选中电容器并右击鼠标旋转
  5. 选中电容器端口并连线
  6. 选择文件菜单栏的“另存为”并把电路保存到“我的电路”(MyCircuits)
  7. 点击紫色超链接框再次启动仿真
- [Simulate Transient](#)

# Infineon Designer案例

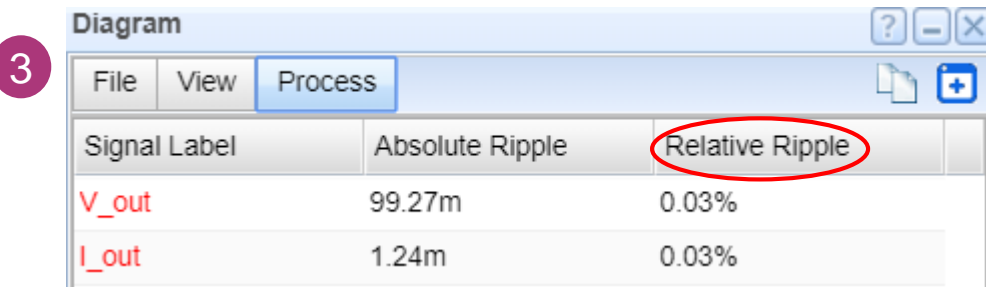
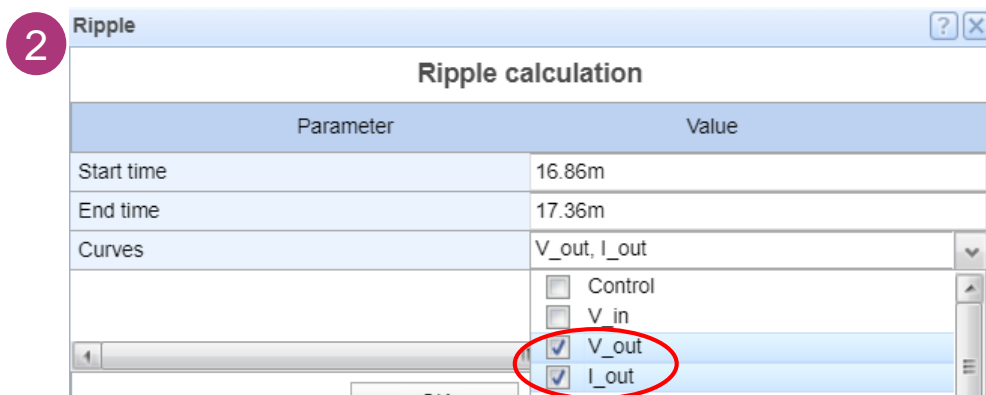
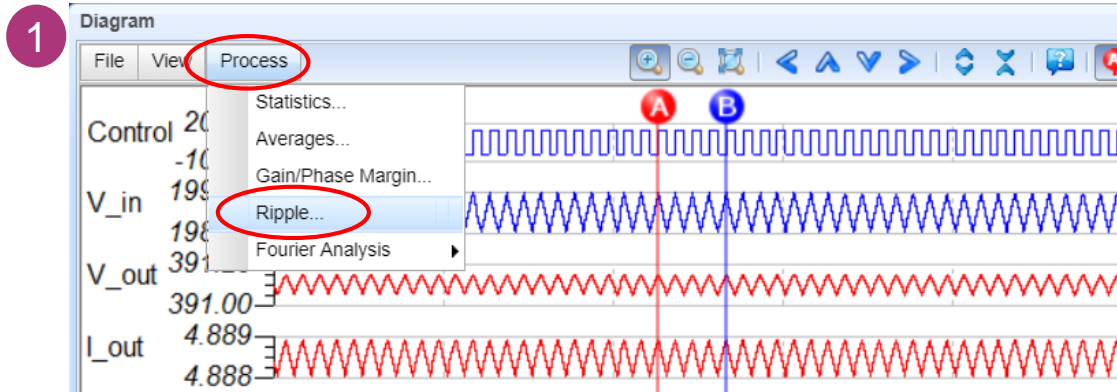
## 升压电路 (1/4: 系统效率)



1. 点击打开带已设定器件功率类型的升压电路并登录myInfineon账户
2. 打开菜单“分析 -> 瞬态...”，设定起始时间确保显示的信号处于电路稳态，勾选“Power dissipation analysis enabled”
3. 点击紫色超链接框启动系统效率和器件损耗的仿真
4. 选择“Power dissipation”窗口，查看系统效率、器件损耗和器件是否符合该应用Pass/Fail
5. 选中瞬态 (Transient) 窗口，缩放全部和放大来检查信号细节，使用光标和来测量信号值

# Infineon Designer案例

## 升压电路 (2/4: 纹波计算)



1. 在上页提到的同一个瞬时信号窗口内，点击菜单栏中“过程 -> Ripple...”，从而打开纹波计算窗口
2. 选择需要纹波计算的信号，比如输出电压V\_out，输出电流I\_out
3. 查看对应信号的绝对纹波(Absolute Ripple)和相对纹波(Relative Ripple)
4. 通过类似步骤进行其他信号处理，比如：平均值计算，傅里叶分析，等等。

# Infineon Designer案例

## 升压电路 (3/4: 参数设置Design Tool)

2

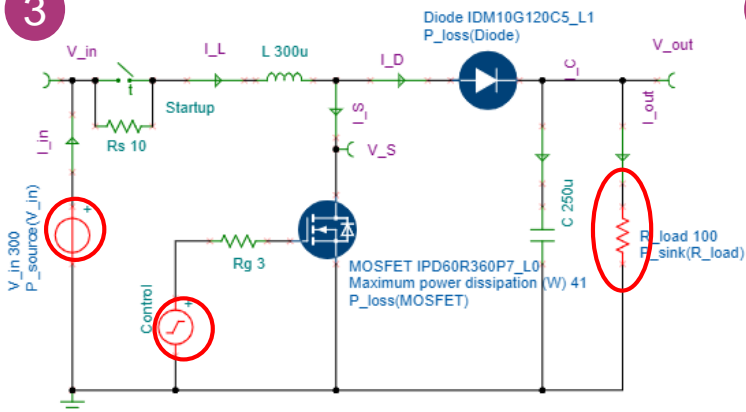
{ Double click to configure your circuit parameters }

```
{ Input voltage [V]
V_IN := 150;
{ Output voltage [V]
V_out := 400;
{ Output current [A]
I_out := 5;
{ Startup time [s]
T_startup := 2m;
{ Startup resistance [Ohm]
Rs := 5;
{ Inductance L [H]
L := 300u;
{ Capacitance C [F]
C := 250u;
{ Gate resistance Rg [Ohm]
Rg := 3;
{ Switching freq [Hz]
fs := 100k;
```

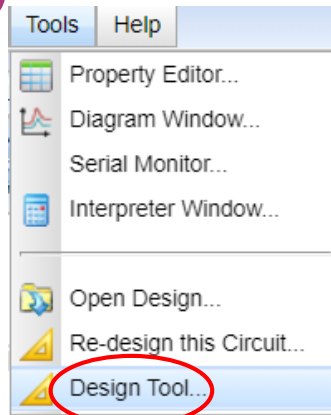
Parameter	Value
V_IN [5,500]	150
V_out [5,800]	400
I_out [0,20]	5
T_startup [0,1]	2m
Rs [0,500]	5
L [0,1000u]	300u
C [0,1000u]	250u
Rg [0,1k]	3
fs [10k,200k]	100k

Run Cancel Properties

3



4

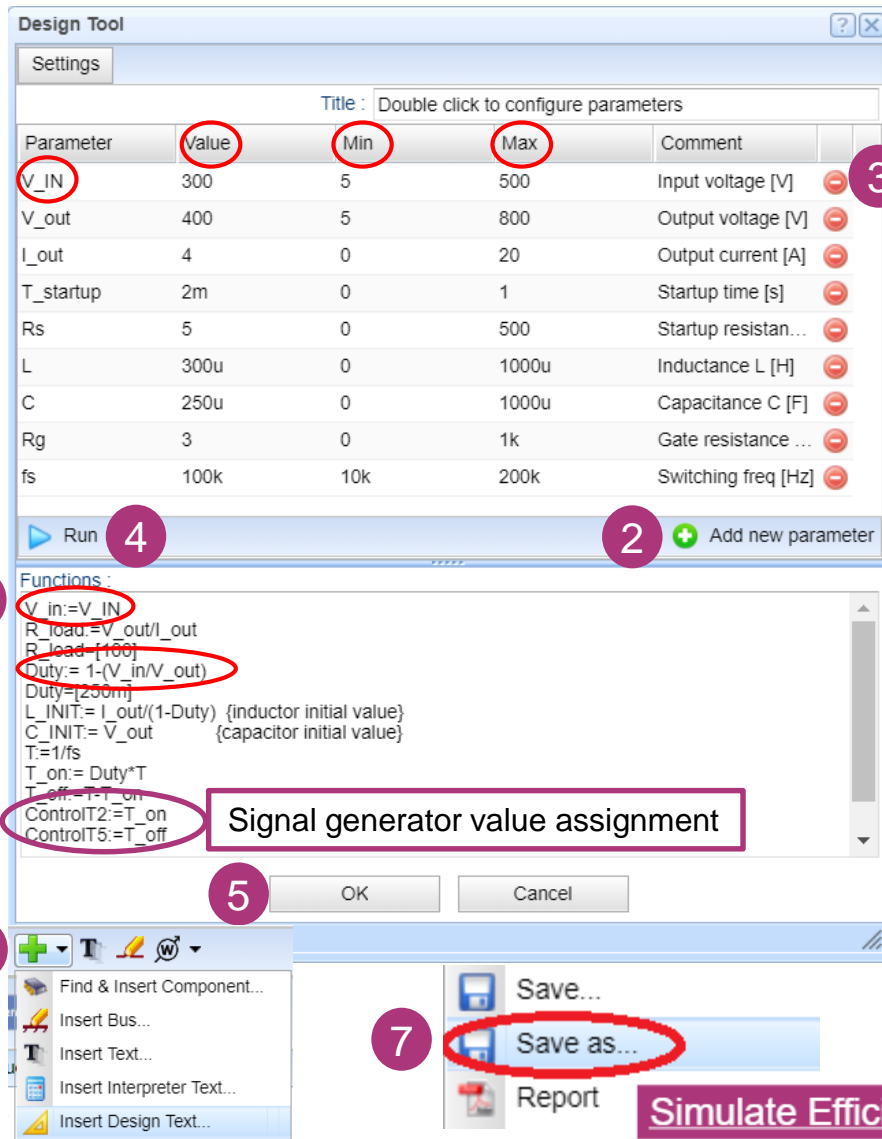


1. 关闭上页提到的信号图表窗口
2. 双击 (需登录myInfineon账户) 绿色参数配置框打开用于电路器件参数设置的设计工具(Design Tool), 设置完参数后点击“运行”用以执行计算和参数配置
3. 被修改参数的器件会以红色高亮显示, 启动仿真查看修改参数后区别
4. 打开菜单“工具-> Design Tool...”来设置参数配置器的设定, 比如修改特定计算公式或者修改赋值限定范围。



# Infineon Designer案例

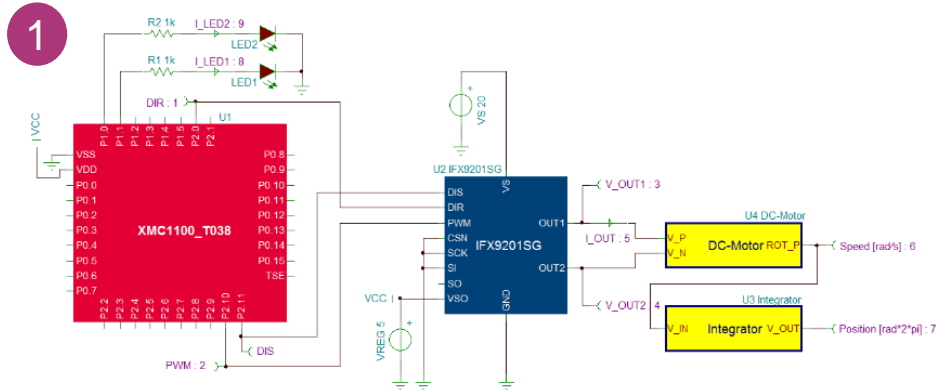
## 升压电路 (4/4: 参数设置Design Tool)



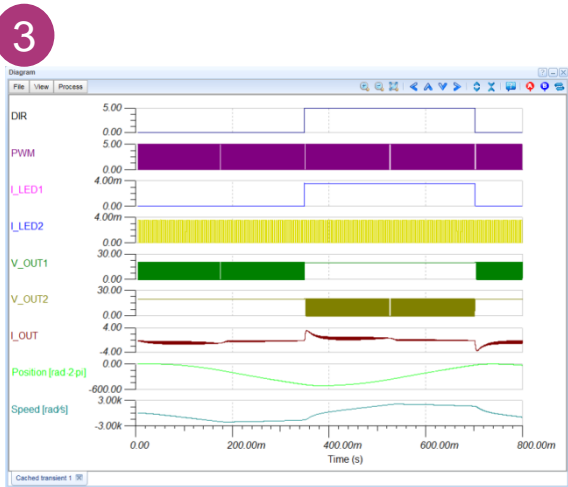
1. 编辑技术赋值公式，比如针对每个特定器件的基本赋值：  
 $V_{in} = V_{IN}$ ， $V_{in}$ 是器件标签， $V_{IN}$ 是自己设定的全局变量，该全局变量用于配置框内对器件 $V_{in}$ 进行赋值，允许实际基础计算公式并赋值（参见左边例子）。
2. 在上方参数框内添加新参数，例如  $V_{IN}$ ，赋值，设定最大最小值并添加注解
3. 多余参数可被直接通过右边减号删除
4. 点击“运行”执行对Design Tool的重新配置
5. 点击“确定”确认并关闭Design Tool窗口
6. 点击菜单栏绿色加号图标 并点击“Insert Design Text...”，把刚刚设定的Design Tool参数配置框插入到电路编辑器中
7. 试验参数配置框，保存电路并启动仿真

# Infinite Designer XMC™ 程序调试案例

## H-Bridge Kit 2Go (1/3: 电路程序调试)



2 Simulate Transient



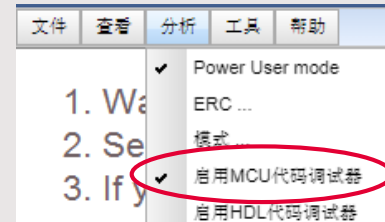
6

```

184 .globl Reset_Handler
185 .type Reset_Handler, %function
186 Reset_Handler:
187 /* Initialize interrupt veneer */
188 ldr r1, =e00data
189 ldr r2, =veneerStart
190 ldr r3, =veneerEnd
191 bl copy_data
192
193 ldr r0, =systemInit
194 blx r0
195
196 /* Initialize data */
    
```

Register	Value	Address	Value
R0	00000000	00000020	00000000
R1	10001E60	00000024	00000000
R2	00000000		
R3	00000000		
R4	00000000		

1. 点击打开电路 [H-Bridge Kit 2Go](#)
2. 点击启动仿真 **Simulate Transient**
3. 通过电路图了解应用电路功能和信号
4. 启用MCU代码调试器



5. 用TR交互模式开始交互瞬态仿真



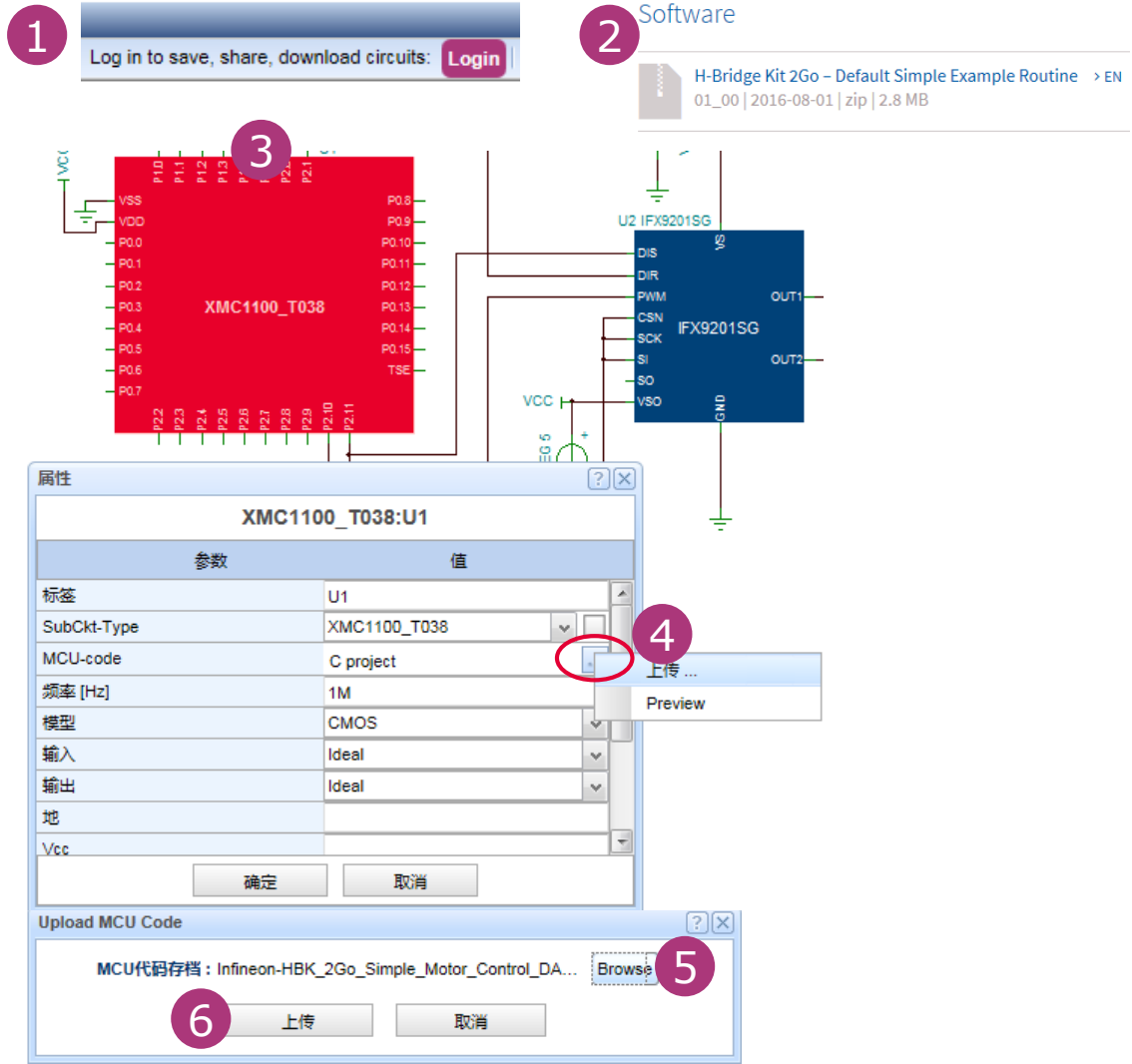
6. 在调试器窗口选择调试代码文件, 设定断点并一步步调试
7. 在线购买样片或评估板



[Buy online](#)

# Infineon Designer XMC™ 程序调试案例

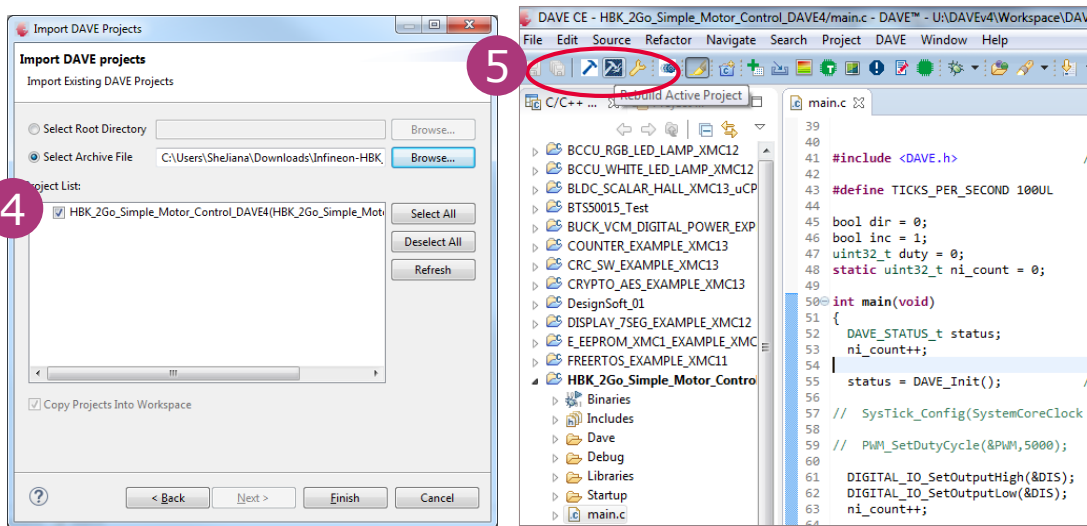
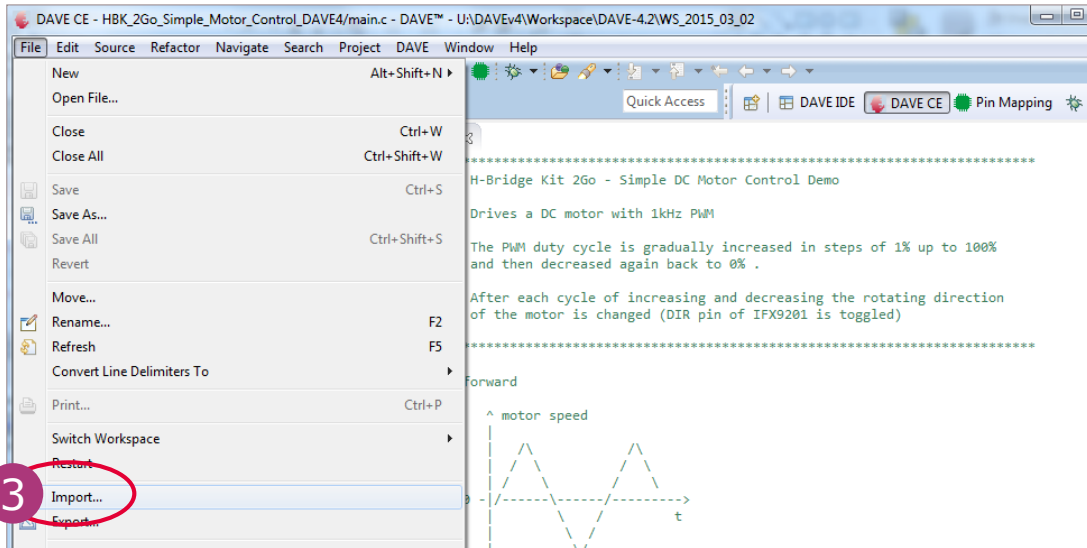
## H-bridge Kit 2Go (2/3: 上传软件)



1. 点击打开电路[H-bridge Kit 2Go](#)并用MyInfineon账户登录
2. 下载代码压缩包文件.zip  
[H-bridge Kit 2Go - default simple example routine](#) 评估板H-bridge Kit 2Go产品页[软件](#)和[工具选项卡](#)
3. 点击红色的XMC1100器件打开属性对话框
4. 点击MCU-code行的“...”打开上传代码
5. 选择路径确认已下载的代码压缩包 (包括.elf, .hex 编译文件和源代码)
6. 上传代码Infineon-HBK\_2Go\_simple\_motor\_control\_DAVE4.zip-SW-v01\_00-EN.zip
7. 点击启动仿真 **Simulate Transient**
8. 查看仿真结果

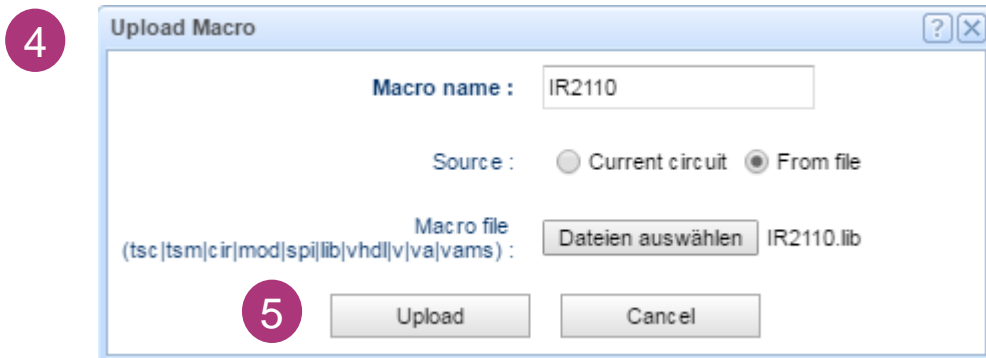
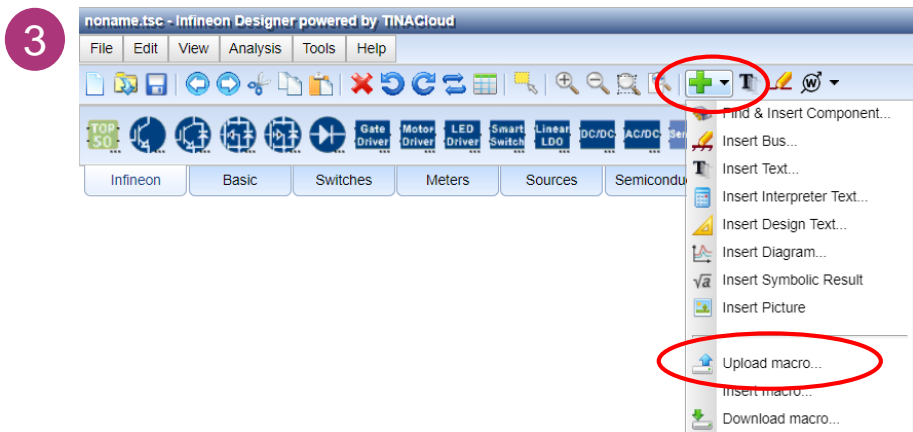
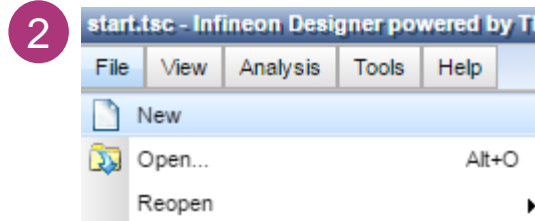
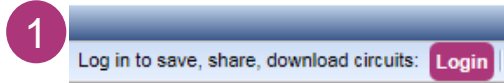
# Infineon Designer XMC™ 程序调试案例

## H-bridge Kit 2Go (3/3: 修改代码并重新编译)



1. 下载并安装DAVE™开发套件  
[DAVE™ for windows](#)
2. 在评估板H-bridge Kit 2Go产品页  
[软件和工具选项卡](#), 下载代码压缩包  
文件.zip [H-bridge Kit 2Go –  
default simple example routine](#) 启  
动DAVE™并导入代码项目File →  
Import → Infineon DAVE™  
Project
3. 点击“Next”, 选择已下载代码压缩包  
路径并勾选项目
4. 修改代码并重新编译
5. 到DAVE™的Workspace工作空间目  
录并把整个项目目录打包成.zip
6. 重新回到电路点击红色XMC1100器  
件并上传修改后的代码

# 如何导入SPICE模型 (1/2)



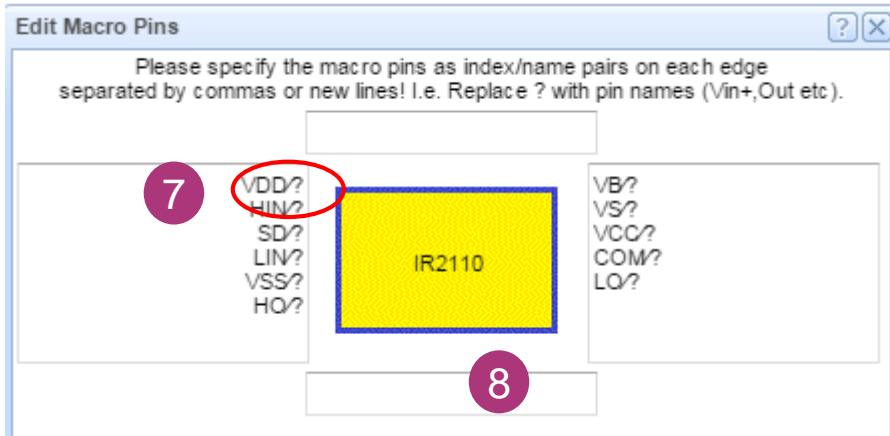
1. 用myInfineon账户[登录](#)
2. 选择菜单“文件 -> 新增”建立一个新的电路
3. 点击菜单栏图标 并点击“上传宏”(Upload macro)
4. 命名需上传的SPICE模型，选择“来自文件”，点击“Browse”并打开存储.SUBCKT格式SPICE模型的目录
5. 点击“上传”进入下一步

样例SPICE模型 [OrCAD Capture for IR2110](#)

```
.SUBCKT IR2110 VDD HIN SD
LIN VSS HO VB VS VCC COM
LO
+PARAMS:
+      T1=-40 T2=25
T3=125
...
.ENDS IR2110
```

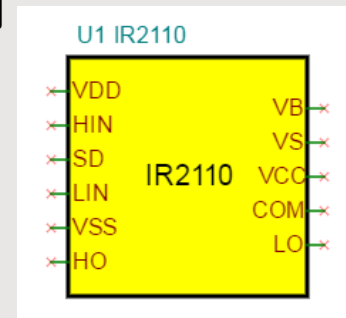
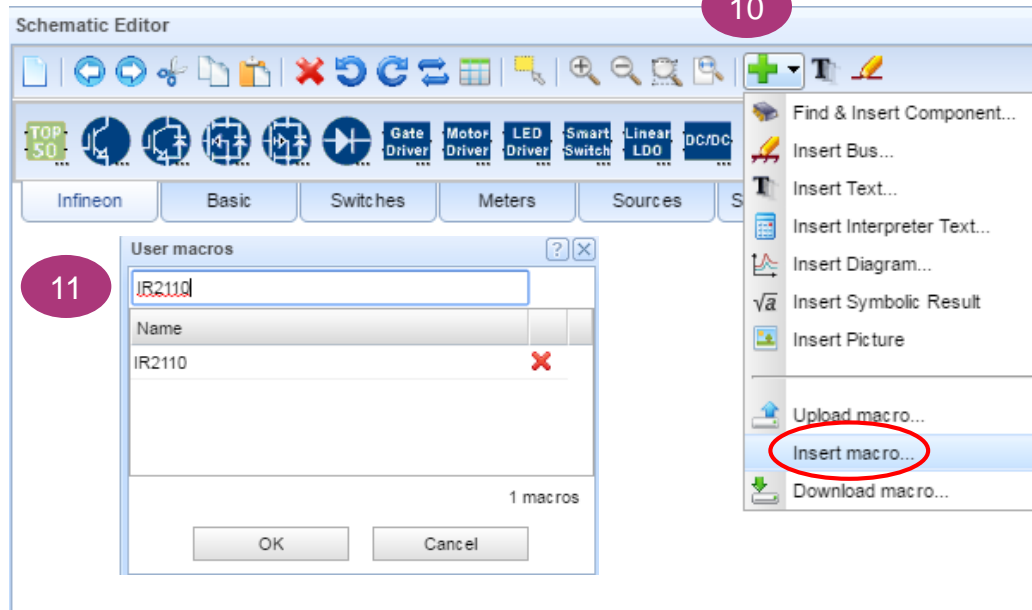
# 如何导入SPICE模型 (2/2)

6



6. 编辑图标管脚分布
7. 可选：用新的管脚名替代“？”（?代表显示和模型中一样的管脚名）  
比如：VDD/? -> VDD/Vdd
8. 可选：把管脚根据需求分布在上、下、左、右
9. 点击“确定”完成上传模型
10. 点击菜单栏图标 且点击“Insert macro...”（插入模型）
11. 选择IR2110模型并放置到当前电路中使用

10



12. 完成电路设计并保存为自己的新电路：“Save...”或“另存为...”
13. 启动仿真测试电路

# Agenda

1

英飞凌在线设计和仿真工具概览

2

参数搜索产品选型工具

3

应用方案查找器

4

Infineon Designer在线时域仿真入门指南及其新特性

5

在线系统效率和热仿真：IPOSIM & PLECS

6

总结和技术支持

# 点击IPOSIM页面，开启功率模块和盘片热仿真之旅



[www.infineon.com/iposim](http://www.infineon.com/iposim)



> Home > 设计工具



be smart.  
prototype  
online.

Start here

下载IPOSIM入门指南  
01\_00 | Oct 01, 2018 | PDF | 1.09 mb

## 欢迎使用全新Infineon IPOSIM

感谢您使用IPOSIM - 用于英飞凌功率模块和盘片的，计算功率损耗和结温（热表现）的在线仿真工具。它将帮助您：

- 选择适用于指定拓扑的匹配产品
- 在给定工作条件下，计算器件的开关损耗和导通功率损耗以及热表现
- 比较不同工作条件下，不同产品的性能，并保存结果

3 第一步：注册myInfineon



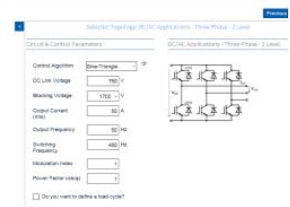
请点击注册myInfineon。注意：您之前旧IPOSIM的账户无法登陆新系统。

第二步：登陆并选择拓扑



请登陆并选择符合您应用需求的拓扑。

第三步：输入参数



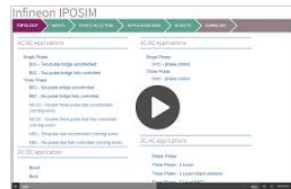
请设定输入参数或选择负载周期仿真。

第四步：选择器件\*

第五步：启动仿真并比较结果

第六步：技术支持

如何使用Infineon IPOSIM



> 如何使用Infineon IPOSIM

Infineon 书籍 - IGBT 模块



### 1. myInfineon账户注册

- 如已有该账户，跳过该步骤直接访问使用
- 由于欧盟新隐私保护法规定，原来老的IPOSIM系统的账户将不被自动转移，用户需重新注册myInfineon账户才能使用新系统

### 2. 入门指南

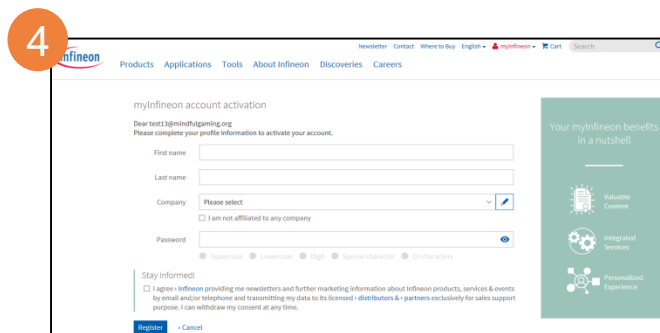
- 文档
- 视频

### 3. 一步步通过带有超链接的步骤解释操作



# 注册myInfineon

## 注册链接



1. 点击英飞凌主页上方 myInfineon 下拉菜单中的“注册 myInfineon 账号”或直接点击[注册链接](#)
2. 在弹出的注册窗口中输入电子邮箱和国家/地区信息
3. 一份确认激活账户的电子邮件会被发送给您
4. 点击确认邮件中的链接并完善注册信息

# IPOSIM使用步骤向导

## 第一步：注册myInfineon



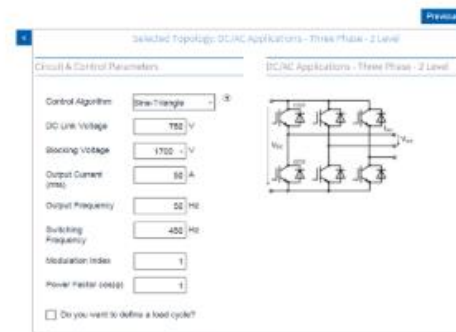
请点击注册myInfineon。注意：您之前旧IPOSIM的账户无法登陆新系统。

## 第二步：登陆并选择拓扑



请登陆并选择符合您应用需求的拓扑。

## 第三步：输入参数



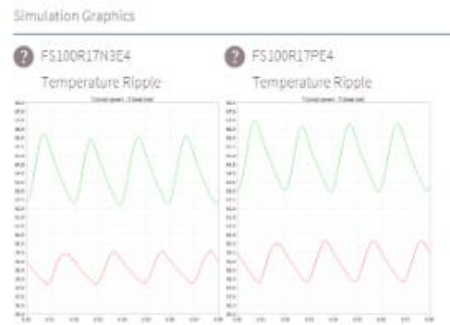
请设定输入参数或选择负载周期仿真。

## 第四步：选择器件"



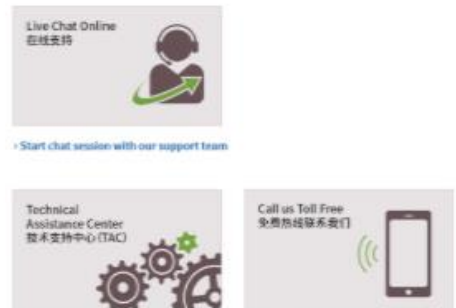
基于您的输入，IPOSIM会列出最合适的产品供您选择。

## 第五步：启动仿真并比较结果



查看仿真结果，点击仿真结果图放大并查看细节，比较所选不同产品的仿真结果。

## 第六步：技术支持



请点击下载入门指南，查看视频教程或联系技术支持。

# 第一步：登陆并选择拓扑



## 交流/直流应用

### 单相

B2U – 双脉冲桥式无控制

B2C – 双脉冲桥式全控制

### 三相

B6U – 六脉冲桥式无控制

B6C – 六脉冲桥式全控制

M3.2U – 双六脉冲星形无控制

M3.2C – 双六脉冲星形全控制

M6U 六脉冲星形无控制

M6C 六脉冲星形全控制

## 直流/直流应用

升压

降压

DC decoupling

## 交流/交流应用

### 单相

W1C 相控制

### 三相

W3C 相控制

例如：三相双电平逆变器拓扑

## 直流/交流应用

### 单相

三相 – 双电平

三相 – 双电平 (堆栈解决方案)

三相 – 三电平 NPC1

三相 – 三电平 NPC2

# 第二步：输入参数

上一步 下一步

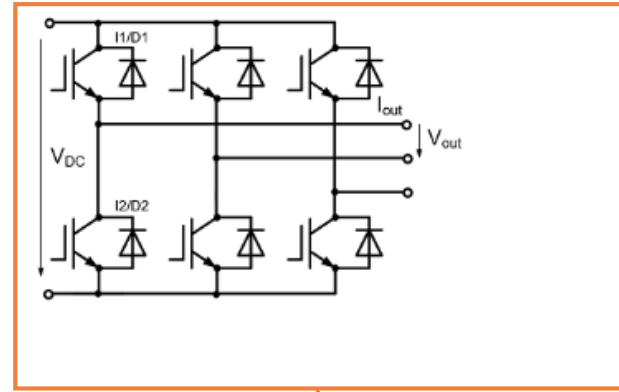
所选拓扑: 直流/交流应用 - 三相 - 双电平

## 电路和控制参数

控制算法	正弦-三角	?
直流母线电压	750	V
阻断电压	1700	V
输出电流均方根	50	A
输出频率	50	Hz
开关频率	2000	Hz
调制指数	1	
功率因数 $\cos(\varphi)$	0.8	

是否想要定义负载周期?

## 直流/交流应用 - 三相 - 双电平



2 拓扑结构

1 设置参数, 选择是否需要负载周期仿真

# 第三步：选择器件

上一步 下一步

所选拓扑: 直流/交流应用 - 三相 - 双电平

请选择产品进行下一步

按封装形式过滤  搜寻:

所选器件: FS100R17KE3 FS100R17PE4 清除选择 每页产品数: 50 1-50 of 173

	Device Name	TIM	Package	模块参数			IGBT参数			二极管参数			Datasheet	
				V <sub>CES</sub> [V]	I <sub>cond</sub> [A]	V <sub>CEsat, 125°C</sub> [V]	E <sub>on</sub> + E <sub>off, 125°C</sub> [mWs]	R <sub>thJH</sub> [K/W]	T <sub>vjmax</sub> [°C]	V <sub>F, 125°C</sub> [V]	E <sub>rec, 125°C</sub> [mWs]	R <sub>thJH</sub> [K/W]		T <sub>vjmax</sub> [°C]
<input type="checkbox"/>	FS50R17KE3_B17		Econo2	1700	50	2.40	31.90	0.55	125	1.9	13.60	0.96	125	
<input type="checkbox"/>	FP75R17N3E4		Econo3	1700	75	2.35	43.95	0.39	150	1.9	17.20	0.69	150	
<input type="checkbox"/>	FP75R17N3E4_B11		Econo3	1700	75	2.35	43.95	0.39	150	1.9	17.20	0.69	150	
<input type="checkbox"/>	FS75R17KE3		Econo3	1700	75	2.40	47.70	0.35	125	1.9	20.50	0.63	125	
<input checked="" type="checkbox"/>	FS100R17KE3		Econo3	1700	100	2.40	63.50	0.31	125	1.9	27.30	0.54	125	
<input type="checkbox"/>	FS100R17KS4F		Econo3	1700	100	4.90	21.50	0.20	125	3.5	1.10	0.78	125	
<input type="checkbox"/>	FS100R17N3E4		Econo3	1700	100	2.35	48.00	0.32	150	1.9	20.00	0.67	150	
<input type="checkbox"/>	FS100R17N3E4_B11		Econo3	1700	100	2.35	48.00	0.32	150	1.9	20.00	0.67	150	
<input checked="" type="checkbox"/>	FS100R17PE4		Econo3	1700	100	2.35	48.00	0.33	150	1.9	23.00	0.60	150	
<input type="checkbox"/>	IFS100B17N3E4P_B11		Econo3	1700	100	2.35	57.10	0.29	150	1.9	24.00	0.52	150	
<input type="checkbox"/>	FF150R17KE4		62mm HB	1700	150	2.35	102.00	0.17	150	1.7	40.00	0.20	150	

1 过滤和搜索

2 产品列表

# 第四步：设置其他应用参数

上一步 下一步

2 设置高级参数和负载周期

所选拓扑: 直流/交流应用 - 三相

冷却条件 高级参数 负载周期数据

在定义散热器时需要帮助? ?

1 设置散热器参数

1. 散热器参数	2. 显示
FS100R17KE3	
<input type="radio"/> 预定义的散热器 <input type="radio"/> 用户自定义散热器 <input checked="" type="radio"/> 固定散热器温度	$T_{heatsink}$ <input type="text" value="50"/> °C
FS100R17PE4	
<input type="radio"/> 预定义的散热器 <input type="radio"/> 用户自定义散热器 <input checked="" type="radio"/> 固定散热器温度	$T_{heatsink}$ <input type="text" value="50"/> °C

# 第四步：按需求设置负载周期

冷却条件
高级参数
负载周期数据

**1 设置负载周期基本信息**

负载周期输入

Interpolation

用户定义的负载周期数

(如果没有提供负载周期数, 则稳态模拟将运行。)

仿真特性 平均值 / 文波

选择仿真特性 温度波动

Excel 处理

将负载周期处理为 Excel 文件  
如要上传负载周期, 请首先选择 Excel 文件!

下载

请选择一个文件! Choose File No file chosen

上传

**5 下载或上传负载周期(Excel)**

负载周期数据

Time [s]	输出电流均方根 [A]	输出频率 [Hz]	功率因数 cos(phi)	开关频率 [Hz]	调制指数	直流母线电压 [V]
0	100	50	0.8	2000	1	750
2	200	50	0.8	2000	1	750
5	150	50	0.8	2000	1	750
10	150	50	0.8	2000	1	750
0	0	0	0	0	0	0

**2 设置负载周期**

Time [s]

输出电流均方根 [A]

输出频率 [Hz]

功率因数 cos(phi)

开关频率 [Hz]

调制指数

直流母线电压 [V]

**3 加减行数**

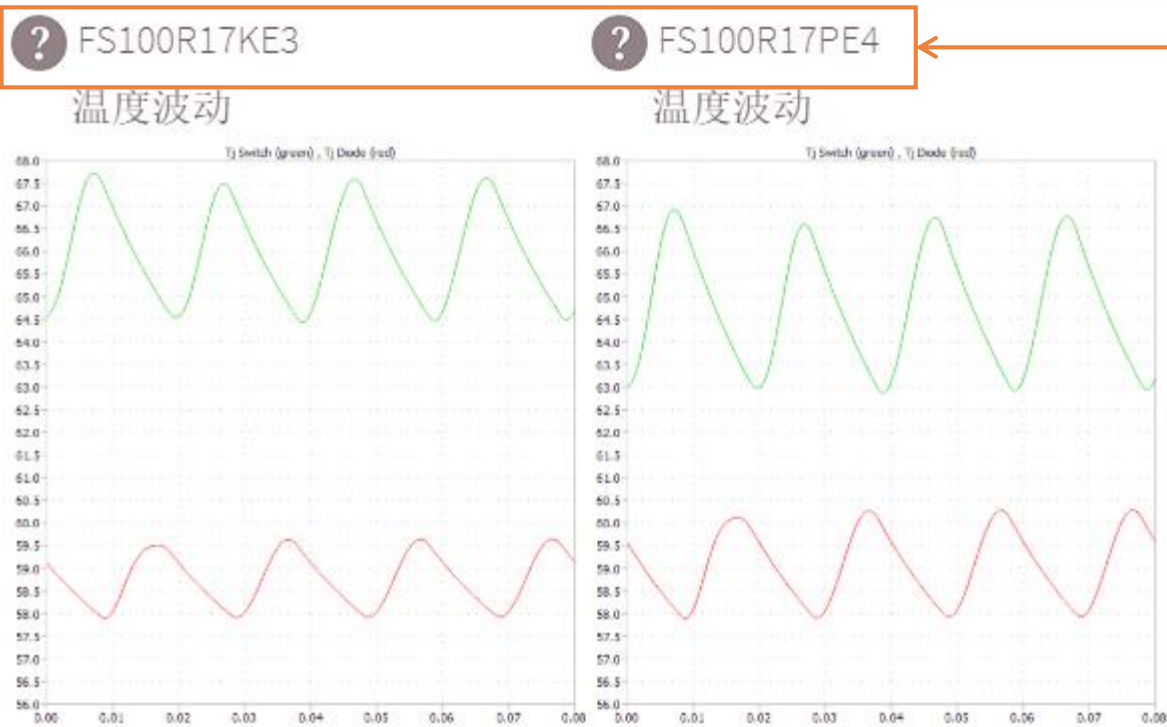
保存

**4 保存负载周期便于超链接分享**

# 第五步：启动仿真并比较结果



模拟图



2 多个IGBT模块的温度纹波



# 第五步：启动仿真并比较结果

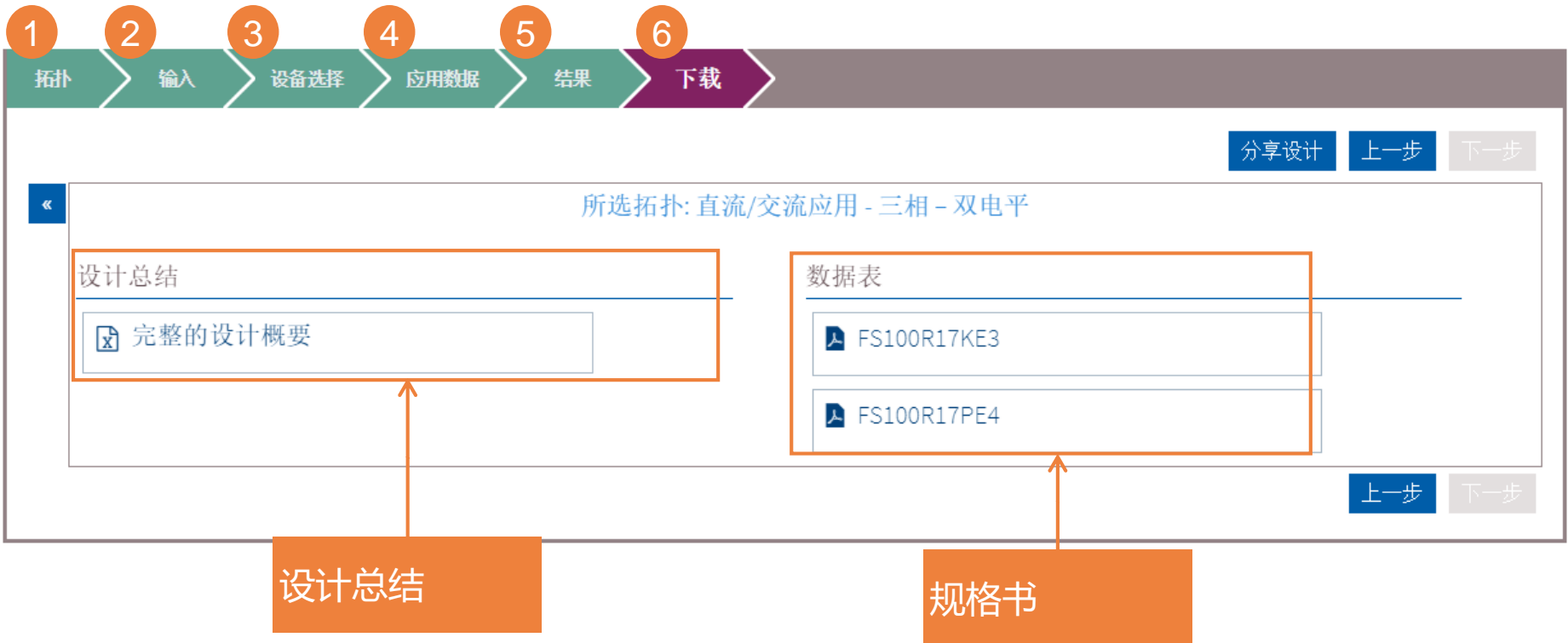
Steady-State Analysis finished: Fri Jun 7 17:36:20 2019      Steady-State Analysis finished: Fri Jun 7 17:36:23 2019

FS100R17KE3		FS100R17PE4	
仿真结果		仿真结果	
最高结温		最高结温	
Switch	67.6 °C	Switch	66.8 °C
Diode	59.6 °C	Diode	60.3 °C
开关功率损耗		开关功率损耗	
Switch	22 W	Switch	14.7 W
Diode	10.1 W	Diode	8.9 W
导通功率损耗		导通功率损耗	
Switch	29.8 W	Switch	29.8 W
Diode	6.2 W	Diode	6.2 W
总功率损耗		总功率损耗	
Switch	51.7 W	Switch	44.4 W
Diode	16.3 W	Diode	15.1 W
FS100R17KE3		FS100R17PE4	

1  
最高结温

2  
导通和开关损耗

# 第六步：下载结果



# PLECS 系统效率和热仿真实例

## IPM Motor Drive Simulator

IPM Motor Drive Simulator

**2** Controller and Modulator blocks are visible in the circuit diagram.

**3** System Parameters:

- System Frequency: 50 Hz
- PWM Frequency: 10 kHz
- Modulation Scheme: Sine PWM
- DC Bus Voltage: 325 V
- Voltage to motor, line to line: 150 Vrms
- Motor Drive Phase Current RMS: 1 A
- Power Factor: 0.8 [-1, 1]
- Thermal Interface Material: Yes
- Thermal Interface Resistance: 0.1 °C/W
- Mounting Option: Mounted heatsink
- Ambient Temperature: 100 °C
- Heatsink Thermal Resistance: 2 °C/W
- Family and Package: All Packages

**4** Parts list:

- IRSM505-015DA 1.2A - Micro DIP23
- IRSM505-015PA 1.2A - Micro SOP23
- IGCM10F60GA 10A - Mini MDIP-24 Fullpack
- IGCM10F60HA 10A - Mini MDIP-24 Fullpack
- IGCM15F60GA 15A - Mini MDIP-24 Fullpack
- IRSM505-025PA 1.5A - Micro SOP23

**5** Get result button

**6** System Probes/Inverter Output:

- Phase-to-Neutral Output Voltage (Van, Vbn, Vcn) [V]
- Phase-to-Phase Output Voltage V\_ab [V]
- Phase Output Current (I\_an, I\_bn, I\_cn) [A]

**7** Inverter Losses:

	Part Name	Total	Efficiency
Switch	IGCM10F60GA	6.71 W	
	IGCM15F60GA	7.63 W	
Diode	IGCM10F60GA	1.73 W	
	IGCM15F60GA	2.19 W	
Inverter	IGCM10F60GA	8.44 W	95.94 %
	IGCM15F60GA	9.82 W	95.27 %

**8** Result History:

- IGCM10F60GA
- IGCM15F60GA

Simulation powered by PLECS using WebSIM® patented technology

1. 点击打开电路 [IPM Motor Drive Simulator](#)
2. 通过框图了解应用电路功能和信号
3. 设置应用参数和散热条件
4. 选择一个或多个产品
5. 点击'Get result'启动仿真
6. 查看仿真结果: 波形, 损耗 (losses), 效率(eficiency), 结温 (junction temperature)
7. 点击'Hold result'保持目前仿真结果和之后仿真结果进行比较, 比如: 改变散热条件等
8. 重新点击'Get result'启动新的仿真并比较结果

# PLECS 系统效率和热仿真实例

## Discrete IGBT Motor Drive Simulator

**2** Schematic diagram of the Discrete IGBT Motor Drive Simulator.

**3** System Frequency: 50 Hz  
 PWM Frequency: 10000 Hz  
 Modulation Scheme: Sine PWM  
 DC Bus Voltage: 400 V  
 Motor Drive Phase-Phase Voltage RMS: 220 V  
 Motor Drive Phase Current RMS: 1 A  
 Power Factor: 0.8 [-1, 1]  
 Thermal Resistance (case to reference): 0.5 K/W  
 Reference Temperature: 100 °C

**4** Parts:  
 IKW75N60TA  
 IKW75N60TA  
 IKW75N65EL5  
 IKW75N65ES5  
 IKZ50N65EH5  
 IKZ50N65NH5  
 IKZ75N65EH5  
 IKZ75N65NH5  
 IKZ75N65NH5

**7** Get result Hold result

**8** Analysis completed. Result History

Component	Value	Unit
IKW75N60TA	111.4	°C
IKZ50N65EH5	104.6	°C
IKW75N60TA, Rth 0.1K/W	103.3	°C
IKZ50N65EH5, Rth 0.1K/W	101.4	°C

**6** Inverter Output

**Inverter Losses**

Category	IGBT Device	Total	Efficiency
IGBTs	IKW75N60TA	18.05 W	
	IKZ50N65EH5	5.947 W	
	IKW75N60TA	17.81 W	
Diodes	IKW75N60TA	1.929 W	
	IKZ50N65EH5	2.035 W	
	IKW75N60TA	1.946 W	
Inverter	IKW75N60TA	19.98 W	93.43 %
	IKZ50N65EH5	7.982 W	97.38 %
	IKW75N60TA	19.65 W	93.54 %
	IKZ50N65EH5	7.984 W	97.41 %

**Phase A High Side Device Losses and Maximum Junction Temperatures**

IGBT Device	Switching		Conduction	Device maximum junction temperature
	Switching	Conduction		
IKW75N60TA	2.965 W	0.1593 W		111.4 °C
IKZ50N65EH5	0.7669 W	0.2281 W		104.6 °C
IKW75N60TA	2.823 W	0.1600 W		103.3 °C
IKZ50N65EH5	0.7538 W	0.2296 W		101.4 °C
Diode	IKW75N60TA	0.2788 W	0.04259 W	110.4 °C
	IKZ50N65EH5	0.2799 W	0.05849 W	104.2 °C
	IKW75N60TA	0.2635 W	0.04415 W	102.3 °C
	IKZ50N65EH5	0.2745 W	0.05909 W	101.0 °C

**Phase A Low Side Device Losses**

IGBT Device	Switching		Conduction	Device maximum junction temperature
	Switching	Conduction		
IKW75N60TA	2.938 W	0.1593 W		111.4 °C
IKZ50N65EH5	0.7602 W	0.2281 W		104.6 °C
IKW75N60TA	2.796 W	0.1600 W		103.3 °C
IKZ50N65EH5	0.7472 W	0.2296 W		101.4 °C
Diode	IKW75N60TA	0.2788 W	0.04259 W	110.4 °C
	IKZ50N65EH5	0.2822 W	0.05849 W	104.2 °C
	IKW75N60TA	0.2635 W	0.04415 W	102.3 °C
	IKZ50N65EH5	0.2768 W	0.05909 W	101.0 °C

1. 点击打开电路 [Discrete IGBT Motor Drive Simulator](#)
2. 通过框图了解应用电路功能和信号
3. 设置应用参数和散热条件
4. 选择产品: 单击选择单个产品, Ctrl键和单击鼠标组合选择多个产品
5. 点击'Get result'启动仿真
6. 查看仿真结果: 波形, 损耗 (losses), 效率(efficiency), 结温 (junction temperature)
7. 点击'Hold result'保持目前仿真结果和之后仿真结果进行比较, 比如: 改变散热条件等
8. 重新点击'Get result'启动新的仿真并比较结果

# Agenda

1

英飞凌在线设计和仿真工具概览

2

参数搜索产品选型工具

3

应用方案查找器

4

Infineon Designer在线时域仿真入门指南及其新特性

5

在线系统效率和热仿真：IPOSIM & PLECS

6

总结和技术支持



## 在线工具 (无需安装)

[www.infineon.com/tools](http://www.infineon.com/tools)

## Infineon Toolbox (离线为主)

[www.infineon.com/toolbox](http://www.infineon.com/toolbox)

### 如何选择合适的产品?

#### 产品级

- › [17个产品查找器](#)
- › 基于参数搜索
- › 适用于已确定产品类型和参数

### 如何选择应用解决方案?

#### 应用级

- › [应用方案查找器](#)
- › 基于系统框图
- › 流程清晰, 简便易用
- › 结合参数查找和系统仿真

### 如何用仿真检测性能?

#### 系统-仿真级

- › [Infineon Designer](#)基于Spice, 适用于瞬时信号仿真或在稳态下的系统效率和损耗仿真, 仿真过程详细, 耗时较长
- › [Infineon Designer](#)已发布超过460个应用电路
- › [IPOSIM/PLECS](#)基于查找表和公式计算, 用于系统效率、损耗和热仿真, 计算过程快速, IPOSIM也带有负载特性曲线仿真

# 技术支持

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## Support Page

Support is available in English, German and Mandarin from our talented team of experts.

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在线支持



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Technical Assistance Center  
技术支持中心 (TAC)



› Get product support from our technical experts

Call us Toll Free  
免费热线联系我们



› Call us toll-free 24/7

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Please state your question (with at least 3 words)

### FAQ

1. Technical Support [CN] [DE]
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3. HiRel Discretes for special applications, e.g. Aero and Space [CN] [DE]
4. Supplier Service, Supplier Page, page registration [CN] [DE]
5. Use Infineon Designer for Simulation and Development of your Circuit [CN] [DE]
6. How to login to myInfineon [CN] [DE]

# 资源列表 <https://www.infineon.com/tools>

## 查找工具

- › [Infineon 半导体应用方案查找器](#)
- › [Infineon 评估版查找工具](#)
- › [Infineon 产品查找工具](#)
- › [Infineon 仿真模型查找工具](#)

## 硬件仿真工具

### 热和功率仿真

- › [Infineon IPOSIM 功率模块和盘片仿真工具](#)
- › [Infineon Integrated Power Modules \(IPM\) 功率和热仿真工具 – 基于PLECS](#)
- › [Infineon 分力IGBT功率和热仿真工具 – 基于PLECS](#)

### 瞬时仿真和程序调试仿真

- › [Infineon Designer SPICE仿真powered by TINACloud](#)
- › [PowerEsim 开关电源 \(SMPS\) 仿真](#)

### 磁传感器设计

- › [Infineon Magnetic Sensor Design Tools](#)

## 软件开发工具

- › [DAVE™ Development Platform for XMC™ 32-bit Industrial Microcontroller based on ARM® Cortex®-M](#)
- › [TriCore™ Development Tools for AURIX™ 32-bit Automotive Microcontroller based on TriCore™](#)

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