

利用 PMLK 革新电源教学

TI 大学计划
2016.4

Agenda

- What?** - 什么是PMLK
- Why?** - 为什么要用PMLK
- Where?** - PMLK可以应用于哪些课程
- How?** - 如何利用PMLK开展电源教学

什么是 PMLK ?

Power Management Lab Kit Series

非隔离DC-DC电源实验套件



Buck



LDO



Boost



Buck - Boost

配有多种实验教材

PMLK 套件



PMLK

Power Management Lab Kit
Cost-Effective Test Methods
Using PMLK LDO Boards

TEXAS INSTRUMENTS

SI000011

PMLK

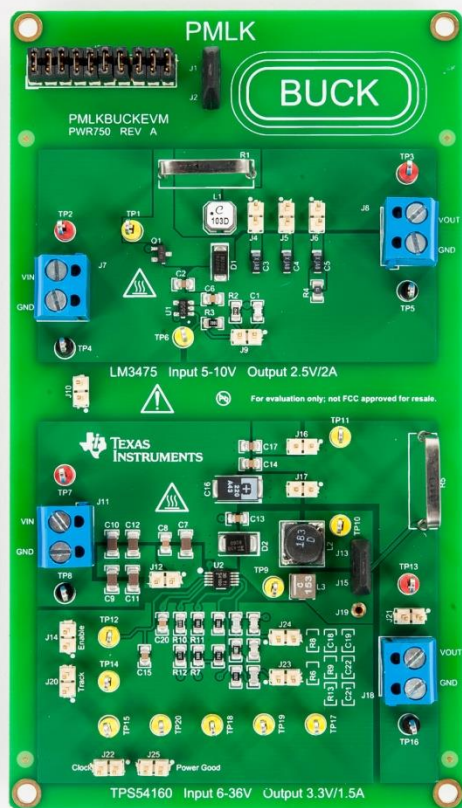
Power Management Lab Kit
LDO WEBENCH Experiment Book

WEBENCH
Design Center

TEXAS INSTRUMENTS

SI000007

PMLK-Buck 实验板硬件



- 2个降压电路：分别基于TPS54160和LM3475
 - TPS54160：电流模式控制转换器(converter)，内部集成MOSFET
 - LM3475：滞环控制控制器(controller)，内部不带MOSFET
- 多组电容、电感、环路补偿对比
- 丰富的测试点
- 康铜丝电阻：方便使用电流探头测量电感电流
- 预留跳线帽，可改变开关频率、软启动时间等

PMLK-Buck 实验教材

每块实验板包含：

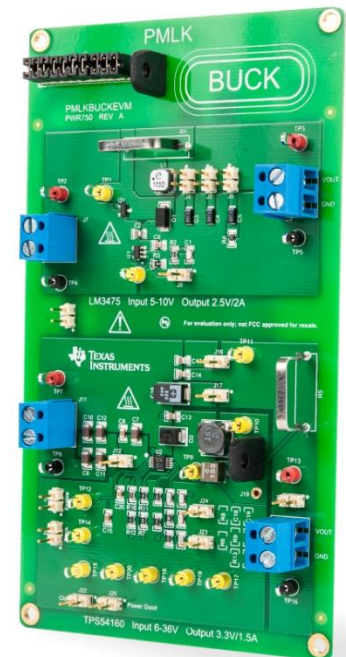
- 实验教材
- 简易测试方法
- WEBENCH仿真指南

PMLK

Power Management Lab Kit
Buck Experiment Book



SSQU007
PMLKBuckEVM REV A



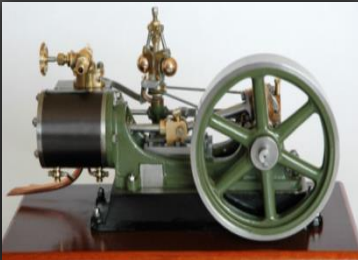
为什么要用 PMLK ?

为什么要学电源？

Our 21st century lives rely on electronics



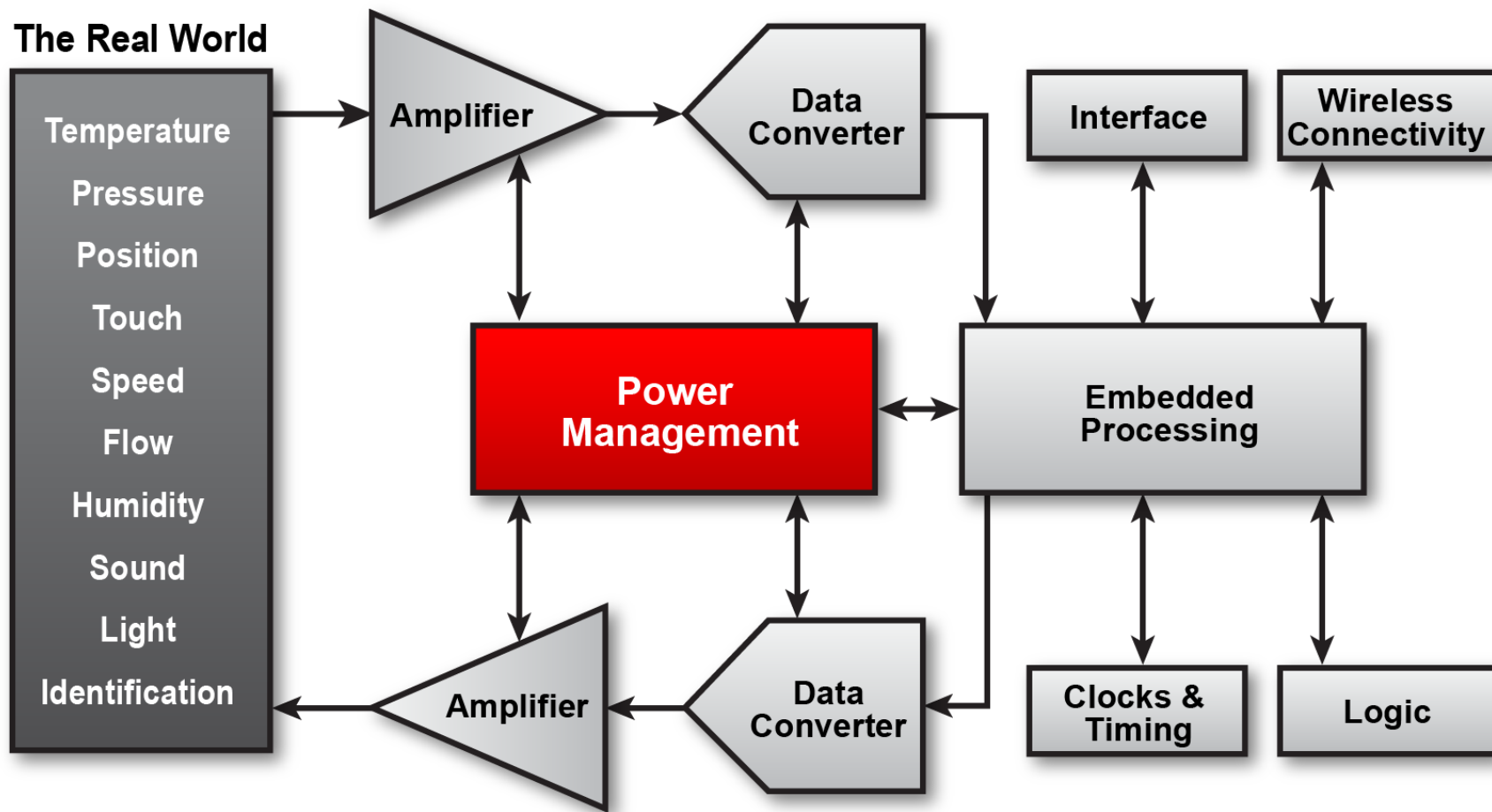
Without it, our day-to-day lives are completely different



Electronics require power to operate

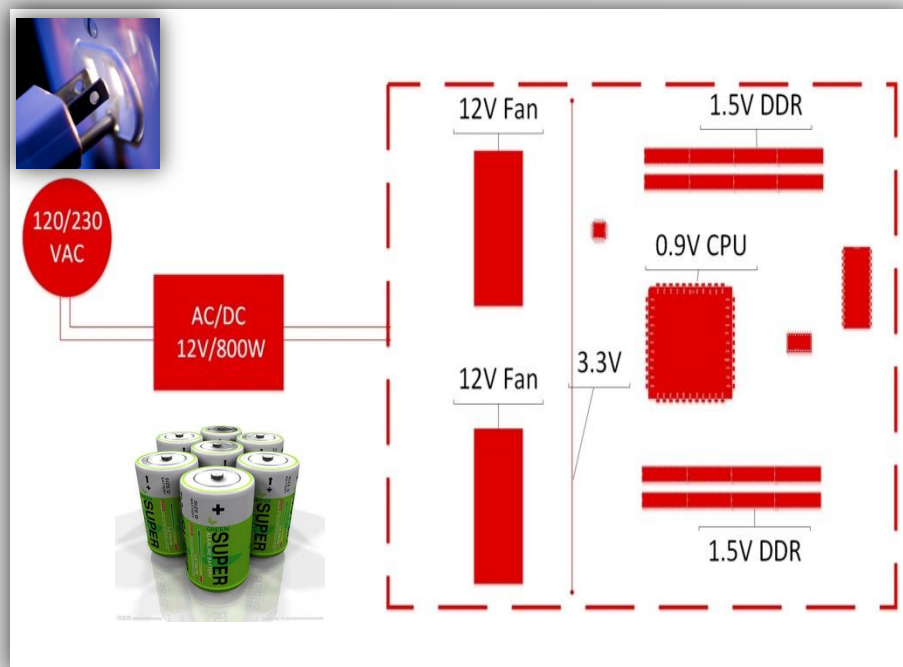


电源是电子系统必不可少的组成部分



电源的性能直接影响到系统的性能：
包括效率、响应度和稳定性

典型的电子系统供电电路

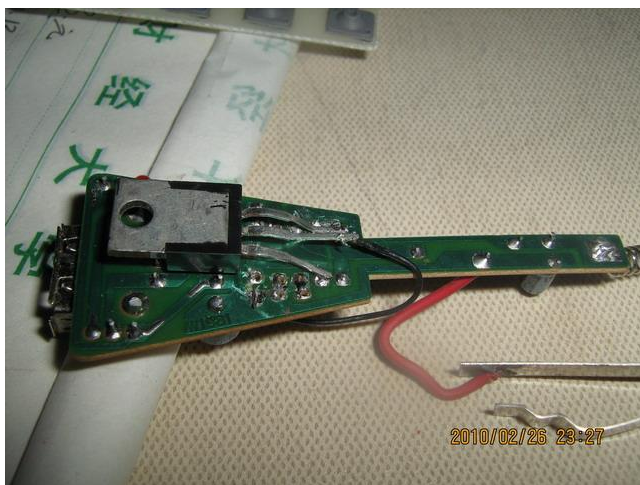


- 电源输入来自于交流市电或电池
- 交流输入经整流滤波后变为直流母线
- 系统的不同部分有不同的供电要求，通过直流母线电压做DC-DC变换来提供

7805不是万能的

电源的发展趋势:

- 效率更高
- 静态功耗更低
- 体积更小



学生对功耗、散热、器件选择
缺乏概念

为什么要用 PMLK 学电源？

拓扑

- LDO
- Buck

无源器件

- 电感
- 电容

控制电路

- 控制方式：
 - 电压型



PMLK 适用于哪些课程?

PMLK 适用课程

- 模拟电子技术：介绍LDO和开关电源
- 电力电子：电源拓扑、电力电子元件
- 电子系统设计：如何设计高效率、稳定的电源
- 电子竞赛培训：系统供电设计、开关电源基础



如何使用 PMLK 开展电源教学?

PMLK支持理论-仿真-实验的学习过程

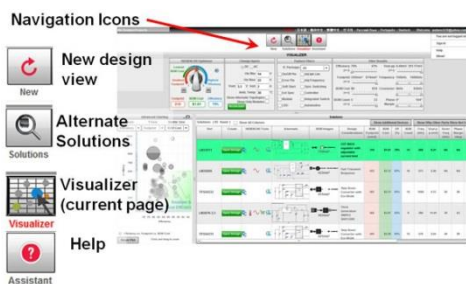
理论

PMLK 教材



仿真

WEBENCH



PMLK WEBENCH
仿真指南

PMLK

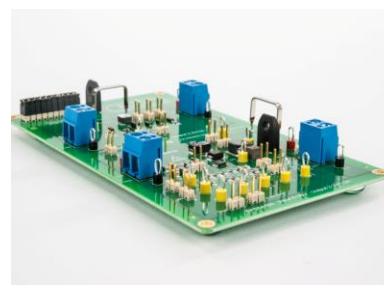
Power Management Lab Kit
LDO WEBENCH Experiment Book



TEXAS INSTRUMENTS

实验

PMLK 实验板



PMLK 实验指导书

PMLK

Power Management Lab Kit
Cost-Effective Test Methods
Using PMLK LDO Boards

TEXAS INSTRUMENTS

PMLK 实验列表

LDO

Exp 1

Impact of line and load conditions on steady-state operation

Exp 2

Impact of line and load conditions on efficiency

Exp 3

Impact of operating conditions and output capacitor on stability

Exp 4

Impact of operating conditions on Power Supply Rejection Ratio

Exp 5

Impact of line and load conditions on dropout voltage

Exp 6

Impact of output capacitor characteristics on load-transient response

Buck

Exp 7

Impact of operating conditions on efficiency

Exp 8

Impact of passive devices and switching frequency on current and voltage ripples

Exp 9

Impact of cross-over frequency and passive devices on load transient response

Exp 10

Impact of the inductor saturation on current and voltage ripples

Exp 11

Impact of inductor characteristics on current limiting operation

Exp 12

Switching frequency, ripple, offset and line immunization capabilities of hysteretic control

Boost

Exp 13

Impact of operation mode on voltage conversion ratio and duty-cycle

Exp 14

Impact of operation mode on efficiency

Exp 15

Impact of operation conditions on the dynamic response

Exp 16

Impact of operating conditions and inductor characteristics on current limiting

Exp 17

Impact of current-mode control on Power Supply Rejection Ratio

Exp 18

Impact of feedback control and operating conditions on Output impedance and reverse Power Supply Rejection Ratio

BuckBoost

Exp 19

Impact of operating conditions on Power Supply Rejection Ratio

Exp 20

Impact of the operating conditions on Input Admittance

Exp 21

Impact of the inductor on operation mode and conversion ratio

Exp 22

Impact of silicon devices, passive devices and operating conditions on efficiency

Exp 23

Impact of the operating mode on the performances of dynamic compensation

Exp 24

Impact of cross-over frequency setup on soft start and current limiting

如何获取 **PMLK** 相关资料?

PMLK 购买渠道



- 通过TI Store订购：[PMLK官方页面](#)
- 通过贸泽电子订购：请在[cn.mouser.com](#)搜索 “PMLK”
 - * 请发邮件至chinauniv@ti.com，注明订购板卡种类及数量，可获得优惠券，凭优惠券至贸泽电子购买可享受优惠价格。

PMLK 官方页面

- 目前已推出Buck和LDO实验板
- 每块实验板有2个版本
 - PMLKLDOEVMB/PMLKBUCKEVMB:
带实验指导书
 - PMLKLDOEVM/PMLKBUCKEVM:
只含实验板
- 相关文档可从ti.com下载, 包括:
 - 实验教材
 - 低成本测试方法
 - WEBENCH仿真实验指导书



PMLK 资料下载

- PMLK Buck 实验指导书（PMLK Buck Experiment Book）
<http://www.ti.com.cn/cn/lit/ug/ssqu007/ssqu007.pdf>
- PMLK Buck 低成本测试方法（Cost Effective Test Methods Using PMLK BUCK Boards）
<http://www.ti.com.cn/cn/lit/ug/ssqu010/ssqu010.pdf>
- PMLK LDO 实验指导书（PMLK LDO Experiment Book）
<http://www.ti.com.cn/cn/lit/ug/ssqu006/ssqu006.pdf>
- PMLK LDO 低成本测试方法（Cost Effective Test Methods Using PMLK LDO Boards）
<http://www.ti.com.cn/cn/lit/ug/ssqu011/ssqu011.pdf>

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Thanks

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