電源法規/市场趋势以及恩智浦AC/DC电源解决方案概览
Regulation/Market Trend and Overview of NXP AC/DC Power Solutions

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September 2018 | APF-SMC-T3293

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電源法規/市场趋势
Regulation/Market Trend

Regulation on Power Saving

Power saving is always so important for power supply. So many well-known regulations have played an important role this year to drive this direction, like EUP Lot6, DOE, COC, Energy Star, etc. However, nowadays, since IoT is so popular what is expected for power saving? What will power look like for TV power, PC power, adapter and fast charger? In this class NXP will help audiences to understand NXP's AC/DC power controller IC portfolio-- from 1W up to 350W.

节能對电源供應器一直是很重要的。今年，EUP Lot6、DOE、COC、Energy Star等许多众所周知的条例在推动节能改进方面起到了重要作用。而如今随着物联网的盛行，对节能又会有怎样的期待呢？电视电源、电脑电源、适配器和快速充电器的电源又会有什么样的新设计？在本课程中，恩智浦将帮助观众了解恩智浦AC/DC电源控制器IC产品组合，所涉及功率从1W到350W不等。

Regulation of Energy Saving – Existing Regulations

- Any Power, Incl. IPS & EPS:
  - EUP Lo6:<0.5W at no load or standby mode
- External Power Supply (EPS):
  - DOE for adapter:
    - 5W~49W: 63%~88% at cable end & <0.1W@ no load
    - >=50W: >88% at cable end & <0.21W@no load
  - COC tier 1 for adapter:
    - 5W~49W: 64%~89% at cable end & <0.15W
    - >=50W : >89% at cable end & <0.25W
  - COC Tier 2 for Adapter:
    - 5W~49W: 64%~89% at cable end & <0.075W
    - >=50W : >89% at cable end & <0.15W
- Energy Star: …..
- 80+ for PC power…

Energy Star V6 Final Requirements

ENERGY STAR® Program Requirements
Product Specification for Computers

Eligibility Criteria
Version 6.0
Rev. Oct-2013

Energy Star 6

Table 5: Power Supply Efficiency Allowance

Power Supply Type	Computer Type	Minimum Efficiency at Specified Proportion of Rated Output Current[ii]				Minimum Average Efficiency[iii]	$Allowance_{PSU}$
		10%	20%	50%	100%		
IPS	Desktop	0.81	0.85	0.88	0.85	-	0.015
		0.84	0.87	0.90	0.87	-	0.03
	Integrated Desktop	0.81	0.85	0.88	0.85	-	0.015
		0.84	0.87	0.90	0.87	-	0.04
EPS	Notebook or Desktop	0.83	-	-	-	0.88	0.015
		0.84	-	-	-	0.89	0.03
	Integrated Desktop	0.83	-	-	-	0.88	0.015
		0.84	-	-	-	0.89	0.04

6 EFFECTIVE DATE

6.1.1 Effective Date: The Version 6.0 ENERGY STAR Computers specification shall take effect **June 2, 2014**. To be ENERGY STAR certified, a product model shall meet the ENERGY STAR specification in effect on its date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

Source: https://energystar.gov/products/specs/node/143

Energy Star 7 – Internal Power Supply (IPS) Requirements

- IPS with maximum rated output power less than 75 watts shall meet minimum efficiency requirements as specified in Table 1.
- IPS with maximum rated output power greater than or equal to 75 watts shall meet both minimum efficiency requirements and minimum power factor requirements, as specified in Table 1 or Table 2 as applicable.

Table 1: Requirements for Internal Power Supplies with Rated Output of 500 Watts and Below

Loading Condition (Percentage of Nameplate Output Current)	Minimum Efficiency (115V)	Minimum Efficiency (230V)	Minimum Power Factor
20%	0.82	0.85	-
50%	0.85	0.88	0.90
100%	0.82	0.85	-

Table 2: Requirements for Internal Power Supplies with Rated Output Above 500 Watts

Loading Condition (Percentage of Nameplate Output Current)	Minimum Efficiency (115V)	Minimum Efficiency (230V)	Minimum Power Factor
20%	0.87	0.90	-
50%	0.90	0.92	0.90
100%	0.87	0.89	-

Source: https://www.energystar.gov/products/spec/displays_specification_version_7_0_pd

Energy Star 7 – External Power Supply (EPS) Requirements

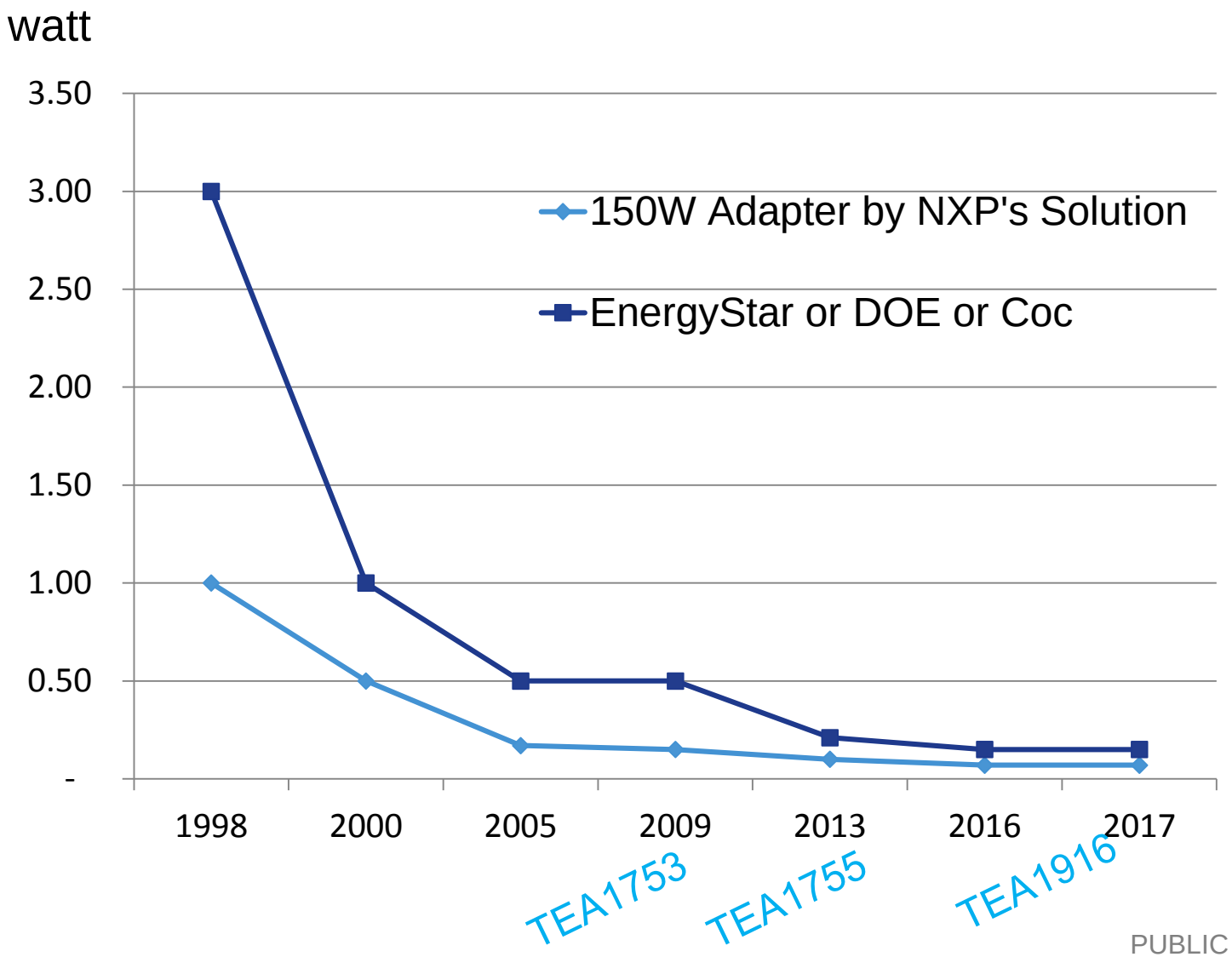
- Single- and Multiple-voltage EPSs shall meet the Level V or higher performance requirements under the International Efficiency Marking Protocol when tested according to the Uniform Test Method for Measuring the Energy Consumption of External Power Supplies, Appendix Z to 10 CFR Part 430.
- Single-voltage EPSs shall include the Level VI or higher marking.
- Multiple-voltage EPSs meeting Level VI or higher shall include the Level VI or higher marking.
- Additional information on the Marking Protocol is availableat http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218

Source: https://www.energystar.gov/products/spec/displays_specification_version_7_0_pd

Regulation of Energy Saving – Coming Possible New Regulations

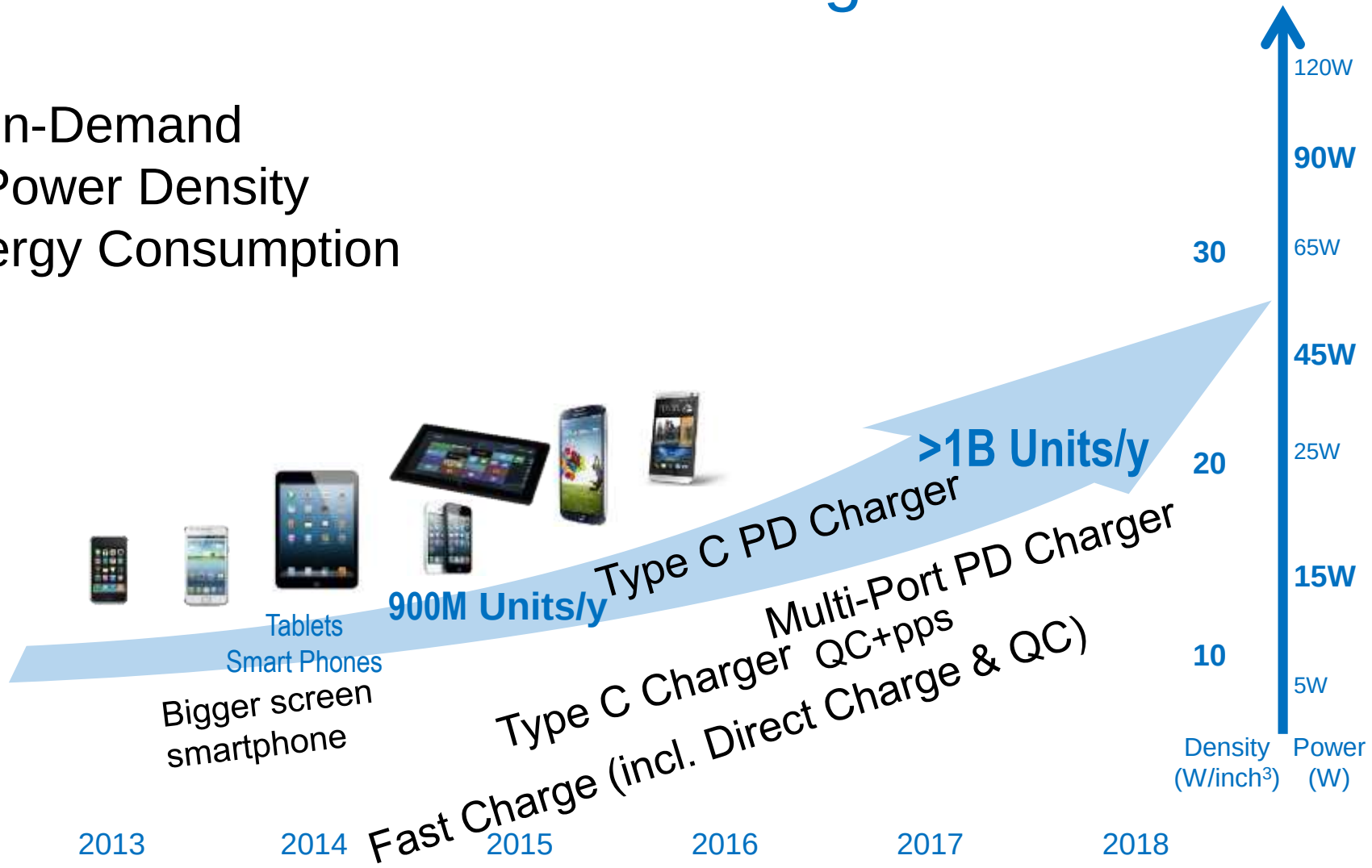
- 加州新能源法規: >80% from ~3W above
- TV Power : <0.3W@standby mode (e.g. 12V/10mA) (some Brands now)
- EPA能源之星 7.0
  - 希望將最低 IPS for Computing 效率從 80Plus Bronze 提高到 80Plus Silver 效率等級 (effective Nov'18)
  - 完整網路連線能力 - 已經修改完整網路連線能力的定義，以因應業界正在開發的全新極低功率模式。這些新模式可讓網路持續處於連線狀態，但功耗低於 2 瓦
- EUP Lot 7: <0.3W@standby Mode (when??)
- UL62368 (2019?)
- …

No Load Standby Power History and Trend (150W Adapter)



Key Market Trends of Mobile Charger

- Power-on-Demand
- Higher Power Density
- Low Energy Consumption



Shape of Current Adapter & Charger

NB 90W/19V

90W/19V

90W/19V

90W/19V

45W/19V

10W/5V

5W/5V

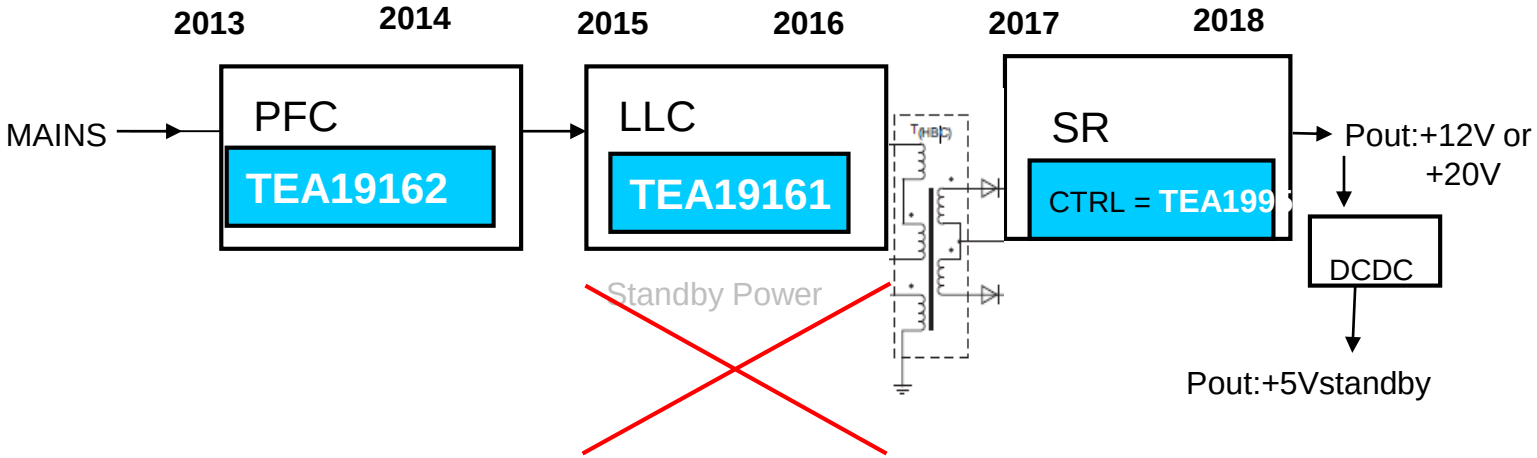
Type C PD/QC charger

- Multi Type A ports
- One Type C PD3.0+QC4.0+

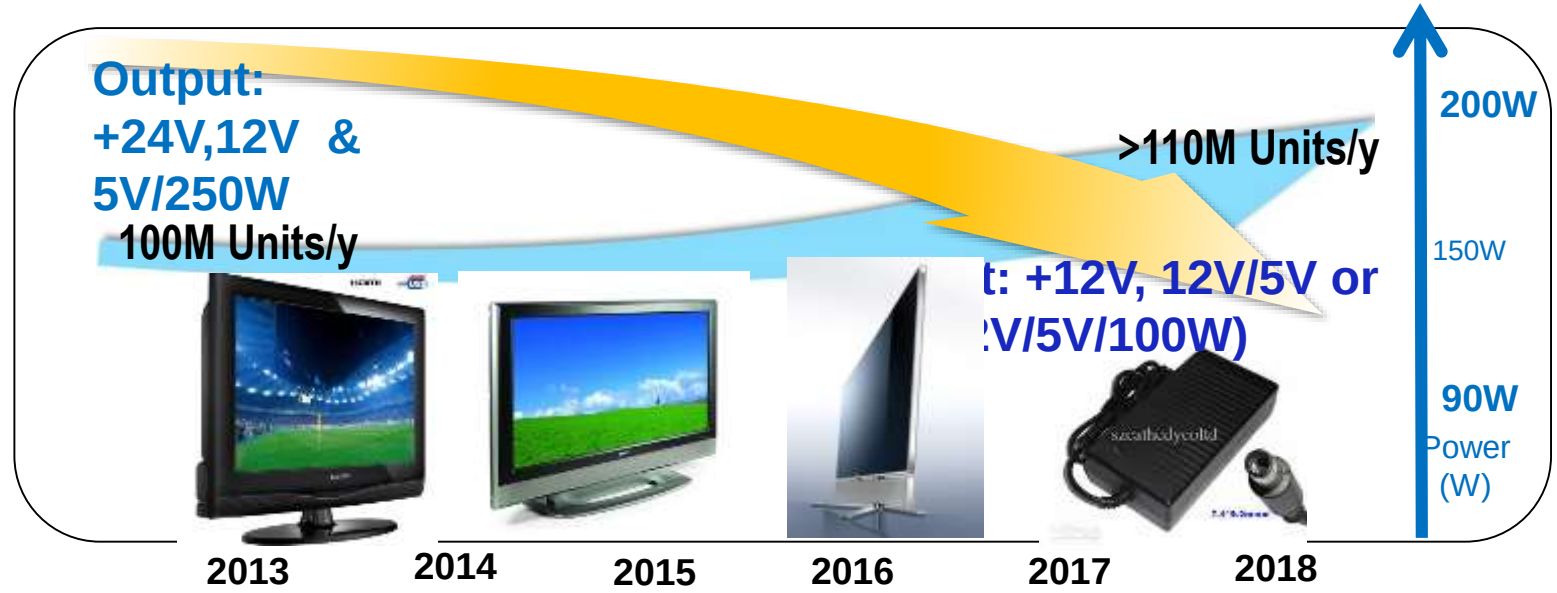
- Multi Layer PCB
- Low profile components

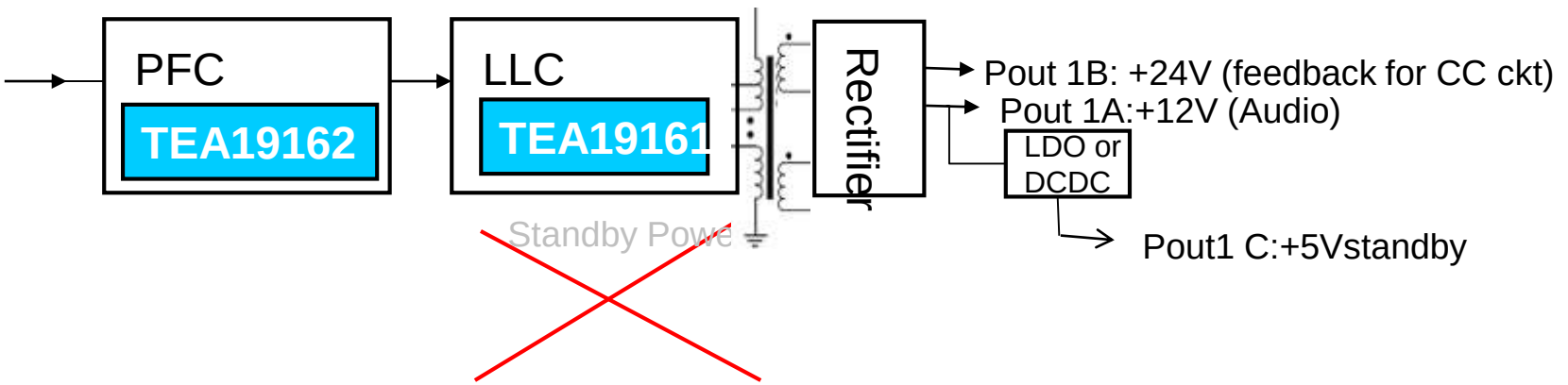
Key Market Trends of PC Power (Desktop + AIO)

Multi output to single output



Multi-outputs Trend: 2 Outputs e.g. LED TV Power (>=37”)





Why Single Output Power for AIO and Slim Type PC Power

- More simple to design;
- Easier to pass the safety
- Less component count
- More robust/reliable & longer product life
- Output power rating going down
- Easier to get certified for EnergyStar regulation
- Higher efficiency and lower cost on LDO or DC/DC stage

恩智浦電源ＩＣ簡介
NXP ACDC Power IC Portfolio Introduction

Thrust Products of ACDC Power Controller Ready

Application	Description	Range	USP
Adapters <75W	Flyback CCM controller	TEA1733(L)T(P) (SO8) or DIP8) TEA1738 (L)T (SO8) TEA1731(L)TS (TSOP6) TEA1732(L)TS (TSOP6) TEA1832(L)TS (TSOP6) TEA1833(L)TS (TSOP6)	1733: >89%; <0.09W@no load 1738: >90%; 0.09W@no load +Peakload (>1.5 times) 1731:>90%;0.09W@no load +Peak load (> 1.5 times) 1732 : >89%; <90mW@no load+ Peak load (>1.5 times)+ Brown -in/out 1832: >89%; <55mW@no load+ peak load (>1.5 times) + Brown in/out **1833: > 90%; <55mW@no load+ peak load (>=2 times) + Brown in/out**
Adapters <75W	Flyback QR Controller	TEA1836(x)(L)T (SO14 or SO8)	1836 + 1892TS: >91% & <25mW@ no load
Adapters 75W~180W	Flyback QR Combo Controller (PFC + PWM)	GreenChip 3.5, TEA1755T TEA1753 TEA1751	1755+1792TS or 1761: >91%; <100mW@no load 1755 +1703TS <30~50mW@ no load Compact Size TEA1753: lower ripple noise
Adapters 120W~300W	Resonant Combo SR for Resonant	TEA1713: Combo LLC TEA1716 Combo LLC SR: TEA1792ATS(TSOP6) for one MOS; TEA1795T (SO8) for 2 MOS	>90%~92% without SR;Combo IC; Less components;Compact Size 1713: <0.3W@no load 1716:<100mW@no load (90w adapter) and EUP lot 6 compliance
X-cap discharge	Active X-cap discharge IC	TEA1708T (SO8)	Reduce 10~20mW for 90W adapterr Capable for 4KV surge
SR IC for Flyback & LLC	Synchronous Rectifier IC	TEA1892T(A)S (TSOP6)	Lower cost for one Low RdsON MOSFET (3~5mΩ) for higher efficiency
<=11Watt Charger/ adapter	Primary sense Flyback + Integrated MOSFET	TEA1721(SO8) or TEA1723(SO8)	<10mW@no load or <20mW@no load >82 (meet COC, DOE & EnergyStar V6) <+/- 5% dynamic load

The Other Thrust Products Released Latterly

Application	Description	Part Number	USP	Status
>75W Adapters, PC power & TV Power	LLC digital controller+ DCM PFC Controller	**TEA19161 (SO16)+ TEA19162 (SO8)**	• **<70mW@no load for 240W/12V** • **2~15% higher at load <10%;** • **<+/-5% voltage regulation for 0% load to 100% load** • **Meets Platinum standard**	19161+19162: MP Q1'16
SR IC for LLC Adapter	LLC Synchronous Rectifier IC	**TEA1995T (SO8)**	• **2~5% High efficiency at middle load via adaptive driving capability by loading**	1995: MP Q3'15
Type C PD/QC & Fast Charger/Adapters <75W	Flyback QR controller + SR IC+ PD3.0/Q4.0+ protocol controller	**TEA1936 (SO10)+TEA1993/8/9(TSOP6)+ TEA1903x (SO10) or TEA19051x (HVSON16)** **Remarks:** **TEA19031: PD2.0** **TEA19051: PD3.0+QC4.0+** **TEA19032: PD3.0**	• **Type C PD3.0 & QC4.0+ compliance;** • **>90%(meet COC tier 2);** • **<30mW@no load;** • **2 Vcc to save regulators ;** • **N MOS switch at output;**	1936x: MP Q1'17 1993: MP Q1'16 1998: MP Q4'16 1999: MP Q2'17 19031x MP Q3'17 19051x MP Q4'17 19032x MP Q1'18

带来更低空载待机功耗、更高效率、更紧凑的尺寸！

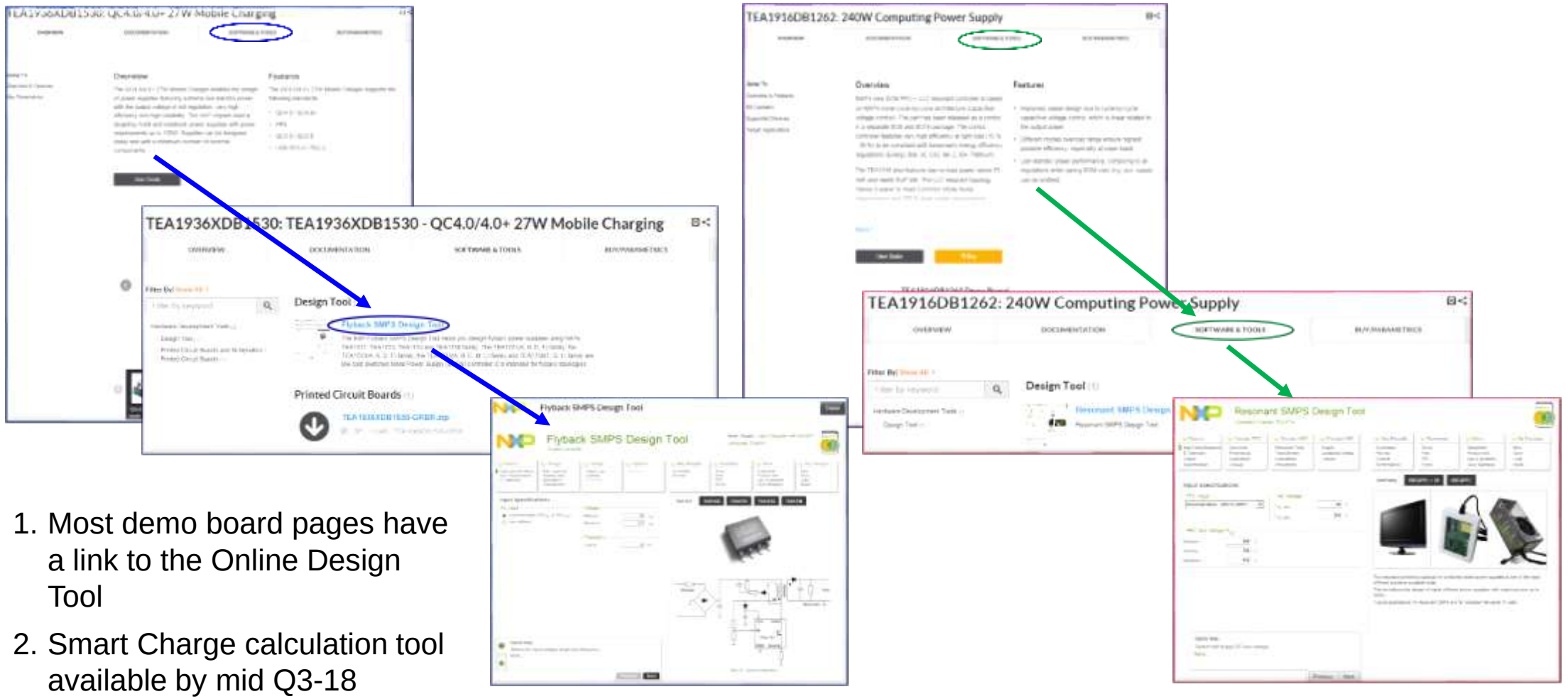
恩智浦網路上的技術支持文件, IC樣品及演示板的取得,申請和購買

How to get the technical documents, apply & purchase IC samples/Demo boards on NXP public website

Online Design Tools

Flyback SMPS Design Tool

Resonant SMPS Design Tool



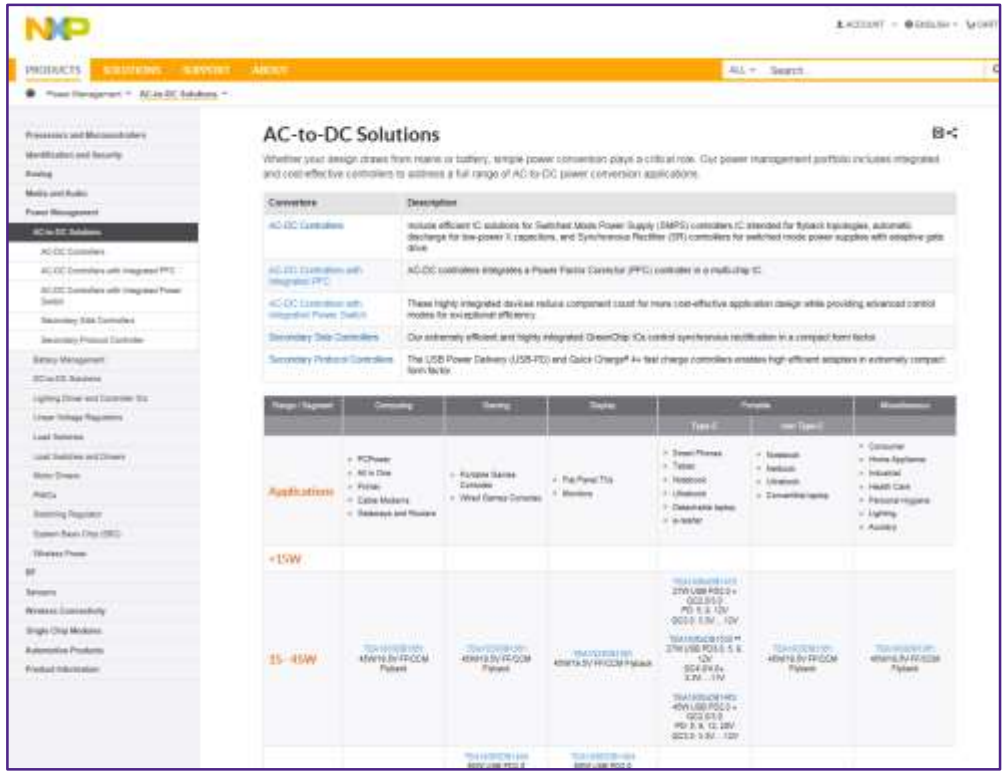
1. Most demo board pages have a link to the Online Design Tool
2. Smart Charge calculation tool available by mid Q3-18

Technical Supporters on NXP Web

Demo Boards, User Manual, Application Notes, Design Tools, etc.

Interested in learning more about
NXP GreenChip Power Solutions?

- A full set of Collateral is available
- Product Information Page
  - Product Leaflets and Datasheets
  - Application Notes
  - Qualification Data
  - Free Samples of all Product Versions
- Demo Board Information Page
  - Demo Boards
  - User Manuals
  - Online Design Tools
- GreenChip Power Product Selection Guide
- Online Calculation Design Tool



Check our website:

Products : https://www.nxp.com/products/power-management:POWER-MANAGEMENT

Demo boards : https://www.nxp.com/products/power-management/ac-to-dc-solutions:MC_34098

Design Tool : "Flyback SMPS Design Tool"
"Resonant SMPS Design Tool"

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