Power Factor Correction (PFC) Parts Selection Guide
Infineon Controllers, CoolMOS™ & SiC thinQ!™ Diodes
Power factor correction BASICS

What is PFC?

Power Factor Correction is a technique of shaping the input current so that it will in-phase with the input voltage in an AC circuit. The purpose of it is to minimize the unwanted effects (harmonic distortion) introduced by electronic equipments in the power system and utilizing the usable power in the mains.

Passive and active PFC explained

- **Passive PFC**
  - AC input current is lagging with respect to AC input voltage hence both current and voltage are not purely in-phase.

- **Active PFC**
  - AC input current is almost perfectly in-phase with AC input voltage.

PFC Simulation*

- **No PFC**
  - Typical input current without harmonic line current reduction
- **Passive PFC**
  - Typical input current with passive harmonic line current reduction
  - Pros:
    - Simple and rugged circuitry
    - Cheaper than active PFC
  - Cons:
    - Not able to effectively eliminate line current harmonics
    - Bulky and heavy magnetics required
    - Not possible for universal input range
- **Active PFC**
  - Typical input current with active harmonic line current reduction
  - Pros:
    - Extensive suppression of line current harmonics
    - Can comply with regulatory requirements such as IEC 61000-3-2 (Limits for harmonic current emissions)
    - Able to operate in universal input range
  - Cons:
    - Complex and costly circuitry

* Source: EPSMA, Harmonic Current Emissions. Guidelines to the standard EN 61000-3-2, Nov. 2010

Difference between DCM and CCM mode PFC

**DCM**

1) Highest efficiency (not ON through full cycle limits conduction losses)
2) Triangular waveform causes EMI due to di/dt changes. (also high ripple)
3) Normally below 300W. (EMI is costly to get rid of above 300W topologies).

**CCM**

1) Fast turn on needed, requires fast PFC diode. Good fit for SiC Diode.
2) Trapezoidal current waveform with low ripple (lower di/dt so EMI easier to get rid of)
3) Normally 300W and above
Power Factor Correction (PFC) Selection Guide

Active Power Factor Correction

Discontinuous Conduction Mode (DCM) or Continuous Conduction Mode (CCM)

- DCM
- CCM

PFC Topologies

- Standard
- Interleaved
- Standard
- Interleaved
- Dual Boost (bridgeless)

CoolMOS™, SiC thinQ!™ Diodes & Controllers

- CoolMOS™ P6 series
- CoolMOS™ C7 or P6 series
- SiC thinQ!™ Generation 5 Diodes
- DCM PFC Controller TDA48xx
- CCM PFC Controller ICEXPxx

Applications

- Telecom
- Server
- PC Silverbox/AIO
- LCD TV/Adapter
- Notebook/Adapter
- C5 C8 Compact Lamp HID
- Lighting HID

Order Number: B152-H9804-X-X-7600-DB2012-0013
Date: 04/2013
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Topologies

Standard DCM PFC
Used in cost performance applications up to 300W, Controller, CoolMOS™ but no SiC thinQ!™ Diode

Standard CCM PFC
Used in applications above 300W Controller, CoolMOS™ & SiC thinQ!™ Diode used

Interleaved CCM PFC
Higher power applications 2 CoolMOS™ and 2 SiC thinQ!™ Diode used

Dual boost (Bridgeless)
Used in critical efficiency applications. Removes losses from input bridge rectifier diodes
Can save around 1.5% efficiency
## Infineon Parts (CoolMOS™ & thinQ!™)

### CoolMOS™ P6 600V

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<tr>
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<th>TO-263 DPAK</th>
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### Silicon Carbide Diode (SiC) thinQ!™ Gen 5

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### 900W CCM PFC PSU

Efficiency difference shown between CP/G2 SiC Diode & C7/G5 SiC Diode

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1¹ Samples available by Q2/2013
2² Samples available by Q3/2013
3³ Samples available by Q4/2013
Infineon Parts (Controllers)

TDA4862

Power Factor Controller (PFC) IC for high-power factor and active harmonic filter
- IC for sinusoidal line-current consumption
- Power factor approaching 1
- Controls boost converter as an active harmonics filter
- Internal start-up with low current consumption
- Zero current detector for discontinuous operation mode
- High current totem pole gate driver
- Trimmed ±1.4% internal reference
- Undervoltage lock out with hysteresis
- Very low start-up current consumption
- Pin compatible with world standard
- Output overvoltage protection
- Current sense input with internal low pass filter
- Totem pole output with active shutdown during UVLO
- Junction temperature range -40 to +150°C
- Available in DIP-8 and SO-8 packages

TDA4863 / TDA4863-2

Power Factor Controller IC for high-power factor and low THD additional features to TDA4862
- Reduced tolerance of signal levels
- Improved light load behavior
- Open loop protection
- Current sense input with leading edge blanking LEB
- Undervoltage protection

Discontinuous Continuous Conduction Mode (DCM) Power Factor Correction IC Portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>Package</th>
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<tr>
<td>TDA4862</td>
<td>DIP-8 and SO-8</td>
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<tr>
<td>TDA4863 / TDA4863-2</td>
<td>DIP-8 and SO-8</td>
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2nd Generation Continuous Conduction Mode (CCM) Power Factor Correction IC Features

Fulfills Class D Requirements of IEC 61000-3-2
- Lowest count of external components
- Adjustable and fixed sw frequencies
- Frequency range from 20kHz to 285kHz
- Versions with brown-out protection available
- Wide input range supported

<table>
<thead>
<tr>
<th>Product</th>
<th>Frequency (kHz)</th>
<th>Current Drives</th>
<th>Package</th>
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<td>ICE2PCS05G</td>
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3rd Generation Continuous Conduction Mode (CCM) Power Factor Correction IC Features

Fulfills Class D Requirements of IEC 61000-3-2
- Fast output dynamic response during load jump
- External synchronization
- Extra low peak current limitation threshold
- SO8 and SO14
- Leadfree, RoHS compliant

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<tr>
<th>Product</th>
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<th>Current Drives</th>
<th>Features</th>
<th>Package</th>
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<td>OVP+Brown-out</td>
<td>DSO-14</td>
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<tr>
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<td>0.75A</td>
<td>Brown-out</td>
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