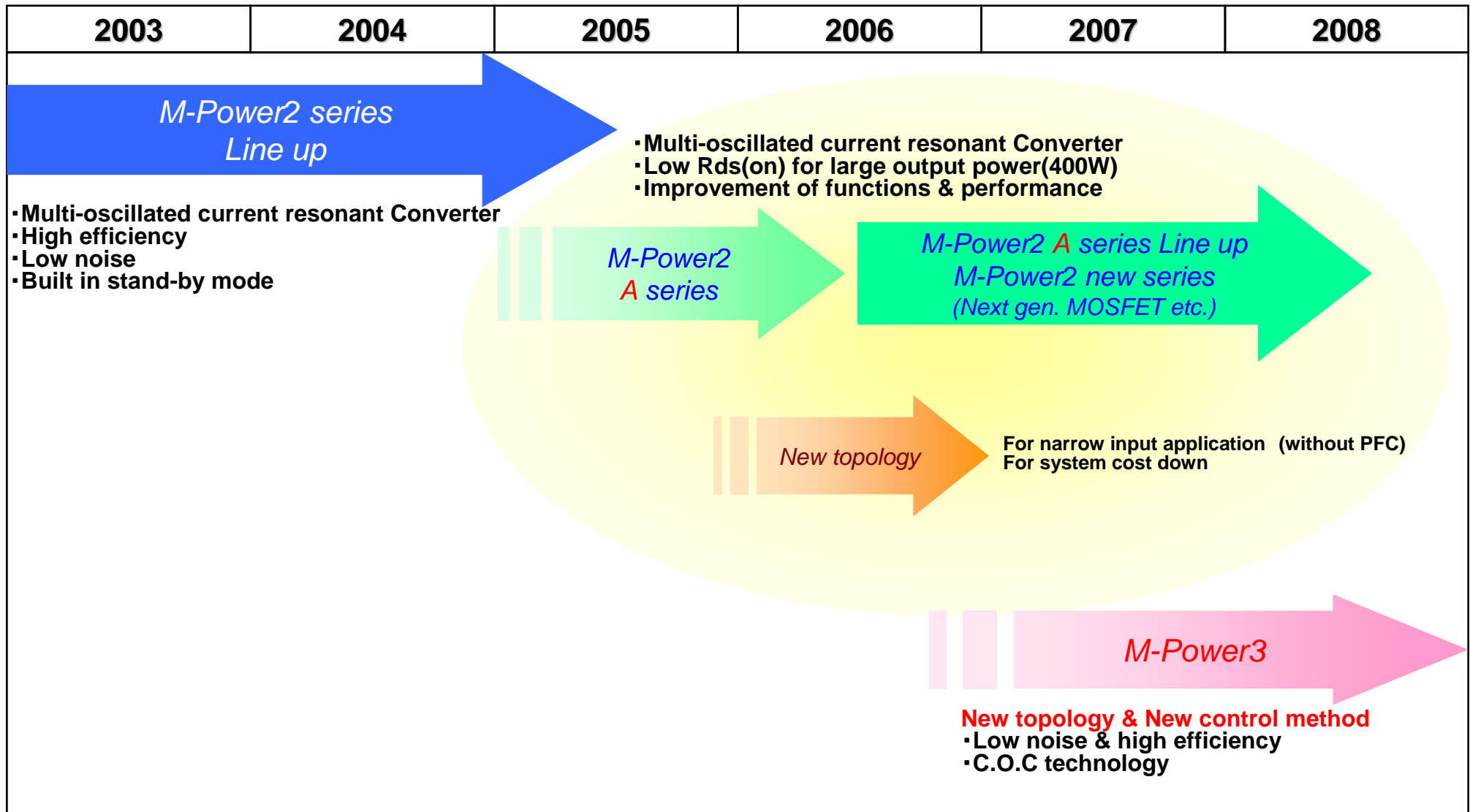


Smart power device M-Power2

Development road map of Fuji M-Power



- High efficiency (a reduction in SMPS size is possible.)
 - ◆ DC/DC : 95.3%(DC input:385V,output:24V)
 - ◆ PFC+DC/DC : 88.4%(AC100V),90.7%(AC200V)

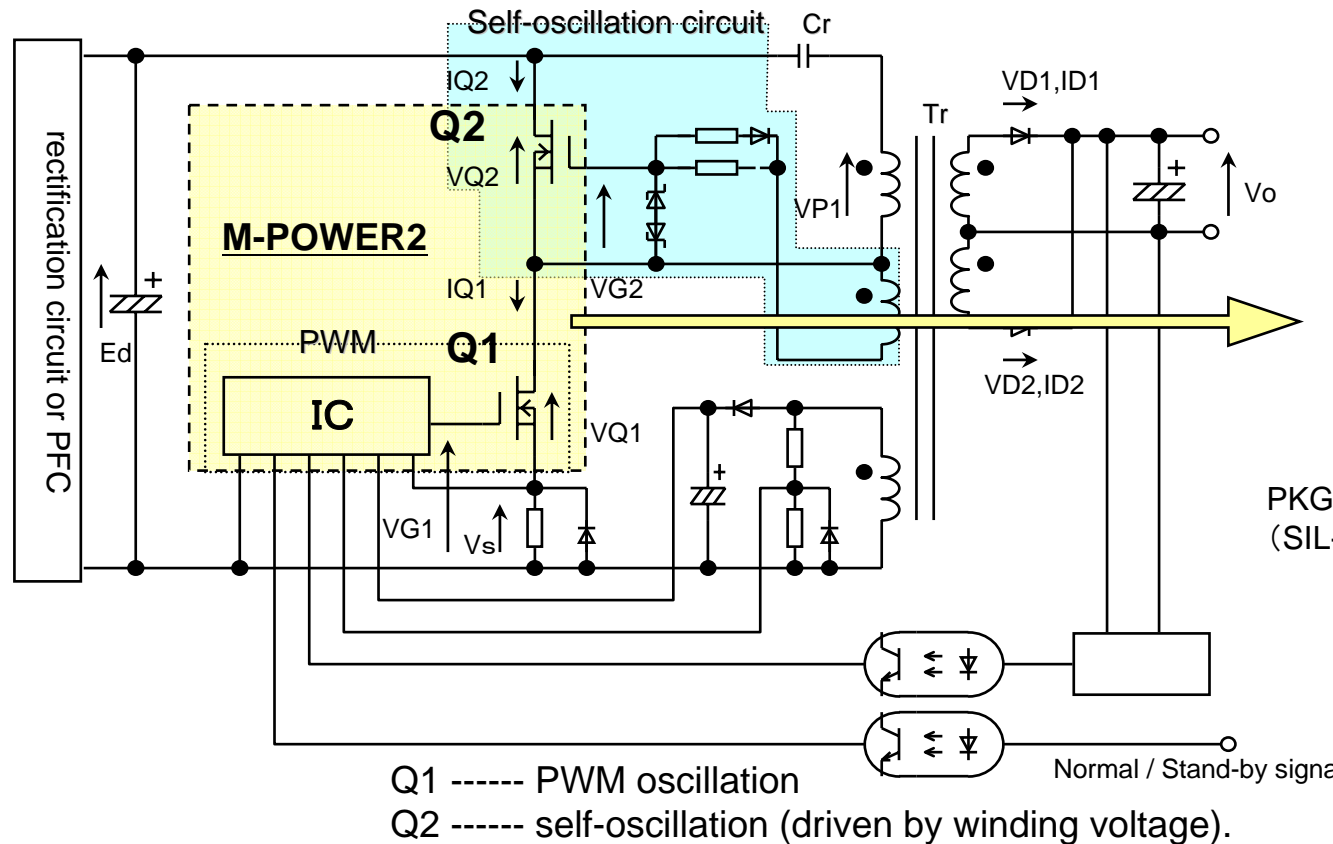
- Low noise (a reduction in the noise suppression parts is possible.)
 - MOSFETs:
 - ◆ Turn-on : ZVS+ZCS
 - ◆ Turn-off : ZVS
 - Diodes (secondary side)
 - ◆ Surge voltage does not occur at reverse recovery.

- Fail-safety (Built in protection functions : OC, SC, OV, Tj(OH))

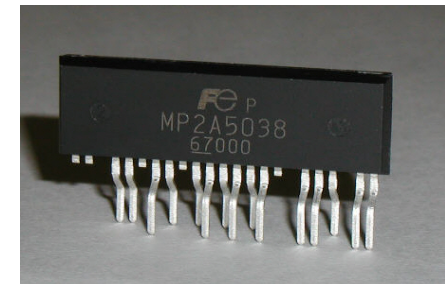
- Easy design power supply (Reduction of design time)

- Stand-by mode (A series: External, Conventional series: Built in)
 - ◆ Pin<0.4W at Pout=0.0W
 - ◆ Pin<1.0W at Pout=0.23W
 - ◆ Pin<4.0W at Pout=2.0W

Multi-oscillated current resonant circuit (MOCRC)



M-Power2 Aseries



PKG: H:10.2mm x W:31.0mm x T:3.5mm
 (SIL-7Pin)

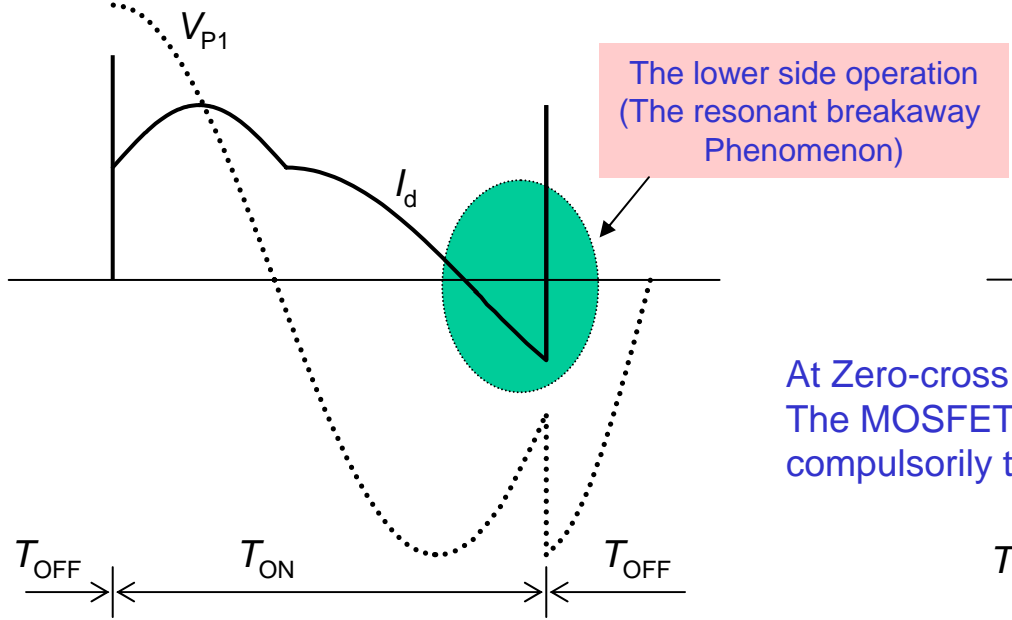
Features of the Multi-oscillated current resonant

- 1) No arm-short circuit by No lower side operation (No resonant breakaway phenomenon) → Easy to design
- 2) Low noise & high efficiency (at light load too) → same as conventional PFM type or more

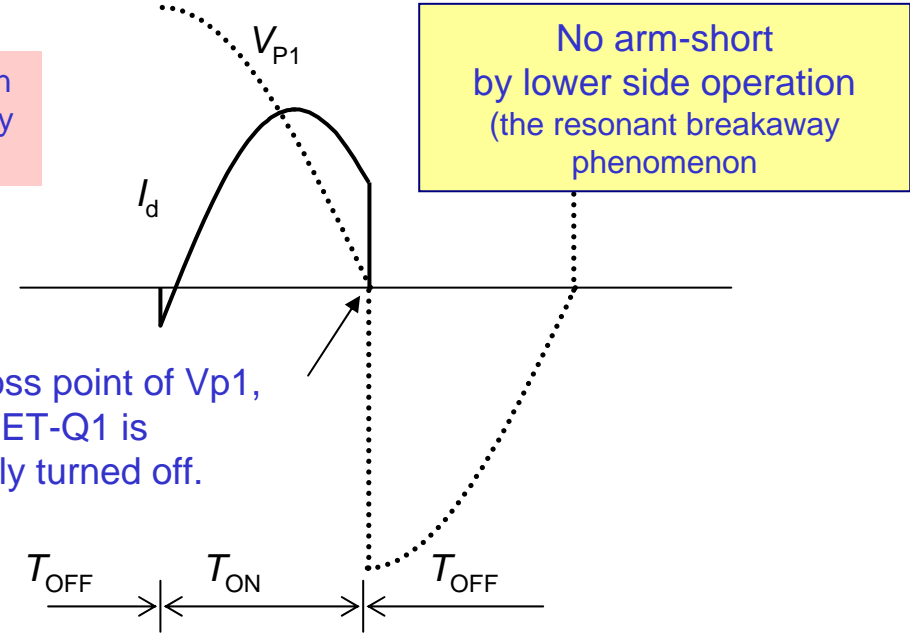
Comparison of conventional PFM type and multi-oscillated type(M-Power2)

| | Conventional PFM type | Multi-oscillated type (M-Power2) |
|-----------------------|-----------------------|-----------------------------------|
| Circuit configuration | | |
| Gate Driving | HVIC | LVIC + Trans. winding (high side) |
| Control method | PFM (Fixed Duty:50%) | PWM + PFM (variable Duty) |
| MOSFET Vds | >500V | >500V |
| Efficiency (DC/DC) | >92-93% | >93-95% |
| Noise | Low | Low |
| Loss at no load | >3W | < 0.4W |
| Size | ○ | ◎ (Built-in standby mode) |
| Design | Difficult | Easy to do fail-safety design |

Conventional PFM type current resonant converter



M-Power2(Multi-oscillated type)

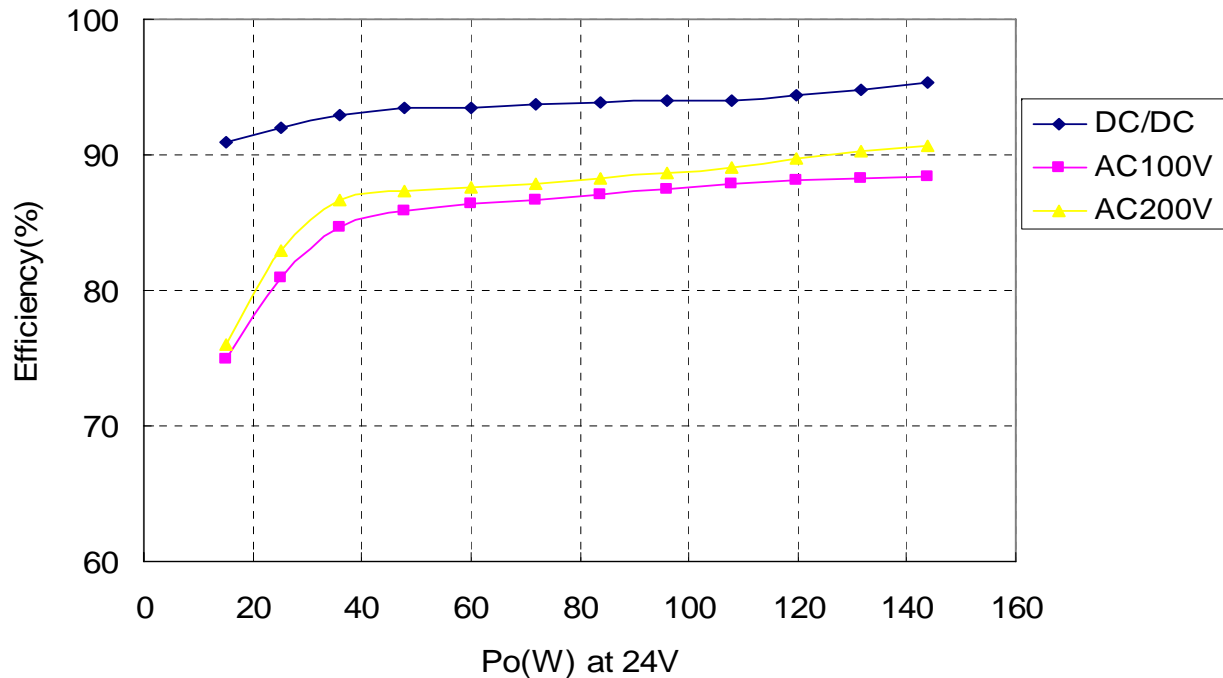


At Zero-cross point of Vp1, The MOSFET-Q1 is compulsorily turned off.

There is a possibility that the lower side operation **(the resonant breakaway phenomenon)** happens. In the condition of a low input voltage and the overload, when the drain current of Low side MOSFET(Q1) becomes minus, Upper-side MOSFET(Q2) turn on and body diode of Q1 operates high – di/dt reverse recovery and the arm-short happens. In the worst case, **MOSFET(Q1) is destroyed.**

M-Power2 always detects winding voltage(Vp3) and has the function of turning off MOSFET(Q1) at Zero-cross point of Vp3(Vp1). The phase of the voltage is later for that of the current (about 90deg.). So the drain current of Low side MOSFET(Q1) is always plus and **the lower side operation (resonant breakaway phenomenon) never happen.**
It is easy to do fail-safety design.

High efficiency



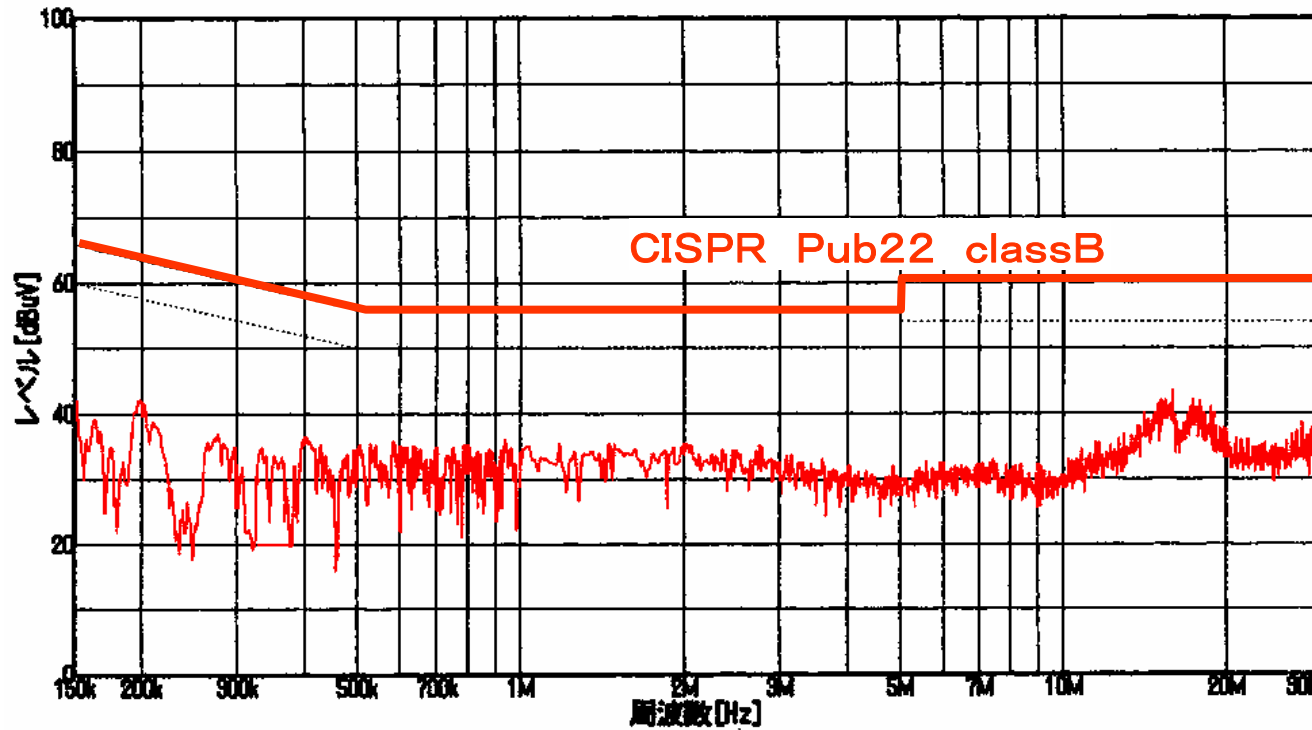
DC/DC : 95.3%
(DC input:385V,output:24V)

PFC+DC/DC:88.4%(AC100V)
90.7%(AC200V)

Efficiency - Load characteristic at normal mode

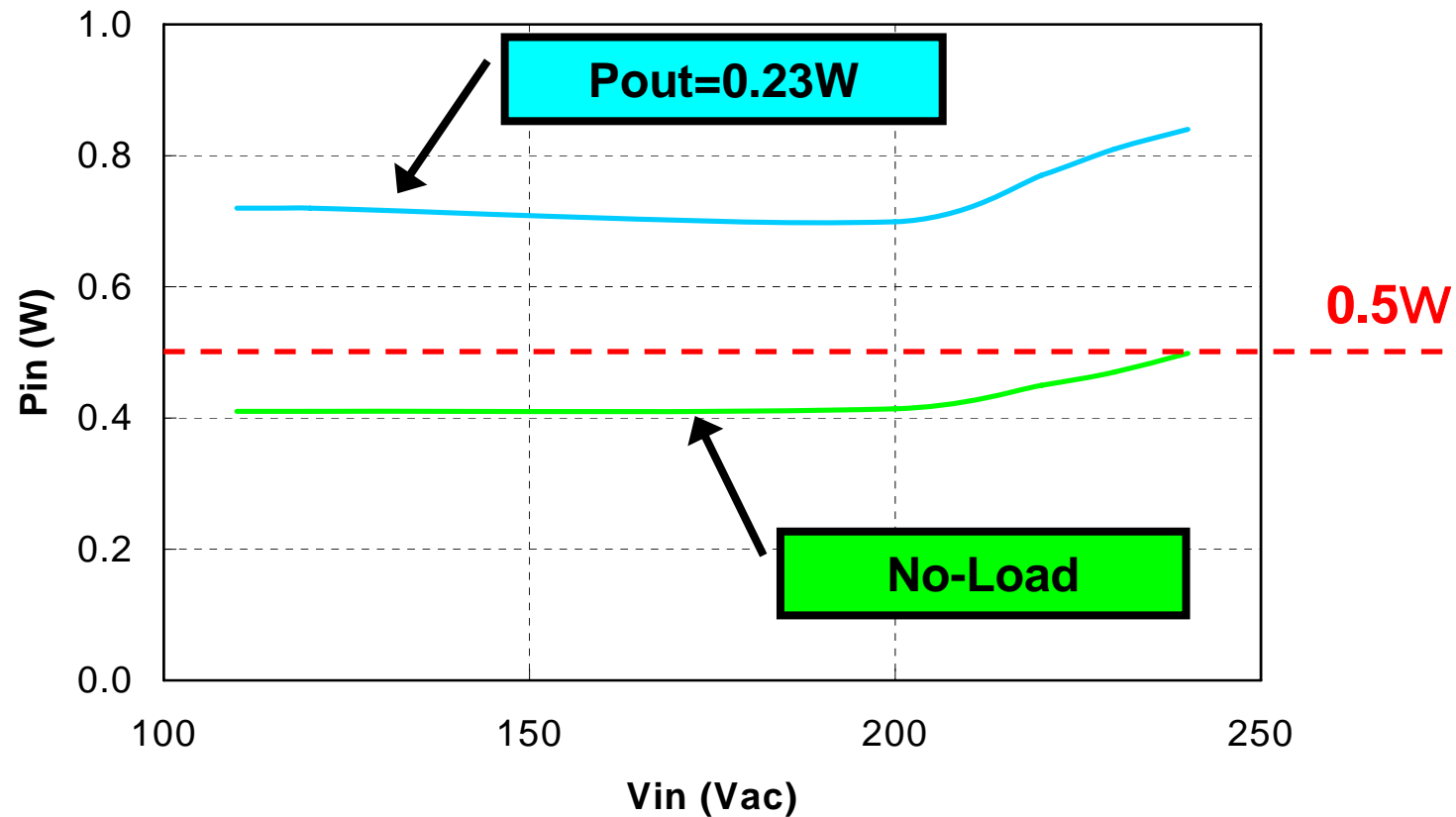
Down size your SMPS

Conducted Emission



Input Power at Stand-by (with PFC)

- ◆ Input power is less than 0.9W at the output power is 0.23W (5V/46mA).
- ◆ Input power is less than 0.5W at the No-load.



◆ Line up of M-Power2 A series

| Type name | MOSFET(Q1) | | MOSFET(Q2) | | Control IC | | Sample |
|-----------|-----------------|---------------------|-----------------|---------------------|---------------------|--------------------|-----------|
| | V _{DS} | R _{DS(ON)} | V _{DS} | R _{DS(ON)} | V _{CC(ON)} | T _{j(OH)} | |
| MP2A5038 | 500V | 0.38Ω | 500V | 0.38Ω | 16.5V | 125 ~ 150 °C | M/P |
| MP2A5060 | 500V | 0.6Ω | 500V | 0.6Ω | | | M/P |
| MP2A5077 | 500V | 0.77Ω | 500V | 0.77Ω | | | Apr.-2007 |
| MP2A5100 | 500V | 1Ω | 500V | 1Ω | | | May-07 |
| MP2A5135 | 500V | 1.35Ω | 500V | 1.35Ω | | | May-07 |
| MP2A2010 | 250V | 0.1Ω | 250V | 0.1Ω | | | Apr.-2007 |
| MP2A2013 | 250V | 0.125Ω | 250V | 0.125Ω | | | Apr.-2007 |

◆ Line up of M-Power2 (Conventional series)

| Type name | MOSFET(Q1) | | MOSFET(Q2) | | Control IC | | Sample |
|-----------|-----------------|---------------------|-----------------|---------------------|---------------------|--------------------|--------|
| | V _{DS} | R _{DS(ON)} | V _{DS} | R _{DS(ON)} | V _{CC(ON)} | T _{j(OH)} | |
| F9220L | 500V | 0.93Ω | 500V | 0.93Ω | 16.5V | 125 ~ 150 °C | M/P |
| F9222L | 500V | 0.6Ω | 500V | 0.6Ω | | | M/P |
| F9223L | 500V | 0.5Ω | 500V | 0.5Ω | | | M/P |
| F9231L | 250 | 0.125Ω | 250V | 0.125Ω | | | M/P |

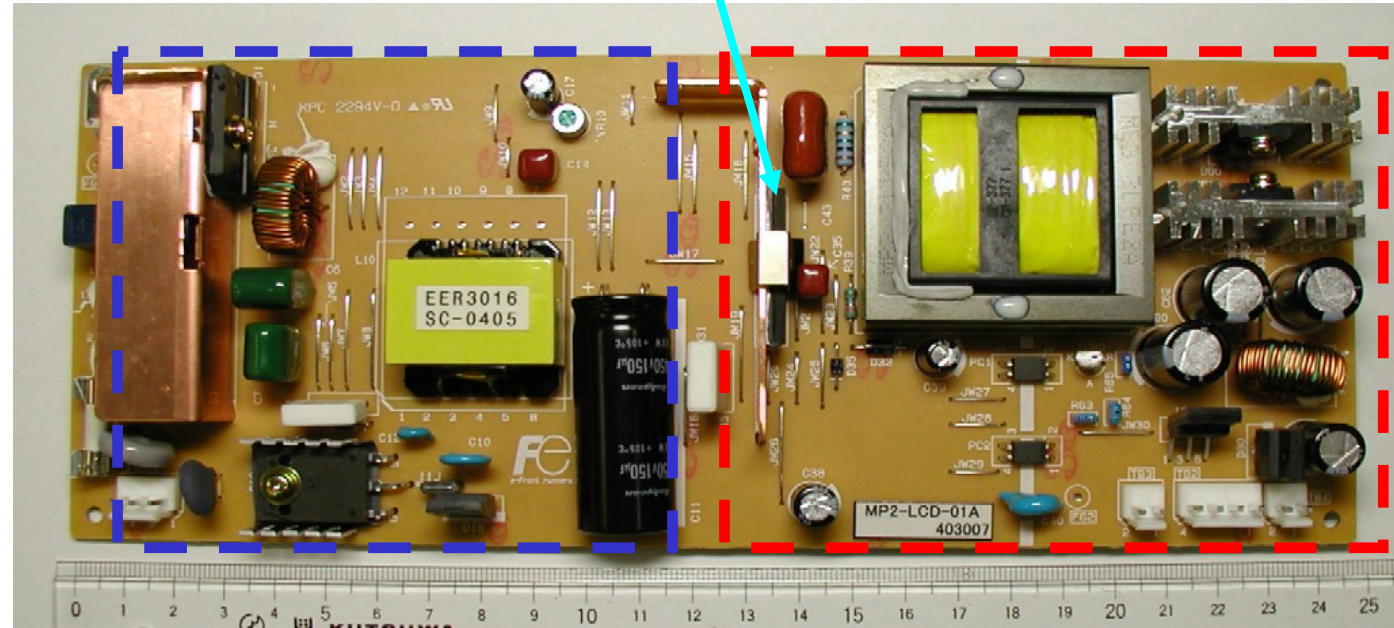
M-Power2

Spec.

Input: AC90~264V
Output: 150W
24V/6A
5V/1.2A

Outline

W: 246mm
D: 100mm
H: 20mm



PFC circuit (CDM)

Multi-oscillated current resonant converter

