

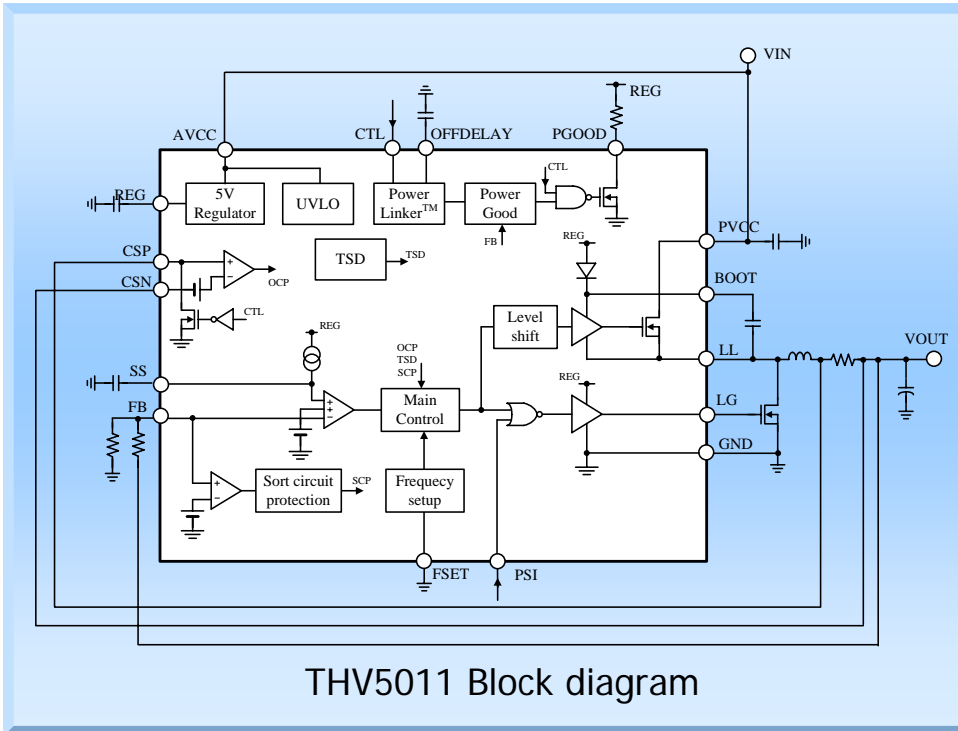
# DC/DC THV501x Series

**Super Quick Response  
Transphase™  
Synchronous/On Time Constant Architecture  
Switching Regulator IC**

THine Electronics., Inc.

Apr. 2007

# THV501x Series feature

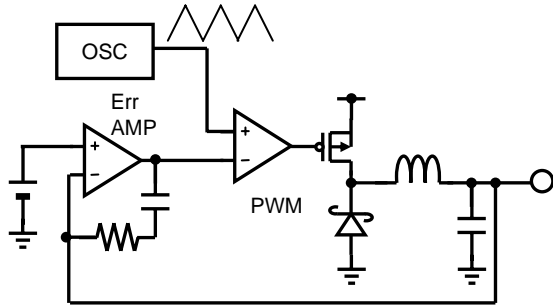


1) **THine original Architecture**  
 → **Very accurate output**  
 by super quick transient response.  
 → **Stable Frequency , not like other**  
 “On Time Constant” architecture.

2) **External parts reduction**  
 → **Total cost merit**  
 → **Mounting space advantage**

3) **Sufficient safety protection**  
 → **High reliability against abnormal condition**

# DC/DC converter architectures

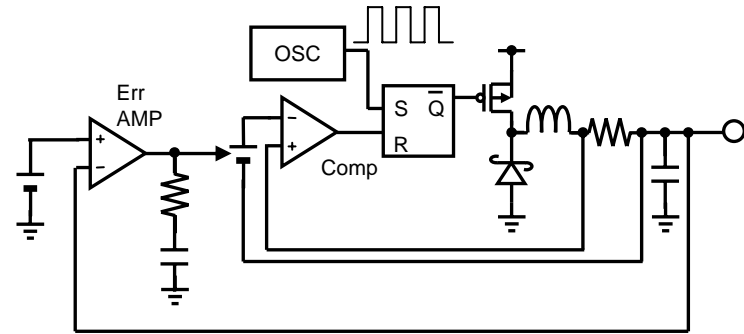


**Voltage mode**

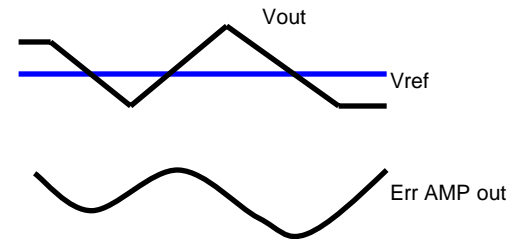
- ✓ **Stable Frequency with internal oscillator.**
- ✓ **Response delays due to latency of error amp, results the necessity of complicated phase compensation and big capacitor**



Output voltage accuracy need improvement for low voltage with big current load. (ex. TV engine IC 1.2V -1.8V)



**Current mode**

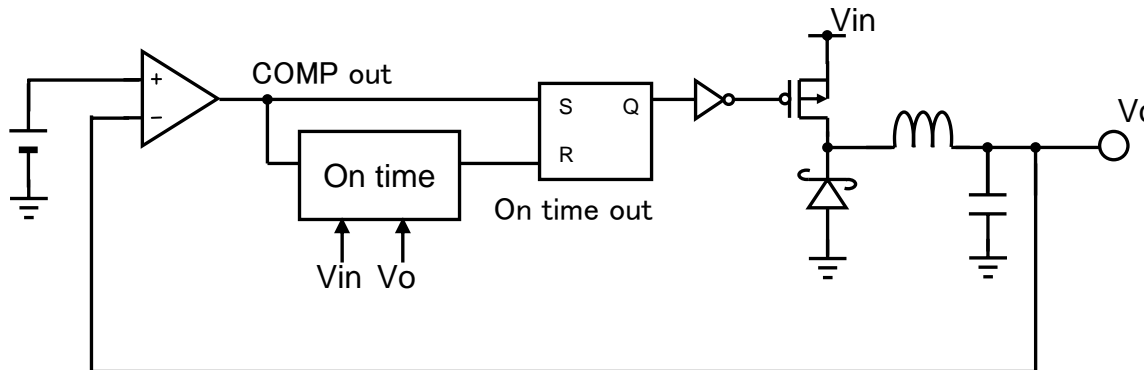


For 1.2V core device : +/-0.1V

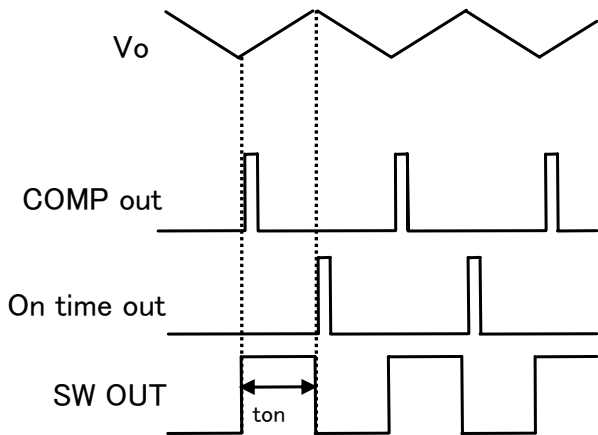
1.5V core device: +/- 10%(+/-0.15V)

1.8V core device: +/- 10%(+/-0.18V)

# DC/DC converter architectures



## On time Constant mode



- ✦ Directly compared Feed back voltage
- ✦ Immediate “On pulse” / “Off pulse” out put
- ✦ “On pulse” generated by  $V_{in}/V_{out}$  calculation



### ✓ Super Quick Response

For 1.2V core device : +/-0.1V

1.5V core device: +/- 10%(+/-0.15V)

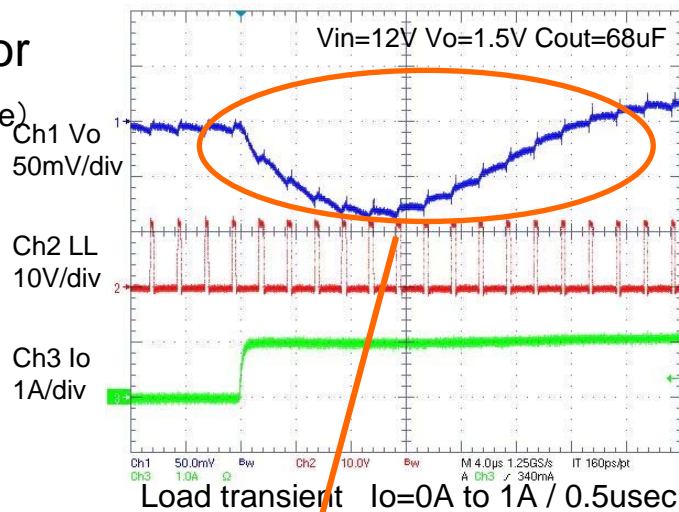
1.8V core device: +/- 10%(+/-0.18V)

**Smaller output capacitor can be used.**

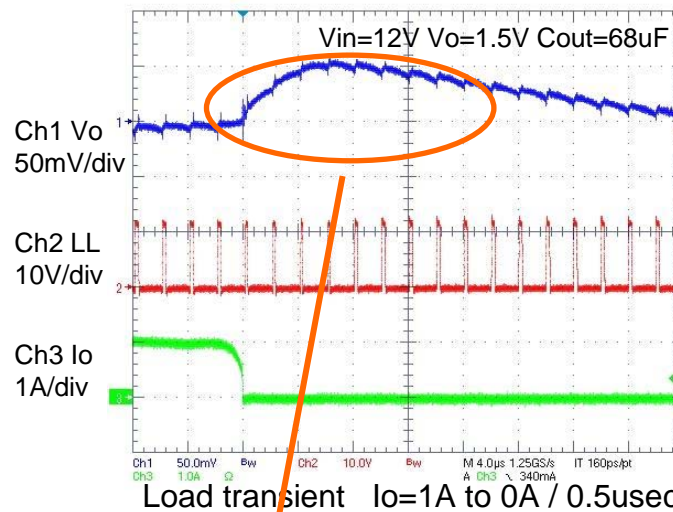
# Transient Response comparison

## Competitor

(Current mode)



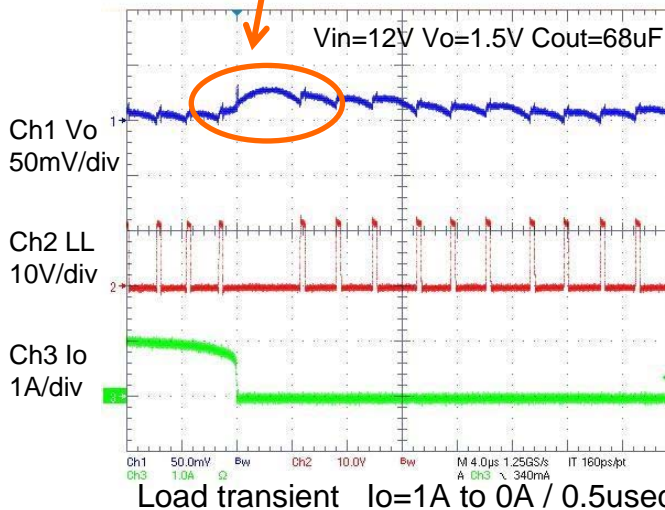
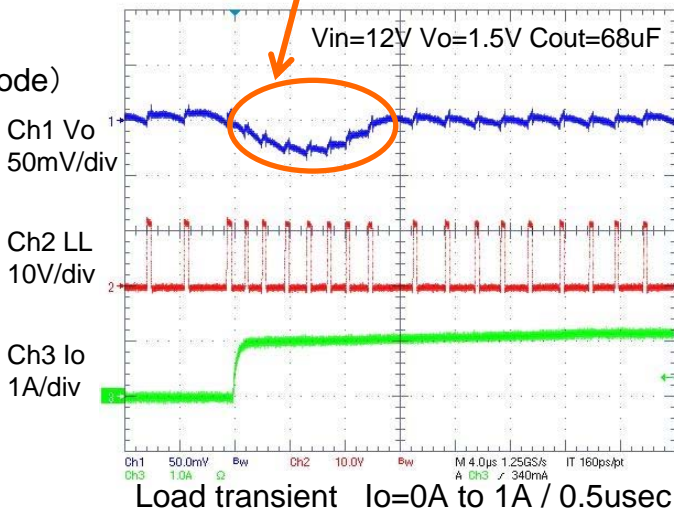
**Light > Heavy Load**



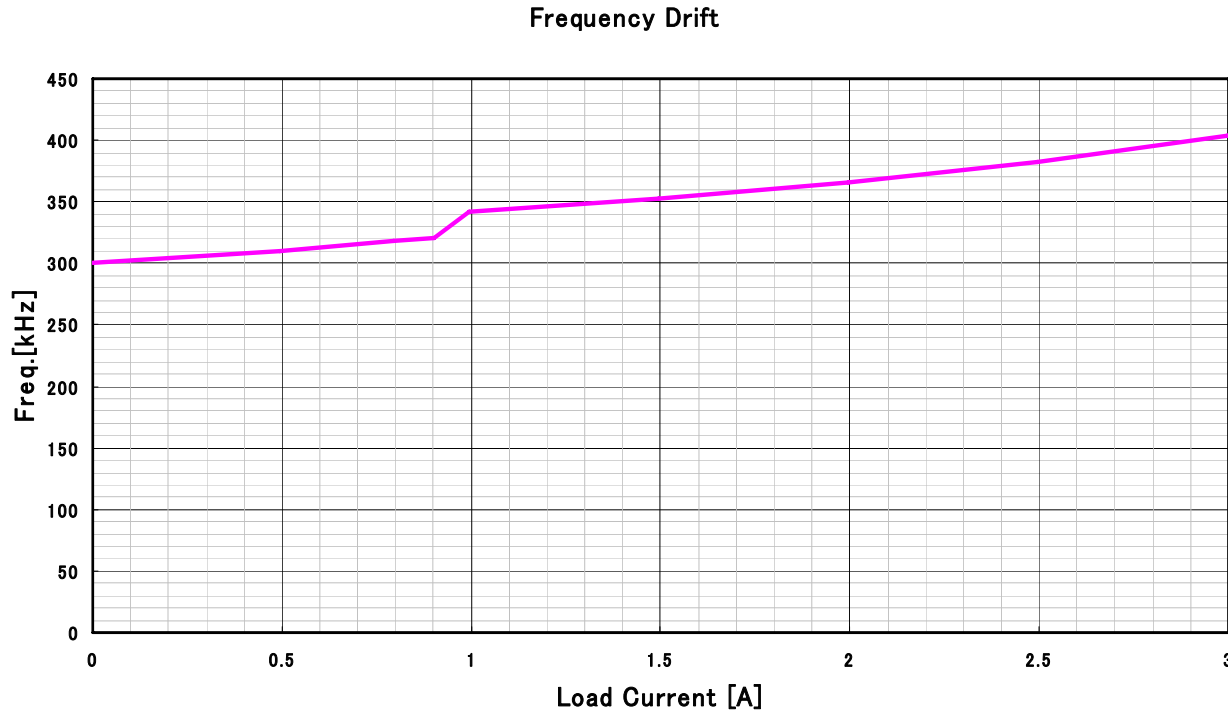
**Heavy > Light Load**

## THV5011

(Synchronous mode)

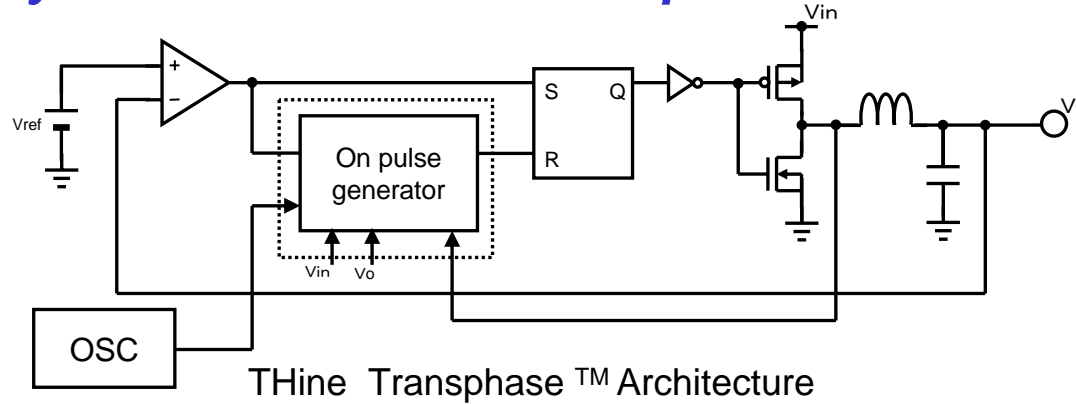


# Frequency Drift problem on ordinary "On Time Constant" mode

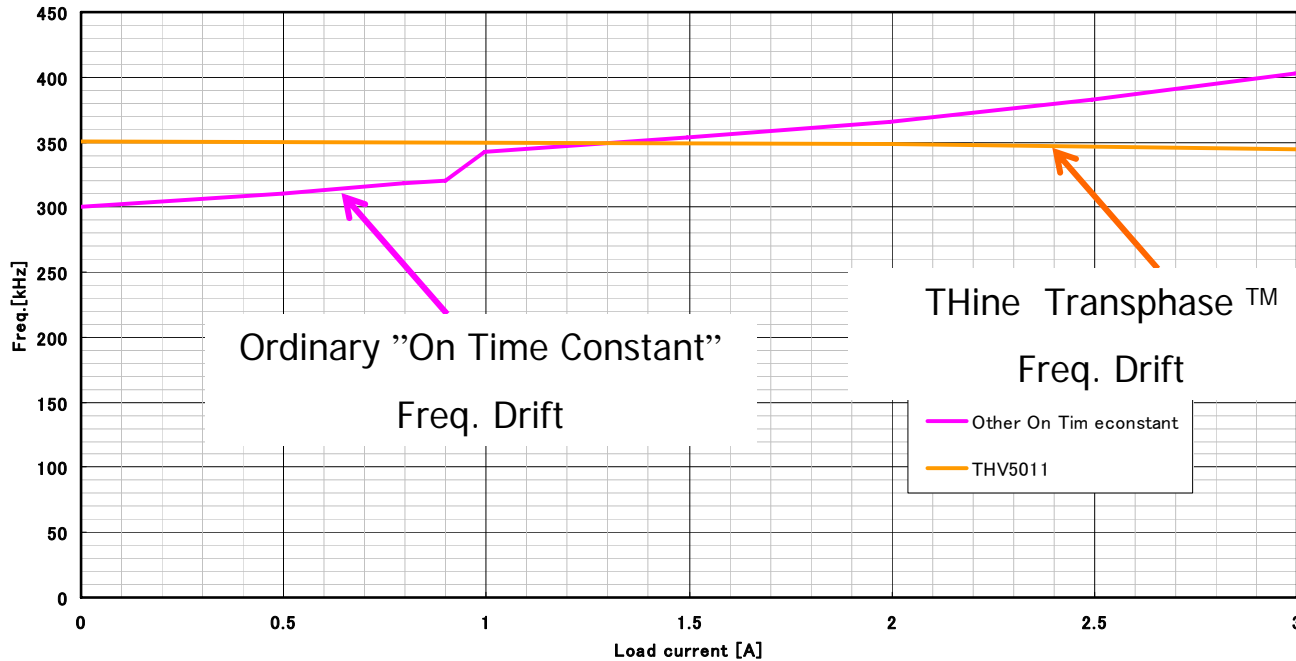


- ✓ Out put Ripple voltage shift
- ✓ Inductor current shift
- ✓ EMI, affect to other devices

# No Frequency Drift on THV501x Transphase™ Architecture



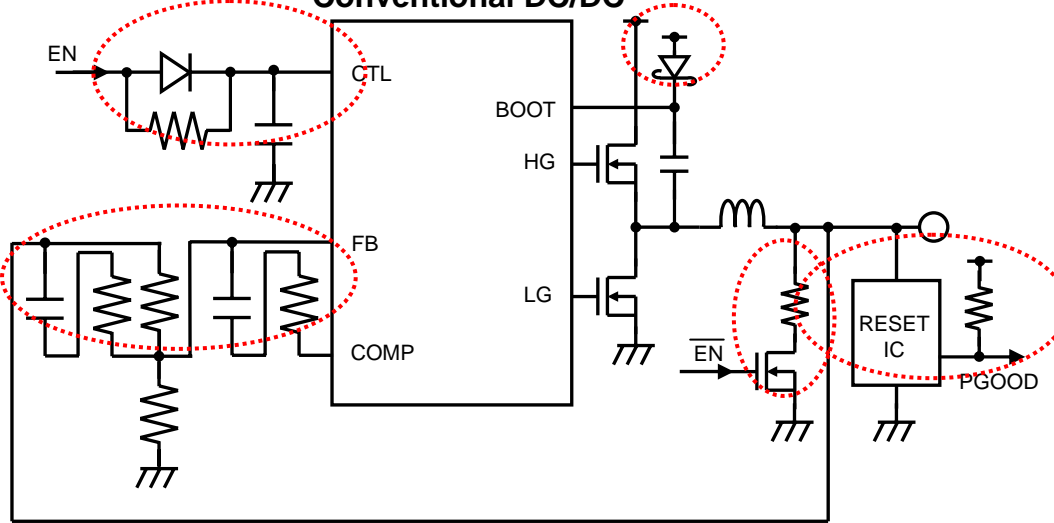
Frequency Drift



# External parts reduction on actual application



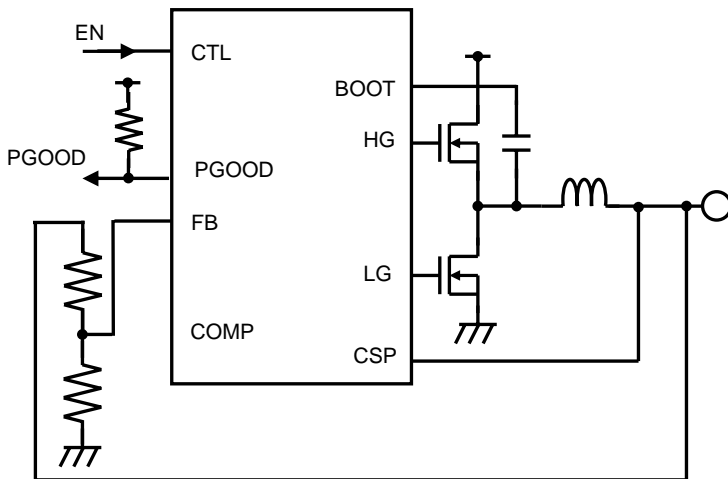
### Conventional DC/DC



### Conventional DC/DC

- Complicated phase compensation
- Output discharge
- Diode for Boot strap
- External parts for Sequence

### THV501x

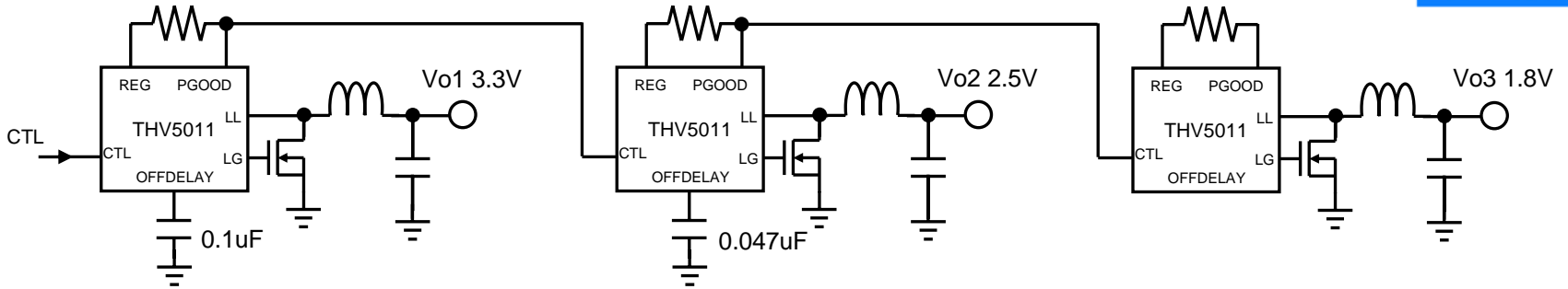


### THV5011 series

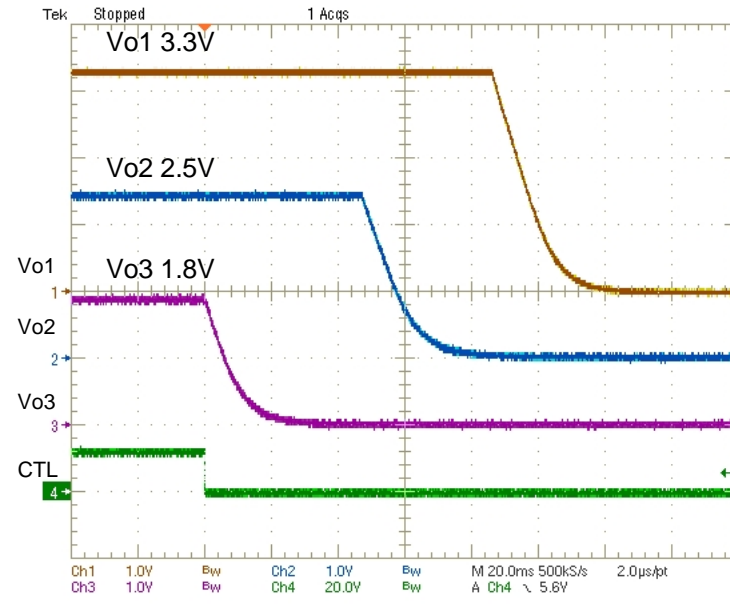
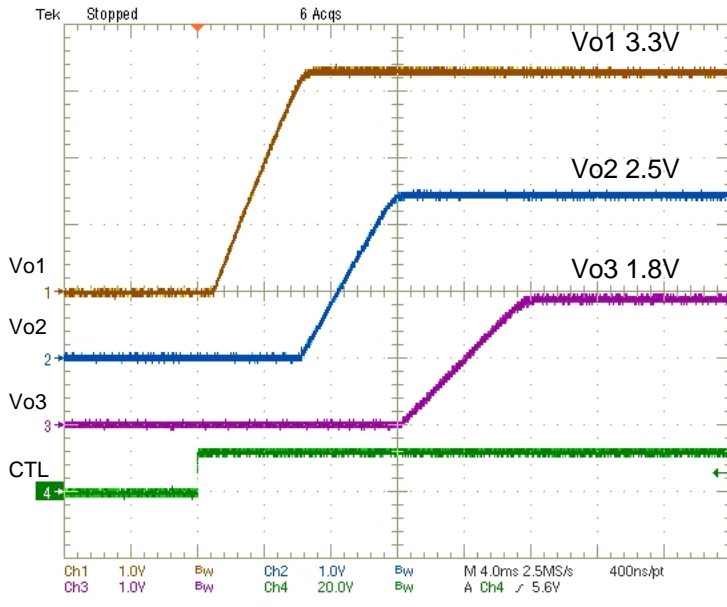
- No phase compensation necessary
- Output discharge function
- Build in Diode for Boot strap
- P\_Good / Off Delay function



# THV5011 Power ON/OFF sequence



- ✧ Connect P\_GOOD to CTL of the next sequence IC (“On Sequence”)
- ✧ Set the capacitance of Off Delay on each chain connected IC.(“Off Sequence”)



# *THV501x series safety protection*

**1) *Over current protection***

*→ Pulse by pulse detection with sense resistor*

**2) *Short circuit protection***

*→ Shutdown after 4.1msec.continuous short circuit  
(Vfeedback < 0.75Vref.)*

**3) *Thermal shutdown***

*→ Detect  $T_j > 150^\circ\text{C}$*

**4) *UVLO***

*→ Stop operation when Vcc drops under UVLO voltage*

**5) *Soft start setting***

*→ Preferable soft start curve setting*

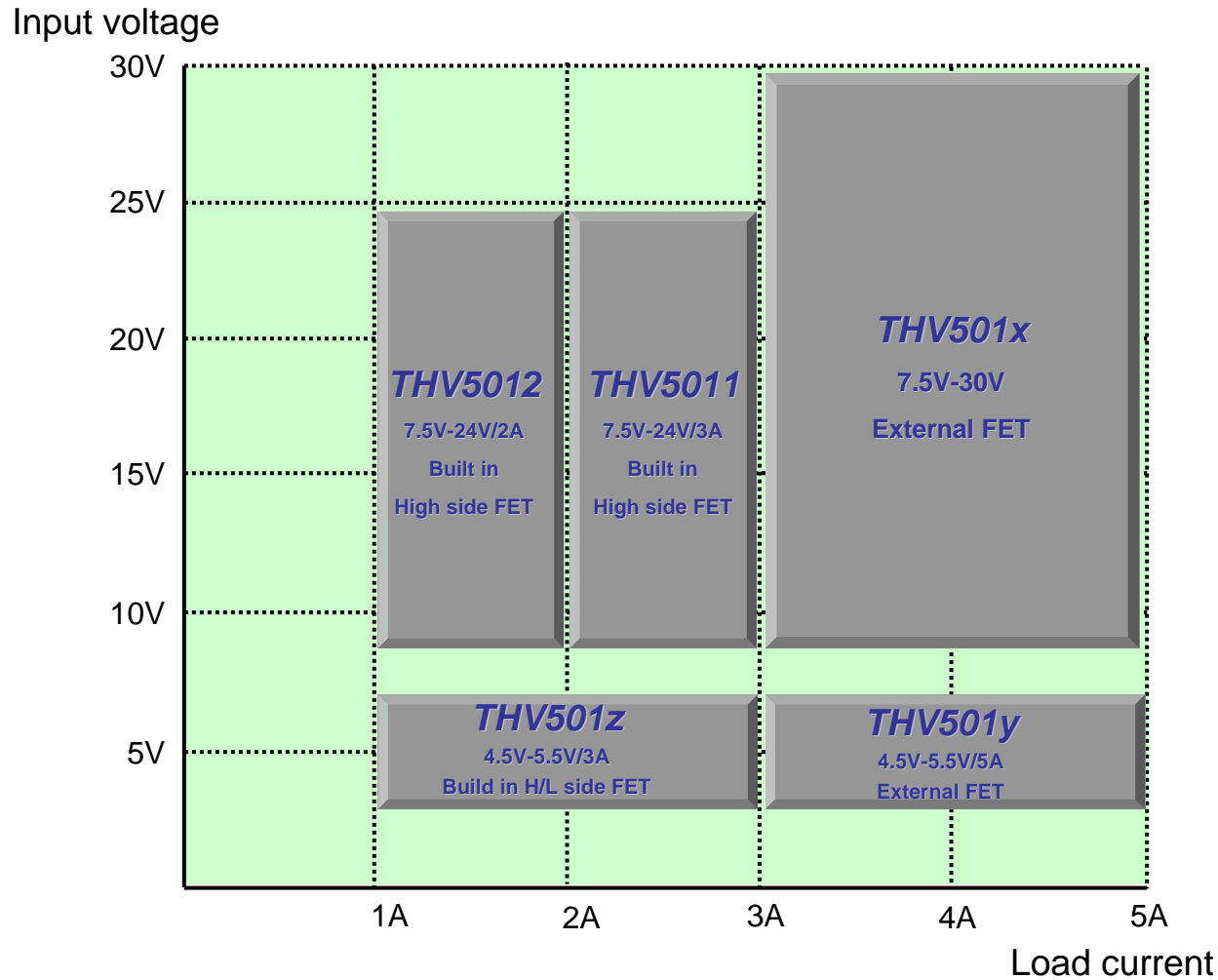
*→ Avoid rush current and over shooting*

## THV501x Series line up

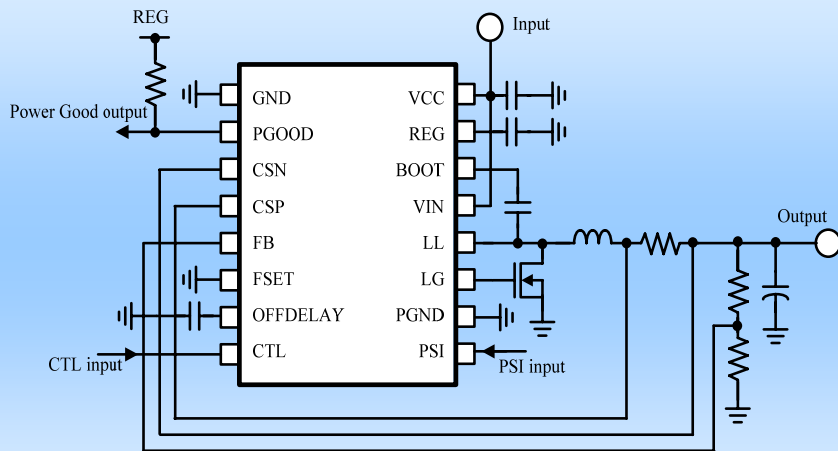
	<i>FET</i>	<i>Input (V<sub>9</sub>)</i>	<i>Output (V)</i>	<i>Operation Freq.</i>	<i>Sample</i>
<u><i>THV5011</i></u>	<i>3A</i>	<i>7.5-25V</i>	<i>1.0V to 3.8V</i>	<i>350kHz/500kHz</i>	<i>Available</i>
<u><i>THV5012</i></u>	<i>2A</i>	<i>7.5-25V</i>	<i>1.0V to 3.8V</i>	<i>350kHz/500kHz</i>	<i>Available</i>
<u><i>THV501x</i></u>	<i>External</i>	<i>7.5-27V</i>	<i>1.0V to 3.8V</i>	<i>350kHz/500kHz</i>	<i>Aug./'07</i>
<u><i>THV501y</i></u>	<i>External</i>	<i>4.2-5.5V</i>	<i>1.0V to 3.3V</i>	<i>350kHz/500kHz/1MHz</i>	<i>Sep./'07</i>
<u><i>THV501z</i></u>	<i>3A</i>	<i>4.2-5.5V</i>	<i>1.0V to 3.3V</i>	<i>350kHz/500kHz/1MHz</i>	<i>Oct./'07</i>

PKG : TSSOP 16 pins ( with no Exposed Pad)

# THV501x series segmentation



# THV5011 / THV5012 Feature



Application circuit example

## Merit of Built in High side FET

- High efficiency with small space
- External Low side : Low Ron loss
- Built in High side : Low Gate loss
- Thermal shutdown on High side FET

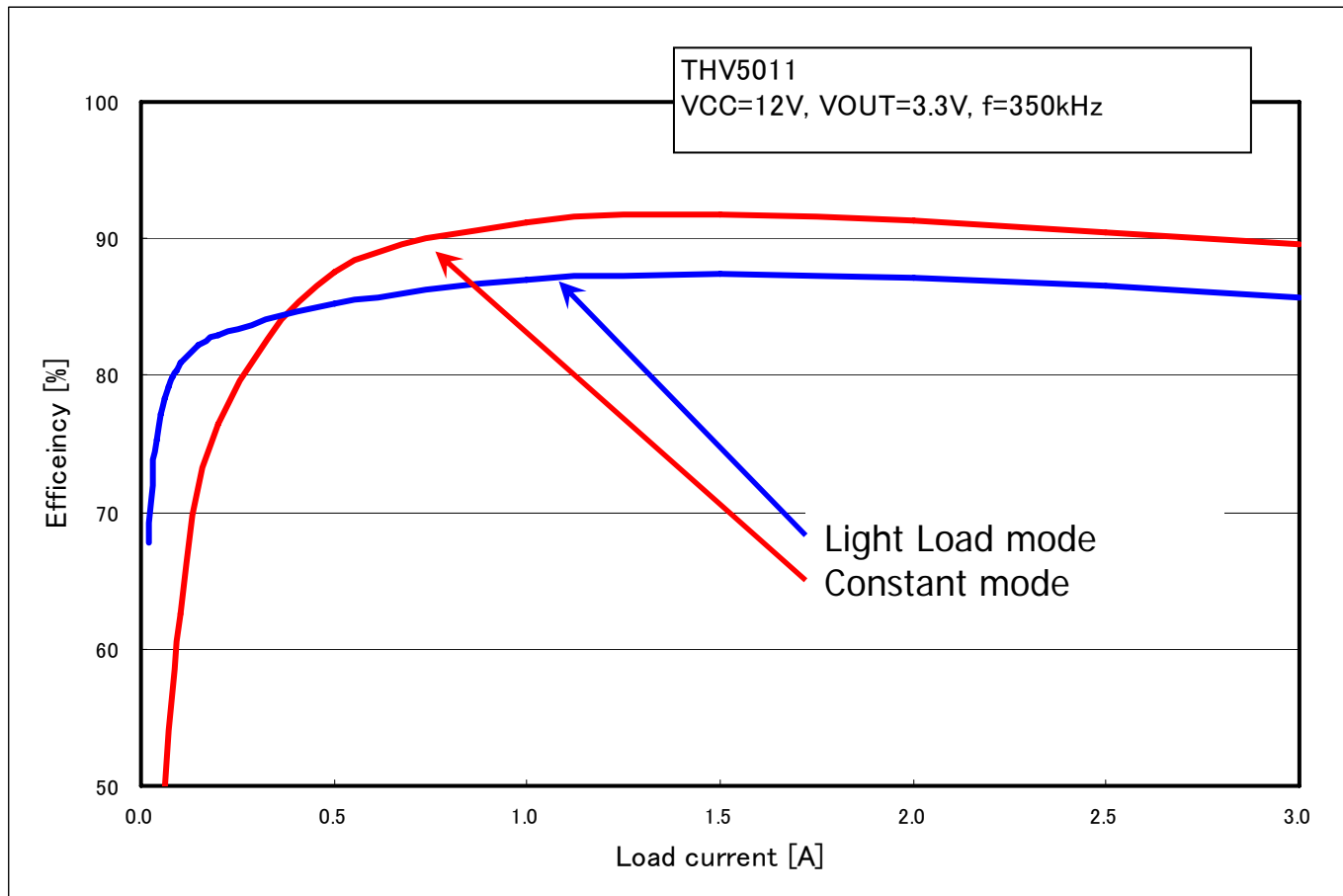
## Light Load mode / Constant mode

- High efficiency
- in wide load current range



THV5011

# THV5011 Efficiency



**High / Flat efficiency curve in the most range of load current**  
**Wide high efficiency load current range at light load mode**

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## HFSS 天线设计培训课程套装

套装包含 6 门视频课程和 1 本图书,课程从基础讲起,内容由浅入深,理论介绍和实际操作讲解相结合,全面系统的讲解了 HFSS 天线设计的全过程。是国内最全面、最专业的 HFSS 天线设计课程,可以帮助您快速学习掌握如何使用 HFSS 设计天线,让天线设计不再难...

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- ※ 经验丰富的一线资深工程师讲授,结合实际工程案例,直观、实用、易学

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