



# **Under 100mW Standby Power Solution (GR8830/8876A/8874)**

2010/01/15

## GR8830 Package

- Sot23-6 and DIP8 package
- High efficiency
- Lower standby power



### Pinning

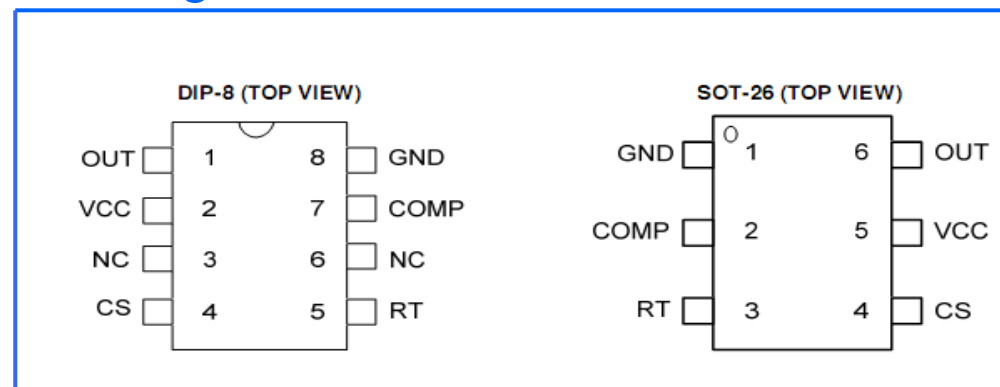


Table 1 Pin description

Pin No.	Nam	Function
1	GND	Ground
2	COMP	Voltage feedback pin, by connecting a photo-coupler to control the Duty cycle
3	RT	this resistor determine the switching frequency
4	CS	Current sense pin ,connect to sense the MOSFET current
5	VCC	Power supply pin
6`	OUT	The output driver for driving the external MOSFET

## GR8830 Key Features

### Features

- Very low startup current
- Under 0.1w standby power (without changing layout)
- Jittering for reducing conduction
- Soft driving for reducing radiation interference
- Non-audible-noise green mode control
- Programmable switching frequency
- Internal soft start
- Internal slope compensation
- Over voltage protection (OVP) on VCC pin
- Over load protection (OLP)
- Over current protection (OCP) on CS pin
- Over temperature protection (OTP) on chip

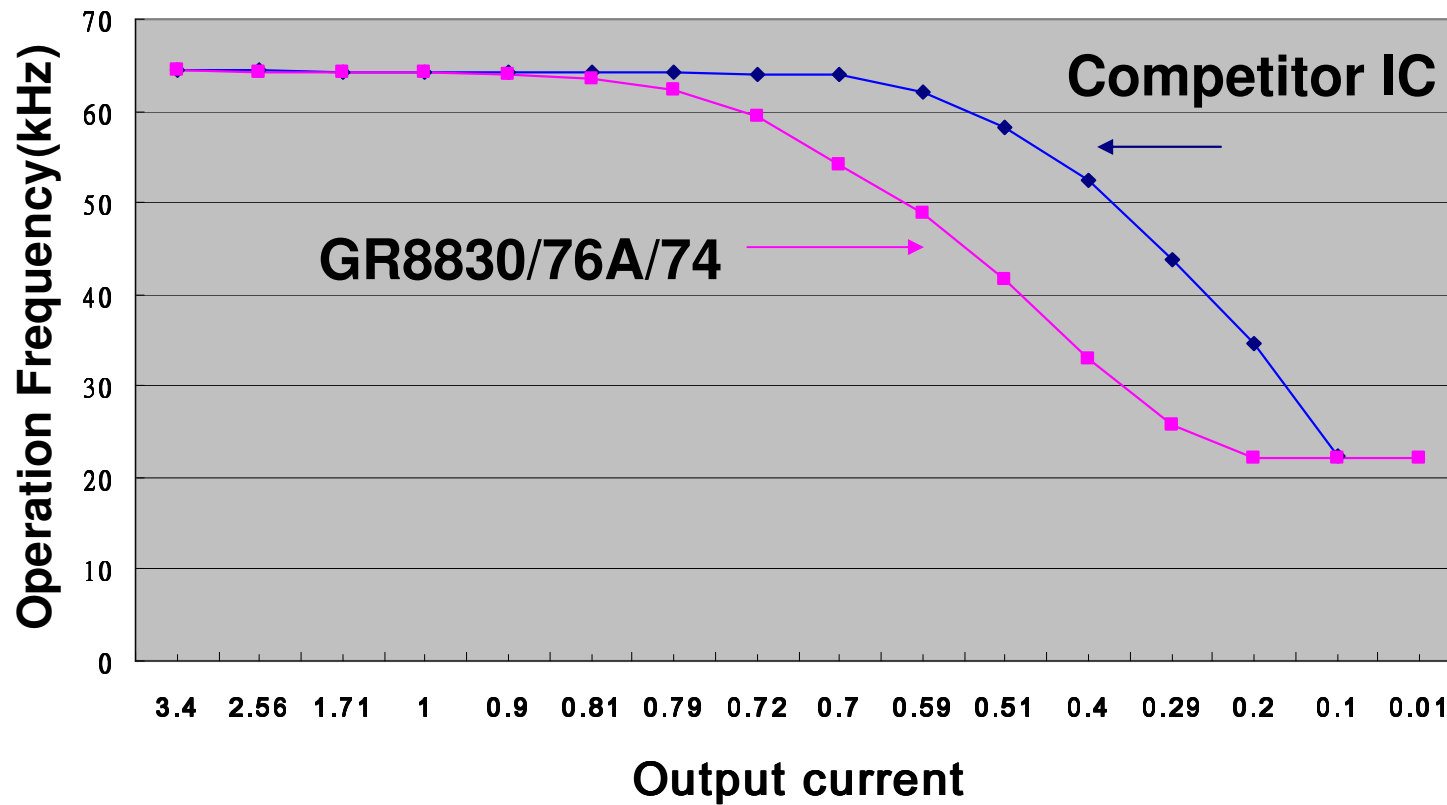
## GR8830 Application field

Typical application market: Adapter, LCD monitor, Set-top box ,  
E-PC and ATX standby power

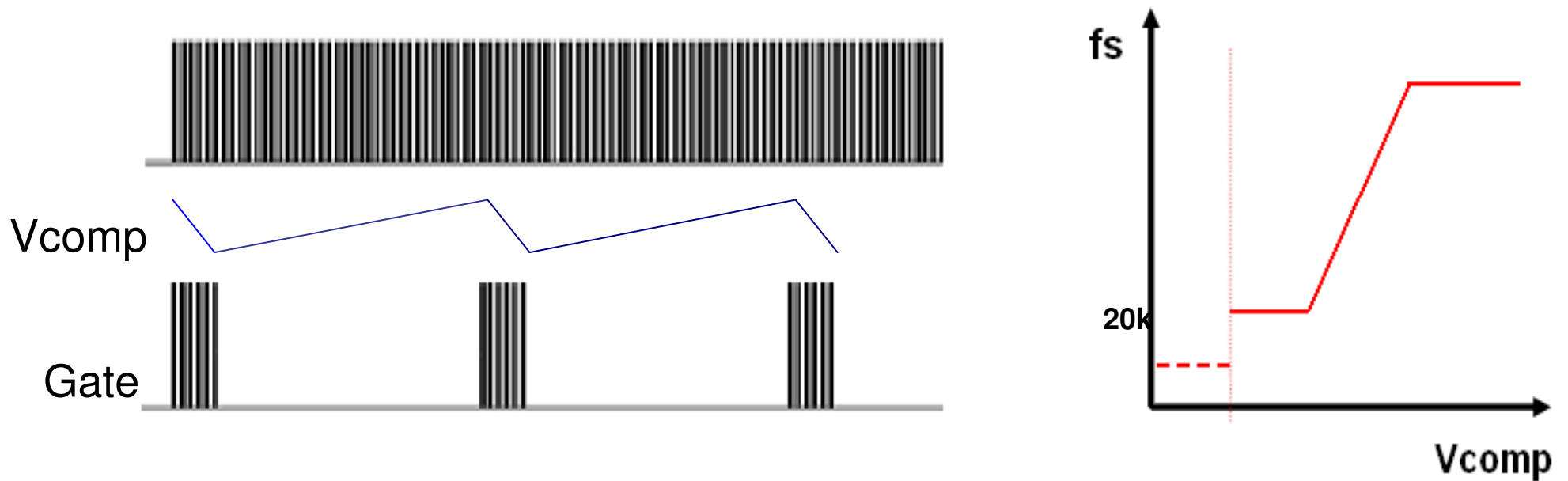


# Green mode for high efficiency

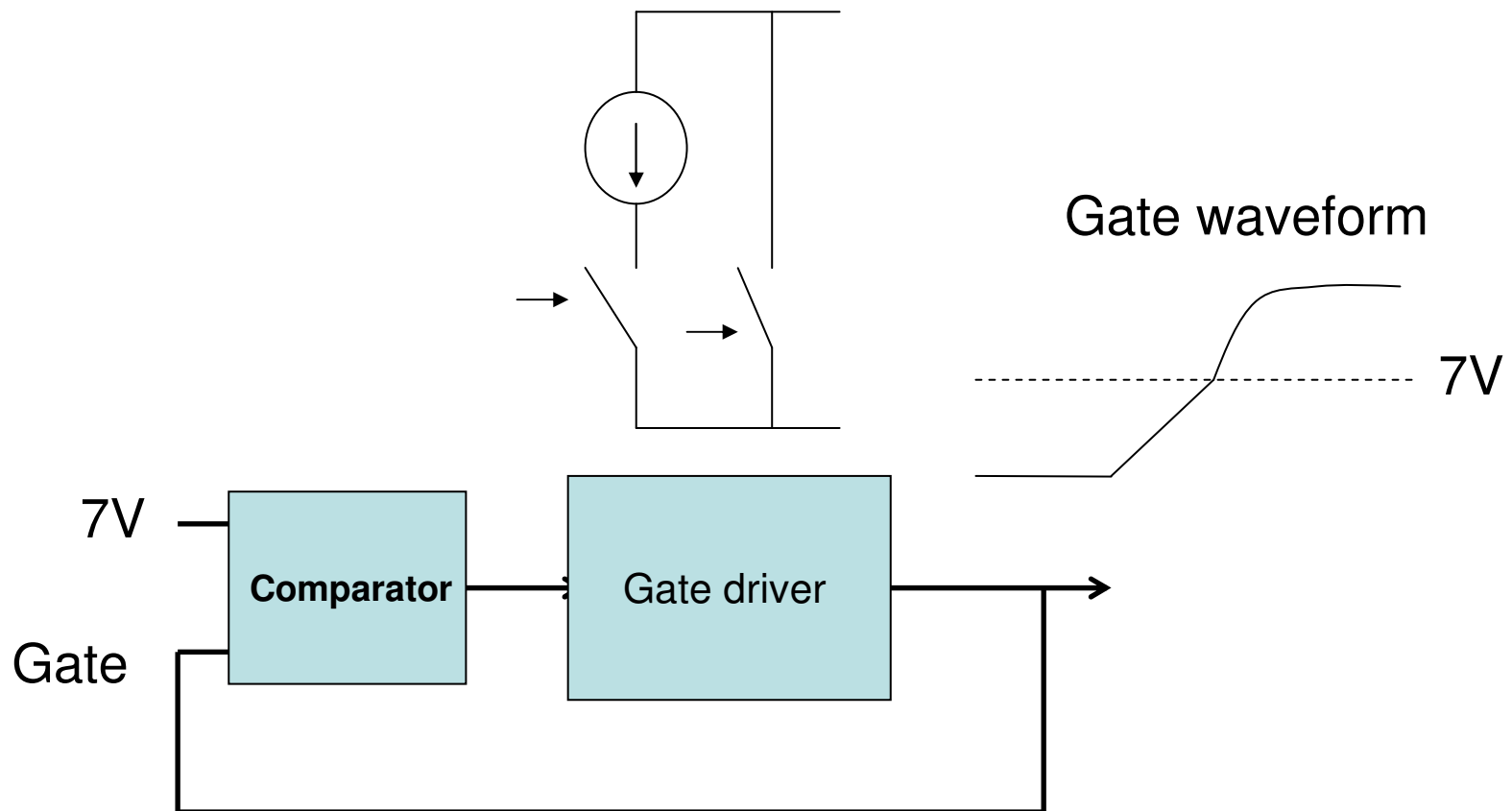
## Green mode



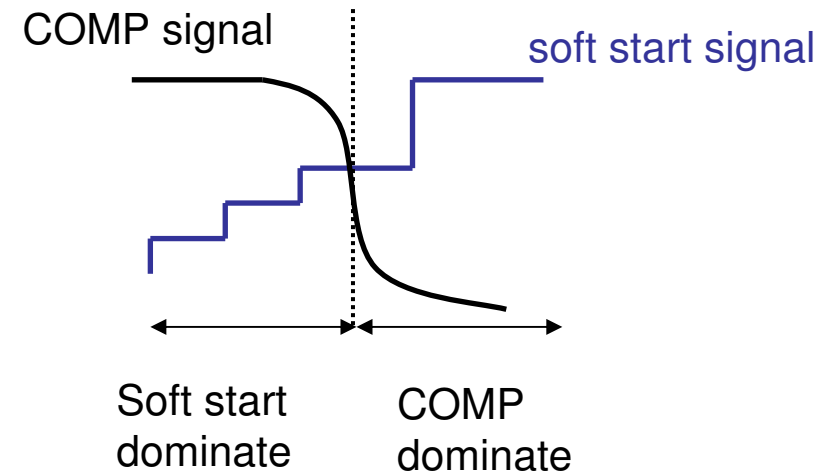
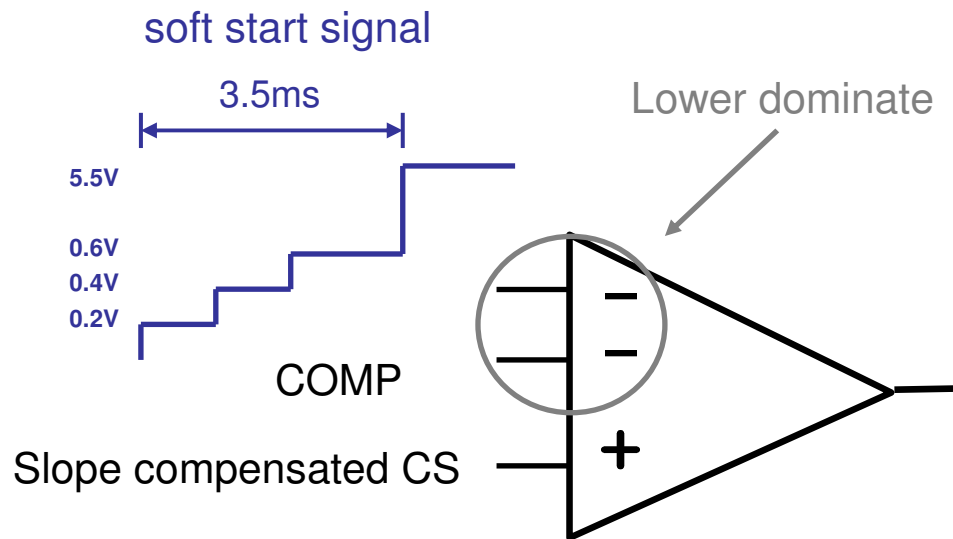
# Burst mode for reducing power consumption



## Soft driving for reducing radiation



# Soft start



Soft start period ~ 3.5ms



## GR8830 High-efficiency

CEC Level 5 =  $0.0626\ln(P_o)+0.622=80.3\%$

GR8830 test condition=12v/1.5A

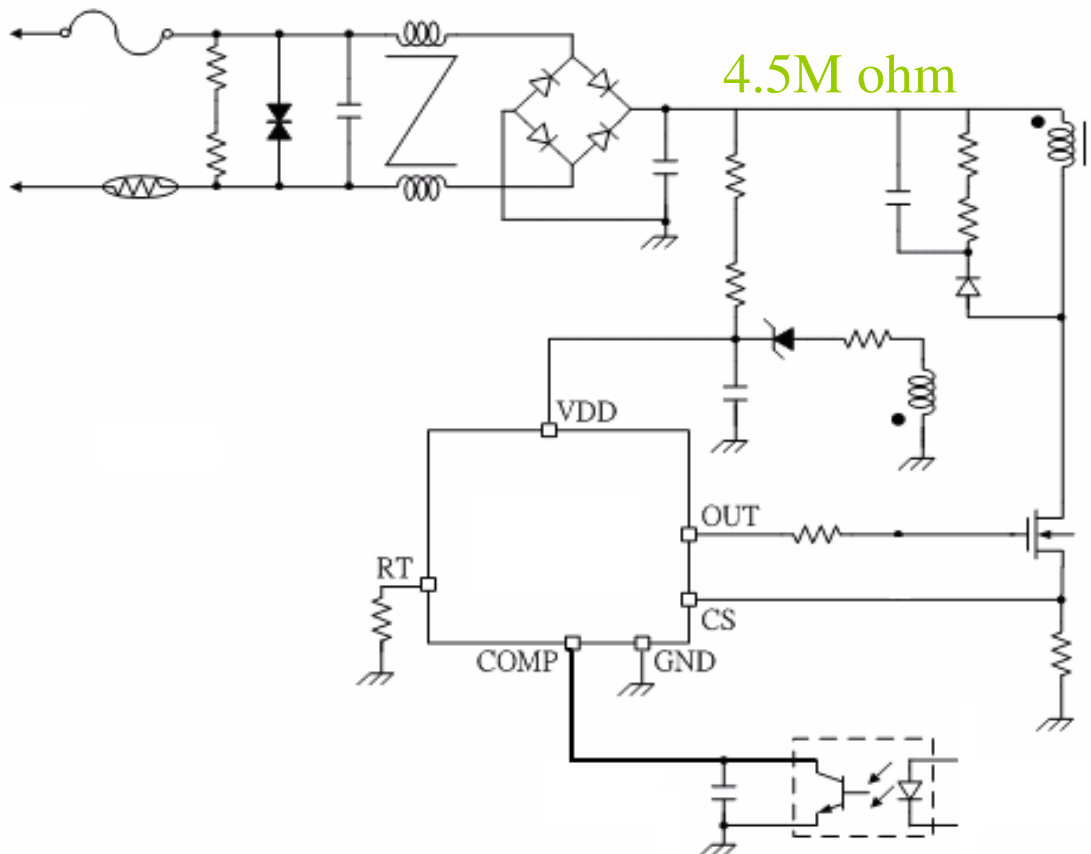
I_ Load (A)	90Vac Efficiency(%)	115Vac Efficiency(%)	230Vac Efficiency(%)	264Vac Efficiency(%)
25%	<b>85.94</b>	<b>86.25</b>	<b>85.95</b>	<b>85.49</b>
50%	<b>86.76</b>	<b>87.36</b>	<b>86.8</b>	<b>87.13</b>
75%	<b>86.22</b>	<b>87.03</b>	<b>87.8</b>	<b>87.14</b>
100%	<b>85.08</b>	<b>86.75</b>	<b>87.52</b>	<b>87.98</b>
<b>Av. <math>\eta</math> (%)</b>	<b>86</b>	<b>86.85</b>	<b>87.02</b>	<b>86.94</b>

## LX7530/1

I_ Load (A)	90Vac Efficiency(%)	115Vac Efficiency(%)	230Vac Efficiency(%)	264Vac Efficiency(%)
25%	<b>84.93</b>	<b>85.31</b>	<b>83.94</b>	<b>83.17</b>
50%	<b>85.27</b>	<b>85.9</b>	<b>85.66</b>	<b>84.35</b>
75%	<b>83.97</b>	<b>85.35</b>	<b>86.03</b>	<b>85.71</b>
100%	<b>82.24</b>	<b>84.73</b>	<b>86.81</b>	<b>86.7</b>
<b>Av. <math>\eta</math> (%)</b>	<b>84.1</b>	<b>85.32</b>	<b>85.61</b>	<b>84.98</b>

# GR8830 lower standby power

## Application circuit 1 (Without changing layout )



### Without Bleeding Resistor

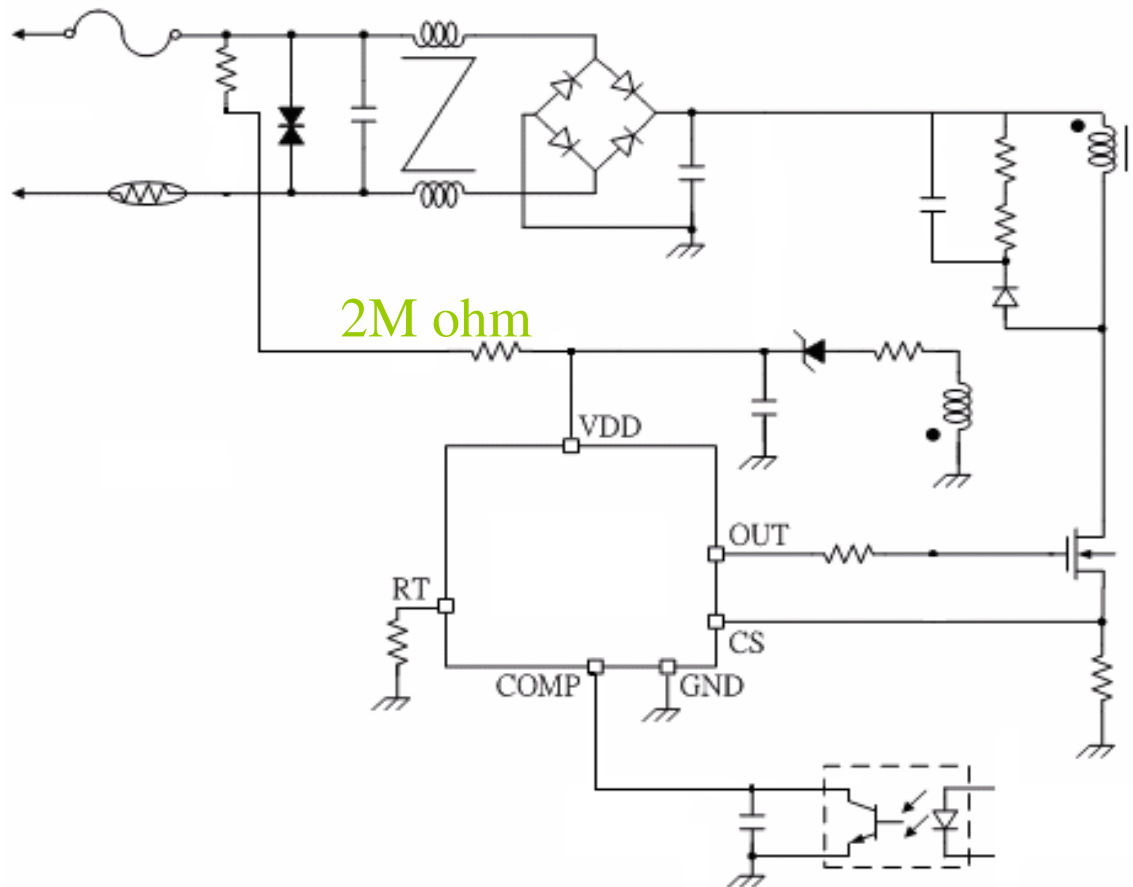
<b>Vin (rms)</b>	90V	120V	230V	264V
<b>Pin (W)</b>	<b>43mw</b>	<b>45mw</b>	<b>65mw</b>	<b>75mw</b>

### Bleeding Resistor=3MΩ

<b>Vin (rms)</b>	90V	120V	240V	264V
<b>Pin (W)</b>	<b>50mw</b>	<b>52mw</b>	<b>80mw</b>	<b>91mw</b>

# GR8830 lower standby power

## Application circuit 2 (lower standby power)



### GR8830

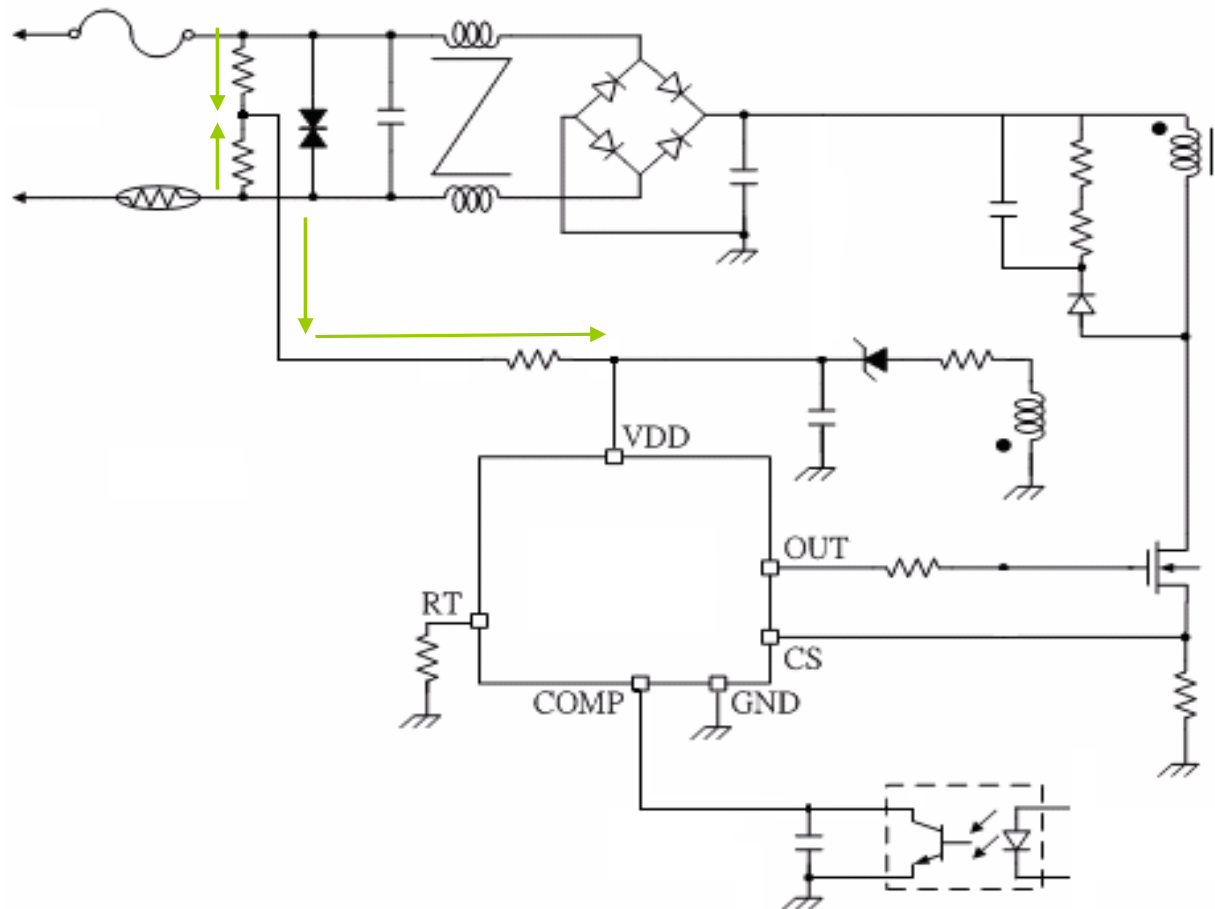
<b>Vin (rms)</b>	90V	120V	230V	264V
<b>Pin (W)</b>	<b>42mw</b>	<b>44mw</b>	<b>64mw</b>	<b>72.5mw</b>

### LX7531

<b>Vin (rms)</b>	90V	120V	230V	264V
<b>Pin (W)</b>	<b>92mw</b>	<b>89mw</b>	<b>95mw</b>	<b>99.8mw</b>

# GR8830 lower standby power

## Application circuit 3 (lower standby power)



## GR8830 Compare with competitors

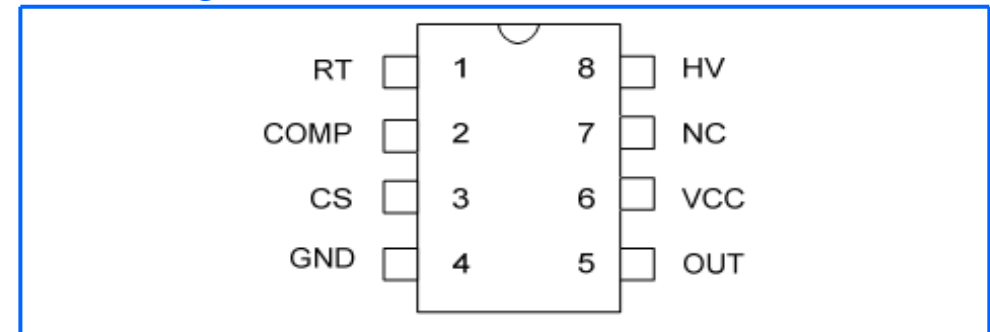
	<b>GR8830</b>	<b>LX7530/1</b>	<b>OX2263</b>
<b>Max start-up current</b>	8uA	12uA	3us
<b>Operating current</b>	2mA	2.65mA	1.4mA
<b>Frequency trembling</b>	<b>+/-6%</b>	<b>+/-4khz</b>	<b>+/-3%</b>
<b>Leading edge blanking</b>	350ns	240ns	375ns
<b>OCP compensation</b>	yes	yes	yes
<b>Over voltage protection</b>	26v/27v/28v	26.8V/28V/29.2V	
<b>Programmable switch frequency</b>	100K $\Omega$ /65KhZ	100K $\Omega$ /65KhZ	100K $\Omega$ /65KhZ
<b>Power saving</b>	<b>&lt;100mw</b>	<b>&gt;100mW</b>	<b>&gt;200mW</b>
<b>Soft driving for reducing Radiation</b>	<b>yes</b>	<b>no</b>	<b>no</b>

## GR8876A/74 Package

- Sop8 package
- High efficiency
- Lower standby power



### Pinning



**Table 1** Pin description

Pin No.	Name	Function
1	RT	Connecting a resistor to ground, this resistor determine the switching frequency
2	COMP	Voltage feedback pin, by connecting a photo-coupler to control the duty cycle
3	CS	Current sense pin ,connect to sense the MOSFET current
4	GND	Ground
5	OUT	The output driver for driving the external MOSFET
6	VCC	Power supply pin
7	NC	Unconnected pin
8	HV	This pin provides the start up current. When VLO(ON) is tripped , this HV loop will be off thus limit the power loss on the startup circuit

## GR8876A/74 Key Features

### Features

- High-voltage startup
- Very low startup current
- Under 70mW standby power (without changing layout)
- Jittering for reducing conduction
- soft driving for reducing EMI
- Non-audible-noise green mode control
- Programmable switching frequency
- Internal soft start
- Internal slope compensation
- Over voltage protection (OVP) on VCC pin
- Over load protection (OLP)
- Over current protection (OCP) on CS pin
-

## GR8876A/74 Application Field

Typical application market: Adapter, LCD monitor/TV Notebook adapter and Set-top box





# GR8876A High-efficiency

CEC Level 5 =87%

GR8876A test condition=19.5v/3A

I_ Load (A)	90Vac Efficiency(%)	115Vac Efficiency(%)	230Vac Efficiency(%)	264Vac Efficiency(%)
25%	88.0	89.1	89	88.8
50%	88.1	89.1	89	89.2
75%	87.4	88.7	89.5	88.9
100%	86.3	87.8	89.1	89.1
<b>Av. <math>\eta</math> (%)</b>	<b>87.4</b>	<b>88.7</b>	<b>89.2</b>	<b>89</b>

## LX7550

I_ Load (A)	90Vac Efficiency(%)	115Vac Efficiency(%)	230Vac Efficiency(%)	264Vac Efficiency(%)
25%	87.30	88.0	88.6	88.4
50%	87.70	87.8	88.7	88.5
75%	87.60	88.8	88.6	88.2
100%	86.5	87.8	87.2	86.9
<b>Av. <math>\eta</math> (%)</b>	<b>87.3</b>	<b>88.10</b>	<b>88.3</b>	<b>88.0</b>

## **GR8876A/74 Lower standby power**

**Test Condition:1. Bleeding Resistor=open**

<b>Input (<math>V_{rms}</math>)</b>	<b>90V</b>	<b>110V</b>	<b>230V</b>	<b>264V</b>
<b>GR8876A Pin (W)</b>	53.9mw	60.4mw	78.1mw	87.5mw
<b>GR8874 Pin (W)</b>	40.1mw	41.9mw	59mw	67.3mw
<b>LX7550 Pin (W)</b>	66.5mw	68.4mw	87.8mw	94.6mw

## GR8876A/74 Compare with competitors

	<b>GR8876A</b>	<b>GR8874</b>	<b>LX7550</b>
<b>HV start up</b>	yes	yes	yes
<b>Operating current</b>	2.2mA	2.2mA	2.9mA
<b>Frequency trembling</b>	+/-6%	+/-6%	+/-4kHz
<b>Leading edge blanking</b>	350ns	350ns	250ns
<b>OCP compensation</b>	0.8V/0.85V/0.9V	0.8V/0.85V/0.9V	0.8V/0.85V/0.9V
<b>Over voltage protection</b>	27v/28v/29v	27v/28v/29v	24.5v/26v/27.5v
<b>Programmable switch frequency</b>	100K $\Omega$ /65KHZ	100K $\Omega$ /65KHZ	65kHz
<b>OTP pin</b>	no	no	OTP
<b>Power saving</b>	Under 90mw	Under 70mw	Under 100mW
<b>Soft start</b>	YES	YES	NO