

# AC input detection and power supply protection IC Monolithic IC MM3313

## Outline

This IC is an IC providing AC input detection and power supply protection for AC power supplies. It provides three detection functions of overvoltage protection and output voltage drop for PFC, etc. required for AC power supplies, and AC input detachment, and allows a protection circuitry to be configured with small component count. In addition, accurate detection can be achieved by integrating the functions into an IC, and standby power can be reduced by lowering current consumption. This IC uses SOP-8 package and supports flow conditions.

## Features

- |   |   |
|---|---|
| 1. High accuracy detection voltage :                  | 2.5V $\pm$ 2% (DET1, DET2)<br>1.25V $\pm$ 2% (AC DET) |
| 2. Low current consumption :                          | 60 $\mu$ A typ.                                       |
| 3. High input impedance :<br>(CMOS input)             | Input bias current below 0.1 $\mu$ A                  |
| 4. Supports high voltage and wide input voltage range | 4V to 30V   |
| 5. Includes a delay circuit and latch function (DET1) |   |

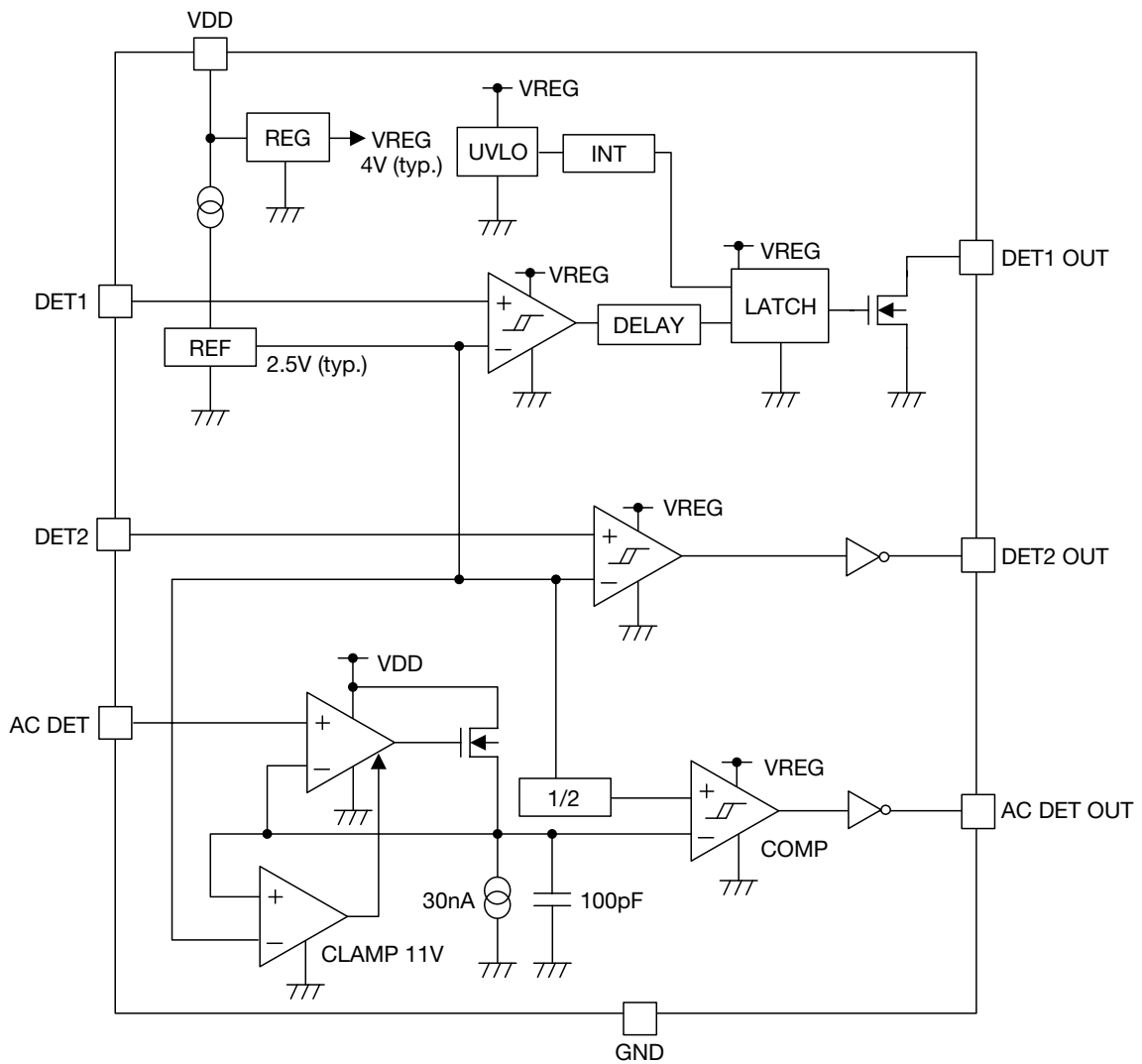
## Package

SOP-8D

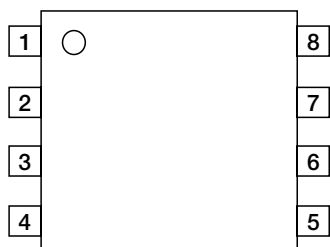
## Applications

1. Flat TVs (LCD, PDP)
  2. Personal computers
  3. Printers
- AC power supplies using a PFC circuit

Block Diagram



Pin Assignment



SOP-8 (TOP VIEW)

1	VDD
2	DET1
3	DET2
4	DET1 OUT
5	AC DET
6	GND
7	AC DET OUT
8	DET2 OUT

Pin Description

Pin No.	Pin Name	INPUT/OUTPUT	Function	Internal Equivalent Circuit
1	VDD	INPUT	Power supply	
2	DET1	INPUT	Power supply detection input1 (with latch function)	
3	DET2	INPUT	Power supply detection input2	
4	DET1 OUT	OUTPUT	Power supply detection output1 (with latch function/open drain)	
5	AC DET	INPUT	AC detection input	
6	GND		GND	
7	AC DET OUT	OUTPUT	AC detection output	
8	DET2 OUT	OUTPUT	Power supply detection output2	

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**Absolute Maximum Ratings** (Except where noted otherwise Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T <sub>STG</sub>	-55~+150	°C
VIN Supply voltage	V <sub>VDDMAX</sub>	-0.3~+33	V
DET1 pin supply voltage	V <sub>INDET1</sub>	-0.3~+30	V
DET2 pin supply voltage	V <sub>INDET2</sub>	-0.3~+30	V
AC DET pin supply voltage	V <sub>INACDET</sub>	-0.3~+30	V
Power dissipation	P <sub>d</sub>	300 (alone)	mW

\*When in use, make sure that the voltage exceeding the maximum rating of 33V is not applied even momentarily.

**Recommended Operating Conditions**

Item	Symbol	Ratings	Units
Operating Temperature	T <sub>OPR</sub>	-40~+85	°C
Operating Supply Voltage	V <sub>OPR</sub>	+4~+30	V
DET1 pin supply voltage	V <sub>INDET1</sub>	0~+30	V
DET2 pin supply voltage	V <sub>INDET2</sub>	0~+30	V
AC DET pin supply voltage	V <sub>INACDET</sub>	0~+30	V

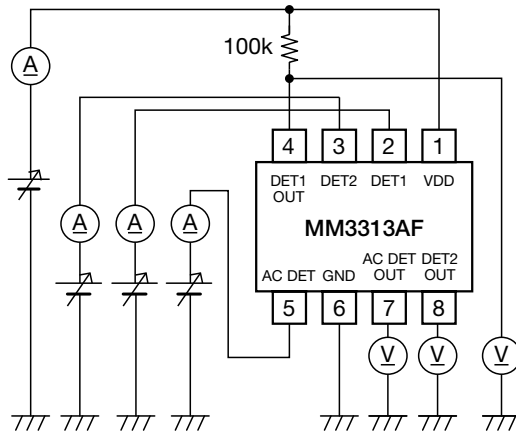
**Electrical Characteristics** (Except where noted otherwise Ta=25°C, VDD=12V)

Item	Symbol	Measurement conditions	Circuit	Min.	Typ.	Max.	Units
Power supply current	I <sub>DD</sub>		①		60	85	μA
<b>UVLO</b>							
Under voltage lockout (UVLO)	V <sub>UVLO</sub>	VDD=H→L	①	3.35	3.50	3.65	V
Under voltage lockout hysteresis voltage	V <sub>hysUVLO</sub>	VDD=H→L→H	①		100		mV
<b>DET1</b>							
DET1 detection voltage	V <sub>INDET1</sub>	DET1=L→H	①	2.45	2.50	2.55	V
DET1 detection temperature coefficient	V <sub>DET1temp</sub>	(guaranteed by design)	①		±100		ppm/°C
DET1 detection hysteresis voltage	V <sub>hysDET1</sub>	DET1=L→H→L (guaranteed by design)	①		15		mV
DET1 pin bias current	I <sub>BINDET1</sub>		①			0.1	μA
DET1 OUT pin output delay time	t <sub>OUTDET1DLY</sub>		②	0.25	0.5	1.0	ms
DET1 OUT pin output sink current	I <sub>OUTDET1SY</sub>	DET1 OUT=0.5V	③	5	10		mA
DET1 OUT pin off leakage current	I <sub>OUTDET1LEAK</sub>	DET1 OUT=12V	③			1	μA
DET1 OUT pin "L" voltage	V <sub>OUTDET1L</sub>	I <sub>OUTDET1SY</sub> =1mA	③			0.2	V
<b>DET2</b>							
DET2 detection voltage	V <sub>INDET2</sub>	DET2=L→H	①	2.45	2.50	2.55	V
DET2 detection temperature coefficient	V <sub>DET2temp</sub>	(guaranteed by design)	①		±100		ppm/°C
DET2 detection hysteresis voltage	V <sub>hysDET2</sub>	DET2=L→H→L	①		15		mV
DET2 pin bias current	I <sub>BINDET2</sub>		①			0.1	μA
DET2 OUT pin output source current	I <sub>OUTDET2SO</sub>	DET2 OUT=VDD-1V	③	5	10		mA
DET2 OUT pin output sink current	I <sub>OUTDET2SY</sub>	DET2 OUT=0.5V	③	5	10		mA
DET2 OUT pin "H" voltage	V <sub>OUTDET2H</sub>	I <sub>OUTDET2SO</sub> =1mA	③	VDD -0.2			V
DET2 OUT pin "L" voltage	V <sub>OUTDET2L</sub>	I <sub>OUTDET2SY</sub> =1mA	③			0.2	V
<b>AC DET</b>							
AC DET detection voltage	V <sub>INAC</sub>	AC DET=H→L	①	1.225	1.25	1.275	V
AC DET pin input voltage range (DC)	V <sub>INACRANGE1</sub>		①	0		30	V
AC DET detection temperature coefficient	V <sub>ACtemp</sub>	(guaranteed by design)	①		±100		ppm/°C
AC DET detection hysteresis voltage	V <sub>hysAC</sub>	AC DET=H→L→H	①	240	300	360	mV
AC DET pin bias current	I <sub>BINAC</sub>		①			0.1	μA
AC DET OUT pin output delay time	t <sub>OUTACDLY</sub>	AC DET=10→0V	②	19.2	28.8	38.4	ms
AC DET OUT pin output source current	I <sub>OUTACSO</sub>	AC DET OUT=VDD-1V	③	5	10		mA
AC DET OUT pin output sink current	I <sub>OUTACSY</sub>	AC DET OUT=0.5V	③	5	10		mA
AC DET OUT pin "H" voltage	V <sub>OUTACH</sub>	I <sub>OUTACSO</sub> =1mA	③	VDD -0.2			V
AC DET OUT pin "L" voltage	V <sub>OUTACL</sub>	I <sub>OUTACSY</sub> =1mA	③			0.2	V

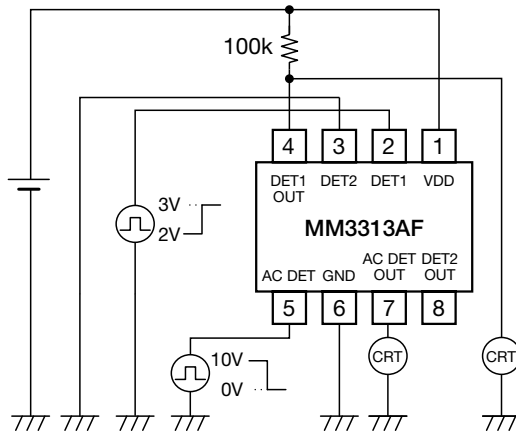
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Application Circuit

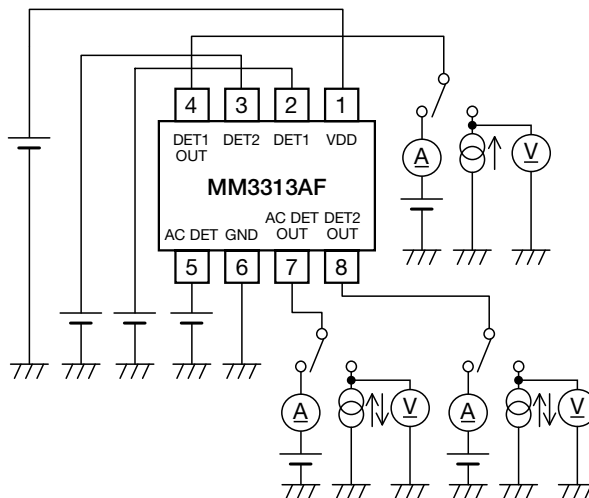
①



②

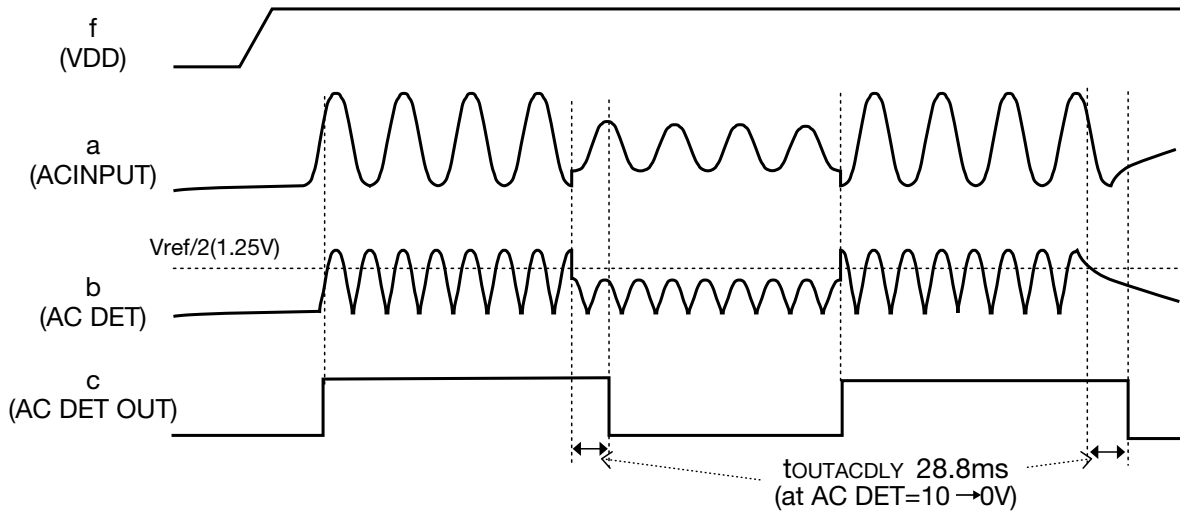


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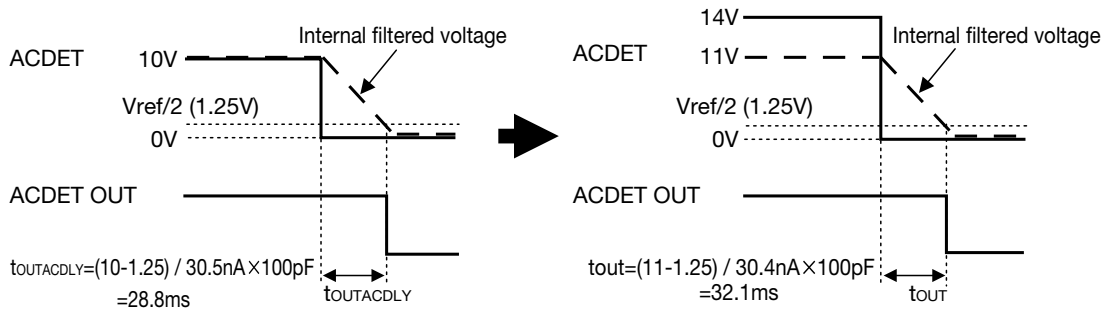


Timing Chart

AC DET→AC DET OUT

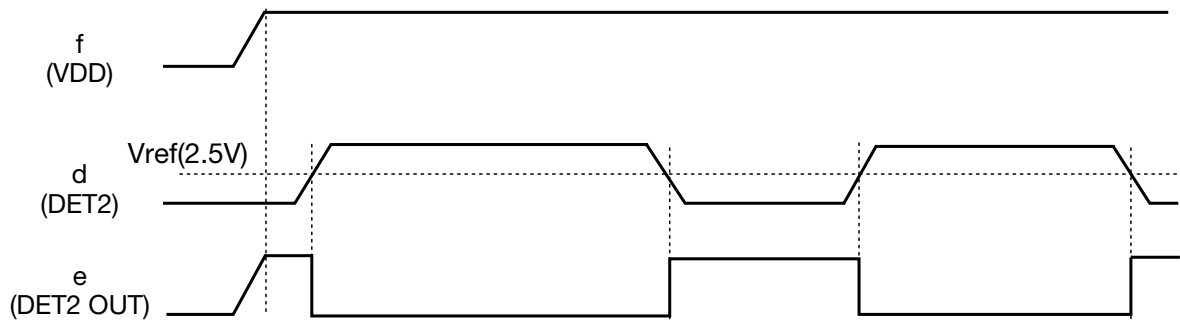


AC DET詳細

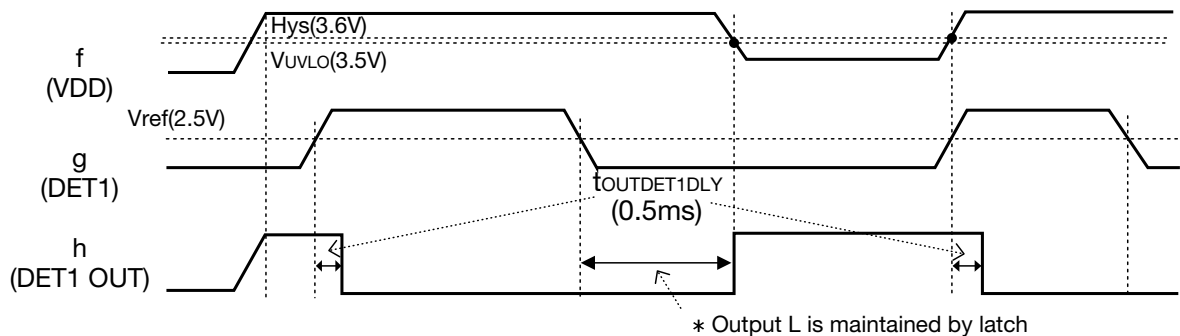


\* When AC DET exceeds 11V, delay time becomes stable due to the internal clamp circuit.

DET2→DET2 OUT



DET1→DET1 OUT



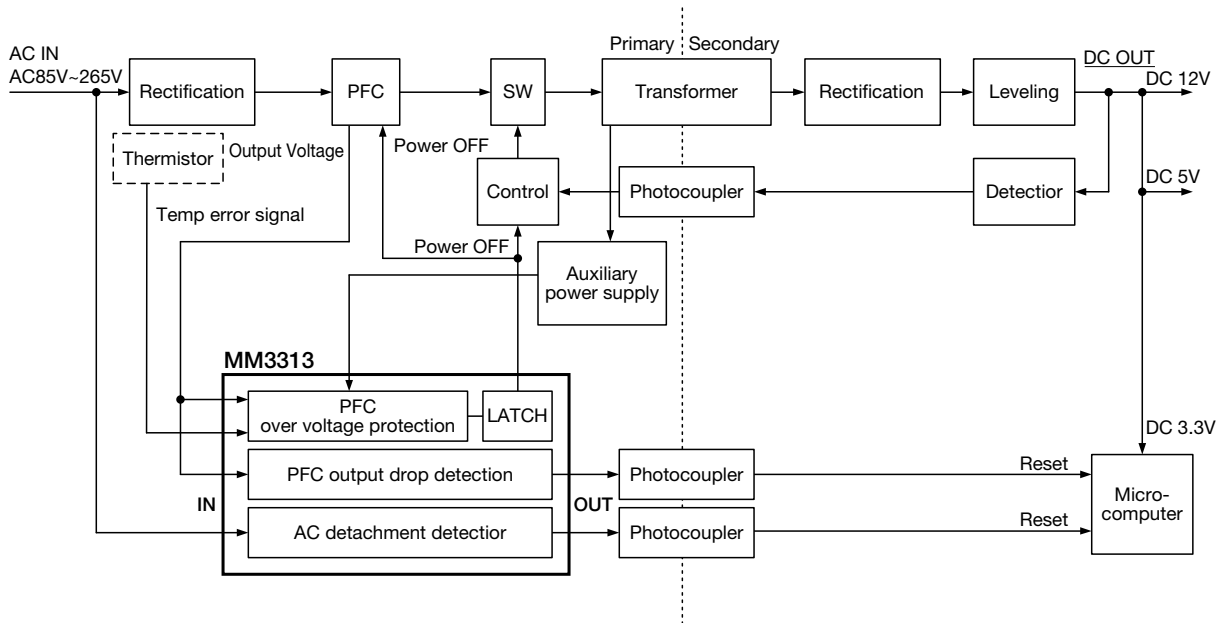
\* Output L is maintained by latch

\* Refer to the next "Application Circuit" for the waveform of a - g.

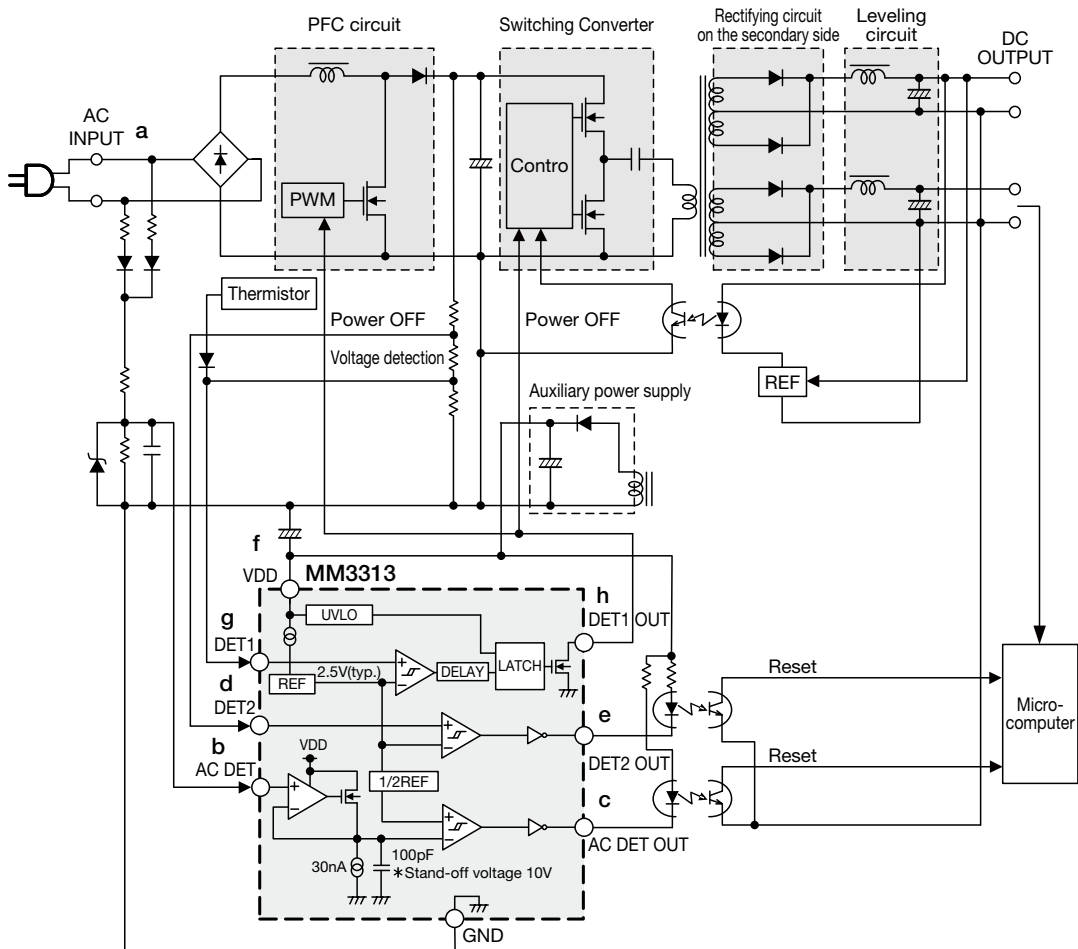
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Application Circuit

1. Architecture example



2. Circuit example (current resonant scheme)



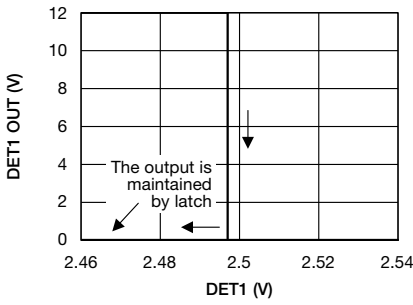
\* Please set the bypass capacitor for VDD in the range of 0.1~10μF depending on the condition of VDD.

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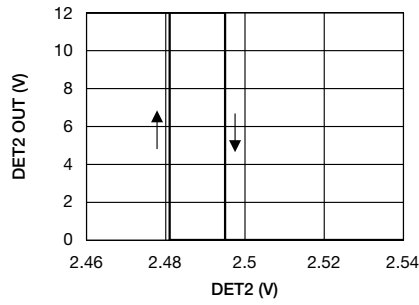


Characteristics (VDD=12V)

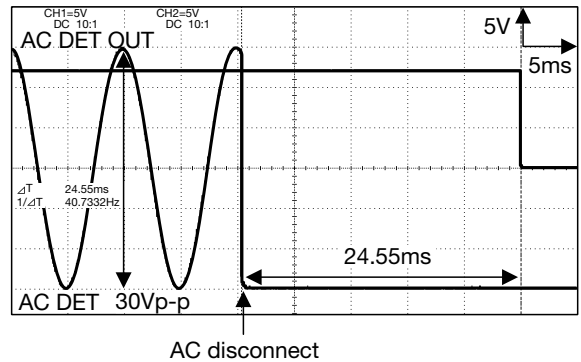
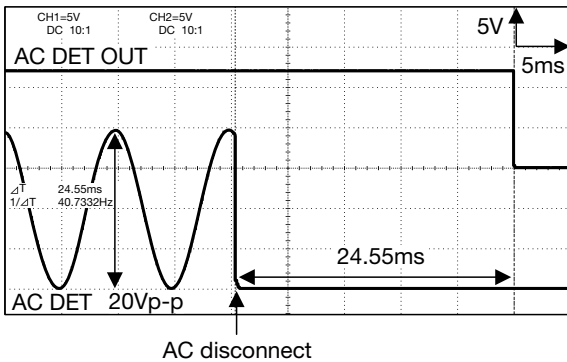
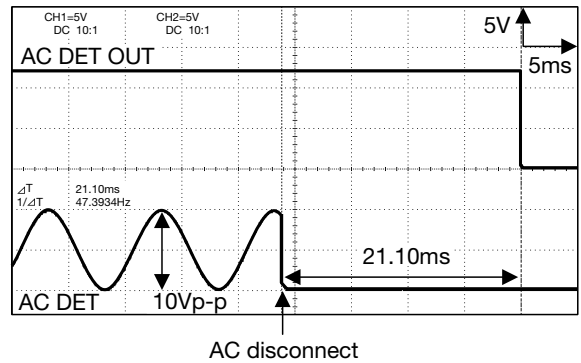
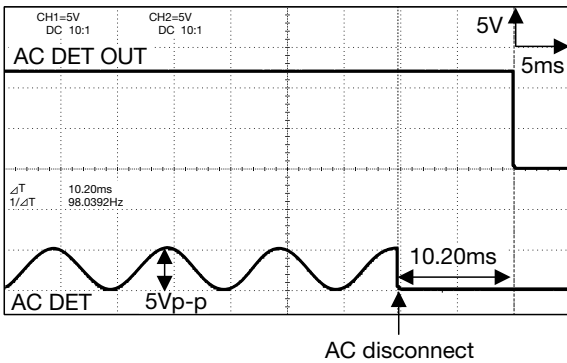
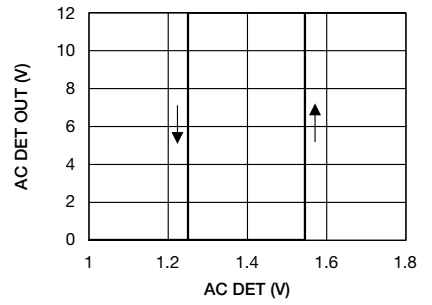
DET1 OUT vs DET1



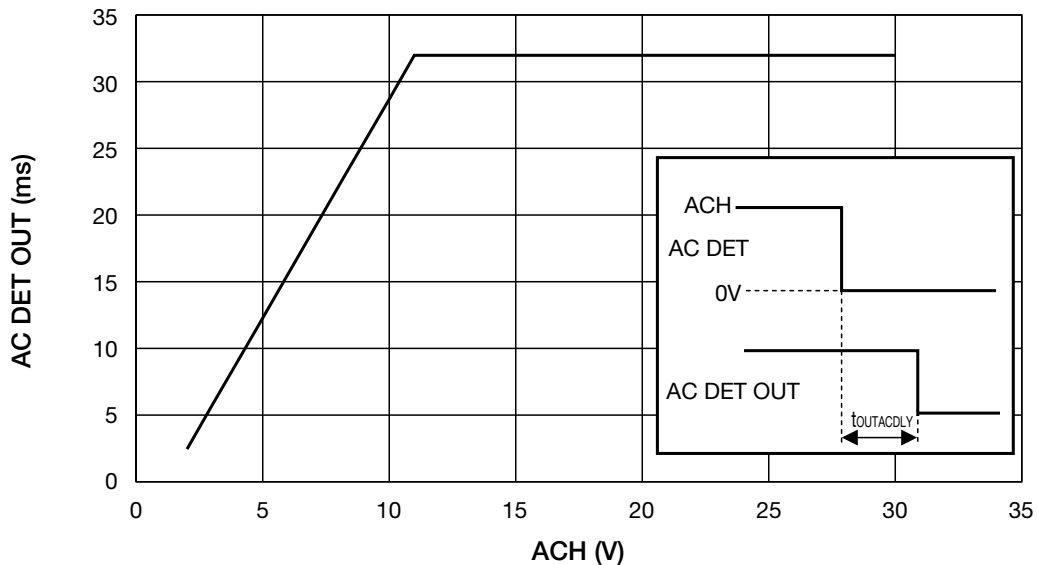
DET2 OUT vs DET2



AC DET OUT vs AC DET



Input Voltage Characteristics of AC DET Delay Time



\* When AC DET exceeds 11V, delay time becomes stable due to the internal clamp circuit.

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