
Power Supply Supervisor + PWM

Features

- PC half-bridge (or 494) power supply supervisor + PWM
- High integration & few external components
- Over-voltage protection for 3.3V, 5V, 12V and PT
- Under-voltage protection for 3.3V, 5V and 12V
- Over-voltage protection for extra voltage input
- Power-down warning circuitry
- Power good circuitry
- Delay time for PSON
- 280ms PG Time Delay
- Remote ON/OFF function
- 280 ms Time Delay for UVP
- On-chip error amplifier
- On-chip oscillator, frequency is adjustable by external resistor
- PWM dead-time control
- Soft-start and maximum 90% duty cycle
- Compatible with WT7520
- Pb-Free DIP-16L Package

Applications

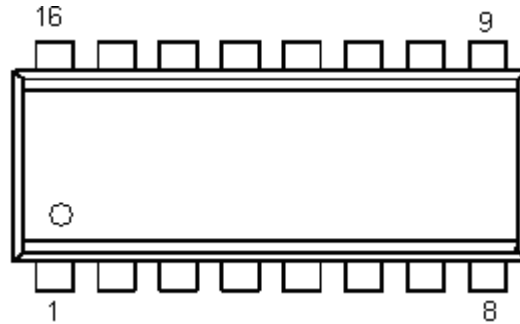
- ATX PC power
- TFT-LCD-TV
- NLX /SFX power

General Description

PHY4943D controller is designed for switching mode power supply for desktop PCs. It provides all the functions necessary to monitor and control the output of the power supply. Remote ON/OFF control, power good circuitry, some protection features against over-voltage and over-power are implemented. It directly senses all the output rails for OVP without the need of external dividers.

An innovated AC-signal sampling circuitry provides a sufficient power-down warning signal for PG. A built-in timer generates accuracy timing for control

circuit including the PS-off delay. The PWM dead-time control prevents the power transformer from the saturation and ensures the fastest response for the short-circuit protection which greatly reduce the stress for power transistors. Utilizing minimum number of external components, the PHY4943D includes all of the functions for push-pull and/or half-bridge topology, decreasing the production cost and PCB space, and increasing the MTBF for power supply

DIP-16L Package (Top-View)**Pin Descriptions**

Pin No.	Pin Name	TYPE	FUNCTION
1	V33	I	OVP/UVLP input for 3.3V.
2	V5	I	OVP/UVLP input for 5V.
3	V12	I	OVP/UVLP input for 12V.
4	PT	I	Extra OVP protection input.
5	GND	P	Ground.
6	RT	O	Oscillation frequency set by external resistor.
7	C1	O	PWM open drain output 1.
8	C2	O	PWM open drain output 2.
9	REM	I	Remote on/off input. REM="low" that means the main SMPS is turned-on. REM="high", the main SMPS is turned-off.
10	SS	O	Soft start function set by external capacitor.
11	PG	O	Power good signal. PG= "high" means "power good".PG= "low" means "power fail".
12	DET	I	Extra protection input.
13	VCC	P	Supply voltage.
14	OPOUT	O	OP compensation output.
15	OPNEGIN	I	OP compensation negative input.
16	VADJ	I	OP compensation positive input , feedback voltage sense input.

ABSOLUTE MAXIMUM RATINGS@V_{cc}=5.5V

Supply voltage	V _{cc}	5.5	V
Drain output voltage	V _{ce1} ,V _{ce2}	5.5	V
Drain output current	I _{ce1} ,I _{ce2}	200	mA
Power dissipation	P _d	200	mW
Operating temperature	T _{opr}	-10 to 70	°C
Operating junction temperature	T _J	-20 to 150	°C
Storage temperature	T _{stg}	-40 to 150	°C

TEMPERATURE CHARACTERISTICS,V_{cc}=5V

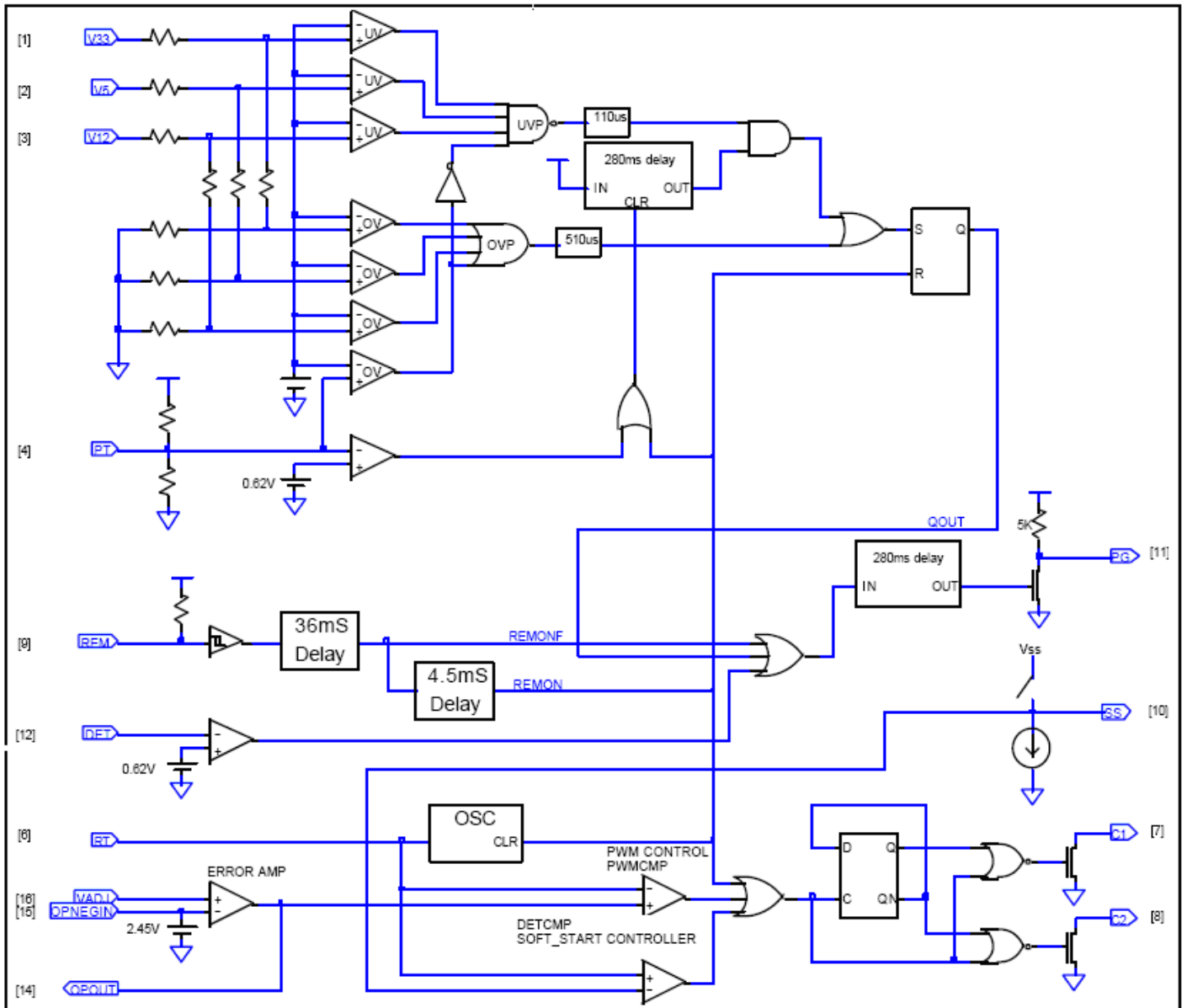
CHARACTERISTICS	SYMBOL	Min	Typ	Max	Unit
Coefficient of V _{ref} (-10°C~+85°C)			0.01		%/°C

ELECTRICAL CHARACTERISTICS.TA=25°C,V_{cc}=5V

CHARACTERISTICS	SYMBOL	TEST CONDITION	Min	Typ	Max	Unit
DEAD TIME CONTROL SECTION						
INPUT THRESHOLD VOLTAGE	V _{thdt}	ZERO DUTY CYCLE		3.0	3.3	V
		MAX.DUTY CYCLE		0.1		
ERROR AMP SECTION						
CLOSE LOOP VOLTAGE GAIN		0.5V~3.5V		65		dB
CROSS OVER POINT		0dB		320		KHz
OPNEG BIAS VOLTAGE		OPNEG OPEN	2.38	2.45	2.52	V
OUTPUT SECTION						
OUTPUT SATURATION VOLTAGE	V _{dssat}	I _d =200mA		1.1	1.3	V
DRAIN OFF-STATE CURRENT	I _{doff}	V _{cc} =V _d =V _s =0V		2	10	uA
RISING TIME	T _r			100	200	ns
FALLING TIME	T _f			50	200	ns

PROTECTION SECTION						
OVER VOLTAGE PROTECTION (OVP)	V33		3.8	4.1	4.3	V
	V5		5.8	6.2	6.6	V
	V12		4.41	4.64	4.90	V
	PT		1.2	1.25	1.3	V
UNDER VOLTAGE PROTECTION (UVP)	V33		1.78	1.98	2.18	V
	V5		2.70	3.00	3.30	V
	V12		2.11	2.37	2.63	V
UVP DISABLE VOLTAGE	PT		0.55	0.62	0.68	V
UVP DELAY TIME	Td.uvp		100	280	500	ms
REMOTE ON/OFF SECTION						
REM HIGH INPUT VOLTAGE	Vremh		2.0			V
REM LOW INPUT VOLTAGE	Vreml				0.8	V
REM PULL HIGH VOLTAGE	Vremo		2.0		5.25	V
REM DELAY TIME	Trem		3.0	36	42	ms
REM OFF DELAY TIME	Toff		3.5	4.5	5.5	ms
POWER GOOD SECTION						
DETECTING INPUT VOLTAGE	Vdet		0.55	0.62	0.68	V
PG OUTPUT PULL-UP RESISTOR	Rpup.pg			5		KΩ
PG OUTPUT LOAD RESISTOR	Rpg		0.5	1	2	KΩ
PG DELAY TIME			150	280	350	ms
OUTPUT SATURATION VOLTAGE	Vsat.pg	lpg=10mA		0.2	0.4	V
TOTAL DEVICE						
STANDBY SUPPLY CURRENT	Icc			10	20	mA
OSCILLATION SECTION						
OSCILLATION FREQUENCY	Fosc	CT=2200P	50		70	KHZ
SOFT START SECTION						
SINK CURRENT OF SS	Iss.sink			13		μA
SOURCE CURRENT OF SS	Iss.source			700		μA

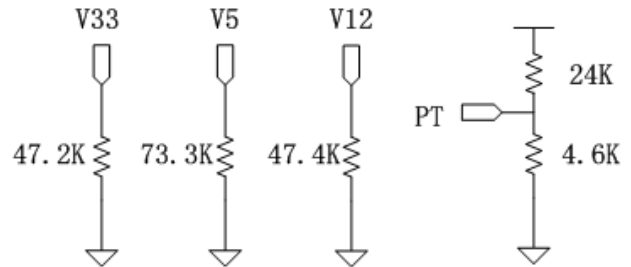
Block Diagram



Typical Application Description

1. Input impedance:

Pin No.	Pin Name	Input impedance
1	V33	47.2KΩ
2	V5	73.3KΩ
3	V12	47.4KΩ
4	PT	24.0KΩ+4.6KΩ



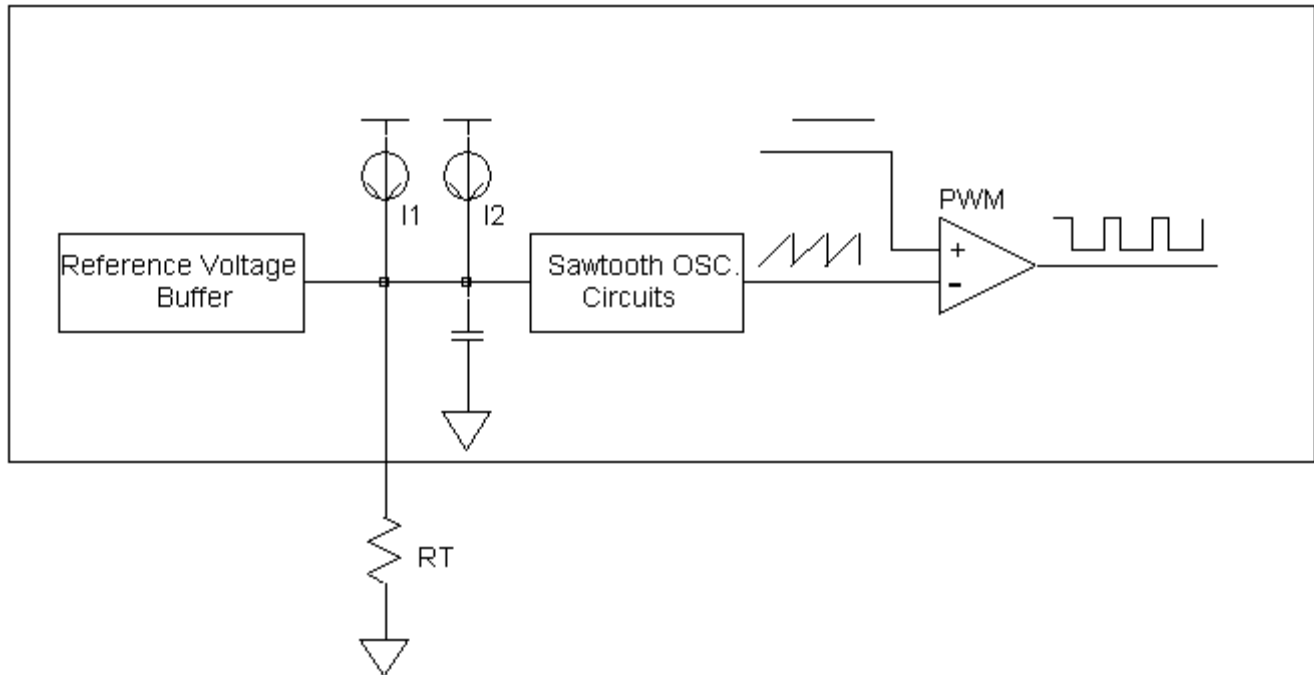
2. OSC Function:

The period of the saw tooth is T_{osc} :

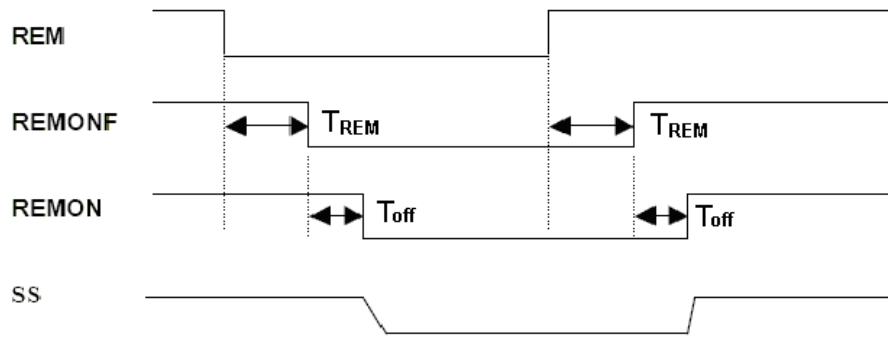
$$I_{charge} = \left(\frac{1.24V}{RT} \right) \times \frac{1}{3} = \left(\frac{1.24V}{120K\Omega} \right) \times \frac{1}{3} = 3.44\mu A$$

$$T_{osc} = \frac{3.3V \times C}{I_{charge}} = 16.6\mu S$$

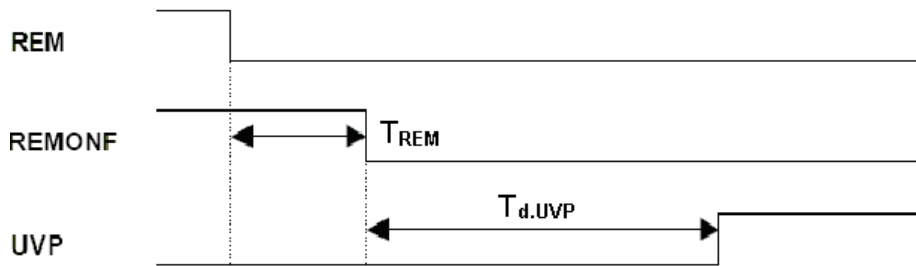
$$F_{osc} = \frac{1}{T_{osc}} = 60KHz$$



3.REMOTE ON/OFF:



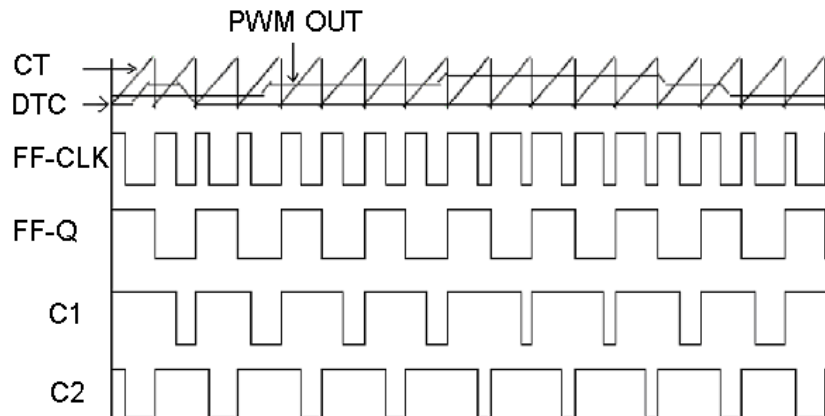
4. Under Voltage Protection Delay Time:



5. Pulse Width Modulation (PWM) Block:

The output pulse width modulation is generated by comparison of the saw-tooth waveform from the capacitor C_T to the feedback of the voltage.

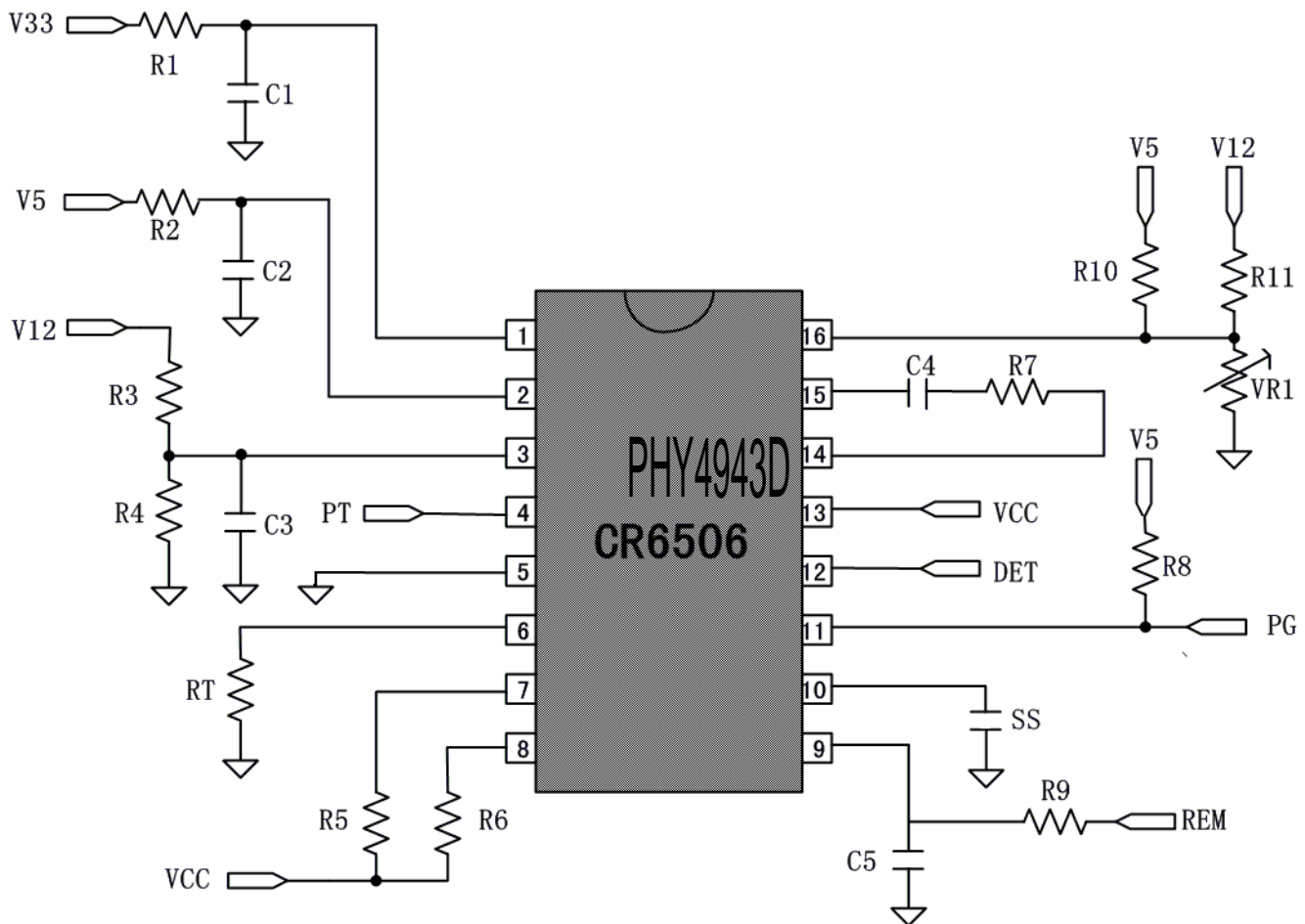
Therefore, an increase in feedback control signal amplitude cause a linear decrease of the output pulse width. Also, the SS(DTC and Soft-Start) limits the output pulse width. The timing diagram is shown as below:



6. Protection control of the Soft-Start:

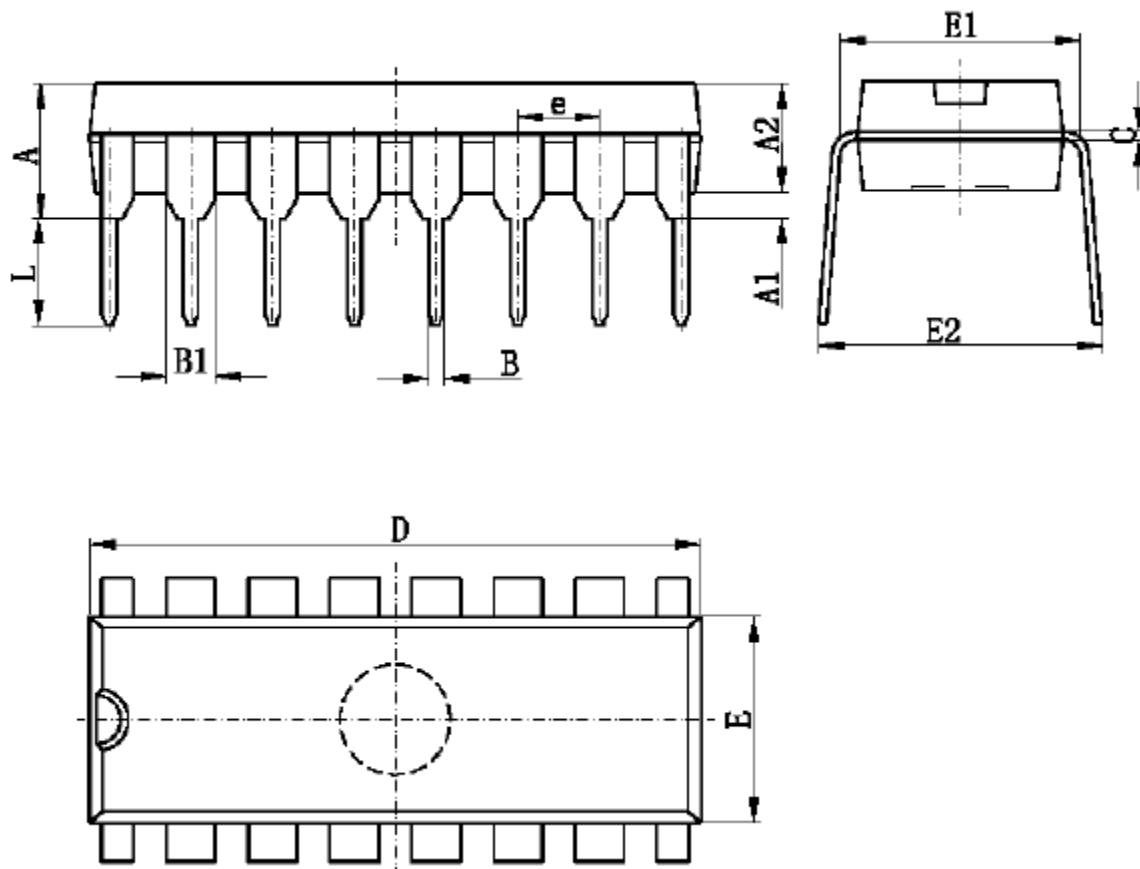
This signal is prepared for extra OVP/OPP ($V_{PT} > 1.25V$) or another Disable Under Voltage Protection function ($V_{PT} < 0.62V$).

7. Reference Application Circuit:



Note: In some application power system, adding an external resistor (R9) could reduce the peak value spike from the environments to pin 9 (REM) and avoid pin 9 (REM) damaged by the external noise.

Package Information (DIP-16L)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354