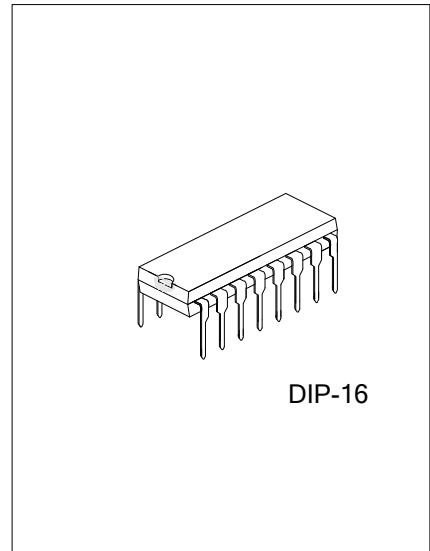# UNISONIC TECHNOLOGIES CO., LTD

3521

PWM CONTROLLER WITH SUPERVISORY CIRCUIT FOR SWITCHING POWER SUPPLY

■ DESCRIPTION

UTC **3521** PWM controller is designed for switching mode power supply for 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 implements.
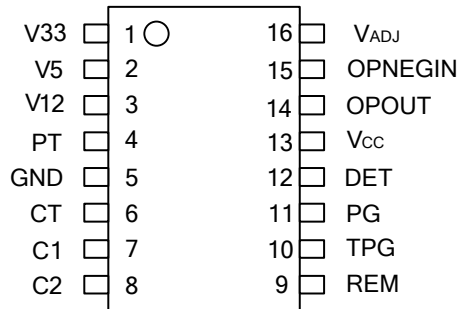
DIP-16

■ FEATURES

* Over-Voltage Protection for 3.3V, 5V and 12V
* Under-Voltage Detection for 3.3V, 5V and 12V
* Over-Power Protection
* Remote ON/OFF Function
* Power Good Circuitry
* Delay Time for PG Signal
* Delay Time for Over-Voltage and Under-Voltage Protection
* On-Chip Oscillator and Error Amplifier

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free Plating	Halogen Free		
3521L-D16-T	3521G-D16-T	DIP-16	Tube

3521L-D16-T	
— (1)Packing Type	(1) T: Tube
— (2)Package Type	(2) D16: DIP-16
— (3)Lead Free	(3) L: Lead Free, G: Halogen Free

■ PIN CONFIGURATION

```
        V33 ☐  1 ○      16 ☐ VADJ
         V5 ☐  2         15 ☐ OPNEGIN
        V12 ☐  3         14 ☐ OPOUT
         PT ☐  4         13 ☐ VCC
        GND ☐  5         12 ☐ DET
         CT ☐  6         11 ☐ PG
         C1 ☐  7         10 ☐ TPG
         C2 ☐  8          9 ☐ REM
```

■ PIN DESCRIPTION

PIN NO.	PIN NAME	TYPE	FUNCTIONS
1	V33	I	OVP/UVP Input For 3.3V
2	V5	I	OVP/UVP Input For 5V
3	V12	I	OVP/UVP Input For 12V
4	PT	I	Additional OVP Protection
5	GND	P	Ground
6	CT		Cap FOR Osciilation Frequency
7	C1	O	Output 1
8	C2	O	Output 2
9	REM	I	Remote ON/OFF Pin.
10	TPG		Power Good Delay Time Setting
11	PG	O	Power Good Signal Out.
12	DET	I	Power Good Signal Detection Input
13	V_{CC}	P	Supply Voltage For IC
14	OPOUT	O	OP AMP Output
15	OPNEGIN	I	OP AMP Negative Input
16	V_{ADJ}	I	Voltage Adjust Pin

■ **BLOCK DIAGRAM**

■ ABSOLUTE MAXIMUM RATINGS (V$_{CC}$=5.5V, unless otherwise specified)

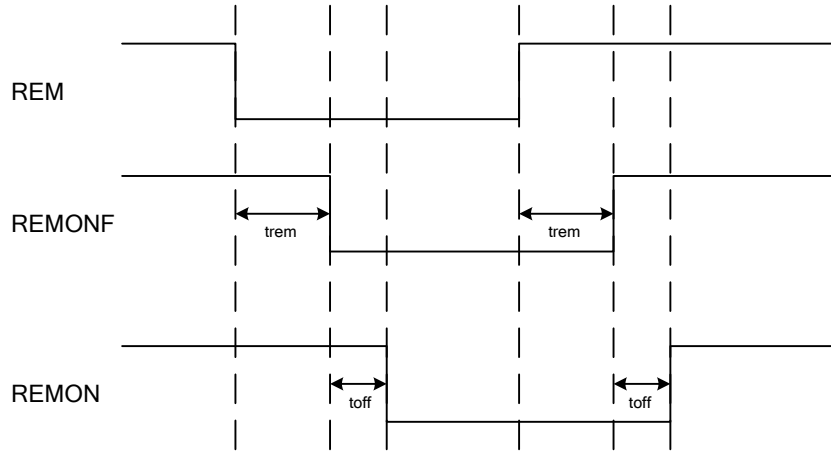| PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V$_{CC}$	5.5	V
Drain Output Voltage	V$_{CC}$1, V$_{CC}$2	5.5	V
Drain Output Current	I$_{CC}$1, I$_{CC}$2	200	mA
Power Dissipation	P$_D$	200	mW
Operating Temperature	T$_{OPR}$	-10 ~ +70	℃
Storage Temperature	T$_{STG}$	-65 ~ +150	℃

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

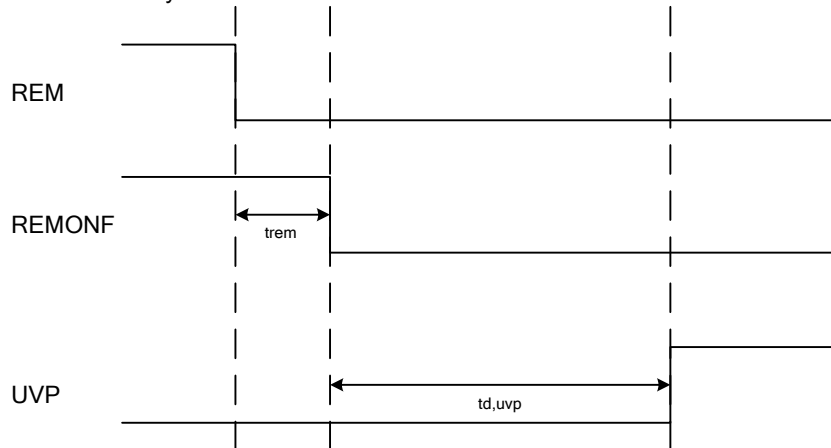### ■ ELECTRICAL CHARACTERISTICS (Ta=25℃, V$_{CC}$ =5V, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DEAD TIME CONTROL SECTION						
Input Threshold Voltage	V$_{I(THR)}$	ZERO DUTY CYCLE		3.0	3.5	V
		MAX. DUTY CYCLE		0.1		
ERROR AMP SECTION						
Opneg Bias Voltage		OPNEG OPEN	2.35	2.45	2.55	V
Close Loop Voltage Gain	G$_{VC}$	0.5V ~ 3.5V		65		dB
Cross Over Point		0dB		320		KHz
OUTPUT SECTION						
Output Saturation Voltage	V$_{DSSAT}$	I$_D$=200mA		1.1	1.3	V
Drain Off-State Current	I$_{D(OFF)}$	V$_{CC}$=V$_D$=V$_S$=0V		2	10	μA
Rising Time	t$_R$	R$_{PULL-UP}$=1 KΩ		100	200	ns
Falling Time	t$_F$	R$_{PULL-UP}$=1 KΩ		50	200	ns
PROTECTION SECTION						
Over Voltage Protection (OVP)	V33		3.8	4.1	4.4	V
	V5		5.8	6.2	6.6	
	V12		4.38	4.64	4.90	
	P$_T$		1.2	1.25	1.3	
Under Voltage Protection (UVP)	V33		1.78	1.98	2.18	V
	V5		2.70	3.00	3.30	
	V12		2.11	2.37	2.63	
UVP Disable Voltage	P$_T$		0.54	0.62	0.70	V
UVP Delay Time	t$_{DLY}$		100	250	500	ms
REMOTE ON/OFF SECTION						
REM High Input Voltage	V$_{IH}$		2.0			V
REM Low Input Voltage	V$_{IL}$				0.8	V
REM Pull High Voltage	V$_{H(PULL)}$		2.0		5.25	V
REM Delay Time	t$_{DLY}$		30	36	42	ms
REM Off Delay Time	t$_{DLY (OFF)}$		3.5	4.5	5.5	ms
POWER GOOD SECTION						
Detecting Input Voltage	V$_{I(DET)}$		0.54	0.62	0.70	V
Output Saturation Voltage	V$_{O(SAT)}$	I$_{PG}$=10mA		0.2	0.4	V
Charging Current For TPG	I$_{CHAR}$			30		μA
PG Output Pull-up Resistor	R$_{O(PULL-UP)}$			5		KΩ
PG Output Load Resistor	R$_{O(LOAD)}$		0.5	1	2	KΩ
PG Delay Time	t$_{DLY}$	C=2.2μF	100	250	500	ms
TOTAL DEVICE						
Standby Supply Current	I$_{CC}$			10	20	mA
OSCILLATION SECTION						
Oscillation Frequency	Fosc	C$_T$=2200P	50		70	KHz
Frequency Change With TEMP.	Fosc/T	C$_T$=2200P		2		%

■ **FUNCTION DESCRIPTION**

(1) REMOTE ON/OFF

REM

REMONF   trem   trem

REMON   toff   toff

(2) Under Voltage Protection Delay Time

REM

REMONF   trem

UVP   td,uvp

(3) Pulse Width Modulation

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.

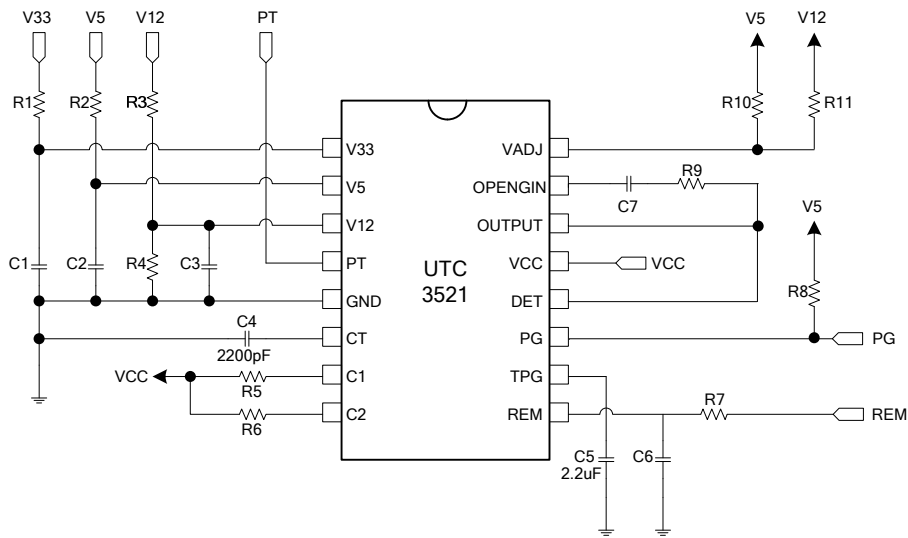Therefore, an increase in feedback control signal amplitude causes a linear decrease of the output pulse width.

(4) 0Protection Control of the Soft-Start

The soft-start function is to reduce the large current surge during power-up or preventing the output voltages (V33/V5/V12) reaches the Over Voltage Protection level.

(5) The function of PT

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

■ APPLICATION CIRCUIT