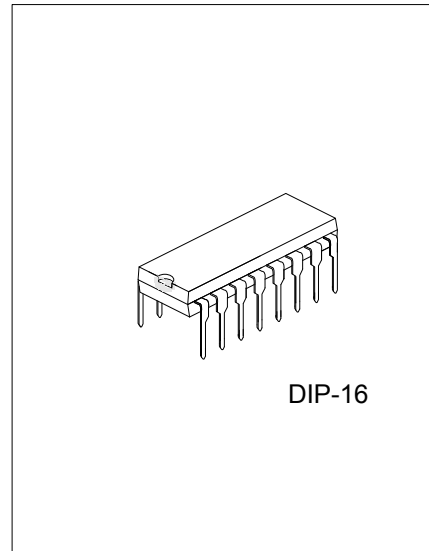




3521

CMOS IC

PWM CONTROLLER WITH SUPERVISORY CIRCUIT FOR SWITCHING POWER SUPPLY



DIP-16

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.

FEATURES

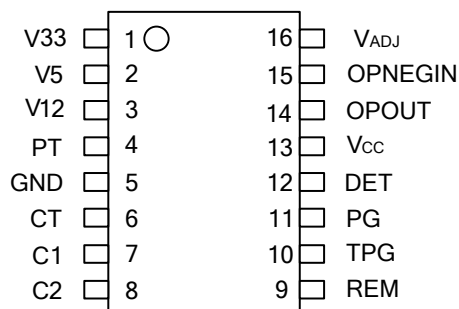
- * Over-Voltage Protection for 3.3V, 5V and 12V
- * Under-Voltage Detection for 3.3V, 5V and 12V
- * Over-Power Protection
- * Remote ON/OFF Function
- * Power Good Circuitry
- * Delay Time for PG Signal
- * Delay Time for Over-Voltage and Under-Voltage Protection
- * On-Chip Oscillator and Error Amplifier

ORDERING INFORMATION

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

<p>3521L-D16-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube (2) D16: DIP-16 (3) L: Lead Free, G: Halogen Free</p>
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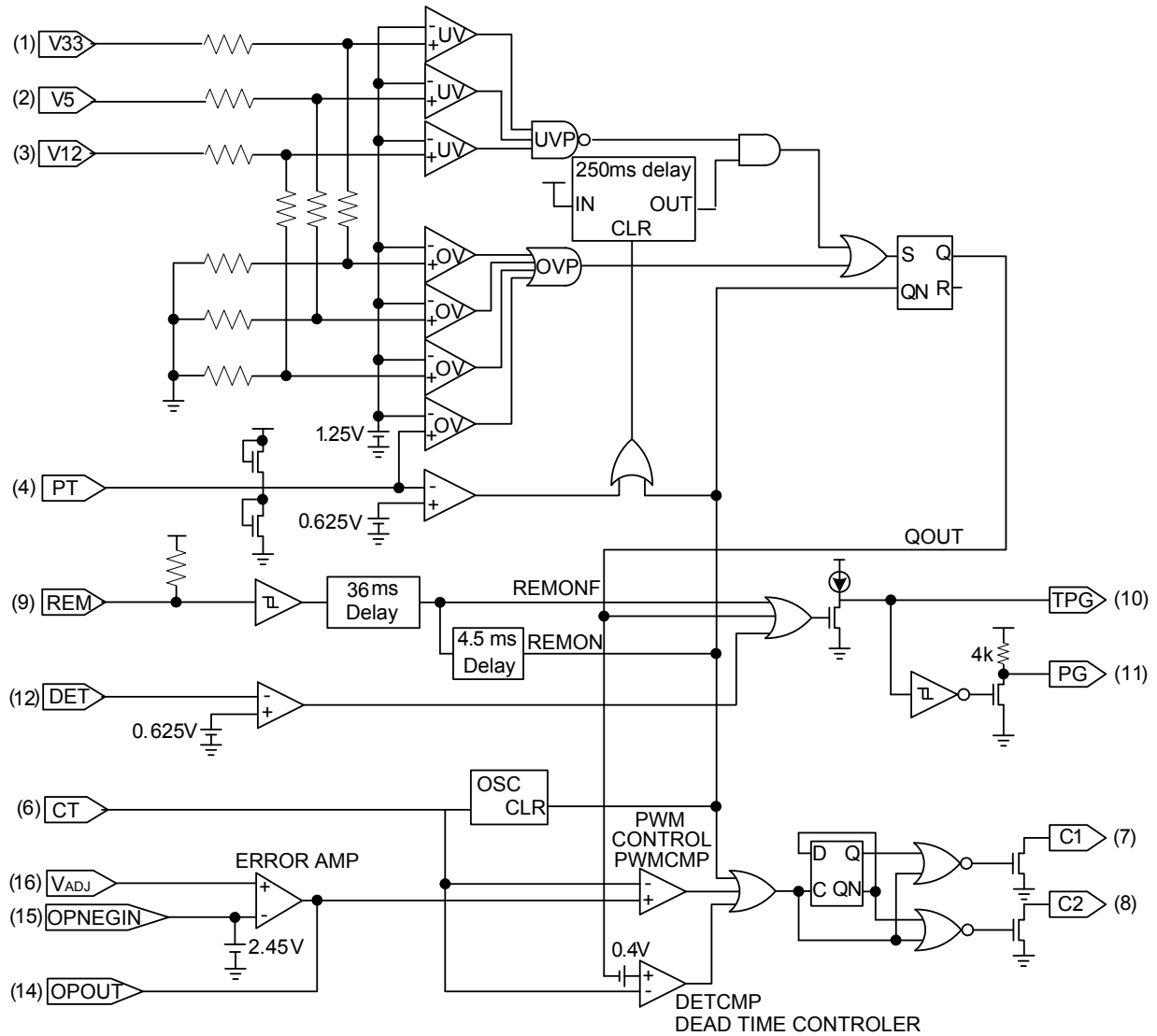
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	TYPE	FUNCTIONS
1	V33	I	OVP/UVI Input For 3.3V
2	V5	I	OVP/UVI Input For 5V
3	V12	I	OVP/UVI Input For 12V
4	PT	I	Additional OVP Protection
5	GND	P	Ground
6	CT		Cap FOR Oscillation 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_{CC1}, V_{CC2}	5.5	V
Drain Output Current	I_{CC1}, I_{CC2}	200	mA
Power Dissipation	P_D	200	mW
Operating Temperature	T_{OPR}	-10 ~ +70	°C
Storage Temperature	T_{STG}	-65 ~ +150	°C

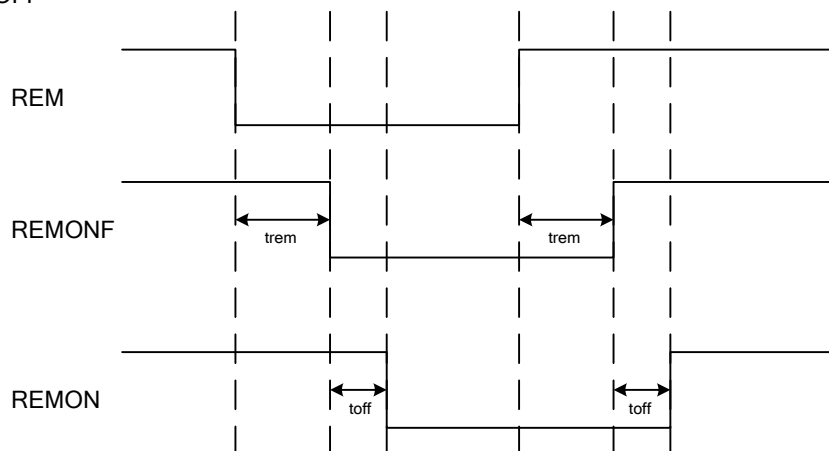
Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS ($T_a=25^{\circ}C$, $V_{CC}=5V$, unless otherwise specified)

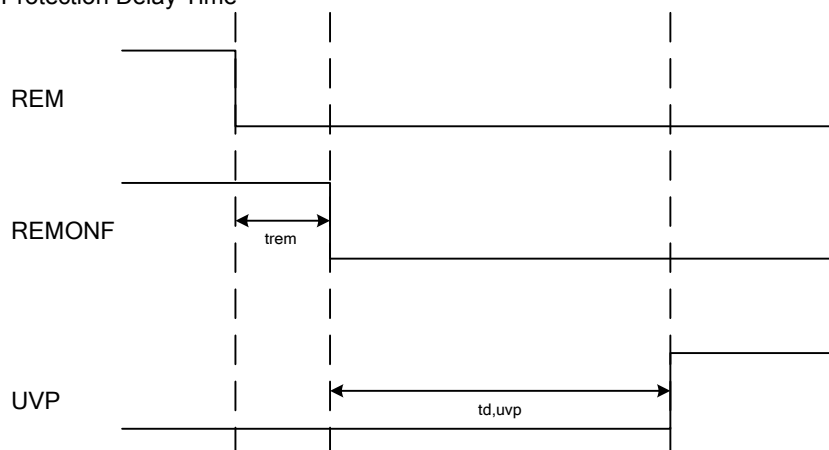
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DEAD TIME CONTROL SECTION						
Input Threshold Voltage	$V_{I(THR)}$	ZERO DUTY CYCLE		3.0	3.5	V
		MAX. DUTY CYCLE		0.1		
ERROR AMP SECTION						
Opneg Bias Voltage		OPNEG OPEN	2.35	2.45	2.55	V
Close Loop Voltage Gain	G_{VC}	0.5V ~ 3.5V		65		dB
Cross Over 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			100	200	ns
Falling Time	t_F			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	$R_{O(PULL-UP)}$			4		K Ω
PG Output Load Resistor	$R_{O(LOAD)}$		0.5	1	2	K Ω
PG Delay Time	t_{DLY}	$C=2.2\mu F$	100	250	500	ms
TOTAL DEVICE						
Standby Supply Current	I_{CC}			10	20	mA
OSCILLATION SECTION						
Oscillation Frequency	F_{OSC}	$C_T=2200P$	50		70	KHz
Frequency Change With TEMP.	$F_{OSC/T}$	$C_T=2200P$		2		%

■ FUNCTION DESCRIPTION

(1) REMOTE ON/OFF



(2) Under Voltage Protection Delay Time



(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.

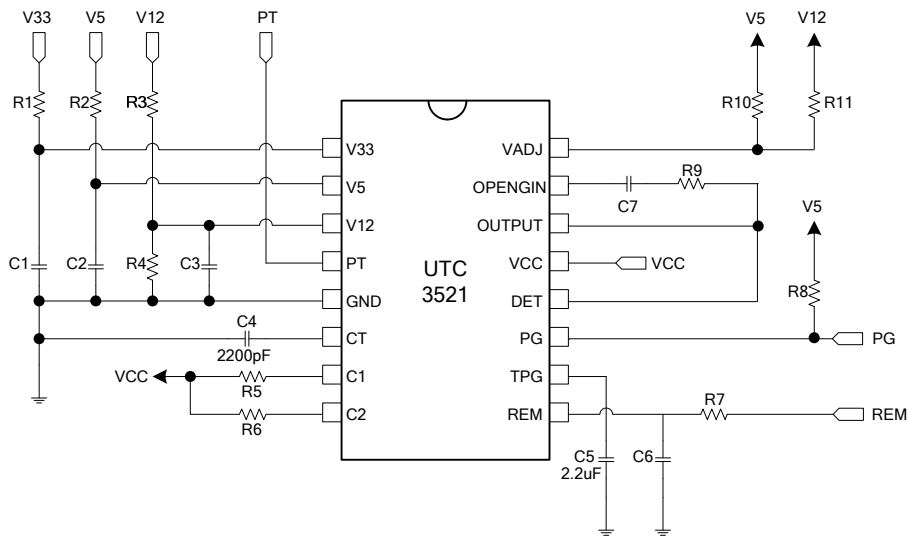
(4) Protection Control of the Soft-Start

The soft-start function is to reduce the large current surge during power-up or preventing the output voltages ($V_{33}/V_5/V_{12}$) 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



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