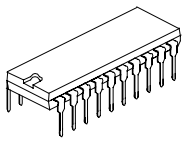
POWER SUPPLY SUPERVISER+REGULATOR+PWM



DIP-20

DESCRIPTION

UTC 3531 is a power supply switching mode controller IC for desktop PCs and it functions to monitor and control the output of the power supply. UTC3531 is designed to sense directly the output rails for OVP without excess external dividers, and provides a power-down warning signal for PG by an AC-signal sampling circuitry. In order to support control circuit including the PS-off delay, accurate timing would be generated by an internal clock generator. The cycle-by-cycle PWM switching 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. Two TL431 that shunt regulator are embedded in to provide stable reference voltage and driver for 3.3V and 5V-standby regulation.

UTC 3531 that including complete functions for push-pull and/or half-bridge topology have taken utilizing minimum external components to decrease the production cost and PCB space into account.

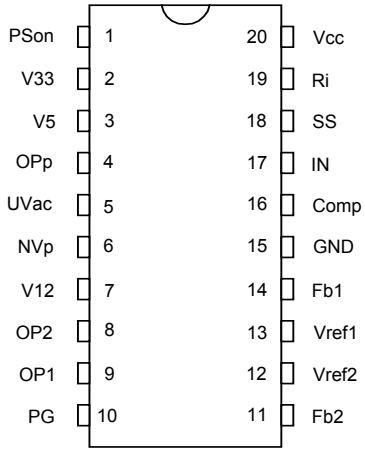
FEATURES

* PC half-bridge (or TL494) power supply supervisor + two TL431(for 3.3V & 5V standby) + PWM
* High integration & few external components
* Over-voltage protection & under-voltage detection for 3.3V, 5V and 12V
* UV protection for –12V and/or –5V
* Over-power and short-circuit protection
* Power-down warning & Power Good circuitry
* Delay time for PSON and PG signal
* Remote ON/OFF function
* On-chip oscillator and error amplifier
* Latching PWM for cycle-by-cycle switching
* Push-pull PWM operation and totem pole outputs
* Soft-start and maximum 93% duty cycle

APPLICATIONS

* Switching mode power supply for Personal Computers, including ATX, NLX, SFX (micro-ATX)

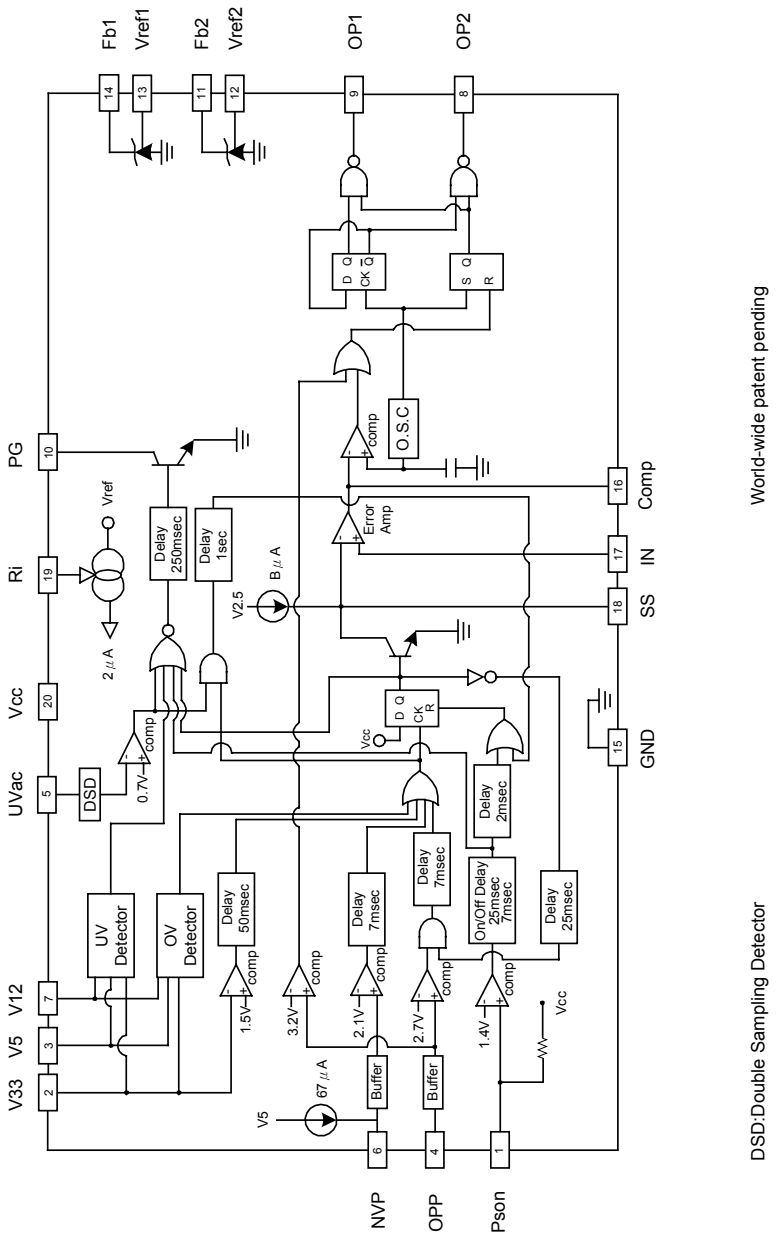
PIN CONFIGUREATION



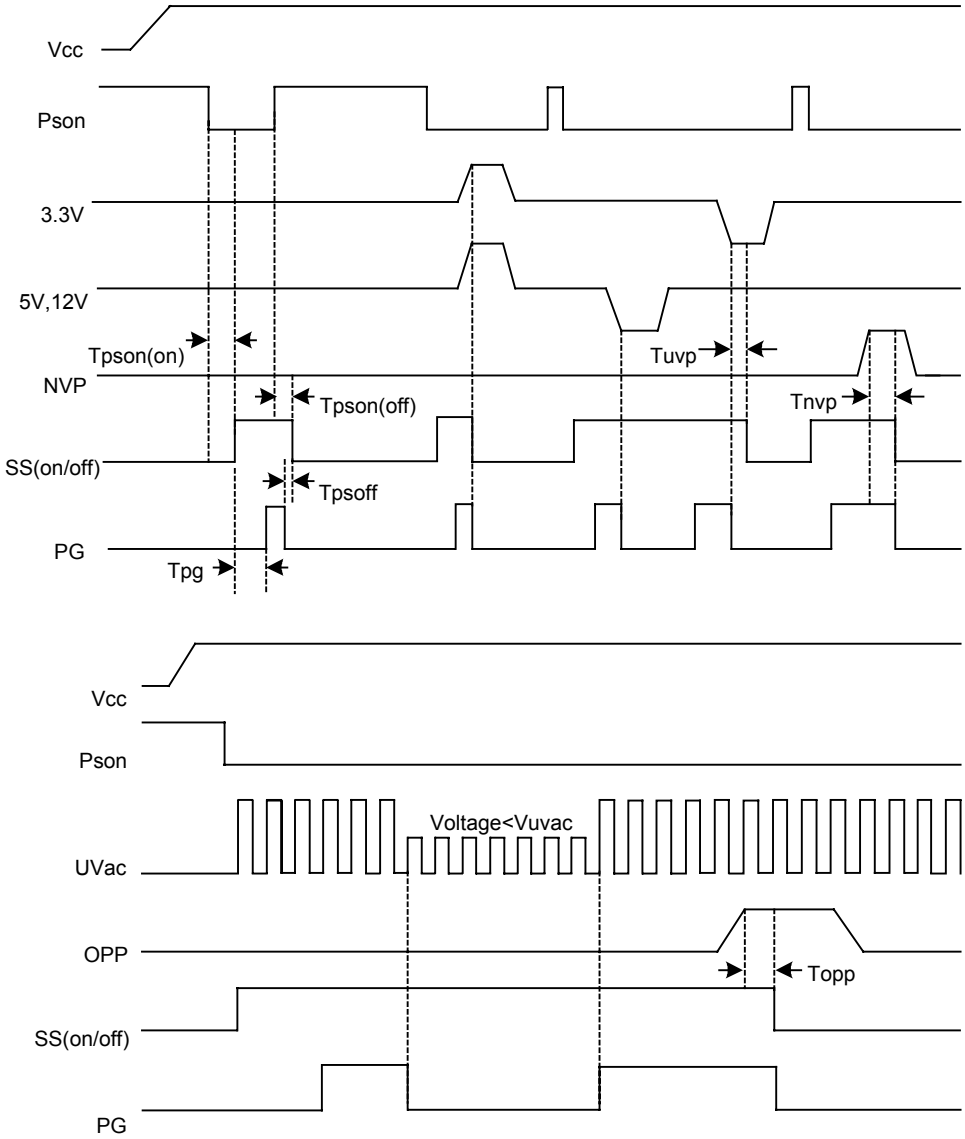
PIN DESCRIPTIONS

PIN NO.	SYMBOL	TYPE	DESCRIPTION
1	PSon	Logic input	Remote On/Off logic input for CPU or controller. Turn on/off the PWM Output after the 7 msec / 25 msec delay. PSon = 0 means that the main SMPS is operational. PSon =1 means that the main SMPS is off and the latch is reset.
2	V33	Analog input	3.3V over-voltage control sense input.
3	V5	Analog input	5V over-voltage control sense input.
4	OPp	Analog input	Over-power sense input. This pin is connected to driver transformer or the output of current transformer. When not in use, this pin should be grounded.
5	UVac	Analog input	AC failure detection, detect main AC voltage under-voltage and/or failure.
6	NVp	Analog input	The protection input for negative output, such as -12V and/or -5V. Trip voltage =2.1V
7	V12	Analog input	12V over-voltage control sense input.
9/8	OP1/OP2	Analog output	The totem-pole output drivers of push-pull PWM. The outputs are enabled (low) only when the NAND gate inputs are high, the maximum duty cycle on an output (OP1or OP2) is 46%.
10	PG	Logic output	Power Good logic output, 0 or 1 (open-collect). Power Good = 1 means that the power is good for operation. The Power Good delay is 250 msec.
11	Fb2	Analog output	Output for second converter regulation loop
12	Vref2	Analog input	Reference comparison input for second converter regulation loop. 2.5V
13	Vref1	Analog input	Reference comparison input for first converter regulation loop. 2.5V
14	Fb1	Analog output	Output for first converter regulation loop
15	GND	Supply	Ground.
16	COMP	Analog output	Error amplifier output and the input of the PWM comparator.
17	IN	Analog input	The negative input of error amplifier. The positive input of error amplifier is a 2.5V reference voltage.
18	SS	Analog input	The soft-start. It is settable through external capacitor. The current source output at this pin is 8uA and the voltage is clamped at 2.5V.
19	Ri	Program. Analog input	Connected to external resistor for the reference setting. Ri = 75k Ω
20	Vcc	Supply	Supply voltage. 4.5V ~ 7.0V. It is connected to 5V-standby.

BLOCK DIAGRAM



TIMING DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage Pin20-note 1	Vcc	16	V
Shunt Regulator Output	Vfb	16	V
Output Current Power Good, Fpo, Fb	Iout	30	mA
Power Dissipation	P_D	1	W
Storage Temperature Range	Tstg	-55 ~ +150	℃
Input Current	Iin	30	mA

Note: All voltage values, except differential voltage, are with respect to network ground terminal.

OPERATING CONDITONS

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage pin 20	Vcc	4.5 ~ 7.0	V
Shunt Regulator Output	Vfb	4 ~ 16	V
Operating Free Air Temperature Range	Toper	-25 ~ +85	℃
Operating Cathode Current,Vref1 and Vref2	Ik	10	mA

ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITONS	MIN.	TYP.	MAX.	UNIT
Total Supply Current	Icc	PG Low			10	mA
Over voltage Sense 3.3V	Vvs1		3.9	4.1	4.4	V
Over voltage Sense 5V	Vvs2		5.8	6.1	6.6	V
Over voltage Sense 12V	Vvs3		13.9	14.5	14.9	V
Under voltage Sense 3.3V for PG	Vus1		2.5	2.8	3.0	V
Under voltage Sense 5V for PG	Vus2		4.0	4.3	4.5	V
Under voltage Sense 12V for PG	Vus3		9.4	10.1	10.4	V
Over power Protection	Vopp	Uvac=1V	2.60	2.75	2.90	V
TIming Opp to Protection	Topp	Ri=75K		7		ms
Negative Voltage Protection	Vnvp		1.9	2.1	2.3	V
Negative Voltage Protection	Invp	Ri=75K	58	67	72	μA
Timing Nvp to PG out	Tnvp	Ri=75K		7		ms
Timing 3.3V Under Voltage to Protection	Tuvp	Ri=75K		50		ms

SHUNT REGULATOR (FB1, VREF1, FB2, VREF2)

PARAMETER	SYMBOL	TEST CONDITONS	MIN.	TYP.	MAX.	UNIT
Reference Voltage	Vref	Ifb=0.5mA, T=25℃	2.475	2.5	2.525	V
Current Stability	Ifb	Ifb=0.5mA ~ 10mA			20	mV
Temperature Stability	Tref				20	mV
Line Regulation	Regli-fb	4<Vcc<16V		1		mV/V
Output Sinking Current Capability	Iout-fb	Vout>2V	10			mA

POWER GOOD SECTION

PARAMETER	SYMBOL	TEST CONDITONS	MIN.	TYP.	MAX.	UNIT
Timing PG delay	Tpg	Ri=75K	200	300	400	ms
Uvac Voltage Detect Level	Vuvac		0.65	0.7	0.72	V
PG Good Output Rise Time	Tr	C_L=100pF		1		μs
PG Good Fall Time	Tf	C_L=100pF		300		ns
Power Good Output Saturation Level	Vol2	Ic=5mA			0.4	V
Power Good Leakage Current Collector	Ioh2	Vout=5V			1	μA

REMOTE ON/OFF

PARAMETER	SYMBOL	TEST CONDITONS	MIN.	TYP.	MAX.	UNIT
Pson Input threshold Level	Vpson		1	1.4	1.8	V
Remote Input driving Current	Ipson				0.5	mA
Timing Pson to SS out On Off (PS-off)	Tpson	Ri=75KΩ		 26 7.5		ms
Timing PG low to SS out	Tpsoff	Ri=75KΩ		2		ms

PWM SECTION:

ERROR AMPLIFIER

PARAMETER	SYMBOL	TEST CONDITON	MIN.	TYP.	MAX.	UNIT
Reference Voltage	V2.5		2.45	2.5	2.55	V
Input Bias Current	Iib				0.1	μA
Open-Loop Voltage Gain	Avol		50	60		dB
Unity Gain Bandwidth	BW	Ta=25℃	0.3	1		MHz
Power Supply Rejection Ratio	PSRR		50			dB

OSCILLATOR SECTION

PARAMETER	SYMBOL	TEST CONDITON	MIN	TYP	MAX	UNIT
Frequency	Fsoc	Ta=25℃, Ri=75KΩ	60	70	75	KHz

SOFT-START SECTION

PARAMETER	SYMBOL	TEST CONDITON	MIN.	TYP.	MAX.	UNIT
Charge Current	Iss	Ri=75KΩ	6.5	8	9.5	μA

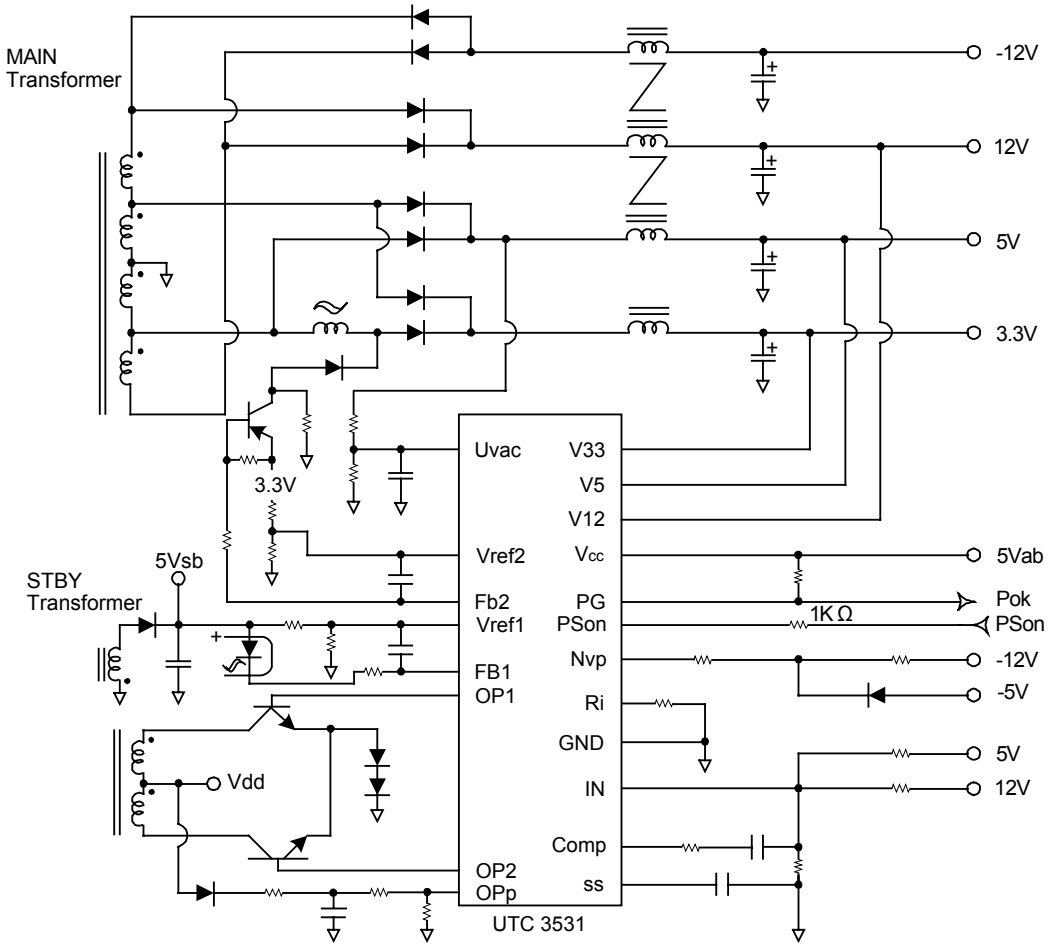
COMPARATOR SECTION

PARAMETER	SYMBOL	TEST CONDITON	MIN.	TYP.	MAX.	UNIT
Maximum Duty Cycle	DC		85		93	%

OUTPUT SECTION

PARAMETER	SYMBOL	TEST CONDITON	MIN.	TYP.	MAX.	UNIT
Output Voltage Low	Vol	Io=5mA			0.5	V
Output Voltage High	Voh		4			V
Output Impedance of Voh	Ro		1.5		3.3	KΩ

APPLICATION 1



APPLICATION 2