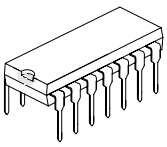
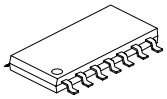
# 3512

**CMOS IC**

# PC POWER SUPPLY SUPERVISORS



DIP-14



SOP-14

*Pb-free plating product number: 3512L

## ■ DESCRIPTION

The UTC **3512** is specially designed for switching power supply system. It provides over-voltage protection, over-current protection, under-voltage protection, on/off control and power good signal generating.

OVP/UVP (Over/Under-Voltage Protection) monitors 3.3V, 5V and double 12V to protect our power supply and PC, FPO goes to high when one of these supply voltages exceeds their normal operation voltage range.

OCP (Over Current Protection) monitors IS33, IS5, IS12 input current. The voltage difference across external current shunt is used for OCP functions. An external resistor which is connected between the RI pin and the GND pin can be used to adjust protection threshold. To achieve better immunity for lighting surge glitch and to prevent accidental power shut down during dynamic loading condition, the de-bounce time for UVP/OCP is 73us respectively. The deglitch time for OVP is 73uS for better noise immunity.



The power supply is turned on after 38mS de-bounce time when PSON signal is set from high to low. To turn off power supply, PSON signal is set from low to high and the de-bounce time is 115mS. When PGI input voltage level is lower than the internal 1.15V reference voltage, after 73uS de-bounce time, the PGO signal is pulled low.

## ■ FEATURES

* Over/Under-voltage protection for 3.3V, 5V, and two 12V
* Over-current protection for 3.3V, 5V, and two 12V
* PGO and FPO pins with open drain output stage
* 300mS power good delay from PGI to PGO
* 75mS delay for 3.3V, 5V and 12V power turn on
* 2.8mS delay for PSON control to FPO turn off
* 38mS / 115mS PSON on/off de-bounce time
* 73uS width noise deglitches
* 73uS de-bounce time for UVP and OCP
* Wide supply voltage range

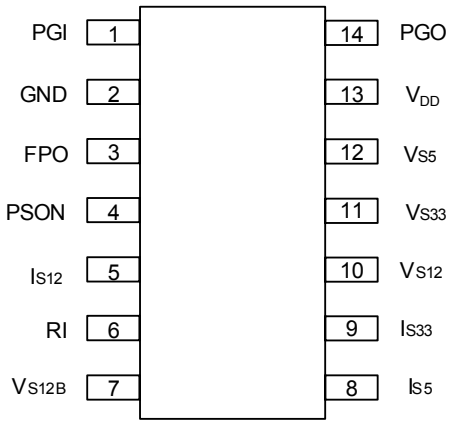
## ■ ORDERING INFORMATION

| Order Number | | Package | Packing |
|---|---|---|---|
| Normal | Lead Free Plating | | |
| 3512-D14-T | 3512L-D14-T | DIP-14 | Tube |
| 3512-S14-R | 3512L-S14-R | SOP-14 | Tape Reel |
| 3512-S14-T | 3512L-S14-T | SOP-14 | Tube |

■ ORDERING INFORMATION(Cont.)

| | |
|---|---|
| 3512L-D14-T<br>(1)Packing Type<br>(2)Package Type<br>(3)Lead Plating | (1) R: Tape Reel, T: Tube<br>(2) D14: DIP-14, S14: SOP-14<br>(3) L: Lead Free Plating, Blank: Pb/Sn |

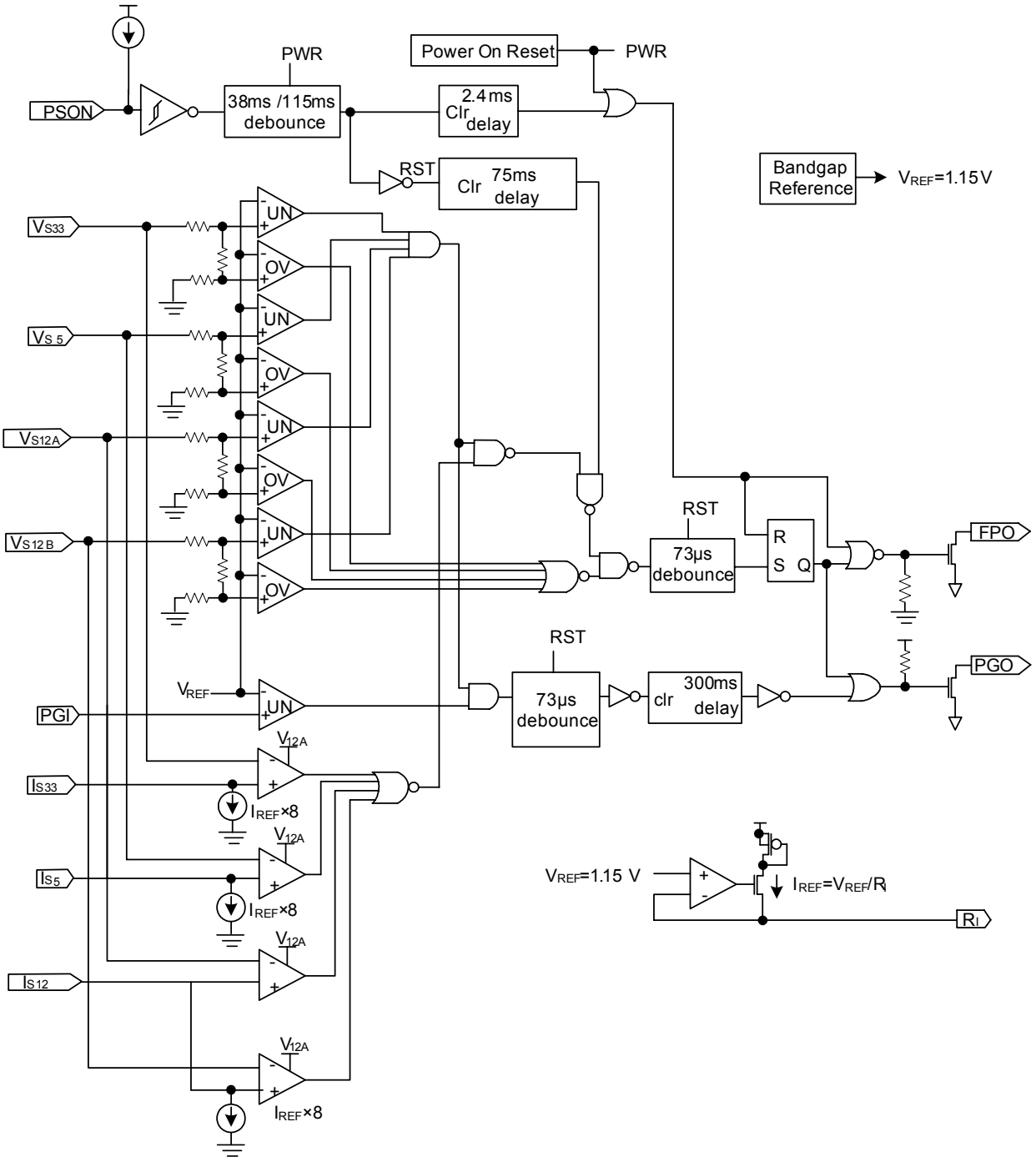
## ■ PIN CONFIGURATION




## ■ PIN DESCRIPTION

| PIN NO | PIN NAME | TYPE | DESCRIPTION |
|---|---|---|---|
| 1 | PGI | input | Power good input. |
| 3 | FPO | output | Fault protection output, open drain output stage. |
| 4 | PSON | input | Power on/off control signal sends from CPU or main-board. The power supply will be turned on/off after 38mS/115mS respectively. |
| 8 | $I_{S5}$ | input | 5V over current protection. |
| 9 | $I_{S33}$ | input | 3.3V over current protection. |
| 5 | $I_{S12}$ | input | 12V over current protection. Regarding typical application, this pin is connected to the positive end of a current shunt through one resistor. When the voltage on IS12 is higher than that of VS12 by 5mV, OCP will be enabled. One current sink, 8 x $I_{REF}$, is used to determine the voltage drop between the positive end of the current shunt and VS12. Adjusting the value of the external resistor can adjust the threshold for OCP accordingly. The operation for IS5 or IS33 is the same. |
| 6 | RI | input | Current sense setting. An external resistor Ri is connected between RI pin and GND pin will adjust a reference current, $I_{REF}$ = 1.15/Ri, for OCP function. |
| 12 | $V_{S5}$ | input | 5V over/under-voltage protection. |
| 7 | $V_{S12B}$ | input | Second 12V over/under-voltage protection. |
| 10 | $V_{S12}$ | input | 12V over/under-voltage protection. |
| 11 | $V_{S33}$ | input | 3.3V over/under-voltage protection. |
| 13 | $V_{DD}$ | power | Supply voltage. 4V ~ 15V. |
| 14 | PGO | output | Power good logic output, open drain output stage. The power good delay is 300mS from PGI to PGO. |
| 2 | GND | power | Ground. |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| DC Supply Voltage | | $V_{DD}$ | -0.3 ~ 16 | V |
| Input Voltage | PSON, $V_{S33}$, $V_{S5}$, PGI | $V_{IN}$ | -0.3 ~ 8 | V |
| Output Voltage | FPO | $V_{OUT}$ | -0.3 ~ 16 | V |
| | PGO | | -0.3 ~ 8 | |
| Power Dissipation | | $P_D$ | 400 | mW |
| Operating Temperature | | $T_{OPR}$ | -40 ~ +85 | ℃ |
| Storage Temperature | | $T_{STG}$ | -55 ~ +150 | ℃ |

Note 1. 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.
2. Stresses above those listed may cause permanent damage to the device.

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | | SYMBOL | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| DC Supply Voltage | | $V_{DD}$ | 4 | 15 | V |
| Input Voltage | PSON, $V_{S33}$, $V_{S5}$, $I_{S33}$, $I_{S5}$, PGI | $V_{IN}$ | | 7 | V |
| Input Voltage | $V_{S12}$,$V_{S12B}$, $I_{S12}$ | | | 15 | |
| Output Voltage | FPO | $V_{OUT}$ | | 15 | V |
| | PGO | | | 7 | |
| Output Sink Current | FPO | $I_{O(SINK)}$ | | 20 | mA |
| | PGO | | | 10 | |
| Supply Voltage Rising Time | See Note | $t_R$ | 1 | | mS |
| Output Current RI | | $I_{RI}$ | 12.5 | 62.5 | μA |

Note $V_{DD}$ rising and falling slew rate must be less than 14V/mS.

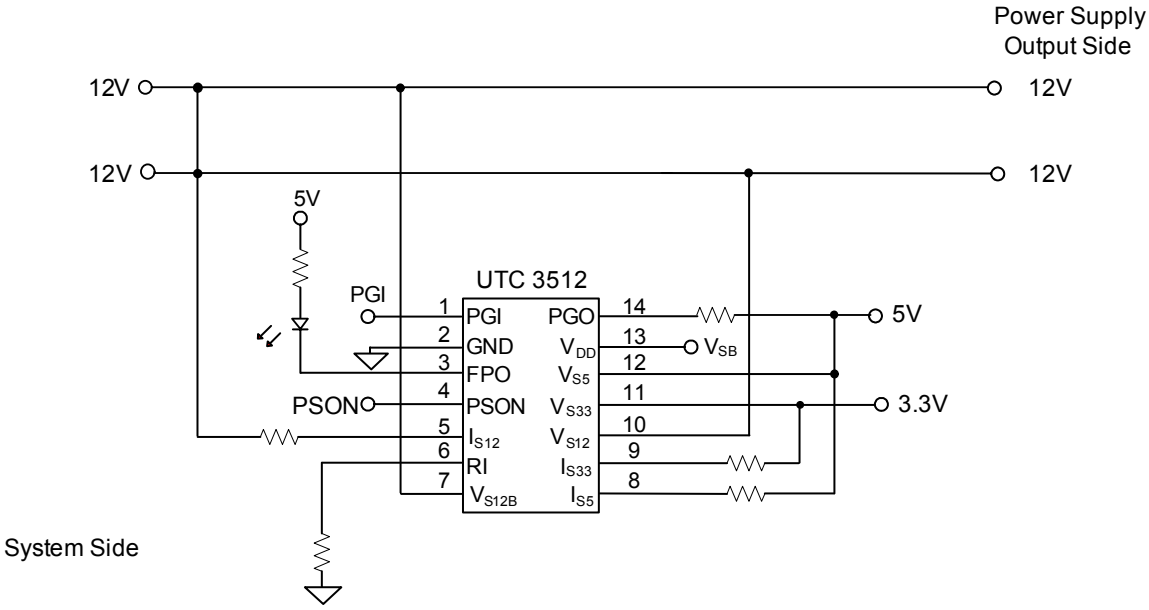
## ■ ELECTRICAL CHARACTERISTICS ($V_{DD}$=12V, $T_A$=25℃)

| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **UNDER-VOLTAGE AND PGI, PGO** | | | | | | | |
| Input Threshold Voltage PGI | | $V_{PGI}$ | | 1.1 | 1.15 | 1.2 | V |
| Under-voltage protect $V_{S33}$ | | $V_{UVp}$ | | 2.6 | 2.8 | 3.0 | V |
| Under-voltage protect $V_{S5}$ | | | | 4.0 | 4.2 | 4.4 | |
| Under-voltage protect $V_{S12}$, $V_{S12B}$ | | | | 9.4 | 9.9 | 10.4 | |
| Low Level Output Voltage (PGO) | | $V_{OL}$ | $V_{DD}$ = 12V $I_{SINK}$ =10mA | | | 0.7 | V |
| Leakage Current (PGO) | | $I_{LEAK}$ | PGO = 5V | | | 5 | μA |
| Under-voltage Enable Delay Time | | | | 49 | 75 | 114 | mS |
| Timing PG Delay | PGI to PGO | $t_{PG}$ | | 200 | 300 | 450 | mS |
| Noise Deglitch Time | PGI to PGO | | | 150 | 250 | 350 | μS |
| Timing UVP to Protection (FPO) | | $T_{UVP}$ | $V_{S33}$,$V_{S5}$, $V_{S12}$,$V_{S12B}$ | | 73 | | μS |
| **OVER-VOLTAGE AND OVER-CURRENT PROTECTION** | | | | | | | |
| Over-Voltage Protection | $V_{S33}$ | $V_{OVP}$ | | 3.7 | 3.9 | 4.1 | V |
| Over-Voltage Protection | $V_{S5}$ | | | 5.7 | 6.1 | 6.5 | |
| Over-Voltage Protection | $V_{S12}$, $V_{S12B}$ | | | 13.2 | 13.8 | 14.4 | |
| Ratio of Current Sense Sink Current to Current Sense Setting Pin (RI) Source Current | | $I_{REF}$ | RI = 30 KΩ, 0.1% Resistor | 7.6 | 8 | 8.4 | |
| Current Source Reference Voltage | | $V_{REF}$ | | 1.1 | 1.15 | 1.2 | V |
| OCP Comparator Input Offset Voltage | | $V_{I(OFF)}$ | | -5 | | 5 | mV |
| Low Level Output Voltage (FPO) | | $V_{OL}$ | $I_{SINK}$ =20mA | | | 0.7 | V |
| Leakage Current (FPO) | | $I_{LEAK}$ | $V_{(FPO)}$ = 5V | | | 5 | μA |
| Timing OVP to Protection | | $T_{OVP}$ | | | 73 | | μS |
| Timing OCP to Protection | | $T_{OCP}$ | | | 73 | | μS |

■ ELECTRICAL CHARACTERISTICS(Cont.)

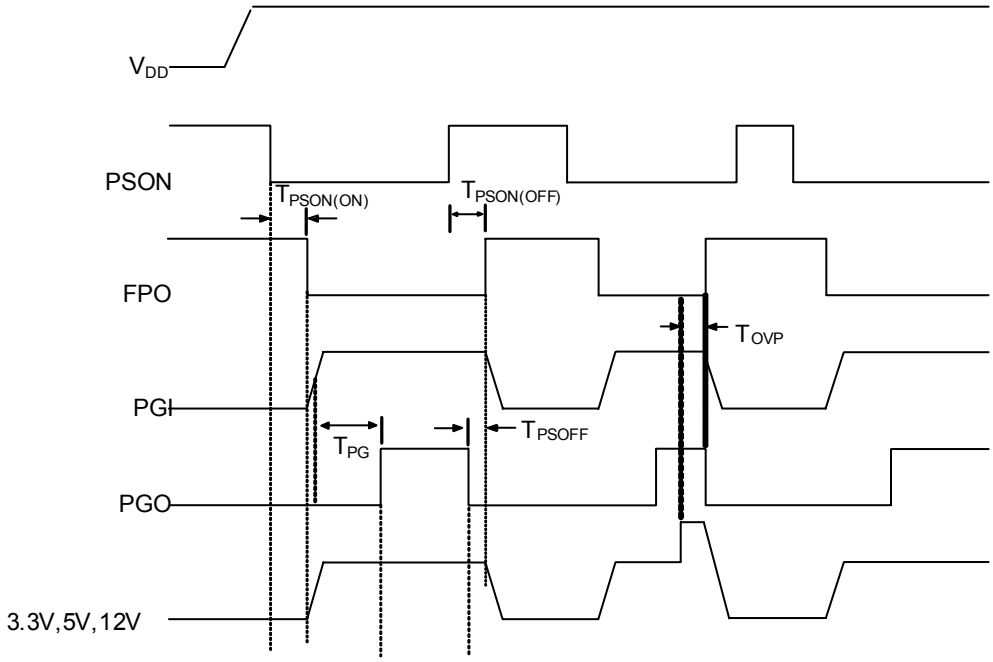
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **PSON CONTROL** | | | | | | | |
| High-Level Input Voltage | | $V_{IH}$ | | 1.9 | | | V |
| Low-Level Input Voltage | | $V_{IL}$ | | | | 0.98 | V |
| Timing PGO Low to FPO High | | $T_{PSOFF}$ | | 1.6 | 2.8 | 4.0 | mS |
| Timing PSON to On/Off | ON | $T_{PSON}$ | | 24 | 38 | 57 | mS |
| | OFF | | | 24 | 38 | 57 | mS |
| Input Pull-up Current | | $I_{PSON}$ | PSON = 0V | | 120 | | μA |
| **TOTAL DEVICE** | | | | | | | |
| Supply Current | | $I_{DD}$ | PSON = 5V, $V_{DD}$ = 5V | | 1.0 | 1.8 | mA |
| $V_{DD}$ Start Threshold Voltage | | $V_{THD}$ | | | | 4.0 | V |
| $V_{DD}$ Min. Operation Voltage After Start-up | | $V_{MIN}$ | | 3.65 | | | V |

## ■ TYPICAL APPLICATION CIRCUIT



## ■ TIMING DIAGRAM

PSON On/Off and 3.3V, 5V,12V OVP Function




3.3V,5 V,12V OVP UVP and OCP Function