

PS224L

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4-Channel Secondary Monitoring IC



新竹市科學園區展業一路9號4樓之3
SILICON TOUCH TECHNOLOGY INC.
9-4F-3, Prosperity Road I, Science Based Industrial Park,
Hsin-Chu, Taiwan 300, R.O.C.
Tel : 886-3-5645656 Fax : 886-3-5645626

PS224L

4-Channel Secondary Monitoring IC

General Description

PS224 is specially designed for switching power supply system. Four important functions of PS224 are the followings: over-voltage protection, over-current protection, under-voltage protection and power good signal generating.

OVP/UVP (Over-Voltage/Under-Voltage Protection) monitors 3.3V, 5V and dual 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, IS12A, IS12B input current sense. An adjustable over-current condition composed of I_{ref} and “protection current range resistor” helps users design OCP easily.

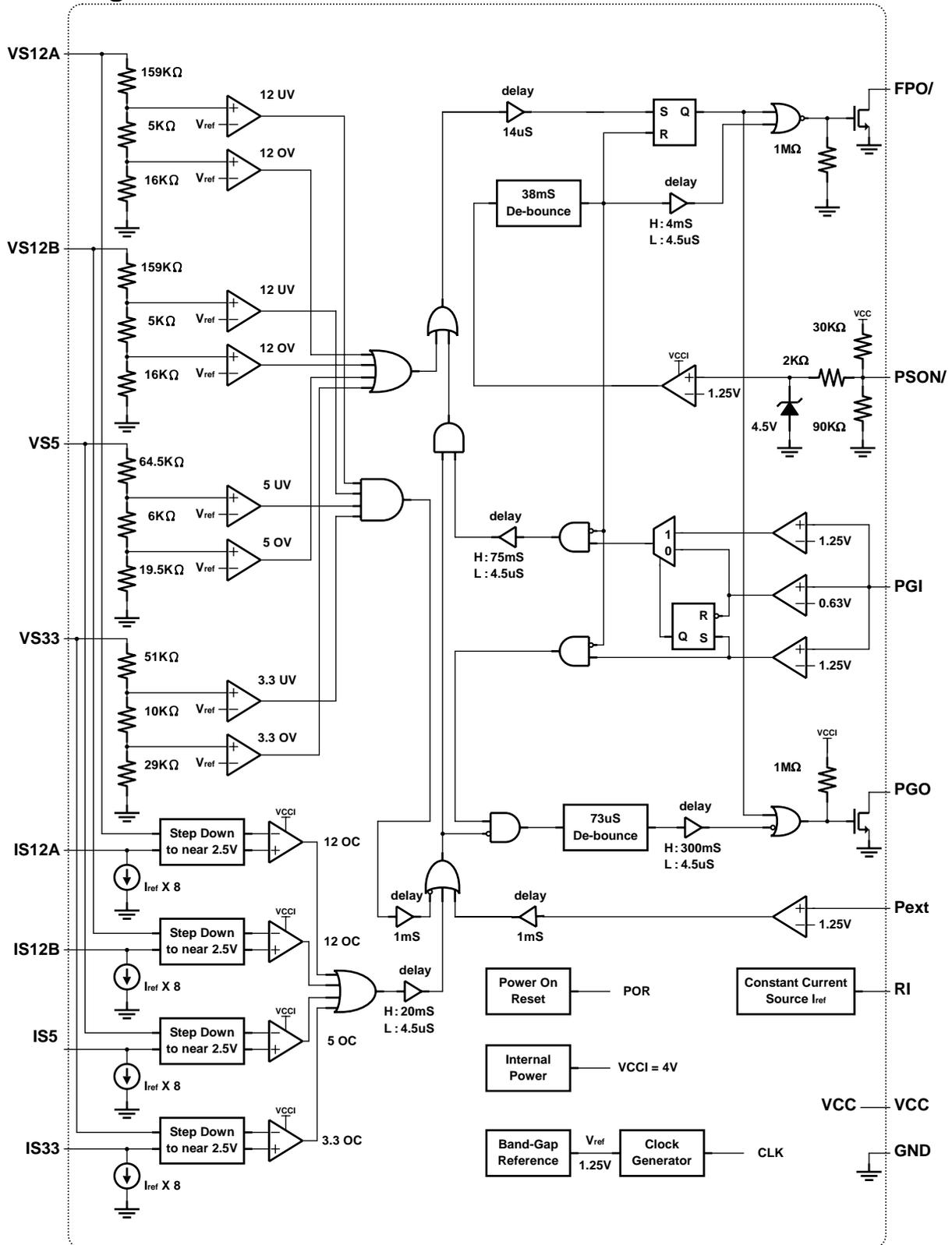
An additional protection input pin provides the flexibility for design protection circuit.

Power good signal generating notifies personal computer when power supply is ready or power supply is going to shutdown, therefore it can provide a reliable power supply environment.

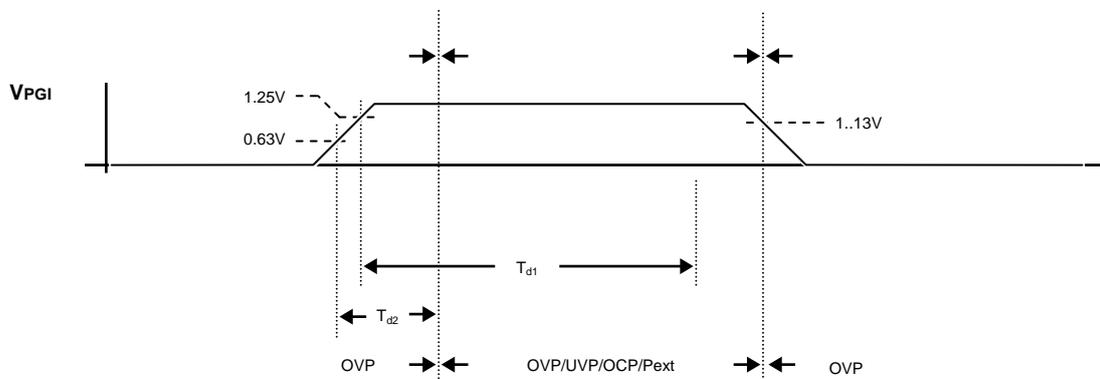
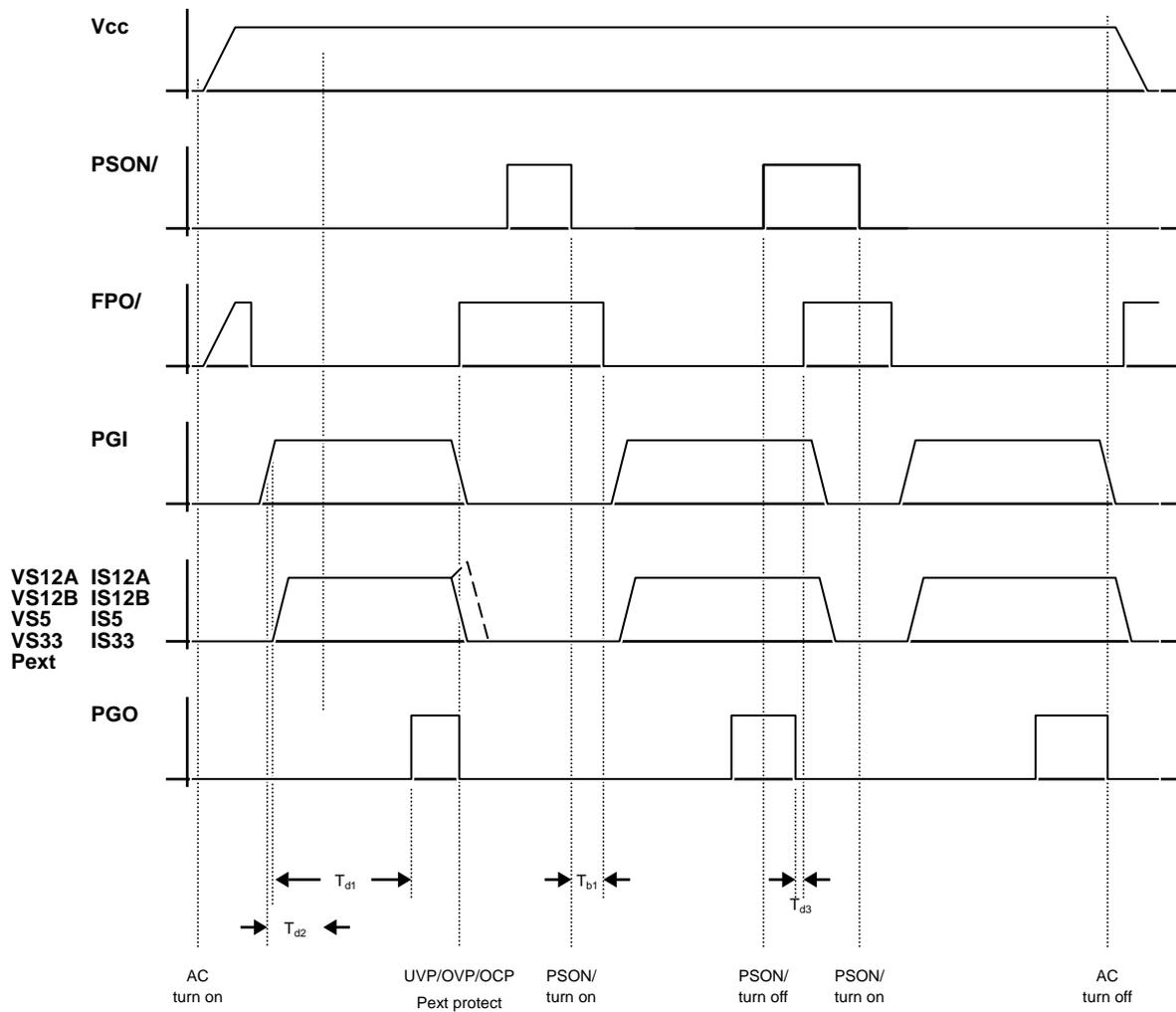
Features

- Over/Under-voltage protection and lock out
- Over-current protection and lock out
- Additional protection input
- Fault protection output with open drain output stage
- Open drain power good output signal for power good input
- Built-in 300mS power good delay
- AC on 75ms delay for UV/OC protection
- 38mS PSON/ control de-bounce
- Wide power supply range (3.8V~16V)
- Special care for AC power off

Block Diagram



Timing Chart



Pin Descriptions

| Pin No | PIN NAME | Descriptions |
|--------|----------|---|
| 1 | PGI | Power good input signal pin |
| 2 | GND | Ground |
| 3 | FPO/ | Inverted fault protection output ,open drain output stage |
| 4 | PSON/ | Remote ON/OFF control input pin |
| 5 | IS12A | 12V(1) over current protection input pin |
| 6 | RI | Current sense setting |
| 7 | IS12B | 12V(2) over current protection input pin |
| 8 | VS12B | 12V(2) over/under voltage protection input pin |
| 9 | Pext | External protection detect input pin |
| 10 | IS5 | 5.0V over current protection input pin |
| 11 | IS33 | 3.3V over current protection input pin |
| 12 | VS12A | 12V(1) over/under voltage protection input pin |
| 13 | VS33 | 3.3V over/under voltage protection input pin |
| 14 | VS5 | 5.0V over/under voltage protection input pin |
| 15 | VCC | Power supply |
| 16 | PGO | Power good output signal pin , open drain output stage |

Absolute Maximum Ratings

| Parameter | | Rating | Unit |
|-----------------------|---------------------|-----------------|--------------------------------|
| Storage Temperature | (T _{stg}) | -40 to +125 | °C |
| Operating Temperature | (T _{opr}) | -30 to +90 | °C |
| Supply Voltage | (V _{cc}) | VCC | -0.5 to +16.0 V |
| Input Voltage Range | (V _i) | ISX, VS12, IS12 | -0.5 to +16.0 V |
| | | VS5, IS5 | -0.5 to +9.0 V |
| | | VS33, IS33 | -0.5 to +7.0 V |
| | | PGI | -0.5 to +16.0 V |
| | | PSON/, Pext | -0.5 to V _{cc} +0.5 V |
| Output Voltage Range | (V _o) | FPO/ | -0.5 to +16.0 V |
| | | PGO | -0.5 to V _{cc} +0.5 V |
| Output Current for RI | (I _{ri}) | RI | 12.5 to 62.5 uA |
| ESD Susceptibility* | (V _{ESD}) | PSON/, PGO | > 5000 V |
| | | FPOB, VS12 | > 2000 V |
| | | PGI, IS12, VS5 | > 3000 V |
| | | Others | > 4000 V |

* Human Body Model (HBM).

Electrical Characteristics, $V_{CC}=12V$, T_a = Full range. (unless otherwise specified)

Power Supply Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|--|------------------|-------|------|-------|------|
| Supply Voltage | | 3.8 | 5.0 | 16.0 | V |
| Supply Current | $V_{PSONV} = 5V$ | | 4.5 | 5.0 | mA |
| Power On Reset Threshold Voltage (V_{POR}) | | 3.2 | 3.4 | 3.6 | V |
| Power On Reset Hysteresis (V_{HYST}) | | -0.15 | -0.3 | -0.45 | V |

Over-Voltage Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|------------------------|------------|------|------|------|------|
| Over-Voltage Threshold | VS33 | 3.8 | 3.9 | 4.0 | V |
| | VS5 | 5.6 | 5.8 | 6.0 | V |
| | VS12A/B | 13.5 | 14.0 | 14.2 | V |

Under-Voltage Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|-------------------------|------------|------|------|------|------|
| Under-Voltage Threshold | VS33 | 2.8 | 2.9 | 3.0 | V |
| | VS5 | 4.2 | 4.4 | 4.6 | V |
| | VS12A/B | 10.3 | 10.8 | 11.0 | V |

Over-Current Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|--|---|------|------|------|---------|
| Offset Voltage (OCP Comparator) | VS33/VS5 | -5 | 0 | 3 | mV |
| | VS12A/B | -5 | 0 | 1 | mV |
| Constant Current Generator Voltage (V_{RI}) | $R = 62.5K$ | 1.20 | 1.25 | 1.30 | V |
| Deviation of V_{RI} over full temperature range ($V_{RI(dev)}$) | $T_A = -30^{\circ}C$ to $90^{\circ}C$ $I_{ref} = 20\mu A$ | | 24 | 45 | mV |
| IS Sink Current | IS33/IS5/IS12A/IS12B $R = 62.5K$ | 148 | 160 | 172 | μA |
| I_{IS} to I_{ref} Current Gain (G_{IS}) | $I_{ref} = 20\mu A$ | 7.5 | 8 | 8.5 | |
| Deviation of G_{IS} over full temperature range ($G_{IS(dev)}$) | $T_A = -30^{\circ}C$ to $90^{\circ}C$ $I_{ref} = 20\mu A$ | | 0.08 | 0.28 | |

Electrical Characteristics (Continued)

PGI, Analog Input

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|--------------------------------------|------------|------|------|------|------|
| Threshold Voltage for start T_{d1} | | 1.16 | 1.25 | 1.28 | V |
| Threshold Voltage for start T_{d2} | | 0.60 | 0.63 | 0.75 | V |
| Threshold Voltage for mask OC,UV | | 1.04 | 1.13 | 1.20 | V |
| Threshold Voltage for PGO disable | | 1.08 | 1.20 | 1.20 | V |
| Hysteresis (V_{HYST})* | | 20 | 50 | 80 | mV |

* All of the comparator for PGI input in block diagram.

PGO, Open Drain Digital Output

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---------------------------------------|-----------------|-----|-----|-----|---------|
| Leakage Current (I_{LKG}) | $V_{PGO}=5V$ | | | 5 | μA |
| Low Level Output Voltage (V_{OL}) | $I_{SINK}=10mA$ | | | 0.3 | V |

FPO/, Open Drain Digital Output

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---------------------------------------|-----------------|-----|-----|-----|---------|
| Leakage Current (I_{LKG}) | $V_{FPO}=5V$ | | | 5 | μA |
| Low Level Output Voltage (V_{OL}) | $I_{SINK}=20mA$ | | | 0.3 | V |

PSON/, Analog Input

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---------------------------|------------|------|------|------|------|
| Threshold Voltage | | 1.16 | 1.25 | 1.33 | V |
| Hysteresis (V_{HYST}) | | 20 | 50 | 80 | mV |

External Protection Detect Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---------------------------|------------|------|------|------|------|
| Threshold(V_{TH}) | | 1.20 | 1.25 | 1.30 | V |
| Hysteresis (V_{HYST}) | | -20 | -50 | -80 | mV |

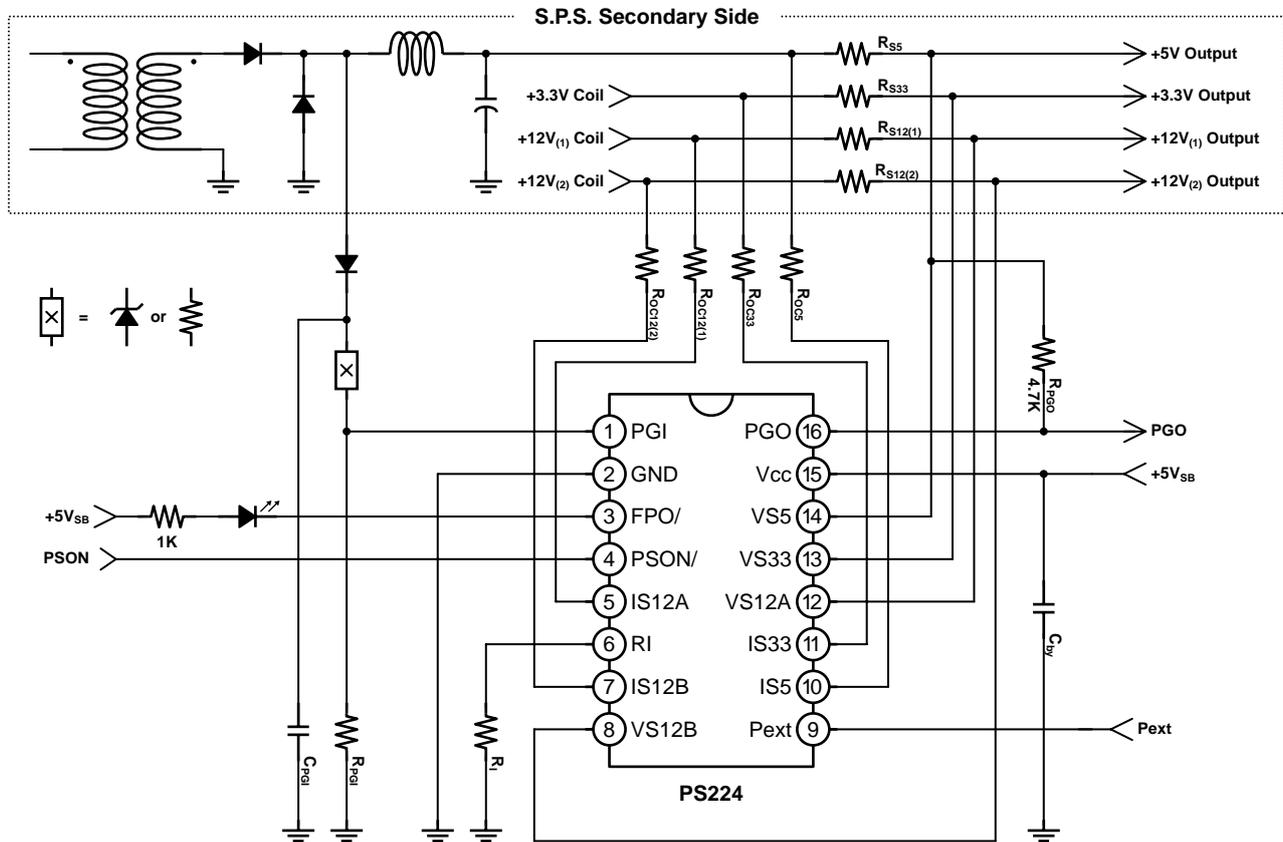
Electrical Characteristics (Continued)

Switching Characteristics, Vcc=12V, T_a = Full range.

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|------------|-----|-----|-----|------|
| PGI to PGO Delay Time (T _{d1}) | | 200 | 300 | 400 | mS |
| Short Circuit Delay Time (T _{d2}) | | 49 | 75 | 100 | mS |
| PGO to FPO/ Delay Time (T _{d3}) | | 2 | 4 | 6 | mS |
| Under Voltage Delay Time (T _{d4}) | | 0.6 | 1 | 1.4 | mS |
| Over Current Delay Time (T _{d5}) | | 13 | 20 | 27 | mS |
| Over Voltage Delay Time (T _{d6}) | | 9 | 14 | 19 | uS |
| Pext Delay Time (T _{d7}) | | 0.6 | 1 | 1.4 | mS |
| PSON/ De-bounce Time (T _{b1}) | | 24 | 38 | 52 | mS |
| PGO Noise De-glitch Time (T _{b2}) | | 47 | 73 | 100 | uS |

Application

Typical 4 rails SPS



Notes:

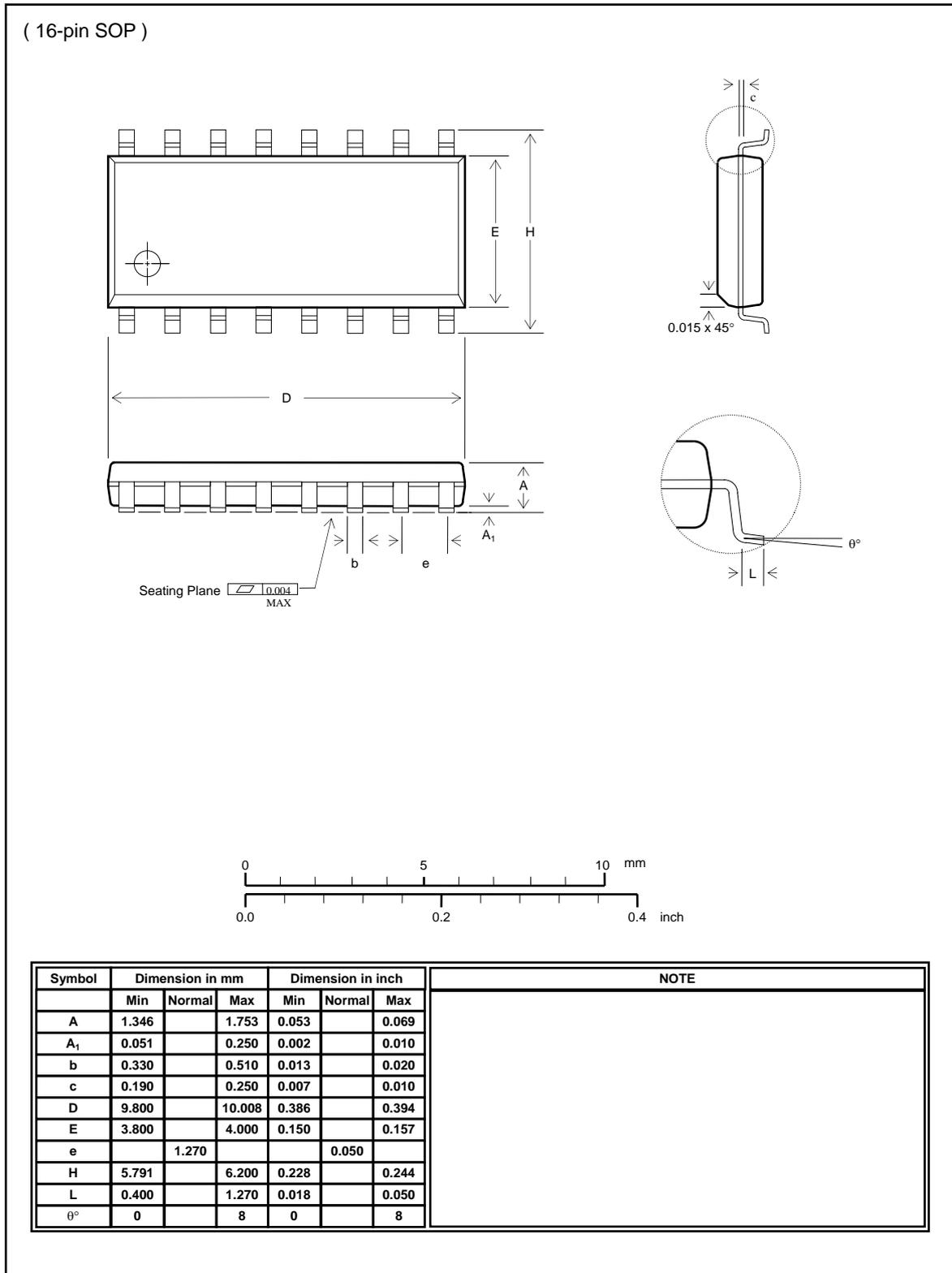
1. Zener diode or resistor or both of them can be used in component X.
2. The bypass capacitor C_{by} suggests to be 0.1uF~ 10uF and layout nearby pin VCC.
3. The recommend sense values of $R_{S12(1)}$, $R_{S12(2)}$, R_{S5} and R_{S33} are $\geq 0.002\Omega$.
4. Over-Current Protection design example:

$$(1) I_{ref} = 20\mu A, R_I = \frac{V_{RI}}{I_{RI}} = \frac{1.25}{20\mu} = 62.5K(\Omega)$$

$$(2) R_{S5} = 0.002\Omega, \Delta V_{5V} = 0.002 \times I_{+5V} = R_{OC5} \times 8 \times I_{ref}$$

$$(3) \text{ If } +5V \text{ OCP trip point is } 20A, R_{OC5} = \frac{0.002 \times 20}{8 \times 20\mu} = 250(\Omega)$$

Package Specification



The products listed herein are designed for ordinary electronic applications, such as electrical appliances, audio-visual equipment, communications devices and so on. Hence, it is advisable that the devices should not be used in medical instruments, surgical implants, aerospace machinery, nuclear power control systems, disaster/crime-prevention equipment and the like. Misusing those products may directly or indirectly endanger human life, or cause injury and property loss.

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