

# PS238

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*Version* : A.001  
*Issue Date* : 2008/05/05  
*File Name* : SP-PS238-A.001.doc  
*Total Pages* : 11

## **8-Channel Secondary Monitoring IC**



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## PS238

# 8-Channel Secondary Monitoring IC

## General Description

PS238 is specially designed for switching power supply system. Four important functions of PS238 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 six 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, IS12C, IS12D, IS12E, IS12F input current sense. An adjustable over-current condition composed of Iref and “protection current range resistor” helps users design OCP easily.

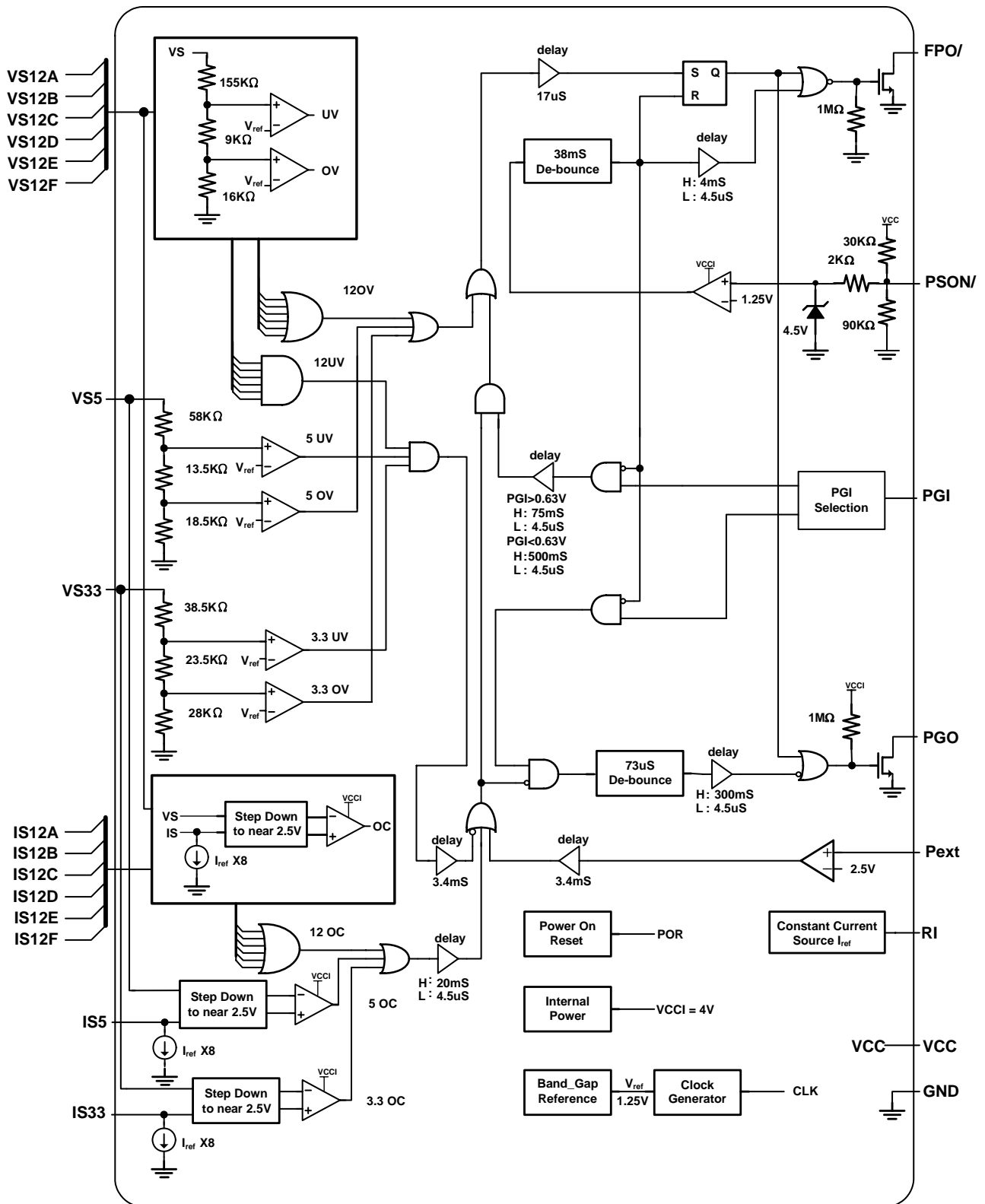
An additional protection input pin provides the flexibility for design protection circuit.

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

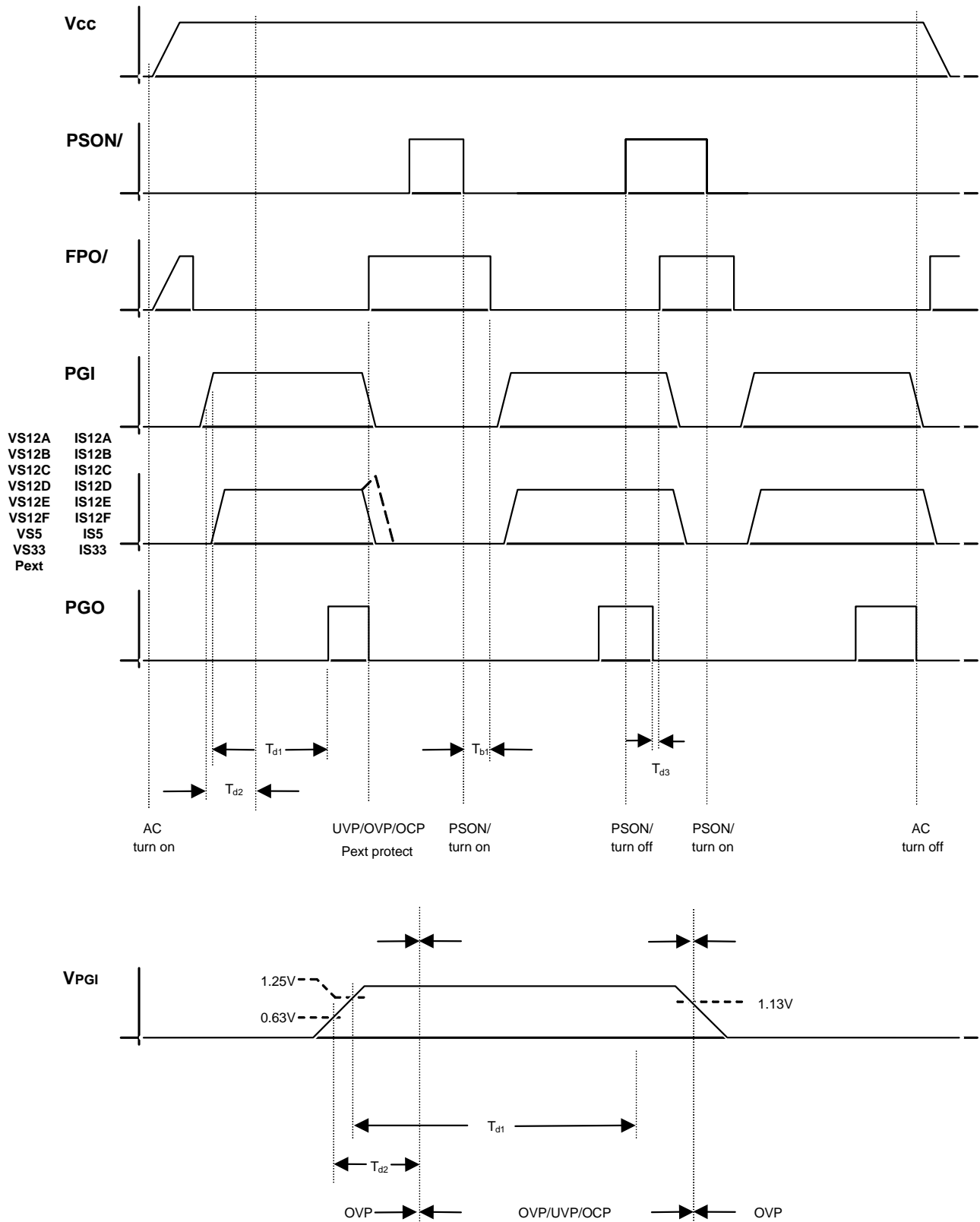
- Over/Under-voltage protection and lock out
- Over-current protection and lock out
- Additional protection input
- Fault protection output with open drain output stage
- Open drain power good output signal for power good input
- Built-in 300mS power good delay
- AC on 75ms delay for UV/OC protection
- 38mS PSON/ control de-bounce
- Wide power supply range (4.2V~16V)
- Special care for AC power off

### Block Diagram



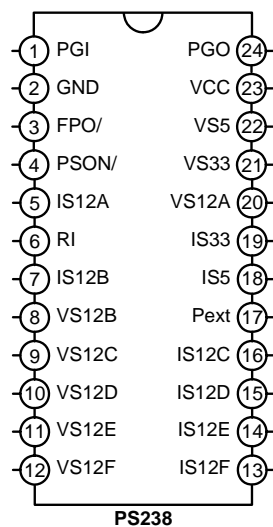


# Timing Chart



## 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	VS12C	12V(3) over/under voltage protection input pin
10	VS12D	12V(4) over/under voltage protection input pin
11	VS12E	12V(5) over/under voltage protection input pin
12	VS12F	12V(6) over/under voltage protection input pin
13	IS12F	12V(6) over current protection input pin
14	IS12E	12V(5) over current protection input pin
15	IS12D	12V(4) over current protection input pin
16	IS12C	12V(3) over current protection input pin
17	Pext	External protection detect input pin
18	IS5	5.0V over current protection input pin
19	IS33	3.3V over current protection input pin
20	VS12A	12V(1) over/under voltage protection input pin
21	VS33	3.3V over/under voltage protection input pin
22	VS5	5.0V over/under voltage protection input pin
23	VCC	Power supply
24	PGO	Power good output signal pin , open drain output stage



## Absolute Maximum Ratings

Parameter		Rating			Unit
Storage Temperature	(T <sub>stg</sub> )	-40	to	+125	°C
Operating Temperature	(T <sub>opr</sub> )	-30	to	+90	°C
Supply Voltage	(V <sub>cc</sub> )	VCC		-0.5 to +16.0	V
Input Voltage Range	(V <sub>i</sub> )	VS12, IS12(A,B,C,D,E,F)		-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 <sub>cc</sub> +0.5	V
Output Voltage Range	(V <sub>o</sub> )	FPO/		-0.5 to +16.0	V
		PGO		-0.5 to V <sub>cc</sub> +0.5	V
Output Current for RI	(I <sub>RI</sub> )	RI		12.5 to 62.5	uA

## Electrical Characteristics, V<sub>cc</sub>=12V, T<sub>a</sub> = 25°C. (Unless otherwise specified)

### Power Supply Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Supply Voltage		4.2	5.0	16.0	V
Supply Current	V <sub>PSON/</sub> = 5V		4.5	5.0	mA
Power On Reset Threshold Voltage (V <sub>POR</sub> )		3.0	3.4	3.6	V
Power On Reset Hysteresis (V <sub>HYST</sub> )		-0.15	-0.3	-0.45	V

### Over-Voltage Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Over-Voltage Threshold	VS33	3.7	3.9	4.1	V
	VS5	5.7	6.1	6.5	V
	VS12A/B/C/D/E/F	13.1	13.8	14.5	V

### Under-Voltage Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Under-Voltage Threshold	VS33	2.0	2.2	2.4	V
	VS5	3.3	3.5	3.7	V
	VS12A/B/C/D/E/F	8.5	9.0	9.5	V

## Electrical Characteristics (Continued)

### Over-Current Section

Parameter		Conditions	MIN	TYP	MAX	Unit
Offset Voltage	VS33, VS5		-3	0	3	mV
	VS12A/B/C/D/E/F		-3	0	4	mV
OCP Bias Current	IS33, IS5	RI=62.5KΩ	148	160	172	uA
	IS12A/B/C/D/E/F					

### PGI, Analog Input

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold Voltage for start $T_{d1}$		1.16	1.25	1.33	V
Threshold Voltage for start $T_{d2}$		0.60	0.63	0.75	V
Threshold Voltage for mask OC,UV		1.05	1.13	1.21	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	uA
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	uA
Low Level Output Voltage ( $V_{OL}$ )	$I_{SINK}=20mA$			0.4	V

### PSON/, Digital Input

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold Voltage ( High )		1.40	1.50	1.60	V
Threshold Voltage ( Low )		0.75	0.85	0.95	V



## Electrical Characteristics (Continued)

### External Protection Detect Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold( $V_{TH}$ )	VCC=12V	2.4	2.5	2.6	V
Hysteresis ( $V_{HYST}$ )		+/-10	+/-20	+/-50	mV

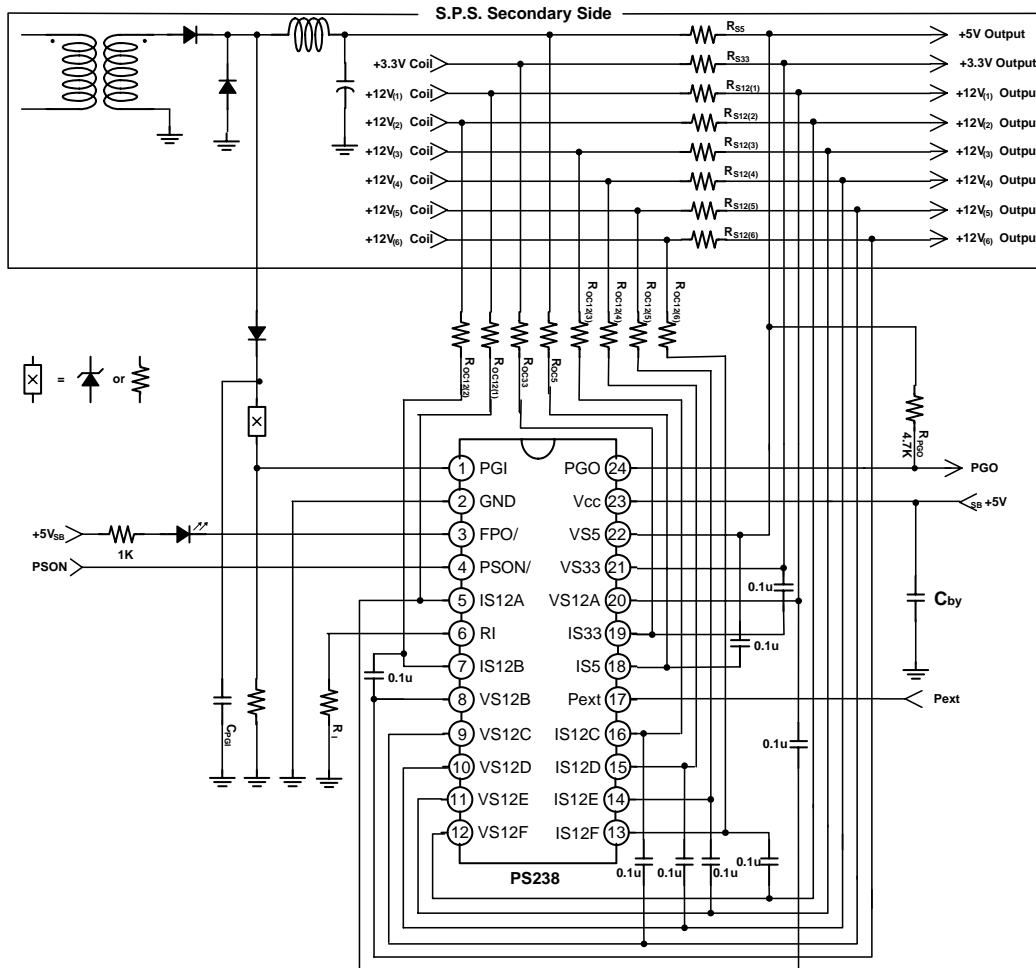
### Switching Characteristics, Vcc=12V, T<sub>a</sub> = Full range.

Parameter	Conditions	MIN	TYP	MAX	Unit
PGI to PGO Delay Time ( $T_{d1}$ )		200	300	480	mS
Short Circuit Delay Time ( $T_{d2}$ )	PGI > 0.63V	49	75	100	mS
Short Circuit Delay Time ( $T_{d2-1}$ )	PGI < 0.63V	400	500	600	mS
PGO to FPO/ Delay Time ( $T_{d3}$ )		2	4	6	mS
Under Voltage Delay Time ( $T_{d4}$ )		2	3.4	4	mS
Over Current Delay Time ( $T_{d5}$ )		13	20	27	mS
Over Voltage Delay Time ( $T_{d6}$ )		9	17	25	uS
Pext Delay Time ( $T_{d7}$ )		2	3.4	4	mS
PSON/ De-bounce Time ( $T_{b1}$ )		24	38	52	mS
PGO Noise De-glitch Time ( $T_{b2}$ )		47	73	110	uS



## Application

### Typical 8 rails SPS



#### Notes:

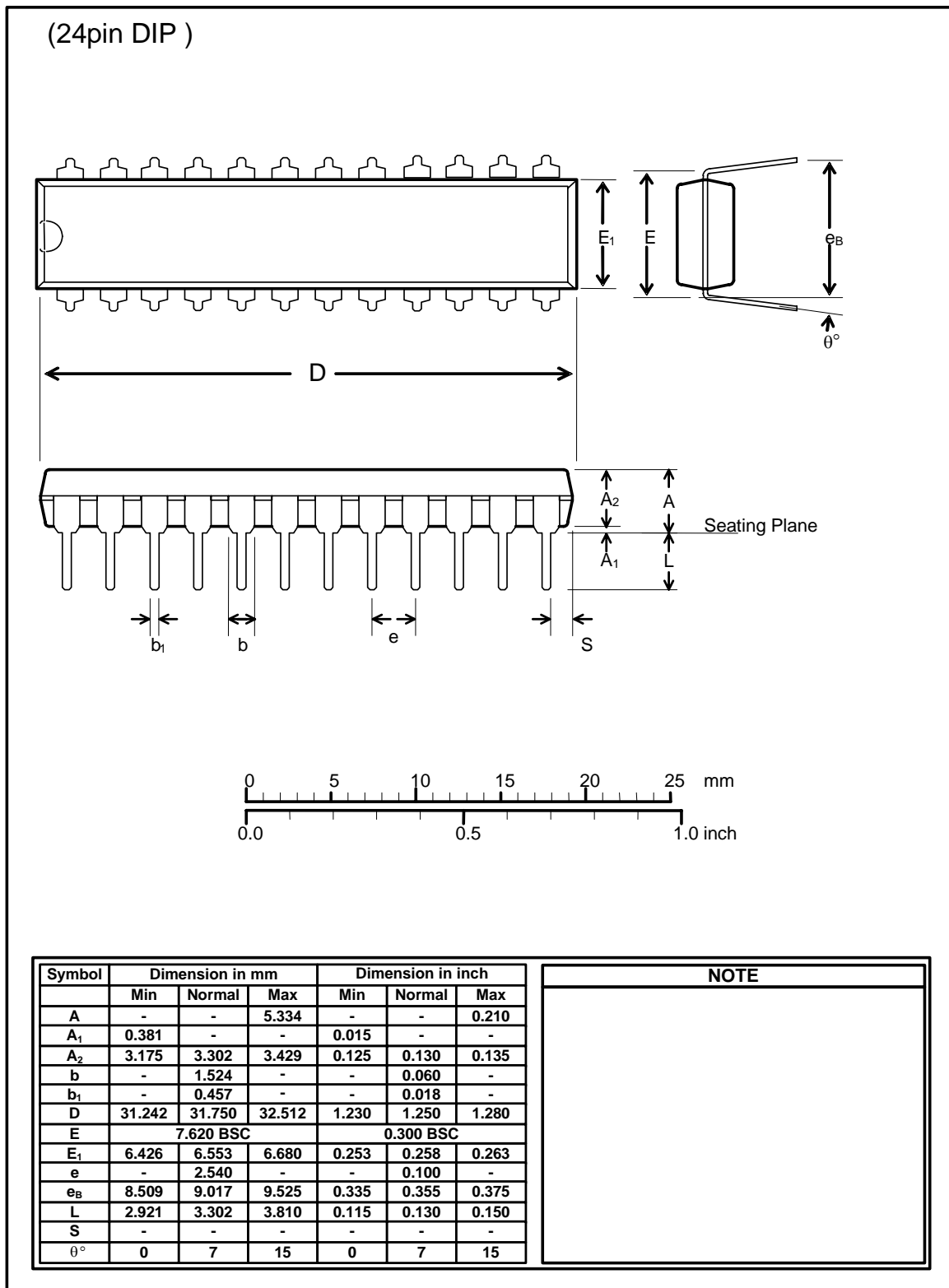
1. Zener diode or resistor or both of them can be used in component X.
2. The bypass capacitor  $C_{by}$  suggests to be  $0.1\mu F \sim 10\mu F$  and layout nearby pin VCC.
3. The recommend sense values of  $R_{S12(1)}$ ,  $R_{S12(2)}$ ,  $R_{S12(3)}$ ,  $R_{S12(4)}$ ,  $R_{S12(5)}$ ,  $R_{S12(6)}$ ,  $R_{S5}$  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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