

# PS223

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***4-Channel Secondary Monitoring IC***  
***With 4-Channel OCP***  
***And an Additional OTP***



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## PS223

# 4-Channel Secondary Monitoring IC With 4-Channel OCP And an Additional OTP

## General Description

PS223 is specially designed for switching power supply system. Four important functions of PS223 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 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, IS12A, IS12B input current sense. An adjustable over-current condition composed of Iref and “protection current range resistor” helps users design OCP easily.

An additional OTP channel helps users monitor if there have any over temperature occur.

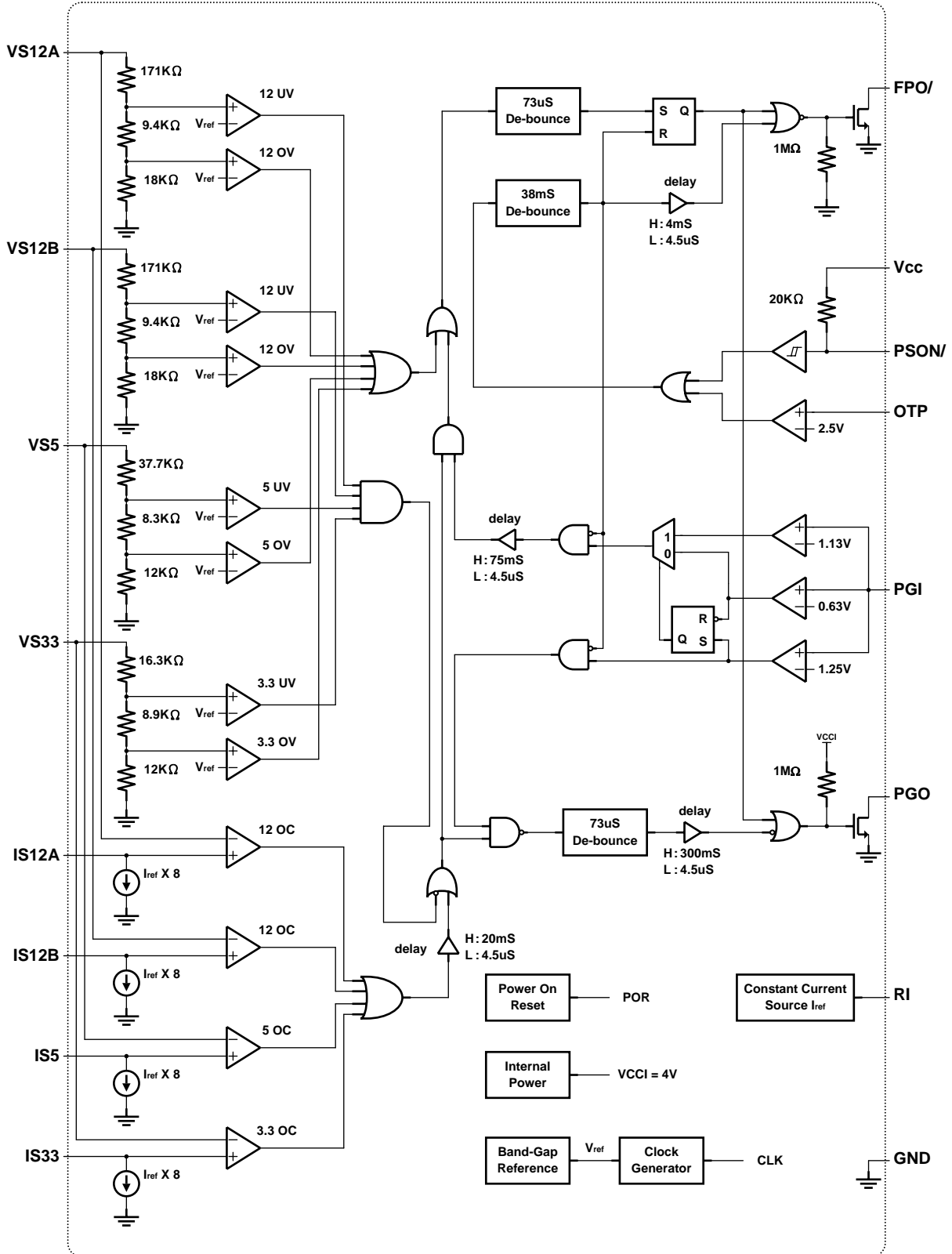
Power good signal generating notifies personal computer when power supply is ready or power supply is going to shutdown, therefore it can provide a reliable power supply environment.

## Features

- Over/Under-voltage protection and lock out
- Over-current protection and lock out
- Over-temperature protection
- 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
- 73uS de-bounce for noise immunity
- Wide power supply range
- Special care for AC power off

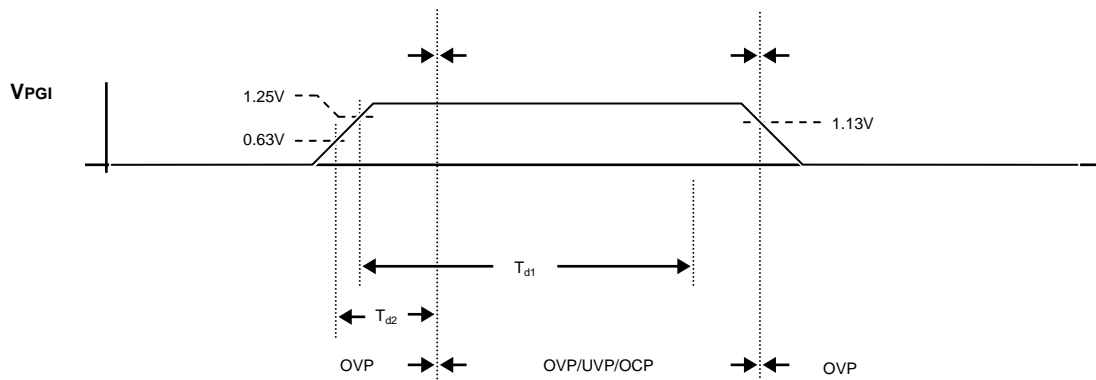
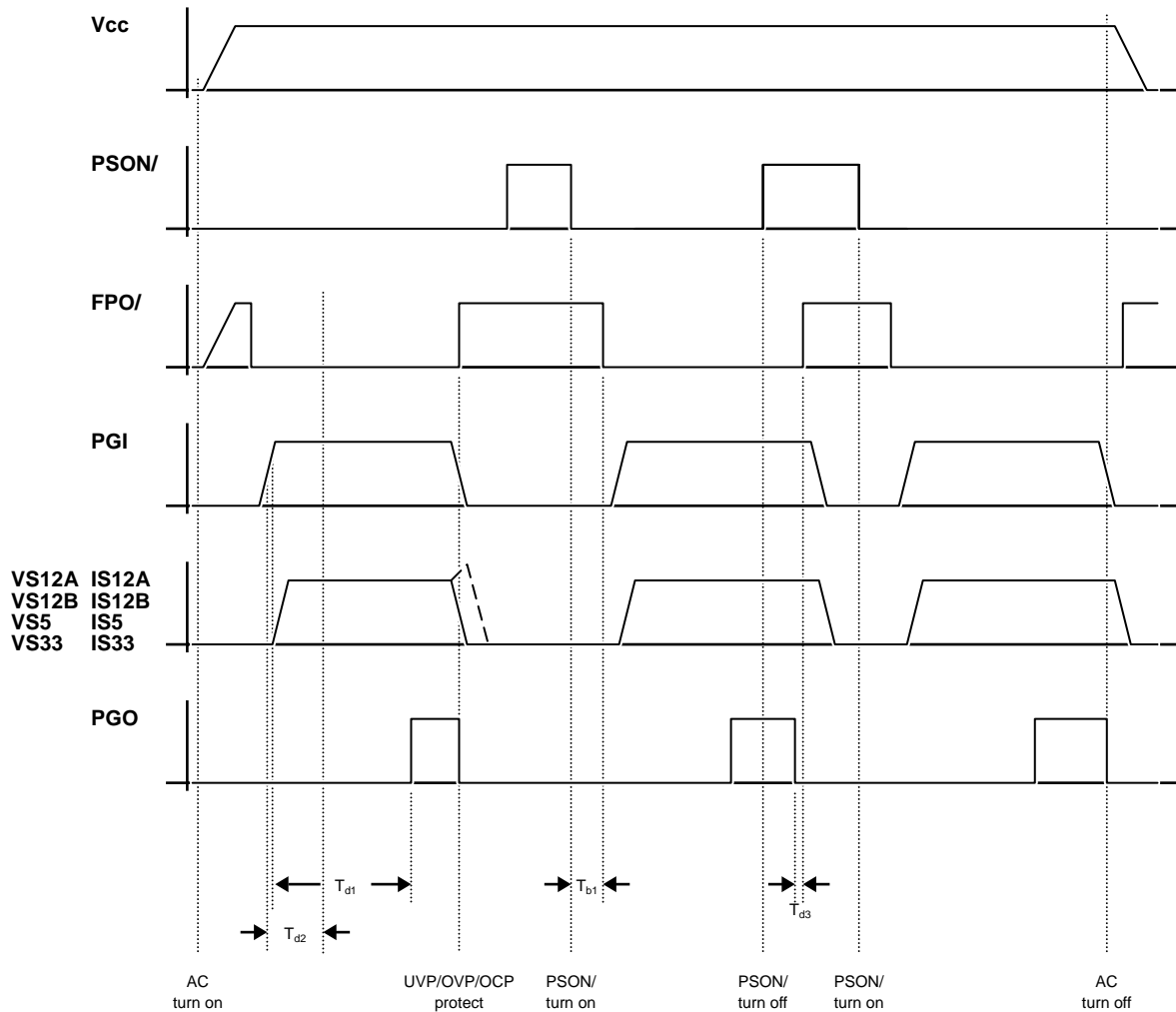


### Block Diagram





## 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	OTP	Over temperature protection 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 <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> )	VS12A/B, IS12A/B	-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/, OTP	-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



## Electrical Characteristics, $V_{CC}=12V$ , $T_a = 25^\circ C$ . (unless otherwise specified)

### Power Supply Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Supply Voltage		4.2	5.0	16.0	V
Supply Current	$V_{PSON} = 5V$		4.5	5.0	mA
Power On Reset Threshold Voltage ( $V_{POR}$ )			3.6		V
Power On Reset Hysteresis ( $V_{HYST}$ )				$\pm 0.6$	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	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	8.5	9.0	9.5	V

### Over-Current Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Constant Current Generator Voltage ( $V_{RI}$ )		1.20	1.25	1.30	V
Constant Current ( $I_{RI}$ )		12.5	20.0	62.5	$\mu A$

### Over-Temperature Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Over-Temperature Threshold ( $V_{TH}$ )		2.4	2.5	2.6	V
Hysteresis ( $V_{HYST}$ )			-0.26		V

## Electrical Characteristics (Continued)

### PSON/, Analog 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

### 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 ( $V_{HYST}$ )*			±50		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

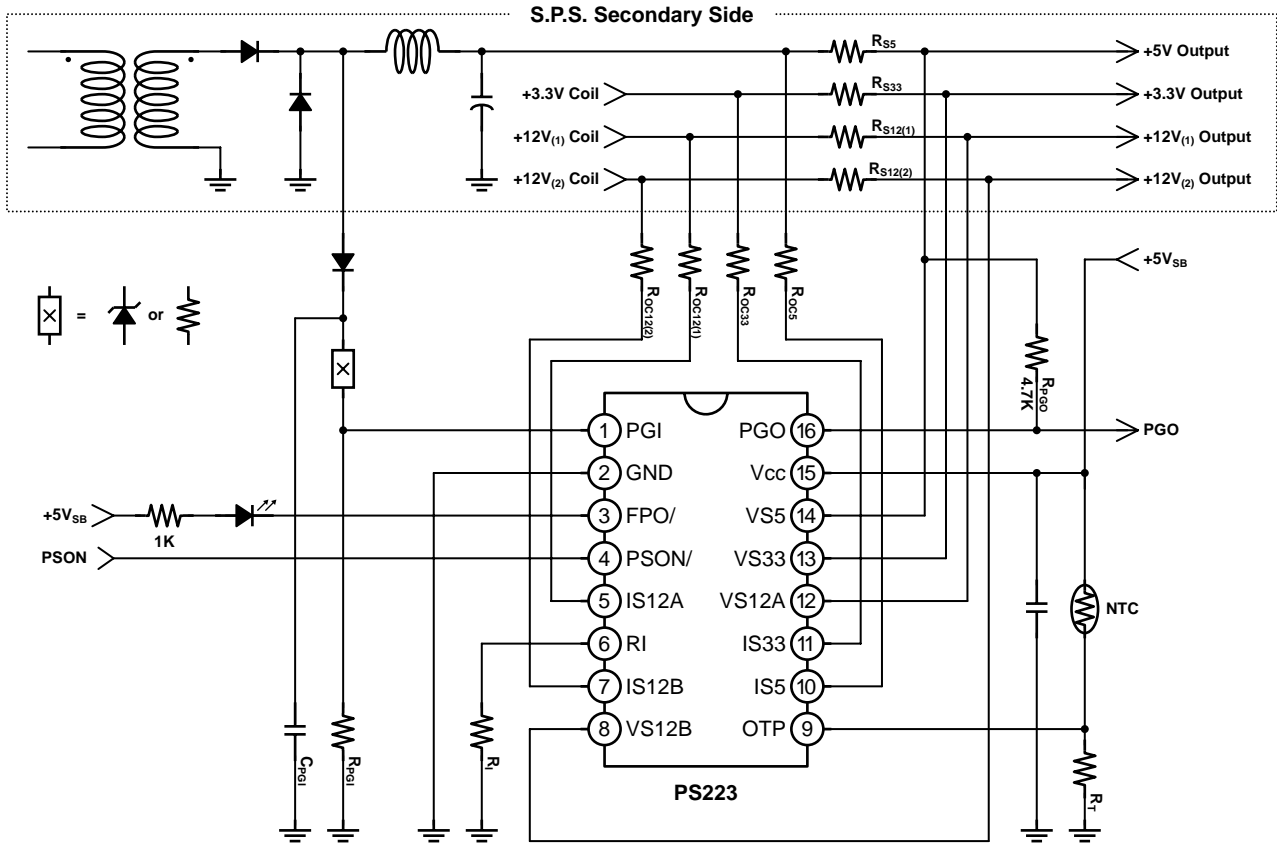
Parameter	Conditions	MIN	TYP	MAX	Unit
Leakage Current ( $I_{LKG}$ )	$V_{FPO}=5V$			5	uA
Low Level Output Voltage ( $V_{OL}$ )	$I_{SINK}=10mA$			0.3	V

### Switching Characteristics, $V_{CC}=12V$ , $T_a = 25^\circ C$ .

Parameter	Conditions	MIN	TYP	MAX	Unit
PGI to PGO Delay Time ( $T_{d1}$ )		200	300	480	mS
Short Circuit Delay Time ( $T_{d2}$ )		49	75	114	mS
PGO to FPO/ Delay Time ( $T_{d3}$ )		2	4	6	mS
Over Current Delay Time ( $T_{d4}$ )		13	20	27	mS
PSON/ De-bounce Time ( $T_{b1}$ )		24	38	61	mS
FPO/ Noise De-glitch Time ( $T_{b2}$ )		47	73	110	uS
PGO Noise De-glitch Time ( $T_{b3}$ )		47	73	110	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  $0.1\mu F \sim 10\mu F$  and layout nearby pin VCC.
3. The recommend sense values of  $R_{S12(1)}$ ,  $R_{S12(2)}$ ,  $R_{S5}$  and  $R_{S33}$  are  $\geq 0.002\Omega$ .
4. Over-Current Protection design example:

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

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

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

5. Over-Temperature Protection design example:

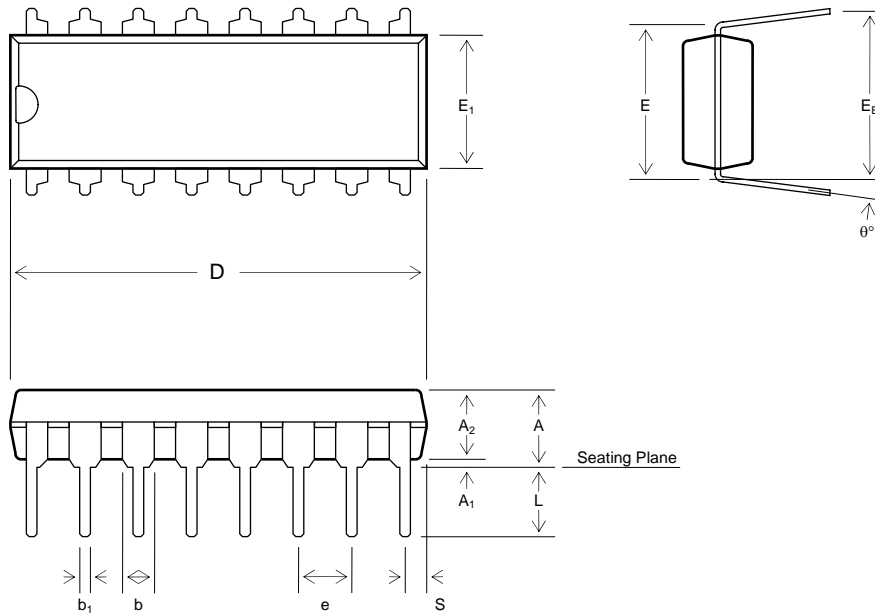
$$(1) \text{ NTC } (25^\circ C - 10K), (70^\circ C - 2.2K)$$

$$(2) \text{ If } 70^\circ C \text{ Over-Temperature occurred, } V_{OTP} = 2.5V, 2.5 = \frac{5 \times R_T}{2.2K + R_T}, R_T = 2.2K$$



## Package Specification

( 16-pin DIP )

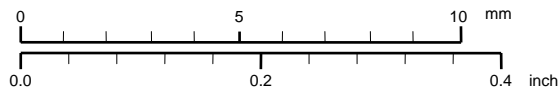
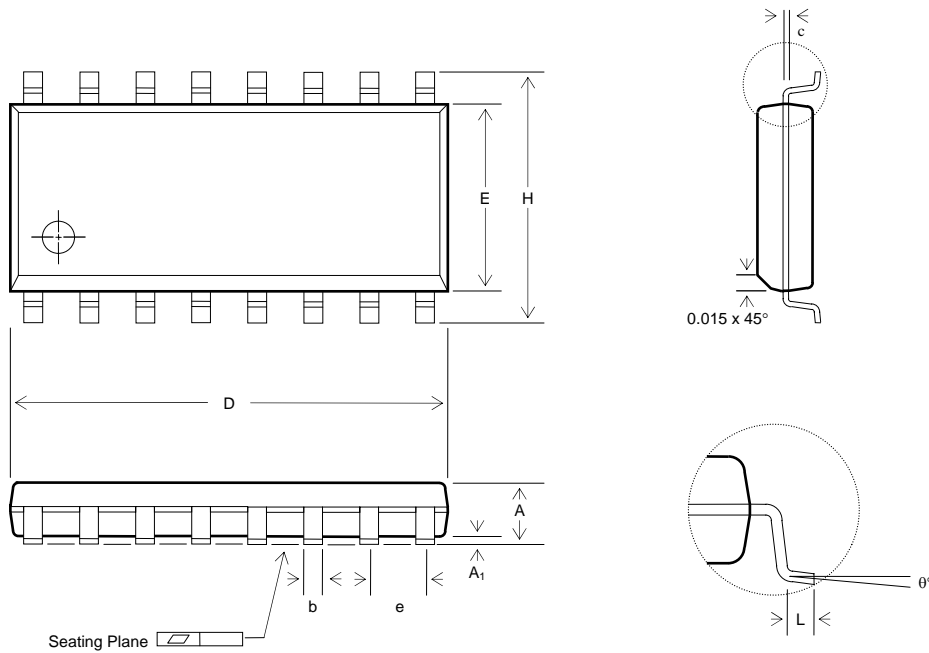


Symbol	Dimension in mm			Dimension in inch			NOTE
	Min	Normal	Max	Min	Normal	Max	
A			5.334			0.210	
A <sub>1</sub>	0.381			0.015			
A <sub>2</sub>	3.175	3.302	3.429	0.125	0.13	0.135	
b	1.300	1.500	1.700	0.051	0.059	0.067	
b <sub>1</sub>	0.400	0.480	0.560	0.015	0.019		
D	18.669	19.495	20.320	0.735	0.768	0.800	
E	7.366	7.620	7.874	0.290	0.300	0.310	
E <sub>1</sub>	6.223	6.812	7.400	0.245	0.268	0.291	
e	2.290	2.540	2.790	0.090	0.100	0.110	
E <sub>B</sub>	8.509	9.017	9.525	0.335	0.355	0.375	
L	2.540	3.175	3.810	0.100	0.125	0.150	
S			1.120			0.044	
θ°	0	7	15	0	7	15	



Package Specification (Continued)

( 16-pin SOP )



Symbol	Dimension in mm			Dimension in inch			NOTE
	Min	Normal	Max	Min	Normal	Max	
A	1.346		1.753	0.053		0.069	
A <sub>1</sub>	0.051		0.250	0.002		0.010	
b	0.330		0.510	0.013		0.020	
c	0.190		0.250	0.007		0.010	
D	9.800		10.008	0.386		0.394	
E	3.800		4.000	0.150		0.157	
e		1.270			0.050		
H	5.791		6.200	0.228		0.244	
L	0.400		1.270	0.018		0.050	
$\theta^\circ$	0		8	0		8	



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