# PS257

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# 4-Channel Secondary Monitoring IC with Fan Control

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## General Description

PS257 is designed for monitoring a switching power supply (S.P.S.), especially for desktop ATX system. It protects the S.P.S. and PC from over voltage, under voltage, over current, short circuit and over temperature status. It monitors dual +12V, 5V, 3.3V and -12V DC supply channels.

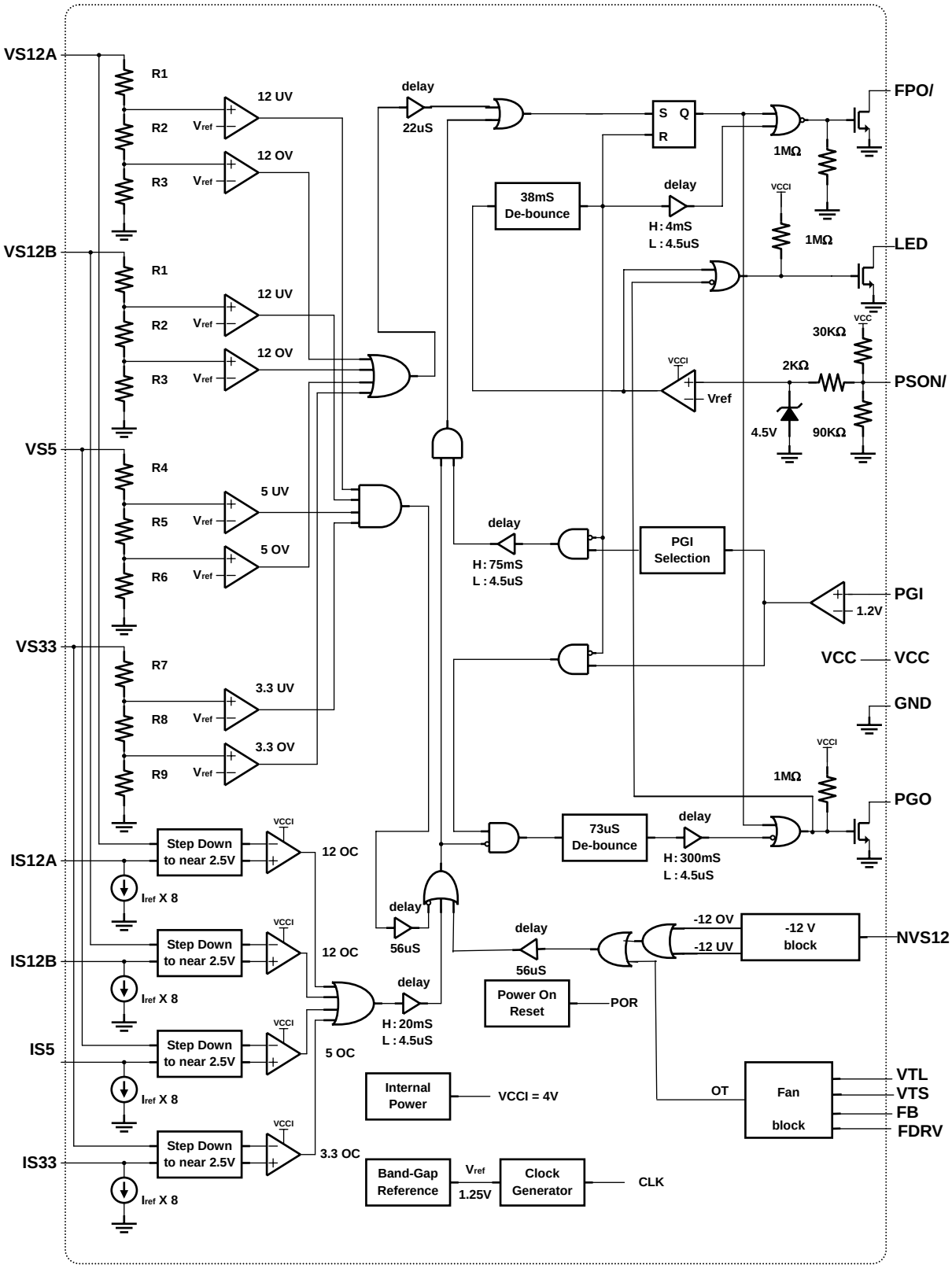
PS257 also provides a FAN drive module with two control modes - "step control mode" and "OP-amp control mode". It adjusts the FAN speed according to the sensed temperature and generates "over-temperature protection" when the temperature is too high.

It monitors the power-good-input signal (PGI) from SPS and generates power-good-output signal (PGO) to motherboard. Therefore it enables/disables protection according to the SPS status and provides a reliable power supply environment.

## Features

- Over-Voltage/Under-Voltage Protection (OVP & UVP) and lock out
  It monitors 3.3V, 5V, -12V and dual +12V. FPO/ goes to high and latch-up when one of these supply voltages exceeds their normal operation voltage range.
- Over Current Protection (OCP) and lock out
  It monitors 3.3V, 5V and dual +12V. FPO/ goes to high and latch-up when one of these supply currents exceeds their normal operation current range.
- PGO (Power Good Output) signal generation-
  It generates PGO to motherboard according to the power status.
- Over Temperature Protection (OTP) and lock out.
- FAN drive control with two modes: "step control mode" and "OPamp control mode"
- Wide power supply range (3.8V~16V)
- Fault-protection output with open drain output stage
- LED lighting-up when error occurs or remote-off
- Built-in delay/debounce for the following important timing features:
  - 300mS power good output delay when remote-on
  - 75ms delay for UV/OC protection when AC-on
  - 38mS PSON/ control de-bounce

## Block Diagram



## Pin Descriptions

| Pin No (20 Pin) | Pin No (24 Pin) | PIN NAME | Descriptions |
|---|---|---|---|
| 1 | 3 | PGI | Power good input signal pin |
| 2 | 4 | GND | Ground |
| 3 | 5 | FPO/ | Inverted fault protection output ,open drain output stage |
| 4 | 6 | PSON/ | Remote ON/OFF control input pin |
| 5 | 7 | NVS12 | -12V over/under voltage protection input pin |
| 6 | 8 | LED | LED drive output |
| 7 | 9 | FDRV | FAN drive output |
| 8 | 10 | FB | FAN feedback voltage input |
| 9 | 11 | VTS | Temperature sense voltage |
| 10 | 12 | VTL | Low temperature threshold voltage |
| 11 | 13 | IS12B | 12V(1) over current protection input pin |
| 12 | 14 | VS12B | 12V(2) over/under voltage protection input pin |
| 13 | 15 | IS12A | 12V(2) over current protection input pin |
| 14 | 16 | VS12A | 12V(1) over/under voltage protection input pin |
| 15 | 17 | IS5 | 5.0V over current protection input pin |
| 16 | 18 | VS5 | 5.0V over/under voltage protection input pin |
| 17 | 19 | IS33 | 3.3V over current protection input pin |
| 18 | 20 | VS33 | 3.3V over/under voltage protection input pin |
| 19 | 21 | VCC | Power supply |
| 20 | 22 | 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 | ($T_{opr}$) | | -10 | to | +90 | °C |
| Supply Voltage | ($V_{CC}$) | VCC | -0.3 | to | +16.0 | V |
| Input Voltage Range | ($V_I$) | VS12A,IS12A,VS12B,IS12B | -0.3 | to | +16.0 | V |
| | | VS5, IS5 | -0.3 | to | +9.0 | V |
| | | VS33, IS33 | -0.3 | to | +7.0 | V |
| | | PGI | -0.3 | to | Vcc+0.3 | V |
| | | VTS,VTL | -0.3 | to | VS12B+0.3 | V |
| | | PSON/ | -0.3 | to | Vcc+0.3 | V |
| | | FB | -0.3 | to | VS12B+0.3 | V |
| | | NVS12 | 0.3 | to | -16 | V |
| Output Voltage Range | ($V_O$) | FPO,LED,PGO | -0.3 | to | Vcc+0.3 | V |
| | | FDRV | -0.3 | to | VS12B+0.3 | V |
| ESD Susceptibility | ($V_{ESD}$) | HBM | | > | 2000 | V |
| | | MM | | > | 200 | V |

## Electrical Characteristics, Vcc=12V, $T_a$ = 25℃. (unless otherwise specified)

### Power Supply Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| Supply Voltage | | 3.8 | 5.0 | 16.0 | V |
| Supply Current | $V_{PSON/}$ = 5V | | 4.5 | 5 | mA |
| Power On Reset Threshold Voltage ($V_{POR}$) | | 3.2 | 3.4 | 3.6 | V |
| Under Voltage Lockout (UVLO) | | 2.8 | 3.0 | 3.2 | V |

### Over-Voltage Section

| Parameter | | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|---|
| Over-Voltage Threshold | VS33 | | 3.9 | 4.0 | 4.1 | V |
| | VS5 | | 5.6 | 5.8 | 6.0 | V |
| | VS12A/B | | 13.75 | 14.1 | 14.45 | V |
| | NVS12 | | -9.5 | -9 | -8.5 | V |

## Electrical Characteristics (Continued)

### Under-Voltage Section

| Parameter | | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|---|
| Under-Voltage Threshold | VS33 | | 2.65 | 2.8 | 2.95 | V |
| | VS5 | | 4.1 | 4.3 | 4.5 | V |
| | VS12A/B | | 9.6 | 10.0 | 10.4 | V |
| | NVS12 | | -15.75 | -15 | -14.25 | V |

### PGI, Analog Input

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| Threshold Voltage for start $T_{d1}$ | | 1.176 | 1.2 | 1.224 | V |
| Threshold Voltage for start $T_{d2}$ | | 0.60 | 0.63 | 0.75 | V |
| Threshold Voltage for mask OC,UV,PGO | | 1.156 | 1.18 | 1.204 | V |

### 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 |

### Over-Current Section

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| Offset Voltage ($V_{OV}$) | | -1 | 2 | 5 | mV |
| Constant $I_{sink}$ Current ($I_{sink}$) | | 150. | 160. | 170 | uA |

### 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 | | | 0.45 | V |

## Electrical Characteristics (Continued)

### LED, Open Drain Digital Output

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

### PSON/, Analog Input

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| Threshold Voltage ( High ) | | 1.60 | | | V |
| Threshold Voltage ( Low ) | | | | 0.9 | V |

### VTS, Analog Input

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| Input Current ($I_{VTS}$) | | | | 1 | μA |
| Full Speed Voltage ($V_{FULL-VTS}$),($V_{TH}$=1/2VS12B) | OP Mode | | 6 | | V |

***1 Fan driver application**

### FB, Analog Input

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| FAN Output Mode Threshold Voltage | | | 3 | | V |

### FDRV, Analog output

| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| FAN driver sink current | $I_{F-SINK}$=1mA | | 5.5 | | V |

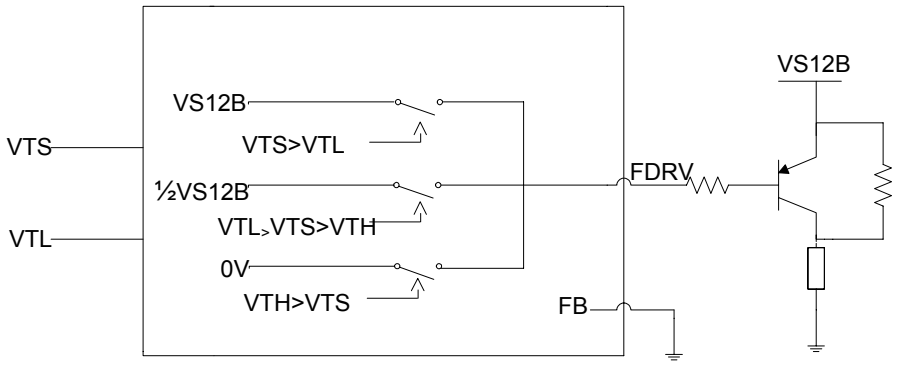
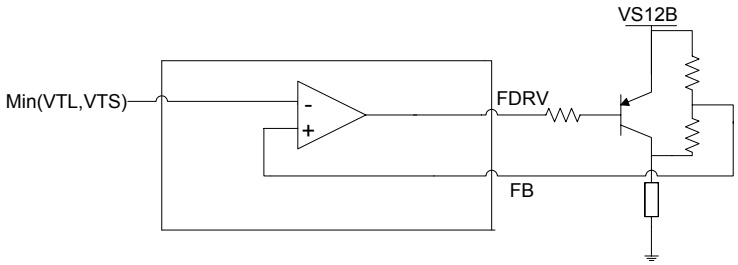
## Electrical Characteristics (Continued)

### Switching Characteristics, Vcc=12V, $T_a$ = 25°C.

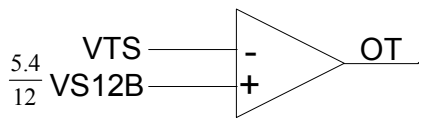
| Parameter | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|
| PGI to PGO Delay Time ($T_{d1}$) | | 200 | 300 | 400 | mS |
| Short Circuit Delay Time ($T_{d2}$) | PGI< 0.63V | Disable UV/OC Protection | | | |
| | PGI> 0.63V | 49 | 75 | 100 | mS |
| PGO to FPO/ Delay Time ($T_{d3}$) | | 2 | 4 | 6 | mS |
| Under Voltage Delay Time ($T_{d4}$) | | 30 | 56 | 81 | uS |
| Over Current Delay Time ($T_{d5}$) | | 13 | 20 | 27 | mS |
| Over Voltage Delay Time ($T_{d6}$) | | 15 | 22 | 30 | uS |
| Over Temperature Delay Time ($T_{d7}$) | | 30 | 56 | 81 | uS |
| NVS12 Over/Under Voltage Delay Time ($T_{d8}$) | | 30 | 56 | 81 | uS |
| PSON/ De-bounce Time ($T_{b1}$) | | 24 | 38 | 52 | mS |
| PGO Noise De-glitch Time ($T_{b2}$) | | 47 | 73 | 100 | uS |

## Electrical Characteristics (Continued)

### Fan driver application

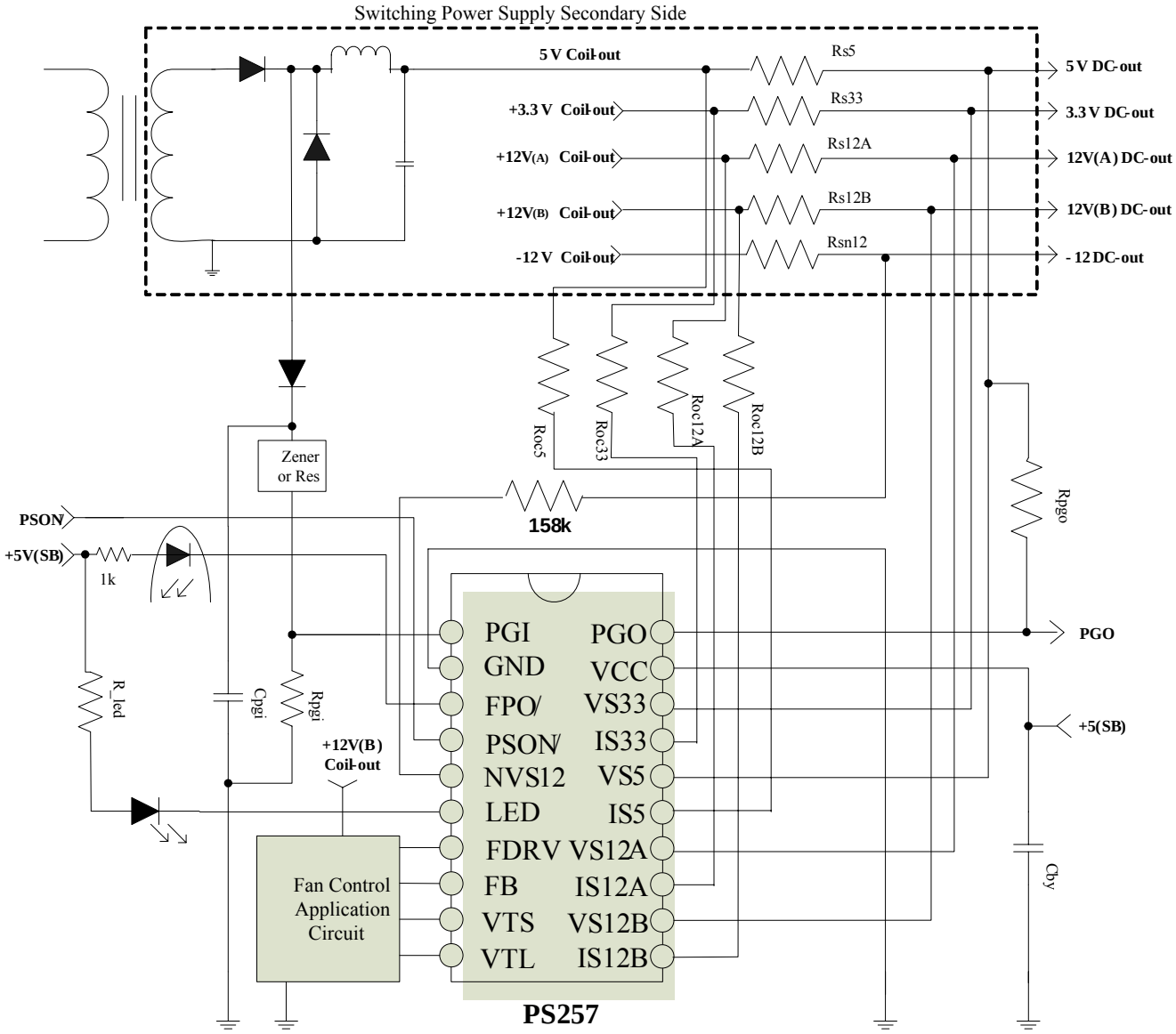
| | |
|---|---|
| **Step Mode ($V_{FB}$ <3V)** |  |
| | **VTS>VTL=> FDRV=VS12B**<br>**VTL>VTS>VTH => FDRV=½VS12B**<br>**VTH>VTS=> FDRV=0V** **#$V_{TH}$=½VS12B** |
| **OP Mode ($V_{FB}$ >3V)** |  |
| | **$V_{FB}$=Min(VS12B,VS12B-[Min($V_{TL}$,$V_{TS}$)- $V_{TH}$])**<br>**#$V_{TH}$ =½VS12B** |

### Over Temperature Protection (OTP)

| | |
|---|---|
| **OTP function (VTS< $\frac{5.4}{12}$ VS12B)** |  |

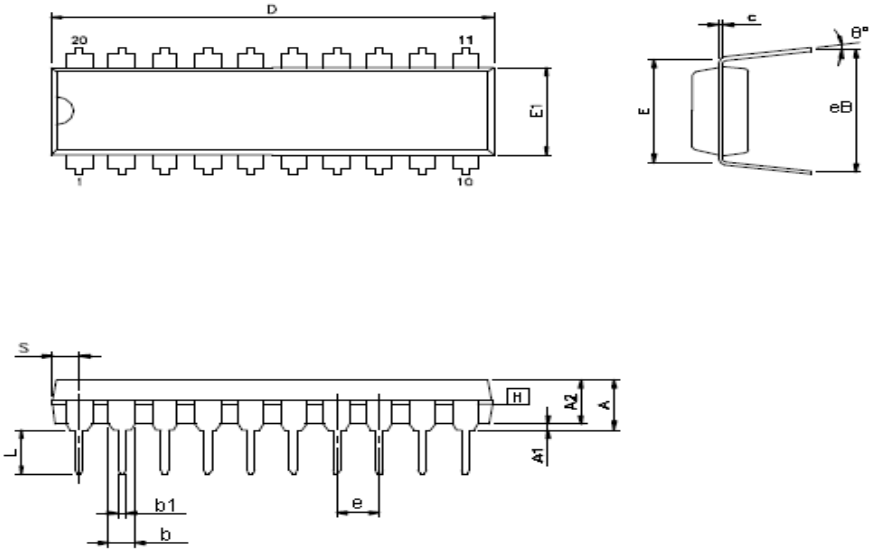
## Electrical Characteristics (Continued)

### <Typical switching power supply application >



# Package Specification

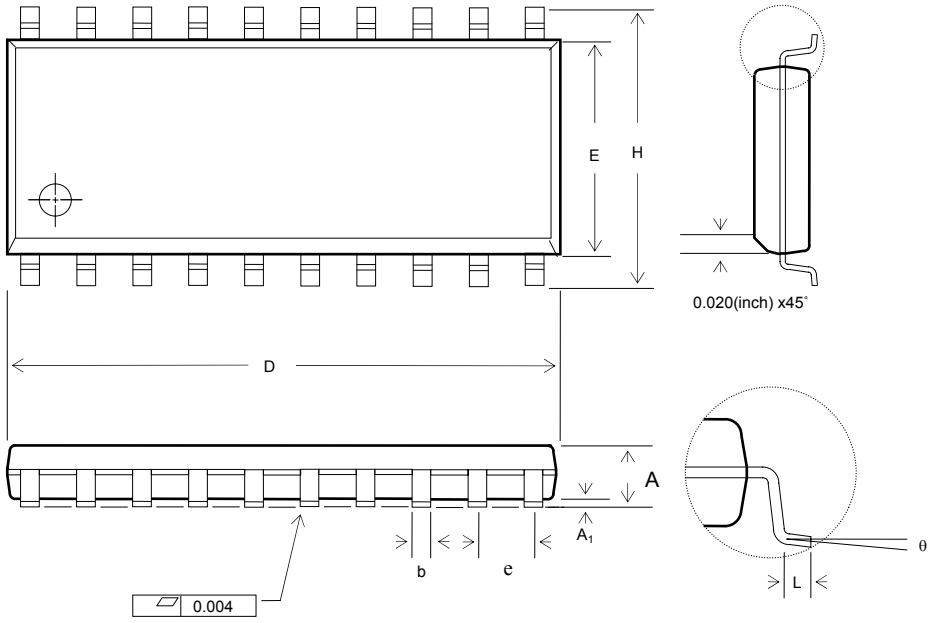
( 20-pin DIP )




| Symbol | Dimension in mm | | Dimension in inch | | NOTE |
|---|---|---|---|---|---|
| A | 5.334 | (MAX) | 0.210 | (MAX) | |
| $A_1$ | 0.381 | (MIN) | 0.015 | (MIN) | |
| $A_2$ | 3.302 | ± 0.130 | 0.130 | ± 0.005 | |
| b | 1.626 | (MAX) | 0.064 | (MAX) | |
| $b_1$ | 0.56 | (MAX) | 0.022 | (MAX) | |
| D | 26.416 | (MAX) | 1.04 | (MAX) | |
| E | 7.620 | (TYP) | 0.300 | (TYP) | |
| $E_1$ | 7.000 | (MAX) | 0.275 | (MAX) | |
| e | 2.794 | (MAX) | 0.110 | (MAX) | |
| eB | 9.017 | ± 0.508 | 0.355 | ± 0.020 | |
| L | 3.556 | (MAX) | 0.140 | (MAX) | |
| S | 1.905 | (MAX) | 0.075 | (MAX) | |
| θ° | 0° ~ 15° | | 0° ~15° | | |

# Package Specification

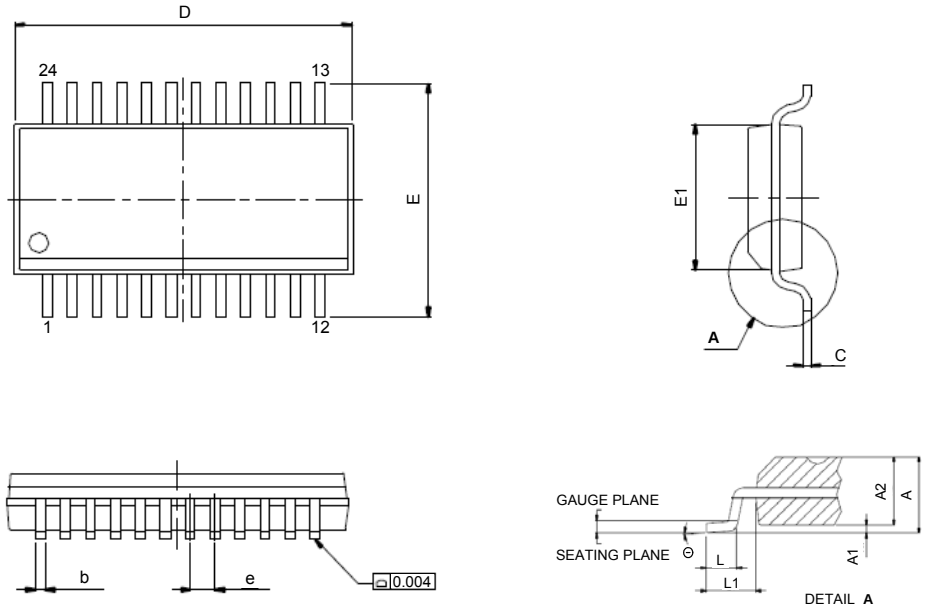
( 20-pin SOP )




| Symbol | Dimension in mm | | Dimension in inch | | NOTE |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 2.36 | 2.64 | 0.093 | 0.104 | |
| $A_1$ | 0.10 | 0.30 | 0.004 | 0.012 | |
| b | 0.41BSC | | 0.016BSC | | |
| e | 1.27BSC | | 0.050BSC | | |
| D | 12.60 | 12.90 | 0.496 | 0.508 | |
| H | 10.01 | 10.64 | 0.394 | 0.419 | |
| E | 7.39 | 7.59 | 0.291 | 0.299 | |
| L | 0.41 | 1.27 | 0.016 | 0.050 | |
| θ | 0° | 8° | 0° | 8° | |

# Package Specification

( 24-pin SSOP )




| | DIMENSIONS IN INCH | | DIMENSIONS IN MM | |
|---|---|---|---|---|
| SYMBOLS | MIN. | MAX. | MIN. | MAX. |
| A | 0.053 | 0.069 | 1.346 | 1.753 |
| A1 | 0.004 | 0.010 | 0.102 | 0.254 |
| A2 | - | 0.059 | - | 1.499 |
| b | 0.008 | 0.012 | 0.203 | 0.305 |
| C | 0.007 | 0.010 | 0.178 | 0.254 |
| D | 0.337 | 0.344 | 8.560 | 8.738 |
| E | 0.228 | 0.244 | 5.791 | 6.198 |
| E1 | 0.150 | 0.157 | 3.810 | 3.988 |
| e | 0.025 BSC. | | 0.635 BSC | |
| L | 0.016 | 0.050 | 0.406 | 1.270 |
| L1 | 0.041 BSC | | 1.041 BSC | |
| Θ | 0° | 8° | 0° | 8° |

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