## ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

$V_{CC}$ .....-0.3V to 6.0V
All Other Inputs (Note 1).....-0.3V to ($V_{CC}$+0.3V)
Input Current
  VCC.....20mA
  GND .....20mA
  Output Current (All outputs) .....20mA
ESD Rating (HBM - Human Body Model) .....4kV
Continuous Power Dissipation
  Plastic DIP (derate 9.09mW/°C above +70°C)....727mW
  SO (derate 5.88mW/°C above +70°C).....471mW
  Mini SO (derate 4.10mW/°C above +70°C) .....330mW
Storage Temperature .....-65°C to 160°C
Lead Temperature (Soldering, 10 sec) .....300°C

## ELECTRICAL SPECIFICATIONS

Unless otherwise indicated, $V_{CC}$ = 4.75V to 5.5V (SP705-SP707-SP813L), $V_{CC}$ = 4.50V to 5.5V (SP706-SP708), $T_A$= $T_{MIN}$ to $T_{MAX}$, typical at 25°C.

| Parameter | Min. | Typ. | Max. | Units | | Conditions |
|---|---|---|---|---|---|---|
| Operating Voltage Range $V_{CC}$ | 1.1 | | 5.5 | V | | |
| Supply Current $I_{SUPPLY}$ | | 40 | 60 | µA | | $\overline{MR}$=$V_{CC}$ or floating, WDI floating |
| Reset Threshold | 4.50 | 4.65 | 4.75 | V | | SP705, SP707, SP813L |
| | 4.25 | 4.40 | 4.50 | | | SP706, SP708 (Note 2) |
| Reset Threshold Hysteresis | | 40 | | mV | | Note 2 |
| Reset Pulse Width $t_{RS}$ | 140 | 200 | 280 | ms | | Note 2 |
| RESET Output Voltage | $V_{CC}$-1.5 | | | V | | $I_{SOURCE}$=800µA, Note 2 |
| | 0.8 | | | | | $I_{SOURCE}$=4µA, $V_{CC}$=1.1V, Note 2 |
| | | | 0.4 | | | $I_{SINK}$=3.2mA, Note 2 |
| | | | 0.3 | | | $I_{SINK}$=100µA, $V_{CC}$=1.2V, Note 2 |
| Watchdog Timeout Period $t_{WD}$ | 1.00 | 1.60 | 2.25 | s | | SP705, SP707, SP813L |
| WDI Pulse Width $t_{WP}$ | 100 | | | ns | | $V_{IL}$=0.4V, $V_{IH}$=0.8x$V_{CC}$ |
| WDI Input Threshold Low | | | 0.8 | V | | SP705, SP707, SP813L $V_{CC}$=5V |
| WDI Input Threshold High | 3.5 | | | V | | |
| WDI Input Current | | 30 | 75 | µA | | SP705, SP707, SP813L, WDI=$V_{CC}$ |
| | -75 | -20 | | µA | | SP705, SP707, SP813L, WDI=0V |
| $\overline{WDO}$ Output Voltage | $V_{CC}$-1.5 | | | V | | $I_{SOURCE}$=800µA |
| | | | 0.4 | | | $I_{SINK}$=3.2mA |
| $\overline{MR}$ Pull-up Current | 100 | 250 | 600 | µA | | $\overline{MR}$ = 0V |
| $\overline{MR}$ Pulse Width $t_{MR}$ | 150 | | | ns | | |
| $\overline{MR}$ Input Threshold Low | | | 0.8 | V | | |
| $\overline{MR}$ Input Threshold High | 2.0 | | | | | |
| $\overline{MR}$ to Reset Out Delay $t_{MD}$ | | | 250 | ns | | Note 2 |
| PFI Input Threshold | 1.20 | 1.25 | 1.30 | V | | $V_{CC}$=5V |
| PFI Input Current | -25.00 | 0.01 | 25.00 | nA | | |
| $\overline{PFO}$ Output Voltage | $V_{CC}$-1.5 | | | V | | $I_{SOURCE}$=800µA |
| | | | 0.4 | | | $I_{SINK}$=3.2mA |

Note 1: The input voltage limits on PFI and $\overline{MR}$ can be exceeded if the input current is less than 10mA.
Note 2: Applies to both $\overline{RESET}$ in the SP705-SP708 and RESET in the SP707/708/813L/813M.



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## BLOCK DIAGRAM

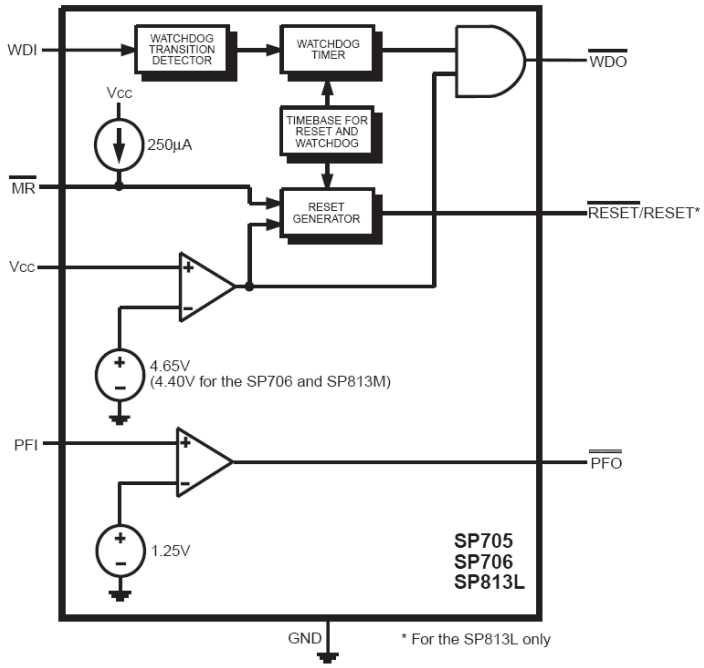


Fig. 1: SP705-SP706-SP813L Block Diagram

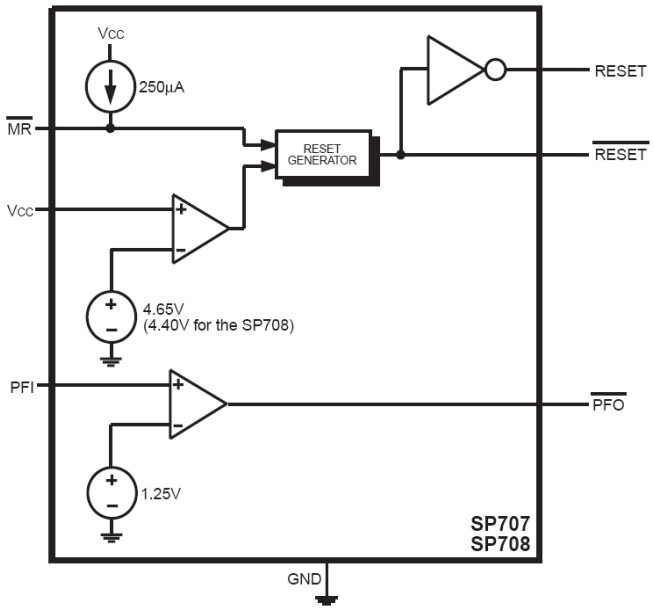


Fig. 2: SP707-SP708 Block Diagram



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## PIN ASSIGNMENT

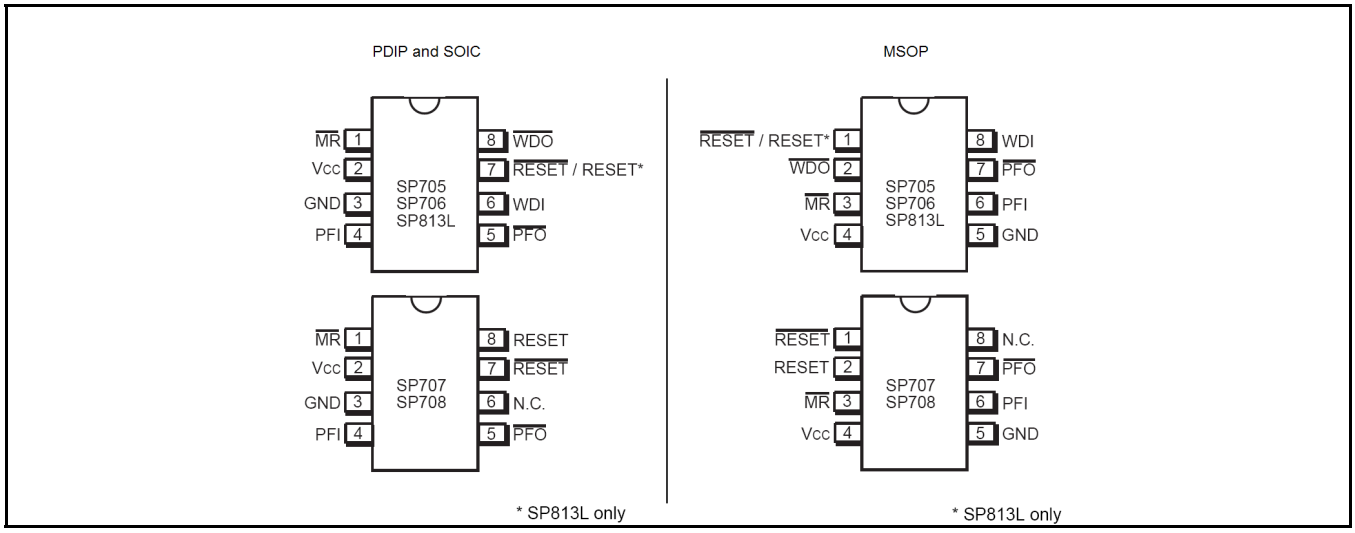


Fig. 3: Pin Assignment

## PIN DESCRIPTION

| Name | Pin Number | | | | | Description |
|---|---|---|---|---|---|---|
| | SP705-SP706 | | SP707-SP708 | | SP813L | |
| | SOIC | MSOP | SOIC | MSOP | DIP SOIC | |
| $\overline{MR}$ | 1 | 3 | 1 | 3 | 1 | Manual Reset<br>This input triggers a reset pulse when pulled below 0.8V. This active LOW input has an internal 250µA pull-up current. It can be driven from a TTL or CMOS logic line or shorted to ground with a switch. |
| $V_{CC}$ | 2 | 4 | 2 | 4 | 2 | +5V power supply |
| GND | 3 | 5 | 3 | 5 | 3 | Ground reference for all signals |
| PFI | 4 | 6 | 4 | 6 | 4 | Power-Fail Input<br>When this voltage monitor input is less than 1.25V, $\overline{PFO}$ goes LOW. Connect PFI to ground or $V_{CC}$ when not in use. |
| $\overline{PFO}$ | 5 | - | 5 | 7 | 5 | Power-Fail Output<br>This output is LOW until PFI is less then 1.25V |
| WDI | 6 | 8 | - | - | 6 | Watchdog Input<br>If this input remains HIGH or LOW for 1.6s, the internal watchdog timer times out and $\overline{WDO}$ goes LOW. Floating WDI or connecting WDI to a high-impedance tri-state buffer disables the watchdog feature. The internal watchdog timer clears whenever $\overline{RESET}$ is asserted, WDI is tri-stated, or whenever WDI sees a rising or falling edge. |
| N.C. | - | - | 6 | 8 | - | No Connect |
| $\overline{RESET}$ | 7 | 1 | 7 | 1 | - | Active-LOW $\overline{RESET}$ Output<br>This output pulses LOW for 200ms when triggered and stays LOW whenever $V_{CC}$ is below the reset threshold (4.65V for the SP705/707/813L and 4.40V for the SP706/708). It remains LOW for 200ms after $V_{CC}$ rises above the reset threshold or $\overline{MR}$ goes from LOW to HIGH. A watchdog timeout will not trigger $\overline{RESET}$ unless $\overline{WDO}$ is connected to $\overline{MR}$. |



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| Name | Pin Number | | | | | Description |
|---|---|---|---|---|---|---|
| | SP705-SP706 | | SP707-SP708 | | SP813L | |
| | SOIC | MSOP | SOIC | MSOP | DIP SOIC | |
| $\overline{WDO}$ | 8 | 2 | - | - | 8 | Watchdog Output<br>This output pulls LOW when the internal watchdog timer finishes its 1.6s count and does not go HIGH again until the watchdog is cleared. $\overline{WDO}$ also goes LOW during low-line conditions. Whenever $V_{CC}$ is below the reset threshold, WDO stays LOW. However, unlike $\overline{RESET}$, $\overline{WDO}$ does not have a minimum pulse width. As soon as $V_{CC}$ is above the reset threshold, $\overline{WDO}$ goes HIGH with no delay. |
| RESET | - | - | 8 | 2 | 7 | Active-HIGH RESET Output<br>This output is the complement of $\overline{RESET}$. Whenever RESET is HIGH, $\overline{RESET}$ is LOW and vice-versa. Note that the SP813L has a reset output only. |

## ORDERING INFORMATION

| Part Number | Temperature Range | Marking | Package | Packing Quantity | Note 1 | Note 2 |
|---|---|---|---|---|---|---|
| SP705CN-L | 0°C≤$T_A$≤+70°C | SP705C<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP705CN-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP705EN-L | -40°C≤$T_A$≤+85°C | SP705E<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP705EN-L/TR | -40°C≤$T_A$≤+85°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP705CU-L | 0°C≤$T_A$≤+70°C | 705C<br>#<br>YWW | 8-pin MSOP | Bulk | Lead Free | |
| SP705CU-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin MSOP | 2.5K/Tape & Reel | Lead Free | |
| | | | | | | |
| SP706CN-L | 0°C≤$T_A$≤+70°C | SP706C<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP706CN-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP706EN-L | -40°C≤$T_A$≤+85°C | SP706E<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP706EN-L/TR | -40°C≤$T_A$≤+85°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP706CU-L | 0°C≤$T_A$≤+70°C | 706C<br>#<br>YWW | 8-pin MSOP | Bulk | Lead Free | |
| SP706CU-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin MSOP | 2.5K/Tape & Reel | Lead Free | |
| | | | | | | |
| SP707CN-L | 0°C≤$T_A$≤+70°C | SP707C<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP707CN-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP707EN-L | -40°C≤$T_A$≤+85°C | SP707E<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP707EN-L/TR | -40°C≤$T_A$≤+85°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP707CU-L | 0°C≤$T_A$≤+70°C | 707C<br>#<br>YWW | 8-pin MSOP | Bulk | Lead Free | |
| SP707CU-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin MSOP | 2.5K/Tape & Reel | Lead Free | |
| | | | | | | |
| SP708CN-L | 0°C≤$T_A$≤+70°C | SP708C<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP708CN-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP708EN-L | -40°C≤$T_A$≤+85°C | SP708E<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP708EN-L/TR | -40°C≤$T_A$≤+85°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| | | | | | | |
| SP813LCN-L | 0°C≤$T_A$≤+70°C | SP813LC<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP813LCN-L/TR | 0°C≤$T_A$≤+70°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP813LEN-L | -40°C≤$T_A$≤+85°C | SP813LE<br>YYWWL<br># | 8-pin NSOIC | Bulk | Lead Free | |
| SP813LEN-L/TR | -40°C≤$T_A$≤+85°C | | 8-pin NSOIC | 2.5K/Tape & Reel | Lead Free | |
| SP813LCP-L | 0°C≤$T_A$≤+70°C | SP813LC<br>YWWL# | 8-pin PDIP | Bulk | Lead Free | |
| SP813LEP-L | -40°C≤$T_A$≤+85°C | SP813LE<br>YWWL# | 8-pin PDIP | Bulk | Lead Free | |

"YY" = Year – "WW" = Work Week – "#" = Lot Number



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## TYPICAL PERFORMANCE CHARACTERISTICS

All data taken at $V_{IN}$ = 2.7V to 5.5V, $T_J = T_A$ = 25°C, unless otherwise specified - Schematic and BOM from Application Information section of this datasheet.

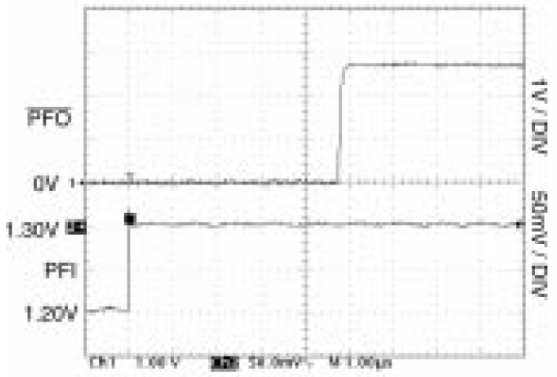


Fig. 4: Power-Fail Comparator De-Assertion Response Time

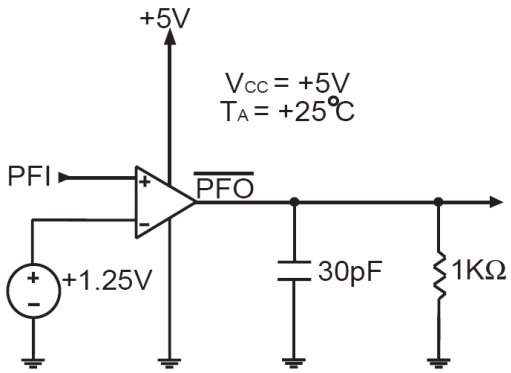


Fig. 5: Power-Fail Comparator De-Assertion Response Time Circuit

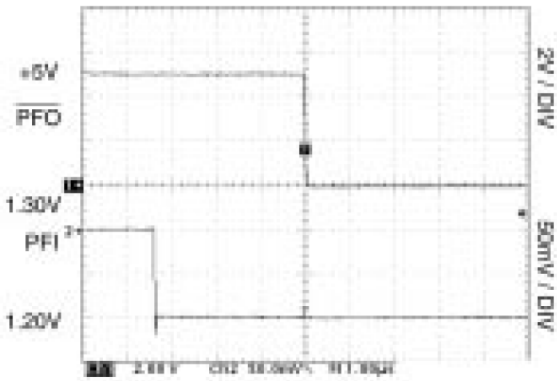


Fig. 6: Power-Fail Comparator Assertion Response Time

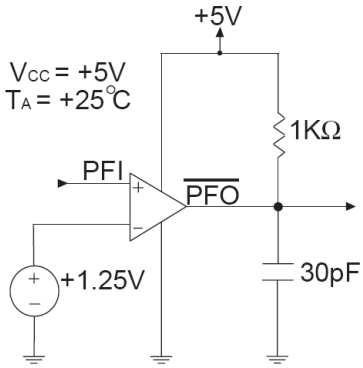


Fig. 7: Power-Fail Comparator Assertion Response Time Circuit

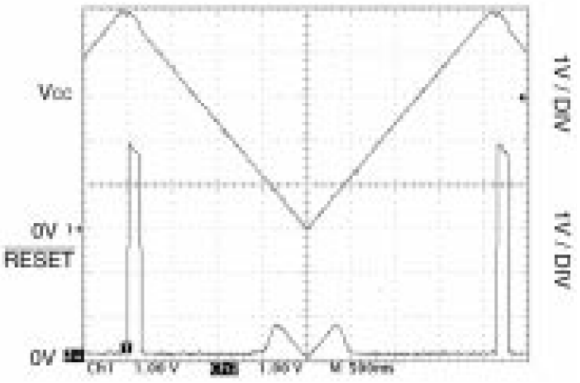


Fig. 8: SP705/707 $\overline{\text{RESET}}$ Output Voltage vs. Supply Voltage

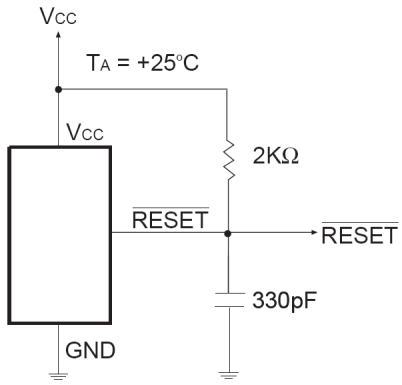


Fig. 9: SP705/707 $\overline{\text{RESET}}$ Output Voltage vs. Supply Voltage Circuit



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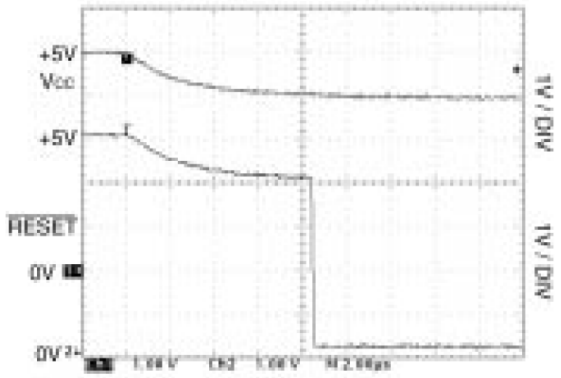


Fig. 10: SP705/707 $\overline{\text{RESET}}$ Response Time

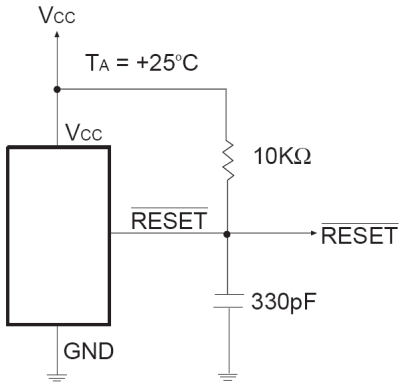


Fig. 11: SP705/707 $\overline{\text{RESET}}$ Response Time Circuit

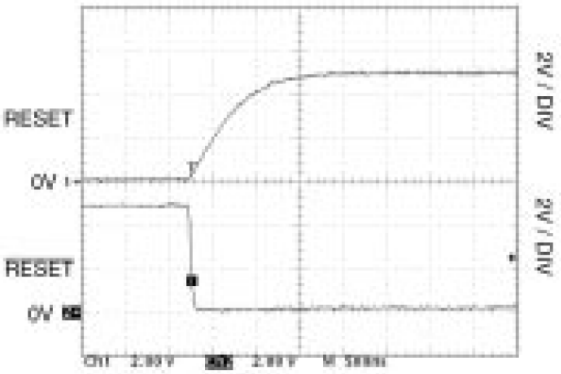


Fig. 12: SP707 RESET and $\overline{\text{RESET}}$ Assertion

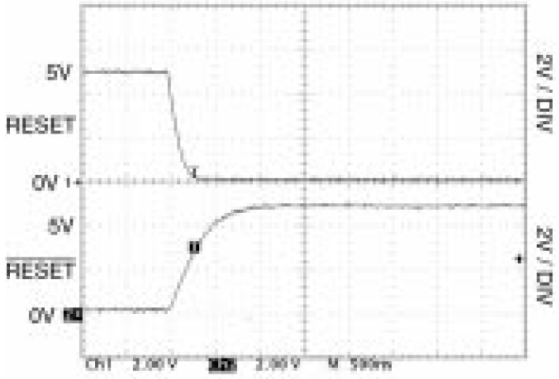


Fig. 13: SP707 RESET and $\overline{\text{RESET}}$ De-Assertion

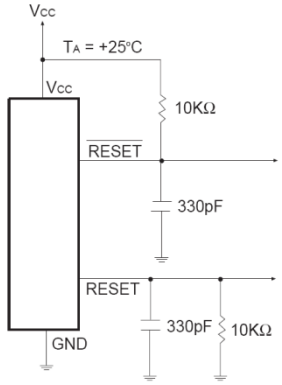


Fig. 14: SP707 RESET and $\overline{\text{RESET}}$ Assertion and De-Assertion Circuit



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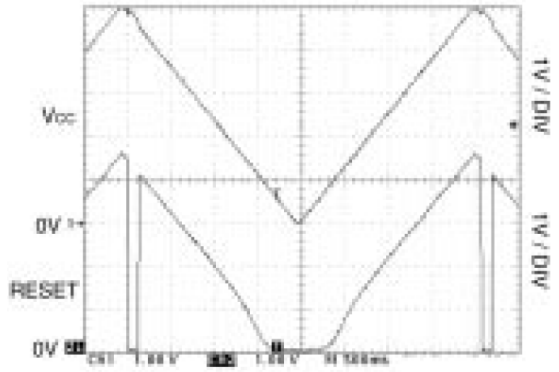


Fig. 15: SP707/708/813L RESET Output Voltage vs. Supply Voltage

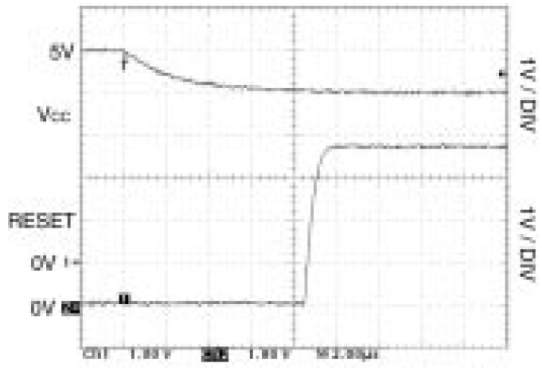


Fig. 16: SP813L RESET Response Time

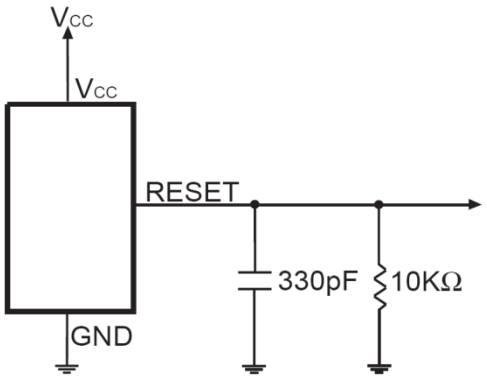


Fig. 17: SP707/708/813L RESET Output Voltage vs. Supply Voltage and SP813L RESET Response Time Circuit



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## FEATURES

The SP705-708/813L series provides four key functions:

1. A reset output during power-up, power-down and brownout conditions.

2. An independent watchdog output that goes LOW if the watchdog input has not been toggled within 1.6 seconds.

3. A 1.25V threshold detector for power-fail warning, low battery detection, or monitoring a power supply other than +5V.

4. An active-LOW manual-reset that allows RESET to be triggered by a pushbutton switch.

The SP707/708 devices are the same as the SP705/706 devices except for the active-HIGH RESET substitution of the watchdog timer. The SP813L is the same as the SP705 except an active-HIGH RESET is provided rather than an active-LOW $\overline{\text{RESET}}$. The SP705/707/813L devices generate a reset when the supply voltage drops below 4.65V. The SP706/708 devices generate a reset below 4.40V.

The SP705-708/813L series is ideally suited for applications in automotive systems, intelligent instruments, and battery-powered computers and controllers. The SP705-708/813L series is ideally applied in environments where monitoring of power supply to a µP and its related components is critical.

## THEORY OF OPERATION

The SP705-708/813L series is a microprocessor (µP) supervisory circuit that monitors the power supplied to digital circuits such as microprocessors, microcontrollers, or memory. The series is an ideal solution for portable, battery-powered equipment that requires power supply monitoring. Implementing this series will reduce the number of components and overall complexity. The watchdog functions of this product family will continuously oversee the operational status of a system. The operational features and benefits of the SP705-708/813L series are described in more detail below.

### RESET OUTPUT

A microprocessor's reset input starts the µP in a known state. The SP705-708/813L series asserts reset during power-up and prevents code execution errors during power down or brownout conditions.

On power-up, once $V_{CC}$ reaches 1.1V, $\overline{\text{RESET}}$ is a guaranteed logic LOW of 0.4V or less. As $V_{CC}$ rises, $\overline{\text{RESET}}$ stays LOW. When $V_{CC}$ rises above the reset threshold, an internal timer releases $\overline{\text{RESET}}$ after 200ms. $\overline{\text{RESET}}$ pulses LOW whenever $V_{CC}$ dips below the reset threshold, such as in a brownout condition. When a brownout condition occurs in the middle of a previously initiated reset pulse, the pulse continues for at least another 140ms. On power down, once $V_{CC}$ falls below the reset threshold, $\overline{\text{RESET}}$ stays LOW and is guaranteed to be 0.4V or less until $V_{CC}$ drops below 1.1V.

The SP707/708/813L active-HIGH RESET output is simply the complement of the $\overline{\text{RESET}}$ output and is guaranteed to be valid with $V_{CC}$ down to 1.1V. Some µPs, such as Intel's 80C51, require an active-HIGH reset pulse.

### WATCHDOG TIMER

The SP705/706/813L watchdog circuit monitors the µP's activity. If the µP does not toggle the watchdog input (WDI) within 1.6 seconds and WDI is not tri-stated, $\overline{\text{WDO}}$ goes LOW. As long as $\overline{\text{RESET}}$ is asserted or the WDI input is tri-stated, the watchdog timer will stay cleared and will not count. As soon as $\overline{\text{RESET}}$ is released and WDI is driven HIGH or LOW, the timer will start counting. Pulses as short as 50ns can be detected.

Typically, $\overline{\text{WDO}}$ will be connected to the non-maskable interrupt input (NMI) of a µP. When $V_{CC}$ drops below the reset threshold, $\overline{\text{WDO}}$ will go LOW whether or not the watchdog timer had timed out. Normally this would trigger an NMI but $\overline{\text{RESET}}$ goes LOW simultaneously and thus overrides the NMI.

If WDI is left unconnected, $\overline{\text{WDO}}$ can be used as a low-line output. Since floating WDI disables the internal timer, $\overline{\text{WDO}}$ goes LOW only when $V_{CC}$ falls below the reset threshold, thus functioning as a low-line output.



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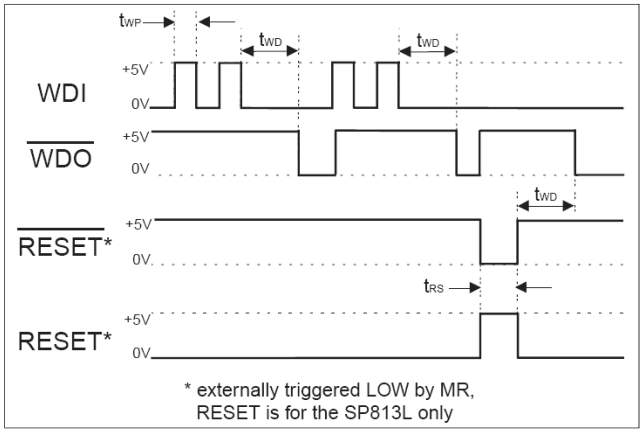


Fig. 18: SP705/706/813L Watchdog Timing Waveforms

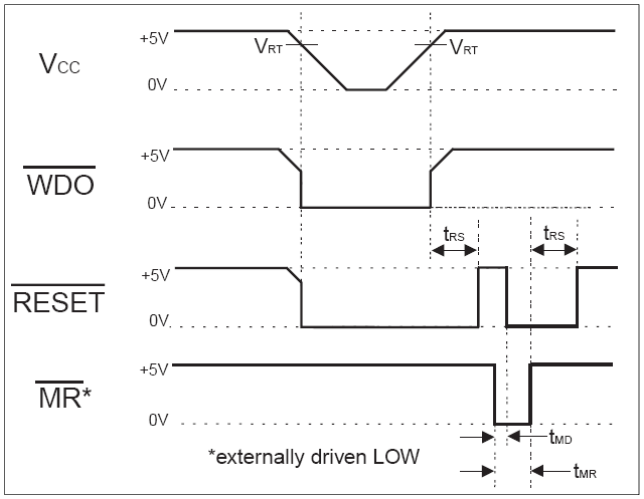


Fig. 19: SP705/706 Timing Diagrams with WDI tri-stated.

## POWER-FAIL COMPARATOR

The power-fail comparator can be used for various purposes because its output and non inverting input are not internally connected. The inverting input is internally connected to a 1.25V reference.

To build an early-warning circuit for power failure, connect the PFI pin to a voltage divider as shown in Figure 20. Choose the voltage divider ratio so that the voltage at PFI falls below 1.25V just before the +5V regulator drops out. Use $\overline{PFO}$ to interrupt the µP so it can prepare for an orderly power-down.

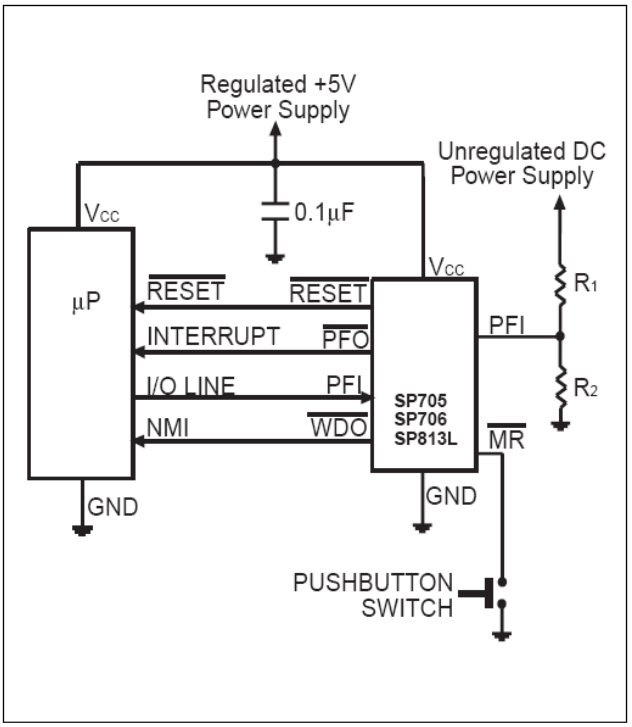


Fig. 20: Typical Operating Circuit

## MANUAL RESET

The manual-reset input ($\overline{MR}$) allows RESET to be triggered by a pushbutton switch. The switch is effectively debounced by the 140ms minimum RESET pulse width. $\overline{MR}$ is TTL/CMOS logic compatible, so it can be driven by an external logic line. $\overline{MR}$ can be used to force a watchdog timeout to generate a RESET pulse in the SP705/706/813L. Simply connect $\overline{WDO}$ to $\overline{MR}$.

### Ensuring a Valid Reset Output Down to $V_{CC}$=0V

When $V_{CC}$ falls below 1.1V, the SP705/706/707/708 $\overline{RESET}$ output no longer sinks current, it becomes an open circuit. High-impedance CMOS logic inputs can drift to undetermined voltages if left undriven. If a pull-down resistor is added to the $\overline{RESET}$ pin, any stray charge or leakage currents will be shunted to ground, holding $\overline{RESET}$ LOW. The resistor value is not critical. It should be about 100KW, large enough not to load $\overline{RESET}$ and small enough to pull $\overline{RESET}$ to ground.



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## MONITORING VOLTAGES OTHER THAN THE UNREGULATED DC INPUT

Monitor voltages other than the unregulated DC by connecting a voltage divider to PFI and adjusting the ratio appropriately. If required, add hysteresis by connecting a resistor (with a value approximately 10 times the sum of the two resistors in the potential divider network) between PFI and PFO. A capacitor between PFI and GND will reduce the power-fail circuit's sensitivity to high-frequency noise on the line being monitored. RESET can be used to monitor voltages other than the +5V $V_{CC}$ line. Connect PFO to MR to initiate a RESET pulse when PFI drops below 1.25V. Figure 21 shows the SP705/706/707/708 configured to assert RESET when the +5V supply falls below the RESET threshold, or when the +12V supply falls below approximately 11V.

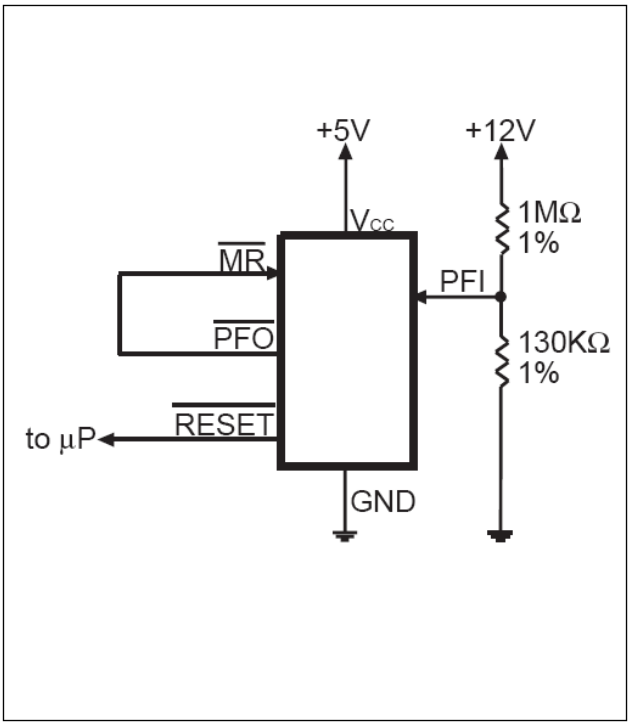


Fig. 21: Monitoring +5V and +12V Power Supplies

## MONITORING A NEGATIVE VOLTAGE SUPPLY

The power-fail comparator can also monitor a negative supply rail, shown in Figure 22. When the negative rail is good (a negative voltage of large magnitude), PFO is LOW. By adding the resistors and transistor as shown, a HIGH PFO triggers RESET. As long as PFO remains HIGH, the SP705-708/813L will keep RESET asserted (where RESET = LOW and RESET = HIGH). Note that this circuit's accuracy depends on the PFI threshold tolerance, the $V_{CC}$ line, and the resistors.

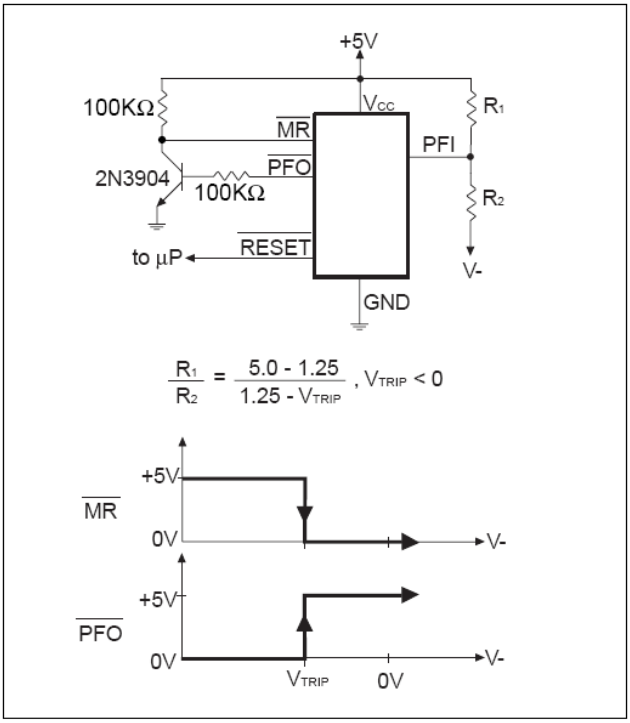


Fig. 22: Monitoring a Negative Voltage Supply

## INTERFACING TO µPS WITH BIDIRECTIONAL RESET PINS

µPs with bidirectional RESET pins, such as the Motorola 68HC11 series, can contend with the SP705/706/707/708 RESET output. If, for example, the RESET output is driven HIGH and the µP wants to pull it LOW, indeterminate logic levels may result. To correct this, connect a 4.7KΩ resistor between the RESET output and the µP reset I/O, as shown if Figure 23. Buffer the RESET output to other system components.



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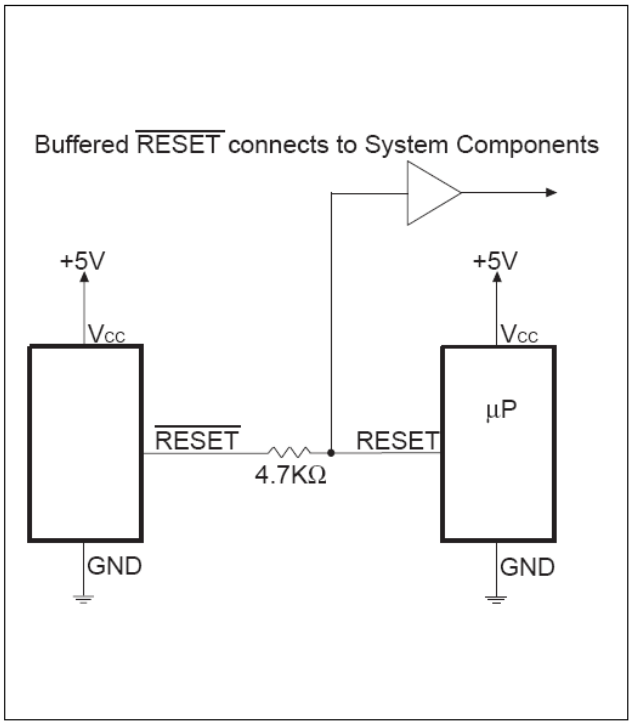


Fig. 23: Interfacing to Microprocessors
with Bidirectional REST I/O (SP705/706/708)

## APPLICATIONS

The SP705-708/813L series offers unmatched performance and the lowest power consumption for these industry standard devices. Refer to Figures 24 and 25 for supply current performance characteristics rated against temperature and supply voltages.

Table 2 shows how the SP705-708/813L series can be used instead of the Dallas Semiconductor DS1232LP/LPS. Table 2 illustrates to a designer the advantages and tradeoffs of the SP705-708/813L series compared to the Dallas Semiconductor device. While the names of the pin descriptions may differ, the functions are the same or very similar. Unlike the DS1232, the SP705-708/813L series has a separate watchdog output pin $\overline{WDO}$ which can be simply connected to the $\overline{MR}$ input to generate a Reset signal. The DS1232 has pin selectable features, while the SP705-708/813L series has more fixed functions of reset threshold and watchdog time-out delay. For most applications, the fixed functions will be preferred, with the benefit of reduced cost due to a less complex part. In addition, the SP705-708/ 813L series has a power fail input and output function not available with the DS1232 that is useful for monitoring systems with unregulated supply voltages. The SP705-708/813L series is available in one of the industry's smallest space-saving package sizes, the MSOP.

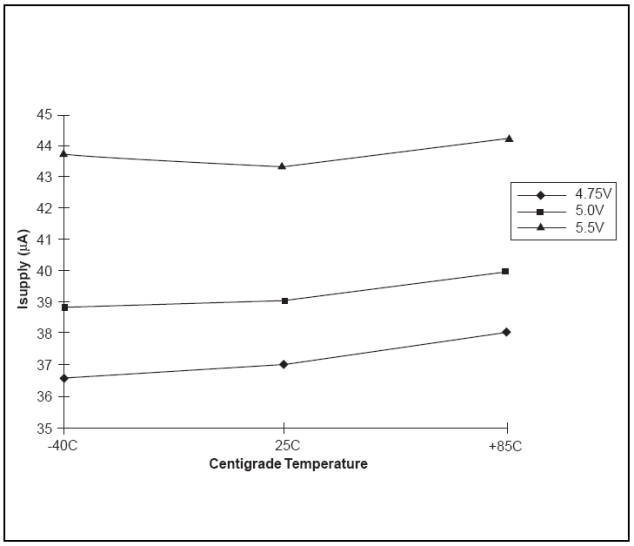


Fig. 24: Supply Current vs. Temperature

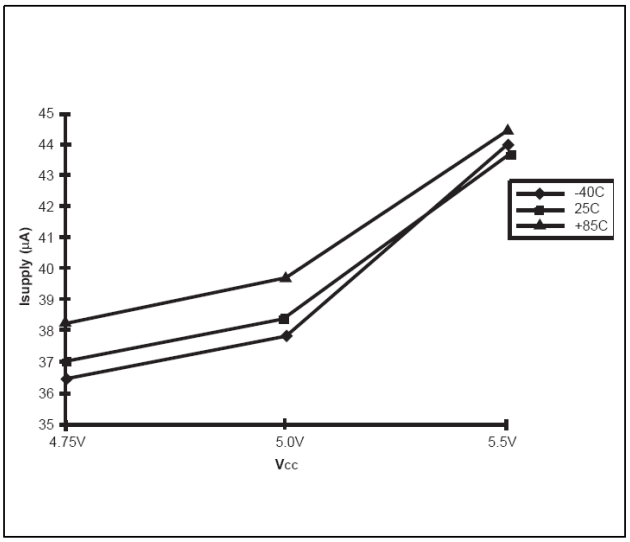


Fig. 25: Supply Current vs. Supply Voltage



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| Function | Dallas DS1232LP/LPS | | Exar Alternative Part Number | | | |
|---|---|---|---|---|---|---|
| | Pin Number DIP or SOIC | Pin Description | Exar Part Number | Pin Number | | Pin Description |
| | | | | DIP or SOIC | MSOP | |
| Manual Reset | 1 | $\overline{\text{PBRST}}$ | SP705-708/ 813L | 1 | 3 | $\overline{\text{MR}}$ |
| WDI Time Delay Set | 2 | TD | SP705-708/ 813L | N/A | N/A | 1.6sec by design |
| $V_{cc}$ Trip 4.6V | 3 | TOL=GND | SP705/707/ 813L | N/A | N/A | 4.6V by design |
| $V_{cc}$ Trip 4.4V | 3 | TOL=$V_{cc}$ | SP706/708/ | N/A | N/A | 4.4V by design |
| Ground | 4 | GND | SP705-708/ 813L | 3 | 5 | GND |
| Reset Active HIGH | 5 | RST | SP707/708 | 8 | 2 | RESET |
| Reset Active HIGH | 5 | RST | SP813L | 7 | 1 | RESET |
| Reset Active LOW | 6 | $\overline{\text{RST}}$ | SP705-708 | 7 | 1 | $\overline{\text{RESET}}$ |
| Watchdog Input | 7 | $\overline{\text{ST}}$ (H to L) | SP705/706/ 813L | 6 | 8 | WDI (any trans.) |
| Voltage Input | 8 | $V_{cc}$ | SP705-708/ 813L | 2 | 4 | $V_{cc}$ |
| Power Fail Input | N/A | N/A | SP705-708/ 813L | 4 | 6 | PFI |
| Power Fail Output | N/A | N/A | SP705-708/ 813L | 5 | 7 | $\overline{\text{PFO}}$ |
| Watchdog Output | N/A | N/A | SP705/706/ 813L | 8 | 2 | $\overline{\text{WDO}}$ |

Fig. 26: Device Overviw on Maxim/Dallas Semiconductor



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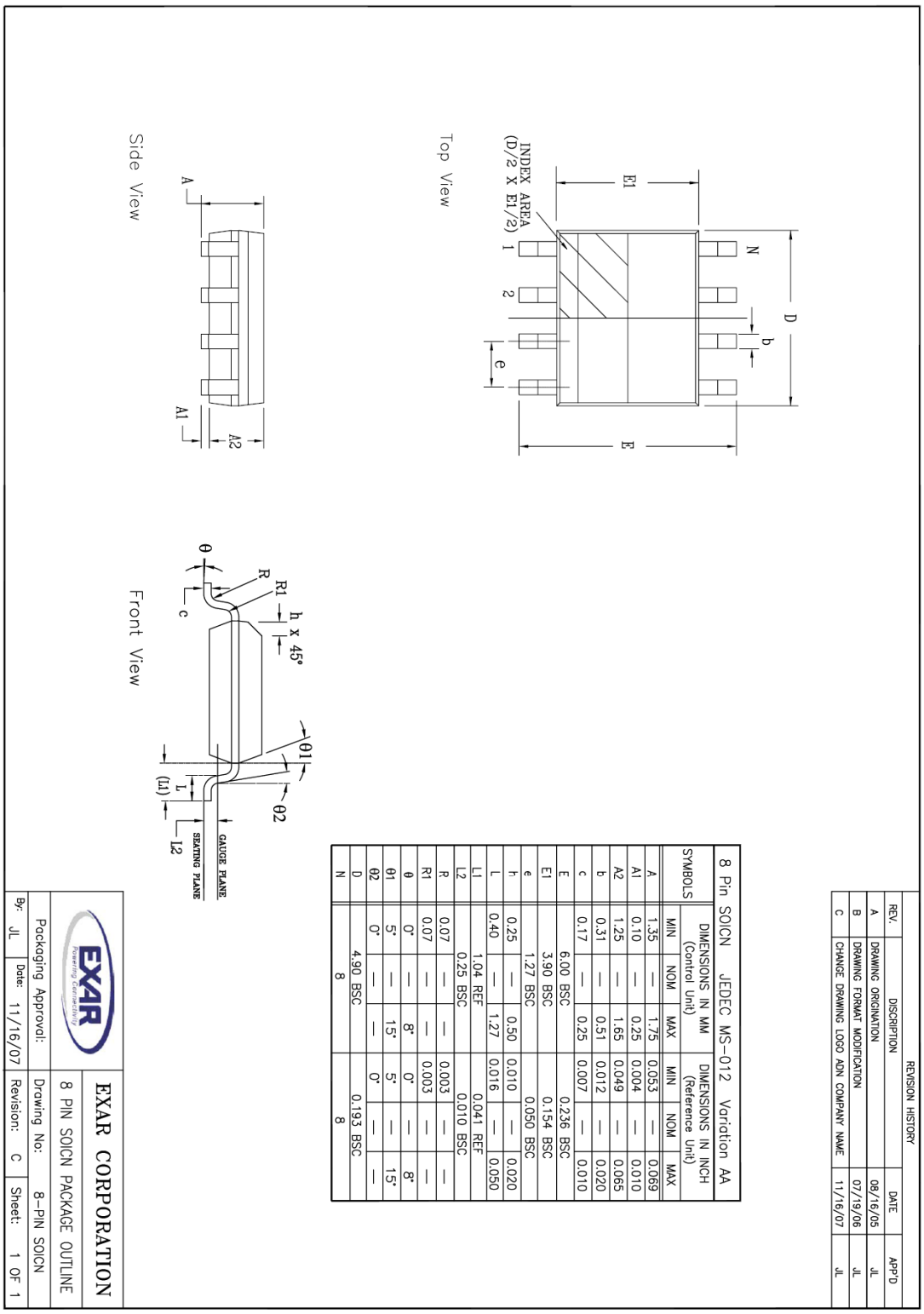
## PACKAGE SPECIFICATION

### 8-PIN NSOIC




REVISION HISTORY

| REV. | DESCRIPTION | DATE | APP'D |
|---|---|---|---|
| A | DRAWING ORIGINATION | 08/16/05 | JL |
| B | DRAWING FORMAT MODIFICATION | 07/19/06 | JL |
| C | CHANGE DRAWING LOGO ADN COMPANY NAME | 11/16/07 | JL |

8 Pin SOICN JEDEC MS-012 Variation AA

| SYMBOLS | DIMENSIONS IN MM (Control Unit) | | | DIMENSIONS IN INCH (Reference Unit) | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.35 | — | 1.75 | 0.053 | — | 0.069 |
| A1 | 0.10 | — | 0.25 | 0.004 | — | 0.010 |
| A2 | 1.25 | — | 1.65 | 0.049 | — | 0.065 |
| b | 0.31 | — | 0.51 | 0.012 | — | 0.020 |
| c | 0.17 | — | 0.25 | 0.007 | — | 0.010 |
| E | 6.00 BSC | | | 0.236 BSC | | |
| E1 | 3.90 BSC | | | 0.154 BSC | | |
| e | 1.27 BSC | | | 0.050 BSC | | |
| h | 0.25 | — | 0.50 | 0.010 | — | 0.020 |
| L | 0.40 | — | 1.27 | 0.016 | — | 0.050 |
| L1 | 1.04 REF | | | 0.041 REF | | |
| L2 | 0.25 BSC | | | 0.010 BSC | | |
| R | 0.07 | — | — | 0.003 | — | — |
| R1 | 0.07 | — | — | 0.003 | — | — |
| θ | 0° | — | 8° | 0° | — | 8° |
| θ1 | 5° | — | 15° | 5° | — | 15° |
| θ2 | 0° | — | — | 0° | — | — |
| D | 4.90 BSC | | | 0.193 BSC | | |
| N | 8 | | | 8 | | |

EXAR CORPORATION

8 PIN SOICN PACKAGE OUTLINE

| Packaging Approval: | Drawing No: 8-PIN SOICN |
|---|---|
| By: JL Date: 11/16/07 | Revision: C Sheet: 1 OF 1 |



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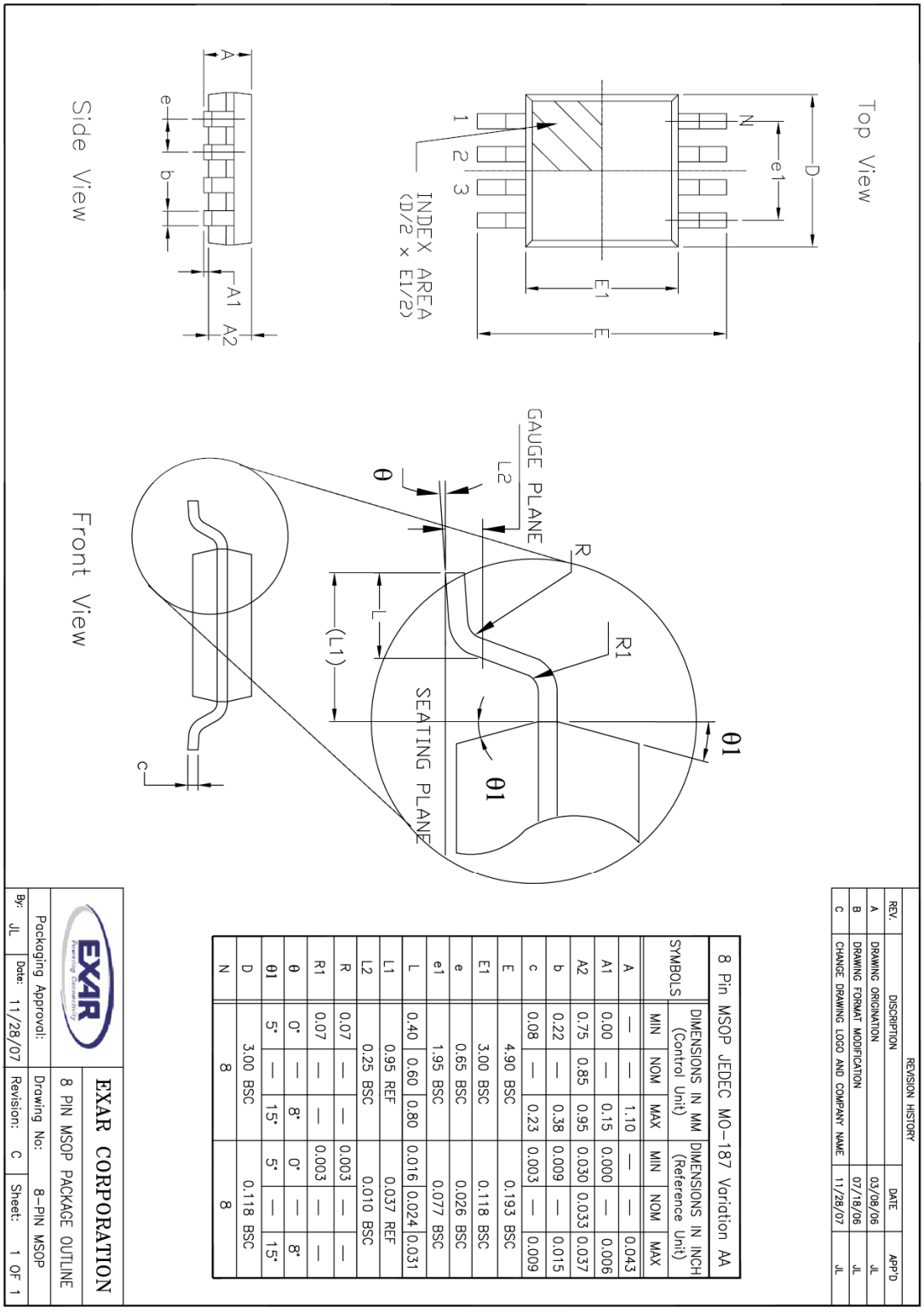
## 8-PIN MSOP



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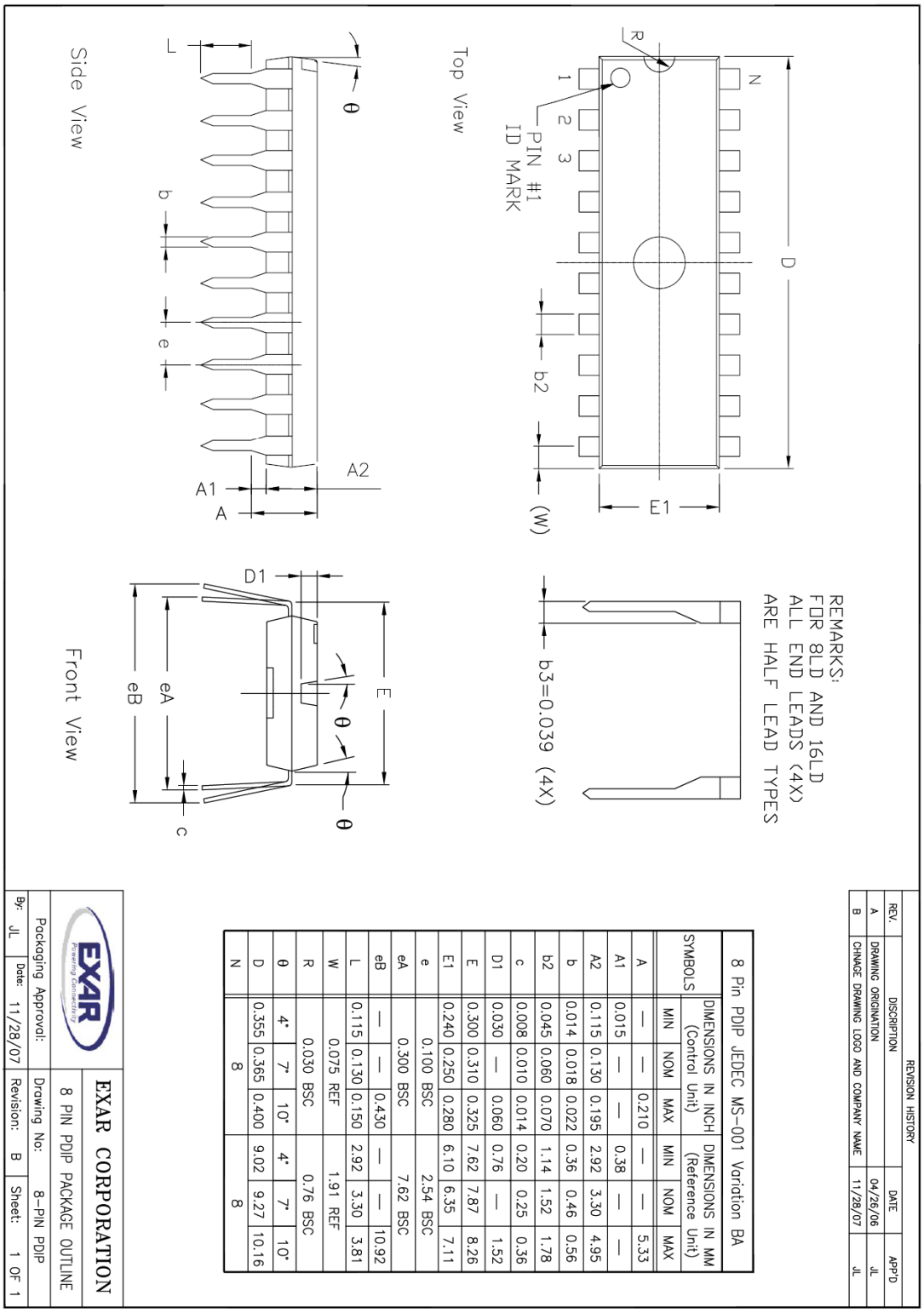
## 8-PIN PDIP




8 Pin PDIP JEDEC MS-001 Variation BA

| SYMBOLS | DIMENSIONS IN INCH (Control Unit) | | | DIMENSIONS IN MM (Reference Unit) | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | — | — | 0.210 | — | — | 5.33 |
| A1 | 0.015 | — | — | 0.38 | — | — |
| A2 | 0.115 | 0.130 | 0.195 | 2.92 | 3.30 | 4.95 |
| b | 0.014 | 0.018 | 0.022 | 0.36 | 0.46 | 0.56 |
| b2 | 0.045 | 0.060 | 0.070 | 1.14 | 1.52 | 1.78 |
| c | 0.008 | 0.010 | 0.014 | 0.20 | 0.25 | 0.36 |
| D1 | 0.030 | — | 0.060 | 0.76 | — | 1.52 |
| E | 0.300 | 0.310 | 0.325 | 7.62 | 7.87 | 8.26 |
| E1 | 0.240 | 0.250 | 0.280 | 6.10 | 6.35 | 7.11 |
| e | 0.100 BSC | | | 2.54 BSC | | |
| eA | 0.300 BSC | | | 7.62 BSC | | |
| eB | — | — | 0.430 | — | — | 10.92 |
| L | 0.115 | 0.130 | 0.150 | 2.92 | 3.30 | 3.81 |
| W | 0.075 REF | | | 1.91 REF | | |
| R | 0.030 BSC | | | 0.76 BSC | | |
| θ | 4° | 7° | 10° | 4° | 7° | 10° |
| D | 0.355 | 0.365 | 0.400 | 9.02 | 9.27 | 10.16 |
| N | 8 | | | 8 | | |



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## REVISION HISTORY

| Revision | Date | Description |
|---|---|---|
| 2.0.0 | 06/03/2010 | Reformat of datasheet |
| 2.1.0 | 06/02/2011 | Minimum WDI Pulse Width $t_{WP}$ reduced from 1µs to 100ns.<br>Change will be effective with release of Device Product Change Notice. |
| | | |

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