**axelite** 亞瑟萊特科技股份有限公司 AXElite Technology Co.,Ltd

# 3-Pin Microprocessor Reset Circuits

## ❖ GENERAL DESCRIPTION

The AX6905/6 is used for microprocessor (µP) supervisory circuits to monitor the power supplies in µP and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V, +2.5V powered circuits.

These circuits perform a single function: they assert a reset signal whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for at least 200ms after VCC has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available. The AX6905/6 has push pull outputs. The AX6905 have an active low $\overline{\text{RESET}}$ output, while the AX6906 has an active high RESET output. The reset comparator is designed to ignore fast transients on VCC, and the outputs are guaranteed to be in the correct logic state for VCC down to 1.0V. Low supply current makes the AX6905/6 ideal for use in portable equipment. The AX6905/6 is available in a 3-pin SOT-23 and SC70 package.

## ❖ FEATURES

- Precision Monitoring of +2.5,+3V, +3.3V, and +5V Power-Supply Voltages
- Fully Specified Over Temperature
- Available in Three Output Configurations
- Push-Pull $\overline{\text{RESET}}$ Low Output(AX6905)
- Push-Pull RESET High Output(AX6906)
- 200ms (Typ.)min Power-On Reset Pulse Width
- 25µA Supply Current
- Guaranteed Reset Valid to VCC = +1.0V
- Power Supply Transient Immunity
- No External Components
- Available in the 3-Pin Pb-Free SOT-23 and SC70 Package

Rev.1.2 Jul.30, 2010

## ❖ BLOCK DIAGRAM
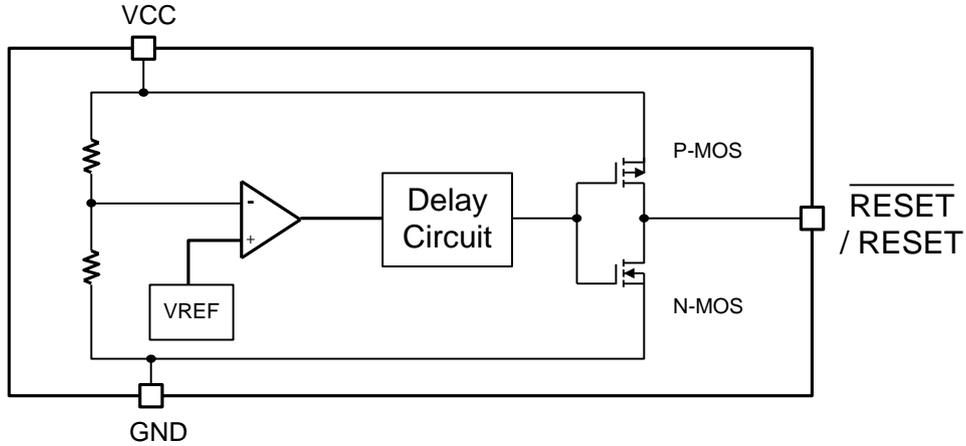


## ❖ PIN ASSIGNMENT

The packages of AX6905/6 are SOT-23-3L and SC70-3L; the pin assignment is given by:

(Top View)



SOT-23-3L/SC70-3L
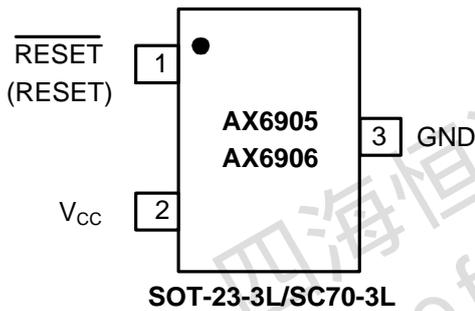
| Name | Description |
|---|---|
| GND | Ground |
| $\overline{\text{RESET}}$ (RESET) | Reset output pin L: forAX6905 H: forAX6906 |
| $V_{CC}$ | Operating voltage input |

## ❖ ORDER/MARKING INFORMATION

| Order Information |
|---|
| AX690 **X X X X** ─────── Packing |
| Blank : Bag |
| A : Taping |

| Enable | Voltage | Package |
|---|---|---|
| 5: Active-Low | A: 4.63 | A:SC70-3L |
| 6: Active-High | B: 4.38 | R:SOT-23-3L |
| | C: 4.00 | |
| | D: 3.08 | |
| | E: 2.93 | |
| | F: 2.63 | |
| | G: 2.25 | |
| | H: 2.70 | |
| | I : 4.25 | |

| Top Marking |
|---|

**L L Y W X** → ID Code: internal
→ WW : 01~26(A~Z)
27~52(a~z)
→ Year : A = 2010
1 = 2011
→ Identification code

→ WW : 01~26(A~Z)
27~52(a~z)
**L L Y W**
• • • •
→ ID Code: internal
→ Year : A = 2010
1 = 2011
→ Identification code

Rev.1.2 Jul.30, 2010

**Appendix**

| Part Number | Package | Identification Code | Part Number | Package | Identification Code |
|---|---|---|---|---|---|
| AX6905A | SOT23-3L | SA | AX6905A | SC70-3L | SQ |
| AX6905B | SOT23-3L | SB | AX6905B | SC70-3L | SR |
| AX6905C | SOT23-3L | SC | AX6905C | SC70-3L | SS |
| AX6905D | SOT23-3L | SD | AX6905D | SC70-3L | ST |
| AX6905E | SOT23-3L | SE | AX6905E | SC70-3L | SU |
| AX6905F | SOT23-3L | SF | AX6905F | SC70-3L | SV |
| AX6905G | SOT23-3L | SG | AX6905G | SC70-3L | SW |
| AX6905H | SOT23-3L | Sa | AX6905H | SC70-3L | Sc |
| AX6905I | SOT23-3L | Sb | AX6905I | SC70-3L | Sd |
| AX6906A | SOT23-3L | SH | AX6906A | SC70-3L | SX |
| AX6906B | SOT23-3L | SI | AX6906B | SC70-3L | SY |
| AX6906C | SOT23-3L | SJ | AX6906C | SC70-3L | SZ |
| AX6906D | SOT23-3L | SK | AX6906D | SC70-3L | S2 |
| AX6906E | SOT23-3L | SL | AX6906E | SC70-3L | S3 |
| AX6906F | SOT23-3L | SO | AX6906F | SC70-3L | S4 |
| AX6906G | SOT23-3L | SP | AX6906G | SC70-3L | S5 |
| AX6906H | SOT23-3L | Se | AX6906H | SC70-3L | Sg |
| AX6906I | SOT23-3L | Sf | AX6906I | SC70-3L | Sh |

## ❖ ABSOLUTE MAXIMUM RATINGS (at $T_A$=25°C)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| VCC Pin Voltage | $V_{CC}$ | GND - 0.3 to GND + 6.5 | V |
| RESET, $\overline{RESET}$ (push-pull) Pin Voltage | $V_{RESET}$ | GND - 0.3 to $V_{CC}$ + 0.3 | V |
| Input Current, $V_{CC}$ | $I_{CC}$ | 20 | mA |
| Output Current, RESET, $\overline{RESET}$ | $I_O$ | 5 | mA |
| Power Dissipation | PD | ( $T_J$-$T_A$ ) / $\theta_{JA}$ | mW |
| Storage Temperature Range | $T_{ST}$ | -60 to +150 | °C |
| Operating Temperature Range | $T_{OP}$ | -40 to +85 | °C |
| Junction Temperature | $T_J$ | -40 to +150 | °C |
| Thermal Resistance from Junction to case | $\theta_{JC}$ | 110 | °C/W |
| Thermal Resistance from Junction to ambient | $\theta_{JA}$ | 250 | °C/W |

Note : $\theta_{JA}$ is measured with the PCB copper area of approximately 1 in$^2$(Multi-layer). That need connect to $V_{SS}$ pin.

Rev.1.2 Jul.30, 2010

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## ❖ ELECTRICAL CHARACTERISTICS

$T_A=25°C$ (unless otherwise noted)

| Characteristics | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Operating $V_{CC}$ Range | $V_{Range}$ | | 1.0 | - | 6 | V |
| Supply Current | $I_{CC}$ | $V_{CC} = V_{TH}+1.0V$ | - | 25 | 35 | μA |
| Reset Threshold $T_A=25°C$ | $V_{TH}$ | AX6905/6A | 4.54 | 4.63 | 4.71 | V |
| | | AX6905/6B | 4.29 | 4.38 | 4.46 | |
| | | AX6905/6I | 4.16 | 4.25 | 4.33 | |
| | | AX6905/6C | 3.92 | 4.00 | 4.08 | |
| | | AX6905/6D | 3.02 | 3.08 | 3.15 | |
| | | AX6905/6E | 2.87 | 2.93 | 3.00 | |
| | | Ax6905/6H | 2.64 | 2.70 | 2.75 | |
| | | AX6905/6F | 2.57 | 2.63 | 2.69 | |
| | | AX6905/6G | 2.20 | 2.25 | 2.30 | |
| Reset Threshold Tempco | $V_{THT}$ | $T_A = 0°C$ to $+85°C$ | - | 50 | - | ppm/°C |
| Set-up Time | $T_S$ | $V_{CC} = 0$ to $(V_{TH} – 100mV)$ | 1 | - | - | μs |
| $V_{CC}$ to Reset Delay | $T_{RD}$ | $V_{CC}=V_{TH}$ to $(V_{TH}-100mV)$ | - | 20 | - | μs |
| Reset Active Timeout Period | $T_{DELAY}$ | $T_A = 0°C$ to $+85°C$ | 140 | 200 | 260 | ms |
| $\overline{RESET}$ Output Voltage (AX6905) | $V_{OL}$ | $1.8V<V_{CC} < V_{TH(min)}$, $I_{SINK} = 1.2mA$ | - | - | 0.3 | V |
| | | $1.2V < V_{CC} < 1.8V$, $I_{SINK} = 50uA$ | | | | |
| | $V_{OH}$ | $V_{CC} > V_{TH (max)}$, $I_{SOURCE} = 500uA$, | $0.8V_{CC}$ | - | - | V |
| RESET Output Voltage (AX6906) | $V_{OL}$ | $V_{CC} > V_{TH (max)}$, $I_{SINK} = 1.2mA$, | - | - | 0.3 | V |
| | $V_{OH}$ | $1.8V < V_{CC} < V_{TH (min)}$, $I_{SOURCE} = 500uA$ | $0.8 V_{CC}$ | - | - | V |
| | | $1.2V < V_{CC} < 1.8V$, $I_{SOURCE} = 150uA$ | | | | |
| Hysteresis at $V_{CC}$ | $V_{Hys}$ | Input voltage | - | 40 | - | mV |

## ❖ APPLICATION CIRCUIT
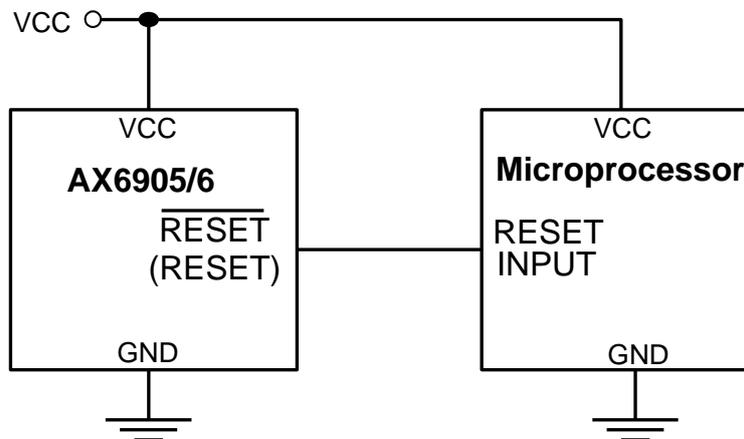
❖ **FUNCTION DESCRIPTIONS**

A microprocessor's (µP's) reset input starts the µP in a known state. The AX6905/6 asserts reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for at least 200ms after VCC has risen above the reset threshold. The AX6905/6 has a push-pull output stage.

❖ **APPLICATION INFORMATION**
**Negative-Going VCC Transients**

In addition to issuing a reset to the µP during power-up, power-down, and brownout conditions, the AX6905/6 is relatively immune to short-duration negative-going VCC transients (glitches).

The AX6905/6 does not generate a reset pulse. The graph was generated using a negative going pulse applied to VCC, starting 0.5V above the actual reset threshold and ending below it by the magnitude indicated (reset comparator overdrive). The graph indicates the maximum pulse width a negative going VCC transient can have without causing a reset pulse. As the magnitude of the transient increases (goes farther below the reset threshold), the maximum allowable pulse width decreases. Typically, a VCC transient that goes 50mV below the reset threshold A 0.1µF bypass capacitor mounted as close as possible to the VCC pin provides additional transient immunity.

**Ensuring a Valid Reset Output Down to VCC = 0**

$\overline{RESET}$ Is guaranteed to be a logic low for VCC > 1.0V. Once VCC exceeds the reset threshold, an internal timer keeps $\overline{RESET}$ low for the reset timeout period; after this interval, $\overline{RESET}$ goes high. If a brownout condition occurs (VCC dips below the reset threshold), $\overline{RESET}$ goes low. Any time VCC goes below the reset threshold, the internal timer resets to zero, and $\overline{RESET}$ goes low. The internal timer starts after VCC returns above the reset threshold, and $\overline{RESET}$ remains low for the reset timeout period.

When VCC falls below 1.0V, the AX6905 RESET output no longer sinks current—it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to $\overline{RESET}$ can drift to undetermined voltages.

This presents no problem in most applications since most µP and other circuitry is inoperative with VCC below 1.0V. However, in applications where $\overline{RESET}$ must be valid down to 0V, adding a pull down resistor to $\overline{RESET}$ causes any stray leakage currents to flow to ground, holding $\overline{RESET}$ low. R1's value is not critical; 100k is large enough not to load $\overline{RESET}$ and small enough to pull $\overline{RESET}$ to ground. For the AX6906 if RESET is required to remain valid for VCC < 1.0V.

**Benefits of Highly Accurate Reset Threshold**

Most µP supervisor ICs has reset threshold voltages between 5% and 10% below the value of nominal sup-ply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal. When using ICs rated at only the nominal supply ±5%, this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted.

Rev.1.2 Jul.30, 2010

❖ **TYPICAL CHARACTERISTICS**

## ❖ TIMING DIAGRAM





Giltch Immunity

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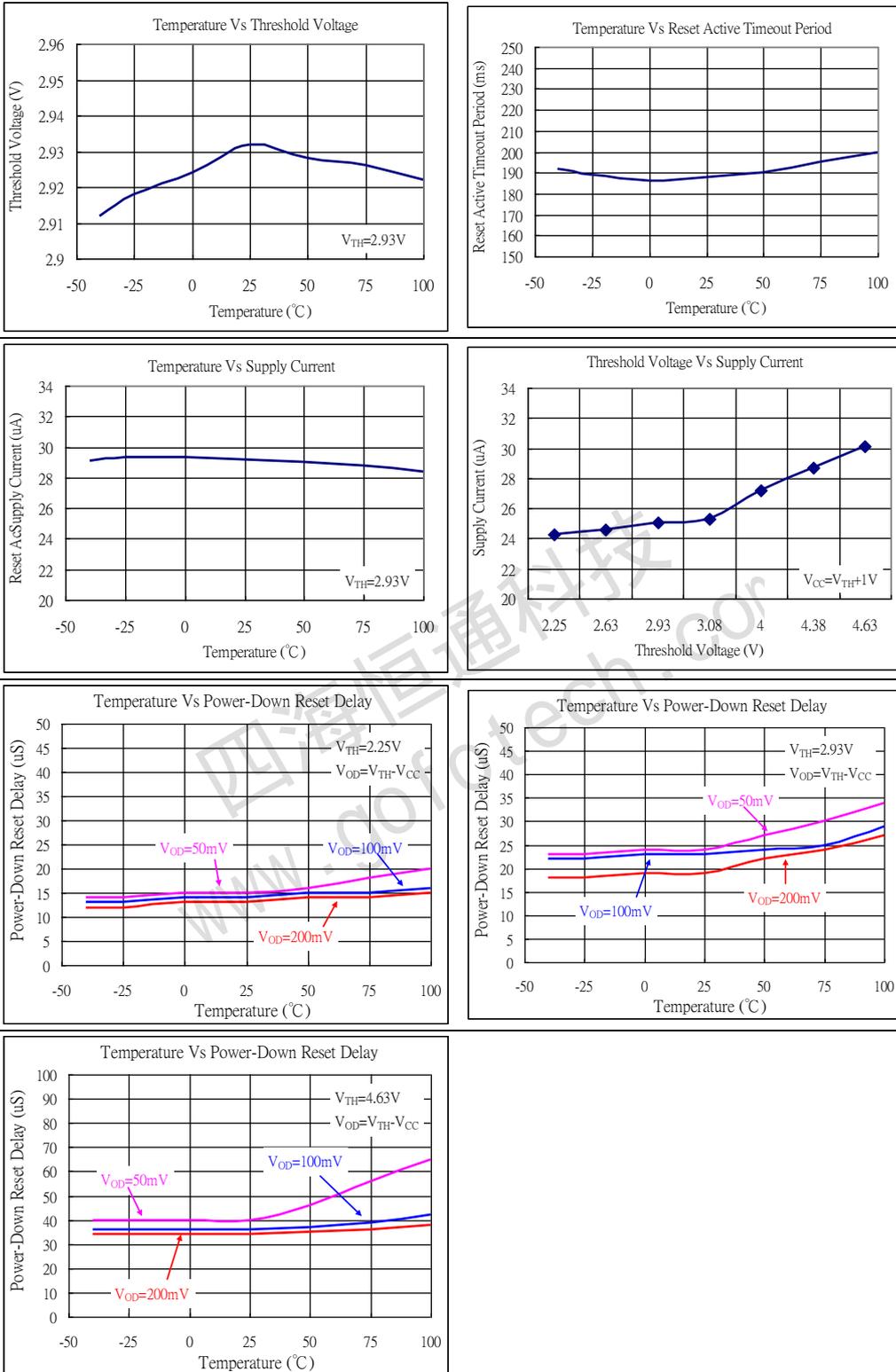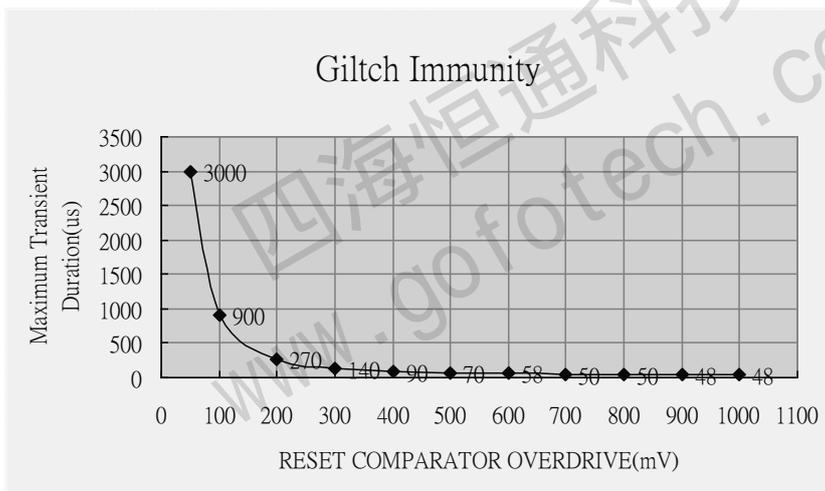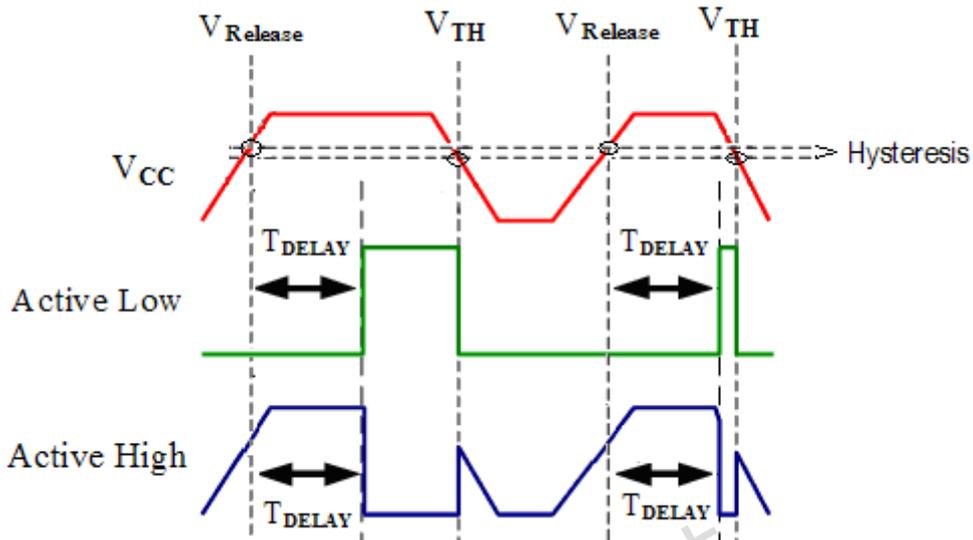
❖ **PACKAGE OUTLINES**

**(1)  SOT-23-3L**

**VIEW C**

**SEE VIEW C**
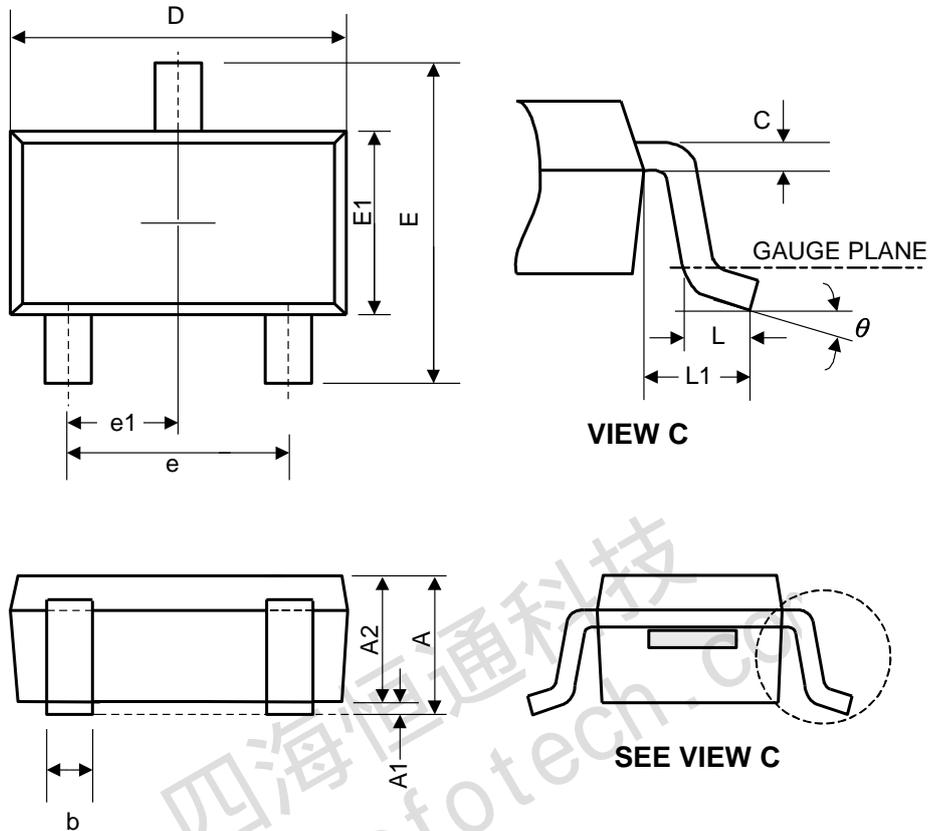
| Symbol | Dimensions in Millimeters | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | - | - | 1.45 | - | - | 0.057 |
| A1 | 0.00 | 0.08 | 0.15 | - | - | 0.006 |
| A2 | 0.90 | 1.10 | 1.30 | 0.035 | 0.043 | 0.051 |
| b | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| C | 0.08 | 0.15 | 0.22 | 0.003 | 0.006 | 0.009 |
| D | 2.70 | 2.90 | 3.10 | 0.106 | 0.114 | 0.122 |
| E | 2.60 | 2.80 | 3.00 | 0.102 | 0.110 | 0.118 |
| E1 | 1.40 | 1.60 | 1.80 | 0.055 | 0.063 | 0.071 |
| L | 0.30 | 0.45 | 0.60 | 0.012 | 0.018 | 0.024 |
| L1 | 0.50 | 0.60 | 0.70 | 0.020 | 0.024 | 0.028 |
| e | 1.9 BSC | | | 0.075 BSC | | |
| e1 | 0.95 BSC | | | 0.037 BSC | | |
| θ | 0º | 4º | 8º | 0º | 4º | 8º |

JEDEC outline: NA

Rev.1.2 Jul.30, 2010

**(2) SC70-3L**
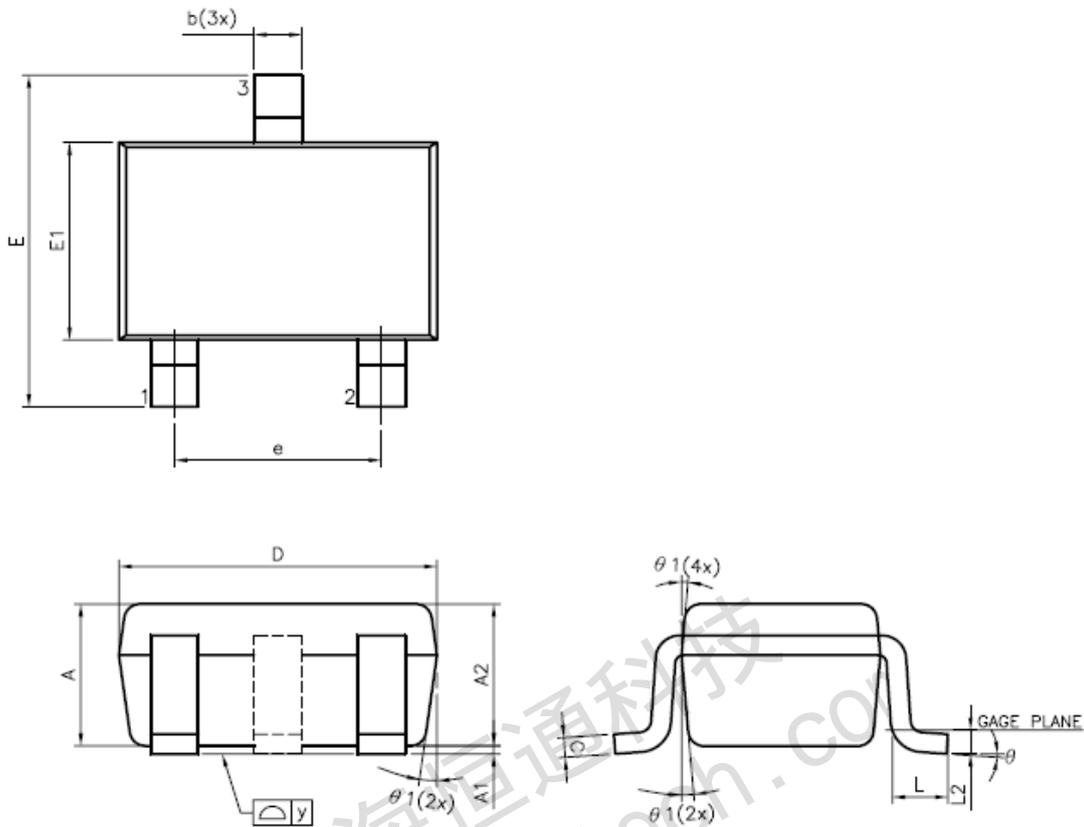


| Symbol | Dimensions in Millimeters | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 0.80 | 0.95 | 1.10 | 0.031 | 0.037 | 0.043 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A2 | 0.70 | 0.90 | 1.00 | 0.028 | 0.035 | 0.039 |
| b | 0.20 | 0.30 | 0.40 | 0.008 | 0.012 | 0.016 |
| C | 0.08 | 0.15 | 0.22 | 0.003 | 0.006 | 0.009 |
| D | 1.80 | 2.00 | 2.20 | 0.071 | 0.079 | 0.087 |
| E | 1.95 | 2.20 | 2.45 | 0.077 | 0.087 | 0.096 |
| E1 | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 1.30 BSC | | | 0.051 BSC | | |
| L | 0.26 | 0.36 | 0.46 | 0.010 | 0.014 | 0.018 |
| L2 | 0.15 BSC | | | 0.006 BSC | | |
| y | - | - | 0.10 | - | - | 0.004 |
| θ | 0º | 4º | 8º | 0º | 4º | 8º |
| θ | 4º | - | 12º | 4º | - | 12º |

Mold flash shall not exceed 0.15mm per side

Rev.1.2 Jul.30, 2010