

Single Operational Amplifier and Voltage Reference



General Description

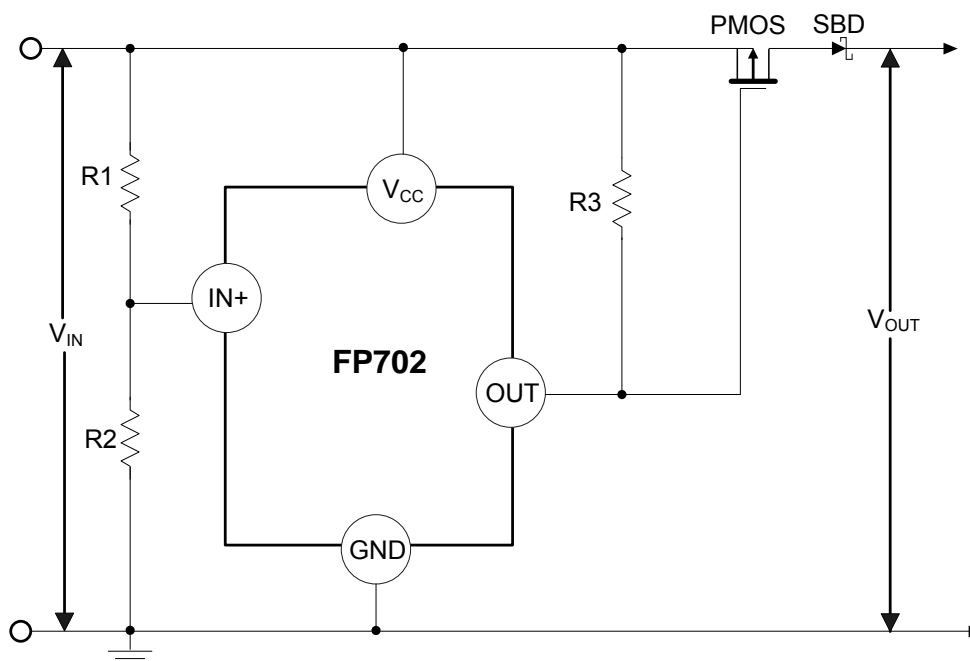
The FP702 is composed one op-amp (OPA) with a 1.25V precision voltage reference on inverting input with an open collector output. It is applied to offer space and low cost in many applications such as the secondary feedback control of power supply, AC / DC converter or adaptor.

The FP702 is designed as an OVP detector with few external components. The circuit diagram of typical application example is shown as below:

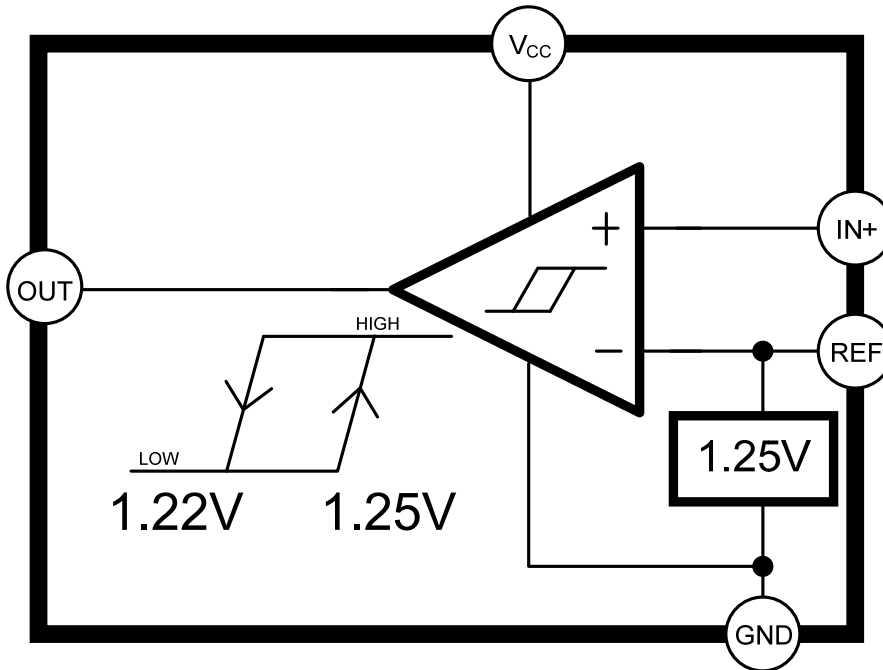
Features

- Wide Operating Voltage From 3.0V~25V
- Fixed Reference Voltage: 1.25V
- Low input Offset Voltage: 1mV
- High Precision Over Temperature: 1%
- Open Collector Output
- Sink Current up to 20mA
- Package: SOT23-5L

Typical Application Circuit

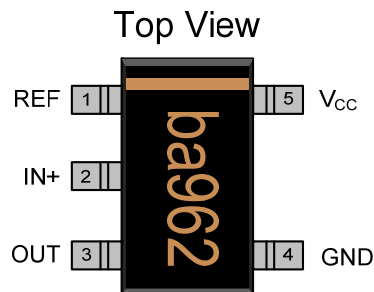


Function Block Diagram



Pin Descriptions

SOT23-5L

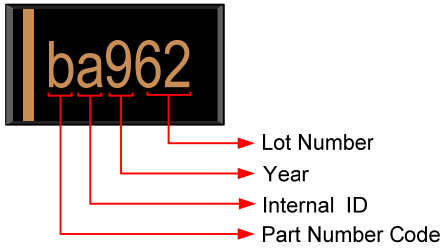


| Name | No. | I / O | Description |
|-----------------|-----|-------|--|
| REF | 1 | O / I | 1.25V Reference Output OPA Inverting Input |
| IN+ | 2 | I | OPA Non-Inverting Input |
| OUT | 3 | O | OPA Open Collector Output |
| GND | 4 | P | IC Ground |
| V _{CC} | 5 | P | IC Power Supply |

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Marking Information

SOT23-5L



Lot Number: Wafer lot number's last two digits

For Example: 1323**62**TB → 62

Year: Production year's last digit

Internal ID: Internal Identification Code

Part Number Code: Part number identification code for this product. It should be always "b".

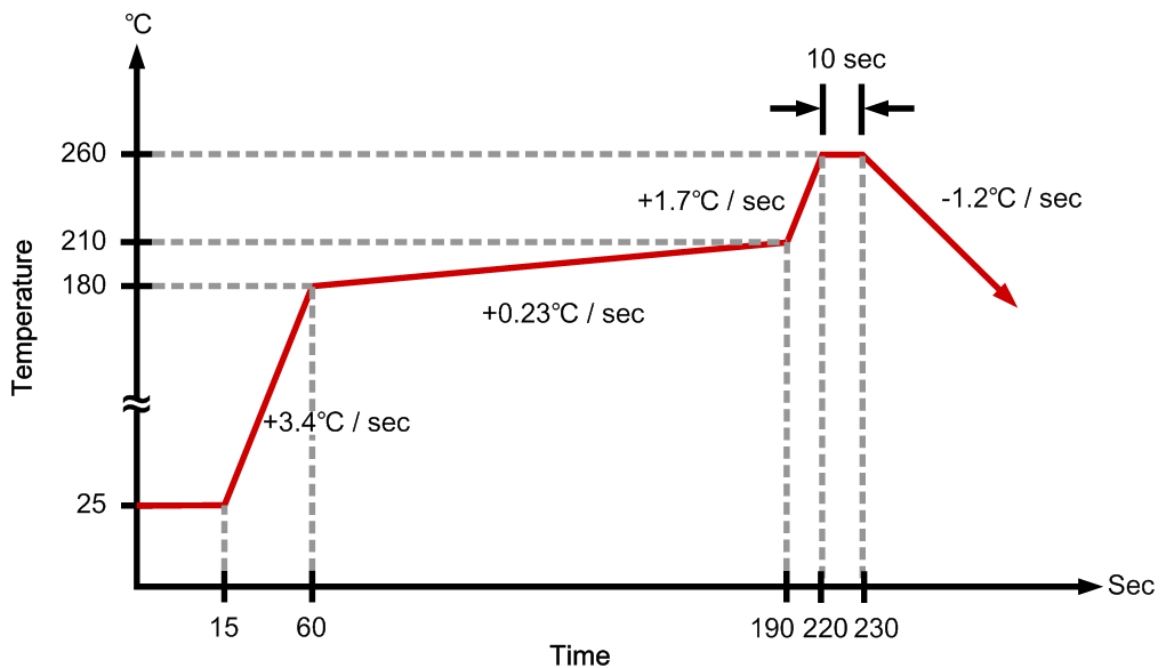
Ordering Information

| Part Number | Operating Temperature | Package | MOQ | Description |
|-------------|-----------------------|----------|--------|-------------|
| FP702KR-LF | -20°C ~ +85°C | SOT23-5L | 2500EA | Tape & Reel |

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|---------------|---------------------|------|------|--------------|--------|
| IN+ Input Voltage | V_i | | -0.3 | | $V_{CC}-1.8$ | V |
| Output Voltage | | | | | 25 | V |
| Output Sink Current | | | | | 30 | mA |
| Maximum Junction Temperature | | | | | +150 | °C |
| Thermal Resistance Junction to Ambient | θ_{ja} | SOT23-5L | | | +400 | °C / W |
| Power Dissipation | P_D | SOT23-5L | | | 250 | mW |
| Storage Temperature | T_{ST} | | -65 | | +150 | °C |
| Lead Temperature | | (soldering, 10 sec) | | | +260 | °C |

IR Re-flow Soldering Curve



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Recommended Operating Conditions

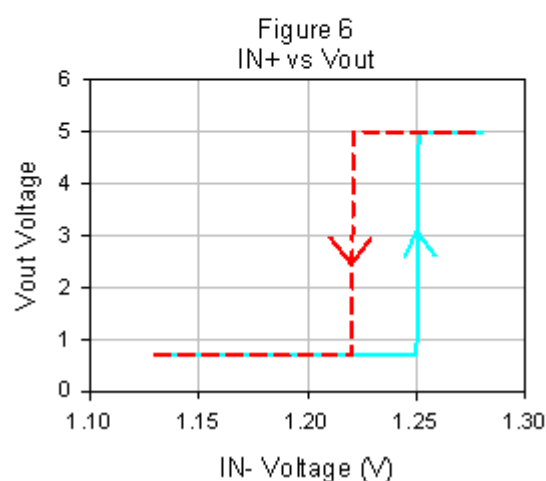
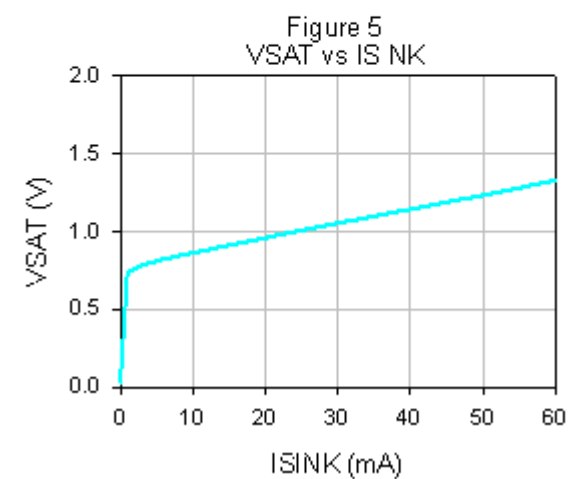
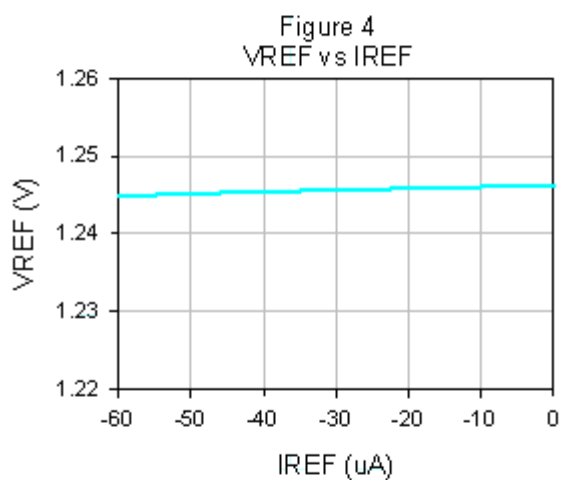
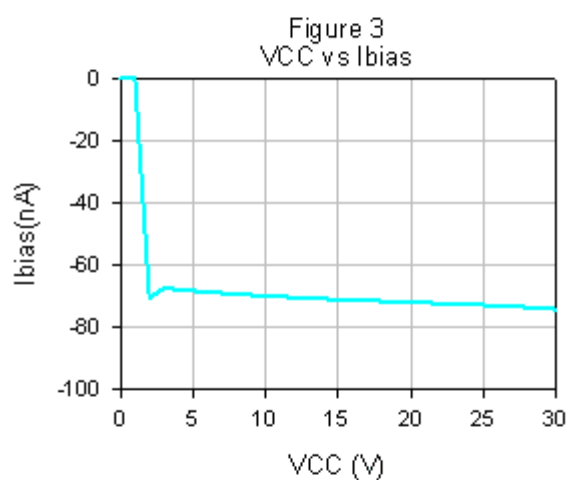
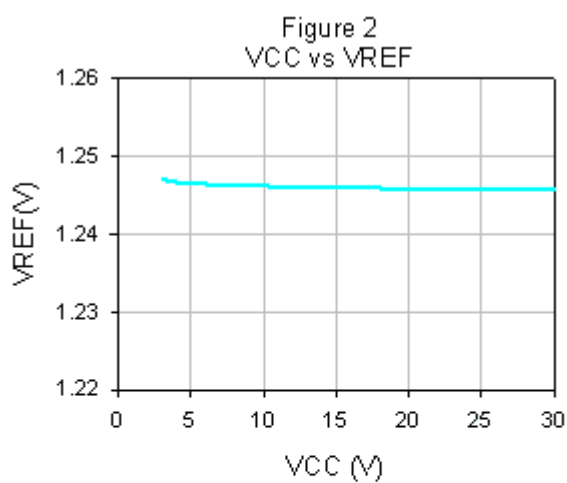
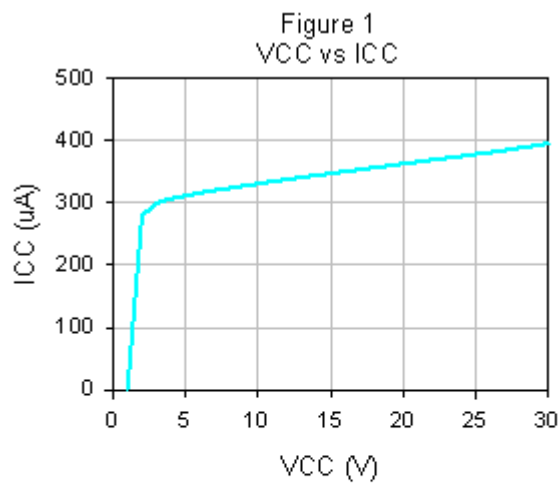
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------|------------|------|------|------|------|
| Supply Voltage | V_{CC} | | 3 | | 25 | V |
| Operating Temperature | | | -20 | | +85 | °C |

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

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|------------------|-------------------------------------|-------|------|-------|--------------------|
| Operating Amplifier | | | | | | |
| Input Offset Voltage | V_{io} | $T_{AMB}=25^\circ C$ | | 1 | 3 | mV |
| | | $T_{MIN} \leq T_{AMB} \leq T_{MAX}$ | | | 5 | |
| Under Voltage Lockout | DV_{io} | | | 7 | | $\mu V / ^\circ C$ |
| IN- Input Bias Current | I_{ib} | $T_{AMB}=25^\circ C$ | | -80 | -250 | nA |
| | | $T_{MIN} < T_{AMB} \leq T_{MAX}$ | | | -500 | |
| Large Signal Voltage Gain | A_{vd} | | | 50 | | V / mV |
| Output Sink Current | I_{SINK} | $V_{IN+}=0.5V$, $V_{OUT}=1.2V$ | | 30 | | mA |
| Low Level Output Voltage | V_{OL} | $V_{IN+}=0.5V$, $I_{SINK}=20mA$ | | 0.9 | 1 | V |
| Output Leakage Current | I_{LEAK} | $V_{OUT}=25V$, $V_{IN+}=2V$ | | 0.1 | 1 | μA |
| Output Switch Hysteris | HYS | | | 30 | | mV |
| Voltage Reference | | | | | | |
| Reference Voltage | V_{REF} | $T_{AMB}=25^\circ C$ | 1.237 | 1.25 | 1.263 | V |
| | | $T_{MIN} \leq T_{AMB} \leq T_{MAX}$ | 1.225 | | 1.275 | % |
| Reference Voltage Deviation Over Temperature Range | ΔV_{REF} | $T_{MIN} \leq T_{AMB} \leq T_{MAX}$ | | 10 | | mV |
| Line Regulation | | $3.0V \leq V_{CC} \leq 25V$ | | 1 | 3 | mV |
| Load Regulation | | $I_{REF}=0\mu A$ to $40\mu A$ | | 3 | 5 | mV |
| Total Supply Current | | | | | | |
| IC Supply Current | I_{CC} | $V_{CC}=25V$ | | 0.4 | | mA |

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Typical Operating Characteristics ($V_{CC}=12V$, $T_A=25^{\circ}C$ unless otherwise noted))



Typical Operating Characteristics ($V_{CC}=12V$, $T_A=25^\circ C$, $R_{OUT}=2K$)

IN+ to V_{OUT} Delay Time

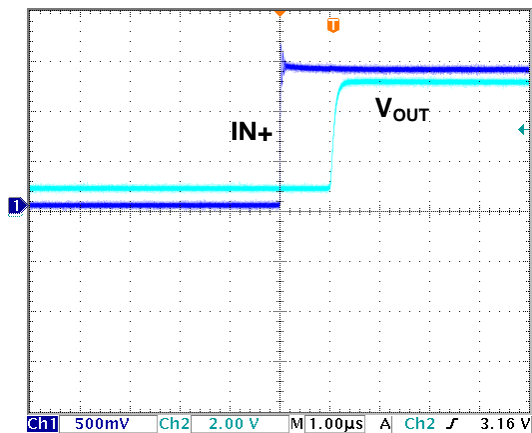


Figure 7

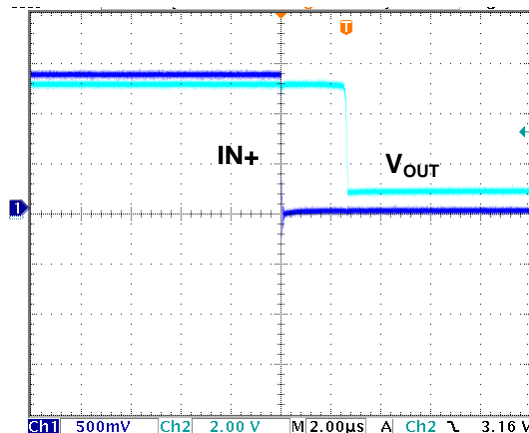


Figure 8

Application Information

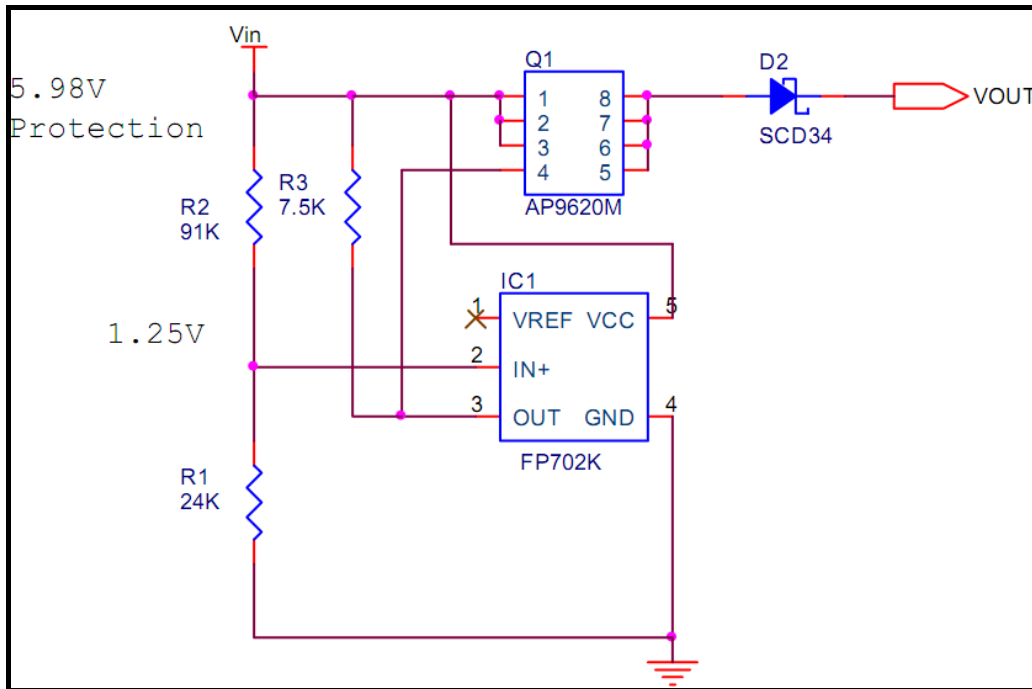
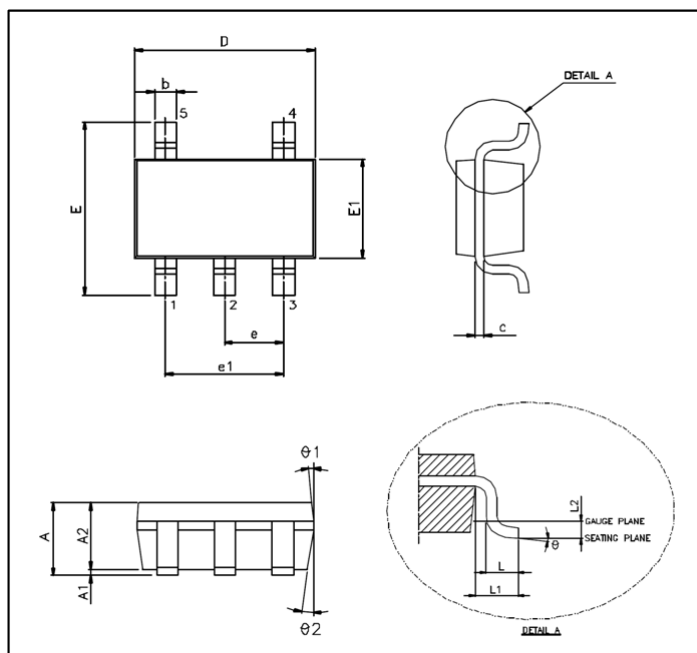


Figure 9. FP702 Over Voltage Protection Circuits

Package Outline

SOT23-5L



Unit: mm

| Symbols | Min. (mm) | Max. (mm) |
|-----------------|-----------|-----------|
| A | 1.050 | 1.350 |
| A1 | 0.050 | 0.150 |
| A2 | 1.000 | 1.200 |
| b | 0.250 | 0.500 |
| c | 0.080 | 0.200 |
| D | 2.700 | 3.000 |
| E | 2.600 | 3.000 |
| E1 | 1.500 | 1.700 |
| e | 0.950 BSC | |
| e1 | 1.900 BSC | |
| L | 0.300 | 0.550 |
| L1 | 0.600 REF | |
| L2 | 0.250 BSC | |
| θ° | 0° | 10° |
| $\theta1^\circ$ | 3° | 7° |
| $\theta2^\circ$ | 6° | 10° |

Note:

1. Package dimensions are in compliance with JEDEC outline: MO-178 AA.
2. Dimension "D" does not include molding flash, protrusions or gate burrs.
3. Dimension "E1" does not include inter-lead flash or protrusions.

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