

# ELM97xxxxA VOLTAGE DETECTOR

## ■ GENERAL DESCRIPTION

ELM 97xxxxA Series is a CMOS voltage detector IC for battery-operated portable devices. It consists of a very low-power-consumption reference voltage source, a comparator, an output driver, a hysteresis circuit, and detection voltage setting resistors. Output logic is positive, therefore output level is low when VDD is lower than detection voltage.

It can be used as a reset controller in microcomputer-based systems. And it can be widely applied to the devices, such as battery checkers, switching circuit of back-up power source, power failure detectors, etc. Two output styles are available, N-ch opendrain and CMOS output.

It is available in SOT-89 and SOT-23.

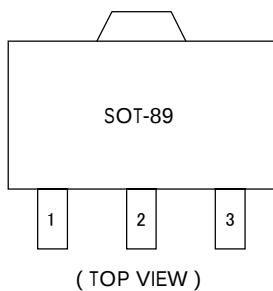
## ■ FEATURES

- Low power operation : TYP.  $1.0 \mu A$  ( $V_{DD} = 1.5V$ )
- Low voltage operation : Reset operation assured at  $0.8V$
- High accuracy of detection voltage :  $\pm 2.5\%$
- Low temperature coefficient : TYP.  $-300ppm/^{\circ}C$  (Detection voltage  $< 2.0V$ )  
: TYP.  $-100ppm/^{\circ}C$  (Detection voltage  $\geq 2.0V$ )
- Very small package : SOT-89, SOT-23

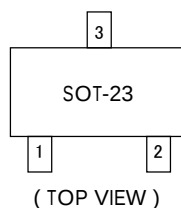
## ■ APPLICATION

- Reset for microcomputer
- Battery checker
- Power failure detector
- Switching of back-up power source

## ■ PIN CONFIGURATION



| Pin No. | Pin Name |
|---------|----------|
| 1       | OUT      |
| 2       | VDD      |
| 3       | VSS      |



| Pin No. | Pin Name |
|---------|----------|
| 1       | OUT      |
| 2       | VSS      |
| 3       | VDD      |

## VOLTAGE DETECTOR ELM97xxxxA

### ■ SELECTION GUIDE

| Symbol |                   |                                                                                                    |
|--------|-------------------|----------------------------------------------------------------------------------------------------|
| a, b   | Detection Voltage | Ex 09 : VDET <sub>N</sub> = 0.9V<br>27 : VDET <sub>N</sub> = 2.7V<br>45 : VDET <sub>N</sub> = 4.5V |
| c      | Output Form       | C : CMOS Output<br>N : N-ch Opendrain Output                                                       |
| d      | Package           | A : SOT-89<br>B : SOT-23                                                                           |
| e      | Product Version   | A : A Version                                                                                      |

ELM97 x x x x A  
 ↑ ↑ ↑ ↑ ↑  
 a b c d e

### ■ SERIES

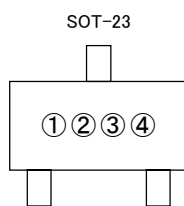
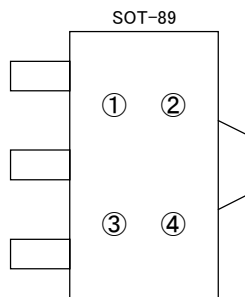
| Model           | Detection Voltage | Output Form | Package | Model           | Detection Voltage | Output Form | Package |
|-----------------|-------------------|-------------|---------|-----------------|-------------------|-------------|---------|
| ELM9709NBA-S(N) | 0.9V              | N-ch        | SOT-23  | ELM9727CAA-S(N) | 2.7V              | CMOS        | SOT-89  |
| ELM9710NBA-S(N) | 1.0V              | N-ch        | SOT-23  | ELM9730CAA-S(N) | 3.0V              | CMOS        | SOT-89  |
| ELM9711NBA-S(N) | 1.1V              | N-ch        | SOT-23  | ELM9732CAA-S(N) | 3.2V              | CMOS        | SOT-89  |
| ELM9722CAA-S(N) | 2.2V              | CMOS        | SOT-89  | ELM9734CAA-S(N) | 3.4V              | CMOS        | SOT-89  |
| ELM9724CAA-S(N) | 2.4V              | CMOS        | SOT-89  | ELM9745CAA-S(N) | 4.5V              | CMOS        | SOT-89  |
| ELM9725CAA-S(N) | 2.5V              | CMOS        | SOT-89  | ELM9748CAA-S(N) | 4.8V              | CMOS        | SOT-89  |

S type : Standard, N type : Reverse

\* Available 0.9V~5.0V detection voltage for N-ch output and 2.0V~5.0V detection voltage for CMOS output at 0.1V step as semi-custom-made IC.

# VOLTAGE DETECTOR ELM97xxxxA

## MARKING



### Rule 1

①: Represents the integer digit of the detection voltage

| Symbol | Detection Voltage | Symbol | Detection Voltage |
|--------|-------------------|--------|-------------------|
| A      | 0.*V (N-ch)       | P      | 2.*V (CMOS)       |
| B      | 1.*V (N-ch)       | R      | 3.*V (CMOS)       |
| C      | 2.*V (N-ch)       | S      | 4.*V (CMOS)       |
| D      | 3.*V (N-ch)       | T      | 5.*V (CMOS)       |
| E      | 4.*V (N-ch)       |        |                   |
| F      | 5.*V (N-ch)       |        |                   |

②: Represents the decimal digit of the detection voltage

| Symbol | Detection Voltage | Symbol | Detection Voltage |
|--------|-------------------|--------|-------------------|
| 0      | *.0V              | 5      | *.5V              |
| 1      | *.1V              | 6      | *.6V              |
| 2      | *.2V              | 7      | *.7V              |
| 3      | *.3V              | 8      | *.8V              |
| 4      | *.4V              | 9      | *.9V              |

③: Represents the assembly lot number

A ~ Z repeated (I,O,X excepted)

④: Represents the assembly lot number

0 ~ 9 repeated

### Rule 2

①: Represents the ELM97xxxxA series

ELM97xxxxA series = A

②: Represents the integer digit of the detection voltage

| Symbol | Detection Voltage | Symbol | Detection Voltage |
|--------|-------------------|--------|-------------------|
| 0      | 0.*V (N-ch)       | Y      | 2.*V (CMOS)       |
| 1      | 1.*V (N-ch)       | W      | 3.*V (CMOS)       |
| 2      | 2.*V (N-ch)       | U      | 4.*V (CMOS)       |
| 3      | 3.*V (N-ch)       | V      | 5.*V (CMOS)       |
| 4      | 4.*V (N-ch)       |        |                   |
| 5      | 5.*V (N-ch)       |        |                   |

③: Represents the decimal digit of the detection voltage

| Symbol | Detection Voltage | Symbol | Detection Voltage |
|--------|-------------------|--------|-------------------|
| 0      | *.0V              | 5      | *.5V              |
| 1      | *.1V              | 6      | *.6V              |
| 2      | *.2V              | 7      | *.7V              |
| 3      | *.3V              | 8      | *.8V              |
| 4      | *.4V              | 9      | *.9V              |

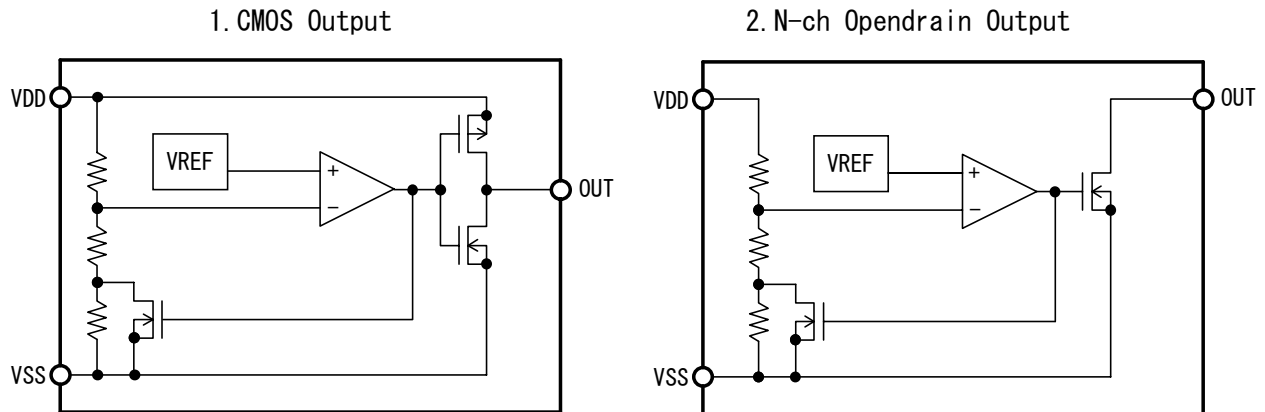
④: Represents the assembly lot number

0 ~ 9, A ~ Z repeated (I,O,X excepted)

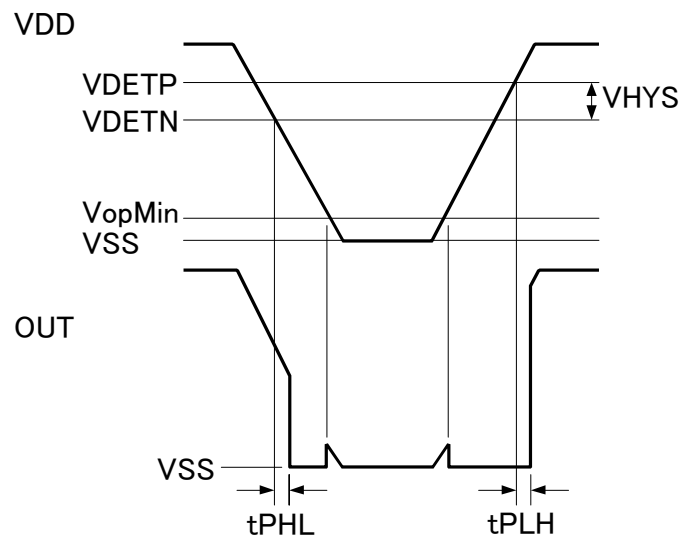
\*Remarks --- ELM97xxxxA series have two kind of mraking rules each package.

# VOLTAGE DETECTOR ELM97xxxxA

## ■ BLOCK DIAGRAM



## ■ TIMING CHART



## ■ MAXIMUM ABSOLUTE RATINGS

| (VSS=0V)              |        |          |                 |
|-----------------------|--------|----------|-----------------|
| Parameter             | Symbol | Limits   | Units           |
| Power Supply Voltage  | VDD    | 10       | V               |
| Output Voltage        | VOUT   | CMOS     | VSS-0.3~VDD+0.3 |
|                       |        | N-ch     | VSS-0.3~+10     |
| Output Current        | IOUT   | 50       | mA              |
| Power Dissipation     | Pd     | SOT-89   | 300             |
|                       |        | SOT-23   | 200             |
| Operating Temperature | Top    | -30~+80  | °C              |
| Storage Temperature   | Tstg   | -40~+125 |                 |

# VOLTAGE DETECTOR ELM97xxxxA

## ELECTRICAL CHARACTERISTICS

### ELM9709NBA

(Top=25°C)

| Parameter                                        | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|--------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                                | VDET <sub>N</sub>                     |                            | 0.878                       | 0.900 | 0.922                       | V     | 2       |
| Hysteresis width                                 | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                              | ISS                                   | VDD=1.5V                   | –                           | 1.0   | 3.0                         | μA    | 1       |
| Operating Voltage                                | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                   | IOUT <sub>N</sub>                     | VDD=0.8V, VDS=0.5V         | 0.02                        | 0.1   | –                           | mA    | 3       |
| Delay Time                                       | tPHL                                  |                            |                             | 2.0   |                             | mS    | 5       |
| Temperature Characteristics of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =-30~+80°C | –                           | -0.27 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

### ELM9710NBA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 0.975                       | 1.000 | 1.025                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=1.5V                   | –                           | 1.0   | 3.0                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=0.8V, VDS=0.5V         | 0.02                        | 0.1   | –                           | mA    | 3       |
| Delay Time                                      | tPHL                                  |                            |                             | 2.0   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =-30~+80°C | –                           | -0.30 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

### ELM9711NBA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 1.073                       | 1.100 | 1.127                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=1.5V                   | –                           | 1.0   | 3.0                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=0.8V, VDS=0.5V         | 0.02                        | 0.1   | –                           | mA    | 3       |
| Delay Time                                      | tPHL                                  |                            |                             | 2.0   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =-30~+80°C | –                           | -0.33 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

# VOLTAGE DETECTOR ELM97xxxxA

## ELM9722CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 2.145                       | 2.200 | 2.255                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=3.0V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.22 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

## ELM9724CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 2.340                       | 2.400 | 2.460                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=3.0V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.24 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

## ELM9725CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 2.438                       | 2.500 | 2.562                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=3.0V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.25 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

## VOLTAGE DETECTOR ELM97xxxxA

### ELM9727CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 2.633                       | 2.700 | 2.767                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=4.5V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.27 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

### ELM9730CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 2.925                       | 3.000 | 3.075                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=4.5V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.30 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

### ELM9732CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 3.120                       | 3.200 | 3.280                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=4.5V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.32 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

## VOLTAGE DETECTOR ELM97xxxxA

### ELM9734CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 3.315                       | 3.400 | 3.485                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=4.5V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=4.5V, VDS=2.1V         | 0.5                         | 1.5   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.34 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

### ELM9745CAA

(Top=25°C)

| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 4.388                       | 4.500 | 4.612                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=6.0V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=6.0V, VDS=2.1V         | 0.5                         | 2.0   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.45 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

### ELM9748CAA

(Top=25°C)

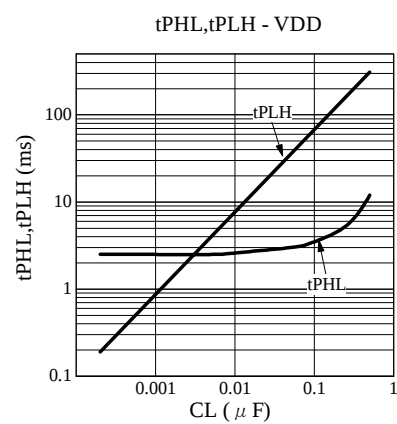
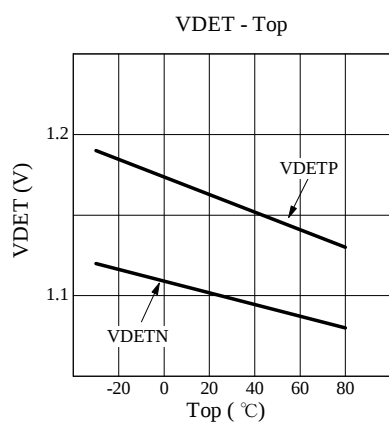
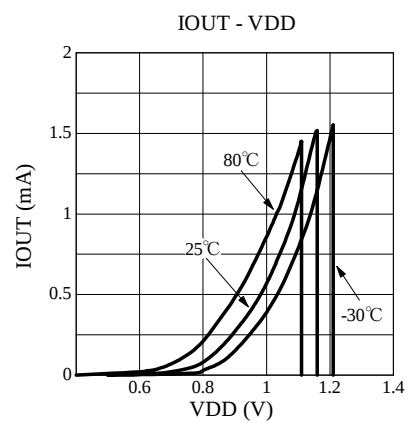
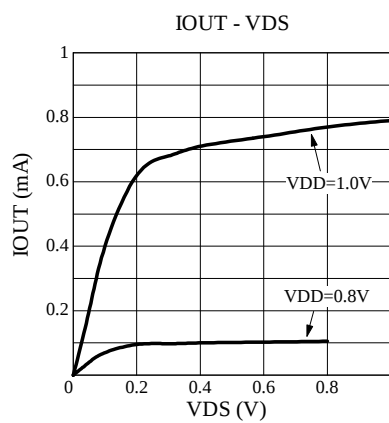
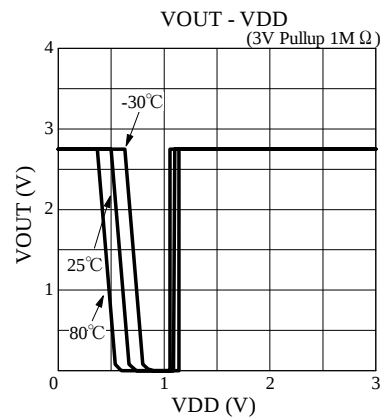
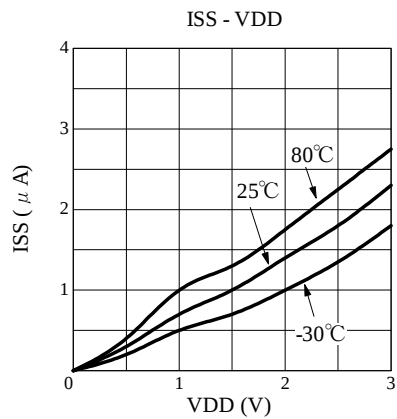
| Parameter                                       | Symbol                                | Conditions                 | Min.                        | Typ.  | Max.                        | Units | Remarks |
|-------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|-------|-----------------------------|-------|---------|
| Detection Voltage                               | VDET <sub>N</sub>                     |                            | 4.680                       | 4.800 | 4.920                       | V     | 2       |
| Hysteresis width                                | VHYS                                  |                            | VDET <sub>N</sub><br>× 0.02 | –     | VDET <sub>N</sub><br>× 0.08 | V     | 2       |
| Current Consumption                             | ISS                                   | VDD=6.0V                   | –                           | 1.5   | 4.5                         | μA    | 1       |
| Operating Voltage                               | VDD                                   |                            | 0.8                         | –     | 6.0                         | V     | 2       |
| Output Current                                  | IOUT <sub>N</sub>                     | VDD=1.5V, VDS=0.5V         | 1.0                         | 2.0   | –                           | mA    | 3       |
|                                                 | IOUT <sub>P</sub>                     | VDD=6.0V, VDS=2.1V         | 0.5                         | 2.0   | –                           | mA    | 4       |
| Delay Time                                      | tPHL                                  |                            |                             | 0.1   |                             | mS    | 5       |
| Temperature Characteristic of VDET <sub>N</sub> | $\frac{\Delta VDET_N}{\Delta T_{op}}$ | T <sub>op</sub> =–30~+80°C | –                           | –0.48 | –                           | mV/°C | –       |

Remarks ) Test circuit No.

# VOLTAGE DETECTOR ELM97xxxxA

## TYPICAL CHARACTERISTICS

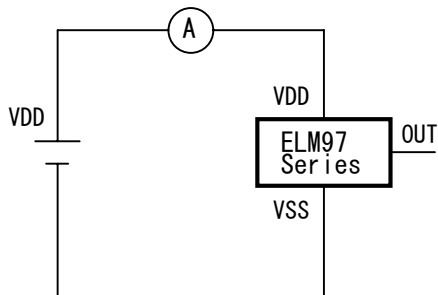
### ● ELM9711NxA



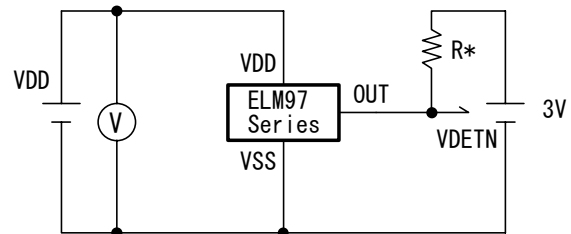
# VOLTAGE DETECTOR ELM97xxxxA

## ■ TEST CIRCUITS

### 1. Current Consumption

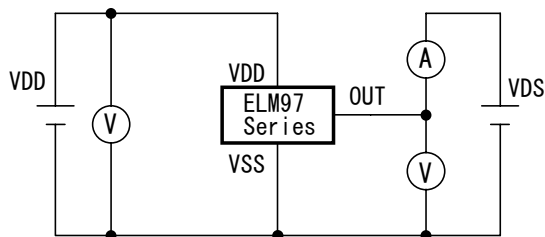


### 2. Detection Voltage

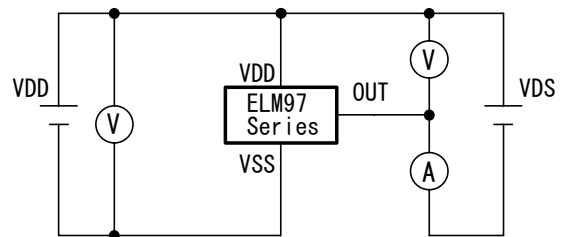


\*  $R=1M\ \Omega$

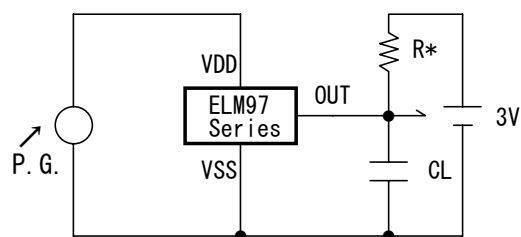
### 3. Output Current (N-ch)



### 4. Output Current (P-ch)



### 5. Delay Time



\*  $R=1M\ \Omega$

R is unnecessary for CMOS output products.

### Input Pulse

