



## 82NXX

CMOS IC

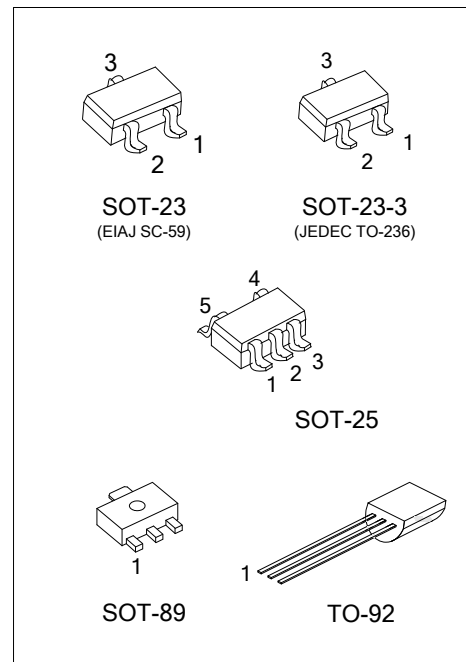
### VOLTAGE DETECTORS

#### DESCRIPTION

The UTC **82NXX** series are highly precise, low power consumption voltage detectors. Detect voltage is extremely accurate with minimal temperature drift. N-channel open drain output configurations are available.

#### FEATURES

- \* High-accuracy detection voltage :  $\pm 2\%$
- \* Detect voltage range : 1.0 to 6.0V in 0.1V increments
- \* Detect voltage temperature characteristics: TYP.  $\pm 100\text{ppm}/^\circ\text{C}$ .
- \* Wide operating voltage range : 0.7V to 10.0V
- \* Low current consumption : TYP 0.7 $\mu\text{A}$ (at  $V_{\text{IN}}=1.5\text{V}$ )



#### ORDERING INFORMATION

| Ordering Number |                | Package  | Pin Assignment |   |   |   |   | Packing   |
|-----------------|----------------|----------|----------------|---|---|---|---|-----------|
| Lead Free       | Halogen Free   |          | 1              | 2 | 3 | 4 | 5 |           |
| -               | 82NXXG-AB3-E-R | SOT-89   | O              | I | G | - | - | Tape Reel |
| -               | 82NXXG-AE2-5-R | SOT-23-3 | G              | O | I | - | - | Tape Reel |
| -               | 82NXXG-AE3-5-R | SOT-23   | G              | O | I | - | - | Tape Reel |
| -               | 82NXXG-AF5-B-R | SOT-25   | O              | I | G | N | N | Tape Reel |
| 82NXXL-T92-D-B  | 82NXXG-T92-D-B | TO-92    | I              | G | O | - | - | Tape Box  |
| 82NXXL-T92-D-K  | 82NXXG-T92-D-K | TO-92    | I              | G | O | - | - | Bulk      |
| 82NXXL-T92-D-R  | 82NXXG-T92-D-R | TO-92    | I              | G | O | - | - | Bulk      |
| 82NXXL-T92-E-B  | 82NXXG-T92-E-B | TO-92    | O              | I | G | - | - | Tape Box  |
| 82NXXL-T92-E-K  | 82NXXG-T92-E-K | TO-92    | O              | I | G | - | - | Bulk      |

Note: 1. Pin assignment: I:  $V_{\text{IN}}$  O:  $V_{\text{OUT}}$  G:  $V_{\text{SS}}$   
 2.xx: Output Voltage, refer to Marking Information

|                       |  |
|-----------------------|--|
| <p>82NXXG-AB3-5-R</p> | <p>(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube<br/>         (2) refer to Pin Assignment<br/>         (3) AB3: SOT-89, AE2: SOT-23-3, AE3: SOT-23, AF5: SOT-25, T92: TO-92<br/>         (4) G: Halogen Free and Lead Free, L: Lead Free<br/>         (5) XX: refer to Marking Information</p> |
|-----------------------|--|

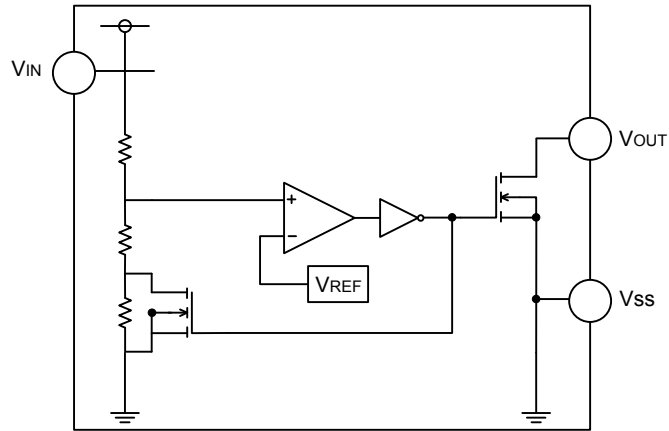
## MARKING INFORMATION

| PACKAGE | VOLTAGE CODE       |         | MARKING |         |  |
|---------|--------------------|---------|---------|---------|--|
| SOT-89  | 10:1.0V            | 35:3.5V |         |         |  |
|         | 11:1.1V            | 36:3.6V |         |         |  |
|         | 12:1.2V            | 37:3.7V |         |         |  |
|         | 13:1.3V            | 38:3.8V |         |         |  |
|         | 14:1.4V            | 39:3.9V |         |         |  |
| TO-92   | 15:1.5V            | 40:4.0V |         |         |  |
|         | 16:1.6V            | 41:4.1V |         |         |  |
|         | 17:1.7V            | 42:4.2V |         |         |  |
|         | 18:1.8V            | 43:4.3V |         |         |  |
|         | 19:1.9V            | 44:4.4V |         |         |  |
|         | 20:2.0V            | 45:4.5V |         |         |  |
|         | 21:2.1V            | 46:4.6V |         |         |  |
|         | 22:2.2V            | 47:4.7V |         |         |  |
|         | SOT-23<br>SOT-23-3 | 23:2.3V |         | 48:4.8V |  |
|         |                    | 24:2.4V |         | 49:4.9V |  |
| 25:2.5V |                    | 50:5.0V |         |         |  |
| 26:2.6V |                    | 51:5.1V |         |         |  |
| 27:2.7V |                    | 52:5.2V |         |         |  |
| SOT-25  | 28:2.8V            | 53:5.3V |         |         |  |
|         | 29:2.9V            | 54:5.4V |         |         |  |
|         | 30:3.0V            | 55:5.5V |         |         |  |
|         | 31:3.1V            | 56:5.6V |         |         |  |
|         | 32:3.2V            | 57:5.7V |         |         |  |
|         | 33:3.3V            | 58:5.8V |         |         |  |
|         | 34:3.4V            | 59:5.9V |         |         |  |
|         |                    | 60:6.0V |         |         |  |

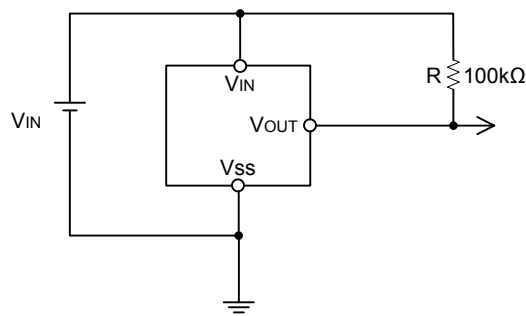
■ MARKING CODE FOR SOT-23/SOT-25

| PART NUMBER | DETECT VOLATGE |      | MARKING CODE | PART NUMBER | DETECT VOLATGE |      | MARKING CODE |
|-------------|----------------|------|--------------|-------------|----------------|------|--------------|
|             | VOLTAGE        | CODE |              |             | VOLTAGE        | CODE |              |
| 82N10       | 1.0V           | 10   | N10          | 82N36       | 3.6V           | 36   | N36          |
| 82N11       | 1.1V           | 11   | N11          | 82N37       | 3.7V           | 37   | N37          |
| 82N12       | 1.2V           | 12   | N12          | 82N38       | 3.8V           | 38   | N38          |
| 82N13       | 1.3V           | 13   | N13          | 82N39       | 3.9V           | 39   | N39          |
| 82N14       | 1.4V           | 14   | N14          | 82N40       | 4.0V           | 40   | N40          |
| 82N15       | 1.5V           | 15   | N15          | 82N41       | 4.1V           | 41   | N41          |
| 82N16       | 1.6V           | 16   | N16          | 82N42       | 4.2V           | 42   | N42          |
| 82N17       | 1.7V           | 17   | N17          | 82N43       | 4.3V           | 43   | N43          |
| 82N18       | 1.8V           | 18   | N18          | 82N44       | 4.4V           | 44   | N44          |
| 82N19       | 1.9V           | 19   | N19          | 82N45       | 4.5V           | 45   | N45          |
| 82N20       | 2.0V           | 20   | N20          | 82N46       | 4.6V           | 46   | N46          |
| 82N21       | 2.1V           | 21   | N21          | 82N47       | 4.7V           | 47   | N47          |
| 82N22       | 2.2V           | 22   | N22          | 82N48       | 4.8V           | 48   | N48          |
| 82N23       | 2.3V           | 23   | N23          | 82N49       | 4.9V           | 49   | N49          |
| 82N24       | 2.4V           | 24   | N24          | 82N50       | 5.0V           | 50   | N50          |
| 82N25       | 2.5V           | 25   | N25          | 82N51       | 5.1V           | 51   | N51          |
| 82N26       | 2.6V           | 26   | N26          | 82N52       | 5.2V           | 52   | N52          |
| 82N27       | 2.7V           | 27   | N27          | 82N53       | 5.3V           | 53   | N53          |
| 82N28       | 2.8V           | 28   | N28          | 82N54       | 5.4V           | 54   | N54          |
| 82N29       | 2.9V           | 29   | N29          | 82N55       | 5.5V           | 55   | N55          |
| 82N30       | 3.0V           | 30   | N30          | 82N56       | 5.6V           | 56   | N56          |
| 82N31       | 3.1V           | 31   | N31          | 82N57       | 5.7V           | 57   | N57          |
| 82N32       | 3.2V           | 32   | N32          | 82N58       | 5.8V           | 58   | N58          |
| 82N33       | 3.3V           | 33   | N33          | 82N59       | 5.9V           | 59   | N59          |
| 82N34       | 3.4V           | 34   | N34          | 82N60       | 6.0V           | 60   | N60          |

■ BLOCK DIAGRAM



■ TYPICAL APPLICATION CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C, unless otherwise specified)

| PARAMETER             |                 | SYMBOL           | RATINGS                   | UNIT |
|-----------------------|-----------------|------------------|---------------------------|------|
| Input Voltage         |                 | V <sub>IN</sub>  | 12                        | V    |
| Output Current        |                 | I <sub>OUT</sub> | 50                        | mA   |
| Output Voltage        |                 | V <sub>OUT</sub> | V <sub>SS</sub> -0.3 ~ 12 | V    |
| Power Dissipation     | SOT-23-3/SOT-23 | P <sub>D</sub>   | 150                       | mW   |
|                       | SOT-25          |                  | 500                       | mW   |
|                       | SOT-89          |                  | 300                       | mW   |
|                       | TO-92           |                  |                           |      |
| Operating Temperature |                 | T <sub>OPR</sub> | -40 ~ +105                | °C   |
| Storage Temperature   |                 | T <sub>STG</sub> | -40 ~ +150                | °C   |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified.)

**Detection voltage (1.0V ~ 1.5V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                               | MIN                   | TYP                        | MAX.                  | UNIT   |
|-----------------------------|--|---------|--|-----------------------|----------------------------|-----------------------|--------|
| Detect Voltage (Note1)      | V <sub>DF</sub>                                      | 1       |  | V <sub>DF</sub> ×0.98 | V <sub>DF</sub><br>(Note2) | V <sub>DF</sub> ×1.02 | V      |
| Hysteresis Range            | V <sub>HYS</sub>                                     | 1       |  | V <sub>DF</sub> ×0.02 | V <sub>DF</sub> ×0.05      | V <sub>DF</sub> ×0.08 | V      |
| Supply Current              | I <sub>SS</sub>                                      | 2       | V <sub>IN</sub> = 1.5V                       |                       | 0.7                        | 2.3                   | μA     |
|                             |  |         | V <sub>IN</sub> = 5V                         |                       | 1.1                        | 3.6                   | μA     |
| Operating Voltage           | V <sub>IN</sub>                                      | 1       |  | 0.7                   |                            | 6.0                   | V      |
| Output Current              | I <sub>OUT</sub>                                     | 3       | V <sub>DS</sub> =0.5V, V <sub>IN</sub> =1.0V | 0.85                  | 2.7                        |                       | mA     |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | T <sub>OPR</sub> = -40 ~ 105°C               |                       | ± 100                      |                       | ppm/°C |
| Transient Delay Time        | t <sub>DLY</sub>                                     | 4       |  |                       |                            | 0.2                   | ms     |

**Detection voltage (1.6V ~ 1.9V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                               | MIN                   | TYP                        | MAX.                  | UNIT   |
|-----------------------------|--|---------|--|-----------------------|----------------------------|-----------------------|--------|
| Detect Voltage(Note1)       | V <sub>DF</sub>                                      | 1       |  | V <sub>DF</sub> ×0.98 | V <sub>DF</sub><br>(Note2) | V <sub>DF</sub> ×1.02 | V      |
| Hysteresis Range            | V <sub>HYS</sub>                                     | 1       |  | V <sub>DF</sub> ×0.02 | V <sub>DF</sub> ×0.05      | V <sub>DF</sub> ×0.08 | V      |
| Supply Current              | I <sub>SS</sub>                                      | 2       | V <sub>IN</sub> = 1.5V                       |                       | 0.7                        | 2.3                   | μA     |
|                             |  |         | V <sub>IN</sub> = 5V                         |                       | 1.1                        | 3.6                   | μA     |
| Operating Voltage           | V <sub>IN</sub>                                      | 1       |  | 0.7                   |                            | 10                    | V      |
| Output Current              | I <sub>OUT</sub>                                     | 3       | V <sub>DS</sub> =0.5V, V <sub>IN</sub> =1.0V | 1.0                   | 2.2                        |                       | mA     |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | T <sub>OPR</sub> = -40 ~ 105°C               |                       | ± 100                      |                       | ppm/°C |
| Transient Delay Time        | t <sub>DLY</sub>                                     | 4       |  |                       |                            | 0.2                   | ms     |

**Detection voltage (2.0V ~ 2.4V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                               | MIN                   | TYP                        | MAX.                  | UNIT   |
|-----------------------------|--|---------|--|-----------------------|----------------------------|-----------------------|--------|
| Detect Voltage(Note1)       | V <sub>DF</sub>                                      | 1       |  | V <sub>DF</sub> ×0.98 | V <sub>DF</sub><br>(Note2) | V <sub>DF</sub> ×1.02 | V      |
| Hysteresis Range            | V <sub>HYS</sub>                                     | 1       |  | V <sub>DF</sub> ×0.02 | V <sub>DF</sub> ×0.05      | V <sub>DF</sub> ×0.08 | V      |
| Supply Current              | I <sub>SS</sub>                                      | 2       | V <sub>IN</sub> = 2.0V                       |                       | 0.8                        | 2.7                   | μA     |
|                             |  |         | V <sub>IN</sub> = 5.0V                       |                       | 1.1                        | 3.6                   | μA     |
| Operating Voltage           | V <sub>IN</sub>                                      | 1       |  | 0.7                   |                            | 10                    | V      |
| Output Current              | I <sub>OUT</sub>                                     | 3       | V <sub>DS</sub> =0.5V, V <sub>IN</sub> =2.0V | 3.0                   | 7.7                        |                       | mA     |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | T <sub>OPR</sub> = -40 ~ 105°C               |                       | ± 100                      |                       | ppm/°C |
| Transient Delay Time        | t <sub>DLY</sub>                                     | 4       |  |                       |                            | 0.2                   | ms     |

■ ELECTRICAL CHARACTERISTICS(Cont.)

**Detection voltage (2.5V ~ 2.9V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 2.0V$                   |                      | 0.8                  | 2.7                  | $\mu A$          |
|                             |  |         | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 2.0V$    | 3.0                  | 7.7                  |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

**Detection voltage (3.0V ~ 3.4V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 3.0V$                   |                      | 0.9                  | 3.0                  | $\mu A$          |
|                             |  |         | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 3.0V$    | 5.0                  | 10.1                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

**Detection voltage (3.5V ~ 3.9V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 3.0V$                   |                      | 0.9                  | 3.0                  | $\mu A$          |
|                             |  |         | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 3.0V$    | 5.0                  | 10.1                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

**Detection voltage (4.0V ~ 4.5V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 4.0V$                   |                      | 1.0                  | 3.2                  | $\mu A$          |
|                             |  |         | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 4.0V$    | 6.0                  | 11.5                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

■ ELECTRICAL CHARACTERISTICS (Cont.)

**Detection voltage (4.6V ~ 4.9V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 4.0V$                   |                      | 1.0                  | 3.2                  | $\mu A$          |
|                             |  |         | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 4.0V$    | 6.0                  | 11.5                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

**Detection voltage (5.0V ~ 5.5V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
|                             |  |         | $V_{IN} = 6.0V$                   |                      | 1.2                  | 3.8                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 5.0V$    | 7.0                  | 13.0                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

**Detection voltage (5.5V ~ 5.9V)**

| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 5.0V$                   |                      | 1.1                  | 3.6                  | $\mu A$          |
|                             |  |         | $V_{IN} = 6.0V$                   |                      | 1.2                  | 3.8                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 5.0V$    | 7.0                  | 13.0                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

**Detection voltage (6.0V)**

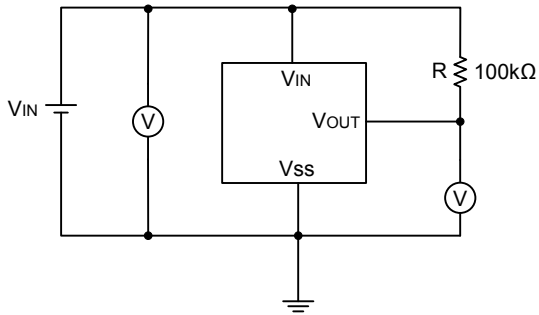
| PARAMETER                   | SYMBOL   | CIRCUIT | TEST CONDITONS                    | MIN                  | TYP                  | MAX.                 | UNIT             |
|-----------------------------|--|---------|-----------------------------------|----------------------|----------------------|----------------------|------------------|
| Detect Voltage(Note1)       | $V_{DF}$   | 1       |                                   | $V_{DF} \times 0.98$ | $V_{DF}$<br>(Note2)  | $V_{DF} \times 1.02$ | V                |
| Hysteresis Range            | $V_{HYS}$  | 1       |                                   | $V_{DF} \times 0.02$ | $V_{DF} \times 0.05$ | $V_{DF} \times 0.08$ | V                |
| Supply Current              | $I_{SS}$   | 2       | $V_{IN} = 6.0V$                   |                      | 1.2                  | 3.8                  | $\mu A$          |
|                             |  |         | $V_{IN} = 7.0V$                   |                      | 1.3                  | 4.0                  | $\mu A$          |
| Operating Voltage           | $V_{IN}$   | 1       |                                   | 0.7                  |                      | 10                   | V                |
| Output Current              | $I_{OUT}$  | 3       | $V_{DS} = 0.5V, V_{IN} = 6.0V$    | 8.0                  | 13.0                 |                      | mA               |
| Temperature Characteristics | $\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$ |         | $T_{OPR} = -40 \sim 105^{\circ}C$ |                      | $\pm 100$            |                      | ppm/ $^{\circ}C$ |
| Transient Delay Time        | $t_{DLY}$  | 4       |                                   |                      |                      | 0.2                  | ms               |

Notes: 1. Detect voltage of  $\pm 1\%$  tolerance is also available per customer's request.

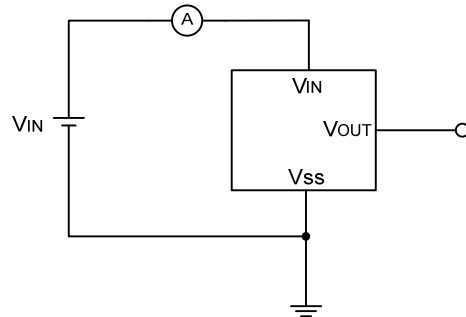
2.  $V_{DF(T)}$  : Established Detect Voltage Value

## ■ TEST CIRCUITS

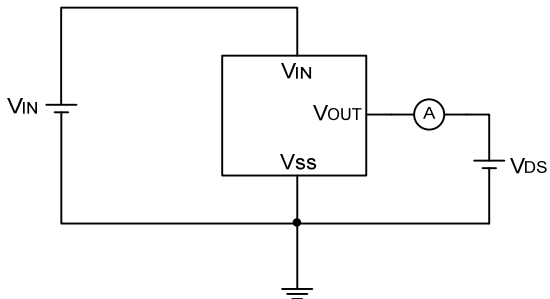
Circuit 1



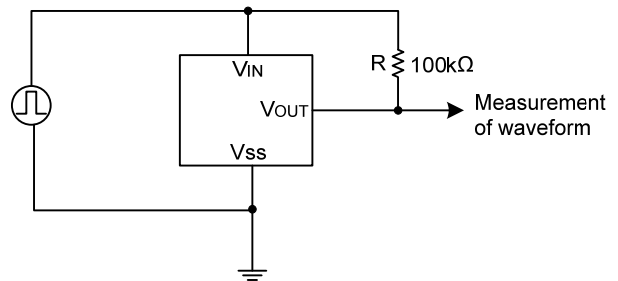
Circuit 2



Circuit 3

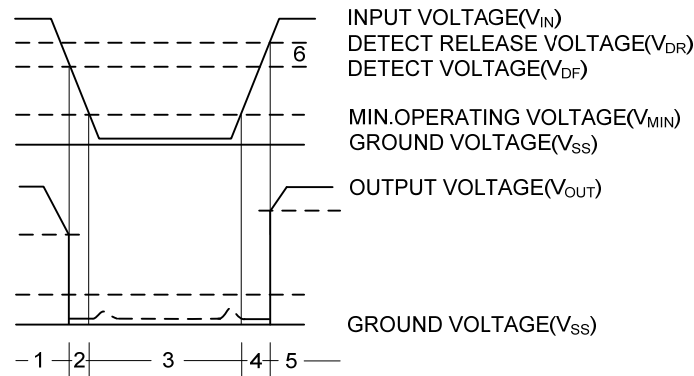


Circuit 4





■ TIMING CHART FUNCTIONAL DESCRIPTION

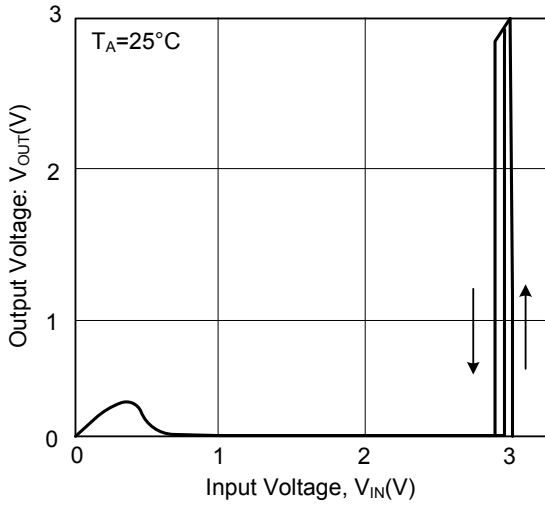


1. When input voltage ( $V_{IN}$ ) rises above detect voltage ( $V_{DF}$ ), output voltage ( $V_{OUT}$ ) will be equal to  $V_{IN}$ .
2. When input voltage ( $V_{IN}$ ) falls below detect voltage ( $V_{DF}$ ), output voltage ( $V_{OUT}$ ) will be equal to the ground voltage ( $V_{SS}$ ) level.
3. When input voltage ( $V_{IN}$ ) falls to a level below that of the minimum operating voltage ( $V_{MIN}$ ), output will become unstable. In this condition,  $V_{IN}$  will equal the pulled-up output (should output be pulled-up.)
4. When input voltage ( $V_{IN}$ ) rises above the ground voltage ( $V_{SS}$ ) level, output will be unstable at levels below the minimum operating voltage ( $V_{MIN}$ ). Between the  $V_{MIN}$  and detect release voltage ( $V_{DR}$ ) levels, the ground voltage ( $V_{SS}$ ) level will be maintained.
5. When input voltage ( $V_{IN}$ ) rises above detect release voltage ( $V_{DR}$ ), output voltage ( $V_{OUT}$ ) will be equal to  $V_{IN}$ .
6. The difference between  $V_{DR}$  and  $V_{DF}$  represents the hysteresis range.

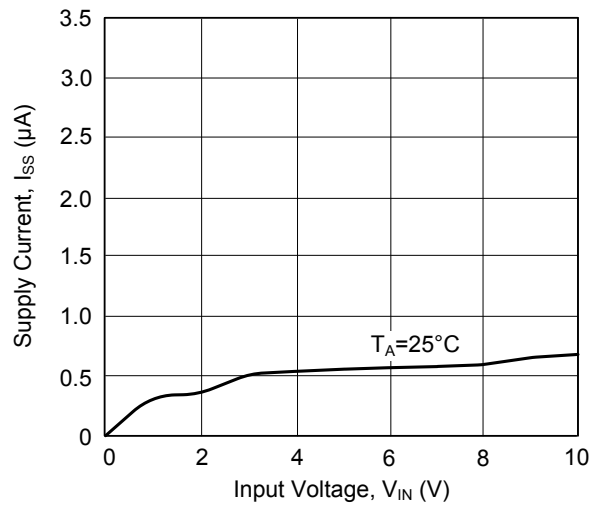
## ■ TYPICAL CHARACTERISTICS

### 82N29

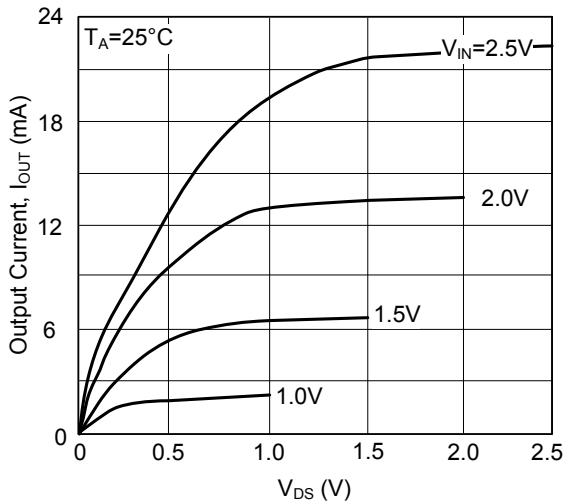
Output Voltage vs. Input Voltage



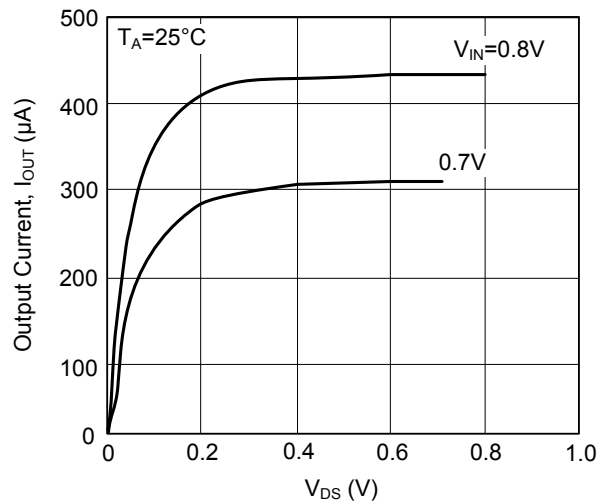
Supply Current vs. Input Voltage



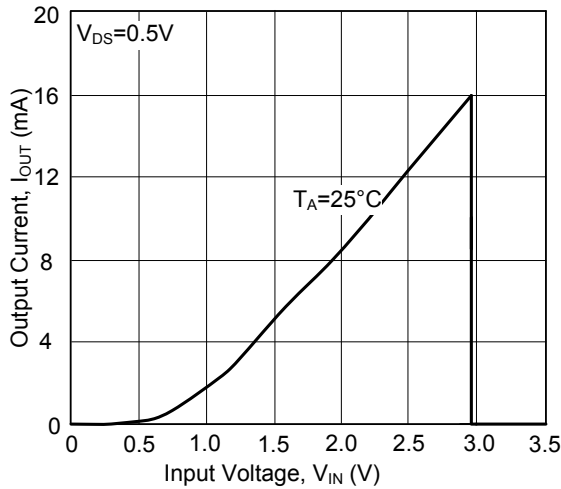
N-ch Driver Output vs.  $V_{DS}$



N-ch Driver Output vs.  $V_{DS}$

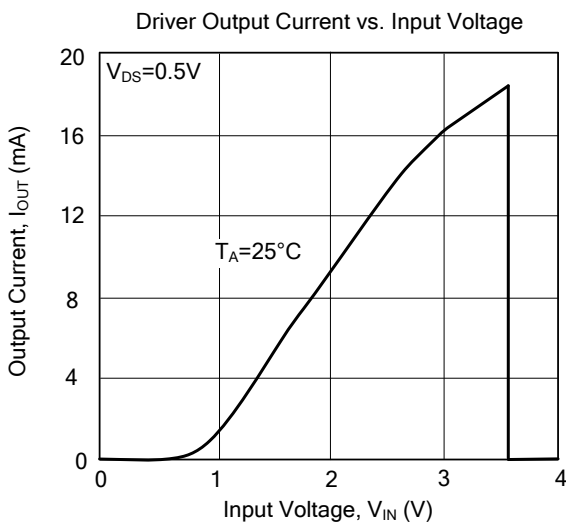
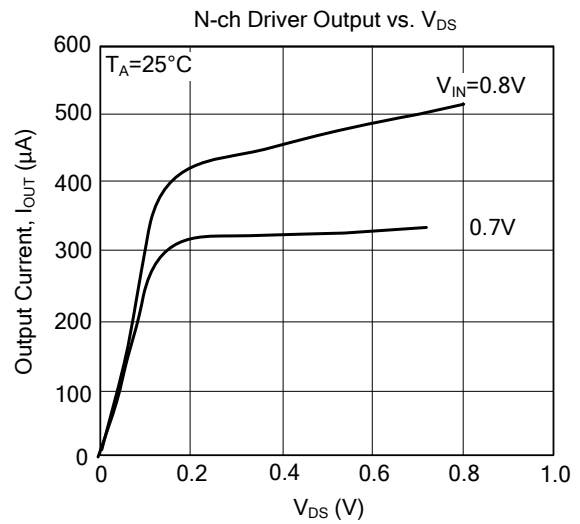
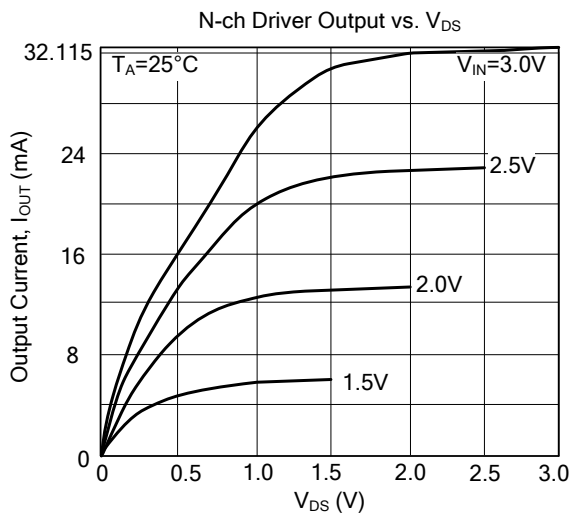
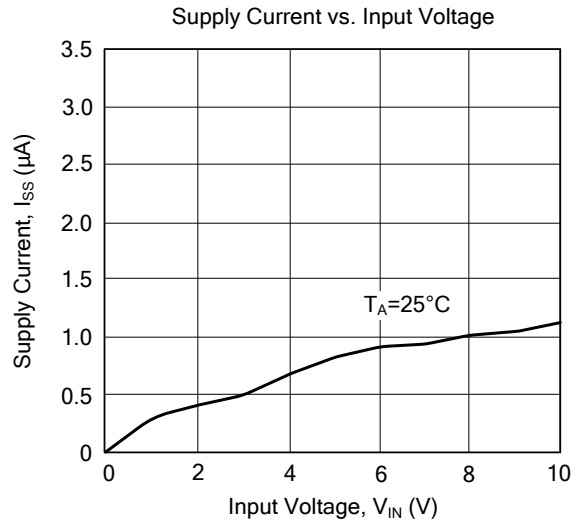
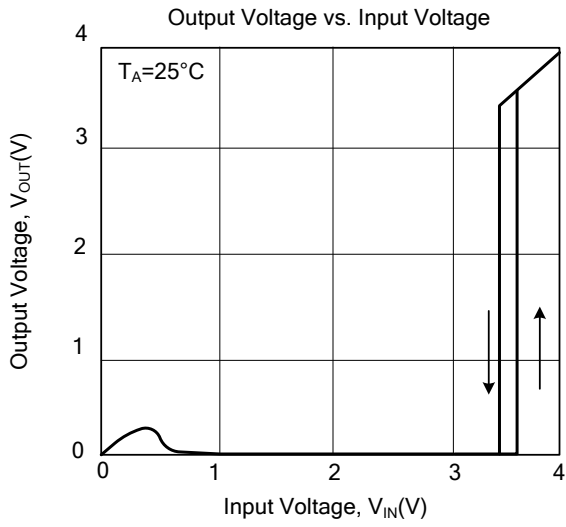


Driver Output Current vs. Input Voltage



■ TYPICAL CHARACTERISTICS

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