# XC61C Series

ETR0201_016

Low Voltage Detectors ($V_{DF}$= 0.8V～1.5V)
Standard Voltage Detectors ($V_{DF}$ 1.6V～6.0V)

## ■GENERAL DESCRIPTION

The XC61C series are highly precise, low power consumption voltage detectors, manufactured using CMOS and laser trimming technologies.
Detect voltage is extremely accurate with minimal temperature drift.
Both CMOS and N-ch open drain output configurations are available.

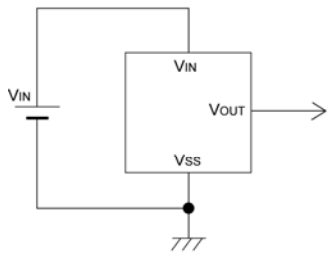
## ■APPLICATIONS

- ●Microprocessor reset circuitry
- ●Memory battery back-up circuits
- ●Power-on reset circuits
- ●Power failure detection
- ●System battery life and charge voltage monitors

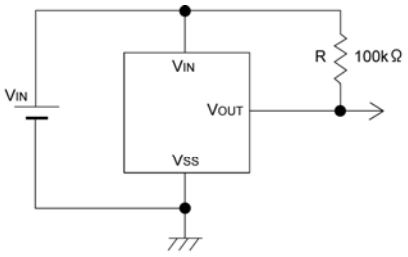
## ■FEATURES

**Highly Accurate** : ± 2%
: ± 1%(Standard Voltage VD: 2.6V~5.1V)
**Low Power Consumption** : 0.7 μA (TYP.) [VIN=1.5V]
**Detect Voltage Range** : 0.8V ~ 6.0V in 0.1V increments
**Operating Voltage Range** : 0.7V ~ 6.0V (Low Voltage)
0.7V～10.0V (Standard Voltage)
**Detect Voltage Temperature Characteristics**
: ±100ppm/℃ (TYP.)
**Output Configuration** : N-ch open drain or CMOS
**Packages** : SSOT-24
SOT-23
SOT-89
**Environmentally Friendly** : EU RoHS Compliant, Pb Free

## ■TYPICAL APPLICATION CIRCUITS

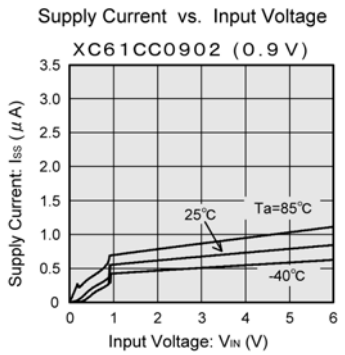


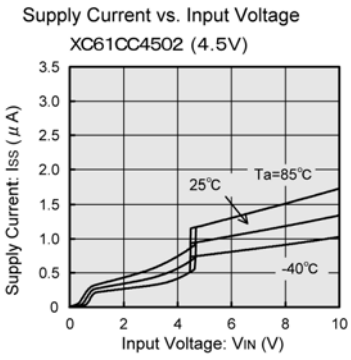

CMOS Output



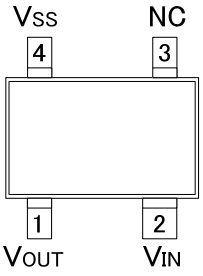

N-ch Open Drain Output

## ■TYPICAL PERFORMANCE CHARACTERISTICS

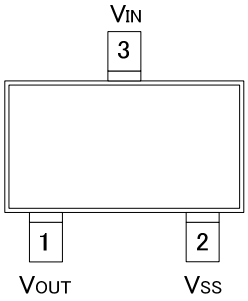


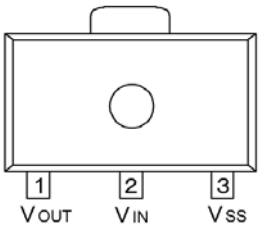
## ■PIN CONFIGURATION




SSOT-24(SC-82)
(TOP VIEW)




SOT-23
(TOP VIEW)




SOT-89
(TOP VIEW)

## ■PIN ASSIGNMENT

| PIN NUMBER | | | PIN NAME | FUNCTIONS |
|---|---|---|---|---|
| SSOT-24 | SOT-23 | SOT-89 | | |
| 2 | 3 | 2 | $V_{IN}$ | Supply Voltage Input |
| 4 | 2 | 3 | $V_{SS}$ | Ground |
| 1 | 1 | 1 | $V_{OUT}$ | Output |
| 3 | - | - | NC | No Connection |

## ■PRODUCT CLASSIFICATION

●Ordering Information

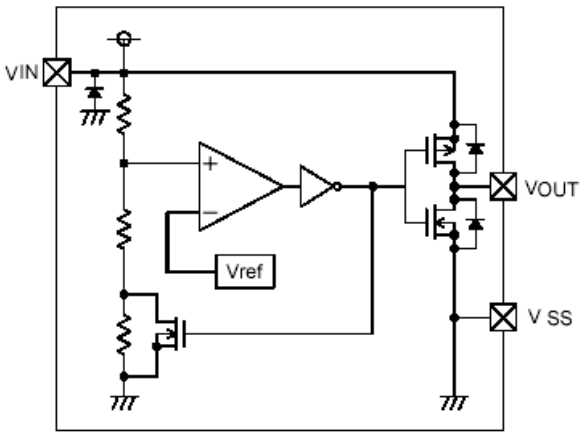
XC61C①②③④⑤⑥⑦-⑧ (*1)

| DESIGNATOR | ITEM | SYMBOL | DESCRIPTION |
|---|---|---|---|
| ① | Output Configuration | C | CMOS output |
| | | N | N-ch open drain output |
| ②③ | Detect Voltage | 08 ~ 60 | e.g.0.9V → ②0, ③9 |
| | | | e.g.1.5V → ②1, ③5 |
| ④ | Output Delay | 0 | No delay |
| ⑤ | Detect Accuracy | 1 | Within ±1% ($V_{DF(T)}$=2.6V~5.1V) |
| | | 2 | Within ±2% |
| ⑥⑦-⑧ (*1) | Packages (Order Unit) | NR | SSOT-24 (3,000pcs/Reel) |
| | | NR-G | SSOT-24 (3,000pcs/Reel) |
| | | MR | SOT-23 (3,000pcs/Reel) |
| | | MR-G | SOT-23 (3,000pcs/Reel) |
| | | PR | SOT-89 (1,000pcs/Reel) |
| | | PR-G | SOT-89 (1,000pcs/Reel) |

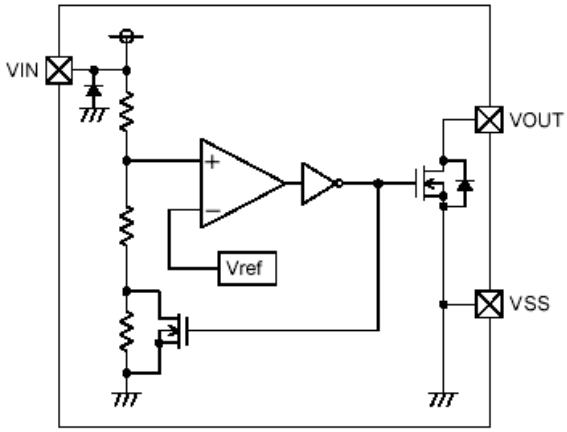
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

## ■BLOCK DIAGRAMS

(1) CMOS Output




(2) N-ch Open Drain Output




## ■ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

| PARAMETER | | SYMBOL | RATINGS | UNITS |
|---|---|---|---|---|
| Input Voltage | *1 | $V_{IN}$ | $V_{SS}$-0.3 ~ 9.0 | V |
| | *2 | | $V_{SS}$-0.3 ~ 12.0 | |
| Output Current | | $I_{OUT}$ | 50 | mA |
| Output Voltage | CMOS | $V_{OUT}$ | $V_{SS}$ -0.3 ~ $V_{IN}$ +0.3 | V |
| | N-ch Open Drain Output *1 | | $V_{SS}$ -0.3 ~ 9.0 | |
| | N-ch Open Drain Output *2 | | $V_{SS}$ -0.3 ~ 12.0 | |
| Power Dissipation | SSOT-24 | Pd | 150 | mW |
| | SOT-23 | | 150 | |
| | SOT-89 | | 500 | |
| Operating Ambient Temperature | | Topr | -40～+85 | ℃ |
| Storage Temperature | | Tstg | -55～+125 | ℃ |

*1: Low voltage: $V_{DF(T)}$=0.8V~1.5V
*2: Standard voltage: $V_{DF(T)}$=1.6V~6.0V

## ■ELECTRICAL CHARACTERISTICS

$V_{DF\ (T)}$ = 0.8V to 6.0V ± 2%

$V_{DF\ (T)}$ = 2.6V to 5.1V ± 1%

Ta=25℃

| PARAMETER | | SYMBOL | CONDITIONS | | MIN. | TYP. | MAX. | UNITS | CIRCUITS |
|---|---|---|---|---|---|---|---|---|---|
| Detect Voltage | | $V_{DF}$ | $V_{DF(T)}$=0.8V~1.5V *1<br>$V_{DF(T)}$=1.6V~6.0V *2 | | $V_{DF(T)}$ x 0.98 | $V_{DF(T)}$ | $V_{DF(T)}$ x 1.02 | V | 1 |
| | | | $V_{DF(T)}$=2.6V~5.1V *2 | | $V_{DF(T)}$ x 0.99 | $V_{DF(T)}$ | $V_{DF(T)}$ x 1.01 | V | 1 |
| Hysteresis Range | | $V_{HYS}$ | | | $V_{DF}$ x 0.02 | $V_{DF}$ x 0.05 | $V_{DF}$ x 0.08 | V | 1 |
| Supply Current | | $I_{SS}$ | $V_{IN}$ = 1.5V | | - | 0.7 | 2.3 | μA | 2 |
| | | | $V_{IN}$ = 2.0V | | - | 0.8 | 2.7 | | |
| | | | $V_{IN}$ = 3.0V | | - | 0.9 | 3.0 | | |
| | | | $V_{IN}$ = 4.0V | | - | 1.0 | 3.2 | | |
| | | | $V_{IN}$ = 5.0V | | - | 1.1 | 3.6 | | |
| Operating Voltage *1 | | $V_{IN}$ | $V_{DF(T)}$ = 0.8V to 1.5V | | 0.7 | - | 6.0 | V | 1 |
| Operating Voltage *2 | | | $V_{DF(T)}$ = 1.6V to 6.0V | | 0.7 | - | 10.0 | | |
| Output Current *1 | | $I_{OUT}$ | N-ch $V_{DS}$ = 0.5V | $V_{IN}$ = 0.7V | 0.10 | 0.80 | - | mA | 3 |
| | | | | $V_{IN}$ = 1.0V | 0.85 | 2.70 | - | | |
| | | | CMOS, P-ch $V_{DS}$ = 2.1V | $V_{IN}$ = 6.0V | - | -7.5 | -1.5 | | 4 |
| Output Current *2 | | | N-ch $V_{DS}$ = 0.5V | $V_{IN}$ = 1.0V | 1.0 | 2.2 | - | | 3 |
| | | | | $V_{IN}$ = 2.0V | 3.0 | 7.7 | - | | |
| | | | | $V_{IN}$ = 3.0V | 5.0 | 10.1 | - | | |
| | | | | $V_{IN}$ = 4.0V | 6.0 | 11.5 | - | | |
| | | | | $V_{IN}$ = 5.0V | 7.0 | 13.0 | - | | |
| | | | CMOS, P-ch $V_{DS}$ = 2.1V | $V_{IN}$ = 8.0V | - | -10.0 | -2.0 | | 4 |
| Leakage Current | CMOS Output (Pch) | $I_{LEAK}$ | $V_{IN}$=$V_{DF}$x0.9, $V_{OUT}$=0V | | - | -10 | - | nA | 3 |
| | N-ch Open Drain | | $V_{IN}$=6.0V, $V_{OUT}$=6.0V*1<br>$V_{IN}$=10.0V, $V_{OUT}$=10.0V*2 | | - | 10 | 100 | | |
| Temperature Characteristics | | $\Delta V_{DF}$/($\Delta$Topr·$V_{DF}$) | -40℃ ≦ Topr ≦ 85℃ | | - | ±100 | - | ppm/℃ | 1 |
| Delay Time ($V_{DR}$→$V_{OUT}$ inversion) | | $t_{DLY}$ | Inverts from $V_{DR}$ to $V_{OUT}$ | | - | 0.03 | 0.20 | ms | 5 |

NOTE:
*1: Low Voltage: $V_{DF(T)}$=0.8V~1.5V
*2: Standard Voltage: $V_{DF(T)}$=1.6V~6.0V
$V_{DF\ (T)}$: Nominal detect voltage
Release Voltage: $V_{DR}$ = $V_{DF}$ + $V_{HYS}$

# ■OPERATIONAL EXPLANATION

(Especially prepared for CMOS output products)

① When input voltage ($V_{IN}$) is higher than detect voltage ($V_{DF)}$, $_o$utput voltage ($V_{OUT}$) will be equal to VIN.
(A condition of high impedance exists with N-ch open drain output configurations.)

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.

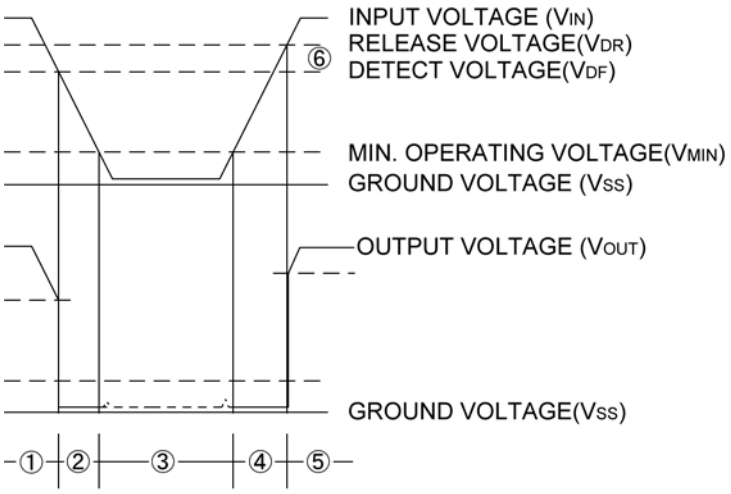
③ When input voltage ($V_{IN}$) falls to a level below that of the minimum operating voltage ($V_{MIN}$), output will become unstable. (As for the N-ch open drain product of XC61CN, the pull-up voltage goes out at the output voltage.)

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 $V_{IN}$.
(A condition of high impedance exists with N-ch open drain output configurations.)

⑥ The difference between $V_{DR}$ and $V_{DF}$ represents the hysteresis range.

●Timing Chart



## ■NOTES ON USE

1. Please use this IC within the stated absolute maximum ratings. For temporary, transitional voltage drop or voltage rising phenomenon, the IC is liable to malfunction should the ratings be exceeded.
2. When a resistor is connected between the $V_{IN}$ pin and the power supply with CMOS output configurations, oscillation may occur as a result of voltage drops at $R_{IN}$ if load current ($I_{OUT}$) exists. (refer to the Oscillation Description (1) below)
3. When a resistor is connected between the $V_{IN}$ pin and the power supply with CMOS output configurations, irrespective of N-ch open-drain output configurations, oscillation may occur as a result of through current at the time of voltage release even if load current ($I_{OUT}$) does not exist. (refer to the Oscillation Description (2) below )
4. Please use N-ch open drain output configuration, when a resistor $R_{IN}$ is connected between the $V_{IN}$ pin and power source. In such cases, please ensure that $R_{IN}$ is less than 10kΩ and that C is more than 0.1μF, please test with the actual device. (refer to the Oscillation Description (1) below)
5. With a resistor $R_{IN}$ connected between the $V_{IN}$ pin and the power supply, the $V_{IN}$ pin voltage will be getting lower than the power supply voltage as a result of the IC's supply current flowing through the $V_{IN}$ pin.
6. In order to stabilize the IC's operations, please ensure that $V_{IN}$ pin input frequency's rise and fall times are more than 2 μ s/ V.
7. Torex places an importance on improving our products and its reliability.
   However, by any possibility, we would request user fail-safe design and post-aging treatment on system or equipment.

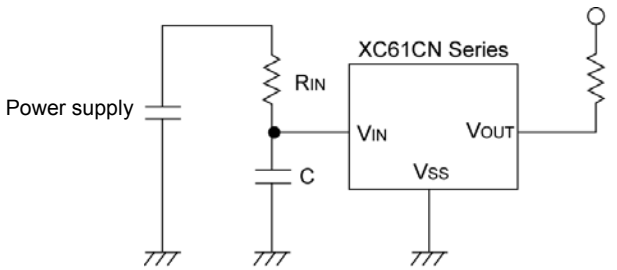


Figure 1: Circuit using an input resistor

### ●Oscillation Description

(1) Load current oscillation with the CMOS output configuration

When the voltage applied at power supply, release operations commence and the detector's output voltage increases. Load current ($I_{OUT}$) will flow at $R_L$. Because a voltage drop ($R_{IN}$ x $I_{OUT}$) is produced at the $R_{IN}$ resistor, located between the power supply and the $V_{IN}$ pin, the load current will flow via the IC's $V_{IN}$ pin. The voltage drop will also lead to a fall in the voltage level at the $V_{IN}$ pin. When the $V_{IN}$ pin voltage level falls below the detect voltage level, detect operations will commence. Following detect operations, load current flow will cease and since voltage drop at $R_{IN}$ will disappear, the voltage level at the $V_{IN}$ pin will rise and release operations will begin over again.

Oscillation may occur with this " release - detect - release " repetition.

Further, this condition will also appear via means of a similar mechanism during detect operations.

(2) Oscillation as a result of through current

Since the XC61C series are CMOS IC s, through current will flow when the IC's internal circuit switching operates (during release and detect operations). Consequently, oscillation is liable to occur as a result of drops in voltage at the through current's resistor ($R_{IN}$) during release voltage operations. (refer to Figure 3)

Since hysteresis exists during detect operations, oscillation is unlikely to occur.

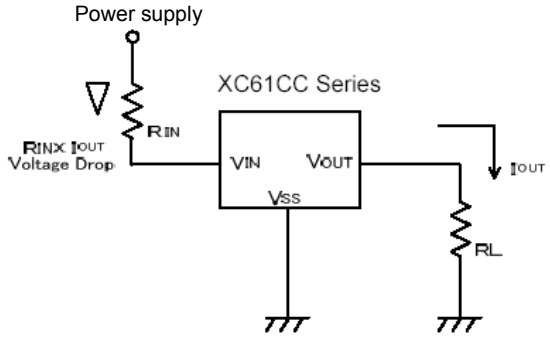


Figure 2: Oscillation in relation to output current

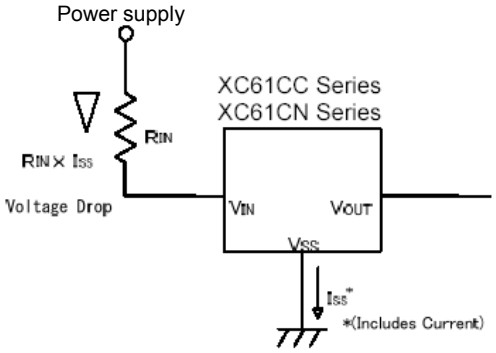
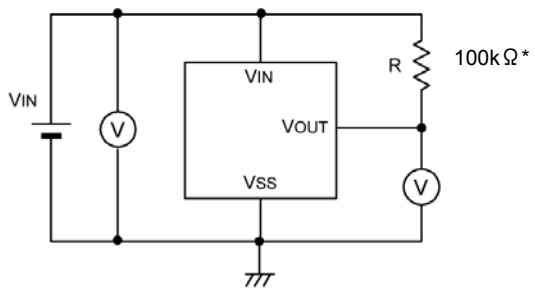


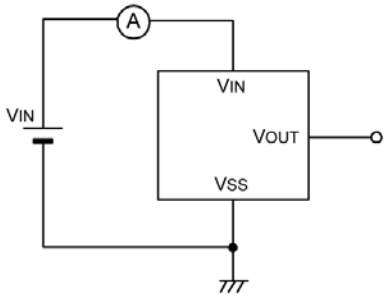
Figure 3: Oscillation in relation to through current

## ■ TEST CIRCUITS

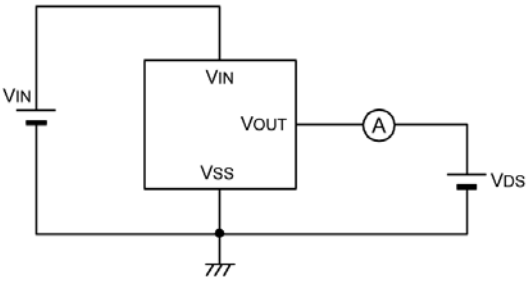
Circuit 1



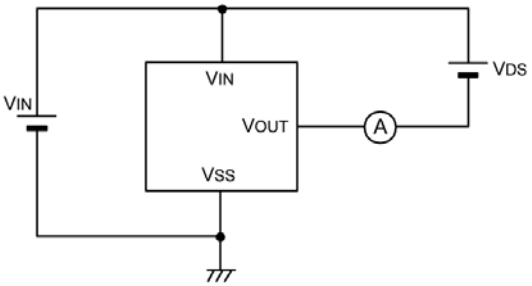

Circuit 2



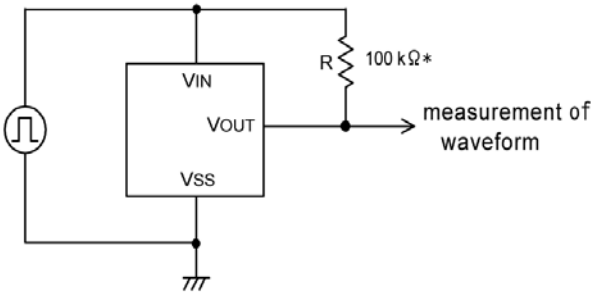

Circuit 3




Circuit 4




Circuit 5

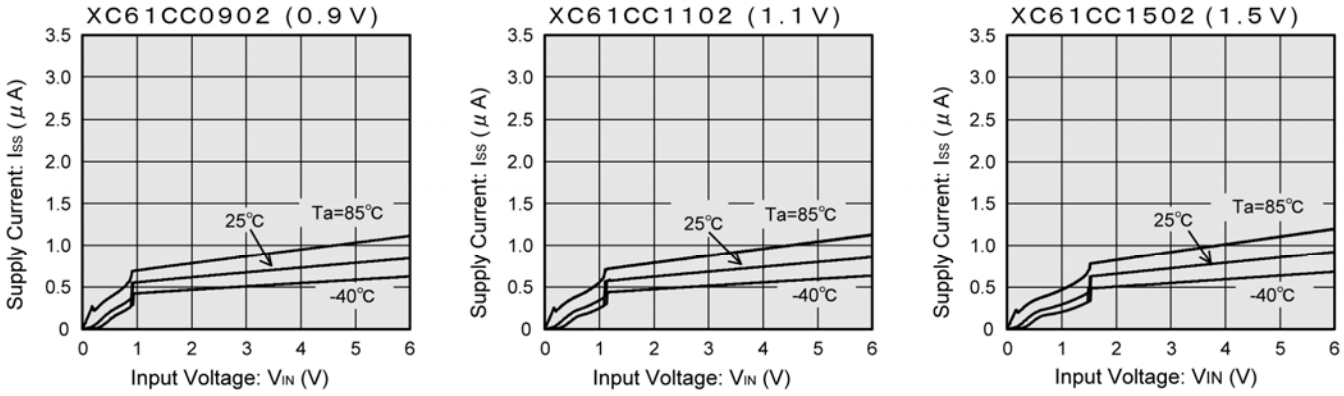



* : A resistor is not necessary with CMOS output products.

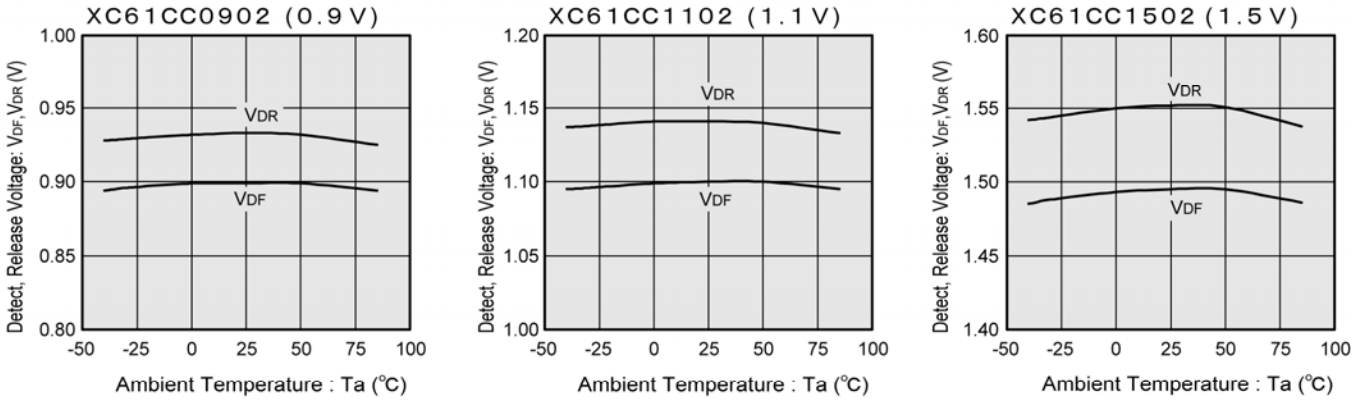
## ■TYPICAL PERFORMANCE CHARACTERISTICS

### ●Low Voltage

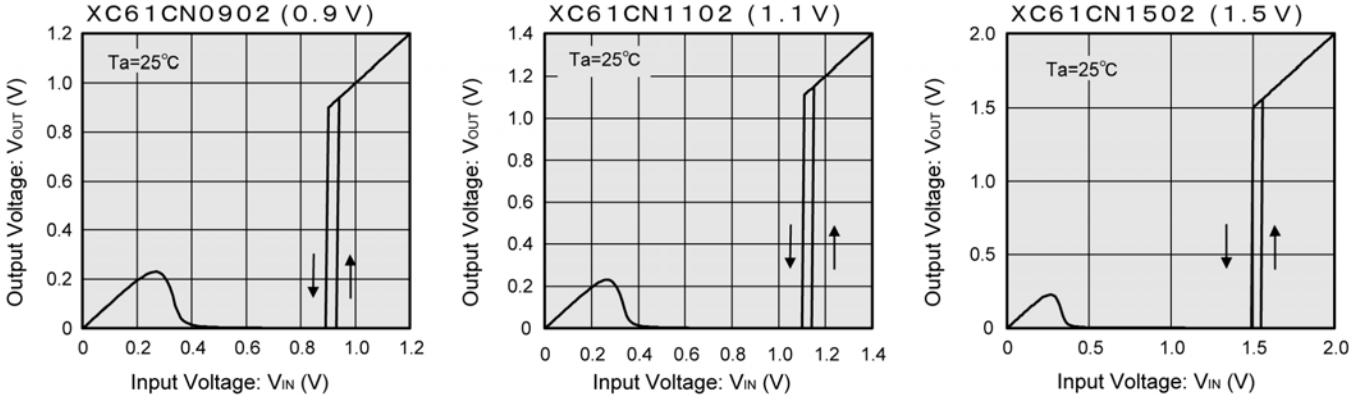
(1) Supply Current vs. Input Voltage




(2) Detect, Release Voltage vs. Ambient Temperature




(3) Output Voltage vs. Input Voltage



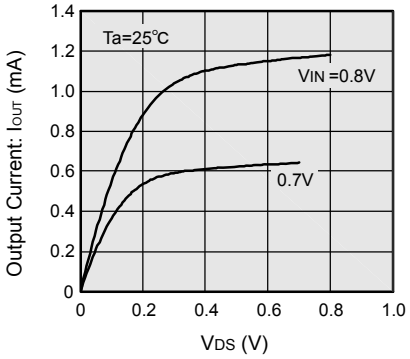

Note : Unless otherwise stated, the N-ch open drain pull-up resistance value is 100kΩ.

# ■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

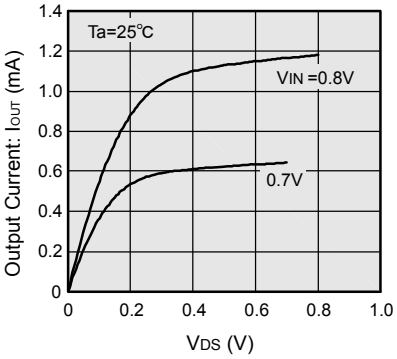
## ●Low Voltage (Continued)

(4) N-ch Driver Output Current vs. $V_{DS}$

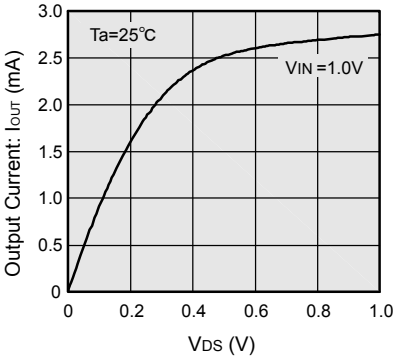
XC61CC0902 (0.9V)



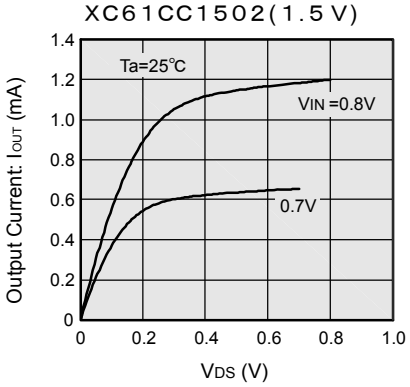

XC61CC1102(1.1V)



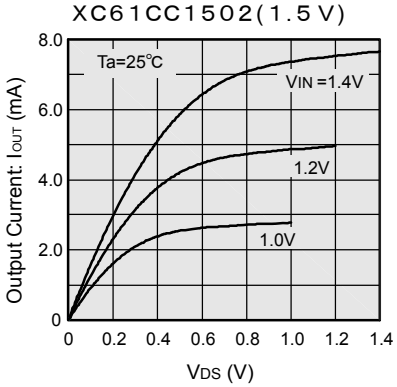

XC61CC1102(1.1V)




XC61CC1502(1.5V)

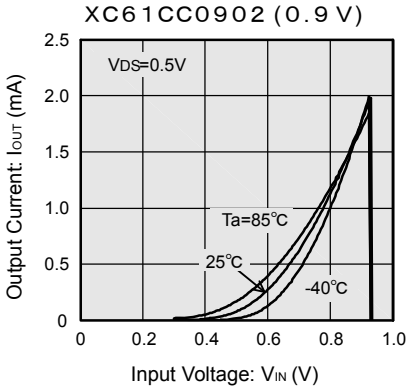



XC61CC1502(1.5V)

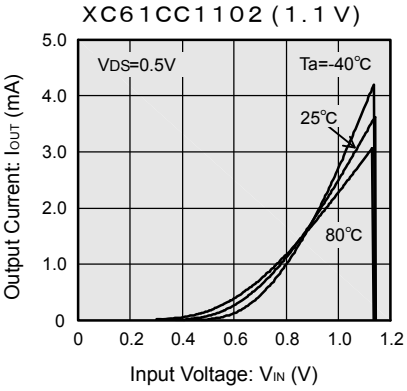



(5) N-ch Driver Output Current vs. Input Voltage

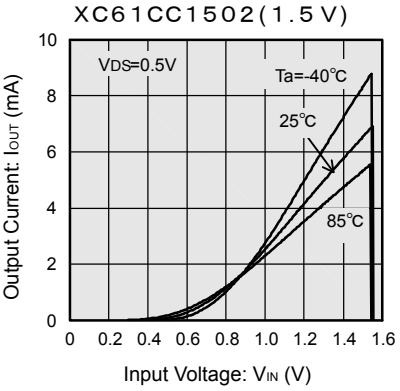
XC61CC0902 (0.9V)




XC61CC1102 (1.1V)

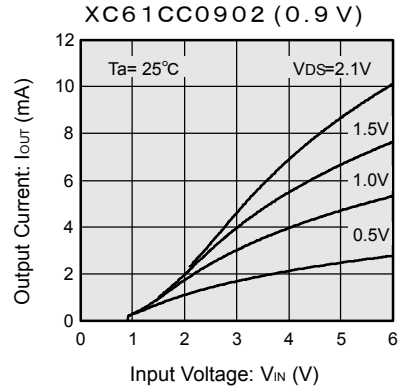



XC61CC1502(1.5V)

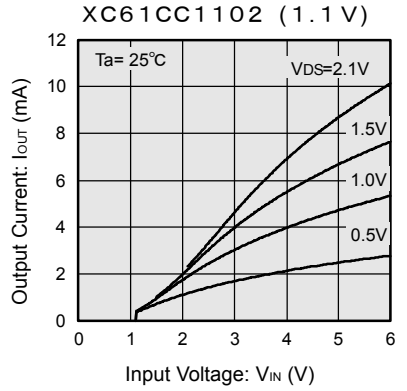



(6) P-ch Driver Output Current vs. Input Voltage

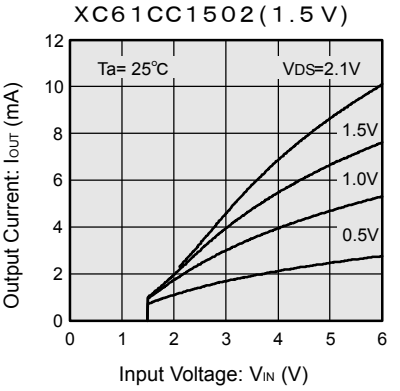
XC61CC0902 (0.9V)




XC61CC1102 (1.1V)




XC61CC1502(1.5V)

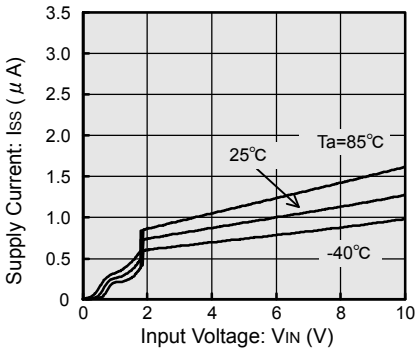


## ■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

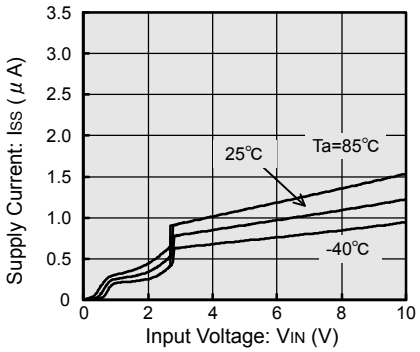
### ●Standard Voltage

(1) Supply Current vs. Input Voltage

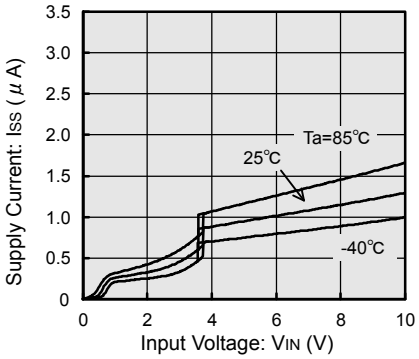
XC61CC1802 (1.8V)



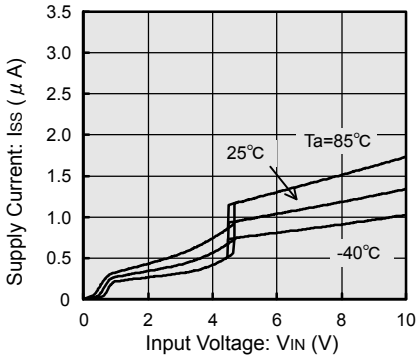

XC61CC2702 (2.7V)




XC61CC3602 (3.6V)

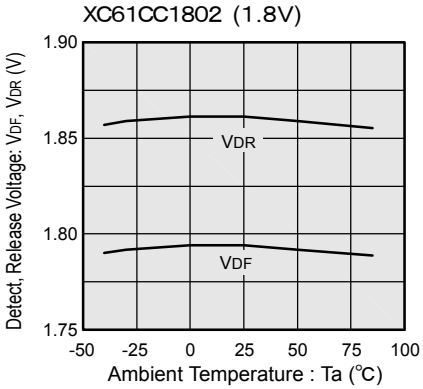



XC61CC4502 (4.5V)

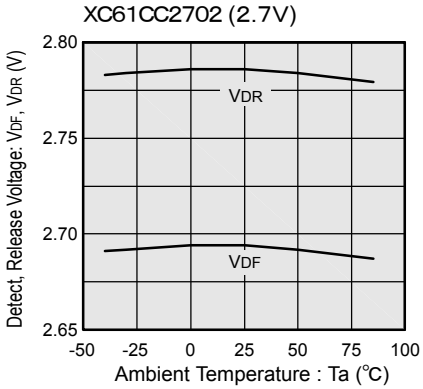



(2) Detect, Release Voltage vs. Ambient Temperature

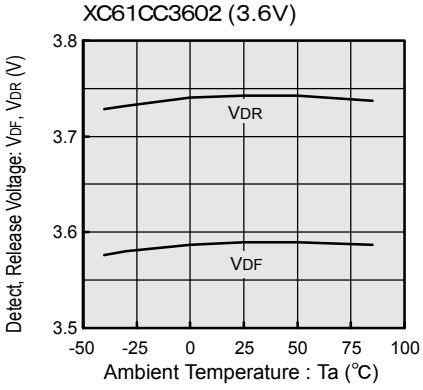
XC61CC1802 (1.8V)



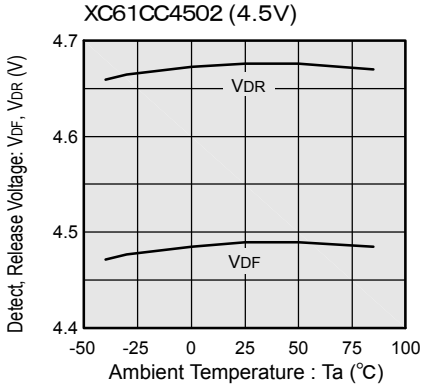

XC61CC2702 (2.7V)




XC61CC3602 (3.6V)




XC61CC4502 (4.5V)

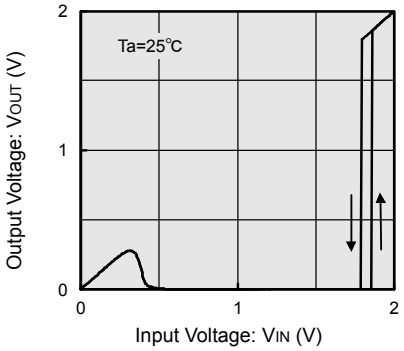


# ■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

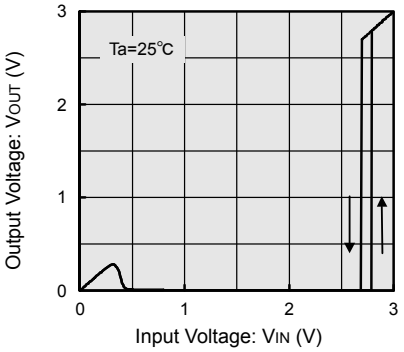
## ●Standard Voltage (Continued)

(3) Output Voltage vs. Input Voltage

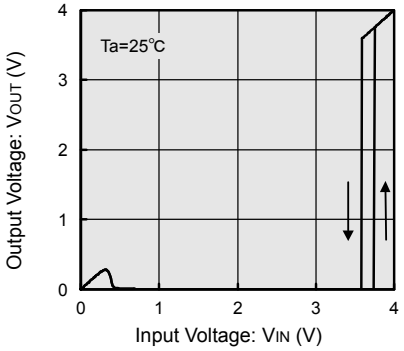
XC61CN1802 (1.8V)



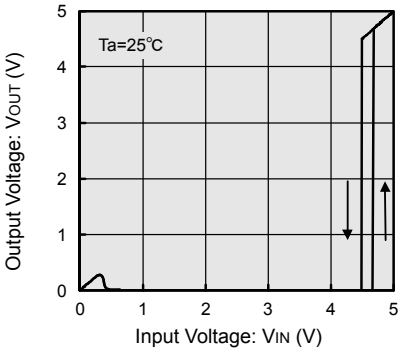

XC61CN2702 (2.7V)




XC61CN3602 (3.6V)



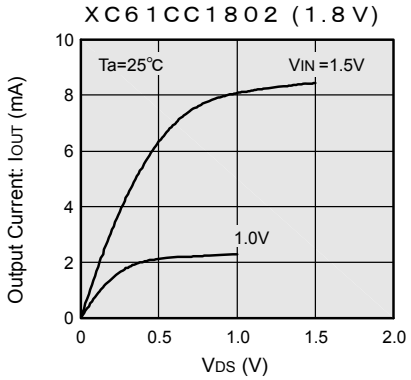

XC61CN4502 (4.5V)



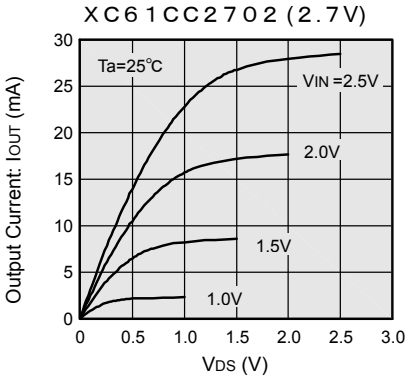

Note : The N-ch open drain pull up resistance value is 100kΩ.

(4) N-ch Driver Output Current vs. VDS

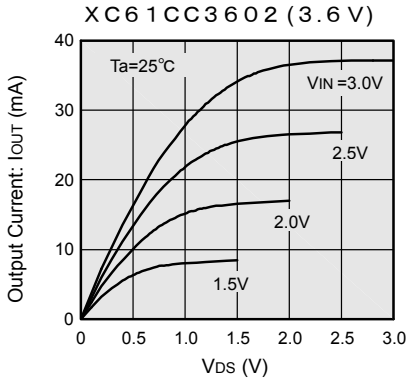
XC61CC1802 (1.8V)



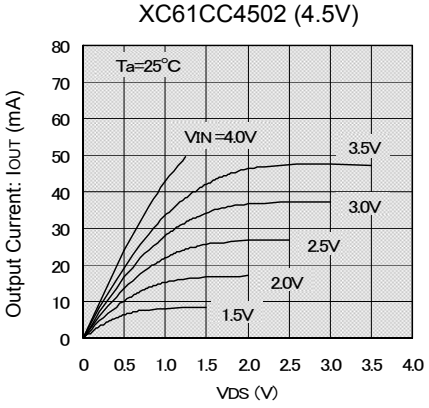

XC61CC2702 (2.7V)




XC61CC3602 (3.6V)




XC61CC4502 (4.5V)

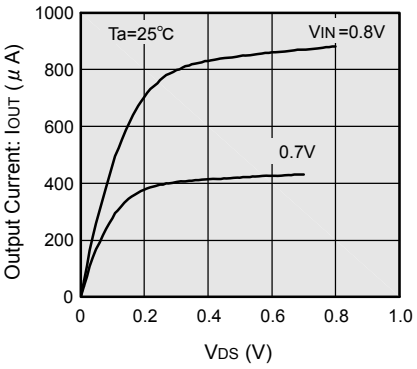


## ■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

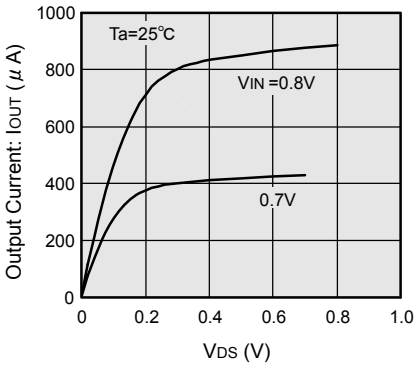
### ●Standard Voltage (Continued)

(4) N-ch Driver Output Current vs. $V_{DS}$

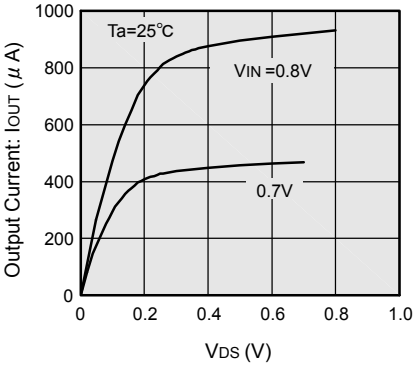
XC61CC1802 (1.8V)



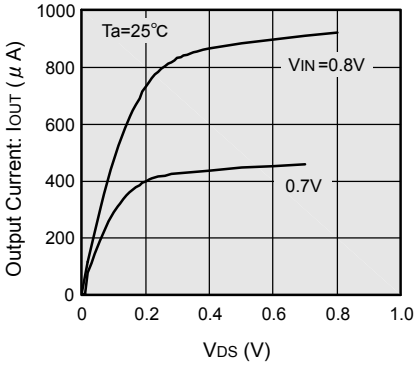

XC61CC2702 (2.7V)




XC61CC3602 (3.6V)

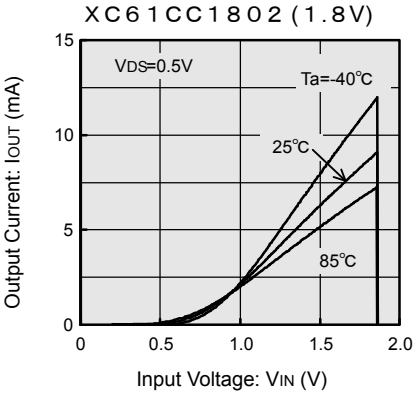



XC61CC4502 (4.5V)

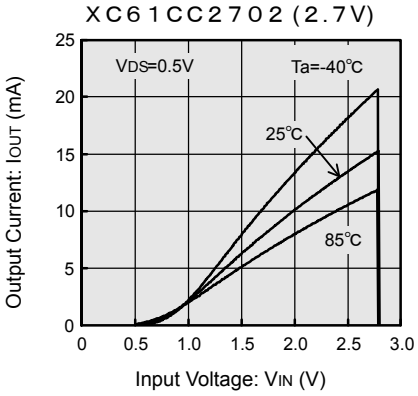



(5) N-ch Driver Output Current vs. Input Voltage

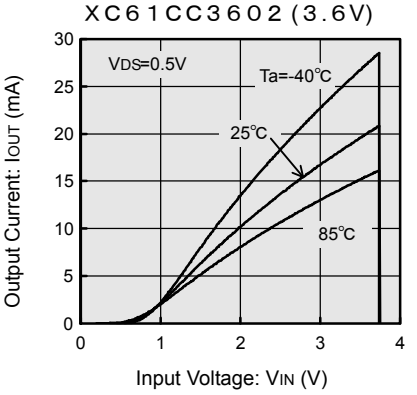
XC61CC1802 (1.8V)



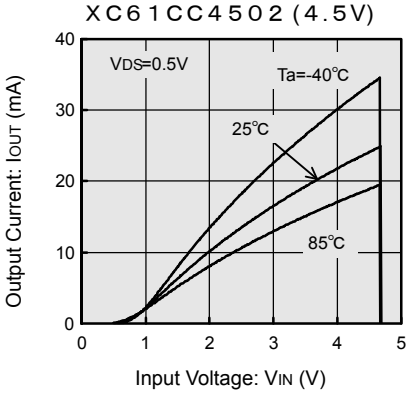

XC61CC2702 (2.7V)




XC61CC3602 (3.6V)




XC61CC4502 (4.5V)

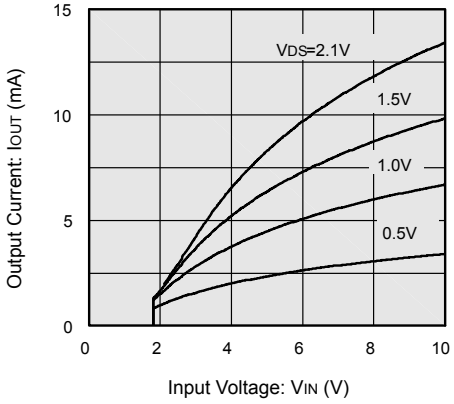


# ■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

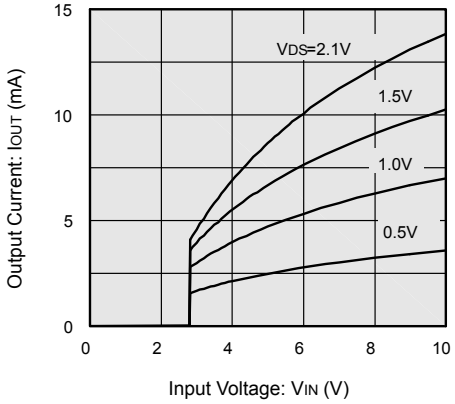
## ●Standard Voltage (Continued)

(6) P-ch Driver Output Current vs. Input Voltage

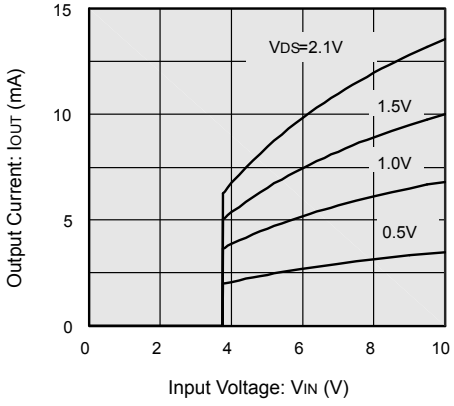
XC61CC1802 (1.8V)



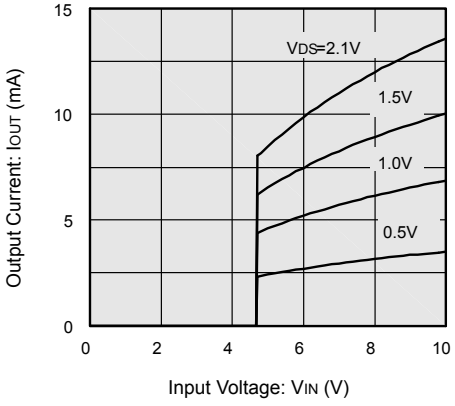

XC61CC2702 (2.7V)




XC61CC3602 (3.6V)

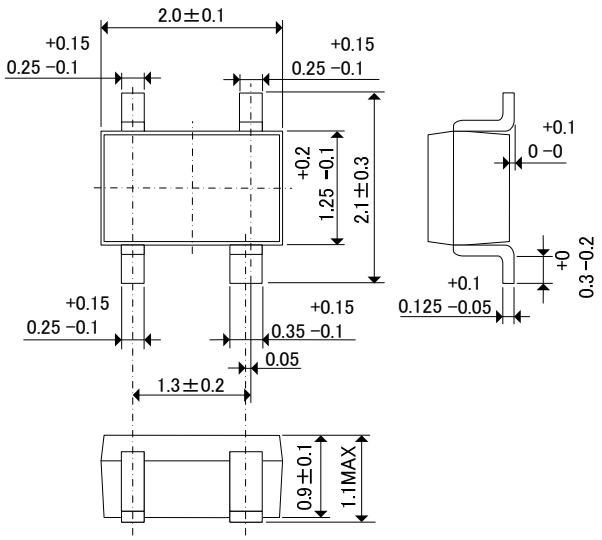



XC61CC4502 (4.5V)

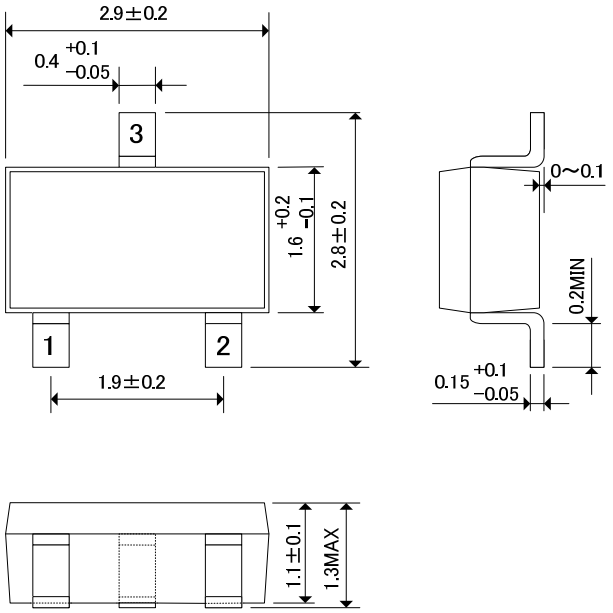


## ■PACKAGING INFORMATION

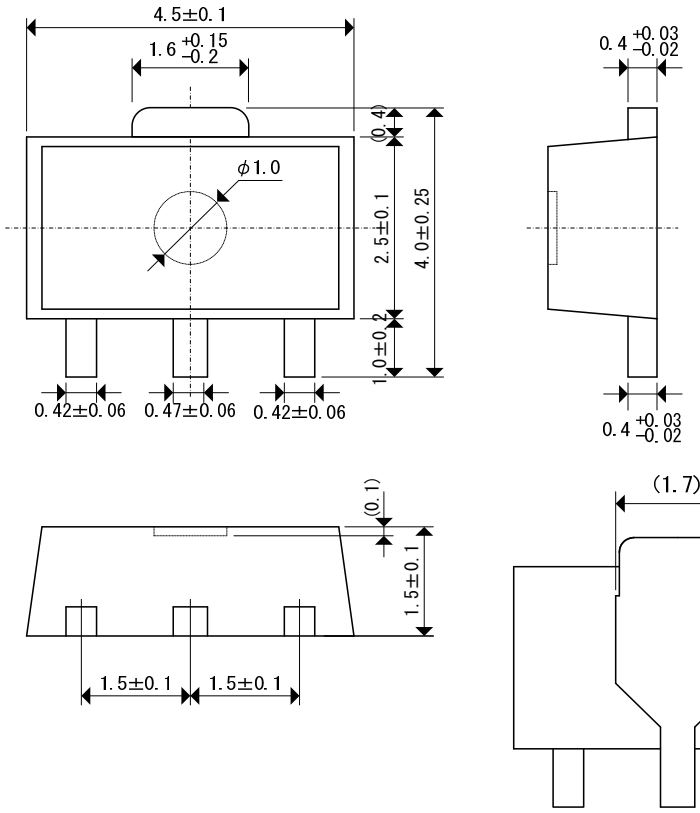
●SSOT-24




●SOT-23

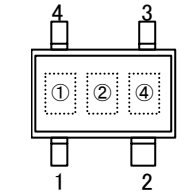



●SOT-89

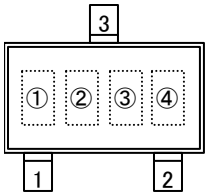


# ■MARKING RULE

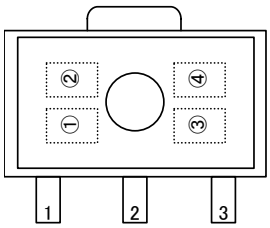
● SSOT-24, SOT-23, SOT-89




SSOT-24 (SC-82)
(TOP VIEW)




SOT - 23
(TOP VIEW)




SOT - 89
(TOP VIEW)

① represents integer of detect voltage and
CMOS Output (XC61CC series)

| MARK | CONFIGURATION | VOLTAGE (V) |
|---|---|---|
| A | CMOS | 0.X |
| B | CMOS | 1.X |
| C | CMOS | 2.X |
| D | CMOS | 3.X |
| E | CMOS | 4.X |
| F | CMOS | 5.X |
| H | CMOS | 6.X |

N-Channel Open Drain Output (XC61CN series)

| MARK | CONFIGURATION | VOLTAGE (V) |
|---|---|---|
| K | N-ch | 0.X |
| L | N-ch | 1.X |
| M | N-ch | 2.X |
| N | N-ch | 3.X |
| P | N-ch | 4.X |
| R | N-ch | 5.X |
| S | N-ch | 6.X |

② represents decimal number of detect voltage

| MARK | VOLTAGE (V) | MARK | VOLTAGE (V) |
|---|---|---|---|
| 0 | X.0 | 5 | X.5 |
| 1 | X.1 | 6 | X.6 |
| 2 | X.2 | 7 | X.7 |
| 3 | X.3 | 8 | X.8 |
| 4 | X.4 | 9 | X.9 |

③ represents delay time
(Except for SSOT-24)

| MARK | DELAY TIME | PRODUCT SERIES |
|---|---|---|
| 3 | No Delay Time | XC61Cxxx0xxx |

④ represents production lot number
Based on the internal standard. (G, I, J, O, Q, W excluded)

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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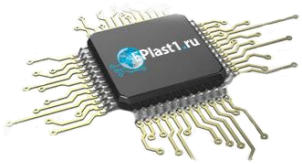
- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.