THE DATASHEET OF

XC61CC4002MR

www.win-source.net 0086-755-83957316

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.

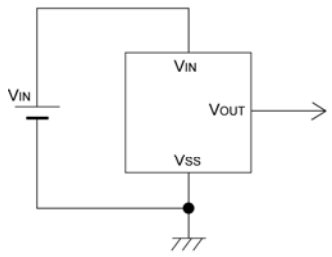
■APPLICATIONS

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

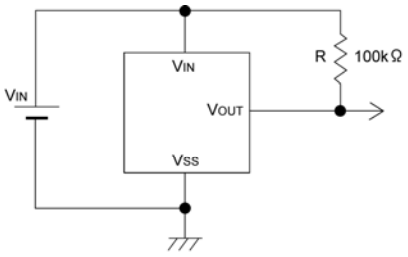
■FEATURES

Highly Accurate : ± 2%
: ± 1%(Standard Voltage VD: 2.6V~5.1V)
Low Power Consumption : 0.7μA (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

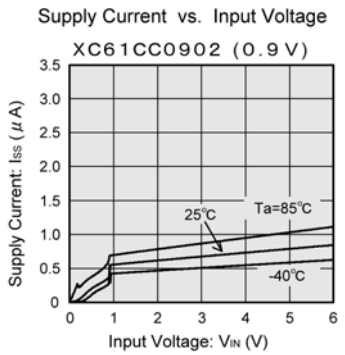


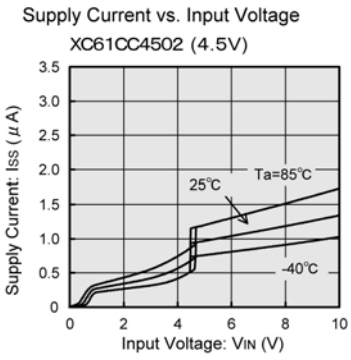
CMOS Output



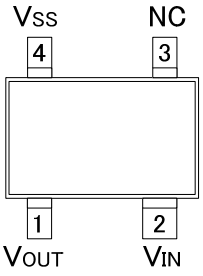
N-ch Open Drain Output

■TYPICAL PERFORMANCE CHARACTERISTICS

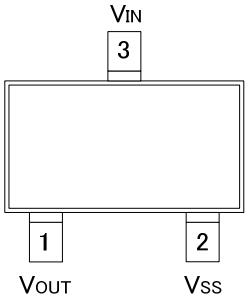




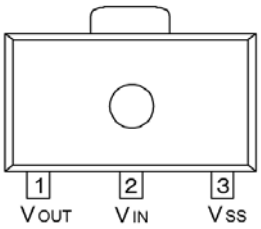
■PIN CONFIGURATION



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

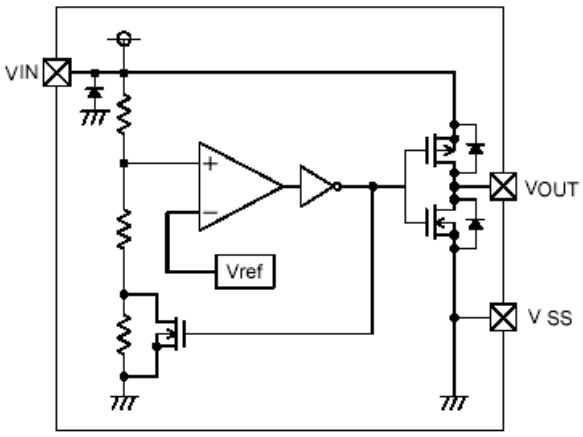
XC61C①②③④⑤⑥⑦-⑧ (*1)

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)

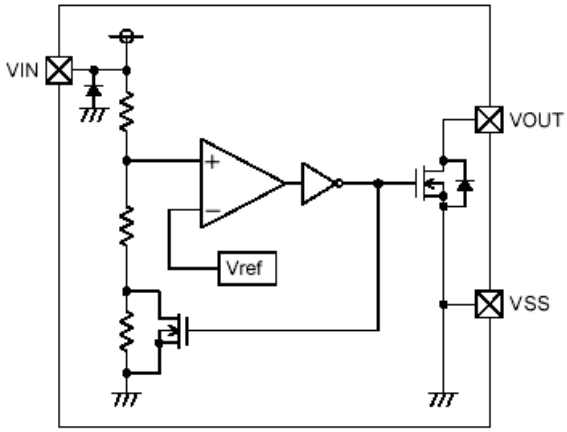
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

■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 $V_{DF(T)}$=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 V_{IN}=10.0V, V_{OUT}=10.0V*2		-	10	100		
Temperature Characteristics		ΔV_{DF}/ (ΔTopr·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.

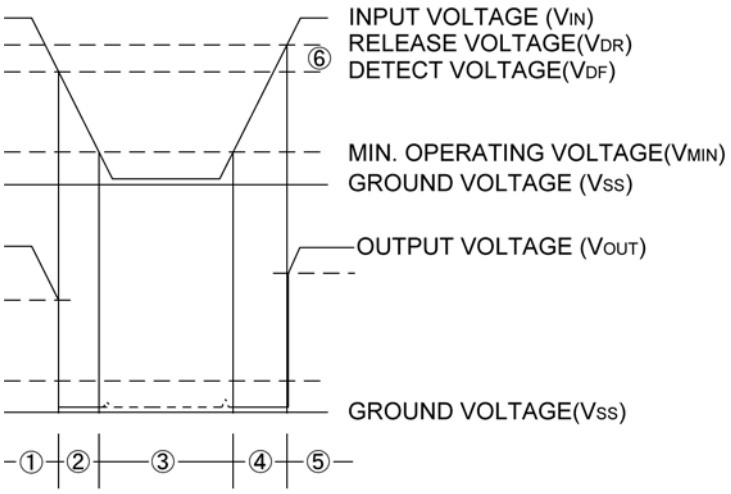
③ When input voltage (V_{IN}) falls to a level below that of the minimum operating voltage (V_{MIN}), output will become unstable. (As for the N-ch open drain product of XC61CN, the pull-up voltage goes out at the output voltage.)

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.

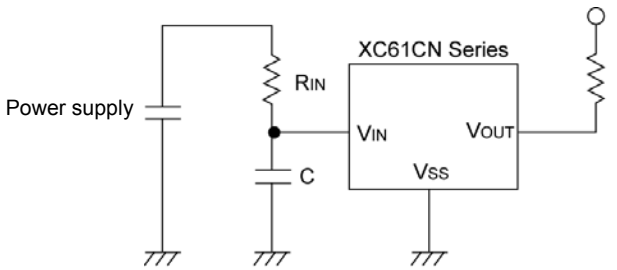


Figure 1: Circuit using an input resistor

●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.

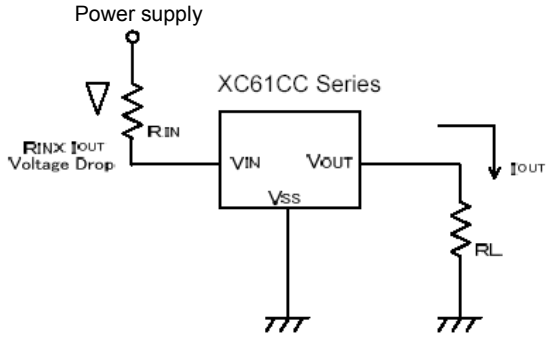


Figure 2: Oscillation in relation to output current

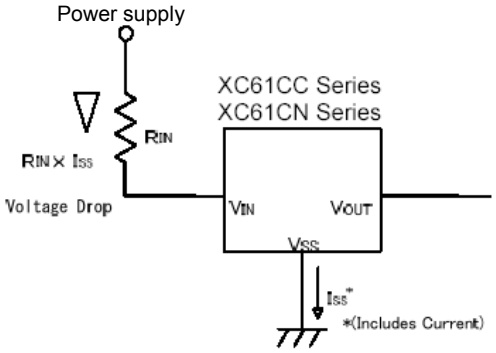
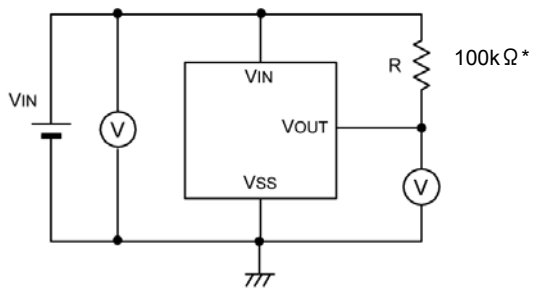


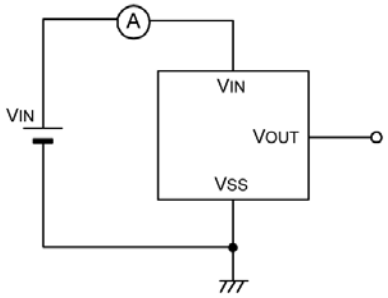
Figure 3: Oscillation in relation to through current

■ TEST CIRCUITS

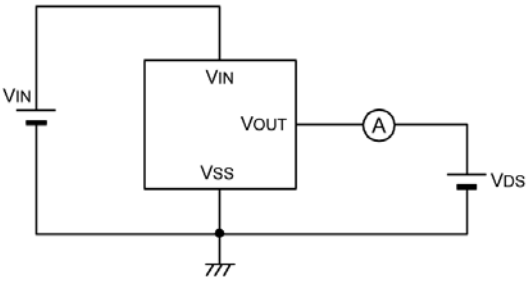
Circuit 1



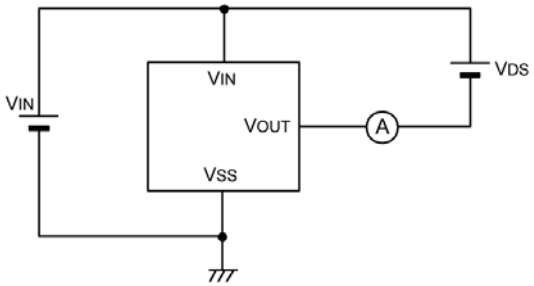
Circuit 2



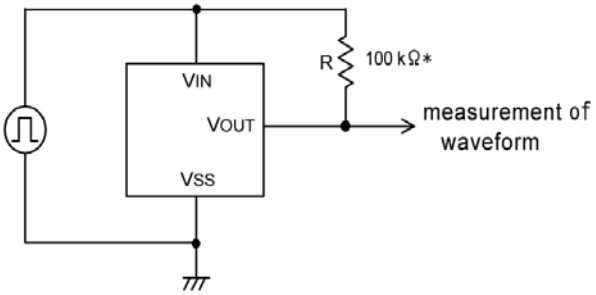
Circuit 3



Circuit 4



Circuit 5

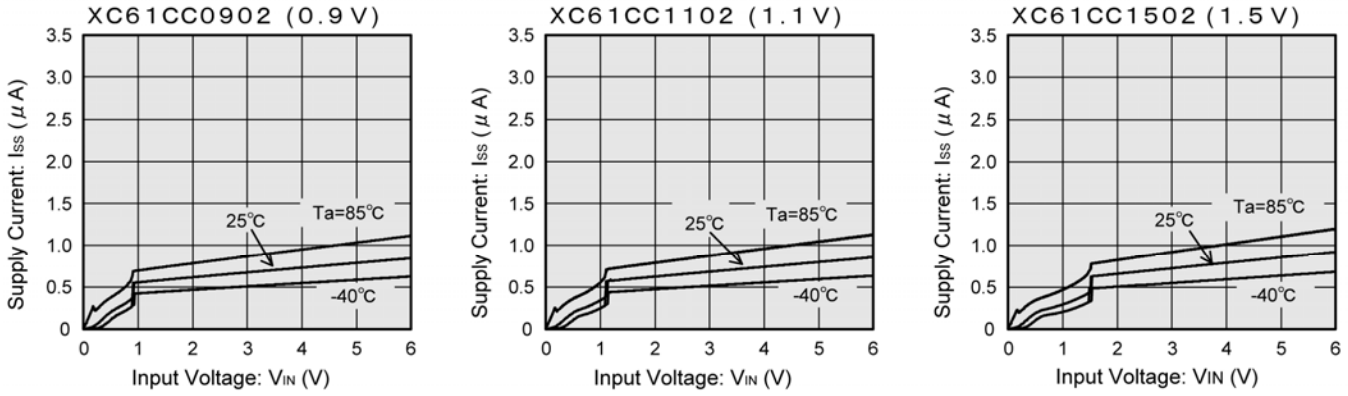


* : A resistor is not necessary with CMOS output products.

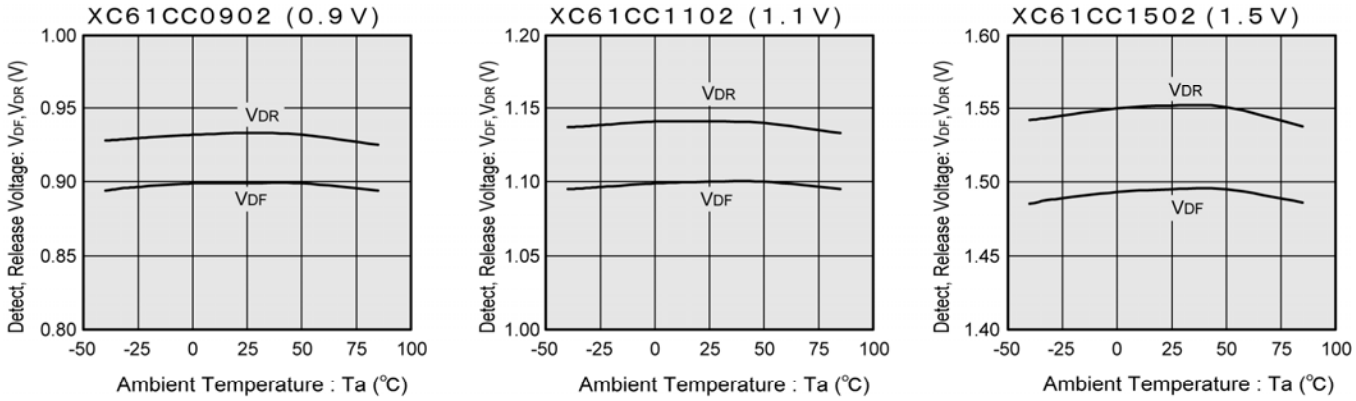
■TYPICAL PERFORMANCE CHARACTERISTICS

●Low Voltage

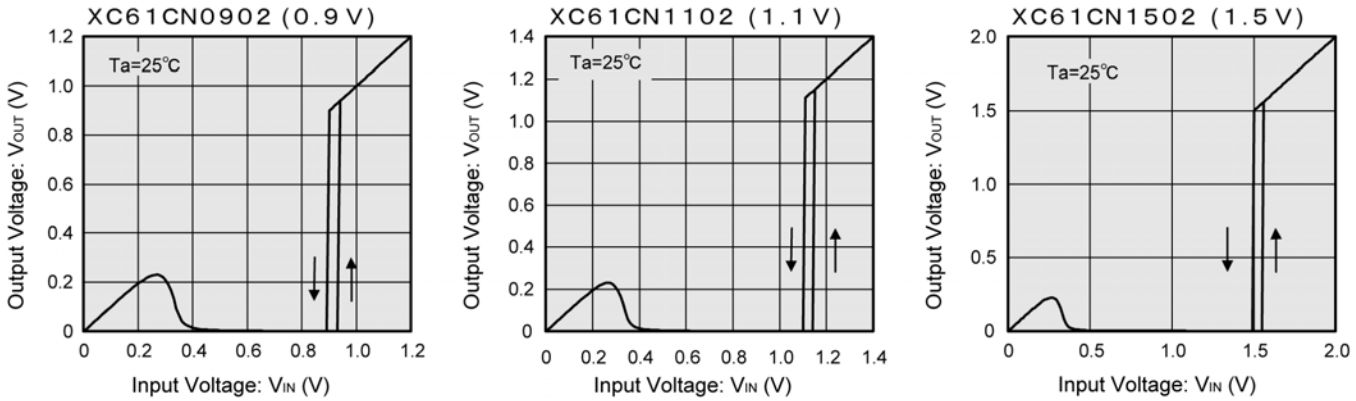
(1) Supply Current vs. Input Voltage



(2) Detect, Release Voltage vs. Ambient Temperature



(3) Output Voltage vs. Input Voltage



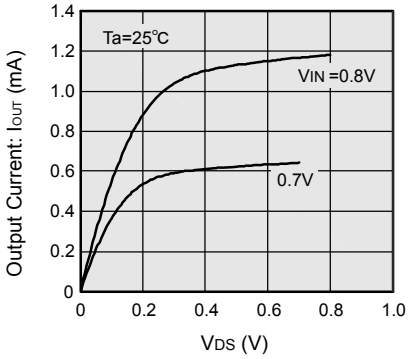
Note : Unless otherwise stated, the N-ch open drain pull-up resistance value is 100kΩ.

■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

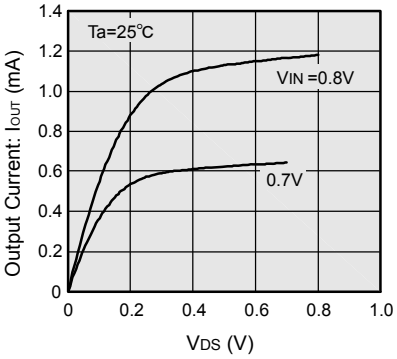
●Low Voltage (Continued)

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

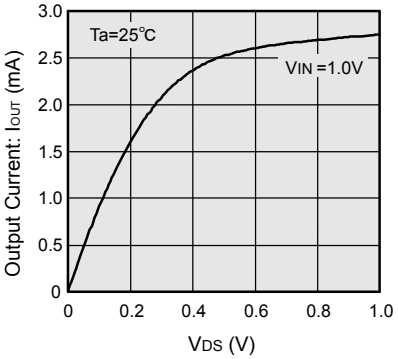
XC61CC0902 (0.9V)



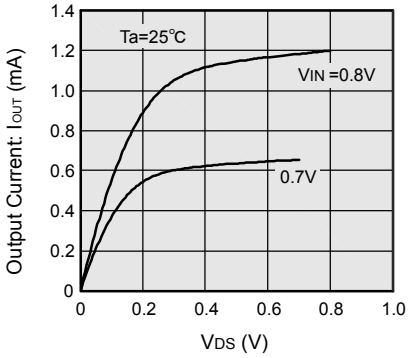
XC61CC1102(1.1V)



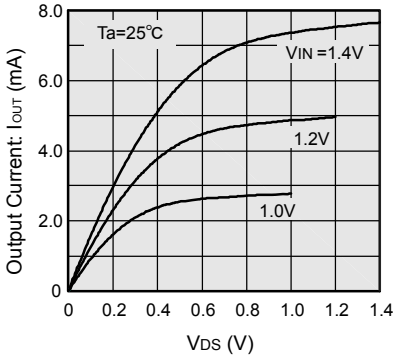
XC61CC1102(1.1V)



XC61CC1502(1.5V)

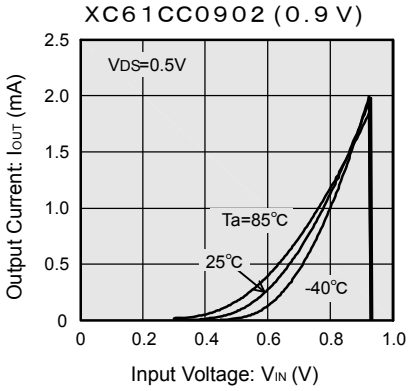


XC61CC1502(1.5V)

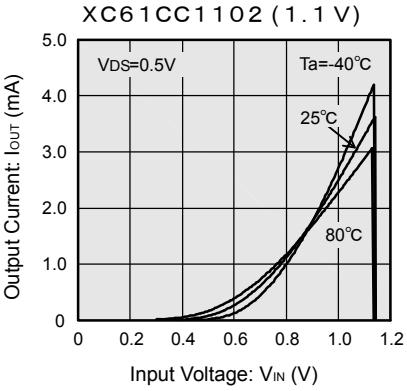


(5) N-ch Driver Output Current vs. Input Voltage

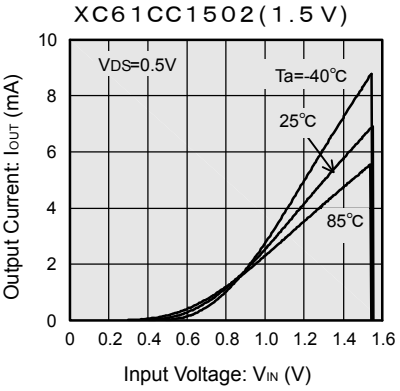
XC61CC0902 (0.9V)



XC61CC1102 (1.1V)

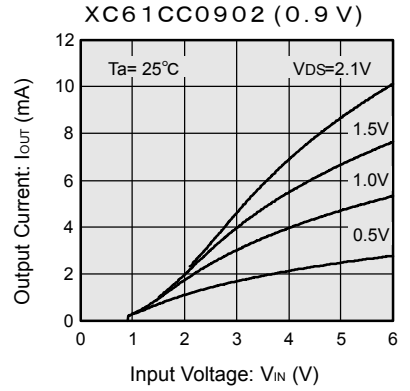


XC61CC1502(1.5V)

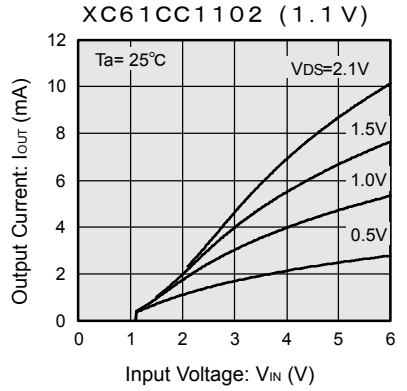


(6) P-ch Driver Output Current vs. Input Voltage

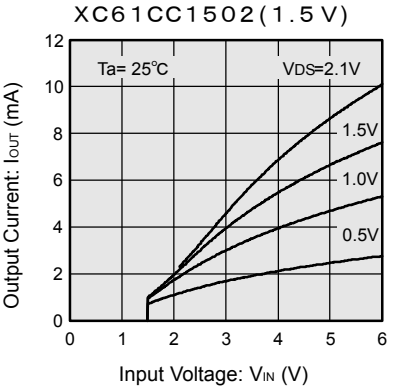
XC61CC0902 (0.9V)



XC61CC1102 (1.1V)



XC61CC1502(1.5V)

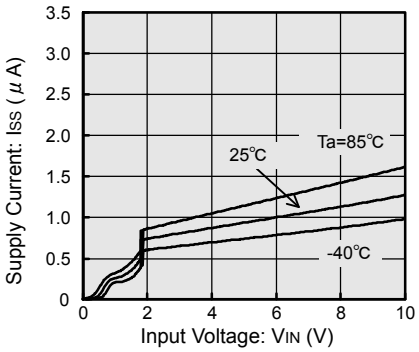


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

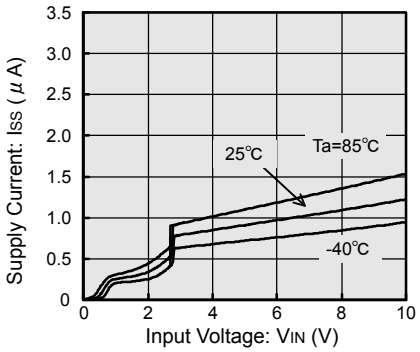
●Standard Voltage

(1) Supply Current vs. Input Voltage

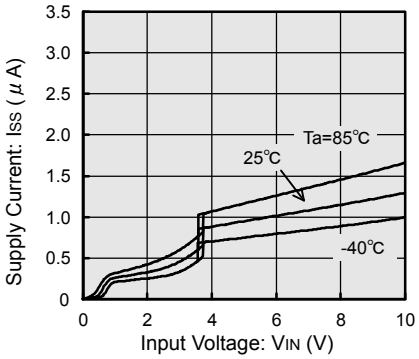
XC61CC1802 (1.8V)



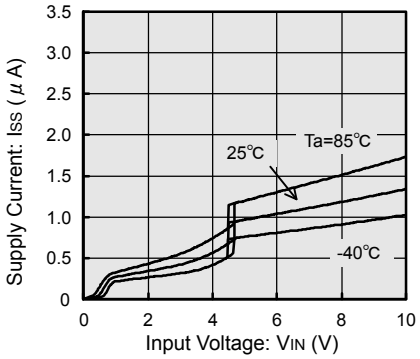
XC61CC2702 (2.7V)



XC61CC3602 (3.6V)

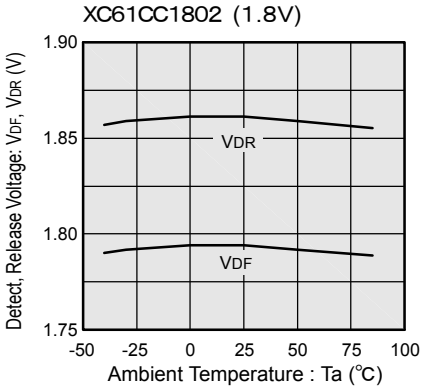


XC61CC4502 (4.5V)

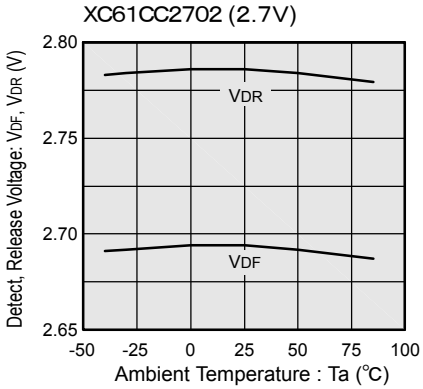


(2) Detect, Release Voltage vs. Ambient Temperature

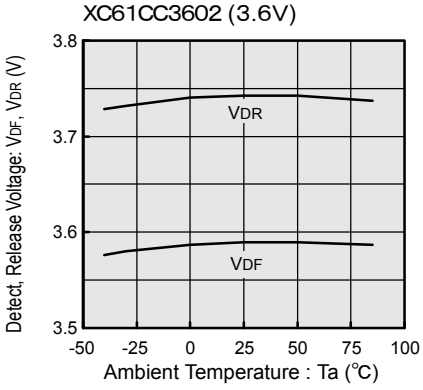
XC61CC1802 (1.8V)



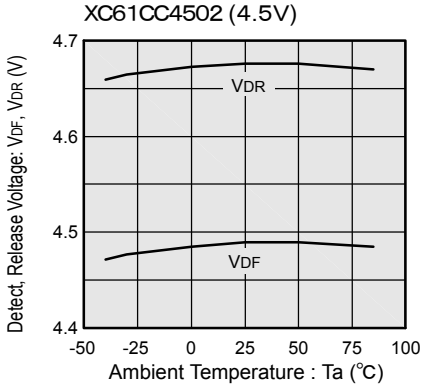
XC61CC2702 (2.7V)



XC61CC3602 (3.6V)



XC61CC4502 (4.5V)

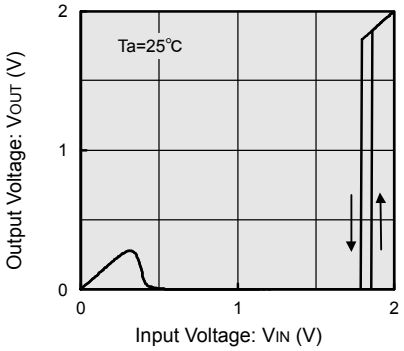


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

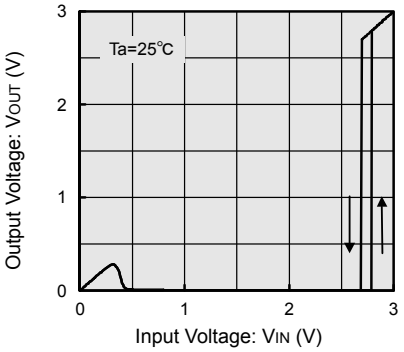
●Standard Voltage (Continued)

(3) Output Voltage vs. Input Voltage

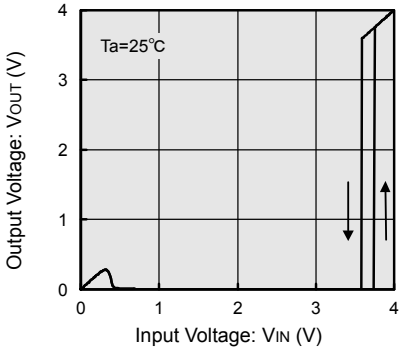
XC61CN1802 (1.8V)



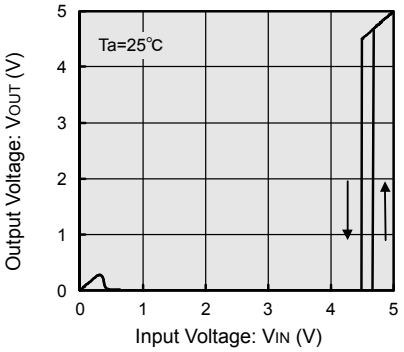
XC61CN2702 (2.7V)



XC61CN3602 (3.6V)



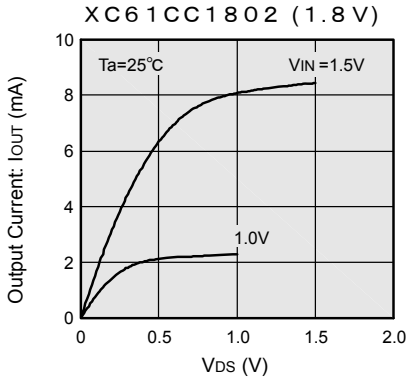
XC61CN4502 (4.5V)



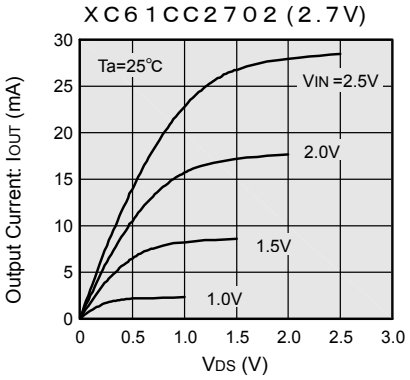
Note : The N-ch open drain pull up resistance value is 100kΩ.

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

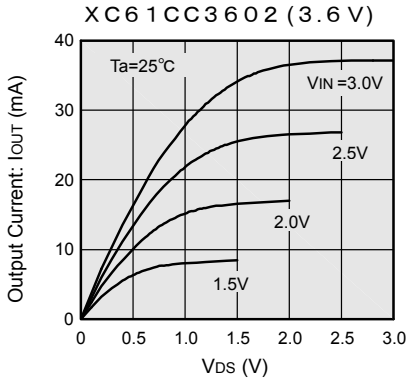
XC61CC1802 (1.8V)



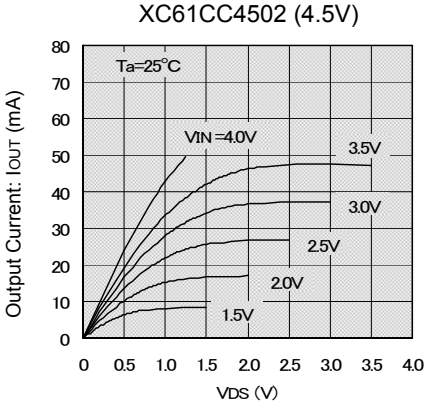
XC61CC2702 (2.7V)



XC61CC3602 (3.6V)



XC61CC4502 (4.5V)

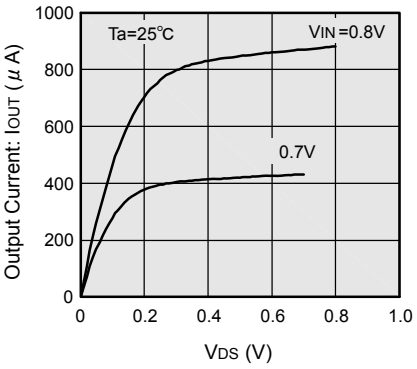


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

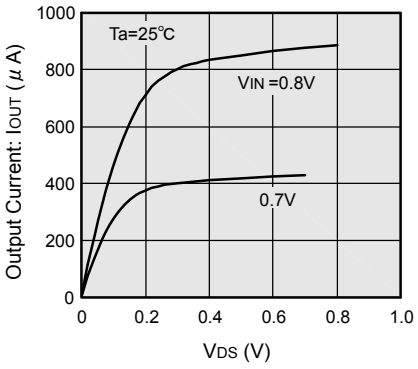
●Standard Voltage (Continued)

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

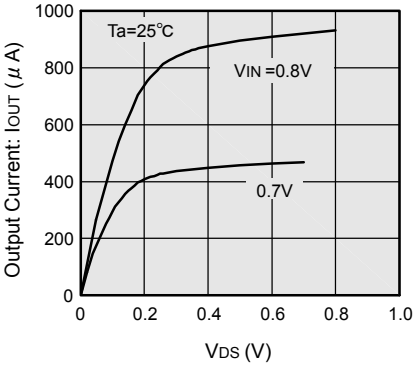
XC61CC1802 (1.8V)



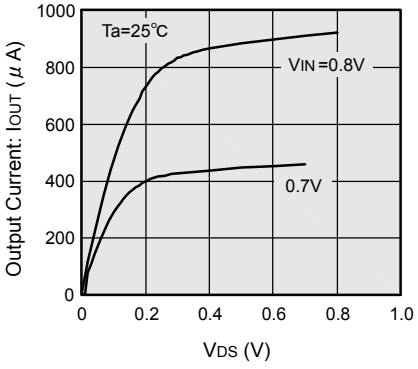
XC61CC2702 (2.7V)



XC61CC3602 (3.6V)

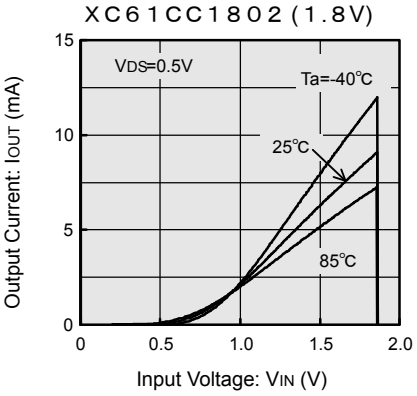


XC61CC4502 (4.5V)

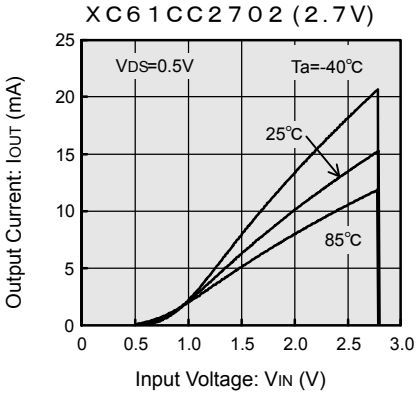


(5) N-ch Driver Output Current vs. Input Voltage

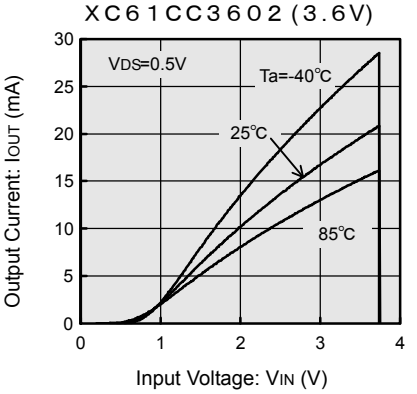
XC61CC1802 (1.8V)



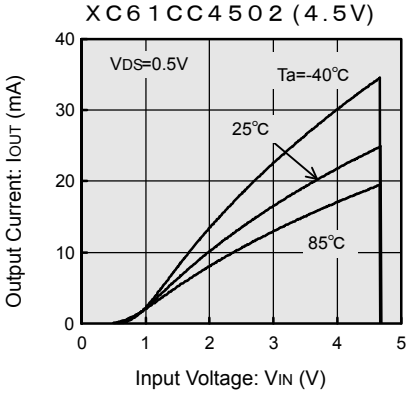
XC61CC2702 (2.7V)



XC61CC3602 (3.6V)



XC61CC4502 (4.5V)

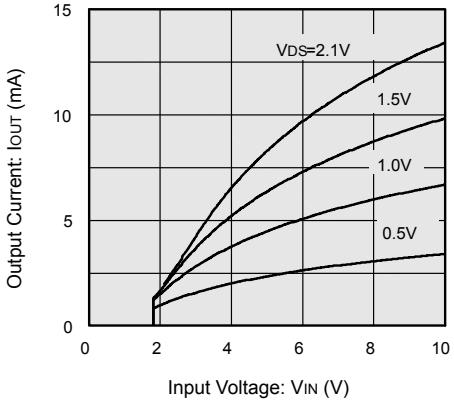


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

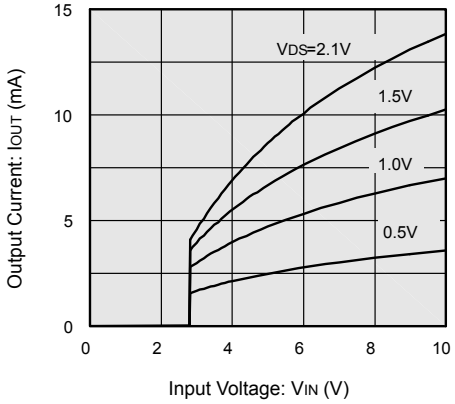
●Standard Voltage (Continued)

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

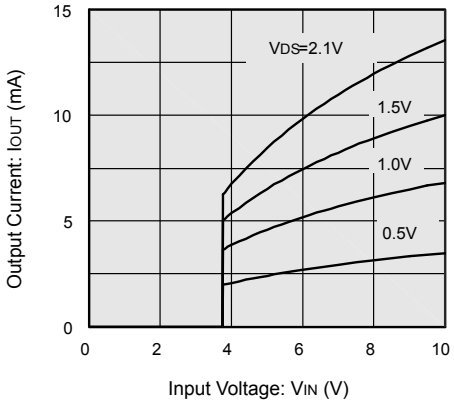
XC61CC1802 (1.8V)



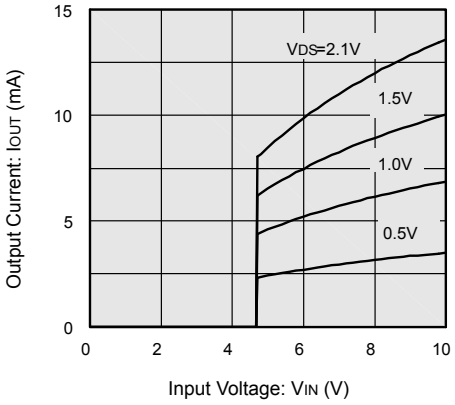
XC61CC2702 (2.7V)



XC61CC3602 (3.6V)

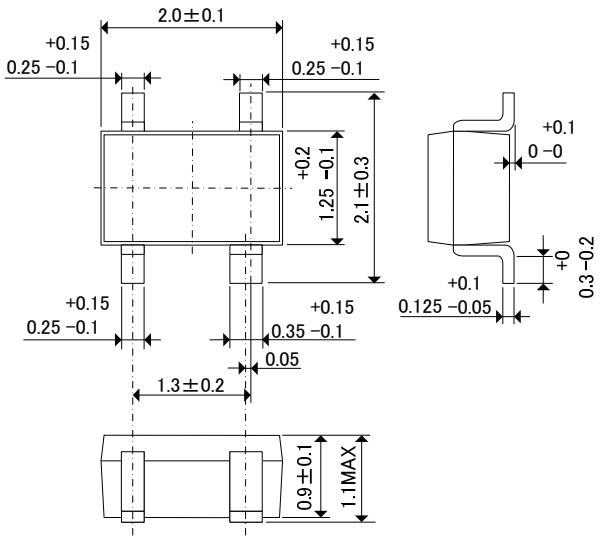


XC61CC4502 (4.5V)

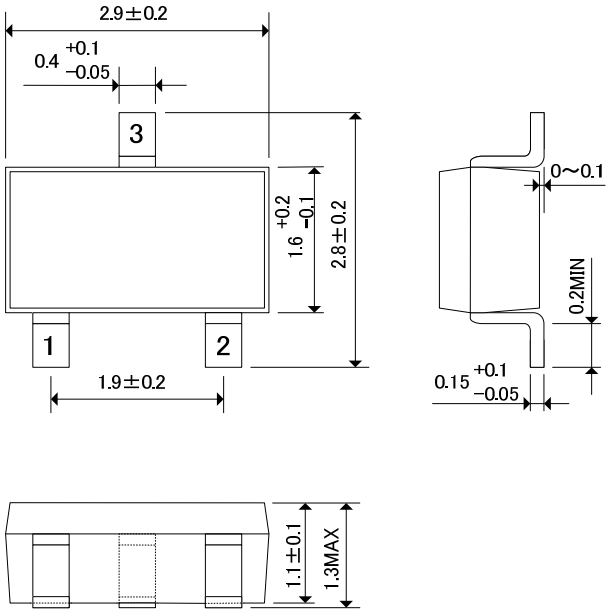


■PACKAGING INFORMATION

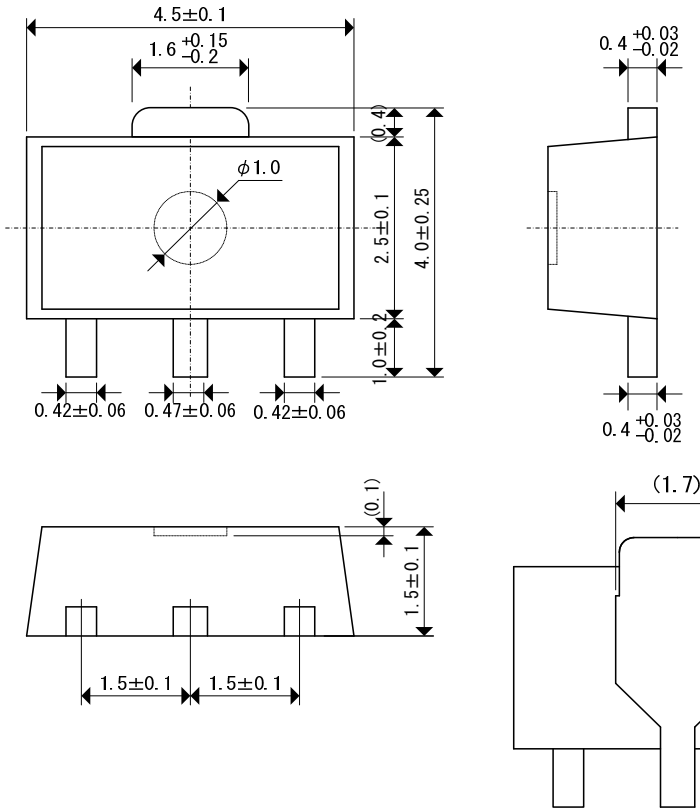
●SSOT-24



●SOT-23

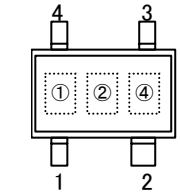


●SOT-89

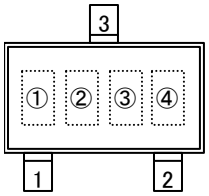


■MARKING RULE

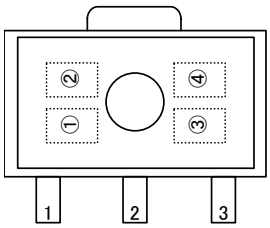
● SSOT-24, SOT-23, SOT-89



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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