XC61G Series

ETR0203_001

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

■GENERAL DESCRIPTION

The XC61G 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-channel open drain output configurations are available.

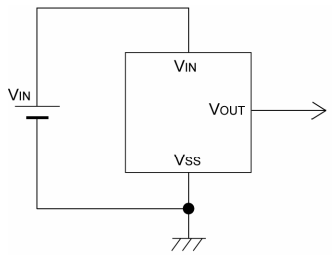
■APPLICATIONS

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

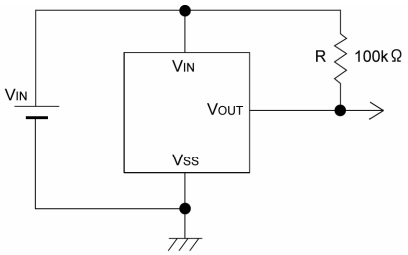
■FEATURES

Highly Accurate	: ±2%
Low Power Consumption	: 0.7 μA [VIN=1.5V] (TYP.)
Detect Voltage Range	: 0.8V ~ 1.5V in 100mV increments (Low Voltage)
	: 1.6V～6.0V in 100mV increments (Standard Voltage)
Operating Voltage Range	: 0.7V ~ 6.0V (Low Voltage)
	: 0.7V～10.0V (Standard Voltage)
Detect Voltage Temperature characteristics	
	: ±100ppm/℃ (TYP.)
Output Configuration	: N-channel open drain or CMOS
CMOS	
Ultra Small Package	: USP-3 (120mW)

■TYPICAL APPLICATION CIRCUITS



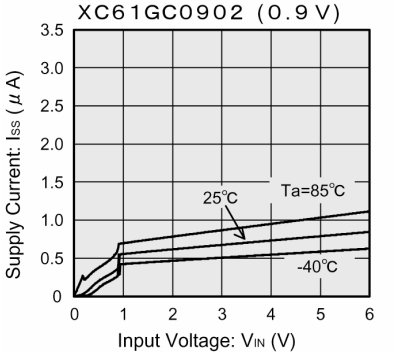
CMOS Output



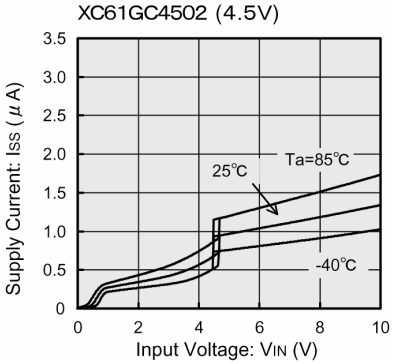
N-ch Open Drain Output

■TYPICAL PERFORMANCE CHARACTERISTICS

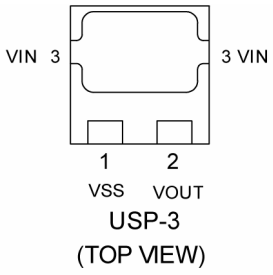
Supply Current vs. Input Voltage
XC61GC0902 (0.9V)



Supply Current vs. Input Voltage
XC61GC4502 (4.5V)



■PIN CONFIGURATION



USP-3
(TOP VIEW)

■PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTION
USP-3		
3	VIN	Supply Voltage
1	VSS	Ground
2	VOUT	Output

■PRODUCT CLASSIFICATION

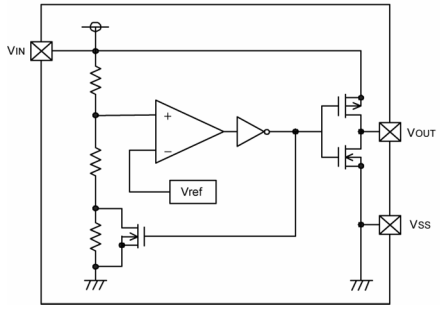
●Ordering Information

XC61G ①②③④⑤⑥⑦

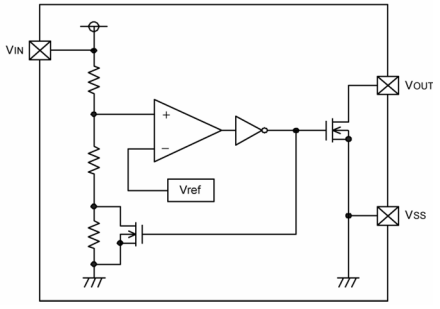
DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Output Configuration	C	: CMOS output
		N	: N-ch open drain output
② ③	Detect Voltage	08 ~ 60	: e.g. 0.8V → ②0, ③8
			: e.g. 1.5V → ②1, ③5
④	Output Delay	0	: No delay
⑤	Detect Accuracy	2	: Within ± 2%
⑥	Package	H	: USP-3
⑦	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed

■BLOCK DIAGRAMS

(1) CMOS Output



(2) N-ch Open Drain Output



■ABSOLUTE MAXIMUM RATINGS

Ta = 25℃

PARAMETER			SYMBOL	RATINGS	UNITS
Input Voltage		*1	V_{IN}	9.0	V
		*2		12.0	
Output Current		*1	I_{OUT}	50	mA
		*2		50	
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	USP-3		Pd	120	mW
Operating Temperature Range			Topr	-40～+85	℃
Storage Temperature Range			Tstg	-40～+125	℃

■ELECTRICAL CHARACTERISTICS

$V_{DF\ (T)}$ = 0.9 to 1.5V ± 2%

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP.	MAX.	UNITS	CIRCUITS
Detect Voltage	V_{DF}			V_{DF} x 0.98	V_{DF}	V_{DF} x 1.02	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	VIN	$V_{DF(T)}$ = 0.9V to 1.5V		0.7	-	6.0	V	1
		$V_{DF(T)}$ = 1.6V to 6.0V		0.7	-	10.0		
Output Current (Low Voltage)	IOUT	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 (Standard Voltage)		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
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta Topr \cdot V_{DF}}$	-40℃ ≦ Topr ≦ 85℃		-	±100	-	ppm/℃	-
Delay Time (V_{DR} → V_{OUT} inversion)	tDLY			-	-	0.2	ms	5

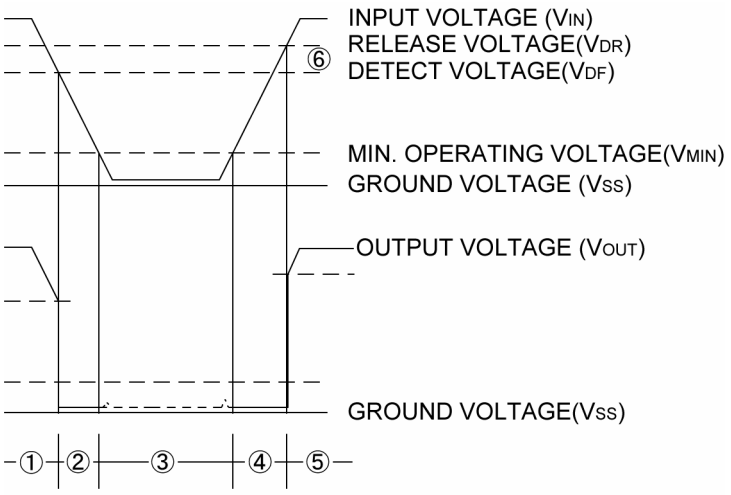
NOTE:
V_{DF} (T): Setting detect voltage
Release Voltage: V_{DR} = V_{DF} + V_{HYS}

■OPERATIONAL EXPLANATION

●CMOS output

① When input voltage (V_{IN}) rises above detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to V_{IN}.
(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. 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}.
(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 maximum ratings. Operation beyond these limits may cause degrading or permanent damage to the device.
2. When a resistor is connected between the VIN pin and the input with CMOS output configurations, oscillation may occur as a result of voltage drops at RIN if load current (IOUT) exists. (refer to the Oscillation Description (1) below)
3. When a resistor is connected between the VIN pin and the input with CMOS output configurations, irrespective of N-ch output configurations, oscillation may occur as a result of through current at the time of voltage release even if load current (IOUT) does not exist. (refer to the Oscillation Description (2) below)
4. With a resistor connected between the VIN pin and the input, detect and release voltage will rise as a result of the IC's supply current flowing through the VIN pin.
5. In order to stabilize the IC's operations, please ensure that VIN pin's input frequency's rise and fall times are more than several μ sec / V.
6. Please use N-ch open drains configuration, when a resistor RIN is connected between the VIN pin and power source. In such cases, please ensure that RIN is less than 10kΩ and that C is more than 0.1μF.

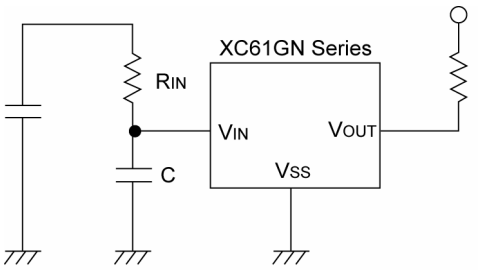


Figure 1: Circuit using an input resistor

●Oscillation Description

(1) Output current oscillation with the CMOS output configuration
When the voltage applied at IN rises, release operations commence and the detector's output voltage increases. Load current (IOUT) will flow at RL. Because a voltage drop (RIN x IOUT) is produced at the RIN resistor, located between the input (IN) and the VIN pin, the load current will flow via the IC's VIN pin. The voltage drop will also lead to a fall in the voltage level at the VIN pin. When the VIN 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 RIN will disappear, the voltage level at the VIN 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 XC61G 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 (RIN) during release voltage operations. (refer to Figure 3)
Since hysteresis exists during detect operations, oscillation is unlikely to occur.

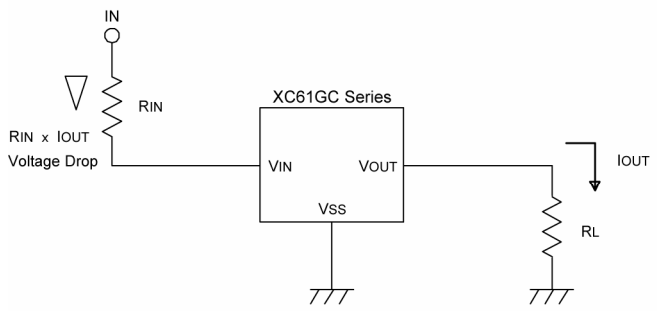


Figure 2: Oscillation in relation to output current

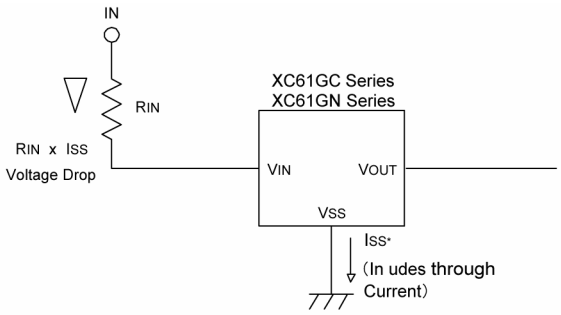
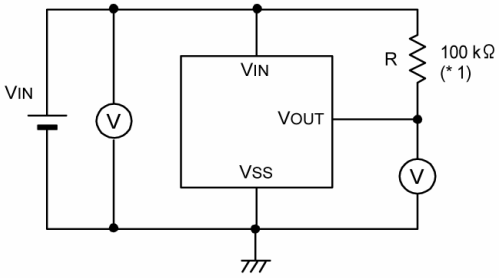


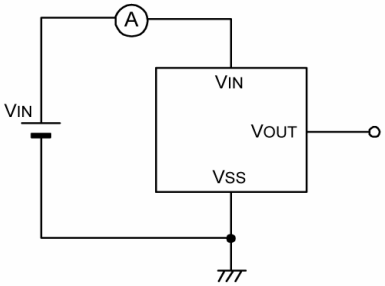
Figure 3: Oscillation in relation to through current

■TEST CIRCUITS

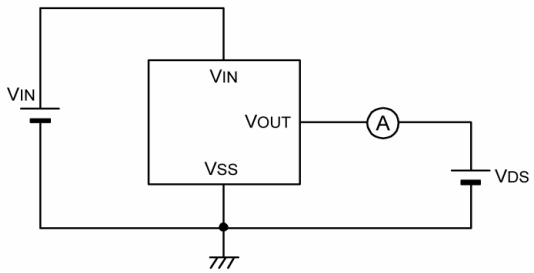
Circuit 1



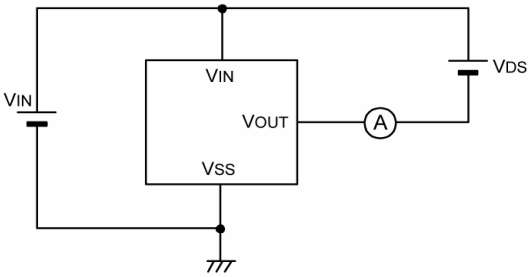
Circuit 2



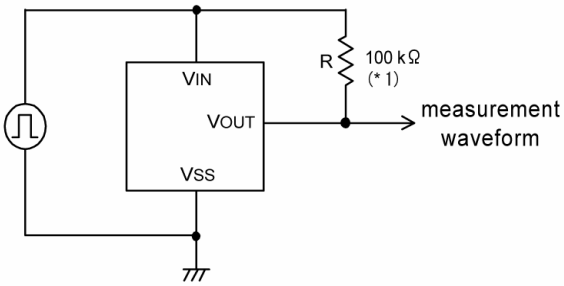
Circuit 3



Circuit 4



Circuit 5

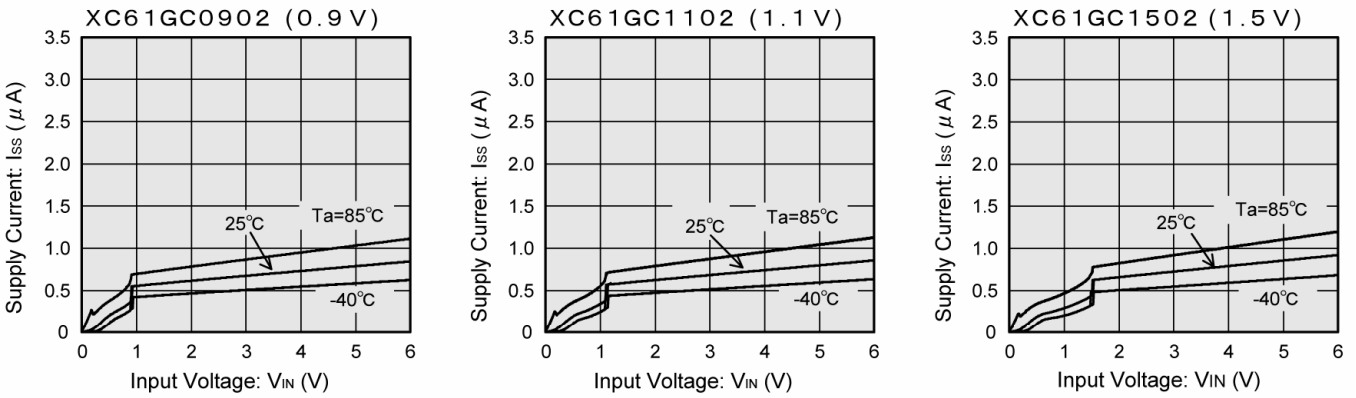


* 1 : The resistor is not necessary with CMOS output products.

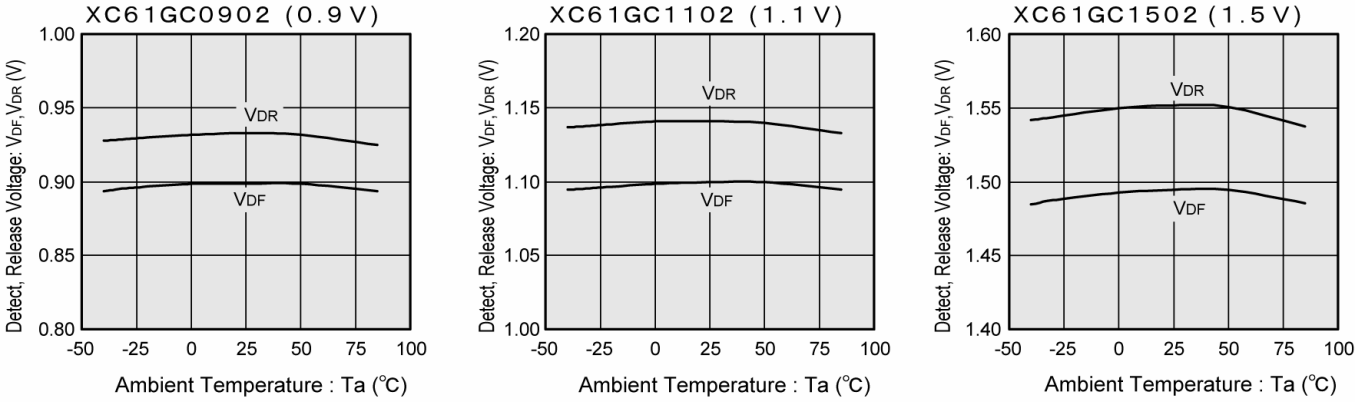
■TYPICAL PERFORMANCE CHARACTERISTICS

●Low Voltage

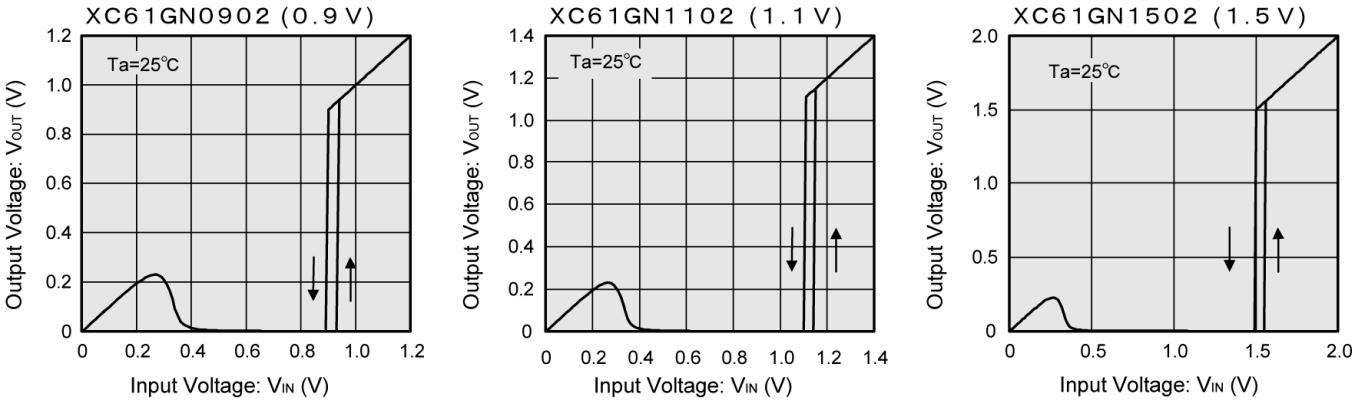
(1) Supply Current vs. Input Voltage



(2) Detect, Release Voltage vs. Ambient Temperature



(3) Output Voltage vs. Input Voltage



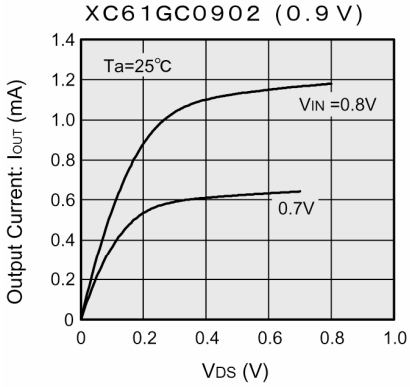
Note : Unless otherwise stated, the N-channel open drain pull-up resistance value is 100kΩ.

■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

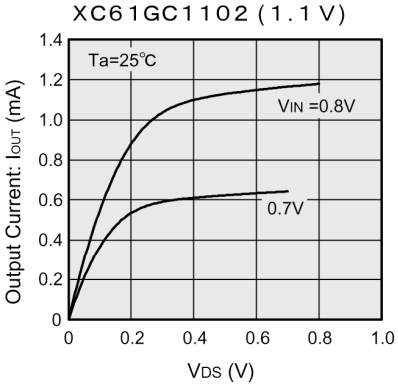
●Low Voltage (Continued)

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

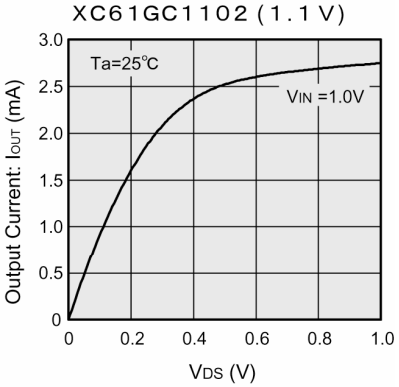
XC61GC0902 (0.9V)



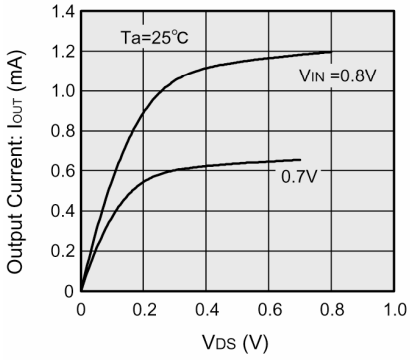
XC61GC1102 (1.1V)



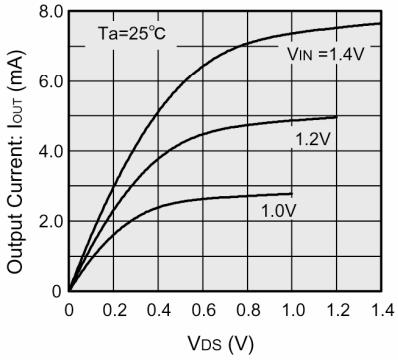
XC61GC1102 (1.1V)



XC61GC1502 (1.5V)

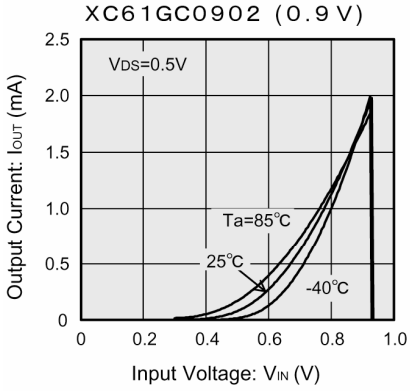


XC61GC1502 (1.5V)

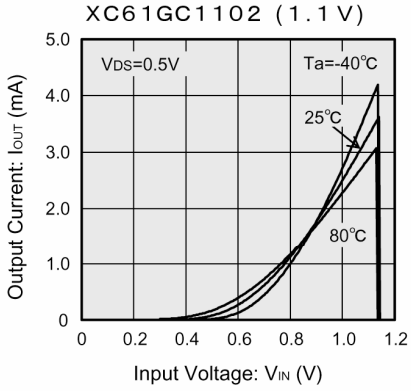


(5) N-ch Driver Output Current vs. Input Voltage

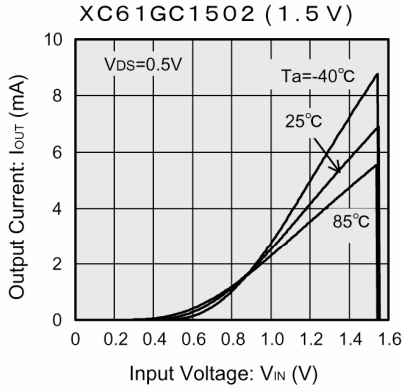
XC61GC0902 (0.9V)



XC61GC1102 (1.1V)

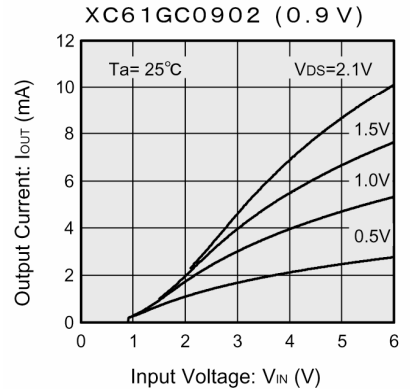


XC61GC1502 (1.5V)

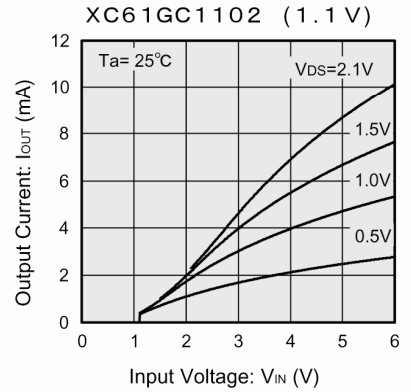


(6) P-ch Driver Output Current vs. Input Voltage

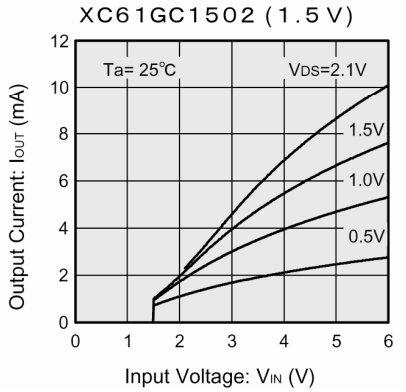
XC61GC0902 (0.9V)



XC61GC1102 (1.1V)



XC61GC1502 (1.5V)

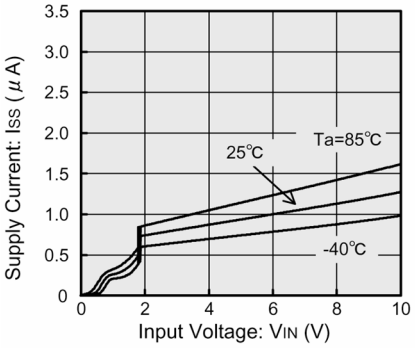


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

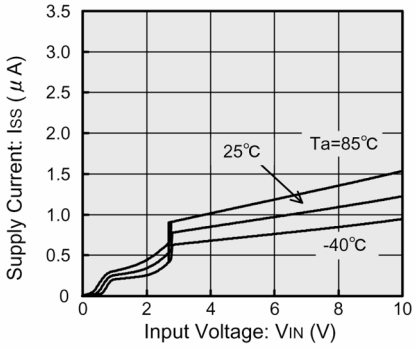
●Standard Voltage

(1) Supply Current vs. Input Voltage

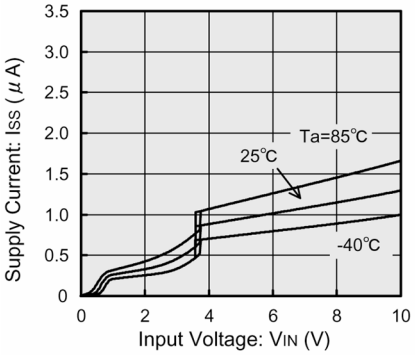
XC61GC1802 (1.8V)



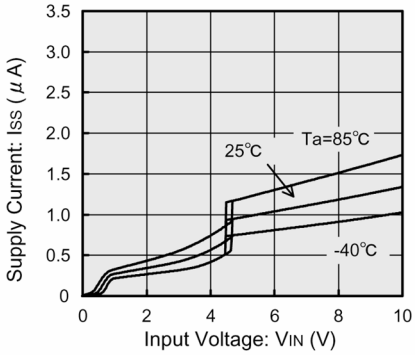
XC61GC2702 (2.7V)



XC61GC3602 (3.6V)

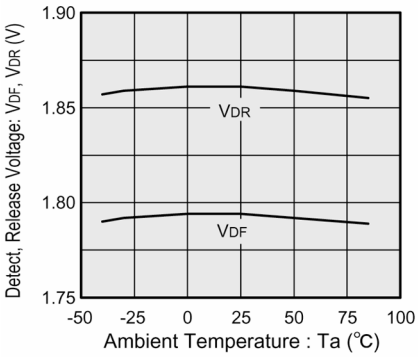


XC61GC4502 (4.5V)

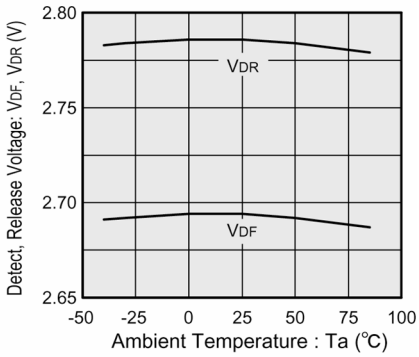


(2) Detect, Release Voltage vs. Ambient Temperature

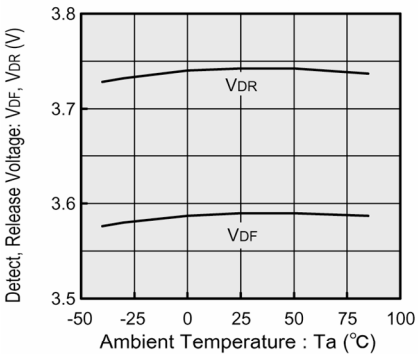
XC61GC1802 (1.8V)



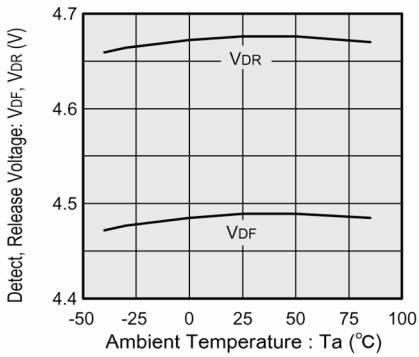
XC61GC2702 (2.7V)



XC61GC3602 (3.6V)



XC61GC4502 (4.5V)

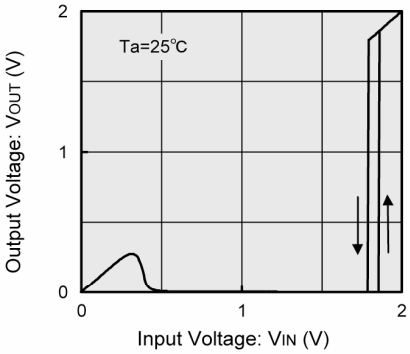


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

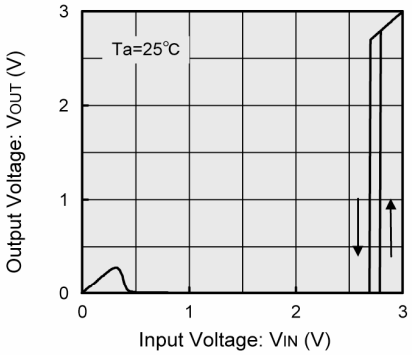
●Standard Voltage (Continued)

(3) Output Voltage vs. Input Voltage

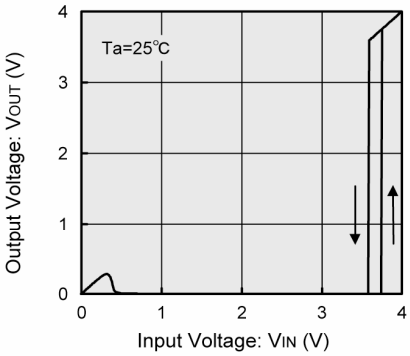
XC61GN1802 (1.8V)



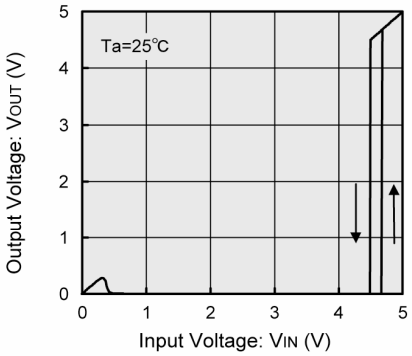
XC61GN2702 (2.7V)



XC61GN3602 (3.6V)



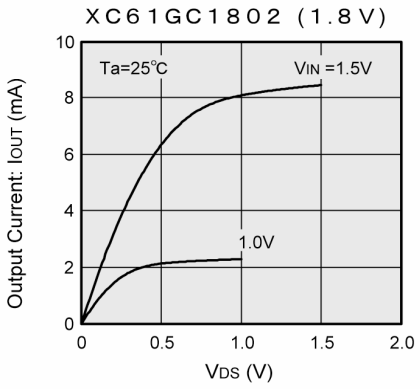
XC61GN4502 (4.5V)



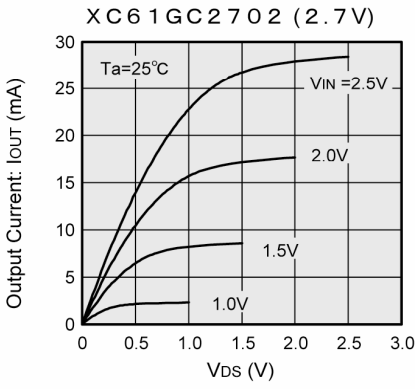
Note : The N-channel open drain pull up resistance value is 100kΩ.

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

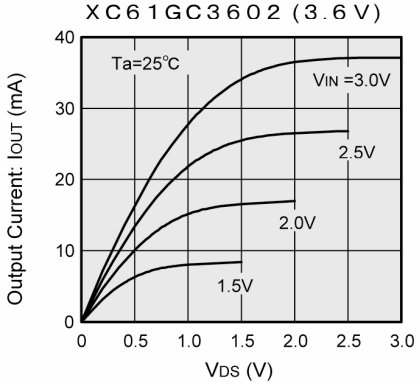
XC61GC1802 (1.8V)



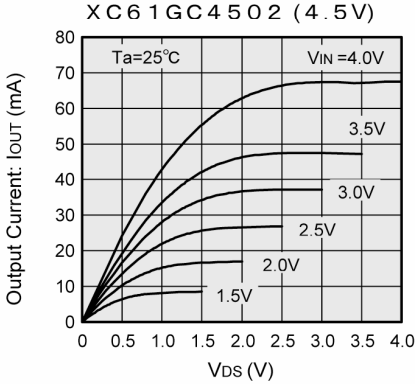
XC61GC2702 (2.7V)



XC61GC3602 (3.6V)



XC61GC4502 (4.5V)

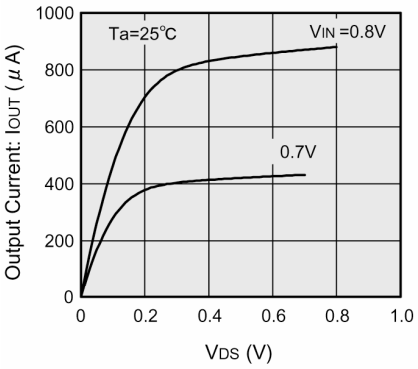


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

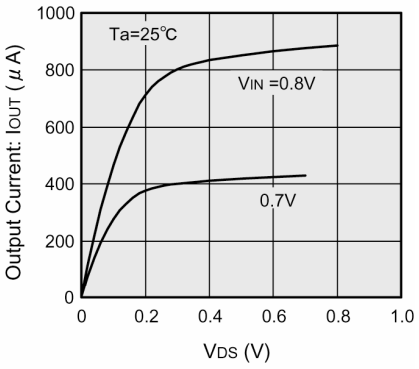
●Standard Voltage (Continued)

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

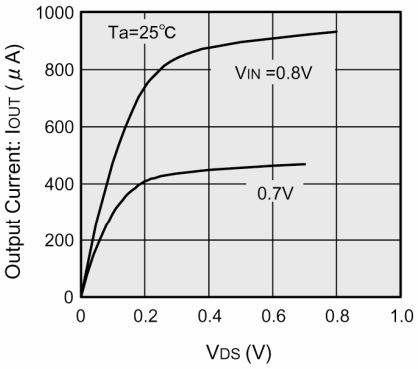
XC61GC1802 (1.8V)



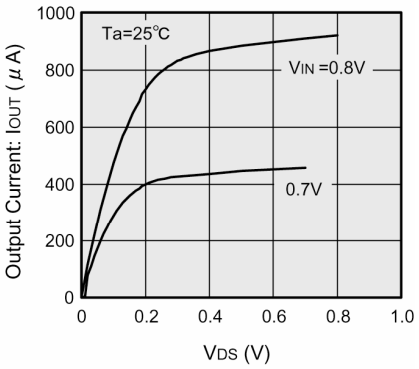
XC61GC2702 (2.7V)



XC61GC3602 (3.6V)

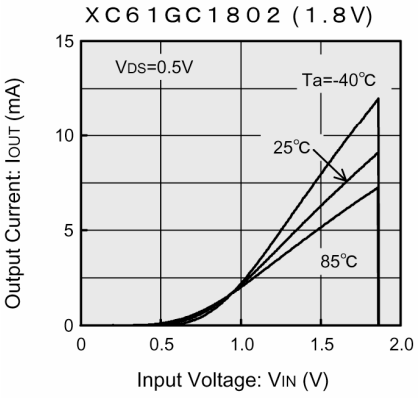


XC61GC4502 (4.5V)

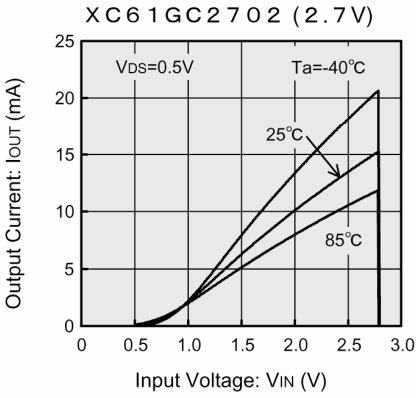


(5) N-ch Driver Output Current vs. Input Voltage

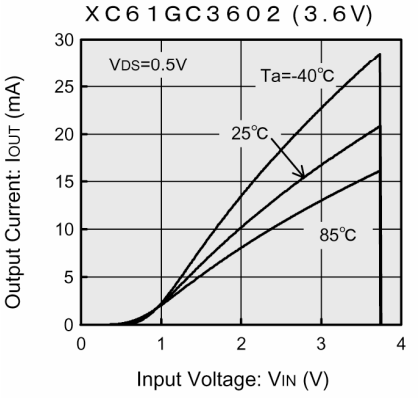
XC61GC1802 (1.8V)



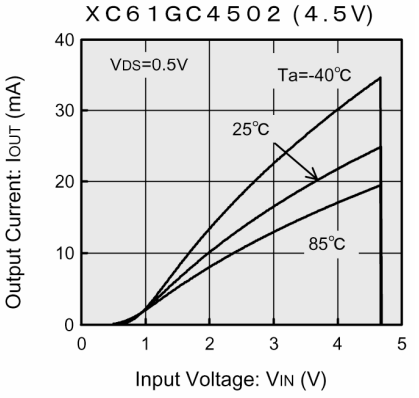
XC61GC2702 (2.7V)



XC61GC3602 (3.6V)



XC61GC4502 (4.5V)

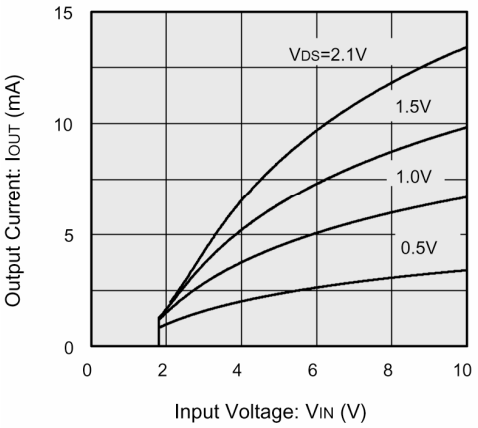


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

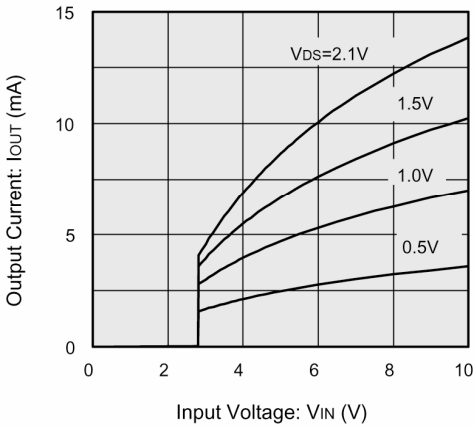
●Standard Voltage (Continued)

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

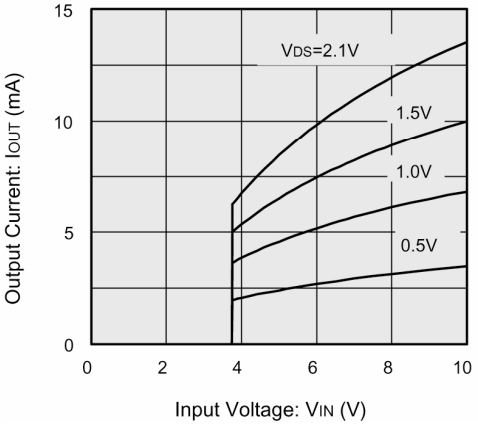
XC61GC1802 (1.8V)



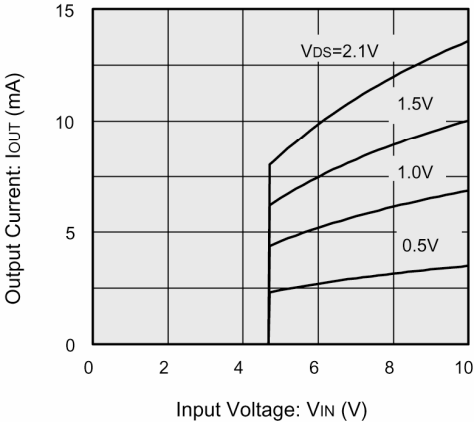
XC61GC2702 (2.7V)



XC61GC3602 (3.6V)

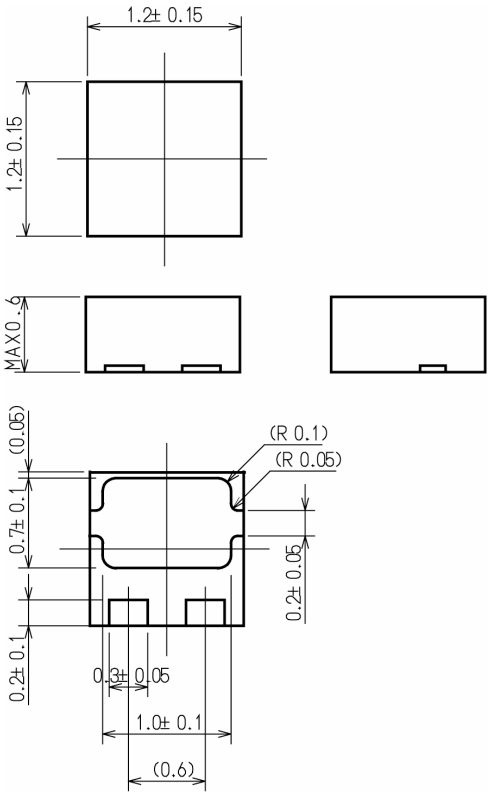


XC61GC4502 (4.5V)



■PACKAGING INFORMATION

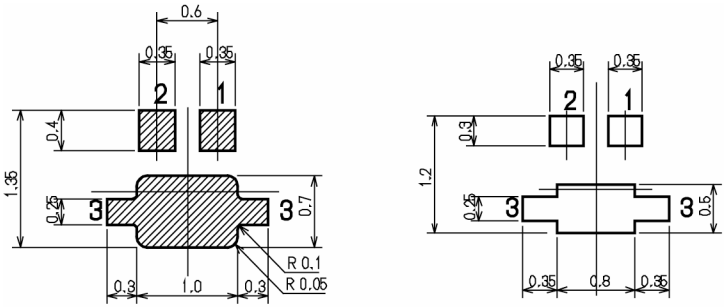
●USP-3



■REFERENCE PATTERN LAYOUT DIMENSIONS

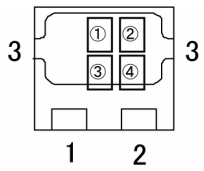
●USP-3

Note: Recommended metal mask design



■MARKING RULE

●USP-3



USP-3
(TOP VIEW)

①Represents integer of output voltage and detect voltage

CMOS Output (XC61GC 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
G	CMOS	6.x

N-channel Open Drain Output (XC61GN 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	5.x
R	N-ch	6.x
S	N-ch	7.x

②Represents 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

③Based on internal standards

MARK
3

④Represents production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excepted)

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