

## 300mA Ultra Small High Speed LDO Regulator, Built-in Inrush Current Protection

### GENERAL DESCRIPTION

The XC6229 series is a high speed LDO regulator that features high accurate, low noise, high ripple rejection, low dropout and low power consumption. Housed in the ultra-small LGA-4B01 (0.75 x 0.75, h=0.3mm MAX.) package, the XC6229 is ideal for space-saving design. The XC6229 consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit, a thermal shutdown circuit and an inrush current protection circuit.

The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor  $C_L$  to be discharged via the internal switch, and as a result the  $V_{OUT}$  pin quickly returns to the  $V_{SS}$  level. The output stabilization capacitor  $C_L$  is also compatible with low ESR ceramic capacitors.

The output voltage is selectable in 0.05V increments within the range of 1.2V to 4.0V which fixed by laser trimming technologies. The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.

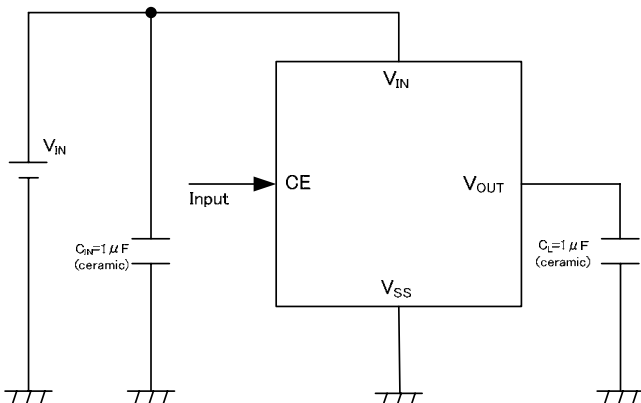
### APPLICATIONS

- Mobile devices / terminals
- Wireless LAN
- Modules (Wireless, Camera, ect.)
- Smart Phones / Mobile phones

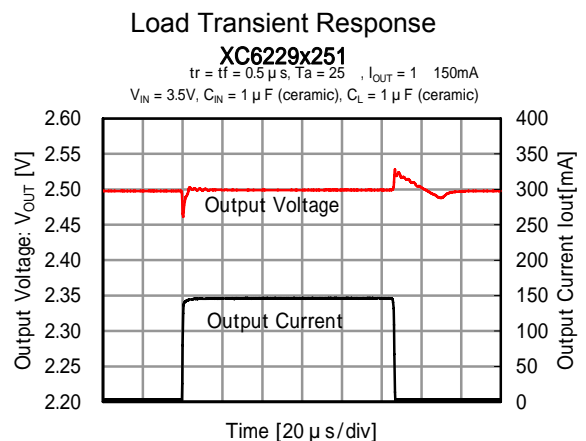
### FEATURES

|                                      |  |
|--------------------------------------|--|
| <b>Maximum Output Current</b>        | : 300mA  |
| <b>Input Voltage Range</b>           | : 1.6 ~ 5.5V   |
| <b>Output Voltages</b>               | : 2.0 ~ 4.0V (Accuracy $\pm 1\%$ )<br>1.2 ~ 1.95V (Accuracy $\pm 20\text{mV}$ )<br>0.05V increments      |
| <b>Dropout Voltage</b>               | : 80mV@ $I_{OUT}=150\text{mA}$ ( $V_{OUT}=3.0\text{V}$ )   |
| <b>Low Power Consumption</b>         | : 100 $\mu\text{A}$  |
| <b>Stand-by Current</b>              | : 0.1 $\mu\text{A}$  |
| <b>High Ripple Rejection</b>         | : 80dB@f=1kHz  |
| <b>Protection Circuits</b>           | : Current Limit (400mA)<br>Short Circuit Protection<br>Over Heat Protection<br>Inrush Current Protection |
| <b>Low ESR Capacitors</b>            | : $C_{IN}=1.0\ \mu\text{F}$ , $C_L=1.0\ \mu\text{F}$   |
| <b>CE Function</b>                   | : Active High<br>$C_L$ High Speed Discharge  |
| <b>Operating Ambient Temperature</b> | : -40 ~ +85  |
| <b>Small Package</b>                 | : LGA-4B01 (0.75mm $\times$ 0.75mm $\times$ h 0.3MAX.)   |
| <b>Environmentally Friendly</b>      | : EU RoHS Compliant, Pb Free   |

### TYPICAL APPLICATION CIRCUIT



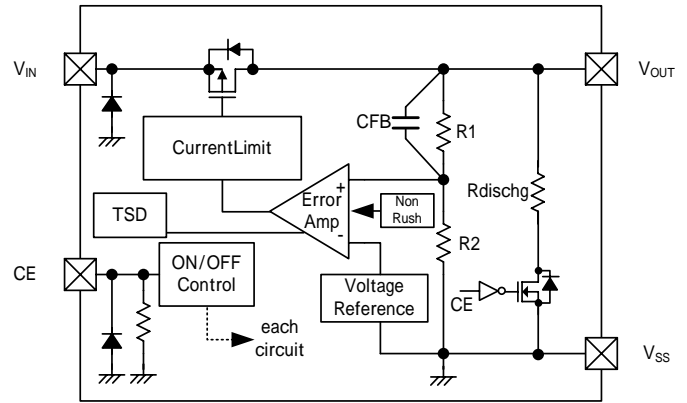
### TYPICAL PERFORMANCE CHARACTERISTICS



## BLOCK DIAGRAMS



XC6229series Type D



XC6229series Type H

\* Diodes inside the circuits are ESD protection diodes and parasitic diodes.

## PRODUCT CLASSIFICATION

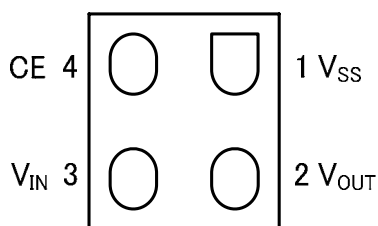
### Ordering Information

XC6229 - (\*)

| DESIGNATOR | ITEM                                  | SYMBOL  | DESCRIPTION  |
|------------|---------------------------------------|---------|--|
|            | Type of Regulator                     | D       | CE Active High<br>Without Inrush Current Protection<br>With CE Pull-down, With $C_L$ discharge |
|            |                                       | H       | CE Active High<br>With Inrush Current Protection<br>With CE Pull-down, With $C_L$ discharge    |
|            | Output Voltage                        | 12 ~ 40 | ex.) 2.80V =2, =8, =please see down below.   |
|            | Output Voltage<br>(2nd decimal place) | 1       | $\pm 1\%$ , In case of 2nd decimal place 0 (ex.2.80V =1)                                       |
|            |                                       | B       | $\pm 1\%$ , In case of 2nd decimal place 5 (ex.2.85V =B)                                       |
| - (*)      | Package<br>(Order Unit)               | 1R-G    | LGA-4B01 (5,000 /Reel)   |

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

## PIN CONFIGURATION



LGA-4B01  
(BOTTOM VIEW)

## PIN ASSIGNMENT

| PIN NUMBER | PIN NAME         | FUNCTIONS      |
|------------|------------------|----------------|
| LGA-4B01   |                  |                |
| 3          | V <sub>IN</sub>  | Power Input    |
| 2          | V <sub>OUT</sub> | Output         |
| 1          | V <sub>SS</sub>  | Ground         |
| 4          | CE               | ON/OFF Control |

## PIN FUNCTION ASSIGNMENT

| CE LOGIC CONDITION | IC OPERATION             |
|--------------------|--------------------------|
| H                  | Operation ON             |
| L                  | Operation OFF (Stand-by) |
| OPEN               | *                        |

\* For D and H types, CE pin voltage is fixed as L level because of internal pull-down resistor.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                     | SYMBOL           | RATINGS                                     | UNITS                            |
|-------------------------------|------------------|---|----------------------------------|
| Input Voltage                 | V <sub>IN</sub>  | V <sub>SS</sub> -0.3 ~ V <sub>SS</sub> +7.0 | V                                |
| Output Current                | I <sub>OUT</sub> | 500 <sup>(*)</sup>                          | mA                               |
| Output Voltage                | V <sub>OUT</sub> | V <sub>SS</sub> -0.3 ~ V <sub>IN</sub> +0.3 | V                                |
| CE Input Voltage              | V <sub>CE</sub>  | V <sub>SS</sub> -0.3 ~ V <sub>SS</sub> +7.0 | V                                |
| Power Dissipation             | LGA-4B01         | Pd  | 150                              |
|                               |                  |   | 600 (PCB mounted) <sup>(*)</sup> |
| Operating Ambient Temperature | Topr             | -40 ~ +85                                   |                                  |
| Storage Temperature           | Tstg             | -55 ~ +125                                  |                                  |

(\*) I<sub>OUT</sub> Pd/(V<sub>IN</sub>-V<sub>OUT</sub>)

(\*) This is a reference data taken by using the test board.

## ELECTRICAL CHARACTERISTICS

XC6229 Series, Type D/H

Ta=25

| PARAMETER                                  | SYMBOL  | CONDITIONS  | MIN.                                    | TYP.                        | MAX.                                    | UNITS    | CIRCUITS |
|--|---|---|---|-----------------------------|---|----------|----------|
| Output Voltage                             | $V_{OUT(E)}$ <sup>(*)</sup>                             | $V_{OUT(T)} = 2.0V, V_{CE}=V_{IN}, I_{OUT}=10mA$  | $V_{OUT(T)} \times 0.99$ <sup>(2)</sup> | $V_{OUT(T)}$ <sup>(2)</sup> | $V_{OUT(T)} \times 1.01$ <sup>(2)</sup> | V        |          |
|  |   | $V_{OUT(T)} < 2.0V, V_{CE}=V_{IN}, I_{OUT}=10mA$ <sup>(3)</sup>   | $V_{OUT(T)} - 20mV$ <sup>(2)</sup>      | $V_{OUT(T)}$ <sup>(2)</sup> | $V_{OUT(T)} + 20mV$ <sup>(2)</sup>      | V        |          |
| Maximum Output Current                     | $I_{OUTMAX}$  | $V_{CE}=V_{IN}$   | 300                                     | -                           | -                                       | mA       |          |
| Load Regulation                            | $\Delta V_{OUT}$  | $V_{CE}=V_{IN}, 0.1mA \leq I_{OUT} \leq 300mA$  | -                                       | 25                          | 45                                      | mV       |          |
| Dropout Voltage                            | $V_{dif}$ <sup>(4)</sup>                                | $V_{CE}=V_{IN}, I_{OUT}=300mA$  | -                                       | E-1                         |   | mV       |          |
| Supply Current                             | $I_{SS}$  | $V_{CE}=V_{IN}$   | -                                       | 100                         | 220                                     | $\mu A$  |          |
| Stand-by Current                           | $I_{STB}$   | $V_{CE}=V_{SS}$   | -                                       | 0.01                        | 0.4                                     | $\mu A$  |          |
| Line Regulation                            | $\frac{\Delta V_{OUT}}{(\Delta V_{IN} \cdot V_{OUT})}$  | $V_{OUT(T)} + 0.5V, V_{IN} = 5.5V, V_{CE}=V_{IN}, I_{OUT}=50mA$   | -                                       | 0.01                        | 0.1                                     | %/V      |          |
| Input Voltage                              | $V_{IN}$  | -   | 1.6                                     | -                           | 5.5                                     | V        |          |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{(\Delta T_{opr} \cdot V_{OUT})}$ | $V_{CE}=V_{IN}, I_{OUT}=10mA, -40 \leq T_a \leq 85$   | -                                       | $\pm 100$                   | -                                       | ppm/     |          |
| Power Supply Rejection Ratio               | PSRR  | $V_{OUT(T)} < 2.5V, V_{IN}=3.0V_{DC}+0.5V_{p-pAC}, V_{CE}=V_{OUT(T)}+1.0V, I_{OUT}=30mA, f=1kHz$                | -                                       | 80                          | -                                       | dB       |          |
|  |   | $V_{OUT(T)} = 2.5V, V_{IN}=\{V_{OUT(T)}+1.0\}V_{DC}+0.5V_{p-pAC}, V_{CE}=V_{OUT(T)}+1.0V, I_{OUT}=30mA, f=1kHz$ |   |                             |   |          |          |
| Current Limit                              | $I_{LIM}$   | $V_{CE}=V_{IN}$   | 310                                     | 400                         | -                                       | mA       |          |
| Short Current                              | $I_{SHORT}$   | $V_{CE}=V_{IN}, V_{OUT}=V_{SS}$   | -                                       | 50                          | -                                       | mA       |          |
| CE High Level Voltage                      | $V_{CEH}$   | -   | 1.0                                     | -                           | 5.5                                     | V        |          |
| CE Low Level Voltage                       | $V_{CEL}$   | -   | 0                                       | -                           | 0.3                                     | V        |          |
| CE High Level Current                      | $I_{CEH}$   | $V_{CE}=V_{IN}=5.5V$  | 3.0                                     | 5.5                         | 9.0                                     | $\mu A$  |          |
| CE Low Level Current                       | $I_{CEL}$   | $V_{CE}=V_{SS}$   | -0.1                                    | -                           | 0.1                                     | $\mu A$  |          |
| $C_L$ Discharge Resistance                 | $R_{DCHG}$  | $V_{IN}=5.5V, V_{OUT}=2.0V, V_{CE}=V_{SS}$  | -                                       | 300                         | -                                       | $\Omega$ |          |
| Inrush Current (H Type)                    | $I_{rush}$  | $V_{IN}=5.5V, V_{CE}=0 \rightarrow 5.5V$  | -                                       | 150                         | -                                       | mA       |          |
| Thermal Shutdown Detect Temperature        | $T_{TSD}$   | Junction Temperature  | -                                       | 150                         | -                                       |          |          |
| Thermal Shutdown Release Temperature       | $T_{TSR}$   | Junction Temperature  | -                                       | 120                         | -                                       |          |          |
| Thermal Shutdown Hysteresis Width          | $T_{TSD} - T_{TSR}$                                     | Junction Temperature  | -                                       | 30                          | -                                       |          |          |

**NOTE:**

Unless otherwise stated regarding input voltage conditions,  $V_{IN}=V_{OUT(T)} + 1.0V$ .

(\*1)  $V_{OUT(E)}$ : Effective output voltage  
(i.e. the output voltage when " $V_{OUT(T)}+1.0V$ " is provided at the  $V_{IN}$  pin while maintaining a certain  $I_{OUT}$  value.)

(\*2)  $V_{OUT(T)}$ : Nominal output voltage

(\*3) The standard output voltage is specified in  $V_{OUT(T)} \pm 20mV$  where  $V_{OUT(T)} < 2.0V$ .

(\*4)  $V_{dif} = V_{IN1} - V_{OUT1}$  ( $V_{IN1} = 1.6V$ )

$V_{IN1}$ =The input voltage when  $V_{OUT1}$  appears as input voltage is gradually decreased.

$V_{OUT1}$ =A voltage equal to 98% of the output voltage whenever an amply stabilized  $V_{OUT(T)}+1.0V$  is input for every  $I_{OUT}$ .

# OUTPUT VOLTAGE CHART

Voltage Chart 1

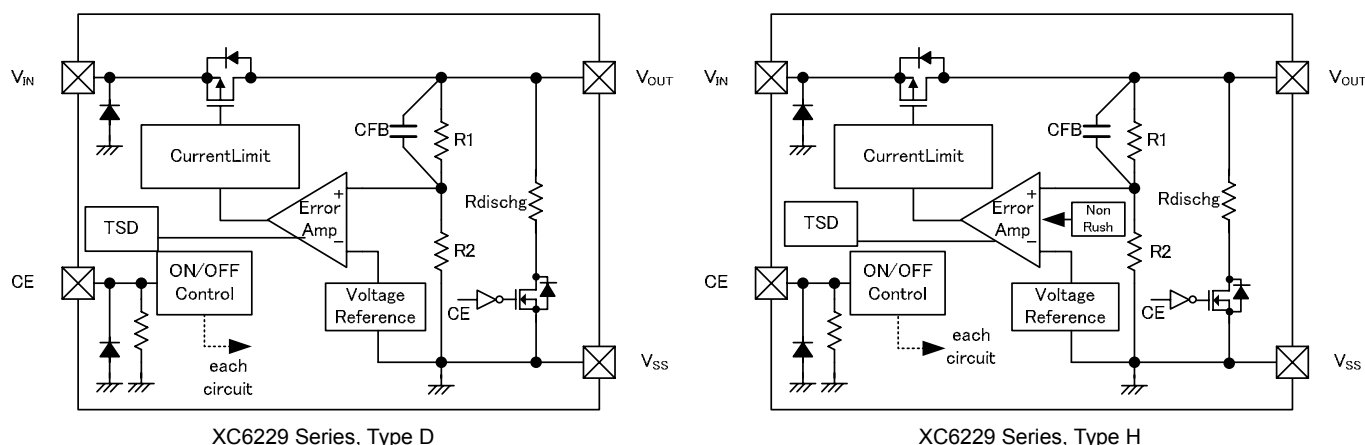
| NOMINAL<br>OUTPUT<br>VOLTAGE<br>(V) | OUTPUT VOLTAGE<br>(V) |        | DROPOUT VOLTAGE<br>(mV)<br>E-1 |      |
|-------------------------------------|-----------------------|--------|--------------------------------|------|
|                                     | $V_{OUT(E)}$          |        | $V_{dif}$                      |      |
|                                     | MIN.                  | MAX.   | TYP.                           | MAX. |
| $V_{OUT(T)}$                        |                       |        |                                |      |
| 1.20                                | 1.1800                | 1.2200 | 470                            | 625  |
| 1.25                                | 1.2300                | 1.2700 |                                |      |
| 1.30                                | 1.2800                | 1.3200 |                                |      |
| 1.35                                | 1.3300                | 1.3700 | 420                            | 575  |
| 1.40                                | 1.3800                | 1.4200 |                                |      |
| 1.45                                | 1.4300                | 1.4700 | 380                            | 505  |
| 1.50                                | 1.4800                | 1.5200 |                                |      |
| 1.55                                | 1.5300                | 1.5700 | 350                            | 455  |
| 1.60                                | 1.5800                | 1.6200 |                                |      |
| 1.65                                | 1.6300                | 1.6700 |                                |      |
| 1.70                                | 1.6800                | 1.7200 | 320                            | 440  |
| 1.75                                | 1.7300                | 1.7700 |                                |      |
| 1.80                                | 1.7800                | 1.8200 |                                |      |
| 1.85                                | 1.8300                | 1.8700 | 260                            | 380  |
| 1.90                                | 1.8800                | 1.9200 |                                |      |
| 1.95                                | 1.9300                | 1.9700 |                                |      |
| 2.00                                | 1.9800                | 2.0200 |                                |      |
| 2.05                                | 2.0295                | 2.0705 | 230                            | 340  |
| 2.10                                | 2.0790                | 2.1210 |                                |      |
| 2.15                                | 2.1285                | 2.1715 |                                |      |
| 2.20                                | 2.1780                | 2.2220 |                                |      |
| 2.25                                | 2.2275                | 2.2725 |                                |      |
| 2.30                                | 2.2770                | 2.3230 |                                |      |
| 2.35                                | 2.3265                | 2.3735 |                                |      |
| 2.40                                | 2.3760                | 2.4240 |                                |      |
| 2.45                                | 2.4255                | 2.4745 |                                |      |
| 2.50                                | 2.4750                | 2.5250 | 190                            | 300  |
| 2.55                                | 2.5245                | 2.5755 |                                |      |
| 2.60                                | 2.5740                | 2.6260 |                                |      |
| 2.65                                | 2.6235                | 2.6765 |                                |      |
| 2.70                                | 2.6730                | 2.7270 |                                |      |
| 2.75                                | 2.7225                | 2.7775 |                                |      |
| 2.80                                | 2.7720                | 2.8280 |                                |      |
| 2.85                                | 2.8215                | 2.8785 |                                |      |
| 2.90                                | 2.8710                | 2.9290 |                                |      |
| 2.95                                | 2.9205                | 2.9795 |                                |      |

## OUTPUT VOLTAGE CHART (Continued)

Voltage Chart 2

| NOMINAL<br>OUTPUT<br>VOLTAGE<br>(V) | OUTPUT VOLTAGE<br>(V) |        | DROPOUT VOLTAGE<br>(mV)<br>E-1 |      |
|-------------------------------------|-----------------------|--------|--------------------------------|------|
|                                     | $V_{OUT(E)}$          |        | $V_{dif}$                      |      |
|                                     | MIN.                  | MAX.   | TYP.                           | MAX. |
| 3.00                                | 2.9700                | 3.0300 | 160                            | 260  |
| 3.05                                | 3.0195                | 3.0805 |                                |      |
| 3.10                                | 3.0690                | 3.1310 |                                |      |
| 3.15                                | 3.1185                | 3.1815 |                                |      |
| 3.20                                | 3.1680                | 3.2320 |                                |      |
| 3.25                                | 3.2175                | 3.2825 |                                |      |
| 3.30                                | 3.2670                | 3.3330 |                                |      |
| 3.35                                | 3.3165                | 3.3835 |                                |      |
| 3.40                                | 3.3660                | 3.4340 |                                |      |
| 3.45                                | 3.4155                | 3.4845 |                                |      |
| 3.50                                | 3.4650                | 3.5350 |                                |      |
| 3.55                                | 3.5145                | 3.5855 |                                |      |
| 3.60                                | 3.5640                | 3.6360 |                                |      |
| 3.65                                | 3.6135                | 3.6865 |                                |      |
| 3.70                                | 3.6630                | 3.7370 |                                |      |
| 3.75                                | 3.7125                | 3.7875 |                                |      |
| 3.80                                | 3.7620                | 3.8380 |                                |      |
| 3.85                                | 3.8115                | 3.8885 |                                |      |
| 3.90                                | 3.8610                | 3.9390 |                                |      |
| 3.95                                | 3.9105                | 3.9895 |                                |      |
| 4.00                                | 3.9600                | 4.0400 |                                |      |

## OPERATIONAL EXPLANATION



The voltage divided by resistors R1 & R2 is compared with the internal reference voltage by the error amplifier. The P-channel MOSFET which is connected to the  $V_{OUT}$  pin is then driven by the subsequent output signal. The output voltage at the  $V_{OUT}$  pin is controlled and stabilized by a system of negative feedback. The current limit circuit and short circuit protection operate in relation to the level of output current and heat dissipation. Further, the IC's internal circuitry can be shutdown via the CE pin signal.

### <Low ESR Capacitor>

The XC6229 series needs an output capacitor  $C_L$  for phase compensation. Please place an output capacitor ( $C_L$ ) at the output pin ( $V_{OUT}$ ) and the ground pin ( $V_{SS}$ ) as close as possible. Please use the output capacitor ( $C_L$ ) is 1.0  $\mu$ F or larger. For a stable power input, please connect an input capacitor ( $C_{IN}$ ) of 1.0  $\mu$ F between the  $V_{IN}$  pin and the  $V_{SS}$  pin.

### <Current Limiter, Short-Circuit Protection>

The XC6229 has current limiter and droop shape of fold-back circuit. When the load current reaches the current limit, the droop current limiter circuit operates and the output voltage drops. When the output voltage dropped, the fold-back circuit operates and the output current goes to decrease. The output current finally falls at the level of 50mA when the output pin is short-circuited.

### <CE Pin>

The IC's internal circuitry can be shutdown via the signal from the CE pin. In shutdown mode, the XC6229 series enables the electric charge at the output capacitor ( $C_L$ ) to be discharged via the internal switch located between the  $V_{OUT}$  and  $V_{SS}$  pins, and as a result the  $V_{OUT}$  pin quickly returns to the  $V_{SS}$  level. The XC6229 series has a pull-down resistor at the CE pin inside, so that the CE pin input current flows.

### <Thermal Shutdown>

When the junction temperature of the built-in driver transistor reaches the temperature limit, the thermal shutdown circuit operates and the driver transistor will be set to OFF. The IC resumes its operation when the thermal shutdown function is released and the IC's operation is automatically restored because the junction temperature drops to the level of the thermal shutdown release voltage.

### <Inrush Current Protection>

The inrush current protection circuit is built in the XC6229 type H.

When the IC starts to operate, the protection circuit limits the inrush current from input pin ( $V_{IN}$ ) to output pin ( $V_{OUT}$ ) to charge  $C_L$  capacitor.

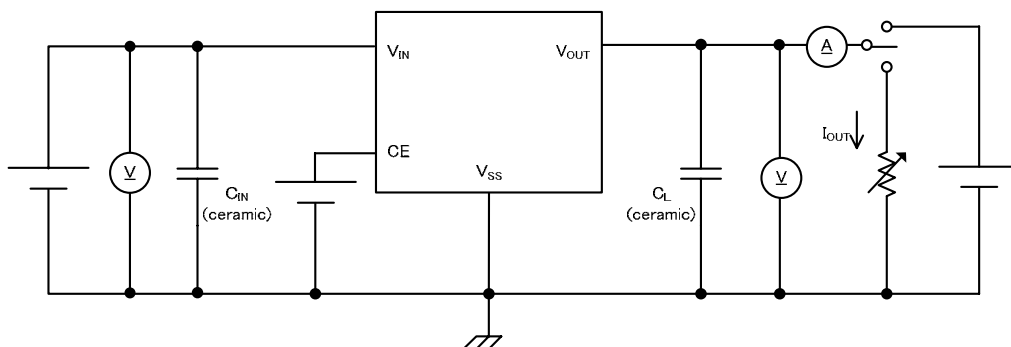
## NOTES ON USE

- 1 . For temporary, transitional voltage drop or voltage rising phenomenon, the IC is liable to malfunction should the ratings be exceeded.
- 2 . Where wiring impedance is high, operations may become unstable due to the noise and/or phase lag depending on output current. Please strengthen  $V_{IN}$  and  $V_{SS}$  wiring in particular.
- 3 . The input capacitor  $C_{IN}$  and the output capacitor  $C_L$  should be placed to the as close as possible with a shorter wiring.
- 4 . The type H is controlled with constant current start-up. Start-up sequence control is requested to draw a load current after the output voltage is raised up to around the internally fixed nominal output voltage.
- 5 . 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.

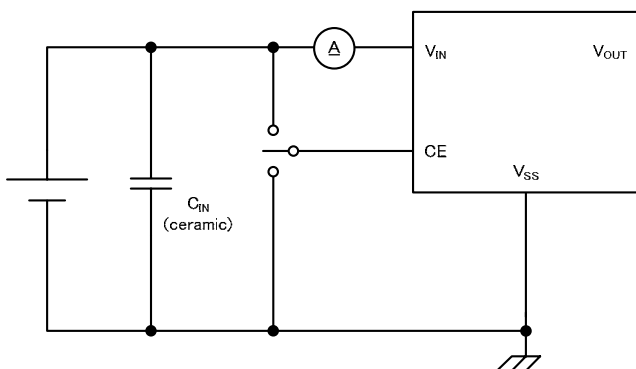


# TEST CIRCUITS

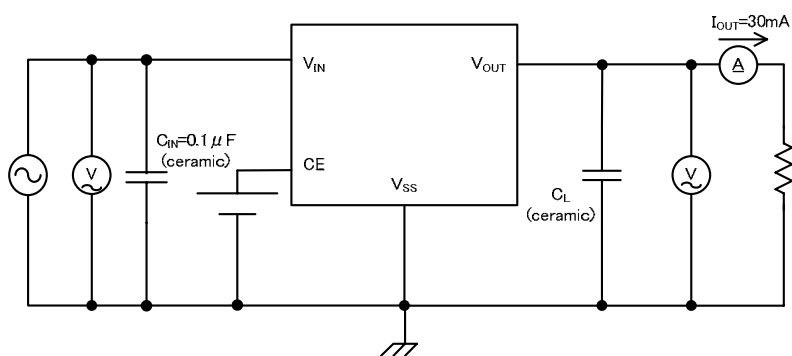
Circuit



Circuit

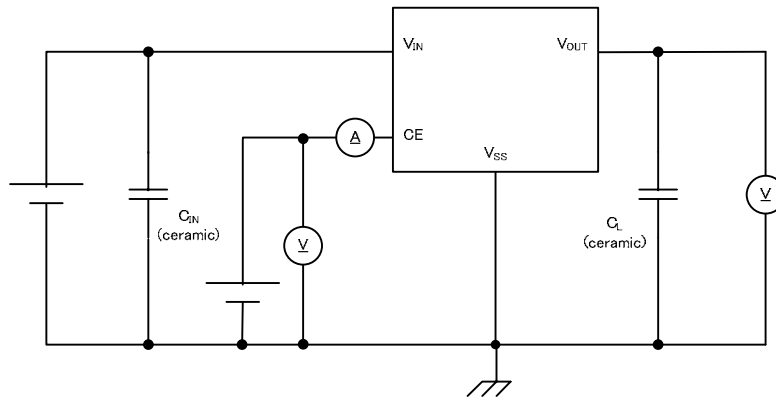


Circuit

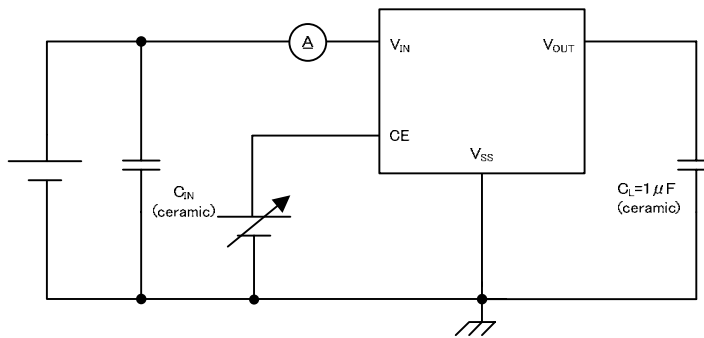


## TEST CIRCUITS (Continued)

Circuit

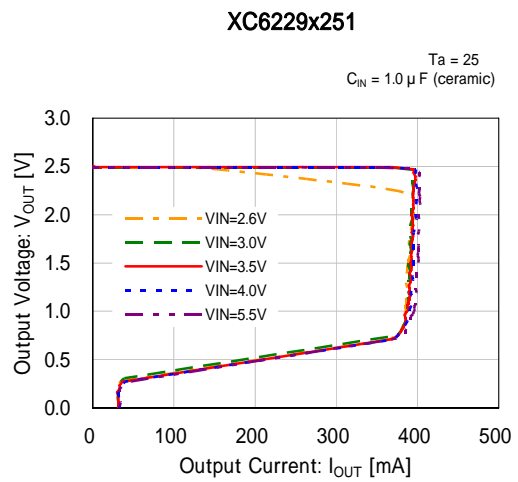
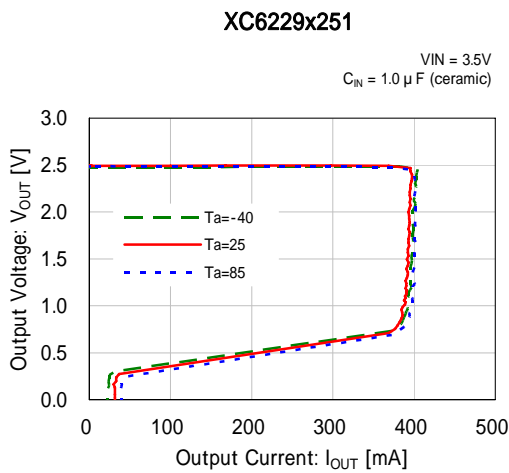
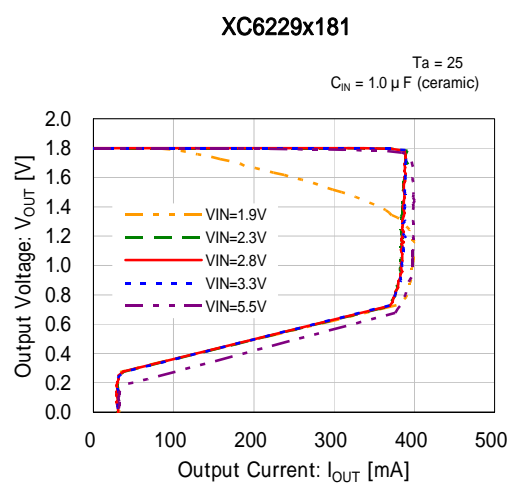
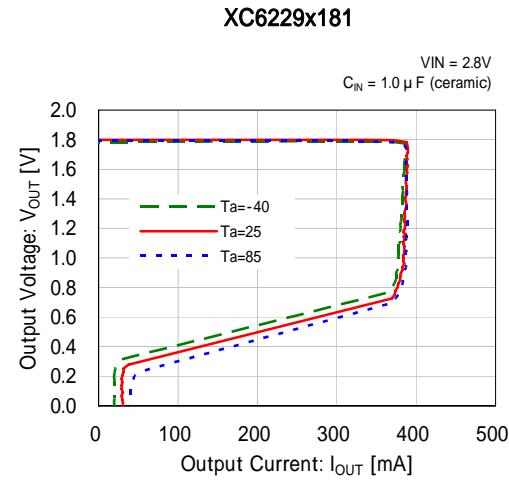
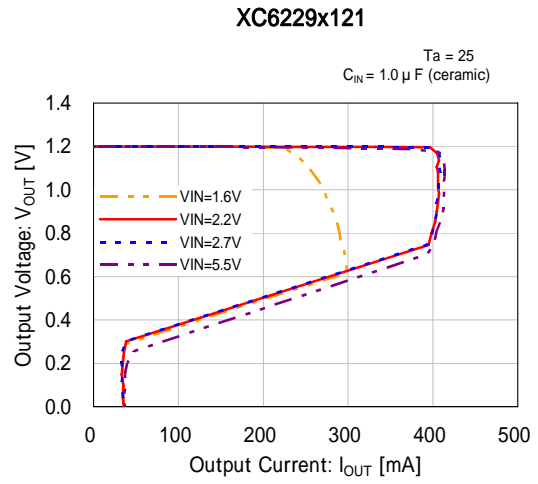
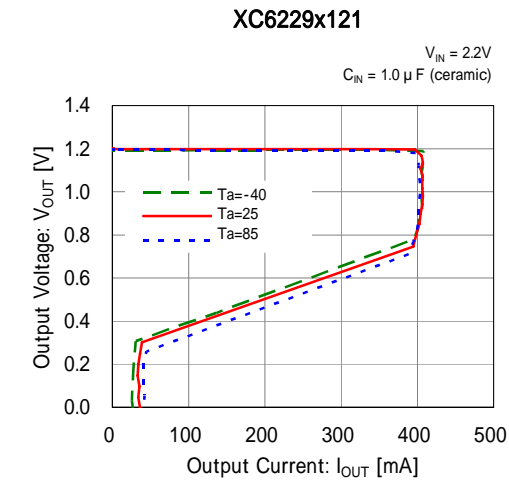


Circuit



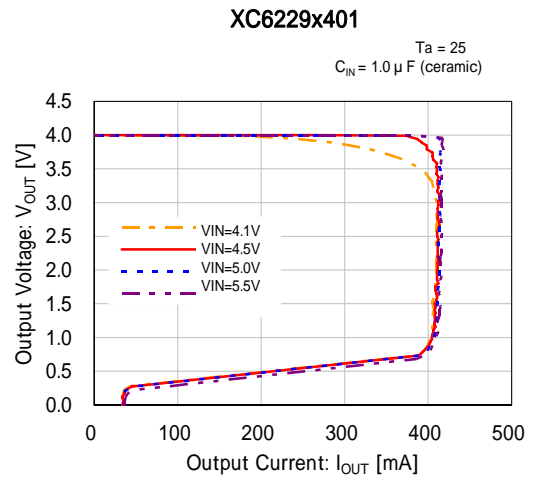
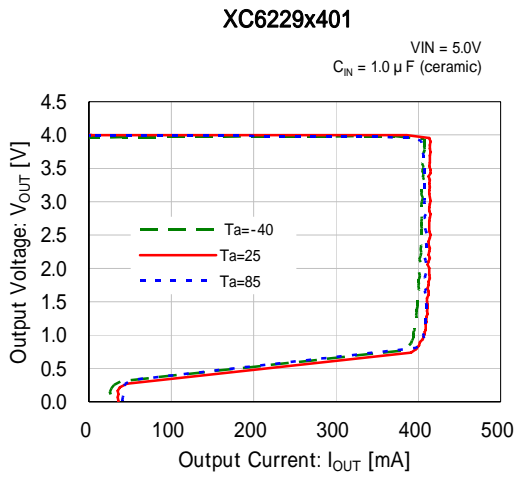
# TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current

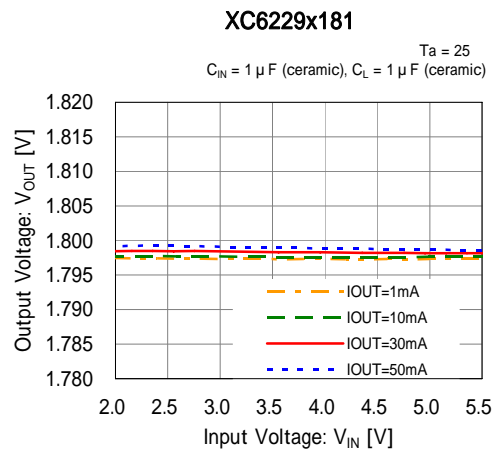
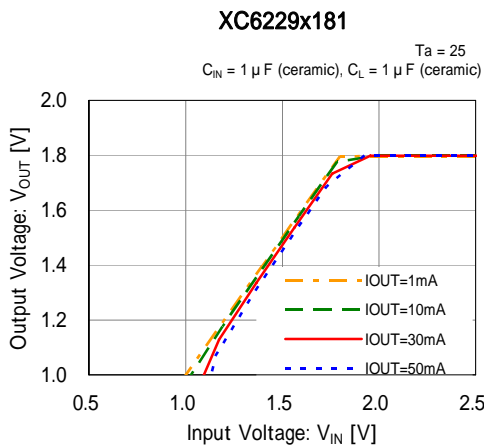
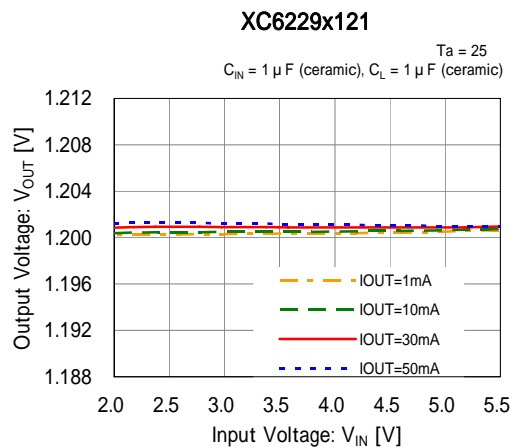


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(1) Output Voltage vs. Output Current (Continued)

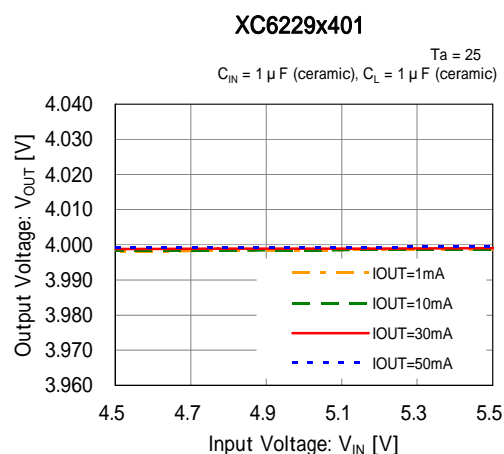
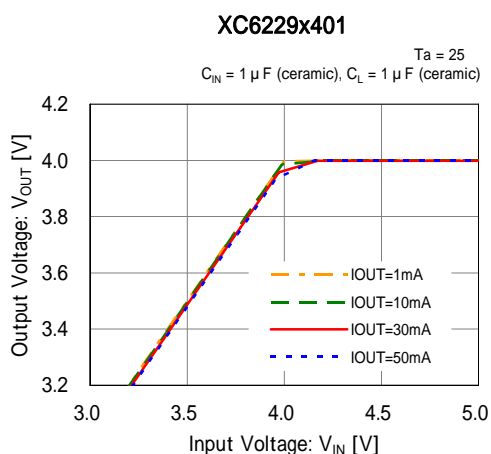
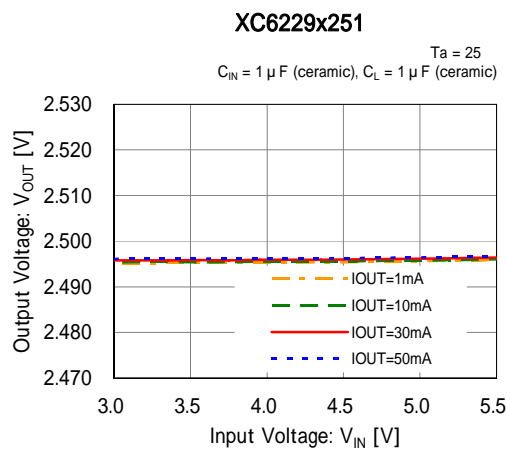
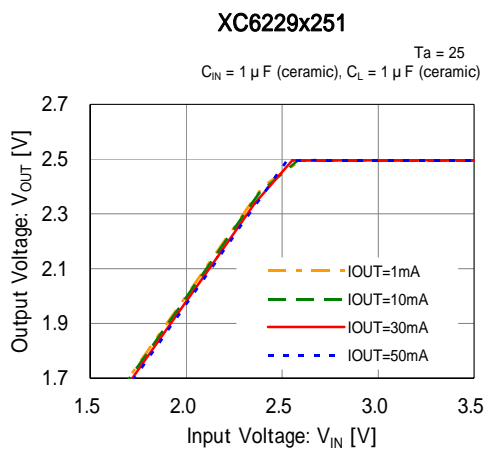


(2) Output Voltage vs. Input Voltage

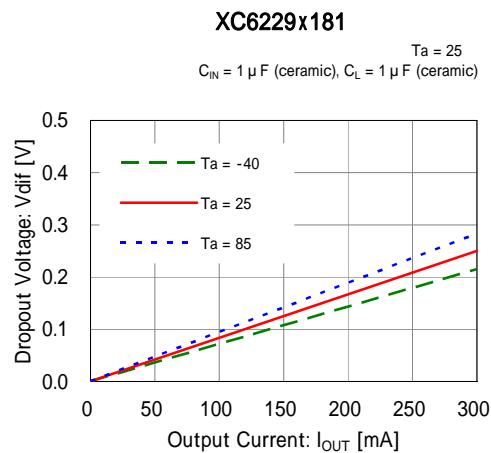
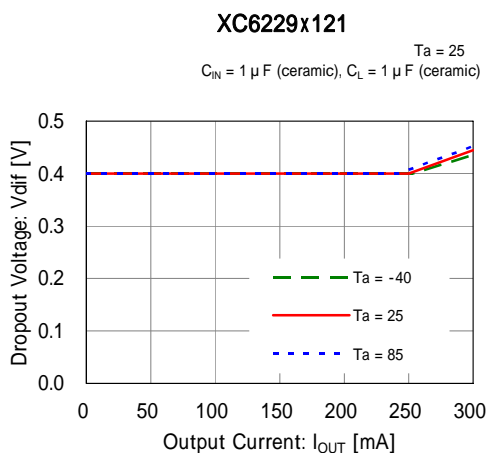


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (2) Output Voltage vs. Input Voltage (Continued)



### (3) Dropout Voltage vs. Output Current

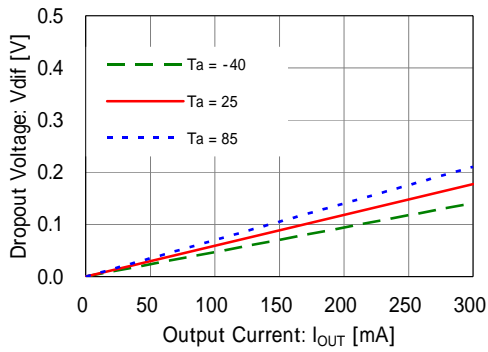


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (3) Dropout Voltage vs. Output Current (Continued)

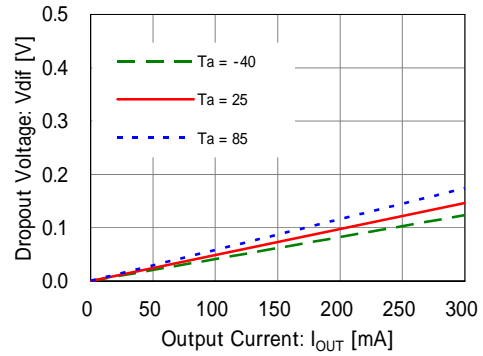
**XC6229x251**

$T_a = 25$   
 $C_{IN} = 1 \mu F$  (ceramic),  $C_L = 1 \mu F$  (ceramic)



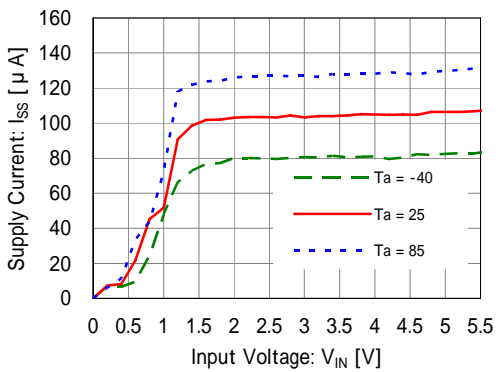
**XC6229x401**

$T_a = 25$   
 $C_{IN} = 1 \mu F$  (ceramic),  $C_L = 1 \mu F$  (ceramic)

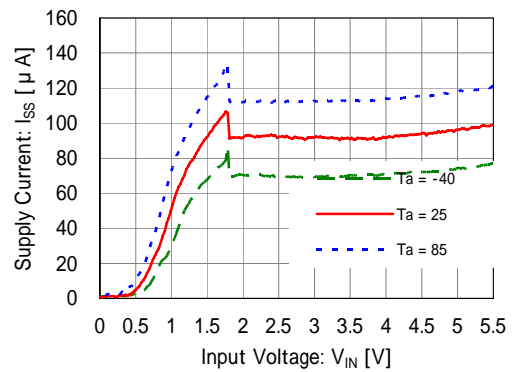


### (4) Supply Current vs. Input Voltage

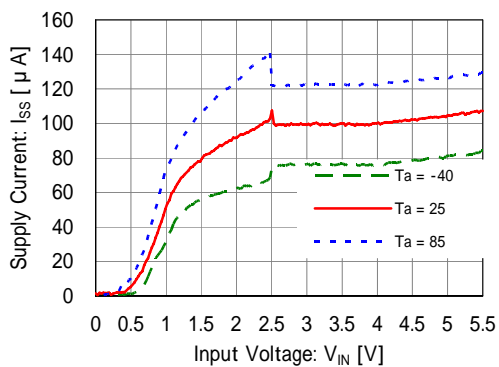
**XC6229x121**



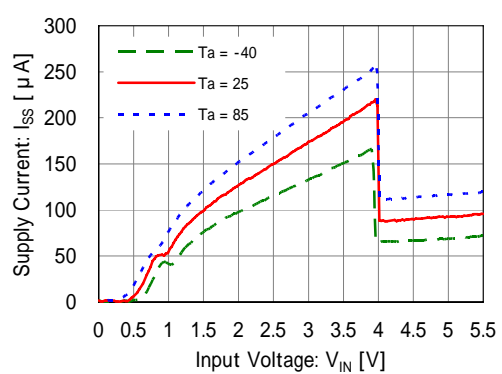
**XC6229x181**



**XC6229x251**

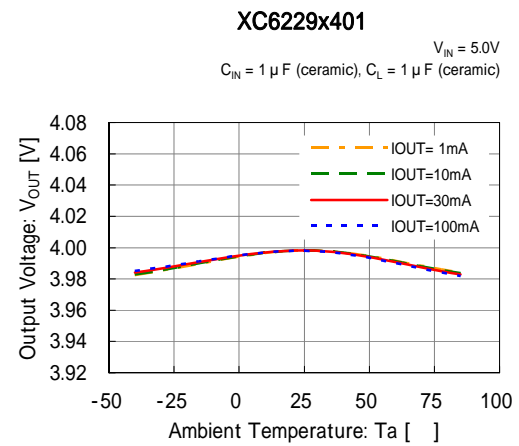
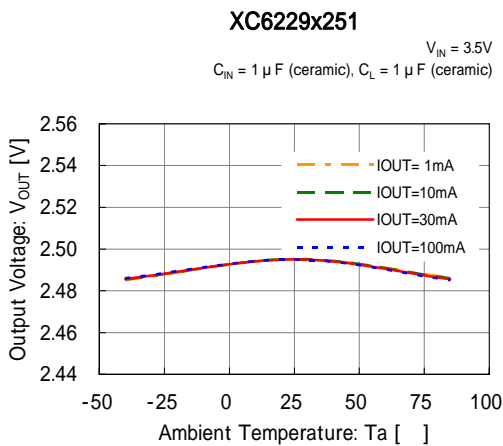
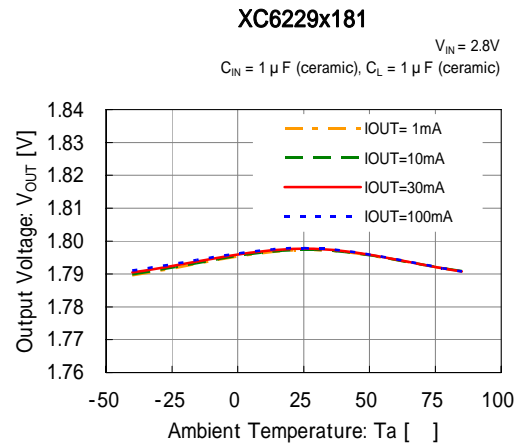
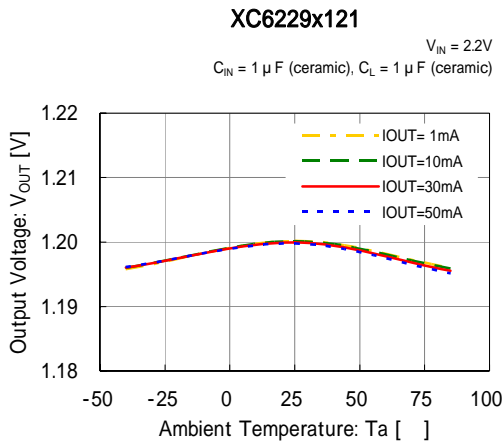


**XC6229x401**

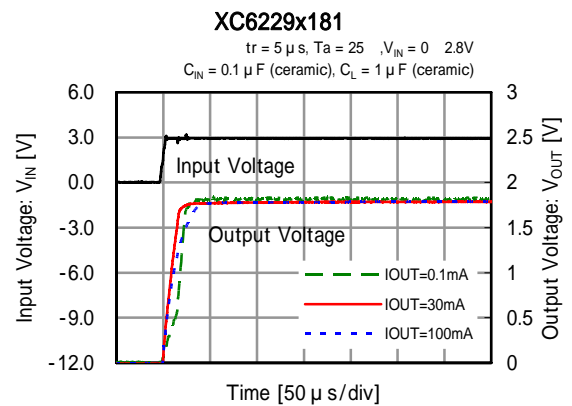
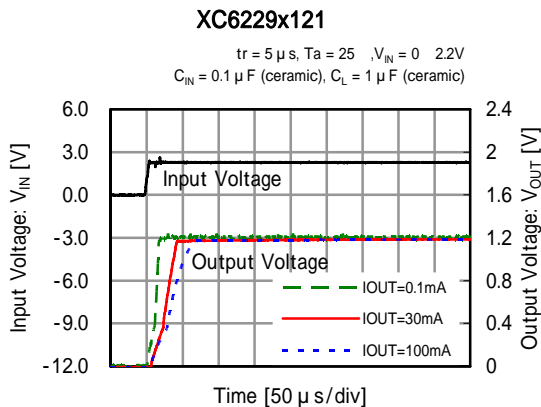


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (5) Output Voltage vs. Ambient Temperature



### (6) Rising Response Time

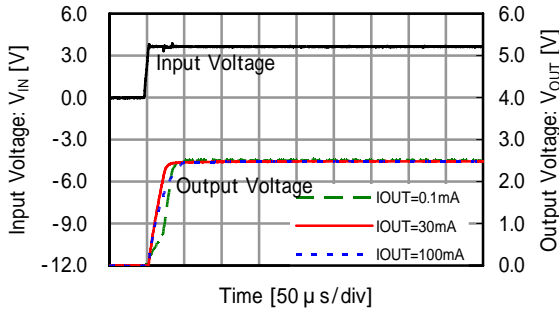


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (6) Rising Response Time (Continued)

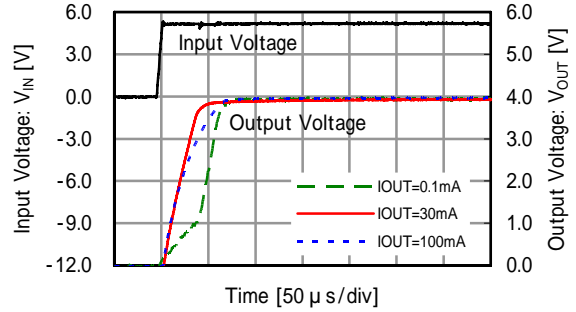
**XC6229x251**

$t_r = 5 \mu s$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 0 \sim 3.5V$   
 $C_{IN} = 0.1 \mu F$  (ceramic),  $C_L = 1 \mu F$  (ceramic)



**XC6229x401**

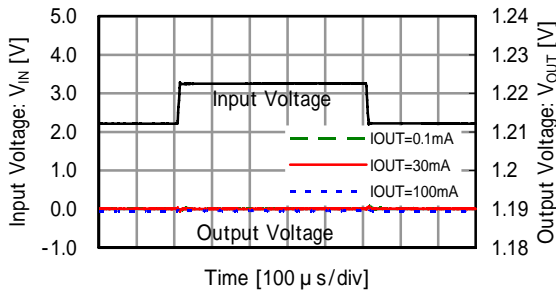
$t_r = 5 \mu s$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 0 \sim 5.0V$   
 $C_{IN} = 0.1 \mu F$  (ceramic),  $C_L = 1 \mu F$  (ceramic)



### (7) Input Transient Response

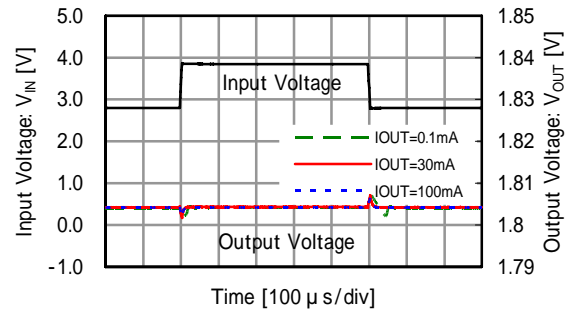
**XC6229x121**

$t_r = t_f = 5 \mu s$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 2.2V \sim 3.2V$   
 $C_{IN} = 0.1 \mu F$  (ceramic),  $C_L = 1.0 \mu F$  (ceramic)



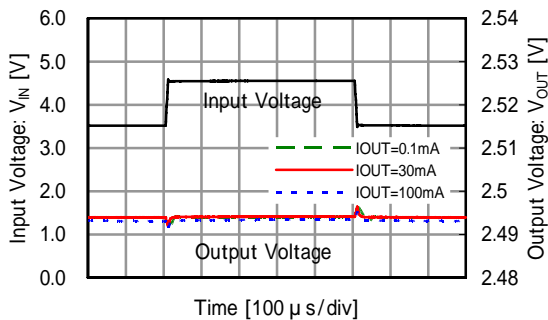
**XC6229x181**

$t_r = t_f = 5 \mu s$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 2.8V \sim 3.8V$   
 $C_{IN} = 0.1 \mu F$  (ceramic),  $C_L = 1.0 \mu F$  (ceramic)



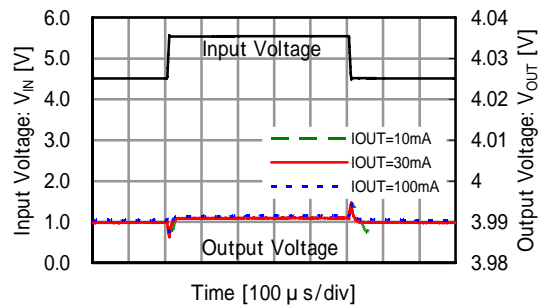
**XC6229x251**

$t_r = t_f = 5 \mu s$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 3.5V \sim 4.5V$   
 $C_{IN} = 0.1 \mu F$  (ceramic),  $C_L = 1.0 \mu F$  (ceramic)



**XC6229x401**

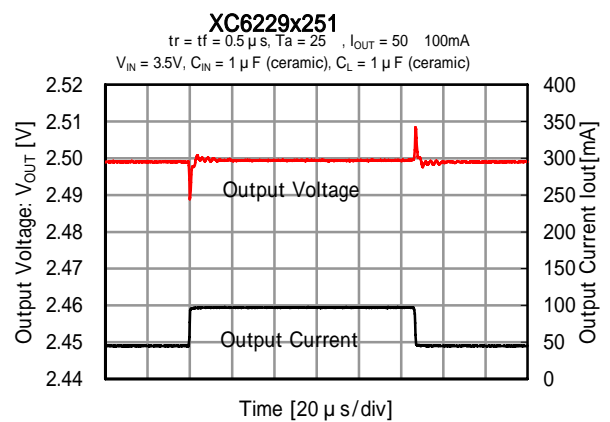
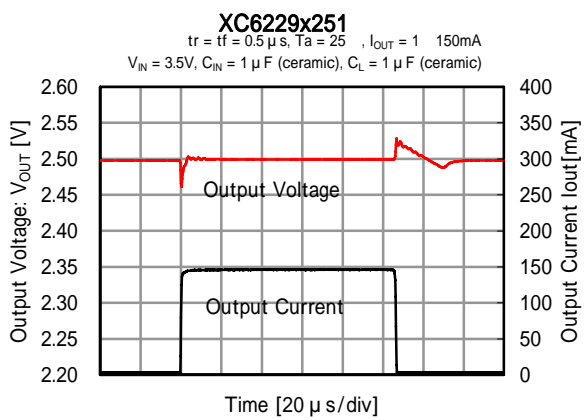
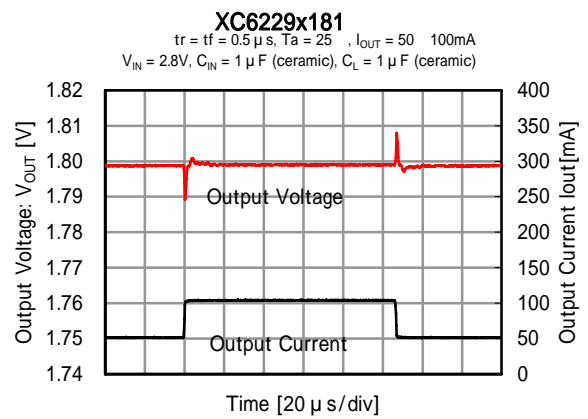
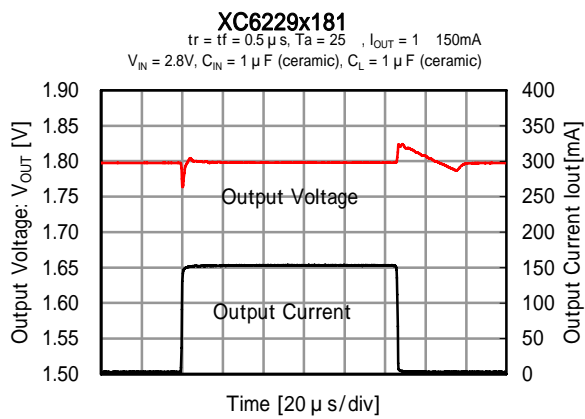
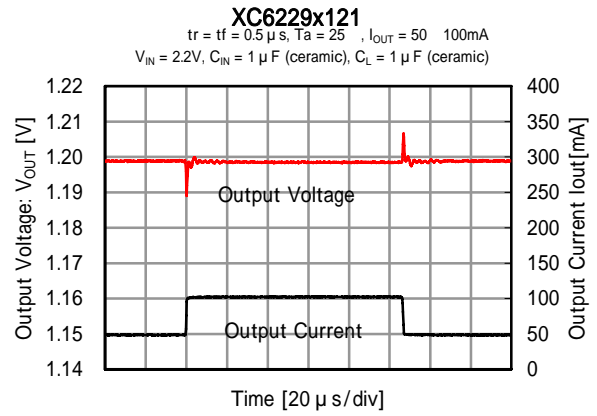
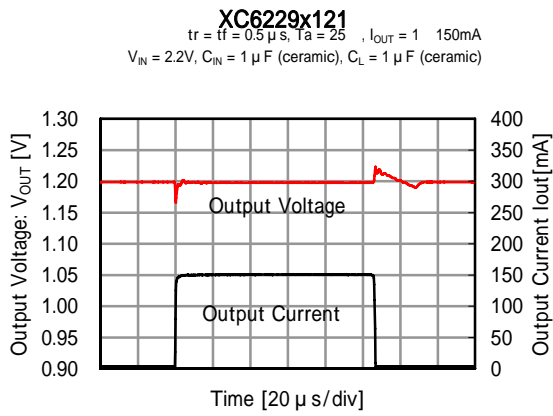
$t_r = t_f = 5 \mu s$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 4.5V \sim 5.5V$   
 $C_{IN} = 0.1 \mu F$  (ceramic),  $C_L = 1.0 \mu F$  (ceramic)





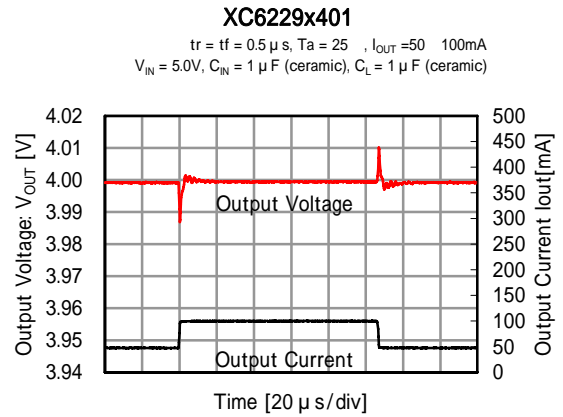
## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Load Transient Response ( $t_r=t_f=0.5\ \mu\text{s}$ )

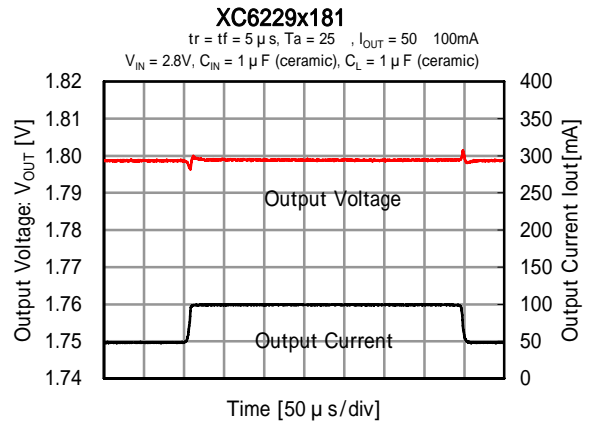
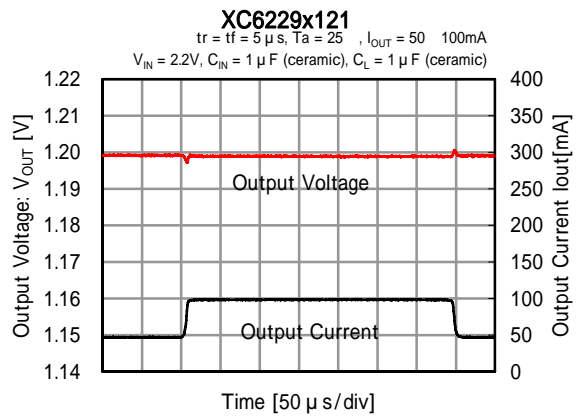


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Load Transient Response ( $t_r=t_f=0.5\ \mu\text{s}$ ) (Continued)

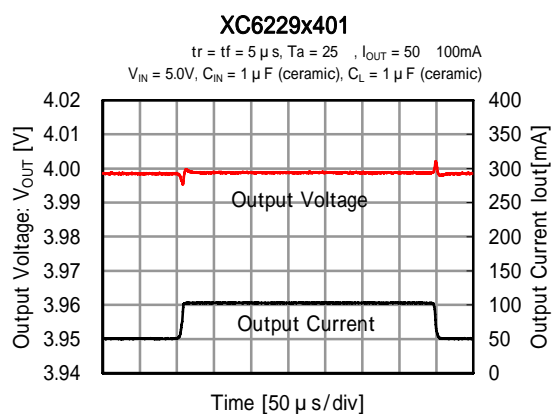
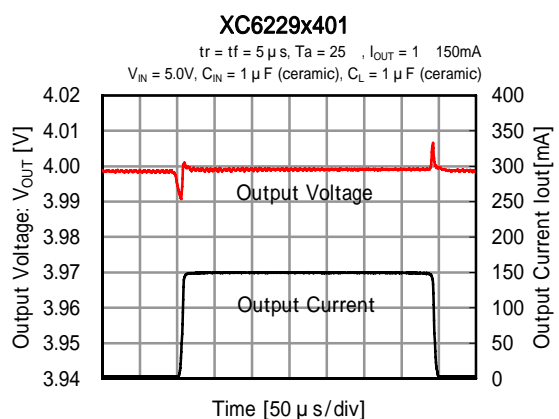
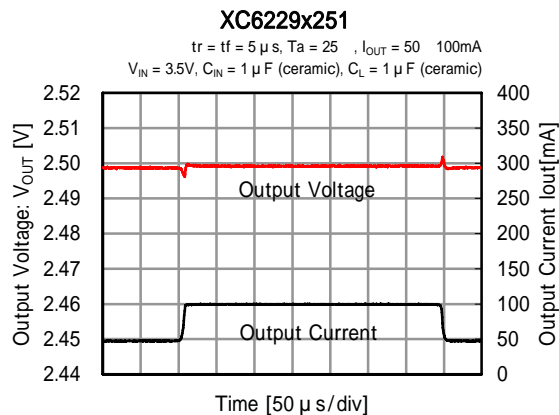
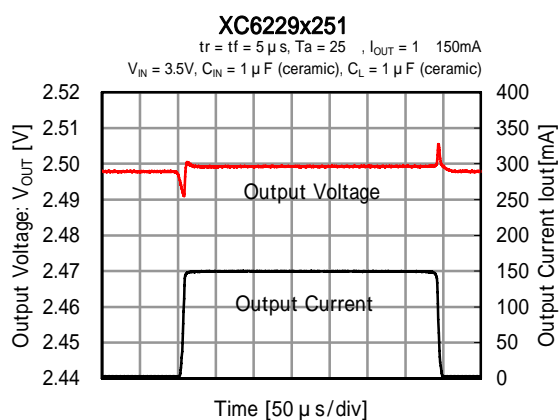


(8) Load Transient Response ( $t_r=t_f=5\ \mu\text{s}$ ) (Continued)

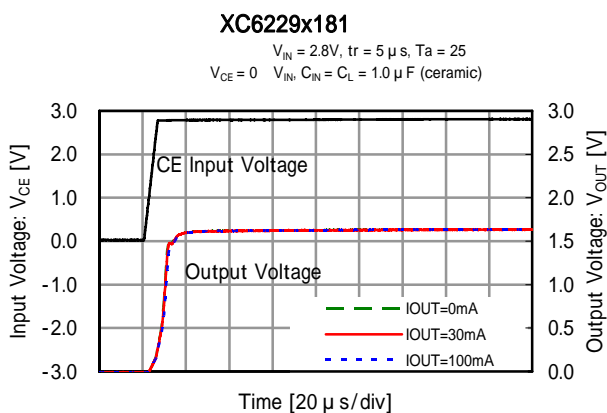
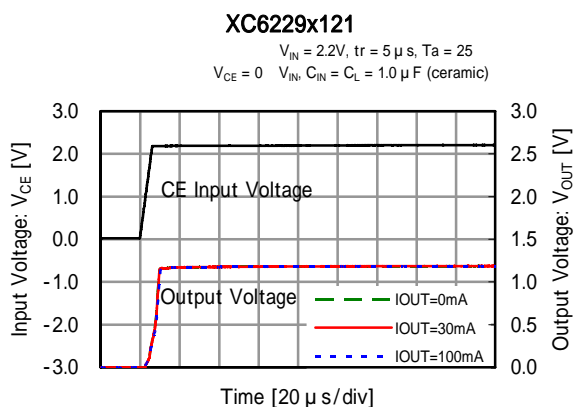


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (8) Load Transient Response ( $t_r=t_f=5\ \mu\text{s}$ ) (Continued)

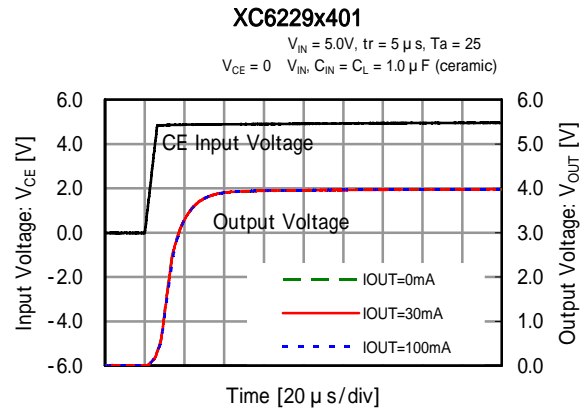
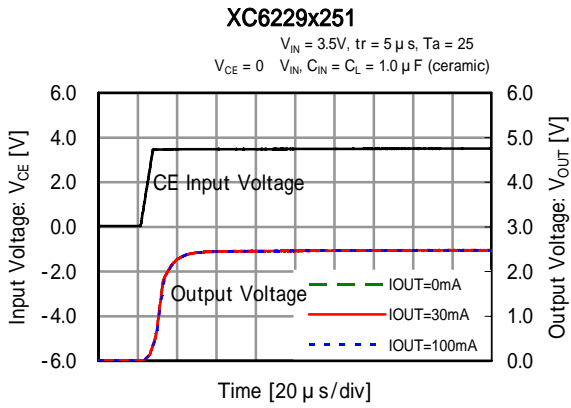


### (9) CE Rising Response Time (Type D)

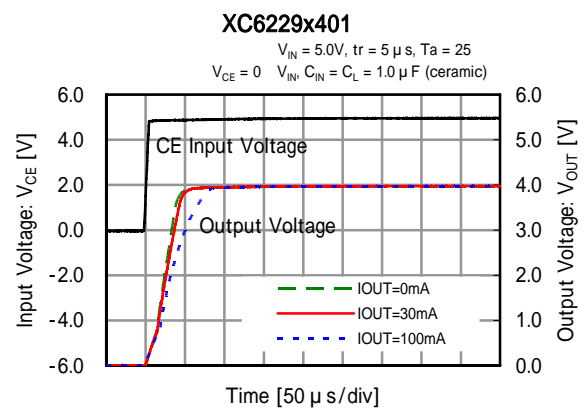
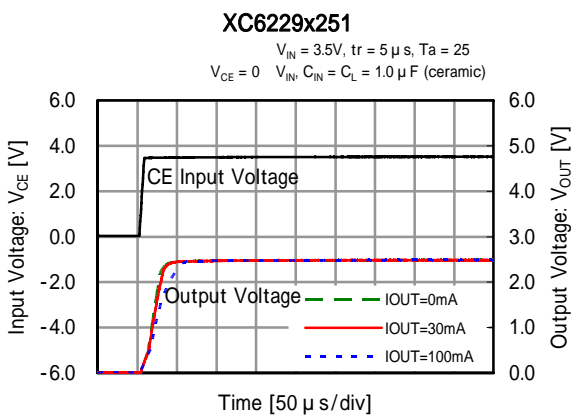
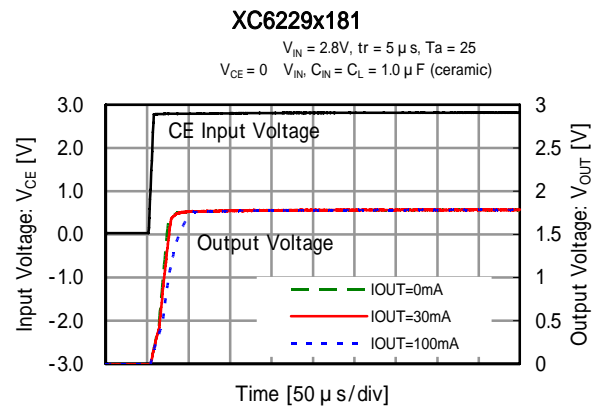
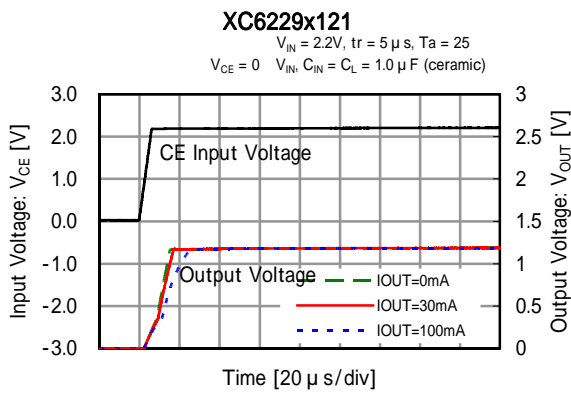


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (9) CE Rising Response Time (Type D) (Continued)

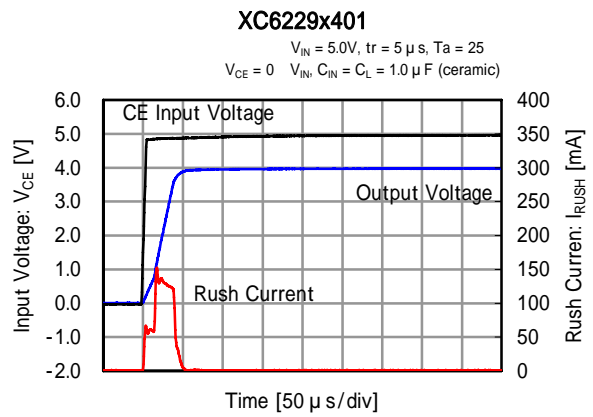
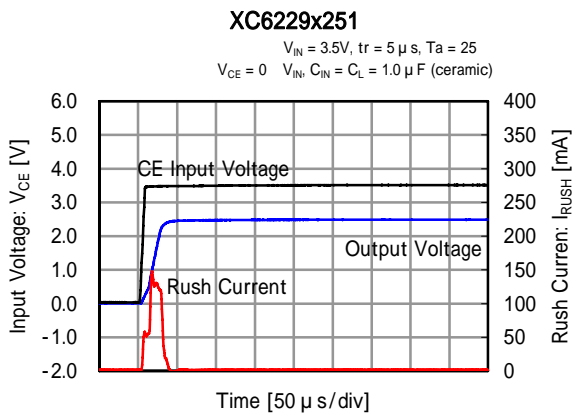
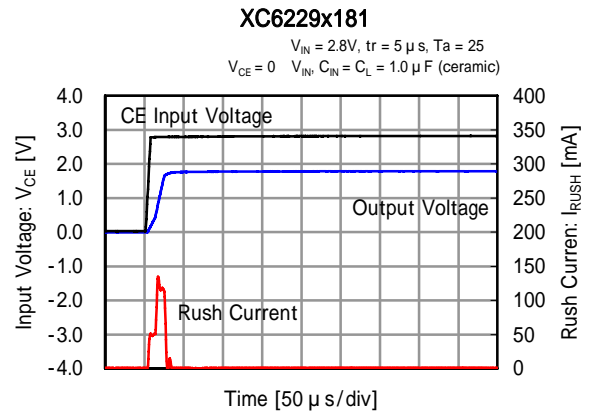
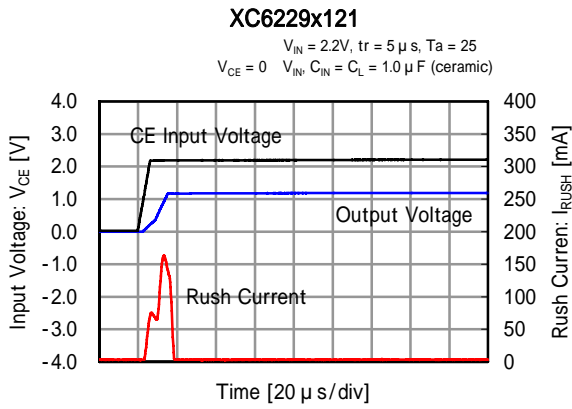


### (9) CE Rising Response Time (Type H) (Continued)



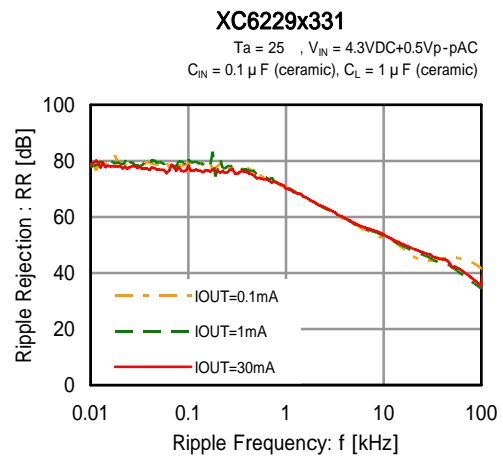
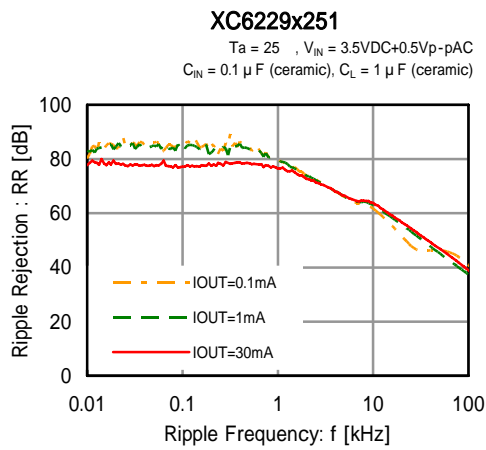
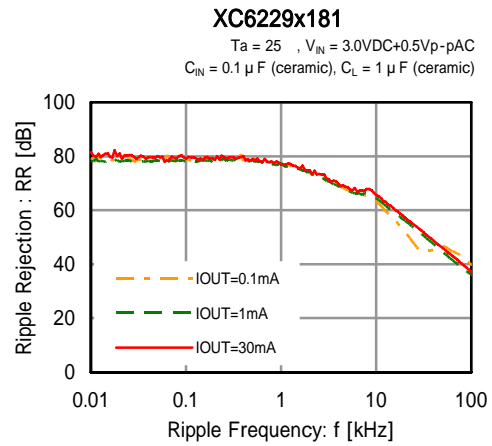
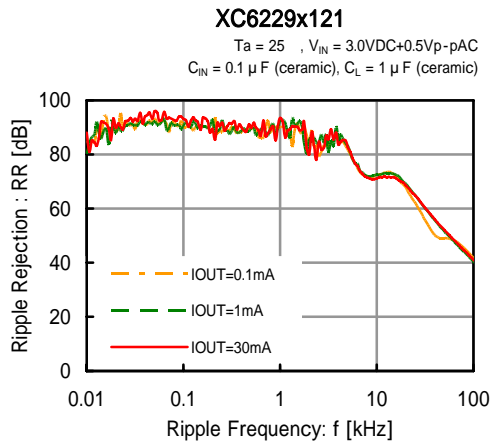
## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(10) Inrush Current Response Time (Type H)

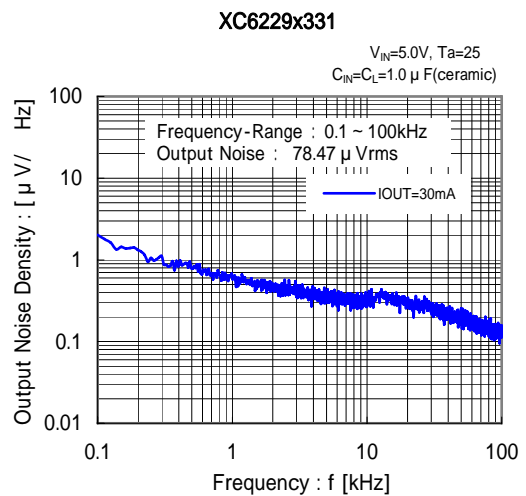
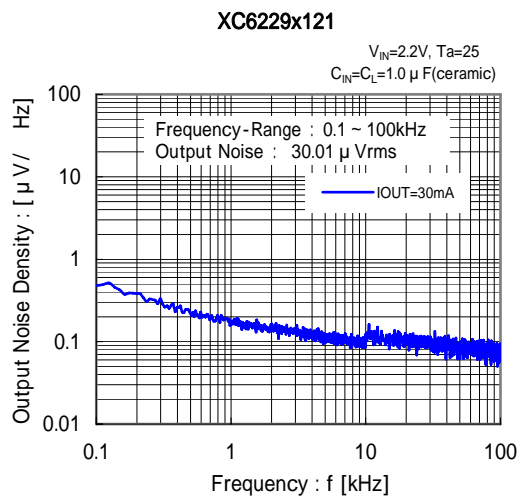


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (11) Ripple Rejection Rate



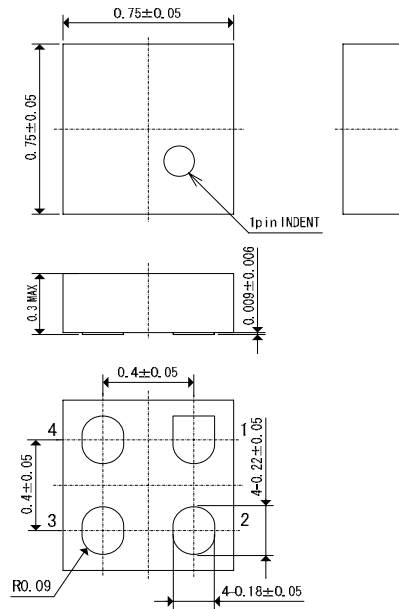
### (12) Output Noise Density



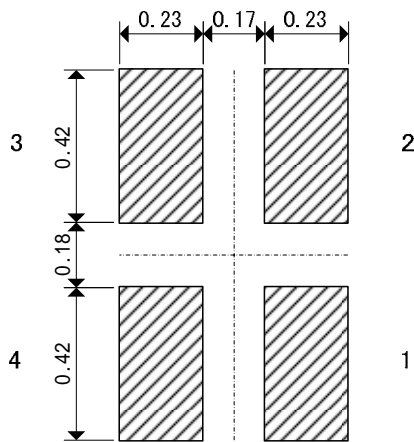
# PACKAGING INFORMATION

LGA-4B01

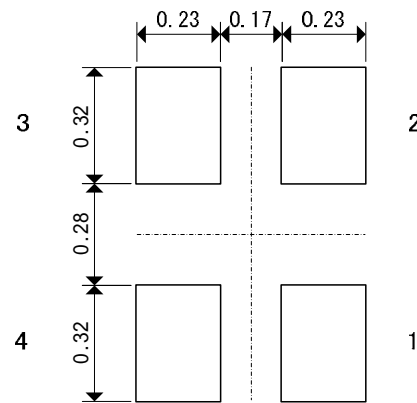
(unit:mm)



LGA-4B01 Reference Pattern Layout



LGA-4B01 Reference Metal Mask Design



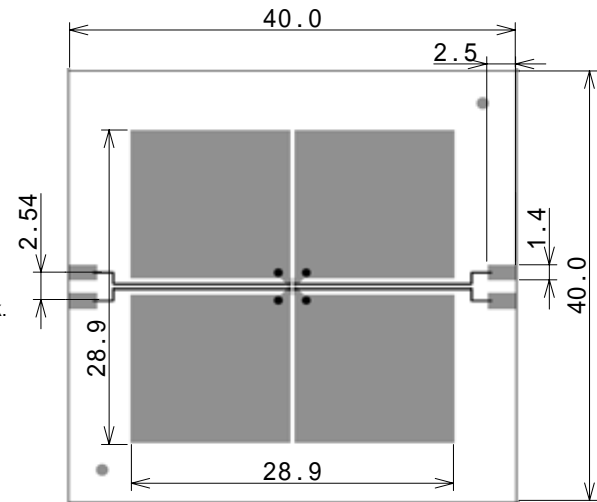
## PACKAGING INFORMATION (Continued)

### LGA-4B01 Power Dissipation

Power dissipation data for the LGA-4B01 is shown in this page.  
 The value of power dissipation varies with the mount board conditions.  
 Please use this data as the reference data taken in the following condition.

#### 1. Measurement Condition

- Condition : Mount on a board
- Ambient : Natural convection
- Soldering : Lead (Pb) free
- Board : 40 x 40 mm (1600mm<sup>2</sup> in one side)  
 Copper (Cu) traces occupy 50% of the front and 50% of the back.  
 The copper area is divided into four block, one block is 12.5% of total.  
 Each terminal connects one copper block in the front and one in the back.
- Material : Glass Epoxy (FR-4)
- Thickness : 1.6 mm
- Through-hole : 4 x 0.4 Diameter

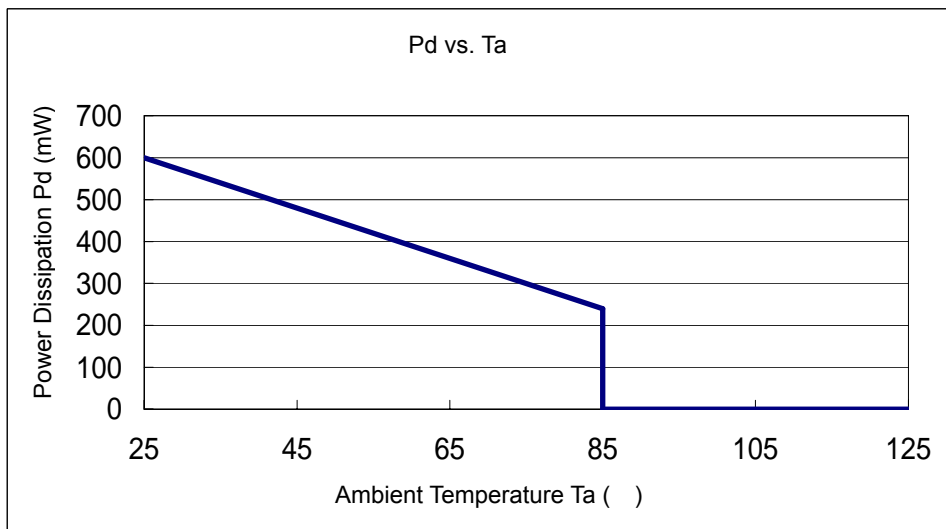


Evaluation Board (Unit: mm)

#### 2. Power Dissipation vs. Ambient Temperature

Board Mount ( $T_j \text{ max} = 125$  )

| Ambient Temperature ( ) | Power Dissipation Pd (mW) | Thermal Resistance ( /W) |
|-------------------------|---------------------------|--------------------------|
| 25                      | 600                       | 166.67                   |
| 85                      | 240                       |                          |



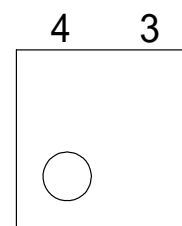


## MARKING RULE

### LGA-4B01

represents type of regulator and output voltage range.

| MARK | TYPE | VOLTAGE RANGE | PRODUCT SERIES                  |
|------|------|---------------|---------------------------------|
| 0    | D    | 1.2 ~ 2.6     | XC6229D1211*-G ~ XC6229D2611*-G |
| 1    |      | 2.65 ~ 4.0    | XC6229D26B1*-G ~ XC6229D4011*-G |
| 2    | H    | 1.2 ~ 2.6     | XC6229H1211*-G ~ XC6229H2611*-G |
| 3    |      | 2.65 ~ 4.0    | XC6229H26B1*-G ~ XC6229H4011*-G |



1 2  
LGA-4B01  
(TOP VIEW)

represents output voltage.

| MARK | OUTPUT VOLTAGE (V) |      | MARK | OUTPUT VOLTAGE (V) |      | MARK | OUTPUT VOLTAGE (V) |      |
|------|--------------------|------|------|--------------------|------|------|--------------------|------|
| 0    | 1.2                | 2.65 | A    | 1.7                | 3.15 | N    | 2.2                | 3.65 |
| 1    | 1.25               | 2.7  | B    | 1.75               | 3.2  | P    | 2.25               | 3.7  |
| 2    | 1.3                | 2.75 | C    | 1.8                | 3.25 | R    | 2.3                | 3.75 |
| 3    | 1.35               | 2.8  | D    | 1.85               | 3.3  | S    | 2.35               | 3.8  |
| 4    | 1.4                | 2.85 | E    | 1.9                | 3.35 | T    | 2.4                | 3.85 |
| 5    | 1.45               | 2.9  | F    | 1.95               | 3.4  | U    | 2.45               | 3.9  |
| 6    | 1.5                | 2.95 | H    | 2.0                | 3.45 | V    | 2.5                | 3.95 |
| 7    | 1.55               | 3.0  | K    | 2.05               | 3.5  | X    | 2.55               | 4.0  |
| 8    | 1.6                | 3.05 | L    | 2.1                | 3.55 | Y    | 2.6                |      |
| 9    | 1.65               | 3.1  | M    | 2.15               | 3.6  |      |                    |      |

represents production lot number.

0 ~ 9, A ~ Z in order.

(G, I, J, O, Q, W excepted)

\*No character inversion used.