

High Current, High Speed LDO Regulators

GENERAL DESCRIPTION

The XC6210 series are precise, low noise, high current, positive voltage low dropout regulators. They are fabricated using Torex's CMOS process.

The series features a voltage reference, an error amplifier, a current limiter, and a phase compensation circuit plus a driver transistor. With a low ON resistance driver transistor built into, batteries can be used until input-output voltage differential is minimal and can accordingly be used for a longer time.

The series is also compatible with low ESR ceramic capacitors which give added output stability.

The output voltage of the LDO is selectable in 50mV increments within the range of 0.8V to 5.0V.

The current limiter's foldback circuit also operates as the output current limiter and the output pin protection.

The IC's internal regulator circuit can be placed in stand-by mode via the CE function. In the stand-by mode, power consumption is greatly reduced.

APPLICATIONS

- CD-ROMs, CD-R / RW drive
- DVD drive
- HDD drive
- Cameras, Video recorders
- Portable AV equipment
- Battery powered equipment

FEATURES

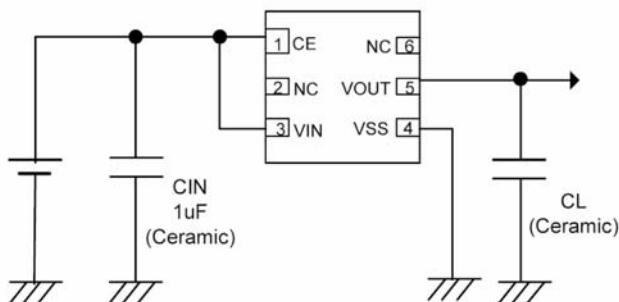
- Maximum Output Current** : More than 700mA
(800mA limit, TYP.)
($1.6V \leq V_{OUT(T)} \leq 5.0V$)
- Dropout Voltage** : 50mV @ 100mA
: 100mV @ 200mA
- Operating Voltage Range** : 1.5V ~ 6.0V
- Output Voltage Range** : 0.8V ~ 5.0V
(50mV increments)
- Highly Accurate** : $\pm 2\%$
(The setting voltage accuracy)
- Low Power Consumption** : 35 μ A (TYP.)
- High Ripple Rejection** : 60dB @ 1kHz
- Operational Ambient Temperature** : -40 ~ 85

CMOS

Low ESR Capacitor Compatible

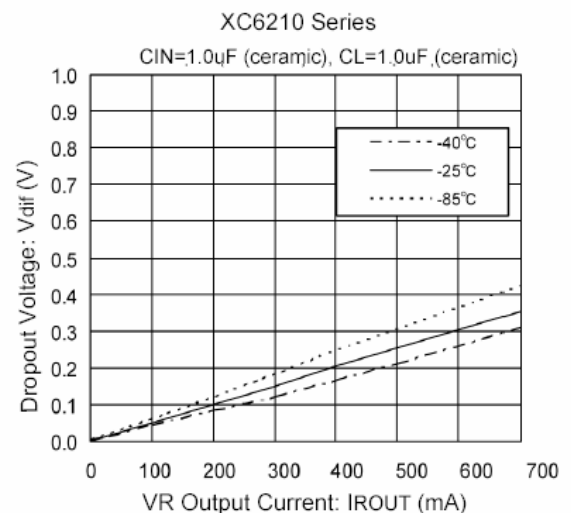
- Ultra Small Packages** : SOT-25 (SOT-23-5)
SOT-89-5
USP-6B

TYPICAL APPLICATION CIRCUIT

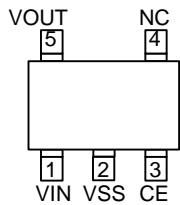


TYPICAL PERFORMANCE CHARACTERISTICS

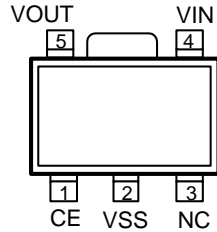
Dropout Voltage vs. Output Current



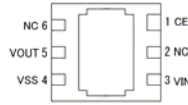
PIN CONFIGURATION



SOT-25 (TOP VIEW)



SOT-89-5 (TOP VIEW)



USP-6B
(BOTTOM VIEW)

*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release. If the pad needs to be connected to other pins, it should be connected to the Vss pins.

PIN ASSIGNMENT

| PIN NUMBER | | | PIN NAME | FUNCTION |
|------------|----------|--------|----------|----------------|
| SOT-25 | SOT-89-5 | USP-6B | | |
| 3 | 1 | 1 | CE | ON/OFF Control |
| 1 | 4 | 3 | VIN | Power Input |
| 2 | 2 | 4 | VSS | Ground |
| 5 | 5 | 5 | VOUT | Output |
| 4 | 3 | 2, 6 | NC | No Connection |

PRODUCT CLASSIFICATION

Selection Guide

CE Input Logic, Internal Pull-Up / Down Resistor

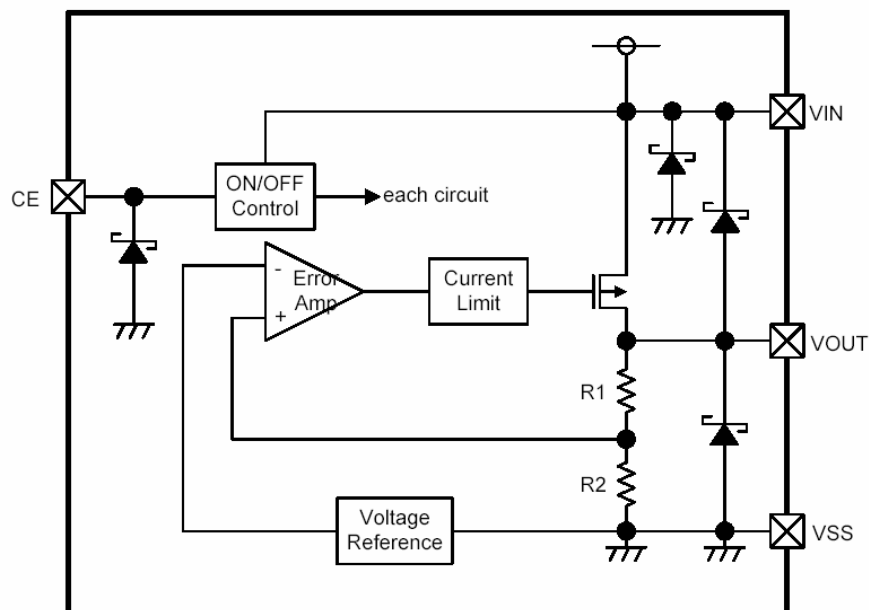
| SERIES | CE INPUT LOGIC |
|---------|--|
| XC6210A | High Active with Pull-Down Resistor |
| XC6210B | High Active with No Pull-Down Resistor |
| XC6210C | Low Active with Pull-Up Resistor |
| XC6210D | Low Active with No Pull-Up Resistor |

Ordering Information

XC6210

| DESIGNATOR | DESCRIPTION | SYMBOL | DESCRIPTION |
|------------|-------------------------|--------|---|
| | CE Pin Functions | A | : High Active with pull-down resistor |
| | | B | : High Active with no pull-down resistor |
| | | C | : Low Active with pull-up resistor |
| | | D | : Low Active with no pull-up resistor |
| | Output Voltage | 08~50 | : ex.) 3.0V =3, =0 |
| | Output Voltage Accuracy | 2 | : 100mV increments, $\pm 2\%$ ($V_{OUT} \leq 1.5V$ less than $\pm 30mV$) ex.) 2.80V =2, =8, =2 |
| | | A | : 50mV increments, $\pm 2\%$ ($V_{OUT} \leq 1.5V$ less than $\pm 30mV$) ex.) 2.85V =2, =8, =A |
| | Packages | M | : SOT-25 (SOT-23-5) |
| | | P | : SOT-89-5 |
| | | D | : USP-6B |
| | Device Orientation | R | : Embossed tape, standard feed |
| | | L | : Embossed tape, reverse feed |

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Ta=25

| PARAMETER | SYMBOL | RATINGS | UNITS |
|-----------------------------|------------------|---|-------|
| Input Voltage | V _{IN} | 6.5 | V |
| Output Current * | I _{OUT} | 900 | mA |
| Output Voltage | V _{OUT} | V _{SS} -0.3 ~ V _{IN} +0.3 | V |
| CE Pin Voltage | V _{CE} | V _{SS} -0.3 ~ 6.5 | V |
| Power Dissipation | SOT-25 | P _d | mW |
| | SOT-89-5 | | |
| | USP-6B | | |
| Operating Temperature Range | T _{opr} | - 40 ~ + 85 | |
| Storage Temperature Range | T _{stg} | - 55 ~ + 125 | |

* I_{OUT}=P_d / (V_{IN} - V_{OUT})

ELECTRICAL CHARACTERISTICS

XC6210 series

Ta=25

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS | CIRCUIT |
|--|-------------------------------------|--|---------|---------|---------|-------|---------|
| Output Voltage (*2), (*3) | VOUT(E) | VIN=VOUT(T)+1.0V, IOUT=30mA VCE=ON (VIN or VSS) | x 0.98 | VOUT(T) | x 1.02 | V | |
| | | VOUT(T)≤1.5V, IOUT=30mA VCE=ON (VIN or VSS) | (-30mV) | VOUT(T) | (+30mV) | | |
| Maximum Output Current [VOUT(E)>1.6V] | IOUTMAX | VIN=VOUT(T)+1.0V, VCE=ON (VIN or VSS) | 700 | - | - | mA | |
| Maximum Output Current [VOUT(E)≤1.5V] | IOUTMAX | VIN=VOUT(T)+1.0V, VCE=ON (VIN or VSS) | 500 | - | - | | |
| Load Regulation | VOUT | 1mA≤IOUT≤100mA, VCE=ON(VIN or VSS) | - | 15 | 60 | mV | |
| Dropout Voltage (*4) | Vdif1 | IROUT=30mA, VCE=ON (VIN or VSS) | E-1 | | | mV | |
| | Vdif2 | IROUT=100mA, VCE=ON (VIN or VSS) | E-2 | | | | |
| Supply Current (A type) | IDD | VIN=VCE=VOUT(T)+1.0V | E-3 | | | μA | |
| Supply Current (B type) | | VIN=VCE=VOUT(T)+1.0V | - | 35 | 55 | | |
| Supply Current (C type) | | VIN=VOUT(T)+1.0V, VCE=VSS | E-3 | | | | |
| Supply Current (D type) | | VIN=VOUT(T)+1.0V, VCE=VSS | - | 35 | 55 | | |
| Stand-by Current | ISTBY | VIN=6.0V, CE=OFF(VIN or VSS) | -0.10 | - | 0.10 | μA | |
| Line Regulation | $\frac{V_{OUT}}{V_{IN} - V_{OUT}}$ | VOUT(T)+1.0V VIN 6.0V When VOUT(T) 4.5V, 5.5V VIN 6.0V VCE=ON (VIN or VSS), IOUT=30mA | - | 0.01 | 0.20 | % / V | |
| Input Voltage | VIN | - | 1.5 | - | 6.0 | V | - |
| Output Voltage Temperature Characteristics | $\frac{V_{OUT}}{V_{OUT} - V_{OUT}}$ | IOUT=30mA, VCE=ON (VIN or VSS) -40 Topr 85 | - | ± 100 | - | ppm/ | |
| Ripple Rejection Rate | PSRR | VIN=[VOUT(T)+1.0]VDC+0.5Vp-pAC When VOUT(T)≥4.75V VIN=5.75VDC+0.5Vp-pAC VCE=ON (VIN or VSS), IOUT=30mA, f=1kHz | - | 60 | - | dB | |
| Current Limiter [VOUT(E)>1.6V] | Ilim | VIN=VOUT(T)+1.0V, VCE=ON(VIN or VSS) | 700 | 800 | - | mA | |
| Current Limiter [VOUT(E)≤1.5V] | Ilim | VIN=VOUT(T)+1.0V, VCE=ON(VIN or VSS) | - | 800 | - | | |
| Short-Circuit Current | Ishort | VIN=VOUT(T)+1.0V, VCE=ON(VIN or VSS) | - | 50 | - | mA | |
| CE "High" Level Voltage | VCEH | - | 1.3 | - | 6.0 | V | |
| CE "Low" Level Voltage | VCEL | - | - | - | 0.25 | | |
| CE "High" Level Current (A type) | ICEH | VIN=VCE=VOUT(T)+1.0V | E-4 | - | E-4 | μA | |
| CE "High" Level Current (B / C / D type) | | | - 0.10 | - | 0.10 | | |
| CE "Low" Level Current (C type) | ICEL | VIN=VOUT(T)+1.0V, VCE=VSS | E-5 | - | E-5 | μA | |
| CE "Low" Level Current (A / B / D type) | | | - 0.10 | - | 0.10 | | |

NOTE:

*1: Unless otherwise stated, VIN=VOUT(T)+1.0V

*2: VOUT(T)=Specified output voltage

*3: VOUT(E)=Effective output voltage

(i.e. the output voltage when " VOUT(T)+1.0V" is provided while maintaining a certain IOUT value).

*4: $V_{dif} = \{V_{IN1}^{(6)} - V_{OUT1}^{(5)}\}$

*5: A voltage equal to 98% of the output voltage whenever a stabilized VOUT1=IOUT{VOUT(T)+1.0V} is input.

*6: VIN1= the input voltage when VOUT1, which appears as input voltage is gradually decreased.

*7: VOUT(T)≤1.50V MIN. : VOUT(T) - 30mV, MAX. : VOUT(T) +30mV

*8: CE conditions: XC6210A / B type: ON=VIN, OFF=VSS

XC6210C / D type: ON=VSS, OFF=VIN

VOLTAGE CHART

Dropout Voltage, Supply Current, CE "H / L" Level Current Chart

Ta=25

| SETTING OUTPUT VOLTAGE | OUTPUT VOLTAGE (Accuracy: 2%) | | E-1 | | E-2 | | E-3 | | E-4 | | E-5 | | | | | | | | |
|------------------------------|-------------------------------------|-------|--|-------|---|-------|-------------------|------|-------------------------|-------|-------------------------|-------|-------|-------|------|------|------|-------|-------|
| | | | DROPOUT VOLTAGE 1 (I _{OUT} =30mA) | | DROPOUT VOLTAGE 2 (I _{OUT} =100mA) | | SUPPLY CURRENT | | CE "H" LEVEL CURRENT | | CE "L" LEVEL CURRENT | | | | | | | | |
| (V) | (V) | | (mV) | | (mV) | | (μA) | | (μA) | | (μA) | | | | | | | | |
| V _{OUT(T)} | V _{OUT} | | V _{dif1} | | V _{dif2} | | I _{DD} | | I _{CEH} | | I _{CEL} | | | | | | | | |
| | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | TYP. | MAX. | MIN. | MAX. | MIN. | MAX. | | | | | | | |
| 0.80 | 0.770 | 0.830 | 100.0 | 700.0 | 250.0 | 800.0 | 38.0 | 60.0 | 1.50 | 5.00 | -5.00 | -1.50 | | | | | | | |
| 0.85 | 0.820 | 0.880 | | 600.0 | | 700.0 | | | | | | | | | | | | | |
| 0.90 | 0.870 | 0.930 | | 50.0 | 500.0 | 150.0 | | | | | | | 600.0 | 38.5 | 61.5 | 2.00 | 6.50 | -6.50 | -2.00 |
| 0.95 | 0.920 | 0.980 | | | 400.0 | | | | | | | | 500.0 | | | | | | |
| 1.00 | 0.970 | 1.030 | 30.0 | | 300.0 | 100.0 | 400.0 | 39.0 | 63.0 | 2.50 | 8.00 | -8.00 | -2.50 | | | | | | |
| 1.05 | 1.020 | 1.080 | | | 200.0 | | 300.0 | | | | | | | | | | | | |
| 1.10 | 1.070 | 1.130 | | 100.0 | 250.0 | | | | | | | | | | | | | | |
| 1.15 | 1.120 | 1.180 | | 27.0 | 41.0 | | 90.0 | | | | | | | 135.0 | 39.0 | 63.0 | 2.50 | 8.00 | -8.00 |
| 1.20 | 1.170 | 1.230 | | | | | | | | | | | | | | | | | |
| 1.25 | 1.220 | 1.280 | | | | | | | | | | | | | | | | | |
| 1.30 | 1.270 | 1.330 | | | | | | | | | | | | | | | | | |
| 1.35 | 1.320 | 1.380 | | | | | | | | | | | | | | | | | |
| 1.40 | 1.370 | 1.430 | | | | | | | | | | | | | | | | | |
| 1.45 | 1.420 | 1.480 | | | | | | | | | | | | | | | | | |
| 1.50 | 1.470 | 1.530 | | | | | | | | | | | | | | | | | |
| 1.55 | 1.519 | 1.581 | | | | | | | | | | | | | | | | | |
| 1.60 | 1.568 | 1.632 | | | | | | | | | | | | | | | | | |
| 1.65 | 1.617 | 1.683 | | | | | | | | | | | | | | | | | |
| 1.70 | 1.666 | 1.734 | | | | | | | | | | | | | | | | | |
| 1.75 | 1.715 | 1.785 | | | | | | | | | | | | | | | | | |
| 1.80 | 1.764 | 1.836 | | | | | | | | | | | | | | | | | |
| 1.85 | 1.813 | 1.887 | | | | | | | | | | | | | | | | | |
| 1.90 | 1.862 | 1.938 | | | | | | | | | | | | | | | | | |
| 1.95 | 1.911 | 1.989 | | | | | | | | | | | | | | | | | |
| 2.00 | 1.960 | 2.040 | 25.0 | 37.0 | 80.0 | 120.0 | 39.5 | 64.5 | 3.00 | 9.50 | -9.50 | -3.00 | | | | | | | |
| 2.05 | 2.009 | 2.091 | | | | | | | | | | | | | | | | | |
| 2.10 | 2.058 | 2.142 | | | | | | | | | | | | | | | | | |
| 2.15 | 2.107 | 2.193 | | | | | | | | | | | | | | | | | |
| 2.20 | 2.156 | 2.244 | | | | | | | | | | | | | | | | | |
| 2.25 | 2.205 | 2.295 | | | | | | | | | | | | | | | | | |
| 2.30 | 2.254 | 2.346 | | | | | | | | | | | | | | | | | |
| 2.35 | 2.303 | 2.397 | | | | | | | | | | | | | | | | | |
| 2.40 | 2.352 | 2.448 | | | | | | | | | | | | | | | | | |
| 2.45 | 2.401 | 2.499 | | | | | | | | | | | | | | | | | |
| 2.50 | 2.450 | 2.550 | 18.0 | 28.0 | 60.0 | 90.0 | 40.0 | 66.0 | 3.50 | 11.00 | -11.00 | -3.50 | | | | | | | |
| 2.55 | 2.499 | 2.601 | | | | | | | | | | | | | | | | | |
| 2.60 | 2.548 | 2.652 | | | | | | | | | | | | | | | | | |
| 2.65 | 2.597 | 2.703 | | | | | | | | | | | | | | | | | |
| 2.70 | 2.646 | 2.754 | | | | | | | | | | | | | | | | | |
| 2.75 | 2.695 | 2.805 | | | | | | | | | | | | | | | | | |
| 2.80 | 2.744 | 2.856 | | | | | | | | | | | | | | | | | |
| 2.85 | 2.793 | 2.907 | | | | | | | | | | | | | | | | | |
| 2.90 | 2.842 | 2.958 | | | | | | | | | | | | | | | | | |
| 2.95 | 2.891 | 3.009 | | | | | | | | | | | | | | | | | |

VOLTAGE CHART (Continued)

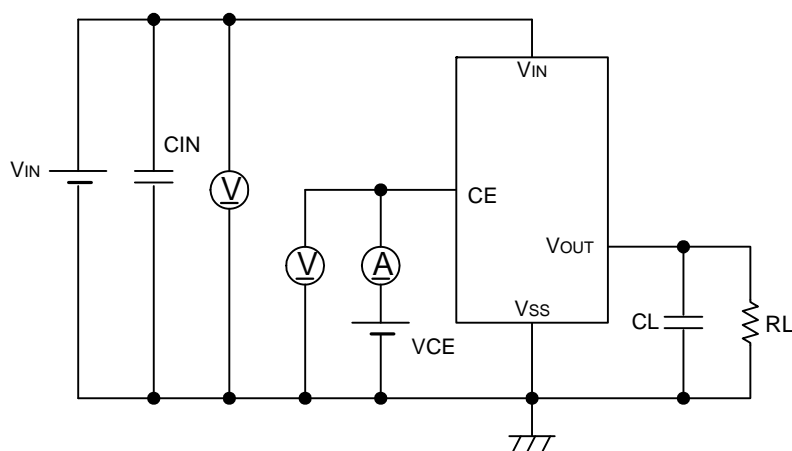
Dropout Voltage, Supply Current, CE "H / L" Level Current Chart

Ta=25

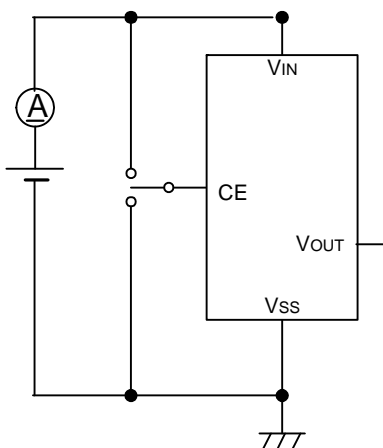
| SETTING OUTPUT VOLTAGE | OUTPUT VOLTAGE (Accuracy: 2%) | | E-1 | | E-2 | | E-3 | | E-4 | | E-5 | |
|------------------------------|-------------------------------------|-------|--|------|---|------|-------------------|------|-------------------------|-------|-------------------------|-------|
| | | | DROPOUT VOLTAGE 1 (I _{OUT} =30mA) | | DROPOUT VOLTAGE 2 (I _{OUT} =100mA) | | SUPPLY CURRENT | | CE "H" LEVEL CURRENT | | CE "L" LEVEL CURRENT | |
| | | | (V) | | (mV) | | (mV) | | (μA) | | (μA) | |
| V _{OUT(T)} | V _{OUT} | | V _{dif1} | | V _{dif2} | | I _{DD} | | I _{CEH} | | I _{CEL} | |
| | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | TYP. | MAX. | MIN. | MAX. | MIN. | MAX. |
| 3.00 | 2.940 | 3.060 | 15.0 | 23.0 | 50.0 | 75.0 | 40.5 | 67.5 | 4.00 | 12.50 | -12.50 | -4.00 |
| 3.05 | 2.989 | 3.111 | | | | | | | | | | |
| 3.10 | 3.038 | 3.162 | | | | | | | | | | |
| 3.15 | 3.087 | 3.213 | | | | | | | | | | |
| 3.20 | 3.136 | 3.264 | | | | | | | | | | |
| 3.25 | 3.185 | 3.315 | | | | | | | | | | |
| 3.30 | 3.234 | 3.366 | | | | | | | | | | |
| 3.35 | 3.283 | 3.417 | | | | | | | | | | |
| 3.40 | 3.332 | 3.468 | | | | | | | | | | |
| 3.45 | 3.381 | 3.519 | | | | | | | | | | |
| 3.50 | 3.430 | 3.570 | 15 | 23 | 50 | 75 | 41.0 | 69.0 | 4.40 | 14.00 | -14.00 | -4.40 |
| 3.55 | 3.479 | 3.621 | | | | | | | | | | |
| 3.60 | 3.528 | 3.672 | | | | | | | | | | |
| 3.65 | 3.577 | 3.723 | | | | | | | | | | |
| 3.70 | 3.626 | 3.774 | | | | | | | | | | |
| 3.75 | 3.675 | 3.825 | | | | | | | | | | |
| 3.80 | 3.724 | 3.876 | | | | | | | | | | |
| 3.85 | 3.773 | 3.927 | | | | | | | | | | |
| 3.90 | 3.822 | 3.978 | | | | | | | | | | |
| 3.95 | 3.871 | 4.029 | | | | | | | | | | |
| 4.00 | 3.920 | 4.080 | 15.0 | 23.0 | 50.0 | 75.0 | 41.5 | 70.5 | 4.85 | 15.50 | -15.50 | -4.85 |
| 4.05 | 3.969 | 4.131 | | | | | | | | | | |
| 4.10 | 4.018 | 4.182 | | | | | | | | | | |
| 4.15 | 4.067 | 4.233 | | | | | | | | | | |
| 4.20 | 4.116 | 4.284 | | | | | | | | | | |
| 4.25 | 4.165 | 4.335 | | | | | | | | | | |
| 4.30 | 4.214 | 4.386 | | | | | | | | | | |
| 4.30 | 4.214 | 4.386 | | | | | | | | | | |
| 4.40 | 4.312 | 4.488 | | | | | | | | | | |
| 4.45 | 4.361 | 4.539 | | | | | | | | | | |
| 4.50 | 4.410 | 4.590 | | | | | | | | | | |
| 4.55 | 4.459 | 4.641 | | | | | | | | | | |
| 4.60 | 4.508 | 4.692 | | | | | | | | | | |
| 4.65 | 4.557 | 4.743 | | | | | | | | | | |
| 4.70 | 4.606 | 4.794 | | | | | | | | | | |
| 4.75 | 4.655 | 4.845 | | | | | | | | | | |
| 4.80 | 4.704 | 4.896 | | | | | | | | | | |
| 4.85 | 4.753 | 4.947 | | | | | | | | | | |
| 4.90 | 4.802 | 4.998 | | | | | | | | | | |
| 4.95 | 4.851 | 5.049 | | | | | | | | | | |
| 5.00 | 4.900 | 5.100 | | | | | | | | | | |
| | | | | | | | 42.0 | 72.0 | 5.30 | 17.00 | -17.00 | -5.30 |

TEST CIRCUITS

Circuit

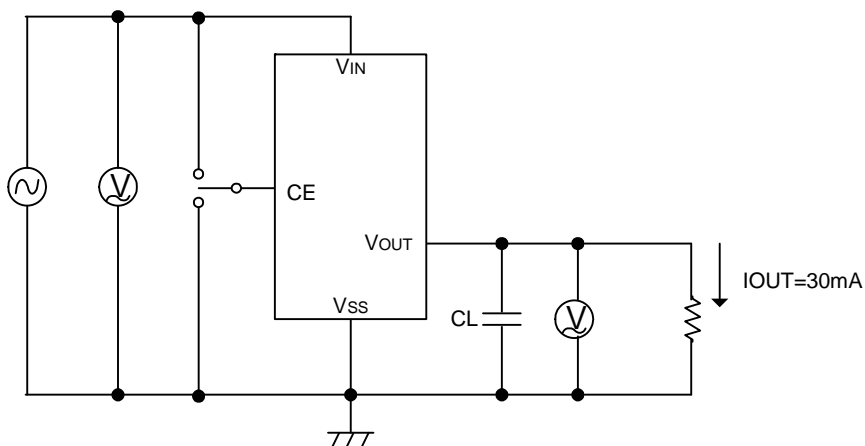


Circuit



Circuit

$V_{IN} = \{V_{OUT} + 1.0V\}V_{DC} + 0.5V_{p-pAC}$
 $V_{OUT} = 4.75V$
 $V_{IN} = 5.75V_{DC} + 0.5V_{p-pAC}$



Output Capacitor Corresponding Chart

| VR OUTPUT VOLTAGE | 0.8V~1.45V | 1.5V ~ 1.75V | 1.8V ~ 5.0V |
|-------------------|-----------------------|-----------------------|-----------------------|
| CL | More than 6.8 μ F | More than 4.7 μ F | More than 1.0 μ F |

OPERATIONAL EXPLANATION

<Output Voltage Regulator Control>

The voltage, divided by resistors R1 & R2, which are connected to the VOUT pin is compared with the internal reference voltage by the error amplifier. The P-channel MOSFET, which is connected to the VOUT pin, is then driven by the subsequent output signal. The output voltage at the VOUT pin is controlled & stabilized by negative feedback. The constant current limit circuit and short circuit protection operate in relation to the level of output current.

<Low ESR Capacitor>

With the XC6210 series regulator, a stable output voltage is achievable even if low ESR capacitors are used, as a phase compensation circuit is built into the regulator. In order to ensure the effectiveness of the phase compensation, we suggest that an output capacitor (CL) be connected as close as possible, between the output pin (VOUT) and the VSS pin. Please use an output capacitor (CL) with a capacitance, based on the chart below. We also suggest an input capacitor (CIN) of 1 μ F: this should be connected between VIN and VSS in order to stabilize input power source.

Output Capacitor Corresponding Chart

| | | | |
|------|-----------------------|-----------------------|-----------------------|
| VOUT | 0.8V ~ 1.45V | 1.5V ~ 1.75V | 1.8V ~ 5.0V |
| CL | More than 6.8 μ F | More than 4.7 μ F | More than 1.0 μ F |

<Current Limiter, Short-Circuit Protection>

The XC6210 series regulator offers a combination of current limit and short circuit protection by means of a built-in fixed current limiter circuit and a foldback circuit. When the load current reaches the current limit level, the fixed current limiter circuit operates and output voltage drops. As a result of this drop in output voltage, the foldback circuit operates, the output voltage drops further and output current decreases. When the output pin is shorted, a current of about 50mA flows.

<CE Pin>

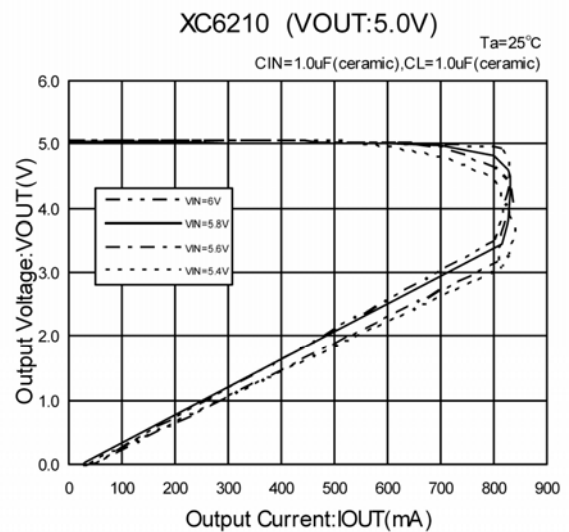
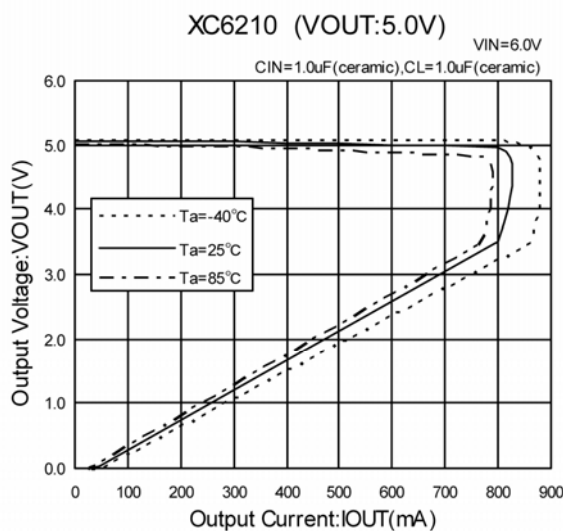
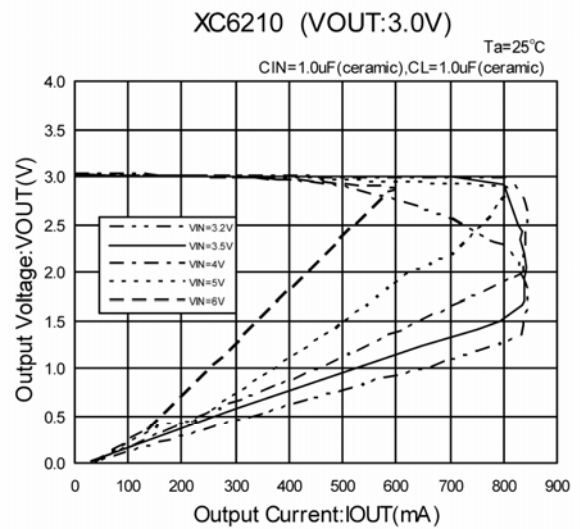
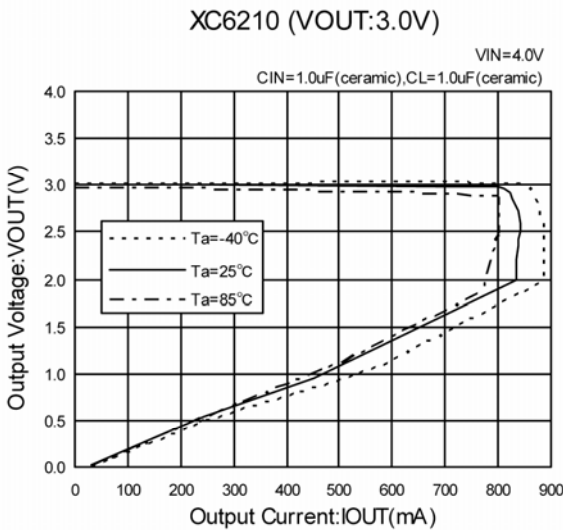
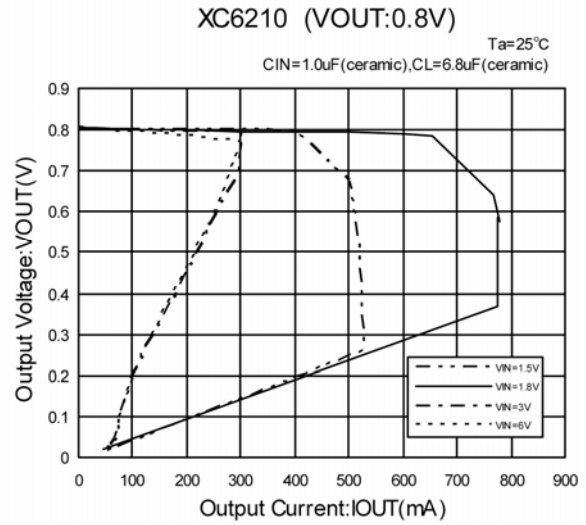
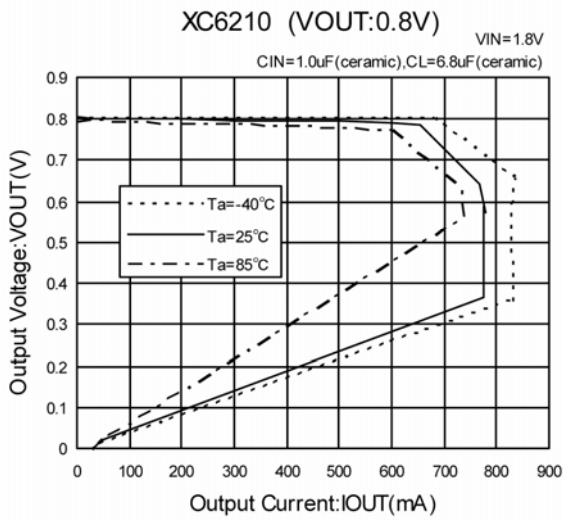
The IC's internal regulator circuitry can be shut down via the signal from the CE pin with the XC6210 series. In shutdown mode, output at the VOUT pin will be pulled down to the VSS level via R1 & R2. Options are available for the CE pin logic (See the product classification). Note that as the XC6210B types are 'High Active / No Pull-Down', operations will become unstable with the CE pin open. Although the CE pin is equal to an inverter input with CMOS hysteresis, with either the pull-up or pull-down options, the CE pin input current will increase when the IC is in operation. We suggest that you use this IC with either a VIN voltage or a VSS voltage input at the CE pin. If this IC is used with the correct specifications for the CE pin, the IC will operate normally. However, supply current may increase as a result of through current in the IC's internal circuitry if a voltage other than VIN or VSS is applied.

NOTES ON USE

1. Please use this IC within the stated absolute maximum ratings. The IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please strengthen VIN and VSS wiring in particular.
3. Please wire the input capacitor (CIN) and the output capacitor (CL) as close to the IC as possible. Should rapid input fluctuation or load fluctuation occur, please increase the capacitor value such as CIN or CL to stabilize the operation.

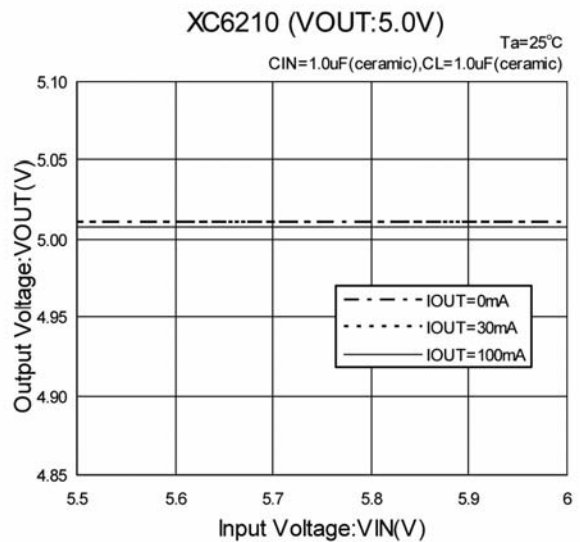
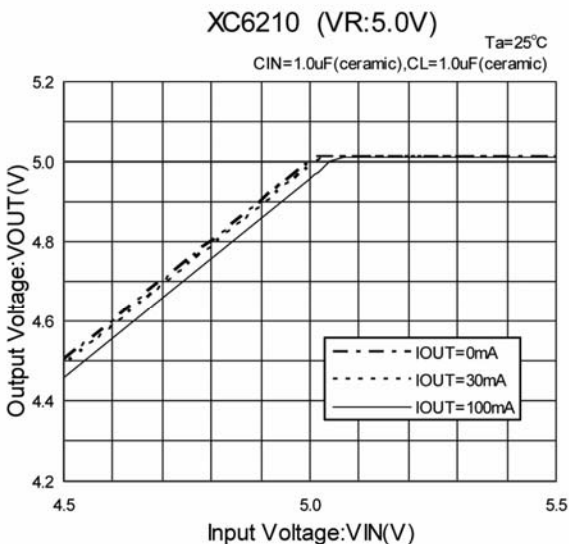
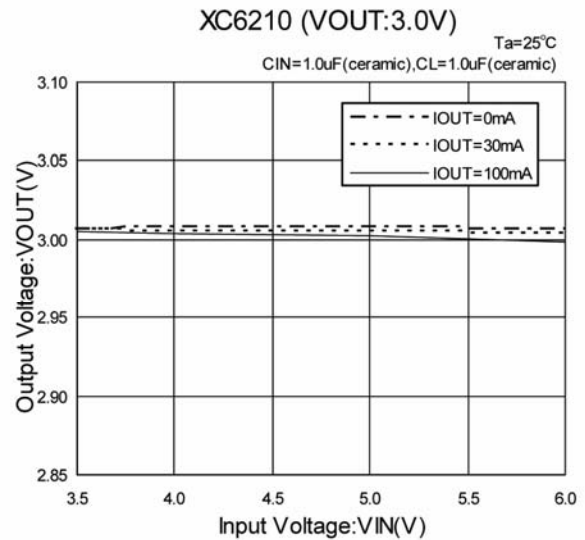
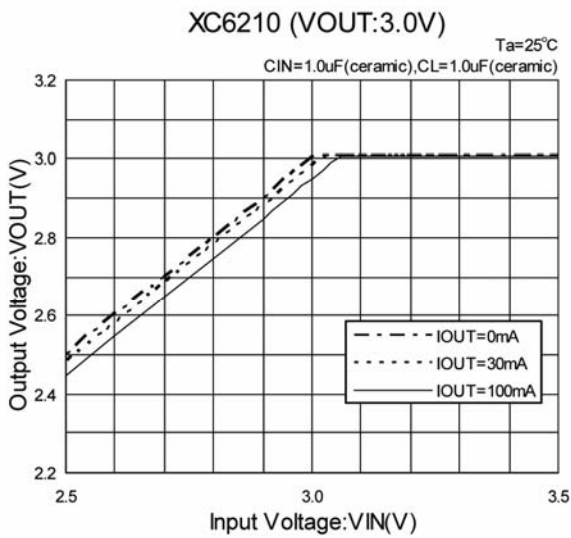
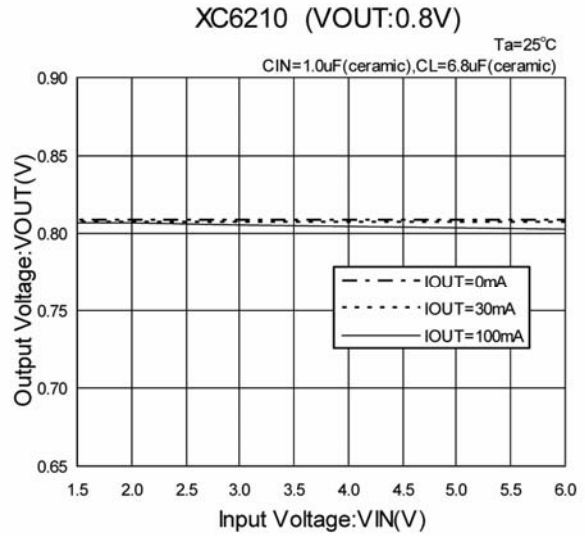
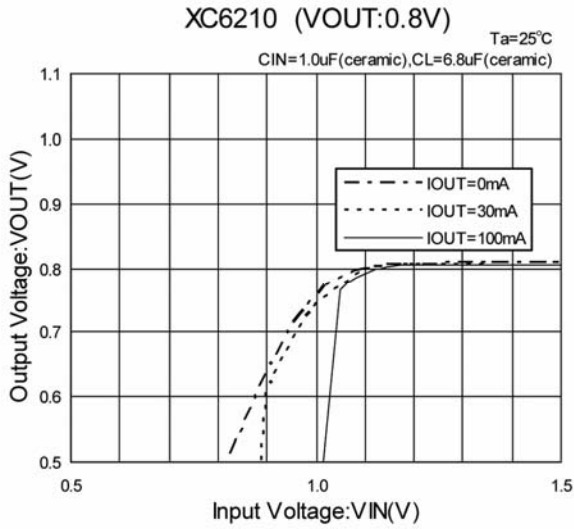
TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

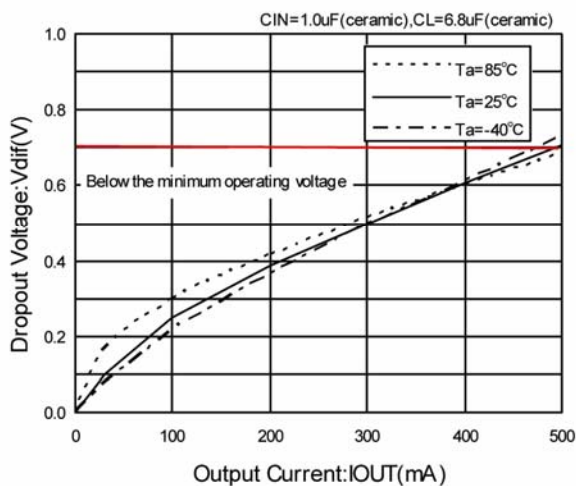
(2) Output Voltage vs. Input Voltage



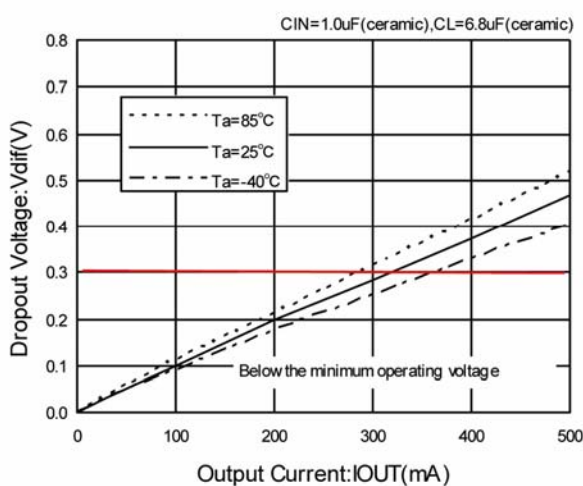
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) Dropout Voltage vs. Output Current

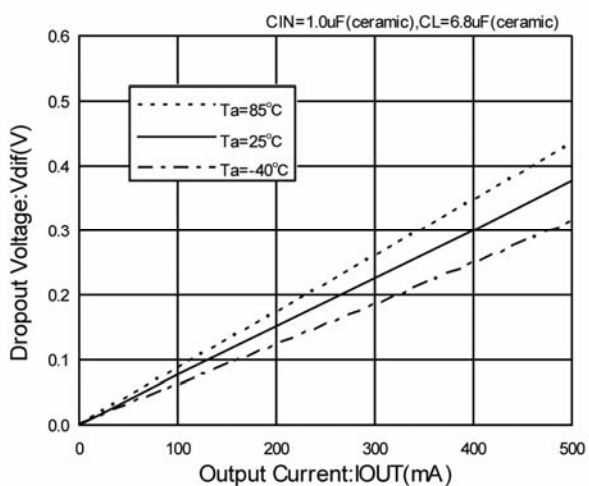
XC6210 (VOUT:0.8V)



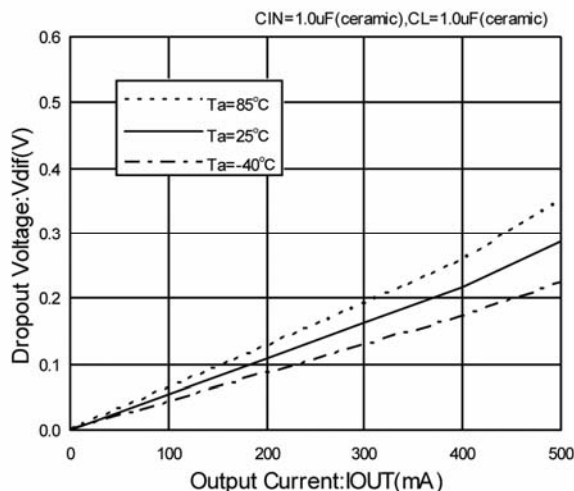
XC6210 (VOUT:1.2V)



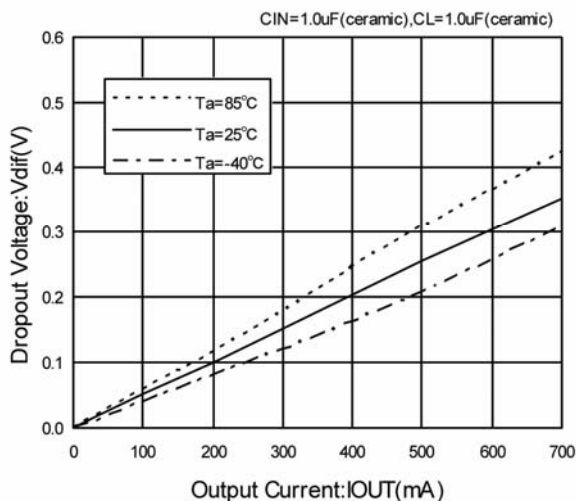
XC6210 (VOUT:1.5V)



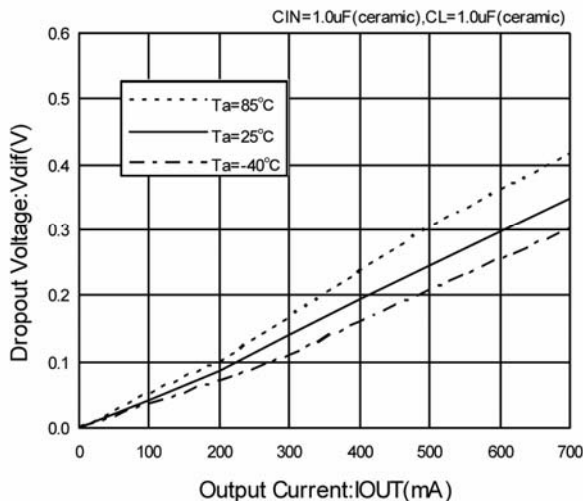
XC6210 (VOUT:2.5V)



XC6210 (VOUT:3.0V)

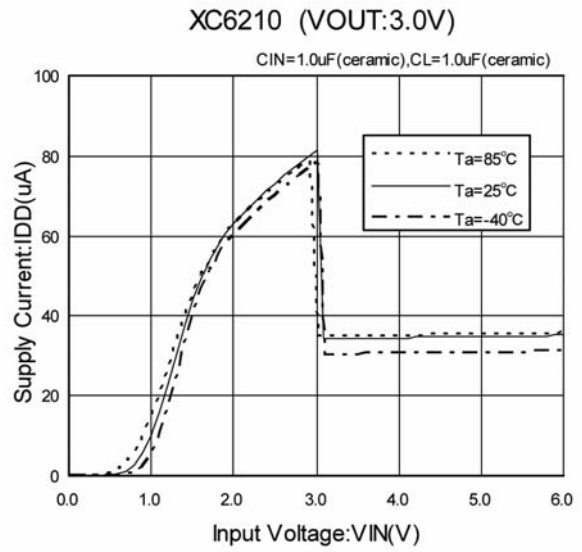
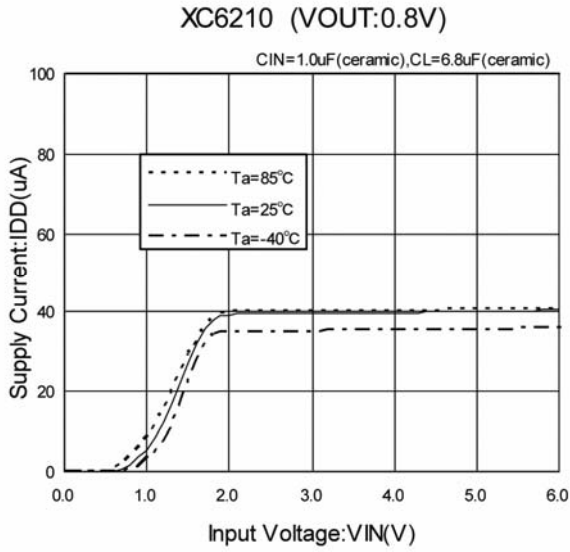


XC6210 (VOUT:5.0V)

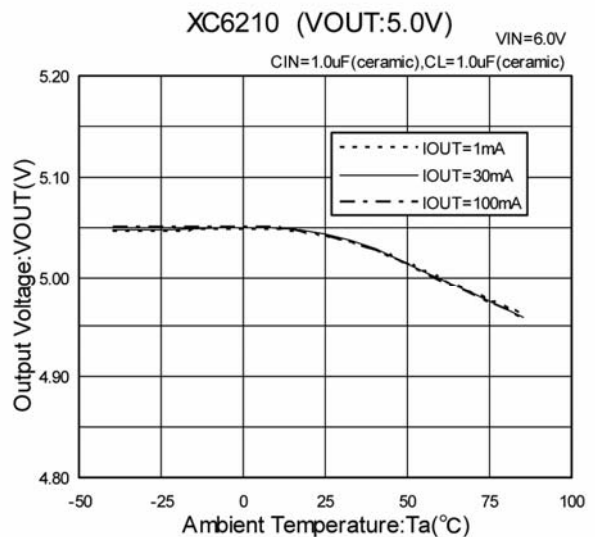
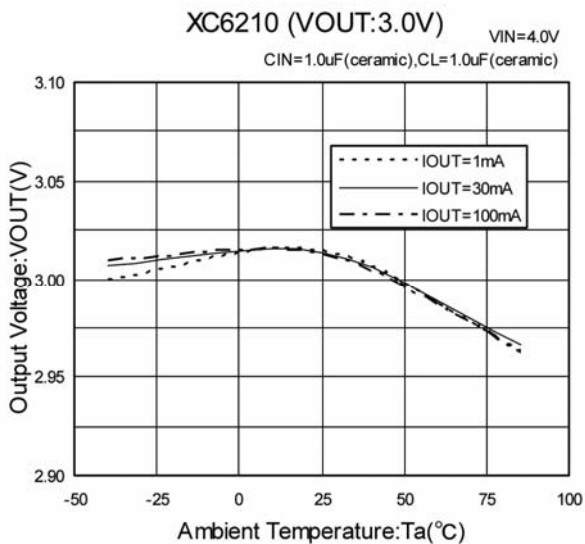
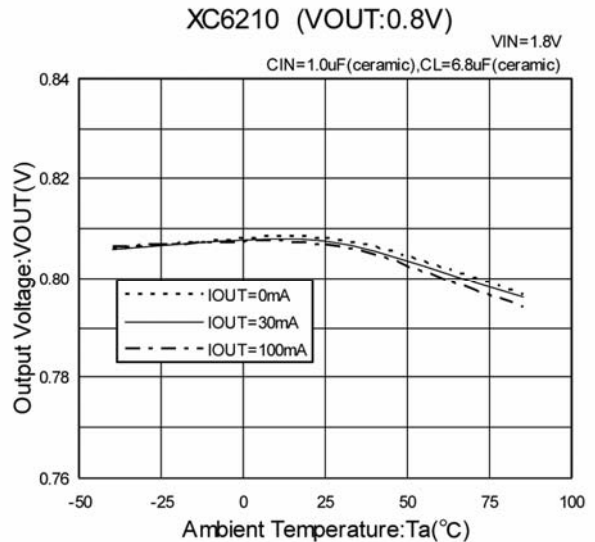
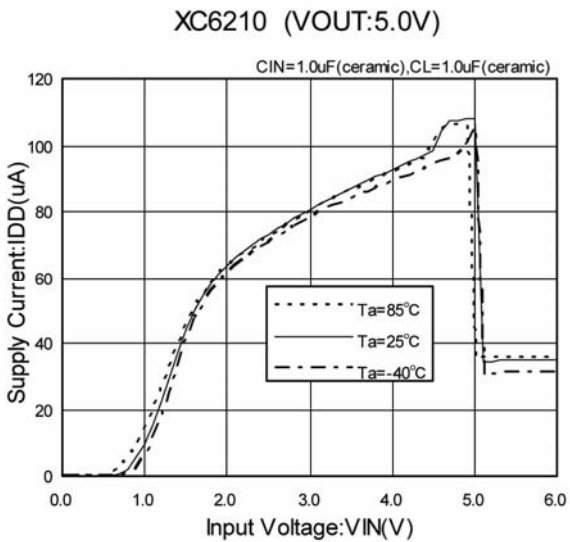


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(4) Supply Current vs. Input Voltage

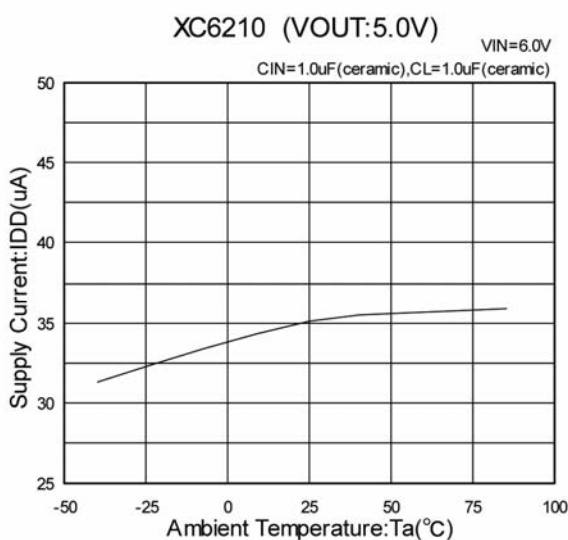
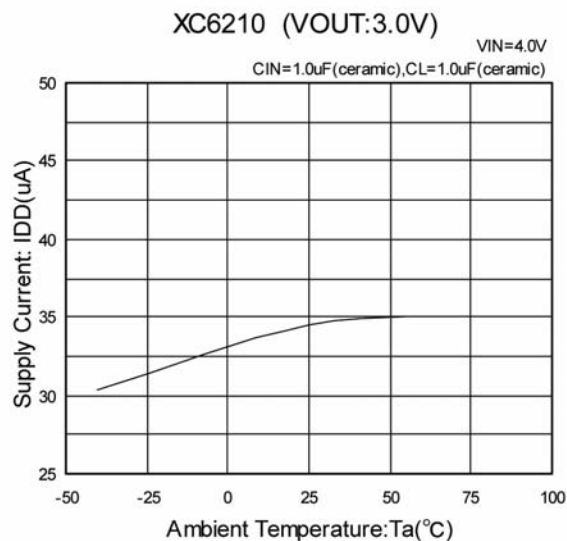
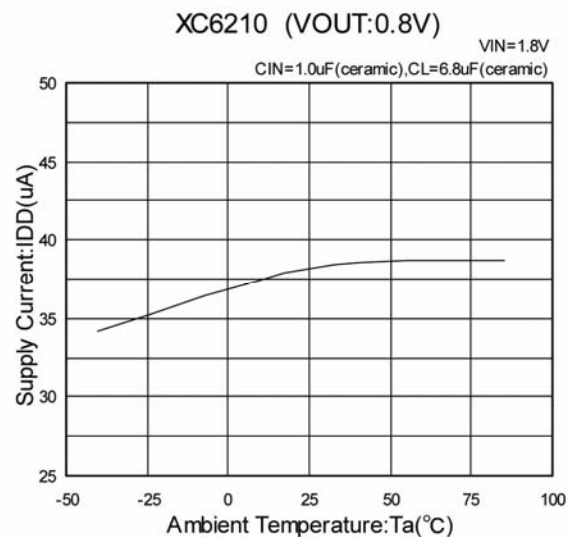


(5) Output Voltage vs. Ambient Temperature

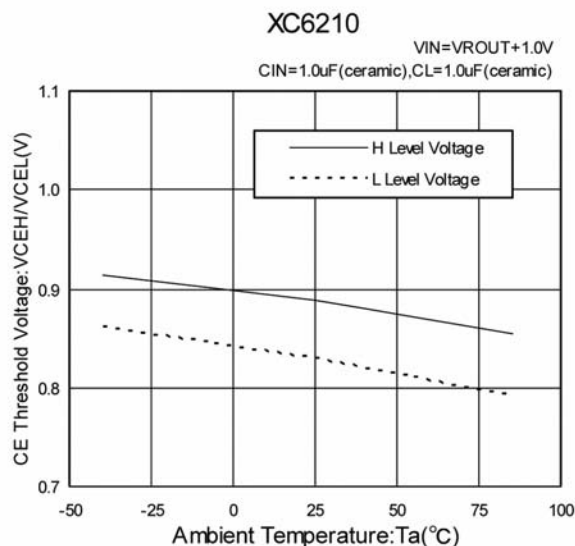


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(6) Supply Current vs. Ambient Temperature

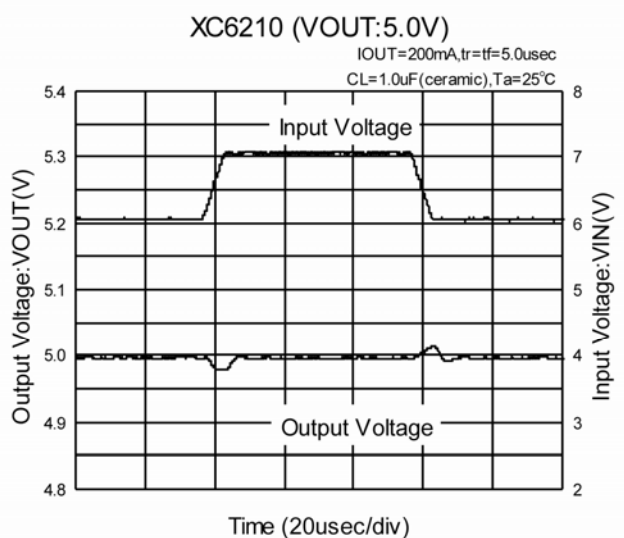
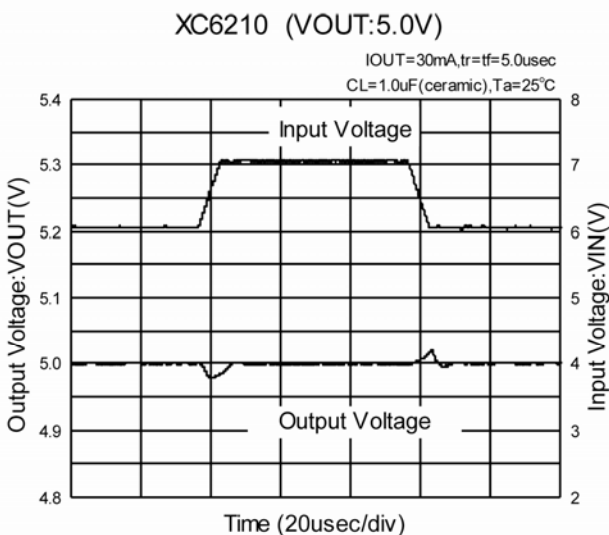
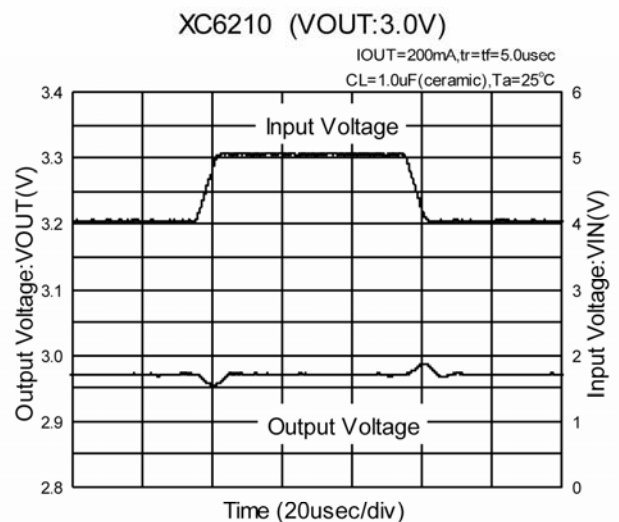
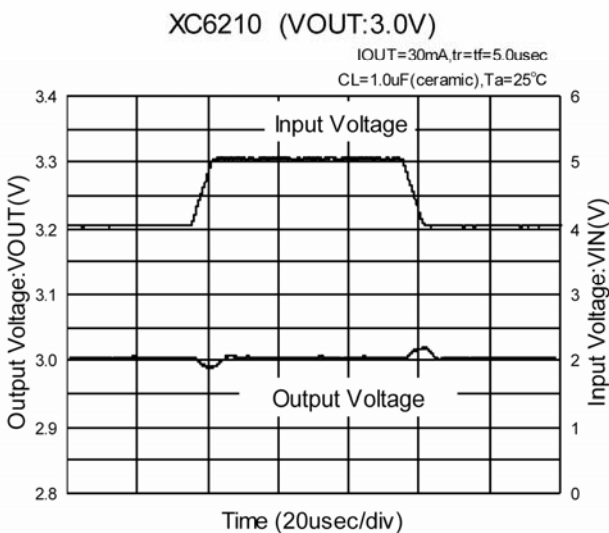
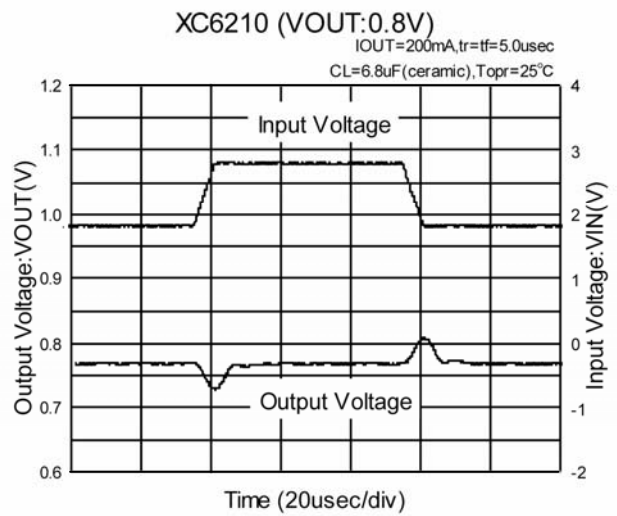
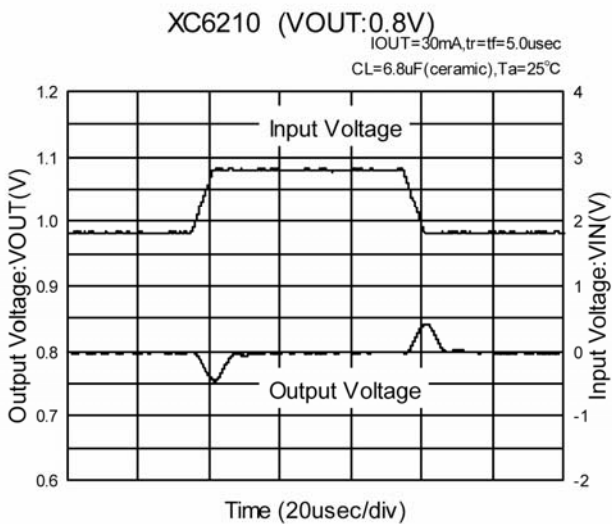


(7) CE Pin Threshold Voltage vs. Ambient Temperature



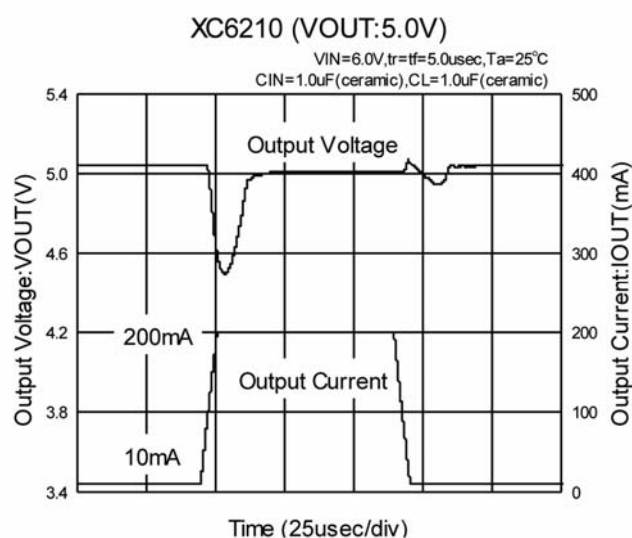
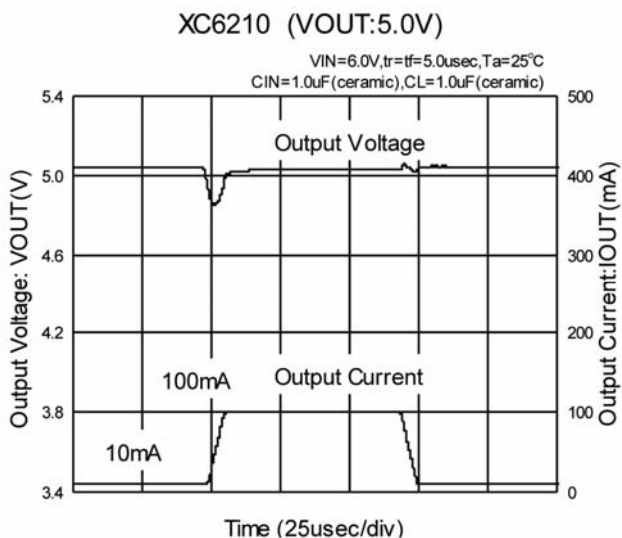
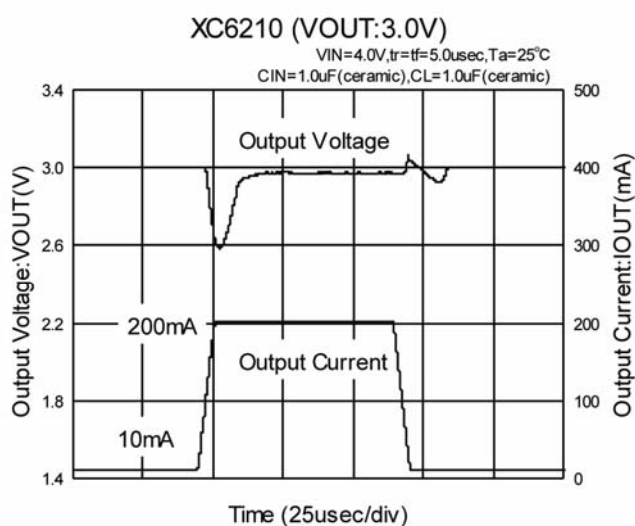
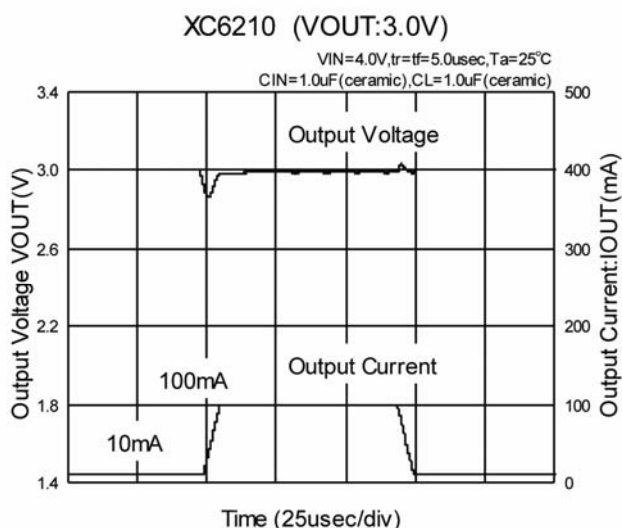
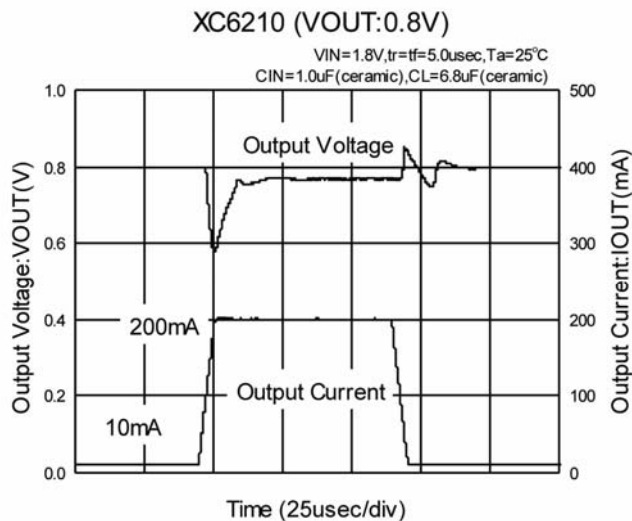
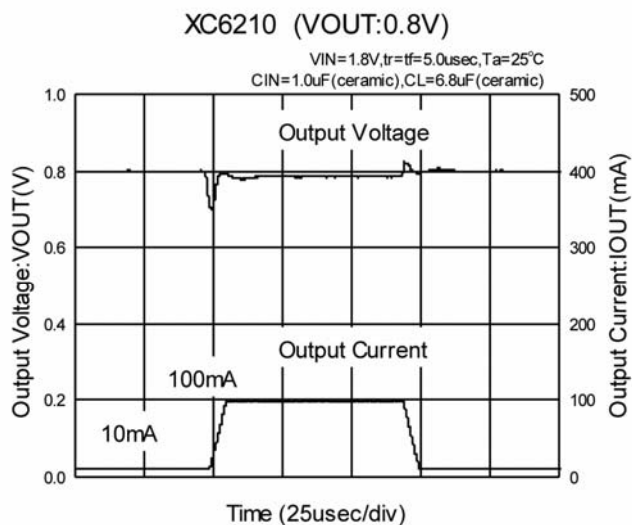
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Input Transient Response 1



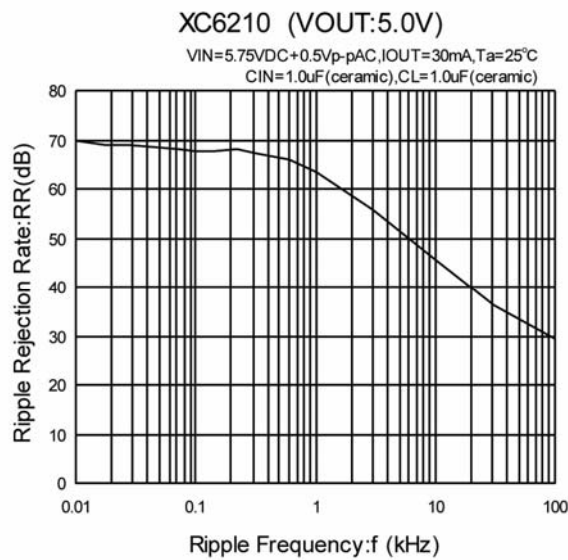
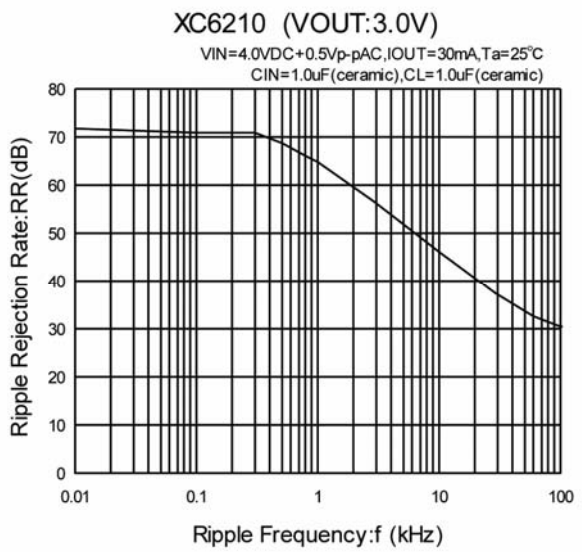
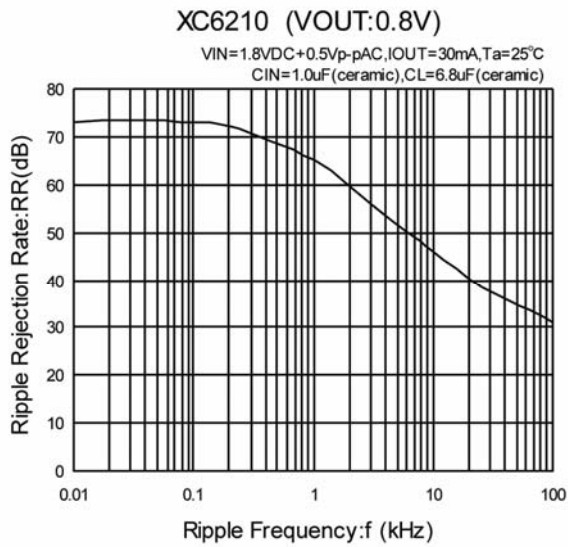
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Load Transient Response



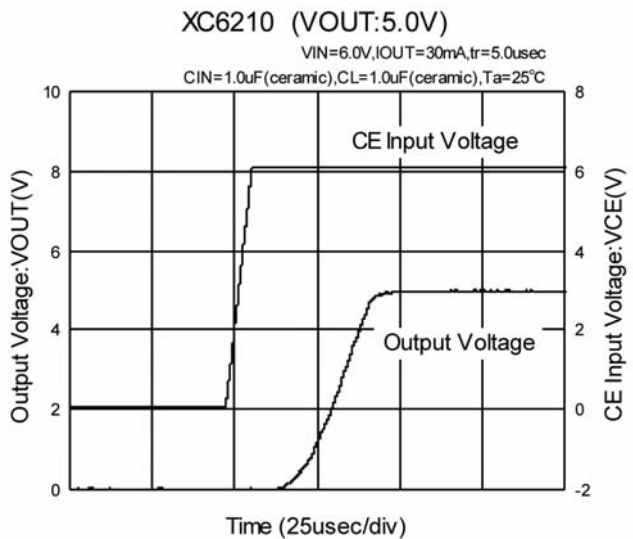
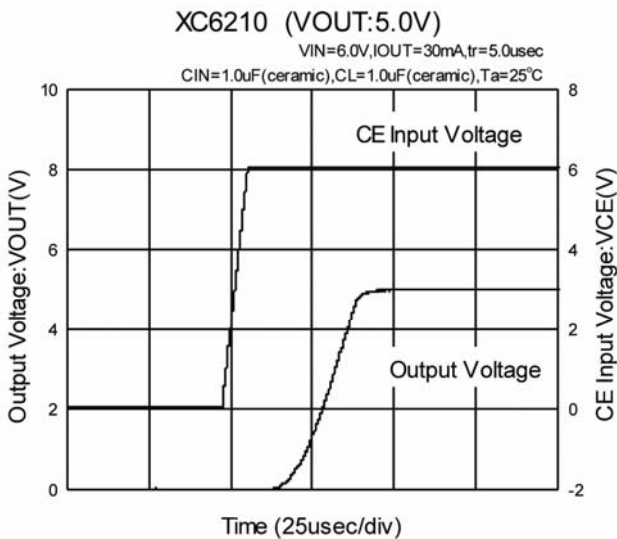
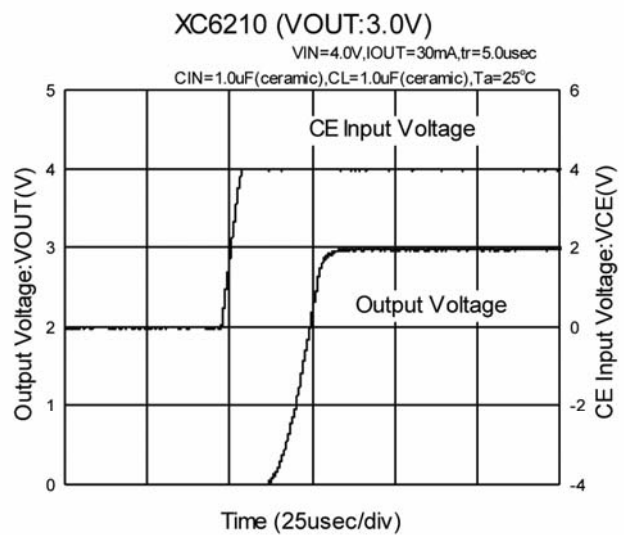
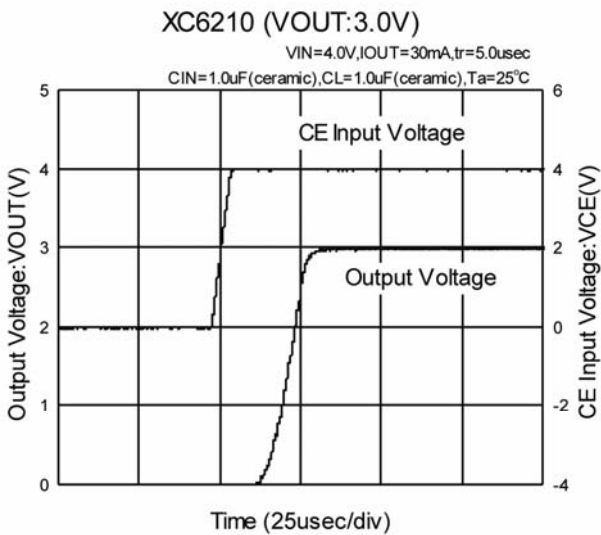
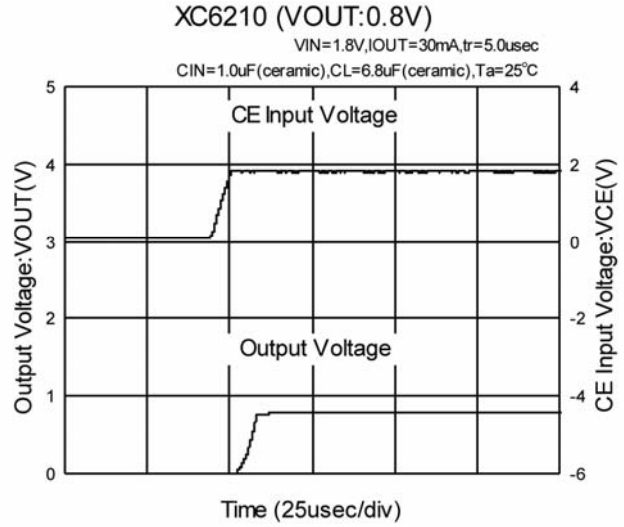
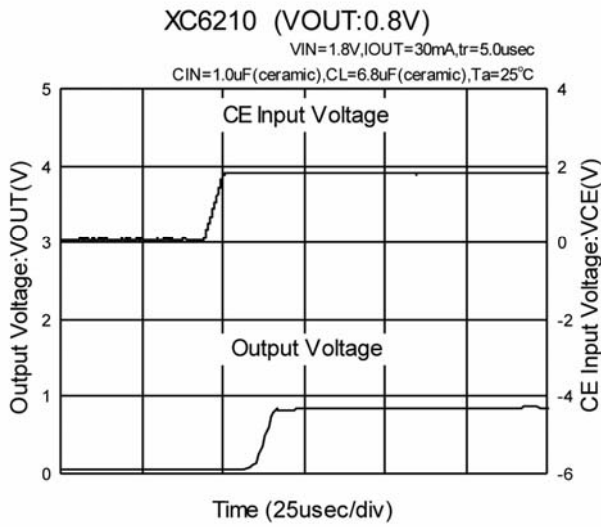
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(10) Ripple Rejection Rate



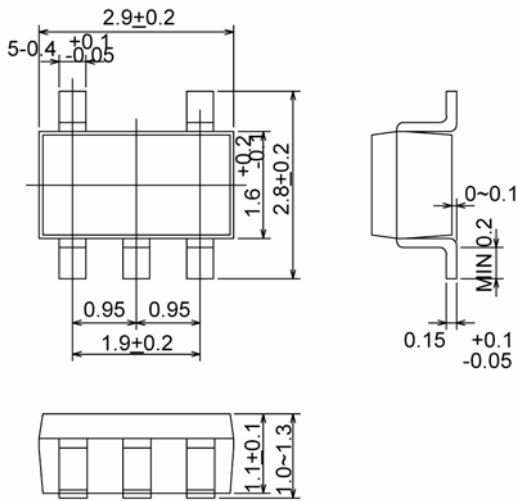
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(11) Input Transient Response 2

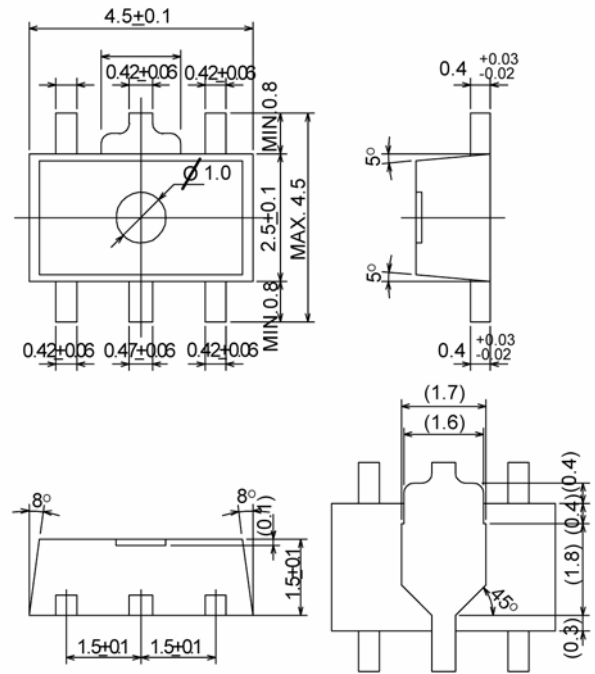


PACKAGING INFORMATION

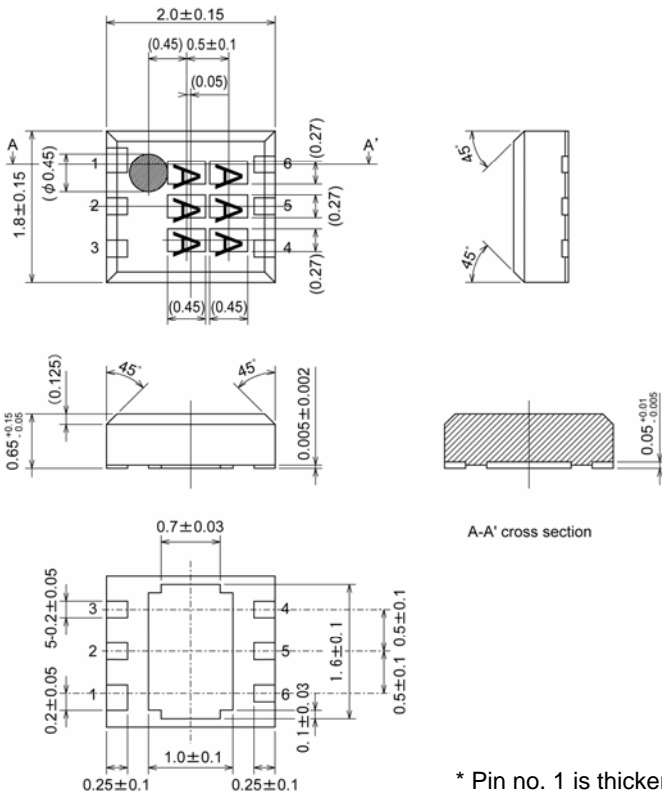
SOT-25 (SOT-23-5)



SOT-89-5



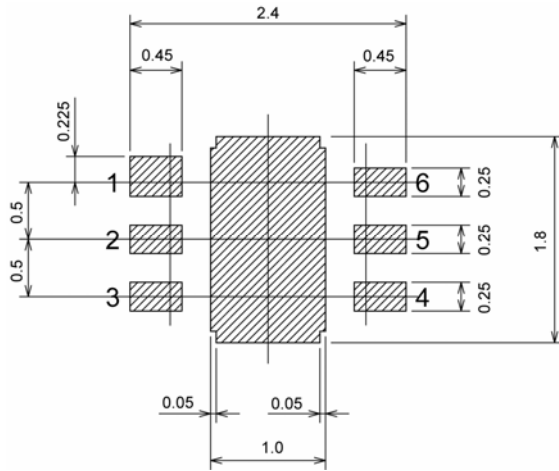
USP-6B



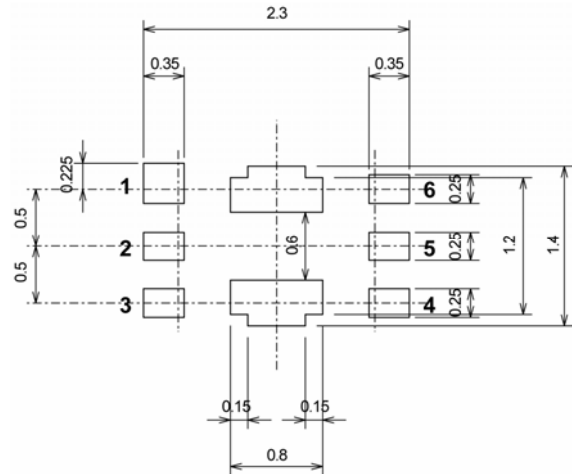
* Pin no. 1 is thicker than other pins.

PACKAGING INFORMATION (Continued)

USP-6B Recommended Pattern Layout

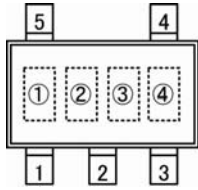


USP-6B Recommended Metal Mask Design



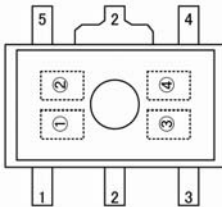
MARKING RULE

SOT-25



SOT-25
(TOP VIEW)

SOT-89-5



SOT-89-5
(TOP VIEW)

Represents product series

| MARK | PRODUCT SERIES |
|------|----------------|
| 0 | XC6210xxxxxx |

Represents CE function

| MARK | | | | PRODUCT SERIES |
|----------------------|----------------------|------------------------|------------------------|----------------|
| VOLTAGE= 0.1~3.0V | VOLTAGE= 3.1~6.0V | VOLTAGE= 0.15~3.05V | VOLTAGE= 3.15~6.05V | |
| V | A | E | L | XC6210Axxxxx |
| X | B | F | M | XC6210Bxxxxx |
| Y | C | H | N | XC6210Cxxxxx |
| Z | D | K | P | XC6210Dxxxxx |

Represents output voltage

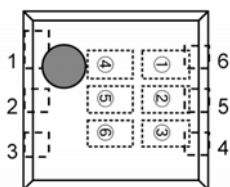
| MARK | OUTPUT VOLTAGE (V) | | | MARK | OUTPUT VOLTAGE (V) | | | | |
|------|--------------------|-----|------|------|--------------------|-----|-----|------|------|
| 0 | - | 3.1 | - | 3.15 | F | 1.6 | 4.6 | 1.65 | 4.65 |
| 1 | - | 3.2 | - | 3.25 | H | 1.7 | 4.7 | 1.75 | 4.75 |
| 2 | - | 3.3 | - | 3.35 | K | 1.8 | 4.8 | 1.85 | 4.85 |
| 3 | - | 3.4 | - | 3.45 | L | 1.9 | 4.9 | 1.95 | 4.95 |
| 4 | - | 3.5 | - | 3.55 | M | 2.0 | 5.0 | 2.05 | - |
| 5 | - | 3.6 | - | 3.65 | N | 2.1 | - | 2.15 | - |
| 6 | - | 3.7 | - | 3.75 | P | 2.2 | - | 2.25 | - |
| 7 | 0.8 | 3.8 | - | 3.85 | R | 2.3 | - | 2.35 | - |
| 8 | 0.9 | 3.9 | 0.85 | 3.95 | S | 2.4 | - | 2.45 | - |
| 9 | 1.0 | 4.0 | 0.95 | 4.05 | T | 2.5 | - | 2.55 | - |
| A | 1.1 | 4.1 | 1.15 | 4.15 | U | 2.6 | - | 2.65 | - |
| B | 1.2 | 4.2 | 1.25 | 4.25 | V | 2.7 | - | 2.75 | - |
| C | 1.3 | 4.3 | 1.35 | 4.35 | X | 2.8 | - | 2.85 | - |
| D | 1.4 | 4.4 | 1.45 | 4.45 | Y | 2.9 | - | 2.95 | - |
| E | 1.5 | 4.5 | 1.55 | 4.55 | Z | 3.0 | - | 3.05 | - |

Represents production lot number

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

MARKING RULE (Continued)

USP-6B



USP-6B
(TOP VIEW)

Represents product series

| MARK | | PRODUCT SERIES |
|------|---|----------------|
| 1 | 0 | |

Represents CE Function

| MARK | TYPE | PRODUCT SERIES |
|------|--|----------------|
| A | High Active With Pull-Down Resistor | XC6210AxxxDx |
| B | High Active With No Pull-Down Resistor | XC6210AxxxDx |
| C | Low Active With Pull-Up Resistor | XC6210AxxxDx |
| D | Low Active With No Pull-Up Resistor | XC6210AxxxDx |
| S | Custom | XC6210AxxxDx |

Represents the integer number of output voltage

| MARK | VOLTAGE (V) | PRODUCT SERIES |
|------|-------------|----------------|
| 3 | 3.3 | XC6210x3xxDx |
| 5 | 5.0 | XC6210x5xxDx |

Represents the decimal point of output voltage

| MARK | VOLTAGE (V) | PRODUCT SERIES | MARK | VOLTAGE (V) | PRODUCT SERIES |
|------|-------------|----------------|------|-------------|----------------|
| 0 | x.0 | XC6210xx02Dx | A | x.05 | XC6210xx0ADx |
| 1 | x.1 | XC6210xx12Dx | B | x.15 | XC6210xx1ADx |
| 2 | x.2 | XC6210xx22Dx | C | x.25 | XC6210xx2ADx |
| 3 | x.3 | XC6210xx32Dx | D | x.35 | XC6210xx3ADx |
| 4 | x.4 | XC6210xx42Dx | E | x.45 | XC6210xx4ADx |
| 5 | x.5 | XC6210xx52Dx | F | x.55 | XC6210xx5ADx |
| 6 | x.6 | XC6210xx62Dx | H | x.65 | XC6210xx6ADx |
| 7 | x.7 | XC6210xx72Dx | K | x.75 | XC6210xx7ADx |
| 8 | x.8 | XC6210xx82Dx | L | x.85 | XC6210xx8ADx |
| 9 | x.9 | XC6210xx92Dx | M | x.95 | XC6210xx9ADx |

Represents production lot number

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

Note: No character inversion used.

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