

300mA/150mA High Speed LDO Regulators with ON-OFF Control

GENERAL DESCRIPTION

The XC6204/XC6205 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a standard voltage source, an error correction, current limiter and a phase compensation circuit plus a driver transistor.

Output voltage is selectable in 0.05V steps within a range of 0.9V ~ 6.0V.

The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.

The current limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin.

The CE function enables the output to be turned off, resulting in greatly reduced power consumption.

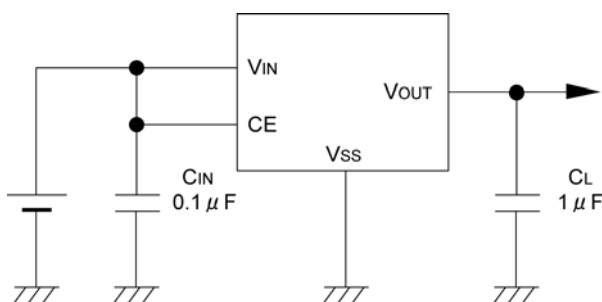
APPLICATIONS

- Mobile phones
- Cordless phones
- Cameras, video recorders
- Portable games
- Portable AV equipment
- Reference voltage
- Battery powered equipment

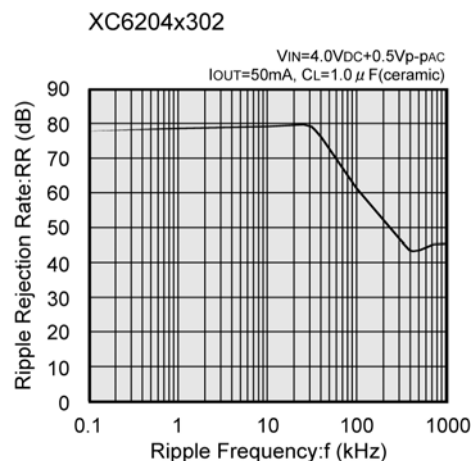
FEATURES

- Maximum Output Current** : 150mA
300mA(XC6204 E to H type)
- Dropout Voltage** : 200mV @ 100mA
60mV @ 30mA
- Operating Voltage** : 2V ~ 10V
- Output Voltage Range** : 1.8V ~ 6.0V (XC6204)
0.9V ~ 1.75V (XC6205)
- Highly Accurate** : ± 2%, ± 1%
- Low Power Consumption** : 70 μ A (TYP.)
- Standby Current** : 0.1 μ A (MAX.)
- High Ripple Rejection** : 70dB@10kHz (XC6204)
60dB@10kHz (XC6205)
- Low ESR Capacitor Compatible**
: Ceramic capacitor
- Operating Ambient Temperature**
: -40 ~ 85
- Packages** : SOT-25, SOT-89-5, USP-6B
- Environmentally Friendly** : EU RoHS Compliant, Pb Free

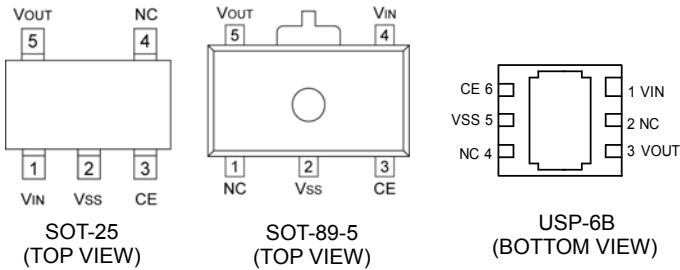
TYPICAL APPLICATION CIRCUIT



TYPICAL PERFORMANCE CHARACTERISTICS



PIN CONFIGURATION



PIN ASSIGNMENT

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

FUNCTIONS

XC6204/6205 A, B, E, F Type

| CE | OPERATIONAL STATE |
|----|-------------------|
| H | ON |
| L | OFF |

H= High Level

L= Low Level

XC6204/6205 C, D, G, H Type

| CE | OPERATIONAL STATE |
|----|-------------------|
| H | OFF |
| L | ON |

PRODUCT CLASSIFICATION

Ordering Information

XC6204/XC6205 -

| DESIGNATOR | ITEM | SYMBOL | DESCRIPTION |
|------------------|-------------------------------------|------------------|--|
| (*) | Type of Regulator (CE pin Logic) | A | 150mA Active High, pull-down resistor built-in ^(*) (Semi-Custom) |
| | | B | 150mA Active High, no pull-down resistor built-in (Standard) |
| | | C | 150mA Active Low, pull-up resistor built-in ^(*) (Semi-Custom) |
| | | D | 150mA Active Low, no pull-up resistor built-in (Semi-Custom) |
| | | E | 300mA ^(*) Active High, pull-down resistor built-in ^(*) (Semi-Custom) |
| | | F | 300mA ^(*) Active High, no pull-down resistor built-in (Standard) |
| | | G | 300mA ^(*) Active Low, pull-up resistor built-in ^(*) (Semi-Custom) |
| | | H | 300mA ^(*) Active Low, no pull-up resistor built-in (Semi-Custom) |
| | Output Voltage | 09 ~ 17 | XC6205 |
| | | 18 ~ 60 | XC6204 e.g. V _{OUT} =2.0V =2, =0 |
| | Output Voltage Accuracy | 2 ^(*) | 0.1V increments, ±2% accuracy e.g. V _{OUT} =2.8V, ±2% =3, =8, =2 |
| | | 1 ^(*) | 0.1V increments, ±1% accuracy e.g. V _{OUT} =3.0V, ±1% =3, =0, =1 |
| | | A ^(*) | 0.05V increments, ±2% accuracy e.g. V _{OUT} =2.85V, ±2% =2, =8, =A |
| | | B ^(*) | 0.05V increments, ±1% accuracy e.g. V _{OUT} =3.85V, ±1% =3, =8, =B |
| ⑦ ^(*) | Packages (Order Unit) | MR | SOT-25 (3,000/Reel) |
| | | MR-G | SOT-25 (3,000/Reel) |
| | | DR | USP-6B (3,000/Reel) |
| | | DR-G | USP-6B (3,000/Reel) |
| | | PR | SOT-89-5 (1,000/Reel) |
| | | PR-G | SOT-89-5 (1,000/Reel) |

(*) E to H types are compatible to 300mA of XC6204 series. (XC6205 can not draw 300mA depending on output voltage.)

(*) With the pull-up resistor or pull-down resistor built-in types, the supply current during operation will increase by V_{IN} / 300kΩ (TYP.)

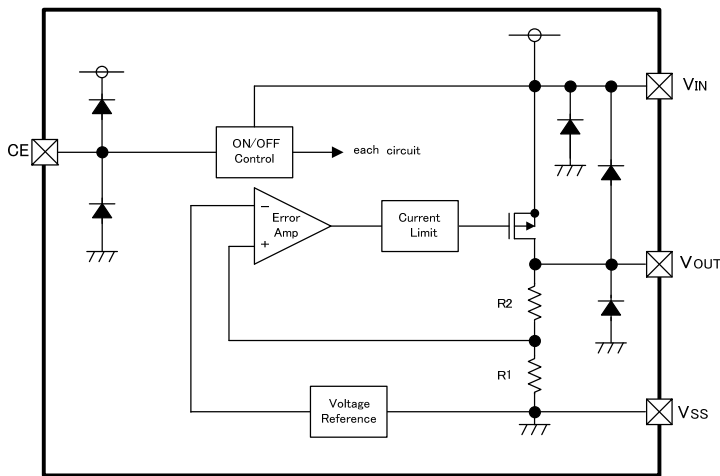
(*) Output voltage range of the ±1% accuracy product is 2.95V to 6.0V.

(*) Output voltage accuracy of the V_{OUT} ≤ 1.5V is ±30mV.

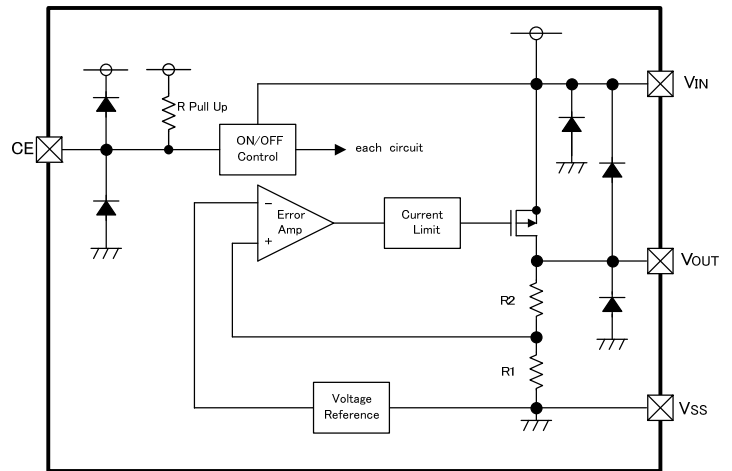
(*) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

BLOCK DIAGRAM

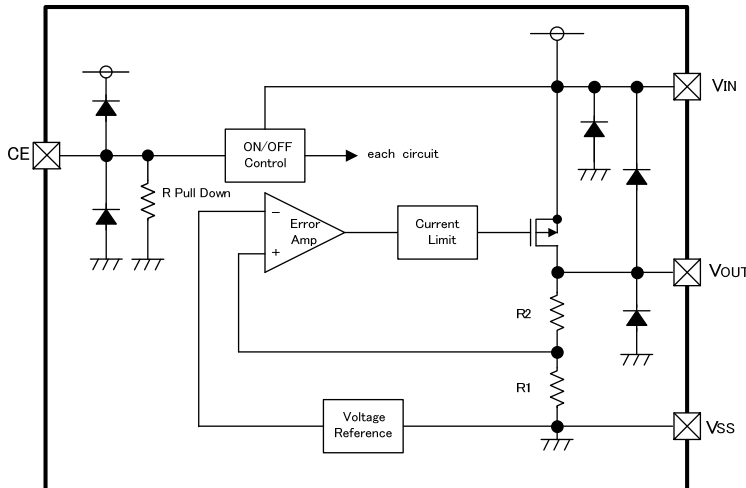
1) XC6204, XC6205 Series B, D, F, H Type



2) XC6204, XC6205 Series C, G Type



3) XC6204, XC6205 Series A, E Type



*Diodes shown in the above circuit are protective diodes.

ABSOLUTE MAXIMUM RATINGS

Ta=25

| PARAMETER | SYMBOL | RATINGS | UNITS | |
|-------------------------------|------------------|---|-------|-----------------------------------|
| Input Voltage | V _{IN} | 12.0 | V | |
| Output Current | I _{OUT} | 500* | mA | |
| Output Voltage | V _{OUT} | V _{SS} -0.3 ~ V _{IN} +0.3 | V | |
| CE Input Voltage | V _{CE} | V _{SS} -0.3 ~ V _{IN} +0.3 | V | |
| Power Dissipation | SOT-25 | 250 | mW | |
| | | 600(PCB mounted) ^{(*)2} | | |
| | | USP-6B | | 120 |
| | | | | 1000(PCB mounted) ^{(*)2} |
| SOT-89-5 | 500 | 1300(PCB mounted) ^{(*)2} | | |
| | | | | |
| Operating Ambient Temperature | T _{opr} | -40 ~ +85 | | |
| Storage Temperature | T _{stg} | -55 ~ +125 | | |

^{(*)1} I_{OUT}=Pd/(V_{IN}-V_{OUT})

^{(*)2} The power dissipation figure shown is PCB mounted and is for reference only. Please refer to page 42~44 for details.

ELECTRICAL CHARACTERISTICS

XC6204A, B Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | -40 ≤ Ta ≤ 85 | | | UNITS | CIRCUIT | |
|---|---|---|-----------|---------------------|-----------------|---------------------|--------|---------------------|--------|---------|---|
| | | | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | | | |
| Output Voltage (2% products) | V _{OUT(E)} | I _{OUT} = 30mA | × 0.98 | V _{OUT(T)} | × 1.02 | V _{OUT(T)} | × 0.97 | V _{OUT(T)} | × 1.03 | V | 1 |
| Output Voltage (1% products) | | | × 0.99 | | × 1.01 | | × 0.98 | | × 1.02 | | |
| Maximum Output Current | I _{OUTMAX} | - | 150 | - | - | 150 | - | - | mA | 1 | |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | - | 30 | 80 | mV | 1 | |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | | | | mV | 1 | |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | | | | | |
| Supply Current (A type) | I _{DD} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | 50 | 80 | 120 | 50 | 90 | 145 | μA | 2 | |
| Supply Current (B type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | 40 | 70 | 100 | 40 | 80 | 120 | | | |
| Standby Current | I _{STBY} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | - | 0.01 | 0.10 | - | 0.05 | 1.00 | μA | 2 | |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$ | V _{OUT(T)} +1.0V V _{IN} 10V I _{OUT} = 30mA | - | 0.01 | 0.20 | - | 0.05 | 0.30 | %/V | 1 | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | 2 | - | 10 | V | - | |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$ | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | - | - | - | ppm/ | 1 | |
| Output Noise | en | I _{OUT} = 10mA 300Hz~50kHz | - | 30 | - | - | - | - | μVrms | 3 | |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC I _{OUT} = 50mA, f=10kHz | - | 70 | - | - | - | - | dB | 4 | |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{IN} | - | 300 | - | - | 280 | - | mA | 1 | |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{IN} | - | 50 | - | - | 60 | - | mA | 1 | |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | 1.7 | - | V _{IN} | V | 1 | |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | - | - | 0.20 | | | |
| CE "High" Current (A type) | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | 3.2 | - | 20.0 | 3.0 | - | 25.0 | μA | 2 | |
| CE "High" Current (B type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | -0.10 | - | 0.10 | -0.15 | - | 0.15 | | | |
| CE "Low" Current | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | -0.10 | - | 0.10 | -0.15 | - | 0.15 | | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

(*5) The values for -40 Ta 85 are designed values.

ELECTRICAL CHARACTERISTICS (Continued)

XC6204C, D Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | -40 ≤ Ta ≤ 85 | | | UNITS | CIRCUIT | |
|---|---|---|-----------|---------------------|-----------------|---------------------|--------|---------------------|--------|---------|---|
| | | | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | | | |
| Output Voltage (2% products) | V _{OUT(E)} | I _{OUT} = 30mA | × 0.98 | V _{OUT(T)} | × 1.02 | V _{OUT(T)} | × 0.97 | V _{OUT(T)} | × 1.03 | V | 1 |
| Output Voltage (1% products) | | | × 0.99 | | × 1.01 | | × 0.98 | | × 1.02 | | |
| Maximum Output Current | I _{OUTMAX} | - | 150 | - | - | 150 | - | - | mA | 1 | |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | - | 30 | 80 | mV | 1 | |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | | | | mV | 1 | |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | | | | | |
| Supply Current (C type) | I _{DD} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | 50 | 80 | 120 | 50 | 90 | 145 | μA | 2 | |
| Supply Current (D type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | 40 | 70 | 100 | 40 | 80 | 120 | | | |
| Standby Current | I _{STBY} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | - | 0.01 | 0.10 | - | 0.05 | 1.00 | μA | 2 | |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$ | V _{OUT(T)} +1.0V V _{IN} 10V I _{OUT} = 30mA | - | 0.01 | 0.20 | - | 0.05 | 0.30 | %/V | 1 | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | 2 | - | 10 | V | - | |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$ | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | - | - | - | ppm/ | 1 | |
| Output Noise | en | I _{OUT} = 10mA 300Hz~50kHz | - | 30 | - | - | - | - | μVrms | 3 | |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 70 | - | - | - | - | dB | 4 | |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | - | 300 | - | - | 280 | - | mA | 1 | |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | - | 50 | - | - | 60 | - | mA | 1 | |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | 1.7 | - | V _{IN} | V | 1 | |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | - | - | 0.20 | | | |
| CE "High" Current | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | -0.10 | - | 0.10 | -0.15 | - | 0.15 | μA | 2 | |
| CE "Low" Current (C type) | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | -20.0 | - | -3.2 | -25.0 | - | -3.0 | | | |
| CE "Low" Current (D type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | -0.10 | - | 0.10 | -0.15 | - | 0.15 | | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

(*5) The values for -40 Ta 85 are designed values.

ELECTRICAL CHARACTERISTICS (Continued)

XC6204E, F Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | UNITS | CIRCUIT |
|---|---|---|-----------|------|-----------------|-------|---------|
| | | | MIN. | TYP. | MAX. | | |
| Output Voltage (2% products) | V _{OUT(E)} | I _{OUT} = 30mA | E-0 | | | V | 1 |
| Maximum Output Current | I _{OUTMAX} | V _{IN} = V _{OUT(T)} +1.0V When V _{OUT} = 2.0V, V _{IN} = 3.0V | 300 | - | - | mA | 1 |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | mV | 1 |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | mV | 1 |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | |
| Supply Current (E type) | I _{DD} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | 50 | 80 | 120 | μA | 2 |
| Supply Current (F type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | 40 | 70 | 100 | | |
| Standby Current | I _{STBY} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | - | 0.01 | 0.10 | μA | 2 |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$ | V _{OUT(T)} +1.0V V _{IN} 10V I _{OUT} = 30mA | - | 0.01 | 0.20 | %/V | 1 |
| | V _{IN} | - | 2 | - | 10 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$ | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | ppm/ | 1 |
| | en | I _{OUT} = 10mA 300Hz~50kHz | | 30 | - | μVrms | 3 |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 70 | - | dB | 4 |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{IN} | - | 380 | - | mA | 1 |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{IN} | - | 50 | - | mA | 1 |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | V | 1 |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | | |
| CE "High" Current (E type) | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | 3.2 | - | 20.0 | μA | 2 |
| CE "High" Current (F type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | -0.10 | - | 0.10 | | |
| CE "Low" Current | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | -0.10 | - | 0.10 | μA | 2 |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

ELECTRICAL CHARACTERISTICS (Continued)

XC6204G, H Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | UNITS | CIRCUIT |
|---|---|---|-----------|------|-----------------|-------------------|---------|
| | | | MIN. | TYP. | MAX. | | |
| Output Voltage (2% products) | V _{OUT(E)} | I _{OUT} = 30mA | E-0 | | | V | 1 |
| Maximum Output Current | I _{OUTMAX} | V _{IN} = V _{OUT(T)} +1.0V When V _{OUT} = 2.0V, V _{IN} = 3.0V | 300 | - | - | mA | 1 |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | mV | 1 |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | mV | 1 |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | |
| Supply Current (G type) | I _{DD} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | 50 | 80 | 120 | μA | 2 |
| Supply Current (H type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | 40 | 70 | 100 | | |
| Standby Current | I _{STBY} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | - | 0.01 | 0.10 | μA | 2 |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$ | V _{OUT(T)} +1.0V V _{IN} 10V I _{OUT} = 30mA | - | 0.01 | 0.20 | %/V | 1 |
| | | | | | | | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$ | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | ppm/ | 1 |
| Output Noise | e _n | I _{OUT} = 10mA 300Hz~50kHz | | 30 | - | μV _{rms} | 3 |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 70 | - | dB | 4 |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | - | 380 | - | mA | 1 |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | - | 50 | - | mA | 1 |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | V | 1 |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | | |
| CE "High" Current | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V | -0.10 | - | 0.10 | μA | 2 |
| CE "Low" Current (G type) | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | -20.0 | - | -3.2 | | |
| CE "Low" Current (H type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} | -0.10 | - | 0.10 | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

ELECTRICAL CHARACTERISTICS (Continued)

XC6205A, B Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | UNITS | CIRCUIT |
|---|---|--|-----------|---------------------|-----------------|-------|---------|
| | | | MIN. | TYP. | MAX. | | |
| Output Voltage ^(*5) | V _{OUT(E)} | I _{OUT} = 30mA | × 0.98 | V _{OUT(T)} | × 1.02 | V | 1 |
| Maximum Output Current | I _{OUTMAX} | | 150 | - | - | mA | 1 |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | mV | 1 |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | mV | 1 |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | |
| Supply Current (A type) | I _{DD} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | 50 | 80 | 120 | μA | 2 |
| Supply Current (B type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | 40 | 70 | 100 | | |
| Standby Current | I _{STBY} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | - | 0.01 | 0.10 | μA | 2 |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$ | V _{OUT(T)} +1.0V V _{IN} 10V I _{OUT} = 30mA, V _{CE} = V _{IN} When V _{OUT} 0.95V, 2.0V V _{IN} 10V | - | 0.01 | 0.20 | %/V | 1 |
| | | | | | | | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$ | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | ppm/ | 1 |
| Output Noise | en | I _{OUT} = 10mA 300Hz~50kHz | - | 30 | - | μVrms | 3 |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC When V _{OUT} 1.5V, V _{IN} =2.5V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 65 | - | dB | 4 |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{IN} | - | 300 | - | mA | 1 |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{IN} | - | 50 | - | mA | 1 |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | V | 1 |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | | |
| CE "High" Current (A type) | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | 3.2 | - | 20.0 | μA | 2 |
| CE "High" Current (B type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | -0.10 | - | 0.10 | | |
| CE "Low" Current | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | -0.10 | - | 0.10 | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

However, when V_{OUT} 0.95V, V_{IN}=2.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

(*5) When V_{OUT(T)} 1.45V, MIN. V_{OUT (T)}-30mV, MAX. V_{OUT (T)}+30mV

ELECTRICAL CHARACTERISTICS (Continued)

XC6205C, D Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | UNITS | CIRCUIT |
|---|-------------------------------------|--|-----------|---------------------|-----------------|-------|---------|
| | | | MIN. | TYP. | MAX. | | |
| Output Voltage ^(*5) | V _{OUT(E)} | I _{OUT} = 30mA | × 0.98 | V _{OUT(T)} | × 1.02 | V | 1 |
| Maximum Output Current | I _{OUTMAX} | | 150 | - | - | mA | 1 |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | mV | 1 |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | mV | 1 |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | |
| Supply Current (C type) | I _{DD} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | 50 | 80 | 120 | μA | 2 |
| Supply Current (D type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | 40 | 70 | 100 | | |
| Standby Current | I _{STBY} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | - | 0.01 | 0.10 | μA | 2 |
| Line Regulation | ΔV _{OUT} | V _{OUT(T)} +1.0V V _{IN} 10V | - | 0.01 | 0.20 | %V | 1 |
| | ΔV _{IN} ·V _{OUT} | I _{OUT} = 30mA, V _{CE} = V _{SS} When V _{OUT} 0.95V, 2.0V V _{IN} 10V | | | | | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | V | - |
| Output Voltage Temperature Characteristics | ΔV _{OUT} | I _{OUT} = 30mA | - | 100 | - | ppm/ | 1 |
| | ΔT _{opr} ·V _{OUT} | -40 T _{opr} 85 | | | | | |
| Output Noise | e _n | I _{OUT} = 10mA 300Hz~50kHz | - | 30 | - | μVrms | 3 |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0V}+1.0Vp-pAC When V _{OUT} 1.5V, V _{IN} =2.5V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 65 | - | dB | 4 |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{SS} | - | 300 | - | mA | 1 |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{SS} | - | 50 | - | mA | 1 |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | V | 1 |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | | |
| CE "High" Current | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | -0.10 | - | 0.10 | μA | 2 |
| CE "Low" Current (C type) | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | -20.0 | - | -3.2 | | |
| CE "Low" Current (D type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | -0.10 | - | 0.10 | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

However, when V_{OUT} 0.95V, V_{IN}=2.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

(*5) When V_{OUT(T)} 1.45V, MIN. V_{OUT(T)}-30mV, MAX. V_{OUT(T)}+30mV

ELECTRICAL CHARACTERISTICS (Continued)

XC6205E, F Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | UNITS | CIRCUIT |
|---|--|--|-----------|---------------------|-----------------|-------|---------|
| | | | MIN. | TYP. | MAX. | | |
| Output Voltage ^(*5) | V _{OUT(E)} | I _{OUT} = 30mA | × 0.98 | V _{OUT(T)} | × 1.02 | V | 1 |
| Maximum Output Current ^(*6) | I _{OUTMAX} | V _{IN} = E-5 | E-4 | | | mA | 1 |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | mV | 1 |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | mV | 1 |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | |
| Supply Current (E type) | I _{DD} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | 50 | 80 | 120 | μA | 2 |
| Supply Current (F type) | | V _{IN} = V _{CE} =V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | 40 | 70 | 100 | | |
| Standby Current | I _{STBY} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | - | 0.01 | 0.10 | μA | 2 |
| Line Regulation | ΔV _{OUT} | V _{OUT(T)} +1.0V V _{IN} 10V | - | 0.01 | 0.20 | %V | 1 |
| | ΔV _{IN} ·V _{OUT} | I _{OUT} = 30mA, V _{CE} = V _{IN} When V _{OUT} 0.95V, 2.0V V _{IN} 10V | | | | | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | V | - |
| Output Voltage Temperature Characteristics | ΔV _{OUT} ΔT _{opr} ·V _{OUT} | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | ppm/ | 1 |
| Output Noise | en | I _{OUT} = 10mA 300Hz~50kHz | - | 30 | - | μVrms | 3 |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC When V _{OUT} 1.5V, V _{IN} =2.5V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 65 | - | dB | 4 |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{IN} | - | 380 | - | mA | 1 |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{IN} | - | 50 | - | mA | 1 |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | V | 1 |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | | |
| CE "High" Current (E type) | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | 3.2 | - | 20.0 | μA | 2 |
| CE "High" Current (F type) | | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | -0.10 | - | 0.10 | | |
| CE "Low" Current | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | -0.10 | - | 0.10 | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

However, when V_{OUT} 0.95V, V_{IN}=2.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

(*5) When V_{OUT(T)} 1.45V, MIN. V_{OUT(T)}-30mV, MAX. V_{OUT(T)}+30mV

(*6) Refer to "Specification & Condition by Series"

ELECTRICAL CHARACTERISTICS (Continued)

XC6205G, H Type

| PARAMETER | SYMBOL | CONDITIONS | Ta = 25°C | | | UNITS | CIRCUIT |
|---|--|---|-----------|---------------------|-----------------|-------|---------|
| | | | MIN. | TYP. | MAX. | | |
| Output Voltage ^(*)5) | V _{OUT(E)} | I _{OUT} = 30mA | × 0.98 | V _{OUT(T)} | × 1.02 | V | 1 |
| Maximum Output Current ^(*)6) | I _{OUTMAX} | V _{IN} = E-5 | E-4 | - | - | mA | 1 |
| Load Regulation | ΔV _{OUT} | 1mA I _{OUT} 100mA | - | 15 | 50 | mV | 1 |
| Dropout Voltage | V _{dif1} | I _{OUT} = 30mA | E-1 | | | mV | 1 |
| | V _{dif2} | I _{OUT} = 100mA | E-2 | | | | |
| Supply Current (G type) | I _{DD} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | 50 | 80 | 120 | μA | 2 |
| Supply Current (H type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | 40 | 70 | 100 | | |
| Standby Current | I _{STBY} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | - | 0.01 | 0.10 | μA | 2 |
| Line Regulation | ΔV _{OUT} | V _{OUT(T)} +1.0V V _{IN} 10V | - | 0.01 | 0.20 | %V | 1 |
| | ΔV _{IN} ·V _{OUT} | I _{OUT} = 30mA, V _{CE} = V _{SS} When V _{OUT} 0.95V, 2.0V V _{IN} 10V | | | | | |
| Input Voltage | V _{IN} | - | 2 | - | 10 | V | - |
| Output Voltage Temperature Characteristics | ΔV _{OUT} ΔT _{opr} ·V _{OUT} | I _{OUT} = 30mA -40 T _{opr} 85 | - | 100 | - | ppm/ | 1 |
| Output Noise | en | I _{OUT} = 10mA 300Hz~50kHz | - | 30 | - | μVrms | 3 |
| Power Supply Rejection Ratio | PSRR | V _{IN} = {V _{OUT(T)} +1.0}V+1.0Vp-pAC When V _{OUT} 1.5V, V _{IN} = 2.5V+1.0Vp-pAC I _{OUT} = 50mA, f = 10kHz | - | 65 | - | dB | 4 |
| Current Limiter | I _{lim} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{SS} | - | 380 | - | mA | 1 |
| Short-circuit Current | I _{short} | V _{IN} = V _{OUT(T)} +2.0V, V _{CE} = V _{SS} | - | 50 | - | mA | 1 |
| CE "High" Voltage | V _{CEH} | - | 1.6 | - | V _{IN} | V | 1 |
| CE "Low" Voltage | V _{CEL} | - | - | - | 0.25 | | |
| CE "High" Current | I _{CEH} | V _{IN} = V _{CE} = V _{OUT(T)} +1.0V When V _{OUT} 0.95V, V _{IN} = V _{CE} = 2.0V | -0.10 | - | 0.10 | μA | 2 |
| CE "Low" Current (G type) | I _{CEL} | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | -20.0 | - | -3.2 | | |
| CE "Low" Current (H type) | | V _{IN} = V _{OUT(T)} +1.0V, V _{CE} = V _{SS} When V _{OUT} 0.95V, V _{IN} = 2.0V | -0.10 | - | 0.10 | | |

NOTE:

(*1) Unless otherwise stated, V_{IN}=V_{OUT(T)}+1.0V

However, when V_{OUT} 0.95V, V_{IN}=2.0V

(*2) V_{OUT(T)}=Specified output voltage

(*3) 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).

(*4) V_{dif}=V_{IN1}-V_{OUT1}

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

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

(*5) When V_{OUT(T)} 1.45V, MIN. V_{OUT(T)}-30mV, MAX. V_{OUT(T)}+30mV

(*6) Refer to "Specification & Condition by Series"

ELECTRICAL CHARACTERISTICS (Continued)

Voltage Chart

XC6204 series Note: For the XC6204E, F, G, H type, see the item "Ta=25" only.

| SYMBOL PARAMETER SETTING OUTPUT VOLTAGE (V) | E-0 | | E-1 | | | | E-2 | | | |
|--|--|-------|--|------|------|------|---|---------|------|------|
| | OUTPUT VOLTAGE (V) (2% products) | | DROPOUT VOLTAGE 1 (mV) I _{OUT} =30mA | | | | DROPOUT VOLTAGE 2 (mV) I _{OUT} =100mA | | | |
| | V _{OUT} | | V _{dif} 1 | | | | V _{dif} 2 | | | |
| | | | Ta = 25 | | -40 | Topr | 85 | Ta = 25 | | -40 |
| V _{OUT} (T) | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | TYP. | MAX. | TYP. | MAX. |
| 1.80 | 1.764 | 1.836 | 200 | 210 | 210 | 230 | 300 | 400 | 340 | 480 |
| 1.85 | 1.813 | 1.887 | 200 | 210 | 210 | 230 | 300 | 400 | 340 | 480 |
| 1.90 | 1.862 | 1.938 | 120 | 150 | 130 | 170 | 280 | 380 | 320 | 460 |
| 1.95 | 1.911 | 1.989 | 120 | 150 | 130 | 170 | 280 | 380 | 320 | 460 |
| 2.00 | 1.960 | 2.040 | 80 | 120 | 90 | 140 | 240 | 350 | 280 | 430 |
| 2.05 | 2.009 | 2.091 | 80 | 120 | 90 | 140 | 240 | 350 | 280 | 430 |
| 2.10 | 2.058 | 2.142 | 80 | 120 | 90 | 140 | 240 | 330 | 280 | 410 |
| 2.15 | 2.107 | 2.193 | 80 | 120 | 90 | 140 | 240 | 330 | 280 | 410 |
| 2.20 | 2.156 | 2.244 | 80 | 120 | 90 | 140 | 240 | 330 | 280 | 410 |
| 2.25 | 2.205 | 2.295 | 80 | 120 | 90 | 140 | 240 | 330 | 280 | 410 |
| 2.30 | 2.254 | 2.346 | 80 | 120 | 90 | 140 | 240 | 310 | 280 | 390 |
| 2.35 | 2.303 | 2.397 | 80 | 120 | 90 | 140 | 240 | 310 | 280 | 390 |
| 2.40 | 2.352 | 2.448 | 80 | 120 | 90 | 140 | 240 | 310 | 280 | 390 |
| 2.45 | 2.401 | 2.499 | 80 | 120 | 90 | 140 | 240 | 310 | 280 | 390 |
| 2.50 | 2.450 | 2.550 | 70 | 100 | 80 | 120 | 220 | 290 | 260 | 370 |
| 2.55 | 2.499 | 2.601 | 70 | 100 | 80 | 120 | 220 | 290 | 260 | 370 |
| 2.60 | 2.548 | 2.652 | 70 | 100 | 80 | 120 | 220 | 290 | 260 | 370 |
| 2.65 | 2.597 | 2.703 | 70 | 100 | 80 | 120 | 220 | 290 | 260 | 370 |
| 2.70 | 2.646 | 2.754 | 70 | 100 | 80 | 120 | 220 | 290 | 260 | 370 |
| 2.75 | 2.695 | 2.805 | 70 | 100 | 80 | 120 | 220 | 290 | 260 | 370 |
| 2.80 | 2.744 | 2.856 | 70 | 100 | 80 | 120 | 220 | 270 | 260 | 350 |
| 2.85 | 2.793 | 2.907 | 70 | 100 | 80 | 120 | 220 | 270 | 260 | 350 |
| 2.90 | 2.842 | 2.958 | 70 | 100 | 80 | 120 | 220 | 270 | 260 | 350 |
| 2.95 | 2.891 | 3.009 | 70 | 100 | 80 | 120 | 220 | 270 | 260 | 350 |
| 3.00 | 2.940 | 3.060 | 60 | 90 | 70 | 110 | 200 | 270 | 240 | 350 |
| 3.05 | 2.989 | 3.111 | 60 | 90 | 70 | 110 | 200 | 270 | 240 | 350 |
| 3.10 | 3.038 | 3.162 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.15 | 3.087 | 3.213 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.20 | 3.136 | 3.264 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.25 | 3.185 | 3.315 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.30 | 3.234 | 3.366 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.35 | 3.283 | 3.417 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.40 | 3.332 | 3.468 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.45 | 3.381 | 3.519 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.50 | 3.430 | 3.570 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.55 | 3.479 | 3.621 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.60 | 3.528 | 3.672 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.65 | 3.577 | 3.723 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.70 | 3.626 | 3.774 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.75 | 3.675 | 3.825 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.80 | 3.724 | 3.876 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.85 | 3.773 | 3.927 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.90 | 3.822 | 3.978 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |
| 3.95 | 3.871 | 4.029 | 60 | 90 | 70 | 110 | 200 | 250 | 240 | 330 |

ELECTRICAL CHARACTERISTICS (Continued)

Voltage Chart (Continued)

XC6204 series (Continued) Note: For the XC6204E, F, G, H type, see the item "Ta=25" only.

| SYMBOL PARAMETER SETTING OUTPUT VOLTAGE (V) | E-0 | | E-1 | | | | E-2 | | | |
|--|--|-------|--|------|------|------|---|---------|------|------|
| | OUTPUT VOLTAGE (V) (2% products) | | DROPOUT VOLTAGE 1 (mV) I _{OUT} =30mA | | | | DROPOUT VOLTAGE 2 (mV) I _{OUT} =100mA | | | |
| | V _{OUT} | | V _{dif} 1 | | | | V _{dif} 2 | | | |
| | | | Ta = 25 | | -40 | Topr | 85 | Ta = 25 | | -40 |
| V _{OUT(T)} | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | TYP. | MAX. | TYP. | MAX. |
| 4.00 | 3.920 | 4.080 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.05 | 3.969 | 4.131 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.10 | 4.018 | 4.182 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.15 | 4.067 | 4.233 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.20 | 4.116 | 4.284 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.25 | 4.165 | 4.335 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.30 | 4.214 | 4.386 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.35 | 4.263 | 4.437 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.40 | 4.312 | 4.488 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.45 | 4.361 | 4.539 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.50 | 4.410 | 4.590 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.55 | 4.459 | 4.641 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.60 | 4.508 | 4.692 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.65 | 4.557 | 4.743 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.70 | 4.606 | 4.794 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.75 | 4.655 | 4.845 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.80 | 4.704 | 4.896 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.85 | 4.753 | 4.947 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.90 | 4.802 | 4.998 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 4.95 | 4.851 | 5.049 | 60 | 80 | 70 | 100 | 180 | 230 | 220 | 310 |
| 5.00 | 4.900 | 5.100 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.05 | 4.949 | 5.151 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.10 | 4.998 | 5.202 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.15 | 5.047 | 5.253 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.20 | 5.096 | 5.304 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.25 | 5.145 | 5.355 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.30 | 5.194 | 5.406 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.35 | 5.243 | 5.457 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.40 | 5.292 | 5.508 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.45 | 5.341 | 5.559 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.50 | 5.390 | 5.610 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.55 | 5.439 | 5.661 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.60 | 5.488 | 5.712 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.65 | 5.537 | 5.763 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.70 | 5.586 | 5.814 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.75 | 5.635 | 5.865 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.80 | 5.684 | 5.916 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.85 | 5.733 | 5.967 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.90 | 5.782 | 6.018 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 5.95 | 5.831 | 6.069 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |
| 6.00 | 5.880 | 6.120 | 50 | 70 | 60 | 90 | 160 | 210 | 200 | 290 |

ELECTRICAL CHARACTERISTICS (Continued)

Voltage Chart (Continued)

XC6204 series, 1% products

Note: ± 1% output voltage accuracy products are available for the XC6204E~H type from $V_{OUT}=2.95V$.

| SYMBOL | E-0 | |
|----------------------------|--------------------|-------|
| PARAMETER | OUTPUT VOLTAGE (V) | |
| SETTING OUTPUT VOLTAGE (V) | (1% products) | |
| $V_{OUT(T)}$ | V _{OUT} | |
| | MIN. | MAX. |
| 2.95 | 2.921 | 2.980 |
| 3.00 | 2.970 | 3.030 |
| 3.05 | 3.020 | 3.081 |
| 3.10 | 3.069 | 3.131 |
| 3.15 | 3.119 | 3.182 |
| 3.20 | 3.168 | 3.232 |
| 3.25 | 3.218 | 3.283 |
| 3.30 | 3.267 | 3.333 |
| 3.35 | 3.317 | 3.384 |
| 3.40 | 3.366 | 3.434 |
| 3.45 | 3.416 | 3.485 |
| 3.50 | 3.465 | 3.535 |
| 3.55 | 3.515 | 3.586 |
| 3.60 | 3.564 | 3.636 |
| 3.65 | 3.614 | 3.687 |
| 3.70 | 3.663 | 3.737 |
| 3.75 | 3.713 | 3.788 |
| 3.80 | 3.762 | 3.838 |
| 3.85 | 3.812 | 3.889 |
| 3.90 | 3.861 | 3.939 |
| 3.95 | 3.911 | 3.990 |
| 4.00 | 3.960 | 4.040 |
| 4.05 | 4.010 | 4.091 |
| 4.10 | 4.059 | 4.141 |
| 4.15 | 4.109 | 4.192 |
| 4.20 | 4.158 | 4.242 |
| 4.25 | 4.208 | 4.293 |
| 4.30 | 4.257 | 4.343 |
| 4.35 | 4.307 | 4.394 |
| 4.40 | 4.356 | 4.444 |
| 4.45 | 4.405 | 4.494 |
| 4.50 | 4.455 | 4.545 |

| SYMBOL | E-0 | |
|----------------------------|--------------------|-------|
| PARAMETER | OUTPUT VOLTAGE (V) | |
| SETTING OUTPUT VOLTAGE (V) | (1% products) | |
| $V_{OUT(T)}$ | V _{OUT} | |
| | MIN. | MAX. |
| 4.55 | 4.505 | 4.596 |
| 4.60 | 4.554 | 4.646 |
| 4.65 | 4.604 | 4.697 |
| 4.70 | 4.653 | 4.747 |
| 4.75 | 4.703 | 4.798 |
| 4.80 | 4.752 | 4.848 |
| 4.85 | 4.802 | 4.899 |
| 4.90 | 4.851 | 4.949 |
| 4.95 | 4.901 | 5.000 |
| 5.00 | 4.950 | 5.050 |
| 5.05 | 5.000 | 5.101 |
| 5.10 | 5.049 | 5.151 |
| 5.15 | 5.099 | 5.202 |
| 5.20 | 5.148 | 5.252 |
| 5.25 | 5.198 | 5.303 |
| 5.30 | 5.247 | 5.353 |
| 5.35 | 5.297 | 5.404 |
| 5.40 | 5.346 | 5.454 |
| 5.45 | 5.396 | 5.505 |
| 5.50 | 5.445 | 5.555 |
| 5.55 | 5.495 | 5.606 |
| 5.60 | 5.544 | 5.656 |
| 5.65 | 5.594 | 5.707 |
| 5.70 | 5.643 | 5.757 |
| 5.75 | 5.693 | 5.808 |
| 5.80 | 5.742 | 5.858 |
| 5.85 | 5.792 | 5.909 |
| 5.90 | 5.841 | 5.959 |
| 5.95 | 5.891 | 6.010 |
| 6.00 | 5.940 | 6.060 |

ELECTRICAL CHARACTERISTICS (Continued)

Voltage Chart (Continued)

XC6205 series

| SYMBOL PARAMETER SETTING OUTPUT VOLTAGE (V) | E-0 | | E-1 | | E-2 | |
|--|--------------------|-------|---|------|---|------|
| | OUTPUT VOLTAGE (V) | | DROPOUT VOLTAGE1 (mV) I _{OUT} =30mA | | DROPOUT VOLTAGE 2 (mV) I _{OUT} =100mA | |
| V _{OUT} (T) | V _{OUT} | | Ta = 25 | | | |
| | | | Vdif 1 | | Vdif 2 | |
| | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. |
| 0.90 | 0.870 | 0.930 | 1050 | 1100 | 1150 | 1200 |
| 0.95 | 0.920 | 0.980 | 1050 | 1100 | 1150 | 1200 |
| 1.00 | 0.970 | 1.030 | 1000 | 1100 | 1050 | 1200 |
| 1.05 | 1.020 | 1.080 | 1000 | 1100 | 1050 | 1200 |
| 1.10 | 1.070 | 1.130 | 900 | 1000 | 950 | 1100 |
| 1.15 | 1.120 | 1.180 | 900 | 1000 | 950 | 1100 |
| 1.20 | 1.170 | 1.230 | 800 | 900 | 850 | 1000 |
| 1.25 | 1.220 | 1.280 | 800 | 900 | 850 | 1000 |
| 1.30 | 1.270 | 1.330 | 700 | 800 | 750 | 900 |
| 1.35 | 1.320 | 1.380 | 700 | 800 | 750 | 900 |
| 1.40 | 1.370 | 1.430 | 600 | 700 | 650 | 800 |
| 1.45 | 1.420 | 1.480 | 600 | 700 | 650 | 800 |
| 1.50 | 1.470 | 1.530 | 500 | 600 | 550 | 700 |
| 1.55 | 1.519 | 1.581 | 500 | 600 | 550 | 700 |
| 1.60 | 1.568 | 1.632 | 400 | 500 | 500 | 600 |
| 1.65 | 1.617 | 1.683 | 400 | 500 | 500 | 600 |
| 1.70 | 1.666 | 1.734 | 300 | 400 | 400 | 500 |
| 1.75 | 1.715 | 1.785 | 300 | 400 | 400 | 500 |

Specification Chart by Series

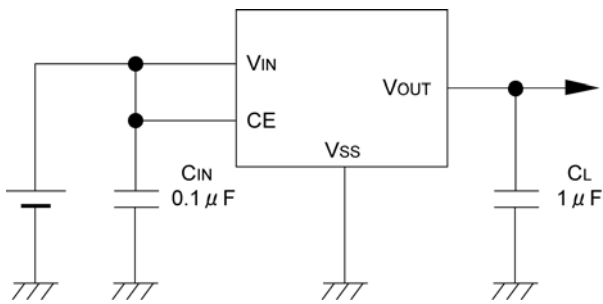
| SYMBOL PRODUCT SERIES | S-1 | | S-2 | S-3 |
|--------------------------|---------------------|-------|---------------------|---------------------|
| | SUPPLY CURRENT (μA) | | CE "H" CURRENT (μA) | CE "L" CURRENT (μA) |
| | MIN. | MAX. | | |
| XC6205A | 52.0 | 115.0 | 18.0 | -0.1 |
| XC6205B | 42.0 | 95.0 | 0.1 | -0.1 |
| XC6205C | 52.0 | 115.0 | 0.1 | -18.0 |
| XC6205D | 42.0 | 95.0 | 0.1 | -0.1 |

Specification & Condition by Series

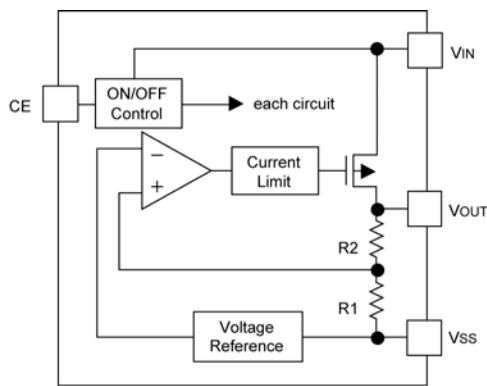
| SYMBOL SPECIFIED OUTPUT VOLTAGE (V) | E-5 | E-4 |
|--|--------------------------------------|-------------------------------------|
| | INPUT VOLTAGE (V) V _{IN} | MAXIMUM OUTPUT CURRENT (mA) MIN. |
| 0.90 ~ 0.95 | 2.5 | 260 |
| 1.00 ~ 1.05 | 2.5 | 260 |
| 1.10 ~ 1.15 | 2.6 | 270 |
| 1.20 ~ 1.25 | 2.7 | 290 |
| 1.30 ~ 1.35 | 2.8 | 300 |
| 1.40 ~ 1.45 | 2.9 | |
| 1.50 ~ 1.75 | 3.0 | |

* V_{OUT(T)}=Specified output voltage

TYPICAL APPLICATION CIRCUIT



OPERATIONAL EXPLANATION



Output voltage control with the XC6204/6205 series:

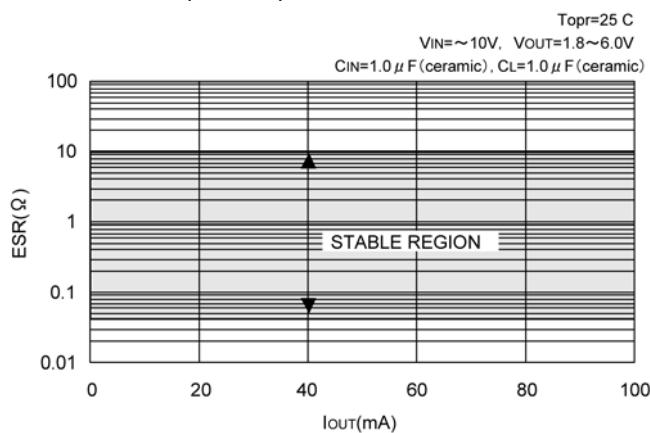
The voltage divided by resistors R1 & R2 is compared with the internal reference voltage by the error amplifier.

The P-channel MOSFET, which is connected to the VOUT pin, is then driven by the subsequent output signal. The output voltage at the VOUT pin is controlled & stabilized by a system of negative feedback.

The current limit circuit and short protect circuit operate in relation to the level of output current. Further, the IC's internal circuitry can be shutdown via the CE pin's signal.

< Low ESR Capacitors >

With the XC6204/05 series, a stable output voltage is achievable even if used with a low ESR capacitor as a phase compensation circuit is built-in. In order to ensure the effectiveness of the phase compensation, we suggest that an output capacitor (CL) is connected as close as possible to the output pin (VOUT) and the VSS pin. Please use an output capacitor with a capacitance value of at least 1 μ F. Also, please connect an input capacitor (CIN) of 0.1 μ F between the VIN pin and the VSS pin in order to ensure a stable power input.



Recommended output capacitor values

| | | |
|------|-------------|---------------|
| VOUT | 0.9V ~ 1.2V | 1.25V ~ 1.75V |
| CL | 4.7 μ F | 2.2 μ F |

<Current Limiter, Short-Circuit Protection>

The XC6204/05 series includes a combination of a fixed current limiter circuit & a foldback circuit, which aid the operations of the current limiter and circuit protection. 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, output voltage drops further and output current decreases. When the output pin is shorted, a current of about 50mA flows. However, when the input/output voltage differential is quite small, this current will be about 200mA.

OPERATIONAL EXPLANATION (Continued)

<CE Pin>

The IC's internal circuitry can be shutdown via the signal from the CE pin with the XC6204/05 series. In shutdown mode, output at the V_{OUT} pin will be pulled down to the V_{SS} level via R1 & R2. The operational logic of the IC's CE pin is selectable (please refer to the selection guide). Note that as the standard XC6204/05B type is '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 V_{IN} voltage or a V_{SS} voltage input at the CE pin. If this IC is used with the correct specifications for the CE pin, the operational logic is fixed and 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 between 0.25V and 1.5V is input.

<Minimum Operating Voltage>

In order to stabilize the IC's operations, an input voltage of more than 2.0V is needed. Should the input voltage be less than 2.0V, the output voltage may not be regulated correctly. (Please refer to Input Voltage vs. Output Voltage characteristics below.)

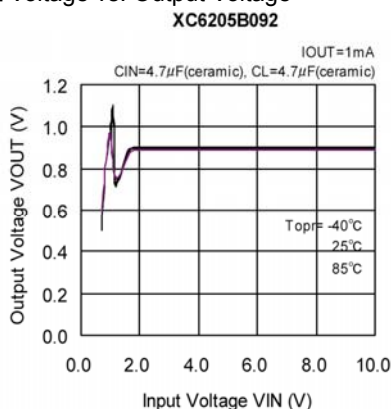
When V_{IN} is less than 2.0V, the CE pin remains in stand-by mode.

When V_{IN} rises above 2.0V, the power supply will turn ON.

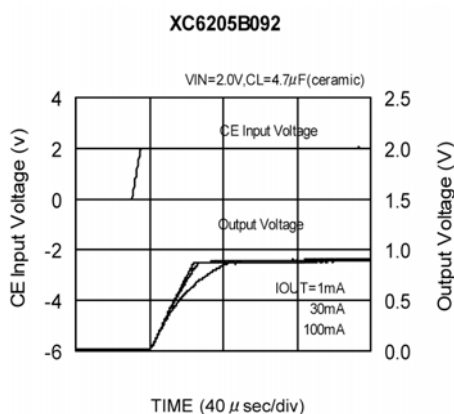
The input power supply will begin to rise after a few hundred msec.

(Please also refer to the transient response characteristics.)

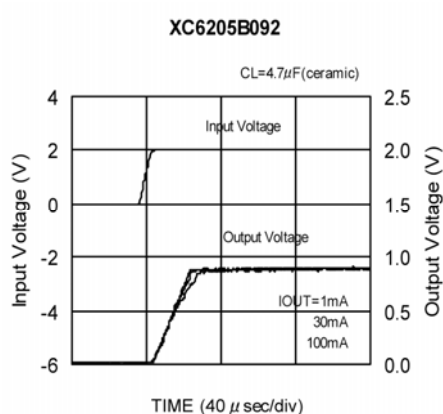
Input Voltage vs. Output Voltage



Enable Response Time



Turn-ON Response Time

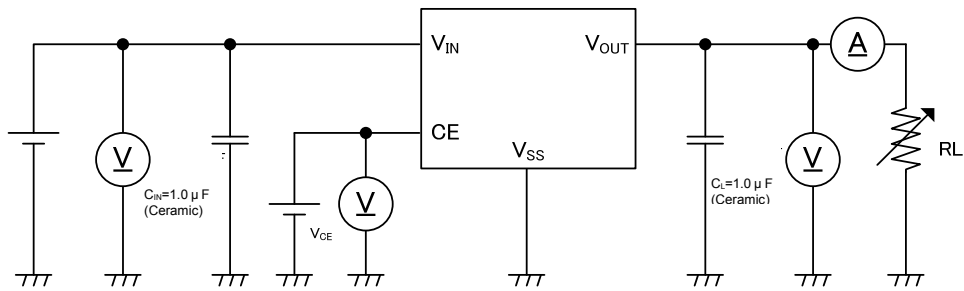


NOTES ON USE

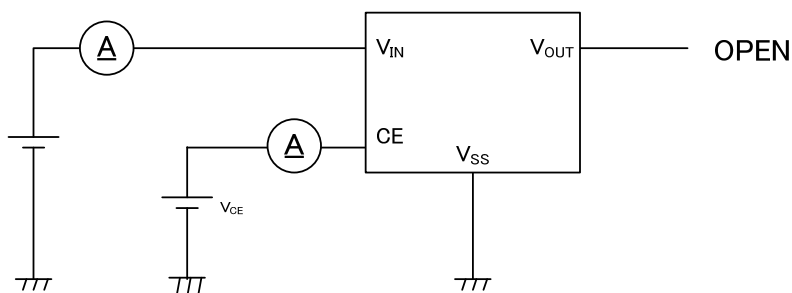
1. Please use this IC within the stated maximum ratings. For temporary, transitional voltage drop or voltage rising phenomenon, the IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please strengthen V_{IN} and V_{SS} wiring in particular.
3. Please wire the input capacitor (C_{IN}) and the output capacitor (C_L) as close to the IC as possible.
4. Torex places an importance on improving our products and their reliability.
We request that users incorporate fail-safe designs and post-aging protection treatment when using Torex products in their systems.

TEST CIRCUITS

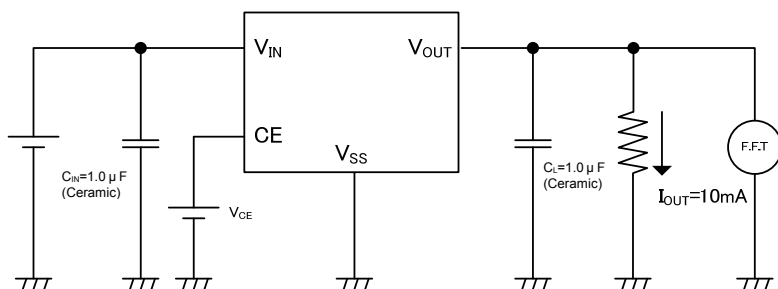
Circuit 1



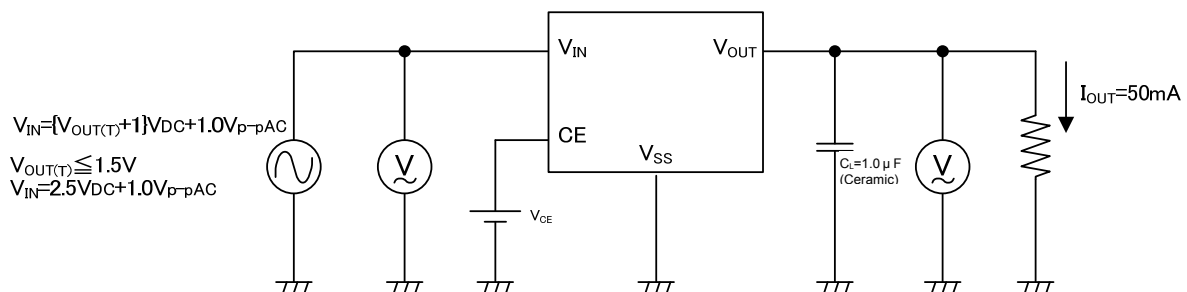
Circuit 2



Circuit 3



Circuit 4



*TEST CIRCUIT V_{CE} (CE Pin Voltage)

ACTIVE

XC6204/XC6205A, B, E, F Type $V_{CE} = V_{IN}$

XC6204/05C, D, G, H Type $V_{CE} = V_{SS}$

STANDBY

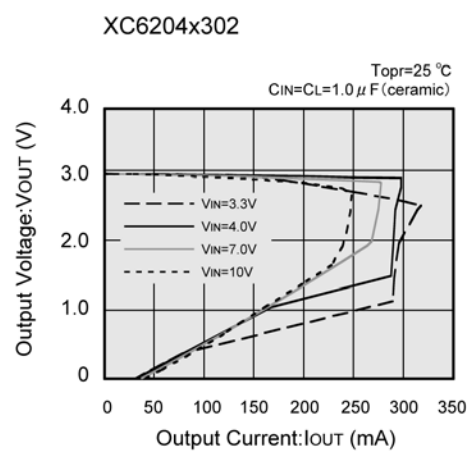
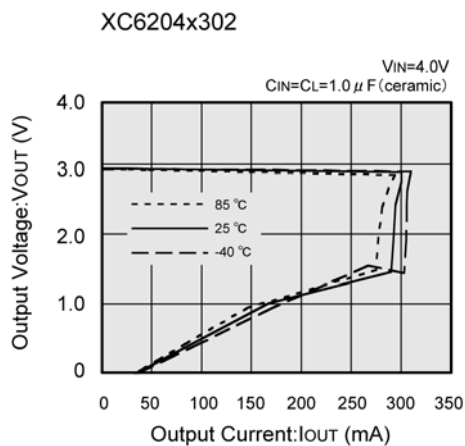
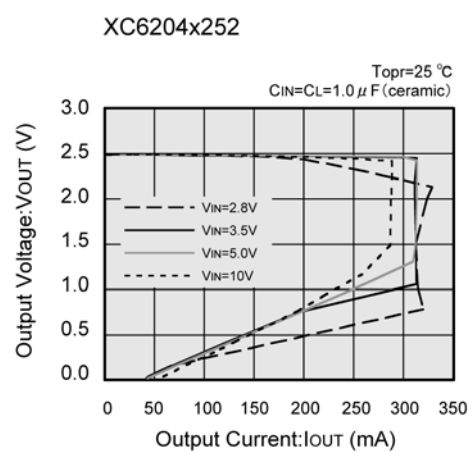
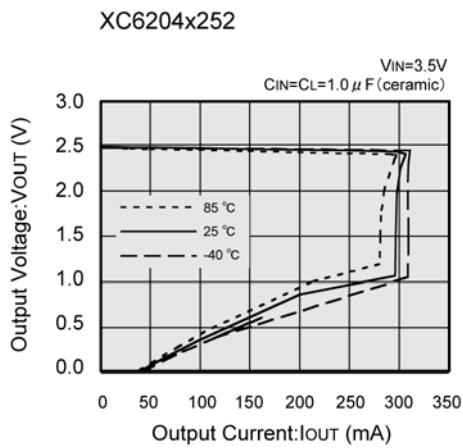
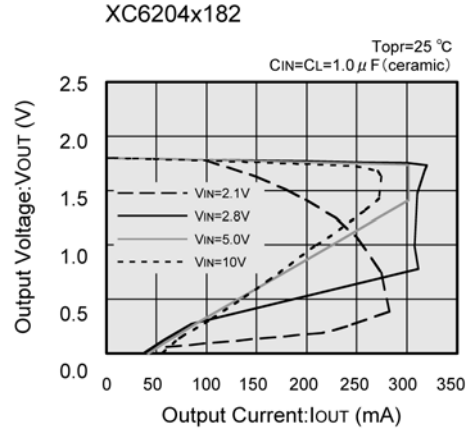
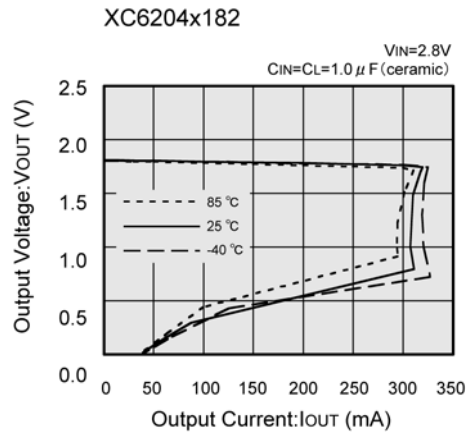
XC6204/05A, B, E, F Type $V_{CE} = V_{SS}$

XC6204/05C, D, G, H Type $V_{CE} = V_{IN}$

TYPICAL PERFORMANCE CHARACTERISTICS

XC6204

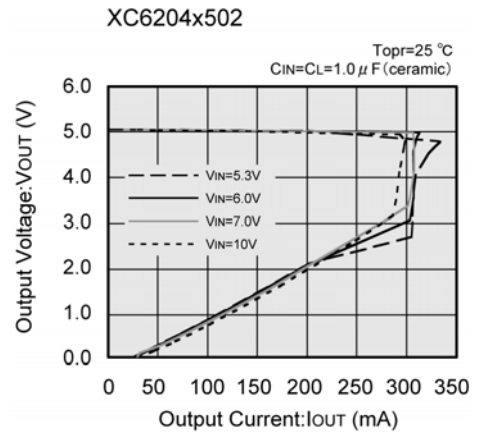
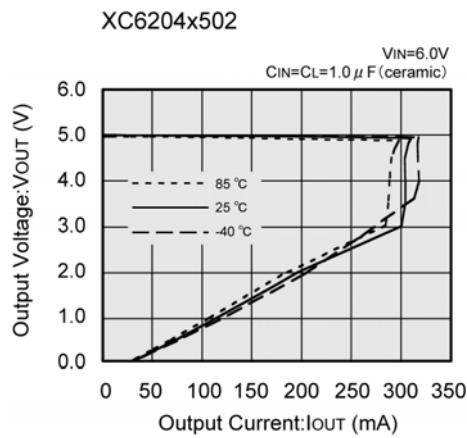
(1) Output Voltage vs. Output Current



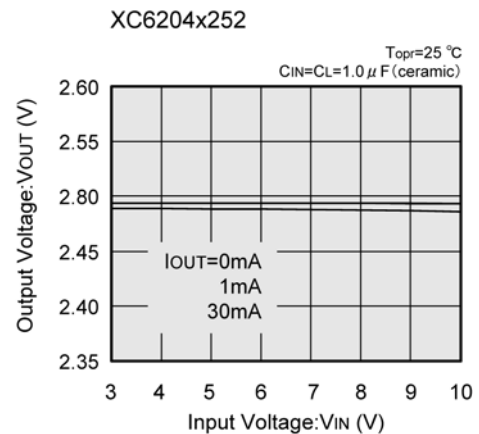
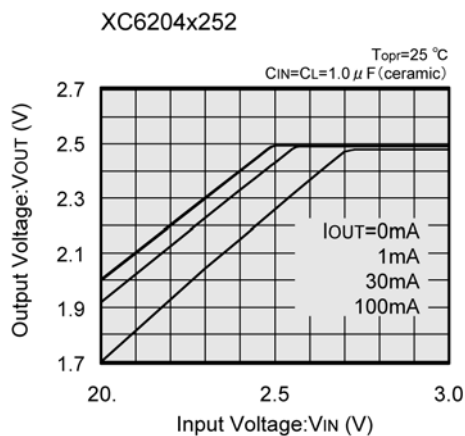
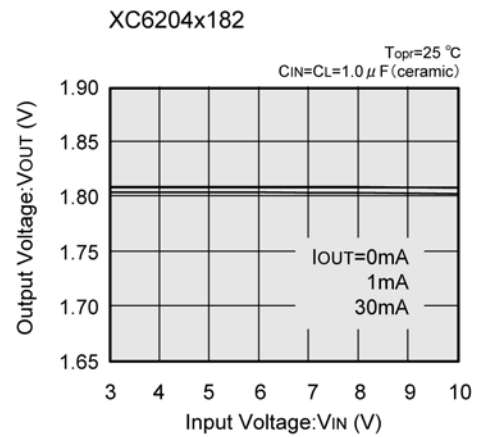
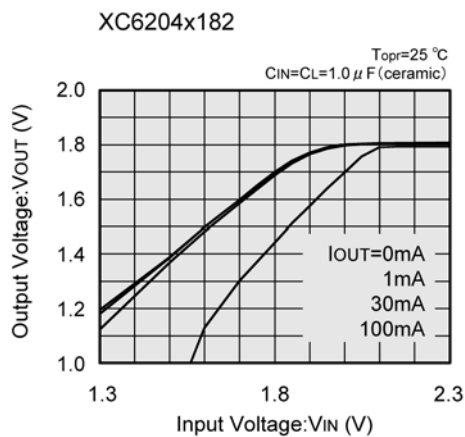
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

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



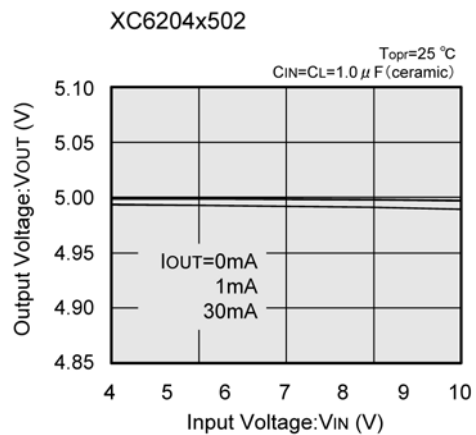
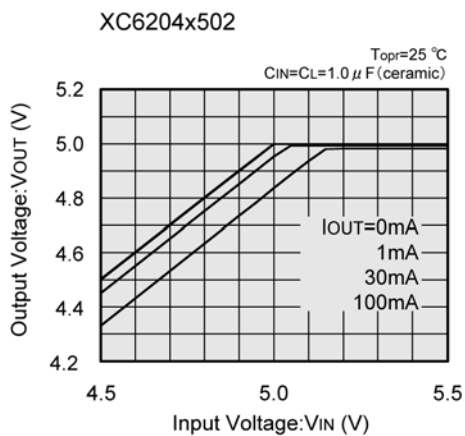
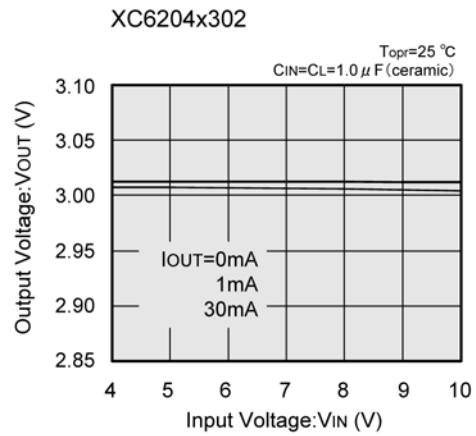
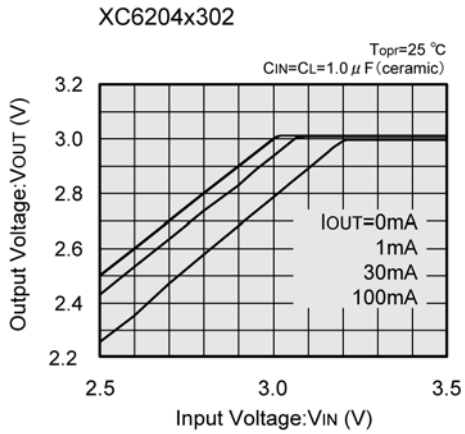
(2) Output Voltage vs. Input Voltage



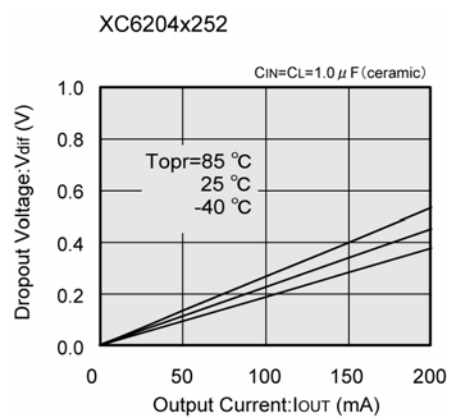
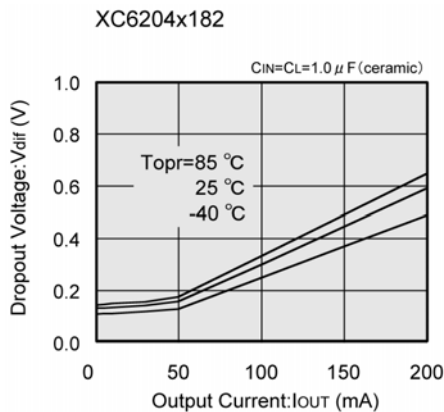
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

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



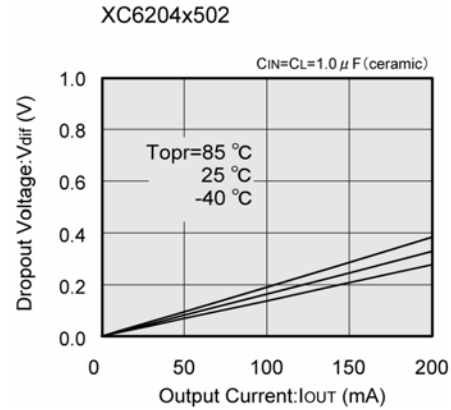
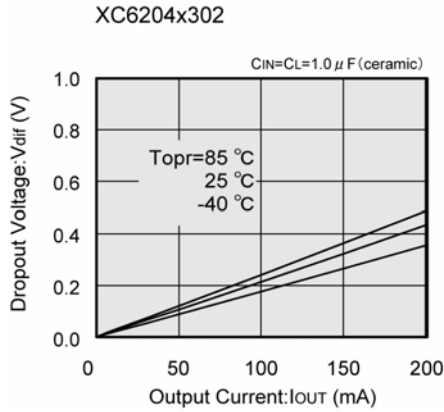
(3) Dropout Voltage vs. Output Current



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

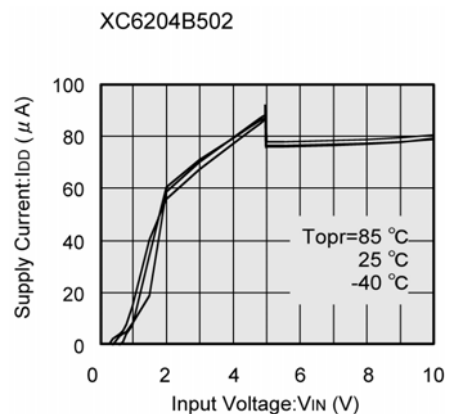
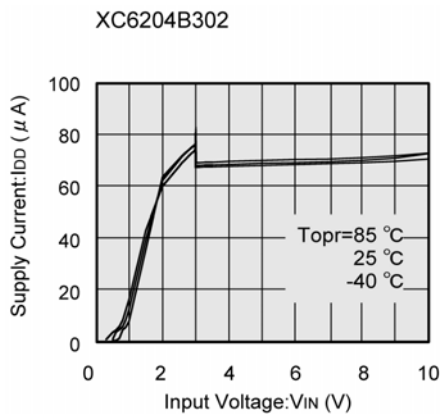
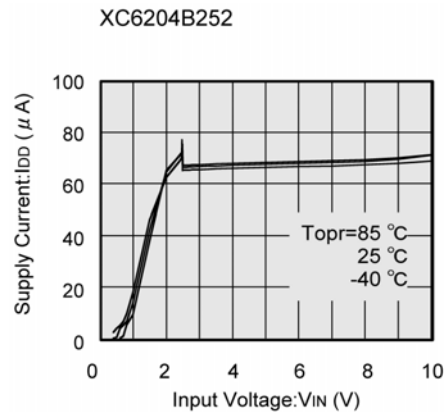
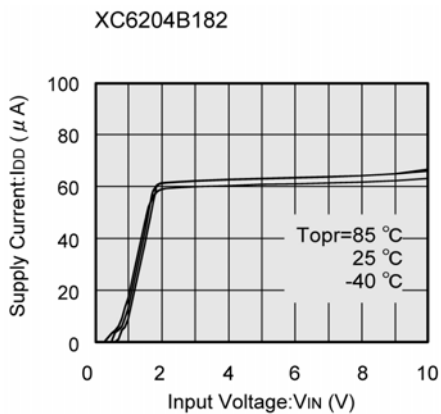
XC6204 (Continued)

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



* Since the operation of this IC is only guaranteed from $V_{IN}=2.0\text{V}$ and above, it is essential that when using with applications where $V_{OUT}=2.0\text{V}$ or less, the difference between V_{IN} and V_{OUT} be at least equal to $2\text{V} - V_{OUT(T)}$.

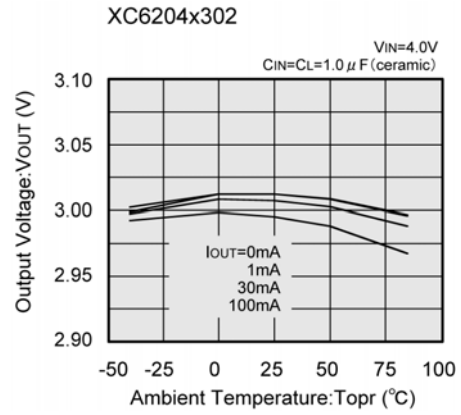
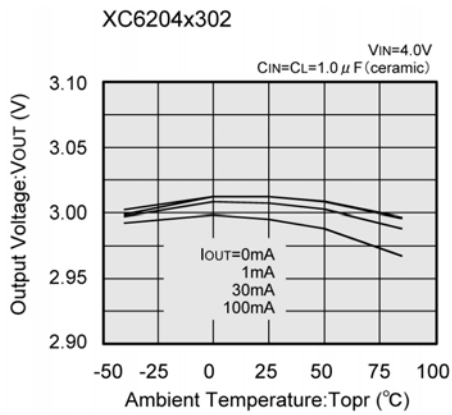
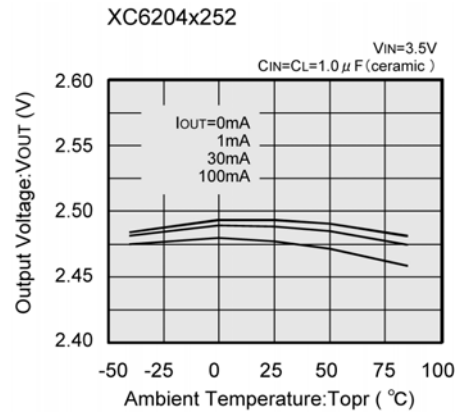
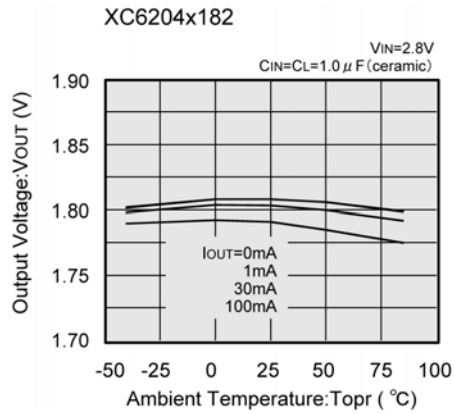
(4) Supply Current vs. Input Voltage



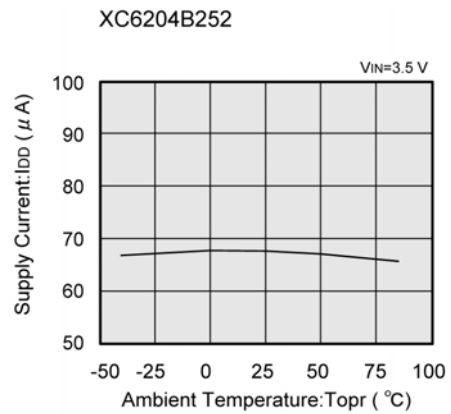
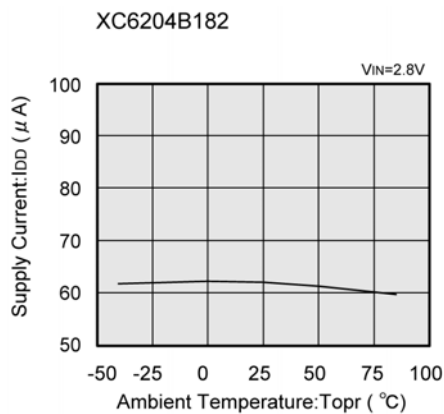
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

(5) Output Voltage vs. Ambient Temperature



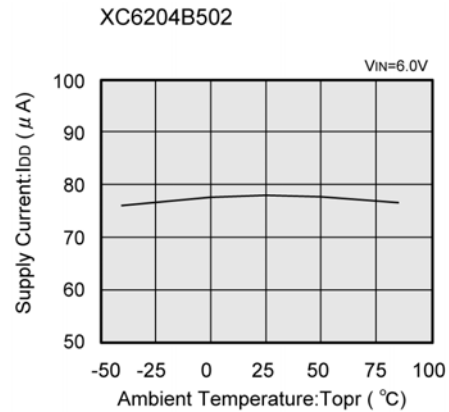
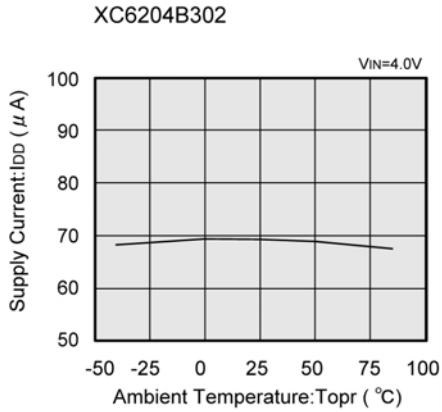
(6) Supply Current vs. Ambient Temperature



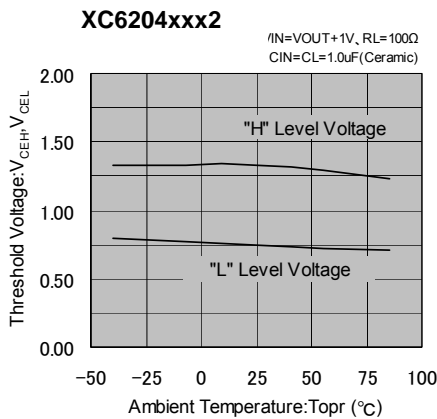
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

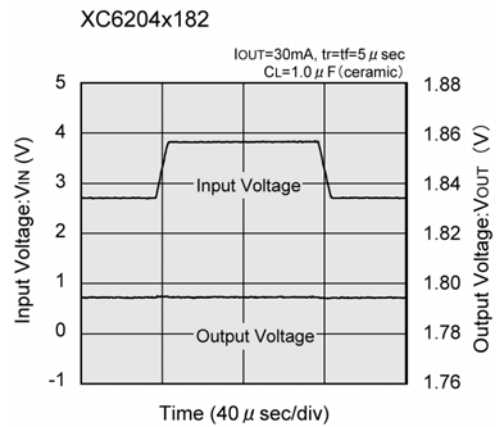
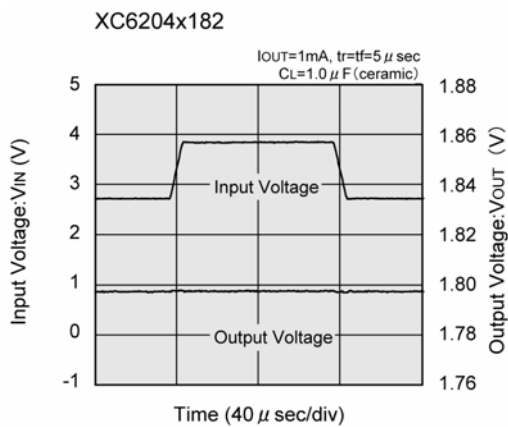
(6) Supply Current vs. Ambient Temperature (Continued)



(7) CE Pin Threshold Voltage vs. Ambient Temperature



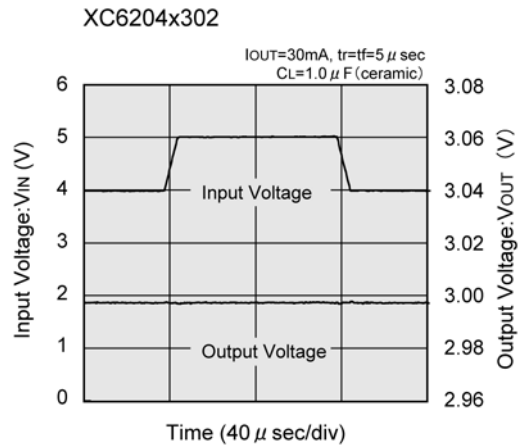
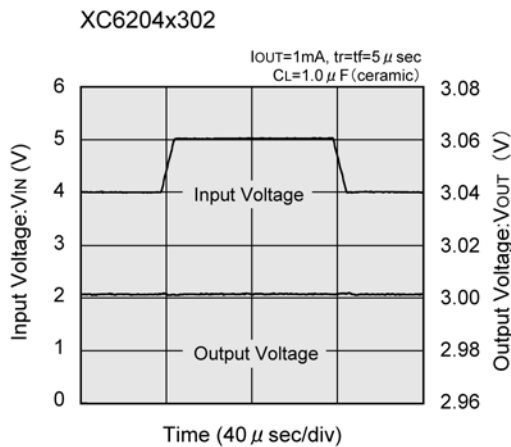
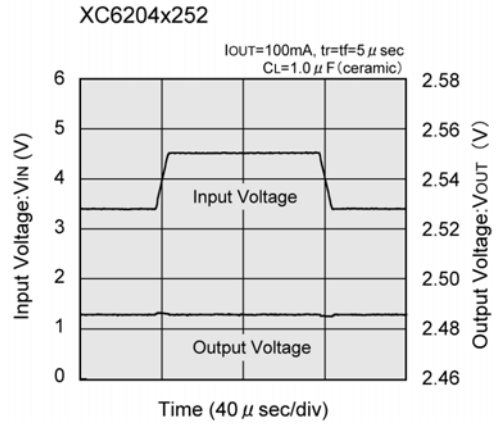
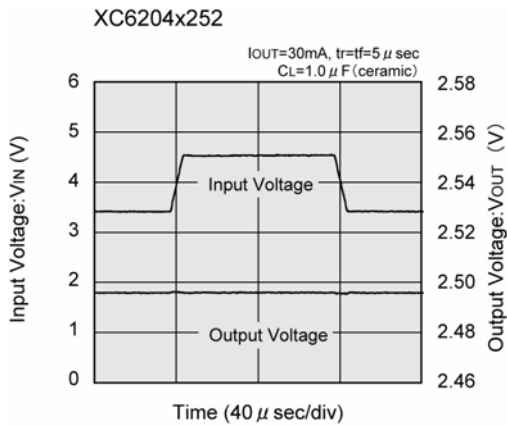
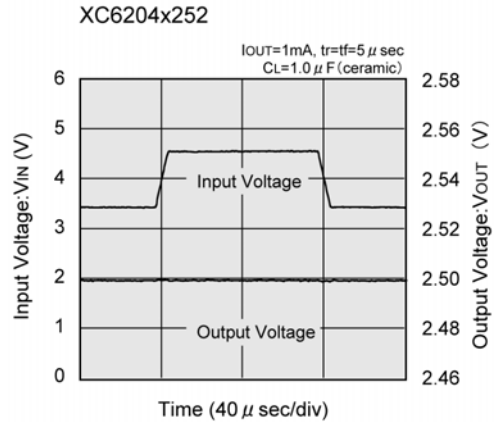
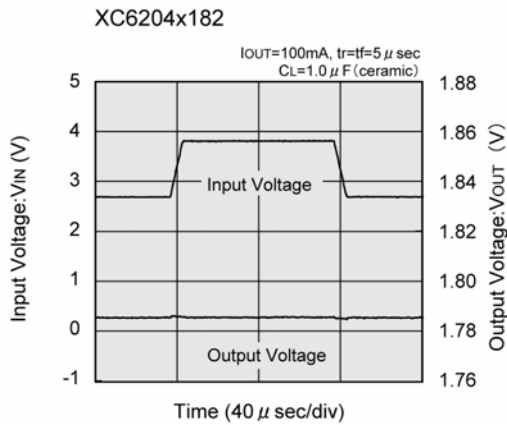
(8) Input Transient Response



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

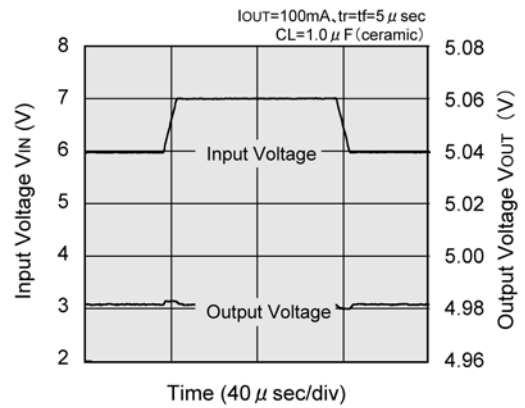
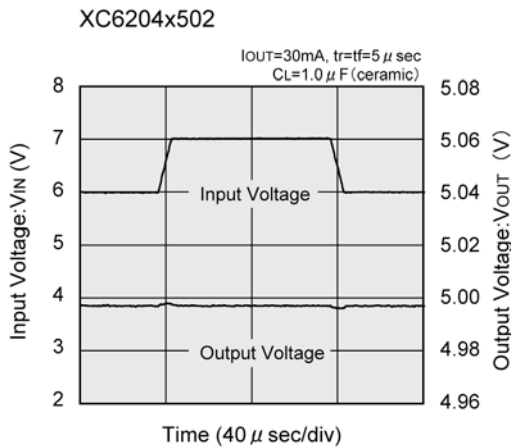
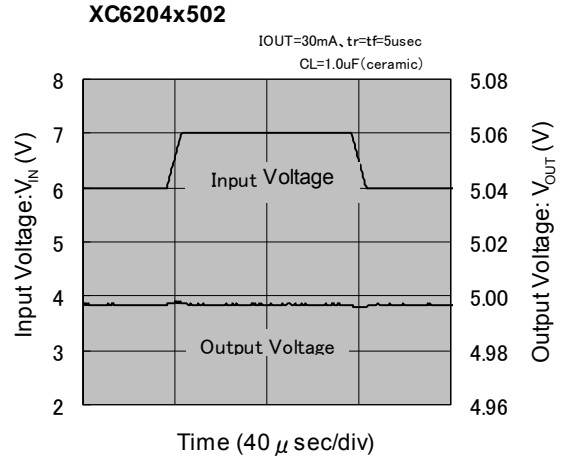
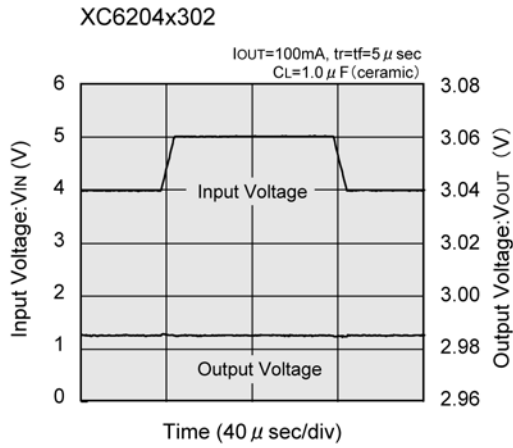
(8) Input Transient Response (Continued)



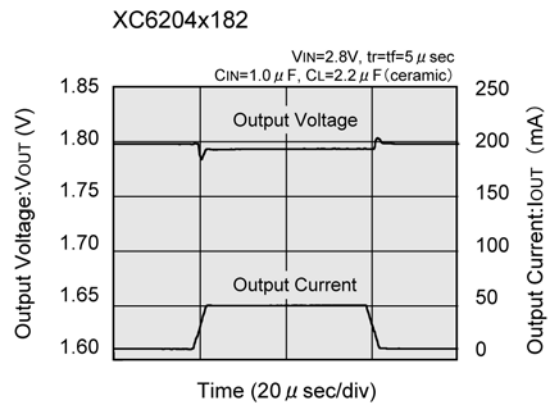
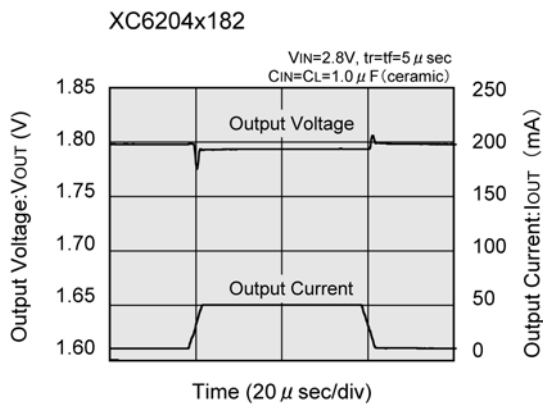
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

(8) Input Transient Response (Continued)



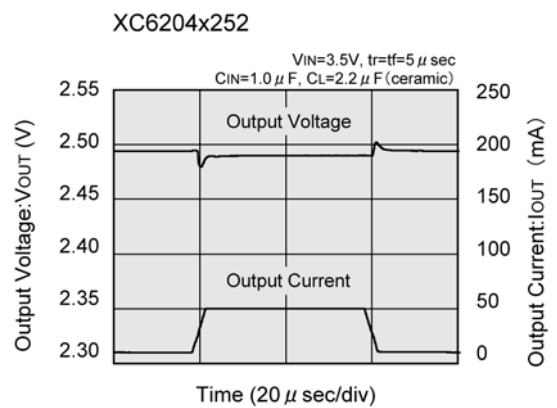
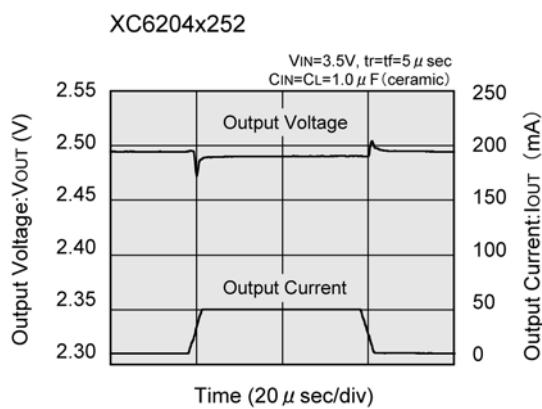
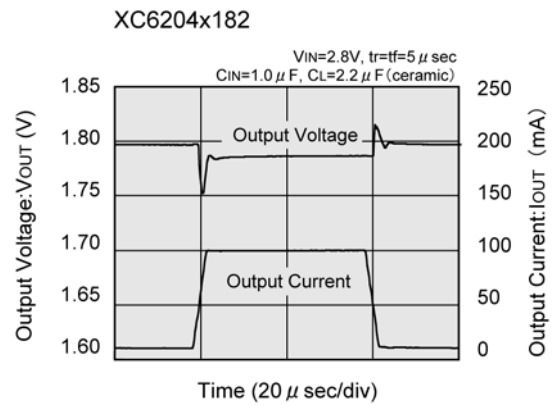
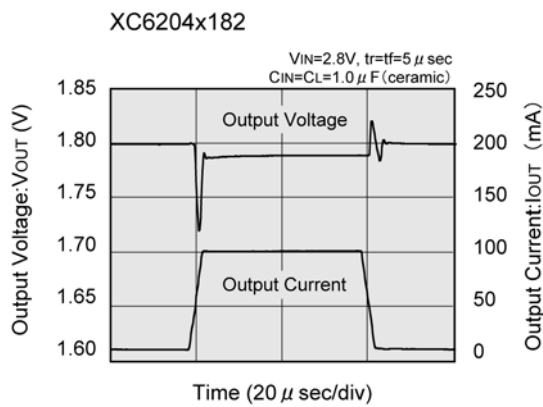
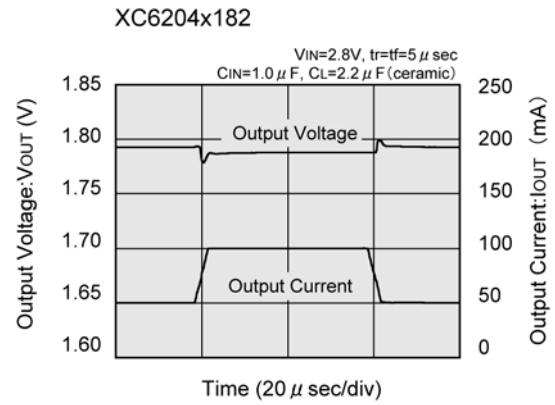
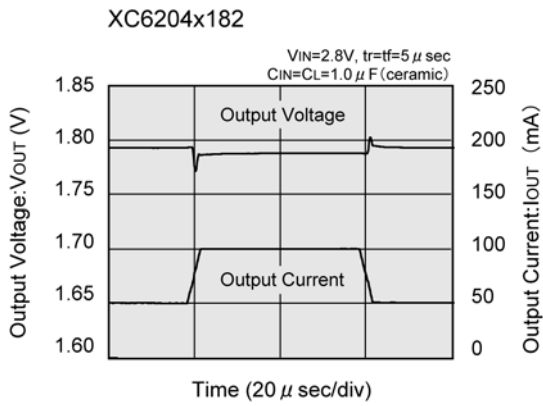
(9) Load Transient Response



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

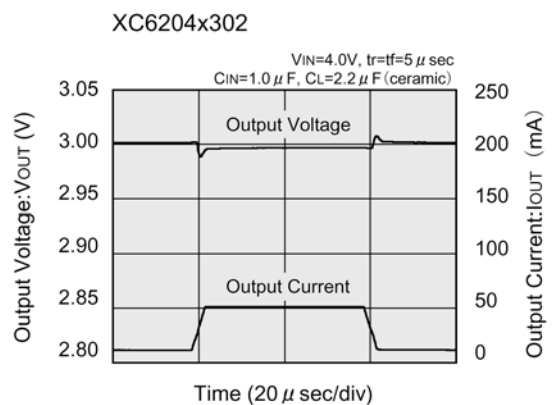
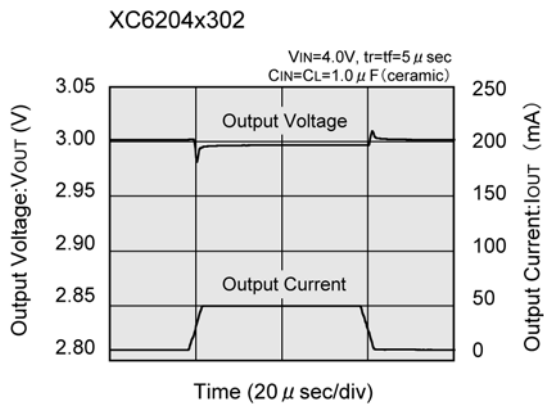
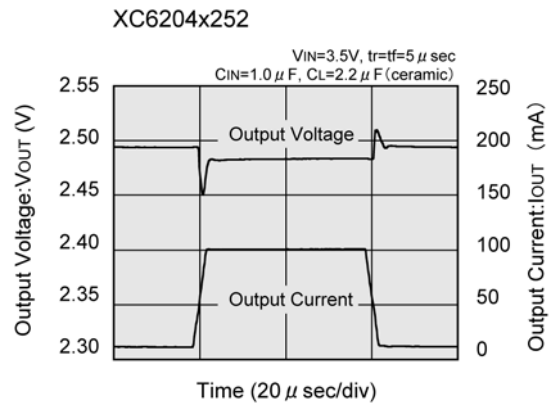
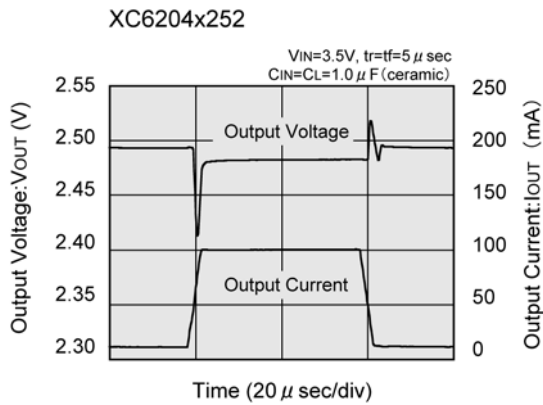
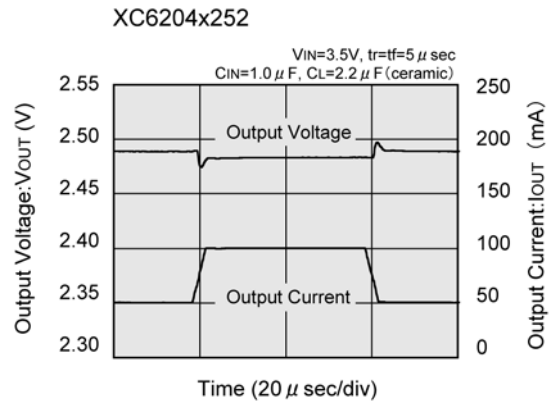
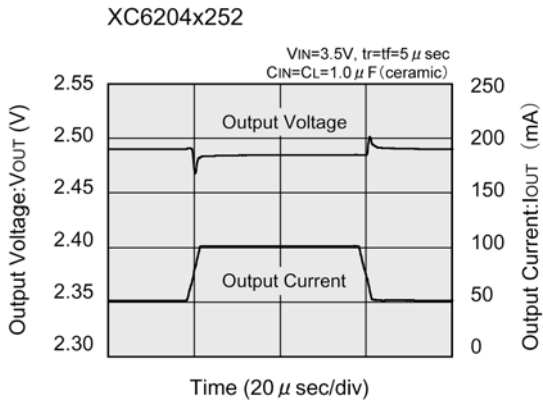
(9) Load Transient Response (Continued)



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

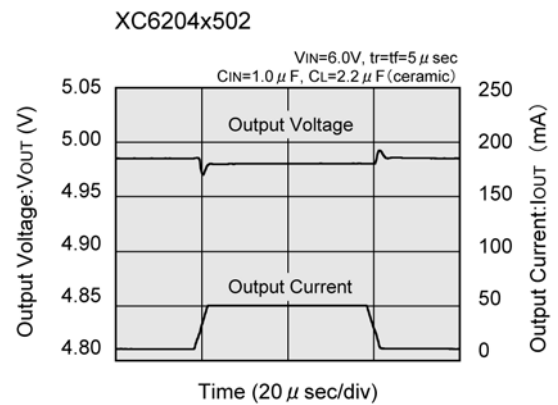
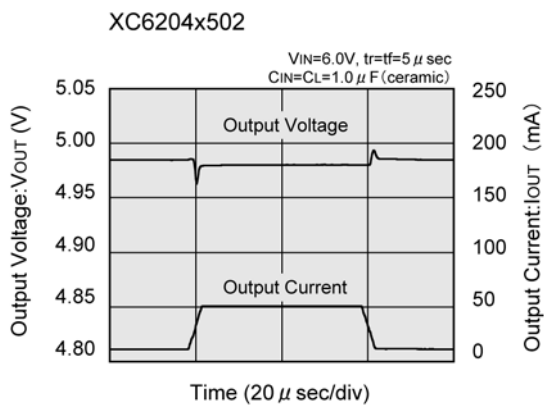
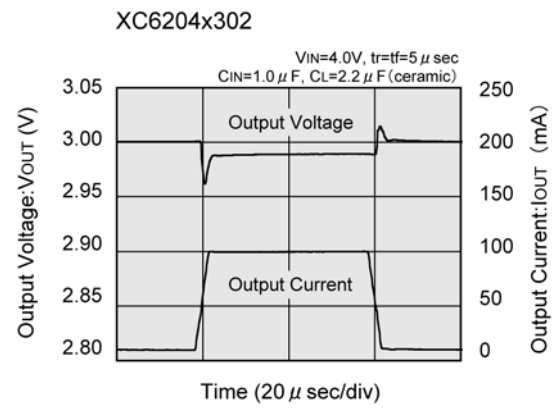
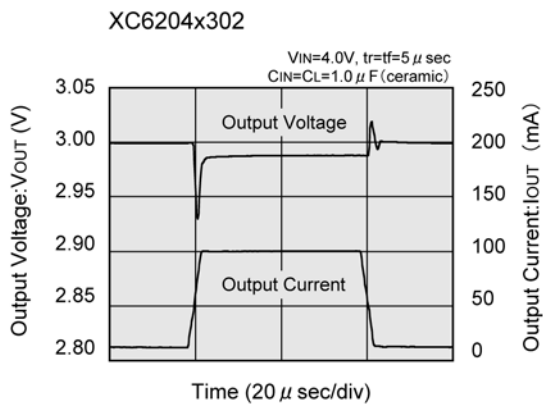
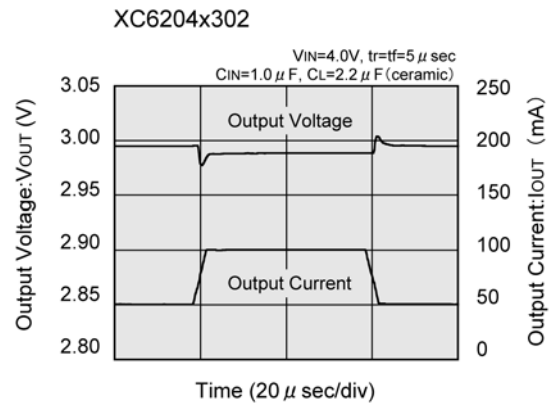
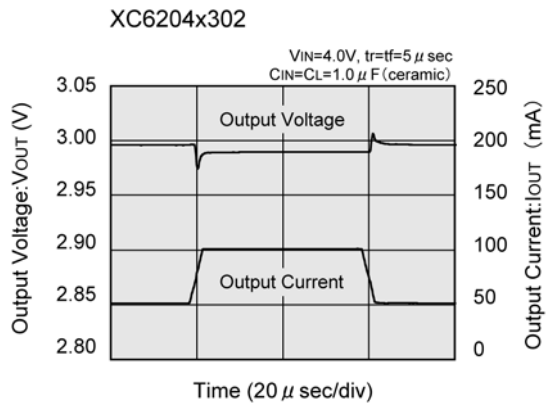
(9) Load Transient Response (Continued)



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

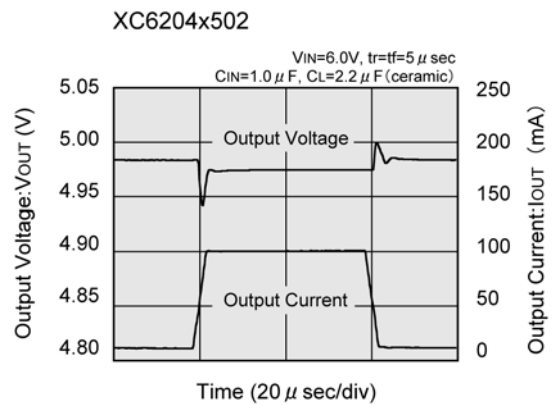
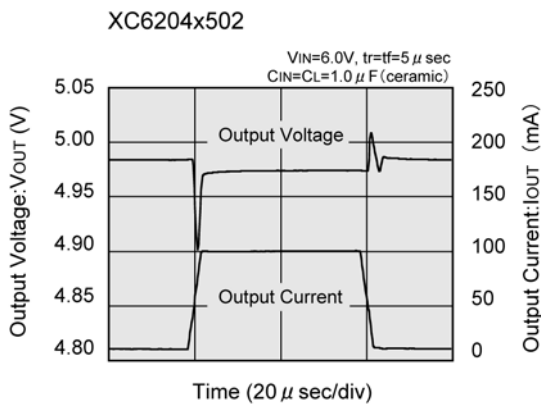
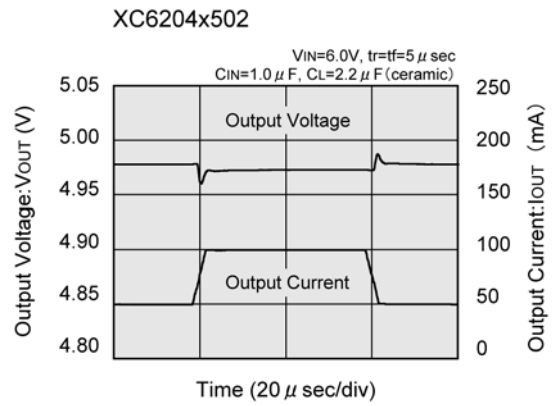
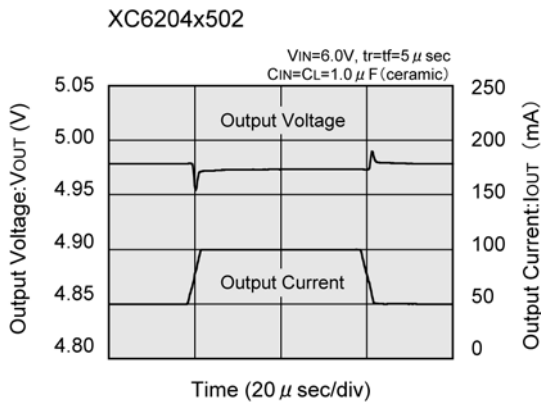
(9) Load Transient Response (Continued)



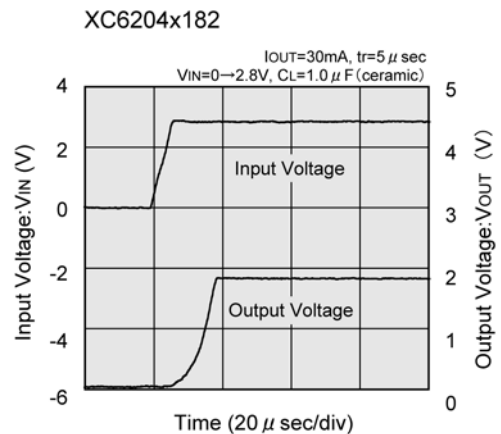
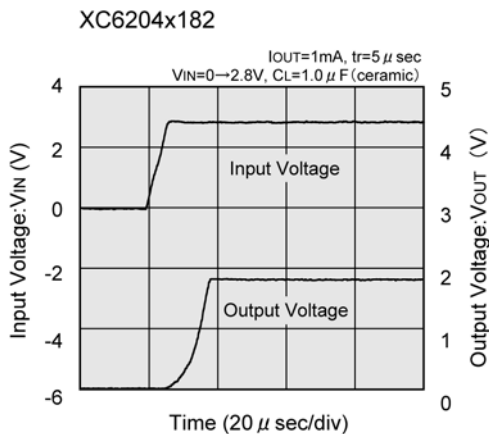
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

(9) Load Transient Response (Continued)



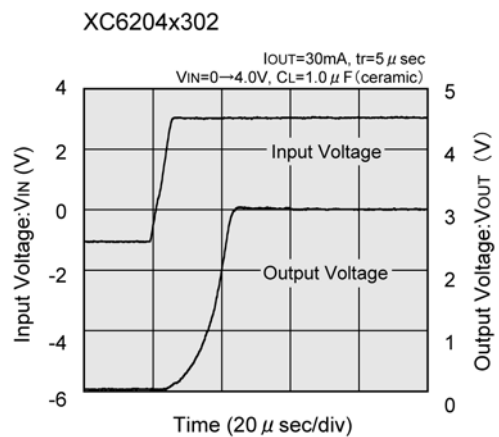
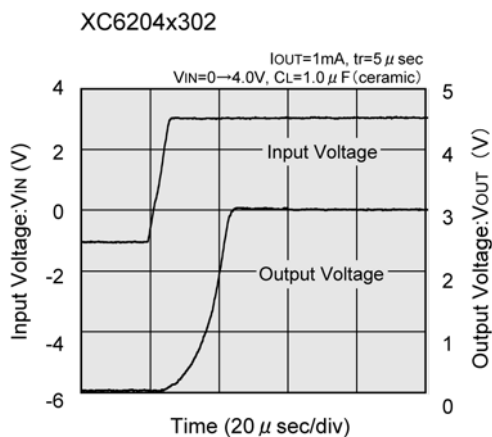
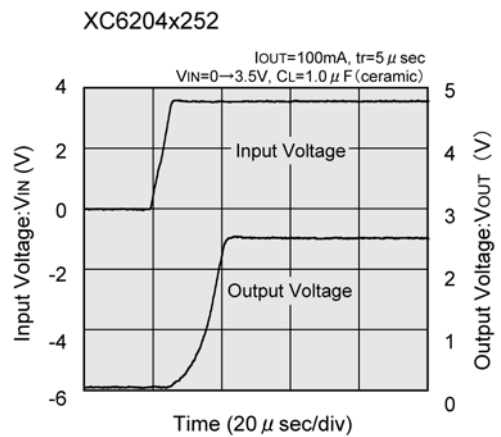
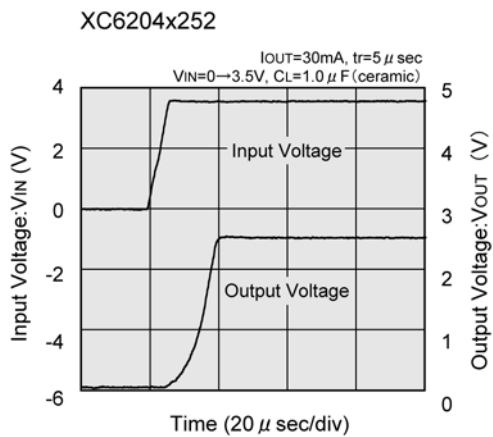
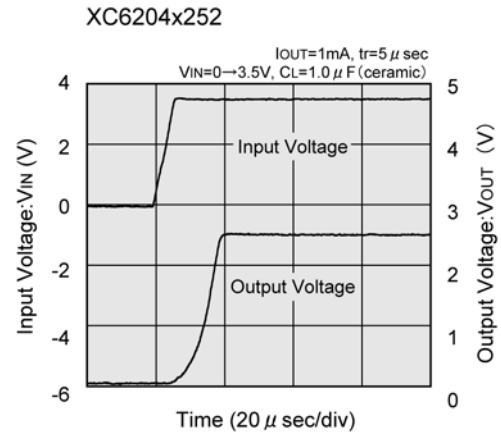
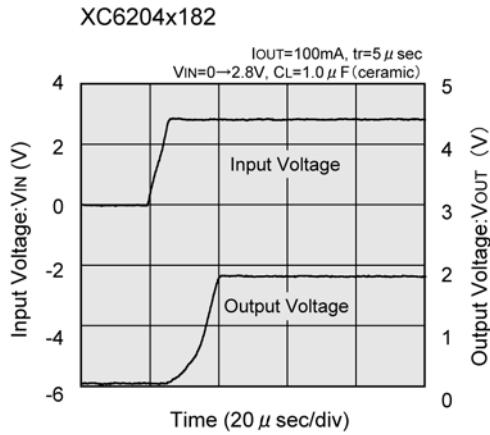
(10) Turn-On Response Time



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

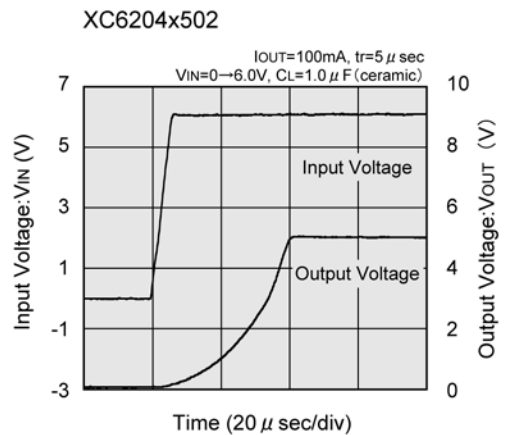
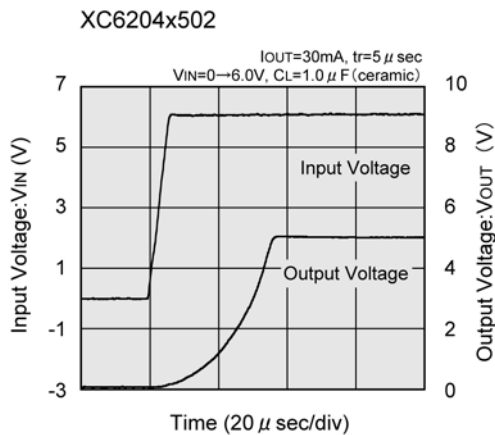
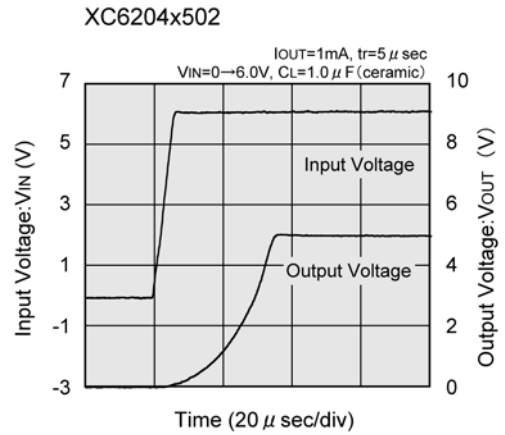
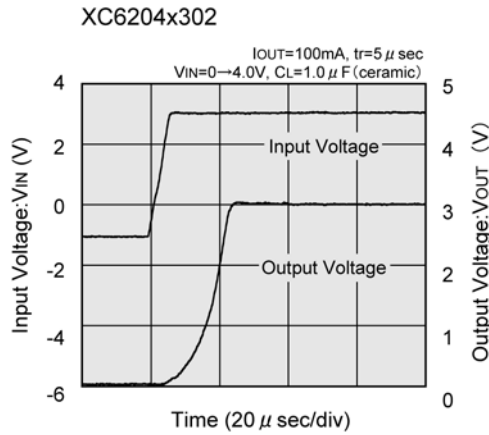
(10) Turn-On Response Time



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

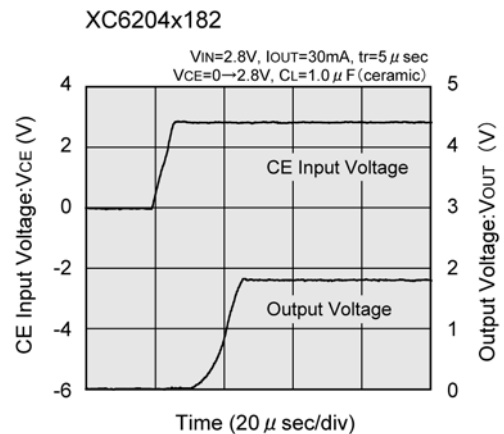
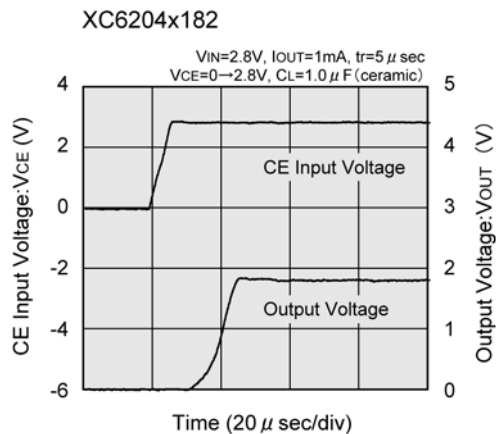
XC6204 (Continued)

(10) Turn-On Response Time (Continued)



(11) Enable Response Time

(These characteristics will not be affected by the nature of the CE pin's logic)

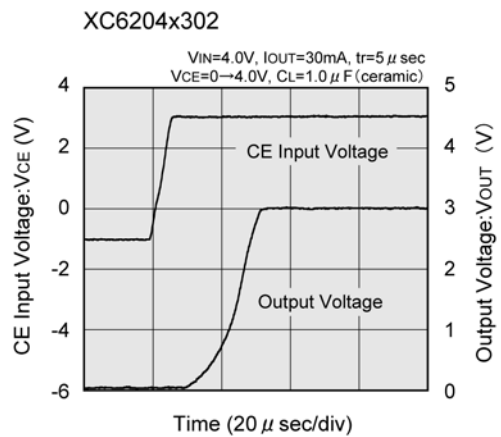
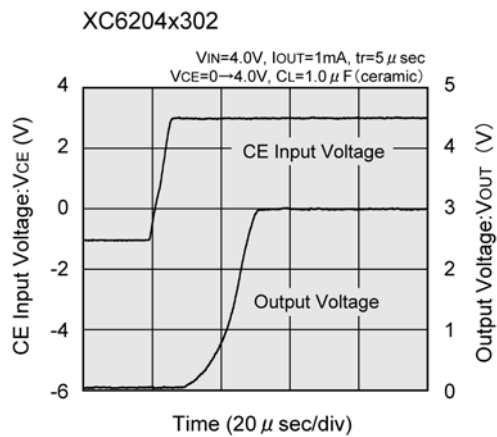
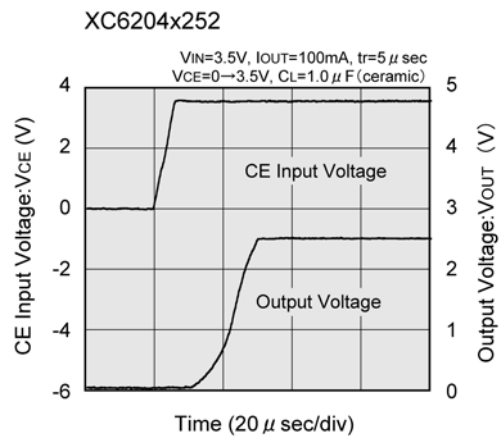
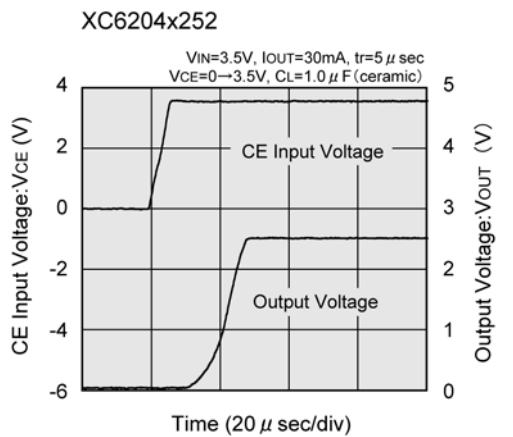
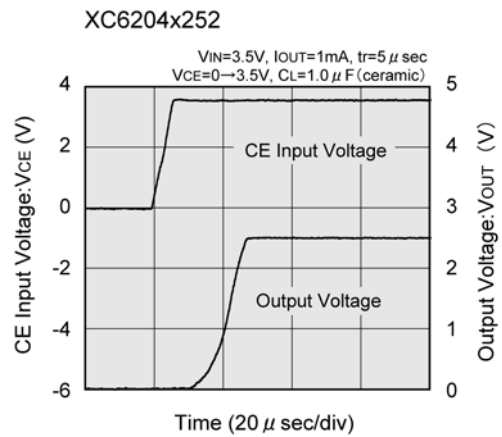
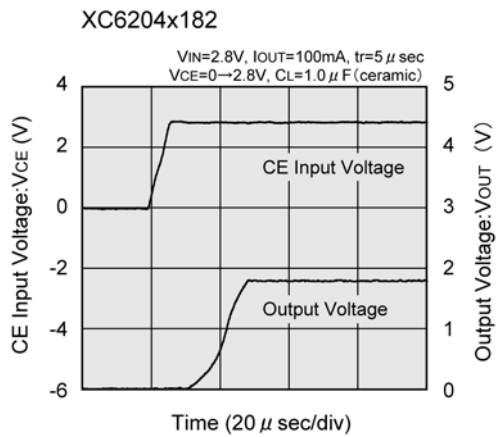


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

(11) Enable Response Time (Continued)

(These characteristics will not be affected by the nature of the CE pin's logic)

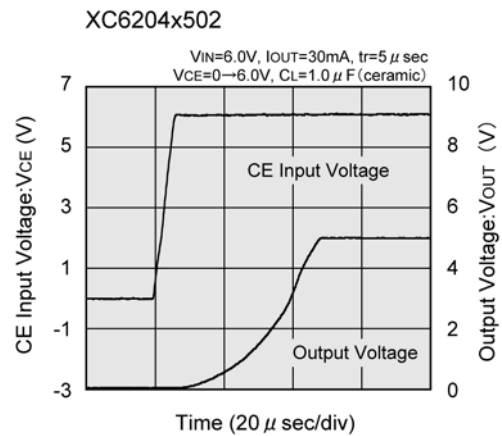
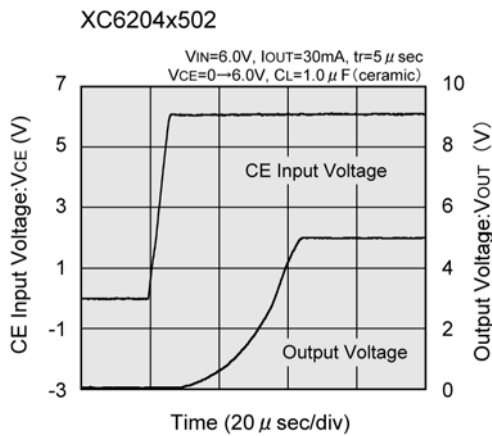
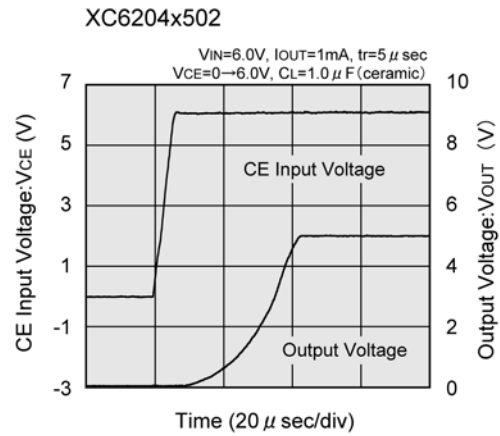
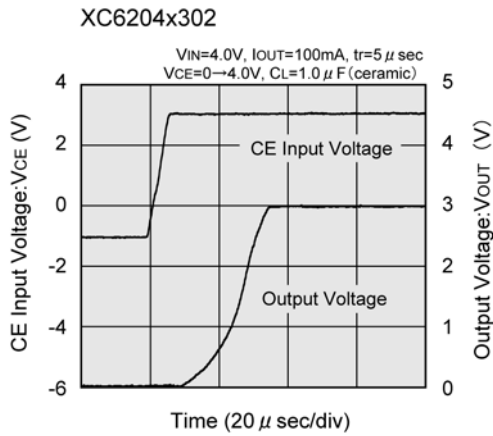


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

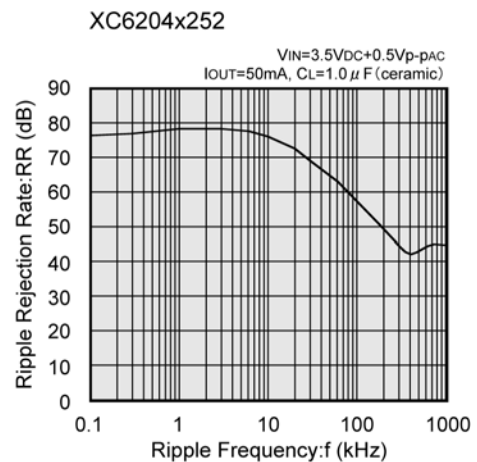
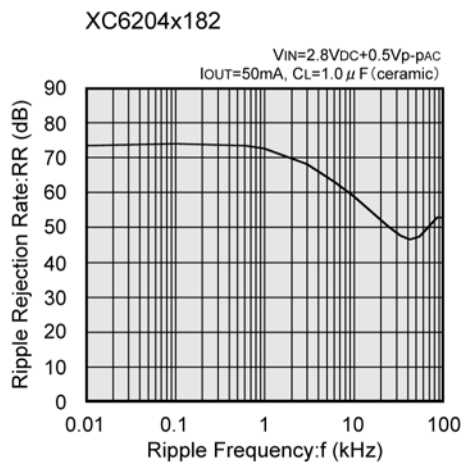
XC6204 (Continued)

(11) Enable Response Time (Continued)

(These characteristics will not be affected by the nature of the CE pin's logic)



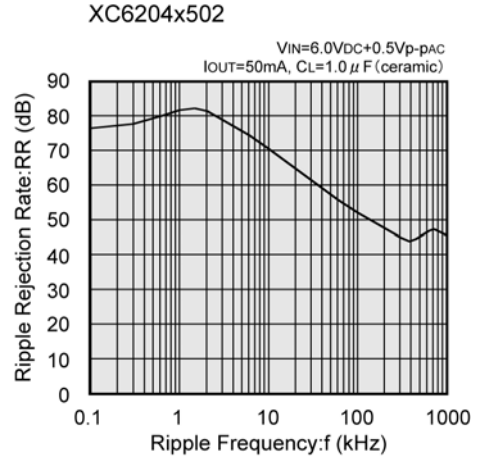
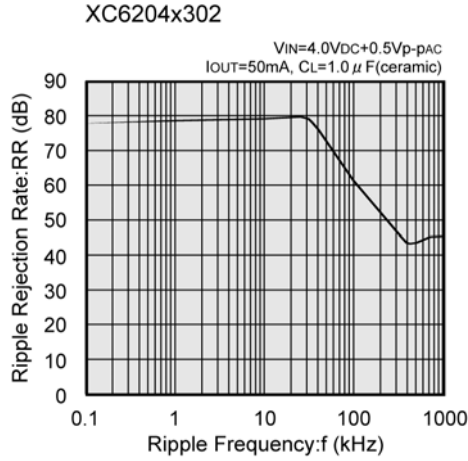
(12) Ripple Rejection Rate



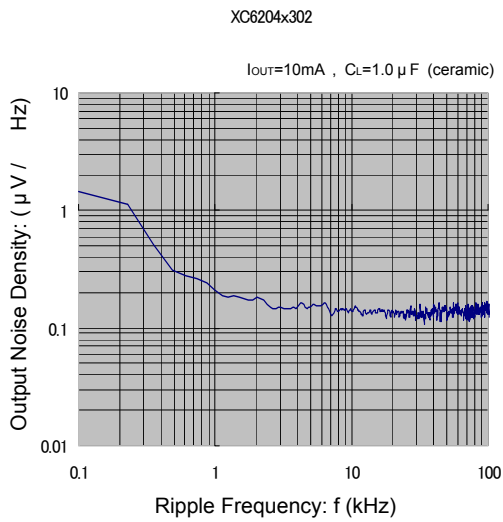
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6204 (Continued)

(12) Ripple Rejection Rate (Continued)



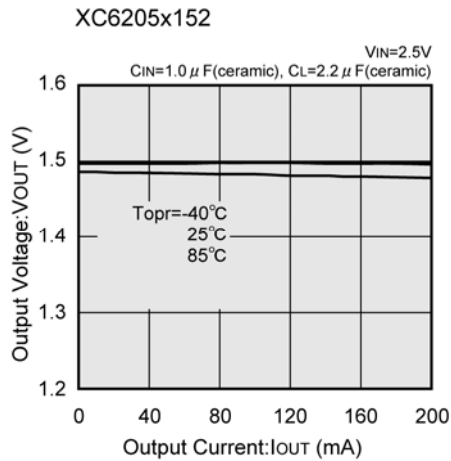
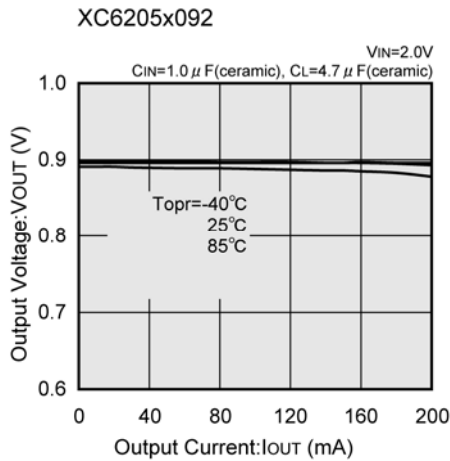
(13) Output Noise Density



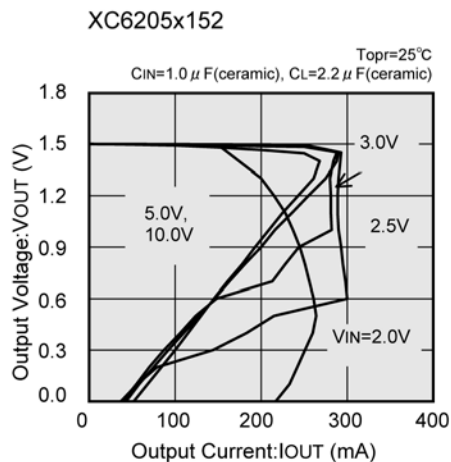
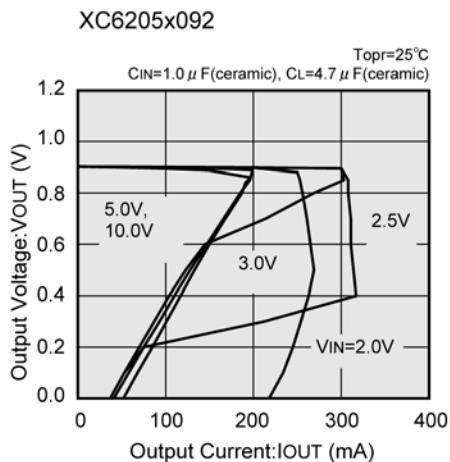
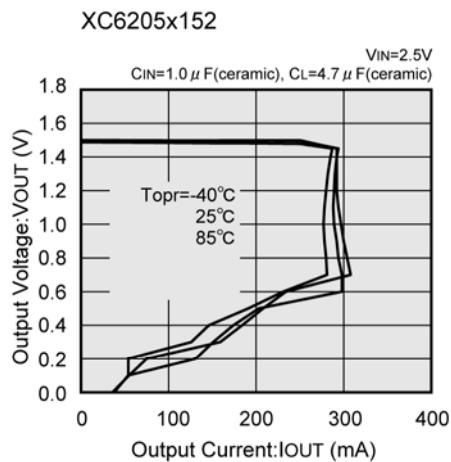
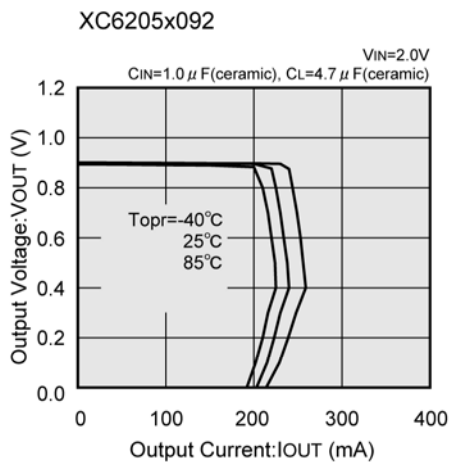
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6205

(1) Output Voltage vs. Output Current



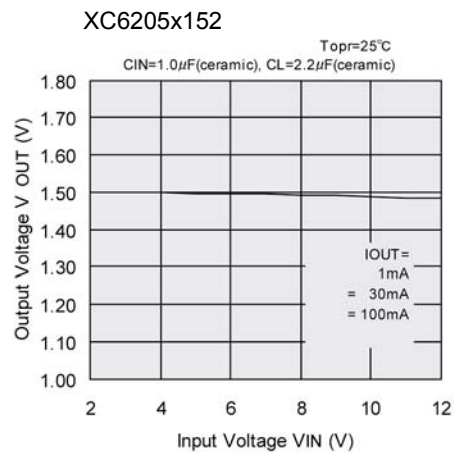
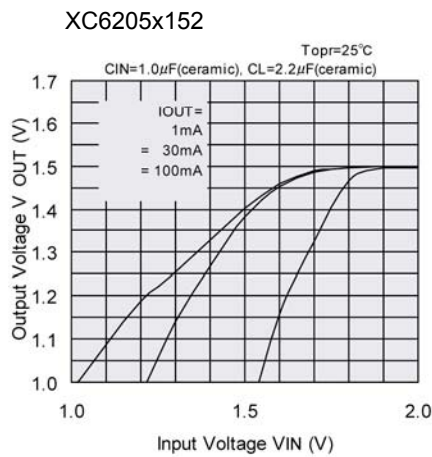
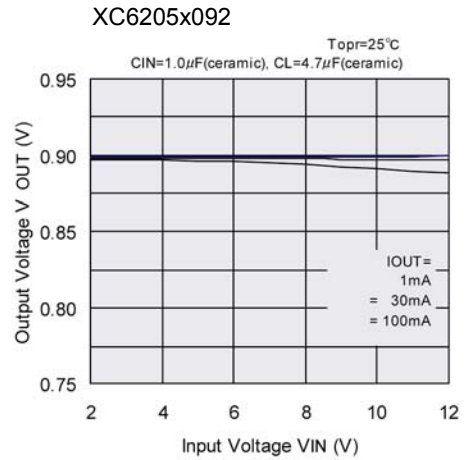
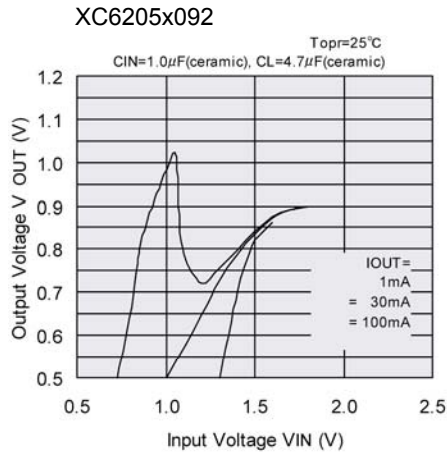
(2) Output Voltage vs. Output Current (Current Limit)



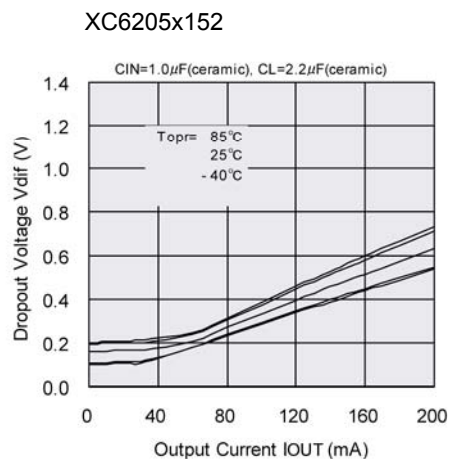
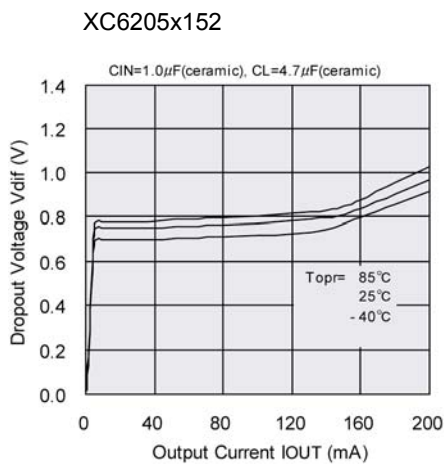
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6205 (Continued)

(3) Output Voltage vs. Input Voltage



(4) Dropout Voltage VS. Output Current

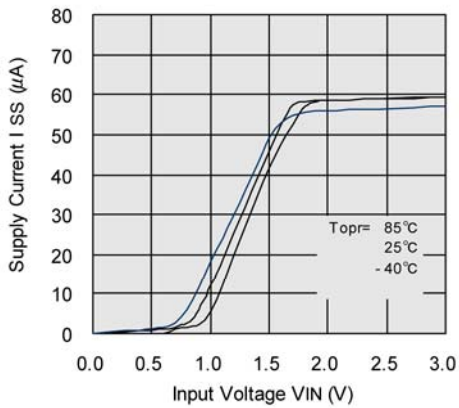


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

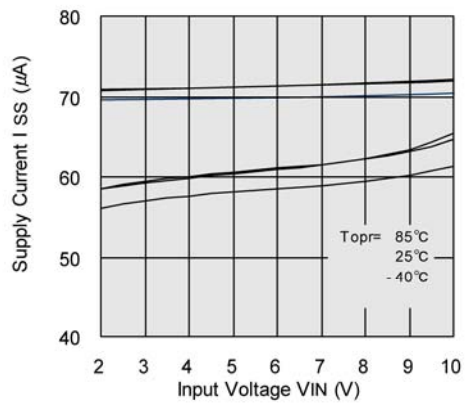
XC6205 (Continued)

(5) Supply Current vs. Input Voltage

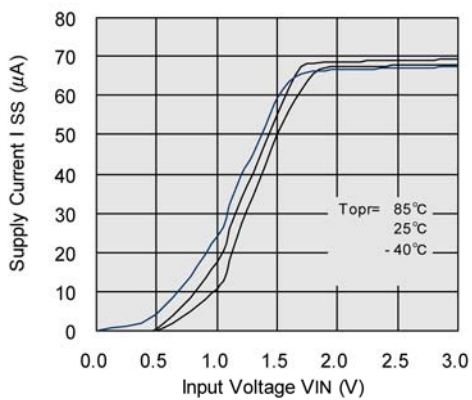
XC6205x092



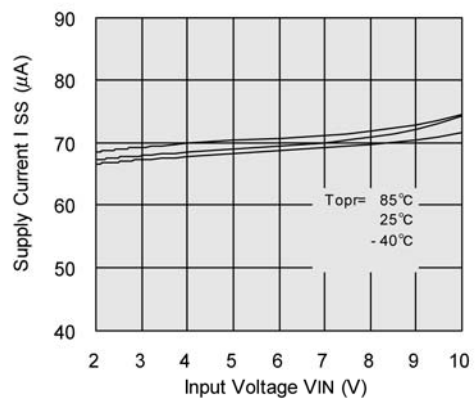
XC6205x092



XC6205x152

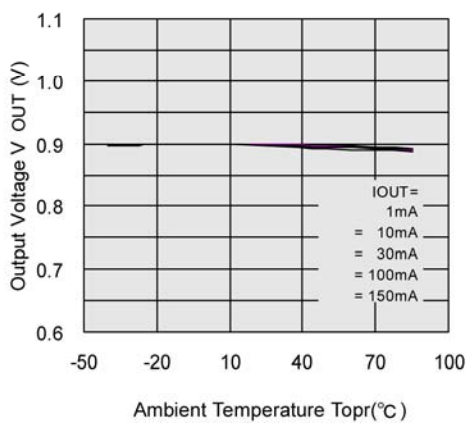


XC6205x152

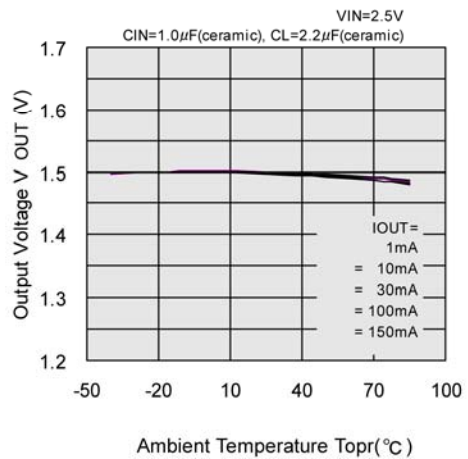


(6) Output Voltage vs. Ambient Temperature

XC6205x092



XC6205x152

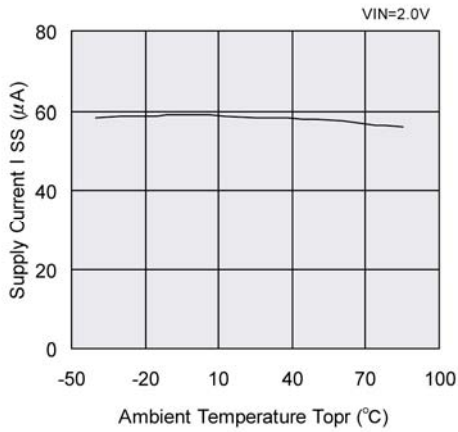


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

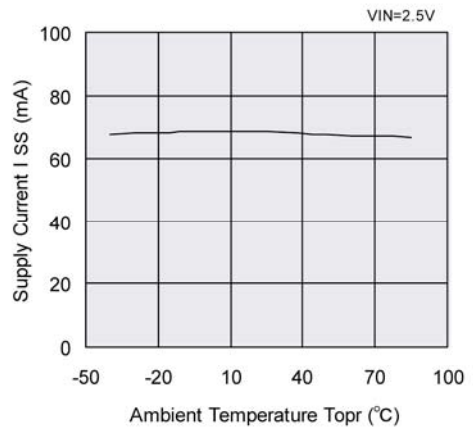
XC6205 (Continued)

(7) Supply Current vs. Ambient Temperature

XC6205x092

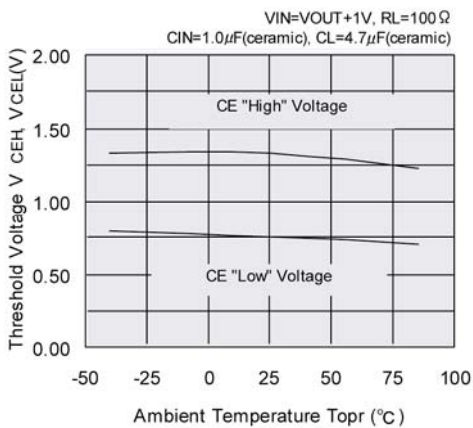


XC6205x152



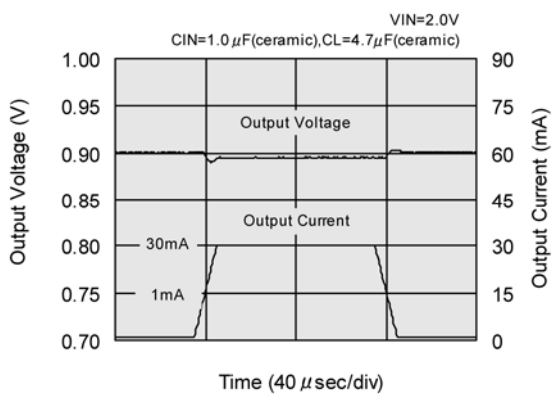
(8) CE Pin Threshold Voltage vs. Ambient Temperature

XC6205xxx2

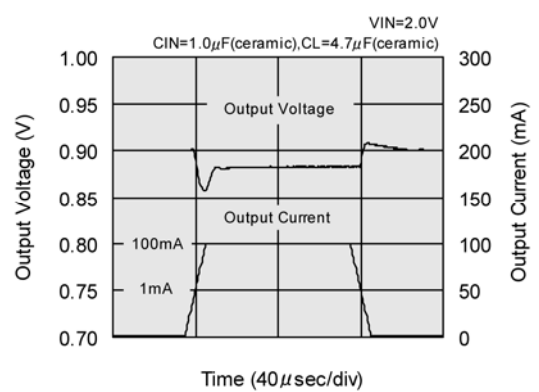


(9) Load Transient Response

XC6205x092



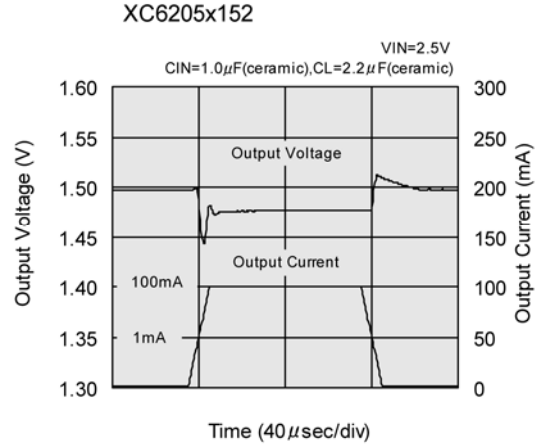
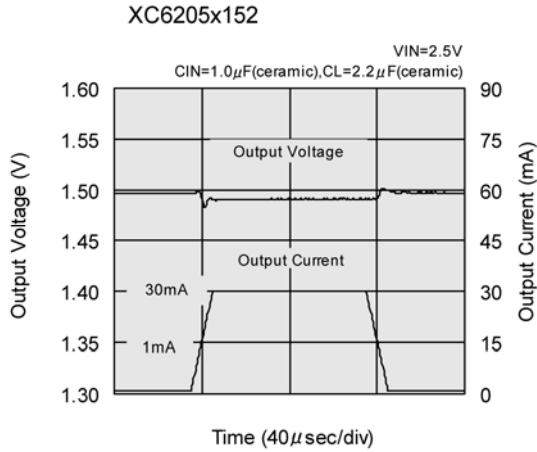
XC6205x092



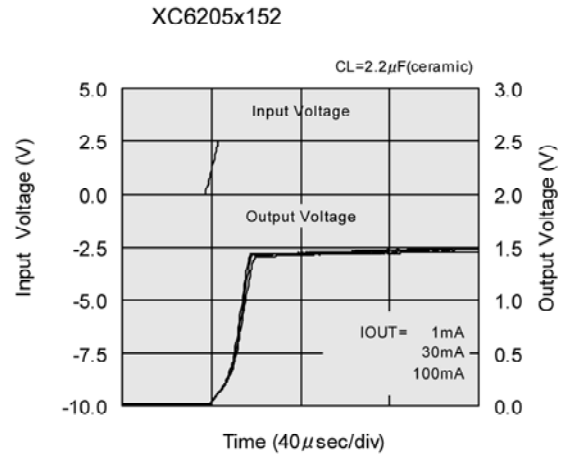
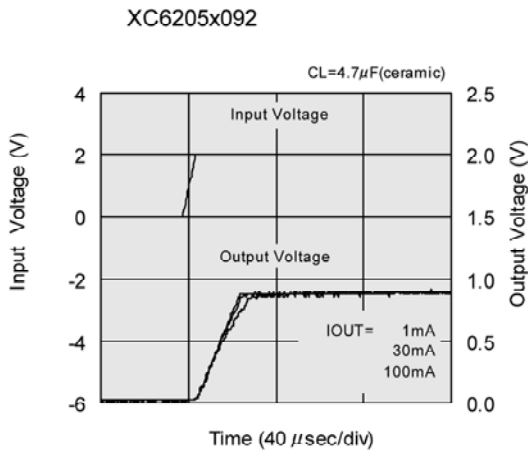
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

XC6205 (Continued)

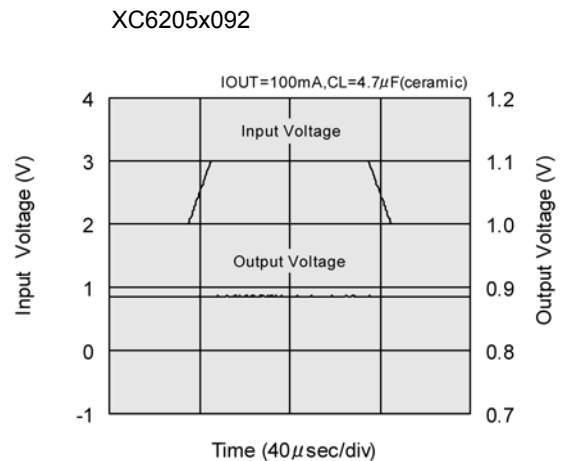
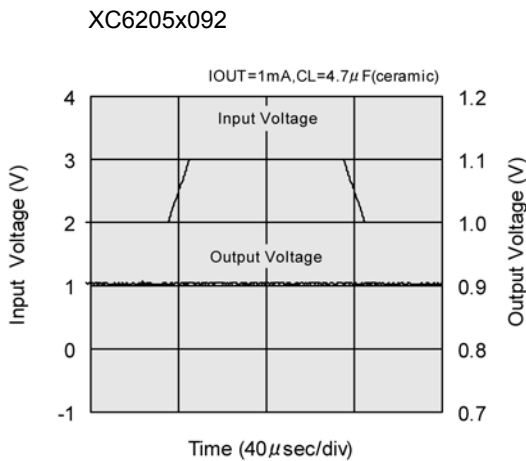
(9) Load Transient Response (Continued)



(10) Input Transient Response 1



(11) Input Transient Response 2

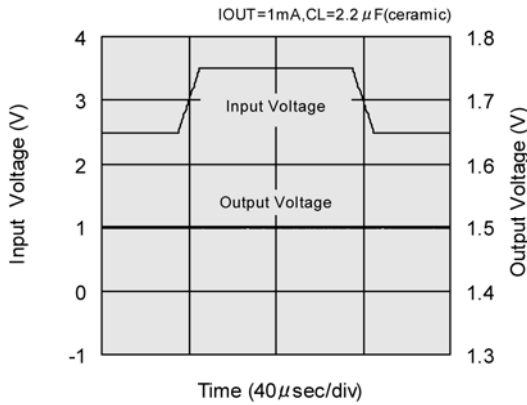


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

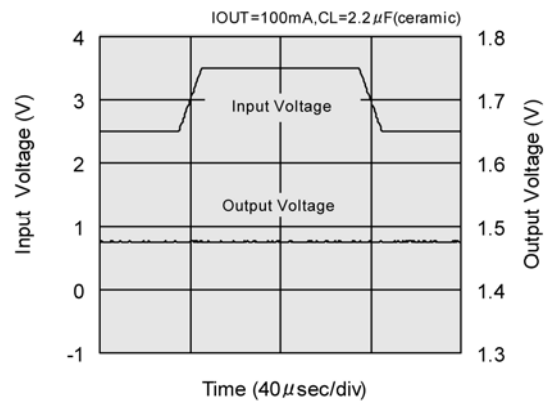
XC6205 (Continued)

(11) Input Transient Response 2 (Continued)

XC6205x152

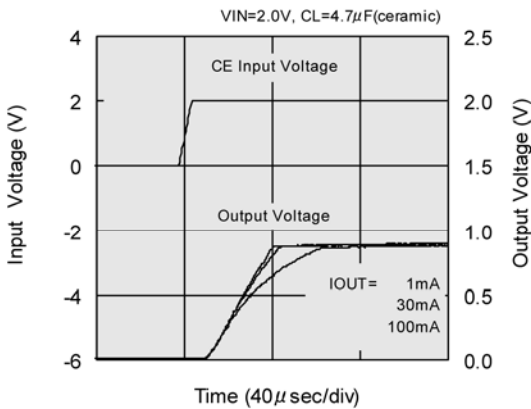


XC6205x152

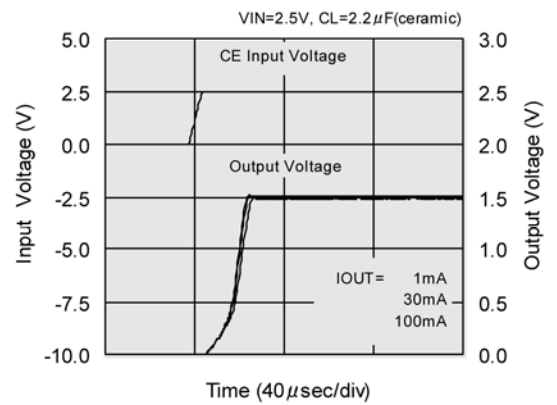


(12) Enable Response Time

XC6205B092

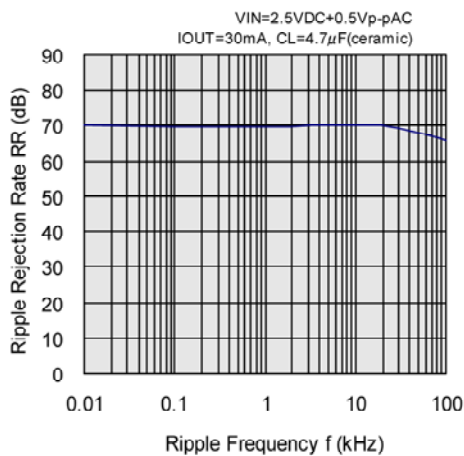


XC6205x152

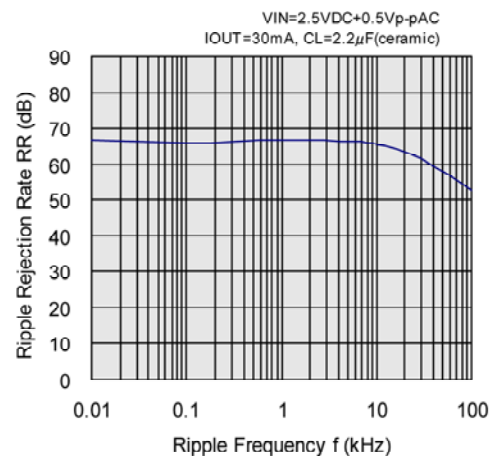


(13) Ripple Rejection Rate

XC6205x092



XC6205x152

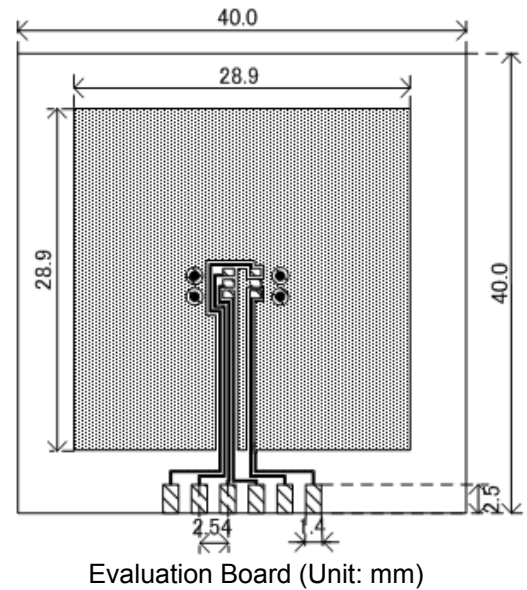


SOT-25 Power Dissipation

Power dissipation data for the SOT-25 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

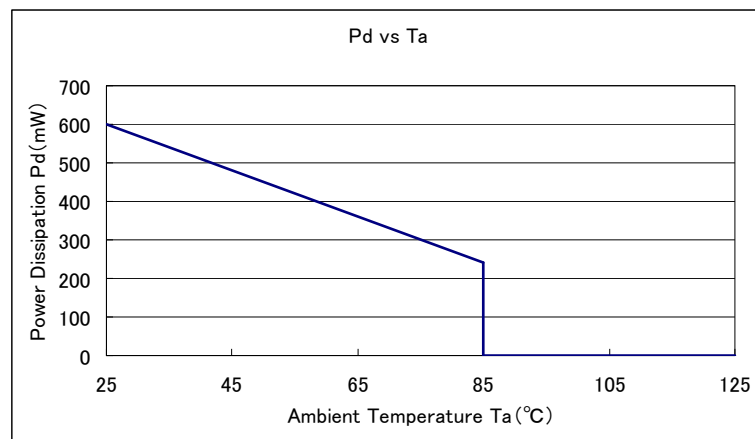
| | |
|-------------------|--|
| Condition: | Mount on a board |
| Ambient: | Natural convection |
| Soldering: | Lead (Pb) free |
| Board Dimensions: | 40 x 40 mm (1600 mm ² in one side) |
| Metal Area : | Copper (Cu) traces occupy 50% of the board area in top and back faces. Package heat-sink is tied to the copper traces |
| Material: | Glass Epoxy (FR-4) |
| Thickness: | 1.6 mm |
| Through-hole: | 4 x 0.8 Diameter |



2. Power Dissipation vs. Ambient temperature(85°C)

Board Mount (T_{jmax}=125°C)

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

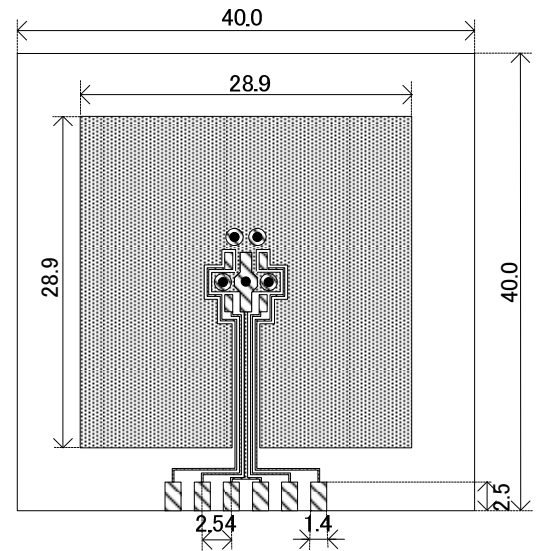


SOT-89-5 Power Dissipation

Power dissipation data for the SOT-89-5 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 Dimensions: 40 x 40 mm (1600 mm² in one side)
- Metal Area : Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces
- Material: Glass Epoxy (FR-4)
- Thickness: 1.6 mm
- Through-hole: 5 x 0.8 Diameter

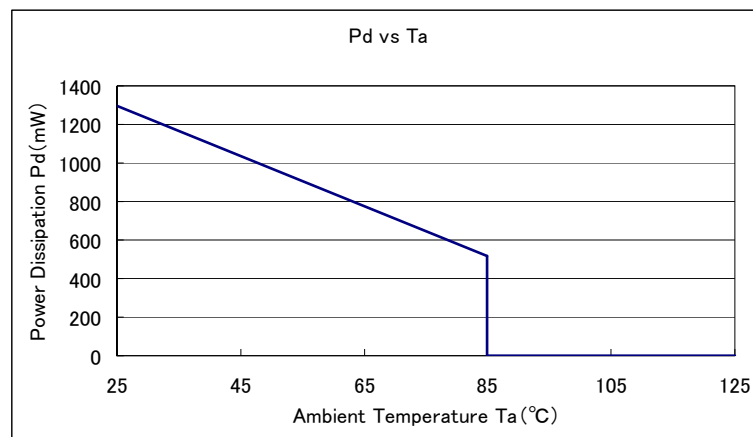


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature(85°C)

Board Mount (Tjmax=125°C)

| Ambient Temperature (°C) | Power Dissipation Pd (mW) | Thermal Resistance (°C/W) |
|--------------------------|---------------------------|---------------------------|
| 25 | 1300 | 76.92 |
| 85 | 520 | |

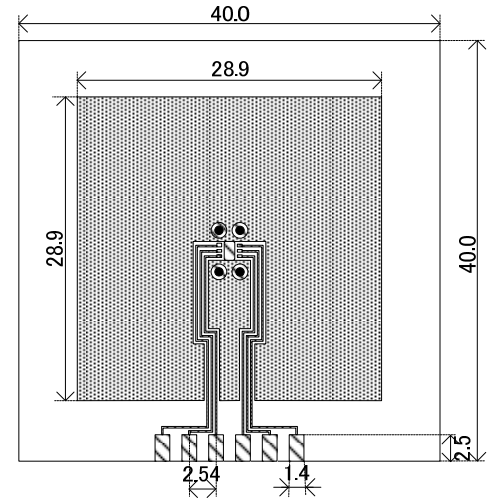


USP-6B Power Dissipation

Power dissipation data for the USP-6B 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 Dimensions: | 40 x 40 mm (1600 mm ² in one side) |
| Metal Area: | Copper (Cu) traces occupy 50% of the board area in top and back faces. Package heat-sink is tied to the copper traces |
| Material: | Glass Epoxy (FR-4) |
| Thickness: | 1.6 mm |
| Through-hole: | 4 x 0.8 Diameter |

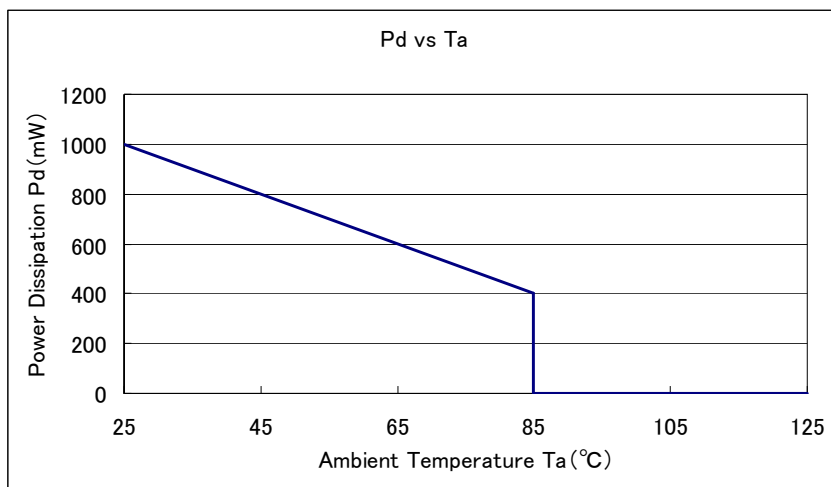


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

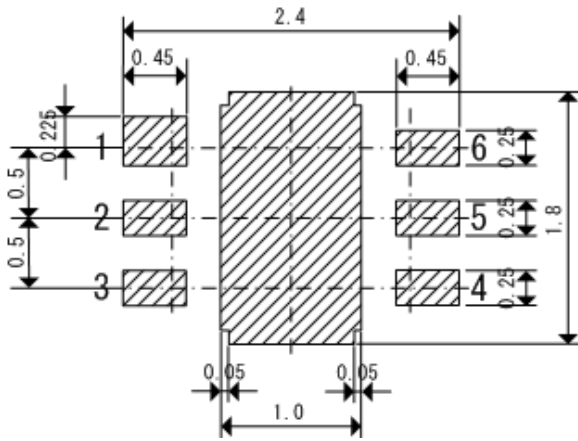
Board Mount ($T_j \text{ max} = 125$)

| Ambient Temperature () | Power Dissipation Pd (mW) | Thermal Resistance(/W) |
|-------------------------|-----------------------------|-------------------------|
| 25 | 1000 | 100.00 |
| 85 | 400 | |

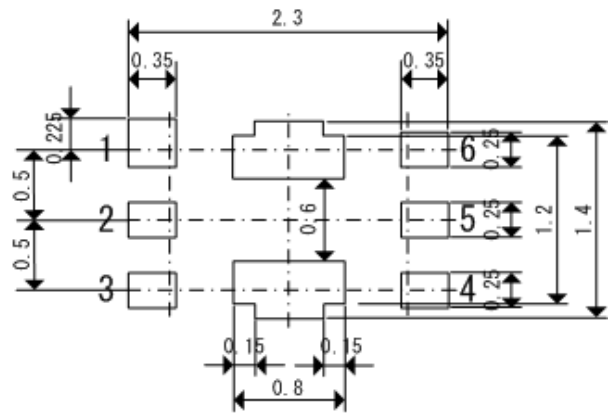


PACKAGING INFORMATION (Continued)

USP-6B Reference Pattern Layout



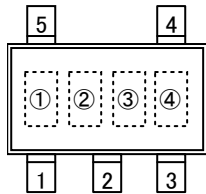
USP-6B Reference Metal Mask Design



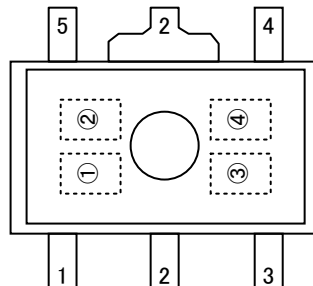
MARKING RULE

[XC6204]

SOT-25, SOT-89-5



SOT-25
(TOP VIEW)



SOT-89-5
(TOP VIEW)

represents product series

| MARK | PRODUCT SERIES |
|------|----------------|
| 4 | XC6204xxxxxx |

represents type of regulator

| MARK | | | | PRODUCT SERIES |
|---------------------------------|-------------------|--------------------------------|-----------------------|----------------|
| OUTPUT VOLTAGE 100mV INCREMENTS | | OUTPUT VOLTAGE 50mV INCREMENTS | | |
| VOLTAGE =0.1~3.0V | VOLTAGE =3.1~6.0V | VOLTAGE =0.15 ~ 3.05V | VOLTAGE =3.15 ~ 6.05V | |
| V | A | E | L | XC6204Axxxxx |
| X | B | F | M | XC6204Bxxxxx |
| Y | C | H | N | XC6204Cxxxxx |
| Z | D | K | P | XC6204Dxxxxx |
| <u>V</u> | <u>A</u> | <u>E</u> | <u>L</u> | XC6204Exxxxx |
| <u>X</u> | <u>B</u> | <u>F</u> | <u>M</u> | XC6204Fxxxxx |
| <u>Y</u> | <u>C</u> | <u>H</u> | <u>N</u> | XC6204Gxxxxx |
| <u>Z</u> | <u>D</u> | <u>K</u> | <u>P</u> | XC6204Hxxxxx |

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 | 5.05 |
| 5 | - | 3.6 | - | 3.65 | N | 2.1 | 5.1 | 2.15 | 5.15 |
| 6 | - | 3.7 | - | 3.75 | P | 2.2 | 5.2 | 2.25 | 5.25 |
| 7 | - | 3.8 | - | 3.85 | R | 2.3 | 5.3 | 2.35 | 5.35 |
| 8 | - | 3.9 | - | 3.95 | S | 2.4 | 5.4 | 2.45 | 5.45 |
| 9 | - | 4.0 | - | 4.05 | T | 2.5 | 5.5 | 2.55 | 5.55 |
| A | - | 4.1 | - | 4.15 | U | 2.6 | 5.6 | 2.65 | 5.65 |
| B | - | 4.2 | - | 4.25 | V | 2.7 | 5.7 | 2.75 | 5.75 |
| C | - | 4.3 | - | 4.35 | X | 2.8 | 5.8 | 2.85 | 5.85 |
| D | - | 4.4 | - | 4.45 | Y | 2.9 | 5.9 | 2.95 | 5.95 |
| E | - | 4.5 | - | 4.55 | Z | 3.0 | 6.0 | 3.05 | 6.05 |

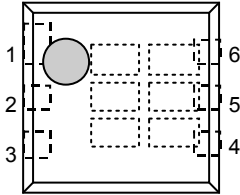
represents production lot number

0 to 9, A to Z, reversed character of 0 to 9 and A to Z repeated. (G, I, J, O, Q, W excluded)

MARKING RULE (Continued)

[XC6204]

USP-6B



USP-6B
(TOP VIEW)

represents product series

| MARK | | PRODUCT SERIES |
|------|---|----------------|
| 0 | 4 | |

represents type of regulator

| MARK | TYPE | PRODUCT SERIES |
|------|---|----------------|
| A | CE pin: High Active, Pull-Down Resistor Built-In | XC6204AxxxDx |
| B | CE pin: High Active, No Pull-Down Resistor Built-In | XC6204BxxxDx |
| C | CE pin: High Active, Pull-Up Resistor Built-In | XC6204CxxxDx |
| D | CE pin: Low Active, No Pull-Up Resistor Built-In | XC6204DxxxDx |
| E | CE pin: High Active, Pull-Down Resistor Built-In | XC6204ExxxDx |
| F | CE pin: High Active, No Pull-Down Resistor Built-In | XC6204FxxxDx |
| Z | CE pin: Low Active, Pull-Up Resistor Built-In | XC6204GxxxDx |
| H | CE pin: Low Active, No Pull-Up Resistor Built-In | XC6204HxxxDx |

represents integer of the output voltage

| MARK | VOLTAGE (V) | PRODUCT SERIES |
|------|---------------|----------------|
| 3 | 3.X | XC6204x3xxDx |
| 5 | 5.X | XC6204x5xxDx |

represents decimal number of output voltage

| MARK | VOLTAGE (V) | PRODUCT SERIES | MARK | VOLTAGE (V) | PRODUCT SERIES |
|------|-------------|----------------|------|-------------|----------------|
| 0 | X.0 | XC6204xx0xDx | A | X.05 | XC6204xx0ADx |
| 1 | X.1 | XC6204xx1xDx | B | X.15 | XC6204xx1ADx |
| 2 | X.2 | XC6204xx2xDx | C | X.25 | XC6204xx2ADx |
| 3 | X.3 | XC6204xx3xDx | D | X.35 | XC6204xx3ADx |
| 4 | X.4 | XC6204xx4xDx | E | X.45 | XC6204xx4ADx |
| 5 | X.5 | XC6204xx5xDx | F | X.55 | XC6204xx5ADx |
| 6 | X.6 | XC6204xx6xDx | H | X.65 | XC6204xx6ADx |
| 7 | X.7 | XC6204xx7xDx | K | X.75 | XC6204xx7ADx |
| 8 | X.8 | XC6204xx8xDx | L | X.85 | XC6204xx8ADx |
| 9 | X.9 | XC6204xx9xDx | M | X.95 | XC6204xx9ADx |

represents production lot number

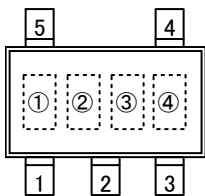
0 to 9, A to Z repeated. (G, I, J, O, Q, W excluded)

Note: No character inversion used.

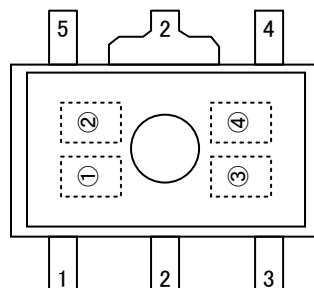
MARKING RULE (Continued)

[XC6205]

SOT-25, SOT-89-5



SOT-25
(TOP VIEW)



SOT-89-5
(TOP VIEW)

represents product series

| MARK | PRODUCT SERIES |
|------|----------------|
| 5 | XC6205xxxxxx |

represents type of regulator

| MARK | | PRODUCT SERIES |
|------------------------------------|-----------------------------------|----------------|
| OUTPUT VOLTAGE 100mV INCREMENTS | OUTPUT VOLTAGE 50mV INCREMENTS | |
| V | E | XC6205Axxxxx |
| X | F | XC6205Bxxxxx |
| Y | H | XC6205Cxxxxx |
| Z | K | XC6205Dxxxxx |
| <u>V</u> | <u>E</u> | XC6205Exxxxx |
| <u>X</u> | <u>F</u> | XC6205Fxxxxx |
| <u>Y</u> | <u>H</u> | XC6205Gxxxxx |
| <u>Z</u> | <u>K</u> | XC6205Hxxxxx |

represents output voltage

| MARK | OUTPUT VOLTAGE (V) | | MARK | OUTPUT VOLTAGE (V) | |
|------|--------------------|------|------|--------------------|------|
| 8 | 0.9 | 0.95 | D | 1.4 | 1.45 |
| 9 | 1.0 | 1.05 | E | 1.5 | 1.55 |
| A | 1.1 | 1.15 | F | 1.6 | 1.65 |
| B | 1.2 | 1.25 | H | 1.7 | 1.75 |
| C | 1.3 | 1.35 | | | |

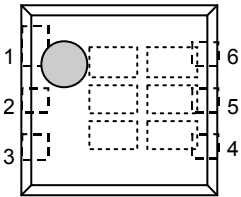
represents production lot number

0 to 9, A to Z, reversed character of 0 to 9 and A to Z repeated. (G, I, J, O, Q, W excluded)

MARKING RULE(Continued)

[XC6205]

USP-6B



USP-6B
(TOP VIEW)

represents product series

| MARK | | PRODUCT SERIES |
|------|---|----------------|
| 0 | 5 | |

represents type of voltage regulator

| MARK | TYPE | PRODUCT SERIES |
|------|---|----------------|
| A | CE pin: High Active with Pull-Down Resistor Built-In | XC6205AxxxDx |
| B | CE pin: High Active with No Pull-Down Resistor Built-In | XC6205BxxxDx |
| C | CE pin: Low Active with Pull-Up Resistor Built-In | XC6205CxxxDx |
| D | CE pin: Low Active with No Pull-Up Resistor Built-In | XC6205DxxxDx |
| E | CE pin: High Active with Pull-Down Resistor Built-In | XC6205ExxxDx |
| F | CE pin: High Active with No Pull-Down Resistor Built-In | XC6205FxxxDx |
| Z | CE pin: Low Active with Pull-Up Resistor Built-In | XC6205GxxxDx |
| H | CE pin: Low Active with No Pull-Up Resistor Built-In | XC6205HxxxDx |

represents integer of output voltage

| MARK | VOLTAGE (V) | PRODUCT SERIES |
|------|-------------|----------------|
| 3 | 3.X | XC6205x3xxDx |
| 5 | 5.X | XC6205x5xxDx |

represents decimal point of output voltage

| MARK | OUTPUT VOLTAGE (V) | | MARK | OUTPUT VOLTAGE (V) | |
|------|--------------------|--------------|------|--------------------|--------------|
| 0 | X.0 | XC6205xx0xDx | A | X.05 | XC6205xx0ADx |
| 1 | X.1 | XC6205xx1xDx | B | X.15 | XC6205xx1ADx |
| 2 | X.2 | XC6205xx2xDx | C | X.25 | XC6205xx2ADx |
| 3 | X.3 | XC6205xx3xDx | D | X.35 | XC6205xx3ADx |
| 4 | X.4 | XC6205xx4xDx | E | X.45 | XC6205xx4ADx |
| 5 | X.5 | XC6205xx5xDx | F | X.55 | XC6205xx5ADx |
| 6 | X.6 | XC6205xx6xDx | H | X.65 | XC6205xx6ADx |
| 7 | X.7 | XC6205xx7xDx | K | X.75 | XC6205xx7ADx |
| 8 | X.8 | XC6205xx8xDx | L | X.85 | XC6205xx8ADx |
| 9 | X.9 | XC6205xx8xDx | M | X.95 | XC6205xx9ADx |

represents production lot number

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

*No character inversion used.