

# XC6211/XC6219 Series



High Speed LDO Regulators, Low ESR Cap. Compatible, ON/OFF Switch

CMOS Low Power Consumption  
 Dropout Voltage : 60mV@30mA  
                   : 200mV@100mA  
 Output Current : 150mA (VOUT<1.75V)  
                   : 240mA (VOUT 1.8V)  
                   (300mA limit)  
 Highly Accurate : ± 2%(VOUT>1.5V)  
                   ± 30mV (VOUT 1.5V)  
 Output Voltage Range : 0.9V to 5.0V (50mV increments)  
 Low ESR Capacitor Compatible

## GENERAL DESCRIPTION

The XC6211/XC6219 series are highly accurate, low noise, CMOS LDO Voltage Regulators. Offering low output noise, high ripple rejection ratio, low dropout and very fast turn-on times, the XC6211/6219 series is ideal for today's cutting edge mobile phone.

Internally the XC6211/6219 includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators. The XC6211/6219's current limiters' foldback circuit also operates as a short protect for the output current limiter and the output pin. The output voltage is set by laser trimming.

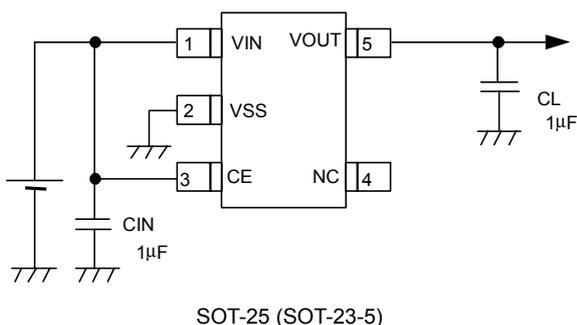
Voltages are selectable in 50mV steps within a range of 0.9V to 5.0V. The XC6211/6219 series is also fully compatible with low ESR ceramic capacitors, reducing cost and improving output stability.

This high level of output stability is maintained even during frequent load fluctuations, due to the excellent transient response performance and high PSRR achieved across a broad range of frequencies.

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

## TYPICAL APPLICATION CIRCUIT

XC6219 series



## APPLICATIONS

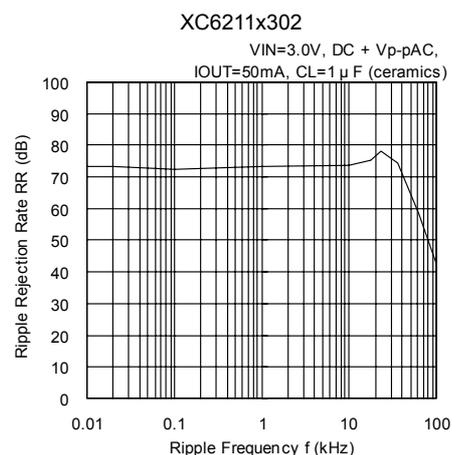
Mobile phones  
 Cordless phones, radio communication equipment  
 Portable games  
 Cameras, Video cameras  
 Reference voltage sources  
 Battery powered equipment

## FEATURES

**Maximum Output Current** : 150mA (VOUT<1.75V)  
                                   : 240mA (VOUT 1.8V)  
                                   (300mA limit (TYP.))  
**Dropout Voltage** : 200mV (IOUT=100mA)  
**Operating Voltage Range** : 2.0V ~ 6.0V  
**Output Voltage Range** : 0.9V ~ 5.0V (50mV steps)  
**Highly Accuracy** : ± 2% (VOUT>1.5)  
                           ± 30mV (VOUT 1.5V)  
**Low Power Consumption** : 25 µ A (TYP.)  
**Standby Current** : Less than 0.1 µ A (TYP.)  
**High Ripple Rejection** : 65dB @10kHz  
**Operating Temperature Range** : -40 ~ 85  
**Low ESR Capacitor** : Ceramic capacitor  
**Ultra Small Packages** : SOT-25 (SOT-23-5)  
                                   SOT-89-5(XC6219)  
                                   USP-6B(XC6219)

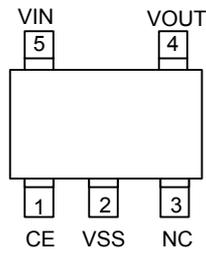
## TYPICAL PERFORMANCE CHARACTERISTICS

Ripple Rejection Rate



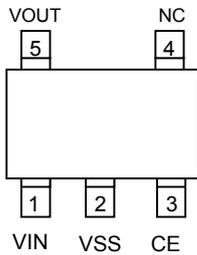
## PIN CONFIGURATION

[XC6211 Series]

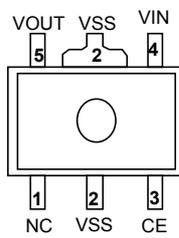


SOT-25 (SOT-23-5)  
(TOP VIEW)

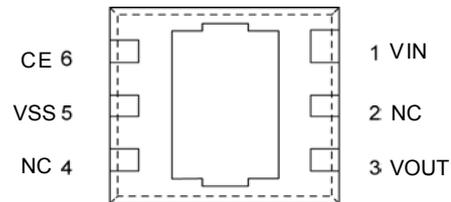
[XC6219 Series]



SOT-25 (SOT-23-5)  
(TOP VIEW)



SOT-89-5  
(TOP VIEW)



USP-6B  
(BOTTOM VIEW)

\*Please use the circuit without connecting the heat dissipation pad. If the pad needs to be connected to other pins, it should be noted that the pin configuration of the USP-6B package is different on the IC series. Please refer to Contents-2.

## PIN ASSIGNMENT

PIN NUMBER				PIN NAME	FUNCTIONS
XC6211	XC6219				
SOT-25	SOT-25	SOT-89-5	USP-6B		
5	1	4	1	VIN	Power Input
2	2	2	5	VSS	Ground
1	3	3	6	CE	ON / OFF Control
3	4	1	2, 4	NC	No Connection
4	5	5	3	VOUT	Output

## PRODUCT CLASSIFICATION

### Selection Guide

The following options for the CE pin logic and internal pull-up/down are available:

High Active + no pull-down resistor built-in (standard)

High Active + 2.0M pull-down resistor built-in <between CE-V<sub>SS</sub>> (semi-custom)

Low Active + no pull-up resistor built-in (semi-custom)

Low Active + 2.0M pull-up resistor built-in <between V<sub>IN</sub>-CE> (semi-custom)

Note: \*With the pull-up resistor or pull-down resistor built-in types, the supply current during operation will increase by  $V_{IN} / 2.0M$  (TYP.)

### Ordering Information

#### XC6211/XC6219

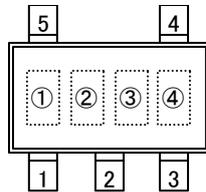
DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
	CE Pin Logic	A	: High Active (pull-down resistor built in)
		B	: High Active (no pull-down resistor built in)
		C	: Low Active (pull-up resistor built in)
		D	: Low Active (no pull-up resistor built in)
	Output Voltage	09 ~ 50	: e.g. =3, =0, → 3.0V
	Output Voltage	2	: 100mV increments, ±2% accuracy e.g. =2, =8, =2 → 2.80V, ±2%
		A	: 50mV increments, ±2% accuracy e.g. =2, =8, =A → 2.85V, ±2%
	Packages	M	: SOT-25 (SOT-23-5)
		P	: SOT-89-5 (XC6219)
		D	: USP-6B (XC6219)
	Device Orientation	R	: Embossed tape, Standard feed
		L	: Embossed tape, Reverse feed



# MARKING RULE

[XC6211 Series]

SOT-25(SOT-23-5)



SOT-25  
(TOP VIEW)

Represents product series

MARK	PRODUCT SERIES
A	XC6211xxxxMx

Represents type of regulator

MARK				PRODUCT SERIES
V <sub>OUT</sub> 100mV STEPS		V <sub>OUT</sub> 50mV STEPS		
V <sub>OUT</sub> :0.1~3.0V	V <sub>OUT</sub> :3.1~6.0V	V <sub>OUT</sub> :0.15~3.05V	V <sub>OUT</sub> :3.15~6.05V	
V	A	E	L	XC6211AxxxMx
X	B	F	M	XC6211BxxxMx
Y	C	H	N	XC6211CxxxMx
Z	D	K	P	XC6211DxxxMx

Represents output voltage

MARK	OUTPUT VOLTAGE				MARK	OUTPUT VOLTAGE			
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

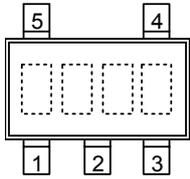
0 to 9, A to Z reverse character of 0 to 9, A to Z repeated (G,I,J,O,Q,W excepted)

## MARKING RULE (Continued)

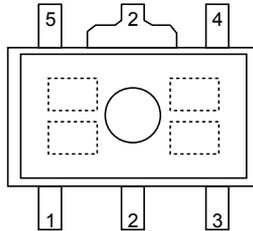
[XC6219 Series]

SOT-25(SOT-23-5)

SOT-89-5



SOT-25  
(TOP VIEW)



SOT-89-5  
(TOP VIEW)

Represents product series

MARK	PRODUCT SERIES
L	XC6219xxxxxx

Represents type of regulator

MARK				PRODUCT SERIES
V <sub>OUT</sub> 100mV STEPS		V <sub>OUT</sub> 50mV STEPS		
V <sub>OUT</sub> :0.1~3.0V	V <sub>OUT</sub> :3.1~6.0V	V <sub>OUT</sub> :0.15~3.05V	V <sub>OUT</sub> :3.15~6.05V	
V	A	E	L	XC6219Axxxxx
X	B	F	M	XC6219Bxxxxx
Y	C	H	N	XC6219Cxxxxx
Z	D	K	P	XC6219Dxxxxx

Represents output voltage

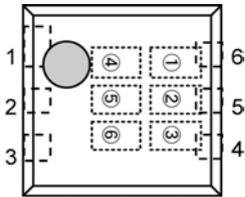
MARK	OUTPUT VOLTAGE(V)				MARK	OUTPUT VOLTAGE(V)			
0	-	3.1	-	3.15	F	1.6	4.6	1.65	4.65
1	-	3.2	-	3.25	H	1.7	4.7	1.75	4.75
2	-	3.3	-	3.35	K	1.8	4.8	1.85	4.85
3	-	3.4	-	3.45	L	1.9	4.9	1.95	4.95
4	-	3.5	-	3.55	M	2.0	5.0	2.05	-
5	-	3.6	-	3.65	N	2.1	-	2.15	-
6	-	3.7	-	3.75	P	2.2	-	2.25	-
7	-	3.8	-	3.85	R	2.3	-	2.35	-
8	0.9	3.9	0.95	3.95	S	2.4	-	2.45	-
9	1.0	4.0	1.05	4.05	T	2.5	-	2.55	-
A	1.1	4.1	1.15	4.15	U	2.6	-	2.65	-
B	1.2	4.2	1.25	4.25	V	2.7	-	2.75	-
C	1.3	4.3	1.35	4.35	X	2.8	-	2.85	-
D	1.4	4.4	1.45	4.45	Y	2.9	-	2.95	-
E	1.5	4.5	1.55	4.55	Z	3.0	-	3.05	-

Represents production lot number

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

## MARKING RULE (Continued)

USP-6B



USP-6B  
(TOP VIEW)

Represents product series

MARK		PRODUCT SERIES
1	9	XC6219xxxxDx

Represents type of regulator

MARK	TYPE	PRODUCT SERIES
A	High Active, Pull-down resistor built-in (semi-custom)	XC6219AxxxMx
B	High Active, No Pull-down resistor built-in (semi-custom)	XC6219BxxxMx
C	Low Active, pull-up resistor built-in (semi-custom)	XC6219CxxxMx
D	Low Active, No pull-up resistor built-in (semi-custom)	XC6219DxxxMx

Represents product series

MARK	VOLTAGE(V)	PRODUCT SERIES
3	3.X	XC6219x3xxDx
5	5.X	XC6219x5xxDx

Represents output voltage

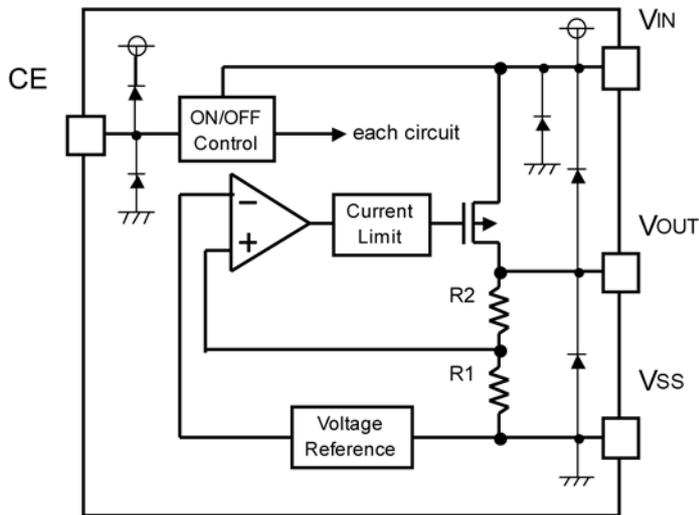
MARK	VOLTAGE	PRODUCT SERIES	SYMBOL	VOLTAGE	PRODUCT SERIES
0	X.0	XC6219xx0xDx	A	X.05	XC6219xx0ADx
1	X.1	XC6219xx1xDx	B	X.15	XC6219xx1ADx
2	X.2	XC6219xx2xDx	C	X.25	XC6219xx2ADx
3	X.3	XC6219xx3xDx	D	X.35	XC6219xx3ADx
4	X.4	XC6219xx4xDx	E	X.45	XC6219xx4ADx
5	X.5	XC6219xx5xDx	F	X.55	XC6219xx5ADx
6	X.6	XC6219xx6xDx	H	X.65	XC6219xx6ADx
7	X.7	XC6219xx7xDx	K	X.75	XC6219xx7ADx
8	X.8	XC6219xx8xDx	L	X.85	XC6219xx8ADx
9	X.9	XC6219xx9xDx	M	X.95	XC6219xx9ADx

Represents production lot number

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

\* No character inversion used.

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Ta=25

PARAMETER	SYMBOL	RATINGS	UNITS
Input Voltage	V <sub>IN</sub>	7.0	V
Output Current	I <sub>OUT</sub>	500	mA
Output Voltage	V <sub>OUT</sub>	V <sub>SS</sub> - 0.3 ~ V <sub>IN</sub> + 0.3	V
CE Pin Voltage	V <sub>CE</sub>	V <sub>SS</sub> - 0.3 ~ V <sub>IN</sub> + 0.3	V
Power Dissipation	SOT-25	250	mW
	SOT-89	500	
	USP-6B	100	
Operating Temperature Range	T <sub>opr</sub>	- 40 ~ + 85	
Storage Temperature Range	T <sub>stg</sub>	- 55 ~ + 125	

## ELECTRICAL CHARACTERISTICS

XC6211/6219B series

Ta=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage (*2)	V <sub>OUT(E)</sub>	I <sub>OUT</sub> =30mA	× 0.98	V <sub>OUT(T)</sub>	× 1.02	V	
Maximum Output Current	I <sub>OUTMAX</sub>		150	-	-	mA	
Load Regulation	ΔV <sub>OUT</sub>	1mA I <sub>OUT</sub> 100mA	-	15	50	mV	
Dropout Voltage (*3)	V <sub>dif1</sub>	I <sub>OUT</sub> =30mA	E-1			mV	
	V <sub>dif2</sub>	I <sub>OUT</sub> =100mA	E-2			mV	
Supply Current	I <sub>DD</sub>	V <sub>CE</sub> =V <sub>IN</sub>	-	25	50	μA	
Standby Current	I <sub>stby</sub>	V <sub>CE</sub> =V <sub>SS</sub>	-	0.01	0.10	μA	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	V <sub>OUT(T)</sub> +1.0V V <sub>IN</sub> 7.0V I <sub>OUT</sub> =30mA	-	0.01	0.20	%/V	
Input Voltage	V <sub>IN</sub>		2.0	-	6.0	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$	I <sub>OUT</sub> =30mA -40 T <sub>opr</sub> 85	-	100	-	ppm/	
Ripple Rejection Rate	PSRR	I <sub>OUT</sub> =50mA, f=1kHz	-	65	-	dB	
Current Limiter	I <sub>lim</sub>		-	300	-	mA	
Short Circuit Current	I <sub>short</sub>		-	50	-	mA	
EN 'High' Voltage	V <sub>CEH</sub>		1.60	-	V <sub>IN</sub>	V	
EN 'Low' Voltage	V <sub>CEL</sub>		-	-	0.25	V	
EN 'High' Current	I <sub>CEH</sub>	V <sub>CE</sub> =V <sub>IN</sub>	-0.10	-	0.10	μA	
EN 'Low' Current	I <sub>CEL</sub>	V <sub>CE</sub> =V <sub>SS</sub>	-0.10	-	0.10	μA	

**NOTE:**

- \* 1: V<sub>OUT(T)</sub> = Specified output voltage
- \* 2: V<sub>OUT(E)</sub> = Effective output voltage  
(I.e. the output voltage when "V<sub>OUT(T)</sub>+1.0V" is provided at the V<sub>IN</sub> pin while maintaining a certain I<sub>OUT</sub> value.)
- \* 3: V<sub>dif</sub>={V<sub>IN1</sub><sup>(\*)</sup>-V<sub>OUT1</sub><sup>(\*)</sup>}
- \* 4: V<sub>OUT</sub>=A voltage equal to 98% of the output voltage whenever an amply stabilized I<sub>OUT</sub> {V<sub>OUT(T)</sub>+1.0V} is input.
- \* 5: V<sub>IN</sub>=The Input Voltage when V<sub>OUT</sub> appears as Input Voltage is gradually decreased.
- \* 6: Unless otherwise stated, V<sub>IN</sub>=V<sub>OUT(T)</sub>+1.0V.

**Dropout Voltage Chart**

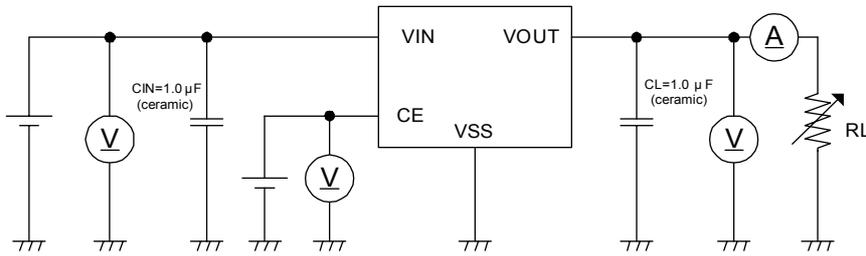
SYMBOL	E-1			E-2		
	V <sub>dif1</sub>			V <sub>dif2</sub>		
PARAMETER	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
OUTPUT VOLTAGE						
0.9	1100	1100	1110	1100	1150	1200
1.50	500	500	510	500	550	600
1.80 ~ 1.85	200	200	210	200	300	400
1.90 ~ 1.95	100	120	150	100	280	380
2.00 ~ 2.05	-	80	120	-	240	350
2.10 ~ 2.25	-	80	120	-	240	330
2.30 ~ 2.45	-	80	120	-	240	310
2.50 ~ 2.75	-	70	100	-	220	290
2.80 ~ 2.95	-	70	100	-	220	270
3.00 ~ 3.05	-	60	90	-	200	270
3.10 ~ 3.95	-	60	90	-	200	250
4.00 ~ 4.95	-	60	80	-	180	230
5.00	-	50	70	-	160	210

\* The input voltage 2.0V (MIN.) is needed to operate the series.

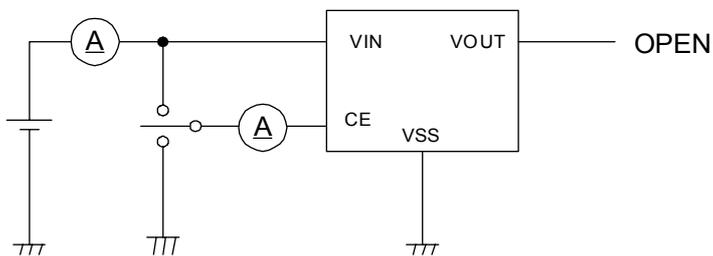
When the output voltage is less than 2.0V, 2.0V-V<sub>OUT(T)</sub> of dropout voltage is needed at minimum.

## TEST CIRCUITS

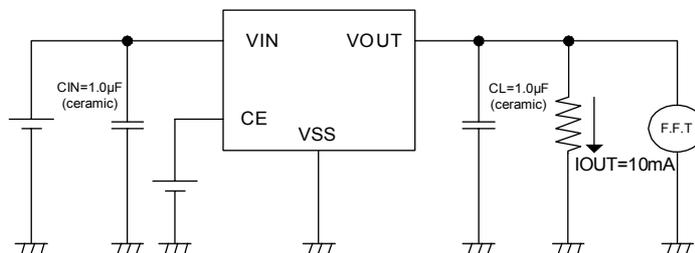
Circuit



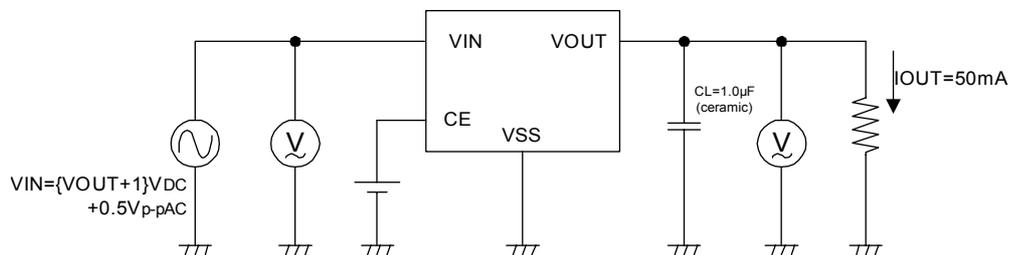
Circuit



Circuit



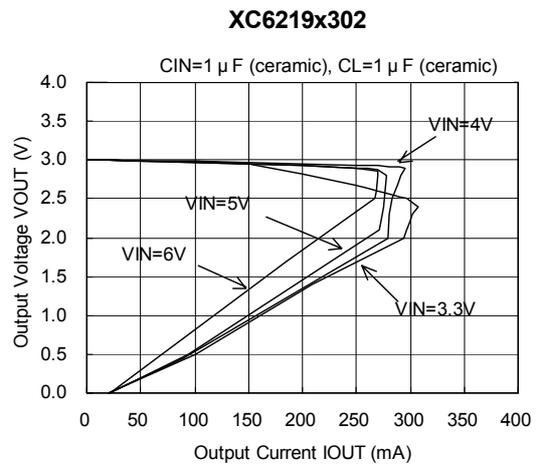
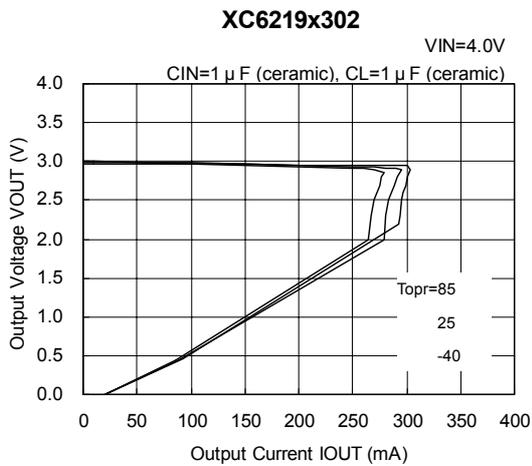
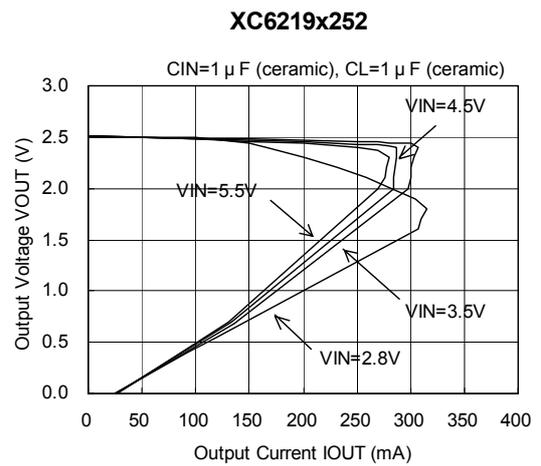
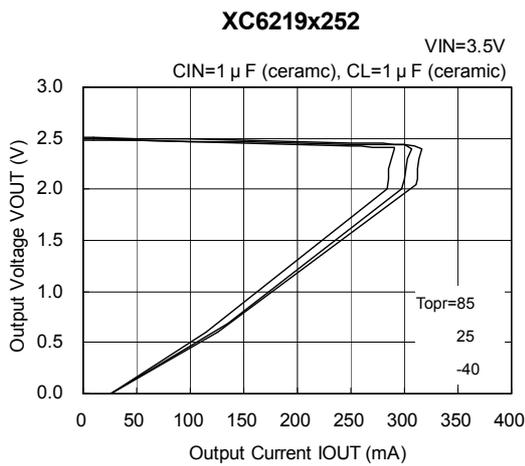
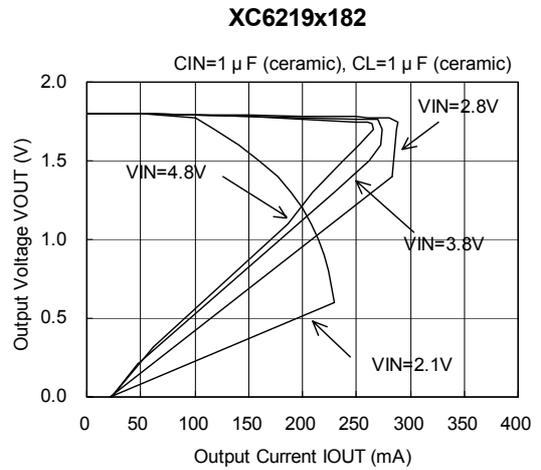
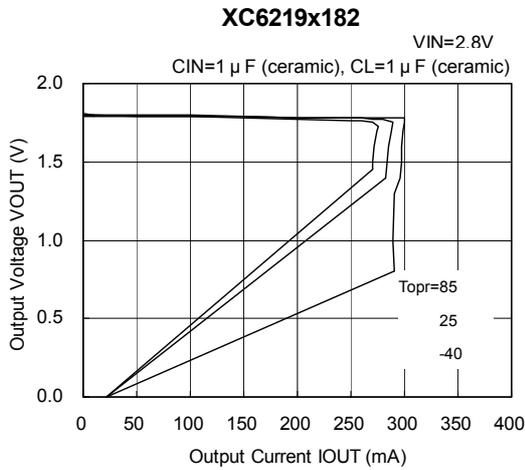
Circuit





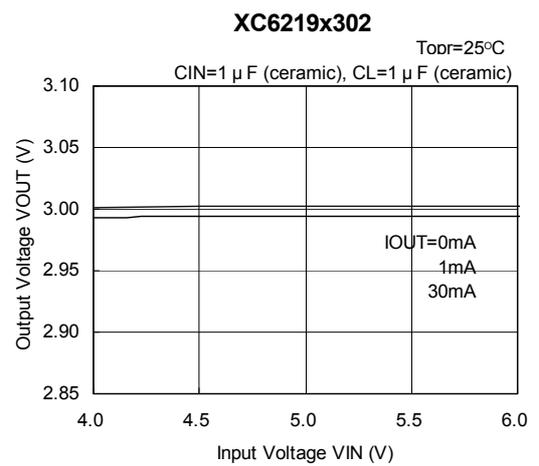
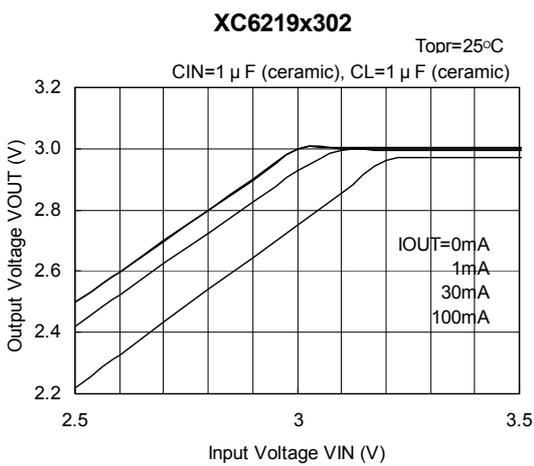
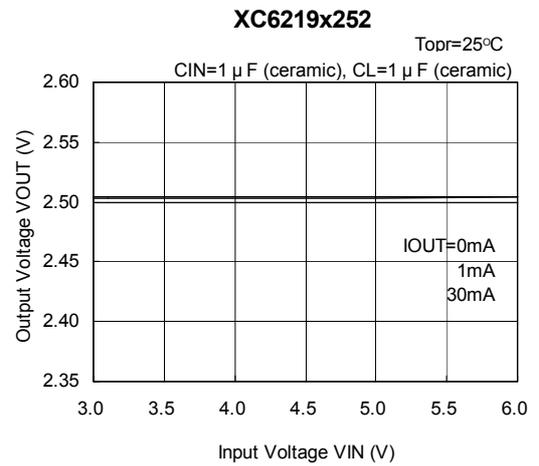
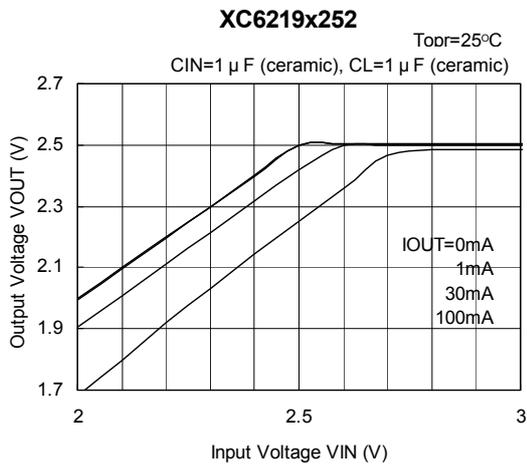
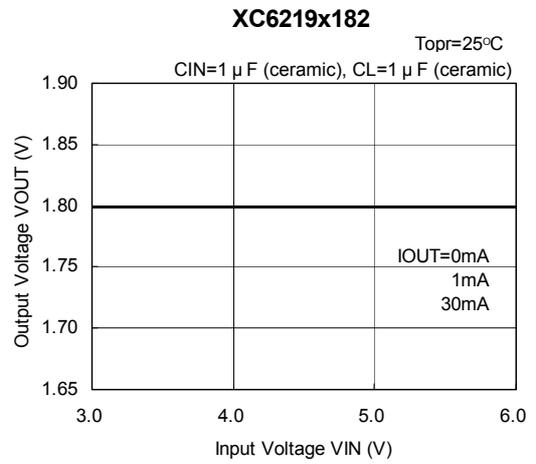
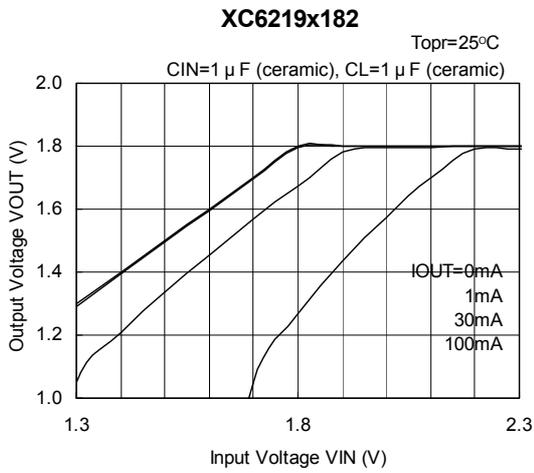
## TYPICAL PERFORMANCE CHARACTERISTICS

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



## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

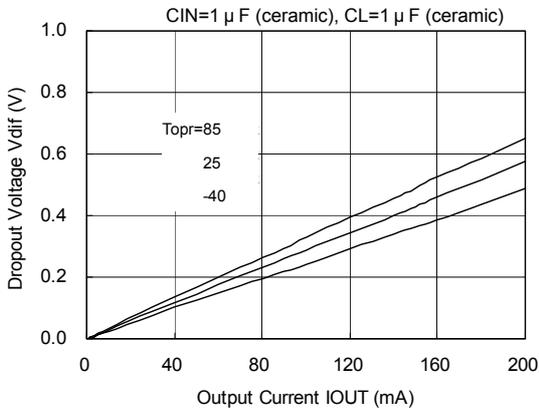
### (2) Output Voltage vs. Input Voltage



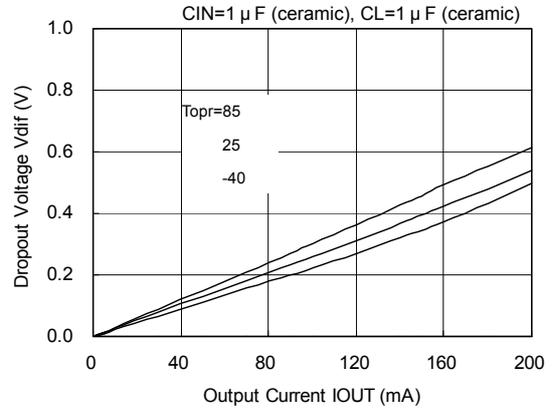
## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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

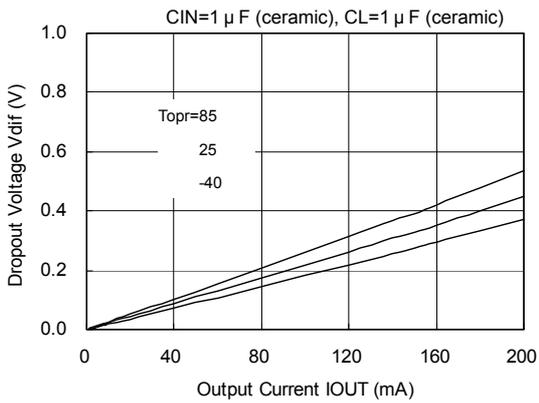
**XC6219x182**



**XC6219x252**

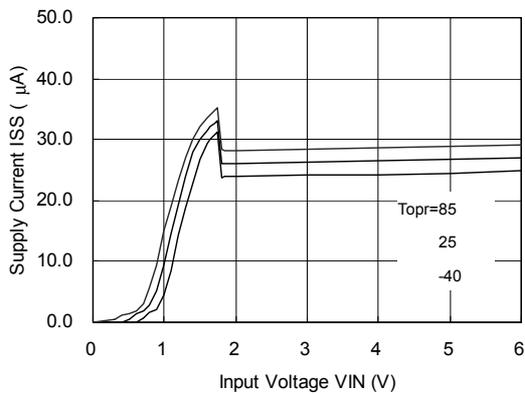


**XC6219x302**

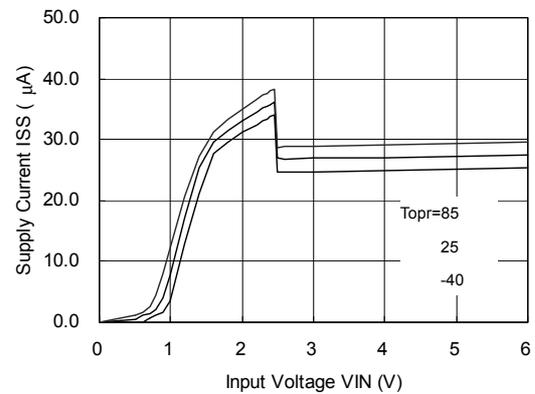


### (4) Supply Current vs. Input Voltage

**XC6219x182**



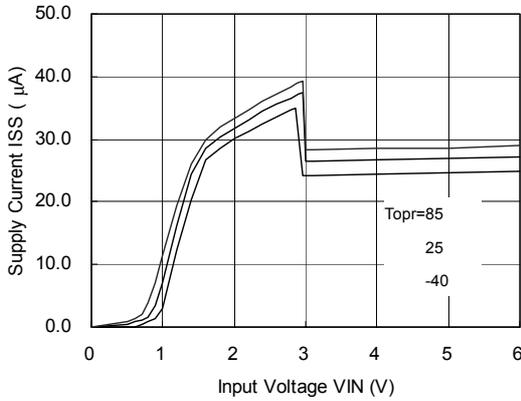
**XC6219x252**



## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

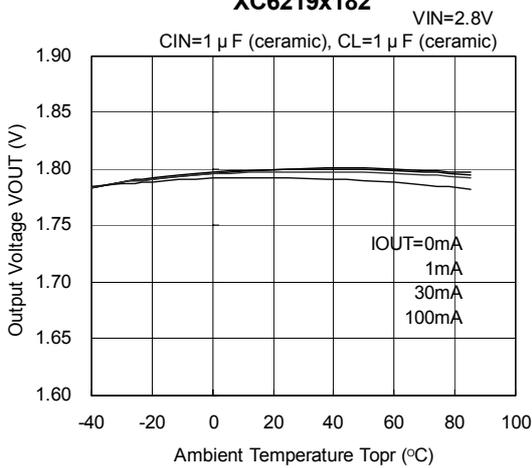
### (4) Supply Current vs. Input Voltage

**XC6210x302**

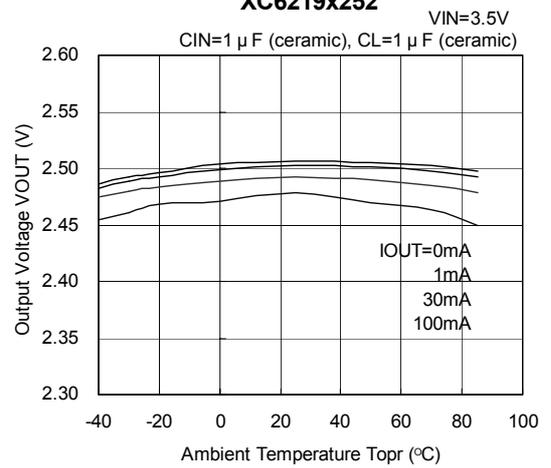


### (5) Output Voltage vs. Ambient Temperature

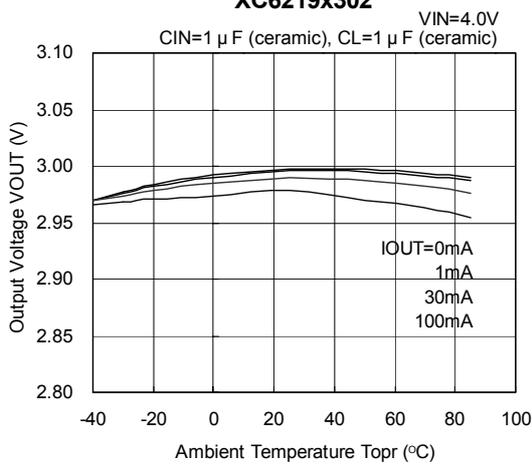
**XC6219x182**



**XC6219x252**

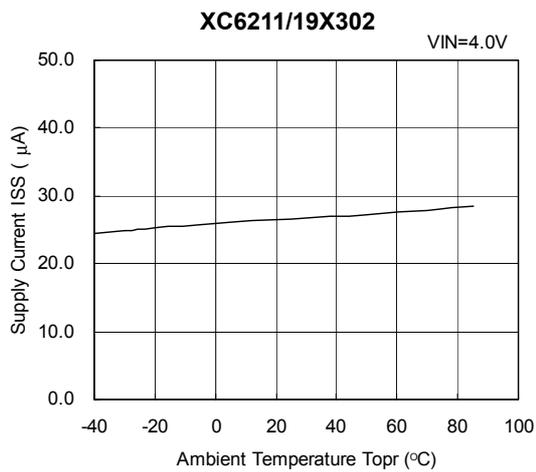
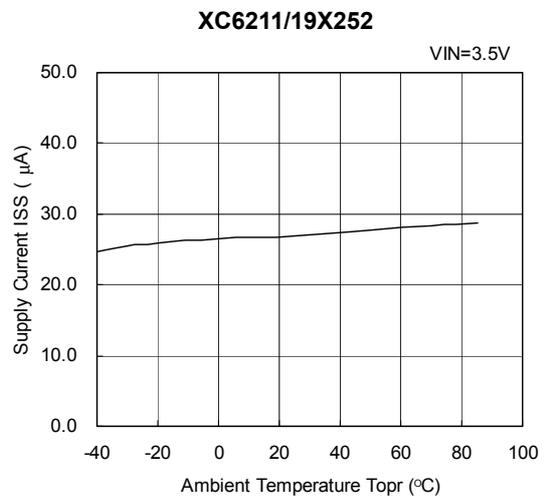
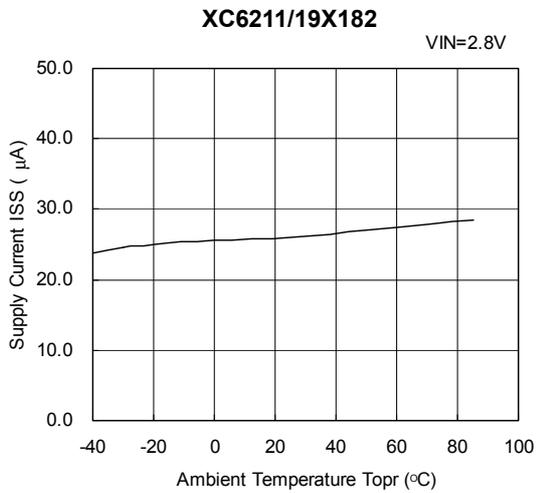


**XC6219x302**



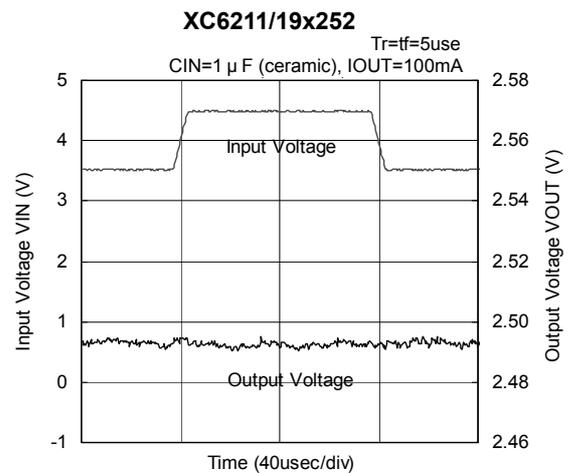
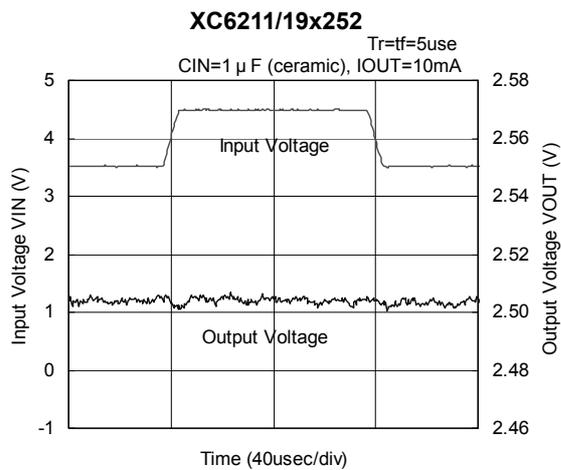
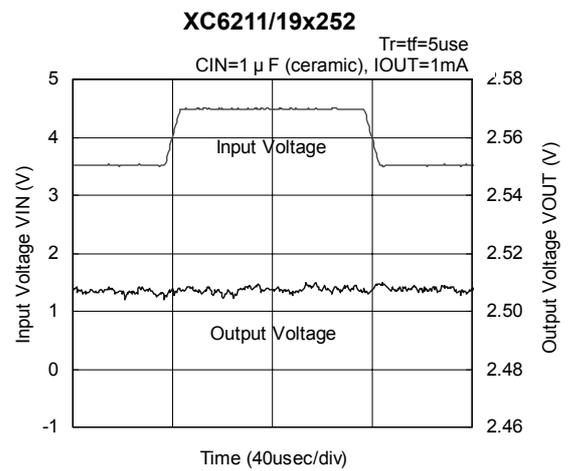
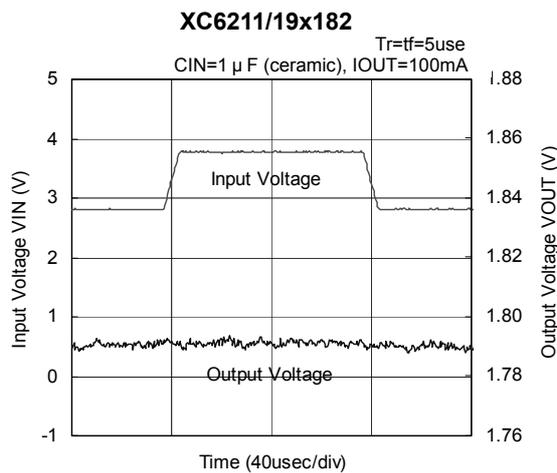
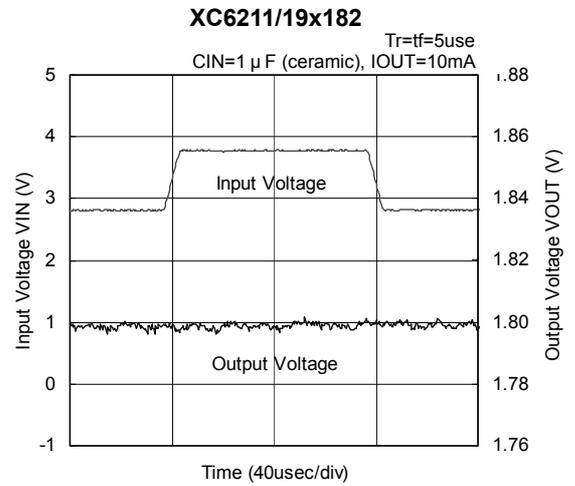
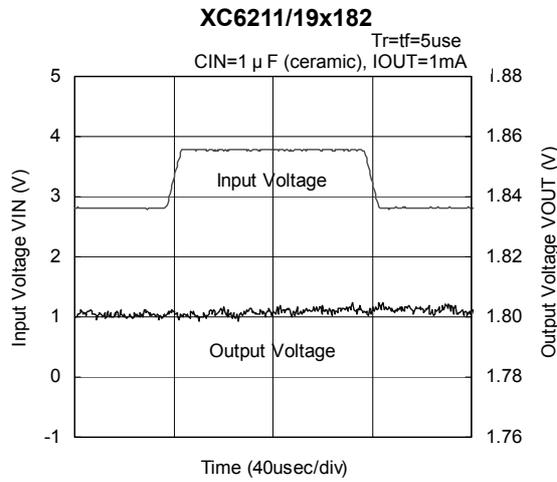
## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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



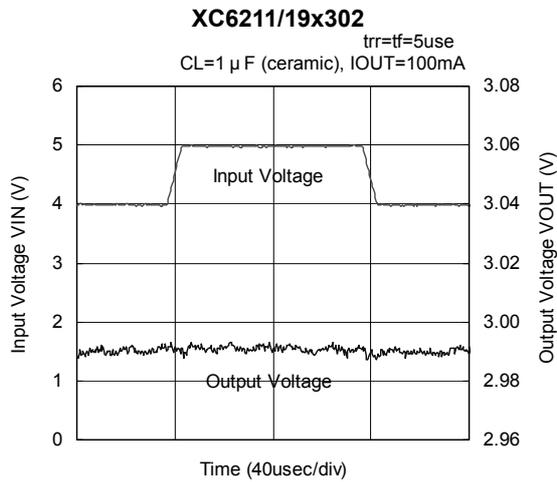
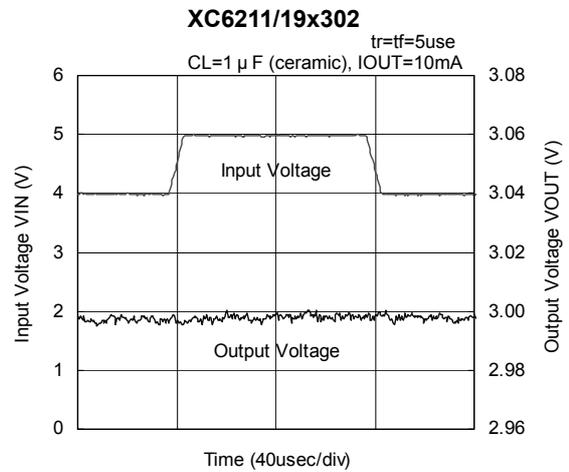
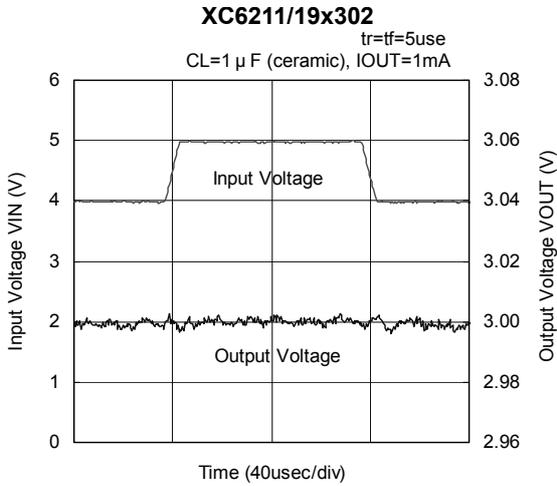
## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (7) Input Transient Response

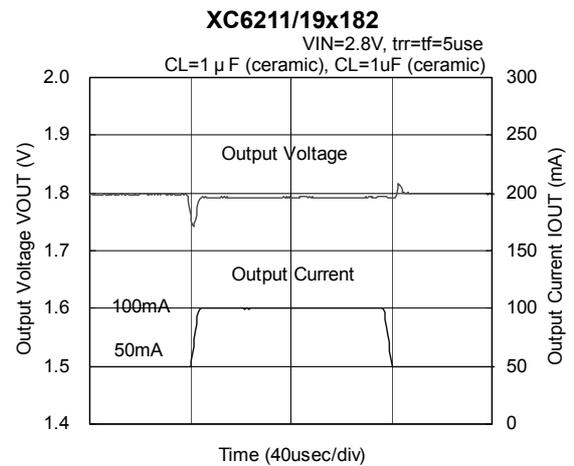
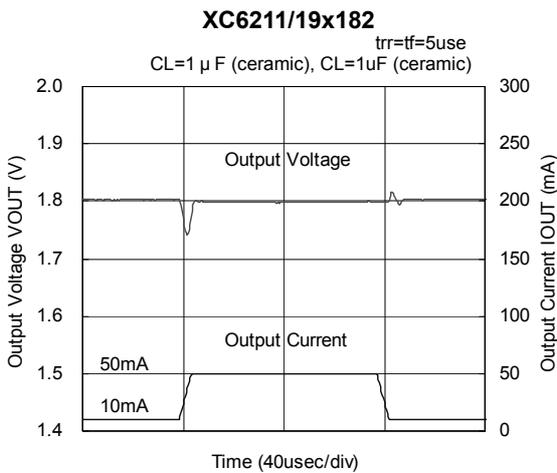


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (7) Input Transient Response (Continued)

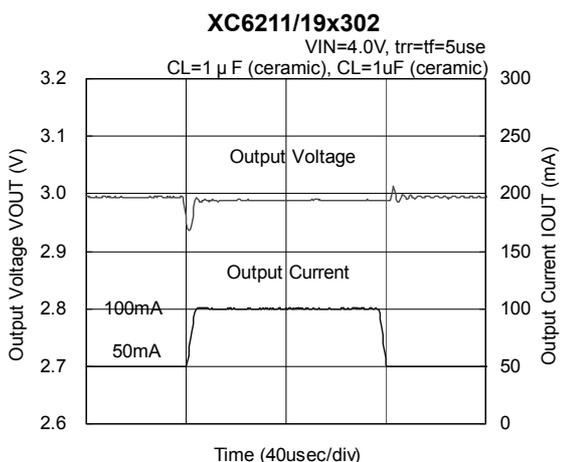
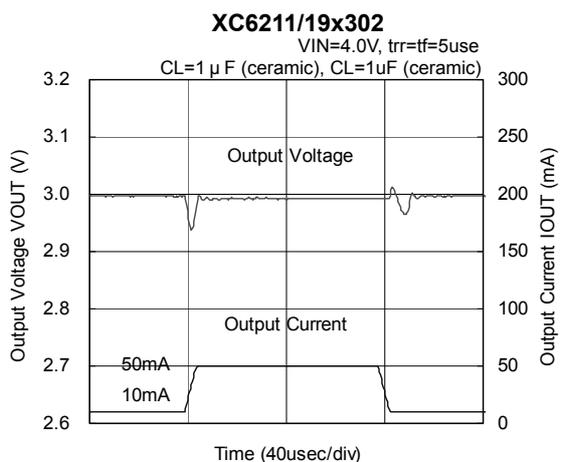
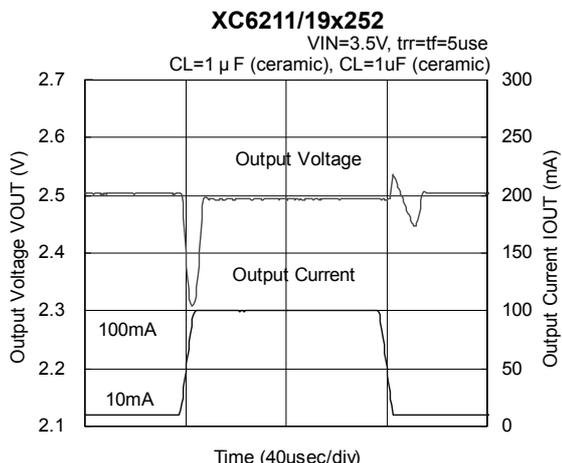
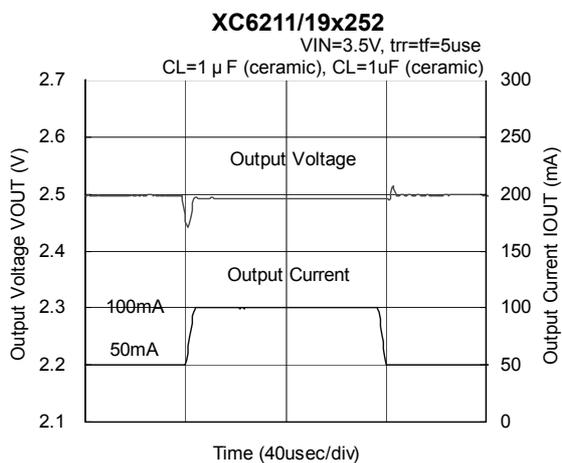
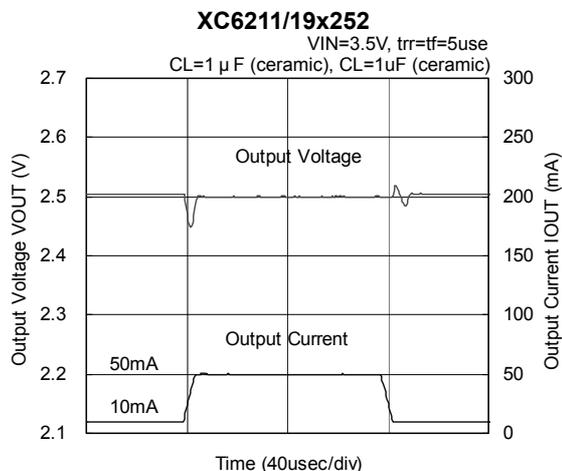
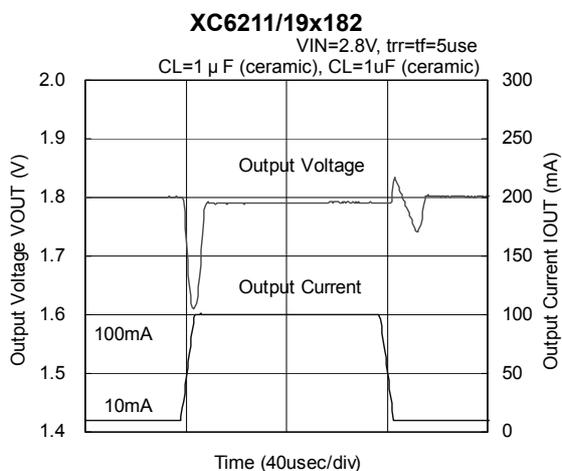


### (8) Load Transient Response



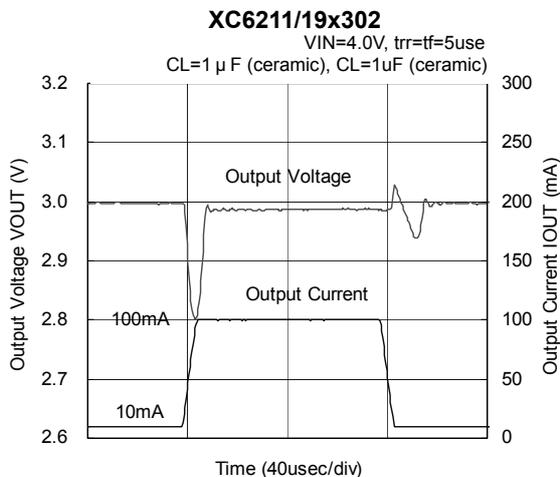
## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (8) Load Transient Response (Continued)



## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

### (8) Load Transient Response (Continued)



### (11) Ripple Rejection Rate

