XC6202 Series

(High Voltage) Positive Voltage Regulators

Preliminary

Apr. 19, 01 Ver. II

- ◆ CMOS Low Power Consumption
- ◆ Operating Voltage Range : up to 20V
- ◆ Dropout Voltage : 200mV @ 30mA, 670mV @ 100mA
- ◆ Maximum Output Current : more than 150mA
- ◆ Highly Accurate : ± 2%
- ◆ Output Voltage Range : 1.8V to 18.0V
- ◆ Current Limiter Circuit Built-In
- ◆ SOT-23 / SOT-89 Package
- ◆ Low ESR Capacitor can be used

■ Applications

- ● Battery Powered Equipment
- ● Reference Voltage Sources
- ● Cameras, Video Cameras
- ● Palmtops

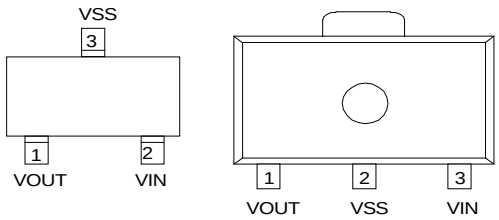
■ General Description

The XC6202 series are highly precise, low power consumption, high voltage, positive voltage regulators manufactured using CMOS and laser trimming technologies. The XC6202 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error correction circuit.
Output voltage is selectable in 0.1V steps from 1.8V ~ 18V.
The series is also compatible with low ESR ceramic capacitors which give added output stability.
Since the current limiter circuit is built-in, the IC is protected against overshoot currents at such times of output shorts etc.
SOT-23(150mW) and SOT-89(500mW) packages are available.

■ Features

Maximum Output Current : 150mA
Dropout Voltage : 200mV @ 30mA
Operating Voltage Range : up to 20V
Output Voltage Range : 1.8V to 18V (selectable in 0.1V steps)
Highly Accurate : ± 2%
Low Power Consumption : TYP 10 μA (VOUT=3.3V)
Operating Ambient Temp. : -40°C ~ 85°C
Line Regulation : TYP 0.01% / V
Ultra Small Packages : SOT-23 (150mW), SOT-89 (500mW)
Low ESR Capacitor Compatible : ceramic capacitor

■ Pin Configuration



SOT-23 (TOP VIEW)

SOT-89 (TOP VIEW)

■ Pin Assignment

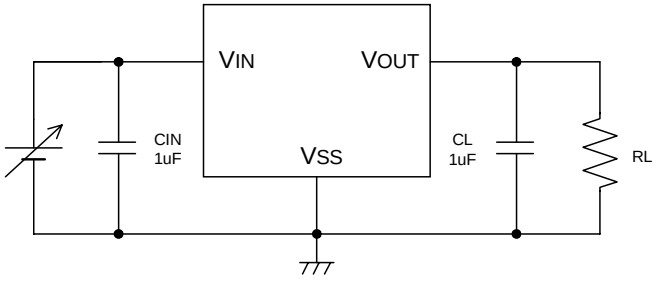
PIN NAME		PIN NAME	FUNCTION
SOT-23	SOT-89		
1	1	VOUT	Output
3	2	VSS	Ground
2	3	VIN	Power Input

■ Ordering Information

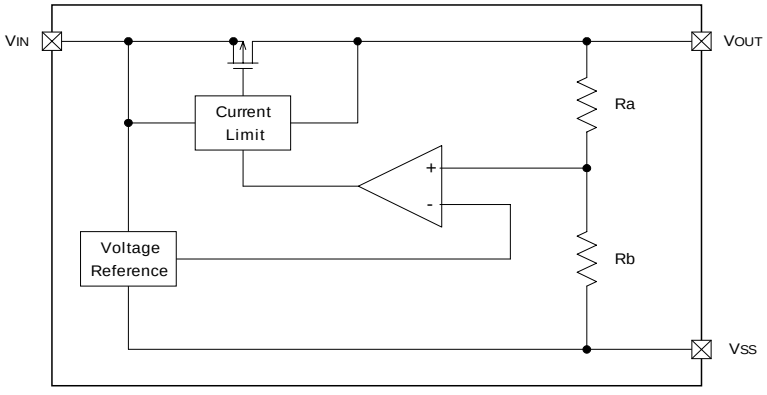
XC6202P①②③④⑤

DESIGNATOR	SYMBOL	DESCRIPTION
①②	18 ~ J0	Output Voltage For the voltage above 10V, see the example 10=A, 11=B, 12=C, 13=D, 14=E, 15=F, 16=G, 17=H, 18=J e.g. VOUT=3.0V→①:3, ②:0 VOUT=12V→①:C, ②:0 VOUT=15V→①:F, ②:0
③	2	Accuracy : ±2%
④	M	Package : SOT-23
	P	SOT-89
⑤	R	Embossed Tape : Standard Feed
	L	Embossed Tape : Reverse Feed

■ Typical Application



■ Block Diagram



■ Absolute Maximum Ratings

Ta = 25°C

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		VIN	22	V
Output Current		IOUT	500	mA
Output Voltage		VOUT	VSS ~ 0.3 to VIN + 0.3	V
Continuous Total Power Dissipation	SOT-23	Pd	150	mW
	SOT-89	Pd	500	
Operating Ambient Temperature		Topr	-40 to +85	°C
Storage Temperature		Tstg	-40 to +125	°C

■ Electrical Characteristics

XC6202P182 VOUT(T) = 1.8V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note2)	VIN=2.8V IOUT=30mA	1.764	1.800	1.836	V	2
Maximum Output Current	IOUT max	VIN=2.8V VOUT ≥ VOUT(E) × 0.9	60			mA	2
Load Regulation	Δ VOUT	VIN=2.8V 1mA ≤ IOUT ≤ 100mA		10	80	mV	2
Dropout Voltage (Note 3)	Vdif 1	IOUT=30mA		340	470	mV	2
	Vdif 2	IOUT=100mA		1000	1500		
Supply Current	ISS	VIN=2.8V		10.0	24.0	μA	1
Line Regulation	$\frac{\Delta VOUT}{\Delta VIN \cdot VOUT}$	IOUT=1mA 2.8V ≤ VIN ≤ 20.0V		0.01	0.2	% / V	2
Input Voltage	VIN				20	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta VOUT}{\Delta Topr \cdot VOUT}$	IOUT=30mA -40°C ≤ Topr ≤ 85°C		±100		ppm / °C	2
Short-circuit Current	Ishort	VIN=3.8V		40		mA	2

Note : 1. VOUT(T) = Specified Output Voltage.
2. VOUT(E) = Effective Output Voltage (i.e. the output voltage when "VOUT(T)+1.0V" is provided at the VIN pin while maintaining a certain IOUT value).
3. Vdif = VIN1 - VOUT1
4. VOUT1 = A voltage equal to 98% of the output voltage when "VOUT(T)+1.0V" is input.e
5. VIN1 = The input voltage when VOUT1 is output following a gradual decrease in the input voltage.

XC6202P332 VOUT(T) = 3.3V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note2)	VIN=4.3V IOUT=30mA	3.234	3.300	3.366	V	2
Maximum Output Current	IOUT max	VIN=4.3V VOUT ≥ VOUT(E) × 0.9	150			mA	2
Load Regulation	ΔVOUT	VIN=4.3V 1mA ≤ IOUT ≤ 100mA		25	90	mV	2
Dropout Voltage (Note 3)	Vdif 1	IOUT=30mA		200	280	mV	2
	Vdif 2	IOUT=100mA		670	900		
Supply Current	ISS	VIN=4.3V		10.0	24.0	μA	1
Line Regulation	$\frac{\Delta VOUT}{\Delta VIN \cdot VOUT}$	IOUT=1mA 4.3V ≤ VIN ≤ 20.0V		0.01	0.2	% / V	2
Input Voltage	VIN				20	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta VOUT}{\Delta Topr \cdot VOUT}$	IOUT=30mA -40°C ≤ Topr ≤ 85°C		±100		ppm / °C	2
Short-circuit Current	Ishort	VIN=5.3V		40		mA	2

XC6202P502 VOUT(T) =5.0V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note2)	VIN=6V IOUT=30mA	4.900	5.000	5.100	V	2
Maximum Output Current	IOUT max	VIN=6V VOUT ≥ VOUT(E) × 0.9	200			mA	2
Load Regulation	ΔVOUT	VIN=6V 1mA ≤ IOUT ≤ 100mA		30	100	mV	2
Dropout Voltage (Note 3)	Vdif 1	IOUT=30mA		130	190	mV	2
	Vdif 2	IOUT=100mA		440	550		
Supply Current	ISS	VIN=6V		10.0	24.0	μA	1
Line Regulation	$\frac{\Delta VOUT}{\Delta VIN \cdot VOUT}$	IOUT=1mA 6V ≤ VIN ≤ 20.0V		0.01	0.2	% / V	2
Input Voltage	VIN				20	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta VOUT}{\Delta Topr \cdot VOUT}$	IOUT=30mA -40°C ≤ Topr ≤ 85°C		±100		ppm / °C	2
Short-circuit Current	Ishort	VIN=7V		40		mA	2

Note : 1. VOUT(T) = Specified Output Voltage.
2. VOUT(E) = Effective Output Voltage (i.e. the output voltage when "VOUT(T)+1.0V" is provided at the VIN pin while maintaining a certain IOUT value).
3. Vdif = VIN1 - VOUT1
4. VOUT1 = A voltage equal to 98% of the output voltage when "VOUT(T)+1.0V" is input.e
5. VIN1 = The input voltage when VOUT1 is output following a gradual decrease in the input voltage.

XC6202PC02 VOUT(T) = 12V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note2)	VIN=13V, IOUT=30mA	11.760	12.000	12.240	V	2
Maximum Output Current	IOUT max	VIN=13V, VOUT ≥ VOUT(E) × 0.9	200			mA	2
Load Regulation	ΔVOUT	VIN=13V, 1mA ≤ IOUT ≤ 100mA		60	230	mV	2
Dropout Voltage (Note 3)	Vdif 1	IOUT=30mA		90	150	mV	2
	Vdif 2	IOUT=100mA		290	380		
Supply Current	ISS	VIN=13V		12.0	28.0	μA	1
Line Regulation	$\frac{\Delta VOUT}{\Delta VIN \cdot VOUT}$	IOUT=1mA, 13V ≤ VIN ≤ 20.0V		0.01	0.2	% / V	2
Input Voltage	VIN				20	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta VOUT}{\Delta Topr \cdot VOUT}$	IOUT=30mA, -40°C ≤ Topr ≤ 85°C		±100		ppm / °C	2
Short-circuit Current	Ishort	VIN=14V		40		mA	2

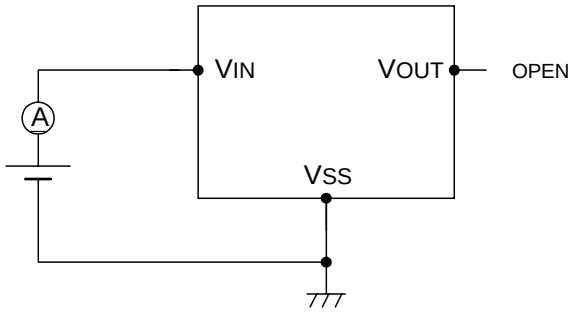
XC6202PJ02 VOUT(T) =18V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note2)	VIN=19V, IOUT=30mA	17.640	18.000	18.360	V	2
Maximum Output Current	IOUT max	VIN=19V, VOUT ≥ VOUT(E) × 0.9	200			mA	2
Load Regulation	ΔVOUT	VIN=19V, 1mA ≤ IOUT ≤ 100mA		120	380	mV	2
Dropout Voltage (Note 3)	Vdif 1	IOUT=30mA		80	150	mV	2
	Vdif 2	IOUT=100mA		280	380		
Supply Current	ISS	VIN=19V		15.0	30.0	μA	1
Line Regulation	$\frac{\Delta VOUT}{\Delta VIN \cdot VOUT}$	IOUT=1mA, 19V ≤ VIN ≤ 20.0V		0.01	0.2	% / V	2
Input Voltage	VIN				20	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta VOUT}{\Delta Topr \cdot VOUT}$	IOUT=30mA, -40°C ≤ Topr ≤ 85°C		±100		ppm / °C	2
Short-circuit Current	Ishort	VIN=20V		40		mA	2

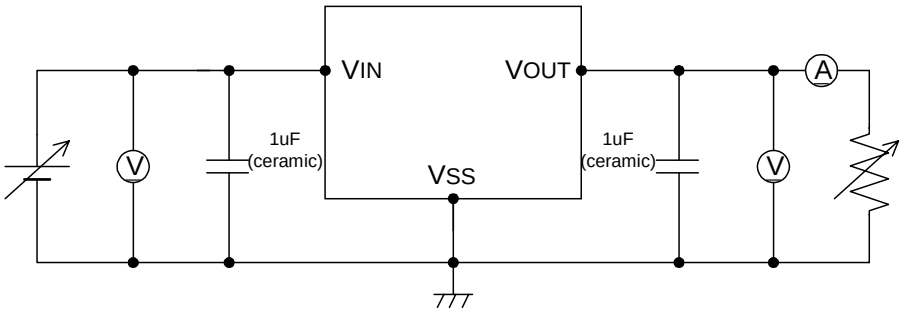
Note : 1. VOUT(T) = Specified Output Voltage.
2. VOUT(E) = Effective Output Voltage (i.e. the output voltage when "VOUT(T)+1.0V" is provided at the VIN pin while maintaining a certain IOUT value).
3. Vdif = VIN1 - VOUT1
4. VOUT1 = A voltage equal to 98% of the output voltage when "VOUT(T)+1.0V" is input.e
5. VIN1 = The input voltage when VOUT1 is output following a gradual decrease in the input voltage.

■ Test Circuits

CIRCUIT 1

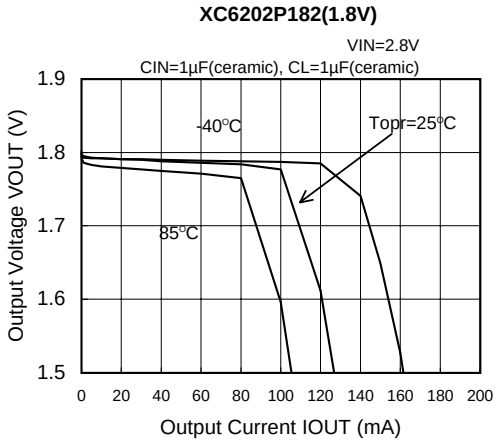


CIRCUIT 2

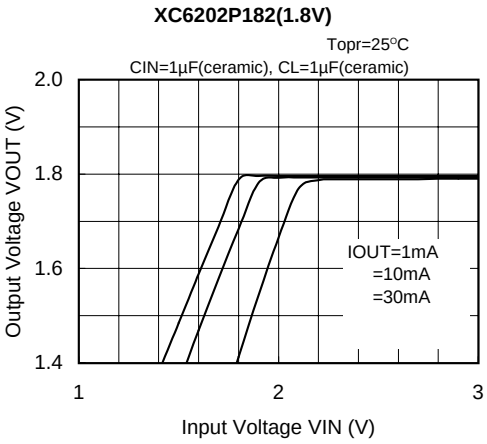


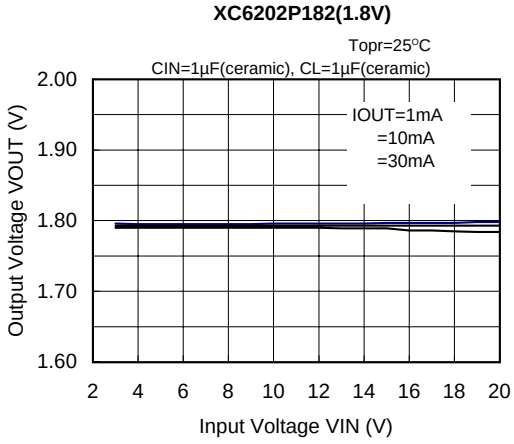
■ XC6202

(1) Output Voltage vs. Output Current

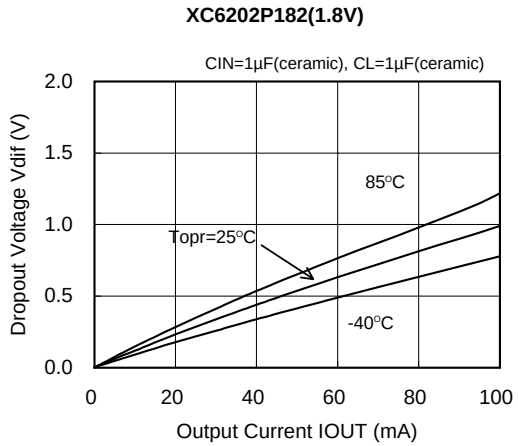


(2) Output Voltage vs. Input Voltage



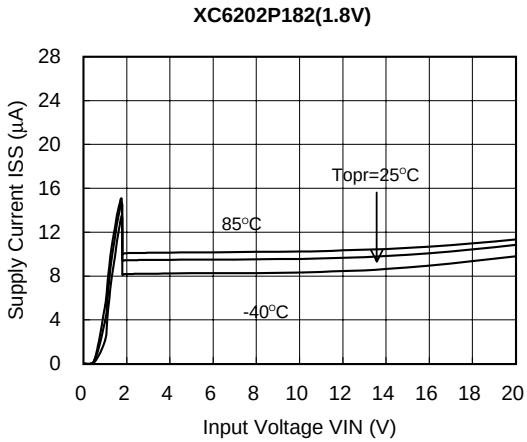


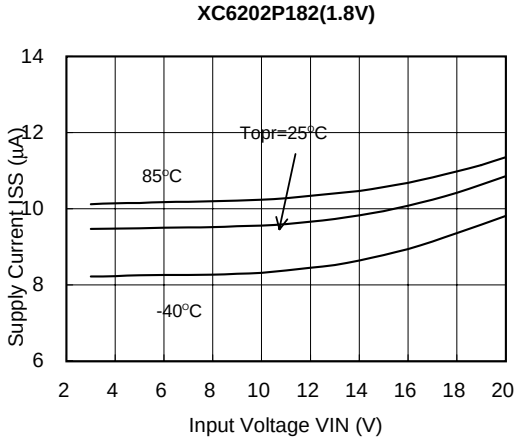
(3) Dropout Voltage vs. Output Current



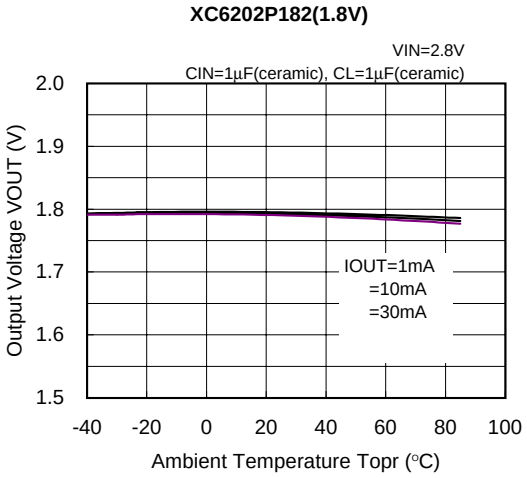
■ XC6202

(4) Supply Current vs. Input Voltage

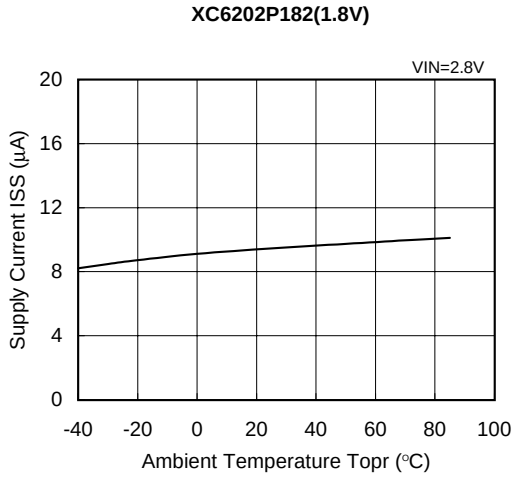




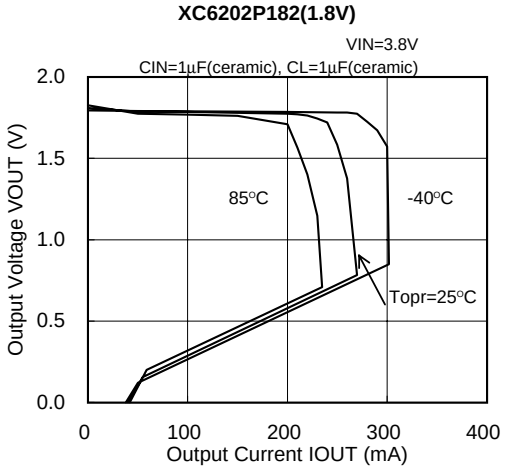
(5) Output Voltage vs. Ambient Temperature



(6) Supply Current vs. Ambient Temperature



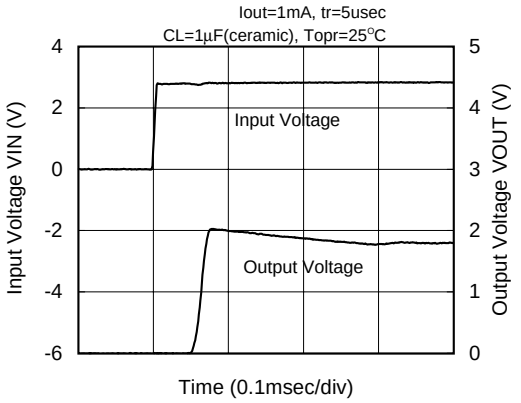
(7) Current Limiter Circuit



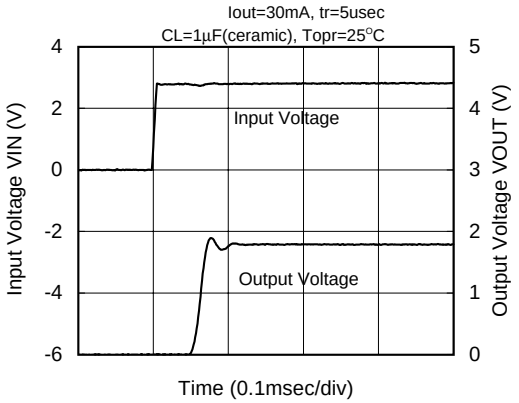
■ XC6202

(8) Input Transient Response 1

XC6202P182(1.8V)

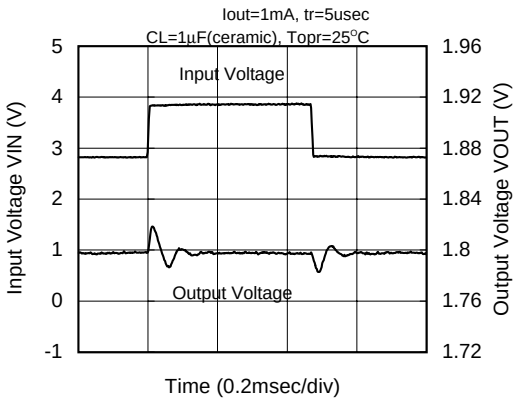


XC6202P182(1.8V)

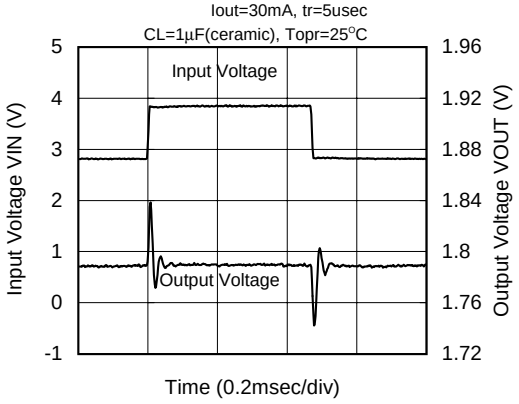


(9) Input Transient Response 2

XC6202P182(1.8V)

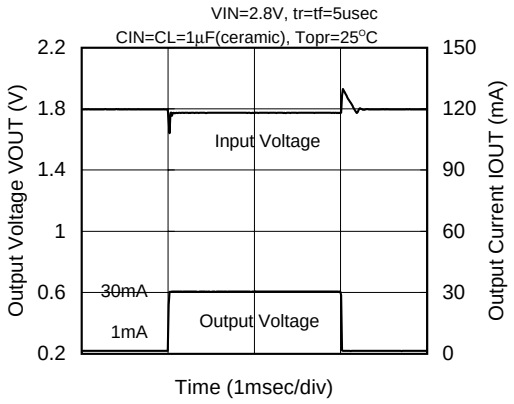


XC6202P182(1.8V)



(10) Load Transient Response

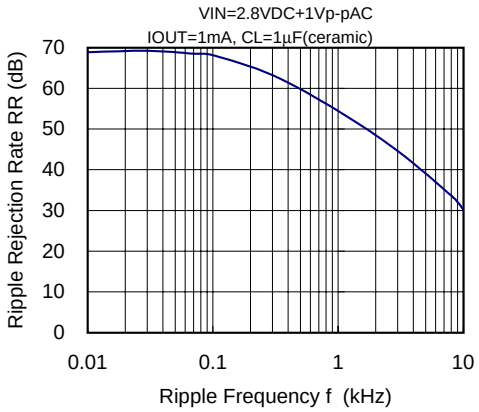
XC6202P182(1.8V)



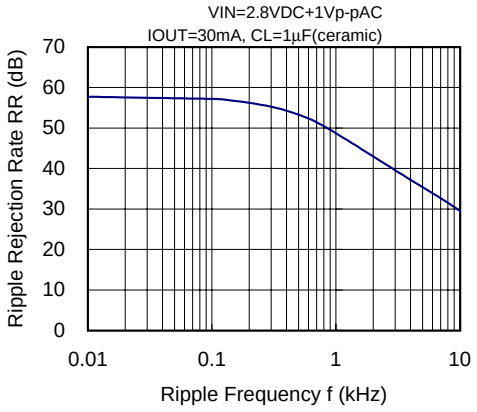
■ XC6202

(11) Ripple Rejection Rate

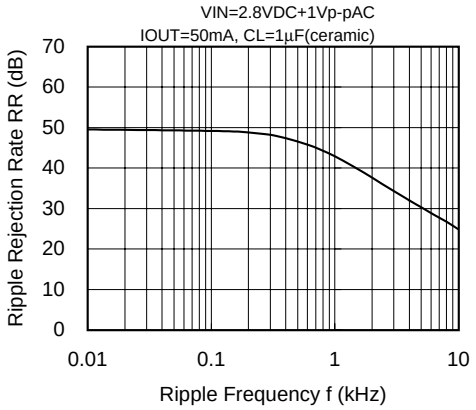
XC6202P182(1.8V)



XC6202P182(1.8V)

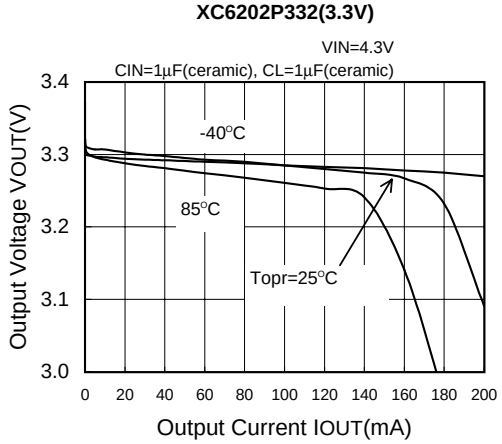


XC6202P182(1.8V)

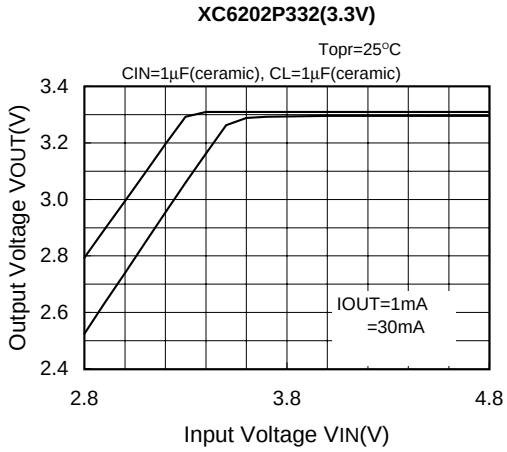


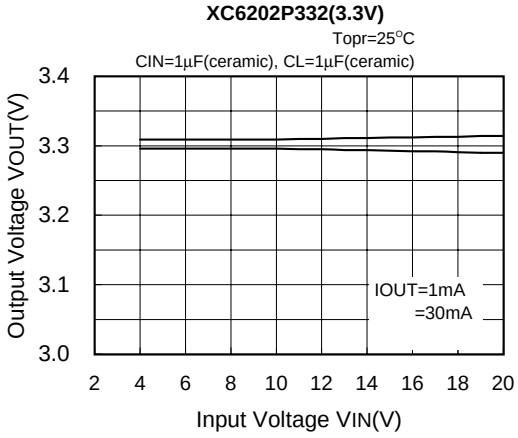
■ XC6202

(1) Output Voltage vs. Output Current

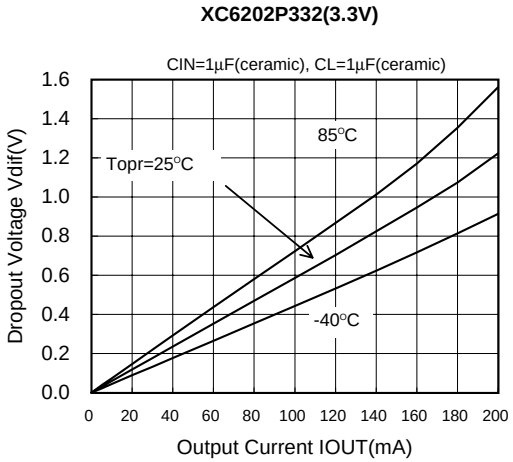


(2) Output Voltage vs. Input Voltage



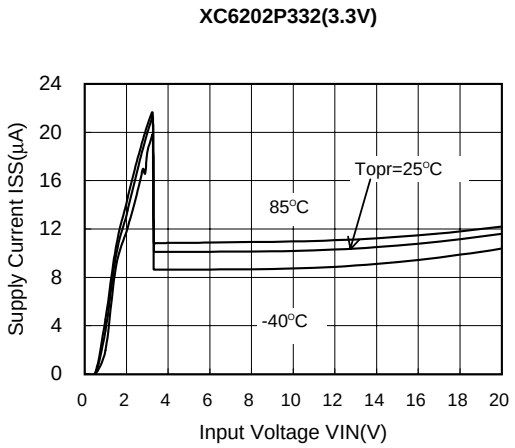


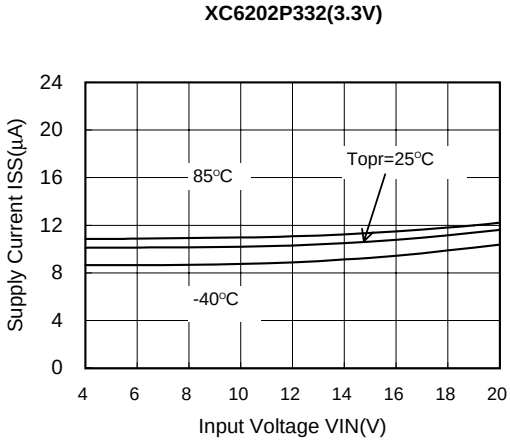
(3) Dropout Voltage vs. Output Current



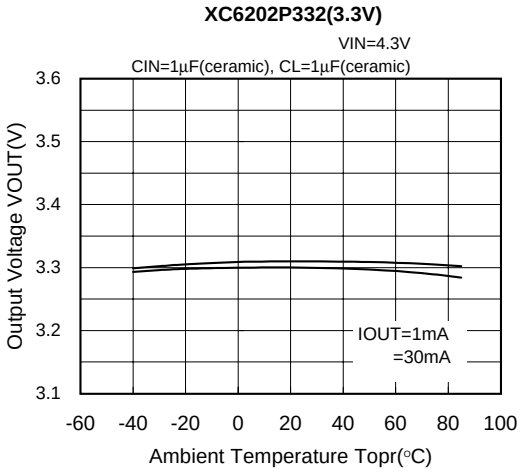
■ XC6202

(4) Supply Current vs. Input Voltage

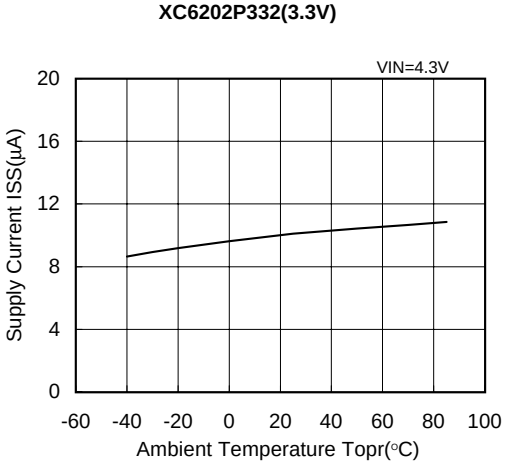




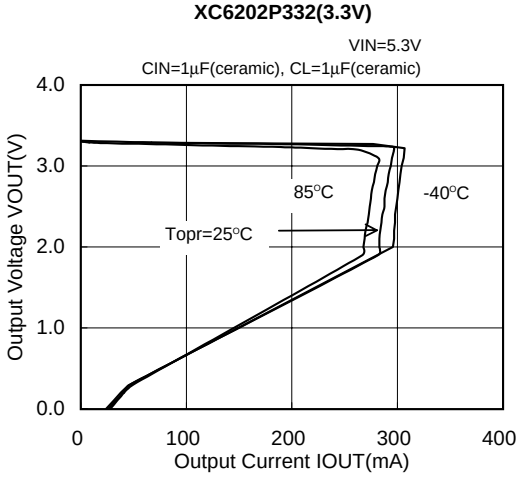
(5) Output Voltage vs. Ambient Temperature



(6) Supply Current vs. Ambient Temperature



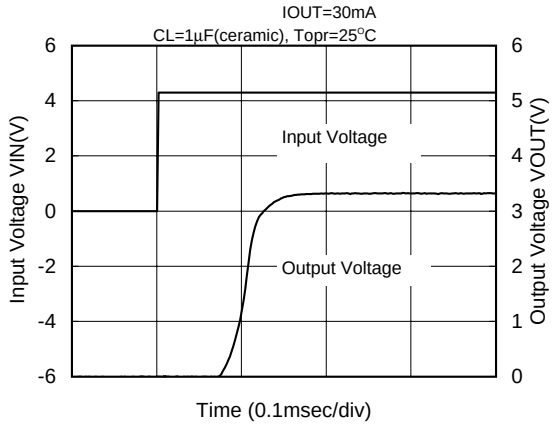
(7) Current Limiter Circuit



■ XC6202

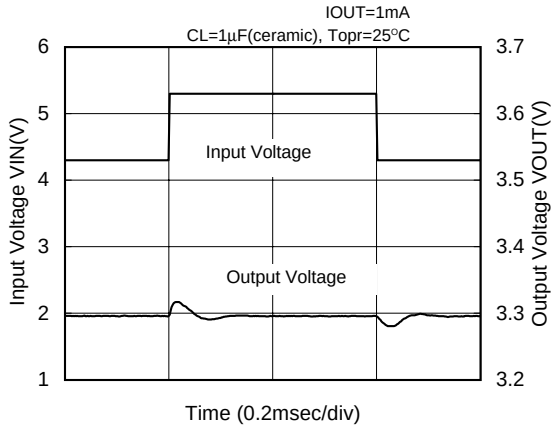
(8) Input Transient Response 1

XC6202P332(3.3V)

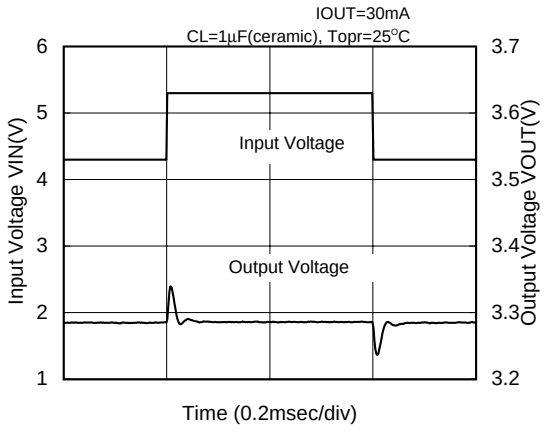


(9) Input Transient Response 2

XC6202P332(3.3V)

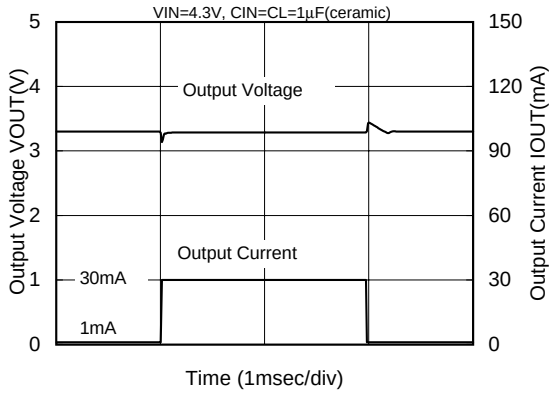


XC6202P332(3.3V)



(10) Load Transient Response

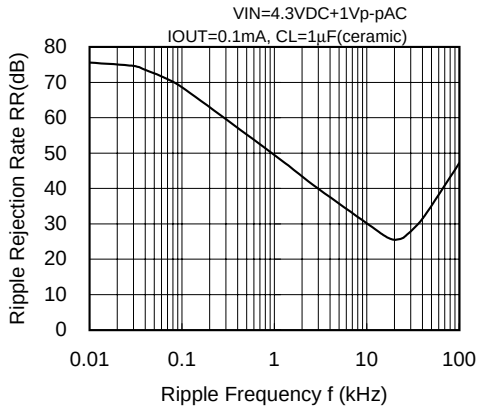
XC6202P332(3.3V)



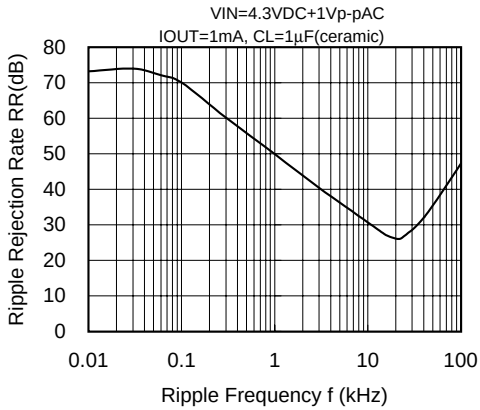
■ XC6202

(11) Ripple Rejection Rate

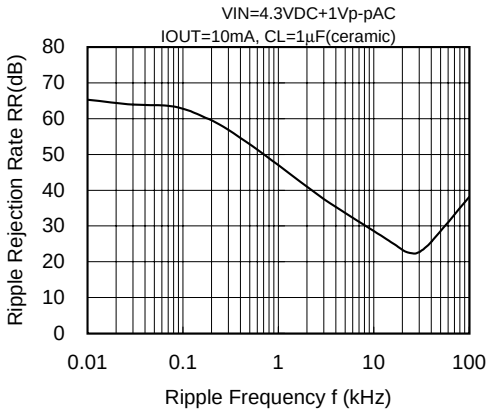
XC6202P332(3.3V)



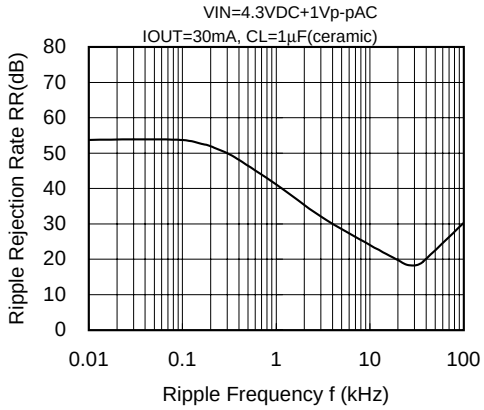
XC6202P332(3.3V)



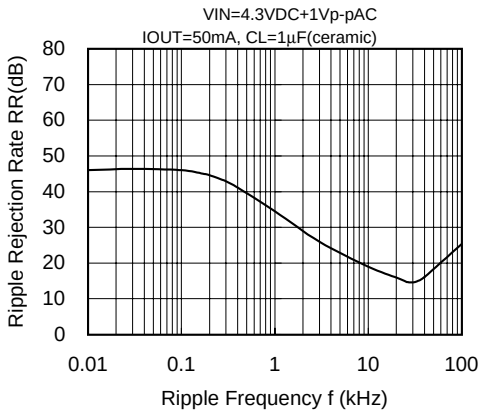
XC6202P332(3.3V)



XC6202P332(3.3V)

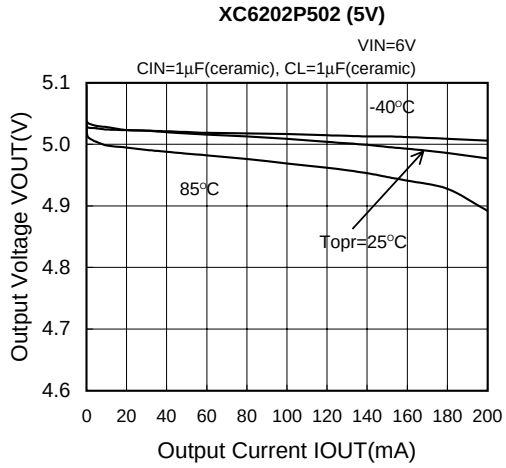


XC6202P332(3.3V)

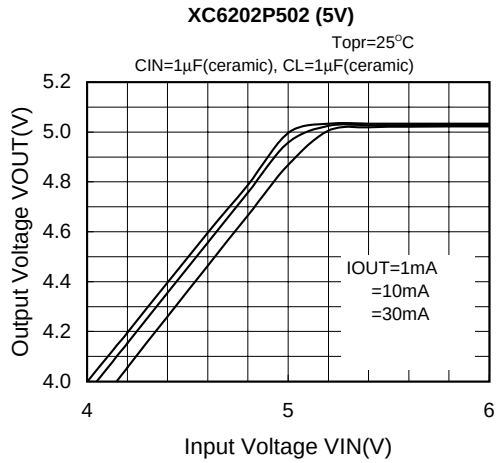


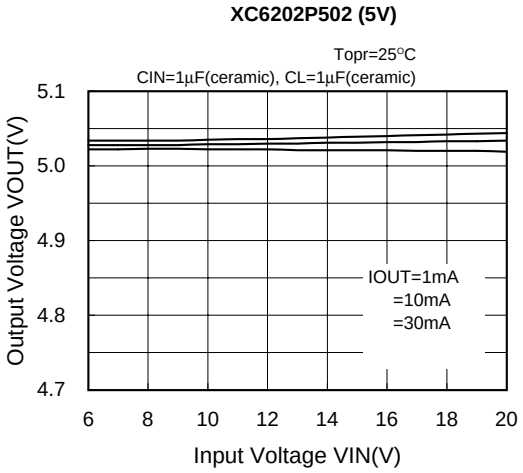
■ XC6202P502

(1) Output Voltage vs. Output Current

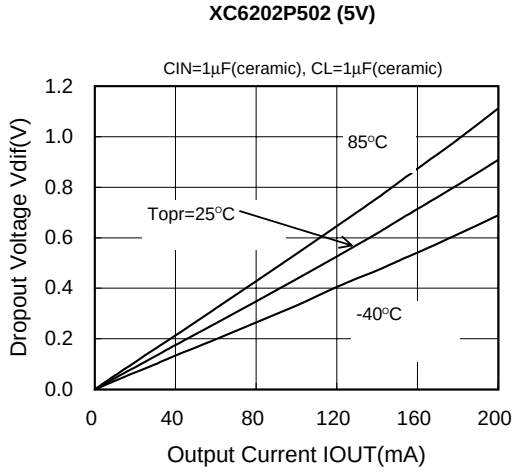


(2) Output Voltage vs. Input Voltage





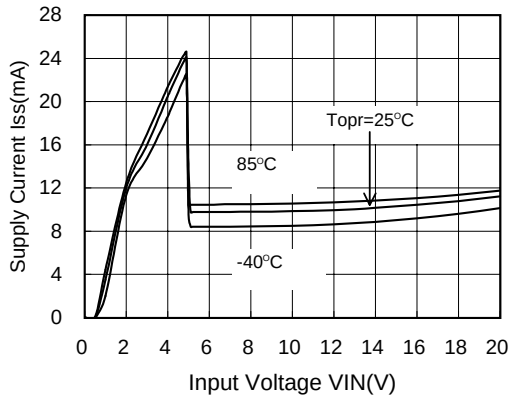
(3) Dropout Voltage vs. Output Current



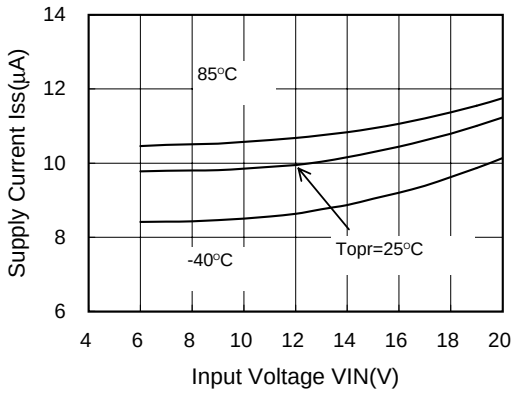
■ XC6202P502

(4) Supply Current vs. Input Voltage

XC6202P502 (5V)

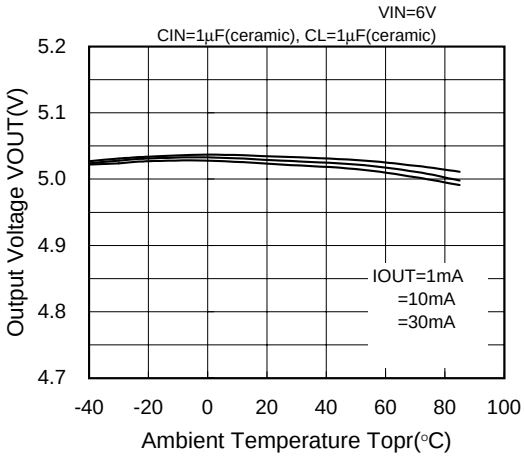


XC6202P502 (5V)



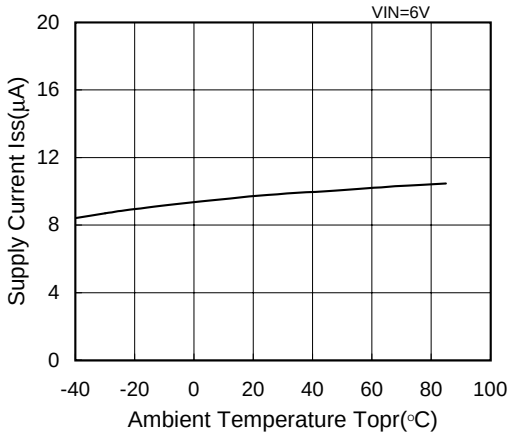
(5) Output Voltage vs. Ambient Temperature

XC6202P502 (5V)



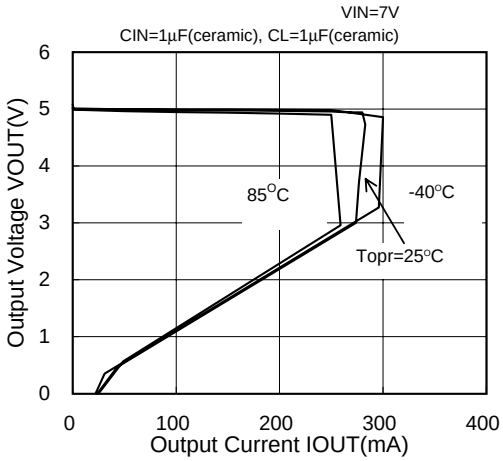
(6) Supply Current vs. Ambient Temperature

XC6202P502 (5V)



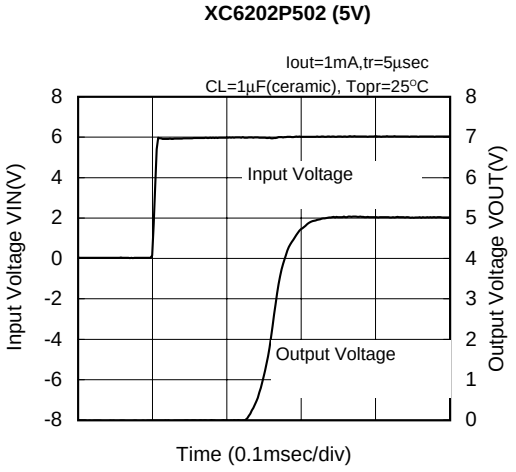
(7) Current Limiter Circuit

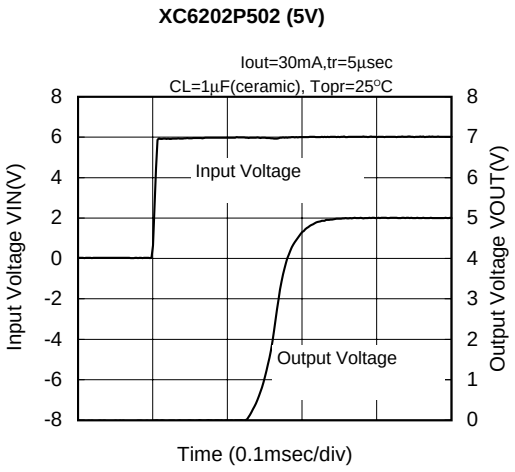
XC6202P502 (5V)



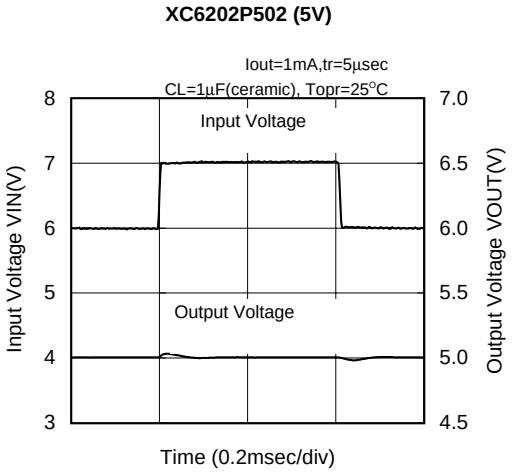
■ XC6202P502

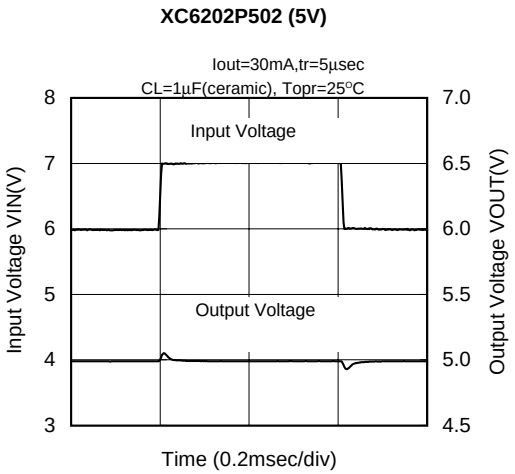
(8) Input Transient Response 1



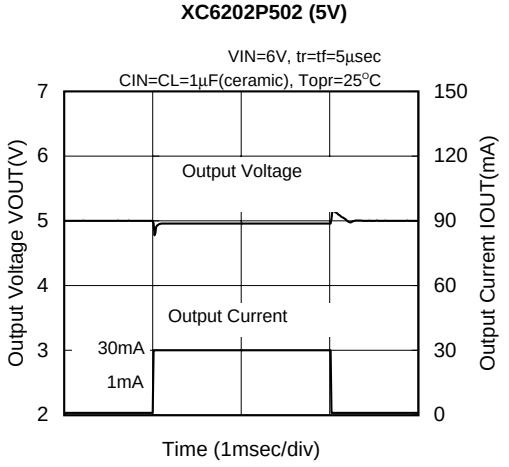


(9) Input Transient Response 2



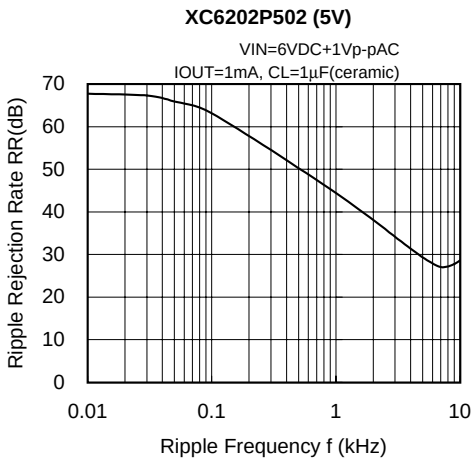


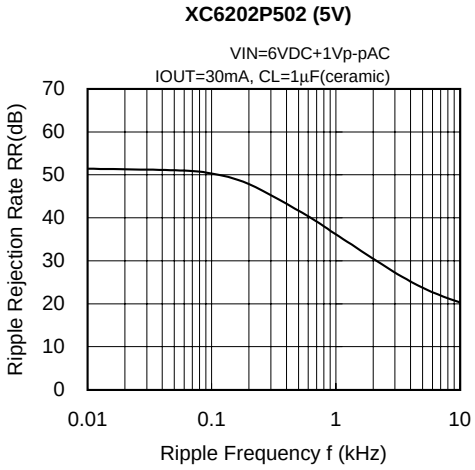
(10) Load Transient Response

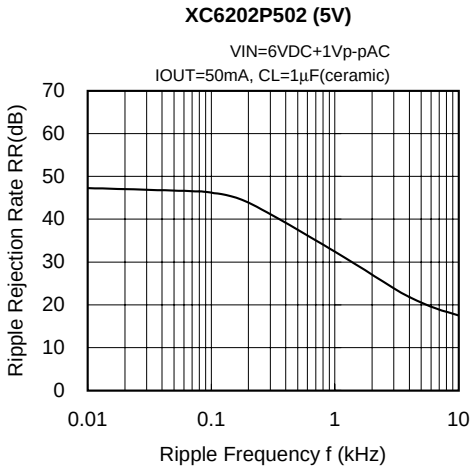


■ XC6202P502

(11) Ripple Rejection Rate

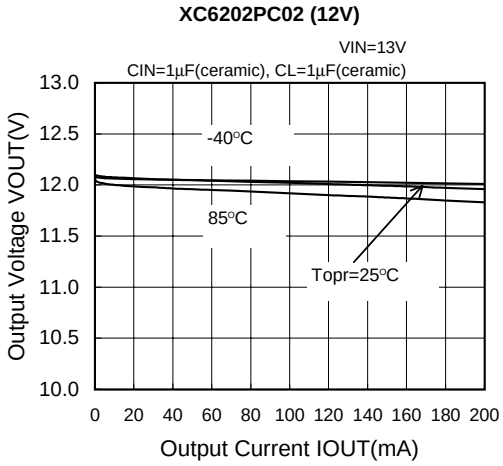




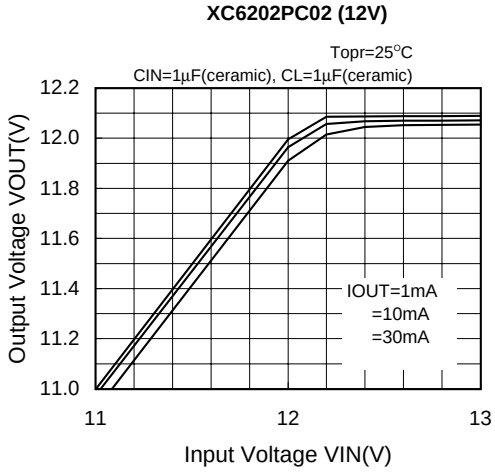


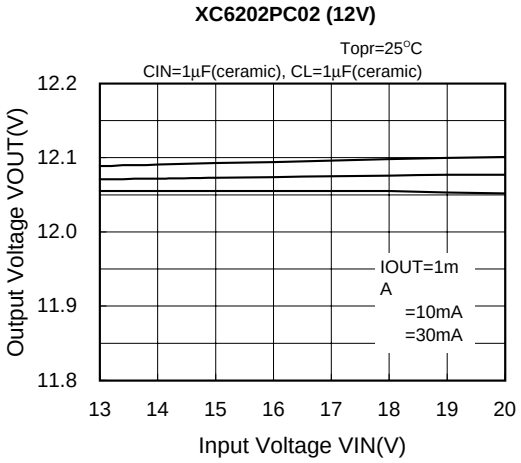
■ XC6202PC02

(1) Output Voltage vs. Output Current

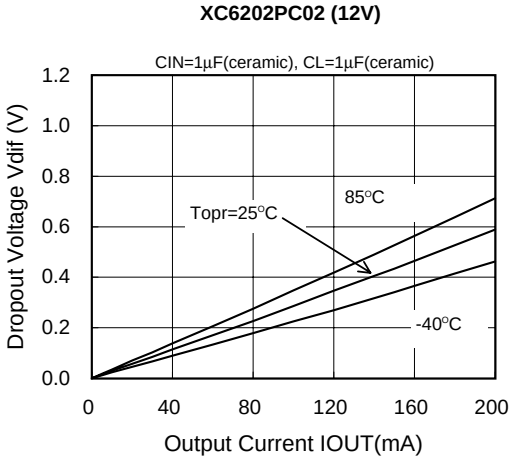


(2) Output Voltage vs. Input Voltage





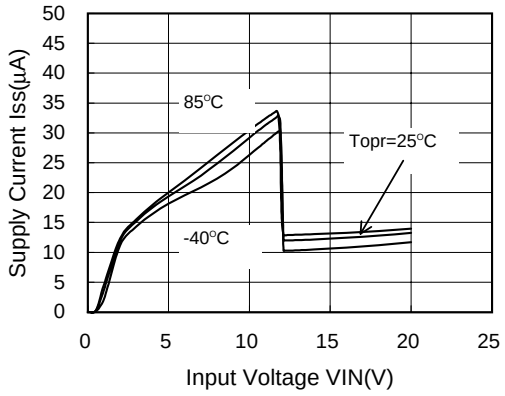
(3) Dropout Voltage vs. Output Current



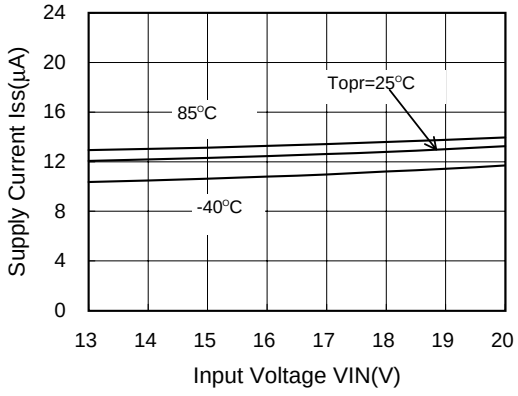
■ XC6202PC02

(4) Supply Current vs. Input Voltage

XC6202PC02 (12V)

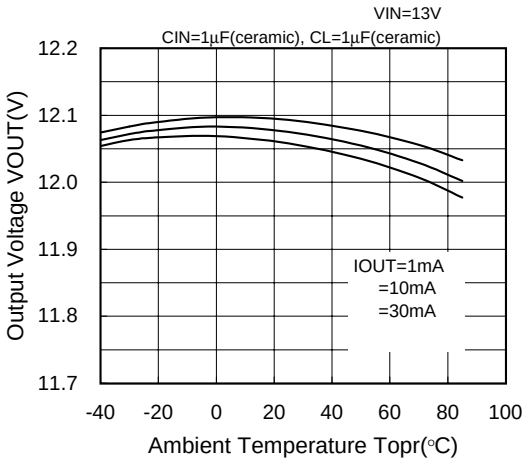


XC6202PC02 (12V)



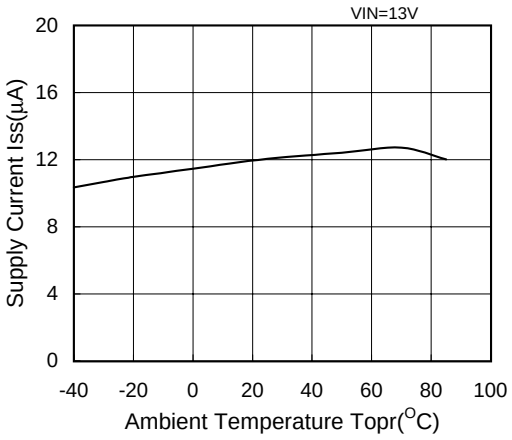
(5) Output Voltage vs. Ambient Temperature

XC6202PC02 (12V)



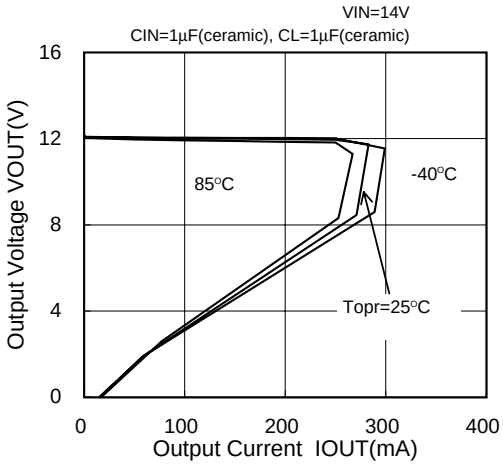
(6) Supply Current vs. Ambient Temperature

XC6202PC02 (12V)



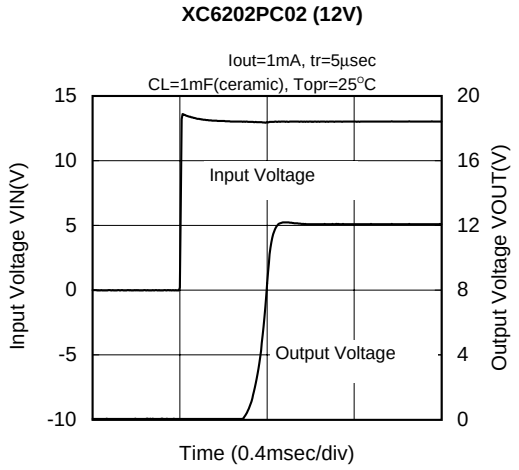
(7) Current Limiter Circuit

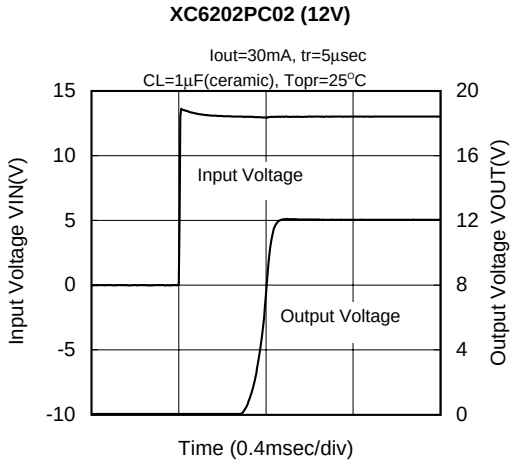
XC6202PC02 (12V)



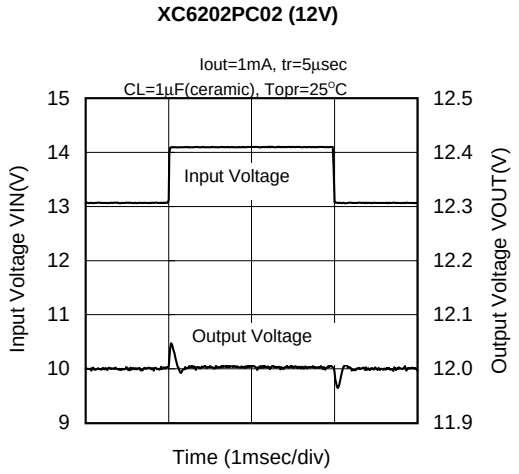
■ XC6202PC02

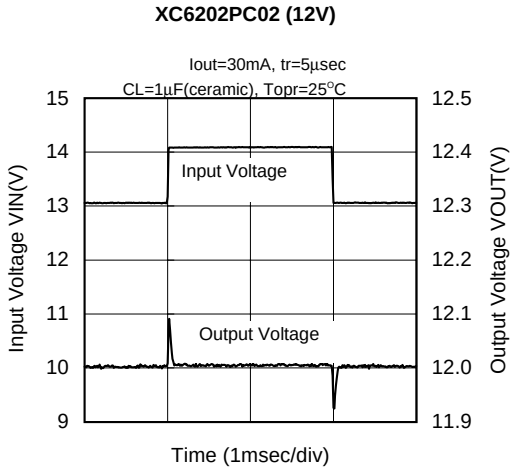
(8) Input Transient Response 1



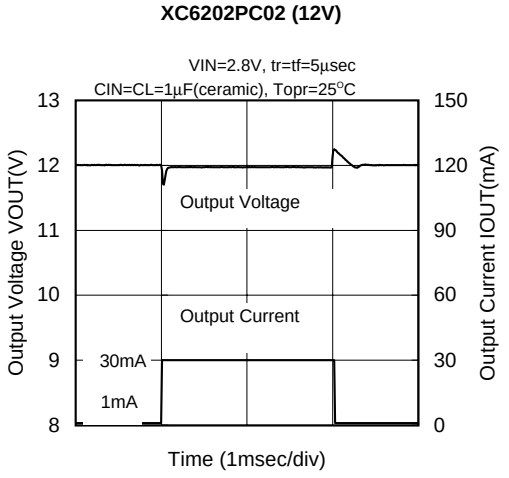


(9) Input Transient Response 2



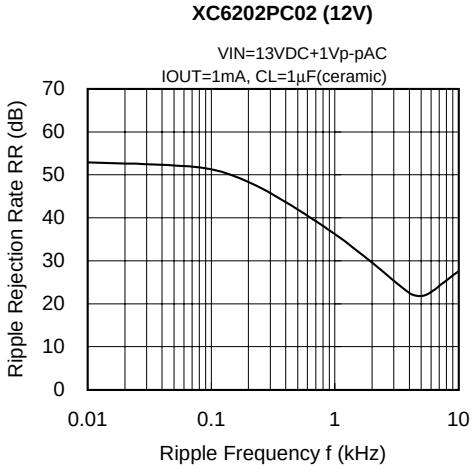


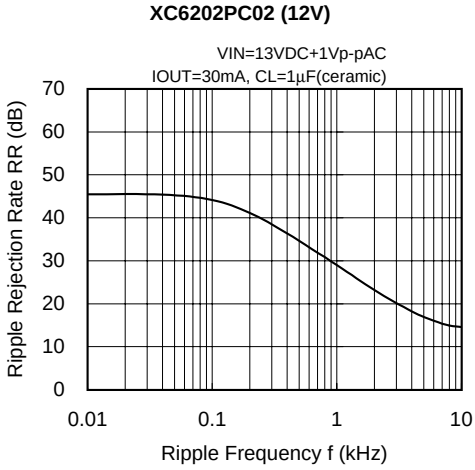
(10) Load Transient Response

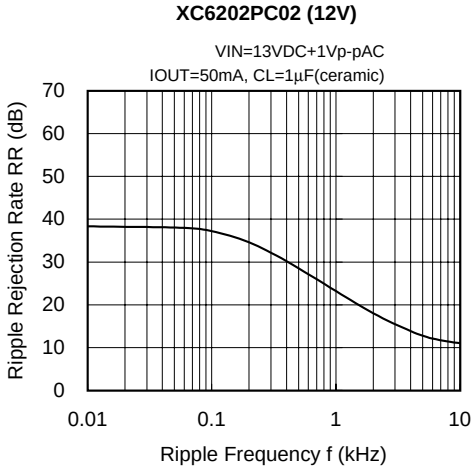


■ XC6202PC02

(11) Ripple Rejection Rate



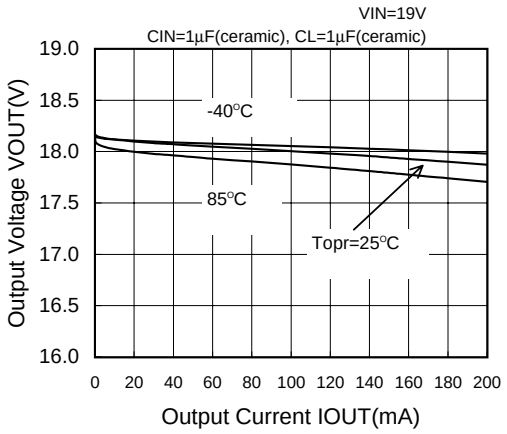




■ XC6202PJ02

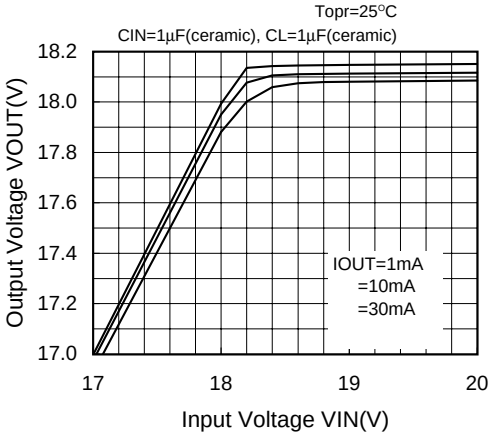
(1) Output Voltage vs. Output Current

XC6202JC02 (18V)



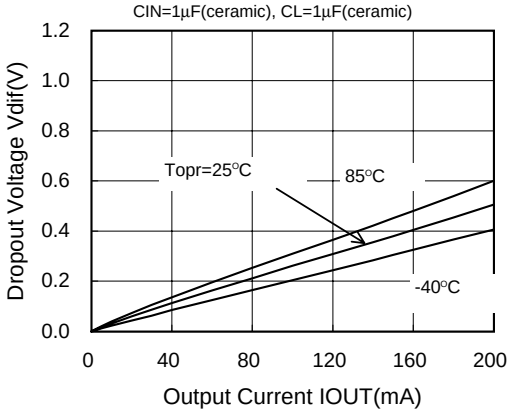
(2) Output Voltage vs. Input Voltage

XC6202JC02 (18V)



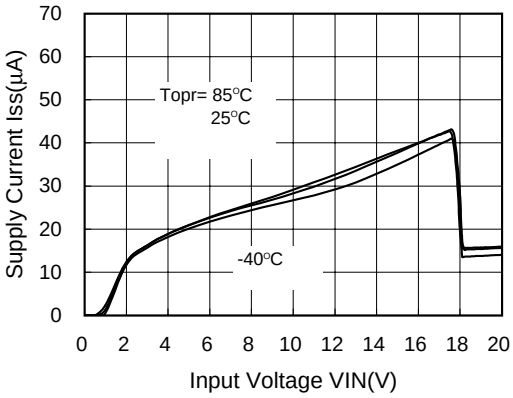
(3) Dropout Voltage vs. Output Current

XC6202JC02 (18V)



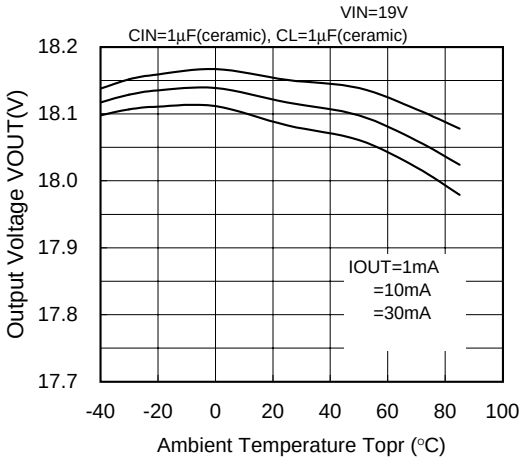
(4) Supply Current vs. Input Voltage VIN(V)

XC6202JC02 (18V)



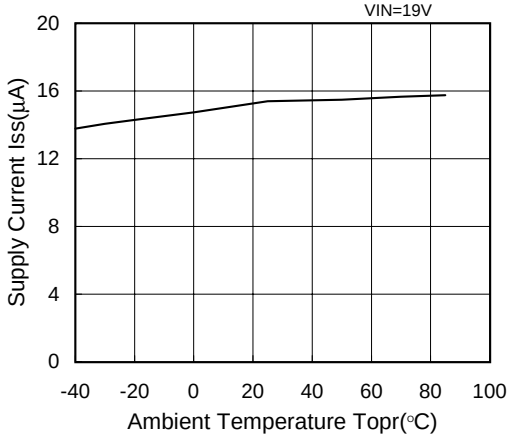
(5) Output Voltage vs. Ambient Temperature

XC6202JC02 (18V)



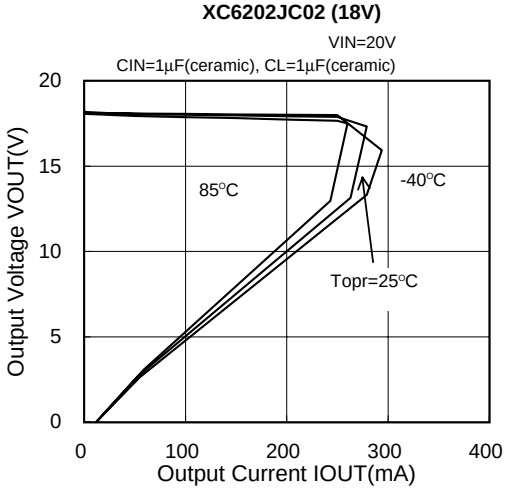
(6) Supply Current vs. Ambient Temperature

XC6202JC02 (18V)

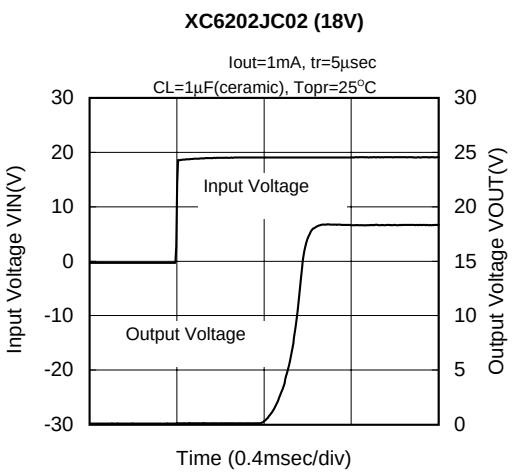


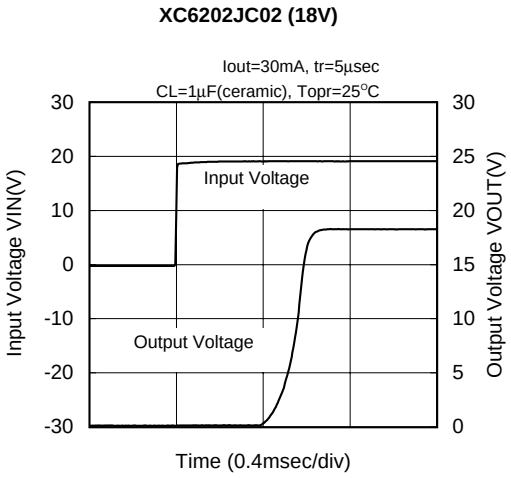
■ XC6202PJ02

(7) Current Limiter Circuit

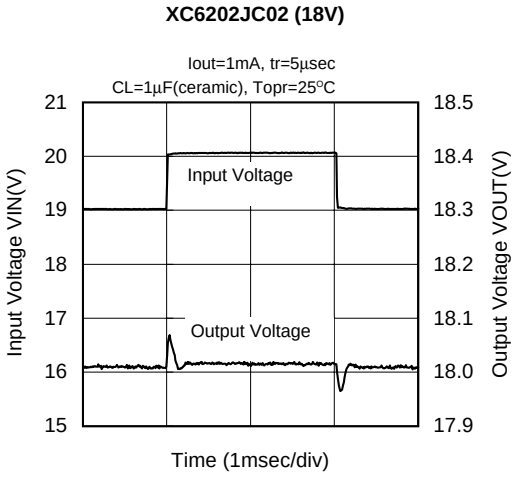


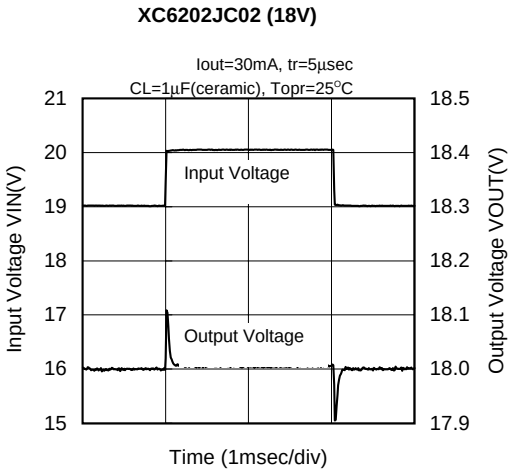
(8) Input Transient Response 1





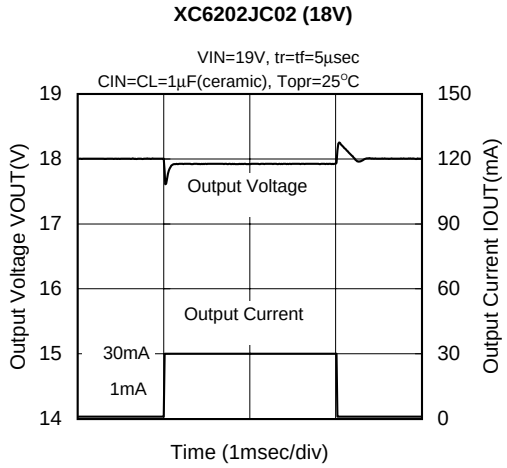
(9) Input Transient Response 2





■ XC6202PJ02

(10) Load Transient Response



(11) Ripple Rejection Rate