XC6206 Series

Low ESR Cap.Compatible Positive Voltage Regulators

December 27, 2004 V7

◆CMOS Low Power Consumption
◆Dropout Voltage : 160mV @ 100mA
: 400mV @ 200mA
◆Output Current : More Than 250mA (5.0V type)
◆Highly Accurate : ±2%
◆Output Voltage Range : 1.2V ~ 5.0V
◆Low ESR Capacitor Compatible

■APPLICATIONS

●Battery powered equipment
●Reference voltage sources
●Cameras, video cameras
●Portable AV systems
●Mobile phones
●Portable games

■GENERAL DESCRIPTION

The XC6206 series are highly precise, low power consumption, high voltage, positive voltage regulators manufactured using CMOS and laser trimming technologies. The series provides large currents with a significantly small dropout voltage.

The XC6206 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error correction circuit.

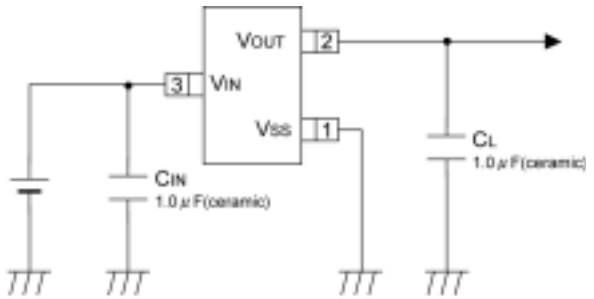
The series is compatible with low ESR ceramic capacitors. The currrent limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin. Output voltage can be set internally by laser trimming technologies. It is selectable in 100mV increments within a range of 1.2V to 5.0V.

SOT-23, SOT-89, TO-92 and USP-6B packages are available.

■FEATURES

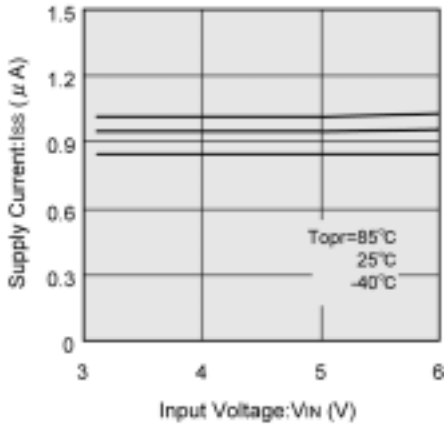
Maximum Output Current	: 250mA (5.0V type)
Dropout Voltage	: 160mV @ IOUT=100mA (5.0V type)
Maximum Operating Voltage	: 6.0V
Output Voltage Range	: 1.2V ~ 5.0V （100mV steps）
Highly Accurate	: ±2% (±30mV@VOUT<1.5V) ±1% @VOUT≧2.0V)
Low Power Consumption	: 1.0μA (TYP.)
Operational Temperature Range	: -40°C ~ 85°C
Ultra Small Package	: SOT-23, SOT-89, TO-92 USP-6B
Low ESR Capacitor	: Ceramic compatible

■TYPICAL APPLICATION CIRCUIT

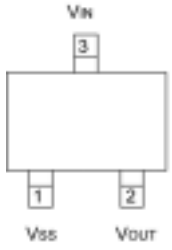


■TYPICAL PERFORMANCE CHARACTERISTICS

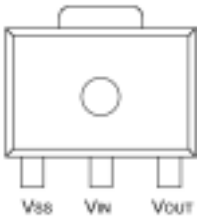
XC6206P302



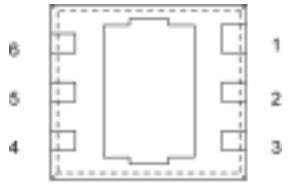
■PIN CONFIGURATION



SOT-23
(TOP VIEW)

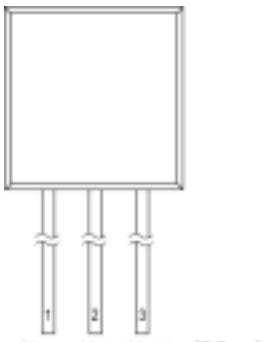


SOT-89
(TOP VIEW)



USP-6B
(BOTTOM VIEW)

*Please refer to recommended pattern layout and recommended metal mask for mounting the heat dissipation pad of USP-6B package in order to strengthen mounting intensity. When the electric potential is needed, please use the pad as the VIN level.



TO-92
(TOP VIEW)

■PIN ASSIGNMENT

PIN NUMBER				PIN NAME	FUNCTIONS
SOT-23	SOT-89/TO-92 (T)	USP-6B	TO-92 (L)		
1	1	2	2	VSS	Ground
3	2	4	1	VIN	Power Input
2	3	6	3	VOUT	Output
-	-	1, 3, 5	-	NC	No Connection

■PRODUCT CLASSIFICATION

●Ordering Information

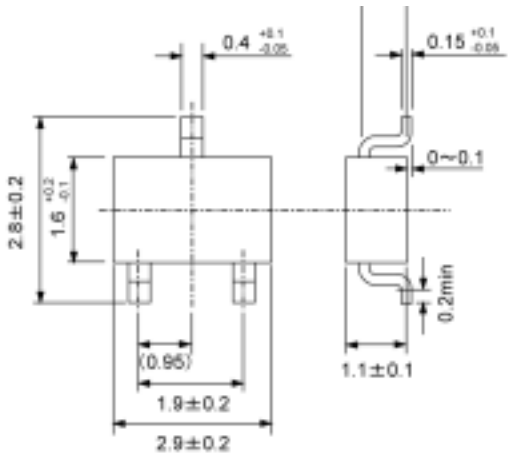
XC6206P ①②③④⑤

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①②	Output Voltage	12~50	: e.g. VOUT: 3.0V→①= 3, ② = 0
③	Accuracy	2	: Within ± 2% (within ±30mV when VOUT<1.5V)
		1 *	: Within ±1%
④	Package	M	: SOT-23
		P	: SOT-89
		D	: USP-6B
		T	: TO-92 (Standard)
		L	: TO-92 (Custom pin configuration)
⑤	Device Orientation	R	: Embossed tape, Standard feed
		L	: Embossed tape, Reverse feed
		H	: Page type (TO-92)
		B	: Bag (TO-92)

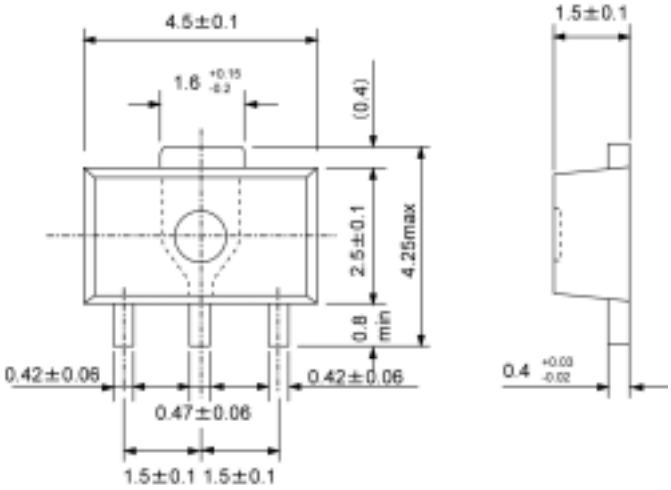
* ±1% accuracy can be set at VOUT(T) ≧ 2.0V.

■PACKAGING INFORMATION

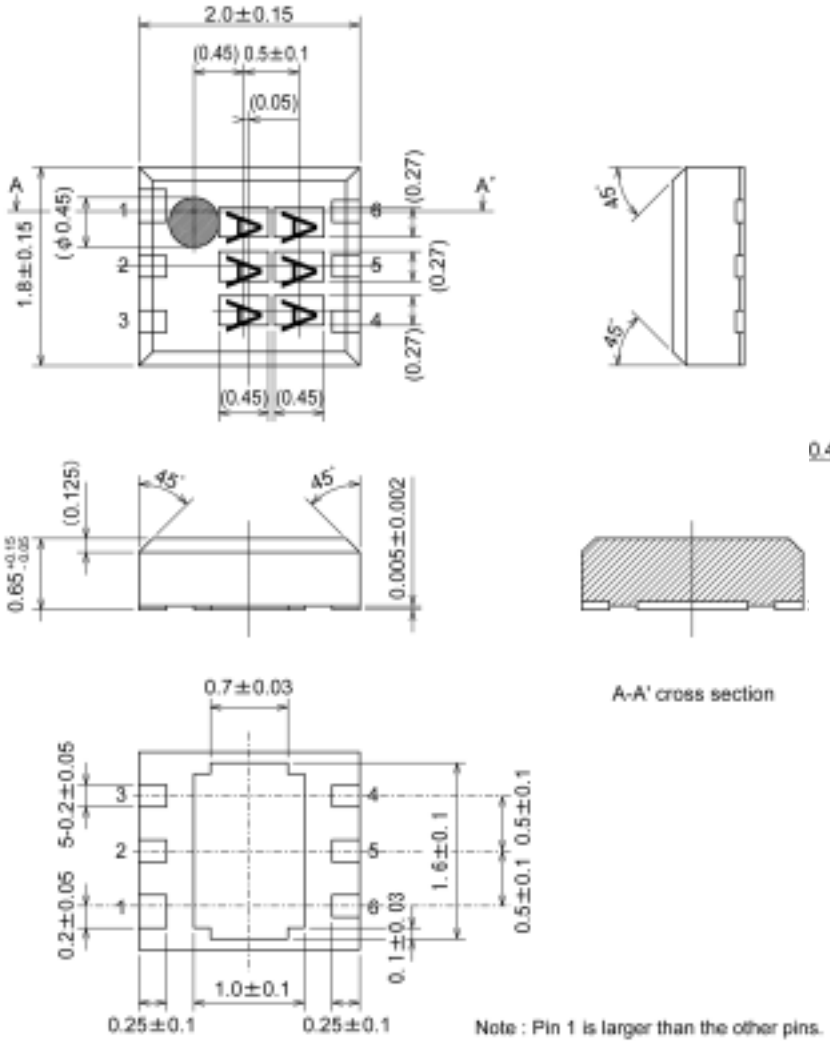
●SOT-23



●SOT-89



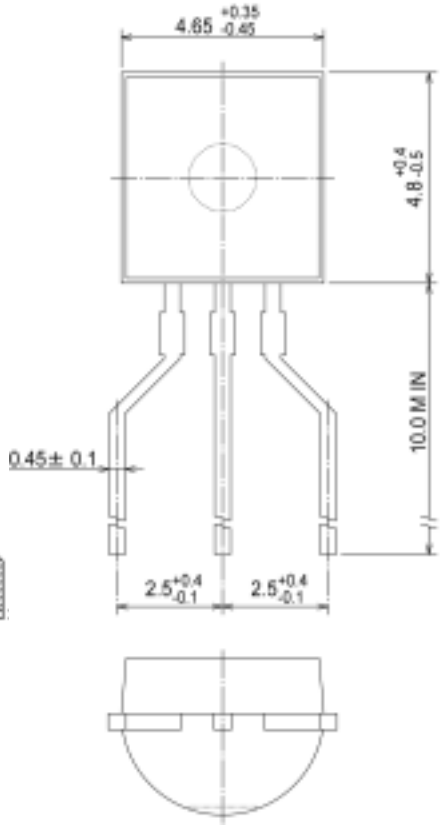
●USP-6B



Note : Pin 1 is larger than the other pins.

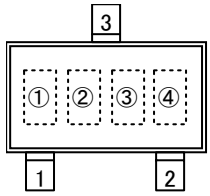
A-A' cross section

●TO-92

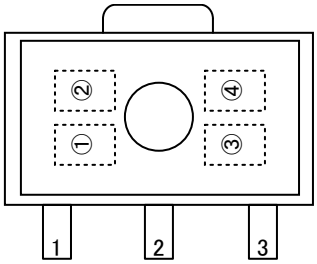


■MARKING RULE

●SOT-23 & SOT-89



SOT-23
(TOP VIEW)



SOT-89
(TOP VIEW)

① Represents product series

MARK	PRODUCT SERIES
6	XC6206Pxxxxx

② Represents three pins regulator

MARK		PRODUCT SERIES
VOLTAGE: 0.1 ~ 3.0V	VOLTAGE: 3.1 ~ 6.0V	
5	6	XC6206Pxxxxx

③ Represents output voltage

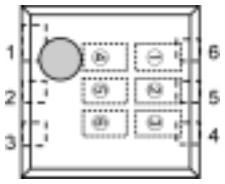
MARK	OUTPUT VOLTAGE (V)			MARK	OUTPUT VOLTAGE (V)		
0	-	3.1	-	F	1.6	4.6	-
1	-	3.2	-	H	1.7	4.7	-
2	-	3.3	-	K	1.8	4.8	-
3	-	3.4	-	L	1.9	4.9	-
4	-	3.5	-	M	2.0	5.0	-
5	-	3.6	-	N	2.1	-	-
6	-	3.7	-	P	2.2	-	-
7	-	3.8	-	R	2.3	-	-
8	-	3.9	-	S	2.4	-	-
9	-	4.0	-	T	2.5	-	-
A		4.1	-	U	2.6	-	-
B	1.2	4.2	-	V	2.7	-	-
C	1.3	4.3	-	X	2.8	-	-
D	1.4	4.4	-	Y	2.9	-	-
E	1.5	4.5	-	Z	3.0	-	-

④ 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 excepted)

● USP-6B

①② Represents product series

MARK		PRODUCT SERIES
①	②	
0	6	XC6206PxxxDx



USP-6B
(TOP VIEW)

③ Represents three pins regulator

MARK	TYPE	PRODUCT SERIES
P	Three pins regulator	XC6206PxxxDx

④⑤ Represents output voltage

MARK		OUTPUT VOLTAGE (V)	PRODUCT SERIES
①	②		
3	3	3.3	XC6206P33xDx
5	0	5.0	XC6206P50xDx

⑥ Represents production lot number
0 to 9, A to Z reversed (G, I, J, O, Q, W excepted)
* No character inversion used.

■MARKING RULE (Continued)

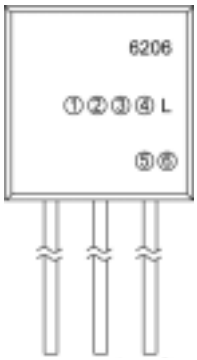
●TO-92

①Represents type of regulator

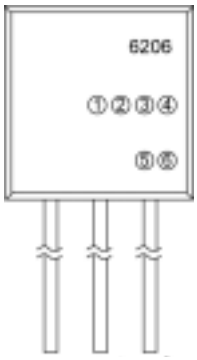
MARK	PRODUCT NAME
P	XC6206Pxxxxx

②③ Represents output voltage

MARK		VOLTAGE (V)	PRODUCT NAME
②	③		
3	3	3.3	XC6206P33xxx
5	0	3.3	XC6206P50xxx



TO-92 (L TYPE)
(TOP VIEW)



TO-92 (T TYPE)
(TOP VIEW)

④ Represents output voltage accuracy

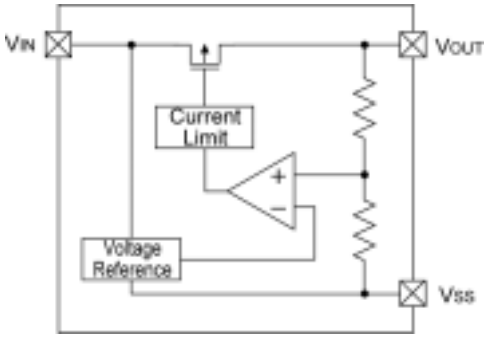
MARK	OUTPUT VOLTAGE ACCURACY	PRODUCT NAME
1	within ±1%	XC6206Pxx1xx
2	within ±2%	XC6206Pxx2xx

⑤ Represents least significant digit of production year

MARK	PRODUCTION YEAR
3	2003
4	2004

⑥ Represents production lot number
0 to 9, A to Z repeated (G, I, J, O, Q, W excepted)
Note: No character inversion used.

■BLOCK DIAGRAM



■ABSOLUTE MAXIMUM RATINGS

Ta=25°C

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		VIN	7.0	V
Output Current		IOUT	500 *	mA
Output Voltage		VOUT	VSS – 0.3 ~ VIN + 0.3	V
Power Dissipation	SOT-23	Pd	250	mW
	SOT-89		500	
	USP-6B		100	
	TO-92		300	
Operating Temperature Range		Topr	- 40 ~ + 85	°C
Storage Temperature Range		Tstg	- 55 ~ + 125	°C

* IOUT=Pd / (VIN-VOUT)

■ELECTRICAL CHARACTERISTICS

●XC6206 series

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MAX.	TYP.	MIN.	UNITS	CIRCUIT
Output Voltage (*7)	VOUT(E)	IOUT=30mA	x 0.98	VOUT(T) E-1	x 1.02	V	①
Maximum Output Current	IOUTMAX		-	-	E-2	mA	①
Load Regulation	ΔVOUT	VOUT(T)>1.8V, 1mA≦IOUT≦100mA VOUT(T)≦1.8V, 1mA≦IOUT≦50mA	-	-	E-3	mV	①
Dropout Voltage	Vdif1	IOUT=30mA	-	E-4		mV	①
	Vdif2	VOUT(T)>1.8V: IOUT=100mA VOUT(T)≦1.8V: IOUT=60mA	-	E-5		mV	
Supply Current	IDD	VCE=VIN	-	1.0	3.0	μA	②
Line Regulation	$\frac{\Delta VOUT}{\Delta VIN \cdot VOUT}$	VOUT(T)<4.5V:VOUT(T)+1.0V≦VIN≦6.0V VOUT(T)≧4.5V:5.5V≦VIN≦6.0V IOUT=30mA	-	0.05	0.25	%/V	①
Input Voltage	VIN		1.8	-	6.0	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta VOUT}{\Delta Topr \cdot VOUT}$	IOUT=30mA -40°C≦Topr≦85°C	-	±100	-	ppm/°C	①
Short Circuit Current	Ishort	VIN=VOUT+1.5V, VOUT=VSS	-	E-6	-	mA	①

NOTE:

* 1 : VOUT(T) = Specified output voltage
* 2 : VOUT(E) = Effective output voltage (Ie. The output voltage when "VOUT(T)+1.0V" is provided at the VIN pin while maintaining a certain IOUT value.)
* 3 : Vdif = {VIN 1(*5) + VOUT 1(*4) }
* 4 : VOUT1 = A voltage equal to 98% of the output voltage whenever an amply stabilized IOUT {VOUT(T) + 1.0V} is input.
* 5 : VIN 1 = The input voltage when VOUT1 appears as input voltage is gradually decreased.
* 6 : Unless otherwise stated, VIN = VOUT(T) + 1.0V
* 7 : When VOUT(T)≧1.5V, accuracy is ±2%.
  When VOUT(T)<1.5V, accuracy is MIN.:VOUT(T) -30mV / MAX.:VOUT(T) +30mV
  +1% accuracy (MIN.: VOUT(T) x 0.99 / MAX.:VOUT(T) x 1.01) is set at VOUT(T)≧2.0V

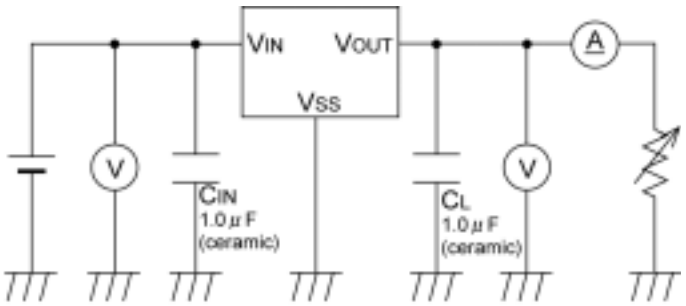
■ELECTRICAL CHARACTERISTICS (Continued)

●Electrical Characteristics Chart

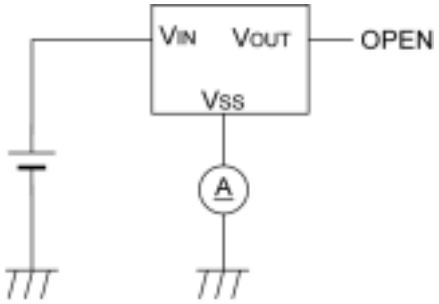
	E-1				E-2	E-3	E-4		E-5		E-6
PARAMETER / SETTING VOLTAGE	OUTPUT VOLTAGE				MAX. OUTPUT CURRENT	LOAD REGULATION	DROPOUT VOLTAGE 1		DROPOUT VOLTAGE 2		SHORT CURRENT
	2% ACCURACY		1% ACCURACY								
VOUT(T)	VOUT(E) (V)		VOUT(E) (V)		IOUTMAX (mA)	△VOUT	Vdif1		Vdif2		Ishort
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	TYP.
1.2	1.170	1.230			60	40	460	760	700	960	180
1.3	1.270	1.330					400	650			
1.4	1.370	1.430					350	590	580	860	
1.5	1.470	1.530				45	300	510			155
1.6	1.568	1.632			80		250	450	450	810	
1.7	1.666	1.734					200	410			
1.8	1.764	1.836					150	390	350	780	130
1.9	1.862	1.938					100	370			
2.0	1.960	2.040	1.980	2.020	120	50					
2.1	2.058	2.042	2.079	2.121						710	
2.2	2.156	2.244	2.178	2.222							
2.3	2.254	2.346	2.277	2.323							100
2.4	2.352	2.448	2.376	2.424							
2.5	2.450	2.550	2.475	2.525	150	55					
2.6	2.548	2.652	2.574	2.626							
2.7	2.646	2.754	2.673	2.727							
2.8	2.744	2.856	2.772	2.828							
2.9	2.842	2.958	2.871	2.929							
3.0	2.940	3.060	2.970	3.030	200	60	75	350	250	680	
3.1	3.038	3.162	3.069	3.131							
3.2	3.136	3.264	3.168	3.232							
3.3	3.234	3.366	3.267	3.333							
3.4	3.332	3.468	3.366	3.434							
3.5	3.430	3.570	3.465	3.535		65					
3.6	3.528	3.672	3.564	3.636							
3.7	3.626	3.774	3.663	3.737							
3.8	3.724	3.876	3.762	3.838							
3.9	3.822	3.978	3.861	3.939							
4.0	3.920	4.080	3.960	4.040	250	70	60	320	200	630	
4.1	4.018	4.182	4.059	4.141							
4.2	4.116	4.284	4.158	4.242							
4.3	4.214	4.386	4.257	4.343							
4.4	4.312	4.488	4.356	4.444							
4.5	4.410	4.590	4.455	4.545		75					
4.6	4.508	4.692	4.554	4.646							
4.7	4.606	4.794	4.653	4.747							
4.8	4.704	4.896	4.752	4.848							
4.9	4.802	4.998	4.851	4.949							
5.0	4.900	5.100	4.950	5.050		80	50	290	175	600	

■TEST CIRCUITS

Circuit ①

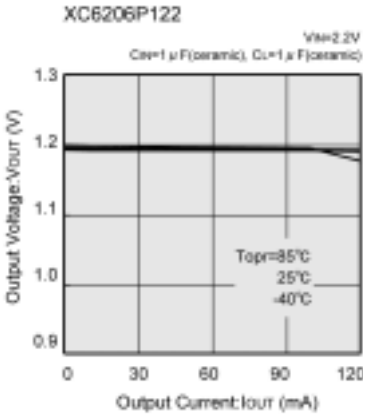


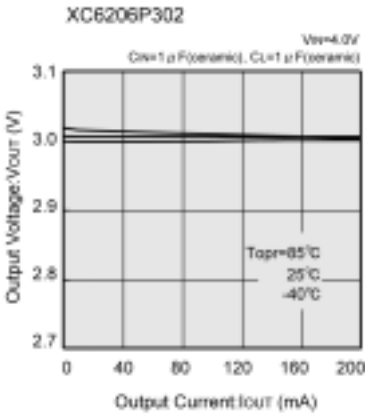
Circuit ②

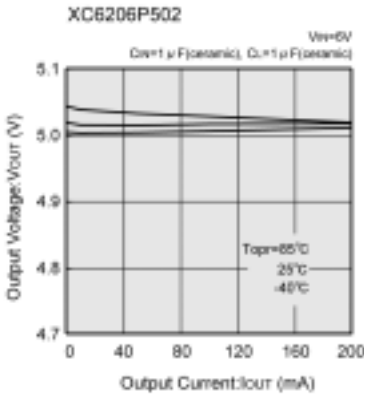


■TYPICAL PERFORMANCE CHARACTERISTICS

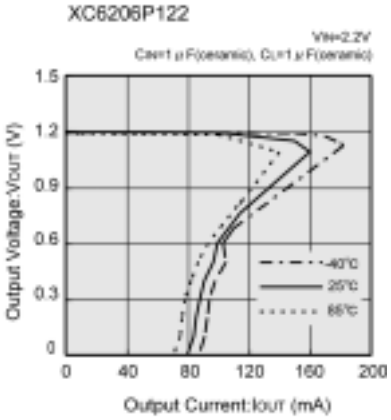
(1) Output Voltage vs. Output Current

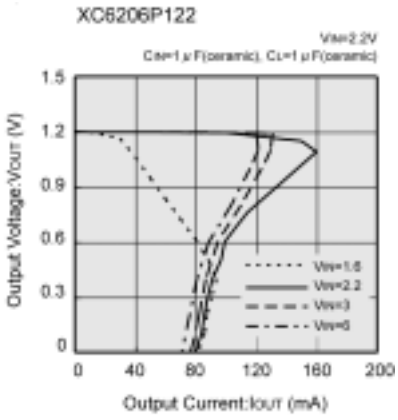


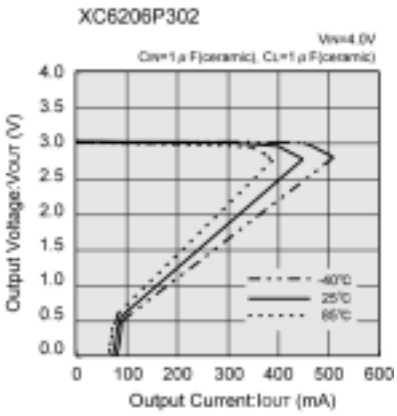


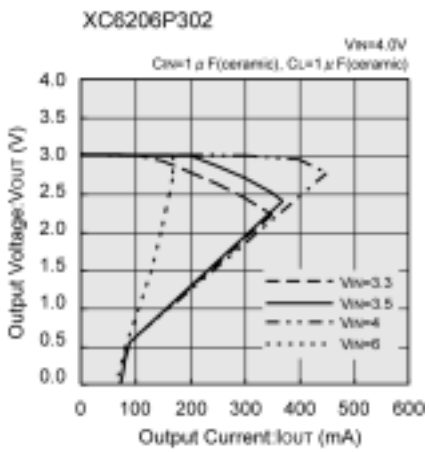


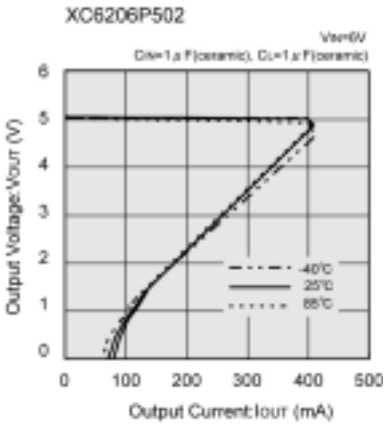
(2) Current Limit

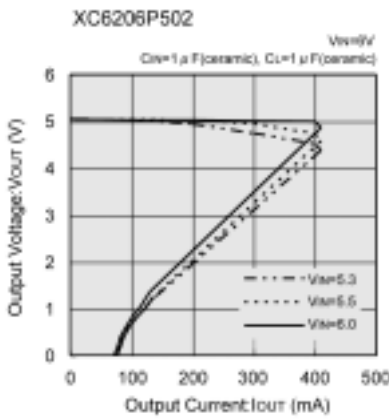






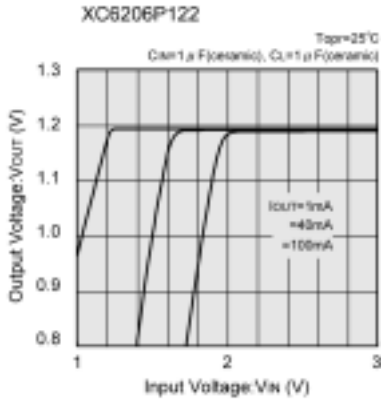


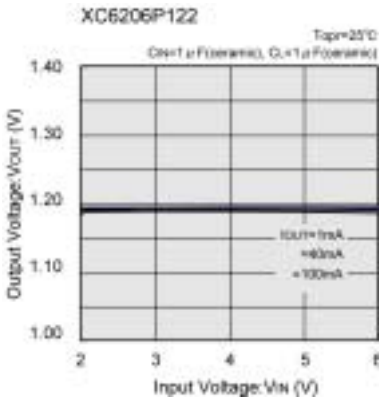


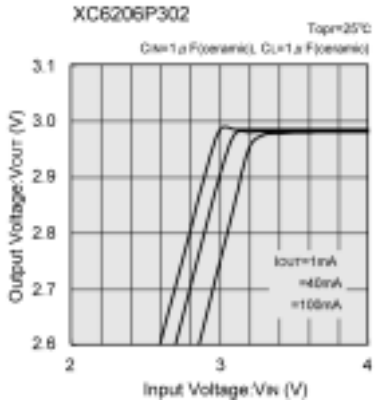


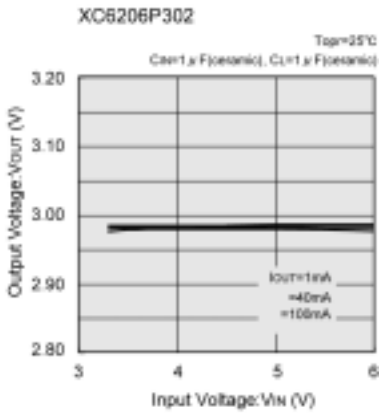
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

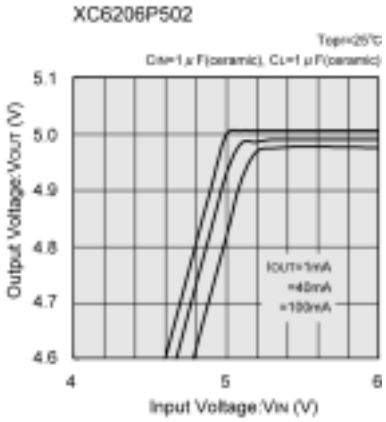
(3) Output Voltage vs. Input Voltage

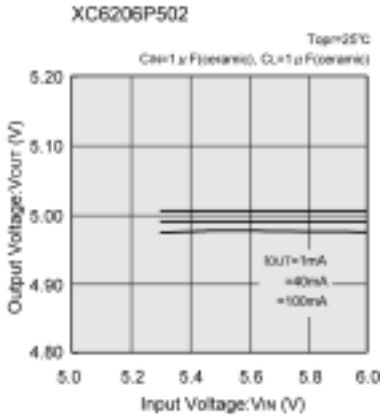




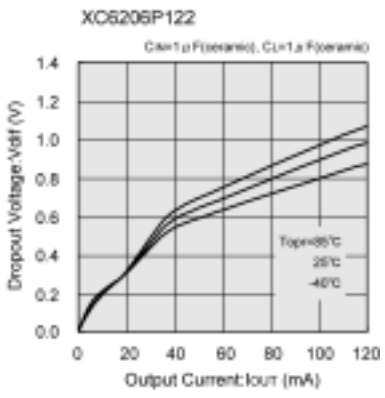


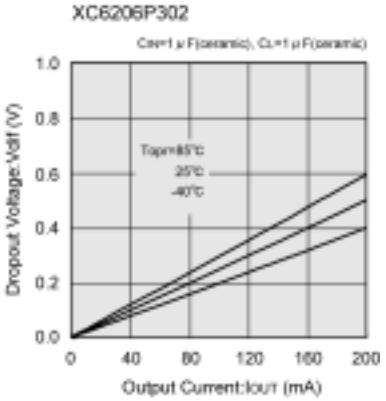


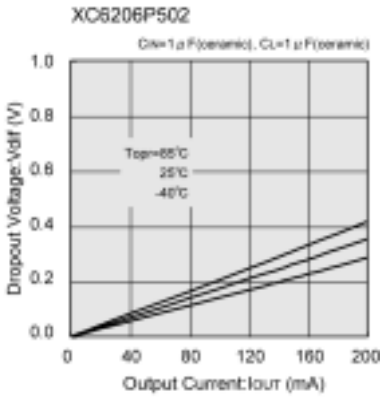




(4) Dropout Voltage vs. Output Current



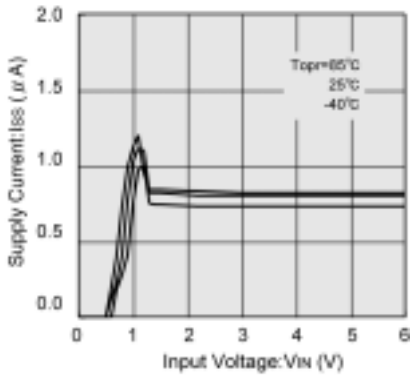




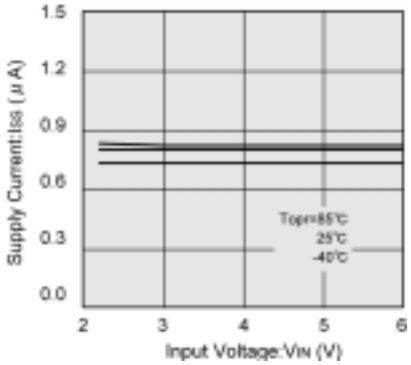
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) Supply Current vs. Input Voltage

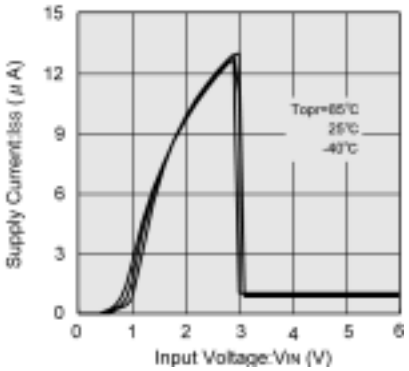
XC6206P122



XC6206P122



XC6206P302



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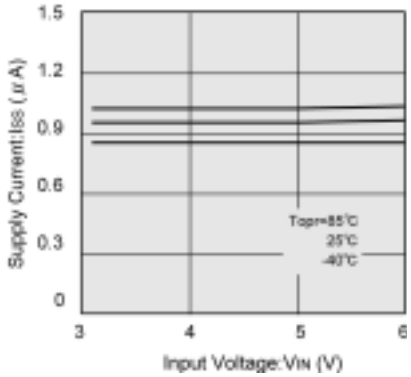
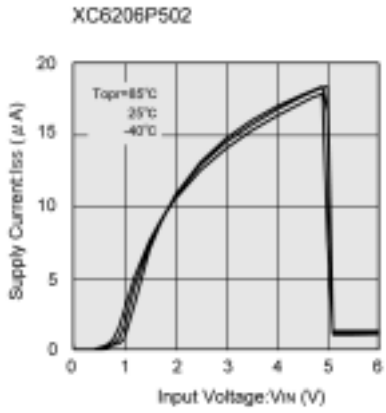


XC6206P502



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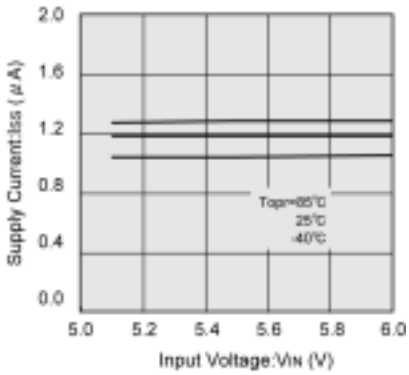
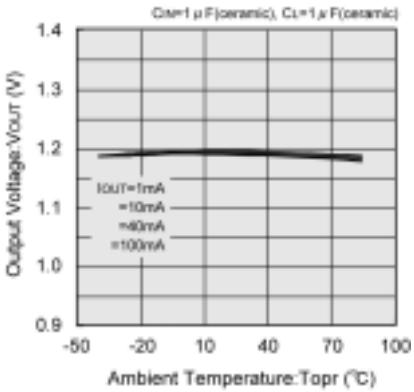


(6) Output Voltage vs. Ambient Temperature

XC6206P122



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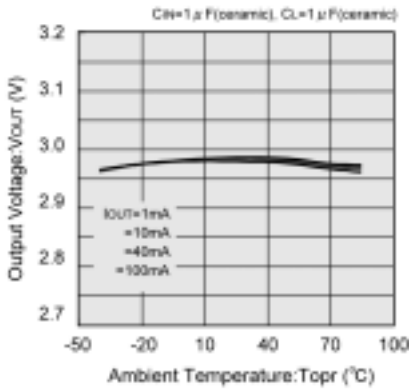

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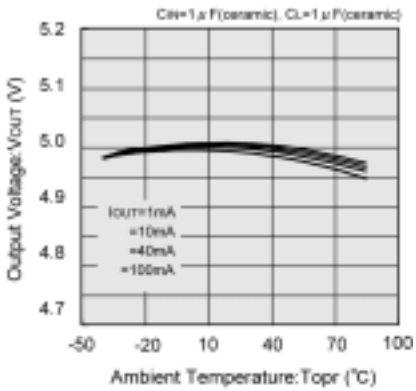
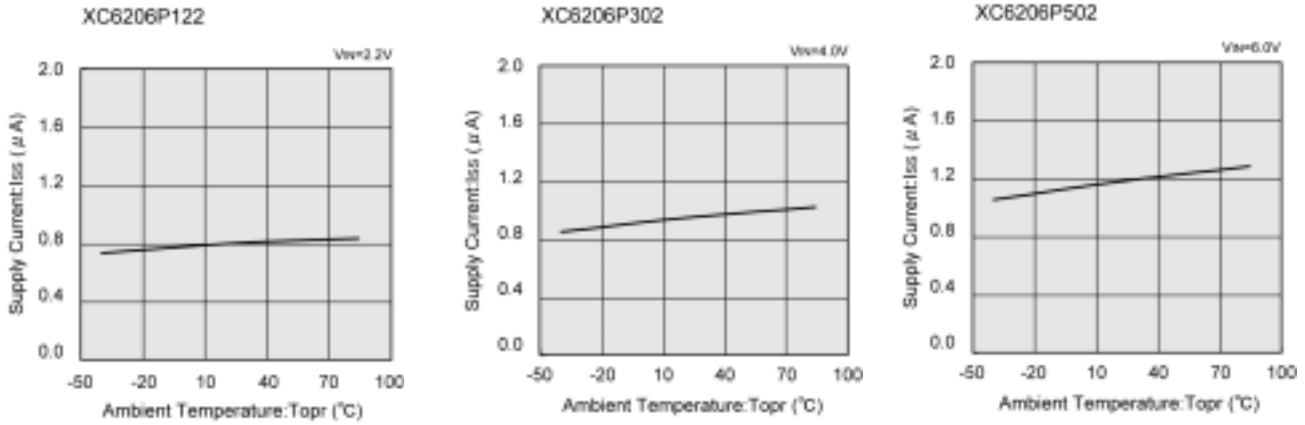
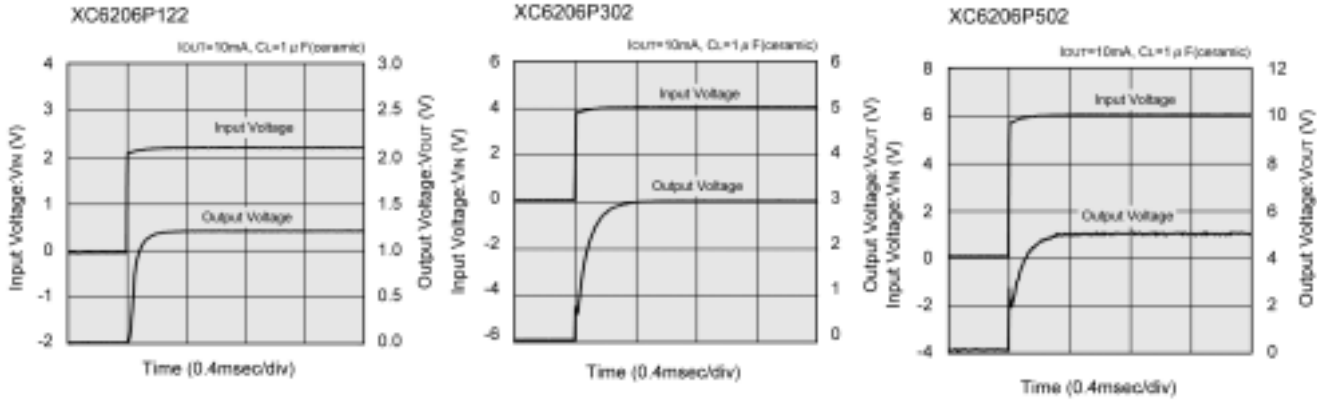


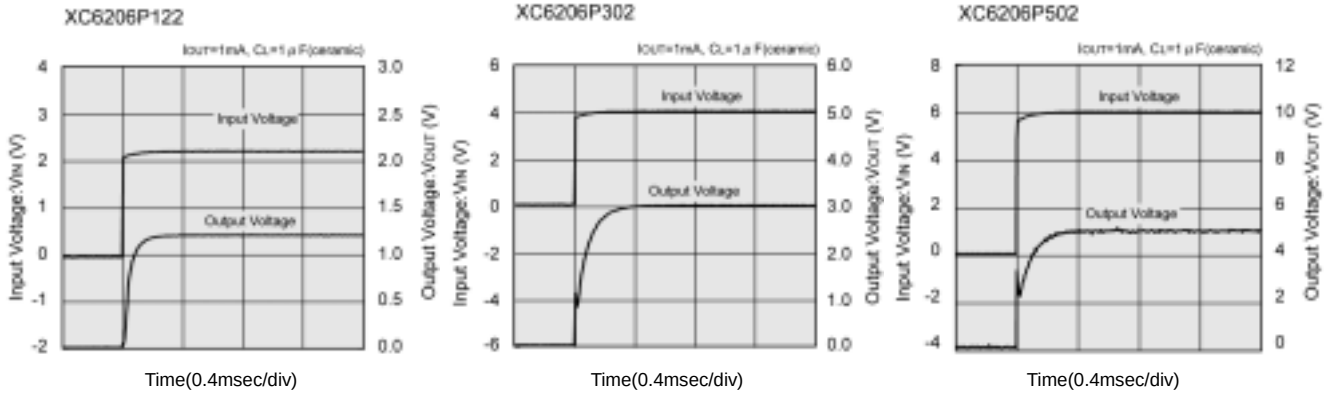
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Output Voltage vs. Ambient Temperature



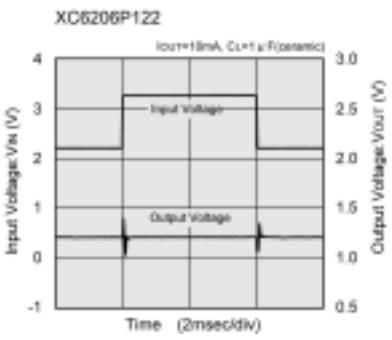
(8) Input Transient Response 1

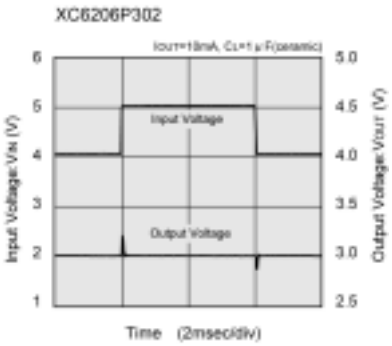


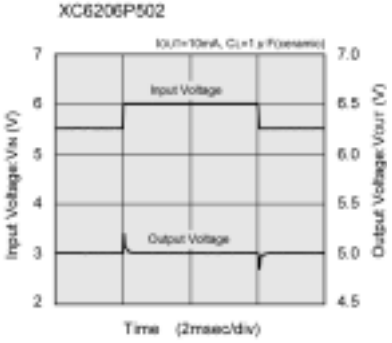


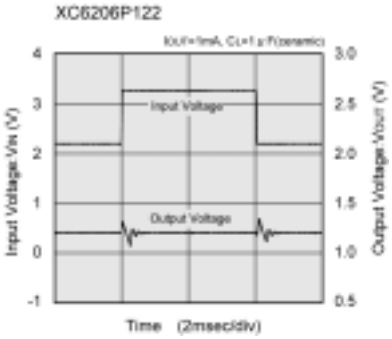
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

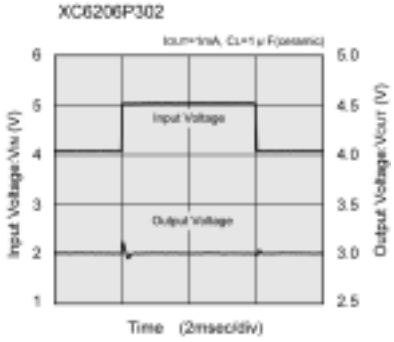
(9) Input Transient Response 2

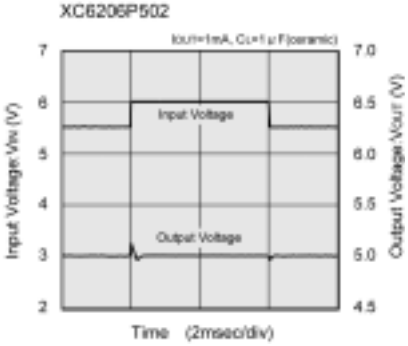




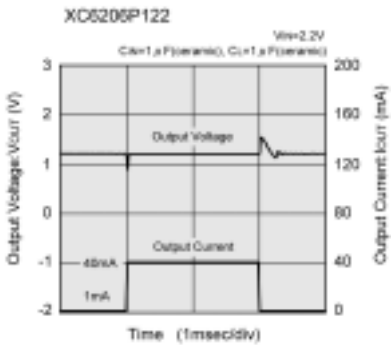


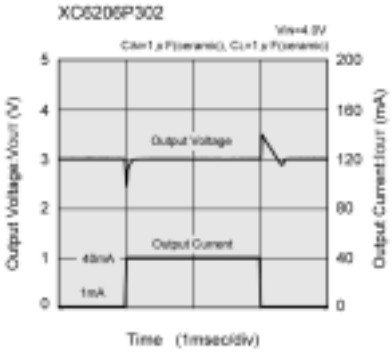


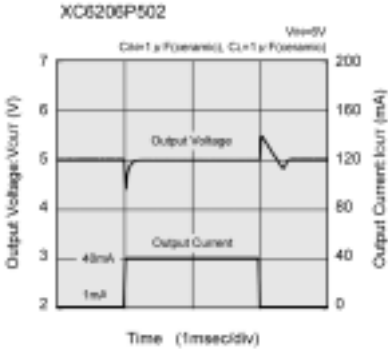




(10) Load Transient Response







■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(11) Ripple Rejection Rate