XC6201 Series

Positive Voltage Regulators

■GENERAL DESCRIPTION

The XC6201 series are highly precise, low power consumption, positive voltage regulators manufactured using CMOS and laser trimming technologies.

The series provides large currents with a significantly small dropout voltage.

The XC6201 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error amplifier. Output voltage is selectable in 0.1V steps between 1.3V ~ 6.0V.

SOT-25, SOT-89, USP-6B and TO-92 packages are available.

■APPLICATIONS

●Smart phones / Mobile phones

●Portable game consoles

●Digital still cameras / Camcorders

●Digital audio equipment

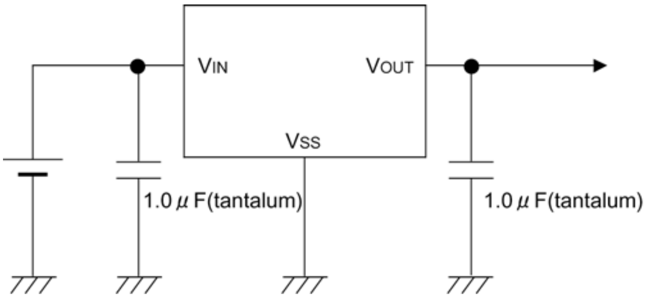
●Reference voltage sources

●Multi-function power supplies

■FEATURES

Maximum Output Current : 250mA (TYP.)
Dropout Voltage : 0.16V @ 100mA
: 0.40V @ 200mA
Maximum Operating Voltage : 10V
Output Voltage Range : 1.3V ~ 6.0V (0.1V increments)
Fixed Voltage Accuracy : ±1% ($V_{OUT(T)} \geq 2.0V$)
±2%
Low Power Consumption : 2.0μA (TYP.)
Operating Ambient Temperature : -40℃ ~ 85℃
Packages : SOT-25,
SOT-89
TO-92
USP-6B
Environmentally Friendly : EU RoHS Compliant, Pb Free
Tantalum or Ceramic Capacitor compatible

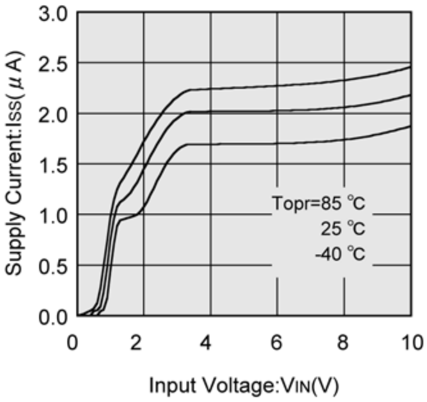
■TYPICAL APPLICATION CIRCUIT



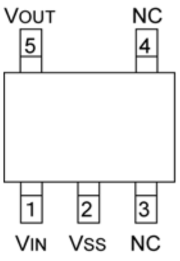
■TYPICAL PERFORMANCE CHARACTERISTICS

●Supply Current vs. Input Voltage

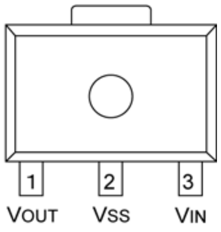
XC6201P332



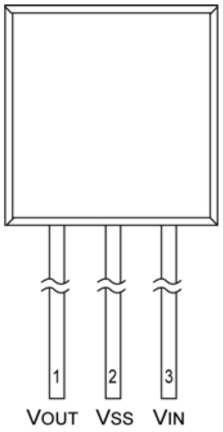
■PIN CONFIGURATION



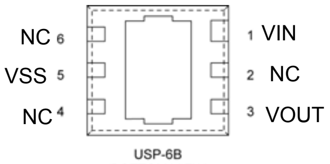
SOT-25
(TOP VIEW)



SOT-89
(TOP VIEW)



TO-92（T Type）
(SIDE VIEW)



USP-6B
(BOTTOM VIEW)

*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release.
If the pad needs to be connected to other pins, it should be connected to the VSS (No.5) pin.

■PIN ASSIGNMENT

PIN NUMBER			PIN NAME	FUNCTION
SOT-25	SOT-89/TO-92 (T)	USP-6B		
5	1	3	VOUT	Output
2	2	5	VSS	Ground
1	3	1	VIN	Power Input
3, 4	−	2,4,6	NC	No Connection

■PRODUCT CLASSIFICATION

●Ordering Information

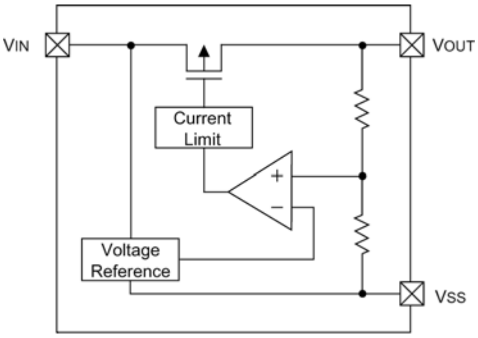
XC6201P③④⑤⑥⑦-⑧(*1)
↑ ↑
① ②

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Product Number	01	-
②	Type of Regulator	P	3-pin regulator
③④	Output Voltage	13～60	e.g. 30:3.0V 50:5.0V
⑤	Output Voltage Accuracy	1	±1%
		2	±2%
⑥⑦-⑧	Packages (Order Unit)	MR	SOT-25 (3,000/Reel)
		MR-G	SOT-25 (3,000/Reel)
		PR	SOT-89 (1,000/Reel)
		PR-G	SOT-89 (1,000/Reel)
		TH	TO-92 Taping Type: Paper type (2,000/Tape)
		TH-G	TO-92 Taping Type: Paper type (2,000/Tape)
		TB	TO-92 Taping Type: Bag (500/Bag)
		TB-G	TO-92 Taping Type: Bag (500/Bag)
		DR	USP-6B (3,000/Reel)
		DR-G	USP-6B (3,000/Reel)

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

* ±1% accuracy can be set at $V_{OUT(T)} \geqq$ 2.0V.

■BLOCK DIAGRAM



■ABSOLUTE MAXIMUM RATINGS

Ta = 25℃

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		VIN	12.0	V
Output Current		IOUT	500	mA
Output Voltage		VOUT	VSS-0.3～VIN+0.3	V
Power Dissipation	SOT-25	Pd	250	mW
	SOT-89		500	
	TO-92		300	
	USP-6B		120	
Operating Temperature		Topr	-40～+85	℃
Storage Temperature		Tstg	-55～+125	℃

■ELECTRICAL CHARACTERISTICS

XC6201P132 VOUT(T)=1.3V (*1) Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	VOUT(E) (*2)	VIN=2.3V IOUT=10mA	1.274	1.300	1.326	V	②
Maximum Output Current	IOUTmax	VIN=2.3V VOUT(E)≧1.17V	60	-	-	mA	②
Load Regulation	△VOUT	VIN=2.3V 1mA≦IOUT≦30mA	-	10	30	mV	②
Dropout Voltage (*3)	Vdif1	IOUT=30mA	-	200	600	mV	②
	Vdif2	IOUT=60mA	-	500	810		
Supply Current	ISS	VIN=2.3V	-	2.0	5.0	μA	①
Line Regulation	$\dfrac{\triangle VOUT}{\triangle VIN \cdot \triangle VOUT}$	IOUT=10mA 2.3V≦VIN≦10.0V	-	0.2	0.3	%/V	②
Input Voltage	VIN		1.8	-	10	V	-
Output Voltage Temperature Characteristics	$\dfrac{\triangle VOUT}{\triangle Topr \cdot \triangle VOUT}$	IOUT=40mA -40℃≦Topr≦85℃	-	±100	-	ppm/℃	②

■ELECTRICAL CHARACTERISTICS (Continued)

XC6201P182 $V_{OUT(T)}$=1.8V (*1) Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	$V_{OUT(E)}$ (*2)	V_{IN}=2.8V I_{OUT}=40mA	1.764	1.800	1.836	V	②
Maximum Output Current	I_{OUTmax}	V_{IN}=2.8V $V_{OUT(E)}$≧1.62V	80	-	-	mA	②
Load Regulation	ΔV_{OUT}	V_{IN}=2.8V 1mA≦I_{OUT}≦40mA	-	10	30	mV	②
Dropout Voltage (*3)	Vdif1	I_{OUT}=40mA	-	200	370	mV	②
	Vdif2	I_{OUT}=80mA	-	450	710		
Supply Current	I_{SS}	V_{IN}=2.8V	-	2.0	5.0	μA	①
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot \Delta V_{OUT}}$	I_{OUT}=40mA 2.8V≦V_{IN}≦10.0V	-	0.2	0.3	%/V	②
Input Voltage	V_{IN}		1.8	-	10	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot \Delta V_{OUT}}$	I_{OUT}=40mA -40℃≦Topr≦85℃	-	±100	-	ppm/℃	②

XC6201P272 $V_{OUT(T)}$=2.7V (*1) Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	$V_{OUT(E)}$ (*2)	V_{IN}=3.7V I_{OUT}=40mA	2.646	2.700	2.754	V	②
Maximum Output Current	I_{OUTmax}	V_{IN}=3.7V $V_{OUT(E)}$≧2.43V	100	-	-	mA	②
Load Regulation	ΔV_{OUT}	V_{IN}=3.7V 1mA≦I_{OUT}≦60mA	-	15	40	mV	②
Dropout Voltage (*3)	Vdif1	I_{OUT}=60mA	-	200	370	mV	②
	Vdif2	I_{OUT}=120mA	-	450	710		
Supply Current	I_{SS}	V_{IN}=3.7V	-	2.0	5.0	μA	①
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot \Delta V_{OUT}}$	I_{OUT}=40mA 3.7V≦V_{IN}≦10.0V	-	0.2	0.3	%/V	②
Input Voltage	V_{IN}		1.8	-	10	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot \Delta V_{OUT}}$	I_{OUT}=40mA -40℃≦Topr≦85℃	-	±100	-	ppm/℃	②

■ELECTRICAL CHARACTERISTICS (Continued)

XC6201P332 VOUT(T)=3.3V (*1)

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	VOUT(E) (*2)	VIN=4.3V IOUT=40mA	3.234	3.300	3.366	V	②
Maximum Output Current	IOUTmax	VIN=4.3V VOUT(E)≧2.97V	150	-	-	mA	②
Load Regulation	△VOUT	VIN=4.3V 1mA≦IOUT≦80mA	-	20	50	mV	②
Dropout Voltage (*3)	Vdif1	IOUT=80mA	-	200	360	mV	②
	Vdif2	IOUT=160mA	-	450	700		
Supply Current	ISS	VIN=4.3V	-	2.0	5.0	μA	①
Line Regulation	$\frac{\triangle \mathrm{VOUT}}{\triangle \mathrm{VIN} \cdot \triangle \mathrm{VOUT}}$	IOUT=40mA 4.3V≦VIN≦10.0V	-	0.2	0.3	%/V	②
Input Voltage	VIN		1.8	-	10	V	-
Output Voltage Temperature Characteristics	$\frac{\triangle \mathrm{VOUT}}{\triangle \mathrm{Topr} \cdot \triangle \mathrm{VOUT}}$	IOUT=40mA -40℃≦Topr≦85℃	-	±100	-	ppm/℃	②

XC6201P502 VOUT(T)=5.0V (*1)

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	VOUT(E) (*2)	VIN=6.0V IOUT=40mA	4.900	5.000	5.100	V	②
Maximum Output Current	IOUTmax	VIN=6.0V VOUT(E)≧4.57V	200	-	-	mA	②
Load Regulation	△VOUT	VIN=6.0V 1mA≦IOUT≦100mA	-	30	70	mV	②
Dropout Voltage (*3)	Vdif1	IOUT=100mA	-	160	340	mV	②
	Vdif2	IOUT=200mA	-	400	600		
Supply Current	ISS	VIN=6.0V	-	2.0	6.0	μA	①
Line Regulation	$\frac{\triangle \mathrm{VOUT}}{\triangle \mathrm{VIN} \cdot \triangle \mathrm{VOUT}}$	IOUT=40mA 6.0V≦VIN≦10.0V	-	0.2	0.3	%/V	②
Input Voltage	VIN		1.8	-	10	V	-
Output Voltage Temperature Characteristics	$\frac{\triangle \mathrm{VOUT}}{\triangle \mathrm{Topr} \cdot \triangle \mathrm{VOUT}}$	IOUT=40mA -40℃≦Topr≦85℃	-	±100	-	ppm/℃	②

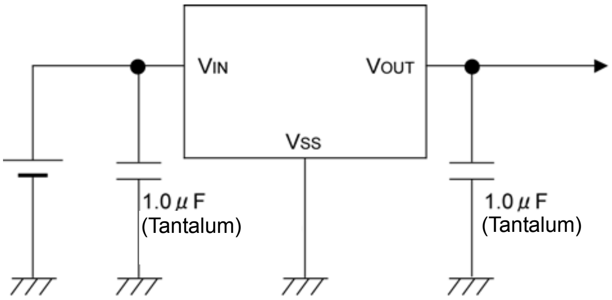
NOTE:

*1: VOUT(T) = Nominal output voltage.

*2: VOUT(E) = Effective output voltage (i.e. the output voltage when "VOUT(T)+1.0V" is provided while maintaining a certain IOUT value).

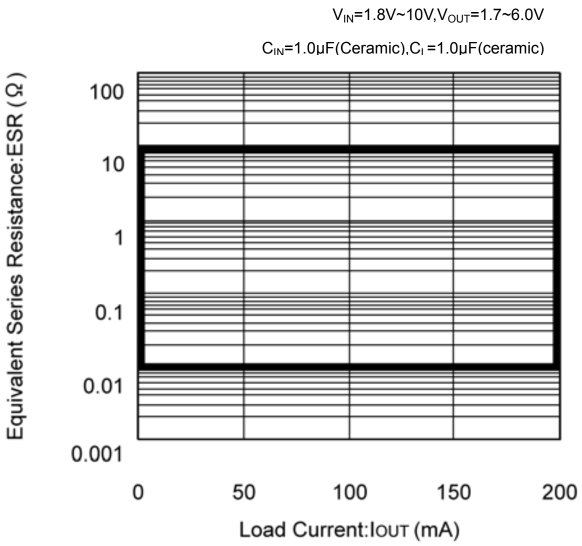
*3: Vdif = (VIN1- VOUT1)
VIN1 :An Input Voltage when VOUT1 appears as the input voltage is gradually decreased.
VOUT1 : A voltage equal to 98% of the output voltage when a stabilized (VOUT(T) + 1.0V) is input.

■TYPICAL APPLICATION CIRCUIT



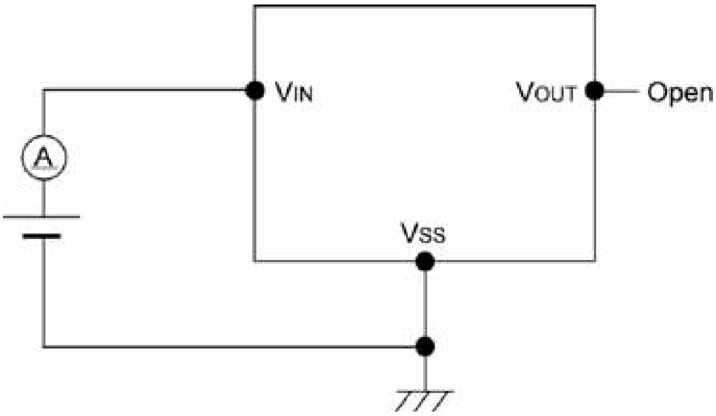
With the XC6201 series regulator, in order to ensure the stabilized output voltage, we suggest that an output capacitor (C_L) of 1μF or more be connected between the output pin (V_{OUT}) and the V_{SS} pin. For using low ESR capacitor (e.g. ceramic capacitors), please make sure that the output voltage is more than 1.7V. When the output voltage is from 1.3V to 1.6V, the output capacitor should be a tantalum capacitor with a capacitance of 2.2μF. We also suggest an input capacitor (C_{IN}) should be connected between the V_{IN} and the V_{SS} in order to stabilize input power source.

OUTPUT VOLTAGE	C_{IN}	C_L (TANTALUM)	C_L (LOW ESR)
1.3V～1.6V	≧1.0μF	≧2.2μF	−
1.7V～6.0V	≧1.0μF	≧1.0μF	≧1.0μF

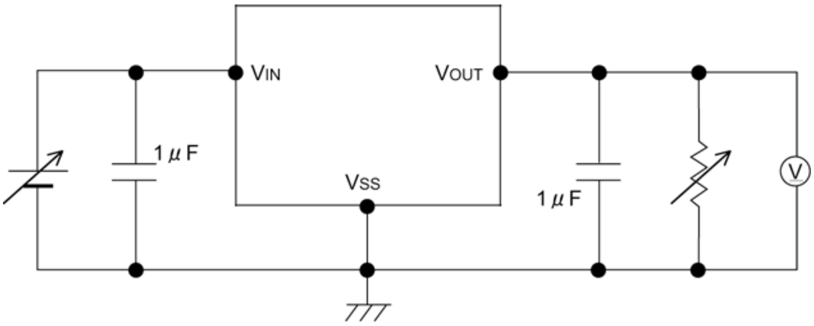


■TEST CIRCUITS

Circuit ① : Supply Current



Circuit ② : Output Voltage, Oscillation, Line Regulation, Dropout Voltage, Load Regulation



■ NOTE ON USE

1. Please use this IC within the stated absolute maximum ratings. The IC is liable to malfunction should the ratings be exceeded. When a voltage higher than the V_{IN} flows to the V_{OUT} like when using two power supplies, please connect a Schottky barrier diode between the V_{OUT} and the V_{IN} and do not exceed the V_{OUT} rating.

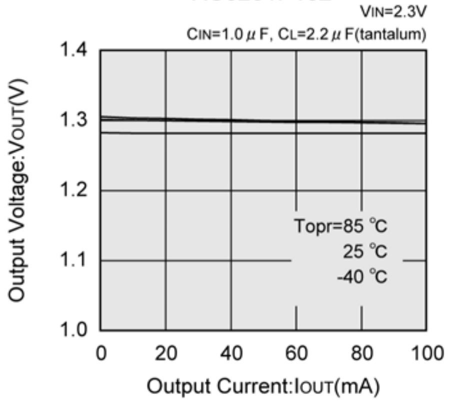
2. An oscillation may occur by the impedance between a power supply and the input of the IC. Where the impedance is 10Ω or more, please use an input capacitor (C_{IN}) of at least 1μF. In case of high output current, operation can be stabilized by increasing the input capacitor value. Also an oscillation may occur if the input capacitor value is smaller than the input impedance when the output capacitance (C_L) is large. In such cases, operations can be stabilized by either increasing the input capacitor value or reducing the output capacitor value.

3. Please ensure that output current (I_{OUT}) is less than $Pd / (V_{IN} - V_{OUT})$ and do not exceed the rated power dissipation value (Pd) of the package.

■TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current

XC6201P132



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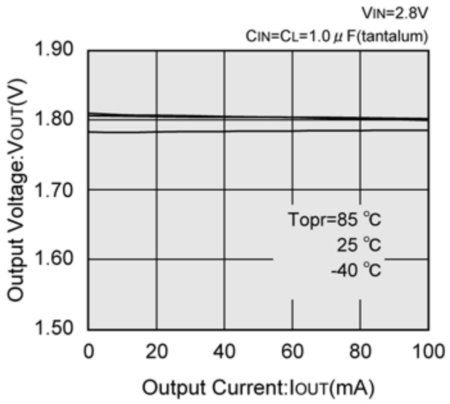

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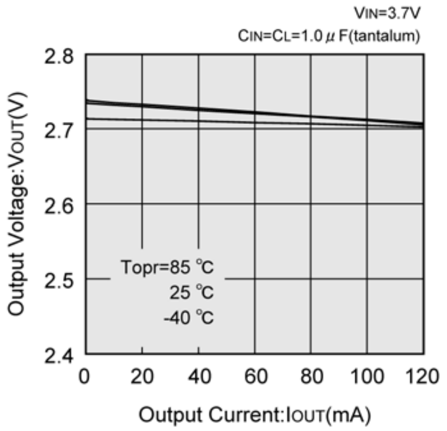

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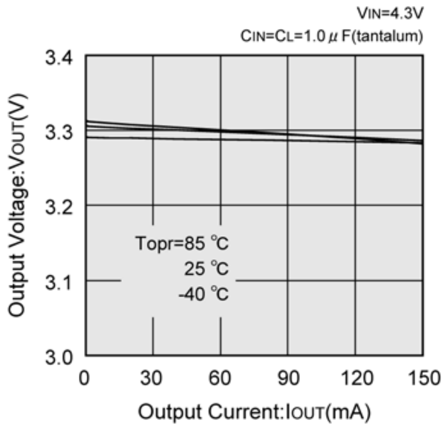

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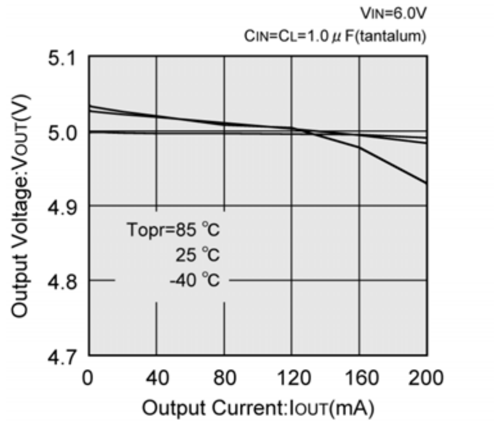
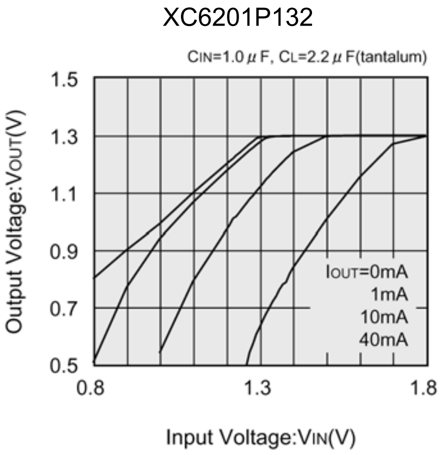
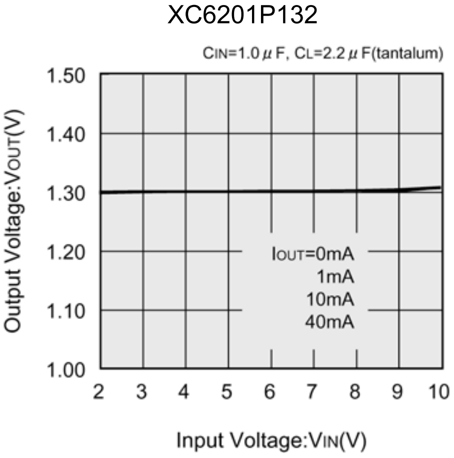
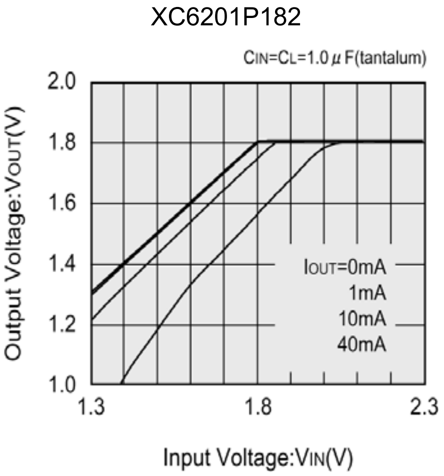


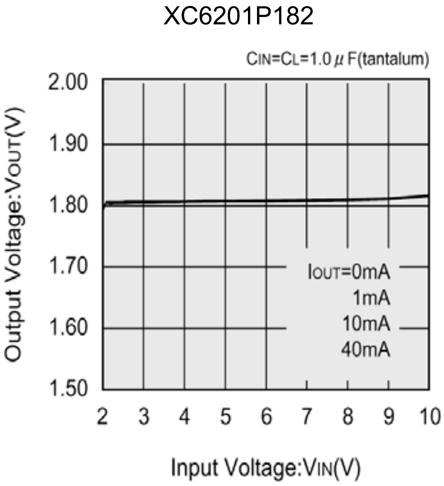
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

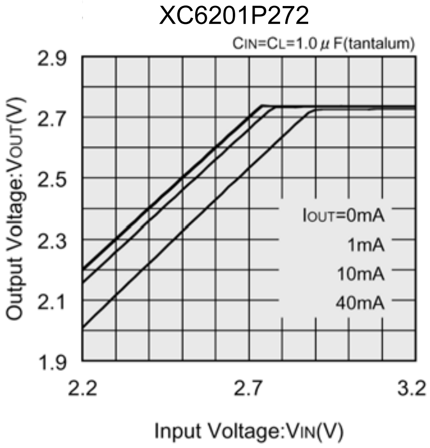
(2) Output Voltage vs. Input Voltage

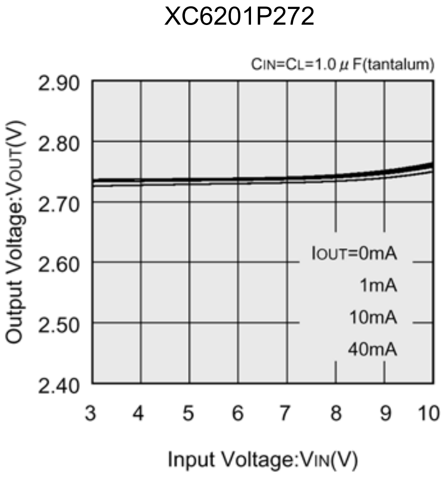












■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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

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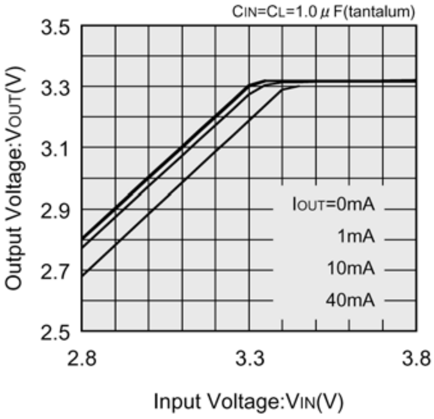

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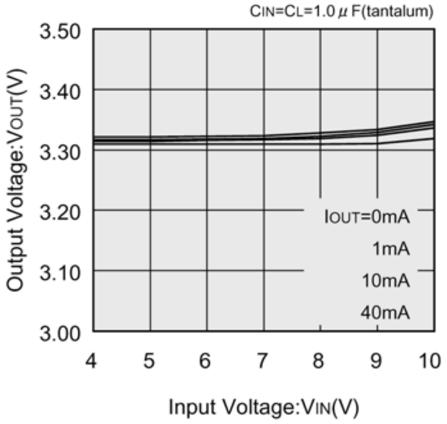

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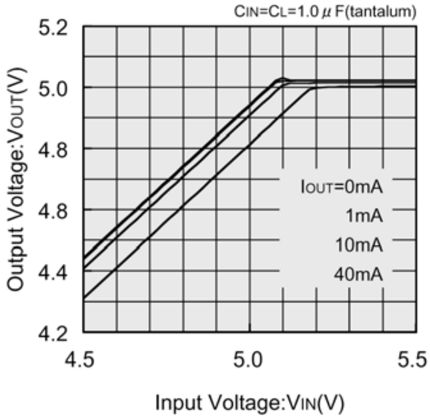

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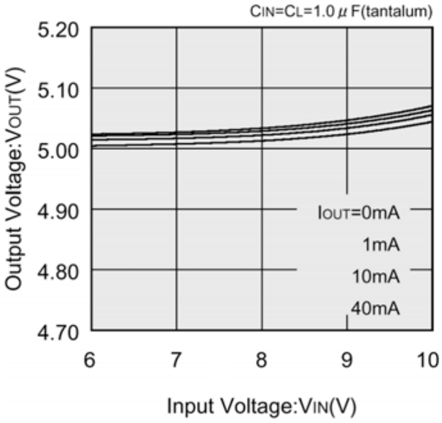

■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) Dropout Voltage vs. Output Current

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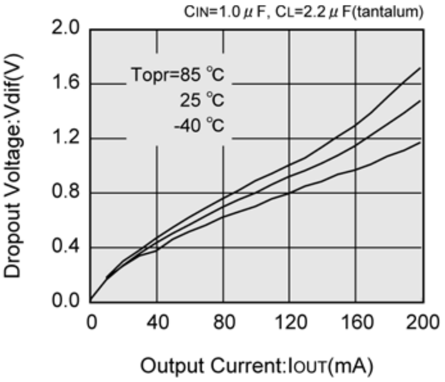

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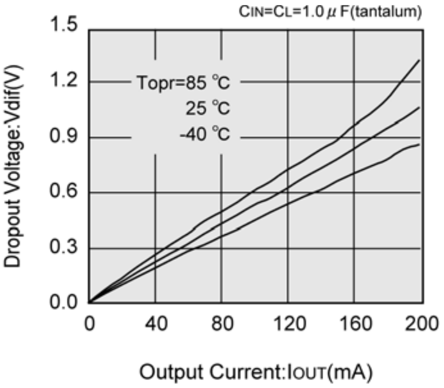

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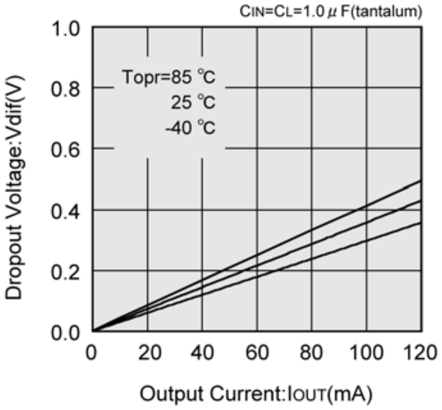

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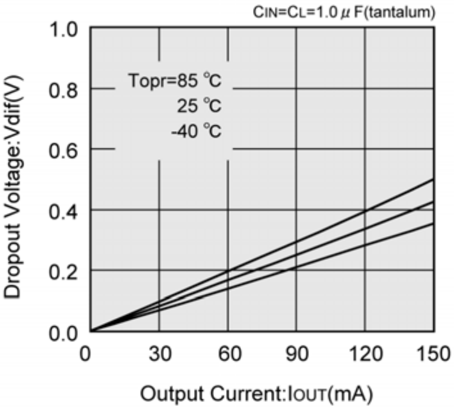

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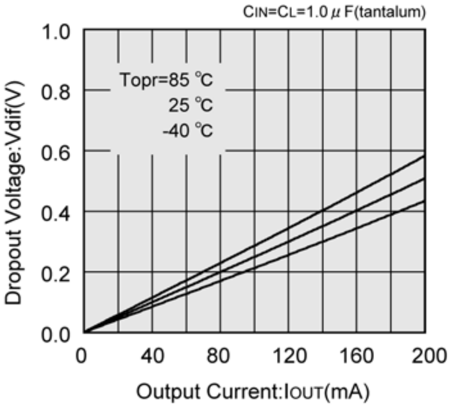

■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(4) Supply Current vs. Input Voltage

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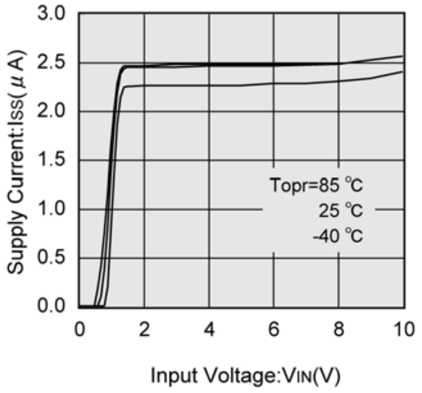

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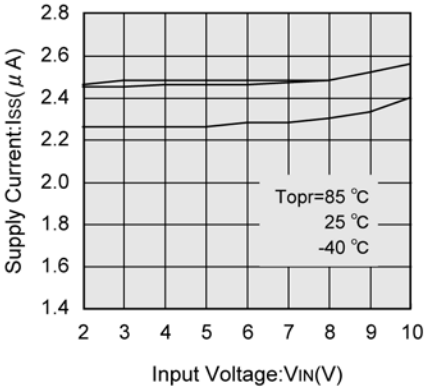

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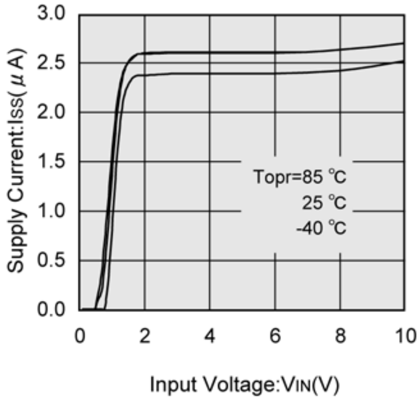

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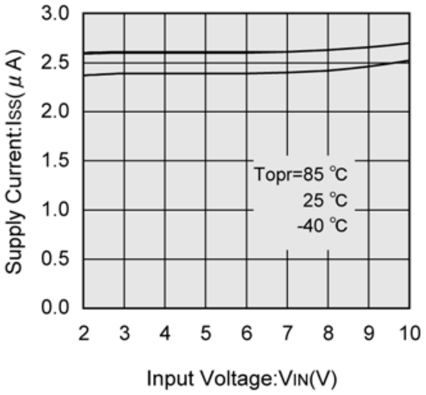

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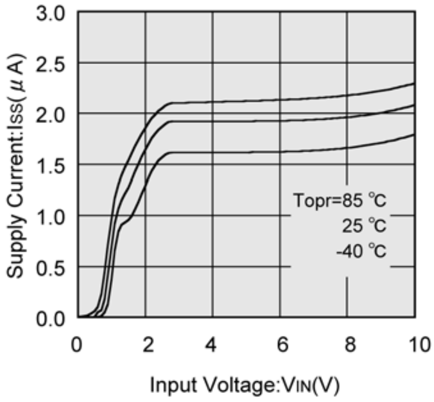

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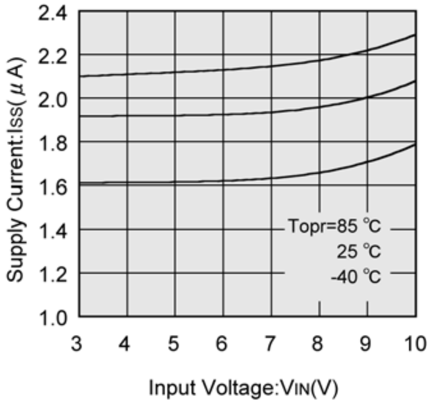
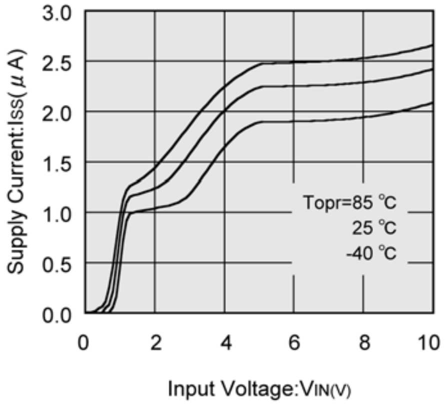


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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

XC6201P332



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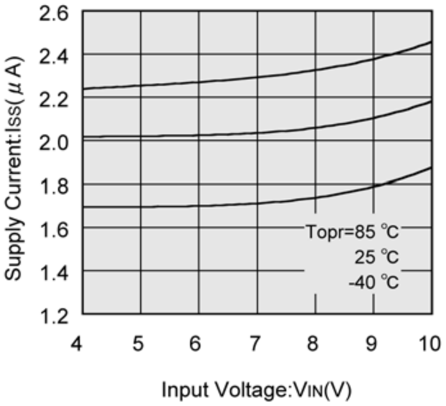

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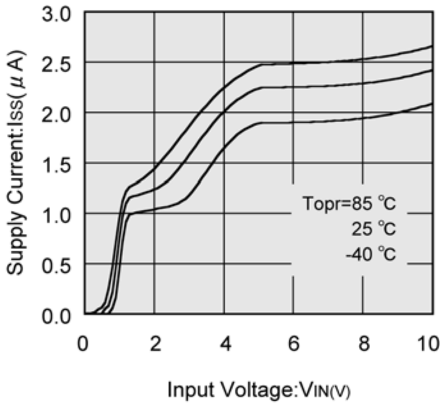

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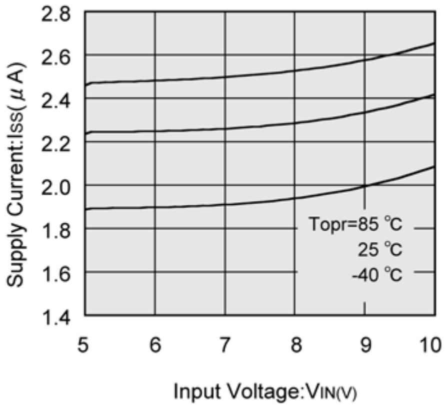
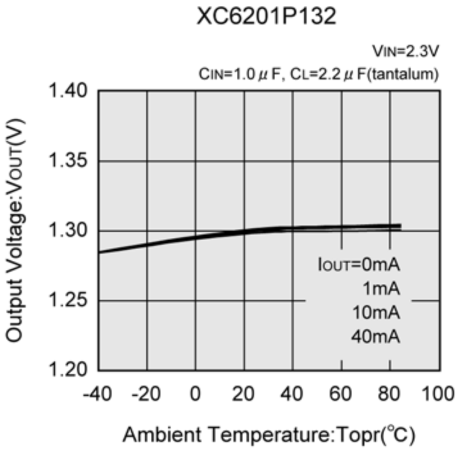
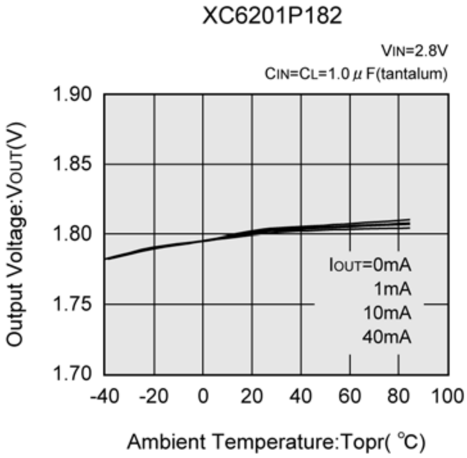
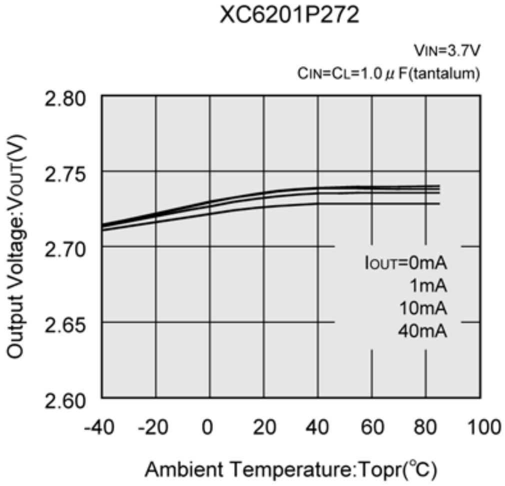


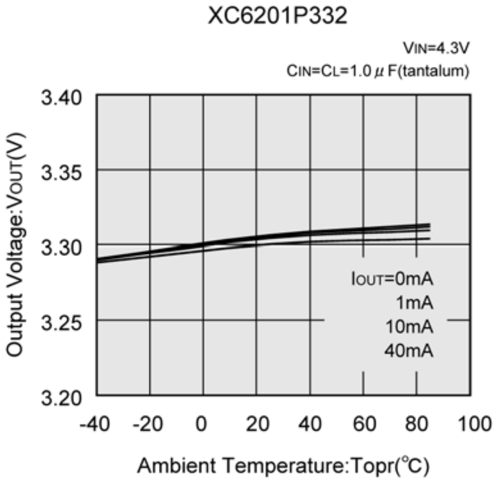
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

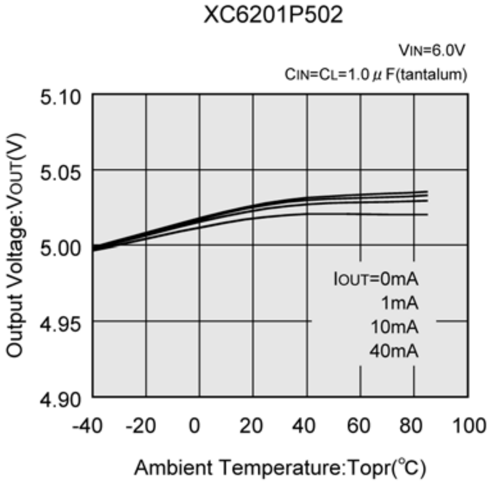
(5) Output Voltage vs. Ambient Temperature







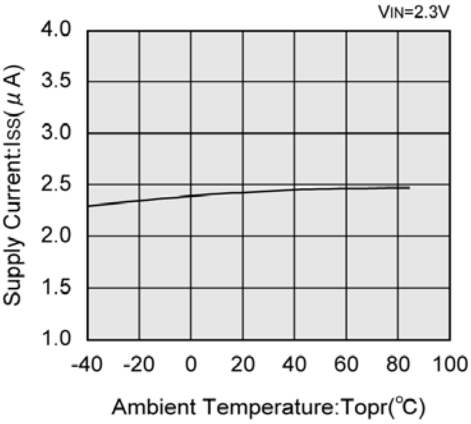




■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(6) Supply Current vs. Ambient Temperature

XC6201P132



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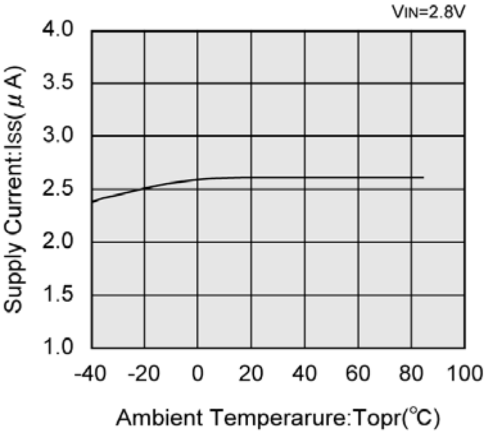

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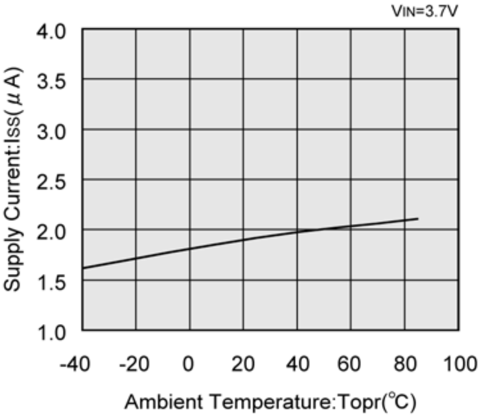

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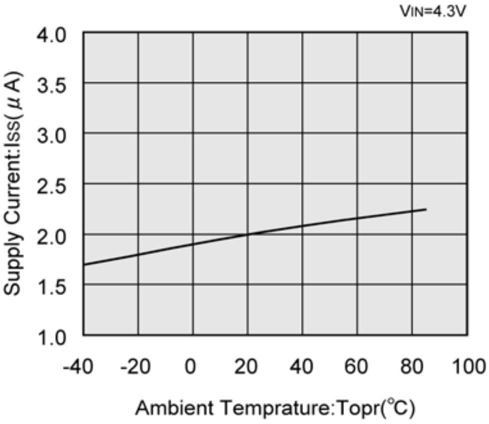

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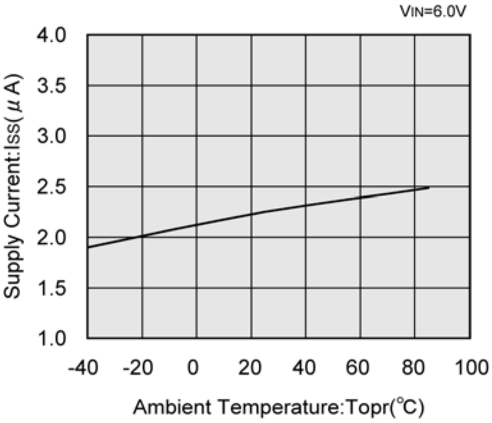
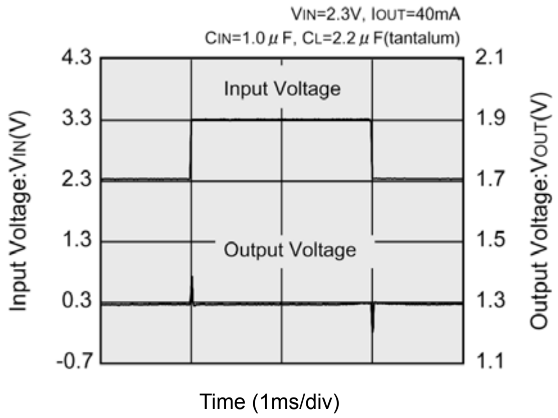


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Input Transient Response

XC6201P132



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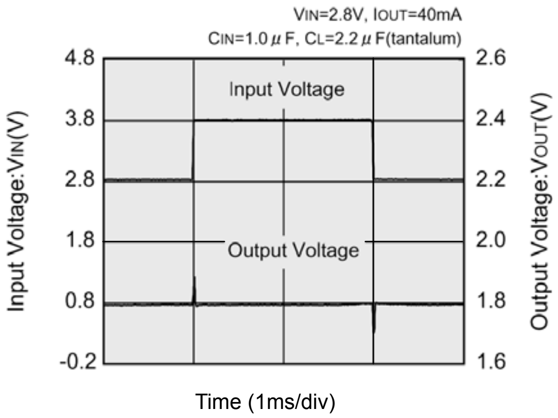

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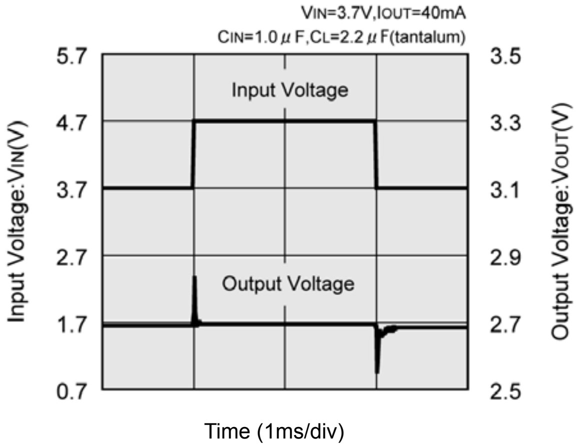

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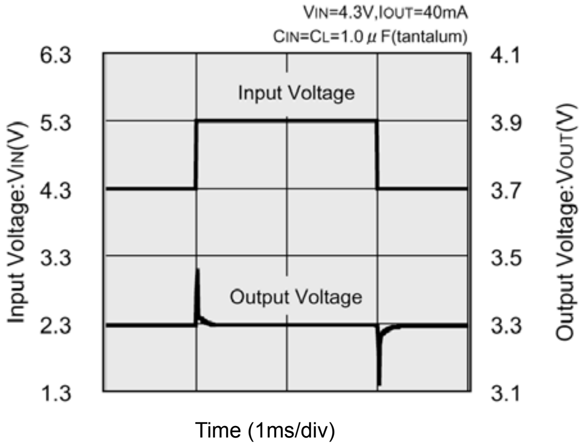

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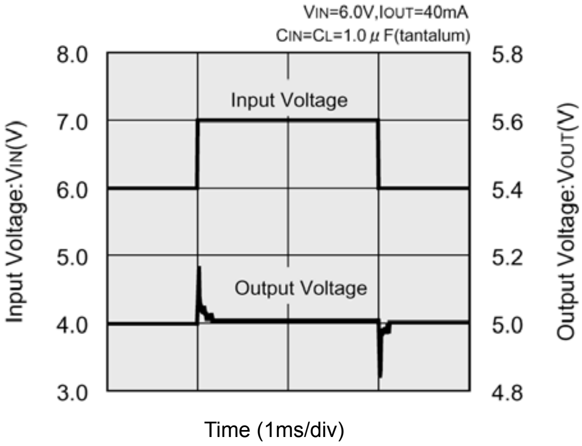

■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Load Transient Response

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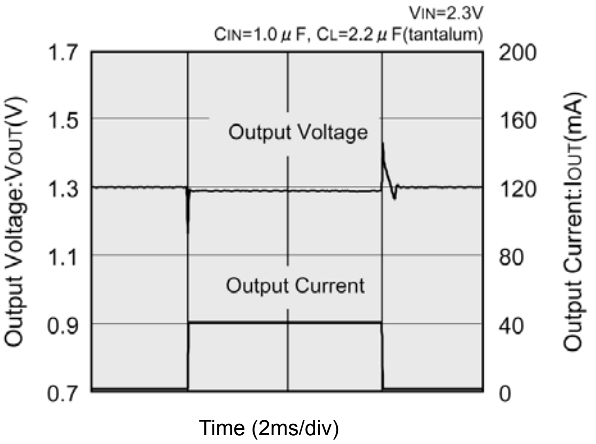

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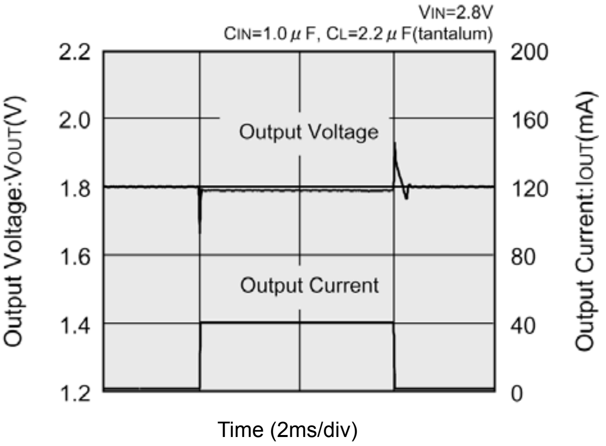

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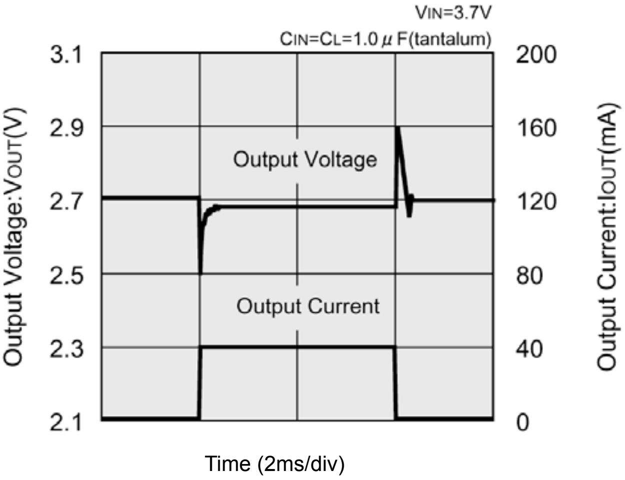

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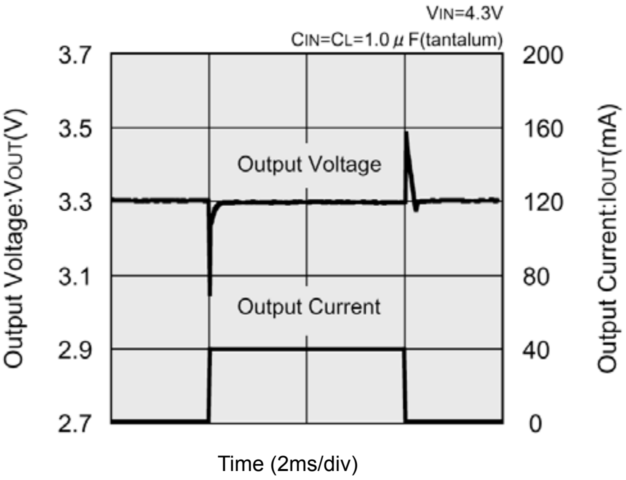

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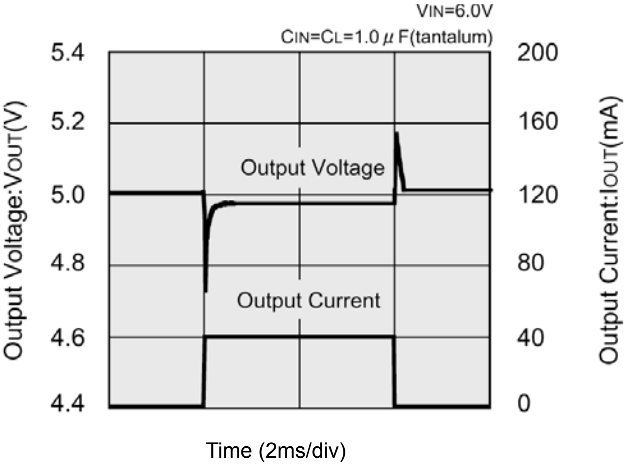
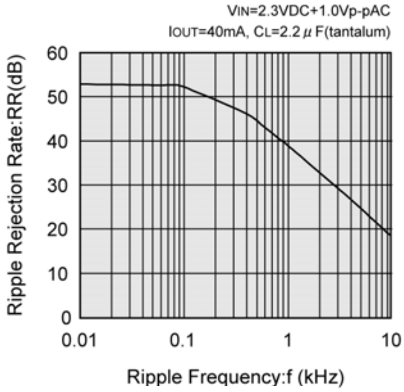


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Ripple Rejection Rate

XC6201P132



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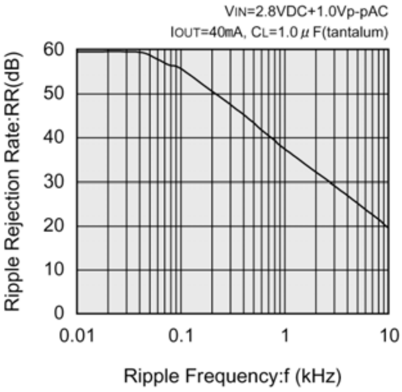

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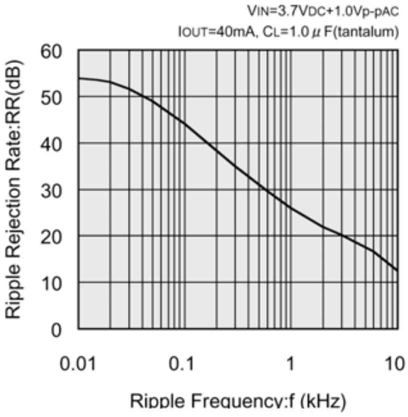

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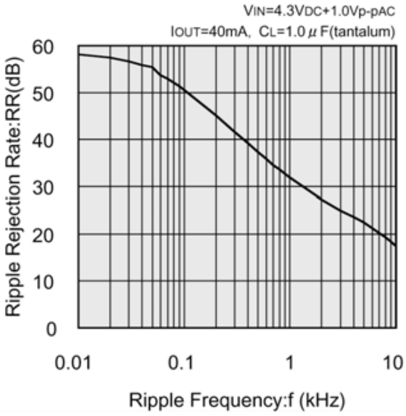

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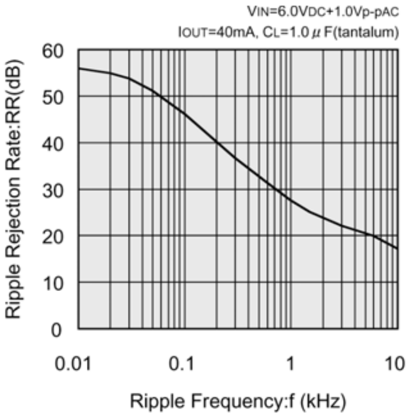
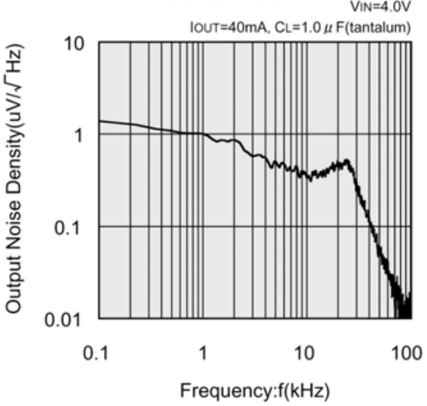


(10) Output Noise Density

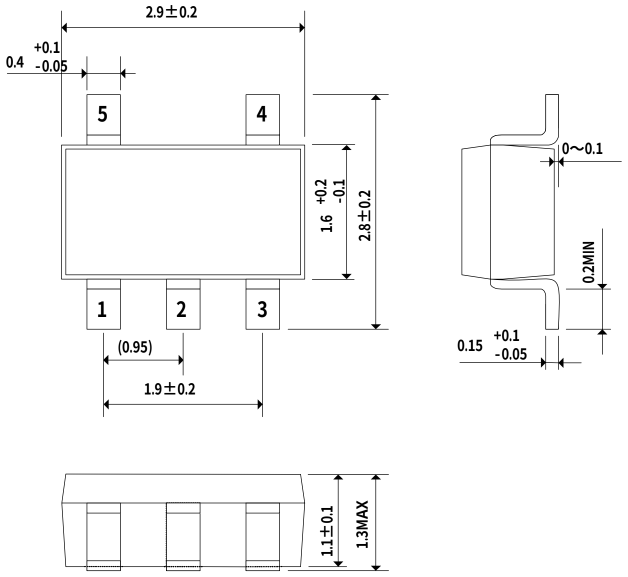
XC6201P302



■PACKAGING INFORMATION

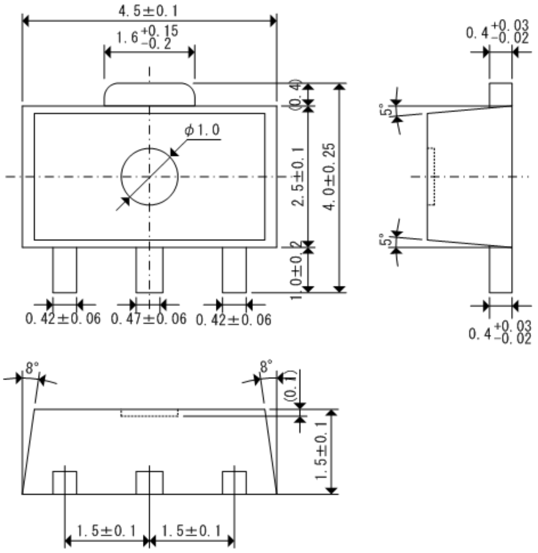
●SOT-25

Unit : mm



●SOT-89

Unit : mm

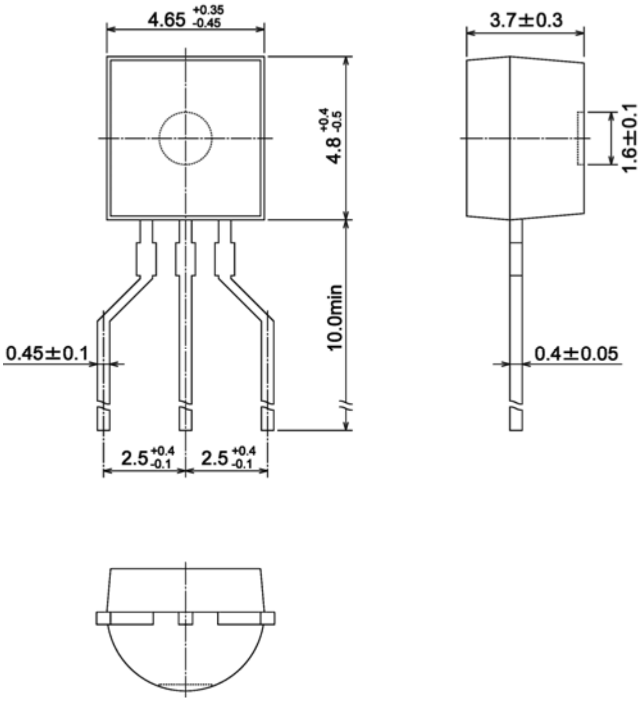


■PACKAGING INFORMATION (Continued)

●TO-92

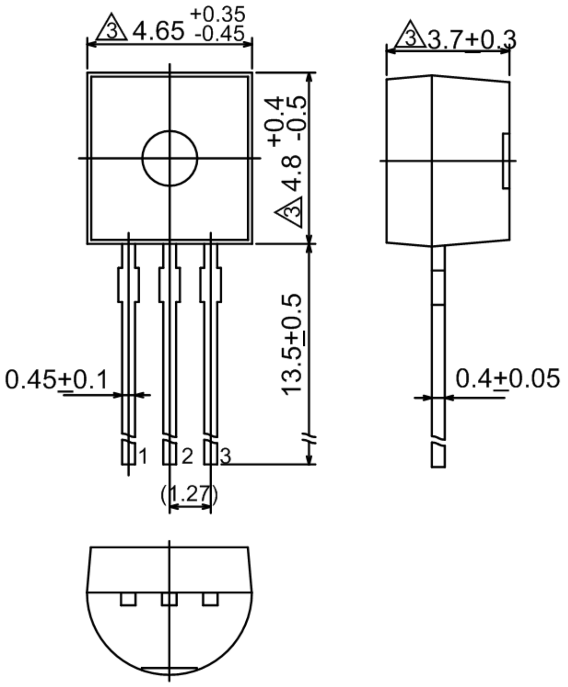
Paper type

Unit : mm



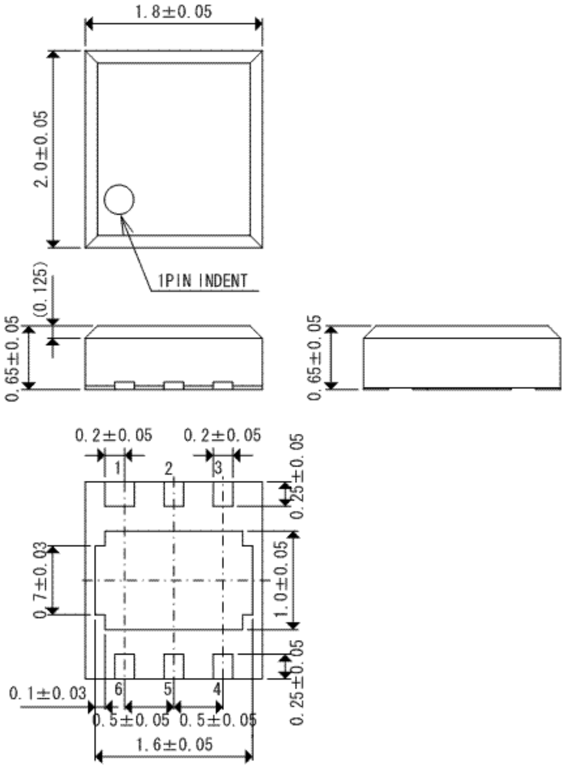
Bag

Unit : mm



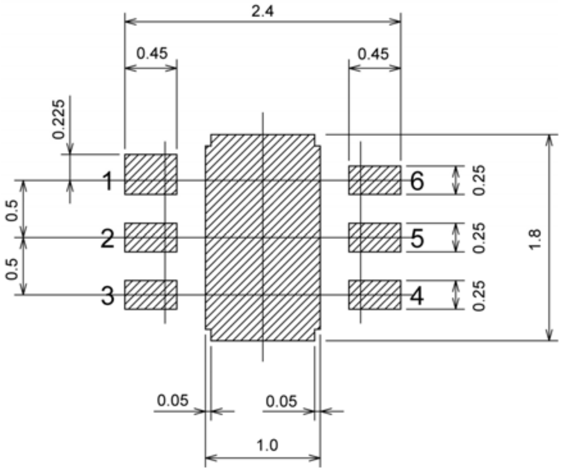
●USP-6B

Unit : mm

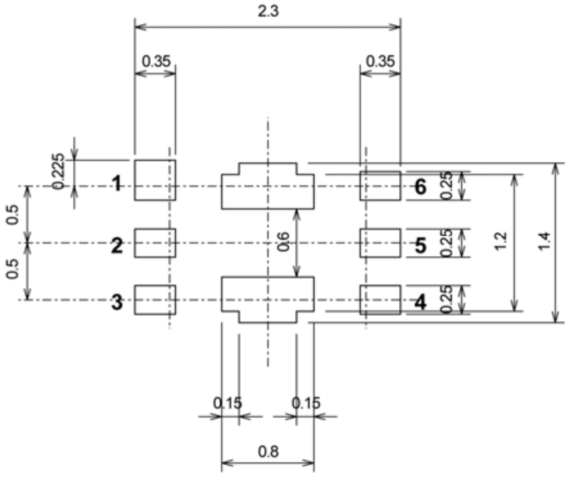


■PACKAGING INFORMATION (Continued)

●USP-6B Reference Pattern Layout

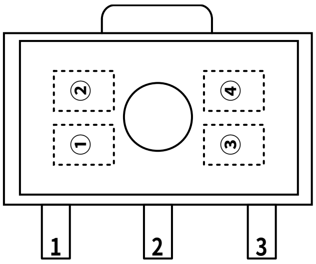


●USP-6B Reference Metal Mask Design

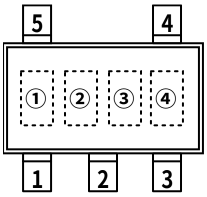


■MARKING RULE

●SOT-89, SOT-25



SOT-89
(TOP VIEW)



SOT-25
(TOP VIEW)

① represents the product series

MARK	PRODUCT SERIES
1	XC6201xxxxxx

② represents type of regulator

MARK		PRODUCT SERIES
Voltage= 0.1 ~ 3.0V	Voltage= 3.1 ~ 6.0V	
5	6	XC6201PXXXXX
8	9	XC6201TXXXPX

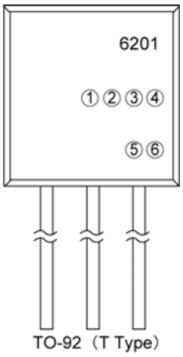
③ represents output voltage

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	5.1	—
6	—	3.7	—	P	2.2	5.2	—
7	—	3.8	—	R	2.3	5.3	—
8	—	3.9	—	S	2.4	5.4	—
9	—	4.0	—	T	2.5	5.5	—
A	—	4.1	—	U	2.6	5.6	—
B	—	4.2	—	V	2.7	5.7	—
C	1.3	4.3	—	X	2.8	5.8	—
D	1.4	4.4	—	Y	2.9	5.9	—
E	1.5	4.5	—	Z	3.0	6.0	—

④ represents assembly lot number
0 to 9, A to Z repeated (G, I, J, O, Q, W excluded)

■MARKING RULE (Continued)

●TO-92



(SIDE VIEW)

① represents type of regulator

MARK	PRODUCT SERIES
P	XC6201Pxxxxx
T	XC6201Txxxxx

②③ represents output voltage

MARK		VOLTAGE (V)	PRODUCT SERIES
②	③		
3	3	3.3	XC6201Px33xx
5	0	5.0	XC6201Px50xx

④ represents detect voltage accuracy

MARK	DETECT VOLTAGE ACCURACY	PRODUCT SERIES
1	Within ±1%	XC6201Pxx1xx
2	Within ±2%	XC6201Pxx2xx

⑤ represents least significant digit of production year

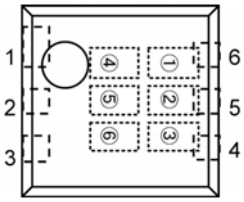
MARK	PRODUCTION YEAR
3	2003
4	2004

⑥ represents the production lot number

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

Note: No character inversion used.

●USP-6B



USP-6B
(TOP VIEW)

①② represents product series

MARK		PRODUCT SERIES
①	②	
0	1	XC6201xxxxDx

③ represents type of regulator

MARK	TYPE	PRODUCT SERIES
P	3pin Regulator	XC6201PxxxDx
T	V_{IN}=7V(Rated)	XC6201TxxxDx

④⑤ represents output voltage

MARK		VOLTAGE (V)	PRODUCT SERIES
④	⑤		
3	3	3.3	XC6201x33xDx
5	0	5.0	XC6201x50xDx

⑥ represents assembly lot number

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

Note: No character inversion used.

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