XC6201
Series
Positive Voltage Regulators

TOREX

◆CMOS Low Power Consumption
◆Dropout Voltage : 0.16V @ 100mA,
0.40V @ 200mA
◆Maximum Output Current : 250mA (V_{OUT}=5.0V, TYP)
◆Highly Accurate : ± 2%
◆Output Voltage Range : 1.3V ~ 6.0V
◆SOT-25 / SOT-89 / TO-92 Package
◆Capacitors can be Tantalum or Ceramic

■Applications
●Mobile phones
●Cordless phones
●Cameras, video recorders
●Portable games
●Portable AV equipment
●Reference voltage
●Battery powered equipment

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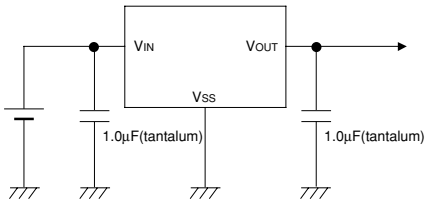
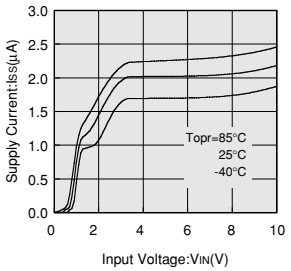
■General Description
The XC6201 series are highly precise, low power consumption, positive voltage regulators manufactured using CMOS and laser trimming technologies.
The series provides large currents with a significantly small dropout voltage.
The XC6201 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error amplifier. Output voltage is selectable in 0.1V steps between 1.3V ~ 6.0V.
SOT-25 (250mW), SOT-89 (500mW) and TO-92 (300mW) packages are available.

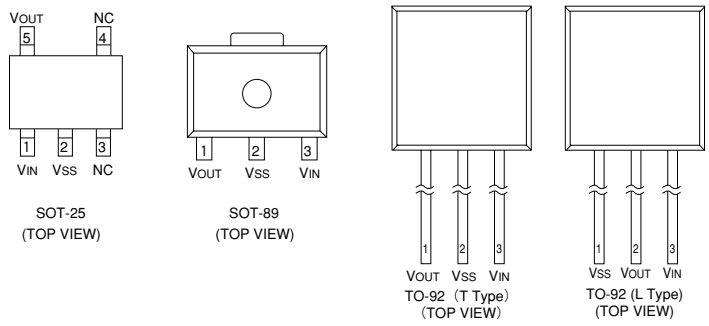
■Features
Maximum Output Current	: 250mA (TYP.)
Dropout Voltage	: 0.16V @ 100mA
Maximum Operating Voltage	: 10V
Output Voltage Range	: 1.3V ~ 6.0V (selectable in 0.1V steps)
Highly Accurate	: ± 2%
Low Power Consumption	: TYP 2.0 μA
Operational Temperature Range	: -40°C ~ 85°C
Ultra Small Packages	: SOT-25 (250mW), SOT-89 (500mW), TO-92 (300mW)

Capacitors can be Tantalum or Ceramic

■Typical Application Circuit


■Typical Performance Characteristic
XC6201P332


■Pin Configuration



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■Pin Assignment

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

■Product Classification

●Ordering Information

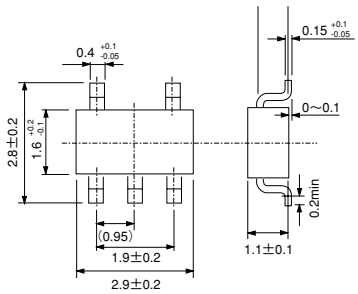
X C 6 2 0 1 P ③④⑤⑥

① ②

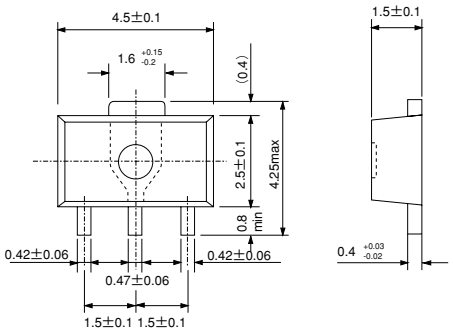
DESIGNATOR	SYMBOL	DESCRIPTION	DESIGNATOR	SYMBOL	DESCRIPTION
①	01	Indicates the product number	④	1/2	Output Voltage Accuracy e.g.1 : ±1.0% 2 : ±2.0%
②	P	Type of regulator 3-pin	⑤	M	Package Type：SOT-25
③	13～60	Output Voltage e.g. 30 : 3.0V 50 : 5.0V		P	：SOT-89
				T	：TO-92（Standard）
				L	：TO-92（Custom pin configuration）
			⑥	R	Embossed Tape:Standard Feed
				L	Embossed Tape:Reverse Feed
				H	Paper Type（TO-92）
				B	Bag（TO-92）

■Packaging Information

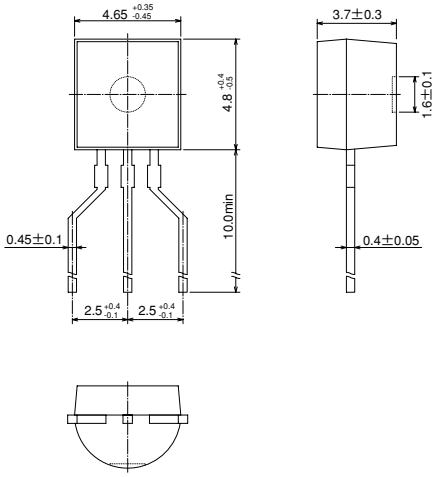
●SOT-25



●SOT-89

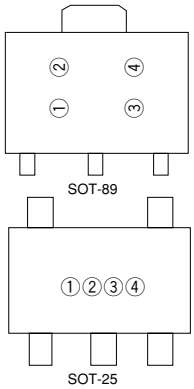


●TO-92



■Marking

●SOT-89, SOT-25



① Represents the product name

SYMBOL	PRODUCT NAME
1	XC6201PXXXXX

② Represents the type of regulator

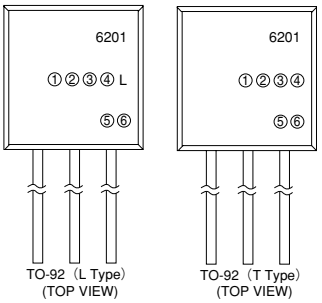
VOLTAGE（V）	0.1～3.0	3.1～6.0	6.1～9.0
SYMBOL	5	6	7

③ Represents the Output Voltage

SYMBOL	OUTPUT VOLTAGE (V)			SYMBOL	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 the assembly lot no.
0～9, A～Z repeated (G, I, J, O, Q, W excepted)

●TO-92



TO-92 (L Type)
(TOP VIEW)

TO-92 (T Type)
(TOP VIEW)

① Represents the type of regulator

DESIGNATOR	PRODUCT NAME
P	XC6201P*****
T	XC6201T*****

②③ Represents the Output Voltage

DESIGNATOR		VOLTAGE(V)	PRODUCT NAME
②	③		
3	3	3.3	XC6201*33***
5	0	5.0	XC6201*50***

④ Represents the Detect Voltage Accuracy

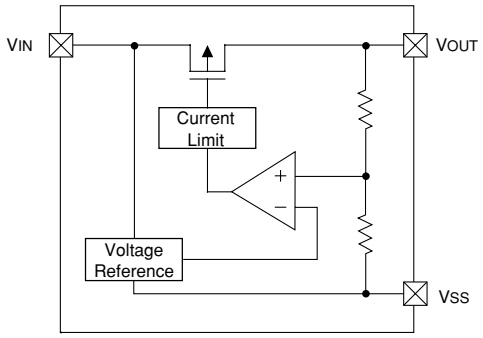
DESIGNATOR	DETECT VOLTAGE ACCURACY	PRODUCT NAME
1	within ±1%	XC6201P**1**
2	within ±2%	XC6201P**2**

⑤ Represents a least significant digit of the produced year

DESIGNATOR	Produced year
0	2000
1	2001

⑥ Denotes the production lot number
0 to 9, A to Z repeated(G.I.J.O.Q.W excepted)
Note : Character inversion is not used

■Block Diagram



■Absolute Maximum Ratings

Ta=25°C

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		VIN	12	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	
Operating Temp.		Topr	−40～+85	℃
Storage Temp.		Tstg	−55～+125	℃

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■Electrical Characteristics

XC6201P132 VOUT(T)=1.3V (Note 1)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note2)	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	ΔVOUT	VIN=2.3V 1mA≤IOUT≤30mA		10	30	mV	2
Dropout Voltage (Note 3)	Vdif1	IOUT=30mA		200	600	mV	2
	Vdif2	IOUT=60mA		500	810		
Supply Current	ISS	VIN=2.3V		3.0	5.0	μA	1
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	IOUT=10mA 2.3V≤VIN≤10.0V		0.2	0.3	%/V	2
Input Voltage	VIN		1.8		10	V	—
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	IOUT=40mA -40°C≤Topr≤85°C		±100		ppm /°C	2

XC6201P182 VOUT(T)=1.8V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note 2)	VIN=2.8V IOUT=40mA	1.764	1.800	1.836	V	2
Maximum Output Current	IOUTmax	VIN=2.8V VOUT(E)≥1.62V	80			mA	2
Load Regulation	ΔVOUT	VIN=2.8V 1mA≤IOUT≤40mA		10	30	mV	2
Dropout Voltage (Note 3)	Vdif1	IOUT=40mA		200	370	mV	2
	Vdif2	IOUT=80mA		450	710		
Supply Current	ISS	VIN=2.8V		3.0	5.0	μA	1
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	IOUT=40mA 2.8V≤VIN≤10.0V		0.2	0.3	%/V	2
Input Voltage	VIN		1.8		10	V	—
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	IOUT=40mA -40°C≤Topr≤85°C		±100		ppm /°C	2

XC6201P272 VOUT(T)=2.7V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	VOUT(E) (Note 2)	VIN=3.7V IOUT=40mA	2.646	2.700	2.754	V	2
Maximum Output Current	IOUTmax	VIN=3.7V VOUT(E)≥2.43V	100			mA	2
Load Regulation	ΔVOUT	VIN=3.7V 1mA≤IOUT≤60mA		15	40	mV	2
Dropout Voltage (Note 3)	Vdif1	IOUT=60mA		200	370	mV	2
	Vdif2	IOUT=120mA		450	710		
Supply Current	ISS	VIN=3.7V		2.0	5.0	μA	1
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	IOUT=40mA 3.7V≤VIN≤10.0V		0.2	0.3	%/V	2
Input Voltage	VIN		1.8		10	V	—
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	IOUT=40mA -40°C≤Topr≤85°C		±100		ppm /°C	2

XC6201P332 $V_{OUT}(T)$=3.3V (Note 1) Ta=25°C

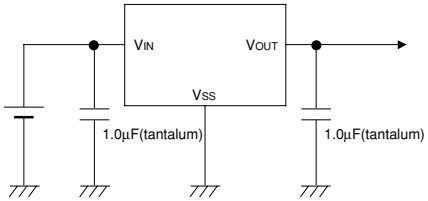
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	$V_{OUT}(E)$ (Note 2)	V_{IN}=4.3V I_{OUT}=40mA	3.234	3.300	3.366	V	2
Maximum Output Current	I_{OUT}max	V_{IN}=4.3V $V_{OUT}(E)\geq$2.97V	150			mA	2
Load Regulation	ΔV_{OUT}	V_{IN}=4.3V 1mA≤I_{OUT}≤80mA		20	50	mV	2
Dropout Voltage (Note 3)	Vdif1	I_{OUT}=80mA		200	360	mV	2
	Vdif2	I_{OUT}=160mA		450	700		
Supply Current	I_{SS}	V_{IN}=4.3V		2.0	5.0	μA	1
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	I_{OUT}=40mA 4.3V≤V_{IN}≤10.0V		0.2	0.3	%/V	2
Input Voltage	V_{IN}		1.8		10	V	—
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	I_{OUT}=40mA -40°C≤Topr≤85°C		±100		ppm /°C	2

XC6201P502 $V_{OUT}(T)$=5.0V (Note 1) Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	CIRCUIT
Output Voltage	$V_{OUT}(E)$ (Note 2)	V_{IN}=6.0V I_{OUT}=40mA	4.900	5.000	5.100	V	2
Maximum Output Current	I_{OUT}max	V_{IN}=6.0V $V_{OUT}(E)\geq$4.5V	200			mA	2
Load Regulation	ΔV_{OUT}	V_{IN}=6.0V 1mA≤I_{OUT}≤100mA		30	70	mV	2
Dropout Voltage (Note 3)	Vdif1	I_{OUT}=100mA		160	340	mV	2
	Vdif2	I_{OUT}=200mA		400	600		
Supply Current	I_{SS}	V_{IN}=6.0V		2.0	6.0	μA	1
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	I_{OUT}=40mA 6.0V≤V_{IN}≤10.0V		0.2	0.3	%/V	2
Input Voltage	V_{IN}		1.8		10	V	—
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	I_{OUT}=40mA -40°C≤Topr≤85°C		±100		ppm /°C	2

Note : 1. $V_{OUT}(T)$ = Specified Output Voltage.
2. $V_{OUT}(E)$ = Effective Output Voltage (i.e. the output voltage when "$V_{OUT}(T)$+1.0V" is provided while maintaining a certain I_{OUT} value).
3. Vdif = { V_{IN1} (Note5) - V_{OUT1} (Note4) }
4. V_{OUT1} = A voltage equal to 98% of the output voltage when a stabilised (V_{OUT} (T) + 1.0V) is input.
5. V_{IN1} = The input voltage at the time V_{OUT1} is output (input voltage has been gradually reduced).

■Typical Application Circuit



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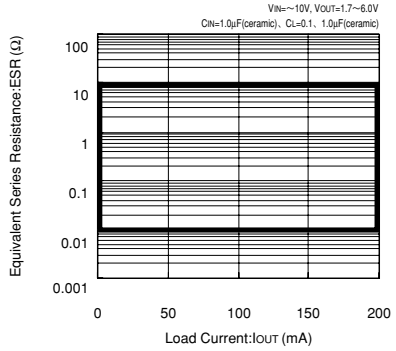
< External Capacitors>

The XC6201 requires an output capacitor between the VOUT pin and the VSS pin in order to obtain stable output voltages. Where output voltage is greater than 1.7V, the output capacitor (CL) used should be more than 0.1μF whether using tantalum or low ESR (ceramic, for example) capacitors. Where output voltage is between 1.3V ~ 1.6V, it is recommended that only a tantalum capacitor of more than 2.2μF be used on the output in order to stabilize operations.

Output Voltage	CIN	CL (tantalum)	CL (low ESR)
1.3V~1.6V	greater than 0.1μF	greater than 2.2μF	–
1.7V~6.0V	greater than 0.1μF	greater than 0.1μF	greater than 0.1μF



■Directions for use

●Notes on Use

1. Please use this IC within the stipulated absolute maximum ratings as the IC is liable to malfunction outside of such parameters. When the voltage on V_{OUT} is larger than that of V_{IN}, for example, when there are two power supply, please insert schottky diode between V_{OUT} and V_{IN} not to exceed the rating of V_{OUT}.
2. There is a possibility that oscillation may occur as a result of the impedance present between the power supply and the IC's input. Where impedance is 10Ω or more, please use a capacitor (C_{IN}) of at least 1μF.
   With a large output current, operations can be stabilised by increasing capacitor size (C_{IN}). If CIN is small and capacitor size (C_L) is increased, there is a possibility of oscillation due to input impedance.
   In such cases, operations can be stabilised by either increasing the size of C_{IN} or decreasing the size of C_L.
3. Please ensure that output current (I_{OUT}) is less than Pd ÷ (V_{IN} - V_{OUT}) and does not exceed the stipulated Continuous Total Power Dissipation value (Pd) for the package.

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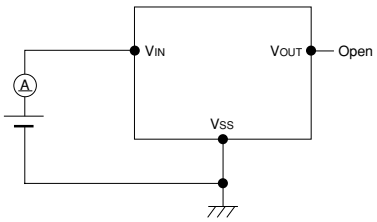
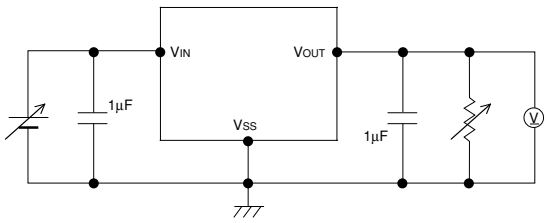
■Test Circuits

Measuring Circuit 1 : Supply Current



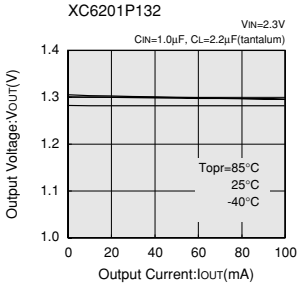
Measuring Circuit 2 : Output Voltage, Oscillation Check, Line Regulation, Dropout Voltage, Load Regulation



■Typical Performance Characteristics

(1) OUTPUT VOLTAGE vs. OUTPUT CURRENT

XC6201P132



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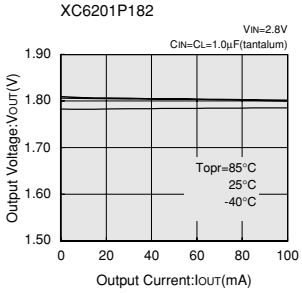
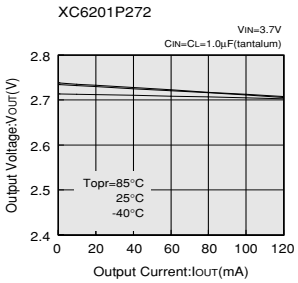


XC6201P272



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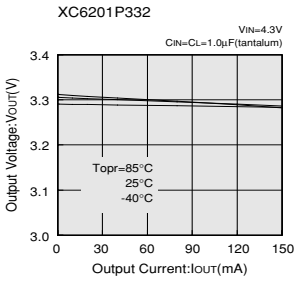
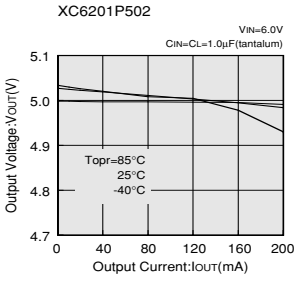
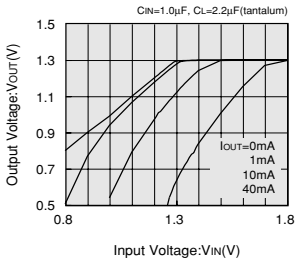


XC6201P502



(2) OUTPUT VOLTAGE vs. INPUT VOLTAGE

XC6201P132



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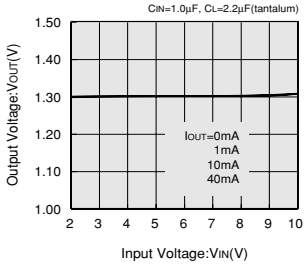

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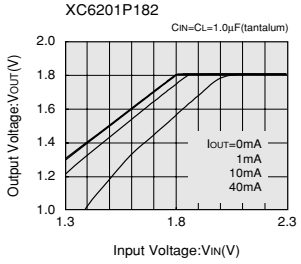

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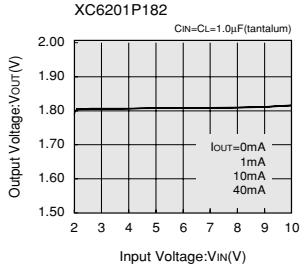

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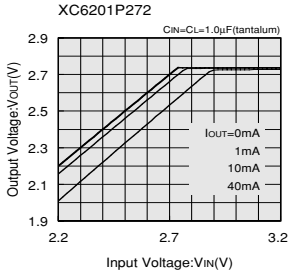

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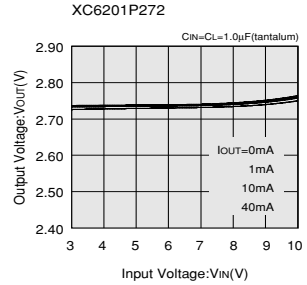

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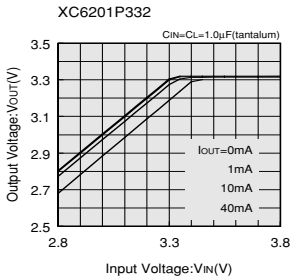

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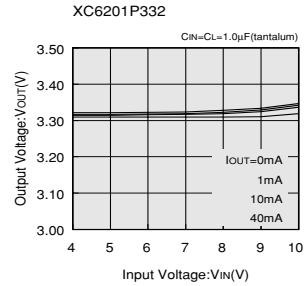

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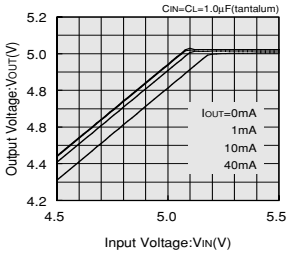
(2) OUTPUT VOLTAGE vs. INPUT VOLTAGE

XC6201P502



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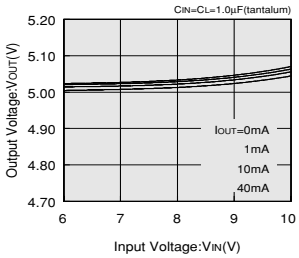

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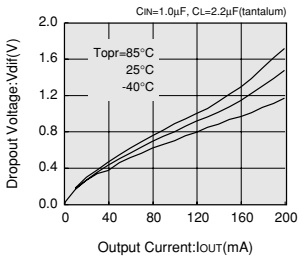
(3) DROPOUT VOLTAGE vs. OUTPUT CURRENT

XC6201P132



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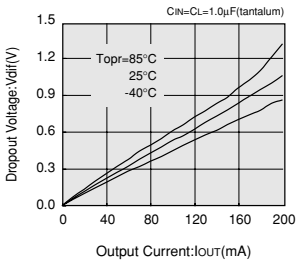

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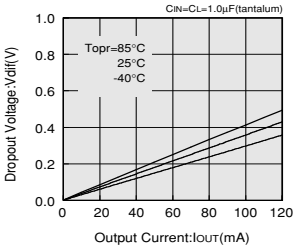

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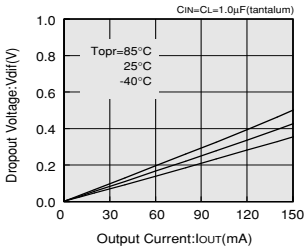

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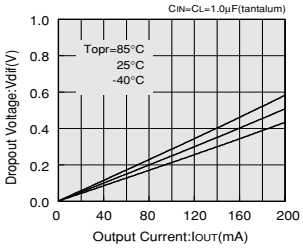

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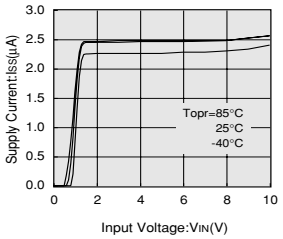
(4) SUPPLY CURRENT vs. INPUT VOLTAGE

XC6201P132



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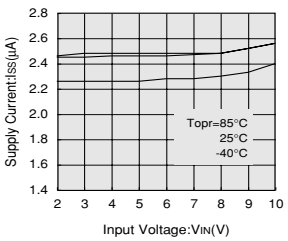

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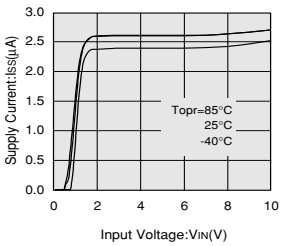

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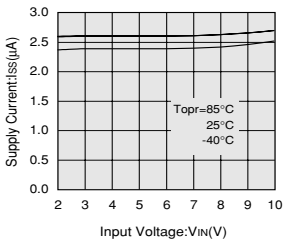

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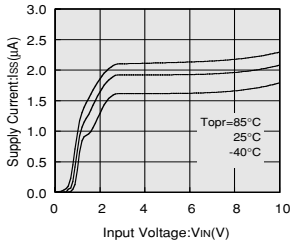

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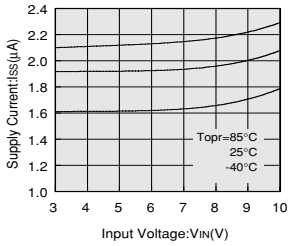

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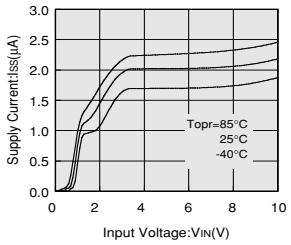

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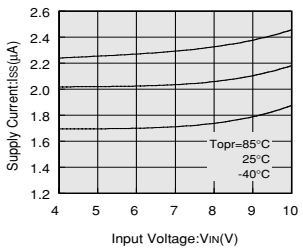
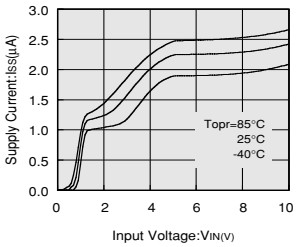


(4) SUPPLY CURRENT vs. INPUT VOLTAGE

XC6201P502



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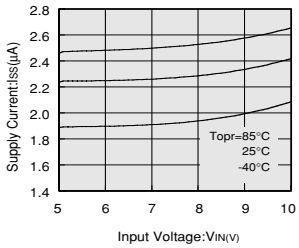

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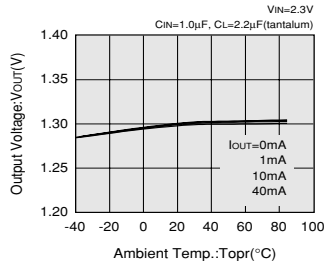
(5) OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE

XC6201P132



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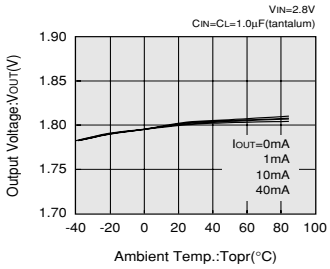

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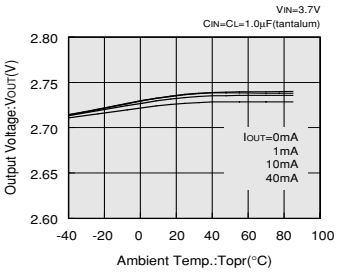

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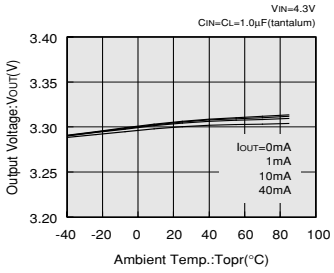

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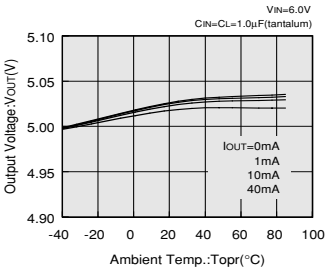
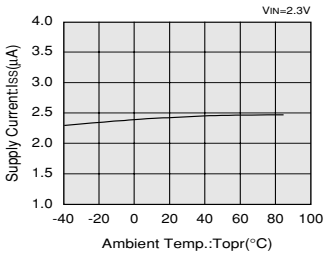


(6) SUPPLY CURRENT vs. AMBIENT TEMPERATURE

XC6201P132



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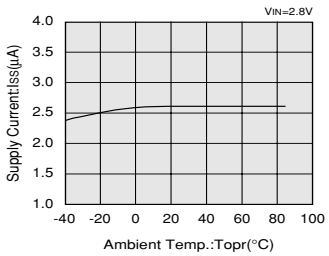

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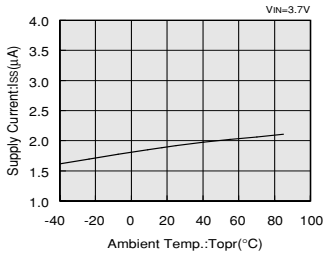

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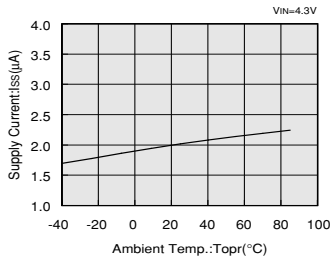

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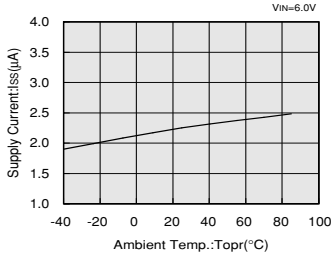

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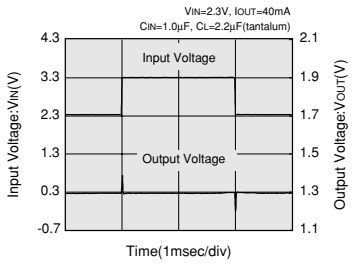
(7) INPUT TRANSIENT RESPONSE

XC6201P132



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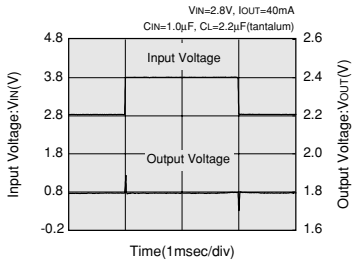

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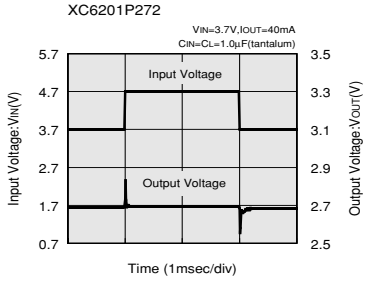

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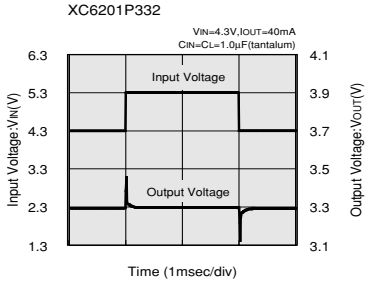

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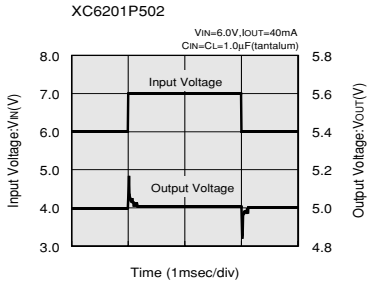
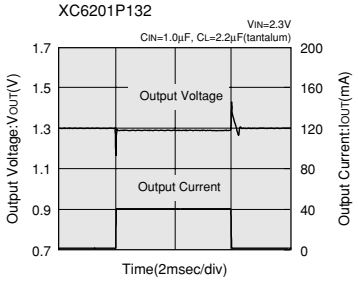


(8) LOAD TRANSIENT RESPONSE

XC6201P132



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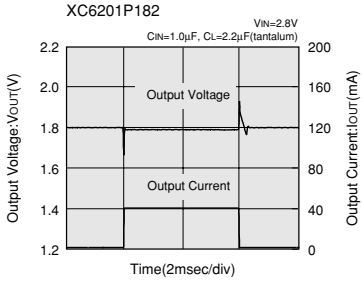

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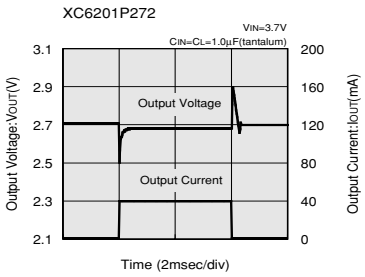

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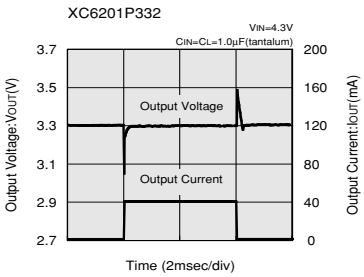

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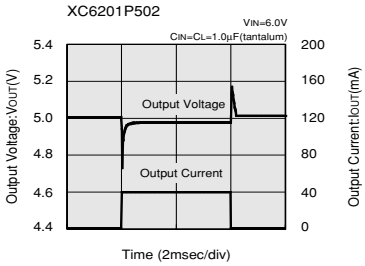

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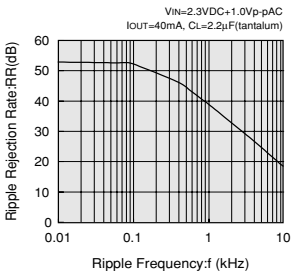
(9) RIPPLE REJECTION RATE

XC6201P132



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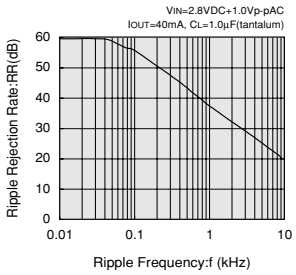

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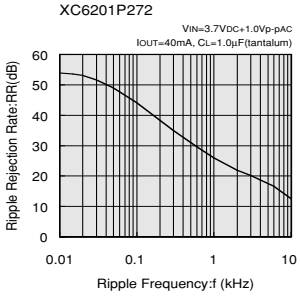

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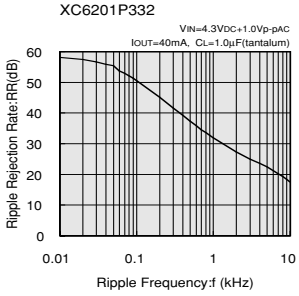

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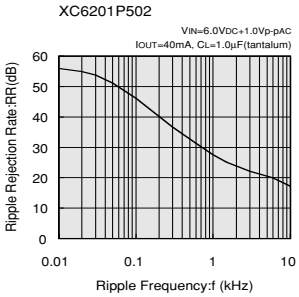

(10) OUTPUT NOISE DENSITY

XC6201P302