XC6206 Series

ETR0305_002

Low ESR Cap.Compatible Positive Voltage Regulators

■ 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 0.1V increments within a range of 1.2V to 5.0V.
SOT-23, SOT-89, TO-92 and USP-6B packages are available.

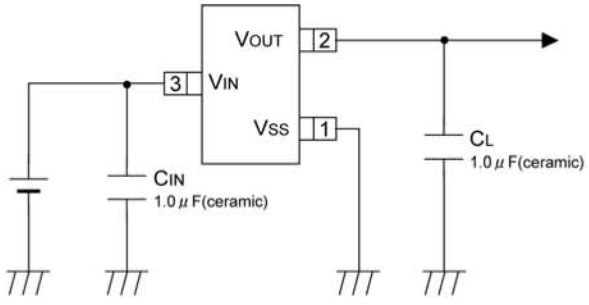
■ APPLICATIONS

- Battery powered equipment
- Reference voltage sources
- Cameras, video cameras
- Portable AV systems
- Mobile phones
- Portable games
- Cordless phones, wireless communication equipment

■ FEATURES

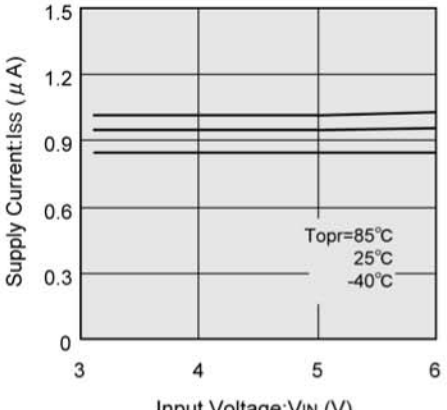
CMOS	
Maximum Output Current	: 250mA (5.0V type)
Dropout Voltage	: 250mV @ 100mA (3.0V type)
Maximum Operating Voltage	: 6.0V
Output Voltage Range	: 1.2V ~ 5.0V (0.1V increments)
Highly Accurate	: Fixed voltage accuracy ± 2% (±30mV@VOUT<1.5V) (±1% @VOUT≧2.0V)
Low Power Consumption	: 1.0μA (TYP.)
Operating Temperature Range	: -40°C ~ 85°C
Low ESR Capacitor	: Ceramic capacitor compatible
Current Limit Circuit Built-in	
Ultra Small Package	: SOT-23 (250mW) SOT-89 (500mW) TO-92 (300mW) USP-6B (100mW)

■ TYPICAL APPLICATION CIRCUIT

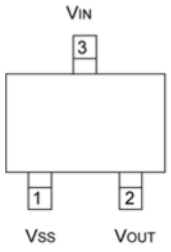


■ TYPICAL PERFORMANCE CHARACTERISTICS

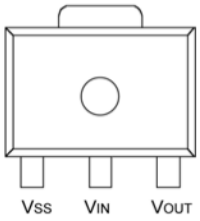
XC6206P302



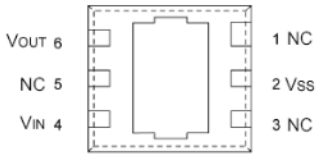
■ PIN CONFIGURATION



SOT-23
(TOP VIEW)

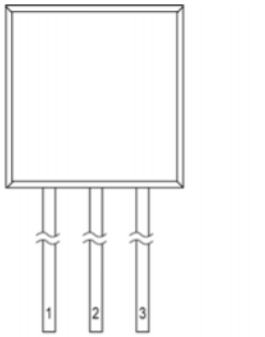


SOT-89
(TOP VIEW)



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 pin number 4 (V_{IN}).



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

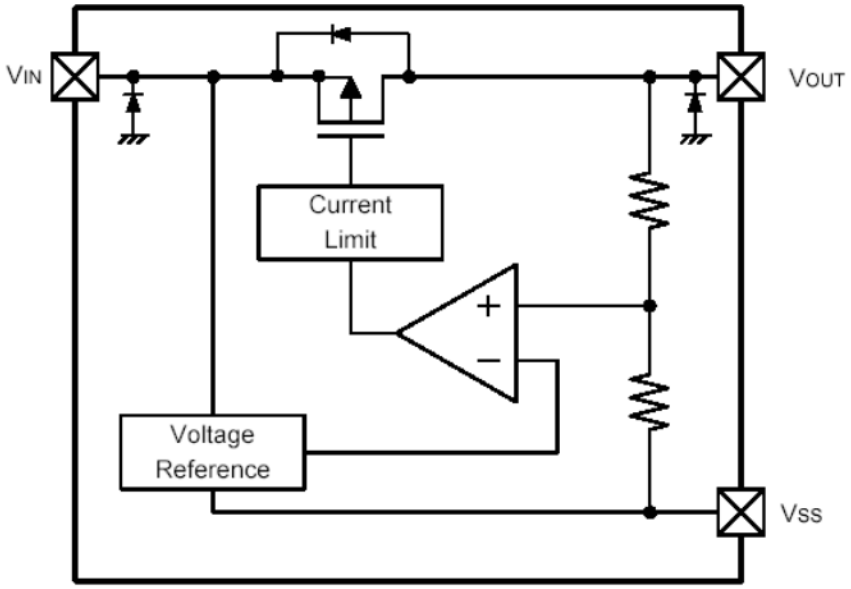
● Ordering Information

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	Packages	M	: SOT-23
		P	: SOT-89
		D	: USP-6B
		T	: TO-92 (T type)
		L	: TO-92 (L type) (Discontinued Product)
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.

■ BLOCK DIAGRAM



*Diodes inside the circuit are an ESD protection diode and a parasitic diode.

■ 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

● XC6206P series

Ta=25 °C

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

NOTE:

* 1 : $V_{OUT(T)}$ = Specified output voltage
* 2 : $V_{OUT(E)}$ = Effective output voltage (Ie. The output voltage when "$V_{OUT(T)}$+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.)
* 3 : Vdif = {V_{IN} 1(*5) -V_{OUT} 1(*4) }
* 4 : V_{OUT1} = A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} {$V_{OUT(T)}$ + 1.0V} is input.
* 5 : V_{IN1} = The input voltage when V_{OUT1} appears as input voltage is gradually decreased.
* 6 : Unless otherwise stated, V_{IN} = $V_{OUT(T)}$ + 1.0V
* 7 : When $V_{OUT(T)}$≧1.5V, accuracy is ±2%.
  When $V_{OUT(T)}$<1.5V, accuracy is MIN.:$V_{OUT(T)}$ -30mV / MAX.:$V_{OUT(T)}$ +30mV
  ±1% accuracy (MIN.: $V_{OUT(T)}$ x 0.99 / MAX.:$V_{OUT(T)}$ x 1.01) is set at $V_{OUT(T)}$≧2.0V

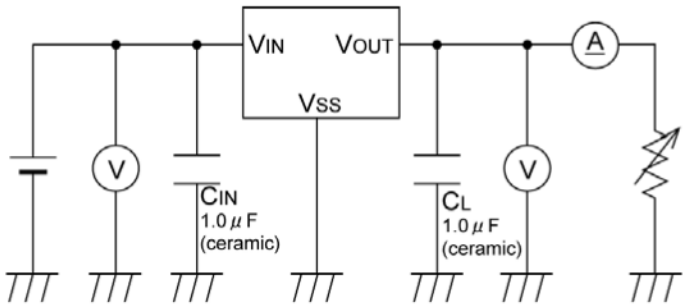
■ ELECTRICAL CHARACTERISTICS (Continued)

● Electrical Characteristics Chart

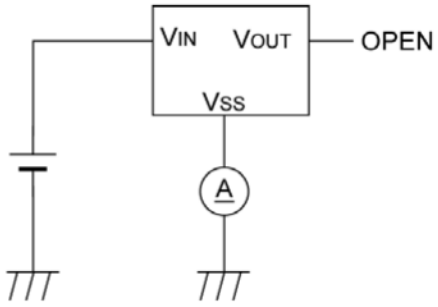
	E-1				E-2	E-3	E-4		E-5		E-6
PARAMETER / SETTING VOLTAGE	OUTPUT VOLTAGE				MAX. OUTPUT CURRENT	LOAD REGULATION	DROPOUT VOLTAGE 1		DROPOUT VOLTAGE 2		SHORT CURRENT
	2% ACCURACY		1% ACCURACY								
$V_{OUT(T)}$	$V_{OUT(E)}$ (V)		$V_{OUT(E)}$ (V)		I_{OUTMAX} (mA)	$\triangle V_{OUT}$ (mV)	Vdif1 (mV)		Vdif2 (mV)		Ishort (mA)
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	TYP.
1.2	1.170	1.230	Not Available		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

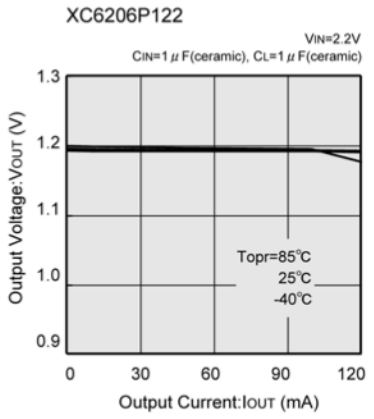


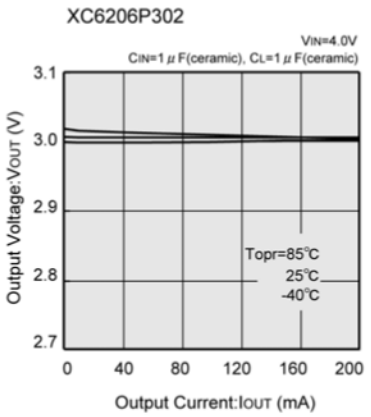
Circuit ②

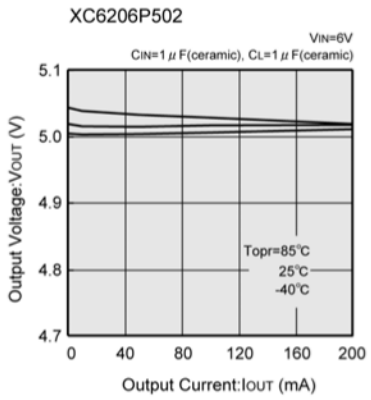


■ TYPICAL PERFORMANCE CHARACTERISTICS

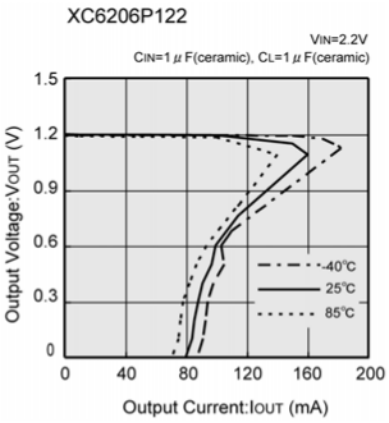
(1) Output Voltage vs. Output Current

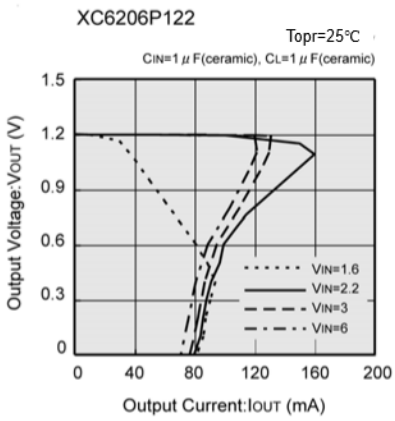


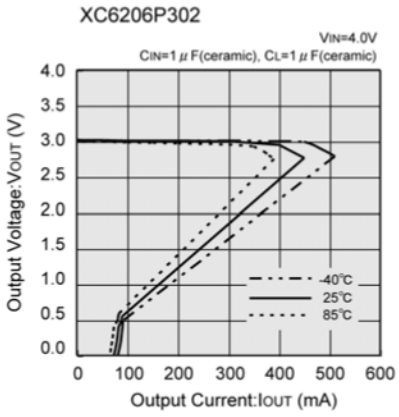


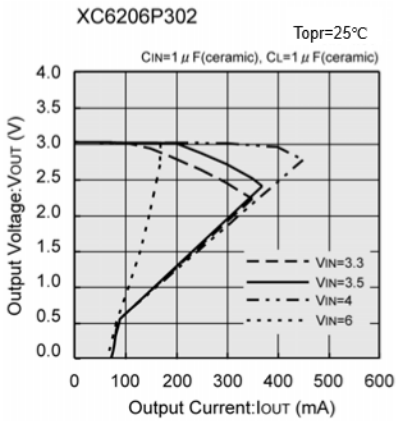


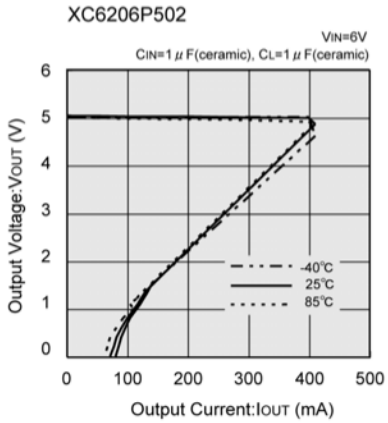
(2) Current Limit

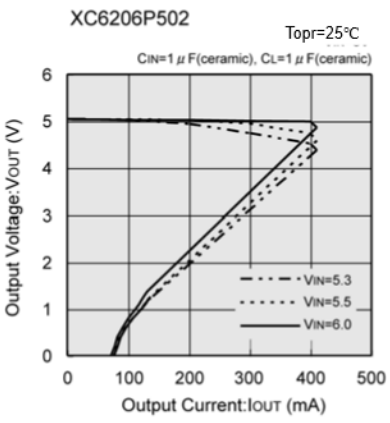






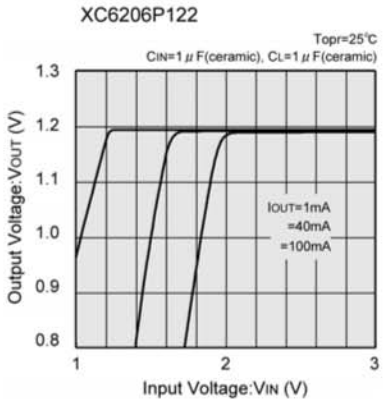


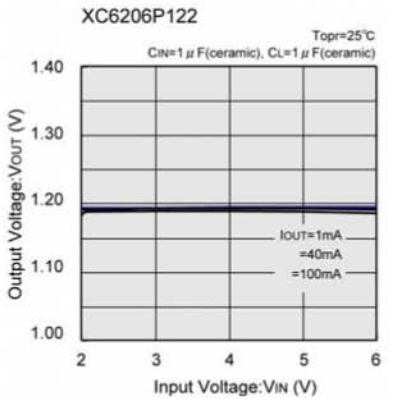


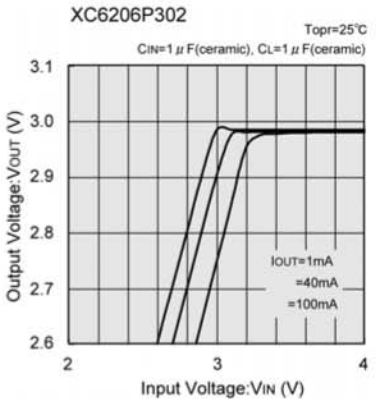


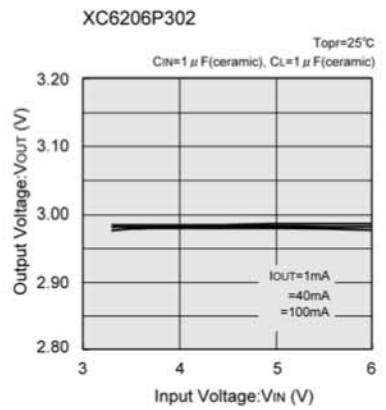
■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

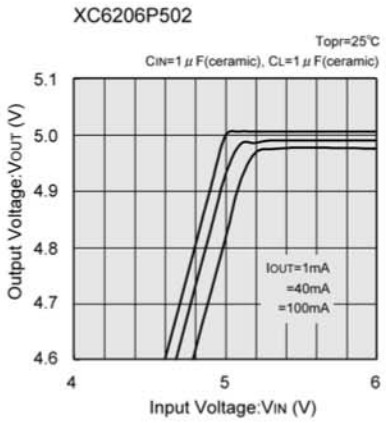
(3) Output Voltage vs. Input Voltage

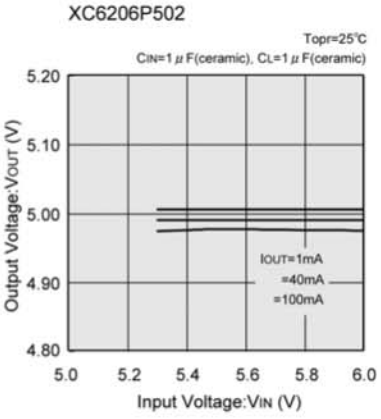




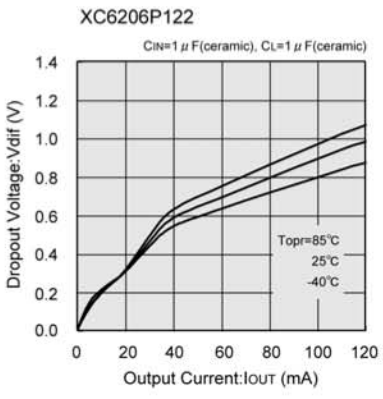


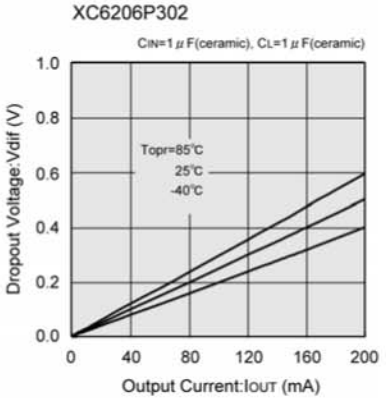


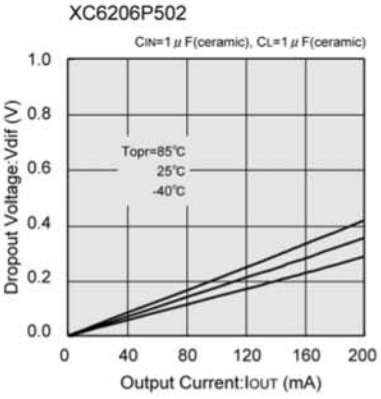




(4) Dropout Voltage vs. Output Current







■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) Supply Current vs. Input Voltage

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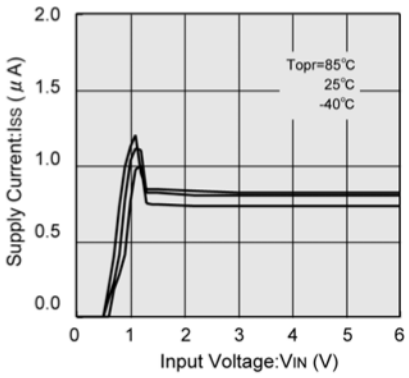

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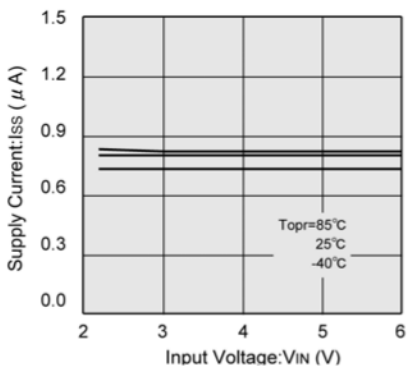

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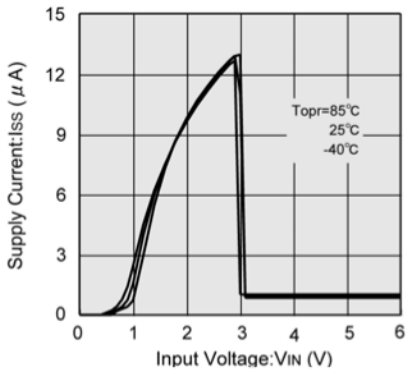

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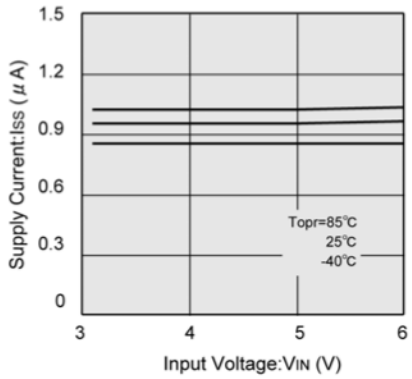
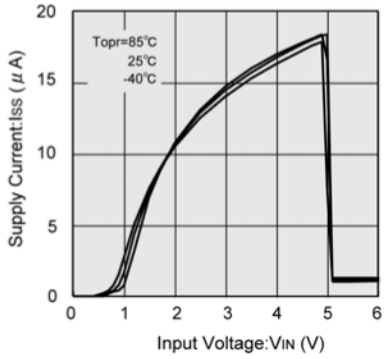


XC6206P502



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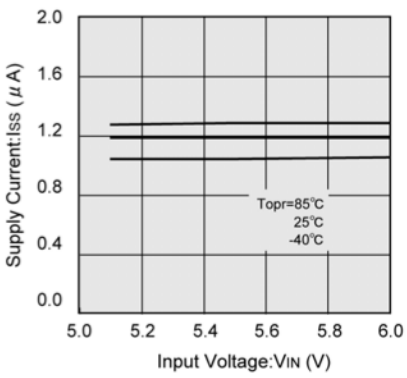
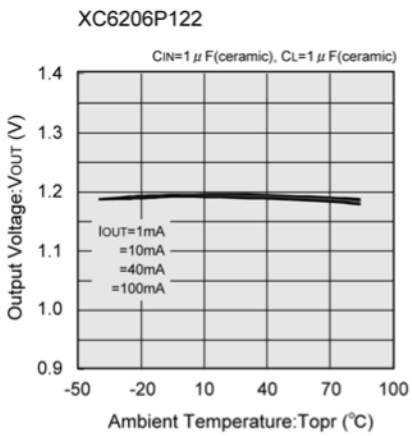


(6) Output Voltage vs. Ambient Temperature

XC6206P122



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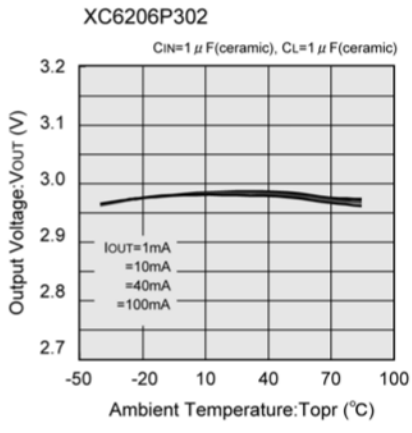
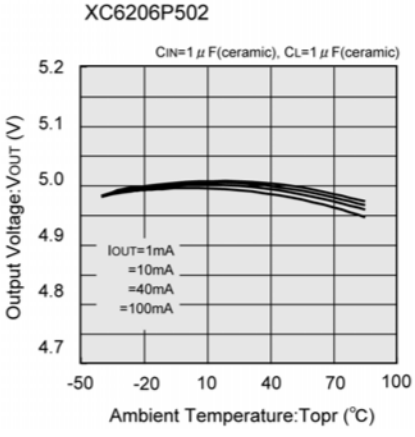


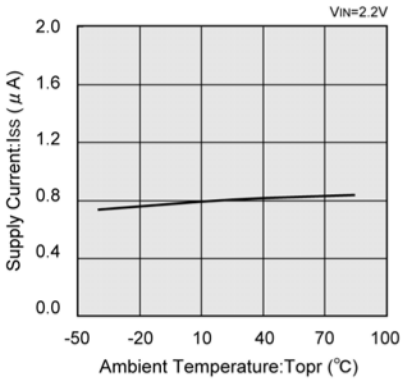
XC6206P502



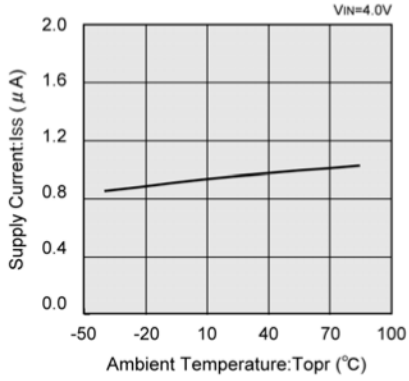
■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Output Voltage vs. Ambient Temperature

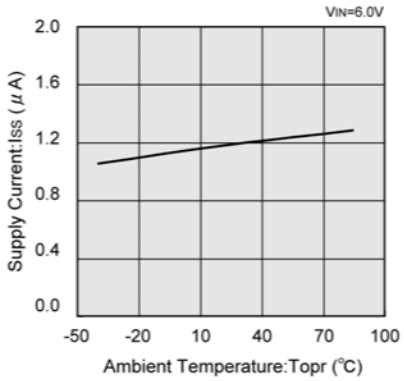
XC6206P122



XC6206P302

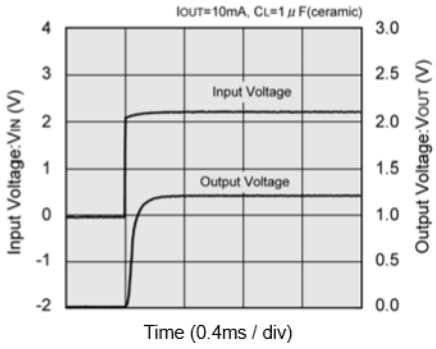


XC6206P502

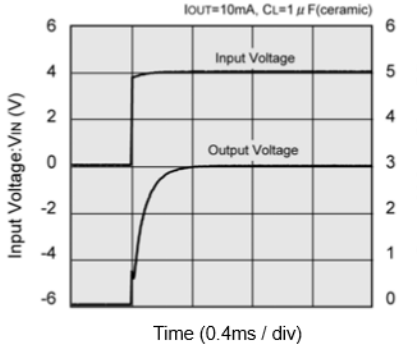


(8) Input Transient Response 1

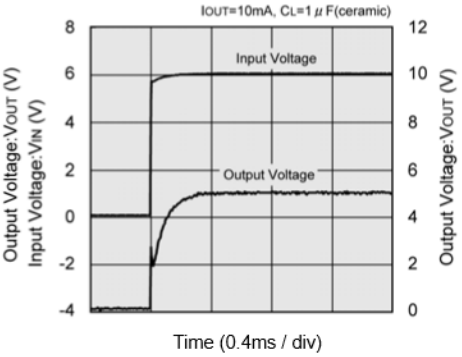
XC6206P122



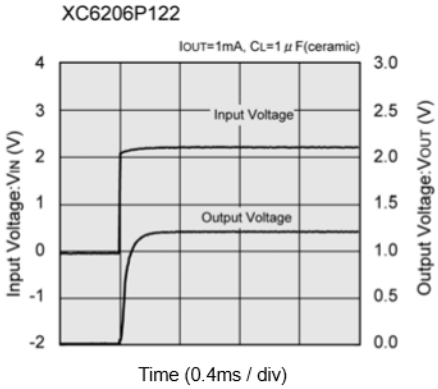
XC6206P302



XC6206P502



XC6206P122



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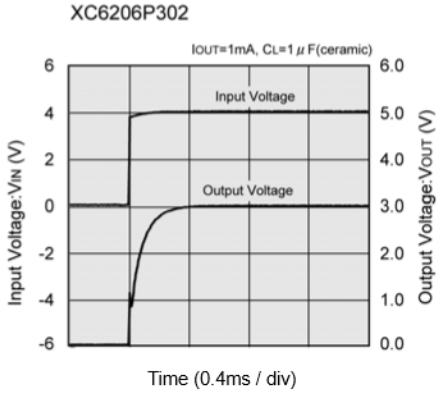
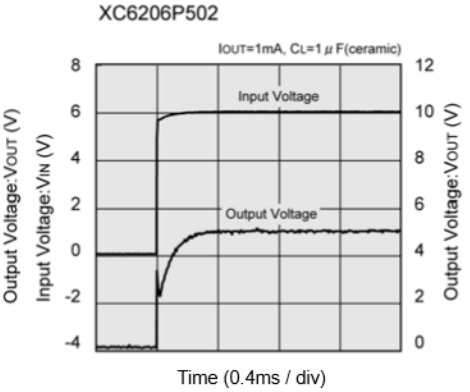
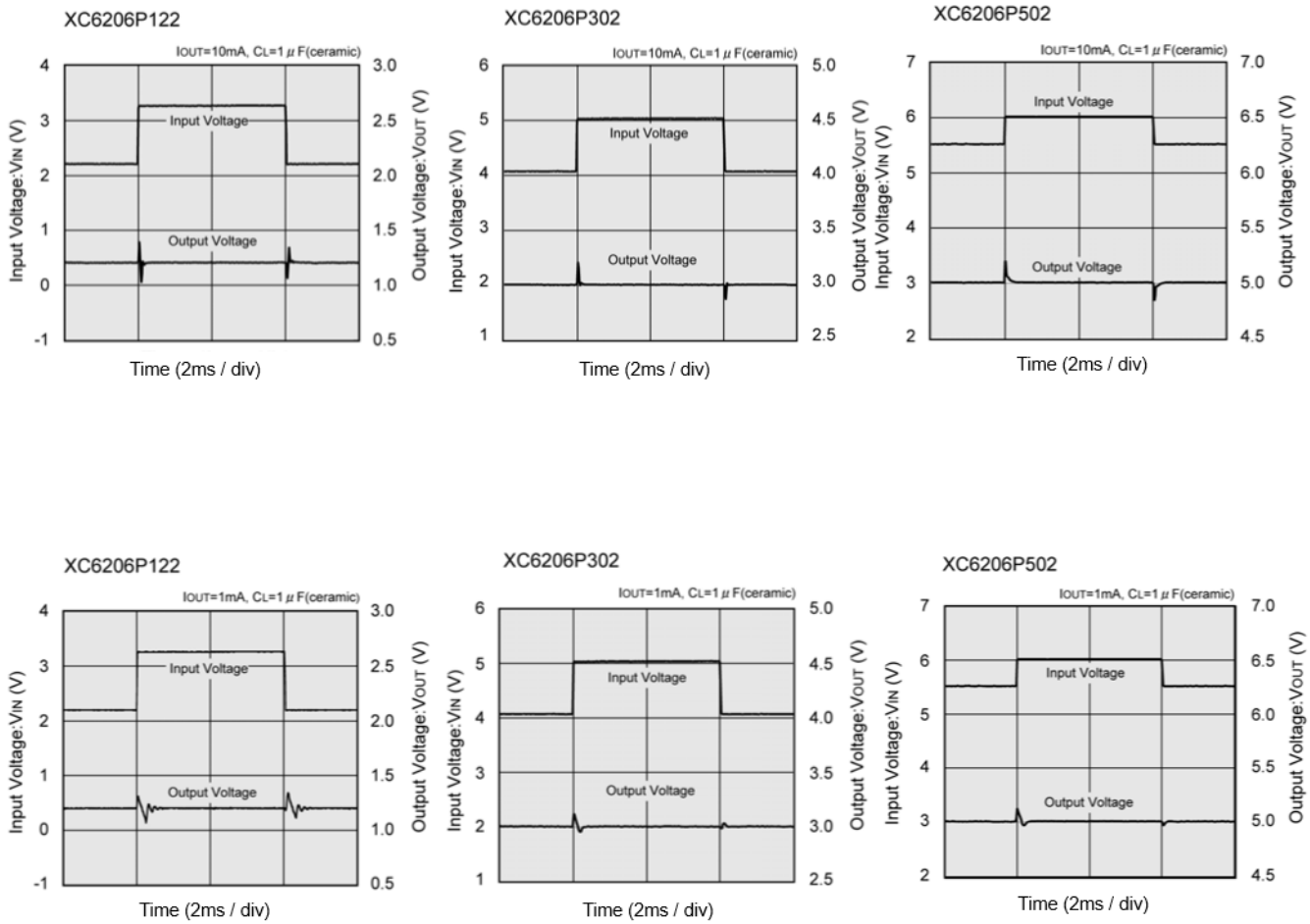


XC6206P502

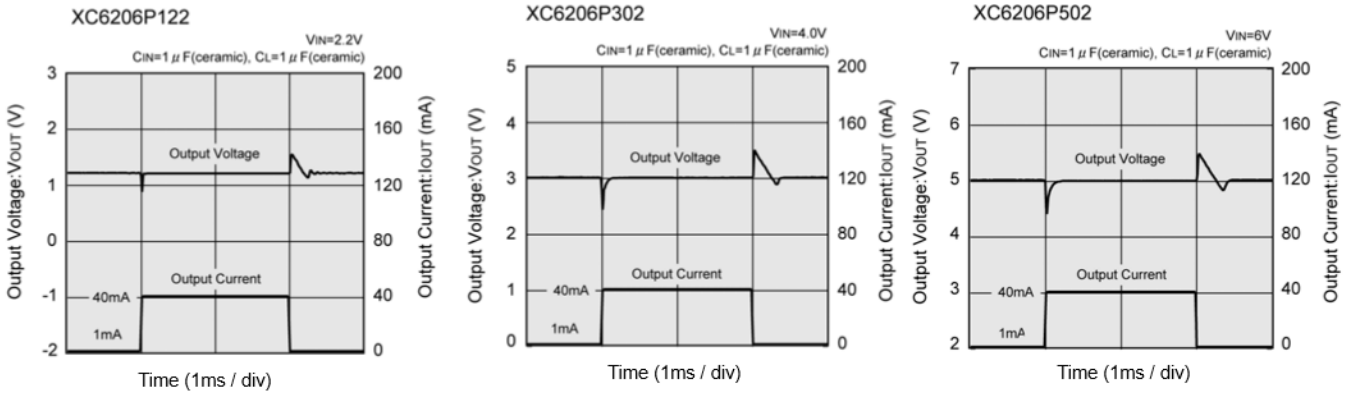


■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Input Transient Response 2

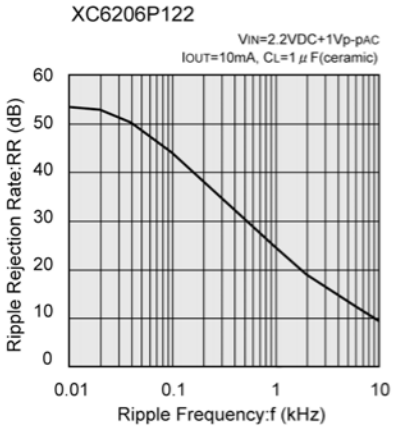


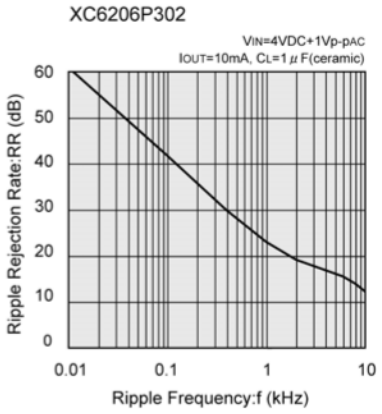
(10) Load Transient Response

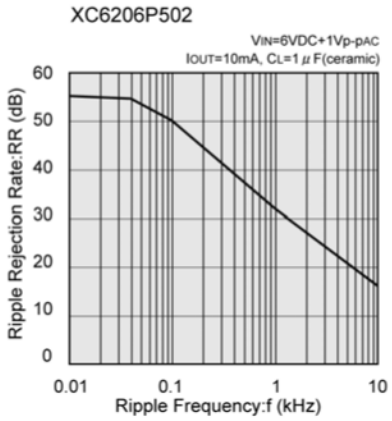


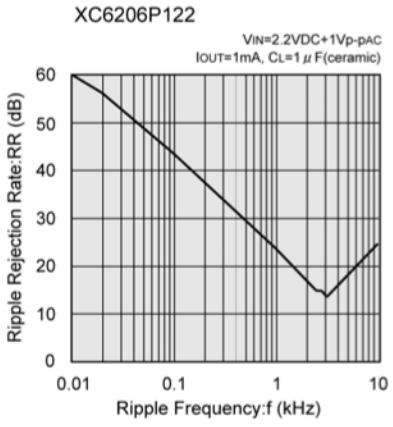
■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

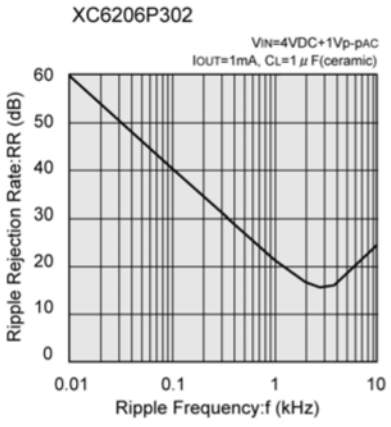
(11) Ripple Rejection Rate

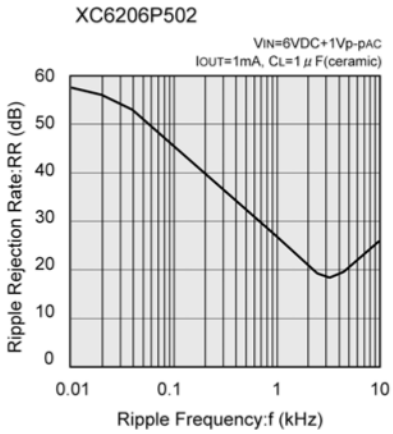






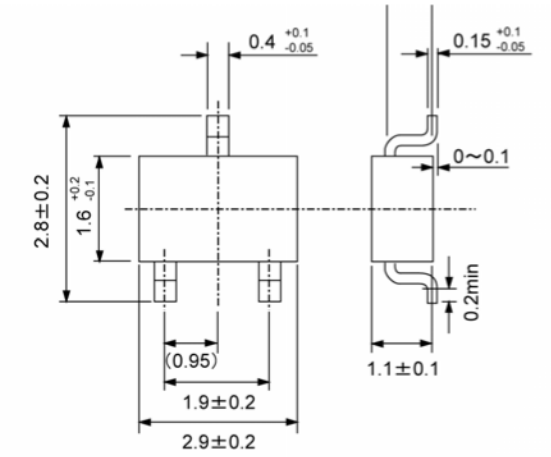




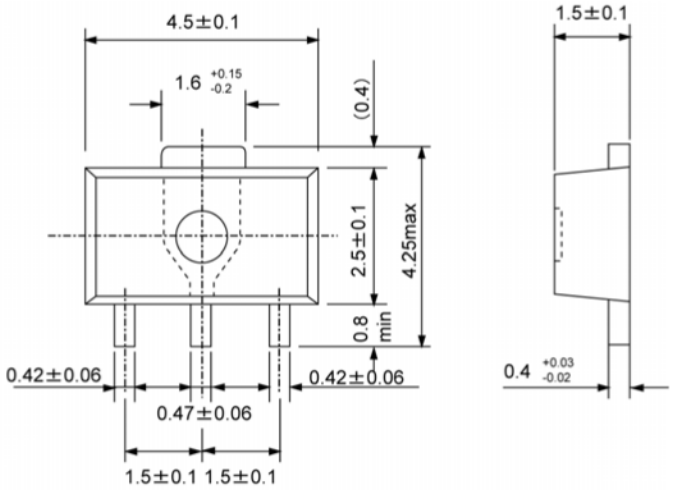


■ PACKAGING INFORMATION

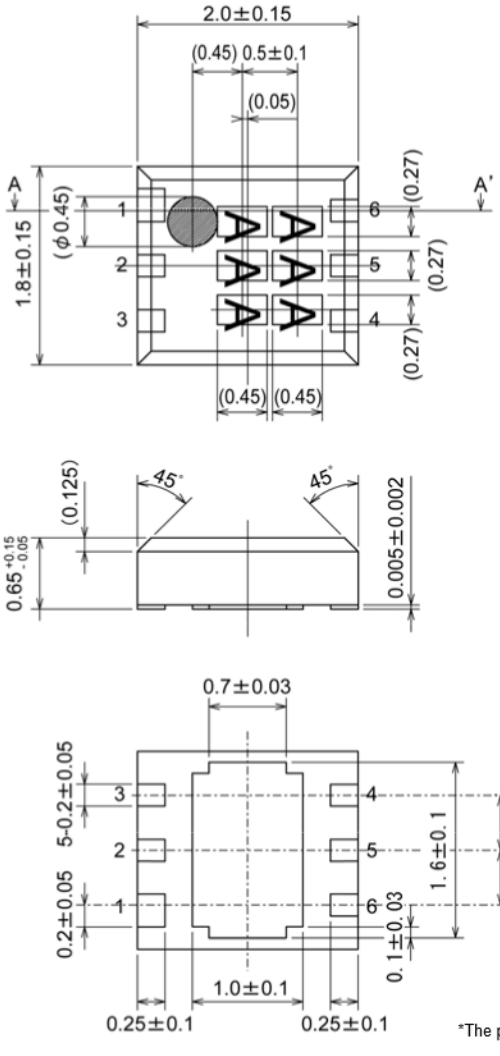
● SOT-23



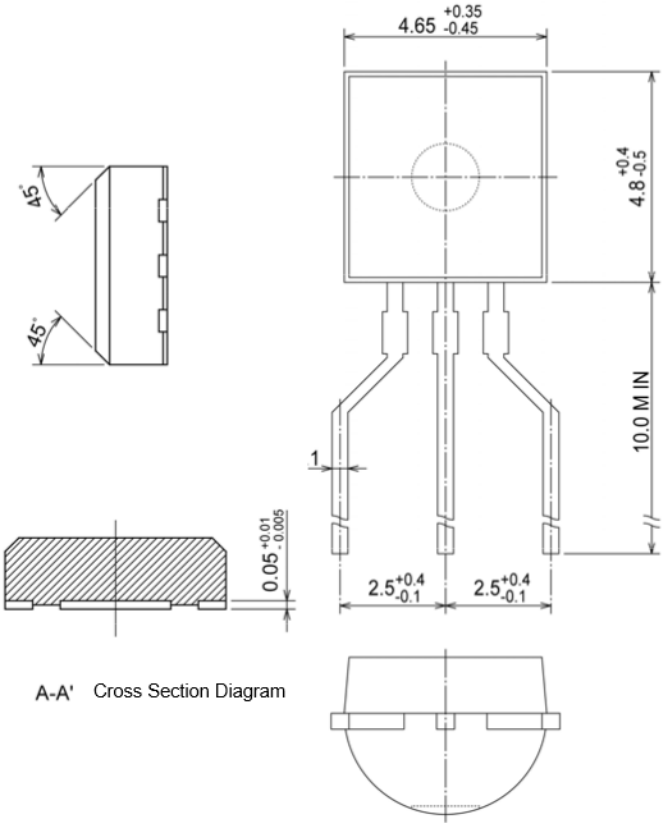
● SOT-89



● USP-6B



● TO-92

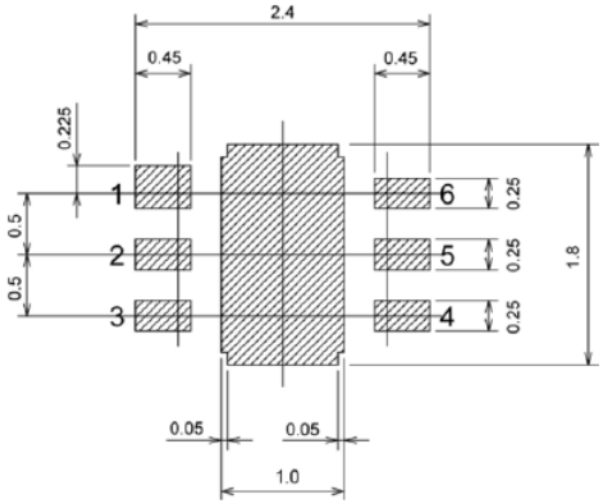


A-A' Cross Section Diagram

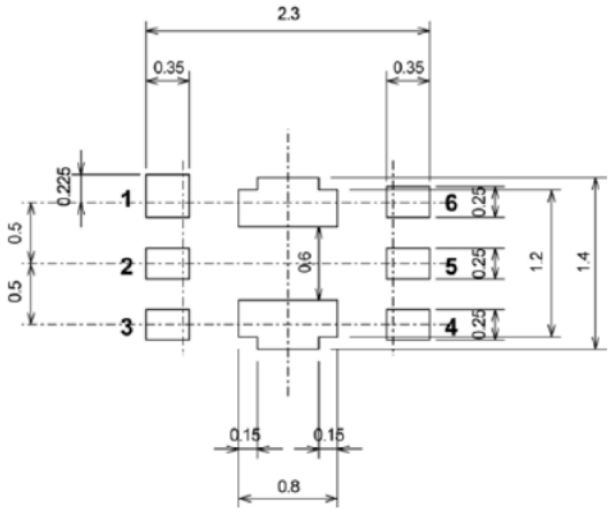
*The pin number 1 is larger than the other pins

■ PACKAGING INFORMATION (Continued)

● USP-6B Reference Pattern Layout

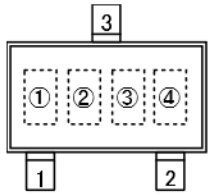


● USP-6B Reference Metal Mask Design

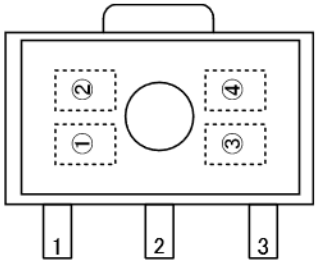


■ MARKING RULE

● SOT-23, SOT-89



SOT-23
(TOP VIEW)



SOT-89
(TOP VIEW)

①Represents product number

MARK	PRODUCT SERIES
6	XC6206P*****

②Represents 3 pins regulator

MARK		PRODUCT SERIES
VOLTAGE = 0.1 ~ 3.0V	VOLTAGE = 3.1 ~ 6.0V	
5	6	XC6206P*****

③Represents output voltage

MARK	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	-	-

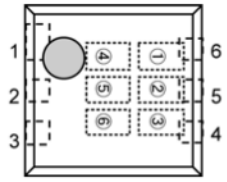
④Represents production lot number

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

*No character inversion used.

■ MARKING RULE (Continued)

● USP-6B



USP-6B
(TOP VIEW)

①②Represents product number

MARK		PRODUCT SERIES
①	②	
0	6	XC6206P***D*

③Represents 3 pins regulator

MARK	PRODUCT SERIES
P	XC6206P***D*

④⑤Represents output voltage

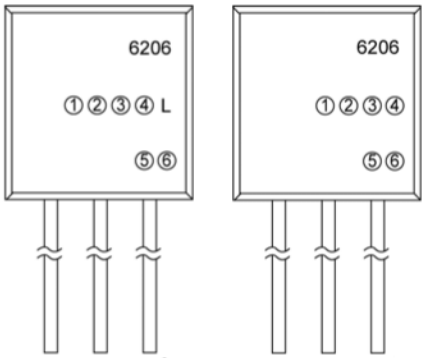
MARK		OUTPUT VOLTAGE(V)	PRODUCT SERIES
④	⑤		
3	3	3.3	XC6206P33*D*
5	0	5.0	XC6206P50*D*

⑥Represents production lot number

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

*No character inversion used.

● TO-92



TO-92 (L Type)
(TOP VIEW)

TO-92 (T Type)
(TOP VIEW)

①Represents type of regulator

MARK	PRODUCT SERIES
P	XC6206P*****

②③Represents output voltage

MARK		VOLTAGE (V)	PRODUCT SERIES
②	③		
3	3	3.3	XC6206P33***
5	0	5	XC6206P50***

④Represents detect voltage accuracy

MARK	DETECT VOLTAGE ACCURACY	PRODUCT SERIES
1	Within ± 1%	XC6206P**1**
2	Within ± 2%	XC6206P**2**

⑤Represents least significant digit of the production year

MARK	PRODUCTION YEAR
3	2003
4	2004

⑥Represents production lot number

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

*No character inversion used.

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2. We assume no responsibility for any infringement of patents, patent rights, or other rights arising from the use of any information and circuitry in this datasheet.
3. Please ensure suitable shipping controls (including fail-safe designs and aging protection) are in force for equipment employing products listed in this datasheet.
4. The products in this datasheet are not developed, designed, or approved for use with such equipment whose failure of malfunction can be reasonably expected to directly endanger the life of, or cause significant injury to, the user.
   (e.g. Atomic energy; aerospace; transport; combustion and associated safety equipment thereof.)
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