

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 current 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

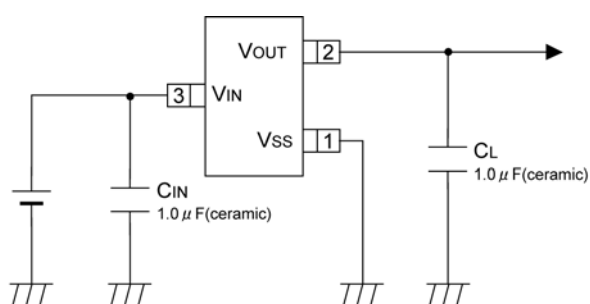
■FEATURES

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 $\pm 2\%$ ($\pm 30\text{mV}$ @ $V_{\text{OUT}} < 1.5\text{V}$) ($\pm 1\%$ @ $V_{\text{OUT}} \geq 2.0\text{V}$)

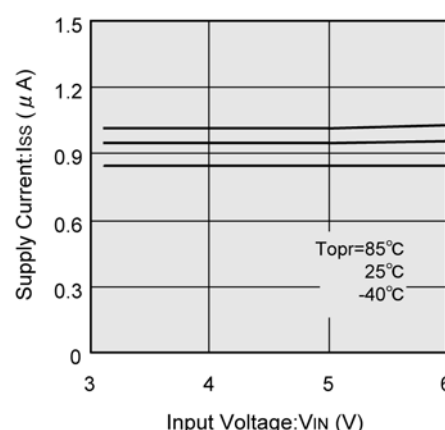
Low Power Consumption	: 1.0 μA (TYP.)
Operating Temperature Range	: -40°C ~ 85°C
Low ESR Capacitor	: Ceramic capacitor compatible
Current Limit Circuit Built-in	
Ultra Small Package	: SOT-23 (250mW) SOT-89 (500mW) TO-92 (300mW) USP-6B (100mW)

■TYPICAL APPLICATION CIRCUIT

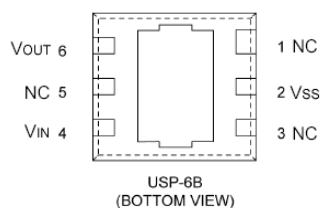
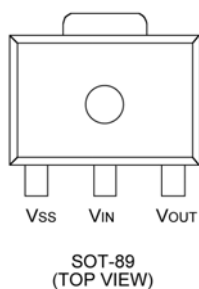
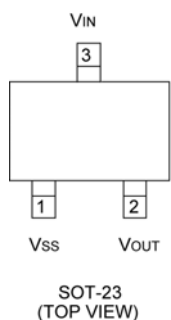


■TYPICAL PERFORMANCE CHARACTERISTICS

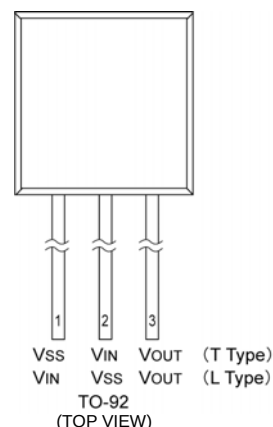
XC6206P302



PIN CONFIGURATION



*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}).



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

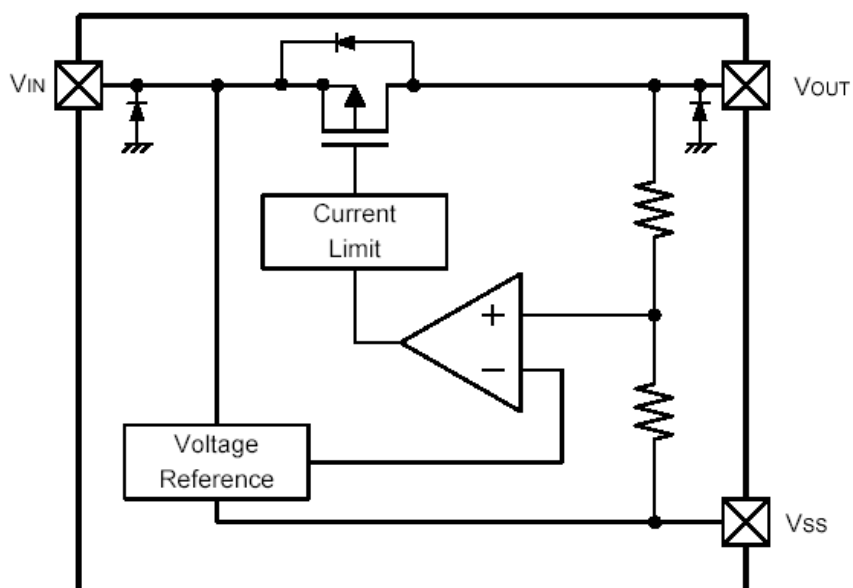
Ordering Information

XC6206P ①②③④⑤

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①②	Output Voltage	12~50	: e.g. VOUT: 3.0V→①=3, ②=0
③	Accuracy	2	: Within $\pm 2\%$ (within $\pm 30\text{mV}$ when $V_{OUT} < 1.5\text{V}$)
		1 *	: Within $\pm 1\%$
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)

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

■ 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		V _{IN}	7.0	V
Output Current		I _{OUT}	500 *	mA
Output Voltage		V _{OUT}	V _{SS} - 0.3 ~ V _{IN} + 0.3	V
Power Dissipation	SOT-23	P _d	250	mW
	SOT-89		500	
	USP-6B		100	
	TO-92		300	
Operating Temperature Range		T _{opr}	- 40 ~ + 85	°C
Storage Temperature Range		T _{stg}	- 55 ~ + 125	°C

* I_{OUT}=P_d / (V_{IN}-V_{OUT})

ELECTRICAL CHARACTERISTICS

XC6206P series

Ta=25 °C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage ^(*)	V _{OUT(E)} ^(*)	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	ΔV _{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	V _{dif1}	I _{OUT} =30mA	-	E-4		mV	①
	V _{dif2}	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	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	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	$\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot V_{OUT}}$	I _{OUT} =30mA -40 °C≤T _{opr} ≤85 °C	-	±100	-	ppm/°C	①
Short Circuit Current	I _{short}	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 (I.e. The output voltage when "V_{OUT(T)}+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.)
- * 3 : V_{dif} = {V_{IN} 1^(*) - V_{OUT} 1^(*)}
- * 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

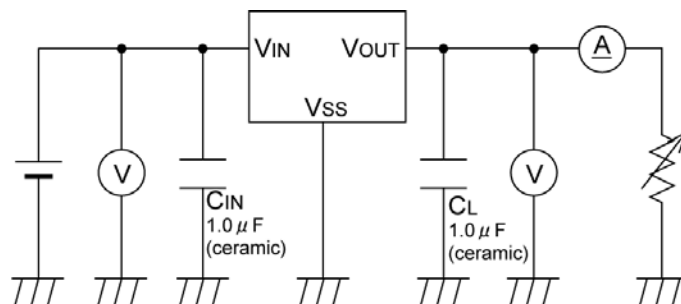
■ ELECTRICAL CHARACTERISTICS (Continued)

● Electrical Characteristics Chart

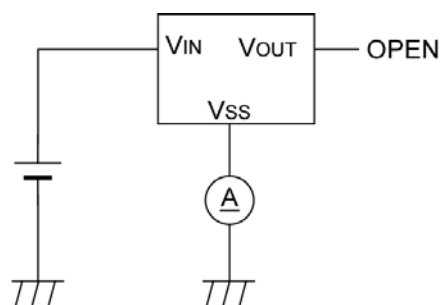
	E-1				E-2	E-3	E-4		E-5		E-6										
PARAMETER SETTING VOLTAGE	OUTPUT VOLTAGE				MAX. OUTPUT CURRENT	LOAD REGULATION	DROPOUT VOLTAGE 1		DROPOUT VOLTAGE 2		SHORT CURRENT										
	2% ACCURACY		1% ACCURACY																		
VOUT(T)	VOUT(E) (V)		VOUT(E) (V)		IOUTMAX (mA)	ΔVout (mV)	Vdif1 (mV)		Vdif2 (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			300	510	450	810													
1.6	1.568	1.632			250	450															
1.7	1.666	1.734			200	410															
1.8	1.764	1.836			150	390		780	130												
1.9	1.862	1.938			120					50		100		370							
2.0	1.960	2.040	1.980	2.020			350									710					
2.1	2.058	2.042	2.079	2.121																	
2.2	2.156	2.244	2.178	2.222																	
2.3	2.254	2.346	2.277	2.323																	
2.4	2.352	2.448	2.376	2.424																	
2.5	2.450	2.550	2.475	2.525	150	55	75	350	250	680											
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						60	320	200	630						
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		65															
3.5	3.430	3.570	3.465	3.535																	
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	250	70															
3.9	3.822	3.978	3.861	3.939																	
4.0	3.920	4.080	3.960	4.040																	
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		75	60	320	200	630											
4.4	4.312	4.488	4.356	4.444																	
4.5	4.410	4.590	4.455	4.545																	
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

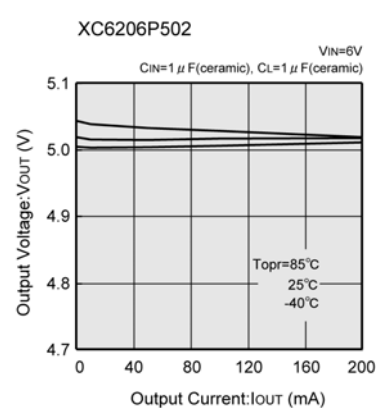
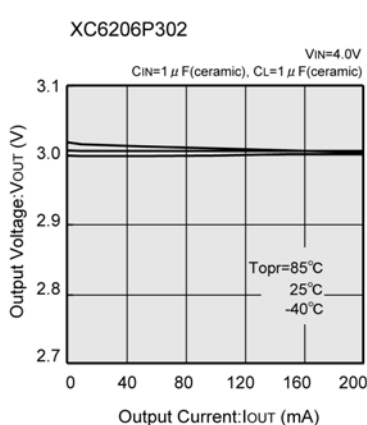
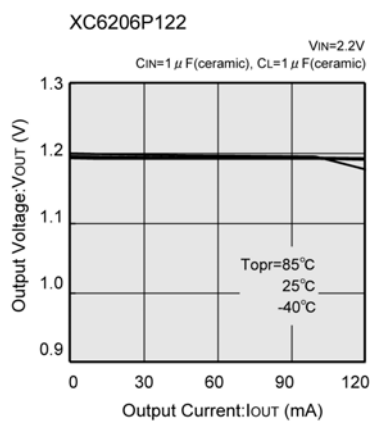


Circuit ②

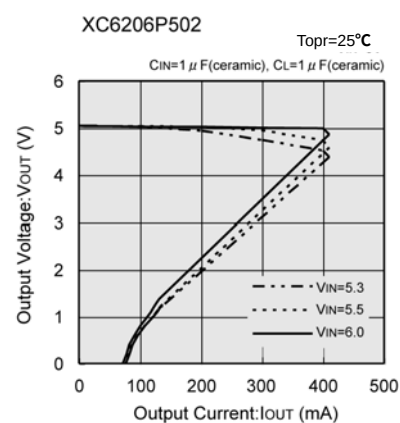
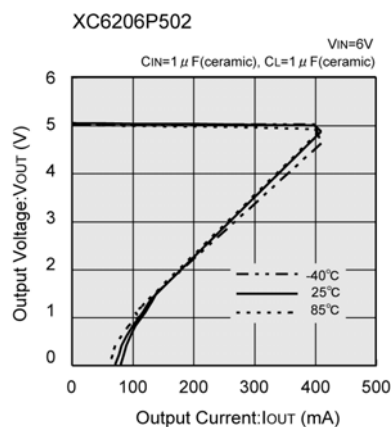
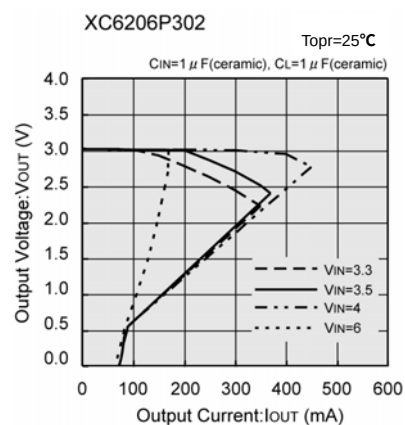
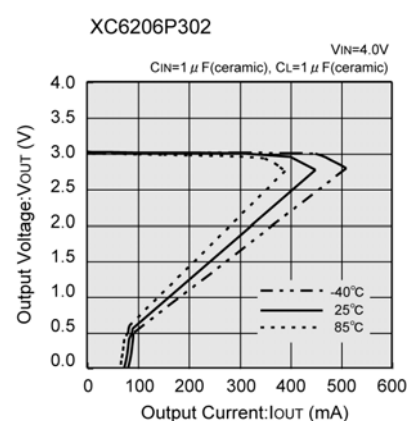
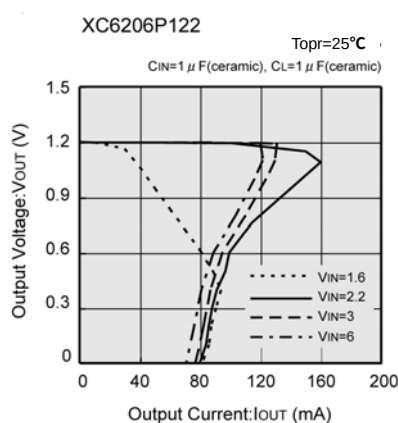
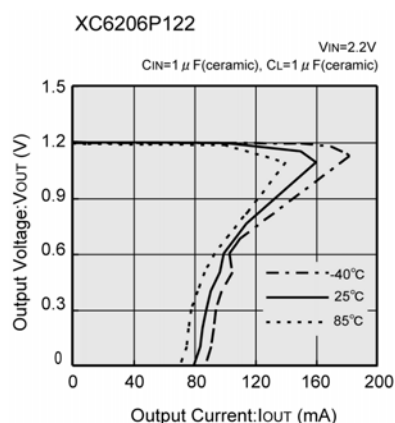


TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current

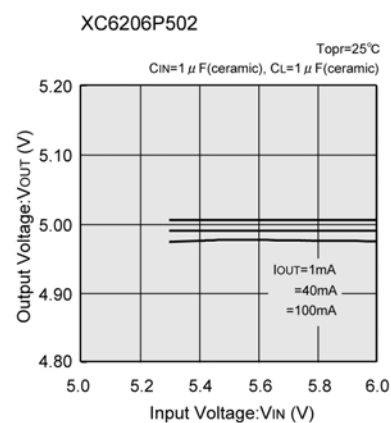
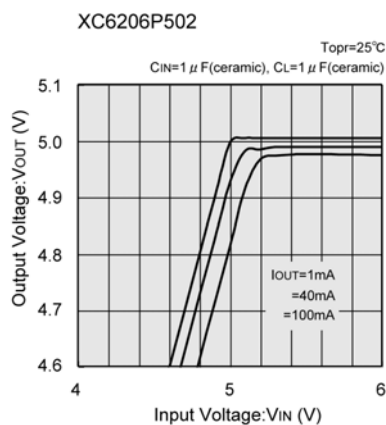
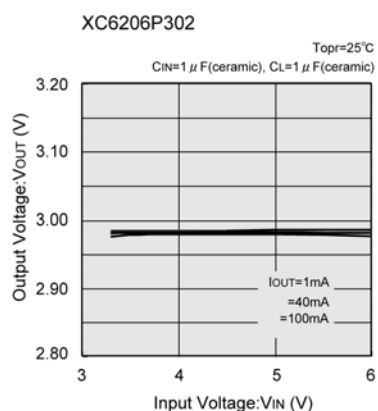
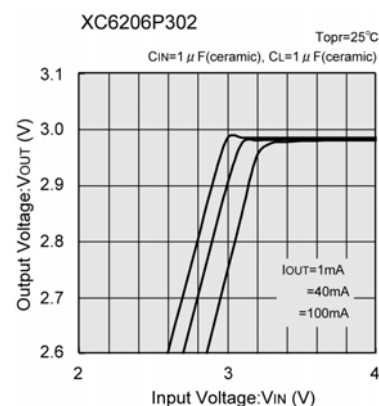
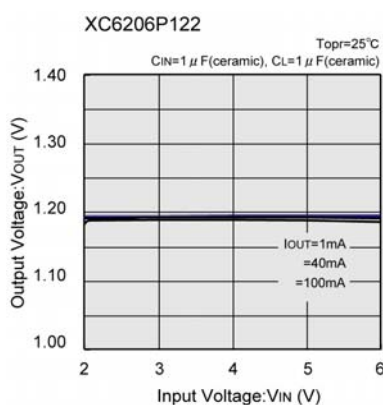
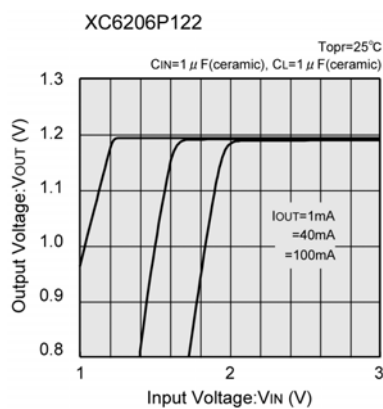


(2) Current Limit

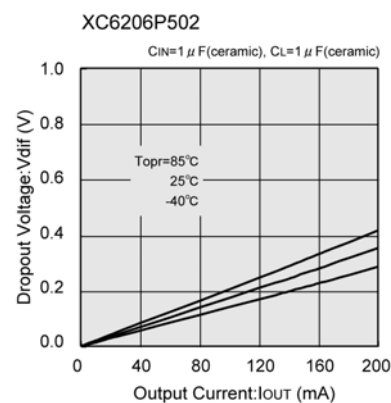
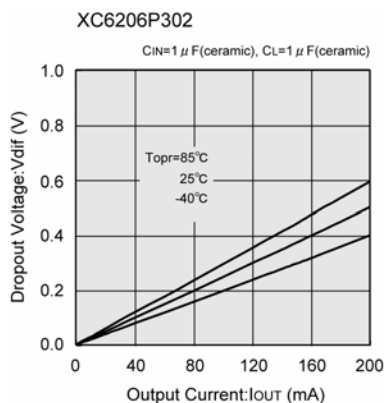
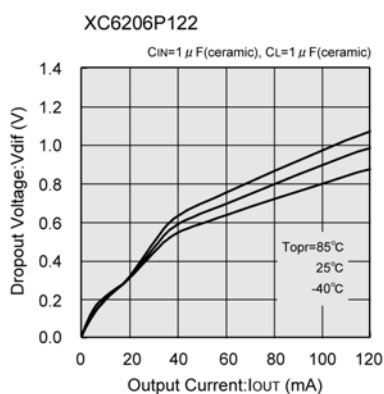


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) Output Voltage vs. Input Voltage

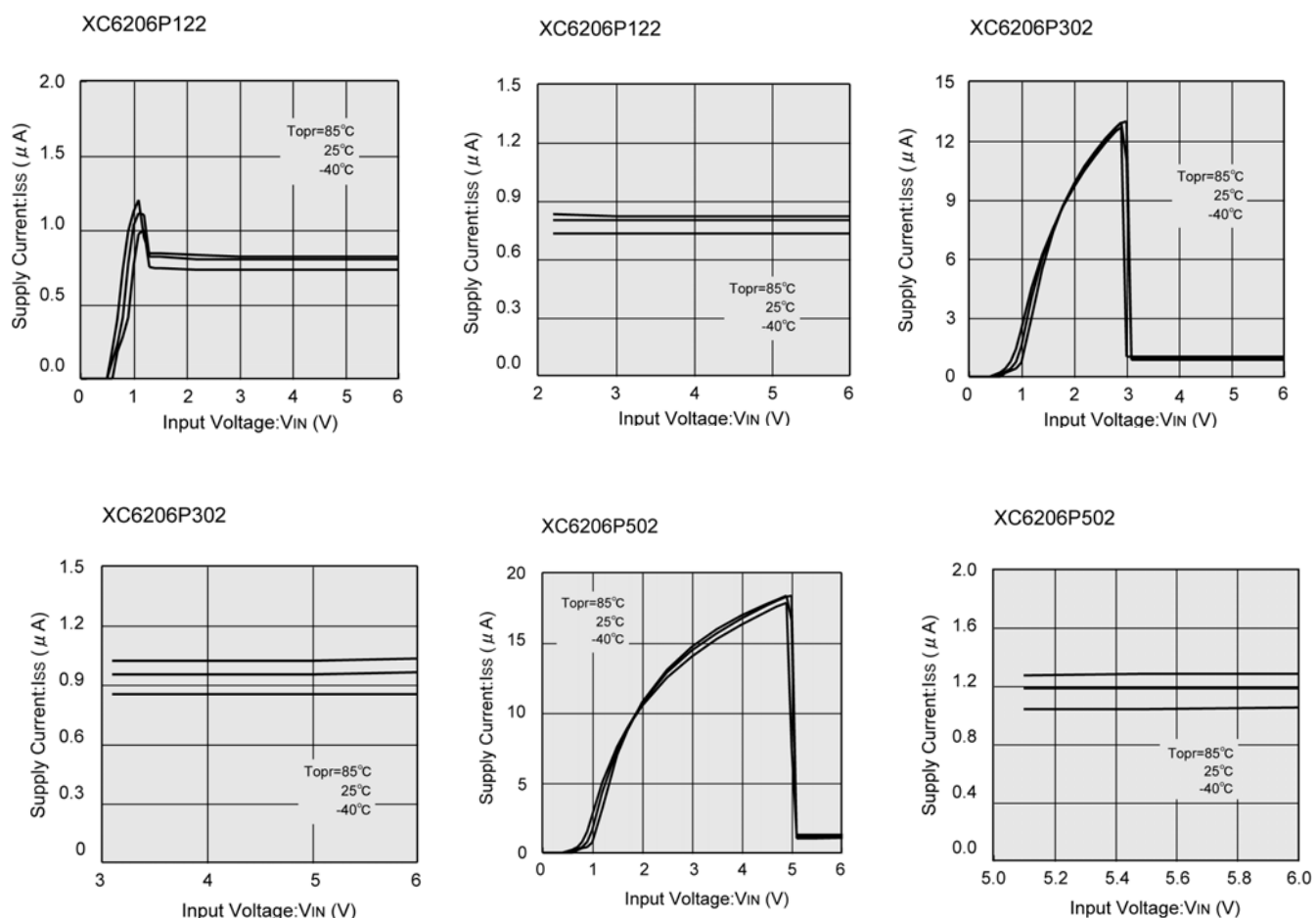


(4) Dropout Voltage vs. Output Current

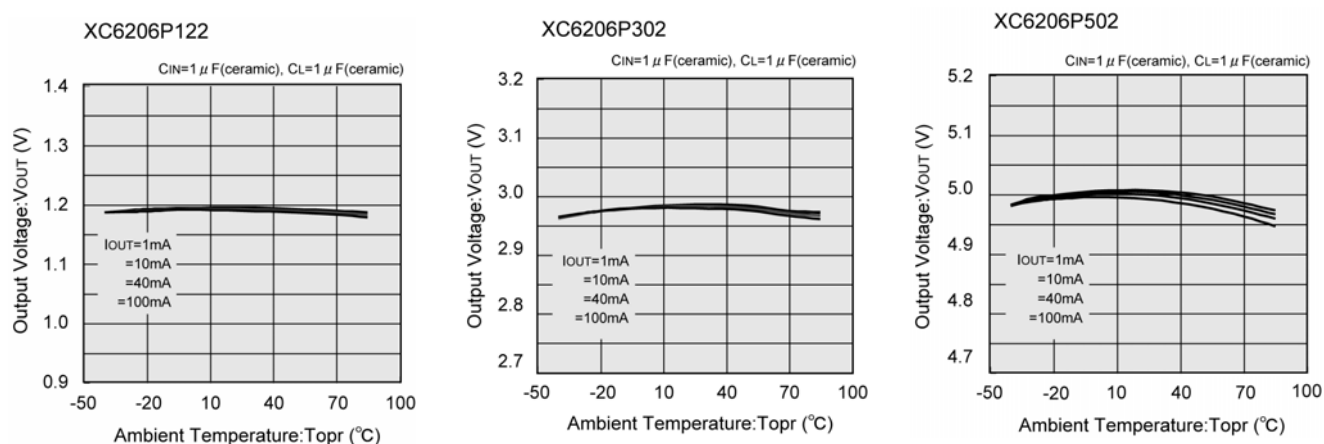


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) Supply Current vs. Input Voltage

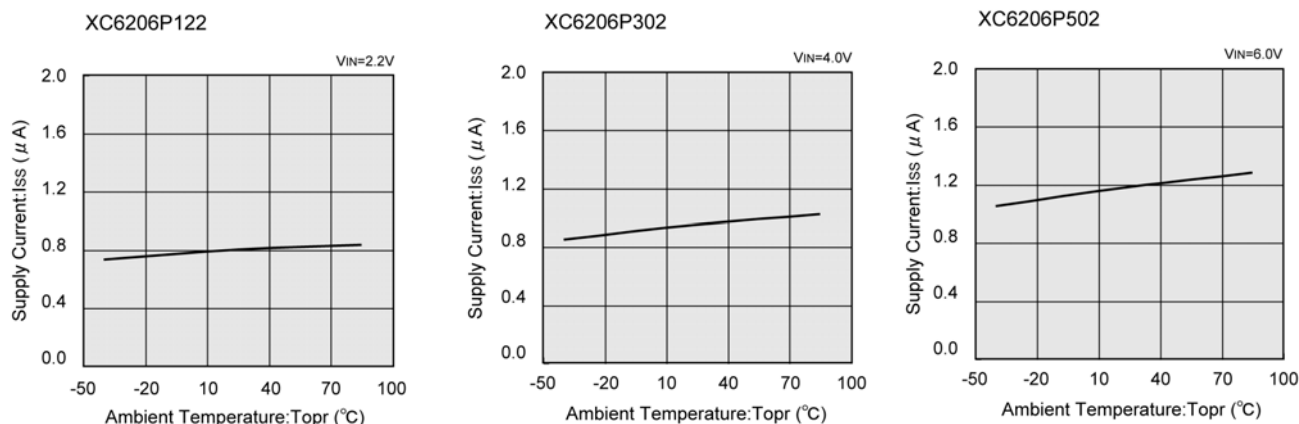


(6) Output Voltage vs. Ambient Temperature

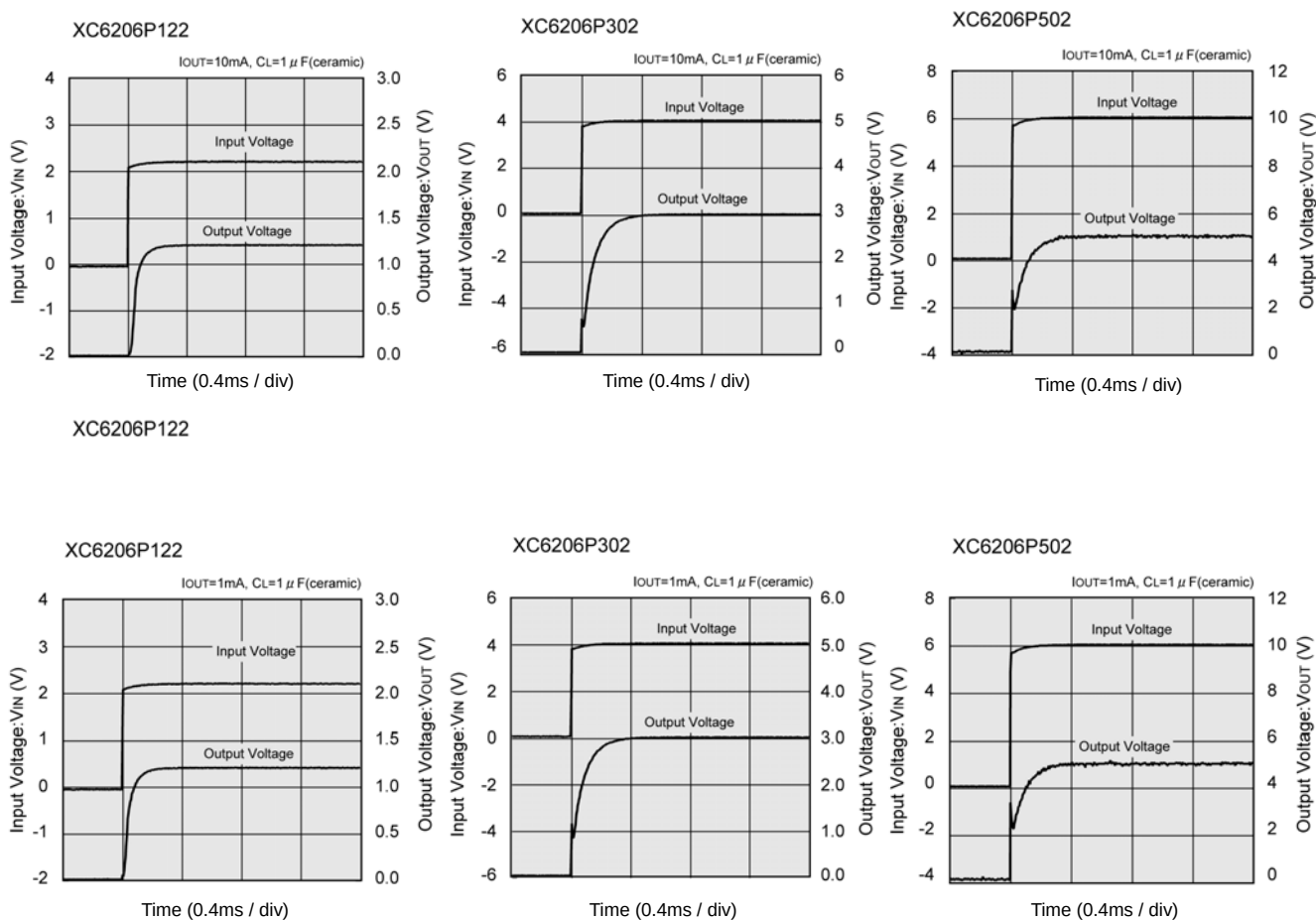


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Output Voltage vs. Ambient Temperature

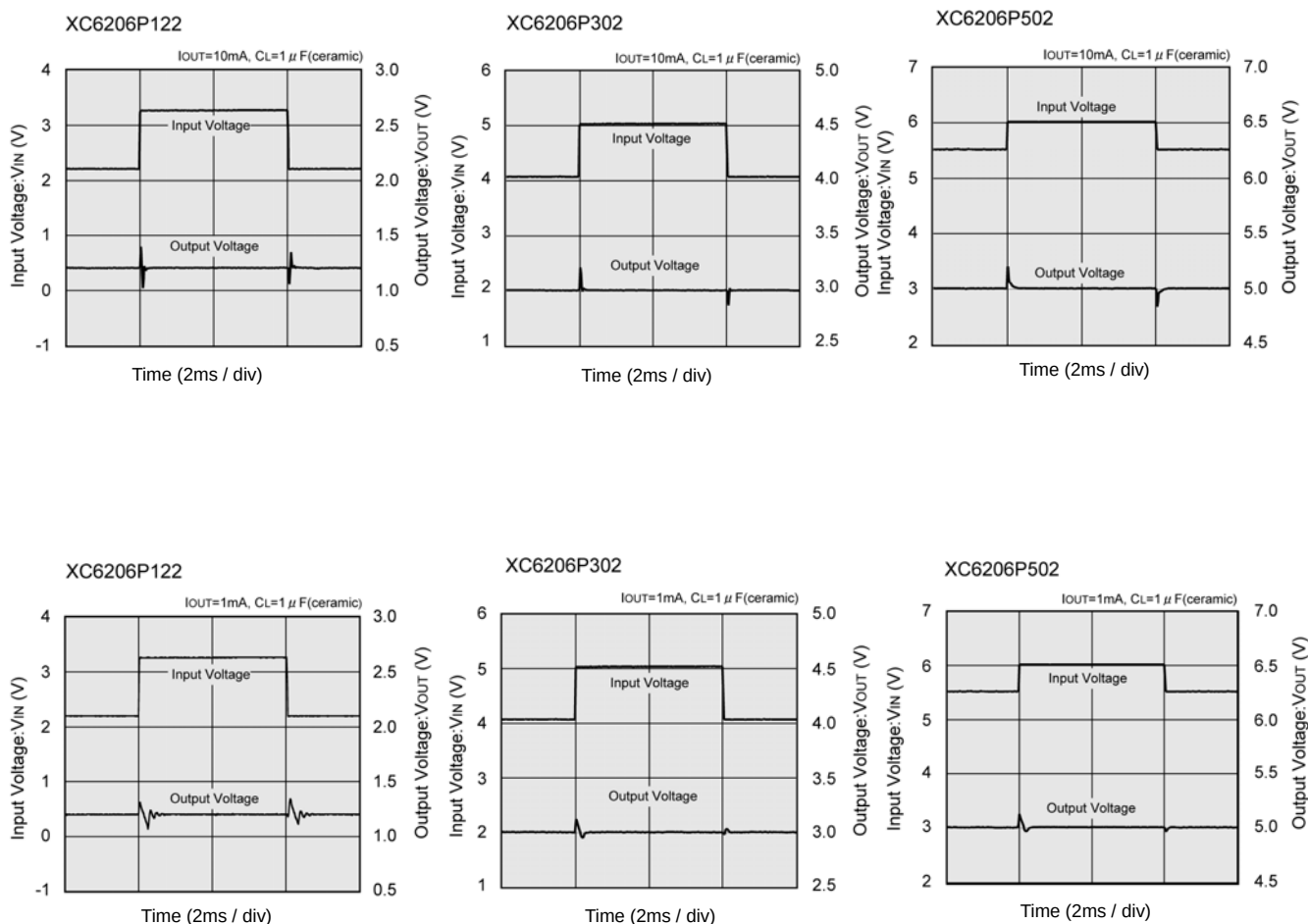


(8) Input Transient Response 1

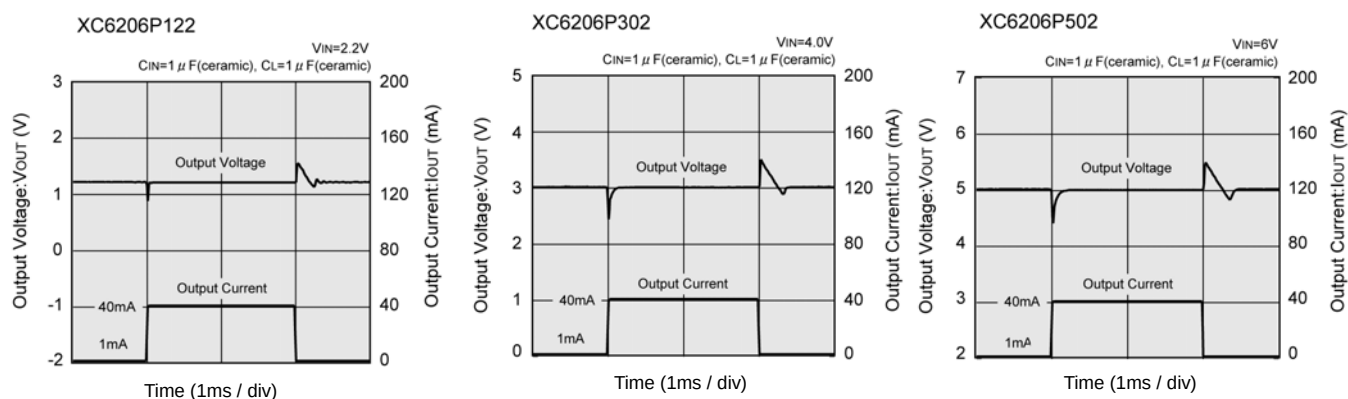


■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Input Transient Response 2

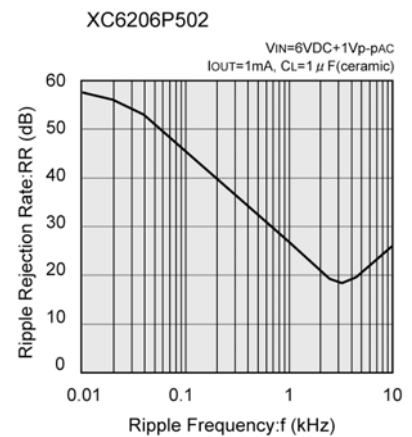
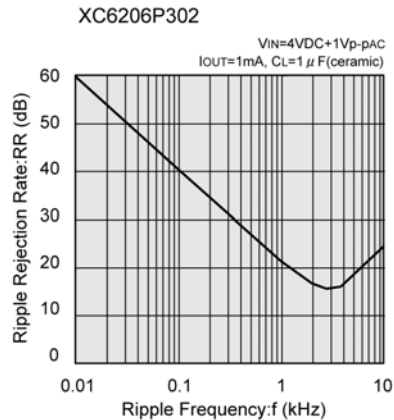
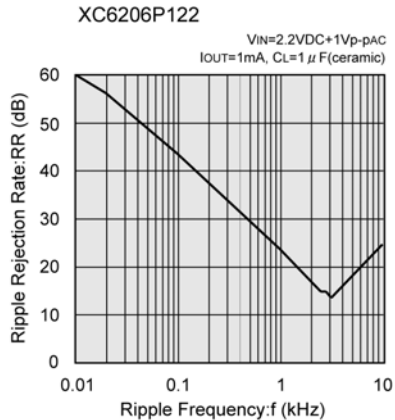
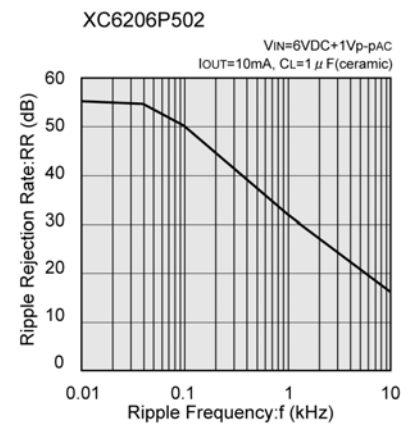
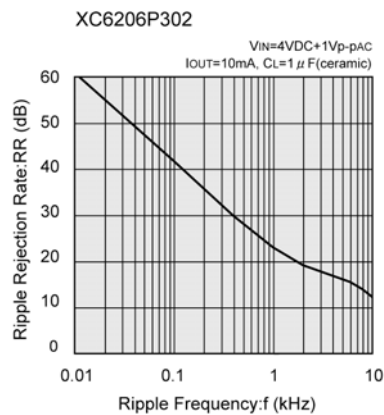
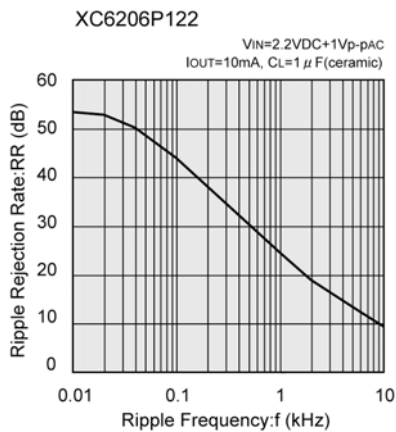


(10) Load Transient Response



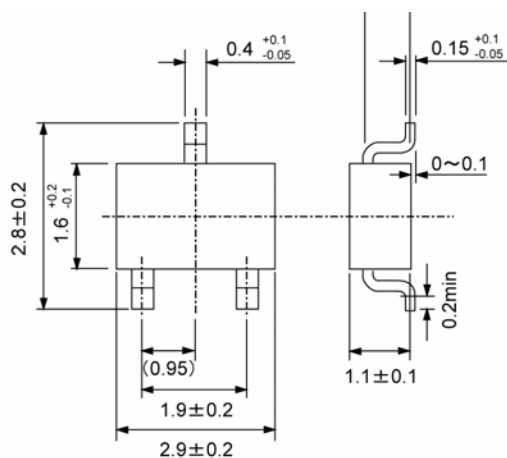
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(11) Ripple Rejection Rate

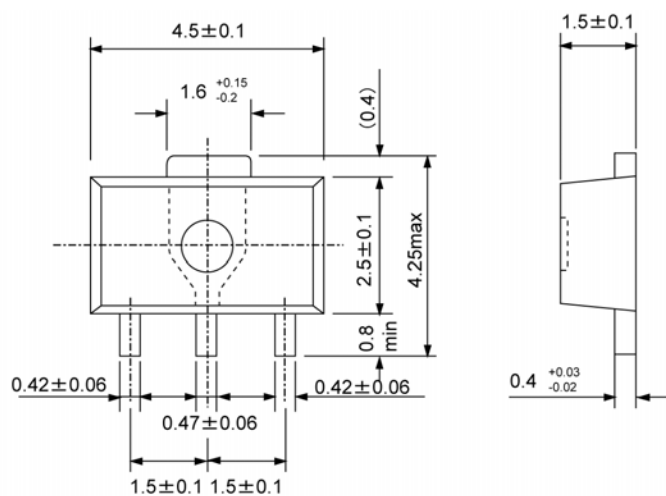


■ PACKAGING INFORMATION

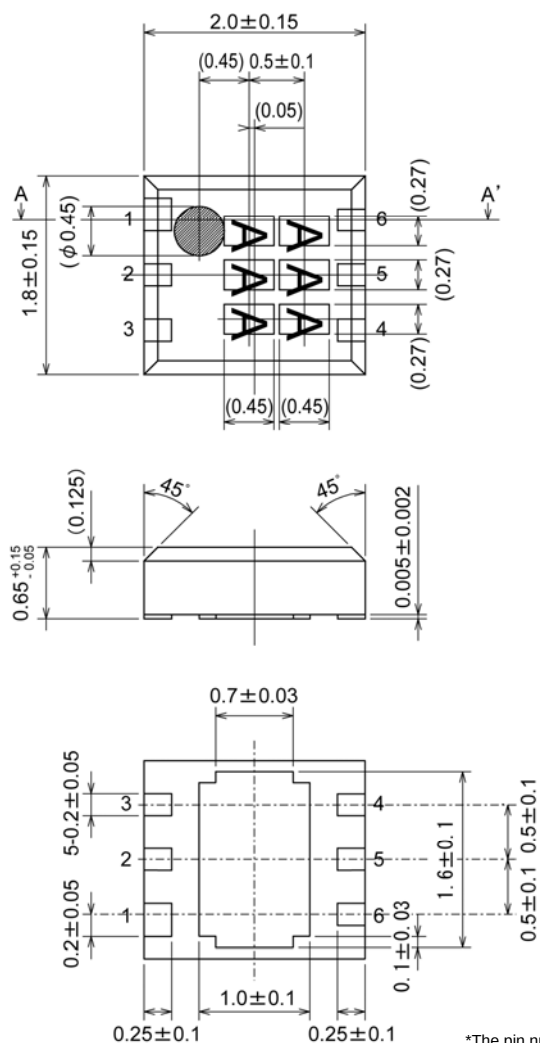
● SOT-23



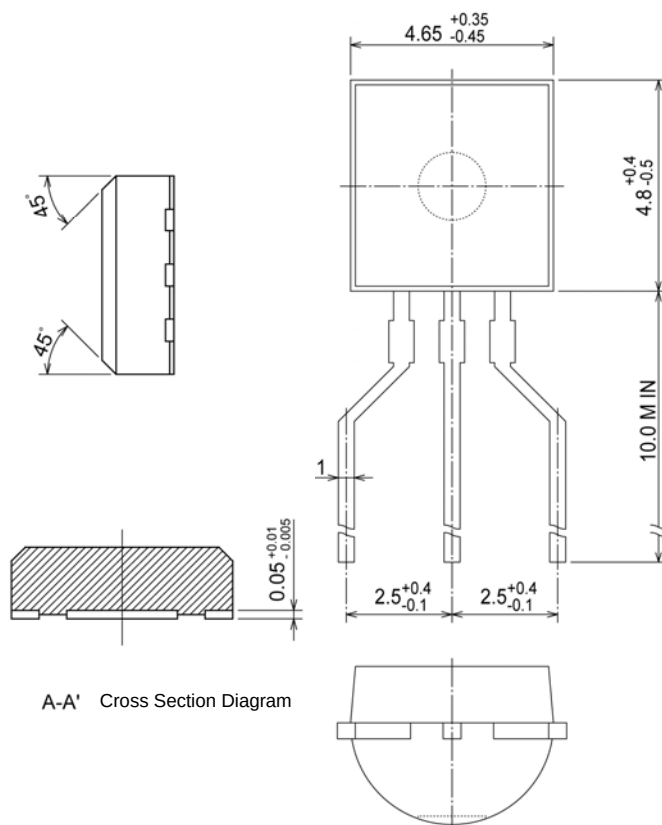
● SOT-89



● USP-6B



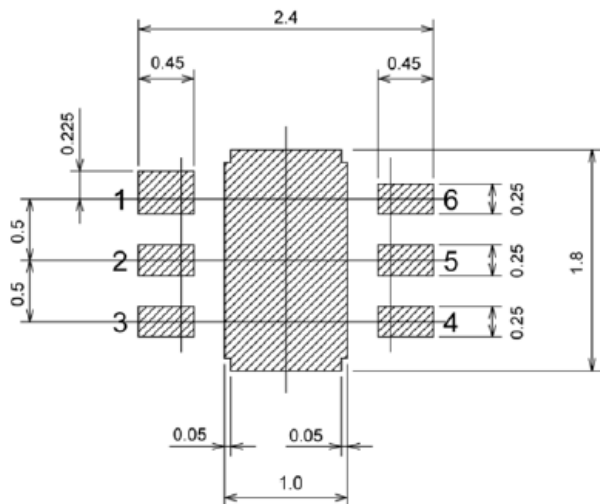
● TO-92



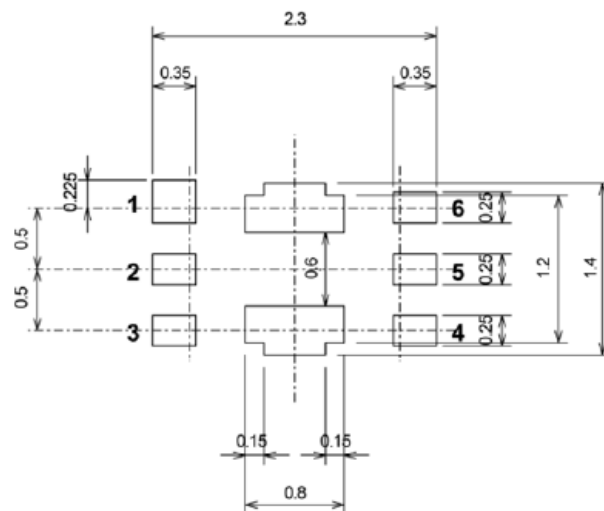
*The pin number 1 is larger than the other pins

PACKAGING INFORMATION (Continued)

● USP-6B Reference Pattern Layout

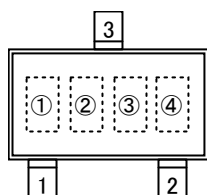


● USP-6B Reference Metal Mask Design

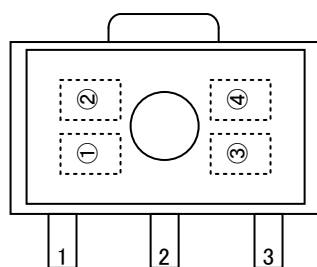


MARKING RULE

●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	-	-

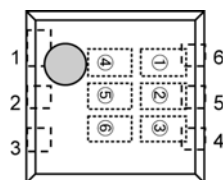
④Represents production lot number

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

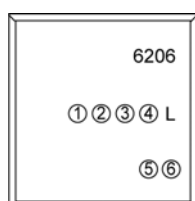
MARK		OUTPUT VOLTAGE(V)	PRODUCT SERIES
④	⑤		
3	3	3.3	XC6206P33*D*
5	0	5.0	XC6206P50*D*

⑥Represents production lot number

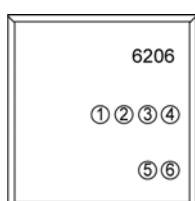
0 to 9, A to Z repeated. (G, I, J, O, Q, W excepted)

*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 $\pm 1\%$	XC6206P**1**
2	Within $\pm 2\%$	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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