

1.5A Positive Voltage Regulator

■ GENERAL DESCRIPTION

The XB1086 is a series of low dropout positive voltage regulators with a high output current capability of 1.5A.

Stable output can be maintained by using $10\mu\text{F}$ (C_{IN}) and $22\mu\text{F}$ (C_L) of tantalum capacitors.

The XB1086P series is available in the fixed voltage types of 1.5V, 1.8V, 2.5V, 3.3V, and 5.0V. The XB1086K is also available as a voltage adjustable type which can set the output voltage with only two external resistors. With an over current and thermal protection circuit built-in, the IC is disabled for protection when an output current reaches limit current or junction temperature increases up to limit temperature.

The XB1086 series is available in TO-252 package.

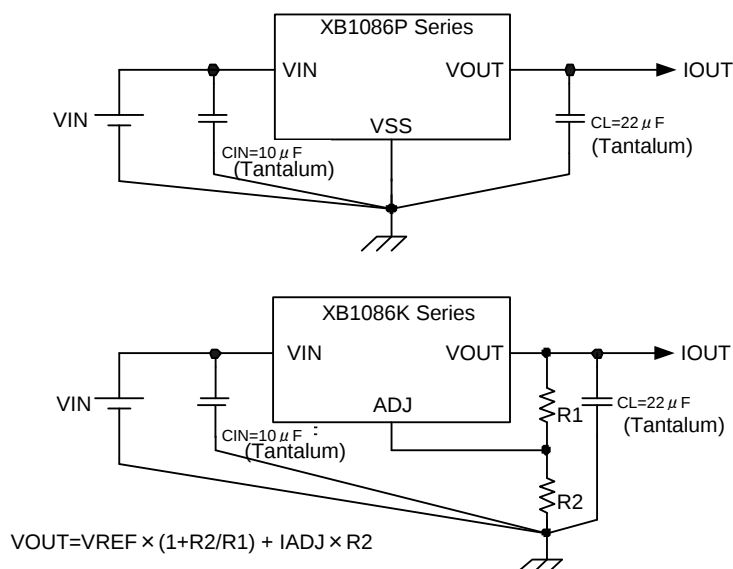
■ APPLICATIONS

- High efficiency linear regulators
- Battery chargers
- DVD drives
- Set top boxes
- Various battery drive equipment

■ FEATURES

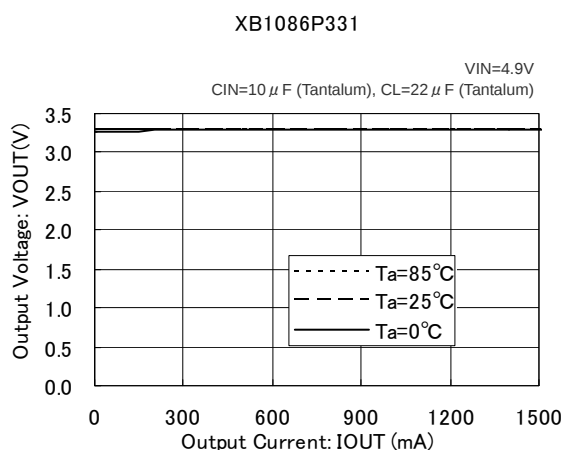
Maximum Output Current	: More than 1.5A (within Pd)
Maximum Operating Voltage	: 15V
Output Voltage	: 1.5V, 1.8V, 2.5V, 3.3V, 5.0V (XB1086P), Externally Set (XB1086K / Reference Voltage 1.25V (TYP.))
Output Voltage Accuracy	: $\pm 1\%$ ($T_j = 25^\circ\text{C}$)
Dropout Voltage	: 1.3V @ $I_{OUT} = 1.5\text{A}$ (TYP.)
Line Regulation	: 0.015% (TYP.) <ADJ>
Load Regulation	: 0.1% (TYP.) <ADJ>
Reference Voltage Pin Current	: Less than $120\mu\text{A}$ <ADJ>
Overcurrent Protection Circuit Built-In	
Thermal Protection Circuit Built-In	
Package	: TO-252
Environmentally Friendly	: EU RoHS Compliant

■ TYPICAL APPLICATION CIRCUITS

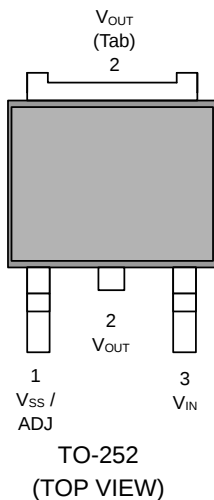


■ TYPICAL PERFORMANCE CHARACTERISTICS

- Output Voltage vs. Output Current



PIN CONFIGURATION



PIN ASSIGNMENT

PIN NUMBER TO-252	PIN NAME	FUNCTIONS
1	V_{SS} / ADJ	Ground / Reference Voltage
2	V_{OUT}	Output
3	V_{IN}	Input

PRODUCT CLASSIFICATION

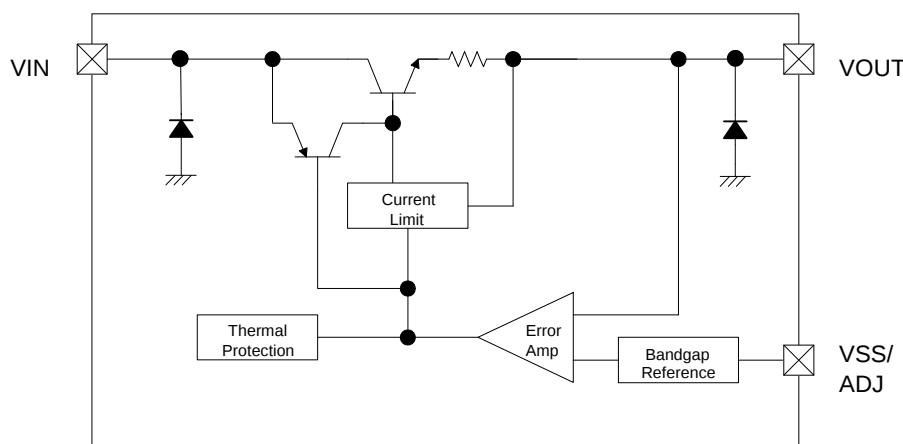
Ordering Information

XB1086①②③④⑤⑥-⑦^(*)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulators	P	Fixed V_{OUT}
		K	Adjustable (Externally Set)
②③④	Output Voltage (Output Voltage Accuracy)	151	$V_{OUT}=1.5V (\pm 1\%)$
		181	$V_{OUT}=1.8V (\pm 1\%)$
		251	$V_{OUT}=2.5V (\pm 1\%)$
		331	$V_{OUT}=3.3V (\pm 1\%)$
		501	$V_{OUT}=5.1V (\pm 1\%)$
	Output Voltage Externally Set (Output Voltage Accuracy)	12B	$V_{OUT}=1.25V (\pm 1\%)$
⑤⑥-⑦	Package (Order Unit)	JR	TO-252 (2,500/Reel)
		JR-G	TO-252 (2,500/Reel)

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

■ BLOCK DIAGRAM



*Diodes inside the circuit are ESD protection diodes.

■ ABSOLUTE MAXIMUM RATINGS

Ta=25°C

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V _{IN}	18	V
Power Dissipation	P _d	1300 (*2)	mW
Operating Junction Temperature	T _j	125	°C
Storage Temperature	T _{stg}	- 55 ~ +125	°C

Note:

(*1) Stresses greater than those listed under the above ratings may cause permanent damage to the device.

(*2) The rating of the power dissipation is determined when mounted on the PCB.

ELECTRICAL CHARACTERISTICS

XB1086PxxxJR

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	CIRCUIT
Output Voltage	V _{OUT} (1.5V)	V _{IN} =3.5V, I _{OUT} =10mA	1.485	1.5	1.515	V	①
		O.T. (*1)	1.47	-	1.53		
	V _{OUT} (1.8V)	V _{IN} =3.8V, I _{OUT} =10mA	1.782	1.8	1.818	V	①
		O.T. (*1)	1.746	-	1.854		
	V _{OUT} (2.5V)	V _{IN} =4.5V, I _{OUT} =10mA	2.475	2.500	2.525	V	①
		O.T. (*1)	2.45	-	2.55		
	V _{OUT} (3.3V)	V _{IN} =5.3V, I _{OUT} =10mA	3.267	3.300	3.333	V	①
		O.T. (*1)	3.235	-	3.366		
	V _{OUT} (5.0V)	V _{IN} =7.0V, I _{OUT} =10mA	4.95	5	5.05	V	①
		O.T. (*1)	4.9	-	5.1		
Line Regulation	ΔV _{OUT1} (1.5V)	1.5V ≤ V _{IN} -V _{OUT} ≤ 10V I _{OUT} =10mA	-	0.3	6	mV	①
		O.T. (*1)	-	0.6	6		
	ΔV _{OUT1} (1.8V)	1.5V ≤ V _{IN} -V _{OUT} ≤ 10V I _{OUT} =10mA	-	0.3	6	mV	①
		O.T. (*1)	-	0.6	6		
	ΔV _{OUT1} (2.5V)	1.5V ≤ V _{IN} -V _{OUT} ≤ 10V I _{OUT} =10mA	-	0.3	6	mV	①
		O.T. (*1)	-	0.6	6		
	ΔV _{OUT1} (3.3V)	1.5V ≤ V _{IN} -V _{OUT} ≤ 10V I _{OUT} =10mA	-	0.5	10	mV	①
		O.T. (*1)	-	1	10		
	ΔV _{OUT1} (5.0V)	1.5V ≤ V _{IN} -V _{OUT} ≤ 10V I _{OUT} =10mA	-	0.5	10	mV	①
		O.T. (*1)	-	1	10		
Load Regulation	ΔV _{OUT2} (1.5V)	V _{IN} -V _{OUT} =2.0V 10mA ≤ I _{OUT} ≤ 1.5A	-	3	12	mV	①
		O.T. (*1)	-	6	20		
	ΔV _{OUT2} (1.8V)	V _{IN} -V _{OUT} =2.0V 10mA ≤ I _{OUT} ≤ 1.5A	-	3	12	mV	①
		O.T. (*1)	-	6	20		
	ΔV _{OUT2} (2.5V)	V _{IN} -V _{OUT} =2.0V 10mA ≤ I _{OUT} ≤ 1.5A	-	3	12	mV	①
		O.T. (*1)	-	6	20		
	ΔV _{OUT2} (3.3V)	V _{IN} -V _{OUT} =2.0V 10mA ≤ I _{OUT} ≤ 1.5A	-	3	15	mV	①
		O.T. (*1)	-	7	20		
	ΔV _{OUT2} (5.0V)	V _{IN} -V _{OUT} =2.0V 10mA ≤ I _{OUT} ≤ 1.5A	-	5	20	mV	①
		O.T. (*1)	-	10	35		
Dropout Voltage	V _{dif}	ΔV _{OUT} =1%, I _{OUT} =1.5A	-	1.3	1.5	V	①
Current Limit	I _{LIM}	V _{IN} -V _{OUT} =2.0V	1.5	2.3	-	A	①
Supply Current	I _{DD}	V _{IN} =V _{OUT} +1.3V	O.T. (*1)	5	10	mA	②
Temperature Stability	T _S	V _{IN} -V _{OUT} =1.5V I _{OUT} =10mA	O.T. (*1)	0.5	-	%	-

Note:

(*1) O.T. denotes the specifications which apply over the range of operating junction temperature (0°C ≤ T_j ≤ 125°C).

Please be sure that the power consumption does not exceed the power dissipation rating, 1300mW. If the power consumption exceeds the power dissipation rating and the operating junction temperature rises more than the rating, 125°C, the IC enters thermal shutdown state.

ELECTRICAL CHARACTERISTICS (Continued)

XB1086K12BJR

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	CIRCUIT
Reference Voltage	V _{REF}	V _{IN} -V _{OUT} =2.0V I _{OUT} =10mA	1.238	1.250	1.262	V	③
		O.T. (*1)	1.225	-	1.270		
Line Regulation	ΔV _{OUT1}	1.5V ≤ V _{IN} -V _{OUT} ≤ 10V I _{OUT} =10mA	-	0.015	0.2	%	③
		O.T. (*1)		0.035	0.2		
Load Regulation	ΔV _{OUT2}	V _{IN} -V _{OUT} =2.0V 10mA ≤ I _{OUT} ≤ 1.5A	-	0.1	0.3	%	③
		O.T. (*1)		0.2	0.4		
Dropout Voltage	V _{dif}	ΔV _{OUT} =1%, I _{OUT} =1.5A	-	1.3	1.5	V	③
Current Limit	I _{LM}	V _{IN} -V _{OUT} =2.0V	1.5	2.3	-	A	③
Temperature Stability	T _S	V _{IN} -V _{OUT} =1.5V I _{OUT} =10mA	O.T. (*1)	-	0.5	-	-
Minimum Output Current	I _{OUTmin}	1.4V ≤ V _{IN} -V _{OUT} ≤ 10V	O.T. (*1)	-	2	5	mA
Adjust Voltage Pin Current	I _{ADJ}	V _{IN} =V _{OUT} +1.5V I _{OUT} =10mA	O.T. (*1)	-	60	120	μA

Note:

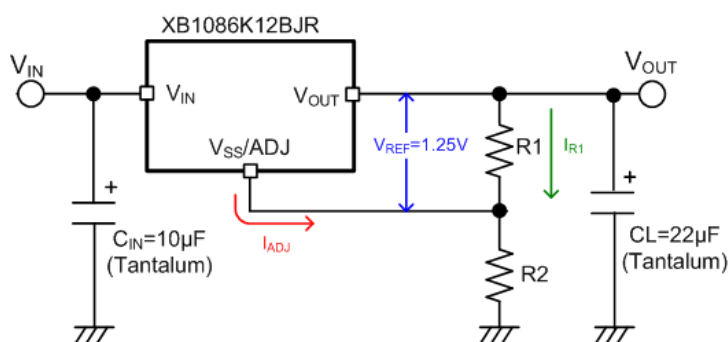
(*1) O.T. denotes the specifications which apply over the range of operating junction temperature (0°C ≤ T_J ≤ 125°C).

Please be sure that the power consumption does not exceed the power dissipation rating, 1300mW. If the power consumption exceeds the power dissipation rating and the operating junction temperature rises more than the rating, 125°C, the IC enters thermal shutdown state.

OUTPUT VOLTAGE ADJUSTMENT

With the adjustable XB1086K12BJR, a 1.25V reference voltage is fixed between the V_{OUT} pin and the ADJ pin and the external resistors R1 and R2 are used to set the output voltage.

Please set it so that an electric current (I_{R1}) flowing through R1 is as above 5mA.



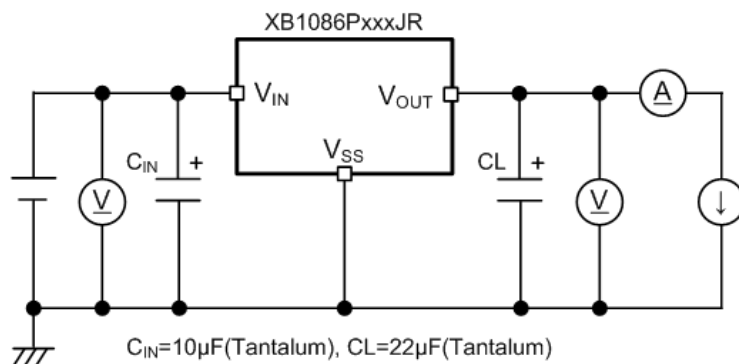
The output voltage is given by the following equation.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R2}{R1}\right) + I_{ADJ} \times R2$$

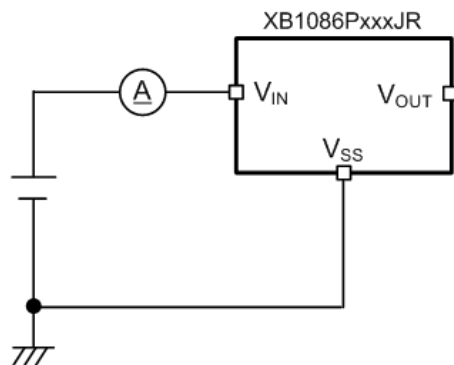
$$R2 = \frac{R1 \times (V_{OUT} - V_{REF})}{V_{REF} + I_{ADJ} \times R1}$$

TEST CIRCUITS

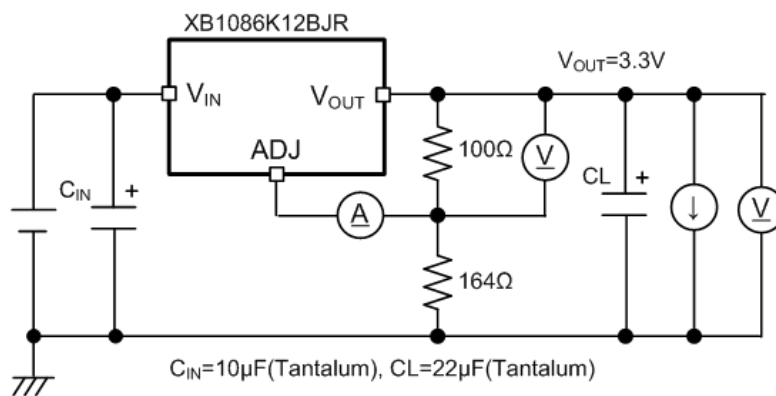
< Circuit ① >



< Circuit ② >



< Circuit ③ >

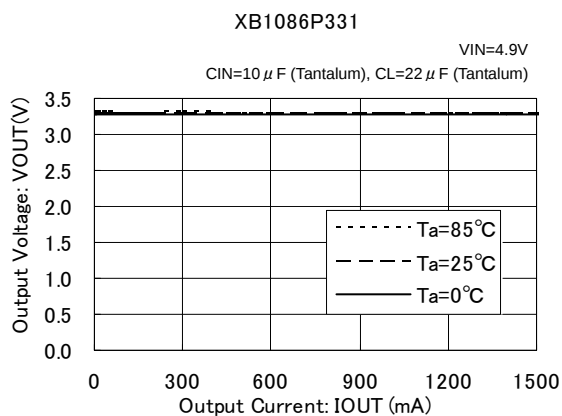


■ NOTES ON USE

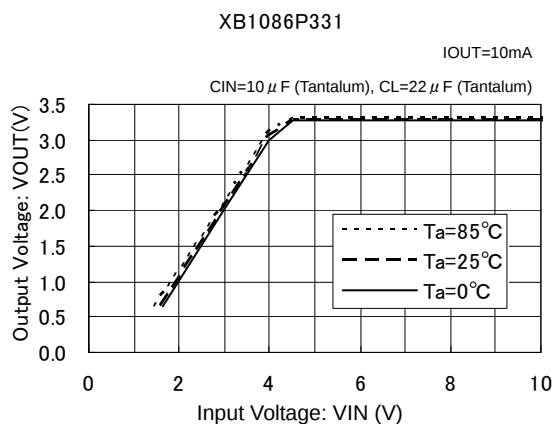
1. For temporary, transitional voltage drop or voltage rising phenomenon, the IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to the noise and/or phase lag depending on output current. Please strengthen V_{IN} and V_{SS} wiring in particular.
3. The input capacitor (C_{IN}) and the output capacitor (C_L) should be placed to the IC as close as possible with a shorter wiring.
4. Torex places an importance on improving our products and its reliability. However, by any possibility, we would request user fail-safe design and post-aging treatment on system or equipment.

TYPICAL PERFORMANCE CHARACTERISTICS

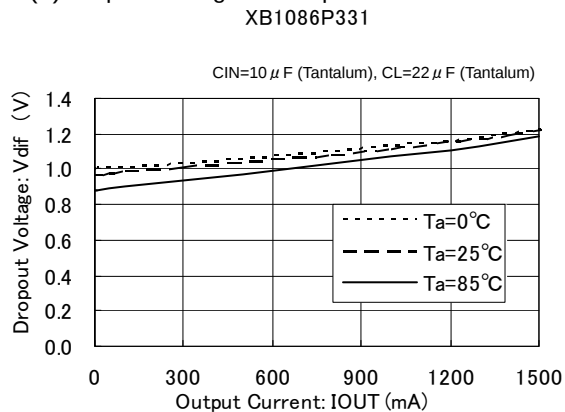
(1) Output Voltage vs. Output Current



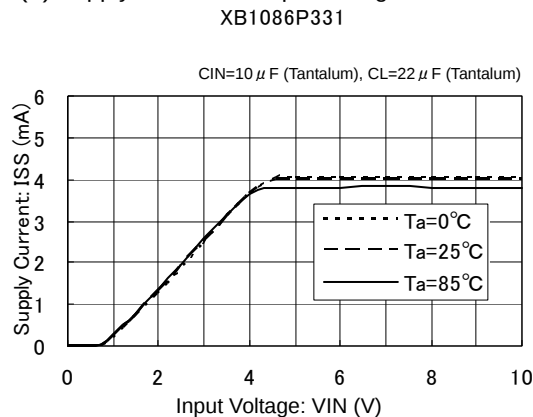
(2) Output Voltage vs. Input Voltage



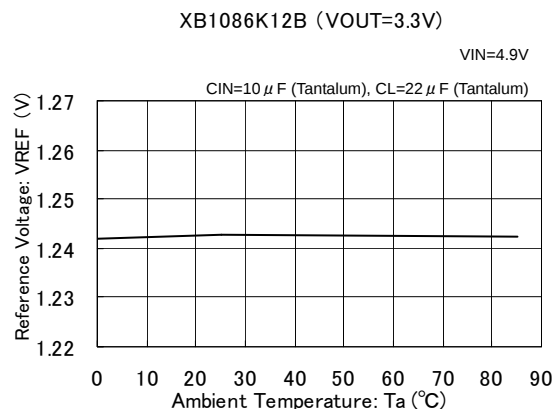
(3) Dropout Voltage vs. Output Current



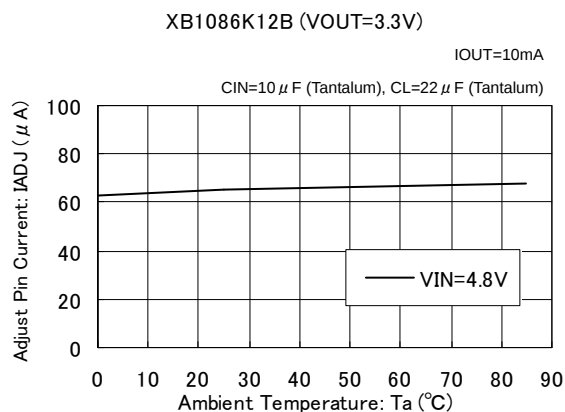
(4) Supply Current vs. Input Voltage



(5) Reference Voltage vs. Ambient Temperature

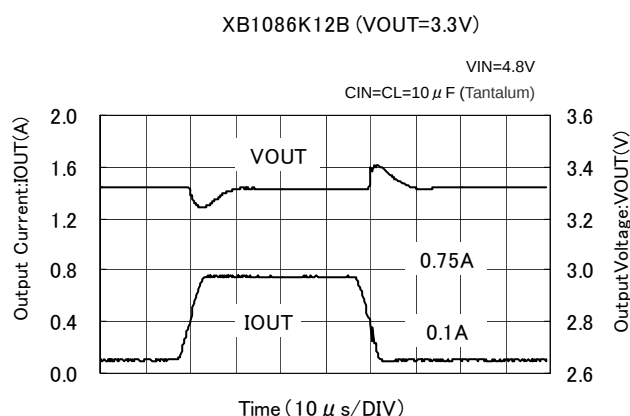
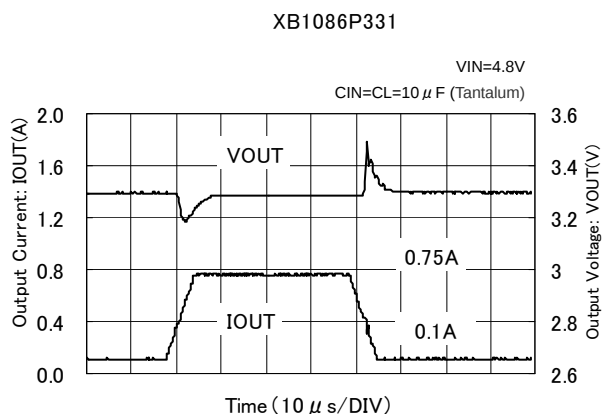


(6) Adjust Pin Current vs. Ambient Temperature

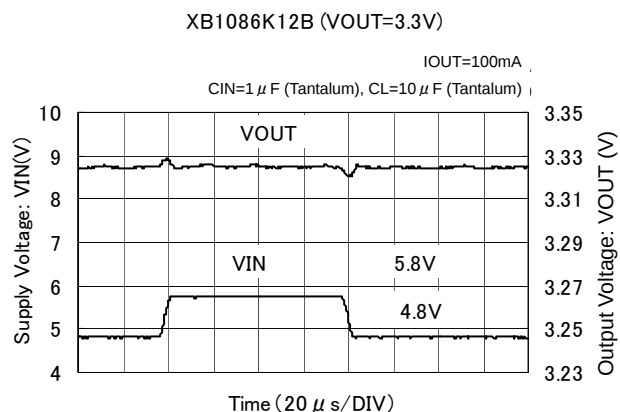
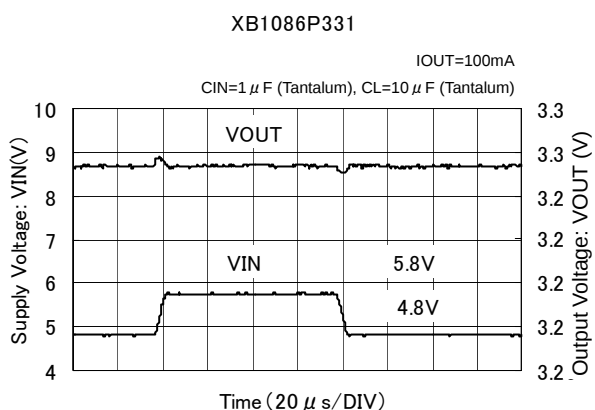


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

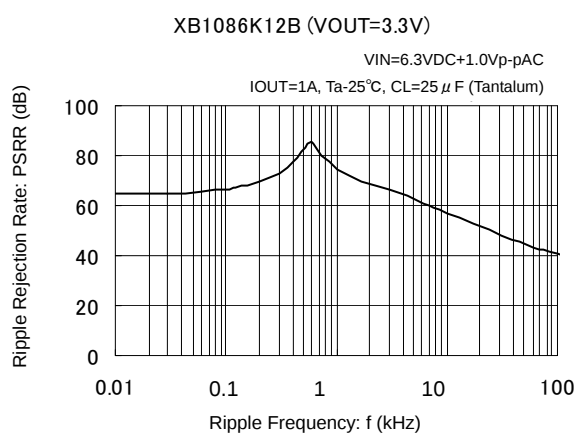
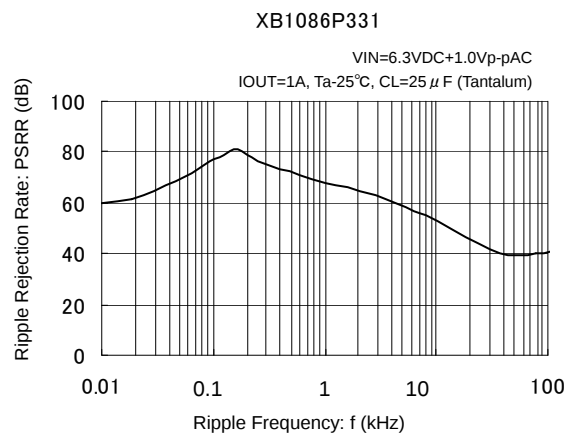
1(7) Load Transient Response



(8) Input Transient Response

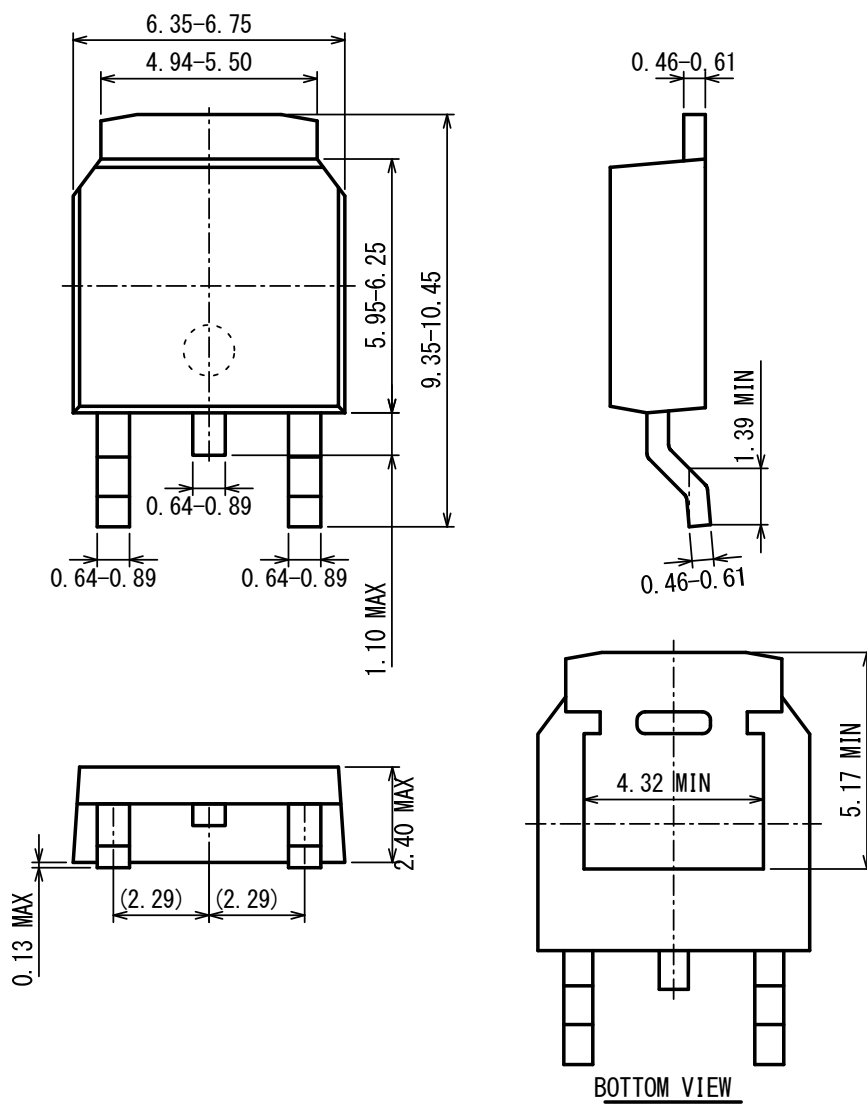


(9) Ripple Rejection Rate



PACKAGING INFORMATION

● TO-252

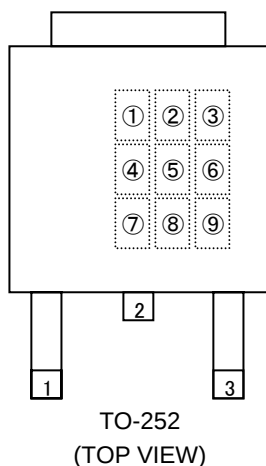


UNIT: mm

■ MARKING RULE

● TO-252

(mark header : ①~⑥) *Mark header does not change with a lot.



①② represents product series

MARK		PRODUCT SERIES
①	②	
8	6	XB1086****J*

③ represent the type of regulator

MARK	PRODUCT SERIES
P	XB1086P***J*
K	XB1086K***J*

④⑤ represents output voltage

MARK		OUTPUT VOTLAGE PRODUCT SERIES	
④	⑤		
1	5	1.5V	XB1086P151J*
1	8	1.8V	XB1086P181J*
2	5	2.5V	XB1086P251J*
3	3	3.3V	XB1086P331J*
5	0	5.0V	XB1086P501J*
1	2	ADJ	XB1086K12BJ*

⑥ represents output voltage accuracy and output type

MARK	OUTPUT VOLTAGE ACCURACY (OUTPUT TYPE)	PRODUCT SERIES
1	1%	XB1086P**1J*
B	ADJ	XB1086K12BJ*

⑦ represents the last digit of production year
ex.)

MARK	PRODUCTION YEAR
7	2007
8	2008

⑧ represents production lot number
0 to 9, A to Z repeated.
(G, I, J, O, Q, W excepted. 'O' of the first digit does not mark.)
*No character inversion used.
ex.)

MARK		PRODUCTION LOT NUMBER
⑧	⑨	
Blank	3	03
1	A	1A

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