

Negative Voltage Regulators

■ GENERAL DESCRIPTION

The XC62K series are highly precise, low power consumption, negative voltage regulators, manufactured using CMOS and laser trimming technologies. The series achieves high output currents with small input-output voltage differentials, and consists of a high precision voltage reference, an error correction circuit, and an output driver with current limitation.

SOT-23, SOT-89, USP-6B packages are available.

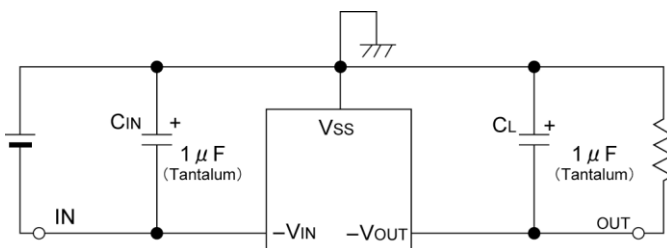
■ APPLICATIONS

- Multi-function power supplies.
- Smart phones / Mobile phones.
- Mobile devices / terminals.

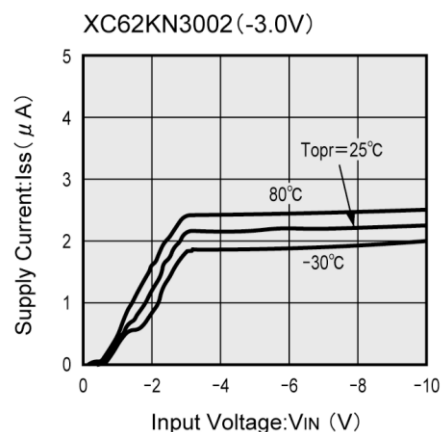
■ FEATURES

- Dropout Voltage** : 0.12V@50mA ($V_{OUT} = -5.0V$)
: 0.38V@100mA
- Maximum Output Current** : 100mA (within MAX. power dissipation, $V_{OUT} = -5.0V$)
- Output Voltage Range** : -2.1V ~ -6.0V (0.1V increments)
-5.0, -4.0, -3.0V, -2.5V standard
(All other voltages are semi-custom)
- Highly Accurate** : Setting output voltage $\pm 2\%$
($\pm 1\%$ for semi-custom products)
- Low Power Consumption** : $3.0 \mu A$ @ $V_{OUT} = -5.0V$ (TYP.)
- Output Voltage Temperature Characteristics**
: $\pm 100 \text{ ppm}/^\circ\text{C}$ (TYP.)
- Line Regulation** : 0.1%/V (TYP.)
- CMOS Low Power Consumption**
- Packages** : SOT-23
SOT-89
USP-6B
- Environmentally Friendly** : EU RoHS Compliant, Pb Free

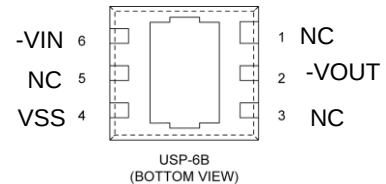
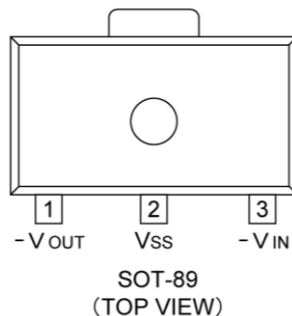
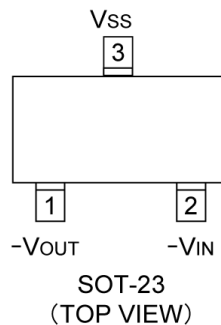
■ TYPICAL APPLICATION CIRCUIT



■ TYPICAL PERFORMANCE CHARACTERISTICS



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 VSS pin.

PIN ASSIGNMENT

PIN NUMBER			PIN NAME	FUNCTIONS
SOT-23	SOT-89	USP-6B		
2	3	6	-VIN	Power Supply Input
3	2	4	VSS	Ground
1	1	2	-VOUT	Output
-	-	1,3,5	NC	No Connection

PRODUCT CLASSIFICATION

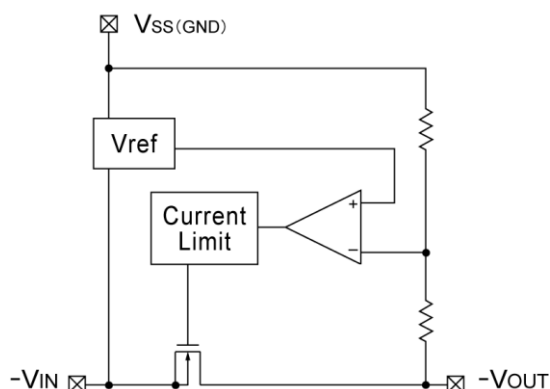
Ordering Information

XC62K①②③④⑤⑥⑦⑧-⑧^(*)

MARK	ITEM	SYMBOL	DESCRIPTION
①	Polarity of Output Voltage	N	Negative
②③	Output Voltage	21 ~ 60	e.g. $V_{OUT} = 2.1V \rightarrow ②=2, ③=1$ $V_{OUT} = 6.0V \rightarrow ②=6, ③=0$
④	Temperature Characteristics	0	$\pm 100\text{ppm (TYP.)}$
⑤	Output Voltage Accuracy	1	$\pm 1\%$ (Semi-custom)
		2	$\pm 2\%$
⑥⑦⑧	Packages (Order Unit)	MR-G	SOT-23 (3,000pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

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

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Ta=25°C			
PARAMETER	SYMBOL	RATINGS	UNITS
Input Voltage	V _{IN}	-12.0	V
Output Current	I _{OUT}	200	mA
Output Voltage	V _{OUT}	-V _{SS} -0.3 ~ V _{IN} +0.3	V
Power Dissipation	SOT-23	Pd	mW
	SOT-89		
	USP-6B		
Operating Ambient Temperature	T _{opr}	-40 ~ 85	°C
Storage Temperature	T _{stg}	-40 ~ 125	°C

Note: Please ensure that I_{OUT} is less than Pd/(V_{OUT}-V_{IN}).

ELECTRICAL CHARACTERISTICS

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	$V_{OUT(E)}^{(*)2}$	$I_{OUT}=20mA$ $V_{IN}=V_{OUT(T)}^{(*)1}-1.0V$	$E1-1^{(*)4}$	$V_{OUT(T)}$	$E1-2^{(*)4}$	V	2
Maximum Output Current	I_{OUTmax}	$V_{IN}=V_{OUT(T)}-1.0V$ $V_{OUT(E)} \geq V_{OUT(T)} \times 0.9$	$E2^{(*)4}$			mA	4
Load Regulation	ΔV_{OUT}	$V_{IN}=V_{OUT(T)}-1.0V$ $1mA \leq I_{OUT} \leq \{E3\}mA$	-	40	80	mV	4
Dropout Voltage	$V_{dif1}^{(*)3}$	$I_{OUT}=\{E4-1\}^{(*)4}mA$	-	120	300	mV	3
	$V_{dif2}^{(*)3}$	$I_{OUT}=\{E4-2\}^{(*)4}mA$	-	380	600		
Supply Current	I_{SS}	$V_{IN}=V_{OUT(T)}-1.0V$	-	$E5-1^{(*)4}$	$E5-2^{(*)4}$	μA	1
Line Regulation	$\frac{\Delta V_{OUT}}{(\Delta V_{IN} \cdot V_{OUT})}$	$I_{OUT}=20mA$ $V_{IN} \geq V_{OUT(T)}-1.0V$ $V_{IN} \leq -10.0V$	-	0.1	0.3	%V	3
Input Voltage	V_{IN}		-	-	-10.0	V	-
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{(\Delta V_{IN} \cdot V_{OUT})}$	$I_{OUT}=20mA$ $-40^{\circ}C \leq T_{opr} \leq 85^{\circ}C$	-	± 100	-	ppm/ $^{\circ}C$	-

*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: $V_{dif1}, V_{dif2} = V_{dif} = \{V_{IN1}^{()5} - V_{OUT1}^{(*)4}\}$

V_{OUT1} =A voltage equal to 98% of the output voltage whenever an amply stabilized $I_{OUT} \{V_{OUT(T)}-1.0V\}$ is input.

V_{IN1} =The input voltage when a voltage equal to 98% of $V_{OUT(E)}$ appears.

*4: Refer to the "Voltage chart".

■ ELECTRICAL CHARACTERISTICS (Continued)

● Voltage Chart

SYMBOL	E1-1	E1-2	E1-1	E1-2	E2	E5-1	E5-2
PARAMETER SETTING OUTPUT VOLTAGE(V)	OUTPUT VOLTAGE (V) (2% products)		OUTPUT VOLTAGE (V) (1% products)		MAXIMUM OUTPUT CURRENT (mA)	SUPPLY CURRENT1 (μ A)	
V _{OUT(T)}	V _{OUT(E)}				I _{OUTmax}	I _{SS}	
	MIN	MAX	MIN	MAX	MIN	TYP	MAX
2.1	2.058	2.142	-	-	40	2.5	6.0
2.2	2.156	2.244	-	-	↑	↑	↑
2.3	2.254	2.346	-	-	↑	↑	↑
2.4	2.352	2.448	-	-	↑	↑	↑
2.5	2.450	2.550	2.475	2.525	↑	↑	↑
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	60	↑	↑
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	↑	↑	↑
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	80	3.0	6.5
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	↑	↑	↑
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	100	↑	7.0
5.1	4.998	5.202	5.049	5.151	↑	↑	↑
5.2	5.096	5.304	5.148	5.252	↑	↑	↑
5.3	5.194	5.406	5.247	5.353	↑	↑	↑
5.4	5.292	5.508	5.346	5.454	↑	↑	↑
5.5	5.390	5.610	5.445	5.555	↑	↑	↑
5.6	5.488	5.712	5.544	5.656	↑	↑	↑
5.7	5.586	5.814	5.643	5.757	↑	↑	↑
5.8	5.684	5.916	5.742	5.858	↑	↑	↑
5.9	5.782	6.018	5.841	5.959	↑	↑	↑
6.0	5.880	6.120	5.940	6.060	↑	↑	↑

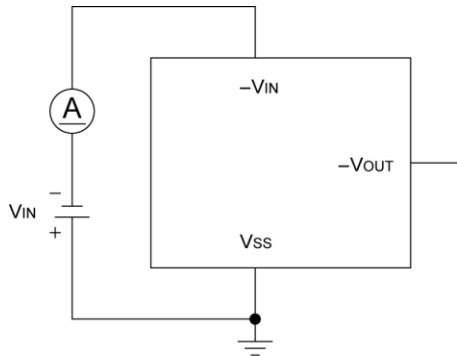
Note) The symbol is as same as that in the chart of electrical characteristics.

● Conditions Chart

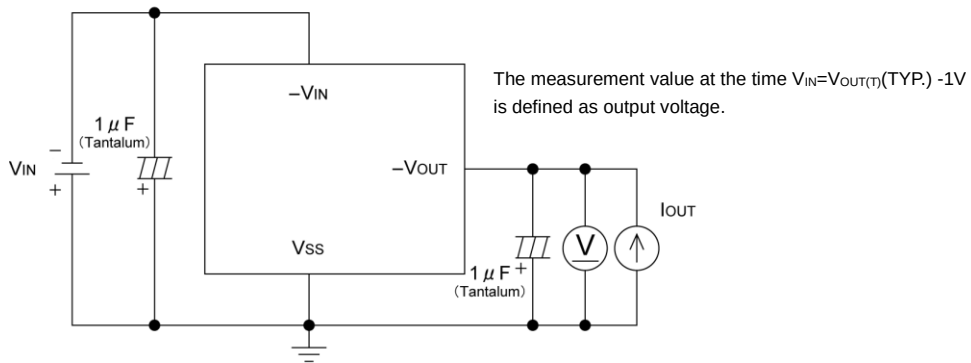
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TEST CIRCUITS

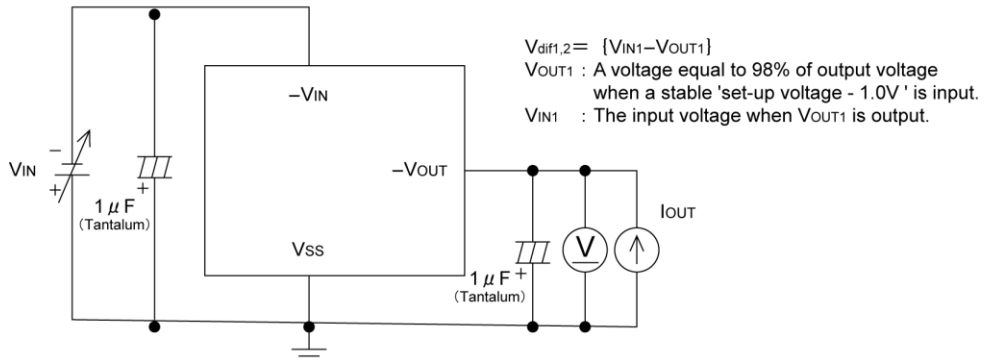
Circuit 1. Supply Current



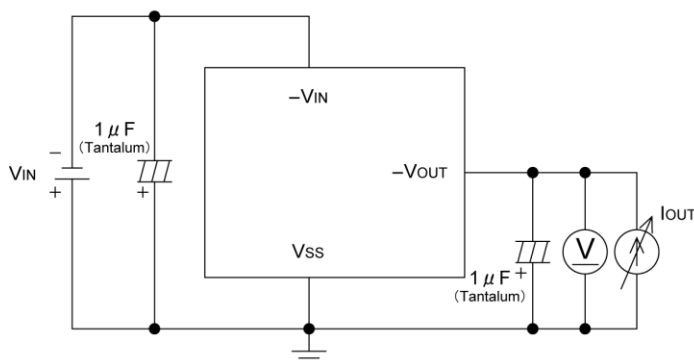
Circuit 2. Output Voltage



Circuit 3. Line Regulation Dropout Voltage



Circuit 4. Load Regulation, Maximum Output Current

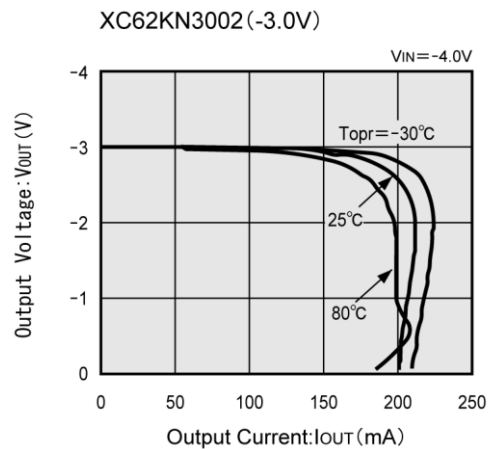
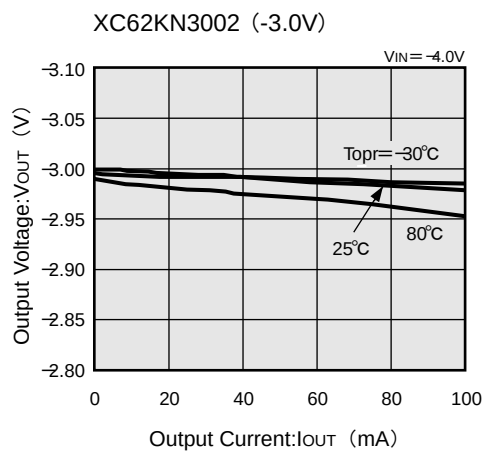
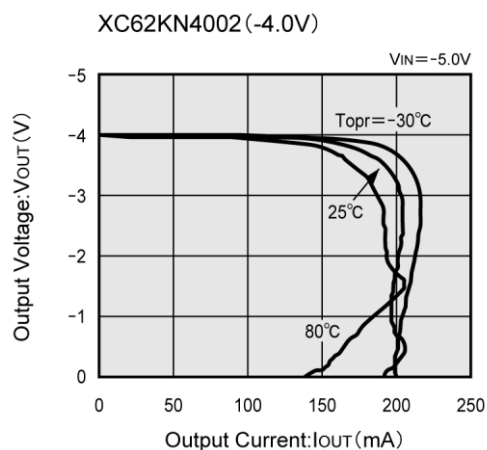
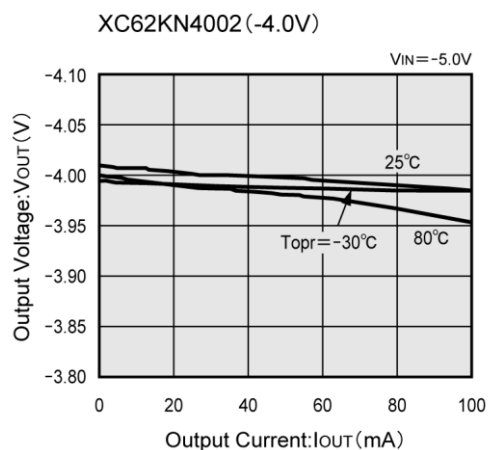
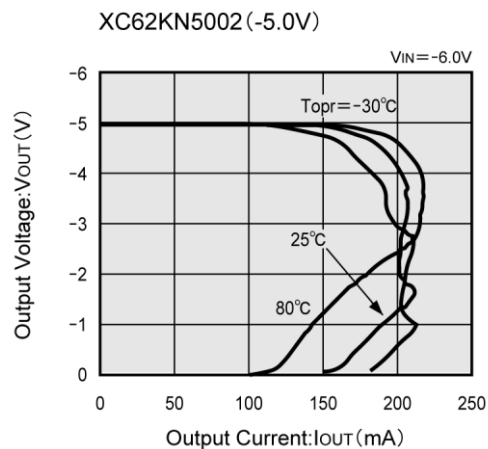
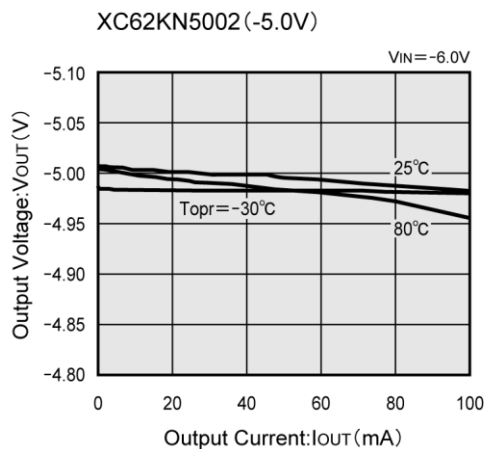


■NOTES ON USE

- 1) For the phenomenon of temporal and transitional voltage decrease or voltage increase, the IC may be damaged or deteriorated if IC is used beyond the absolute MAX. specifications.
- 2) Please ensure that values for input capacitance, C_{IN} and out capacitance, C_L , are more than $1\mu F$ (Tantalum).
- 3) Torex places an importance on improving our products and their reliability.
We request that users incorporate fail-safe designs and post-aging protection treatment when using Torex products in their systems.

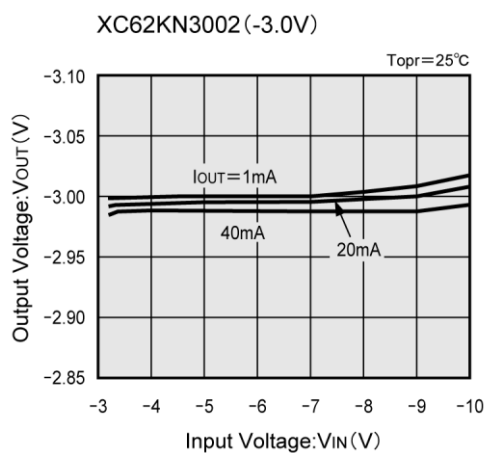
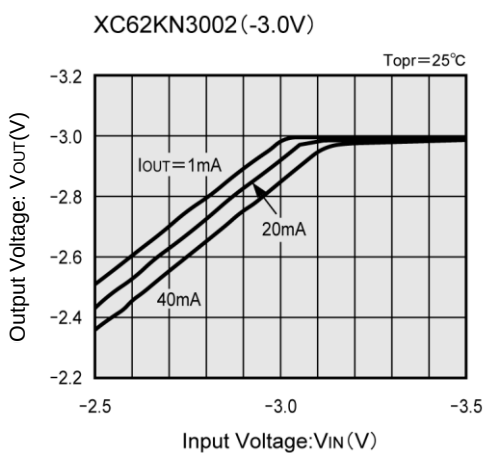
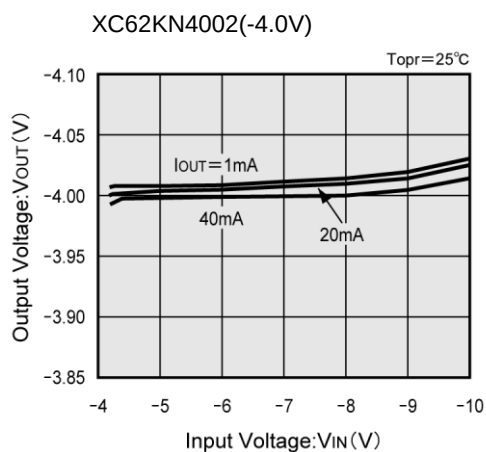
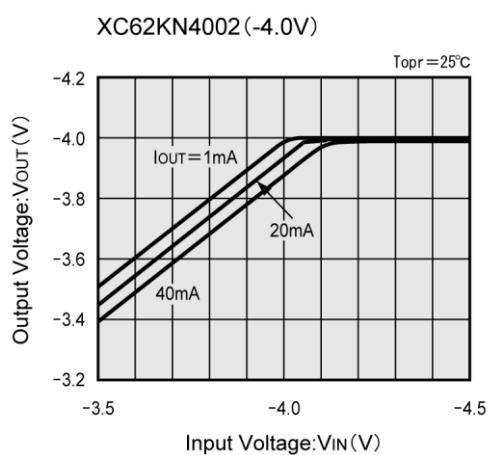
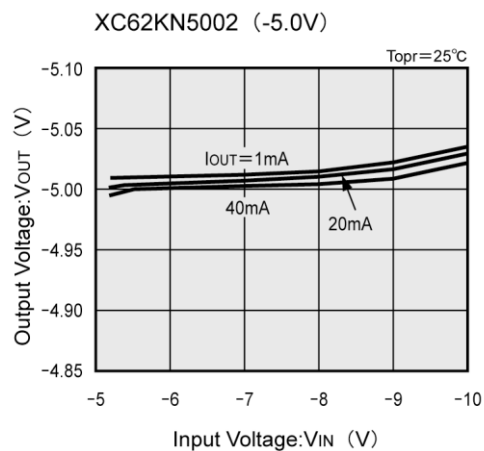
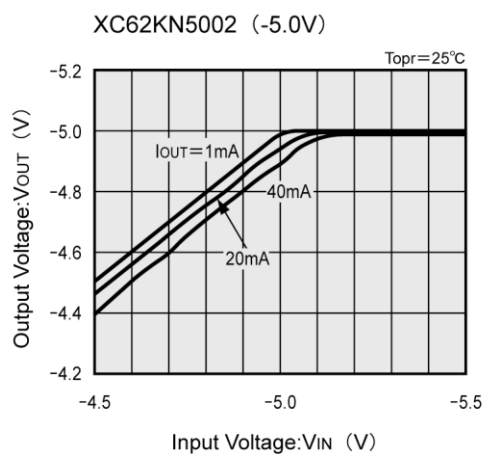
TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current



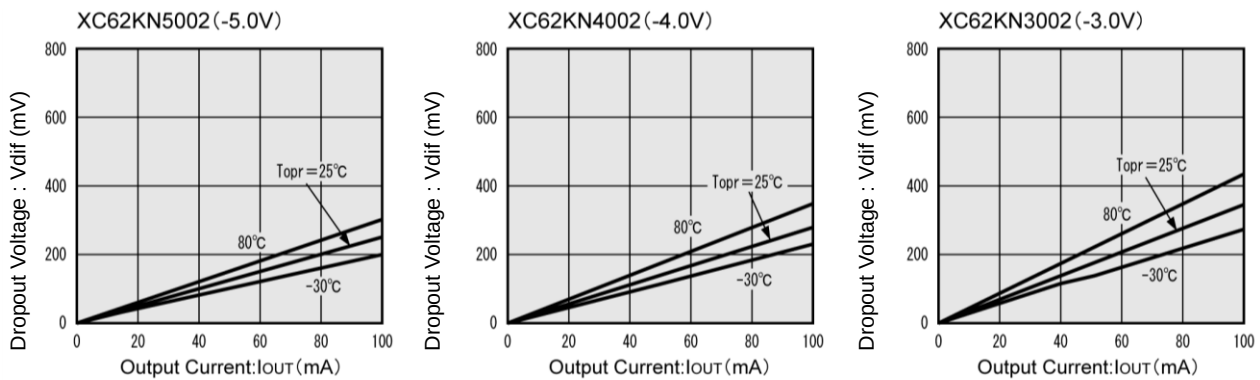
■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(2) Output Voltage vs. Input Voltage

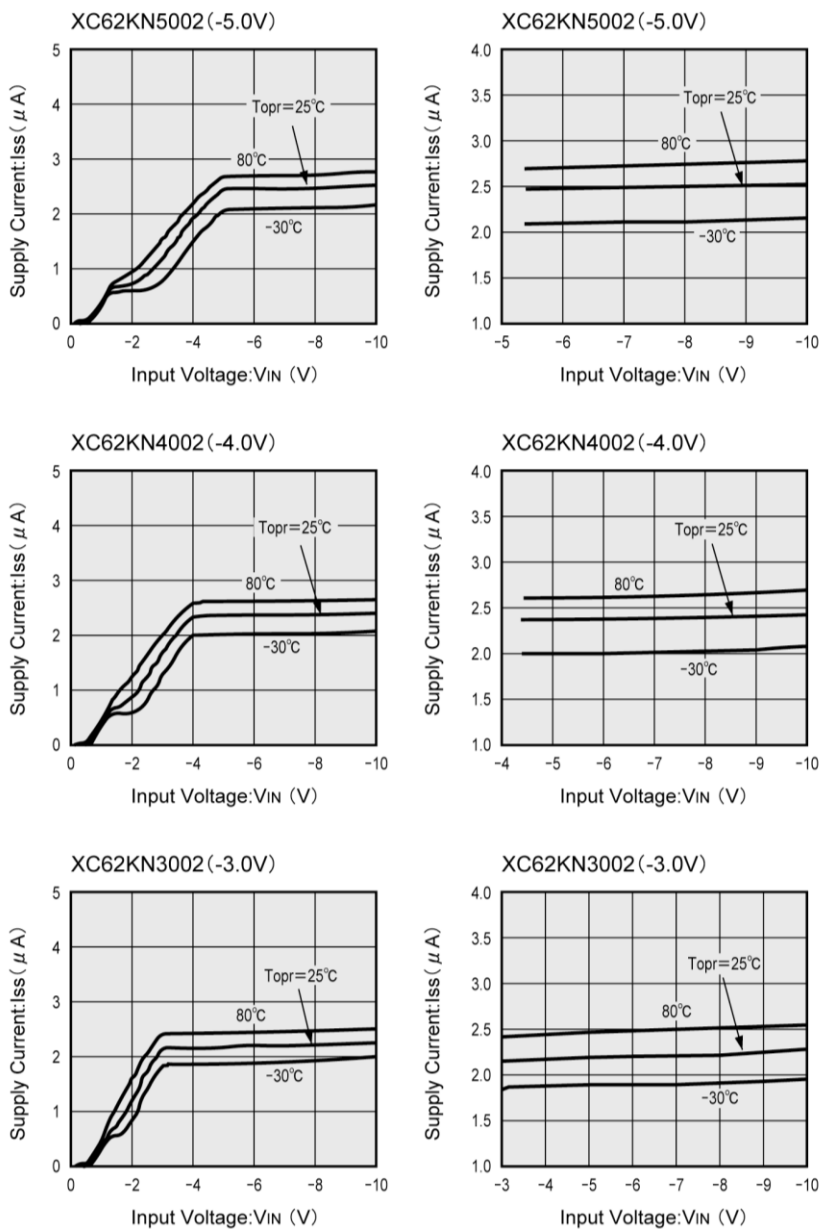


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) Dropout Voltage vs. Output Current

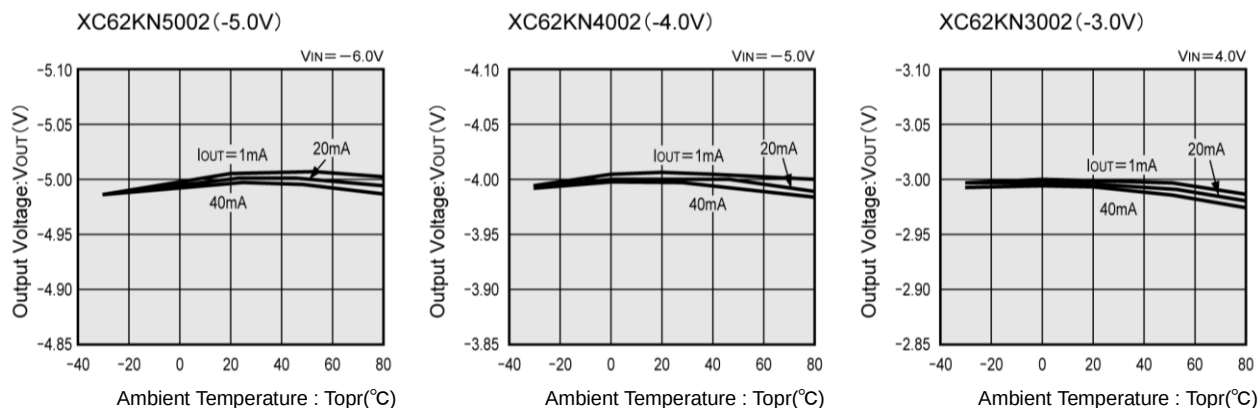


(4) Supply Current vs. Input Voltage

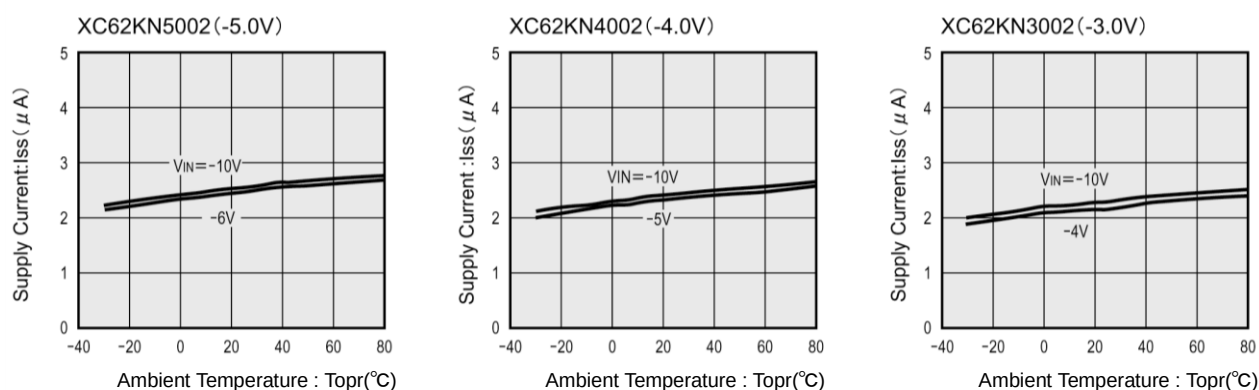


■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

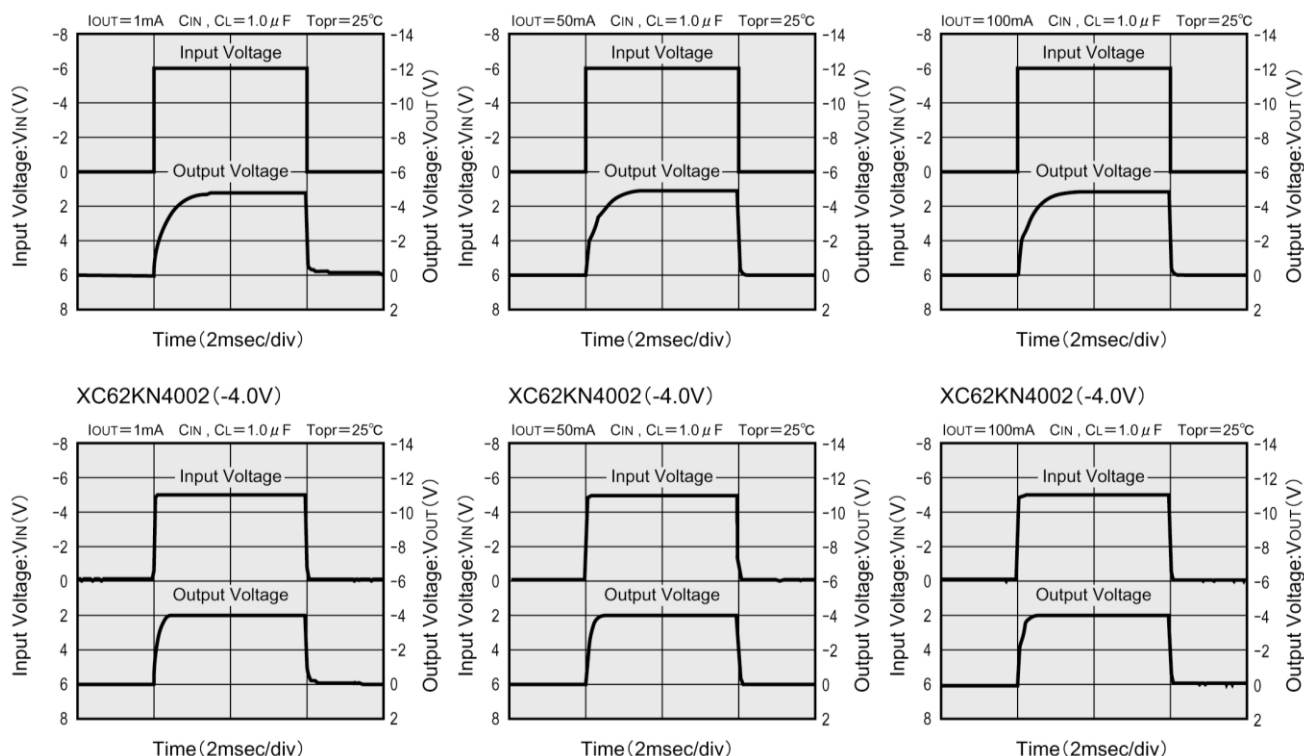
(5) Output Voltage vs. Ambient Temperature



(6) Supply Current vs. Ambient Temperature

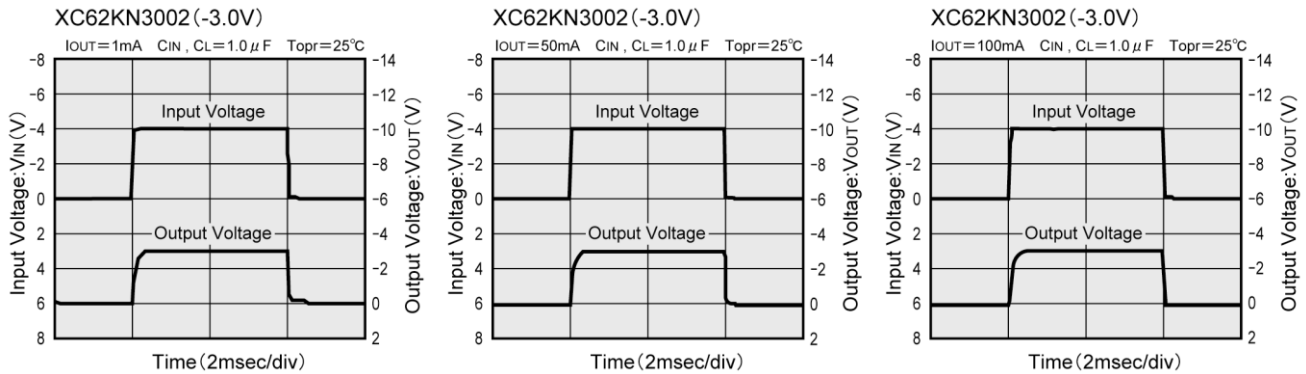


(7) Input Transient Response 1

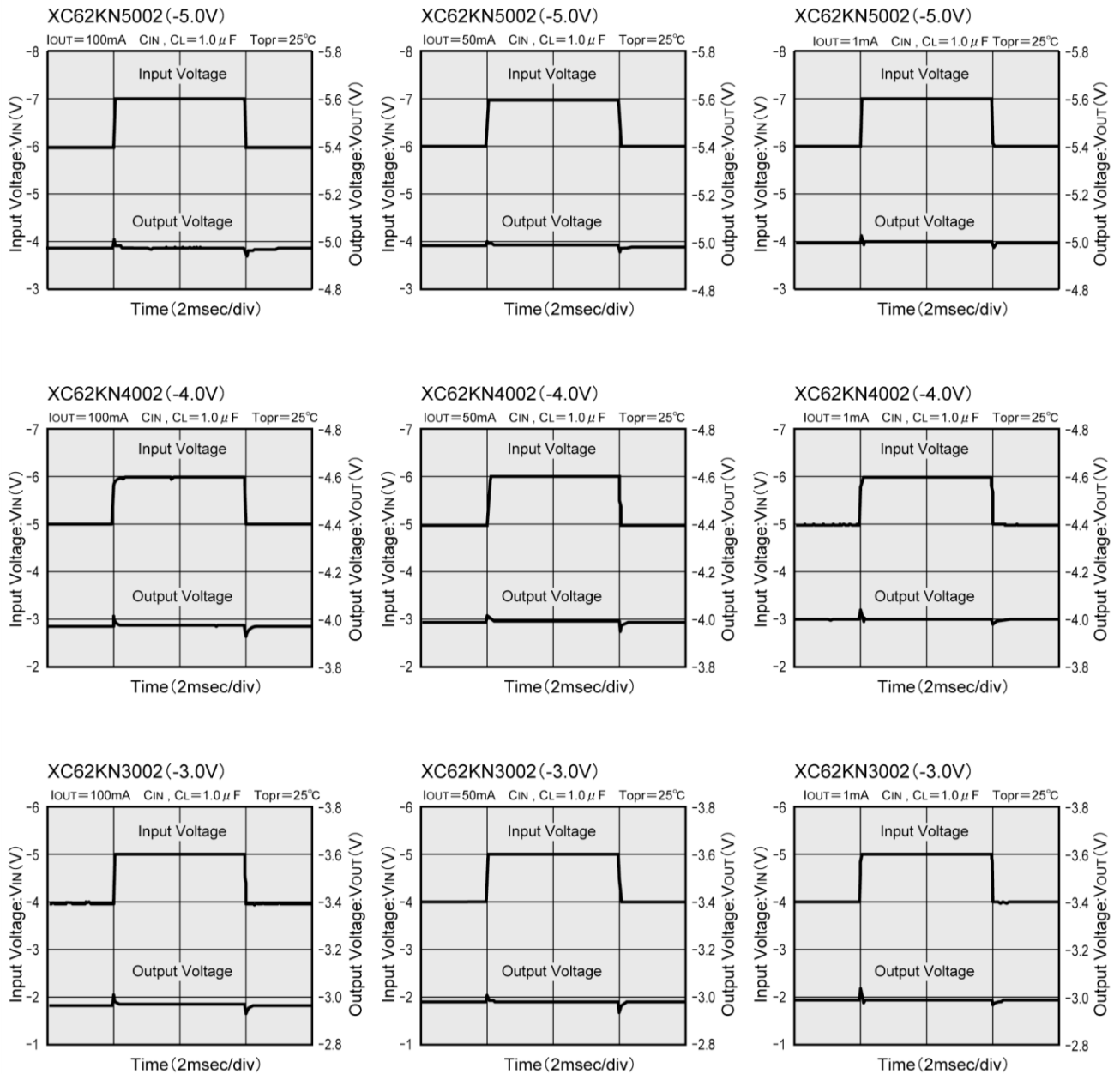


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Input Transient Response 1

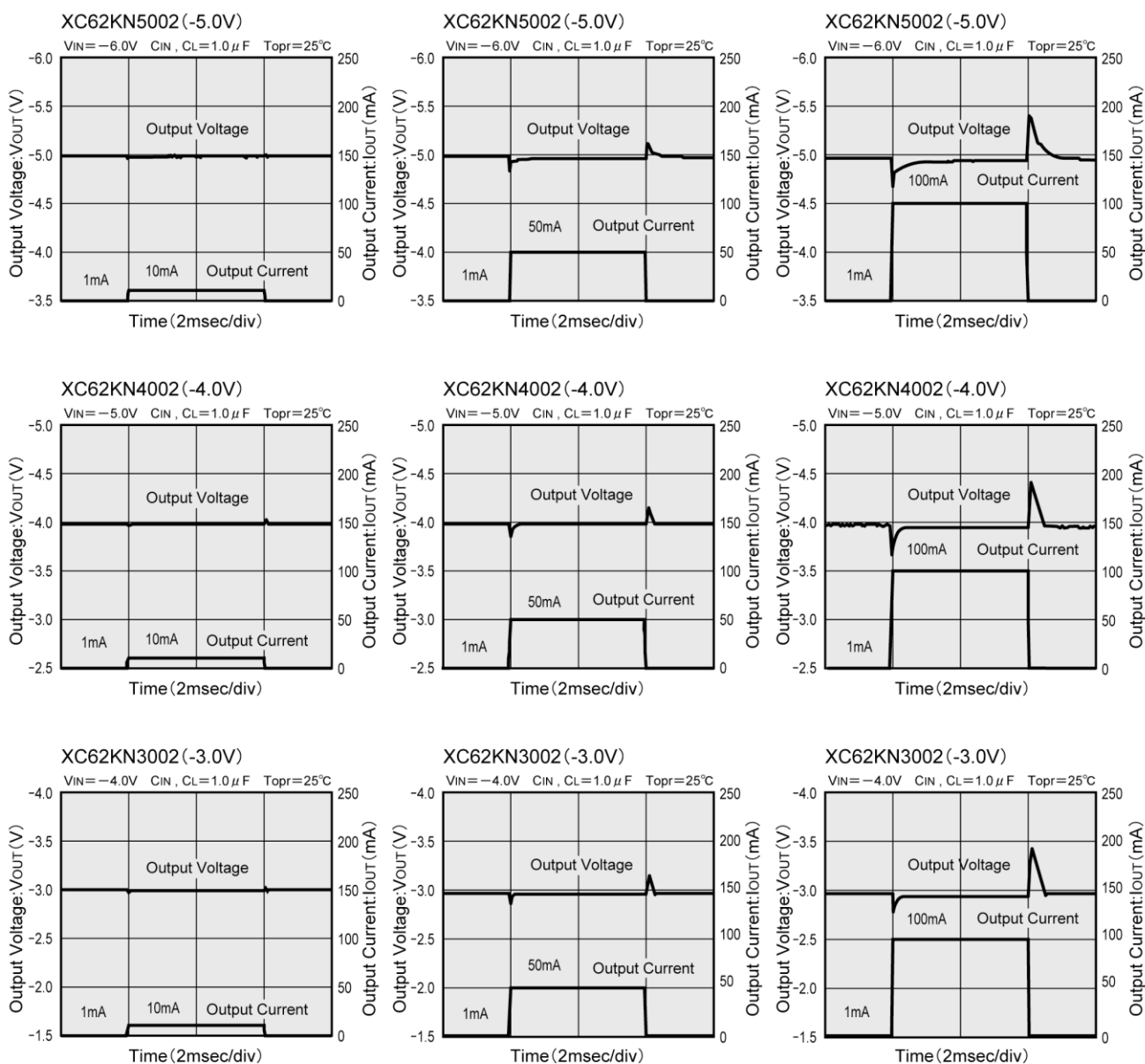


(8) Input Transient Response 2

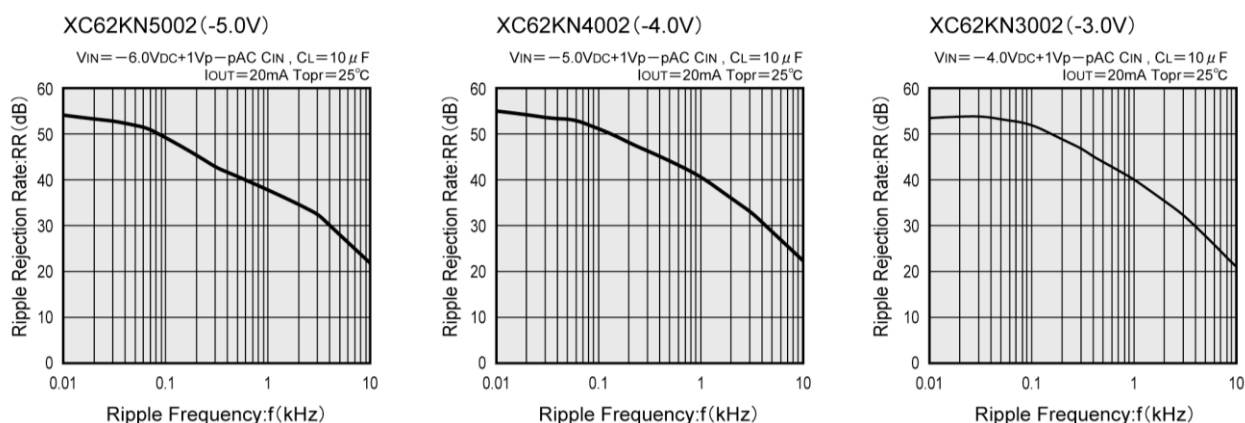


■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Load Transient Response



(10) Ripple Rejection Rate



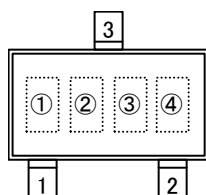
■ PACKAGING INFORMATION

For the latest package information, please visit www.torex.co.jp/technical-support/packages/

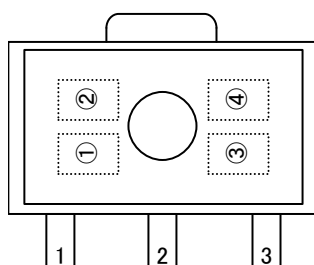
PACKAGE	OUTLINE / LAND PATTERN	THERMAL CHARACTERISTICS
SOT-23	SOT-23 PKG	SOT-23 Power Dissipation
SOT-89	SOT-89 PKG	SOT-89 Power Dissipation
USP-6B	USP-6B PKG	USP-6B Power Dissipation

■ MARKING RULE

● SOT-23, SOT-89



SOT-23
(TOP VIEW)



SOT-89
(TOP VIEW)

① represents integral number of output voltage

MARK	VOLTAGE (V)	MARK	VOLTAGE (V)
2	2.X	5	5.X
3	3.X	6	6.X
4	4.X		

② represents decimal number of output voltage

MARK	VOLTAGE (V)	MARK	VOLTAGE (V)
A	x.0	F	x.5
B	x.1	H	x.6
C	x.2	K	x.7
D	x.3	L	x.8
E	x.4	M	x.9

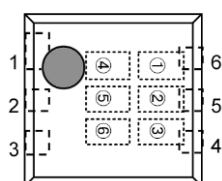
③ represents polarity of output voltage

MARK	POLARITY
5	Negative

④ represents production lot number

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

● USP-6B



USP-6B
(TOP VIEW)

① represents production series

MARK	PRODUCT SERIES
K	XC62KNxx0xDx

② represents polarity of output voltage

MARK	POLARITY	PRODUCT SERIES
N	— (Negative)	XC62KNxx0xDx

③④ represents output voltage (ex.)

MARK		VOLTAGE (V)	PRODUCT SERIES
③	④		
3	3	3.3	XC62KN330xDx
5	0	5.0	XC62KN500xDx

⑤ represents temperature characteristics

MARK	TEMPERATURE CHARACTERISTICS	PRODUCT SERIES
0	± 100 ppm (TYP.)	XC62KNxx0xDx

⑥ represents production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excluded)
Note: No character inversion used.

1. The product and product specifications contained herein are subject to change without notice to improve performance characteristics. Consult us, or our representatives before use, to confirm that the information in this datasheet is up to date.
2. The information in this datasheet is intended to illustrate the operation and characteristics of our products. We neither make warranties or representations with respect to the accuracy or completeness of the information contained in this datasheet nor grant any license to any intellectual property rights of ours or any third party concerning with the information in this datasheet.
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5. Although we make continuous efforts to improve the quality and reliability of our products; nevertheless Semiconductors are likely to fail with a certain probability. So in order to prevent personal injury and/or property damage resulting from such failure, customers are required to incorporate adequate safety measures in their designs, such as system fail safes, redundancy and fire prevention features.
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[XC62KS0PXXMR-G](#)