XC62K Series

Negative Voltage Regulators

TOREX

◆CMOS Low Power Consumption
◆Small Input-Output Voltage Differential
: 0.12V @ 50mA,
0.38V @ 100mA
◆Maximum Output Current : 100mA (VOUT=-5.0V)
◆Highly Accurate : ±2% (±1%)
◆Output Voltage Range : -2.1V~ -6.0V
◆Supply Current : 3.0μA (VOUT=-5.0V)
◆SOT-23/SOT-89/TO-92 Package

■Applications

●Battery Powered Equipment
●Portable & Cellular Phones
●Various Portable Equipment
●Power Supply for GaAs Applications

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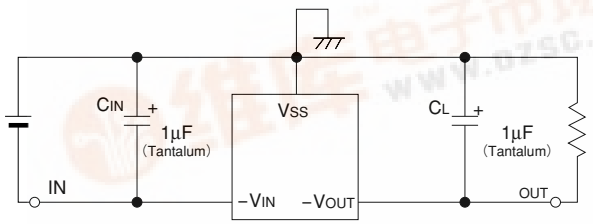
■General Description

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 (150mW), SOT-89 (500mW) and TO-92 (300mW) packages are available.

■Features

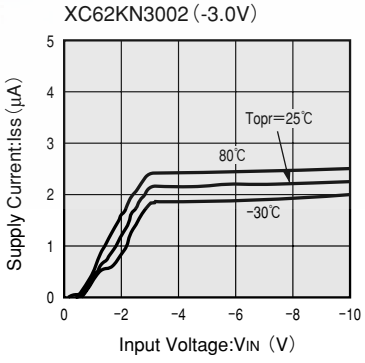
Ultra Small Input-Output Voltage Differential : 50mA output possible with a 0.12V differential (VOUT=-5.0V).
Maximum Output Current : 100mA (within max. power dissipation, VOUT= -5.0V)
Output Voltage Range : -2.1V ~ -6.0V in 0.1V increments. -5.0, -4.0, -3.0V, -2.5V standard. (All other voltages are semi-custom)
Highly Accurate : Output voltage ±2% (±1% for semi-custom products)
Low Power Consumption : Typ. 3.0μA @ VOUT= -5.0V
Output Voltage Temperature Characteristics : Typ. ±100ppm/°C
Input Stability : Typ. 0.1%/V
Ultra Small Packages : SOT- 23 (150mW) mini-mold, SOT-89 (500mW) mini-power mold TO-92 (300mW)

■Typical Application Circuit

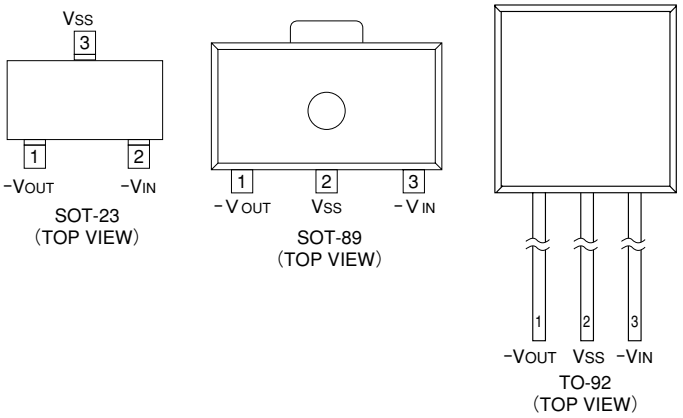


■Typical Performance Characteristic

XC62KN3002 (-3.0V)



■Pin Configuration



■Pin Assignment

PIN NUMBER			PIN NAME	FUNCTION
SOT-23	SOT-89	TO-92		
2	3	3	−VIN	Power Supply Input
3	2	2	VSS	Ground
1	1	1	−VOUT	Output

■Product Classification

●Ordering Information

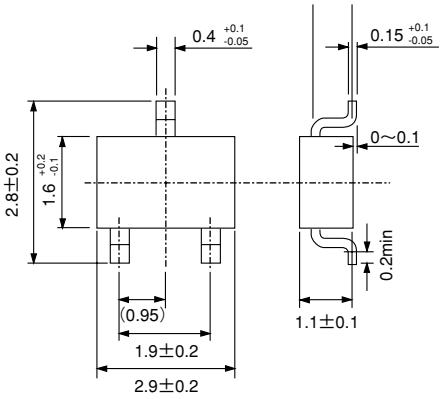
X C 6 2 K X X X X X X X

a b c d e f

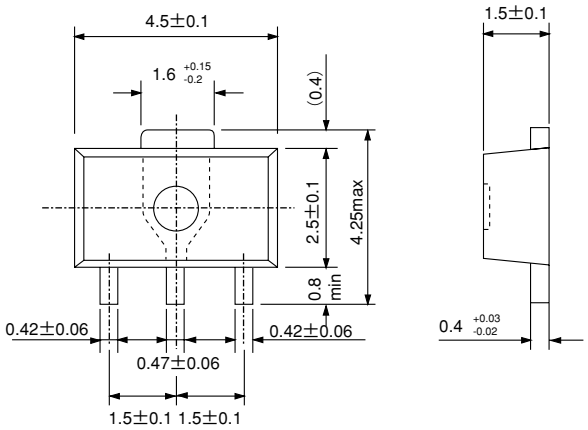
DESIGNATOR	DESCRIPTION	DESIGNATOR	DESCRIPTION
a	Polarity of Output Voltage N=Negative	e	Package Type M=SOT-23 P=SOT-89 T=TO-92 (Standard)
b	Output Voltage 30=3.0V 50=5.0V		
c	Temperature Characteristics 0=±100ppm/°C(typical)	f	Device Orientation R=Embossed Tape (Standard Feed) L=Embossed Tape (Reverse Feed) H=Paper Tape (TO-92) B=Bag (TO-92)
d	Accuracy 1=±1.0%(Semi-custom products) 2=±2.0%		

■Packaging Information

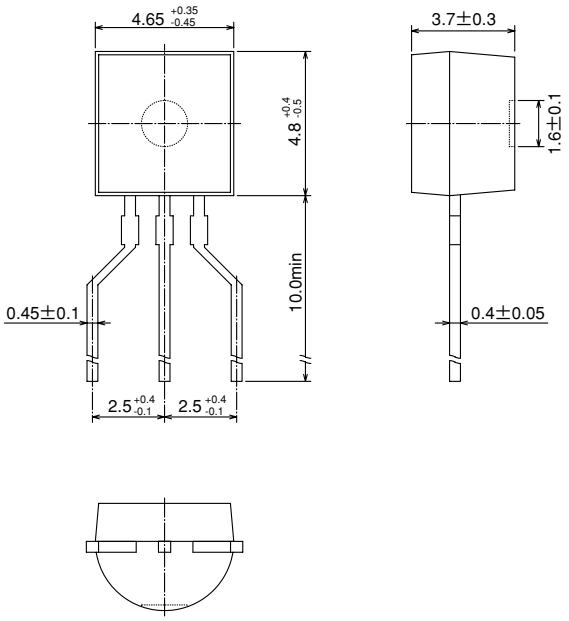
●SOT-23



●SOT-89



●TO-92



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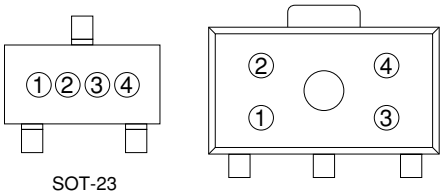
■Marking

●SOT-23, SOT-89



SOT-23
(TOP VIEW)

SOT-89
(TOP VIEW)

① Integral Number of Output Voltage

DESIGNATOR	VOLTAGE(V)	DESIGNATOR	VOLTAGE(V)
2	2.②	5	5.②
3	3.②	6	6.②
4	4.②		

② Decimal number of Output Voltage

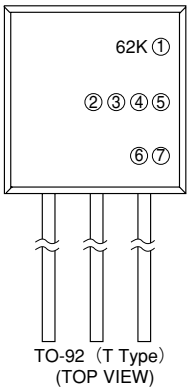
DESIGNATOR	VOLTAGE(V)	DESIGNATOR	VOLTAGE(V)
A	①.0	F	①.5
B	①.1	H	①.6
C	①.2	K	①.7
D	①.3	L	①.8
E	①.4	M	①.9

③ Polarity of Output Voltage

DESIGNATOR	POLARITY
5	Negative

④ Assembly Lot Number
Based on internal standards.

●TO-92



TO-92 (T Type)
(TOP VIEW)

① Represents the Polarity of Output Voltage

DESIGNATOR	OUTPUT CONFIGURATION
N	—

④ Represents the temperature Characteristics

DESIGNATOR	TEMPERATURE CHARACTERISTICS
0	TPY±100ppm

⑤ Represents the Detect Voltage Accuracy

DESIGNATOR	DETECT VOLTAGE ACCURACY
1	within ±1% (semi-custom)
2	within ±2%

⑥ Represents a least significant digit of the produced year

DESIGNATOR	PRODUCED YEAR
0	2000
1	2001

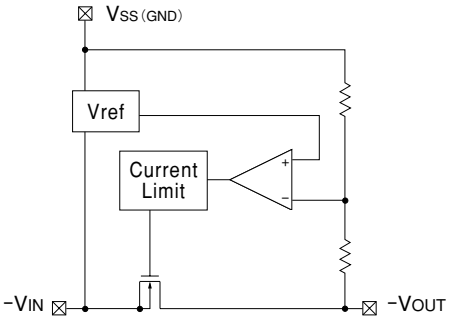
⑦ Denotes the production lot number
0 to 9, A to Z repeated(G.I.J.O.Q.W excepted)

②③ Represents the Detect Voltage

DESIGNATOR		VOLTAGE (V)
②	③	
3	3	3.3
5	0	5.0

3

■Block Diagram



■Absolute Maximum Ratings

Ta=25°C

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	−12	V
Output Current		I_{OUT}	200	mA
Output Voltage		V_{OUT}	$-V_{DD}-0.3 \sim V_{IN}+0.3$	V
Continuous Total Power Dissipation	SOT-23	P_d	150	mW
	SOT-89		500	
	TO-92		300	
Operating Ambient Temperature		T_{opr}	−30 ~ +80	°C
Storage Temperature		T_{stg}	−40 ~ +125	°C

Note: Please ensure that I_{OUT} is less than $Pd \div (V_{OUT} - V_{IN})$

■Electrical Characteristics

XC62KN5002 $V_{OUT}(T)$=–5.0V Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	$V_{OUT}(E)$	I_{OUT}=20mA V_{IN}=–6.0V	×0.98 –4.90	$V_{OUT}(T)$ –5.0	×1.02 –5.10	V
Maximum Output Current	I_{OUT} max.	V_{IN}=–6.0V, $V_{OUT}(E) \geq$ –4.5V	100			mA
Load Stability	ΔV_{OUT}	V_{IN}=–6.0V 1mA ≤ I_{OUT} ≤ 50mA		40	80	mV
Input/Output Voltage Differential	Vdif	I_{OUT}=50mA I_{OUT}=100mA		120 380	300 600	mV
Supply Current	Iss	V_{IN}=–6.0V		3.0	7.0	μA
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	I_{OUT}=20mA –6.0V ≤ V_{IN} ≤ –10.0V		0.1	0.3	%/V
Input Voltage	V_{IN}				–10.0	V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	I_{OUT}=20mA –30°C ≤ Topr ≤ 80°C		±100		ppm/°C

XC62KN4002 $V_{OUT}(T)$=–4.0V Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	$V_{OUT}(E)$	I_{OUT}=20mA V_{IN}=–5.0V	×0.98 –3.92	$V_{OUT}(T)$ –4.0	×1.02 –4.08	V
Maximum Output Current	I_{OUT} max.	V_{IN}=–5.0V, $V_{OUT}(E) \geq$ –3.6V	80			mA
Load Stability	ΔV_{OUT}	V_{IN}=-5.0V 1mA ≤ I_{OUT} ≤ 45mA		40	80	mV
Input/Output Voltage Differential	Vdif	I_{OUT}=45mA I_{OUT}=90mA		120 380	300 600	mV
Supply Current	Iss	V_{IN}=–5.0V		3.0	6.5	μA
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	I_{OUT}=20mA –5.0V ≤ V_{IN} ≤ –10.0V		0.1	0.3	%/V
Input Voltage	V_{IN}				–10.0	V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	I_{OUT}=20mA –30°C ≤ Topr ≤ 80°C		±100		ppm/°C

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. Vdif = {V_{IN1} - V_{OUT1}}
4. V_{OUT1} =A voltage equal to 98% of the Output Voltage whenever an amply stabilised I_{OUT} {$V_{OUT}(T)$ -1.0V} is input.
5. V_{IN1}=The Input Voltage when a voltage equal to 98% of $V_{OUT}(E)$ appears. (Input Voltage is gradually decreased.)
6. I_{OUTmax}=Please ensure that output current is within the values given for power dissipation.

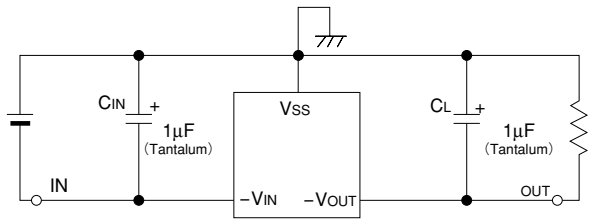
XC62KN3002 $V_{OUT}(T)$=–3.0V Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	$V_{OUT}(E)$	I_{OUT}=20mA V_{IN}=–4.0V	×0.98 –2.94	$V_{OUT}(T)$ –3.0	×1.02 –3.06	V
Maximum Output Current	I_{OUT} max.	V_{IN}=–4.0V, $V_{OUT}(E) \geq$ –2.7V	60			mA
Load Stability	ΔV_{OUT}	V_{IN}=–4.0V 1mA ≤ I_{OUT} ≤ 40mA		40	80	mV
Input/Output Voltage Differential	Vdif	I_{OUT}=40mA I_{OUT}=80mA		120 380	300 600	mV
Supply Current	Iss	V_{IN}=–4.0V		2.5	6.0	µA
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	I_{OUT}=20mA –4.0V ≤ V_{IN} ≤ –10.0V		0.1	0.3	%/V
Input Voltage	V_{IN}				–10.0	V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Topr \cdot V_{OUT}}$	I_{OUT}=20mA –30°C≤ Topr ≤ 80°C		±100		ppm/°C

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. Vdif = {$V_{IN}1$ - $V_{OUT}1$}
4. $V_{OUT}1$ =A voltage equal to 98% of the Output Voltage whenever an amply stabilised I_{OUT} {$V_{OUT}(T)$ -1.0V} is input.
5. $V_{IN}1$=The Input Voltage when a voltage equal to 98% of $V_{OUT}(E)$ appears. (Input Voltage is gradually decreased.)
6. I_{OUT}max=Please ensure that output current is within the values given for power dissipation.

■Typical Application Circuit

●Standard Circuit



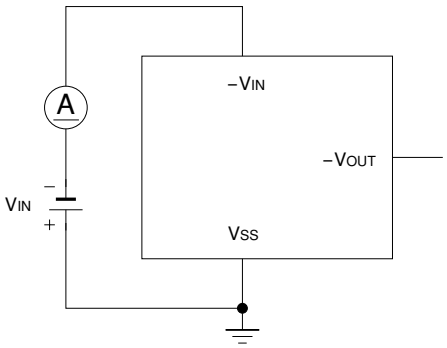
■Directions for use

●Notes on Use

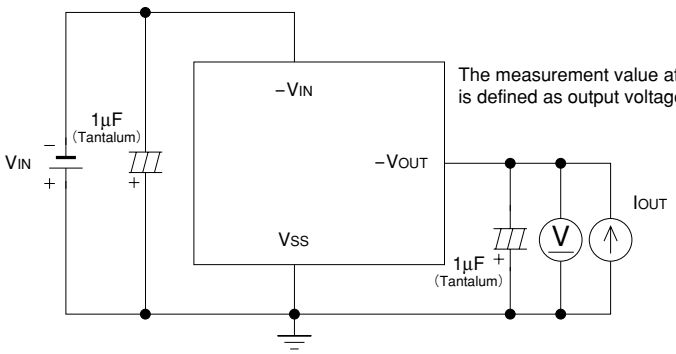
Please ensure that values for C_{IN} and C_L are more than 1µF (Tantalum).

■Test Circuits

1. Supply Current

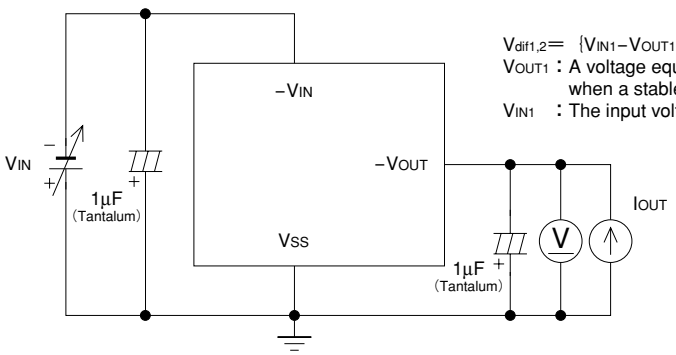


2. Output Voltage



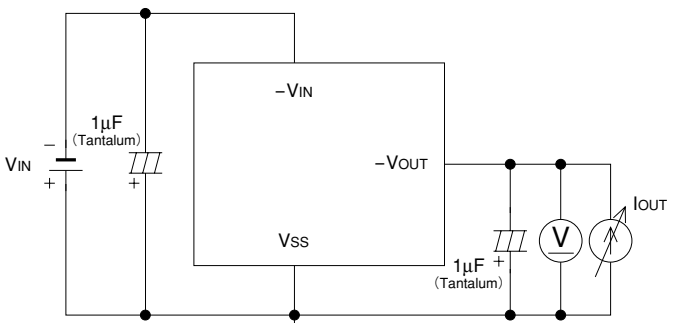
The measurement value at the time V_{IN}=V_{OUT} (typ) -1V is defined as output voltage.

3. Input stability, Input/Output voltage differential



$V_{dif1,2}$= {V_{IN1}−V_{OUT1}}
V_{OUT1} : A voltage equal to 98% of output voltage when a stable 'set-up voltage - 1.0V ' is input.
V_{IN1} : The input voltage when V_{OUT1} is output.

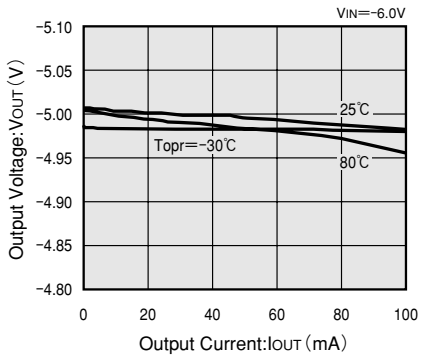
4. Load stability, Maximum output current



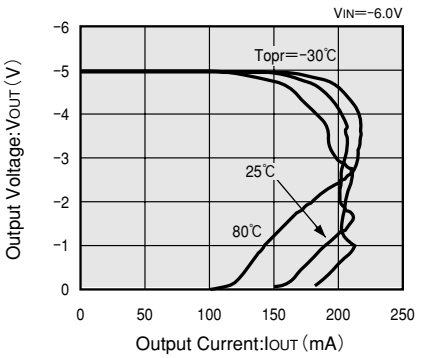
■Typical Performance Characteristics

(1) OUTPUT VOLTAGE vs. OUTPUT CURRENT

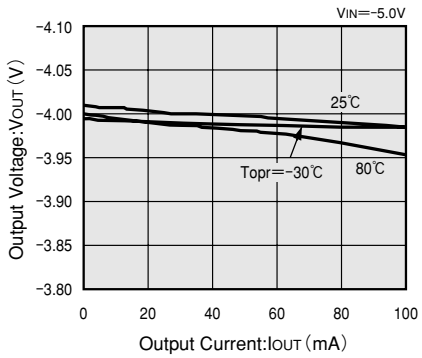
XC62KN5002 (-5.0V)



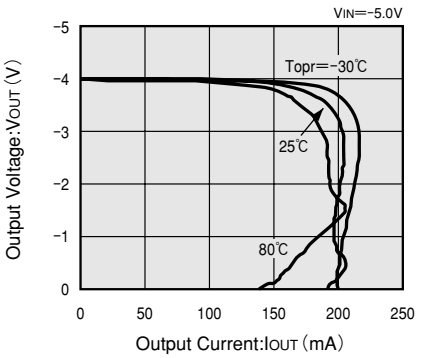
XC62KN5002 (-5.0V)



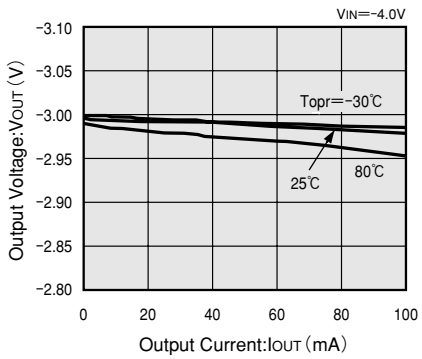
XC62KN4002 (-4.0V)



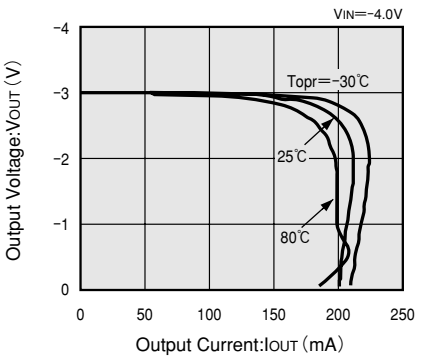
XC62KN4002 (-4.0V)



XC62KN3002 (-3.0V)



XC62KN3002 (-3.0V)



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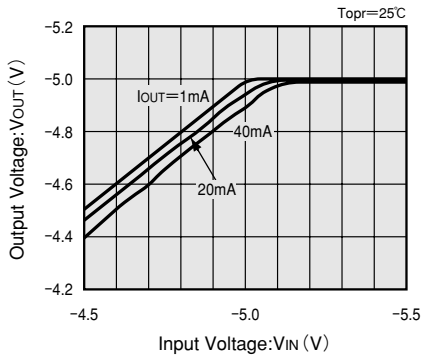
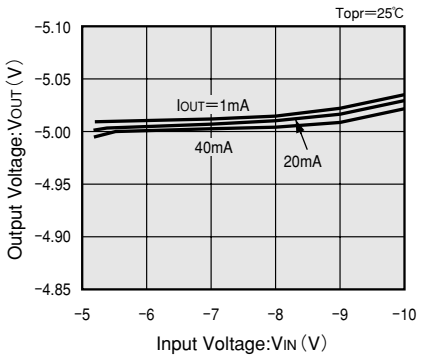
(2) OUTPUT VOLTAGE vs. INPUT VOLTAGE

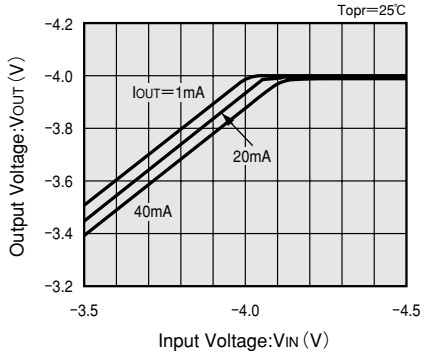
XC62KN5002 (-5.0V)



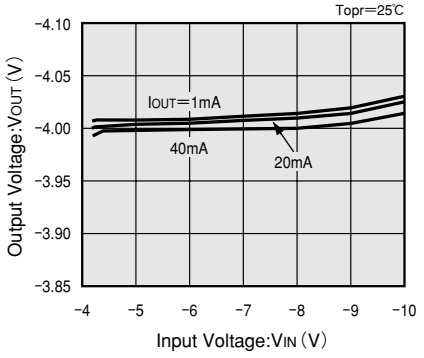
XC62KN5002 (-5.0V)



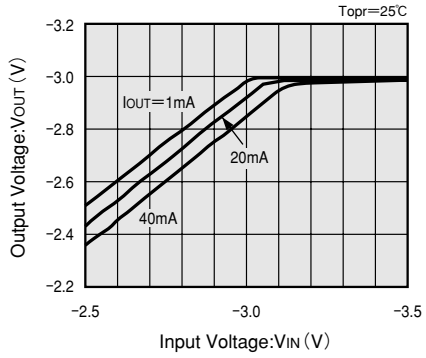
XC62KN4002 (-4.0V)



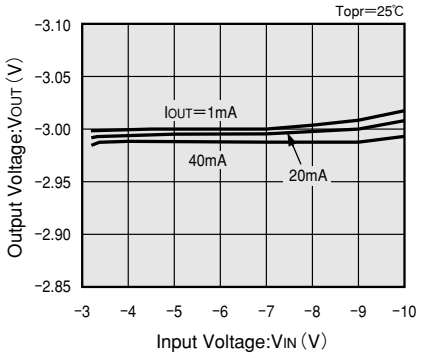
XC62KN4002 (-4.0V)



XC62KN3002 (-3.0V)

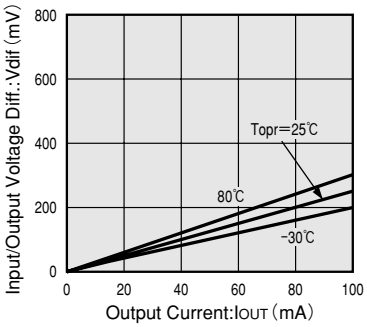


XC62KN3002 (-3.0V)

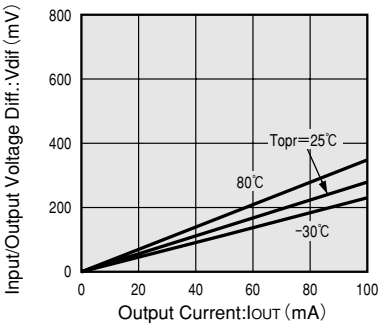


(3) INPUT/OUTPUT VOLTAGE DIFFERENTIAL vs. OUTPUT CURRENT

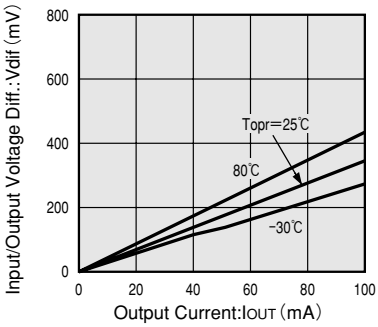
XC62KN5002 (-5.0V)



XC62KN4002 (-4.0V)

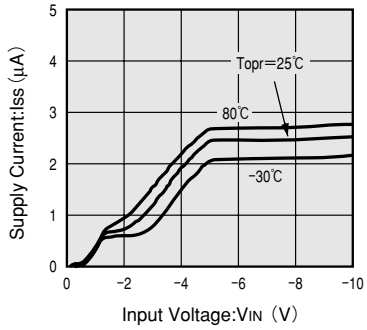


XC62KN3002 (-3.0V)

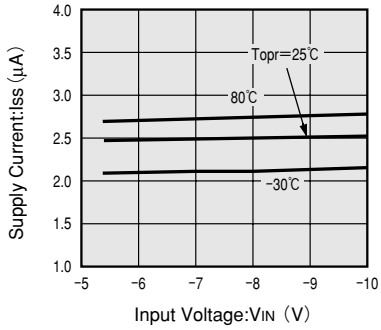


(4) SUPPLY CURRENT vs. INPUT VOLTAGE

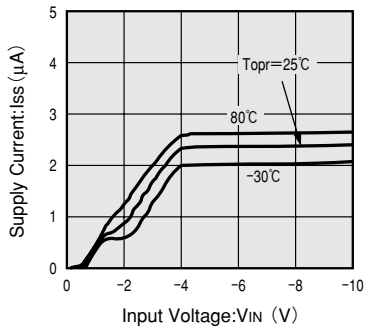
XC62KN5002 (-5.0V)



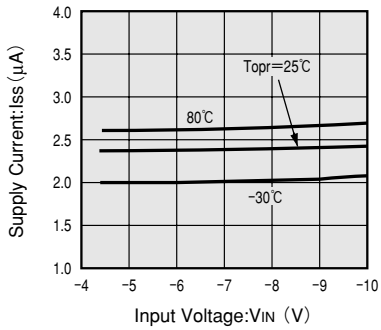
XC62KN5002 (-5.0V)



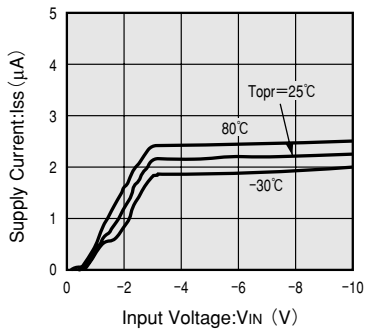
XC62KN4002 (-4.0V)



XC62KN4002 (-4.0V)



XC62KN3002 (-3.0V)



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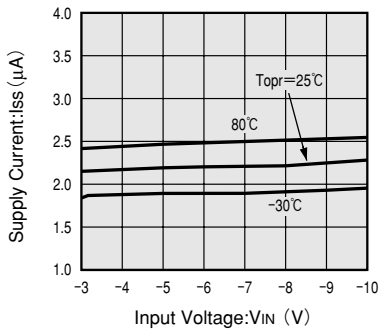
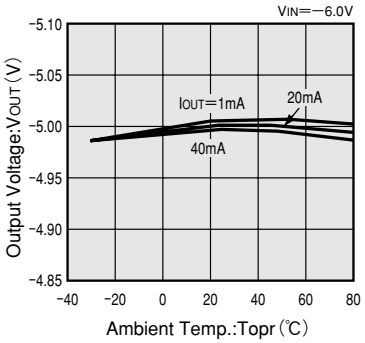
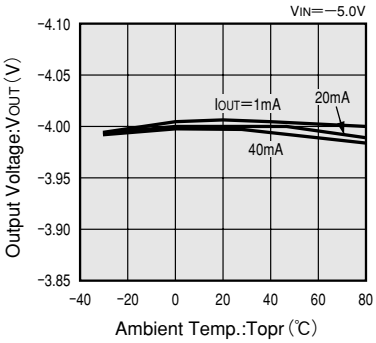


(5) OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE

XC62KN5002 (-5.0V)



XC62KN4002 (-4.0V)



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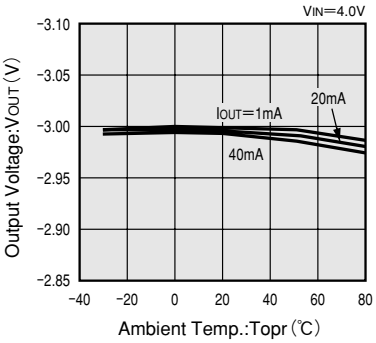
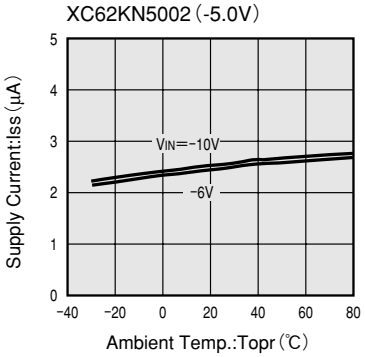


(6) SUPPLY CURRENT vs. AMBIENT TEMPERATURE

XC62KN5002 (-5.0V)



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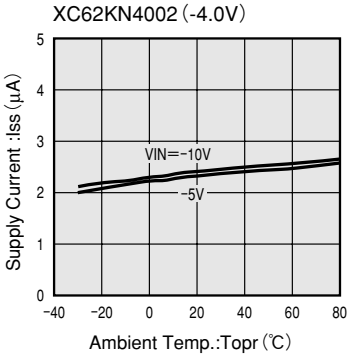

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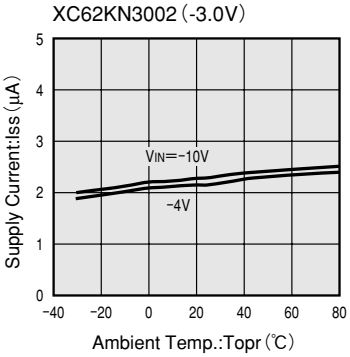
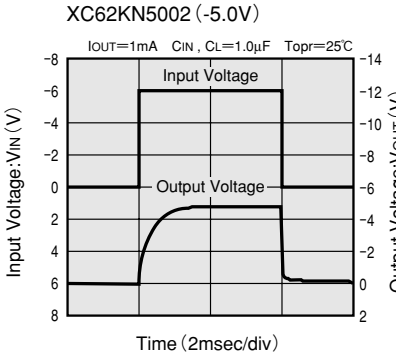


(7) INPUT TRANSIENT RESPONSE 1

XC62KN5002 (-5.0V)



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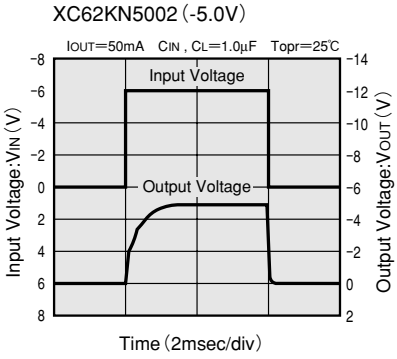

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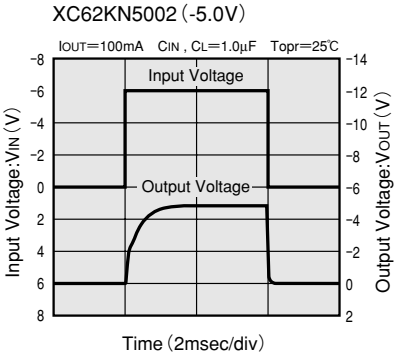

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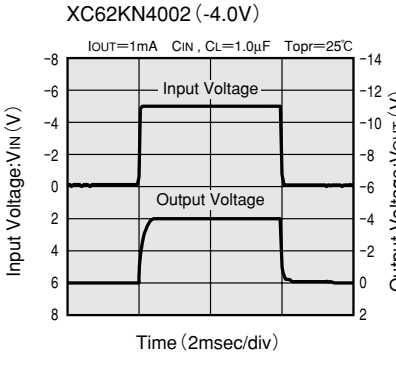

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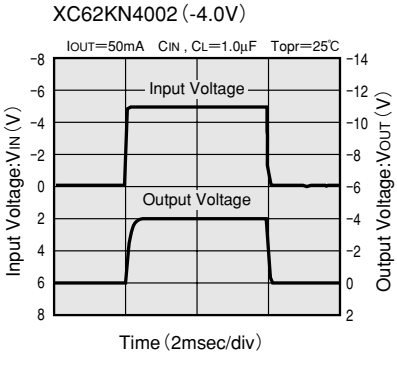

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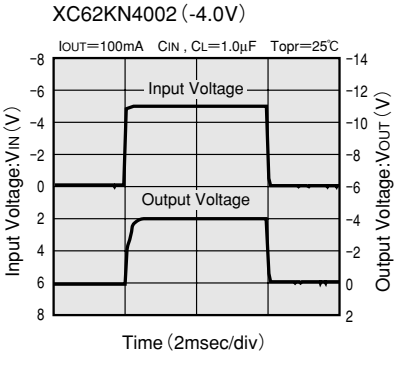
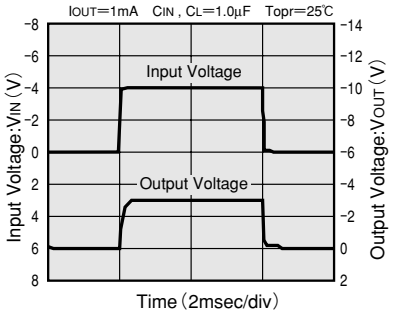


(7) INPUT TRANSIENT RESPONSE 1

XC62KN3002 (-3.0V)



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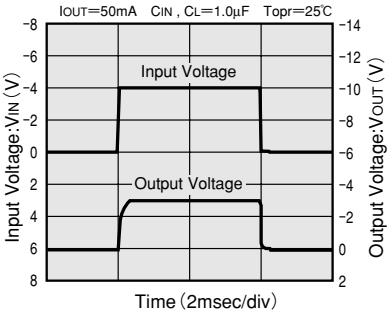

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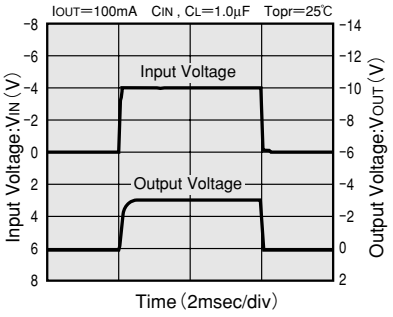
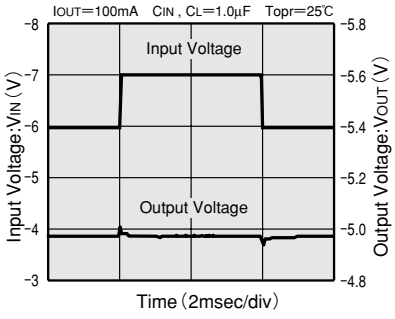


(8) INPUT TRANSIENT RESPONSE 2

XC62KN5002 (-5.0V)



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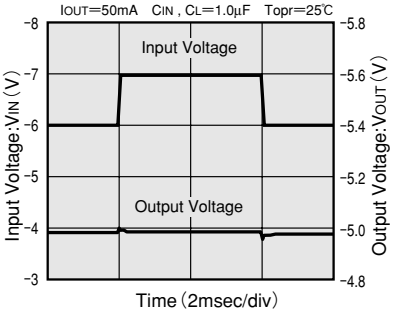

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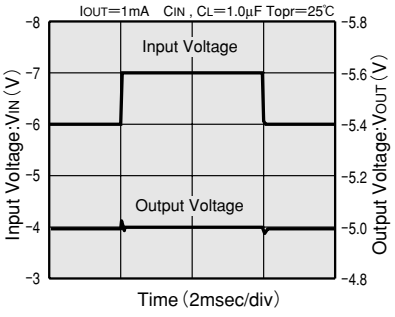

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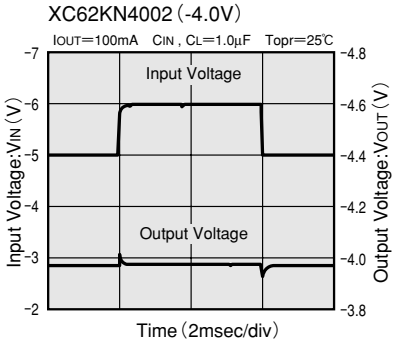

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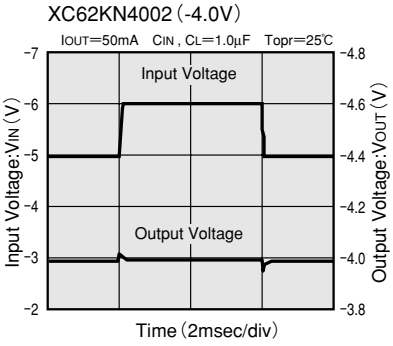

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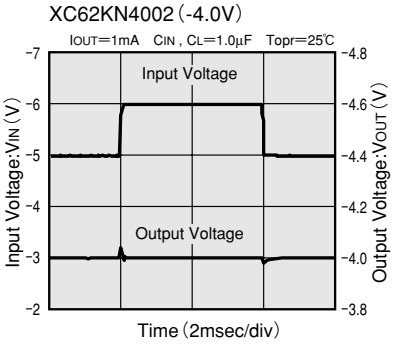

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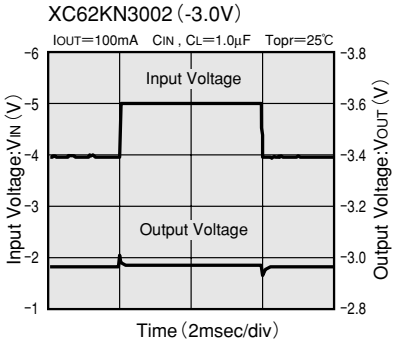

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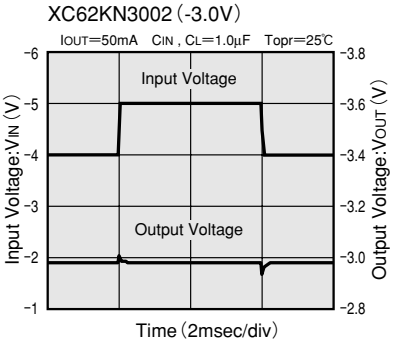

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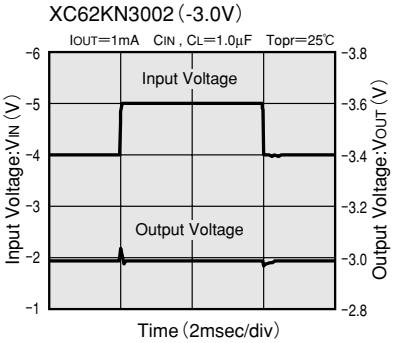
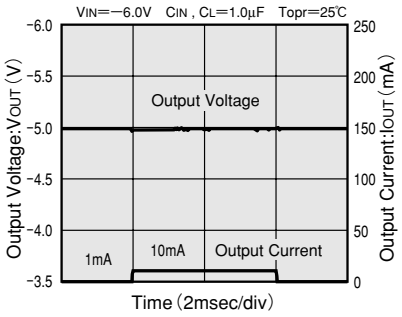


(9) LOAD TRANSIENT RESPONSE

XC62KN5002 (-5.0V)



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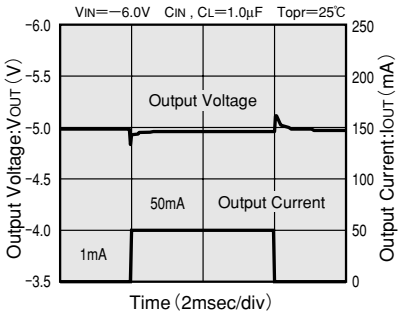

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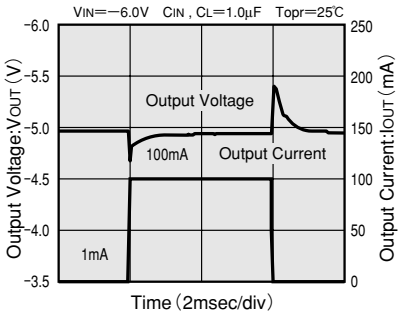

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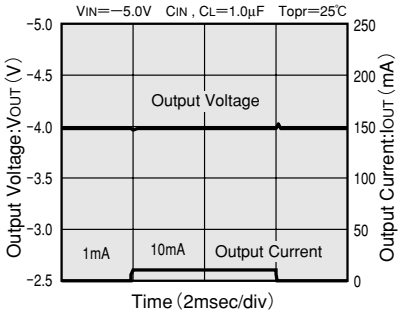

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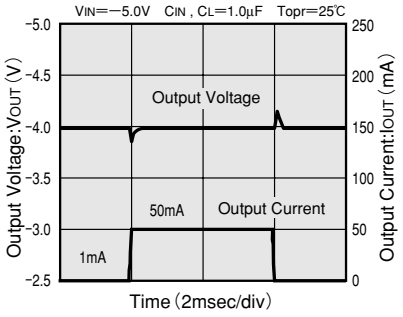

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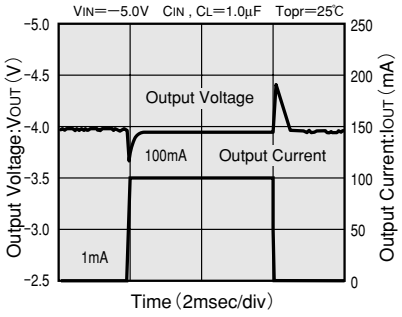

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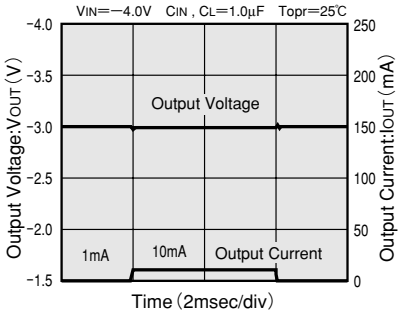

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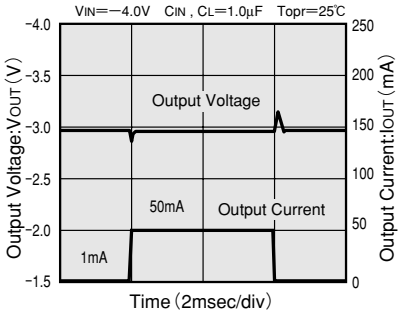

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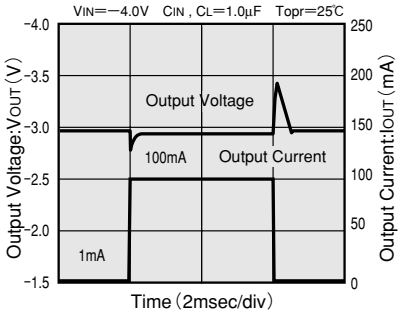
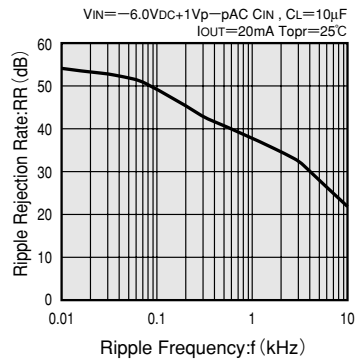


(10) RIPPLE REJECTION RATE

XC62KN5002 (-5.0V)



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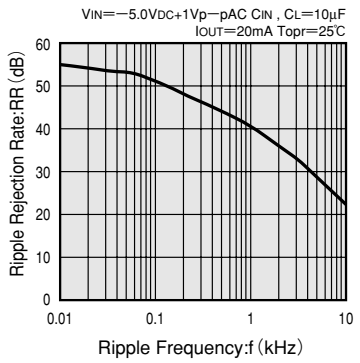

XC62KN3002 (-3.0V)