

## Seamless Low Supply Current 150mA LDO REGULATOR

NO.EA-133-130416

### OUTLINE

The R1182x Series are CMOS-based positive voltage regulator ICs with high output voltage accuracy and low supply current. Each of these ICs consists of a voltage reference unit, an error amplifier, resistor-net for voltage setting, a current limit circuit which prevents the destruction by excess current, and so on.

The output voltage of these ICs is fixed with high accuracy.

The R1182x Series has low dropout voltage caused by built in low on resistance transistor. Further, the consumption current of IC itself is Typ. 3.0 $\mu$ A at no load, at the same time, compared with the conventional low supply current regulator, transient response is improved in all the load range by our original seamless technology.

Since the packages for these ICs are SOT-23-5 and ultra small DFN(PLP)1616-6, high density mounting of the ICs on boards is possible.

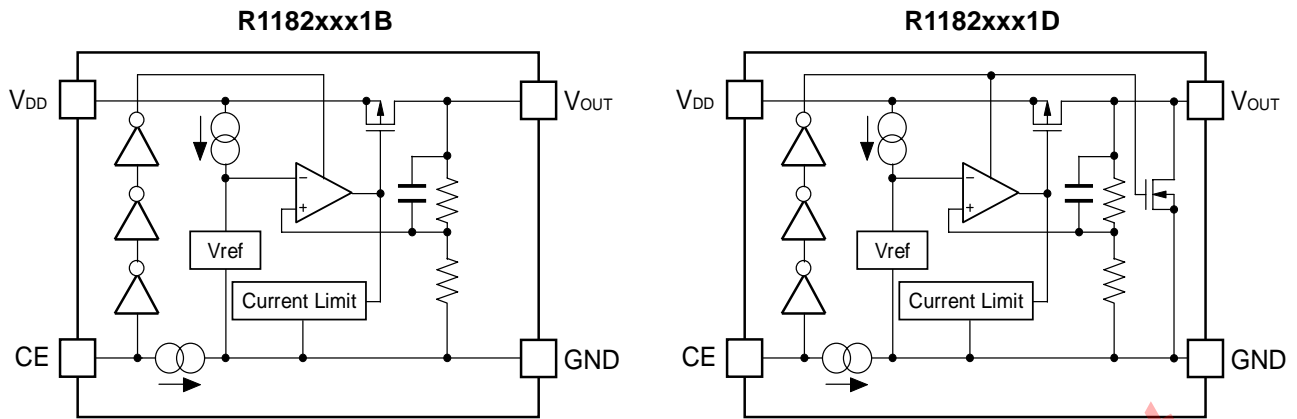
### FEATURES

- Supply Current ..... Typ. 3 $\mu$ A  
(Except the current through CE pull-down circuit)
- Standby Current ..... Typ. 0.1 $\mu$ A
- Input Voltage Range ..... 1.5V to 6.0V
- Output Voltage Range..... 1.2V to 4.0V (0.1V steps)  
(For other voltages, please refer to MARK INFORMATIONS.)
- Dropout Voltage ..... Typ. 0.23V ( $I_{OUT}=150mA$ , 3.0V Output type)
- Output Voltage Accuracy.....  $\pm 1.0\%$  ( $V_{OUT}>1.5V$ )  
 $\pm 15mV$  ( $V_{OUT} \leq 1.5V$ )
- Temperature-Drift Coefficient of Output Voltage ..... Typ.  $\pm 100ppm/^{\circ}C$
- Line Regulation ..... Typ. 0.1%/V
- Packages ..... DFN(PLP)1616-6, SOT-23-5
- Built-in Fold Back Protection Circuit ..... Typ. 50mA (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC (0.1 $\mu$ F or more)

### APPLICATIONS

- Stable voltage reference.
- Power source for electrical appliances such as cameras, camcorders, mobile communication equipment.
- Power source for battery-powered equipment.

## BLOCK DIAGRAMS



## SELECTION GUIDE

The output voltage, auto discharge function, package, etc. for the ICs can be selected at the user's request.

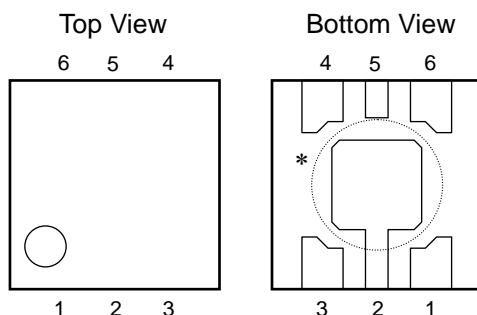
Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1182Kxx1*-TR	DFN(PLP)1616-6	5,000 pcs	Yes	Yes
R1182Nxx1*-TR-FE	SOT-23-5	3,000 pcs	Yes	Yes

xx: The output voltage can be designated in the range from 1.2V(12) to 4.0V(40) in 0.1V steps.  
(For other voltages, please refer to MARK INFORMATIONS.)

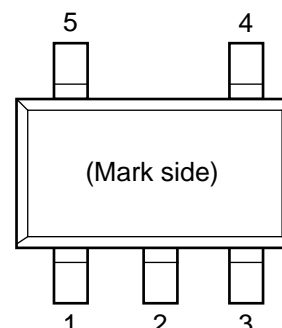
\* : The auto discharge function at off state are options as follows.  
(B) without auto discharge function at off state  
(D) with auto discharge function at off state

## PIN CONFIGURATIONS

### ● DFN(PLP)1616-6



### ● SOT-23-5



## PIN DESCRIPTIONS

### ● DFN(PLP)1616-6

Pin No	Symbol	Pin Description
1	$V_{DD}$	Input Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin ("H" Active)
4	NC	No Connection
5	NC	No Connection
6	$V_{OUT}$	Output pin

\*) Tab is GND level. (They are connected to the reverse side of this IC.)

The tab is better to be connected to the GND, but leaving it open is also acceptable.

### ● SOT-23-5

Pin No	Symbol	Pin Description
1	GND	Ground Pin
2	$V_{DD}$	Input Pin
3	$V_{OUT}$	Output pin
4	NC	No Connection
5	CE	Chip Enable Pin ("H" Active)

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Item	Rating	Unit
$V_{IN}$	Input Voltage	6.5	V
$V_{CE}$	Input Voltage (CE Pin)	-0.3 to 6.5	V
$V_{OUT}$	Output Voltage	-0.3 to $V_{IN}+0.3$	V
$I_{OUT}$	Output Current	200	mA
$P_D$	Power Dissipation (DFN(PLP)1616-6) *	640	mW
	Power Dissipation (SOT-23-5) *	420	
$T_{opt}$	Operating Temperature Range	-40 to 85	°C
$T_{stg}$	Storage Temperature Range	-55 to 125	°C

\*) For Power Dissipation, please refer to PACKAGE INFORMATION.

**ABSOLUTE MAXIMUM RATINGS**

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field.

The functional operation at or over these absolute maximum ratings is not assured.

## ELECTRICAL CHARACTERISTICS

### • R1182xxx1B/D

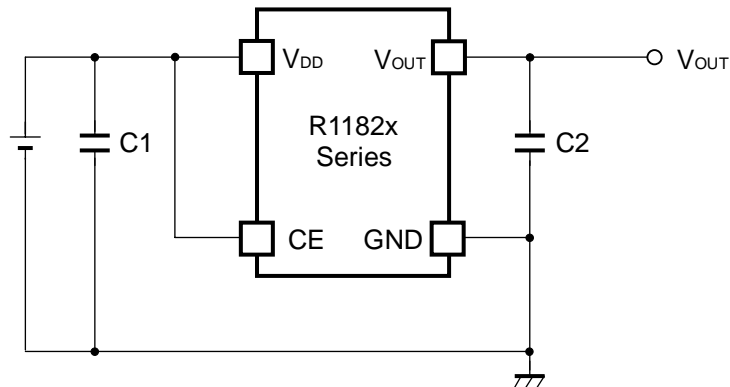
T<sub>opt</sub>=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit	
V <sub>OUT</sub>	Output Voltage	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V I <sub>OUT</sub> =1mA	V <sub>OUT</sub> > 1.5V	×0.99		×1.01	V
			V <sub>OUT</sub> ≤ 1.5V	-15		+15	mV
I <sub>OUT</sub>	Output Current	V <sub>IN</sub> -V <sub>OUT</sub> =1.0V	150			mA	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V 1mA ≤ I <sub>OUT</sub> ≤ 150mA		30	80	mV	
V <sub>DIF</sub>	Dropout Voltage	I <sub>OUT</sub> =150mA	1.2 ≤ V <sub>OUT</sub> < 1.3		0.60	0.82	V
			1.3 ≤ V <sub>OUT</sub> < 1.4		0.53	0.75	
			1.4 ≤ V <sub>OUT</sub> < 1.5		0.46	0.67	
			1.5 ≤ V <sub>OUT</sub> < 2.0		0.43	0.60	
			2.0 ≤ V <sub>OUT</sub> < 2.8		0.31	0.40	
			2.8 ≤ V <sub>OUT</sub> < 4.0		0.23	0.29	
			V <sub>OUT</sub> =4.0		0.19	0.23	
I <sub>SS</sub>	Supply Current	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA		3.0	7.0	μA	
I <sub>standby</sub>	Standby Current	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>CE</sub> =GND		0.1	1.0	μA	
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> =30mA		0.1	0.3	%/V	
V <sub>IN</sub>	Input Voltage		1.5		6.0	V	
$\frac{\Delta V_{OUT}}{\Delta T_{opt}}$	Output Voltage Temperature Coefficient	I <sub>OUT</sub> =30mA -40°C ≤ T <sub>opt</sub> ≤ 85°C		±100		ppm/°C	
I <sub>SC</sub>	Short Current Limit	V <sub>OUT</sub> =0V		50		mA	
I <sub>PD</sub>	CE Pull-down Current		0.05	0.30	0.55	μA	
V <sub>CEH</sub>	CE Input Voltage "H"		1.0		6.0	V	
V <sub>CEL</sub>	CE Input Voltage "L"		0		0.4	V	
en	Output Noise	BW=10Hz to 100kHz		30		μVrms	
R <sub>LOW</sub>	Nch Tr. On resistance for auto discharge function (Only applied to D Version)	V <sub>CE</sub> =0V		50		Ω	

#### RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

## TYPICAL APPLICATIONS



(External components)

Output capacitor : Ceramic type  
 Input capacitor : Ceramic type

Output Capacitor: 0.1 $\mu$ F	Kyocera CM05B104K06AB
	Murata GRM155B31C104KA87B
1.0 $\mu$ F	Kyocera CM05X5R105K06AB
	TDK C1005JB0J105K
	Murata GRM155B30J105KE18B

## TECHNICAL NOTES

When using these ICs, consider the following points:

### Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a 0.1 $\mu$ F or more capacitor C2 (Ceramic type).

If a tantalum capacitor is used, and its ESR (Equivalent Series Resistance) of C2 is large, the loop oscillation may result. Because of this, select C2 carefully considering its frequency characteristics.

### Mounting on Board

Make VDD and GND lines sufficient. If their impedance is high, pick-up the noise or unstable operation may result.

Connect the capacitor C1 with a 0.1 $\mu$ F or more between VDD and GND as close as possible.

Set external components, especially the output capacitor C2, as close as possible to the ICs and make wiring as short as possible. (Refer to the typical application)

## TEST CIRCUITS

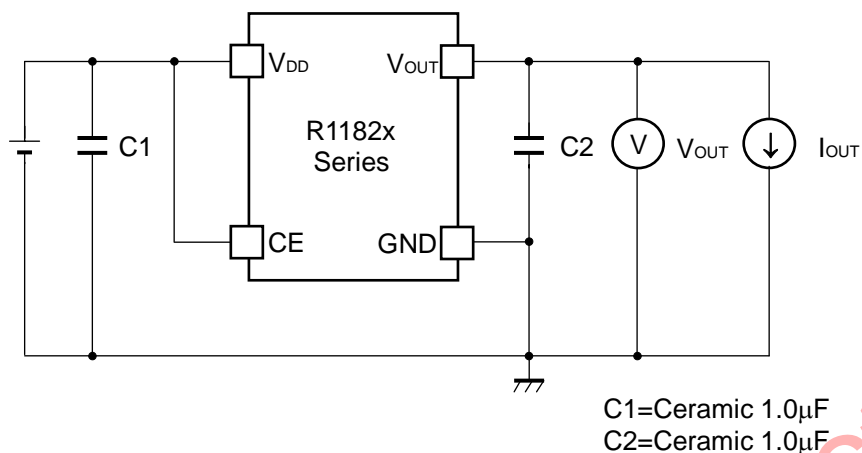


Fig.1 Standard test Circuit

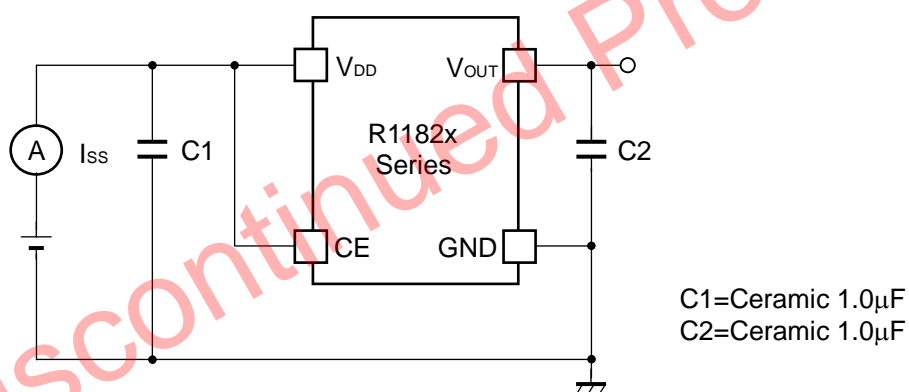


Fig.2 Supply Current Test Circuit

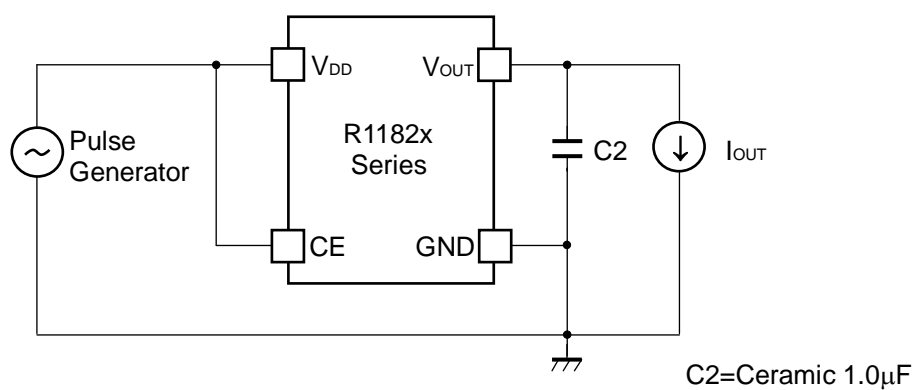
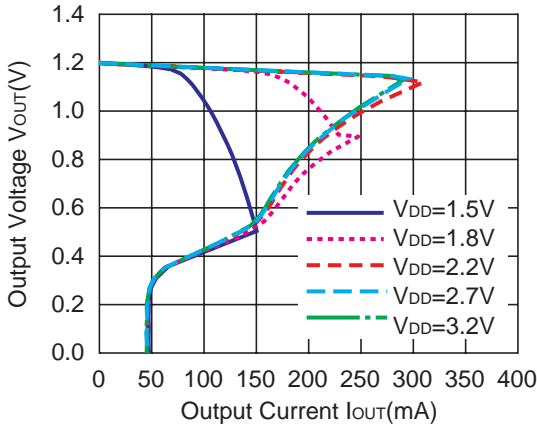


Fig.3 Ripple Rejection, Line Transient Response Test Circuit

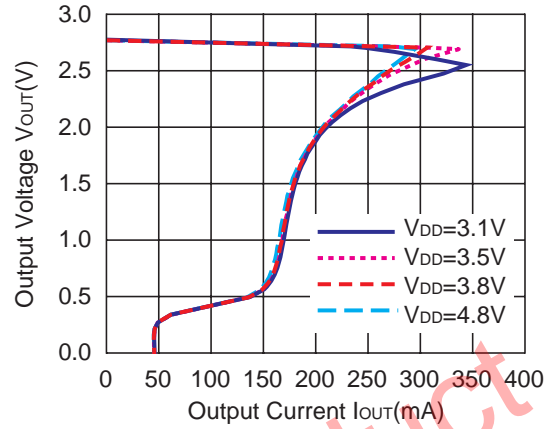
## TYPICAL CHARACTERISTICS

### 1) Output Voltage vs. Output Current (Topt=25°C)

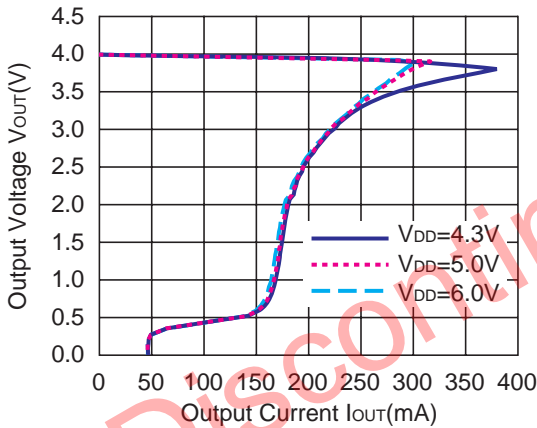
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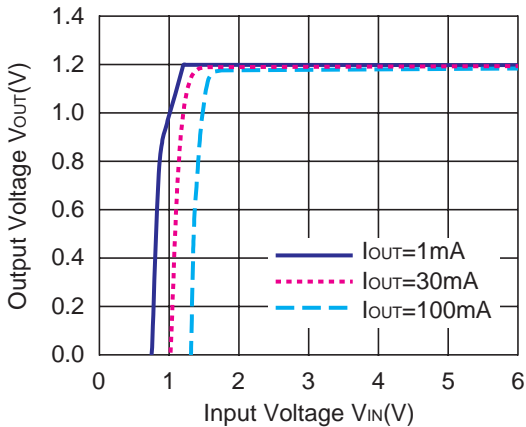


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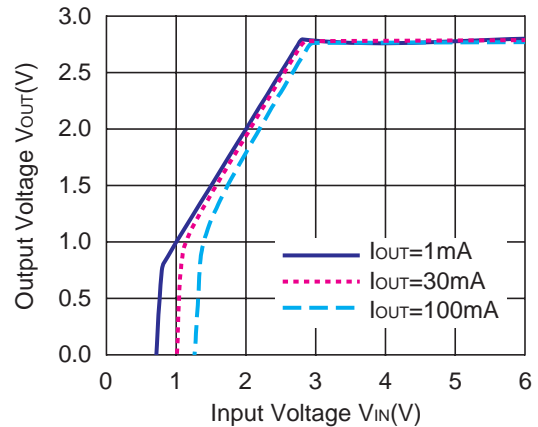


### 2) Output Voltage vs. Input Voltage (Topt=25°C)

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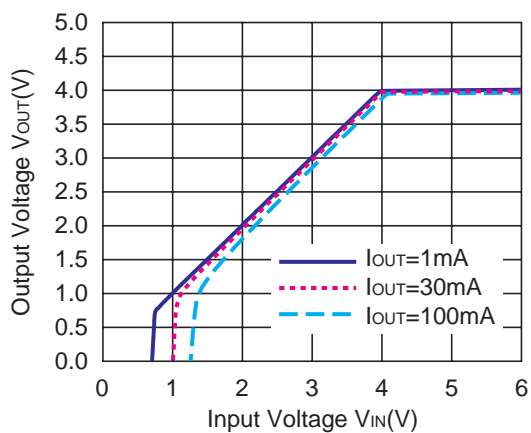


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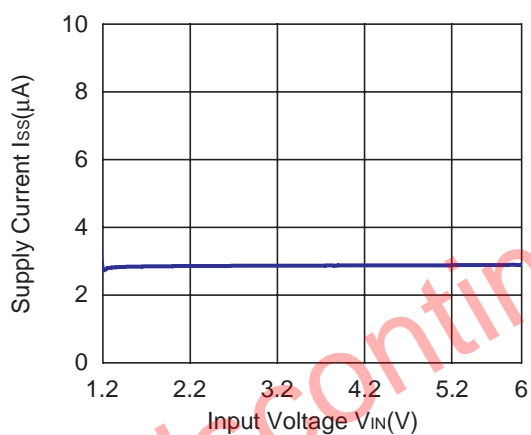


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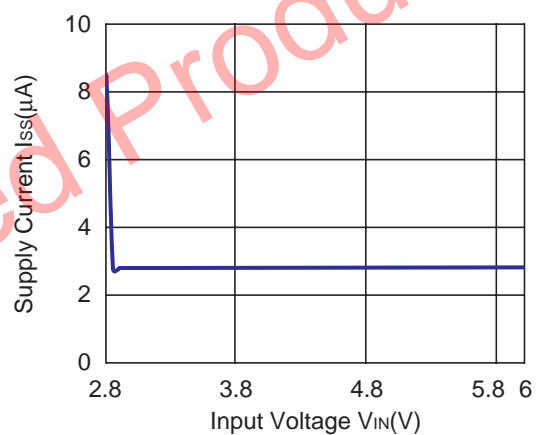


3) Supply Current vs. Input Voltage

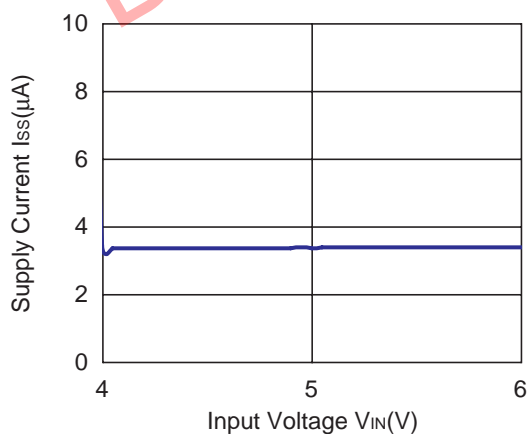
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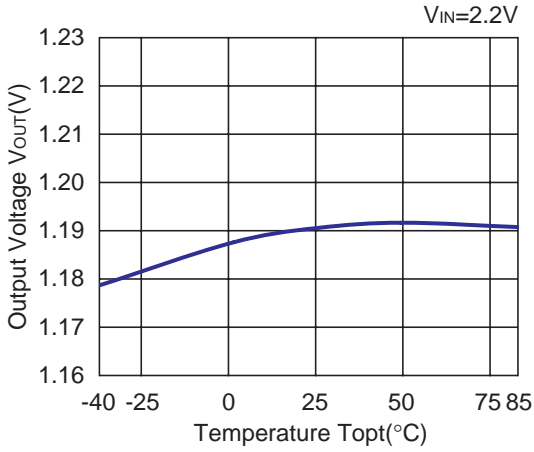


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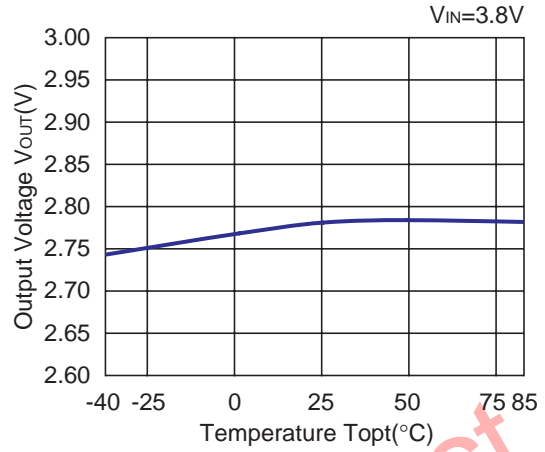


4) Output Voltage vs. Temperature ( $I_{OUT}=30mA$ )

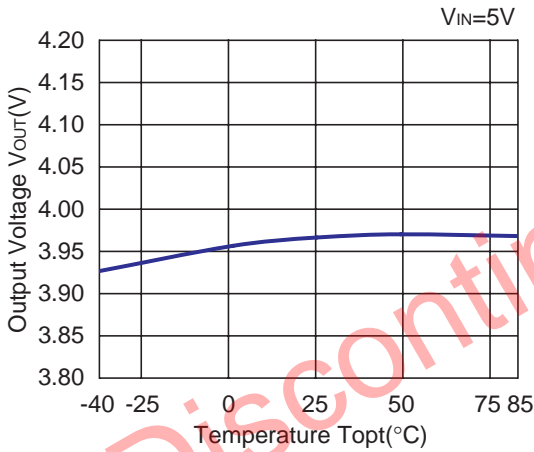
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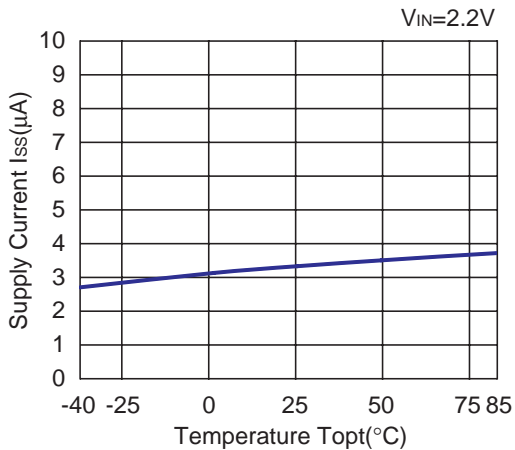


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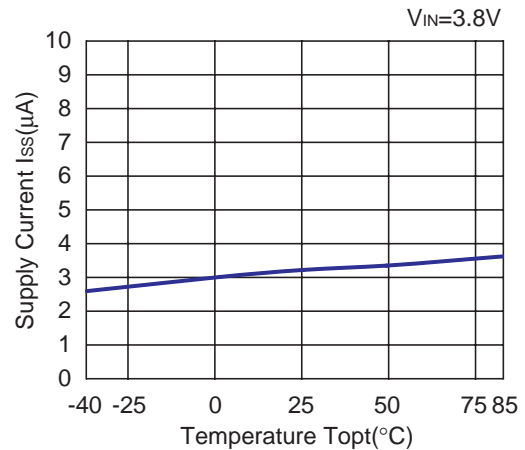


5) Supply Current vs. Temperature ( $T_{opt}=25^{\circ}C$ )

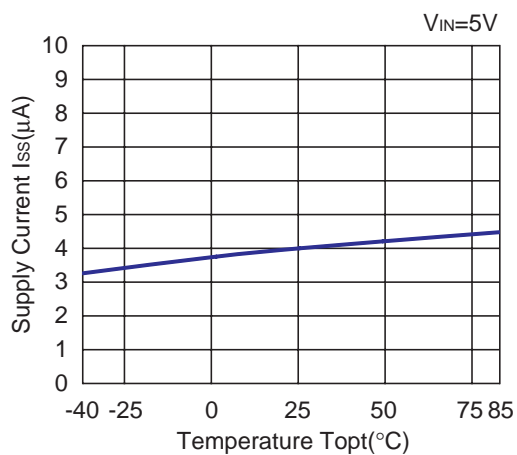
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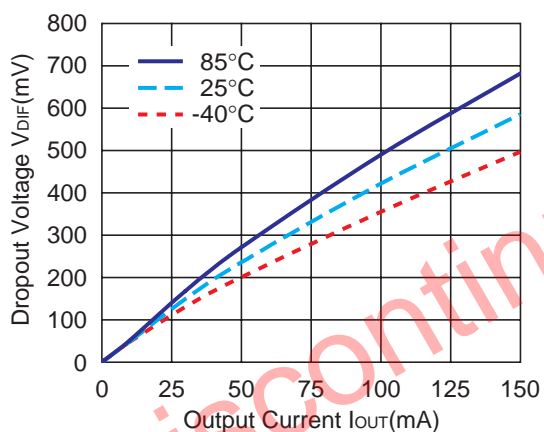


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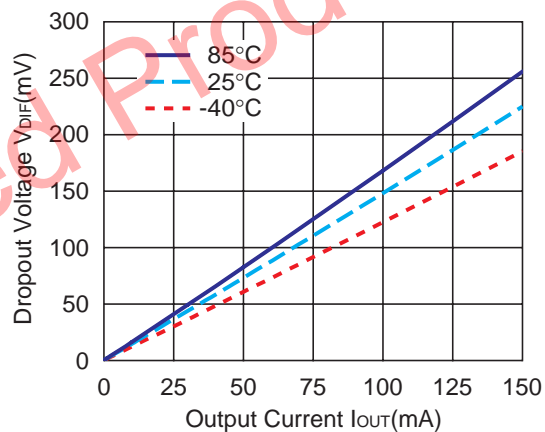


6) Dropout Voltage vs. Output Current

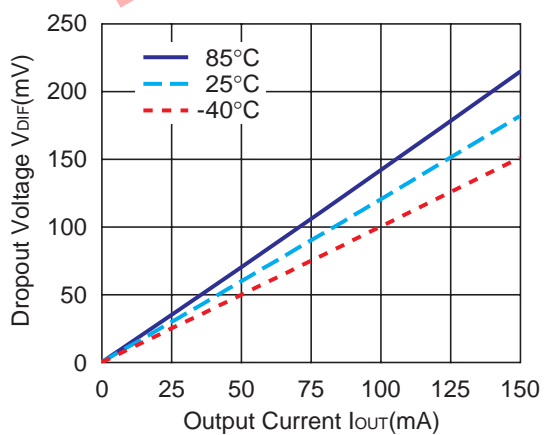
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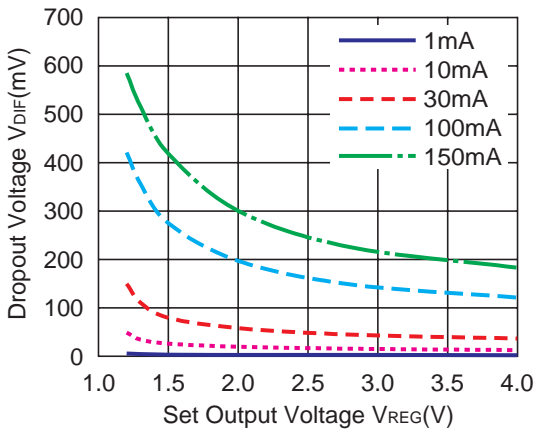
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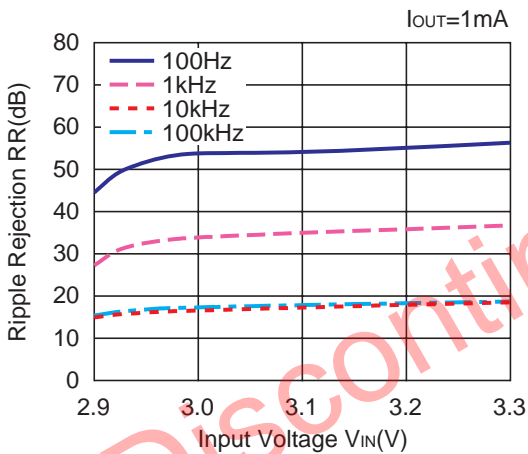


7) Dropout Voltage vs. Set Output Voltage ( $T_{opt}=25^{\circ}C$ )

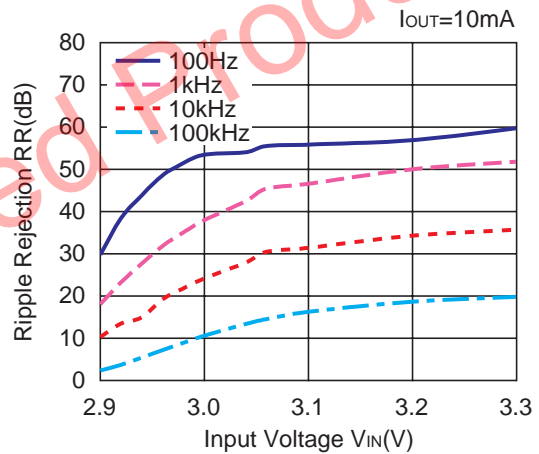


8) Ripple Rejection vs. Input Bias Voltage (Ripple=0.2Vp-p)

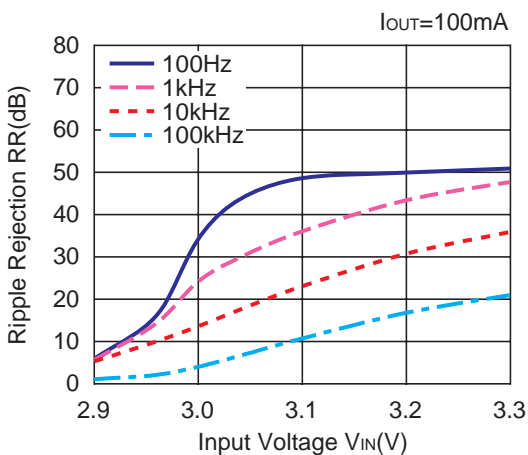
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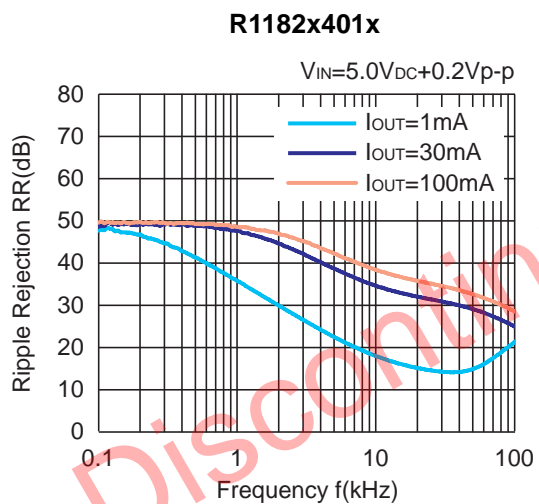
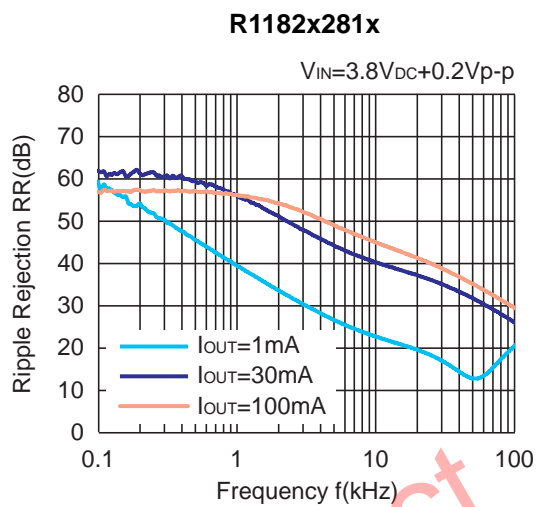
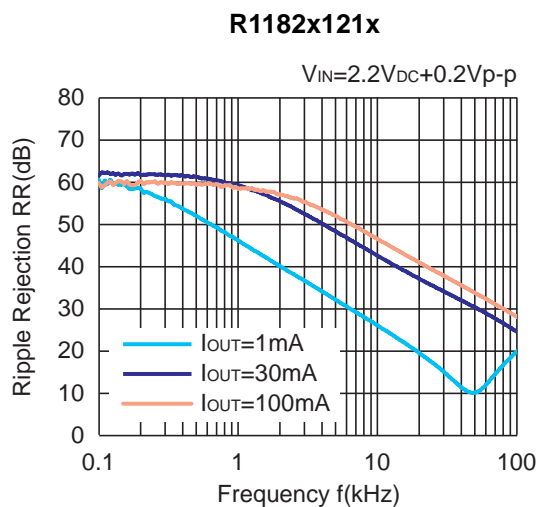
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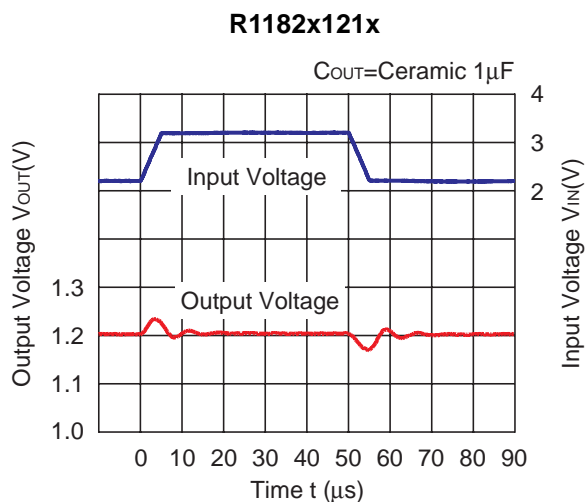
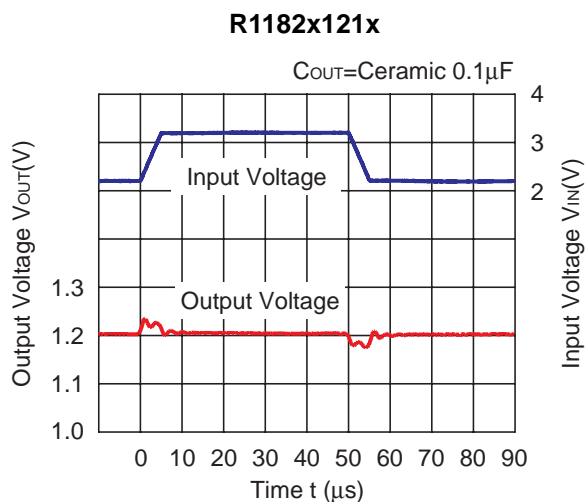
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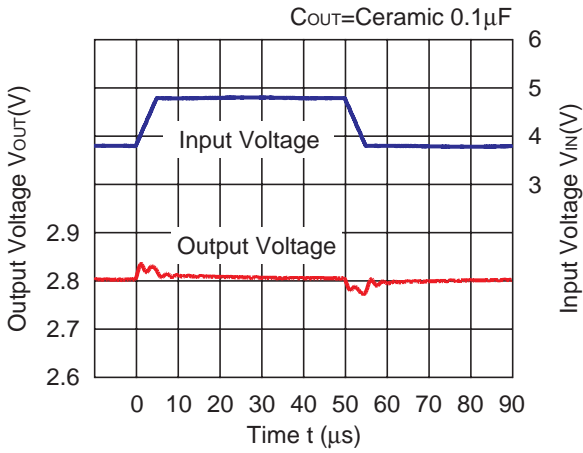
9) Ripple Rejection vs. Frequency ( $C_{OUT}$ =ceramic $0.1\mu\text{F}$ )



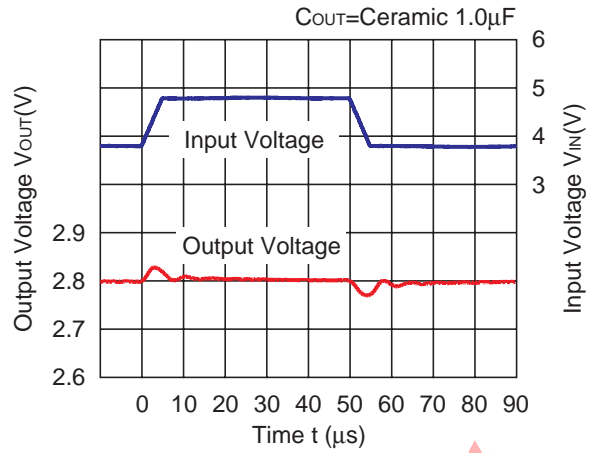
10) Input Transient Response ( $t_r=t_f=5\mu\text{s}$ ,  $I_{OUT}=30\text{mA}$ )



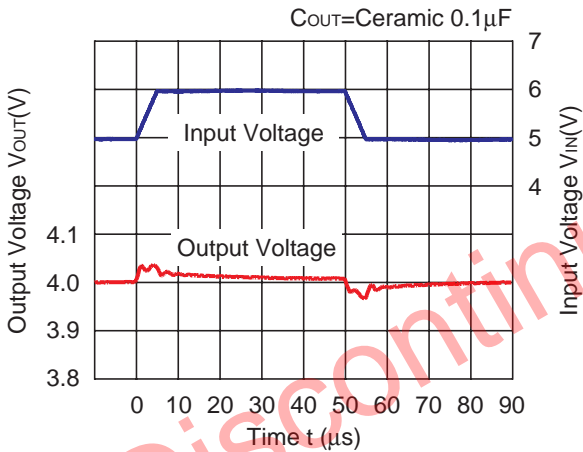
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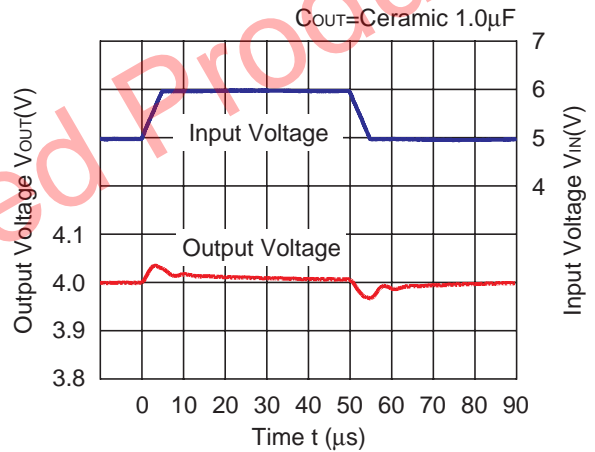
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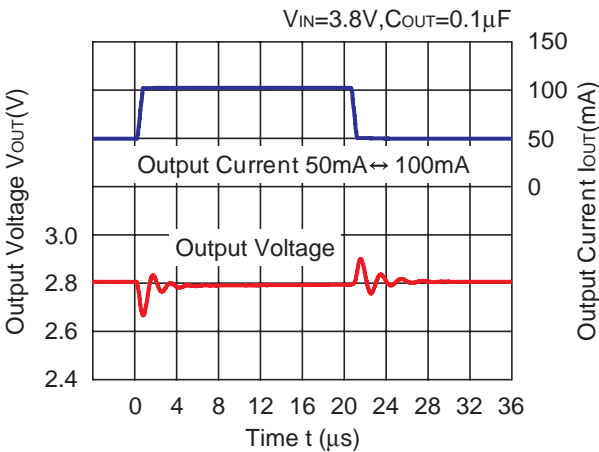


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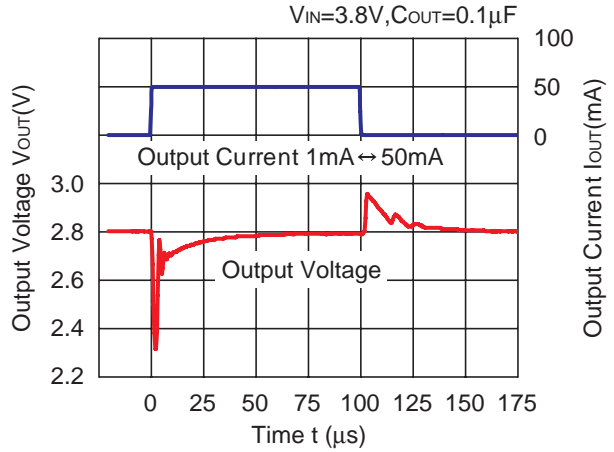


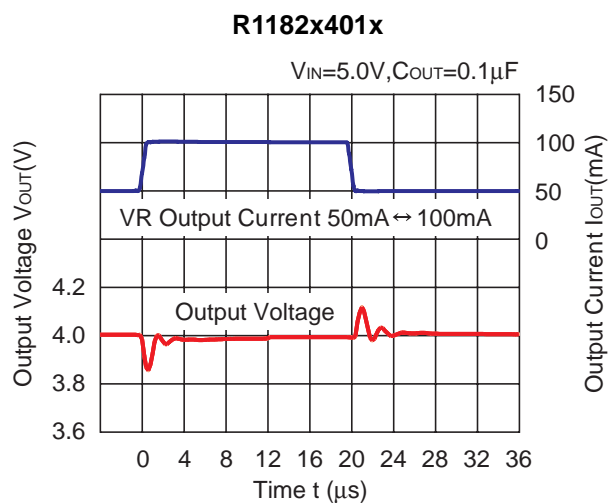
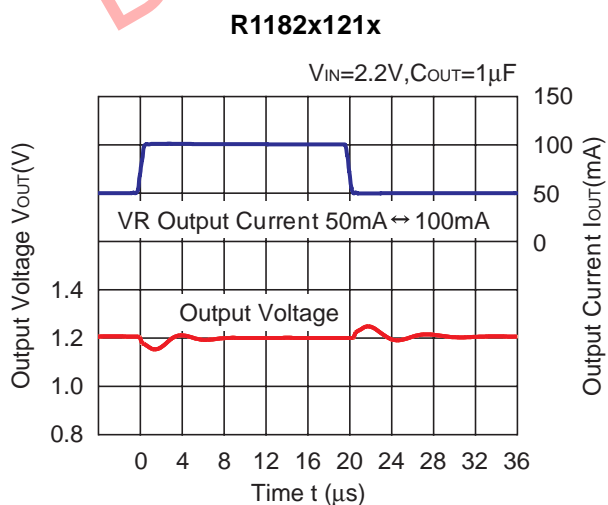
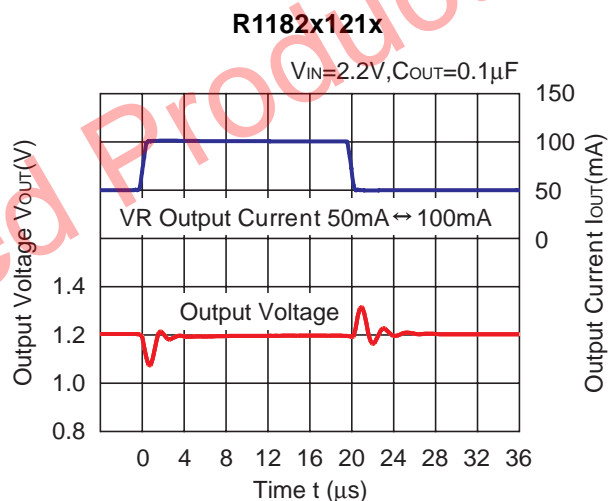
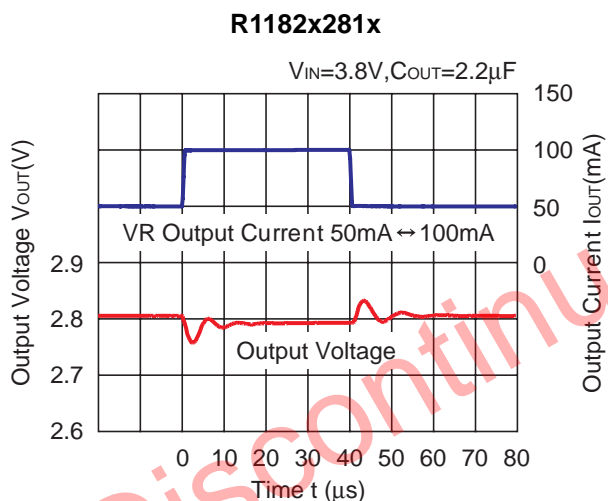
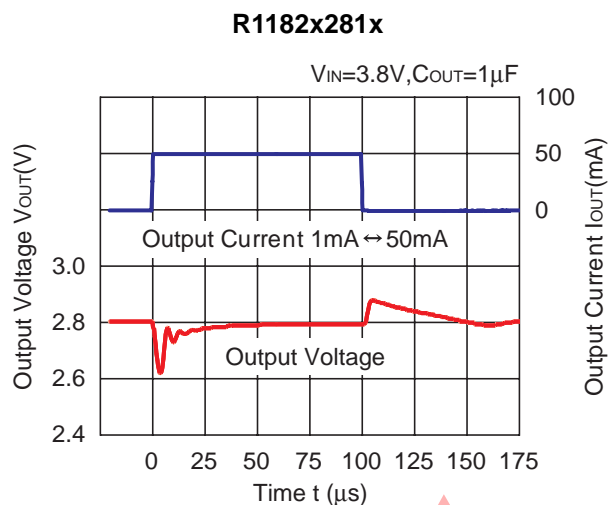
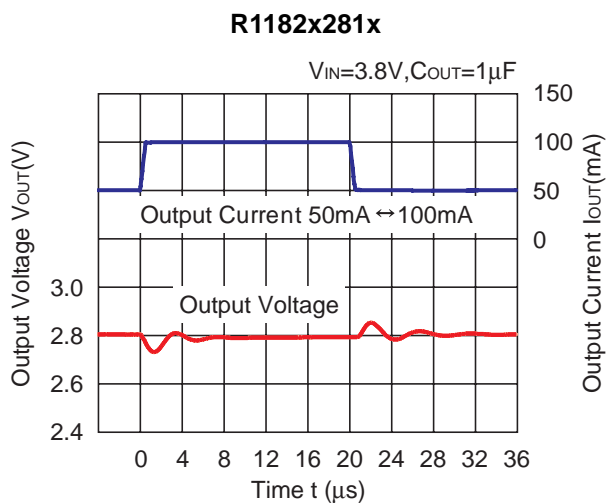
11) Load Transient Response ( $t_r=t_f=0.5\mu s$ ,  $C_{IN}=\text{Ceramic } 0.1\mu F$ )

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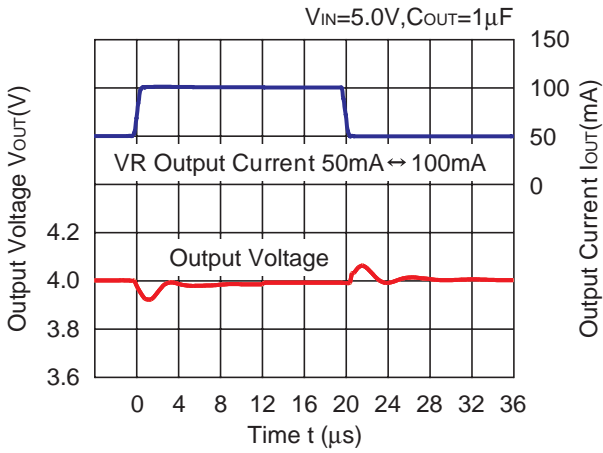


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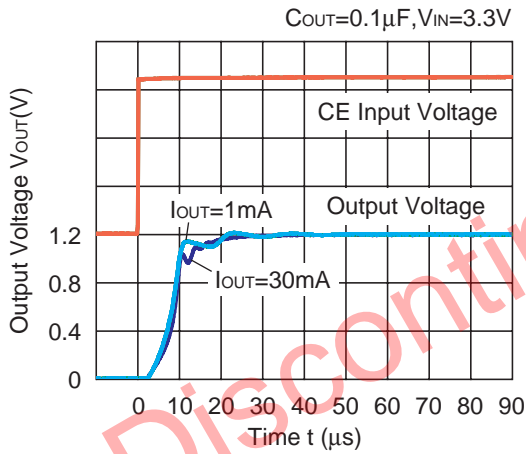


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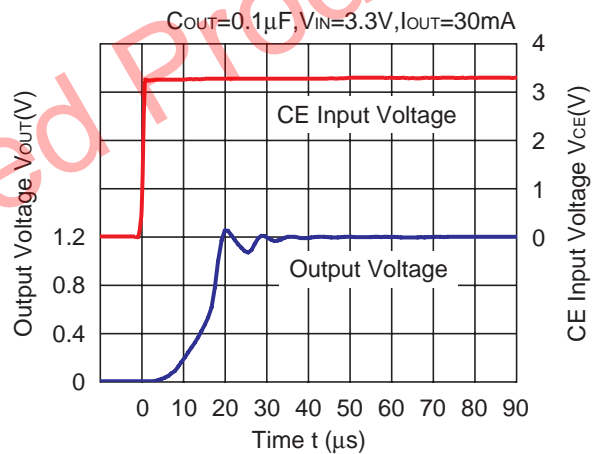


**12) Turn on speed by CE pin ( $C_{IN}$ =Ceramic 0.1 $\mu F$ )**

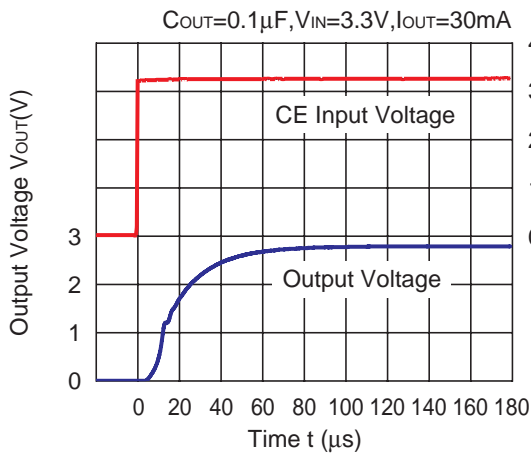
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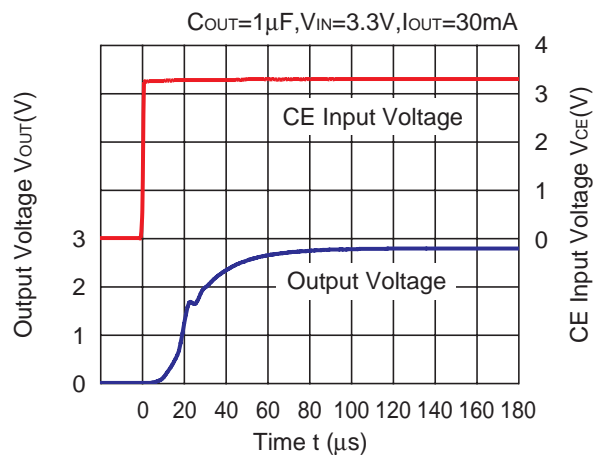
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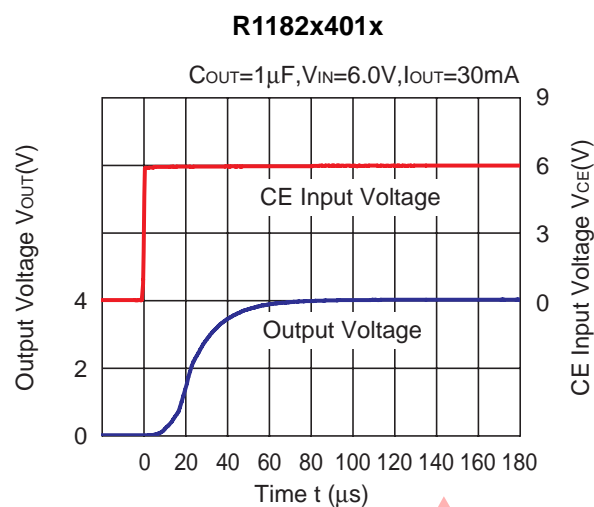
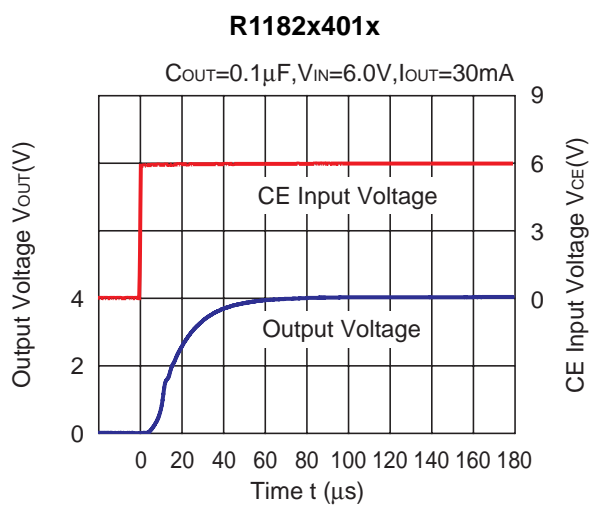
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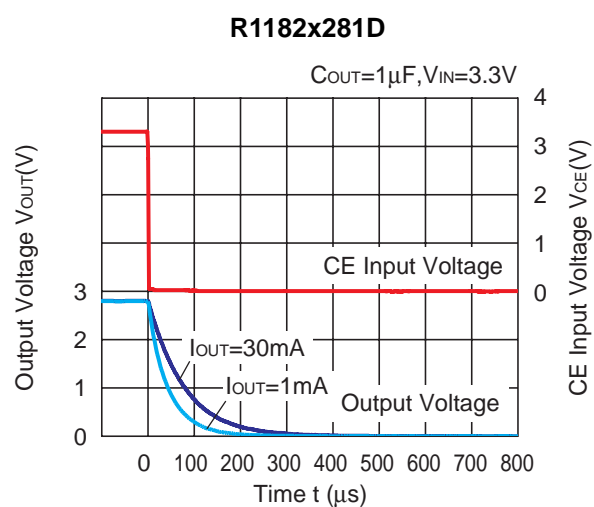
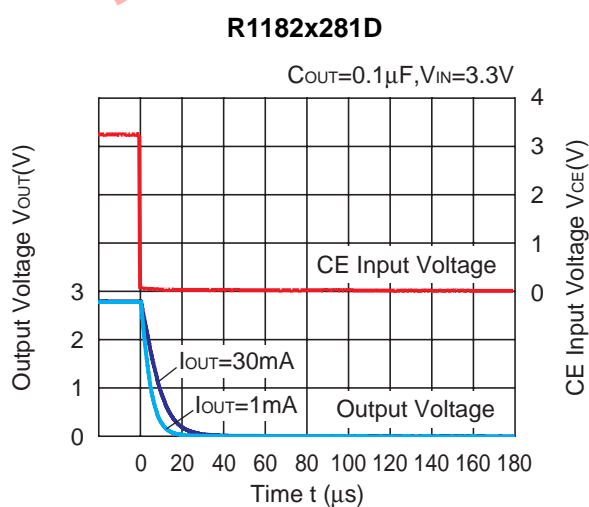
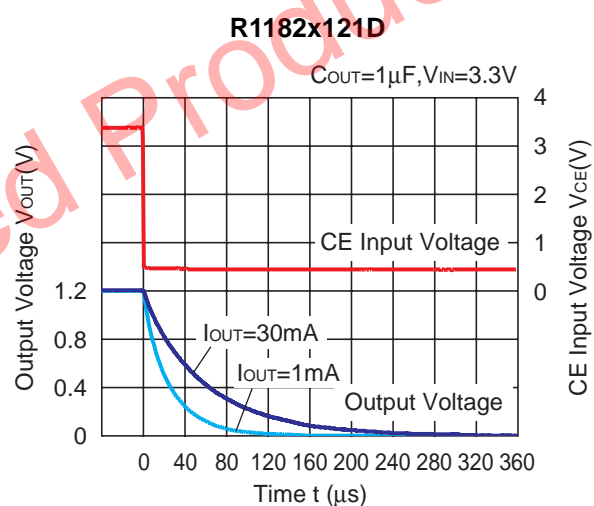
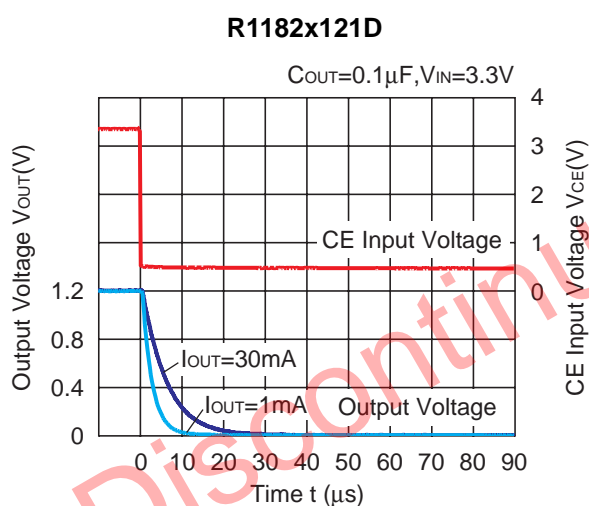
**R1182x281x**





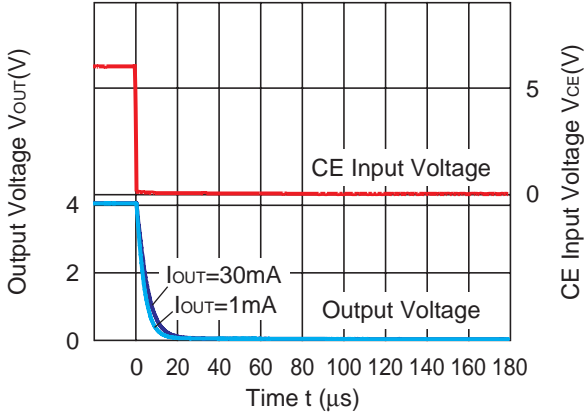


### 13) Turn-off Speed by CE pin ( $C_{IN}$ =Ceramic $0.1\mu F$ ) (D version)



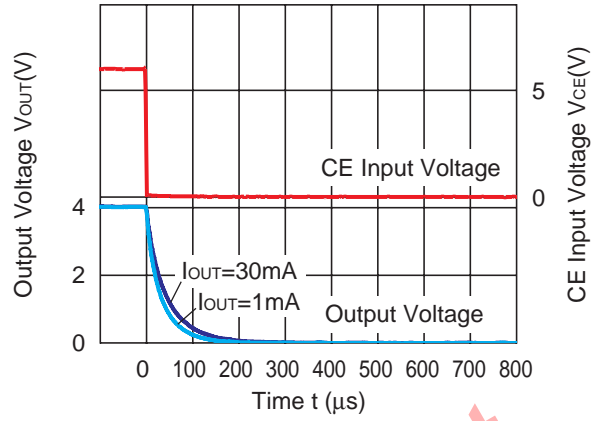
R1182x401D

$C_{OUT}=0.1\mu F, V_{IN}=6.0V$



R1182x401D

$C_{OUT}=1\mu F, V_{IN}=6.0V$



Discontinued Product



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**Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.**

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