RICOH

RP132x SERIES

Low on Resistance / Low Voltage 1A LDO

NO.EA-265-110727

OUTLINE

The RP132x Series are voltage-regulators with a built-in low ON-resistance transistor and output current is 1A capability. These ICs have two versions: fixed output voltage type and externally adjustable output voltage type. The minimum output voltage can be set from 1.4V. Otherwise, the load regulation of RP132x has much improved when compared with conventional regulators. It's Typ.5mV at I_{OUT}=0.1mA to 1A.

Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor net for setting output voltage, current limit circuits to prevent over-current and a thermal-shutdown circuit. A standby mode with ultra low supply current can be realized with the chip enable function. Additionally, E/F Version with delay pin for inrush current limit time setting are also available.

The packages for these ICs are DFN1616-6B and DFN(PLP)1820-6 which are suitable for high density mounting of the ICs on boards. SOT-89-5, HSOP-6J and TO-252-5-P2 with high wattage dissipation are also available.

FEATURES

- Output Current ..... Min. 1A
- Supply Current ..... Typ. 65μA
- Standby Current ..... Typ. 0.15μA
- Input Voltage Range ..... 1.4V to 6.5V
- Output Voltage Range ..... Fixed Output Voltage Type: 0.8V to 5.5V (0.1V steps)
  Adjustable Output Voltage Type: 0.8V to 5.5V
  (For other voltages, please refer to MARK INFORMATIONS.)
- Dropout Voltage ..... Typ. 0.52V (V_{OUT}=2.8V, I_{OUT}=1A)
- Ripple Rejection ..... Typ. 70dB (f=1kHz, V_{OUT}=2.8V)
- Output Voltage Accuracy ..... ±1.0%
- Output Voltage Temperature-Drift Coefficient ..... Typ. ±60ppm/°C
- Line Regulation ..... Typ. 0.052%/V
- Load Regulation ..... Typ. 3mV at I_{OUT}=300mA, Typ. 5mV at I_{OUT}=1A
- Packages ..... DFN(PLP)1820-6, SOT-89-5, HSOP-6J,TO-252-5-P2
- Inrush Current Limit Circuit ..... Typ. 500mA (for 500μs after start-up)
  inrush current delay time setting is possible
  (only for E/F version)(Under Development)
- Fold-Back Protection Circuit ..... Typ. 250mA (Current at short mode)
- Thermal Shutdown Circuit ..... Thermal Shutdown Temperature : Typ. 165°C
  Released Temperature :Typ. 95°C
- Auto Discharge Function ..... D, F version
- Ceramic capacitors are recommended to be used with this IC .... 2.2μF or more (V_{OUT} ≤ 3.6V)
  4.7μF or more (V_{OUT} > 3.6V)

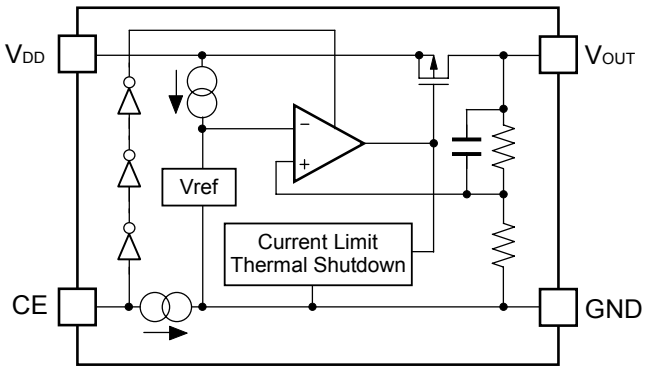
APPLICATIONS

- Power source for battery-powered equipment.
- Power source for portable communication equipment
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for home appliances and Notebook PC.

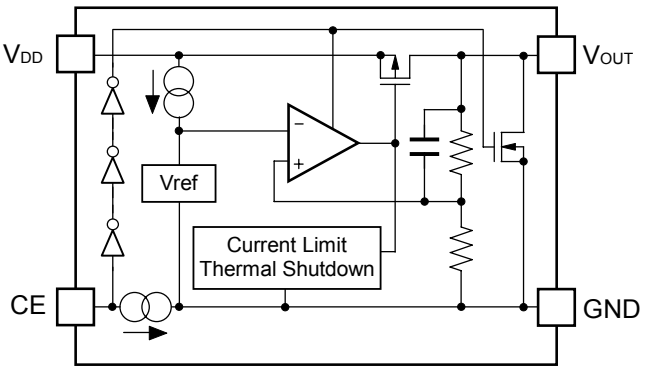
BLOCK DIAGRAMS

- **Fixed Output Voltage Type（HSOP-6J / SOT89-5）**

RP132Sxx1B / RP132Hxx1B

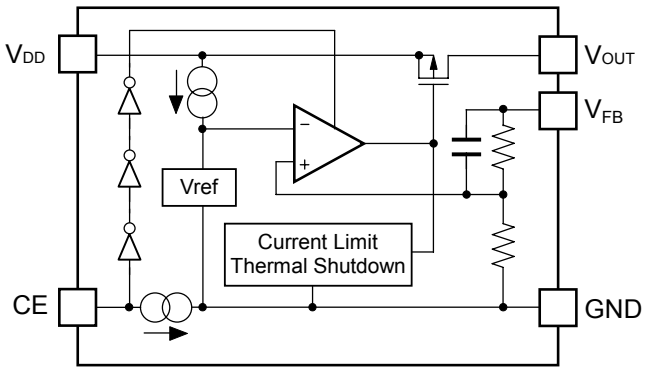


RP132Sxx1D / RP132Hxx1D

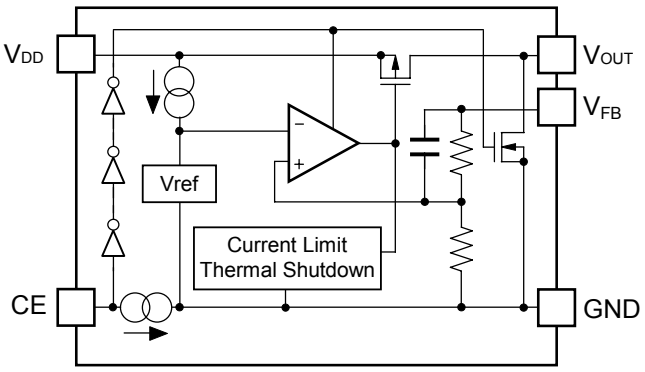


- **Fixed Output Voltage Type（TO-252-5-P2 / DFN(PLP)1820-6）**

RP132Jxx1B / RP132Kxx1B

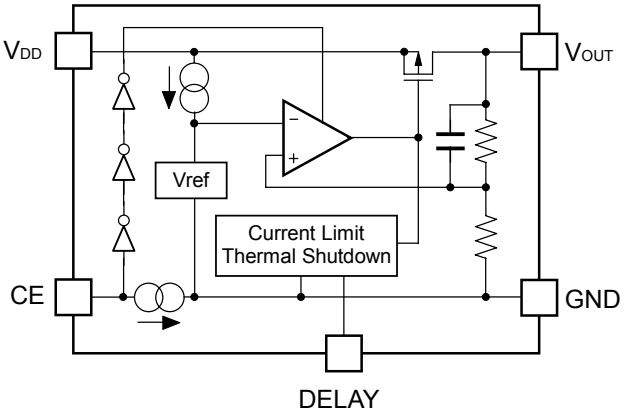


RP132Jxx1D / RP132Kxx1D

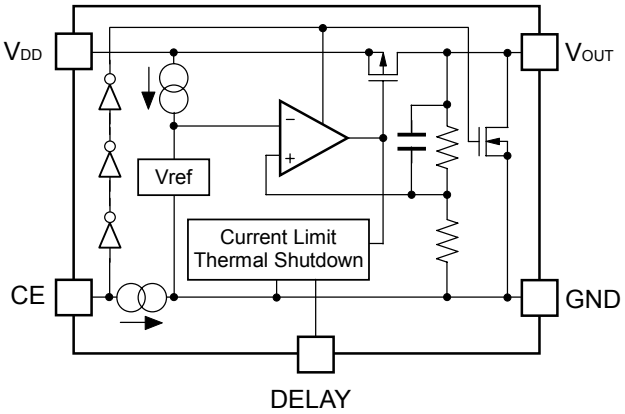


- **Fixed Output Voltage Type with DELAY pin（HSOP-6J（Under Development））**

RP132Sxx1E（Under Development）

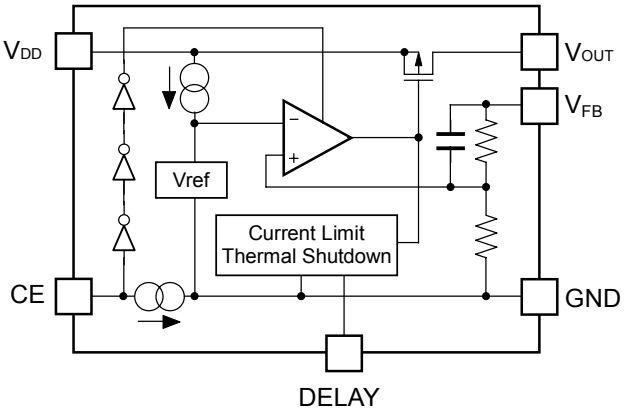


RP132Sxx1F（Under Development）

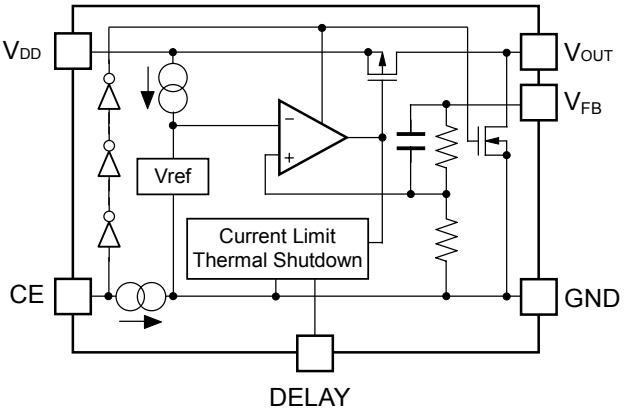


- **Fixed Output Voltage Type with DELAY pin（DFN(PLP)1820-6（Under Development））**

RP132Kxx1E（Under Development）

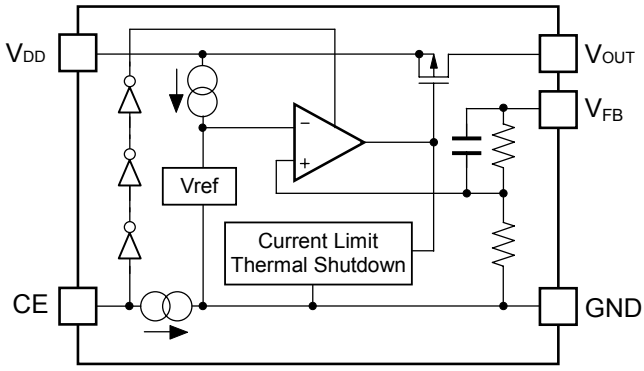


RP132Kxx1F（Under Development）

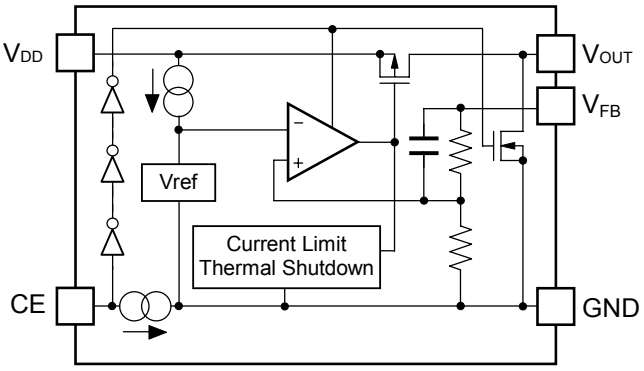


- **Adjustable Output Voltage Type（HSOP-6J / SOT-89-5 / TO-252-5-P2 /DFN(PLP)1820-6）**

RP132S001B / RP132H001B / RP132J001B / RP132K001B

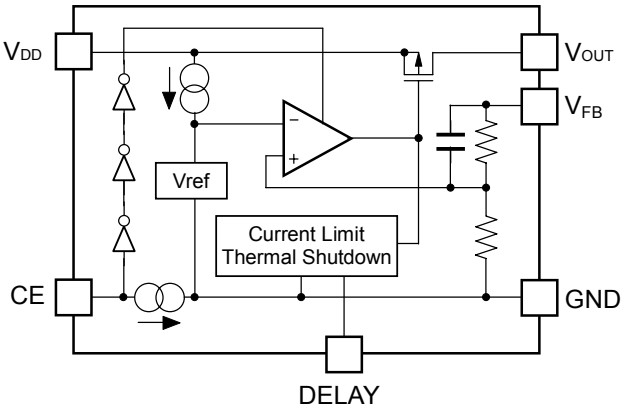


RP132S001D / RP132H001D / RP132J001D / RP132K001D

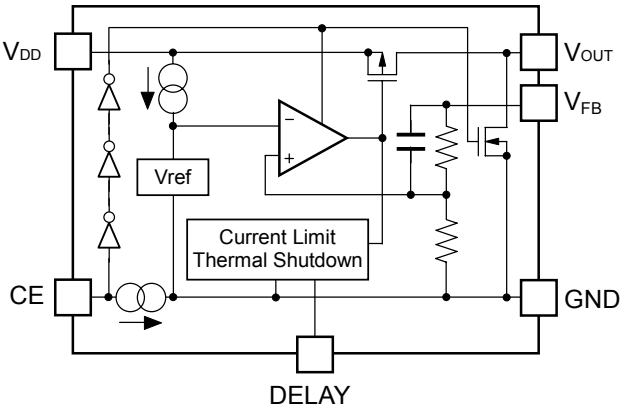


- **Adjustable Output Voltage Type with DELAY pin（DFN(PLP)1820-6（Under Development））**

RP132K001E（Under Development）



RP132K001F（Under Development）



SELECTION GUIDE

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

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP132Kxx1∗-TR	DFN(PLP)1820-6	5,000 pcs	Yes	Yes
RP132Hxx1#-T1-FE	SOT-89-5	1,000 pcs	Yes	Yes
RP132Sxx1∗-E2-FE	HSOP-6J	1,000 pcs	Yes	Yes
RP132Jxx1#-T1-FE	TO-252-5-P2	3,000 pcs	Yes	Yes

xx: The output voltage can be designated in the range from 0.8V(08) to 5.5V(55) in 0.1V steps.
(For other voltages, please refer to MARK INFORMATIONS.)

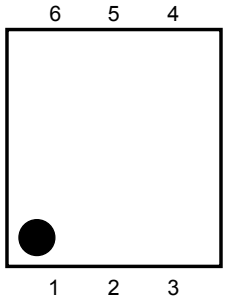
∗: The combination of the auto discharge function and delay pin (for setting inrush current limit time) are follows.
(B) without auto discharge function
(D) with auto discharge function
(E) without auto discharge function, with delay pin (for setting inrush current limit time)(Under Development)
(F) with auto discharge function and delay pin (for setting inrush current limit time)(Under Development)

#: 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

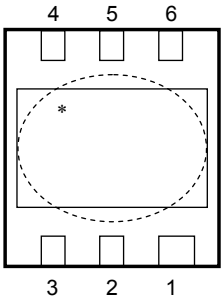
PIN CONFIGURATIONS

● **DFN(PLP)1820-6**

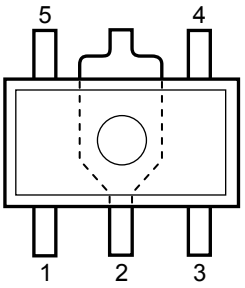
Top View



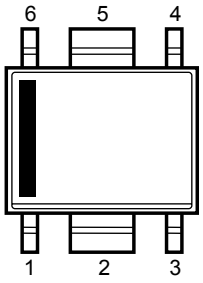
Bottom View



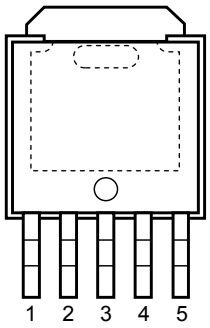
● **SOT-89-5**



● **HSOP-6J**



● **TO-252-5-P2**



PIN DESCRIPTIONS

● **DFN(PLP)1820-6**

Pin No.	Symbol	Pin Description
1	V_{OUT}	Output Pin
2	V_{FB}	Feed Back Pin
3	GND	Ground Pin
4	CE	Chip Enable Pin ("H" Active)
5	NC	No Connection(RP132K001B/D, RP132Kxx1B/D)
	DELAY	Delay Pin (for setting inrush current limit time) (RP132K001E/F, RP132Kxx1E/F)
6	V_{DD}	Input 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.
- V_{OUT} pin and V_{FB} pin should be connected when it's used on Fixed Output Voltage Type(RP132Kxx1x).
- When using Adjstable Output Voltage Type (RP132K001x), please follow " Notes on the Adjustable Output Voltage Type Settings".

- **SOT-89-5**

Pin No.	Symbol	Pin Description
1	CE	Chip Enable Pin ("H" Active) (RP132Hxx1B/D)
	V_{FB}	Feed Back Pin (RP132H001B/D)
2	GND	Ground Pin
3	NC	No Connection (RP132Hxx1B/D)
	CE	Chip Enable Pin ("H" Active) (RP132H001B/D)
4	V_{DD}	Input Pin
5	V_{OUT}	Output Pin

・When using Adjstable Output Voltage Type (RP132K001x), please follow " Notes on Adjustable Output Voltage Type Settings".

- **HSOP-6J**

Pin No.	Symbol	Pin Description
1	V_{OUT}	Output Pin
2	GND	Ground Pin*
3	NC	No Connection (RP132Sxx1B/D)
	V_{FB}	Feed Back Pin (RP132S001B/D)
	DELAY	Delay Pin (for setting inrush current limit time)(RP132S001E/F)
4	CE	Chip Enable Pin ("H" Active)
5	GND	Ground Pin*
6	V_{DD}	Input Pin

*) Please make sure to be wired No.2 pin and No.5 pin each other.
・When using Adjstable Output Voltage Type (RP132K001x), please follow " Notes on Adjustable Output Voltage Type Settings".

- **TO-252-5-P2**

Pin No.	Symbol	Pin Description
1	CE	Chip Enable Pin ("H" Active)
2	V_{DD}	Input Pin
3	GND	Ground Pin
4	V_{OUT}	Output Pin
5	V_{FB}	Feed Back Pin

・V_{OUT} pin and V_{FB} pin should be connected when it's used on Fixed Output Voltage Type(RP132Kxx1x).
・When using Adjstable Output Voltage Type (RP132K001x), please follow " Notes on the Adjustable Output Voltage Type Settings"

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	7.0	V
V_{CE}	Input Voltage (CE Pin)	−0.3 to 7.0	V
V_{FB}	Input Voltage (V_{FB} Pin)	−0.3 to 7.0	V
V_{OUT}	Output Voltage	−0.3 to V_{IN}+0.3	V
P_D	Power Dissipation (DFN(PLP)1820-6)*	880	mV
	Power Dissipation (SOT-89-5)*	900	
	Power Dissipation (HSOP-6J)*	1700	
	Power Dissipation (TO-252-5-P2)*	1900	
Topt	Operating Temperature Range	−40 to 85	°C
Tstg	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

V_{IN}=Set V_{OUT}+1.0V, I_{OUT}=1mA,C_{IN}=2.2µF, C_{OUT}=2.2µF(V_{OUT} ≤ 3.6V), 4.7µF(V_{OUT}＞3.6V).

The specification in □ is checked and guaranteed by design engineering at −40°C ≤T_{opt}≤ 85°C, unless otherwise noted.

- **RP132xxx1B/D(Fixed Output Voltage Type)**
- **RP132S/Kxx1E/F(Fixed Output Voltage Type with DELAY pin)** **(Under Development)**

Topt=25°C

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	Topt=25°C	V_{OUT} > 1.5V	×0.99		×1.01	V
			V_{OUT} ≤ 1.5V	−15		15	mV
		−40°C ≤ Topt ≤ 85°C	V_{OUT} > 1.5V	□×0.981		□×1.019	V
			V_{OUT} ≤ 1.5V	□−29		□29	mV
I_{LIM}	Output Current Limit			□1			A
ΔV_{OUT}/ ΔI_{OUT}	Load Regulation	0.1mA ≤ I_{OUT} ≤ 300mA			3	□20	mV
		0.1mA ≤ I_{OUT} ≤ 1A			5	□60	
V_{DIF}	Dropout Voltage	Refer to the following "Dropout Voltage"					
I_{SS}	Supply Current	I_{OUT}=0mA (V_{IN}=6.5V)			65	□85	µA
Istandby	Standby Current	V_{CE}=0V, V_{IN}=6.5V			0.15	0.60	µA
ΔV_{OUT}/ ΔV_{IN}	Line Regulation	Set V_{OUT}+0.5V ≤ V_{IN} ≤ 6.5V ∗However, V_{IN} ≥1.6V			0.05	□0.10	%/V
RR	Ripple Rejection	f=1kHz Ripple 0.2Vp-p I_{OUT}=100mA	V_{OUT} ≤ 3.3V		70		dB
			V_{OUT} > 3.3V		60		
V_{IN}	Input Voltage			□1.4		□6.5	V
ΔV_{OUT}/ ΔT_{opt}	Output Voltage Temperature Coefficient	−40°C ≤ Topt ≤ 85°C			±60		ppm /°C
I_{SC}	Short Current Limit	V_{OUT}=0V			250		mA
I_{PD}	CE Pull-down Current				0.3	□0.7	µA
V_{CEH}	CE Input Voltage "H"			□1.0			V
V_{CEL}	CE Input Voltage "L"					□0.4	V
en	Output Noise	BW=10Hz to 100kHz			70		µVrms
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature			165		°C
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature			95		°C
R_{LOW}	Low Output Nch Tr. ON Resistance (D/F version)	V_{IN}=4.0V, V_{CE}=0V			50		Ω
I_{DELAY}	DELAY pin Current (DELAY pin Version only)	V_{IN}=4.0V		□0.7	1.2	□1.7	µA

All of unit are tested and specified under load conditions such that Tj≈Topt=25°C except for Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient, Dropout Voltage at 1A Output Current and Load Regulation and Thermal Shutdown.

• Dropout Voltage

Topt=25°C

Output Voltage V_{OUT} (V)	Dropout Voltage V_{DIF} (V)					
	Condition	Typ.	Max.	Condition	Typ.	Max.
0.8 ≤ V_{OUT} < 0.9	I_{OUT}=300mA	0.67	0.89	I_{OUT}=1A	1.20	1.54
0.9 ≤ V_{OUT} < 1.0		0.59	0.82		1.10	1.46
1.0 ≤ V_{OUT} < 1.1		0.51	0.73		1.05	1.39
1.1 ≤ V_{OUT} < 1.2		0.42	0.63		0.96	1.31
1.2 ≤ V_{OUT} < 1.5		0.36	0.54		0.90	1.23
1.5 ≤ V_{OUT} < 2.6		0.24	0.33		0.78	1.05
2.6 ≤ V_{OUT} < 3.3		0.15	0.21		0.52	0.72
3.3 ≤ V_{OUT} ≤ 5.5		0.13	0.18		0.46	0.68

The specification in ☐ is checked and guaranteed by design engineering at −40°C≤T_{opt}≤85°C, unless otherwise noted.
All of unit are tested and specified under load conditions such that Tj≈T_{opt}=25°C except for Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient, Dropout Voltage at 1A Output Current and Load Regulation and Thermal Shutdown.

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.

ELECTRICAL CHARACTERISTICS

V_{IN}=Set V_{OUT}+1.0V, I_{OUT}=1mA,C_{IN}=2.2µF, C_{OUT}=2.2µF(V_{OUT} ≤ 3.6V), 4.7µF(V_{OUT}＞3.6V).

The specification in □ is checked and guaranteed by design engineering at −40°C ≤T_{opt} ≤ 85°C, unless otherwise noted.

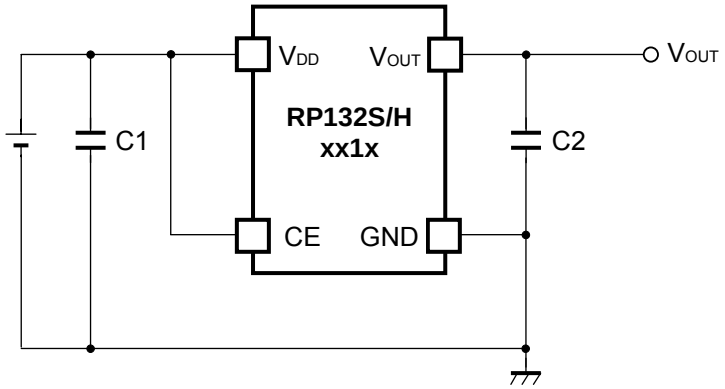
- **RP132x001B/D(Adjustable Output Voltage Type)**
- **RP132K001E/F(Adjustable Output Voltage Type with DELAY pin)** **(Under Development)** Topt=25°C

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_{FB}	Feedback Voltage	Topt=25°C	V_{OUT}=V_{FB}	0.785	0.800	0.815	V
		−40°C ≤ Topt ≤ 85°C		□ 0.771		□ 0.829	
V_{OUT}	Output Voltage Adjusting Range			0.8		5.5	V
I_{LIM}	Output Current Limit	V_{OUT}=V_{FB}		□ 1			A
ΔV_{OUT}/ ΔI_{OUT}	Load Regulation	0.1mA ≤ I_{OUT} ≤ 300mA			3	□ 20	mV
		0.1mA ≤ I_{OUT} ≤ 1A			5	□ 60	
V_{DIF}	Dropout Voltage	V_{OUT}=V_{FB}	I_{OUT}=300mA		0.67	□ 0.89	V
			I_{OUT}=1A		1.20	□ 1.54	
I_{SS}	Supply Current	V_{OUT}=V_{FB}, I_{OUT}=0mA (V_{IN}=6.5V)			65	□ 85	µA
Istandby	Standby Current	V_{CE}=0V, V_{IN}=6.5V			0.15	0.60	µA
ΔV_{OUT}/ ΔV_{IN}	Line Regulation	V_{OUT}=V_{FB}, 1.6V ≤ V_{IN} ≤ 6.5V			0.05	□ 0.10	%/V
RR	Ripple Rejection	f=1kHz, Ripple 0.2Vp-p, I_{OUT}=100mA	V_{OUT}=V_{FB}		70		dB
V_{IN}	Input Voltage			□ 1.4		□ 6.5	V
ΔV_{OUT}/ ΔTopt	Output Voltage Temperature Coefficient	−40°C ≤ Topt ≤ 85°C			±60		ppm /°C
I_{SC}	Short Current Limit	V_{OUT}=V_{FB}=0V			250		mA
I_{PD}	CE Pull-down Current				0.3	□ 0.7	µA
V_{CEH}	CE Input Voltage "H"			□ 1.0			V
V_{CEL}	CE Input Voltage "L"					□ 0.4	V
en	Output Noise	BW=10Hz to 100kHz			70		µVrms
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature			165		°C
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature			95		°C
R_{LOW}	Low Output Nch Tr. ON Resistance (D/F version)	V_{IN}=4.0V, V_{CE}=0V			50		Ω
I_{DELAY}	DELAY pin Current (DELAY pin Version)	V_{IN}=4.0V		□ 0.7	1.2	□ 1.7	µA

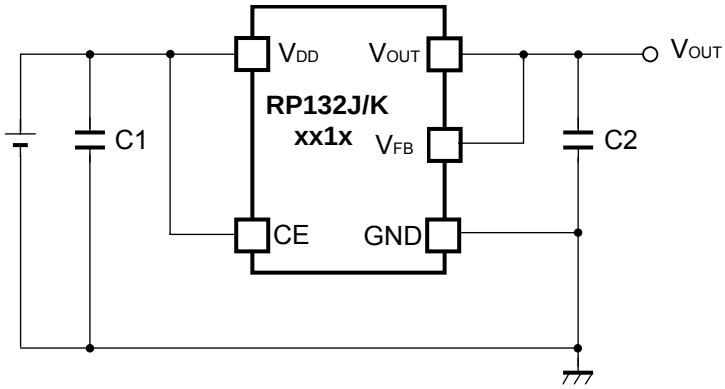
All of unit are tested and specified under load conditions such that Tj≈Topt=25°C except for Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient, Dropout Voltage at 1A Output Current and Load Regulation and Thermal Shutdown.

TYPICAL APPLICATION

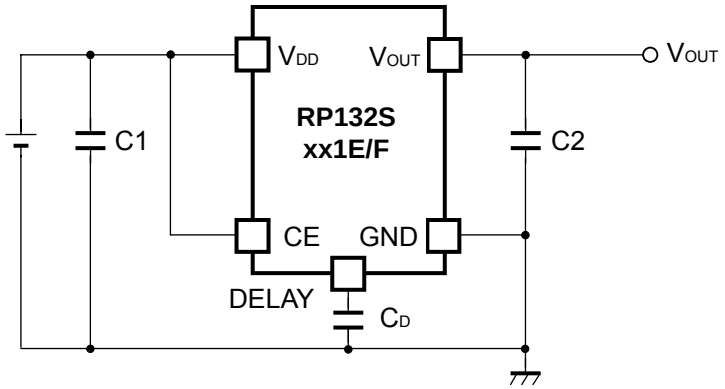
- **Fixed Output Voltage Type（HSOP-6J / SOT89-5）**



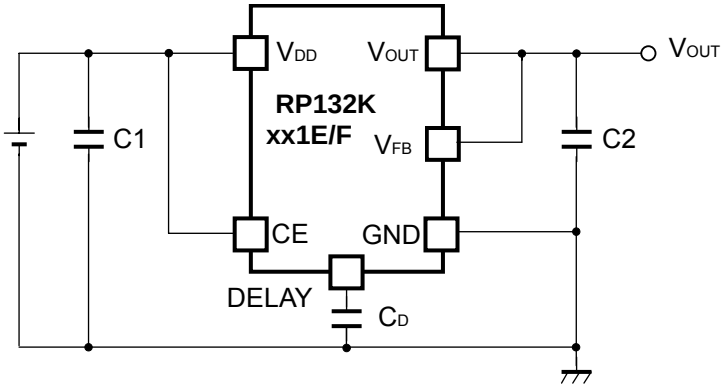
- **Fixed Output Voltage Type（TO-252-5-P2 / DFN(PLP)1820-6）**



- **Fixed Output Voltage Type with DELAY pin （HSOP-6J（Under Development））**



- **Fixed Output Voltage Type with DELAY pin（DFN(PLP)1820-6（Under Development））**



Recommendation value of the external capacitors

VOUT	Capacitors	
VOUT ≤ 3.6V	C1	Kyocera 2.2μF (size:1005) [CM05X5R225M06A]
	C2	Kyocera 2.2μF (size:1608) [CM105X5R225K06AB]
VOUT > 3.6V	C1	Kyocera 2.2μF (size:1005) [CM05X5R225K06A]
	C2	Kyocera 4.7μF (size:1608) [CM105X5R475M06AB]

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, use a capacitor C2 with good frequency characteristics and ESR (Equivalent Series Resistance).

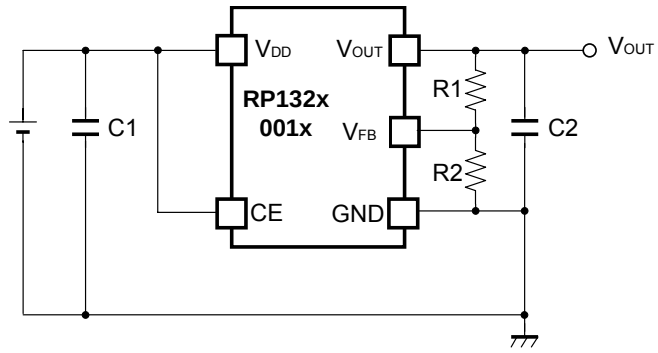
If a tantalum capacitor is used, and its ESR of C2 is large, the loop oscillation may result. Because of this, select C2 carefully considering its frequency characteristics.

PCB Layout

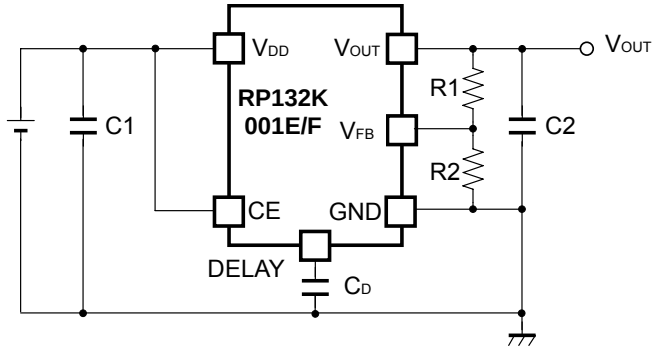
Make V_{DD} and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 between V_{DD} and GND pin with a capacitance value as "Recommendation value of the external capacitors" above or more, and as close as possible to the pins.

Set external components, especially the output capacitor C2, as close as possible to the ICs, and make wiring as short as possible.

TECHNICAL NOTES on Adjustable Output Voltage Type



Typical Application for Adjustable Output Voltage Type （HSOP-6J / SOT89-5/ TO-252-5-P2 / DFN(PLP)1820-6）



Typical Application for Adjustable Output Voltage Type with DELAY pin（DFN(PLP)1820-6（Under Development））

Recommendation value of the external capacitors

V_{OUT}	Capacitors	
$V_{OUT} \leq 3.6V$	C1	Kyocera 2.2μF (size:1005) [CM05X5R225M06A]
	C2	Kyocera 2.2μF (size:1608) [CM105X5R225K06AB]
$V_{OUT} > 3.6V$	C1	Kyocera 2.2μF (size:1005) [CM05X5R225K06A]
	C2	Kyocera 4.7μF (size:1608) [CM105X5R475M06AB]

Phase Compensation

Similar to the Fixed Output Voltage Type, Phase compensation is made for the Adjustable Output Voltage Type for securing stable operation even if the load current is varied. For this purpose, use a 4.7μF or more capacitor C2 between V_{OUT} pin and GND pin, and as close as possible to the pins.

PCB Layout

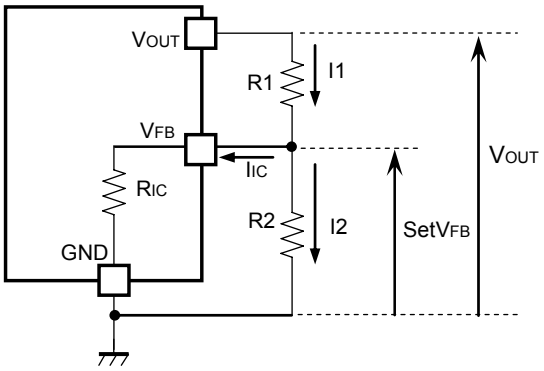
Make V_{DD} and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 with a capacitance value as much as 2.2μF or more between V_{DD} and GND pin, and as close as possible to the pins.

When using the Adjustable Output Voltage Type, the transient response could be affected by the external resistors. Evaluate the circuit taking the actual conditions of use into account.

Adjustable Output Voltage Type Settings

- **Output Voltage Setting Method**

RP132x081x can be adjusted the output voltage up to 5.5V by using the external divider resistors.
Also, please use 16kΩ or less for R2 resistor.
If the V_{FB} voltage is described as setV_{FB}, the output voltage can be set by using the following equations
SetV_{FB} is equal to 0.8V. The V_{OUT} pin of RP132x081x should be connected to the V_{FB} pin.



$I1 = I_{IC} + I2$ .....(1)
$I2 = setV_{FB} / R2$ .....(2)

Thus,

$I1 = I_{IC} + setV_{FB} / R2$ .....(3)

Therefore,

$V_{OUT} = setV_{FB} \times R1 \times I1$ .....(4)

Put Equation (3) into Equation (4), then

$V_{OUT} = setV_{FB} + R1(I_{IC} + setV_{FB} / R2)$
$= setV_{FB} \times (1+R1/ R2) + R1 \times I_{IC}$ .....(5)

In Equation (5), R1x I_{IC} is the error-causing factor in V_{OUT}.

As for I_{IC},

$I_{IC} = setV_{FB} / R_{IC}$ .....(6)

Therefore, the error-causing factor R1x I_{IC} can be described as follows.

$R1 \times I_{IC} = R1 \times setV_{FB} / R_{IC}$
$= setV_{FB} \times R1 / R_{IC}$ .....(7)

For better accuracy, choosing R1 ($<<R_{IC}$) reduces this error.

Without the error-causing factor R1x I_{IC}, the output voltage can be calculated by the following equation

$V_{OUT} = setV_{FB} \times ((R1 + R2) / R2)$ .....(8)

R_{IC} of RP132x is approximately Typ.1.3MΩ (T_{opt}=25°C, this value is guaranteed by design.).

The value could be affected by the temperature, therefore evaluate the circuit taking the actual conditions of use into account.

Inrush Current Limit Time Settings

RP132xSeries includes the circuit which can limit the inrush current under 500mA at the start-up.

B/D version of current limit time is set as approximately Typ.500μs, E/F version can be set the certain length of time for inrush current limit according to the value of DELAY pin (the value of capacitance between DEALY pin and GND pin) .

Inrush Current Limit Time and the capacitance of DELAY pin is calculated by following equation.

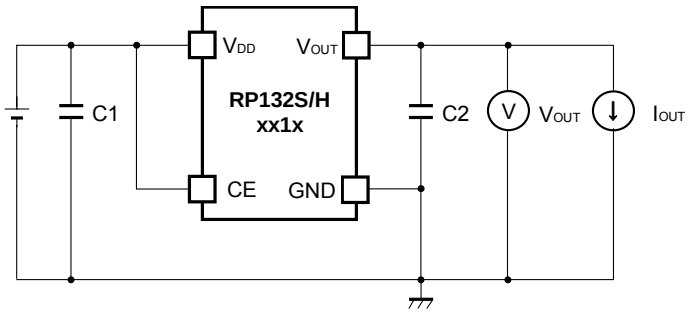
$$t_D=(C_D+70\times10^{-12})\times0.525\times10^{6}$$

DELAY pin is open, even if not connected to C_D, inrush current can be also limited for approximately 37μs. If put C_D=0 in the above equation, the same value (37μs) can be obtained.

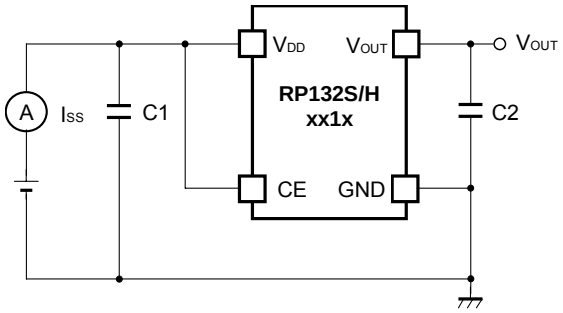
Moreover, when not using C_D on E/F version, DELAY pin should be open.

TEST CIRCUITS

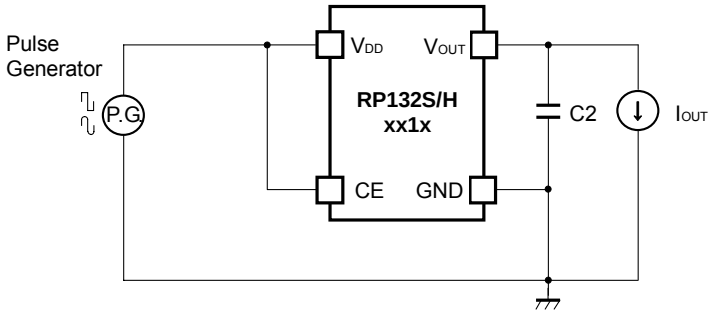
- **Fixed Output Voltage Type（HSOP-6J / SOT89-5）**



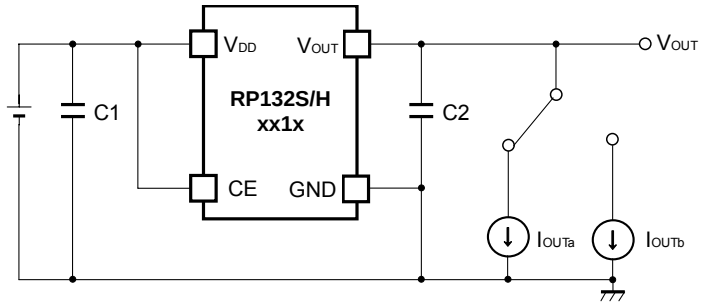
Basic Test Circuit



Test Circuit for Supply Current

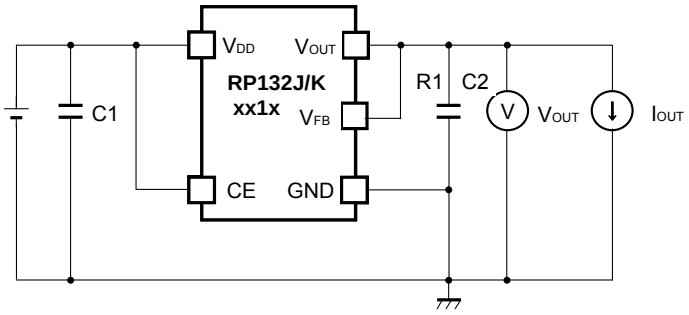


Test Circuit for Ripple Rejection

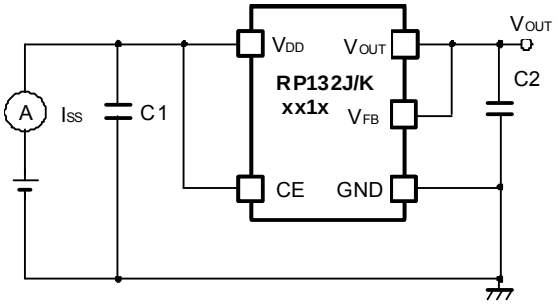


Test Circuit for Load Transient Response

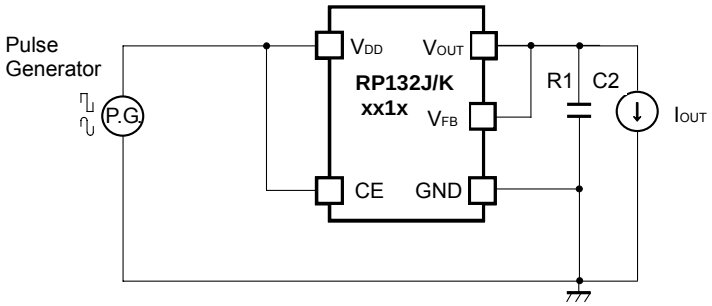
- **Fixed Output Voltage Type（TO-252-5-P2 / DFN(PLP)1820-6）**



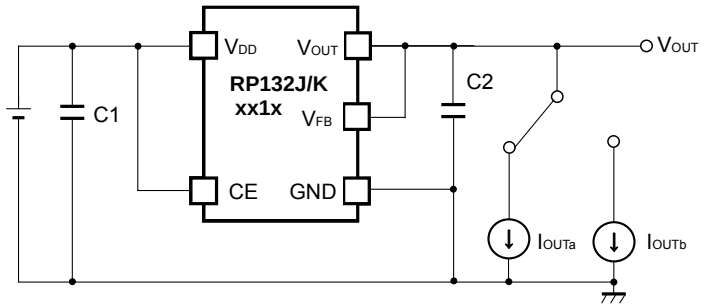
Basic Test Circuit



Test Circuit for Supply Current

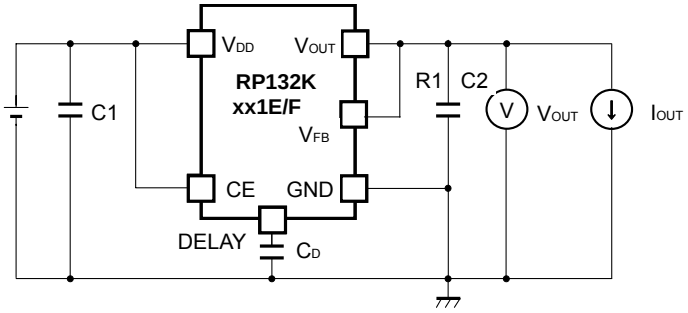


Test Circuit for Ripple Rejection

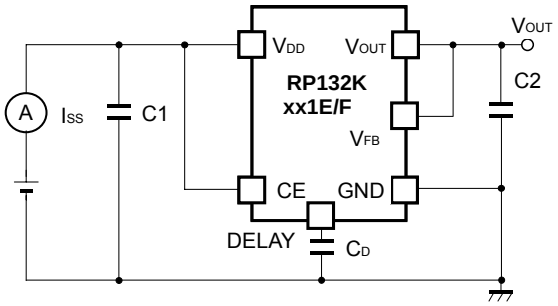


Test Circuit for Load Transient Response

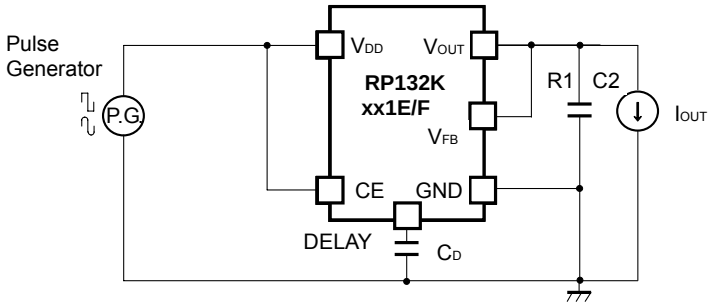
- **Fixed Output Voltage Type with DELAY pin（DFN(PLP)1820-6（Under Development））**



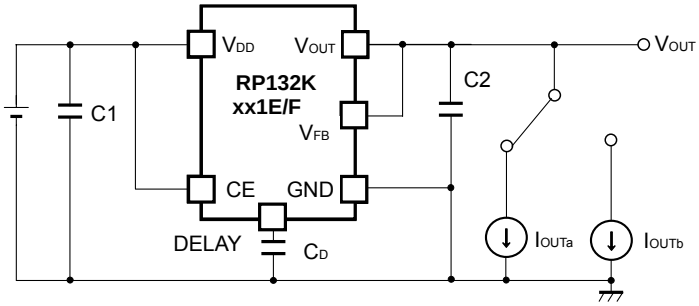
Basic Test Circuit



Test Circuit for Supply Current

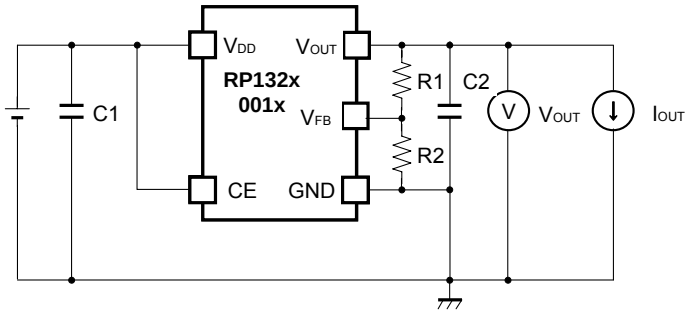


Test Circuit for Ripple Rejection

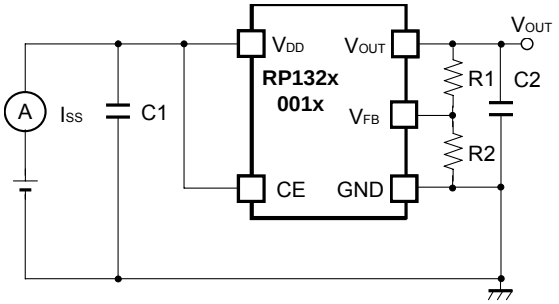


Test Circuit for Load Transient Response

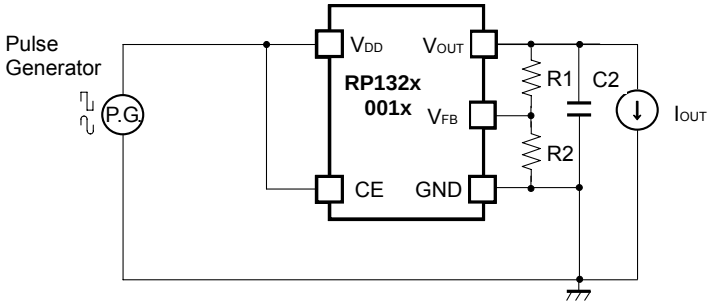
- **Adjustable Output Voltage Type（HSOP-6J / SOT89-5/ TO-252-5-P2 / DFN(PLP)1820-6）**



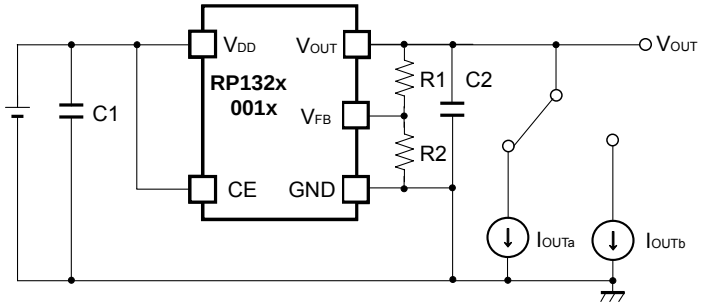
Basic Test Circuit



Test Circuit for Supply Current



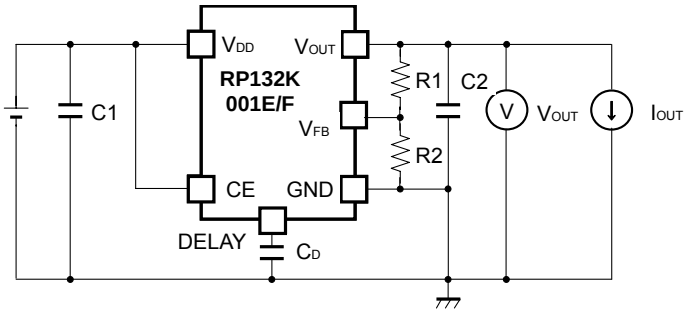
Test Circuit for Ripple Rejection



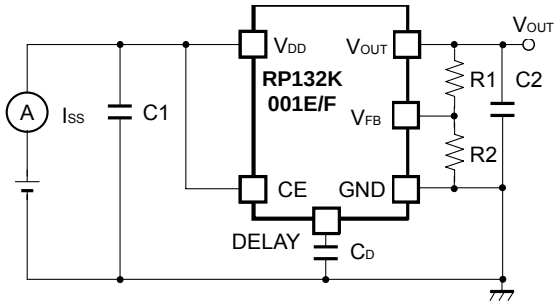
Test Circuit for Load Transient Response

Please refer to "Technical Notes on Adjustable Output Voltage Type" when using R1 and R2 as output capacitors

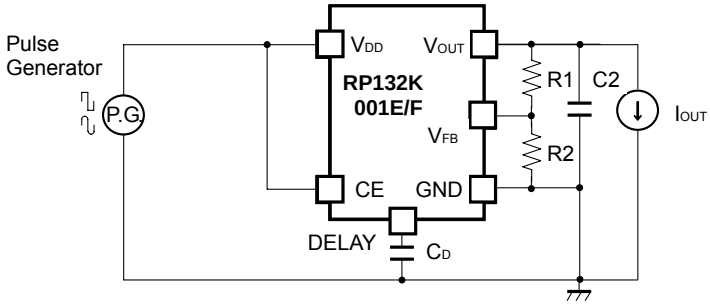
- **Adjustable Output Voltage Type with DELAY pin（DFN(PLP)1820-6（Under Development））**



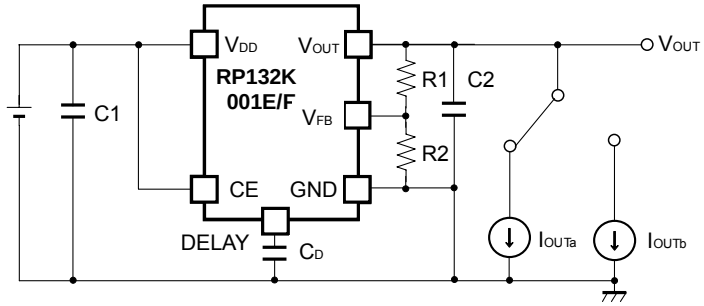
Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection



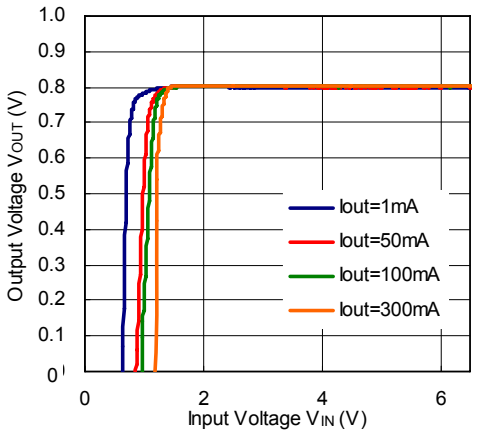
Test Circuit for Load Transient Response

Please refer to "Technical Notes on Adjustable Output Voltage Type" when using R1 and R2 as output capacitors. Also refer to "Inrush Current Limit Time Settings" concerning with C_D.

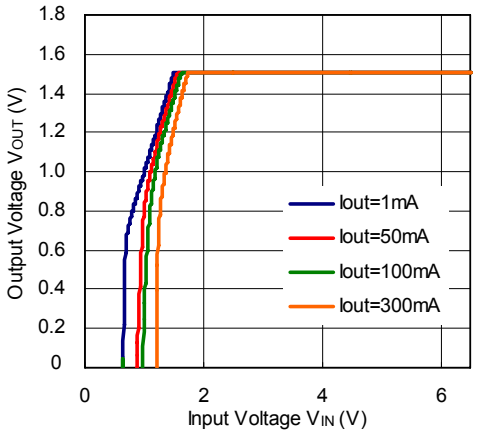
TYPICAL CHARACTERISTICS

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

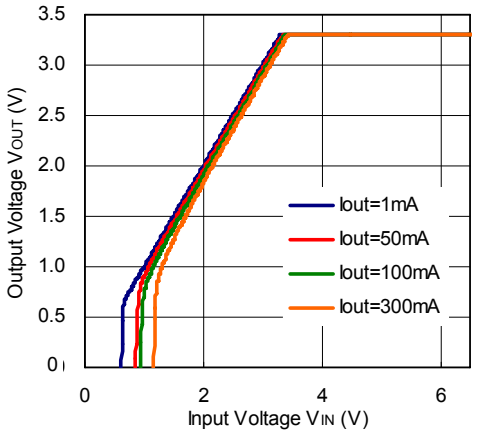
RP132x081x



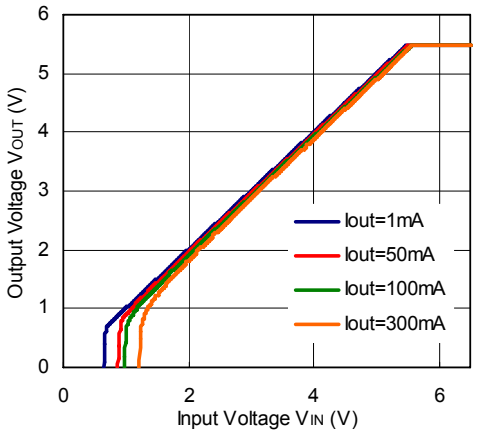
RP132x151x



RP132x331x

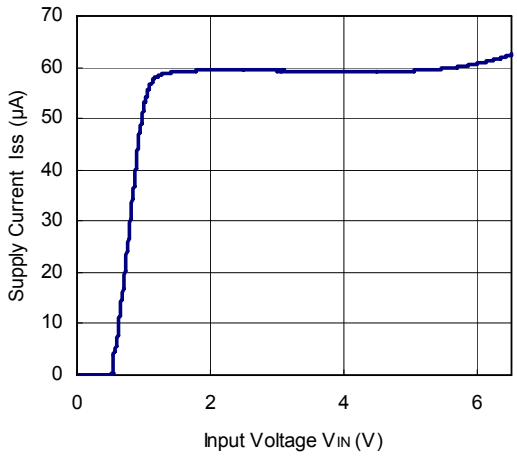


RP132x551x

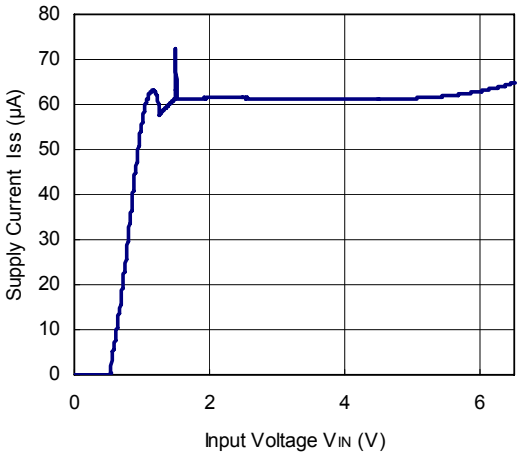


2) Supply Current vs. Input Voltage (Topt=25°C)

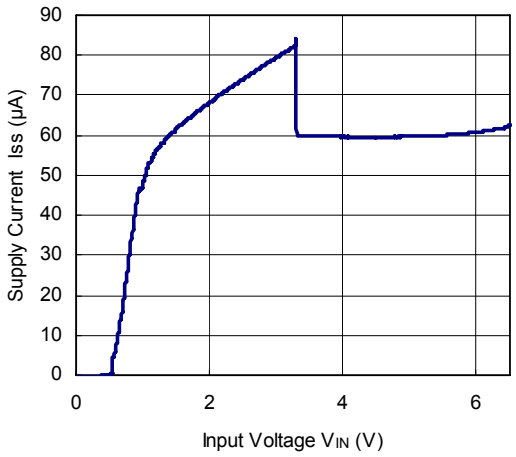
RP13x081x



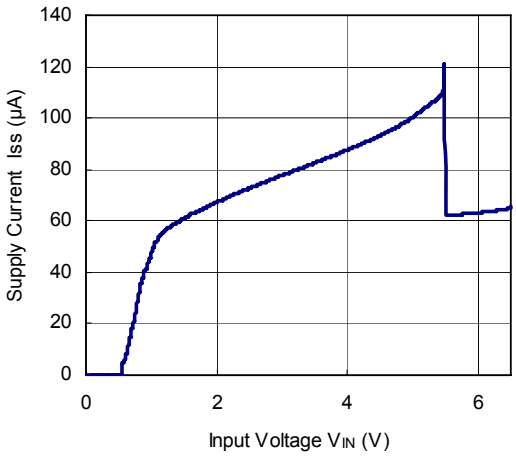
RP132x151x



RP132x331x

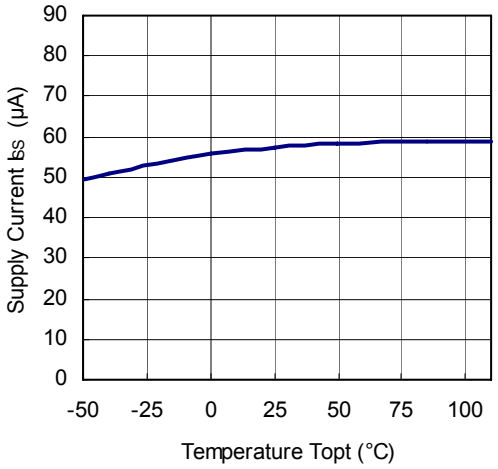


RP132x551x

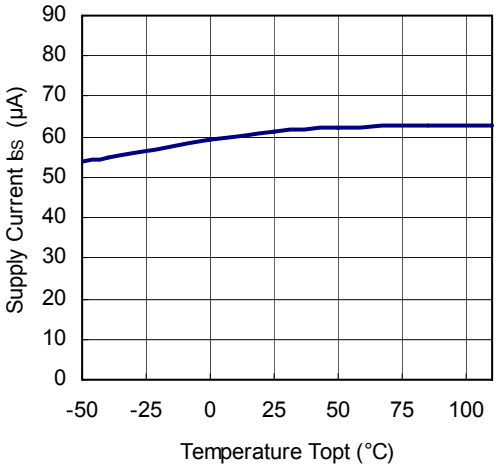


3) Supply Current vs. Temperature

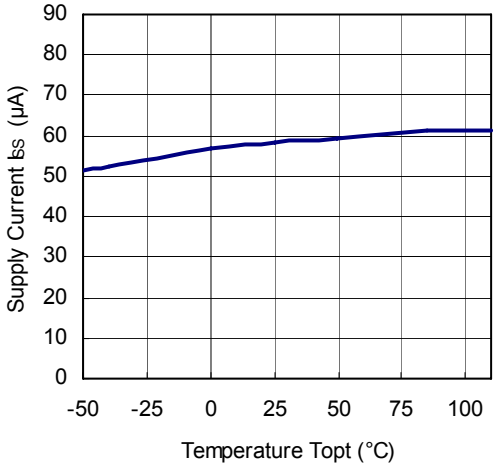
RP132x081x



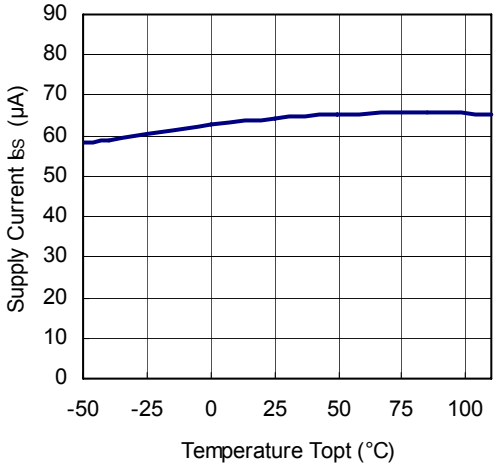
RP132x151x



RP132x331x

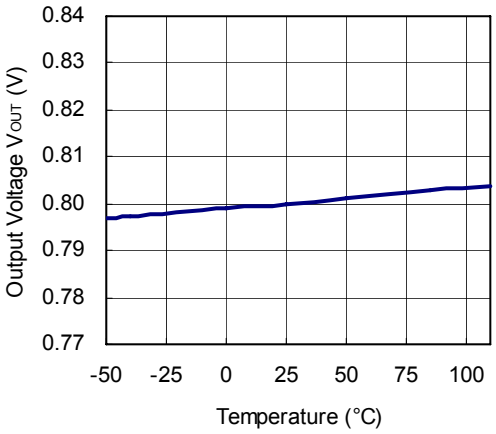


RP132x551x

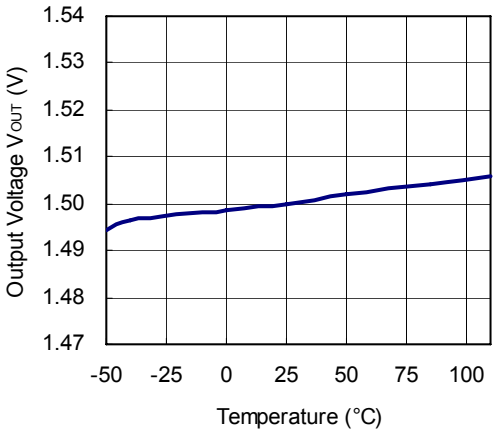


4) Output Voltage vs. Temperature

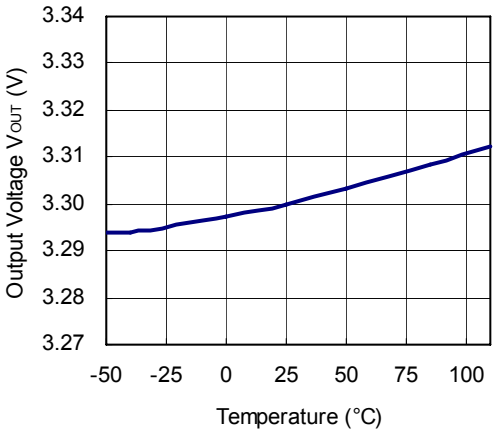
RP132x081x



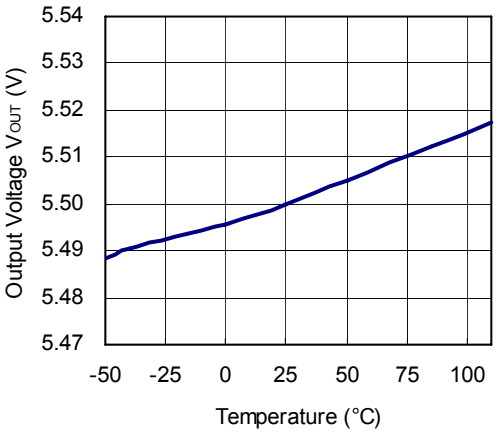
RP132x151x



RP132x331x

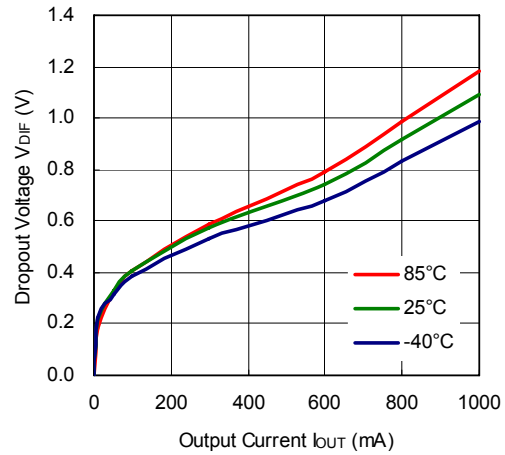


RP132x551x

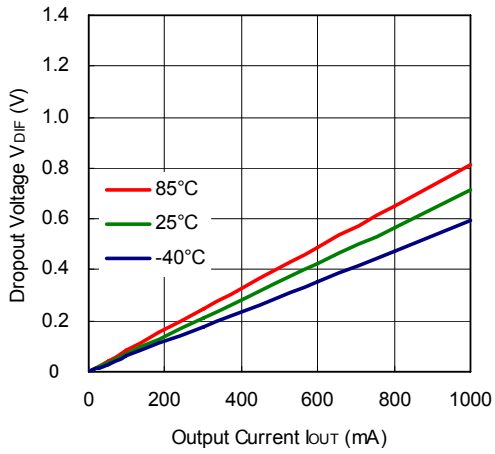


5) Dropout Voltage vs. Output Current

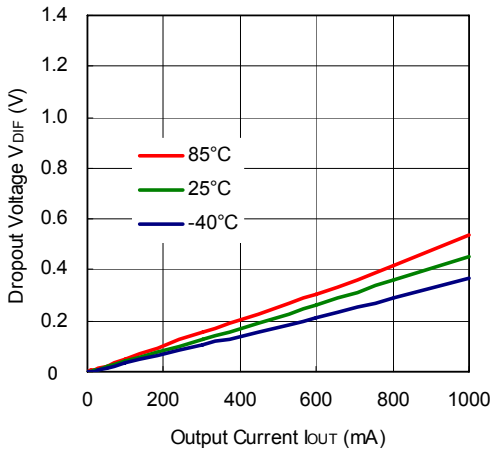
RP132x081x



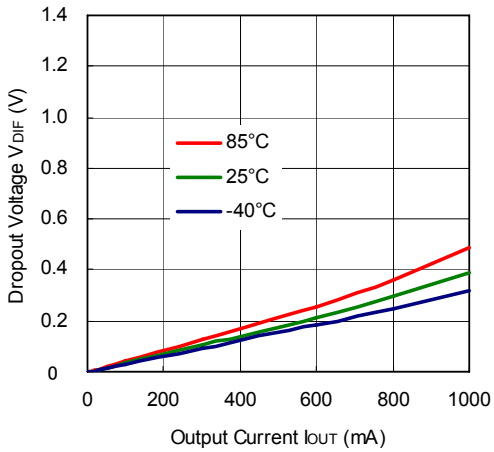
RP132x151x



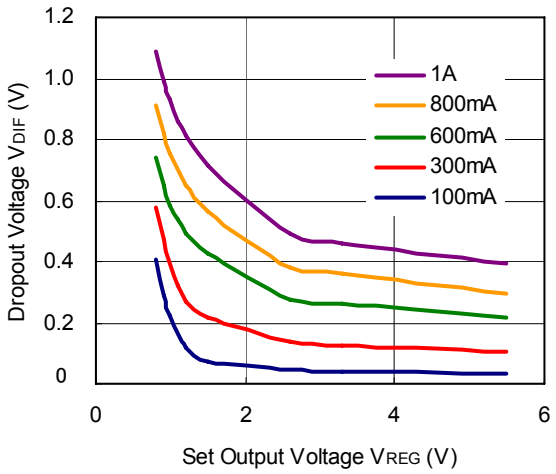
RP132x331x



RP132x551x

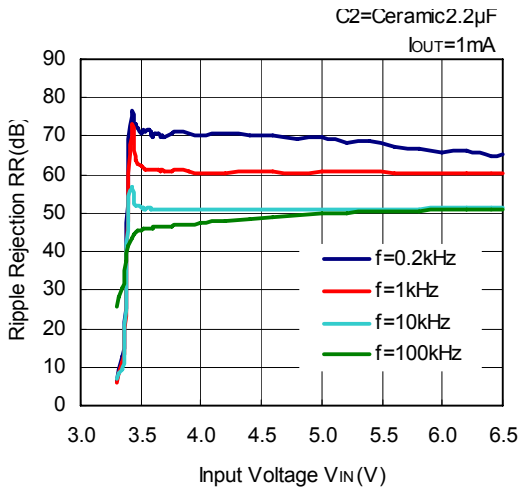


6) Dropout Voltage vs. Set Output Voltage

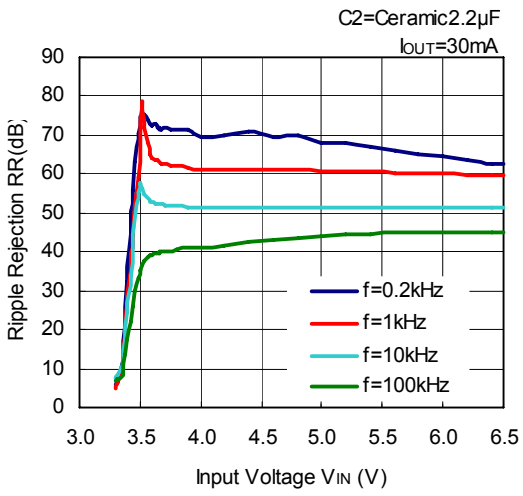


7) Ripple Rejection vs. Input Voltage (C1=none, Ripple=0.2Vp-p, Topt=25°C)

RP132x331x



RP132x331x



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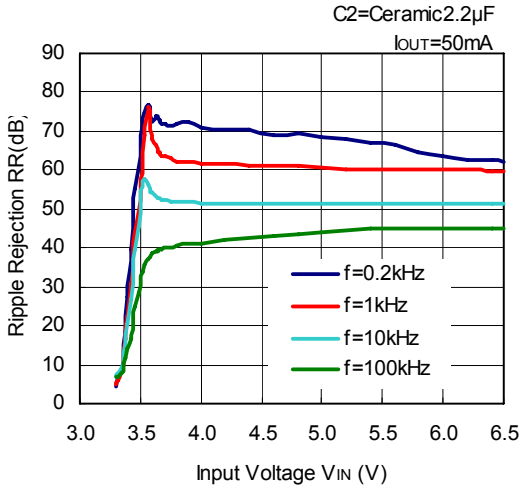

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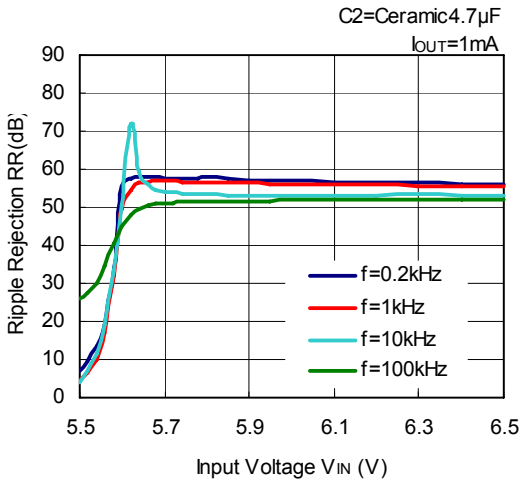

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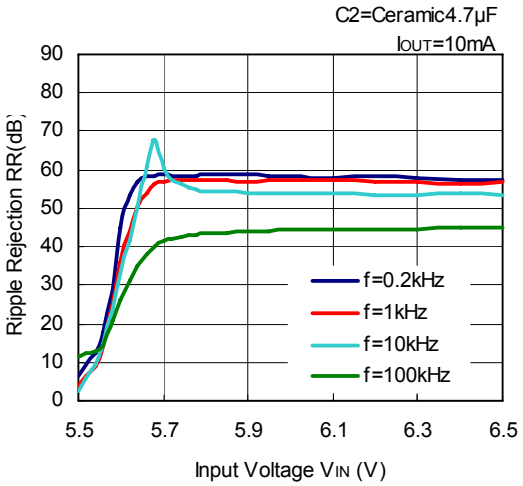

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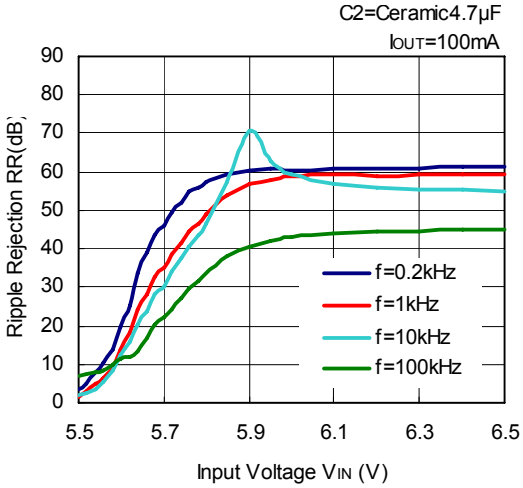
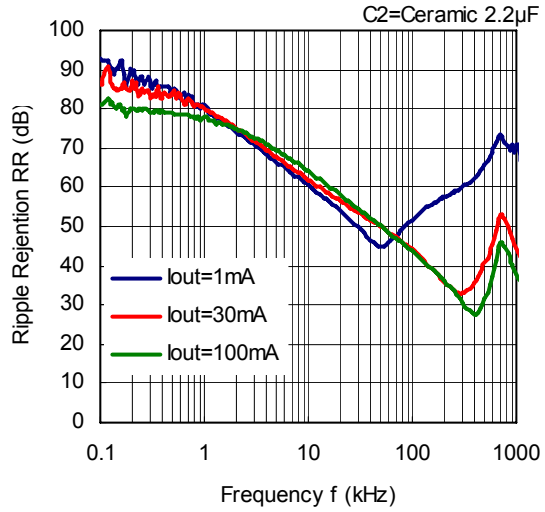


8) Ripple Rejection vs. Frequency (C1=none, Topt=25°C)

RP132x081x



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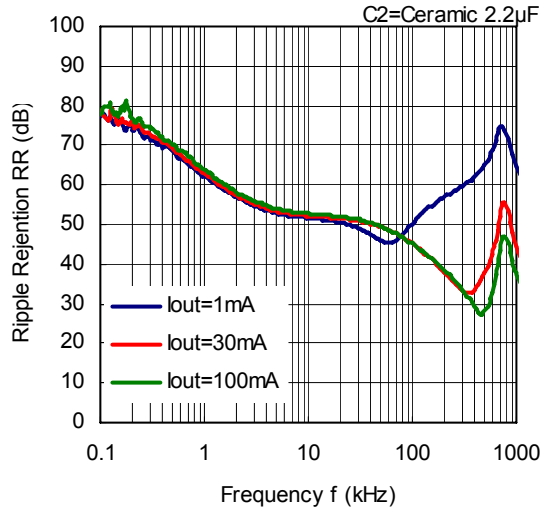

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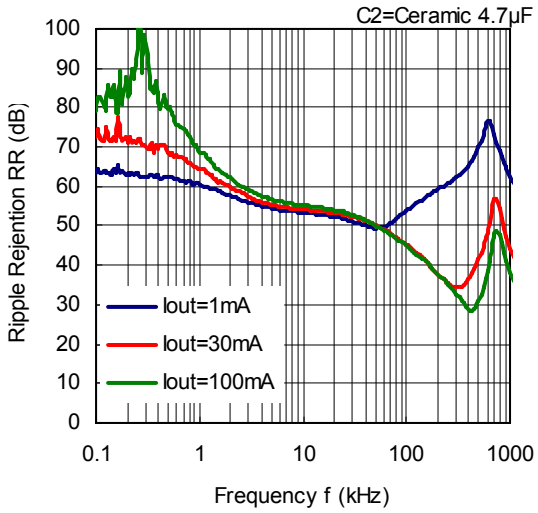
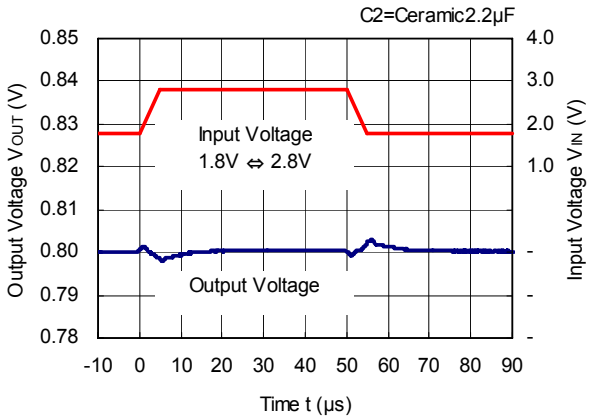


9) Input Transient Response (C1=none, I_{OUT}=100mA, tr=tf=5µs, Topt=25°C)

RP132x081x



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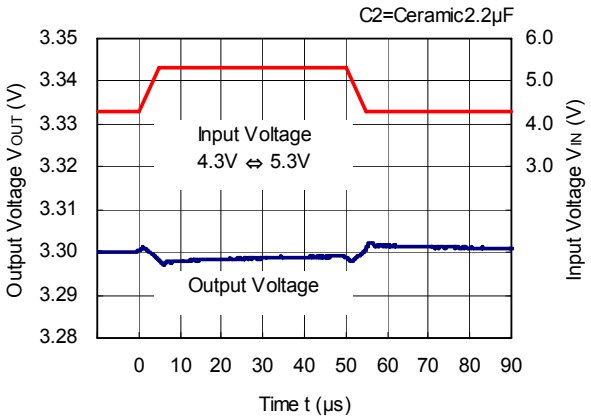

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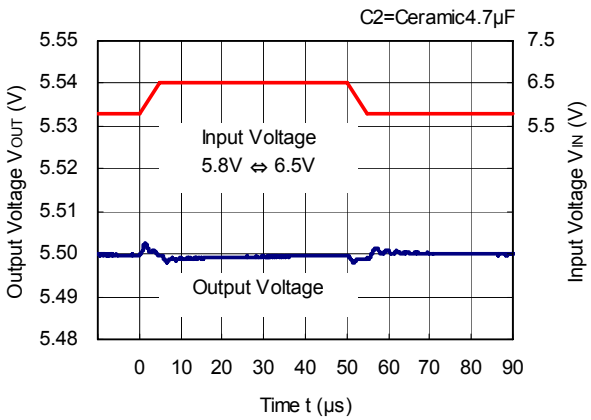
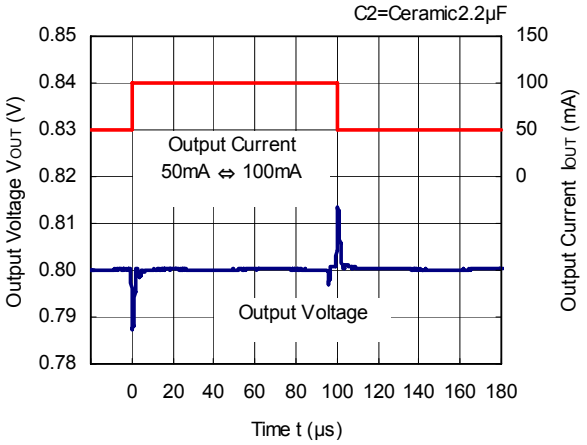


10) Load Transient Response (V_{IN}=V_{OUT}+1.0V, C1=Ceramic 2.2µF, tr=tf=0.5µs, Topt=25°C)

RP132x081x



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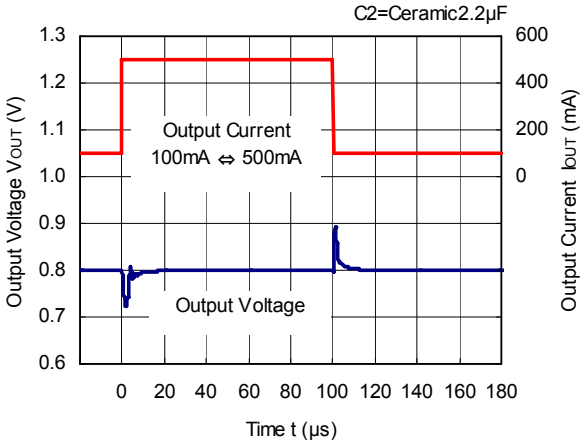

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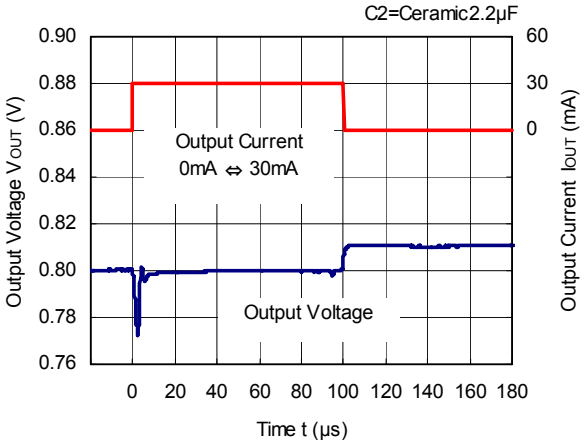

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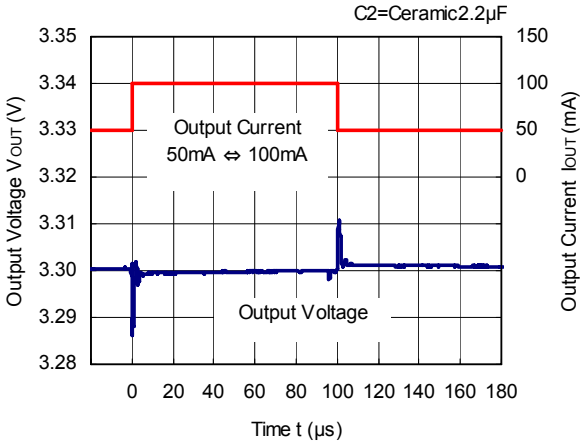

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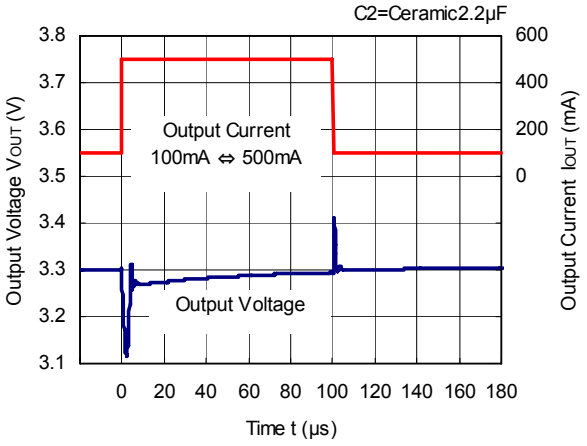

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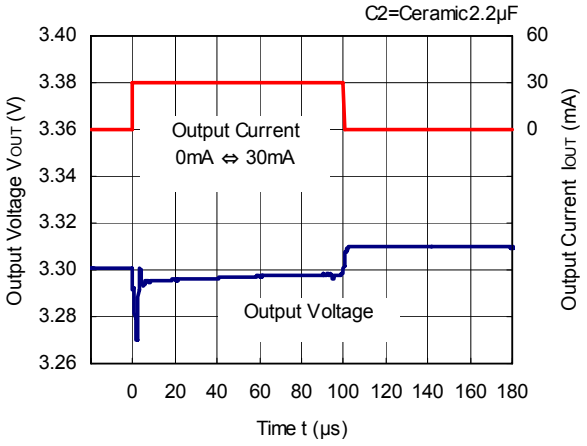

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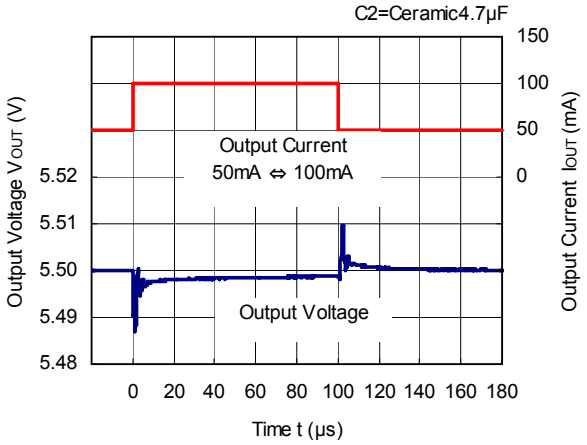

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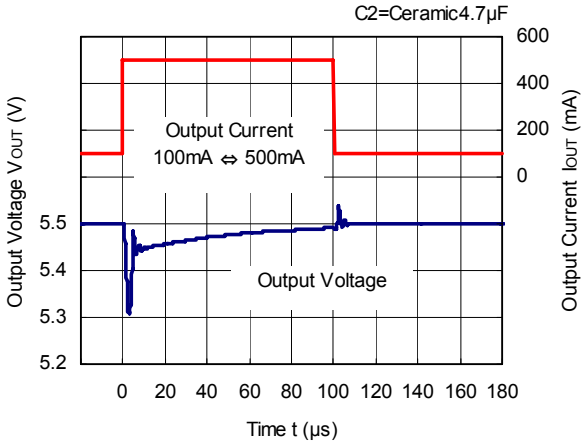

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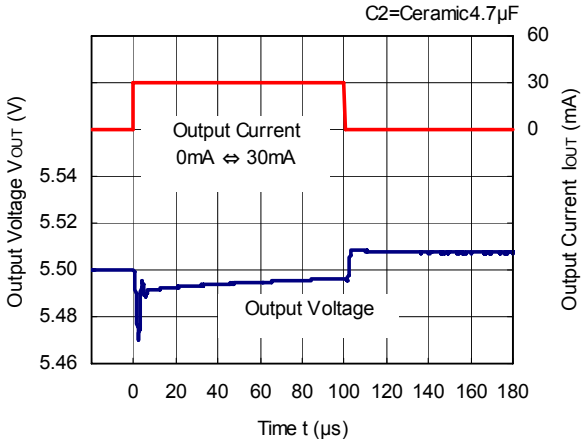
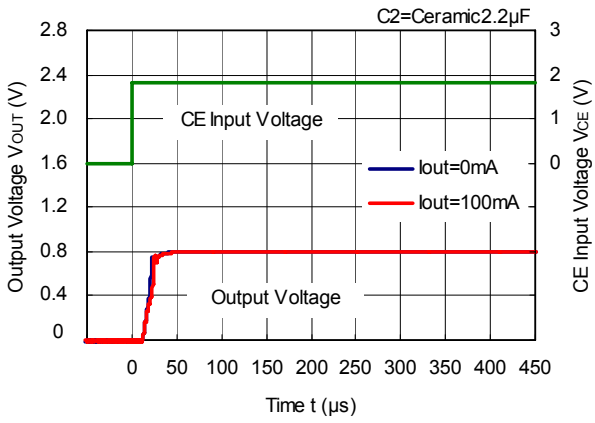


11) Turn on Speed with CE pin (C1=Ceramic 2.2µF, Topt=25°C)

RP132x081x



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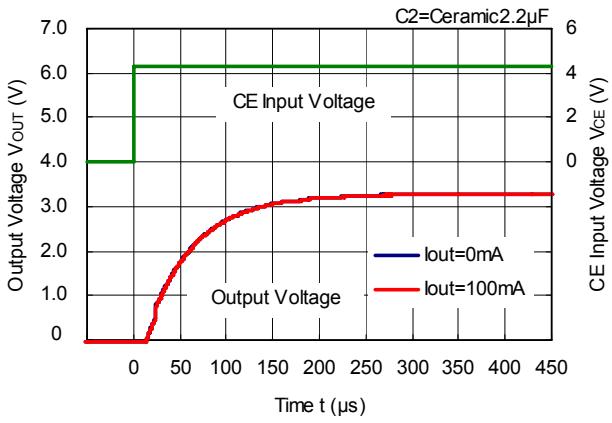

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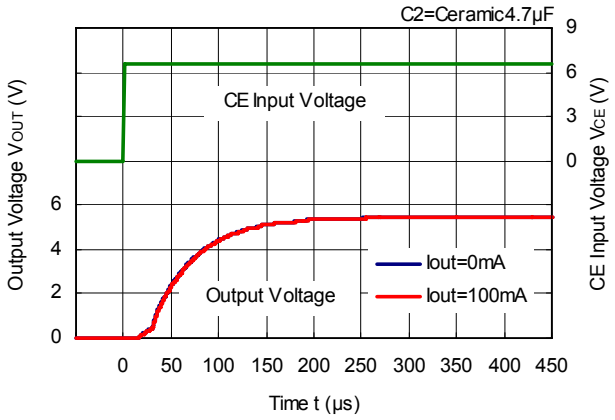
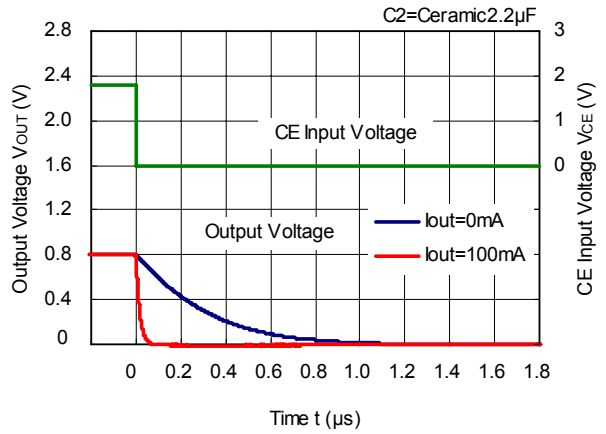


12) Turn off Speed with CE pin (D version) (C1=Ceramic 2.2µF, Topt=25°C)

RP132x081D



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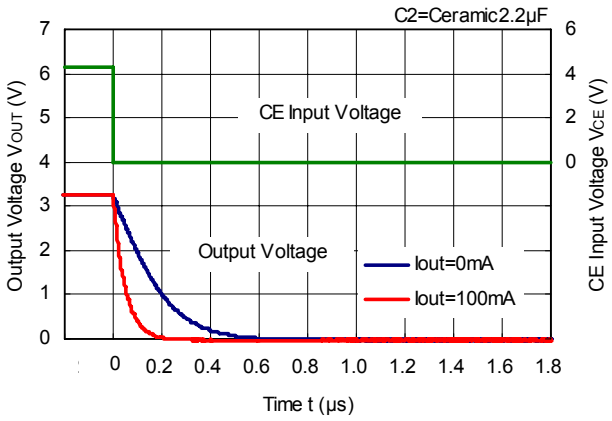

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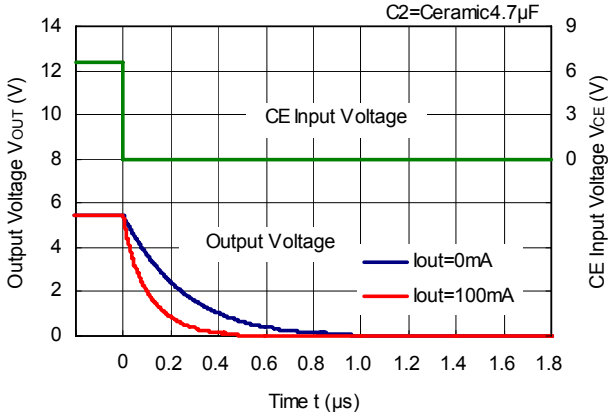
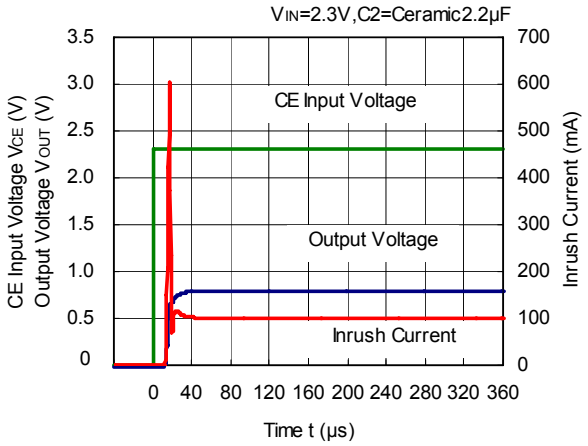


13) Inrush Current (C1=Ceramic 2.2µF, I_{OUT}=100mA, Topt=25°C)

RP132x081x



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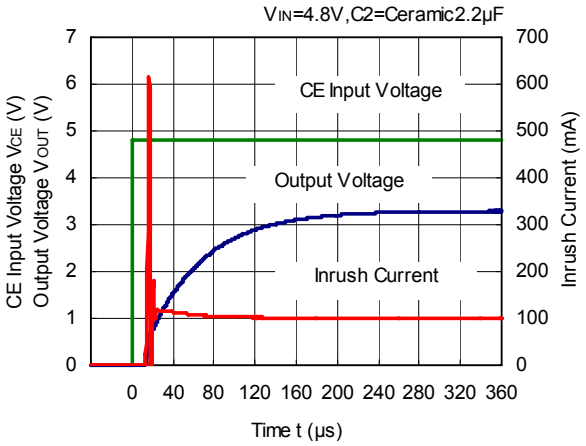

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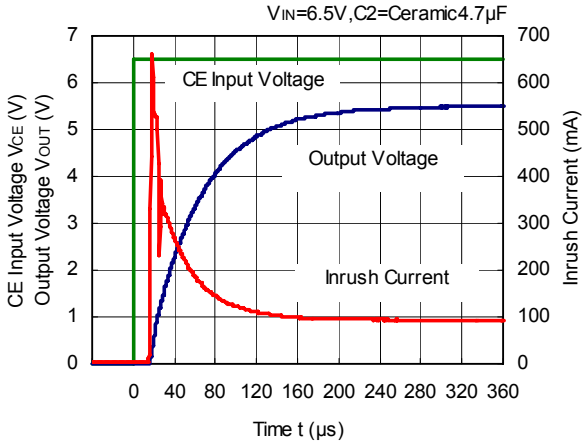
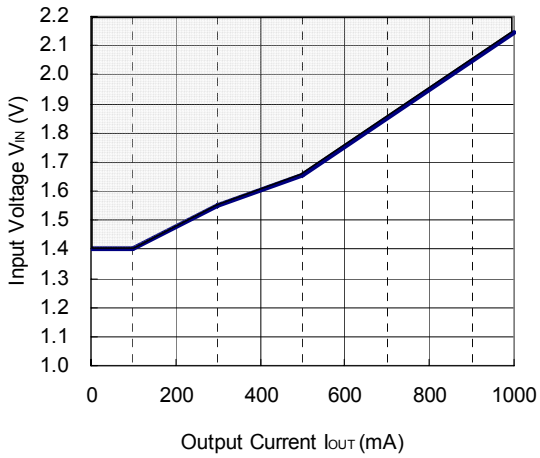


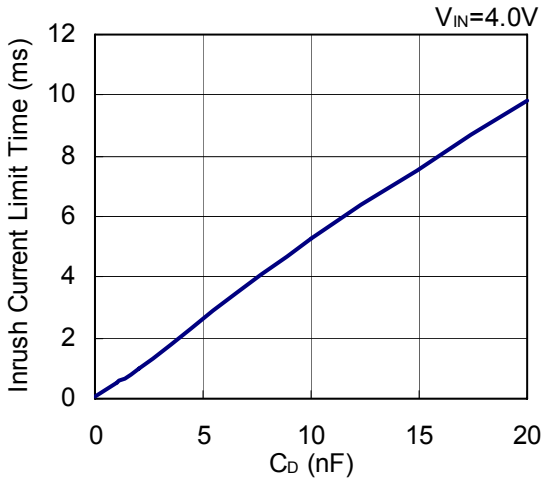
14) Minimum Operating Voltage

RP132x081x



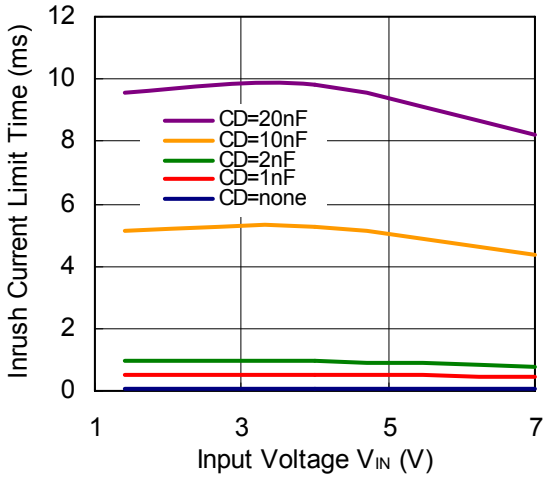
15) Inrush Current Limit Time vs. C_D Capacitance (E / F Version) (Under Development)

RP132x081x



16) Inrush Current Limit Time vs. Input Voltage (E / F Version) (Under Development)

RP132x081x



ESR vs. Output Current

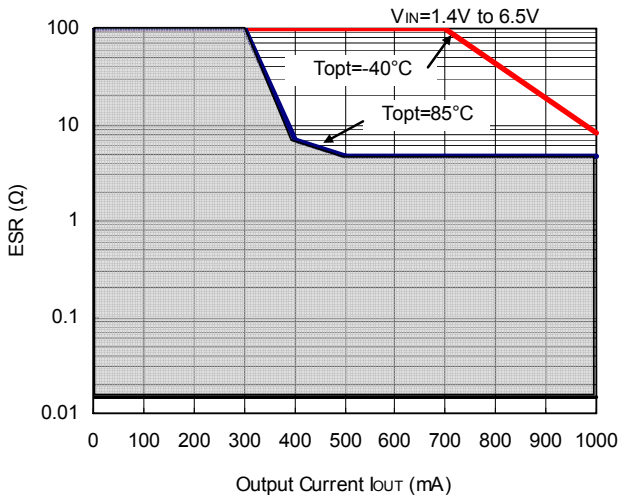
When using these ICs, consider the following points:

The relations between I_{OUT} (Output Current) and ESR of an output capacitor are shown below.
The conditions when the white noise level is under 40μV (Avg.) are marked as the hatched area in the graph.

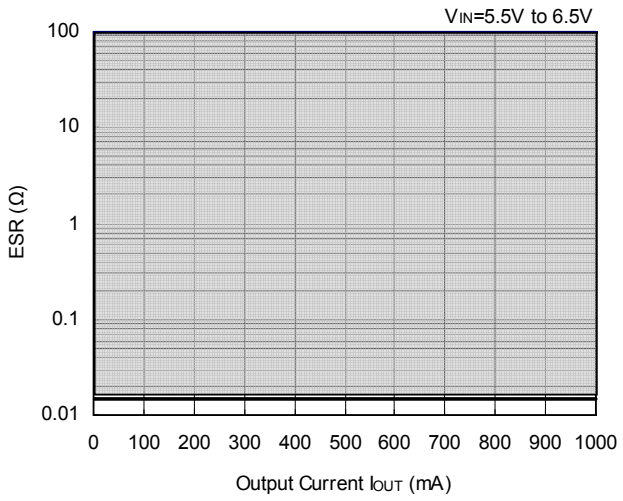
Measurement conditions

Frequency Band : 10Hz to 3MHz
Temperature : −40°C to 85°C
Hatched Area : Noise level is under 40μVms (Avg.)
C_{IN} : 2.2μF Kyocera (CM05X5R225M06A)
C_{OUT} : 4.7μF Kyocera (CM105X5R475M06AB)

RP132x081x



RP132x551x



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■Ricoh awarded ISO 14001 certification.
The Ricoh Group was awarded ISO 14001 certification, which is an international standard for environmental management systems, at both its domestic and overseas production facilities. Our current aim is to obtain ISO 14001 certification for all of our business offices.

RoHS Compliant
Ricoh completed the organization of the Lead-free production for all of our products. After Apr. 1, 2006, we will ship out the lead free products only. Thus, all products that will be shipped from now on comply with RoHS Directive.

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