AEC-Q100 Grade 2 Compliant

Low Input Voltage 3 A LDO Regulator for Automotive Applications

NO.EC-203-201216

OUTLINE

The RP108J is a voltage regulator IC featuring 3 A output with low ON-resistance developed with CMOS process technology.

This device consists of a voltage reference unit, an error amplifier, resistor-net for voltage setting, a fold-back protection circuit, and a thermal shutdown circuit. This device features both low supply current and high output current, and the dropout voltage is much smaller than bi-polar's. The minimum input voltage is as low as 1.6 V and the output voltage can be set from 0.8 V, therefore it can be connected with the DC/DC converter as the latter power supply for high density LSI that is operated by low output voltage.

The output voltage of RP108J081x is externally adjustable by using external divide resistors. The CE pin of the RP108J can switch the regulator to standby mode. In addition to a fold-back protection circuit, which is already built in the conventional regulators, this device contains a thermal shutdown circuit, a constant slope circuit as a soft-start function and a reverse current protection circuit. Ceramic capacitors can be used.

FEATURES

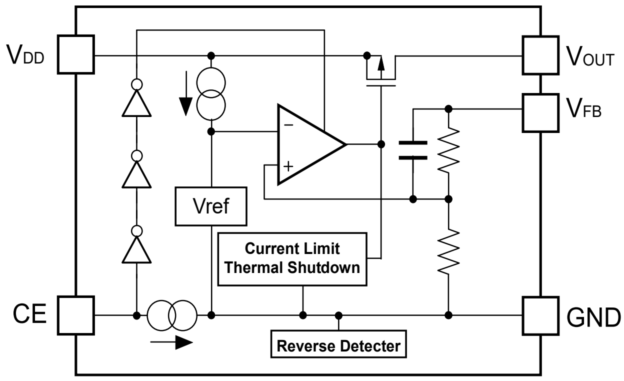
- Input Voltage Range (Maximum Rating) .... 1.6 V to 5.25 V (6.0 V)
- Operating Temperature.. −40°C to 105°C
- Output Current.. Min. 3 A
- Supply Current... Typ. 350 μA
- Standby Current .... Typ. 2 μA
- Output Voltage Range .... 0.8 V/1.2 V/1.5 V/1.8 V/2.5 V/3.0 V/3.3 V
  *Contact our sales representatives for other voltages.
  RP108J081x: 0.8 V to 4.2 V
- Output Voltage Accuracy .... ±1.0% (Ta = 25°C)
  (±15 mV accuracy, when V_{OUT} ≤ 1.5 V)
- Output Voltage Temperature-drift Coefficient .... Typ. ±100 ppm/°C
- Ripple Rejection .... Typ. 65 dB (f = 1 kHz, V_{OUT} = 2.5 V)
- Dropout Voltage.. Typ. 0.51 V (V_{OUT} = 2.5 V)
- Line Regulation.. Typ. 0.1%/V
- Package.. TO-252-5-P2
- Built-in Fold-back Protection Circuit .... Typ. 220 mA
- Built-in Thermal Shutdown Circuit .... Stops at 165°C
- Built-in Constant Slope Circuit
- Built-in Reverse Current Protection Circuit
- Ceramic capacitors are recommended to be used with this IC···· 10 μF or more

APPLICATIONS

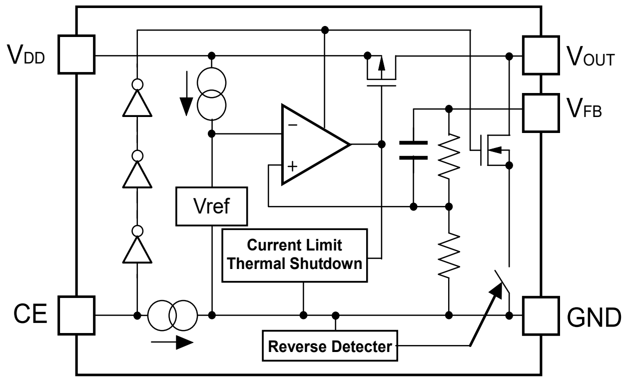
- Power source for car accessories including car audio equipment, car navigation system, and ETC system.

BLOCK DIAGRAMS

RP108Jxx1B/E



RP108Jxx1D/F



SELECTION GUIDE

The output voltage, the auto-discharge function, and the soft-start time for the device can be selected at the user's request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP108Jxx1∗-T1-#E	TO-252-5-P2	3,000 pcs	Yes	Yes

xx: Specify the set output voltage (V_{SET})
0.8 V (08), 1.2 V (12), 1.5 V (15), 1.8 V (18), 2.5 V (25), 3.0 V (30), 3.3 V (33)
*Contact our sales representatives for other voltages.

∗ : Specify the auto-discharge function at off state and the soft-start time
(B) No auto-discharge function, soft start time typ. 180 μs
(D) Auto-discharge function, soft start time typ. 180 μs
(E) No auto-discharge function, soft start time typ. 570 μs
(F) Auto-discharge function, soft start time typ. 570 μs

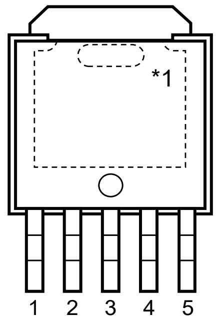
#: Specify Automotive Class Code

	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
A	-40°C to 105°C	25°C	High Temperature

Auto-discharge function quickly lowers the output voltage to 0 V by releasing the electrical charge in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.
Refer to *CONSTANT SLOPE CIRCUIT* for detailed information on the difference of soft-start time and its effect.

PIN DESCRIPTION

TO-252-5-P2



●**TO-252-5-P2**

Pin No.	Symbol	Description
1	CE	Chip Enable Pin (Active-high)
2	V_{DD}	Input Pin
3	GND	Ground Pin
4	V_{OUT}	Output Pin
5	V_{FB}	Feedback Pin

[*1] The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.
The V_{OUT} pin should be connected to the V_{FB} pin when using RP108J as an internal fixed output voltage type. In case of using this device as an external adjustable type, refer to *Adjustable Output Voltage Type Settings* for detailed information.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item		Rating	Unit
V_{IN}	Input Voltage		6.0	V
V_{CE}	Input Voltage (CE Input Pin)		–0.3 to 6.0	V
V_{FB}	Input Voltage (V_{FB} Pin)		–0.3 to 6.0	V
V_{OUT}	Output Voltage		–0.3 to V_{IN} + 0.3	V
P_D	Power Dissipation (TO-252-5-P2)[*1]	Standard Land Pattern	2350	mV
		Ultra High Wattage Land Pattern	4800	
Tj	Junction Temperature		–40 to 150	°C
Tstg	Storage Temperature		–55 to 150	°C

[*1] Refer to *PACKAGE INFORMATION* for detailed 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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage[*2]	1.6 to 5.25	V
Ta	Operating Temperature Range	-40 to 105	°C

[*2] In case of exceeding the maximum Input Voltage of 5.25 V, the device must be operated on condition that the Input Voltage is up to 5.5 V and the total operating time is within 500 hrs.

RECOMMENDED OPERATING CONDITIONS
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} = V_{SET} + 1.0 V, I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 10 μF, unless otherwise noted.
The specifications surrounded by ☐ are guaranteed by design engineering at –40°C ≤ Ta ≤ 105°C.

RP108Jxx1B/D/E/F-AE (Ta = 25°C)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_{OUT}	Output voltage	Ta = 25°C	V_{OUT} > 1.5 V	×0.99		×1.01	V
			V_{OUT} ≤ 1.5 V	–15		+15	mV
		–40°C ≤ Ta ≤ 105°C	V_{OUT} > 1.5 V	×0.97		×1.024	V
			V_{OUT} ≤ 1.5 V	–45		36	mV
I_{LIM}	Output Current			3.0			A
$\Delta V_{OUT}/\Delta I_{OUT}$	Load regulation	1 mA ≤ I_{OUT} ≤ 300 mA		–15	2.0	20	mV
		1 mA ≤ I_{OUT} ≤ 3000 mA		–70	3.0	50	
V_{DIF}	Dropout Voltage	I_{OUT} = 3 A		Refer to the *Product-specific Electrical Characteristics*			
I_{SS}	Supply Current	I_{OUT} = 0 mA			350	500	μA
$I_{standby}$	Standby Current	V_{CE} = 0 V			2.0	5.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line regulation	Set V_{OUT} + 0.5 V ≤ V_{IN} ≤ 5.25 V, I_{OUT} = 1 mA (When V_{OUT} ≤ 1.1 V , V_{IN} = 1.6 V)			0.10	0.15	%/V
I_{SC}	Short Current Limit	V_{OUT} = 0 V			220		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
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 (of D/F version)	V_{IN} = 4.0 V, V_{CE} = 0 V			30		Ω
I_{REV}	Reverse Current Limit	V_{OUT} > 0.5 V, 0 ≤ V_{IN} ≤ 5.25 V			10		μA

All test items listed under Electrical Characteristics are done under the pulse load condition (Tj ≈ Ta = 25°C)

Product-specific Electrical Characteristics

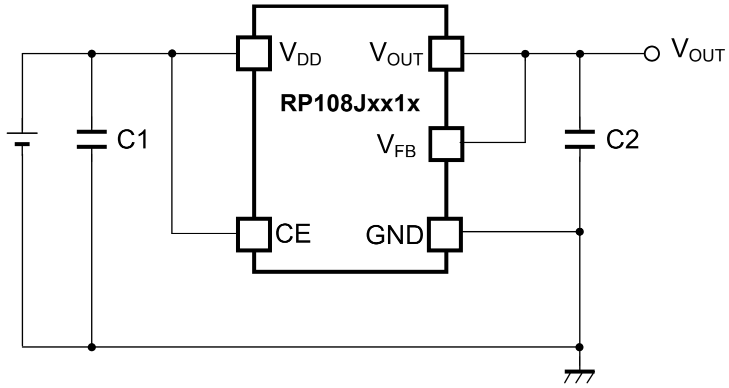
The specifications surrounded by ☐ are guaranteed by design engineering at –40°C ≤ Ta ≤ 105°C.

(Ta = 25°C)

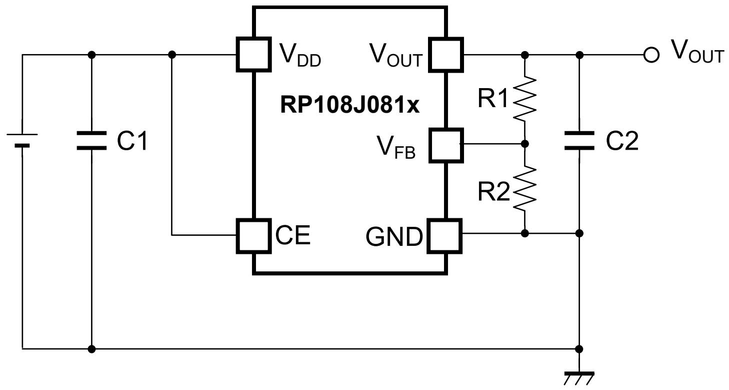
Product Name	V_{OUT} [V]					V_{DIF} [V]	
	(Ta = 25°C)			(−40°C ≤ Ta ≤ 105°C)			
	MIN.	TYP.	MAX.	MIN.	MAX.	TYP.	MAX.
RP108J081x	0.785	0.800	0.815	0.755	0.836	0.910	1.155
RP108J121x	1.185	1.200	1.215	1.155	1.236	0.720	0.890
RP108J151x	1.485	1.500	1.515	1.455	1.536	0.630	0.790
RP108J181x	1.782	1.800	1.818	1.746	1.843		
RP108J251x	2.475	2.500	2.525	2.425	2.560	0.510	0.670
RP108J301x	2.970	3.000	3.030	2.910	3.072		
RP108J331x	3.267	3.300	3.333	3.201	3.379	0.480	0.590

TYPICAL APPLICATIONS

Internally Fixed Output Voltage



Externally Adjustable Output Voltage



External Components

Symbol	Description
C1 (C_{IN}), C2 (C_{OUT})	10 µF, Ceramic Capacitor, Kyocera CM21X7R106M06AB

TECHNICAL NOTES

When using the RP108J, please consider the following points.

When using an internally fixed output voltage type, please connect the V_{OUT} pin to the V_{FB} pin. However, in the case of using the Adjustable Output Voltage Type, please follow the *Adjustable Output Voltage Setting*.

Phase Compensation

In this device, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use a 10 μF or more capacitor C2.

In case of using a tantalum capacitor, and its ESR is large, the output may be unstable. Therefore, select C2 carefully considering its frequency characteristics.

The recommended temperature characteristics for C1 and C2 capacitors are the followings.

・ X7R Characteristics: Temperature range from −55°C to 125°C, Capacitance change of ±15%

The recommended capacitor's tolerable voltage is twice as large as the voltage of use (C1: Input voltage, C2: Output voltage). The upper limit of the capacitance value for C2 is 100 μF.

However, the increase of C2 leads to the increase of inrush current. Refer to *CONSTANT SLOPE CIRCUIT* for detailed information.

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 10 μF or more between V_{DD} and GND pin, and as close as possible to the pins.

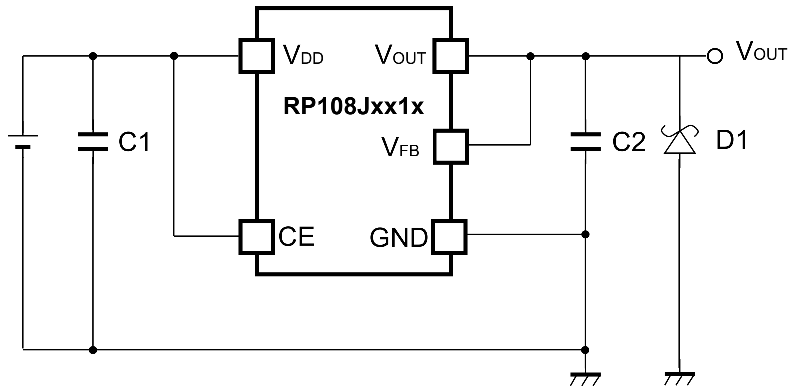
Set external components, especially the output capacitor C2, as close as possible to the device, and make wiring as short as possible (Refer to *TYPICAL APPLICATION*).

Transient Response

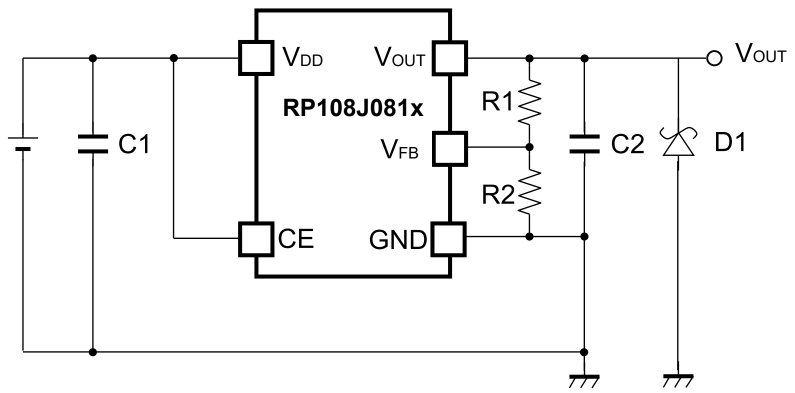
When using the Adjustable Output Voltage Type, the transient response could be affected by the external resistors. Evaluate the circuit taking the actual conditions of use into account.

TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION

Internally Fixed Output Voltage



Externally Adjustable Output Voltage

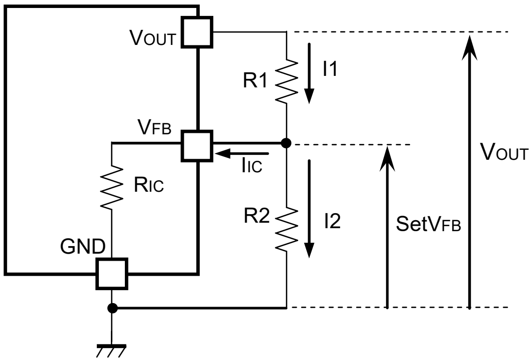


When a sudden surge of electrical current travels along the V_{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C2) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D1) between the V_{OUT} pin and GND has the effect of preventing damage to them.

Adjustable Output Voltage Setting (RP108J081x)

• Output Voltage Setting Method

RP108J081x is capable of adjusting the output voltage by using the external divider resistors.
If the V_{FB} voltage fixed in the device is described as setV_{FB}, the output voltage can be set by using the following equations. SetV_{FB} is equal to 0.8 V. The V_{OUT} pin of RP108J081x should be connected to the V_{FB} pin.



Adjustable Output Voltage Type Setting Using External Divider Resistors (R1, R2)

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

Thus,

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

Therefore,

$V_{OUT} = setV_{FB} + R1 \times I1$ ....(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 RP108J is approximately Typ.1.6 MΩ (Ta = 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. The output voltage of the externally adjustable output voltage type should be set to 4.2 V or less. Also, total resistors value of R1 and R2 should be 20 kΩ or less.

REVERSE CURRENT PROTECTION CIRCUIT

The RP108J includes a Reverse Current Protection Circuit, which stops the reverse current from V_{OUT} pin to V_{DD} pin or to GND pin when V_{OUT} becomes higher than V_{IN}.

Usually, the LDO using Pch output transistor contains a parasitic diode between V_{DD} pin and V_{OUT} pin. Therefore, if V_{OUT} is higher than V_{IN}, the parasitic diode becomes forward direction. As a result, the current flows from V_{OUT} pin to V_{DD} pin.

This device switches the mode to the reverse current protection mode before V_{IN} becomes lower than V_{OUT} by connecting the parasitic diode of Pch output transistor to the backward direction, and connecting the gate to V_{OUT} pin. As a result, the Pch output transistor is turned off and the all the current pathways from V_{OUT} pin to GND pin are shut down to maintain the reverse current lower than 10 μA.

Switching to either the normal mode or to the reverse current protection mode is determined by the magnitude of V_{IN} voltage and V_{OUT} voltage. For the stable operation, offset and hysteresis are set as the threshold. Offset is set to 30 mV (Typ. 25°C) and hysteresis is set to 5mV (Typ. 25°C).

Therefore, the minimum dropout voltage under the small load current condition is restricted by the value of 35 mV (Typ. 25°C).

Fig. 1 and Fig. 2 show the diagrams of each mode, and Fig. 3 shows the load characteristics of each mode. When giving the V_{OUT} pin a constant-voltage and decreasing the V_{IN} voltage, the dropout voltage will become lower than 30 mV (Typ. 25°C). As a result, the reverse current protection starts to function to stop the load current. By increasing the dropout voltage higher than 35 mV (Typ. 25°C), the protection mode will be released to let the load current to flow. If the dropout voltage to be used is lower than 30 mV (Typ. 25°C), the detection and the release may be repeated.

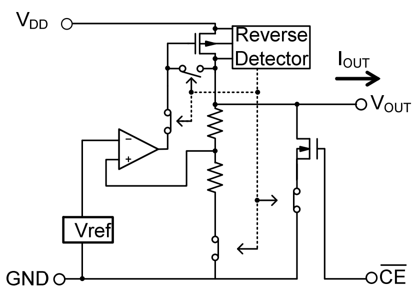


Fig. 1 Normal Mode

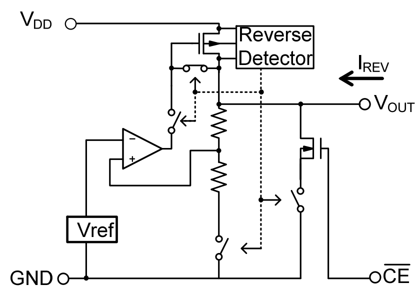


Fig. 2 Reverse Current Protection Mode

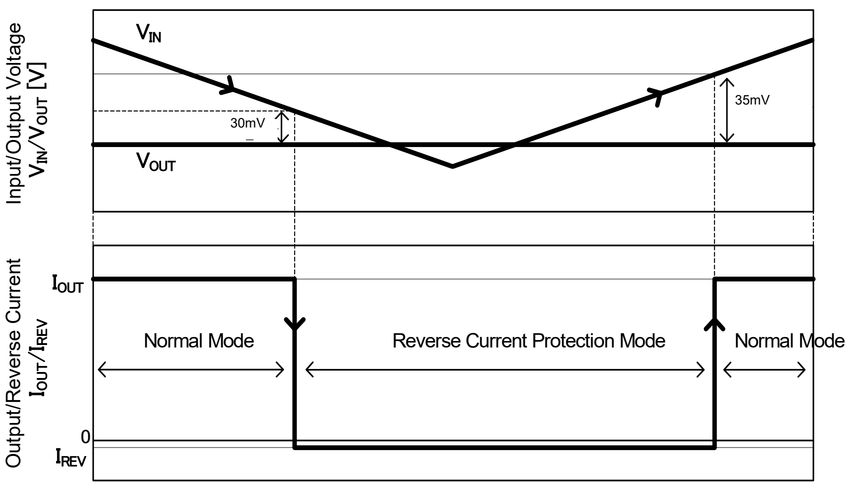


Fig. 3 Reverse Current Protection Mode Detection/ Release &
Reverse Current/ Output Current Characteristics

CONSTANT SLOPE CIRCUIT (RP108Jxx1B/xx1D)

RP108Jxx1B/xx1D has a Constant Slope Circuit (soft-start circuit) which allows the output voltage to start-up gradually. The capacitor to create the start-up slope is built-in the IC so that it does not require any external components. The upper limit of inrush current during the start-up is controlled by the short current ISC and the output current limit ILIM.

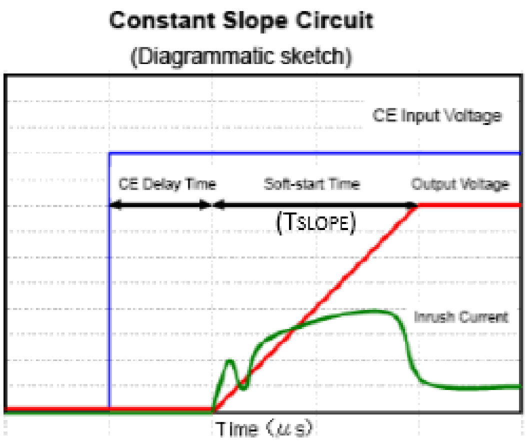
In the following characteristics C_{OUT} = 10 μF (R_{LOAD} = 380 Ω), the inrush current I_{RUSH} is not controlled by the short current ISC and the output current limit ILIM. Therefore the output voltage rises with the soft-start time (T_{SLOPE}) set inside IC, and it enables to control the overshoot of the output voltage and the inrush current. T_{SLOPE} is typ. 180 μs.

In the characteristics C_{OUT} = 20 μF, I_{RUSH} at the low output voltage is controlled by the short current ISC. After the current is released from ISC, the output voltage rises with the soft-start time (T_{SLOPE}).

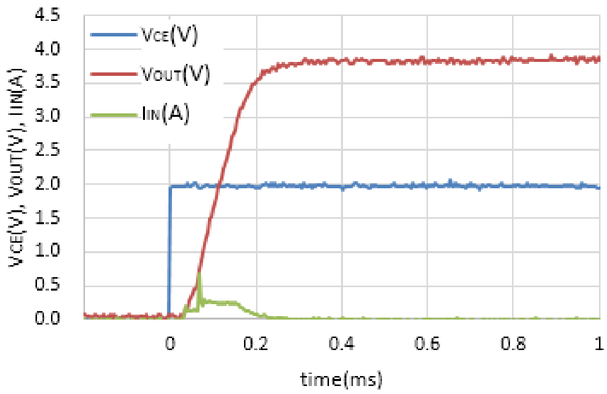
In the characteristics C_{OUT} = 100 μF, I_{RUSH} at the low output voltage is controlled by the short current ISC. After the current is released from ISC, it is controlled by the output current limit. The output voltage rises with the soft-start time (T_{SLOPE}) or longer.

The relation of the inrush current and the constant slope depends on the output voltage since the inrush current is a sum of the charge current of C_{OUT} and the load current. Use RP108Jxx1E/xx1F to avoid an influence on peripheral components due to the inrush current generated in the use environment conditions (C_{OUT} and output voltage).

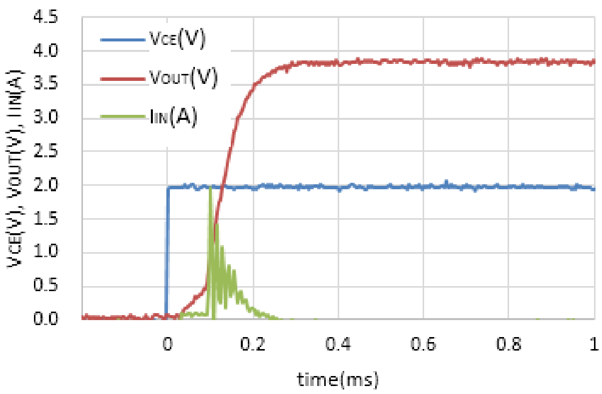
RP108J381B/D Inrush current characteristics



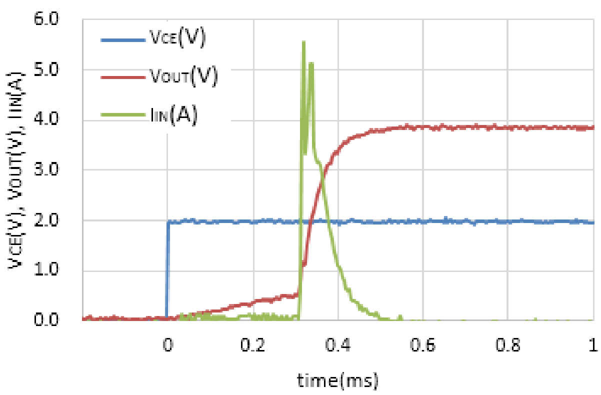
CIN=4.7μF, COUT=10μF, Topt=25°C, RLOAD=380Ω



CIN=4.7μF, COUT=20μF, Topt=25°C, RLOAD=380Ω



CIN=4.7μF, COUT=100μF, Topt=25°C, RLOAD=380Ω



CONSTANT SLOPE CIRCUIT (RP108Jxx1E/xx1F)

RP108Jxx1E/xx1F has a constant slope circuit (soft-start circuit) which allows the output voltage to start-up gradually. The capacitor to create the start-up slope is built-in the IC so that it does not require any external components. The upper limit of inrush current during the start-up is controlled by the output current limit ILIM.

As shown in the following Foldback Characteristics, the inrush current is not controlled by the short current ISC during the soft-start time at the start-up. Therefore the output voltage rises with the soft-start time (T_{SLOPE}) set inside IC, and it enables to control the overshoot of the output voltage and the inrush current. T_{SLOPE} is typ. 570 μs (max. 900 μs/85°C). Use RP108Jxx1B/xx1D to avoid an influence on peripheral components due to the output start-up time is slow in the system.

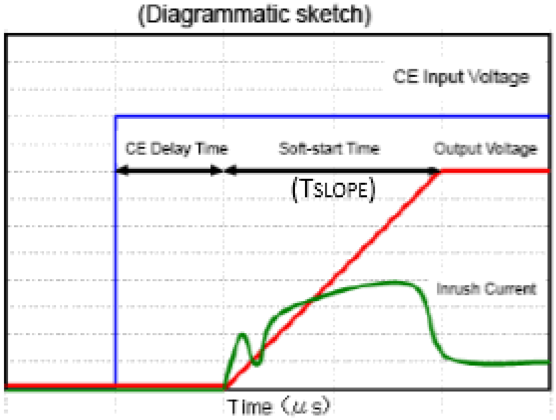
In the characteristics C_{OUT} = 20 μF, the inrush current is lower or equal to the output current limit ILIM. The output voltage rises with the soft-start time (T_{SLOPE}).

Similarly in the characteristics C_{OUT} = 100 μF, the inrush current is lower or equal to the output current limit ILIM. The output voltage rises with the soft-start time (T_{SLOPE}).

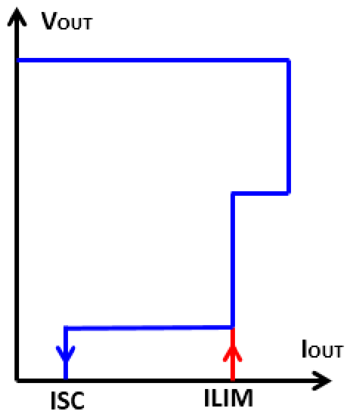
The relation of the inrush current and the constant slope depends on the output voltage since the inrush current is a sum of the charge current of C_{OUT} and the load current.

RP108J381E/F Inrush current characteristics

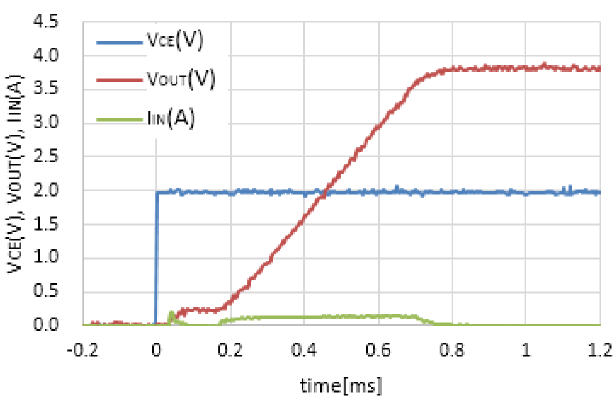
Constant Slope Circuit
(Diagrammatic sketch)



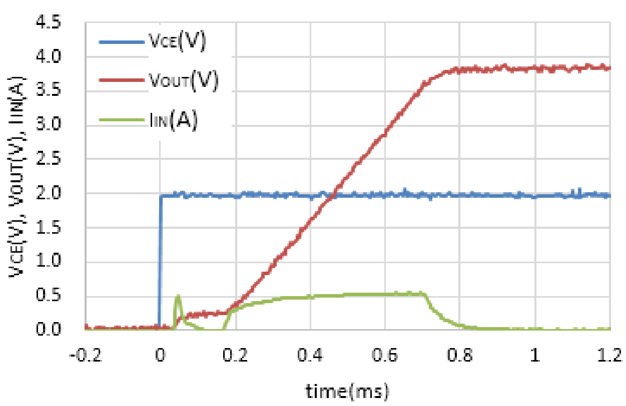
Foldback Characteristics
(Diagrammatic sketch)



C_{IN}=4.7μF, C_{OUT}=20μF, Topt=25°C, R_{LOAD}=380Ω



C_{IN}=4.7μF, C_{OUT}=100μF, Topt=25°C, R_{LOAD}=380Ω



PACKAGE INFORMATION

POWER DISSIPATION (TO-252-5-P2)

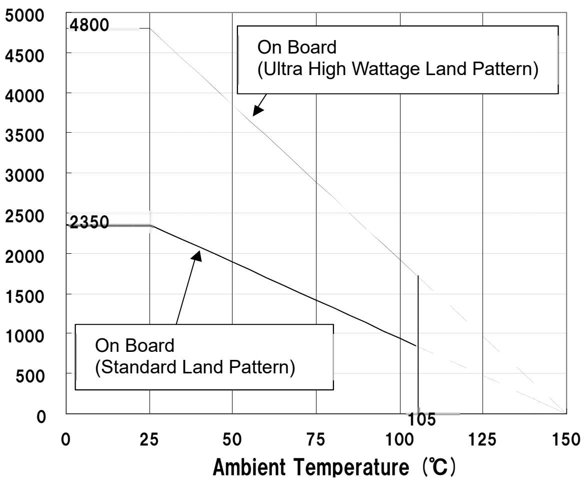
Power Dissipation (P_D) depends on conditions of mounting on board.
This specification is based on the measurement at the condition below:

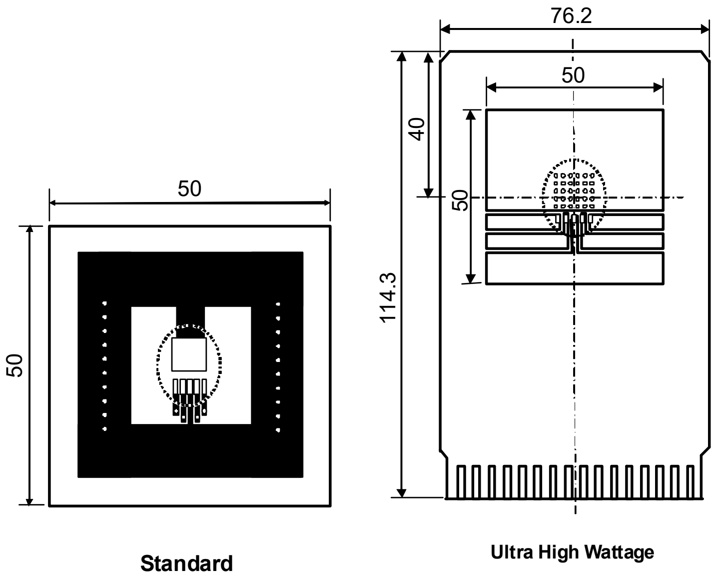
* Measurement conditions

	Standard Land Pattern	Ultra High Wattage Land Pattern
Environment	Mounting on board (Wind velocity 0 m/s)	
Board Material	Glass cloth epoxy plastic (Double layers)	Glass cloth epoxy plastic (Four layers)
Board Dimensions	50 mm x 50 mm x 1.6 mm	76.2 mm x 114.3 mm x 0.8 mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%	Top, Back side: Approx. 96%, 2nd, 3rd: 100%
Through - hole	ϕ 0.5 mm x 24 pcs	ϕ 0.4 mm x 30 pcs

* Measurement Results (Ta = 25°C, Tjmax = 150°C)

	Standard Land Pattern	Ultra High Wattage Land Pattern
Power Dissipation	2350 mW	4800 mW
Thermal Resistance	θja = (150 - 25°C)/2.35 W = 53°C/W	θja = (150 - 25°C)/4.8 W = 26°C/W
	θjc = 17°C/W	θjc = 7°C/W



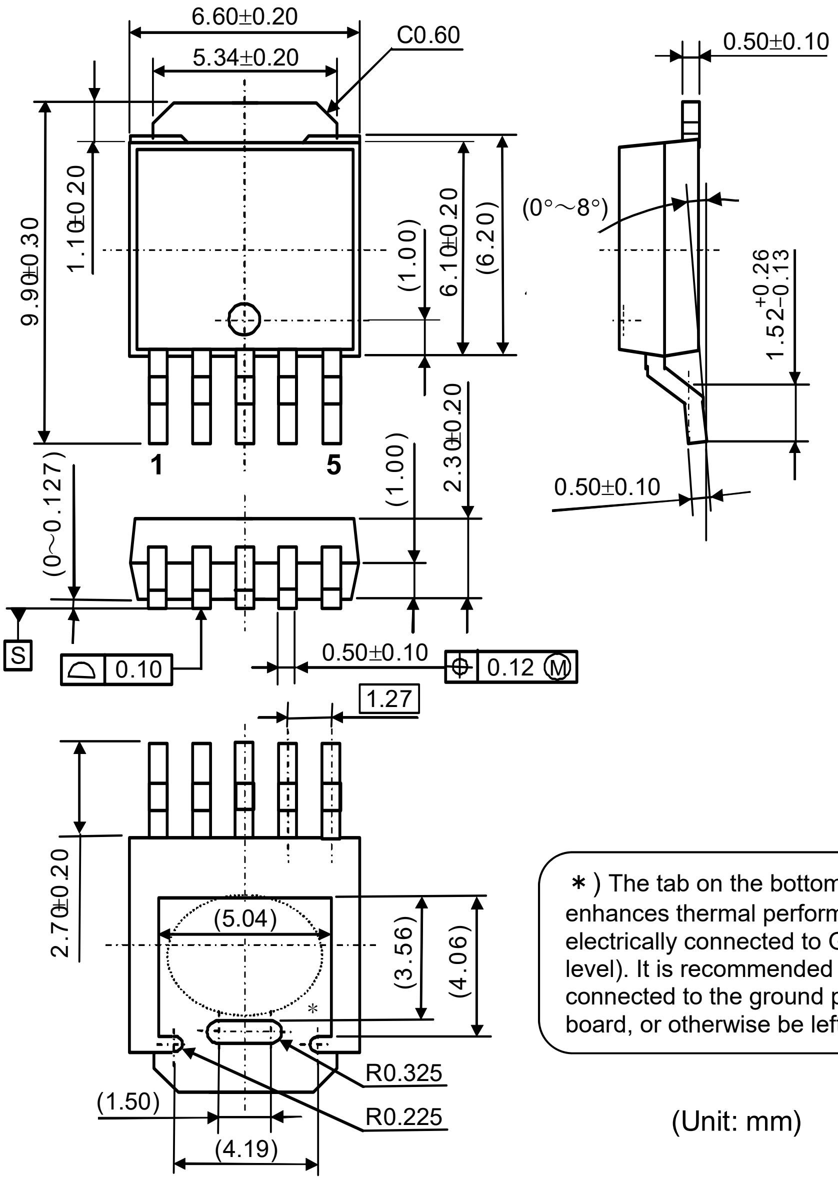


IC Mount Area (Unit: mm)

Power Dissipation vs. Ambience Temperature (TO-252-5-P2)

Measurement Board Pattern (TO-252-5-P2)

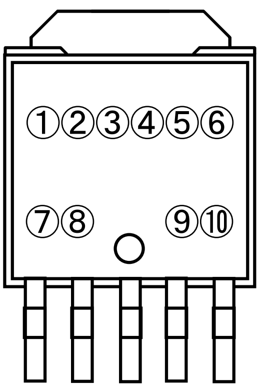
PACKAGE DIMENSIONS (TO-252-5-P2)



＊) The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.

(Unit: mm)

MARK SPECIFICATION (TO-252-5-P2)



①②③④⑤⑥⑦⑧: Product Code…**Refer to *MARK SPECIFICATION TABLE***
⑨⑩: Lot Number … Alphanumeric Serial Number

MARK SPECIFICATION TABLE (TO-252-5-P2)

RP108Jxx1B

Product Name	①②③④⑤⑥⑦⑧	V_{SET}
RP108J081B	**E 1 J 0 8 1 B**	0.8V
RP108J121B	**E 1 J 1 2 1 B**	1.2V
RP108J151B	**E 1 J 1 5 1 B**	1.5V
RP108J181B	**E 1 J 1 8 1 B**	1.8V
RP108J251B	**E 1 J 2 5 1 B**	2.5V
RP108J301B	**E 1 J 3 0 1 B**	3.0V
RP108J331B	**E 1 J 3 3 1 B**	3.3V

RP108Jxx1D

Product Name	①②③④⑤⑥⑦⑧	V_{SET}
RP108J081D	**E 1 J 0 8 1 D**	0.8V
RP108J121D	**E 1 J 1 2 1 D**	1.2V
RP108J151D	**E 1 J 1 5 1 D**	1.5V
RP108J181D	**E 1 J 1 8 1 D**	1.8V
RP108J251D	**E 1 J 2 5 1 D**	2.5V
RP108J301D	**E 1 J 3 0 1 D**	3.0V
RP108J331D	**E 1 J 3 3 1 D**	3.3V

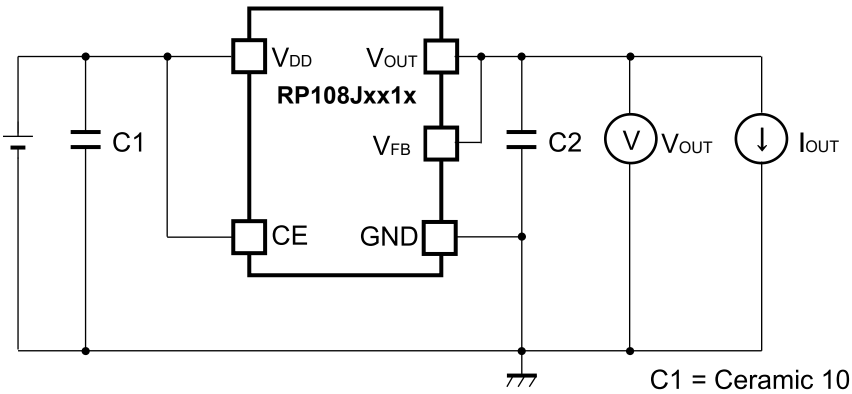
RP108Jxx1E

Product Name	①②③④⑤⑥⑦⑧	V_{SET}
RP108J081E	**E 1 J 0 8 1 E**	0.8V
RP108J121E	**E 1 J 1 2 1 E**	1.2V
RP108J151E	**E 1 J 1 5 1 E**	1.5V
RP108J181E	**E 1 J 1 8 1 E**	1.8V
RP108J251E	**E 1 J 2 5 1 E**	2.5V
RP108J301E	**E 1 J 3 0 1 E**	3.0V
RP108J331E	**E 1 J 3 3 1 E**	3.3V

RP108Jxx1F

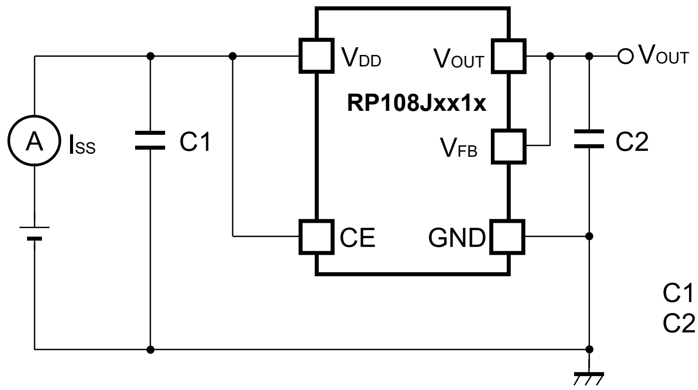
Product Name	①②③④⑤⑥⑦⑧	V_{SET}
RP108J081F	**E 1 J 0 8 1 F**	0.8V
RP108J121F	**E 1 J 1 2 1 F**	1.2V
RP108J151F	**E 1 J 1 5 1 F**	1.5V
RP108J181F	**E 1 J 1 8 1 F**	1.8V
RP108J251F	**E 1 J 2 5 1 F**	2.5V
RP108J301F	**E 1 J 3 0 1 F**	3.0V
RP108J331F	**E 1 J 3 3 1 F**	3.3V

TEST CIRCUITS



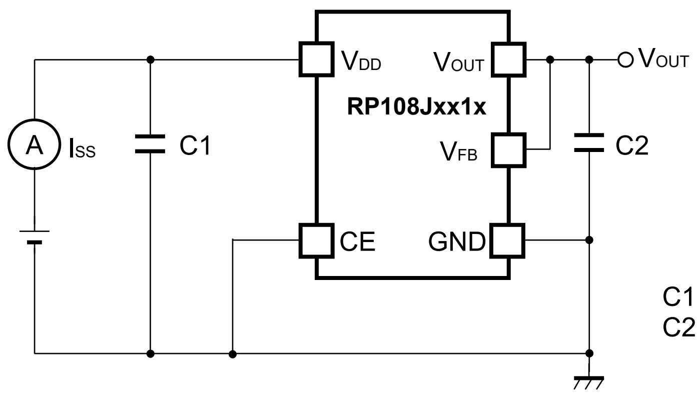
C1 = Ceramic 10 μF
C2 = Ceramic 10 μF

Basic Test Circuit



C1 = Ceramic 10 μF
C2 = Ceramic 10 μF

Test Circuit for Supply Current

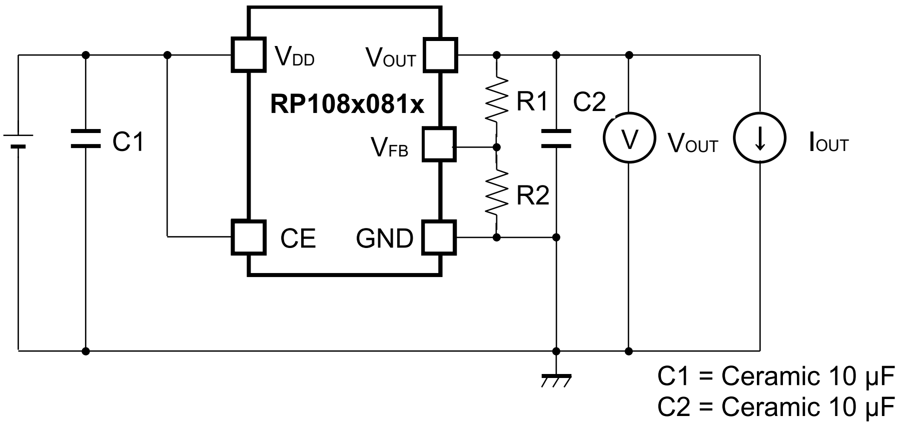


C1 = Ceramic 10 μF
C2 = Ceramic 10 μF

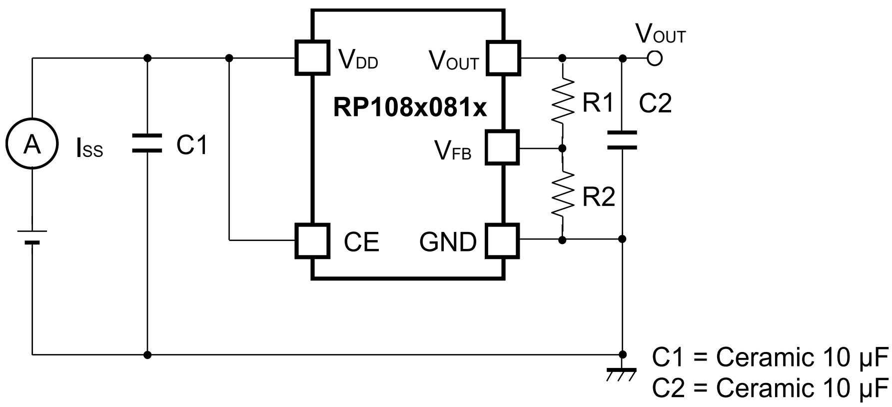
Test Circuit for Standby Current

TEST CIRCUITS for Adjustable Output Voltage Type (RP108J081x)

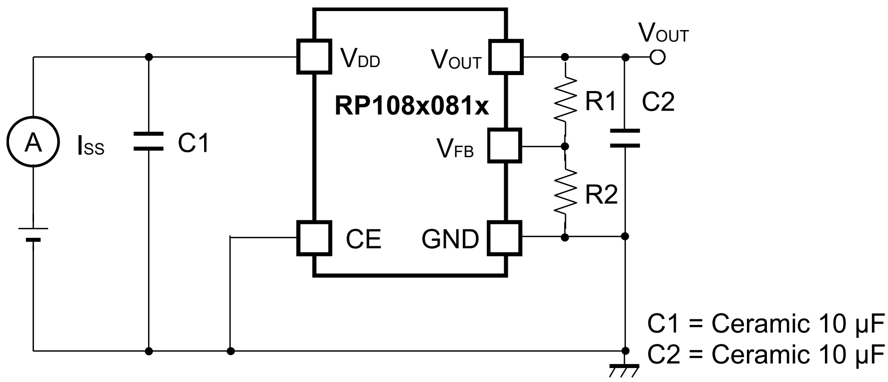
Refer to *Adjustable Output Voltage Setting* when using R1 and R2 as output resistors.



Basic Test Circuit



Test Circuit for Supply Current



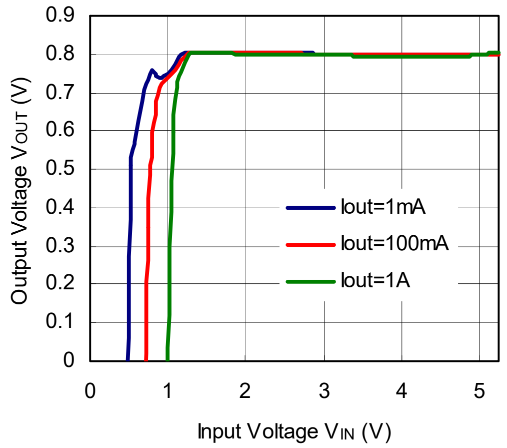
Test Circuit for Standby Current

TYPICAL CHARACTERISTICS

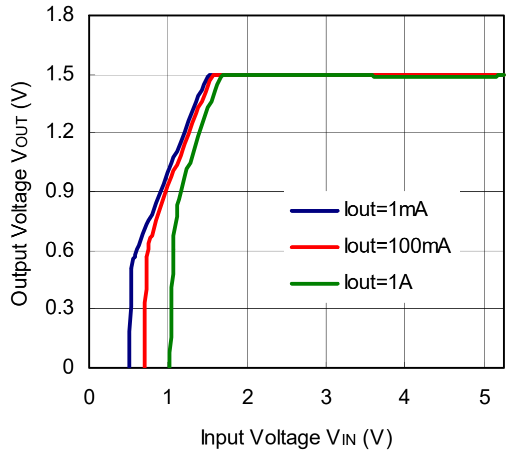
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Input Voltage (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, Ta = 25°C)

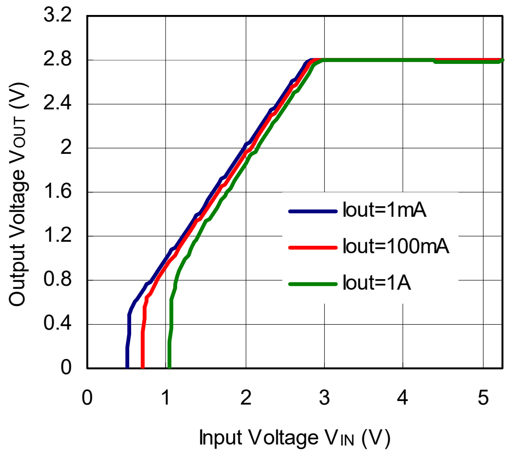
RP108J081x



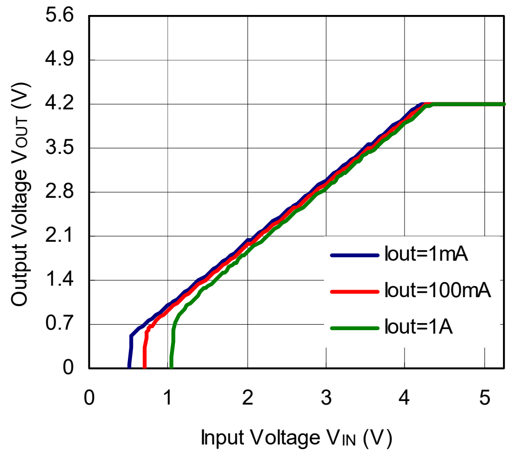
RP108J151x



RP108J281x

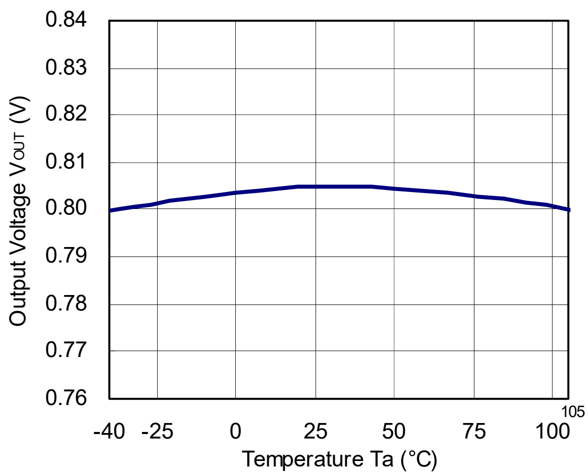


RP108J421x

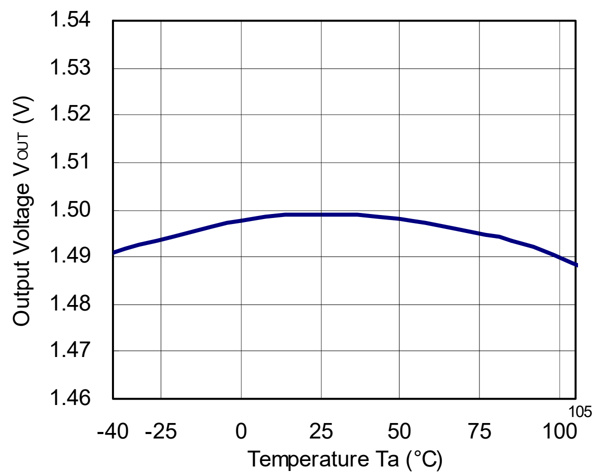


2) Output Voltage vs. Ambient Temperature (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, Ta = −40°C to 105°C)

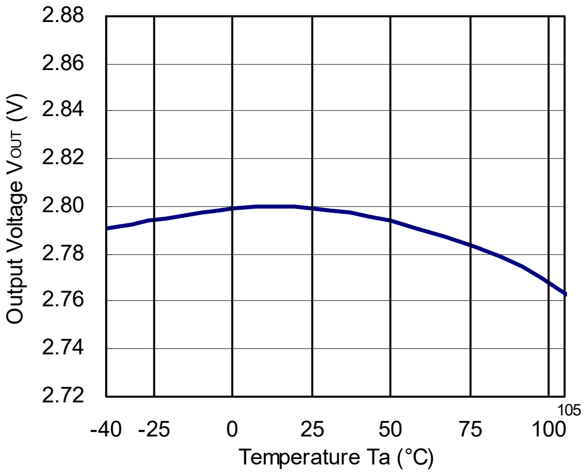
RP108J081x



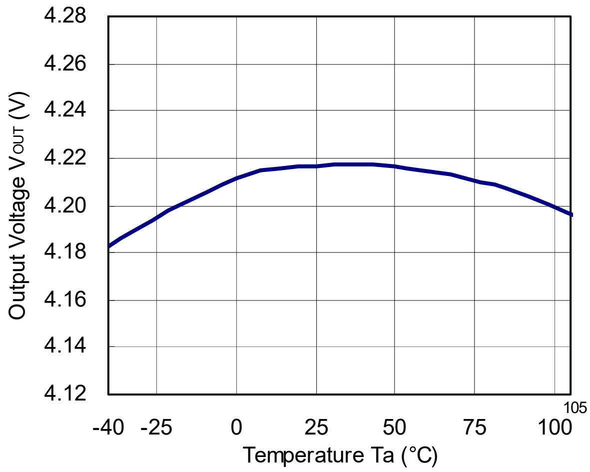
RP108J151x



RP108J281x

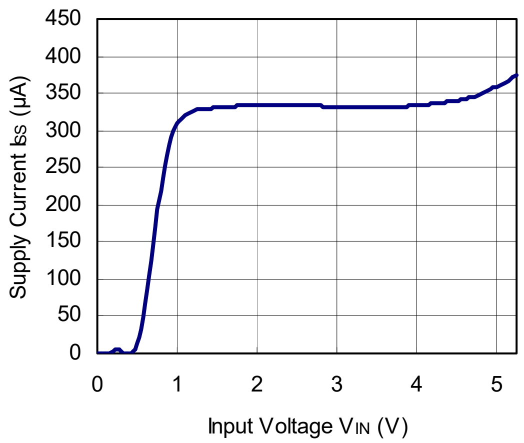


RP108J421x

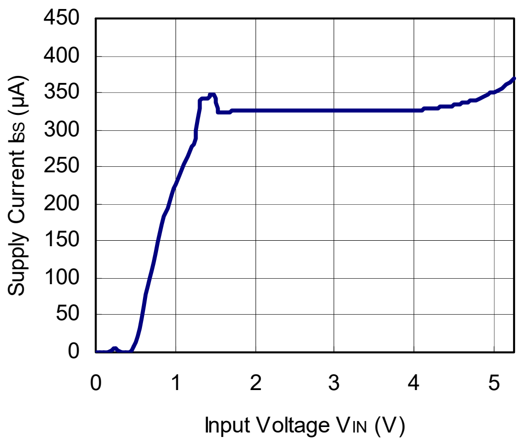


3) Supply Current vs. Input Voltage (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, I_{OUT} = 0 mA, Ta = 25°C)

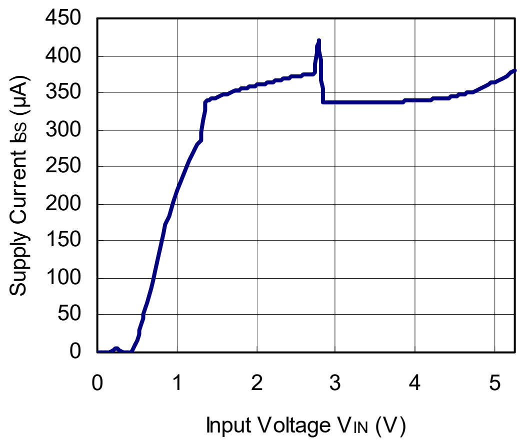
RP108J081x



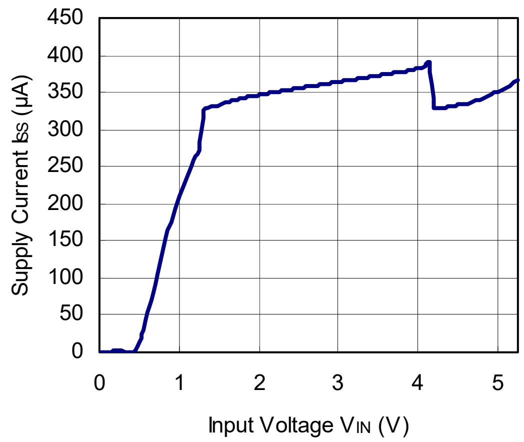
RP108J151x



RP108J281x



RP108J421x

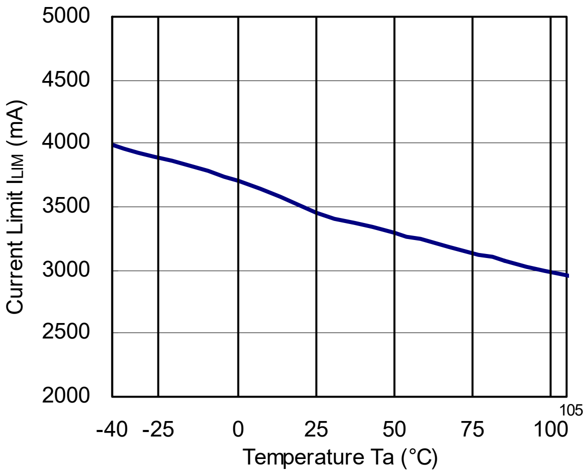


4) Short Current Limit vs. Temperature/Current Limit vs. Temperature

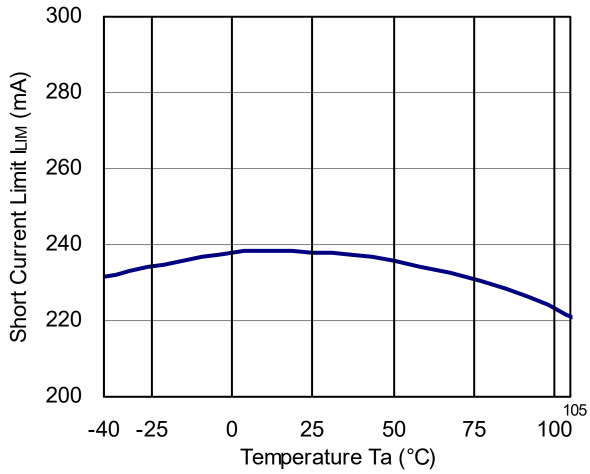
RP108J includes a Fold-back Protection Circuit, while a Fold-back Protection Circuit is operated, Thermal Shutdown Circuit starts to operate. Therefore RP108J is not allowed to test "Output voltage vs. Output Current" on condition that a Thermal Shutdown Circuit is operated to prevent heat generated by itself.

See the following graphs for short current limit and current limit characteristics.

RP108J081x

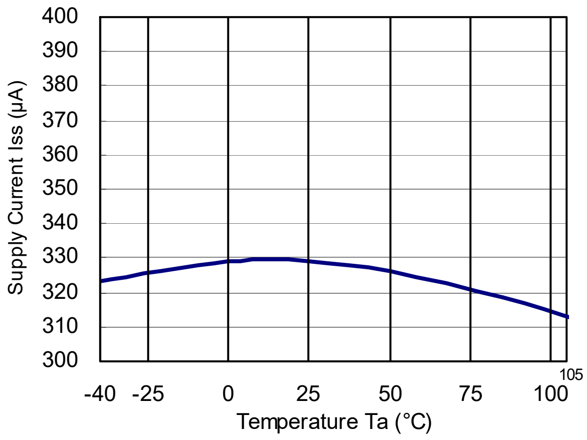


RP108J081x

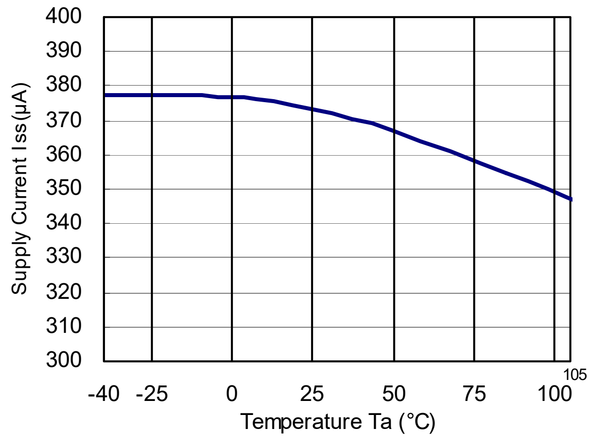


5) Supply Current vs. Ambient Temperature (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, I_{OUT} = 0 mA)

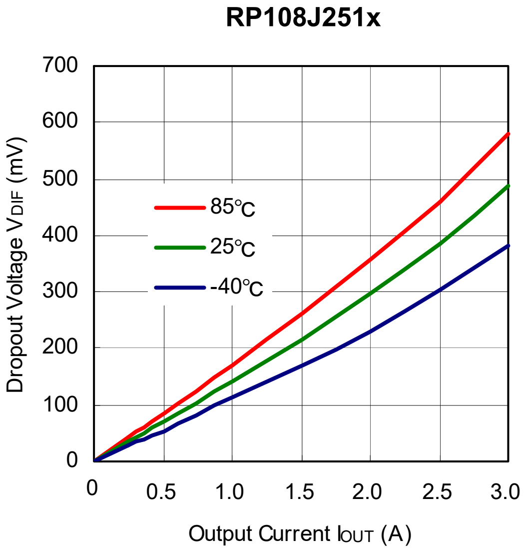
RP108J081x



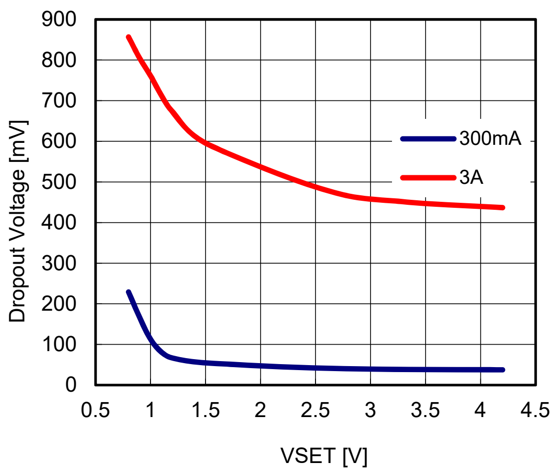
RP108J421x



6) Dropout Voltage vs. Output Current (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF)

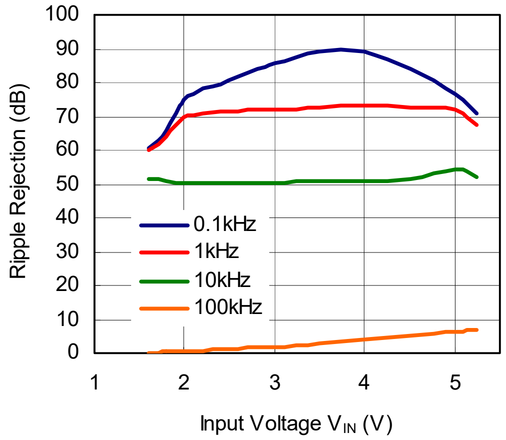


7) Dropout Voltage vs. Set Output Voltage (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, Ta = 25°C)

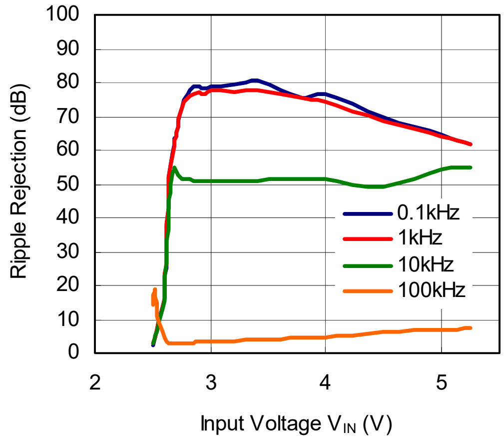


8) Ripple Rejection vs. Input Voltage (C1 = C2 = 10 μF, Ripple = 0.2 Vp-p, I_{OUT} = 100 mA Ta = 25°C)

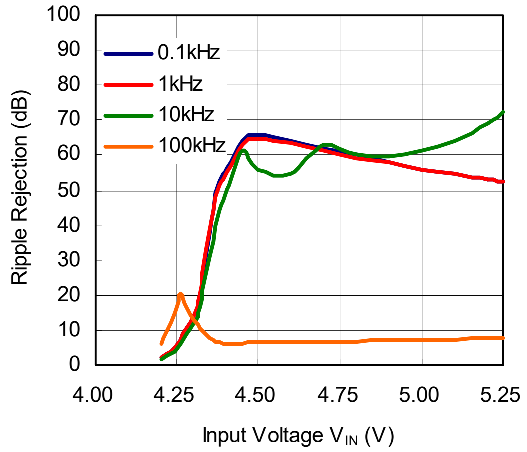
RP108J081x



RP108J251x

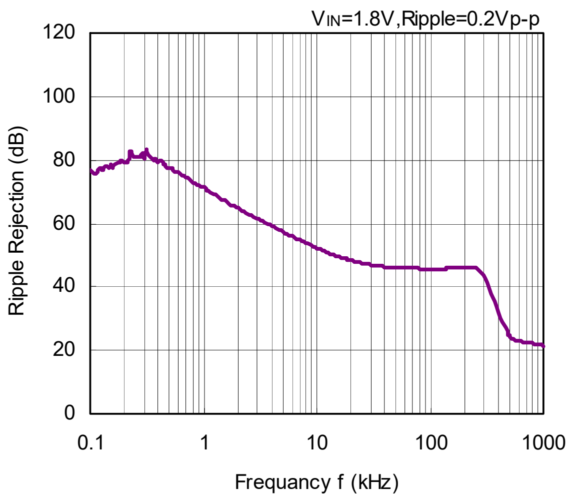


RP108J421x

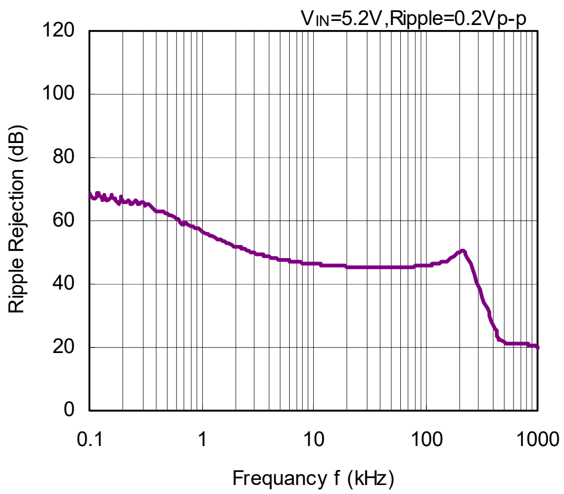


9) Ripple Rejection vs. Frequency (C1 = none, C2 = 10 μF, I_{OUT} = 100 mA, Ta = 25°C)

RP108J081x

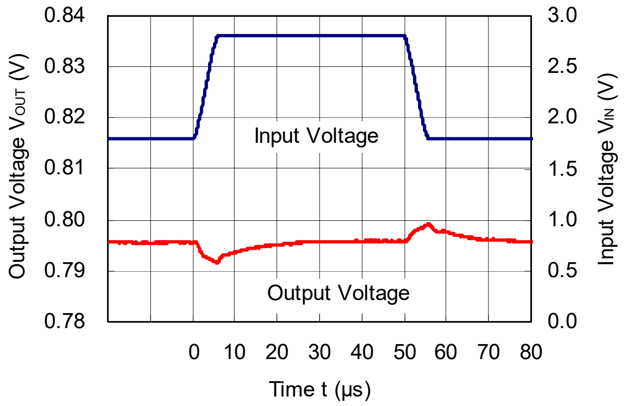


RP108J421x

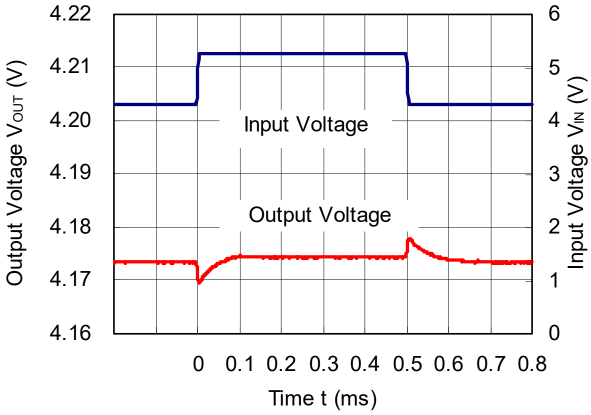


10) Input Transient Response (C1 = none, C2 = 10 μF, I_{OUT} = 30 mA, tr = tf = 5 μs, Ta = 25°C)

RP108J081x

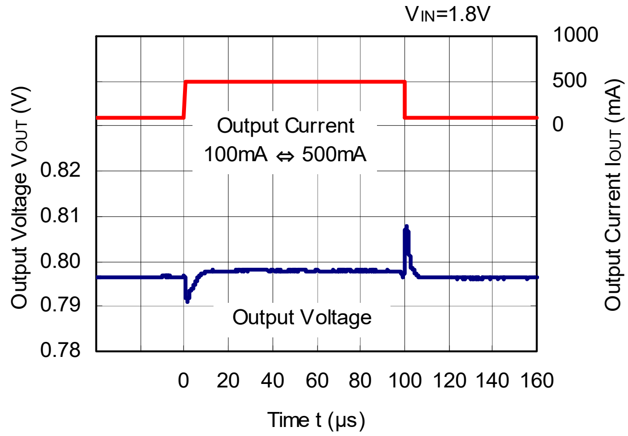


RP108J421x

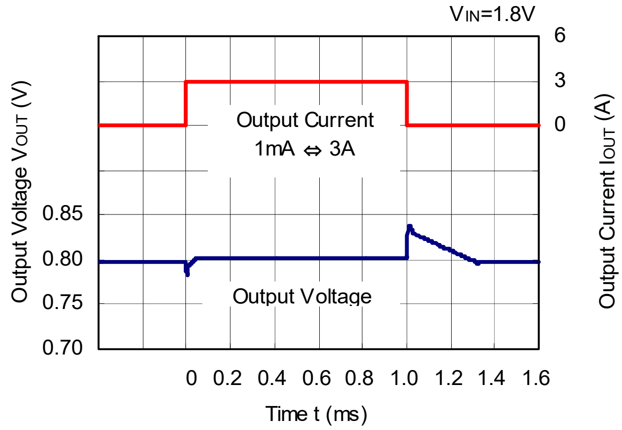


11) Load Transient Response (C1 = C2 = 10μF, tr = tf = 0.5μs, Ta = 25°C)

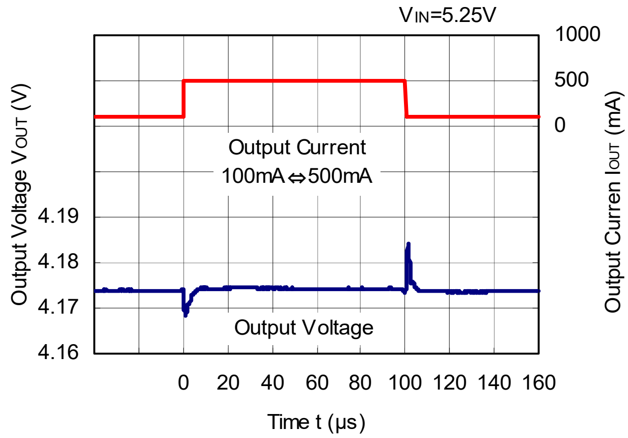
RP108J081x



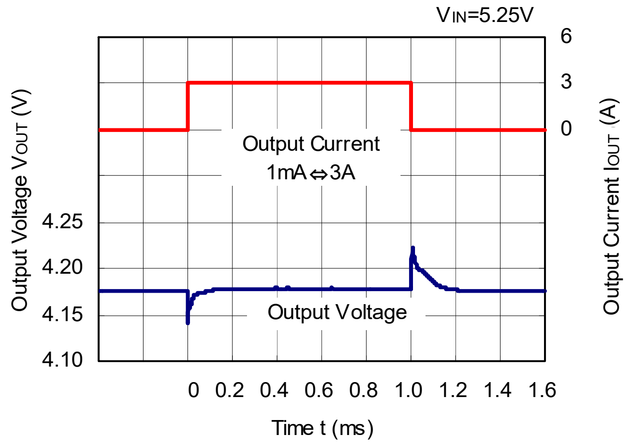
RP108J081x



RP108J421x

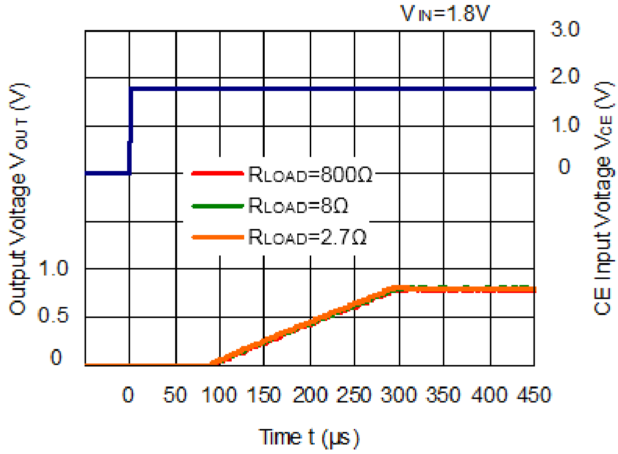


RP108J421x

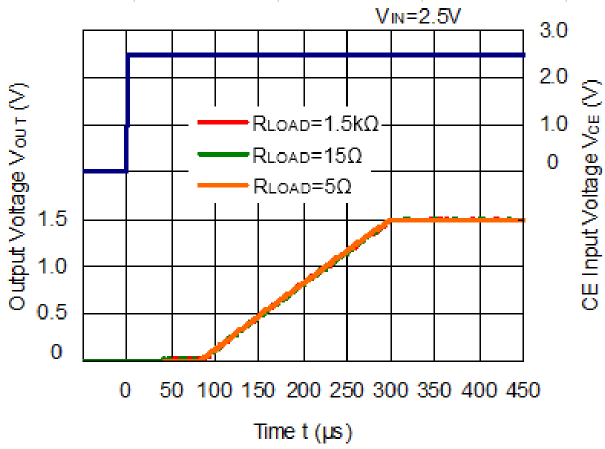


12) Turn on Speed with CE pin (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, Ta = 25°C)

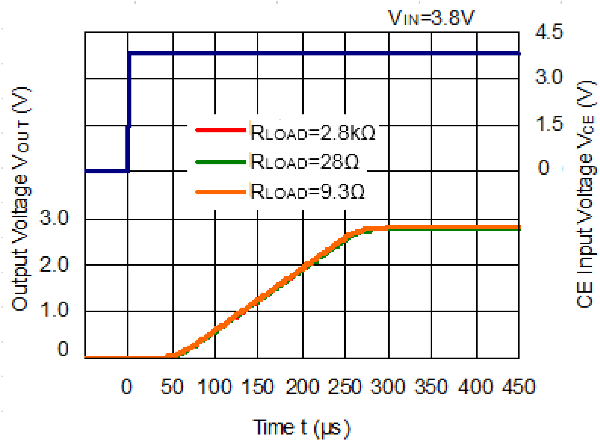
RP108J081B/D



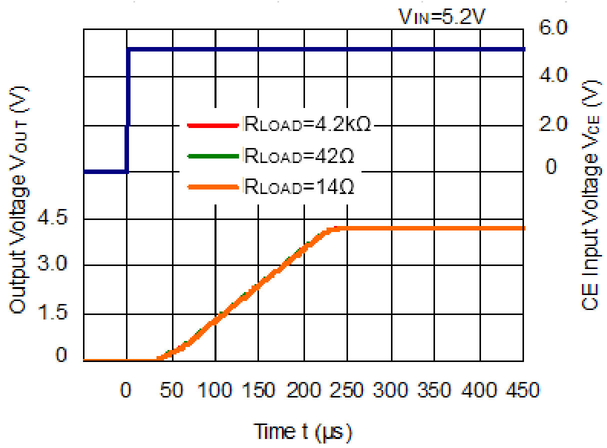
RP108J151B/D



RP108J281B/D

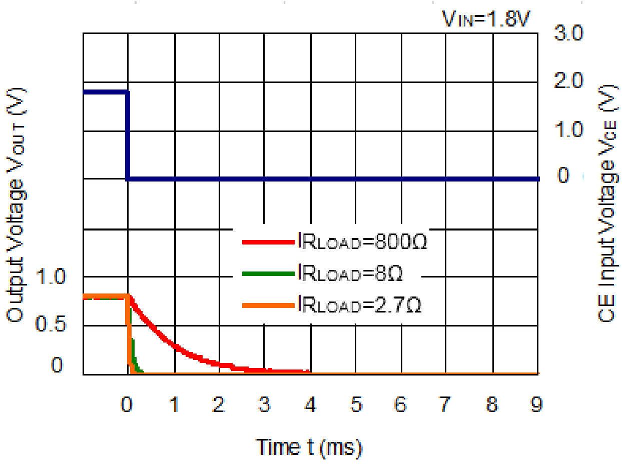


RP108J421B/D

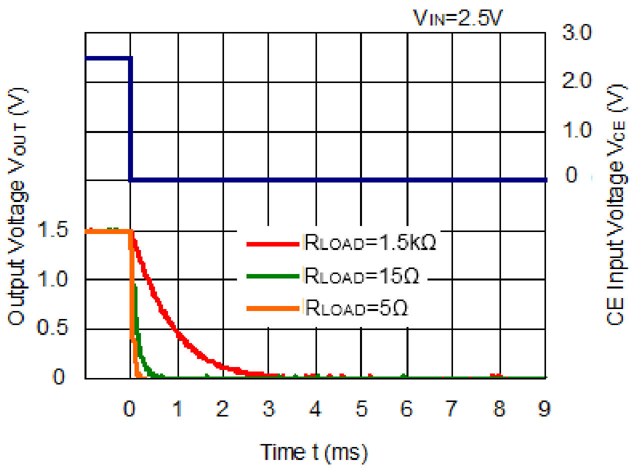


13) Turn off Speed with CE pin (C1 = Ceramic 10 μF, C2 = Ceramic 10 μF, Ta = 25°C)

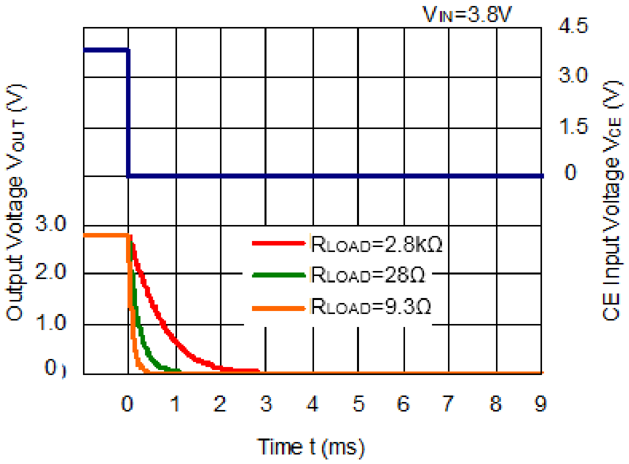
RP108J081D/F



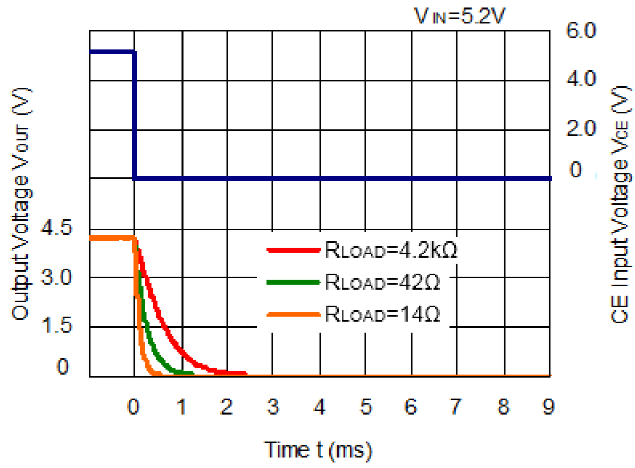
RP108J151D/F



RP108J281D/F

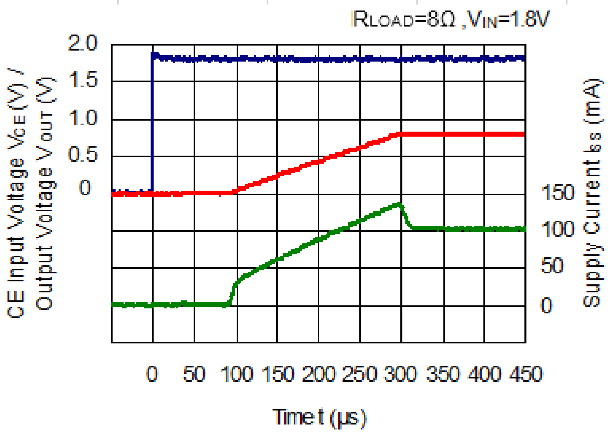


RP108J421D/F

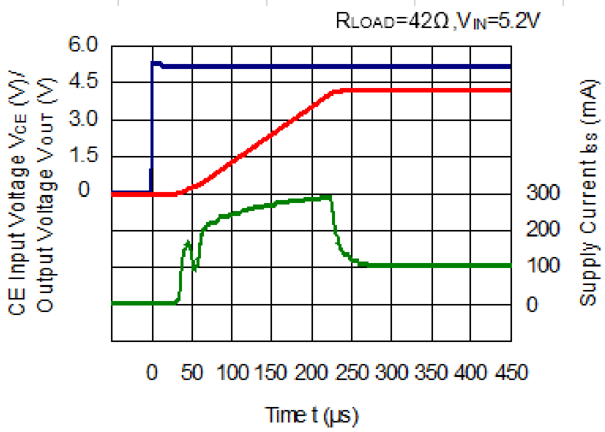


14) Inrush Current

RP108J081B/D



RP108J421B/D



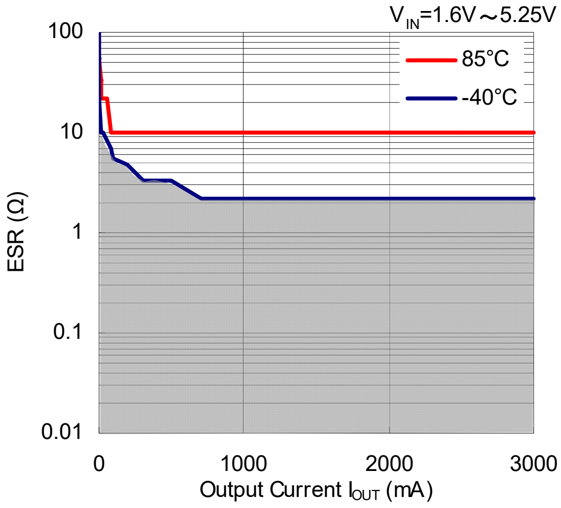
ESR vs. OUTPUT CURRENT

When using this device, 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 40 μV (Avg.) are marked as the hatched area in the graph.

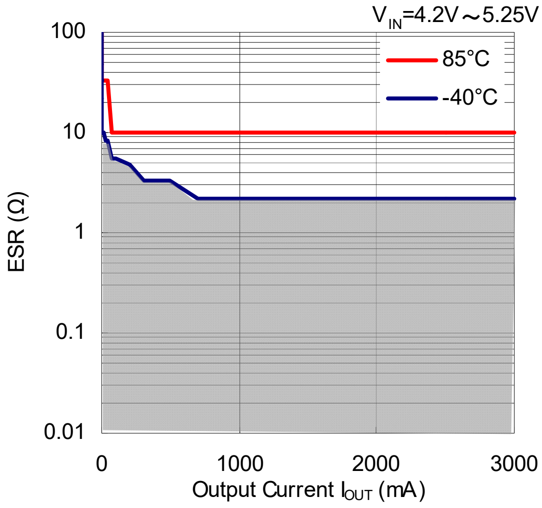
Measurement Conditions

- Frequency Band: 10 Hz to 2 MHz
- Temperature : −40°C to 85°C
- Hatched area : Noise level is under 40 μV
- C1, C2 :10 µF or more

RP108J081x



RP108J421x



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