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## 300 mA LDO REGULATOR

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No.EA-236-220901

### OUTLINE

The RP114x is a CMOS-based voltage regulator IC with high output voltage accuracy, low supply current, low dropout, and high ripple rejection. This IC consists of a voltage reference unit, an error amplifier, resistors for setting output voltage, a short current limit circuit, a chip enable circuit, and so on. The RP114x features a minimum input voltage from 1.4V and the output voltage, which can be set from 0.8V to 3.6V (in 0.1V step). The output voltage of this IC is internally fixed. This IC perform with low dropout voltage due to built-in transistor with low ON resistance. Low supply current and a chip enable function prolong the battery life of each system. The ripple rejection, line transient response and load transient response of the RP114x is excellent, thus this IC is very suitable for the power supply for hand-held communication equipment. Since the packages for this IC are DFN(PLP)1010-4、DFN(PLP)1010-4B、SC-88A、SOT-23-5, therefore high density mounting of the IC on boards is possible.

### FEATURES

- Supply Current..... Typ. 50 $\mu$ A
- Standby Current ..... Typ. 0.1 $\mu$ A
- Input Voltage Range ..... 1.4V to 5.25V
- Output Voltage Range<sup>(1)</sup> ..... 0.8V to 3.6V (0.1V steps)
- Output Voltage Accuracy .....  $\pm 1.0\%$  ( $V_{SET} > 2.0V$ ,  $T_a = 25^\circ C$ )
- Temperature-Drift Coefficient of Output Voltage..... Typ.  $\pm 80$ ppm/ $^\circ C$
- Dropout Voltage..... Typ. 0.25V ( $I_{OUT} = 300mA$ ,  $V_{SET} = 2.8V$ )
- Ripple Rejection ..... Typ. 75dB ( $f=1kHz$ )
- Line Regulation..... Typ. 0.02%/V
- Packages ..... DFN(PLP)1010-4、DFN(PLP)1010-4B、SC-88A、SOT-23-5
- Built-in Fold Back Protection Circuit..... Typ. 60mA (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC ..... 1.0 $\mu$ F or more

### APPLICATIONS

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

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<sup>(1)</sup> For other voltages, please refer to *Product-specific Electrical Characteristics*.

## SELECTION GUIDE

The set output voltage, the auto discharge function<sup>(1)</sup>, and the package type for the ICs are user-selectable options.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP114Kxx1*(y)-TR	DFN(PLP)1010-4	10,000 pcs	Yes	Yes
RP114Kxx1*(y)-TRB	DFN(PLP)1010-4B	10,000 pcs	Yes	Yes
RP114Qxx2*(y)-TR-FE	SC-88A	3,000 pcs	Yes	Yes
RP114Nxx1*(y)-TR-FE	SOT-23-5	3,000 pcs	Yes	Yes

xx: Specify the set output voltage within the range of 0.8 V (08) to 3.6 V (36) in 0.1 V step.

(y): If the output voltage includes the 3rd digit, indicate the digit of 0.01V.

Ex. If the output voltage is 1.25V, RP114K121\*5-TR

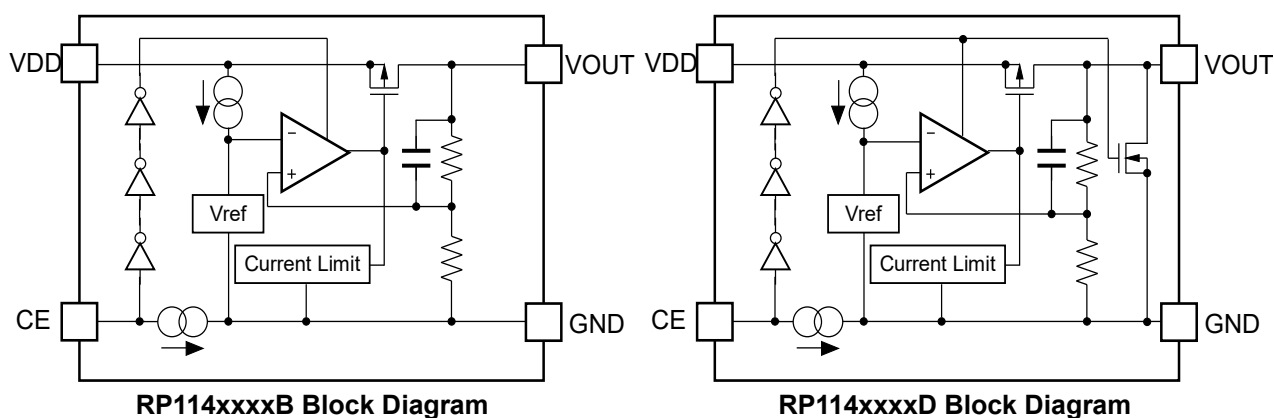
If the output voltage is 1.85V, RP114K181\*5-TR

\*: Specify a combination of the CE pin polarity and the auto-discharge function.

(B) "H" Active, without Auto-Discharge function

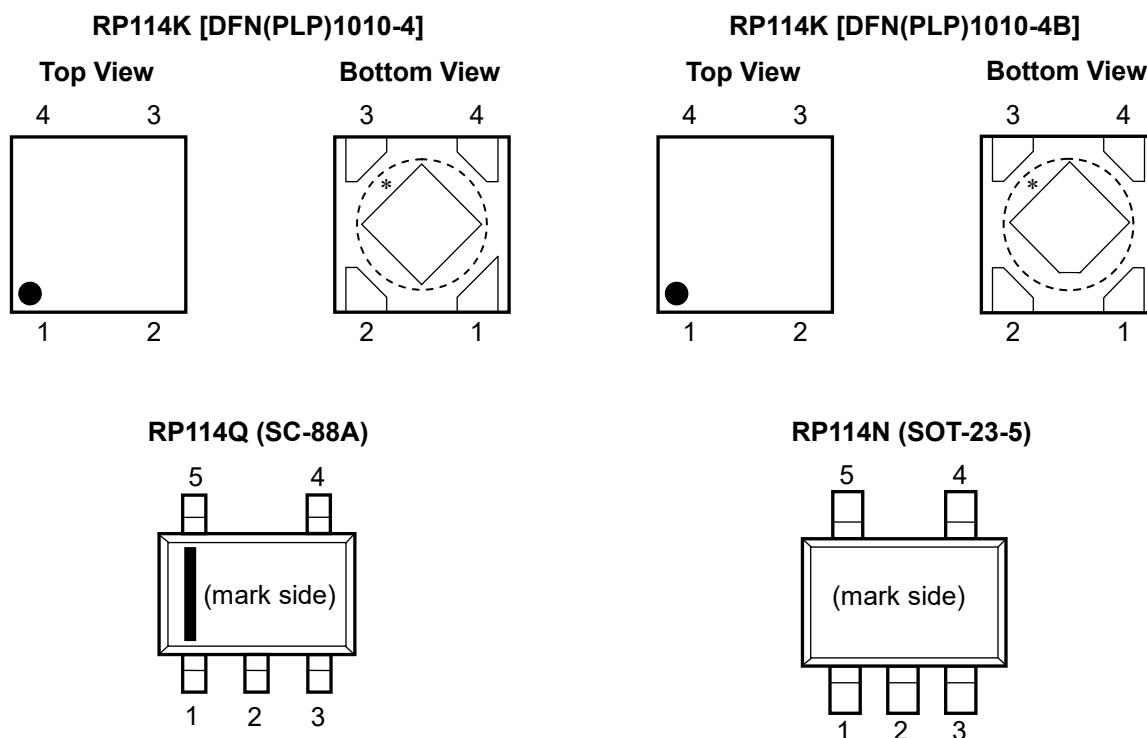
(D) "H" Active, with Auto-Discharge function

## BLOCK DIAGRAMS



<sup>(1)</sup> Auto-Discharge function quickly lowers the output voltage to 0V by releasing the electrical charge in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.

## PIN DESCRIPTIONS



### RP114K Pin Description [DFN(PLP)1010-4 / DFN(PLP)1010-4B]

Pin No	Symbol	Pin Description
1	VOUT	Output Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin ("H" Active)
4	VDD	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.

### RP114Q Pin Description (SC-88A)

Pin No	Symbol	Description
1	CE	Chip Enable Pin ("H" Active)
2	NC	No Connection
3	GND	Ground Pin
4	VOUT	Output Pin
5	VDD	Input Pin

**RP114N Pin Description (SOT-23-5)**

<b>Pin No</b>	<b>Symbol</b>	<b>Description</b>
1	VDD	Input Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin ("H" Active)
4	NC	No Connection
5	VOUT	Output Pin

## ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit	
V <sub>IN</sub>	Input Voltage	6.0	V	
V <sub>CE</sub>	Input Voltage (CE Pin)	6.0	V	
V <sub>OUT</sub>	Output Voltage	-0.3 to V <sub>IN</sub> +0.3	V	
I <sub>OUT</sub>	Output Current	400	mA	
P <sub>D</sub>	Power Dissipation <sup>(1)</sup>	DFN(PLP)1010-4, JEDEC STD. 51	800	mW
		DFN(PLP)1010-4B, JEDEC STD. 51	800	
		SC-88A, Our Evaluation Board	380	
		SOT-23-5, JEDEC STD. 51	660	
T <sub>J</sub>	Junction Temperature Range	-40 to 125	°C	
T <sub>stg</sub>	Storage Temperature Range	-55 to 125	°C	

### 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 are not assured.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V <sub>IN</sub>	Input Voltage	1.4 to 5.25 <sup>(2)</sup>	V
T <sub>a</sub>	Operating Temperature Range	-40 to 85	°C

### 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 ratings by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

<sup>(1)</sup> Refer to *POWER DISSIPATION* for detailed information.

<sup>(2)</sup> If the input voltage exceeds the maximum value of 5.25 V for some reasons, the operational accumulated time becomes up to 500 hours at 5.5V.

## ELECTRICAL CHARACTERISTICS

$V_{IN} = V_{SET}^{(1)} + 1.0 \text{ V}$  ( $V_{SET} > 1.5 \text{ V}$ ),  $V_{IN} = 2.5 \text{ V}$  ( $V_{SET} \leq 1.5 \text{ V}$ ),  $I_{OUT} = 1 \text{ mA}$ ,  $C_{IN} = C_{OUT} = 1.0 \mu\text{F}$ , unless otherwise noted.

The specifications in   are guaranteed by design engineering at  $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ .

### RP114xxxxB/D Electrical Characteristics

( $T_a = 25^\circ\text{C}$ )

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit		
$V_{OUT}$	Output Voltage	$T_a = 25^\circ\text{C}$	$V_{SET} > 2.0 \text{ V}$	$\times 0.99$		$\times 1.01$	V	
			$V_{SET} \leq 2.0 \text{ V}$	-20		+20	mV	
		$-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	$V_{SET} > 2.0 \text{ V}$	<span style="border: 1px solid black; padding: 0 2px;"><math>\times 0.97</math></span>			<span style="border: 1px solid black; padding: 0 2px;"><math>\times 1.03</math></span>	V
			$V_{SET} \leq 2.0 \text{ V}$	<span style="border: 1px solid black; padding: 0 2px;">-60</span>			<span style="border: 1px solid black; padding: 0 2px;">+60</span>	mV
$I_{OUT}$	Output Current		<span style="border: 1px solid black; padding: 0 2px;">300</span>			mA		
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	$1 \text{ mA} \leq I_{OUT} \leq 300 \text{ mA}$		15	<span style="border: 1px solid black; padding: 0 2px;">40</span>	mV		
$V_{DIF}$	Dropout Voltage	Please refer to <i>Product-specific Electrical Characteristics</i> attached.						
$I_{SS}$	Supply Current	$I_{OUT} = 0 \text{ mA}$		50	<span style="border: 1px solid black; padding: 0 2px;">75</span>	$\mu\text{A}$		
$I_{standby}$	Standby Current	$V_{CE} = 0 \text{ V}$		0.1	1.0	$\mu\text{A}$		
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$V_{SET} + 0.5 \text{ V} \leq V_{IN} \leq 5.25 \text{ V}$ ( $V_{IN} \geq 1.4 \text{ V}$ )		0.02	<span style="border: 1px solid black; padding: 0 2px;">0.10</span>	%/V		
$R_R$	Ripple Rejection	$f = 1 \text{ kHz}$ , Ripple $0.2 \text{ V}_{p-p}$ , $V_{IN} = V_{SET} + 1 \text{ V}$ , $I_{OUT} = 30 \text{ mA}$ (When $V_{SET} \leq 2.0 \text{ V}$ , $V_{IN} = 3.0 \text{ V}$ )		75		dB		
$\Delta V_{OUT}/\Delta T_a$	Output Voltage Temperature Coefficient	$-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$		$\pm 80$		ppm/ $^\circ\text{C}$		
$I_{SC}$	Short Current Limit	$V_{OUT} = 0 \text{ V}$		60		mA		
$I_{PD}$	CE Pull-down Current			0.3	<span style="border: 1px solid black; padding: 0 2px;">0.6</span>	$\mu\text{A}$		
$V_{CEH}$	CE Input Voltage "H"		<span style="border: 1px solid black; padding: 0 2px;">1.0</span>			V		
$V_{CEL}$	CE Input Voltage "L"				<span style="border: 1px solid black; padding: 0 2px;">0.4</span>	V		
$e_n$	Output Noise	$\text{BW} = 10 \text{ Hz to } 100 \text{ kHz}$ , $I_{OUT} = 30 \text{ mA}$		75		$\mu\text{V}_{rms}$		
$R_{LOW}$	Low Output Nch. On Resistance (RP114xxxxD Only)	$V_{IN} = 4.0 \text{ V}$ , $V_{CE} = 0 \text{ V}$		50		$\Omega$		

All test items listed under Electrical Characteristics are done under the pulse load condition ( $T_j \approx T_a = 25^\circ\text{C}$ ) except for Output Noise, Ripple Rejection, and Output Voltage Temperature Coefficient.

<sup>(1)</sup>  $V_{SET}$ : Set Output Voltage

The specifications in  are guaranteed by design engineering at  $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$ .

**Dropout Voltage by Set Output Voltage**

(Ta=25°C)

Set Output Voltage $V_{\text{SET}}$ (V)	Dropout Voltage $V_{\text{DIF}}$ (V)		
	Condition	Typ.	Max.
$V_{\text{SET}}=0.8$	$I_{\text{OUT}}=300\text{mA}$	0.560	<input type="text" value="0.720"/>
$V_{\text{SET}}=0.9$		0.510	<input type="text" value="0.650"/>
$1.0 \leq V_{\text{SET}} < 1.2$		0.460	<input type="text" value="0.590"/>
$1.2 \leq V_{\text{SET}} < 1.4$		0.390	<input type="text" value="0.500"/>
$1.4 \leq V_{\text{SET}} < 1.7$		0.350	<input type="text" value="0.440"/>
$1.7 \leq V_{\text{SET}} < 2.1$		0.300	<input type="text" value="0.390"/>
$2.1 \leq V_{\text{SET}} < 2.5$		0.260	<input type="text" value="0.340"/>
$2.5 \leq V_{\text{SET}} < 3.0$		0.250	<input type="text" value="0.300"/>
$3.0 \leq V_{\text{SET}} \leq 3.6$		0.220	<input type="text" value="0.290"/>

**Product-specific Electrical Characteristics**

The specifications in   are guaranteed by design engineering at  $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$ .

Product Name	V <sub>OUT</sub> [V] (Ta = 25°C)			V <sub>OUT</sub> [V] (-40°C ≤ Ta ≤ 85°C)			V <sub>DIF</sub> [V]	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
RP114x081x	0.780	0.800	0.820	<span style="border: 1px solid black; padding: 0 2px;">0.740</span>	0.800	<span style="border: 1px solid black; padding: 0 2px;">0.860</span>	0.560	<span style="border: 1px solid black; padding: 0 2px;">0.720</span>
RP114x091x	0.880	0.900	0.920	<span style="border: 1px solid black; padding: 0 2px;">0.840</span>	0.900	<span style="border: 1px solid black; padding: 0 2px;">0.960</span>	0.510	<span style="border: 1px solid black; padding: 0 2px;">0.650</span>
RP114x101x	0.980	1.000	1.020	<span style="border: 1px solid black; padding: 0 2px;">0.940</span>	1.000	<span style="border: 1px solid black; padding: 0 2px;">1.060</span>	0.460	<span style="border: 1px solid black; padding: 0 2px;">0.590</span>
RP114x101x5	1.030	1.050	1.070	<span style="border: 1px solid black; padding: 0 2px;">0.990</span>	1.050	<span style="border: 1px solid black; padding: 0 2px;">1.110</span>		
RP114x111x	1.080	1.100	1.120	<span style="border: 1px solid black; padding: 0 2px;">1.040</span>	1.100	<span style="border: 1px solid black; padding: 0 2px;">1.160</span>		
RP114x111x5	1.130	1.150	1.170	<span style="border: 1px solid black; padding: 0 2px;">1.090</span>	1.150	<span style="border: 1px solid black; padding: 0 2px;">1.210</span>		
RP114x121x	1.180	1.200	1.220	<span style="border: 1px solid black; padding: 0 2px;">1.140</span>	1.200	<span style="border: 1px solid black; padding: 0 2px;">1.260</span>		
RP114x121x5	1.230	1.250	1.270	<span style="border: 1px solid black; padding: 0 2px;">1.190</span>	1.250	<span style="border: 1px solid black; padding: 0 2px;">1.310</span>	0.390	<span style="border: 1px solid black; padding: 0 2px;">0.500</span>
RP114x131x	1.280	1.300	1.320	<span style="border: 1px solid black; padding: 0 2px;">1.240</span>	1.300	<span style="border: 1px solid black; padding: 0 2px;">1.360</span>		
RP114x131x5	1.330	1.350	1.370	<span style="border: 1px solid black; padding: 0 2px;">1.290</span>	1.350	<span style="border: 1px solid black; padding: 0 2px;">1.410</span>		
RP114x141x	1.380	1.400	1.420	<span style="border: 1px solid black; padding: 0 2px;">1.340</span>	1.400	<span style="border: 1px solid black; padding: 0 2px;">1.460</span>	0.350	<span style="border: 1px solid black; padding: 0 2px;">0.440</span>
RP114x151x	1.480	1.500	1.520	<span style="border: 1px solid black; padding: 0 2px;">1.440</span>	1.500	<span style="border: 1px solid black; padding: 0 2px;">1.560</span>		
RP114x161x	1.580	1.600	1.620	<span style="border: 1px solid black; padding: 0 2px;">1.540</span>	1.600	<span style="border: 1px solid black; padding: 0 2px;">1.660</span>	0.300	<span style="border: 1px solid black; padding: 0 2px;">0.390</span>
RP114x171x	1.680	1.700	1.720	<span style="border: 1px solid black; padding: 0 2px;">1.640</span>	1.700	<span style="border: 1px solid black; padding: 0 2px;">1.760</span>		
RP114x171x5	1.730	1.750	1.770	<span style="border: 1px solid black; padding: 0 2px;">1.690</span>	1.750	<span style="border: 1px solid black; padding: 0 2px;">1.810</span>		
RP114x181x	1.780	1.800	1.820	<span style="border: 1px solid black; padding: 0 2px;">1.740</span>	1.800	<span style="border: 1px solid black; padding: 0 2px;">1.860</span>		
RP114x181x5	1.830	1.850	1.870	<span style="border: 1px solid black; padding: 0 2px;">1.790</span>	1.850	<span style="border: 1px solid black; padding: 0 2px;">1.910</span>		
RP114x191x	1.880	1.900	1.920	<span style="border: 1px solid black; padding: 0 2px;">1.840</span>	1.900	<span style="border: 1px solid black; padding: 0 2px;">1.960</span>	0.260	<span style="border: 1px solid black; padding: 0 2px;">0.340</span>
RP114x201x	1.980	2.000	2.020	<span style="border: 1px solid black; padding: 0 2px;">1.940</span>	2.000	<span style="border: 1px solid black; padding: 0 2px;">2.060</span>		
RP114x211x	2.079	2.100	2.121	<span style="border: 1px solid black; padding: 0 2px;">2.037</span>	2.100	<span style="border: 1px solid black; padding: 0 2px;">2.163</span>		
RP114x221x	2.178	2.200	2.222	<span style="border: 1px solid black; padding: 0 2px;">2.134</span>	2.200	<span style="border: 1px solid black; padding: 0 2px;">2.266</span>	0.250	<span style="border: 1px solid black; padding: 0 2px;">0.300</span>
RP114x231x	2.277	2.300	2.323	<span style="border: 1px solid black; padding: 0 2px;">2.231</span>	2.300	<span style="border: 1px solid black; padding: 0 2px;">2.369</span>		
RP114x241x	2.376	2.400	2.424	<span style="border: 1px solid black; padding: 0 2px;">2.328</span>	2.400	<span style="border: 1px solid black; padding: 0 2px;">2.472</span>		
RP114x251x	2.475	2.500	2.525	<span style="border: 1px solid black; padding: 0 2px;">2.425</span>	2.500	<span style="border: 1px solid black; padding: 0 2px;">2.575</span>		
RP114x261x	2.574	2.600	2.626	<span style="border: 1px solid black; padding: 0 2px;">2.522</span>	2.600	<span style="border: 1px solid black; padding: 0 2px;">2.678</span>		
RP114x271x	2.673	2.700	2.727	<span style="border: 1px solid black; padding: 0 2px;">2.619</span>	2.700	<span style="border: 1px solid black; padding: 0 2px;">2.781</span>	0.220	<span style="border: 1px solid black; padding: 0 2px;">0.290</span>
RP114x281x	2.772	2.800	2.828	<span style="border: 1px solid black; padding: 0 2px;">2.716</span>	2.800	<span style="border: 1px solid black; padding: 0 2px;">2.884</span>		
RP114x281x5	2.822	2.850	2.879	<span style="border: 1px solid black; padding: 0 2px;">2.765</span>	2.850	<span style="border: 1px solid black; padding: 0 2px;">2.936</span>		
RP114x291x	2.871	2.900	2.929	<span style="border: 1px solid black; padding: 0 2px;">2.813</span>	2.900	<span style="border: 1px solid black; padding: 0 2px;">2.987</span>	0.220	<span style="border: 1px solid black; padding: 0 2px;">0.290</span>
RP114x301x	2.970	3.000	3.030	<span style="border: 1px solid black; padding: 0 2px;">2.910</span>	3.000	<span style="border: 1px solid black; padding: 0 2px;">3.090</span>		
RP114x311x	3.069	3.100	3.131	<span style="border: 1px solid black; padding: 0 2px;">3.007</span>	3.100	<span style="border: 1px solid black; padding: 0 2px;">3.193</span>		
RP114x321x	3.168	3.200	3.232	<span style="border: 1px solid black; padding: 0 2px;">3.104</span>	3.200	<span style="border: 1px solid black; padding: 0 2px;">3.296</span>		
RP114x331x	3.267	3.300	3.333	<span style="border: 1px solid black; padding: 0 2px;">3.201</span>	3.300	<span style="border: 1px solid black; padding: 0 2px;">3.399</span>		
RP114x341x	3.366	3.400	3.434	<span style="border: 1px solid black; padding: 0 2px;">3.298</span>	3.400	<span style="border: 1px solid black; padding: 0 2px;">3.502</span>		
RP114x341x5	3.416	3.450	3.485	<span style="border: 1px solid black; padding: 0 2px;">3.347</span>	3.450	<span style="border: 1px solid black; padding: 0 2px;">3.554</span>		
RP114x351x	3.465	3.500	3.535	<span style="border: 1px solid black; padding: 0 2px;">3.395</span>	3.500	<span style="border: 1px solid black; padding: 0 2px;">3.605</span>		
RP114x361x	3.564	3.600	3.636	<span style="border: 1px solid black; padding: 0 2px;">3.492</span>	3.600	<span style="border: 1px solid black; padding: 0 2px;">3.708</span>		



TEST CIRCUITS

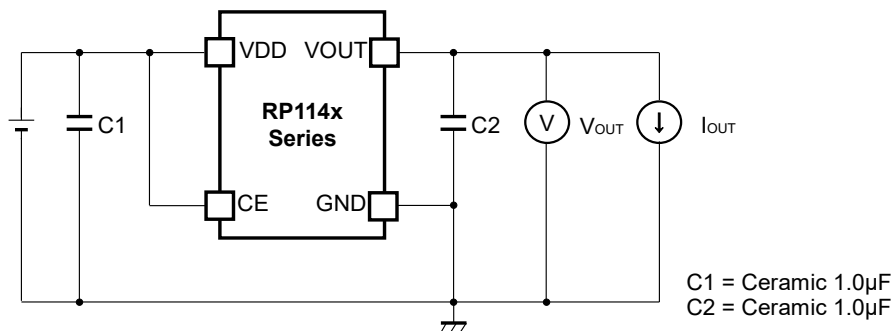


Figure 1. Basic Test Circuit

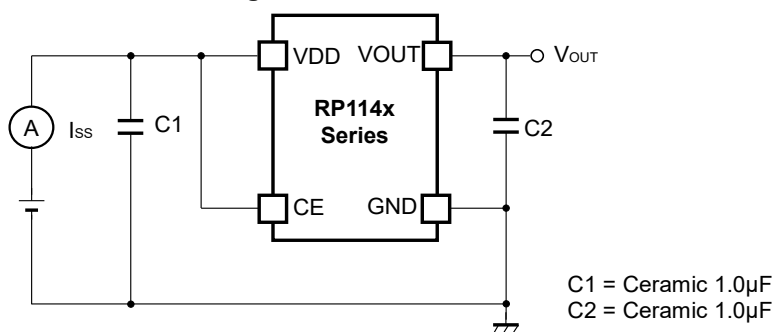


Figure 2. Test Circuit for Supply Current

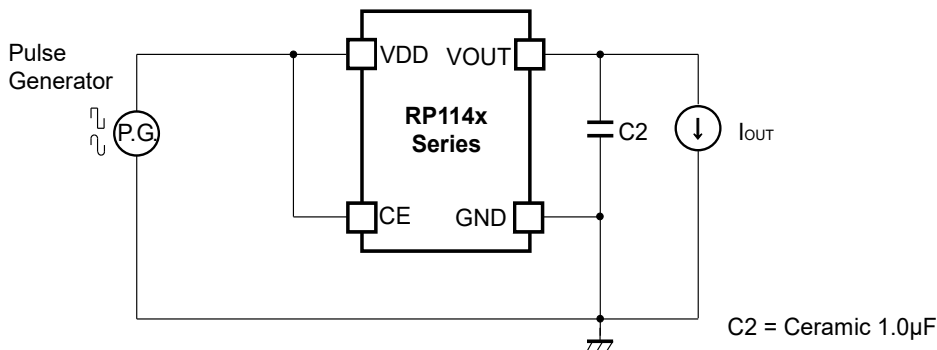


Figure 3. Test Circuit for Ripple Rejection

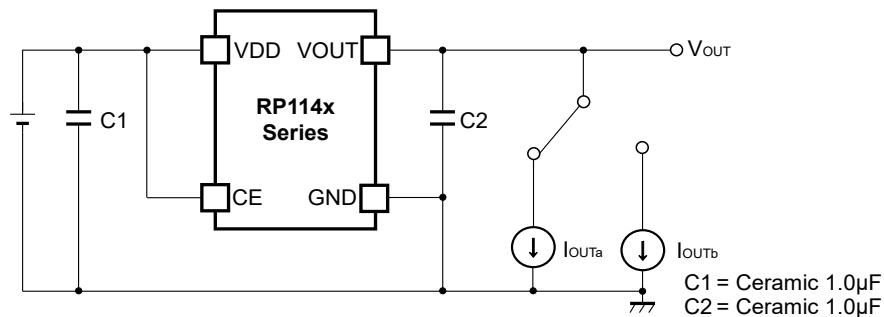


Figure 4. Test Circuit for Load Transient Response

## TECHNICAL NOTES ON EXTERNAL COMPONENTS

When using these ICs, consider the following points:

### Phase Compensation

In this IC, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use a capacitor C2 with 1.0 $\mu$ F or more and good ESR (Equivalent Series Resistance).

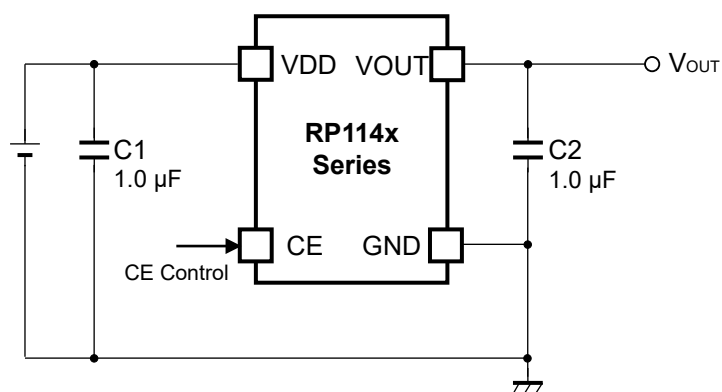
(Note: If additional ceramic capacitors are connected with parallel to the output pin with an output capacitor for phase compensation, the operation might be unstable. Because of this, test this IC with as same external components as ones to be used on the PCB.)

### PCB Layout

Make V<sub>DD</sub> 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 1.0 $\mu$ F or more between V<sub>DD</sub> and GND pins, and as close as possible to the pins.

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

### Typical Application Circuit



### ESR vs. Output Current

When using these ICs, consider the following points:

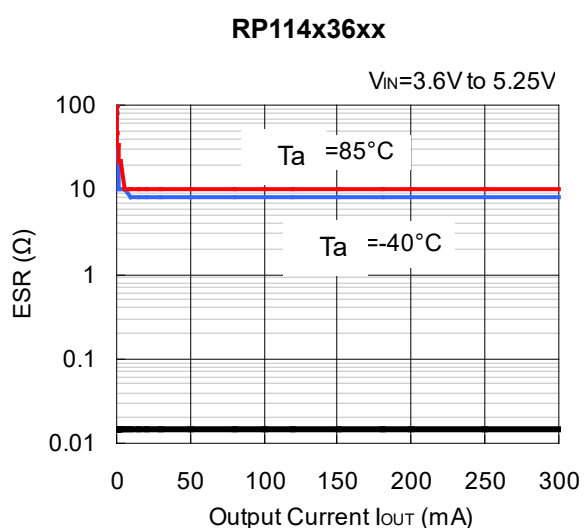
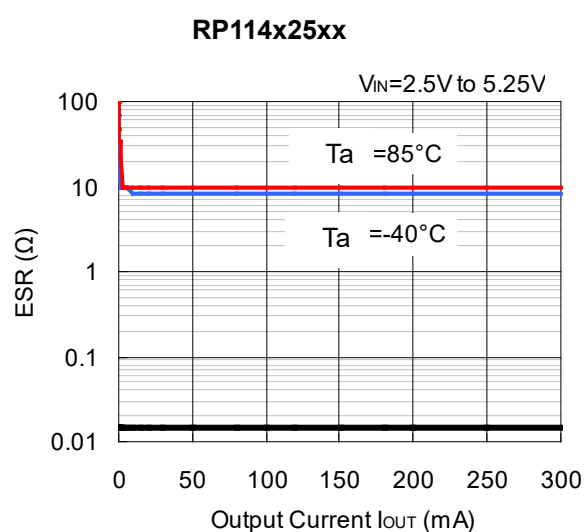
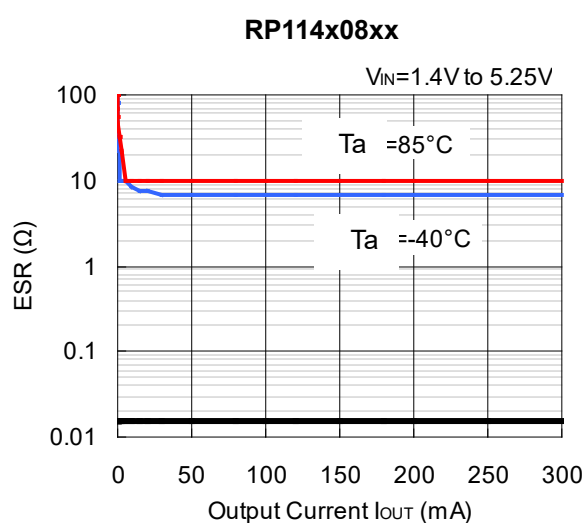
The relations between  $I_{OUT}$  (Output Current) and ESR of an output capacitor are shown below. The conditions when the white noise level is under  $40\mu V$  (Avg.) are marked as the hatched area in the graph.

#### Measurement conditions

Frequency Band: 10Hz to 2MHz

Temperature :  $-40^{\circ}C$  to  $85^{\circ}C$

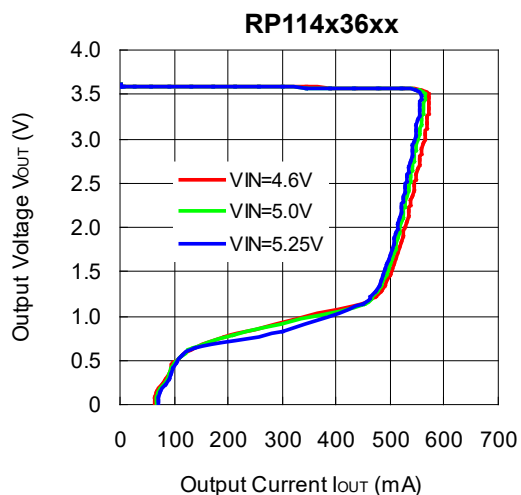
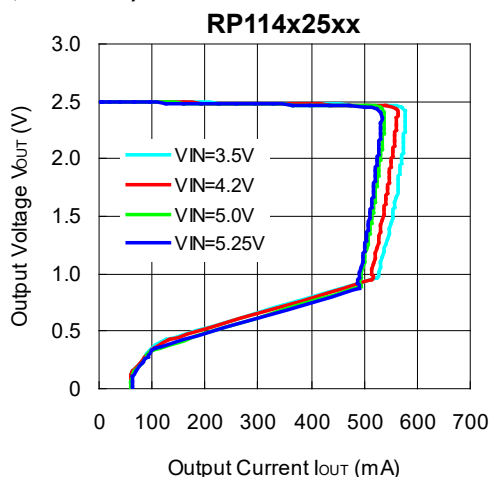
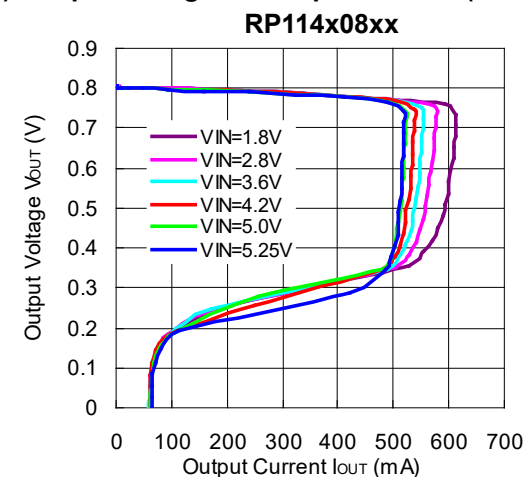
C1, C2 :  $1.0\mu F$



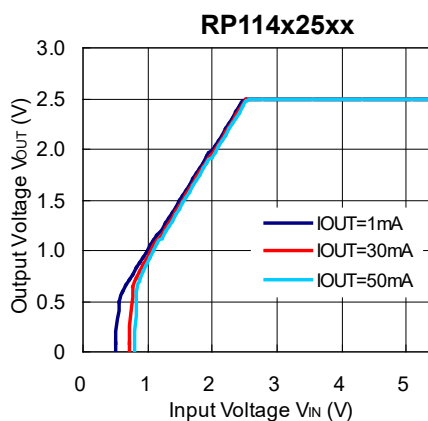
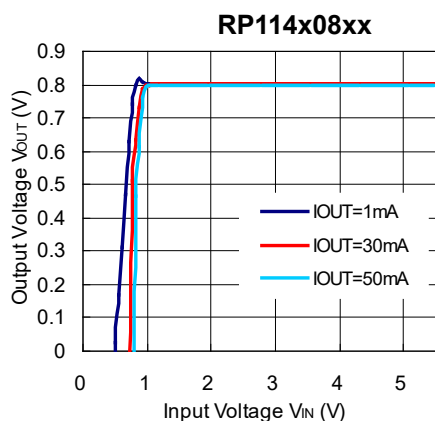
## TYPICAL CHARACTERISTICS

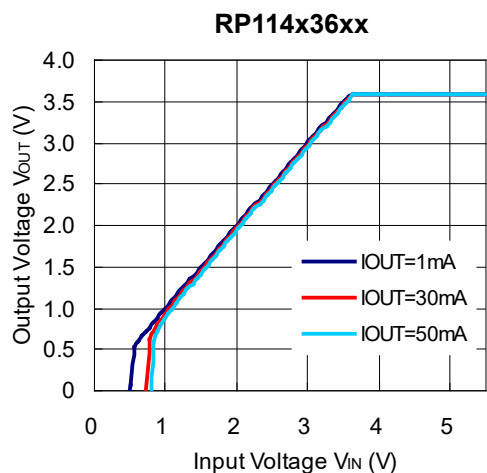
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

### 1) Output Voltage vs. Output Current (C1=1.0μF, C2=1.0μF, Ta=25°C)

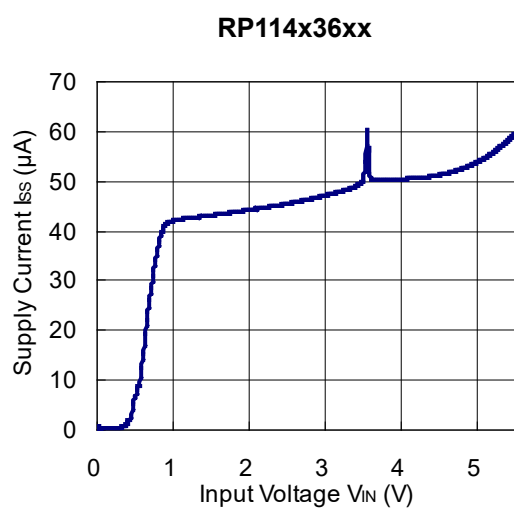
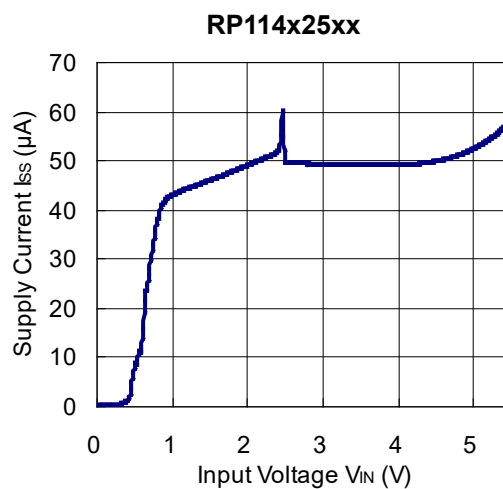
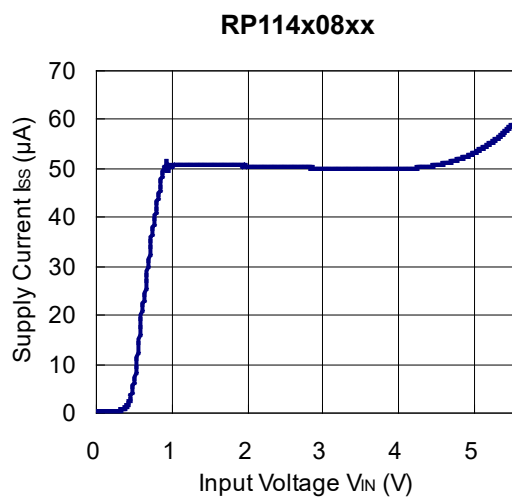


### 2) Output Voltage vs. Input Voltage (C1=1.0μF, C2=1.0μF, Ta=25°C)

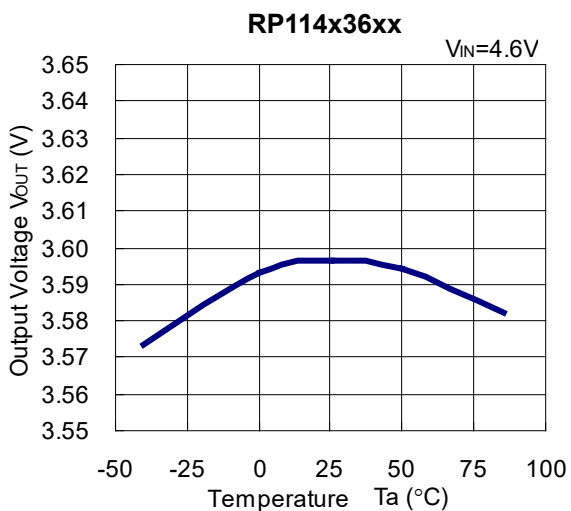
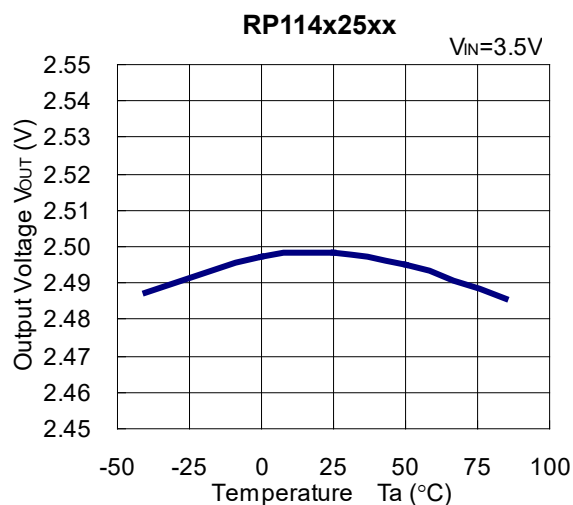
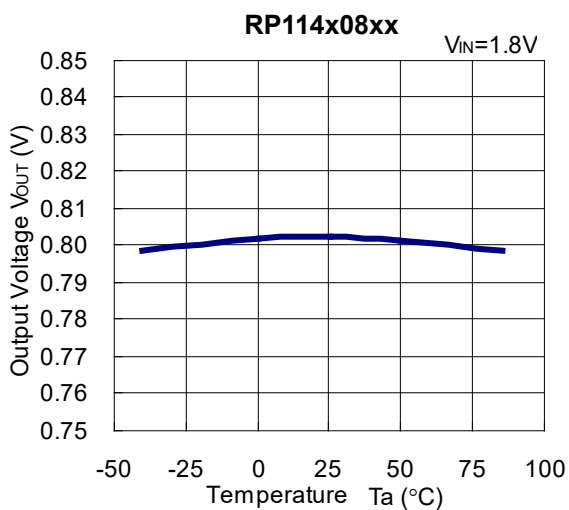




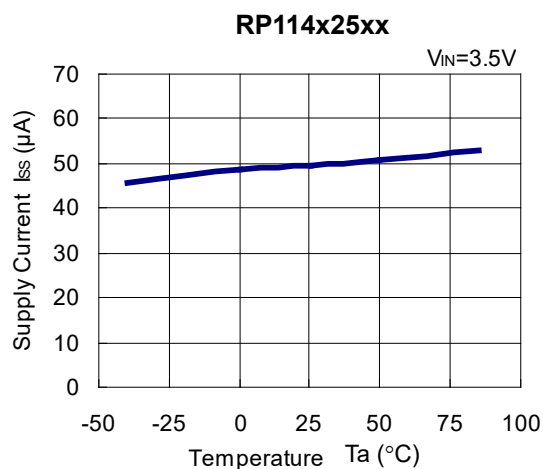
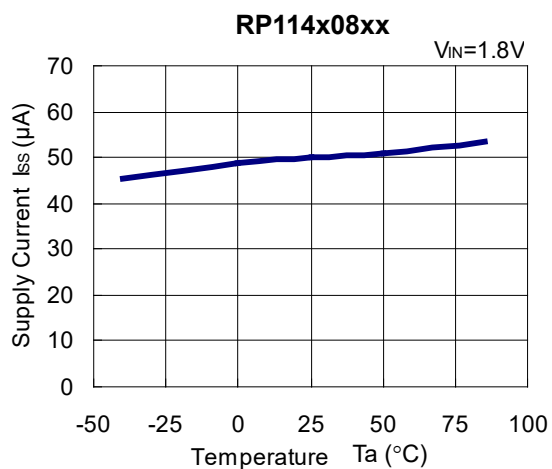
**3) Supply Current vs. Input Voltage ( $C1=1.0\mu F$ ,  $C2=1.0\mu F$ ,  $T_a=25^\circ C$ )**

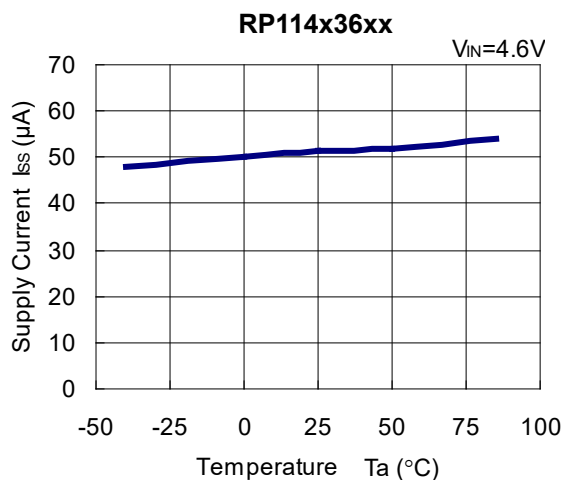


4) Output Voltage vs. Temperature (C1=1.0μF, C2=1.0μF, I<sub>OUT</sub>=1mA)

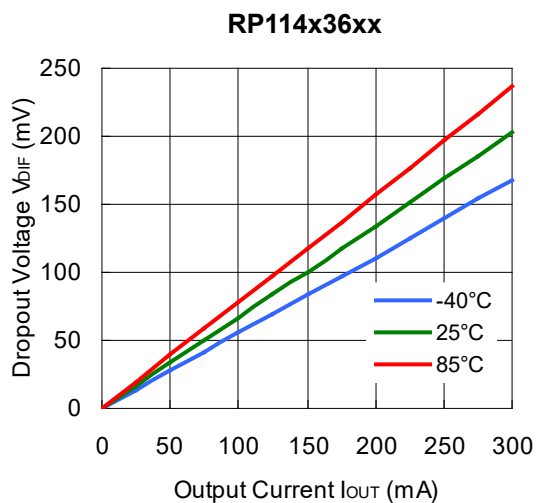
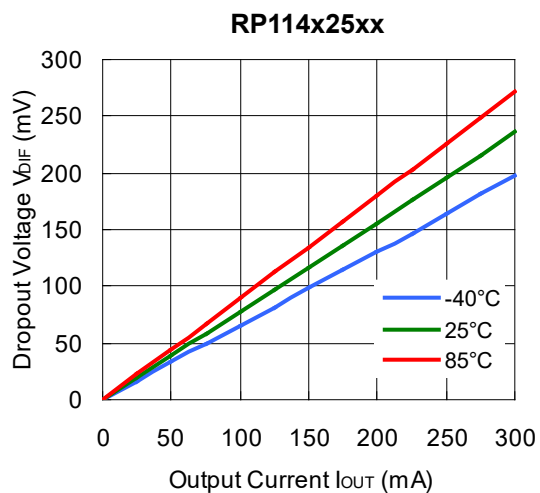
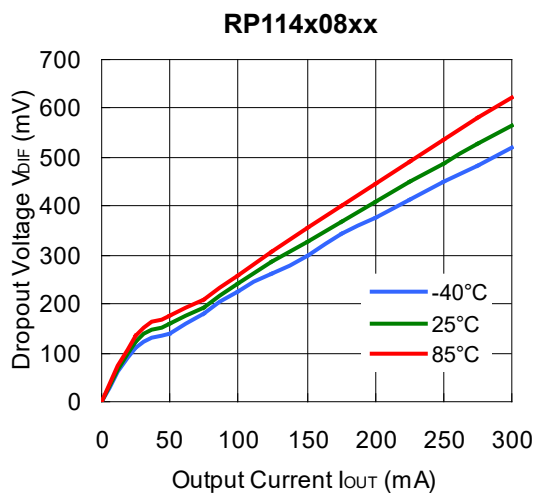


5) Supply Current vs. Temperature (C1=1.0μF, C2=1.0μF, I<sub>OUT</sub>=0mA)

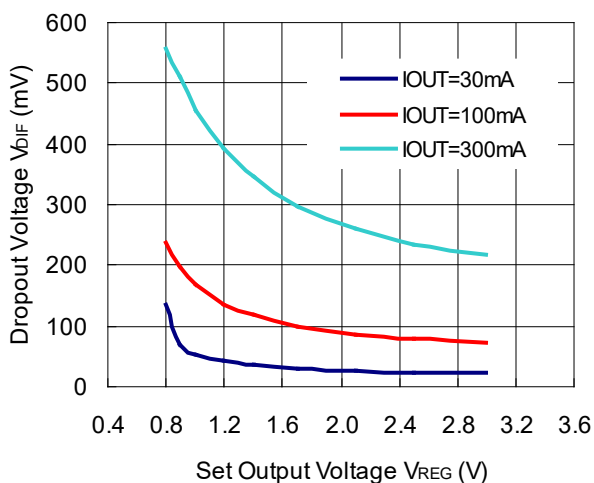




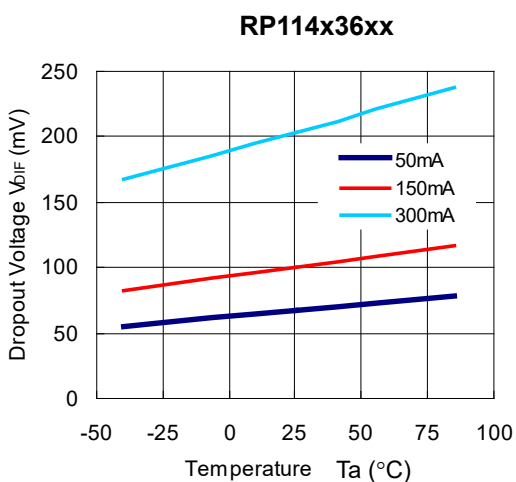
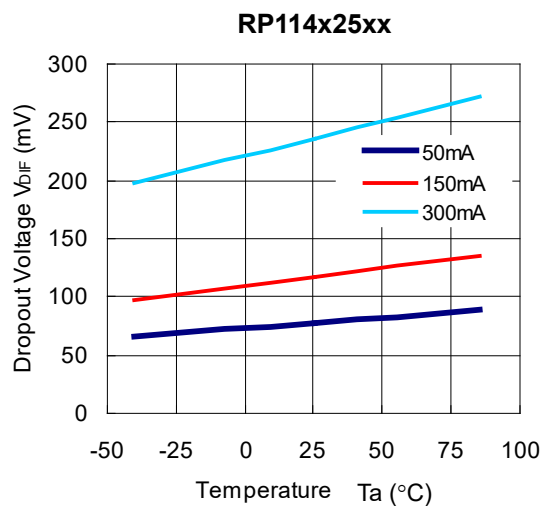
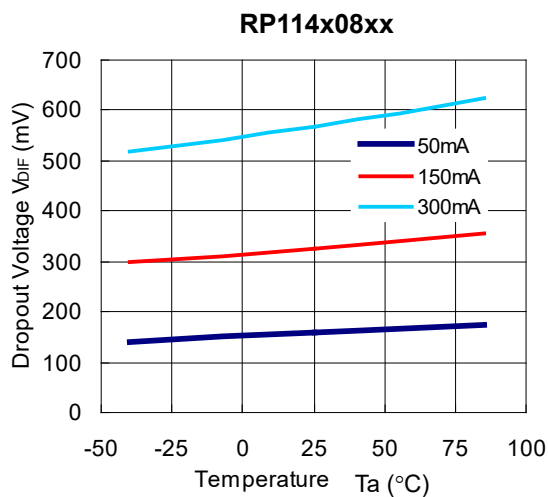
**6) Dropout Voltage vs. Output Current ( $C1=1.0\mu F$ ,  $C2=1.0\mu F$ )**



7) Dropout Voltage vs. Set Output Voltage (C1=1.0μF, C2=1.0μF, Ta=25°C)

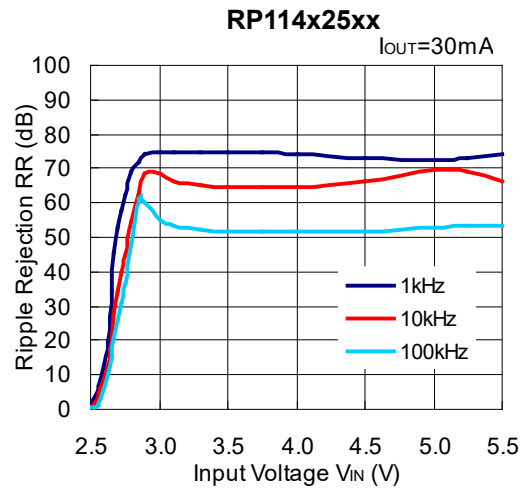
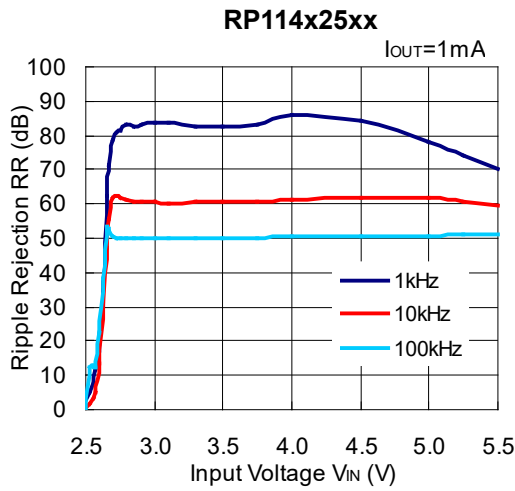


8) Dropout Voltage vs. Temperature (C1=none, C2=1.0μF)

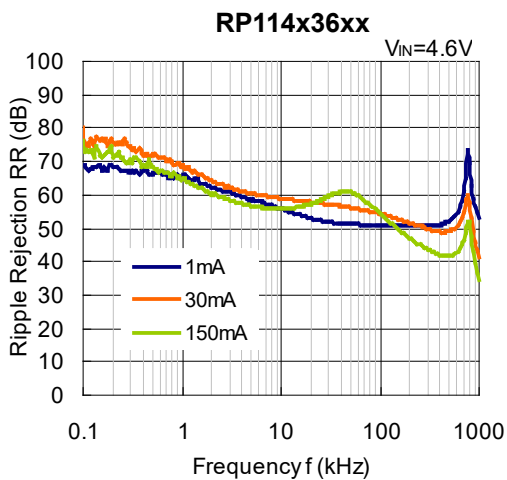
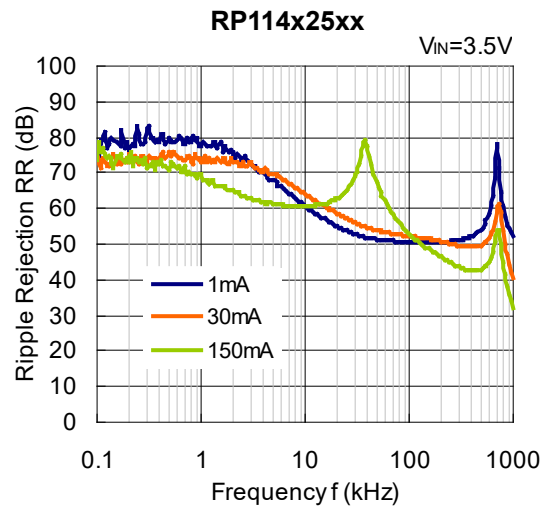
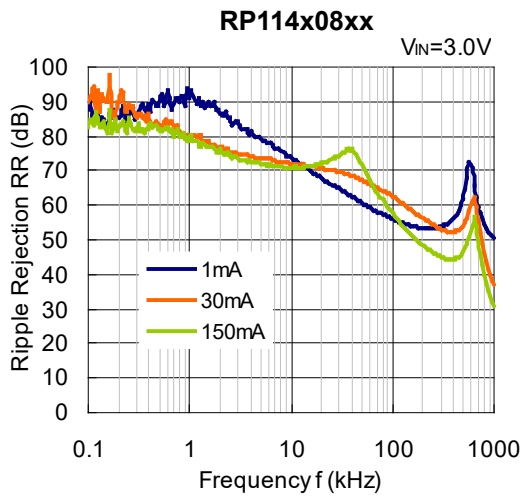




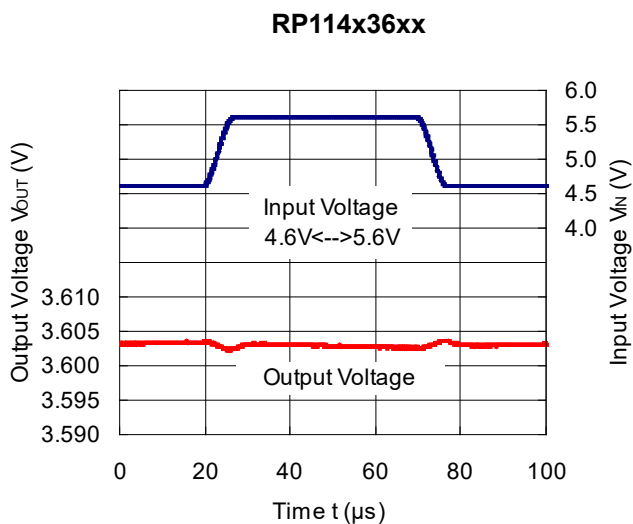
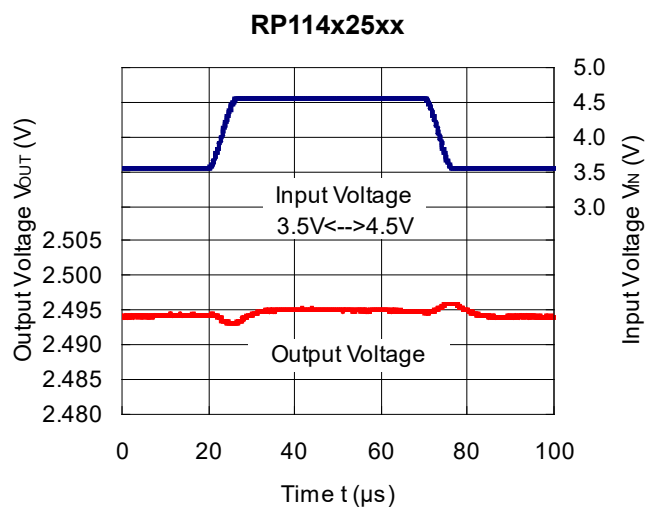
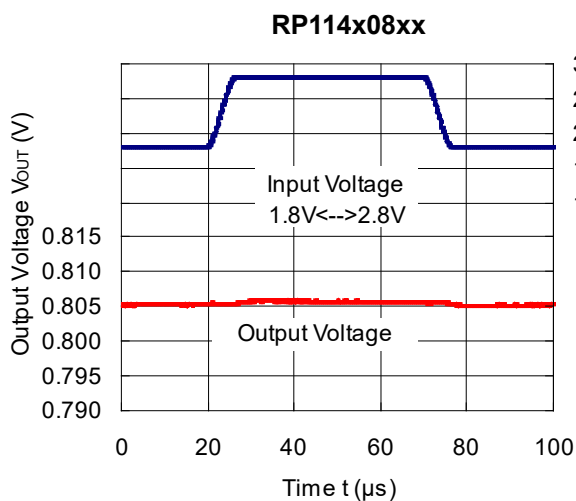
9) Ripple Rejection vs. Input Voltage (C1=none, C2=1.0μF, Ripple=0.2Vp-p, Ta=25°C)



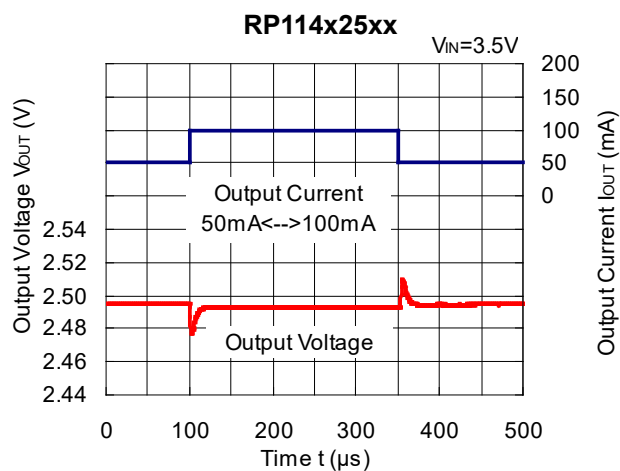
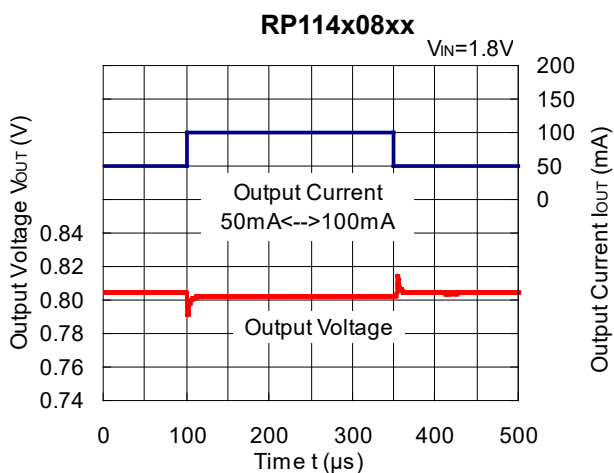
10) Ripple Rejection vs. Frequency (C1=none, C2=1.0μF, Ta=25°C)

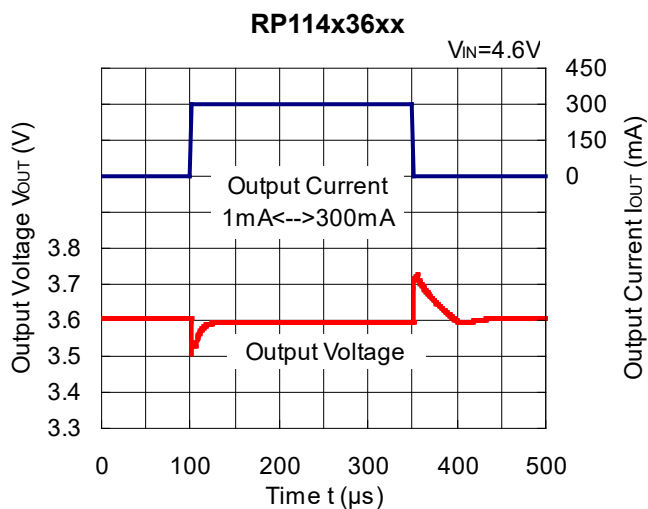
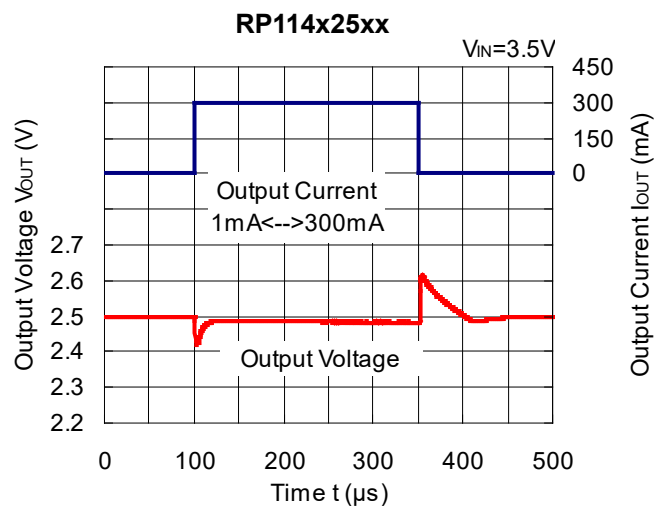
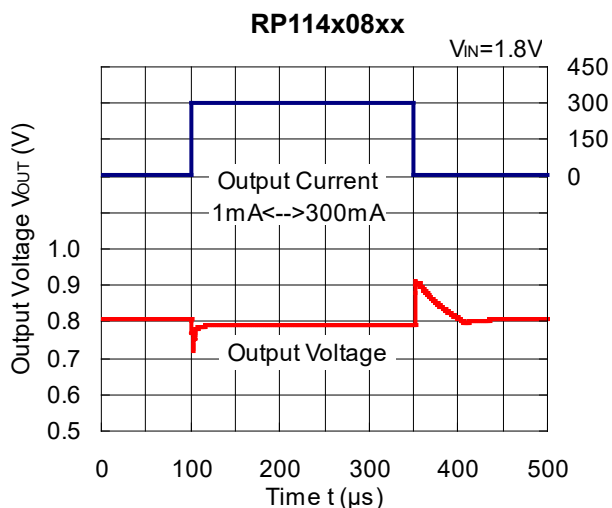
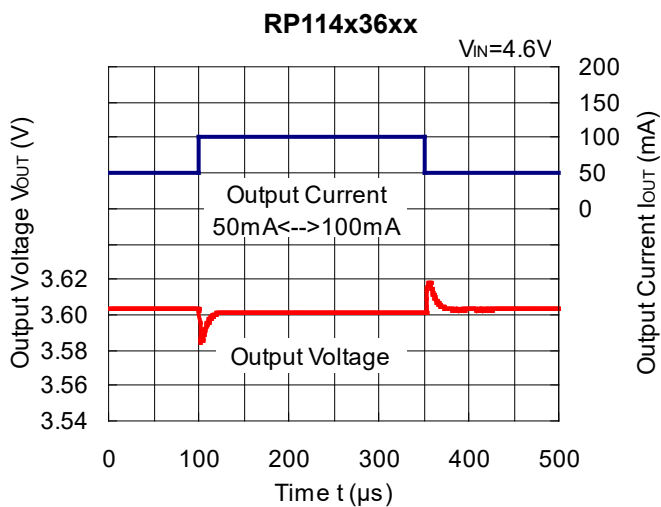


11) Input Transient Response ( $I_{OUT}=30\text{mA}$ ,  $t_r=t_f=5\mu\text{s}$ ,  $T_a=25^\circ\text{C}$ )

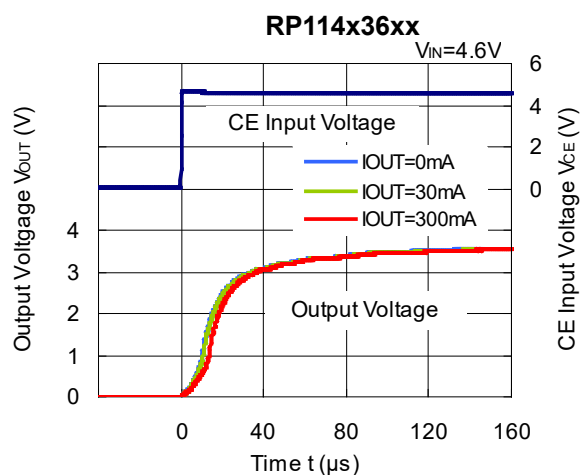
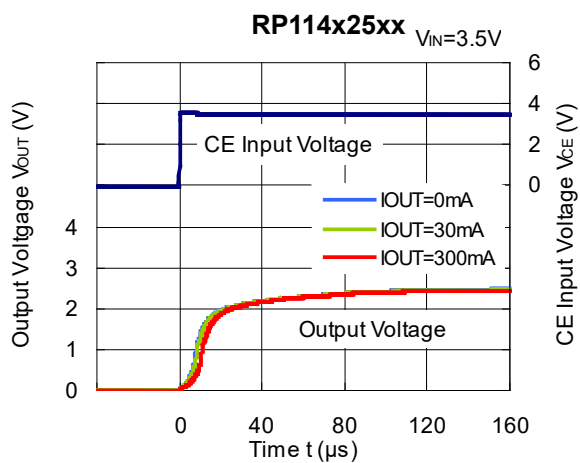
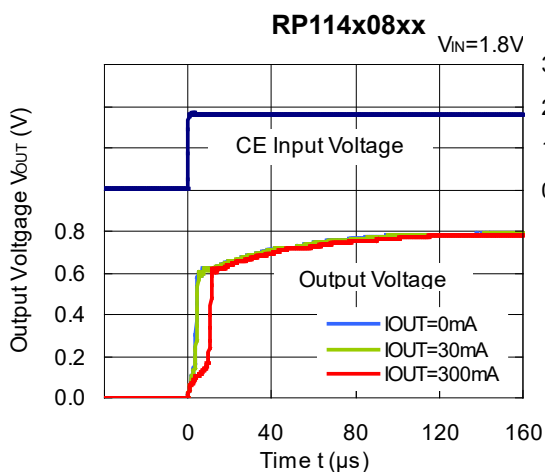


12) Load Transient Response ( $C_1=1.0\mu\text{F}$ ,  $C_2=1.0\mu\text{F}$ ,  $t_r=t_f=0.5\mu\text{s}$ ,  $T_a=25^\circ\text{C}$ )

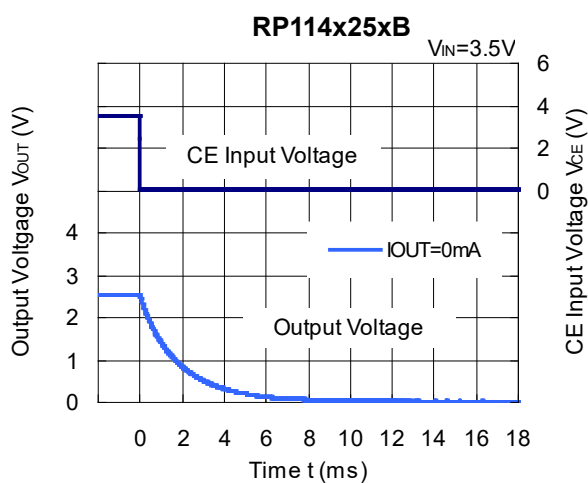
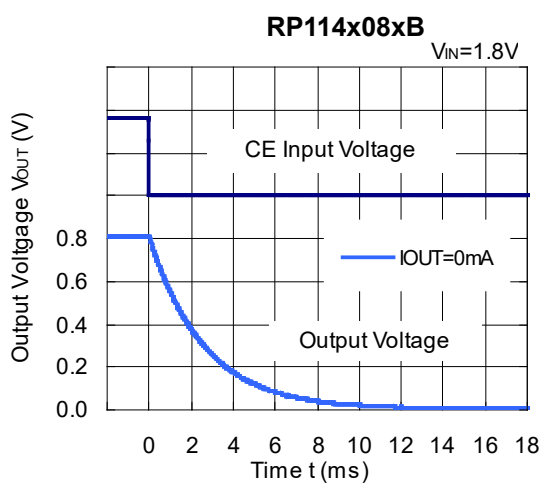




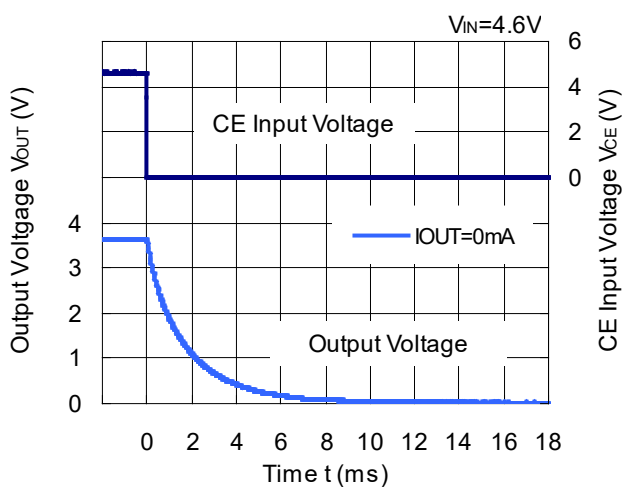
13) Turn On Speed with CE pin (C1=1.0μF, C2=1.0μF, Ta=25°C)



14) Turn Off Speed with CE pin (B version) (C1=1.0μF, C2=1.0μF, Ta=25°C)

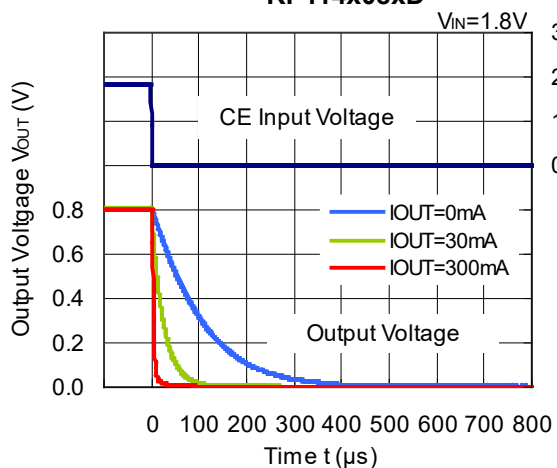


RP114x36xB

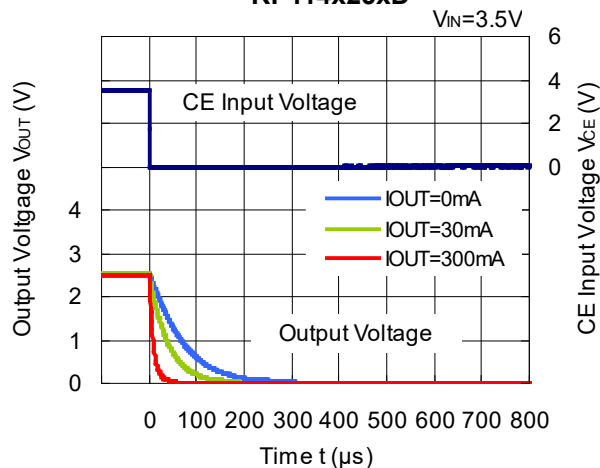


15) Turn Off Speed with CE pin (D version) (C1=1.0μF, C2=1.0μF, Ta=25°C)

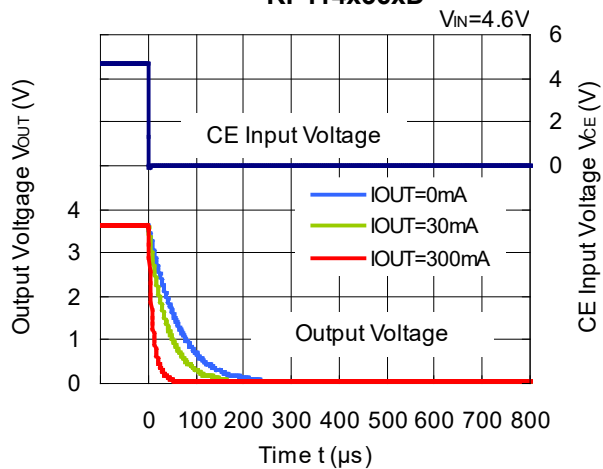
RP114x08xD



RP114x25xD



RP114x36xD



The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

**Measurement Conditions**

Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square
Through-holes	φ 0.2 mm × 11 pcs

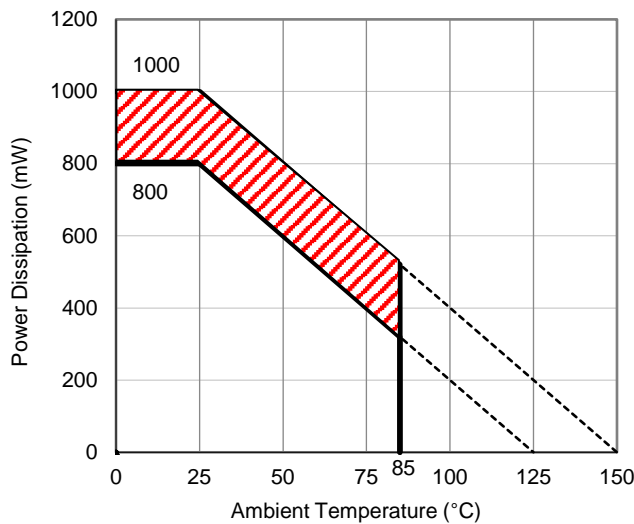
**Measurement Result**

(Ta = 25°C, Tjmax = 125°C)

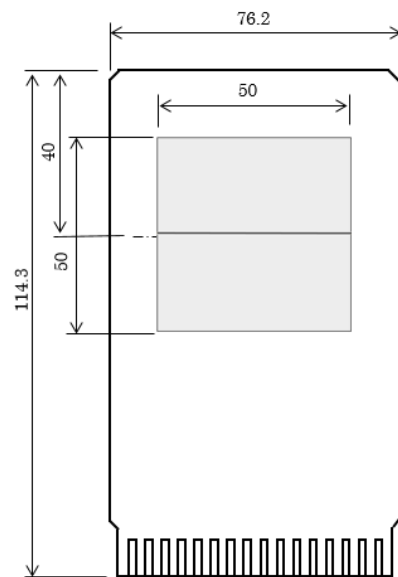
Item	Measurement Result
Power Dissipation	800 mW
Thermal Resistance (θja)	θja = 125°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 58°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



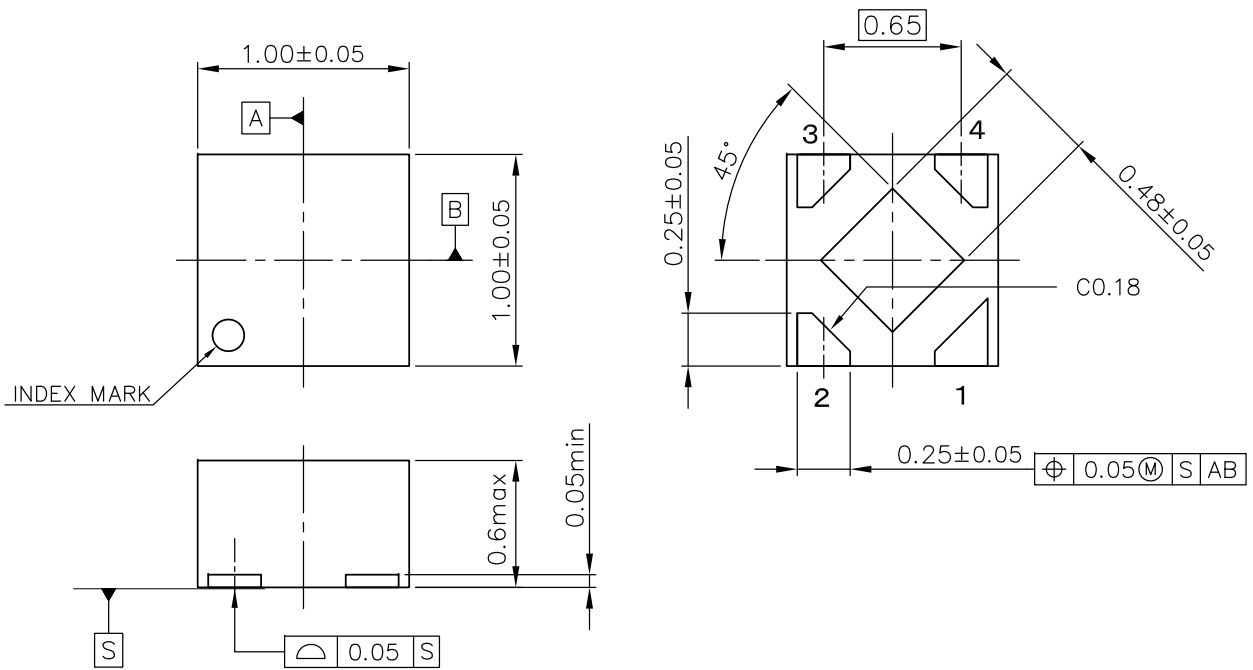
**Power Dissipation vs. Ambient Temperature**



**Measurement Board Pattern**

The above graph shows the power dissipation of the package at Tjmax = 125°C and Tjmax = 150°C. Operating the device in the hatched range might have a negative influence on its lifetime. The total hours of use and the total years of use must be limited as follows:

Total Hours of Use	Total Years of Use (4 hours/day)
13,000 hours	9 years



UNIT: mm

**DFN(PLP)1010-4 Package Dimensions**

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

**Measurement Conditions**

Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square
Through-holes	φ 0.2 mm × 11 pcs

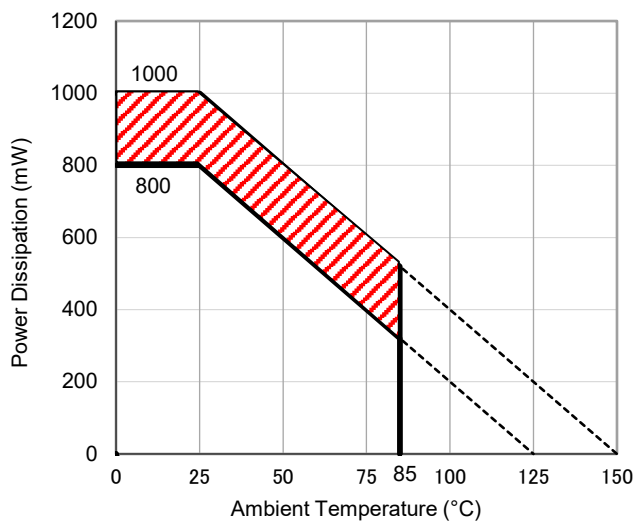
**Measurement Result**

(Ta = 25°C, Tjmax = 125°C)

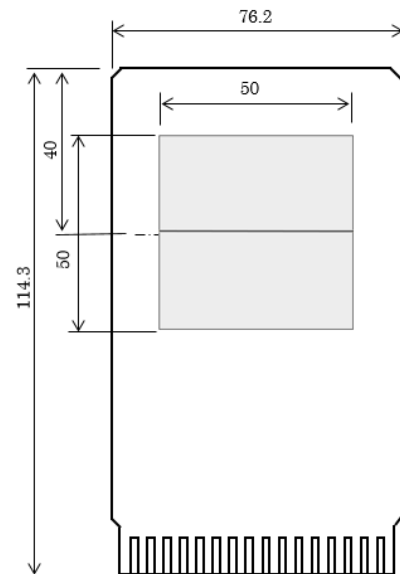
Item	Measurement Result
Power Dissipation	800 mW
Thermal Resistance ( $\theta_{ja}$ )	$\theta_{ja} = 125^\circ\text{C/W}$
Thermal Characterization Parameter ( $\psi_{jt}$ )	$\psi_{jt} = 58^\circ\text{C/W}$

$\theta_{ja}$ : Junction-to-Ambient Thermal Resistance

$\psi_{jt}$ : Junction-to-Top Thermal Characterization Parameter



**Power Dissipation vs. Ambient Temperature**



**Measurement Board Pattern**

The above graph shows the power dissipation of the package at  $T_{jmax} = 125^\circ\text{C}$  and  $T_{jmax} = 150^\circ\text{C}$ . Operating the device in the hatched range might have a negative influence on its lifetime. The total hours of use and the total years of use must be limited as follows:

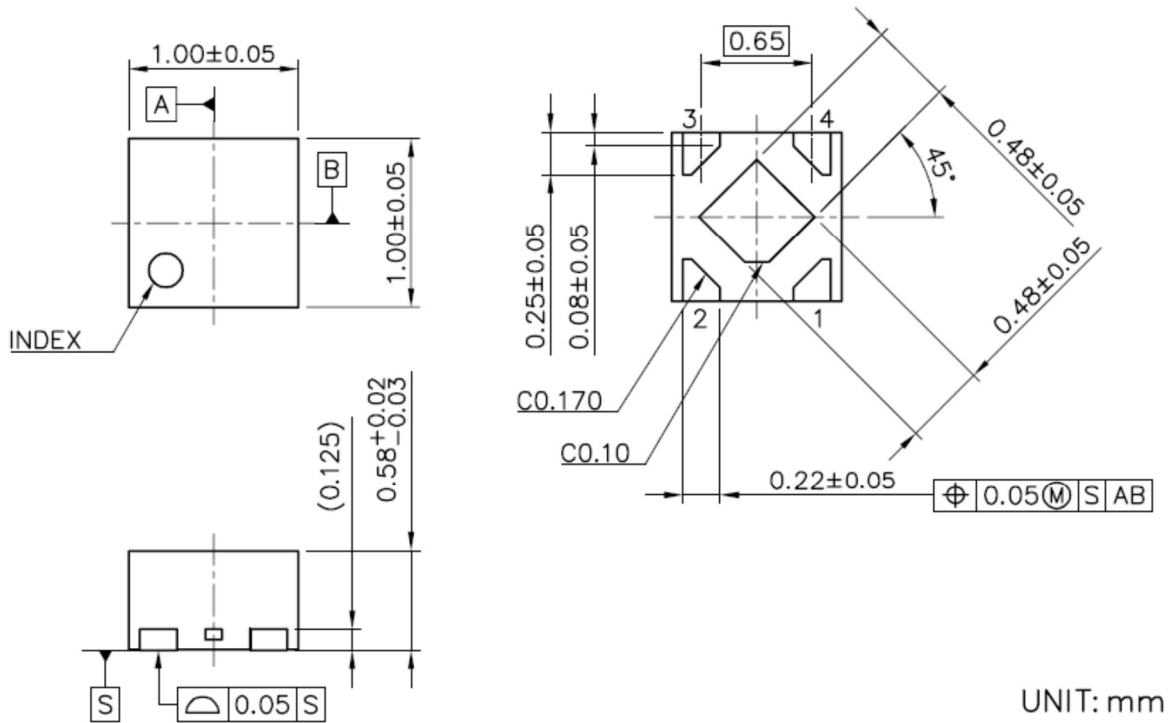
Total Hours of Use	Total Years of Use (4 hours/day)
13,000 hours	9 years



# PACKAGE DIMENSIONS

# DFN(PLP)1010-4B

DM-DFN(PLP)1010-4B-JE-B

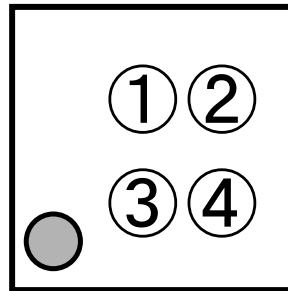


DFN (PLP) 1010-4B Package Dimensions

\* The tab on the bottom of the package is a substrate potential (GND/V<sub>DD</sub>). It is recommended that this tab be connected to the ground plane/V<sub>DD</sub> pin on the board but it is possible to leave the tab floating.

①②: Product Code ... Refer to *Part Marking List*

③④: Lot Number ... Alphanumeric Serial Number



**RP114K [DFN(PLP)1010-4B], DFN(PLP)1010-4 Part Markings**

**NOTICE**

There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or our distributor before attempting to use AOI.

**RP114Kxx1B Part Marking List**

Product Name	①②	Set Output Voltage
RP114K081B	L 0	0.8V
RP114K091B	L 1	0.9V
RP114K101B	L 2	1.0V
RP114K111B	L 3	1.1V
RP114K121B	L 4	1.2V
RP114K131B	L 5	1.3V
RP114K141B	L 6	1.4V
RP114K151B	L 7	1.5V
RP114K161B	L 8	1.6V
RP114K171B	L 9	1.7V
RP114K181B	M 0	1.8V
RP114K191B	M 1	1.9V
RP114K201B	M 2	2.0V
RP114K211B	M 3	2.1V
RP114K221B	M 4	2.2V
RP114K231B	M 5	2.3V
RP114K241B	M 6	2.4V
RP114K251B	M 7	2.5V
RP114K261B	M 8	2.6V
RP114K271B	M 9	2.7V
RP114K281B	N 0	2.8V
RP114K291B	N 1	2.9V
RP114K301B	N 2	3.0V
RP114K311B	N 3	3.1V
RP114K321B	N 4	3.2V
RP114K331B	N 5	3.3V
RP114K341B	N 6	3.4V
RP114K351B	N 7	3.5V
RP114K361B	N 8	3.6V
RP114K121B5	N 9	1.25V
RP114K181B5	P 0	1.85V
RP114K281B5	P 1	2.85V
RP114K341B5	P 2	3.45V
RP114K101B5	P 3	1.05V
RP114K171B5	P 4	1.75V
RP114K111B5	P 5	1.15V
RP114K131B5	P 6	1.35V

**RP114Kxx1D Part Marking List**

Product Name	①②	Set Output Voltage
RP114K081D	Q 0	0.8V
RP114K091D	Q 1	0.9V
RP114K101D	Q 2	1.0V
RP114K111D	Q 3	1.1V
RP114K121D	Q 4	1.2V
RP114K131D	Q 5	1.3V
RP114K141D	Q 6	1.4V
RP114K151D	Q 7	1.5V
RP114K161D	Q 8	1.6V
RP114K171D	Q 9	1.7V
RP114K181D	R 0	1.8V
RP114K191D	R 1	1.9V
RP114K201D	R 2	2.0V
RP114K211D	R 3	2.1V
RP114K221D	R 4	2.2V
RP114K231D	R 5	2.3V
RP114K241D	R 6	2.4V
RP114K251D	R 7	2.5V
RP114K261D	R 8	2.6V
RP114K271D	R 9	2.7V
RP114K281D	S 0	2.8V
RP114K291D	S 1	2.9V
RP114K301D	S 2	3.0V
RP114K311D	S 3	3.1V
RP114K321D	S 4	3.2V
RP114K331D	S 5	3.3V
RP114K341D	S 6	3.4V
RP114K351D	S 7	3.5V
RP114K361D	S 8	3.6V
RP114K121D5	S 9	1.25V
RP114K181D5	T 0	1.85V
RP114K281D5	T 1	2.85V
RP114K341D5	T 2	3.45V
RP114K101D5	T 3	1.05V
RP114K171D5	T 4	1.75V
RP114K111D5	T 5	1.15V
RP114K131D5	T 6	1.35V

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

**Measurement Conditions**

Item	Our Evaluation Board
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-Sided Board)
Board Dimensions	40 mm × 40 mm × 1.6 mm
Copper Ratio	Top Side: Approx. 50% Bottom Side: Approx. 50%
Through-holes	φ 0.5 mm × 44 pcs

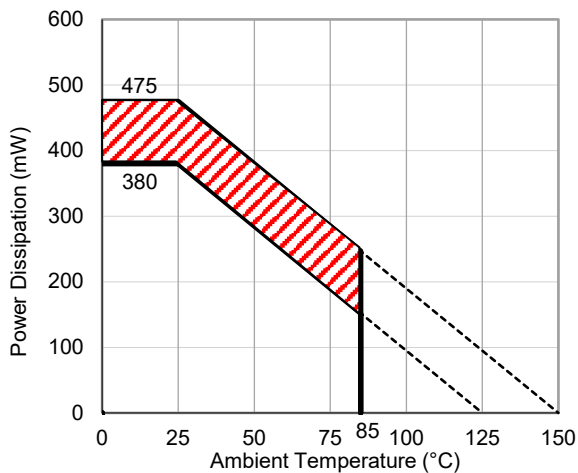
**Measurement Result**

(Ta = 25°C, Tjmax = 125°C)

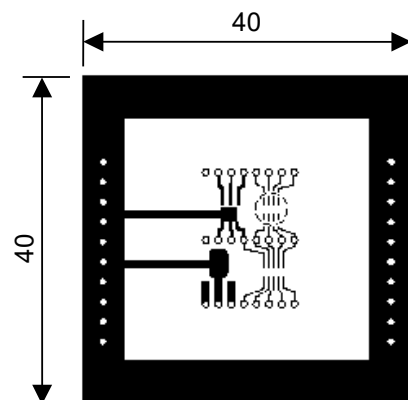
Item	Our Evaluation Board
Power Dissipation	380 mW
Thermal Resistance (θja)	θja = 263°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 75°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



**Power Dissipation vs. Ambient Temperature**



**Measurement Board Pattern**

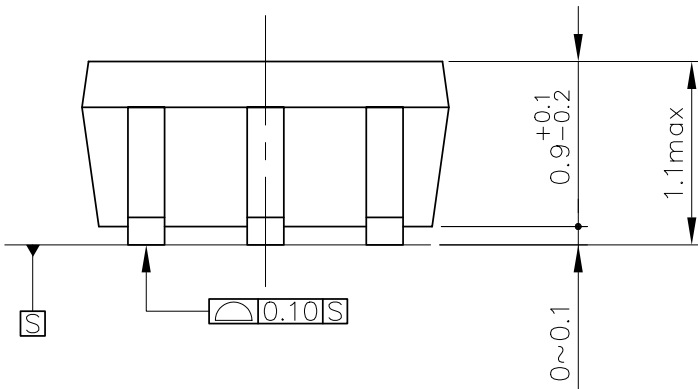
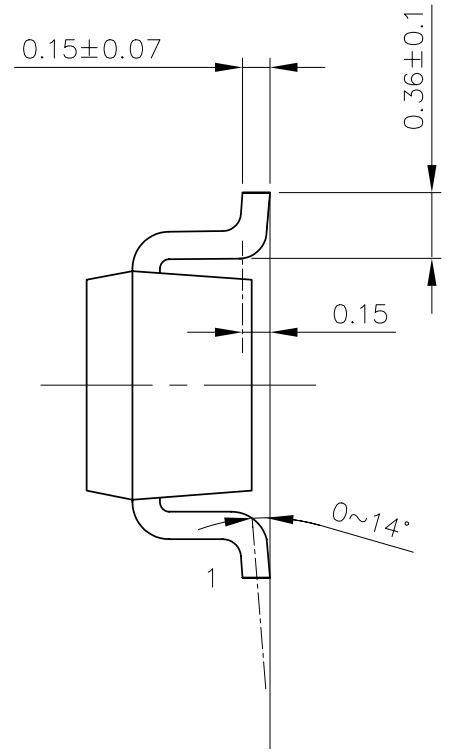
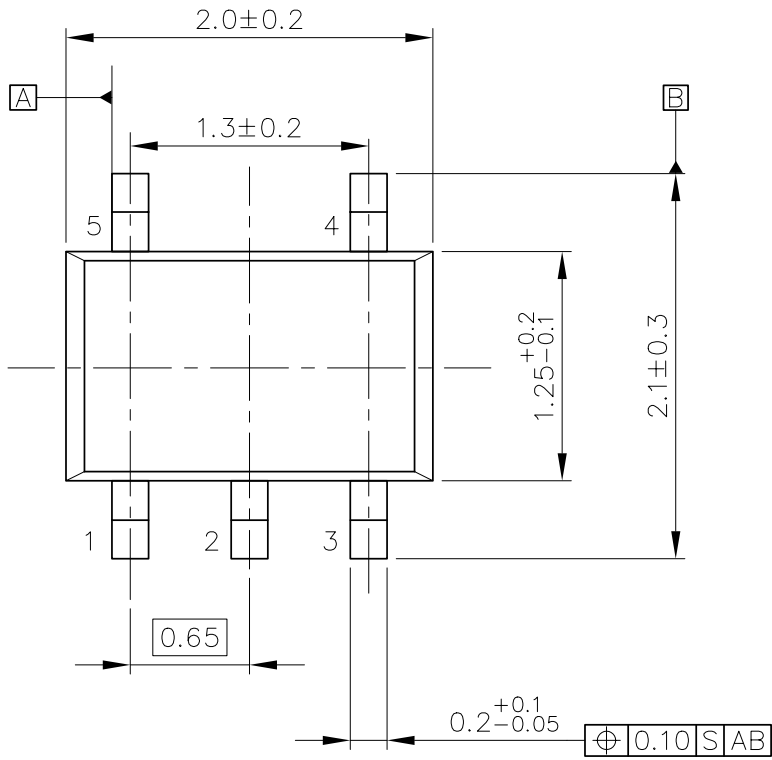
The above graph shows the power dissipation of the package at Tjmax = 125°C and Tjmax = 150°C. Operating the device in the hatched range might have a negative influence on its lifetime. The total hours of use and the total years of use must be limited as follows:

Total Hours of Use	Total Years of Use (4 hours/day)
13,000 hours	9 years

**PACKAGE DIMENSIONS**

**SC-88A**

DM-SC-88A-JE-A

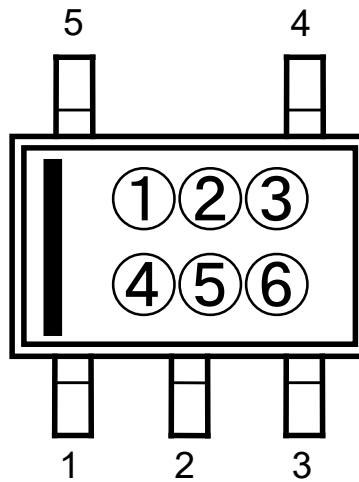


UNIT: mm

**SC-88A Package Dimensions**

①②③④: Product Code ··· Refer to *Part Marking List*

⑤⑥: Lot Number ··· Alphanumeric Serial Number



**RP114Q (SC-88A) Part Markings**

**NOTICE**

There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or our distributor before attempting to use AOI.

**RP114Qxx2B Part Marking List**

Product Name	①②③④	Set Output Voltage
RP114Q082B	<b>AG 0 8</b>	0.8 V
RP114Q092B	<b>AG 0 9</b>	0.9 V
RP114Q102B	<b>AG 1 0</b>	1.0 V
RP114Q112B	<b>AG 1 1</b>	1.1 V
RP114Q122B	<b>AG 1 2</b>	1.2 V
RP114Q132B	<b>AG 1 3</b>	1.3 V
RP114Q142B	<b>AG 1 4</b>	1.4 V
RP114Q152B	<b>AG 1 5</b>	1.5 V
RP114Q162B	<b>AG 1 6</b>	1.6 V
RP114Q172B	<b>AG 1 7</b>	1.7 V
RP114Q182B	<b>AG 1 8</b>	1.8 V
RP114Q192B	<b>AG 1 9</b>	1.9 V
RP114Q202B	<b>AG 2 0</b>	2.0 V
RP114Q212B	<b>AG 2 1</b>	2.1 V
RP114Q222B	<b>AG 2 2</b>	2.2 V
RP114Q232B	<b>AG 2 3</b>	2.3 V
RP114Q242B	<b>AG 2 4</b>	2.4 V
RP114Q252B	<b>AG 2 5</b>	2.5 V
RP114Q262B	<b>AG 2 6</b>	2.6 V
RP114Q272B	<b>AG 2 7</b>	2.7 V
RP114Q282B	<b>AG 2 8</b>	2.8 V
RP114Q292B	<b>AG 2 9</b>	2.9 V
RP114Q302B	<b>AG 3 0</b>	3.0 V
RP114Q312B	<b>AG 3 1</b>	3.1 V
RP114Q322B	<b>AG 3 2</b>	3.2 V
RP114Q332B	<b>AG 3 3</b>	3.3 V
RP114Q342B	<b>AG 3 4</b>	3.4 V
RP114Q352B	<b>AG 3 5</b>	3.5 V
RP114Q362B	<b>AG 3 6</b>	3.6 V
RP114Q122B5	<b>AG 3 7</b>	1.25 V
RP114Q182B5	<b>AG 3 8</b>	1.85 V
RP114Q282B5	<b>AG 3 9</b>	2.85 V
RP114Q342B5	<b>AG 4 0</b>	3.45 V
RP114Q102B5	<b>AG 4 1</b>	1.05 V

**RP114Qxx2D Part Marking List**

Product Name	①②③④	Set Output Voltage
RP114Q082D	<b>AH 0 8</b>	0.8 V
RP114Q092D	<b>AH 0 9</b>	0.9 V
RP114Q102D	<b>AH 1 0</b>	1.0 V
RP114Q112D	<b>AH 1 1</b>	1.1 V
RP114Q122D	<b>AH 1 2</b>	1.2 V
RP114Q132D	<b>AH 1 3</b>	1.3 V
RP114Q142D	<b>AH 1 4</b>	1.4 V
RP114Q152D	<b>AH 1 5</b>	1.5 V
RP114Q162D	<b>AH 1 6</b>	1.6 V
RP114Q172D	<b>AH 1 7</b>	1.7 V
RP114Q182D	<b>AH 1 8</b>	1.8 V
RP114Q192D	<b>AH 1 9</b>	1.9 V
RP114Q202D	<b>AH 2 0</b>	2.0 V
RP114Q212D	<b>AH 2 1</b>	2.1 V
RP114Q222D	<b>AH 2 2</b>	2.2 V
RP114Q232D	<b>AH 2 3</b>	2.3 V
RP114Q242D	<b>AH 2 4</b>	2.4 V
RP114Q252D	<b>AH 2 5</b>	2.5 V
RP114Q262D	<b>AH 2 6</b>	2.6 V
RP114Q272D	<b>AH 2 7</b>	2.7 V
RP114Q282D	<b>AH 2 8</b>	2.8 V
RP114Q292D	<b>AH 2 9</b>	2.9 V
RP114Q302D	<b>AH 3 0</b>	3.0 V
RP114Q312D	<b>AH 3 1</b>	3.1 V
RP114Q322D	<b>AH 3 2</b>	3.2 V
RP114Q332D	<b>AH 3 3</b>	3.3 V
RP114Q342D	<b>AH 3 4</b>	3.4 V
RP114Q352D	<b>AH 3 5</b>	3.5 V
RP114Q362D	<b>AH 3 6</b>	3.6 V
RP114Q122D5	<b>AH 3 7</b>	1.25 V
RP114Q182D5	<b>AH 3 8</b>	1.85 V
RP114Q282D5	<b>AH 3 9</b>	2.85 V
RP114Q342D5	<b>AH 4 0</b>	3.45 V
RP114Q102D5	<b>AH 4 1</b>	1.05 V

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

**Measurement Conditions**

Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square
Through-holes	φ 0.3 mm × 7 pcs

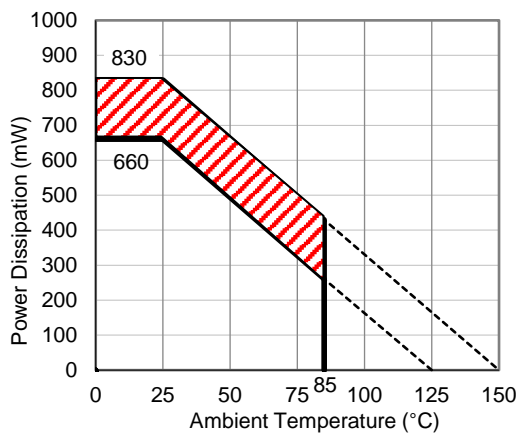
**Measurement Result**

(Ta = 25°C, Tjmax = 125°C)

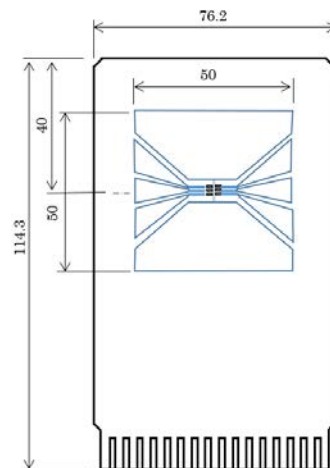
Item	Measurement Result
Power Dissipation	660 mW
Thermal Resistance (θja)	θja = 150°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 51°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



**Power Dissipation vs. Ambient Temperature**

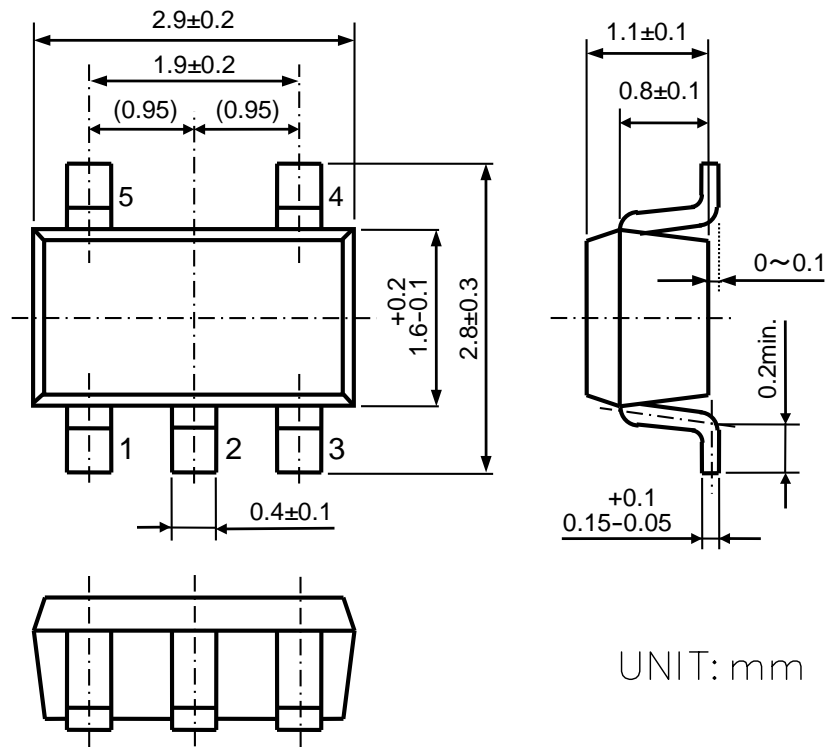


**Measurement Board Pattern**

The above graph shows the power dissipation of the package at Tjmax = 125°C and Tjmax = 150°C. Operating the device in the hatched range might have a negative influence on its lifetime. The total hours of use and the total years of use must be limited as follows:

Total Hours of Use	Total Years of Use (4 hours/day)
13,000 hours	9 years



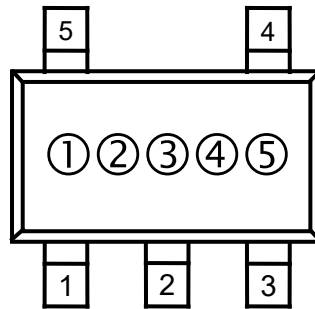


UNIT: mm

SOT-23-5 Package Dimensions

①②③: Product Code ... Refer to *Part Marking List*

④⑤: Lot Number ... Alphanumeric Serial Number



**RP114N (SOT-23-5) Part Markings**

**NOTICE**

There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or our distributor before attempting to use AOI.

RP114Nxx1B Part Marking List

Product Name	①②③	Set Output Voltage
RP114N081B	Q A A	0.8 V
RP114N091B	Q A B	0.9 V
RP114N101B	Q A C	1.0 V
RP114N111B	Q A D	1.1 V
RP114N121B	Q A E	1.2 V
RP114N131B	Q A F	1.3 V
RP114N141B	Q A G	1.4 V
RP114N151B	Q A H	1.5 V
RP114N161B	Q A J	1.6 V
RP114N171B	Q A K	1.7 V
RP114N181B	Q A L	1.8 V
RP114N191B	Q A M	1.9 V
RP114N201B	Q A N	2.0 V
RP114N211B	Q A P	2.1 V
RP114N221B	Q A Q	2.2 V
RP114N231B	Q A R	2.3 V
RP114N241B	Q A S	2.4 V
RP114N251B	Q A T	2.5 V
RP114N261B	Q A U	2.6 V
RP114N271B	Q A V	2.7 V
RP114N281B	Q A W	2.8 V
RP114N291B	Q A X	2.9 V
RP114N301B	Q A Y	3.0 V
RP114N311B	Q A Z	3.1 V
RP114N321B	R A A	3.2 V
RP114N331B	R A B	3.3 V
RP114N341B	R A C	3.4 V
RP114N351B	R A D	3.5 V
RP114N361B	R A E	3.6 V
RP114N121B5	R A F	1.25 V
RP114N181B5	R A G	1.85 V
RP114N281B5	R A H	2.85 V
RP114N341B5	R A J	3.45 V
RP114N101B5	R A K	1.05 V

RP114Nxx1D Part Marking List

Product Name	①②③	Set Output Voltage
RP114N081D	Q B A	0.8 V
RP114N091D	Q B B	0.9 V
RP114N101D	Q B C	1.0 V
RP114N111D	Q B D	1.1 V
RP114N121D	Q B E	1.2 V
RP114N131D	Q B F	1.3 V
RP114N141D	Q B G	1.4 V
RP114N151D	Q B H	1.5 V
RP114N161D	Q B J	1.6 V
RP114N171D	Q B K	1.7 V
RP114N181D	Q B L	1.8 V
RP114N191D	Q B M	1.9 V
RP114N201D	Q B N	2.0 V
RP114N211D	Q B P	2.1 V
RP114N221D	Q B Q	2.2 V
RP114N231D	Q B R	2.3 V
RP114N241D	Q B S	2.4 V
RP114N251D	Q B T	2.5 V
RP114N261D	Q B U	2.6 V
RP114N271D	Q B V	2.7 V
RP114N281D	Q B W	2.8 V
RP114N291D	Q B X	2.9 V
RP114N301D	Q B Y	3.0 V
RP114N311D	Q B Z	3.1 V
RP114N321D	R B A	3.2 V
RP114N331D	R B B	3.3 V
RP114N341D	R B C	3.4 V
RP114N351D	R B D	3.5 V
RP114N361D	R B E	3.6 V
RP114N121D5	R B F	1.25 V
RP114N181D5	R B G	1.85 V
RP114N281D5	R B H	2.85 V
RP114N341D5	R B J	3.45 V
RP114N101D5	R B K	1.05 V

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  - Various Safety Devices
  - Traffic control system
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  - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
  - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
  - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
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