

\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

# RICOH

## RP170x SERIES

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### 300mA 10V INPUT LDO REGULATOR

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NO.EA-205-160425

#### OUTLINE

The RP170x Series are CMOS-based LDO regulators featuring 300mA output current. Because of the 10V maximum input voltage, RP170x can be used in 2 cell lithium-ion battery powered portable appliances and besides a portable equipment. The supply current is Typ. 23 $\mu$ A though an excellent response characteristics.

The output voltage range from 1.2V is possible. The output voltage accuracy and temperature-drift coefficient of output voltage of the RP170x Series are excellent.

RP170x has a fold-back protection circuit and a thermal shutdown circuit. Moreover, a standby mode with ultra low supply current can be realized with the chip enable function.

SC-88A, SOT-23-5 and SOT-89-5 with high power dissipation packages are available.

#### FEATURES

- Supply Current ..... Typ. 23 $\mu$ A
- Standby Mode ..... Typ. 0.1 $\mu$ A
- Dropout Voltage..... Typ. 0.20V ( $I_{OUT}=100\text{mA}$ ,  $V_{OUT}=3.0\text{V}$ )  
Typ. 0.77V ( $I_{OUT}=300\text{mA}$ ,  $V_{OUT}=2.8\text{V}$ )
- Ripple Rejection ..... Typ. 70dB ( $f=1\text{kHz}$ )
- Temperature-Drift Coefficient of Output Voltage ..... Typ.  $\pm 80\text{ppm}/^\circ\text{C}$
- Line Regulation ..... Typ. 0.02%/V
- Output Voltage Accuracy .....  $\pm 1.0\%$
- Packages..... SC-88A, SOT-23-5, SOT-89-5
- Input Voltage Range ..... 2.6V to 10.0V
- Output Voltage Range ..... 1.2V to 6.0V (0.1V steps)  
(For other voltages, please refer to MARK INFORMATIONS.)
- Built-in Fold Back Protection Circuit..... Typ. 40mA (Current at short mode)
- Built-in Thermal Shutdown Circuit..... Shutdown Temperature at 165 $^\circ\text{C}$
- Built-in Constant Slope Circuit (Soft-start Function)
- Ceramic capacitors are recommended to be used with this IC .... 1.0 $\mu$ F or more

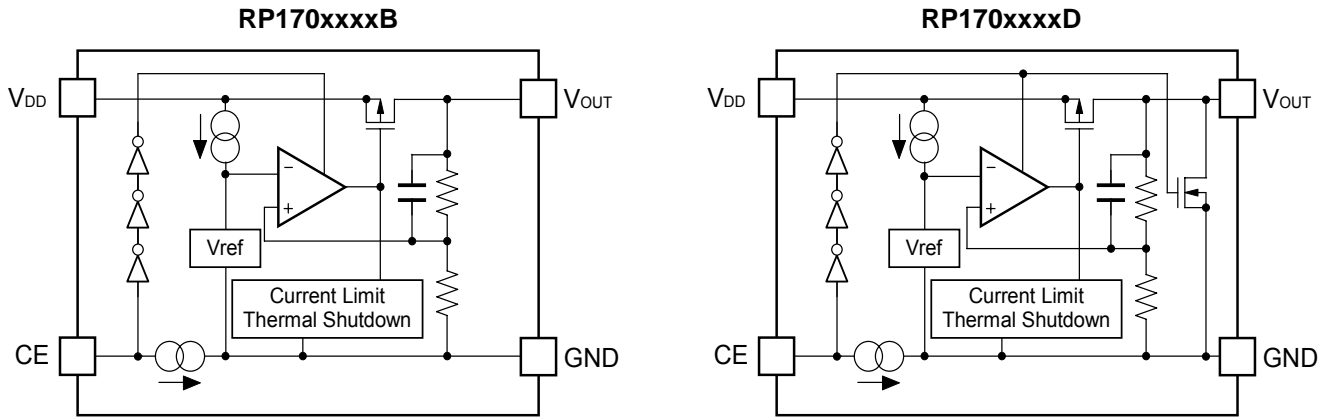
#### APPLICATIONS

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

**RP170x**

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**BLOCK DIAGRAMS**



**SELECTION GUIDE**

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

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP170Qxx2*-TR-FE	SC-88A	3,000 pcs	Yes	Yes
RP170Nxx1*-TR-FE	SOT-23-5	3,000 pcs	Yes	Yes
RP170Hxx1*-T1-FE	SOT-89-5	1,000 pcs	Yes	Yes

xx: The output voltage can be designated in the range from 1.2V(12) to 6.0V(60) in 0.1V steps.  
(For other voltages, please refer to MARK INFORMATIONS.)

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

## PIN CONFIGURATIONS



## PIN DESCRIPTIONS

### • SC-88A

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

### • SOT-23-5

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

### • SOT-89-5

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

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### ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
$V_{IN}$	Input Voltage	12	V
$V_{CE}$	Input Voltage (CE Pin)	12	V
$V_{OUT}$	Output Voltage	-0.3 to $V_{IN}+0.3$	V
$I_{OUT}$	Output Current	330	mA
$P_D$	Power Dissipation* (SC-88A)	380	mW
	Power Dissipation* (SOT-23-5)	420	
	Power Dissipation* (SOT-89-5)	900	
$T_{opt}$	Operating Temperature Range	-40 to 85	°C
$T_{stg}$	Storage Temperature Range	-55 to 125	°C

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

#### ABSOLUTE MAXIMUM RATINGS

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

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

#### 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

### • RP170xxxxB/D

$V_{IN}$ =Set  $V_{OUT}+1V$ ,  $I_{OUT}=1mA$ , unless otherwise noted.

  values indicate  $-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$ , unless otherwise noted.

$T_{opt}=25^{\circ}C$

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit	
$V_{OUT}$	Output Voltage	$T_{opt}=25^{\circ}C$	$V_{OUT} > 1.5V$	$\times 0.99$		$\times 1.01$	V
			$V_{OUT} \leq 1.5V$	-15		+15	mV
		$-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$	$V_{OUT} > 1.5V$	<span style="border: 1px solid black; padding: 0 2px;"><math>\times 0.974</math></span>		<span style="border: 1px solid black; padding: 0 2px;"><math>\times 1.023</math></span>	V
			$V_{OUT} \leq 1.5V$	<span style="border: 1px solid black; padding: 0 2px;">-40</span>		<span style="border: 1px solid black; padding: 0 2px;">+35</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	$0.1mA \leq I_{OUT} \leq 300mA$		10	<span style="border: 1px solid black; padding: 0 2px;">70</span>	mV	
$V_{DIF}$	Dropout Voltage	$I_{OUT}=300mA$	$1.2V \leq V_{OUT} < 1.3V$		1.400	<span style="border: 1px solid black; padding: 0 2px;">1.800</span>	V
			$1.3V \leq V_{OUT} < 1.5V$		1.350	<span style="border: 1px solid black; padding: 0 2px;">1.750</span>	
			$1.5V \leq V_{OUT} < 1.8V$		1.200	<span style="border: 1px solid black; padding: 0 2px;">1.550</span>	
			$1.8V \leq V_{OUT} < 2.3V$		0.980	<span style="border: 1px solid black; padding: 0 2px;">1.300</span>	
			$2.3V \leq V_{OUT} < 3.0V$		0.770	<span style="border: 1px solid black; padding: 0 2px;">1.080</span>	
			$3.0V \leq V_{OUT} < 4.0V$		0.600	<span style="border: 1px solid black; padding: 0 2px;">0.850</span>	
			$4.0V \leq V_{OUT} \leq 6.0V$		0.500	<span style="border: 1px solid black; padding: 0 2px;">0.750</span>	
$I_{SS}$	Supply Current	$I_{OUT}=0mA$		23	<span style="border: 1px solid black; padding: 0 2px;">40</span>	$\mu A$	
$I_{standby}$	Standby Current	$V_{IN}=10.0V, V_{CE}=GND$		0.1	1.0	$\mu A$	
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	Set $V_{OUT}+0.5V \leq V_{IN} \leq 10.0V$ (In case that $V_{OUT} \leq 2.1V$ , $2.6V \leq V_{IN} \leq 10.0V$ )		0.02	<span style="border: 1px solid black; padding: 0 2px;">0.2</span>	%/V	
RR	Ripple Rejection	$f=1kHz$ , Ripple $0.2Vp-p$ , $I_{OUT}=30mA$ (In case that $V_{OUT} < 2.0V$ , $V_{IN}=3.0V$ )		70		dB	
$V_{IN}$	Input Voltage		<span style="border: 1px solid black; padding: 0 2px;">2.6</span>		<span style="border: 1px solid black; padding: 0 2px;">10</span>	V	
$\Delta V_{OUT}/\Delta T_{opt}$	Output Voltage Temperature Coefficient	$-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$		$\pm 80$		ppm/ $^{\circ}C$	
$I_{SC}$	Short Current Limit	$V_{OUT}=0V$		40		mA	
$I_{PD}$	CE Pull-down Current			0.30		$\mu A$	
$V_{CEH}$	CE Input Voltage "H"		<span style="border: 1px solid black; padding: 0 2px;">1.7</span>			V	
$V_{CEL}$	CE Input Voltage "L"				<span style="border: 1px solid black; padding: 0 2px;">0.8</span>	V	
$T_{TSD}$	Thermal Shutdown Temperature	Junction Temperature		165		$^{\circ}C$	
$T_{TSR}$	Thermal Shutdown Released Temperature	Junction Temperature		110		$^{\circ}C$	
en	Output Noise	BW=10Hz to 100kHz		100		$\mu V_{rms}$	
$R_{LOW}$	Low Output Nch Tr. ON Resistance (of D version)	$V_{IN}=7.0V$ $V_{CE}=0V$		250		$\Omega$	

All of unit are tested and specified under load conditions such that  $T_j \approx T_{opt}=25^{\circ}C$  except for Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient and Thermal Shutdown.

## RP170x

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## TYPICAL APPLICATION



(External Components)

C2 1.0 $\mu$ F MURATA: GRM155B31A105KE15

## 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 1.0 $\mu$ F or more and good ESR (Equivalent Series Resistance).

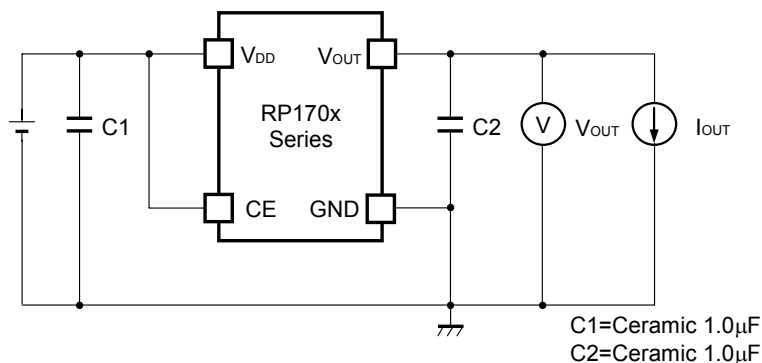
(Note: If additional ceramic capacitors are connected with parallel to the output pin with an output capacitor for phase compensation, the operation might be unstable. Because of this, test these ICs with as same external components as ones to be used on the PCB.)

### PCB Layout

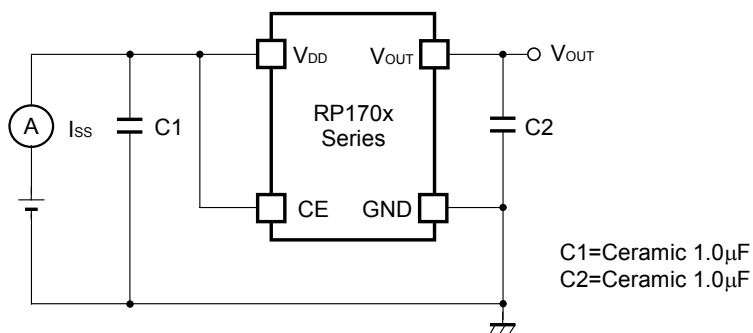
Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 with a capacitance value as much as 1.0 $\mu$ F or more between  $V_{DD}$  and GND pin, and as close as possible to the pins.

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

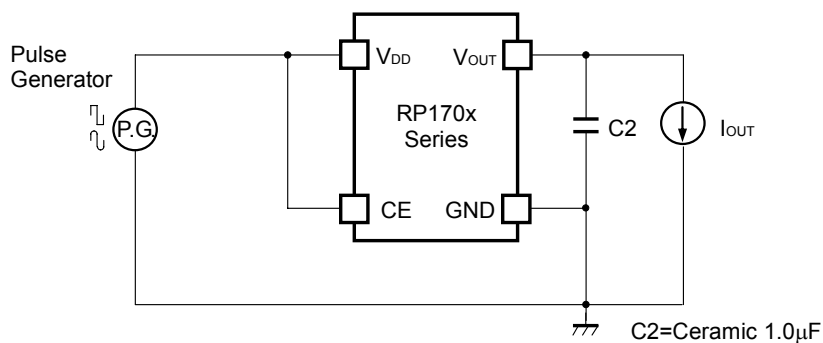
## TEST CIRCUITS



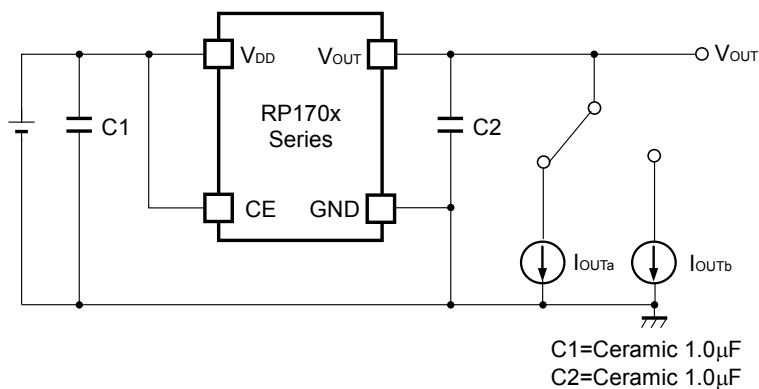
**Basic Test Circuit**



**Test Circuit for Supply Current**



**Test Circuit for Ripple Rejection**



**Test Circuit for Load Transient Response**

**RP170x**

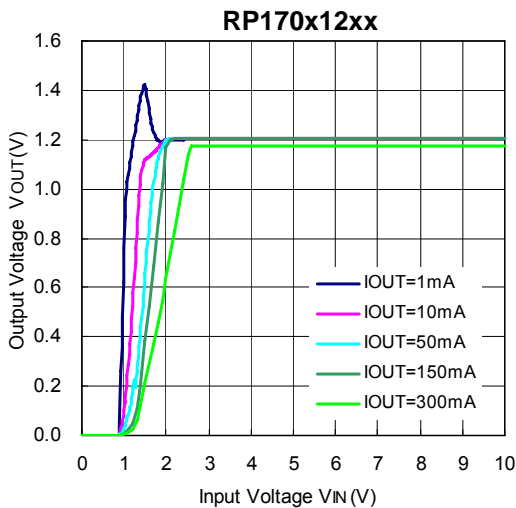
NO.EA-205-160425

**TYPICAL CHARACTERISTICS**

**1) Output Voltage vs. Output Current (T<sub>opt</sub>=25°C)**



**2) Output Voltage vs. Input Voltage (T<sub>opt</sub>=25°C)**

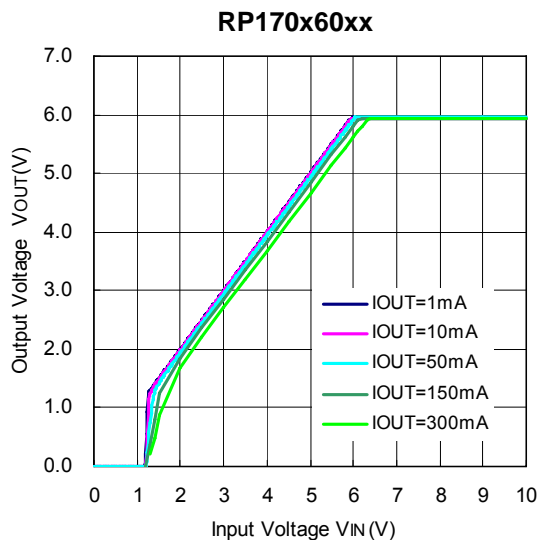




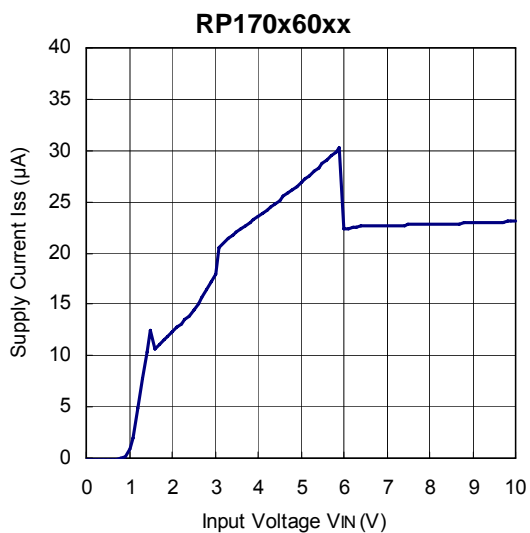
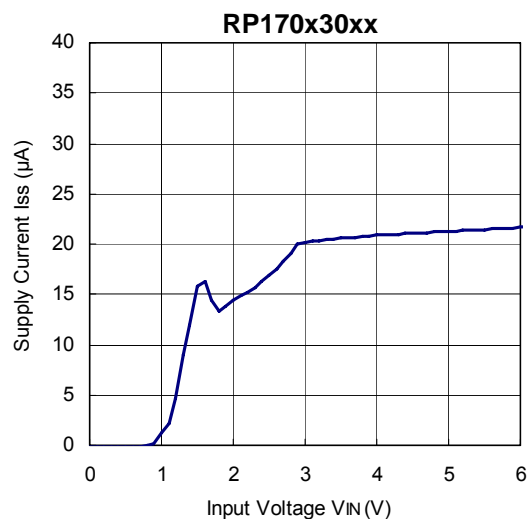
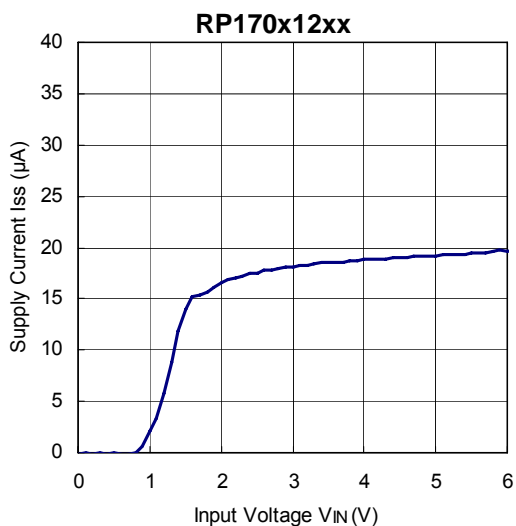
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### 3) Supply Current vs. Input Voltage ( $T_{opt}=25^{\circ}C$ )



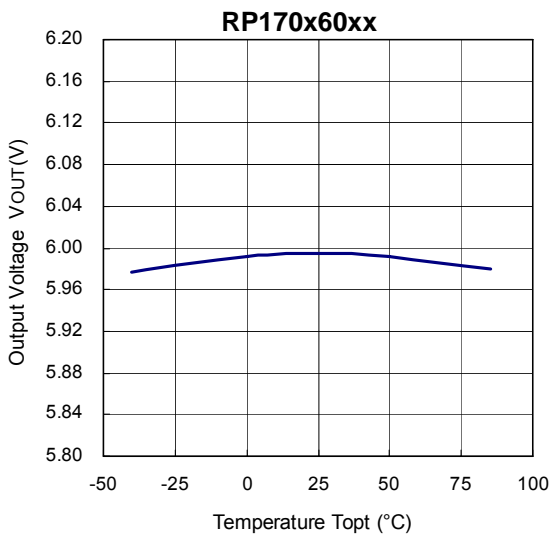
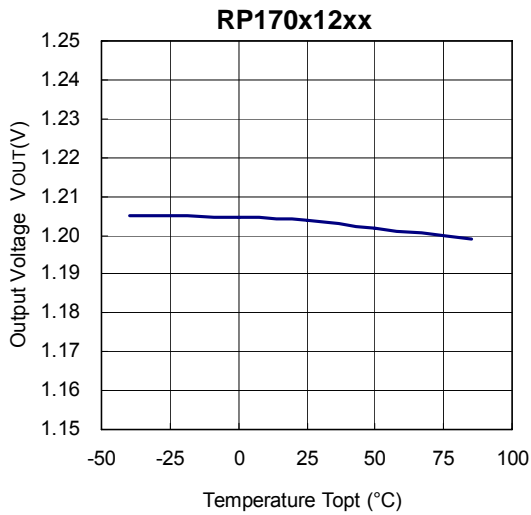
## RP170x

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### 4) Supply Current vs. Output Current (T<sub>opt</sub>=25°C)



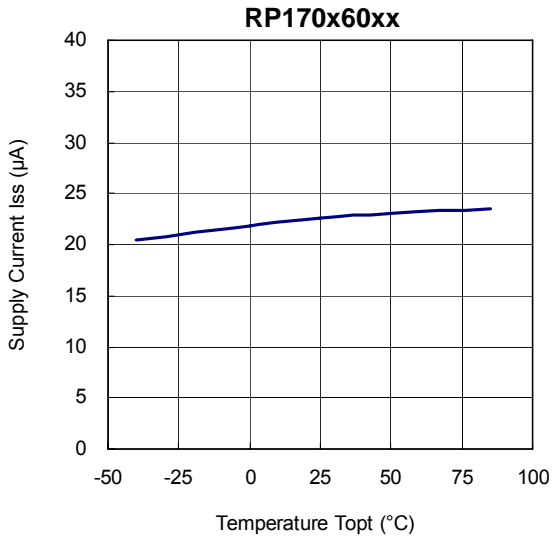
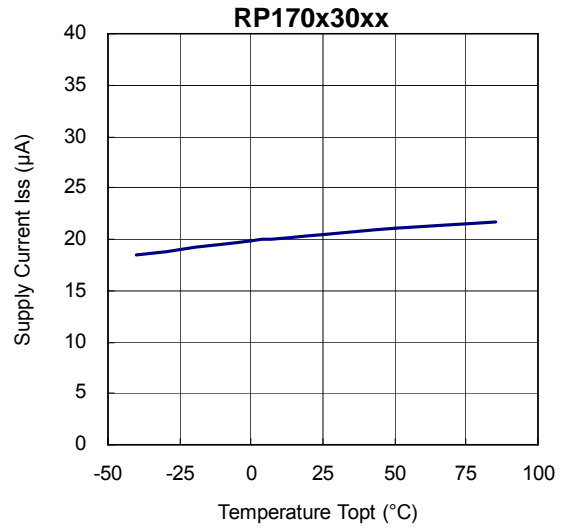
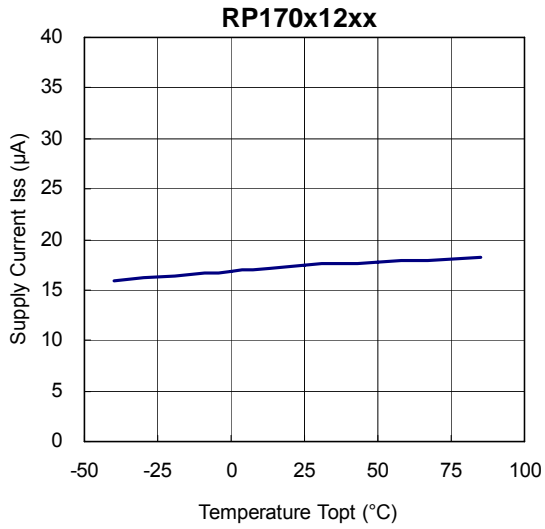
### 5) Output Voltage vs. Temperature



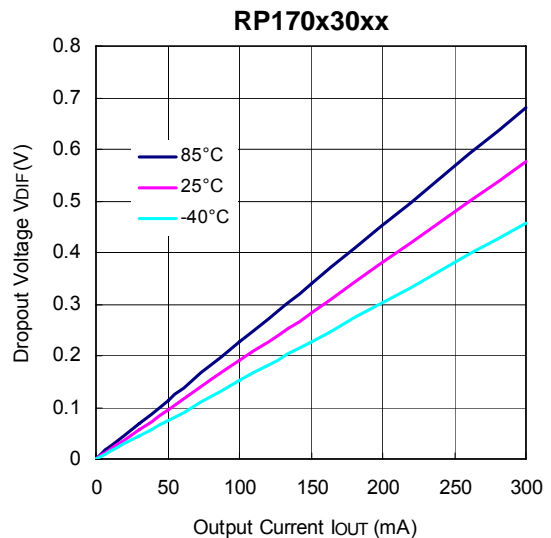
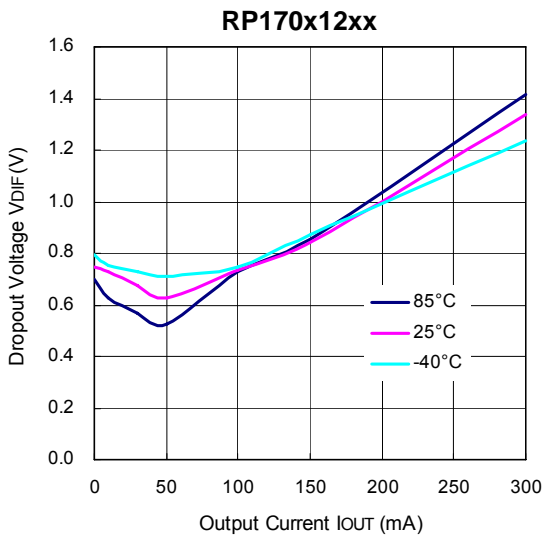
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## 6) Supply Current vs. Temperature

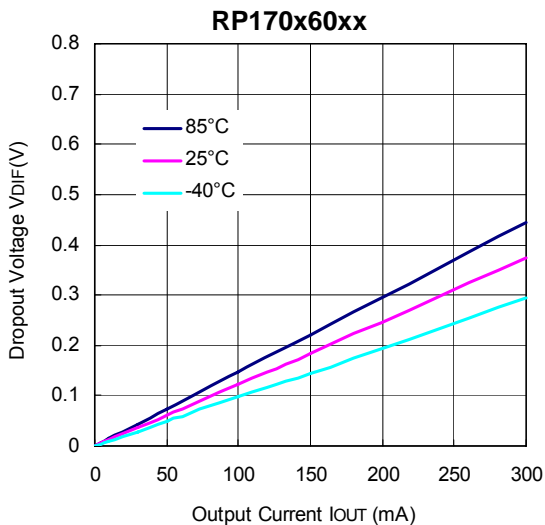


## 7) Dropout Voltage vs. Output Current

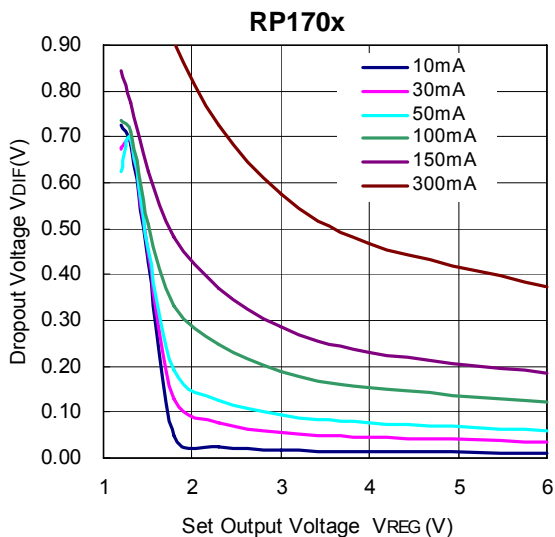


**RP170x**

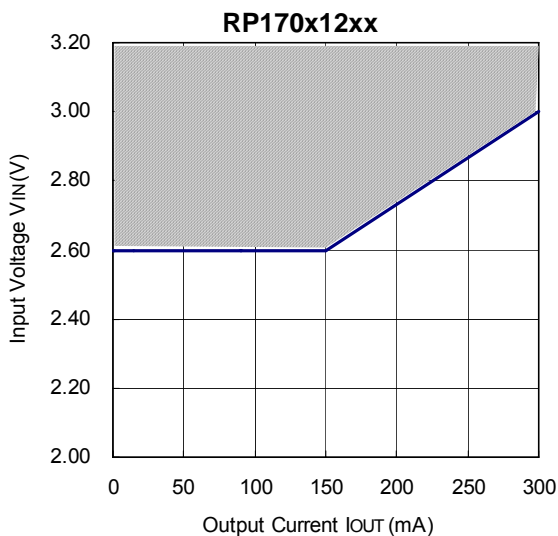
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**8) Dropout Voltage vs. Set Output Voltage ( $T_{opt}=25^{\circ}\text{C}$ )**

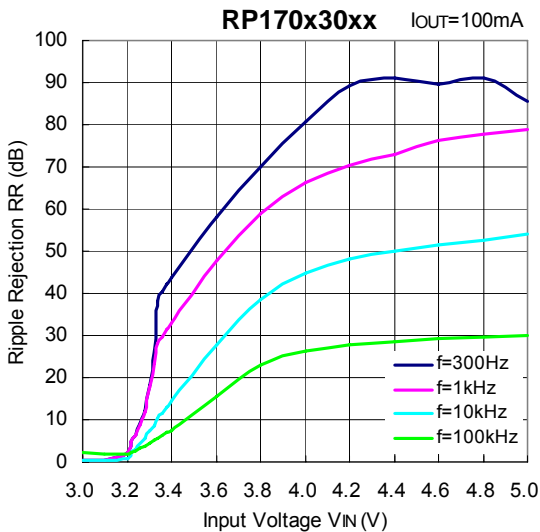
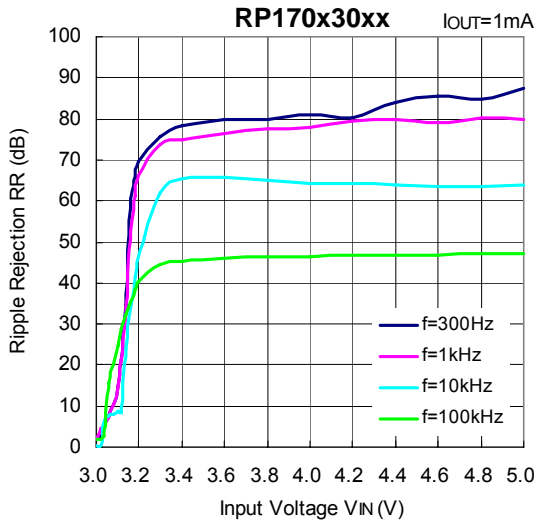


**9) Minimum Operating Voltage**

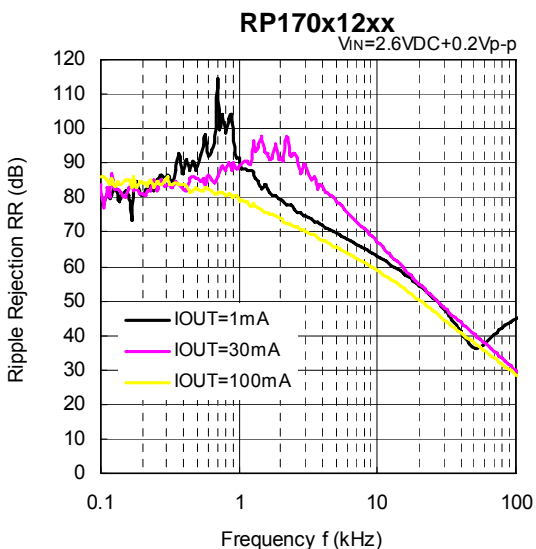


Hatched area is available for 1.2V output

10) Ripple Rejection vs. Input Bias Voltage (C1=none, C2=Ceramic 1.0 $\mu$ F, Ripple=0.2Vp-p, T<sub>opt</sub>=25°C)

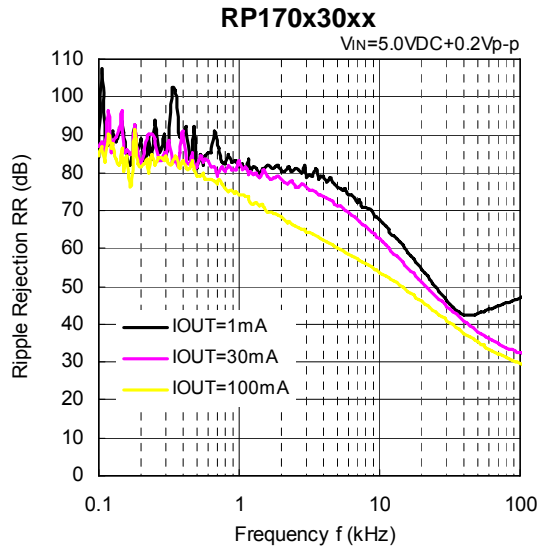
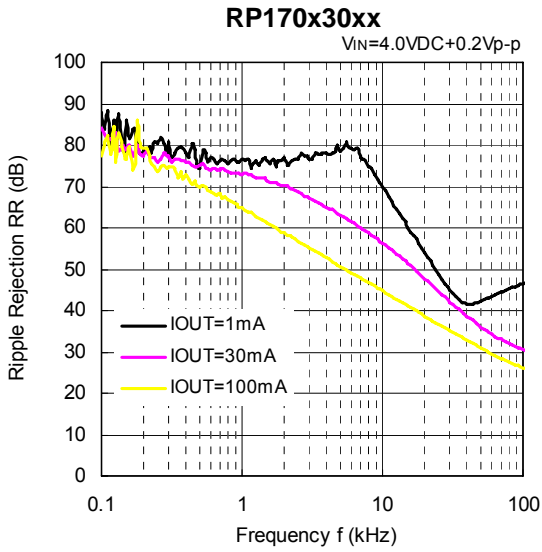


11) Ripple Rejection vs. Frequency (C1=none, C2=Ceramic 1.0 $\mu$ F, T<sub>opt</sub>=25°C)



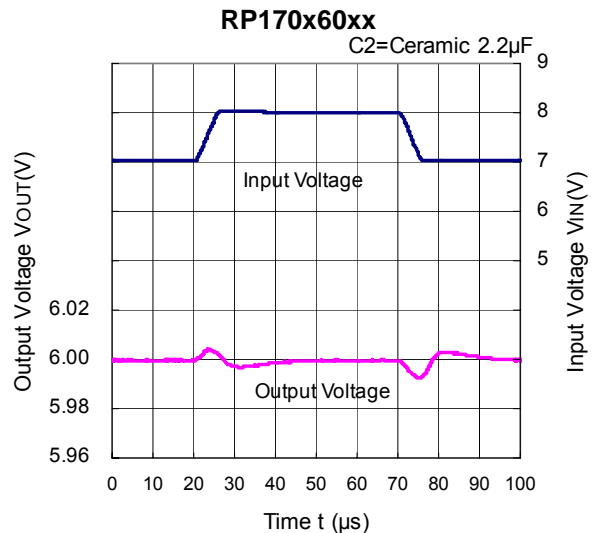
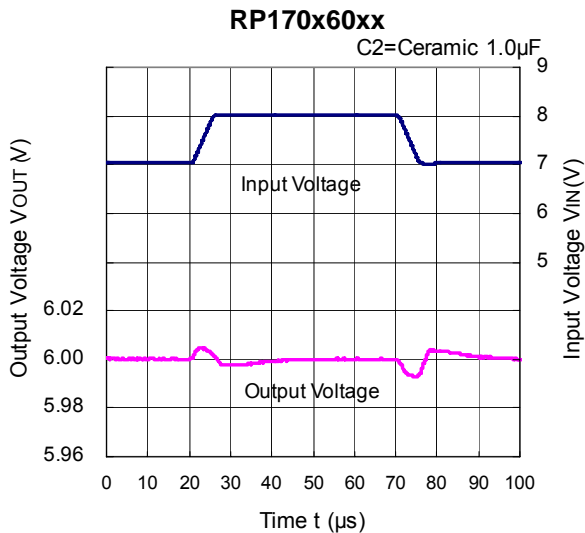
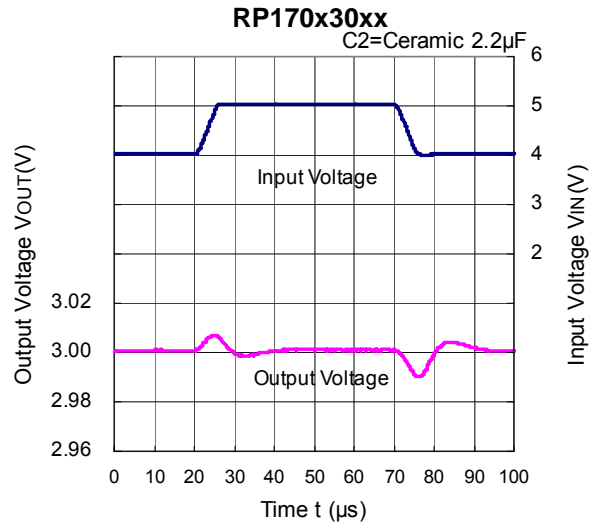
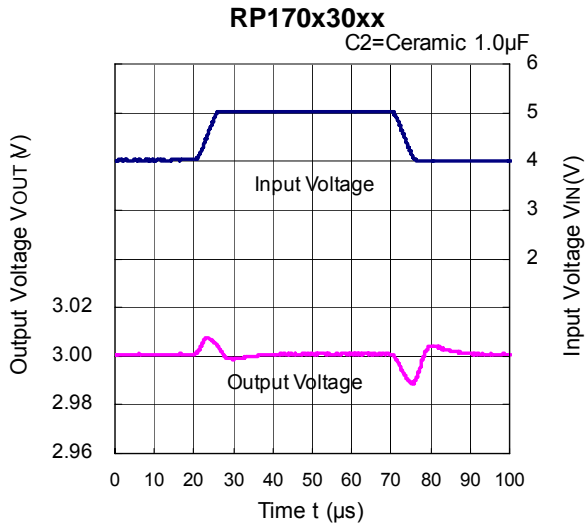
**RP170x**

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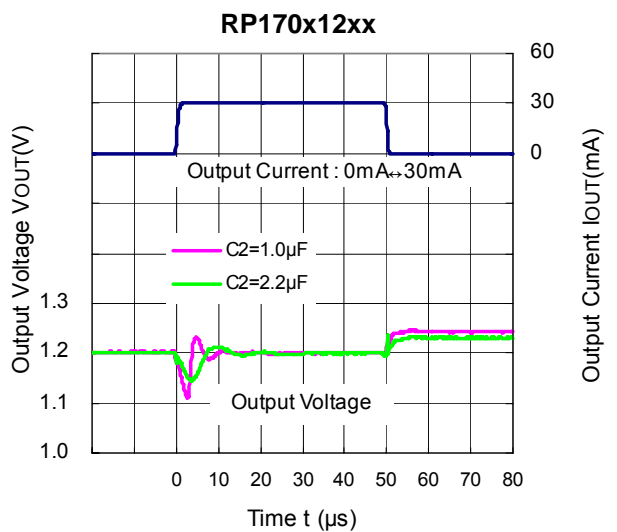


**12) Input Transient Response (C1=none, IOUT=30mA, tr=tf=5μs, Topt=25°C)**



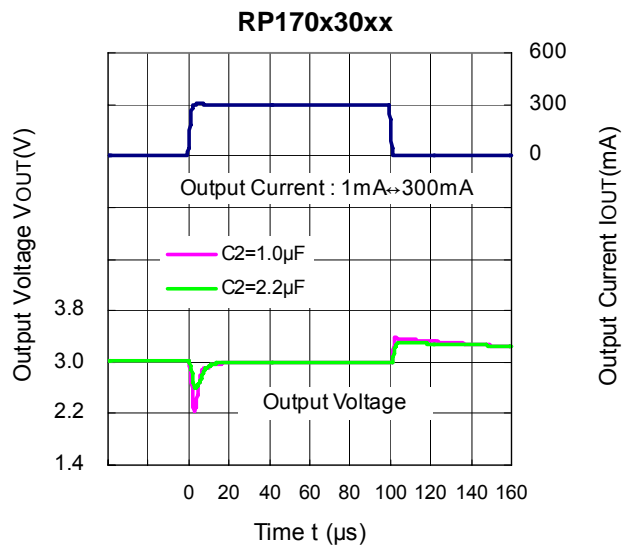
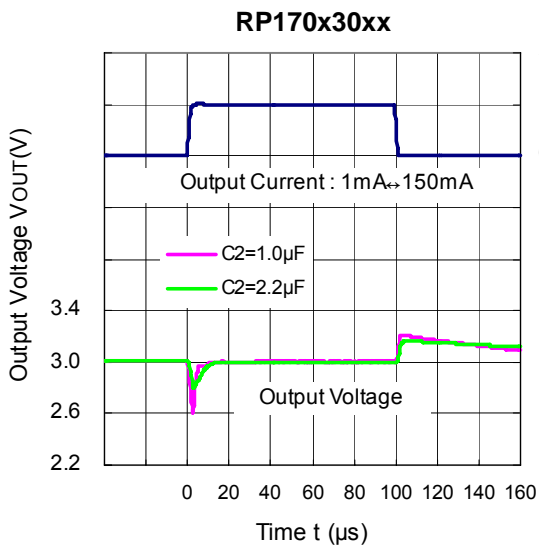
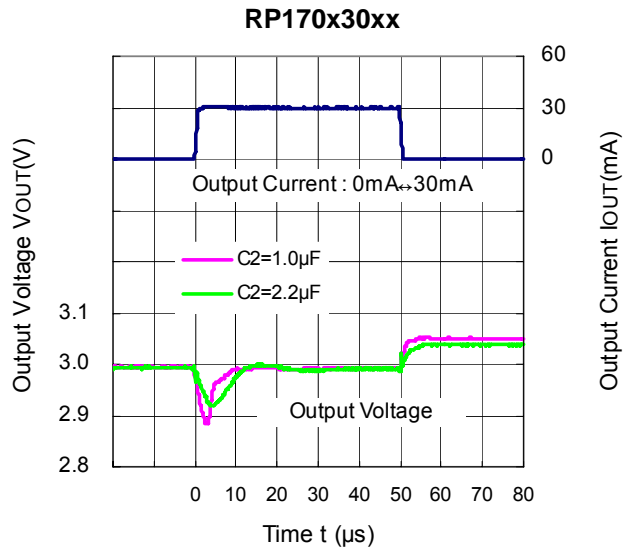
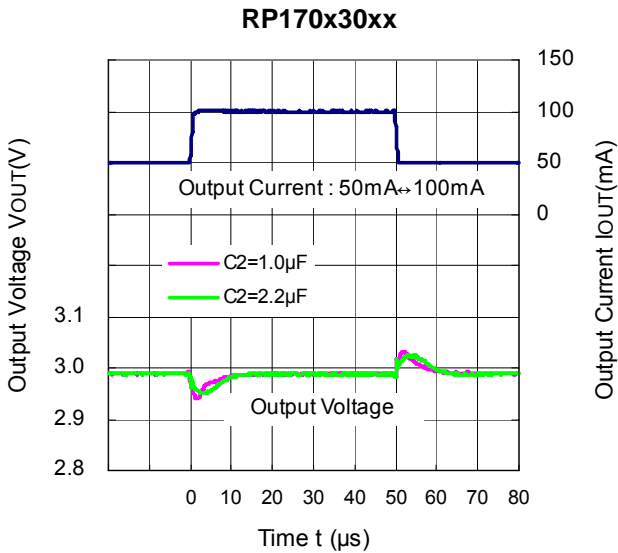
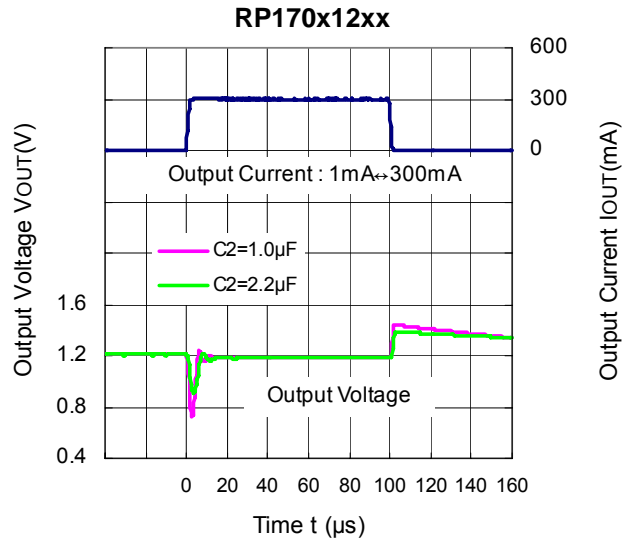
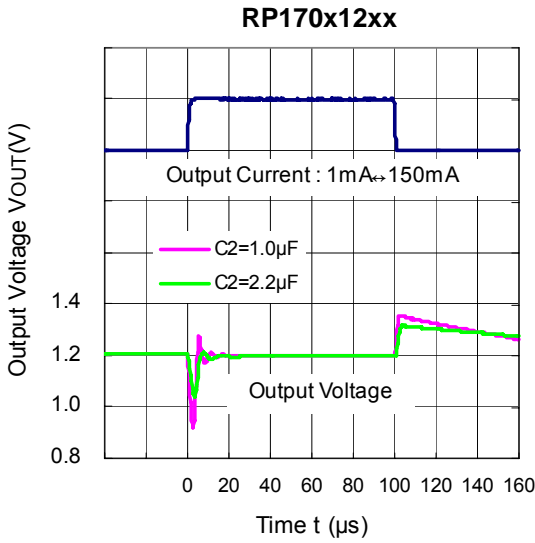


**13) Load Transient Response (C1=Ceramic 1.0 $\mu$ F,  $t_r=t_f=500ns$ ,  $T_{opt}=25^{\circ}C$ )**

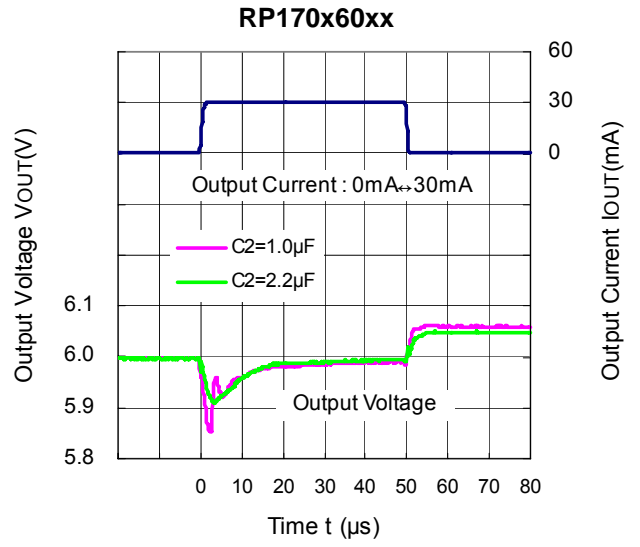
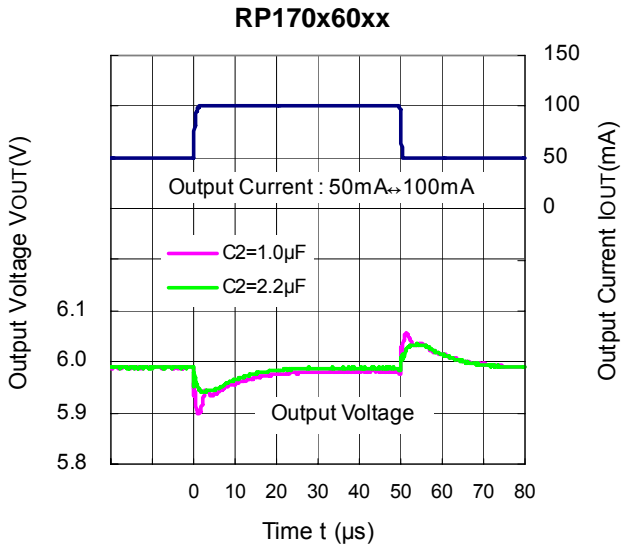


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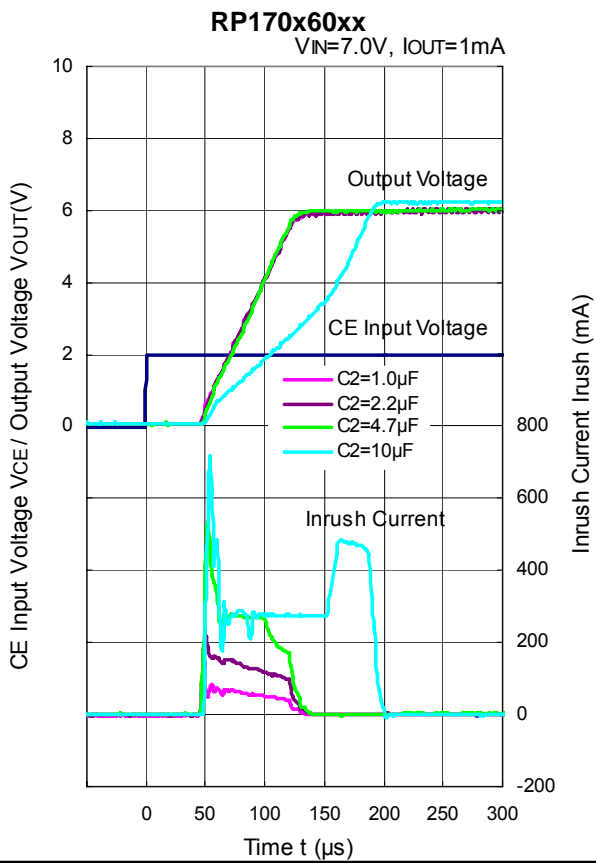
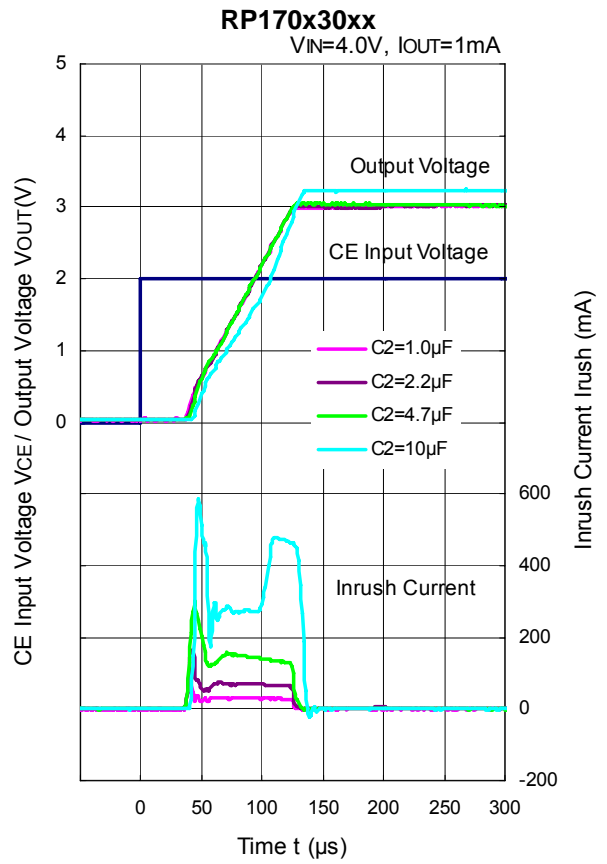
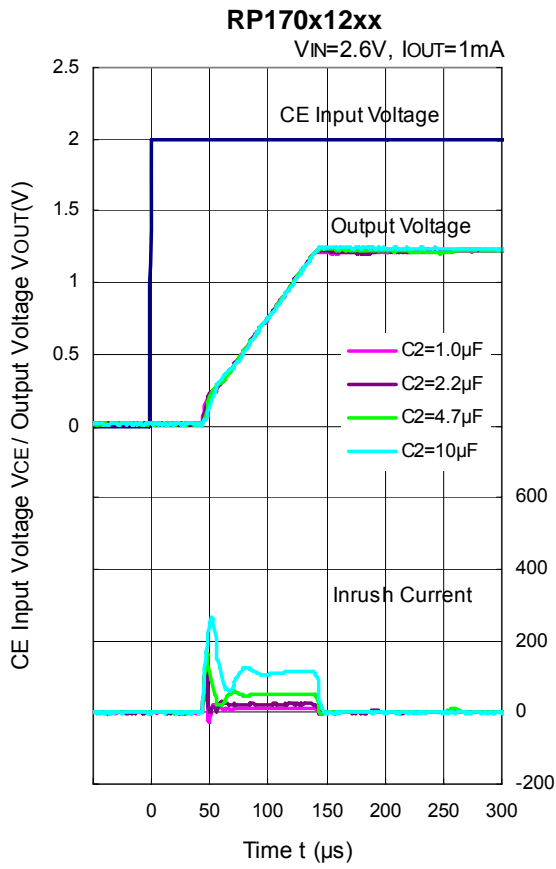


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**14) Turn On Speed with CE pin (C1=Ceramic 1.0μF, T<sub>opt</sub>=25°C)**



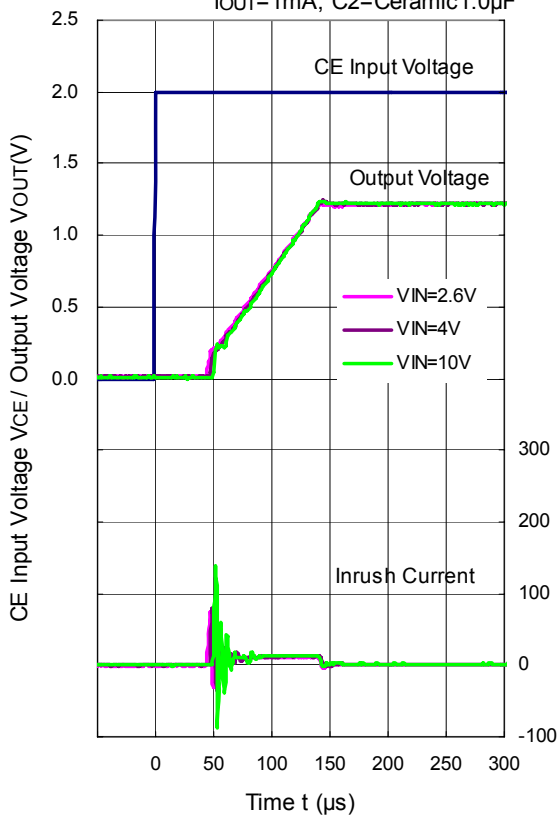


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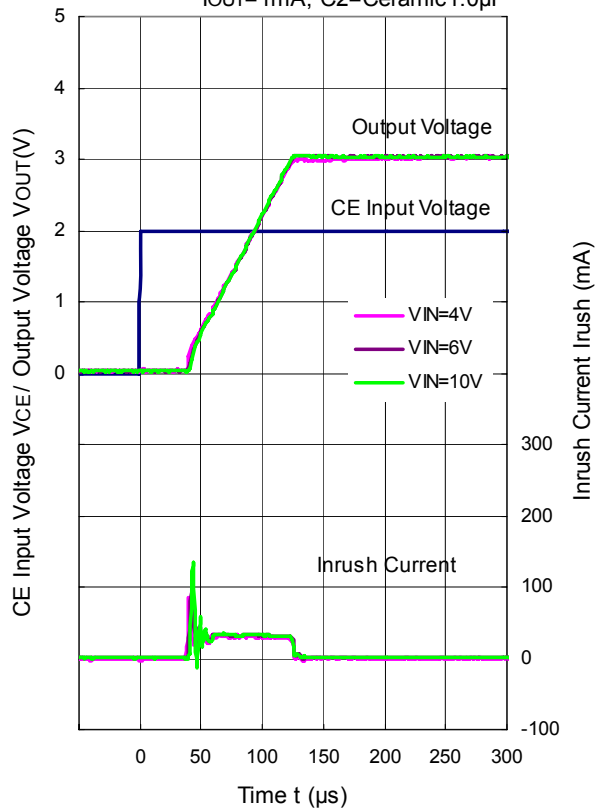
**RP170x12xx**

I<sub>OUT</sub>=1mA, C<sub>2</sub>=Ceramic1.0μF



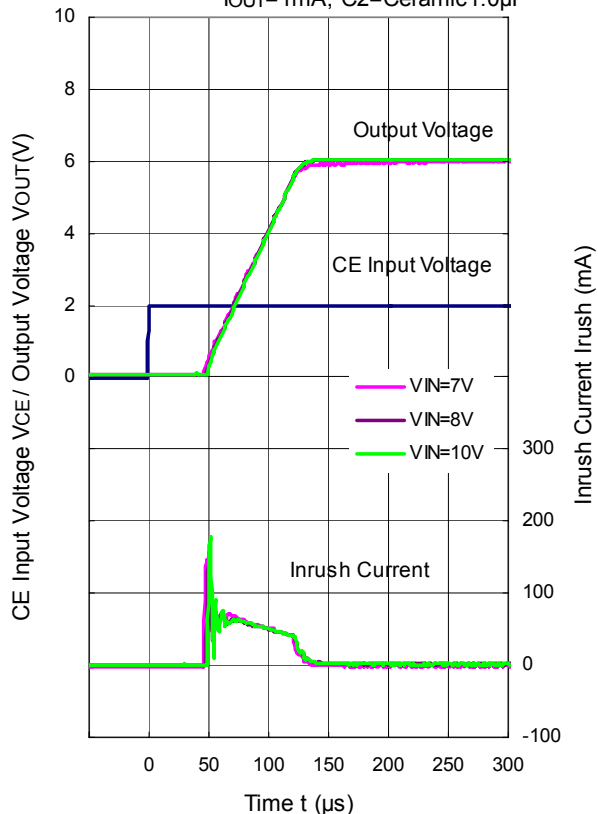
**RP170x30xx**

I<sub>OUT</sub>=1mA, C<sub>2</sub>=Ceramic1.0μF

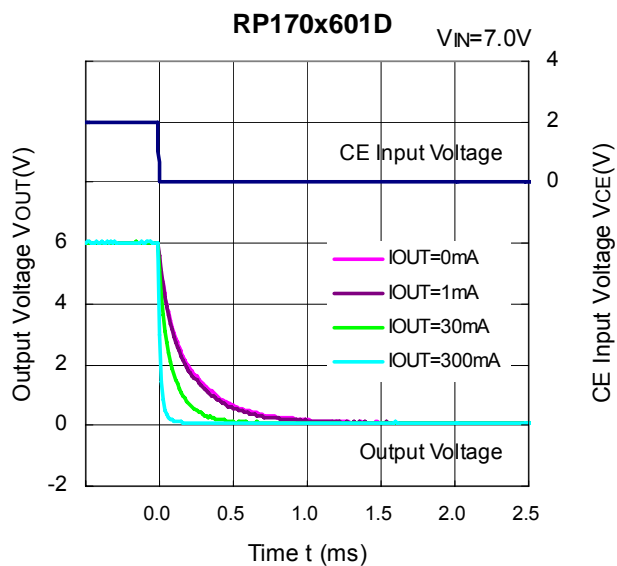


**RP170x60xx**

I<sub>OUT</sub>=1mA, C<sub>2</sub>=Ceramic1.0μF



15) Turn Off Speed with CE pin (D Version) (C1=Ceramic 1.0 $\mu$ F, T<sub>opt</sub>=25°C)



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NO.EA-205-160425

### ESR vs. Output Current

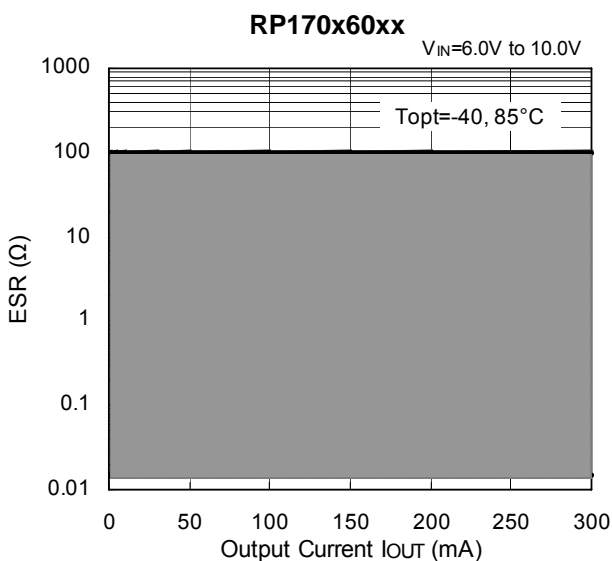
Ceramic type output capacitor is recommended for this series; however, the other output capacitors with low ESR also can be used. The relations between  $I_{OUT}$  (Output Current) and ESR of an output capacitor are shown below. The conditions when the white noise level is under  $40\mu\text{V}$  (Avg.) are marked as the hatched area in the graph.

#### Measurement conditions

Frequency Band : 10Hz to 2MHz

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

C1, C2 : Ceramic  $1.0\mu\text{F}$  (Murata GRM155B31A105KE)



## PACKAGE INFORMATION

### • Power Dissipation (SC-88A)

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

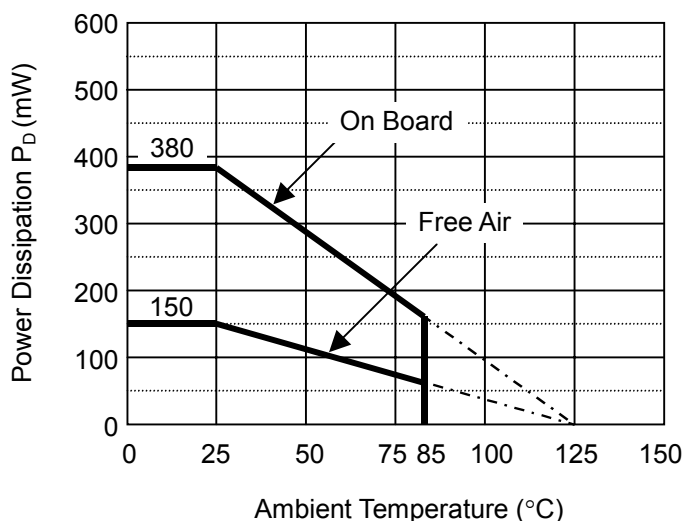
#### Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double Layers)
Board Dimensions	40mm × 40mm × 1.6mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-hole	φ0.5mm × 44pcs

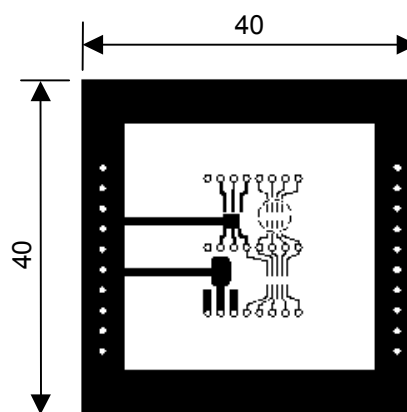
#### Measurement Result

( $T_a=25^\circ\text{C}$ ,  $T_{j\text{max}}=125^\circ\text{C}$ )

	Standard Land Pattern	Free Air
Power Dissipation	380mW	150mW
Thermal Resistance	$\theta_{ja}=(125-25^\circ\text{C})/0.38\text{W}=263^\circ\text{C/W}$ $\theta_{jc}=75^\circ\text{C/W}$	$\theta_{ja}=(125-25^\circ\text{C})/0.15\text{W}=667^\circ\text{C/W}$ -



Power Dissipation



Measurement Board Pattern

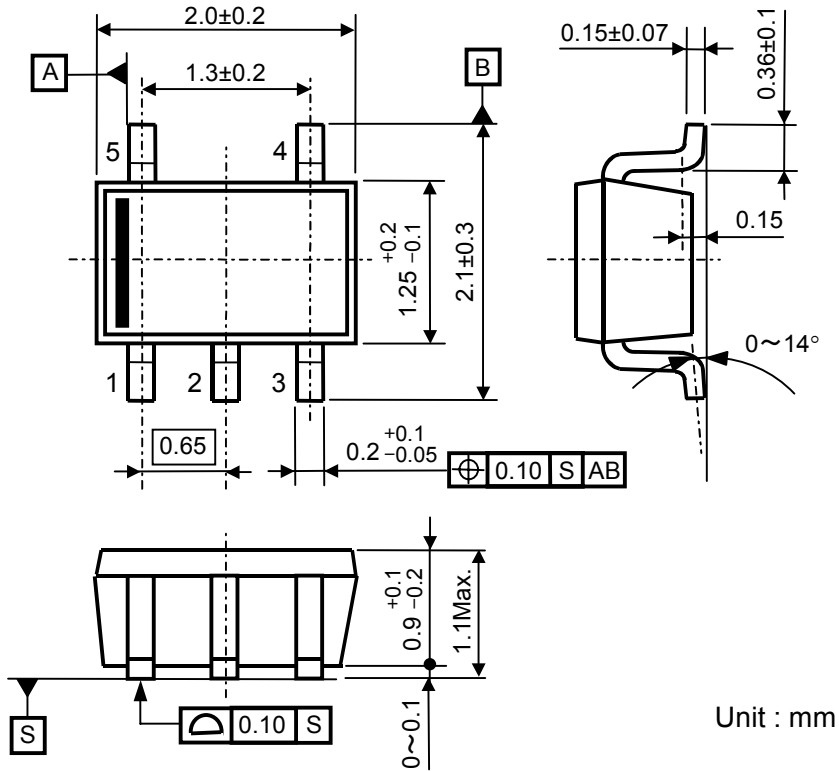
○ IC Mount Area (Unit : mm)

\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

**RP170x**

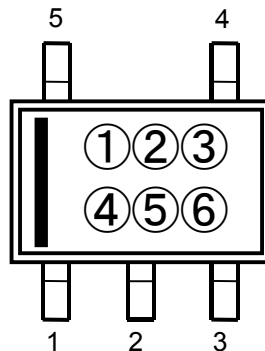
NO.EA-205-160425

● **Package Dimensions (SC-88A)**



● **Mark Specification (SC-88A)**

- ①②③④ : Product Code.....Refer to the marking list table
- ⑤⑥ : Lot No.....Alphanumeric serial number.





\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

**RP170x**

NO.EA-205-160425

## RP170Q Series marking list table

PKG: SC-88A (Non-promotion)

### RP170Qxx2B

Product Name	①②③④	Vset
RP170Q122B	<b>AA01</b>	1.2V
RP170Q132B	<b>AA03</b>	1.3V
RP170Q142B	<b>AA04</b>	1.4V
RP170Q152B	<b>AA05</b>	1.5V
RP170Q162B	<b>AA06</b>	1.6V
RP170Q172B	<b>AA07</b>	1.7V
RP170Q182B	<b>AA08</b>	1.8V
RP170Q192B	<b>AA10</b>	1.9V
RP170Q202B	<b>AA11</b>	2.0V
RP170Q212B	<b>AA12</b>	2.1V
RP170Q222B	<b>AA13</b>	2.2V
RP170Q232B	<b>AA14</b>	2.3V
RP170Q242B	<b>AA15</b>	2.4V
RP170Q252B	<b>AA16</b>	2.5V
RP170Q262B	<b>AA17</b>	2.6V
RP170Q272B	<b>AA18</b>	2.7V
RP170Q282B	<b>AA19</b>	2.8V
RP170Q292B	<b>AA21</b>	2.9V
RP170Q302B	<b>AA22</b>	3.0V

Product Name	①②③④	Vset
RP170Q312B	<b>AA23</b>	3.1V
RP170Q322B	<b>AA24</b>	3.2V
RP170Q332B	<b>AA25</b>	3.3V
RP170Q342B	<b>AA26</b>	3.4V
RP170Q352B	<b>AA27</b>	3.5V
RP170Q362B	<b>AA28</b>	3.6V
RP170Q372B	<b>AA29</b>	3.7V
RP170Q382B	<b>AA30</b>	3.8V
RP170Q392B	<b>AA31</b>	3.9V
RP170Q402B	<b>AA32</b>	4.0V
RP170Q412B	<b>AA33</b>	4.1V
RP170Q422B	<b>AA34</b>	4.2V
RP170Q432B	<b>AA35</b>	4.3V
RP170Q442B	<b>AA36</b>	4.4V
RP170Q452B	<b>AA37</b>	4.5V
RP170Q462B	<b>AA38</b>	4.6V
RP170Q472B	<b>AA39</b>	4.7V
RP170Q482B	<b>AA40</b>	4.8V
RP170Q492B	<b>AA41</b>	4.9V
RP170Q502B	<b>AA42</b>	5.0V

Product Name	①②③④	Vset
RP170Q512B	<b>AA43</b>	5.1V
RP170Q522B	<b>AA44</b>	5.2V
RP170Q532B	<b>AA45</b>	5.3V
RP170Q542B	<b>AA46</b>	5.4V
RP170Q552B	<b>AA47</b>	5.5V
RP170Q562B	<b>AA48</b>	5.6V
RP170Q572B	<b>AA49</b>	5.7V
RP170Q582B	<b>AA50</b>	5.8V
RP170Q592B	<b>AA51</b>	5.9V
RP170Q602B	<b>AA52</b>	6.0V
RP170Q122B5	<b>AA02</b>	1.25V
RP170Q182B5	<b>AA09</b>	1.85V
RP170Q282B5	<b>AA20</b>	2.85V

### RP170Qxx2D

Product Name	①②③④	Vset
RP170Q122D	<b>AB01</b>	1.2V
RP170Q132D	<b>AB03</b>	1.3V
RP170Q142D	<b>AB04</b>	1.4V
RP170Q152D	<b>AB05</b>	1.5V
RP170Q162D	<b>AB06</b>	1.6V
RP170Q172D	<b>AB07</b>	1.7V
RP170Q182D	<b>AB08</b>	1.8V
RP170Q192D	<b>AB10</b>	1.9V
RP170Q202D	<b>AB11</b>	2.0V
RP170Q212D	<b>AB12</b>	2.1V
RP170Q222D	<b>AB13</b>	2.2V
RP170Q232D	<b>AB14</b>	2.3V
RP170Q242D	<b>AB15</b>	2.4V
RP170Q252D	<b>AB16</b>	2.5V
RP170Q262D	<b>AB17</b>	2.6V
RP170Q272D	<b>AB18</b>	2.7V
RP170Q282D	<b>AB19</b>	2.8V
RP170Q292D	<b>AB21</b>	2.9V
RP170Q302D	<b>AB22</b>	3.0V

Product Name	①②③④	Vset
RP170Q312D	<b>AB23</b>	3.1V
RP170Q322D	<b>AB24</b>	3.2V
RP170Q332D	<b>AB25</b>	3.3V
RP170Q342D	<b>AB26</b>	3.4V
RP170Q352D	<b>AB27</b>	3.5V
RP170Q362D	<b>AB28</b>	3.6V
RP170Q372D	<b>AB29</b>	3.7V
RP170Q382D	<b>AB30</b>	3.8V
RP170Q392D	<b>AB31</b>	3.9V
RP170Q402D	<b>AB32</b>	4.0V
RP170Q412D	<b>AB33</b>	4.1V
RP170Q422D	<b>AB34</b>	4.2V
RP170Q432D	<b>AB35</b>	4.3V
RP170Q442D	<b>AB36</b>	4.4V
RP170Q452D	<b>AB37</b>	4.5V
RP170Q462D	<b>AB38</b>	4.6V
RP170Q472D	<b>AB39</b>	4.7V
RP170Q482D	<b>AB40</b>	4.8V
RP170Q492D	<b>AB41</b>	4.9V
RP170Q502D	<b>AB42</b>	5.0V

Product Name	①②③④	Vset
RP170Q512D	<b>AB43</b>	5.1V
RP170Q522D	<b>AB44</b>	5.2V
RP170Q532D	<b>AB45</b>	5.3V
RP170Q542D	<b>AB46</b>	5.4V
RP170Q552D	<b>AB47</b>	5.5V
RP170Q562D	<b>AB48</b>	5.6V
RP170Q572D	<b>AB49</b>	5.7V
RP170Q582D	<b>AB50</b>	5.8V
RP170Q592D	<b>AB51</b>	5.9V
RP170Q602D	<b>AB52</b>	6.0V
RP170Q122D5	<b>AB02</b>	1.25V
RP170Q182D5	<b>AB09</b>	1.85V
RP170Q282D5	<b>AB20</b>	2.85V

\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

## RP170x

NO.EA-205-160425

### • Power Dissipation (SOT-23-5)

Power Dissipation ( $P_D$ ) depends on conditions of mounting on board. This specification is based on the measurement at the condition below. (Power Dissipation (SOT-23-5) is substitution of SOT-23-6.)

#### Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity=0m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	40mm x 40mm x 1.6mm
Copper Ratio	Topside: Approx. 50%, Backside: Approx. 50%
Through-holes	$\phi$ 0.5mm x 44pcs

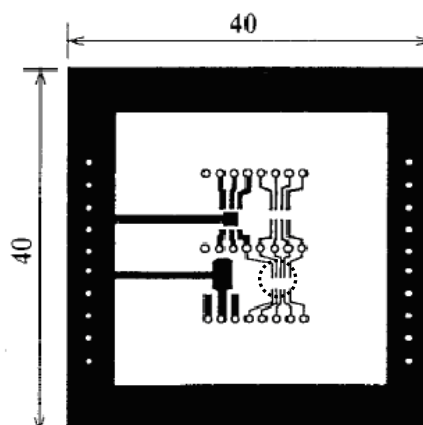
#### Measurement Result

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

	Standard Land Pattern	Free Air
Power Dissipation	420mW ( $T_{j\max}=125^\circ\text{C}$ ) 525mW ( $T_{j\max}=150^\circ\text{C}$ )	250mW ( $T_{j\max}=125^\circ\text{C}$ )
Thermal Resistance	$\theta_{ja} = (125-25^\circ\text{C})/0.42\text{W} = 238^\circ\text{C/W}$	400 $^\circ\text{C/W}$



Power Dissipation



Measurement Board Pattern

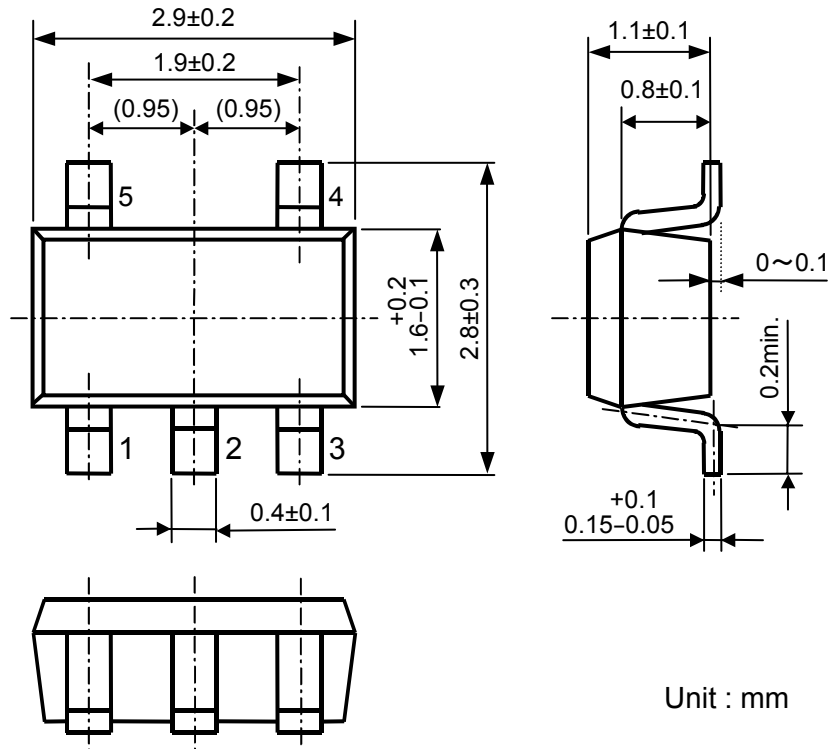
○ IC Mount Area (Unit: mm)

The above graph shows the Power Dissipation of the package based on  $T_{j\max}=125^\circ\text{C}$  and  $T_{j\max}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence it's lifetime.

Operating time must be within the time limit described in the table below, in case of operating in the shaded area.

Operating Time	Estimated years (Operating 4 hours/day)
9,000 hours	6 years

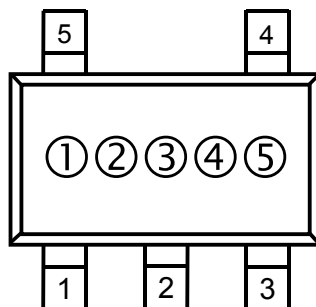
• Package Dimensions (SOT-23-5)



• Mark Specification (SOT-23-5)

①②③: Product Code ... Refer to the marking list table

④⑤: Lot No. ... Alphanumeric Serial Number



\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

## RP170x

NO.EA-205-160425

# RP170N Series marking list table

PKG: SOT-23-5

### RP170Nxx1B

Product Name	①②③	Vset
RP170N121B	<b>FAA</b>	1.2V
RP170N131B	<b>FAC</b>	1.3V
RP170N141B	<b>FAD</b>	1.4V
RP170N151B	<b>FAE</b>	1.5V
RP170N161B	<b>FAF</b>	1.6V
RP170N171B	<b>FAG</b>	1.7V
RP170N181B	<b>FAH</b>	1.8V
RP170N191B	<b>FAK</b>	1.9V
RP170N201B	<b>FAL</b>	2.0V
RP170N211B	<b>FAM</b>	2.1V
RP170N221B	<b>FAN</b>	2.2V
RP170N231B	<b>FAP</b>	2.3V
RP170N241B	<b>FAQ</b>	2.4V
RP170N251B	<b>FAR</b>	2.5V
RP170N261B	<b>FAS</b>	2.6V
RP170N271B	<b>FAT</b>	2.7V
RP170N281B	<b>FAU</b>	2.8V
RP170N291B	<b>FAW</b>	2.9V
RP170N301B	<b>FAX</b>	3.0V

Product Name	①②③	Vset
RP170N311B	<b>FAY</b>	3.1V
RP170N321B	<b>FAZ</b>	3.2V
RP170N331B	<b>GAA</b>	3.3V
RP170N341B	<b>GAB</b>	3.4V
RP170N351B	<b>GAC</b>	3.5V
RP170N361B	<b>GAD</b>	3.6V
RP170N371B	<b>GAE</b>	3.7V
RP170N381B	<b>GAF</b>	3.8V
RP170N391B	<b>GAG</b>	3.9V
RP170N401B	<b>GAH</b>	4.0V
RP170N411B	<b>GAJ</b>	4.1V
RP170N421B	<b>GAK</b>	4.2V
RP170N431B	<b>GAL</b>	4.3V
RP170N441B	<b>GAM</b>	4.4V
RP170N451B	<b>GAN</b>	4.5V
RP170N461B	<b>GAP</b>	4.6V
RP170N471B	<b>GAQ</b>	4.7V
RP170N481B	<b>GAR</b>	4.8V
RP170N491B	<b>GAS</b>	4.9V
RP170N501B	<b>GAT</b>	5.0V

Product Name	①②③	Vset
RP170N511B	<b>GAU</b>	5.1V
RP170N521B	<b>GAV</b>	5.2V
RP170N531B	<b>GAW</b>	5.3V
RP170N541B	<b>GAX</b>	5.4V
RP170N551B	<b>GAY</b>	5.5V
RP170N561B	<b>GAZ</b>	5.6V
RP170N571B	<b>HAA</b>	5.7V
RP170N581B	<b>HAB</b>	5.8V
RP170N591B	<b>HAC</b>	5.9V
RP170N601B	<b>HAD</b>	6.0V
RP170N121B5	<b>FAB</b>	1.25V
RP170N181B5	<b>FAJ</b>	1.85V
RP170N281B5	<b>FAV</b>	2.85V

### RP170Nxx1D

Product Name	①②③	Vset
RP170N121D	<b>FBA</b>	1.2V
RP170N131D	<b>FBC</b>	1.3V
RP170N141D	<b>FBD</b>	1.4V
RP170N151D	<b>FBE</b>	1.5V
RP170N161D	<b>FBF</b>	1.6V
RP170N171D	<b>FBG</b>	1.7V
RP170N181D	<b>FBH</b>	1.8V
RP170N191D	<b>FBK</b>	1.9V
RP170N201D	<b>FBL</b>	2.0V
RP170N211D	<b>FBM</b>	2.1V
RP170N221D	<b>FBN</b>	2.2V
RP170N231D	<b>FBP</b>	2.3V
RP170N241D	<b>FBQ</b>	2.4V
RP170N251D	<b>FBR</b>	2.5V
RP170N261D	<b>FBS</b>	2.6V
RP170N271D	<b>FBT</b>	2.7V
RP170N281D	<b>FBU</b>	2.8V
RP170N291D	<b>FBW</b>	2.9V
RP170N301D	<b>FBX</b>	3.0V

Product Name	①②③	Vset
RP170N311D	<b>FBY</b>	3.1V
RP170N321D	<b>FBZ</b>	3.2V
RP170N331D	<b>GBA</b>	3.3V
RP170N341D	<b>GBB</b>	3.4V
RP170N351D	<b>GBC</b>	3.5V
RP170N361D	<b>GBD</b>	3.6V
RP170N371D	<b>GBE</b>	3.7V
RP170N381D	<b>GBF</b>	3.8V
RP170N391D	<b>GBG</b>	3.9V
RP170N401D	<b>GBH</b>	4.0V
RP170N411D	<b>GBJ</b>	4.1V
RP170N421D	<b>GBK</b>	4.2V
RP170N431D	<b>GBL</b>	4.3V
RP170N441D	<b>GBM</b>	4.4V
RP170N451D	<b>GBN</b>	4.5V
RP170N461D	<b>GBP</b>	4.6V
RP170N471D	<b>GBQ</b>	4.7V
RP170N481D	<b>GBR</b>	4.8V
RP170N491D	<b>GBS</b>	4.9V
RP170N501D	<b>GBT</b>	5.0V

Product Name	①②③	Vset
RP170N511D	<b>GBU</b>	5.1V
RP170N521D	<b>GBV</b>	5.2V
RP170N531D	<b>GBW</b>	5.3V
RP170N541D	<b>GBX</b>	5.4V
RP170N551D	<b>GBY</b>	5.5V
RP170N561D	<b>GBZ</b>	5.6V
RP170N571D	<b>HBA</b>	5.7V
RP170N581D	<b>HBB</b>	5.8V
RP170N591D	<b>HBC</b>	5.9V
RP170N601D	<b>HBD</b>	6.0V
RP170N121D5	<b>FBB</b>	1.25V
RP170N181D5	<b>FBJ</b>	1.85V
RP170N281D5	<b>FBV</b>	2.85V

\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

**RP170x**

NO.EA-205-160425

● **Power Dissipation (SOT-89-5)**

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

Measurement Conditions

	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double-sided)	Glass cloth epoxy plastic (Double-sided)
Board Dimensions	30mm * 30mm * 1.6mm	50mm * 50mm * 1.6mm
Copper Ratio	Top side: Approx. 20% Back side: Approx. 100%	Top side: Approx. 10% Back side: Approx. 100%
Through-hole	$\phi 0.85\text{mm} * 10\text{pcs}$	-

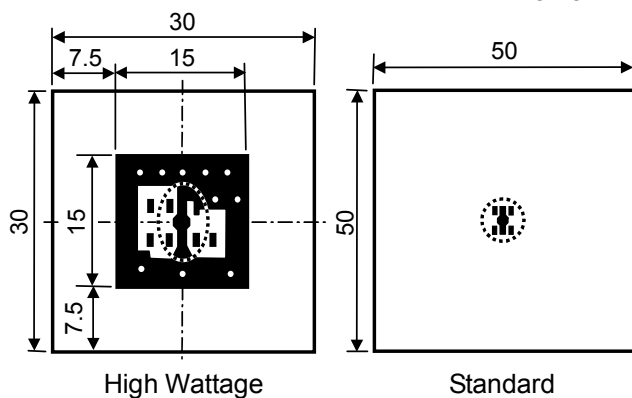
Measurement Result

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

	High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	1300mW	900mW ( $T_{j\max}=125^\circ\text{C}$ ) 1125mW ( $T_{j\max}=150^\circ\text{C}$ )	500mW
Thermal Resistance	$77^\circ\text{C/W}$	$111^\circ\text{C/W}$	$200^\circ\text{C/W}$



**Power Dissipation**



**Measurement Board Pattern**

○ IC Mount Area Unit: mm

- The above graph shows the Power Dissipation of the package based on  $T_{j\max}=125^\circ\text{C}$  and  $T_{j\max}=150^\circ\text{C}$ .

Operating the IC in the shaded area in the graph might have an influence it's lifetime.

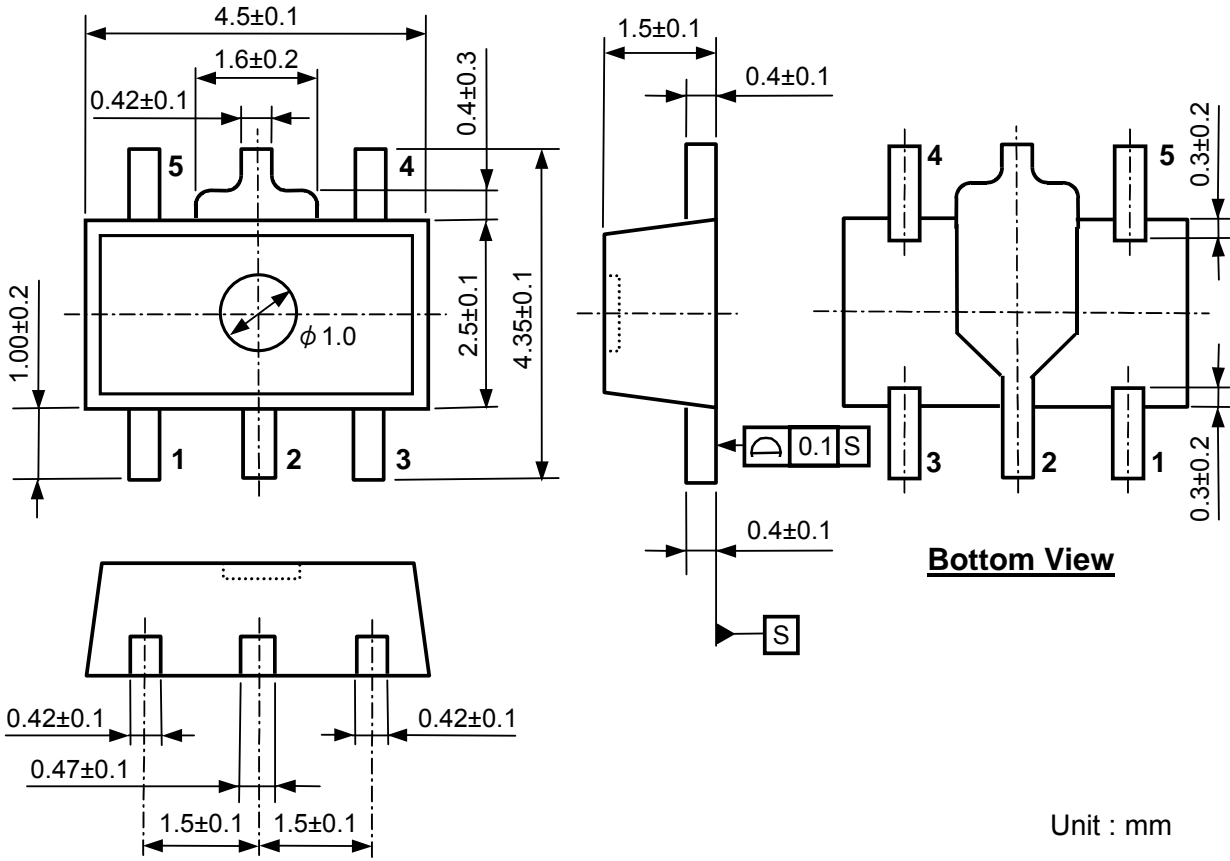
Operating time must be within the time limit described in the table below, in case of operating in the shaded area.

Operating Time	Estimated years (Operating four hours/day)
9,000 hours	6years

**RP170x**

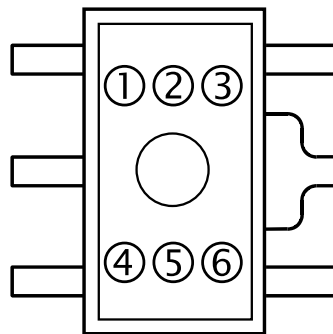
NO.EA-205-160425

• **Package Dimensions (SOT-89-5)**



• **Mark Specification (SOT-89-5)**

- ①②③④ : Product Code.....Refer to the mark list table
- ⑤⑥ : Lot No. ....Alphanumeric serial number.



\* RP170Q (SC-88A) is the discontinued product as of April, 2016.

**RP170x**

NO.EA-205-160425

## RP170H Series marking list table

PKG: SOT-89-5

### RP170Hxx1B

Product Name	①②③④	Vset
RP170H121B	<b>Y12B</b>	1.2V
RP170H131B	<b>Y13B</b>	1.3V
RP170H141B	<b>Y14B</b>	1.4V
RP170H151B	<b>Y15B</b>	1.5V
RP170H161B	<b>Y16B</b>	1.6V
RP170H171B	<b>Y17B</b>	1.7V
RP170H181B	<b>Y18B</b>	1.8V
RP170H191B	<b>Y19B</b>	1.9V
RP170H201B	<b>Y20B</b>	2.0V
RP170H211B	<b>Y21B</b>	2.1V
RP170H221B	<b>Y22B</b>	2.2V
RP170H231B	<b>Y23B</b>	2.3V
RP170H241B	<b>Y24B</b>	2.4V
RP170H251B	<b>Y25B</b>	2.5V
RP170H261B	<b>Y26B</b>	2.6V
RP170H271B	<b>Y27B</b>	2.7V
RP170H281B	<b>Y28B</b>	2.8V
RP170H291B	<b>Y29B</b>	2.9V
RP170H301B	<b>Y30B</b>	3.0V

Product Name	①②③④	Vset
RP170H311B	<b>Y31B</b>	3.1V
RP170H321B	<b>Y32B</b>	3.2V
RP170H331B	<b>Y33B</b>	3.3V
RP170H341B	<b>Y34B</b>	3.4V
RP170H351B	<b>Y35B</b>	3.5V
RP170H361B	<b>Y36B</b>	3.6V
RP170H371B	<b>Y37B</b>	3.7V
RP170H381B	<b>Y38B</b>	3.8V
RP170H391B	<b>Y39B</b>	3.9V
RP170H401B	<b>Y40B</b>	4.0V
RP170H411B	<b>Y41B</b>	4.1V
RP170H421B	<b>Y42B</b>	4.2V
RP170H431B	<b>Y43B</b>	4.3V
RP170H441B	<b>Y44B</b>	4.4V
RP170H451B	<b>Y45B</b>	4.5V
RP170H461B	<b>Y46B</b>	4.6V
RP170H471B	<b>Y47B</b>	4.7V
RP170H481B	<b>Y48B</b>	4.8V
RP170H491B	<b>Y49B</b>	4.9V
RP170H501B	<b>Y50B</b>	5.0V

Product Name	①②③④	Vset
RP170H511B	<b>Y51B</b>	5.1V
RP170H521B	<b>Y52B</b>	5.2V
RP170H531B	<b>Y53B</b>	5.3V
RP170H541B	<b>Y54B</b>	5.4V
RP170H551B	<b>Y55B</b>	5.5V
RP170H561B	<b>Y56B</b>	5.6V
RP170H571B	<b>Y57B</b>	5.7V
RP170H581B	<b>Y58B</b>	5.8V
RP170H591B	<b>Y59B</b>	5.9V
RP170H601B	<b>Y60B</b>	6.0V
RP170H121B5	<b>Y01B</b>	1.25V
RP170H181B5	<b>Y02B</b>	1.85V
RP170H281B5	<b>Y03B</b>	2.85V

### RP170Hxx1D

Product Name	①②③④	Vset
RP170H121D	<b>Y12D</b>	1.2V
RP170H131D	<b>Y13D</b>	1.3V
RP170H141D	<b>Y14D</b>	1.4V
RP170H151D	<b>Y15D</b>	1.5V
RP170H161D	<b>Y16D</b>	1.6V
RP170H171D	<b>Y17D</b>	1.7V
RP170H181D	<b>Y18D</b>	1.8V
RP170H191D	<b>Y19D</b>	1.9V
RP170H201D	<b>Y20D</b>	2.0V
RP170H211D	<b>Y21D</b>	2.1V
RP170H221D	<b>Y22D</b>	2.2V
RP170H231D	<b>Y23D</b>	2.3V
RP170H241D	<b>Y24D</b>	2.4V
RP170H251D	<b>Y25D</b>	2.5V
RP170H261D	<b>Y26D</b>	2.6V
RP170H271D	<b>Y27D</b>	2.7V
RP170H281D	<b>Y28D</b>	2.8V
RP170H291D	<b>Y29D</b>	2.9V
RP170H301D	<b>Y30D</b>	3.0V

Product Name	①②③④	Vset
RP170H311D	<b>Y31D</b>	3.1V
RP170H321D	<b>Y32D</b>	3.2V
RP170H331D	<b>Y33D</b>	3.3V
RP170H341D	<b>Y34D</b>	3.4V
RP170H351D	<b>Y35D</b>	3.5V
RP170H361D	<b>Y36D</b>	3.6V
RP170H371D	<b>Y37D</b>	3.7V
RP170H381D	<b>Y38D</b>	3.8V
RP170H391D	<b>Y39D</b>	3.9V
RP170H401D	<b>Y40D</b>	4.0V
RP170H411D	<b>Y41D</b>	4.1V
RP170H421D	<b>Y42D</b>	4.2V
RP170H431D	<b>Y43D</b>	4.3V
RP170H441D	<b>Y44D</b>	4.4V
RP170H451D	<b>Y45D</b>	4.5V
RP170H461D	<b>Y46D</b>	4.6V
RP170H471D	<b>Y47D</b>	4.7V
RP170H481D	<b>Y48D</b>	4.8V
RP170H491D	<b>Y49D</b>	4.9V
RP170H501D	<b>Y50D</b>	5.0V

Product Name	①②③④	Vset
RP170H511D	<b>Y51D</b>	5.1V
RP170H521D	<b>Y52D</b>	5.2V
RP170H531D	<b>Y53D</b>	5.3V
RP170H541D	<b>Y54D</b>	5.4V
RP170H551D	<b>Y55D</b>	5.5V
RP170H561D	<b>Y56D</b>	5.6V
RP170H571D	<b>Y57D</b>	5.7V
RP170H581D	<b>Y58D</b>	5.8V
RP170H591D	<b>Y59D</b>	5.9V
RP170H601D	<b>Y60D</b>	6.0V
RP170H121D5	<b>Y01D</b>	1.25V
RP170H181D5	<b>Y02D</b>	1.85V
RP170H281D5	<b>Y03D</b>	2.85V



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