RP200x SERIES

3-MODE 300mA LDO REGULATOR

OUTLINE

The RP200x Series consist of CMOS-based voltage regulator ICs with high output voltage accuracy, low dropout voltage and low supply current. These ICs perform with the chip enable function and realize a standby mode with ultra low supply current. To prevent the destruction by over current, the current limit circuit is included. The RP200x Series have 3-mode. One is standby mode with CE pin. Other two modes are realized with ECO Function. Fast Response Mode (Fast Mode) and Fast and Low Power auto-change Mode (Auto ECO Mode) are alternative with Auto Eco pin (AE pin). Supply current of IC itself at light load is automatically reduced at Auto ECO Mode compared with Fast Mode. The output voltage is maintained between Fast Mode and Auto ECO Mode.

Without AE pin type is also available. It is an LDO regulator with Auto ECO mode. (RP200Z in WLCSP.) Since the packages for these ICs are SOT-23-5, SC-88A, thin DFN(PLP)1212-6, and WLCSP-4-P5, high density mounting of the ICs on boards is possible. RP200Q (SC-88A), RP200K (DFN(PLP)1212-6) and RP200N (SOT-23-5) has AE pin, then if the AE pin is "H", Fast Mode is available. If the AE pin is set at "L" level, Auto ECO Mode operation is available.

FEATURES

- Supply Current (Low power Mode) ......................... Typ. 1.0μA (V_{OUT} ≤ 1.85V)
- Supply Current (Fast Mode) ............................... Typ. 55μA
- Supply Current (Standby Mode) ............................ Typ. 0.1μA
- Ripple Rejection .................................................. Typ. 70dB (f=1kHz)
- Input Voltage Range .............................................. 1.4V to 5.25V
- Output Voltage Range ............................................ 0.8V to 4.0V (0.1V steps)

(For other voltages, please refer to MARK INFORMATIONS.)

- Output Voltage Accuracy ...................................... ±1.0% (V_{OUT} > 2.0V, T_{opt}=25°C)
- Temperature-Drift Coefficient of Output Voltage ....... Typ. ±50ppm/°C
- Dropout Voltage .................................................... Typ. 0.23V (I_{OUT}=300mA, V_{OUT}=2.8V)
- Line Regulation ..................................................... Typ. 0.02%/V
- Packages .............................................................. DFN(PLP)1212-6, SOT-23-5, SC-88A, WLCSP-4-P5

- Built-in Fold Back Protection Circuit ...................... Typ. 50mA (Current at short mode)
- Ceramic capacitors are recommended ..................... 1.0μF

APPLICATIONS

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

* RP200Q (SC-88A) is the limited product. As of March in 2014.
* RP200Q (SC-88A) is the limited product. As of March in 2014.

**BLOCK DIAGRAMS**
SELECTION GUIDE

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

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package</th>
<th>Quantity per Reel</th>
<th>Pb Free</th>
<th>Halogen Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP200Zxx1*-TR-F</td>
<td>WLCSP-4-P5</td>
<td>5,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RP200Kxx1*-TR</td>
<td>DFN(PLP)1212-6</td>
<td>5,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RP200Qxx2*-TR-FE</td>
<td>SC-88A</td>
<td>3,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RP200Nxx1*-TR-FE</td>
<td>SOT-23-5</td>
<td>3,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

xx: The output voltage can be designated in the range from 0.8V(08) to 4.0V(40) in 0.1V steps. (For other voltages, please refer to MARK INFORMATIONS.)

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

- **WLCSP-4-P5**
  
  **Silicon Side**
  
  4 3
  
  1 2

  **Bump Side**
  
  3 4
  
  2 1

- **DFN(PLP)1212-6**
  
  **Top View**
  
  6 5 4
  
  1 2 3

  **Bottom View**
  
  4 5 6
  
  3 2 1

- **SC-88A**
  
  5 4
  
  1 2 3

  (mark side)

- **SOT-23-5**
  
  5 4
  
  1 2 3

  (mark side)

*RP200Q (SC-88A) is the limited product. As of March in 2014.*
### RP200Q (SC-88A) is the limited product. As of March in 2014.

#### WLCSP-4-P5

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VDD</td>
<td>Input Pin</td>
</tr>
<tr>
<td>2</td>
<td>CE</td>
<td>Chip Enable Pin (&quot;H&quot; Active)</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>4</td>
<td>VOUT</td>
<td>Output Pin</td>
</tr>
</tbody>
</table>

#### DFN(PLP)1212-6

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AE</td>
<td>Auto ECO Pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>CE</td>
<td>Chip Enable Pin (&quot;H&quot; Active)</td>
</tr>
<tr>
<td>4</td>
<td>VDD</td>
<td>Input Pin</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>VOUT</td>
<td>Output Pin</td>
</tr>
</tbody>
</table>

#### SC-88A

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AE</td>
<td>Auto ECO Pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>VOUT</td>
<td>Output Pin</td>
</tr>
<tr>
<td>4</td>
<td>VDD</td>
<td>Input Pin</td>
</tr>
<tr>
<td>5</td>
<td>CE</td>
<td>Chip Enable Pin (&quot;H&quot; Active)</td>
</tr>
</tbody>
</table>

#### SOT-23-5

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VDD</td>
<td>Input Pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>CE</td>
<td>Chip Enable Pin (&quot;H&quot; Active)</td>
</tr>
<tr>
<td>4</td>
<td>AE</td>
<td>Auto ECO Pin</td>
</tr>
<tr>
<td>5</td>
<td>VOUT</td>
<td>Output Pin</td>
</tr>
</tbody>
</table>
### ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIN</td>
<td>Input Voltage</td>
<td>6.0</td>
<td>V</td>
</tr>
<tr>
<td>VCE</td>
<td>Input Voltage (CE Pin)</td>
<td>−0.3 to 6.0</td>
<td>V</td>
</tr>
<tr>
<td>VAE</td>
<td>Input Voltage (AE Pin)</td>
<td>−0.3 to 6.0</td>
<td>V</td>
</tr>
<tr>
<td>VOUT</td>
<td>Output Voltage</td>
<td>−0.3 to VIN+0.3</td>
<td>V</td>
</tr>
<tr>
<td>IOUT</td>
<td>Output Current</td>
<td>400 mA</td>
<td>mA</td>
</tr>
<tr>
<td>PD</td>
<td>Power Dissipation (WLCSP-4-P5)</td>
<td>278</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation (DFN(PLP)1212-6)</td>
<td>400</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation (SC-88A)</td>
<td>380</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation (SOT-23-5)</td>
<td>420</td>
<td>mW</td>
</tr>
<tr>
<td>Topt</td>
<td>Operating Temperature Range</td>
<td>−40 to 85</td>
<td>°C</td>
</tr>
<tr>
<td>Tstg</td>
<td>Storage Temperature Range</td>
<td>−55 to 125</td>
<td>°C</td>
</tr>
</tbody>
</table>

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

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.

* RP200Q (SC-88A) is the limited product. As of March in 2014.
ELECTRICAL CHARACTERISTICS

Vin=Set Vout+1V, Iout=1mA, Cin=Cout=1μF, unless otherwise noted.

The specification in [ ] is checked and guaranteed by design engineering at −40°C ≤ Topt ≤ 85°C.

• RP200x

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOUT</td>
<td>Output Voltage (Fast Mode)</td>
<td>Iout=5mA, Topt=25°C</td>
<td>Vout &gt; 2.0V</td>
<td>×0.99</td>
<td>×1.01</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vout ≤ 2.0V</td>
<td>−20</td>
<td>20</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iout=5mA, −40°C ≤ Topt ≤ 85°C</td>
<td>Vout &gt; 2.0V</td>
<td>×0.975</td>
<td>×1.015</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vout ≤ 2.0V</td>
<td>−50</td>
<td>30</td>
<td>mV</td>
</tr>
<tr>
<td>IOUT</td>
<td>Output Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔVOUT/ΔIOUT</td>
<td>Load Regulation</td>
<td>1mA ≤ IOUT ≤ 10mA</td>
<td>Vout &gt; 2.0V</td>
<td>−1.0</td>
<td>1.0</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vout ≤ 2.0V</td>
<td>−20</td>
<td>20</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10mA ≤ IOUT ≤ 300mA</td>
<td></td>
<td></td>
<td>35</td>
<td>80</td>
</tr>
<tr>
<td>VDIFF</td>
<td>Dropout Voltage</td>
<td>IOUT=300mA</td>
<td>0.8V ≤ Vout &lt; 0.9V</td>
<td>0.62</td>
<td>0.85</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.9V ≤ Vout &lt; 1.0V</td>
<td>0.55</td>
<td>0.78</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.0V ≤ Vout &lt; 1.5V</td>
<td>0.48</td>
<td>0.70</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.5V ≤ Vout &lt; 2.6V</td>
<td>0.34</td>
<td>0.50</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.6V ≤ Vout &lt; 4.0V</td>
<td>0.23</td>
<td>0.35</td>
<td>V</td>
</tr>
<tr>
<td>ISS1</td>
<td>Supply Current (Low Power Mode)*1</td>
<td>IOUT=0mA</td>
<td>VOUT ≤ 1.85V</td>
<td>1.0</td>
<td>4.0</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VOUT &gt; 1.85V</td>
<td>1.5</td>
<td>4.0</td>
<td>μA</td>
</tr>
<tr>
<td>ISS2</td>
<td>Supply Current (Fast Mode)</td>
<td>IOUT=10mA</td>
<td></td>
<td>55</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>Istandby</td>
<td>Standby Current</td>
<td>VCE=GND</td>
<td></td>
<td>0.1</td>
<td>1.0</td>
<td>μA</td>
</tr>
<tr>
<td>IOUTH</td>
<td>Fast Mode switch-over current</td>
<td>IOUT=Light load to Heavy load</td>
<td></td>
<td>8.0</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>IOUTL</td>
<td>Low Power Mode switch-over current</td>
<td>IOUT=Heavy load to Light load</td>
<td></td>
<td>1.0</td>
<td>2.0</td>
<td>mA</td>
</tr>
<tr>
<td>ΔVOUT/ΔVIN</td>
<td>Line Regulation</td>
<td>VOUT+0.5V≤VIN≤5.0V, VIN ≥ 1.4V</td>
<td>IOUT=1mA (Low Power Mode)</td>
<td></td>
<td>0.50</td>
<td>%/V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IOUT=10mA (Fast Mode)</td>
<td>0.02</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>RR</td>
<td>Ripple Rejection (Fast Mode)</td>
<td>f=1kHz, Ripple 0.2Vp-p</td>
<td>VIN=VOUT+1V, IOUT=30mA (In case that VOUT ≤ 1.2V, VIN=2.2V)</td>
<td></td>
<td>70</td>
<td>dB</td>
</tr>
<tr>
<td>VIN</td>
<td>Input Voltage*2</td>
<td></td>
<td></td>
<td>1.40</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td>ΔVOUT/ΔTopt</td>
<td>Output Voltage Temperature Coefficient</td>
<td>−40°C ≤ Topt ≤ 85°C</td>
<td></td>
<td>±50</td>
<td></td>
<td>ppm/°C</td>
</tr>
<tr>
<td>ISC</td>
<td>Short Current Limit</td>
<td>VOUT=0V</td>
<td></td>
<td>50</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>ICEPD</td>
<td>CE Pull-down Constant Current</td>
<td></td>
<td></td>
<td>0.1</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>VCEH</td>
<td>CE Input Voltage &quot;H&quot;</td>
<td></td>
<td></td>
<td>1.0</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

* RP200Q (SC-88A) is the limited product. As of March in 2014.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{CEL} )</td>
<td>CE Input Voltage &quot;L&quot;</td>
<td></td>
<td></td>
<td></td>
<td>( 0.4 )</td>
<td>V</td>
</tr>
<tr>
<td>( I_{AEPD} )</td>
<td>AE Pull-down Constant Current(^{*3})</td>
<td></td>
<td></td>
<td>0.1</td>
<td></td>
<td>( \mu A )</td>
</tr>
<tr>
<td>( V_{AEH} )</td>
<td>AE Input Voltage &quot;H&quot;(^{*3})</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>( V_{AEL} )</td>
<td>AE Input Voltage &quot;L&quot;(^{*3})</td>
<td></td>
<td></td>
<td>0.4</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>( R_{LOW} )</td>
<td>Low Output Nch Tr. ON Resistance (of D version)</td>
<td>( V_{IN}=4.0V, V_{CE}=0V )</td>
<td></td>
<td>50</td>
<td></td>
<td>( \Omega )</td>
</tr>
</tbody>
</table>

All of units are tested and specified under load conditions such that \( T_j = T_{opt} = 25^\circ C \) except for Ripple Rejection, Output Voltage Temperature Coefficient.

\(^{*1}\) The value of supply current is excluding the Pull-down constant current of CE Pin and AE Pin.

\(^{*2}\) The maximum Input Voltage of the ELECTRICAL CHARACTERISTICS is 5.25V. In case of exceeding this specification, the IC must be operated on condition that the Input Voltage is up to 5.5V and the total operating time is within 500hrs.

\(^{*3}\) Applied to RP200K/N/Q

**RECOMMENDED OPERATING CONDITIONS**

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

![Circuit Diagram](image)

(External Components)

C1, C2 : Ceramic Capacitor 1.0μF  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 1.0μF 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 VDD 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 1.0μF or more between VDD 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.

**Impedance of Input Pin (CE Pin and AE Pin)**

In those ICs, there is a pull-down constant current in the CE Pin and the AE Pin. However, if those pins are floating and wired long that produce the noise environment, it might miss-operation of ICs. For this purpose, please make sure enough evaluation of ICs.
TEST CIRCUITS

Basic Test Circuit

Test Circuit for Supply Current

Test Circuit for Ripple Rejection

Test Circuit for Load Transient Response

* RP200Q (SC-88A) is the limited product. As of March in 2014.
TYPICAL CHARACTERISTICS

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

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

*RP200Q (SC-88A) is the limited product. As of March in 2014.*
3) Supply Current vs. Input Voltage (C1=1.0μF, C2=1.0μF, T_{opt}=25°C)

RP200x28xx

RP200x40xx

RP200Q (SC-88A) is the limited product. As of March in 2014.
4) Supply Current vs. Output Current (C1=1.0μF, C2=1.0μF, T_{opt}=25°C)

5) Output Voltage vs. Temperature (C1=1.0μF, C2=1.0μF, I_{OUT}=5mA)

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7) Dropout Voltage vs. Output Current (C1=1.0μF, C2=1.0μF)
RP200x

8) Dropout Voltage vs Set Output Voltage

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

**RP200x28xx**
(Auto ECO Low Power Mode)

\[ \text{IOUT}=1\text{mA} \]
\[ \text{AE}=0\text{V} \]

**RP200x28xx**
(Fixed Fast Mode)

\[ \text{IOUT}=1\text{mA} \]
\[ \text{AE}=\text{Set } V_{OUT}+1\text{V} \]

10) Ripple Rejection vs. Frequency (C1=none, C2=1.0μF, Ripple=0.2Vp-p, Topt=25°C)

**RP200x08xx**

\[ V_{IN}=1.8\text{V}+0.2\text{Vp-p} \]

**RP200x18xx**

\[ V_{IN}=2.8\text{V}+0.2\text{Vp-p} \]
11) Input Transient Response (C1=none, C2=1.0μF, tr=tf=5μs, T_{opt}=25°C)

**RP200x08xx**
(Auto ECO Low Power Mode)

\[
\begin{align*}
V_{IN}=1.8V & \leftrightarrow 2.8V \\
I_{OUT}=1mA
\end{align*}
\]

\[\text{Input Voltage} \quad \text{Output Voltage} \]

**RP200x18xx**
(Auto ECO Low Power Mode)

\[
\begin{align*}
V_{IN}=2.8V & \leftrightarrow 3.8V \\
I_{OUT}=1mA
\end{align*}
\]

\[\text{Input Voltage} \quad \text{Output Voltage} \]

**RP200x28xx**
(Auto ECO Low Power Mode)

\[
\begin{align*}
V_{IN}=3.8V & \leftrightarrow 4.8V \\
I_{OUT}=1mA
\end{align*}
\]

\[\text{Input Voltage} \quad \text{Output Voltage} \]

**RP200x40xx**
(Auto ECO Low Power Mode)

\[
\begin{align*}
V_{IN}=4.5V & \leftrightarrow 5.25V \\
I_{OUT}=1mA
\end{align*}
\]

\[\text{Input Voltage} \quad \text{Output Voltage} \]

*RP200Q (SC-88A) is the limited product. As of March in 2014.*
**RP200x**

12) Load Transient Response (C1=1.0μF, C2=1.0μF, tr=tf=0.5μs, Topt=25°C)

<table>
<thead>
<tr>
<th>VIN</th>
<th>Output Voltage VOUT (V)</th>
<th>Input Voltage VIN (V)</th>
<th>Time t (ms)</th>
<th>Output Current IOUT (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8V</td>
<td>0.790 0.792 0.794 0.796 0.798 0.800 0.802</td>
<td>2.794 2.796 2.798 2.800 2.802 2.806 2.808</td>
<td>0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8</td>
<td>0mA → 30mA</td>
</tr>
<tr>
<td>2.8V</td>
<td>1.788 1.790 1.792 1.794 1.796 1.798 1.800</td>
<td>3.991 3.993 3.995 3.997 3.999 4.001</td>
<td>0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8</td>
<td>0mA → 30mA</td>
</tr>
</tbody>
</table>

*RP200Q (SC-88A) is the limited product. As of March in 2014.*
RP200Q (SC-88A) is the limited product. As of March in 2014.
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*RP200Q (SC-88A) is the limited product. As of March in 2014.*
RP200x

(Fixed Fast Mode)

VIN=3.8V
AE=3.8V

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

VIN=5.0V
AE=5.0V

RP200x28xx
Auto ECO (Low Power Mode→Fast Mode)

VIN=3.8V
AE=0V

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

VIN=5.0V
AE=0V

RP200x40xx
Auto ECO (Low Power Mode→Fast Mode)

VIN=3.8V
AE=0V

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

VIN=5.0V
AE=0V

RP200x28xx
(Auto ECO Fast Mode)

VIN=3.8V
AE=0V

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

VIN=5.0V
AE=0V

RP200x40xx
(Auto ECO Fast Mode)

VIN=5.0V
AE=0V

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

Output Voltage VOUT (V)

Output Current IOUT (mA)

Time t (μs)

* RP200Q (SC-88A) is the limited product. As of March in 2014.
13) AE Switch Transient Response (C1=1.0μF, C2=1.0μF, tr=tf=0.5μs, Topt=25°C)

14) Turn On Speed with CE pin (C1=1.0μF, C2=1.0μF, Topt=25°C)
*RP200Q (SC-88A) is the limited product. As of March in 2014.*

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

**RP200x08xx**

**RP200x18xx**

**RP200x28xx**

**RP200x40xx**

**RP200x**
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 $I_{\text{OUT}}$ (Output Current) and ESR of an output capacitor are shown below. The conditions when the white noise level is under 40μV (Avg.) are marked as the hatched area in the graph.

**Measurement conditions**
- Frequency Band: 10Hz to 2MHz
- Temperature: -40°C to 85°C
- C1, C2: 1.0μF

*RP200Q (SC-88A) is the limited product. As of March in 2014.*
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For the conservation of the global environment, Ricoh is advancing the decrease of the negative environmental impact material.
After Apr. 1, 2006, we will ship out the lead free products only. Thus, all products that will be shipped from now on comply with RoHS Directive.
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