OUTLINE

The RP171x is a LDO regulator featuring 150 mA output current that is developed with CMOS process technology. The RP171x offers the maximum input voltage of 10 V which makes it ideal for the use in car audio equipment, car navigation system and ETC system. The RP171x provides a supply current as low as Typ. 23 µA and achieves fast-response characteristics.

The RP171x offers an output voltage as low as 1.2 V. Compared to existing high-speed lines, the RP171x provides excellent output voltage accuracy and output voltage temperature coefficient.

Internally, the RP171x consists of a fold-back protection circuit and a thermal shutdown circuit. A standby mode with ultra low supply current has been realized by a chip enable function.

The RP171x is available in a 5-pin SOT-23-5 package with high power dissipation.

FEATURES

- Input Voltage Range (Absolute Maximum Ratings) :: 2.6 V to 10 V (12 V)
- Operating Temperature :: -40°C to 105°C
- Supply Current :: Typ. 23 µA (VIN = VSET +1.0 V)
- Standby Current :: Typ. 0.1µA (VIN = 10.0 V, CE = “L”)
- Output Voltage Range :: 1.2 V/1.5 V/1.8 V/2.5 V/2.8 V/3.0 V/3.3 V/3.4 V/5.0 V/6.0 V
  * Contact Ricoh sales representatives for other voltages.
- Output Voltage Accuracy :: ±1.0%
- Output Voltage Temperature Coefficient :: Typ. ±80 ppm/°C
- Line Regulation :: Typ. 0.02%/V
- Dropout Voltage :: Typ. 0.4 V (IOUT = 150 mA, VSET = 2.8 V)
- Ripple Rejection :: Typ. 70 dB (f = 1 kHz)
- Fold-back Protection Circuit :: Typ. 40 mA
- Constant Slope Circuit (Soft-start Function)
- Thermal Shutdown Circuit :: Stops at 165°C
- Auto-discharge Function :: RP171xxxxD
- Package :: SOT-23-5
- Ceramic Capacitor Compatible :: 1.0 µF or more

APPLICATIONS

- Power source for car audio equipment, car navigation system, ETC system, etc.
BLOCK DIAGRAM

RP171xxxxB Block Diagram

RP171xxxxD Block Diagram

VDD

GND

VOUT

VDD

GND

VOUT

Vref

Current Limit
Thermal Shutdown

Current Limit
Thermal Shutdown

RP171N

NO. EC-245-150210

SELECTION GUIDE

The set output voltage, the auto-discharge function and the automotive class are user-selectable options.

<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>RP171Nxx1+-TR-#E</td>
<td>SOT-23-5</td>
<td>3,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

xx: Specify the set output voltage ($V_{SET}$) within the range of
1.2 V / 1.5 V / 1.8 V / 2.5 V / 2.8 V / 3.0 V / 3.3 V / 3.4 V / 5.0 V / 6.0 V
* Contact Ricoh sales representatives for other voltages.

*: Select from (B) CE = Active-high without auto-discharge function or (D) CE = Active-high with Auto-discharge function.

#: Specify the automotive class code.

<table>
<thead>
<tr>
<th>Operating Temperature Range</th>
<th>Guaranteed Specs Temperature Range</th>
<th>Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-40°C to 105°C</td>
<td>25°C</td>
</tr>
<tr>
<td>J</td>
<td>-40°C to 105°C</td>
<td>-40°C to 105°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High and low temperature</td>
</tr>
</tbody>
</table>

*1 Auto-discharge function quickly lowers the output voltage to 0 V by releasing the electrical charge accumulated in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.
PIN DESCRIPTION

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( V_{DD} )</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, Active-high</td>
</tr>
<tr>
<td>4</td>
<td>( NC )</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>( V_{OUT} )</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>12</td>
<td>V</td>
</tr>
<tr>
<td>VCE</td>
<td>Input Voltage (CE Pin)</td>
<td>12</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>330</td>
<td>mA</td>
</tr>
<tr>
<td>PD</td>
<td>Power Dissipation (Standard Land Pattern)*1</td>
<td>525</td>
<td>mW</td>
</tr>
<tr>
<td>Tj</td>
<td>Junction Temperature</td>
<td>−40 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>Tstg</td>
<td>Storage Temperature Range</td>
<td>−55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

*1 Refer to PACKAGE INFORMATION for detailed 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.

# RECOMMENDED OPERATING CONDITIONS

<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>2.6 to 10</td>
<td>V</td>
</tr>
<tr>
<td>Ta</td>
<td>Operating Temperature Range</td>
<td>−40 to 105</td>
<td>°C</td>
</tr>
</tbody>
</table>

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.
**ELECTRICAL CHARACTERISTICS**

\( V_{IN} = V_{SET} + 1.0 \text{ V}, \ I_{OUT} = 1 \text{ mA}, \) unless otherwise noted.

The specifications surrounded by \[-----\] are guaranteed by design engineering at \(-40^\circ \text{C} \leq T_a \leq 105^\circ \text{C}\).

---

**RP171x (-AE)**  
(Ta = 25°C)

<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>
</table>
| VOUT  | Output Voltage | \(1.5 \text{ V} \leq V_{SET}\)  
\(\leq 1.5 \text{ V}\) | \(T_a = 25^\circ \text{C}\)  
\(-40^\circ \text{C} \leq T_a \leq 105^\circ \text{C}\) | \(V_{SET} \times 0.99\)  
\(V_{SET} \times 0.965\) | \(V_{SET} \times 1.01\)  
\(V_{SET} \times 1.03\) | V  
mV |
| IOUT  | Output Current | \(0.1 \text{ mA} \leq I_{OUT} \leq 150 \text{ mA}\) | 150 | 150 | 150  | mA |
| \(\Delta V_{OUT}/\Delta I_{OUT}\) | Load Regulation | | 5 | 45 | mV |
| VDIFF | Dropout Voltage | \(I_{OUT} = 150 \text{ mA}\) | Refer to the Product-specific Electrical Characteristics |
| ISS   | Supply Current | \(I_{OUT} = 0 \text{ mA}\) | 23 | 45  | 45  | µA |
| Istandby | Standby Current | \(V_{IN} = 10.0 \text{ V}, \ V_{CE} = \text{GND}\) | 0.1 | 1.2 | 1.2 | µA |
| \(\Delta V_{OUT}/\Delta V_{IN}\) | Line Regulation | \(V_{SET} + 0.5 \text{ V} \leq V_{IN} \leq 10.0 \text{ V}\)  
Note: When \(V_{OUT} \leq 2.1 \text{ V}, \ 2.6 \text{ V} \leq V_{IN} \leq 10.0 \text{ V}\) | ±0.02 | ±0.25 |  | %/V |
| ISC   | Short Current Limit | \(V_{OUT} = 0 \text{ V}\) | 40  |  | mA |
| IPD   | CE Pull-down Current | | 0.30 |  | µA |
| VCEH  | CE Input Voltage “H” | | 1.7  |  | V |
| VCEL  | CE Input Voltage “L” | | 0.8  |  | V |
| TSD   | Thermal Shutdown Temperature | Junction Temperature | 165  |  | °C |
| TTSR  | Thermal Shutdown Released Temperature | Junction Temperature | 110  |  | °C |
| RLLOW | Auto-discharge Nch Tr. ON Resistance (RP171xxxxD) | \(V_{CE} = 0 \text{ V}, \ V_{IN} = 7.0 \text{ V}\) | 250  |  | Ø |

---

All test items listed under **ELECTRICAL CHARACTERISTICS** are done under the pulse load condition \(T_j = T_a = 25^\circ \text{C}\).
Product-specific Electrical Characteristics

The specifications surrounded by  are guaranteed by design engineering at $-40^\circ C \leq T_a \leq 105^\circ C$.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>$V_{\text{OUT}}$ (V) $(T_a = 25^\circ C)$</th>
<th>$V_{\text{OUT}}$ (V) $(-40^\circ C \leq T_a \leq 105^\circ C)$</th>
<th>$V_{\text{DIFF}}$ (V) $(I_{\text{OUT}} = 150$ mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN.</td>
<td>TYP.</td>
<td>MAX.</td>
</tr>
<tr>
<td>RP171x121x</td>
<td>1.185</td>
<td>1.200</td>
<td>1.215</td>
</tr>
<tr>
<td>RP171x151x</td>
<td>1.485</td>
<td>1.500</td>
<td>1.515</td>
</tr>
<tr>
<td>RP171x181x</td>
<td>1.782</td>
<td>1.800</td>
<td>1.818</td>
</tr>
<tr>
<td>RP171x251x</td>
<td>2.475</td>
<td>2.500</td>
<td>2.525</td>
</tr>
<tr>
<td>RP171x281x</td>
<td>2.772</td>
<td>2.800</td>
<td>2.828</td>
</tr>
<tr>
<td>RP171x301x</td>
<td>2.970</td>
<td>3.000</td>
<td>3.030</td>
</tr>
<tr>
<td>RP171x331x</td>
<td>3.267</td>
<td>3.300</td>
<td>3.333</td>
</tr>
<tr>
<td>RP171x341x</td>
<td>3.366</td>
<td>3.400</td>
<td>3.434</td>
</tr>
<tr>
<td>RP171x501x</td>
<td>4.950</td>
<td>5.000</td>
<td>5.050</td>
</tr>
<tr>
<td>RP171x601x</td>
<td>5.940</td>
<td>6.000</td>
<td>6.060</td>
</tr>
</tbody>
</table>


\[
V_{\text{IN}} = V_{\text{SET}} + 1.0 \text{ V}, \ I_{\text{OUT}} = 1 \text{ mA}, \text{ unless otherwise noted.}
\]

### RP171x (-JE)  
\((-40^\circ \text{C} \leq T_a \leq 105^\circ \text{C})\)

<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_{\text{OUT}})</td>
<td>Output Voltage</td>
<td>(1.5 \text{ V} &lt; V_{\text{SET}})</td>
<td>(V_{\text{SET}} \times 0.99)</td>
<td>(V_{\text{SET}} \times 1.01)</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-40^\circ \text{C} \leq T_a \leq 105^\circ \text{C})</td>
<td>(V_{\text{SET}} \times 0.965)</td>
<td>(V_{\text{SET}} \times 1.03)</td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{SET}} \leq 1.5 \text{ V})</td>
<td>(T_a = 25^\circ \text{C})</td>
<td>(-15)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-40^\circ \text{C} \leq T_a \leq 105^\circ \text{C})</td>
<td>(-53)</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>(I_{\text{OUT}})</td>
<td>Output Current</td>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td>(\Delta V_{\text{OUT}} / \Delta I_{\text{OUT}})</td>
<td>Load Regulation</td>
<td>(0.1 \text{ mA} \leq I_{\text{OUT}} \leq 150 \text{ mA})</td>
<td></td>
<td>5</td>
<td>45</td>
<td>mV</td>
</tr>
<tr>
<td>(V_{\text{DIF}})</td>
<td>Dropout Voltage</td>
<td>(I_{\text{OUT}} = 150 \text{ mA})</td>
<td></td>
<td></td>
<td></td>
<td>Refer to the Product-specific Electrical Characteristics</td>
</tr>
<tr>
<td>(I_{\text{SS}})</td>
<td>Supply Current</td>
<td>(I_{\text{OUT}} = 0 \text{ mA})</td>
<td></td>
<td>23</td>
<td>45</td>
<td>(\mu\text{A})</td>
</tr>
<tr>
<td>(I_{\text{STANDBY}})</td>
<td>Standby Current</td>
<td>(V_{\text{IN}} = 10.0 \text{ V}, \ V_{\text{CE}} = \text{GND})</td>
<td></td>
<td>0.1</td>
<td>1.2</td>
<td>(\mu\text{A})</td>
</tr>
<tr>
<td>(\Delta V_{\text{OUT}} / \Delta V_{\text{IN}})</td>
<td>Line Regulation</td>
<td>(V_{\text{SET}} + 0.5 \text{ V} \leq V_{\text{IN}} \leq 10.0 \text{ V})</td>
<td></td>
<td>(\pm 0.02)</td>
<td>(\pm 0.25)</td>
<td>%/V</td>
</tr>
<tr>
<td>(I_{\text{SC}})</td>
<td>Short Current Limit</td>
<td>(V_{\text{OUT}} = 0 \text{ V})</td>
<td></td>
<td>40</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>(I_{\text{PD}})</td>
<td>CE Pull-down Current</td>
<td></td>
<td></td>
<td>0.30</td>
<td></td>
<td>(\mu\text{A})</td>
</tr>
<tr>
<td>(V_{\text{CEH}})</td>
<td>CE Input Voltage “H”</td>
<td></td>
<td></td>
<td></td>
<td>1.7</td>
<td>V</td>
</tr>
<tr>
<td>(V_{\text{CEL}})</td>
<td>CE Input Voltage “L”</td>
<td></td>
<td></td>
<td></td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>(T_{\text{TSD}})</td>
<td>Thermal Shutdown Temperature</td>
<td>Junction Temperature</td>
<td></td>
<td>165</td>
<td></td>
<td>(^\circ\text{C})</td>
</tr>
<tr>
<td>(T_{\text{TSR}})</td>
<td>Thermal Shutdown Released Temperature</td>
<td>Junction Temperature</td>
<td></td>
<td>110</td>
<td></td>
<td>(^\circ\text{C})</td>
</tr>
<tr>
<td>(R_{\text{LOW}})</td>
<td>Auto-discharge Nch Tr. ON Resistance ((\text{RP171xxxxD}))</td>
<td>(V_{\text{CE}} = 0 \text{ V}, \ V_{\text{IN}} = 7.0 \text{ V})</td>
<td></td>
<td>250</td>
<td></td>
<td>(\Omega)</td>
</tr>
</tbody>
</table>
### Product-specific Electrical Characteristics

Product-specific Electrical Characteristics

<table>
<thead>
<tr>
<th>Product Name</th>
<th>$V_{OUT}$ (V) $(Ta = 25°C)$</th>
<th>$V_{OUT}$ (V) $(-40°C ≤ Ta ≤ 105°C)$</th>
<th>$V_{DIFF}$ (V) $(I_{OUT} = 150 mA)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN.</td>
<td>TYP.</td>
<td>MAX.</td>
</tr>
<tr>
<td>RP171x121x</td>
<td>1.185</td>
<td>1.200</td>
<td>1.215</td>
</tr>
<tr>
<td>RP171x151x</td>
<td>1.485</td>
<td>1.500</td>
<td>1.515</td>
</tr>
<tr>
<td>RP171x181x</td>
<td>1.782</td>
<td>1.800</td>
<td>1.818</td>
</tr>
<tr>
<td>RP171x251x</td>
<td>2.475</td>
<td>2.500</td>
<td>2.525</td>
</tr>
<tr>
<td>RP171x281x</td>
<td>2.772</td>
<td>2.800</td>
<td>2.828</td>
</tr>
<tr>
<td>RP171x301x</td>
<td>2.970</td>
<td>3.000</td>
<td>3.030</td>
</tr>
<tr>
<td>RP171x331x</td>
<td>3.267</td>
<td>3.300</td>
<td>3.333</td>
</tr>
<tr>
<td>RP171x341x</td>
<td>3.366</td>
<td>3.400</td>
<td>3.434</td>
</tr>
<tr>
<td>RP171x501x</td>
<td>4.950</td>
<td>5.000</td>
<td>5.050</td>
</tr>
<tr>
<td>RP171x601x</td>
<td>5.940</td>
<td>6.000</td>
<td>6.060</td>
</tr>
</tbody>
</table>
TYPICAL APPLICATION

External Components

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2 (C_{OUT})</td>
<td>1.0 \mu F, Ceramic Capacitor, MURATA GRM155B31A105KE15</td>
</tr>
</tbody>
</table>

TECHNICAL NOTES

Phase Compensation

In the RP171x, phase compensation is provided to secure stable operation even when the load current is varied. For this purpose, use a 1.0 \mu F or more output capacitor (C2) with good frequency characteristics and proper ESR (Equivalent Series Resistance).

In case of using a tantalum type capacitor and the ESR value of the capacitor is large, the output might be unstable. Evaluate the circuit including consideration of frequency characteristics.

PCB Layout

Ensure the V_{DD} and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect a 1.0 \mu F or more output capacitor (C1) with suitable values between the V_{DD} and GND pins, and as close as possible to the pins.
TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION

When a sudden surge of electrical current travels along the V\textsubscript{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C\textsubscript{2}) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D\textsubscript{1}) between the V\textsubscript{OUT} pin and GND has the effect of preventing damage to them.
PACKAGE INFORMATION

Power Dissipation (SOT-23-5)

Power Dissipation ($P_D$) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement. This data is taken from the SOT-23-6 package data.

<table>
<thead>
<tr>
<th>Measurement Conditions</th>
<th>Standard Land Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Mounting on Board (Wind Velocity = 0 m/s)</td>
</tr>
<tr>
<td>Board Material</td>
<td>Glass Cloth Epoxy Plastic (Double-sided)</td>
</tr>
<tr>
<td>Board Dimensions</td>
<td>40 mm x 40 mm x 1.6 mm</td>
</tr>
<tr>
<td>Copper Ratio</td>
<td>Top-side: Approx. 50%, Back-side: Approx. 50%</td>
</tr>
<tr>
<td>Through-hole</td>
<td>$\phi 0.5$ mm x 44 pcs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement Result</th>
<th>Standard Land Pattern</th>
<th>Free Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>525 mW</td>
<td>310 mW</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>$\theta_{ja} = \frac{(150 - 25)°C}{0.525W} = 238°C/W$</td>
<td>$400°C/W$</td>
</tr>
</tbody>
</table>

Power Dissipation

![](image.png)
PACKAGE DIMENSIONS (SOT-23-5)

MARK SPECIFICATION (SOT-23-5)

①②③: Product Code … Refer to MARK SPECIFICATION TABLE (SOT-23-5).
④⑤: Lot Number … Alphanumeric Serial Number
# MARK SPECIFICATION TABLE (SOT-23-5)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>①</th>
<th>②</th>
<th>③</th>
<th>V&lt;sub&gt;SET&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP171N121B</td>
<td>J</td>
<td>A</td>
<td>A</td>
<td>1.2 V</td>
</tr>
<tr>
<td>RP171N151B</td>
<td>J</td>
<td>A</td>
<td>E</td>
<td>1.5 V</td>
</tr>
<tr>
<td>RP171N181B</td>
<td>J</td>
<td>A</td>
<td>H</td>
<td>1.8 V</td>
</tr>
<tr>
<td>RP171N251B</td>
<td>J</td>
<td>A</td>
<td>R</td>
<td>2.5 V</td>
</tr>
<tr>
<td>RP171N281B</td>
<td>J</td>
<td>A</td>
<td>U</td>
<td>2.8 V</td>
</tr>
<tr>
<td>RP171N301B</td>
<td>J</td>
<td>A</td>
<td>X</td>
<td>3.0 V</td>
</tr>
<tr>
<td>RP171N331B</td>
<td>K</td>
<td>A</td>
<td>A</td>
<td>3.3 V</td>
</tr>
<tr>
<td>RP171N341B</td>
<td>K</td>
<td>A</td>
<td>B</td>
<td>3.4 V</td>
</tr>
<tr>
<td>RP171N501B</td>
<td>K</td>
<td>A</td>
<td>T</td>
<td>5.0 V</td>
</tr>
<tr>
<td>RP171N601B</td>
<td>L</td>
<td>A</td>
<td>D</td>
<td>6.0 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Name</th>
<th>①</th>
<th>②</th>
<th>③</th>
<th>V&lt;sub&gt;SET&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP171N121D</td>
<td>J</td>
<td>B</td>
<td>A</td>
<td>1.2 V</td>
</tr>
<tr>
<td>RP171N151D</td>
<td>J</td>
<td>B</td>
<td>E</td>
<td>1.5 V</td>
</tr>
<tr>
<td>RP171N181D</td>
<td>J</td>
<td>B</td>
<td>H</td>
<td>1.8 V</td>
</tr>
<tr>
<td>RP171N251D</td>
<td>J</td>
<td>B</td>
<td>R</td>
<td>2.5 V</td>
</tr>
<tr>
<td>RP171N281D</td>
<td>J</td>
<td>B</td>
<td>U</td>
<td>2.8 V</td>
</tr>
<tr>
<td>RP171N301D</td>
<td>J</td>
<td>B</td>
<td>X</td>
<td>3.0 V</td>
</tr>
<tr>
<td>RP171N331D</td>
<td>K</td>
<td>B</td>
<td>A</td>
<td>3.3 V</td>
</tr>
<tr>
<td>RP171N341D</td>
<td>K</td>
<td>B</td>
<td>B</td>
<td>3.4 V</td>
</tr>
<tr>
<td>RP171N501D</td>
<td>K</td>
<td>B</td>
<td>T</td>
<td>5.0 V</td>
</tr>
<tr>
<td>RP171N601D</td>
<td>L</td>
<td>B</td>
<td>D</td>
<td>6.0 V</td>
</tr>
</tbody>
</table>
TEST CIRCUITS

Basic Test Circuit

Test Circuit for Supply Current

Test Circuit for Ripple Rejection

Test Circuit for Load Transient Response
**TYPICAL CHARACTERISTICS**

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

1) **Output voltage vs. Output Current (Ta = 25°C)**

![RP171x12xx](image1)

![RP171x30xx](image2)

![RP171x60xx](image3)

2) **Output Voltage vs. Input Voltage (Ta = 25°C)**

![RP171x12xx](image4)

![RP171x30xx](image5)
3) Supply Current vs. Input Voltage (Ta = 25°C)
4) Supply Current vs. Output Current (Ta = 25°C)

5) Output Voltage vs. Temperature
6) Supply Current vs. Temperature

- **RP171x12xx**
  - Temperature $Ta \, (^\circ C)$
  - Supply Current $Iss \, (\mu A)$

- **RP171x30xx**
  - Temperature $Ta \, (^\circ C)$
  - Supply Current $Iss \, (\mu A)$

- **RP171x60xx**
  - Temperature $Ta \, (^\circ C)$
  - Supply Current $Iss \, (\mu A)$

7) Dropout Voltage vs. Output Current

- **RP171x12xx**
  - Output Current $IOUT \, (mA)$
  - Dropout Voltage $VDIF \, (V)$

- **RP171x30xx**
  - Output Current $IOUT \, (mA)$
  - Dropout Voltage $VDIF \, (V)$
8) Dropout Voltage vs. Set Output Voltage (Ta = 25°C)

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

11) Ripple Rejection vs. Frequency (C1 = none, C2 = Ceramic 1.0 µF, Ta = 25°C)
12) Input Transient Response (C1 = none, I_{OUT} = 30 mA, tr = tf = 5μs, Ta = 25°C)
13) Load Transient Response (C1 = Ceramic 1.0 µF, tr = tf = 500 ns, Ta = 25°C)
Output Current IOUT (mA)

-20 -10 0 10 20 30 40 50 60 70 80

Output Voltage VOUT (V)

-250 -200 -150 -100 -50 0 50 100 150

Time t (μs)

C2=1.0μF
C2=2.2μF

Output Current : 50mA~100mA

Output Current : 0mA~30mA

Output Current : 1mA~150mA

Output Voltage
14) Turn On Speed with CE pin (C1 = Ceramic 1.0 µF, Ta = 25°C)

**RP171x12xx**

- VIN=2.6V, C2=Ceramic 1.0µF
- CE Input Voltage VCE / Output Voltage VOUT
- CE Input Voltage Vce: Output Voltage Vout
- Inrush Current Irush (mA)
- IOUT=0mA
- IOUT=1mA
- IOUT=30mA
- IOUT=150mA

**RP171x30xx**

- VIN=4.0V, C2=Ceramic 1.0µF
- CE Input Voltage VCE / Output Voltage VOUT
- CE Input Voltage Vce: Output Voltage Vout
- Inrush Current Irush (mA)
- IOUT=0mA
- IOUT=1mA
- IOUT=30mA
- IOUT=150mA

**RP171x60xx**

- VIN=7.0V, C2=Ceramic 1.0µF
- CE Input Voltage VCE / Output Voltage VOUT
- CE Input Voltage Vce: Output Voltage Vout
- Inrush Current Irush (mA)
- IOUT=0mA
- IOUT=1mA
- IOUT=30mA
- IOUT=150mA
The diagrams show the CE input voltage, output voltage, and inrush current for different capacitors (C2) and input voltages (Vin) over time (t). The graphs illustrate the behavior of the devices under various conditions, including different input voltages and capacitance values. The data points and curves are color-coded for easy differentiation.
**RP171x12xx**

- **CE Input Voltage**
- **Output Voltage**
- **Inrush Current**

Parameters:
- \( i_{out} = 1mA \)
- \( C_2 = \text{Ceramic} 1.0\mu F \)

**RP171x30xx**

- **CE Input Voltage**
- **Output Voltage**
- **Inrush Current**

Parameters:
- \( i_{out} = 1mA \)
- \( C_2 = \text{Ceramic} 1.0\mu F \)

**RP171x60xx**

- **CE Input Voltage**
- **Output Voltage**
- **Inrush Current**

Parameters:
- \( i_{out} = 1mA \)
- \( C_2 = \text{Ceramic} 1.0\mu F \)
15) Turn Off Speed with CE pin (RP171xxxxD) (C1 = C2 = Ceramic 1.0 µF, Ta = 25°C)

RP171x121D

Vin=2.6V

CE Input Voltage

IOUT=0mA
IOUT=1mA
IOUT=30mA
IOUT=150mA

Output Voltage

Time t (ms)

-0.4
0.0
0.4
0.8
1.2
1.6
2.0
2.4

0
1
2
3
4

CE Input Voltage

Output Voltage

Time t (ms)

0.0
0.5
1.0
1.5
2.0
2.5

RP171x301D

Vin=4.0V

CE Input Voltage

IOUT=0mA
IOUT=1mA
IOUT=30mA
IOUT=150mA

Output Voltage

Time t (ms)

-1
0
1
2
3
4

-1
0
1
2
3
4

CE Input Voltage

Output Voltage

Time t (ms)

0.0
0.5
1.0
1.5
2.0
2.5

RP171x601D

Vin=7.0V

CE Input Voltage

IOUT=0mA
IOUT=1mA
IOUT=30mA
IOUT=150mA

Output Voltage

Time t (ms)

-2
0
2
4
6

-2
0
2
4
6

CE Input Voltage

Output Voltage

Time t (ms)

0.0
0.5
1.0
1.5
2.0
2.5
EQUIVALENT SERIES RESISTANCE (ESR) vs. OUTPUT CURRENT (I_{OUT})

Ceramic type output capacitor is recommended for the RP171x; 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 µV (Avg.) are marked as the hatched area in the graph.

**Measurement Conditions**

Noise Frequency Band: 10 Hz to 2 MHz  
Measurement Temperature: −40°C to 85°C  
Hatched area: Noise level below 40 µV (Avg.).  
C1, C2: Ceramic 1.0 µF (Murata, GRM155B31A105KE)
1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to Ricoh sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without prior written consent of Ricoh.
3. Please be sure to take any necessary formalities under relevant laws or regulations before exporting or otherwise taking out of your country the products or the technical information described herein.
4. The technical information described in this document shows typical characteristics of and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under Ricoh’s or any third party’s intellectual property rights or any other rights.
5. The products in this document are designed for automotive applications. However, when using the products for automotive applications, please make sure to contact Ricoh sales representative in advance due to confirming the quality level.
6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. Anti-radiation design is not implemented in the products described in this document.
8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
9. WL CSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
10. 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 Ricoh sales or our distributor before attempting to use AOI.
11. Please contact Ricoh sales representatives should you have any questions or comments concerning the products or the technical information.

Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.
Ricoh has been providing RoHS compliant products since April 1, 2006 and Halogen-free products since April 1, 2012.

RICOH ELECTRONIC DEVICES CO., LTD.

https://www.e-devices.ricoh.co.jp/en/