Automatic Mode Shift Dual 150mA LDO

OUTLINE

The R5326x Series are CMOS-based voltage regulator ICs with high output voltage accuracy, Typ. 5.5μA low supply current, and remarkably improved transient response compared with the conventional low supply current voltage regulators. The supply current of IC itself is automatically shifts between fast mode and low power mode depending on the load current. (The current threshold is fixed internally.) Each of these voltage regulator ICs consists of a voltage reference unit, an error amplifier, resistors for setting the output voltage, a current limit circuit for preventing from the destruction by an over current, and so on.

The chip enable function realizes the standby mode with ultra low supply current.

Since the packages for these ICs are SOT-23-6 and DFN(PLP)1820-6, and chip size package, WLCSP-6-P1, dual LDO regulators are included in each package, high density mounting of the ICs on boards is possible.

FEATURES

- Supply Current (Low Power Mode)............................Typ. 5.5μA×2 (VR1&VR2) (IOUT=0mA)
- Supply Current (Fast Mode).................................Typ. 50μA×2 (VR1&VR2) (IOUT=10mA)
- Standby Current...........................................Typ. 0.1μA (VR1&VR2)
- Dropout Voltage ..............................................Typ. 0.19V (IOUT=150mA, VOUT=2.8V)
- Ripple Rejection..............................................Typ. 70dB (f=1kHz)
  Typ. 60dB (f=10kHz)
- Input Voltage Range ....................................... 1.4V to 6.0V
- Output Voltage Range .................................. 0.8V to 4.2V (0.1V steps)
  (For details, please refer to MARK INFORMATIONS.)
- Output Voltage Accuracy ..................±1.0% (VOUT>1.5V)
- Line Regulation ........................................ Typ. 0.02%/V
- Packages ........................................... WLCSP-6-P1, DFN(PLP)1820-6,
  SOT-23-6
- Built-in fold-back protection circuit ....................Typ. 50mA (Current at short mode)
- Ceramic Capacitor is recommended. ....................1.0μF to 3.3μF
  (Depending on VIN and set VOUT. Refer to the electrical characteristics table.)

APPLICATIONS

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

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
SELECTION GUIDE

The output voltage, auto discharge function, package 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>R5326Zxxx*-E2-F</td>
<td>WLCSP-6-P1</td>
<td>5,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R5326Kxxx*-TR</td>
<td>DFN(PLP)1820-6</td>
<td>5,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R5326Nxxx*-TR-FE</td>
<td>SOT-23-6</td>
<td>3,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

xxx : The combination of output voltage for each channel can be designated by serial numbers. (from 001)
The output voltage for each channel can be set in the range from 0.8V to 4.2V in 0.1V steps.
(For details, please refer to MARK INFORMATIONS.)

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

*R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.*
PIN CONFIGURATIONS

**WLCSP-6-P1**

<table>
<thead>
<tr>
<th>Mark Side</th>
<th>Bump Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

**DFN (PLP) 1820-6**

Top View

Bottom View

**SOT-23-6**

PIN DESCRIPTIONS

- **WLCSP-6-P1, SOT-23-6**

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( V_{OUT1} )</td>
<td>Output Pin 1</td>
</tr>
<tr>
<td>2</td>
<td>( V_{DD} )</td>
<td>Input Pin</td>
</tr>
<tr>
<td>3</td>
<td>( V_{OUT2} )</td>
<td>Output Pin 2</td>
</tr>
<tr>
<td>4</td>
<td>CE2</td>
<td>Chip Enable Pin 2 (&quot;H&quot; Active)</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>6</td>
<td>CE1</td>
<td>Chip Enable Pin 1 (&quot;H&quot; Active)</td>
</tr>
</tbody>
</table>

- **DFN (PLP) 1820-6**

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( V_{OUT2} )</td>
<td>Output Pin 2</td>
</tr>
<tr>
<td>2</td>
<td>( V_{DD} )</td>
<td>Input Pin</td>
</tr>
<tr>
<td>3</td>
<td>( V_{OUT1} )</td>
<td>Output Pin 1</td>
</tr>
<tr>
<td>4</td>
<td>CE1</td>
<td>Chip Enable Pin 1 (&quot;H&quot; Active)</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>6</td>
<td>CE2</td>
<td>Chip Enable Pin 2 (&quot;H&quot; Active)</td>
</tr>
</tbody>
</table>

*) 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.

R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
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>6.5</td>
<td>V</td>
</tr>
<tr>
<td>VCE</td>
<td>Input Voltage (CE Pin)</td>
<td>−0.3 to 6.5</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>IOUT1, IOUT2</td>
<td>Output Current</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>PD</td>
<td>Power Dissipation (WLCSP-6-P1)</td>
<td>633</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation (DFN(PLP)1820-6)</td>
<td>880</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation (SOT-23-6)</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.

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

#### R5326xxxxA/B

<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><strong>V_OUT</strong></td>
<td>Output Voltage</td>
<td>$V_{IN} - V_{OUT} = 1V$ $I_{OUT} = 1mA$</td>
<td>$V_{OUT} &gt; 1.5V$ $V_{OUT} \leq 1.5V$</td>
<td>$\times 0.99$ $-15$</td>
<td>$\times 1.01$ $+15$</td>
<td>mV</td>
</tr>
<tr>
<td><strong>I_OUT</strong></td>
<td>Output Current</td>
<td>$V_{IN} - V_{OUT} = 1V$</td>
<td>150</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$\Delta V_{OUT}/\Delta I_{OUT}$</td>
<td>Load Regulation</td>
<td>$V_{IN} - V_{OUT} = 1V$ $1mA \leq I_{OUT} \leq 150mA$</td>
<td>80</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$V_{DIF}$</td>
<td>Dropout Voltage</td>
<td>$I_{OUT} = 150mA$</td>
<td>0.8V</td>
<td>0.62</td>
<td>0.87</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0.9V \leq V_{OUT} &lt; 1.0V$</td>
<td>0.58</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1.0V \leq V_{OUT} &lt; 1.2V$</td>
<td>0.48</td>
<td>0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1.2V \leq V_{OUT} &lt; 1.5V$</td>
<td>0.40</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1.5V \leq V_{OUT} &lt; 2.0V$</td>
<td>0.31</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2.0V \leq V_{OUT} &lt; 2.8V$</td>
<td>0.22</td>
<td>0.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2.8 \leq V_{OUT}$</td>
<td>0.19</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{SS1}$</td>
<td>Supply Current (Low Power Mode)</td>
<td>$V_{IN} - V_{OUT} = 1V, I_{OUT} = 0mA$</td>
<td>5.5</td>
<td>16</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>$I_{SS2}$</td>
<td>Supply Current (Fast Mode)</td>
<td>$V_{IN} - V_{OUT} = 1V, I_{OUT} = 10mA$</td>
<td>50</td>
<td>105</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>$I_{STANDBY}$</td>
<td>Standby Current</td>
<td>$V_{N} = 6V, V_{CE1} = V_{CE2} = GND$</td>
<td>0.1</td>
<td>1.0</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>$I_{OUTL}$</td>
<td>Low Power Mode Current threshold</td>
<td>$V_{IN} - V_{OUT} = 1V, I_{OUT} = 30mA$</td>
<td>0.6</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$I_{OUTH}$</td>
<td>Fast Response Mode Current threshold</td>
<td>$V_{IN} - V_{OUT} = 1V, I_{OUT} = 1μA$</td>
<td>3</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$\Delta V_{OUT}/\Delta V_{IN}$</td>
<td>Line Regulation</td>
<td>$V_{OUT} = 0.5V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$ ($+V_{IN} \leq 1.8V$)</td>
<td>$\pm 0.02$</td>
<td>$\pm 0.2$</td>
<td>%/V</td>
<td></td>
</tr>
<tr>
<td>$RR$</td>
<td>Ripple Rejection</td>
<td>Ripple $0.2V_{p-p}$, $V_{IN} - V_{OUT} = 1V$, $I_{OUT} = 30mA$ (In case that $V_{OUT} &lt; 1.5V$, $V_{IN} - V_{OUT} = 1.5V$)</td>
<td>f=1kHz</td>
<td>70</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f=10kHz</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{IN}$</td>
<td>Input Voltage</td>
<td></td>
<td>1.4</td>
<td>6.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$\Delta V_{OUT}/\Delta T_{opt}$</td>
<td>Output Voltage Temperature Coefficient</td>
<td>$I_{OUT} = 30mA$, $-40°C \leq T_{opt} \leq 85°C$</td>
<td>$\pm 100$</td>
<td></td>
<td>ppm/°C</td>
<td></td>
</tr>
<tr>
<td>$I_{SC}$</td>
<td>Short Current Limit</td>
<td>$V_{OUT} = 0V$</td>
<td>50</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$I_{PD}$</td>
<td>CE Pull-down Current</td>
<td></td>
<td>0.15</td>
<td>0.30</td>
<td>0.45</td>
<td>μA</td>
</tr>
<tr>
<td>$V_{CEH}$</td>
<td>CE Input Voltage &quot;H&quot;</td>
<td></td>
<td>1.0</td>
<td>6.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{CEL}$</td>
<td>CE Input Voltage &quot;L&quot;</td>
<td></td>
<td>0</td>
<td>0.4</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$en$</td>
<td>Output Noise</td>
<td>BW=10Hz to 100kHz</td>
<td>30</td>
<td></td>
<td></td>
<td>μVrms</td>
</tr>
<tr>
<td>$R_{LOW}$</td>
<td>Low Output Nch Tr. ON Resistance (of B version)</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
</tbody>
</table>

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
TYPICAL APPLICATION

(External Components)
Capacitor; Ceramic Type
C1 : 1.0μF Ceramic
C2, C3 : Refer to the following table

Recommended Ceramic capacitor for Output (C2, C3)

<table>
<thead>
<tr>
<th>Output Voltage Range</th>
<th>Minimum Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8V ≤ VOUT &lt; 1.2V</td>
<td>3.3μF or more</td>
</tr>
<tr>
<td>1.2V ≤ VOUT ≤ 4.2V</td>
<td>3.3μF or more</td>
</tr>
</tbody>
</table>

Output Capacitors
3.3μF (Murata) GRM219B31A335KE18B
2.2μF (Murata) GRM155B30J225M
1.0μF (Murata) GRM155B31A105KE15

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
**TECHNICAL NOTES**

When using these ICs, consider the following points:

**Mounting on PCB**

Make VDD and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor with a capacitance value as much as 1.0μF or more as C1 between VDD and GND pin, and as close as possible to the pins.

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

**Phase Compensation**

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use capacitors C2 and C3 which are shown below table "Recommended Ceramic capacitor for output "If you use a tantalum type capacitor and ESR value of the capacitor is large, output might be unstable. Evaluate your circuit with considering frequency characteristics.

**TEST CIRCUITS**

![Fig.1 Standard test Circuit](image1)

C1=Ceramic 1.0μF
C2,C3=refer to the term of the external capacitors

![Fig.2 Supply Current Test Circuit](image2)

C1=Ceramic 1.0μF
C2,C3=refer to the term of the external capacitors

![Fig.3 Ripple Rejection, Line Transient Response Test Circuit](image3)

C2,C3= refer to the term of the external capacitors

![Fig.4 Load Transient Response Test Circuit](image4)

C1=Ceramic 1.0μF
C2,C3= refer to the term of the external capacitors

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*R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.*
TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

- **0.8V(\text{VR1}/\text{VR2})**
  - \( V_{IN} = 1.4V \)
  - \( V_{IN} = 1.5V \)
  - \( V_{IN} = 1.6V \)
  - \( V_{IN} = 1.8V \)
  - \( V_{IN} = 2.8V \)
  - \( V_{IN} = 3.8V \)

- **1.5V(\text{VR1}/\text{VR2})**
  - \( V_{IN} = 1.8V \)
  - \( V_{IN} = 2.5V \)
  - \( V_{IN} = 3.5V \)

- **2.8V(\text{VR1}/\text{VR2})**
  - \( V_{IN} = 3.1V \)
  - \( V_{IN} = 3.8V \)
  - \( V_{IN} = 4.8V \)

- **4.0V(\text{VR1}/\text{VR2})**
  - \( V_{IN} = 4.3V \)
  - \( V_{IN} = 5.0V \)
  - \( V_{IN} = 6.0V \)

2) Input Voltage vs. Output Voltage

- **0.8V(\text{VR1}/\text{VR2})**
  - \( I_{OUT} = 1\,\text{mA} \)
  - \( I_{OUT} = 10\,\text{mA} \)
  - \( I_{OUT} = 100\,\text{mA} \)
  - \( I_{OUT} = 150\,\text{mA} \)

- **1.5V(\text{VR1}/\text{VR2})**
  - \( I_{OUT} = 1\,\text{mA} \)
  - \( I_{OUT} = 10\,\text{mA} \)
  - \( I_{OUT} = 100\,\text{mA} \)
  - \( I_{OUT} = 150\,\text{mA} \)

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
R5326x

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.

3) Supply Current vs. Input Voltage

0.8V(VR1/VR2)

Input Voltage VIN(V)

Supply Current ISS(μA)

1.5V(VR1/VR2)

Input Voltage VIN(V)

Supply Current ISS(μA)

2.8V(VR1/VR2)

Input Voltage VIN(V)

Supply Current ISS(μA)

4.0V(VR1/VR2)

Input Voltage VIN(V)

Supply Current ISS(μA)
4) Supply current vs. Output current

![Graph showing supply current vs. output current](image)

5) Output Voltage vs. Temperature

**0.8V (VR1/VR2)**

![Graph showing output voltage vs. temperature for 0.8V](image)

**1.5V (VR1/VR2)**

![Graph showing output voltage vs. temperature for 1.5V](image)

**2.8V (VR1/VR2)**

![Graph showing output voltage vs. temperature for 2.8V](image)

**4.0V (VR1/VR2)**

![Graph showing output voltage vs. temperature for 4.0V](image)

*R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.*
6) Supply Current vs. Temperature

![Graph showing supply current vs. temperature for different temperature levels.

7) Dropout Voltage vs. Output Current

- **0.8V (VR1/VR2)**
  - 85°C
  - 25°C
  - -40°C

- **0.9V (VR1/VR2)**
  - 85°C
  - 25°C
  - -40°C

- **1.0V (VR1/VR2)**
  - 85°C
  - 25°C
  - -40°C

- **1.2V (VR1/VR2)**
  - 85°C
  - 25°C
  - -40°C

---

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
1.5V(VR1/VR2)

2.0V(VR1/VR2)

2.8V(VR1/VR2)

4.0V(VR1/VR2)

8) Dropout Voltage vs. Set Output Voltage

* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
9) Ripple Rejection vs. Input Voltage

(Topt=25°C, Ripple 0.5Vp-p, Cin=none, Cout=Ceramic 1.0μF)

2.8V(VR1/VR2)

10) Minimum Operating Voltage

0.8V(VR1/VR2)

Hatched area is available for 0.8V output
11) Ripple Rejection vs Frequency (C\text{in}=\text{none})

**0.8\text{V(VR1/VR2)}**

- \(V_{\text{IN}}=2.2\text{VDC}+0.5\text{Vp-p},\)
- \(C_{\text{OUT}}=\text{Ceramic 2.2}\mu\text{F}\)

![Graph](image1)

- \(I_{\text{OUT}}=1\text{mA}\)
- \(I_{\text{OUT}}=10\text{mA}\)
- \(I_{\text{OUT}}=50\text{mA}\)

---

**0.8\text{V(VR1/VR2)}**

- \(V_{\text{IN}}=2.2\text{VDC}+0.5\text{Vp-p},\)
- \(C_{\text{OUT}}=\text{Ceramic 3.3}\mu\text{F}\)

![Graph](image2)

- \(I_{\text{OUT}}=1\text{mA}\)
- \(I_{\text{OUT}}=10\text{mA}\)
- \(I_{\text{OUT}}=50\text{mA}\)

---

**1.5\text{V(VR1/VR2)}**

- \(V_{\text{IN}}=2.5\text{VDC}+0.5\text{Vp-p},\)
- \(C_{\text{OUT}}=\text{Ceramic 1.0}\mu\text{F}\)

![Graph](image3)

- \(I_{\text{OUT}}=1\text{mA}\)
- \(I_{\text{OUT}}=10\text{mA}\)
- \(I_{\text{OUT}}=50\text{mA}\)

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**1.5\text{V(VR1/VR2)}**

- \(V_{\text{IN}}=2.5\text{VDC}+0.5\text{Vp-p},\)
- \(C_{\text{OUT}}=\text{Ceramic 2.2}\mu\text{F}\)

![Graph](image4)

- \(I_{\text{OUT}}=1\text{mA}\)
- \(I_{\text{OUT}}=10\text{mA}\)
- \(I_{\text{OUT}}=50\text{mA}\)

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**2.8\text{V(VR1/VR2)}**

- \(V_{\text{IN}}=3.8\text{VDC}+0.5\text{Vp-p},\)
- \(C_{\text{OUT}}=\text{Ceramic 1.0}\mu\text{F}\)

![Graph](image5)

- \(I_{\text{OUT}}=1\text{mA}\)
- \(I_{\text{OUT}}=10\text{mA}\)
- \(I_{\text{OUT}}=50\text{mA}\)

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**2.8\text{V(VR1/VR2)}**

- \(V_{\text{IN}}=3.8\text{VDC}+0.5\text{Vp-p},\)
- \(C_{\text{OUT}}=\text{Ceramic 2.2}\mu\text{F}\)

![Graph](image6)

- \(I_{\text{OUT}}=1\text{mA}\)
- \(I_{\text{OUT}}=10\text{mA}\)
- \(I_{\text{OUT}}=50\text{mA}\)
12) Input Transient Response (\(I_{\text{OUT}}=30\text{mA}, t_r=t_f=5\mu\text{s}, C_{\text{IN}}=\text{none}\))

**0.8V(VR1/VR2)**

\[C_{\text{OUT}}=2.2\mu\text{F}\]

- Input Voltage
- Output Voltage

**1.5V(VR1/VR2)**

\[C_{\text{OUT}}=1.0\mu\text{F}\]

- Input Voltage
- Output Voltage

**2.8V(VR1/VR2)**

\[C_{\text{OUT}}=1.0\mu\text{F}\]

- Input Voltage
- Output Voltage

**4.0V(VR1/VR2)**

\[C_{\text{OUT}}=1.0\mu\text{F}\]

- Input Voltage
- Output Voltage

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* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
13) Load Transient Response

**0.8V(VR1/VR2)**

- **C<sub>OUT</sub>=Ceramic 2.2μF**
- **C<sub>OUT</sub>=Ceramic 3.3μF**
- **C<sub>OUT</sub>=Ceramic 4.7μF**
- **C<sub>OUT</sub>=Ceramic 10μF**

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* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
14) Load Transient Response 2 (tr= tf = 0.5μs, Cin=1.0μF)

2.8V(VR1/VR2)

C_OUT=Ceramic 1.0μF

VR1 Output Current: 0mA → 30mA
VR1 Output Voltage
VR2 Output Voltage: IOUT=1mA

0 10 20 30 40 50 60 70 80 90 100
Time t (μs)

2.8V(VR1/VR2)

C_OUT=Ceramic 1.0μF

VR2 Output Current: 0mA → 30mA
VR1 Output Voltage
VR2 Output Voltage

0 10 20 30 40 50 60 70 80 90 100
Time t (μs)

15) Load Transient Response 3 (tr= tf = 10ns)

3.0V(VR1/VR2)

C_OUT=Ceramic 1.0μF

Output Current: 0.1mA → 100mA
Output Voltage

0 5 10 15 20 25 30 35 40 45 50
Time t (μs)
16) Turn on speed with CE Pin (C_{IN}=Ceramic 1.0\mu F)

- **0.8V(VR1/VR2)**
  - \(V_{IN}=1.8V, C_{OUT}=Ceramic 2.2\mu F\)

- **1.5V(VR1/VR2)**
  - \(V_{IN}=2.5V, C_{OUT}=Ceramic 1.0\mu F\)

17) Turn off speed with CE Pin (C_{IN}=Ceramic 1.0\mu F)

- **0.8V(VR1/VR2)**
  - \(V_{IN}=1.8V, C_{OUT}=Ceramic 2.2\mu F\)

- **1.5V(VR1/VR2)**
  - \(V_{IN}=2.5V, C_{OUT}=Ceramic 1.0\mu F\)
* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
**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$\mu$V (Avg.) are marked as the hatched area in the graph.

**Measurement conditions**
- Frequency Band: 10Hz to 2MHz
- Temperature: -40°C to 85°C

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* R5326N (SOT-23-6) and R5326Z (WLCSP-6-P1) are the limited product. As of March in 2014.
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