RICOH

# RP155Z Series

## 200 mA LDO Regulator with Alternative Dual-Voltage Level Output

NO.EA-334-190610

## OUTLINE

The RP155Z is a 200-mA LDO regulator with a selectable dual-voltage level output. It provides the VSEL pin that is used to select one of two preset output voltage levels.

Excellent ripple rejection, input transient response, and load transient response make the RP155Z ideal for the application for mobile communication equipment.

For protection, the RP155Z provides a short-current limiting circuit, a thermal shutdown circuit and an inrush current limiting circuit.

The RP155Z is offered in al 5-pin WLCSP-5-P1 package which achieves the smallest possible footprint solution on boards where area is limited.

## FEATURES

- Input Voltage Range (Maximum Ratings)··············· 1.9 V to 5.25 V (6.0 V)
- Supply Current················································ Typ. 80 µA
- Standby Current·············································· Typ. 0.1 µA
- Dropout Voltage ·············································· Typ. 0.085 V, $I_{OUT}$ = 200 mA, $V_{SET}$ = 2.5 V
- Ripple Rejection·············································· Typ. 75 dB, f = 1 kHz,
  Typ. 70 dB, f = 10 kHz
- Output Voltage Accuracy··································· ±1.0%
- Output Voltage Temperature Coefficient ················ Typ. ±30 ppm/°C
- Output Voltage Range ······································· 1.6 V to 3.6 V
- Line Regulation················································ Typ. 0.02%/V
- Short-current Limiting ······································· Typ. 50 mA
- Overcurrent Protection ····································· Fold-back Type
- Thermal Shutdown ··········································· Typ. 165°C
- Inrush Current Limiting ····································· Typ. 160 mA during 180 µs after start-up
- Ceramic Capacitor Compatible··························· 1.0 µF or more
- Package······················································· WLCSP-5-P1, 1.346 mm x 0.98 mm

## APPLICATIONS

- Printers and PCs with SD Card Slots
- Battery-powered Equipment: Portable Music Players, IC Recorders, Cameras and Camcorders
- Portable Communication Equipment: Smartphones, Feature Phones
- Electronic Equipment System that Requires Two Levels of Output Voltage Regulation in Normal Mode/ Power-Saving Mode

## SELECTION GUIDE

The set output voltage, the package type and the auto discharge function(1) are user-selectable options.

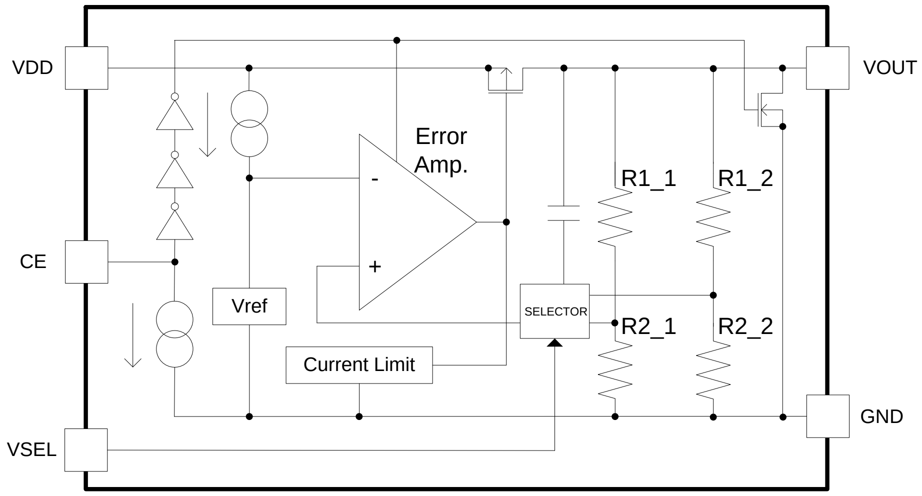
**Selection Guide**

| Product Name | Package | Quantity per Reel | Pb Free | Halogen Free |
|---|---|---|---|---|
| RP155Zxxx∗-E2-F | WLCSP-5-P1 | 5,000 pcs | Yes | Yes |

xxx: Specify a combination of two set output voltages ($V_{SET1}$/ $V_{SET2}$).
$V_{SET1}$/ $V_{SET2}$ can be selected within the range of 1.6 V to 3.6 V.

∗: Specify the auto-discharge option.
B: Auto discharge function included

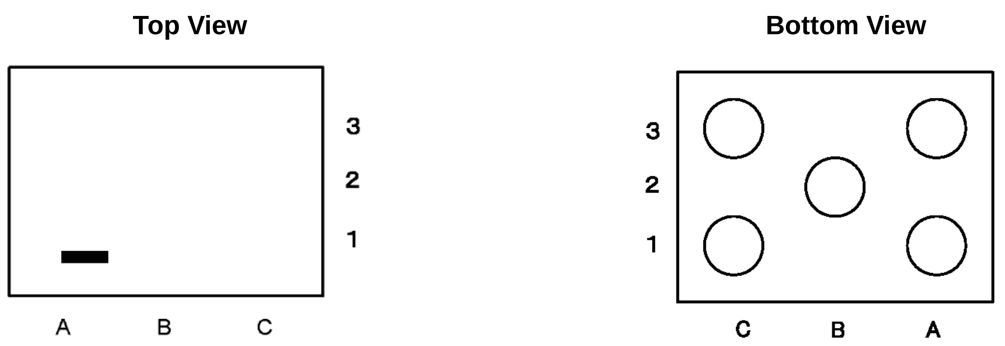
## BLOCK DIAGRAM




**RP155Z Block Diagram**

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

# PIN DESCRIPTIONS




**WLCSP-5-P1 Pin Configurations**

**WLCSP-5-P1 Pin Descriptions**

| Pin No. | Symbol | Description |
|---|---|---|
| A1 | CE | Chip Enable Pin, Active-high |
| A3 | VSEL | Output Voltage Selector Pin, $V_{SET1}$-low, $V_{SET2}$-high |
| B2 | GND | Ground Pin |
| C1 | VOUT | Output Pin |
| C3 | VDD | Input Pin |

# ABSOLUTE MAXIMUM RATINGS

**Absolute Maximum Ratings**

| Symbol | Item | Rating | Unit |
|---|---|---|---|
| $V_{IN}$ | Input Voltage | −0.3 to 6.0 | V |
| $V_{CE}$ | CE Pin Input Voltage | −0.3 to 6.0 | V |
| $V_{SEL}$ | VSEL Pin Input Voltage | −0.3 to 6.0 | V |
| $V_{OUT}$ | VOUT Pin Output Voltage | −0.3 to $V_{IN}$+0.3 | V |
| $I_{OUT}$ | Output Current | 510 | mA |
| $P_D$ | Power Dissipation (JEDEC STD.51)[1] | 550 | mW |
| Tj | Junction Temperature | −40 to 125 | °C |
| Tstg | Storage Temperature | −55 to 125 | °C |

| ABSOLUTE MAXIMUM RATINGS |
|---|
| Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage 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

**Recommended Operating Conditions**

| Symbol | Item | Rating | Unit |
|---|---|---|---|
| $V_{IN}$ | Input Voltage[2] | 1.9 to 5.25 | V |
| Ta | Operating Temperature | −40 to 85 | °C |

| RECOMMENDED OPERATING CONDITIONS |
|---|
| All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if 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. |

(1) Refer to *POWER DISSIPATION* for detailed information.
(2) In case of operating the device beyond 5.25 V, do not exceed 5.5 V with 500 total operating hours.

# ELECTRICAL CHARACTERISTICS

$V_{IN}$ = $V_{SET}$ +1.0 V, $I_{OUT}$ = 1 mA, $C_{IN}$ = $C_{OUT}$ = 1.0 μF, $V_{SEL}$ = low/ high, unless otherwise noted.

The specifications surrounded by [ ] are guaranteed by design engineering at −40°C ≤ Ta ≤ 85°C.

**RP155Z Electrical Characteristics** (Ta = 25°C)

| Symbol | Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | Ta = 25°C | x0.990 | | x1.010 | V |
| | | −40°C ≤ Ta ≤ 85°C | [x0.985] | | [x1.015] | V |
| $I_{OUT}$ | Output Current | | [200] | | | mA |
| $\Delta V_{OUT}/\Delta I_{OUT}$ | Load Regulation | 1 mA ≤ $I_{OUT}$ ≤ 200 mA | | 1 | [10] | mV |
| $V_{DIF}$ | Dropout Voltage | $I_{OUT}$ = 200 mA | Refer to *Product-specific Electrical Characteristics* | | | |
| $I_{SS}$ | Supply Current | $I_{OUT}$ = 0 mA | | 80 | [125] | μA |
| Istandby | Standby Current | $V_{CE}$ = 0 V | | 0.1 | 1.0 | μA |
| $\Delta V_{OUT}/\Delta V_{IN}$ | Line Regulation | $V_{SET}$ + 0.5 V ≤ $V_{IN}$ ≤ 5.25 V | | 0.02 | [0.10] | %/V |
| RR | Ripple Rejection | f = 1 kHz, Ripple 0.2 Vp-p,<br>$V_{IN}$ = $V_{SET}$ +1.0 V, $I_{OUT}$ = 30 mA<br>($V_{OUT}$ ≤ 2.0 V, $V_{IN}$ = 3.0 V) | | 75 | | dB |
| $\Delta V_{OUT}/\Delta Ta$ | Output Voltage Temperature Coefficient | −40°C ≤ Ta ≤ 85°C | | ±30 | | ppm /°C |
| $I_{SC}$ | Short Current Limit | $V_{OUT}$ = 0 V | | 50 | | mA |
| $I_{PD}$ | CE Pull-down Current | | | 0.3 | [0.6] | μA |
| $V_{CEH}$ | CE Input Voltage "H" | | [1.0] | | | V |
| $V_{CEL}$ | CE Input Voltage "L" | | | | [0.4] | V |
| $V_{VSELH}$ | VSEL Input Voltage "H" | | [1.0] | | | V |
| $V_{VSELL}$ | VSEL Input Voltage "L" | | | | [0.4] | V |
| $T_{TSD}$ | Thermal Shutdown Temperature | Junction Temperature | | 165 | | °C |
| $T_{TSR}$ | Thermal Shutdown Released Temperature | Junction Temperature | | 100 | | °C |
| en | Output Noise | BW = 10 Hz to 100 kHz | | 17 x $V_{SET}$+ 8 | | μVrms |
| $R_{LOW}$ | Low Output Nch Tr. ON Resistance | $V_{IN}$ = 4.0 V, $V_{CE}$ = 0 V | | 60 | | Ω |

All test items listed under *ELECTRICAL CHARACTERISTICS* are done under the pulse load condition (Tj ≈ Ta = 25°C) except Output Voltage Temperature Coefficient, Output Noise and Ripple Rejection.

# ELECTRICAL CHARACTERISTICS (continued)

$V_{IN} = V_{SET} + 1.0$ V, $I_{OUT} = 1$ mA, $C_{IN} = C_{OUT} = 1.0$ μF, $V_{SEL}$ = low/high, unless otherwise noted.

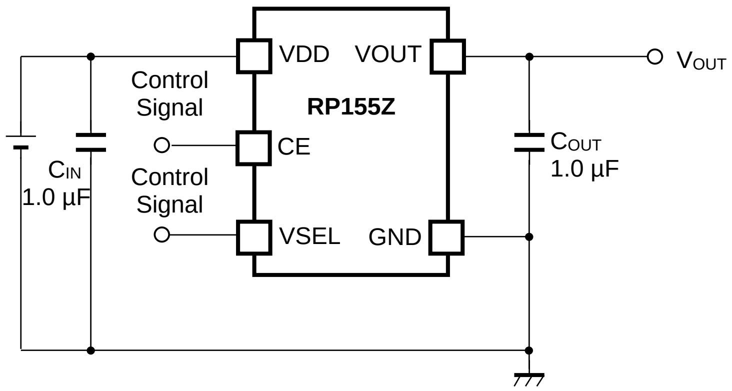
The specifications surrounded by ☐ are guaranteed by design engineering at −40°C ≤ Ta ≤ 85°C.

**RP155Z Product-specific Electrical Characteristics** (Ta = 25°C)

| Product Name | $V_{SET1}$/ $V_{SET2}$ | $V_{OUT}$ [V] | | | | | | $V_{DIF}$ [V] | |
|---|---|---|---|---|---|---|---|---|---|
| | | Ta = 25°C | | | −40°C ≤ Ta ≤ 85°C | | | | |
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Typ. | Max. |
| RP155Z001B | $V_{SET1}$ | 1.782 | 1.800 | 1.818 | 1.773 | 1.800 | 1.827 | 0.100 | 0.138 |
| | $V_{SET2}$ | 2.822 | 2.850 | 2.878 | 2.808 | 2.850 | 2.892 | 0.085 | 0.117 |
| RP155Z003B | $V_{SET1}$ | 1.584 | 1.600 | 1.616 | 1.576 | 1.600 | 1.624 | -[(1)] | -[1] |
| | $V_{SET2}$ | 3.564 | 3.600 | 3.636 | 3.546 | 3.600 | 3.654 | 0.071 | 0.105 |
| RP155Z004B | $V_{SET1}$ | 1.782 | 1.800 | 1.818 | 1.773 | 1.800 | 1.827 | 0.100 | 0.138 |
| | $V_{SET2}$ | 3.267 | 3.300 | 3.333 | 3.251 | 3.300 | 3.349 | 0.071 | 0.105 |
| RP155Z005B | $V_{SET1}$ | 3.267 | 3.300 | 3.333 | 3.251 | 3.300 | 3.349 | 0.071 | 0.105 |
| | $V_{SET2}$ | 1.782 | 1.800 | 1.818 | 1.773 | 1.800 | 1.827 | 0.100 | 0.138 |
| RP155Z006B | $V_{SET1}$ | 2.871 | 2.900 | 2.929 | 2.857 | 2.900 | 2.943 | 0.085 | 0.117 |
| | $V_{SET2}$ | 1.782 | 1.800 | 1.818 | 1.773 | 1.800 | 1.827 | 0.100 | 0.138 |

[(1)] The input voltage should be equal or more than the minimum operating voltage (1.9 V).

# TYPICAL APPLICATION




**RP155Z Typical Application Circuit**

### Technical Notes on the External Components

- Ensure the VDD and GND lines are sufficiently robust. If their impedances are too high, noise pickup or unstable operation may result. Connect a 1.0 µF or more input capacitor ($C_{IN}$) between the VDD and GND pins with shortest-distance wiring. Using ceramic capacitors (voltage rating of 6.3 V or more) with small Equivalent Series Resistance (ESR), Equivalent Series Inductance (ESL) and temperature dependence, such as X7R and X5R are recommended.

- In this device, phase compensation is provided to secure stable operation even when the load current is varied. For this purpose, connect a 1.0 µF or more output capacitor ($C_{OUT}$) between the VOUT and GND pins with shortest-distance wiring. In addition, as capacitance of a ceramic capacitor depends on temperature, DC bias and a package size, select capacitors with attention to influence by them bearing in mind the effective capacitance indicated below.

| Set Output Voltage ($V_{SET}$) | Effective Capacitance |
|---|---|
| 1.6 V ≤ $V_{SET}$ < 2.1 V | 0.75 µF or more |
| 2.1 V ≤ $V_{SET}$ < 2.6 V | 0.70 µF or more |
| 2.6 V ≤ $V_{SET}$ < 3.2 V | 0.65 µF or more |
| 3.2 V ≤ $V_{SET}$ ≤ 3.6 V | 0.60 µF or more |

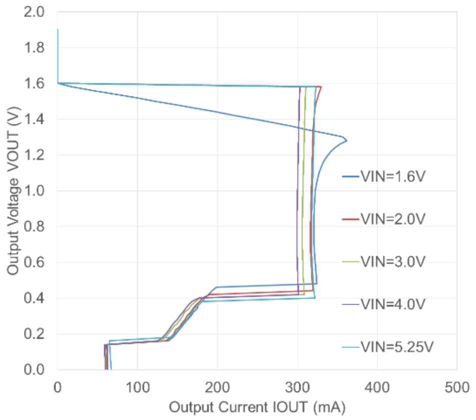
Using tantalum capacitors with large ESR may cause unstable output. Fully evaluate characteristics including frequency to ensure stable output.

# TYPICAL CHARACTERISTICS

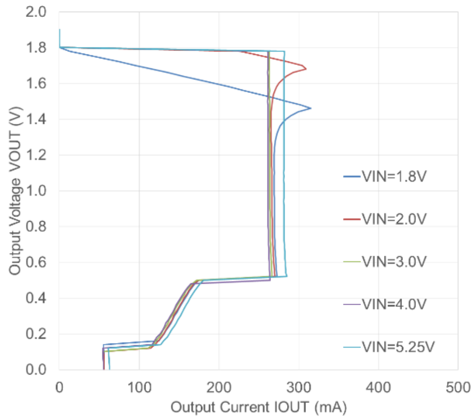
**Note: Typical Characteristics are intended to be used as reference data, they are not guaranteed.**

**1) Output Voltage vs. Output Current ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF, Ta = 25°C)**

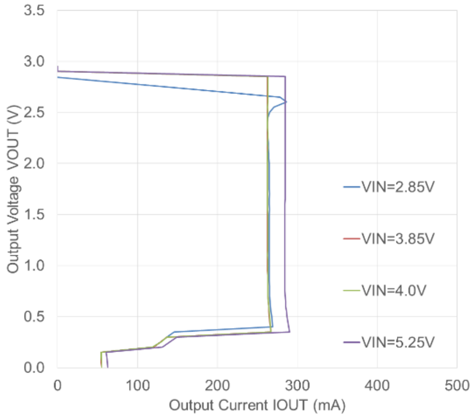
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**



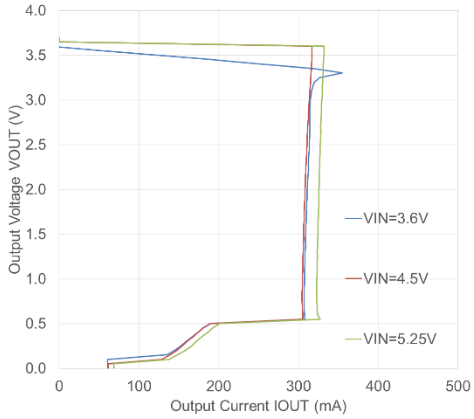

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**




**2.85 V ($V_{SET1}$/ $V_{SET2}$)**

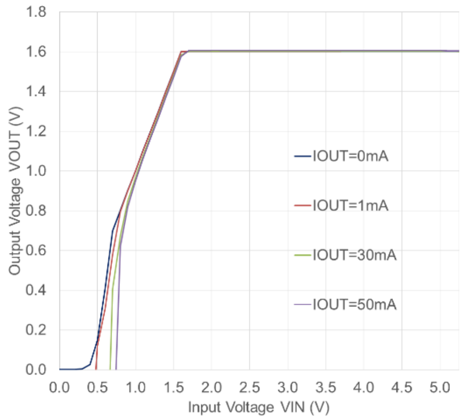



**3.6 V ($V_{SET1}$/ $V_{SET2}$)**

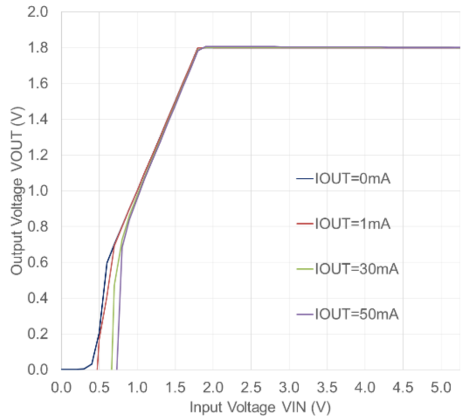



**2) Output Voltage vs. Input Voltage ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF, Ta = 25°C)**

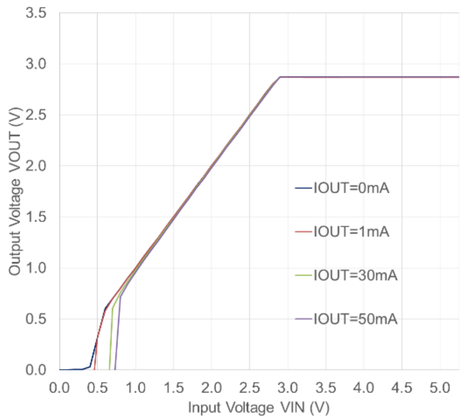
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**



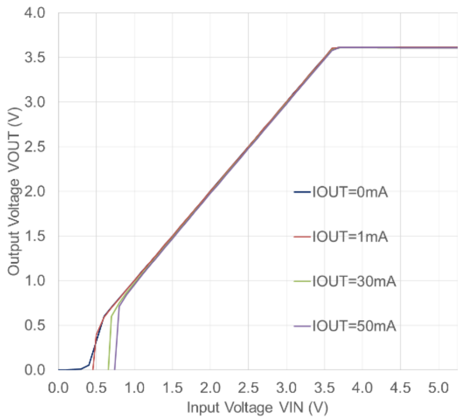

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**



**2.85 V ($V_{SET1}$/ $V_{SET2}$)**

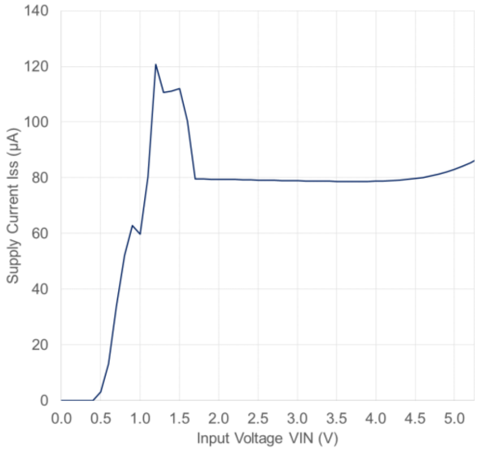



**3.6 V ($V_{SET1}$/ $V_{SET2}$)**

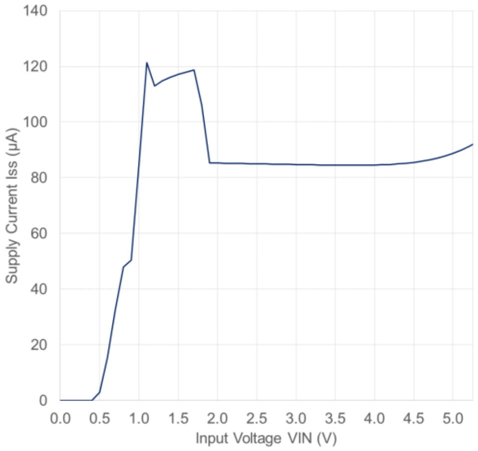



**3) Supply Current vs. Input Voltage ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF, Ta = 25°C)**

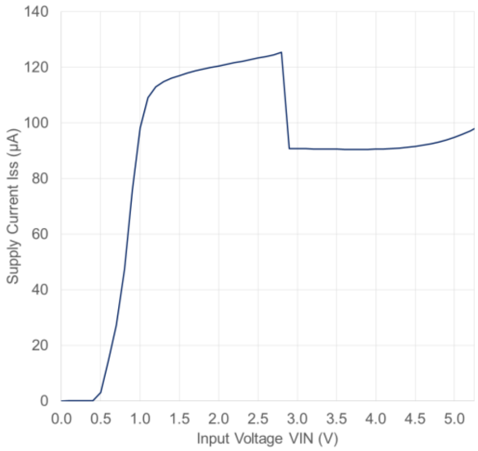
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**



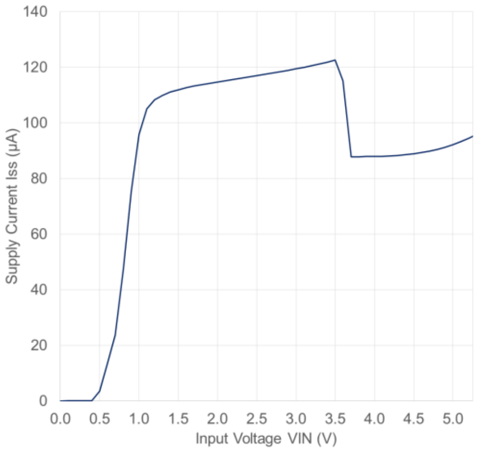

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**




**2.85 V ($V_{SET1}$/ $V_{SET2}$)**

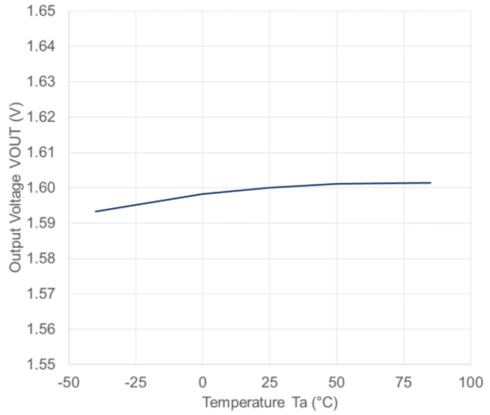



**3.6 V ($V_{SET1}$/ $V_{SET2}$)**

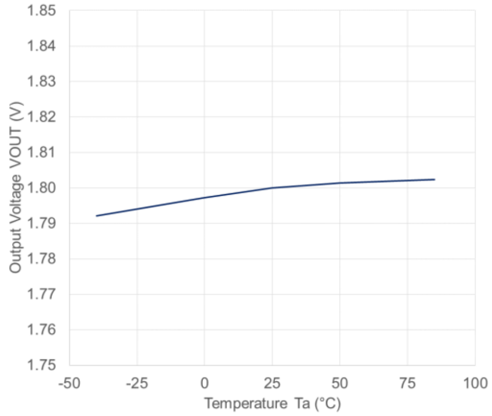


**4) Output Voltage vs. Temperature ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF)**

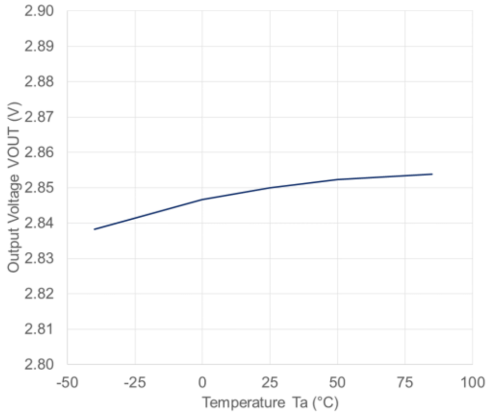
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 2.6 V, $I_{OUT}$ = 1 mA**



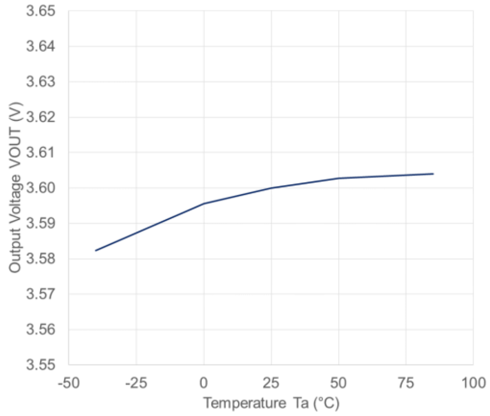

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 2.8 V, $I_{OUT}$ = 1 mA**




**2.85 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 3.85 V, $I_{OUT}$ = 1 mA**

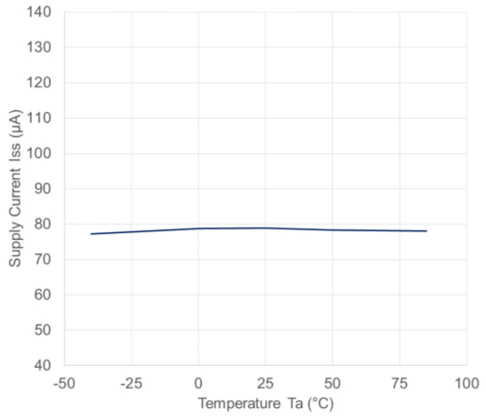



**3.6 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 4.6 V, $I_{OUT}$ = 1 mA**

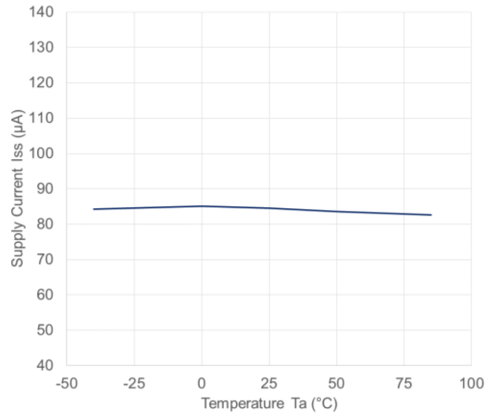



**5) Supply Current vs. Temperature**

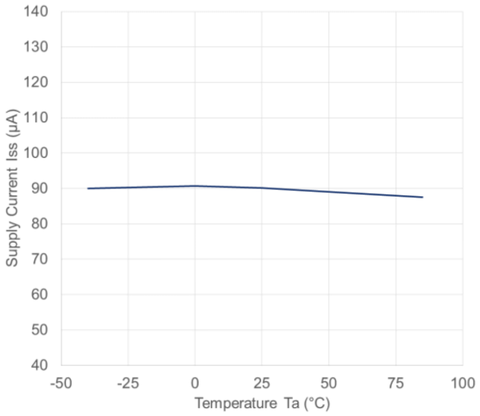
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 2.6 V, $I_{OUT}$ = 0 mA**



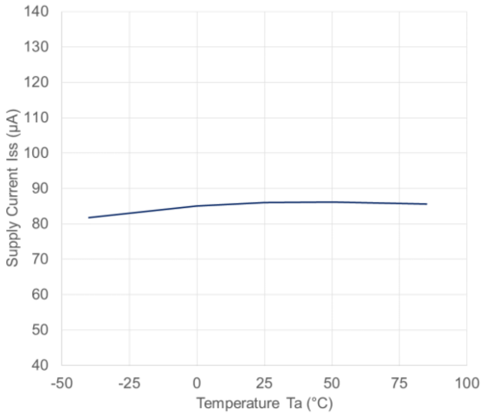

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 2.8 V, $I_{OUT}$ = 0 mA**



**2.85 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 3.85 V, $I_{OUT}$ = 0 mA**

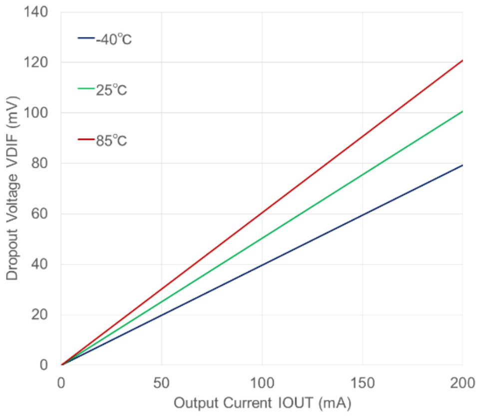



**3.6 V ($V_{SET1}$/ $V_{SET2}$)**
**$V_{IN}$ = 4.6 V, $I_{OUT}$ = 0 mA**

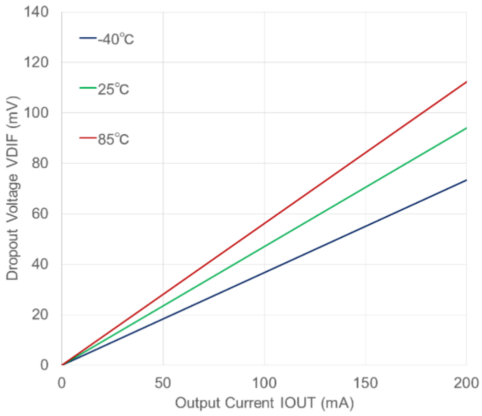



**6) Dropout Voltage vs. Output Current ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF)**

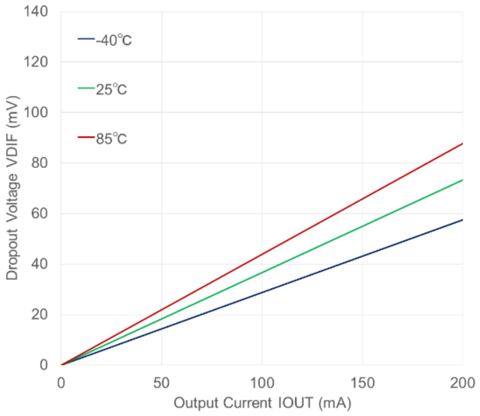
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**



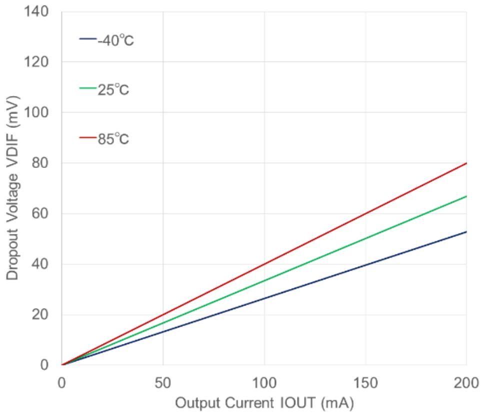

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**




**2.85 V ($V_{SET1}$/ $V_{SET2}$)**

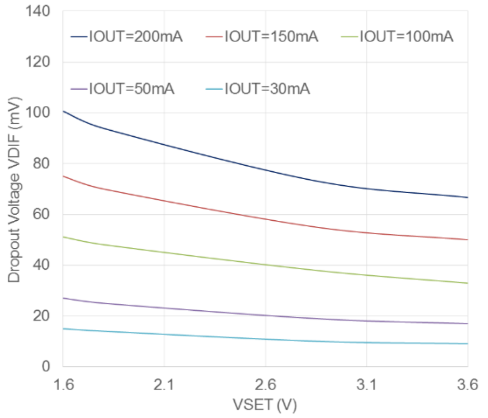



**3.6 V ($V_{SET1}$/ $V_{SET2}$)**



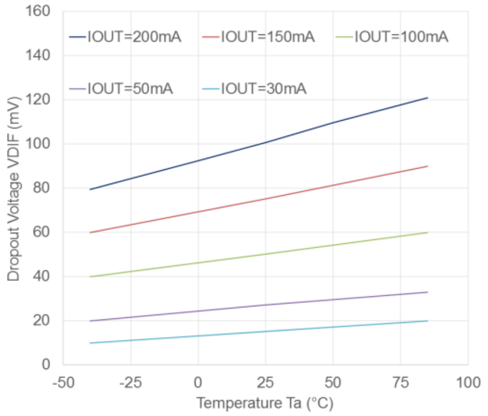
### 7) Dropout Voltage vs. VR_$V_{SET}$ ($C_{IN}$ = Ceramic 1.0 μF, $C_{OUT}$ = Ceramic 1.0 μF, Ta = 25°C)

**$V_{SET1}$/ $V_{SET2}$**

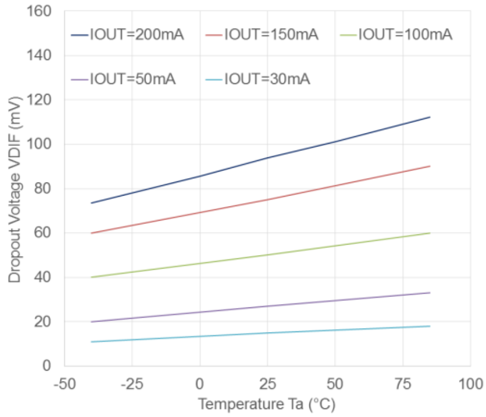



### 8) Dropout Voltage vs. Temperature ($C_{IN}$ = Ceramic 1.0 μF, $C_{OUT}$ = Ceramic 1.0 μF)

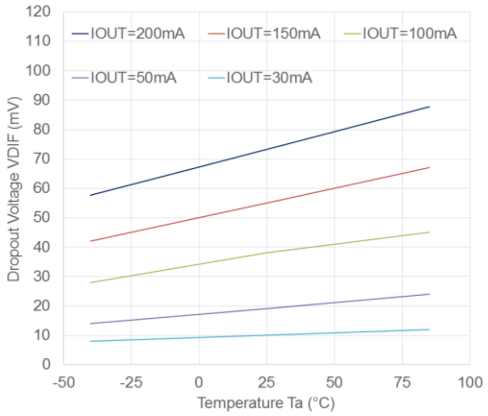
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**



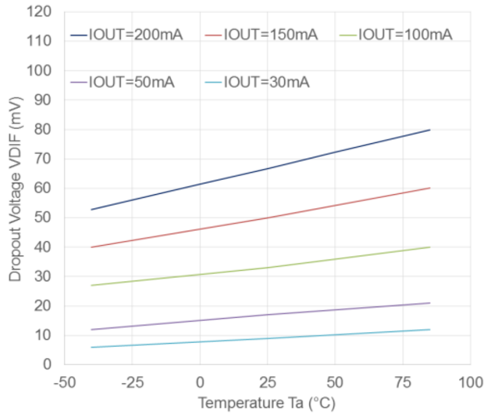

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**




**2.85 V ($V_{SET1}$/ $V_{SET2}$)**



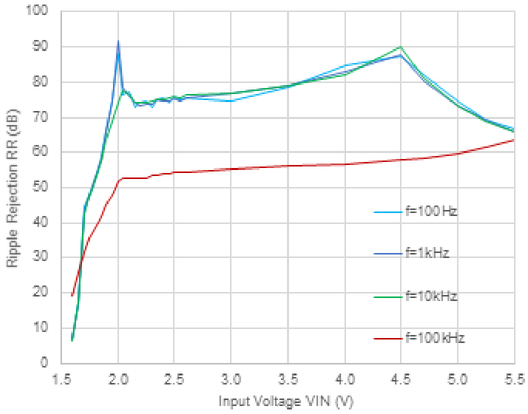

**3.6 V ($V_{SET1}$/ $V_{SET2}$)**



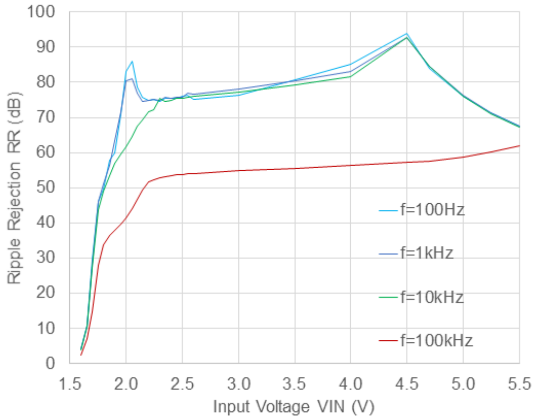
**9) Ripple Rejection vs. Input Bias ($C_{IN}$ = none, $C_{OUT}$ = Ceramic 1.0 μF, Input Ripple = 0.2 Vp-p, Ta = 25°C)**

**1.6 V ($V_{SET1}$/ $V_{SET2}$)**

**$I_{OUT}$ = 1 mA**

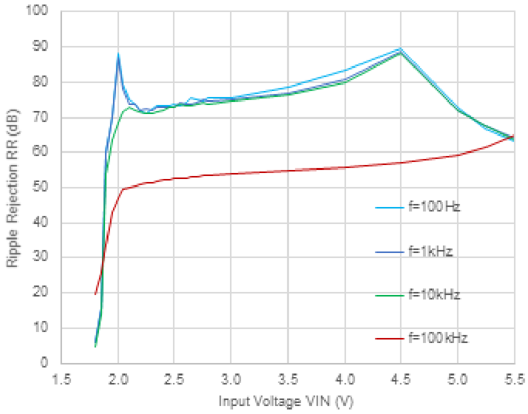



**$I_{OUT}$ = 30 mA**

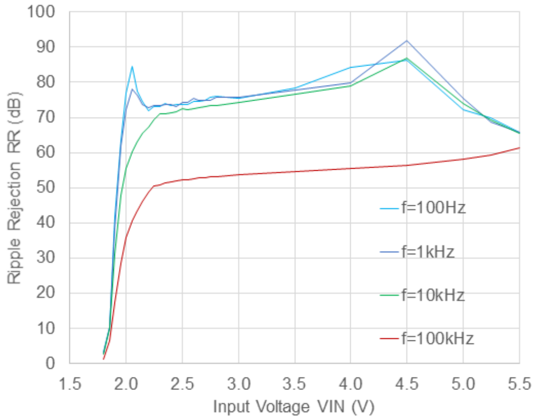



**1.8 V ($V_{SET1}$/ $V_{SET2}$)**

**$I_{OUT}$ = 1 mA**

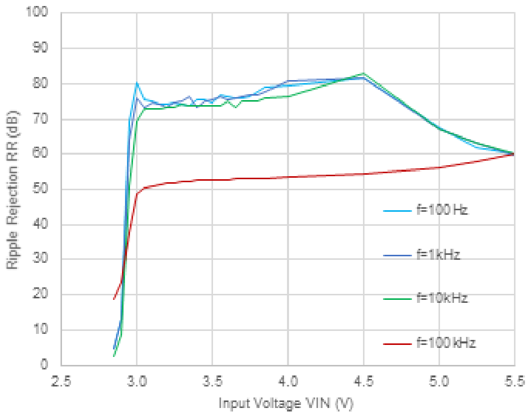



**$I_{OUT}$ = 30 mA**

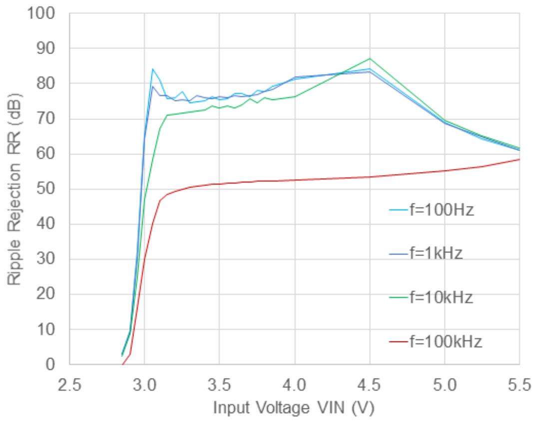



**2.85 V ($V_{SET1}$/ $V_{SET2}$)**

**$I_{OUT}$ = 1 mA**

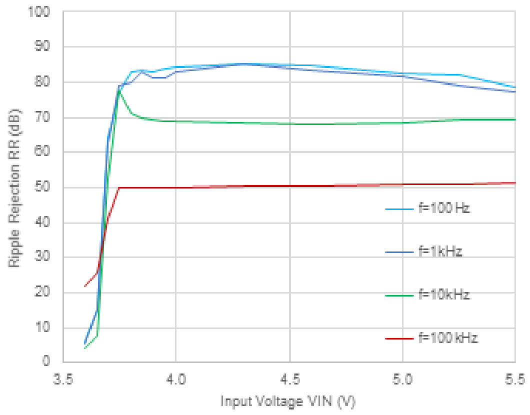



**$I_{OUT}$ = 30 mA**

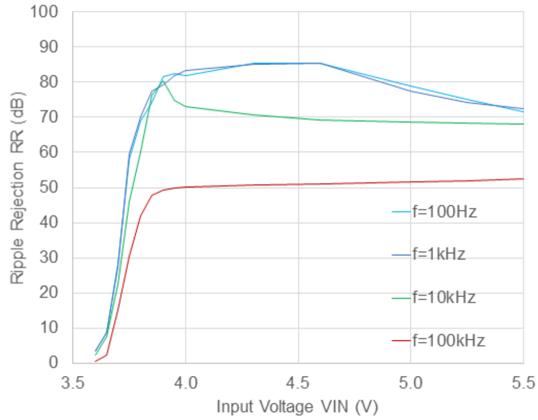


**3.6 V ($V_{SET1}$/ $V_{SET2}$)**

**$I_{OUT}$ = 1 mA**

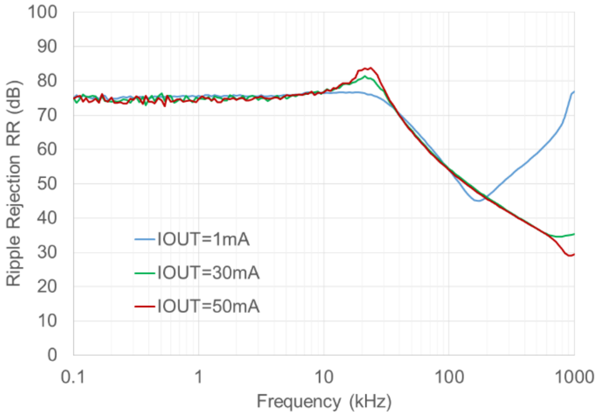



**$I_{OUT}$ = 30 mA**

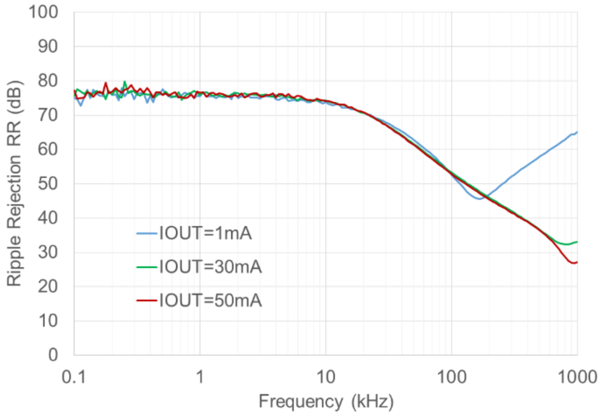



**10) Ripple Rejection vs. Frequency ($C_{IN}$ = none, $C_{OUT}$ = Ceramic 1.0 µF, Input Ripple = 0.2 Vp-p, Ta = 25°C)**

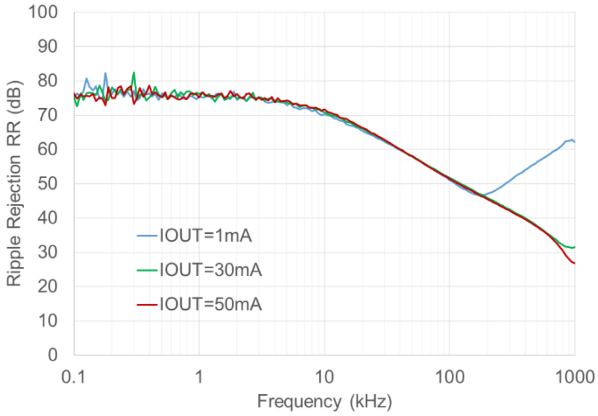
**1.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.6 V**



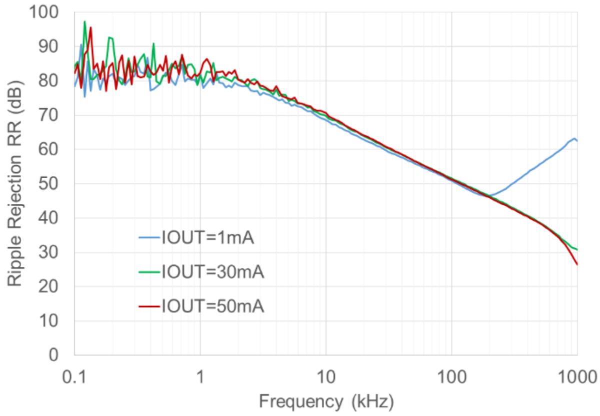

**1.8 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.8 V**




**2.85 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 3.85 V**

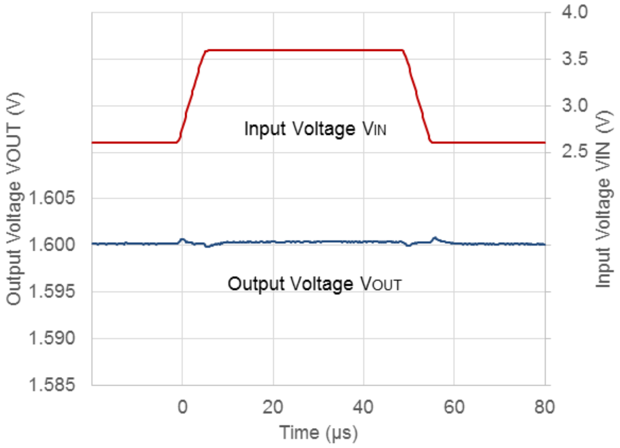



**3.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 4.6 V**

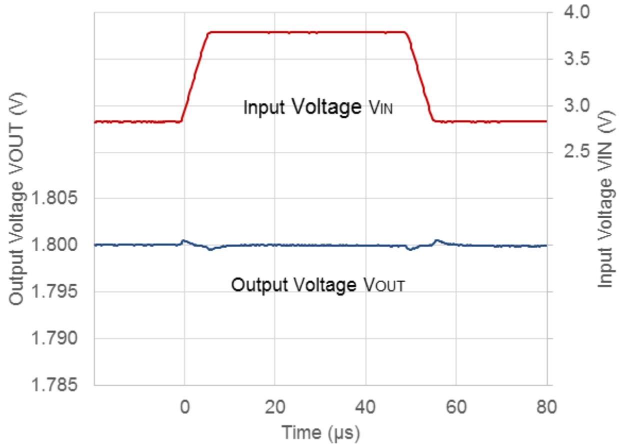


### 11) Input Transient Response ($C_{IN}$ = none, $C_{OUT}$ = Ceramic 1.0 µF, $I_{OUT}$ = 30 mA, tr = tf = 5 µs, Ta = 25°C)

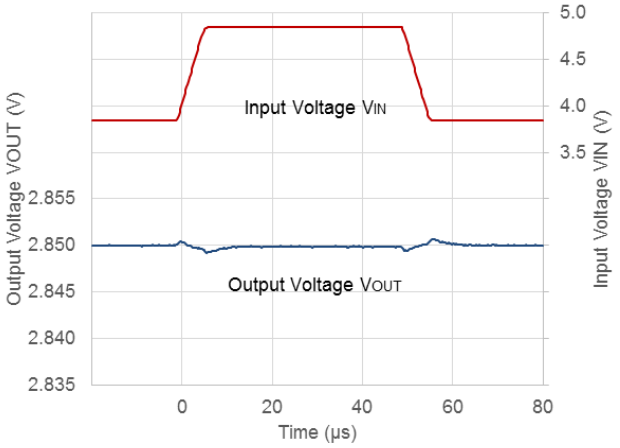
**1.6 V ($V_{SET1}$/ $V_{SET2}$)**



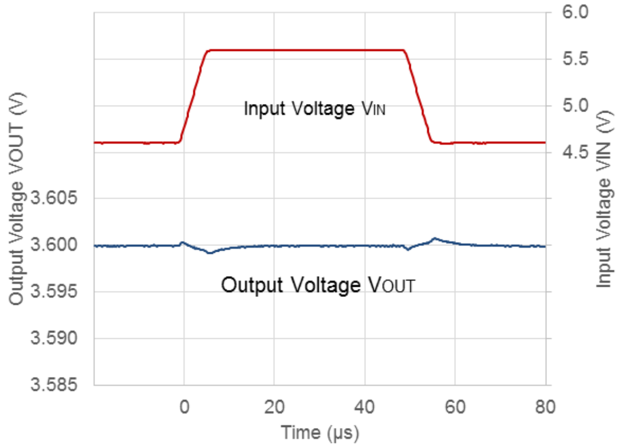

**1.8 V ($V_{SET1}$/ $V_{SET2}$)**




**2.85 V ($V_{SET1}$/ $V_{SET2}$)**



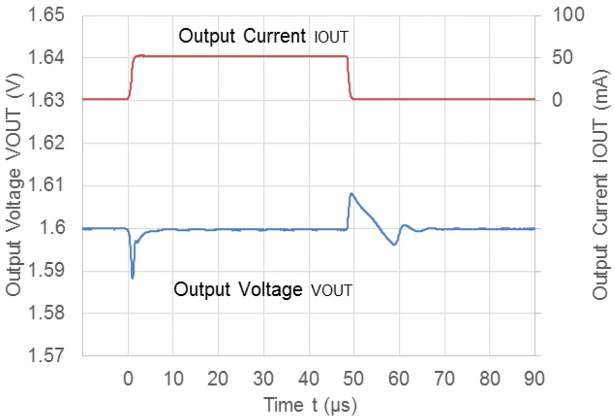

**3.6 V ($V_{SET1}$/ $V_{SET2}$)**



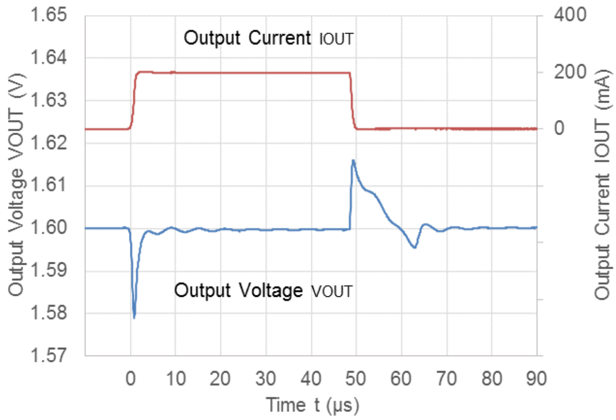

### 12) Load Transient Response ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF, tr = tf = 0.5 µs, Ta = 25°C)

**1.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.6 V**

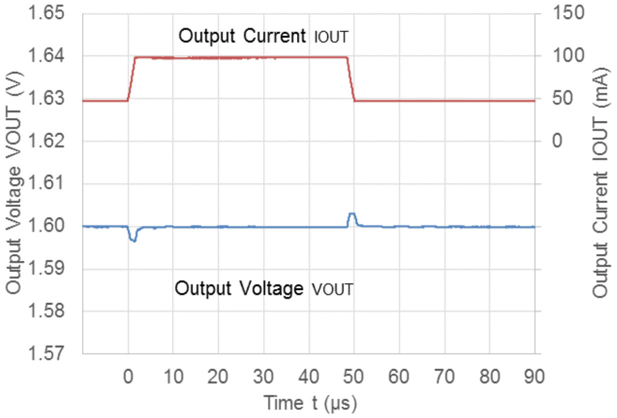
**1 mA ⇔ 50 mA**




**1 mA ⇔ 200 mA**

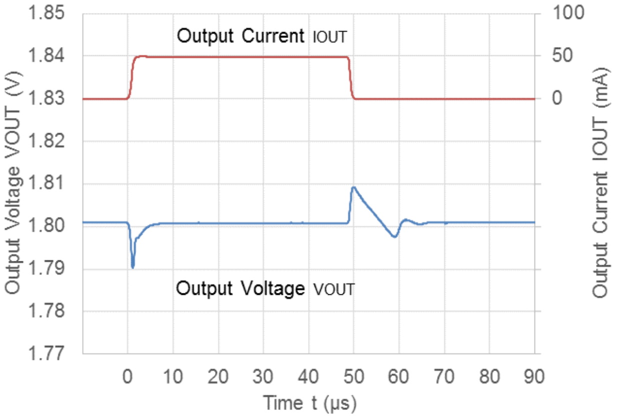


**50 mA ⇔ 200 mA**

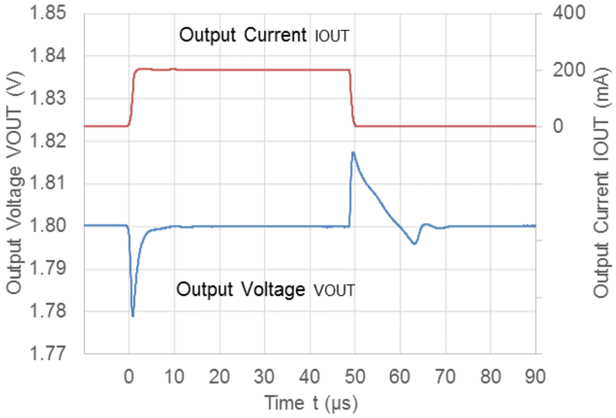



**1.8 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.8 V**

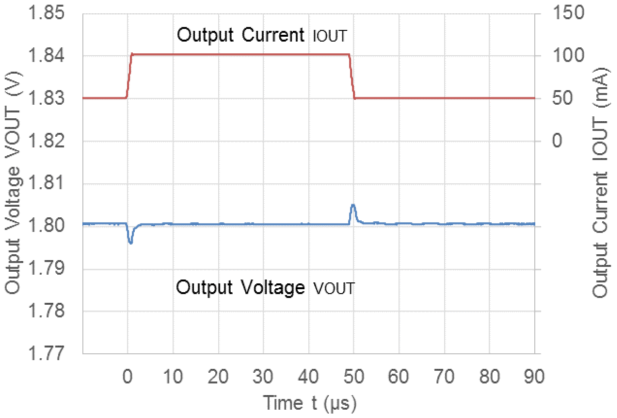
**1 mA ⇔ 50 mA**




**1 mA ⇔ 200 mA**

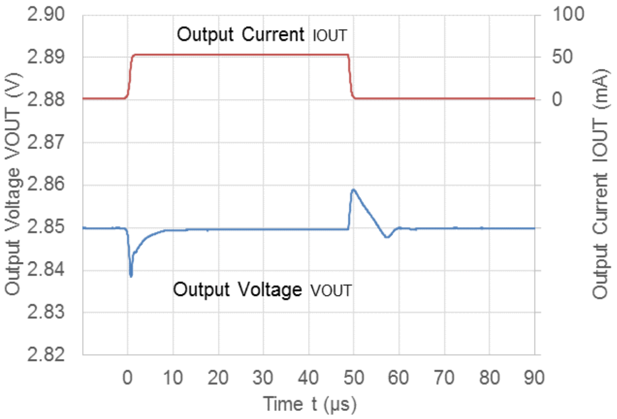



**50 mA ⇔ 200 mA**

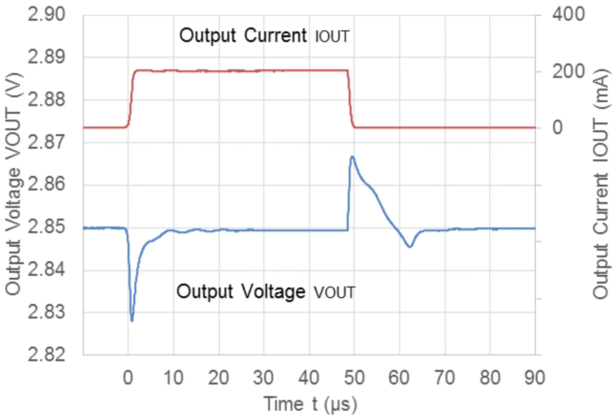


**2.85 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 3.85 V**

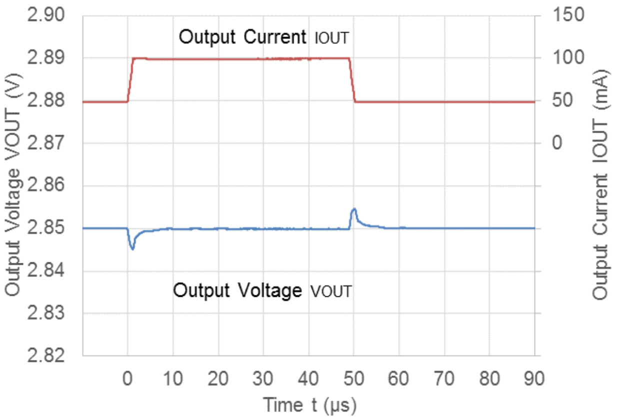
**1 mA ⇔ 50 mA**




**1 mA ⇔ 200 mA**

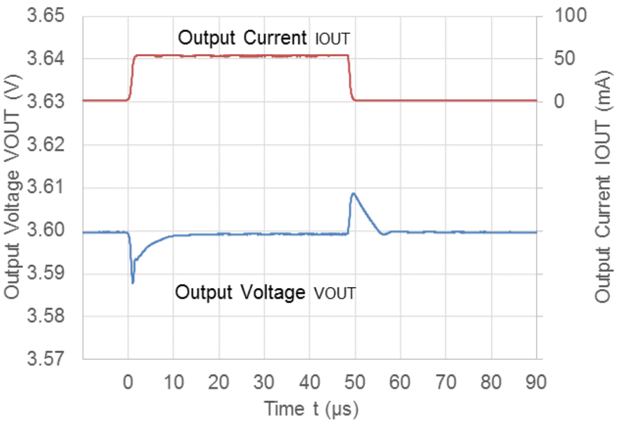



**50 mA ⇔ 200 mA**

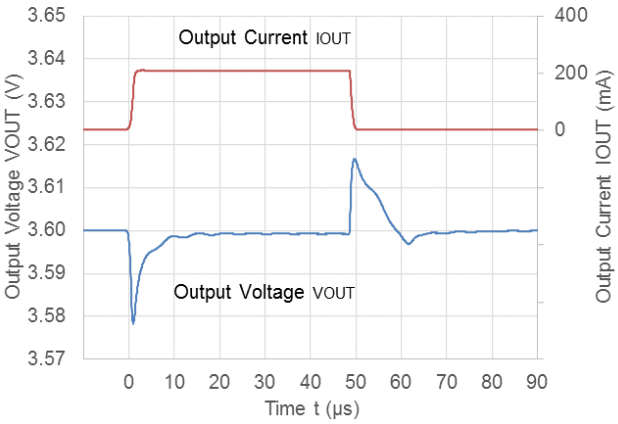



**3.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 4.6 V**

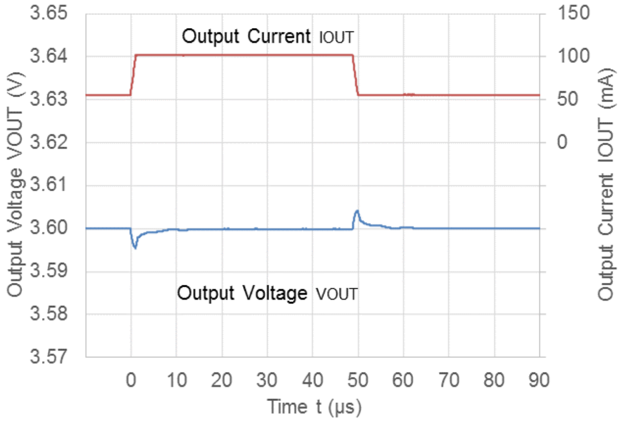
**1 mA ⇔ 50 mA**




**1 mA ⇔ 200 mA**

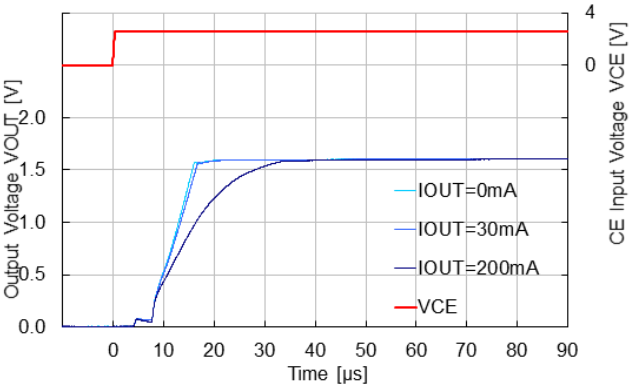


**50 mA ⇔ 200 mA**

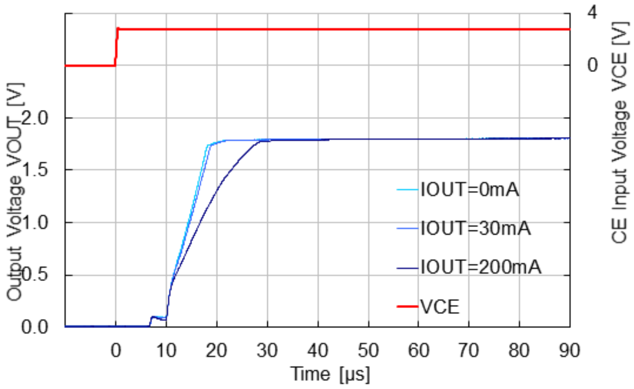



**13) Turn On Speed with CE pin ($C_{IN}$ = Ceramic 1.0 μF, $C_{OUT}$ = Ceramic 1.0 μF, Ta = 25°C)**

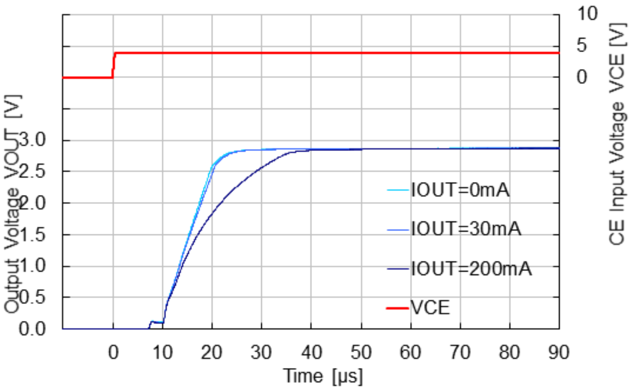
**1.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.6 V**



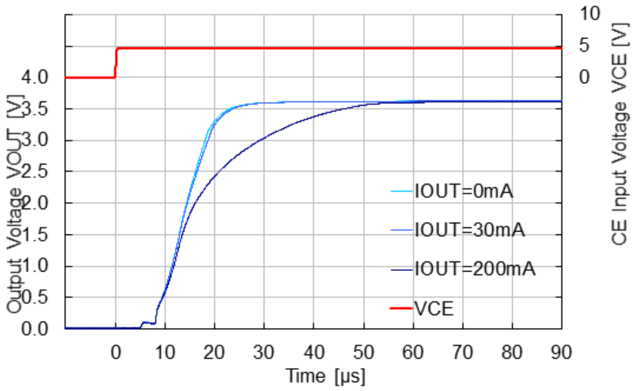

**1.8 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.8 V**




**2.85 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 3.85 V**

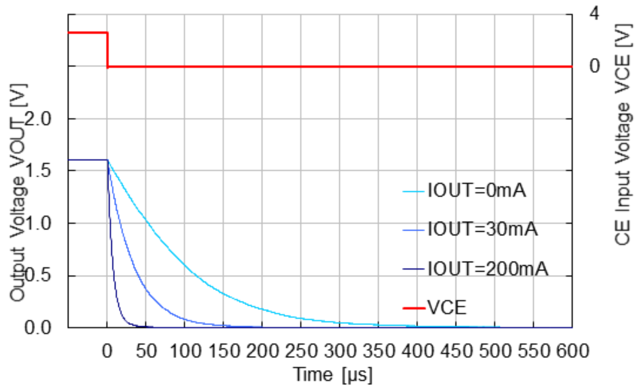



**3.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 4.6 V**

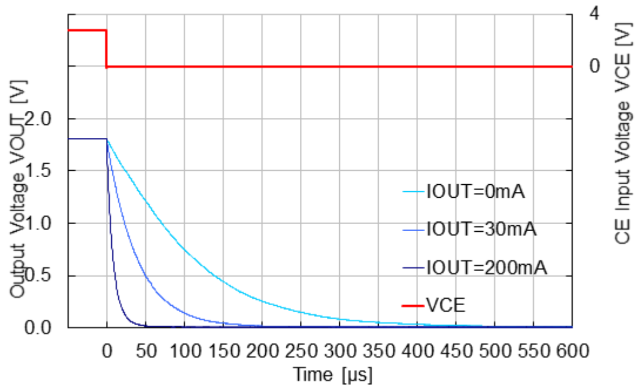


**14) Tum Off Speed with CE pin ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF, Ta = 25°C)**

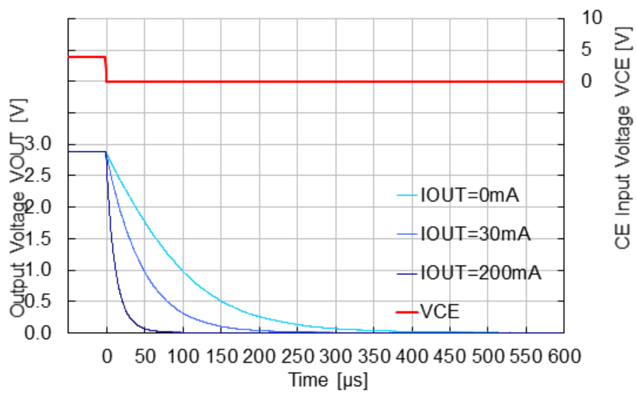
**RP155ZxxxB**
**1.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.6 V**



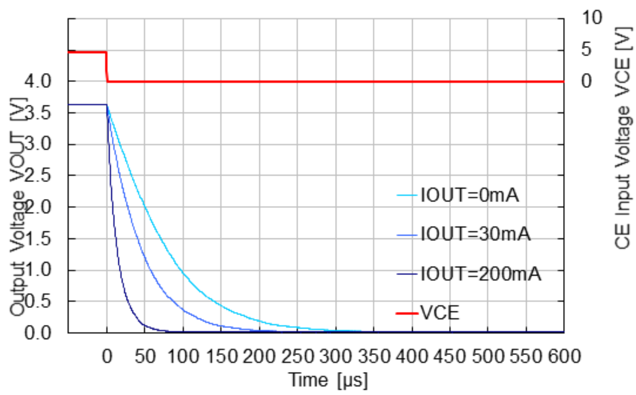

**RP155ZxxxB**
**1.8 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.8 V**




**RP155ZxxxB**
**2.85 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 3.85 V**

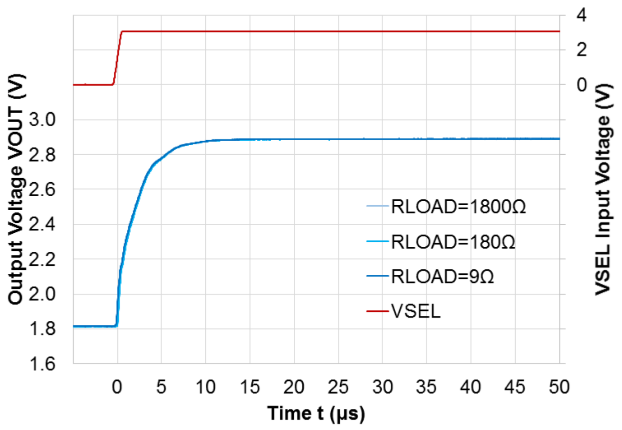



**RP155ZxxxB**
**3.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 4.6 V**

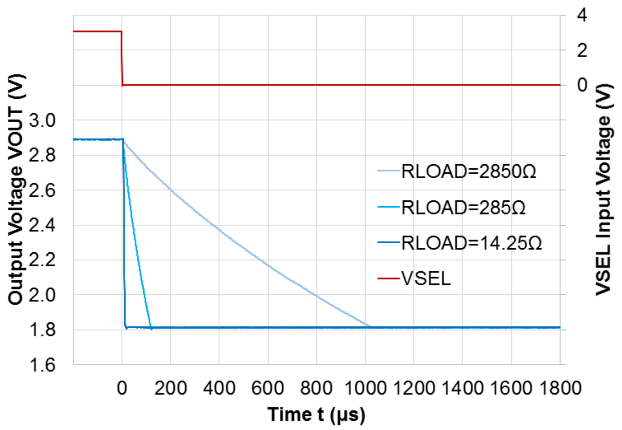



**15) $V_{OUT}$ Transient Response with VSEL Pin ($C_{IN}$ = Ceramic 1.0 µF, $C_{OUT}$ = Ceramic 1.0 µF, tr = tf = 5 µs, Ta = 25°C)**

**RP155Z001B**
**$V_{SET1}$ (1.8 V) ⇒ $V_{SET2}$ (2.85 V)**




**RP155Z001B**
**$V_{SET2}$ (2.85 V) ⇒ $V_{SET1}$ (1.8 V)**

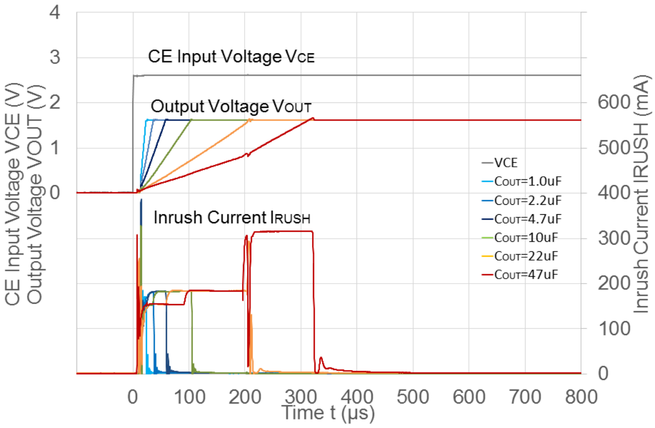




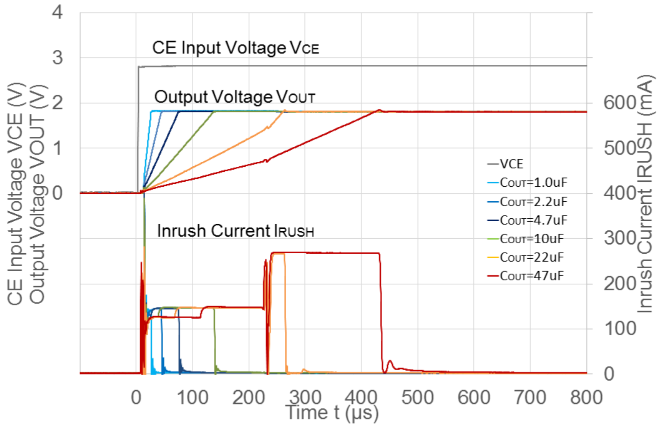

RICOH

### 16) Inrush Current ($C_{IN}$ = Ceramic 1.0 μF, $I_{OUT}$ = 0 mA, Ta = 25°C)

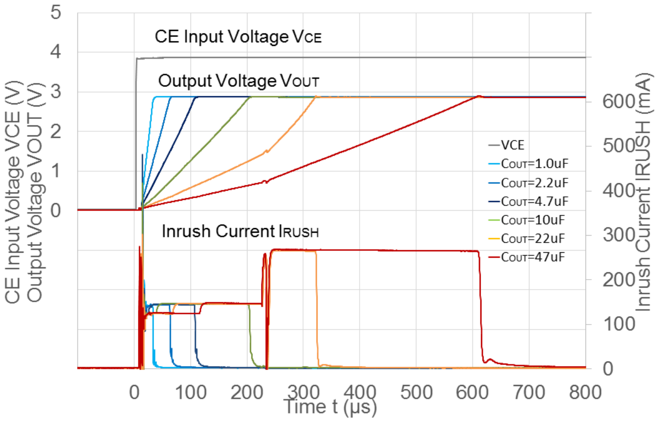
**1.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.6 V**



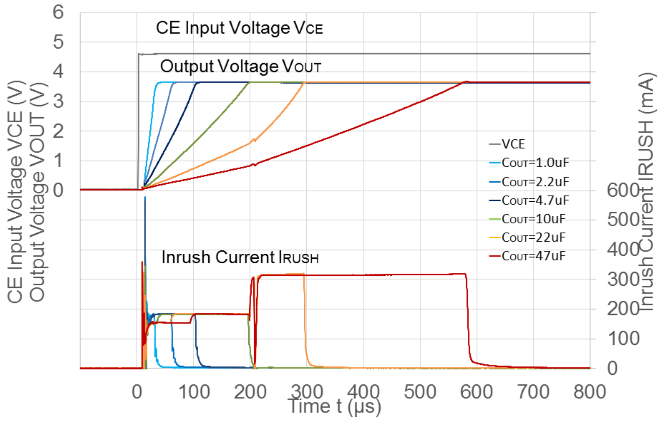

**1.8 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.8 V**



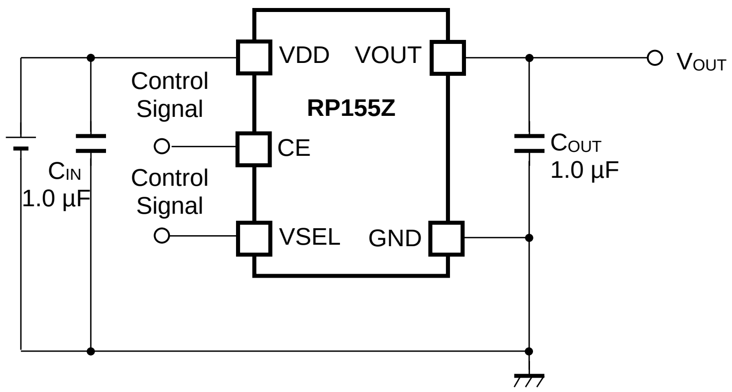

**2.85 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 3.85 V**




**3.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 4.6 V**



## Test Circuit




**RP155Z circuit for measuring Typical Characteristics**

### Measurement Components of Typical Characteristics

| Symbol | Description |
|---|---|
| $C_{IN}$, $C_{OUT}$ | Ceramic Capacitor, 1.0 µF, GRM155B31A105KE15, MURATA |

# EQUIVALENT SERIES RESISTANCE VS. OUTPUT CURRENT

A ceramic output capacitor is recommended to be used but any output capacitor with low ESR could also be used. The graphs below show the relations between output current and ESR of an output capacitor when the average white noise level is 40 µV or less.

**1.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 1.9 V to 5.25 V**

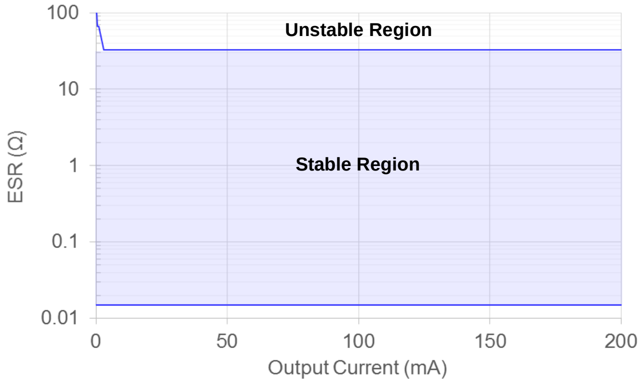



**Fig. 1 Range of Stable ESR Values**

**1.8 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 1.9 V to 5.25 V**

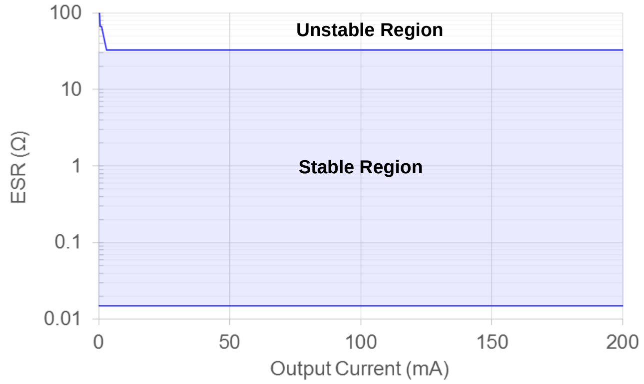



**Fig. 2 Range of Stable ESR Values**

**2.85 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 2.85 V to 5.25 V**

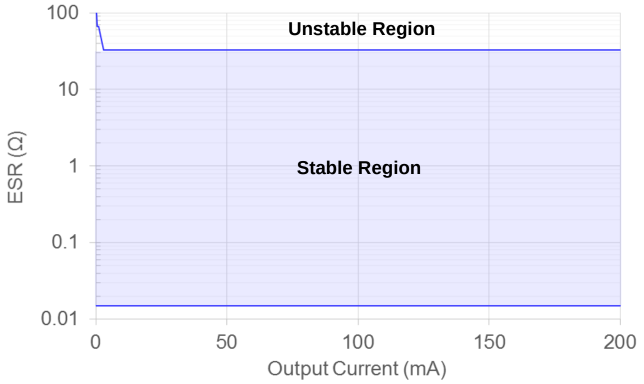



**Fig. 3 Range of Stable ESR Values**

**3.6 V ($V_{SET1}$/ $V_{SET2}$), $V_{IN}$ = 3.6 V to 5.25 V**

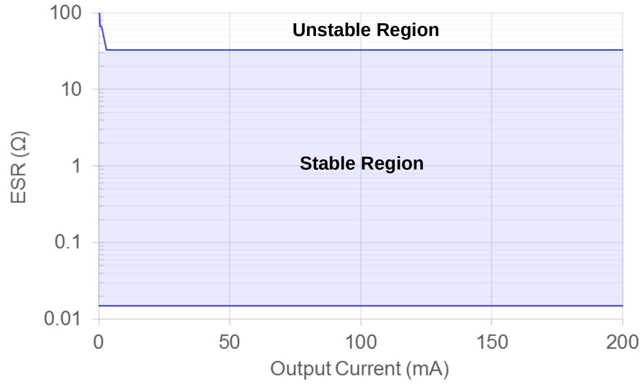



**Fig. 4 Range of Stable ESR Values**

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

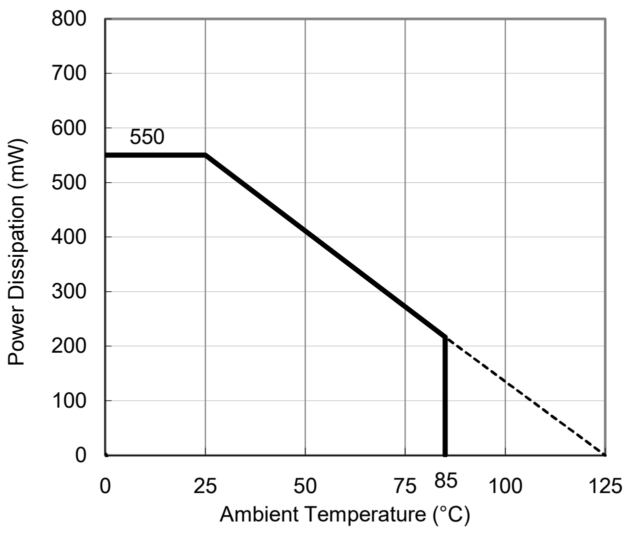
**Measurement Conditions**

| Item | Measurement Conditions |
|---|---|
| Environment | Mounting on Board (Wind Velocity = 0 m/s) |
| Board Material | Glass Cloth Epoxy Plastic (Four-Layer Board) |
| Board Dimensions | 101.5 mm x 114.5 mm x 1.6 mm |
| Copper Ratio | Outer Layer (First Layer): 10% 50um<br>Inner Layers (Second and Third Layers): 99.5 x 99.5mm 100% 70um<br>Outer Layer (Fourth Layer): 10% 50um |

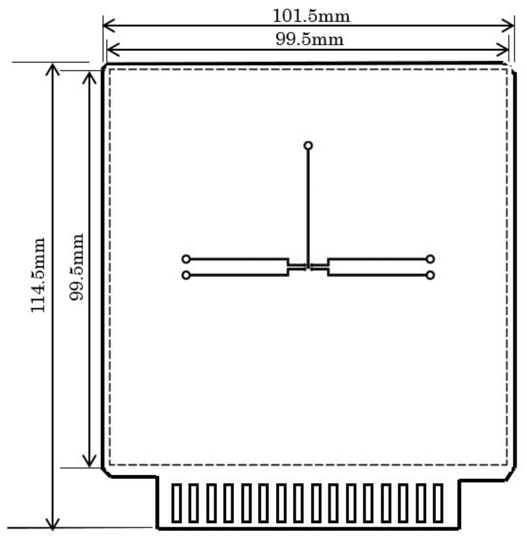
**Measurement Result** (Ta = 25°C, Tjmax = 125°C)

| Item | Measurement Result |
|---|---|
| Power Dissipation | 550 mW |
| Thermal Resistance (θja) | θja = 180°C/W |

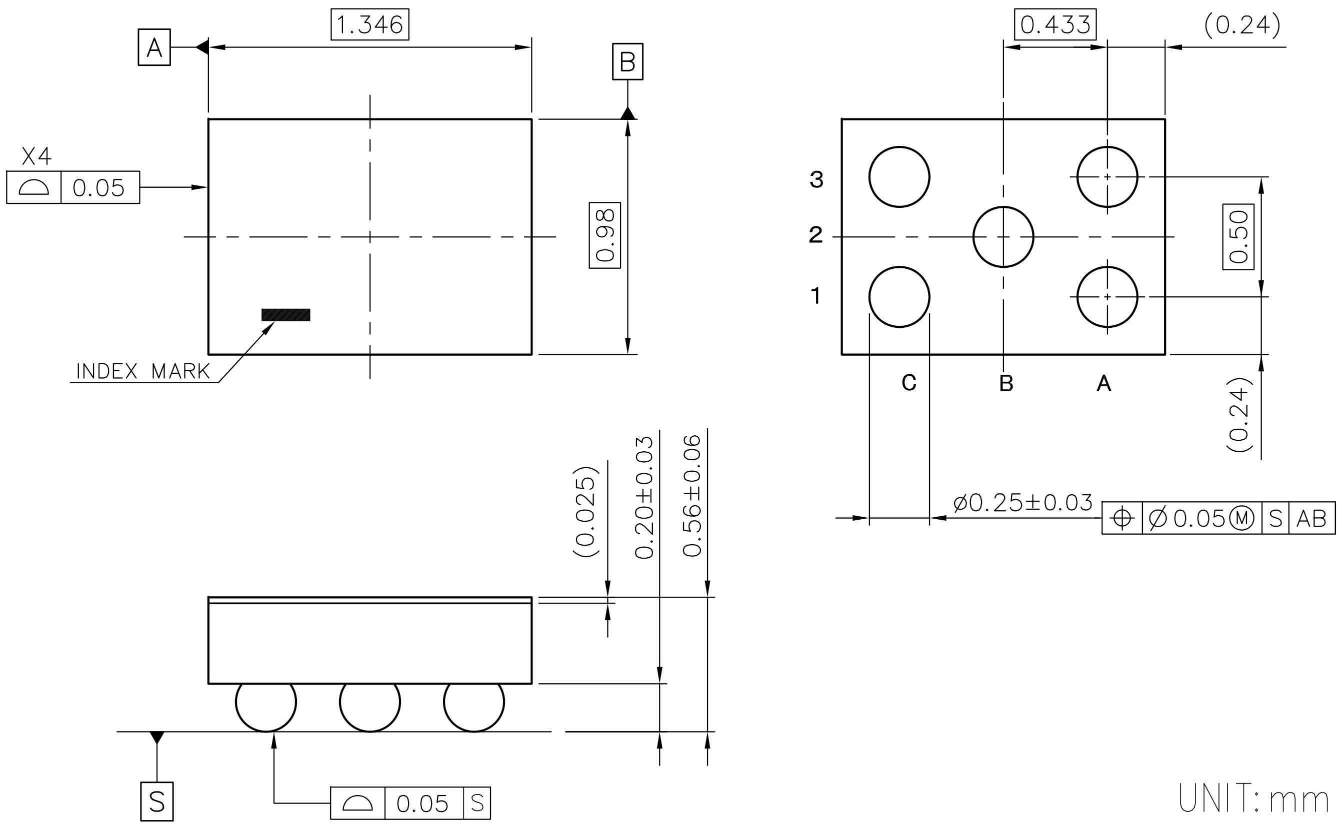
θja: Junction-to-Ambient Thermal Resistance




**Power Dissipation vs. Ambient Temperature**




**Measurement Board Pattern**




**WLCSP-5-P1 Package Dimensions**

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8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
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RoHS Compliant
Halogen Free

**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.

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