R1524x Series

AEC-Q100 Compliant

Low Supply Current 36 V Input 200 mA Voltage Regulator

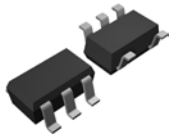
RICOH
imagine. change.

- **50-V Rating (60 V Peak Voltage) LDO Achieves an Industry-leading level Low Supply Current of Typ. 2.2 μA(1)**
- **Provides Excellent Transient Response Characteristics and Prevents Malfunction of Load Devices: 5 Times Improved Input Transient Response/2.5 Times Improved Load Transient Response(2)**
- **High-accuracy Output Voltage to Assure a Design Margin: ±0.6% (Ta = 25℃), ±1.6% (Ta = −40℃ to 125℃)**
- **A direct power supply to microcomputer from high power voltage (12 V, 24 V) eliminates the need of an external step-down circuit and contributes to area saving and power saving**

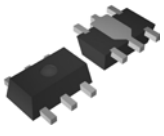
KEY SPECIFICATIONS

- Lineup; Operating Temperature range:
  Automotive; -40°C to 125°C, Industrial;-50°C to 125°C,
  Consumer; -40°C to 105°C
- Input Voltage Range (Maximum Rating): 3.5 V to 36.0 V (50.0 V)
- Absolute Maximum Ratings: 50 V (Peak Voltage: 60 V within 200 ms)
- Supply Current: Typ. 2.2 μA
- Standby Current: Typ. 0.1 μA
- Dropout Voltage: Typ. 0.6 V (I_{OUT} = 200 mA, V_{SET} = 5.0 V)
- Output Voltage Range: 1.8 V, 2.5 V, 2.8 V, 3.0 V, 3.3 V, 3.4 V, 5.0 V, 5.5 V, 6.0 V, 6.4 V, 7.5 V, 8.0 V, 8.5 V, 9.0 V
  10.0 V, 10.5 V, 11.0 V, 12.0 V
- Output Voltage Accuracy: ±0.6% (Ta = 25°C)
- Output Voltage Temperature-Drift Coefficient: Typ. ±60 ppm/℃
- Output Current: 200 mA
- Protection: Thermal Shutdown, Overcurrent Protection, Short-circuit Current Limiting
- Tjmax = 150℃

PACKAGES



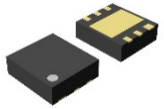
SOT-23-5
2.9 x 2.8 x 1.1 (mm)



SOT-89-5
4.5 x 4.35 x 1.5 (mm)

HSOP-6J
5.02 x 6.0 x 1.5 (mm)

HSOP-8E
5.2 x 6.2 x 1.45 (mm)



DFN(PLP)1820-6
1.8 x 2.0 x 0.6 (mm)

(not applicable to Automotive Applications)

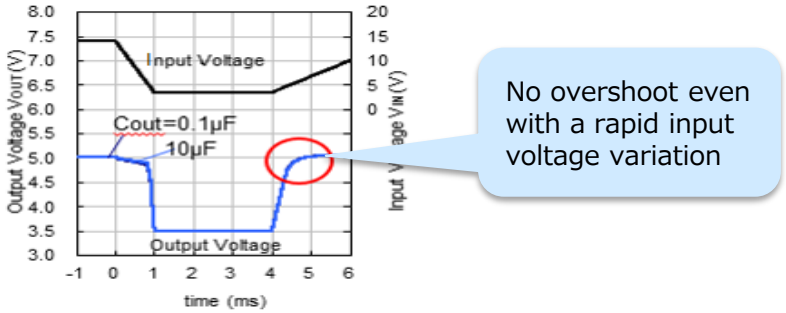
(1) Operation voltage over 36 V (Research by RICOH as of March 15, 2016)
(2) Compared with our conventional product, R1514x

APPLICATIONS

- Power source for accessories such as car audios, car navigation systems, and ETC systems
- Power source for ECUs such as EV inverter and battery charge control unit
- Power source for home applications such as refrigerators, rice cookers, and electric hot-water pot.
- Power source for notebook PCs, digital TVs, cordless phones and private LAN systems.
- Industrial equipment such as FAs and smart meters
- Equipment used under high-temperature conditions such as surveillance cameras and vending machines

TYPICAL CHARACTERISTICS

Transient Response Characteristics



No. EV-332-200326

R1524x Series

AEC-Q100 Compliant

Low Supply Current 36 V Input 200 mA Voltage Regulator

RICOH imagine. change.

50-V Rating (60 V Peak Voltage) LDO Achieves an Industry-leading Low Supply Current of Typ. 2.2 µA(1)

(1) Operation voltage over 36 V (Research by RICOH as of March 15, 2016)

CLIENT'S CONCERNS

- We are using a high-voltage LDO for a battery driving system, but a large current consumption exhausts battery under the non-charging condition.

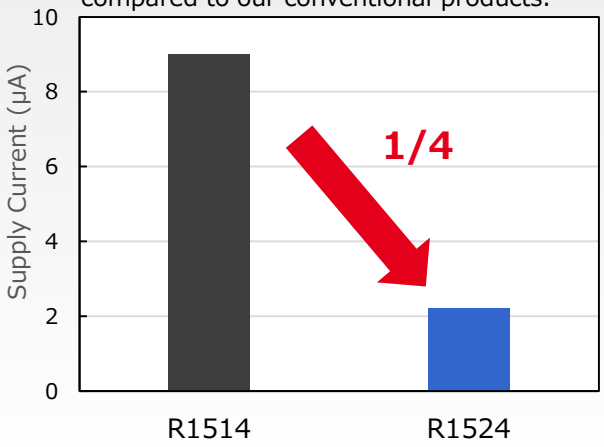
RICOH'S SOLUTIONS

- The R1524x achieves industry-leading low supply current of Typ. 2.2 µA for high-voltage LDO products. This is best used for a product which needs to reduce power consumption of a system. Especially for battery driving products, the R1524x contributes to a longer battery life.

Development of Ricoh Products and Technologies

World's Top Class Spec.
(High Voltage LDO category (1))

The supply current is successfully reduced, compared to our conventional products.



	R1514 (Released in March, 2007)	R1524
Input Voltage	4.0 V to 36 V	3.5 V to 36 V(2)
Supply Current	9 µA	**2.2 µA**(3)

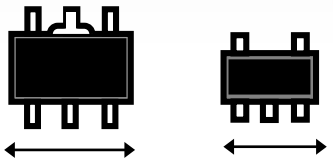
(2) Applicable up to 60 V within 200 ms although the rating is 50 V.

(3) Reduces power consumption and achieves the faster response than conventional products.

The ultra-low supply current LDO R1524x contributes to:

-Higher efficiency of system power source
-Dark current reduction
-Long-life battery
-Miniaturization of battery size

Lineup of small package



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- **Provides Excellent Transient Response Characteristics and Prevents Malfunction of Load Devices: 5 Times Improved Input Transient Response/2.5 Times Improved Load Transient Response(1)**

(1) Compared with our conventional product, R1514x

CLIENT'S CONCERNS

- LDOs with low supply current generally show low responsiveness and this may cause over/under voltage leading failure or malfunction with variation in input voltage or load current.

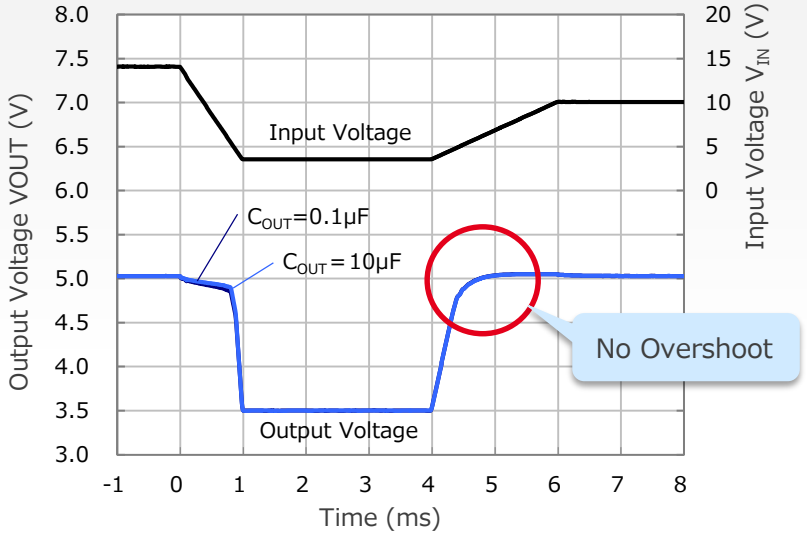
RICOH'S SOLUTIONS

- The R1524 achieves an industry-leading level ultra-low supply current while preventing from output voltage overshoot during vehicle cranking.
- Also, the R1524 achieves excellent transient response against sharp rising/falling of input voltage or load current.

Excellent Transient Response Characteristics of R1524x

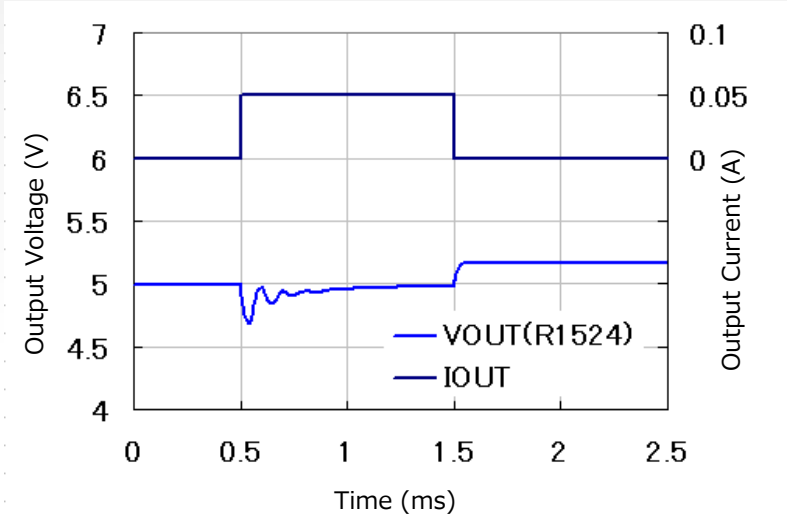
Input Transient Response Characteristics

V_{SET} = 5.0 V, V_{IN}: 14 V → 3.5 V → 10 V, Ta=25℃



Load Transient Response Characteristics

V_{IN} = 12 V, V_{SET} = 5.0 V, I_{OUT}: 1 ⇔ 50 mA, C_{OUT} = 4.7 μF



No. EV-332-200326

- **High-accuracy Output Voltage to Assure a Design Margin: ±0.6% (Ta = 25℃), ±1.6% (Ta = −40℃ to 125℃)**

CLIENT'S CONCERNS

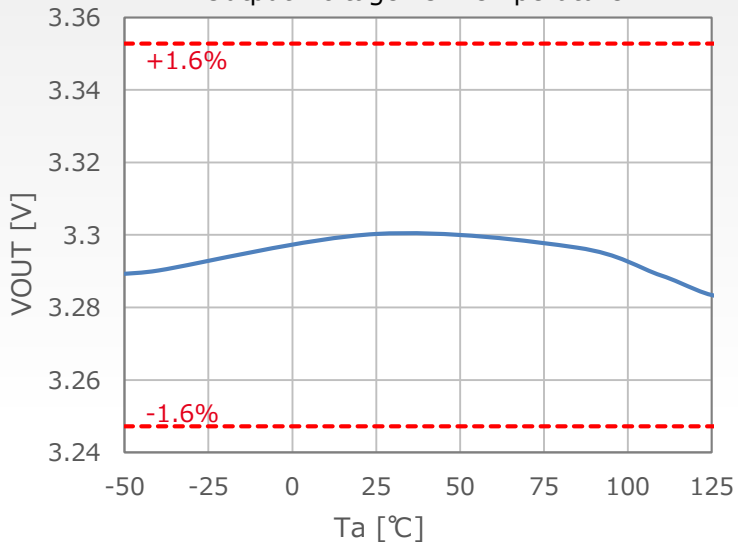
- Devices which require high input voltage accuracy such as sensors, AD converters, and voltage reference etc. need a stable power supply even under a harsh environment in order to assure a design margin.

RICOH'S SOLUTIONS

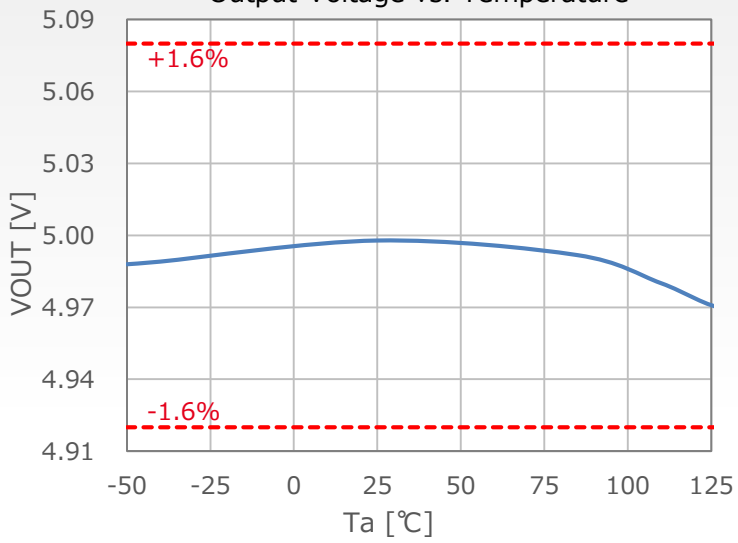
- The R1524x achieves high-accuracy output voltage of ±0.6% (Ta = 25℃) and ±1.6% (Ta = −40℃ to 125℃). A low output variation even under harsh environment contributes to a power supply circuit design with allowances. The R1524x can also be used as a reference voltage source.

High-accuracy Output Voltage of R1524x

V_{IN} = 14 V, V_{SET} = 3.3 V, I_{OUT} = 1 mA
Output Voltage vs. Temperature



V_{IN} = 14 V, V_{SET} = 5.0 V, I_{OUT} = 1 mA
Output Voltage vs. Temperature



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A direct power supply to microcomputer from high power voltage (12 V, 24 V) eliminates the need of an external step-down circuit and contributes to area saving and power saving

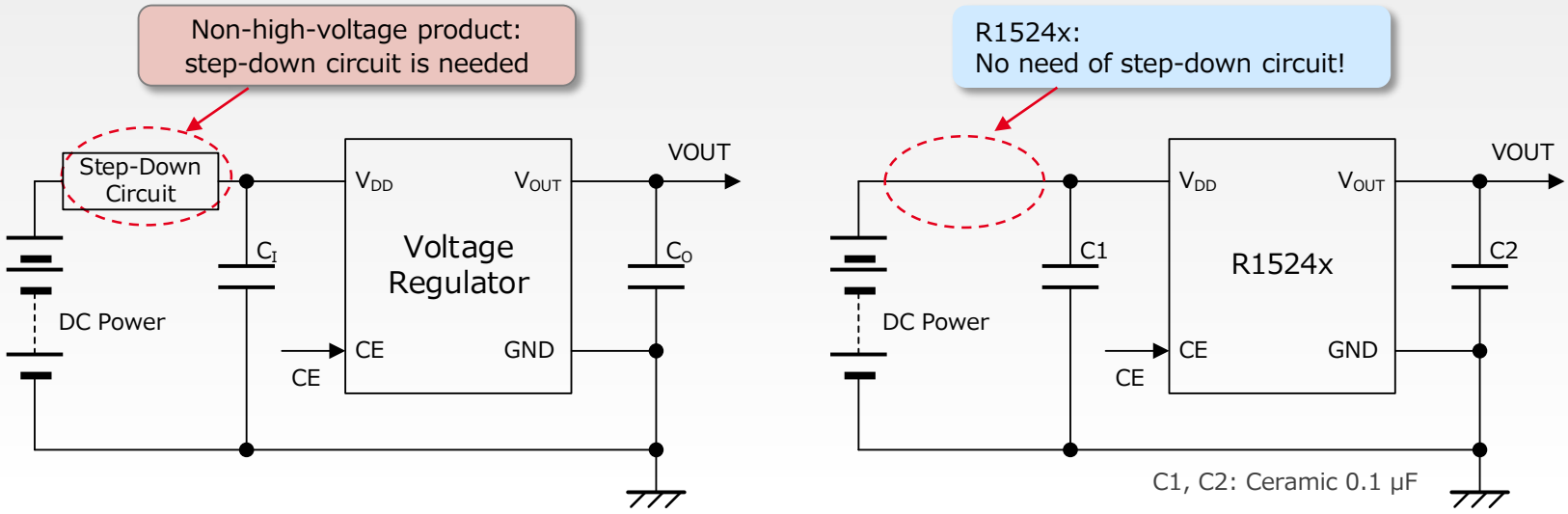
CLIENT'S CONCERNS

- A system with high power voltage uses a step-down regulator to supply the power of microcomputer, but a separate step-down circuit is needed at the shortage of high voltage.

RICOH'S SOLUTIONS

- The R1524x enables to supply power directly from the DC power source with maximum voltage of 36 V and contributes to simplify the system

Eliminates the external circuit by directly connecting to the high power voltage



・Increase in the mounting area due to the addition of the external circuit
・Wasteful power consumption occurs due to the external circuit

・Reduced mounting area due to the elimination of the external circuit
・No wasteful power consumption due to the direct connection of power supply

SELECTION GUIDE

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1524KxxxB-TR-#	DFN(PLP)1820-6	5,000pcs	Yes	Yes
R1524NxxxB-TR-#E	SOT-23-5	3,000pcs	Yes	Yes
R1524HxxxB-T1-#E	SOT-89-5	1,000pcs	Yes	Yes
R1524SxxxB-E2-#E	HSOP-6J	1,000pcs	Yes	Yes
R1524SxxxH-E2-#E	HSOP-8E	1,000pcs	Yes	Yes

xxx:Set Output Voltage (V_{SET})
1.8 V (018) / 2.5 V (025) / 2.8 V (028) / 3.0 V (030) / 3.3 V (033) / 3.4 V (034) / 5.0 V (050) / 5.5 V (055) / 6.0 V (060) / 6.4 V (064) / 7.5 V (075) / 8.0 V (080) / 8.5 V (085) / 9.0 V (090)) / 10.0 V (100) / 10.5 V (105) / 11.0 V (110) / 12.0 V (120)

#: Quality Class

#	Applications	Operating Temp. Range
A	Automotive accessories	-40℃ ≤ Ta ≤ 125℃
K	Automotive general equipment (body systems)	-40℃ ≤ Ta ≤ 125℃
Y	Industrial applications	-50℃ ≤ Ta ≤ 125℃
F	Consumer applications	-40℃ ≤ Ta ≤ 105℃