The R5524x is a CMOS-based high-side MOSFET switch IC which conforms to the universal serial bus (USB) standard. The device is suitable for protecting a USB power source. By using an Nch MOSFET with low On-resistance (Typ. 100 mΩ) as a switching transistor, the device can provide low dropout voltage. Internally, the device consists of an overcurrent limiting circuit, a thermal shutdown circuit, an undervoltage lockout (UVLO) circuit and a reverse current protection circuit. The device also consists of an internal delay circuit to prevent the output of false flag signals caused by inrush current. To achieve simplification of layout design, the overcurrent detection accuracy has been improved. The R5524x is offered in a 5-pin SOT-23-5 package and a 6-pin DFN(PLP)1820-6 package which achieve the smallest possible footprint solution on boards where area is limited.

FEATURES

- N-channel MOS High-Side Switch IC
- Switch ON Resistance Typ. 100 mΩ at 5 V Input
- Current Limit Threshold Min. 650 mA\(^{(1)}\), Min. 1.25 A\(^{(2)}\)
- Overcurrent Limit Min. 550 mA
- Flag Delay Time Typ. 20 ms
- Under-voltage Lockout (UVLO) Circuit
- Thermal Shutdown Circuit
- Reverse Current Protection Circuit
- Package SOT-23-5, DFN(PLP)1820-6\(^{(3)}\)

APPLICATIONS

- PCs and PC Peripherals
- Digital Televisions (DTV)
- Set Top Boxes (STB)
- Printers
- PDA
- Game Consoles

\(^{(1)}\) Only for R5524x001A/B, R5524x002A/B
\(^{(2)}\) Only for R5524N004A
\(^{(3)}\) Only for R5524K001x, R5524K002x
SELECTION GUIDE

The overcurrent limit protection type, the current limit threshold and the auto discharge options\(^{(1)}\) for the ICs 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>R5524N00x*-TR-FE</td>
<td>SOT-23-5</td>
<td>3,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R5524K00x*-TR</td>
<td>DFN(PLP)1820-6</td>
<td>5,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

\(x\): Specify the combination of Overcurrent Limit Protection type and Current Limit Threshold.
1: Latch-off Type, Current Limit Threshold: Min. 650 mA
2: Constant Current Type, Current Limit Threshold: Min. 650 mA
4: Constant Current Type, Current Limit Threshold: Min. 1.25 A\(^{(2)}\)

\(\ast\): Specify auto-discharge options.
A: Auto-discharge included
B: Auto-discharge not included

---

\(^{(1)}\) 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.

\(^{(2)}\) Only for R5524N004A
BLOCK DIAGRAMS

R5524xxxxA Block Diagram

R5524xxxxB Block Diagram
PIN DESCRIPTIONS

R5524N (SOT-23-5) Pin Configuration

R5524K (DFN(PLP)1820-6) Pin Configuration

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VIN</td>
<td>Input Pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>EN</td>
<td>Chip Enable Pin, Active-high</td>
</tr>
<tr>
<td>4</td>
<td>FLG</td>
<td>Flag Pin, Open Drain Output</td>
</tr>
<tr>
<td>5</td>
<td>VOUT</td>
<td>Output Pin</td>
</tr>
</tbody>
</table>

The exposed tab is substrate level (GND). It is recommended that the exposed tab be connected to the ground plane on the board or otherwise be left open.
# ABSOLUTE MAXIMUM RATINGS

## Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{IN}$</td>
<td>Input Voltage</td>
<td>6.0</td>
<td>V</td>
</tr>
<tr>
<td>$V_{EN}$</td>
<td>Enable Pin Input Voltage</td>
<td>$-0.3$ to $6.0$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{FLG}$</td>
<td>Flag Pin Voltage</td>
<td>$-0.3$ to $6.0$</td>
<td>V</td>
</tr>
<tr>
<td>$I_{FLG}$</td>
<td>Flag Pin Current</td>
<td>14</td>
<td>mA</td>
</tr>
<tr>
<td>$V_{OUT}$</td>
<td>Output Pin Voltage</td>
<td>$-0.3$ to $6.0$</td>
<td>V</td>
</tr>
<tr>
<td>$I_{OUT}$</td>
<td>Output Current</td>
<td>Internally Controlled</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_D$</td>
<td>Power Dissipation$^{(1)}$</td>
<td>SOT-23-5, JEDEC STD.51-7</td>
<td>660</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DFN(PLP)1820-6, JEDEC STD.51-7</td>
<td>2200</td>
</tr>
<tr>
<td>$T_j$</td>
<td>Junction Temperature Range</td>
<td>$-40$ to $125$</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>Storage Temperature Range</td>
<td>$-55$ to $125$</td>
<td>°C</td>
</tr>
</tbody>
</table>

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the lifetime 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>Parameter</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_i$</td>
<td>Operating Input Voltage</td>
<td>2.7 to 5.5</td>
<td>V</td>
</tr>
<tr>
<td>$T_a$</td>
<td>Operating Temperature Range</td>
<td>$-40$ to $85$</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 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.

$^{(2)}$ Refer to POWER DISSIPATION for detailed information.
R5524x

NO.EA-188-190627

ELECTRICAL CHARACTERISTICS

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

R5524xxxxA/B Electrical Characteristics

(\( Ta = 25°C \))

<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>
<tbody>
<tr>
<td>( V_{IN} )</td>
<td>Input Voltage</td>
<td></td>
<td>2.7</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>( I_{DD1} )</td>
<td>Supply Current (Active Mode)</td>
<td>( V_{OUT} = \text{OPEN}, \ \text{EN} = \text{&quot;H&quot;}, \ V_{IN} = 5 \text{ V} )</td>
<td></td>
<td>110</td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>( I_{DD2} )</td>
<td>Supply Current (Standby Mode)</td>
<td>( V_{OUT} = \text{OPEN}, \ \text{EN} = \text{&quot;L&quot;}, \ V_{IN} = 5 \text{ V} )</td>
<td>110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{ON} )</td>
<td>Switch On Resistance</td>
<td>( V_{IN} = 5 \text{ V}, \ I_{OUT} = 500 \text{ mA} )</td>
<td>100</td>
<td></td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>( t_{on} )</td>
<td>Output Turn-on Delay</td>
<td>( V_{IN} = 5 \text{ V}, \ R_{L} = 60 \Omega )</td>
<td></td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_{off} )</td>
<td>Output Turn-off Delay</td>
<td>( V_{IN} = 5 \text{ V}, \ R_{L} = 60 \Omega )</td>
<td></td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{UVLO} )</td>
<td>UVLO Release Voltage</td>
<td>( V_{IN} ) Rising</td>
<td>2.3</td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>( V_{HYS} )</td>
<td>UVLO Hysteresis Range</td>
<td>( V_{IN} ) Falling</td>
<td></td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{TH} )</td>
<td>Current Limit Threshold</td>
<td>R5524x001A/B R5524x002A/B</td>
<td></td>
<td>550</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{ILIM} )</td>
<td>Overcurrent Limit</td>
<td>( V_{IN} = 5 \text{ V}, \ \text{After } 5 \text{ ms from when } V_{OUT} = 0 \text{ V}^{(1)} )</td>
<td>550</td>
<td>650</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>( t_{FD} )</td>
<td>Flag Delay Time(^{(2)})</td>
<td>( V_{IN} = 5 \text{ V}, \ \text{From when overcurrent detection until when FLG = &quot;L&quot;} )</td>
<td>7</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>( T_{TSD} )</td>
<td>Thermal Shutdown Temperature</td>
<td>Junction Temperature</td>
<td></td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{TSR} )</td>
<td>Thermal Shutdown Released Temperature</td>
<td>Junction Temperature</td>
<td></td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{EN} )</td>
<td>Enable Pin Input Current</td>
<td></td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{EN1} )</td>
<td>Enable Pin Input Voltage 1</td>
<td>( V_{EN} ) Rising</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{EN2} )</td>
<td>Enable Pin Input Voltage 2</td>
<td>( V_{EN} ) Falling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{LO} )</td>
<td>Output Leakage Current</td>
<td></td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{LF} )</td>
<td>Flag &quot;L&quot; Output Voltage</td>
<td>( I_{SINK} = 1 \text{ mA} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{FOF} )</td>
<td>Flag Off Current</td>
<td>( V_{FLG} = 5.5 \text{ V} )</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{REV} )</td>
<td>Reverse Leakage Current</td>
<td>( V_{IN} = 0 \text{ V}, \ V_{OUT} = 5.5 \text{ V} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{LOW} )</td>
<td>Nch. On-resistance for Auto Discharge (R5524x00xA only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All test items listed under Electrical Characteristics are done under the pulse load condition (\( T_{J} \approx Ta = 25°C \)) except Thermal Shutdown Temperature and Thermal Shutdown Released Temperature.

\(^{(1)}\) Refer to "Overcurrent limit Function" in THEORY OF OPERATION for details.

\(^{(2)}\) Flag Delay Time is dependent on Input Voltage.
THEORY OF OPERATION

Overcurrent Limit Function

The R5524x001A/001B has the built-in latch-off type over-current limit circuit. When the over-current is detected, the protection circuit becomes active and the switch-transistor is turned OFF. The latch function is released if the input voltage value is exceeded in the release threshold of the UVLO circuit value after it became lower than the detection threshold of the UVLO circuit value; or the EN pin set to the enabling condition again after set to the disabling condition.

If the over current condition occurred when the input voltage value was close to the minimum operating input voltage value. Under this condition, the voltage descends by the parasitic impedance on the power supply side, and it might fall below the detection threshold of the UVLO circuit. In this case, the switch-transistor is turned OFF and because of that the voltage drop of power line's parasitic impedance stops; the latch function is released with the UVLO and it becomes the over current condition again. The switch transistor keeps continual ON and OFF until one of the following is done; increasing the input voltage value; the setting of EN pin is disabling; or reducing the value of load current.

Moreover, the supply-voltage changed by the load-current dramatically changed depends upon the parasitic impedance of the wiring on the load side or the power supply side. Due to this, decreasing the parasitic impedance by the wiring on board is recommended.

The switch transistor of the R5524x001A/001B is turned OFF when the latch-off-function operates under the condition of the load of the constant current as the load device, such as the electronic load and so on, connecting with the VOUT pin of the R5524x001A/001B. Because the load device keeps the constant current, the VOUT pin voltage may become negative potential. If the VOUT pin is exceed the absolute maximum rating may cause the permanent damages to the device, please avoid using in this situation.

The R5524x002A/002B and R5524N004A have the built-in over current protection circuit as the constant current type. It detects as the over-current condition, if the current flows as the ITH defined. Then operating the switch transistor to limit the output current to be the constant current defined by the I_LIM.

If the condition of the over-current limit caused by the VOUT pin clamped to the GND were continued the temperature of the ICs would increase drastically. The switch-transistor is turned OFF if the temperature of the ICs becomes over 135°C (Typ.). And after this, the switch-transistor is turned ON again when the temperature of ICs decreased approximately 15°C. The switch-transistor keeps continual ON and OFF until either the switch is turned OFF or the VOUT pin is removed from GND.
R5524x
NO.EA-188-190627

Timing Chart

R5524xxxxA/B
Output On-time and Output Off-time

![Timing Chart Diagram](image)

R5524x001A/B (Latch-off Type)
Flag Delay Time

![Flag Delay Time Diagram](image)

(1) When the \( I_{OUT} \) is \( I_{TH} \) or less, the current is not limited.
(2) Once the \( I_{OUT} \) reaches to \( I_{TH} \), the \( I_{OUT} \) is limited by \( I_{LIM} \).
(3) When the \( I_{OUT} \) drops to \( I_{LIM} \) or less within the \( t_{FD} \) time, the current limit is released. The current is not limited until the \( I_{OUT} \) exceeds \( I_{TH} \) again.
(4) When the \( I_{OUT} \) reaches to \( I_{TH} \) and it is limited by \( I_{LIM} \) for \( t_{FD} \) or more, the switch transistor turns off and \( V_{FLG} \) becomes “Low.”
Flag Delay Time

(1) When I_{OUT} is I_{TH} or less, the current is not limited.
(2) Once the I_{OUT} reaches to I_{TH}, the I_{OUT} is limited by I_{LIM}.
(3) When the I_{OUT} drops to I_{LIM} or less within the t_{FD} time, the current limit is released. The current is not limited until the I_{OUT} exceeds I_{TH} again.
(4) When the I_{OUT} reaches to I_{TH} and it is limited by I_{LIM} for t_{FD} or more, the V_{FLG} becomes “Low”.

R5524x002A/002B and R5524N004A (Constant Current Type) Timing Chart
APPLICATION INFORMATION

Precautions for Selecting External Components

Bypass Capacitor
A 0.1µF to 1 µF bypass capacitor between the VIN pin and the GND pin, close to the device, is recommended. This precaution reduces power supply transients that may cause ringing on the input.

Pull-up Resistor of FLG Pin
A 10 kΩ to 100 kΩ pull-up resistor is recommended for the FLG pin.

R5524x001A/001B
The R5524x001A/001B is equipped with a latch-off function which requires initialization before start-up.

Case 1: Start-up by EN Pin Control
EN pin must be enabled with the delay of 10 µs or more against 90% of VIN voltage rising edge.

Case 2: Start-up by EN Pin Tied to VIN Pin
Slew rate of VIN must be 40 µs/V or slower.

(1) FLG pin is Nch. Open Drain Output.
(2) A 47 µF or more output capacitor is recommended. According to a USB standard, a 120 µF or more output capacitor is required.

RICOH
TYPICAL CHARACTERISTICS

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

1) Supply Current vs. Temperature

2) Supply Current vs. Input Voltage

3) Switch ON Resistance vs. Temperature

4) Switch ON Resistance vs. Input Voltage

5) Output ON Time vs. Temperature

6) Output ON Time vs. Input Voltage

(R_L = 56 Ω)
7) UVLO Voltage vs. Temperature

![UVLO Voltage vs. Temperature Graph]

8) Output Voltage vs. Input Voltage

![Output Voltage vs. Input Voltage Graph]

9) Current Limit Threshold vs. Temperature (001x/ 002x)

![Current Limit Threshold vs. Temperature Graph (001x/ 002x)]

10) Current Limit Threshold vs. Temperature (004A)

![Current Limit Threshold vs. Temperature Graph (004A)]

11) Current Limit Threshold vs. Input Voltage (001x/ 002x)

![Current Limit Threshold vs. Input Voltage Graph (001x/ 002x)]

12) Current Limit Threshold vs. Input Voltage (004A)

![Current Limit Threshold vs. Input Voltage Graph (004A)]
13) Overcurrent Limit vs. Temperature

14) Overcurrent Limit vs. Input Voltage

15) Flag Delay Time vs. Temperature

16) Flag Delay Time vs. Input Voltage

17) Enable Input Voltage vs. Temperature

18) Enable Input Voltage vs. Input Voltage
19) Overcurrent Response with Ramped Load
20) Overcurrent Response with Ramped Load

(R5524x001x)  
(R5524x002x)

21) Overcurrent Response with Ramped Load
(R5524x004A)

22) Overcurrent Limit Transient Response
(Enable "H" during Output Short)
23) Thermal Shutdown Operation

24) Output Voltage vs. Output Current

25) Output ON Time Response

26) Output OFF Time Response

27) Inrush current Characteristic
The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

### Measurement Conditions

<table>
<thead>
<tr>
<th>Item</th>
<th>Measurement Conditions</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 (Four-Layer Board)</td>
</tr>
<tr>
<td>Board Dimensions</td>
<td>76.2 mm × 114.3 mm × 0.8 mm</td>
</tr>
<tr>
<td>Copper Ratio</td>
<td>Outer Layer (First Layer): Less than 95% of 50 mm Square</td>
</tr>
<tr>
<td></td>
<td>Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square</td>
</tr>
<tr>
<td></td>
<td>Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square</td>
</tr>
<tr>
<td>Through-holes</td>
<td>ϕ 0.3 mm × 7 pcs</td>
</tr>
</tbody>
</table>

### Measurement Result

(Ta = 25°C, Tjmax = 125°C)

<table>
<thead>
<tr>
<th>Item</th>
<th>Measurement Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>660 mW</td>
</tr>
<tr>
<td>Thermal Resistance (θja)</td>
<td>θja = 150°C/W</td>
</tr>
<tr>
<td>Thermal Characterization Parameter (ψjt)</td>
<td>ψjt = 51°C/W</td>
</tr>
</tbody>
</table>

θja: Junction-to-Ambient Thermal Resistance  
ψjt: Junction-to-Top Thermal Characterization Parameter

![Power Dissipation vs. Ambient Temperature](image1)

![Measurement Board Pattern](image2)
The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

### Measurement Conditions

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>Board Dimensions</td>
<td>76.2 mm × 114.3 mm × 0.8 mm</td>
</tr>
<tr>
<td>Copper Ratio</td>
<td>Outer Layer (First Layer): Less than 95% of 50 mm Square&lt;br&gt;Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square&lt;br&gt;Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square</td>
</tr>
<tr>
<td>Through-holes</td>
<td>$\phi$ 0.2 mm × 34 pcs</td>
</tr>
</tbody>
</table>

### Measurement Result

<table>
<thead>
<tr>
<th>Item</th>
<th>Measurement Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>2200 mW</td>
</tr>
<tr>
<td>Thermal Resistance ($\theta_{ja}$)</td>
<td>$\theta_{ja} = 45^\circ$C/W</td>
</tr>
<tr>
<td>Thermal Characterization Parameter ($\psi_{jt}$)</td>
<td>$\psi_{jt} = 18^\circ$C/W</td>
</tr>
</tbody>
</table>

$\theta_{ja}$: Junction-to-Ambient Thermal Resistance

$\psi_{jt}$: Junction-to-Top Thermal Characterization Parameter

![Power Dissipation vs. Ambient Temperature](image1.png)

![Measurement Board Pattern](image2.png)
The tab on the bottom of the package is substrate level (GND). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.
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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 a 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.

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