

## Low on Resistance / Low Voltage 1A LDO

NO.EA-265-160426

### OUTLINE

The RP132x Series are voltage-regulators with a built-in low ON-resistance transistor and output current is 1A capability. These ICs have two versions: fixed output voltage type and externally adjustable output voltage type. The minimum output voltage can be set from 1.4V. Otherwise, the load regulation of RP132x has much improved when compared with conventional regulators. It's Typ.5mV at  $I_{OUT}=0.1mA$  to 1A.

Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor net for setting output voltage, current limit circuits to prevent over-current and a thermal-shutdown circuit. A standby mode with ultra low supply current can be realized with the chip enable function. Additionally, E/F Version with delay pin for inrush current limit time setting are also available.

The packages for these ICs are DFN(PLP)1820-6, SOT-89-5, HSOP-6J and TO-252-5-P2. DFN(PLP)1820-6 is suitable for high density mounting of the ICs on boards. SOT-89-5, HSOP-6J and TO-252-5-P2 are supporting high wattage.

### FEATURES

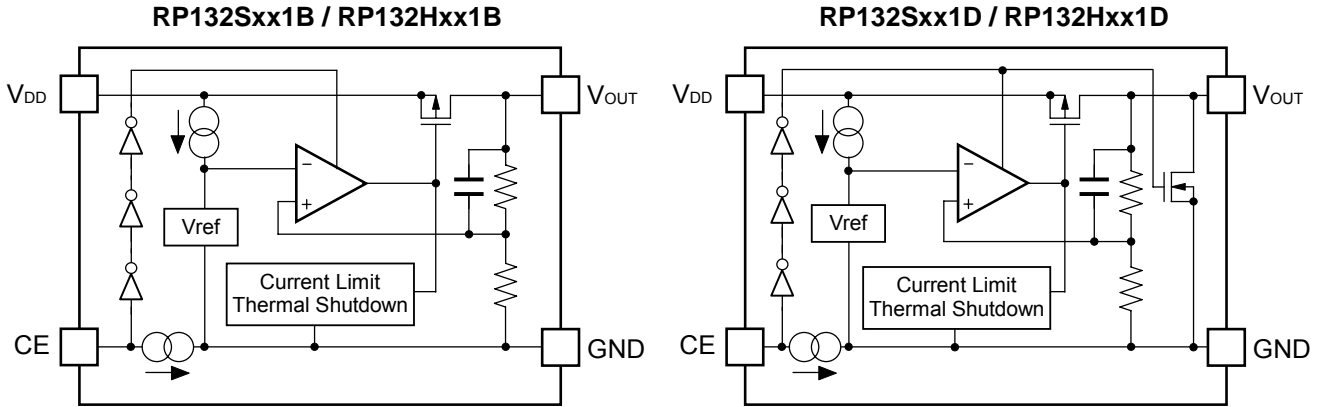
- Output Current ..... Min. 1A
- Supply Current ..... Typ. 65 $\mu$ A
- Standby Current ..... Typ. 0.15 $\mu$ A
- Input Voltage Range ..... 1.4V to 6.5V
- Output Voltage Range ..... Fixed Output Voltage Type: 0.8V to 5.5V (0.1V steps)  
Adjustable Output Voltage Type: 0.8V to 5.5V  
(For other voltages, please refer to MARK INFORMATION.)
- Dropout Voltage..... Typ. 0.52V ( $V_{OUT}=2.8V$ ,  $I_{OUT}=1A$ )
- Ripple Rejection ..... Typ. 70dB ( $f=1kHz$ ,  $V_{OUT}=2.8V$ )
- Output Voltage Accuracy .....  $\pm 1.0\%$
- Output Voltage Temperature-Drift Coefficient ..... Typ.  $\pm 60ppm/^{\circ}C$
- Line Regulation ..... Typ. 0.052%/V
- Load Regulation ..... Typ. 3mV at  $I_{OUT}=300mA$ , Typ. 5mV at  $I_{OUT}=1A$
- Packages ..... DFN(PLP)1820-6, SOT-89-5, HSOP-6J, TO-252-5-P2
- Inrush Current Limit Circuit ..... Typ. 500mA  
B/D version: Inrush current limit time is 500 $\mu$ s.  
E/F version: Inrush current limit time is adjustable.
- Fold-Back Protection Circuit ..... Typ. 250mA (Current at short mode)
- Thermal Shutdown Circuit ..... Thermal Shutdown Temperature: Typ. 165 $^{\circ}C$   
Released Temperature: Typ. 95 $^{\circ}C$
- Auto Discharge Function ..... D, F version
- Ceramic capacitors are recommended to be used with this IC .... 2.2 $\mu$ F or more ( $V_{OUT} \leq 3.6V$ )  
4.7 $\mu$ F or more ( $V_{OUT} > 3.6V$ )

### APPLICATIONS

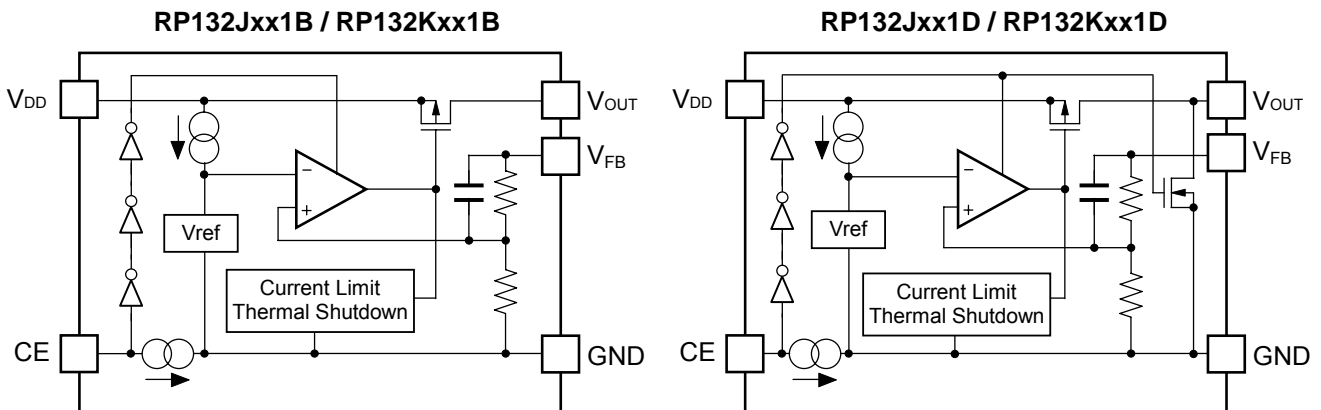
- Power source for battery-powered equipment.
- Power source for portable communication equipment
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for home appliances and Notebook PC.

**BLOCK DIAGRAMS**

• Fixed Output Voltage Type (HSOP-6J / SOT89-5)



• Fixed Output Voltage Type (TO-252-5-P2 / DFN(PLP)1820-6)



• Fixed Output Voltage Type with DELAY pin (HSOP-6J)



• Fixed Output Voltage Type with DELAY pin (DFN(PLP)1820-6)



• Adjustable Output Voltage Type (HSOP-6J / SOT-89-5 / TO-252-5-P2 /DFN(PLP)1820-6)



• Adjustable Output Voltage Type with DELAY pin (DFN(PLP)1820-6)



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**RP132x**

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NO.EA-265-160426

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**SELECTION GUIDE**

The output voltage, the auto discharge function, and the package type for the ICs can be selected at the user's request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP132K001*-TR	DFN(PLP)1820-6	5,000 pcs	Yes	Yes
RP132Kxx1*-TR				
RP132H001#-T1-FE	SOT-89-5	1,000 pcs	Yes	Yes
RP132Hxx1#-T1-FE				
RP132S001#-E2-FE	HSOP-6J	1,000 pcs	Yes	Yes
RP132Sxx1*-E2-FE				
RP132J001#-T1-FE	TO-252-5-P2	3,000 pcs	Yes	Yes
RP132Jxx1#-T1-FE				

RP132x001x is the adjustable output voltage type.

xx: The output voltage can be designated in the range from 0.8V(08) to 5.5V(55) in 0.1V step.

\*: The combination of the auto discharge function and delay pin (for setting inrush current limit time) are as follows.

B: without auto discharge function

D: with auto discharge function

E: without auto discharge function, with delay pin (for setting inrush current limit time)

F: with auto discharge function and delay pin (for setting inrush current limit time)

#: The auto discharge function at off state are options as follows.

B: without auto discharge function at off state

D: with auto discharge function at off state

Auto-discharge function quickly lowers the output voltage to 0V, 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 CONFIGURATIONS



## PIN DESCRIPTIONS

### • DFN(PLP)1820-6

Pin No.	Symbol	Pin Description
1	$V_{OUT}$	Output Pin
2	$V_{FB}$	Feed Back Pin
3	GND	Ground Pin
4	CE	Chip Enable Pin ("H" Active)
5	NC	No Connection (RP132K001B/D, RP132Kxx1B/D)
	DELAY	Delay Pin (for setting inrush current limit time) (RP132K001E/F, RP132Kxx1E/F)
6	$V_{DD}$	Input Pin

\* 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.

- When using Fixed Output Voltage Type(RP132Kxx1x), the  $V_{OUT}$  pin and the  $V_{FB}$  pin should be connected.
- When using Adjustable Output Voltage Type (RP132K001x), please follow "Notes on the Adjustable Output Voltage Type Settings".

## RP132x

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### • SOT-89-5

Pin No.	Symbol	Pin Description
1	CE	Chip Enable Pin ("H" Active) (RP132Hxx1B/D)
	V <sub>FB</sub>	Feed Back Pin (RP132H001B/D)
2	GND	Ground Pin
3	NC	No Connection (RP132Hxx1B/D)
	CE	Chip Enable Pin ("H" Active) (RP132H001B/D)
4	V <sub>DD</sub>	Input Pin
5	V <sub>OUT</sub>	Output Pin

- When using Adjustable Output Voltage Type (RP132H001x), please follow "Notes on Adjustable Output Voltage Type Settings".

### • HSOP-6J

Pin No.	Symbol	Pin Description
1	V <sub>OUT</sub>	Output Pin
2	GND	Ground Pin* <sup>1</sup>
3	NC	No Connection (RP132Sxx1B/D)
	V <sub>FB</sub>	Feed Back Pin (RP132S001B/D)
	DELAY	Delay Pin (for setting inrush current limit time)(RP132Sxx1E/F)
4	CE	Chip Enable Pin ("H" Active)
5	GND	Ground Pin* <sup>1</sup>
6	V <sub>DD</sub>	Input Pin

\*<sup>1</sup> No.2 pin and No.5 pin must be wired each other when mounted on boards.

- When using Adjustable Output Voltage Type (RP132S001x), please follow "Notes on Adjustable Output Voltage Type Settings".

### • TO-252-5-P2

Pin No.	Symbol	Pin Description
1	CE	Chip Enable Pin ("H" Active)
2	V <sub>DD</sub>	Input Pin
3	GND	Ground Pin
4	V <sub>OUT</sub>	Output Pin
5	V <sub>FB</sub>	Feed Back Pin

\* 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.

- when using Fixed Output Voltage Type(RP132Jxx1x),V<sub>OUT</sub> pin and V<sub>FB</sub> pin should be connected.
- When using Adjustable Output Voltage Type (RP132J001x), please follow "Notes on the Adjustable Output Voltage Type Settings".

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Item	Rating	Unit
$V_{IN}$	Input Voltage	7.0	V
$V_{CE}$	Input Voltage (CE Pin)	-0.3 to 7.0	V
$V_{FB}$	Input Voltage ( $V_{FB}$ Pin)	-0.3 to 7.0	V
$V_{OUT}$	Output Voltage	-0.3 to $V_{IN}+0.3$	V
$P_D$	Power Dissipation (DFN(PLP)1820-6)*	880	mV
	Power Dissipation (SOT-89-5)*	900	
	Power Dissipation (HSOP-6J)*	1700	
	Power Dissipation (TO-252-5-P2)*	1900	
$T_{opt}$	Operating Temperature Range	-40 to 85	°C
$T_{stg}$	Storage Temperature Range	-55 to 125	°C

\*) For Power Dissipation, please refer to PACKAGE INFORMATION.

**ABSOLUTE MAXIMUM RATINGS**

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.

**RP132x**

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**ELECTRICAL CHARACTERISTICS**
 $V_{IN} = \text{Set } V_{OUT} + 1.0V, I_{OUT} = 1mA, C_{IN} = 2.2\mu F, C_{OUT} = 2.2\mu F (V_{OUT} \leq 3.6V), 4.7\mu F (V_{OUT} > 3.6V).$ 

The specification in   is checked and guaranteed by design engineering at  $-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$ , unless otherwise noted.

- **RP132xxx1B/D(Fixed Output Voltage Type)**

- **RP132S/Kxx1E/F(Fixed Output Voltage Type with DELAY pin)**

 $T_{opt} = 25^{\circ}C$ 

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit	
$V_{OUT}$	Output Voltage	$T_{opt} = 25^{\circ}C$	$V_{OUT} > 1.5V$	$\times 0.99$		$\times 1.01$	V
			$V_{OUT} \leq 1.5V$	-15		15	mV
		$-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$	$V_{OUT} > 1.5V$	<span style="border: 1px solid black; padding: 0 2px;"><math>\times 0.981</math></span>		<span style="border: 1px solid black; padding: 0 2px;"><math>\times 1.019</math></span>	V
			$V_{OUT} \leq 1.5V$	<span style="border: 1px solid black; padding: 0 2px;">-29</span>		<span style="border: 1px solid black; padding: 0 2px;">29</span>	mV
$I_{LIM}$	Output Current Limit		<span style="border: 1px solid black; padding: 0 2px;">1</span>			A	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	$0.1mA \leq I_{OUT} \leq 300mA$		3	<span style="border: 1px solid black; padding: 0 2px;">20</span>	mV	
		$0.1mA \leq I_{OUT} \leq 1A$		5	<span style="border: 1px solid black; padding: 0 2px;">60</span>		
$V_{DIF}$	Dropout Voltage	Refer to the following "Dropout Voltage"					
$I_{SS}$	Supply Current	$I_{OUT} = 0mA$ ( $V_{IN} = 6.5V$ )		65	<span style="border: 1px solid black; padding: 0 2px;">85</span>	$\mu A$	
$I_{standby}$	Standby Current	$V_{CE} = 0V, V_{IN} = 6.5V$		0.15	0.60	$\mu A$	
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	Set $V_{OUT} + 0.5V \leq V_{IN} \leq 6.5V$ * However, $V_{IN} \geq 1.6V$		0.05	<span style="border: 1px solid black; padding: 0 2px;">0.10</span>	%/V	
RR	Ripple Rejection	$f = 1kHz$ Ripple 0.2Vp-p $I_{OUT} = 100mA$	$V_{OUT} \leq 3.3V$		70	dB	
			$V_{OUT} > 3.3V$		60		
$V_{IN}$	Input Voltage		<span style="border: 1px solid black; padding: 0 2px;">1.4</span>		<span style="border: 1px solid black; padding: 0 2px;">6.5</span>	V	
$\frac{\Delta V_{OUT}}{\Delta T_{opt}}$	Output Voltage Temperature Coefficient	$-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$		$\pm 60$		ppm/ $^{\circ}C$	
$I_{SC}$	Short Current Limit	$V_{OUT} = 0V$		250		mA	
$I_{PD}$	CE Pull-down Current			0.3	<span style="border: 1px solid black; padding: 0 2px;">0.7</span>	$\mu A$	
$V_{CEH}$	CE Input Voltage "H"		<span style="border: 1px solid black; padding: 0 2px;">1.0</span>			V	
$V_{CEL}$	CE Input Voltage "L"				<span style="border: 1px solid black; padding: 0 2px;">0.4</span>	V	
en	Output Noise	BW=10Hz to 100kHz		70		$\mu V_{rms}$	
$T_{TSD}$	Thermal Shutdown Temperature	Junction Temperature		165		$^{\circ}C$	
$T_{TSR}$	Thermal Shutdown Released Temperature	Junction Temperature		95		$^{\circ}C$	
$R_{LOW}$	Low Output Nch Tr. ON Resistance (D/F version)	$V_{IN} = 4.0V, V_{CE} = 0V$		50		$\Omega$	
$I_{DELAY}$	DELAY pin Current (DELAY pin version)	$V_{IN} = 4.0V$	<span style="border: 1px solid black; padding: 0 2px;">0.7</span>	1.2	<span style="border: 1px solid black; padding: 0 2px;">1.7</span>	$\mu A$	

All test items listed under Electrical Characteristics are done under the pulse load condition ( $T_j \approx T_a = 25^{\circ}C$ ) except Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient, Dropout Voltage at 1A Output Current and Load Regulation and Thermal Shutdown.



• Dropout Voltage

T<sub>opt</sub>=25°C

Output Voltage V <sub>OUT</sub> (V)	Dropout Voltage V <sub>DIF</sub> (V)					
	Condition	Typ.	Max.	Condition	Typ.	Max.
0.8 ≤ V <sub>OUT</sub> < 0.9	I <sub>OUT</sub> =300mA	0.67	0.89	I <sub>OUT</sub> =1A	1.20	1.54
0.9 ≤ V <sub>OUT</sub> < 1.0		0.59	0.82		1.10	1.46
1.0 ≤ V <sub>OUT</sub> < 1.1		0.51	0.73		1.05	1.39
1.1 ≤ V <sub>OUT</sub> < 1.2		0.42	0.63		0.96	1.31
1.2 ≤ V <sub>OUT</sub> < 1.5		0.36	0.54		0.90	1.23
1.5 ≤ V <sub>OUT</sub> < 2.6		0.24	0.33		0.78	1.05
2.6 ≤ V <sub>OUT</sub> < 3.3		0.15	0.21		0.52	0.72
3.3 ≤ V <sub>OUT</sub> ≤ 5.5		0.13	0.18		0.46	0.68

The specification in  is checked and guaranteed by design engineering at -40°C ≤ T<sub>opt</sub> ≤ 85°C, unless otherwise noted.

All test items listed under Electrical Characteristics are done under the pulse load condition (T<sub>j</sub> ≈ T<sub>a</sub> = 25°C) except Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient, Dropout Voltage at 1A Output Current and Load Regulation and Thermal Shutdown.

**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.

**RP132x**

NO.EA-265-160426

**ELECTRICAL CHARACTERISTICS**
 $V_{IN} = \text{Set } V_{OUT} + 1.0\text{V}, I_{OUT} = 1\text{mA}, C_{IN} = 2.2\mu\text{F}, C_{OUT} = 2.2\mu\text{F} (V_{OUT} \leq 3.6\text{V}), 4.7\mu\text{F} (V_{OUT} > 3.6\text{V}).$ 

The specification in   is checked and guaranteed by design engineering at  $-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$ , unless otherwise noted.

- **RP132x001B/D(Adjustable Output Voltage Type)**

- **RP132K001E/F(Adjustable Output Voltage Type with DELAY pin)**

 $T_{opt} = 25^{\circ}\text{C}$ 

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$V_{FB}$	Feedback Voltage	$T_{opt} = 25^{\circ}\text{C}$	$V_{OUT} = V_{FB}$	0.785	0.800	0.815	V
		$-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$		<span style="border: 1px solid black; padding: 0 2px;">0.771</span>		<span style="border: 1px solid black; padding: 0 2px;">0.829</span>	
$V_{OUT}$	Output Voltage Adjusting Range			0.8		5.5	V
$I_{LIM}$	Output Current Limit	$V_{OUT} = V_{FB}$		<span style="border: 1px solid black; padding: 0 2px;">1</span>			A
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	$0.1\text{mA} \leq I_{OUT} \leq 300\text{mA}$			3	<span style="border: 1px solid black; padding: 0 2px;">20</span>	mV
		$0.1\text{mA} \leq I_{OUT} \leq 1\text{A}$			5	<span style="border: 1px solid black; padding: 0 2px;">60</span>	
$V_{DIF}$	Dropout Voltage	$V_{OUT} = V_{FB}$	$I_{OUT} = 300\text{mA}$		0.67	<span style="border: 1px solid black; padding: 0 2px;">0.89</span>	V
			$I_{OUT} = 1\text{A}$		1.20	<span style="border: 1px solid black; padding: 0 2px;">1.54</span>	
$I_{SS}$	Supply Current	$V_{OUT} = V_{FB}, I_{OUT} = 0\text{mA} (V_{IN} = 6.5\text{V})$			65	<span style="border: 1px solid black; padding: 0 2px;">85</span>	$\mu\text{A}$
$I_{standby}$	Standby Current	$V_{CE} = 0\text{V}, V_{IN} = 6.5\text{V}$			0.15	0.60	$\mu\text{A}$
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$V_{OUT} = V_{FB}, 1.6\text{V} \leq V_{IN} \leq 6.5\text{V}$			0.05	<span style="border: 1px solid black; padding: 0 2px;">0.10</span>	%/V
RR	Ripple Rejection	$f = 1\text{kHz}, \text{Ripple } 0.2\text{Vp-p}, I_{OUT} = 100\text{mA}$	$V_{OUT} = V_{FB}$		70		dB
$V_{IN}$	Input Voltage			<span style="border: 1px solid black; padding: 0 2px;">1.4</span>		<span style="border: 1px solid black; padding: 0 2px;">6.5</span>	V
$\frac{\Delta V_{OUT}}{\Delta T_{opt}}$	Output Voltage Temperature Coefficient	$-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$			$\pm 60$		ppm/ $^{\circ}\text{C}$
$I_{SC}$	Short Current Limit	$V_{OUT} = V_{FB} = 0\text{V}$			250		mA
$I_{PD}$	CE Pull-down Current				0.3	<span style="border: 1px solid black; padding: 0 2px;">0.7</span>	$\mu\text{A}$
$V_{CEH}$	CE Input Voltage "H"			<span style="border: 1px solid black; padding: 0 2px;">1.0</span>			V
$V_{CEL}$	CE Input Voltage "L"					<span style="border: 1px solid black; padding: 0 2px;">0.4</span>	V
en	Output Noise	BW=10Hz to 100kHz			70		$\mu\text{Vrms}$
$T_{TSD}$	Thermal Shutdown Temperature	Junction Temperature			165		$^{\circ}\text{C}$
$T_{TSR}$	Thermal Shutdown Released Temperature	Junction Temperature			95		$^{\circ}\text{C}$
$R_{LOW}$	Low Output Nch Tr. ON Resistance (D/F version)	$V_{IN} = 4.0\text{V}, V_{CE} = 0\text{V}$			50		$\Omega$
$I_{DELAY}$	DELAY pin Current (DELAY pin version)	$V_{IN} = 4.0\text{V}$		<span style="border: 1px solid black; padding: 0 2px;">0.7</span>	1.2	<span style="border: 1px solid black; padding: 0 2px;">1.7</span>	$\mu\text{A}$

All of unit are tested and specified under load conditions such that  $T_j \approx T_{opt} = 25^{\circ}\text{C}$  except for Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient, Dropout Voltage at 1A Output Current and Load Regulation and Thermal Shutdown.

## TYPICAL APPLICATION

- Fixed Output Voltage Type (HSOP-6J/ SOT89-5)



- Fixed Output Voltage Type (TO-252-5-P2/ DFN(PLP)1820-6)



- Adjustable Output Voltage Type (HSOP-6J / SOT89-5/ TO-252-5-P2 / DFN(PLP)1820-6)



- Fixed Output Voltage Type with DELAY pin (HSOP-6J)



- Fixed Output Voltage Type with DELAY pin (DFN(PLP)1820-6)



- Adjustable Output Voltage Type with DELAY pin (DFN(PLP)1820-6)



**Recommendation value of the external capacitors**

$V_{OUT}$	Capacitors	
$V_{OUT} \leq 3.6V$	C1	Kyocera 2.2 $\mu$ F (size:1005) [CM05X5R225M06A]
	C2	Kyocera 2.2 $\mu$ F (size:1608) [CM105X5R225K06AB]
$V_{OUT} > 3.6V$	C1	Kyocera 2.2 $\mu$ F (size:1005) [CM05X5R225K06A]
	C2	Kyocera 4.7 $\mu$ F (size:1608) [CM105X5R475M06AB]

Please refer to "Technical Notes on Adjustable Output Voltage Type" when using R1 and R2 as output capacitors. Also refer to "Inrush Current Limit Time Settings" concerning with  $C_D$ .

## TECHNICAL NOTES

When using these ICs, consider the following points:

### Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use a capacitor C2 with good frequency characteristics and ESR (Equivalent Series Resistance).

If a tantalum capacitor is used, and its ESR of C2 is large, the loop oscillation may result. Because of this, select C2 carefully considering its frequency characteristics.

### PCB Layout

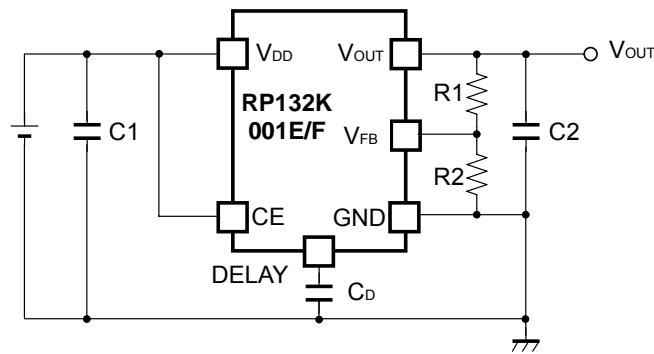
Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 between  $V_{DD}$  and GND pin with a capacitance value as "Recommendation value of the external capacitors" above or more, and as close as possible to the pins.

Set external components, especially the output capacitor C2, as close as possible to the ICs, and make wiring as short as possible.

## TECHNICAL NOTES on Adjustable Output Voltage Type



Typical Application for Adjustable Output Voltage Type (HSOP-6J / SOT89-5 / TO-252-5-P2 / DFN(PLP)1820-6)



Typical Application for Adjustable Output Voltage Type with DELAY pin (DFN(PLP)1820-6)

### Recommendation value of the external capacitors

$V_{OUT}$	Capacitors	
$V_{OUT} \leq 3.6V$	C1	Kyocera 2.2 $\mu$ F (size:1005) [CM05X5R225M06A]
	C2	Kyocera 2.2 $\mu$ F (size:1608) [CM105X5R225K06AB]
$V_{OUT} > 3.6V$	C1	Kyocera 2.2 $\mu$ F (size:1005) [CM05X5R225K06A]
	C2	Kyocera 4.7 $\mu$ F (size:1608) [CM105X5R475M06AB]

### Phase Compensation

Similar to the Fixed Output Voltage Type, Phase compensation is made for the Adjustable Output Voltage Type for securing stable operation even if the load current is varied. For this purpose, use a 4.7 $\mu$ F or more capacitor C2 between  $V_{OUT}$  pin and GND pin, and as close as possible to the pins.

### PCB Layout

Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 with a capacitance value as much as 2.2 $\mu$ F or more between  $V_{DD}$  and GND pin, and as close as possible to the pins.

When using the Adjustable Output Voltage Type, the transient response could be affected by the external resistors. Evaluate the circuit taking the actual conditions of use into account.

## Adjustable Output Voltage Type Settings

### • Output Voltage Setting Method

RP132x081x can be adjusted the output voltage up to 5.5V by using the external divider resistors.

Also, please use 16kΩ or less for R2 resistor.

If the V<sub>FB</sub> voltage is described as setV<sub>FB</sub>, the output voltage can be set by using the following equations  
SetV<sub>FB</sub> is equal to 0.8V. The V<sub>OUT</sub> pin of RP132x081x should be connected to the V<sub>FB</sub> pin.



$$I_1 = I_{1C} + I_2 \dots\dots\dots (1)$$

$$I_2 = \text{set}V_{FB} / R_2 \dots\dots\dots (2)$$

Thus,

$$I_1 = I_{1C} + \text{set}V_{FB} / R_2 \dots\dots\dots (3)$$

Therefore,

$$V_{OUT} = \text{set}V_{FB} \times R_1 \times I_1 \dots\dots\dots (4)$$

Put Equation (3) into Equation (4), then

$$\begin{aligned} V_{OUT} &= \text{set}V_{FB} + R_1(I_{1C} + \text{set}V_{FB} / R_2) \\ &= \text{set}V_{FB} \times (1 + R_1 / R_2) + R_1 \times I_{1C} \dots\dots\dots (5) \end{aligned}$$

In Equation (5), R<sub>1</sub> × I<sub>1C</sub> is the error-causing factor in V<sub>OUT</sub>.

As for I<sub>1C</sub>,

$$I_{1C} = \text{set}V_{FB} / R_{1C} \dots\dots\dots (6)$$

Therefore, the error-causing factor R<sub>1</sub> × I<sub>1C</sub> can be described as follows.

$$\begin{aligned} R_1 \times I_{1C} &= R_1 \times \text{set}V_{FB} / R_{1C} \\ &= \text{set}V_{FB} \times R_1 / R_{1C} \dots\dots\dots (7) \end{aligned}$$

For better accuracy, choosing R<sub>1</sub> (<<R<sub>1C</sub>) reduces this error.

Without the error-causing factor R<sub>1</sub> × I<sub>1C</sub>, the output voltage can be calculated by the following equation

$$V_{OUT} = \text{set}V_{FB} \times ((R_1 + R_2) / R_2) \dots\dots\dots (8)$$

R<sub>1C</sub> of RP132x is approximately Typ.1.3MΩ (T<sub>opt</sub>=25°C, this value is guaranteed by design.).

The value could be affected by the temperature, therefore evaluate the circuit taking the actual conditions of use into account.

## Inrush Current Limit Time Settings

The RP132xSeries include the circuit which can limit the inrush current at start-up to 500mA or less.

The current limit time of B/D version is fixed internally as approximately Typ.500 $\mu$ s.

On the other hand, the current limit times of E/F versions are adjustable by controlling the DELAY pin value, which is the capacitance value connected between DLEAY pin and GND pin.

The relation between Inrush Current Limit Time ( $t_D$ [s]) and the DELAY pin capacitance ( $C_D$ [F]) can be described in the following equation.

$$t_D=(C_D+70 \times 10^{-12}) \times 0.525 \times 10^6$$

When not using  $C_D$  on E/F versions, DELAY pin should be open.

In this case,  $C_D=0$  is applied to the above equation and as a result, 37 $\mu$ s can be obtained.

That means, when using  $C_D$  on E/F versions, the inrush current limit time will be more than 37 $\mu$ s.

Please note that during the inrush current limit time, the load current cannot be more than the limited current.



## TEST CIRCUITS

- Fixed Output Voltage Type (HSOP-6J / SOT89-5)



Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection

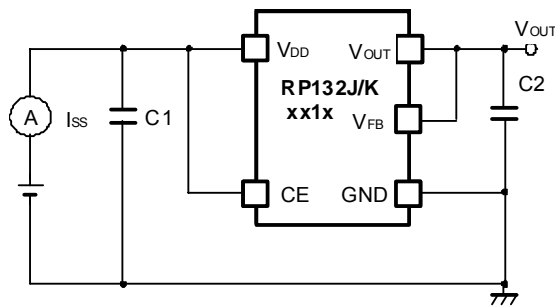


Test Circuit for Load Transient Response

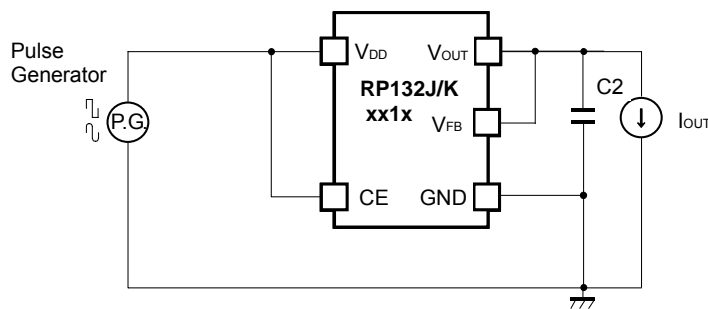
• Fixed Output Voltage Type (TO-252-5-P2 / DFN(PLP)1820-6)



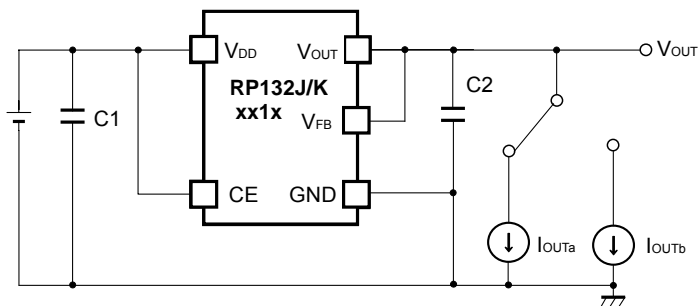
Basic Test Circuit



Test Circuit for Supply Current

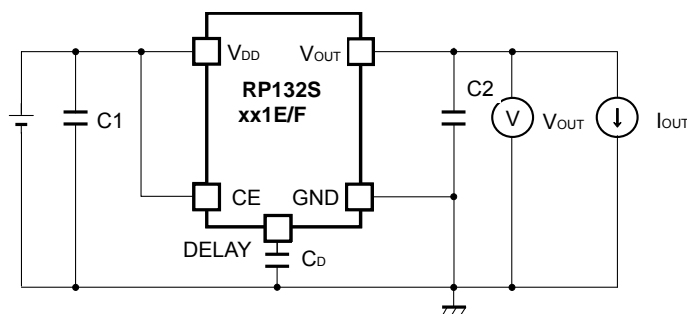


Test Circuit for Ripple Rejection

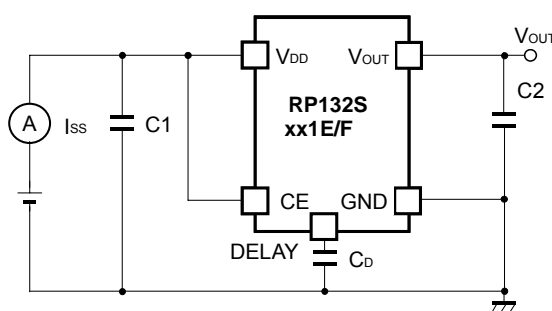


Test Circuit for Load Transient Response

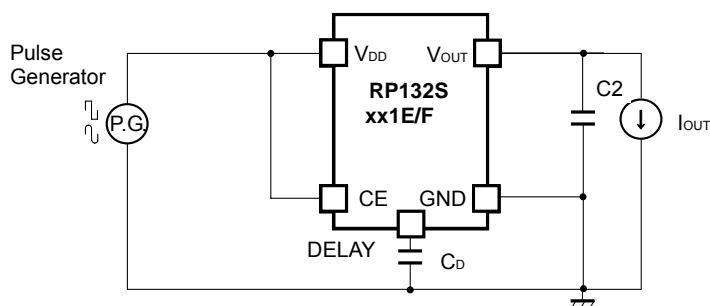
• Fixed Output Voltage Type with DELAY pin (HSOP-6J)



Basic Test Circuit



Test Circuit for Supply Current



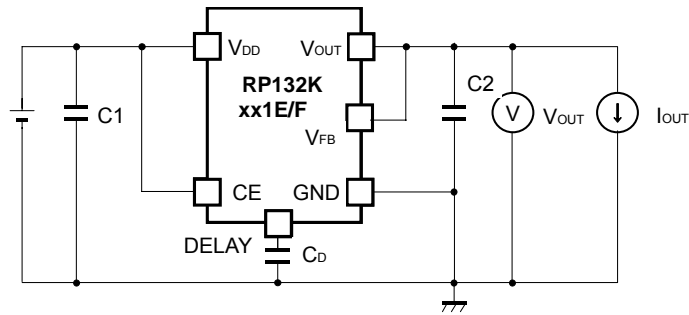
Test Circuit for Ripple Rejection



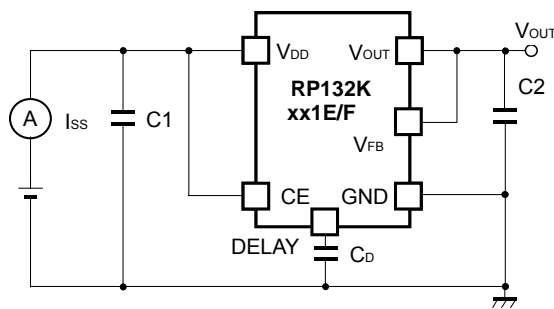
Test Circuit for Load Transient Response

Please refer to "Inrush Current Limit Time Settings" concerning with  $C_D$ .

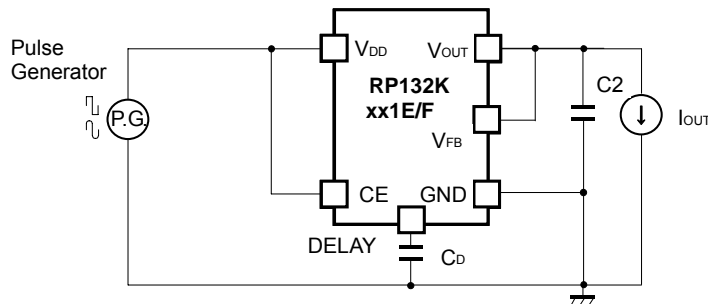
• **Fixed Output Voltage Type with DELAY pin (DFN(PLP)1820-6)**



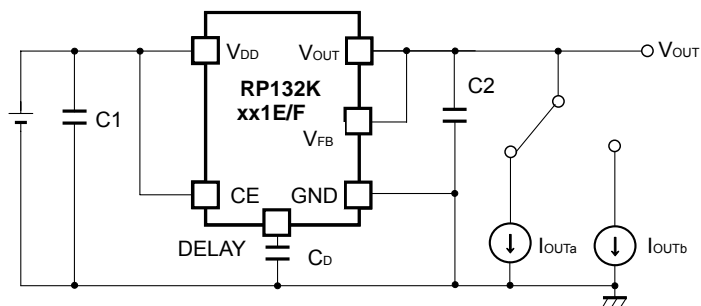
**Basic Test Circuit**



**Test Circuit for Supply Current**



**Test Circuit for Ripple Rejection**



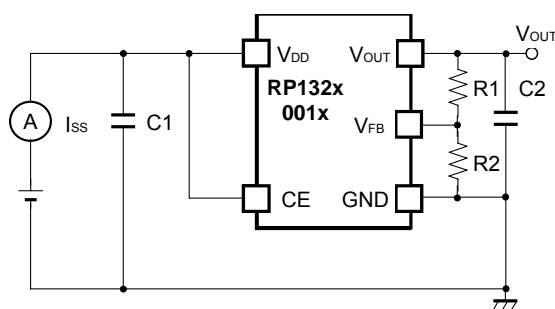
**Test Circuit for Load Transient Response**

Please refer to "Inrush Current Limit Time Settings" concerning with  $C_D$ .

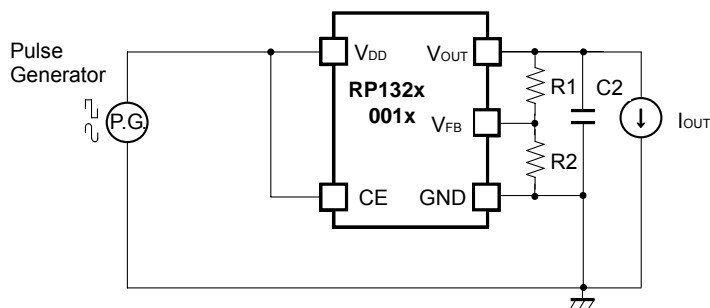
• Adjustable Output Voltage Type (HSOP-6J / SOT89-5/ TO-252-5-P2 / DFN(PLP)1820-6)



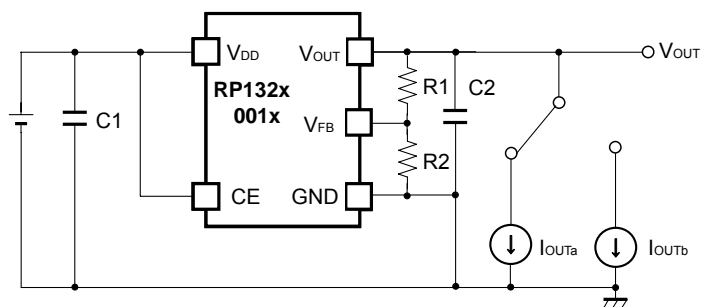
Basic Test Circuit



Test Circuit for Supply Current



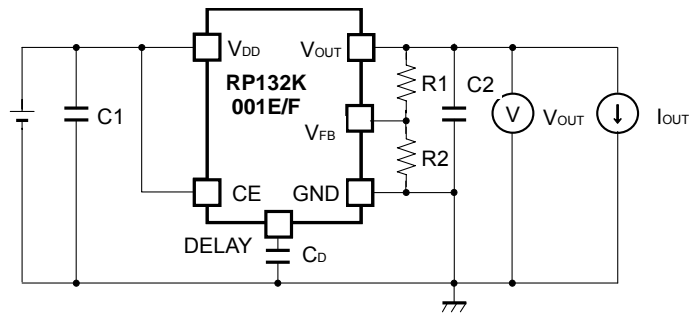
Test Circuit for Ripple Rejection



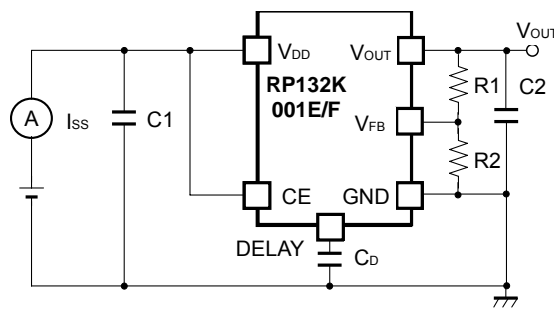
Test Circuit for Load Transient Response

Please refer to "Technical Notes on Adjustable Output Voltage Type" when using R1 and R2 as output capacitors.

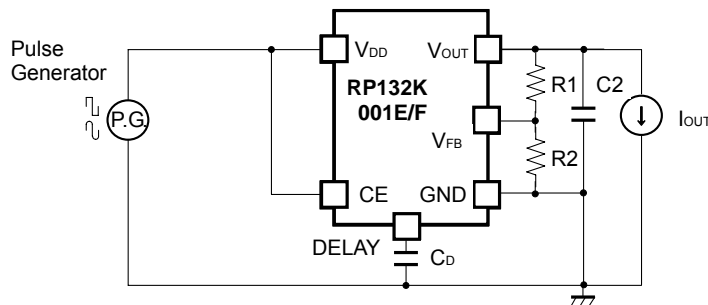
• Adjustable Output Voltage Type with DELAY pin (DFN(PLP)1820-6)



Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

Please refer to "Technical Notes on Adjustable Output Voltage Type" when using R1 and R2 as output capacitors. Also refer to "Inrush Current Limit Time Settings" concerning with  $C_D$ .

## TYPICAL CHARACTERISTICS

### 1) Output Voltage vs. Input Voltage (T<sub>opt</sub>=25°C)

RP132x081x



RP132x151x



RP132x331x

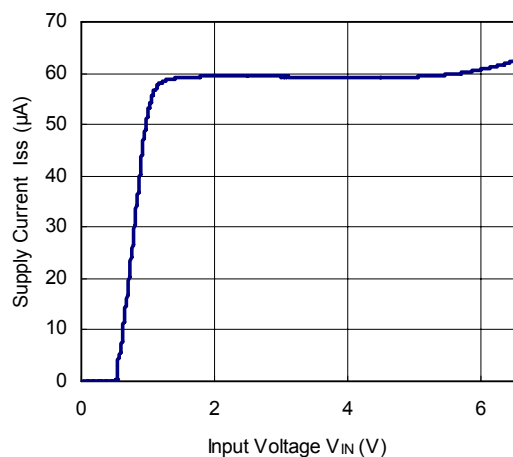


RP132x551x

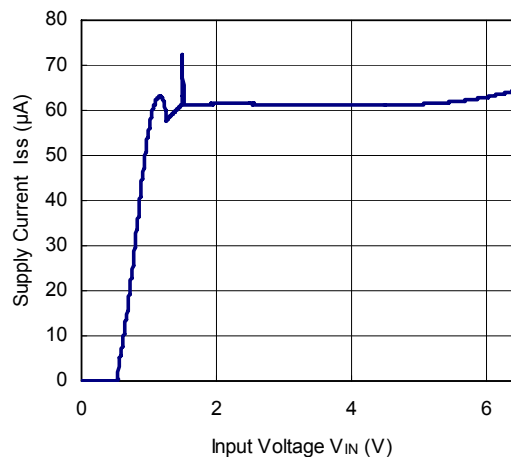


### 2) Supply Current vs. Input Voltage (T<sub>opt</sub>=25°C)

RP13x081x



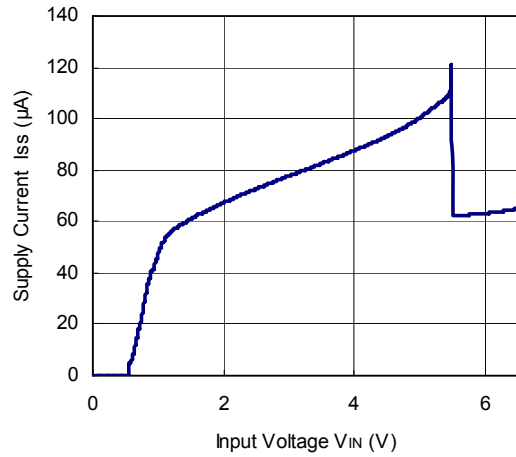
RP132x151x



**RP132x331x**



**RP132x551x**

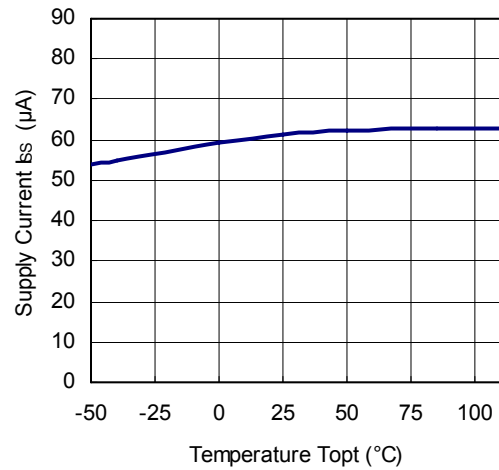


**3) Supply Current vs. Temperature**

**RP132x081x**



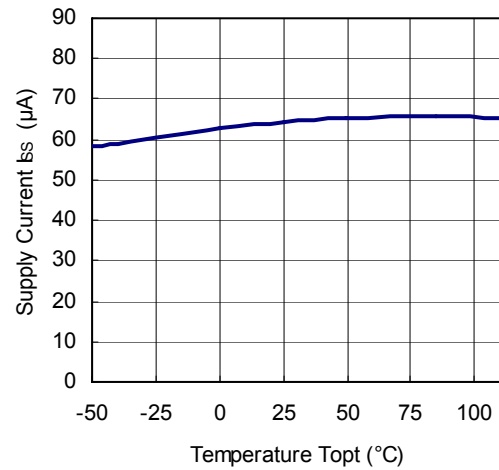
**RP132x151x**



**RP132x331x**



**RP132x551x**





4) Output Voltage vs. Temperature

RP132x081x



RP132x151x



RP132x331x

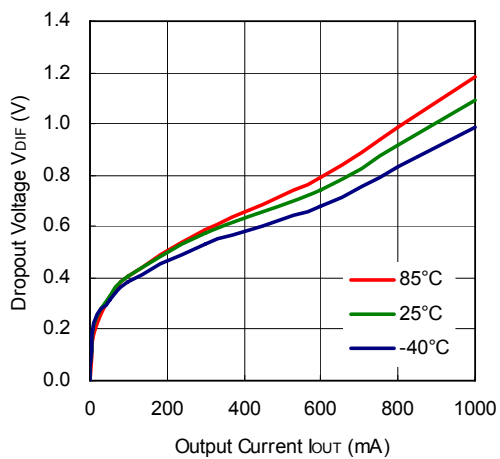


RP132x551x

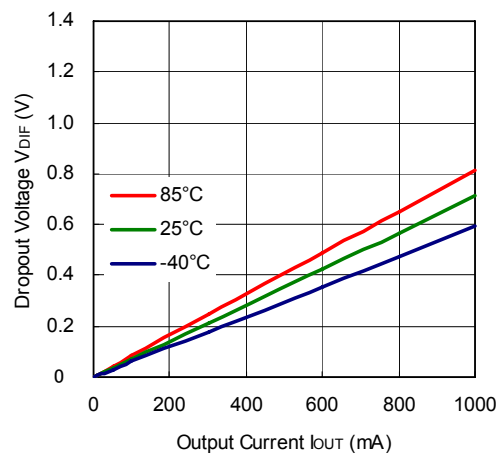


5) Dropout Voltage vs. Output Current

RP132x081x



RP132x151x



# RP132x

NO.EA-265-160426

**RP132x331x**



**RP132x551x**



## 6) Dropout Voltage vs. Set Output Voltage



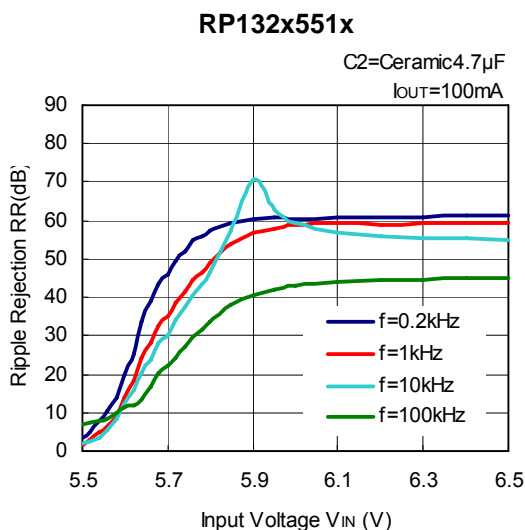
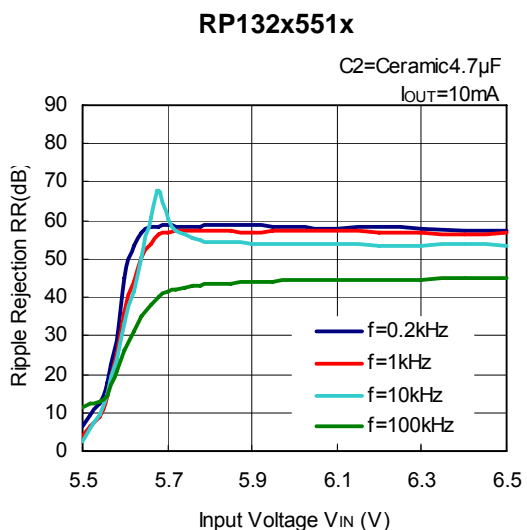
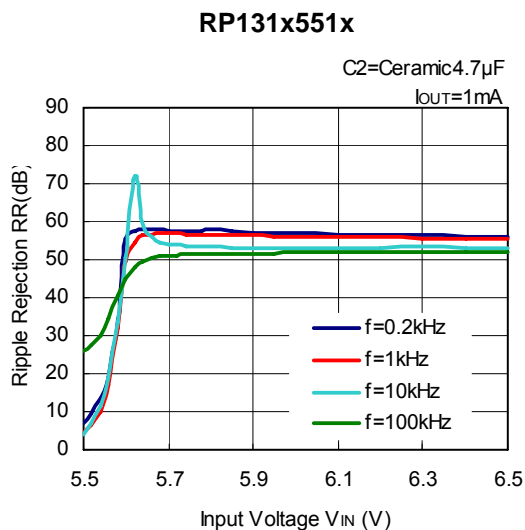
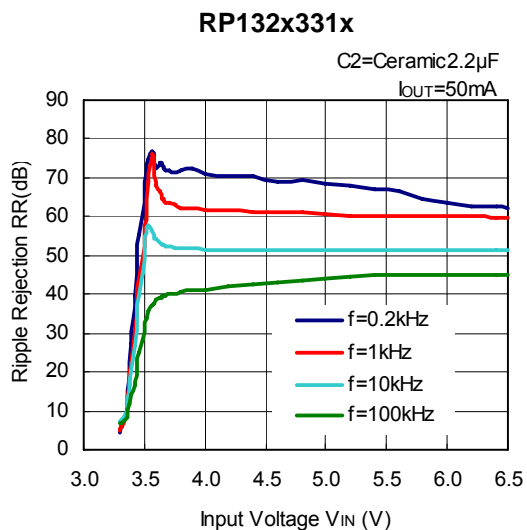
## 7) Ripple Rejection vs. Input Voltage (C1=none, Ripple=0.2Vp-p, T<sub>opt</sub>=25°C)

**RP132x331x**

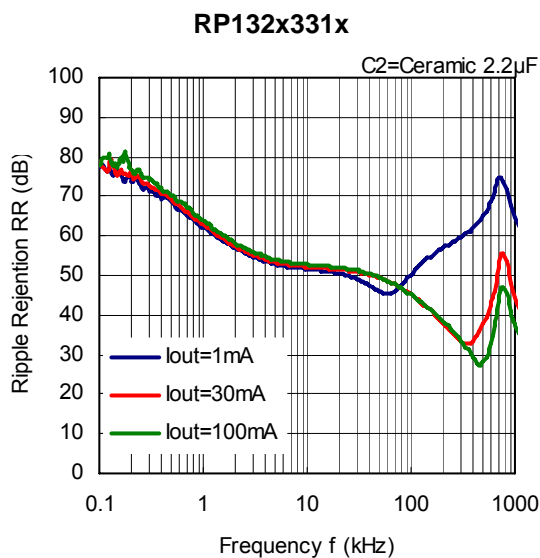
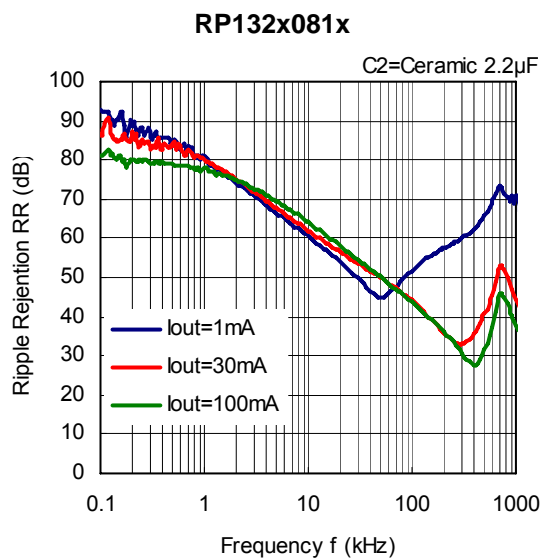


**RP132x331x**





**8) Ripple Rejection vs. Frequency (C1=none, T<sub>opt</sub>=25°C)**



**RP132x551x**

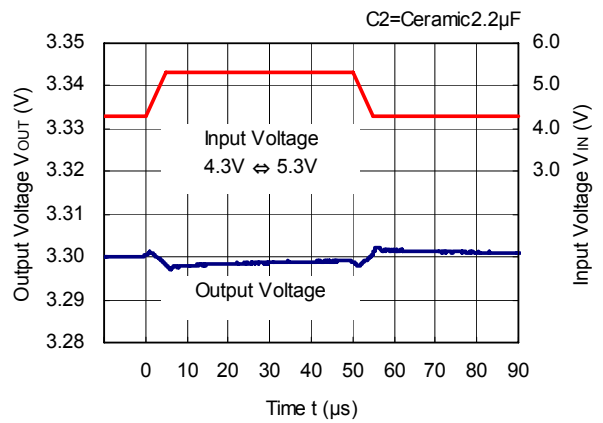


**9) Input Transient Response (C1=none, Iout=100mA, tr=tf=5 $\mu$ s, Topt=25°C)**

**RP132x081x**



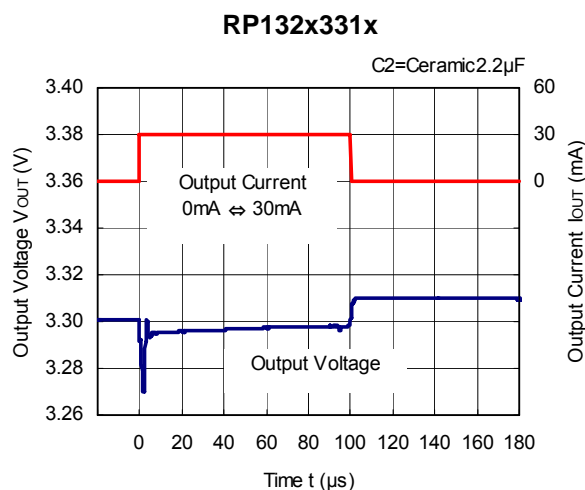
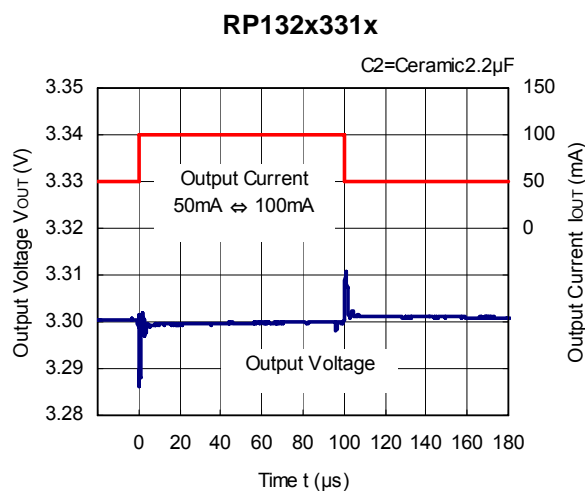
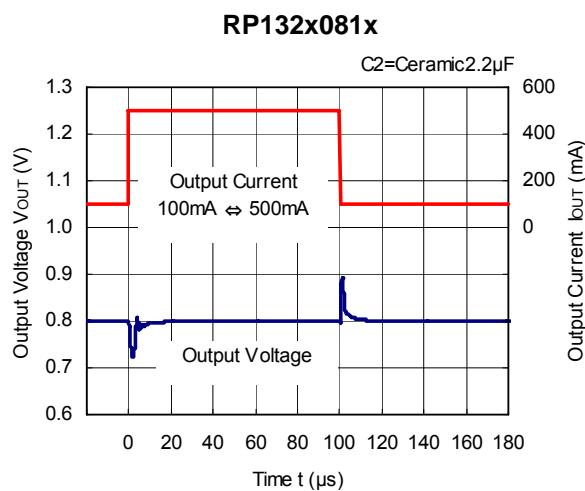
**RP132x331x**



**RP132x551x**



10) Load Transient Response ( $V_{IN}=V_{OUT}+1.0V$ ,  $C_1=Ceramic\ 2.2\mu F$ ,  $t_r=t_f=0.5\mu s$ ,  $T_{opt}=25^{\circ}C$ )



# RP132x

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### RP132x551x



### RP132x551x

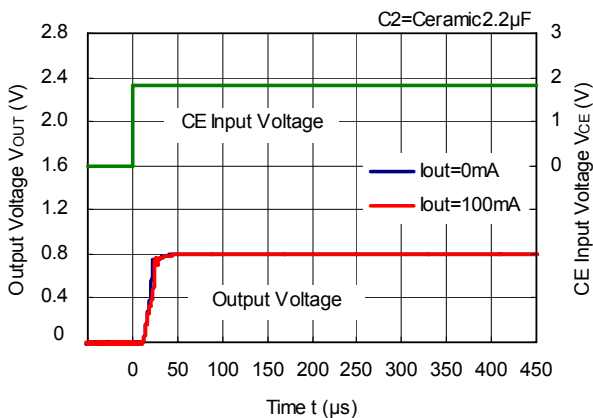


### RP132x551x

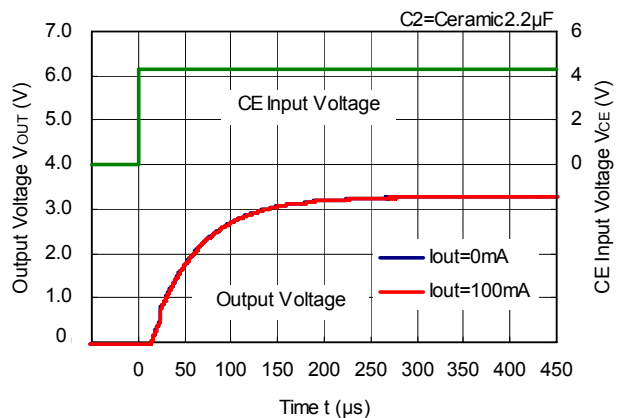


## 11) Turn on Speed with CE pin (C1=Ceramic 2.2 $\mu$ F, T<sub>opt</sub>=25 $^{\circ}$ C)

### RP132x081x



### RP132x331x



RP132x551x



12) Turn off Speed with CE pin (D version) (C1=Ceramic 2.2μF, T<sub>opt</sub>=25°C)

RP132x081D



RP132x331D



RP132x551D



# RP132x

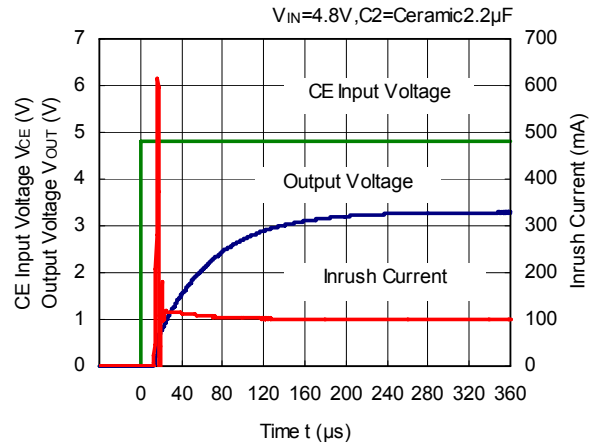
NO.EA-265-160426

## 13) Inrush Current (C1=Ceramic 2.2 $\mu$ F, I<sub>OUT</sub>=100mA, T<sub>opt</sub>=25°C)

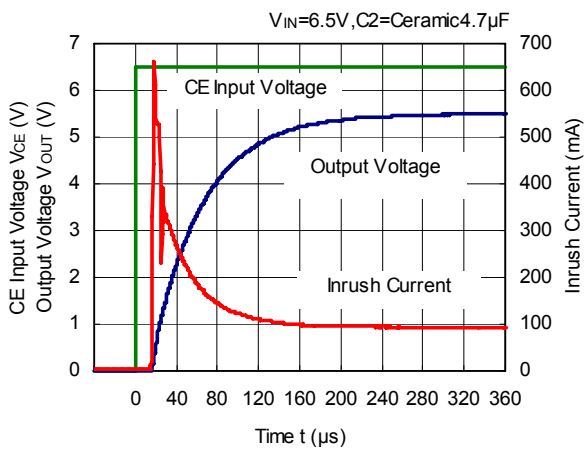
### RP132x081x



### RP132x331x

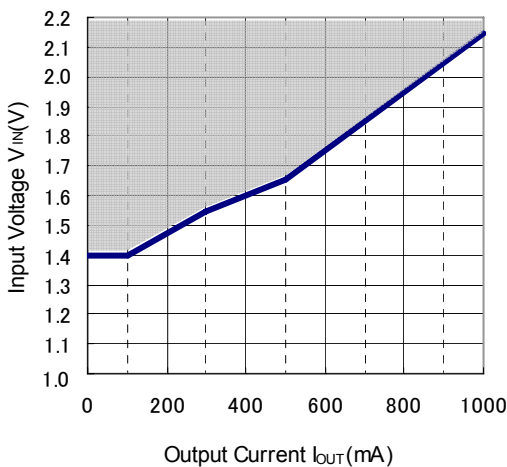


### RP132x551x



## 14) Minimum Operating Voltage

### RP132x081x



The operation range that can output 0.8V is shown by the hatched area in the graph.



15) Inrush Current Limit Time vs.  $C_D$  Capacitance (E / F Version)

RP132x081x



16) Inrush Current Limit Time vs. Input Voltage (E / F Version)

RP132x081x



## ESR vs. Output Current

When using these ICs, consider the following points:

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  $40\mu\text{V}$  (Avg.) are marked as the hatched area in the graph.

### Measurement Conditions

Frequency Band : 10Hz to 2MHz

Temperature :  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

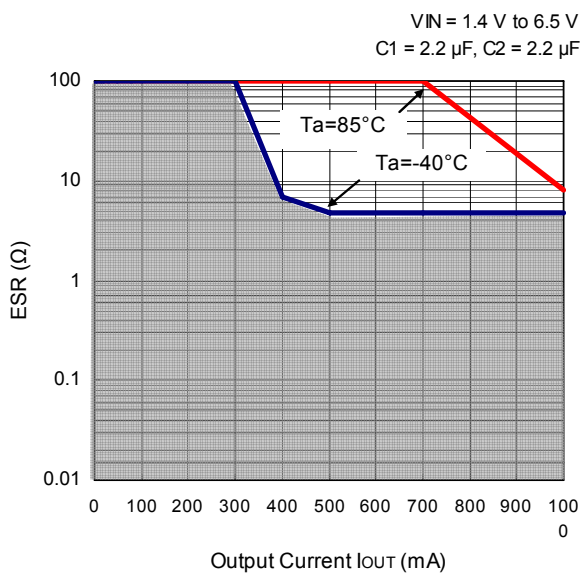
Hatched Area : Noise level is under  $40\mu\text{Vms}$  (Avg.)

$C_{IN}$  :  $2.2\mu\text{F}$  (Kyocera CM05X5R225M06A)

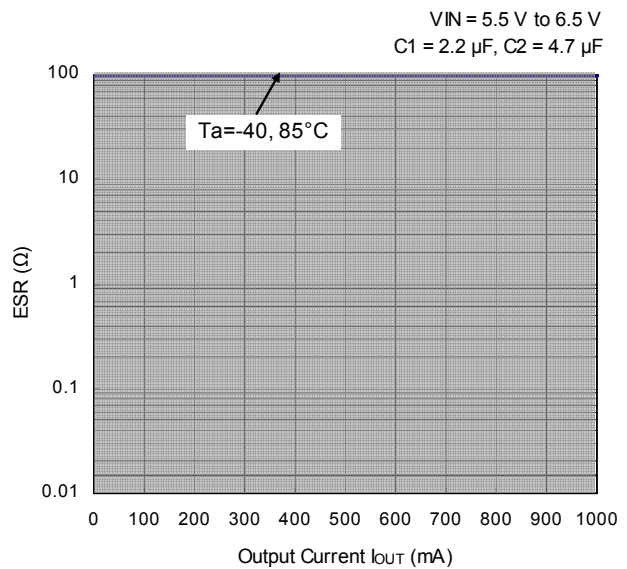
$C_{OUT}$  :  $2.2\mu\text{F}$  ( $V_{OUT} = 0.8\text{V}$ , Kyocera CM105X5R225K06AB)

$4.7\mu\text{F}$  ( $V_{OUT} = 5.5\text{V}$ , Kyocera CM105X5R475M06AB)

**RP132x081x**



**RP132x551x**



## PACKAGE INFORMATION

### Power Dissipation (DFN(PLP)1820-6)

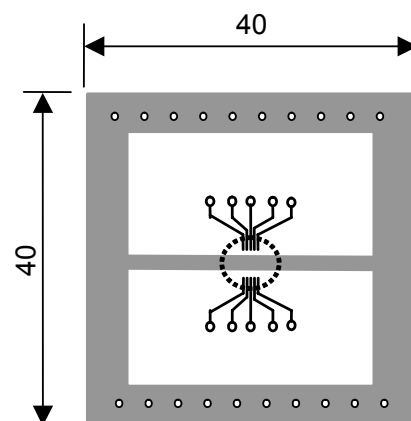
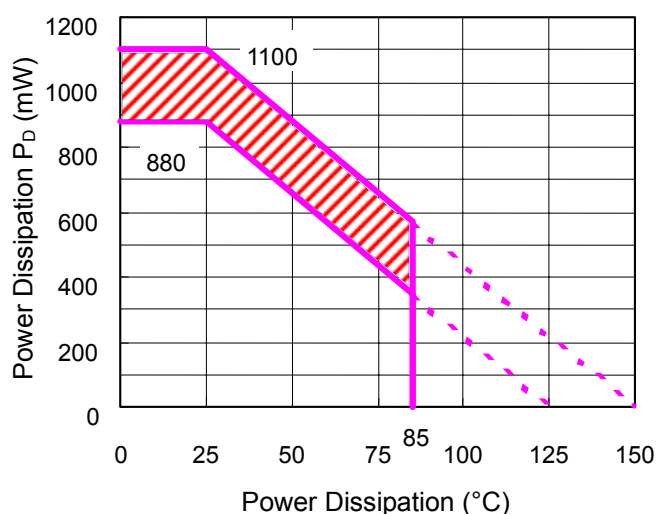
Power Dissipation ( $P_D$ ) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

#### Measurement Conditions

	Standard Test Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	40 mm x 40 mm x 1.6 mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-holes	$\phi$ : 0.54 mm x 30 pcs

#### Measurement Result ( $T_a = 25^\circ\text{C}$ )

	Standard Test Land Pattern
Power Dissipation	880mW ( $T_{jmax}=125^\circ\text{C}$ ) 1100mW ( $T_{jmax}=150^\circ\text{C}$ )
Thermal Resistance	$\theta_{ja} = (125-25^\circ\text{C}) / 0.88\text{W} = 114^\circ\text{C} / \text{W}$



IC Mount Area (Unit: mm)

#### Power Dissipation vs. Ambient Temperature

#### Measurement Board Pattern

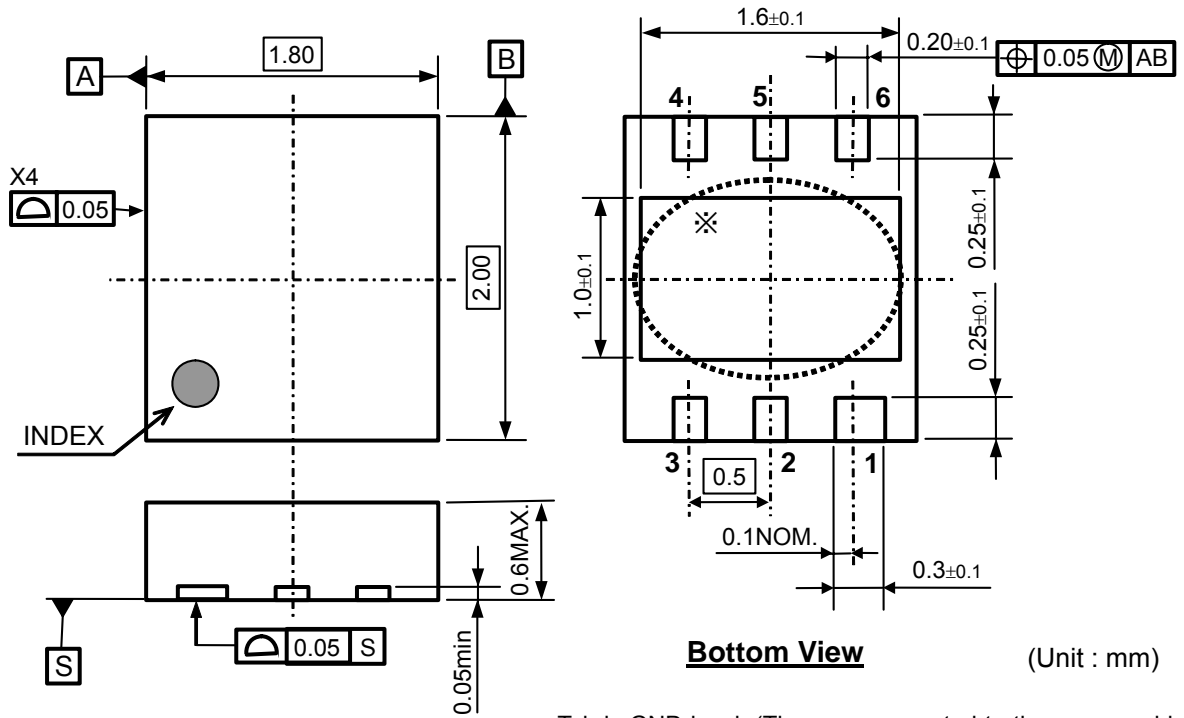
Note: The above graph shows the Power Dissipation of the package based on  $T_{jmax}=125^\circ\text{C}$  and  $T_{jmax}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below, in case of operating in the shaded area.

Operating Time	Estimated Years (Operating four hours/ day)
13,000 hours	9 years

**RP132x**

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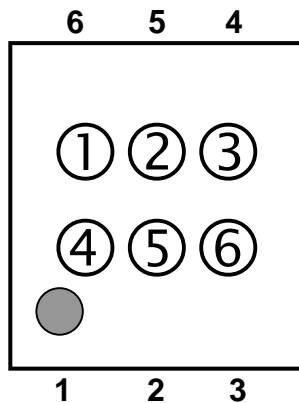
**Package Dimensions (DFN(PLP)1820-6)**



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.

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

- ①②③④: Product Code ... Refer to RP132K Series Mark Specification Table.
- ⑤⑥: Lot Number ... Alphanumeric Serial Number



# RP132K Series Mark Specification Table

PKG: DFN(PLP)1820-6

● RP132Kxx1B		● RP132Kxx1D		● RP132Kxx1E		● RP132Kxx1F		設定電圧
製品名	①②③④	製品名	①②③④	製品名	①②③④	製品名	①②③④	
RP132K081B	CX08	RP132K081D	CY08	RP132K081E	DF08	RP132K081F	DG08	0.8V
RP132K091B	CX09	RP132K091D	CY09	RP132K091E	DF09	RP132K091F	DG09	0.9V
RP132K101B	CX10	RP132K101D	CY10	RP132K101E	DF10	RP132K101F	DG10	1.0V
RP132K111B	CX11	RP132K111D	CY11	RP132K111E	DF11	RP132K111F	DG11	1.1V
RP132K121B	CX12	RP132K121D	CY12	RP132K121E	DF12	RP132K121F	DG12	1.2V
RP132K131B	CX13	RP132K131D	CY13	RP132K131E	DF13	RP132K131F	DG13	1.3V
RP132K141B	CX14	RP132K141D	CY14	RP132K141E	DF14	RP132K141F	DG14	1.4V
RP132K151B	CX15	RP132K151D	CY15	RP132K151E	DF15	RP132K151F	DG15	1.5V
RP132K161B	CX16	RP132K161D	CY16	RP132K161E	DF16	RP132K161F	DG16	1.6V
RP132K171B	CX17	RP132K171D	CY17	RP132K171E	DF17	RP132K171F	DG17	1.7V
RP132K181B	CX18	RP132K181D	CY18	RP132K181E	DF18	RP132K181F	DG18	1.8V
RP132K191B	CX19	RP132K191D	CY19	RP132K191E	DF19	RP132K191F	DG19	1.9V
RP132K201B	CX20	RP132K201D	CY20	RP132K201E	DF20	RP132K201F	DG20	2.0V
RP132K211B	CX21	RP132K211D	CY21	RP132K211E	DF21	RP132K211F	DG21	2.1V
RP132K221B	CX22	RP132K221D	CY22	RP132K221E	DF22	RP132K221F	DG22	2.2V
RP132K231B	CX23	RP132K231D	CY23	RP132K231E	DF23	RP132K231F	DG23	2.3V
RP132K241B	CX24	RP132K241D	CY24	RP132K241E	DF24	RP132K241F	DG24	2.4V
RP132K251B	CX25	RP132K251D	CY25	RP132K251E	DF25	RP132K251F	DG25	2.5V
RP132K261B	CX26	RP132K261D	CY26	RP132K261E	DF26	RP132K261F	DG26	2.6V
RP132K271B	CX27	RP132K271D	CY27	RP132K271E	DF27	RP132K271F	DG27	2.7V
RP132K281B	CX28	RP132K281D	CY28	RP132K281E	DF28	RP132K281F	DG28	2.8V
RP132K291B	CX29	RP132K291D	CY29	RP132K291E	DF29	RP132K291F	DG29	2.9V
RP132K301B	CX30	RP132K301D	CY30	RP132K301E	DF30	RP132K301F	DG30	3.0V
RP132K311B	CX31	RP132K311D	CY31	RP132K311E	DF31	RP132K311F	DG31	3.1V
RP132K321B	CX32	RP132K321D	CY32	RP132K321E	DF32	RP132K321F	DG32	3.2V
RP132K331B	CX33	RP132K331D	CY33	RP132K331E	DF33	RP132K331F	DG33	3.3V
RP132K341B	CX34	RP132K341D	CY34	RP132K341E	DF34	RP132K341F	DG34	3.4V
RP132K351B	CX35	RP132K351D	CY35	RP132K351E	DF35	RP132K351F	DG35	3.5V
RP132K361B	CX36	RP132K361D	CY36	RP132K361E	DF36	RP132K361F	DG36	3.6V
RP132K371B	CX37	RP132K371D	CY37	RP132K371E	DF37	RP132K371F	DG37	3.7V
RP132K381B	CX38	RP132K381D	CY38	RP132K381E	DF38	RP132K381F	DG38	3.8V
RP132K391B	CX39	RP132K391D	CY39	RP132K391E	DF39	RP132K391F	DG39	3.9V
RP132K401B	CX40	RP132K401D	CY40	RP132K401E	DF40	RP132K401F	DG40	4.0V
RP132K411B	CX41	RP132K411D	CY41	RP132K411E	DF41	RP132K411F	DG41	4.1V
RP132K421B	CX42	RP132K421D	CY42	RP132K421E	DF42	RP132K421F	DG42	4.2V
RP132K431B	CX43	RP132K431D	CY43	RP132K431E	DF43	RP132K431F	DG43	4.3V
RP132K441B	CX44	RP132K441D	CY44	RP132K441E	DF44	RP132K441F	DG44	4.4V
RP132K451B	CX45	RP132K451D	CY45	RP132K451E	DF45	RP132K451F	DG45	4.5V
RP132K461B	CX46	RP132K461D	CY46	RP132K461E	DF46	RP132K461F	DG46	4.6V
RP132K471B	CX47	RP132K471D	CY47	RP132K471E	DF47	RP132K471F	DG47	4.7V
RP132K481B	CX48	RP132K481D	CY48	RP132K481E	DF48	RP132K481F	DG48	4.8V
RP132K491B	CX49	RP132K491D	CY49	RP132K491E	DF49	RP132K491F	DG49	4.9V
RP132K501B	CX50	RP132K501D	CY50	RP132K501E	DF50	RP132K501F	DG50	5.0V
RP132K511B	CX51	RP132K511D	CY51	RP132K511E	DF51	RP132K511F	DG51	5.1V
RP132K521B	CX52	RP132K521D	CY52	RP132K521E	DF52	RP132K521F	DG52	5.2V
RP132K531B	CX53	RP132K531D	CY53	RP132K531E	DF53	RP132K531F	DG53	5.3V
RP132K541B	CX54	RP132K541D	CY54	RP132K541E	DF54	RP132K541F	DG54	5.4V
RP132K551B	CX55	RP132K551D	CY55	RP132K551E	DF55	RP132K551F	DG55	5.5V
RP132K121B5	CX01	RP132K121D5	CY01	RP132K121E5	DF01	RP132K121F5	DG01	1.25V
RP132K181B5	CX02	RP132K181D5	CY02	RP132K181E5	DF02	RP132K181F5	DG02	1.85V
RP132K281B5	CX03	RP132K281D5	CY03	RP132K281E5	DF03	RP132K281F5	DG03	2.85V
RP132K001B	CX00	RP132K001D	CY00	RP132K001E	DF00	RP132K001F	DG00	-

# RP132x

NO.EA-265-160426

## Power Dissipation (SOT-89-5)

Power Dissipation ( $P_D$ ) depends on conditions of mounting on board. This specification is based on the Measurement Conditions below.

### Measurement Conditions

	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity=0m/s)	Mounting on Board (Wind Velocity=0m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	30mm x 30mm x 1.6mm	50mm x 50mm x 1.6mm
Copper Ratio	Top-side: Approx. 20%, Back-side: Approx. 100%	Top-side: Approx. 10%, Back-side: Approx. 100%
Through-hole	$\phi 0.85\text{mm} \times 10\text{pcs}$	-

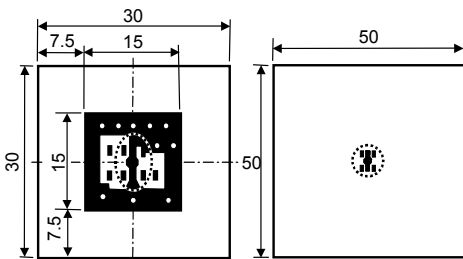
### Measurement Result

( $T_a=25^\circ\text{C}$ )

	High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	1300mW	900mW ( $T_{j\text{max}}=125^\circ\text{C}$ ) 1125mW ( $T_{j\text{max}}=150^\circ\text{C}$ )	500mW
Thermal Resistance	$77^\circ\text{C/W}$	$111^\circ\text{C/W}$	$200^\circ\text{C/W}$



### Power Dissipation



High Wattage

Standard

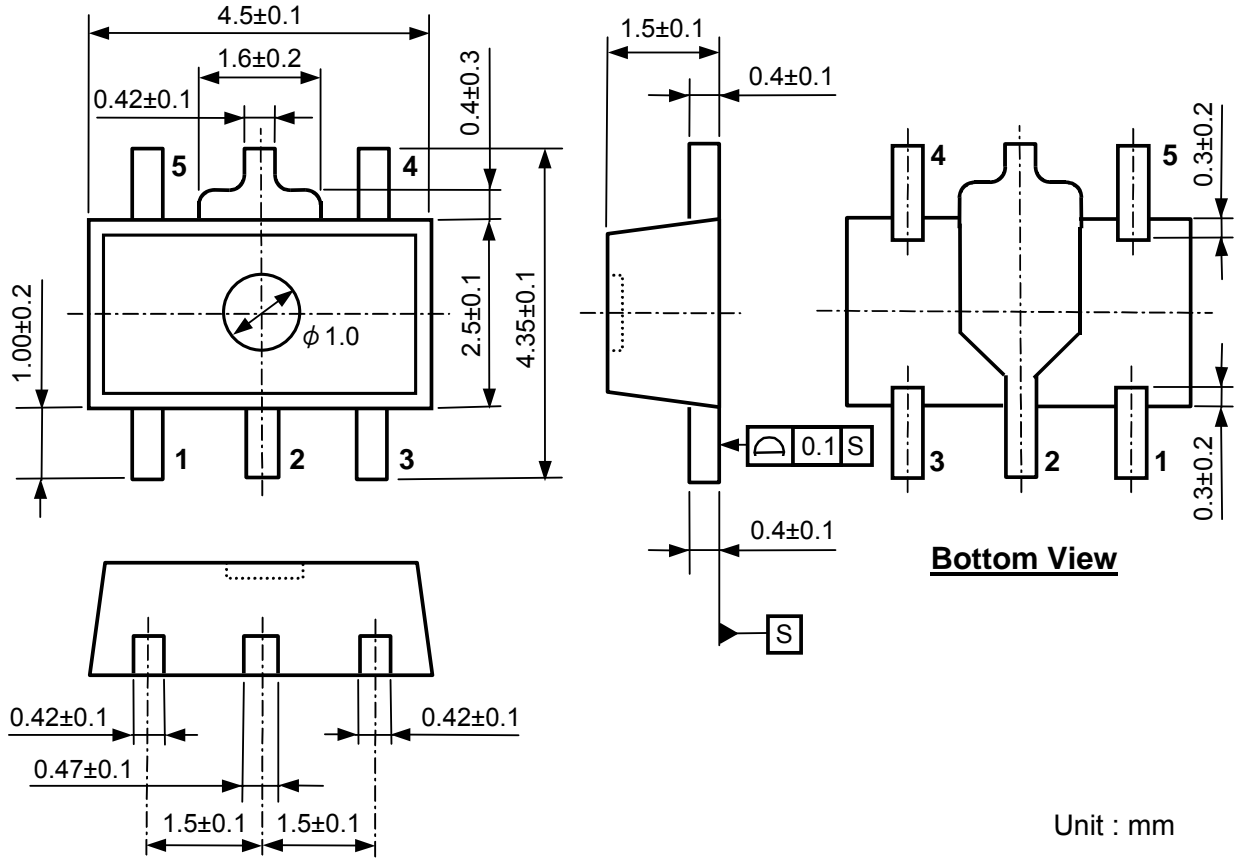
### Measurement Board Pattern

IC Mount Area (Unit : mm)

Note: The above graph shows the Power Dissipation of the package based on  $T_{j\text{max}}=125^\circ\text{C}$  and  $T_{j\text{max}}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below, in case of operating in the shaded area.

Operating Time	Estimated Years (Operating four hours/ day)
13,000 hours	9 years

Package Dimensions (SOT-89-5)

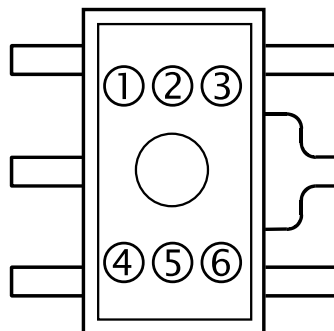


Unit : mm

Mark Specifications (SOT-89-5)

①②③④: Product Code ...Refer to RP132H Series Mark Specification Table.

⑤⑥: Lot Number ... Alphanumeric Serial Number



## RP132H Series Mark Specification Table

PKG: SOT-89-5

● **RP132Hxx1B**

製品名	①②③④	設定電圧
RP132H081B	<b>C 0 8 B</b>	0.8V
RP132H091B	<b>C 0 9 B</b>	0.9V
RP132H101B	<b>C 1 0 B</b>	1.0V
RP132H111B	<b>C 1 1 B</b>	1.1V
RP132H121B	<b>C 1 2 B</b>	1.2V
RP132H131B	<b>C 1 3 B</b>	1.3V
RP132H141B	<b>C 1 4 B</b>	1.4V
RP132H151B	<b>C 1 5 B</b>	1.5V
RP132H161B	<b>C 1 6 B</b>	1.6V
RP132H171B	<b>C 1 7 B</b>	1.7V
RP132H181B	<b>C 1 8 B</b>	1.8V
RP132H191B	<b>C 1 9 B</b>	1.9V
RP132H201B	<b>C 2 0 B</b>	2.0V
RP132H211B	<b>C 2 1 B</b>	2.1V
RP132H221B	<b>C 2 2 B</b>	2.2V
RP132H231B	<b>C 2 3 B</b>	2.3V
RP132H241B	<b>C 2 4 B</b>	2.4V
RP132H251B	<b>C 2 5 B</b>	2.5V
RP132H261B	<b>C 2 6 B</b>	2.6V
RP132H271B	<b>C 2 7 B</b>	2.7V
RP132H281B	<b>C 2 8 B</b>	2.8V
RP132H291B	<b>C 2 9 B</b>	2.9V
RP132H301B	<b>C 3 0 B</b>	3.0V
RP132H311B	<b>C 3 1 B</b>	3.1V
RP132H321B	<b>C 3 2 B</b>	3.2V
RP132H331B	<b>C 3 3 B</b>	3.3V
RP132H341B	<b>C 3 4 B</b>	3.4V
RP132H351B	<b>C 3 5 B</b>	3.5V
RP132H361B	<b>C 3 6 B</b>	3.6V
RP132H371B	<b>C 3 7 B</b>	3.7V
RP132H381B	<b>C 3 8 B</b>	3.8V
RP132H391B	<b>C 3 9 B</b>	3.9V
RP132H401B	<b>C 4 0 B</b>	4.0V
RP132H411B	<b>C 4 1 B</b>	4.1V
RP132H421B	<b>C 4 2 B</b>	4.2V
RP132H431B	<b>C 4 3 B</b>	4.3V
RP132H441B	<b>C 4 4 B</b>	4.4V
RP132H451B	<b>C 4 5 B</b>	4.5V
RP132H461B	<b>C 4 6 B</b>	4.6V
RP132H471B	<b>C 4 7 B</b>	4.7V
RP132H481B	<b>C 4 8 B</b>	4.8V
RP132H491B	<b>C 4 9 B</b>	4.9V
RP132H501B	<b>C 5 0 B</b>	5.0V
RP132H511B	<b>C 5 1 B</b>	5.1V
RP132H521B	<b>C 5 2 B</b>	5.2V
RP132H531B	<b>C 5 3 B</b>	5.3V
RP132H541B	<b>C 5 4 B</b>	5.4V
RP132H551B	<b>C 5 5 B</b>	5.5V
RP132H121B5	<b>C 0 1 B</b>	1.25V
RP132H181B5	<b>C 0 2 B</b>	1.85V
RP132H281B5	<b>C 0 3 B</b>	2.85V
RP132H001B	<b>C 0 0 B</b>	-

● **RP132Hxx1D**

製品名	①②③④	設定電圧
RP132H081D	<b>C 0 8 D</b>	0.8V
RP132H091D	<b>C 0 9 D</b>	0.9V
RP132H101D	<b>C 1 0 D</b>	1.0V
RP132H111D	<b>C 1 1 D</b>	1.1V
RP132H121D	<b>C 1 2 D</b>	1.2V
RP132H131D	<b>C 1 3 D</b>	1.3V
RP132H141D	<b>C 1 4 D</b>	1.4V
RP132H151D	<b>C 1 5 D</b>	1.5V
RP132H161D	<b>C 1 6 D</b>	1.6V
RP132H171D	<b>C 1 7 D</b>	1.7V
RP132H181D	<b>C 1 8 D</b>	1.8V
RP132H191D	<b>C 1 9 D</b>	1.9V
RP132H201D	<b>C 2 0 D</b>	2.0V
RP132H211D	<b>C 2 1 D</b>	2.1V
RP132H221D	<b>C 2 2 D</b>	2.2V
RP132H231D	<b>C 2 3 D</b>	2.3V
RP132H241D	<b>C 2 4 D</b>	2.4V
RP132H251D	<b>C 2 5 D</b>	2.5V
RP132H261D	<b>C 2 6 D</b>	2.6V
RP132H271D	<b>C 2 7 D</b>	2.7V
RP132H281D	<b>C 2 8 D</b>	2.8V
RP132H291D	<b>C 2 9 D</b>	2.9V
RP132H301D	<b>C 3 0 D</b>	3.0V
RP132H311D	<b>C 3 1 D</b>	3.1V
RP132H321D	<b>C 3 2 D</b>	3.2V
RP132H331D	<b>C 3 3 D</b>	3.3V
RP132H341D	<b>C 3 4 D</b>	3.4V
RP132H351D	<b>C 3 5 D</b>	3.5V
RP132H361D	<b>C 3 6 D</b>	3.6V
RP132H371D	<b>C 3 7 D</b>	3.7V
RP132H381D	<b>C 3 8 D</b>	3.8V
RP132H391D	<b>C 3 9 D</b>	3.9V
RP132H401D	<b>C 4 0 D</b>	4.0V
RP132H411D	<b>C 4 1 D</b>	4.1V
RP132H421D	<b>C 4 2 D</b>	4.2V
RP132H431D	<b>C 4 3 D</b>	4.3V
RP132H441D	<b>C 4 4 D</b>	4.4V
RP132H451D	<b>C 4 5 D</b>	4.5V
RP132H461D	<b>C 4 6 D</b>	4.6V
RP132H471D	<b>C 4 7 D</b>	4.7V
RP132H481D	<b>C 4 8 D</b>	4.8V
RP132H491D	<b>C 4 9 D</b>	4.9V
RP132H501D	<b>C 5 0 D</b>	5.0V
RP132H511D	<b>C 5 1 D</b>	5.1V
RP132H521D	<b>C 5 2 D</b>	5.2V
RP132H531D	<b>C 5 3 D</b>	5.3V
RP132H541D	<b>C 5 4 D</b>	5.4V
RP132H551D	<b>C 5 5 D</b>	5.5V
RP132H121D5	<b>C 0 1 D</b>	1.25V
RP132H181D5	<b>C 0 2 D</b>	1.85V
RP132H281D5	<b>C 0 3 D</b>	2.85V
RP132H001D	<b>C 0 0 D</b>	-



**Power Dissipation (HSOP-6J)**

Power Dissipation ( $P_D$ ) depends on conditions of mounting on board. This specification is based on the Measurement Conditions below.

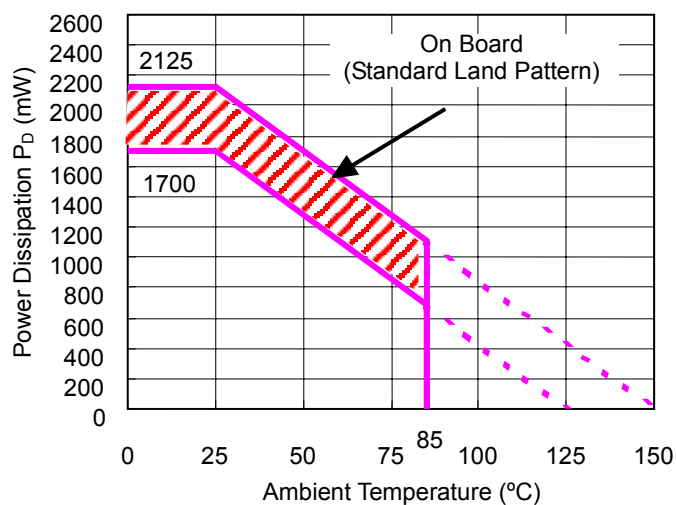
Measurement Conditions

	High Wattle Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity=0m/s)	Mounting on Board (Wind Velocity=0m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	50mm x 50mm x 1.6mm	50mm x 50mm x 1.6mm
Copper Ratio	90%	50%
Through-hole	$\phi$ 0.5mm x 24pcs	$\phi$ 0.5mm x 24pcs

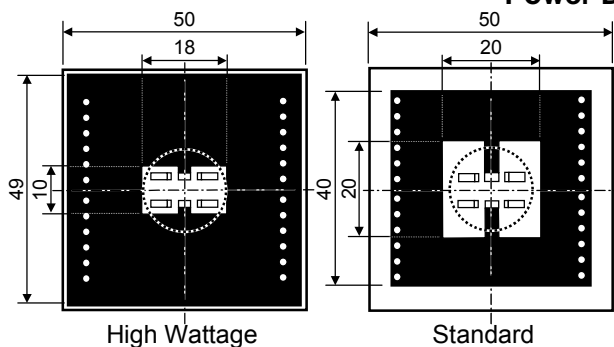
Measurement Result

( $T_a=25^\circ\text{C}$ )

	High Wattle Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	2000mW	1700mW ( $T_{jmax}=125^\circ\text{C}$ ) 2125mW ( $T_{jmax}=150^\circ\text{C}$ )	540mW
Thermal Resistance	$50^\circ\text{C/W}$	$59^\circ\text{C/W}$	$185^\circ\text{C/W}$



**Power Dissipation**



Measurement Board Pattern

IC Mount Area (Unit: mm)

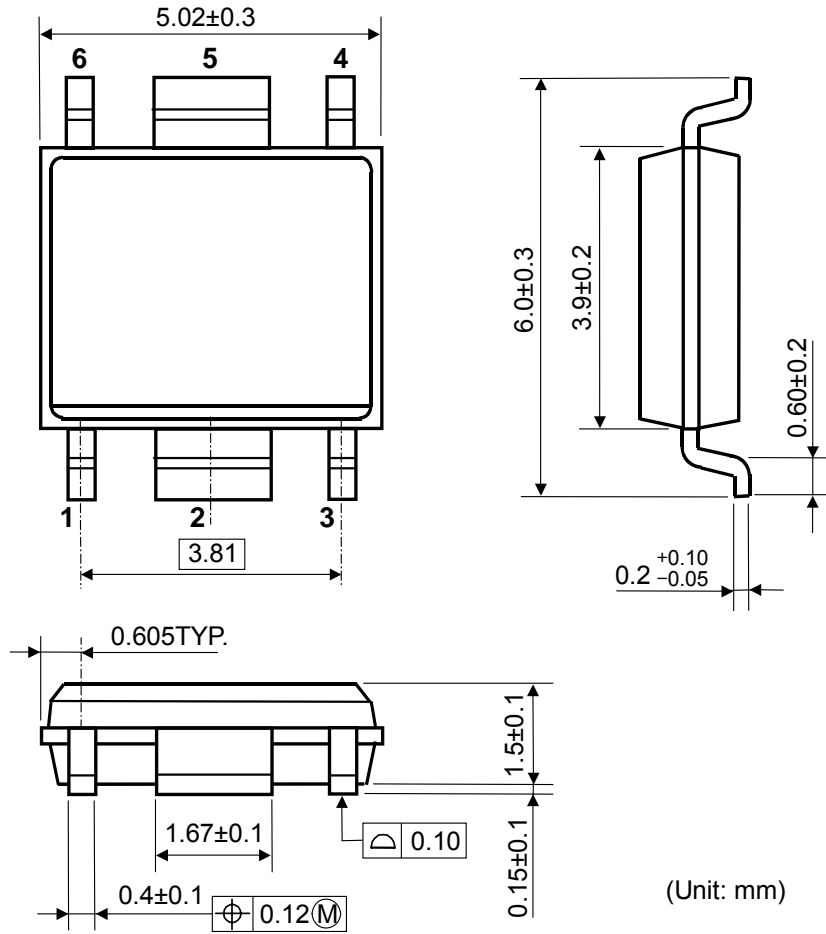
Note: The above graph shows the Power Dissipation of the package based on  $T_{jmax}=125^\circ\text{C}$  and  $T_{jmax}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below, in case of operating in the shaded area.

Operating Time	Estimated Years (Operating four hours/ day)
13,000 hours	9 years

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**RP132x**NO.EA-265-160426

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**Package Dimensions (HSOP-6J)****Mark Specifications (HSOP-6J)**①②③④: Product Code ... Refer to RP132S Series Mark Specification Table.

⑤⑥: Lot Number ... Alphanumeric Serial Number



# RP132S Series Mark Specification Table

PKG: HSOP-6J

● RP132Sxx1B

製品名	①②③④
RP132S081B	Q 08 B
RP132S091B	Q 09 B
RP132S101B	Q 10 B
RP132S111B	Q 11 B
RP132S121B	Q 12 B
RP132S131B	Q 13 B
RP132S141B	Q 14 B
RP132S151B	Q 15 B
RP132S161B	Q 16 B
RP132S171B	Q 17 B
RP132S181B	Q 18 B
RP132S191B	Q 19 B
RP132S201B	Q 20 B
RP132S211B	Q 21 B
RP132S221B	Q 22 B
RP132S231B	Q 23 B
RP132S241B	Q 24 B
RP132S251B	Q 25 B
RP132S261B	Q 26 B
RP132S271B	Q 27 B
RP132S281B	Q 28 B
RP132S291B	Q 29 B
RP132S301B	Q 30 B
RP132S311B	Q 31 B
RP132S321B	Q 32 B
RP132S331B	Q 33 B
RP132S341B	Q 34 B
RP132S351B	Q 35 B
RP132S361B	Q 36 B
RP132S371B	Q 37 B
RP132S381B	Q 38 B
RP132S391B	Q 39 B
RP132S401B	Q 40 B
RP132S411B	Q 41 B
RP132S421B	Q 42 B
RP132S431B	Q 43 B
RP132S441B	Q 44 B
RP132S451B	Q 45 B
RP132S461B	Q 46 B
RP132S471B	Q 47 B
RP132S481B	Q 48 B
RP132S491B	Q 49 B
RP132S501B	Q 50 B
RP132S511B	Q 51 B
RP132S521B	Q 52 B
RP132S531B	Q 53 B
RP132S541B	Q 54 B
RP132S551B	Q 55 B
RP132S121B5	Q 01 B
RP132S181B5	Q 02 B
RP132S281B5	Q 03 B
RP132S001B	Q 00 B

● RP132Sxx1D

製品名	①②③④
RP132S081D	Q 08 D
RP132S091D	Q 09 D
RP132S101D	Q 10 D
RP132S111D	Q 11 D
RP132S121D	Q 12 D
RP132S131D	Q 13 D
RP132S141D	Q 14 D
RP132S151D	Q 15 D
RP132S161D	Q 16 D
RP132S171D	Q 17 D
RP132S181D	Q 18 D
RP132S191D	Q 19 D
RP132S201D	Q 20 D
RP132S211D	Q 21 D
RP132S221D	Q 22 D
RP132S231D	Q 23 D
RP132S241D	Q 24 D
RP132S251D	Q 25 D
RP132S261D	Q 26 D
RP132S271D	Q 27 D
RP132S281D	Q 28 D
RP132S291D	Q 29 D
RP132S301D	Q 30 D
RP132S311D	Q 31 D
RP132S321D	Q 32 D
RP132S331D	Q 33 D
RP132S341D	Q 34 D
RP132S351D	Q 35 D
RP132S361D	Q 36 D
RP132S371D	Q 37 D
RP132S381D	Q 38 D
RP132S391D	Q 39 D
RP132S401D	Q 40 D
RP132S411D	Q 41 D
RP132S421D	Q 42 D
RP132S431D	Q 43 D
RP132S441D	Q 44 D
RP132S451D	Q 45 D
RP132S461D	Q 46 D
RP132S471D	Q 47 D
RP132S481D	Q 48 D
RP132S491D	Q 49 D
RP132S501D	Q 50 D
RP132S511D	Q 51 D
RP132S521D	Q 52 D
RP132S531D	Q 53 D
RP132S541D	Q 54 D
RP132S551D	Q 55 D
RP132S121D5	Q 01 D
RP132S181D5	Q 02 D
RP132S281D5	Q 03 D
RP132S001D	Q 00 D

● RP132Sxx1E

製品名	①②③④
RP132S081E	Q 08 E
RP132S091E	Q 09 E
RP132S101E	Q 10 E
RP132S111E	Q 11 E
RP132S121E	Q 12 E
RP132S131E	Q 13 E
RP132S141E	Q 14 E
RP132S151E	Q 15 E
RP132S161E	Q 16 E
RP132S171E	Q 17 E
RP132S181E	Q 18 E
RP132S191E	Q 19 E
RP132S201E	Q 20 E
RP132S211E	Q 21 E
RP132S221E	Q 22 E
RP132S231E	Q 23 E
RP132S241E	Q 24 E
RP132S251E	Q 25 E
RP132S261E	Q 26 E
RP132S271E	Q 27 E
RP132S281E	Q 28 E
RP132S291E	Q 29 E
RP132S301E	Q 30 E
RP132S311E	Q 31 E
RP132S321E	Q 32 E
RP132S331E	Q 33 E
RP132S341E	Q 34 E
RP132S351E	Q 35 E
RP132S361E	Q 36 E
RP132S371E	Q 37 E
RP132S381E	Q 38 E
RP132S391E	Q 39 E
RP132S401E	Q 40 E
RP132S411E	Q 41 E
RP132S421E	Q 42 E
RP132S431E	Q 43 E
RP132S441E	Q 44 E
RP132S451E	Q 45 E
RP132S461E	Q 46 E
RP132S471E	Q 47 E
RP132S481E	Q 48 E
RP132S491E	Q 49 E
RP132S501E	Q 50 E
RP132S511E	Q 51 E
RP132S521E	Q 52 E
RP132S531E	Q 53 E
RP132S541E	Q 54 E
RP132S551E	Q 55 E
RP132S121E5	Q 01 E
RP132S181E5	Q 02 E
RP132S281E5	Q 03 E
-	-

● RP132Sxx1F

製品名	①②③④
RP132S081F	Q 08 F
RP132S091F	Q 09 F
RP132S101F	Q 10 F
RP132S111F	Q 11 F
RP132S121F	Q 12 F
RP132S131F	Q 13 F
RP132S141F	Q 14 F
RP132S151F	Q 15 F
RP132S161F	Q 16 F
RP132S171F	Q 17 F
RP132S181F	Q 18 F
RP132S191F	Q 19 F
RP132S201F	Q 20 F
RP132S211F	Q 21 F
RP132S221F	Q 22 F
RP132S231F	Q 23 F
RP132S241F	Q 24 F
RP132S251F	Q 25 F
RP132S261F	Q 26 F
RP132S271F	Q 27 F
RP132S281F	Q 28 F
RP132S291F	Q 29 F
RP132S301F	Q 30 F
RP132S311F	Q 31 F
RP132S321F	Q 32 F
RP132S331F	Q 33 F
RP132S341F	Q 34 F
RP132S351F	Q 35 F
RP132S361F	Q 36 F
RP132S371F	Q 37 F
RP132S381F	Q 38 F
RP132S391F	Q 39 F
RP132S401F	Q 40 F
RP132S411F	Q 41 F
RP132S421F	Q 42 F
RP132S431F	Q 43 F
RP132S441F	Q 44 F
RP132S451F	Q 45 F
RP132S461F	Q 46 F
RP132S471F	Q 47 F
RP132S481F	Q 48 F
RP132S491F	Q 49 F
RP132S501F	Q 50 F
RP132S511F	Q 51 F
RP132S521F	Q 52 F
RP132S531F	Q 53 F
RP132S541F	Q 54 F
RP132S551F	Q 55 F
RP132S121F5	Q 01 F
RP132S181F5	Q 02 F
RP132S281F5	Q 03 F
-	-

設定電圧
0.8V
0.9V
1.0V
1.1V
1.2V
1.3V
1.4V
1.5V
1.6V
1.7V
1.8V
1.9V
2.0V
2.1V
2.2V
2.3V
2.4V
2.5V
2.6V
2.7V
2.8V
2.9V
3.0V
3.1V
3.2V
3.3V
3.4V
3.5V
3.6V
3.7V
3.8V
3.9V
4.0V
4.1V
4.2V
4.3V
4.4V
4.5V
4.6V
4.7V
4.8V
4.9V
5.0V
5.1V
5.2V
5.3V
5.4V
5.5V
1.25V
1.85V
2.85V
-

# RP132x

NO.EA-265-160426

## Power Dissipation (TO-252-5-P2)

Power Dissipation ( $P_D$ ) depends on conditions of mounting on board. This specification is based on the Measurement Conditions below.

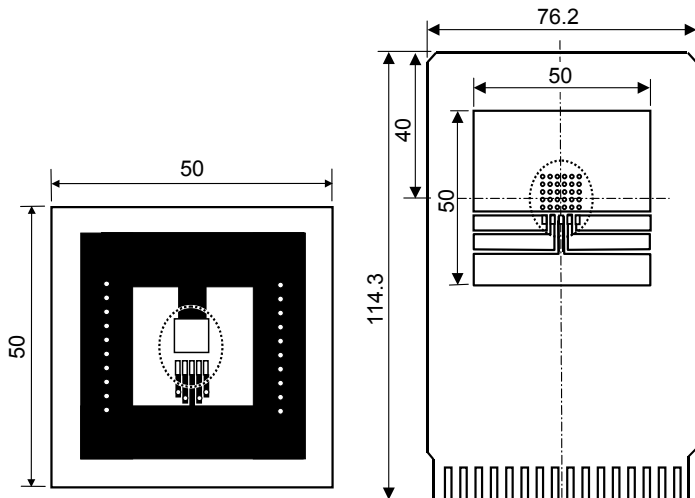
### Measurement conditions

	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on board (Wind velocity 0m/s)	Mounting on board (Wind velocity 0m/s)
Board Material	Glass cloth epoxy plastic (Double layers)	Glass cloth epoxy plastic (Four-layers)
Board Dimensions	50mm × 50mm × 1.6mm	76.2mm × 114.3mm × 0.8mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%	Top, Back side: Approx. 96%, 2nd, 3rd: 100%
Through - hole	φ 0.5mm x 24pcs	φ 0.4mm x 30pcs

### Measurement Results

( $T_a=25^\circ\text{C}$ )

	High Wattage Land Pattern	Standard Land Pattern
Power Dissipation	1900mW ( $T_{jmax}=125^\circ\text{C}$ ) 2375mW ( $T_{jmax}=150^\circ\text{C}$ )	3800mW ( $T_{jmax}=125^\circ\text{C}$ ) 4750mW ( $T_{jmax}=150^\circ\text{C}$ )
Thermal Resistance	$\theta_{ja} = (125-25^\circ\text{C})/1.9\text{W} = 53^\circ\text{C/W}$ $\theta_{jc} = 17^\circ\text{C/W}$	$\theta_{ja} = (125-25^\circ\text{C})/3.8\text{W} = 26^\circ\text{C/W}$ $\theta_{jc} = 7^\circ\text{C/W}$



High Wattage Land Pattern

Standard Land Pattern

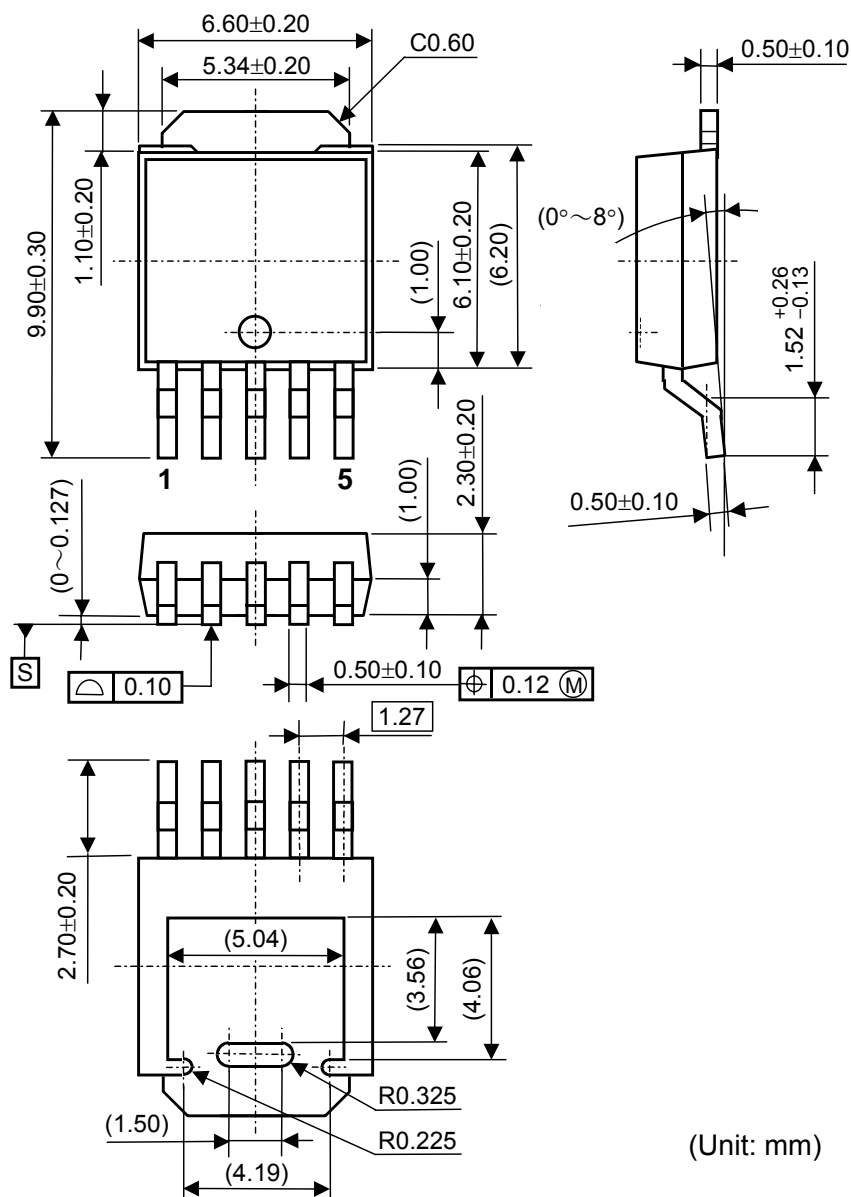
○ IC Mount Area (Unit: mm)

○ IC Mount Area (Unit: mm)

Note: The above graph shows the Power Dissipation of the package based on  $T_{jmax}=125^\circ\text{C}$  and  $T_{jmax}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below, in case of operating in the shaded area.

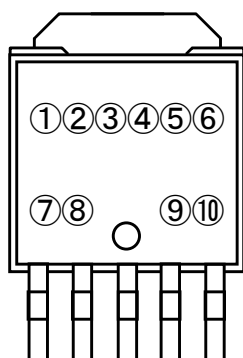
Operating Time	Estimated Years (Operating four hours/ day)
13,000 hours	9 years

Package Dimensions (TO-252-5-P2)



(Unit: mm)

Mark Specifications (TO-252-5-P2)



① ② ③ ④ ⑤ ⑥ ⑦ ⑧: Refer to RP132J Series Mark Specification Table.

⑨ ⑩: Lot Number ... Alphanumeric Serial Number

**RP132x**

NO.EA-265-160426

**RP132J Series Mark Specification Table**

PKG: TO-252-5-P2

● **RP132Jxx1B**

製品名	①②③④⑤⑥⑦⑧	設定電圧
RP132J081B	<b>G 1 J 0 8 1 B</b>	0.8V
RP132J091B	<b>G 1 J 0 9 1 B</b>	0.9V
RP132J101B	<b>G 1 J 1 0 1 B</b>	1.0V
RP132J111B	<b>G 1 J 1 1 1 B</b>	1.1V
RP132J121B	<b>G 1 J 1 2 1 B</b>	1.2V
RP132J131B	<b>G 1 J 1 3 1 B</b>	1.3V
RP132J141B	<b>G 1 J 1 4 1 B</b>	1.4V
RP132J151B	<b>G 1 J 1 5 1 B</b>	1.5V
RP132J161B	<b>G 1 J 1 6 1 B</b>	1.6V
RP132J171B	<b>G 1 J 1 7 1 B</b>	1.7V
RP132J181B	<b>G 1 J 1 8 1 B</b>	1.8V
RP132J191B	<b>G 1 J 1 9 1 B</b>	1.9V
RP132J201B	<b>G 1 J 2 0 1 B</b>	2.0V
RP132J211B	<b>G 1 J 2 1 1 B</b>	2.1V
RP132J221B	<b>G 1 J 2 2 1 B</b>	2.2V
RP132J231B	<b>G 1 J 2 3 1 B</b>	2.3V
RP132J241B	<b>G 1 J 2 4 1 B</b>	2.4V
RP132J251B	<b>G 1 J 2 5 1 B</b>	2.5V
RP132J261B	<b>G 1 J 2 6 1 B</b>	2.6V
RP132J271B	<b>G 1 J 2 7 1 B</b>	2.7V
RP132J281B	<b>G 1 J 2 8 1 B</b>	2.8V
RP132J291B	<b>G 1 J 2 9 1 B</b>	2.9V
RP132J301B	<b>G 1 J 3 0 1 B</b>	3.0V
RP132J311B	<b>G 1 J 3 1 1 B</b>	3.1V
RP132J321B	<b>G 1 J 3 2 1 B</b>	3.2V
RP132J331B	<b>G 1 J 3 3 1 B</b>	3.3V
RP132J341B	<b>G 1 J 3 4 1 B</b>	3.4V
RP132J351B	<b>G 1 J 3 5 1 B</b>	3.5V
RP132J361B	<b>G 1 J 3 6 1 B</b>	3.6V
RP132J371B	<b>G 1 J 3 7 1 B</b>	3.7V
RP132J381B	<b>G 1 J 3 8 1 B</b>	3.8V
RP132J391B	<b>G 1 J 3 9 1 B</b>	3.9V
RP132J401B	<b>G 1 J 4 0 1 B</b>	4.0V
RP132J411B	<b>G 1 J 4 1 1 B</b>	4.1V
RP132J421B	<b>G 1 J 4 2 1 B</b>	4.2V
RP132J431B	<b>G 1 J 4 3 1 B</b>	4.3V
RP132J441B	<b>G 1 J 4 4 1 B</b>	4.4V
RP132J451B	<b>G 1 J 4 5 1 B</b>	4.5V
RP132J461B	<b>G 1 J 4 6 1 B</b>	4.6V
RP132J471B	<b>G 1 J 4 7 1 B</b>	4.7V
RP132J481B	<b>G 1 J 4 8 1 B</b>	4.8V
RP132J491B	<b>G 1 J 4 9 1 B</b>	4.9V
RP132J501B	<b>G 1 J 5 0 1 B</b>	5.0V
RP132J511B	<b>G 1 J 5 1 1 B</b>	5.1V
RP132J521B	<b>G 1 J 5 2 1 B</b>	5.2V
RP132J531B	<b>G 1 J 5 3 1 B</b>	5.3V
RP132J541B	<b>G 1 J 5 4 1 B</b>	5.4V
RP132J551B	<b>G 1 J 5 5 1 B</b>	5.5V
RP132J121B5	<b>G 1 J 1 2 1 B 5</b>	1.25V
RP132J181B5	<b>G 1 J 1 8 1 B 5</b>	1.85V
RP132J281B5	<b>G 1 J 2 8 1 B 5</b>	2.85V
RP132J001B	<b>G 1 J 0 0 1 B</b>	-

● **RP132Jxx1D**

製品名	①②③④⑤⑥⑦⑧	設定電圧
RP132J081D	<b>G 1 J 0 8 1 D</b>	0.8V
RP132J091D	<b>G 1 J 0 9 1 D</b>	0.9V
RP132J101D	<b>G 1 J 1 0 1 D</b>	1.0V
RP132J111D	<b>G 1 J 1 1 1 D</b>	1.1V
RP132J121D	<b>G 1 J 1 2 1 D</b>	1.2V
RP132J131D	<b>G 1 J 1 3 1 D</b>	1.3V
RP132J141D	<b>G 1 J 1 4 1 D</b>	1.4V
RP132J151D	<b>G 1 J 1 5 1 D</b>	1.5V
RP132J161D	<b>G 1 J 1 6 1 D</b>	1.6V
RP132J171D	<b>G 1 J 1 7 1 D</b>	1.7V
RP132J181D	<b>G 1 J 1 8 1 D</b>	1.8V
RP132J191D	<b>G 1 J 1 9 1 D</b>	1.9V
RP132J201D	<b>G 1 J 2 0 1 D</b>	2.0V
RP132J211D	<b>G 1 J 2 1 1 D</b>	2.1V
RP132J221D	<b>G 1 J 2 2 1 D</b>	2.2V
RP132J231D	<b>G 1 J 2 3 1 D</b>	2.3V
RP132J241D	<b>G 1 J 2 4 1 D</b>	2.4V
RP132J251D	<b>G 1 J 2 5 1 D</b>	2.5V
RP132J261D	<b>G 1 J 2 6 1 D</b>	2.6V
RP132J271D	<b>G 1 J 2 7 1 D</b>	2.7V
RP132J281D	<b>G 1 J 2 8 1 D</b>	2.8V
RP132J291D	<b>G 1 J 2 9 1 D</b>	2.9V
RP132J301D	<b>G 1 J 3 0 1 D</b>	3.0V
RP132J311D	<b>G 1 J 3 1 1 D</b>	3.1V
RP132J321D	<b>G 1 J 3 2 1 D</b>	3.2V
RP132J331D	<b>G 1 J 3 3 1 D</b>	3.3V
RP132J341D	<b>G 1 J 3 4 1 D</b>	3.4V
RP132J351D	<b>G 1 J 3 5 1 D</b>	3.5V
RP132J361D	<b>G 1 J 3 6 1 D</b>	3.6V
RP132J371D	<b>G 1 J 3 7 1 D</b>	3.7V
RP132J381D	<b>G 1 J 3 8 1 D</b>	3.8V
RP132J391D	<b>G 1 J 3 9 1 D</b>	3.9V
RP132J401D	<b>G 1 J 4 0 1 D</b>	4.0V
RP132J411D	<b>G 1 J 4 1 1 D</b>	4.1V
RP132J421D	<b>G 1 J 4 2 1 D</b>	4.2V
RP132J431D	<b>G 1 J 4 3 1 D</b>	4.3V
RP132J441D	<b>G 1 J 4 4 1 D</b>	4.4V
RP132J451D	<b>G 1 J 4 5 1 D</b>	4.5V
RP132J461D	<b>G 1 J 4 6 1 D</b>	4.6V
RP132J471D	<b>G 1 J 4 7 1 D</b>	4.7V
RP132J481D	<b>G 1 J 4 8 1 D</b>	4.8V
RP132J491D	<b>G 1 J 4 9 1 D</b>	4.9V
RP132J501D	<b>G 1 J 5 0 1 D</b>	5.0V
RP132J511D	<b>G 1 J 5 1 1 D</b>	5.1V
RP132J521D	<b>G 1 J 5 2 1 D</b>	5.2V
RP132J531D	<b>G 1 J 5 3 1 D</b>	5.3V
RP132J541D	<b>G 1 J 5 4 1 D</b>	5.4V
RP132J551D	<b>G 1 J 5 5 1 D</b>	5.5V
RP132J121D5	<b>G 1 J 1 2 1 D 5</b>	1.25V
RP132J181D5	<b>G 1 J 1 8 1 D 5</b>	1.85V
RP132J281D5	<b>G 1 J 2 8 1 D 5</b>	2.85V
RP132J001D	<b>G 1 J 0 0 1 D</b>	-



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