

## 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

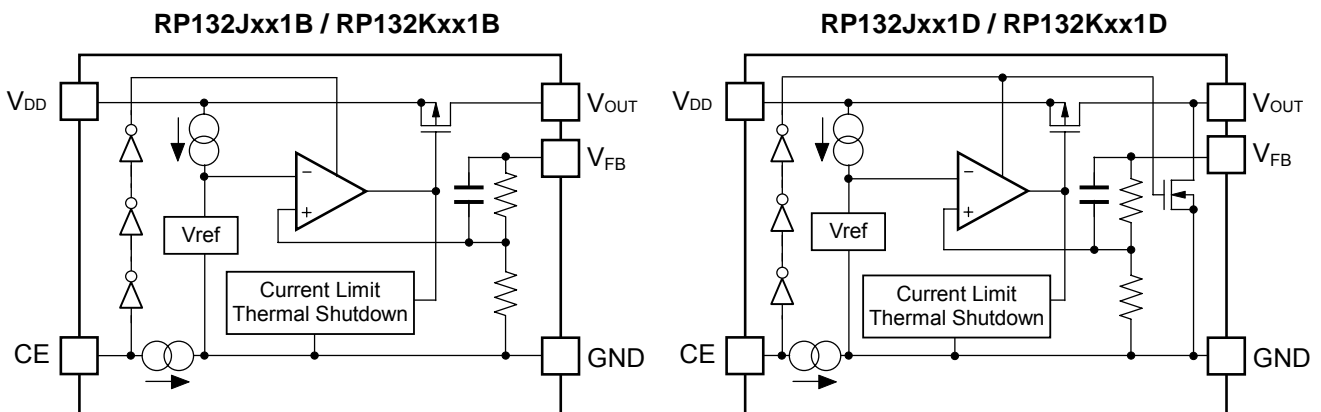
- Power source for battery-powered equipment.
- Power source for portable communication equipment
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for home appliances and Notebook PC.

### 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  $-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$ , unless otherwise noted.

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

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

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

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit	
$V_{OUT}$	Output Voltage	$T_{opt} = 25^{\circ}\text{C}$	$V_{OUT} > 1.5V$	$\times 0.99$		$\times 1.01$	V
			$V_{OUT} \leq 1.5V$	-15		15	mV
		$-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$	$V_{OUT} > 1.5V$	<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	$-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$		$\pm 60$		ppm/ $^{\circ}\text{C}$	
$I_{SC}$	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		$^{\circ}\text{C}$	
$T_{TSR}$	Thermal Shutdown Released Temperature	Junction Temperature		95		$^{\circ}\text{C}$	
$R_{LOW}$	Low Output Nch Tr. ON Resistance (D/F version)	$V_{IN} = 4.0V, V_{CE} = 0V$		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 ( $T_j \approx T_a = 25^{\circ}\text{C}$ ) 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**
 $V_{IN} = \text{Set } V_{OUT} + 1.0V, I_{OUT} = 1mA, C_{IN} = 2.2\mu F, C_{OUT} = 2.2\mu F (V_{OUT} \leq 3.6V), 4.7\mu F (V_{OUT} > 3.6V).$ 

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

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

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

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

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$V_{FB}$	Feedback Voltage	$T_{opt} = 25^{\circ}C$	$V_{OUT} = V_{FB}$	0.785	0.800	0.815	V
		$-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$		<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	$0.1mA \leq I_{OUT} \leq 300mA$			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	$V_{OUT} = V_{FB}$	$I_{OUT} = 300mA$		0.67	<span style="border: 1px solid black; padding: 0 2px;">0.89</span>	V
			$I_{OUT} = 1A$		1.20	<span style="border: 1px solid black; padding: 0 2px;">1.54</span>	
$I_{SS}$	Supply Current	$V_{OUT} = V_{FB}, I_{OUT} = 0mA (V_{IN} = 6.5V)$			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	$V_{OUT} = V_{FB}, 1.6V \leq V_{IN} \leq 6.5V$			0.05	<span style="border: 1px solid black; padding: 0 2px;">0.10</span>	%/V
RR	Ripple Rejection	$f = 1kHz, \text{Ripple } 0.2Vp-p, I_{OUT} = 100mA$	$V_{OUT} = V_{FB}$		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	$-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$			$\pm 60$		ppm/ $^{\circ}C$
$I_{SC}$	Short Current Limit	$V_{OUT} = V_{FB} = 0V$			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 of unit are tested and specified under load conditions such that  $T_j \approx T_{opt} = 25^{\circ}C$  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)



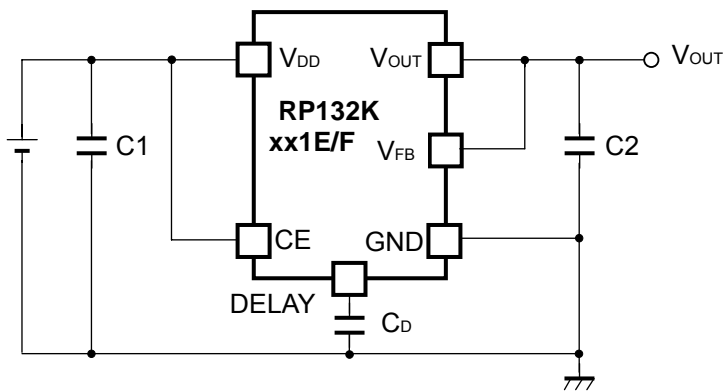
- Adjustable Output Voltage Type (HSOP-6J / SOT89-5/ TO-252-5-P2 / DFN(PLP)1820-6)



- 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**

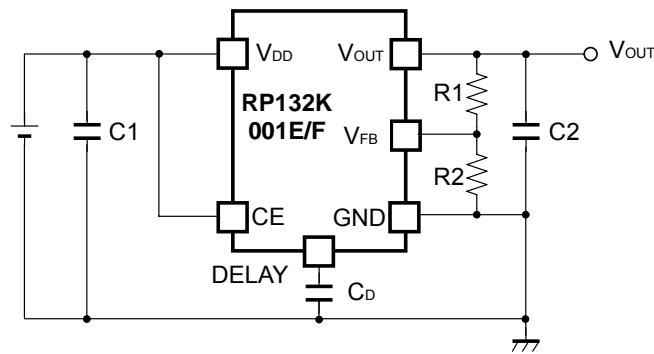
Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 between  $V_{DD}$  and GND pin with a capacitance value as "Recommendation value of the external capacitors" above or more, and as close as possible to the pins.

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.



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

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

Thus,

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

Therefore,

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

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

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

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

As for I<sub>IC</sub>,

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

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

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

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

Without the error-causing factor R<sub>1</sub> × I<sub>IC</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>IC</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.

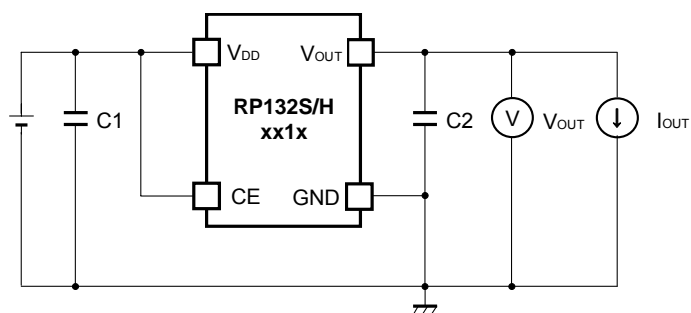
That means, when using  $C_D$  on E/F versions, the inrush current limit time will be more than 37 $\mu$ s.

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

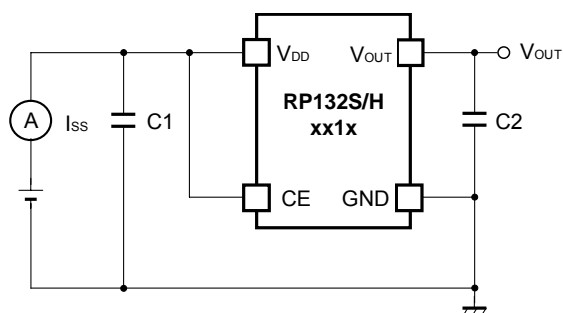


## TEST CIRCUITS

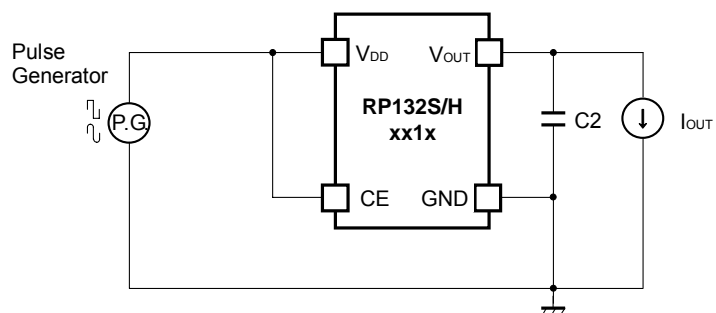
- Fixed Output Voltage Type (HSOP-6J / SOT89-5)



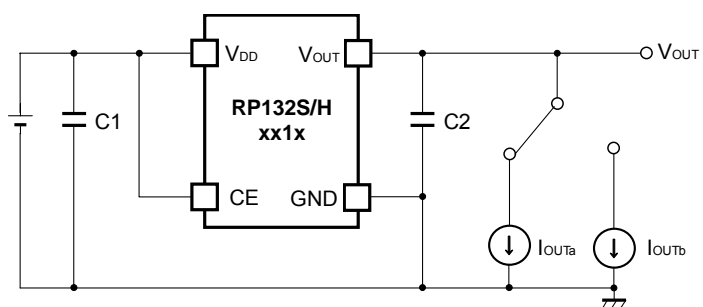
Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection

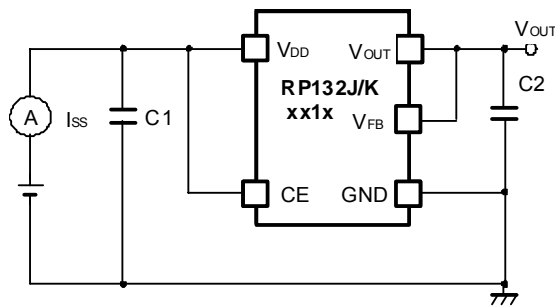


Test Circuit for Load Transient Response

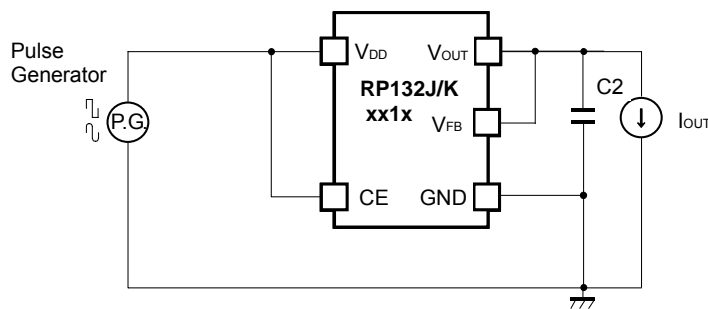
• Fixed Output Voltage Type (TO-252-5-P2 / DFN(PLP)1820-6)



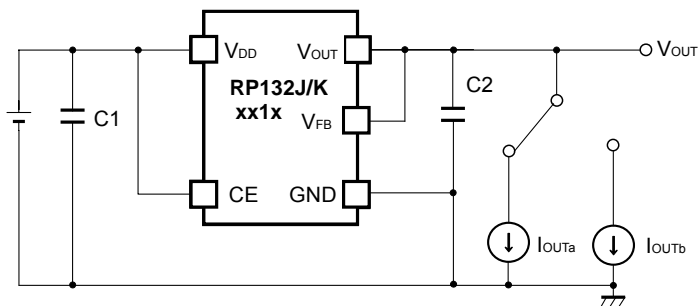
Basic Test Circuit



Test Circuit for Supply Current

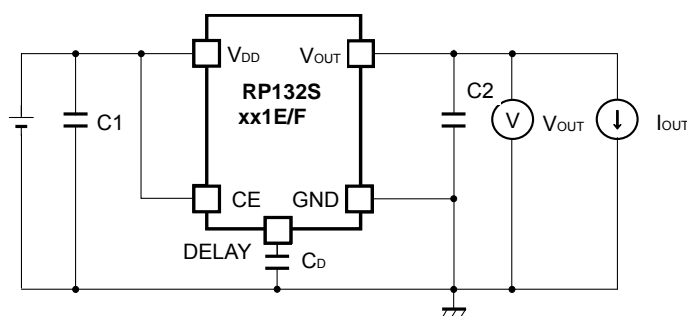


Test Circuit for Ripple Rejection

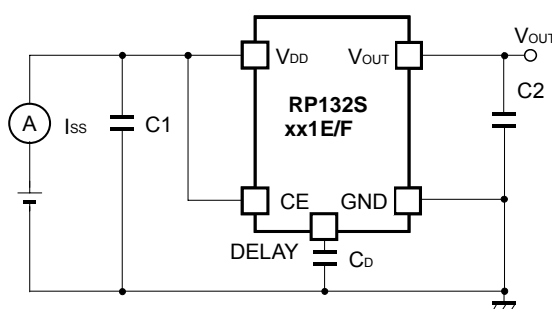


Test Circuit for Load Transient Response

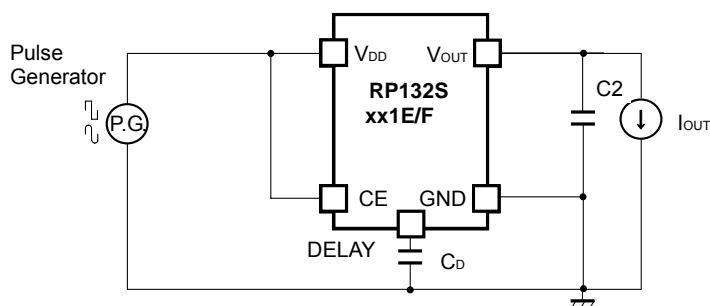
• Fixed Output Voltage Type with DELAY pin (HSOP-6J)



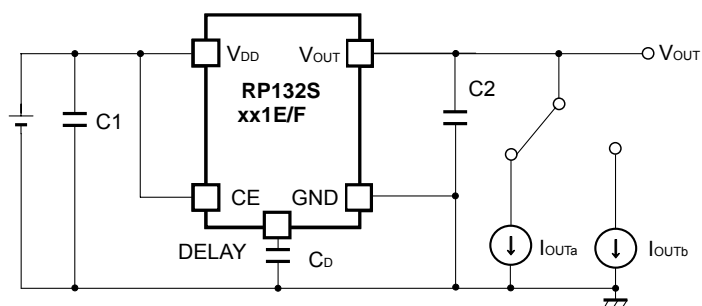
Basic Test Circuit



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



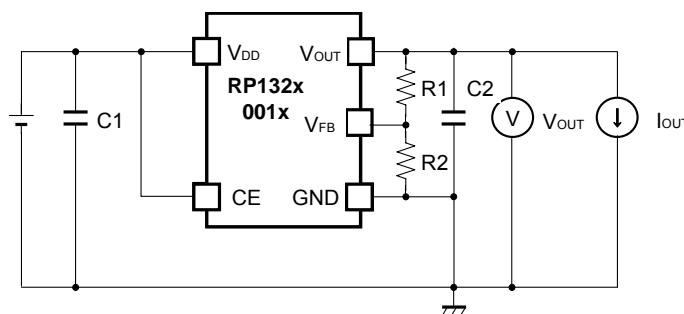
Test Circuit for Ripple Rejection



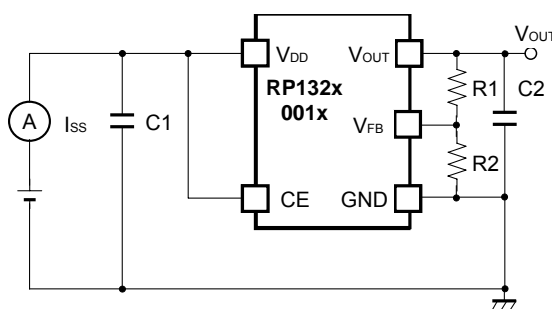
Test Circuit for Load Transient Response

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

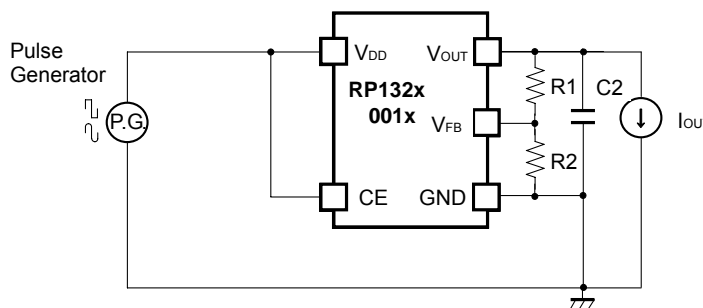
• Adjustable Output Voltage Type (HSOP-6J / SOT89-5/ TO-252-5-P2 / DFN(PLP)1820-6)



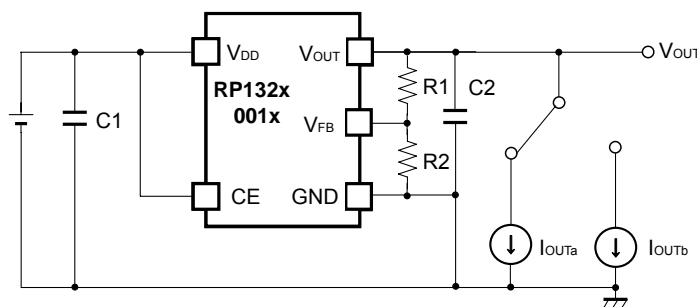
Basic Test Circuit



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.

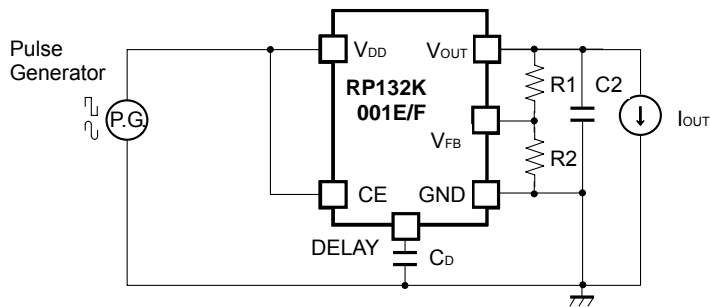
• **Adjustable Output Voltage Type with DELAY pin (DFN(PLP)1820-6)**



**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

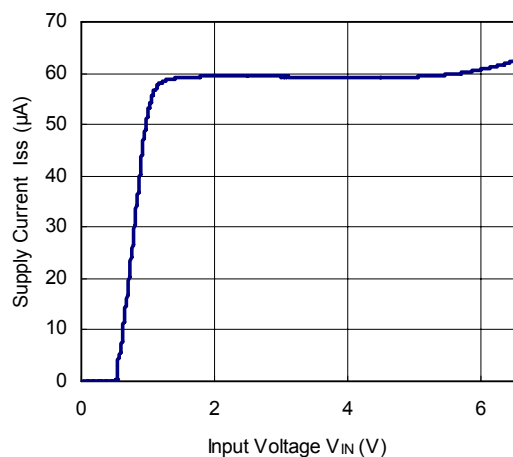


RP132x551x

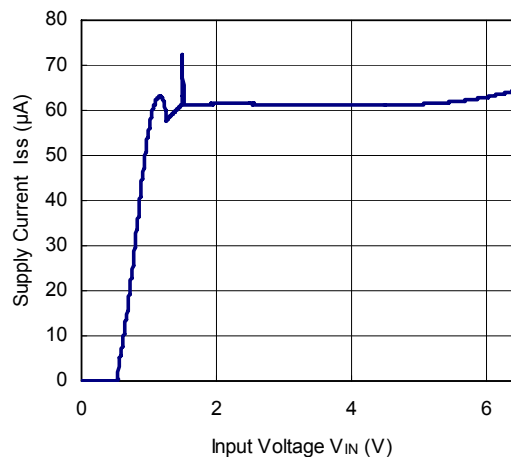


### 2) Supply Current vs. Input Voltage (T<sub>opt</sub>=25°C)

RP13x081x



RP132x151x



**RP132x331x**

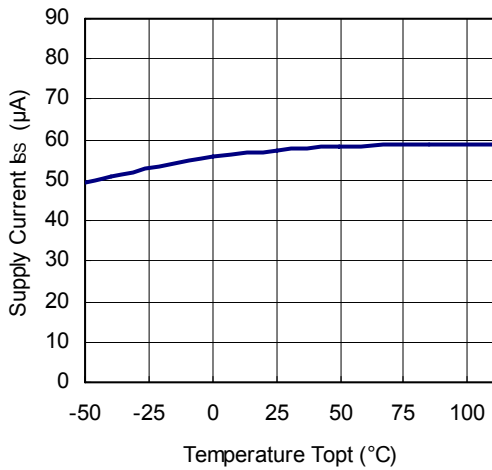


**RP132x551x**

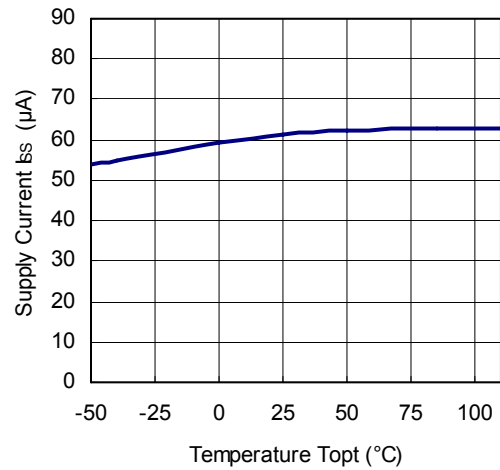


**3) Supply Current vs. Temperature**

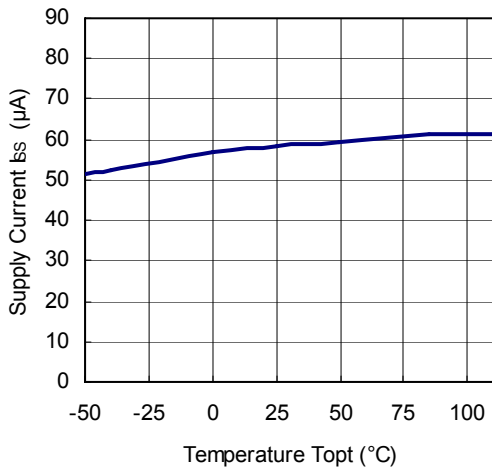
**RP132x081x**



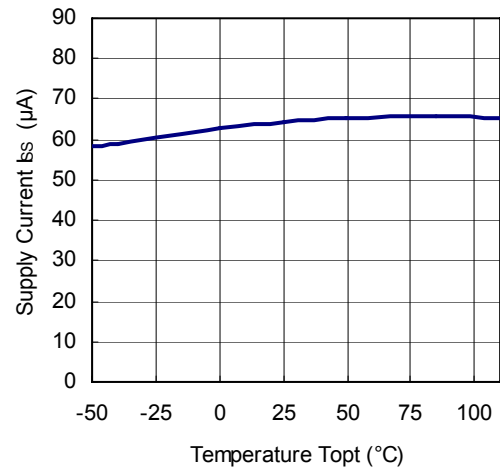
**RP132x151x**



**RP132x331x**



**RP132x551x**





#### 4) Output Voltage vs. Temperature

RP132x081x



RP132x151x



RP132x331x



RP132x551x

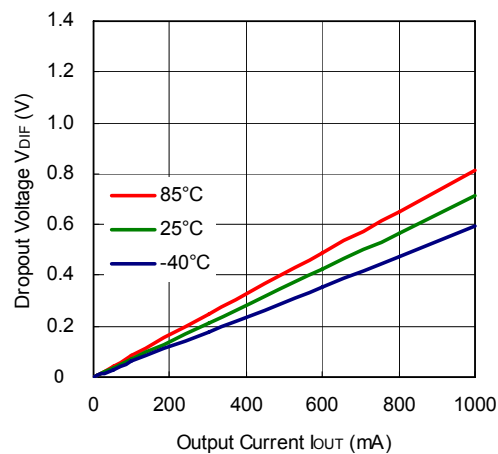


#### 5) Dropout Voltage vs. Output Current

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)

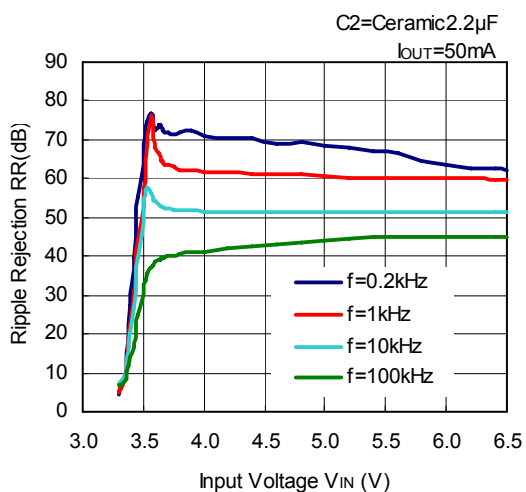
**RP132x331x**



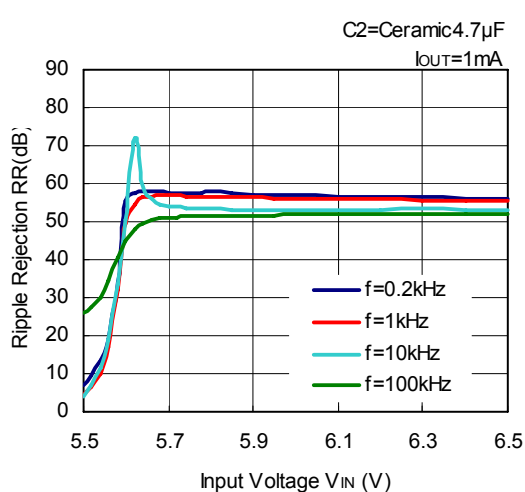
**RP132x331x**



RP132x331x



RP131x551x



RP132x551x



RP132x551x

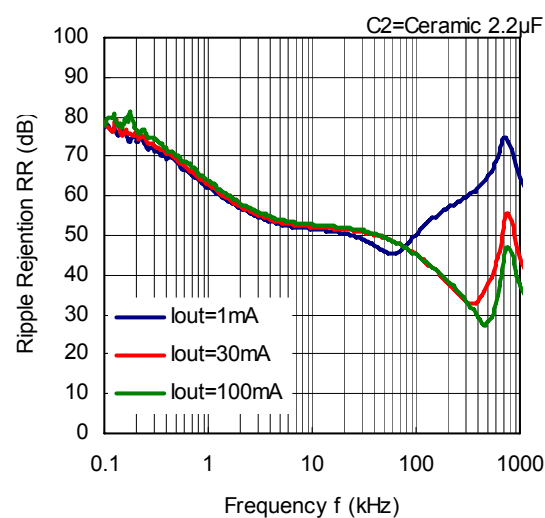


8) Ripple Rejection vs. Frequency (C1=none, T<sub>opt</sub>=25°C)

RP132x081x



RP132x331x



**RP132x551x**

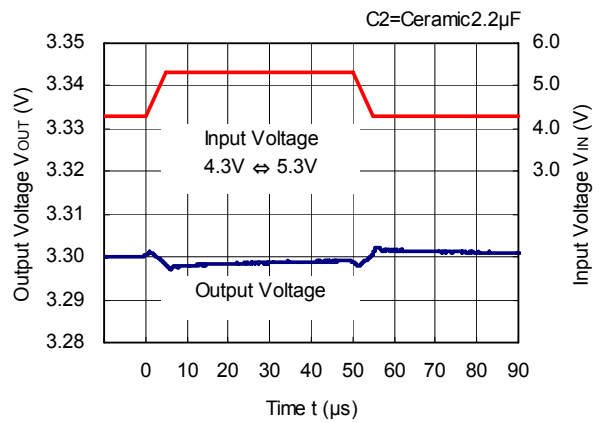


**9) Input Transient Response (C1=none, I<sub>OUT</sub>=100mA, tr=tf=5 $\mu$ s, T<sub>opt</sub>=25°C)**

**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

NO.EA-265-160426

### RP132x551x



### RP132x551x

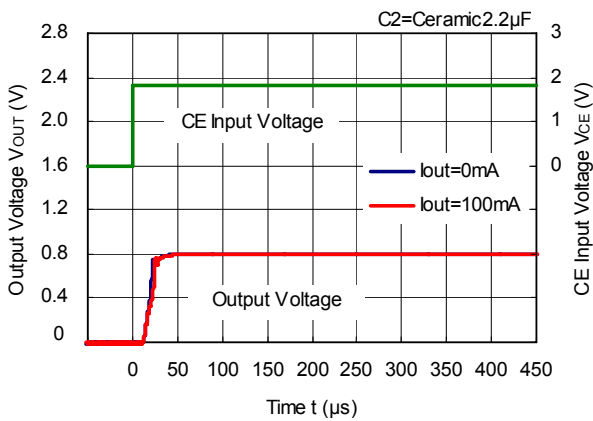


### RP132x551x



## 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,  $T_{opt}=25^{\circ}C$ )

RP132x081D



RP132x331D



RP132x551D



# RP132x

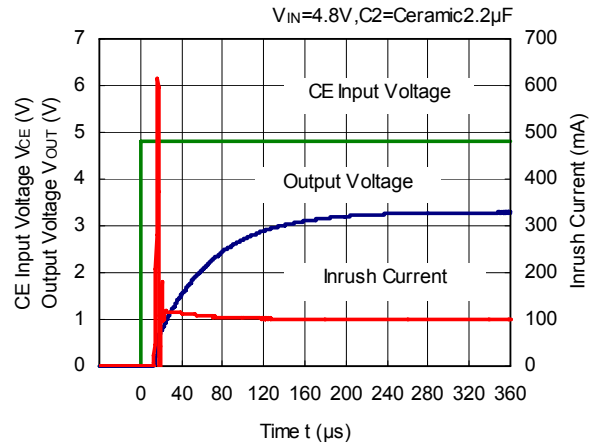
NO.EA-265-160426

## 13) Inrush Current (C1=Ceramic 2.2 $\mu$ F, I<sub>OUT</sub>=100mA, T<sub>opt</sub>=25 $^{\circ}$ 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  $40\mu V$  (Avg.) are marked as the hatched area in the graph.

### Measurement Conditions

Frequency Band : 10Hz to 2MHz

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

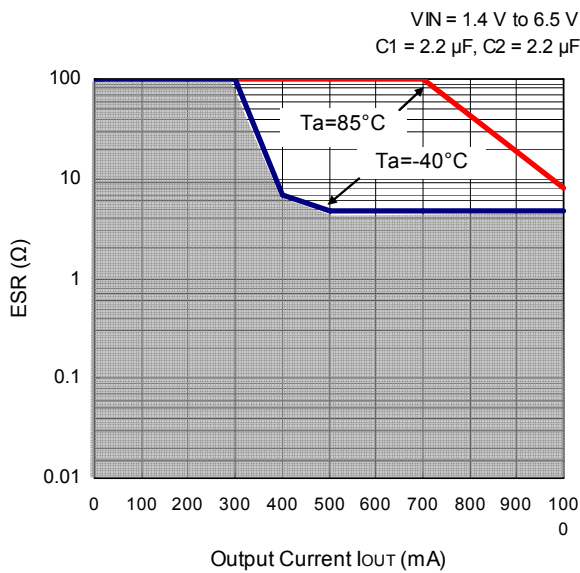
Hatched Area : Noise level is under  $40\mu Vms$  (Avg.)

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

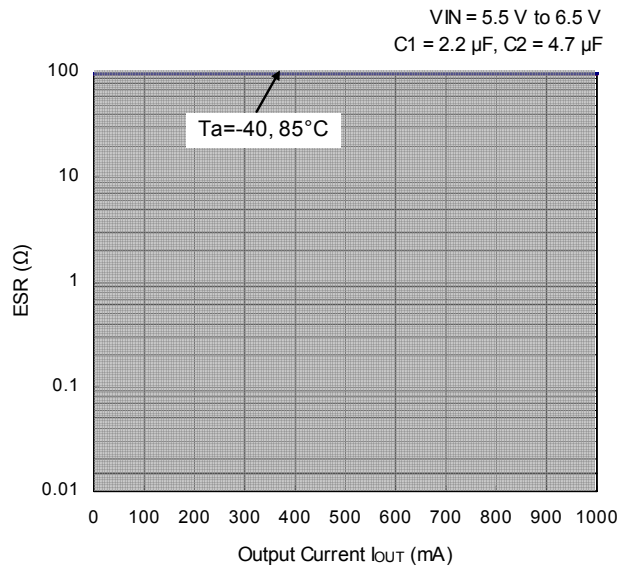
$C_{OUT}$  :  $2.2\mu F$  ( $V_{OUT} = 0.8V$ , Kyocera CM105X5R225K06AB)

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

RP132x081x



RP132x551x



## PACKAGE INFORMATION

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

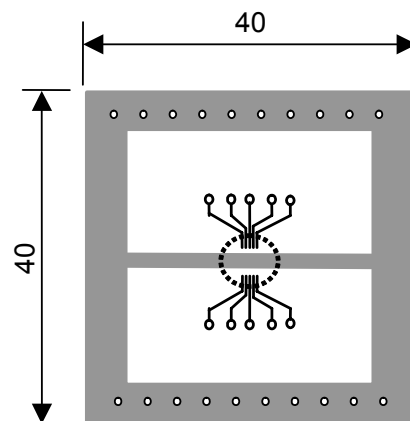
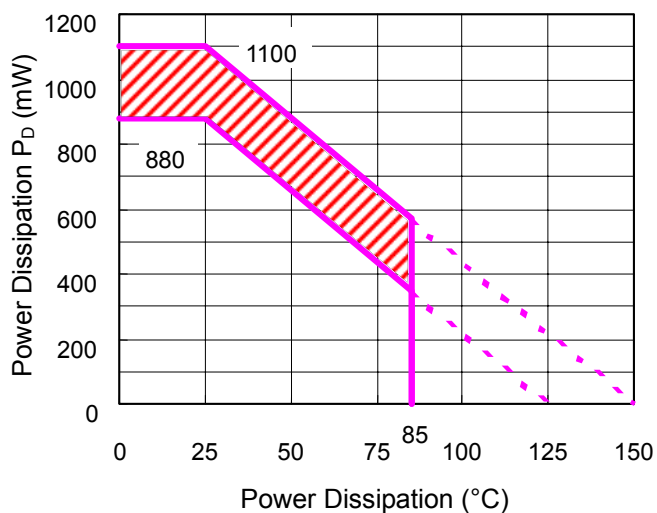
Power Dissipation ( $P_D$ ) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

#### 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

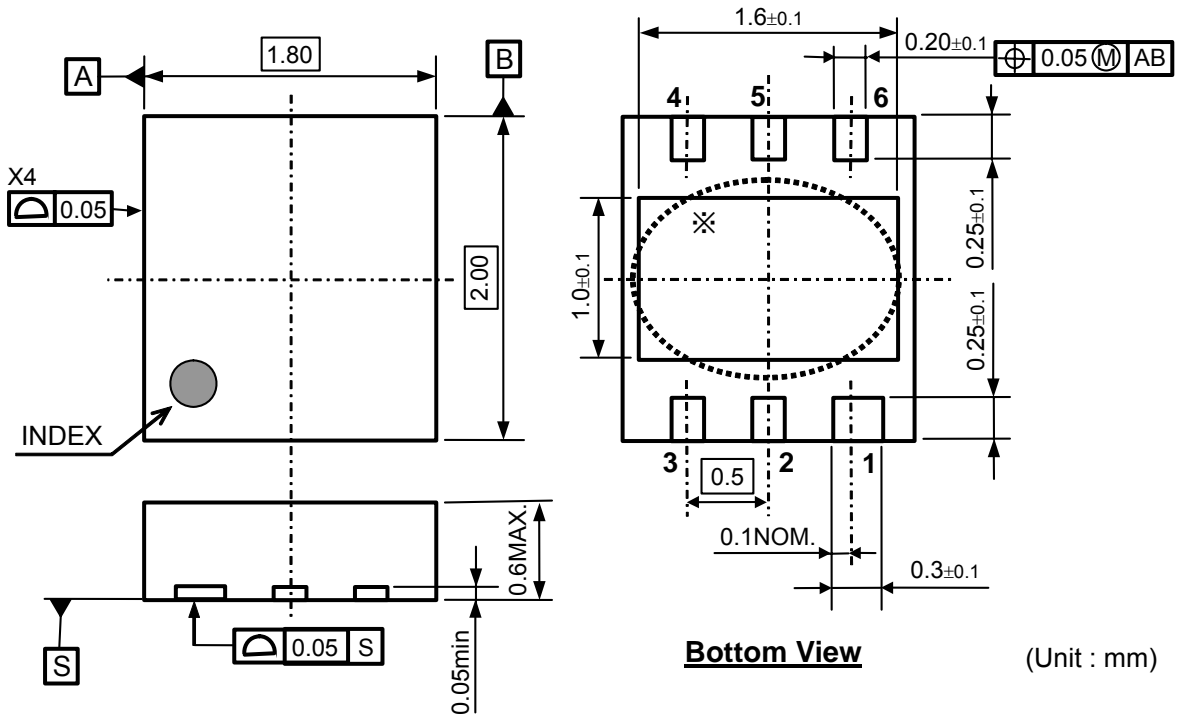
Note: The above graph shows the Power Dissipation of the package based on  $T_{jmax}=125^\circ\text{C}$  and  $T_{jmax}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below,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

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

**RP132x**

NO.EA-265-160426

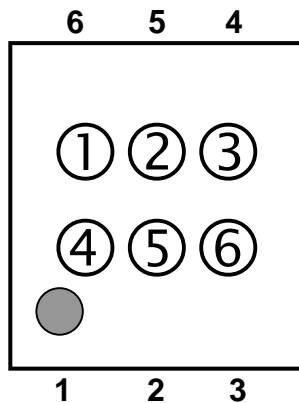
**Package Dimensions (DFN(PLP)1820-6)**



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

製品名	①②③④
RP132K081B	C X 08
RP132K091B	C X 09
RP132K101B	C X 10
RP132K111B	C X 11
RP132K121B	C X 12
RP132K131B	C X 13
RP132K141B	C X 14
RP132K151B	C X 15
RP132K161B	C X 16
RP132K171B	C X 17
RP132K181B	C X 18
RP132K191B	C X 19
RP132K201B	C X 20
RP132K211B	C X 21
RP132K221B	C X 22
RP132K231B	C X 23
RP132K241B	C X 24
RP132K251B	C X 25
RP132K261B	C X 26
RP132K271B	C X 27
RP132K281B	C X 28
RP132K291B	C X 29
RP132K301B	C X 30
RP132K311B	C X 31
RP132K321B	C X 32
RP132K331B	C X 33
RP132K341B	C X 34
RP132K351B	C X 35
RP132K361B	C X 36
RP132K371B	C X 37
RP132K381B	C X 38
RP132K391B	C X 39
RP132K401B	C X 40
RP132K411B	C X 41
RP132K421B	C X 42
RP132K431B	C X 43
RP132K441B	C X 44
RP132K451B	C X 45
RP132K461B	C X 46
RP132K471B	C X 47
RP132K481B	C X 48
RP132K491B	C X 49
RP132K501B	C X 50
RP132K511B	C X 51
RP132K521B	C X 52
RP132K531B	C X 53
RP132K541B	C X 54
RP132K551B	C X 55
RP132K121B5	C X 01
RP132K181B5	C X 02
RP132K281B5	C X 03
RP132K001B	C X 00

● RP132Kxx1D

製品名	①②③④
RP132K081D	C Y 08
RP132K091D	C Y 09
RP132K101D	C Y 10
RP132K111D	C Y 11
RP132K121D	C Y 12
RP132K131D	C Y 13
RP132K141D	C Y 14
RP132K151D	C Y 15
RP132K161D	C Y 16
RP132K171D	C Y 17
RP132K181D	C Y 18
RP132K191D	C Y 19
RP132K201D	C Y 20
RP132K211D	C Y 21
RP132K221D	C Y 22
RP132K231D	C Y 23
RP132K241D	C Y 24
RP132K251D	C Y 25
RP132K261D	C Y 26
RP132K271D	C Y 27
RP132K281D	C Y 28
RP132K291D	C Y 29
RP132K301D	C Y 30
RP132K311D	C Y 31
RP132K321D	C Y 32
RP132K331D	C Y 33
RP132K341D	C Y 34
RP132K351D	C Y 35
RP132K361D	C Y 36
RP132K371D	C Y 37
RP132K381D	C Y 38
RP132K391D	C Y 39
RP132K401D	C Y 40
RP132K411D	C Y 41
RP132K421D	C Y 42
RP132K431D	C Y 43
RP132K441D	C Y 44
RP132K451D	C Y 45
RP132K461D	C Y 46
RP132K471D	C Y 47
RP132K481D	C Y 48
RP132K491D	C Y 49
RP132K501D	C Y 50
RP132K511D	C Y 51
RP132K521D	C Y 52
RP132K531D	C Y 53
RP132K541D	C Y 54
RP132K551D	C Y 55
RP132K121D5	C Y 01
RP132K181D5	C Y 02
RP132K281D5	C Y 03
RP132K001D	C Y 00

● RP132Kxx1E

製品名	①②③④
RP132K081E	D F 08
RP132K091E	D F 09
RP132K101E	D F 10
RP132K111E	D F 11
RP132K121E	D F 12
RP132K131E	D F 13
RP132K141E	D F 14
RP132K151E	D F 15
RP132K161E	D F 16
RP132K171E	D F 17
RP132K181E	D F 18
RP132K191E	D F 19
RP132K201E	D F 20
RP132K211E	D F 21
RP132K221E	D F 22
RP132K231E	D F 23
RP132K241E	D F 24
RP132K251E	D F 25
RP132K261E	D F 26
RP132K271E	D F 27
RP132K281E	D F 28
RP132K291E	D F 29
RP132K301E	D F 30
RP132K311E	D F 31
RP132K321E	D F 32
RP132K331E	D F 33
RP132K341E	D F 34
RP132K351E	D F 35
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RP132K431E	D F 43
RP132K441E	D F 44
RP132K451E	D F 45
RP132K461E	D F 46
RP132K471E	D F 47
RP132K481E	D F 48
RP132K491E	D F 49
RP132K501E	D F 50
RP132K511E	D F 51
RP132K521E	D F 52
RP132K531E	D F 53
RP132K541E	D F 54
RP132K551E	D F 55
RP132K121E5	D F 01
RP132K181E5	D F 02
RP132K281E5	D F 03
RP132K001E	D F 00

● RP132Kxx1F

製品名	①②③④
RP132K081F	D G 08
RP132K091F	D G 09
RP132K101F	D G 10
RP132K111F	D G 11
RP132K121F	D G 12
RP132K131F	D G 13
RP132K141F	D G 14
RP132K151F	D G 15
RP132K161F	D G 16
RP132K171F	D G 17
RP132K181F	D G 18
RP132K191F	D G 19
RP132K201F	D G 20
RP132K211F	D G 21
RP132K221F	D G 22
RP132K231F	D G 23
RP132K241F	D G 24
RP132K251F	D G 25
RP132K261F	D G 26
RP132K271F	D G 27
RP132K281F	D G 28
RP132K291F	D G 29
RP132K301F	D G 30
RP132K311F	D G 31
RP132K321F	D G 32
RP132K331F	D G 33
RP132K341F	D G 34
RP132K351F	D G 35
RP132K361F	D G 36
RP132K371F	D G 37
RP132K381F	D G 38
RP132K391F	D G 39
RP132K401F	D G 40
RP132K411F	D G 41
RP132K421F	D G 42
RP132K431F	D G 43
RP132K441F	D G 44
RP132K451F	D G 45
RP132K461F	D G 46
RP132K471F	D G 47
RP132K481F	D G 48
RP132K491F	D G 49
RP132K501F	D G 50
RP132K511F	D G 51
RP132K521F	D G 52
RP132K531F	D G 53
RP132K541F	D G 54
RP132K551F	D G 55
RP132K121F5	D G 01
RP132K181F5	D G 02
RP132K281F5	D G 03
RP132K001F	D G 00

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
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2.4V
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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 (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	$\phi 0.85\text{mm} \times 10\text{pcs}$	-

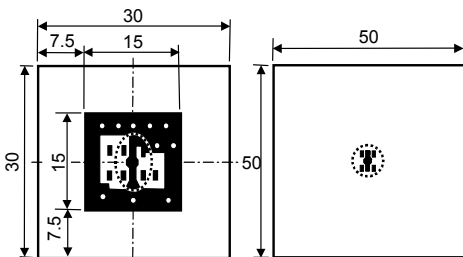
### Measurement Result

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

	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

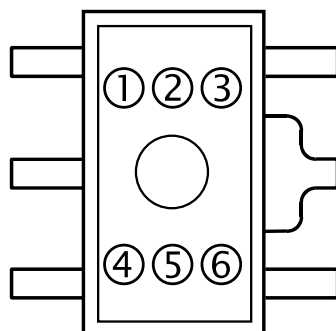
Package Dimensions (SOT-89-5)



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.

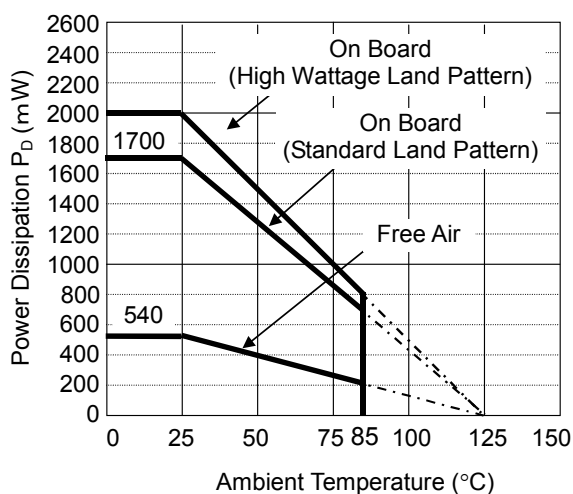
Measurement Conditions

	High 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	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

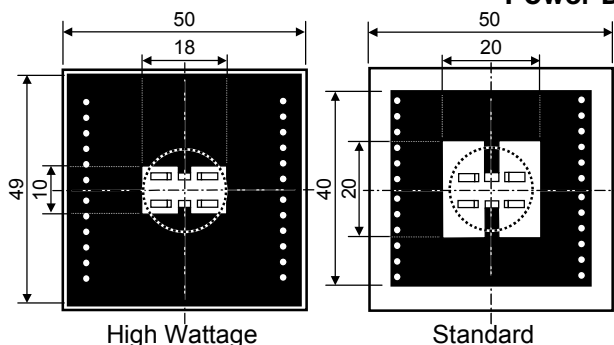
Measurement Result

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

	High Wattage 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)

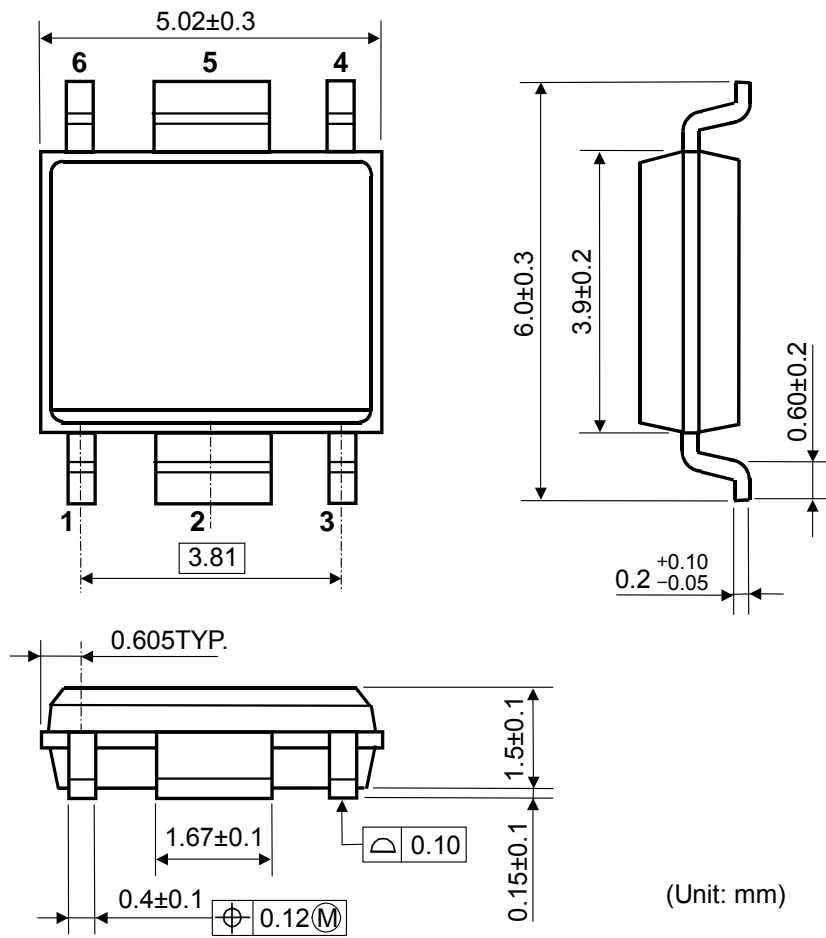
Note: The above graph shows the Power Dissipation of the package based on  $T_{jmax}=125^\circ\text{C}$  and  $T_{jmax}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below, 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
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RP132S281E	Q 28 E
RP132S291E	Q 29 E
RP132S301E	Q 30 E
RP132S311E	Q 31 E
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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.

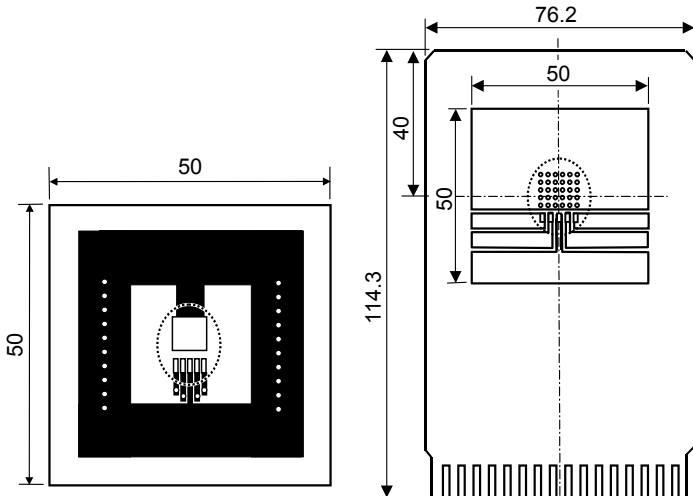
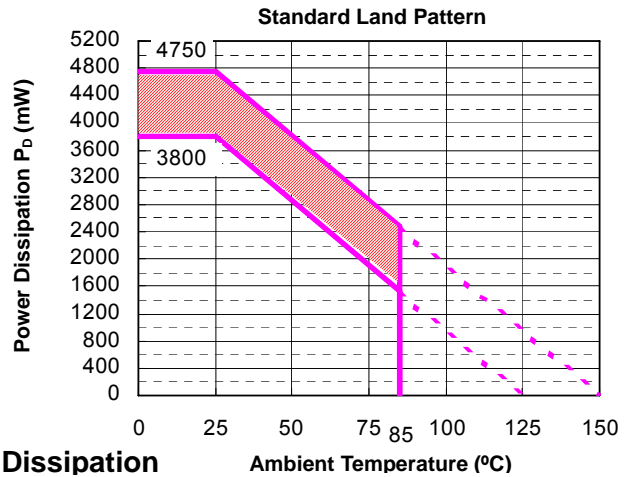
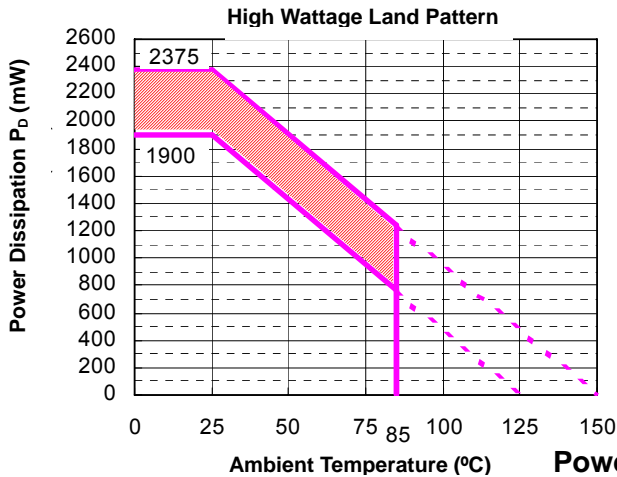
### Measurement conditions

	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

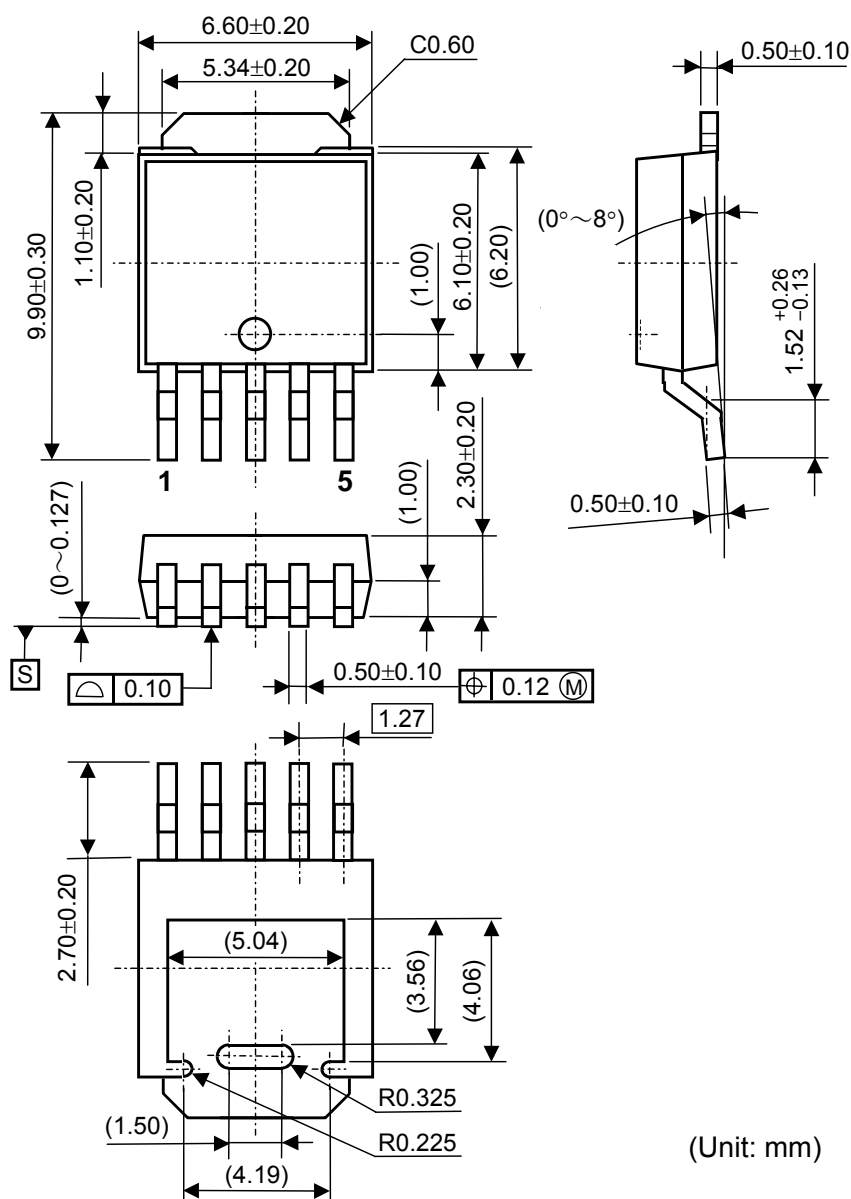
○ IC Mount Area (Unit: mm)

○ IC Mount Area (Unit: mm)

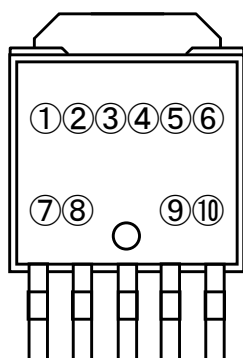
Note: The above graph shows the Power Dissipation of the package based on  $T_{jmax}=125^\circ\text{C}$  and  $T_{jmax}=150^\circ\text{C}$ . Operating the IC in the shaded area in the graph might have an influence on its lifetime. Operating time must be within the time limit described in the table below,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



Mark Specifications (TO-252-5-P2)



①②③④⑤⑥⑦⑧: Refer to RP132J Series Mark Specification Table.

⑨⑩: 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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