To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

M5294P

SYSTEM RESET IC WITH LOW INPUT-OUTPUT VOLTAGE DIFFERENTIAL TYPE±5V REGURATOR, AND 3.0V REGULATOR FOR MUTE FUNCTION

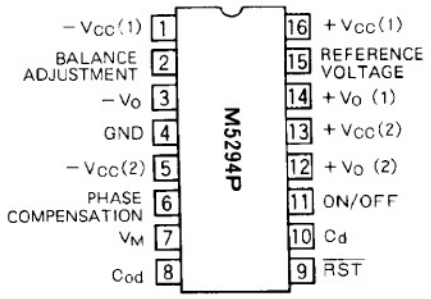
DESCRIPTION

M5294P is a semiconductor integrated circuit designed for dual tracking type voltage regulator, which includes system reset circuit, and 3.0V regulator for mute function.

Since the output voltage (±5V, 3V) are fixed inside, and this IC includes pull-up registor (10kΩ) of reset output, User can omit the outside parts. ±5V output is low power dissipation type, that is to say, this is able to operate even if input-output voltage difference is very low status such as 0.2V ($@I_O$ = ±100mA). Therefore, User can shrink the input transformer.

User can be prevent making a noise by means of operating mute function before Power supply (±5V) of Amplifier starts up, for 3.0V regulator for mute function starts up earlier than ±5V output.

PIN CONFIGURATION (TOP VIEW)



Outline 16P4

Note 1: Please use the capacitor not to depend on the ambient temperature.
2: Please connect $-V_{CC}(1)$ and $-V_{CC}(2)$, $+V_{CC}(1)$ and $+V_{CC}(2)$, $+V_O(1)$ and $+V_O(2)$, firmly each other.

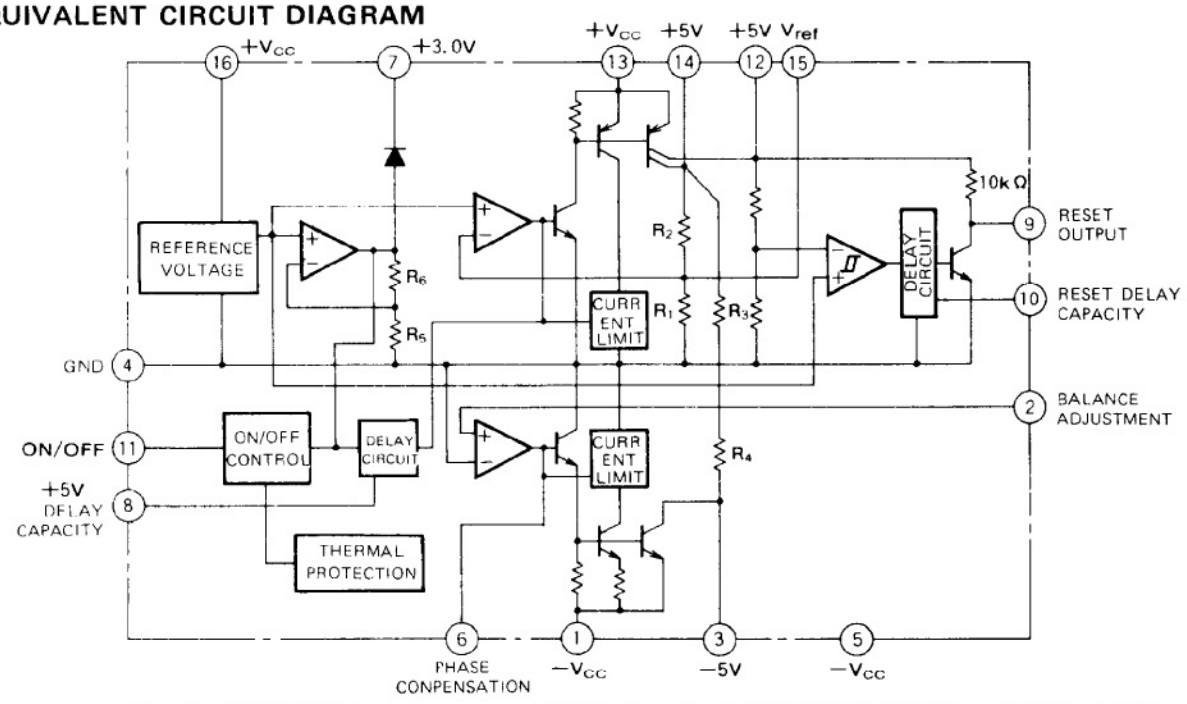
FEATURES

- Fixed output voltage
- Power supply for mute function
- Very low input-output voltage differential operation
- Current limiting circuit
  - ±5V output . . . . . short circuit protection with current fold back
  - mute output . . . . . short circuit protection
- Thermal protection circuit
- Capable on/off control (11-pin terminal)
- Internal system reset circuit with pull-up registor, hysteresis detectable voltage . . . . . 3.9V (delay time is variable by connecting capacity at 7-pin terminal)

APPLICATION

CD, VCR and dual power supply power system

EQUIVALENT CIRCUIT DIAGRAM



SYSTEM RESET IC WITH LOW INPUT-OUTPUT VOLTAGE DIFFERENTIAL TYPE±5V REGURATOR, AND 3.0V REGULATOR FOR MUTE FUNCTION

ELECTRICAL CHARACTERISTICS (V_{IN} = ±7V, $I_{O\oplus}$ = 100mA, $I_{O\ominus}$ = −100mA, Ta = 25℃)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$\oplus I_{CC}$	Positive circuit current	without load	—	6	10	mA
$\ominus I_{CC}$	Negative circuit current	without load	—	−1.5	−5.0	mA
$I_{LOSS\oplus1}$	Loss current	$I_{O\oplus}$ = 100mA	—	10	30	mA
$I_{LOSS\oplus2}$		$I_{O\oplus}$ = 200mA	—	30	90	mA
$I_{LOSS\ominus1}$		$I_{O\ominus}$ = −100mA	—	−2	−20	mA
$I_{LOSS\ominus2}$		$I_{O\ominus}$ = −200mA	—	−5	−40	mA

REGULATOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_O	Output voltage		±4.75	±5.0	±5.25	V
REG-in	Input voltage rejection	V_{CC} ±6 ~ ±10V	—	0.05	0.2	%/V
REG-o	Lording voltage rejection	I_O = 1 ~ 100mA	—	20	100	mV
R.R⊕	Positive ripple rejection	C_{REF} = 1μF, f = 120Hz	60	85	—	dB
R.R⊖	Negative ripple rejection	C_{REF} = 1μF, f = 120Hz	50	60	—	dB
$\Delta V\oplus\ominus$	Dual voltage tracking		—	0.5	5	%
V_{NO}	Output noise voltage	f = 20Hz ~ 100kHz	—	20	—	μVrms
$V_{O(off)}$	Output cut-off voltage	0V ≦ ⑪ pin voltage ≦ 0.2V	—	—	0.1	V
Vref	Reference input voltage		1.13	1.24	1.35	V
$V_{DIF\oplus}$	Input-Output voltage differential	$I_{O\oplus}$ = 100mA	—	0.2	0.5	V
$V_{DIF\ominus}$	Input-Output voltage differential	$I_{O\ominus}$ = −100mA	—	0.2	0.5	V
Tod	Output delay time *1	Cod = 0.1μF	4.5	9	18	mS
I_{OS+}	Output short current	T_J = 125℃	—	30	—	mA
I_{OS-}		T_J = 125℃	—	30	—	mA

MUTE REGULATOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_M	Mute output voltage	I_{LM} = 3mA	2.7	3.0	3.3	V
$V_{D\,IFM}$	Input/Output voltage difference	I_{LM} = 3mA	—	2.5	3.2	V

RESET PART

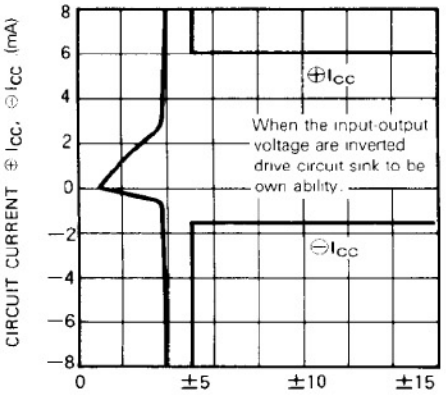
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_S	Detected voltage		3.70	3.9	4.10	V
ΔV_S	Hysteresis voltage		50	100	200	mV
Tpd	Delay time *2	Cd = 0.1μF	5.5	11	22	mS
Vsat	Output saturation voltage	R_L = 10kΩ	—	0.2	0.4	V

*1. The period by when +5V output starts up since MUTE Reg. rises up to 1.5V.
*2. Reset output includes resistor (10kΩ) from the +5V output, but output saturation voltage is condition with outside registor (10kΩ).

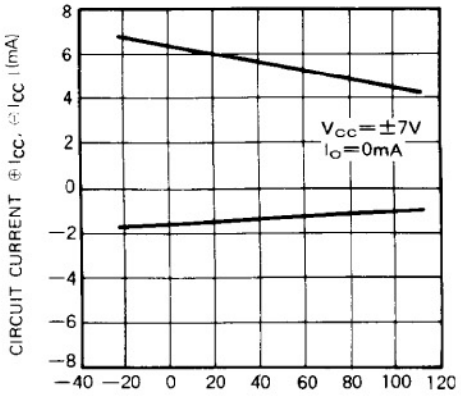
SYSTEM RESET IC WITH LOW INPUT-OUTPUT VOLTAGE DIFFERENTIAL TYPE±5V REGURATOR, AND 3.0V REGULATOR FOR MUTE FUNCTION

TYPICAL CHARACTERISTICS

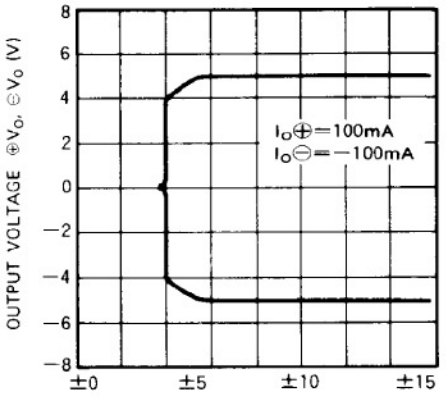
CIRCUIT CURRENT VS. POWER SUPPLY



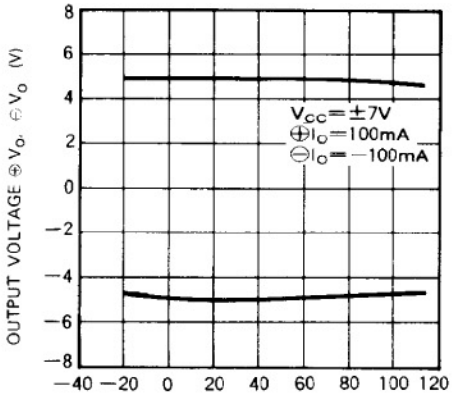
CIRCUIT CURRENT VS. AMBIENT TEMPERATURE



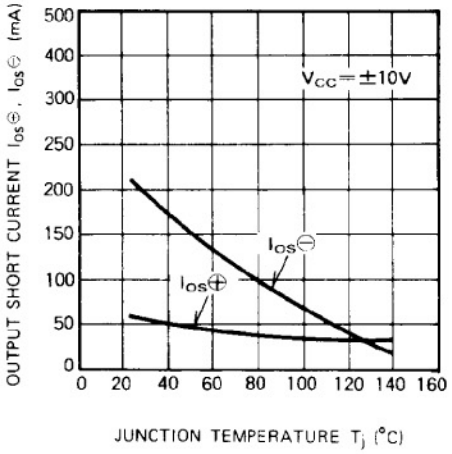
OUTPUT VOLTAGE VS. POWER SUPPLY



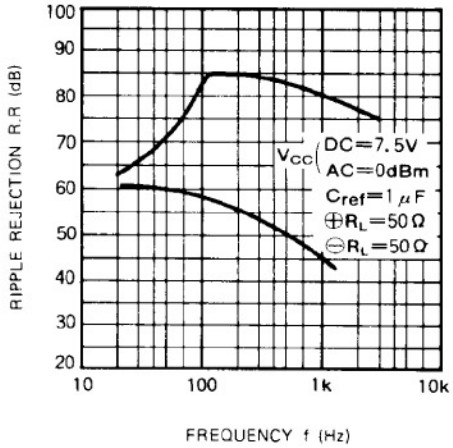
OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE



OUTPUT SHORT CURRENT VS. JUNCTION TEMPERATURE

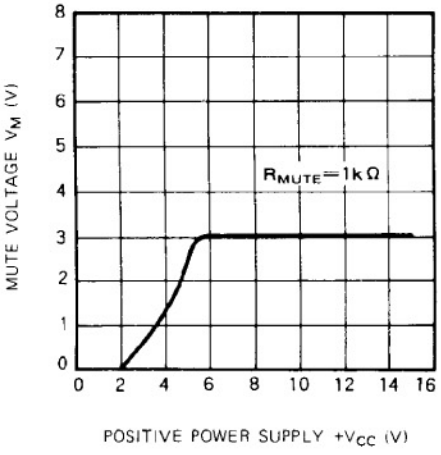


RIPPLE REJECTION VS. FREQUENCY

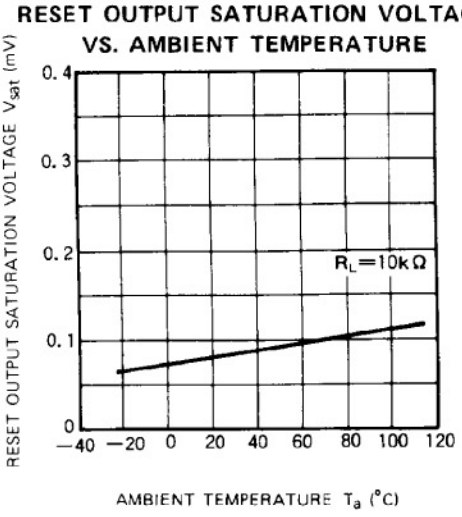


SYSTEM RESET IC WITH LOW INPUT-OUTPUT VOLTAGE DIFFERENTIAL TYPE±5V REGURATOR, AND 3.0V REGULATOR FOR MUTE FUNCTION

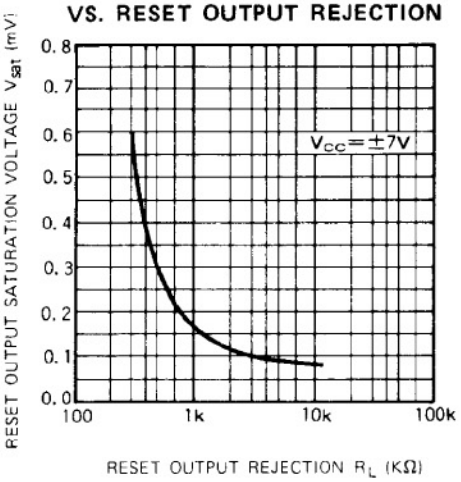
MUTE VOLTAGE VS. POWER SUPPLY



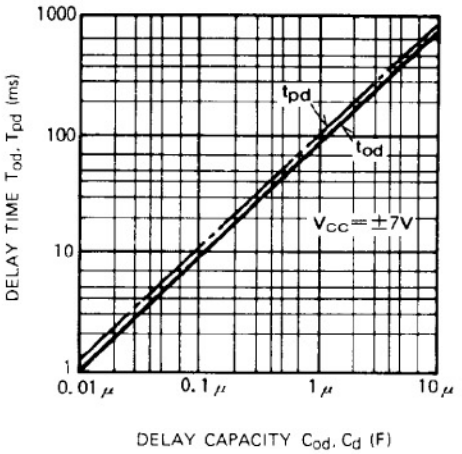
RESET OUTPUT SATURATION VOLTAGE VS. AMBIENT TEMPERATURE



RESET OUTPUT SATURATION VOLTAGE VS. RESET OUTPUT REJECTION

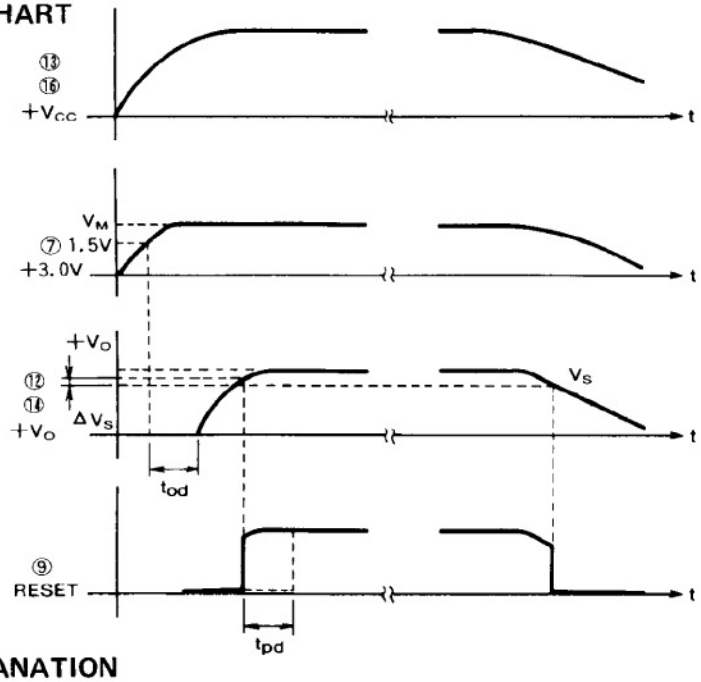


DELAY TIME VS. DELAY CAPACITY



SYSTEM RESET IC WITH LOW INPUT-OUTPUT VOLTAGE DIFFERENTIAL TYPE±5V REGURATOR, AND 3.0V REGULATOR FOR MUTE FUNCTION

OUTPUT TIMING CHART

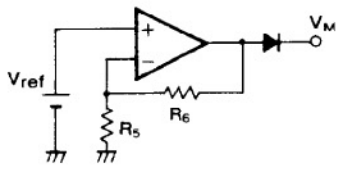


OPERATING EXPLANATION

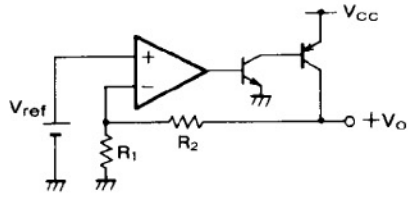
① M5294P amplifies the stable reference voltage, and it makes

Mute voltage V_M (3.0V) and Positive output voltage $+V_O$ (5.0V).

$$V_M = V_{ref} \times (1 + \frac{R_6}{R_5}) - V_F$$

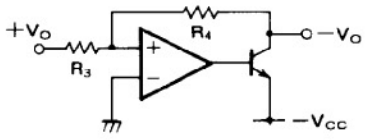


$$+V_O = V_{ref} \times (1 + \frac{R_2}{R_1})$$



$+V_O$ is inverted by this IC, and makes $-V_O$. (Therefore, $-V_O$ depend on $+V_O$)

$$-V_O = -\frac{R_4}{R_3} \times V_O$$



Each $\pm V_O$ includes the short-circuit protection with current foldback.

$\pm VM$ includes the short-circuit protection without current foldback.

② $+V_O$ (±5V) output rise up since V_M (1.5V) rises up to 1.5V.

$+V_O$ output delay time T_{od} is set by adding external capacitor Cod.

$T_{od} = 9 \times 10^4 \times C_{od}$ (s)

③ Low Reset output is cancelled when $+V_O$ output ruses up to $V_S + \Delta V_S$ (4.0VTYP). The delay time T_{od} is set by adding external capacitor C_d.

$T_{pd} = 11 \times 10^4 \times C_d$ (s)

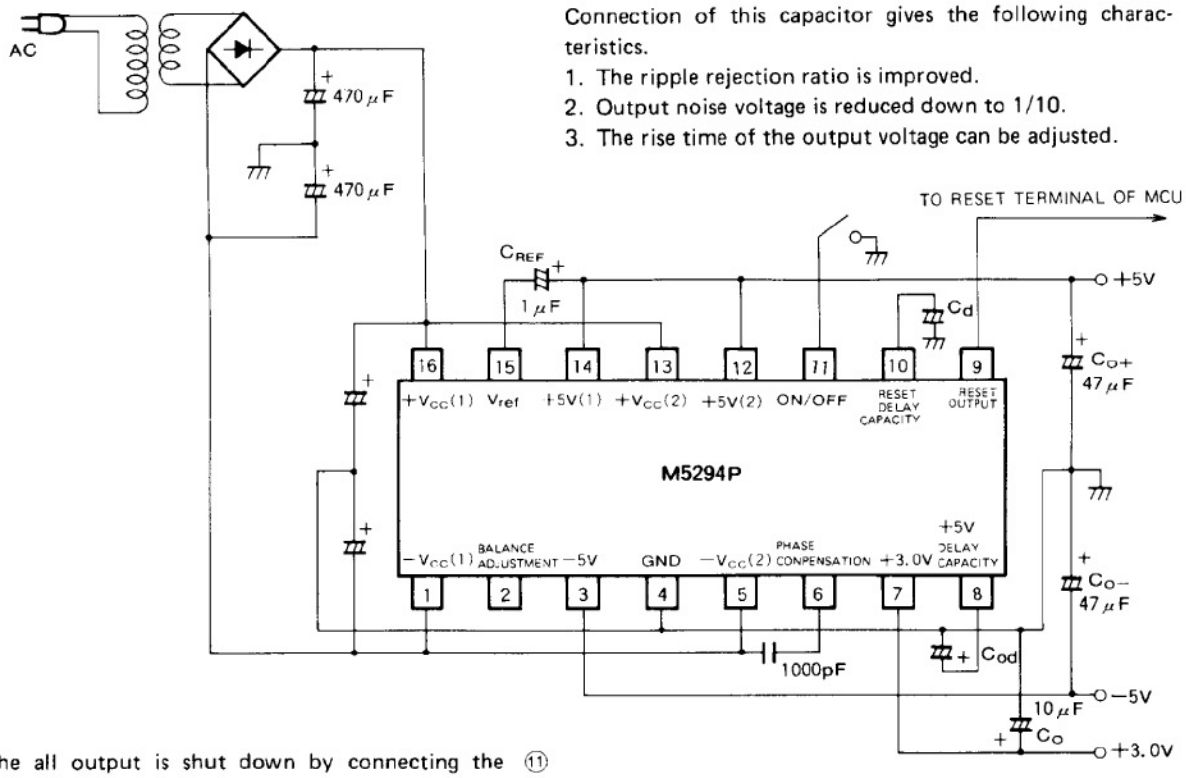
④ V_M is composed through the diode, therefore the transient time rises varies by external capacity and load condition. Consequently, $\pm V_O$ had been down, and if your system needs MUTE voltage, you have to increase the external capacity.

⑤ The Reset output is low when the $+V_O$ is down to V_S (3.9V).

M5294P

SYSTEM RESET IC WITH LOW INPUT-OUTPUT VOLTAGE DIFFERENTIAL TYPE±5V REGURATOR, AND 3.0V REGULATOR FOR MUTE FUNCTION

TYPICAL APPLICATION



C_{REF}

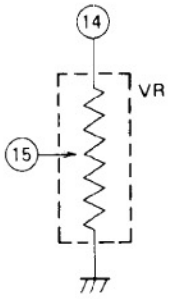
Connection of this capacitor gives the following characteristics.

1. The ripple rejection ratio is improved.
2. Output noise voltage is reduced down to 1/10.
3. The rise time of the output voltage can be adjusted.

The all output is shut down by connecting the ⑪ terminal to GND level ($0 \leqq V$ ⑪ $\leqq 0.2V$).

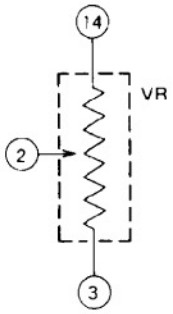
When $-V_O$ is shorted to GND, $-V_O$ sometimes causes OSC condition, therefore please add the capacitor between ⑥ and ⑤ terminal. The capacity is about 1000pF.

1. In adjusting the output voltage (use ⑮pin)



M5294P is fixed the output voltage by inside resistors, but user can adjust it by using the outside resistor.
(inside resistor: 1.6KΩ ⑮ to ④ 4.85KΩ ⑭ to ⑮)

2. In adjusting the tracking voltage (user ②pin)



M5294P is fixed the tracking voltage by inside resistor, but user can adjust it by using the output resistor.
(inside resistor: ⑭ to ② ② to ③, 5KΩ)