

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

±12V TRACKING REGULATOR WITH RESET CIRCUIT

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		±20(40)	V
I _{LP}	Load current		±30	mA
V _{DIF}	Input/output voltage difference		±15(30)	V
P _d	Internal power consumption		1.0(P)/0.55(FP)	W
K _θ	Thermal derating	Ta ≥ 25°C	10.0(P)/5.5(FP)	mW/°C
T _{opr}	Operating ambient temperature		−20 ~ +75	°C
T _{stg}	Storage temperature		−55 ~ +125	°C

ELECTRICAL CHARACTERISTICS (Ta = 25°C, V_{CC} = ±15V, I_L = ±10mA, unless otherwise stated)

Symbol	Parameter	Test condition	Limit			Unit
			Min	Typ	Max	
I _{CC}	Circuit current	V _{I3} = 5V		3.0	6.0	mA

REGULATOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V _{IN}	Input voltage		±V _O ±2		±20	V
V _O	Output voltage		±11.4	±12.0	±12.6	V
V _{REF}	Reference input voltage		1.15	1.20	1.25	V
ΔV _O	Positive/negative voltage tracking			0.5	2	%
RR	Ripple rejection	C _{REF} = 1μF, f = 120Hz	50	62		dB
Reg-in	Input voltage variation	V _I = ±15 ~ ±18V		0.05	0.2	%/V
Reg-LO	Load variation	I _L = 0 ~ 20mA		30	240	mV
V _{NO}	Output noise voltage	f = 20Hz ~ 100kHz		15		μVrms
V _{O(OFF)}	Output cut-off voltage	Terminal ⑩ GND			+0.1	V

RESET PART

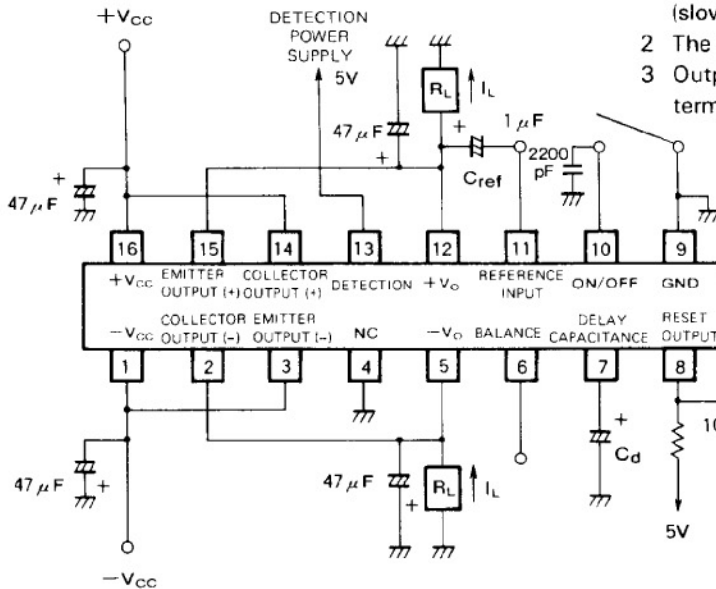
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V _S	Detected voltage		3.95	4.2	4.45	V
ΔV _S	Hysteresis voltage		50	100	300	mV
t _{pd}	Delay time	C _d = 0.1μF	3	7	14	ms
V _{sat}	Output saturation voltage	I _{sink} = 3mA		0.2	0.4	V

Note: The employed measurement circuit conforms to application circuit example (1).

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APPLICATION EXAMPLES

(1) Standard Application Circuit Example



C_{REF}

Connection of this capacitor gives the following characteristics.

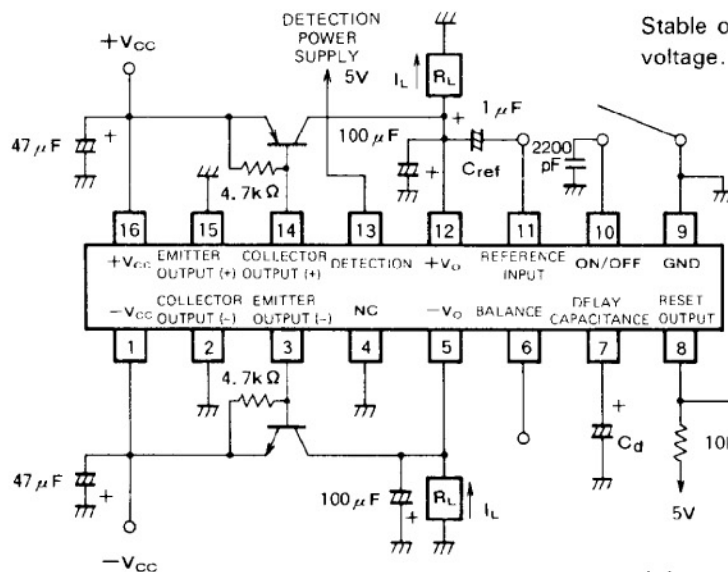
- 1 The rise time of the output voltage can be adjusted (slowed).
- 2 The ripple rejection ratio is improved.
- 3 Output noise voltage is reduced down to 1/10 of three terminal regulator IC.

TO BE CONNECTED TO A MICROCOMPUTER OR OTHER RESET TERMINAL

The output is cut off when 10pin is connected to the GND terminal.

NOTE: Ensure that the capacitance of the employed capacitor does not significantly vary with the temperature.

(2) Very Low Input/Output Voltage Differential Application Example



Stable operations are expected even if the input-output voltage. Differences are quite low as 0.2V.

TO BE CONNECTED TO A MICROCOMPUTER OR OTHER RESET TERMINAL

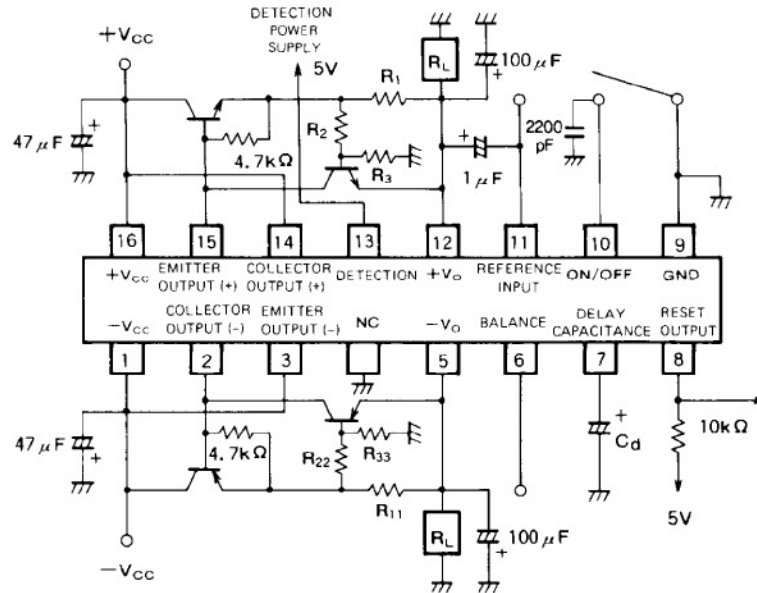
It is possible to drive 1A by connecting Power Transistor. By shorting the 10pin to the GND, the output is shut down.

±12V TRACKING REGULATOR WITH RESET CIRCUIT

(3) Foldback Protection Circuit Application

Example (M5292P Foldback System)

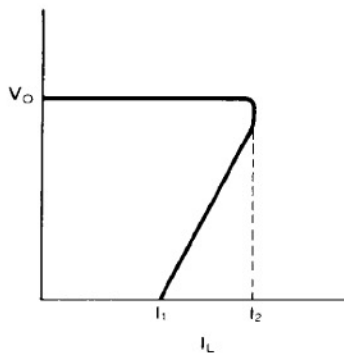
The input/output voltage differential V_{IO} should be adjusted to be high enough considering the voltage difference developed at R_1 .



When two protective transistors are employed, the M5292P/FP can provide foldback characteristic for protection purposes. The I_1 and I_2 values are determined according to the external resistance.

$$I_1 \approx \frac{R_2 + R_3}{R_1 \cdot R_3} \times 0.65 \text{ (A)}$$

$$I_2 \approx I_1 + \frac{R_2}{R_1 \cdot R_3} \times 12 \text{ (A)}$$



Cases where $I_{L(PEAK)} = I_2 \approx 1.0\text{A}$ and $I_1 \approx 200\text{mA}$

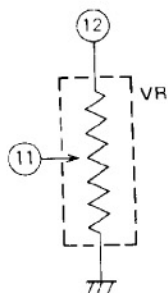
$R_1 = R_{11} = 4.0\Omega$, $R_2 = R_{22} = 1.0\text{k}\Omega$, $R_3 = R_{33} = 3.9\text{k}\Omega$

The required input/output voltage differential is 6V or greater.

± 12V TRACKING REGULATOR WITH RESET CIRCUIT

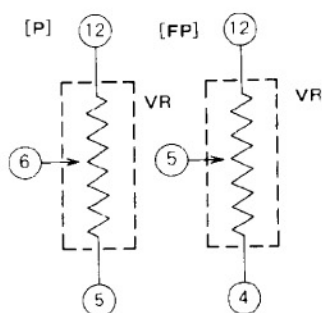
PRECAUTIONS

1. In adjusting the output voltage (use ⑪ pin)



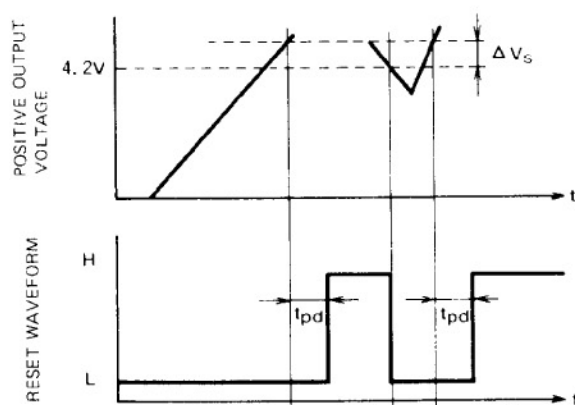
M5292P, FP is fixed the output voltage by inside resistors, but user can adjust it by using the outside resistor.
(inside resistor: 2.4k Ω ⑪ to 9, 21.7k Ω ⑫ to ⑪)

2. In adjusting the tracking voltage (use ⑥ pin (⑤ pin on FP))



M5292P, FP is fixed the tracking voltage by inside resistor, but user can adjust it by using the output resistor.
(inside resistor: ⑫ to ⑥ ⑥ to ⑤, 10k Ω for the M5292P)
⑫ to ⑤ ⑤ to ④, 10k Ω for the M5292FP)

3. Explaining figure of reset operation



When the positive output voltage is normal, the Reset output is High.
If it is lower than 4.2V, the Reset output is low.
(delay time is variable by connecting capacity at 7pin (6pin for the FP))

$$t_{pd} = 7.0 \times 10^4 \times C \text{ (sec)}$$

C: delay time capacity