

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.)

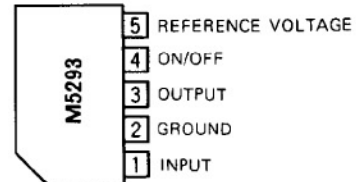
Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, 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

M5293L**FLUORESCENT CHARACTER DISPLAY TUBE
(-32V FIXED-VOLTAGE POWER SUPPLY) IC****DESCRIPTION**

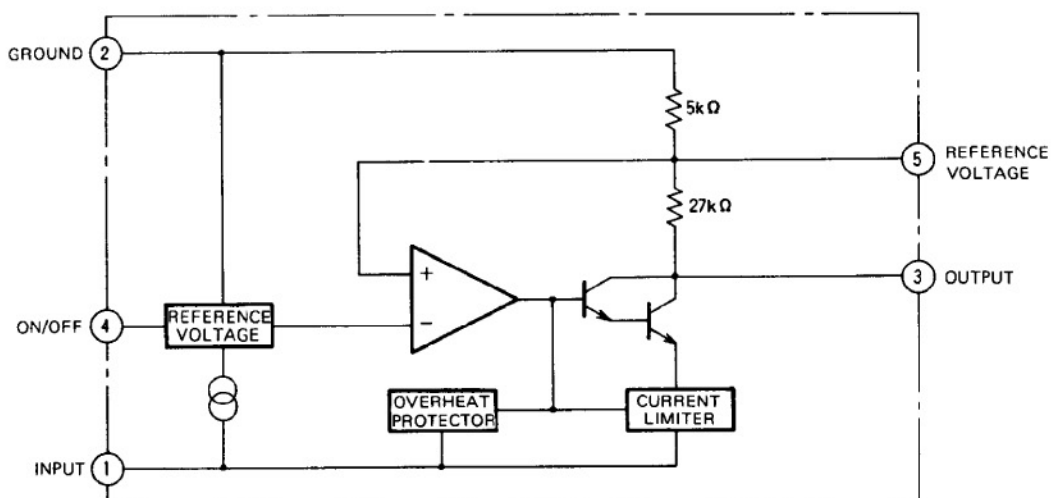
The M5293L is a semiconductor integrated circuits that is designed as a constant-voltage negative power supply. Since this high-voltage type integrated circuits accepts a maximum input voltage of -60V and provides a fixed output voltage of -32V, it serves, for instance, as an ideal fluorescent character display tube drive power supply. As the output voltage is fixed inside the integrated circuits, only a capacitor is needed as the external part. Further, the use of a small-size 5-pin SIP assures high packaging density for power supply circuits.

PIN CONFIGURATION (TOP VIEW)**Outline 5P5T****FEATURES**

- High input voltage range $V_I = -20 \sim -60V$
- Fixed output voltage $V_O = -32V$ ($I_{LP} = -30mA$)
Variable with an external resistor . . . $V_O = -10 \sim -50V$
- Output ON/OFF control (Terminal ④)
- Built-in current-limiting circuit.
- Built-in overheat protection circuit.

APPLICATION

CD players, VTR, and other general electronic equipment

BLOCK DIAGRAM

FLUORESCENT CHARACTER DISPLAY TUBE (-32V FIXED-VOLTAGE POWER SUPPLY) IC

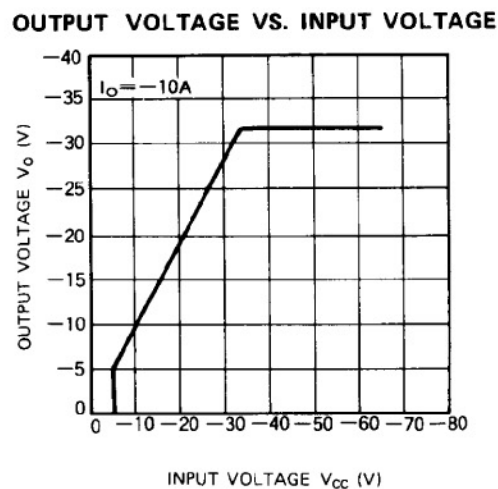
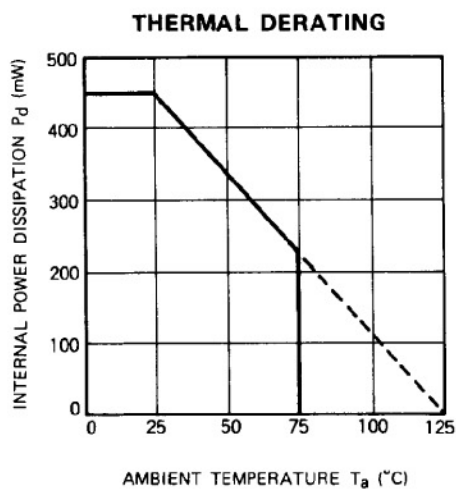
ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$, unless otherwise noted)

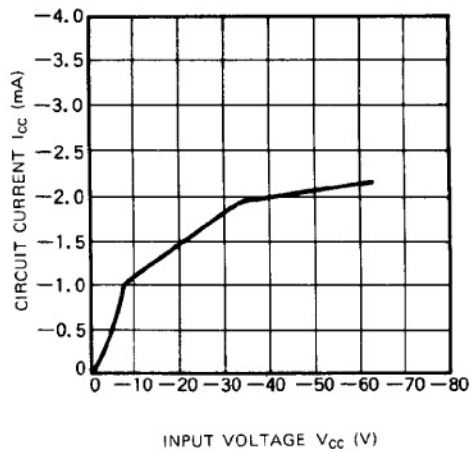
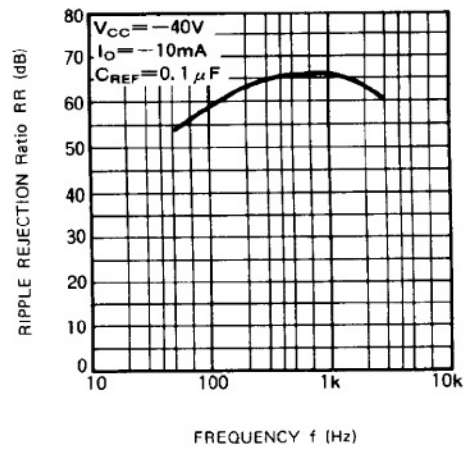
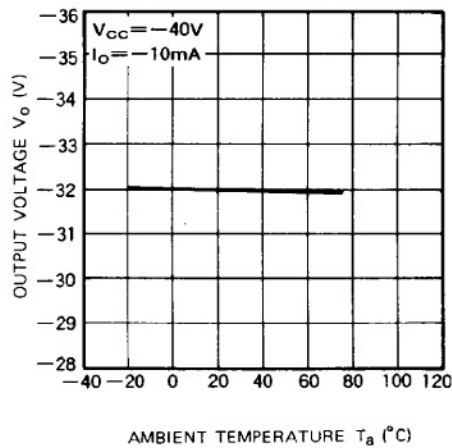
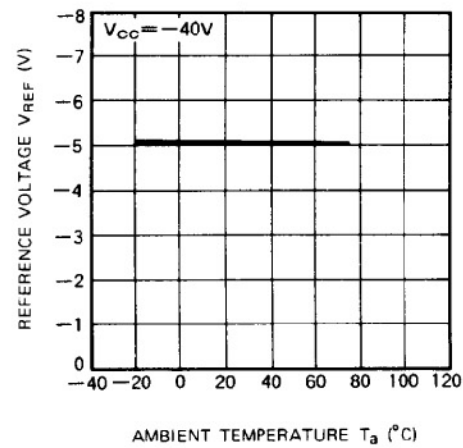
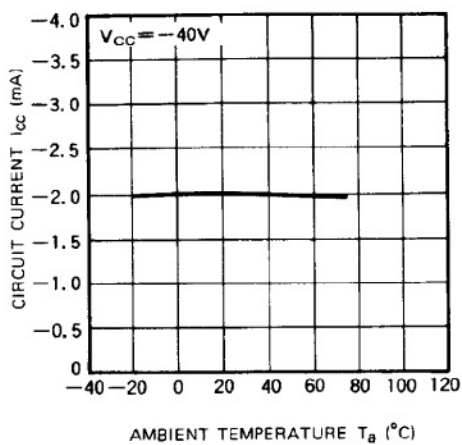
Symbol	Parameter	Conditions	Ratings	Unit
V_i	Input voltage		- 60	V
I_{LP}	Load current		- 30	mA
V_{DIF}	Input/output voltage differential		30	V
P_d	Internal power consumption		450	mW
K_θ	Thermal derating	$T_a \geq 25^\circ\text{C}$	4.5	mW/ $^\circ\text{C}$
T_{opr}	Operating ambient temperature		-20 ~ +75	$^\circ\text{C}$
T_{stg}	Storage temperature		-55 ~ +125	$^\circ\text{C}$

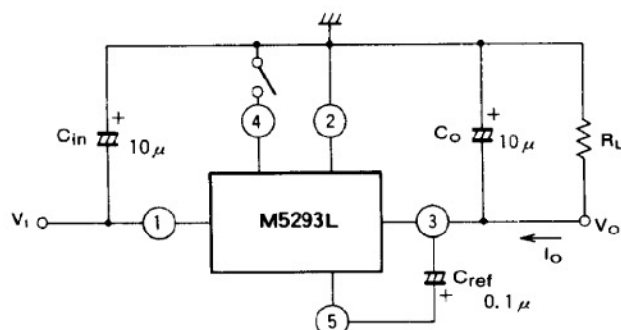
ELECTRICAL CHARACTERISTICS ($V_{IN} = -40\text{V}$, $I_O = -10\text{mA}$, $T_a = 25^\circ\text{C}$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{CC}	Circuit current	Under no load		-2.0	-6	mA
V_O	Output voltage		-30.0	-32.0	-34.0	V
Reg-in	Input variation	$V_{IN} = -40 \sim -50\text{V}$		0.05	0.2	%/V
Reg-LO	Load variation	$I_O = -1 \sim -20\text{mA}$		100	400	mV
RR	Ripple rejection ratio	$C_{REF} = 0.1\mu\text{F}$, $f = 120\text{Hz}$	40	60		dB
V_{NO}	Output noise voltage	$f = 20\text{Hz} \sim 100\text{kHz}$		100		μV_{rms}
$V_{O(off)}$	Output cutoff voltage	$-0.3\text{V} \leq V_4 \leq \text{GND}$			0.1	V
V_{ref}	Reference voltage		-4.65	-5.0	-5.35	V
V_{DIF}	Input/output voltage differential			1.5	3.5	V

TYPICAL CHARACTERISTIC



M5293L**FLUORESCENT CHARACTER DISPLAY TUBE
(-32V FIXED-VOLTAGE POWER SUPPLY) IC****CIRCUIT CURRENT VS. INPUT VOLTAGE****RIPPLE REJECTION RATIO****OUTPUT VOLTAGE VS.
AMBIENT TEMPERATURE****REFERENCE VOLTAGE VS.
AMBIENT TEMPERATURE****CIRCUIT CURRENT VS.
AMBIENT TEMPERATURE**

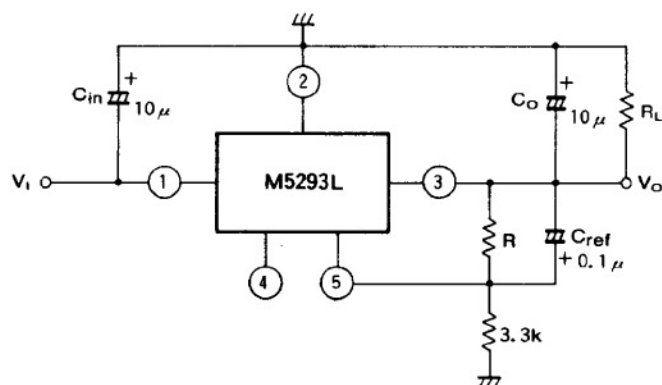
M5293L**FLUORESCENT CHARACTER DISPLAY TUBE
(-32V FIXED-VOLTAGE POWER SUPPLY) IC****APPLICATION EXAMPLES****(1) Standard Application Circuit Example**

When terminal ④ is set at the ground level (0 to -0.3V), an output voltage of 0V can be obtained.

C_{REF}

Connection of this capacitor provides ripple rejection ratio improvement, output noise voltage improvement, and output voltage rise time constant adjustment (use a 1000pF to 1μF capacitor).

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

(2) Output Voltage Variation Procedure

$$V_o = \left(1 + \frac{R//27k}{5k//3.3k}\right) \cdot V_{REF}$$

$$R = \frac{1}{\frac{1}{\left(\frac{V_o}{V_{REF}} - 1\right) \cdot 5k//3.3k} - \frac{1}{27k}}$$

($V_{REF} = 5.00V$, $5k//3.3k = 1.988k$)

(BUILT-IN RESISTORS
BETWEEN TERMINALS ② AND ⑤: 5kΩ
BETWEEN TERMINALS ③ AND ⑤: 27kΩ)