Ordering number : EN 3314

Monolithic Linear IC

SANYO No.3314

# LA7857, 7858

## Very High Resolution CRT Display Synchronization

### Overview

The LA7857, 7858 are sync·deflection circuit ICs dedicated to CRT display use. They can be connected to the LA7837, 7838 (for vertical output use) to form a sync·deflection circuit that meets every requirement for CRT display use.

The LA7857, 7858 are performance-improved versions of the existing LA7852, 7853. The LA7857, 7858 are intended for use in very high-definition display ($f_H$=64 to 150kHz) applications. When the horizontal frequency exceeds approximately 64kHz, problems are experienced with horizontal jitter which has been less of a problem in low-frequency display applications. The newly developed LA7857, 7858, which are fabricated with a special production process, are capable of suppressing horizontal jitter components successfully (30% reduced as compared with our existing similar Type Nos.). The LA7857, 7858 are ideally suited for use in high performance-required applications.

The LA7857, 7858 are pin-compatible with the LA7852, 7853, respectively. The LA7857, 7858 are different in the vertical sync pull-in range (LA7857 : 10Hz, LA7858 : 20Hz).

### Features

- The horizontal oscillation frequency can be adjusted stably from 15kHz to 150kHz.
- The horizontal display can be shifted right/left.
- The horizontal/vertical sync input can be used intact regardless of the difference in pulse polarity and pulse width.
- The AFC feedback sawtooth wave can be obtained by simply applying a flyback pulse to the IC as a trigger pulse.
- Any duty of the horizontal pulse can be set.
- The LA7857, 7858 can be connected to the LA7837, 7838 to develop pictures with the interlace characteristics, crossover distortion characteristics improved.

### On-Chip Functions

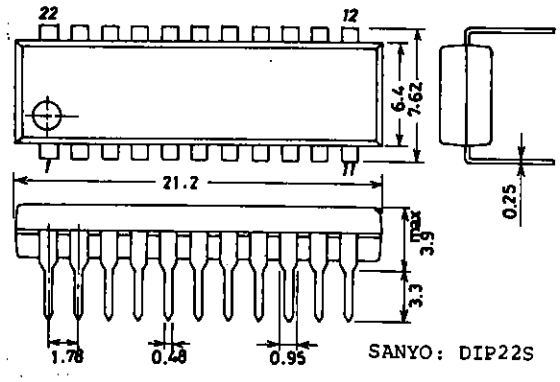
[Horizontal Block]
- Horizontal sync input
- Horizontal phase shift
- AFC sawtooth wave generator
- Horizontal pulse duty setting
- Horizontal OSC
- AFC
- X-ray protector

[Vertical Block]
- Vertical trigger input
- Vertical OSC
- Vertical sawtooth wave generator
- Sampling type DC voltage control

### Package Dimensions

(unit :mm)

3059



| **Maximum Ratings** at Ta = 25°C | | | | unit |
|---|---|---|---|---|
| Maximum Supply Voltage | $V_{11}$,$V_{22}$ max | | 14 | V |
| Allowable Power Dissipation | Pd max | Ta ≦ 65°C | 780 | mW |
| Operating Temperature | Topr | | −20 to +85 | °C |
| Storage Temperature | Tstg | | −55 to +125 | °C |

| **Operating Conditions** at Ta = 25°C | | | unit |
|---|---|---|---|
| Recommended Supply Voltage | $V_{11}$,$V_{22}$ | 12 | V |
| Operating Voltage Rage | $V_{11}$,$V_{22}$ op | 9 to 13.5 | V |
| Recommended Vertical Pulse Input Peak Value | $V_{pulse}$ | 5 | Vp-p |
| Operating Vertical Pulse Input Peak Value Range | $V_{pulse}$ | 2 to 6 | Vp-p |
| Recommended Horizontal Pulse Input Peak Value | $H_{pulse}$ | 5 | Vp-p |
| Operating Horizontal Pulse Input Peak Value Range | $H_{pulse}$ | 2 to 6 | Vp-p |

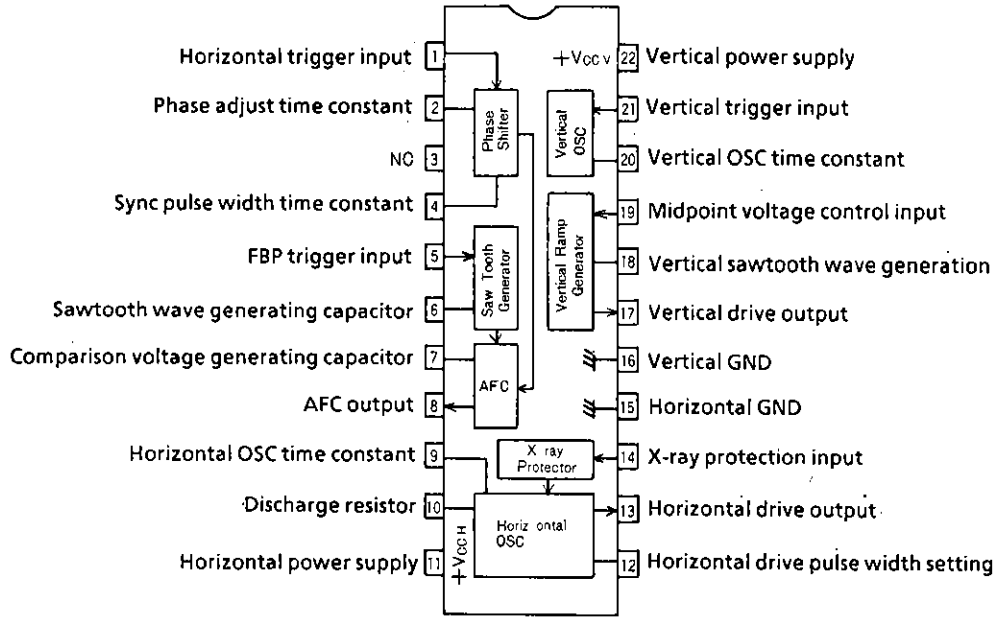
| **Operating Characteristics** at Ta = 25°C, $V_{11}$, $V_{22}$ = 12V | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| $V_{CC10}$ Current Dissipation | $I_{11}$ | | 12 | | 30 | mA |
| $V_{CC20}$ Current Dissipation | $I_{22}$ | | 5 | | 12 | mA |
| Vertical Frequency Pull-in Range | $V_{pIN}$ | Vertical sync 60Hz<br>( ) : LA7858 | 10.0<br>(21.0) | | 12.0<br>(23.0) | Hz |
| Vertical Free-running Frequency | $f_V$ | $f_V$ center 55Hz | 50 | | 60 | Hz |
| Increased/Reduced Voltage Characteristic of Vertical Frequency | $\Delta f_{V.V}$ | $V_{22}$ = 12 ± 1V, 55Hz at 12V | −0.1 | | 0.1 | Hz |
| Midpoint Control Threshold Level | | | 3.8 | | 4.4 | V |
| Vertical OSC Start Voltage | $f_{V.st}$ | | | | 4.0 | V |
| Temperature Characteristic of Vertical Frequency | | Ta = −10 to +60°C | −0.028 | | 0.028 | Hz/°C |
| Vertical Driver Amplification Factor | $G_V$ | | 12 | | 18 | dB |
| Horizontal AFC DC Loop Gain | $I_{AFC}$ | | ±0.85 | | ±1.6 | mA |
| Horizontal Free-running Frequency | $f_H$ | $f_H$ center 15.734kHz | −750 | | 750 | Hz |
| Horizontal OSC Start Voltage | $f_{H.st}$ | | | | 4.0 | V |
| Increased/Reduced Voltage Characteristic of Horizontal Frequency | $\Delta_{H.V}$ | $V_{11}$ = 12 ± 1V, 15.734kHz at 12V | −50 | | 50 | Hz |
| Horizontal OSC Warm-up Drift | $\Delta f_H$ | 5s. to 30min. after application of power | −50 | | 50 | Hz |
| Temperature Characteristic of Horizontal Frequency | | Ta = −10 to +60°C | −2.9 | | 2.9 | Hz/°C |
| Horizontal Output Drive Current | $I_{13}$ | | 6.0 | | 12.0 | mA |
| Increased/Reduced Voltage Characteristic of Phase Shifter Delay Time | | $V_{11}$ = 12 ± 1V | −0.5 | | 0.5 | %/V |
| Temperature Characteristic of Phase Shifter Delay Time | | Ta = −10 to +60°C | −0.1 | | 0.1 | %/°C |
| Increased/Reduced Voltage Characteristic of Phase Shifter Pulse Width | | $V_{11}$ = 12 ± 1V | −1.0 | | 1.0 | %/V |
| Temperature Characteristic of Phase Shifter Pulse Width | | Ta = −10 to +60°C | −0.13 | | 0.13 | %/°C |
| AFC Phase Comparison Center Time | | 15.734kHz after F.B.P. input | 9.9 | | 11.5 | µs |
| Increased/Reduced Voltage Characteristic of AFC Phase Comparison Center Time | | $V_{11}$ = 12 ± 1V | −1.5 | | 1.5 | %/V |
| Temperature Characteristic of AFC Phase Comparison Center Time | | Ta = −10 to +60°C | −0.2 | | 0.2 | %/°C |
| Comparison Waveform Generating Input Operation Voltage | $V_5$ | | 0.65 | | 0.95 | V |
| Pin 13 Voltage at Hold-down Operation Start | $V_{14}$ | | 0.55 | | 0.85 | V |

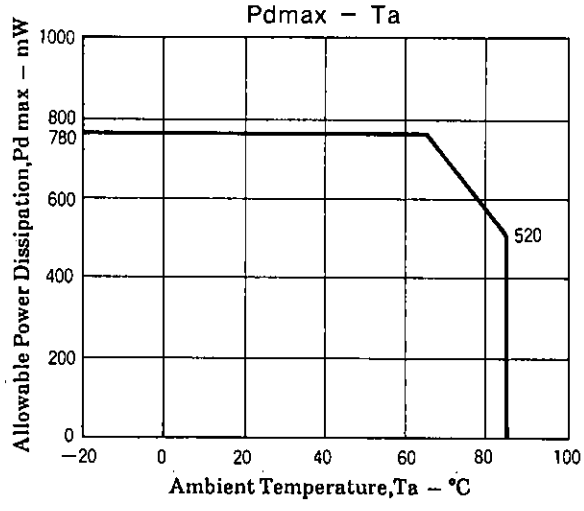
Correspondence with the Existing IC Series

LA7850 ⟶ LA7855
LA7851 ⟶ LA7856
LA7852 ⟶ LA7857
LA7853 ⟶ LA7858

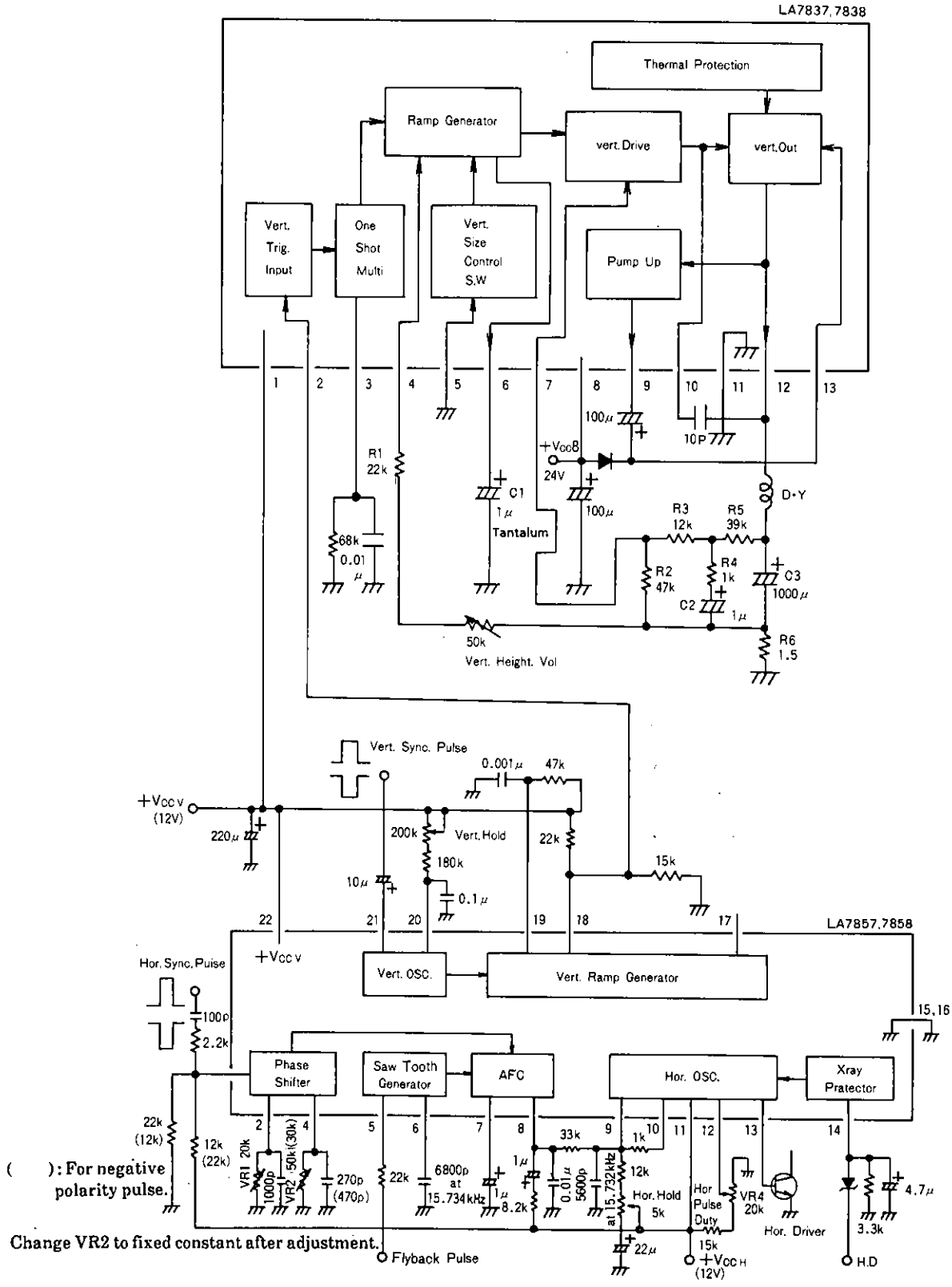
| Type No. | Package | Vertical Pull-in Range | GND Pin |
|---|---|---|---|
| LA7850, 7855 | DIP-20S | 10Hz (at 60Hz) | Common to horizontal/vertical |
| LA7851, 7856 | DIP-20S | 20Hz (at 60Hz) | Common to horizontal/vertical |
| LA7852, 7857 | DIP-22S | 10Hz (at 60Hz) | Separated for horizontal/vertical |
| LA7853, 7858 | DIP-22S | 20Hz (at 60Hz) | Separated for horizontal/vertical |

## Equivalent Circuit Block Diagram



**Sample Application Circuit:** 14" monitor
Vertical retrace time ≦ 700μs

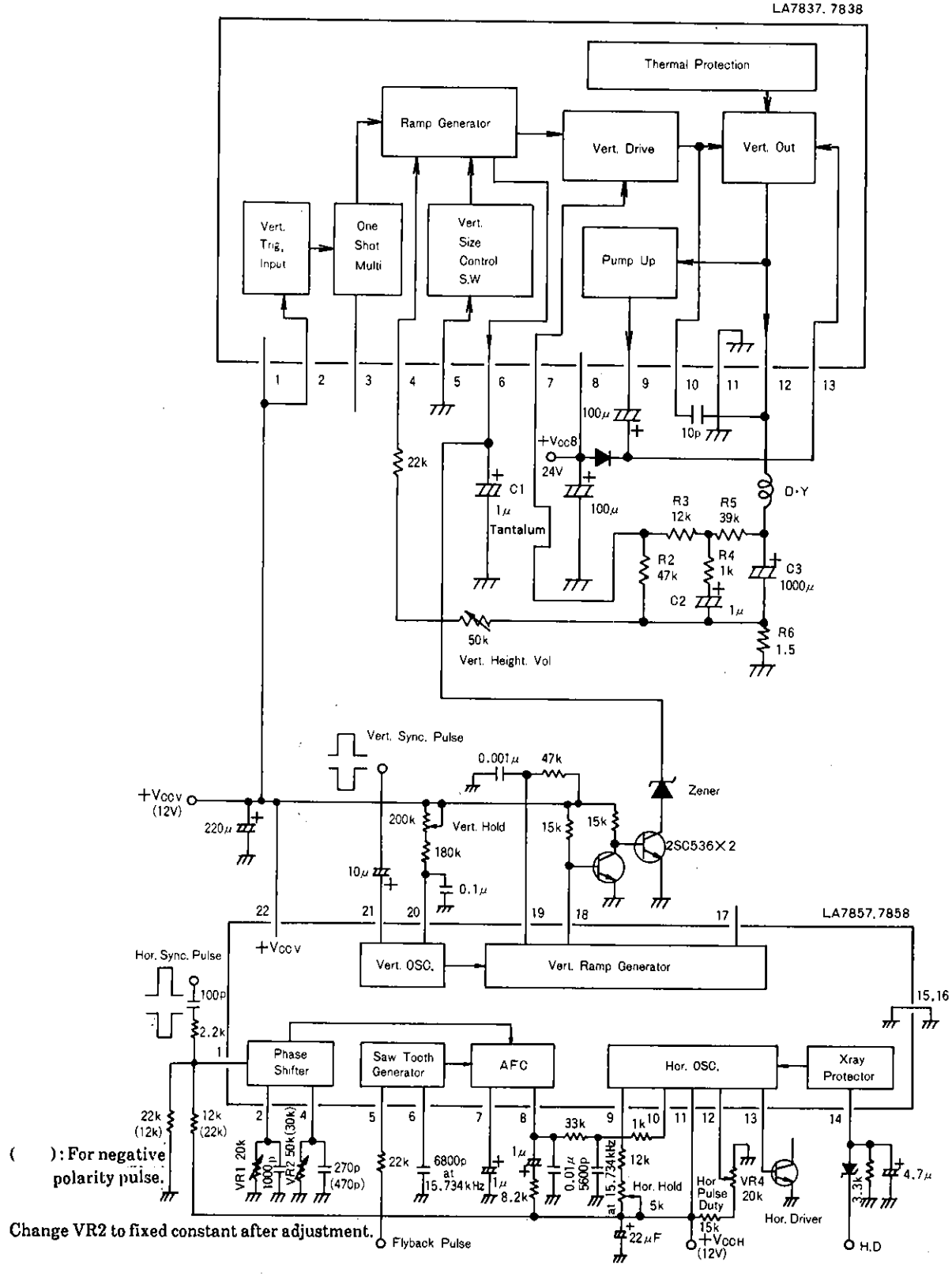



( ): For negative polarity pulse.

Change VR2 to fixed constant after adjustment.

Fig.1 Unit (resistance:Ω, capacitance:F)

**Sample Application Circuit:** 14" display
Vertical retrace time ≒ 300μs




( ): For negative polarity pulse.

Change VR2 to fixed constant after adjustment.

Unit ( resistance:Ω, capacitance:F )

**Precautions when using with vertical output ICs LA7837, 7838:**

The vertical output ICs LA7837,7838 are appropriate for use in monitors and displays because the interlace and crossover distortion responses are superior to those of the LA7835,7836.

However, since the vertical retrace time of displays is shorter than that of TV, the upper portion of the vertical picture may stretch. This is because the start waveform of the pin 6 sawtooth wave bends, as shown in Fig.3, due to the diode response of the clamp waveform. If there is not much time difference between $T_1$ and $T_R$, the upper portion of the vertical picture will tend to stretch. The use of a circuit as shown in Fig.2 will cause pin 6 waveform start wave to become linear, so that stretching is suppressed.

The example of circuit application shown in Fig.2 does not use the trigger input circuit (pin 2) and one-shot multivibrator (pin 3) built in the LA7837,7838 ; the pin 6 sawtooth wave is controlled by the LA7855,7856 vertical output pulse.

Therefore, the discharge circuit and clamp circuit are formed by the external Zener diode and transistor TR2.

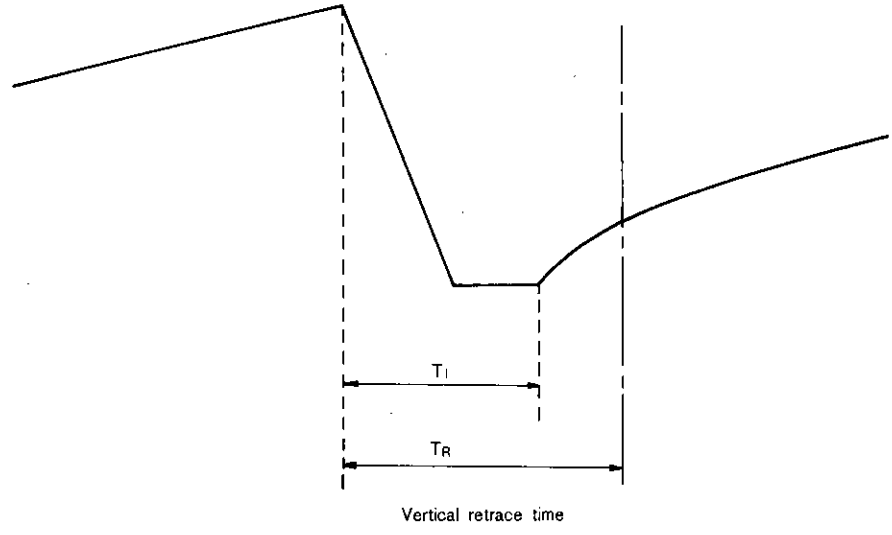



Fig.3

**Design Example**

For 12V pin 1 power supply

On the LA7837,7838, pin 3 one-shot multivibrator operates when a trigger pulse enters pin 2. During this time, the sawtooth wave generator discharge circuit and clamp circuit inside pin 6 operate.

The clamp voltage at this time is figured according to this formula :

$$V_{CLAMP} = 5/12 \cdot V_{CC} \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad ①$$

For 12V,

$$V_{CLAMP} = 5\,[V]$$

Therefore, the Zener diode used in Fig.2 must be rated more than 5V (e.g. 5.6V), otherwise the clamp circuit inside the IC will operate.

For 9V pin 1 power supply

The same as for 12V, according to formula ① :

$$V_{CLAMP} = 3.75\,[V]$$

So, the Zener diode must be rated more than 4V (e.g. 4.5V).

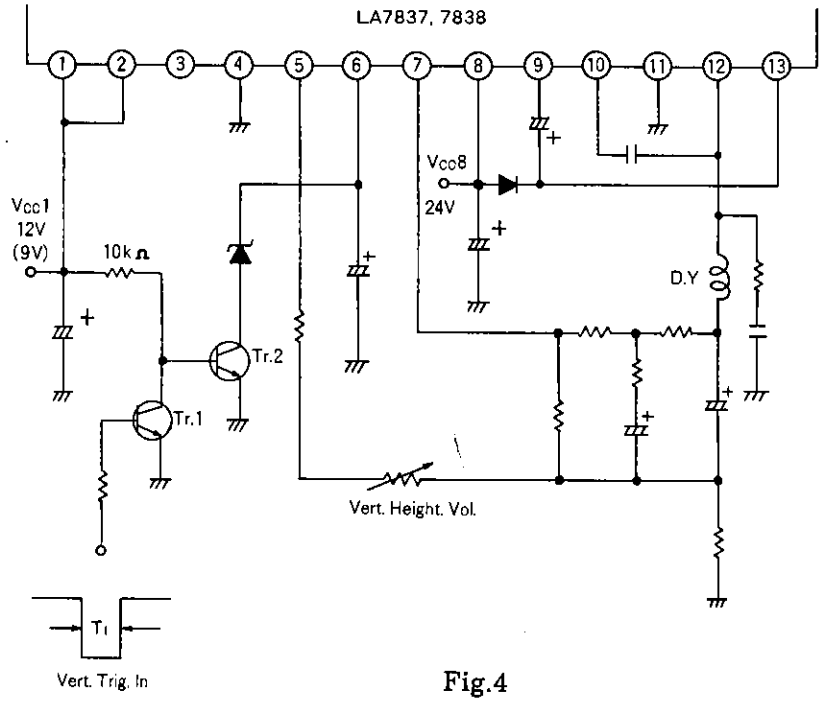
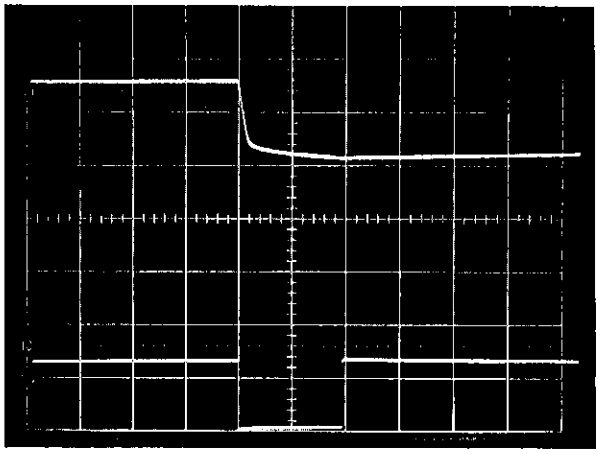



Fig.4

Pin 6 waveform when using the LA7837,7838 in a display application circuit (Fig.2)

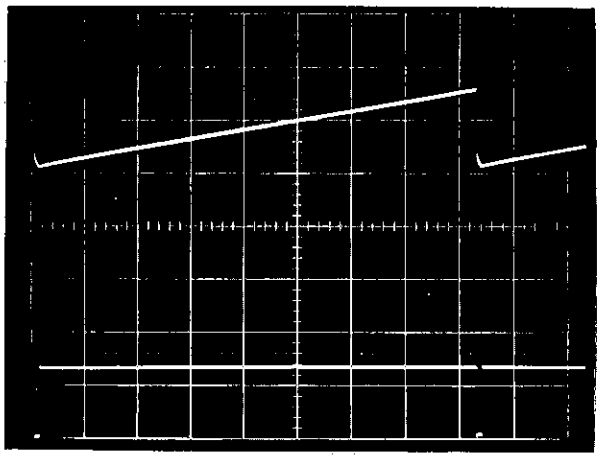


Pin 6 waveform 1 [V/div]
Horizontal : 100 [ μs ]

LA7857,7858 pin 18 waveform
0.5 [V/div]

0 V

Fig.5



Pin 6 waveform 1 [V/div]
Horizontal : 2 [ ms ]

LA7857,7858 pin 18 waveform
0.5 [V/div]

0 V

Fig.6