SANYO

Monolithic Linear IC

Color TV Synchronization, Deflection Circuit

The LA7811 is an IC containing not only the main functions required for synchronization, deflection of color television sets but also the generator of vertical blanking pulses (open collector output) and burst gate pulses (not sand castle type) and further the AFC time constant selector for VTR.

With the horizontal jitter at the time of weak electric field strength minimized and the picture distortion due to brightness variation minimized, this IC for synchronization, deflection functions is aimed at realization of multifunction and high quality picture reproduction.

Functions

- Synchronizing separation
- Horizontal AFC
- Burst gate pulse
- Noise (weak electric field strength)
- AFC time constant selection
- Vertical oscillation
- Horizontal oscillation
- Vertical blanking pulse (open collector output)
- Synchronization, asynchronization detection
- Vertical drive
- X-ray protection

Features

- Minimized horizontal jitter at the time of weak electric field strength.
- Minimized picture distortion due to brightness variation at the time of strong electric field strength.
- Horizontal, vertical oscillation, being small in warm-up drift, is stable against ambient temperature and supply voltage variations.
- Minimized variations in horizontal oscillation frequency.
- DC bias at the vertical output stage is sampling-controlled within retrace time, thereby enabling improved linearity and interlacing.
- Vertical blanking pulse width can be set independently with external constants.
- Multifunctional and compact (DIP-22)

Maximum Ratings at Ta = 25°C

				unit
Maximum Supply Voltage	V_{CC14}		14	V
Maximum Supply Current	I_{CC4}		16	mA
Allowable Power Dissipation	Pd max	Ta = 65°C	720	mW
Operating Temperature	Topg		−20 to +85	°C
Storage Temperature	Tstg		−55 to +125	°C

Operating Conditions at Ta = 25°C

			unit
Recommended Supply Voltage	V_{CC14}	12	V
Recommended Supply Current	I_{CC4}	13	mA
Operating Voltage Range	V_{CC14} op	12 ± 10%	V

Case Outline 3010A-D22IC
(unit : mm)

SANYO: DIP22

Specifications and information herein are subject to change without notice.

Operating Characteristics at Ta = 25°C, V_{CC14} = 12V, I_{CC4} = 13mA			min	typ	max	unit
$I_{CC}14$ Current Dissipation	I_{CC14}		15	20	27	mA
$V_{CC}4$ Supply Voltage	V_{CC4}		11.8	12.6	13.2	V
$I_{CC}4$ Current Dissipation	I_{CC4}	V_{CC4} = 11V			10.5	mA
Sync Separation Input DC Level	V_{18}	Resistor R_{18} = 15kΩ	9.0	9.3	9.6	V
Sync Signal Peak Value	V_{16}		10	10.8		V
Burst Gate Pulse Peak Value	V_{BGP}		10	10.8		V
Burst Gate Pulse Leading Edge Delay Time	T_{BR}			0.25	0.5	μsec
Burst Gate Pulse Trailing Edge Delay Time	T_{BF}		3.2	3.5	3.8	μsec
Vertical Blanking Pulse Saturation Voltage	V_{BLS}	Load current I_{22} = 1mA			1.5	V
Vertical Blanking Threshold Level	V_{VBS}		5.0	5.35	5.7	V
Midpoint Control Threshold Level	V_{CES}		3.8	4.1	4.4	V
Vertical Driver Amplification Factor	G_{VD}		4.0	6.0	7.0	times
Vertical Free-running Frequency	f_{VOSC}	f_{VOSC} center = 55Hz	50		60	Hz
Vertical Oscillation Pull-in Frequency Range	f_{VP}	Vertical sync signal f = 60Hz	11	12	13	Hz
Supply Voltage Dependence of Vertical Oscillation Frequency	f_{VD}	55Hz at V_{CC14} = 12V, V_{CC14} = 12±1V	−0.5		0.5	Hz
Vertical Oscillation Start Voltage	V_{VOSC}				4	V
Temperature Characteristic of Vertical Oscillation Frequency	f_{VT}	Ta = −10 to +60°C	−0.028		+0.028	Hz/°C
Horizontal Free-running Frequency	f_{HOSC}	f_{HOSC} center = 15.734kHz	14.984		16.484	kHz
Supply Voltage Dependence of Horizontal Oscillation Frequency	f_{HD}	V_{CC4} to V_{CC4}×0.9	−50		50	Hz
Horizontal Oscillation Start Voltage	V_{HOSC}				4	V
Temperature Characteristic of Horizontal Oscillation Frequency	f_{HT}	Ta = −10 to +60°C	−3.4		+3.4	Hz/°C
Horizontal Oscillation Frequency Warm-up Drift	f_{HWD}	6sec to 30min after switch ON	−70		70	Hz
Horizontal Output Pulse Width	P_{WH}	f_{HOSC} = 15.734kHz	21.5	24.5	26.5	μs
Horizontal Output Drive Current	I_{DH}		4.6	6.0	7.2	mA
Horizontal AFC Control Output Current I	$I_{AFC I}$		±380	±560	±780	μA
Horizontal AFC Control Output Current II	$I_{AFC II}$		±1.4	±2.4	±3.4	mA
Horizontal AFC Limiter Voltage (Upper)	V_{AFCH}	I_3 = 1mA	7.9		8.6	V
Horizontal AFC Limiter Voltage (Lower)	V_{AFCL}	I_3 = 1mA	4.6		5.3	V
Hold-down Operating Voltage	V_{HDOP}		0.6		0.9	V
Hold-down Nonreset Voltage	V_{HDUR}		7			V
Synchronization · Asynchronization Detection Output Current	I_{sas}		0.8	1.1	1.6	mA
Synchronization · Asynchronization Detection Threshold Level	V_{sas}		4	4.4	4.8	V
Weak Field Detection Output Voltage	V_{WF}	f = 1MHz, 150mV	0.5	0.85	1.4	V
Horizontal AFC Time Constant Select Current I	$I_{SE I}$	V_{21} = 1V, V_2 = 1V	0.1			mA
Horizontal AFC Time Constant Select Current II	$I_{SE II}$	V_2 = 1V	0.3			mA

Pd max − Ta

Allowable Power Dissipation,Pd max − mW

800
720
600
400
200
0

480

−20 0 20 40 60 80 100
Ambient Temperature,Ta − °C

Functions and Features

The LA7811 is made more complete in functions and improved in characteristics with new functions provided in addition to the basic functions (sync separator, vertical oscillator, horizontal oscillator, AFC, X-ray protector) required for a synchronization and deflection IC. The new functions are described below. We have the LA7800 that is similar to the LA7811 but contains only the basic functions.

1. Functions to reduce horizontal jitter when in weak electric fields; functions to reduce image distortions when in strong electric fields

When white noise in video signal increases, horizontal jitter is generated. To reduce horizontal jitter, it is not enough to further integrate effects of the AFC filter. Image distortions, caused by brightness variation when in a strong electric field, will be amplified. Accordingly the AFC time constant has been selected as a trade-off between horizontal jitter and image distortions.

White noise detected in video signals by a noise detection circuit and the AFC time constant are controlled by a voltage proportional to the noise. This permits operations with optimum AFC time constants in both weak and strong electric fields.

The LA7811 also has a horizontal synchronization/asynchronization detection circuit. It reduces asynchronized integrating effects of AFC. This provides faster responses for synchronous pull-in. This synchronization /asynchronization detection circuit output can also be utilized as a muting control signal.
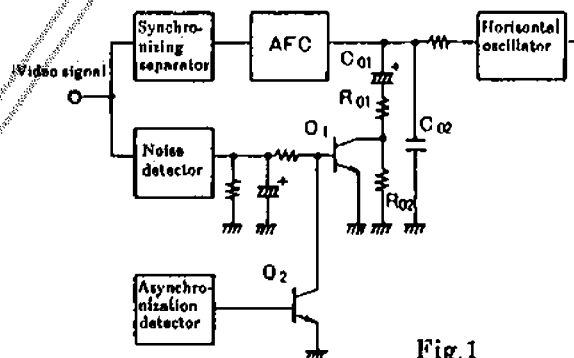
Fig.1

1-1 Noise Detection Circuit

The purpose of the noise detection circuit is to detect noises existing in the synchronizing signal sector of video signals, generate a DC voltage proportional in magnitude to them, control with the voltage an AFC time constant selector, and reduce horizontal jitter when in weak electric fields.
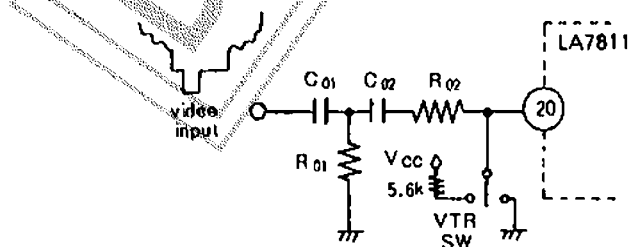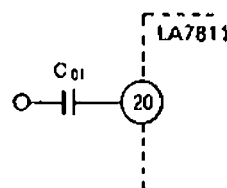
Fig.2

Fig.3

Continued from preceding page.

In Fig.2, C_{01} and R_{01} constitute a high-pass filter (differentiating circuit). High-frequency range noises in video signals are applied to pin 20. The magnitude of noises applied to pin 20 is varied by varying the C_{01} capacitance. The field strength for when the AFC time constant selector starts operating can be designated there.

Generally, when using a VTR, it is not considered preferable to lower the AFC control sensitivity even for noisy video signals (images). For this reason, the LA7811 is arranged so that locking the AFC time constant selector to a strong electric field mode is feasible by connecting pin 20 to V_{CC} through a resistor of 5.6kΩ or to ground directly.

C_{02} in Fig.2 is a DC blocking capacitor. R_{02} prevents excessively low input impedances, if pin 20 is connected to V_{CC} or ground when using a VTR.

A major feature of AFC in LA7811 is a capability to select the AFC output time constant circuits individually and independently for strong and weak electric fields. When used with VTR, it is possible to omit the VTR switch shown in Fig.2, if weak field picture images are rare. In this case, pin 20 is required only for C_{01} as shown in Fig.3. The value of C_{01} should optimally be about 10pF.

1-2 Synchronization/Asynchronization Detection Circuit

The synchronization/asynchronization detection circuit judges if horizontal oscillation is in a synchro-nized or an asynchronized mode. Its output controls the AFC output current, AFC time constant selector and noise detection circuit. Synchronization/asynchronization detection is performed by comparing phases of synchronizing and flyback pulses (slightly phase corrected). When the phases coincide with each other, a current flows into resistor R and capacitor C that are externally connected to pin 19, raising pin 19 potential. Then, when the potential exceeds the comparator threshold level (4.4V), it is considered to be in synchronization. Pin 19 potential remains below the comparator threshold level in asynchronized mode. The value of resistor R is selected to provide levels above threshold (4.4V) when in weak-field mode, and levels below the threshold (4.4V) in an asynchronized mode. The value of capacitor C should be determined considering ripple magnitude at pin 19 and response speeds.

1-3 AFC Time Constant Selector

Fig.4 shows the time constant selector. Operation varies, depending on the electric field, the resistance R_0 of the circuit (C_0 and R_0) connected to the AFC output shown in Fig.5. The smaller the resistance of R_0 is, the larger the flattening (integrating) effects of the AFC output current and the smaller the noise-induced jitter will be. On the other hand, the larger the resistance of R_0 is, the smaller image distortions by brightness variation will be.
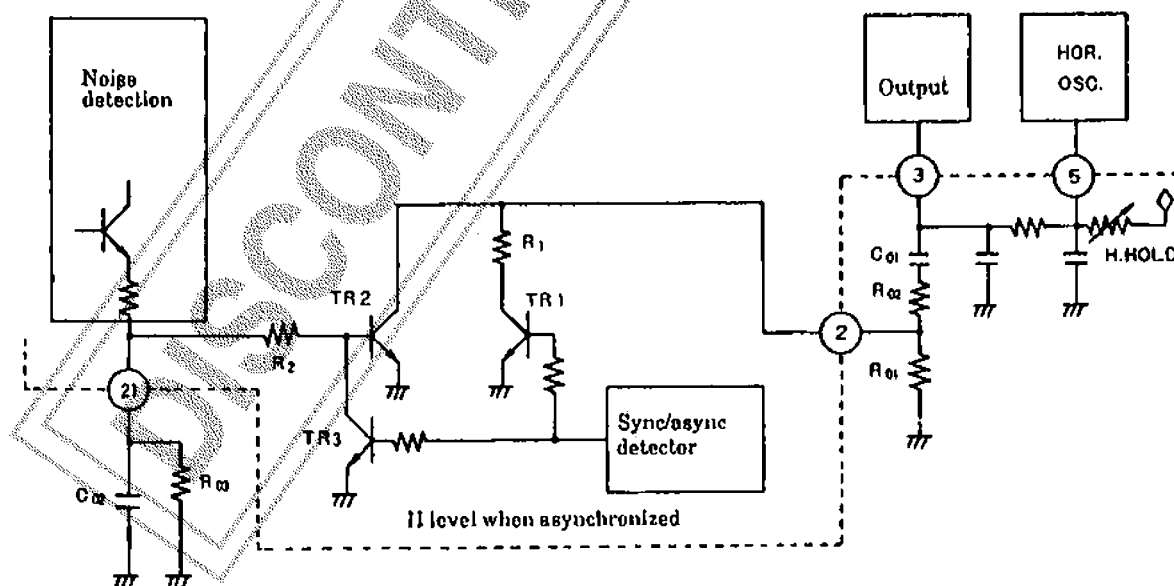

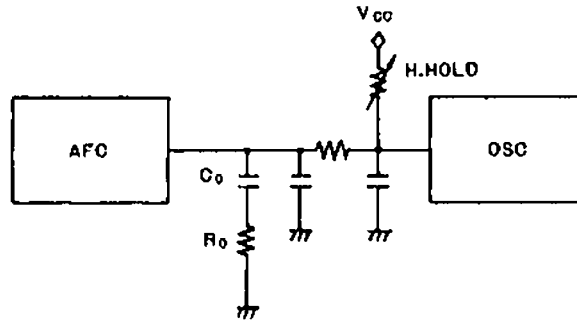Fig.4 Time Constant - Selecting Circuit

Fig.5 Fundamental Circuit

In transition from asynchronized mode to synchronized mode, the larger the resistance R_0 in Fig.5 and additionally the larger the AFC output current, the faster pull-in speeds will be. For this reason, TR3 is turned on to increase the resistance value that corresponds to resistor R_0, when LA7811 is in asynchronized mode. At the same time, the AFC current is made to be 4.3 times the normal value. Resistor R_1 prevents over-shifting of the horizontal oscillation frequency by pulse noises in asynchronized mode in weak electric fields. Fig.6 shows a table summarizing this operation.

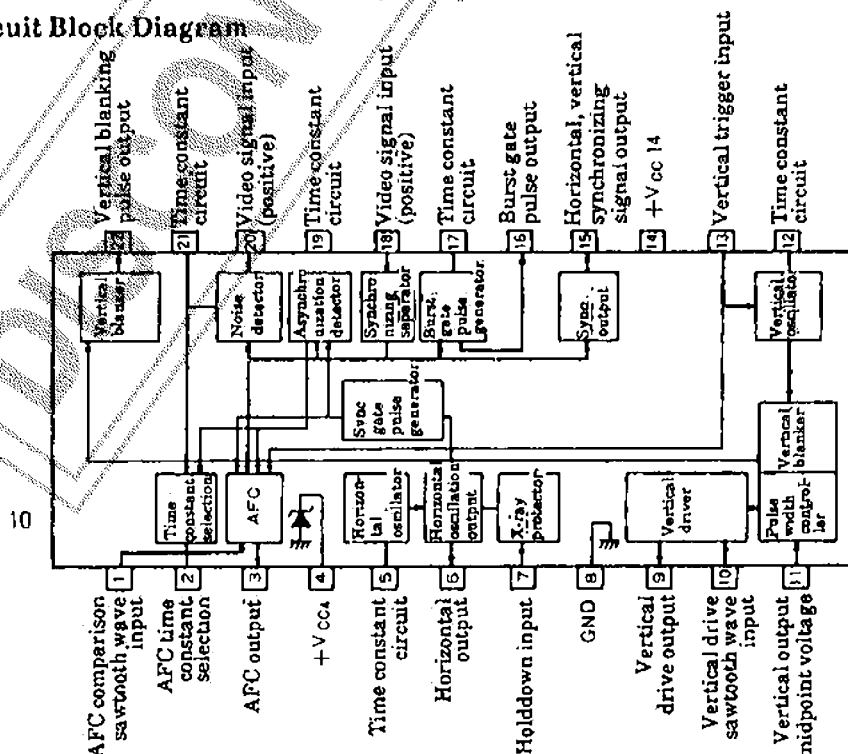|	Electric Field	AFC Control Current	TR1	TR2	TR3	I_R
Synchronized mode	Strong	100%	OFF	OFF	OFF	$R_{02}+R_{01}$
	Weak	100%	OFF	ON	OFF	Saturation resistance of R_{02}+TR2
Asynchronized mode	Every field	430%	ON	OFF	ON	$R_{02}+\dfrac{1}{\dfrac{1}{R_{01}}+\dfrac{1}{R_1}}$

Fig.6

2. Vertical Oscillation

Any capacitors ranging from $0.1\mu F$ film to $1\mu F$ tantalum electrolytic capacitors can be used for the oscillating capacitor connected to pin 12.
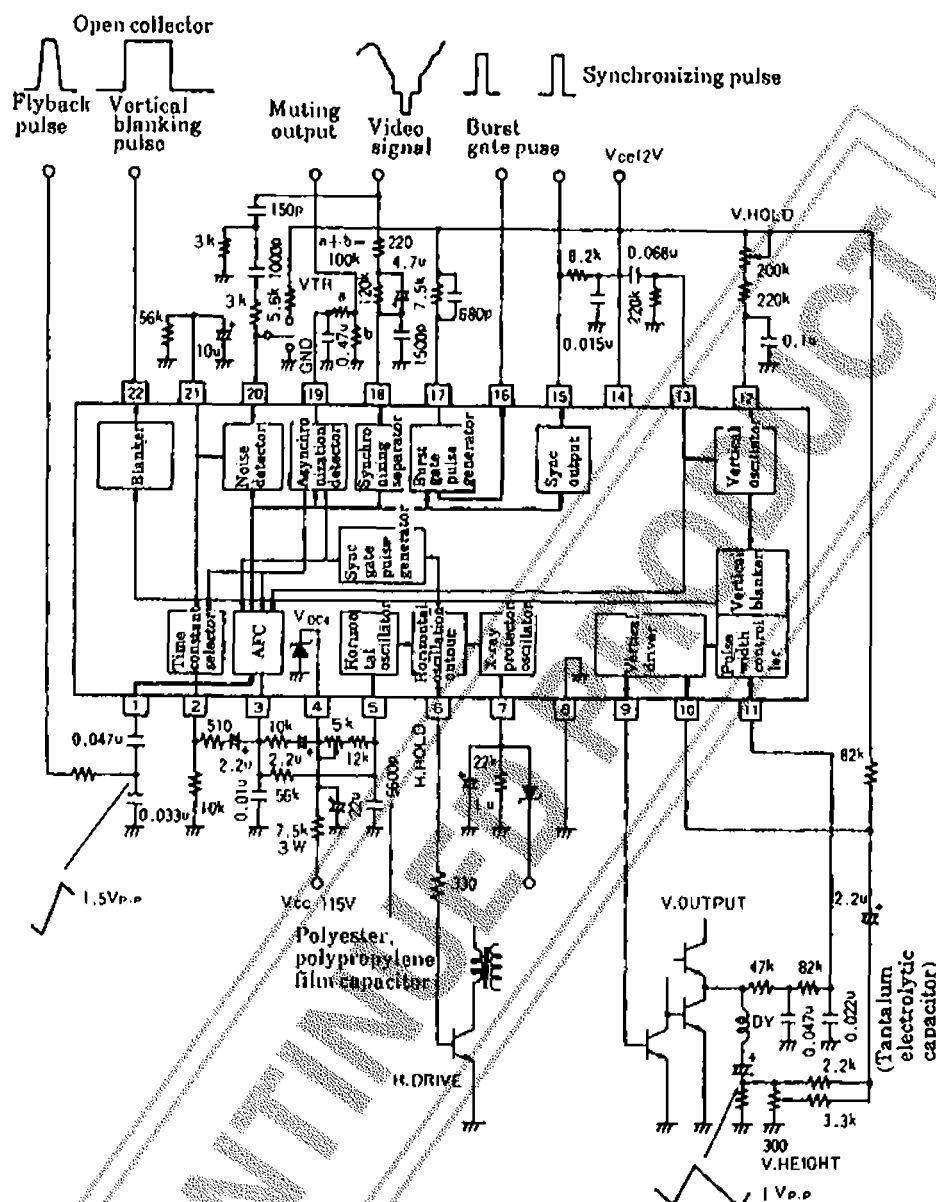
3. Vertical Driver

Capacitors, which can be used for the sawtooth wave generating capacitors connected to pin 10, range from $0.33\mu F$ film to $2.2\mu F$ tantalum electrolytic capacitors.
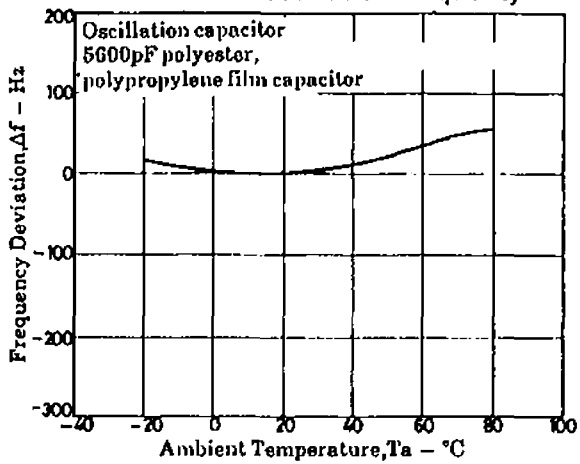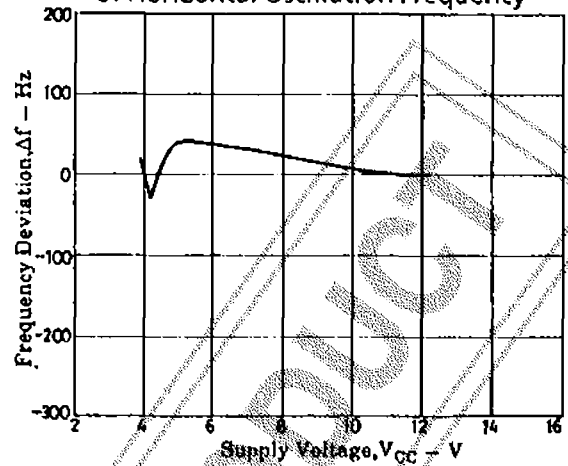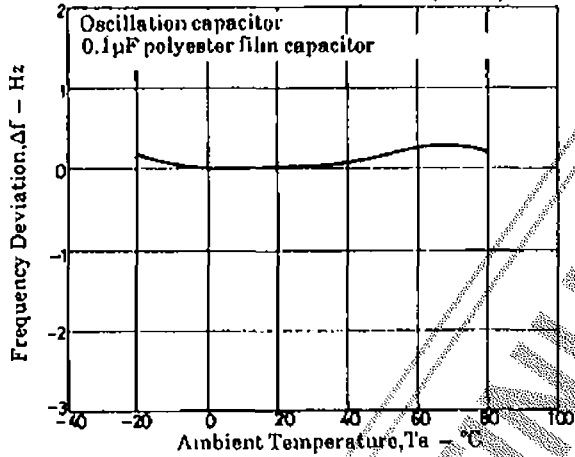
Equivalent Circuit Block Diagram

Sample Application Circuit

Note) 1. The vertical output circuit is shown by the basic circuit.
2. The peripheral parts at pin 11 should be changed in accordance with the Ver. Out circuit conditions.
3. The limiting resistor (220Ω : 1Vp-p) at pin 18 should be changed in proportion to the magnitude of the input video signal.
4. In the time constant circuit (120kΩ, 4.7μF) at pin 18, the time constant should be changed by changing the resistance value in accordance with the DC level of the input video signal and then by changing the capacitance value.
5. Burst gate pulse width can be changed by changing the value of 680pF at pin 17
6. If the value of 150pF at pin 20 is decreased, the AFC time constant is changed-over at a point of weaker electric field strength.

Temperature Characteristic
of Horizontal Oscillation Frequency

Oscillation capacitor
5600pF polyester,
polypropylene film capacitor

Frequency Deviation,Δf — Hz

Ambient Temperature,Ta — °C

Supply Voltage Characteristic
of Horizontal Oscillation Frequency

Frequency Deviation,Δf — Hz

Supply Voltage,V$_{CC}$ — V

Temperature Characteristic
of Vertical Oscillation Frequency

Oscillation capacitor
0.1μF polyester film capacitor

Frequency Deviation,Δf — Hz

Ambient Temperature,Ta — °C

Supply Voltage Characteristic
of Vertical Oscillation Frequency

Frequency Deviation,Δf — Hz

Supply Voltage,V$_{CC}$ — V