FLJ-D5, D6
Digital-Programmable, High-Order Lowpass Filter

FEATURES

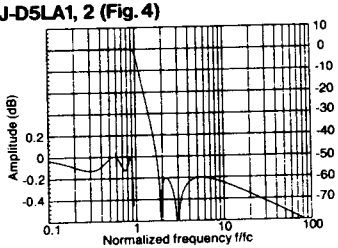
- **60dB, 80dB/octave rolloff low-pass filter**
- **Cutoff frequency programmed by logic at 8 points**
- **Compact, lightweight, hybrid IC construction**

GENERAL DESCRIPTION

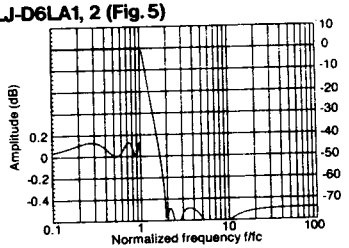
FLJ-D5, and D6 series are lowpass filters that, although compact, have higher order and high attenuation performance. They are Chebyshev type filters. The FLJ-D5LA is a 5-pole filter which has a rolloff of 60 dB/oct and the FLJ-D6LA is a 6-pole filter with a rolloff of 80 dB/oct. The cutoff frequency is programmed with 3-bit, TTL-compatible digital logic and the settings can be changed to 8 different levels. Cut-off frequency range of the lower range type (which has suffix 1) is 10Hz-2kHz, and the higher range type (with suffix 2) is 100Hz-20KHz.

Ripple within the pass band is minimal at 0.13dBp-p and the distortion rate is held extremely low at 0.05%. These filters are optimal as anti-aliasing filters in A/D conversion circuits of data acquisition systems.

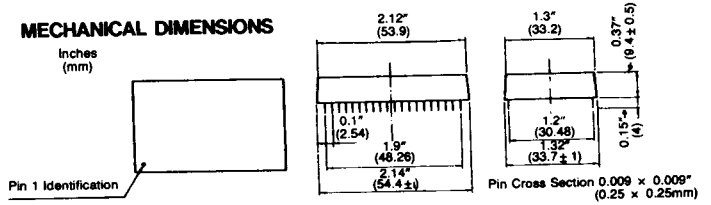
FLJ-D5LA1, 2 (Fig. 4)

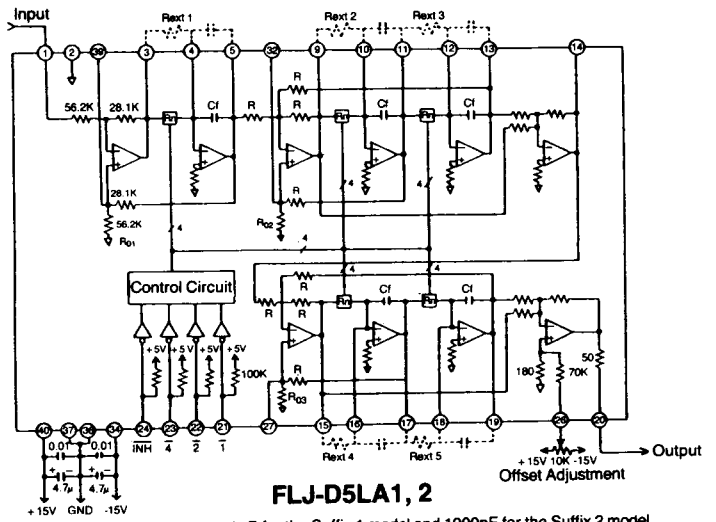


FLJ-D6LA1, 2 (Fig. 5)



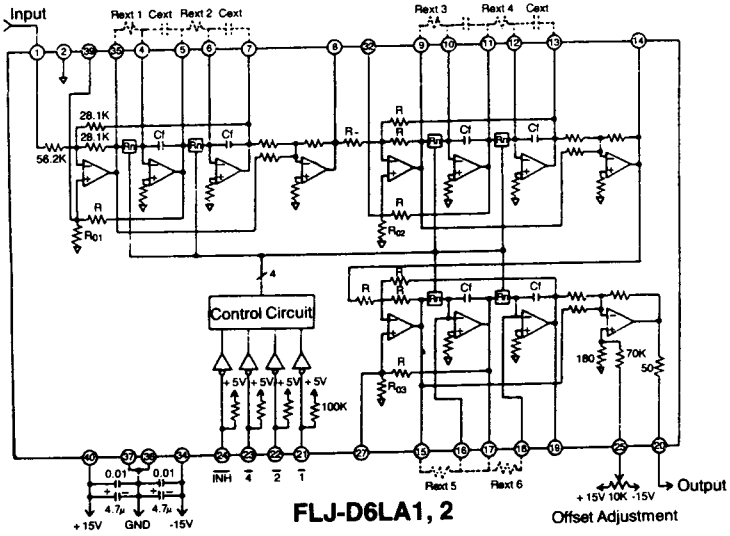
MECHANICAL DIMENSIONS





FLJ-D5LA1, 2

Cf in the diagram is 10000pF for the Suffix 1 model and 1000pF for the Suffix 2 model.



FLJ-D6LA1, 2

Cf in the diagram is 10000pF for the Suffix 1 model and 1000pF for the Suffix 2 model.

SPECIFICATIONS (Table 1)

Typical at 25°C and ±15V supply voltage unless otherwise specified.

ABSOLUTE RATINGS

Supply voltage (±Vs) ..... ±16V
Input voltage ..... ±Vs
Logic input voltage ..... +5.5V

FILTER CHARACTERISTICS, CUTOFF FREQUENCY

Low Range (10, 20, 50, 100, 200, 500, 1K, 2KHz, 8 points programmable, at -3dB)
FLJ-D5LA1 ..... 5-pole Chebyshev
FLJ-D6LA1 ..... 6-pole Chebyshev
High Range (100, 200, 500, 1K, 2K, 5K, 10K, 20KHz, 8 points programmable, at 0dB)
FLJ-D5LA2 ..... 5-pole Chebyshev
FLJ-D6LA2 ..... 6-pole Chebyshev
Setting of Cutoff Frequency ... 3-bit binary, TTL-compatible

Model 1	Model 2	Control TNH	4	2	1
10Hz	100Hz	0	0	0	0
20	200	0	0	0	1
50	500	0	0	1	0
100	1KHz	0	0	1	1
200	2K	0	1	0	0
500	5K	0	1	0	1
1K	10K	0	1	1	0
2K	20K	0	1	1	1

"0": +5V or OPEN
"1": 0V

Accuracy of setting of cutoff frequency ..... ±3%max.

PASS BAND CHARACTERISTICS

Gain	0dB±0.3dBmax. (0.05fc)
Ripple	0.13dBp-p (central designed value)
Distortion rate	0.05%

ROLLOFF CHARACTERISTICS

	FLJ-D5LA1,2	FLJ-D6LA1,2
Rolloff	60dB/oct	80dB/oct
Attenuation volume	60dB (1.82fc)	74dB (1.9fc)
Minimum attenuation	60dB	74dB
Attenuation at 10fc-1MHz	55dBmin.	60dBmin.

INPUT CHARACTERISTICS

Input impedance	50KΩmin.
Maximum input voltage	±10Vmin.

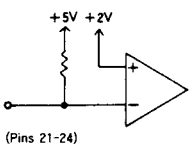
OUTPUT CHARACTERISTICS

Output impedance	100Ωmax.
Maximum output voltage	±10Vmin.
Noise (input shorted)	140μVrms max. (BW10Hz-500KHz)
Offset voltage	10mV adjustable

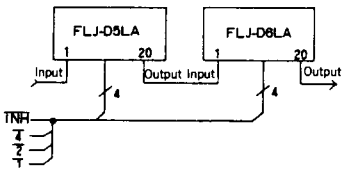
POWER SUPPLY AND ENVIRONMENTAL CONDITIONS

Supply voltage	±15V ±1Vmax.
Power consumption current	±28mA (FLJ-D5), ±33mA (FLJ-D6)
Operating temperature/ Humidity range	-20°C to +70°C, 10%-95%RH
Storage temperature/ Humidity range	-30°C to +80°C, 10%-80%RH

LOGIC INPUT PINS (Fig. 6)



CASCADE WIRING DIAGRAM (Fig. 7)



TECHNICAL NOTES

1. A switching-type power supply is not recommended. Install 0.01 μF multilayer ceramic and 4.7 μF tantalum bypass capacitors in parallel as close to the filter as possible.
2. Each logic input (Pins 21-24) which programs the cutoff frequency has an internal analog comparator as shown in Fig. 6. External logic signals are TTL-compatible.
3. The fc setting input logic is negative true. Terminal open or +5V represents logic "0", while GND level is logic "1". The $\overline{INH}$ terminal is used normally open. Once $\overline{INH}$ is given logic "1", all $\overline{4}$, $\overline{2}$ and $\overline{1}$ logic inputs are inhibited and all internal resistor network switches are opened. The fc setting with external resistors becomes available with logic "1" at this $\overline{INH}$ terminal. The relationship between fc and the external resistors in this case is as follows:

FLJ-D5LA1 (Low Range Type)

$$Rext1 = \frac{31.423 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext2 = Rext3 = \frac{21.399 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext4 = Rext5 = \frac{16.358 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

FLJ-D6LA1 (Low Range Type)

$$Rext1 = Rext2 = \frac{29.622 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext3 = Rext4 = \frac{18.633 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext5 = Rext6 = \frac{15.215 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

FLJ-D5LA2 (High Range Type)

$$Rext1 = \frac{314.23 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext2 = Rext3 = \frac{213.99 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext4 = Rext5 = \frac{163.58 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

FLJ-D6LA2 (High Range Type)

$$Rext1 = Rext2 = \frac{296.22 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext3 = Rext4 = \frac{186.33 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

$$Rext5 = Rext6 = \frac{152.15 \times 10^3}{fc\ (Hz)}\ (K\Omega)$$

4. An 11-pole ultra-high attenuation filter is available once cascaded as shown in Fig. 7. As can be seen from the curves (Figs. 4,5), the amplitude of the ripple in the pass band is reversed between FLJ-D5LA and FLJ-D6LA. As a result, when connected in a cascade, the pass band ripple amplitude is greatly reduced, and moreover, the rolloff becomes steeper.
5. For filters that have been constructed like those in this series, it is not recommended to change the fc setting range with external capacitors. This is because trimming of the internal constants is performed with pairs of internal resistors and capacitors. Although shifting to a lower fc setting range is possible through the addition of external capacitors, in this case a change will result in ripple amplitude.

ORDERING INFORMATION

Low Cutoff Frequency Type (10Hz-2KHz)
FLJ-D5LA1: 60dB/oct., 5-pole
FLJ-D6LA1: 80dB/oct., 6-pole

High Cutoff Frequency Type (100Hz-20KHz)
FLJ-D5LA2 60dB/oct., 5-pole
FLJ-D6LA2: 80dB/oct., 6-pole

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