J-76

Digital millivoltmeter with ICL7107 converter

Parts in set allow building digital millivoltmeter with LED display. Millivoltmeter parameters:

Voltage measurement range:	+/-199,9mV
Measurement rate:	3 readings / second
Linearity:	+/-0,2 digit
Temperature coefficient:	0.2V/K
Converting temperature coefficient:	1pp/K
Noise reduction attenuation:	86dB
Input current:	10pA
Current consumption:	180mA

This circuit is a model of AC converter designed by the company INTERSIL . It can be used as a base to build different measurement tools like voltmeters, ammeters, ohmmeters, thermometers, etc. – in every application where measured signal can be converted to voltage. Millivoltmeter is especially designed for fixed tools with fixed power supply, because of quite big displays current consumption. Circuit is mounted onto one printed circuit board together with display. Before assembly beginning you should carefully check (with ohmmeter) if printed circuit board doesn't have micro short circuits. Assembly should start from soldering copper wire or silver steel cramps. Next you should solder RC components, holder and display. Switching millivoltmeter on should be trouble-free if it was mounted correctly. The only regulation necessary is setting reference voltage by P1 regulator, to be equals 100mV (measured by meter with big input resistance) between REF HI (36) and REF LO (35 ends of ICL7107 integrated circuit. As ICL7107 integrated circuit needs additional 5V voltage, it's generated by simple converter based on 4050 (4049) integrated circuit. After rectification voltage is transferred to 26th pin of US1 chip. (CAUTION! This voltage is about 3.3-3.6V which is enough for correct operation). Checking operation of display control outputs and display itself is possible by connecting TEST (37) pin of ICL7107 and powering for a while. Display should show 1888. Caution! Millivoltmeter can work with basic measurement range of 199,9mV (parts in package). You can also change measurement range to 1,999V. To do so, solder 47nF capacitor instead of C3 capacitor, 470k resistor instead of R4 resistor and 2k resistor instead of R2 resistor and set reference voltage to 1V in the same way as for 199,9mV range.
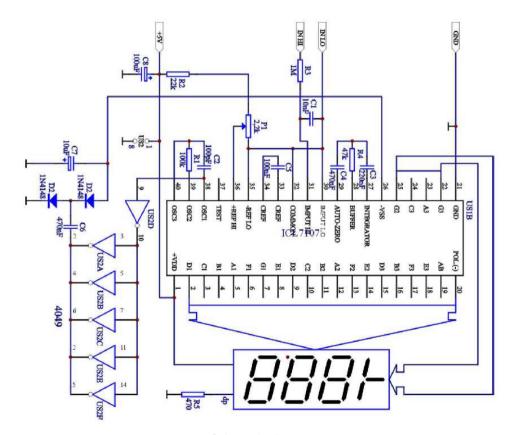
WHEN HI AND LO INPUTS ARE SHORTENED, THE DISPLAY SHOULD SHOW 000,0 AND "-" SIGN SHOULD APPEAR FROM TIME TO TIME.

ICL7197 integrated circuit is very sensitive for static electricity. It should be kept in aluminum film or conductive sponge after taking out from the holder.
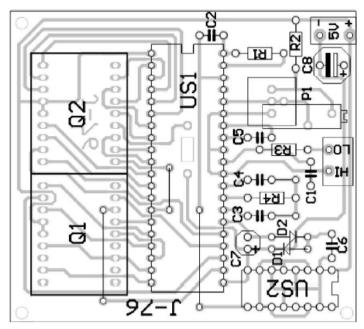
Millivotmeter needs stabilized powering voltage 5V/200mA.

Package contains:

US1	....	ICL7107	R1	....	100k
US2	....	4050 or 4049	R2	....	22k
D1,D2	....	1N4148	R3	....	1M
C1	....	10nF	R4	....	47k
C2	....	100pF	R5		470
C3	....	220nF	P1	....	HELITRIM 2,2k
C4,C6	....	470nF	PRINTED CIRCUIT BOARD		
C5	....	100nF	DIP40 HOLDER		
C7	....	10F	CAUTION! R5 RESISTOR MUST BE MOUNTED		
C8	....	100F	FROM PATHS SIDE		
Q1,Q2	....	DISPLAY			

Schematic diagram

Assembly diagram