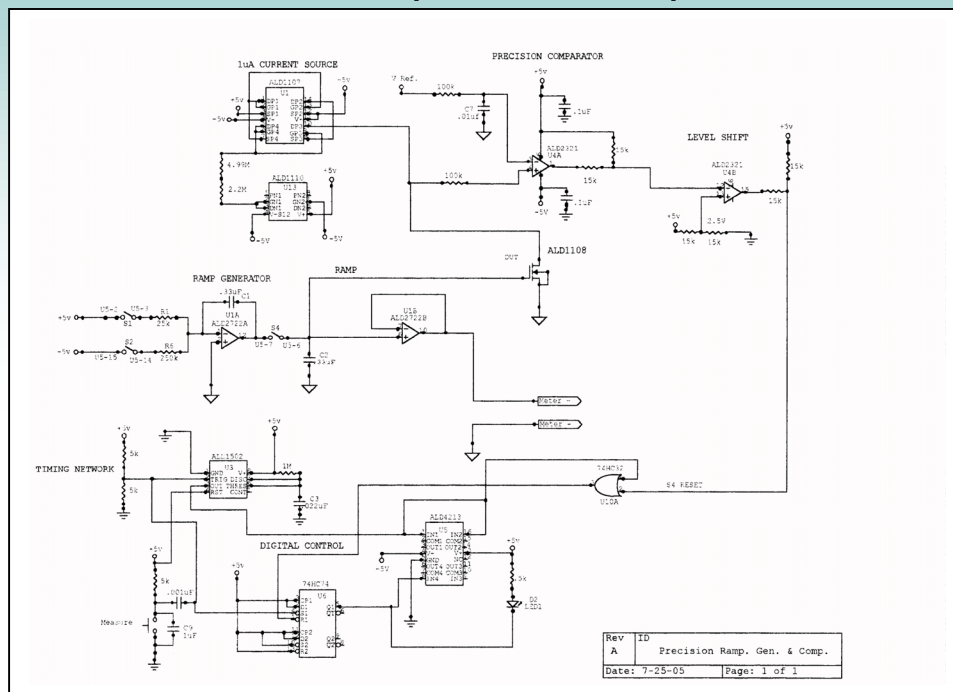


Precision Ramp Generator & Comparator



Description

This circuit generates a precision linear ramp from $-5V$ to $+5V$ that could be stopped within $1mV$ of the DUT (device under test) desired output. The DUT in this example is the ALD1108 MOSFET. The V_{GS} voltage of this device is defined as that gate voltage at which the drain current is $1\mu A$ and the drain voltage is at $100mV$. The challenge in this case is to measure that gate voltage V_{GS} at which $V_{DS}=100mV$ and drain current $I_{DS}=1\mu A$ simultaneously. This is accomplished by using a precision current source that supplies a calibrated $1\mu A$ to the drain of the DUT while setting up a precision comparator to continuously comparing the drain voltage V_{DS} to that of a precision reference voltage set at $100mV$. When the ramp voltage increments from $V=-5V$, it charges the holding capacitor $C2$, and V_{GS} measurement accuracy is determined by the accuracy and response time of the comparator and the time it takes to subsequently control the logic and open the analog switch to stop the ramp generator. The comparator selected has an input offset voltage specification of $0.2mV$. The current source accuracy, the comparator Input Reference voltage accuracy, the input offset voltage of the buffer operational amplifier and the precision of the readout meter all contribute to the measurement error terms. Last but not least, the value as well as the quality of the holding capacitor $C2$, the leakage currents surrounding this $C2$ node has direct impact on the leakage currents and the accuracy of the readout. In general, the actual reading using a high precision external DVM as a readout meter can be obtained within a second or less at a total error of less than $1mV$. A high quality $C2$ such as a low leakage polypropylene type can retain the measured voltage for well over a minute without additional errors due to internal leakage currents.

Recommended Components

ALD2321 for voltage comparator; ALD1107 and ALD1110 for current source; ALD2722 for buffer amplifier and ramp generator; ALD4213 for analog switch; ALD1502 for timing network function

Other Related Circuit Ideas

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