Design of Measurement of Common Electric Parameters in Memory Oscillograph

Song, Yue Zhou, Minghui Lei, Ruiping Tai, Aiqun

Abstract: To meet the requirements of high precision measurement of electric parameters in the design of memory oscillograph, a 24 bit AD chip ADS1211 was used to realize the five and a half bits high precision multimeter, equal precision and gate count technology were applied for common counter measure on FPGA, experiments showed the design was feasible, its system design plan was discussed, design thought and practice method of ADS1211 and FPGA were given mainly in the paper.

Key words: Measurement of Electric Parameters; ADS1211; Multimeter; Common Counter; FPGA

![示波表结构框图](Image 297x483 to 514x629)

图 1 示波表结构框图

(1) A, B 通道示波表数据采集
- FPGA 通用计数器样控制
- 存储器模块
- 存储器控制
- 系统接口
- 字符显示
- 万用表转换
- 测量输入
- 多路开关
- 至从 μP ARM&MCU

ADS1211 :ADS1211; FPGA :TP274; TM5935 :A
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(2) \( \mu \) P 2105 ARM \( \mu \) P, MCU 89C51R2 \( \mu \) P, ARM \( \mu \) P, MCU
10MHz \( \mu \) P, FIFO, FIFO

(3) \( \mu \) P 536, FPGA EPIC6 \( \mu \) P, FPGA\( \mu \) P, \( \mu \) P, \( \mu \) P

(4) \( \mu \) P, FPGA EPIC6 \( \mu \) P, FPGA\( \mu \) P, \( \mu \) P, \( \mu \) P

(5) \( \mu \) P, FPGA EPIC6 \( \mu \) P, FPGA\( \mu \) P, \( \mu \) P, \( \mu \) P

(6) \( \mu \) P, FPGA EPIC6 \( \mu \) P, FPGA\( \mu \) P, \( \mu \) P, \( \mu \) P

10Hz \( \mu \) P, \( \mu \) P, \( \mu \) P, \( \mu \) P, \( \mu \) P

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图2 信号输入电路
1000Hz，16位
AD637
AD637
AD637
... AOW214... MAX232
PDUSB50
MAX6161
+5V
MAX6325 ADS1211 +2.5V AINP
MAX6325 1ppm

图3 与MCU接口电路

表1 T_{ph}, f_{e} 关系表

<table>
<thead>
<tr>
<th>f_{e} (Hz)</th>
<th>T_{ph} (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt; f_{e} &lt; 2</td>
<td>1.2</td>
</tr>
<tr>
<td>2&lt; f_{e} &lt; 4</td>
<td>0.6</td>
</tr>
<tr>
<td>4&lt; f_{e} &lt; 8</td>
<td>0.3</td>
</tr>
<tr>
<td>8&lt; f_{e} &lt; 16</td>
<td>0.15</td>
</tr>
<tr>
<td>16&lt; f_{e} &lt; 10^3</td>
<td>0.075</td>
</tr>
</tbody>
</table>

表2 实验代表数据

<table>
<thead>
<tr>
<th>电</th>
<th>频率表</th>
</tr>
</thead>
<tbody>
<tr>
<td>参考电压</td>
<td>测量值</td>
</tr>
<tr>
<td>5.000000</td>
<td>4.999997</td>
</tr>
<tr>
<td>2.300000</td>
<td>2.899997</td>
</tr>
<tr>
<td>5.100000</td>
<td>5.159996</td>
</tr>
<tr>
<td>-0.04370</td>
<td>-0.043635</td>
</tr>
<tr>
<td>-0.600000</td>
<td>-0.600001</td>
</tr>
<tr>
<td>-5.000000</td>
<td>-4.99996</td>
</tr>
</tbody>
</table>

MCU JIEKOU MCU JIEKOU MCU JIEKOU MCU JIEKOU JIEKOU}

3 FPGA

@EKP


Author brief introduction: Song Yue, male, was born in 1963, professor, the director of Master’s degree candidates. His researching work is focusing on the electric circuit and system, electronics apparatus and devices.

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