# READ：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| reg. No. | variable | | function | spi\_add | number | Is used |
| 0 | CHA\_RUN\_REG | | 当前操作的那个通道 | 0 | 1 | N |
| 1 | CHA\_STA\_REG | | 通道状态存器 | 1 | =CN | Y |
| 2 | DAT\_LEN\_H | | 通道数据长度寄存器高字节 | 2 | =CN | Y |
| 3 | DAT\_LEN\_L | | 通道数据长度寄存器低字节 | 3 | =CN | Y |
| 4 | DAT\_MAX\_REG | | 上次采集的**峰值** | 4 | =CN | N |
| 5 | DAT\_AVR\_REG | | 上次采集的**均值** | 5 | =CN | N |
| 6 | SYN\_FRE\_REG | | 保留 | 6 | =CN | N |
| 7 | CHA\_DAT\_ITR | | 保留 | 7 | =CN | N |
| 8 | ONE\_SECOND\_CNT\_H [31:16] | | FPGA对1S时间计数的高16bit | 8 |  |  |
| 9 | ONE\_SECOND\_CNT\_L[15:0] | | FPGA对1S时间计数的低16bit | 9 |  |  |
| 10 | CHA0\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_H [31:16] | | 通道0故障原始波形距离秒脉冲的时钟计数高16bit | 10 |  |  |
| 11 | CHA0\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_L [15:0] | | 通道0故障原始波形距离秒脉冲的时钟计数低16bit | 11 |  |  |
| 12 | CHA1\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_H [31:16] | | 通道1故障原始波形距离秒脉冲的时钟计数高16bit |  |  |  |
| 13 | CHA1\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_L [15:0] | | 通道1故障原始波形距离秒脉冲的时钟计数低16bit |  |  |  |
| 14 | fpga\_version | | FPGA版本信息16bit\*32 |  |  |  |
| 15 | fpga\_read\_test\_reg | | 固定为0x1357 |  |  |  |
|  |  | |  |  |  |  |
|  | | Channel number=CN | | | | |

Reg0: CHA\_RUN\_REG (16Bit) 显示操作那个通道【FPGA内部只有一个】

Bit4:清除高频通道0数据有效指令。STM32通过往bit4写1通知FPGA高频通道0的数据已读完，FPGA收到该指令后会将高频通道0相关标志位清0，准备抓取下一个异常波形，bit4置位后会自动清零，无需单片机程序清零。

Bit5:清除高频通道1数据有效指令。STM32通过往bit5写1通知FPGA高频通道1的数据已读完，FPGA收到该指令后会将高频通道1相关标志位清0，准备抓取下一个异常波形，bit5置位后会自动清零，无需单片机程序清零。

Reg1：CHA\_STA\_REG（16Bit）通道状态寄存器【FPGA内部针对每个通道都有一个】

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CRA\_NUM | | | | | | | | | | | |  | IDLE | INT | OVER |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| 保留 | | | | | | | | | | | |  |  | 1/0 | 保留 |

INT:Bit1,表示该通道是否抓取到异常波形，如果抓取到异常波形该寄存器为1，对于通道0，STM通过往寄存器CHA\_RUN\_REG的Bit4写1清除该标志；对于通道1，STM通过往寄存器CHA\_RUN\_REG的Bit5写1清除该标志。（注意STM32要将通道数据读完才能将该标志清除，一旦该标志被清除，FPGA缓存的异常数据可能会被新的数据清掉）

Reg2：DAT\_LEN\_H (16Bit)通道数据长度寄存器高字节【FPGA内部针对每个通道都有一个】

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DAT\_LEN\_HIGH:数据长度高字节 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| 该版本硬件缓存只有8M字节，所以数据长度高字节最大为0x80,后续版本可能突破该限制。 | | | | | | | | | | | | | | | |

Reg3：DAT\_LEN\_L (16Bit)通道数据长度寄存器低字节【FPGA内部针对每个通道都有一个】

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DAT\_LEN\_LOW:数据长度低字节 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|  | | | | | | | | | | | | | | | |

Reg4：DAT\_MAX\_REG（16Bit）上次采集的峰值(峰-峰值的峰值) 【FPGA内部针对每个通道都有一个】

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DAT\_MAX: 上次采集的峰值 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| 该版本硬件AD分辨率最高为12位，所以B12、B13、B14、B15应该永远为0 | | | | | | | | | | | | | | | |

Reg5：DAT\_AVR\_REG（16Bit）上次采集的均值(峰-峰值的均值) 【FPGA内部针对每个通道都有一个】

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DAT\_MAX: 上次采集的均值 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|  | | | | | | | | | | | | | | | |

Reg6：保留

Reg7: 保留

Reg8: （16Bit） ONE\_SECOND\_CNT\_H [31:16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FPGA以100M的时钟对1S计数，该寄存器位计数的高16bit | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg9: （16Bit） ONE\_SECOND\_CNT\_L[15:0]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FPGA以100M的时钟对1S计数，该寄存器位计数的低16bit | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg10: CHA0\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_H [31:16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 通道0故障原始波形距离秒脉冲的时钟计数高16bit | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg11: CHA0\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_L [15:0]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 通道0故障原始波形距离秒脉冲的时钟计数低16bit | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg12: CHA1\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_H [31:16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 通道1故障原始波形距离秒脉冲的时钟计数高16bit | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg13: CHA1\_CLK\_CNT\_FROM\_ONE\_SECOND\_PLUS\_L [15:0]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 通道1故障原始波形距离秒脉冲的时钟计数低16bit | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg14: （16Bit） fpga\_version

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 读数据接口：ARM通过该寄存器读取fpga程序版本，单片机连续读该寄存器32次，读到32个16bit数据，得到完整fpga程序版本信息，fpga代码暂时不支持 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Reg15: 测试寄存器

该寄存器固定为0x1357,供STM32测试与FPGA的SPI接口是否正常。

# WRITE：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| reg. No. | variable | function | Fsmc\_addr | Num. | used |
| 0 | CHA\_RUN\_REG | 决定操作那个通道 | 0000 | 1 | Y |
| 1 | DAT\_THR\_REG | 通道异常判决门限 |  | CN | Y |
| 2 | SAM\_CYC\_REG | 保留 |  | CN | N |
| 3 | SAM\_CTR\_REG | 保留 |  | 1 | N |
| 4 | ONE\_PHA\_DATNUM\_REG | 保留 |  | CN | N |
| 5 | AD\_BPS\_REG | 保留 |  |  | N |
| 6 | CHANGE\_RATE\_THR | 通道变化率门限 |  | CN | Y |
| 7 | RESET\_INT\_REG | 保留 | 0111 |  |  |
| 8 | START\_SAMPLE\_REG |  | 1000 |  |  |
| 9 | write\_m25p64\_reg | 保留 |  |  |  |
| 10 | FILTER\_START\_REQUENCY | 保留 |  |  |  |
| 11 | FILTER\_STOP\_REQUENCY | 保留 |  |  |  |
| 12 | utc [31:16] | 保留 |  |  |  |
| 13 | utc [15:0] | 保留 |  |  |  |
| 14 |  |  |  |  |  |
| 15 | fpga\_ctrl0 | 保留 |  |  |  |
|  |  |  |  |  |  |

Reg0: (16Bit) 决定操作那个通道【FPGA内部只有一个】CHA\_RUN\_REG

Bit4:清除高频通道0数据有效指令。STM32通过往bit4写1通知FPGA高频通道0的数据已读完，FPGA收到该指令后会将高频通道0相关标志位清0，准备抓取下一个异常波形，bit4置位后会自动清零，无需单片机程序清零。

Bit5:清除高频通道1数据有效指令。STM32通过往bit5写1通知FPGA高频通道1的数据已读完，FPGA收到该指令后会将高频通道1相关标志位清0，准备抓取下一个异常波形，bit5置位后会自动清零，无需单片机程序清零。

Reg1: (16Bit) 通道门限【FPGA内部针对每个通道都有一个】DAT\_THR\_REG

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 通道门限，FPGA判决异常的门限。 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|  | | | | | | | | | | | | | | | |

Reg2:保留

Ｒeg3: 保留

Reg4: 保留

Reg6: (16Bit) 通道变化率门限【FPGA内部针对每个通道都有一个】CHANGE\_RATE\_THR

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 通道门限，FPGA判决异常的变化率门限。 | | | | | | | | | | | | | | | |
| B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|  | | | | | | | | | | | | | | | |

Reg7: 保留