MD14_PowerDown_Retention_ram

版本：

Config Tool Version：2.7.6

MD1x SDK version：1.3.1

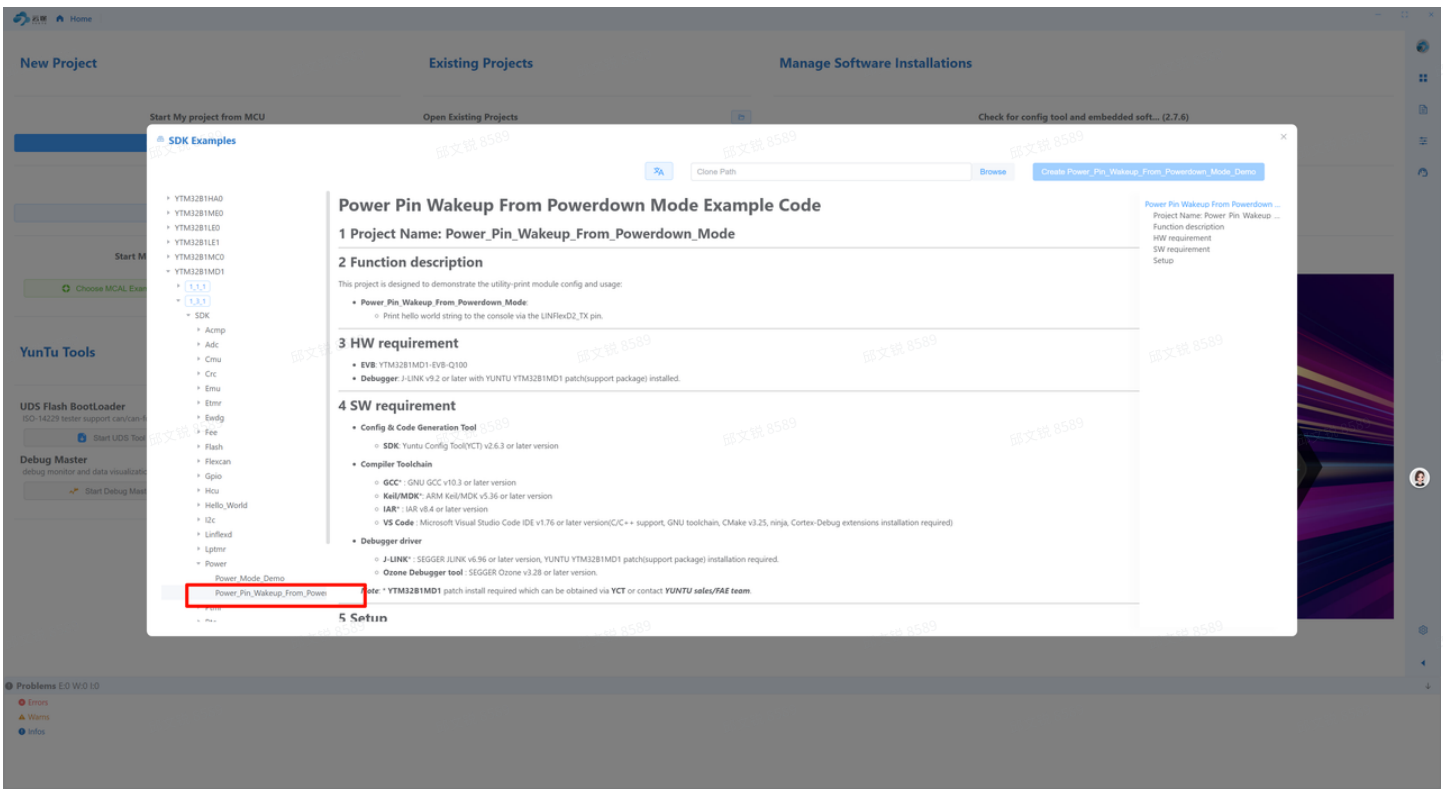
前言：

云途MD，ME系列有PowerDown下唤醒RAM保持的功能（retention_ram）。MD和ME的retention_ram都在整片RAM的中间。所以如果把retention_ram这段分出来，就会把主RAM分割为两段，主RAM和RAM1，就需要把分割出来的RAM1像主RAM一样利用起来。

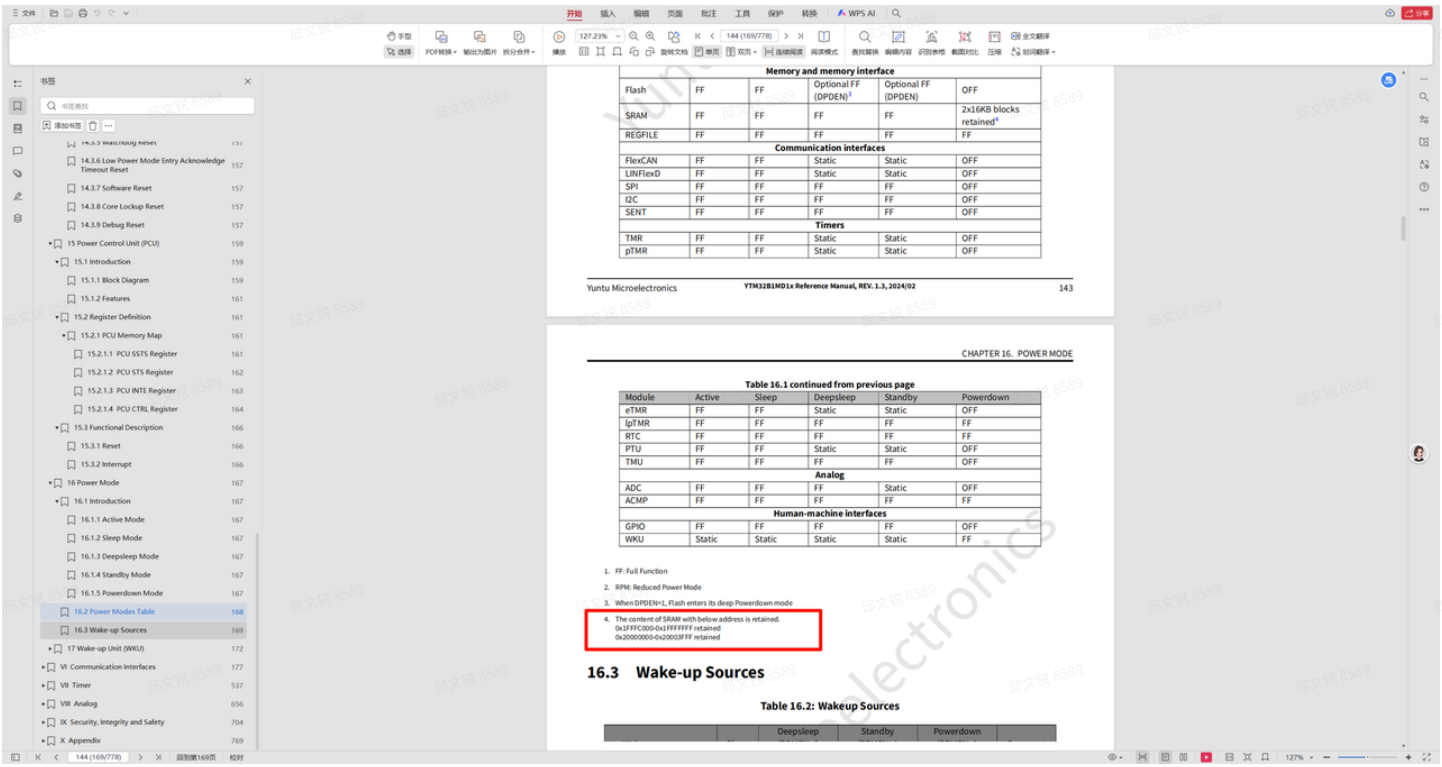
本文将简述云途YTM32B1MDx系列PowerDown下唤醒RAM保持，并且分割出来的RAM1像主RAM一样利用起来的实现过程及使用方法。ME系列可参考本文。

1. retention_ram

1. 工程基于MD14的SDK Power_Pin_Wakeup_From_Powerdown_Mode_Demo修改



2. YT_Link配置一段retention_ram,将剩余的RAM空间利用起来。MD14的retention_ram区域如下：



Memory and memory interface					
Flash	FF	FF	Optional FF (DPDEN)[3]	Optional FF (DPDEN)	OFF
SRAM	FF	FF	FF	FF	2x16KB blocks retained[4]
REGFILE	FF	FF	FF	FF	FF
Communication interfaces					
FlexCAN	FF	FF	Static	Static	OFF
LINFlexD	FF	FF	Static	Static	OFF
SPI	FF	FF	FF	FF	OFF
I2C	FF	FF	FF	FF	OFF
SENT	FF	FF	FF	FF	OFF
Timers					
TMR	FF	FF	Static	Static	OFF
pTMR	FF	FF	Static	Static	OFF

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CHAPTER 16. POWER MODE

Table 16.1 continued from previous page

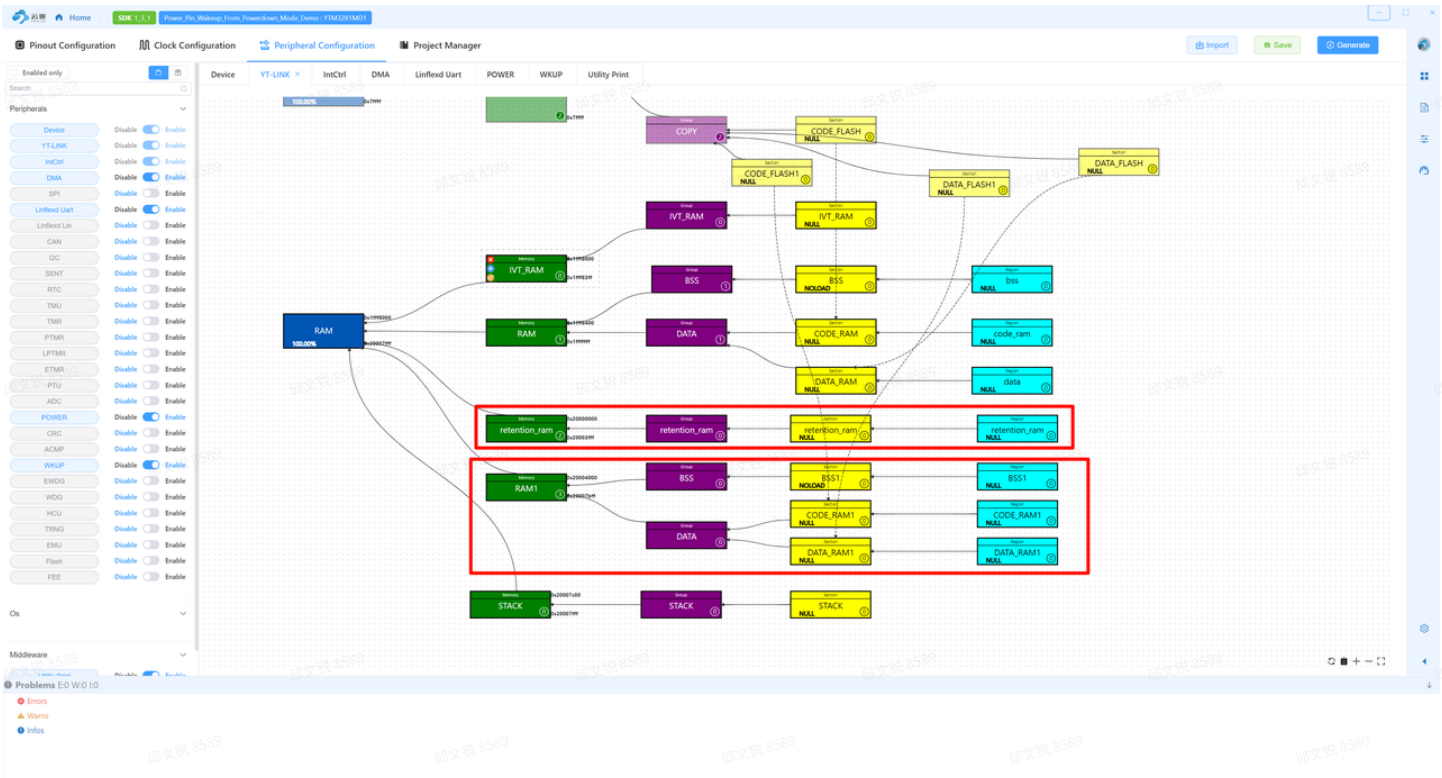
Module	Active	Sleep	Deepsleep	Standby	Powerdown
eTMR	FF	FF	Static	Static	OFF
lpTMR	FF	FF	FF	FF	FF
RTC	FF	FF	FF	FF	FF
PTU	FF	FF	Static	Static	OFF
TMU	FF	FF	FF	FF	OFF
Analog					
ADC	FF	FF	FF	Static	OFF
ACMP	FF	FF	FF	FF	FF
Human-machine interfaces					
GPIO	FF	FF	FF	FF	OFF
WKU	Static	Static	Static	Static	FF

1. FF: Full Function
2. RPM: Reduced Power Mode
3. When DPDEN=1, Flash enters its deep Powerdown mode
4. The content of SRAM with below address is retained.
   0x1FFFC000-0x1FFFFFFF retained
   0x20000000-0x20003FFF retained

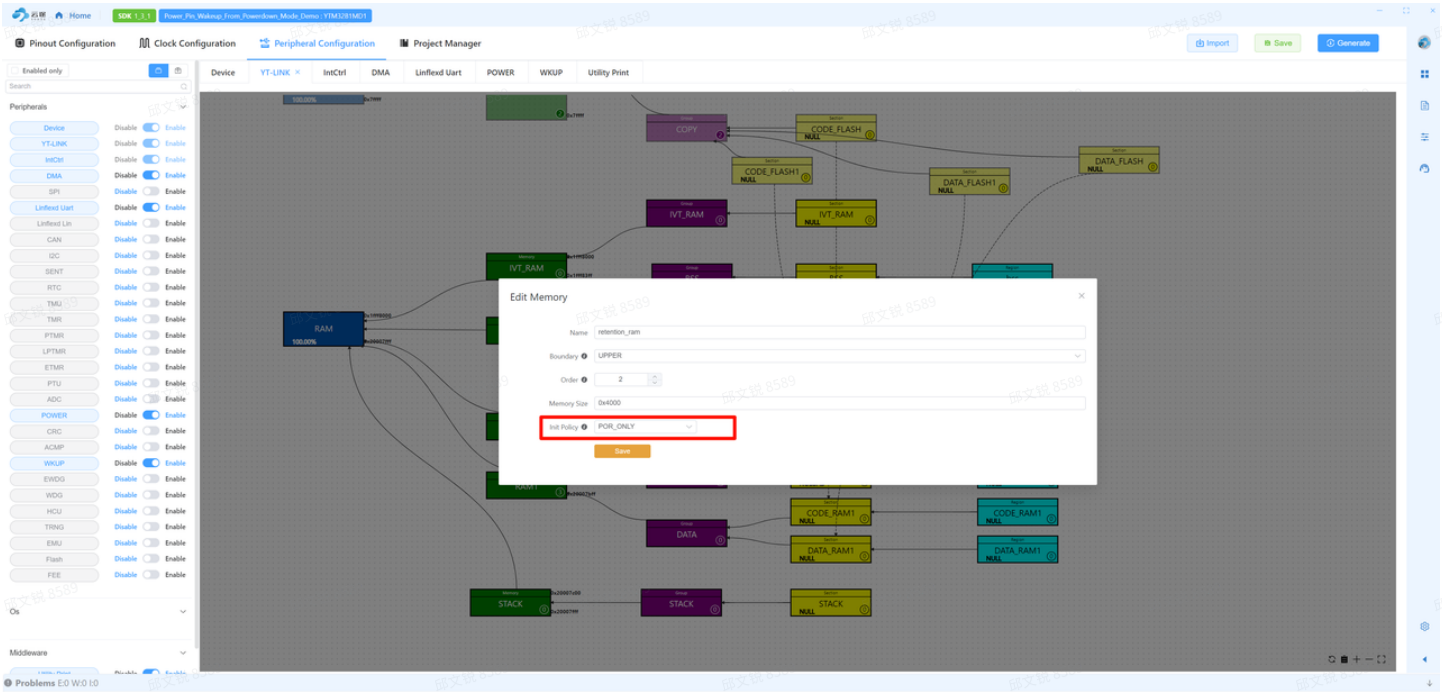
16.3 Wake-up Sources

Table 16.2: Wakeup Sources

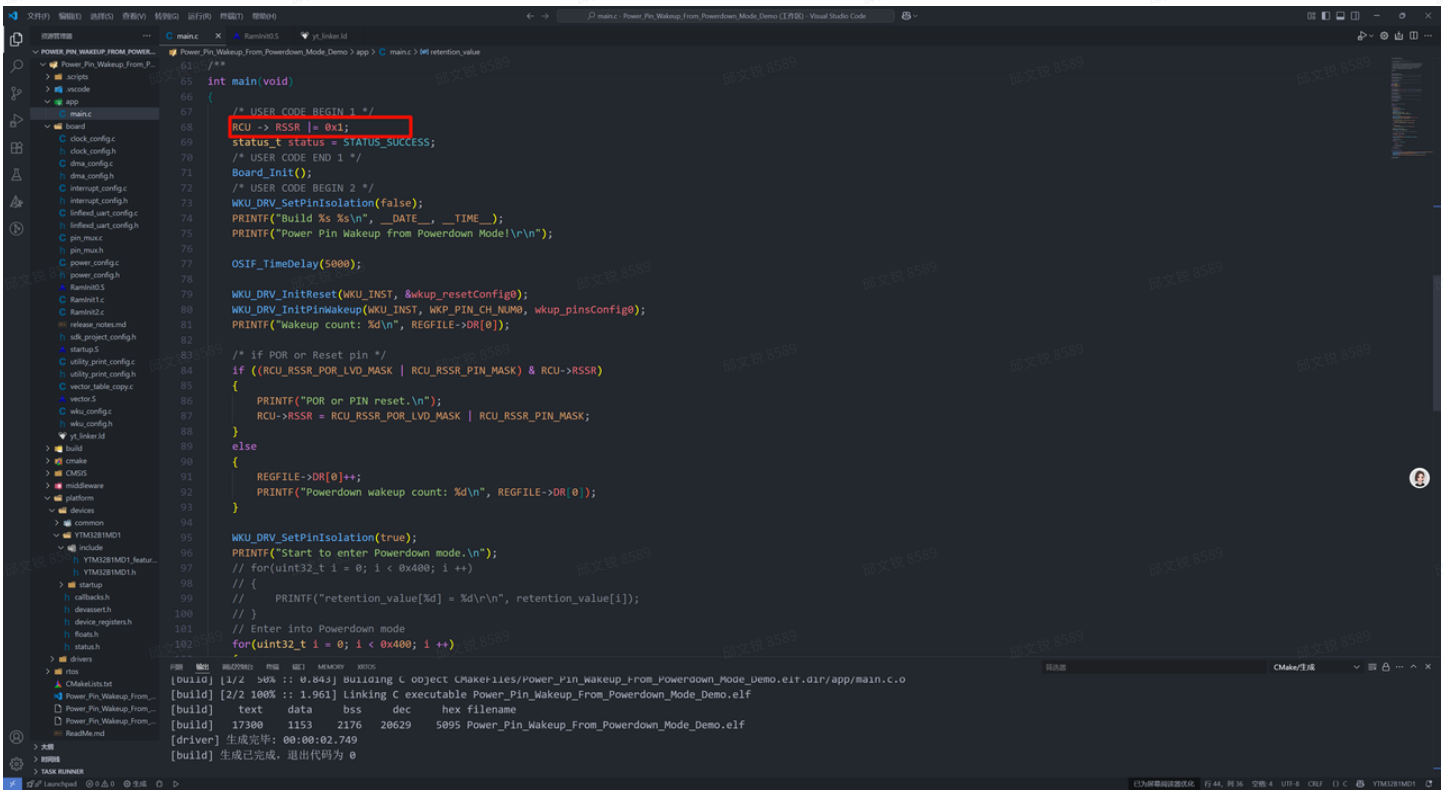
	Deepsleep	Standby	Powerdown



同时配置这段RAM为POR_ONLY，确保其Powerdown唤醒不被初始化，实现变量保持的功能。



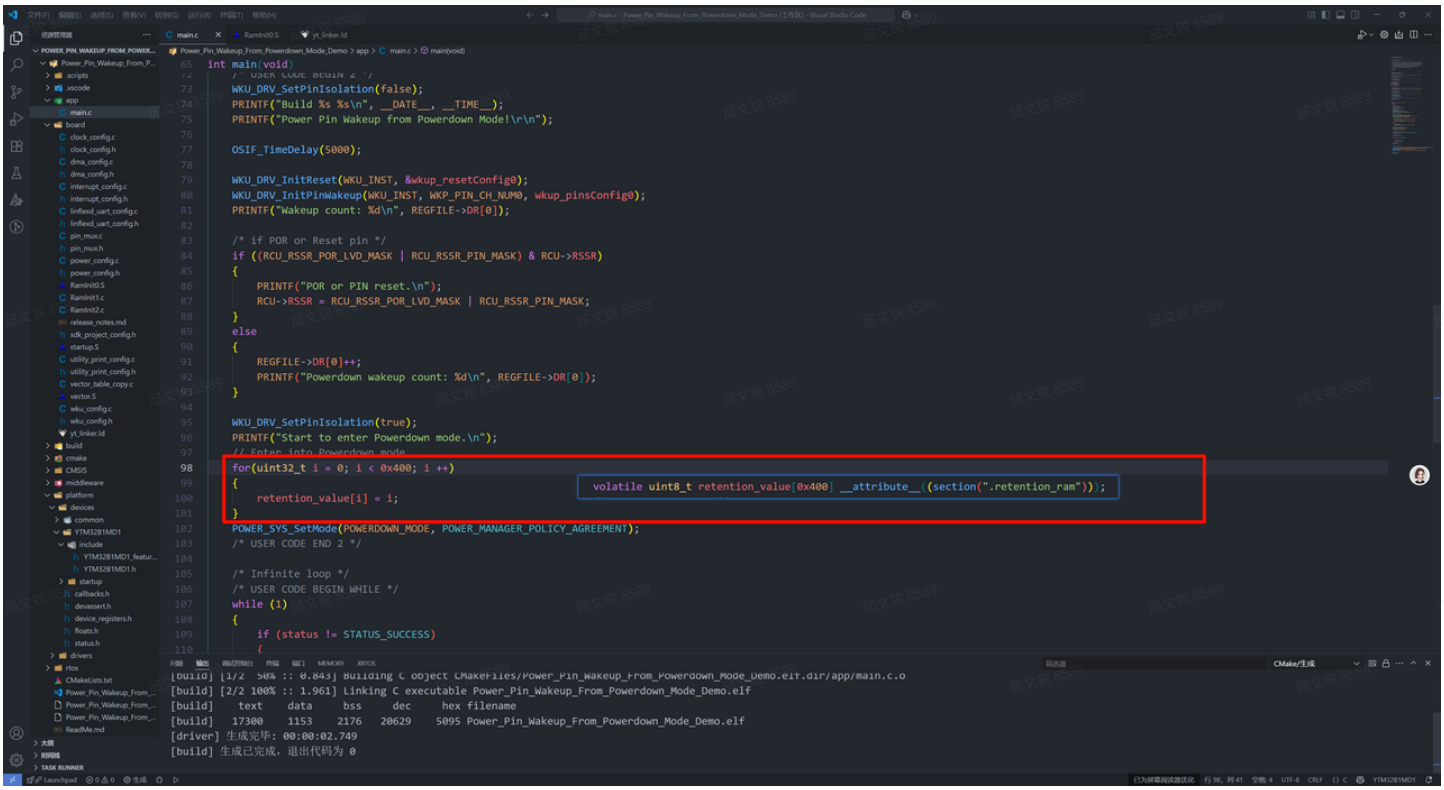
3. 在程序中清除RCU上电复位标志位，保证PowerDown唤醒后retenram_ram不会重复初始化：



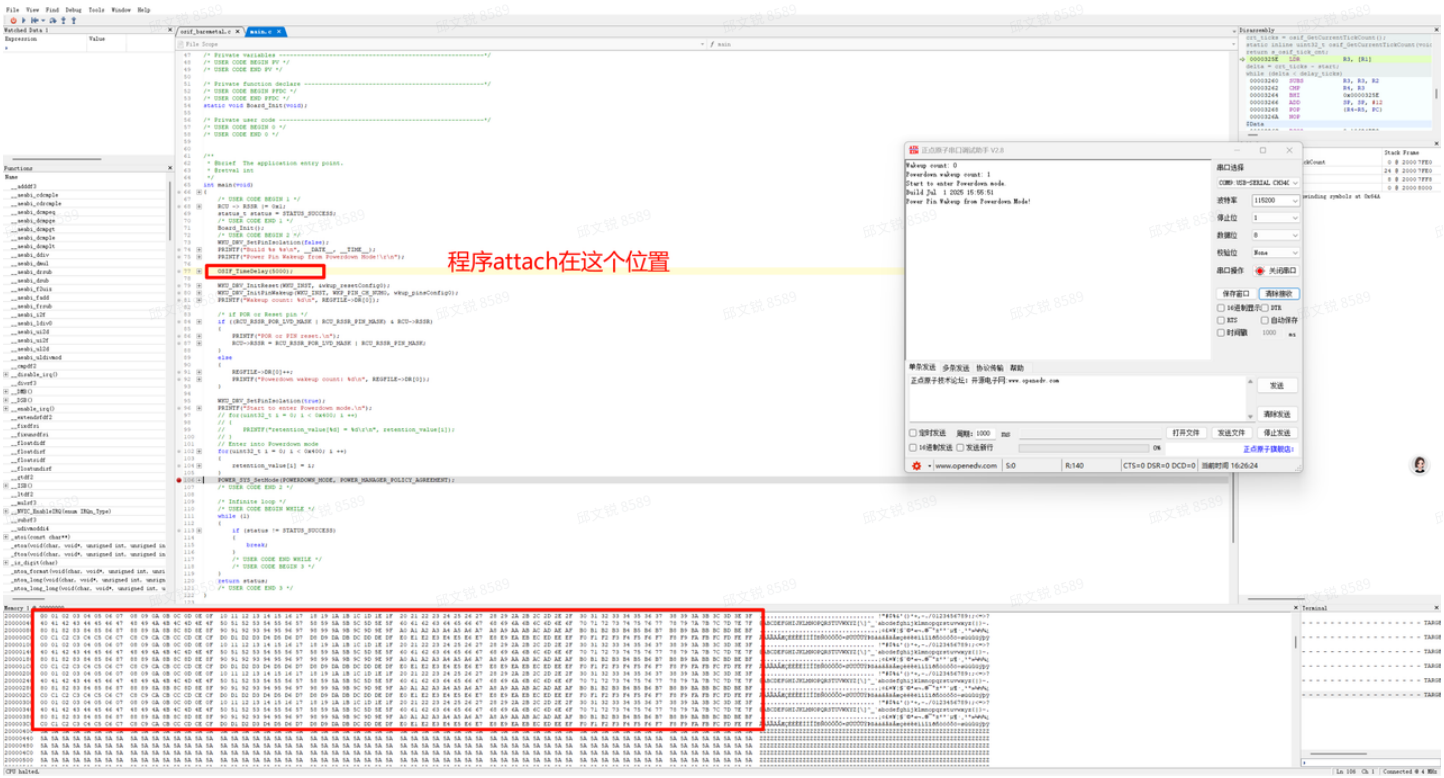
```
/**
int main(void)
{
    /* USER CODE BEGIN 1 */
    RCU -> RSSR |= 0x1;
    status_t status = STATUS_SUCCESS;
    /* USER CODE END 1 */
    Board_Init();
    /* USER CODE BEGIN 2 */
    WKU_DRV_SetPinIsolation(false);
    PRINTF("Build %s %s\n", __DATE__, __TIME__);
    PRINTF("Power Pin Wakeup from Powerdown Mode!\r\n");

    OSIF_TimeDelay(5000);

    WKU_DRV_InitReset(WKU_INST, &wkup_resetConfig0);
    WKU_DRV_InitPinWakeup(WKU_INST, WKP_PIN_CH_NUM0, wkup_pinsConfig0);
    PRINTF("Wakeup count: %d\n", REGFILE->DR[0]);

    /* if POR or Reset pin */
    if ((RCU_RSSR_POR_LVD_MASK | RCU_RSSR_PIN_MASK) & RCU->RSSR)
    {
        PRINTF("POR or PIN reset.\n");
        RCU->RSSR = RCU_RSSR_POR_LVD_MASK | RCU_RSSR_PIN_MASK;
    }
    else
    {
        REGFILE->DR[0]++;
        PRINTF("Powerdown wakeup count: %d\n", REGFILE->DR[0]);
    }

    WKU_DRV_SetPinIsolation(true);
    PRINTF("Start to enter Powerdown mode.\n");
    // for(uint32_t i = 0; i < 0x400; i ++)
    // {
    //     PRINTF("retention_value[%d] = %d\r\n", retention_value[i]);
    // }
    // Enter into Powerdown mode
    for(uint32_t i = 0; i < 0x400; i ++)
```

```
[build] [2/2 100% :: 1.961] Linking C executable Power_Pin_Wakeup_From_Powerdown_Mode_Demo.elf
[build]    text    data     bss     dec     hex filename
[build]   17300    1153    2176   20629    5095 Power_Pin_Wakeup_From_Powerdown_Mode_Demo.elf
[driver] 生成完毕: 00:00:02.749
[build] 生成已完成，退出代码为 0
```

4. 在进入PowerDown之前给测试数组赋值，按键唤醒后查看这段数组的内存：

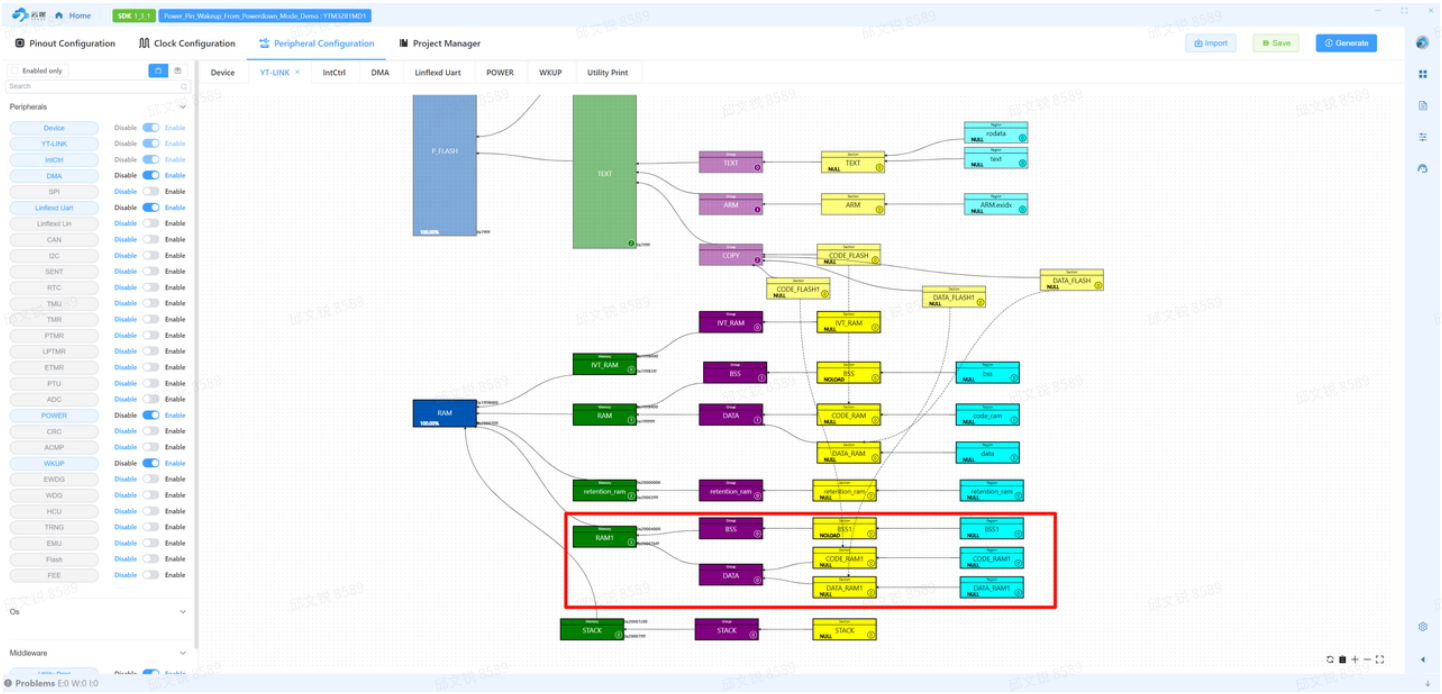


5. 测试，程序下载后等5s进入Powerdown，按下按键2唤醒后attach，查看0x20000000这段内存，实测可以保持

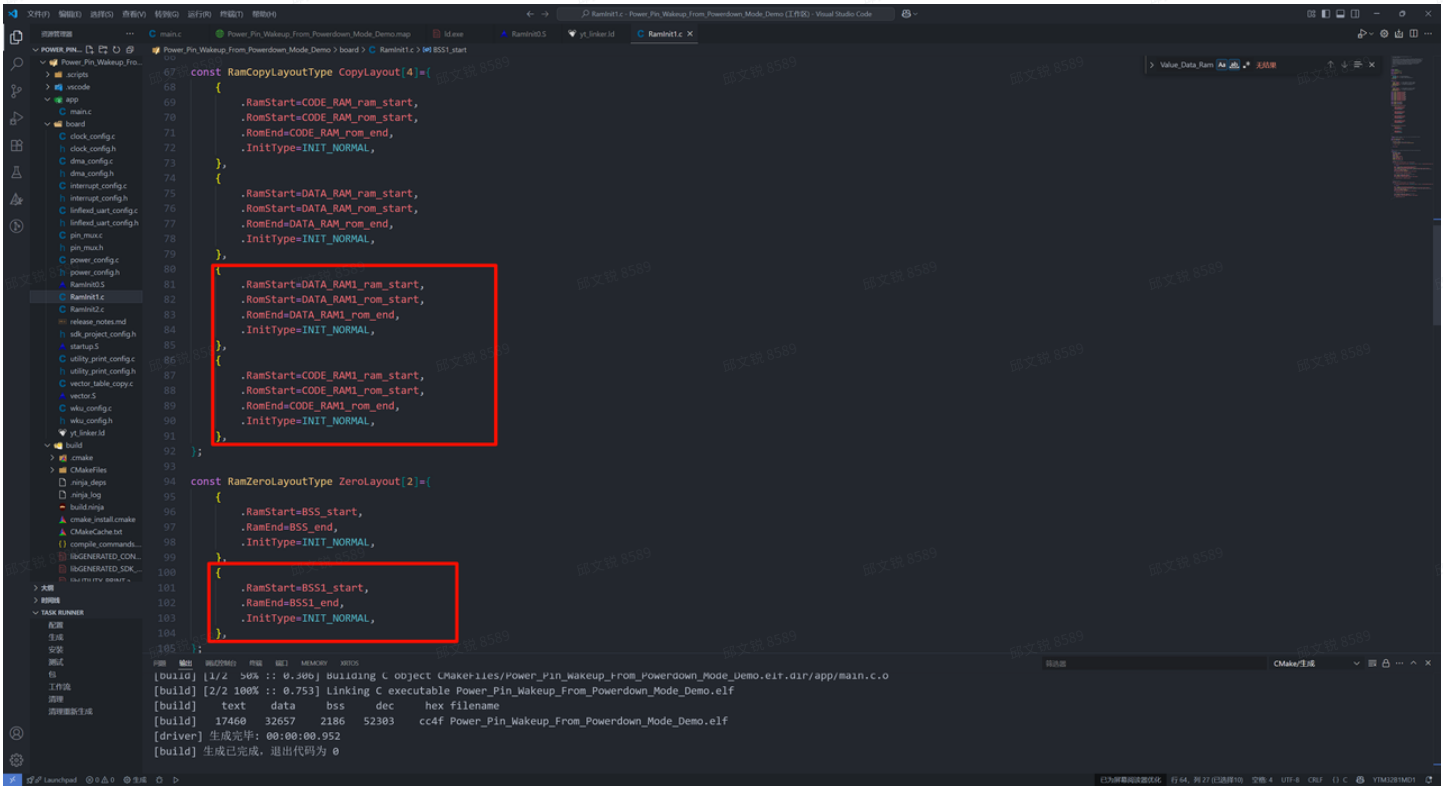


2. 将RAM1利用起来

如下图所示将RAM1像主RAM一样分段，包含BSS,CODE_RAM,DATA_RAM.并且设置COPY_From属性



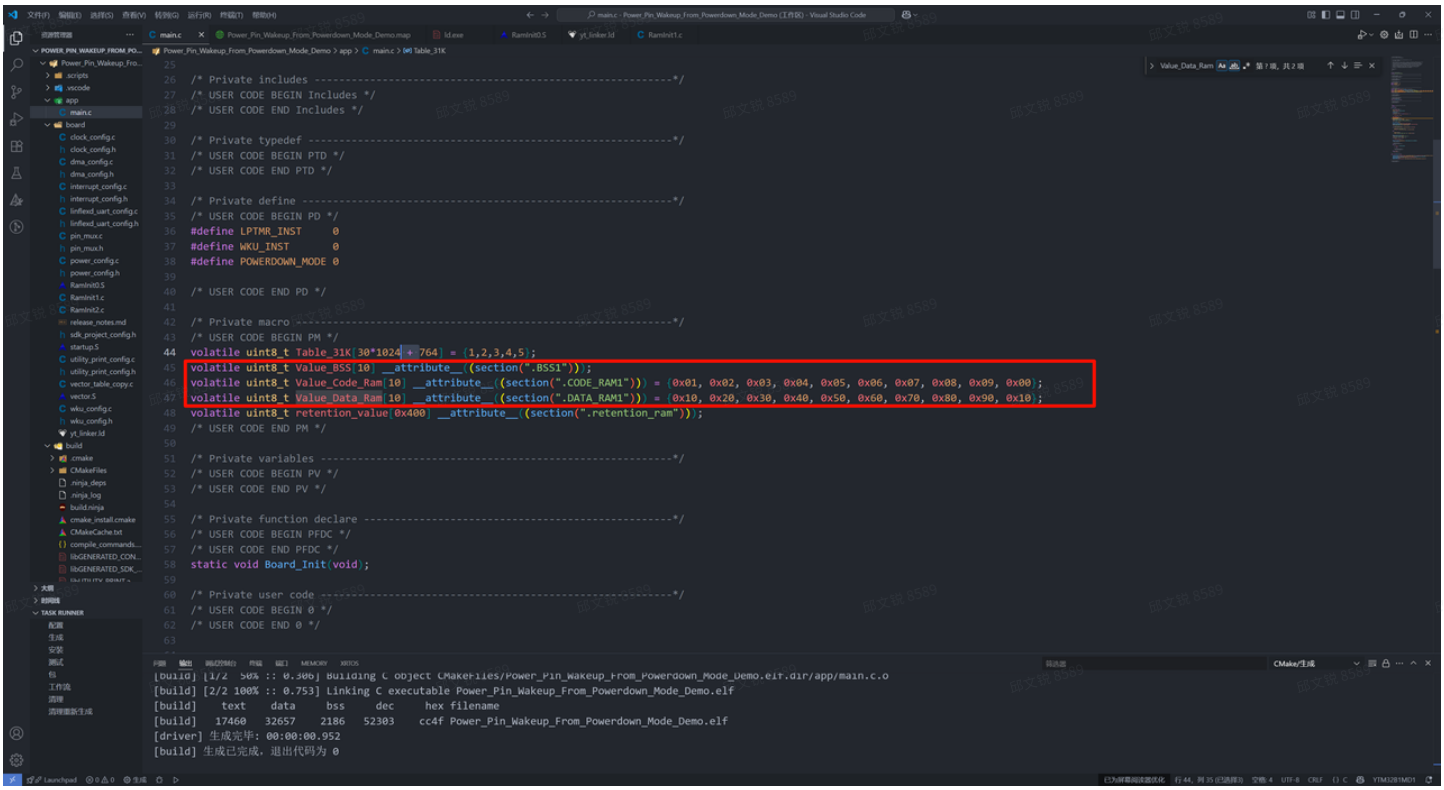
在Ram_Init1文件里可以看到增加了三个RAM1的初始化段，可以实现和主ram一样的功能。

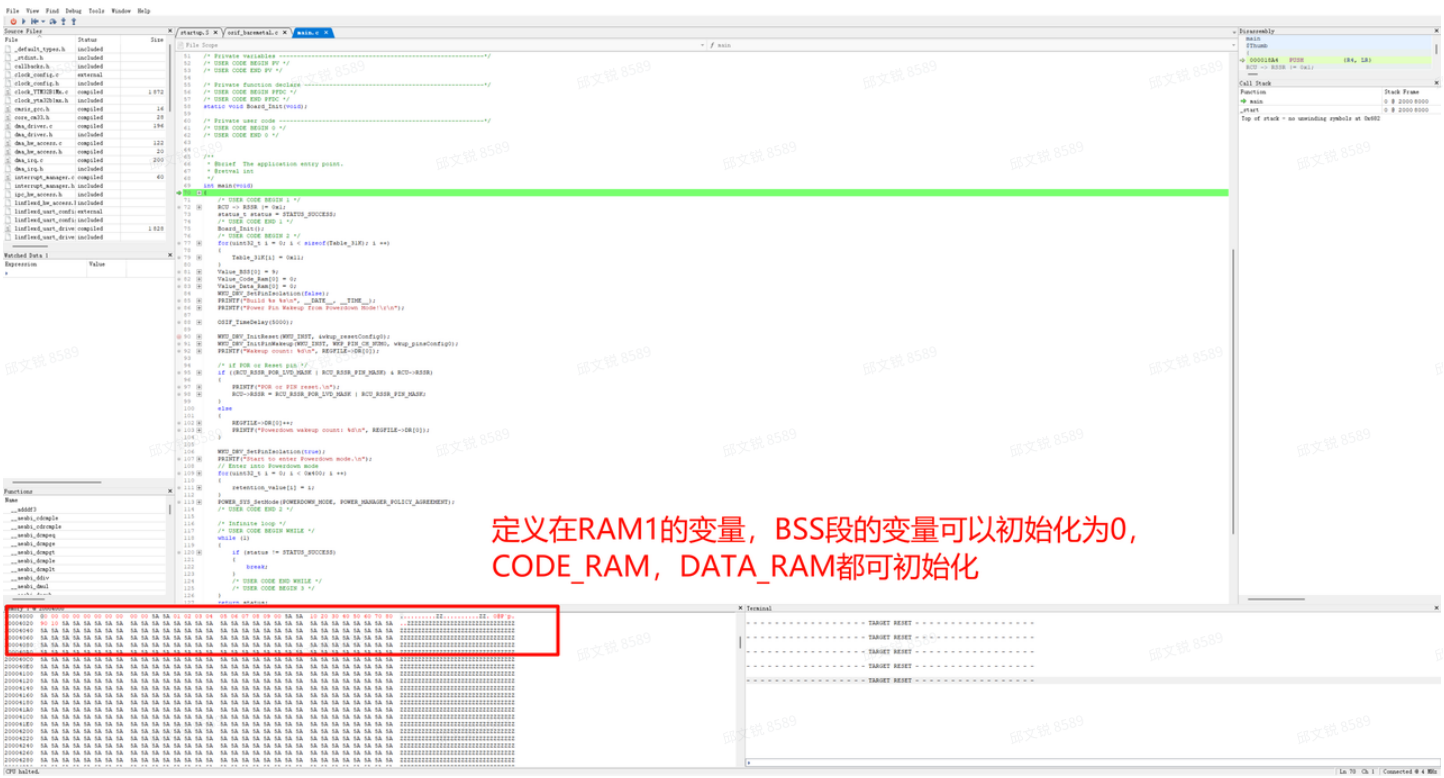


```
const RamCopyLayoutType CopyLayout[4]={
    {
        .RamStart=CODE_RAM_ram_start,
        .RomStart=CODE_RAM_rom_start,
        .RomEnd=CODE_RAM_rom_end,
        .InitType=INIT_NORMAL,
    },
    {
        .RamStart=DATA_RAM_ram_start,
        .RomStart=DATA_RAM_rom_start,
        .RomEnd=DATA_RAM_rom_end,
        .InitType=INIT_NORMAL,
    },
    {
        .RamStart=DATA_RAM1_ram_start,
        .RomStart=DATA_RAM1_rom_start,
        .RomEnd=DATA_RAM1_rom_end,
        .InitType=INIT_NORMAL,
    },
    {
        .RamStart=CODE_RAM1_ram_start,
        .RomStart=CODE_RAM1_rom_start,
        .RomEnd=CODE_RAM1_rom_end,
        .InitType=INIT_NORMAL,
    },
};

const RamZeroLayoutType ZeroLayout[2]={
    {
        .RamStart=BSS_start,
        .RamEnd=BSS_end,
        .InitType=INIT_NORMAL,
    },
    {
        .RamStart=BSS1_start,
        .RamEnd=BSS1_end,
        .InitType=INIT_NORMAL,
    },
};
```

```
[build] [2/2 100% :: 0.753] Linking C executable Power_Pin_Wakeup_From_Powerdown_Mode_Demo.elf
[build]    text    data     bss     dec     hex filename
[build]   17460   32657    2186   52303    cc4f Power_Pin_Wakeup_From_Powerdown_Mode_Demo.elf
[driver] 生成完毕: 00:00:00.952
[build] 生成已完成，退出代码为 0
```

在各个RAM段定义变量进行测试，主RAM写满了，需要把变量手动声明定义到RAM1，如下图：





3. 工程

Power_Pin_Wakeup_From_Power
down_Mode_Demo.7z
533.98KB