



T5L DGUS II Application Development Guide

1. OVERVIEW

DGUS II software based on T5L ASIC CPU, main features include:

- (1) Based on T5L dual-core ASIC, GUI and OS cores are running at 200MHz main frequency with very low power consumption.
- (2) 16Mbytes low-cost SPI Flash, JPEG image, icon compression storage, you can specify the size of the background image storage space.
- (3) 320Kbytes Nor Flash user database.
- (4) 128Kbytes data variable space.
- (5) Up to 255 display variables per page.
- (6) Support standard T5 DWIN OS platform: Hardware can lead to 20 IO, 4 - way UART, multi - way AD, to provide custom services.
- (7) 20mS DGUS cycle, UI extremely smooth.
- (8) Display variables can be turned on, off or modified in an application to achieve complex combination of display functions.
- (9) Touch commands can be turned on, off or modified in an application to achieve complex combination of touch functions.
- (10) Support SD interface download and configuration, display the file statistics downloaded .
- (11) The sensitivity adjustment of capacitive touch screen is supported to facilitate the application of front panel (the thickest to 6mm tempered glass).

2. DGUS Function Overview

2.1 Display variables

| NUM. | Key code | Function | User variable length (word) | Description |
|------|----------|---------------------|-----------------------------|--|
| 01 | 0x00 | Variable Icon | 1 | Icon display related with a data variable. If variable changes, icon will be switches accordingly which is widely used for dashboard, progress bar application. Support for background overlay and transparency setting. |
| 02 | 0x01 | Animation Icon | 2 | 3 kinds of icon status corresponding to a data variable: no display, display fixed, Animation icon display which is widely used for alerting. Variables occupy two word positions, position(VP+1) is reserved, the icon can not exceed 255(0xFF). Support for background overlay and transparency setting, can set the speed of animation |
| 03 | 0x02 | Slider | 1 | Slider related with a data variable for value changes. Normally it was used for liquid level, dial board, progress bar. Support for background overlay and transparency setting. |
| 04 | 0x03 | Artistic Variables | 1/2/4 | Use created icon material of artistic variables to display data. Support for background overlay and transparency setting. |
| 05 | 0x04 | Image Animation | 0 | Auto play of images at a certain speed. Normally used in welcome page or screensaver. |
| 06 | 0x05 | Icon Rotation | 1 | Use a pointer as icon file to display data changes on a dashboard. Normally used for pointer dashboard display. |
| 07 | 0x06 | Bit Variable Icon | 3 | Connect status 0 or 1 on each bit of a variable to display 2 status, 8 pcs of status in option totally, then use icon to display the status. Normal use for display of on-off state |
| 08 | 0x10 | Data Variable | 1/2/4 | Display a variable in designated format, including decimals, font type, and alphabet. |
| 09 | 0x11 | Text | 2K max | Display character strings in text area. |
| 10 | 0x12_00 | Digital RTC | 0 | Display RTC in form of text with custom format |
| 11 | 0x12_01 | Analog Clock | 0 | Use ICON to display RCT in form of watch-face |
| 12 | 0x13 | HEX Variable | 8 max | Use ASCII to display variables in byte HEX interval. E.g.: display 1234 to 12:34 on timer. |
| 13 | 0x14 | Roll Text | 0 | Scroll text stored in variable space in the specified area of the screen. |
| 14 | 0x15 | Data Window | 2 | Display the variable data in the specific window, highlighting the selected data. Combined with touch screen sliding or incremental adjustment, Data can be adjusted by scrolling. Also can adjust the speed by the DWIN OS. Variables occupy 2 positions, (VP+1) position is reserved. |
| 15 | 0x20 | Dynamic Trend Curve | 2K per channel | Based on curve buffer data to configure curve in real-time automatically. Display area, coordinate, scales(zoom in/out), curve direction can be managed. |
| 16 | 0x21_01 | Dot | User defined | Dot set (x,y,color) |
| 17 | 0x21_02 | Line | | Dot Connection (color,(x0,y0),...(xn,yn)) |
| 18 | 0x21_03 | Rectangle | | Rectangle displayed. Color/position/size can be managed. |

DGUSII_T5L Application development guide

| | | | | |
|----|---------|---------------------|---------|--|
| 19 | 0x21_04 | Rectangle Area Fill | | Fill designated rectangle area, color/position/size can be managed. |
| 20 | 0x21_05 | Circle | | Display entire arc, color/position/size can be managed. |
| 21 | 0x21_06 | Picture Cut/Paste | | Cut an area from designated image to current page. |
| 22 | 0x21_07 | Icon Display | | ICON display, icon library in option. |
| 23 | 0x21_09 | Spectrum | | Spectrum display according to variable data. Color/position can be managed. |
| 24 | 0x21_0D | Rectangle XOR | | Perform XOR operation on the bitmap data of a specific rectangular field in designated color. Usually for highlighting. |
| 25 | 0x24 | Zone scrolling | 1 | Move the contents of the specific area in a circular motion,the direction can be set. Used for the simple realization of the flow chart,process bar and other dynamic effect. Variables are taken up by system,the user does not. |
| 26 | 0x25 | QR_code | 259 max | Display QR_code based on the specific content. |
| 27 | 0x26 | Brightness | 1 | Adjust the brightness of a specific display to highlight or lighten the background display |

NOTE:

- ☀ Please refer to 《DWIN DUGS screen DEV. guide》 for more detailed functions.
- ☀ VP refers to the storage location(pointer) of the user variable storage space.
- ☀ When setting the variable description pointer in the development of PC configuration software, the display variable configuration information will be stored in the user variable space pointed by the variable description pointer. Applications can be accessed through the serial port or DWIN OS, dynamically open, close or modify variable configuration information to achieve complex display variable combination functions.

2.2 Touch variables

| NUM. | Key code | Function | User variable length (word) | Description |
|------|----------|------------------------|-----------------------------|--|
| 01 | 00 | Variable Data Input | 1/2/4 | Integer and fixed-point decimals and other data to designated variable space. The popup keyboard transparency can be set. |
| 02 | 01 | Popup menu | 1 | Touch to active a popup window and return to the top of menu. The popup keyboard transparency can be set. |
| 03 | 02 | Incremental Adjustment | 1 | Button for +/- adjustment, both steps and up/down limits are allowed. Circulation set in Range 0-1 for check box in options. |
| 04 | 03 | Drag | 1 | Drag operation for data input and steps set available |
| 05 | 05 | Return Value | 1 | Send pressed value to variables upon button touched, bit-variable included. |
| 06 | 06 | Text | 127 max | ASCII or GBK Chinese text input text characters, input process support cursor movement, editing. The input status and input length can be set at (vp-1) position. ASCII input mode popup keyboard transparency can be set. |

| | | | | |
|----|----|------------------------------------|--------------|--|
| 07 | 08 | Return the press state value of TP | User defined | Return value by convention to variable data if touch the screen. Return to serial mode is not supported, but can be configured to automatically transmit touch data to the implementation. |
| 08 | 0A | Sliding adjustment | 2 | According to the specified area X axis or Y axis direction touch screen sliding, real-time return relative adjustment value. With data window indication display variable, can achieve dynamic word - rolling adjustment. VP reserved, return data at (VP+1) position. |
| 09 | 0B | Page sliding | 0 | The touch screen slides along the X axis in the specified area to achieve dynamic page dragging. You can set the target and area of page switching, and the variable display of the current page will follow the drag. If there are other touch buttons on the sliding page at the same time, and the whole page (including the drag and drop touch button) needs to be able to turn the page with gestures, the touch priority must be set to the highest. |

NOTE:

- ☀ Please refer to 《DWIN DUGS screen DEV. guide》 for more detailed functions.
- ☀ Touch configuration file(13.bin) can't exceed 32Kbytes.
- ☀ Through serial port or DWIN OS to access the touch instruction interface defined in 0x00B0 variable space, it can dynamically open, close or modify the specific touch instruction to achieve complex touch function of interaction and combination

2.3 Serial communication protocol (UART2)

The mode of the system debugging serial port UART2 is fixed as 8N1, the baud rate can be set, and the data frame is composed of 5 parts:

| Data block | 1 | 2 | 3 | 4 | 5 |
|----------------|--------------|-------------------------------|---------------------|----------|---------------------|
| Definition | Frame header | Word length | command | data | CRC check(optional) |
| Length(Word) | 2 | 1 | 1 | N | 2 |
| Description | 0x5AA5 | Include :command, data, check | 0x81 0x82 0x83 0x84 | | |
| E.G.(No check) | 5A A5 | 04 | 83 | 00 10 04 | |
| E.G.(Check) | 5A A5 | 06 | 83 | 00 10 04 | 25 A3 |

The start/close of CRC check is controlled by **0x05.6** bit of the configuration file.

UART2 debugging interface instruction as following:

| Command | Data | Description |
|---------|--|--|
| 0x80 | Issue: Register page (0x00-0x08)+ register address (0x00-0xFF)+ data written | Write data string in designated addresses to register. |
| | Response: 0x4F 0x4B | Write instruction response |

DGUSII_T5L Application development guide

| | | |
|------|---|---|
| 0x81 | Issue: Register page (0x00-0x08)+ register address (0x00-0xFF)+ read data byte length(0x01-0xFB) | Read data from designated register |
| | Response: Register page (0x00-0x08)+ register address (0x00-0xFF)+ data length+ data | Data response |
| 0x82 | Issue: Variable space head address (0x0000-0xFFFF)+ data written | Specifies the address to start writing data strings (literal data) into the variable space. Do not write space that the system reserves. |
| | Response: 0x4F 0x4B | Write instruction response |
| 0x83 | Issue: Variable space head address (0x0000-0xFFFF)+read data byte length(0x01-0x7D) | Read the specified length word data from the specified address in the variable space |
| | Response : Variable space head address+data byte length+data read | Data response |

Register page defined below:

| Register page ID | Definition | Description |
|------------------|--------------------|--|
| 0x00-0x07 | Data register | 256 per group, R0-R255 |
| 0x08 | Interface register | DRO-DR255.Refer to 《DWIN OS DEV. Guide of T5》 3.4 the definition of interface register |

3. System variable interface(0x0000--0xFFFF Variable memory space)

Data with the same background color in the table are updated at the same time and must be rewritten once.

| Variable address | Definition | Length | Description |
|------------------|------------------|--------|--|
| 0x00 | Reserved | 4 | Undefined |
| 0x04 | System_Reset | 2 | Writing 0x55AA 5AA5 resets the T5L CPU once. |
| 0x06 | OS_Update_CMD | 2 | D3:0x5A starts an update DWIN OS program operation (write to chip Flash), and the CPU is cleared to 0. D2: set to 0x10. The DWIN OS code must start at 0x1000. D1:0: the first address of the data variable space where the upgrade code is stored, must be even. |
| 0x08 | NOR_FLASH_RW_CMD | 2 | D7: operation mode 0x5A= read 0xA5= write, CPU operation complete zero. D6:4: chip Nor Flash database header address, which must be even, 0x000000-0x02:7FFE, 160KWords. D3:2: the first address of the data variable space, which must be even. D1:0: read-write word length must be even. |
| 0x0C | Reserved | 3 | |
| 0x0F | Ver | 1 | Application version. D1 represents the GUI software version, D0 represents the DWIN OS software version. |
| 0x10 | RTC | 4 | D7= year (0-0x63) D6= month (0-0x0c) D5= day (0-0x1f) D4= week (0-0x6) D3= hour (0-0x17) D2= minutes (0-0x3b) |

DGUSII_T5L Application development guide

| | | | |
|-----------|-------------------|----|--|
| | | | D1= seconds (0-0x3b) D0=undefined , data in HEX format. Hardware support is required (no built-in RTC hardware, RTC time is written by the user). |
| 0x14 | PIC_Now | 1 | Current page display ID |
| 0x15 | GUI_Status | 1 | GUI operation status feedback: 0x0000 means idle and 0x0001 means variable files are being processed. |
| 0x16 | TP_Status | 4 | D7:0x5A indicates that the touch screen data has been updated. D6: touch screen status 0x00= release 0x01= first press 0x02= lift 0x03= pressing D5:D4=X coordinate D3:D2=Y coordinate D1:D0=0x0000. |
| 0x1A-0x30 | Reserved | 23 | Undefined |
| 0x31 | LED_Now | 1 | D1:0x5A indicates that the backlight brightness, the momentary value of AD0-AD7 have been updated. D0: the current backlight brightness, 0x00-0x64. |
| 0x32 | Momentary AD0-AD7 | 8 | Momentary value of AD0-AD7 channel, 1 word per channel. The voltage=AD*3300/4095mV |
| 0x3A-0x79 | Reserved | 64 | Undefined |
| 0x7A | LCD_HOR | 1 | Horizontal resolution |
| 0x7B | LCD_VER | 1 | vertical resolution |
| 0x7C-0x7F | Reserved | 4 | Undefined |
| 0x80 | System_Config | 2 | D3: the user writes 0x5A to start the system parameter configuration once, the CPU processed and reset. D2: touch screen sensitivity configuration value, read only. D1: touch screen mode configuration value, read only. D0: system status setting. .7: serial CRC check Settings, 1= on, 0= off, read only. .6: hold, write0 .5: 22 File initialization variable space 1= load 0= no load, read only. .4: variable automatic upload setting 1= on, 0= off, read and write. .3: touch screen audio control 1= open 0= close, read and write. .2: touch screen backlight standby control 1= open 0= close, read and write. .1. 0: display orientation 00 = 0 °, 01 = 90 °, 10 =180 °, 11 = 270 °, read and write. |
| 0x82 | LED_Config | 2 | TP backlight standby setting: D3=open lightness,0x00-0x64; Off the backlight control, D3 act as software lightness adjustment interface. D2=close lightness,0x00-0x64; D1:0=open time/10ms. |
| 0x84 | PIC_Set | 2 | D3:0x5A means that a page processing is started once and the CPU has cleared the zero. D2:processing mode 0x01=page switching(Displays the image specified in the image store onto the current |

DGUSII_T5L Application development guide

| | | | |
|-----------|--|----|--|
| | | | background page) D1:D0:picture ID |
| 0x86 | PWMO_Set | 2 | D3=0x5A starts the PWM0 setting once, and the CPU has cleared the zero. D2= frequency division coefficient D1:D0=PWM0 precision PWM1 carrier frequency = 825.7536mhz /(frequency division coefficient *PWM0 precision). |
| 0x88-0x91 | Reserved | 10 | Undefined |
| 0x92 | PWMO_Out | 1 | D1:D0=PWM0 output high level width, 0x0000-PWM0 precision. |
| 0x93-0xA9 | Reserved | 23 | Undefined |
| 0xAA | 16Mbytes external memory write operation | 6 | Update the external memory contents with 32Kbytes block as the benchmark. D11:0x5A= start an external memory (16Mbytes) write operation and the CPU operation is cleared. D10: fixed to 0x02. D9:D8:32Kbytes block address, 0x0000-0x01ff, corresponds to the entire 16Mbytes memory. D7:D6: update the first address of the data stored in the data variable space, which must be even. D5:D4: the delay time waiting for the next write operation after the completion of this operation, Unit=1mS,the DGUS refresh will stop while the delay, to prevent an error from being caused by an incomplete update. D3:D0: undefined, write 0x00. |
| 0xB0 | Touch instruction access interface | 36 | 0xB0:0x5AA5 start to access to touch instruction once and the CPU operation is cleared. 0xB1:access the page ID of the touch instruction 0xB2:the high byte is the ID of touch instruction to be accessed(DGUS II configuration development settings),0x01-0xFF; the low byte is touch instruction code,0x01-0x7F. 0xB3:access mode 0xB4-0xD3:modified data of 0x02/0x03 mode. Mode 0x0000: close the touch instruction . Mode 0x0001: open the touch instruction. Mode 0x0002: read the touch instruction to the beginning data space of 0xB4. Mode 0x0003: replace the touch instruction data by the beginning data of 0xB4, the format and the data length must be the same. |
| 0xD4 | TP operation simulation | 4 | 0xD4:0x5AA5 start an operation simulation of TP once and the CPU operation is cleared. 0xD5:Pressing mode 0x0001= pressing,0x0002= releasing,0x0003= continuing pressing,0x0004= clicking (pressing + lifting). 0xD6: the x coordinate of the pressed position. 0xD7: the y coordinate of the pressed position. After the simulated pressing modes 0x0001 and 0x0003, there must be a simulated lifting mode of 0x0002. Touch screen coordinates (x, y) to the relative 0 ° display screen Settings, |

DGUSII_T5L Application development guide

| | | | |
|-------------|-------------------------|-----|--|
| | | | The CPU automatically processes the display flip. |
| 0xD8 | Reserved | 8 | |
| 0xE0 | Memory CRC check | 2 | <p>D3: write 0x5A to perform a memory CRC check, and the CPU operation is cleared to zero.</p> <p>D2: memory type selection 0x00= byte store (16Mbytes memory) 0x02=DWIN OS code 0x03=Nor database (LIB file).</p> <p>D1:D0:data interface. ▶ Starts the CRC Font check mode: D1= start font ID (256KB for each font); D0= the number of 4KB blocks checked, 0x00-0xFF. OS code check mode: D1:D0= starting at 0x1000, the byte length of OS code to be checked is 0x0001-0x7000. D1:D0=Nor database ID, fixed validation of 4KB data each time. ▶ after check Return value.</p> |
| 0xE2-0xFF | Reserved | 30 | Undefined |
| 0x100-0x2FF | Reserved | 512 | |
| 0x300-0x37F | Dynamic curve interface | 128 | <p>0x300-0x30f: state feedback for 8 channel curve buffers (read only advised), 2 characters per channel, high word is the storage pointer location (0x0000-0x07ff) where curve data is stored, and low word is the effective data length of curve buffer (0x0000-0x0800). Writing 0x0000 to the effective data length of the curve buffer will cause the curve unable display.</p> <p>0x310-0x311: curve buffer data write started.</p> <p>D3: D2:0x5AA5 starts a curve buffer data write operation once, and the CPU operation is cleared to zero.</p> <p>D1: the number of data blocks, 0x01-0x08.</p> <p>D0: undefined, 0x00.</p> <p>0x312-0x37f: data block written to the curve buffer, which is 16 bits unsigned.</p> <p>Single data block: data channel ID (0x00-0x07) + data word length (0x01-0x6E) + data.</p> <p>With dynamic curve display enabled, start at 0x1000 and create a data buffer for each curve according to 2K words per channel.</p> <p>The CH0 buffer is 0x1000-0x17ff, the CH1 buffer is 0x1800-0x1fff, and so on, the unused curve buffer zones can be used as user variables. Also Users can directly overwrite the curve buffer data and then modify 0x300-0x30f corresponding storage pointer position and data length to ensure the correct display of the curve.</p> |
| 0x380-0xFF | Reserved | 3K | Undefined, user can't use |
| | | | |

| | | | |
|--------------|---------------------------------|------|--|
| 0x400-0x4FF | Network communication interface | 256 | WiFi and other Internet communication equipment application control interface. |
| 0x500-0xEFF | Reserved | 2660 | Undefined, user can't use |
| 0x0F00 | Variable change indication | 2 | After setting variables to change the automatic upload function, this function is enabled. D3=5A means variable change, D2:D1= variable memory pointer, D0= variable length (word). |
| 0xF02-0xFFFF | Reserved | 254 | Undefined, user can't use |

0x1000--0xFFFF variable storage space can be used at will.

3.1 Network communication interface(0x0400-0x04FF)

| Definition | Address | Length | Description | Recommended value |
|----------------------------------|---------|--------|--|----------------------|
| Network interface tap | 0x400 | 1 | 0x5AA5 indicates that the network communication interface is enabled. | 5AA5 |
| RMA alarm | 0x401 | 3 | D5-D4:0x5AA5 indicates that the specified RMA spatial data is immediately uploaded to the server once ,and the CPU operation is cleared to zero. D3-D2: RMA variable memory word address to be uploaded. D1-D0: the word length of the RMA variable memory to be uploaded. | 0000 0000 0000 |
| Reserved | 0x404 | 12 | Reserved | All 00 |
| Device description | 0x410 | 1 | High byte: 0x5A indicates that the device description is valid. Low byte: the encoding method and length of the device description text. .7-.6: encoding 0x00=UNICODE 0x01=GBK, GBK is recommended. .5-.0: describes the text length 0x00-0x34. | 5A45 |
| | 0x411 | 2 | 4Bytes Device manufacturer ID assigned by DWIN, 0xFFFF: 0000 - 0xFFFF: FFFF segment reserved. | 0000 0001 |
| | 0x413 | 1 | 2Bytes The classification of each manufacturer's equipment,according to the DWIN equipment standard classification,by their own. | 0000 |
| | 0x414 | 2 | 4Bytes The individual device number of each type of device. | User-defined |
| | 0x416 | 26 | Device description text, up to 52Bytes. | |
| Device description (RMA mapping) | 0x430 | 1 | RMA automatically refreshes the server interval 0x0000-0xffff in 0.1 seconds. 0x0000 means need not automatic refresh . | 012C |
| | 0x431 | 1 | RMA (mapped to the server's variable memory) read space start address, word address, out of bounds can not be read. | 1000 |
| | 0x432 | 1 | RMA read space size, unit: 128Words ,max:64KWords , 0x0000 indicates forbidden reading. | 0004 |
| | 0x433 | 1 | RMA write space start address, can overlap with the read space, can not write out of bounds. | 2000 |

DGUSII_T5L Application development guide

| | | | | |
|-------------------------------------|-------|---|---|------------------------------|
| | 0x434 | 1 | RMA write space size, unit: 128Words ,max:64KWords , 0x0000 indicates forbidden reading. | 0004 |
| | 0x435 | 3 | reserved | 000000000000 |
| Device description (remote upgrade) | 0x438 | 1 | The remote upgrade interface is enabled. 0x5AA5 indicates that the device is enabled to the remote upgrade interface,the system will automatically detect the Buffer. | 5AA5 |
| | 0x439 | 1 | Remote upgrade packet timeout timer configuration in 0.1 second. | 0064 |
| | 0x43A | 4 | The first remote upgrade space for the device (corresponding to T5L 1MB Flash, aligned to 4KB) is defined: D7:0x5A indicates that the remote upgrade space is enabled. D6-D3: 32-bit start address of the upgradeable space (lower 12 bits is 0), up to 4 GB. D2-D0: The size of the upgradeable space, in 4KB, up to 4GB. | 5A00 0100 0000 0F00 |
| | 0x43E | 4 | The second remote upgradeable space definition for the device,corresponding to 16MB image and font memory. | 5A00 0000 0000 8000 |
| | 0x442 | 4 | The third remote upgradeable space definition for the device | All 00 |
| | 0x446 | 4 | The third remote upgradeable space definition for the device | All 00 |
| | 0x44A | 2 | Remote upgrade Buffer interface definition: D7=0x5A indicates that the remote upgrade Buffer is valid. D6= upgrade mode ,0x00= the communication side is responsible for verifying the data CRC, and the error frame informs the host to resend. D5= the number of buffers available for remote upgrades, 0x01-0x10, up to 16. D4=Buffer0 starting address high byte (word address), low address 8 bits is 0x00. Each Buffer holds a fixed 2304 words (0x900), starting at the end of the sequence. A single Buffer definition (the first 512 bytes are control interfaces, followed by 4KB is data) : D0:0x5A indicates that a remote upgrade of the buffer is started and the CPU operation is cleared to zero. D1: select one of four remote upgrade Spaces (0x00-0x03) for a 4KB block writing operation. D2-D5: write remote upgrade space destination address, low 12bit is 0. D6-D7: data byte length 0x0001-0x1000. D8-D9: data CRC check. D10-D11: reserve. D512: data start, up to 4096 bytes. | 5A00 08B0 |
| | 0x44C | 2 | Block erasure configuration, D3-D0 successively indicates whether erasure is required before writing in the upgrade of the 1st to 4th upgrade space. 0x00 : no erasure; Other means need to erase first, erase block size 0x01=64KB; 0x02 = 128 KB; 0x04 = 256 KB. Upgrade space 2 (outbound SPI Flash) must be configured to 0x01, or an error may occur. | 0001 0000 |
| | 0x44E | 2 | D3=0xA0-0xA3 corresponds to selecting to start a block erase operation for the 1st | **** |

DGUSII_T5L Application development guide

| | | | | |
|----------------------------------|-------|-----|---|--------------|
| | | | - 4th remote upgrade space at CPU,and clear to zero and upload the variable state actively once. D2= number of erasure blocks, D1: D0= high 2Bytes of erasure space address,(low 16bit 0x00) . | |
| Device description retention | 0x450 | 48 | Reserved | All 00 |
| Communication device description | 0x480 | 16 | D31:0x5A indicates that the communication device description data is valid. D30: encoding and length of device description text. .7-.6: encoding 0x00=UNICODE 0x01=GBK, GBK is recommended. .5-.0: describes the text length 0x00-0x14. D29: communication device class 0x01=WiFi D28: communication equipment status, bit definition 7. Device working state 0= in configuration 1= normal; .6-.3 undefined, write 0; .2-.0 signal quality, 0x00-0x07 a total of 8, 0x00 means the worst, 0x07 means the best. D27-d20 =8Bytes (bytes) align the MAC address of the communication device. D19-d0: text format communication device description information, up to 20Bytes. | |
| Communication device description | 0x490 | 112 | Communication device customization, such as WiFi user name, password. | User-defined |

The device description information is configured by the corresponding contents of the 22 initialization file 0x0800-0x09ff (No matter if enabling the 22 file initialization variable buffer function).

4 SD Interface

SD card upgrade cannot support hot plug update, you must power off firstly,insert the card,and then download while power on.

The SD/SDHC interface supports downloading and updating the following files based on T5L serial port instruction screen.

| File Type | Naming rule | description |
|--------------------|---|--|
| Program | T5L_UI*.BIN T5L_OS*.BIN | Application program |
| DWIN OS program | DWINOS.BIN | DWIN OS program ,the code must start at 0x1000 |
| Nor Flash database | ID+(optional) file name.LIB | Each ID corresponds to 2KWords memory, and the ID range is 0-79. The database in NOR Flash on chip, 160KWords, Can be used to save user data or DWIN OS library files. |
| Fonts | Font ID+(optional) file name. BIN/DZK/HZK | Font ID:00-31;ASCII: 0# DGUS font |
| DGUS input method | 12*.BIN | Fixed storage in 12 font location |
| DGUS touch | 13*.BIN | Fixed storage in 13font location,cannot over 32KB |
| DGUS variables | 14*.BIN | Fixed storage in 14 font location,cannot over 256KB,DGUS 2 format |



DGUSII_T5L Application development guide

| | | |
|-------------------------------|--|--|
| DGUS variables initialization | 22*.BIN | Fixed storage in 14 font location, initializes the variable space of 0x1000-0xFFFF by Loading 0x2000-0x1FFFF address . |
| JPEG, Icon | Font ID+(optional) file name. ICL | Must be JPEG ICO file format of DGUS3 format |
| Hardware configuration | T5LCFG*.CFG | |

16MB Flash memory is divided into two parts.

(1)4-12MB font space, single font of 256Kbytes, can save font, icon library, configuration file.

(2)4-12MB of background image file storage space (.icl).

For the T5L1 CPU platform, a single JPG image file size should not exceed 256KB, and for the T5L2 CPU not exceed 768KB. The download file must be in the SD card root directory **DWIN_SET** folder, and be a 4KB sector, SD or SDHC card in FAT32 format. The file of T5LCFG*.CFG hardware configuration adopts binary data format and can be edited using UltraEdit and other software. The instructions are shown in the following table:

| Category | Address | Length | Definition | Description |
|---------------------------------|---------|--------|--|--|
| Configuration identification | 0x00 | 5 | 0x54 0x35 0x4C 0x43 0x31 | Fixed content |
| System configuration | 0x05 | 1 | Parameter configuration | .7: serial port CRC check, 0= close 1= open. .6: reserved, 0. .5: load 22 file initialization variable space , 0= no 1= yes .4: upload touch variable changes automatically, 0= no 1= yes. .3: touch screen audio control, 0= off 1= on. .2: touch screen backlight standby control, 1= on 0= off. .1: 0: electricity display orientation 00 = 0 ° , 01 = 90 ° , 10 = 180 ° , 11 = 270 ° |
| | 0x06 | 2 | Reserved | 0x00 |
| | 0x08 | 1 | ICL file storage position | 0x10--0x30(16--48), corresponding to 12MB-4MB background image space |
| | 0x09 | 1 | TP alarm rate setting | 0x01-0xFF, default 0x28, alarm rate =400Hz/ setting value. |
| | 0x0A | 2 | Serial port band rate setting | Baud rate setting value =3225600/ set baud rate. 115200bps, set value =0x001C, maximum 0x03FF. |
| Backlight standby configuration | 0x0C | 1 | Normal operation and starting brightness | 0x00--0x64, unit 1%. |
| | 0x0D | 1 | Standby brightness | 0x00--0x64, unit 1%. |
| | 0x0E | 2 | Turn on time after standby | 0x0001--0xFFFF, unit 10ms. |
| Display configuration | 0x10 | 2 | Display_Config_En | 0x5AA5= display configuration is valid, factory configured, the user need not. |
| | 0x12 | 1 | PCLK_PHS | Data latching phase setting: 0x00=PCLK descending edge 0x01=PCLK ascending edge. |
| | 0x13 | 1 | PCLK_DIV | Pixel clock PCLK frequency setting, PCLK frequency (MHz) =206.4/PCLK_DIV. |
| | 0x14 | 1 | H_W | |
| | 0x15 | 1 | H_S | |
| | 0x16 | 2 | H_D | Horizontal (X direction) resolution |

DGUSII_T5L Application development guide

| | | | | |
|----------------------------|------|---|----------------|--|
| | 0x18 | 1 | H_E | |
| | 0x19 | 1 | V_W | |
| | 0x1A | 1 | V_S | |
| | 0x1B | 2 | V_D | Vertical (Y) resolution |
| | 0x1D | 1 | V_E | |
| | 0x1E | 1 | TCON_SEL | 0x00=no need to configure TCON |
| | 0x1F | 1 | Reserved | 0x00 |
| TP configuration | 0x20 | 1 | TP_Set_En | 0x5A= display configuration is valid, factory configured, the user need not. |
| | 0x21 | 1 | TP_Mode | TP mode configuration. .7-.4(high 4bit),Select the TP type: 0x0*=Resistance Touch 0x1*=GT911,GT9271,GT9110 drive IC capacitive TP 0x2*=ILI9881H Incell CTP .3 RTP test: 0= off 1= on, enabled only when SD is downloaded. .2-.0 (low 4bit), select TP mode: .2 X axis data selection: 0=0 to Xmax 1=Xmax to 0; .1 Y axis data selection: 0=0 to Ymax 1=Ymax to 0; .0 XY swap: 0=XY 1=YX. (7 "RTP is 0x07; 8 "RTP is 0x05; 10.4 "RTP is 0x03) |
| | 0x22 | 1 | TP_Sense | TP sensitivity setting: 0x00-0x1F, 0x00 lowest, 0x1F highest.Default 0x14, with high sensitivity. (ILI9881 is 0x01-0x06). |
| | 0x23 | 1 | TP_Freq | Frequency range selection, ILI9881H applicable, 0x01-0x14 is fixed frequency, 0x00 frequency hopping. |
| Clock output configuration | 0x24 | 1 | CKO_Set_En | 0x5A indicates that this configuration is valid. |
| | 0x25 | 1 | CKO_En | 0x5A:turn on CKO(P3.0) clock output and the rest to off. |
| | 0x26 | 1 | CKO_DIV | CKO output clock setting,frequency =825.7536/CKO_DIV MHz. |
| Buzzer setting | 0x27 | 1 | BUZZ_Set_En | 0x5A indicates that this configuration is valid. |
| | 0x28 | 1 | BUZZ_Freq_DIV1 | BUZZ_Freq=825753.6/ (BUZZ_Freq_DIV1*BUZZ_Freq_DIV1) KHz |
| | 0x29 | 2 | BUZZ_Freq_DIV2 | Factory setting: DIV1=0x6E, DIV2=0x0BB8, corresponding to 2.5KHz frequency. |
| | 0x2B | 2 | BUZZ_Freq_Duty | Buzzer duty cycle setting: High duty ratio =BUZZ_Freq_Duty/ BUZZ_Freq_DIV2. Factory setting: 0x00F0 corresponds to 8% high level duty cycle. |
| | 0x2D | 1 | BUZZ_Time | The sound time of the touch screen sound buzzer is 10ms; Factory setting 0x0A. |

NOTE:The green background part of the parameters must be configured.

Display configuration reference:

| Size_resolution | T5L_SET.CFG display configuration (HEX format) | | | | | | | | | | | | | |
|------------------------------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 0x12 | 0x13 | 0x14 | 0x15 | 0x16 | 0x17 | 0x18 | 0x19 | 0x1A | 0x1B | 0x1C | 0x1D | 0x1E | 0x1F |
| 2.4_240*320 (IPS) | 01 | 26 | 0A | 14 | 00 | F0 | 0A | 02 | 02 | 01 | 40 | 02 | 05 | 00 |
| 2.8_240*320A | 01 | 26 | 0A | 14 | 00 | F0 | 0A | 02 | 02 | 01 | 40 | 02 | 03 | 00 |
| 2.8_240*320B | 01 | 20 | 10 | 20 | 00 | F0 | 20 | 02 | 0E | 01 | 40 | 08 | 01 | 00 |
| 3.5_320*240 | 01 | 1C | 1E | 14 | 01 | 40 | 40 | 03 | 0F | 00 | F0 | 10 | 02 | 00 |
| 3.5_320*480 | 01 | 14 | 0A | 04 | 01 | 40 | 0A | 02 | 02 | 01 | E0 | 02 | 04 | 00 |
| 3.5_320*480 (IPS) | 01 | 14 | 0A | 04 | 01 | 40 | 0A | 02 | 02 | 01 | E0 | 02 | 06 | 00 |
| 3.5_480*640 | 01 | 0A | 10 | 20 | 01 | E0 | 20 | 02 | 03 | 02 | 80 | 02 | 07 | 00 |
| 4.0_480*480 (IPS) | 00 | 0E | 08 | 08 | 01 | E0 | 08 | 02 | 0C | 01 | E0 | 06 | 08 | 00 |
| 4.0_480*800 (IPS) | 00 | 08 | 08 | 08 | 01 | E0 | 08 | 04 | 0A | 03 | 20 | 0A | 09 | 00 |
| 4.0_720*720 (IPS Incell) | 00 | 03 | 70 | B4 | 02 | D0 | B4 | 02 | 14 | 02 | D0 | DC | 0A | 00 |
| 5.0_720*1280 (IPS Incell) | 00 | 03 | 04 | 14 | 02 | D0 | 14 | 02 | 12 | 05 | 00 | C8 | 0A | 00 |
| 5.0_480*854 (IPS) | 00 | 08 | 08 | 08 | 01 | E0 | 08 | 02 | 0C | 03 | 56 | 06 | 0C | 00 |
| 480*272 | 01 | 16 | 29 | 02 | 01 | E0 | 02 | 0A | 02 | 01 | 10 | 02 | 00 | 00 |
| 640*480 | 01 | 08 | 1E | 72 | 02 | 58 | 10 | 03 | 20 | 01 | E0 | 0A | 00 | 00 |
| 800*480 | 01 | 06 | 1E | 10 | 03 | 20 | D2 | 03 | 14 | 01 | E0 | 0C | 00 | 00 |
| 800*600 | 01 | 05 | 1E | 10 | 03 | 20 | D2 | 03 | 14 | 02 | 58 | 0C | 00 | 00 |
| 1024*600 | 01 | 04 | A0 | 88 | 04 | 00 | 18 | 06 | 1D | 02 | 58 | 03 | 00 | 00 |
| 1024*768 | 01 | 04 | 10 | 40 | 04 | 00 | 20 | 04 | 08 | 03 | 00 | 04 | 00 | 00 |
| 1280*720 | 01 | 03 | 10 | 40 | 05 | 00 | 20 | 08 | 20 | 02 | D0 | 20 | 00 | 00 |
| 1280*800 | 01 | 03 | 10 | 1C | 05 | 00 | 10 | 08 | 10 | 03 | 20 | 10 | 00 | 00 |
| 1366*768 | 01 | 03 | 10 | 20 | 05 | 54 | 20 | 06 | 10 | 03 | 00 | 08 | 00 | 00 |



Appendix 1 Revision records

| Data | Revise content | Ver. |
|------------|---|------|
| 2019.02.02 | First Posted | V1.0 |
| 2019.03.04 | Added background image space can be customized by SD card CFG file. | V1.1 |
| 2019.03.22 | Added the network communication interface 0x0400, which can be directly connected to the DWIN cloud through the DWIN WiFi module. | V1.2 |
| 2019.04.10 | Increased the background filtering intensity setting of the icon transparent display to solve the boundary burr problem caused by JPEG low-quality compression. Added PWM0 output interface; Increased the system clock frequency division output function. | V1.4 |
| 2019.04.28 | Added configurable buzzer output function. | V1.5 |
| | | |

If you have any questions during the use of this document or DWIN products, or want to know more about the latest information of DWIN products, please contact us in time:

400 toll-free number: 400 018 9008

Enterprise QQ and WeChat: 400 018 9008

Enterprise mail: dwinhmi@dwin.com.cn

Thank you for your support all the time. Your support is the driving force of our progress!
Thank you!