

ZLG 7290 I²C Interface Keyboard and LED Driver

1. Characteristics

LED Display and Keypad driver chip for use with the I²C serial interface. Supports interfacing with processor by supplying a keyboard interrupt signal. The ZLG7290 can sample up to 64 keys and detect the number of repeated hits on each key before the buffer is read.

The ZLG7290 can control up to 8 seven-segment displays at a time. In each display update period, the ZLG7290 sends the content in an 8-byte display buffer **DpRam0~DpRamN** to the LED driver in order, according to the number of display digits N stored in the scan number register **ScanNum**.

2. Pinout

24pin DIP Package, shown in Fig 1.

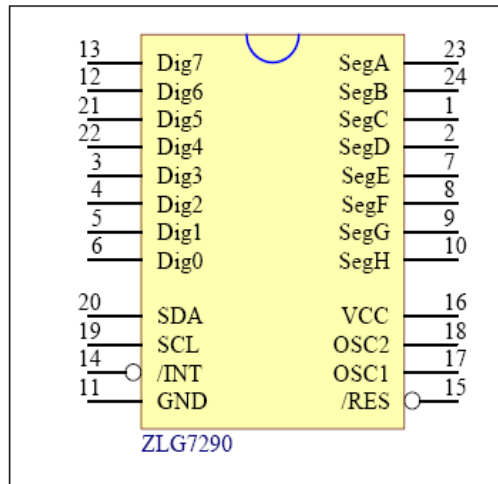


Figure 1: ZLG7290 pinout

No of Pin	Name	Attribution	Description
13,12,21,22,3~6	Dig7~ Dig0	Input/Output	LED display driver and keys scan line
10~7,2,1,24,23	SegH~SegA	Input/Output	Display segment driver and keys scan line
20	SDA	Input/Output	I ² C bus interface data/address line
19	SCL	Input/Output	I2C bus interface Clock line
14	/INT	Output	Interrupt output, Low-level available
15	/RES	Input	Reset output, Low-level available
17	OSC1	Input	Connect to the crystal to generate inner clock
18	OSC2	Output	
16	VCC	Power	+(3.3-5.5V)
11	GND	Power	0V

Table 1: Pin descriptions for the ZLG7290

3. Control

The ZLG7290 supports two control approaches: **Register mapping control** and **Instruction command control**. Register mapping control uses direct access to the low-level internal registers to realize the basic control functions. Instruction command control loads one of a set of “commands” into the command buffer register(s) **CmdBuf0~CmdBuf1**. The ZLG7290 then interprets the command and alters the low-level registers accordingly.

4. ZLG7290 internal registers

The arrangement of the ZLG7290 internal system registers is shown in figure 2.

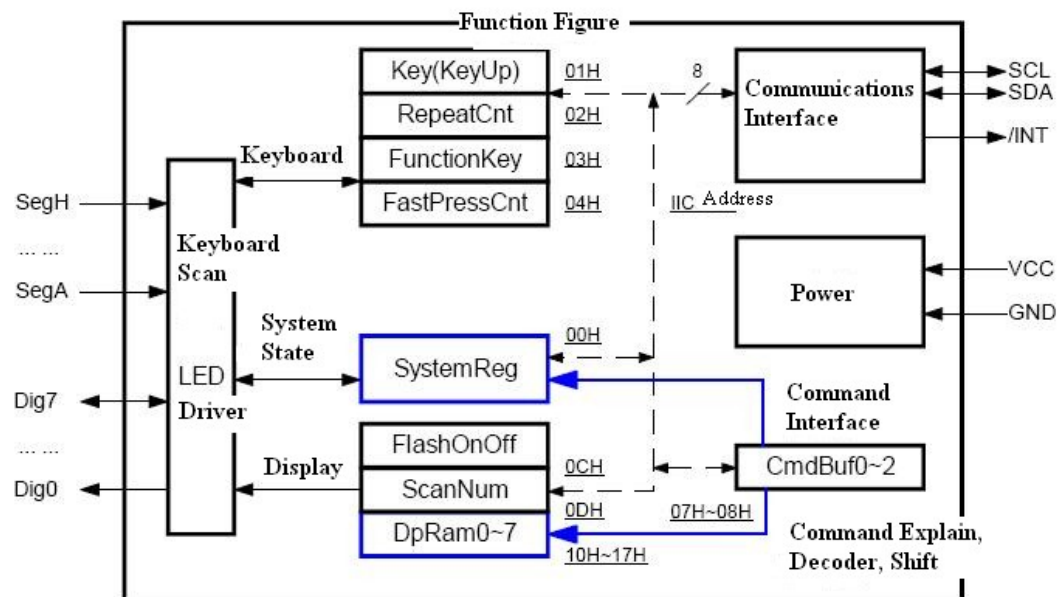


Fig 2. ZLG7290 internal registers

System register (SystemReg): Address 00h

Reset value 11110000B. SystemReg stores the state of ZLG7290 and configures the system operation state. The KeyAvi bit (SystemReg.0) is set to 1 on a valid key-press (the /INT pin signal will go low at this point), keyavi is set to 0 when there is no key-press (/INT pin signal will be high). After a key is read, KeyAvi change to 0 automatically.

Key values register (Key): Address 01H

Reset Value 00H. Key represent the pressed key value. Key=0 either represents a function key (in which case the FunctionKey register must be read) or no key was pressed.

Repeat count register (RepeatCnt): Address 02H

Reset Value 00H. RepeatCnt=0 represents the key has been pressed once (i.e. no repeats) , RepeatCnt>0 represents the number of repeat presses after the first press.

Function key register (FunctionKey): Address 03H

Reset Value FFH. If a bit in the FunctionKey register is 0, this shows that the corresponding function key is pressed. For example if the register is 11111101 then F2 is currently pressed.

Command Buffer register (CmdBuf0~CmdBuf1): Addresses 07H~08H

Reset Value 00H~00H. The command buffer registers are used to store the commands in when using the Instruction command control technique.

Flash Control register (FlashOnOff): Address 0CH

Reset Value 0111B/0111B. This register is used to set the on/off duty cycle for flashing the display. The higher 4 bits represent the flash ON time, while the other 4 bits represent the flash OFF time. One unit of FlashOnOff corresponds to 150~250ms depending on the crystal oscillator frequency. (The range of On and OFF is 1~16 units).

Scan Number register (ScanNum): Address 0DH

Reset Value 07h. This register is used to control the maximum number display digits that are scanned (Valid range 0~7, corresponding display number is 1~8). By decreasing the scan number it is possible to improve the dutycycle of scan time of each digit. For instance, if there are only 4 displays, set ScanNum=3 so only the content of DpRam0~DpRam3 will be displayed.

Display Cache register(DpRam0~DpRam7): Addresses 10H 17H

Reset Value 00H for all 8 bytes.

These 8 registers store the bit patterns for the LED displays. Bits that are 1 represent the LED is On, The display of DpRam7~DpRam0 corresponds to pins Dig7~Dig0.

5. Communication Interface

The ZLG7290 I²C interface can sync up to 32kbit/s. The slave address of the ZLG7290 is 70H (01110000B). A valid key press (Including ordinary keys and function keys) will set the KeyAvi bit of SystemReg to 1 (and hence set the /INT output to low). The ZLG7290 internal register addresses (the register “**sub addresses**”) that can be accessed from the I²C bus are 00H~17H.

All internal registers can be written and read directly for register mapping control but some special functions are implemented using Instruction Command Control.

6. Instruction Command Control: Commands in detail

The ZLG7290 has a useful set of built-in functions that can be accessed by issuing a command value to the command buffer register(s). A valid command is composed of a one-byte operation code and possibly a second byte for parameter settings. A single-byte command is known as a “pure command”, and a 2-byte command is known as a “complex command”. Single-byte “Pure” commands are loaded into command buffer register 0 (CmdBuf0) and 2-byte commands are loaded into CmdBuf0 and CmdBuf1.

6.1 Pure commands (1-byte)

(1)Left shift

Bit7 Bit6 Bit5 Bit4 Bit3 Bit2 Bit1 Bit0

CmdBuf0: 0 0 0 1 N3 N2 N1 N0

Shift Display N digits ((N3~N0)+1) to the left. After execution, the right N digits show nothing.

(2)Right shift

Bit7 Bit6 Bit5 Bit4 Bit3 Bit2 Bit1 Bit0

CmdBuf0: 0 0 1 0 N3 N2 N1 N0

Shift Display N digits ((N3~N0)+1) to the right. After execution, the right N digits show nothing.

(3)Cycle Left shift

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CmdBuf0:	0	0	1	1	N3	N2	N1	N0

Rotate Display N bits((N3~N0)+1) to the left. After execution, the former left display data will show on the right N digits.

(4) Cycle Right shift

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CmdBuf0:	0	1	0	0	N3	N2	N1	N0

Rotate Display N bits((N3~N0)+1) to the right. After execution, the former right display data will show on the left N digits.

(5)SystemReg register digit addressing

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CmdBuf0:	0	1	0	1	On	S2	S1	S0

When On=1, The S(S2~S1)th bit set to 1; On=0, The Sth digit is set to 0.

6.2 Complex Commands (2-byte)

(1) Display pixel address command

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CmdBuf0:	0	0	0	0	0	0	0	1
CmdBuf1:	On	0	S5	S4	S3	S2	S1	S0

An 8-digit display has 64 LED elements (8x seven-segments plus decimal points). This command allows control of the individual LED elements. When On=1, The S(S5~S0)th pixel is lit. When On=0, the Sth pixel is turned off.

(2) Flash control Command

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CmdBuf0:	0	1	1	1	X	X	X	X
CmdBuf1:	F7	F6	F5	F4	F3	F2	F1	F0

When Fn=1, the corresponding digit flashes (n range from 0~7). When Fn=0 the corresponding digit is permanently lit.

(3) Set digit to encoded character

	Bit7	Bit6	Bit5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
CmdBuf1:	0	1	1	0	A3	A2	A1	A0
CmdBuf2:	DP	Flash	0	D4	D3	D2	D1	D0

This function allows you to chose a display digit and set it to display a certain character chosen from table 2. A3~A0 is the address of the display digit (Range: 0000B~0111B, corresponding to DpRam0~DpRam7). DP=1, the corresponding digit's decimal point is ON. If Flash=1, the corresponding digit will flash; if Flash=0 it will be permanently lit. Bits D4~D0 are the code for the character to display. The codes are shown in table overleaf.

D5	D4	D3	D2	D1	D0	Hex	Display	D5	D4	D3	D2	D1	D0	Hex	Display
0	0	0	0	0	0	00H	0	0	1	0	0	0	0	10H	G
0	0	0	0	0	1	01H	1	0	1	0	0	0	1	11H	H
0	0	0	0	1	0	02H	2	0	1	0	0	1	0	12H	i
0	0	0	0	1	1	03H	3	0	1	0	0	1	1	13H	J
0	0	0	1	0	0	04H	4	0	1	0	1	0	0	14H	L
0	0	0	1	0	1	05H	5	0	1	0	1	0	1	15H	o
0	0	0	1	1	0	06H	6	0	1	0	1	1	0	16H	P
0	0	0	1	1	1	07H	7	0	1	0	1	1	1	17H	q
0	0	1	0	0	0	08H	8	0	1	1	0	0	0	18H	r
0	0	1	0	0	1	09H	9	0	1	1	0	0	1	19H	t
0	0	1	0	1	0	0AH	A	0	1	1	0	1	0	1AH	U
0	0	1	0	1	1	0BH	b	0	1	1	0	1	1	1BH	y
0	0	1	1	0	0	0CH	C	0	1	1	1	0	0	1CH	c
0	0	1	1	0	1	0DH	d	0	1	1	1	0	1	1DH	h
0	0	1	1	1	0	0EH	E	0	1	1	1	1	0	1EH	T
0	0	1	1	1	1	0FH	F	0	1	1	1	1	1	1FH	No display

Table 2: Encodings for “Set digit to encoded character” complex command