Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

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DISTINCTIVE CHARACTERISTICS

Standard with Enhanced Illumination:

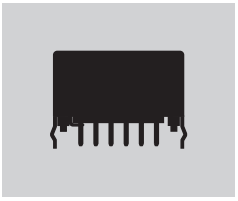
Programmable to display graphics, alphanumeric characters and animated sequences.

Standard SMARTDISPLAY™ can be used alone or in conjunction with electromechanical switches.

Integrated liquid crystal display provides wide viewing angle with high contrast and clarity.

Viewing area 14.4mm x 11.8mm (horizontal x vertical) at 36 x 24 pixels.

Actual Size



PART NUMBER & DESCRIPTION

Part Number	Terminals	LCD Mode	LED Color
IS01BBFEF	Straight PC	Yellow FSTN Positive	* Yellow/Green

LCD & LED SPECIFICATIONS

Characteristics of Display

Display Operation Mode	FSTN positive
Display Condition	Transflective with built-in LED backlight
Viewing Angle	6 o'clock
Driving Method	1/24 duty. 1/5 bias (built-in driving circuit)
Viewing Area	14.4mm x 11.8mm (horizontal x vertical)
Pixel Format	36 x 24 pixels (horizontal x vertical)
Pixel Size	0.371mm x 0.445mm (horizontal x vertical)
Operating Temp. Range	–20°C ~ +60°C (–4°F ~ +140°F)
Storage Temp. Range	–30°C ~ +70°C (–22°F ~ +158°F)
Backlight LED	Yellow/Green

LCD Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Supply Voltage for Logistics	V_{DD}	–0.3V to +7.0V
Supply Voltage for LCD	V_{LC}	–0.3V to +12.0V
Input Voltage	V_I	–0.3V to V_{DD} +0.3V
Output Voltage	V_O	–0.3V to V_{DD} +0.3V

Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
Supply Voltage for Logics	V_{DD}	4.5V	5.0V	5.5V
Supply Voltage LCD	V_{LC}	7.1V	7.3V	7.5V
Input Voltage	V_I	0V	—	V_{DD}
Driving Frequency	f_{FLM}	—	150Hz	—

LED Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Forward Current	I_F	20mA
***Power Dissipation**	P_d	130mW

Color	Yellow/Green	
	Yellow	Green
Unicolor	60mW	60mW
LED Overall	130mW	

*For uniform light emission, Power Dissipation should not exceed the Absolute Maximum Rating, and the Forward Current should not exceed the derated Absolute Forward Current.

LCD & LED SPECIFICATIONS

DC Characteristics of LCD Drive IC (Temperature at −20°C to +60°C and V_{DD} = 5.0V ±10%)

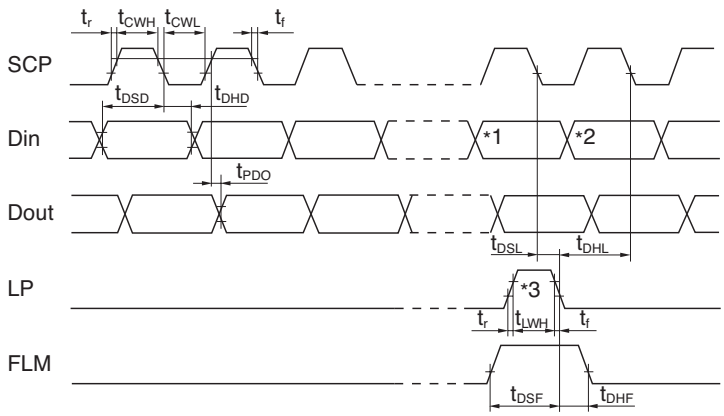
Items	Symbols	Test Conditions	Minimum	Typical	Maximum	Unit
High Level Input Voltage	V_{IH}		0.7V_{DD}		V_{DD}	V
Low Level Input Voltage	V_{IL}		0		0.3V_{DD}	V
High Level Input Leakage Current	I_{LIH}	$V_I = V_{DD}$			10	µA
Low Level Input Leakage Current	I_{LIL}	V_I = 0V			10	µA
High Level Output Voltage	V_{OH}	I_{OH} = −500µA	V_{DD}−0.5			V
Low Level Output Voltage	V_{OL}	I_{OH} = 500µA			0.5	V
High Level Output Leakage Current	I_{LOH}	$V_O = V_{DD}$			10	µA
Low Level Output Leakage Current	I_{LOL}	V_O = 0V			10	µA
Supply Current	I_{DD}	f_{SCP} = 1.0MHz			500	µA
LCD Drive Current	I_{LC}	f_{LP} = 2.4kHz V_{LC} = 7.3V		500	2,000	µA

Timing Characteristics of LCD Drive IC

(Temperature at −20°C to +60°C and V_{DD} = 5.0V ±10%)

Items	Symbols	Minimum	Maximum
Clock Operation Frequency	f_{SCP}		6.0MHz
Latch Pulse Frequency	f_{LP}		50kHz
Clock High Level Pulse Width	t_{CWH}	70ns	
Clock Low Level Pulse Width	t_{CWL}	70ns	
Data Setup Time	t_{DSD}	45ns	
Data Hold Time	t_{DHD}	50ns	
Data Output Delay Time	t_{PDO}		25ns
Latch Setup Time	t_{DSL}	50ns	
Latch Hold Time	t_{DHL}	50ns	
Latch High Level Width	t_{LWH}	200ns	
FLM Setup Time	t_{DSF}	50ns	
FLM Hold Time	t_{DHF}	50ns	
SCP, LP Rise/Fall Time	t_r/t_f		15ns

Timing Diagram



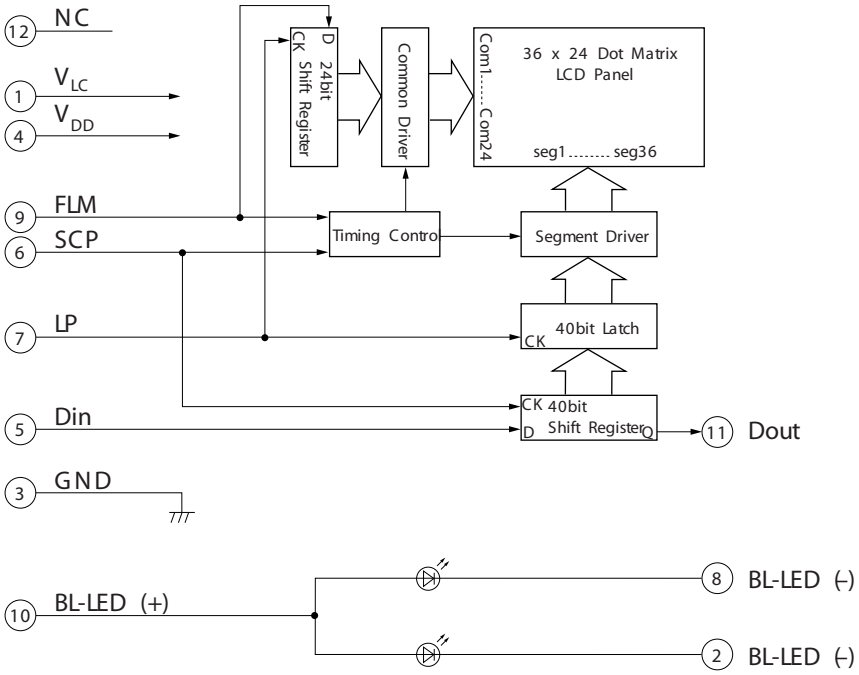
*1 Last data on first line
*2 Beginning data on second line
*3 Location of LP signal on first line

Display Electrical Characteristics

Items			Symbols	Test Condition	Minimum	Typical	Maximum
LCD	Supply Voltage	Logic Circuit	V_{DD}		4.5	5.0	5.5
		LCD Circuit	V_{LC}		7.1	7.3	7.5
	Input Voltage	H	V_{IH}		0.7V_{DD}	—	V_{DD}
		L	V_{IL}		0	—	0.3 V_{DD}
	Output Voltage	H	V_{OH}	D_{OUT}, I_{OH} = 500 µA	V_{DD} −0.5	—	—
		L	V_{OL}	D_{OUT}, I_{OL} = 500 µA	—	—	0.5
	Power	Logic Circuit	I_{DD}	f_{scp} = 1.0MHz	—	—	500
		LCD Circuit	I_{LC}	f_{LP} = 2.4kHz V_{LC} = 7.3V	—	500	2,000

Items		Symbols	Test Condition	Yellow/Green
LED	Forward Current	I_F		Red
				10mA
	Forward Voltage	V_F	I_F = Forward Current Ta = 25°C	Red
				2.0V
	Current Reduction Rate	ΔI_F(DC)	Ta = 25°C above	−0.33mA/°C

BLOCK DIAGRAM & PIN CONFIGURATIONS FOR RGB LEDS



IS01BBFEF
Yellow/Green LED Backlight
Black and White LCD

Pin No.	Symbol	Name	Function
1	V_{LC}	Power	Power source for LCD drive
2	**BL-LED (–)**	Terminal of Backlight LED	Cathode: green
3	**GND**	Ground	
4	V_{DD}	Power	Power source for logic circuit
5	**Din**	Data Input	Display serial data bit. Note: to map the display data, because of the difference between the number of internal shift register data (40) and the single line of LCD pixels (36), the first four bits of data shifted will be dummy bits.
6	**SCP**	Serial Clock Pulse	Clock used by 40-bit internal shift register of the switch, shifting the display data bit presented at Din at falling edge.
7	**LP**	Latch Pulse	Line data latch pulse will latch content of internal 40-bit shift register at falling edge for one line of display. LP will also increment the display line by one.
8	**BL-LED (–)**	Terminal of Backlight LED	Cathode: yellow
9	**FLM**	First Line Marker	The marking signal for the first line data of LCD display. The first line of LCD will be selected by the falling edge of LP signal during the high level (FLM).
10	**BL-LED (+)**	Terminal of Backlight LED	Anode for common
11	**Dout**	Data Output	Display serial output. Can be used to connect to Din of the next SMARTDISPLAY. As a result, many SMARTDISPLAYS can be controlled with one clock and data signal.
12	**NC**	None	No connection

SUPER BRIGHT LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	Yellow/Green	Unit
Forward Current	I_F	15/15	mA
Forward Voltage	V_F	2.2/3.3	V

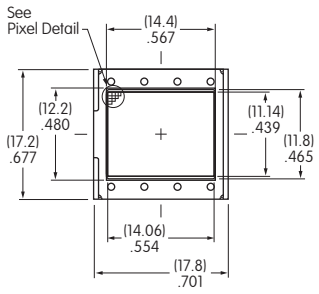
ABSOLUTE MAXIMUM FOR LED

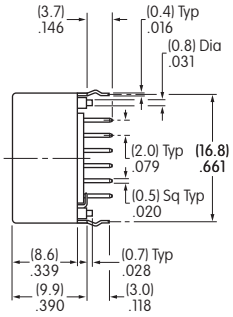
Electrical Characteristics (Temperature at 25°C)

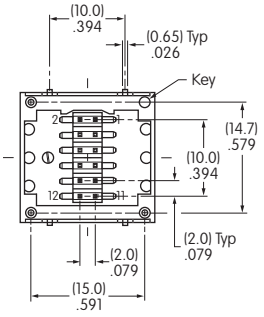
Backlight Color	Symbols	Yellow/Green	Unit
Forward Current	I_F	20	mA
Reverse Voltage	V_R	4.0	V
Current Reduction Rate Above 25°C	$\Delta I_F(DC)$	–0.33	mA/°C
***Power Dissipation**	P_D	40	mW

* For uniform light emission, Power Dissipation should not exceed the Absolute Maximum Rating, and the Forward Current should not exceed the derated Absolute Forward Current.

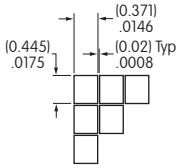
TYPICAL DISPLAY DIMENSIONS



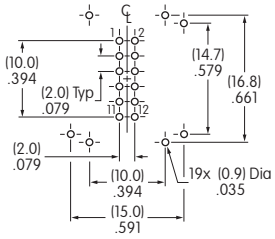




Terminal numbers are not on the device.



Pixel Detail



Footprint

PRECAUTIONS FOR HANDLING & STORAGE OF LCD 36 x 24 DEVICES

Handling

1. The IS Series devices are electrostatic sensitive.
2. The IS series devices are not process sealed.
3. If the LCD is accidentally broken, avoid contact with the liquid and wash off any liquid spills to the skin or clothing.
4. Clean cap surface with dry cloth. If further cleaning is needed, wipe with dampened cloth using neutral cleanser and dry with clean cloth. Do not use organic solvent.
5. Recommended soldering time and temperature limits:

   Do not exceed 70°C at the LCD level.
   Wave Soldering: see Profile B in the Supplement section.
   Manual Soldering: see Profile B in the Supplement section.
6. Recommendation for backlight color uniformity: Use constant current driver. For current limiting resistor method, the power source should be at least twice the backlight LED forward voltage.
7. The VLC voltage should not be applied before logic voltage. If VLC voltage is present before logic voltage, it may cause the driver logic to freeze and damage the LCD, and the driver logic may become damaged.
8. Backlight Forward Current should not exceed the derated Absolute Maximum Forward Current based on the temperature.
9. Excessive images may result after the same image is emitted continuously for an extended period of time.

Storage

1. Store in original container and away from direct sunlight.
2. Keep away from static electricity.
3. Avoid extreme temperatures, high humidity, gaseous substances, and all forms of chemical contamination.