

ZQ1111-SOP8

Data Sheet

V2.0

1. Brief

1.1 Summary

ZQ1111 is a CMOS chip employing single-line transmission specially designed for LED drive application. ZQ1111 is particularly suitable for multi-chip cross-unit cascade application and application requiring higher system security. ZQ1111 uses internal generated clock.

Since the cascade signal is encoded again each time the signal passes one chip, accumulated signal deviation caused by multi-level chip cascade can be eliminated.

1.2 Features

- 12bit brightness depths
- cascade signal is encoded again each time the signal passes one chip
- SOP8 package, no need of peripheral devices
- Single-line cascade, maximum cascade number: 1024 Pixel
- Fault indication
- 5V CMOS Input.

1.3 Type

Type	Package
ZQ1111 –SOP	SOP8

2. Function

2.1 Function Introduction

The cascade data receiving module receives input data signal from the interface, extracts frequency and data information from it, and validates the signal based on the signal frequency and signal flag. The ERRLED exhibits error state if the input signal is invalid.

The cascade data transmitting module generates cascade PWM signal to be transmitted to output interface.

The data storage module receives encoded data from the local display control module and stores the data.

The local display control module reads data from the data storage module according to certain logical sequence and outputs the data to directly drive the LED pixels.

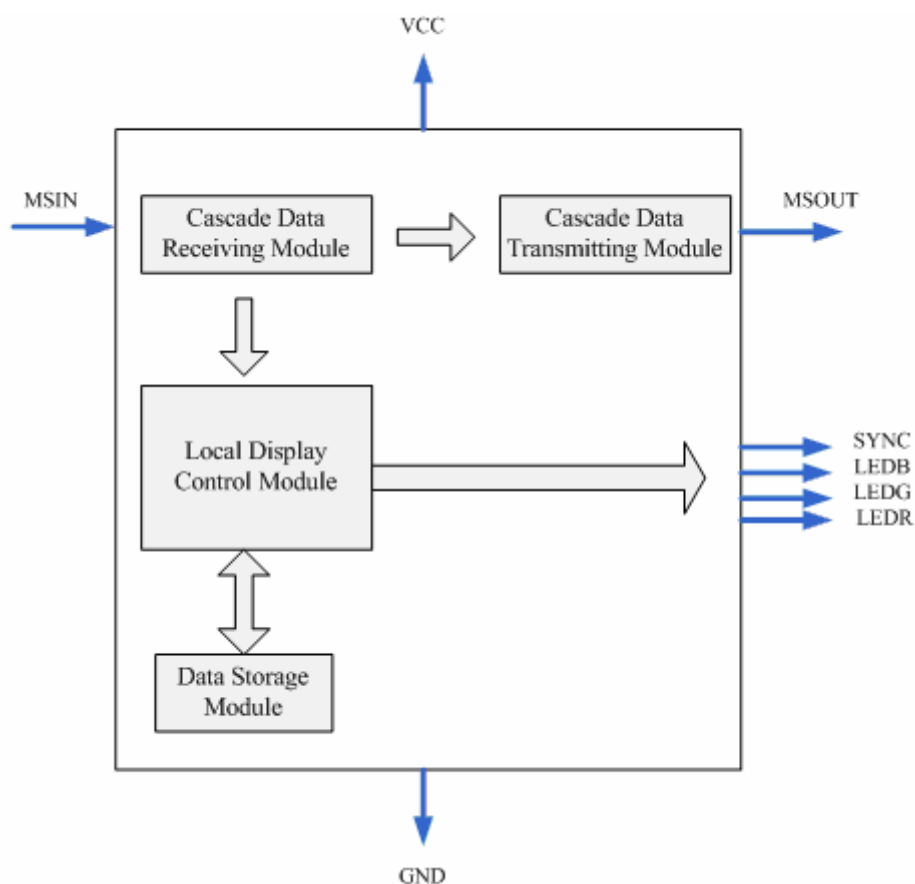


Fig. 1 Structure

3. Characteristics

Characteristic	Symbol	Range	Unit
Supply Voltage	VDD	4.5~5.5	V
Input Voltage	VIN	-0.5~VDD+0.5	V
Output Current	IOUT	10~30	mA
Output Voltage	VOUT	-0.5~5.0	V
Internal Clock Frequency	OSC	12~25	MHz
Operating Temperature	T _{opr}	-40~+85	°C
Storage Temperature	T _{stg}	-40~+100	°C

3.1 Recommended Operating Condition

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	VDD		4.5	5	5.5	V
Output Voltage	VOUT			5		V
Output Current	IOUT	Drive Output	10	20	30	mA
	IOH	Other Output			1.0	mA
	IOL	Other Output			-1.0	mA
Input Voltage	VIH		4	5	5.5	V
	VIL		-0.5		2.1	V
Clock Frequency	CLK		12		25	MHz
Clock High-level Width	CLKH		20		42	ns
Clock Low-level Width	CLKL		20		42	ns
Signal Setup Time	SETUP		10			ns
Signal Hold Time	HOLD		10			ns
Storage Temperature	T _{stg}		-40~+100	-40~+100	-40~+100	°C

4. Package

4.1 SOP 8

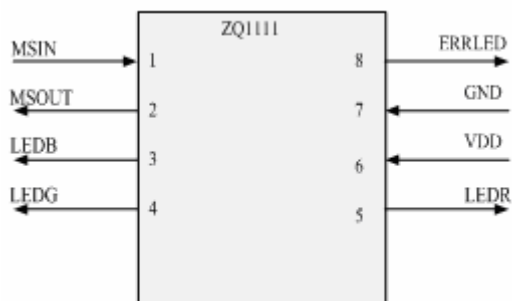
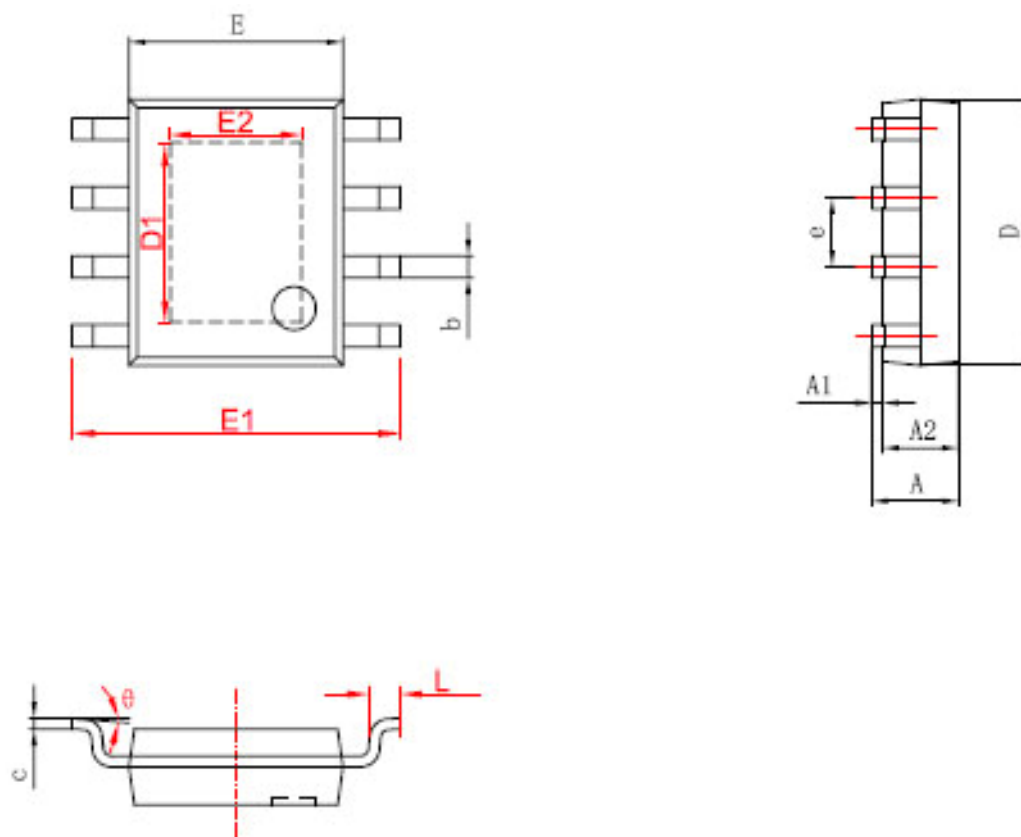


Fig.2 ZQ1111 Pin Assignment

4.2 Pin Definition

Name	PIN. NO	I/O	Description
MSIN	1	input	Signal Input
MSOUT	2	output	Signal Output
LEDB	3	output	Drive LED,
LEDG	4	output	Drive LED,
LEDR	5	output	Drive LED,
VDD	6	input	Power Source
GND	7	input	Ground
ERRLED	8	output	Chip Error State Output

4.3 Physical Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
e	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°

Fig. 3 Physical Dimensions and Table thereof

5. Application Circuit

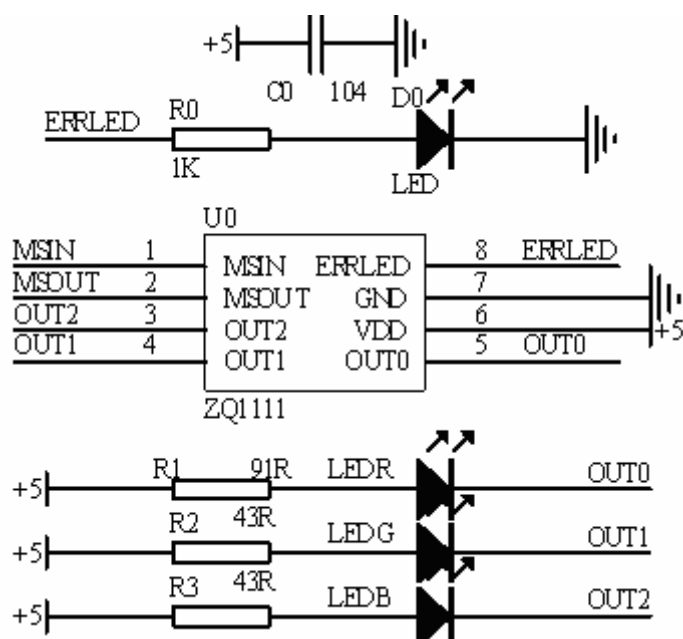


Fig.4 ZQ1111 Application Circuit

- ZQ1111 employs single-line cascade, MSIN is cascade signal input, MSOUT is cascade signal output;
- ZQ1111 outputs can control 3 LEDs (single-pixel), and LEDR, LEDG and LEDB respectively control Red、 Green and Blue LED. However, the sequence is not unique. By setting setup parameters of the control system, different output sequences can be supported;
- ZQ1111 can detect cascade signal faults, which include input signal interrupt or error. The ERRLED pin is used to drive the external fault indicating LED, and it is recommended to use a red LED as an indicator.
- ZQ1111 output is low level active, and the typical drive current is 20mA. Figure 4 shows the value of the resistance of the resistors R1,R2,R3, when the supply voltage is 5V and the operating current is 20mA, the function for calculating the resistances is:

$$R = \frac{VCC - V_{OL} - V_{LED}}{I_D}$$

in which, R is the resistance of the resistor R1, R2, R3, VCC is the supply voltage, V_{OL} is the

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voltage value of output pin when output is low level, V_{LED} is LED operating voltage (for red LED, it is 2.2V, and for green and blue LED, it is 3.2V), I_d is the corresponding operating current. It should be noted that the finally obtained resistances should be the nominal value of the 5% precision carbon film resistor which most approaches the theoretical value.

- A decoupling capacitor must be placed at the chip power input.

6. Interface

ZQ1111 employs single-line cascade transmission, the input interface includes SIN and GND, and the output interface includes SOUT and GND. The input/output signal name should be explicitly labeled on the Top-Over-Layer.

The twisted-pair is recommended to be used in the unit connection, one as signal and the other as GND.

7. Notes

7.1 Power Source Circuit

ZQ1111 is 5V operating chip, and the power source circuit should have over-voltage protection to prevent damage to the chip. Moreover, if the LED employs high voltage, reasonable resistance of the voltage divider should be calculated first, and over-voltage protection and a bulk capacitor should be applied to the voltage input, thereby preventing damage due to over voltage at the input pins.

7.2 PCB Layout

- For double-sided PCB, no via or no cross on SIN, SOUT. Both sides of the signal line and the same positions of the opposed layer must be grounded;
- The width of the power line is selected according to the actual operating currents. Generally, it can be 40mil/A. And the LED circuit should be effectively grounded.

7.3 High Power Application

Typical application circuit of ZQ1111 for high power LED control will be added in the future version whenever it passes corresponding tests.