



# **PRODUCT DATASHEET**



- 3838 IC 0.85t
- Red/Green/Blue





AEC-Q100

**AEC-Q102** 



# **APPLICATIONS:**

- Automotive
- Telecommunication
- Indicator

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- Home Appliance .
- **Decoration Lighting**
- Full Colour LED Strip

Support sleep/wake up mode. In sleep mode the LED's current was lower than 1µA

#### 3838 IC-Integrated RoHS Compliant

# **FEATURES:**

- Package: EMC EIA STD Package with Integrated IC
- Forward Current: max.60mA/channel
- Forward Voltage (typ.): +4.0~+5.5V
- Luminous Intensity (typ.): 4000mcd mixed white@63mA
- Dominant Wavelength (typ.): 625/525/460nm
- Viewing Angle: 120°
- Operating Temperature: -40~+125°C
- Storage Temperature: -40~+125°C
- IC Feature: Support tunable 8-16 bits PWM dimming for each RGB output to realize simple modulation of colour and brightness. 6 bits global current adjustment. Excellent high VDD voltage endurance up to 11V. Built-in OTP for colour calibration to perform great colour consistency. Built-in thermal detection and reporting. CRC protected serial communication. Built-in LED voltage detection, open/short/ VDS detections and reporting function. Watch-Dog function to prevent flicking caused by hotplug. Signal transmission frequency up to 5MHz
- Soldering Methods: Reflow soldering
- MSL Level: acc. to JEDEC Level 2a

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# CHARACTERISTICS:

# Absolute Maximum Characteristics (T<sub>a</sub>=25°C)

Parameter	Symbol	Ratings	Unit
Output Current	Іоит	60	mA
IC Power Supply Voltage	V <sub>DD</sub>	11	V
Input Voltage (DAI/CKI)	VIN	-0.5~V <sub>DD</sub> +0.5	V
Operating Temperature	Topr	-40~+125	°C
Storage Temperature	Тѕтб	-40~+125	°C
Electrostatic Discharge (HBM: ANSI/ESDA/JEDEC JS-001 Class 2)	Vesd	2	kV

## Electrical & Optical Characteristics (Ta=25°C, VDD=5V)

Parameter		Symbol		Values	Linit	Test		
		Symbol	Min.	Тур.	Max.	Onit	Condition	
Supply Voltage		$V_{\text{DD}}$	4.0	5.0	5.5	V		
	R			1200				
Luminous Intensity	G	L.		2720		med	I⊧=63mA	
	В	IV		142		mca		
	W	-		4000				
Dominant Wavelength	R	λD	620		630		I⊧=63mA	
	G		520		530	nm		
	В		455		465			
Colour Coordinato	Х			0.3127			L (2m)	
	Y			0.3290			I⊧=05IIIA	
Viewing Angle		<b>2</b> θ <sub>1/2</sub>		120		deg	l⊧=63mA	

1. Tolerance of Measure: Luminous Intensity: ±10%mcd, Dominant Wavelength: ±1.0nm, View Angle(201/2): ±5%



Devenuetor	Currente e l		1 locit	Test			
Parameter	Symbol	Min.	Тур.	Max.	Unit	Condition	
Supply Voltage	V <sub>DD</sub>	4.0	5.0	5.5	V		
Input High Voltage	VIH	$0.6V_{DD}$		V <sub>DD</sub> +0.4	V	V <sub>DD</sub> =4.0~5.5V	
Input Low Voltage	VIL	-0.5		0.25V <sub>DD</sub>	V	V <sub>DD</sub> =4.0~5.5V	
Output Current	I <sub>OUT</sub>	58.8	60	61.2	mA		
Current Accuracy	Iosb	-2		2	%		
Output Leakage Current	Ileak			1.0	μΑ		
IC Working Current	I <sub>DD_OPR</sub>		4.5		mA	l <sub>out(0-2)</sub> = 60mA	
Quiescent Power Supply Current	Idd_stb		1.2		mA		
Data Clock Frequency	F <sub>CKI</sub>			5	MHz		
PWM Frequency of Output *	Fout	108	120	132	Hz	PWM=16bits V <sub>DD</sub> =5V	

### Electrical & Optical Characteristics (T<sub>a</sub>=25°C)

\* When different PWM set, the PWM frequency will change correspondently, e.g., PWM=12 bits, the typical PWM frequency is 120Hz x 16 (24) = 1920Hz.



# **OUTLINE DIMENSION:**

### Package Dimension:



- 1. All dimensions are in millimetre (mm).
- 2. Tolerance ±0.1mm, unless otherwise noted.

### Recommended Soldering Pad Dimension:



- 1. Dimensions are in millimetre (mm).
- 2. Tolerance  $\pm 0.1$ mm with angle tolerance  $\pm 0.5^{\circ}$ .

# **PIN CONFIGURATION:**





No.	Symbol	Function Description
1	VDD	IC Supply Voltage
2	DAI	Serial Data Input
3	СКІ	Data Clock Input
4	NC	Not Connected Pin
5 *	GND	Ground Terminal
6 *	VDD	IC Supply Voltage
7	GND	Ground Terminal
8	DAO	Serial Data Output
9	СКО	Data Clock Output
10	GND	Ground Terminal

- 1. About not connected pin (NC), it's recommended to solder the pad on PCB but not to electrically connect other pins.
- 2. \* Note: Pad 5 and Pad 6 are recommended to be designed with Cu foil on the PCB as big as possible for thermal dissipation, but users have to notice the electrical connection of these two pads. The Pad 5 must be connected to ground or kept isolated, and pad 6 must be connected to VDD line or kept isolated.
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# **CIE CHROMATICITY DIAGRAM:**



### Chromaticity Coordinates Classifications:

	Codo	Cer	itre	Rad	dius	Angle
a	Code	Х	Y	а	b	Φ
	D65	0.3127	0.3290	0.00669	0.00285	58.57



# **ELECTRO-OPTICAL CHARACTERISTICS:**





# **Function Description**

### 1. Application Circuit:



- 1. RC Filter is recommended to be added or reserved on the board for better waveform of signals in different applications. The value is subject to the practical system environment.
- 2. The bypass capacitor of VDD pin is necessary to be added on the board for the stability of operation. The suggested value of capacitor is 0.1uF.

### 2. Data Communication of Cascading:

Each iCLed needs 72 bits command data and 72 bits PWM data. All iCLeds will latch the command data or PWM data when the CKI keeps at low level over 80us. The data sequence is shown below and the MSB (Most Significant Bit) bit is sent firstly.



### 3. LOD/LSD/VDS/Thermal (THD) Detections:

N0M67S34IC has LED open (LOD), LED short (LSD), LED diodes voltage (VDS) and thermal detections. The detection is activated when the N0M67S34IC receives the 72bits command data (CMD DATA) set by the Primary Register. The data sequence and detection operation are shown below. The detection result outputs from DAO of the last iCLed with 8 bits data format (LEDN\_DET).





					1		
	73 bits	72 bits	72 bits				
LED1 DAL	LED1_CMD DATA	LED2_CMD DATA	LED3_CMD DATA		1		
		72 bits	72 bits				
IED2 DAL		LED2_CMD DATA	LED3_CMD DATA				
			72 bits				
			LED3_CMD DATA				
LEDJ DAI					8 bits	8 bits	8 bits
1502 040				>21.5us	LED3_DET	LED2_DET	LED1_DET
LEDS DAO							

### 4. CKO/DAO Frequency Selection:

The CKO/DAO frequency can be adjusted by setting the Primary Register. This selected frequency is only for detection data report, OTP Memory Read and OTP Register Read. The related frequency is shown below.

CKO/DAO frequency
2.75Mbps
1.38Mbps
0.69Mbps

5. Software Reset:

The PWM display data can be reset by setting the Primary Register to make image initialization once. After making a software reset, user has to send the PWM data again.

6. Watch-Dog Function:

During the PWM data operation, if the CKI keeps at low level over 300ms, the IC makes software reset to turn off all outputs of IC. The software reset can be disabled by setting the Primary Register.

7. Sleep Mode:

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When the PWM data of all IC outputs is set to 0 (black image) and keeps the CKI at low level 300ms, LED enters into "Sleep Mode" to lower the IC power consumption.

The "Sleep Mode" can be disabled by set the Primary Register.

• Enter into Sleep Mode:

1 <sup>st</sup> CKI 1 <sup>st</sup> DAI 1 <sup>st</sup> 72Bits 2 <sup>st</sup> 72Bits
1 <sup>st</sup> DAI 1#72Bits 2#72Bits ····
N <sub>th</sub> CKI
wait ≥300ms



• Leave Sleep Mode:

Under Sleep Mode, when IC receives 16 clocks and keep DAI at low, the IC wakes up one by one. When all ICs leave Sleep Mode, it returns to normal display mode.



8. Thermal Protection:

When the internal temperature of IC is over 150oC, iCLed turns off all outputs automatically until the temperature returns to safe range. The function can be disabled by set the Primary Register.





# **RECOMMENDED SOLDERING PROFILE:**





Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			
		Minimum	Recommendation	Maximum	
Ramp-up Rate to Preheat 25 °C to 150 °C			2	3	K/s
Time ts Tsmin to Tsmax	ts	60	100	120	s
Ramp-up Rate to Peak T <sub>Smax</sub> to T <sub>P</sub>			2	3	K/s
Liquids Temperature	TL		217		°C
Time Above Liquids Temperature	tL		80	100	s
Peak Temperature	Тр			245	°C
Time Within 5 °C of the Specified Peak Temperature T <sub>P</sub> - 5 K	TP			10	s
Ramp-down Rate Tp to 100 °C			3	4	K/s
Time 25 °C to T <sub>P</sub>				480	s

Note:

- 1. We recommend the reflow temperature 240°C (±5°C). The maximum soldering temperature should be limited to 245°C.
- 2. Maxima reflow soldering: 2 times.
- 3. Before, during, and after soldering, should not apply stress on the components and PCB board.

# **PRECAUTIONS OF USE:**



### Storage:

It is recommended to store the products in the following conditions:

- Humidity: 60% R.H. Max.
- Temperature: 5°C~30°C (41°F ~86°F).

Shelf life in sealed bag: 12 months at 5°C~30°C and <60% R.H.

Once the package is opened, the products should be used within 4 weeks. Otherwise, they should be kept in a damp-proof box with descanting agent stored at R.H.<10% and apply baking before use.

### **Over-Current Proof:**

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Must apply resistors for protection otherwise slight voltage shift will cause big current change and burnout will happen.

### Baking:

It is recommended to bake the LED before soldering if the pack has been unsealed for longer than 24hrs. The suggested baking conditions are as followings:

60±3°C x 6hrs and <5%RH, taped / reel package.

It's normal to see slight color fading of carrier (light yellow) after baking in process.

### Cleaning:

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LED carrier / package. Avoid putting any stress force directly on to the LED lens.

### ESD (Electrostatic Discharge):

Static Electricity or power surge will damage the LED. Use of a conductive wrist band or anti-electrosatic glove is recommended when handing the LED all time. All devices, equipment, machinery, work tables, and storage racks must be properly grounded.



# **REVISION RECORD:**

Version	Date	Summary of Revision
A1.0	21/05/2024	Datasheet set-up.
A1.1	13/09/2024	Add product photos.