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July 2016

FL77904
Phase-cut Dimmable Compact LED Direct AC Driver

Features

The simplest Direct AC LED Driver with Only Two External RC Passive Components

Wide AC Input Range: 90~305 V_{AC}

Four

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Pin Configuration

Figure 3. Pin Configuration (Top View)

Thermal Characteristics [1] [2]

Component	Package	θ_{JA} (1S PCB)	θ_{JA} (2S2P PCB)	Units
FL77904MX	8-Lead, Small Outline Integrated Circuit (SOIC) JEDEC MS012 150” Narrow Body, Exposed Pad	156	37	

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Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V_{IN}	VIN Voltage	-0.3	500	V
V_{LED1}	LED1 Pin Voltage	-0.3	500	V
V_{LED2}	LED2 Pin Voltage	-0.3	500	V
V_{LED3}	LED3 Pin Voltage	-0.3	500	V
V_{LED4}	LED4 Pin Voltage	-0.3	200	V
V_{CS}				

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Electrical Characteristics

Unless otherwise noted, R_{CS} = 10 Ω, and T_A = 25°C. Currents are defined as positive into the device and negative out of the device.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
VIN Supply						
$I_{QUIES.VIN}$	V_{IN} Quiescent Current	V_{IN} = 500 V Maximum				

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Typical Performance Characteristics

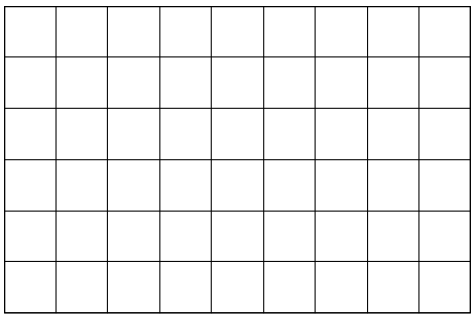

Figure 4. $I_{QUIES.VIN}$ vs. Temperature

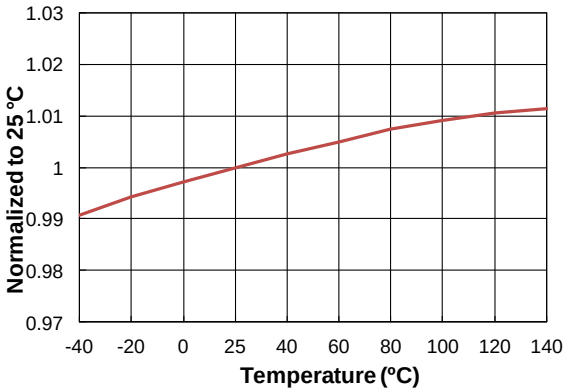

Figure 5. V_{DD} vs. Temperature

Figure 6. I_{LED1} vs. Temperature

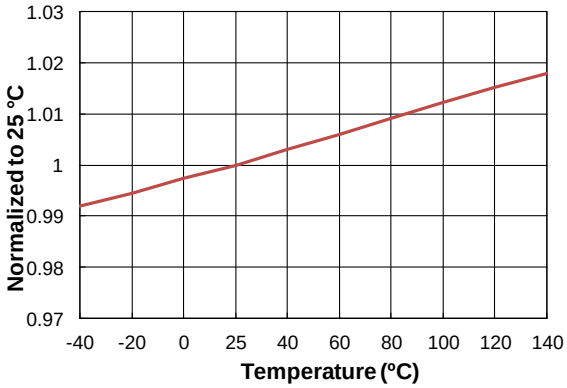

Figure 7. I_{LED2} vs. Temperature

Figure 8. I_{LED3} vs. Temperature

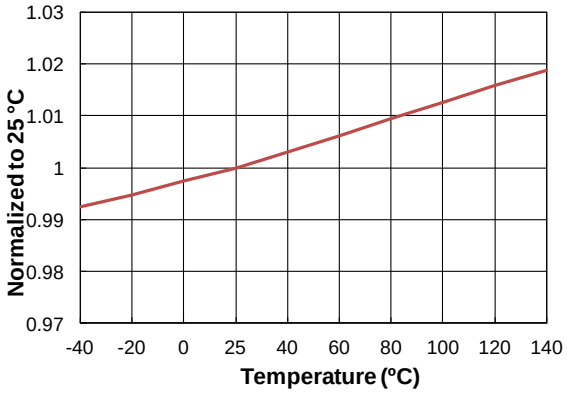

Figure 9. I_{LED4} vs. Temperature

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A good starting point for choosing a LED configuration is to have about 260 V~280 V of the total V_F for 220 V_{AC} mains and 130 V~140 V of the total V_F for 120 V_{AC}.

Internal Shunt Regulator Output, V_{DD}

The system implemented with FL77904 does not require a bulk capacitor after bridge-rectification diodes. As a result, the V_{DD}, which supplies biasing voltage for the FL77904, has voltage ripple like the rectification voltage after the bridge diodes as shown in Figure 11.

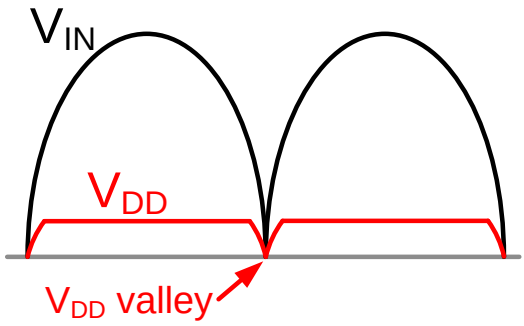

Figure 11. V_{DD} Ripple without C_{VDD}

The V_{DD} ripple can be reduced by a bypassing capacitor, C_{VDD}. If the C_{VDD} is not used, or its value is small, the V_{DD} voltage fluctuates and goes even down to 0 V. It makes the FL77904 reset, but the FL77904 automatically restarts every cycle when the AC line voltage reaches a certain level. General design suggestion is to add C_{VDD} for noise filtering. The recommended C_{VDD} value is 1 µF with 50 V of voltage rating.

Over-Temperature Protection (OTP)

The FL77904 provides over temperature protection (OTP) inherently. When the driver's junction temperature exceeds a specified threshold temperature (T_J = 170°C), the driver will shut down automatically and recover once the temperature drops lower enough than the internal threshold temperature. Without this protection, the lifetime of the FL77904 can be reduced and irreparable damage can occur. Good thermal management is required to achieve best performance and long life span of the FL77904

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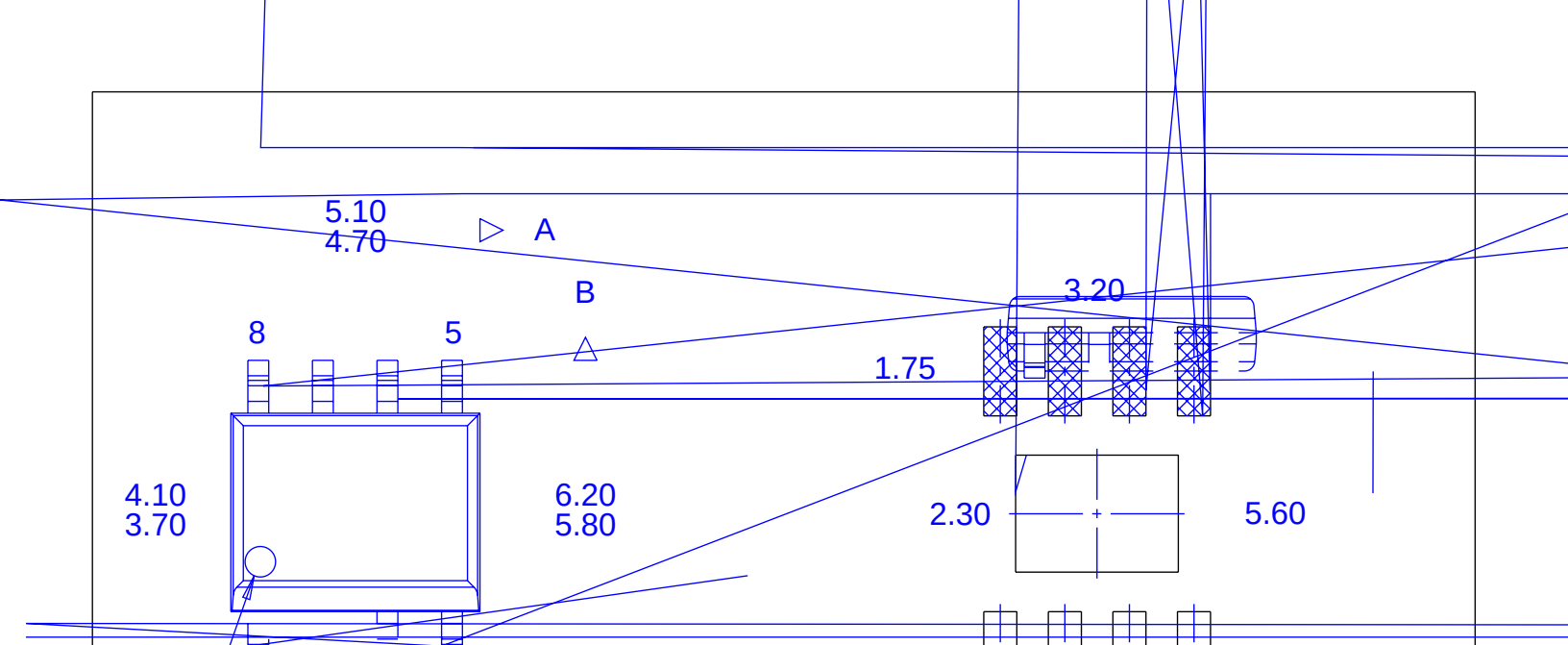
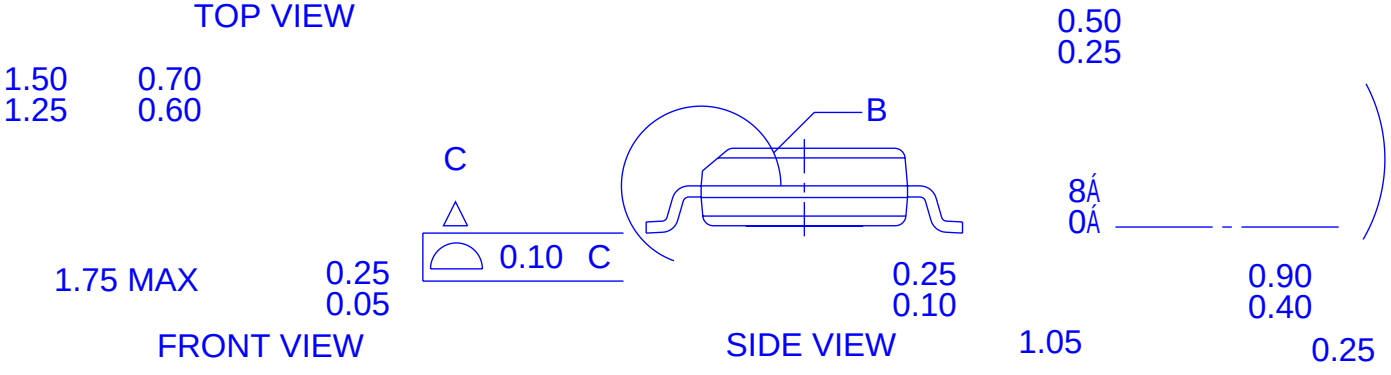


TOP VIEW

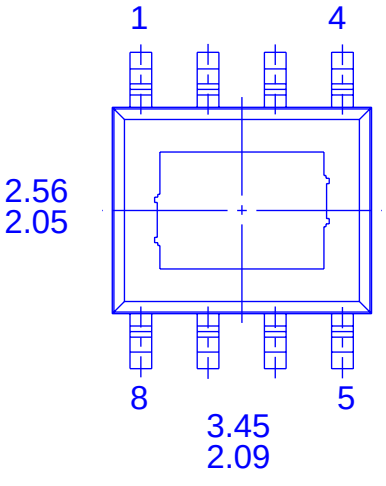
LAND PATTERN RECOMMENDATION



FRONT VIEW

SIDE VIEW

DETAIL B
SCALE 2:1



BOTTOM VIEW

NOTES:

A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE
B. ALL DIMENSIONS ARE IN MILLIMETERS
C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
D. DRAWING FILENAME: MKT-M08Frev2

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