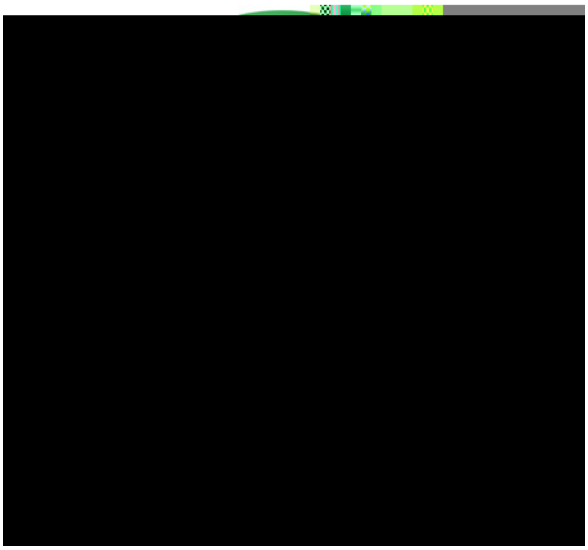
Is Now Part of



To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

July 2016

FL77905

Analog / PWM / Phase-cut Dimmable Compact LED Direct AC Driver

Features

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

Pin Configuration

Figure 2. Pin Configuration (Top View)

Thermal Characteristics [1] [2]

Component	Package	θ_{JA} (1S PCB)	θ_{JA} (2S2P PCB)	Unit
FL77905MX	8-Lead, Small Outline Integrated Circuit (SOIC) JEDEC MS012 150òNarrow Body, Exposed Pad	156	37	°C/W

Notes:
1.

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	500.0	V
V_{LED1}	LED1 Pin Voltage	-0.3	500.0	V
V_{LED2}	LED2 Pin Voltage	-0.3	500.0	V
V_{LED3}	LED3 Pin Voltage	-0.3	200.0	V
V_{CS}	CS Pin Voltage	-0.3	6.0	V
V_{DIM}	DIM Pin Voltage	-0.3	6.0	V
T_J	Junction Temperature	-55	+150	ºC
T_{STG}	Storage Temperature	-65	+150	ºC
I_{LED1}	LED1 Current		80	mA
I_{LED2}	LED2 Current		100	mA
I_{LED3}	LED3 Current		150	mA

Notes:

3. Stress beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.
4. All voltage values, except differential voltages, are given with respect to the GND pin.
5. Human Body Model, ANSI/ESDA/JEDEC JS-001-2012: 1.0 kV at Pins 2~4, 0.4 kV at Pin 5, 1.5 kV at Pins 1, 7~8.
6. Charged Device Model, JESD22-C101: 1.0 kV at Pins 1~8.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
T_J	Operating Junction Temperature	-40	+125	°C

Electrical Characteristics

Unless otherwise noted, R_{CS} = 10 q, T_A = 25°C.

Typical Performance Characteristics

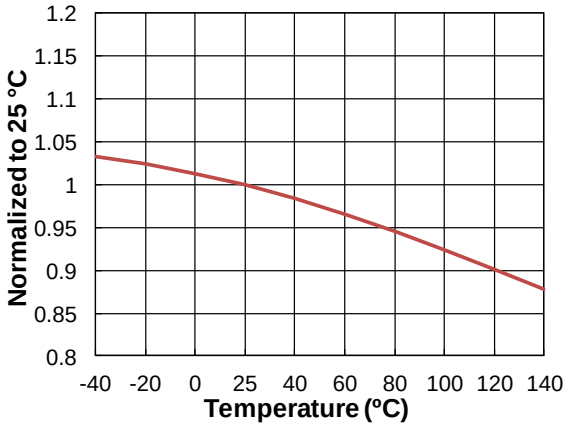


Figure 3. $I_{QUIES.VIN}$ vs. Temperature

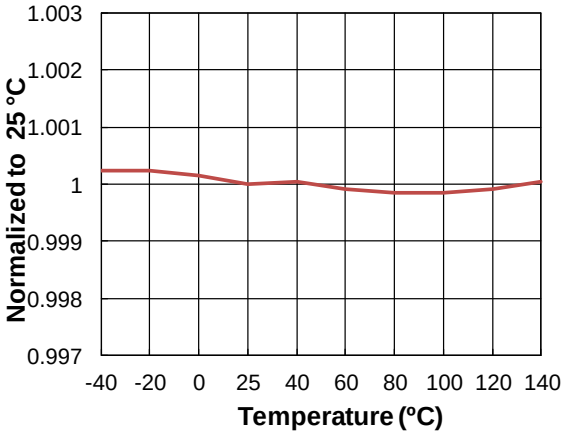


Figure 4. V_{DD} vs. Temperature

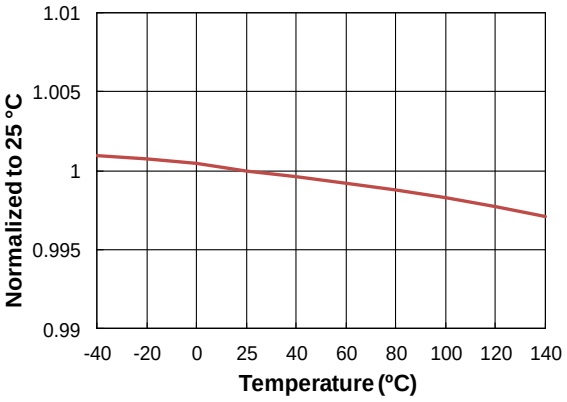


Figure 5. I_{LED1} vs. Temperature

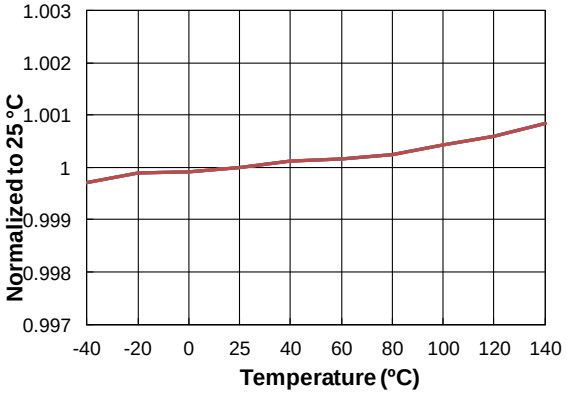


Figure 6. I_{LED2} vs. Temperature

Figure 7. I_{LED3} vs. Temperature

Functional Description

The FL77905 can drive LED strings attached directly to the rectified AC mains using only two external RC components (R_{CS} and C_{VDD}). With three integrated high voltage current sink, LED current in each string is precisely controlled with system compactness. High PF and low THD are obtained by the optimized current sink levels. Phase-cut dimming is easily obtained with wide dimming range and good dimmer compatibility. Dedicated DIM pin is used to implement analog or digital dimming function. Flicker index in the direct AC drive topology can be improved by adopting proprietary self valley-fill solution.

Operation

When the rectified AC line voltage, V_{IN}, is higher than the forward voltage of the consecutive LED groups, each LED group turns on automatically as the corresponding current sink has enough voltage headroom across it. Each current sink increases up to the predefined current level and maintains that level until the following channel's current sink gets enough voltage headroom across it.

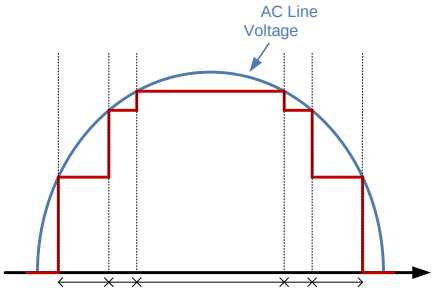
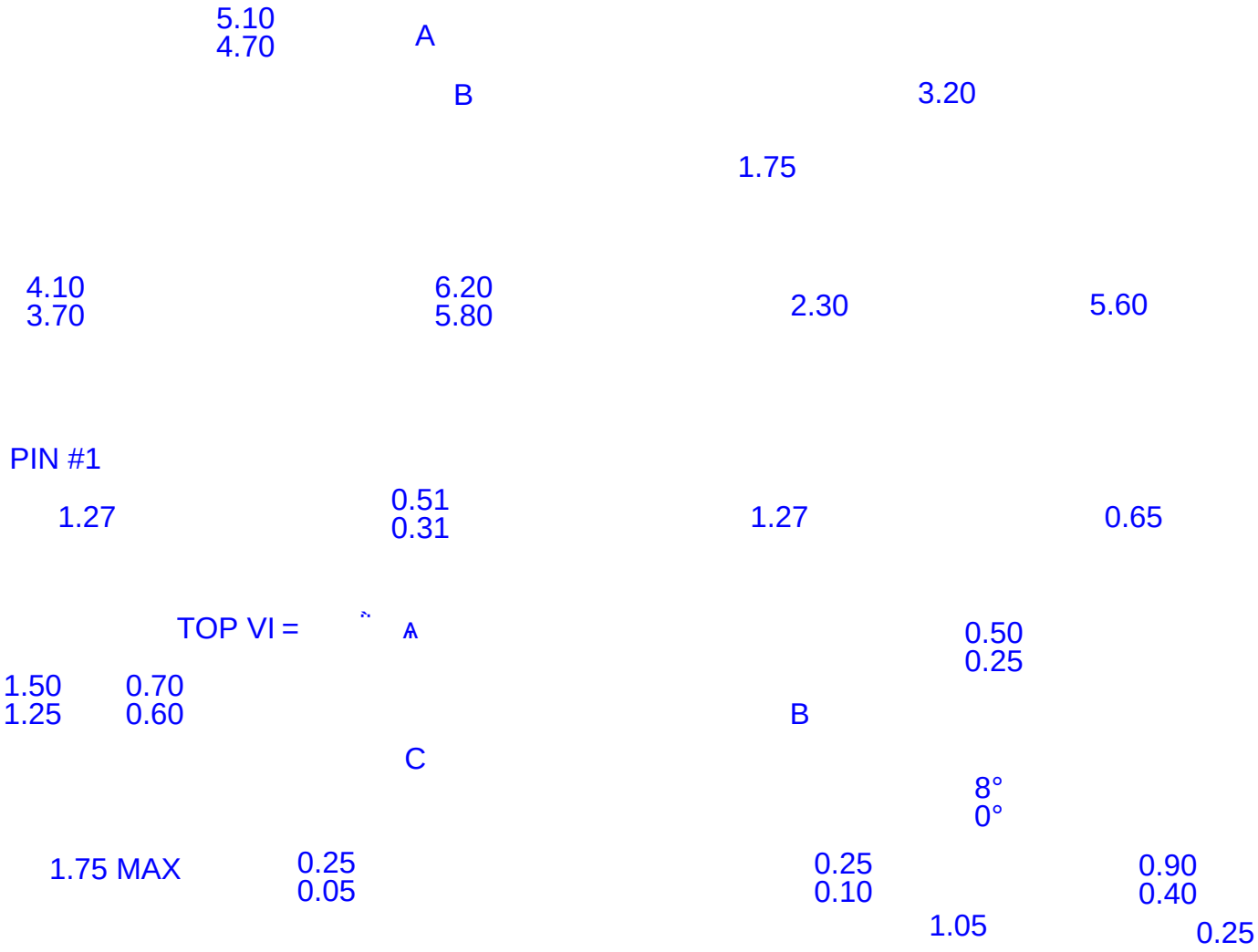


Figure 8. FL77905 Operation

When V_{IN} reaches to the forward voltage across the 1st LED group (V_{F1}) at forward current $I_F = I_{LED1}$, the current drawn from the V_{IN} is directed to the LED1 through the 1st LED group. In sequence, when V_{IN} reaches forward voltage across 1st and 2nd LED groups ($V_{F1}'+V_{F2}$) at $I_F = I_{LED2}$

Internal Shunt Regulator Output, V_{DD}

The system implemented with FL77905 does not


5.10
4.70
A
B
3.20
1.75
4.10
3.70
6.20
5.80
2.30
5.60
PIN #1
1.27
0.51
0.31
1.27
0.65
TOP VI =
A
0.50
0.25
1.50
1.25
0.70
0.60
B
C
8°
0°
1.75 MAX
0.25
0.05
0.25
0.10
0.90
0.40
1.05
0.25
2.56
2.05
3.45
2.09