

# IS31FL3293/6/9: 3/6/9-Channel LED Drivers



This article highlights the benefits and applications for Lumissil's newly released IS31FL3293/6/9 Linear LED drivers; they are enhanced versions of the IS31FL3193/6/9 respectively.

## APPLICATION DETAILS

IS31FL3293/6/9 drivers are micro power with 12-bit color resolution, pre-established pattern sequences in space-saving packages to address the needs of small appliances, gaming accessories, Bluetooth appliances, personal grooming and medical devices.

## KEY FEATURES AND BENEFITS

The IS31FL3293/6/9 devices address the critical challenges of minimal board space and low power consumption required by IoT devices. They consume less than 200uA when fully operational and only 0.3uA when placed into sleep mode, making them ideal for applications requiring long battery life. The LED channel currents can sink up to 40mA with an accuracy of  $\pm 5\%$  between channels and between parts. Device registers can further fine tune the channel currents. A 6-bits global current register will adjust all the channel currents to a value lower than the default 40mA in 64 levels. An 8-bits register will individually tune each Red, Green or Blue LED current in 256 levels for an added level of current control. Furthermore, a 12-bits register [4096 levels] can be programmed to output a precise PWM [Pulse Width Modulation] on each LED channel yielding the best possible color mixing for the Red, Green and Blue LEDs.

LED Driver	Packages Available	#Ch	Operating Current (typ)	Shutdown Current (typ)	Current Per Channel
IS31FL3293	UTQFN-9 [1.5 x 1.5mm]	3	100uA	0.3uA	20mA
IS31FL3296	QFN-20 [3 x 3mm] UTQFN-12 [2 x 2mm]	6	200uA	0.3uA	40mA
IS31FL3299	QFN-20 [3 x 3mm]	9	200uA	0.3uA	40mA

Table 1: IS32FL3293/6/9 Power Capabilities

**Power Saving:** The devices take advantage of latest silicon design processes to dramatically reduce operating current from 3mA [previous generation] to 200uA; a greater than 10x reduction. Device shutdown current is also reduced from 2uA [previous generation] to 0.3uA; a 6x reduction.

**High Resolution:** The devices integrate programming registers that result in high resolution color mixing. A programmable 12-bits, 23 kHz PWM generator operating above the human-audible frequency, along with an 8-bits per channel current register enable brightness and contrast adjustments for vivid color reproduction and zero audible noise.

**Programmable Patterns:** The devices integrate an "auto breath" engine to simplify software coding when creating LED fade in and out color pattern sequences. A gamma corrected fade ON/Off is automatically created for a register defined duration to create smooth color transition cycles for a specific period of time or indefinitely.

The table below contrasts IS31FL3293 to previous generation driver, IS31FL3193

Part Number	IS31FL3193	IS31FL3293
No of Channels	3	3
Quiescent current	800uA	90 uA
Shutdown current	2.5uA	0.3uA
Current/Channel	42mA max	20mA max
LED control	8-bits PWM 5-levels Global Current Control (GCC)	12-bits PWM 8-bits Dot Correction [DC] 6-bits GCC
PWM frequency		200/400Hz
I2C Speed	400KHz	1MHz
Protection	Over-temperature	Over-temperature
Pattern	1 auto breath pattern	1 auto breath pattern with Gamma Correction
Package & Size	DFN-10 [3×3mm]	UTQFN-9 [1.5 × 1.5mm]
Operating Temp.	-40°C to +85°C	-40°C to +125°C

Table 2: IS31FL3193 vs. IS31FL3293

The table below contrasts IS31FL3296 to previous generation driver, IS31FL3196A

Part Number	IS31FL3196A	IS31FL3296
No of Channels	6	6
Quiescent current	3000uA	200uA
Shutdown current	1uA	0.3uA
Current/Channel	20mA max	40mA max
LED Control	8-bits PWM 8 levels of GCC	12-bits PWM 8-bits Dot Correction [DC] 6-bits GCC
PWM frequency		23kHz [12+8 bits PWM mode]
I2C Speed	400KHz	1MHz
Protection	Over-temperature	Over-temperature
Patterns	1 auto breath pattern Audio mode with AGC 2 Driver cascade sync	3 patterns with Gamma Correction 2 Driver cascade sync
Package & Size	QFN-20 [3×3mm]	QFN-20 [3×3mm]
Operating Temp.	-40°C to +85°C	-40°C to +125°C

Table 3: IS31FL3196A vs. IS31FL3296

The table below contrasts IS31FL3299 to previous generation driver, IS31FL3199

Part Number	IS31FL3199	IS31FL3299
No of Channels	9	9
Quiescent current	3000uA	200uA
Shutdown current	1uA	0.3uA
Current/Channel	20mA max	40mA max
LED Control	8-bits PWM 8 levels of GCC	12-bits/8+4-bits PWM 8-bits DC 6-bits GCC
PWM frequency		23kHz [8+4 bits PWM mode]
I2C Speed	400KHz	1MHz
Protection	Over-temperature	Over-temperature
Auto Breath	1 auto breath pattern Audio mode with AGC 2 Driver cascade sync	3 patterns with Gamma Correction 2 Driver cascade sync
Package	QFN-20 [3×3mm]	QFN-20 [3×3mm]
Operating Temp.	-40°C to +85°C	-40°C to +125°C

Table 4: IS31FL3199 vs. IS31FL3299

Lumissil has been a leading supplier of multi-channel LEDs for the past 10 years. We are committed to keep them relevant for our growing customer base. The IS31FL3293/6/9 devices are an example of integrating advanced technology into already popular product offerings. The IS31FL3293/6/9 serve as a technology refresh for the popular IS31FL3193/6/9 devices which remain in volume production.

**CONTACT**

For more information, email [marketing@lumissil.com](mailto:marketing@lumissil.com) or Aaron Reynoso at [areynoso@lumissil.com](mailto:areynoso@lumissil.com)