

# Power logic: the single-chip solution to LED control

High-brightness LED drivers



May 2009

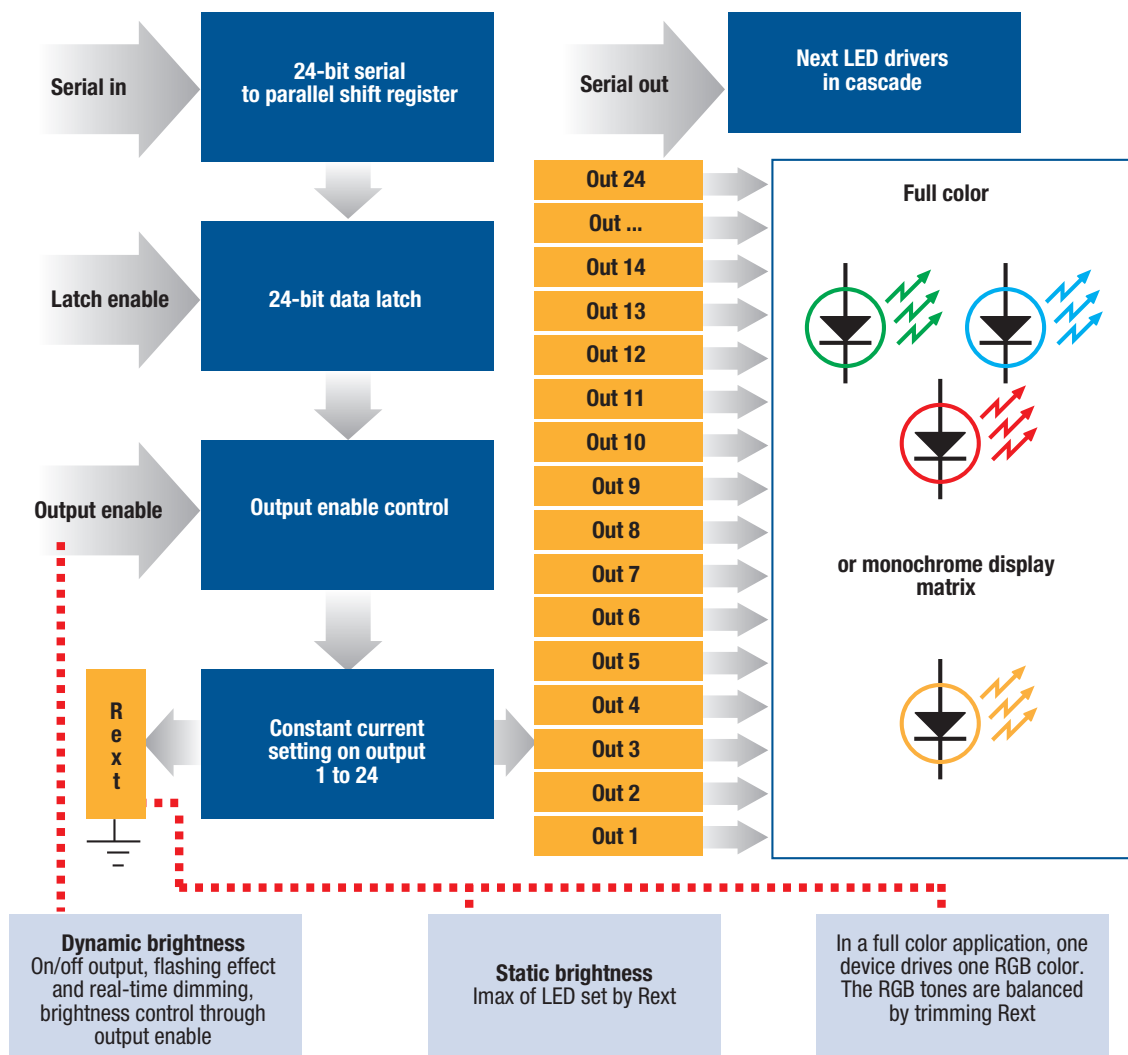
The new LED driver (power logic) family from STMicroelectronics fully integrates all functions required to drive high-brightness LEDs.

These devices allow constant-current control in a single-chip solution. The external parts are reduced to only one resistor which sets the preferred maximum current for all outputs.

An innovative feature of this family is the clock and data resynchronization; this occurs when the devices are connected in cascade. Devices also come with additional features such as high current, high precision, thermal shutdown, error detection and auto power-saving functionalities.

## Key features

- 24, 16, 8 and 4 constant-current outputs per output group set by only one external resistor
- Output current range per channel: 5 to 400 mA
- High output voltage per channel up to 20 V
- Serial data and clock resynchronization
- $V_{DD}$ : 3.3 V (5 V available)
- Cascadable devices
- Packages: available in DIP, SO, SSOP, TSSOP, TSSOP exposed pad and TQFP exposed pad
- Common footprints for universal device replacements on the same PCB
- ESD protection: up to 2.5 kV
- Robust operating temperature range: -40 °C to +125 °C
- Thermal protection by automatic thermal shutdown circuitry
- Embedded error detection for remote status monitoring on LED for open/short conditions
- Embedded power-saving circuitry to reduce system power consumption



## Key benefits

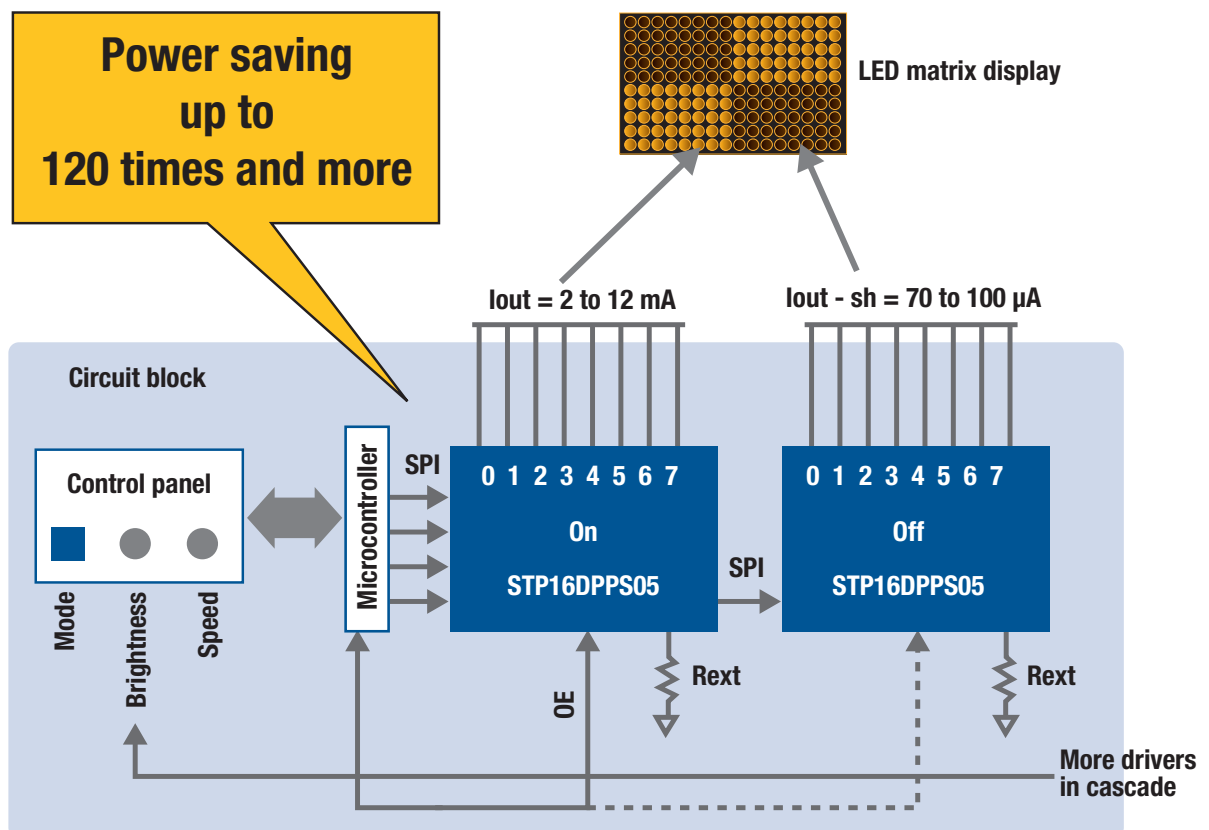
- Thermal protection reduces risk of damaging device when it exceeds 170 °C – prolongs device lifespan
- Embedded error detection detects LED status remotely in the field – system could activate service crew in event of failure
- Embedded power-saving circuitry drives device with low quiescent current when no outputs are active – achieving power saving and especially beneficial for battery/solar-operated applications

## Applications

- Full-color or monochrome LED driving: electronic matrices and high-resolution giant video displays
- Consumer electronics: 7-segment digits or discrete LED driving
- Industrial: gaming machines and white goods
- General lighting: power-LED driving in special and architectural lighting
- Display backlighting
- Traffic displays, roadwork signage and battery-operated or solar-powered electronic signs

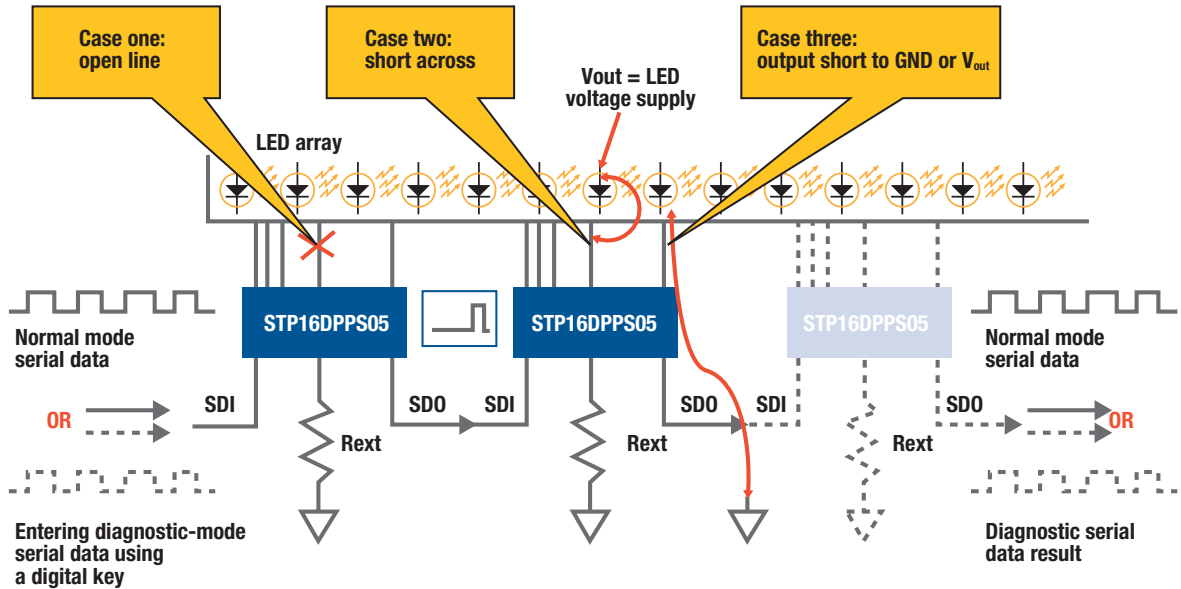
## Auto power saving

The product is specially developed to reduce total power consumed by LED drivers that are not actively driving any output in real-time. This auto power shutdown and power-on feature allows the device to save power without any external intervention, making it the ideal solution to support all worldwide energy-saving programs which encourage power efficiency in lighting applications.

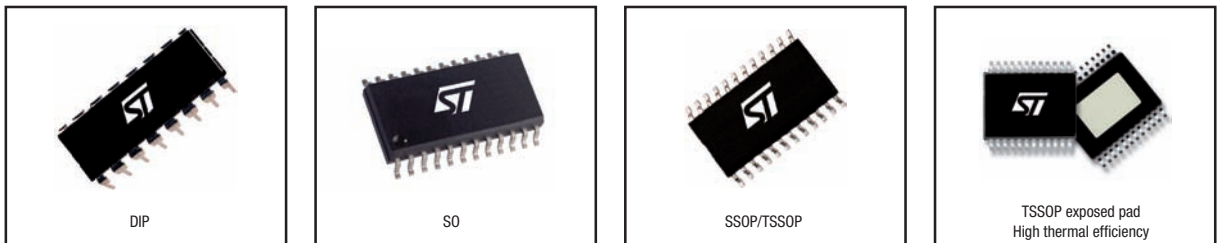


## Output error detection

The device features built-in error detection for short-to-ground, short-to-supply or open-line faults. The error detection mode can be remotely controlled using specific digital keys through the device's SPI port. Fault data is shifted out of the device via the same SPI with no additional pin. This reduces the system downtime by alerting maintenance crews for any event of faulty LED.



## Wide range of packages



## Universal pin layout

These devices are specifically designed with similar pin layouts, and devices with a different number of channels and features are replaceable on the same PCB.

For example:

- SO24 is replaceable by SO16
- STP08CP05TTR is replaceable by STP08DP05TTR

## Constant current LED drivers by features

Part number	with thermal shutdown	with output error detection	with auto power saving
STP24DP05	✓	✓	
STP16CP05	✓		
STP16CPS05	✓		✓
STP16DP05	✓	✓	
STP16DPS05	✓	✓	✓
STP16CPC05	✓		
STP16CPP05	✓		
STP16CPS05	✓		✓
STP16DPP05	✓	✓	
STP16DPS05	✓	✓	✓
STP08CP05	✓		
STP08DP05	✓	✓	
STP04CM05	✓		

## ST LED drivers (power logic)

Part number	Description	I/O	V <sub>DD</sub> (V)	Bit-to-bit accuracy (+/- %)	I <sub>out</sub> max (mA)
STP04CM05	4-bit constant-current power LED driver	Serial in/parallel out	3.3 to 5.5	1	80 to 400
STP08DP05	8-bit constant-current LED driver with output error detection	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP08CP05	8-bit constant-current LED driver	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP16CP05	16-bit constant-current LED driver	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP16DP05	16-bit constant-current LED driver with output error detection	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP16CPS05	16-bit constant-current LED driver with auto-power saving	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP16DPS05	16-bit constant-current LED driver with auto-power saving and output error detection	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP16CPC05	16-bit constant-current LED driver with balanced on/off	Serial in/parallel out	3.0 to 5.5	1.5	5 to 100
STP16CPP05	16-bit low-current, high-precision LED driver	Serial in/parallel out	3.0 to 5.5	2	3 to 40
STP16DPP05	16-bit low-current, high-precision LED driver with output error detection	Serial in/parallel out	3.0 to 5.5	2	3 to 40
STP16CPS05	16-bit low-current, high-precision LED driver with auto-power saving	Serial in/parallel out	3.0 to 5.5	2	3 to 40
STP16DPS05	16-bit low-current, high-precision LED driver with auto-power saving and output error detection	Serial in/parallel out	3.0 to 5.5	2	3 to 40
STP24DP05	24-bit constant-current LED driver with output error detection	Serial in/parallel out	3.0 to 5.5	3	5 to 80
STPIC6C595	8-bit LED driver with overvoltage protection	Serial in/parallel out	4.5 to 5.5	N/A	100 continuous
STPIC6D595	8-bit LED driver	Serial in/parallel out	4.5 to 5.5	N/A	100 continuous

## ST LED drivers (power logic) evaluation boards

Evaluation board	Product	Description	Features	Support
STEVAL-ILL003V2	STP16CP05, STP16CPS05	High-brightness 32-LED evaluation board based on STP16CP05/CPS05 LED driver	Adjustable brightness Adjustable blinking speed Animated text	AN2141
STEVAL-ILL002V3	STP08DP05	High-brightness 40 OSRAM LED evaluation board with output error detection based on STP08DP05 LED driver	Adjustable brightness Adjustable blinking speed Animated text Error detection feature	AN2478
STEVAL-ILL002V4	STP08DP05	High-brightness 40 VISHAY LED evaluation board with output error detection based on STP08DP05 LED driver	Adjustable brightness Adjustable blinking speed Animated text Error detection feature	AN2478
STEVAL-ILL009V3	STP04CM05	OSRAM OSTAR® projection LED board	STEVAL-ILL009V5 daughter board Adjustable brightness Adjustable blinking speed Animated text Power LED driving	AN2531
STEVAL-ILL009V4	STP04CM05	OSRAM Golden DRAGON® LED board	STEVAL-ILL009V5 daughter board Adjustable brightness Adjustable blinking speed Animated text Power LED driving	AN2531
STEVAL-ILL009V5	STP04CM05	New RGB color demonstration board based on the STP04CM05 and ST1S10	Adjustable brightness Adjustable blinking speed Animated text Power LED driving	AN2531
STEVAL-ILL015V1	ST24DP05	High-brightness RGB LED array with LED error detection based on the STP24DP05 and STM32	Adjustable brightness JTAG interface for C firmware change update Mini USB connector for PC GUI connection Error detection feature	UM0574



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