# LED Displays and Signage Solutions

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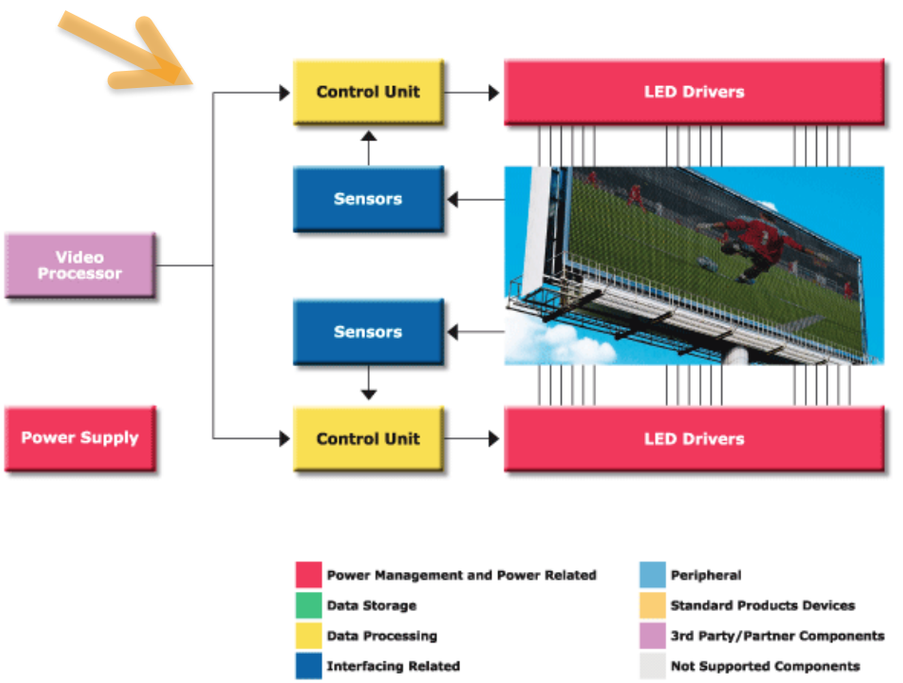



## ST Position:

- #1 in Lighting Segment*
- #2 in Power Management**

## ST Expertise:

- System Solutions
- Technology Integration and Innovation
- Excellent Technical Support

*STMicroelectronics, Datapoint and Darnell - 2008
**iSupply - 2010

# Content

- LED Displays and Signage Solutions
  - LED Array Driver Features/Benefits
    - Constant Current
    - Error Detection/Diagnostics
    - Auto Power Savings/Shutdown
    - High Precision
    - High Current
    - Balanced Turn-on/off
  - System Evaluation Boards and Tools
    - HB LED driver solution with Diagnostics (32, 40 LEDs)
    - 16 x 32 LED Matrix Display Panel
    - RGB LED driver for Color Displays and Backlighting
    - Super HB RGB Color LED solution
    - High Brightness LED Array Dimmer Solution
    - RGB Moving Message Display System


# LED array drivers

From Small to Very Large LED Displays and Signs

- Full color video
- Monochrome message boards
- Variable message signs
- Transportation
- Information
- Special Lighting
- LED Backlighting

**STP04CM05, STP08*P05, STP16*05, and STP24*05 families**

- Constant-current drivers, set by only one external resistor
- Serial data and clock resynchronization
- High current and high precision
- Thermal shutdown
- Error detection and auto power-saving

# LED Array Driver general portfolio

STPXXYY05 Series Features

- Absolute Output Voltage up to 20V
- Output Enable frequency up to 1MHz
- SDI and CLK re-synchronized device by device w/o use of CLK falling edge
- Analog Thermal Shutdown protection
- Clock frequency over 30MHz,
- TSSOP package with exposed pad

Extended Junction Temperature range of -40° to 125 C

C= Constant current

P= Precision

PP = Precision and lower output current range (3-40mA output current)

M= High current (80-400mA)

D= Error Detection/Diagnostic

S = Auto-Shutdown

| Part Number | Description | Iout | Bit Prec. | Chip Prec. | Evaluation Board |
|---|---|---|---|---|---|
| **STP08CP05** | 8-bit C.C. LED driver | 5-100mA | +/-1% | +/-3% | - |
| **STP08DP05** | 8-bit C.C. LED driver w/Diagnostics | 5–100mA | +/-1.5% | +/-5% | **STEVAL-ILL002V3** **STEVAL-ILL002V4** |
| **STP16CP(P)(S)05*** | 16-bit w/AutoPower-Saving | 5–100mA | +/-1.5% | +/-5% | **STEVAL-ILL003V2** |
| **STP16DP(P)(S)05** | 16-bit with Diagnostics | 5–100mA | +/-1.5% | +/-5% | **STEVAL-ILL025V1** |
| **STP1612PW05** | 16-bit w/12/16 bit e-PWM | 3–80mA | +/-1.5% | +/-6% | **STEVAL-ILL028V1** |
| **STP04CM05** | 4-bit C.C. Power LED Driver | 80–400mA | +-1% | +/-6% | **STEVAL-ILL009V5** |
| **STP24DP05** | 24-bit with Diagnostics | 3–80mA | +/-3% | +/-8% | **STEVAL-ILL015V1** |

***Also available as STP16CPC05, STP16CPC26 with balanced turn-on/turn-off feature**

# LED Array Driver Portfolio Features

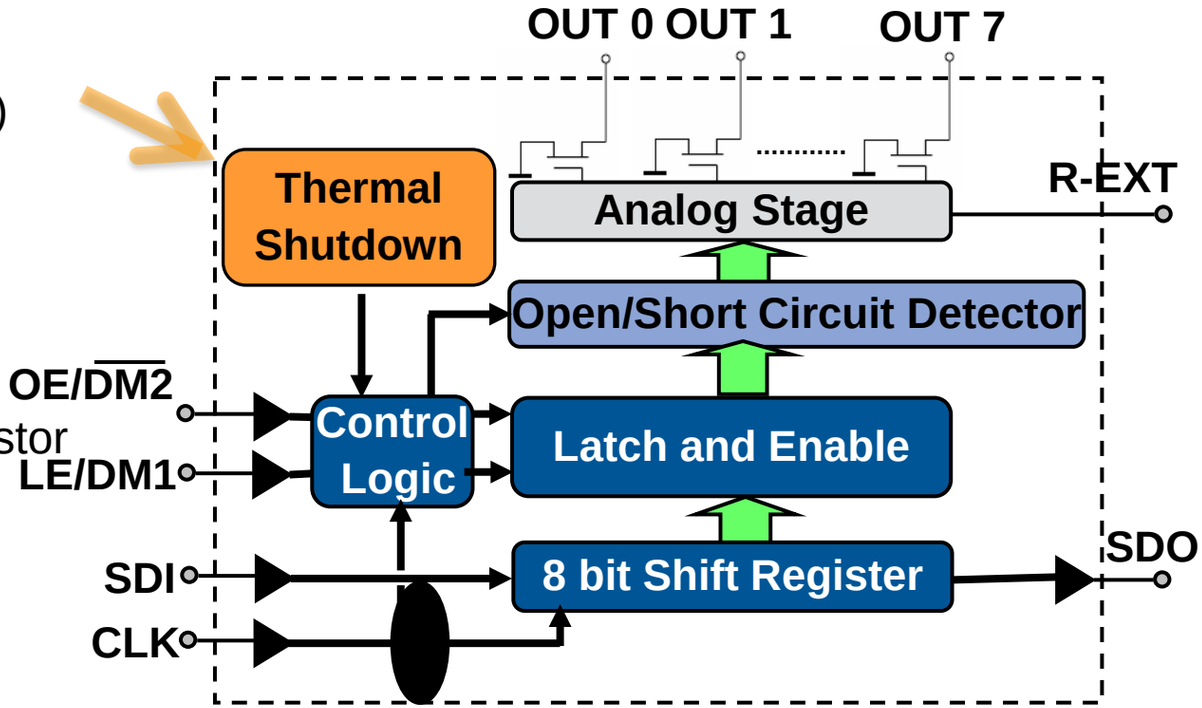
| | |
|---|---|
| **Standard constant current LED array drivers** | **STP08CP05, STP16CP05, STP16CPC26** |
| ***Low current/high accuracy*** **LED array drivers** | **STP16CPP05, STP16DPP05, STP16CPPS05, STP16DPPS05** |
| **LED array drivers with *Error Detection*** | **STP08DP05, STP16DP05, STP16DPP05, STP16DPS05, STP16DPPS05** |
| **LED array drivers with *Auto Shut-Down*** | **STP16CPS05, STP16CPPS05, STP16DPS05, STP16DPPS05** |
| **LED array drivers with *Balanced $T_{ON}/T_{OFF}$*** | **STP16CPC05, STP16CPC26** |
| **LED array drivers w/ *PWM brightness control*** | **STP1612PW05** |
| **LED array drivers for *RGB solutions*** | **STP04CM05, STP24DP05,** |

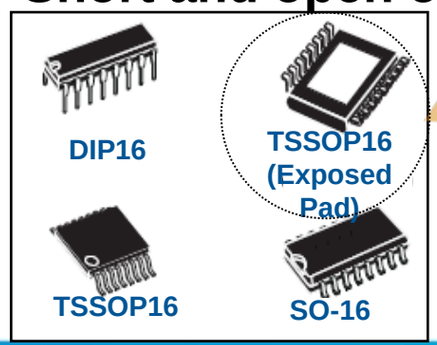
# STP08CP/DP05 – 8 ch, 5-100ma

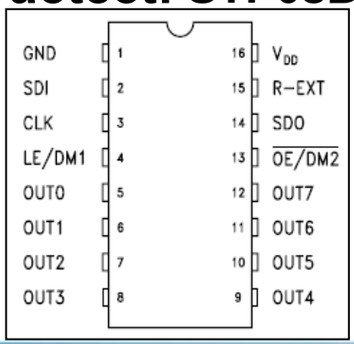
## LED Array Drivers

### Key Features:

- Low-voltage power supply (3V – 5.5V)
- 8 constant-current output channels
- 8-bit shift register
- Serial data IN/parallel data OUT
- Output current: 5-100 mA
- Adjustable output current thru ext resistor
- Maximum clock frequency: 30 MHz
- 3.3V microcontroller driver-able
- Current accuracy: +/-1.5% between bits
  - STP08CP05: +/-3% between ICs
  - STP08DP05: +/-5% between ICs
- ESD protection: 2.5 kV HBM, 200V MM
- Extended thermal shut-down and protection features
- **Short and open output error detect: STP08DP05**



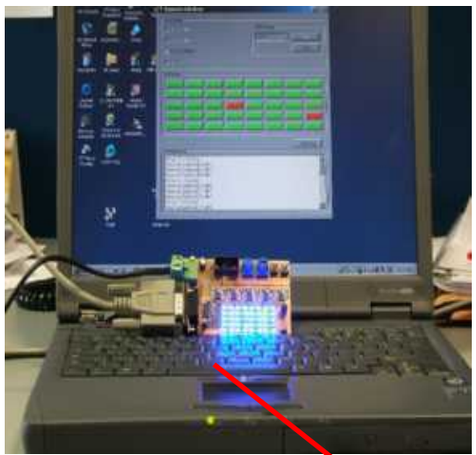

# STP08DP05 w/Diagnostics

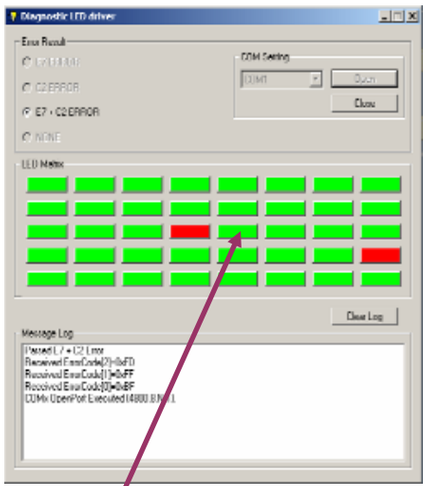
## LED Driver Evaluation Board Solution

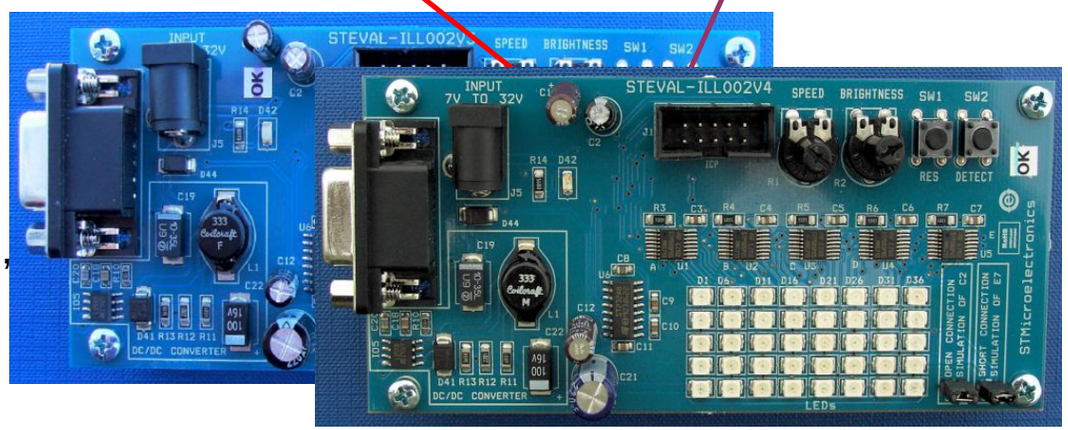
**Key Features:**

40 LED Matrix with

- **Error detection**
- Current regulation
- Adjustable brightness
- Animated text implemented
- Adjustable blinking speed
- GUI SW for LEDs diagnostic
- Input voltage from 7V to 32V
- DC/DC Converter for high efficiency
- Standard supply connector








**Key Products:**

- STP08DP05 LED constant current driver
- ST7FLite39 8-bit microcontroller (10-bit ADC, SPI, SCI communication)
- LE50AB Linear voltage regulator
- ST3232C RS-232 Drivers and Receivers
- L5970D DC/DC Converter

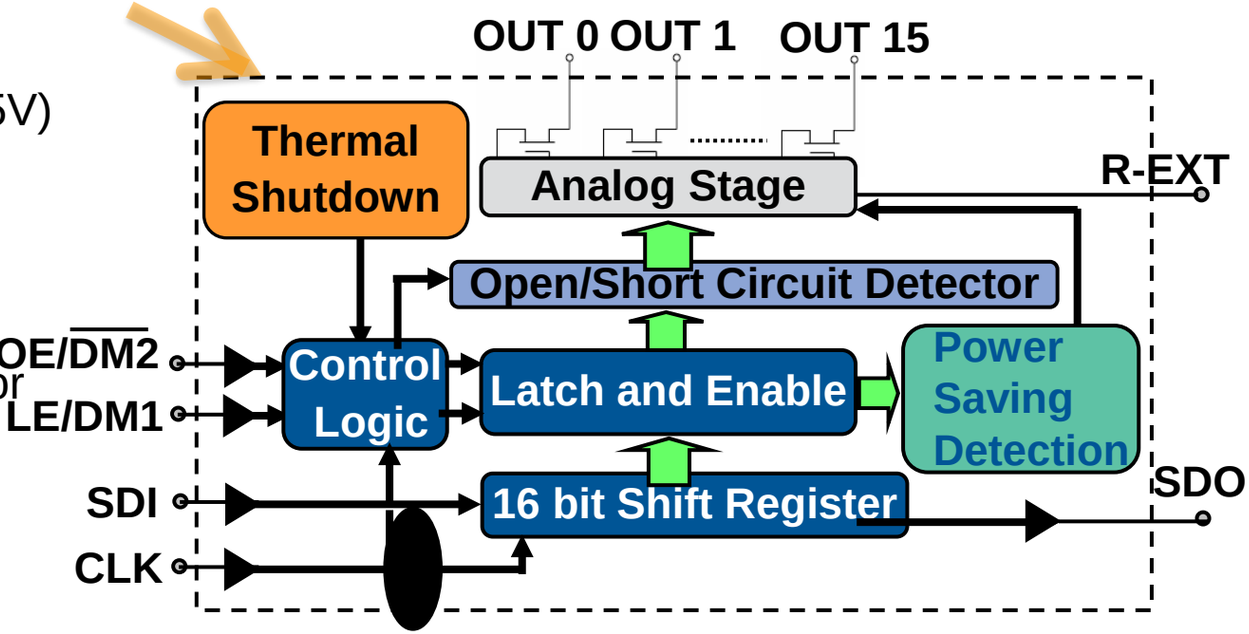
| Evaluation board | App note | Description |
|---|---|---|
| **STEVAL-ILL002V3 (Osram LEDs)**<br>**STEVAL-ILL002V4 (Vishay LEDs)** | **AN2478, AN2415** | **High-brightness LED driver with diagnostics (40 LEDs) demonstration board** |

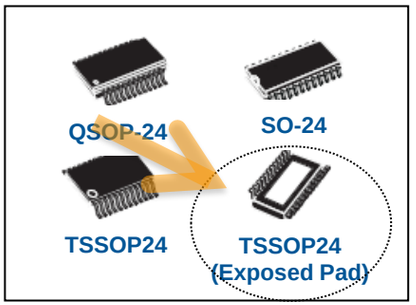
# STP16CP(S)05 or STP16DP(S)05

## 16 channel, 5-100mA LED Array Drivers

**Key Features:**

- Low-voltage power supply: (3V to 5.5V)
- 16 constant-current output channels
- 16-bit shift register
- Output current:
  - 5 to 100mA for STP16*P05 series
- Adjustable output current - ext resistor
- 3.3 V microcontroller drivable
- Maximum clock frequency: 30 MHz
- Current accuracy:
  - +/-1.5% between bits
  - +/-3% between ICs
- ESD protection: 2.5 kV HBM, 200V MM
- Extended thermal range and protection features
- **Short and open output ERROR DETECT:**
  - **STP16DP05 and STP16DPS05**
- **Auto Shut-Down:**
  - **STP16CPS05 and STP16DPS05**
- **Balanced output rise/fall time, typ 100ns:**
  - **STP16CPC05**



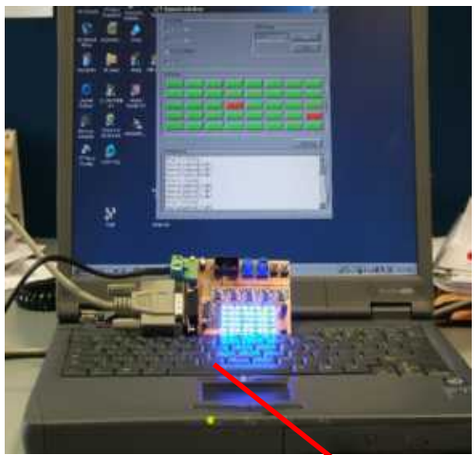



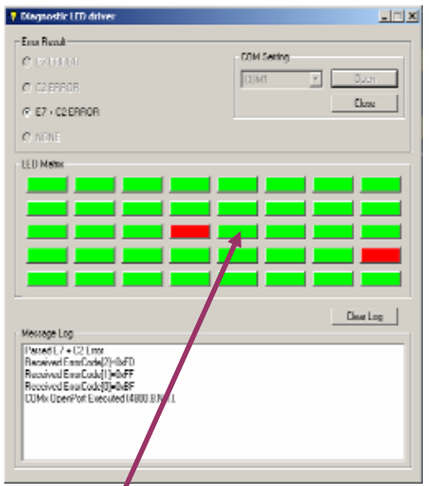

# STP16CP05 LED Driver Eval Board

## Key Features:

32 LED Matrix with

- Current regulation
- Adjustable brightness
- Animated text capability
- Adjustable blinking speed
- GUI SW for LEDs diagnostic
- Input voltage from 5V to 35V
- DC/DC Converter for high efficiency





## Key Products:

- STP16CP05 LED constant current driver
- STP16CPS05 LED constant current driver w/auto power saving/shut down
- ST7FLite09 8-bit microcontroller
- L78L33AC Voltage regulator
- STPS340U Schottky diode
- L5970D DC/DC converter


| Evaluation board | Application note | Description |
|---|---|---|
| **STEVAL-ILL003V2** | **AN2141** | **High-brightness 32-LED evaluation board without diagnostic based on the STP16CP05 LED driver** |

# STP16DP05 w/Diagnostics

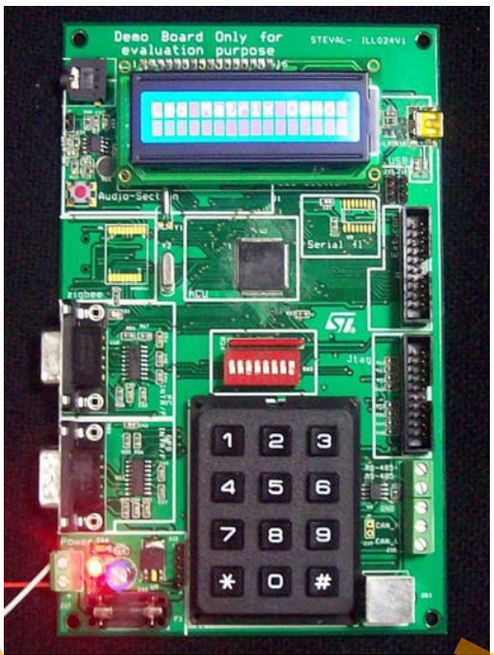
## LED Driver Evaluation Board Solution

**Key Features:**

- 16 x 32 LED Matrix display with STP16DP05
- Mother/slave board for LED display based on STM32 uCtlr
- Supports up to 8 add'l display units in series
- Controlled by a single control unit supporting up to 254 display units
- Configurable through Windows HyperTerminal via serial interface and through a PS2 keyboard
- GPS Interface
- Audio Output -Playback of Pre-recorded .wav files

**Key Products:**

- STP16DP05 LED display driver
- STM32F103 32-bit ARM-based microcontroller
- STM1001 Reset IC
- ESDALC6V1W Quad Transil




**STEVAL-ILL024V1**
LED Matrix Control Unit
For based upon
STM32F103VB

**STEVAL-ILL025V1**
Shows Capability of
STP16DP05 in driving
Matrix LED Display panel

| Evaluation boards | User Manual | Description |
|---|---|---|
| **STEVAL-ILL025V1/STEVAL-ILL024V1 LED matrix control unit** | **UM0767** | **Demonstration boards based on the STP16DP05 LED matrix driver and the STM32F103VB** |

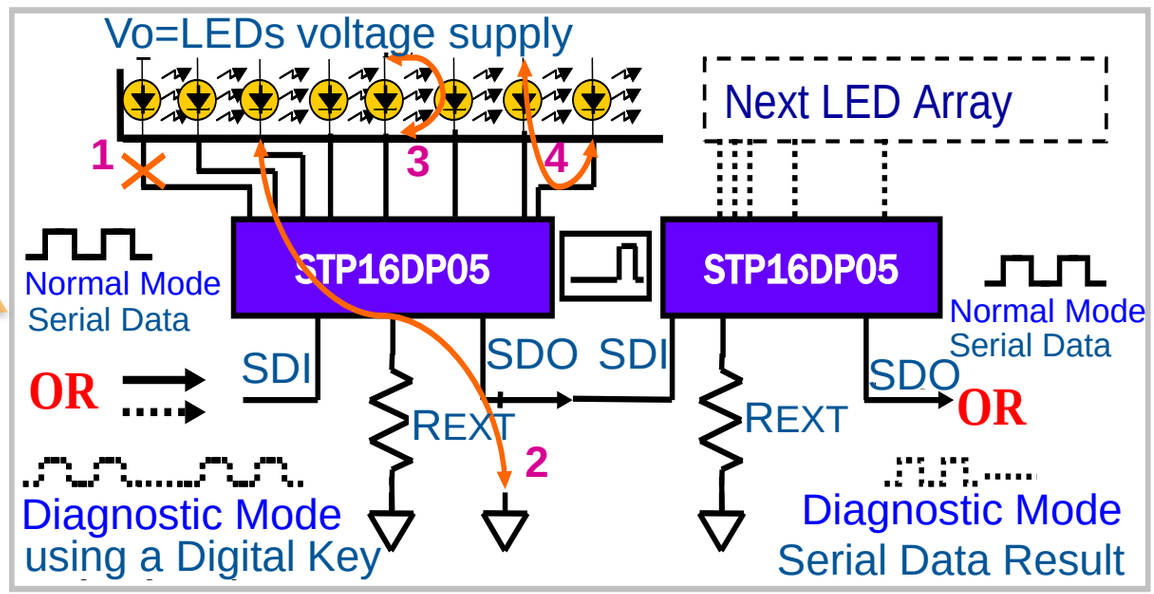
# Error Detection/Diagnostic Mode

**ERROR DETECTION** → ***Detects Open and Shorts LED on the Output***

***NORMAL MODE***
**Device works like a Constant Current LED Driver**

***DIAGNOSTIC MODE***
**The LED Driver enters the Diagnostic mode by using a *Digital Key* input to the SERIAL DATA IN**

| Detection conditions | Detection results |
|---|---|
| $I_{ODEC} \leq 0.5 \times I_O$ | *OPEN LINE (1) or OUTPUT SHORT TO GND (2) detected* |
| $I_{ODEC} \geq 0.5 \times I_O$ | NO ERROR DETECTED |
| $V_O \geq 2.4V$ | *SHORT ON LED (3) or SHORT TO $V_O$ (4)* |
| $V_O \leq 2.2V$ | NO ERROR DETECTED |




Error Detection availability: ***STP08DP05 ,STP16DP05, STP16DPS05, STP16DPP05, STP16DPPS05, and STP24DP05, STP24GPL05, and STP1612PW05***

# AutoPower Saving/ShutDown Mode

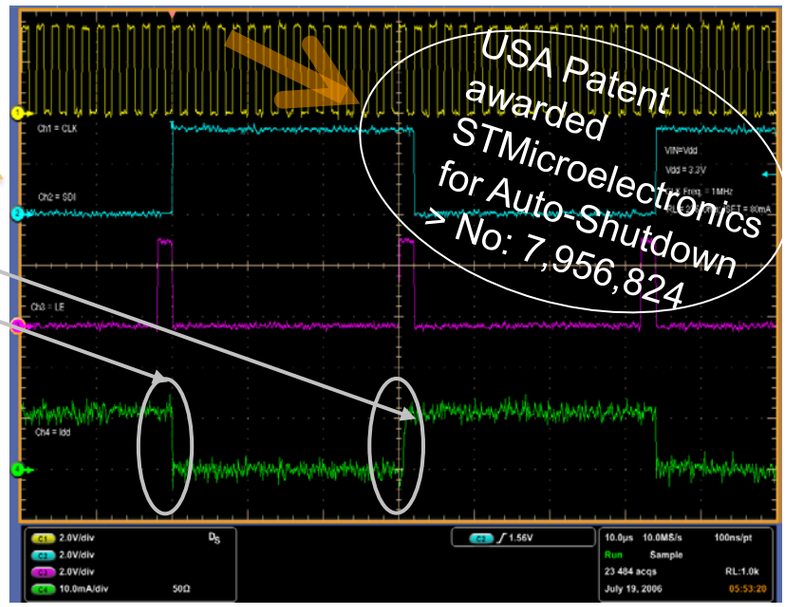
**NO Active Data Latched** → ***Automatically Shuts Down***

**First Active Data Latched** → ***Automatically Powers Up***

**At Io = 80mA,**

- **Active: $I_{DD\ (ON)}$ = 11.7mA (typ)**
- **Not Active: $I_{DD\ (Shut\text{-}down)}$ = 100uA (typ)**

**$I_{DD(SHUT\text{-}DOWN)}$ is 117 times less than $I_{DD(ON)}$**



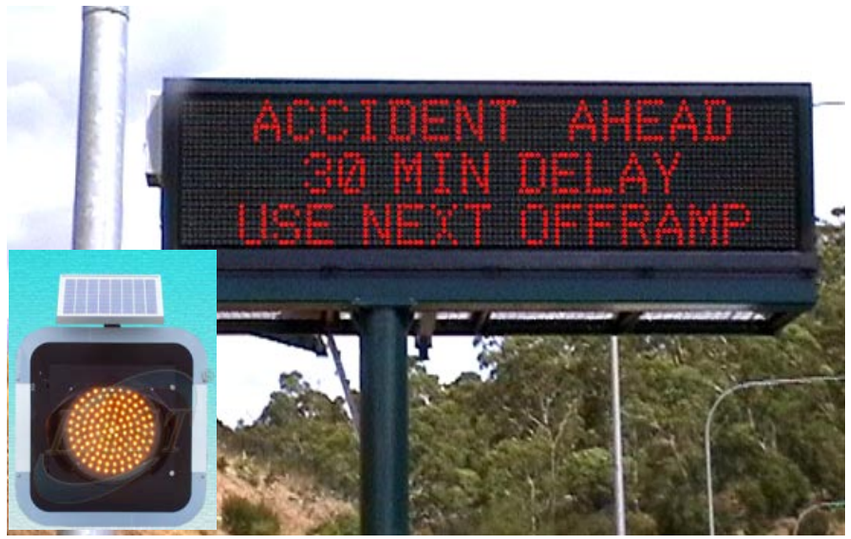

*EXAMPLE*

- LED panel size: 10m x 5m
- Estimated number of LED Drivers: 10,000 pcs
- LED drivers active at any one time : ~ 20%

❖ Using std LED driver ➔ All 10,000 will consume high current (approx 117 A)

❖ Using STP16DPS05 ➔ Only 2,000 will consumer high current (approx 23 A)

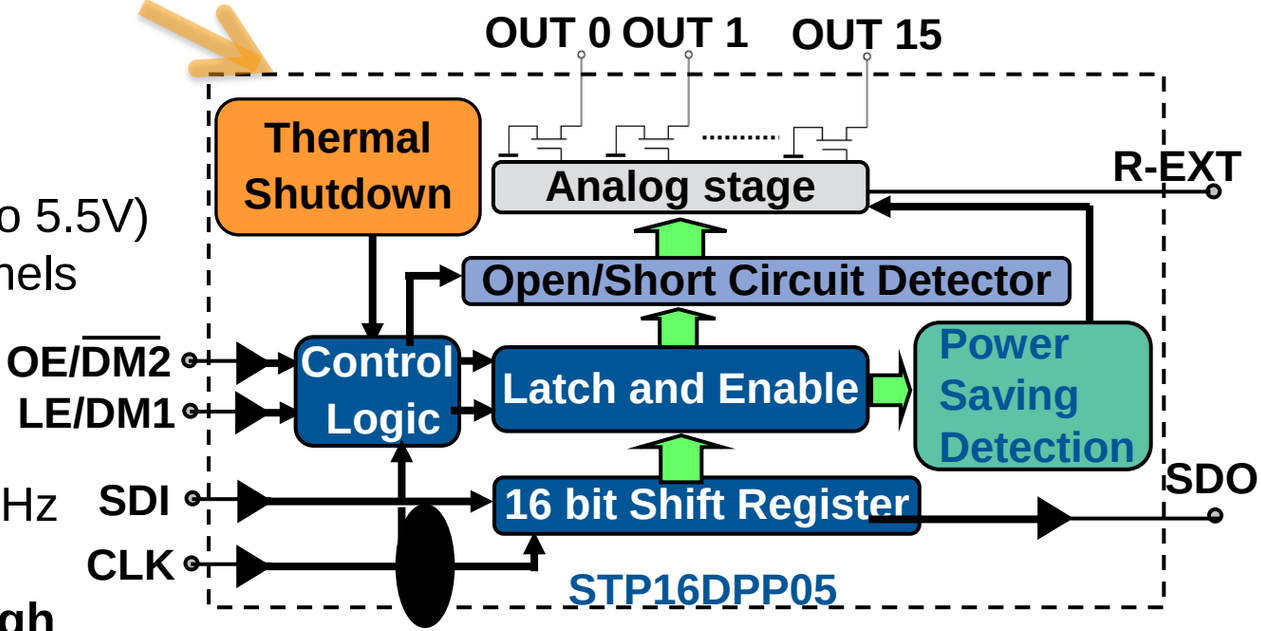
**Power savings using STP16CPS05 is ~ 80 %**




Auto Shut-Down available in ***STP16CPS05, STP16DPS05, STP16CPPS05, STP16DPPS05***

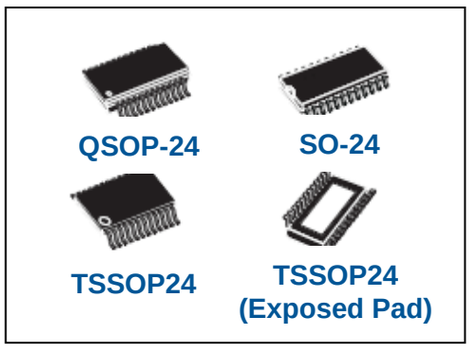
# STP16CPP/DPP05 - 16 ch, 3-40mA

## High Accuracy LED drivers




### Key Features:

- Low-voltage power supply: (3V to 5.5V)
- 16 constant-current output channels
- 16-bit shift register
- Serial data in/parallel data out
- 3.3V microcontroller driver-able
- Maximum clock frequency: 30 MHz
- **Output current:**
  - **3 to 40mA (adjustable through external resistor)**
- **Current accuracy:**
  - **+/-0.5% @ 20mA**
  - **+/-2% @ 3mA**
- ESD protection: 2.5 kV HBM, 200 V MM
- Extended thermal range and protection features
- **Auto Shut-Down available:**
  **STP16CPPS05 and STP16DPPS05**



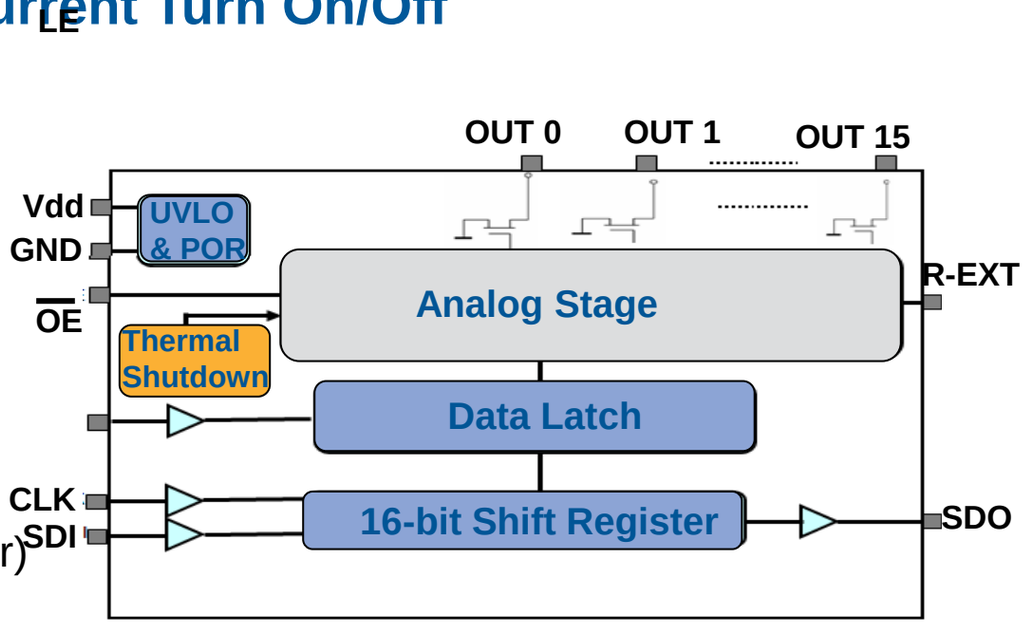


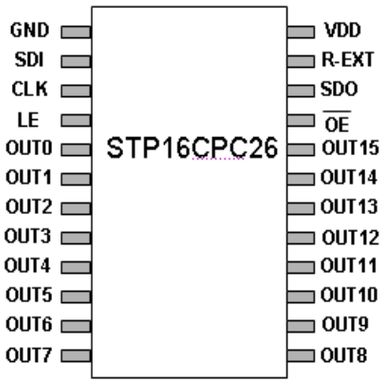
# STP16CPC26 – 16 channel, 5-90mA

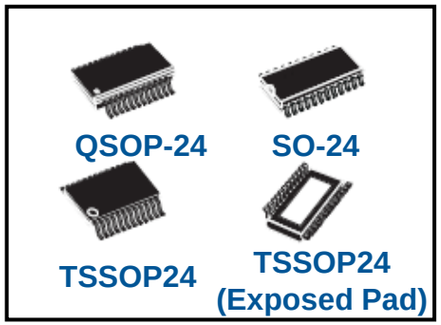
## w/Noise Immunity & Quasi-Balanced Current Turn On/Off

### Key Features:

- 5V power supply
- 16 constant-current output channels
- Serial data in/parallel data out, cascadable
- 20V driving capability,
  - Allows users to connect more LEDs in series to each current source.
- Maximum clock frequency: 30 MHz
- Current range:
  - 5 to 90mA (adjustable through external resistor)
- Channel to Channel Current accuracy:
  - +/-1% @ 20mA
- **Quasi-Balanced Current Turn On/Off at from 5mA**
  - **Excellent performance over full current range**
  - **Optimal Driver dynamic Response**
  - **Perfect Balanced Current Setting avoids flickering**
  - **No Image Distortions up to 4 MHz**
- **Better Noise Immunity due to higher hysteresis**
- ESD protection: 2.5 kV HBM
- Thermal Shutdown for Over Temperature Protection
- Power-on Reset, Undervoltage Lock-out Functions
- Operating Temperature -40°C to 125°C



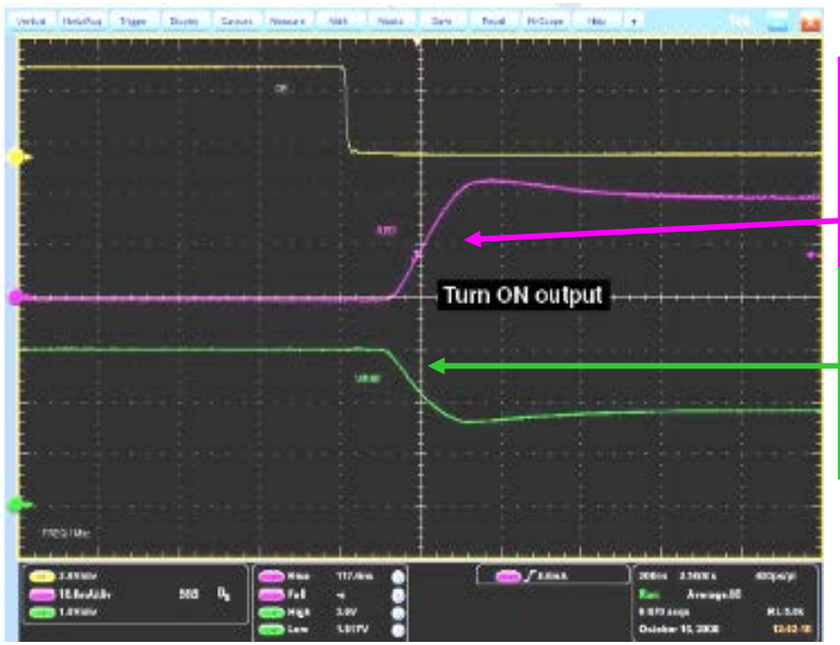




### Applications:

- Full color/Monochrome Large Displays, Gaming
- LED Signage

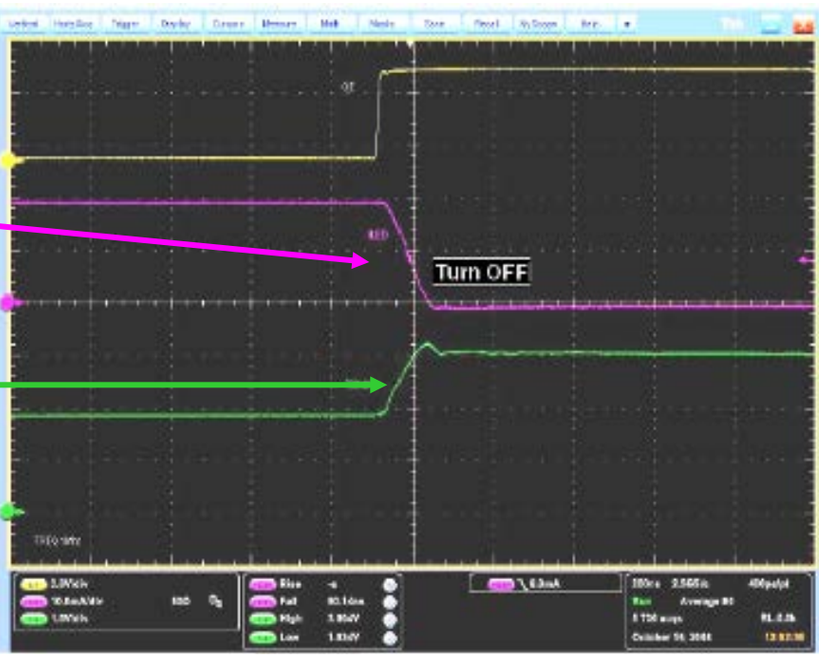
# Balanced Turn ON/OFF

**Balanced turn ON/OFF** → **Improves System Performance by Avoiding Ringing or Noise Generation (EMI problems) due to Parasitic Inductance**




Current Turn-ON/OFF

Voltage Turn-ON/OFF




***Turn-ON and Turn-OFF Time typically around 100ns***

**Typical $T_{ON}$ and $T_{OFF}$ of other products -> tens of nanoseconds**

Balanced turn ON/OFF available in ***STP16CPC05, STP16CPC26***

# STP1612PW05 –16 ch, 3-60mA

## LED Driver w/Independent 12/16-bit PWM & Error Detection

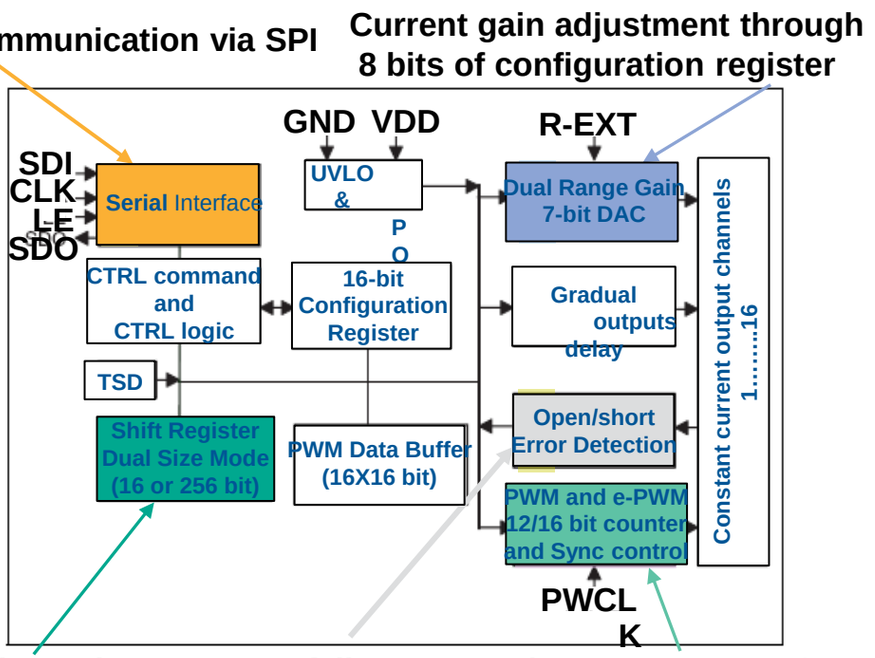
**Key Features:**

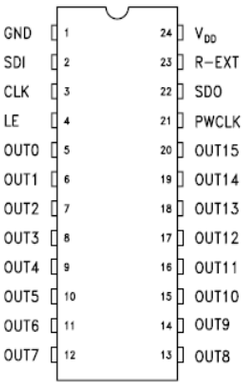
- Low-voltage power supply: (3V to 5.5V)
- 16-channel, 3-to-60mA Constant Current Channels
- **e-PWM enhanced algorithm to improve image fidelity**
- **Prog Controlled In-Rush Current to reduce flickering**
- **12/16-bit Grayscale PWM resolution w/2 counters**
- **8-bit current gain control by means of 256 steps in two selectable ranges**
- **Full Output Open and Short LED Error Detection**
- **Advanced Thermal management**
- **20V output driving capability for more LEDs in series**
- **Maximum Clock Frequency: 30 MHz**
- Excellent Current Accuracy +/- 1.5%
- PWM CLK – Time-out, Power-Off
- Timeout alert if clock signal is missing
- ESD protection 2.5kV HBM, 200V MM
- QFN 4x4 package tiny footprint solution
- Pin-out Compatible with STP16xP05 series

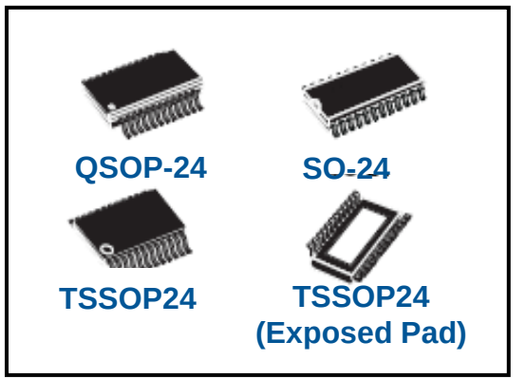
**Applications:**

Full motion RGB video displays

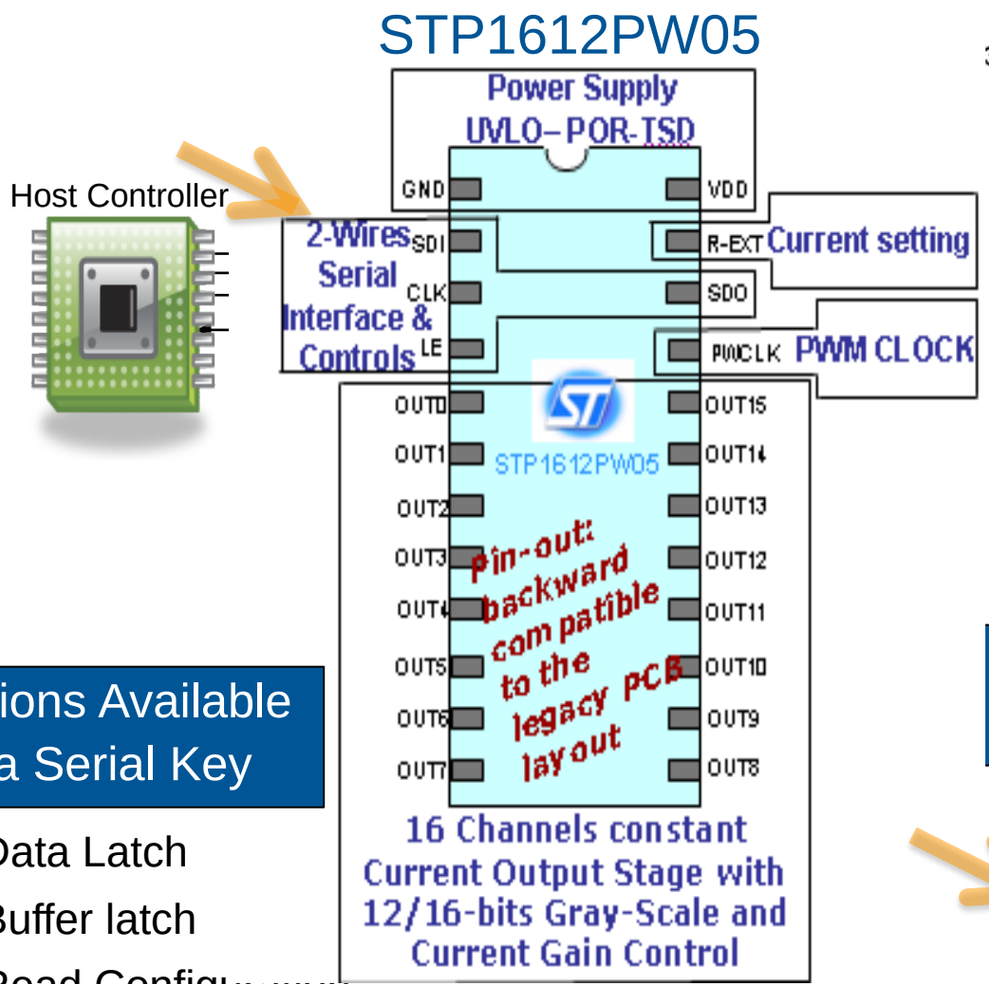
- Monochrome LED display
- Signs, Billboards, and Scoreboards
- Gaming machine, Channel letter signs

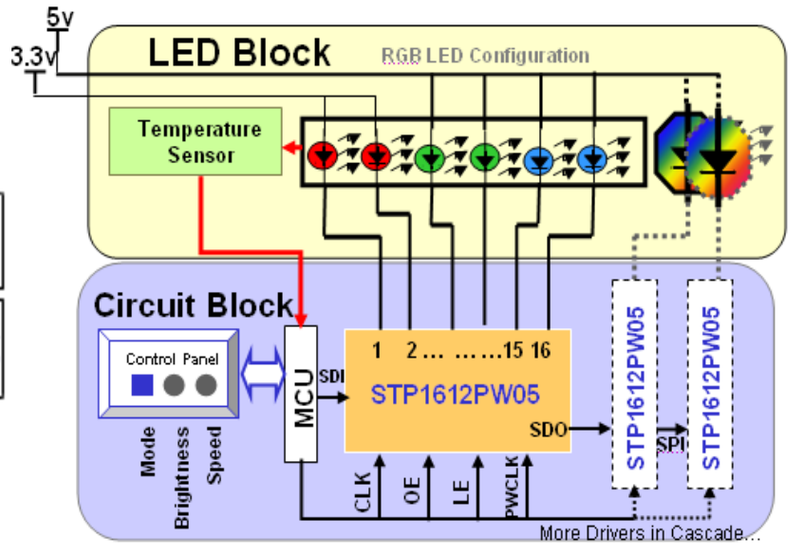


# STP1612PW05 – Control Functions




## Functions Available via Serial Key

- Data Latch
- Buffer latch
- Read Configuration
- Enable Error Detection
- Read Error Status
- Write Configuration
- Reset Register length

## Functions Available via Configuration Registers

- Set 16 or 256 SR length
- Read Thermal Flag
- Enable Thermal Shutdown
- Set PWM Counter 16 or 12 bit
- Set PWM or Enhanced PWM mode
- Set Auto Sync or Manual Sync
- Set Current Gain
- Enable PWMCLK time out disconnection

# STP1612PW05 Eval Board

## LED Display w/PWM Generating Driver and STM32F103

### Key Features:

- Three STP1612PW05 (16-channel LED driver w/16-bit PWM, 8-bit gain and full LED error detection)
- 6 RGB LEDs with adjustable color (48 LEDs)
- DC-DC power supply using the ST1S10
- JTAG interface for microcontroller firmware change/update
- 6 jumpers simulating LED failure for testing of the driver error detection mode
- Mini USB connector for interconnection w/PC software
- Stand-alone demonstration firmware w/animated menu

### Key Products:

- STP1612PW05
- STM32F103
- ST1S10

### Support:

- High level of low power LEDs, color or monochrome
- Open software architecture
- USB and JTAG programming connectivity for easy development with STM32 microcontroller

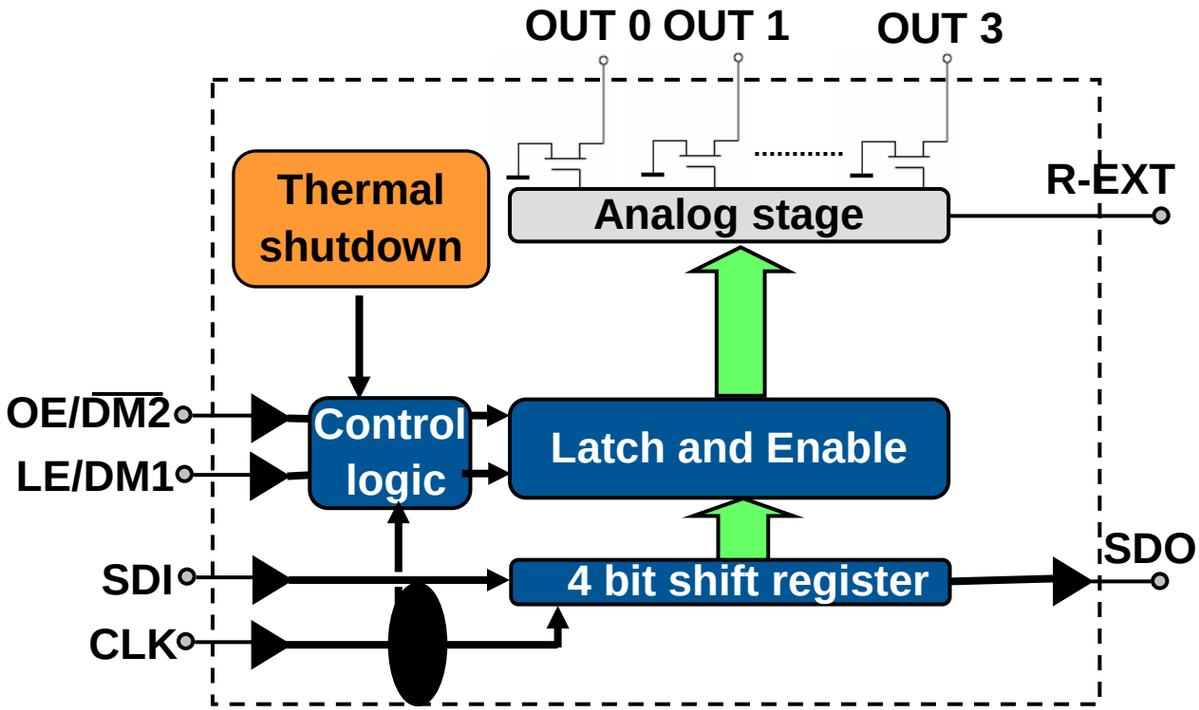
| Evaluation board | Documentation | Description |
|---|---|---|
| **STEVAL-ILL028V1** | **UM0882, UM0885** | **RGB LED driver for color displays and backlighting based on the STP1612PW05 and STM32** |

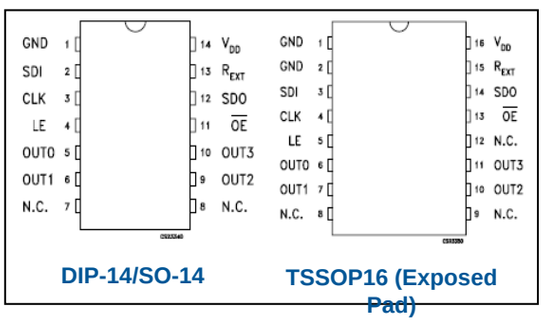
# STP04CM05–4 channel, 80-400mA

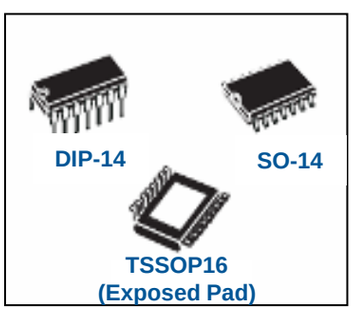
## High-Power LED Array Driver

### Key Features:

- Low-voltage power supply: (3V to 5.5V)
- 4 constant-current output channels
- 4-bit shift register
- **Adjustable output current (80 to 400 mA) using a single external resistor**
- 20 V output driving capability
- Serial data in/parallel data out
- Output enable pin for dimming (PWM)
- Maximum clock frequency: 30 MHz
- ESD protection: 2.5 kV HBM, 200 V MM
- Extended thermal range and protection features


### Applications:

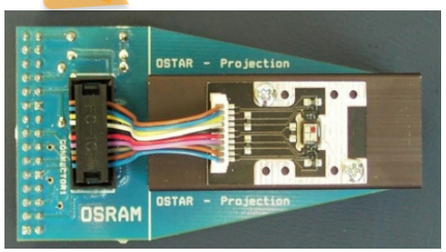
- Very high brightness displays
- Special Lighting Applications.
- High-power LEDs

# STP04CM05 LED Driver Eval Board

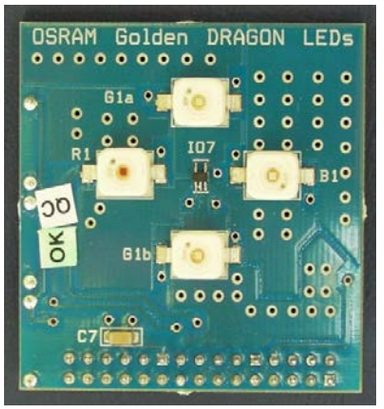
## Key Features:

Drives Super High Brightness Multicolor RGB LEDs

- 8 LEDs can be driven w/350mA or 4 LEDs w/700mA
- 6 lighting modes implemented
- 64 brightness levels for each LED
- 3A at 4V DC/DC converter using the ST1S10 for input voltage range (7-18V)
- LED drivers STP04CM05 and STP08CP05
- Input over voltage protection with Transil SMAJ15A
- Protection against input voltage reversion




STEVAL-ILL009V3




STEVAL-ILL009V4

## Key Products:

- STP04CM05 LED driver
- STP08CP05 LED driver
- ST7FLITE09 8-bit microcontroller
- L78L05AC Voltage regulator
- ST1S10 DC/DC converter
- STLM20 Temp Sensor
- SMAJ15A-TR Transil


| Evaluation board | Application note | Description |
|---|---|---|
| **STEVAL-ILL009V5 (replaces STEVAL-ILL009V1)** | **AN2531** | **RGB Color LED Demonstration Board based on the STP04CM05 and ST1S10** |
| **STEVAL-ILL009V3**<br>**STEVAL-ILL009V4** | **See above** | **OSTAR Projection Module load board**<br>**Golden Dragon LEDs load board** |

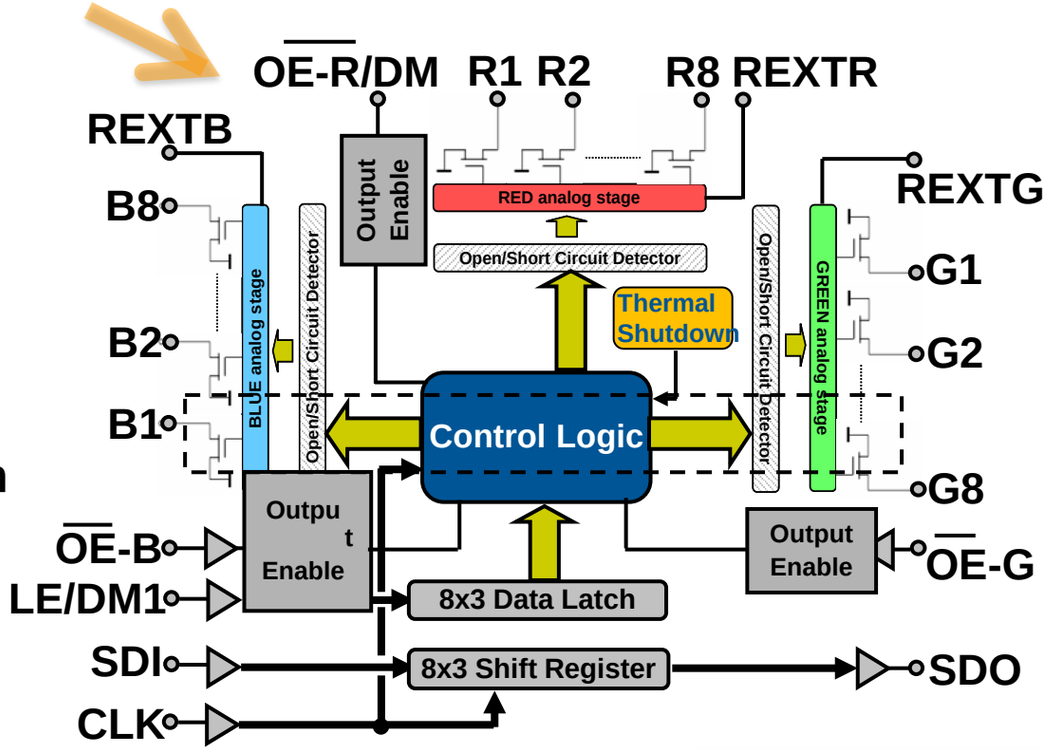
# STP24DP05 – 24 channel, 5-80mA

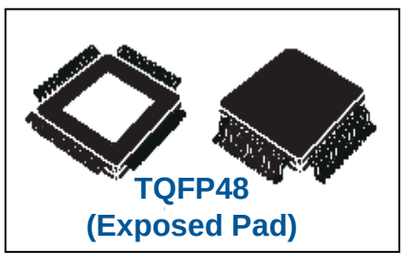
## Key Features:

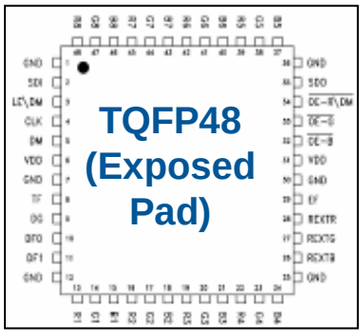
- **Low-voltage power supply: from 3V-5.5V**
- **24-bit shift registers**
- **Serial data in/parallel data out**
- **3 groups (RGB) of 8 constant-current output channels from 5-80mA**
- **Short and Open output error detection**
- **Adjustable output current through external resistor for each group of 8-channel**
- **Gradual output delay (30ns for each group RGB)**
- 3.3 V microcontroller driveable
- Maximum clock frequency: 25 MHz
- ESD protection: 2.5 kV HBM, 200 V MM
- Thermal Shutdown with flag pin

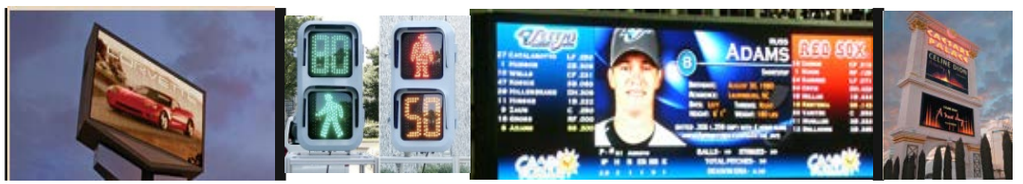
## Applications:

- Full color high resolution LED panel displays
- Colored traffic signs



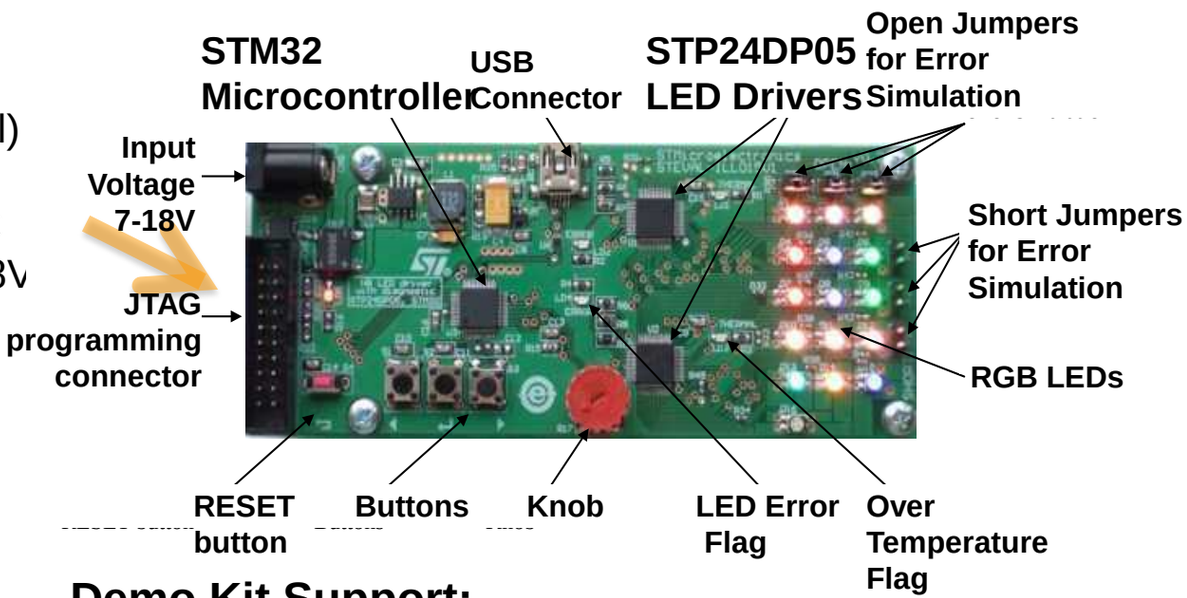



# HB RGB Dimmer Evaluation Board

## Based on STP24DP05 and STM32F103C6

### Key Features:

- Two STP24DP05 (TQFP48) w/16 RGB high brightness LEDs connected (48 LEDs in total)
- STM32 with cost-effective internal HS osc
- High efficient switching power supply DC/DC ST1S10 with input voltage range of 7,5V - 18V current 0.7A.
- Error Detection Feature/Over-Temp Flag
- Adjustable Brightness
- JTAG interface for C firmware updates
- Mini USB connector for PC GUI connection
- Imp signal test points for lab evaluation
- Buttons and a knob to control the board.
- 3 jumpers each for simulating disconnection and simulating shortage of 3 LEDs




### Demo Kit Support:

- STEVAL-ILL015V1with OSRAM LEDs
- CD with User Manual, Application Note, Datasheets
- C Library for dimming control of every single LED
- Demo Firmware and PC Software:
- Stand alone: A game, color dimming effects, Error Detection
- USB demo: Error Detection over USB

### Key Products:

- STP24DP05
- STM32F103
- ST1S10

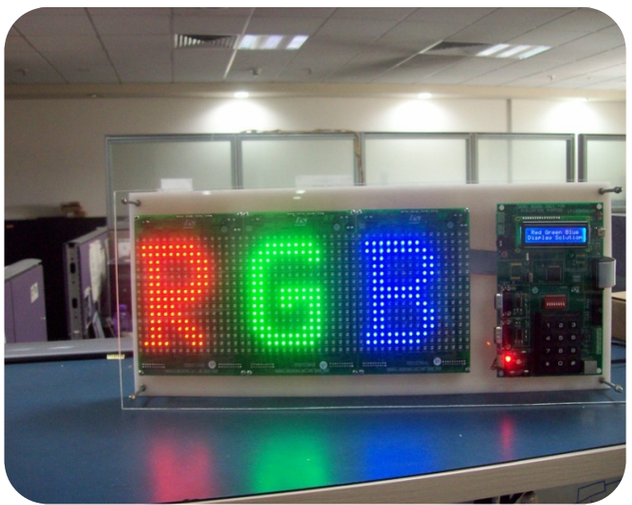
| Evaluation board | App Notes /User Manuals | Description |
|---|---|---|
| **STEVAL-ILL015V1** | **AN2841, UM0574, UM0588** | **High Brightness RGB LED Array dimmer demo board based on the STP24DP05 and STM32** |

# Multicolor LED Display Panel

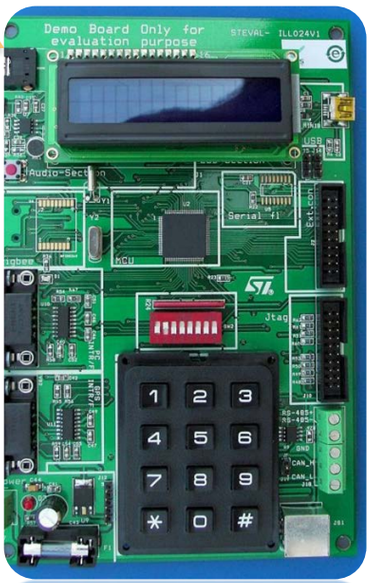
## Evaluation Board - RGB Moving Message Display System with STP24DP05 and STM32F103

### Key Features:

- Control unit with PS2 keyboard interface for data entry
- LCD on control unit for showing the display text and background color options
- 4xSTP24DP05 for each display panel
- 8 panels can be cascaded in series through flat ribbon cable
- System configuration in typing data mode or in audio playback mode or in demo mode




STEVAL-ILL032V1




STEVAL-ILL033V1

### Key Products:

- STP24DP05 LED Display Driver
- STM32F103 32-bit microcontroller on control board
- STM1001 Reset IC
- STPS3L60 Schottky Diode
- ST3232C 3V RS232 com interface

### Support:

- Full color Display Panels
- Airport and Railway information system
- Bank currency conversion rate boards

| Evaluation board | User Manuals | Description |
|---|---|---|
| STEVAL-ILL032V1, STEVAL-ILL033V1 | UM1449 | STM32-based RGB LED Matrix Display Demo |

# LED Array Driver Feature Summary

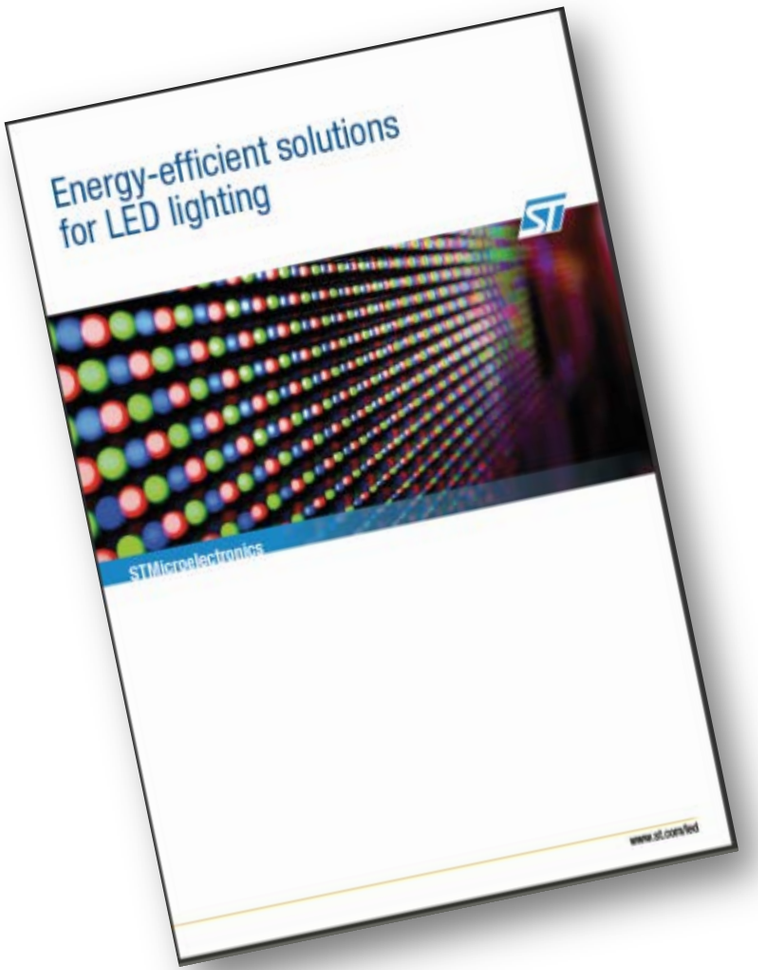
| Part Number | #ch | $I_{LED}$ (mA) | $\Delta I_{LED}$ | | Error detect | Auto Power Saving | Balanced Turn ON/OFF | Gray-scale Brightness control | Current Gain Adjustment | Staggered output delay |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Channel to channel (MAX) | IC to IC (MAX) | | | | | | |
| STP04CM05 | 4 | 80 - 400 | 1.5% (80 400mA) | 6% | | | | | | |
| STP08CP05 | 8 | 5 - 100 | 3% (20 100mA) | 6% | | | | | | |
| STP08DP05 | 8 | 5 - 100 | 3% (20 100mA) | 6% | ✓ | | | | | |
| STP16CP05 | 16 | 5 - 100 | 3% (20 100mA) | 5% | | | | | | |
| STP16CPS05 | 16 | 5 - 100 | 3% (20 100mA) | 5% | | ✓ | | | | |
| STP16DP05 | 16 | 5 - 100 | 3% (20 100mA) | 5% | ✓ | | | | | |
| STP16DPS05 | 16 | 5 - 100 | 3% (20 100mA) | 5% | ✓ | ✓ | | | | |
| STP16CPP05 | 16 | 3 - 40 | 3% (20 40mA) | 5% | | | | | | |
| STP16CPPS05 | 16 | 3 - 40 | 3% (20 40mA) | 5% | | ✓ | | | | |
| STP16DPP05 | 16 | 3 - 40 | 3% (20 40mA) | 5% | ✓ | | | | | |
| STP16DPPS05 | 16 | 3 - 40 | 3% (20 40mA) | 5% | ✓ | ✓ | | | | |
| STP16CPC05 | 16 | 5 - 100 | 3% (20 100mA) | 5% | | | ✓ | | | |
| STP16CPC26 | 16 | 5 - 90 | 3% | 6% | | | ✓ | | | |
| STP24DP05 | 24 | 5 - 80 | 6% (5 15mA)<br>3% (15 80mA) | 6% | ✓ | | | | | ✓ |
| STP1612PW05 | 16 | 3 - 60 | 1.5% (3 60mA) | 6% | ✓ | | | ✓ | ✓ | ✓ |

# Evaluation Boards Summary

| Part Number | Order Code | Description | Feature | App Notes | Power Supply |
|---|---|---|---|---|---|
| **STP16CP05**<br>**STP16CPS05** | **STEVAL-ILL003V2** | 32 LEDs Array Reference Board | - Adjustable Brightness, Blinking Speed<br>- Animated Text<br>- GUI SW for LEDs diagnostics | **AN2241** | Std Supply Connector |
| **STP16DP05** | **STEVAL-ILL024V1**<br>**STEVAL-ILL025V1** | Mother/slave board for LED display based on STM32 16x32 LED matrix | - Animated Text<br>- Adjustable Blinking Speed<br>- GPS Interface | **UM0767** | 5V, 0.5A 3.5V-5V, 3A |
| **STP1612PW05** | **STEVAL-ILL028V1** | RGB LED Driver w/Indep PWM for Color Display via STM32 SPI | -Adjustable Color<br>- JTAG interface for C firmware update | **UM0882**<br>**UM0885** | Std Supply Connector |
| **STP08DP05** | **STEVAL-ILL002V3** | 40 LEDs Diagnostic Reference Board Using OSRAM Blue LEDs | - Adjustable Brightness, Blinking Speed<br>- Animated Text<br>- Error Detection Feature | **AN2415**<br>**AN2478** | Std Supply Connector |
| **STP08DP05** | **STEVAL-ILL002V4** | 40 LEDs Diagnostic Reference Board Using Vishay Green LEDs | -Adjustable Brightness, Blinking Speed<br>- Animated Text<br>- Error Detection Feature | **AN2415**<br>**AN2478** | Std Supply Connector |
| **STP04CM05** | **STEVAL-ILL009V3**<br>**STEVAL-ILL009V4**<br>**STEVAL-ILL009V5** | RGB LED Reference Board OSTAR Proj Mod Golden Dragon LEDs | - Adjustable Brightness, Blinking Speed<br>- Animated Text<br>- PowerLED Driving | **AN2531** | Std Supply Connector |
| **STP24DP05** | **STEVAL-ILL015V1** | 16 RGB LED Array based on STP24DP05 and STM32F103C6 | - Adjustable Brightness<br>- JTAG interface for C firmware update<br>- Mini USB connector for PC GUI<br>- Error Detection Feature | **UM0574** | Std Supply Connector |
| **STP24DP05** | **STEVAL-ILL032V1**<br>**STEVAL-ILL033V1** | STM32-based RGB LED Matrix Display Demo | - Adjustable text color and speed<br>- Adjustable background color<br>- Audio Playback Mode | **UM1449** | Std Supply Connector |

# ST.COM Displays & Signage Sol'ns

## LED Lighting Brochure

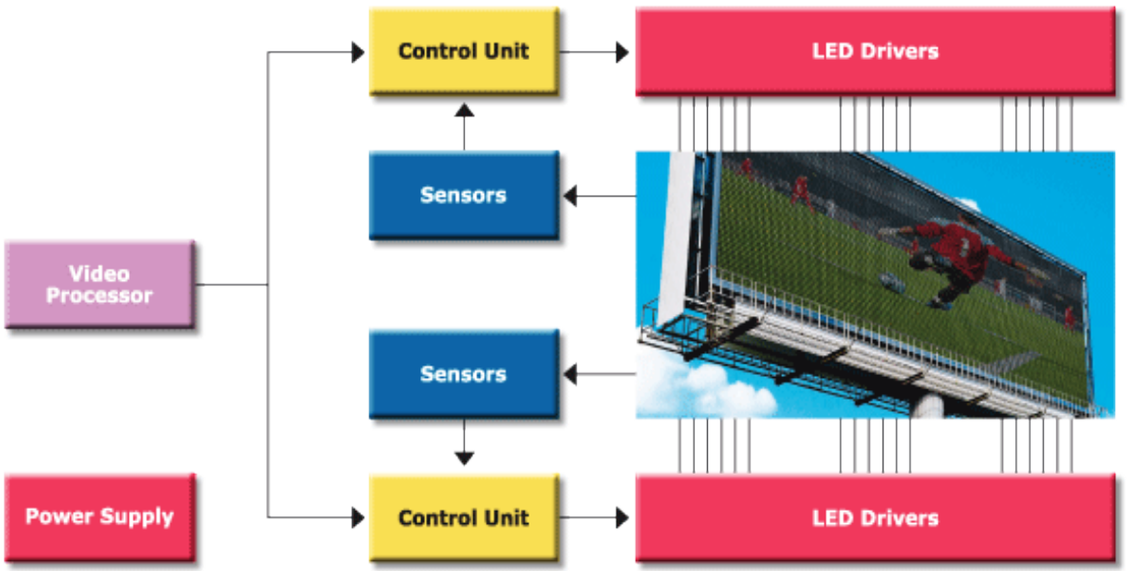


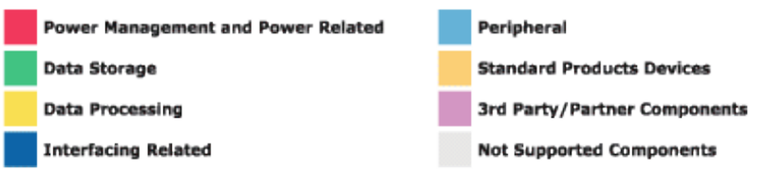

http://www.st.com/internet/com/SALES_AND_MARKETING_RESOURCES/MARKETING_COMMUNICATION/MARKETING_BROCHURE/brlighting.pdf

## LED Application web pages

**Lighting**
ST's lighting solutions are split into five main categories: dimmer, fluorescent, halogen, HID and LED.

http://www.st.com/internet/com/http://www.st.com/internet/com/end_application/58.jspsegment/4.jsp



# ST LED Lighting Solutions

For more information, visit:

www.st.com > home > support > tools & resources
www.st.com > LED Displays and Signage

Thank you