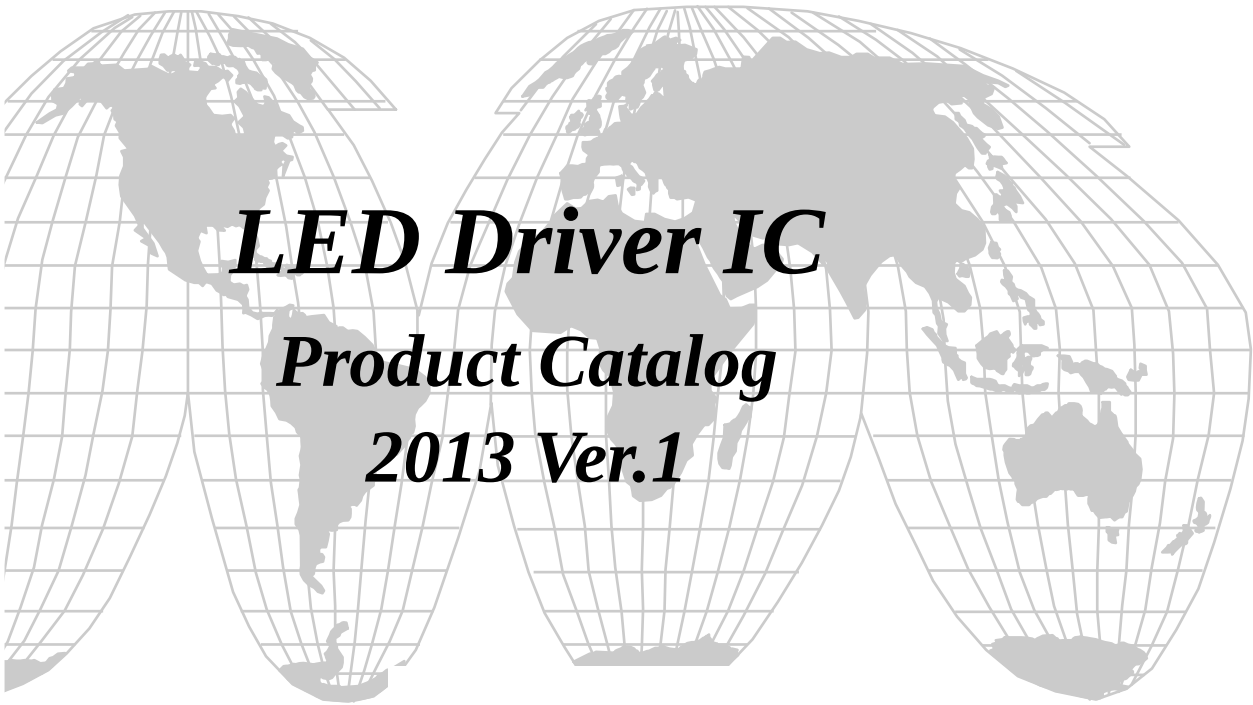

LED Driver IC

Product Catalog

2013 Ver.1

Silicon Touch Technology Inc.

Lighting the World

Product List

LED Dot Matrix			
Part Number	**Application**	**Main Features**	**Page**
DM114/DM115	**L**ED Display	• 8-Channel with optimized current skew and 3.3V~5V supply voltage.	1
DM11C	**L**ED Display	• 8-Channel with optimized current skew, 3.3V~5.5V supply voltage and error detection.	4
DM11H	**L**ED Display	• 8-Channel with optimized current skew, 3.0~5.5V supply voltage, 7-bit Global Brightness control, Error detection, Short to GND detection, Sleep mode.	7
DM134B/135B	**L**ED Display	• 16-Channel with optimized current skew and 3.3V~5V supply voltage.	10
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DM13C	**L**ED Display	• 16-Channel with optimized current skew, 3.3V~5.5V supply voltage and error detection.	16
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Product List

LED Dot Matrix			
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LED Lighting			
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DD331	**L**ED lighting	• 4- channel Flexible LED Pre- Driver, driving up to 90mA and 18V output voltage	70

Package Information

Package Type	Package Size	Number / Weight (typ.)	
		Tube / Tray	Reel (Box included)
DIP16	DIP16-300-2.54	30pcs / Tube	1,800pcs/One Box
DIP24	SkinnyDIP24-300-2.54	18pcs / Tube	1,080pcs/One Box
DIP28	DIP28-310-2.54	16pcs/Tube	960pcs/One Box
SOP8	SOP8-150-1.27	100pcs / Tube	2,500pcs / Reel
SOP16	SOP16-150-1.25	50pcs / Tube	2,500pcs / Reel
SOP24	SOP24-300-1.27	31pcs / Tube	1,000pcs / Reel
SOP24B	SOP24-236-1.00	36pcs / Tube	2,000pcs / Reel
SOP28	SOP28-295-1.27	16pcs/Tube	1,500pcs/Reel
SSOP16	SSOP16-150-0.635	100pcs / Tube	2,500pcs / Reel
SSOP24	SSOP24-150-0.635	58pcs / Tube	2,500pcs / Reel
SSOP28	SSOP28-150-0.635	58pcs/Tube	2,500pcs/Reel
SSOP48	SSOP48-295-0.635	N/A	1,000pcs/
TSSOP16	TSSOP16-173-0.65	96pcs / Tube	2,500pcs / Reel
TSSOP24	TSSOP24-173-0.65	60pcs / Tube	2,500pcs / Reel
TSSOP28	TSSOP28-252-0.650	50pcs/Tube	2,500pcs/Reel
TO252	TO252-1.27	80pcs / Tube	2,500pcs / Reel
QFN20	QFN20-4*4	490pcs/Tray	2,500pcs / Reel
QFN32	QFN32-5*5	490pcs/Tray	2,500pcs / Reel
QFN40	QFN40-6*6	490pcs/Tray	2,500pcs / Reel
QFN48	QFN48-7*7	260pcs/Tray	2,500pcs / Reel
QFP44	QFP44	96pcs/Tray	500pcs/Reel
LQFP48	LQFP48-7*7	250pcs/Tray	2,500pcs / Reel

DM114、DM115

8-Bit CONSTANT CURRENT LED DRIVERS with 3.3v ~ 5v Supply Voltage

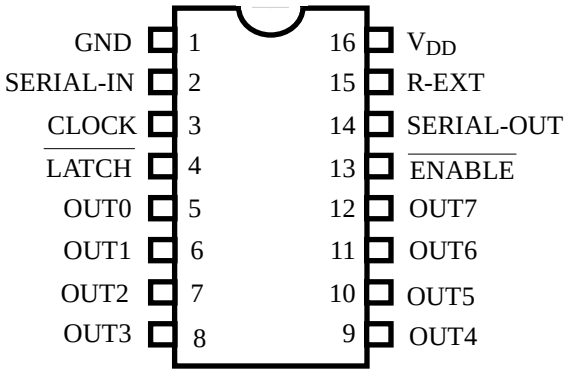
General Description

The DM114、DM115 is the constant current driver specifically designed for LED display applications. The value of constant current can be varied using an external resistor. The devices include an 8-bit shift register, latches, and constant current drivers on a single Silicon CMOS chip.

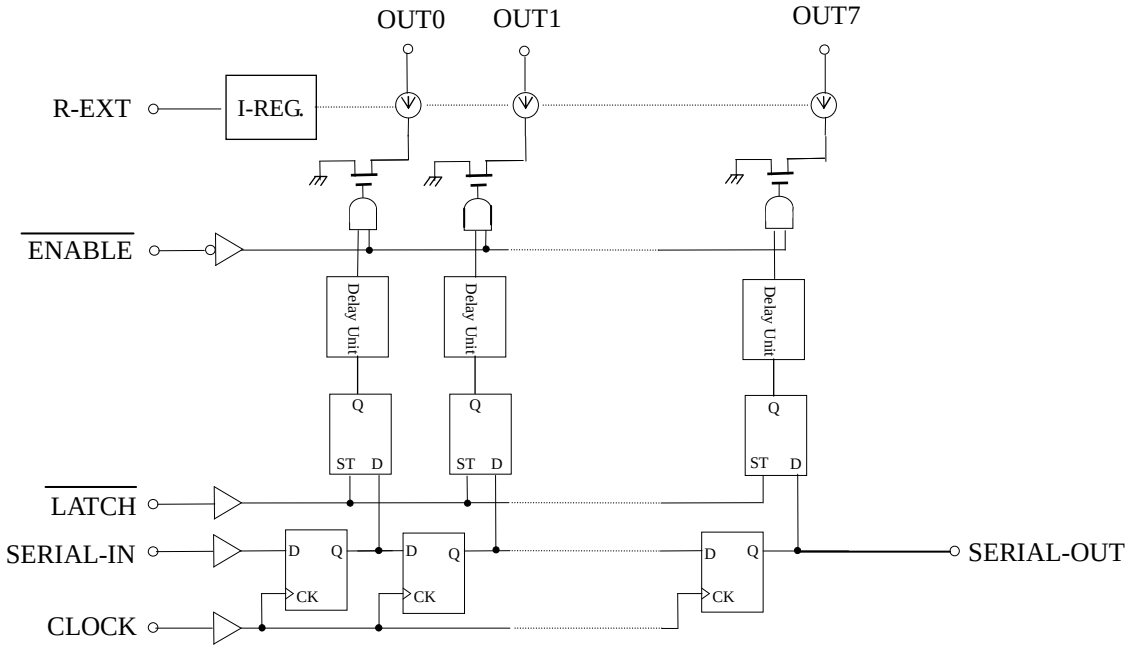
Features

- Maximum Output Voltage: 17V
- Maximum Clock Frequency: 25MHz (Cascade Operation)
- Power Supply Voltage: 3.3V to 5.0V
- CMOS Compatible Input
- Package: PDIP16, SOP16, SSOP16
- Package and Pin Layout: Pin layout and functionality are similar to those of the ST2221A. (Each characteristic value is different.)
- Constant Current Matching: (Ta = 25°C、V_{DD} = 5.0V)
  Chip-to-Chip: ± 10.0%
  DM114: Bit-to-Bit: ± 4.0% @ I_{OUT} = 30 ~ 90mA
  ± 6.0% @ I_{OUT} = 20 ~ 30mA
  DM115: Bit-to-Bit: ± 4.0% @ I_{OUT} = 20 ~ 60mA
  ± 6.0% @ I_{OUT} = 5 ~ 20mA

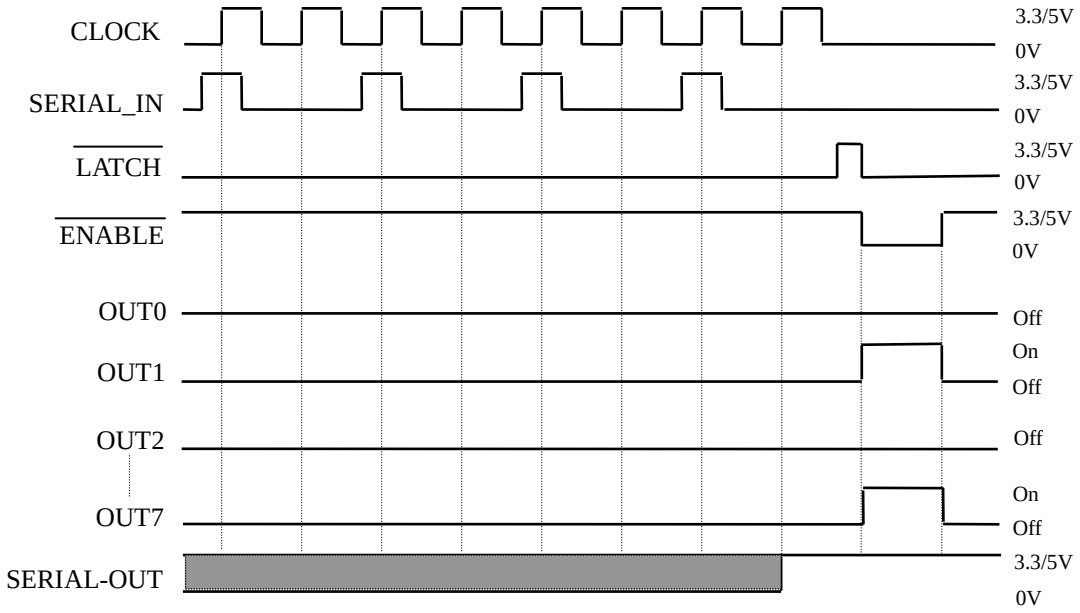
Pin Connection (Top view)



Block Diagram



Timing Diagram



(Note) Latches are level sensitive (not edge triggered).

$\overline{\text{LATCH}}$-terminal = H level, latches become transparent; $\overline{\text{LATCH}}$-terminal = L level, latches hold data.

$\overline{\text{ENABLE}}$-terminal = H level, all outputs (OUT0~7) are off.

An external resistor is connected between R-EXT and GND for setting up the value of constant current.

SERIAL-OUT changes state on the rising edges of clock.

Pin Description

PIN No.	PIN NAME	FUNCTION
1	GND	GND terminal
2	SERIAL-IN	Input terminal of a data shift register
3	CLOCK	Input terminal of a clock for shift register
4	$\overline{\text{LATCH}}$	Input terminal for data strobe
5~12	OUT0~7	Output terminals
13	$\overline{\text{ENABLE}}$	Input terminal for output enable (active low)
14	SERIAL-OUT	Output terminal of a data shift register
15	R-EXT	Input terminal of an external resistor
16	V_{DD}	3.3/5V Supply voltage terminal

DM11C

8-bit Constant Current LED Driver with Error Detection

General Description

DM11C is a constant-current sink driver specifically designed for LED display applications. The device incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS chip. The maximum output current value of all 8 channels is adjustable by a single external resistor. Its built-in open/short detection circuits help users detect LED failures. System retrieve the error messages to indicate which channel has failure by serial output data. The thermal shutdown function provides the over temperature protection.

Features

- Constant-current outputs: 5mA to 120mA adjustable by one external resistor
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Built-in real-time LED open/short detection
- Fast detecting response: 0.1us (min.)
- Over temperature protection: thermal shutdown (junction temperature > 180˚C)
- Package and pin assignment compatible to conventional LED drivers (ST2221A, DM114/5)
- Power supply voltage: 3.3V to 5.5V

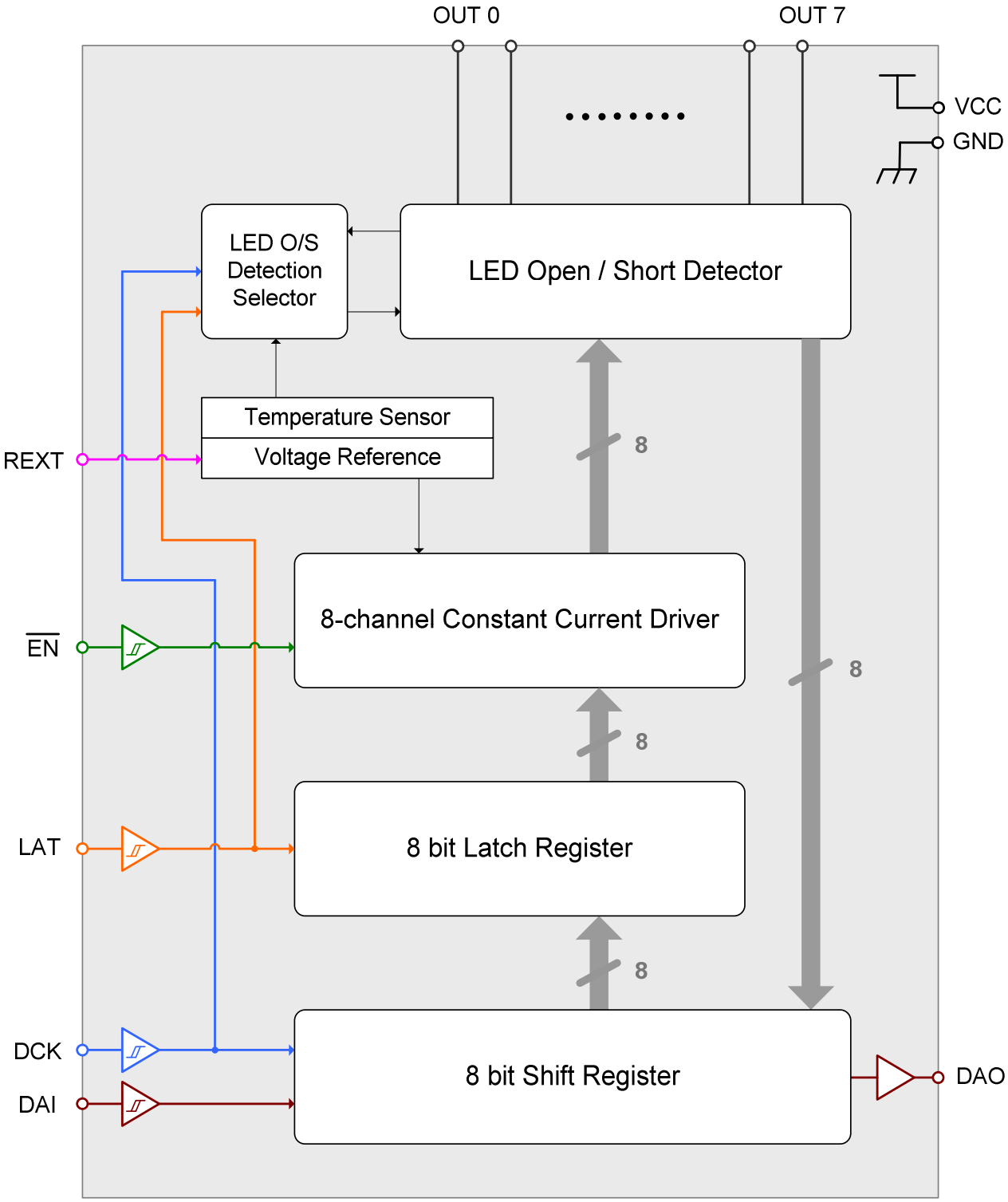
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System

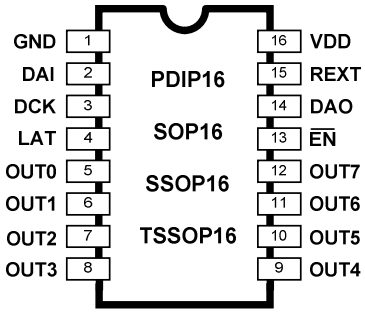
Package Types

- PDIP16, SSOP16, SOP16, TSSOP16 (with exposed pad)

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
1 TSSOP16: exposed pad	GND	Ground terminal.
2	DAI	Serial data input terminal.
3	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
4	LAT	Input terminal of data strobe. Data on shift register goes through at the rising edge of LAT (edge trigger). Otherwise, data is latched.
5~12	OUT0~7	Sink constant-current outputs (open-drain).
13	$\overline{EN}$	Output enable terminal: **'H'** for all outputs are turned off , **'L'** for all outputs are active.
14	DAO	Serial data output terminal.
15	REXT	External resistors connected between REXT and GND for output current value setting.
16	VCC	Supply voltage terminal.

DM11H

8-Channel Constant Current LED Driver With Error Detection

General Description

DM11H is a 8-channel constant-current sink driver specifically designed for LED display applications. The device incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS chip. The maximum output current of each channel is set by a single external resistor. Overall output currents can be adjusted by a 7-bit serial shift-in data. Its built-in LED open/short detection, output channels short to GND detection help users to detect LED failures, outputs short. The thermal alarm and shutdown functions provide the over-temperature protection.

Features

- 8-Channel Constant-current outputs: 5mA to 90mA adjustable by one external resistor
- Maximum output voltage: 17V
- Maximum cascade clock frequency: 25MHz
- 7-bit linear global brightness control
- Built-in LED open/short detection: Real-time detection or Smart detection
- Built-in Outputs short to GND detection: Real-time or Smart detection
- Fast detecting response: 100ns (min.)
- Over temperature protection: Alarm (junction temperature > 130℃)
  Shutdown (junction temperature > 170℃)
- Sleep mode (sleep current : <5uA)
- In-rush current control
- Schmitt trigger input
- Power supply voltage: 3.0V to 5.5V
- Package pin assignment compatible to conventional LED drivers (DM114B/115B,DM11C)

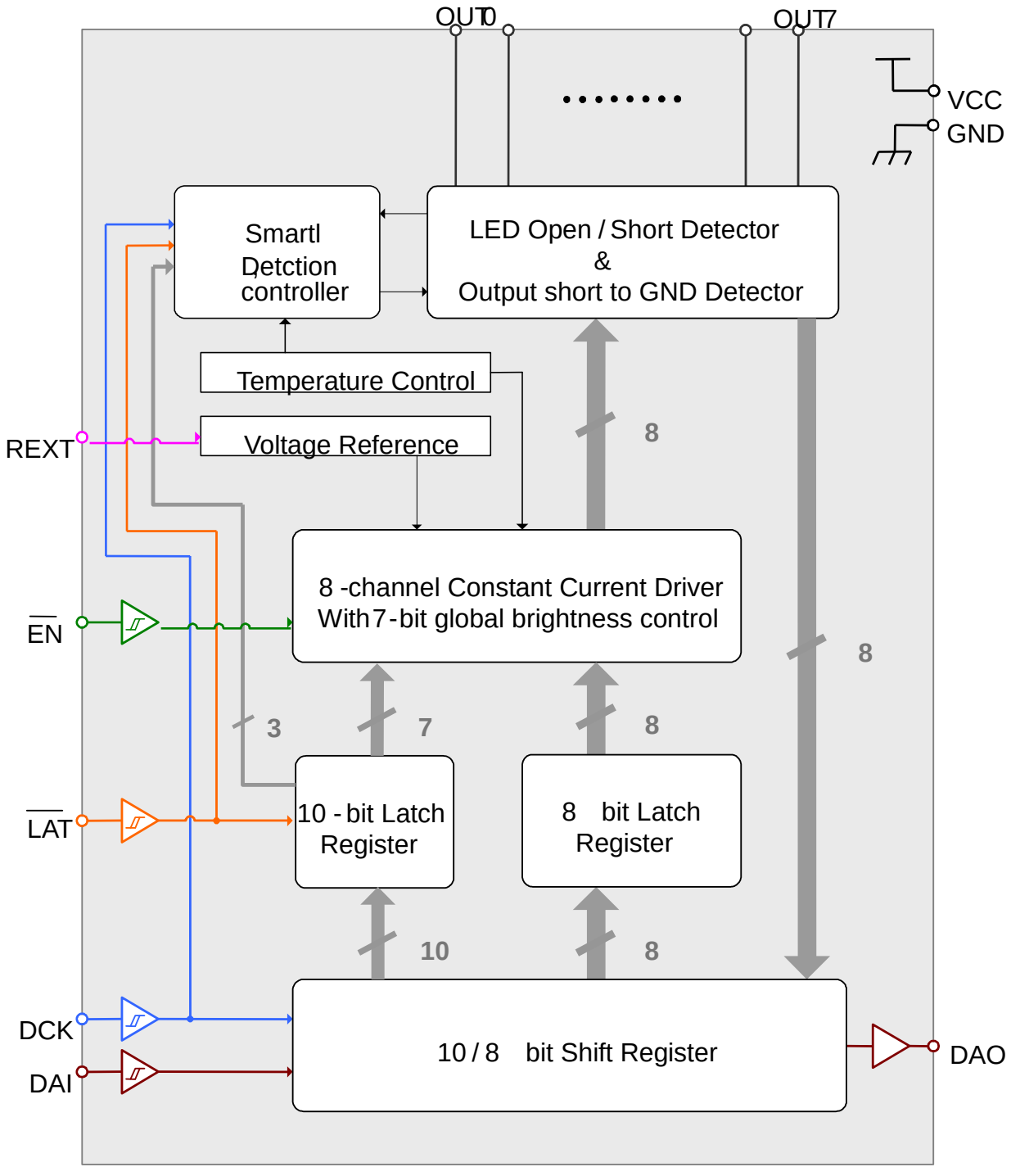
Applications

- LED Variable Message Signs (VMS) System
- Indoor/Outdoor LED Video Display

Packages

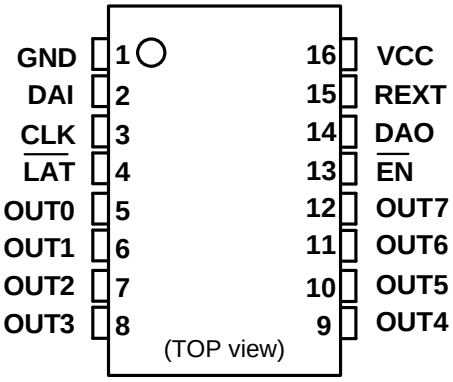
SOP16, SSOP16

Block Diagram



Pin Connection

SOP16/SSOP16



Pin Description

PIN No.	PIN NAME	FUNCTION
1	GND	Ground terminal.
2	DAI	Serial data input terminal.
3	CLK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of CLK.
4	$\overline{LAT}$	Input terminal of data strobe. Data on shift register goes through at the rising edge (edge trigger). Otherwise, data is latched.
5~12	OUT0~7	Sink constant-current outputs (open-drain).
13	$\overline{EN}$	Output enable terminal: '**H**' for all outputs are turned off , '**L**' for all outputs are active.
14	DAO	Serial data output terminal.
15	REXT	External resistors connected between REXT and GND for output current value setting.
16	VCC	Supply voltage terminal.

DM134B、DM135

16-Bit Constant Current LED Drivers with

3.3v ~ 5v Supply Voltage

General Description

The DM134B、DM135B are constant current drivers specifically designed for LED display applications. The value of constant current can be varied using an external resistor. The devices include a 16-bit shift register, latches, and constant current drivers on a single Silicon CMOS chip.

Features

- 3.3V~5V CMOS Compatible Input
- Maximum Clock Frequency: 25MHz (Cascade Operation)
- Maximum Output Voltage: 17V
- Package: DIP24, SOP24, SSOP24, QFN32
- Package and Pin Layout: Pin layout and functionality are similar to those of the ST2221C. (Each characteristic value is different.)
- Constant Current Matching: (Ta = 25°C、V_{DD} = 5.0V)

  Chip-to-Chip: ± 10.0%

  Bit-to-Bit:

  DM134B:± 4.0% @ I_{OUT} = 30 ~ 90mA

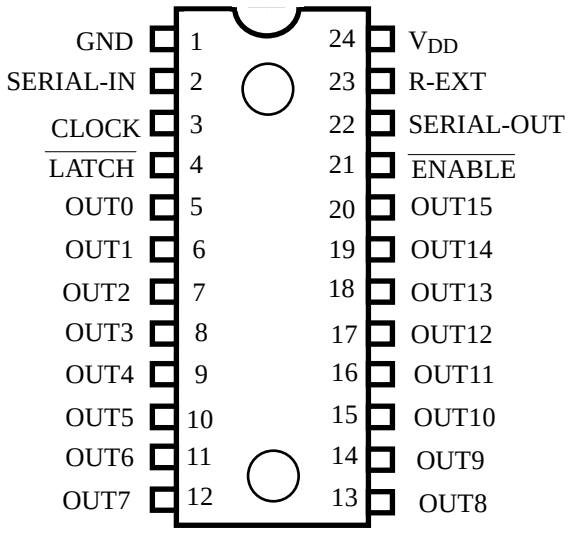
  ± 6.0% @ I_{OUT} = 20 ~ 30mA

  DM135B:± 4.0% @ I_{OUT} = 20 ~ 60mA

  ± 6.0% @ I_{OUT} = 5 ~ 20mA

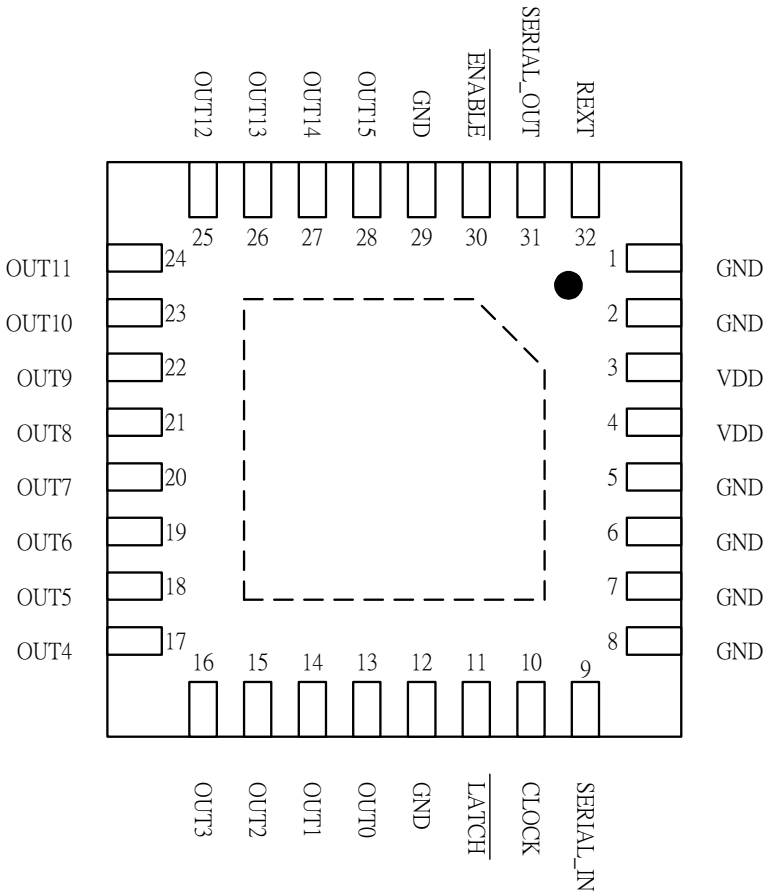
Pin Connection (Top view)

DIP24、SOP24、SSOP24

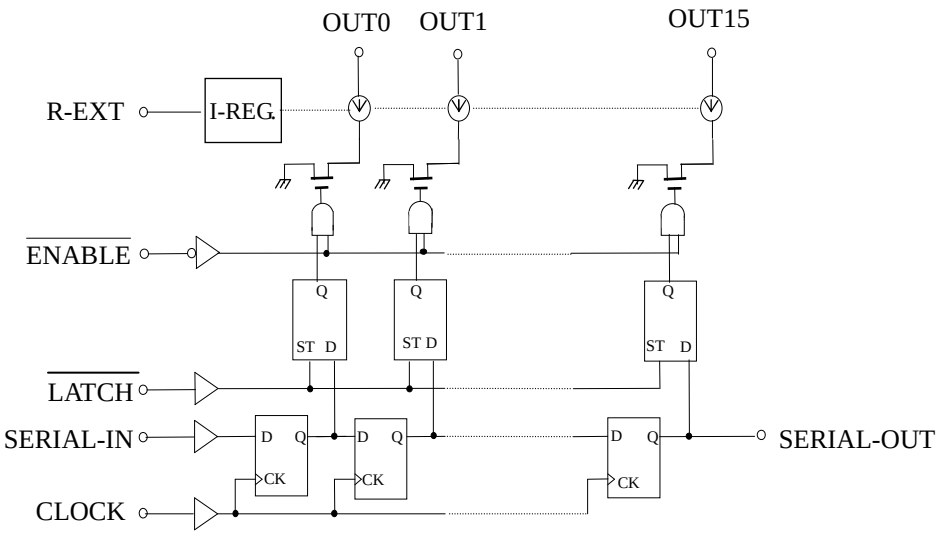


Pin Connection (Bottom view)

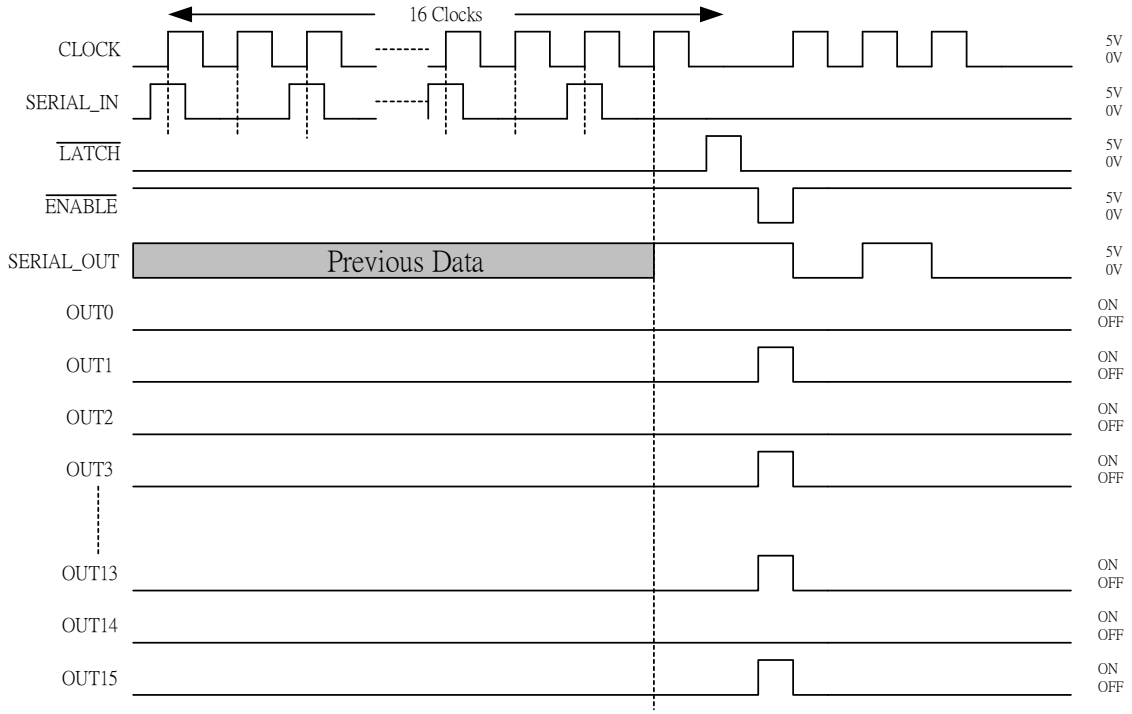
QFN32



Block Diagram



Timing Diagram



(Note) Latches are level sensitive (not edge triggered).

LATCH-terminal = H level, latches become transparent; LATCH-terminal = L level, latches hold data.

ENABLE-terminal = H level, all outputs (OUT0~15) are off.

An external resistor is connected between R-EXT and GND for setting up the value of constant current.

SERIAL-OUT changes state on the rising edges of clock.

DM13A

16-bit Constant Current LED Driver

General Description

DM13A is a constant-current sink driver specifically designed for LED display applications. The device incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS chip. The maximum output current value of all 16 channels is adjustable by a single external resistor.

Features

- Constant-current outputs: 3mA to 60mA adjustable by one external resistor
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Power supply voltage: 3.3V to 5V
- In-rush current control
- Bit-to-bit skew : ± 3 % Chip-to-chip skew : ± 6 %
- Package and pin assignment compatible to conventional LED drivers (ST2221C, DM134/5/6)

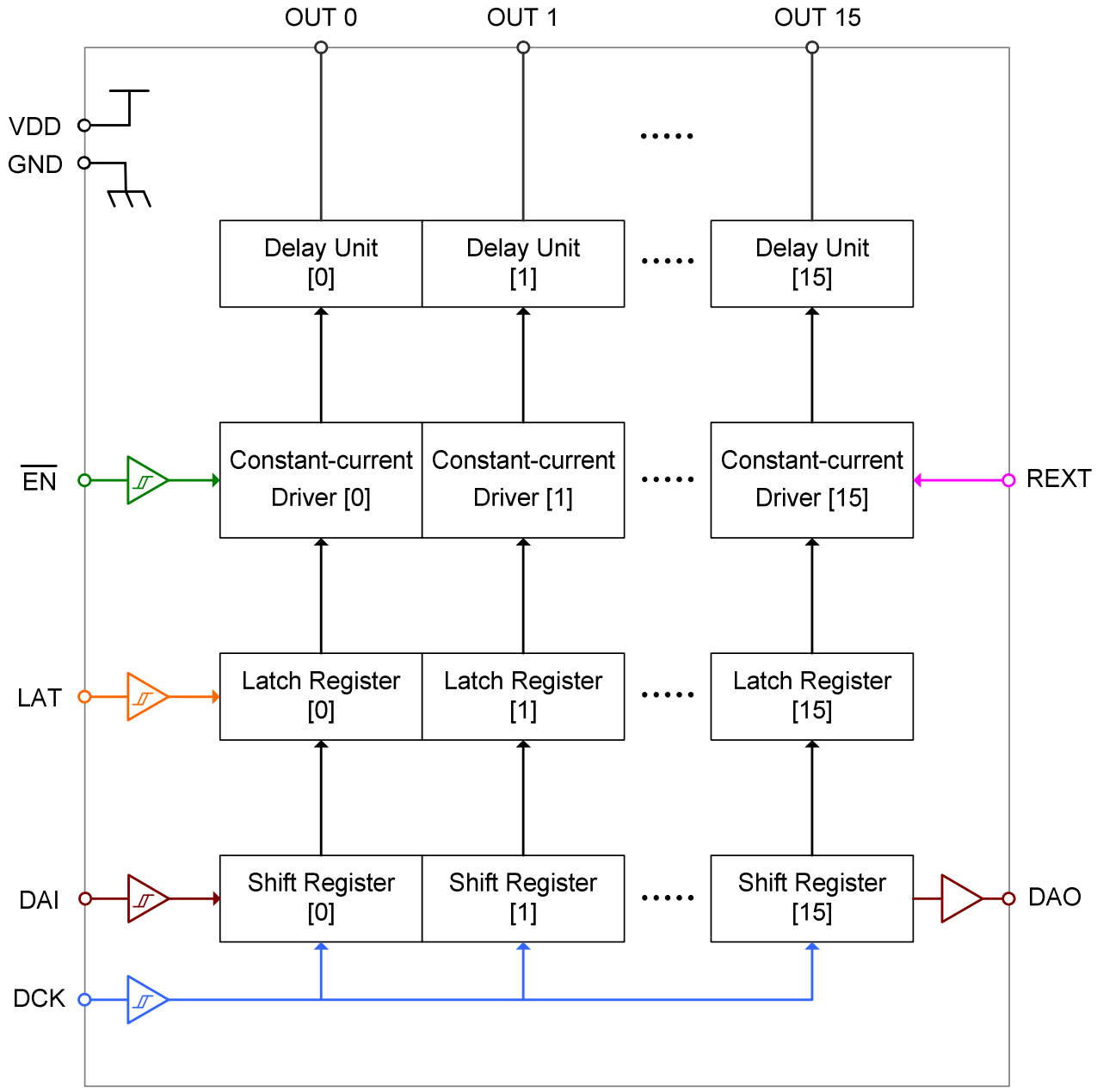
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System

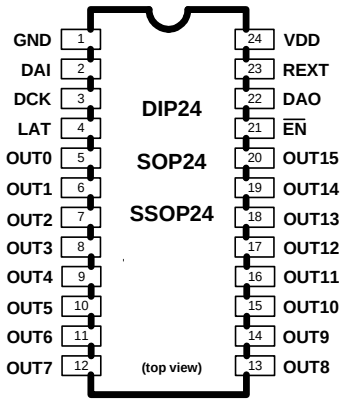
Package Types

- PDIP24, SOP24, SOP24B, SSOP24

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
DIP24/SOP24/SSOP24: 1	GND	Ground terminal.
DIP24/SOP24/SSOP24: 2	DAI	Serial data input terminal.
DIP24/SOP24/SSOP24: 3	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
DIP24/SOP24/SSOP24: 4	LAT	Input terminal of data strobe. Data on shift register goes through at the high level of LAT (level trigger). Otherwise, data is latched.
DIP24/SOP24/SSOP24: 5~20	OUT0~15	Sink constant-current outputs (open-drain).
DIP24/SOP24/SSOP24: 21	$\overline{\text{EN}}$	Output enable terminal: **'H'** for all outputs are turned off , **'L'** for all outputs are active.
DIP24/SOP24/SSOP24: 22	DAO	Serial data output terminal.
DIP24/SOP24/SSOP24: 23	REXT	External resistors connected between REXT and GND for output current value setting.
DIP24/SOP24/SSOP24: 24	VDD	Supply voltage terminal.

DM13C

16-bit Constant Current LED Driver with Error Detection

General Description

DM13C is a constant-current sink driver specifically designed for LED display applications. The device incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS chip. The maximum output current value of all 16 channels is adjustable by a single external resistor. Its built-in open/short detection circuits help users detect LED failures. System retrieve the error messages to indicate which channel has failure by serial output data. The thermal shutdown function provides the over temperature protection.

Features

- Constant-current outputs: 5mA to 90mA adjustable by one external resistor
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Built-in real-time LED open/short detection
- Fast detecting response: 0.1us (min.)
- Over temperature protection: thermal shutdown (junction temperature > 180˚C)
- Package and pin assignment compatible to conventional LED drivers (ST2221C, DM134/5/6)
- Power supply voltage: 3.3V to 5.5V
- Bit-to-bit skew : ±3% @ 25mA~90mA ±6% @ 5mA~25mA Chip-to-chip skew : ±6% @ 25mA~90mA ±10% @ 5mA~25mA

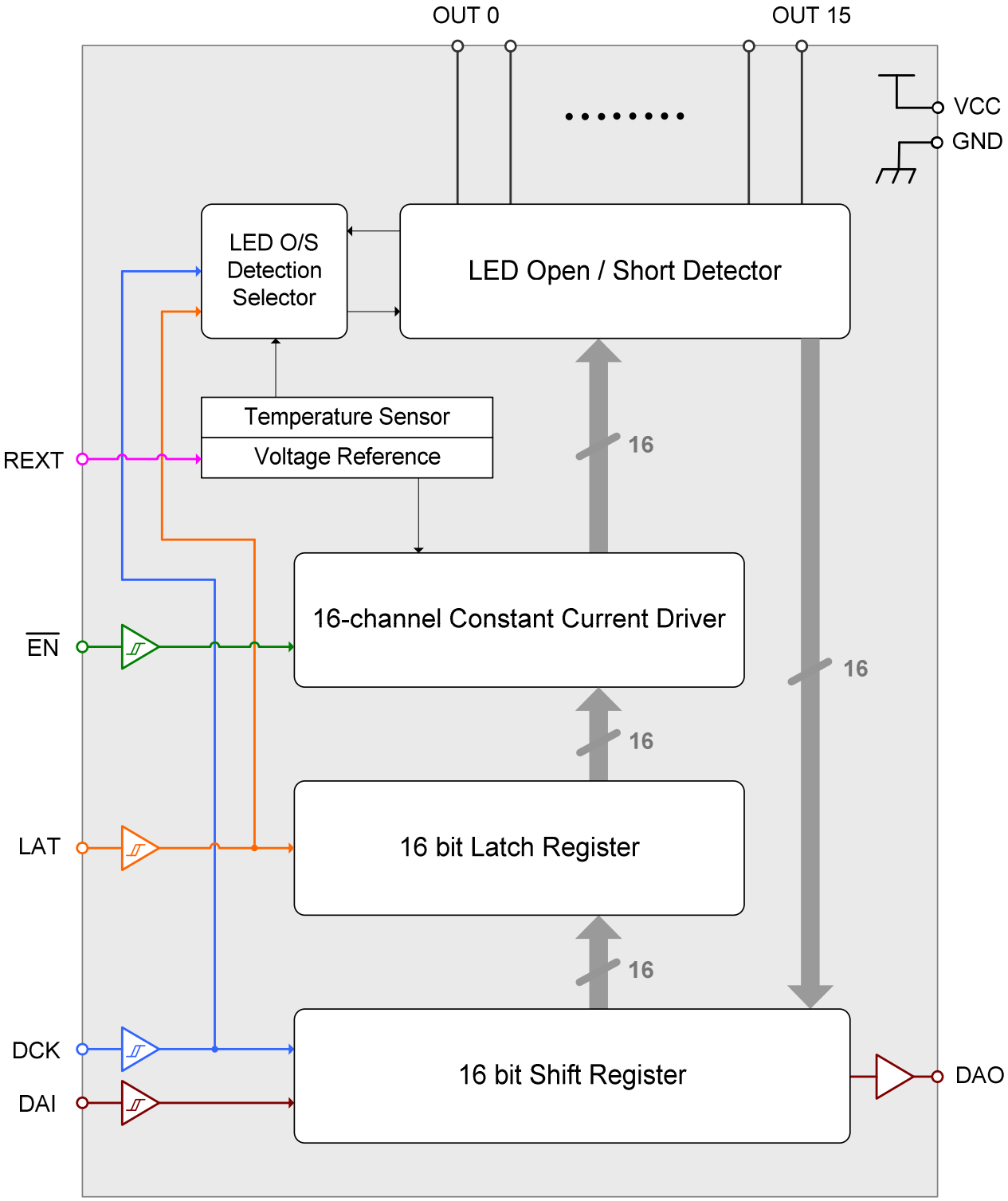
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System

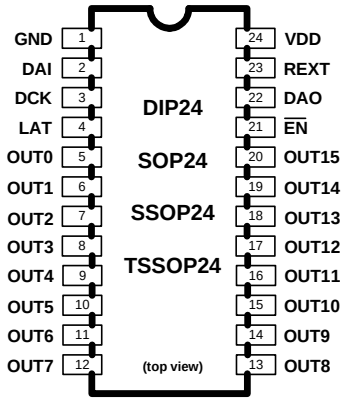
Package Types

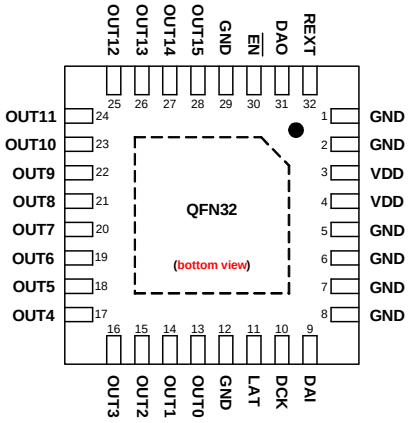
- DIP24, SOP24, SOP24B, SSOP24, TSSOP24 (with exposed pad), QFN32 (with exposed pad)

Block Diagram



Pin Connection





Pin Description

PIN No.	PIN NAME	FUNCTION
DIP24/SOP24/SSOP24/TSSOP24: 1 TSSOP24: exposed pad QFN32: 1, 2, 5, 6, 7, 8, 12, 29, exposed pad	GND	Ground terminal.
DIP24/SOP24/SSOP24/TSSOP24: 2 QFN32: 9	DAI	Serial data input terminal.
DIP24/SOP24/SSOP24/TSSOP24: 3 QFN32: 10	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
DIP24/SOP24/SSOP24/TSSOP24: 4 QFN32: 11	LAT	Input terminal of data strobe. Data on shift register goes through at the rising edge of LAT (edge trigger). Otherwise, data is latched.
DIP24/SOP24/SSOP24/TSSOP24: 5~20 QFN32: 13~28	OUT0~15	Sink constant-current outputs (open-drain).
DIP24/SOP24/SSOP24/TSSOP24: 21 QFN32: 30	$\overline{\text{EN}}$	Output enable terminal: **'H'** for all outputs are turned off , **'L'** for all outputs are active.
DIP24/SOP24/SSOP24/TSSOP24: 22 QFN32: 31	DAO	Serial data output terminal.
DIP24/SOP24/SSOP24/TSSOP24: 23 QFN32: 32	REXT	External resistors connected between REXT and GND for output current value setting.

DM13H

16-bit Constant Current LED Driver With Error Detection

▪ General Description

DM13H is a constant-current sink driver specifically designed for LED display applications. The device incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS chip. The maximum output current of each channel is set by a single external resistor. Overall output currents can be adjusted by a 7-bit serial shift-in data. Its built-in LED open/short detection, output channels short to GND detection help users to detect LED failures, outputs short. The thermal alarm and shutdown functions provide the over-temperature protection.

Features

- Constant-current outputs: 5mA to 90mA adjustable by one external resistor
- Maximum output voltage: 17V
- Maximum cascade clock frequency: 25MHz
- 7-bit linear global brightness control
- Built-in LED open/short detection: Real-time detection or Smart detection
- Built-in Outputs short to GND detection: Real-time or Smart detection
- Fast detecting response: 100ns (min.)
- Over temperature protection: Alarm (junction temperature > 130℃)
  Shutdown (junction temperature > 170℃)
- Sleep mode (sleep current : 5uA)
- In-rush current control
- Schmitt trigger input
- Power supply voltage: 3.0V to 5.5V
- Package pin assignment compatible to conventional LED drivers (DM134B/5B,DM13C)

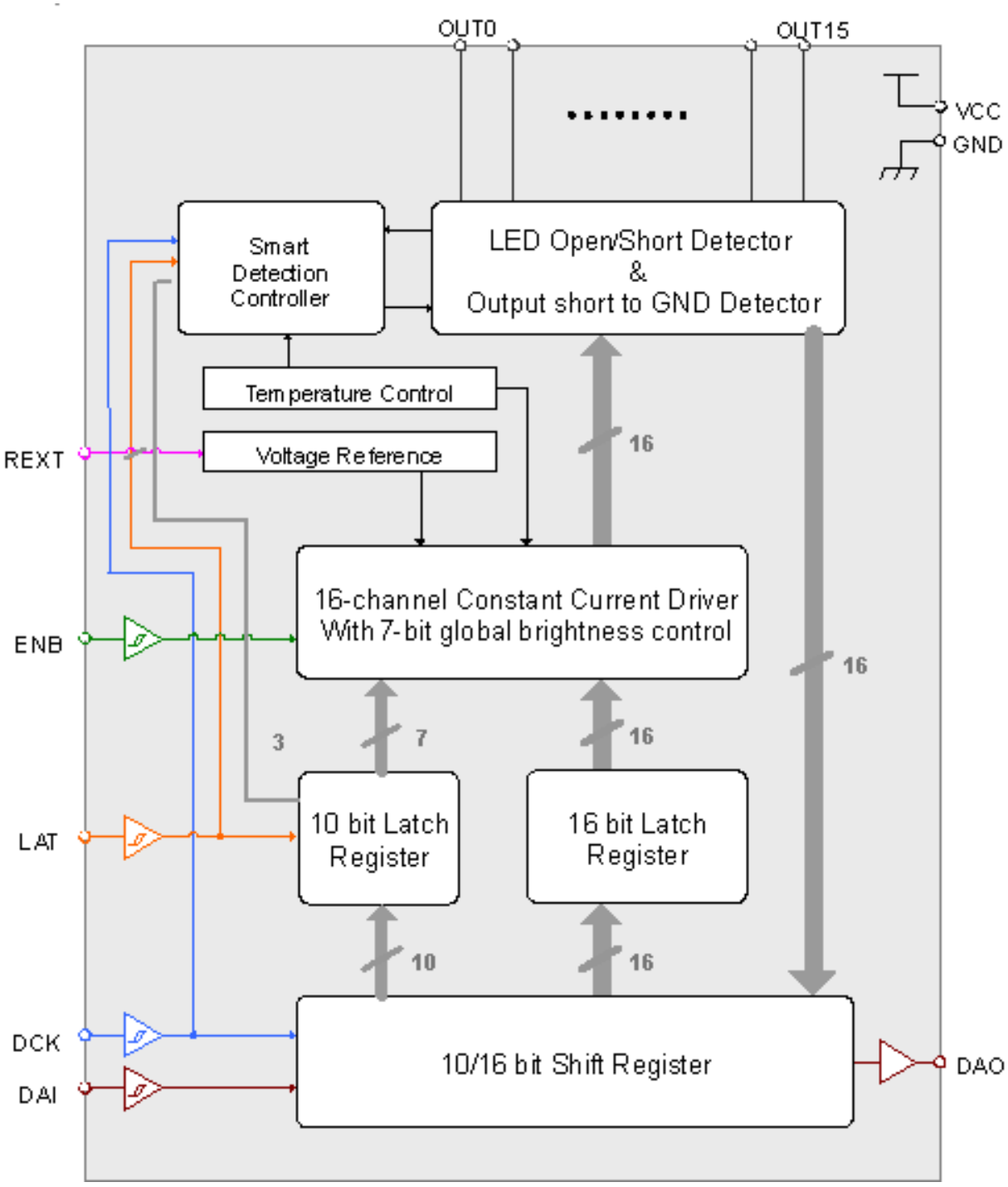
Applications

- LED Variable Message Signs (VMS) System
- Indoor/Outdoor LED Video Display

Packages

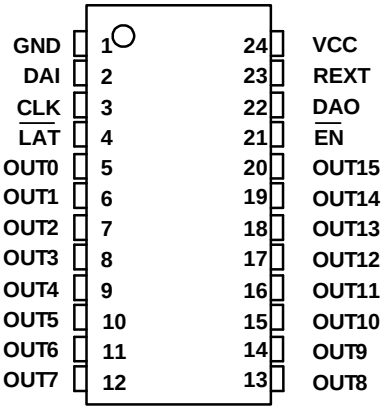
SSOP24, TSSOP24E, SOP24B,QFN24

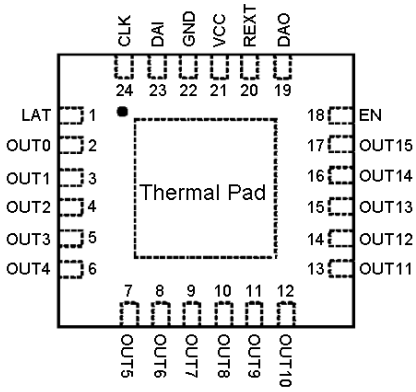
Block Diagram



Pin Connection (Top View)

SSOP24 / TSSOP24E / SOP24B/ QFN24





Pin Description

PIN No.	PIN NAME	FUNCTION
SSOP24/TSSOP24E/SOP24B: 1 QFN24: 22	GND	Ground terminal.
SSOP24/TSSOP24E/SOP24B: 2 QFN24: 23	DAI	Serial data input terminal.
SSOP24/TSSOP24E/SOP24B: 3 QFN24: 24	CLK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of CLK.
SSOP24/TSSOP24E/SOP24B: 4 QFN24: 1	$\overline{LAT}$	Input terminal of data strobe. Data on shift register goes through at the rising edge (edge trigger). Otherwise, data is latched.
SSOP24/TSSOP24E/SOP24B: 5~20 QFN24: 2~17	OUT0~15	Sink constant-current outputs (open-drain).
SSOP24/TSSOP24E/SOP24B: 21 QFN24: 18	$\overline{EN}$	Output enable terminal: '**H**' for all outputs are turned off , '**L**' for all outputs are active.
SSOP24/TSSOP24E/SOP24B: 22 QFN24: 19	DAO	Serial data output terminal.
SSOP24/TSSOP24E/SOP24B: 23 QFN24: 20	REXT	External resistors connected between REXT and GND for output current value setting.
SSOP24/TSSOP24E/SOP24B: 24 QFN24: 21	VCC	Supply voltage terminal.

DM13G

16-bit Constant Current LED Driver With Error Detection

General Description

DM13G is a constant-current sink driver specifically designed for LED display applications. The device incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS chip. The maximum output current value of all 16 channels is adjustable by a single external resistor. The global current also can be further adjusted by 7-bit serial shift-in data. Its built-in LED open/short detection, output channels short to GND detection and thermal alarm circuits help users detect LED failures, outputs short and overheating. There are two methods to communicate the error messages to the system. One is through serial output data to indicate which channel has failure. The other is by means of dedicated Alarm pin.

Features

- Constant-current outputs: 5mA to 90mA adjustable by one external resistor
- Maximum output voltage: 17V
- Maximum clock frequency: 30MHz
- 7-bit linear global brightness control
- Built-in LED open/short detection: Real-time detection or Smart detection
- Outputs short to GND detection: Smart detection
- Fast detecting response: 100ns (min.)
- Over temperature protection: Alarm (junction temperature > 130℃)
  Shutdown (junction temperature > 170℃)
- Sleep mode selection :sleep current < 5uA (typ.)
- Ghost image elimination
- In-rush current control
- Schmitt trigger input
- Power supply voltage: 3.0V to 5.5V

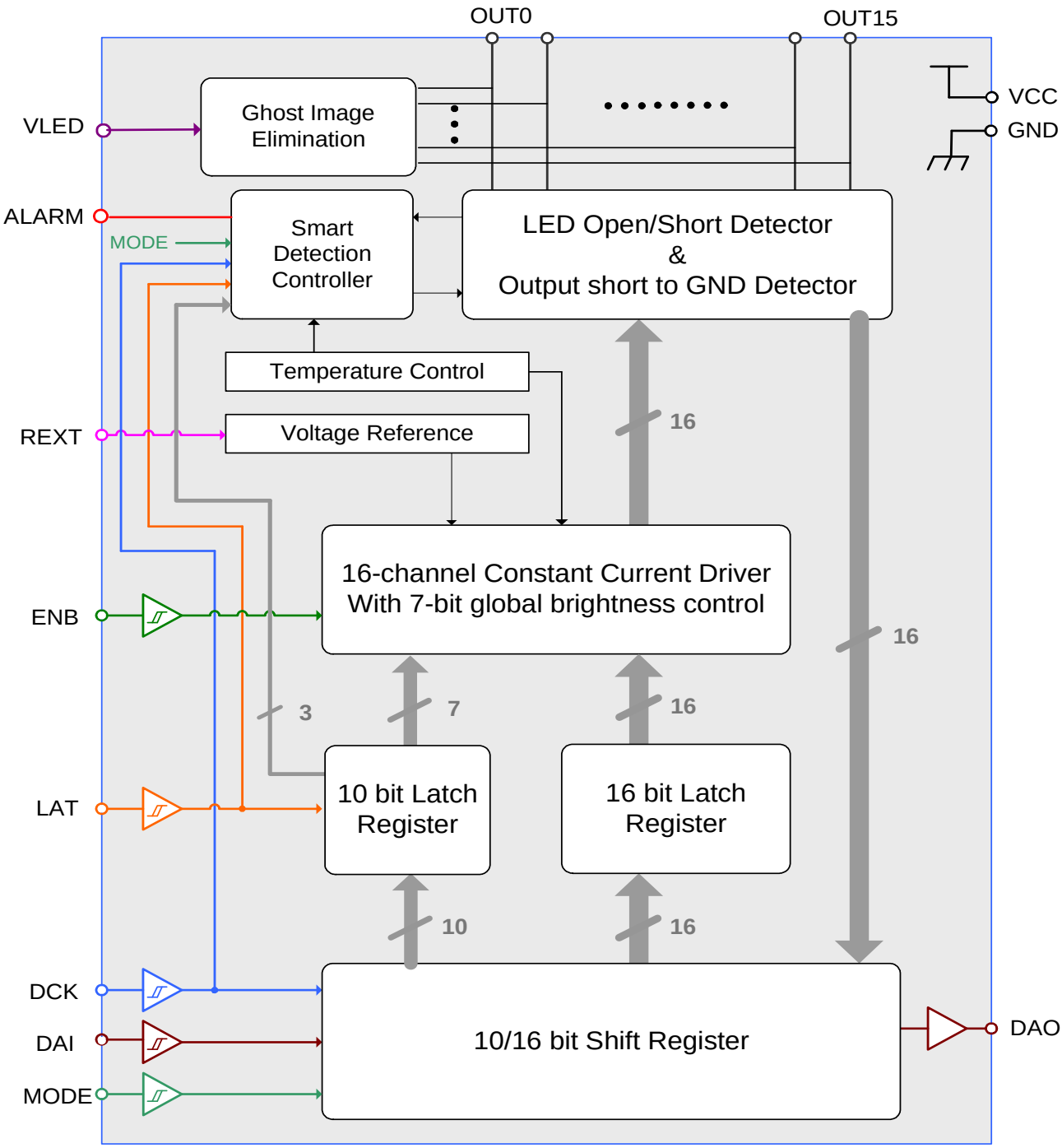
Applications

- LED Variable Message Signs (VMS) System
- Indoor/Outdoor LED Video Display

Package

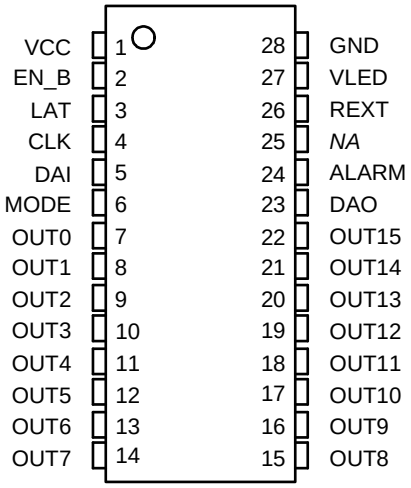
- SSOP28, TSSOP28E, QFN32

Block Diagram

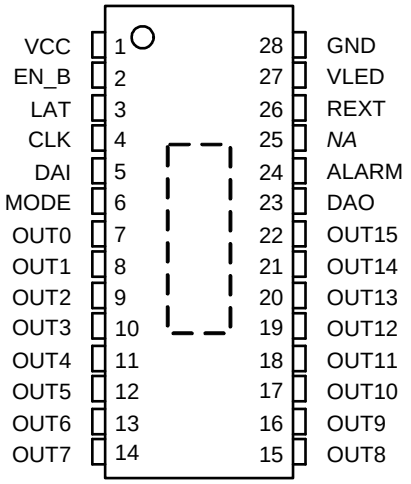


Pin Connection

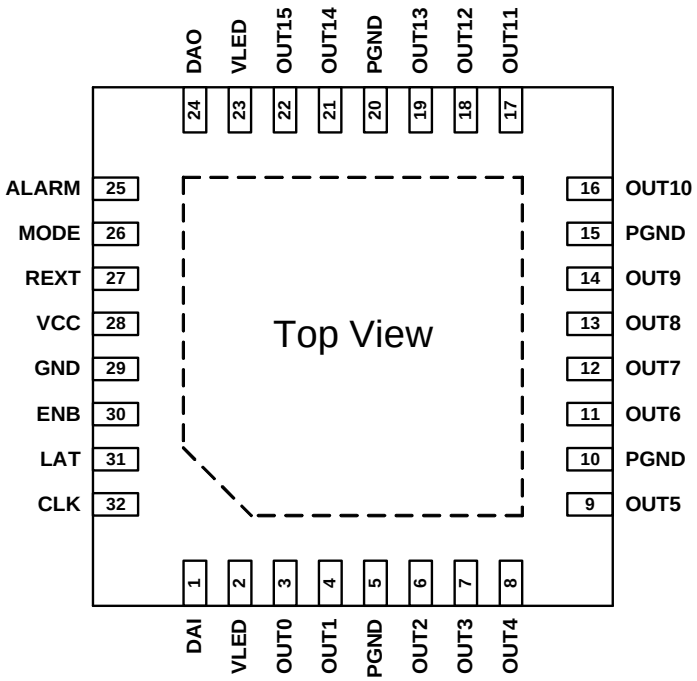
SSOP28



TSSOP28E



QFN32



DM163

8x3-CHANNEL CONSTANT CURRENT LED DRIVERS

General Description

The DM163 is a LED driver that comprises shift registers, data latches, 8x3-channel constant current circuitry with current value set by 3 external resistors, and 64 x 256 gray level PWM (Pulse Width Modulation) function unit. Each channel provides a maximum current of 60 mA. The grayscale data are separated into BANK0 and BANK1 respectively, selected by SELBK pin. BANK0 is 6-bits grayscale data and the BNAK1 is 8-bits grayscale data. Depending on the system requirement, both PWM banks could be utilized jointly to achieve maximum 8+6 bit grayscale performance. Alternatively, users can choose either 64-graylevel bank or 256-graylevel bank for dot correction, and the remaining bank as image data.

DM163 could also be constructed as a PWM controller for LED drivers. When VDDH is connected to VDD, each of the 24 output channels outputs can act as an inverse digital signal for controlling the LED driver.

Features

- 24 Output Channels
- 8 + 6-bits PWM grayscale Control
- Constant Current Output: 5mA to 60mA
- LED Power Supply Voltage up to 17V
- VDD=3V to 5.5V
- Varied Output Current Level Set By 3 External Resistors
- Serial Shift-In Architecture for Grayscale Data

Block Diagram

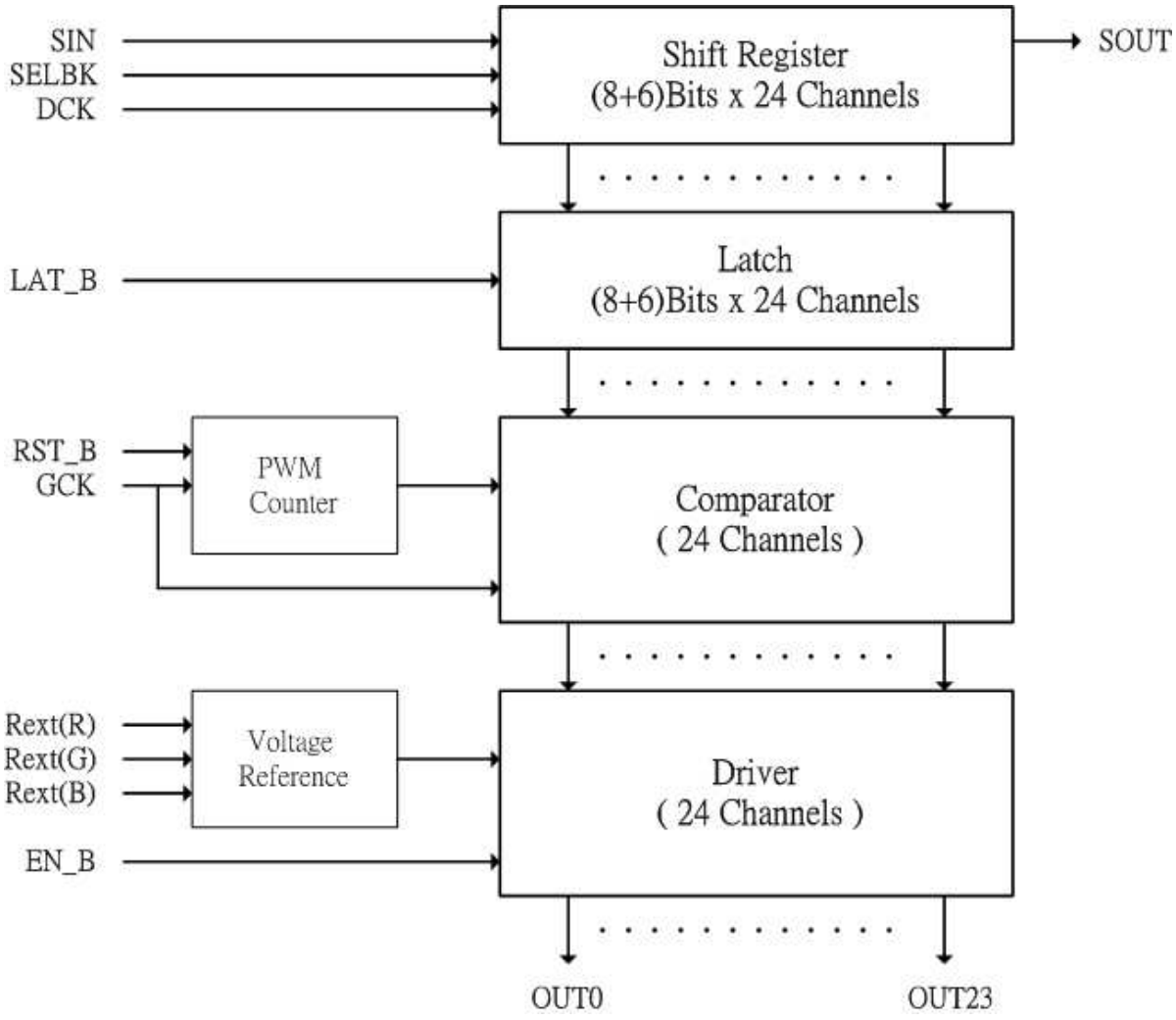


Figure 1. Functional Schematic of Whole Chip

The schematic of DM163 comprises of several fundamental units as shown in Figure 1. The grayscale data are input onto the DM163 by the **SIN** pin and transferred according to the synchronous clock **DCK**. Meanwhile, in order to separate the data into two groups, **SELBK** is designed as a switch control pin. When a sequence of data is already transferred onto the chip, the **LAT_B**="H" is set to convey it into the comparator unit. Compared with the counter signals, the grayscale data will determine the PWM control signal to display varied luminance at driver output. The **Rext** resistors are able to set diverse output current levels. The detailed schematic of each channel is shown as Figure 2.

Block Diagram

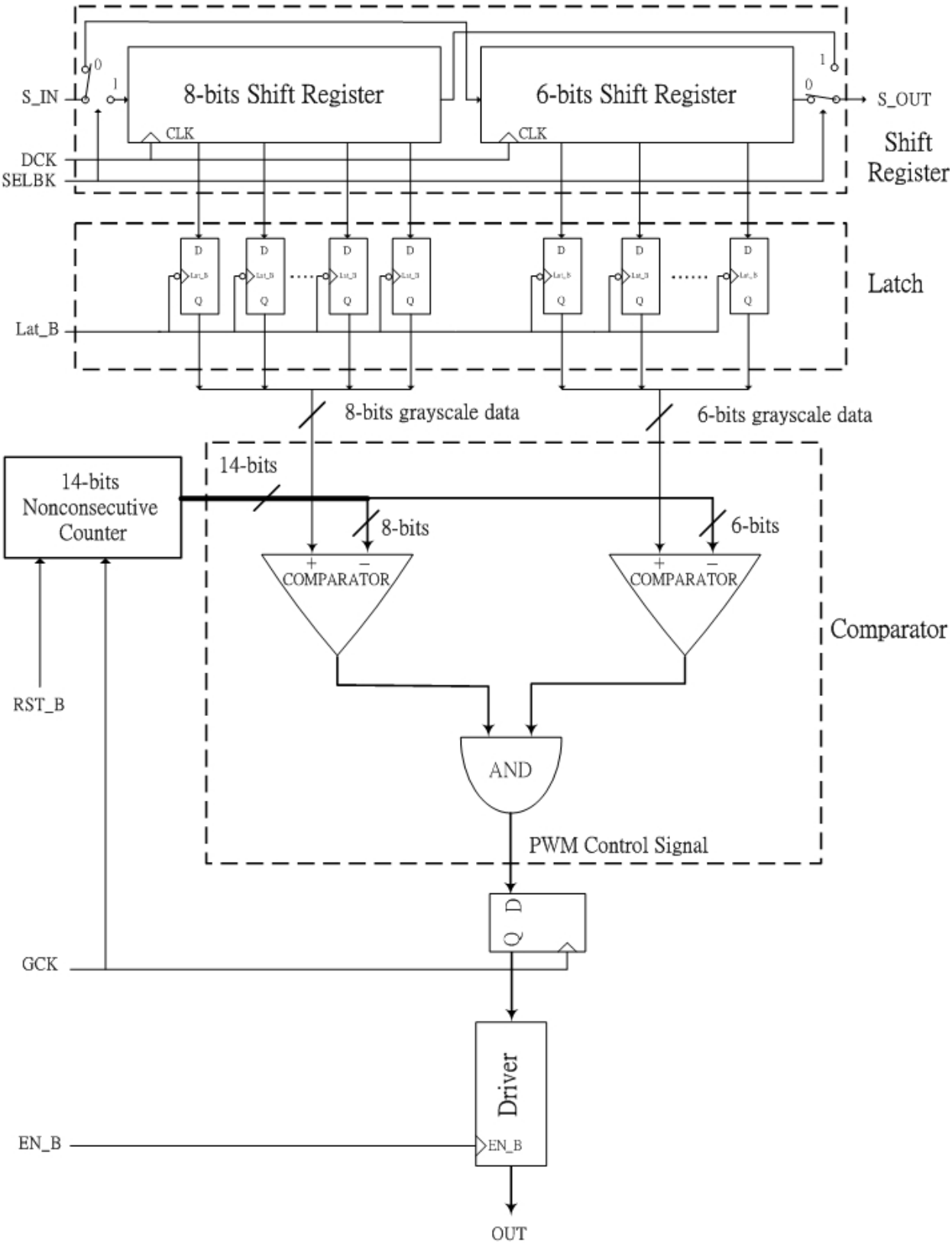


Figure 2. The Detailed Schematic of Each Channel

DM164

8x3-CHANNEL CONSTANT CURRENT LED DRIVERS

General Description

The DM164 is a LED current sink driver incorporating independent shift registers and data latches for grayscale PWM data (GD mode[*1]) and current adjustment data (D&G mode[*1]), 8x3-channels constant current circuitry with current value set by 3 external resistors, 65,536 grayscale PWM function unit, 128 levels current adjustment for each channel and 256 levels global brightness control (White balance). Each channel provides maximum current of 90mA. The DM164 also supports the LED open detection capability, thermal alarm and shutdown function. There are two methods to communicate error signals to the system. One is through serial output data to indicate which channel has failure. The other is by means of dedicated Alarm pin.

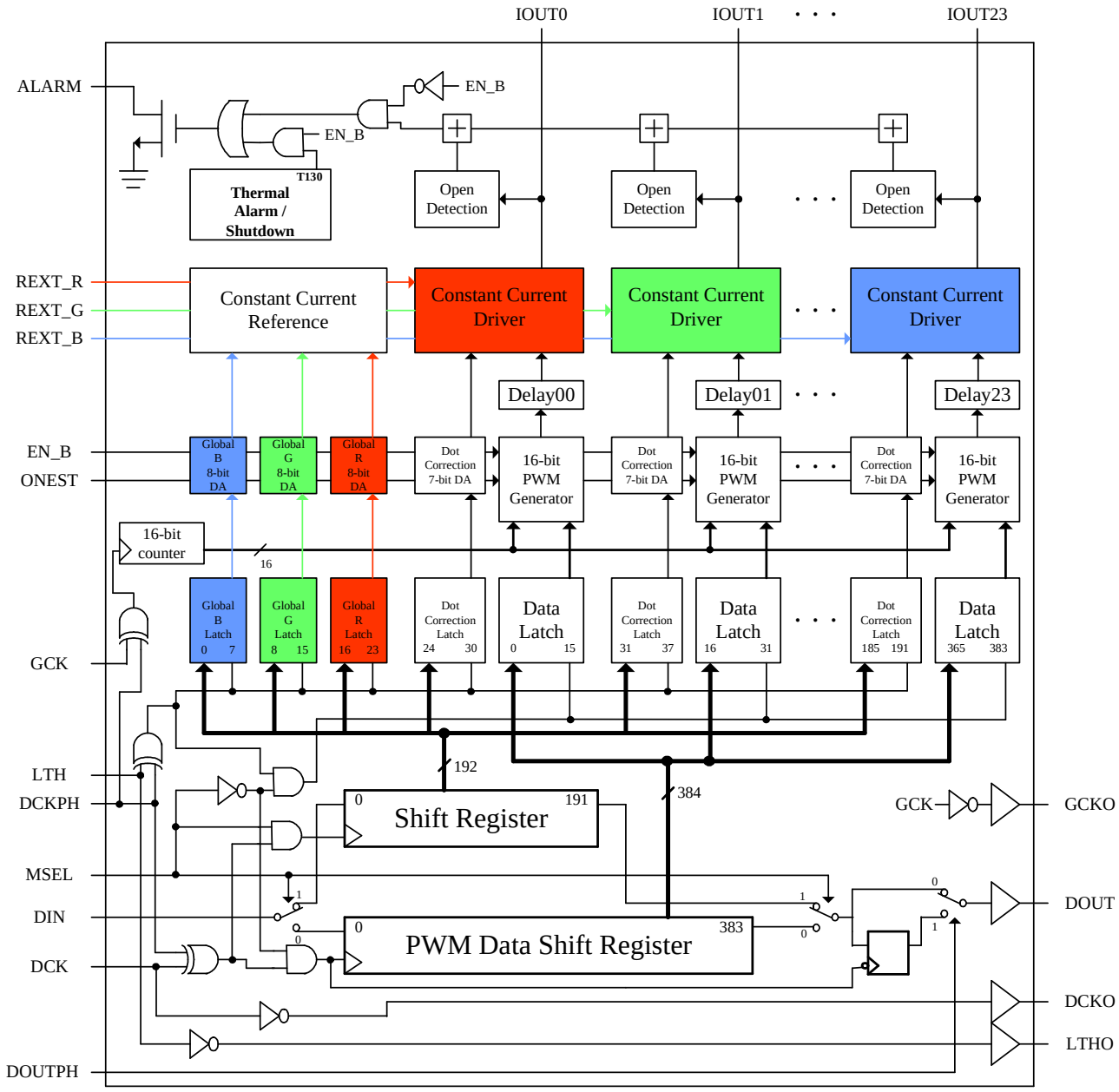
Features

- Constant current outputs with current value set by 3 external resistors.
- Max PWM clock frequency
  Cascade: 36MHz@VDD=3.3V(Refresh rate≒550Hz), 40MHz@VDD=5V (610Hz)
- Max data clock frequency
  Cascade: 30MHz@VDD=3.3V, 35MHz@VDD=5V
- Maximum output current: 90mA
- Maximum output voltage: 17V
- 16-bit grayscale for each LED
- 8-bit current adjustment for global brightness control (White Balance)
- 7-bit current adjustment for each LED (Dot Correction)
- Supply Voltage: 3V to 5.5V
- LED Open Detection
- Thermal Alarm and Shutdown
  Alarm (junction temperature >130^{o}C)
  Shutdown (junction temperature > 170^{o}C)
- One-Shot Option
- Built-in Buffer for Data, PWM Clock, Latch signal and Data Clock
- Average Separate IOUT PWM Waveform Option

Package

- LQFP48 (7mmX7mm), QFN48 (7mmX7mm)

Block Diagram

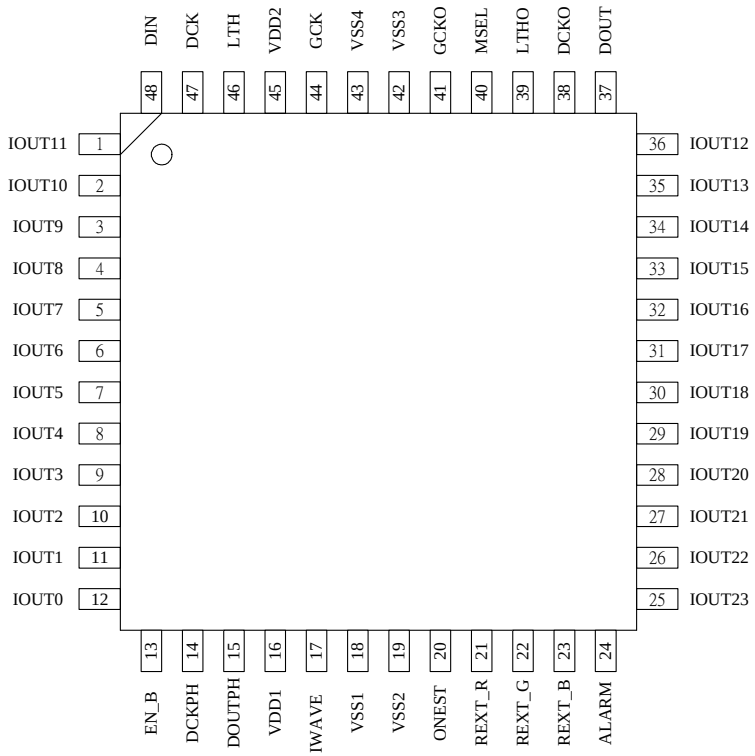


DISSIPATION RATINGS

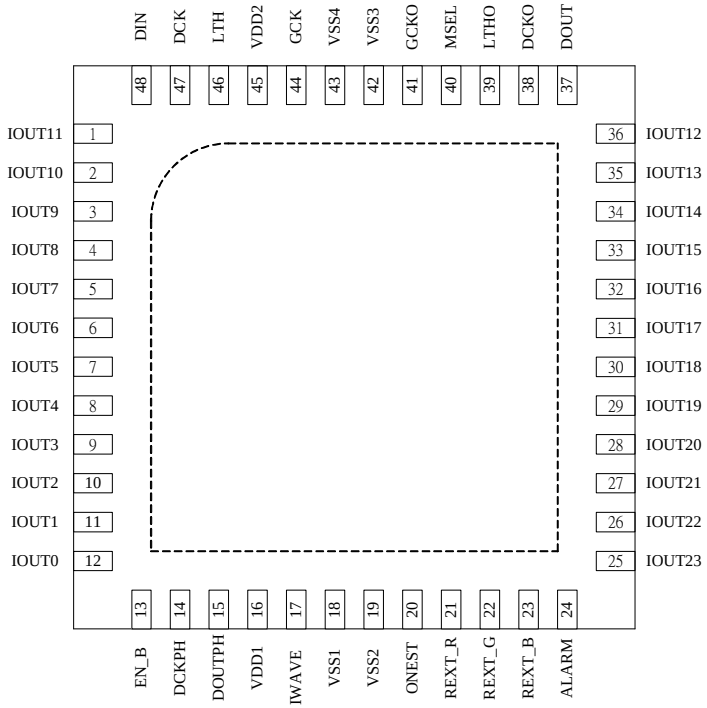
PACKAGE	POWER DISSIPATION (Tj_max=150 °C)	THERMAL RESISTANCE (Rja, Ta=25°C)
QFN48	4.00 W	31.22 °C/W
LQFP48	2.16 W	57.86 °C/W

Pin Description

LQFP48 (Top View)



QFN48 (Top View)



DM631

16-CHANNEL CONSTANT CURRENT LED DRIVER WITH PROGRAMMABLE PWM OUTPUTS

General Description

DM631 is a 16-channel constant current sink LED driver. Each channel has adjustable 12-bits (4096 steps) grayscale PWM control current outputs. It incorporates shift registers, data latches, constant current circuitry with current value set by an external resistor, selectable oscillator source for PWM function, and built-in LED open detection circuit to detect error status. It is specifically designed for LED display or lighting applications.

Features

- Constant-current outputs: 5mA to 90mA adjustable by one external resistor
- 12-bit PWM control current outputs for each channel
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Selectable internal/external PWM reference clock
- PWM free-running capability (refresh rate (~4.4KHz) with internal oscillator (~ 18 MHz))
- Build-in real-time LED open detection
- Package and pin assignment (except QFN32) compatible to pure LED drivers series (ST2221C, DM134/5/6, DM13C)
- Power supply voltage: 3.3V to 5.5V

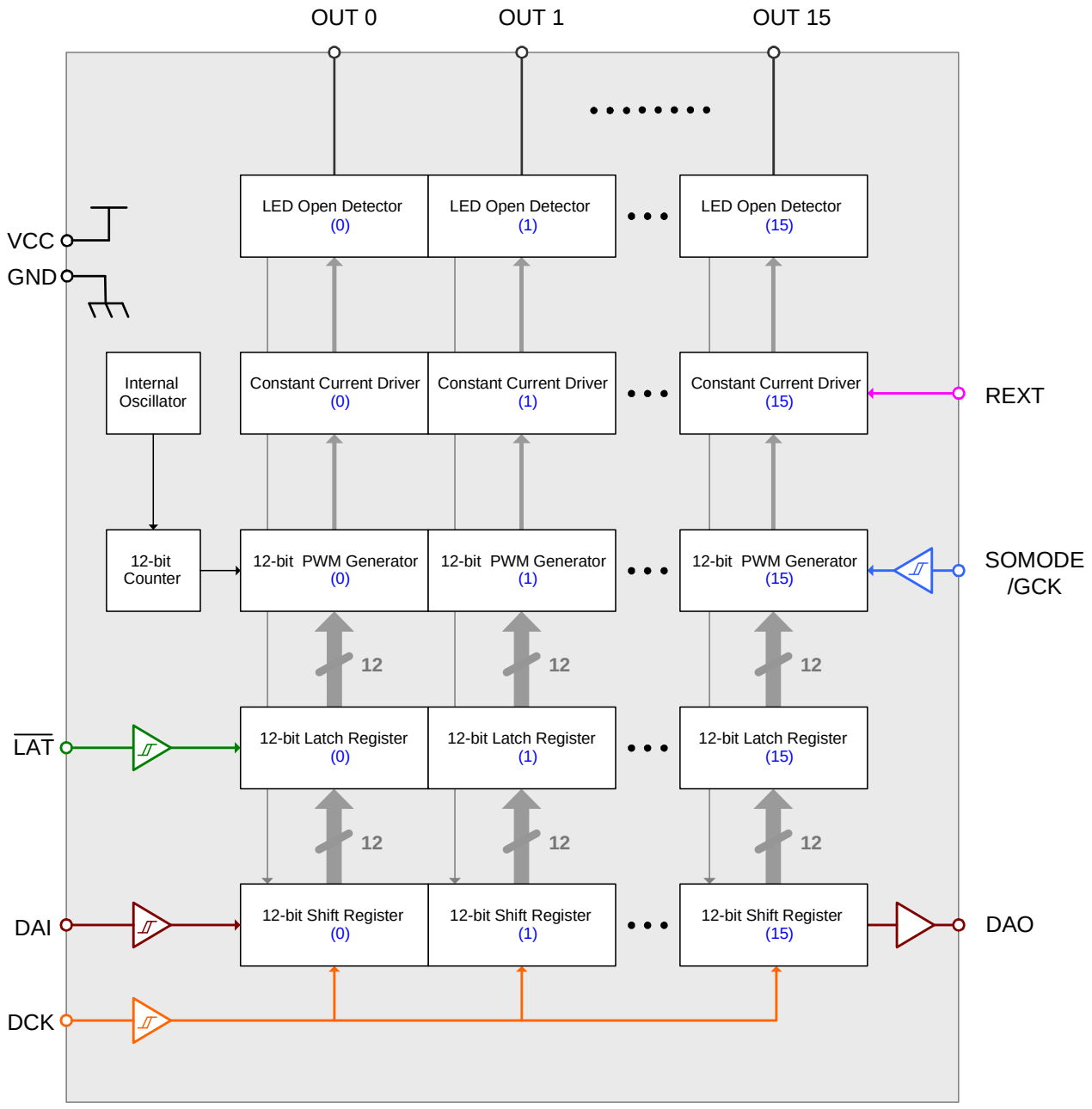
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System
- LED Decorative Lighting

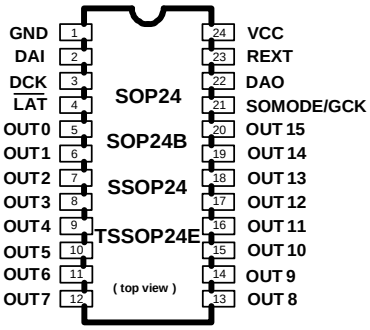
Package Types

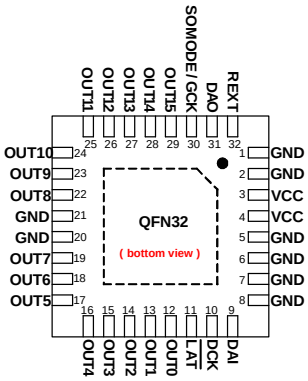
- SOP24, SOP24B, SSOP24, TSSOP24E (with exposed pad), QFN32 (with exposed pad)

Block Diagram



Pin Connection





Pin Description

PIN No.	PIN NAME	FUNCTION
SOP24/SOP24B/SSOP24 /TSSOP24E: 1 TSSOP24E, QFN32: exposed pad QFN32: 1, 2, 5, 6, 7, 8, 20,21	GND	Ground terminal.
SOP24/SOP24B/SSOP24 /TSSOP24E: 2 QFN32: 9	DAI	Serial data input terminal.
SOP24/SOP24B/SSOP24 /TSSOP24E: 3 QFN32: 10	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
SOP24/SOP24B/SSOP24 /TSSOP24E: 4 QFN32: 11	$\overline{\text{LAT}}$	Input terminal of data strobe: (level trigger) '**H**' means latch register keep data '**L**' means latch register gets data
SOP24/SOP24B/SSOP24/TSSOP24E: 5~20 QFN32: 12~19, 22~29	OUT0~15	Sink constant-current outputs (open-drain).
SOP24/SOP24B/SSOP24 /TSSOP24E: 21 QFN32: 30	SOMODE /GCK	Serial Out Mode Selection(SOMODE) : **'H'**: DAO is shifted out and synchronized to falling edge of DCK, **'L'** : DAO is shifted out and synchronized to rising edge of DCK. Gray Scale Clock(GCK) : Input terminal for PWM operation.
SOP24/SOP24B/SSOP24 /TSSOP24E: 22 QFN32: 31	DAO	Serial data output terminal.
SOP24/SOP24B/SSOP24 /TSSOP24E: 23 QFN32: 32	REXT	External resistors connected between REXT and GND for output current value setting.
SOP24/SOP24B/SSOP24 /TSSOP24E: 24 QFN32: 3, 4	VCC	Supply voltage terminal.

DM631B

16-CHANNEL CONSTANT CURRENT LED DRIVER WITH 12-bit PROGRAMMABLE PWM OUTPUTS

General Description

DM631B is a 16-channel constant current sink LED driver. Each channel has independent 12-bits (4096 steps) grayscale PWM control current outputs. It incorporates shift registers, data latches, constant current circuitry with current value set by an external resistor, and built-in LED open detection circuit to detect error status. It combines the selections with rising / falling edge serial out, auto-reload/one-shot PWM output, internal/external grayscale clock source. It is specifically designed for LED display or lighting applications.

Features

- Constant-current outputs: 5mA to 60mA adjustable by one external resistor
- 12-bit linear PWM control current outputs for each channel
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Auto-Reload / One-Shot Mode selection.
- Serial out clock edge selection – Rising / Falling edge selection
- Internal / External PWM clock mode selection
- Built-in real-time open detection
- Package and pin assignment compatible to conventional LED drivers (DM134/5/6, DM13C)
- Power supply voltage: 3.3V to 5V
- Schmitt Trigger input
- Output channel delay

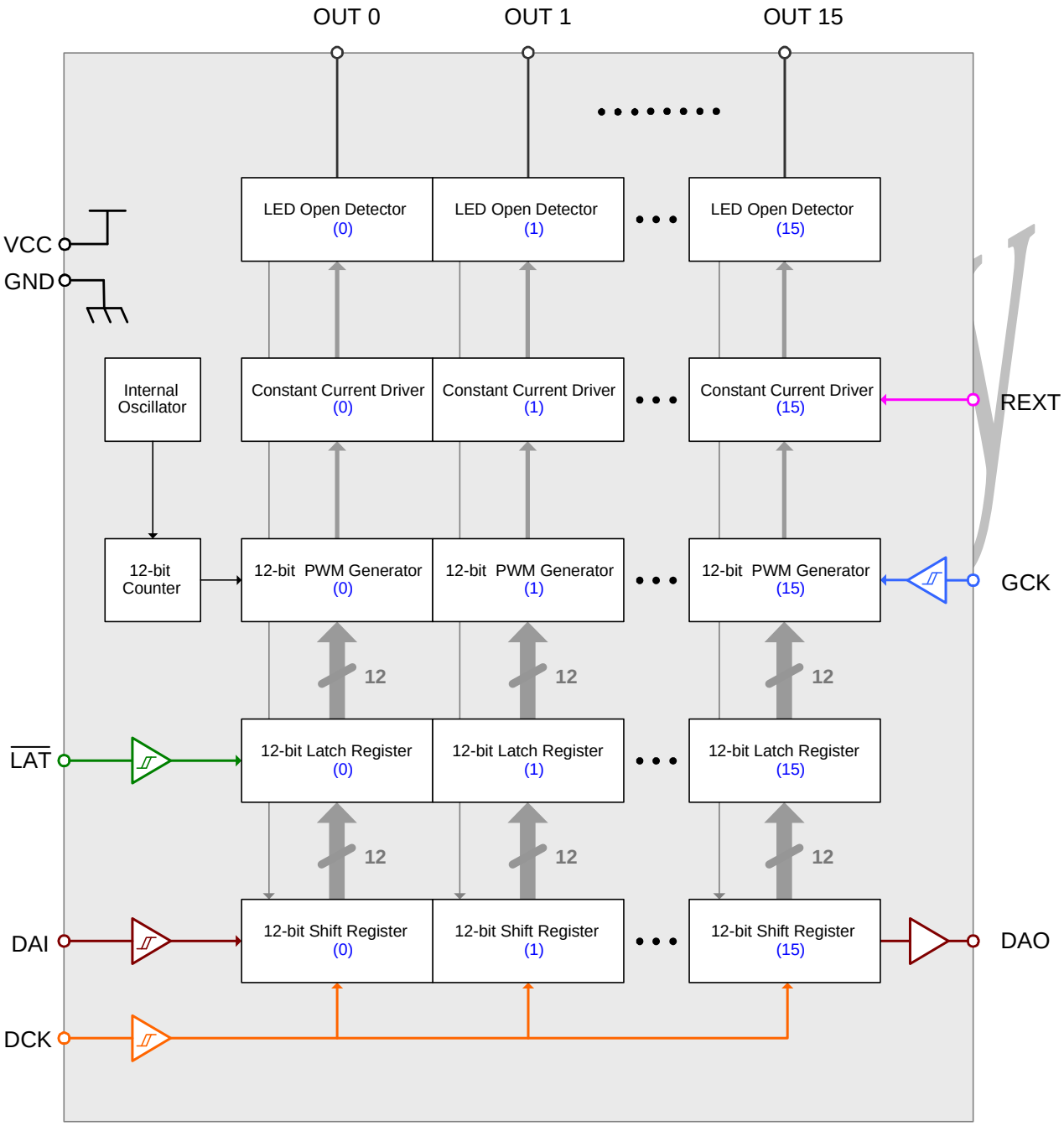
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System
- LED Decorative Lighting

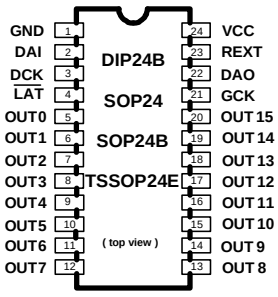
Package Types

- DIP24B, SOP24B, SSOP24, TSSOP24E (with exposed pad)

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
SOP24B/SSOP24/TSSOP24E: 1 TSSOP24E: exposed pad	GND	Ground terminal.
SOP24B/SSOP24/TSSOP24E: 2	DAI	Serial data input terminal.
SOP24B/SSOP24/TSSOP24E: 3	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
SOP24B/SSOP24/TSSOP24E: 4	$\overline{\text{LAT}}$	Input terminal of data strobe: 'H' means data on shift register goes through latch (level trigger), all outputs off and counter reset immediately 'L' means data is latched.
SOP24B/SSOP24/TSSOP24E: 5~20	OUT0~ 15	Sink constant-current outputs (open-drain).
SOP24B/SSOP24/TSSOP24E: 21	GCK	Gray Scale Clock (GCK) : Input terminal for PWM operation.
SOP24B/SSOP24/TSSOP24E: 22	DAO	Serial data output terminal. Data shift out at the rising edge of DCK in REM∗1 (default), or data shift out at the falling edge of DCK in FEM∗2.
SOP24B/SSOP24/TSSOP24E: 23	REXT	External resistors connected between REXT and GND for output current value setting.

*1 Rising Edge Mode
*2 Falling Edge Mode

DM632

16-CHANNEL CONSTANT CURRENT LED DRIVER WITH PROGRAMMABLE PWM OUTPUTS

General Description

DM632 is a 16-channel constant current sink LED driver. Each channel has adjustable 16-bits (65536 steps) grayscale PWM control current outputs. It incorporates shift registers, data latches, constant current circuitry with current value set by an external resistor, selectable oscillator source for PWM functioning, and built-in LED open detection circuit to detect error status. It is specifically designed for LED display or lighting applications.

Features

- Constant-current outputs: 5mA to 90mA adjustable by one external resistor
- 16-bit linear PWM control current outputs for each channel
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Selectable internal/external PWM reference clock
- PWM free-running capability (refresh rate (~ 275Hz) with internal oscillator (~ 18 MHz))
- Build-in real-time open detection
- Package and pin assignment (except QFN32) compatible to pure LED driver series (ST2221C, DM134/5/6, DM13C)
- Power supply voltage: 3.3V to 5.5V

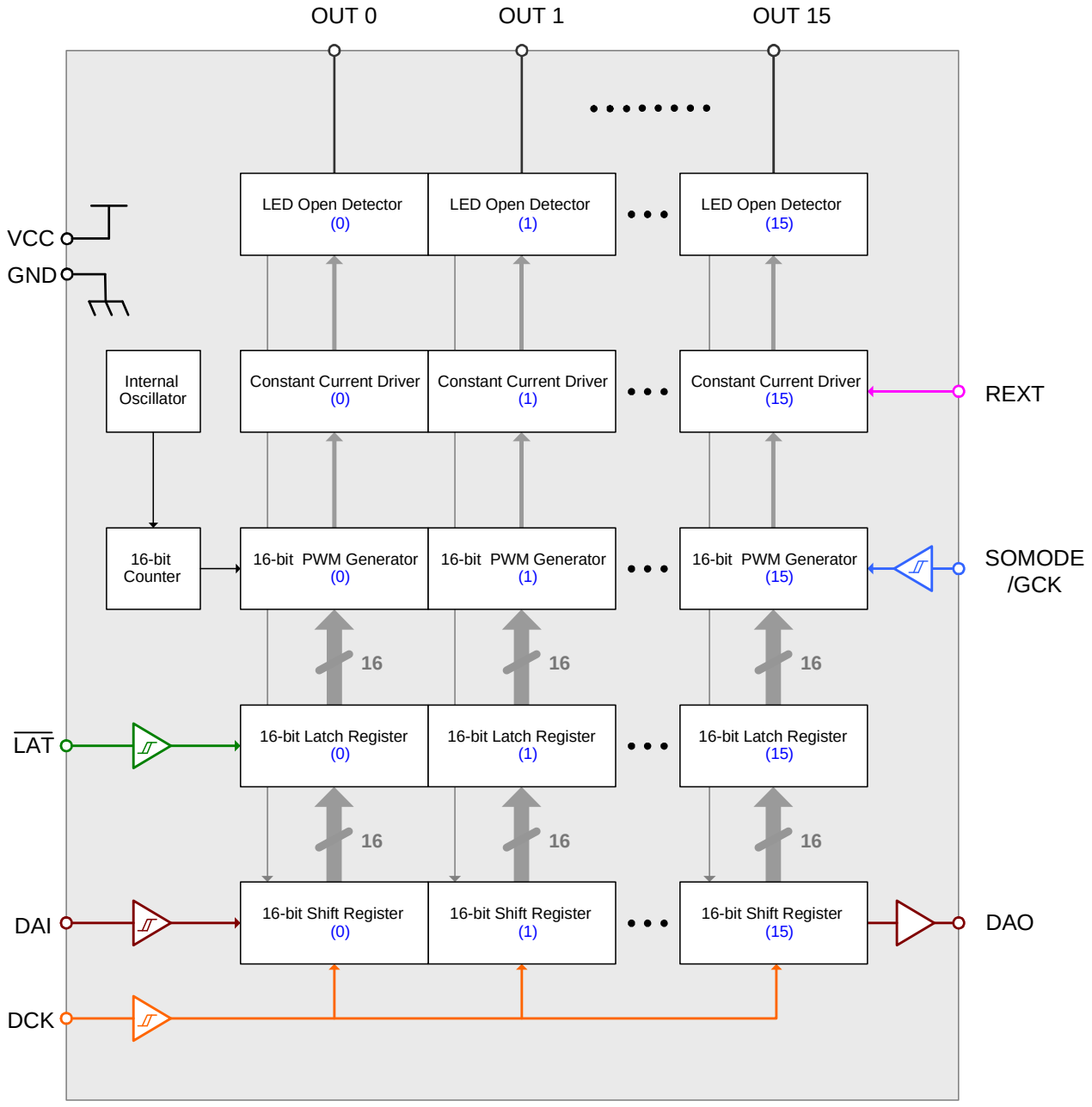
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System
- LED Decorative Lighting

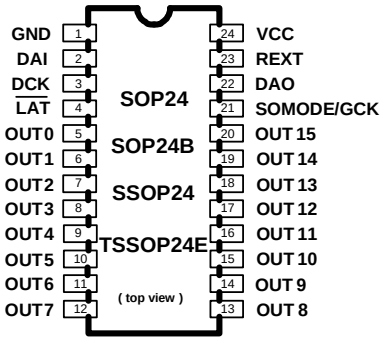
Package Types

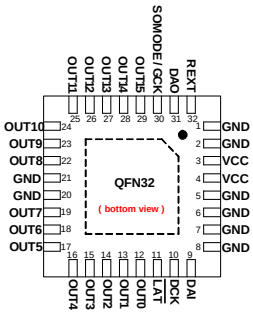
- SOP24, SOP24B, SSOP24, TSSOP24E (with exposed pad), QFN32 (with exposed pad)

Block Diagram



Pin Connection





Pin Description

PIN No.	PIN NAME	FUNCTION
SOP24/SOP24B/SSOP24/TSSOP24E: 1 TSSOP24E, QFN32: exposed pad QFN32: 1, 2, 5, 6, 7, 8, 20,21	GND	Ground terminal.
SOP24/SOP24B/SSOP24/TSSOP24E: 2 QFN32: 9	DAI	Serial data input terminal.
SOP24/SOP24B/SSOP24/TSSOP24E: 3 QFN32: 10	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
SOP24/SOP24B/SSOP24/TSSOP24E: 4 QFN32: 11	$\overline{\text{LAT}}$	Input terminal of data strobe: '**H**' means data on shift register goes through latch (level trigger), '**L**' means data is latched.
SOP24/SOP24B/SSOP24/TSSOP24E: 5~20 QFN32: 12~19, 22~29	OUT0~15	Sink constant-current outputs (open-drain).
SOP24/SOP24B/SSOP24/TSSOP24E: 21 QFN32: 30	SOMODE /GCK	Serial Out Mode Selection(SOMODE) : **'H'**: DAO is shifted out and synchronized to falling edge of DCK, **'L'** : DAO is shifted out and synchronized to rising edge of DCK. Gray Scale Clock(GCK) : Input terminal for PWM operation.
SOP24/SOP24B/SSOP24/TSSOP24E: 22 QFN32: 31	DAO	Serial data output terminal.
SOP24/SOP24B/SSOP24/TSSOP24E: 23 QFN32: 32	REXT	External resistors connected between REXT and GND for output current value setting.
SOP24/SOP24B/SSOP24/TSSOP24E: 24 QFN32: 3, 4	VCC	Supply voltage terminal.

DM632B

16-CHANNEL CONSTANT CURRENT LED DRIVER WITH 16-bit PROGRAMMABLE PWM OUTPUTS

General Description

DM632B is a 16-channel constant current sink LED driver. Each channel has independent 16-bits (65536 steps) grayscale PWM control current outputs. It incorporates shift registers, data latches, constant current circuitry with current value set by an external resistor, and built-in LED open detection circuit to detect error status. It combines the selections with rising / falling edge serial out, auto-reload/one-shot PWM output, internal/external grayscale clock source. It is specifically designed for LED display or lighting applications.

Features

- Constant-current outputs: 5mA to 60mA adjustable by one external resistor
- 16-bit linear PWM control current outputs for each channel
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Auto-Reload / One-Shot Mode selection.
- Serial out clock edge selection – Rising / Falling edge selection
- Internal / External PWM clock mode selection
- Built-in real-time open detection
- Package and pin assignment compatible to conventional LED drivers (DM134/5/6, DM13C)
- Power supply voltage: 3.3V to 5V
- Schmitt Trigger input
- Output channel delay

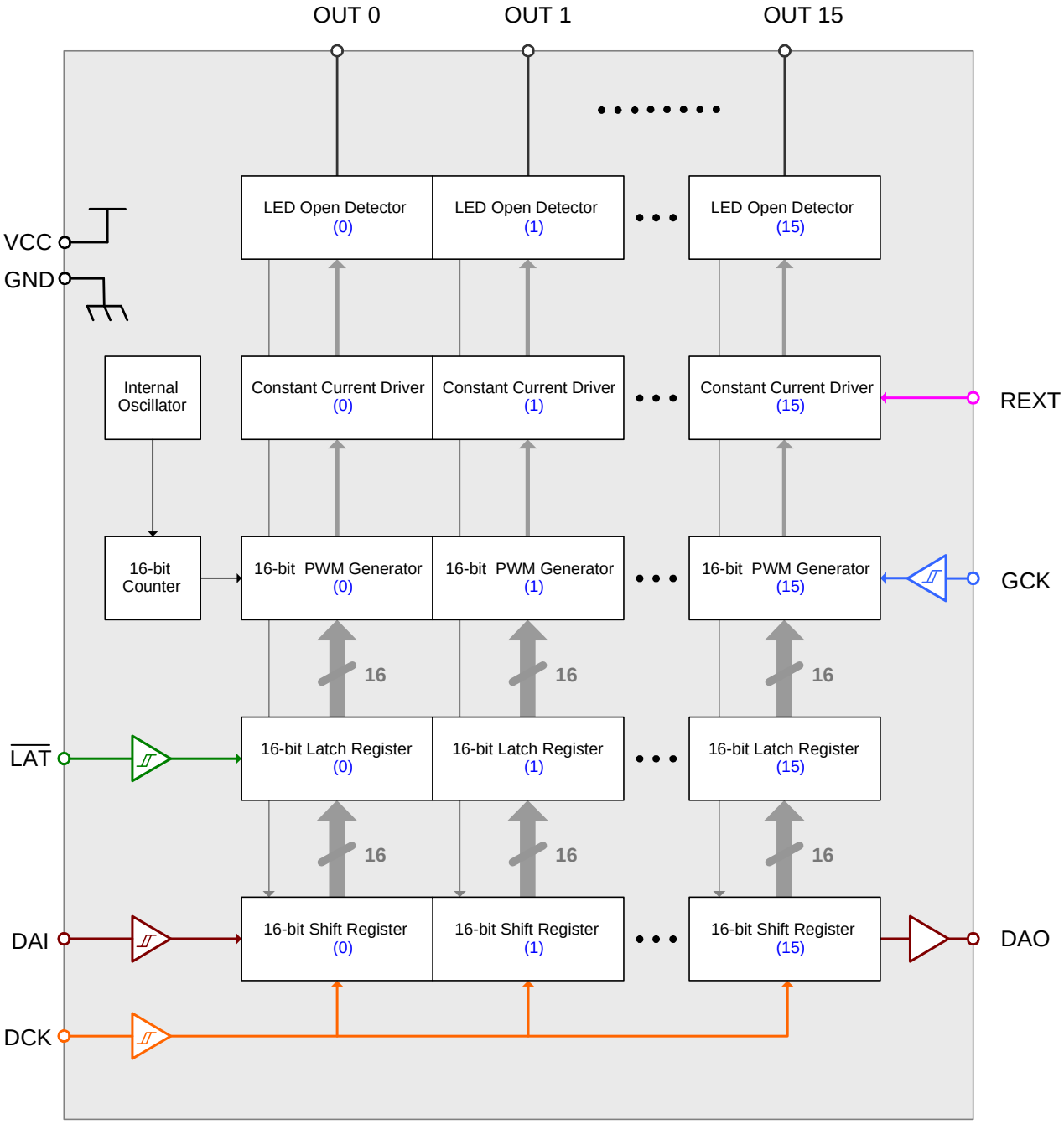
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System
- LED Decorative Lighting

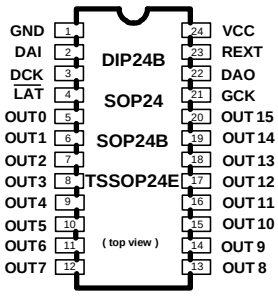
Package Types

- DIP24B, SOP24B, SSOP24, TSSOP24E (with exposed pad)

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
SOP24B/SSOP24/TSSOP24E: 1 TSSOP24E: exposed pad	GND	Ground terminal.
SOP24B/SSOP24/TSSOP24E: 2	DAI	Serial data input terminal.
SOP24B/SSOP24/TSSOP24E: 3	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
SOP24B/SSOP24/TSSOP24E: 4	$\overline{\text{LAT}}$	Input terminal of data strobe: '**H**' means data on shift register goes through latch (level trigger), all outputs off and counter reset immediately '**L**' means data is latched.
SOP24B/SSOP24/TSSOP24E: 5~20	OUT0~15	Sink constant-current outputs (open-drain).
SOP24B/SSOP24/TSSOP24E: 21	GCK	Gray Scale Clock (GCK) : Input terminal for PWM operation.
SOP24B/SSOP24/TSSOP24E: 22	DAO	Serial data output terminal. Data shift out at the rising edge of DCK in REM*1 (default), or data shift out at the falling edge of DCK in FEM*2.
SOP24B/SSOP24/TSSOP24E: 23	REXT	External resistors connected between REXT and GND for output current value setting.
SOP24B/SSOP24/TSSOP24E: 24	VCC	Supply voltage terminal.

*1 Rising Edge Mode
*2 Falling Edge Mode

DM633

16-CHANNEL CONSTANT CURRENT LED DRIVER WITH PROGRAMMABLE PWM OUTPUTS

General Description

DM633 is a 16-channel constant current sink LED driver. Each channel has adjustable 12-bits (4096 steps) grayscale PWM control current outputs. 7-bit global brightness control is included in supporting user to adjust chip current easily. It incorporates shift registers, data latches, constant current circuitry with current value set by an external resistor, selectable oscillator source for PWM functioning, and built-in LED open/short detection circuit to detect error status. It supports thermal alarm and shutdown function, system retrieve the message to indicate when junction temperature over limitation of chip. It is specifically designed for LED display and lighting applications.

Features

- Constant-current outputs: 5mA to 90mA
- 12-bit PWM control current output per channel
- 7-bit high accuracy global brightness control
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Selectable internal/external PWM reference clock
- PWM free-running capability (refresh rate ~ 4.4k Hz with internal oscillator ~ 18 MHz)
- Build-in real-time LED open/short detection
- Thermal Alarm and Shotdown –
  Alarm : Junction Temperature >110℃
  Shutdown : Junction Temperature > 180℃
- Package and pin assignment (except QFN32) compatible to conventional LED driver series (ST2221C, DM134/5/6, DM13C)
- Power supply voltage: 3.3V to 5.5 V

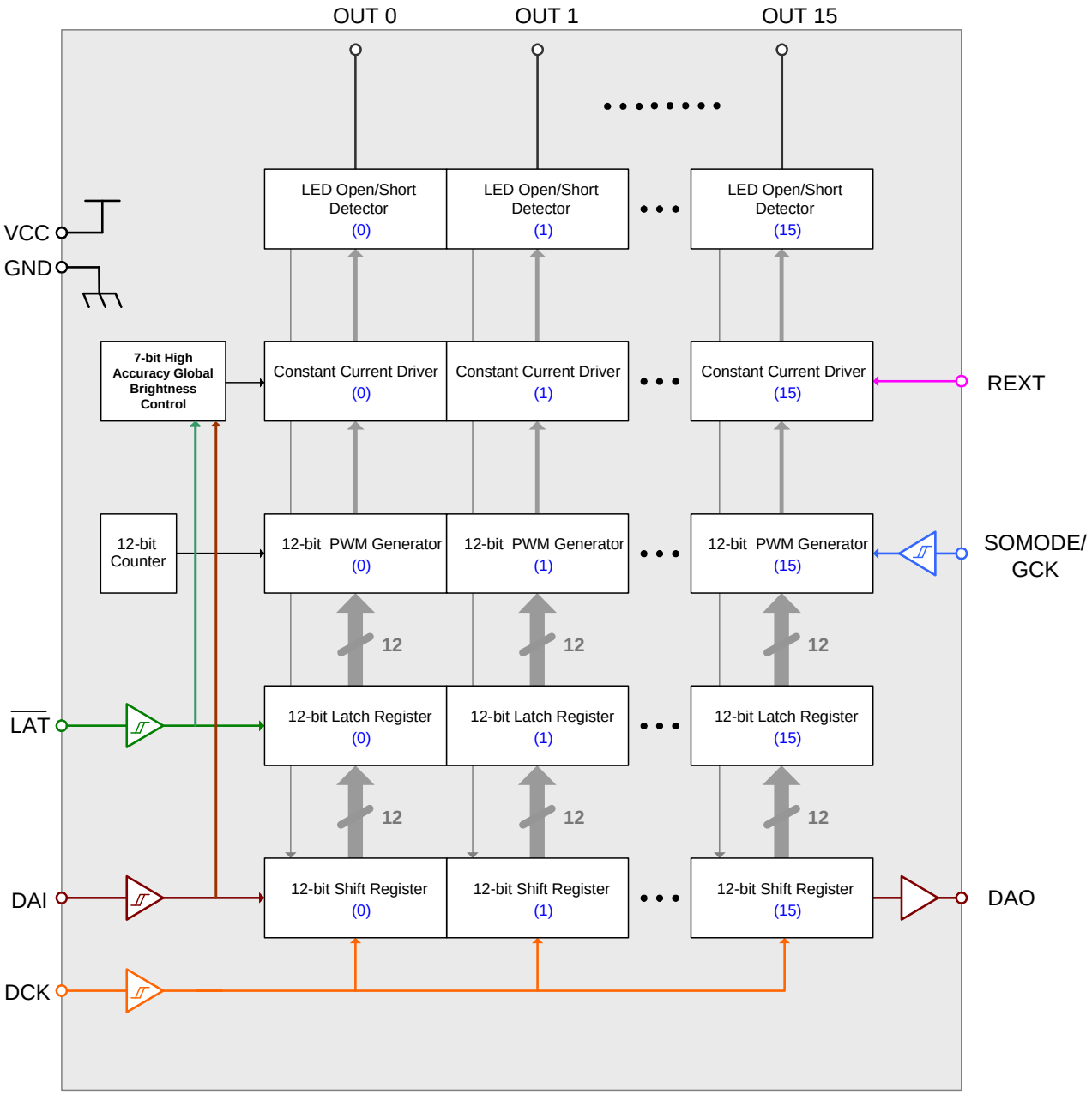
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System
- LED Decorative Lighting

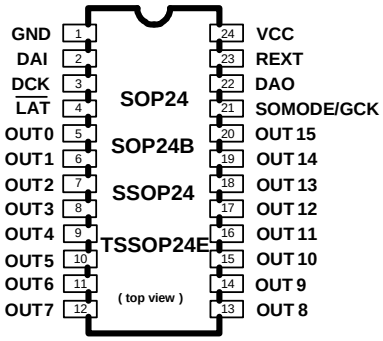
Package Types

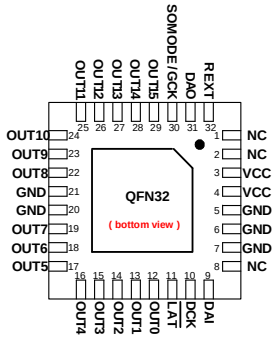
- SOP24, SOP24B, SSOP24, TSSOP24E(with exposed pad), QFN32 (with exposed pad)

Block Diagram



Pin Connection





Pin Description

PIN No.	PIN NAME	FUNCTION
SOP24/SOP24B/SSOP24/TSSOP24E: 1 TSSOP24E: exposed pad QFN32: 5, 6, 7, 20,21	GND	Ground terminal.
QFN32: 1,2,8,exposed pad	NC	No internal connection
SOP24/SOP24B/SSOP24/TSSOP24E: 2 QFN32: 9	DAI	Serial data input terminal.
SOP24/SOP24B/SSOP24/TSSOP24E: 3 QFN32: 10	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
SOP24/SOP24B/SSOP24/TSSOP24E: 4 QFN32: 11	$\overline{\text{LAT}}$	Input terminal of data strobe: **'H'** means data on shift register goes through latch (level trigger), **'L'** means data is latched.
SOP24/SOP24B/SSOP24/TSSOP24E: 5~20 QFN32: 12~19, 22~29	OUT0~15	Sink constant-current outputs (open-drain).
SOP24/SOP24B/SSOP24/TSSOP24E: 21 QFN32: 30	SOMODE /GCK	Serial Out Mode Selection(SOMODE) : **'H'**: DAO is shifted out and synchronized to falling edge of DCK, **'L'** : DAO is shifted out and synchronized to rising edge of DCK. Gray Scale Clock(GCK) : Input terminal for PWM operation.
SOP24/SOP24B/SSOP24/TSSOP24E: 22 QFN32: 31	DAO	Serial data output terminal.
SOP24/SOP24B/SSOP24/TSSOP24E: 23 QFN32: 32	REXT	External resistors connected between REXT and GND for output current value setting.
SOP24/SOP24B/SSOP24/TSSOP24E: 24 QFN32: 3, 4	VCC	Supply voltage terminal.

DM634

16-CHANNEL CONSTANT CURRENT LED DRIVER WITH PROGRAMMABLE PWM OUTPUTS

General Description

DM634 is a 16-channel constant current sink LED driver. Each channel has adjustable 16-bits (65536 steps) grayscale PWM control current outputs. 7-bit global brightness control is included in supporting user to adjust chip current easily. It incorporates shift registers, data latches, constant current circuitry with current value set by an external resistor, selectable oscillator source for PWM functioning, and built-in LED open/short detection circuit to detect error status. It supports thermal alarm and shutdown function; system retrieve the message to indicate when junction temperature over limitation of chip. It is specifically designed for LED display and lighting applications.

Features

- Constant-current outputs: 5mA to 90mA
- 16-bit linear PWM control current output per channel
- 7-bit high accuracy global brightness control
- Maximum output voltage: 17V
- Maximum clock frequency: 25MHz
- Selectable internal/external PWM reference clock
- PWM free-running capability (refresh rate ~ 275 Hz with internal oscillator ~ 18 MHz)
- Build-in real-time LED open/short detection
- Thermal Alarm and Shotdown –
  Alarm : Junction Temperature >110℃
  Shutdown : Junction Temperature > 180℃
- Package and pin assignment (except QFN32) compatible to conventional LED driver series (ST2221C, DM134B/5B, DM13C)
- Power supply voltage: 3.3V to 5.5 V

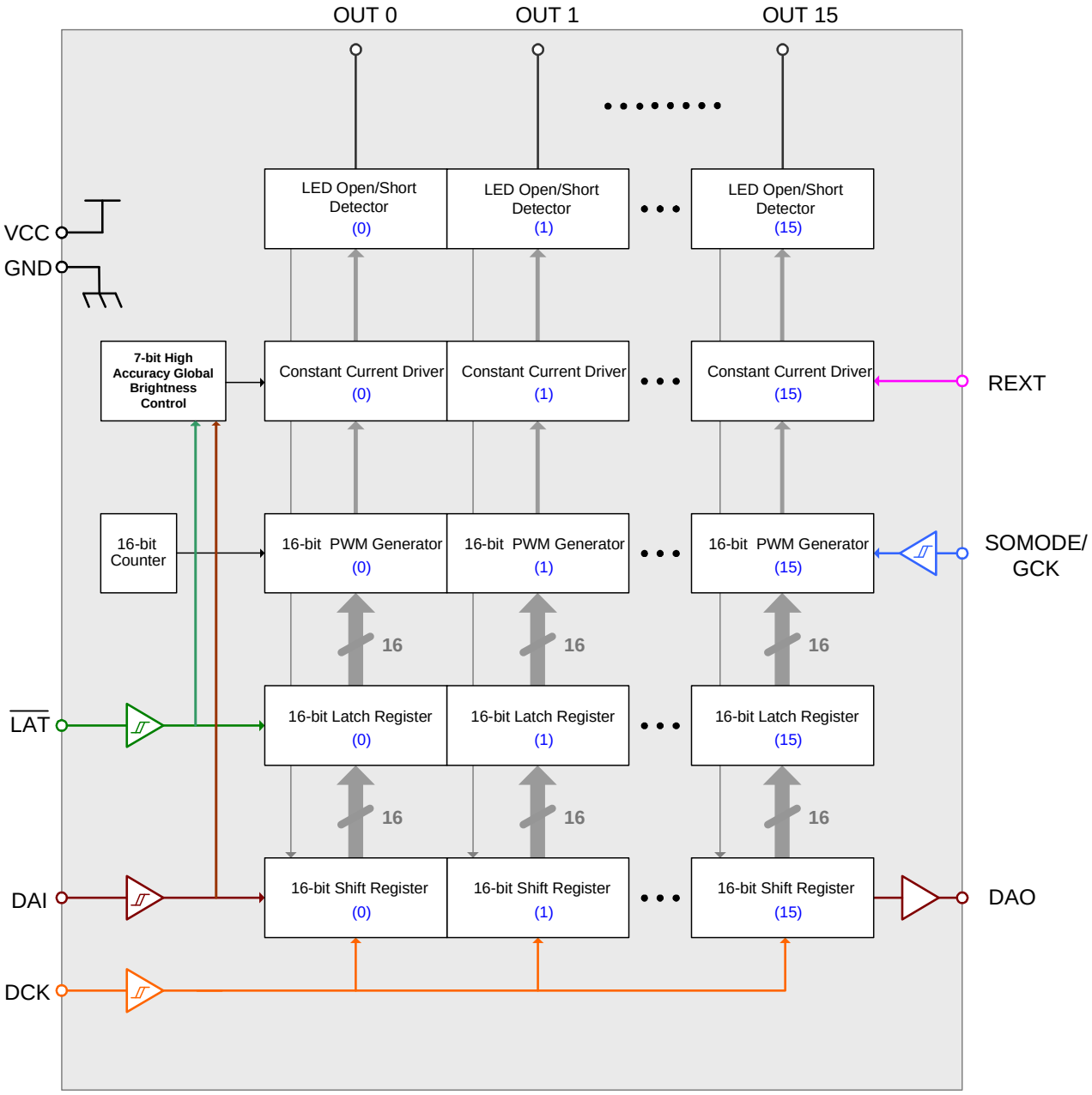
Applications

- Indoor/Outdoor LED Video Display
- LED Variable Message Signs (VMS) System
- LED Decorative Lighting

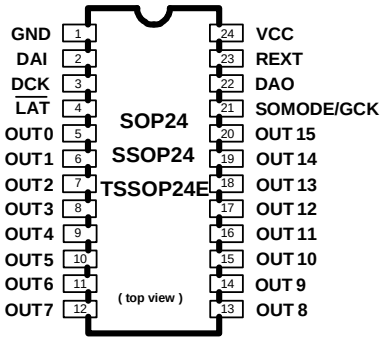
Package Types

- SOP24, SSOP24, TSSOP24E (with exposed pad)

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
SOP24/SSOP24/TSSOP24E: 1 TSSOP24E: exposed pad	GND	Ground terminal.
SOP24/SSOP24/TSSOP24E: 2	DAI	Serial data input terminal.
SOP24/SSOP24/TSSOP24E: 3	DCK	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of DCK.
SOP24/SSOP24/TSSOP24E: 4	$\overline{\text{LAT}}$	Input terminal of data strobe: **'H'** means data on shift register goes through latch (level trigger), **'L'** means data is latched.
SOP24/SSOP24/TSSOP24E: 5~20	OUT0~15	Sink constant-current outputs (open-drain).
SOP24/SSOP24/TSSOP24E: 21	SOMODE /GCK	Serial Out Mode Selection(SOMODE) : **'H'**: DAO is shifted out and synchronized to falling edge of DCK, **'L'** : DAO is shifted out and synchronized to rising edge of DCK. Gray Scale Clock(GCK) : Input terminal for PWM operation.
SOP24/SSOP24/TSSOP24E: 22	DAO	Serial data output terminal.
SOP24/SSOP24/TSSOP24E: 23	REXT	External resistors connected between REXT and GND for output current value setting.
SOP24/SSOP24/TSSOP24E: 24	VCC	Supply voltage terminal.

DM412

3-CHANNEL CONSTANT CURRENT LED DRIVERS WITH LED OPEN DETECTION

General Description

DM412 is a PWM enabled LED driver specifically designed for LED video display or lighting applications. Each channel has linear adjustable 16-bits (65536 steps) grayscale PWM control current outputs. It incorporates shift registers, data latches, 3-channel constant current circuitry with current value set by 3 external resistors, and built-in oscillator for PWM functioning. Data, clock, and latch buffer outputs are designed for cascading another chip. Its built-in open detection function help users locate LED failures without additional circuits. The output polarity reverse function is designed for more high power LED applications.

Features

- Maximum constant current outputs: 200mA determined by three external resistors
- Maximum sinking output voltage: 17V
- Maximum serial-in clock frequency: 20 MHz
- 16-bit linear PWM control current outputs
- Built-in buffers for cascading clock, data, and strobe to next driver
- PWM free-running capability (refresh rate (~ 267 Hz) with internal oscillator (~ 17.5 MHz))
- Selectable auto/manual strobe (Patent pending)
- LED open detection
- Output polarity reverse function
- Power supply voltage: 4V ~ 5.5V

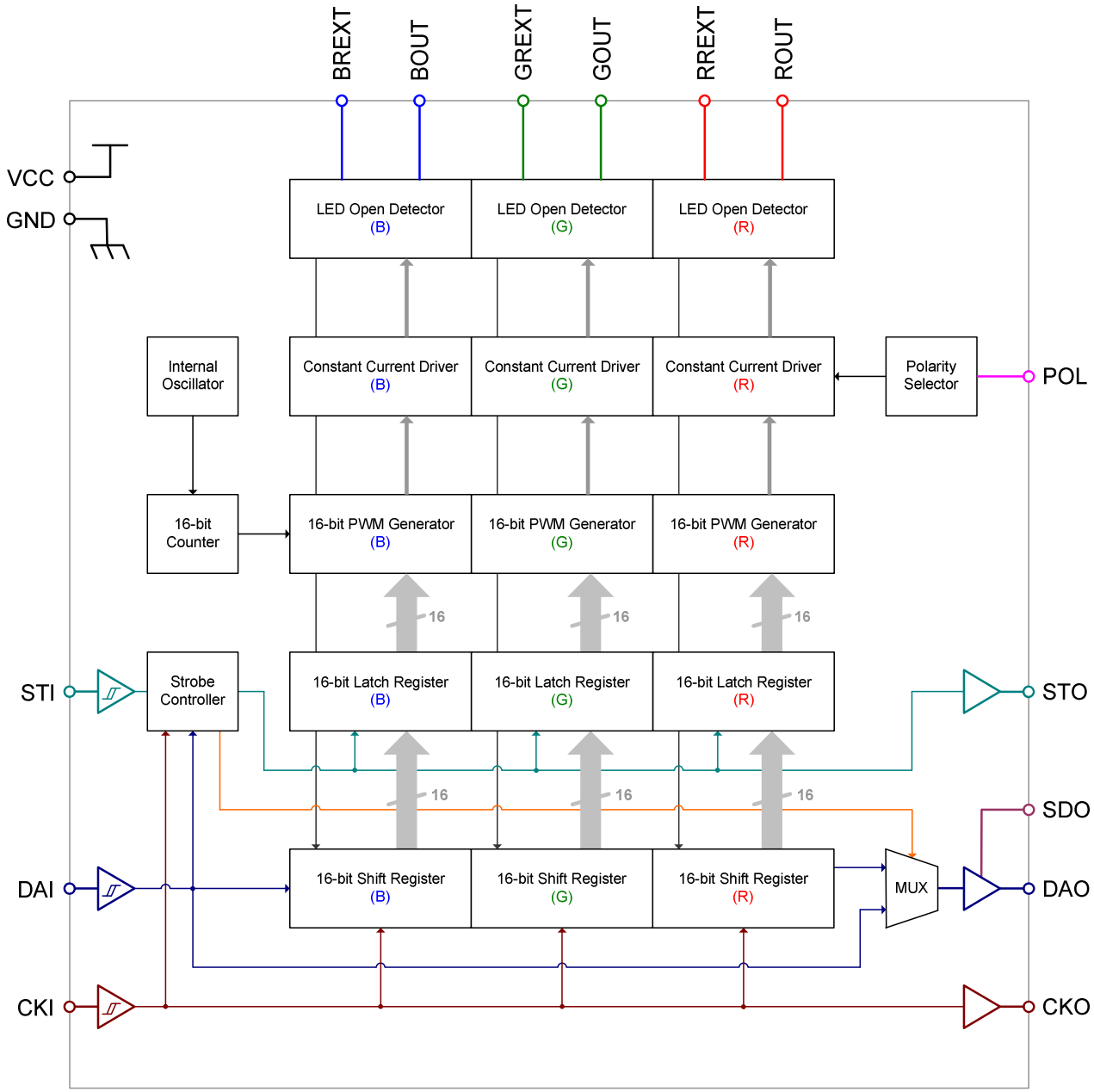
Applications

- LED Decorative Lighting
- Indoor/Outdoor LED Video or Message Display
- PWM Signal Generator

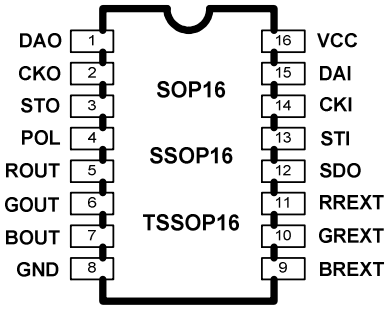
Package

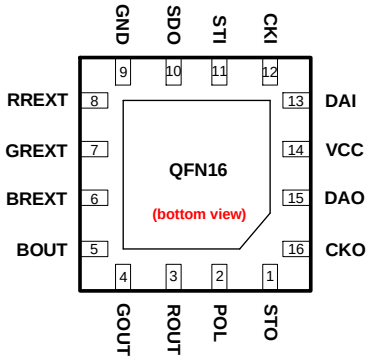
- SSOP16, SOP16 (with exposed pad), TSSOP16 (with exposed pad), QFN16 (with exposed pad)

Block Diagram



Pin Connection





Pin Description

PIN No.	PIN NAME	FUNCTION
SOP16/SSOP16/TSSOP16: 1 QFN16: 15	DAO	Serial data output terminal.
SOP16/SSOP16/TSSOP16: 2 QFN16: 16	CKO	Clock output terminal.
SOP16/SSOP16/TSSOP16: 3 QFN16: 1	STO	Strobe output terminal.
SOP16/SSOP16/TSSOP16: 4 QFN16: 2	POL	PWM current output polarity selection: **'H'** means DM412 is to be LED driver, **'L'** means DM412 is to be PWM generator.
SOP16/SSOP16/TSSOP16: 5~7 QFN16: 3~5	R(G、B)OUT	Sink constant current outputs (open-drain).
SOP16/SSOP16/TSSOP16: 8 QFN16: 9	GND	Ground terminal.
SOP16/SSOP16/TSSOP16: 9~11 QFN16: 6~8	R(G、B)REXT	External resistors connected between R(G、B)REXT and GND for driver current value setting.
SOP16/SSOP16/TSSOP16: 12 QFN16: 10	SDO[*1]	Serial data output trigger mode selection: **'H'** means data is shifted out on synchronization to falling edge of CKO, **'L'** means data is shifted out on synchronization to rising edge of CKO.
SOP16/SSOP16/TSSOP16: 13 QFN16: 11	STI	Input terminal of data strobe: **'H'** means data is latched, **'L'** means data on shift register goes through latch (level latch).
SOP16/SSOP16/TSSOP16: 14 QFN16: 12	CKI	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of CKI.
SOP16/SSOP16/TSSOP16: 15 QFN16: 13	DAI	Serial data input terminal.

[*1] It is recommended that SDO should be set to **high level** in cascading system applications.

DM413

3-CHANNEL CONSTANT CURRENT LED DRIVERS WITH PROGRAMMABLE PWM OUTPUTS

General Description

DM413 is a PWM enabled LED driver specifically designed for LED lighting or display applications. It incorporates shift registers, data latches, 3-channel constant current circuitry with current value set by 3 external resistors, and built-in oscillator for PWM functioning. Data and clock buffer outputs are designed for cascading another chip. Additionally the Output Polarity Reverse function is designed to adapt to more high power LED applications.

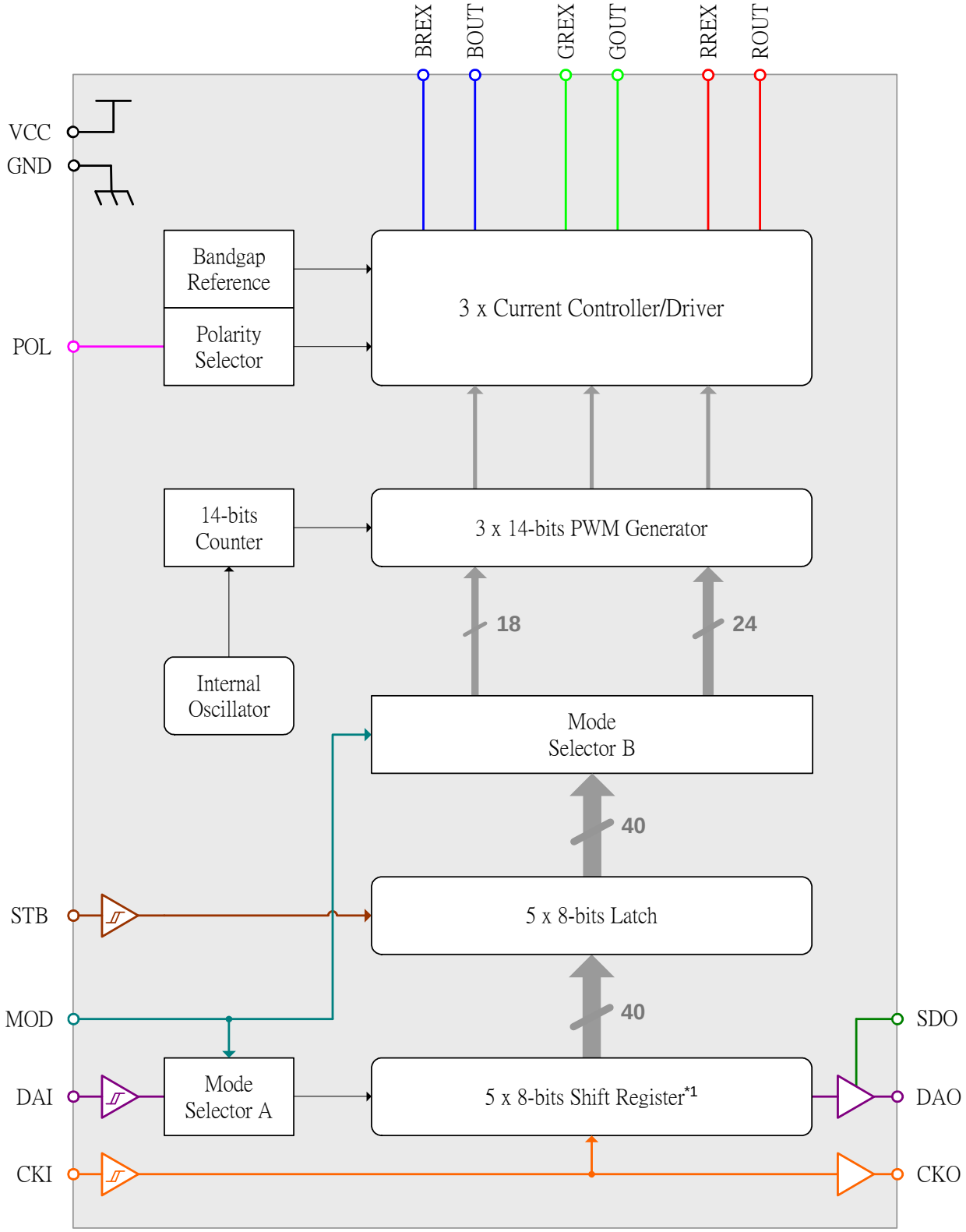
Features

- Maximum constant current outputs: 100mA determined by three external resistors
- Maximum sinking output voltage: 17V
- Maximum serial-in clock frequency: 20 MHz
- Built-in buffers for cascading clock and data to next driver
- PWM free-running capability (refresh rate (~ 400 Hz) with internal oscillator (~ 6.5 MHz))
- Selectable modes for PWM control:
  - 8-bits luminance data with PWM current outputs (8 bits mode)
  - 8-bits luminance data and 6-bits global brightness data (14 bits mode)
  - 8-bits luminance data and 5-bits individual color correction data (13 bits mode)
- Output polarity reverse function
- TTL/CMOS compatible input

Applications

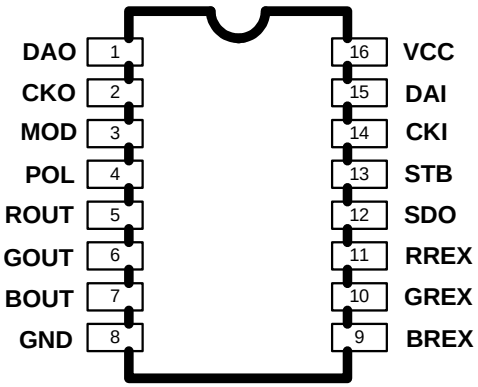
- LED Decorative Lighting
- Indoor/Outdoor LED Video or Message Display
- PWM Signal Generator

Block Diagram



*1 For 13-bits/5byte mode. For 14-bits/4byte mode, there are 4 x 8-bits S-Rs. For 8-bits/3byte mode, there are 3 x 8-bits S-Rs.

Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
1	DAO	Serial data output terminal.
2	CKO	Clock output terminal.
3	MOD	Input mode selection: '**H**' for 13bits/5byte mode, '**L**' for 14bits/4byte mode, '**Floating**'[*1] for 8bits/3byte mode.
4	POL	PWM current output polarity selection: '**H**' for positive polarity, '**L**' for negative polarity.
5~7	R(G、B)OUT	Sink constant current outputs (open-drain).
8	GND	Ground terminal.
9~11	R(G、B)REX	External resistors connected between REXTR(G、B) and GND for driver current value setting.
12	SDO	Serial data output trigger mode selection: '**H**' means data is shifted out on synchronization to falling edge of CKO, '**L**' means data is shifted out on synchronization to rising edge of CKO.
13	STB	Input terminal of data strobe: '**H**' means data is latched, '**L**' means data on shift register goes through latch (level latch).
14	CKI	Synchronous clock input terminal for serial data transfer. Data is sampled at the rising edge of CKI.
15	DAI	Serial data input terminal.
16	VCC	Power supply terminal.

[*1] When choosing "floating" mode, a capacitor (>100pF) should be connected between MOD and GND.

DM621

12-CHANNELS PRE-PROGRAMMABLE CONSTANT CURRENT LED DRIVER

General Description

The DM621 is an innovative LED driver that integrates a new data transmit interface to accomplish **2-wires** control for lighting applications. By the combination of SIN and DCK, DM621 could be pre-programmed to set the operating modes that involve GCK frequency division, PWM grayscale selection, inverse IOUT PWM signal, and GCK frequency selection. DM621 also provides the auto-latch function and incorporates a particular PWM method (AS-PWM). The IOUT waveform is averagely divided into 16 sections in order to reduce the flickers and enhance the visual refresh rate. The DM621 could also be constructed as a PWM controller for LED drivers. In this case, resistors must be connected at output pins to achieve this function (Fig.18).

This chip incorporates 4x3-channel constant current circuitry with current value set by 3 external resistors and 256/1024/4096/16384 gray scale PWM function unit. Each channel provides a maximum current of 90mA. The maximum output sustaining voltage of 28V would make more serial LEDs possible. And DM621 also integrates an internal regulator to make power supply voltage up to 12V. Meanwhile, retiming of DCKO and SOUT is advantageous in the LED decorating and long-cascade applications.

Features

- 4 x 3(R/G/B) Output Channels
- 8/10/12/14-bits PWM grayscale Control
- Maximum Clock Frequency: 20MHz
- Constant Current Output: 5mA to 90mA
- Maximum Output Sustaining voltage: 28V
- Power Supply Voltage: 5V to 12V
- Average Separated IOUT PWM Waveform
- **Auto-latch** Function
- **Retiming of DCKO and SOUT** for long cascade applications
- Serial Shift-In Architecture for Data of Grayscale, frequency Division and PWM bit number
- Incorporating internal GCK oscillator 12MHz (Refresh rate = 46.8KHz @ 8-bits PWM)
- Package: TSSOP24 (with thermal pad), QFN20 (with thermal pad)

Block Diagram

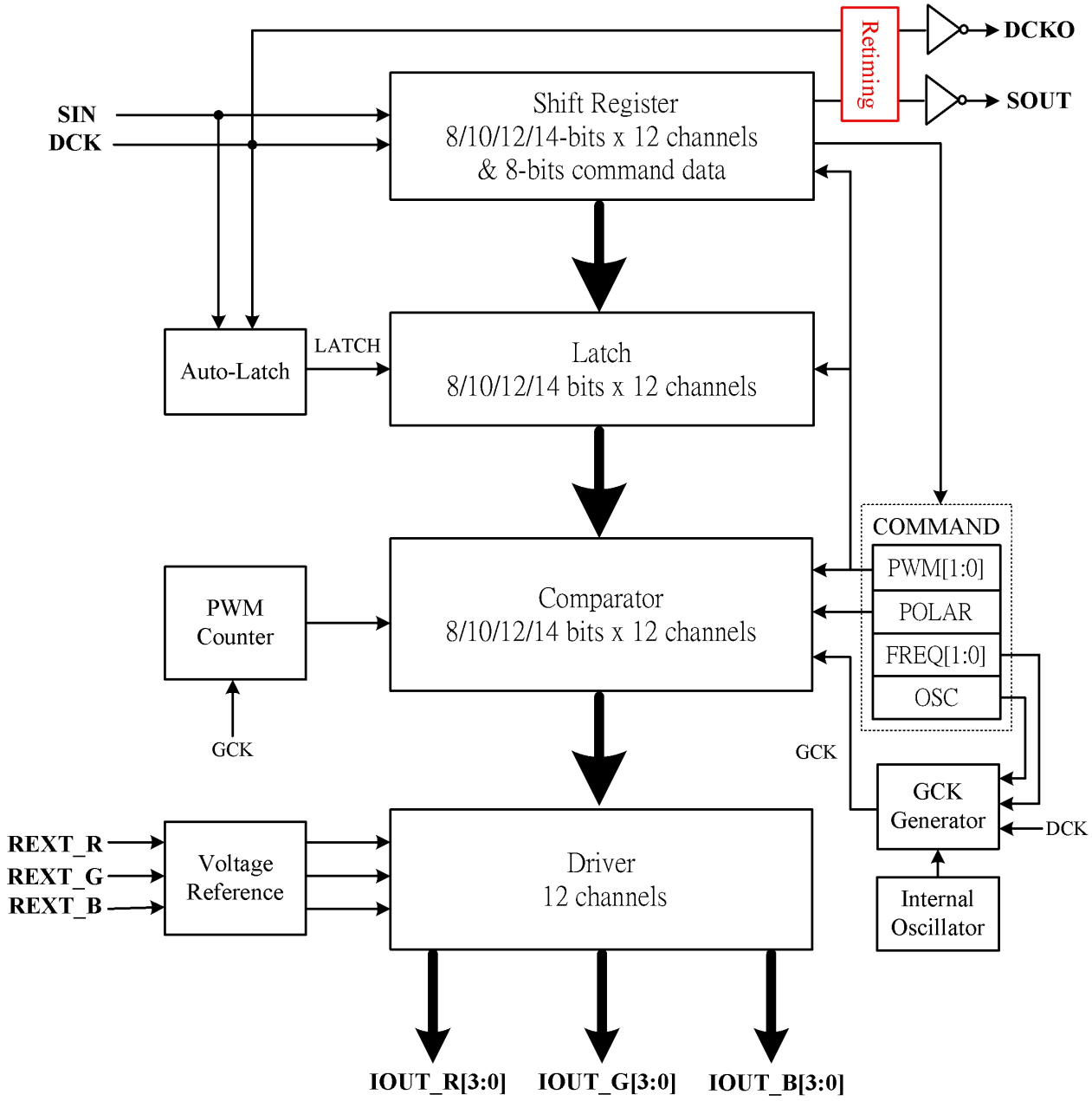


Figure 1. Functional Schematic of Whole Chip

The schematic of DM621 comprises of several fundamental units as shown in Figure1. The grayscale data and command data, transferred according to the synchronous clock DCK, are input into the SIN pin of DM621. Meanwhile, the combination of DCK and SIN data could produce the control signal to switch these two modes and achieve the auto-latch function. The **Retiming** block is advised to rearrange the timing of DCKO and SOUT in order to realize the Auto-Latch function and improve the ability of long cascade.

Pin Description

PIN NAME	FUNCTION	PIN No.
VDD	Power supply terminal	QFN20:1 ,TSSOP24:23
DCK	Synchronous clock input for serial data. The input data of SIN is transferred at rising edges of DCK. It also could be used as GCK.	QFN20:11 ,TSSOP24:11
DCKO	Synchronous clock output	QFN20:12 ,TSSOP24:12
VSS_DR	Driver ground terminal	QFN20: Thermal Pad TSSOP24:10,15,22,24
SIN	Serial input for grayscale data	QFN20:13 ,TSSOP24:13
SOUT	Serial output for grayscale data	QFN20:14 ,TSSOP24:14
REXT_R	External resistor connected between REXT and GND for driver current setting.	QFN20:2 ,TSSOP24:1
REXT_G		QFN20:3 ,TSSOP24:2
REXT_B		QFN20:4 ,TSSOP24:3
IOUT_R [3:0]	LED driver outputs	QFN20:5,8,15,18 TSSOP24:4,7,16,19
IOUT_G [3:0]		QFN20:6,9,16,19 TSSOP24:5,8,17,20
IOUT_B [3:0]		QFN20:7,10,17,20 TSSOP24:6,9,18,21

Pin Configuration (Top View)

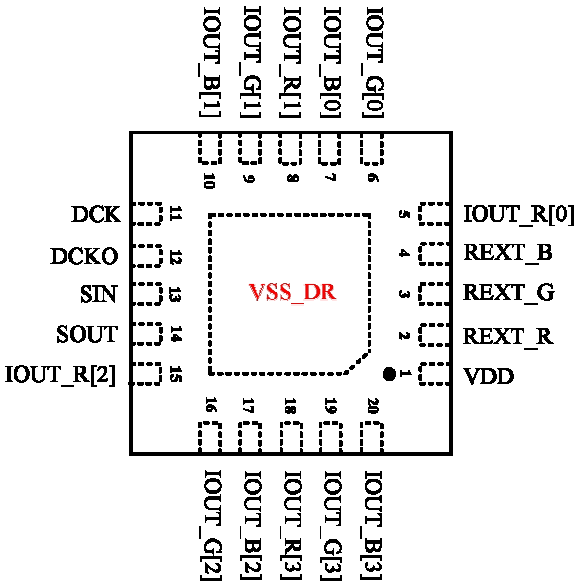


Figure 2. The Package of QFN20

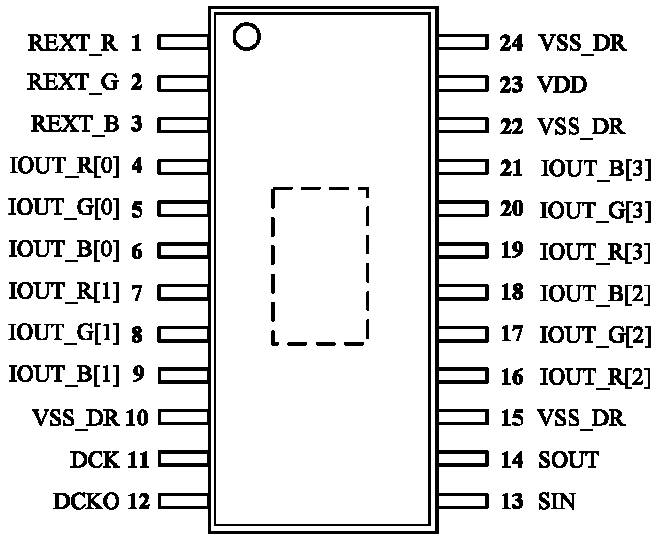


Figure 3. The Package of TSSOP24

DD235

8x3-bit Constant Current LED Driver

General Description

DD235 is a 24 channel constant-current sink driver specifically designed for LED decorating and backlighting applications. This chip incorporates shift registers, data latches, and constant current circuitry on the silicon CMOS process. The constant current values are set by three external resistors (Rext_R, Rext_G and Rext_B) separately. Each channel can provide a maximum current of 60mA. The three enable terminals (EN_R, EN_G and EN_B) supply dimming applications and control eight channels independently.

Features

- Maximum constant current output: 60mA
- Maximum output sustaining voltage: 17V
- Output enable terminal: 1MHz(max)
- Power supply voltage: 6V to 18V
- Over current protection
- Bit-to-bit skew : ±6% (max) Chip-to-chip skew : ±10% (max)

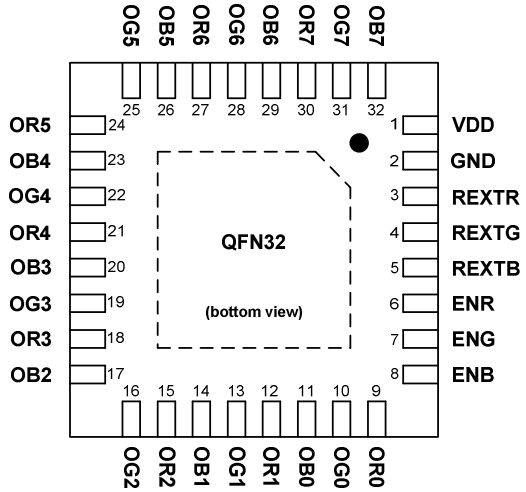
Applications

- LED decorative lamps or bulbs
- LED backlighting applications

Package Types

- QFN32 (with exposed pad)

Pin Connection (Bottom View)

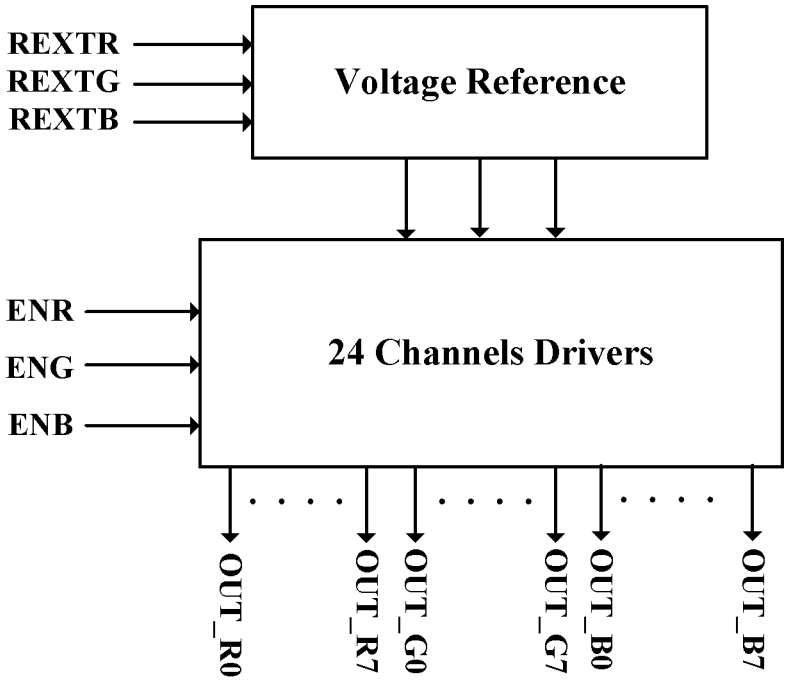


The package of QFN32

Pin Description

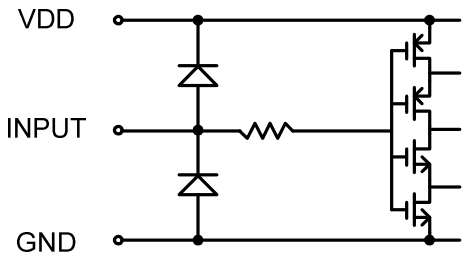
PIN NAME	FUNCTION
VDD [1]	Supply voltage terminal
GND [2]	Ground terminal
ENR [6]	Output enable terminals: **'H'** for all outputs are active , **'L'** for all outputs are turned off.
ENG [7]	
ENB [8]	
REXTR [3]	External resistors connected between REXT and GND for driver current setting
REXTG [4]	
REXTB [5]	
OR0~OR7 [9,12,15,18,21,24,27,30]	LED driver outputs
OG0~OG7 [10,13,16,19,22,25,28,31]	
OB0~OB7 [11,14,17,20,23,26,29,32]	

Block Diagram



Equivalent Circuit of Inputs and Outputs

1. ENR, ENG, ENB terminals



DD311

HIGH CONSTANT CURRENT LED DRIVER

General Description

DD311 is a single-channel constant current LED driver, which incorporates current mirror and current switch, designed to drive power LEDs. It can provide a maximum sink current of 1A, adjustable by reference current input. The output current is 100 times the input current value set by an external resistor or bias voltage. Tuning or enabling the bias voltage can provide dot correction or global brightness control in LEDs system. The Maximum output voltage of 36V can provide more series power LEDs in a string. The output enable allows dimming control applications.

Features

- Maximum output current: 1A (determined by input reference current)
- Minimum output voltage: 1V (Iout = 1A)
- Maximum output voltage: 36V (output leakage current < 0.1uA)
- Maximum output enable frequency: 1MHz
- Excellent output current accuracy

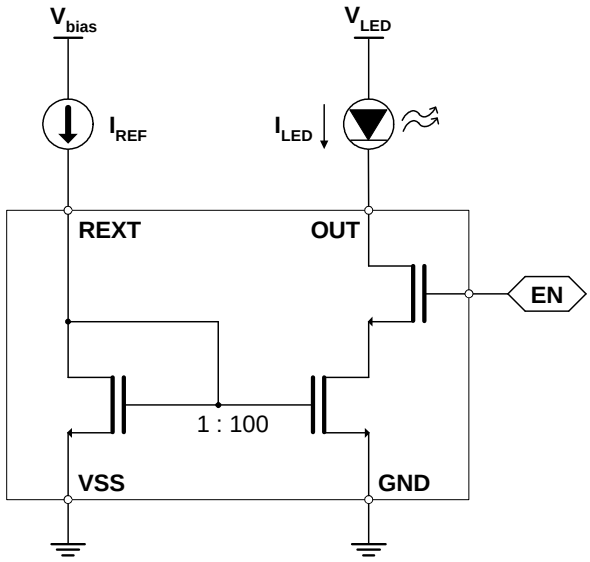
Applications

- LED architectural or entertainment lighting
- LED general or specialty illumination
- LED backlighting applications

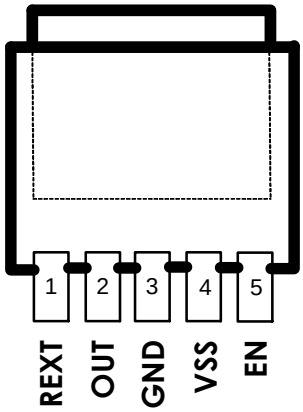
Package Types

- TO-252

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
1	REXT	Reference current input terminal.
2	OUT	Sink constant current outputs (open-drain).
3	GND	Ground terminal.
4	VSS	Ground terminal.
5	EN	Output current enable terminal: V_{EN} = **0V**, output current is turned **OFF**. V_{EN} > **3.3V**, output current is turned **ON**.

Maximum Ratings (Ta=25°C, Tj(max) = 125°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT

Input Reference Current	I_{REF}	10	mA
Output Current	Iout	1.0	A
Output Voltage	Vout	-0.3 ~ 36	V
Enable Voltage	V_{EN}	-0.3 ~ 18	
Output Enable Frequency	F_{EN}	1	MHz
GND Terminal Current	I_{GND}	1.01	A
Power Dissipation	Pd	4.2 (Ta=25°C)	W
Thermal Resistance (Junction to Air)	Rth(j-a)	23.38	°C/W
Thermal Resistance (Junction to Case)	Rth(j-c)	1.77	
Operating Temperature	Top	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~ 150	

Recommended Operating Condition

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Bias Voltage	Vbias	force REXT terminal directly	—	—	2.7	V
		with an external resistor	5	—	36	
Output Voltage	Vout	Driver On *1	1	—	—	V
Output Voltage	Vout	Driver Off *2	—	—	36	
Output Current	Iout	Ven > 3.3V	—	—	1	A
Input Enable Voltage	$V_{EN(IH)}$	I_{REF} = 1mA ~ 10mA	3.3	—	18	V
	$V_{EN(IL)}$		-0.3	—	0.0	
Input Enable Frequency	F_{EN}	Ven > 3.3V	DC	—	1	MHz

*1 Notice that the power dissipation is limited to its package and ambient temperature.
*2 The driver output voltage including any overshoot stress has to be compliant with the maximum voltage (33V).

DD312

HIGH CONSTANT CURRENT LED DRIVER
with ERROR DETECTION

General Description

DD312 is a high constant current driver designed for LED lighting application and power LEDs. It incorporates a constant current circuitry with current value set by an external resistor. The output enable terminal allows dimming control by system. The fast response of output current can adapt to high dimming resolution and high refresh rate applications. Built-in LED open detection, over temperature, and over current protection functions ensure the system reliability.

Features

- Maximum output current: 1A (determined by the external resistor)
- Minimum output voltage: 1V (Iout = 1A)
- Maximum output voltage: 18V
- Output enable terminal: 1MHz (max.)
- Supply voltage range: 5V ~ 18V
- Over current protection
- Thermal shutdown
- Thermal alarm (SOP8 only)
- LED open detection (SOP8 only)

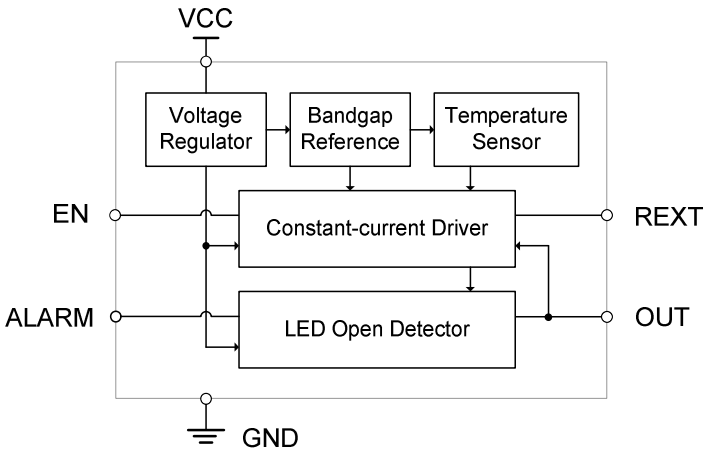
Applications

- LED architectural or entertainment lighting
- LED general or specialty illumination
- LED backlighting applications

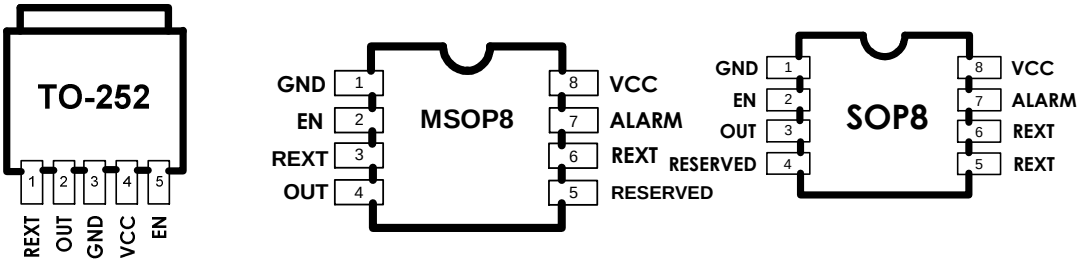
Package Types

- TO-252, SOP8 (with thermal pad), MSOP8, SOP8

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
TO252:3/MSOP8:1/SOP8:1	GND	Ground terminal.
TO252:5/ MSOP8:2/SOP8:2	EN	Output current enable terminal.
TO252:2/ MSOP8:4/SOP8:3	OUT	Sink constant current outputs (open-drain).
MSOP8:5/SOP8:4	RESERVED	Terminal for testing, user should leave this pin open.
TO252:1/ MSOP8:3,6/SOP8:5,6	REXT[*1]	External resistor connected between REXT and GND for driver current value setting.
MSOP8:7/SOP8:7	ALARM	Output open drain terminal: (connected to a pull-high resistor) '**H**' for normal conditions, '**L**' for LED open or chip overheated.
TO252:4/ MSOP8:8/SOP8:8	VCC	Power supply terminal.

Maximum Ratings (Ta=25°C, Tj(max) = 125°C)

[*1] Notice that both REXT pins (SOP8: pin5 and pin6) should be connected in PCB layout.

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	VDD	-0.3 ~ 18	V
Input Voltage	VIN	-0.3 ~ VDD+0.3	
Output Current	Iout	1.0	A
Output Voltage	Vout	-0.3 ~ 18	V
Enable Voltage	V_{EN}	-0.3 ~ 18	
Output Enable Frequency	F_{EN}	1	MHz
GND Terminal Current	I_{GND}	1.01	A
Power Dissipation	Pd	3.27 (TO-252) 1.67 (SOP8 EP) 0.58(MSOP8) 1.02 (SOP8)	W
Thermal Resistance (Junction to Air)	Rth(j-a)*1	30.6 (TO-252) 60 (SOP8) 172(MSOP8) 97.1 (SOP8)	°C/W
Operating Temperature	Top	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~ 150	

Recommended Operating Condition

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	VDD	—	5.0	—	18	V
Output Voltage	Vout	Driver On *2	1.0	—	—	V
		Driver Off *3	—	—	18	
Output Current	Iout	OUT	—	—	1.0	A
Input Enable Voltage	VIH	VDD = 5V ~ 18V	3.0	—	18	V
	VIL		-0.3	—	1.0	
Input Enable Frequency	F_{EN}	Ven > 3.0V	DC	—	1	MHz

*1 Base on JEDEC high conductivity test board (4-layer) simulation.
*2 Notice that the power dissipation is limited to its package and ambient temperature.
*3 The driver output voltage including any overshoot stress has to be compliant with the maximum voltage (18V).

DD313

3-CHANNEL HIGH CONSTANT CURRENT LED DRIVER with ERROR DETECTION

General Description

DD313 is a high constant current driver designed for power LED applications. It incorporates three-channel constant current circuitry with current value set by three external resistors. The three enable pins are specifically designed for independent control over each of the three output terminals. The fast response of the output current can adapt to high dimming resolution and high refresh rate applications. Built-in LED open detection, over temperature, and over current protection functions ensure the system reliability.

Features

- Three channel with independent dimming control and current adjustment
- Maximum output current: 500mA determined by three external resistors
- Minimum output voltage: 1V (Iout = 500mA)
- Maximum output voltage: 18V
- Fast output current response
- Supply voltage range: 5V ~ 18V
- Over current protection
- LED open detection
- Thermal alarm (junction temperature > 110˚C)
- Thermal shutdown (junction temperature > 180˚C)

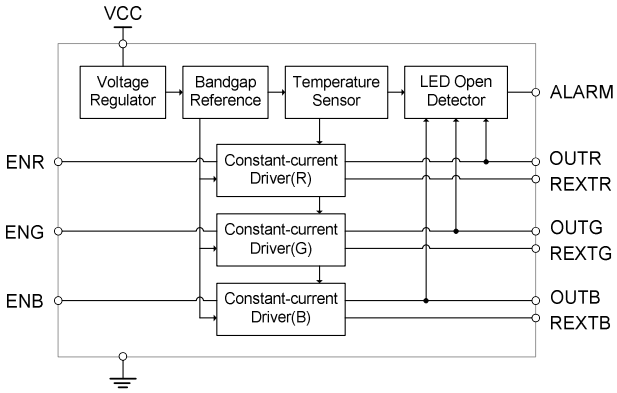
Applications

- LED architectural or entertainment lighting
- LED general or specialty illumination
- LED backlighting applications

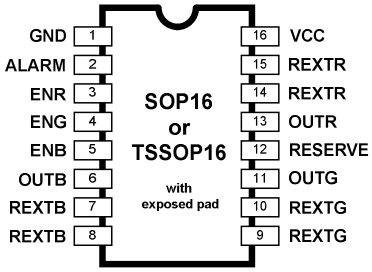
Package Types

- SOP16 (with exposed pad), TSSOP16 (with exposed pad)

Block Diagram



Pin Connection



Pin Description

PIN No.	PIN NAME	FUNCTION
SOP16/TSSOP16: 1	GND	Ground terminal.
SOP16/TSSOP16: 2	ALARM	Output open drain terminal: (connected to a pull-high resistor) **'H'** means normal conditions, **'L'** means LED open or chip overheated.
SOP16/TSSOP16: 3,4,5	ENR,G,B	Output current enable terminal.
SOP16/TSSOP16: 6,11,13	OUTB,G,R	Sink constant current outputs (open-drain).
SOP16/TSSOP16: 7,8,9,10,14,15	REXTB[*1] REXTG[*1] REXTR[*1]	External resistors connected between REXT and GND for driver current value setting.
SOP16/TSSOP16: 12	RESERVE	Terminal for testing, user should leave this pin open.
SOP16/TSSOP16: 16	VCC	Power supply terminal.

[*1] Notice that both REXT pins (pin7 and 8, pin9 and 10, pin14 and 15) should be connected in PCB layout.

Maximum Ratings (Ta=25°C, Tj(max) = 140°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	VCC	-0.3 ~ 18	V
Input Voltage	VIN	-0.3 ~ VCC	
Output Current	Iout	0.5	A
Output Voltage	Vout	-0.3 ~ 18	V
Enable Voltage	V_{EN}	-0.3 ~ 18	
GND Terminal Current	I_{GND}	1.5	A
Power Dissipation	Pd	3.3 (TSSOP16 with exposed pad) 2.7 (SOP16 with exposed pad)	W
Thermal Resistance (Junction to Air)	Rth(j-a) *1	38 (TSSOP16 with exposed pad) 46 (SOP16 with exposed pad)	°C/W
Operating Temperature	Top	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~ 150	

Recommended Operating Condition

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	VCC	—	5.0	—	18	V
Output Voltage	Vout	Driver On *2	0.8	—	—	V
		Driver Off *3	—	—	18	
Output Current	Iout	OUT(R, G, B)	—	—	0.5	A
Input Enable Voltage *4	VIH	VCC = 5V ~ 18V	3.0	—	18	V
	VIL		-0.3	—	0.7	
Input Enable Frequency	F_{EN}	Ven > 3.0V	DC	—	1	MHz

*1 Base on JEDEC high conductivity test board (4-layer) simulation.
*2 The power dissipation is limited to its package and ambient temperature.
*3 The driver output voltage including any overshoot stress has to be compliant with the maximum voltage (18V).
*4.To avoid destroying the ESD protection circuit, the input enable voltage should be lower than the supply voltage.

DD331

4-Channel Flexible LED Pre-Driver

General Description

DD331 is a 4-channel LED pre-driver. It could provide constant-current to drive LED with four N-type MOSFETs and external resistors. The four output enable terminals are designed to drive LED with PWM functions. The maximum voltage and current in LED string are determined by specification of N-type MOSFET.

Features

- Four independent LED output channels enable terminals, and current adjustment.
- Flexible in system design:
  Maximum constant current output (ILED),
  maximum sinking output voltage (VLED), and
  minimum output voltage
  are determined by the characteristic of N-type MOSFET
- Fast dimming frequency
  (determined by gate capacitance of MOSFET)
- Supply voltage range: 5V ~ 18V

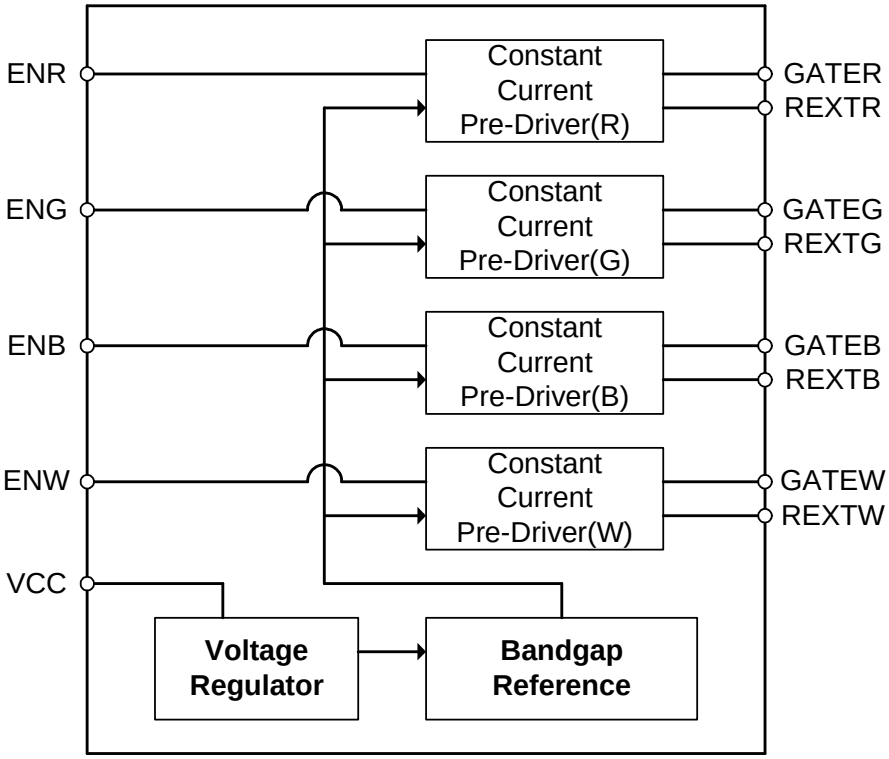
Applications

- LED architectural or entertainment lighting
- LED general or specialty illumination
- LED backlighting applications

Package Types

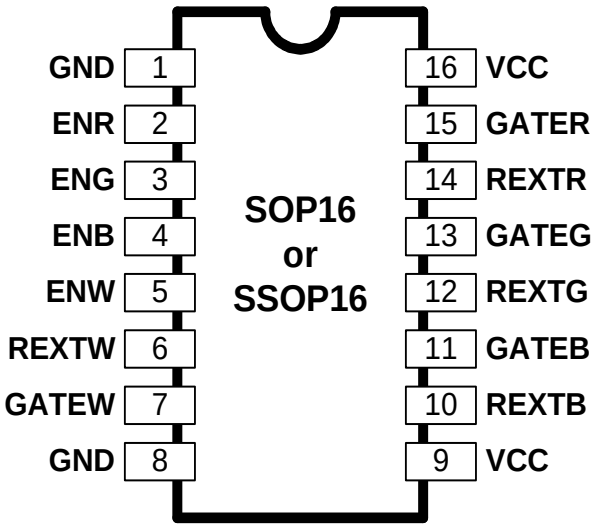
SOP16, SSOP16

Block Diagram



Pin Connection

SOP16 / SSOP16 (Top View)



Pin Description

PIN NAME	FUNCTION	SOP16 / TSSOP16 pin number
GND	Ground terminal	1,8
VCC	Power supply terminal	9,16
ENR	Output current enable terminals	2
ENG		3
ENB		4
ENW		5
GATER	External N-type MOSFET gate connection terminals	15
GATEG		13
GATEB		11
GATEW		7
REXTR	External resistors connected between REXT and GND for driver current value setting.	14
REXTG		12
REXTB		10
REXTW		6

Maximum Ratings (Ta=25°C, Tj(max) = 150°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	VCC	-0.3 ~ 18.0	V
Input Voltage	VIN	-0.3 ~ VCC+0.3	
Enable Voltage	VEN[*1]	-0.3 ~ 18.0	
GND Terminal Current	I_{GND}	0.5	A
Power Dissipation	Pd	1.7 (SOP16) 1.5 (SSOP16)	W
Thermal Resistance (Junction to Air)	Rth(j-a)[*2]	72.1 (SOP16) 82 (SSOP16)	°C/W
Operating Temperature	Top	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~ 150	

[*1] VEN could not higher than VCC.
[*2] Base on JEDEC high conductivity test board (4-layer) simulation.

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