TLC6C5912 Flexible LED Driving Solution

LED driving topology II

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# TLC6C5912-Q1: Flexible Simple LED Driver

Features

- Load VCC up to 40V
- Logic supply VCC ranges from 3V to 5.5V
- PW package Current capability:
  - 12ch x 50mA
  - 8 ch x 110mA
  - 1 ch x 280mA
- DW package Current capability:
  - 12ch x 60mA
  - 8 ch x 130mA
  - 1 ch x 320mA
- Daisy chain I/F:
  - support cascade
  - 3 or 4 MCU GPIO requirement
- Output channel number:
  - 12ch for TLC6C5912
  - 8 ch for TLC6C598
- Low side MOSFET structure supports parallel connection
- Package: PW, D

Applications

- Appliance display panel
- Industry machine LED indication panel
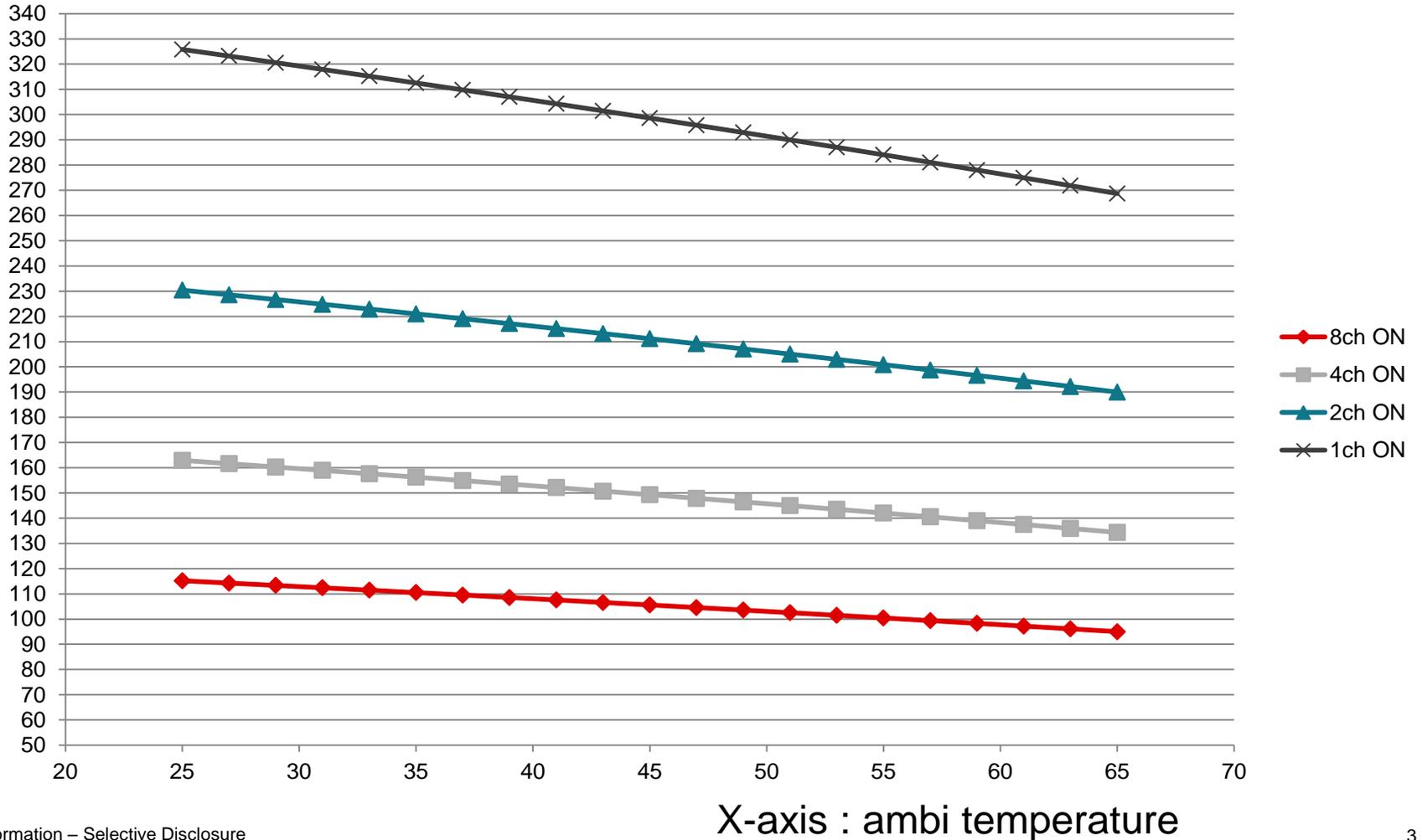- Consumer product LED indication panel

Benefit

- Saving GPIO , PCB space,
- Simplify design
- Direct support 12V or 5V system

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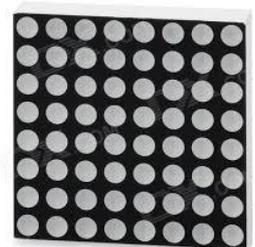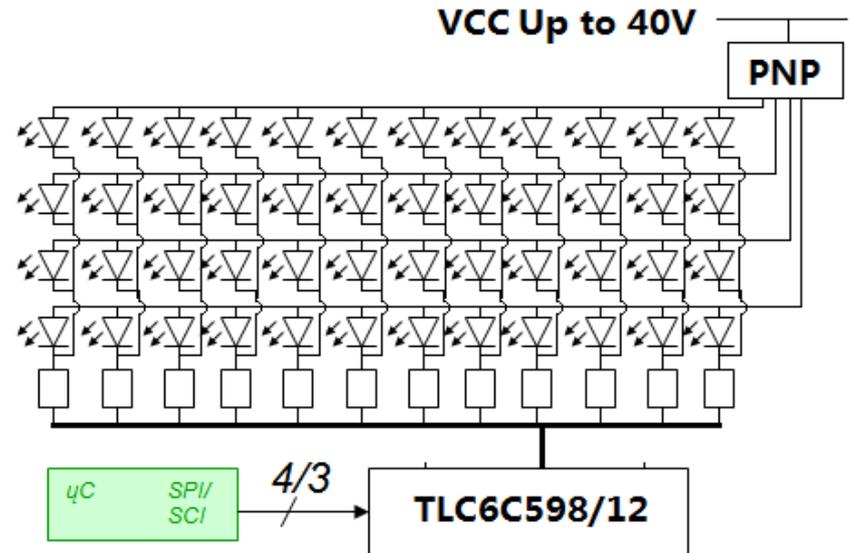
TLC6C5912 Current Capability

Package : DW ; V_{CC} = 5V ; Output 100% duty cycle

X-axis : ambi temperature

Detail Implementation of TLC6C5912 LED driving topology

1. **Work with 5V I/O MCU for normal current LED load**
   - Resource: (3+N) x GPIO
   - LED number: N x 12

2. **Work with 5V I/O MCU for <u>high</u> current LED in 5V system**
   - Resource: (3+N) x GPIO , N x PNP
   - LED number: N x 12

3. **Drive multiple LED with <u>only 3 GPIOs</u> for 5V system**
   - Resource: 3 x GPIO, N x 74LS595
   - LED number: N x 96

4. **Drive <u><36</u> LED from <u>12V / 24V</u> supply**
   - Resource: 3 x GPIO, N x PNP
   - LED number: (N x (12-N)) (max. is 36 when N=6)

5. **Drive <u>multiple</u> LED from <u>12V /24V</u> supply**
   - Resource: (3+N) x GPIO, N x NPN , N x PNP
   - LED number: N x 12

2.1 Work with 5V I/O MCU for normal current LED load
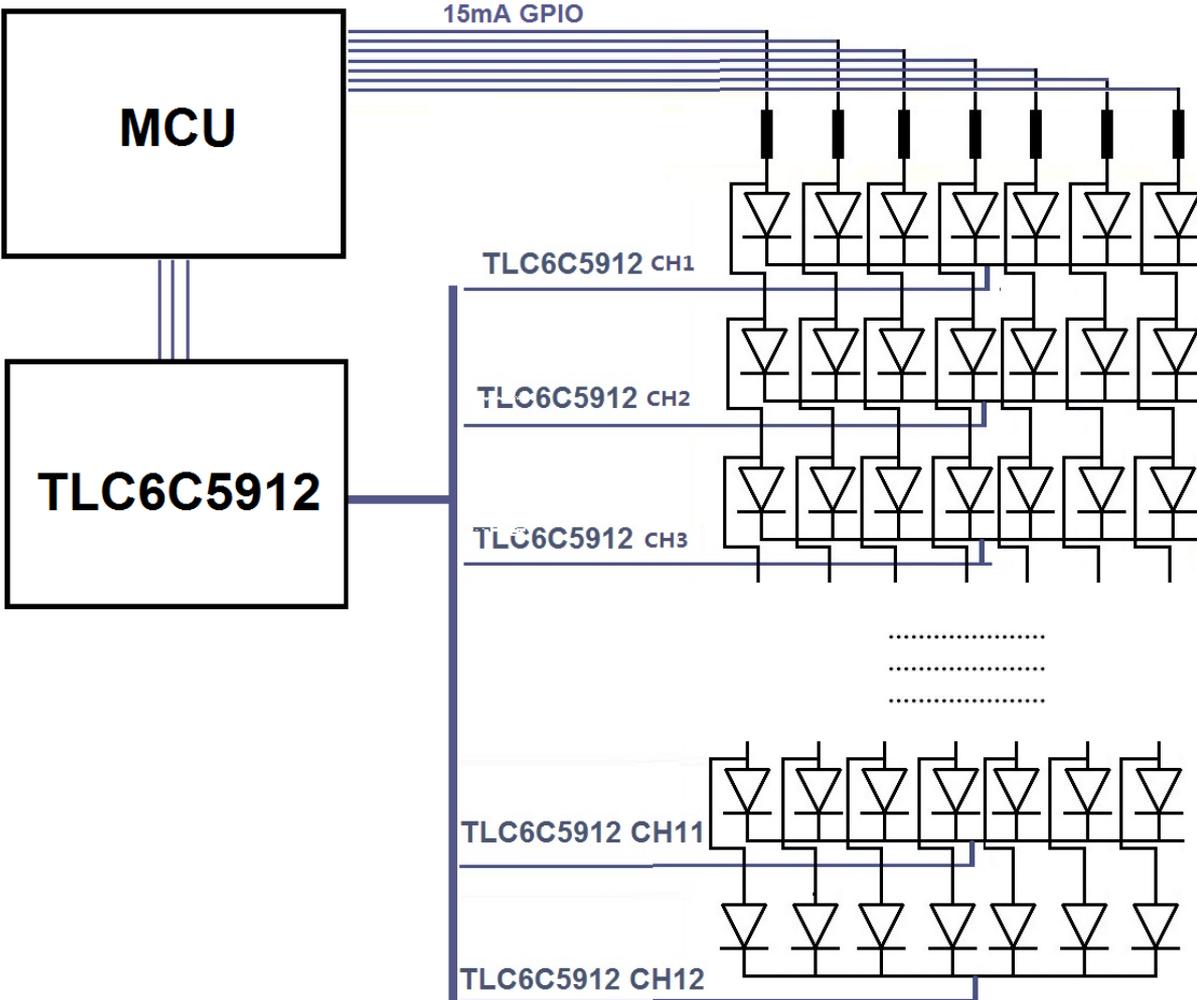
2.1 Work with 5V I/O MCU for normal current LED load

Resource Requirement:
(N +3) x GPIO , 1 x TLC6C5912
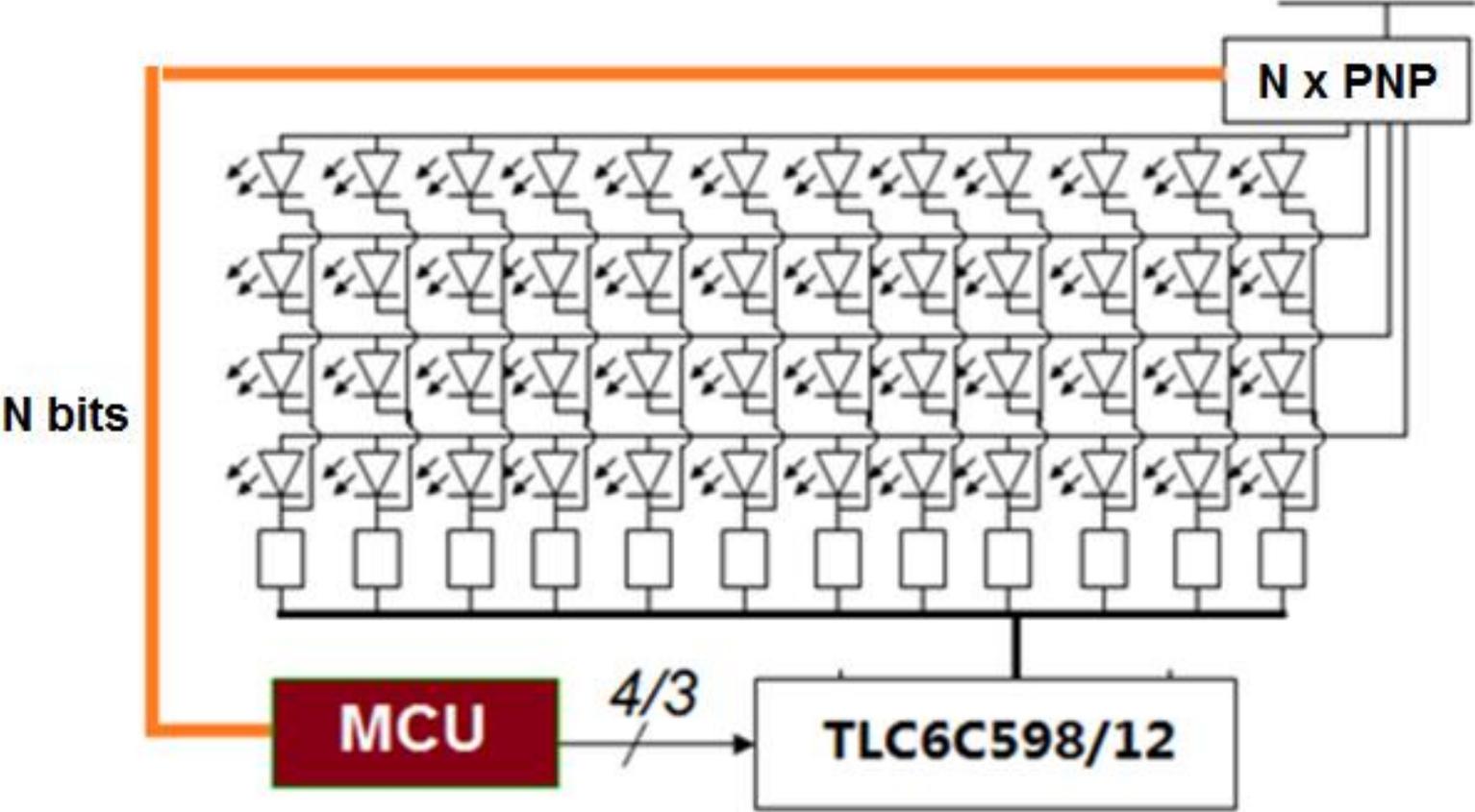
LED Load Number: N x 12

Detail Characters
1. MCU I/O provide LED column current, equal to single LED current. Normally 10~20mA.
2. TLC6C5912 provide common sink current for each row. The current requirement is N x (10~20)mA. Only one channel is ON and rest channels keep in Hi-Z mode, thus the ON channel can provide larger current capability.

Benefit:
1. Save I/O and PCB
2. Easy load expansion:
    1. 1 GPIO for additional 12LED.
    2. Serial chain connect TLC6C598 for additional 8 rows

MCU GPIO	4	5	6	7	8	9	10
LED number	12	24	36	48	60	72	84

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2.2 Work with 5V I/O MCU for HIGH current LED in 5V system

2.2 Work with 5V I/O MCU for <u>HIGH</u> current LED in 5V system

Resource Requirement:
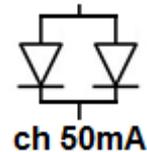(N +3) x GPIO , 1 x TLC6C5912 , N x PNP bjt

LED Load Number: N x 12

Detail Characters
1. TLC6C5912 provides LED column current, equal to single LED current. Current can be up to 12ch x 50mA. It can drive high current LED or drive two LED parallel for greater brightness. If output is controlled in time-sharing fashion, it can provide higher current capability.
2. MCU I/O drive PNP for common row current sourcing.   Any moment, only one PNP is ON.
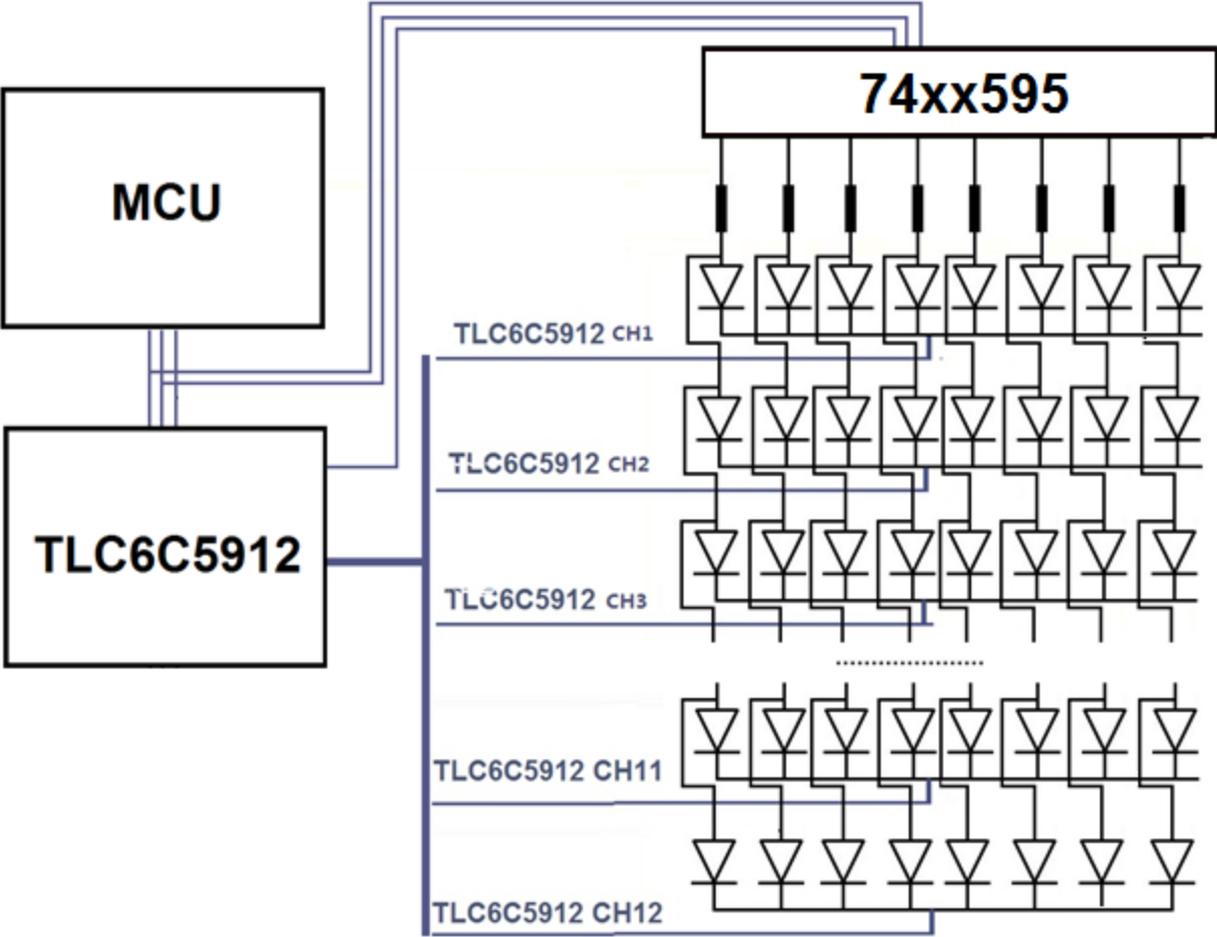
Benefit:
1. Save I/O and PCB
2. Easy load expansion:
    1. 1 GPIO for additional 12LED.
    2. Serial chain connect TLC6C598 for additional 8 rows
3. Provide high current capability for brighter LED effect.

Better Brightness

ch 50mA

MCU GPIO	4	5	6	7	8	9	10
PNP Bjt	1	2	3	4	5	6	7
LED number	12	24	36	48	60	72	84

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2.3 Drive multiple LED with ONLY 3 GPIOs for 5V system

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2.3 Drive multiple LED with ONLY 3 GPIOs for 5V system

Resource Requirement:
3 x GPIO , 1 x TLC6C5912, 1 x 74xx595

LED Load Number: N x 12

Detail Characters
1. MCU drive TLC6C5912 and 595 through 3bit GPIO.
2. 74xx595 provides LED column current, equal to single LED current. Normally 10~20mA.
3. TLC6C5912 provides common sink current for each row. The current requirement is N x (10~20)mA. Only one channel is ON and rest channels keeps in Hi-Z mode, thus the ON channel can provide larger current capability.

Benefit:
1. Save I/O and PCB
2. Easy load expansion:
    1. Add one 74xx595 for additional 8 columns
    2. Serial chain connect TLC6C598 for additional 8 rows

MCU GPIO	3	3	3
74xx595 number	1	2	3
LED number	96	192	288

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2.1 Drive <36 LEDs from 12V / 24V supply

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2.1 Drive <u><36</u> LEDs from <u>12V / 24V</u> supply

Resource Requirement:
3 x GPIO , 1 x TLC6C5912 , N x PNP bjt

LED Load Number: N x (12 – N)

Detail Characters
1. TLC6C5912 provides LED column current, equal to single LED current. Current can be up to 50mA. It can drive high current LED or drive two LED parallel for greater brightness. If output is controlled in time-sharing fashion, it can provide higher current capability.
2. N channels of TLC6C5912 outputs drive PNP BJT for common rows current sourcing

Benefit:
1. Save I/O and PCB
2. Provide high current capability for brighter LED effect.
3. PWM chopping for LED dimming control.
4. Compare against 5V system, 12V system can save energy by PWM chopping . No energy waste on LDO.
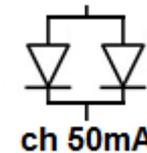5. Support multiple LED cascade. System can serial connects 2~4 LEDs for better brightness.

MCU GPIO	3	3	3	3	3	3
PNP number	1	2	3	4	5	6
LED number	11	20	27	32	35	36

12 V support LED cascade connection.

LED Vf (V)		2	2.5	3	
LED cascade #		5	4	3	

2 ways for Better Brightness

12V

ch 50mA

ch

Better Energy by PWM
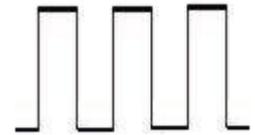
12

2.1 Drive multiple LED from 12V / 24V supply
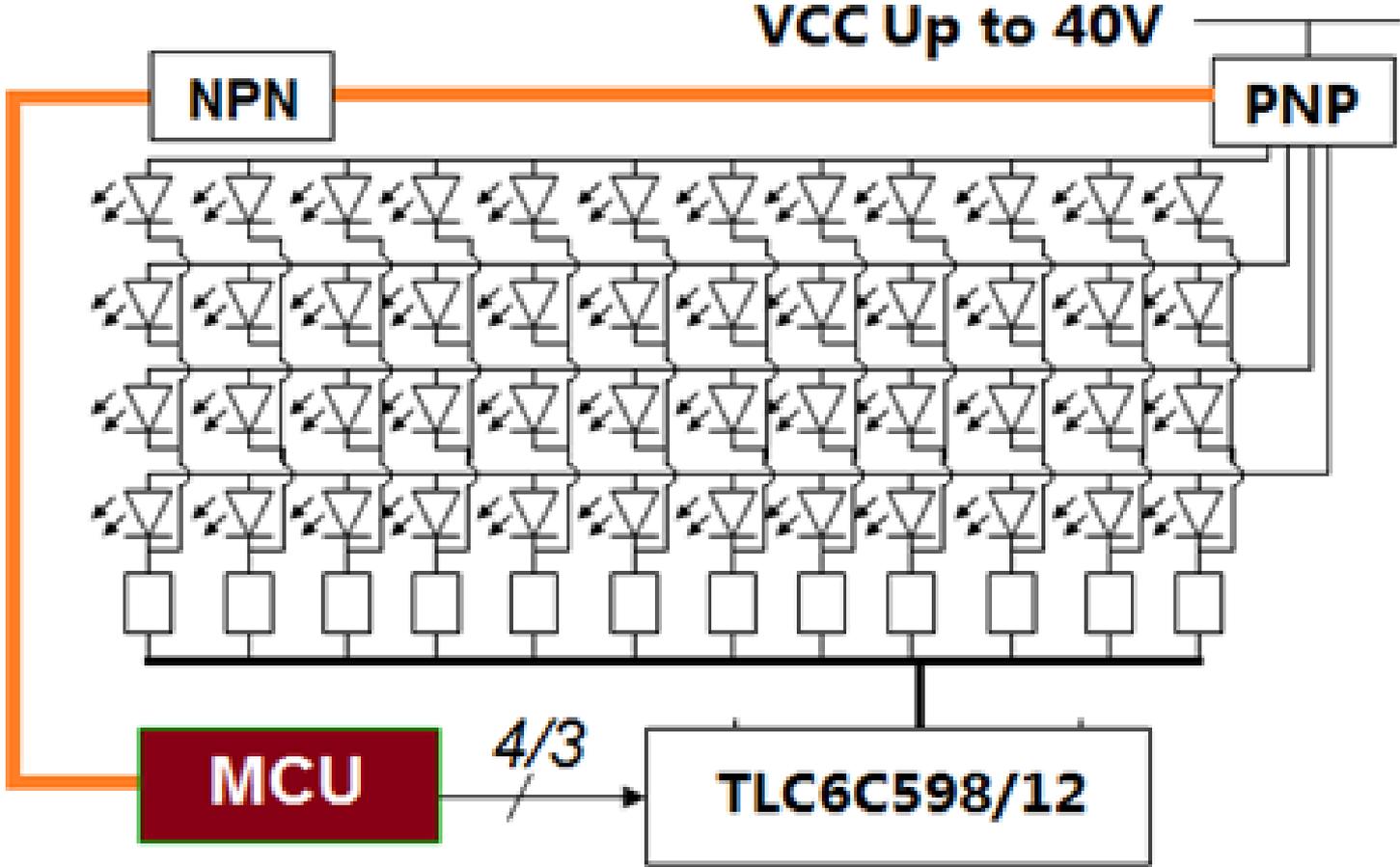
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2.1 Drive multiple LED from 12V / 24V supply

Resource Requirement:
3 x GPIO , 1 x TLC6C5912 , N x PNP bjt, N x NPN bjt

LED Load Number: N x 12

Detail Characters
1. TLC6C5912 provides LED column current, equal to single LED current. Current can be up to 50mA. It can drive high current LED or drive two LED parallel for greater brightness. If output is controlled in time-sharing fashion, it can provide higher current capability.
2. MCU drive NPN BTJ to control PNP BJT for common rows current sourcing.

Benefit:
1. Save I/O and PCB
2. Provide high current capability for brighter LED effect.
3. PWM chopping for LED dimming control.
4. Compare against 5V system, 12V system can save energy by PWM chopping . No energy waste on LDO.
5. Support multiple LED cascade. System can serial connects 2~4 LEDs for better brightness.
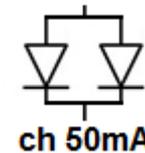
MCU GPIO	4	5	6	7	8	9	10
NPN number	1	2	3	4	5	6	7
PNP number	1	2	3	4	5	6	7
LED number	12	24	36	48	60	72	84

12 V support LED cascade connection.

LED Vf (V)	2	2.5	3
LED cascade #	5	4	3

2 ways for Better Brightness

12V

ch 50mA

ch

Better Energy by PWM
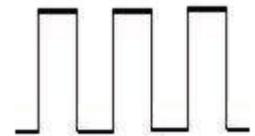
Thank You

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