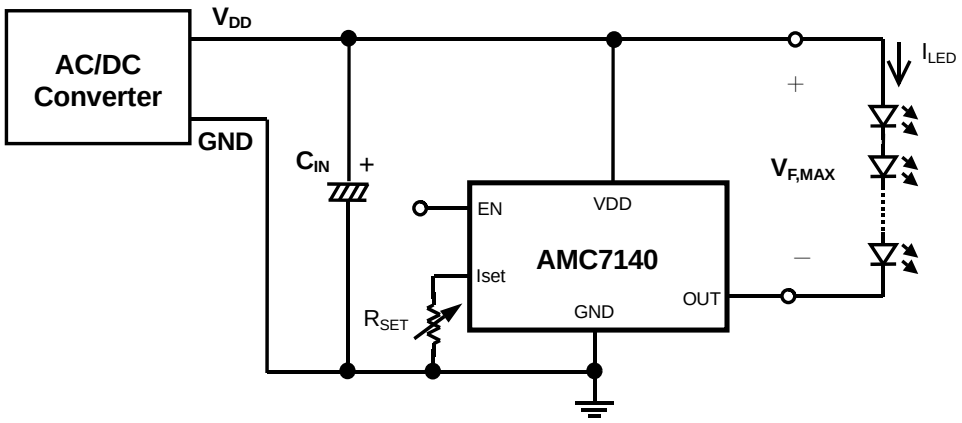
AMC7140 for LED Lighting

✓ **Typical Application Circuit:**



** Recommend：$V_{DD} = V_{F,MAX} + 0.5V$

** Tolerance：$V_{F,MAX} + 3V \geq V_{DD} \geq V_{F,MAX} + 0.35V$

(With appropriate heat-sink area for AMC7140)

✓ **BOM:**

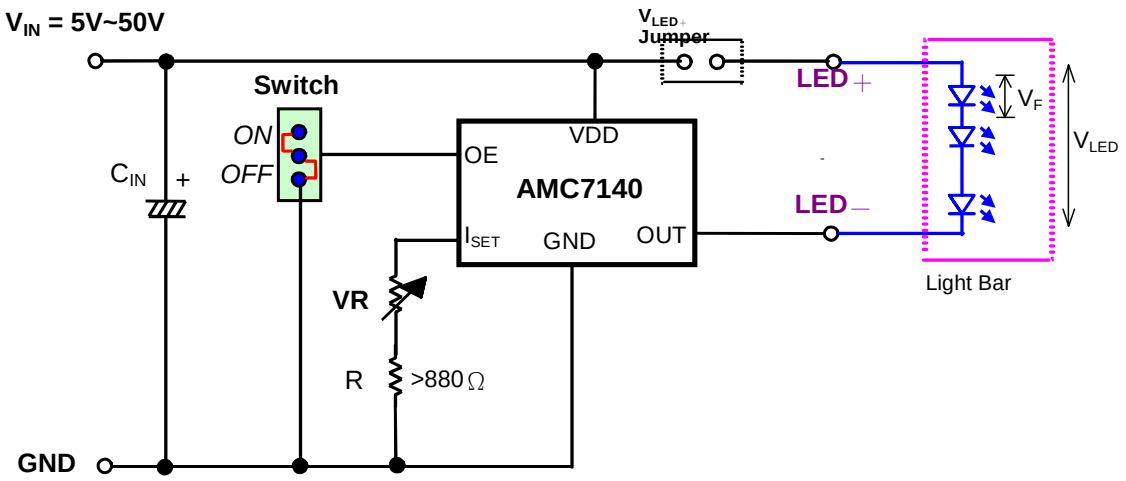
C. R. No.	Q'TY	Description
IC	1	AMC7140DL
C_{IN}	1	E. C. Cap. 10uF/63V
R_{SET}	1	$R_{SET} = \frac{V_{SET}}{I_{SET}} = \frac{1.2V}{I_{SET}}$; $I_{SET} = \frac{I_{LED}}{500}$

◆ Description

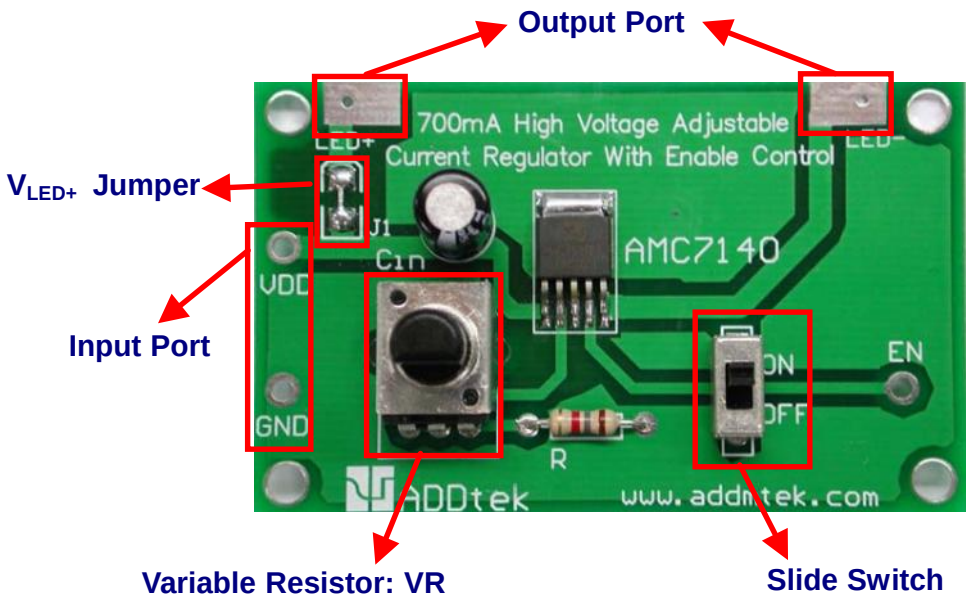
【1】The recommended range for input voltage V_{DD} is: $\mathbf{V_{F,MAX}+0.35V \leqq V_{DD} \leqq V_{F,MAX}+3V}$. Where, $V_{F,MAX}$ is the maximum total forward voltage drops of the LED string. Too large input voltage will result in too large voltage drop between OUT pin and GND pin. In such condition, additional heat sink is necessary and appropriate size of copper foil on EVM is required.

【2】The resistor R_{SET} is used to set the LED driving current. The minimum value of R_{SET} is 880Ω that is corresponding to the 700mA maximum output current.

Circuit Scheme:



Picture



Bill of Material

C.R No.	Q'TY	Description
PCB	1	PCB-AMC7140 (version: 060912)
IC	1	AMC7140DL
C_{IN}	1	E. C. Cap. 10uF / 63V
R	1	$R = \frac{1.2V}{I_{SET}}$; $I_{SET} = \frac{I_{OUT,MAX}}{500}$
VR	1	Variable Resistor / 20KΩ
Switch	1	3P, 180° Slide Switch

Description

【1】 The recommended range for input voltage V_{IN} is: $\mathbf{V_{LED}+0.35V \leqq V_{IN} \leqq V_{LED}+1.5V}$. Where, V_{LED} is the total forward voltage drops of the LED string ($V_{LED}=nxV_F$, where, V_F is the forward voltage of one LED, and n is the number of LEDs in the string). Too large input voltage will result in too large voltage drop between OUT pin and GND pin. In such condition, additional heat sink is necessary and appropriate size of copper foil on EVM is required.

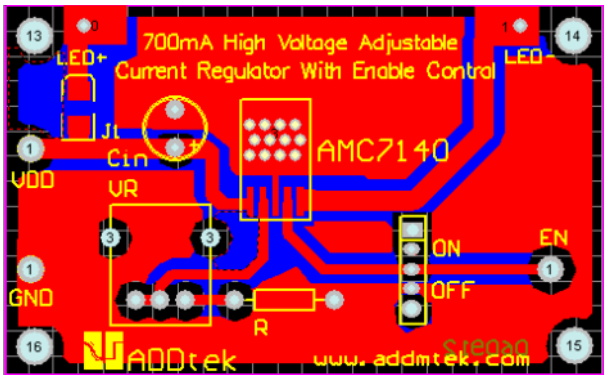
【2】 The slide switch is used to turn ON or OFF the output stage of the chip.

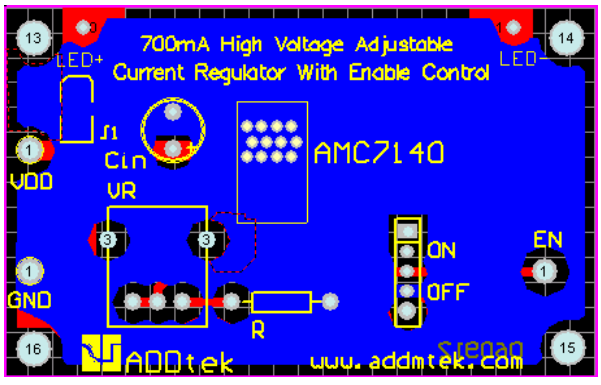
【3】 The resistor R is used to set the maximum allowable LED driving current. The value of R is calculated by the following formula:

$$I_{SET} = \frac{I_{OUT,MAX}}{500}, \qquad R = \frac{V_{SET}}{I_{SET}} = \frac{1.2V}{I_{SET}}$$

【4】 The dimming function can be accomplished by variable resistor VR. The current ratio between I_{OUT} and I_{SET} is 500.

Reference PCB Layout





Thermal Consideration of AMC7140

When power consumption is over about 687mW for TO-252 package, at T_A=70˚C, additional heat sink is required to control the junction temperature below 125˚C.

The junction temperature is: $T_J = P_D (\theta_{JT} + \theta_{CS} + \theta_{SA}) + T_A$

P_D: Dissipated power.

θ_{JT}: Thermal resistance from the junction to the mounting tab of the package.

For TO-252 package, θ_{JT} = 7.0 °C /W.

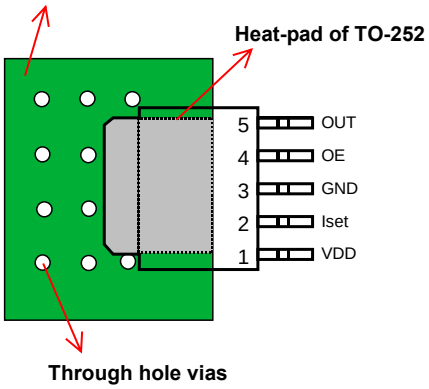
θ_{CS}: Thermal resistance through the interface between the IC and the surface on which it is mounted. (Typically, θ_{CS} < 1.0˚C /W)

θ_{SA}: Thermal resistance from the mounting surface to ambient (thermal resistance of the heat sink).

If PC Board copper is going to be used as a heat sink, below table can be used to determine the appropriate size of copper foil required. For multi-layered PCB, these layers can also be used as a heat sink. They can be connected with several through hole vias.

PCB θ_{SA} (°C /W)	59	45	38	33	27	24	21
PCB heat sink size (mm^2)	500	1000	1500	2000	3000	4000	5000

Recommended figure of PCB area used as a heat sink.



When I_{OUT} =700mA and V_{DROP} = 2V, P_D = 0.7 x 2 = 1.4(W)

Then, the needed θ_{SA} is: $\theta_{SA} = (T_J - T_A) / P_D - \theta_{JT} - \theta_{CS}$ = (125 – 70) / 1.4 – 7 – 1 = 31.3

A PCB area of 2000mm^2 is needed for heat sink.

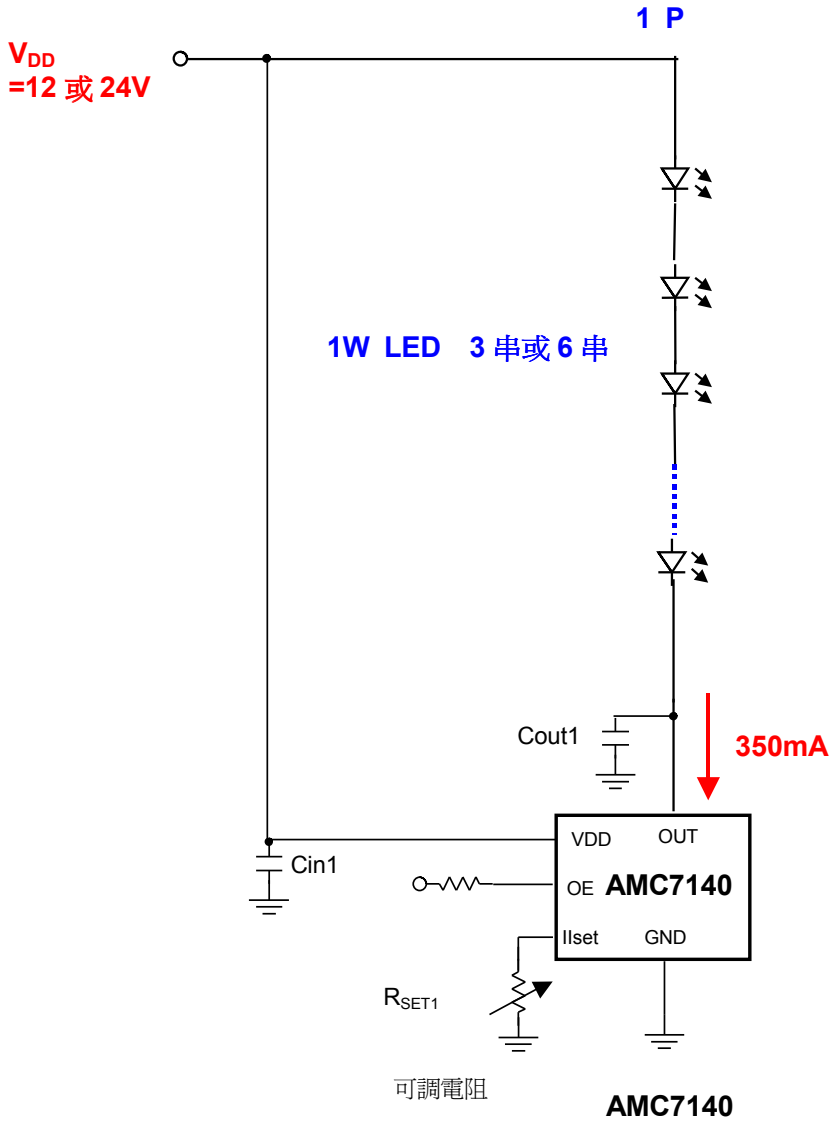
If I_{OUT} =350mA and V_{DROP} = 0.6V, P_D = 0.35 x 0.6 = 0.21(W)

Then, the needed θ_{SA} is: $\theta_{SA} = (T_J - T_A) / P_D - \theta_{JT} - \theta_{CS}$ = (125 – 70) / 0.21 – 7 – 1 = 254

A PCB area of the same size as heat-pad of chip is enough for heat sink.

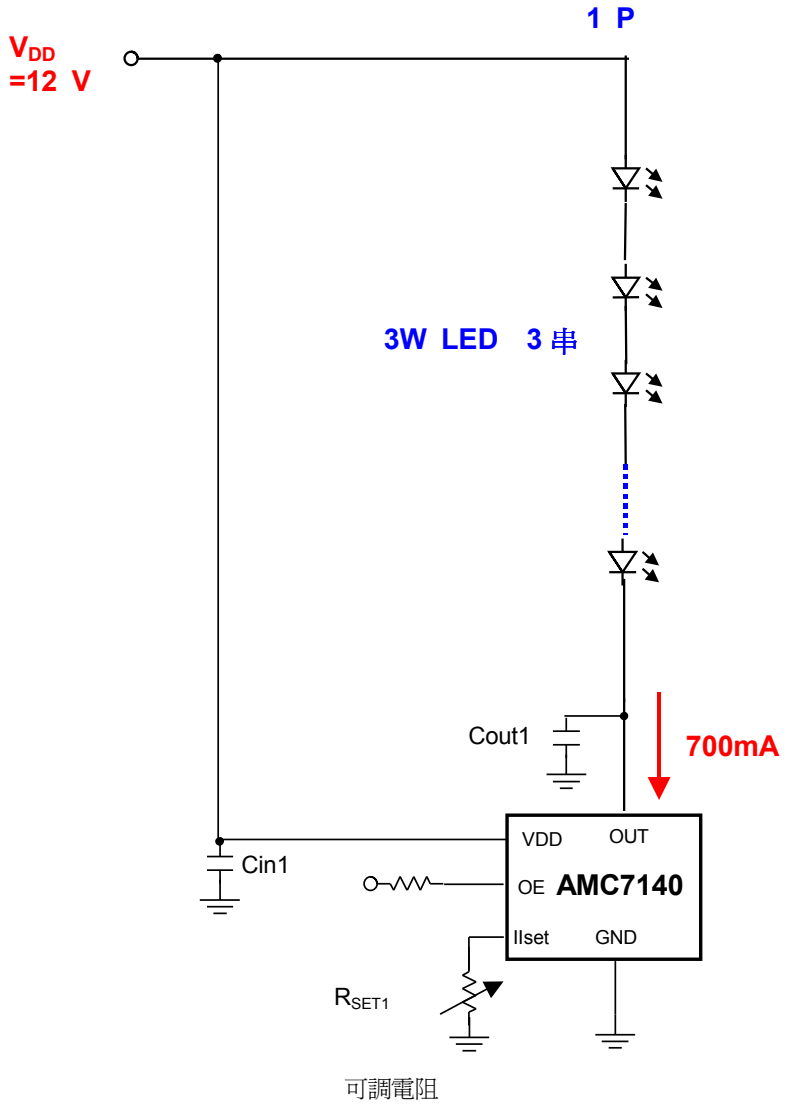
♦ Application condition – 1W LED (Vf=3.5V , ILed=350mA)

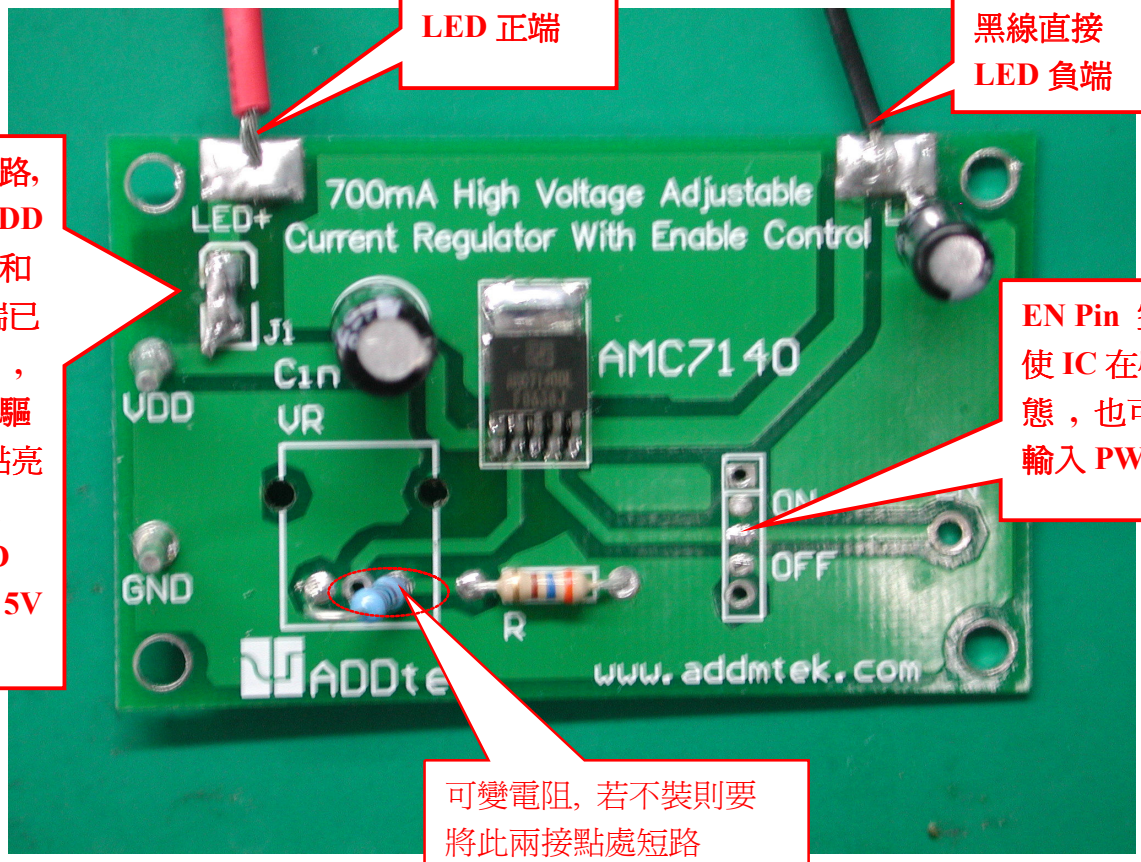
Vcc=12 V , Load = 3S1P / Vcc=24V , Load=6S1P Driving scheme –



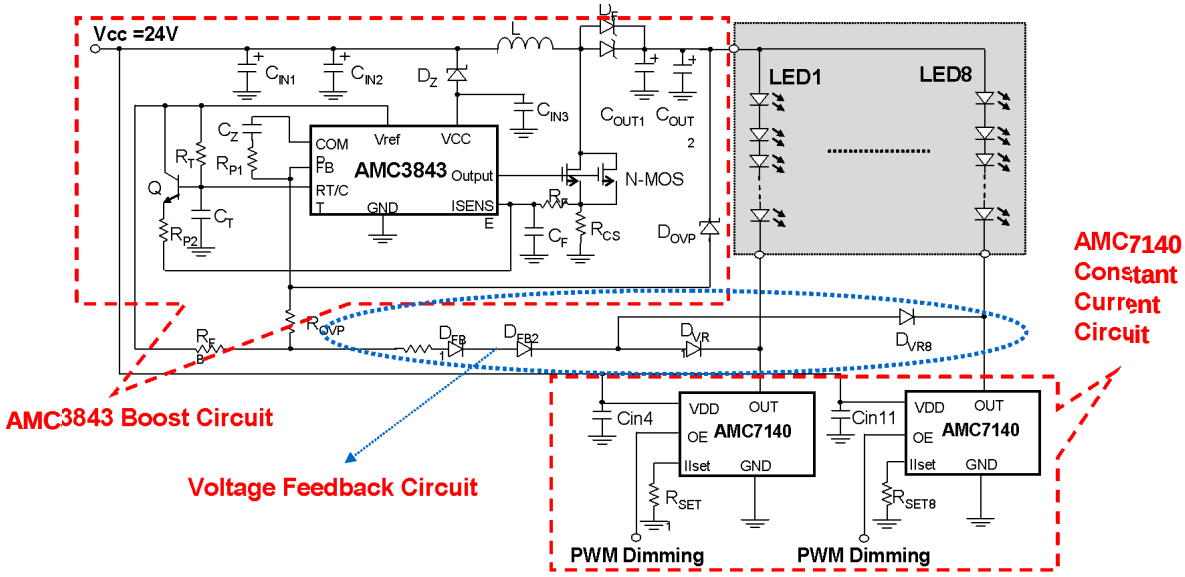
♦ Application condition – 3W LED LED (Vf=3.7V , ILed=700mA)

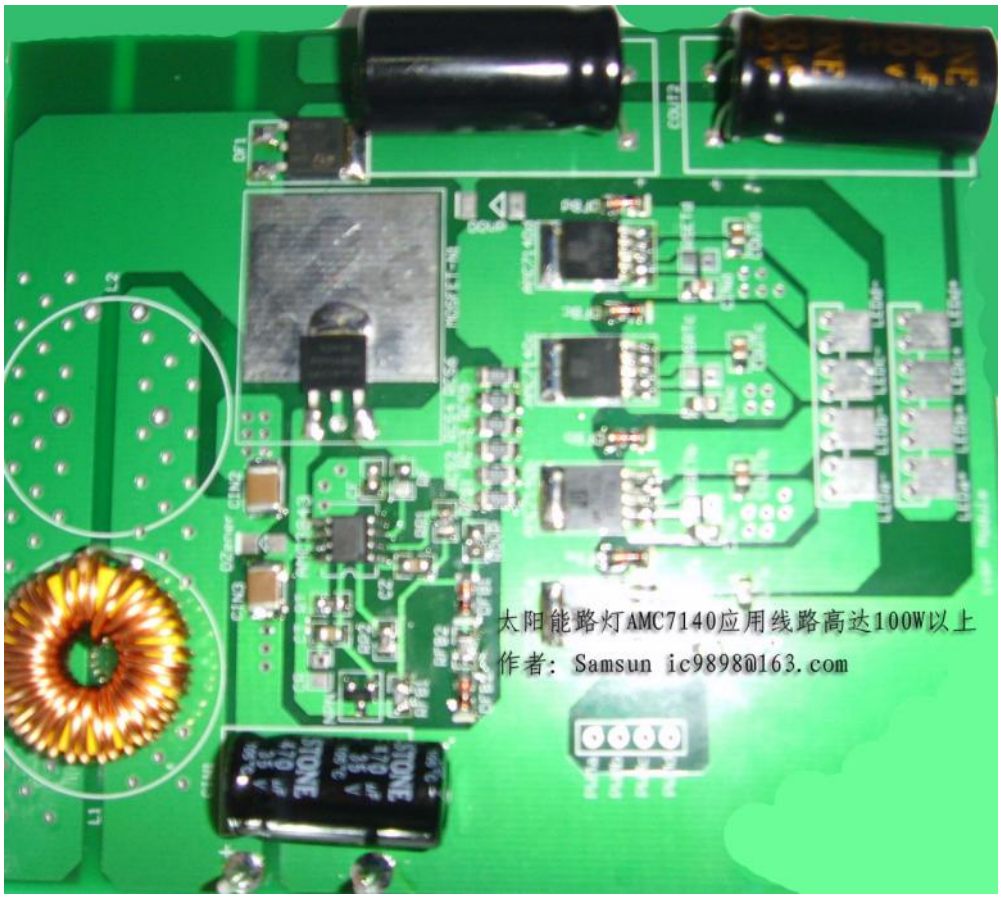
Vcc=12 V , Load = 3S1P Driving scheme –




紅線直接接
LED 正端
黑線直接
LED 負端
若此點短路,
則代表 VDD
輸入端和和
LED 正端已
連在一起，
可以同時驅
動 IC 及點亮
LED，但
7140 VDD
range 在 5V
至 50V
EN Pin 空接仍可
使 IC 在啓動的狀
態，也可在此處
輸入 PWM 訊號
可變電阻，若不裝則要
將此兩接點處短路
LED+
700mA High Voltage Adjustable
Current Regulator With Enable Control
J1
Cin
VR
AMC7140
VDD
GND
ON
OFF
R
www.addmtek.com

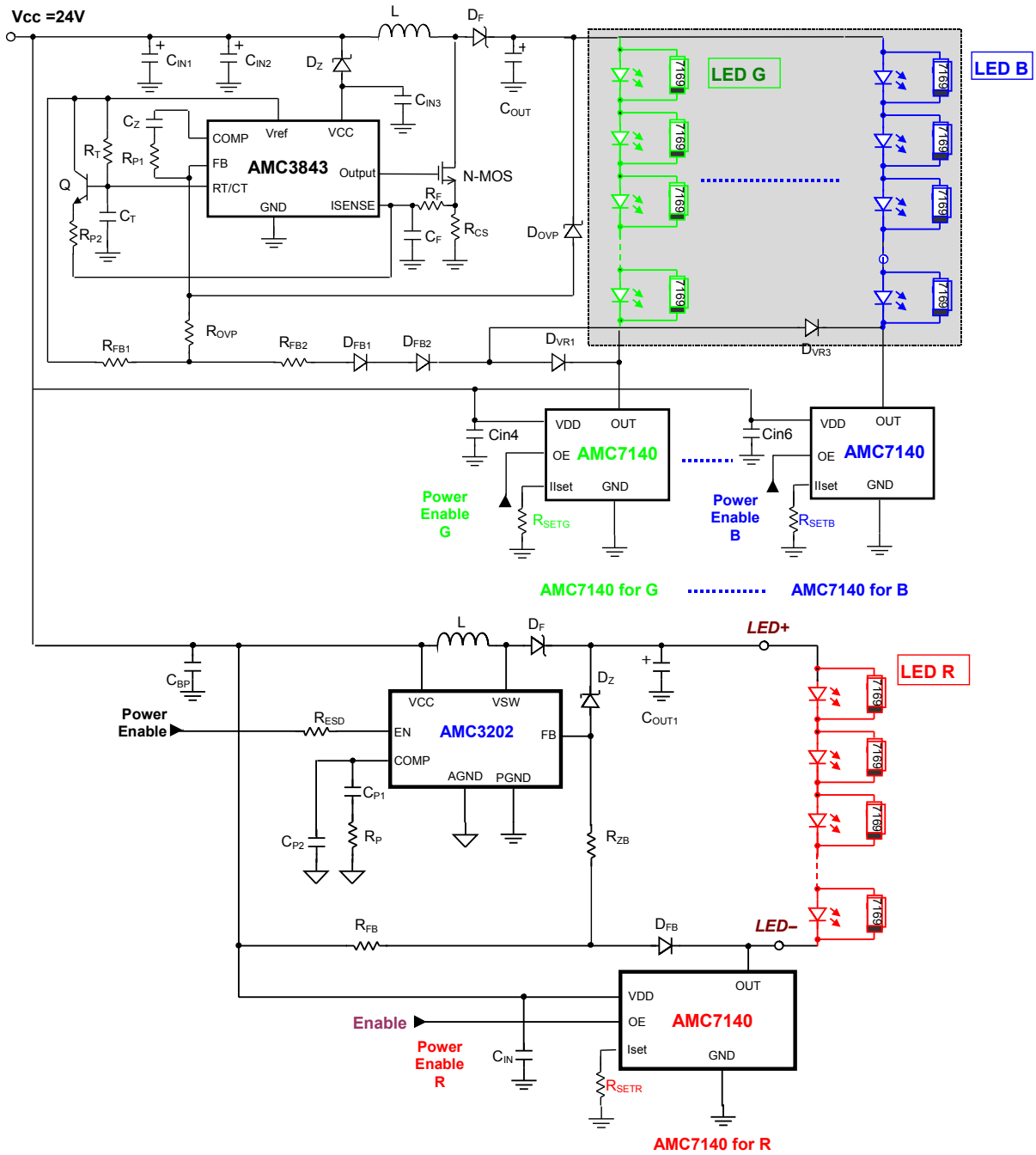
- One string LED can get 24 series
- Wide input voltage Range 10V to 40V
- Up to 100W low cost boost converter.
- > 90% efficiency.
- Maximum 700mA adjustable current per string.
- A7140 TO-252-5L package for high power dissipation





- ✓ **V_{IN}=12V or 24V**
- ✓ **Load: 10pcs LED in series / 3 strings / Each string = 350mA (R G B)**
- ✓ **AMC7169 is a optional device for customer's design. It's a LED Protector.**

  When LED have open circuit condition, AMC7169 can bypass the current and keep the hole string of LEDs still light.



AMC3843 & AMC7140 LED Backlight Module Schematic

- ✓ 效率高達 90% 達到節能的要求
- ✓ 每一路 7140 有可自由調整的 700mA(下個月會提昇至 1.2A)
- ✓ 7140 輸出端耐壓 75V，輸入端耐壓 50V
- ✓ 精準純直流輸出保護 LED 的壽命.
- ✓ 7140 OE pin 可作調光功能

Project ：

- ✓ **V_{IN}=12V**
- ✓ **Load: 15pcs LED in series / 1 strings / Each string = 300mA**
- ✓ **Vout=60V(3.5Vf*15)**