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The technical content of this austriamicrosystems application note is still valid.

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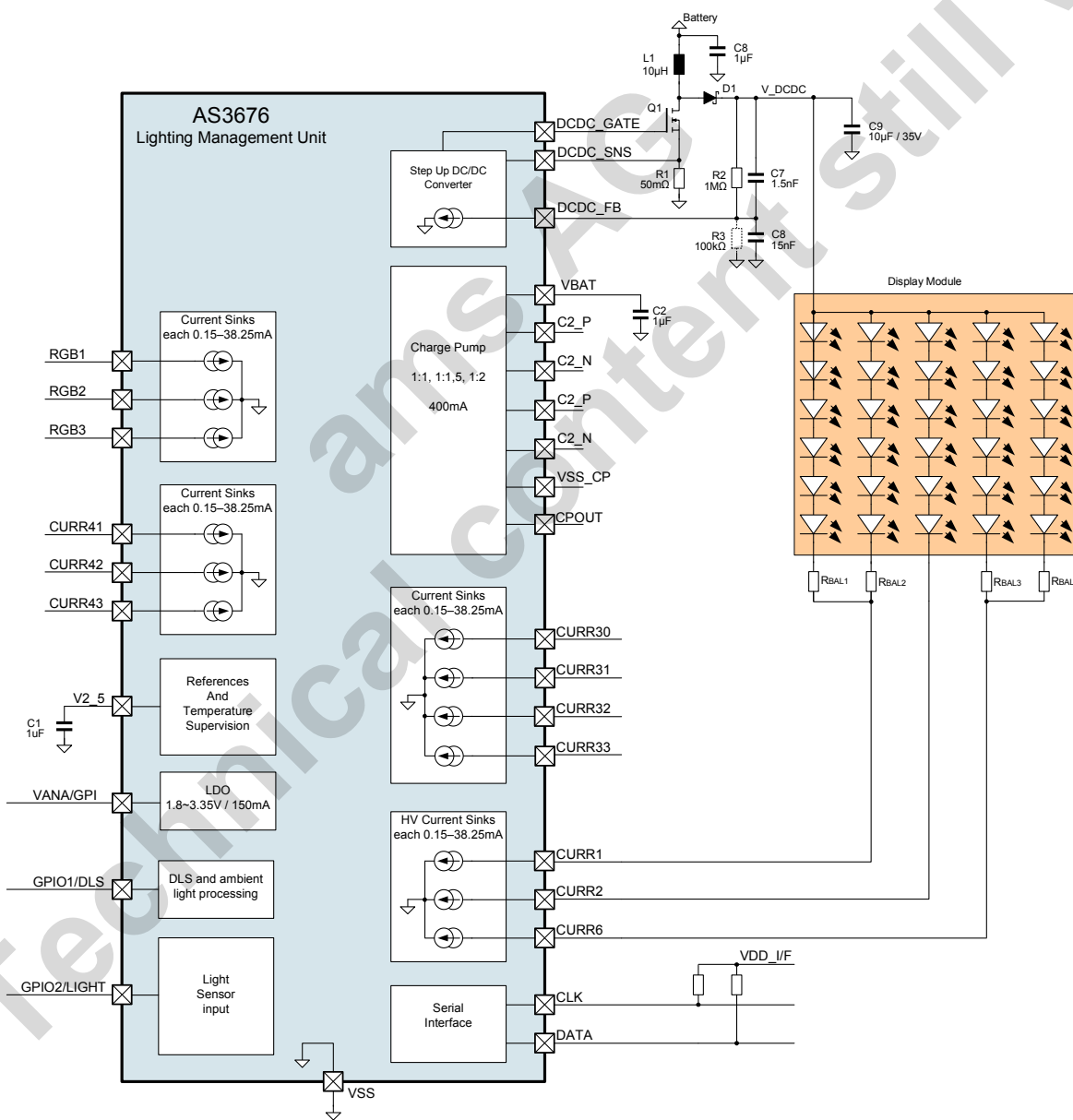
Application Note: AS3676_AN_TABLET

AS3676

Lighting Management Unit for Tablet Applications



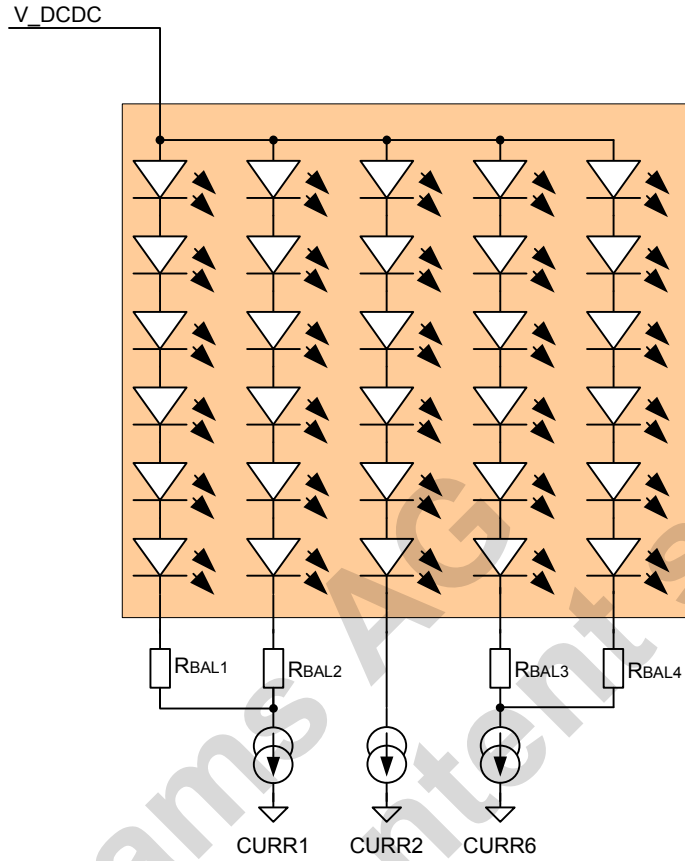
This application note describes how to use the AS3676, as a lighting management unit for tablet applications with up to 30 LEDs.



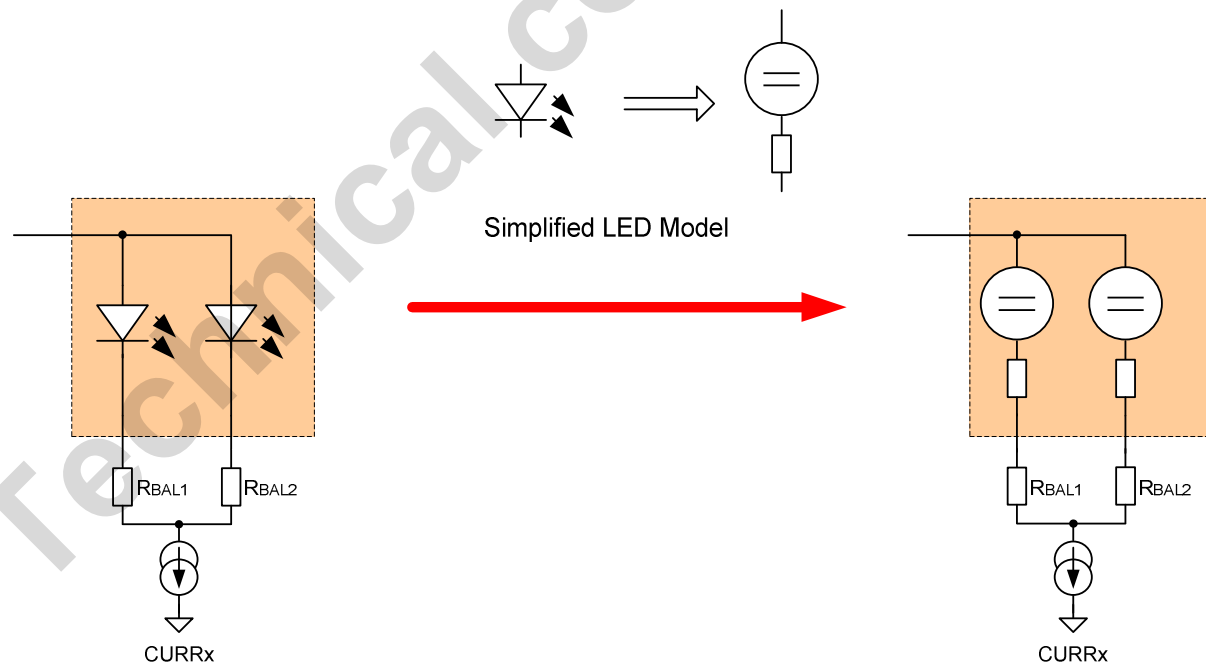
Typical application circuit for 30 LEDs

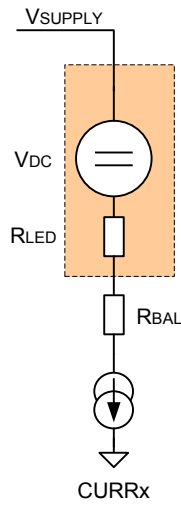
Balance Resistor Calculation

To calculate the correct balance resistors it is necessary to construct a calculation model of the LED. All information should be documented in the Datasheet of the LED supplier.

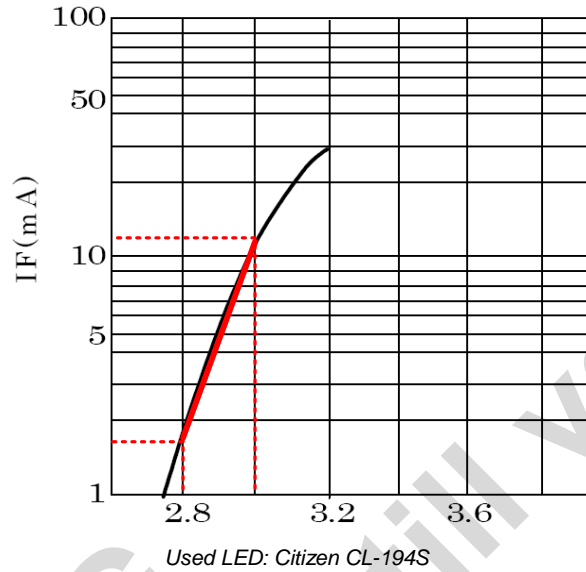


For the calculation of the balance resistors the tolerances of the LEDs has to be known to set up a calculation model.





IF-VF Characteristics



$$R_{LED} = \frac{\Delta U}{\Delta I} = \frac{U_1 - U_2}{I_1 - I_2}$$

Calculation Formula for the Resistance of the LED

Vf = 3.0V @ 11mA
 Vf = 2.8V @ 1.8mA

Δ Voltage = 3.0V-2.8V = 0.2V
 Δ Current = 11mA-1.8mA = 9.2mA
 RLED = Δ Voltage / Δ Current
 RLED = 0.2V / 9.2mA = 22 Ω
 VDC = VF - ILED * RLED
 VDC = 3.0V - 11mA * 22 Ω = 2.76V

VF Rank

rank	VF(V)
F	2.65 – 2.75
G	2.75 – 2.85
H	2.85 – 2.95
I	2.95 – 3.05
J	3.05 – 3.15

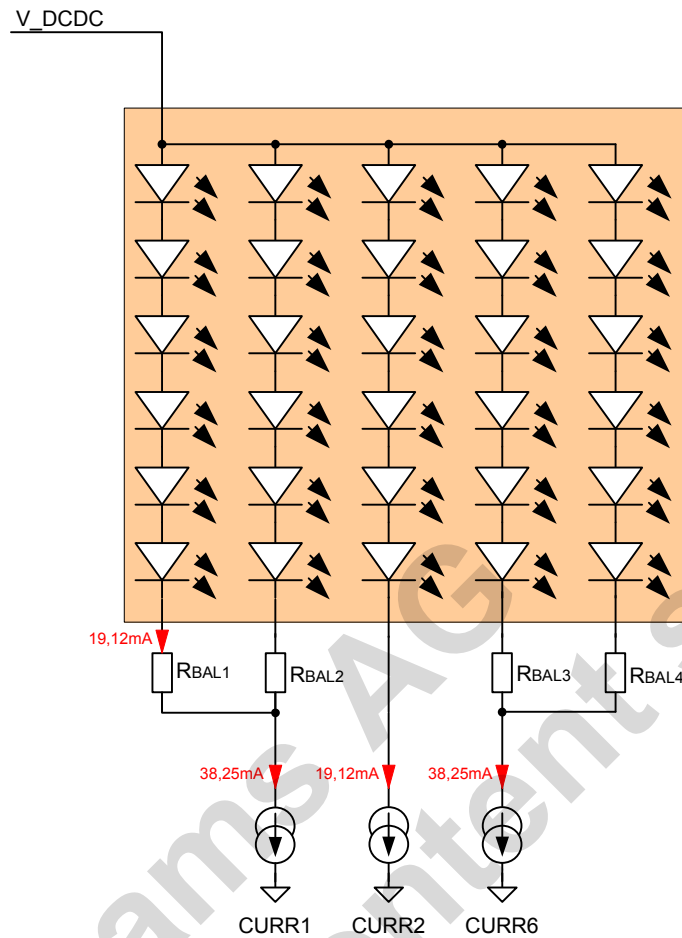
LED Variation for VF is 2.85 to 2.95V = +/-50mV -> LED Unevenness

Used values for the Formula:
 IMaxTol = maximum Tolerance allowed. In [mA]
 LEDCount = amount of LEDs
 VLEDUnevenness = Tolerance of VF Rank
 RLED = Resistance model of the LEDs

$$R_{BAL} = \frac{LED_{Count} * V_{LED_{Unevenness}} - \left(\frac{R_{LED} * LED_{Count}}{I_{MaxTol}} \right)}{I_{MaxTol}}$$

Calculation Formula for the Balance resistor

Current distribution

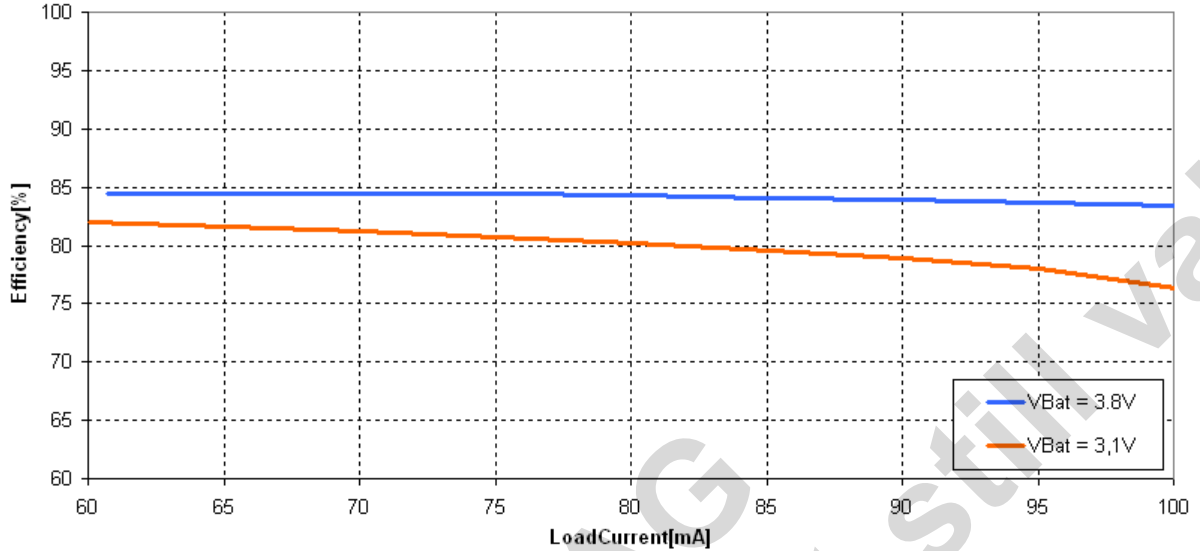


The current distribution of this example shows that CURR1 and CURR6 have to take the doubled current in comparison to CURR2. The string current of this example has a max. current of 19,12mA.

Note = Maximum output current is $3 \times 38,25\text{mA} = 114,75\text{mA}$

Efficiency

AS3676 - 30 LEDs Application Efficiency



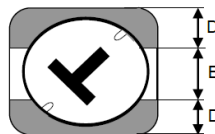
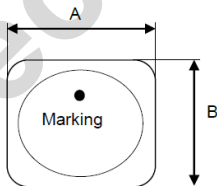
Application Efficiency of VDCDC = 25V and with the external components mentioned below
 Note = This efficiency does not include the balance resistors as they are depending on the chosen LED.

External Components

Part Number	Value Typ.	tol. (min)	Rating (max)	Notes	Package(min.)
L1	10µH	+/-20%	1,3A	Recommended Type: Würth Elektronik 4818	4,8x4,8x1,8mm
Q1 & D1	FDFMA3N109			Integrated NMOS and Schottky diode	MicroFET 2x2mm
R1	50mΩ	+/-5%		Shunt Resistor RU1005JR051CW	0402
C9	10uF	+/-10%	35V	CL32A106KLULNN	1210 1,8mm height
C1,C8	1uF	+/-10%	6.3V	CL05A16KQ5NNN	0402 0,5mm height

Inductor Dimensions

A Mechanische Abmessungen / dimensions:



	Type 4818	
A	4,8 ± 0,2	mm
B	4,8 ± 0,2	mm
C	1,8 ± 0,2	mm
D	1,60 typ.	mm
E	1,60 typ.	mm

Würth Elektronik 4818 Inductor

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