DESCRIPTION

The A8180A is a continuous mode inductive step-down converter, designed for driving single or multiple series connected LEDs efficiently from a voltage source higher than the LED voltage. The device operates from an input supply between 6V and 36V and provides an externally adjustable output current of up to 1A. Depending upon supply voltage and external components, this can provide up to 30 watts of output power. The A8180A includes the output switch and a high-side output current sensing circuit, which uses an external resistor to set the nominal average output current.

Output current can be adjusted below the set value, by applying an external control signal to the V_{SET} pin. The V_{SET} pin will accept either a DC voltage or a PWM waveform. The soft-start time can be increased using an external capacitor from the V_{SET} pin to ground. Applying a voltage of 0.2V or lower to the V_{SET} pin turns the output off and switches the device into a low current standby state.

A8180A is available in SOT89-5 package.

ORDERING INFORMATION

Package Type	Part Number	
SOT89-5 SPQ: 1,000pcs/Reel	K5	A8180AK5R
		A8180AK5VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

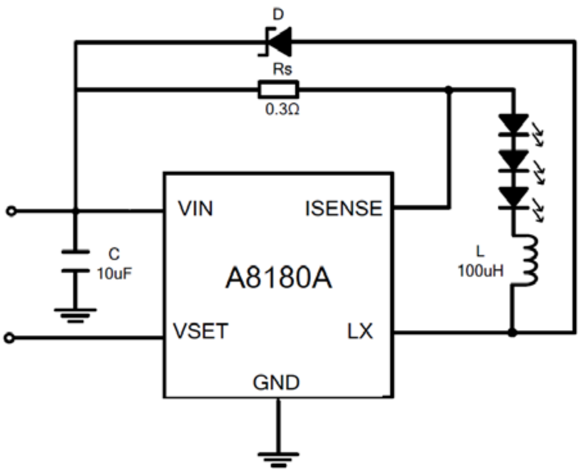
FEATURES

- Simple low parts count
- Internal 40V NDMOS switch
- 1A output current
- Single pin on/off and brightness control Using DC voltage or PWM
- Soft-start
- High efficiency (up to 97%)
- Wide input voltage range: 6V to 36V
- Open LED Protection
- Short LED Protection
- Up to 1MHz switching frequency
- Typical 5% output current accuracy
- Available in SOT89-5 package

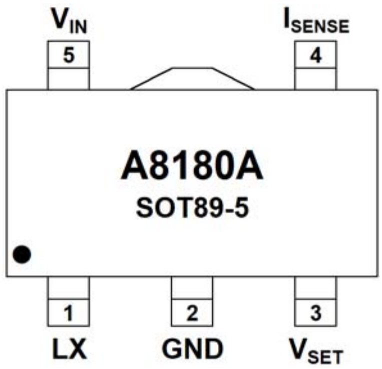
APPLICATIONS

- Low voltage halogen replacement LEDs
- Low voltage industrial lighting
- LED back-side lighting

TYPICAL APPLICATION



PIN DESCRIPTION



SOT89-5, K5

Top View

Pin #	Symbol	Function
1	LX	Drain of NDMOS switch.
2	GND	Ground (0V).
3	V_{SET}	Multi-function On/Off and brightness control pin: • Leave floating for normal operation. • Drive to voltage below 0.2V to turn off output current • Drive with DC voltage (0.3V < V_{SET}< 2.5V) to adjust output current from 12% to 100% of I_{OUTnom} • Drive with PWM signal from open-collector or open-drain transistor, to adjust output current. Adjustment range 1% to 100% of I_{OUTnom} for f < 500Hz • Connect a capacitor from this pin to ground to increase soft-start time. (Default soft-start time = 0.1ms. Additional soft-start time is approx.1.5ms/1nF)
4	I_{SENSE}	Connect resistor R_S from this pin to V_{IN} to define nominal average output current I_{OUTnom} = 0.1/Rs
5	V_{IN}	Input voltage (6V to 36V).

ABSOLUTE MAXIMUM RATINGS

V_{IN}, Input Voltage	38V
V_{LED}, V_{CS}, Voltage on LX, I_{SENSE}	-0.3V ~ V_{DD} +0.3V
V_{EXT}, Voltage on V_{SET}	-0.3V ~ +6V
I_{OUT}, Output Current	1.5A
P_D, Power Dissipation, SOT89-5	500mW 1300mW (PCB mounted) *
T_J, Junction Temperature	125℃
T_{STG}, Storage Temperature Range	-40℃ ~ 150℃
Lead Temperature	300℃,5sec
Thermal Resistance	76.92℃/W

Stresses above may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

* The power dissipation figure shown in PCB mounted. Please refer to page9 for details.

ELECTRICAL CHARACTERISTICS

Test conditions: V_{IN} =16V, T_A = 25℃, unless otherwise noted

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	V_{IN}		6		36	V
Output current	I_{LED}	R_S=0.3Ω		333		mA
		R_S=0.1Ω		1		A
Shutdown current	I_{SD}	V_{SET} pin grounded		20		μA
Quiescent current without switching	I_Q	V_{SET} pin floating, V_{IN}=16V		0.4		mA
Mean current sense threshold voltage	V_{sense}	Measured on I_{sense} pin with respect to V_{IN}	95	100	105	mV
Sense threshold hysteresis	V_{sense_hys}			±13		%
I_{sense} pin input current	I_{sense}	V_{sense} = V_{IN} – 0.1		8		μA
V_{set} range on V_{SET} pin	V_{en}	For DC dimming	0.3		2.5	V
DC voltage on V_{SET} pin to enable	V_{enon}	Ven rising		0.25		V
DC voltage on V_{SET} pin to disable	V_{enoff}	Ven falling		0.2		V
LX switch on resistance	R_{LX}	@ILX=100mA		0.3		Ω
LX switch leakage current	$I_{LX(leak)}$				5	μA
Soft start time	T_{SS}	V_{IN}=16V, Cen = 1nF		1.5		ms
Operating frequency	F_{LX}	V_{IN}=16V, V_O=9.6V (3 LEDS), L=47μH, ΔI=0.25A (ILED=1A)		233		kHz
Recommended minimum switch ON time	T_{on_rec}	For 4% accuracy		500		ns
Recommended maximum switch frequency	F_{LXmax}				1.0	MHz
Max duty circle				98		%
Recommended duty cycle range	D_{LX}		25		75	%
Internal comparator propagation delay	T_{PD}			45		ns
Over temperature protection	T_{OTP}			150		℃
Temp protection hysteresis	T_{OTP_hys}			40		℃
Current limit	I_{XLmax}	Peak inductor current	1.5			A

TYPICAL PERFORMANCE CHARACTERISTICS

Test conditions: T_A=25℃ , V_{IN}=16V,unless otherwise noted.

Fig.1 Efficiency vs. Input Voltage
(Rs=0.3Ω, L=100uH)

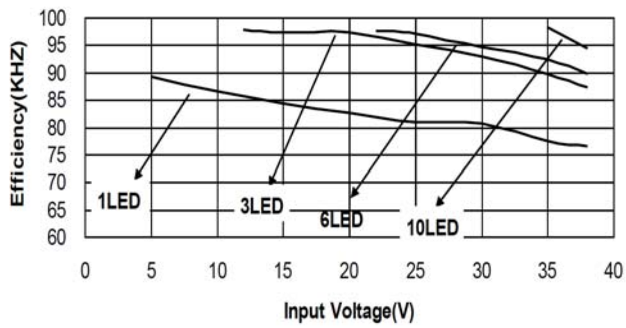


Fig.2 Efficiency vs. Input Voltage
(Rs=0.15Ω, L=47uH)

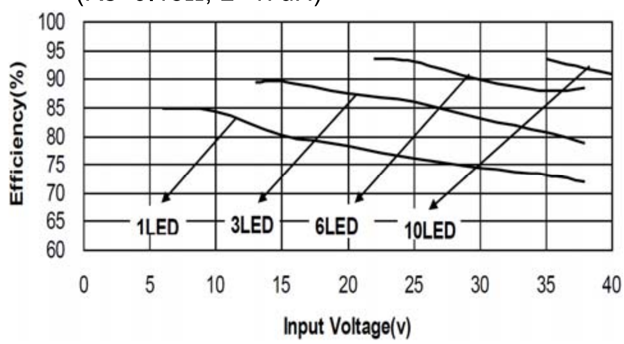


Fig.3 Efficiency vs. Input Voltage
(Rs=0.1Ω, L=33uH)

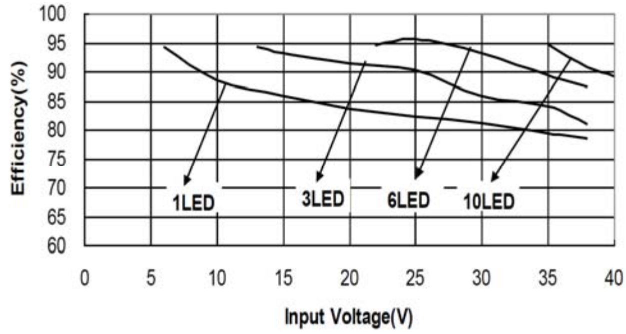


Fig.4 Frequency vs. Input Voltage
(Rs=0.3Ω, L=100uH)

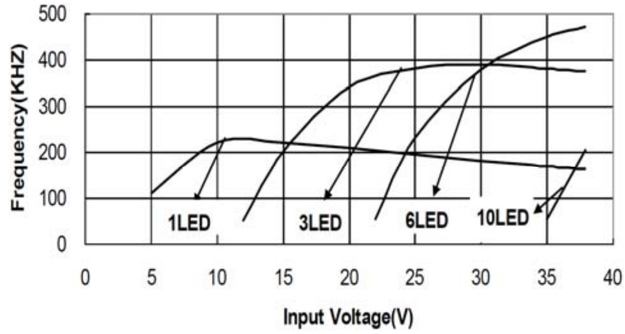


Fig.5 Frequency vs. Input Voltage
(Rs=0.15Ω, L=47uH)

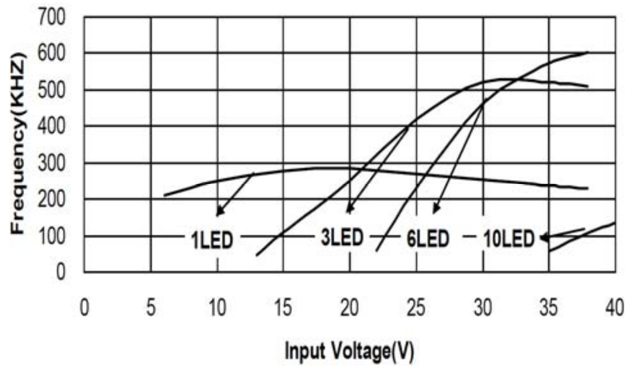


Fig.6 Frequency vs. Input Voltage
(Rs=0.1Ω, L=47uH)

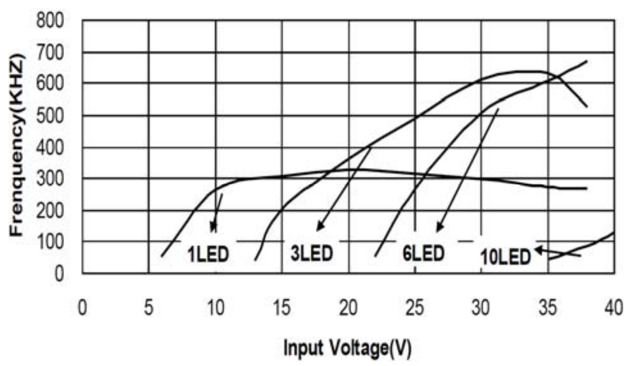


Fig.7 Quiescent Current vs. Input Voltage

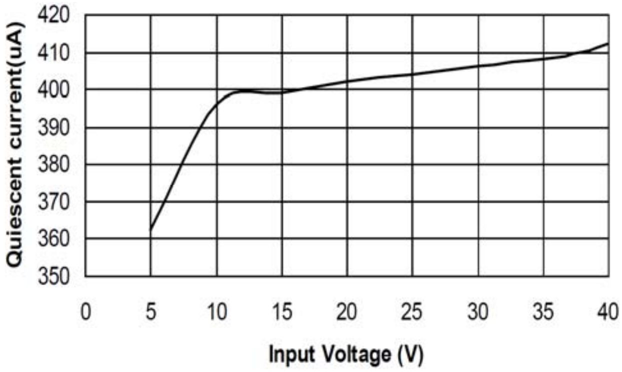


Fig.8 Shutdown Current vs. Input Voltage

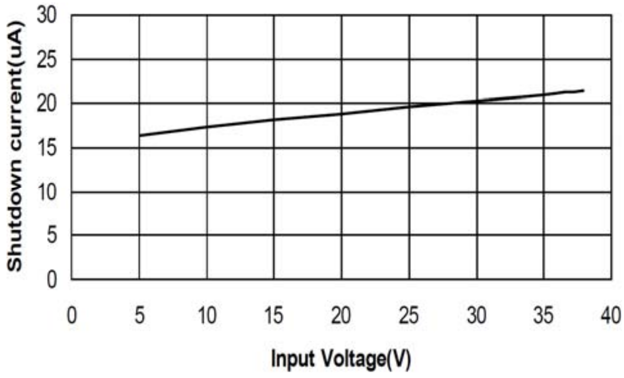


Fig.9 Duty Cycle vs. LED Current

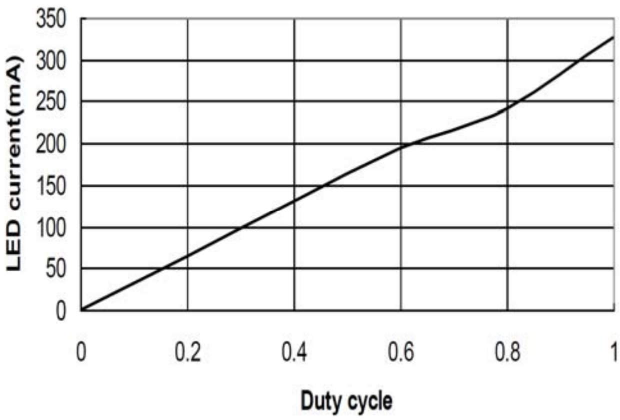


Fig.10 LED Current vs. V_{set} (R_s=0.3Ω, L=100uH)

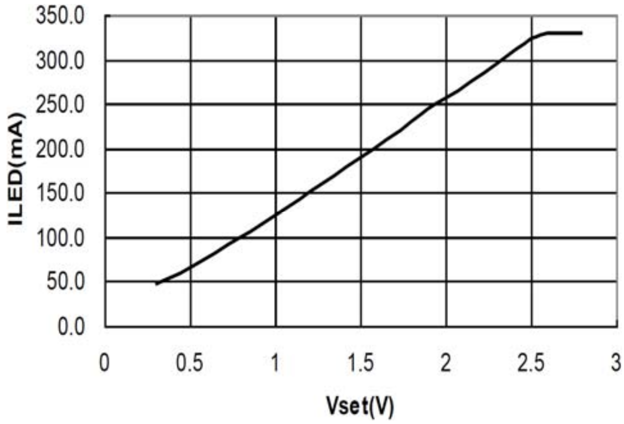


Fig.11 LED Current vs. V_{set} (R_s=0.15Ω, L=47uH)

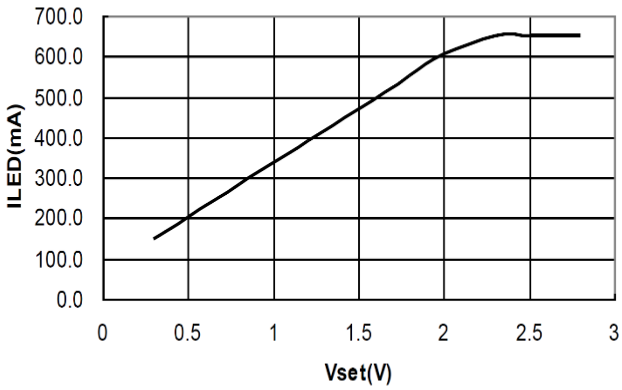


Fig.12 Steady State Waveforms

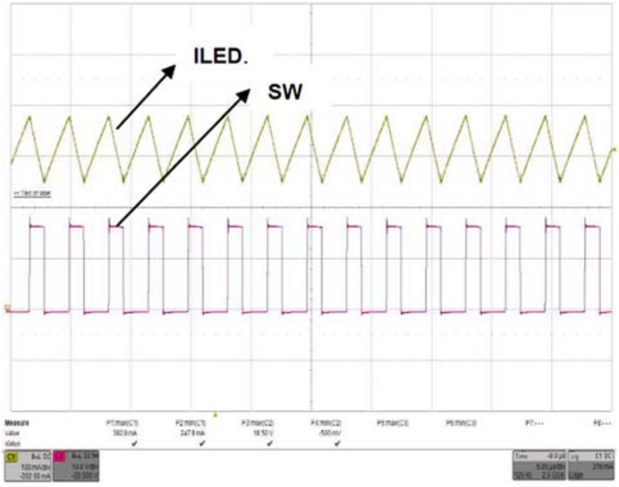


Fig.13 Start-up Waveforms

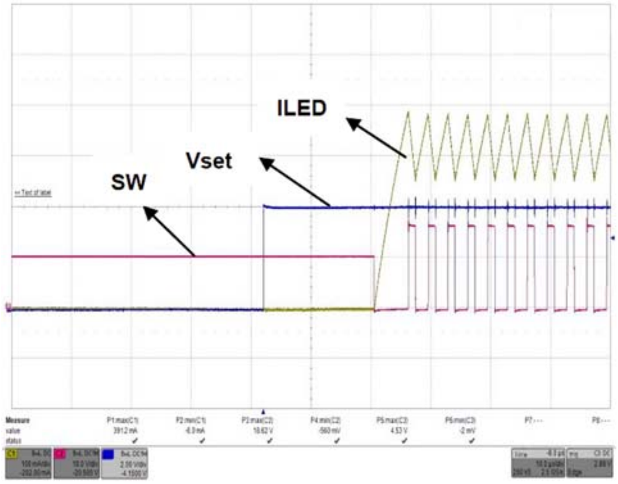


Fig.14 Dimming Waveforms (PWM=50%)

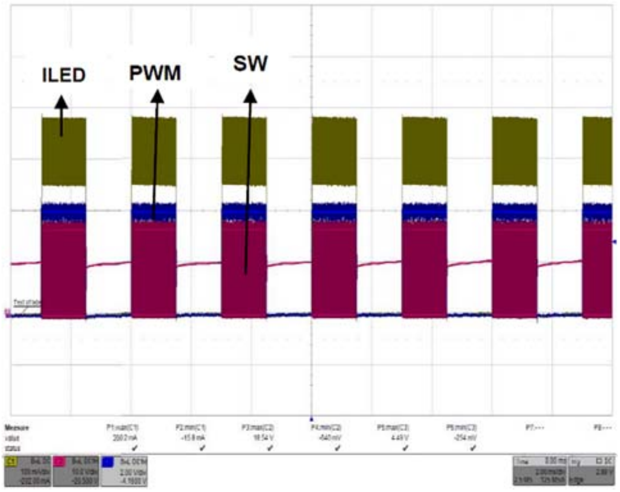
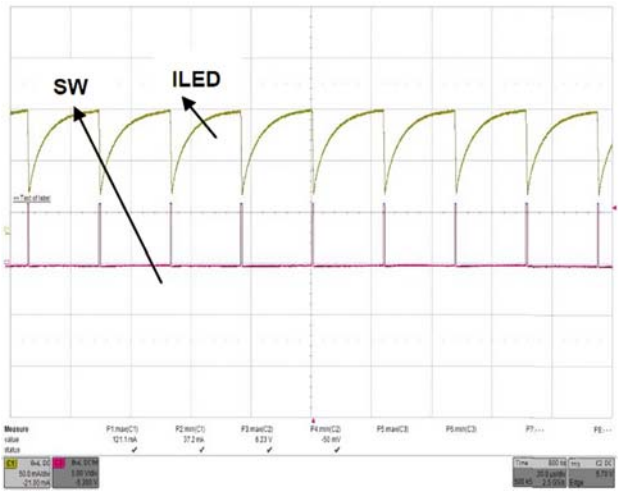


Fig.15 Pulse skip mode



DETAILED INFORMATION

Setting nominal average output current with external resistor R_S

The nominal average output current in the LED(s) is determined by the value of the external current sense resistor (R_S) connected between V_{IN} and I_{SENSE} and is given by:

$$I_{OUTnom} = \frac{0.1}{R_S}$$

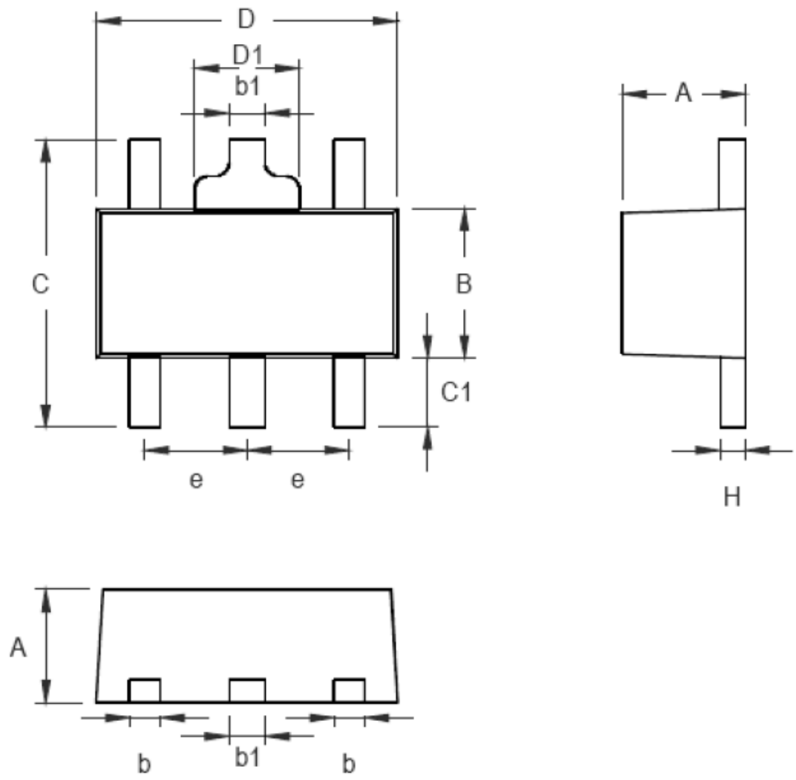
The table below gives values of nominal average output current for several preferred values of current setting resistor (R_S) in the typical application circuit shown on page 1

Nominal Average Output Current (mA)	R_S(Ω)
1000	0.1
760	0.13
667	0.15
333	0.3
167	0.6

The above values assume that the V_{SET} pin is floating and at a nominal voltage of V_{REF} (1.25V). Note that R =0.1Ω is the minimum allowed value of sense resistor under these conditions to maintain switch current below the specified maximum value. It is possible to use different values of R_S if the V_{SET} pin is driven from an external voltage.

PACKAGE INFORMATION

Dimension in SOT89-5 (Unit: mm)



Symbol	MILLIMETERS	
	Min.	Max.
A	1.400	1.600
b	0.320	0.520
b1	0.380	0.580
B	2.300	2.600
C	3.940	4.400
C1	0.800	1.200
D	4.400	4.600
D1	1.550 TYP	
e	1.500 TYP	
H	0.350	0.470

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