ELM915BA 54V 1A switching LED driver

■General description

ELM915BA is constant current LED driver with fixed off time, which consists of internal switching that can drive 1A peak current and capable of driving single or multiple LEDs in series connection efficiently. ELM915BA consists of switch NMOS transistor (Max.1A current) can operate from 6V to 54V. The low-side current detection circuit which is able to set the average current of output by output NMOS switch and external resistors is also included in ELM915BA. ELM915BA can be used as buck type and buck-boost type as well.

Through input of external control signal to LD/PWM pin, ELM915BA is capable of adjusting the value of output current. The LD/PWM is able to control the continuous output current which is from DC level input and the digital one which is from PWM input. The LD/PWM is also equipped with soft start function to prevent inrush current.

The SOT-26 small package makes ELM915BA suitable for LED MR-16 bulb applications.

■Features

- Linear or PWM dimming
- Soft-start function
- Cycle by cycle current limit
- Constant off time control
- Off time period programmable
- Thermal shutdown protection
- Internal NMOS switch : 54V, 1A
- High efficiency : Max.90%
- Wide input voltage range : 6V to 54V
- Package : SOT-26

■Application

- MR16 and general lighting
- Automotive lighting
- Low voltage Industrial lighting
- Battery charging
- LED back lighting
- Illuminated signs

■Maximum absolute ratings

Parameter	Symbol	Limit	Unit
Power supply voltage	Vdd	60	V
SW output peak current	Isw	1	A
I/O pin voltage	Vio	GND-0.3 to Vdd+0.3	V
Power dissipation	Pd	450	mW
Operating ambient temperature	Top	-40 to +125	°C
Storage temperature	Tstg	-55 to +150	°C

Caution:Permanent damage to the device may occur when ratings above maximum absolute ones are used.

■Selection guide

ELM915BA-S

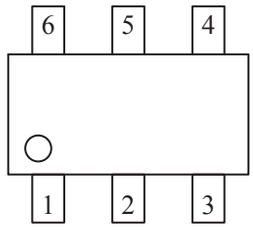
Symbol		
a	Package	B: SOT-26
b	Product version	A
c	Taping direction	S: Refer to PKG file

ELM915BA - S
↑↑ ↑
a b c

∗ Taping direction is one way.

■Pin configuration

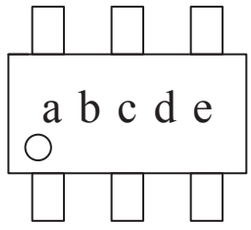
SOT-26(TOP VIEW)



Pin No.	Pin name	Pin description
1	CS	Current sense
2	GND	Ground
3	RT	Constant off time setting
4	LD/PWM	Linear dim/PWM dim
5	VDD	Power input
6	SW	Internal switch drain

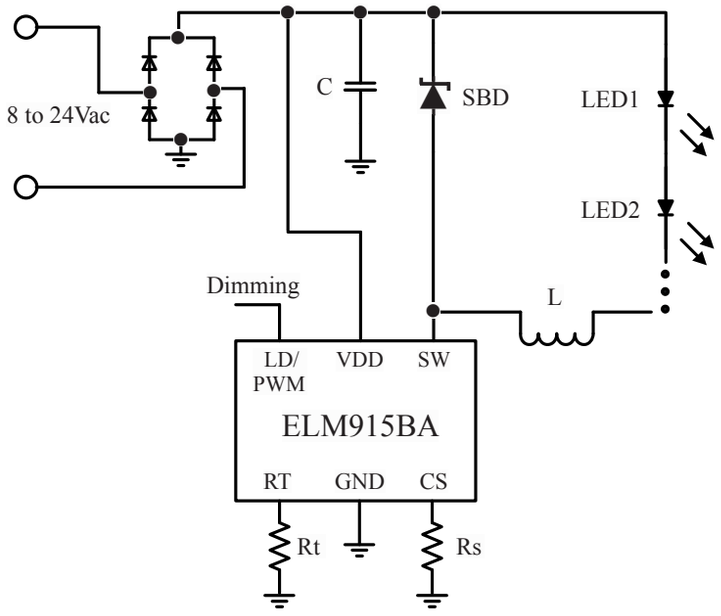
■Marking

SOT-26

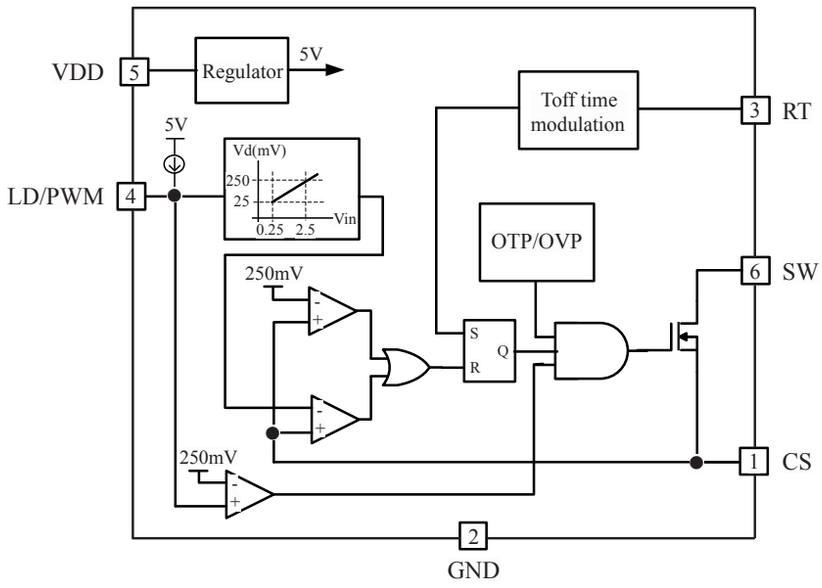


a to e : Assembly lot No. ——
A to Z (I, O, X excepted) and 0 to 9

■Standard circuit



■Block diagram



■Electrical characteristics

Vin=6V Top=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input DC supply voltage range	Vdd	DC supply voltage	6		54	V
Shut-down mode supply current	Iin_SD	LD/PWM to GND, Vin=6V		600		μA
VDD under voltage lockout threshold	UVLO	Vdd rising		5.4		V
UVLO hysteresis	ΔUVLO	Vdd falling		300		mV
LD/PWM low disable voltage	Vsd	LD/PWM voltage falling	180			mV
LD/PWM linear dimming voltage range	Vld		0.25		2.50	V
Current sense pull-in threshold voltage	Vcs-th	Vin=6V, Top=25°C	238	250	262	mV
Constant off time(100kΩ)	Toff	Rt=100kΩ, Vin=6V, Vcs=0.4V		0.7		μs
Constant off time(500kΩ)	Toff	Rt=500kΩ, Vin=6V, Vcs=0.4V		3.5		μs
SW switch resistance	Rsw(on)	Vin=6V, Vcs=0V		0.5		Ω
Current sense blanking time	Tblank	Vld/pwm=Vdd, Vcs=0.4V		300		ns

■Application notes

1) Setting peak current with external resistor Rs

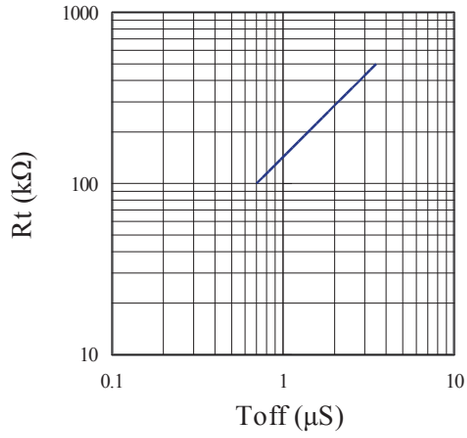
ELM915BA uses open loop peak current mode driver with internal power switch; peak current is determined by the value of Rs which is connected between CS and GND.

$$Ipk = 0.25/Rs\ (A)$$

2) Setting constant off time period Toff

RT is used to set the fixed off time of internal NMOS switch . The fixed off time is determined by the value of the resistor which is connected to RT and GND. The connection between Rt and ToffIt is shown as following chart. When RT is set to be 100kΩ, Toff becomes 700ns.

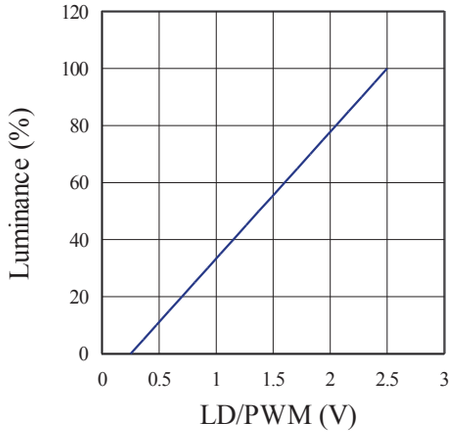
Toff-Rt characteristic

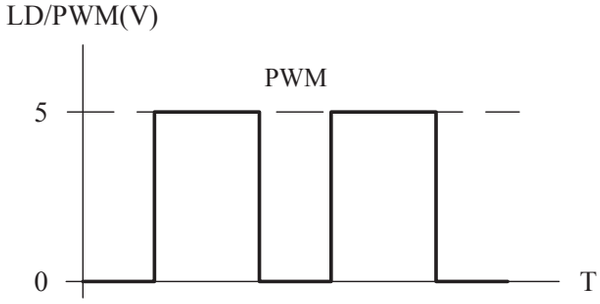


3) Dimming function

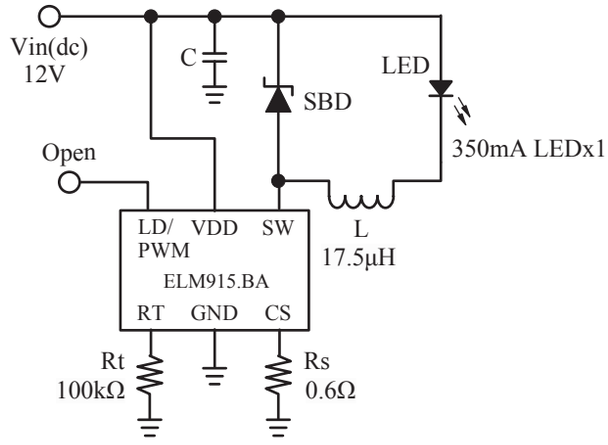
ELM915BA provides two types of dimming function: linear dimming and PWM one. Linear dimming activates when DC voltage added to LD/PWM is within the range from 0.25V to 2.5V; the luminance would be 0% under 0.25V, and 100% under 2.5V. For PWM dimming function, ELM915BA is able to adjust the luminance by digital signal when voltage of LD/PWM is under 0.25V.

LD/PWM-Luminance





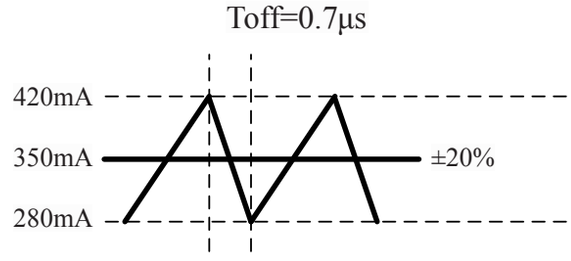
4) Buck topology application



The above diagram shows buck topology circuit.

a) Vin = 12Vdc. b) Vled = 3.5V

LED average forward current is 350mA and ripple current range is 20%(280mA~420mA). If constant off time is 700ns, then Rt is required to be 100kΩ.

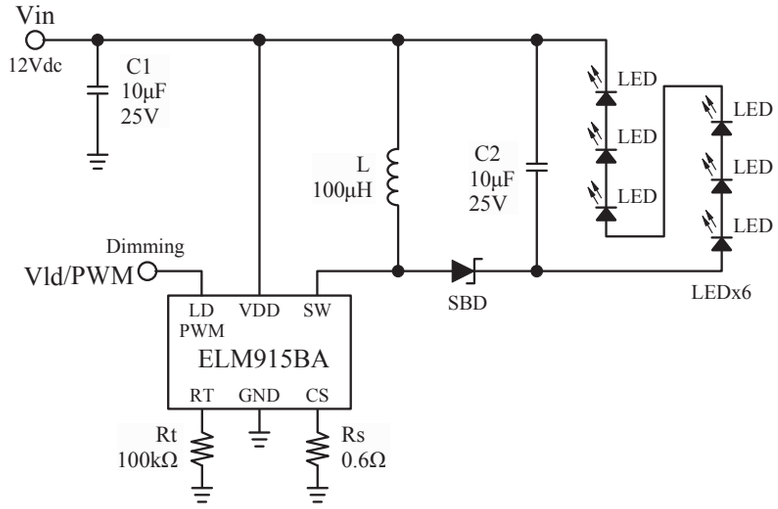


D = Vled / Vin = 3.5 / 12 = 0.292, Rs = 0.25 / Imax. = 0.25 / 420mA = 0.595 Ω

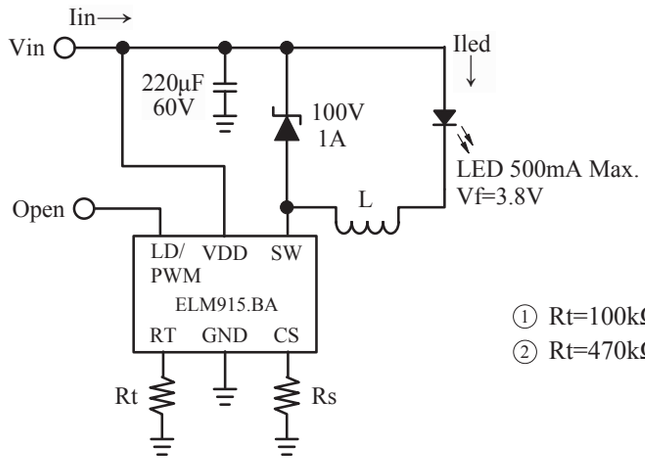
ΔI = 140mA = Vled / L × Toff = 3.5 / L × 0.7µ, L = 3.5 × 0.7µ / 0.14 = 17.5µH

The duty would be changed by Vin voltage.

5) Buck-boost topology application

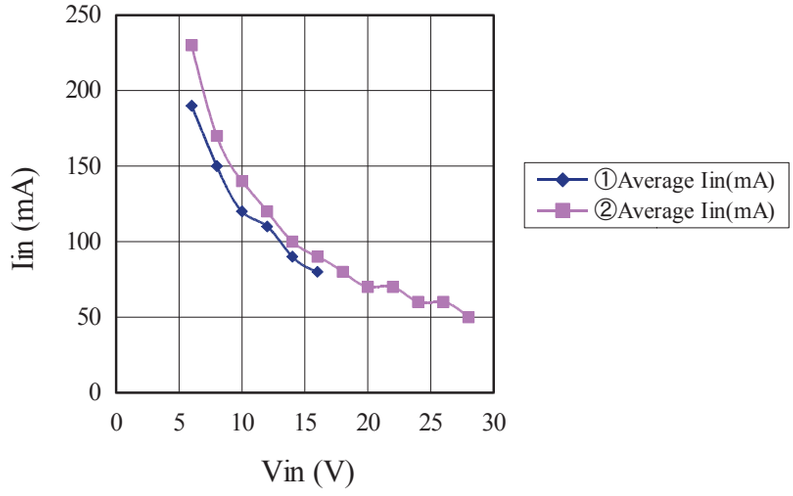


■1 LED buck topology application characteristics



① Rt=100kΩ, L=15µH, Rs=0.5Ω
② Rt=470kΩ, L=100µH, Rs=0.5Ω

Vin vs Iin



Vin-Average Iled