ELM915BA 50V 1A switching LED driver

■General description

ELM915BA is capable of driving single or multiple series connected LEDs efficiently from a voltage source higher than the LED voltage. ELM915BA is Buck and Buck-Boost controller with internal switching which can stress 1A peak current stress. The controller operating wide input voltage range from 6V to 50V.

ELM915BA consists of an output switch and a high-side output current sensing circuit that uses an external resistor to set the nominal average output current. Through applying an external control signal to the LD/PWM pin, it can adjust the output current to above or below the set value. The LD/PWM pin will accept either a DC voltage or a PWM waveform to provide a continuous or a gated output current. The LD/PWM also provide 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
- Over temperature protection : 155±30°C
- Over voltage protection : 53V±5%
- Internal NMOS switch : 54V
- NMOS with peak current : 1A
- Low quiescent current : <250μA
- High efficiency : Max.90%
- Wide input voltage range : 6V to 50V
- 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
Input voltage	Vdd	60	V
SW output peak current	Isw	1	A
Other I/O pin voltage	Vio	7	V
Junction temperature	Tj	+150	°C
Power dissipation	Pd	450	mW
Operating ambient temperature	Top	-40 to +85	°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

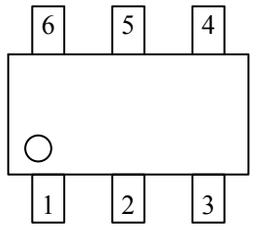
Symbol		
a	Package	B: SOT-26
b	Product version	A
c	Taping direction	S: Refer to PKG file

ELM915BA - S
↑↑ ↑
a b c

∗ Taping direction is one way.

■Pin configuration

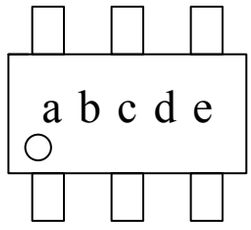
SOT-26(TOP VIEW)



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

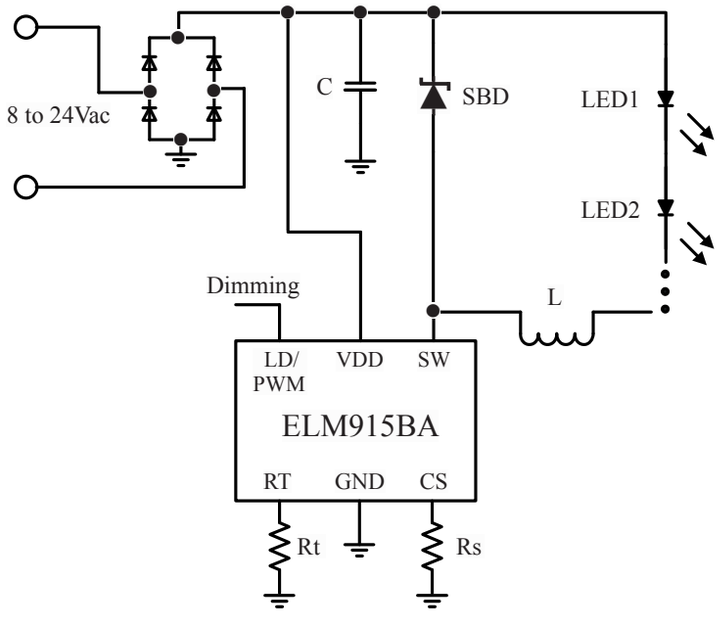
■Marking

SOT-26

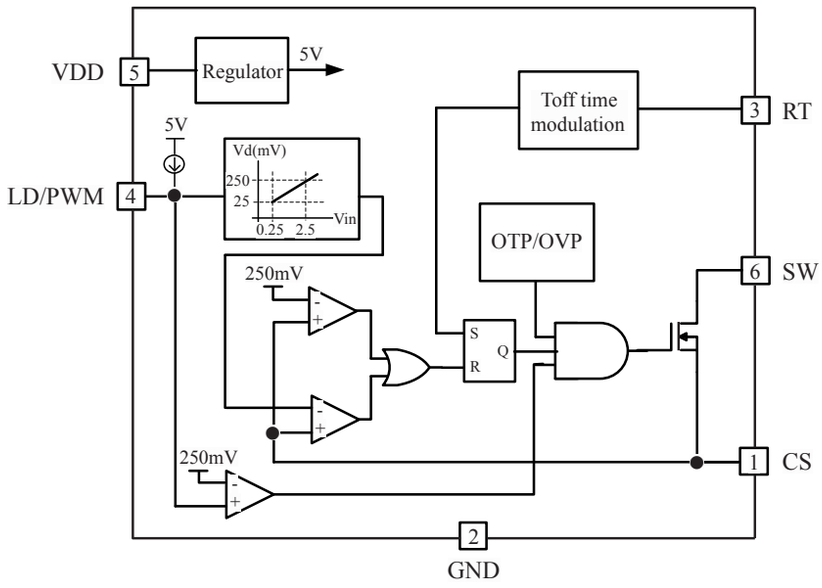


a to e : Assembly lot No. ——
A to Z (I, O, X excepted) and 0 to 9

■Standard circuit



■Block diagram



■Electrical characteristics

Vin=6.0V Top=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input DC supply voltage range	Vin	Input voltage	6		50	V
LD/PWM Pull-up current	Ild			4.5		μA
Shut-down mode supply current	Iin_SD	LD/PWM to GND, Vin=6V	450	600	750	μA
VDD under voltage lockout threshold	UVLO	Vdd rising	4.86	5.40	5.94	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(200kΩ)	Toff	Rt=200kΩ, Vin=6V, Vcs=0.4V		2.5		μs
Constant off time(820kΩ)	Toff	Rt=820kΩ, Vin=6V, Vcs=0.4V		9.0		μs
SW switch on resistor	Rsw(on)	Vin=6V, Vcs=0V			0.5	Ω
Current sense blanking time	Tblank	Vld/pwm=Vdd, Vcs=0.4V			500	ns
Voltage overvoltage protection	OVP		50	53	56	V
Overheat protection temperature	OTP		125	155	185	°C

■Application notes

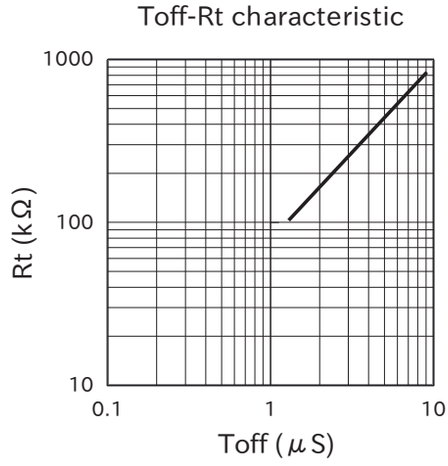
1) Setting peak current with external resistor Rs

ELM915BA is open loop peak current mode driver with internal power switch; Which peak current setting by external resistor Rs connected between CS and GND.

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

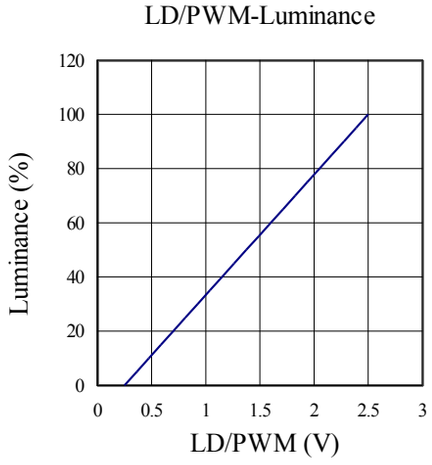
2) Setting constant off time value (Toff)

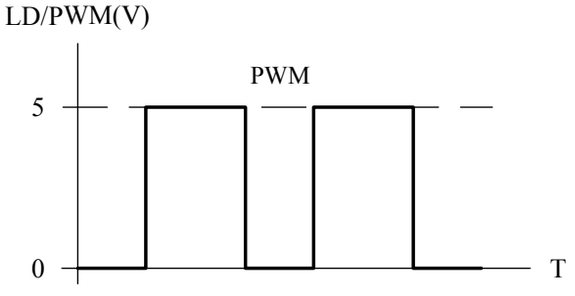
The RT pin can set internal power switch of time with period. The time with period is constant when resistor value between RT to GND is fixed. Following diagram is the reference data for setting the off-time.



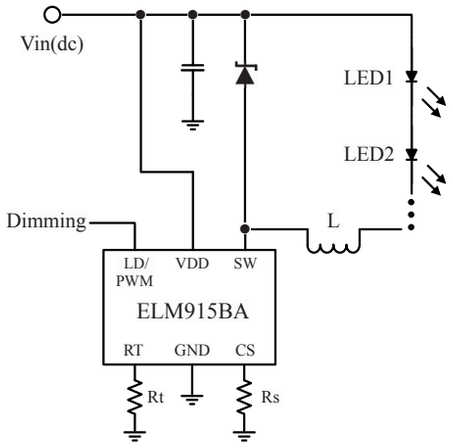
3) Dimming function

ELM915BA is capable of two types of dimming function-linear and PWM dimming. The linear dimming function works by setting the LD/PWM voltage between 0.25V to 2.5V. ELM915BA shutdowns once the LD/PWM voltage is bellow 0.25V.





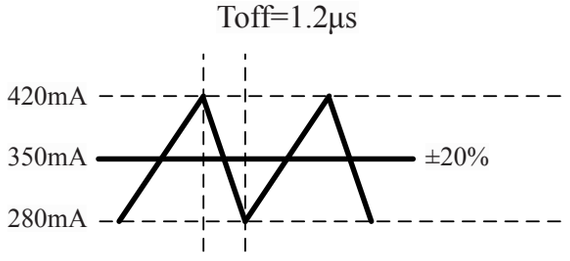
4) Buck topology application



The above diagram is buck topology circuit. The input and output specifications as following.

Vin = 12Vdc. Vled = Vo = 3.5V

LED average current is 350mA, and the current ripple is ±20%. If constant off time is 1.2μs, then set Rt to 100kΩ.



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

ΔI = Vled / L × Toff ⇒ 140mA = 3.5 / L × 1.2μs, L = 3.5 × 1.2μs / 0.14 = 30μH

The duty will change when Vin voltage varies.

5) Buck-boost topology application