

RGB LED Driver With Dimming

❖ GENERAL DESCRIPTION

AX2005 series are 3-channels RGB LED Driver, it provide a constant current for LED, and the LED current can be set by external resistance. Independent dimming function can be changed each LED for different current easily. Input a different duty or frequency clock to Dim pin can change LED current.

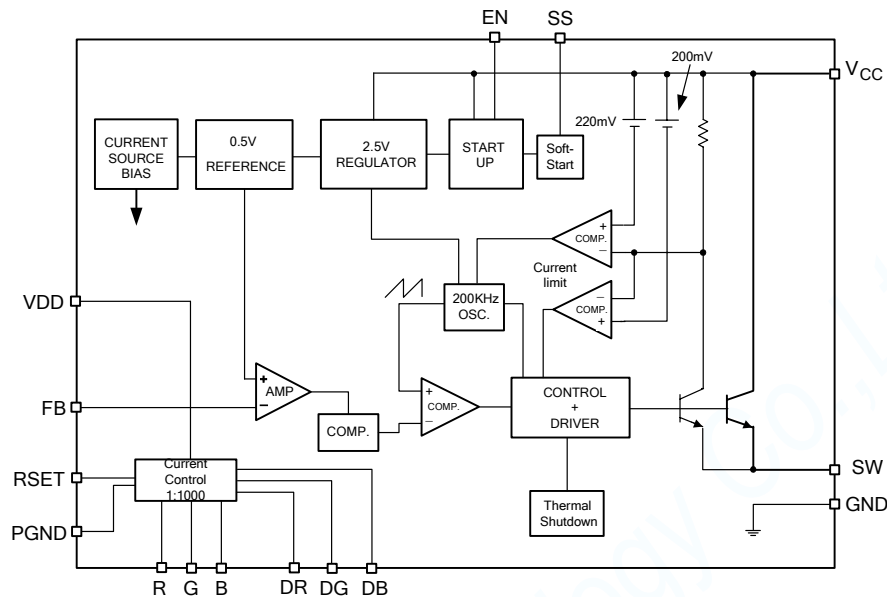
The AX2005 series are monolithic IC designed for a step-down DC/DC converter, and own the ability of driving a 1.2A load without additional transistor. The external shutdown function can be controlled by logic level and then come into standby mode. The internal compensation makes feedback control having good line and load regulation without external design. Regarding protected function, thermal shutdown is to prevent over temperature operating from damage, and current limit is against over current operating of the output switch. If current limit function occurs, the switching frequency will be reduced. This converter also contains an error amplifier circuit as well as a soft-start circuit that prevents inrush-current at startup; the soft-start time is set by an outside capacitor.

The AX2005 series operates at a switching frequency of 200KHz thus allow smaller sized filter components than what would be needed with lower frequency switching regulators. Other features include a guaranteed +3% tolerance on feedback voltage under specified input voltage and output load conditions, the chips is available in a 16-lead TSSOP Expose-Pad package.

❖ FEATURES

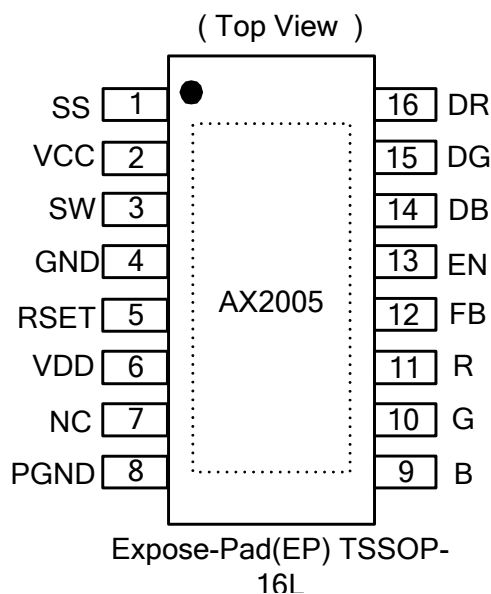
- Output voltage: adjustable output version.
- Adjustable version output voltage range: 0.5V to 22V.
- Operating voltage can be up to 24V.
- Output load current: 1.2A.
- 200KHz fixed switching frequency.
- Low power standby mode.
- Thermal-shutdown and current-limit protection.
- Short Circuit Protect (SCP).
- 3-channel independent LED Dimming maximum 500KHz.
- LED current can be programming.
- Expose-Pad (EP) TSSOP-16 Pb-Free packages.
- Built-in switching transistor on chip.

❖ BLOCK DIAGRAM



❖ PIN ASSIGNMENT

The package of AX2005 is EP TSSOP-16L; the pin assignment is given by:

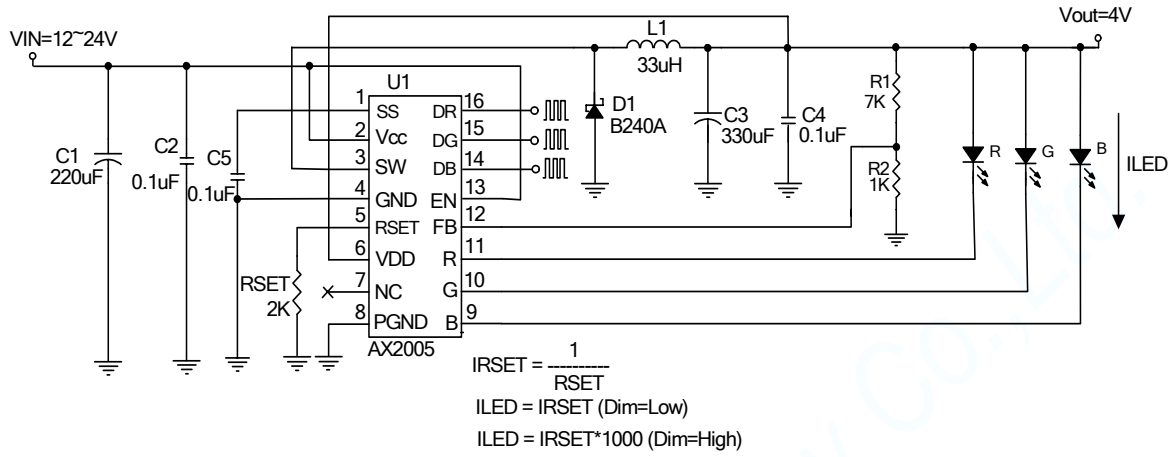


Name	Description
VCC	Operating voltage input
SW	Switching output
FB	Output voltage feedback control
EN	ON/OFF Shutdown
V _{SS}	GND pin
RSET	LED Current Setting
DR	R-LED Current Dimming
DG	G-LED Current Dimming
DB	B-LED Current Dimming
R	R-LED Current Source
G	G-LED Current Source
B	B-LED Current Source
VDD	Digital Control Power Input
PGND	Power Ground pin
SS	Soft Start

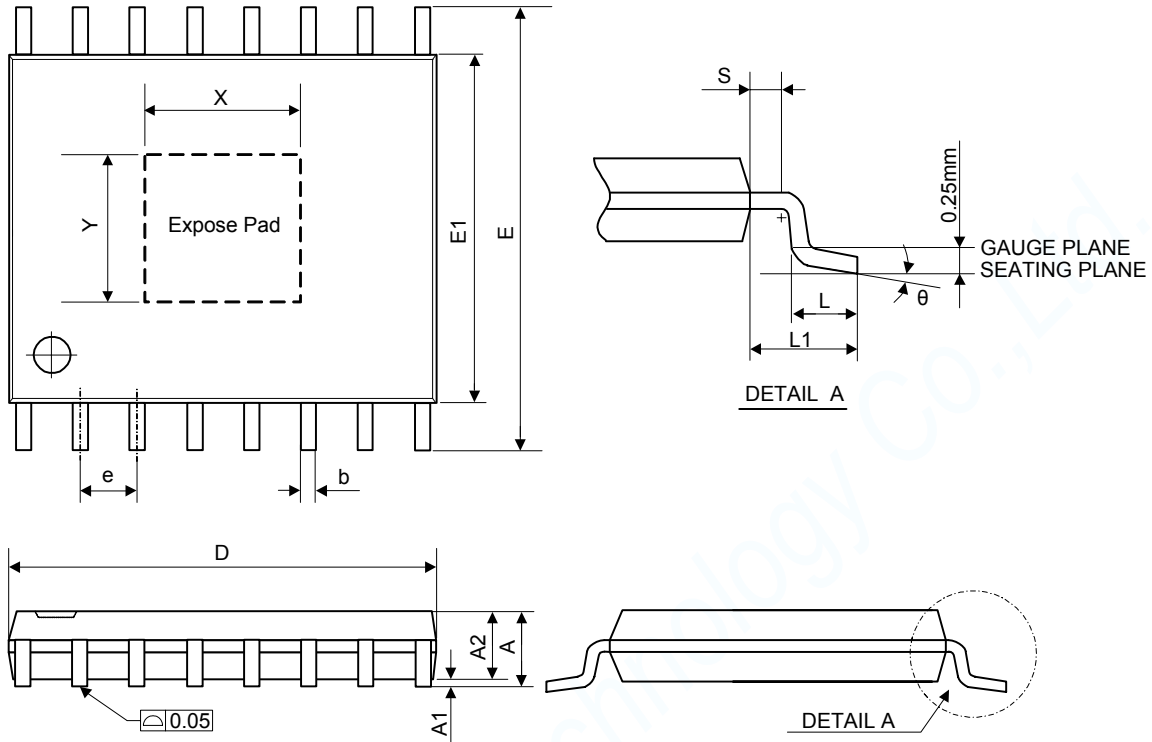
❖ **Electrical Characteristics** (Unless otherwise specified, $T_a=25^{\circ}\text{C}$, $V_{CC}=12\text{V}$, $I_{LOAD} = 0.2\text{A}$)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Feedback Voltage	V_{FB}	$I_{OUT}=0.2\text{A}$	0.485	0.500	0.515	V
Quiescent Current	I_Q	$V_{FB}=1.2\text{V}$ force driver off $DR/DG/DB=0\text{V}$	-	7	10	mA
Feedback bias current	I_{FB}	$I_{OUT}=0.1\text{A}$	-	-50	-500	nA
Shutdown supply Current	I_{SD}	$V_{EN} = 0\text{V}$	-	2	10	μA
Oscillator frequency	F_{OSC}		140	200	260	KHz
Oscillator frequency of short circuit protect	F_{SCP}	When Current Limit happened	-	50	-	KHz
Max. Duty Cycle (ON)	DC	$V_{FB}=1.2\text{V}$ force driver off	-	0	-	%
Min. Duty Cycle (OFF)		$V_{FB}=0\text{V}$ force driver on	-	100	-	
Current limit	I_{CL}	Peak current, No outside circuit $V_{FB}=0\text{V}$ force driver on	1.5	-	-	A
RSET Current	I_{RSET}	$I_{SET}=1/R_{SET}$	-	-	1	mA
Saturation voltage	V_{SAT}	$I_{OUT}=1.0\text{A}$, No outside circuit $V_{FB}=0\text{V}$ force driver on		1.2	1.5	V
Dimming Frequency	F_{DIM}	DR/DG/DB Pin Frequency input	-	-	500K	Hz
Dimming Voltage	V_{DIM-H}	DR/DG/DB Pin High input	-	1.2	2.0	V
	V_{DIM-L}	DR/DG/DB Pin Low input	0.5		-	
Soft Start Current	I_{SS}		1	3	5	μA
SW pin=0V	SW pin leakage current	No outside circuit $V_{FB}=1.0\text{V}$ force driver off	-	-	-200	μA
SW pin=-0.8V		$V_{CC}=24\text{V}$ force driver off	-	-5	-	mA
EN pin logic input threshold voltage	V_{IH}	High (regulator ON)	-	1.2	2.0	V
	V_{IL}	Low (regulator OFF)	0.5		-	
EN pin logic input current	I_H	$V_{EN}=2.5\text{V}$ (ON)	-	20	-	μA
EN pin input current	I_L	$V_{EN}=0.3\text{V}$ (OFF)	-	-5	-	
Thermal shutdown Temp	TSD		-	145	-	$^{\circ}\text{C}$

❖ **Application Circuit**



❖ Package Outlines



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.60	1.75	0.055	0.063	0.069
A1	0.10	-	0.25	0.040	-	0.100
A2	1.30	1.45	1.50	0.051	0.057	0.059
C	0.19	0.20	0.25	0.0075	0.008	0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E	3.80	3.90	4.00	0.150	0.154	0.157
H	5.79	5.99	6.20	0.228	0.236	0.244
L	0.38	0.71	1.27	0.015	0.028	0.050
b	0.33	0.41	0.51	0.013	0.016	0.020
e	1.27 TYP			0.050 TYP		
y	-	-	0.10	-	-	0.004
X	-	3.43	-	-	0.135	-
Y	-	2.41	-	-	0.095	-
θ	0°	-	8°	0°	-	8°