

1200mA step down - LED controller IC ILD4120

Small Signal Discretes



Never stop thinking

Edition 2009-07-06

**Published by Infineon Technologies AG,
81726 München, Germany**

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ILD4120, 1200mA step down - LED controller IC

Revision History: 2009-07-06, Rev. 1.0

Page	Subjects (major changes since last revision)
	I

1 Bipolar Buck- converter LED Controller IC

Features

- Wide Input Voltage Range: 4.5 V ... 40 V
- Internal Power Switch
- Over voltage protection
- Over current protection
- Temperature shut down mechanism
- Inherent Open- Circuit LED protection
- Soft- Start capability
- Low shut down current < 200 nA in operating voltage range
- Maximum operating average LED output current: 1200 mA
- Multifunctional Enable Pin
- Analog and PWM dimming possible
- PWM control for LED brightness possible
- Typical 3% output current accuracy
- Minimum external component required
- Package: DSO-8 with exposed pad



Applications

- LED Controller for industrial applications
- Universal Constant Current Source
- General Illumination e.g. Halogen Replacement
- Residential Architectural and Industrial Commercial Lighting for in- and outdoor
- Signal and Marker Lights for Orientation or Navigation (e.g. steps, exit ways, etc.)

2 Description

The ILD4120 is a hysteretic buck LED controller IC for industrial applications realized in a bipolar IC technology. The LED Controller is capable to drive high current, high brightness LEDs up to 1200 mA.

The IC incorporates a wide input voltage range, an internal power switch and the output current level can be adjusted with an external sense resistor.

According to the multifunctional control pin the IC can be switched on and off by an external signal, which is also suitable to regulate brightness of the LEDs by PWM or analog dimming.

Depending on the value of the switching inductor the switching frequency and the voltage ripple could be set.

The precise internal bandgap stabilizes the circuit and provides stable current conditions over temperature range.

Furthermore, over voltage protection and temperature shut down mechanism enforce the IC to protect attached LEDs.

Additional features are included to protect the LED's from overload, short circuit events as well as from over voltage. The LED's can be also protected against thermal overload by thermally coupling the LED's to the ILD4120.

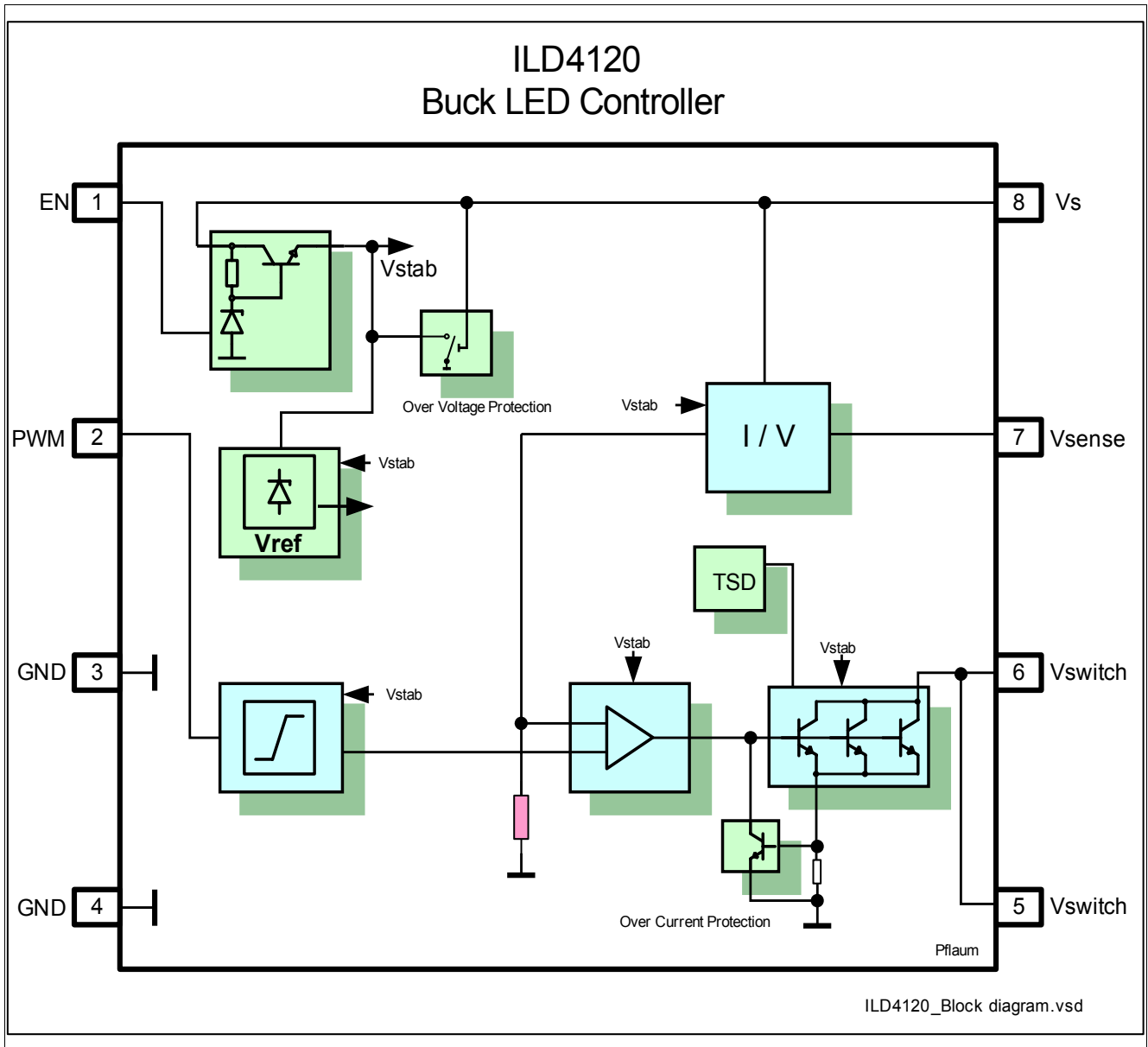


Figure 1 Block diagram

Pin Definition

Table 1 Pin definition and function

Pin number	Pin Symbol	Function
1	EN	Enable Voltage
2	PWM	Multifunctional Pin; Analog and digital (<i>PWM input</i>) dimming
3	GND	IC ground
4	GND	IC ground
5	V_{switch}	Power Switch Output
6	V_{switch}	Power Switch Output
7	I_{sense}	LED current sense pin
8	V_s	Supply Voltage

Maximum Ratings

Table 2 Maximum ratings

Parameter	Symbol	Limit Value	Unit
Supply voltage	V_s	45	V
Average Output current	I_{out}	1500	mA
Total Power Dissipation; $T_s = xx^\circ\text{C}$	P_{tot}	tbf	mW
Junction temperature	T_J	150	$^\circ\text{C}$
Storage temperature range	T_{STG}	-65... 150	$^\circ\text{C}$
ESD capability Human Body Model ¹⁾	V_{ESD_HBM}	2000	V
ESD capability Machine Model ²⁾	V_{ESD_MM}	400	V

1) For ESD testing, the chip was mounted in a DSO-8 package on an application board, where GND is electrically connected to the chip GND

2) For ESD testing, the chip was mounted in a DSO-8 package, where GND is electrically connected to the chip GND

Thermal resistance

Table 3 Thermal resistance

Parameter	Symbol	Value	Unit
Junction - solder point	R_{thJS}	tbf	K/W

3 Electrical Characteristics

3.1 DC Characteristics

4.5 V < V_s < 40 V; - 40 °C < T_J < 150 °C, all voltages with respect to ground; positive; current flowing into pin; unless otherwise specified

All parameters have been measured at 25 °C, unless otherwise specified

Table 4 DC Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Overall current consumption	$I_{S_{short}}$	tbf	tbf		mA	LEDs short; $V_s = 4.5$ V $I_{LED} = 350$ mA
Overall current consumption	$I_{S_{short}}$	tbf	tbf		mA	LEDs short; $V_s = 40$ V $I_{LED} = 350$ mA
Overall current consumption	$I_{S_{short}}$			tbf	μA	LEDs short; $V_s = 45$ V $I_{LED} = 350$ mA
Overall current consumption open load	$I_{S_{open\ load}}$		tbf		μA	$V_s = 4.5$ V $I_{LED} = 0$ mA
Overall current consumption open load	$I_{S_{open\ load}}$		tbf		μA	$V_s = 40$ V $I_{LED} = 0$ mA
Overall current consumption open load	$I_{S_{open\ load}}$		tbf		μA	$V_s = 45$ V $I_{LED} = 0$ mA
Overall standby current consumption	$I_{S_{standby}}$			200	nA	EN = 0 V; $V_s = 4.5$ V
Overall standby current consumption	$I_{S_{standby}}$			200	nA	EN = 0 V; $V_s = 40$ V
Input Current of multifunctional control pin	I_{EN}	20	40	70	μA	At any condition
Current of Sense input	I_{sense}			200	nA	At any LED current
Voltage of Sense input	V_{sense}		100		mV	$I_{LED} = 1200$ mA
Sense threshold hysteresis	$V_{sensehys}$		+/- 15		%	At any LED current
Over voltage Protection	$V_{s,OV}$	42			V	$I_{out} \rightarrow 0$ A
Residual voltage at collector of power transistor	V_{CE}		1		V	$I_{out} > 200$ mA
Temperature shut down	Th_{TSD}	115	125	135	°C	$I_{out} \rightarrow 0$ A; refer to T_J

3.2 AC Characteristics

All parameters have been measured at 25 °C, unless otherwise specified

Table 5 AC Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Switching frequency	F_{sw}		200		kHz	$V_s = 12\text{ V}$ 3 LEDs in series $R_{sense} = 100\text{ m}\Omega$ $L = 100\text{ }\mu\text{H}$ $V_{EN} = 3\text{ V}$ $I_{out} = 1200\text{ mA}$
Maximum switching frequency	F_{swmax}		500		kHz	Recommended

3.3 Digital Signals

All parameters have been measured at 25 °C, unless otherwise specified

Table 6 Digital Control Parameter (EN)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Multifunctional control pin voltage range	U_{Pon}	-0.3		40	V	
Control voltage for power on	U_{On}	2	2.2	40	V	Full LED current
Control voltage for power off	U_{Off}	-0.3		0.6	V	
Control voltage for analog dimming	U_{dim}	1		2	V	Linear dimming
PWM signal frequency	f_{PWM}			1000	Hz	$t_{duty\ cycle} = 1\%$; signal level reaches 100% in on and off mode
PWM Duty cycle	$t_{duty\ PWM}$	5			%	$f = 5\text{ KHz}$; signal level reaches 100% in on and off mode
PWM voltage	U_{PWM}			40	V	

3.4 Transient Parameters

$4.5\text{ V} < V_S < 40\text{ V}$; $-40\text{ °C} < T_J < 150\text{ °C}$, all voltages with respect to ground; positive; current flowing into pin; unless otherwise specified

All parameters have been measured at 25 °C, unless otherwise specified

Table 7 Digital Control Parameter (EN)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Response Time	T_{ON}		10		μs	EN: 0 -> 5 V @ $t_{rise} < 20\text{ns}$ $I_{out} = 1200\text{mA}$
	T_{OFF}		10		μs	EN: 5 V -> 0 @ $t_{fall} < 20\text{ ns}$ $I_{out} = 1200\text{mA}$

4 Application Circuit

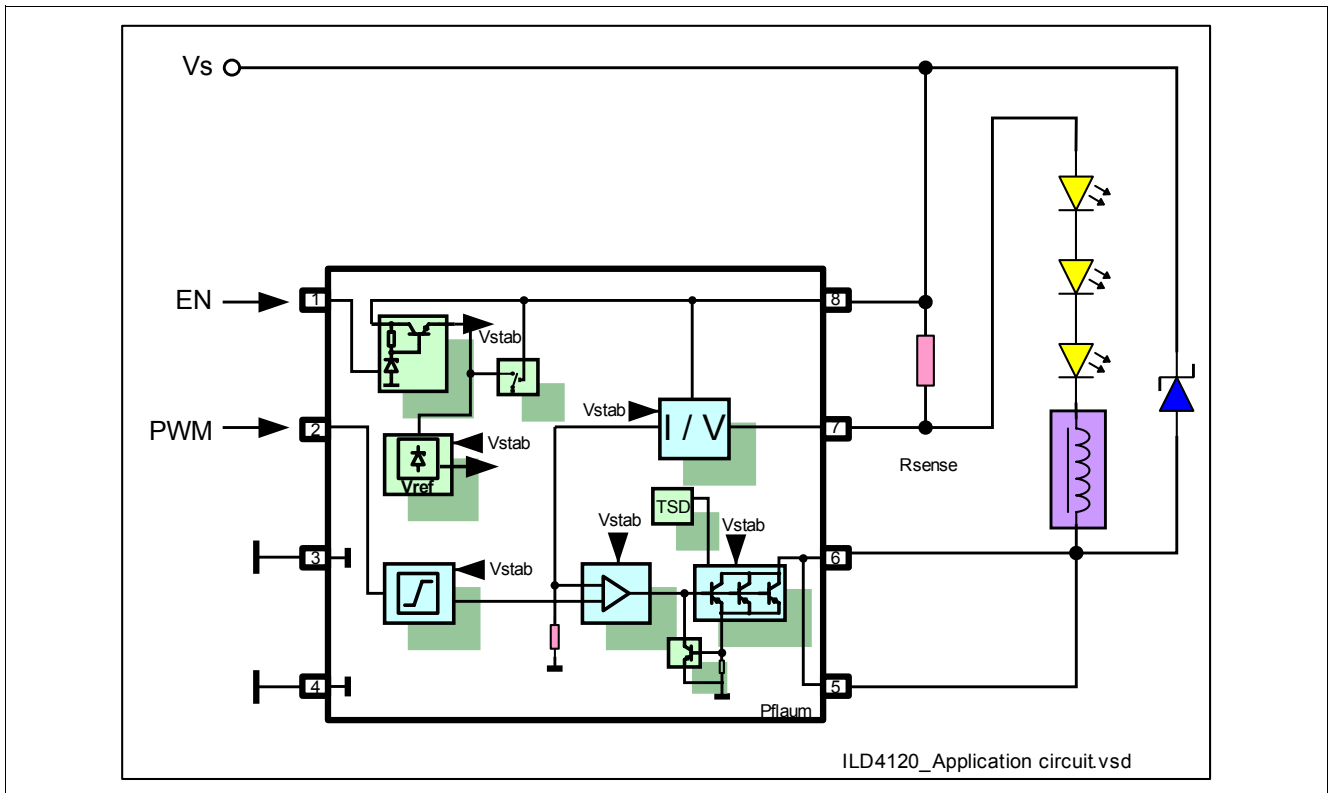


Figure 2 ILD4035; Application Circuit

5 Package Information

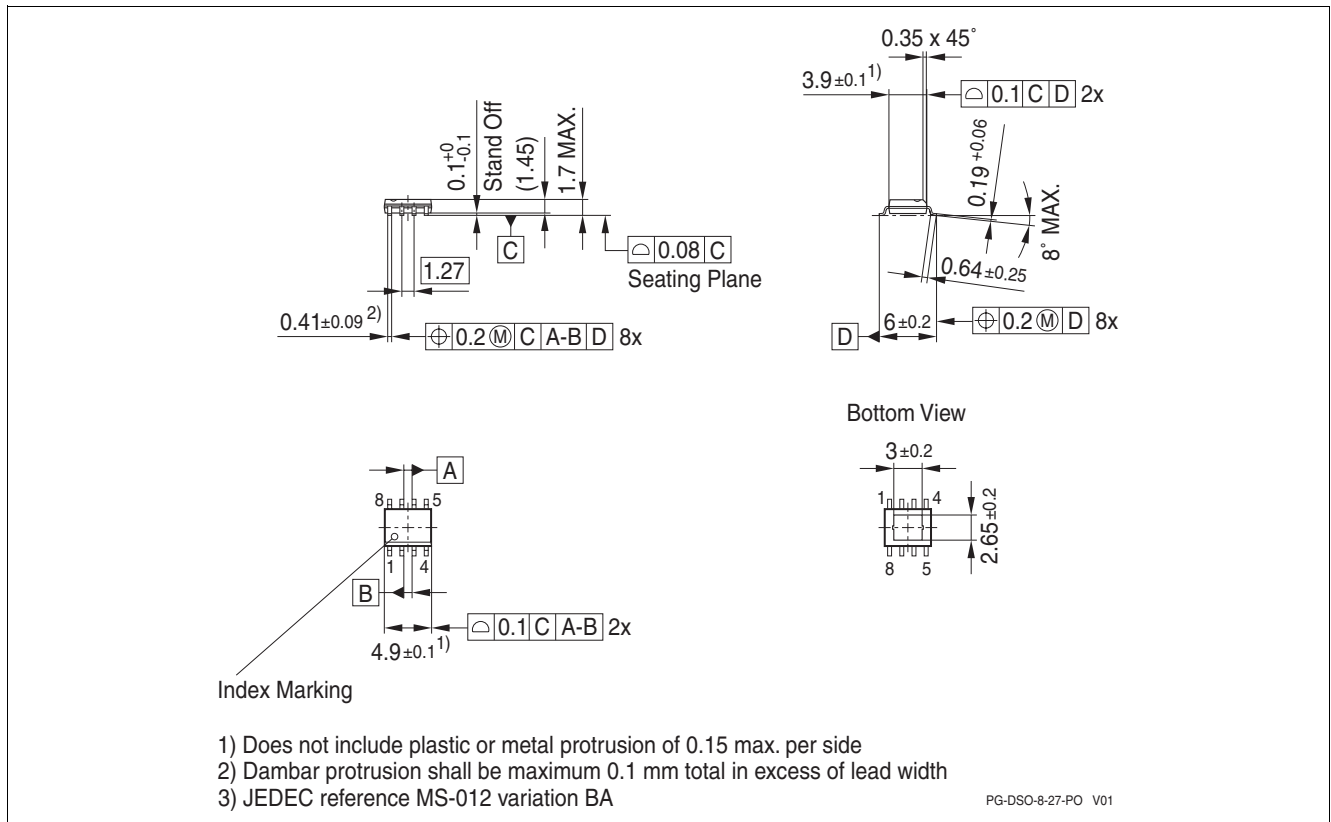


Figure 3 Package Outline; P/PG-DSO-8-27

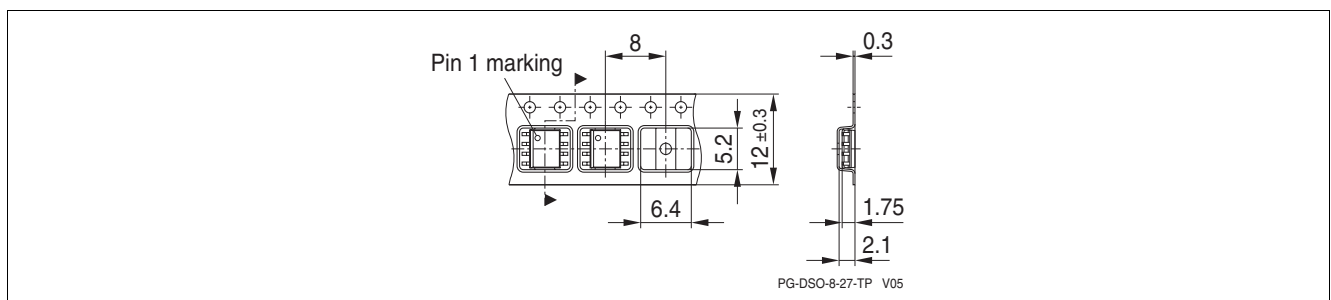


Figure 4 Tape loading