

## 3 Pin Switch-Mode LED Lamp Driver IC

### 1. Functional Description of the AMG-LL992X

The AMG-LL992X are high-voltage LED driver control IC with built-in MOSFET switch and intended for LED lighting control. They allow efficient operation of LED strings from voltage sources ranging up to 400VDC. The AMG-LL992X includes an internal high-voltage switching MOSFET controlled with fixed off-time TOFF of approximately 10 $\mu$ s. The LED string is driven at constant current, thus providing constant light output and enhanced reliability. The output current is internally fixed at 20/30/50mA. The peak current control scheme provides good regulation of the output current throughout the universal AC line voltage range of 85 to 264VAC or DC input voltage of 20 to 400V.

### 2. Features

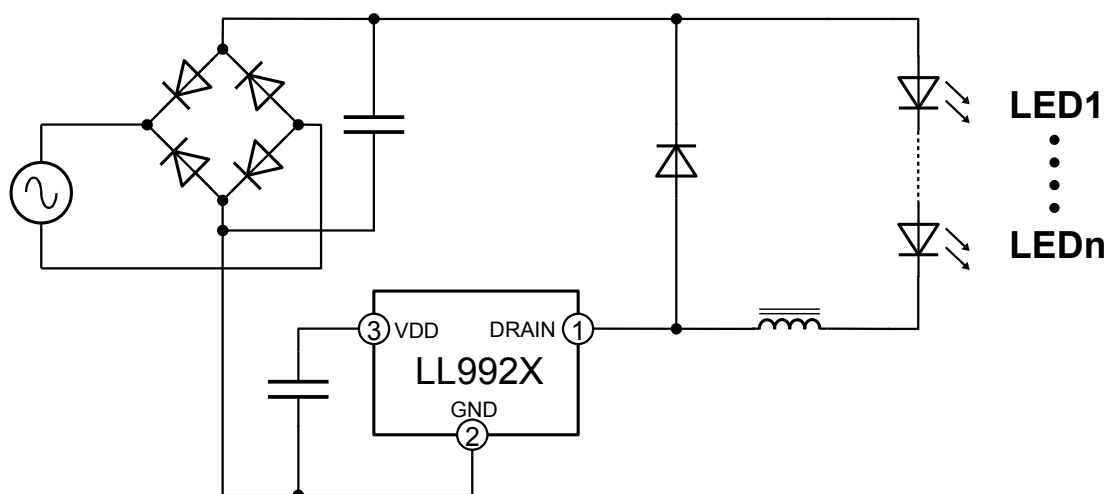
- Operating temperature range -40 ... +85 °C
- ON-resistance of the MOSFET switch 210 Ohm
- Constant output current of 20mA (LL9921), 30mA (LL9923) and 50mA (LL9922)
- Universal 85-264VAC operation
- Fixed off-time buck converter
- OFF-state breakdown voltage of the MOSFET switch not less 500 V

### 3. Application

The AMG-LL992X are suitable for:

- Decorative lighting
- Low power lighting fixtures
- LED Signs and Displays
- Architectural Lighting
- Incandescent Lamp Replacements

#### 3.1. Typical Application Circuit



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## 6. Pinning

PIN#	Symbol	Description
1	V <sub>DRAIN</sub>	Supply input
2	GND	Ground
3	V <sub>DD</sub>	Linear regulator output

## 7. Absolute Maximum Ratings

The Absolute Maximum Ratings may not be exceeded under any circumstances.

#	Symbol	Parameter	Min	Max	Unit
1	V <sub>DRAIN</sub>	Supply input voltage	-0.3	420	V
2	T <sub>j</sub>	Junction temperature		125	C
3	T <sub>s</sub>	Storage temperature	-65	150	C
6	V <sub>DDmax</sub>	Max. voltage on V <sub>DD</sub>	-0.3	10	V

Note: All voltages are with respect to GND

## 8. Electrical Characteristics

### 8.1. Operational Range

(T<sub>a</sub>=25°C unless noted otherwise)

#	Symbol	Parameter	Min	Max	Unit
1	V <sub>DRAIN</sub>	Supply input voltage	20	400	V
2	T <sub>a</sub>	Operating ambient temperature	-40	85	°C
3	R <sub>thja</sub>	Thermal resistance junction ambient		46	K/W
4	R <sub>thjc</sub>	Thermal resistance junction case		12	K/W

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### 8.2. DC Characteristics

(Ta=25°C unless noted otherwise)

#	Symbol	Rem.	Parameter	Conditions	Min	Typ	Max	Unit
1	V <sub>DDR</sub>		Regulator output voltage	V <sub>DRAIN</sub> = (20 - 400)V	5.5		9.0	V
2	V <sub>UVLO</sub>		Undervoltage threshold	I <sub>DRAIN</sub> = 20 mA	3.4		V <sub>DDR</sub> -0.3	V
3	R <sub>ON</sub>		ON-resistance of the switch (DRAIN)	V <sub>DD</sub> =V <sub>DDR</sub> I <sub>DRAIN</sub> = 20 mA			210	Ω
4	I <sub>DD</sub>		Low-voltage (control) part of IC consumption current	V <sub>DD</sub> = 9.5 V V <sub>DRAIN</sub> = 40 V			350	μA
5	I <sub>SAT</sub>	*	MOSFET saturation current (DRAIN pin)	V <sub>DD</sub> =V <sub>DDR</sub> V <sub>DRAIN</sub> = 50 V	100			mA
6	V <sub>BR</sub>	*	MOSFET switch breakdown voltage	V <sub>DD</sub> =V <sub>DDR</sub> I <sub>DRAIN</sub> = 1 mA	500			V
7	I <sub>TH</sub>	**	Threshold current LL9923	V <sub>DD</sub> =V <sub>DDR</sub> V <sub>DRAIN</sub> = 50 V -40°C < Ta < 85°C	30.8		38.2	mA
			Threshold current LL9921		20.5		25.5	mA
			Threshold current LL9922		52.0		63.0	mA

Note: \* Confirmed during the Wafertest only

\*\* Adjusted during the Wafertest

### 8.3. AC Characteristics

(Ta=25°C unless noted otherwise)

#	Symbol	Rem.	Parameter	Min	Typ	Max	Unit
1	T <sub>BLANK</sub>	*	Leading Edge Blanking Delay	200		400	ns
2	T <sub>ON</sub>	*	Minimum ON-time of the switch (DRAIN)			650	ns
3	T <sub>OFF</sub>	**	OFF time (DRAIN )	8.0		13.0	μs

Note: \* Confirmed during the Wafertest only

\*\* Adjusted during the Wafertest

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**9. Application**

**9.1. Example Application Circuit**

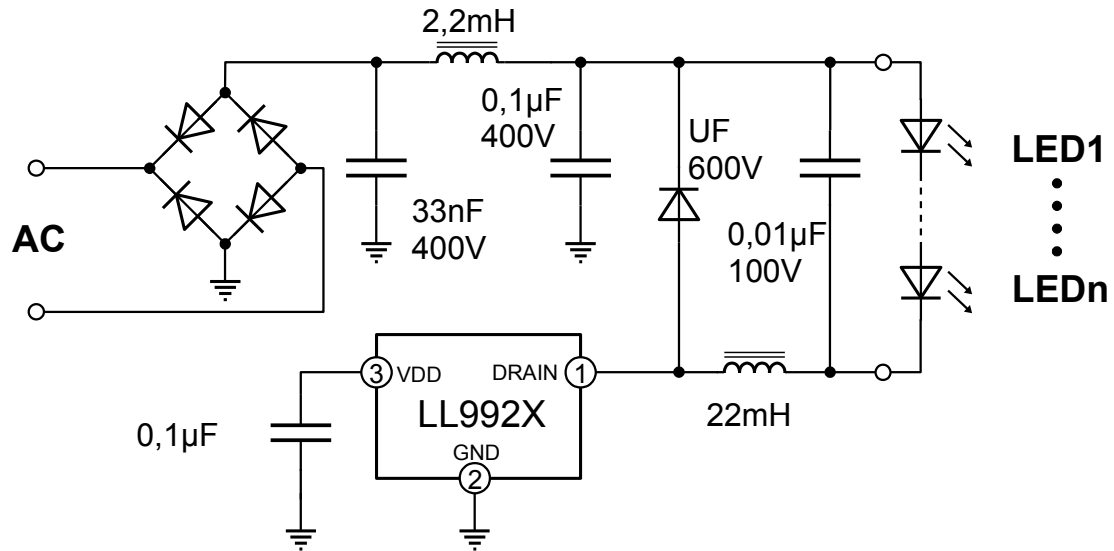


Figure 2:

**10. Ordering Information**

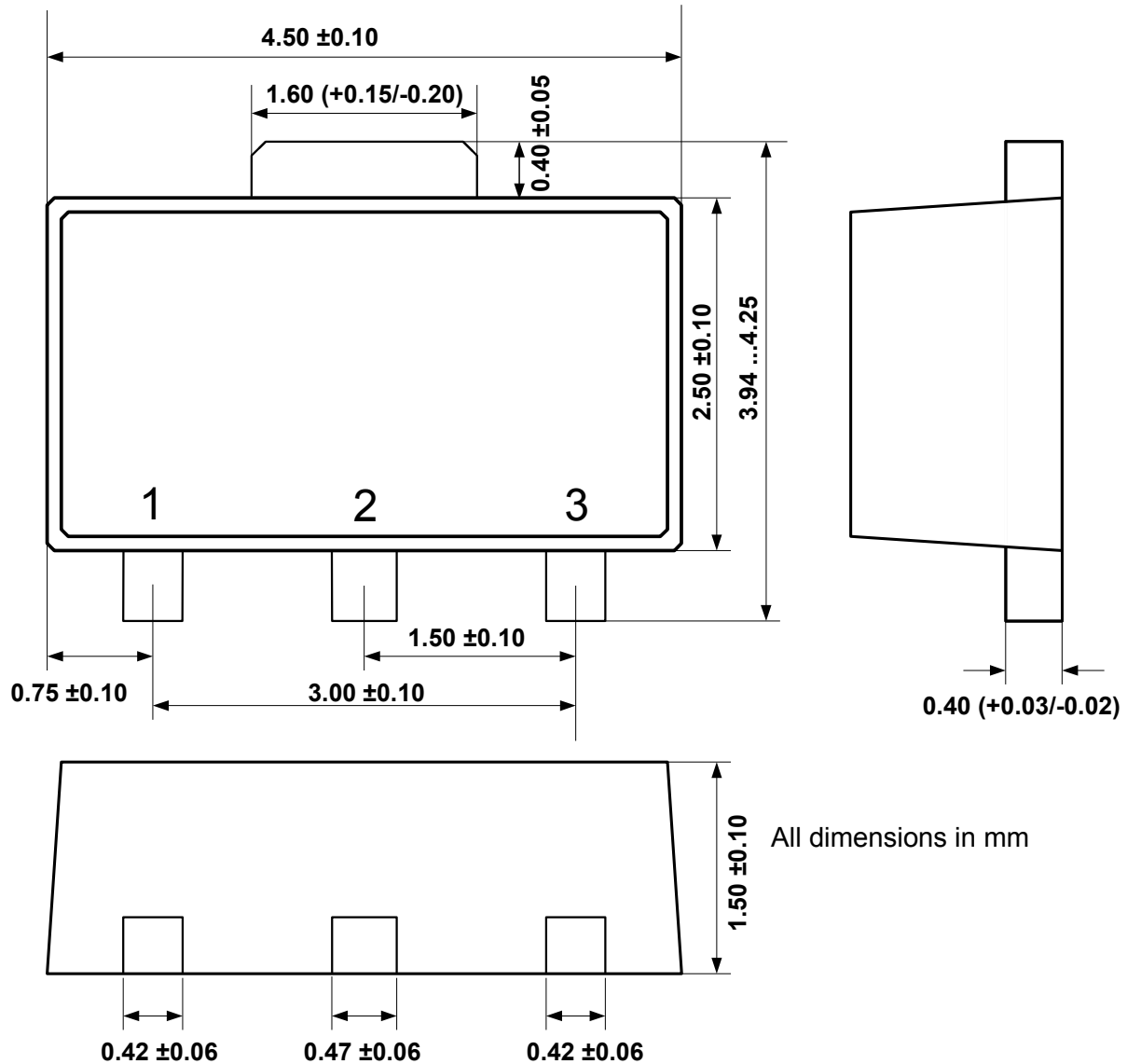
AMG-LL9923-IST89R  
 AMG-LL9921-IST89R  
 AMG-LL9922-IST89R

SOT89 in tape and reel  
 SOT89 in tape and reel  
 SOT89 in tape and reel

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**11. IC-Package**

**SOT89**



**12. IC-Marking**

$\alpha$ LL9921 or  $\alpha$ LL9922 or  $\alpha$ LL9923

4 digit date code

7 digit lot code

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### 13. Notes and Cautions

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#### 13.1. ESD Protection

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The Requirements for Handling Electrostatic Discharge Sensitive Devices are described in the JEDEC standard JESD625-A. Please note the following recommendations:

- When handling the device, operators must be grounded by wearing a for the purpose designed grounded wrist strap with at least 1MΩ resistance and direct skin contact.
- Operators must at all times wear ESD protective shoes or the area should be surrounded by for ESD protection intended floor mats.
- Opening of the protective ESD package that the device is delivered in must only occur at a properly equipped ESD workbench. The tape with which the package is held together must be cut with a sharp cutting tool, never pulled or ripped off.
- Any unnecessary contact with the device or any unprotected conductive points should be avoided.
- Work only with qualified and grounded tools, measuring equipment, casing and workbenches.
- Outside properly protected ESD-areas the device or any electronic assembly that it may be part of should always be transported in EGB/ESD shielded packaging.

#### 13.2. Storage conditions

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The AMG-LL992X corresponds to moisture sensitivity classification ML2, according to JEDEC standard J-STD-020, and should be handled and stored according to J-STD-033.

### 14. Disclaimer

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### 15. Contact Information

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This data sheet is published by alpha microelectronics gmbh. To order samples or inquire information please contact:

alpha microelectronics gmbh  
Im Technologiepark 1  
15236 Frankfurt (Oder)  
Germany

[am.info@alpha-microelectronics.de](mailto:am.info@alpha-microelectronics.de)  
[www.alpha-microelectronics.de](http://www.alpha-microelectronics.de)

+49-335-557-1750 (telephone)  
+49-335-557-1759 (fax)

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