IK402U is a high-stable current source IC designed to be used as a constant current LED driver. Application of a constant current source provides continuous brightness of LED light and long LED life time. Moreover, a constant current source provides an over-temperature protection to LED.

**FEATURES**
- High-stability output current
- Low dropout voltage
- Easy adjustable output current
- Negative thermal coefficient of output current
- Small overall dimensions, possible chip mount in a single package with LED
- Low cost, no external elements, simple use
- LED drive current of 22mA
- Output current adjustable up to 65mA with external resistor
- Supply voltage up to 42V
- Easy paralleling of drivers to increase current
- Low voltage overhead of 1.2V
- High current accuracy at supply voltage variation
- No EMI
- ESD Rating: Human Body Model 2KV
- Reduced output current at higher temperatures (-) negative thermal coefficient of -0.1 % / K

**APPLICATION**
- Channel letters for advertising, LED strips for decorative lighting
- Aircraft, train, ship illumination
- Retrofits for general lighting, white goods like refrigerator lighting, Medical lighting
- Automotive applications like CHMSL and rear combination lights

---

**Part NO.** | **Package** | **Current Range (mA)** | **Maximum Voltage (V)** | **PD (mW)** | **Compatibility Device**
---|---|---|---|---|---
IK402U | SO23-6L (SC74) | 22–65 | 40 | 300 | BCR402U (Infineon) KCR402T (KEC)

---

For more information about LED Lighting driver IC, please refer to the Homepage.
**Universal High-Voltage LED Driver**

The IL9910 is a PWM high-efficient LED driver specifically designed for driving multi-LED strings or arrays, supplied from voltage sources rating from 8Vdc up to 450Vdc. IC controls an external MOSFET at fixed switching frequency up to 300 kHz. The operating frequency can be set using an external resistor.

**FEATURES**  
- 8 V to 450 V input range  
- LED string current can be set from a few mA to more than 1 A  
- Brightness control for LED string from one to hundreds of diodes  
- PWM low-frequency LED dimming  
- Functional Analogue of HV9910 (Supertex)  
- Linear LED dimming  
- Operating temperature range -40℃ to +85℃

**APPLICATION**  
- DC/DC or AC/DC LED Driver applications  
- Low-cost off-line buck, boost or buck-boost converter control IC  
- RGB Backlighting LED Driver  
- Back Lighting of Flat Panel Displays  
- General purpose constant current source  
- Signage and Decorative LED Lighting  
- Automotive  
- Chargers

**Typical Application Circuit**

---

**LED Driver with Average-Mode Constant Current Control**

The IL9961 is an average current mode control LED driver IC operating in a constant off-time mode. This control IC does not produce a peak-to-average error, and therefore greatly improves accuracy, line and load regulation of the LED current without any need for loop compensation or high-side current sensing. The output LED current accuracy is ±3%. The IC is equipped with a current limit comparator for hiccupmode output short circuit protection. The IL9961 can be powered from an 8.0~450V supply. A PWM dimming input is provided that accepts an external control TTL compatible signal. The output current can be programmed by an internal 275mV reference, or controlled externally through a 0~1.5V dimming input. IL9961 is pin-to-pin compatible with IL9910 and can be used as a drop-in replacement for many applications to improve the LED current accuracy and regulation.

**FEATURES**  
- Input Voltage range VIN from 8 V to 450 V  
- Control by Fast average current  
- Programmed fixed duration of the current off state in the induction coil  
- Linear LED dimming  
- Option of LED brightness trimming by low frequency PWM signal  
- Output short circuit protection  
- IL9910 IC pin-to-pin compatibility  
- Functional Analogue of HV9961 (Supertex)  
- Operating temperature range -40℃ to +125℃

**APPLICATION**  
- DC/DC or AC/DC LED Driver applications  
- LED backlight driver for LCD displays  
- General purpose constant current source  
- LED panels and screens  
- Architectural and decorative LED lighting  
- LED street lighting

**Typical Application Circuit**

---
## Compatibility and Functional Differences Between the IL9961 and IL9910 LED Drivers

<table>
<thead>
<tr>
<th>Feature</th>
<th>IL9910</th>
<th>IL9961</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed-Frequency Mode</td>
<td>Resistor from RT to GND</td>
<td>N/A</td>
</tr>
<tr>
<td>Fixed Off-Time Mode</td>
<td>Resistor from RT to GATE</td>
<td>Resistor from RT to GND (Value adjustment needed for conversion from IL9910)</td>
</tr>
<tr>
<td>Current Threshold</td>
<td>250mV or ( V_{LD} ) (peak)</td>
<td>272mV or ( V_{LD}/5.5 ) (average)</td>
</tr>
<tr>
<td>Current Threshold Accuracy</td>
<td>10% Auto-Zero</td>
<td></td>
</tr>
<tr>
<td>LED Current Accuracy</td>
<td>Depends on inductance and switching frequency variation</td>
<td>Independent of inductance and switching frequency variation</td>
</tr>
<tr>
<td>LED Current Regulation</td>
<td>Poor. LED current depends on input and output voltage</td>
<td>Good</td>
</tr>
<tr>
<td>LD (Linear attenuation)</td>
<td>0~250mV</td>
<td>0.2V ((0.15V)~1.5V)</td>
</tr>
<tr>
<td>Residual LED Current ( V_{LD}=GND )</td>
<td>5% (typ.) of ( I_{LED} @ V_{LD}=250mV )</td>
<td>0A</td>
</tr>
<tr>
<td>Current Limit Threshold</td>
<td>None</td>
<td>440mV</td>
</tr>
<tr>
<td>Hiccup Time</td>
<td>N/A</td>
<td>400(\mu s)</td>
</tr>
<tr>
<td>Minimum On-Time</td>
<td>465ns</td>
<td>1000ns</td>
</tr>
<tr>
<td>Maximum Duty Cycle</td>
<td>0.5 (fixed freq.), 0.8 (fixed ( T_{off} ))</td>
<td>0.75</td>
</tr>
</tbody>
</table>

**Typical Application Circuit of IL9910 and IL9961**

---

**High-Voltage LED Driver with Build-in MOSFET Switch**

IK2306 is high-voltage LED driver control ICs with built-in MOSFET switch and purposed for LED lighting control. IC allows efficient operation of LED strings from voltage sources ranging up to 400 VDC. The IK2306 includes an internal high-voltage switching MOSFET controlled with fixed off-time \( T_{off} \) 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 50mA for IK2306. 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.

**FEATURES**
- ON-resistance of the MOSFET switch 210 \( \Omega \) for ambient temperature 25 \( ^\circ\)C
- OFF-state breakdown voltage of the MOSFET switch not less 500 V for ambient temperature 25 \( ^\circ\)C
- Operating temperature range -40 \( ^\circ\)C~+85 \( ^\circ\)C
- Own Design Item

**APPLICATION**
- Decorative Lighting
- Low Power Light Fixtures
- LED Signs and Displays
- Architectural Lighting
- Incandescent Replacements
- Industrial Lighting

**Functional Block Diagram**

**Typical Application Circuit**

---

www.iksemi.com 5/10
The IL9921, IL9922, and IL9923 are pulse width modulated (PWM) LED driver control ICs. They allow efficient operation of low current LED strings from voltage sources ranging up to 400VDC. They include an internal high-voltage switching MOSFET controlled with fixed off-time \( T_{\text{off}} \) of approximately 10ms, which allow driving of LED voltage strings of up to 80% of the input voltage. The LED string is driven at constant current, providing constant light output and enhanced reliability. The output current is internally fixed at 20mA for the IL9921, 50mA for the IL9922, and 30mA for IL9923.

The peak current control scheme of the IL9921, IL9922, and IL9923 provide good LED current regulation throughout the universal AC input voltage range of 85 to 264VAC or DC input voltage of 20 to 400V.

### FEATURES
- ON-resistance of the MOSFET switch 210 Ohm for ambient temperature 25 °C
- OFF-state breakdown voltage of the MOSFET switch not less 500 V for Ambient temperature 25 °C
- Operating temperature range -40°C to 85°C
- Pin to Pin compatibility HV9921/22/23 (Supertex)

### APPLICATION
- Decorative Lighting
- Low Power Light Fixtures
- LED Signs and Displays
- Architectural Lighting
- Signage Lighting
- Backlight Inverters
- Industrial Lighting

### APPLICATION
- Constant output current invariant to load voltage change
- Output current adjusted through an external resistor
- All Load Supply Voltage drift about 17V (Max)
- Schmitt trigger input
- 5V supply voltage
- Built-in Thermal Protection
- Pin to Pin compatibility MBI1802/03/16 (Macroblock)

### CHARACTERISTIC
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IK2802D</th>
<th>IK2804D</th>
<th>IK2816TSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant-Current Output Channels</td>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Maximum output current per channel</td>
<td>360mA</td>
<td>240mA</td>
<td>60mA</td>
</tr>
<tr>
<td>Excellent output current accuracy</td>
<td>Between Channels (Max)</td>
<td>(&lt;\pm 3%)</td>
<td>(&lt;\pm 3%)</td>
</tr>
<tr>
<td></td>
<td>Between ICs (Max)</td>
<td>(&lt;\pm 6%)</td>
<td>(&lt;\pm 6%)</td>
</tr>
<tr>
<td>Thermal protection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Package type</td>
<td>SOP-8</td>
<td>SOP-8</td>
<td>SOP-8</td>
</tr>
</tbody>
</table>

### FUNCTIONAL BLOCK DIAGRAM
IK2312ET High-Voltage LED Driver with Build-in MOSFET Switch And Average-Mode Constant Current Control

The IK2312ET is a pulse width modulated (PWM) LED driver control IC. It allows efficient operation of low current LED strings from voltage sources ranging up to 400V DC. The IK2312ET include an internal high-voltage switching MOSFET controlled with fixed off-time TOFF of approximately 10µs. The LED string is driven at constant current, providing constant light output and enhanced reliability. The IK2312ET does not produce a peak-to-average error, and therefore greatly improves accuracy of the LED current. The IK2312ET designed for using low inductance value. The average current control scheme of the IK2312ET provide good LED current regulation throughout the universal AC input voltage range of 85 to 264 VAC or DC input voltage of 20 to 400V.

**FEATURES**
- Decorative Lighting
- Low Power Light Fixtures
- LED Signs and Displays
- Architectural Lighting
- Industrial Lighting

**APPLICATION**
- Decorative Lighting
- Single resistor LED current setting
- 5% accurate LED current
- Output short circuit protection with skip mode
- Over-temperature protection
- Own Design item

**Functional Block Diagram**
A New Era Semiconductor Company
The Best Partner for your Success

Head Office / R&D Lab.
Rm. 503, DMC Hi-Tech Industrial Center, 330 SeongAm-Ro, Mapo-gu
Seoul 121–912 S. Korea
TEL : 82-2-3153–7090 ~ 4 FAX : 82-2-3153–7095
Korea Sales : steveweon@iksemi.com Oversea Sales : hjiang@iksemi.com

Sales Office (Guro)
Ra-4721, Chung-Ang Industry Distribution (Circulation) Complex, 15,
Gyeongin-ro, 53-gil, Guro-gu, Seoul 152–721 S. Korea
TEL : 82-2-2613–1630 FAX : 82-2-2613–1707
Sales Office : pig0919@iksemi.com

Hong Kong Branch Office
Workshop E4, 9F., Wah Lok Industrial Centre
Nos.31–35 Shan Mei Street, Shatin, Fotan, N.T., Hong Kong
TEL : 852–3142–9790
Sales : hjiang@iksemi.com

India Branch Office
Flat No.503, Bldg No.9, Shanthi Park Appts,
9th Block, Jayanagar, Bangalore 560069, India
TEL : 91998–0185734
Sales : sunildhiman@iksemi.com & integralindia@outlook.com

Sales Agency & Distributors

SEUNG JUN Co., Ltd.
151–7, Chonggyecheon-ro, Jongno-gu, Seoul, 110–430 S. Korea
Sales : smseo@seungjun.co.kr

ESKOR Co., Ltd.
(Seoul Office)
A–802, Chung-Ang Industry Distribution (Circulation) Complex, 15,
Gyeongin-ro, 53-gil, Guro-gu, Seoul 152–721 S. Korea
Sales : jacky.yoon@eskor.com

(Busan Head Office)
3F 19, Jeonpo-daero 223 beon-gil, Busanjin-gu, Busan, 614–740
S.Korea (Jeonpo-dong, Technoplaza A dong)
Sales : dennis.ro@eskor.com

ASTEL Co., Ltd.
E–302 (Pangyo Innovalley) 255, Pangyo-ro, Bundang–gu, Seongnam–si,
Gyeonggi-do, 463–400 S. Korea
Sales : shawn@astel.kr