

PRODUCTS

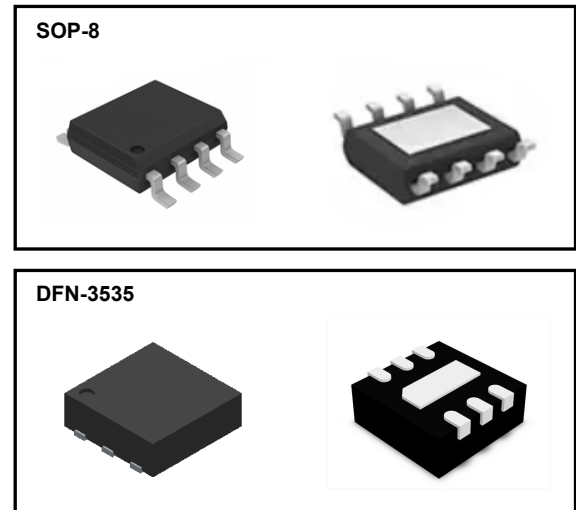
| Type | Pkg | Vout Max | Iout Max |
|-----------------|-------|----------|----------|
| GVN3501A | SOP-8 | 520V | 110mA |
| GVN3501B | DFN | 520V | 110mA |

FEATURES

- Two identical constant current sinks
- Each constant current sink output is independently adjustable up to 110mA
- Up to 520V input voltage
- Outputs can be paralleled for higher power applications
- Built in thermal foldback protection
- Suitable for both dimming and non-dimming LED drivers
- Low component count reference designs available for DOBs, filament bulbs, and lighting fixtures
- Standard SOP-8 and DFN-3535 packages

APPLICATIONS

- Direct AC LED Drive lighting
- E12, E26, A19 LED lamps
- T5, T8 LED tube striplights
- LED light fixtures
- LED flood lighting
- High voltage current sinks



DESCRIPTION

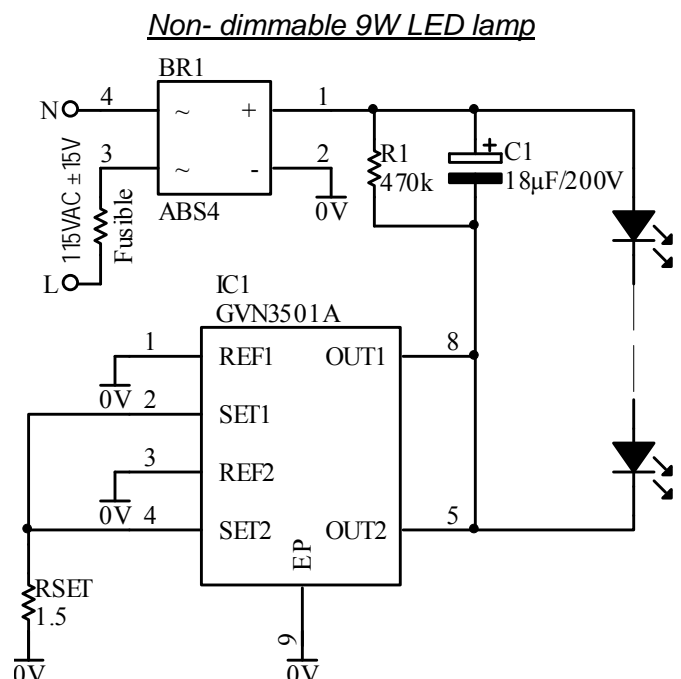
The GVN3501 includes two independent GaN-on-Silicon current sinks in a single heat-dissipating exposed-pad package.

The GVN3501 is designed for 100V - 120V and 200V - 240V offline AC LED drivers. Current sinks can be used independently or paralleled for higher power applications.

The GVN3501 is offered in small footprint SOP-8 and DFN-3535 packages. Both offer an exposed pad for enhanced heat dissipation.

The GVN3501 offers a simple and low-cost solution for cost-sensitive LED light bulbs and other high voltage linear applications.

TYPICAL OPERATING CIRCUIT



Package Pinouts

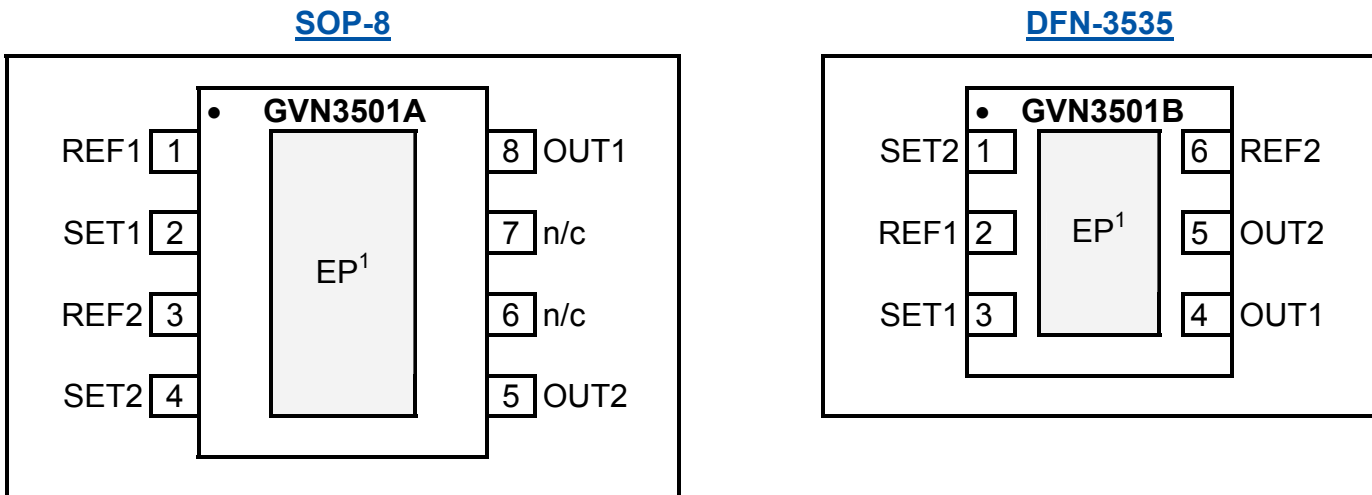


Figure 1. SOP-8 and DFN Package Pinouts

Table 1. SOP-8 and DFN Package Pin Descriptions

| PIN | NAME | FUNCTION |
|-----|------|--------------------------------|
| 1 | REF1 | Voltage reference for sink 1 |
| 2 | SET1 | Current setting pin for sink 1 |
| 3 | REF2 | Voltage reference for sink 2 |
| 4 | SET2 | Current setting pin for sink 2 |
| 5 | OUT2 | Output of sink 2 |
| 6 | n/c | Not internally connected |
| 7 | n/c | Not internally connected |
| 8 | OUT1 | Output of sink 1 |
| 9 | GND | Exposed pad ¹ |

| PIN | NAME | FUNCTION |
|-----|------|--------------------------------|
| 1 | SET2 | Current setting pin for sink 2 |
| 2 | REF1 | Voltage reference for sink 1 |
| 3 | SET1 | Current setting pin for sink 1 |
| 4 | OUT1 | Output of sink 1 |
| 5 | OUT2 | Output of sink 2 |
| 6 | REF2 | Voltage reference for sink 2 |
| 7 | GND | Exposed pad ¹ |

¹ Exposed pad should be connected to the lowest voltage in the circuit (0V or GND), and as much copper as available for heatsinking

Ordering Information

| PART | TOP MARK | PACKAGE | DESCRIPTION |
|----------|----------|----------|---|
| GVN3501A | GVN3501 | SOP-8 | Plastic 8 lead small outline package with exposed pad |
| GVN3501B | GVN3501 | DFN-3535 | Plastic 8 pad DFN leadless package with exposed pad |

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Specification | | | Unit |
|------------------|---|---------------|-----|-----|------|
| | | Min | Typ | Max | |
| V _{os} | Output Voltage | -0.3 | - | 520 | V |
| V _{RS} | Input Voltage | -20 | - | +1 | V |
| I _{OUT} | Output current at TC = 25°C | - | - | 150 | mA |
| P _{tot} | Total Dissipation at TC = 25°C ¹ | - | - | 1 | W |

THERMAL DATA – SOP-8

| Symbol | Parameter | Specification | | | Unit |
|------------------|--|---------------|-----|-----|------|
| | | Min | Typ | Max | |
| Θ _{ja} | Thermal resistance junction to °C/W ¹ | | 45 | | °C/W |
| Θ _{jc} | Thermal resistance junction to case | | 12 | | °C/W |
| T _j | Thermal Operating Junction Temperature | -40 | | 125 | °C |
| T _{stg} | Storage Temperature | -55 | | 150 | °C |

1, When Mounted on 1 inch² FR-4 board, 1 oz of Cu

Thermal and temperature ratings for DFN-3535 - TBD

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED)

| Symbol | Parameter | | Specification | | | Unit |
|---------------------|-------------------------|--|---------------|-----|-----|------|
| | | | Min | Typ | Max | |
| V _{OUTMAX} | Maximum Output Voltage | V _{REF} = -5V | 520 | - | - | V |
| I _{OUT} | Output Current | V _{REF} = V _{SET} = 0V | - | - | 110 | mA |
| I _{OUTACC} | Output Current Variance | | - | 5 | - | % |
| I _Q | Quiescent Current | V _{OUT} = 450V, V _{REF} = -10V | - | 20 | 200 | μA |

APPLICATION INFORMATION

The GVN3501 is a GaN-on-Silicon (Gallium Nitride) based dual current source where the output current is set based on the voltage between the REF pin and the SET pin and the current source's internal impedance. The current can be set up to 110mA peak. More current is available with parallel sinks. It is also flexible enough to be used for low power dimmable LED applications and multi-stage LED driver applications. Since the sink is normally-on there is no need for a bias supply.

Setting the peak output current

When grounding the REF pin a single resistor (R_{SET}) placed on a SET pin achieves the desired performance for constant current LED driving. The resistor value to set the output current can be determined from either Figure 2 or Table 2.

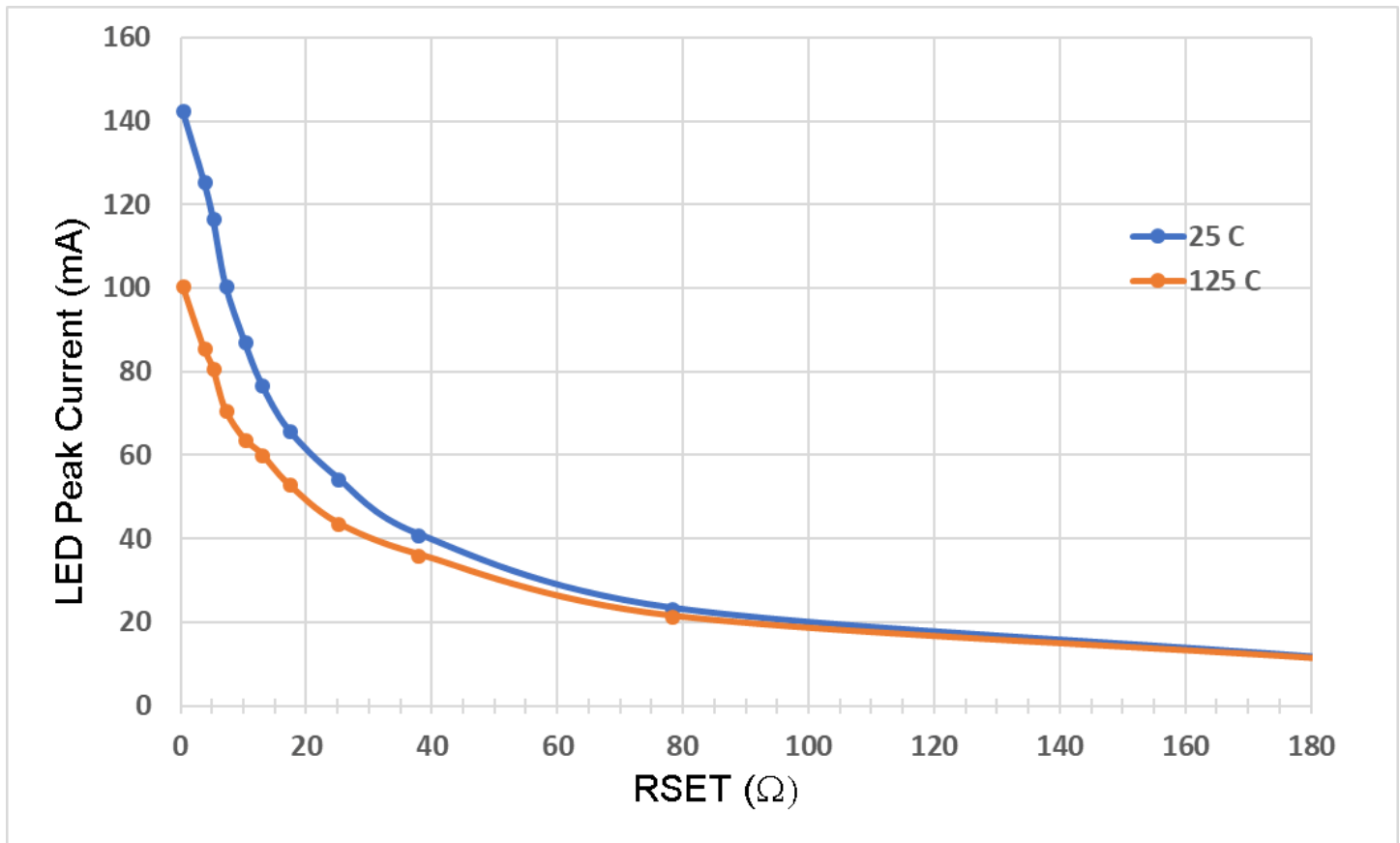


Figure 2. Output current vs R_{SET} ($V_{REF}=0$, $R_{eq}= 17.2 \Omega$)

Table 2. R_{SET} selection for required peak LED current ($V_{REF}=0$, $R_{eq}= 17.2\Omega$)

| R_{SET} (Ω) | Peak LED Current |
|------------------------|------------------|
| 183 | 10mA |
| 78 | 20mA |
| 35.8 | 35mA |
| 24.7 | 45mA |
| 17.1 | 55mA |
| 12.8 | 65mA |
| 9.5 | 75mA |
| 7.0 | 85mA |
| 5.1 | 95mA |
| 3.6 | 105mA |

Thermal Foldback

The GVN3501 can foldback the current in relationship to the temperature. This can help to protect the lamp from high temperature LED degradation and catastrophic failure in the event of an over temperature of the device. This foldback mechanism reduces the LED current gradually and smoothly reducing the power and temperature, ensuring a non-visible reduction in luminous output.

PCB layout recommendations

Both the SOP-8 and DFN-3535 packages have exposed thermal pads. These greatly help to remove heat from within the package. The PCB must then spread the heat out over sufficient surface area to dissipate the excess heat. FR4 boards have limited performance based on how much Copper can be placed around the device. Only 1W to 2W per square inch dissipation is typically obtained with FR4/copper boards. Vias can also help to carry heat to the other PCB layers.

Metal Core (MC) PCBs offer superior thermal performance. Unfortunately, vias are not yet available in this technology and so, as a consequence, the PCB must be a single sided layout. If the LED are to be place on the PCB with the regulator this almost requires MC PCB. Even with a MC PCB, designs above 4W may require additional heat sinking to spread the heat.

As with all off-line circuits, creepage and clearances for the PCB traces must be held to the applicable standards. The degree of pollution, moisture, coating and potting can affect the usable life of the circuit.