

LED Driver

BCR 402U E6327

Datasheet

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Power Management & Multimarket

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Table of Contents

| | | |
|----------|---|----|
| | Table of Contents | 4 |
| | List of Figures | 5 |
| | List of Tables | 6 |
| 1 | LED Driver | 7 |
| 1.1 | Features | 7 |
| 1.2 | Applications | 7 |
| 1.3 | General Description | 7 |
| 2 | Electrical Characteristics | 9 |
| 3 | Typical characteristics | 10 |
| 4 | Application hints | 16 |
| 5 | Package | 17 |
| | Terminology | 18 |

List of Figures

| | | |
|-------------|--|----|
| Figure 1-1 | Pin configuration and typical application | 8 |
| Figure 3-1 | Total Power Dissipation $P_{tot} = f(T_S)$ | 10 |
| Figure 3-2 | Permissible Pulse Load $R_{thJS} = f(t_p)$ | 10 |
| Figure 3-3 | Permissible Pulse Load $P_{totmax} / P_{totDC} = f(t_p)$ | 11 |
| Figure 3-4 | Output Current versus $V_S I_{out} = f(V_S)$, $V_S - V_{out} = 1.4 V$, $R_{ext} = \text{Parameter}$ | 12 |
| Figure 3-5 | Supply Current versus $V_S I_S = f(V_S)$, $T_A = \text{Parameter}$ | 12 |
| Figure 3-6 | Output Current versus $V_S I_{out} = f(V_S)$, $V_S - V_{out} = \text{Parameter}$ | 13 |
| Figure 3-7 | Output Current versus $V_S I_{out} = f(V_S)$, $V_S - V_{out} = 1.4 V$, $T_A = \text{Parameter}$ | 13 |
| Figure 3-8 | Output Current versus $R_{ext} I_{out} = f(R_{ext})$, $V_S = 10 V$, $V_S - V_{out} = 1.4 V$, $T_A = \text{Parameter}$ | 14 |
| Figure 3-9 | Output Current versus $T_S I_{out} = f(T_S)$, $V_S = 10 V$, $V_S - V_{out} = 1.4 V$, $R_{ext} = \text{Parameter}$ | 14 |
| Figure 3-10 | Reference Voltage V_{drop} vs I_{out} $V_{drop} = f(I_{out})$, $I_{out} = 10 \mu A$ to $10 mA$ | 15 |
| Figure 3-11 | Reference Voltage V_{drop} vs I_{out} $V_{drop} = f(I_{out})$, $I_{out} = 10 mA$ to $65 mA$ | 15 |
| Figure 4-1 | Application Circuit: Stand alone current source | 16 |
| Figure 4-2 | Application Circuit: Boost mode current source with external power transistor | 16 |
| Figure 5-1 | Package Outline for SC74 (dimensions in mm) | 17 |
| Figure 5-2 | Package Footprint for SC74 (dimensions in mm). | 17 |
| Figure 5-3 | Tape and Reel Information for SC74 (dimensions in mm) | 17 |

List of Tables

| | | |
|-----------|--|---|
| Table 2-1 | Maximum Ratings at $T_A = 25\text{ °C}$, unless otherwise specified | 9 |
| Table 2-2 | Thermal Resistance at $T_A = 25\text{ °C}$, unless otherwise specified | 9 |
| Table 2-3 | Electrical Characteristics at $T_A = 25\text{ °C}$, unless otherwise specified | 9 |
| Table 2-4 | DC Characteristics with stabilized LED load at $T_A = 25\text{ °C}$, unless otherwise specified | 9 |

1 LED Driver

1.1 Features

- LED drive current preset to 20 mA
- Output current adjustable up to 65 mA with an external resistor
- Easy paralleling of drivers to increase current
- Supply voltage up to 40 V
- High current accuracy at supply voltage variation
- Low voltage overhead of 1.4 V
- Up to 750 mW power dissipation in a small SC74 package
- Negative thermal coefficient of -0.2 %/K reduces output current at higher temperatures
- RoHS compliant (Pb-free) package
- Automotive qualified according AEC Q101



SC74-3D



1.2 Applications

- 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

1.3 General Description

The BCR 402U E6327 is a cost efficient LED driver to drive low power LEDs. The advantages towards resistor biasing are:

- homogenous light output despite varying forward voltages in different LED strings
- homogenous light output of LEDs despite voltage drop across long supply lines
- homogenous light output independent from supply voltage variations
- longer lifetime of the LEDs due to reduced output current at higher temperatures (negative thermal coefficient)

The advantages towards discrete solutions are:

- lower assembly cost
- smaller form factor
- higher reliability due to less soldering joints
- higher output current accuracy due to pretested LED drivers

Dimming is possible by using an external digital transistor at the ground pin.

The BCR 402U E6327 can be operated at higher supply voltages by putting LEDs between the supply voltage V_S and the power supply pin of the LED driver. You can find further details in our application notes.

The BCR 402U E6327 is a perfect fit for numerous low power LED applications by combining small form factor with low cost. These LED drivers offer several advantages to resistors like significantly higher current control at very low voltage drop ensuring high lifetime of LEDs.

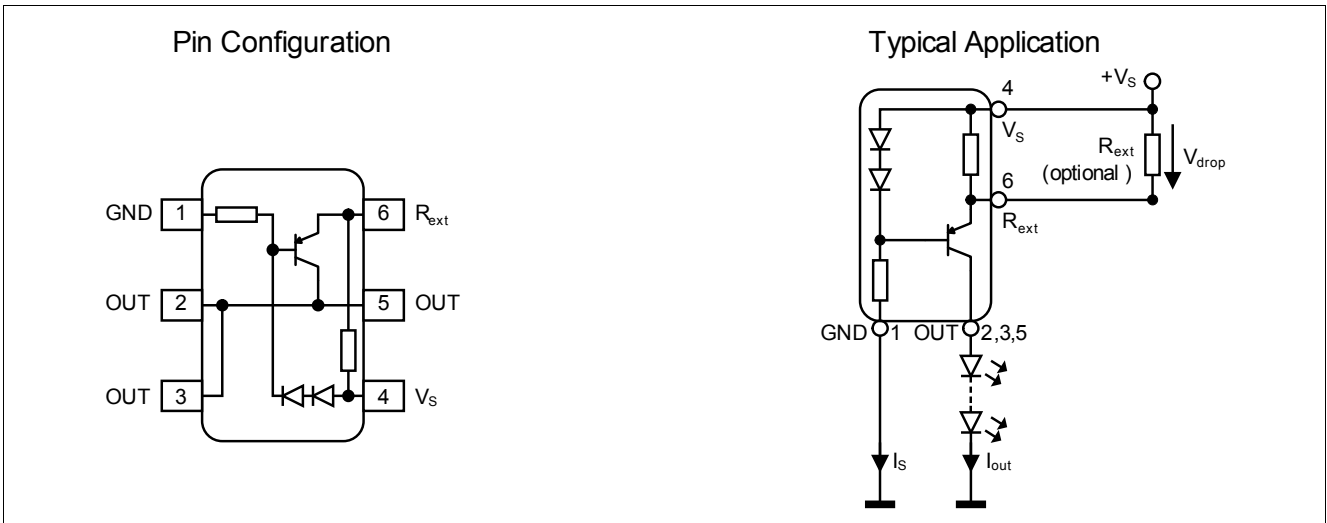


Figure 1-1 Pin configuration and typical application

| Sales Name | Marking | Pin Configuration | | | | Package |
|----------------|---------|-------------------|---------------|-----------|---------------|---------|
| BCR 402U E6327 | L2s | 1 = GND | 2; 3; 5 = OUT | 4 = V_S | 6 = R_{ext} | SC74 |

2 Electrical Characteristics

Table 2-1 Maximum Ratings at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---------------------------------------|-----------|--------|------|------|------------------|--|
| | | Min. | Typ. | Max. | | |
| Supply voltage | V_S | - | - | 40 | V | |
| Output current | I_{out} | - | - | 65 | mA | |
| Output voltage | V_{out} | - | - | 40 | V | |
| Reverse voltage between all terminals | V_R | - | - | 0.5 | V | |
| Total power dissipation | P_{tot} | - | - | 750 | mW | $T_S \leq 112.5\text{ }^\circ\text{C}$ |
| Junction temperature | T_J | - | - | 150 | $^\circ\text{C}$ | |
| Storage temperature range | T_{STG} | -65 | - | 150 | $^\circ\text{C}$ | |

Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

Table 2-2 Thermal Resistance at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Junction - soldering point ¹⁾ | R_{thJS} | - | - | 50 | K/W | |

1) For calculation of R_{thJA} please refer to Application Note AN077 (Thermal Resistance Calculation)

Table 2-3 Electrical Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-------------------------------------|---------------|--------|------|------|---------------|---|
| | | Min. | Typ. | Max. | | |
| Collector-emitter breakdown voltage | $V_{BR(CEO)}$ | 40 | - | - | V | $I_C = 1\text{ mA}, I_B = 0$ |
| Supply current | I_S | 340 | 420 | 500 | μA | $V_S = 10\text{ V}$ |
| DC current gain | h_{FE} | 100 | 220 | 470 | - | $I_C = 50\text{ mA}, V_{CE} = 1\text{ V}$ |
| Internal resistor | R_{int} | 38 | 44 | 52 | Ω | $I_{Rint} = 10\text{ mA}$ |
| Output current | I_{out} | 18 | 20 | 22 | mA | $V_S = 10\text{ V}$ $V_{out} = 8.6\text{ V}$ |
| Voltage drop (V_{Rext}) | V_{drop} | 0.8 | 0.85 | 0.9 | V | $I_{out} = 20\text{ mA}$ |

Table 2-4 DC Characteristics with stabilized LED load at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------------------|--------|------|------|------|--------------------------|
| | | Min. | Typ. | Max. | | |
| Lowest sufficient supply voltage overhead | V_{Smin} | - | 1.4 | - | V | $I_{out} > 18\text{ mA}$ |
| Output current change versus T_A | $\Delta I_{out}/I_{out}$ | - | -0.2 | - | %/K | $V_S = 10\text{ V}$ |
| Output current change versus V_S | $\Delta I_{out}/I_{out}$ | - | 1 | - | %/V | $V_S = 10\text{ V}$ |

3 Typical characteristics

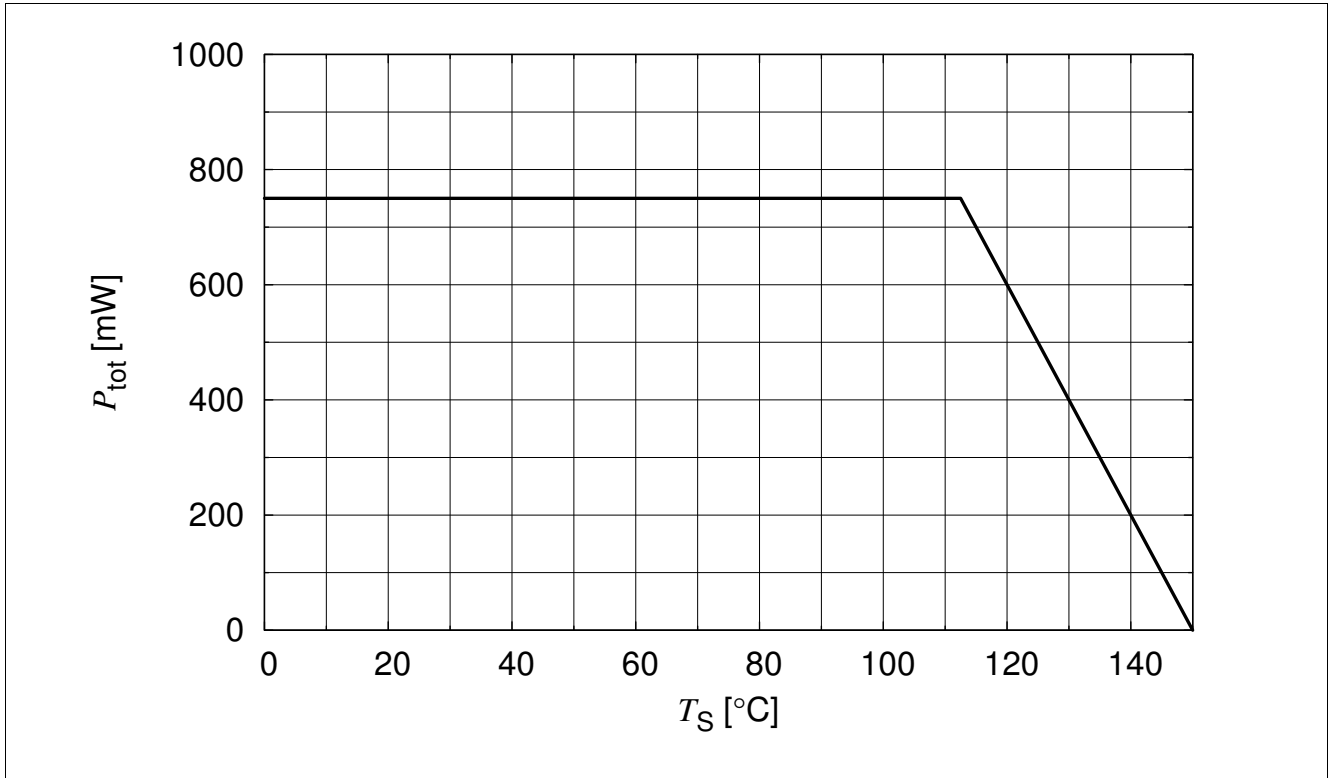


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

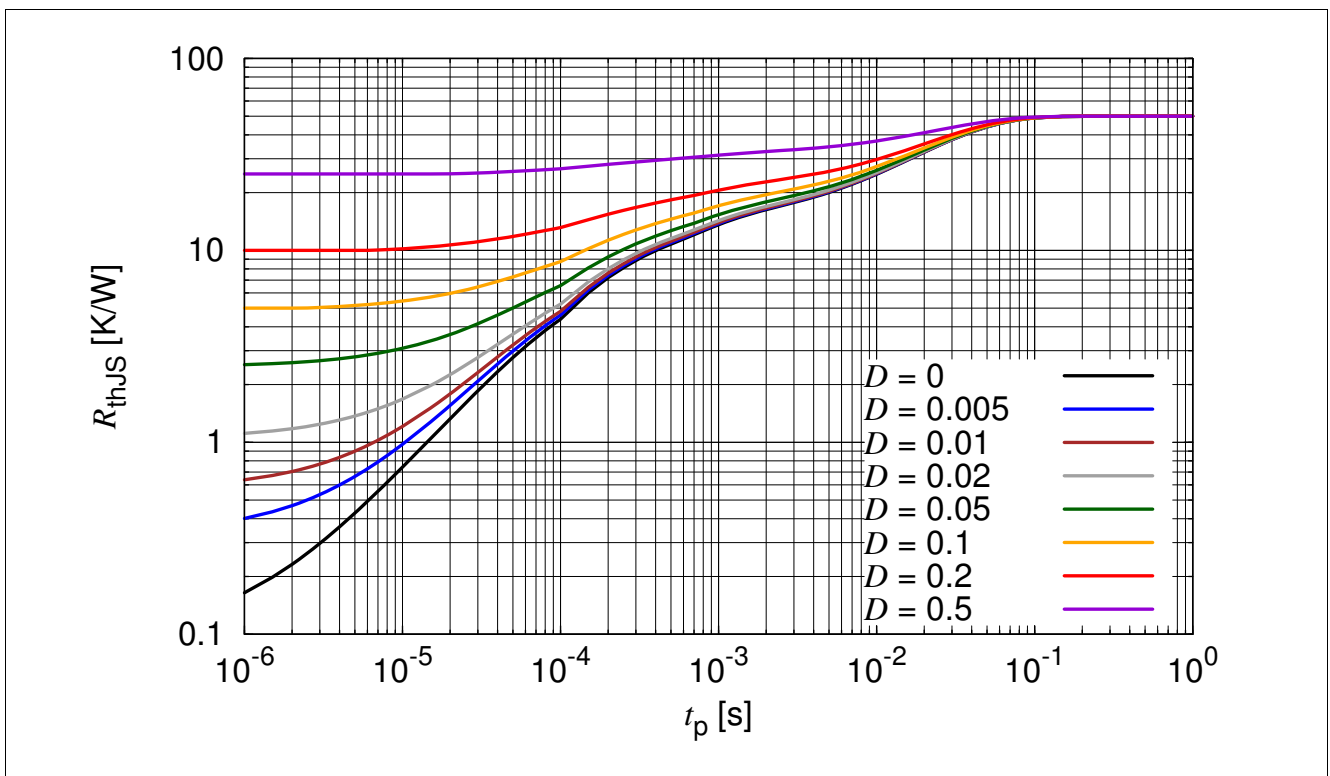


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

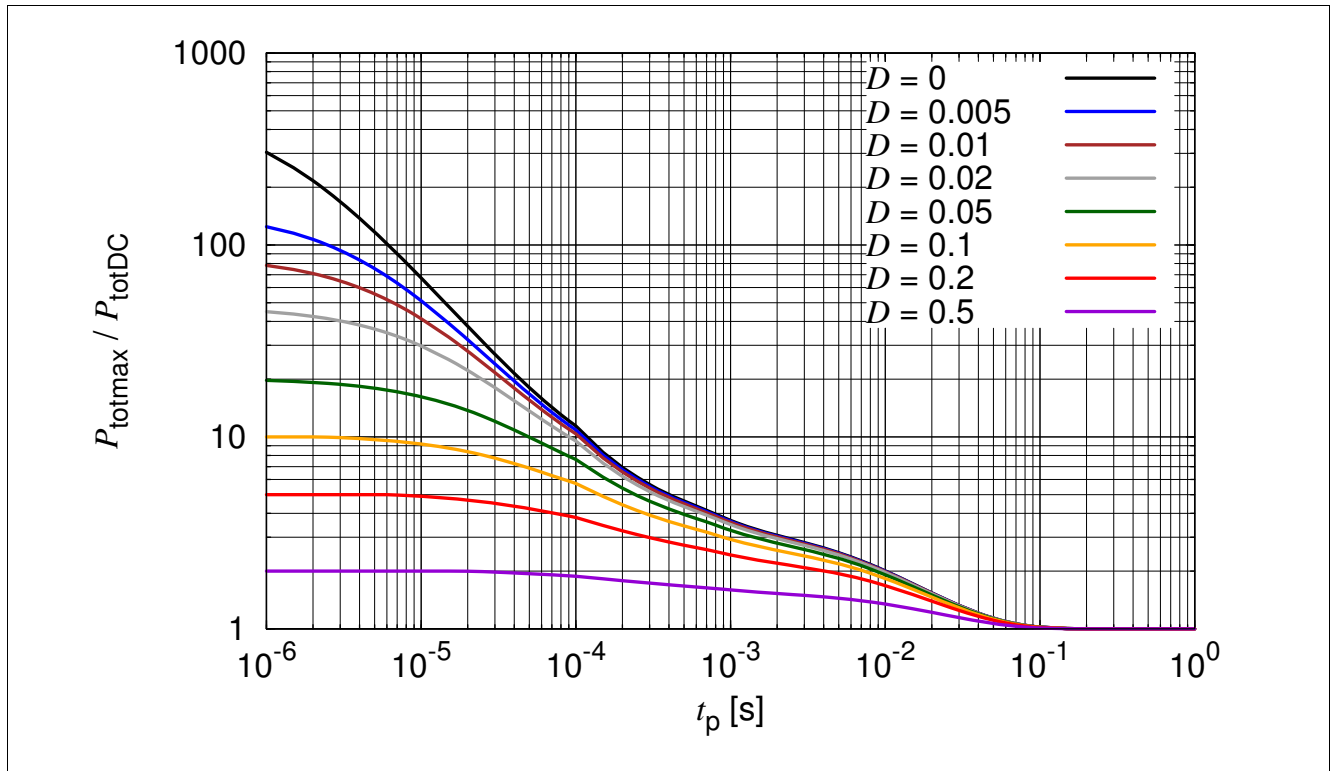


Figure 3-3 Permissible Pulse Load $P_{totmax} / P_{totDC} = f(t_p)$

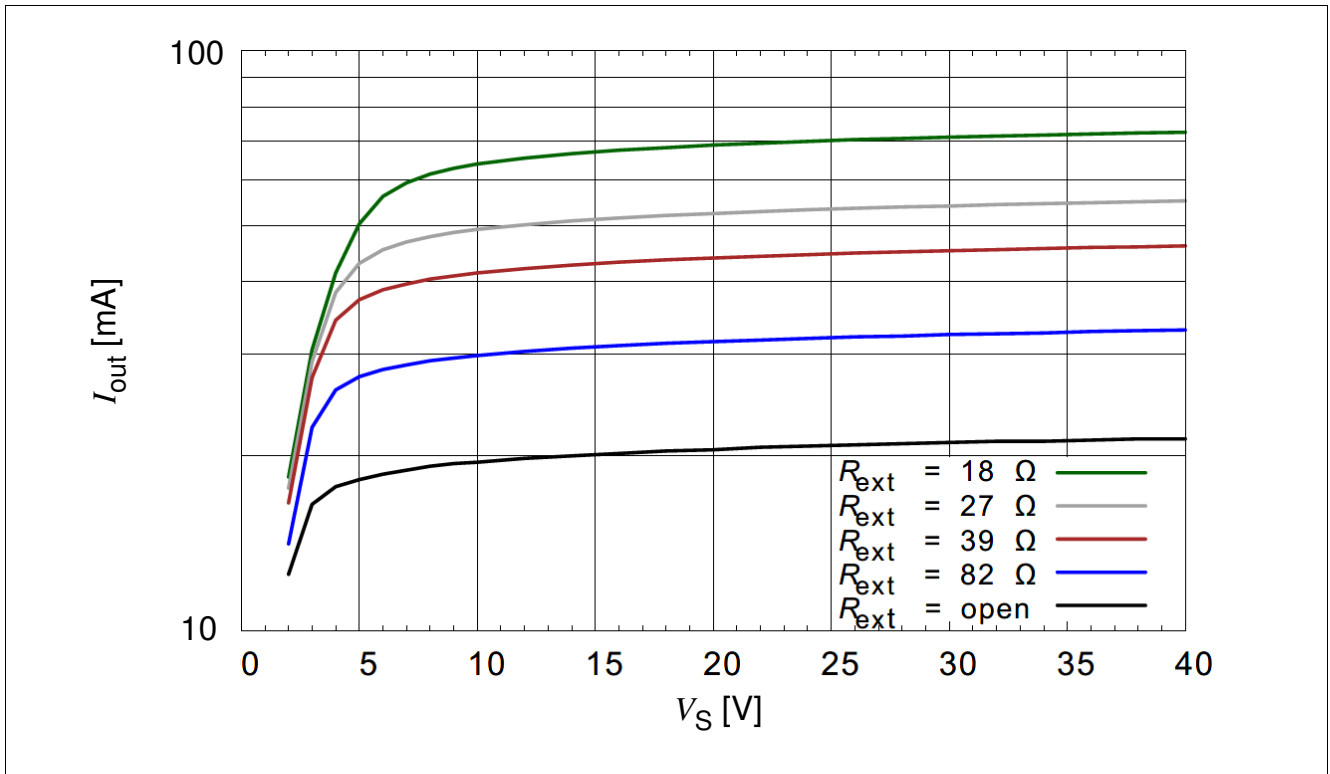


Figure 3-4 Output Current versus V_S $I_{out} = f(V_S)$, $V_S - V_{out} = 1.4$ V, $R_{ext} = \text{Parameter}$

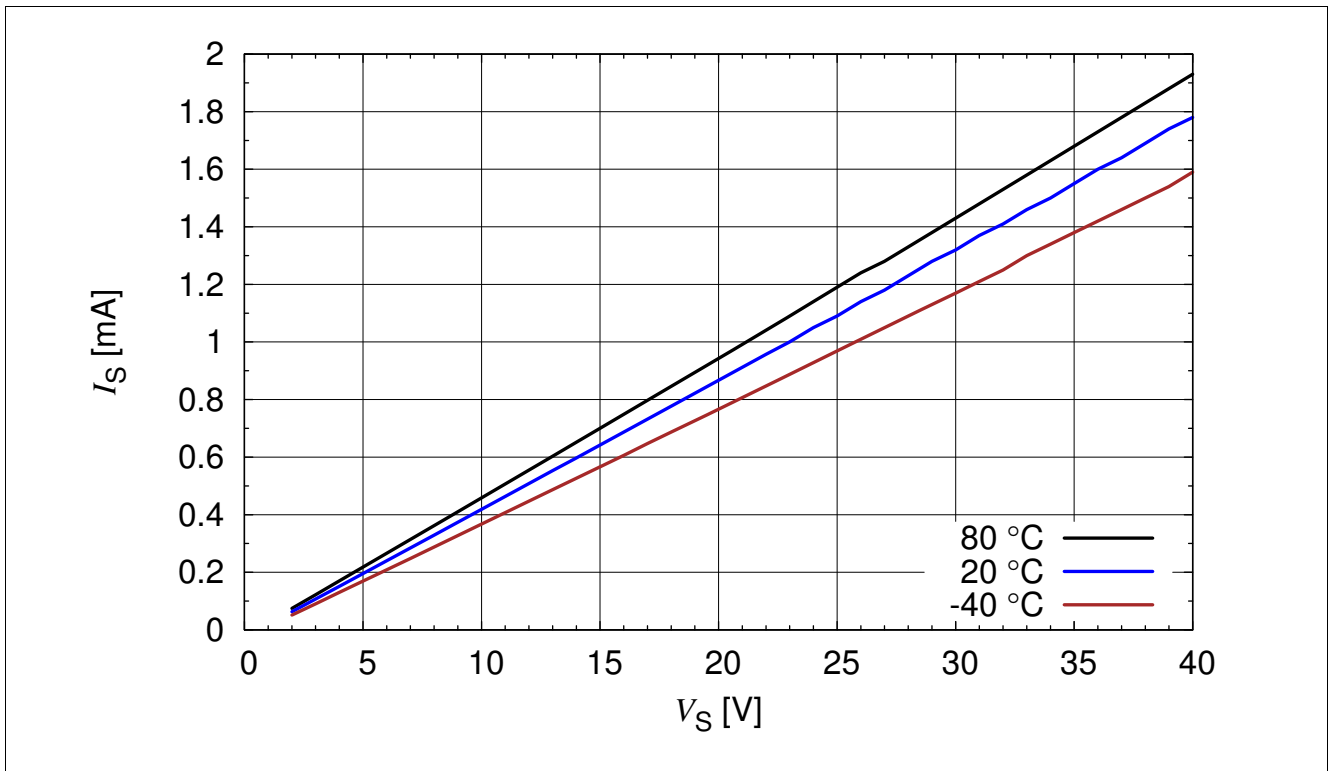


Figure 3-5 Supply Current versus V_S $I_S = f(V_S)$, $T_A = \text{Parameter}$

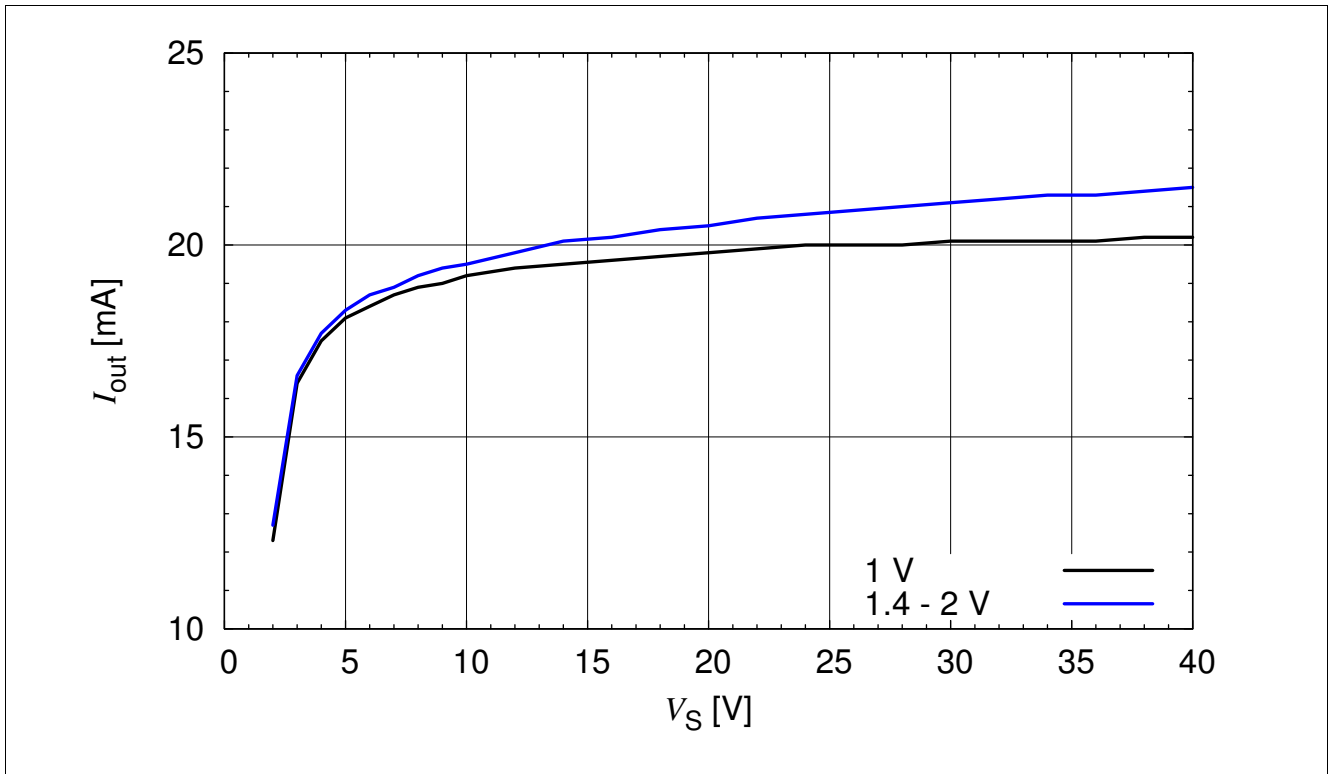


Figure 3-6 Output Current versus V_S $I_{out} = f(V_S)$, $V_S - V_{out} =$ Parameter

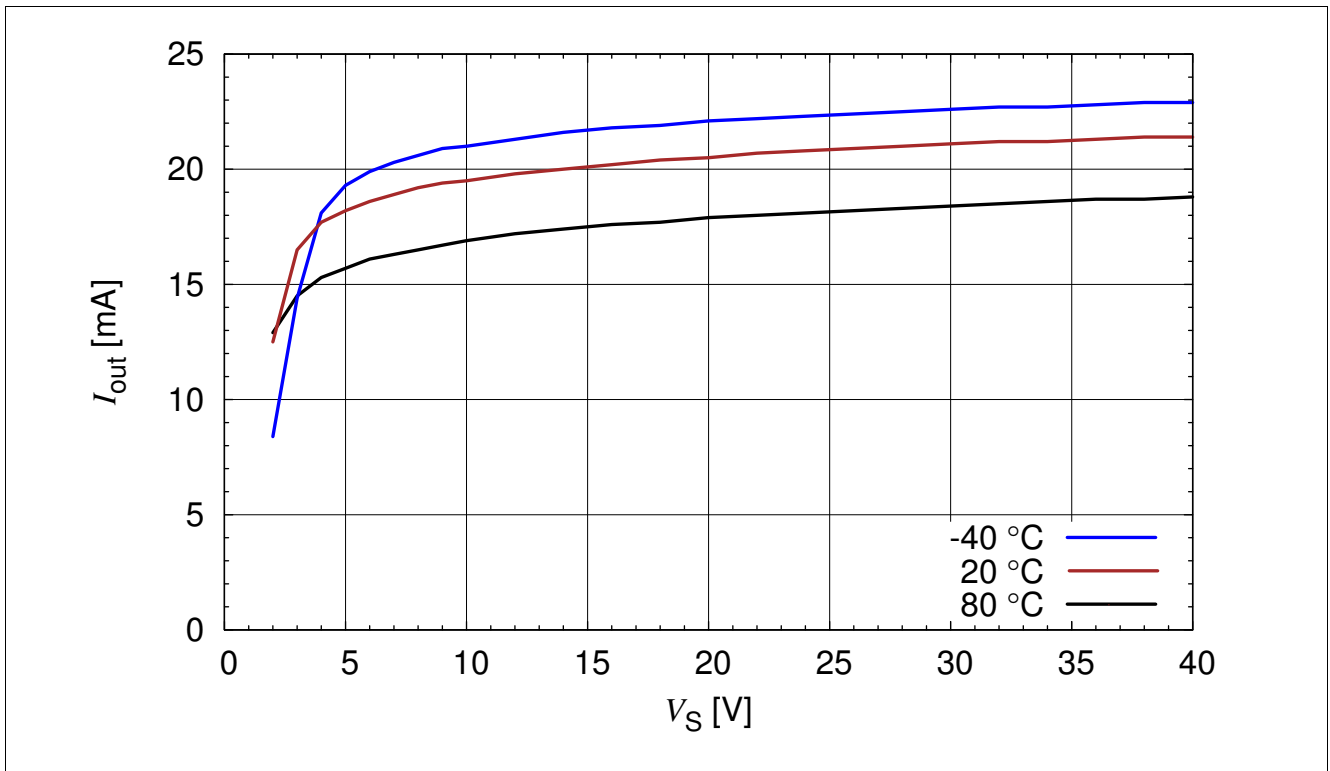


Figure 3-7 Output Current versus V_S $I_{out} = f(V_S)$, $V_S - V_{out} = 1.4$ V, $T_A =$ Parameter

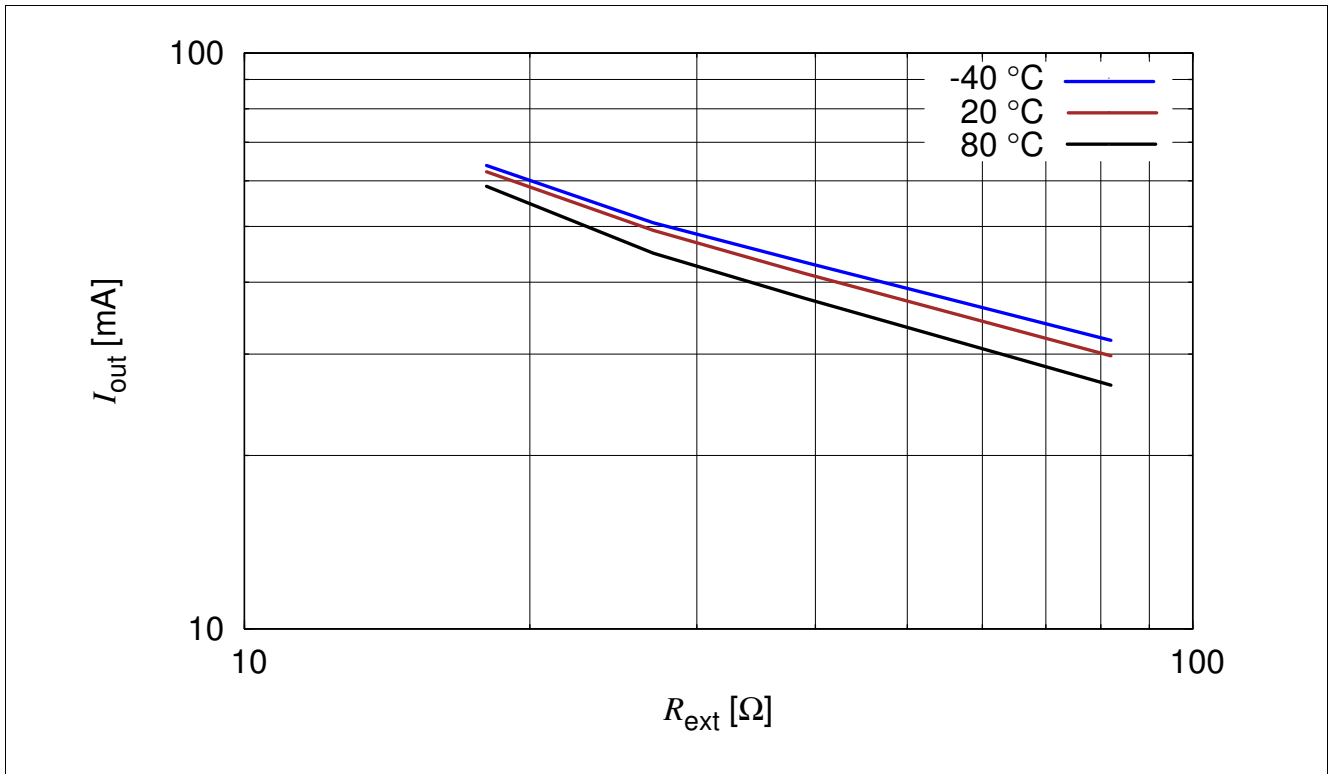


Figure 3-8 Output Current versus R_{ext} $I_{out} = f(R_{ext})$, $V_S = 10\text{ V}$, $V_S - V_{out} = 1.4\text{ V}$, $T_A = \text{Parameter}$

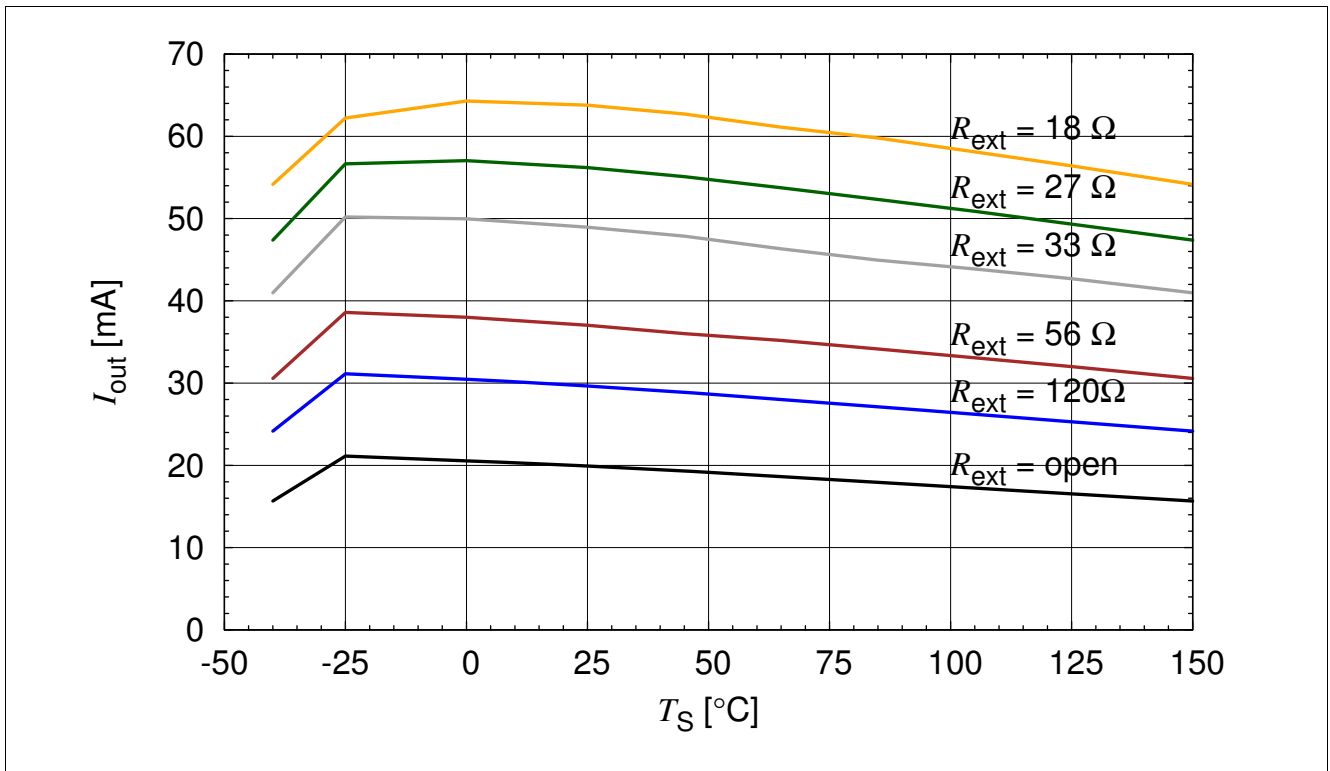


Figure 3-9 Output Current versus T_S $I_{out} = f(T_S)$, $V_S = 10\text{ V}$, $V_S - V_{out} = 1.4\text{ V}$, $R_{ext} = \text{Parameter}$

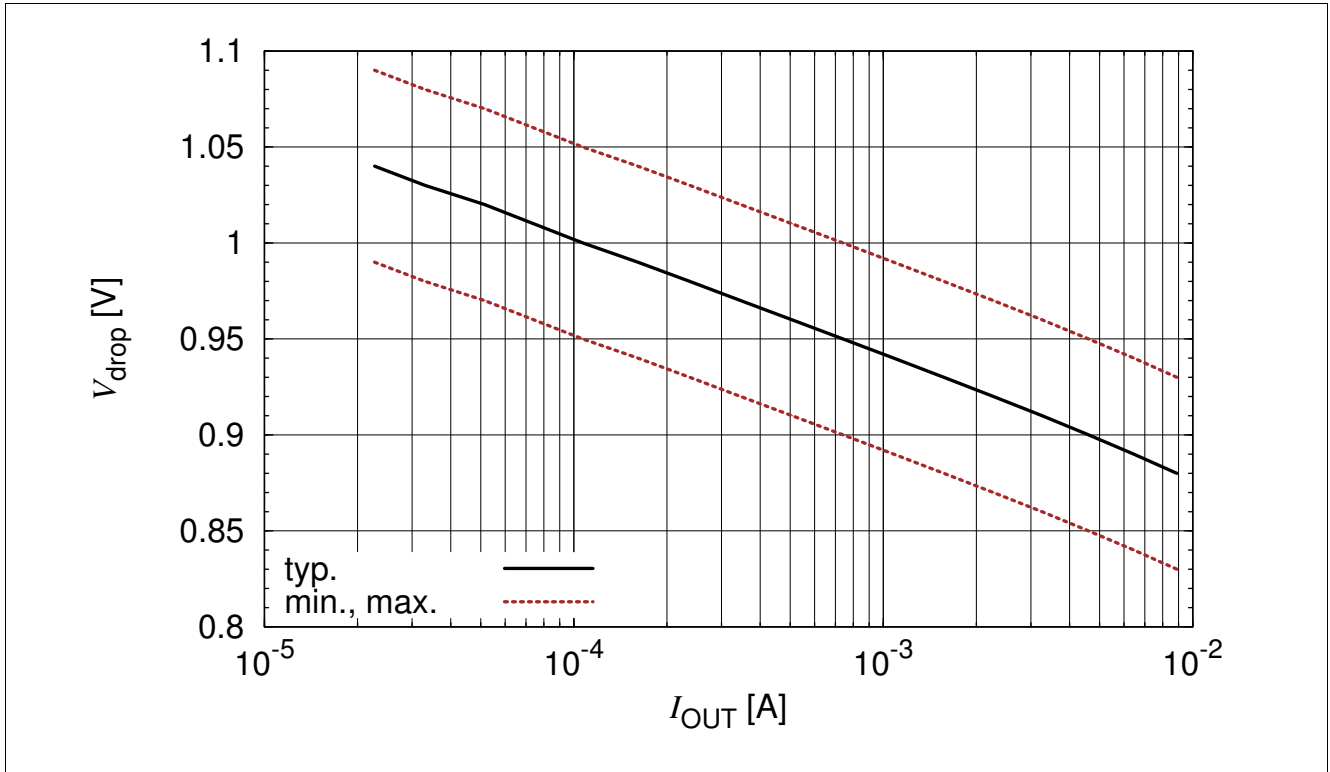


Figure 3-10 Reference Voltage V_{drop} vs I_{out} $V_{drop} = f(I_{out})$, $I_{out} = 10 \mu\text{A}$ to 10 mA

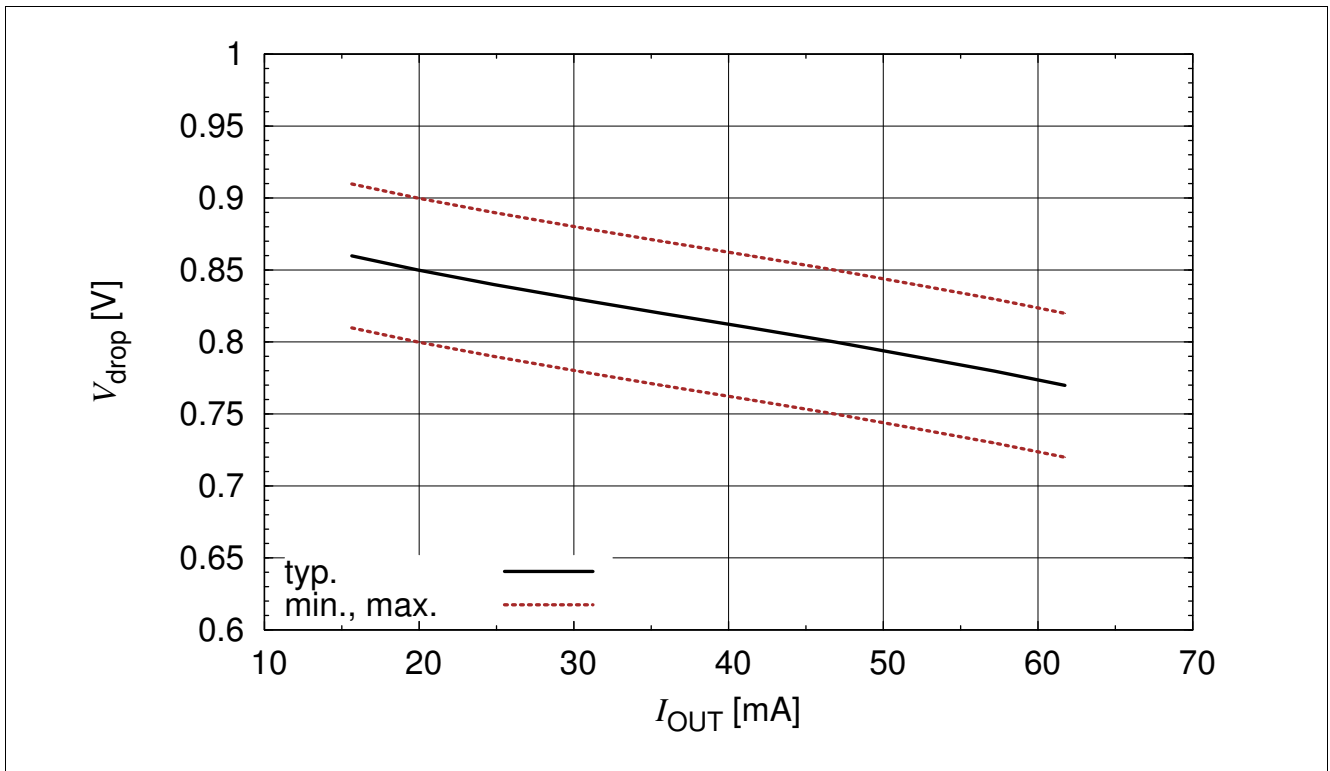


Figure 3-11 Reference Voltage V_{drop} vs I_{out} $V_{drop} = f(I_{out})$, $I_{out} = 10 \text{ mA}$ to 65 mA

4 Application hints

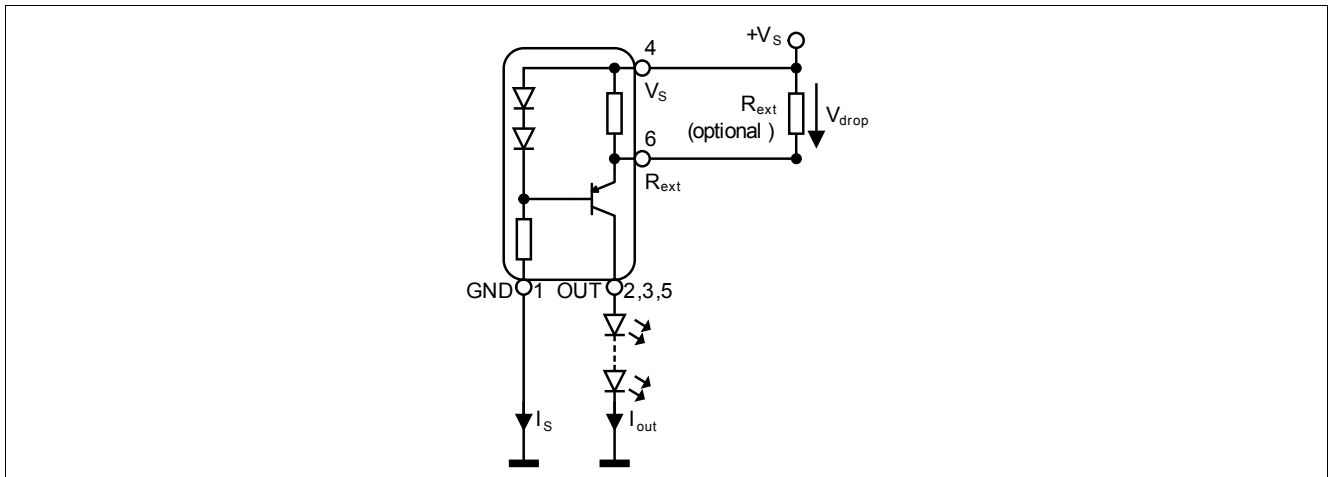


Figure 4-1 Application Circuit: Stand alone current source

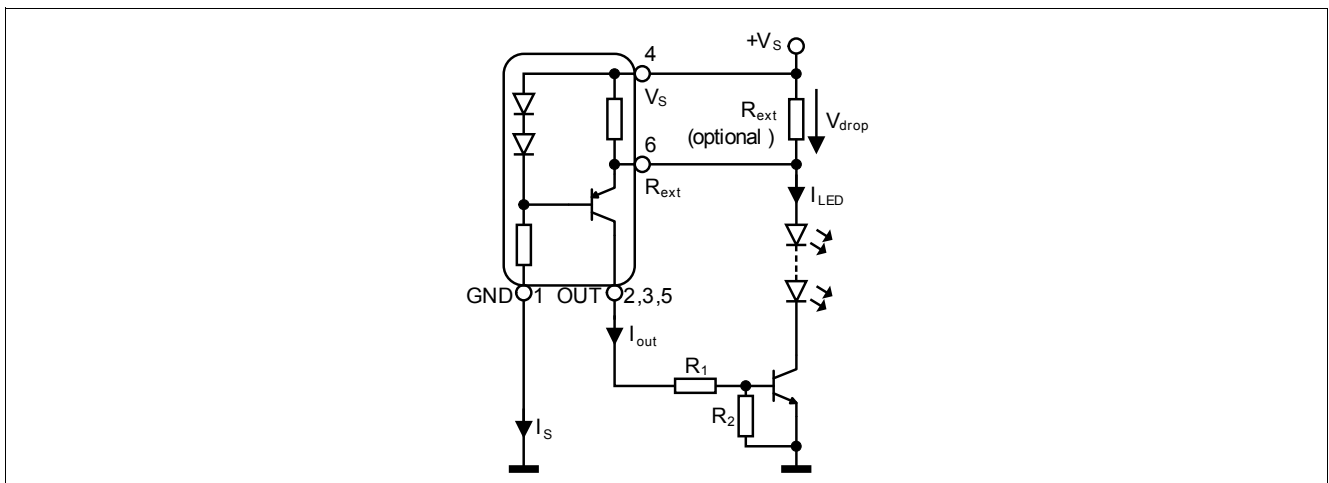


Figure 4-2 Application Circuit: Boost mode current source with external power transistor

Application hints

BCR 402U E6327 serves as an easy to use constant current source for LEDs. In stand alone application an external resistor R_{ext} can be connected to adjust the current between 20 mA and 65 mA. R_{ext} can be determined by using [Figure 3-8](#). Connecting a low tolerance resistor R_{ext} will improve the overall accuracy of the current sense resistance formed by the parallel connection of R_{int} and R_{ext} leading to an improved current accuracy. Please take into account that the resulting output currents will be slightly lower due to the self heating of the component and the negative thermal coefficient.

In boost mode configuration the LED current can be extended to drive high power LEDs. Please visit our web site www.infineon.com/lowcostleddriver for detailed application notes.

5 Package

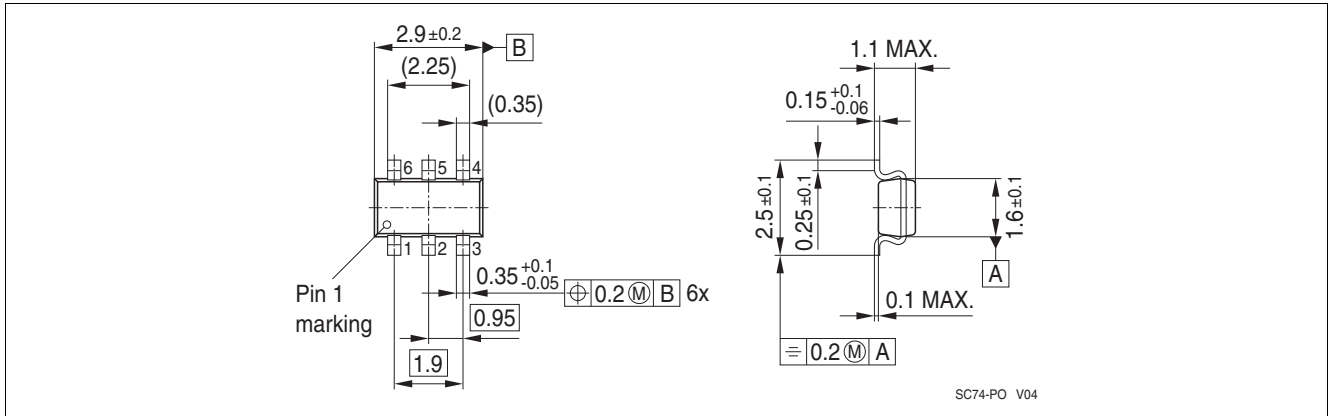


Figure 5-1 Package Outline for SC74 (dimensions in mm)

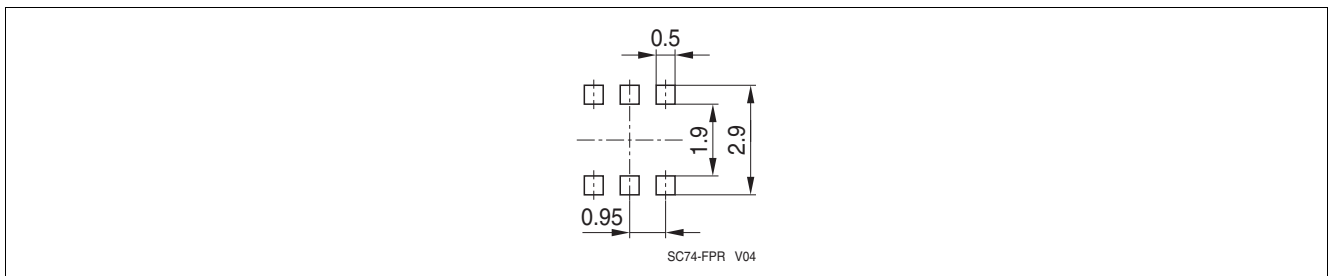


Figure 5-2 Package Footprint for SC74 (dimensions in mm)

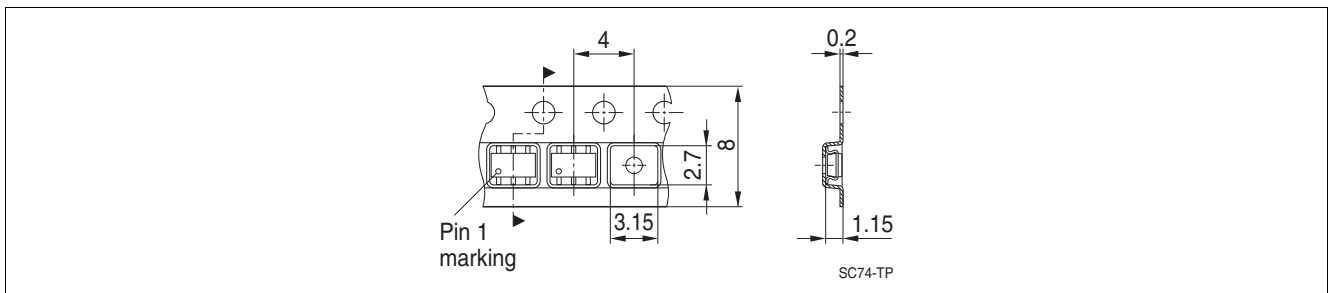


Figure 5-3 Tape and Reel Information for SC74 (dimensions in mm)

Terminology

| | |
|--------------------------|--|
| $\Delta I_{out}/I_{out}$ | Output current change |
| h_{FE} | DC current gain |
| I_{EN} | Enable current |
| I_{LED} | LED current |
| I_{out} | Output current |
| I_R | Reverse current |
| LED | Light Emitting Diode |
| PCB | Printed Circuit Board |
| P_{tot} | Total power dissipation |
| PWM | Pulse Width Modulation |
| R_B | Bias resistor |
| R_{ext} | External resistor |
| R_{int} | Internal resistor |
| RoHs | Restriction of Hazardous Substance directive |
| R_{thJS} | Thermal resistance junction to soldering point |
| T_A | Ambient temperature |
| T_J | Junction temperature |
| T_S | Soldering point temperature |
| T_{stg} | Storage temperature |
| $V_{BR(CEO)}$ | Collector-emitter breakdown voltage |
| V_{BR} | Breakdown voltage |
| V_{drop} | Voltage drop |
| V_{EN} | Enable voltage |
| V_{out} | Output voltage |
| V_R | Reverse voltage |
| V_S | Supply voltage |
| V_{Smin} | Lowest sufficient supply voltage overhead |

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