

## LED Driver

### Features

- LED drive current of 10mA
- Output current adjustable up to 60mA with external resistor
- Supply voltage up to 18V
- Easy paralleling of drivers to increase current
- Low voltage overhead of 1.2V
- High current accuracy at supply voltage variation
- No EMI
- Reduced output current at higher temperatures - negative thermal coefficient of  $-0.3\% / K$
- RoHS compliant (pb-free) SOT143R package
- Qualified according AEC Q101



### 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

### General Description

The BCR401R is a cost efficient LED driver to drive low power LED's. The advantages towards resistor biasing are:

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

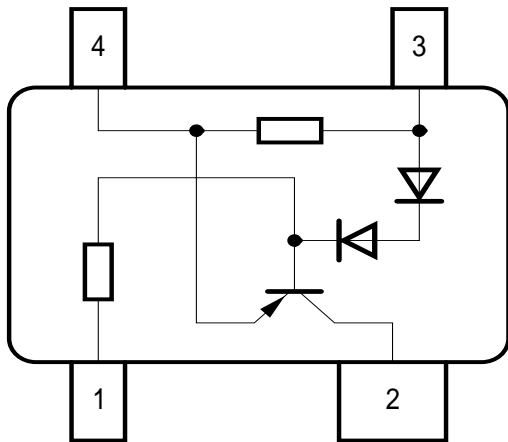
The advantages towards discrete solutions are:

- lower assembly cost
- smaller form factor
- better quality due to less soldering points
- higher output current accuracy due to pretested LED drivers

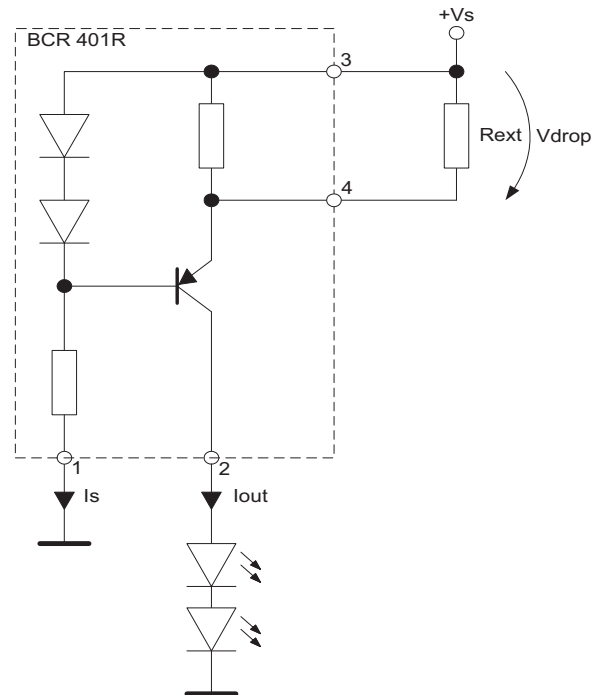
Dimming is possible by using an external digital transistor at the ground pin.

The BCR401R can be operated at higher supply voltages by putting LED's between the power supply +VS and the power supply pin of the LED driver. You can find further details in the application note AN066.

The BCR401R 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 LED's.

**Pin Configuration**


EHA07188

**Typical Application**


Type	Marking	Pin Configuration				Package
BCR401R	W5s	1 = GND	2 = $I_{out}$	3 = $V_S$	4 = $R_{ext}$	SOT143R

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Supply voltage	$V_S$	18	V
Output current	$I_{out}$	60	mA
Output voltage	$V_{out}$	16	V
Reverse voltage between all terminals	$V_R$	0.5	
Total power dissipation, $T_S = 75\text{ °C}$	$P_{tot}$	330	mW
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-65 ... 150	

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	225	K/W

<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

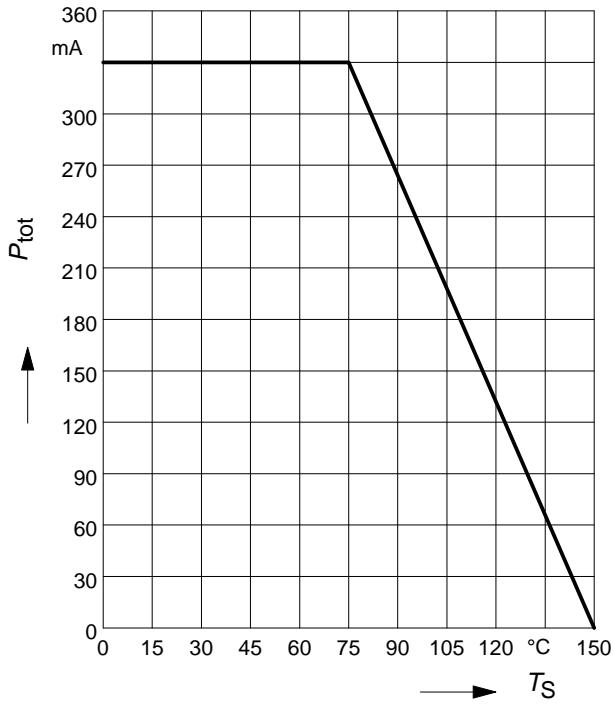
**Electrical Characteristics** at  $T_A=25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Collector-emitter breakdown voltage $I_C = 100 \mu\text{A}$ , $I_B = 0$	$V_{BR(CEO)}$	18	-	-	-
Supply current $V_S = 10 \text{ V}$	$I_S$	350	440	540	$\mu\text{A}$
DC current gain $I_C = 50 \text{ mA}$ , $V_{CE} = 1 \text{ V}$	$h_{FE}$	-	150	-	-
Internal resistor $I_{Rint} = 10 \text{ mA}$	$R_{int}$	66	79	94	$\Omega$
Output current $V_S = 10 \text{ V}$ , $V_{out} = 7.6 \text{ V}$	$I_{out}$	9	10	11	$\text{mA}$
Voltage drop ( $V_S - V_E$ ) $I_{out} = 20 \text{ mA}$	$V_{drop}$	-	0.79	-	$\text{V}$

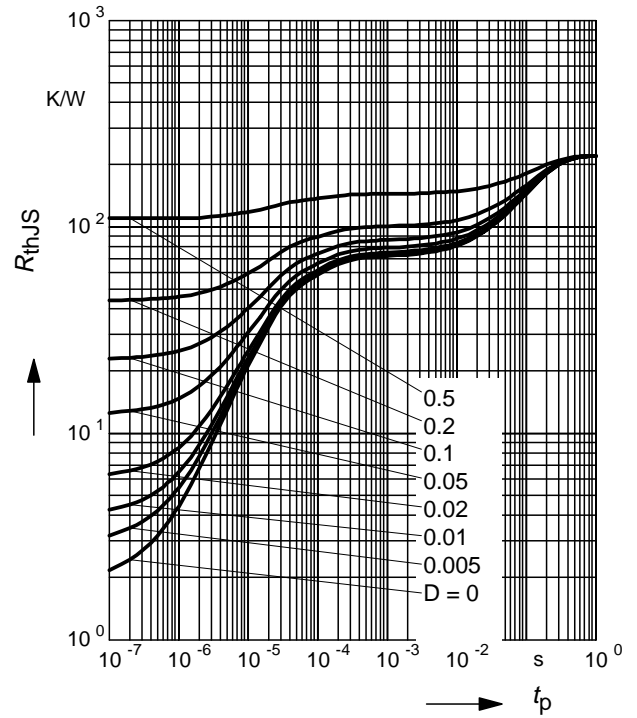
**DC Characteristics with stabilized LED load**

Lowest sufficient supply voltage overhead $I_{out} > 8\text{mA}$	$V_{Smin}$	-	1.2	-	$\text{V}$
Output current change versus $T_A$ $V_S = 10 \text{ V}$	$\Delta I_{out}/I_{out}$	-	-0.3	-	$\%/K$
Output current change versus $V_S$ $V_S = 10 \text{ V}$	$\Delta I_{out}/I_{out}$	-	2	-	$\%/V$

**Total power dissipation  $P_{tot} = f(T_S)$**

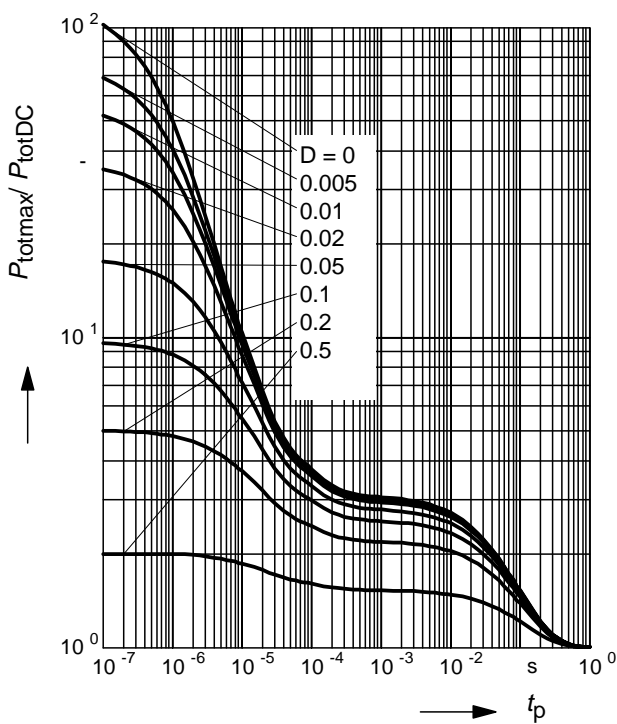


**Permissible Pulse Load  $R_{thJS} = f(t_p)$**



**Permissible Pulse Load**

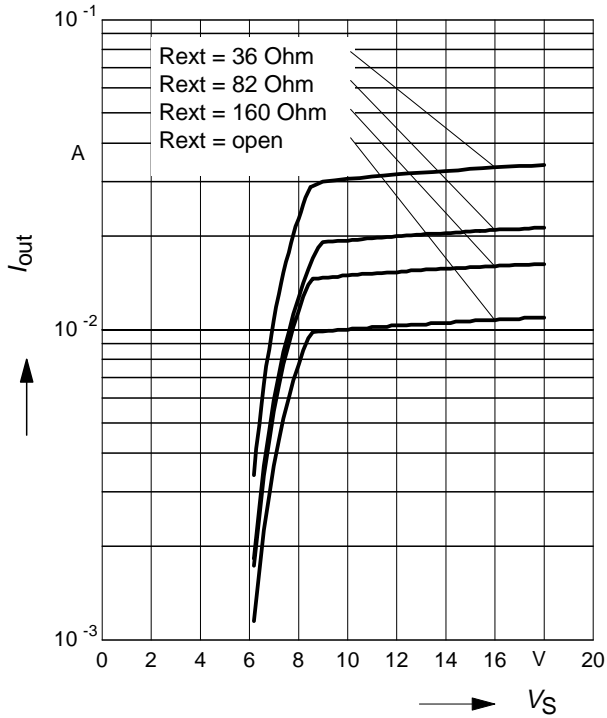
$P_{totmax} / P_{totDC} = f(t_p)$



**Output current versus supply voltage**

$I_{out} = f(V_S); R_{ext} = \text{Parameter}$

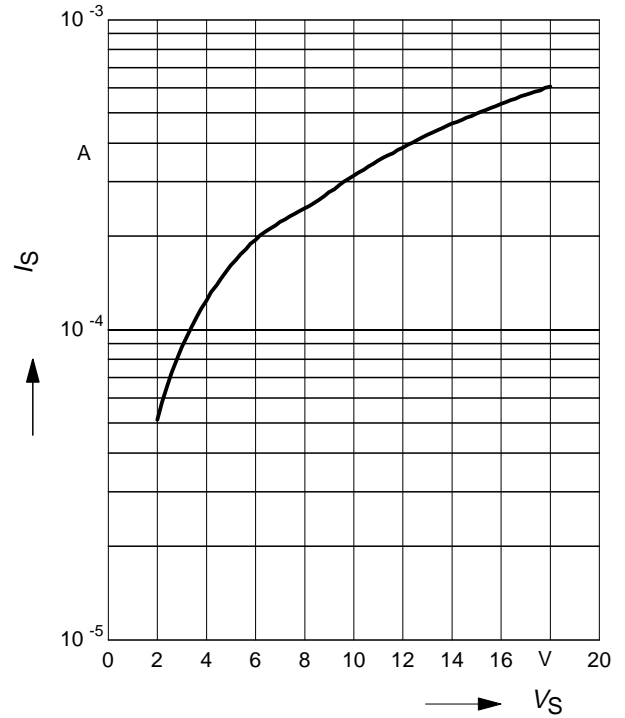
Load: two LEDs with  $V_F = 3.8V$  in series



**Supply current versus supply voltage**

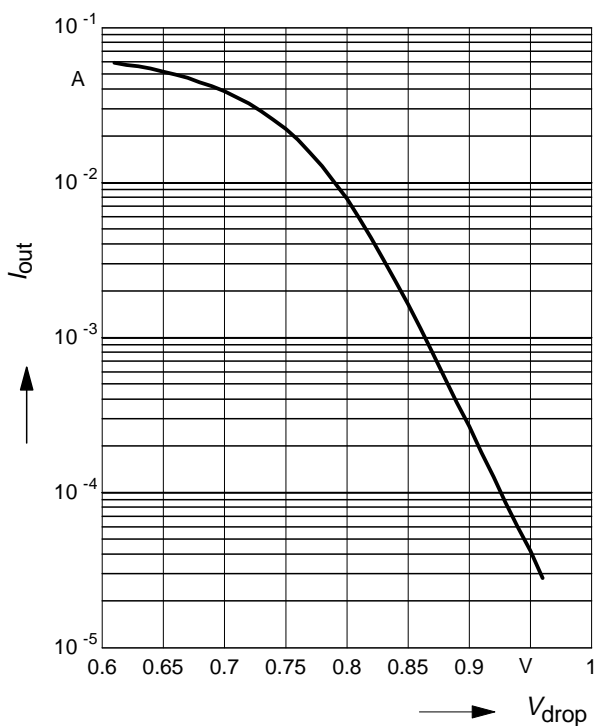
$I_S = f(V_S)$

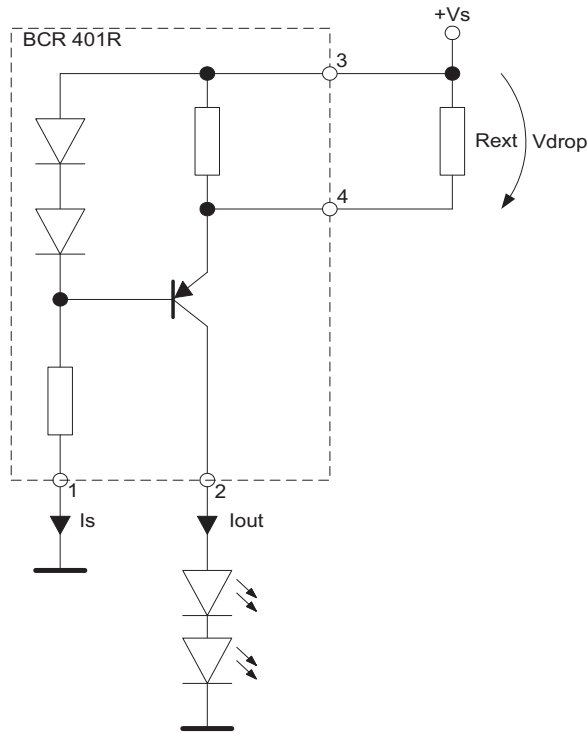
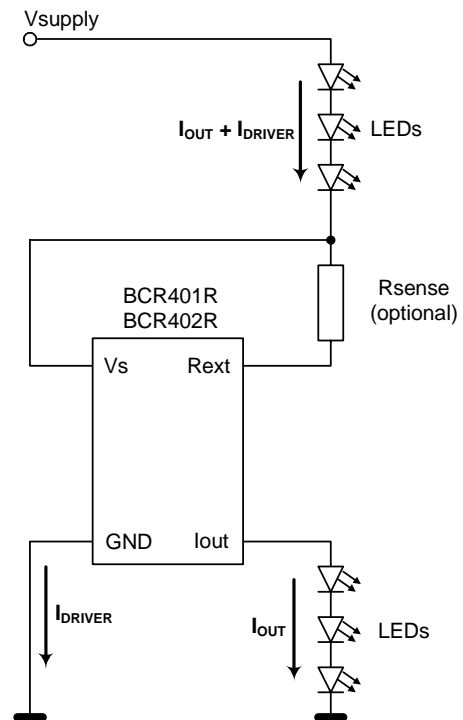
Load: two LEDs with  $V_F = 3.8V$  in series



**Output current versus reference voltage**

$I_{out} = f(V_{DROP}); V_S = 10V; V_{out} = 7.6V$



**Standard Application Circuit:**

**Application Circuit:**  
 supply voltages >18V

**Application hints**

BCR401R serves as an easy to use constant current source for LEDs. In stand alone application an external resistor can be connected to adjust the current from 10 mA to 60 mA. Rext can be determined by using the diagram 'Output current versus external resistor', or by referring to diagram 'Output current versus reference voltage'. Look for your desired output current on the y axis and read out the corresponding Vdrop. Calculate Rext:

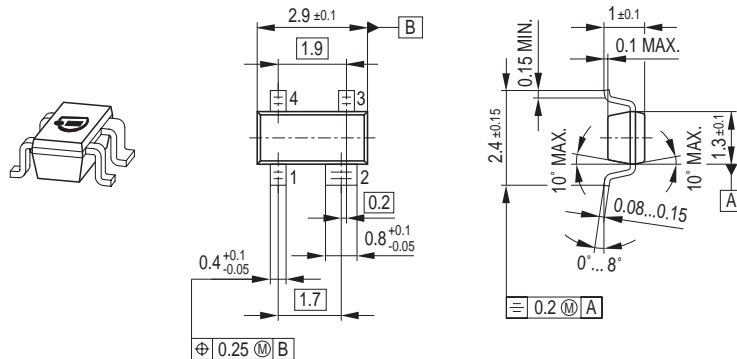
$$R_{ext} = \frac{V_{drop}}{I_{out} - (V_{drop}/R_{int})}$$

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.

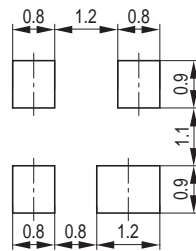
Please visit our web site for application notes: [www.infineon.com/lowcostleddriver](http://www.infineon.com/lowcostleddriver)

- AN066 explains the basic concept
- AN077 gives hints to thermal design
- AN159 provides information how to add a power transistor to increase the output current

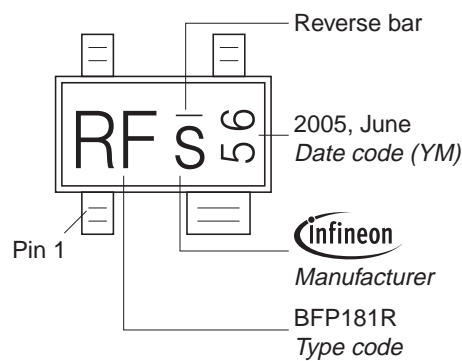
Package Outline



Foot Print

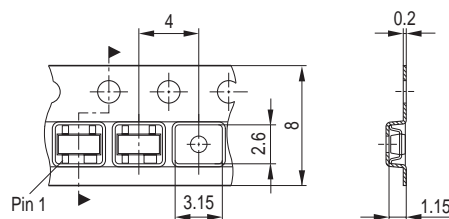


Marking Layout (Example)



Standard Packing

Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel



Published by  
Infineon Technologies AG  
81726 München, Germany  
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