INFORMATION NOTE

N° 016/12

Update of datasheets for LED drivers BCR401W, BCR402W, BCR401U, BCR402U, BCR320U/BCR321U, BCR420U/BCR421U

Subject of Change:

Update of datasheets respective higher max. ratings of output voltage V_{out}, tighter limits of internal resistor R_{int} and tighter limits of output current I_{out}.

Products affected:

BCR401W
BCR402W
BCR401U
BCR402U
BCR320U
BCR321U
BCR420U
BCR421U

Reason of Change:

1. Electrical Changes

- Higher max. ratings of output voltage V_{out} for BCR401W, BCR402W, BCR401U, BCR402U, BCR420U, BCR421U.
- Tighter limits of internal resistor R_{int} for BCR401W, BCR402W, BCR401U, BCR402U, BCR320U, BCR321U, BCR420U, BCR421U.
- Tighter limits of output current I_{out} for BCR320U, BCR321U, BCR420U, BCR421U.
- Updated figures in data sheets of BCR402U, BCR420U, BCR421U.

See details of the changes on the next page.

2. Layout Changes

Layout of all affected datasheets updated according to new Infineon template.

INFORMATION NOTE

N° 016/12

Description of change:

Old datasheet edition | **New datasheet edition**

Product	Datasheet edition	2010-01-12			2012-04-12			
BCR401W	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
	V_{out}	-	-	16	-	-	18	V
	R_{int}	66	79	94	68	79	90	Ω
BCR402W	Datasheet edition	2010-01-12			2012-04-12			
	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
	V_{out}	-	-	16	-	-	18	V
	R_{int}	33	38	47	33	38	45	Ω
BCR401U	Datasheet edition	2009-07-31			2012-04-12			
	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
	V_{out}	-	-	38	-	-	40	V
	R_{int}	72	91	110	78	91	104	Ω
BCR402U	Datasheet edition	2009-07-31			2012-04-13			
	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
	V_{out}	-	-	38	-	-	40	V
	R_{int}	37	44	53	38	44	52	Ω
					Temperature labels updated on Figure 3-7 Output Current versus VS Iout = f(VS)			
					Temperature labels updated on Figure 3-8 Output Current versus Rext Iout = f(Rext)			
BCR320U BCR321U	Datasheet edition	2010-01-15			2012-05-04			
	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
	R_{int}	65	90	105	85	95	105	Ω
	I_{out}	8	10	12	9	10	11	mA
BCR420U BCR421U	Datasheet edition	2010-01-15			2012-05-04			
	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
	V_{out}	-	-	38	-	-	40	V
	R_{int}	65	90	105	85	95	105	Ω
	I_{out}	8	10	12	9	10	11	mA
					Update of Figure 3-13 BCR420U: Enable Current versus VEN IEN = f(VEN)			
					8 Ω label updated on Figure 3-22 BCR421U: Output Current versus VEN Iout			

Changes are marked in red.

Assessment:

Due to the higher maximum ratings and tighter limits technical performance of the products is improved.

There is no impact on form, fit, function, reliability and processability.

Data sheets have been updated accordingly, see attachment 3_cip01612.

Time schedule:

Will be implemented on July 2, 2012 with datecode 1227 (YYWW) printed on the barcode product label.

If you have any questions, please do not hesitate to contact your local Sales office.

LED Driver

BCR320U / BCR321U

Datasheet

Revision 2.0, 2012-05-04

Power Management & Multimarket

Edition 2012-05-04

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Revision 2.0, 2012-05-04	
All	Datasheet layout updated
Table 2-3	R_{int} limits tightened
Table 2-3	I_{out} limits tightened

Table of Contents

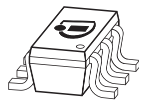
List of Figures

List of Tables

1 LED Driver

1.1 Features

- LED drive current preset to 10 mA
- Continuous output current up to 250 mA with an external resistor
- Easy paralleling of drivers to increase current
- Supply voltage up to 25 V
- Low side current control
- Digital PWM input up to 10 kHz frequency (BCR321U)
- Up to 1 W 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

- Architectural LED lighting
- Channel letters for advertising, LED strips for decorative lighting
- Retail lighting in fridge, freezer case and vending machines
- Emergency lighting (e.g. steps lighting, exit way signs etc.)

1.3 General Description

The BCR320U / BCR321U provides a low-cost solution for driving 0.5 W LEDs with a typical LED current of 150 mA to 200 mA. Internal breakdown voltage is higher than 16 V which is the maximum voltage the LED driver can sustain when the output is directly connected to supply voltage.

The BCR320U / BCR321U can be operated with a supply voltage of more than 16 V considering the voltage drop of the LED load which reduces the output voltage to the maximum rating of the driver.

The enable pin of BCR320U can withstand a maximum voltage of 25 V which can be increased adding a series resistor in front of the enable pin reducing the voltage at the enable pin below 25 V.

The digital input pin of BCR321U allows dimming via a micro controller with frequencies up to 10 kHz.

A reduction of the output current at higher temperatures is the result of the negative temperature coefficient of -0.2 %/K of the LED driver.

With no need for additional external components like inductors, capacitors and free wheeling diodes, the BCR320U / BCR321U LED drivers are a cost-efficient and PCB-area saving solution for driving 0.5 W LEDs.

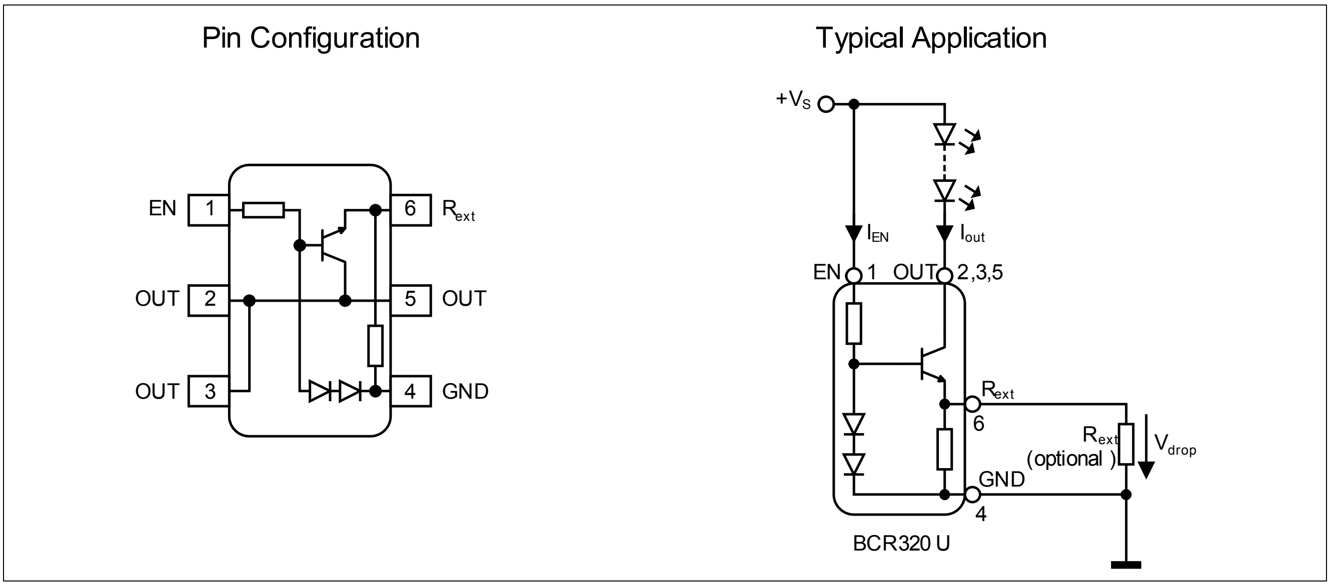


Figure 1-1 Pin configuration and typical application

Type	Marking	Pin Configuration				Package
BCR320U	30	1 = EN	2; 3; 5 = OUT	4 = GND	6 = R_{ext}	SC74
BCR321U	31	1 = EN	2; 3; 5 = OUT	4 = GND	6 = R_{ext}	SC74

2 Electrical Characteristics

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Enable voltage BCR320U BCR321U	V_{EN}	 - -	 - -	 25 4.5	V	
Output current	I_{out}	-	-	300	mA	
Output voltage	V_{out}	-	-	16	V	
Reverse voltage between all terminals	V_R	-	-	0.5	V	
Total power dissipation	P_{tot}	-	-	1000	mW	$T_S \leq 100$ °C
Junction temperature	T_J	-	-	150	°C	
Storage temperature range	T_{STG}	-65	-	150	°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 °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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Collector-emitter breakdown voltage	$V_{BR(CEO)}$	16	-	-	V	I_C = 1 mA, I_B = 0
Enable current BCR320U BCR321U	I_{EN}	 - -	 1.2 1.2	 - -	mA	 V_{EN} = 12 V V_{EN} = 3.3 V
DC current gain	h_{FE}	200	350	500	-	I_C = 50 mA, V_{CE} = 1 V
Internal resistor	R_{int}	85	95	105	Ω	I_{Rint} = 10 mA
Bias resistor BCR320U BCR321U	R_B	 - -	 10 1.5	 - -	kΩ	

Table 2-3 Electrical Characteristics at T_A = 25 °C, unless otherwise specified (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Output current	I_{out}				mA	V_{out} = 1.4 V
BCR320U		9	10	11		V_{EN} = 12 V
BCR321U		9	10	11		V_{EN} = 3.3 V
Output current at R_{ext} = 3 Ω						V_{out} > 1.4 V
BCR320U		-	250	-		V_{EN} = 12 V
BCR321U		-	250	-		V_{EN} = 3.3 V
Voltage drop (V_{Rext})	V_{drop}	0.85	0.95	1.05	V	I_{out} = 10 mA

Table 2-4 DC Characteristics with stabilized LED load at T_A = 25 °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 mA
Output current change versus T_A	$\Delta I_{out}/I_{out}$				%/K	V_{out} > 2.0 V
BCR320U		-	-0.2	-		V_{EN} = 12 V
BCR321U		-	-0.2	-		V_{EN} = 3.3 V
Output current change versus V_S	$\Delta I_{out}/I_{out}$				%/V	V_{out} > 2.0 V
BCR320U		-	1	-		V_{EN} = 12 V
BCR321U		-	1	-		V_{EN} = 3.3 V

3 Typical characteristics

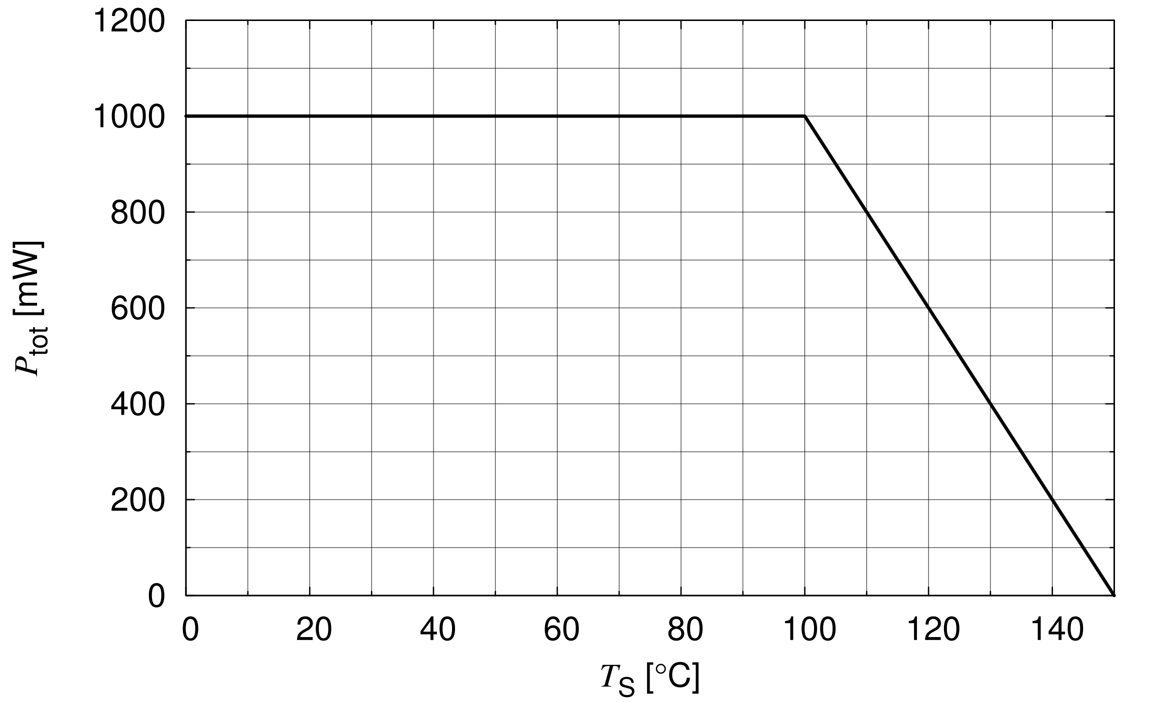


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

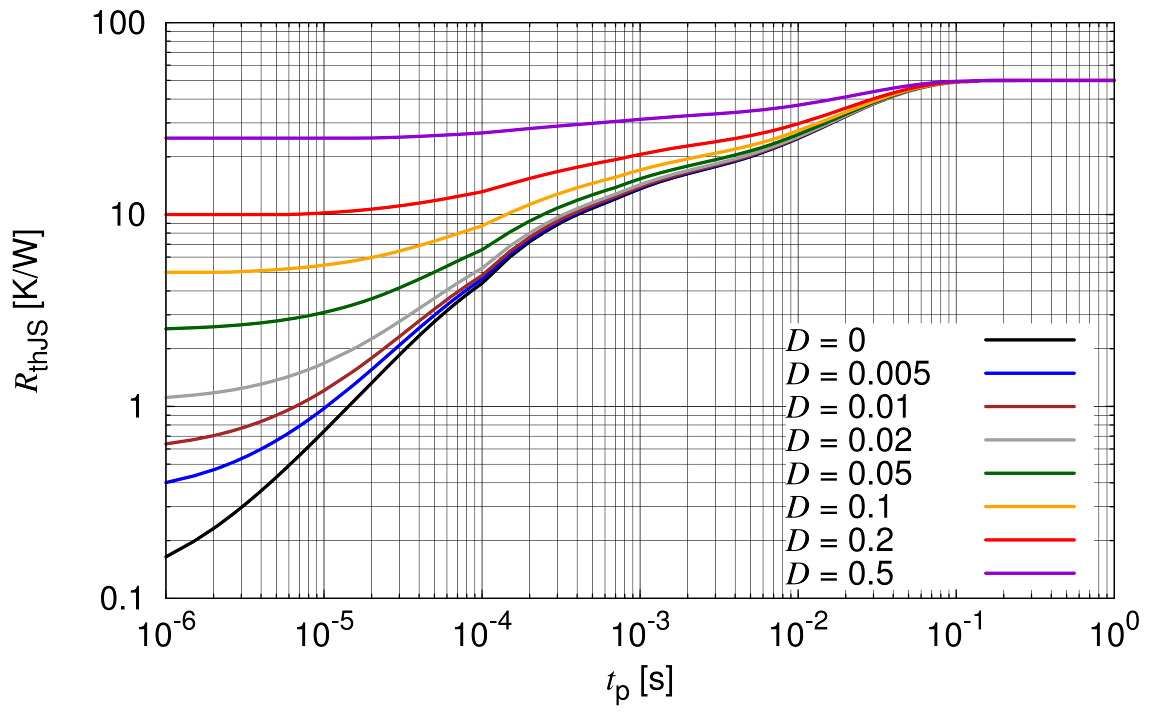


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

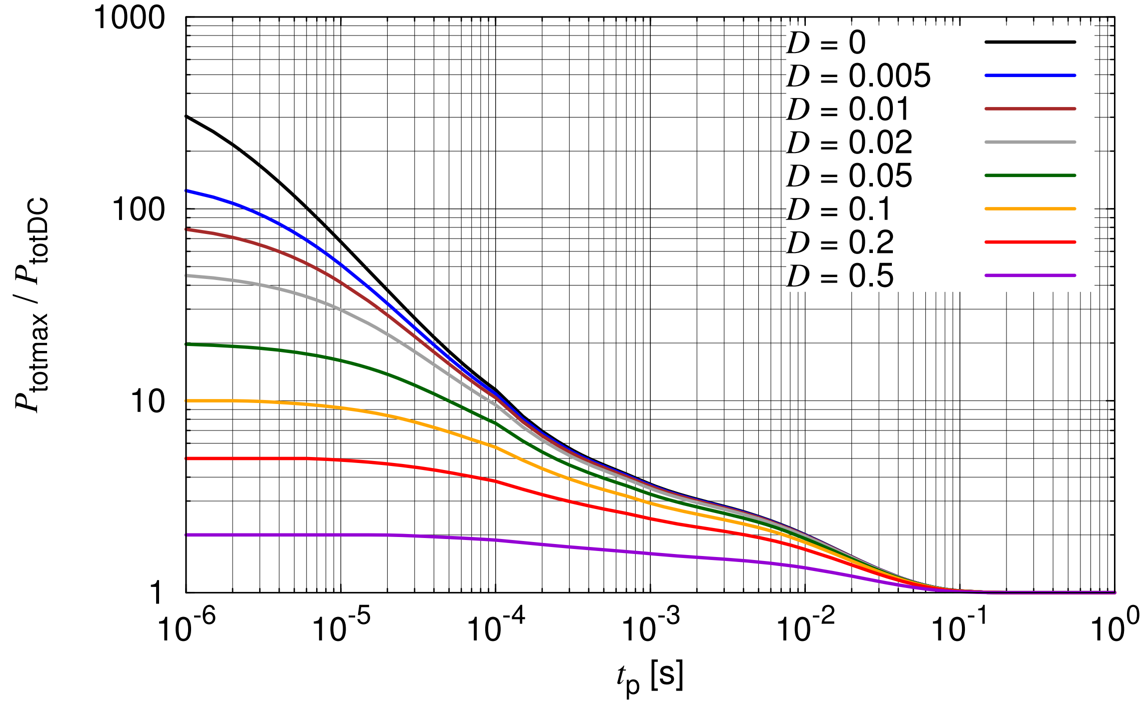


Figure 3-3 Permissible Pulse Load P_{totmax} / P_{totDC}= $f(t_p)$

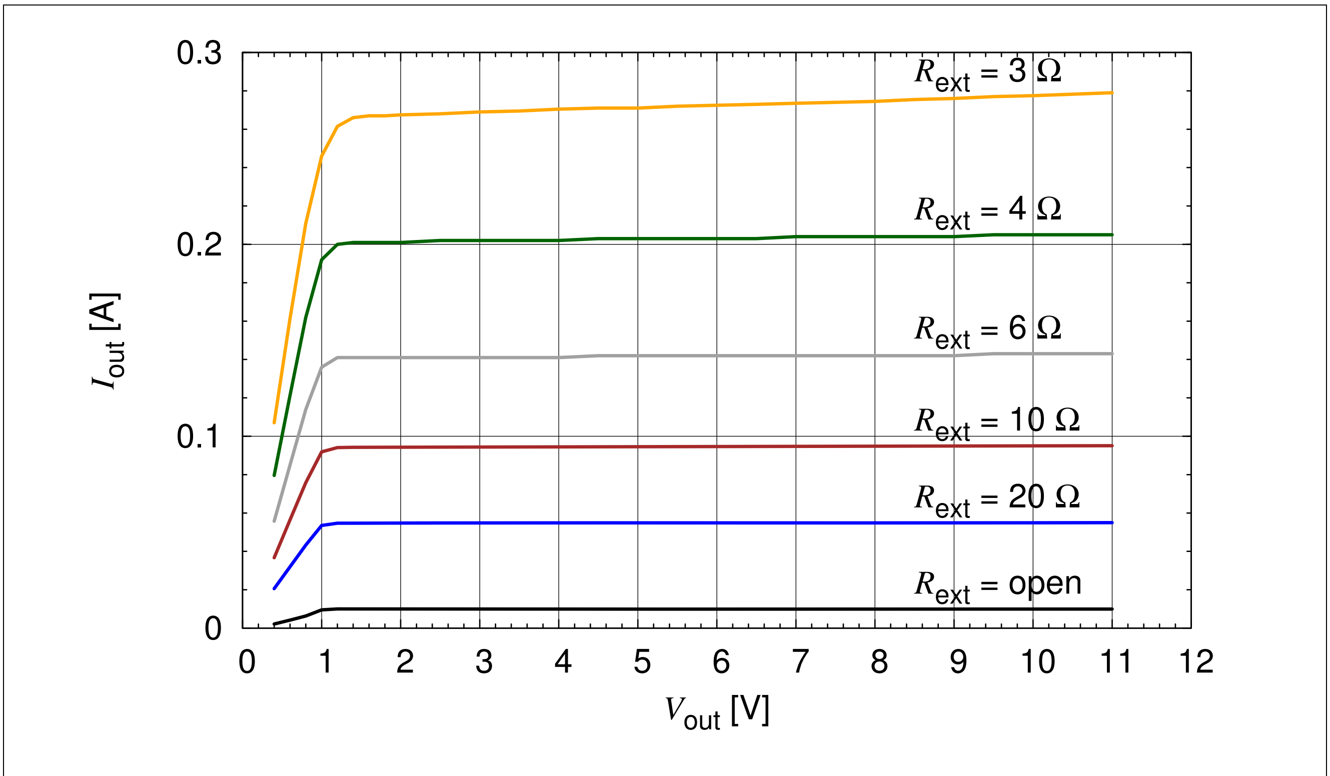


Figure 3-4 BCR320U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 12 V, R_{ext} = Parameter

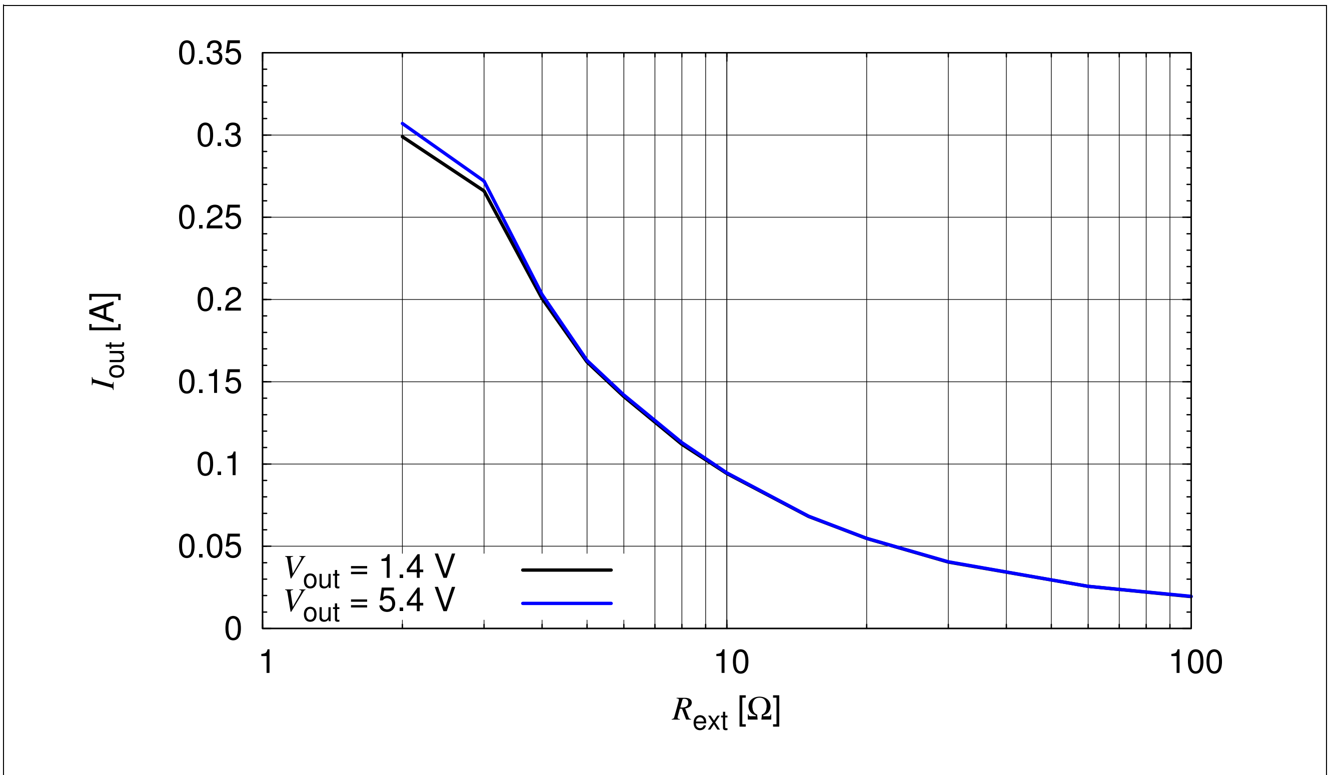


Figure 3-5 BCR320U: Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_{EN} = 12 V, V_{out} = Parameter

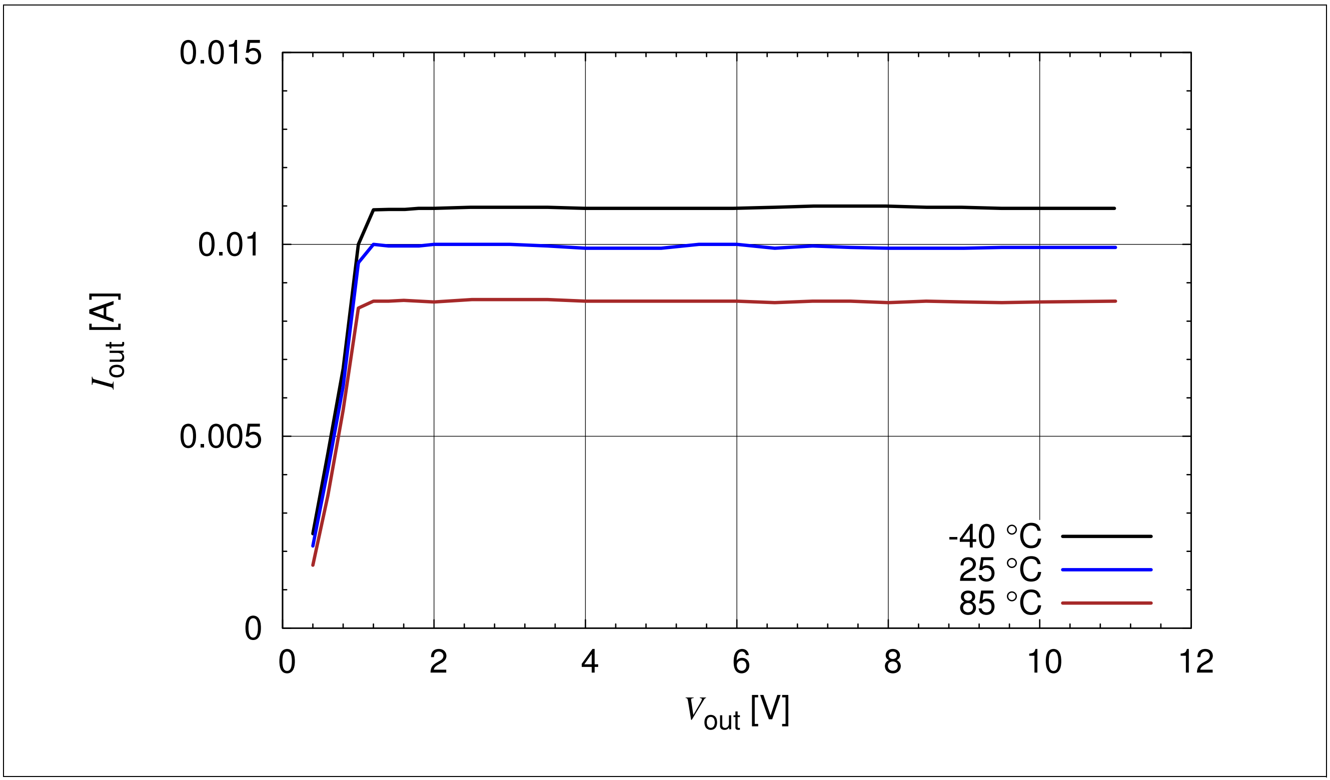


Figure 3-6 BCR320U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 12 V, R_{ext} = open, T_A = Parameter

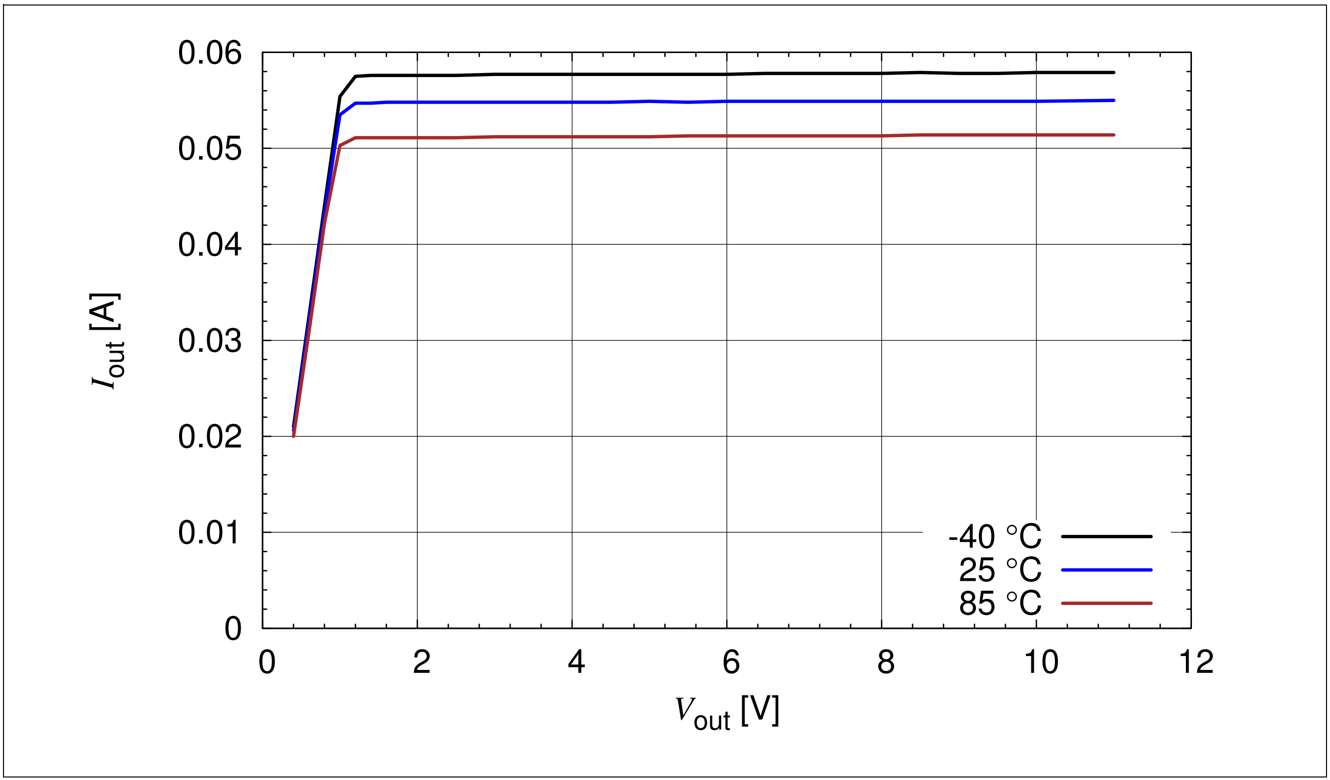


Figure 3-7 BCR320U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 12 V, R_{ext} = 20 Ω, T_A = Parameter

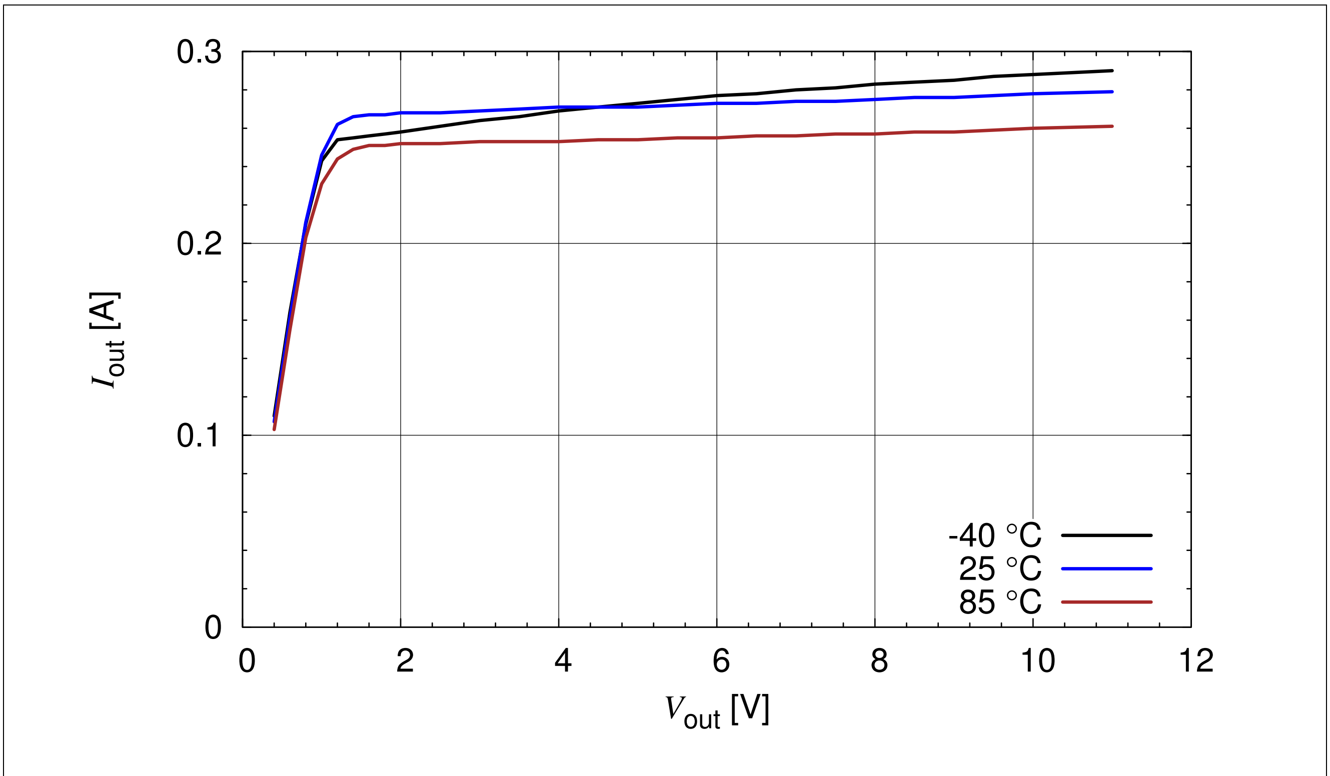


Figure 3-8 BCR320U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 12 V, R_{ext} = 3 Ω, T_A = Parameter

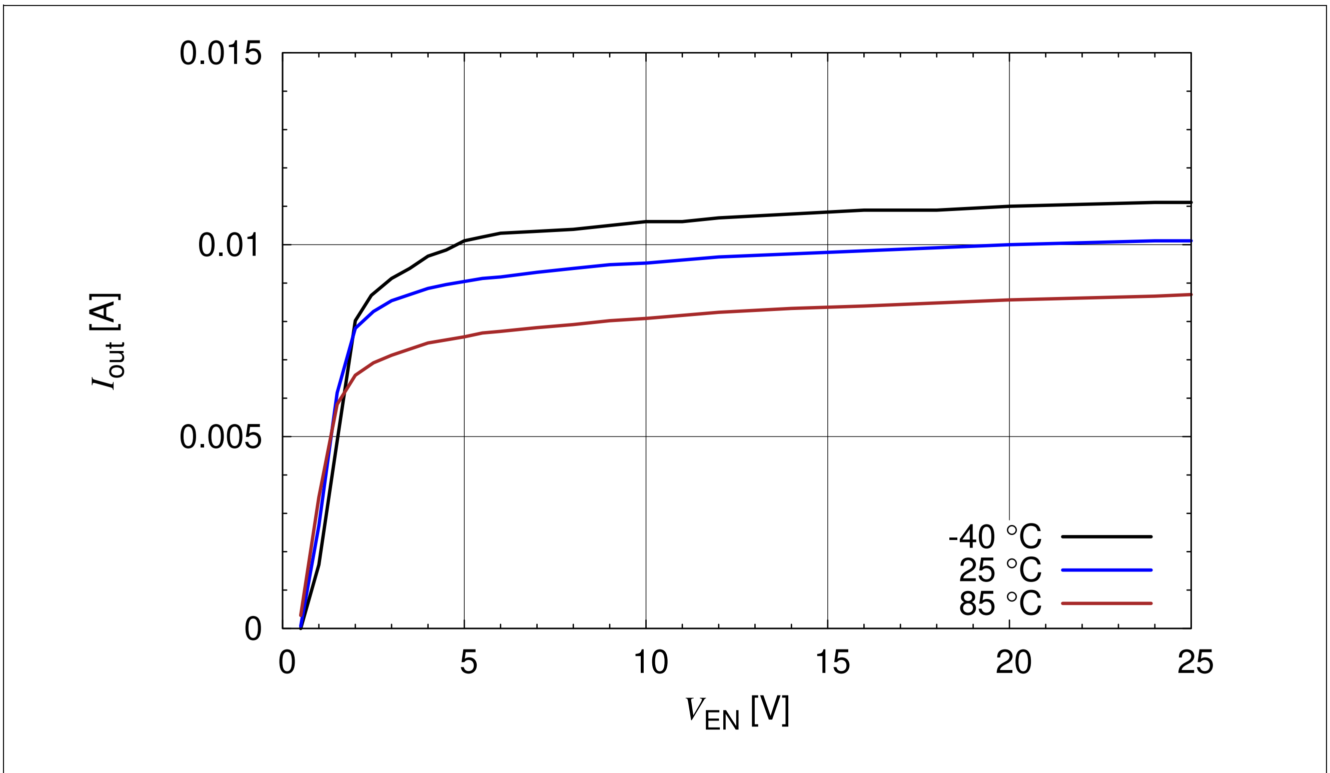


Figure 3-9 BCR320U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = open, T_A = Parameter

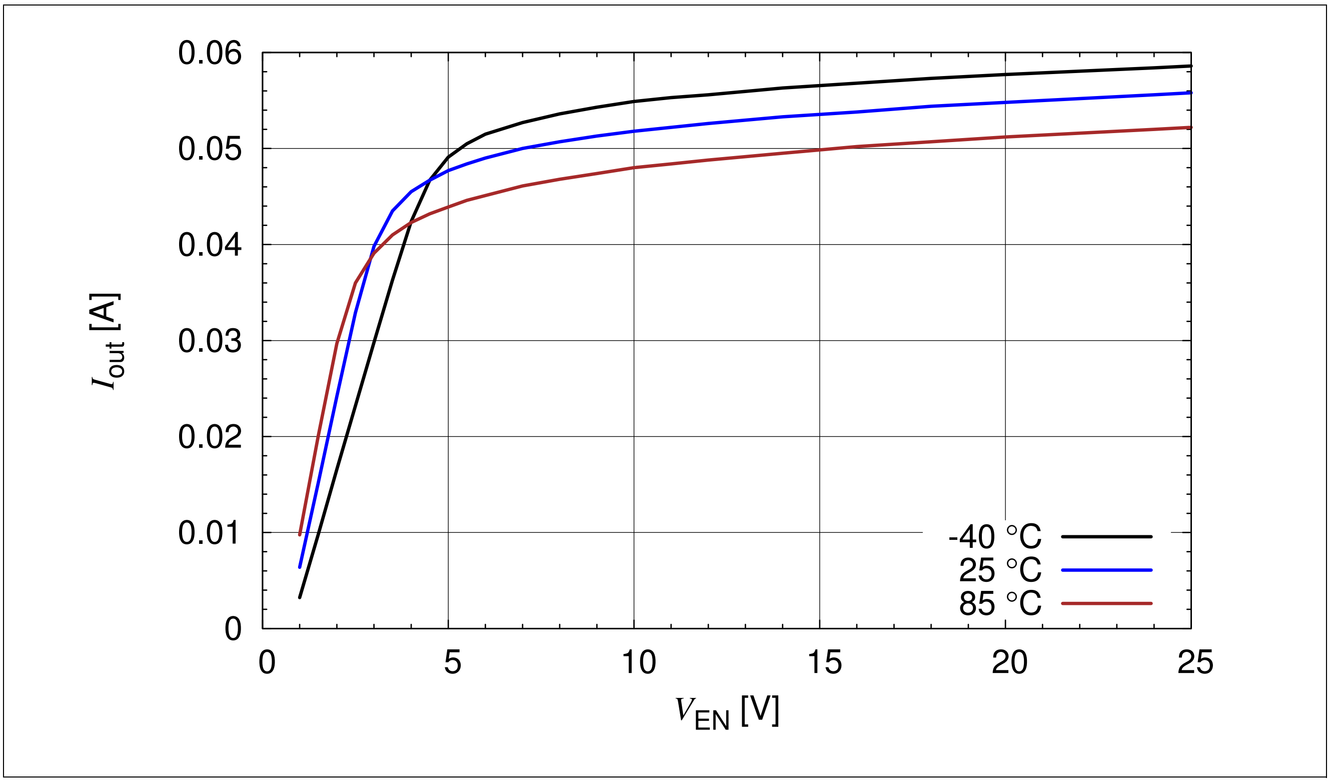


Figure 3-10 BCR320U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 20 Ω, T_A = Parameter

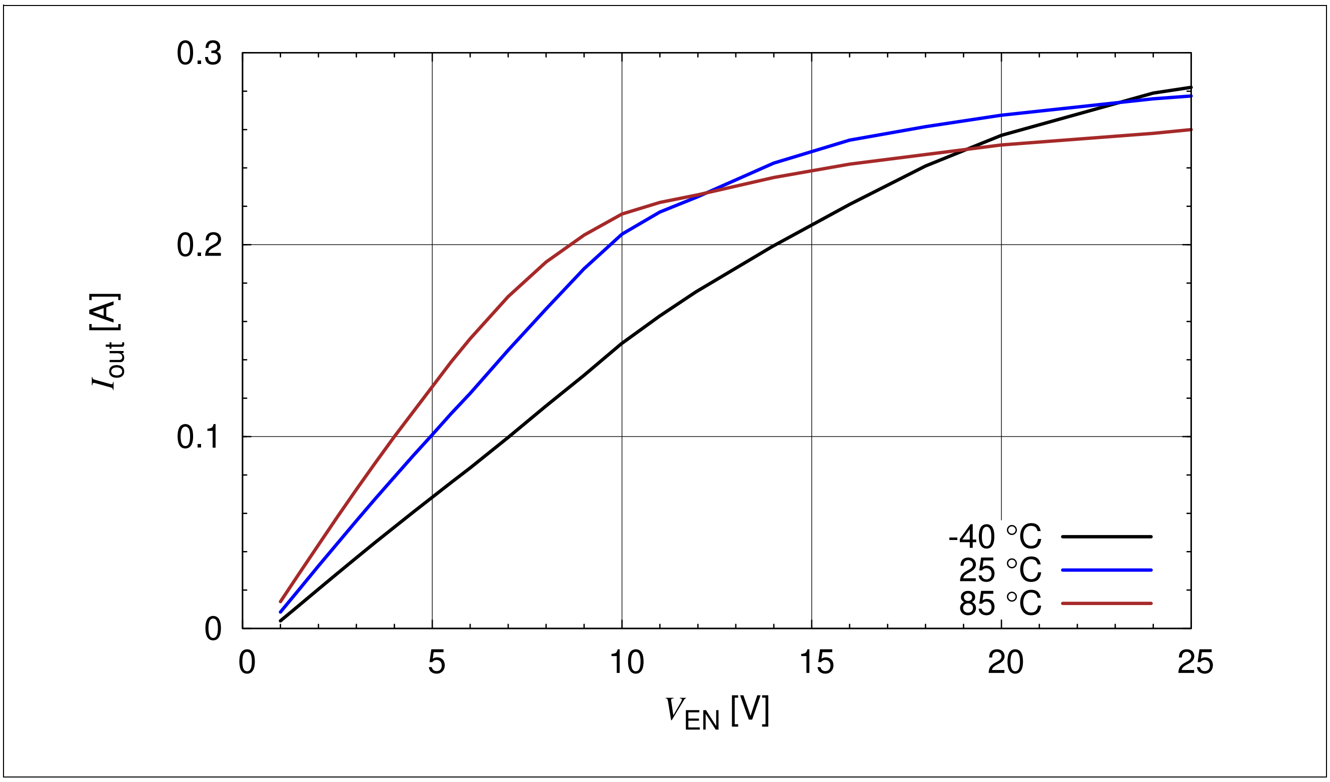


Figure 3-11 BCR320U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 3 Ω, T_A = Parameter

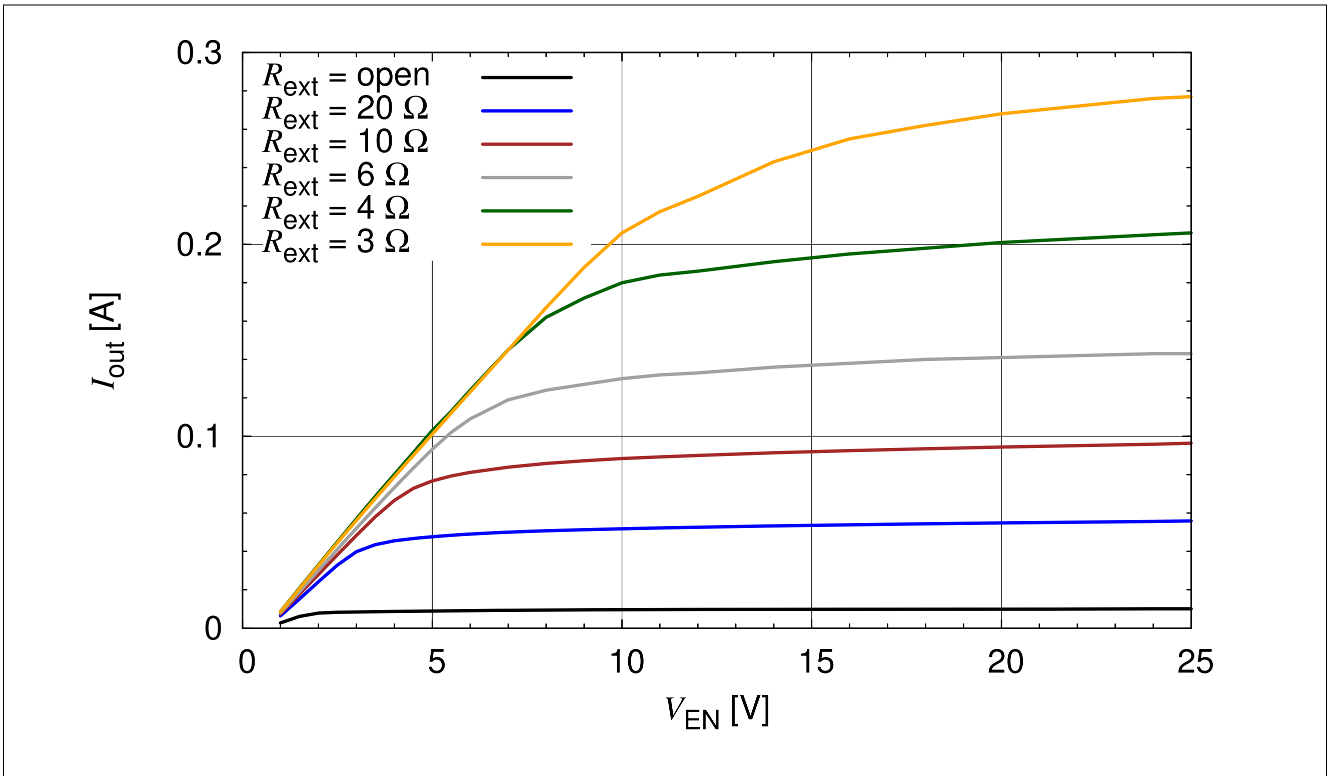


Figure 3-12 BCR320U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = Parameter

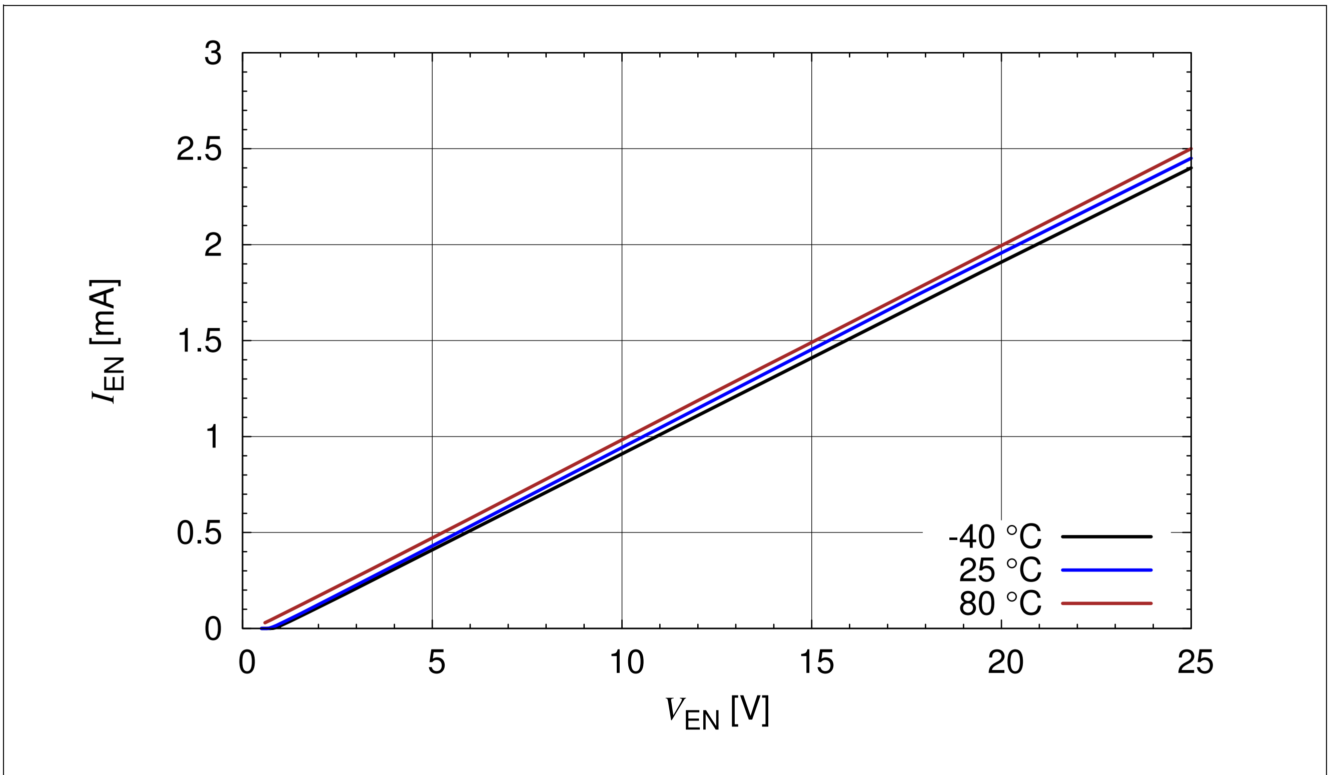


Figure 3-13 BCR320U: Enable Current versus V_{EN} $I_{EN} = f(V_{EN})$, R_{ext} = open, I_{out} = 0 A, T_A = Parameter

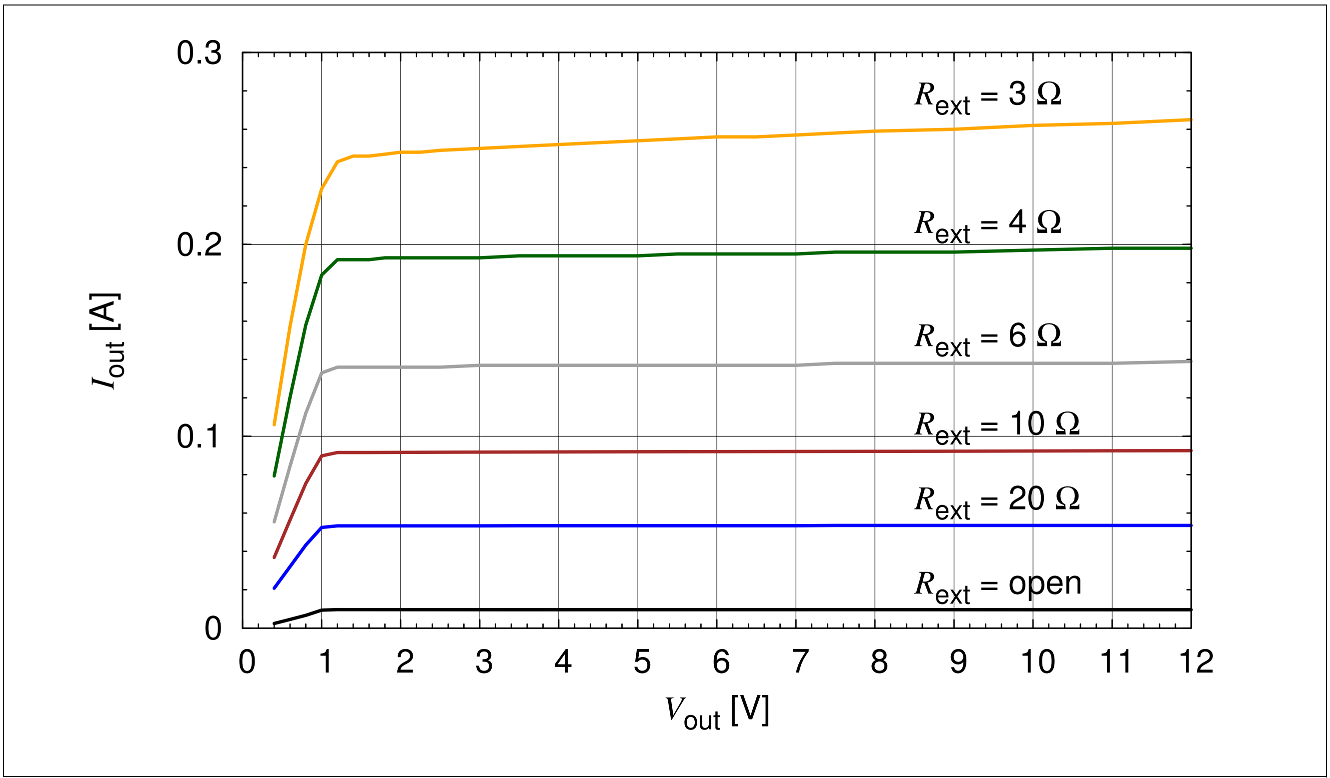


Figure 3-14 BCR321U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = Parameter

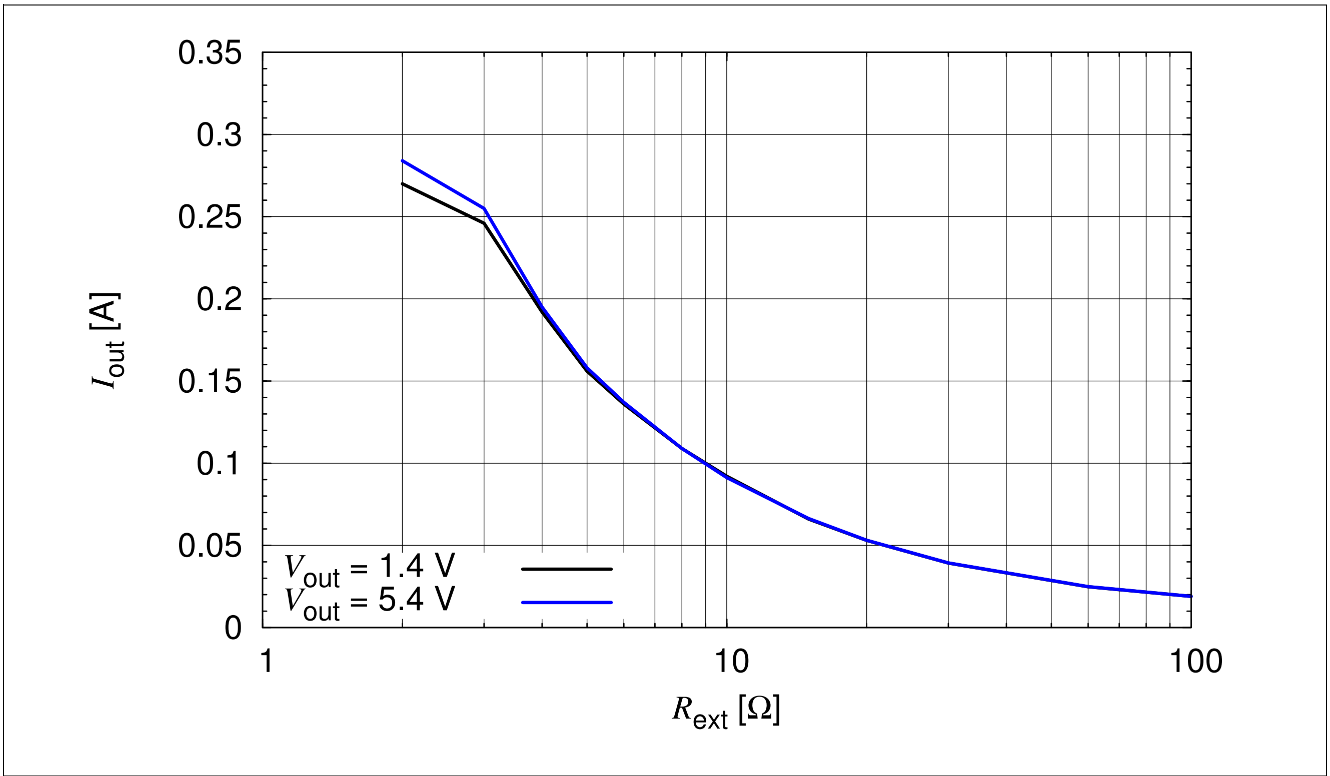


Figure 3-15 BCR321U: Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_{EN} = 3.3 V, V_{out} = Parameter

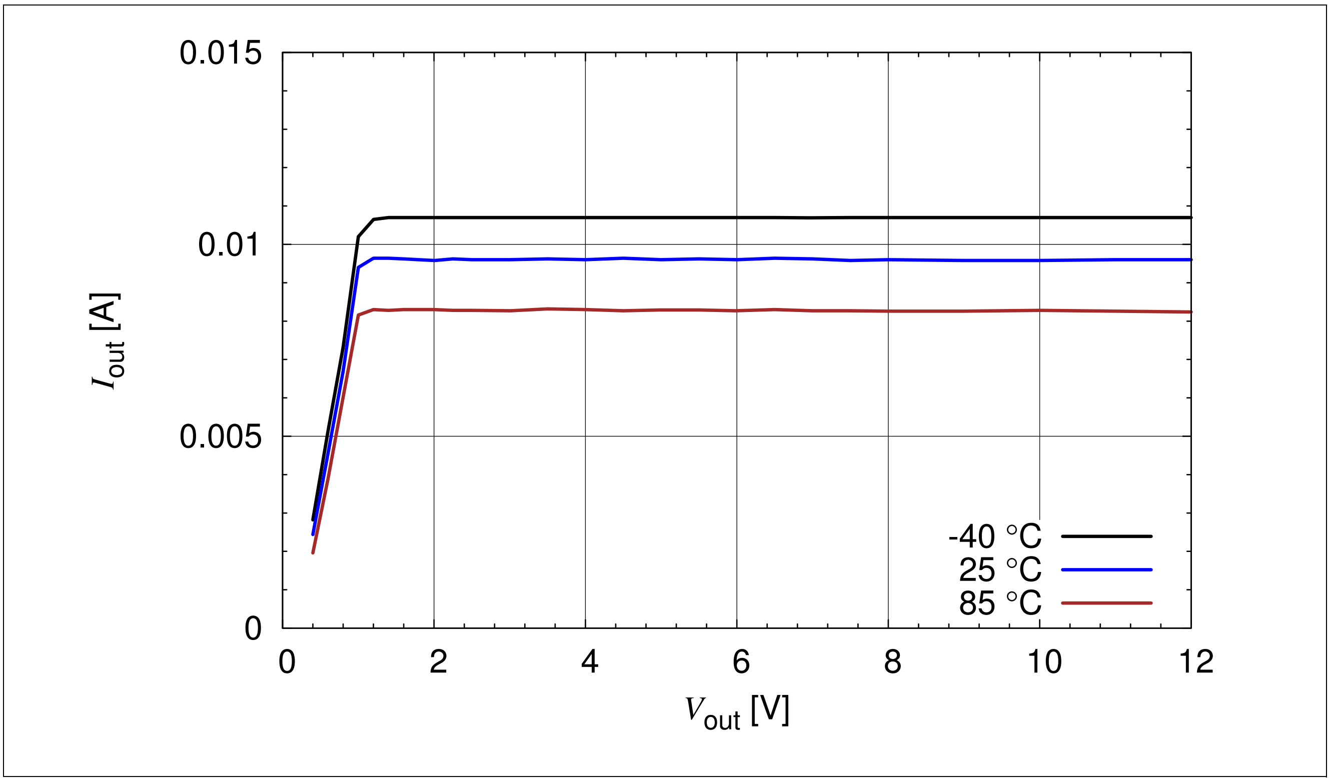


Figure 3-16 BCR321U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = open, T_A = Parameter

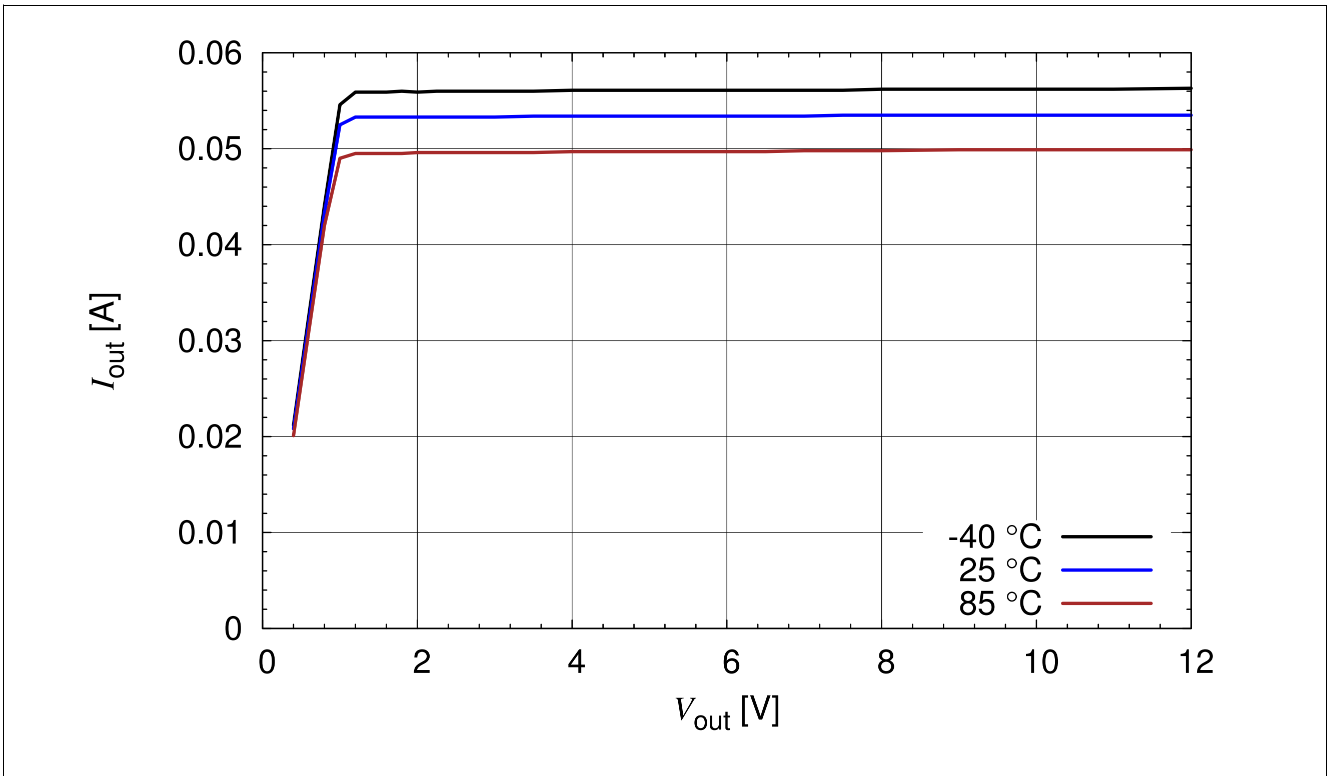


Figure 3-17 BCR321U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = 20 Ω, T_A = Parameter

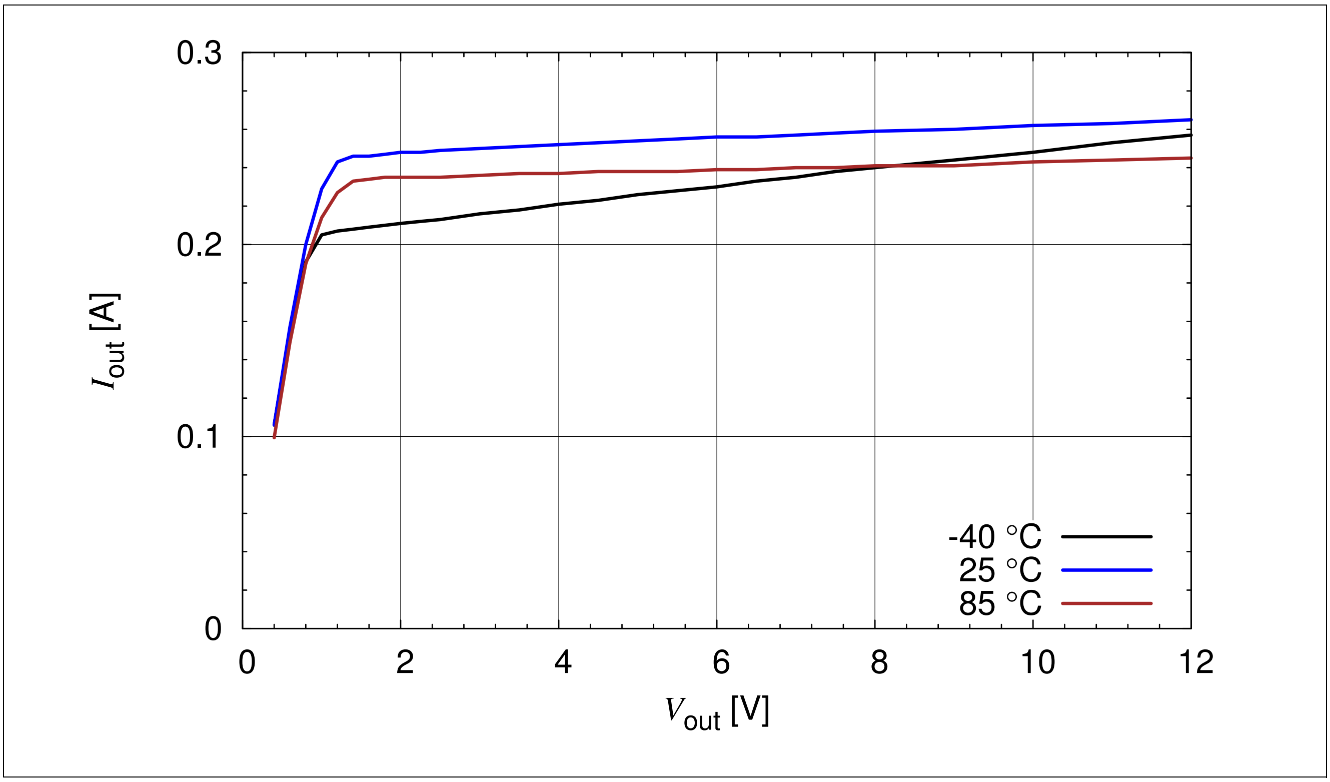


Figure 3-18 BCR321U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = 3 Ω, T_A = Parameter

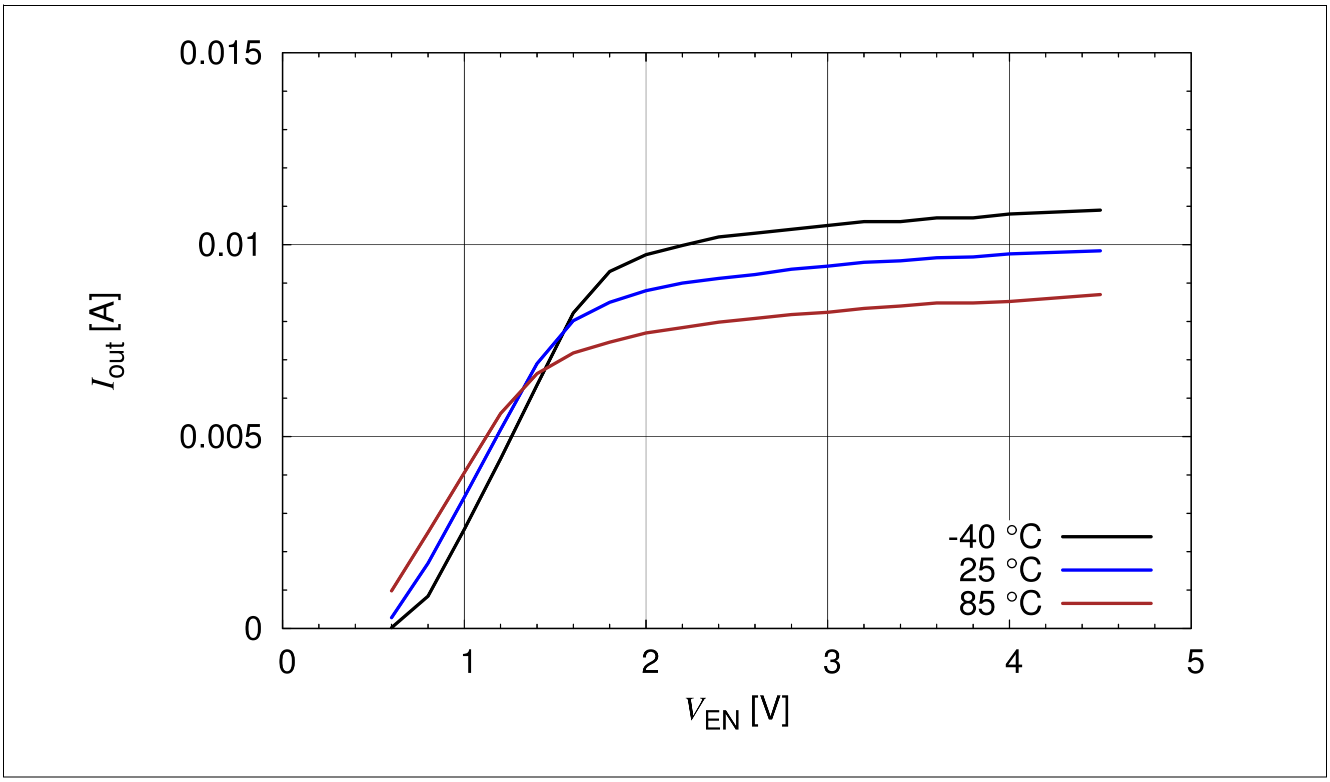


Figure 3-19 BCR321U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = open, T_A = Parameter

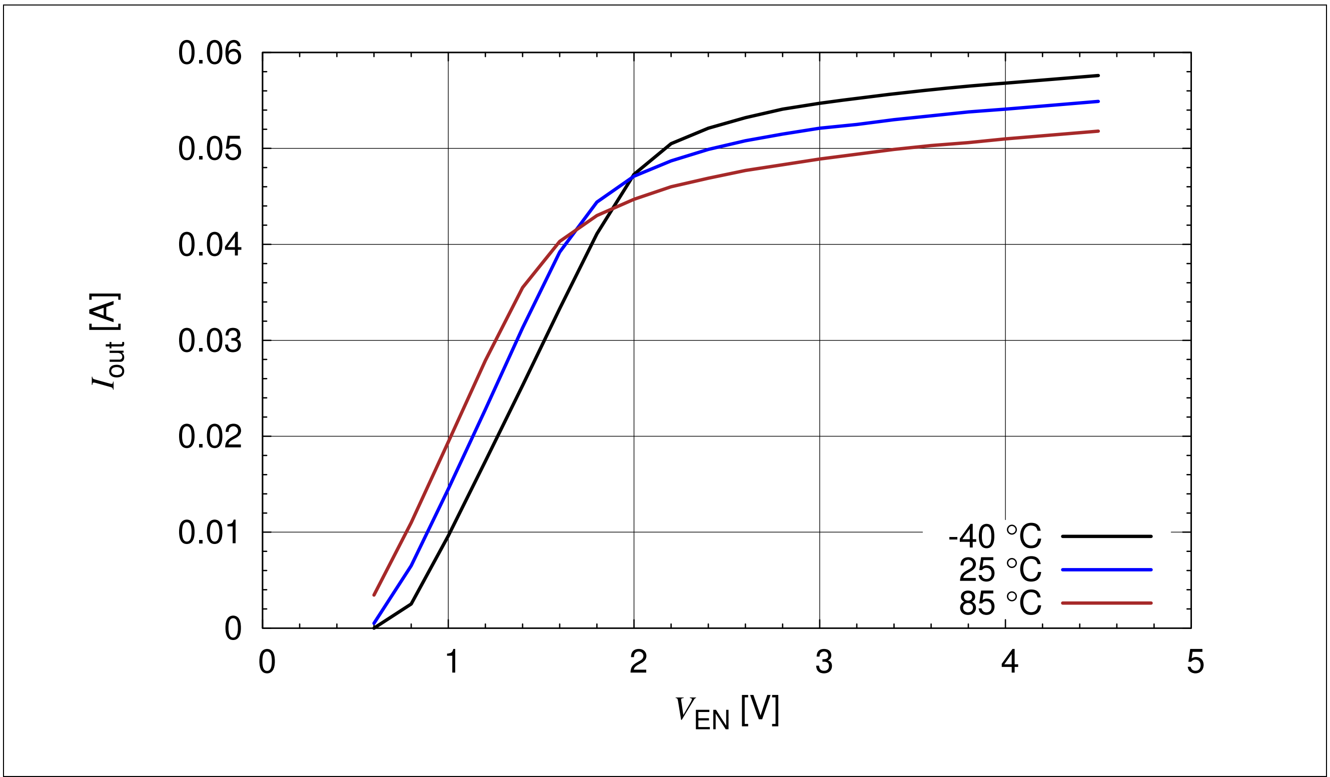


Figure 3-20 BCR321U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 20 Ω, T_A = Parameter

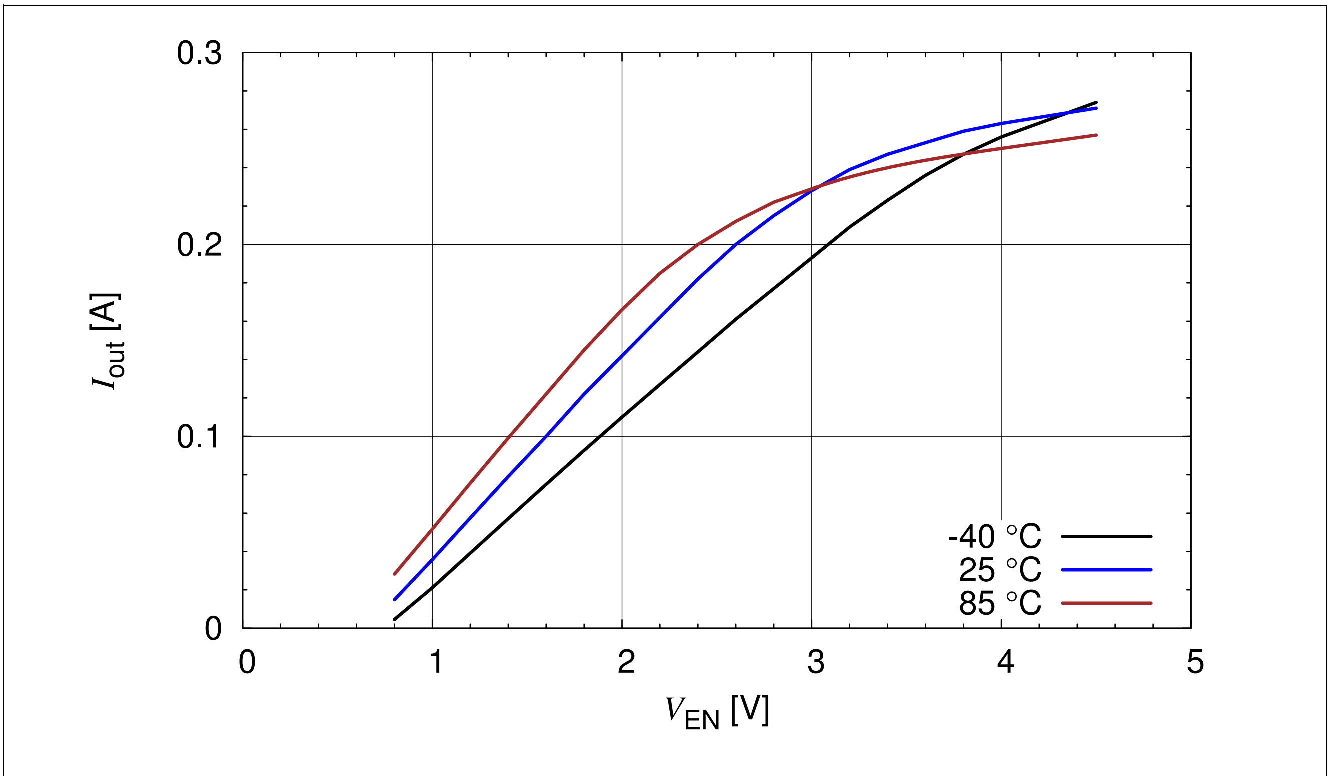


Figure 3-21 BCR321U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 3 Ω, T_A = Parameter

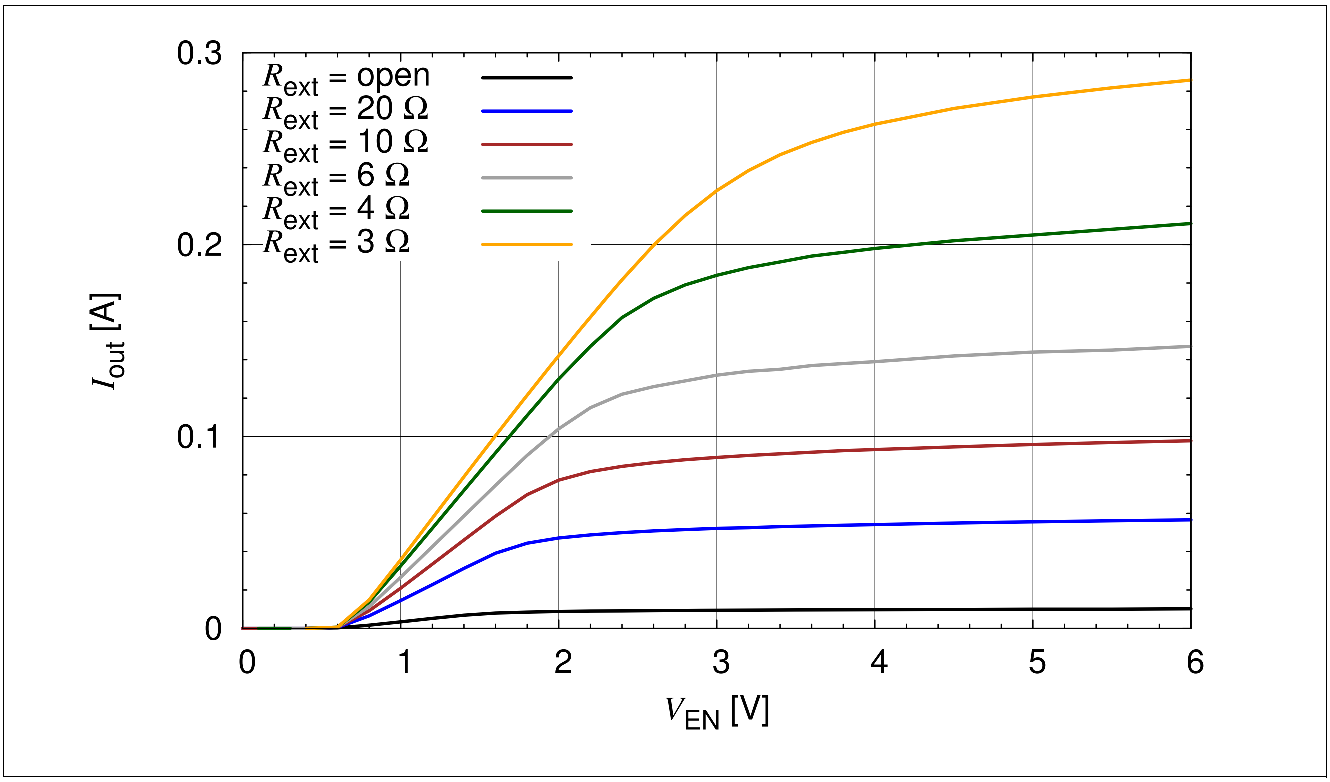


Figure 3-22 BCR321U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = Parameter

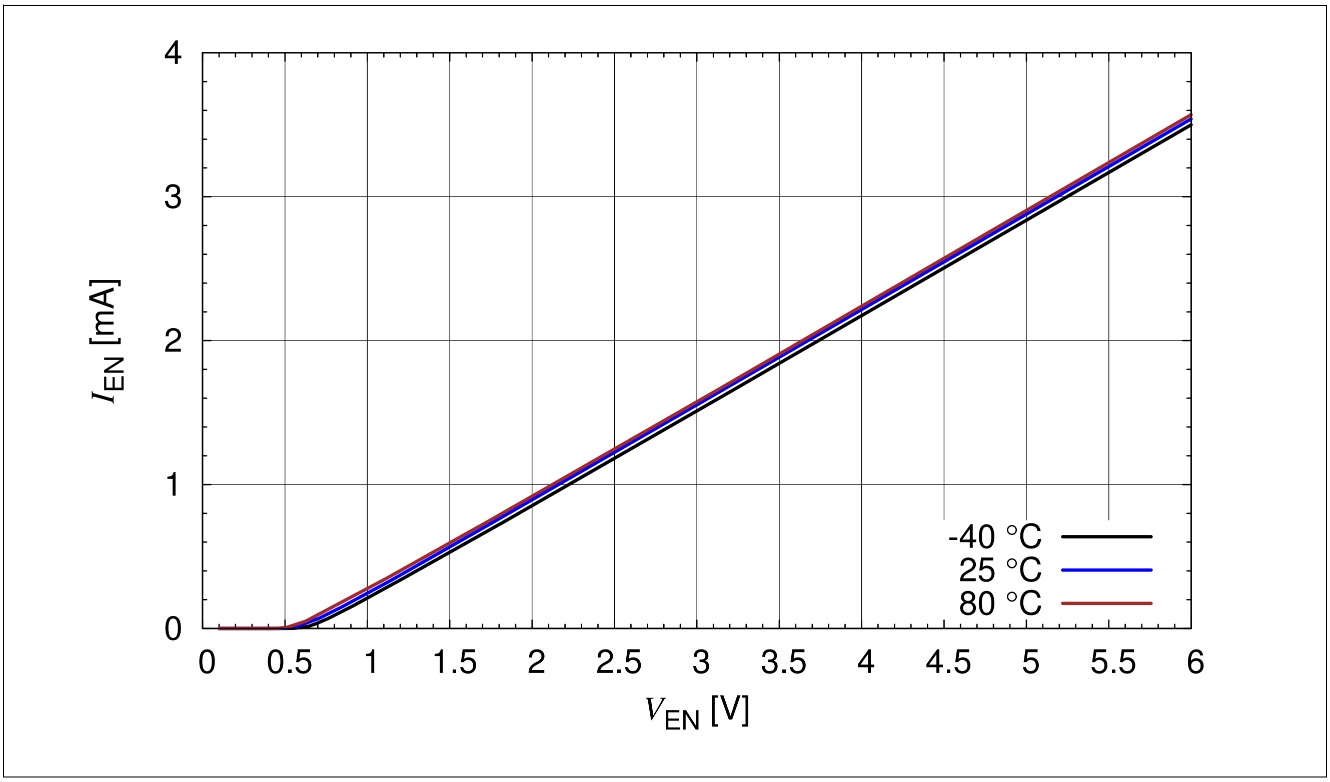


Figure 3-23 BCR321U: Enable Current versus V_{EN} $I_{EN} = f(V_{EN})$, R_{ext} = open, I_{out} = 0 A, T_A = Parameter

4 Application hints

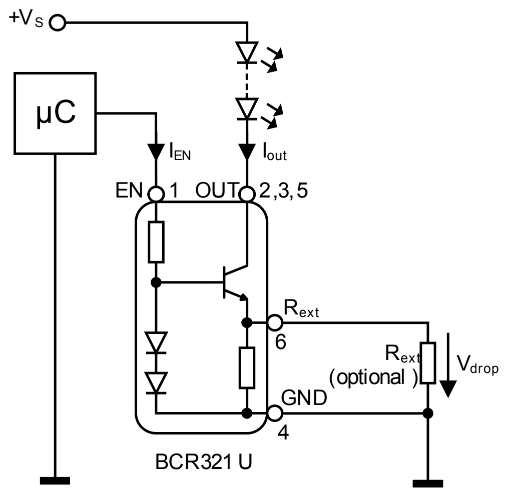


Figure 4-1 Application Circuit: Enabling / PWM by Micro Controller

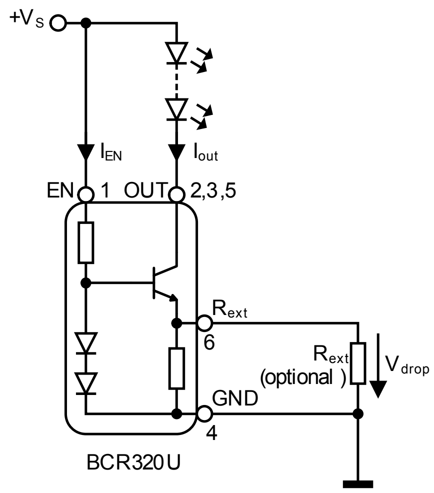


Figure 4-2 Application Circuit: Enabling by Connecting to V_S

Application hints

BCR320U / BCR321U serve as an easy to use constant current sources for LEDs. In stand alone application an external resistor can be connected to adjust the current from 10 mA to 250 mA. R_{ext} can be determined by using **Figure 3-5** or **Figure 3-15**. 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.

Please visit our web site **www.infineon.com/lowcostleddriver** for application notes and for up-to-date application information.

5 Package

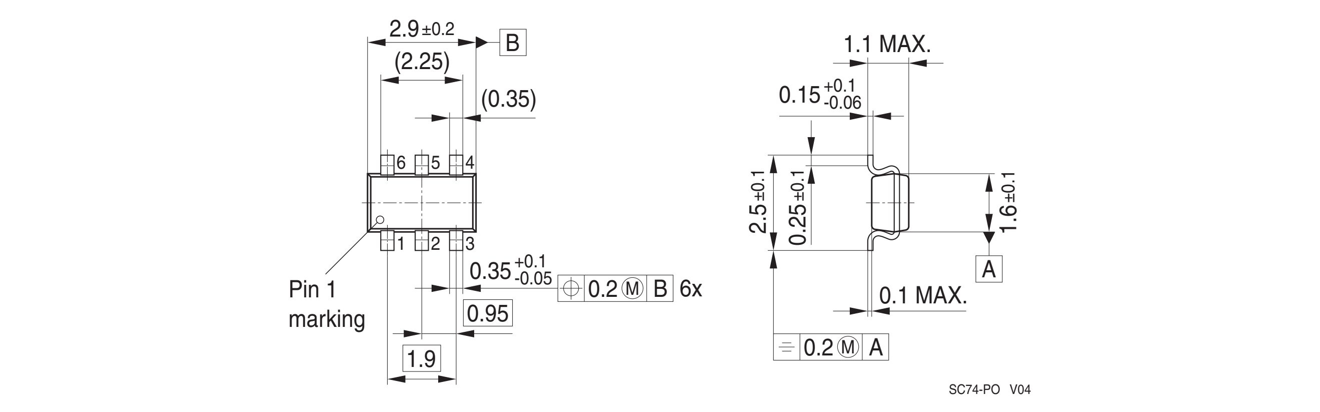


Figure 5-1 Package Outline for SC74 (dimensions in mm)

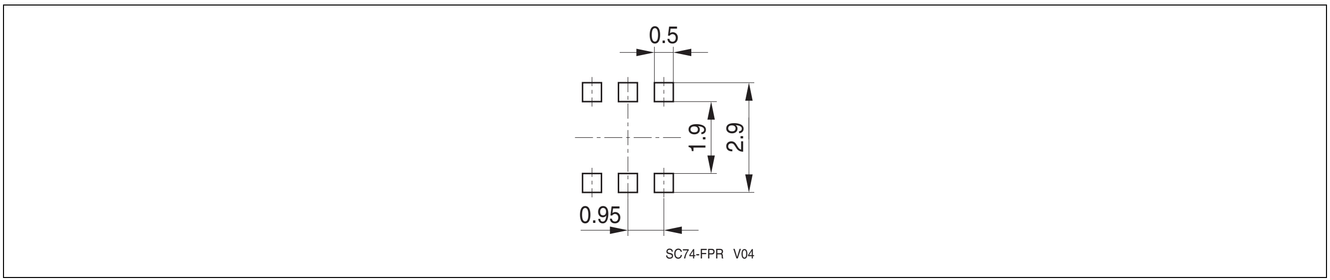


Figure 5-2 Package Footprint for SC74 (dimensions in mm)

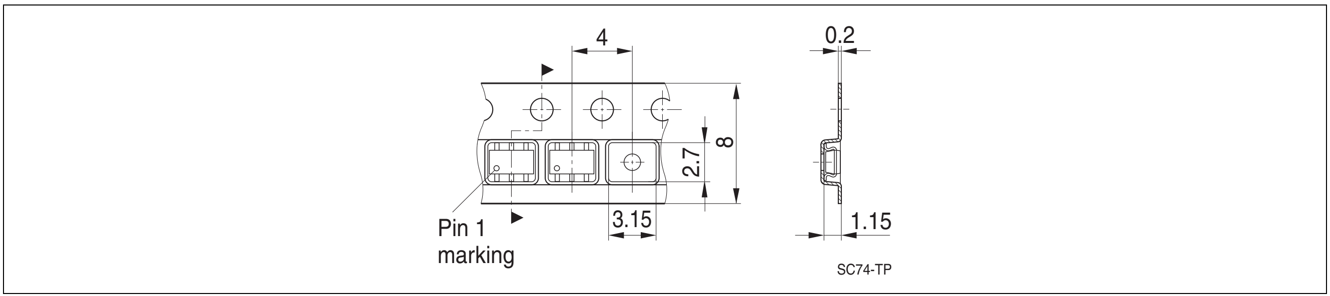


Figure 5-3 Tape and Reel Information for SC74 (dimensions in mm)

Terminology

$\Delta I_{out}/I_{out}$	Output current change
h_{FE}	DC current gain
I_{EN}	Enable current
I_{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

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

LED Driver

BCR401U

Datasheet

Revision 2.0, 2012-04-12

Power Management & Multimarket

Edition 2012-04-12

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Revision 2.0, 2012-04-12	
All	Datasheet layout updated
Table 2-1	V_{out} limit increased
Table 2-3	R_{int} limits tightened

Trademarks of Infineon Technologies AG

AURIX™, C166™, CanPAK™, CIPOS™, CIPURSE™, EconoPACK™, CoolMOS™, CoolSET™, CORECONTROL™, CROSSAVE™, DAVE™, DI-POL™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPIM™, EconoPACK™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, I²RF™, ISOFACE™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OptiMOS™, ORIGA™, POWERCODE™; PRIMARION™, PrimePACK™, PrimeSTACK™, PRO-SIL™, PROFET™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SINDRION™, SIPMOS™, SmartLEWIS™, SOLID FLASH™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™.

Other Trademarks

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, KEIL™, PRIMECELL™, REALVIEW™, THUMB™, µVision™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-iq™ of DECT Forum. COLOSSUS™, FirstGPS™ of Trimble Navigation Ltd. EMV™ of EMVCo, LLC (Visa Holdings Inc.). EPCOS™ of Epcos AG. FLEXGO™ of Microsoft Corporation. FlexRay™ is licensed by FlexRay Consortium. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. MAXIM™ of Maxim Integrated Products, Inc. MICROTEC™, NUCLEUS™ of Mentor Graphics Corporation. MIPI™ of MIPI Alliance, Inc. MIPS™ of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO., MICROWAVE OFFICE™ (MWO) of Applied Wave Research Inc., OmniVision™ of OmniVision Technologies, Inc. Openwave™ Openwave Systems Inc. RED HAT™ Red Hat, Inc. RFMD™ RF Micro Devices, Inc. SIRIUS™ of Sirius Satellite Radio Inc. SOLARIS™ of Sun Microsystems, Inc. SPANSION™ of Spansion LLC Ltd. Symbian™ of Symbian Software Limited. TAIYO YUDEN™ of Taiyo Yuden Co. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. TOKO™ of TOKO KABUSHIKI KAISHA TA. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VLYNQ™ of Texas Instruments Incorporated. VXWORKS™, WIND RIVER™ of WIND RIVER SYSTEMS, INC. ZETEX™ of Diodes Zetex Limited.

Last Trademarks Update 2011-11-11

Table of Contents

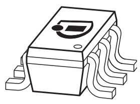
List of Figures

List of Tables

1 LED Driver

1.1 Features

- LED drive current preset to 10 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 BCR401U 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 BCR401U 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 BCR401U 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 the LEDs.

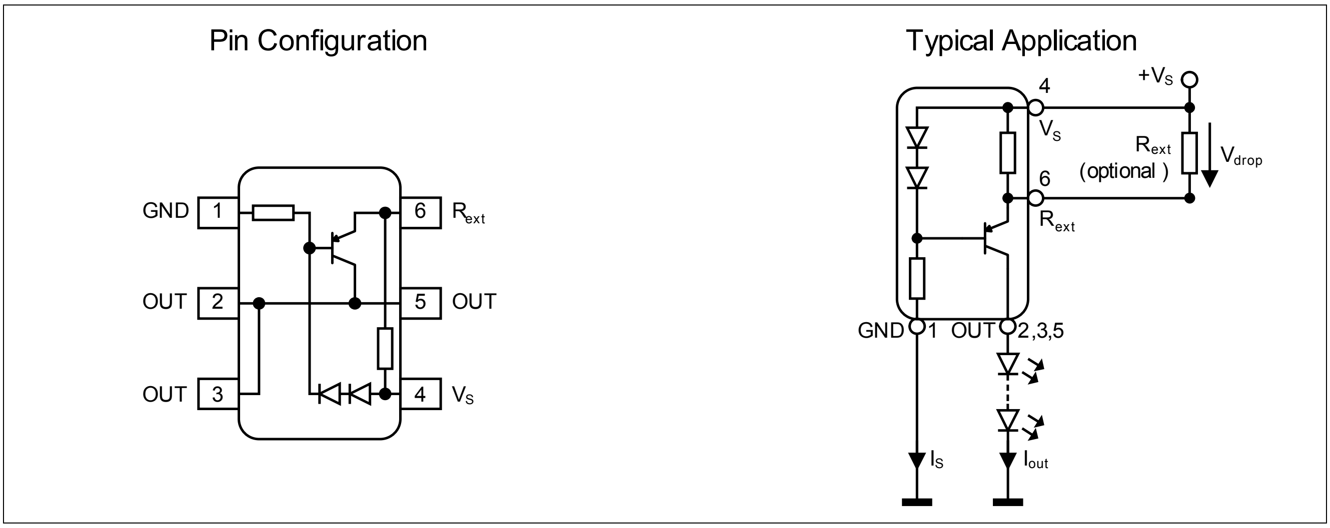


Figure 1-1 Pin configuration and typical application

Type	Marking	Pin Configuration				Package
BCR401U	L1s	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 °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	$T_S \leq 112.5$ °C
Junction temperature	T_J	-	-	150	°C	
Storage temperature range	T_{STG}	-65	-	150	°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 °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 °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 mA, I_B = 0
Supply current	I_S	340	420	500	µA	V_S = 10 V
DC current gain	h_{FE}	100	220	470	-	I_C = 50 mA, V_{CE} = 1 V
Internal resistor	R_{int}	78	91	104	Ω	I_{Rint} = 10 mA
Output current	I_{out}	9	10	11	mA	V_S = 10 V V_{out} = 8.6 V
Voltage drop (V_{Rext})	V_{drop}	0.82	0.91	1	V	I_{out} = 10 mA

Table 2-4 DC Characteristics with stabilized LED load at T_A = 25 °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 mA
Output current change versus T_A	$\Delta I_{out}/I_{out}$	-	-0.2	-	%/K	V_S = 10 V
Output current change versus V_S	$\Delta I_{out}/I_{out}$	-	1	-	%/V	V_S = 10 V

3 Typical characteristics

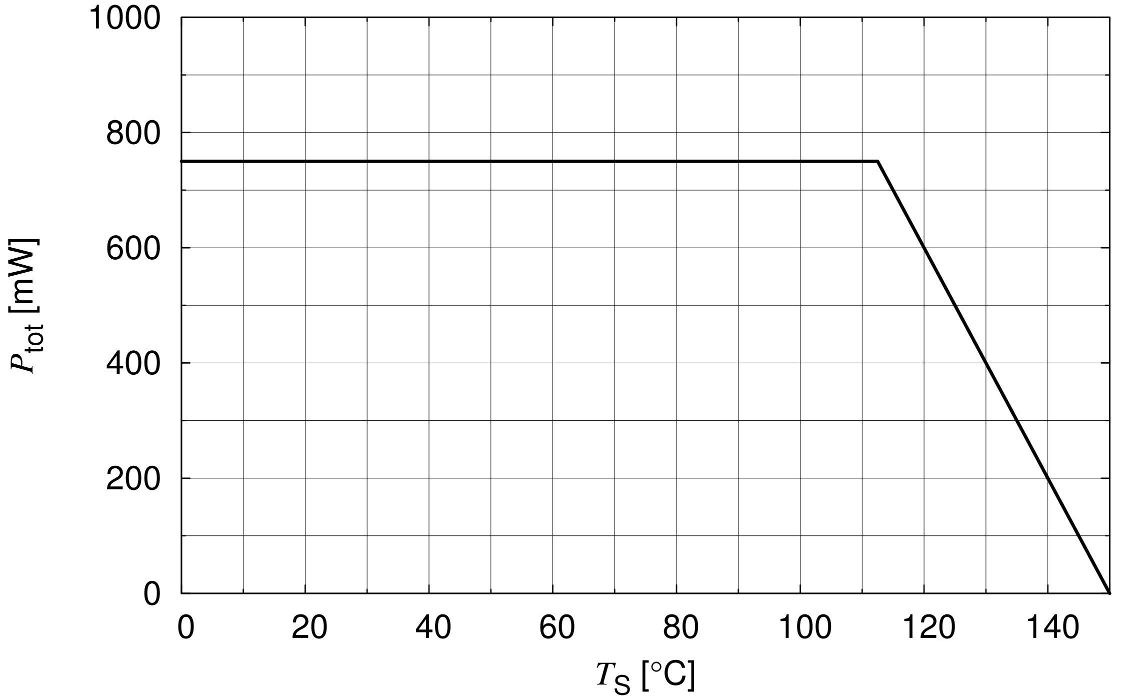


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

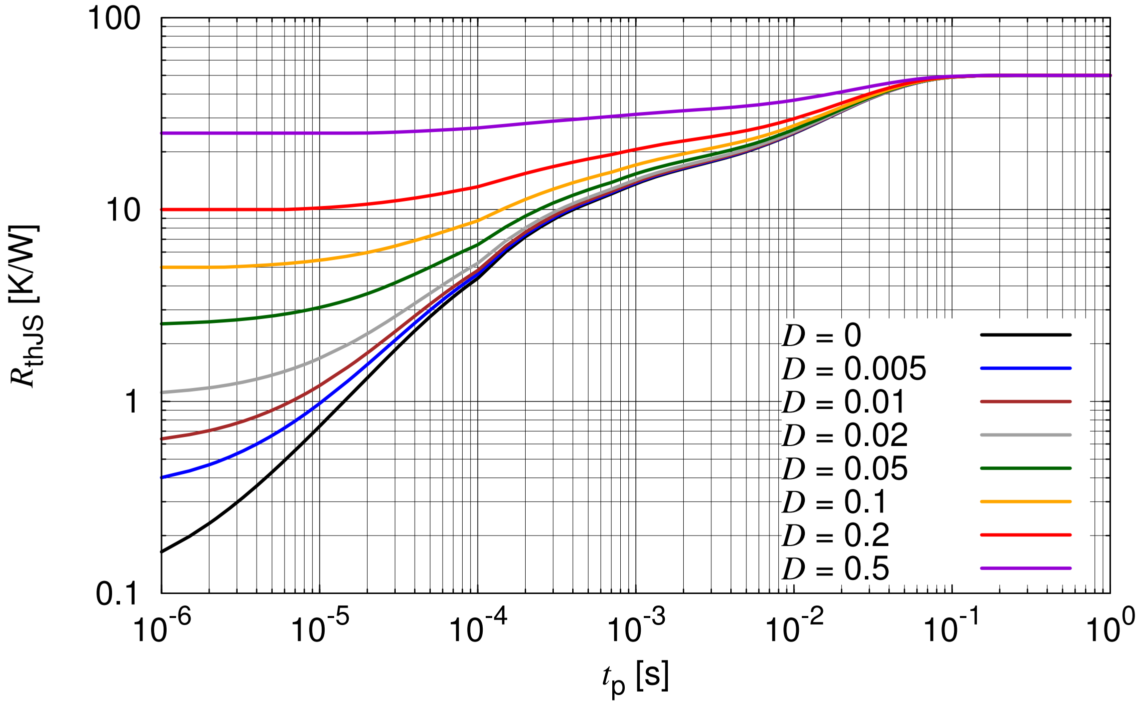


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

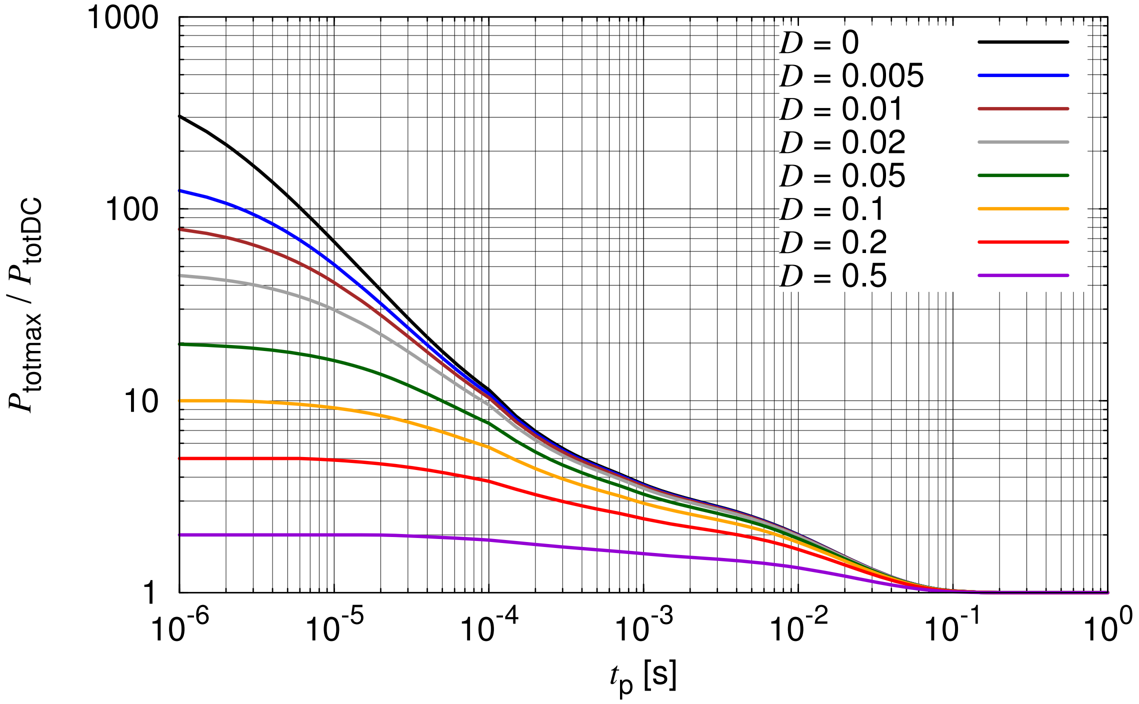


Figure 3-3 Permissible Pulse Load P_{totmax} / P_{totDC}= $f(t_p)$

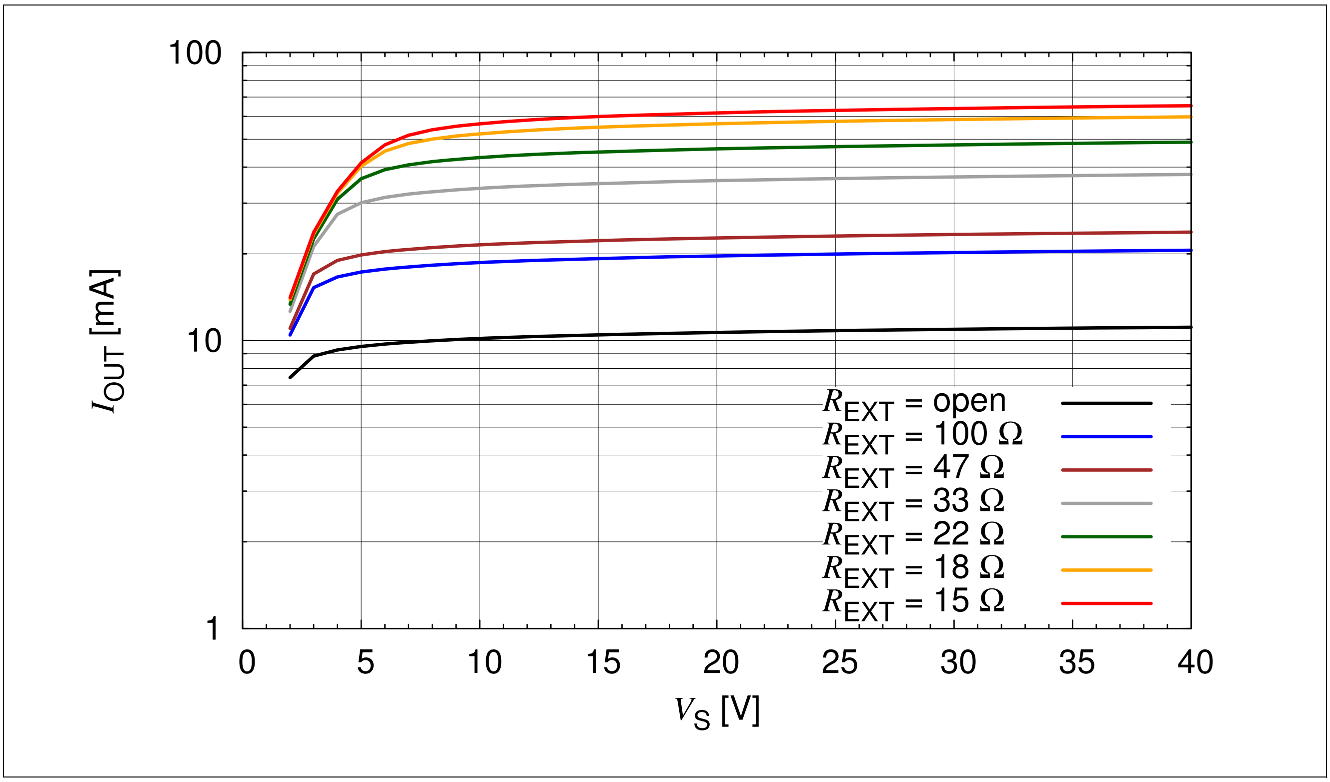


Figure 3-4 Output Current versus V_S $I_{out} = f(V_S)$, V_S - V_{out} = 1.4 V, R_{ext} = Parameter

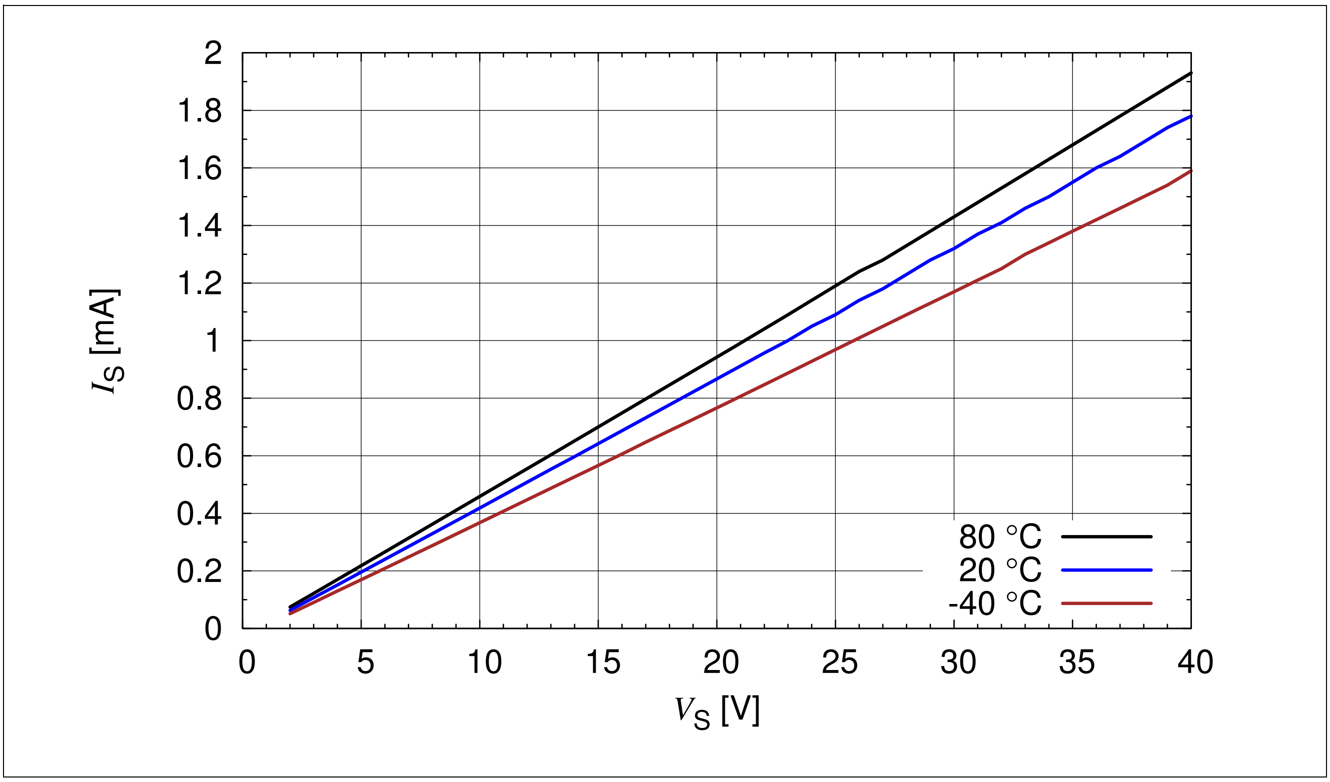


Figure 3-5 Supply Current versus V_S $I_S = f(V_S)$, T_A = Parameter

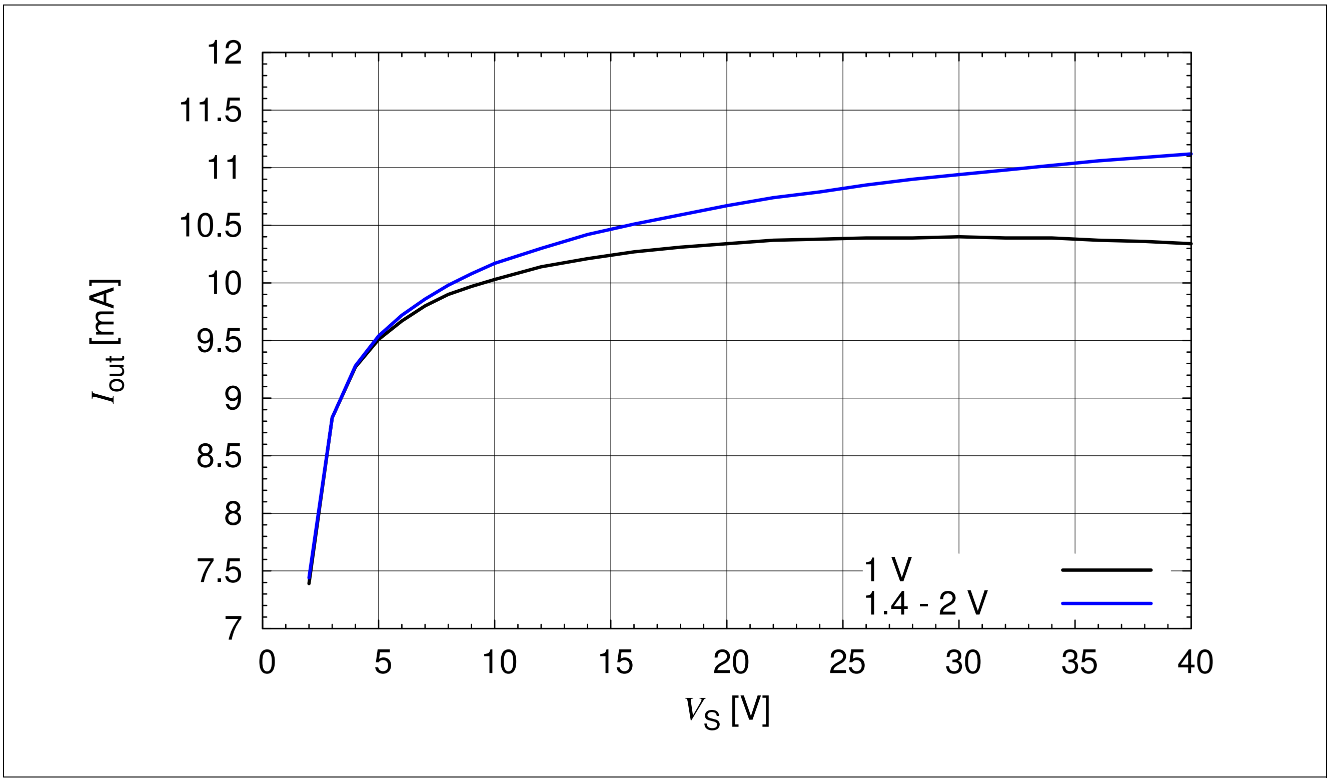


Figure 3-6 Output Current versus V_S $I_{out} = f(V_S)$, V_S - V_{out} = Parameter

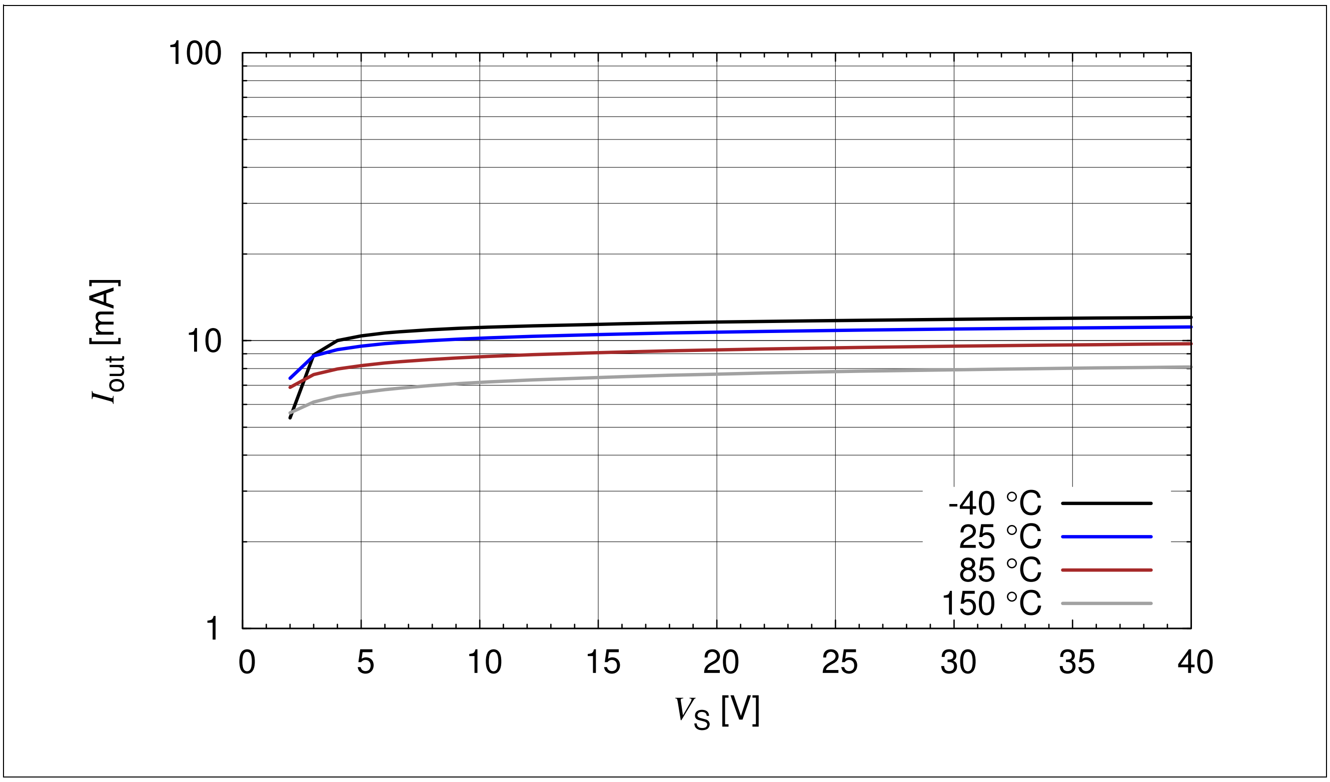


Figure 3-7 Output Current versus V_S $I_{out} = f(V_S)$, V_S - V_{out} = 1.4 V, T_A = Parameter

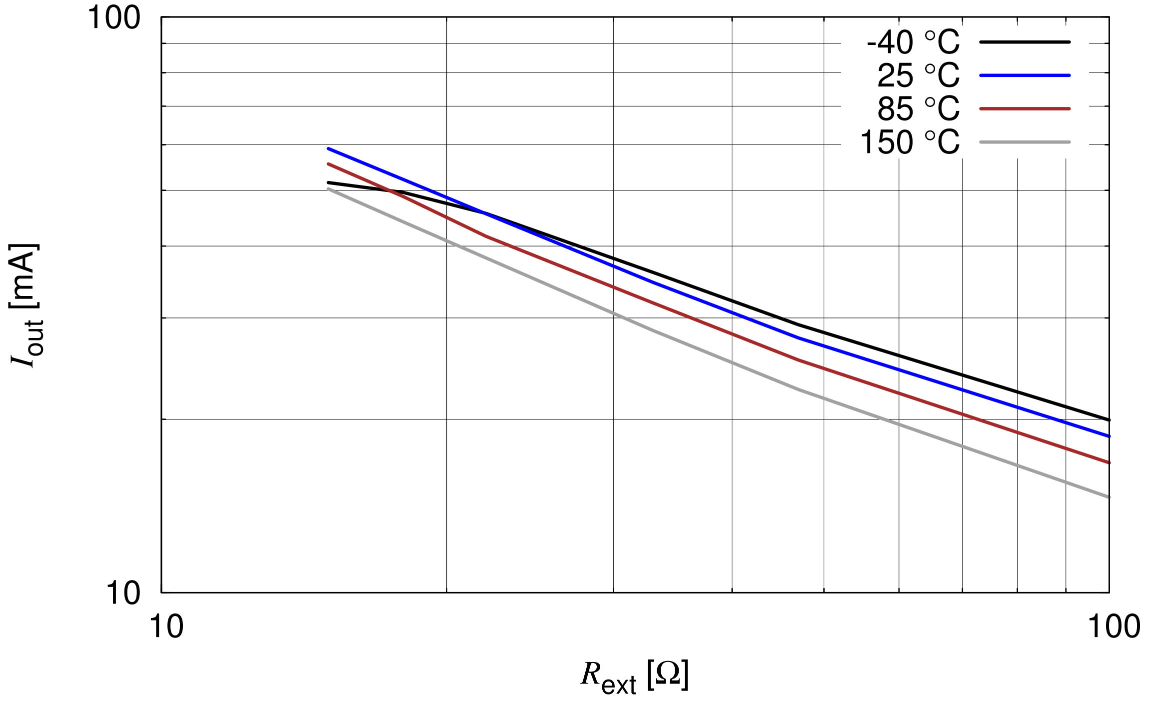


Figure 3-8 Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_S = 10 V, V_S - V_{out} = 1.4 V, T_A = Parameter

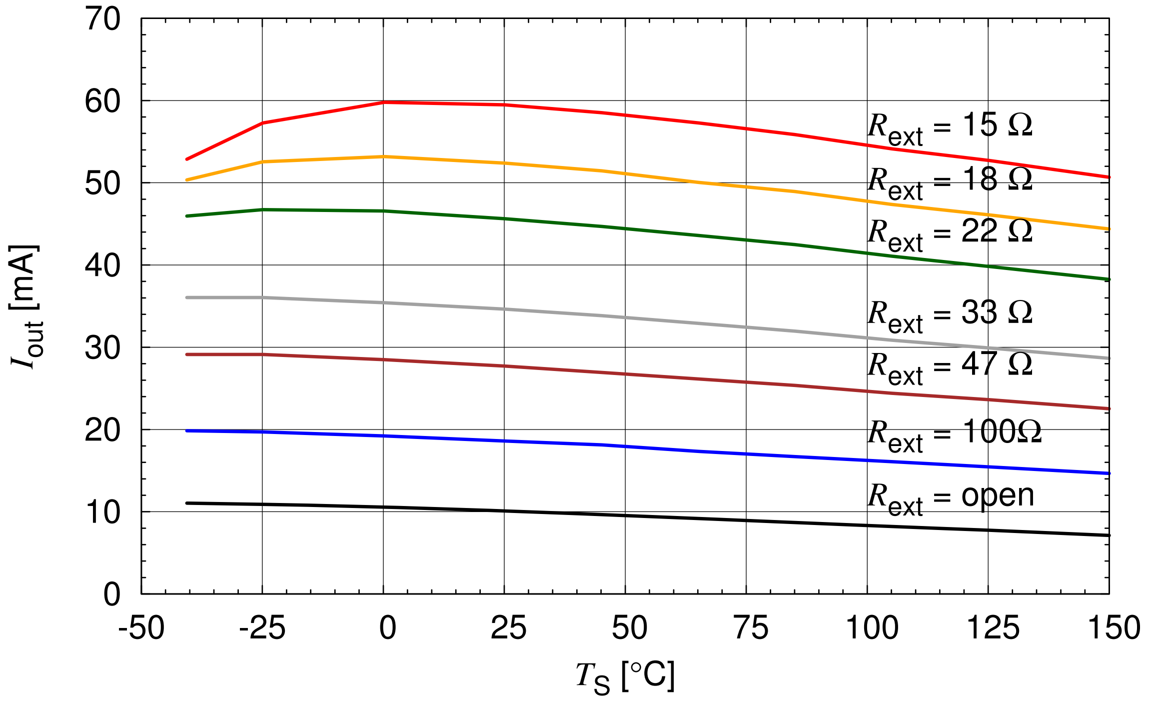


Figure 3-9 Output Current versus T_S $I_{out} = f(T_S)$, V_S = 10 V, V_S - V_{out} = 1.4 V, R_{ext} = Parameter

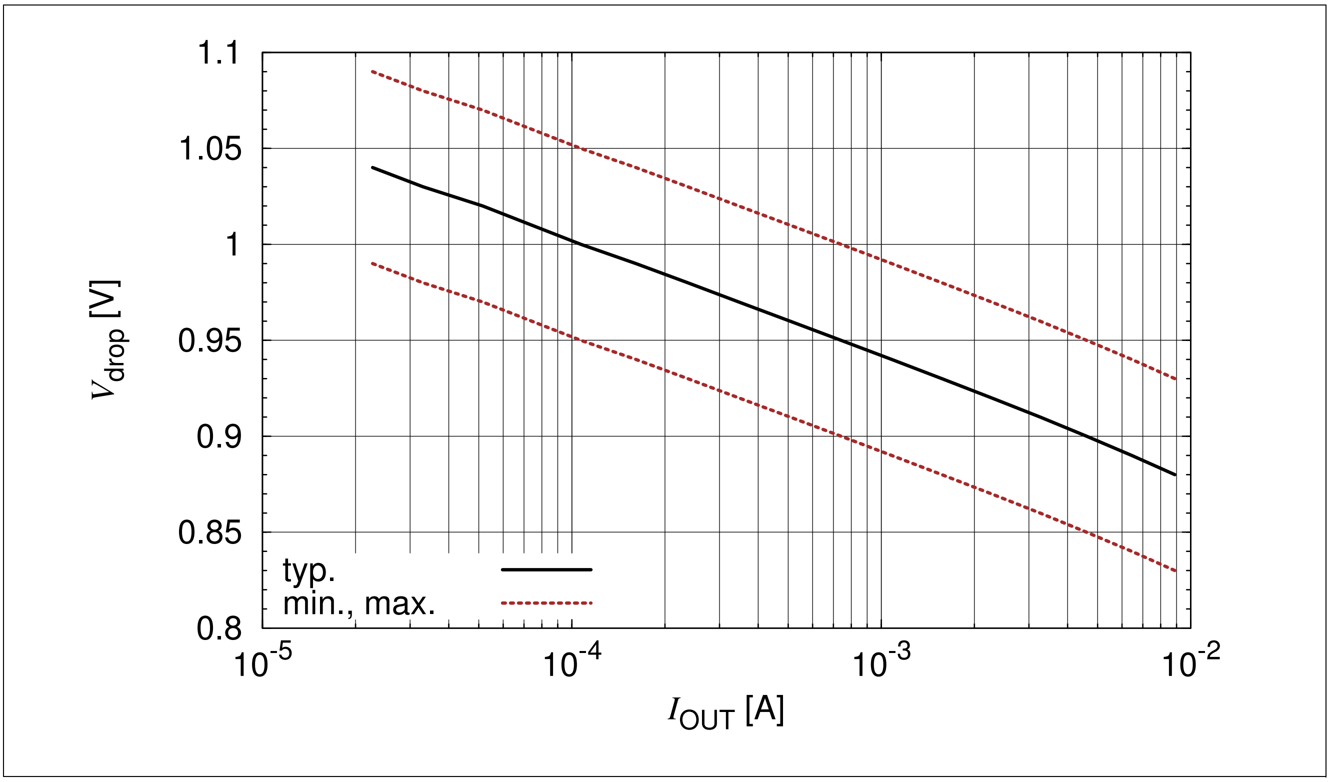


Figure 3-10 Reference Voltage V_{drop} versus I_{out} $V_{drop} = f(I_{out})$, I_{out} = 10 µA to 10 mA

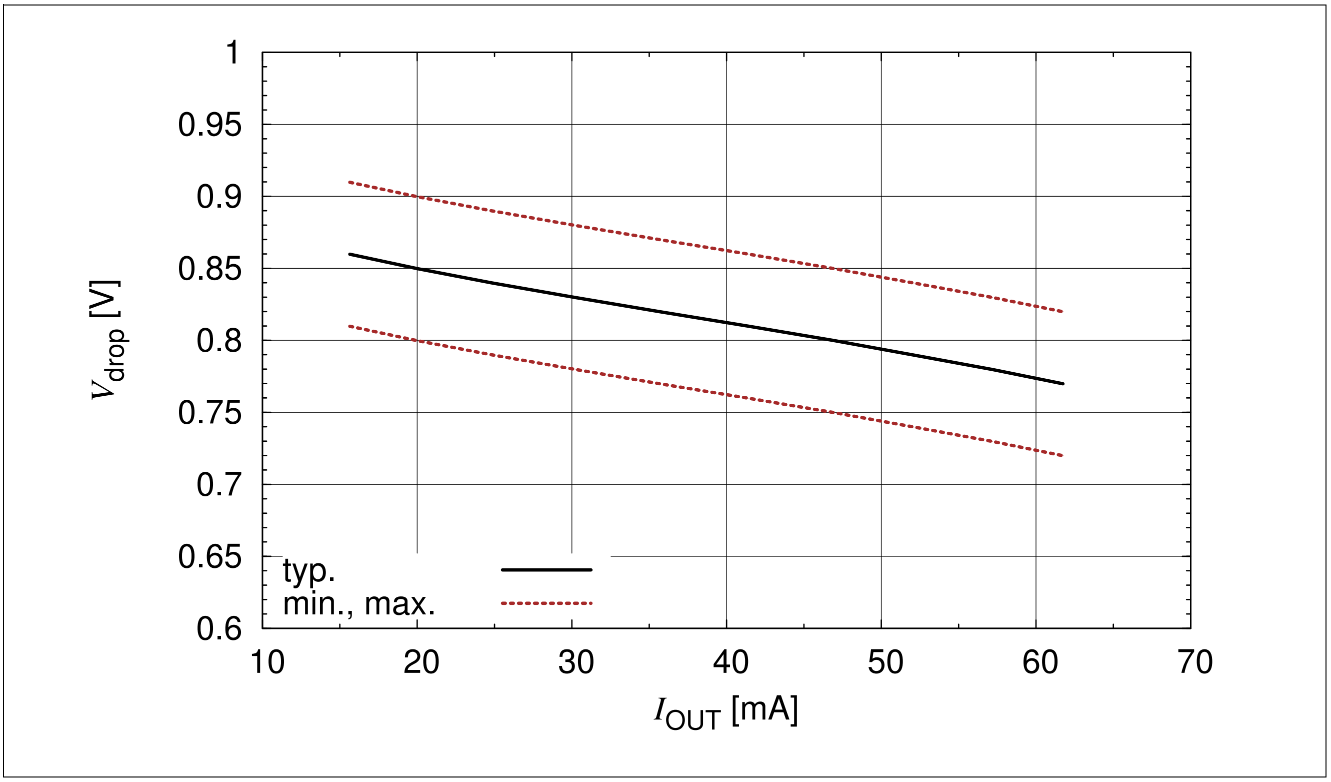


Figure 3-11 Reference Voltage V_{drop} versus I_{out} $V_{drop} = f(I_{out})$, I_{out} = 10 mA to 65 mA

4 Application hints

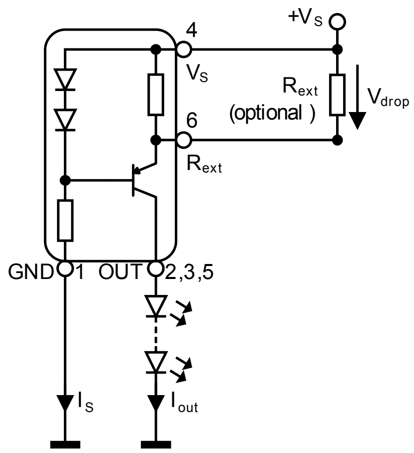


Figure 4-1 Application Circuit: Stand alone current source

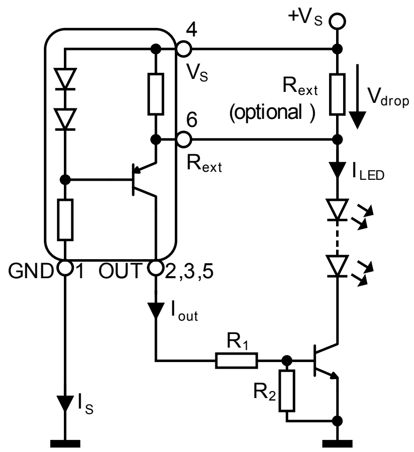


Figure 4-2 Application Circuit: Boost mode current source with external power transistor

Application hints

BCR401U 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 10 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

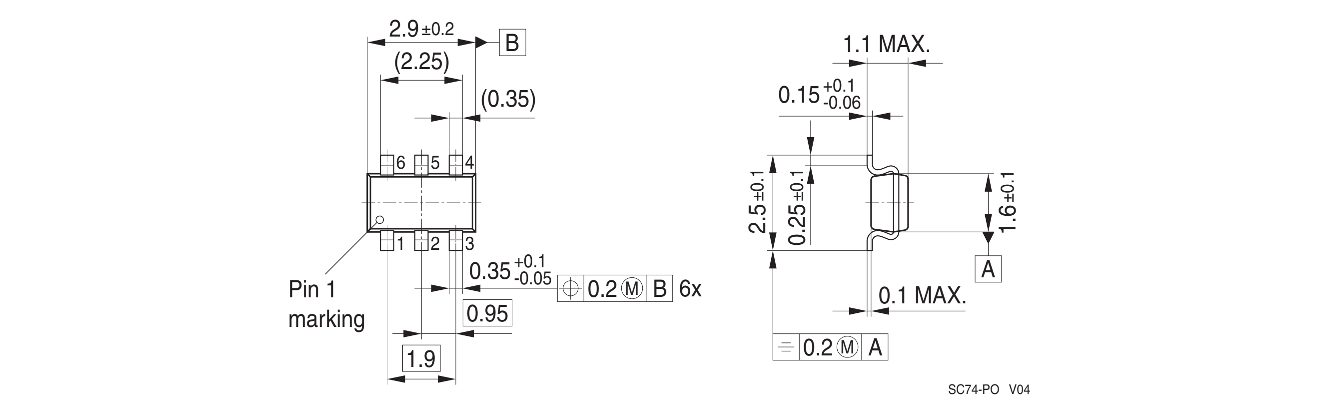


Figure 5-1 Package Outline for SC74 (dimensions in mm)

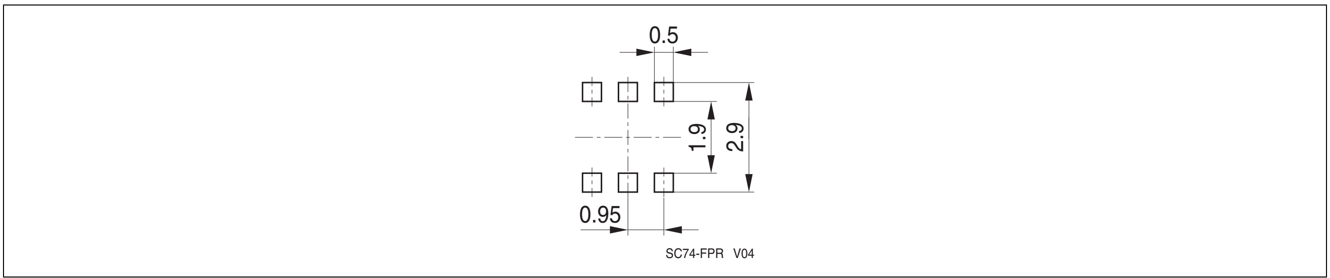


Figure 5-2 Package Footprint for SC74 (dimensions in mm)

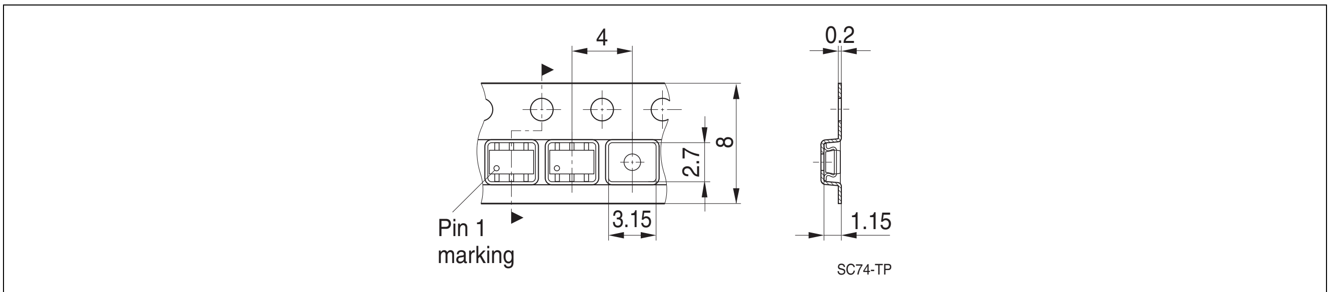


Figure 5-3 Tape and Reel Information for SC74 (dimensions in mm)

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_{out}	Output voltage
V_R	Reverse voltage
V_S	Supply voltage
V_{Smin}	Lowest sufficient supply voltage overhead

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

LED Driver

BCR401W

Datasheet

Revision 2.0, 2012-04-12

Power Management & Multimarket

Edition 2012-04-12

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Revision 2.0, 2012-04-12	
All	Datasheet layout updated
Table 2-1	V_{out} limit increased
Table 2-3	R_{int} limits tightened

Table of Contents

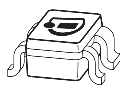
List of Figures

List of Tables

1 LED Driver

1.1 Features

- LED drive current preset to 10 mA
- Output current adjustable up to 60 mA with an external resistor
- Easy paralleling of drivers to increase current
- Supply voltage up to 18 V
- High current accuracy at supply voltage variation
- Low voltage overhead of 1.2 V
- Up to 500 mW power dissipation in a small SOT343 package
- Negative thermal coefficient of -0.3 %/K reduces output current at higher temperatures
- RoHS compliant (Pb-free) package
- Automotive qualified according AEC Q101



SOT343-3D

AEC Qualified RoHS HAL

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 BCR401W is a cost efficient LED driver to drive low power LEDs. The advantages towards resistor biasing are:

- homogenous light output despite of varying forward voltages in different LED strings
- homogenous light output of LEDs despite of 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 BCR401W can be operated at higher supply voltages adding 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 BCR401W 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 the LEDs.

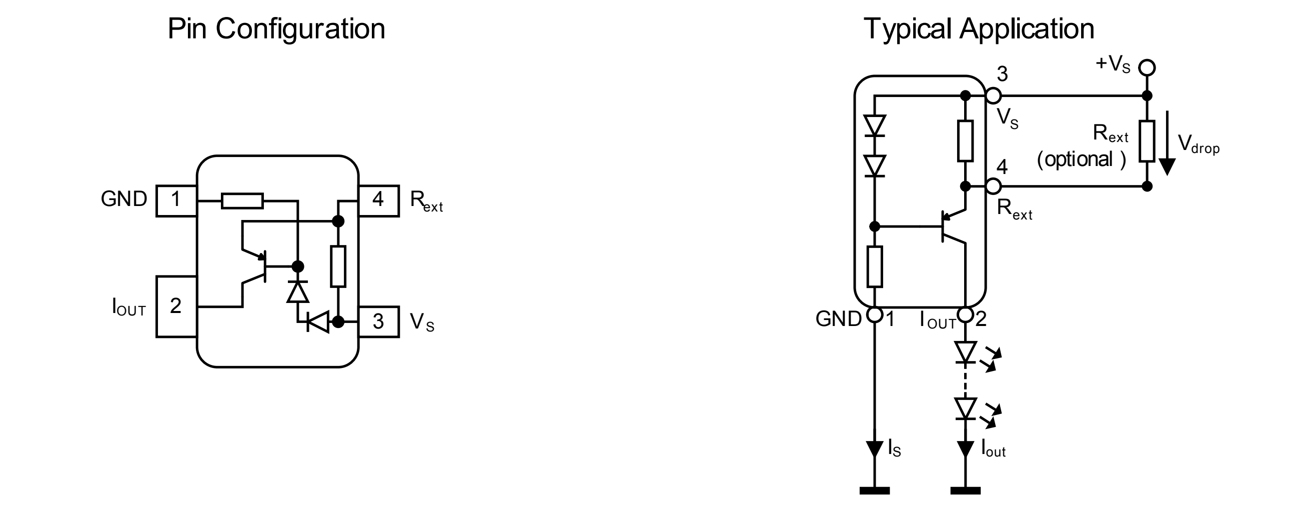


Figure 1-1 Pin configuration and typical application

Type	Marking	Pin Configuration				Package
BCR401W	W5s	1 = GND	2 = I_{OUT}	3 = V_S	4 = R_{ext}	SOT343

2 Electrical Characteristics

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_S	-	-	18	V	
Output current	I_{out}	-	-	60	mA	
Output voltage	V_{out}	-	-	18	V	
Reverse voltage between all terminals	V_R	-	-	0.5	V	
Total power dissipation	P_{tot}	-	-	500	mW	$T_S \leq 95$ °C
Junction temperature	T_J	-	-	150	°C	
Storage temperature range	T_{STG}	-65	-	150	°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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Junction - soldering point[1)]	R_{thJS}	-	-	110	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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Collector-emitter breakdown voltage	$V_{BR(CEO)}$	18	-	-	V	I_C = 100 µA, I_B = 0
Supply current	I_S	350	440	540	µA	V_S = 10 V
DC current gain	h_{FE}	-	150	-	-	I_C = 50 mA, V_{CE} = 1 V
Internal resistor	R_{int}	68	79	90	Ω	I_{Rint} = 10 mA
Output current	I_{out}	9	10	11	mA	V_S = 10 V V_{out} = 7.6 V
Voltage drop (V_{Rext})	V_{drop}	-	0.79	-	V	I_{out} = 10 mA

Table 2-4 DC Characteristics with stabilized LED load at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Lowest sufficient supply voltage overhead	V_{Smin}	-	1.2	-	V	I_{out} > 8 mA
Output current change versus T_A	$\Delta I_{out}/I_{out}$	-	-0.3	-	%/K	V_S = 10 V
Output current change versus V_S	$\Delta I_{out}/I_{out}$	-	2	-	%/V	V_S = 10 V

3 Typical characteristics

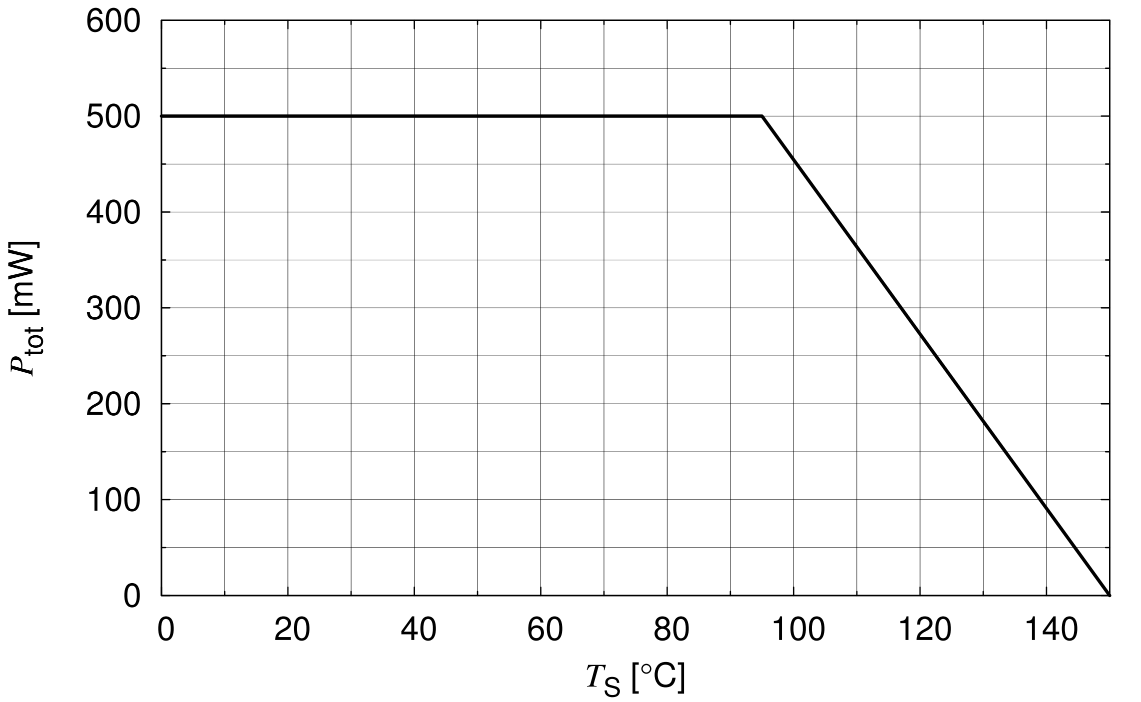


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

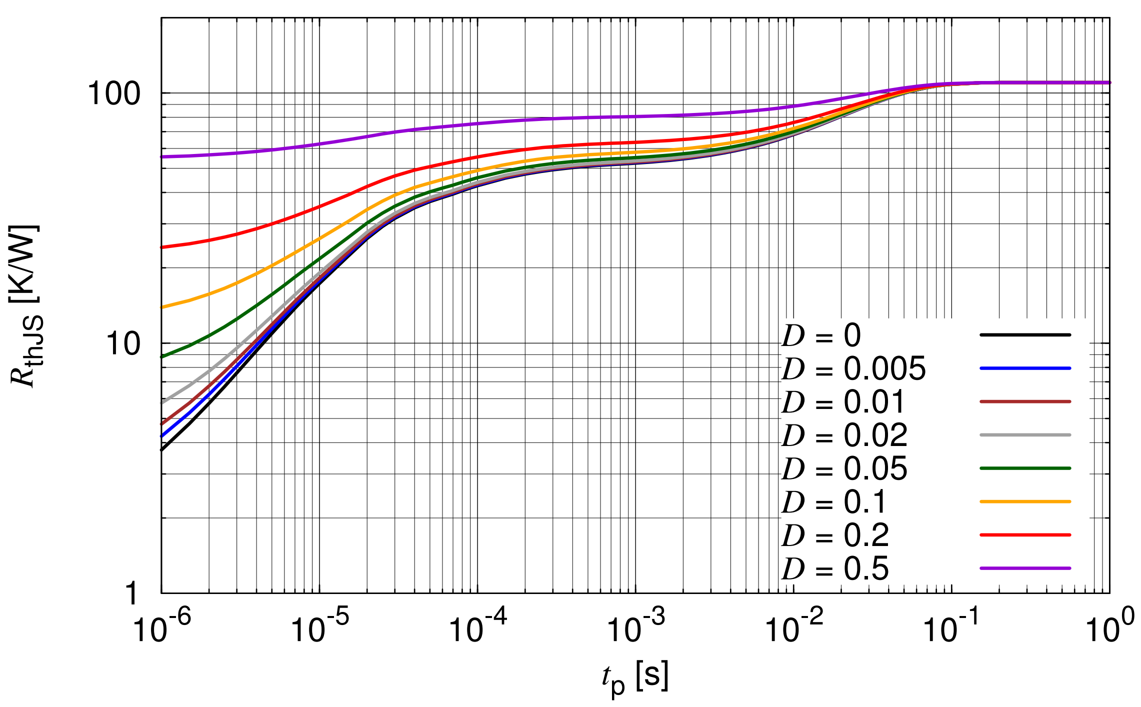


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

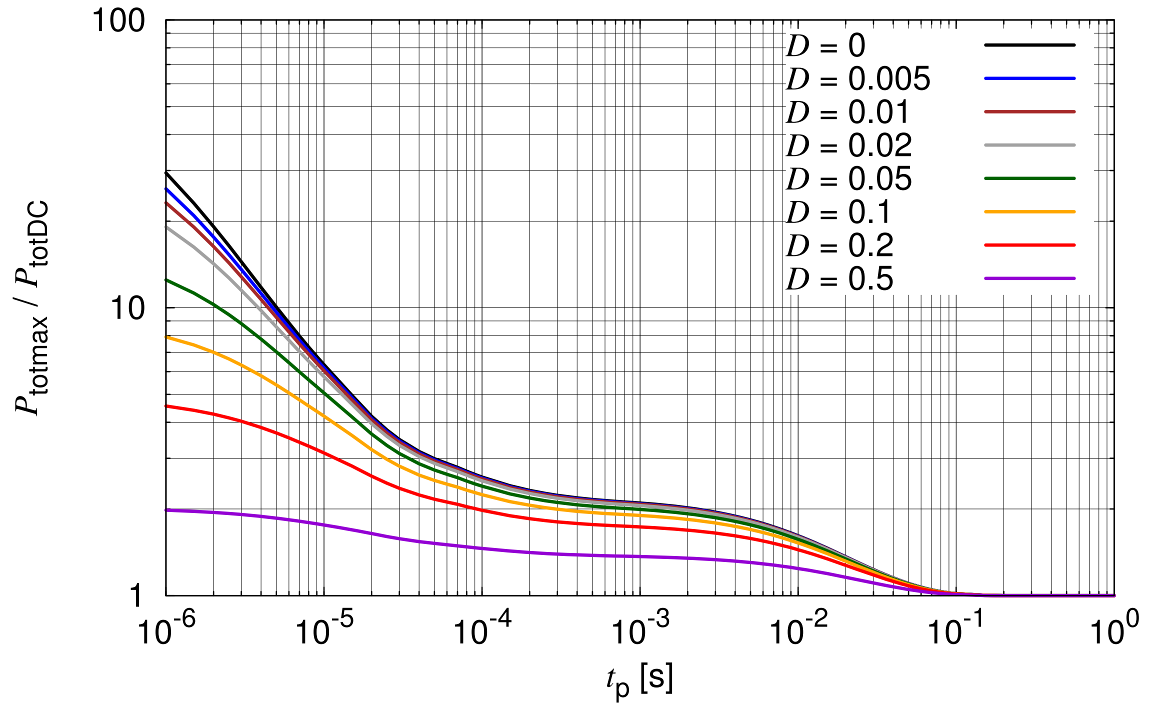


Figure 3-3 Permissible Pulse Load P_{totmax} / P_{totDC}= $f(t_p)$

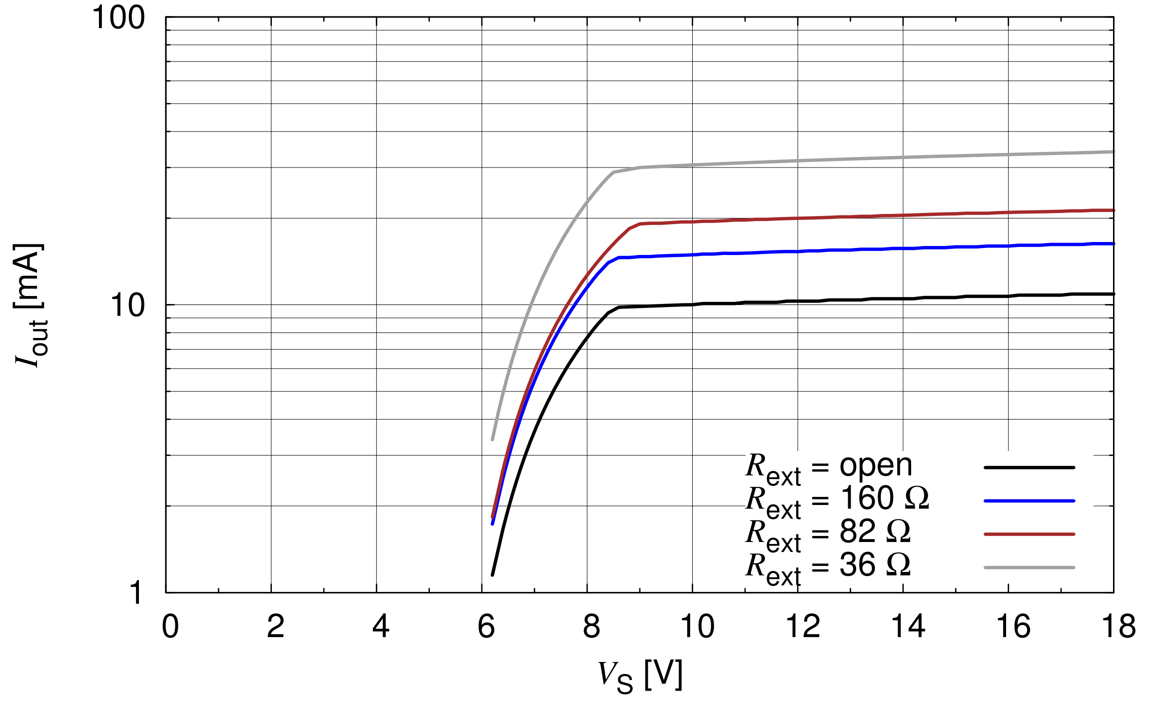


Figure 3-4 Output Current versus V_S $I_{out} = f(V_S)$, 2 LEDs load with V_F = 3.8V in series, R_{ext} = Parameter

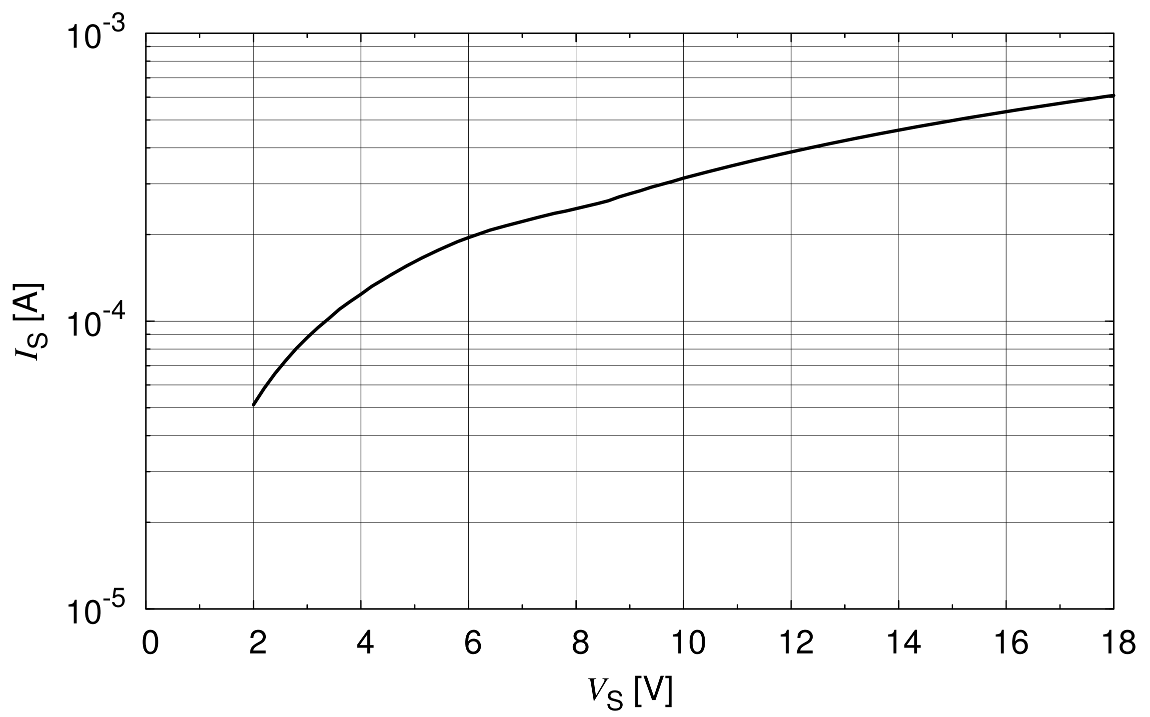


Figure 3-5 Supply Current versus V_S $I_S = f(V_S)$, 2 LEDs load with V_F = 3.8V in series

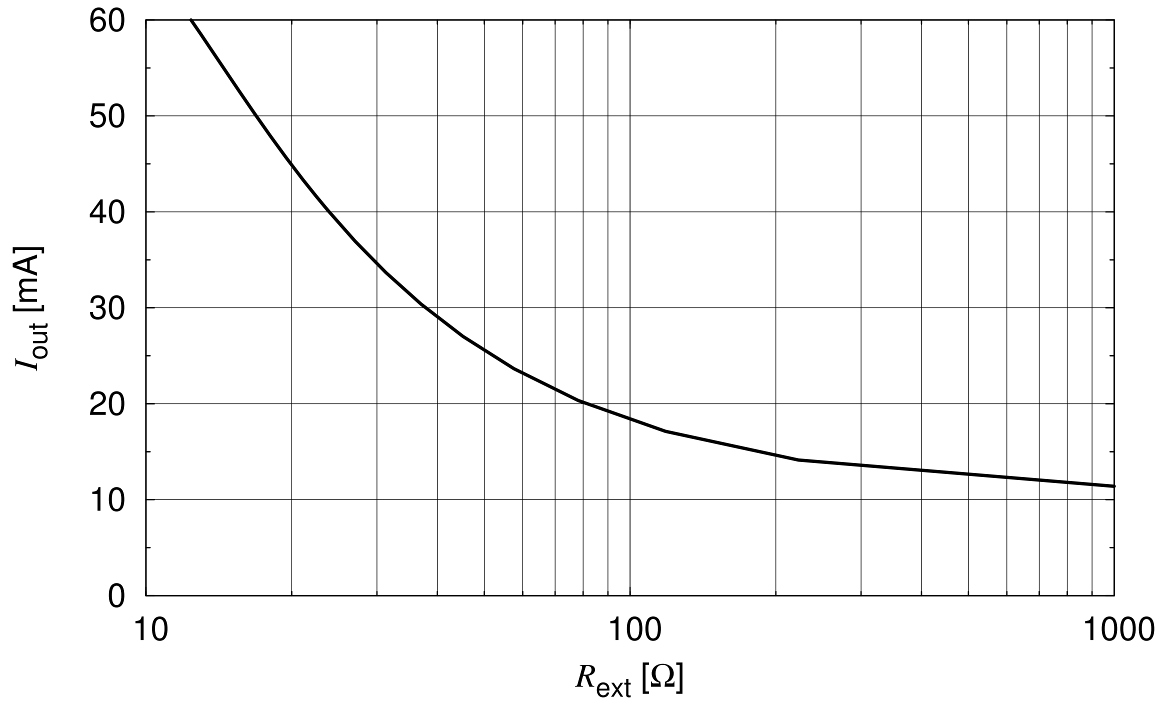


Figure 3-6 Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_S = 10 V, V_{out} = 7.6 V

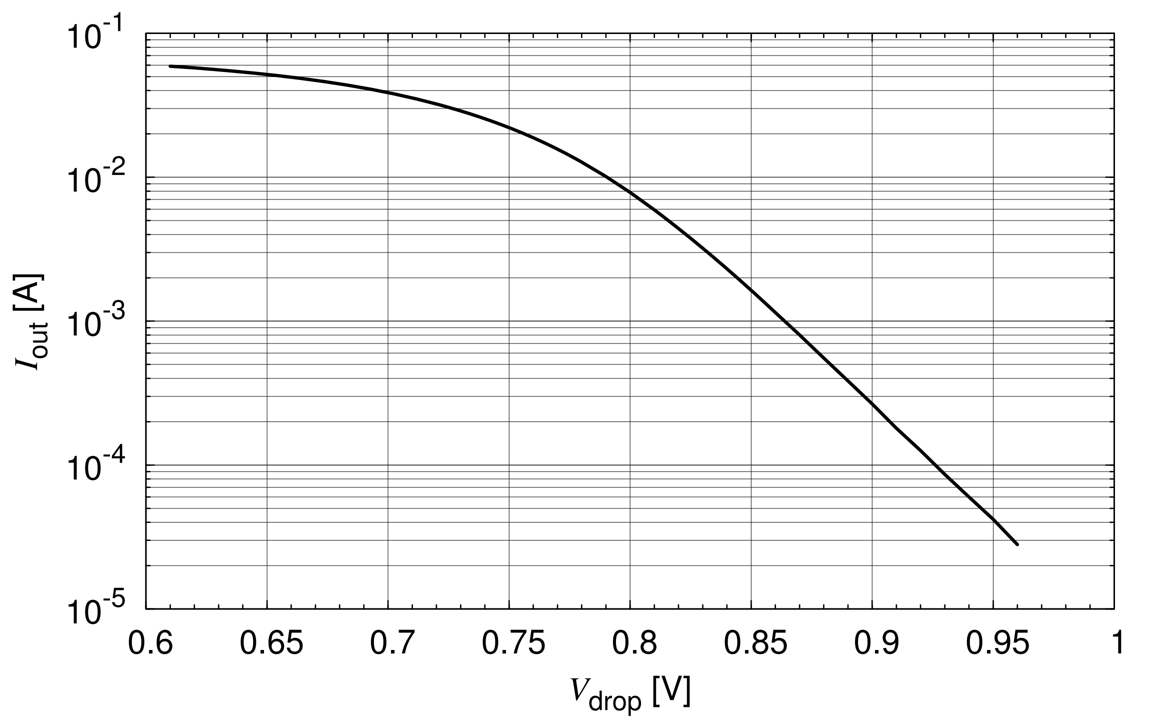


Figure 3-7 Output Current versus V_{drop} $I_{out} = f(V_{drop})$, V_S = 10 V, V_{out} = 7.6 V

4 Application hints

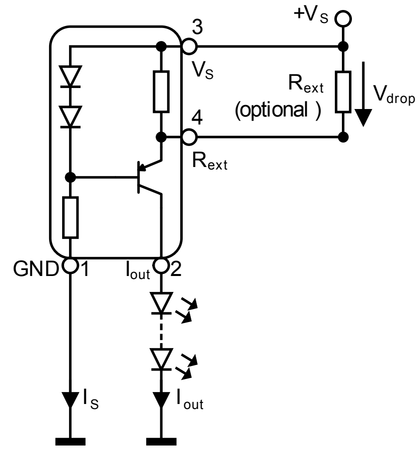


Figure 4-1 Application Circuit: Stand alone current source

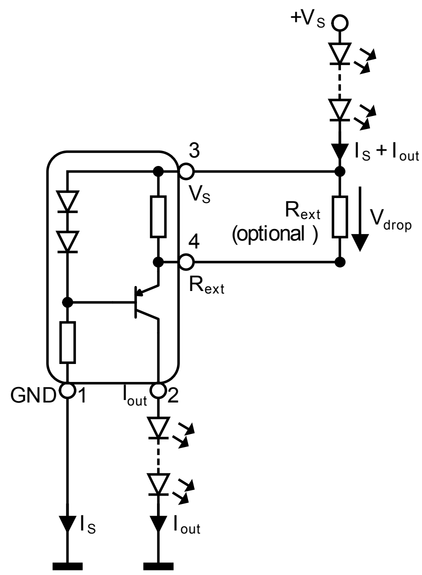


Figure 4-2 Application Circuit: Supply voltages > 18 V

Application hints

BCR401W 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 10 mA and 60 mA. R_{ext} can be determined by using **Figure 3-6**. 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.

Please visit our web site **www.infineon.com/lowcostleddriver** for detailed application notes.

5 Package

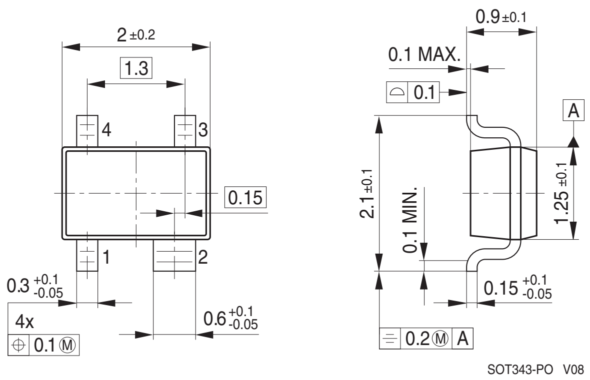


Figure 5-1 Package Outline for SOT343 (dimensions in mm)

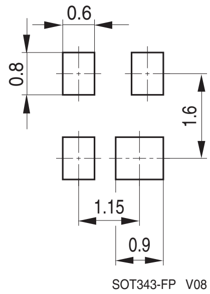


Figure 5-2 Package Footprint for SOT343 (dimensions in mm)

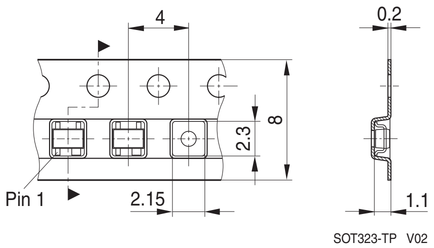


Figure 5-3 Tape and Reel Information for SOT343 (dimensions in mm)

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_{out}	Output voltage
V_R	Reverse voltage
V_S	Supply voltage
V_{Smin}	Lowest sufficient supply voltage overhead

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

LED Driver

BCR402U

Datasheet

Revision 2.0, 2012-04-13

Power Management & Multimarket

Edition 2012-04-13

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Revision 2.0, 2012-04-13	
All	Datasheet layout updated
Table 2-1	V_{out} limit increased
Table 2-3	R_{int} limits tightened
Figure 3-7	Temperature labels updated
Figure 3-8	Temperature labels updated

Table of Contents

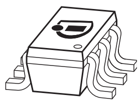
List of Figures

List of Tables

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 BCR402U 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 BCR402U 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 BCR402U 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.

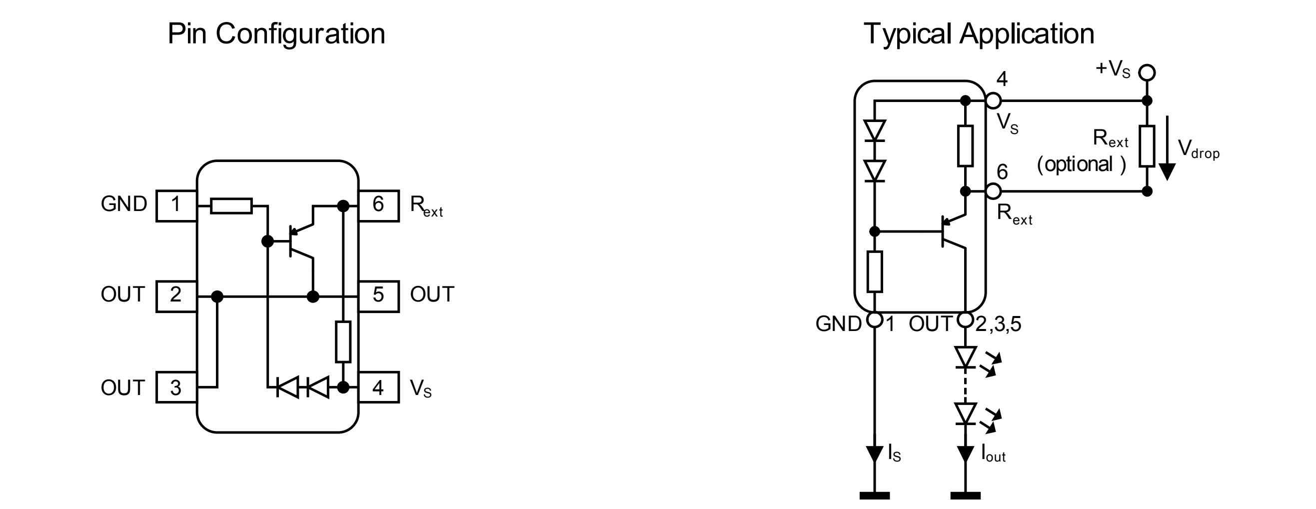


Figure 1-1 Pin configuration and typical application

Type	Marking	Pin Configuration				Package
BCR402U	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 °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	$T_S \leq 112.5$ °C
Junction temperature	T_J	-	-	150	°C	
Storage temperature range	T_{STG}	-65	-	150	°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 °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 °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 mA, I_B = 0
Supply current	I_S	340	420	500	µA	V_S = 10 V
DC current gain	h_{FE}	100	220	470	-	I_C = 50 mA, V_{CE} = 1 V
Internal resistor	R_{int}	38	44	52	Ω	I_{Rint} = 10 mA
Output current	I_{out}	18	20	22	mA	V_S = 10 V V_{out} = 8.6 V
Voltage drop (V_{Rext})	V_{drop}	0.8	0.85	0.9	V	I_{out} = 20 mA

Table 2-4 DC Characteristics with stabilized LED load at T_A = 25 °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 mA
Output current change versus T_A	$\Delta I_{out}/I_{out}$	-	-0.2	-	%/K	V_S = 10 V
Output current change versus V_S	$\Delta I_{out}/I_{out}$	-	1	-	%/V	V_S = 10 V

3 Typical characteristics

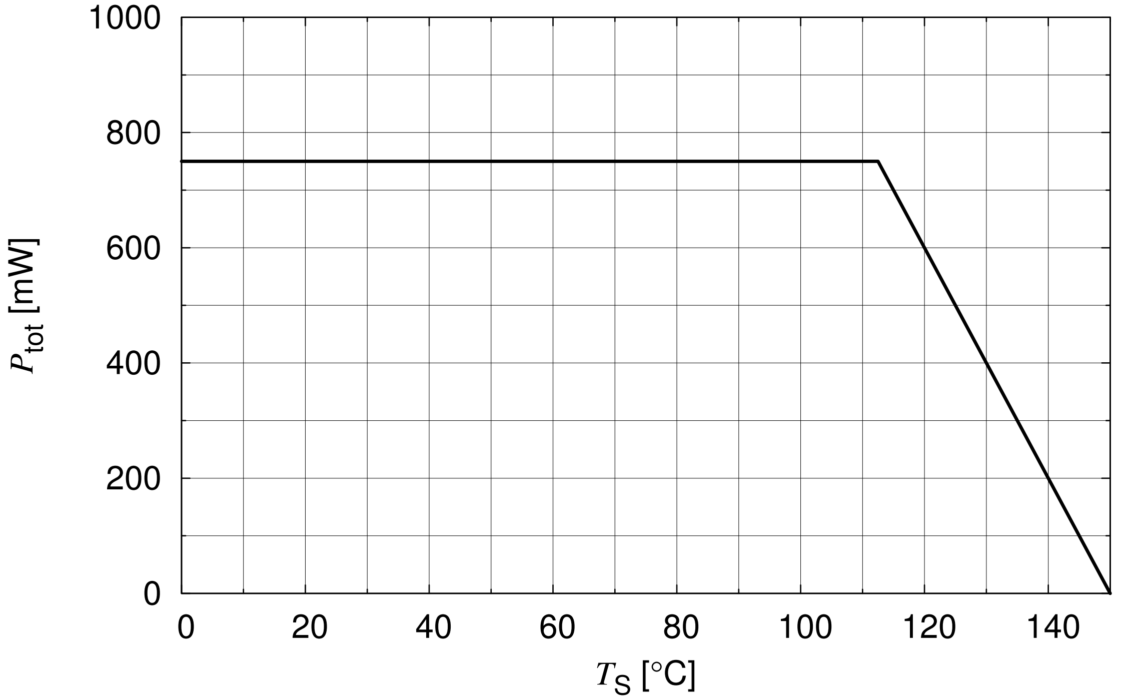


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

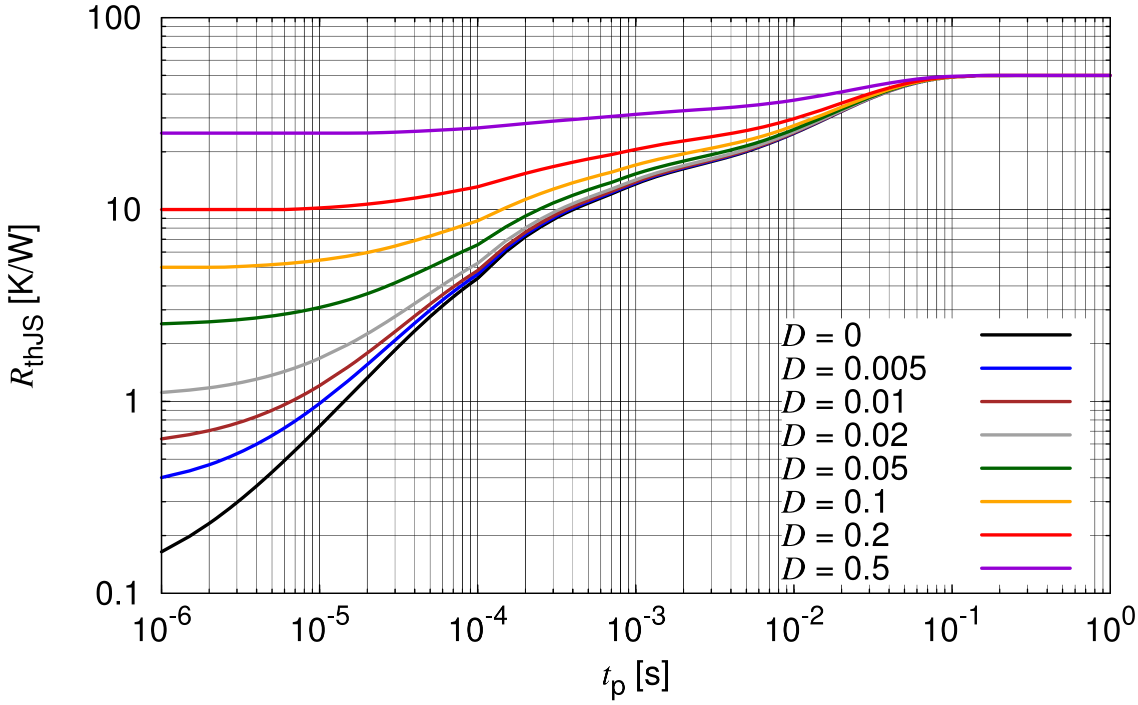


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

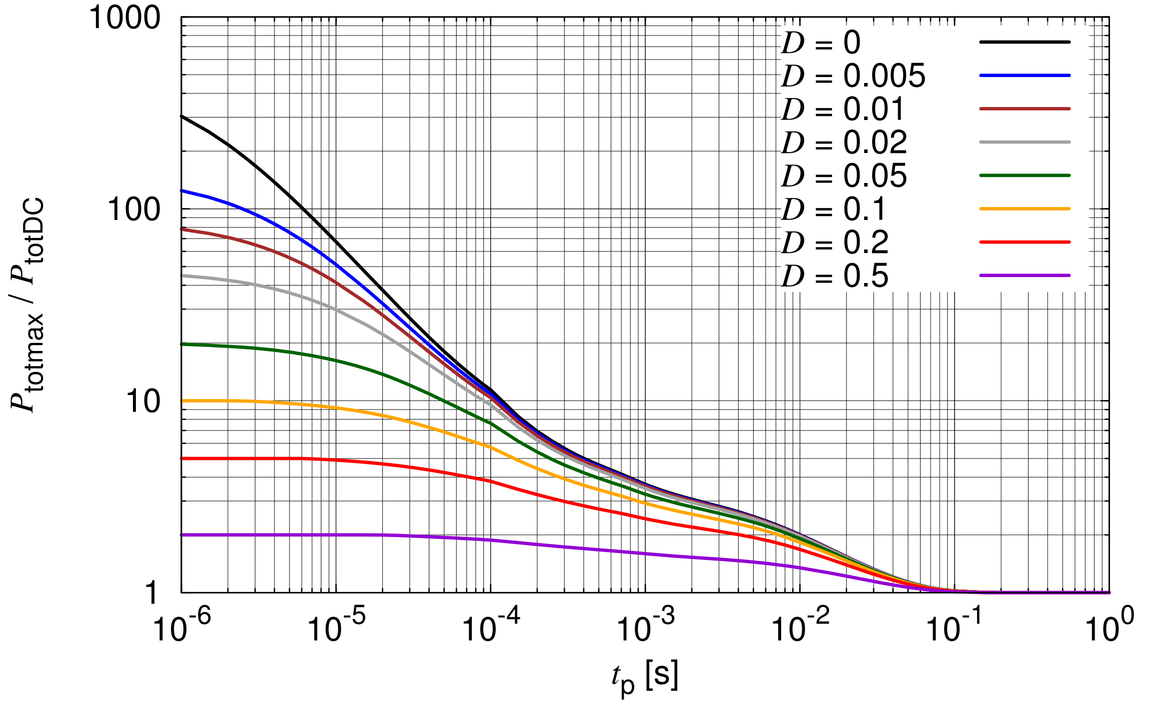


Figure 3-3 Permissible Pulse Load P_{totmax} / P_{totDC}= $f(t_p)$

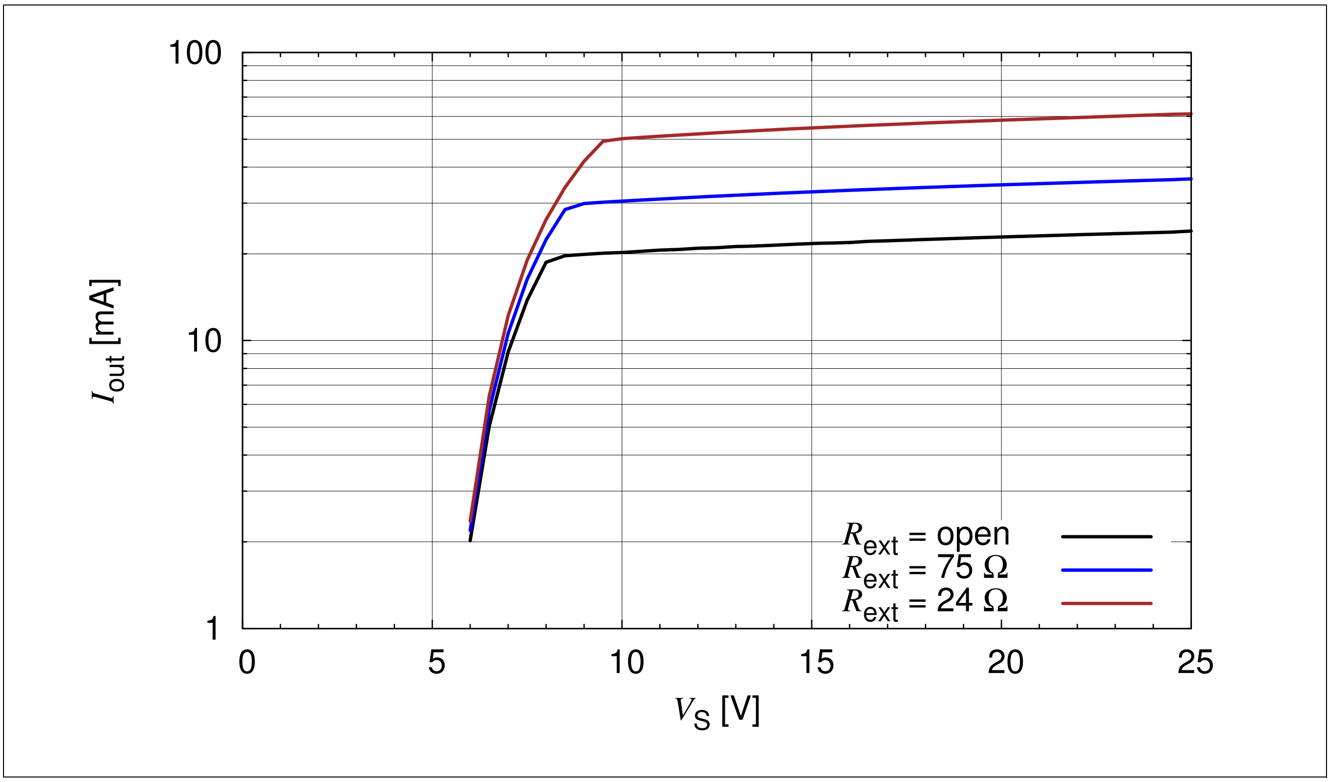


Figure 3-4 Output Current versus V_S $I_{out} = f(V_S)$, V_S - V_{out} = 1.4 V, R_{ext} = Parameter

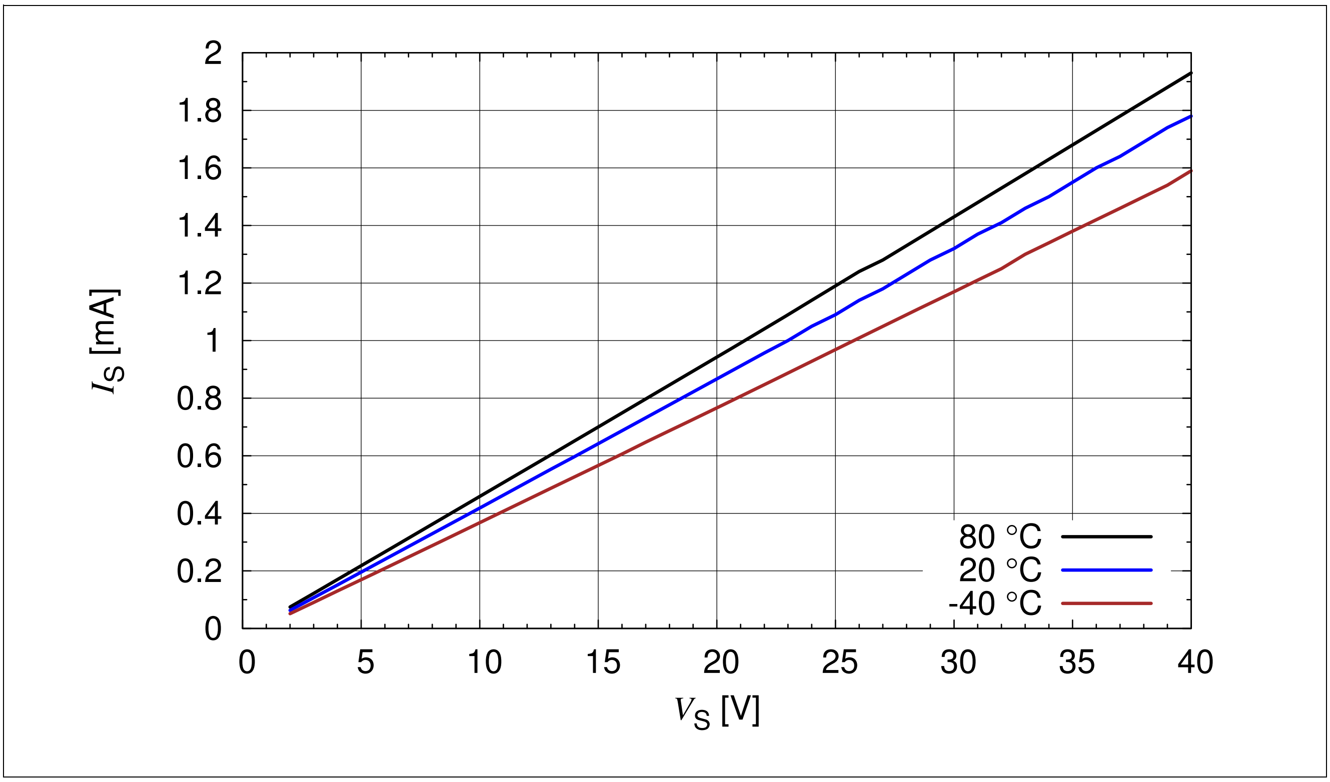


Figure 3-5 Supply Current versus V_S $I_S = f(V_S)$, T_A = Parameter

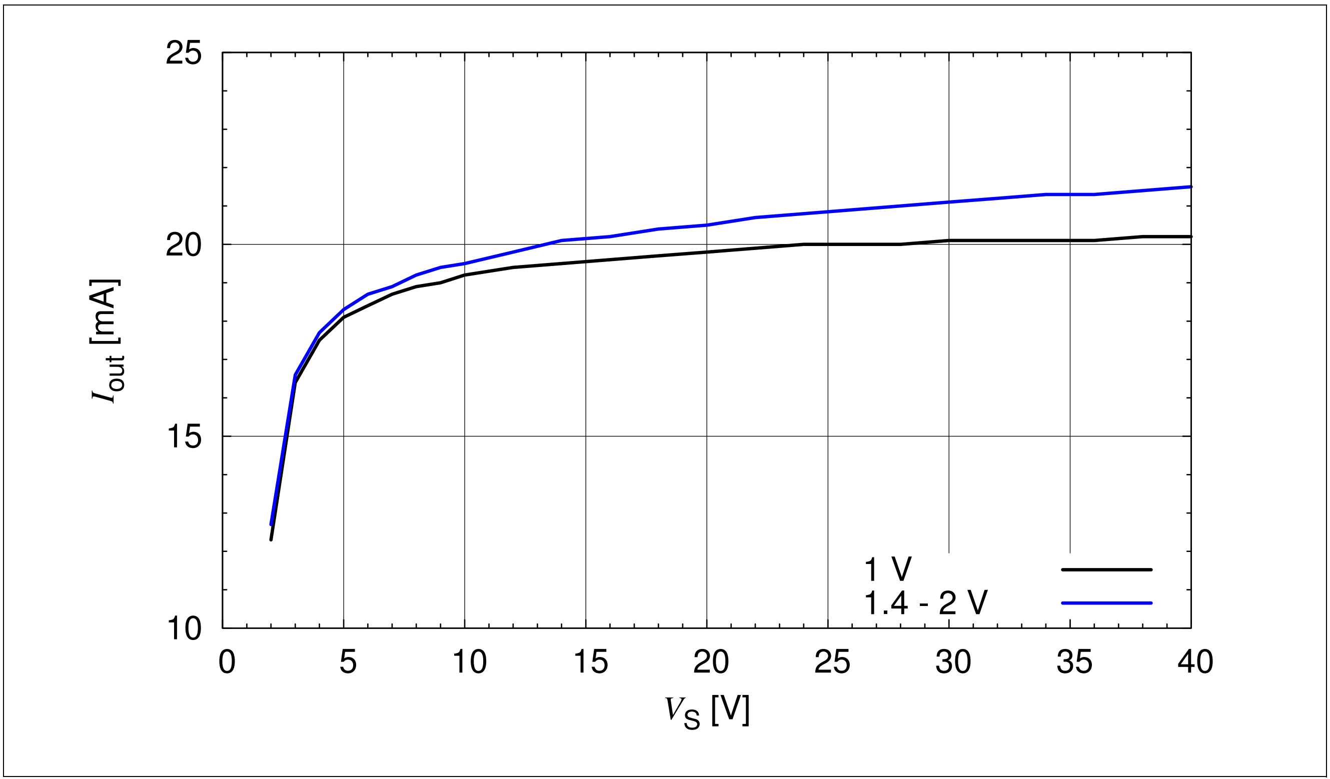


Figure 3-6 Output Current versus V_S $I_{out} = f(V_S)$, V_S - V_{out} = Parameter

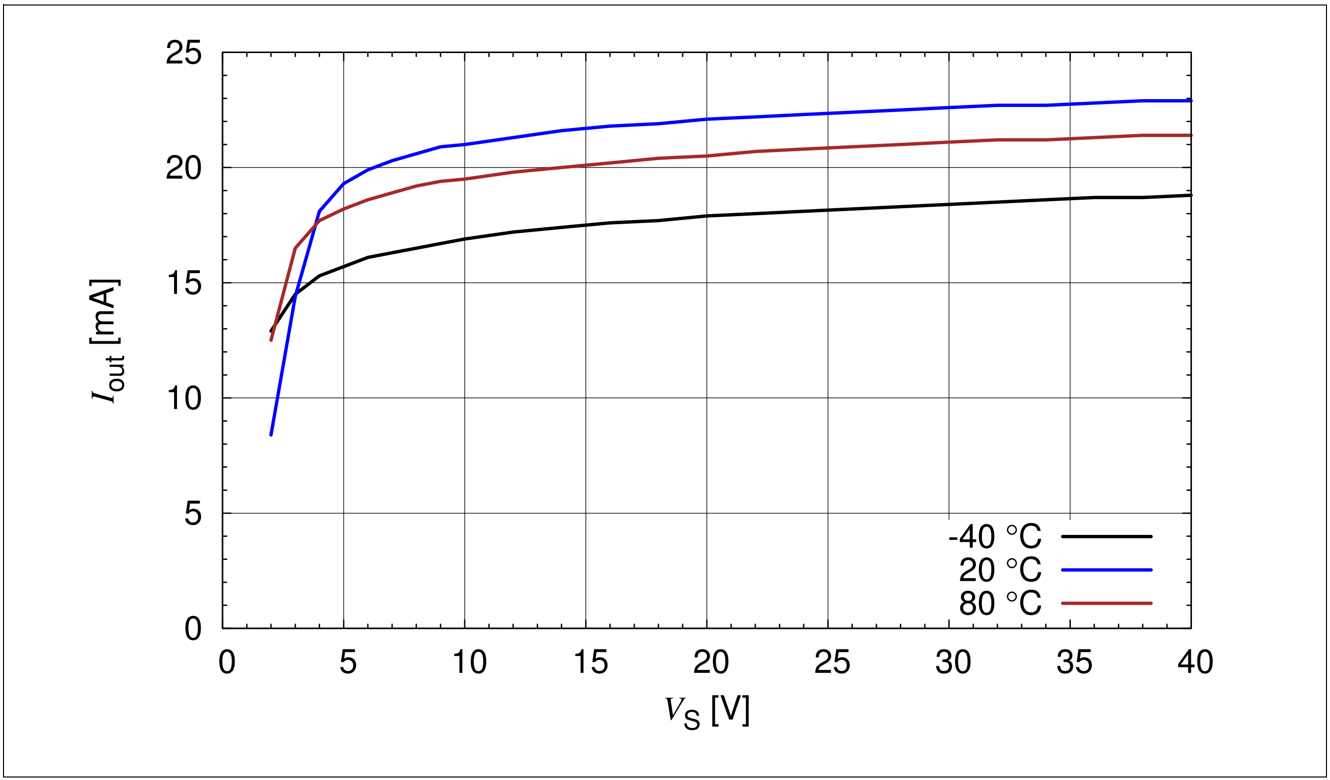


Figure 3-7 Output Current versus V_S $I_{out} = f(V_S)$, V_S - V_{out} = 1.4 V, T_A = Parameter

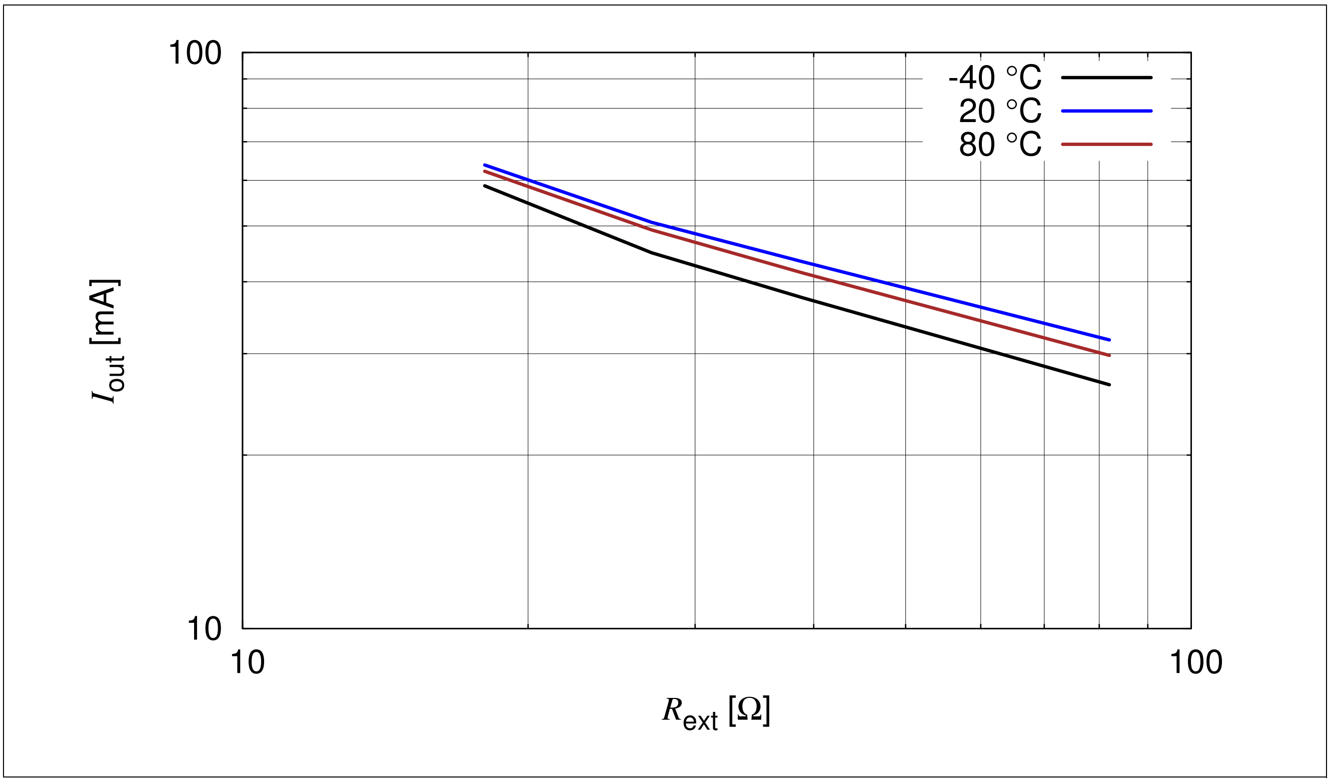


Figure 3-8 Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_S = 10 V, V_S - V_{out} = 1.4 V, T_A = Parameter

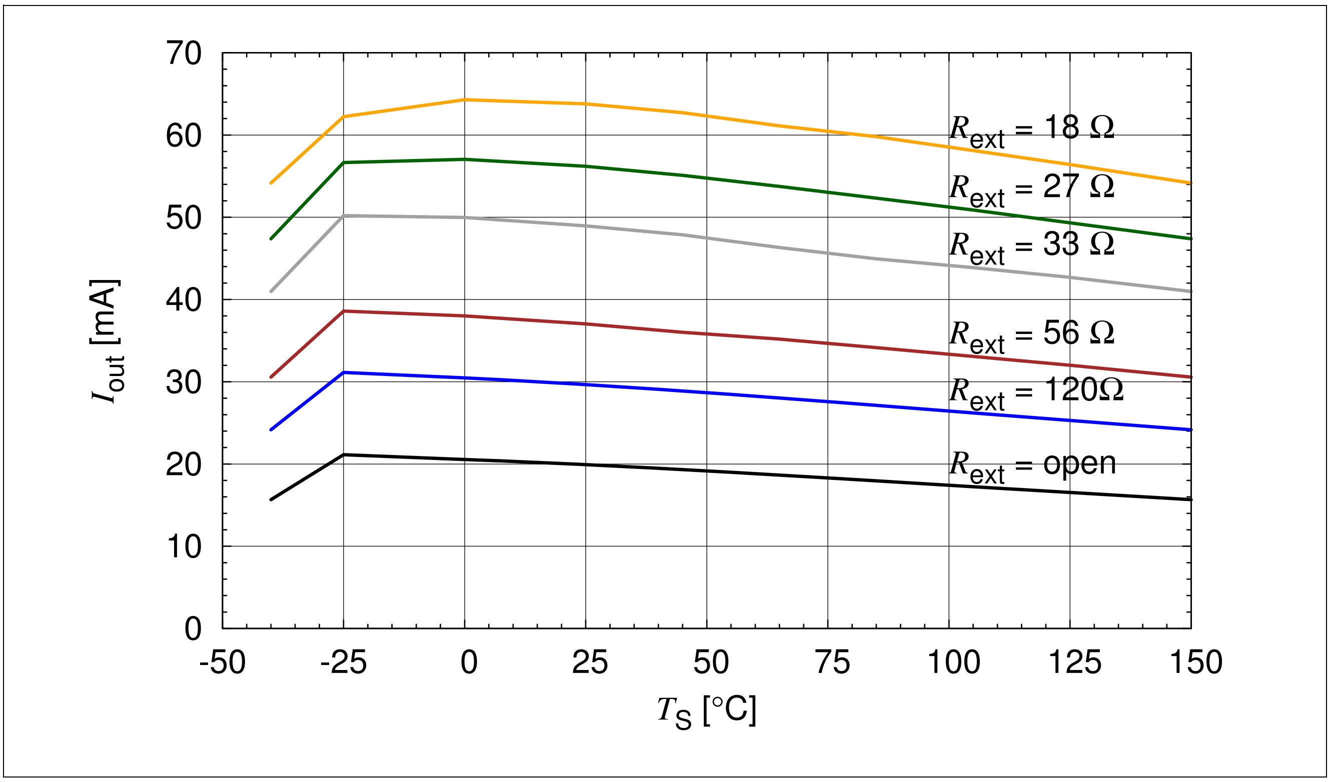


Figure 3-9 Output Current versus T_S $I_{out} = f(T_S)$, V_S = 10 V, V_S - V_{out} = 1.4 V, R_{ext} = Parameter

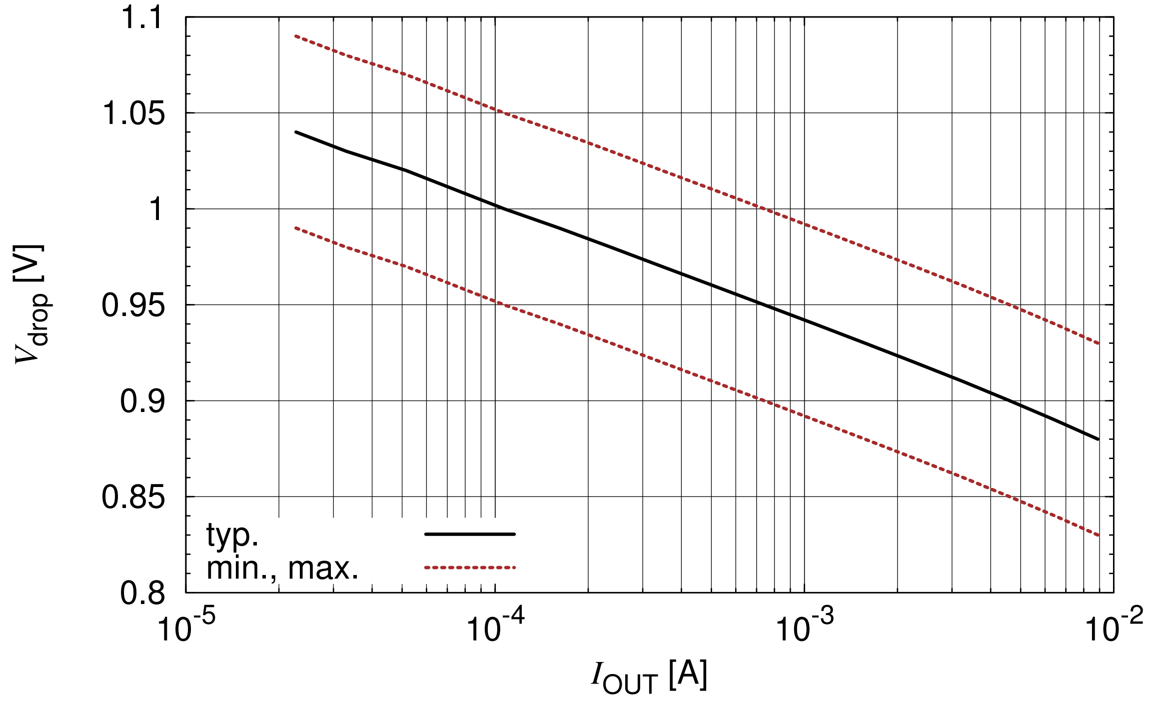


Figure 3-10 Reference Voltage V_{drop} vs I_{out} $V_{drop} = f(I_{out})$, I_{out} = 10 µA to 10 mA

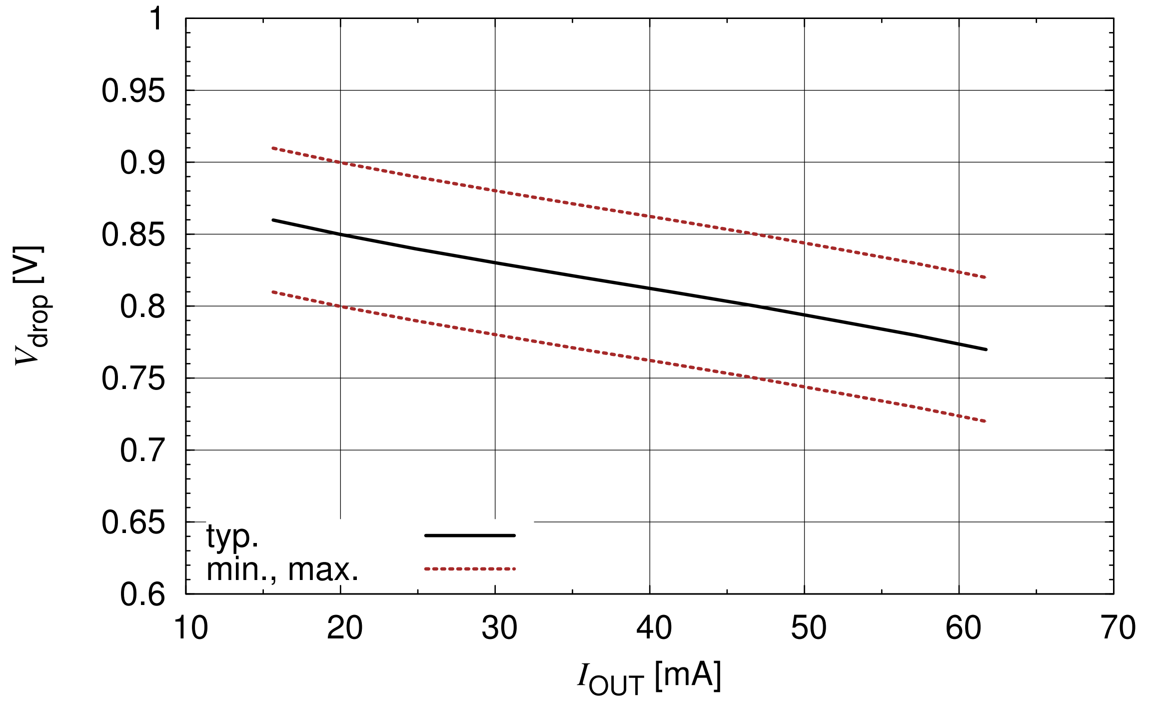


Figure 3-11 Reference Voltage V_{drop} vs I_{out} $V_{drop} = f(I_{out})$, I_{out} = 10 mA to 65 mA

4 Application hints

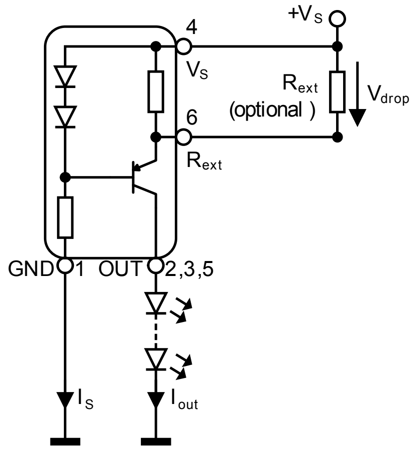


Figure 4-1 Application Circuit: Stand alone current source

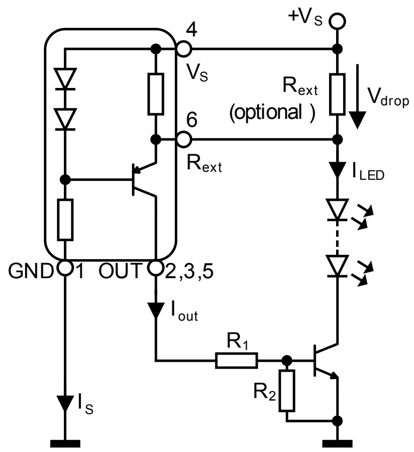


Figure 4-2 Application Circuit: Boost mode current source with external power transistor

Application hints

BCR402U 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

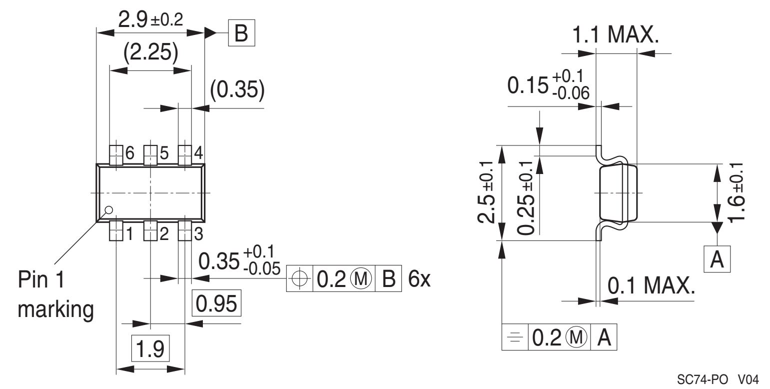


Figure 5-1 Package Outline for SC74 (dimensions in mm)

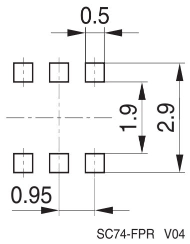


Figure 5-2 Package Footprint for SC74 (dimensions in mm)

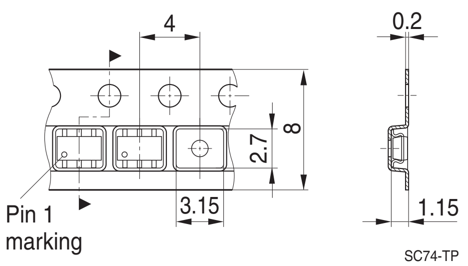


Figure 5-3 Tape and Reel Information for SC74 (dimensions in mm)

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

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

LED Driver

BCR402W

Datasheet

Revision 2.0, 2012-04-12

Power Management & Multimarket

Edition 2012-04-12

Published by
Infineon Technologies AG
81726 Munich, Germany

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Revision 2.0, 2012-04-12	
All	Datasheet layout updated
Table 2-1	V_{out} limit increased
Table 2-3	R_{int} limits tightened

Trademarks of Infineon Technologies AG

AURIX™, C166™, CanPAK™, CIPOS™, CIPURSE™, EconoPACK™, CoolMOS™, CoolSET™, CORECONTROL™, CROSSAVE™, DAVE™, DI-POL™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPIM™, EconoPACK™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, I²RF™, ISOFACE™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OptiMOS™, ORIGA™, POWERCODE™; PRIMARION™, PrimePACK™, PrimeSTACK™, PRO-SIL™, PROFET™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SINDRION™, SIPMOS™, SmartLEWIS™, SOLID FLASH™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™.

Other Trademarks

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, KEIL™, PRIMECELL™, REALVIEW™, THUMB™, µVision™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-iq™ of DECT Forum. COLOSSUS™, FirstGPS™ of Trimble Navigation Ltd. EMV™ of EMVCo, LLC (Visa Holdings Inc.). EPCOS™ of Epcos AG. FLEXGO™ of Microsoft Corporation. FlexRay™ is licensed by FlexRay Consortium. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. MAXIM™ of Maxim Integrated Products, Inc. MICROTEC™, NUCLEUS™ of Mentor Graphics Corporation. MIPI™ of MIPI Alliance, Inc. MIPS™ of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO., MICROWAVE OFFICE™ (MWO) of Applied Wave Research Inc., OmniVision™ of OmniVision Technologies, Inc. Openwave™ Openwave Systems Inc. RED HAT™ Red Hat, Inc. RFMD™ RF Micro Devices, Inc. SIRIUS™ of Sirius Satellite Radio Inc. SOLARIS™ of Sun Microsystems, Inc. SPANSION™ of Spansion LLC Ltd. Symbian™ of Symbian Software Limited. TAIYO YUDEN™ of Taiyo Yuden Co. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. TOKO™ of TOKO KABUSHIKI KAISHA TA. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VLYNQ™ of Texas Instruments Incorporated. VXWORKS™, WIND RIVER™ of WIND RIVER SYSTEMS, INC. ZETEX™ of Diodes Zetex Limited.

Last Trademarks Update 2011-11-11

Table of Contents

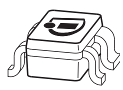
List of Figures

List of Tables

1 LED Driver

1.1 Features

- LED drive current preset to 20 mA
- Output current adjustable up to 60 mA with an external resistor
- Easy paralleling of drivers to increase current
- Supply voltage up to 18 V
- High current accuracy at supply voltage variation
- Low voltage overhead of 1.2 V
- Up to 500 mW power dissipation in a small SOT343 package
- Negative thermal coefficient of -0.3 %/K reduces output current at higher temperatures
- RoHS compliant (Pb-free) package
- Automotive qualified according AEC Q101



SOT343-3D

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 BCR402W is a cost efficient LED driver to drive low power LEDs. The advantages towards resistor biasing are:

- homogenous light output despite of varying forward voltages in different LED strings
- homogenous light output of LEDs despite of 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 BCR402W can be operated at higher supply voltages adding 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 BCR402W 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 the LEDs.

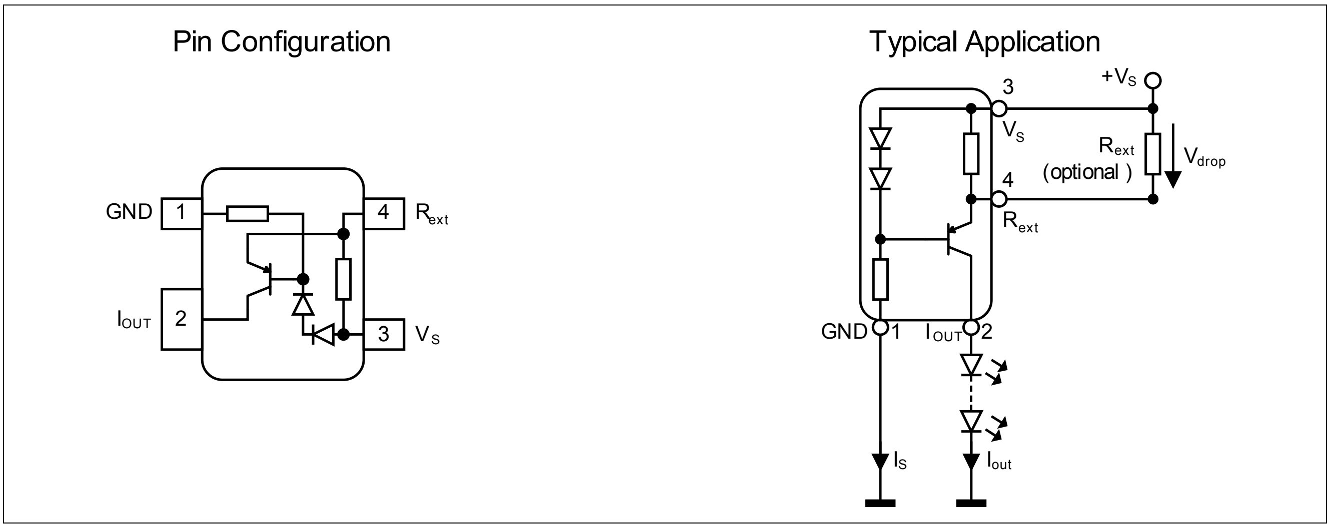


Figure 1-1 Pin configuration and typical application

Type	Marking	Pin Configuration				Package
BCR402W	W6s	1 = GND	2 = I_{OUT}	3 = V_S	4 = R_{ext}	SOT343

2 Electrical Characteristics

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_S	-	-	18	V	
Output current	I_{out}	-	-	60	mA	
Output voltage	V_{out}	-	-	18	V	
Reverse voltage between all terminals	V_R	-	-	0.5	V	
Total power dissipation	P_{tot}	-	-	500	mW	$T_S \leq 95$ °C
Junction temperature	T_J	-	-	150	°C	
Storage temperature range	T_{STG}	-65	-	150	°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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Junction - soldering point[1)]	R_{thJS}	-	-	110	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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Collector-emitter breakdown voltage	$V_{BR(CEO)}$	18	-	-	V	I_C = 100 µA, I_B = 0
Supply current	I_S	350	440	540	µA	V_S = 10 V
DC current gain	h_{FE}	-	150	-	-	I_C = 50 mA, V_{CE} = 1 V
Internal resistor	R_{int}	33	38	45	Ω	I_{Rint} = 10 mA
Output current	I_{out}	18	20	22	mA	V_S = 10 V V_{out} = 7.6 V
Voltage drop (V_{Rext})	V_{drop}	-	0.76	-	V	I_{out} = 20 mA

Table 2-4 DC Characteristics with stabilized LED load at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Lowest sufficient supply voltage overhead	V_{Smin}	-	1.2	-	V	I_{out} > 8 mA
Output current change versus T_A	$\Delta I_{out}/I_{out}$	-	-0.3	-	%/K	V_S = 10 V
Output current change versus V_S	$\Delta I_{out}/I_{out}$	-	2	-	%/V	V_S = 10 V

3 Typical characteristics

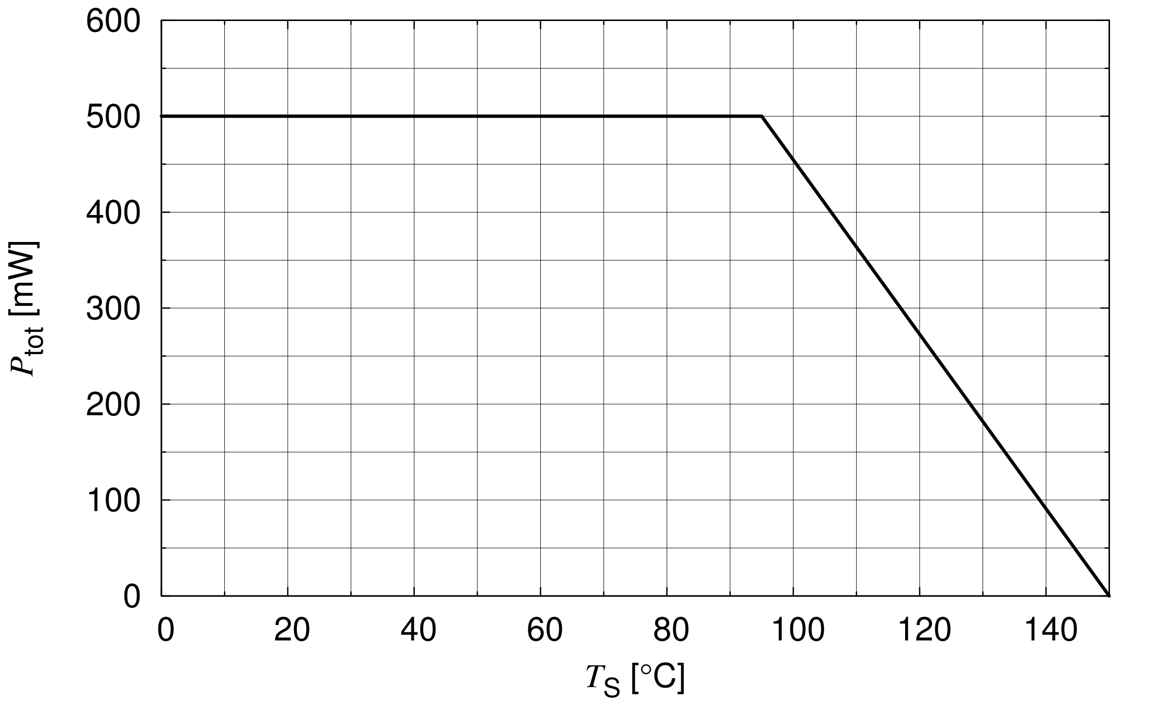


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

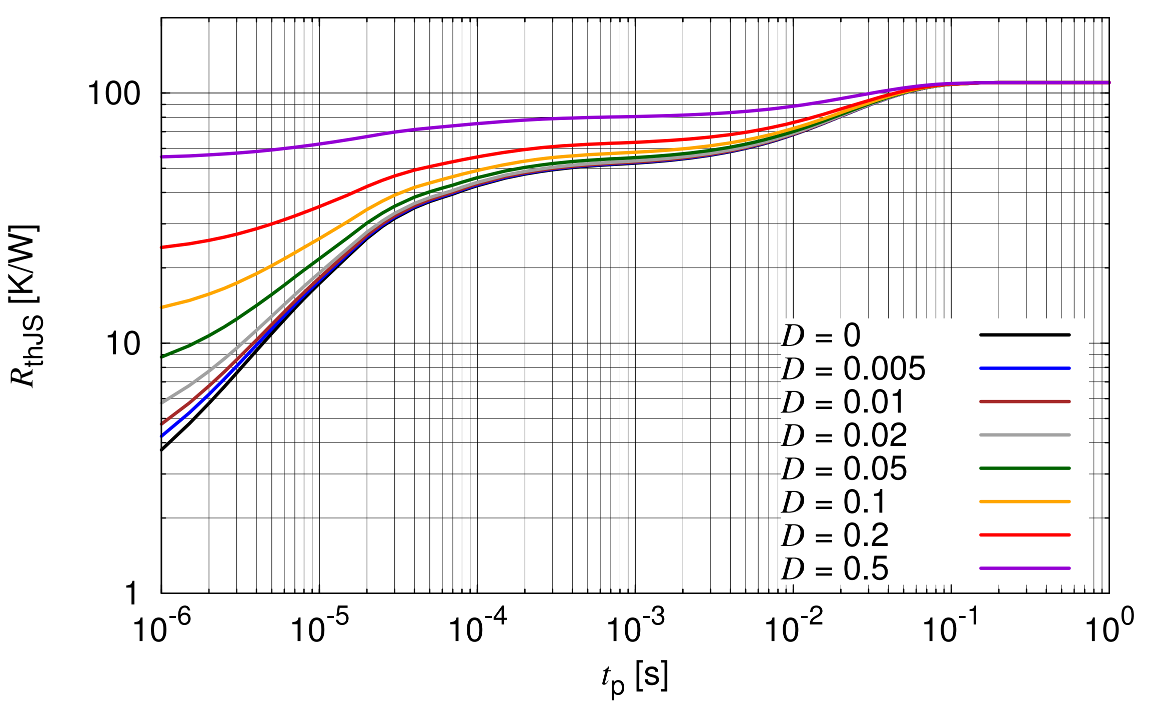


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

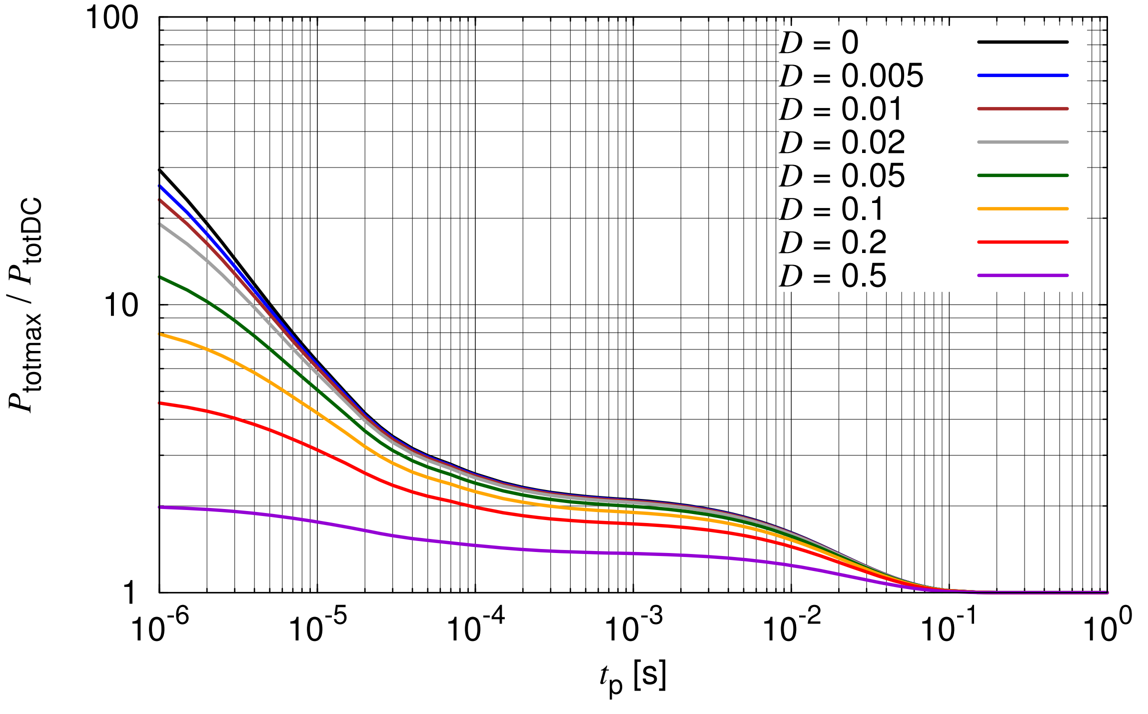


Figure 3-3 Permissible Pulse Load P_{totmax} / P_{totDC}= $f(t_p)$

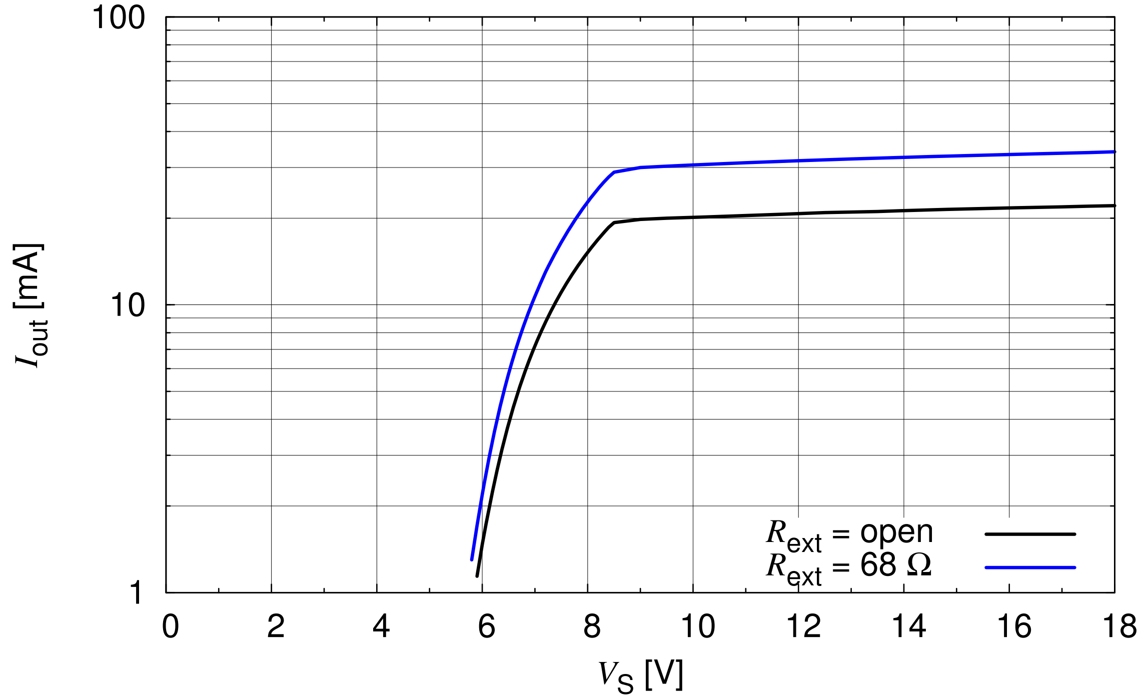


Figure 3-4 Output Current versus V_S $I_{out} = f(V_S)$, 2 LEDs load with V_F = 3.8V in series, R_{ext} = Parameter

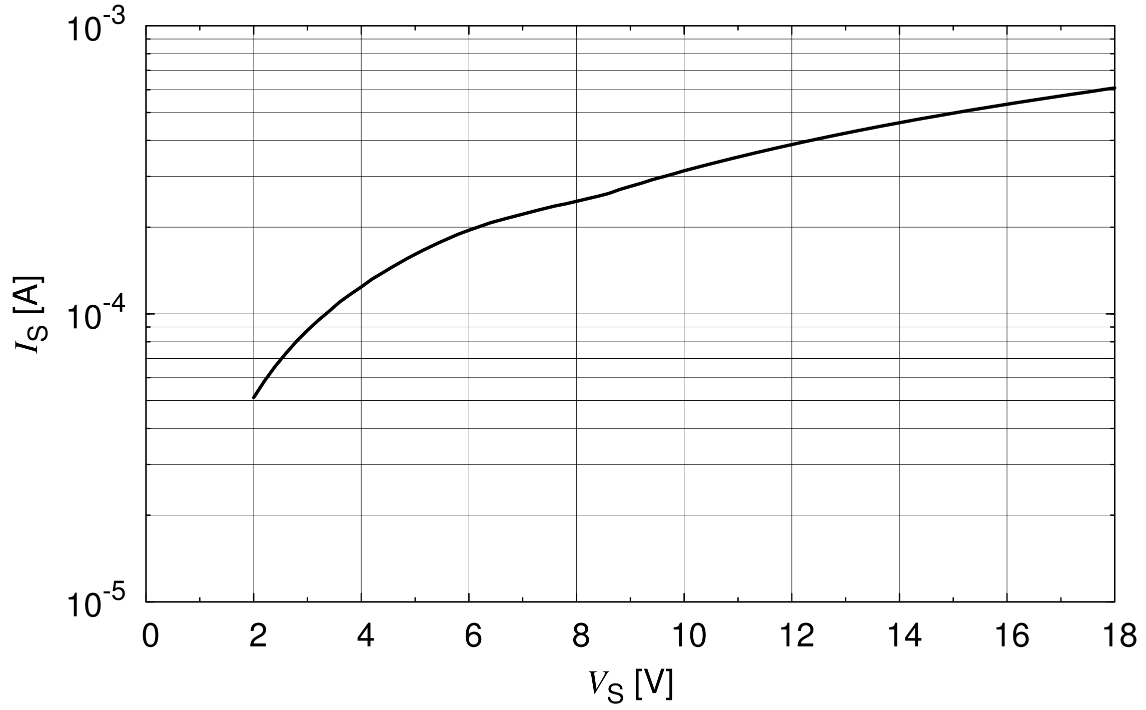


Figure 3-5 Supply Current versus V_S $I_S = f(V_S)$, 2 LEDs load with V_F = 3.8V in series

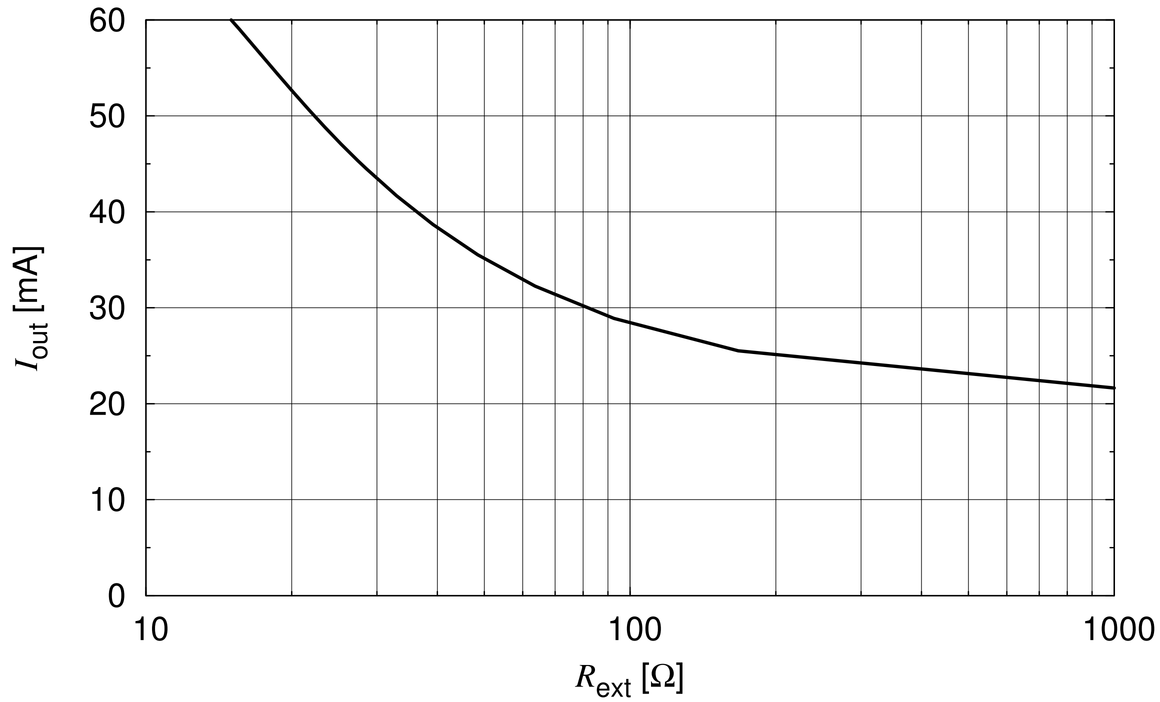


Figure 3-6 Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_S = 10 V, V_{out} = 7.6 V

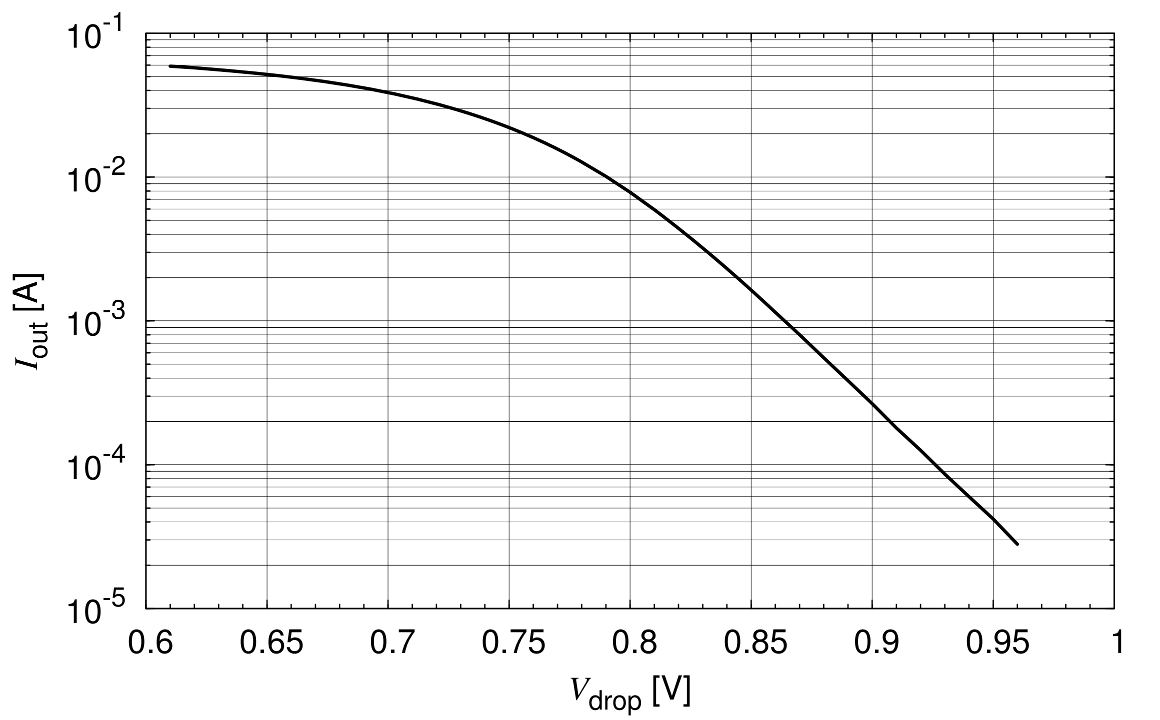


Figure 3-7 Output Current versus V_{drop} $I_{out} = f(V_{drop})$, V_S = 10 V, V_{out} = 7.6 V

4 Application hints

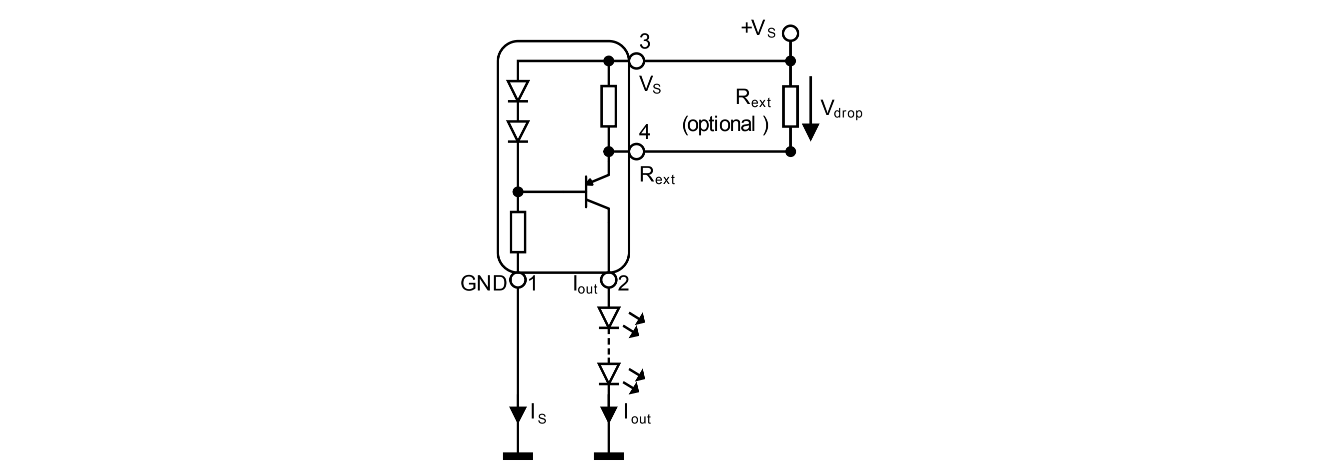


Figure 4-1 Application Circuit: Stand alone current source

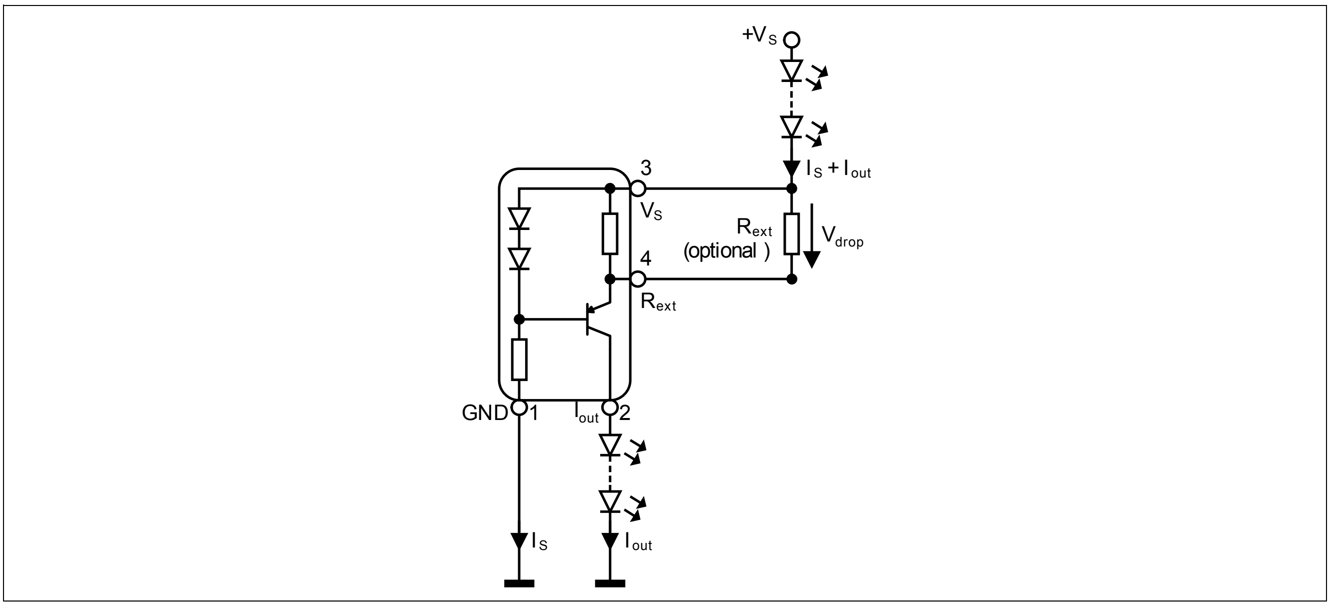


Figure 4-2 Application Circuit: Supply voltages > 18 V

Application hints

BCR402W 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 60 mA. R_{ext} can be determined by using **Figure 3-6**. 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.

Please visit our web site **www.infineon.com/lowcostleddriver** for detailed application notes.

5 Package

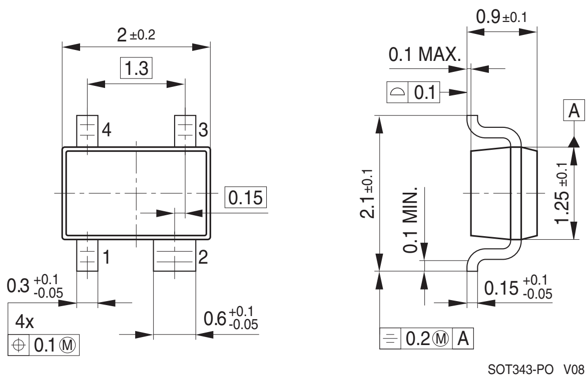


Figure 5-1 Package Outline for SOT343 (dimensions in mm)

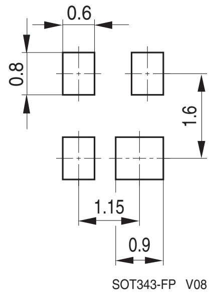


Figure 5-2 Package Footprint for SOT343 (dimensions in mm)

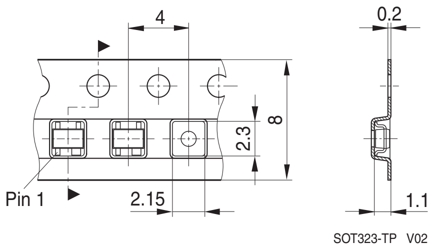


Figure 5-3 Tape and Reel Information for SOT343 (dimensions in mm)

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_{out}	Output voltage
V_R	Reverse voltage
V_S	Supply voltage
V_{Smin}	Lowest sufficient supply voltage overhead

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

LED Driver

BCR420U / BCR421U

Datasheet

Revision 2.0, 2012-05-04

Power Management & Multimarket

Edition 2012-05-04

Published by
Infineon Technologies AG
81726 Munich, Germany

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Revision 2.0, 2012-05-04	
All	Datasheet layout updated
Table 2-1	V_{out} limit increased
Table 2-3	R_{int} limits tightened
Table 2-3	I_{out} limits tightened
Figure 3-13	Figure updated
Figure 3-22	8 Ω label updated

Table of Contents

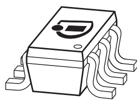
List of Figures

List of Tables

1 LED Driver

1.1 Features

- LED drive current preset to 10 mA
- Continuous output current up to 150 mA with an external resistor
- Easy paralleling of drivers to increase current
- Supply voltage up to 40 V
- Low side current control
- Digital PWM input up to 10 kHz frequency (BCR421U)
- Up to 1 W 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

AEC Qualified   RoHS   HAL

1.2 Applications

- Architectural LED lighting
- Channel letters for advertising, LED strips for decorative lighting
- Retail lighting in fridge, freezer case and vending machines
- Emergency lighting (e.g. steps lighting, exit way signs etc.)

1.3 General Description

The BCR420U / BCR421U provides a low-cost solution for driving 0.25 W LEDs with a typical LED current of 75 mA to 150 mA. Internal breakdown voltage is higher than 40 V which is the maximum voltage the LED driver can sustain when the output is directly connected to supply voltage.

The BCR420U / BCR421U can be operated with a supply voltage of more than 40 V considering the voltage drop of the LED load which reduces the output voltage to the maximum rating of the driver.

The enable pin of BCR420U can withstand a maximum voltage of 40 V which can be increased adding a series resistor in front of the enable pin reducing the voltage at the enable pin below 40 V.

The digital input pin of BCR421U allows dimming via a micro controller with frequencies up to 10 kHz.

A reduction of the output current at higher temperatures is the result of the negative temperature coefficient of -0.2 %/K of the LED driver.

With no need for additional external components like inductors, capacitors and free wheeling diodes, the BCR420U / BCR421U LED drivers are a cost-efficient and PCB-area saving solution for driving 0.25 W LEDs.

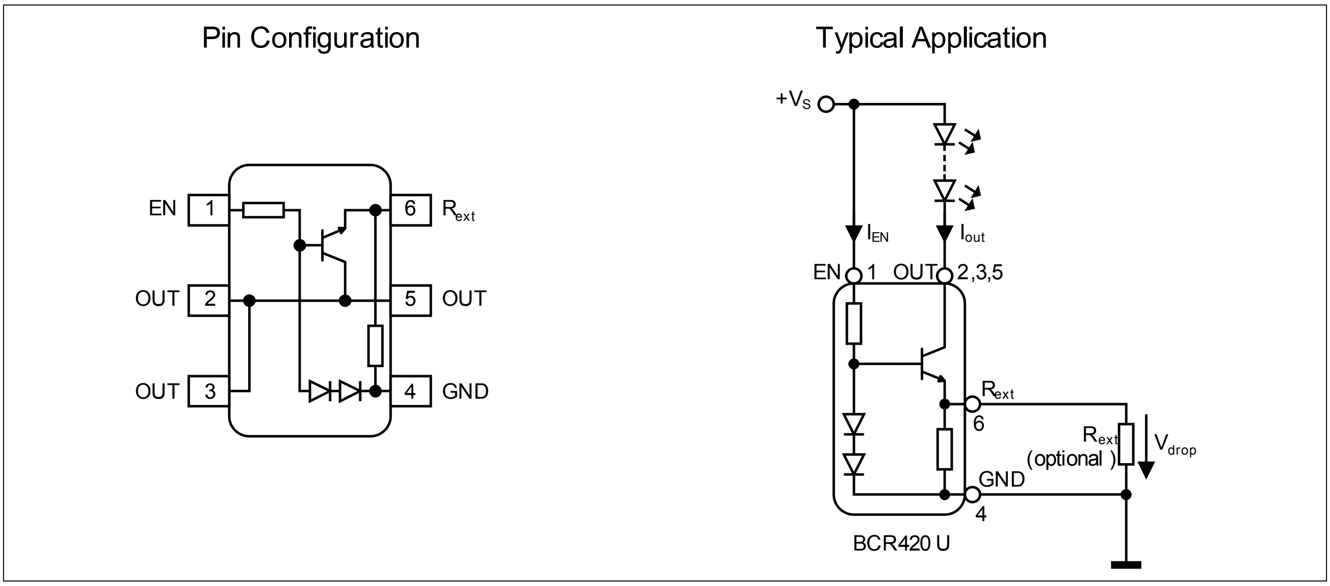


Figure 1-1 Pin configuration and typical application

Type	Marking	Pin Configuration				Package
BCR420U	40	1 = EN	2; 3; 5 = OUT	4 = GND	6 = R_{ext}	SC74
BCR421U	41	1 = EN	2; 3; 5 = OUT	4 = GND	6 = R_{ext}	SC74

2 Electrical Characteristics

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Enable voltage BCR420U BCR421U	V_{EN}	 - -	 - -	 40 4.5	V	
Output current	I_{out}	-	-	200	mA	
Output voltage	V_{out}	-	-	40	V	
Reverse voltage between all terminals	V_R	-	-	0.5	V	
Total power dissipation	P_{tot}	-	-	1000	mW	$T_S \leq 100$ °C
Junction temperature	T_J	-	-	150	°C	
Storage temperature range	T_{STG}	-65	-	150	°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 °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 °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 mA, I_B = 0
Enable current BCR420U BCR421U	I_{EN}	 - -	 1.2 1.2	 - -	mA	 V_{EN} = 24 V V_{EN} = 3.3 V
DC current gain	h_{FE}	200	350	500	-	I_C = 50 mA, V_{CE} = 1 V
Internal resistor	R_{int}	85	95	105	Ω	I_{Rint} = 10 mA
Bias resistor BCR420U BCR421U	R_B	 - -	 20 1.5	 - -	kΩ	

Table 2-3 Electrical Characteristics at T_A = 25 °C, unless otherwise specified (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Output current	I_{out}				mA	V_{out} = 1.4 V
BCR420U		9	10	11		V_{EN} = 24 V
BCR421U		9	10	11		V_{EN} = 3.3 V
Output current at R_{ext} = 5.1 Ω						V_{out} > 2.0 V
BCR420U		-	150	-		V_{EN} = 24 V
BCR421U		-	150	-		V_{EN} = 3.3 V
Voltage drop (V_{Rext})	V_{drop}	0.85	0.95	1.05	V	I_{out} = 10 mA

Table 2-4 DC Characteristics with stabilized LED load at T_A = 25 °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 mA
Output current change versus T_A	$\Delta I_{out}/I_{out}$				%/K	V_{out} > 2.0 V
BCR420U		-	-0.2	-		V_{EN} = 24 V
BCR421U		-	-0.2	-		V_{EN} = 3.3 V
Output current change versus V_S	$\Delta I_{out}/I_{out}$				%/V	V_{out} > 2.0 V
BCR420U		-	1	-		V_{EN} = 24 V
BCR421U		-	1	-		V_{EN} = 3.3 V

3 Typical characteristics

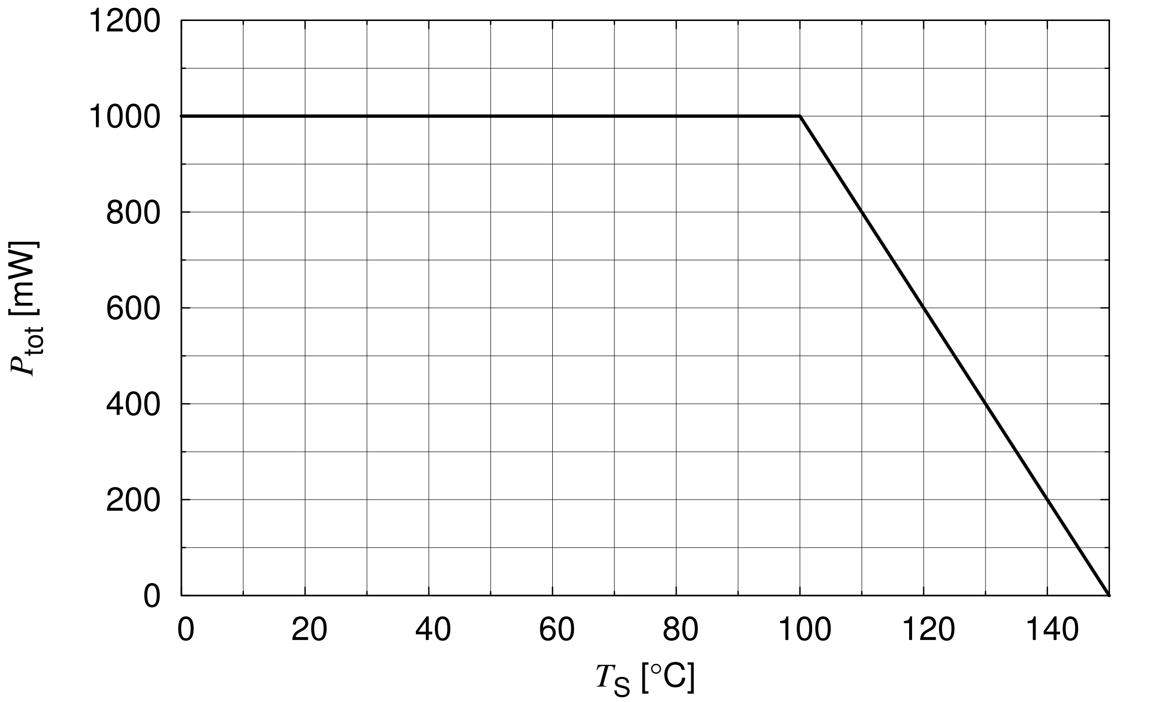


Figure 3-1 Total Power Dissipation $P_{tot} = f(T_S)$

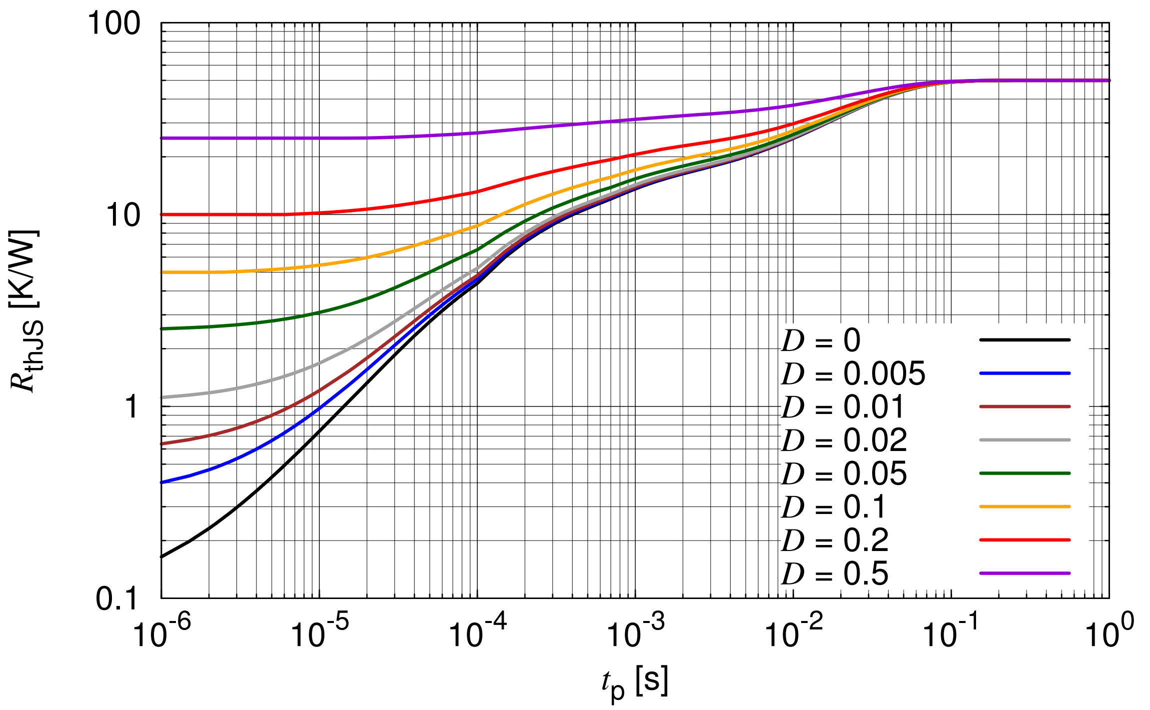


Figure 3-2 Permissible Pulse Load $R_{thJS} = f(t_p)$

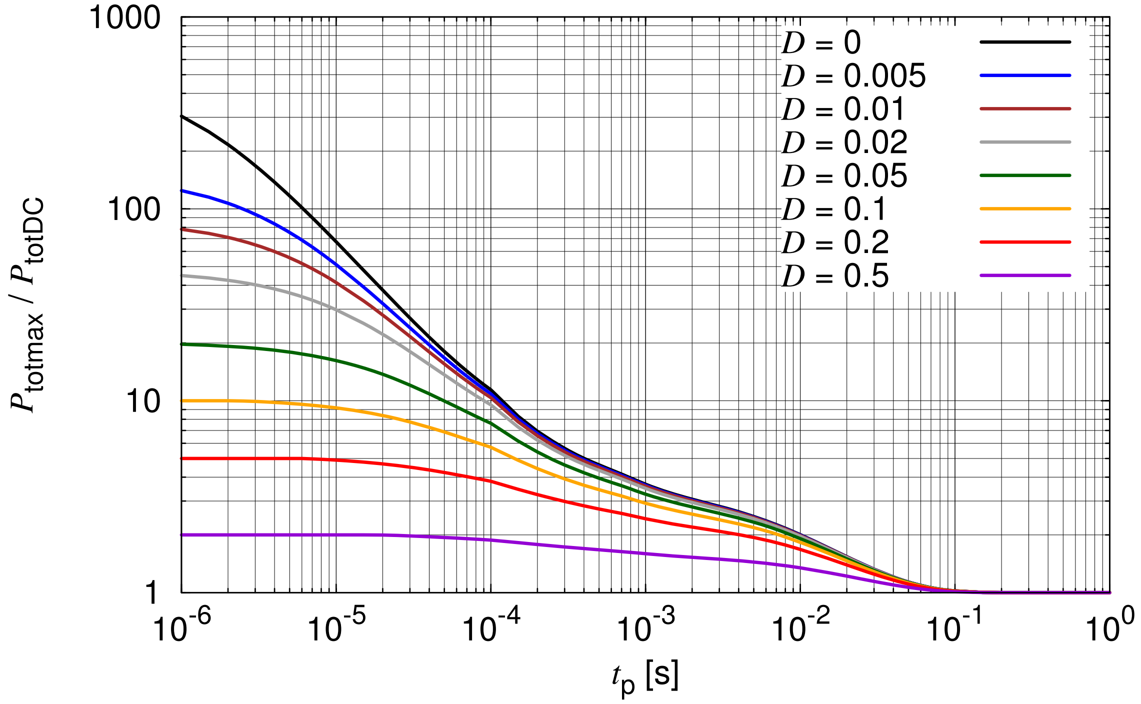


Figure 3-3 Permissible Pulse Load P_{totmax} / P_{totDC}= $f(t_p)$

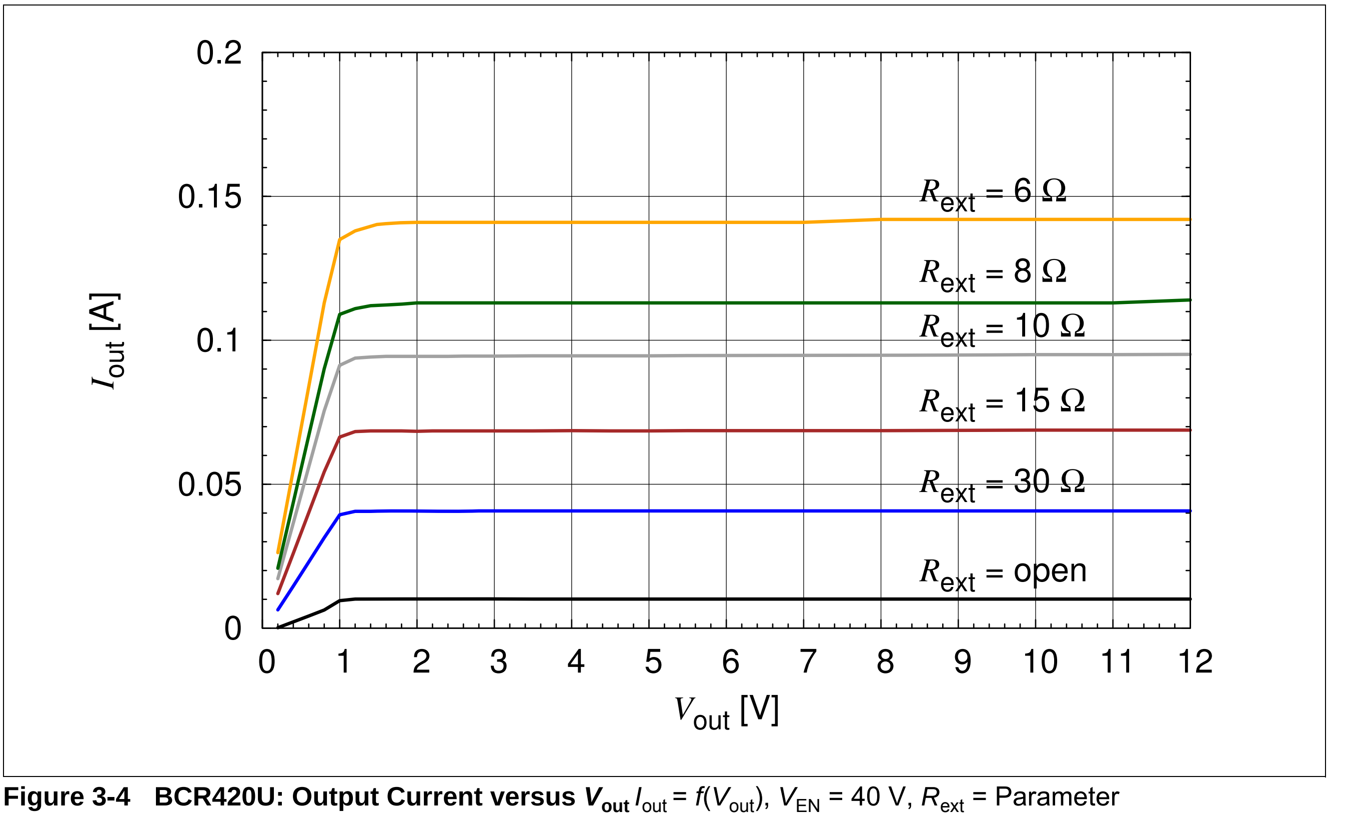


Figure 3-4 BCR420U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 40 V, R_{ext} = Parameter

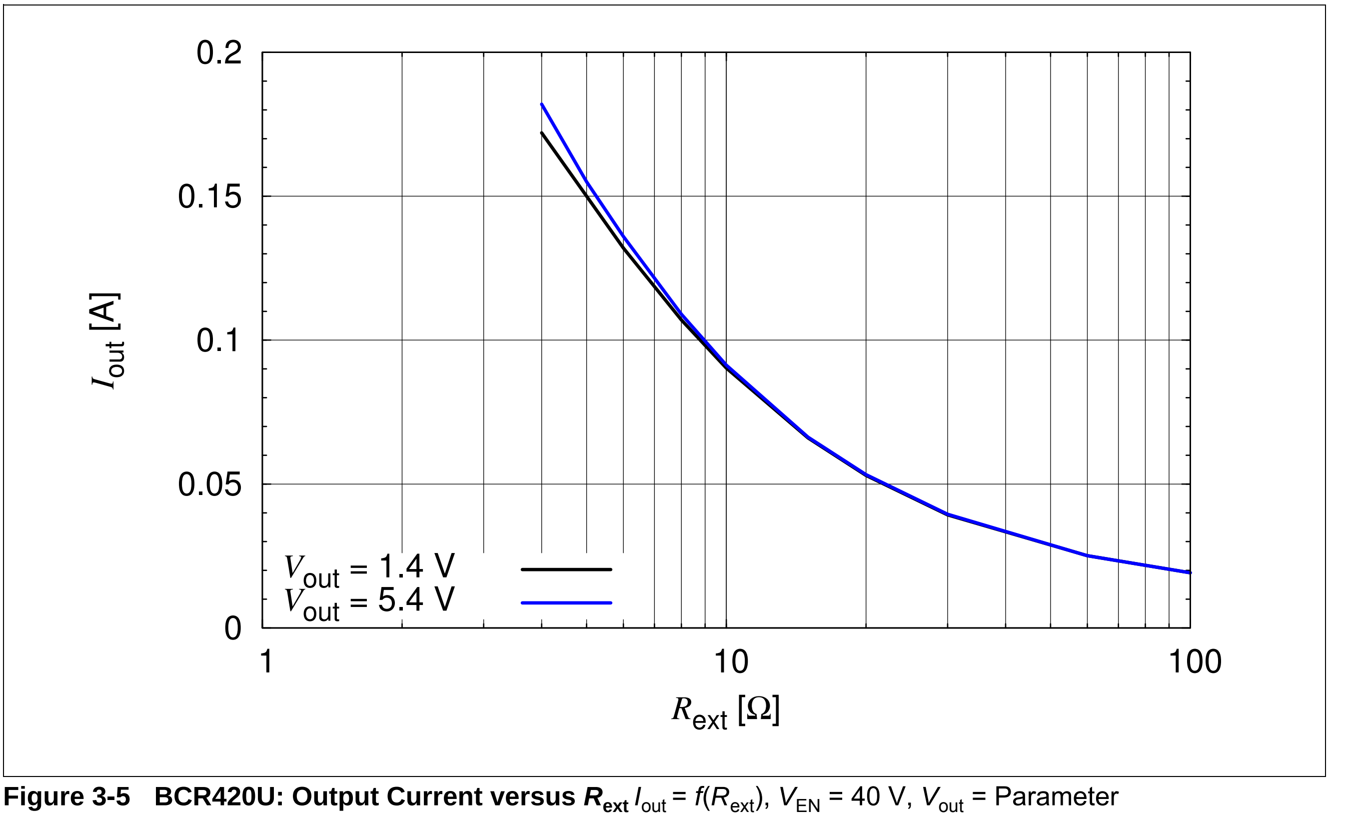


Figure 3-5 BCR420U: Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_{EN} = 40 V, V_{out} = Parameter

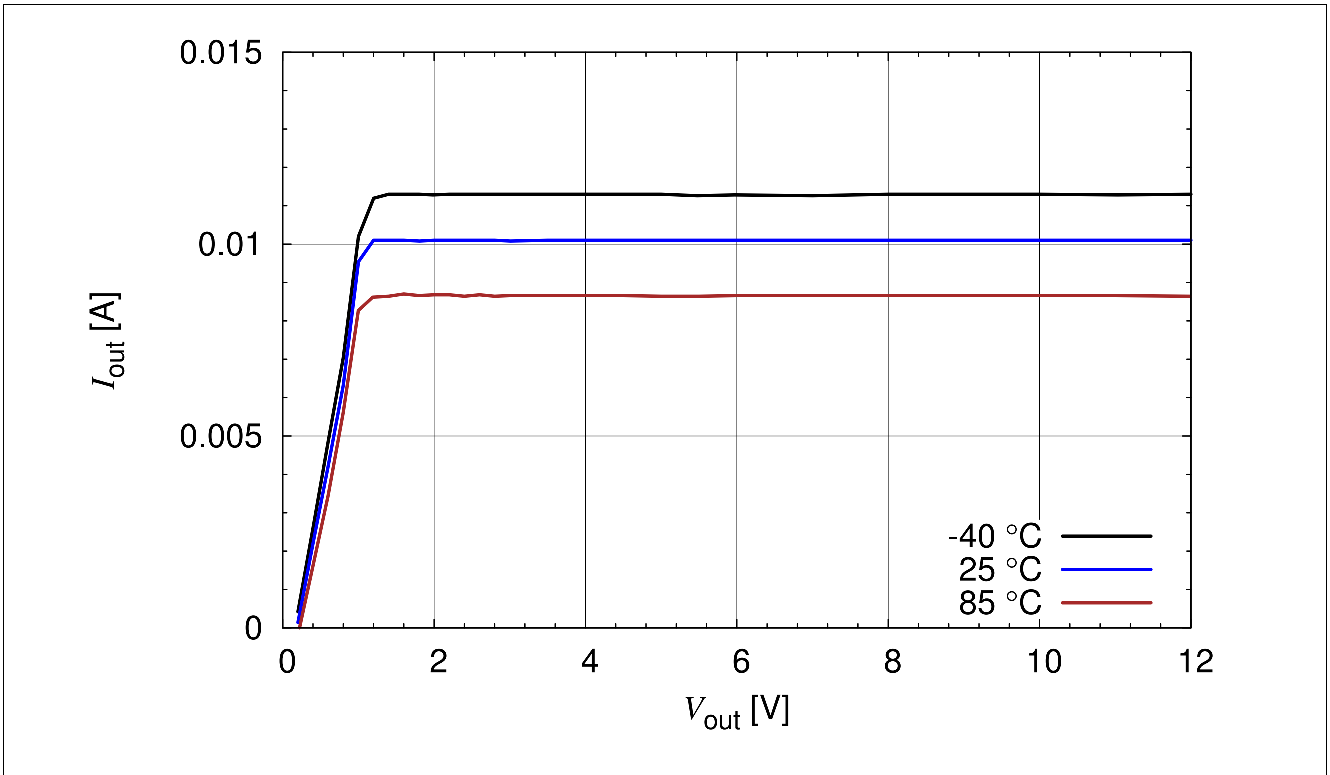


Figure 3-6 BCR420U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 40 V, R_{ext} = open, T_A = Parameter

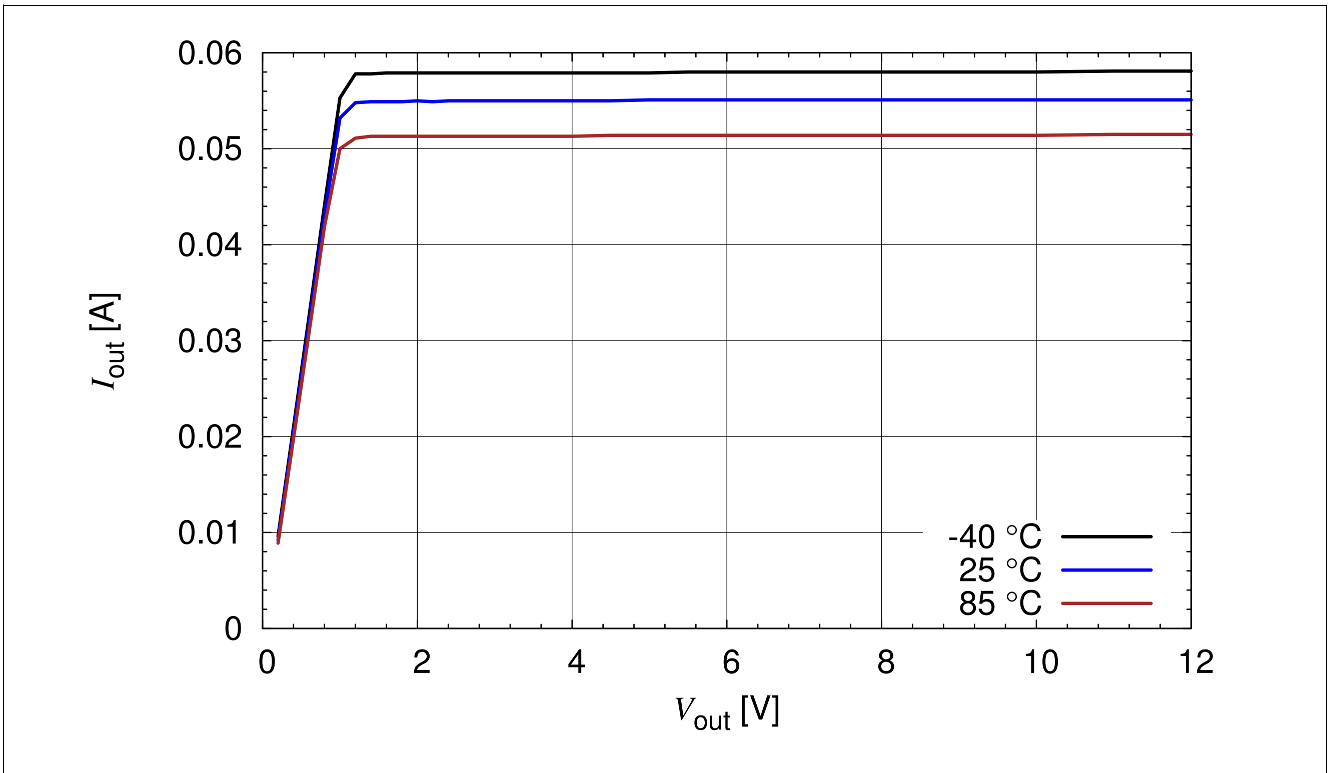


Figure 3-7 BCR420U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 40 V, R_{ext} = 20 Ω, T_A = Parameter

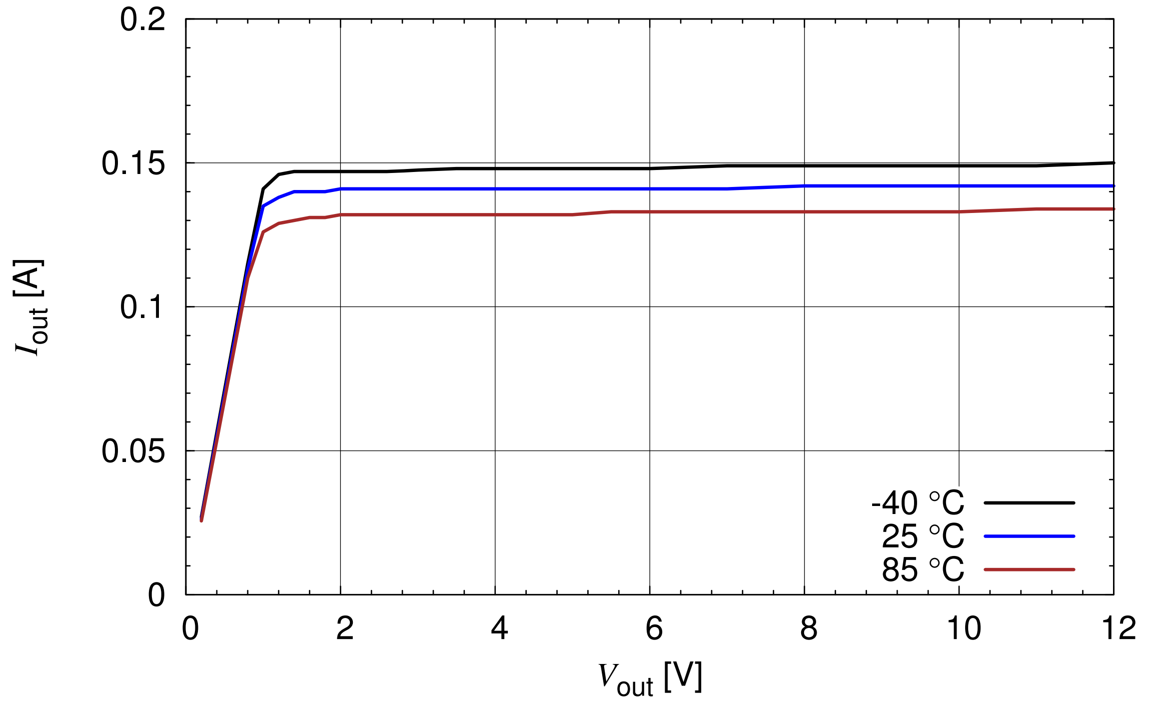


Figure 3-8 BCR420U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 40 V, R_{ext} = 6 Ω, T_A = Parameter

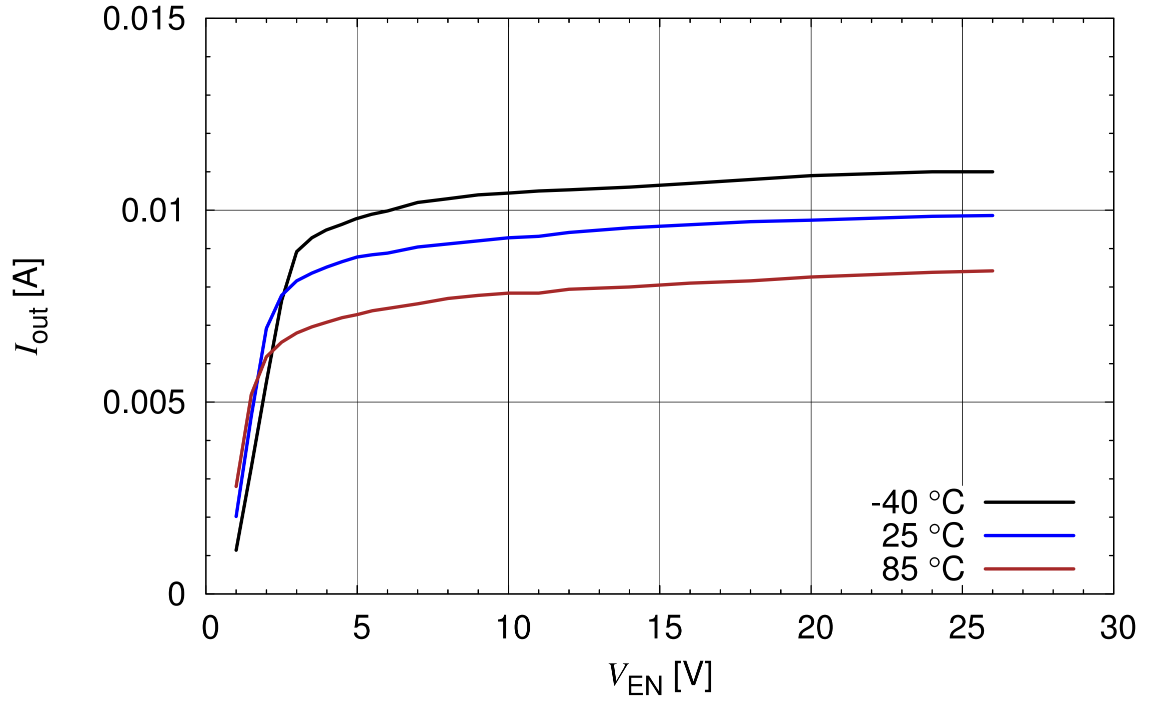


Figure 3-9 BCR420U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = open, T_A = Parameter

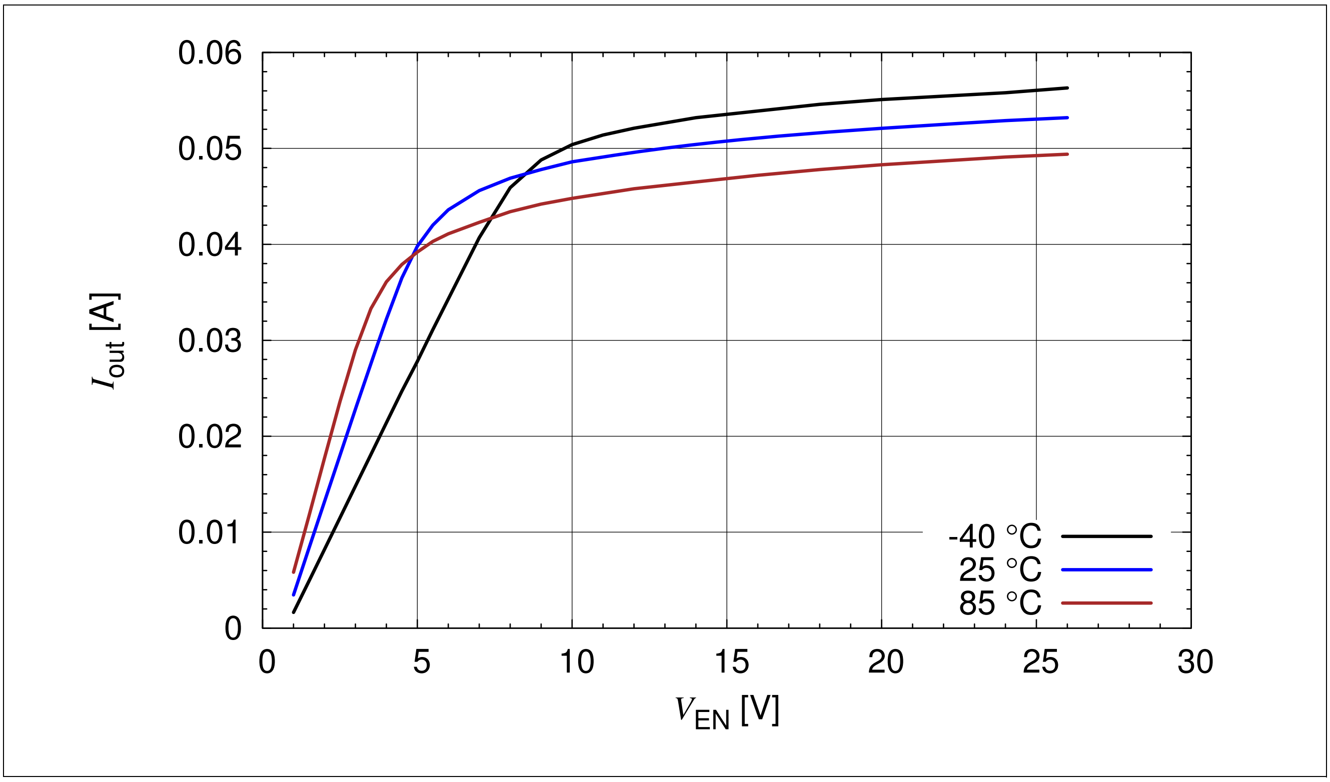


Figure 3-10 BCR420U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 20 Ω, T_A = Parameter

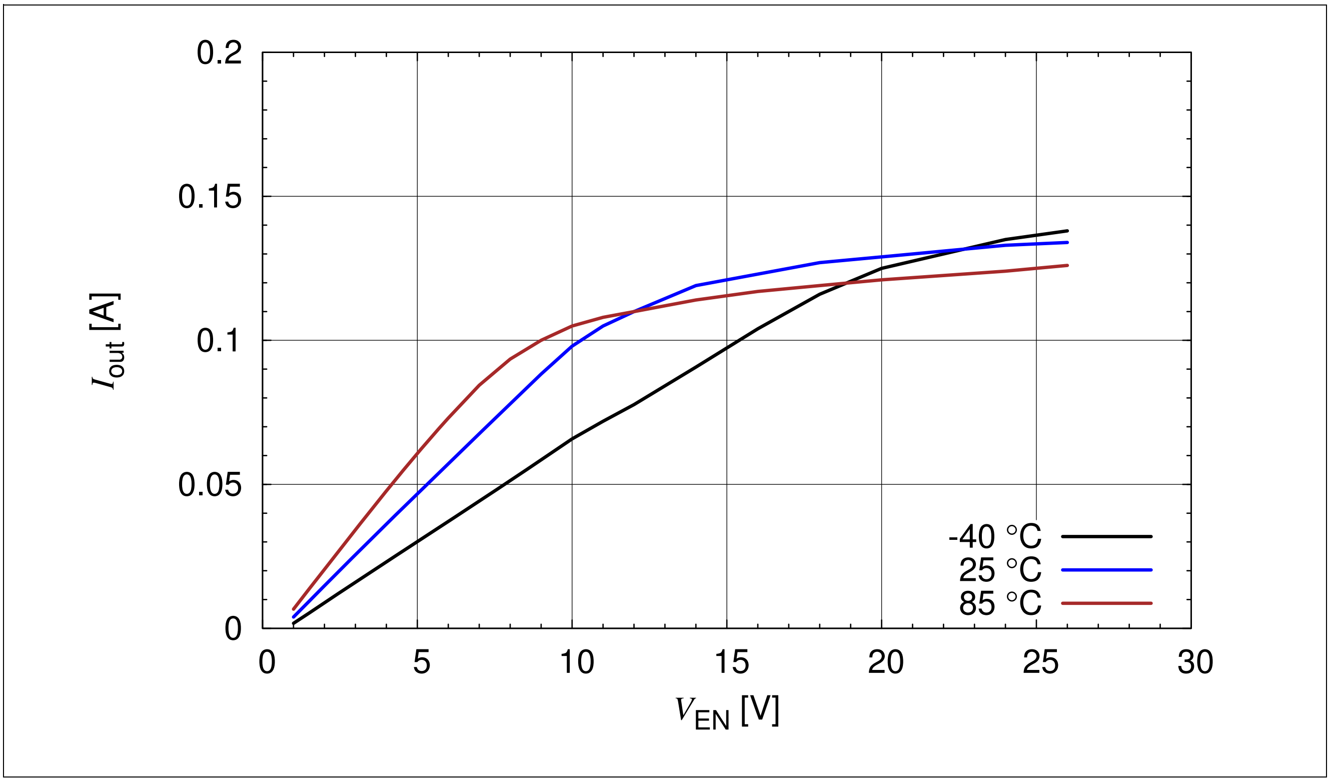


Figure 3-11 BCR420U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 6 Ω, T_A = Parameter

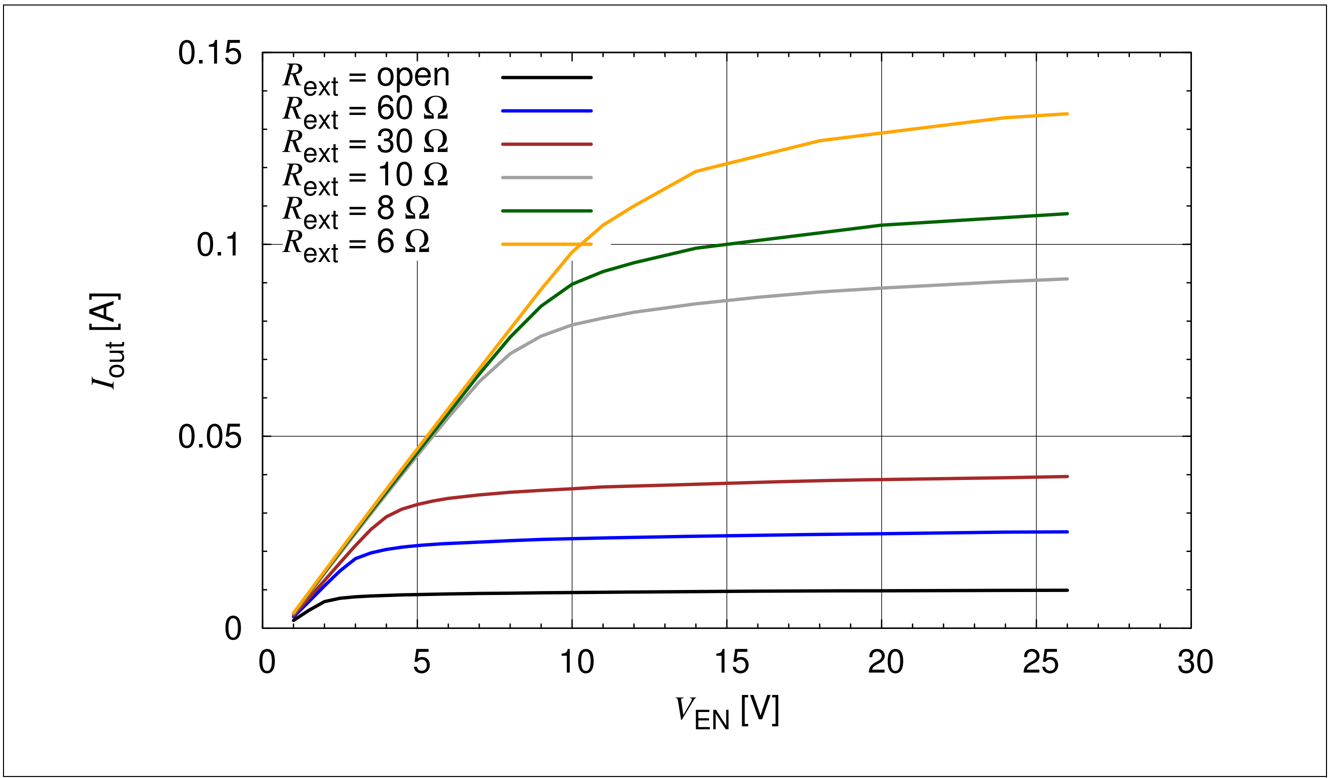


Figure 3-12 BCR420U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = Parameter

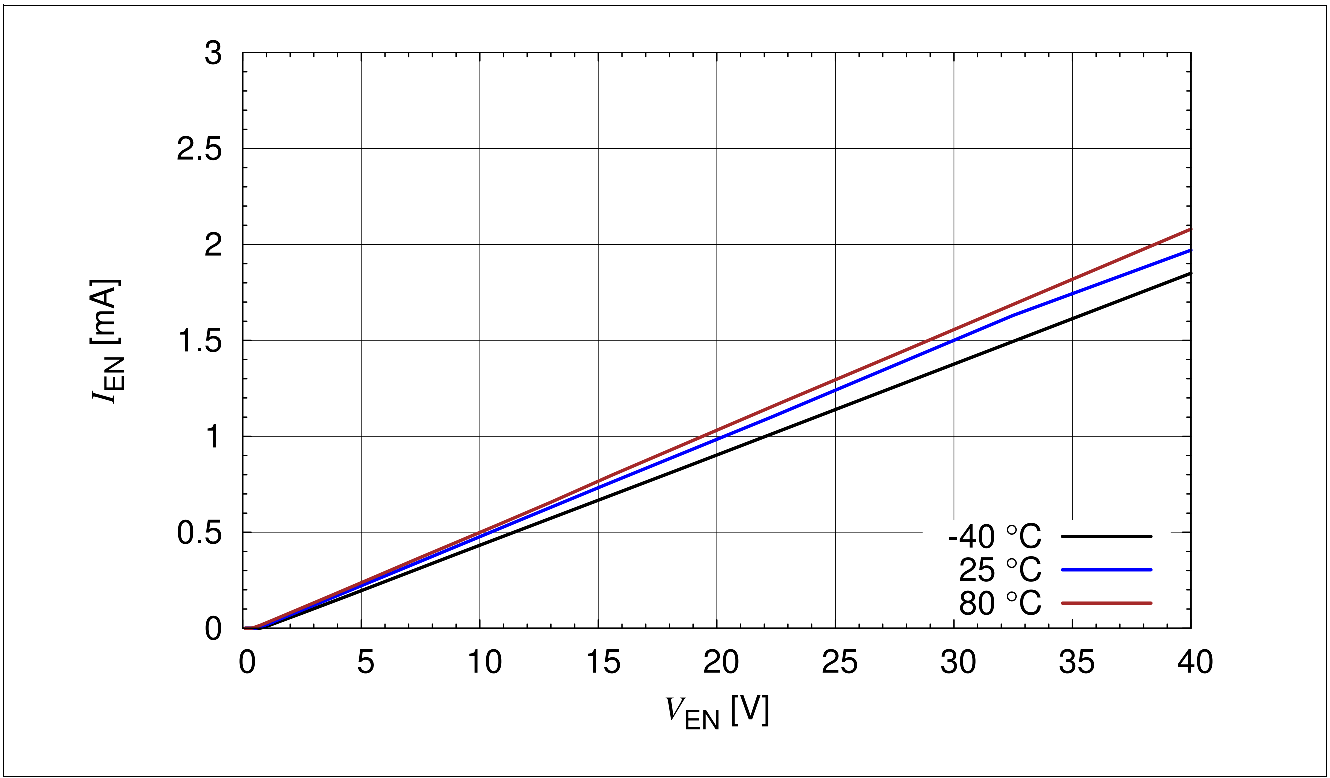


Figure 3-13 BCR420U: Enable Current versus V_{EN} $I_{EN} = f(V_{EN})$, R_{ext} = open, I_{out} = 0 A, T_A = Parameter

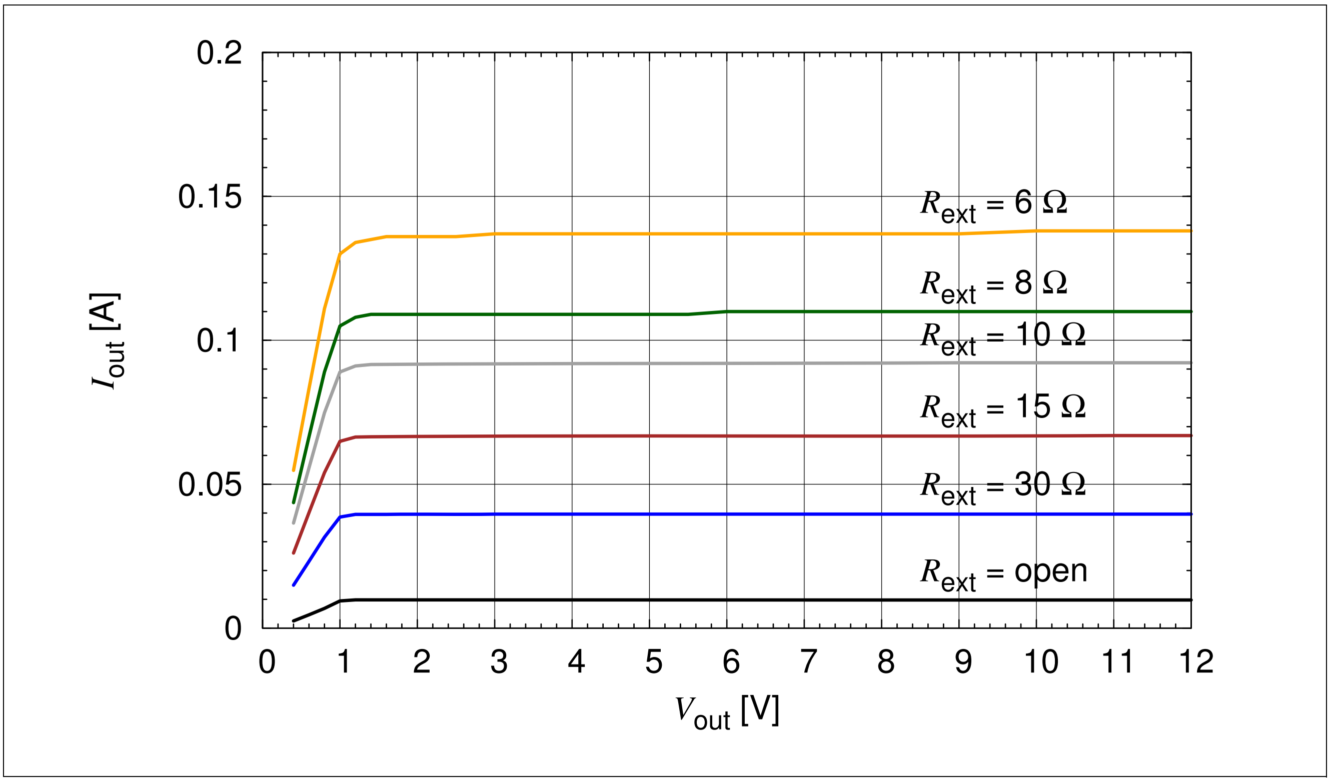


Figure 3-14 BCR421U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = Parameter

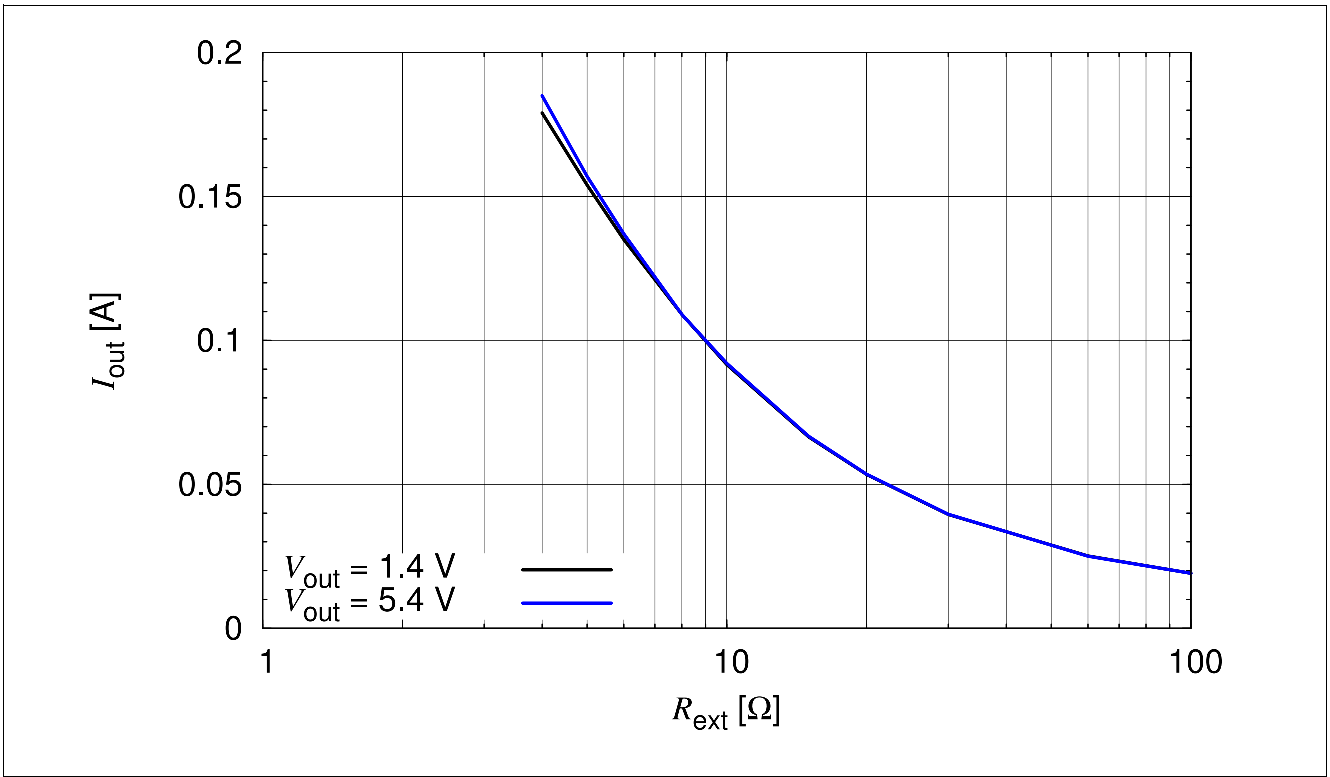


Figure 3-15 BCR421U: Output Current versus R_{ext} $I_{out} = f(R_{ext})$, V_{EN} = 3.3 V, V_{out} = Parameter

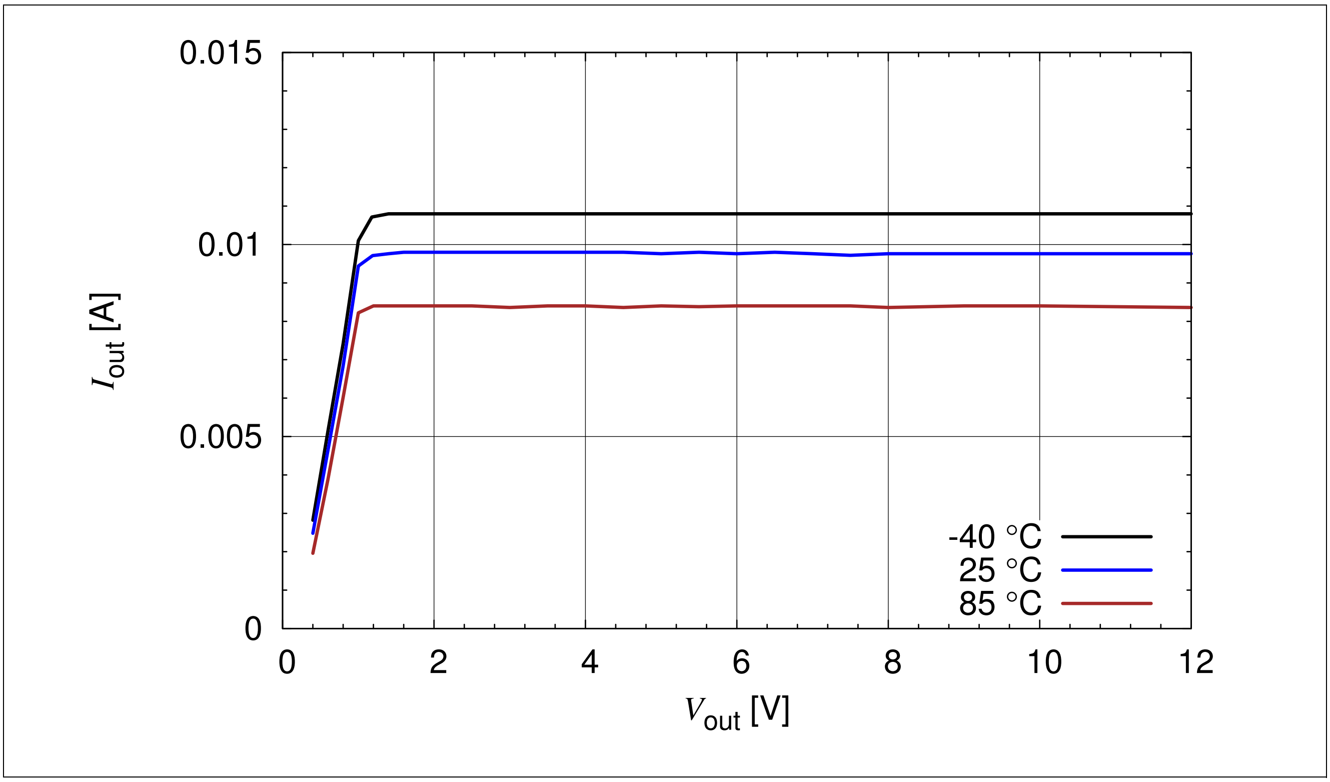


Figure 3-16 BCR421U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = open, T_A = Parameter

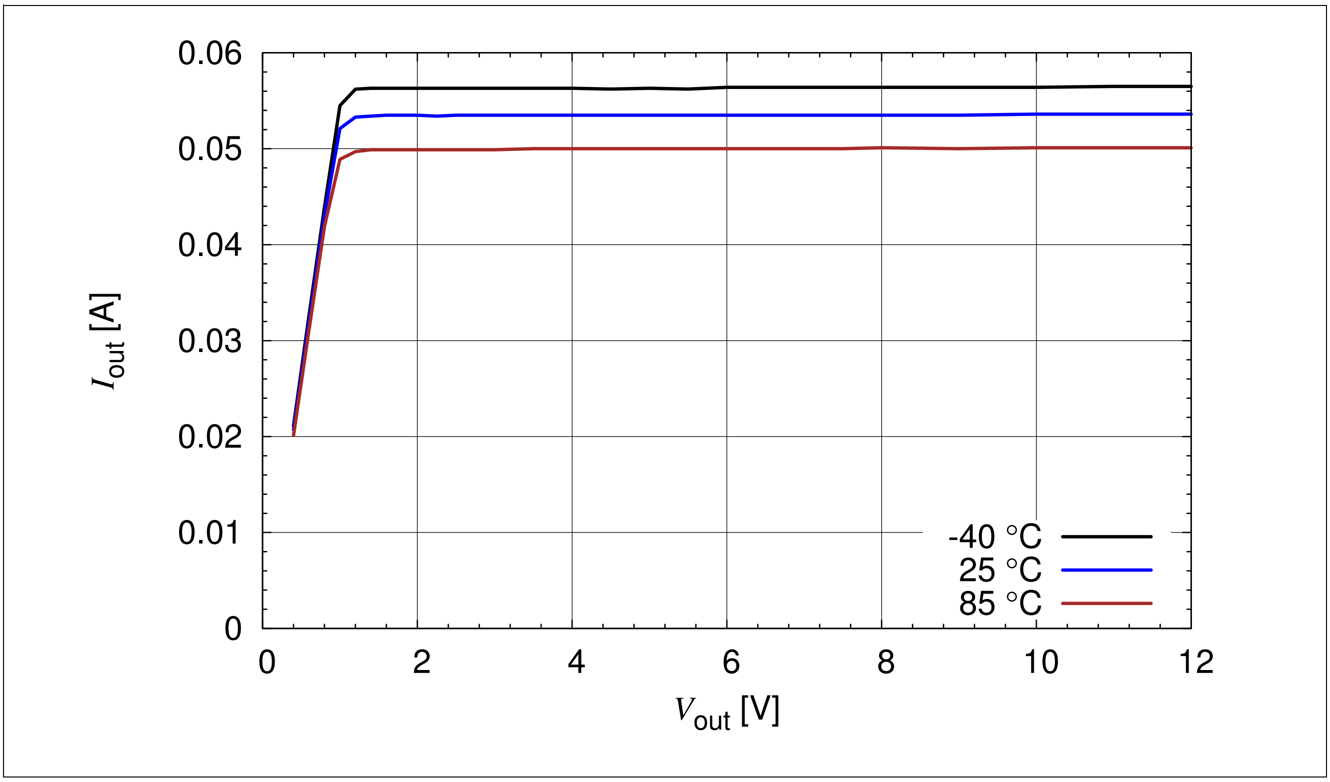


Figure 3-17 BCR421U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = 20 Ω, T_A = Parameter

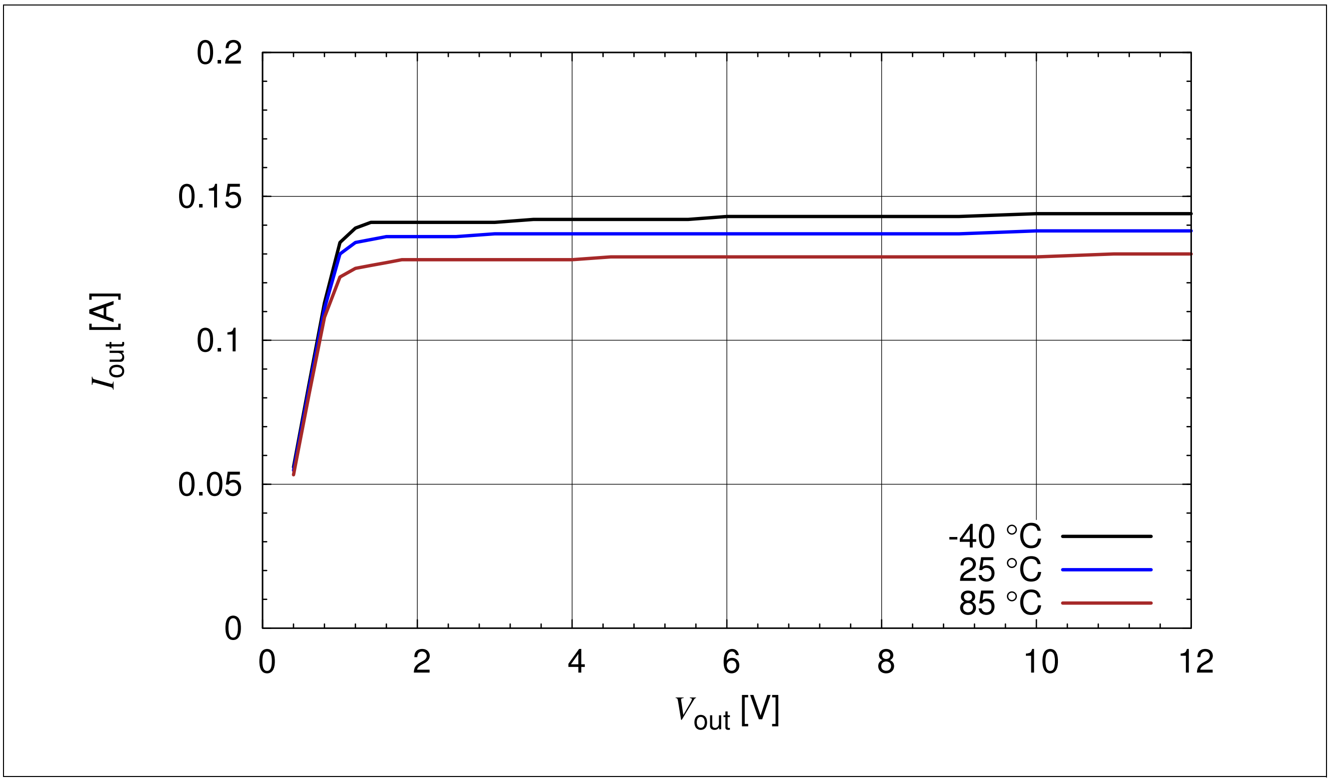


Figure 3-18 BCR421U: Output Current versus V_{out} $I_{out} = f(V_{out})$, V_{EN} = 3.3 V, R_{ext} = 6 Ω, T_A = Parameter

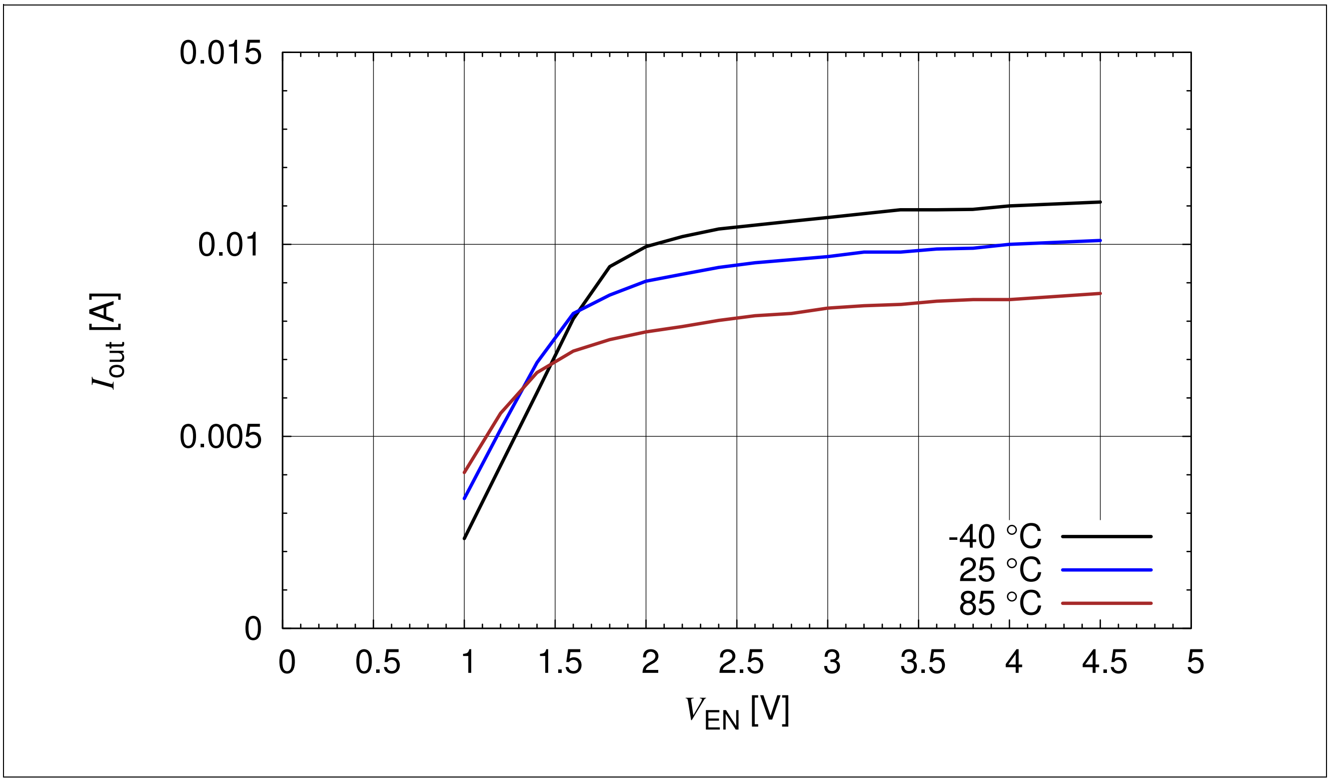


Figure 3-19 BCR421U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = open, T_A = Parameter

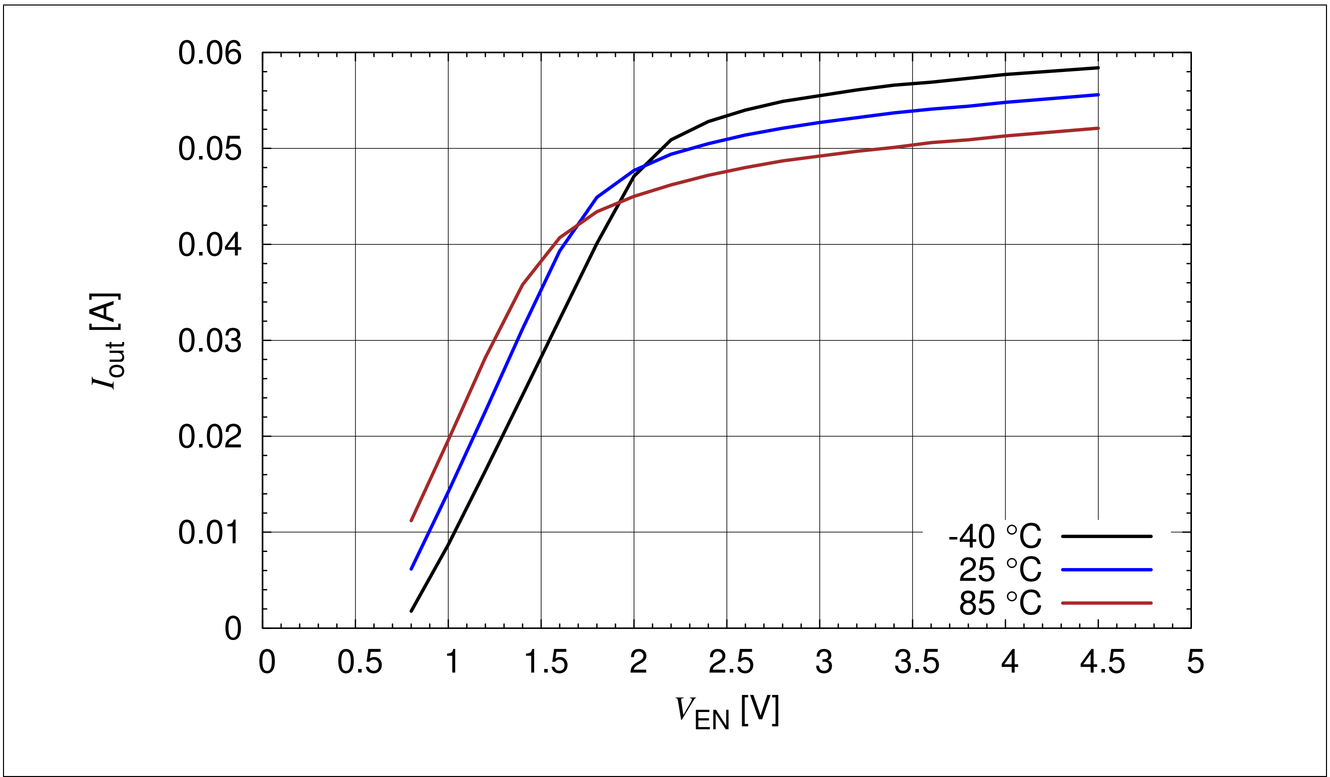


Figure 3-20 BCR421U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 20 Ω, T_A = Parameter

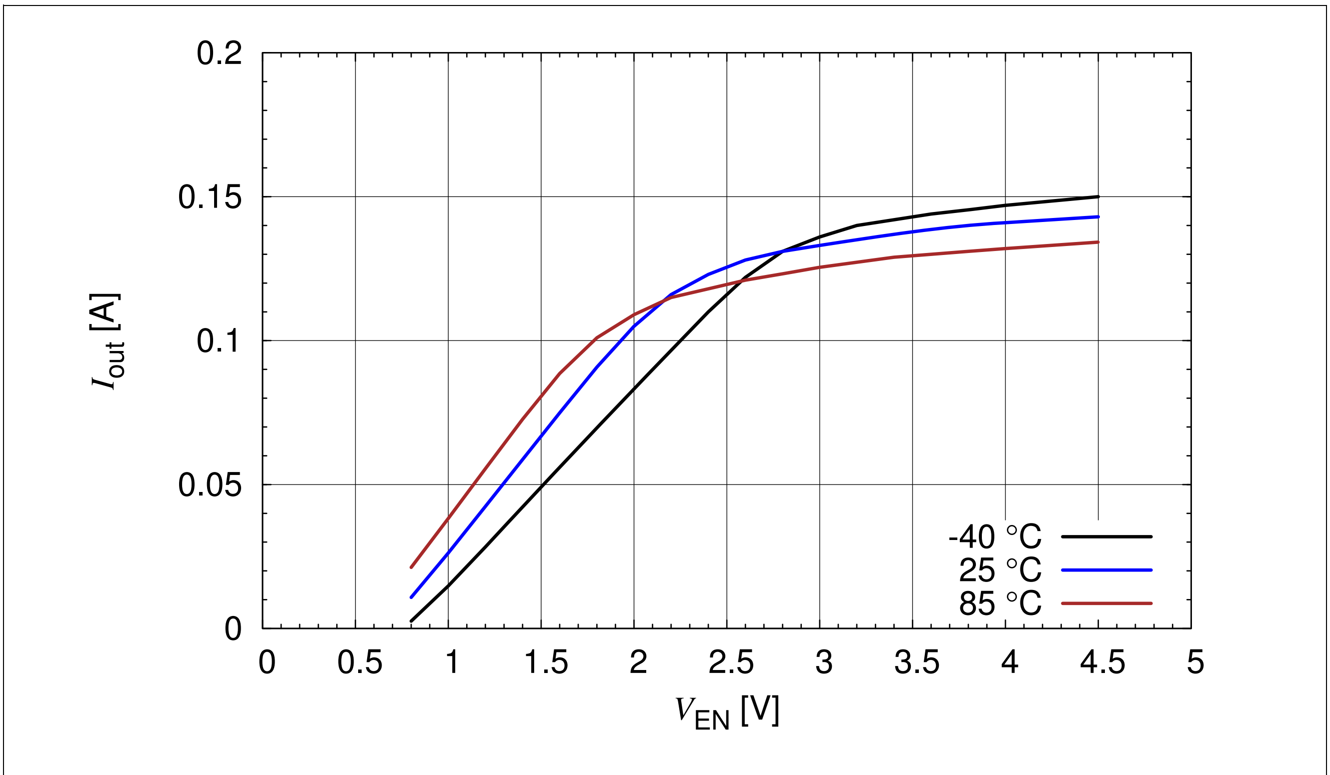


Figure 3-21 BCR421U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = 6 Ω, T_A = Parameter

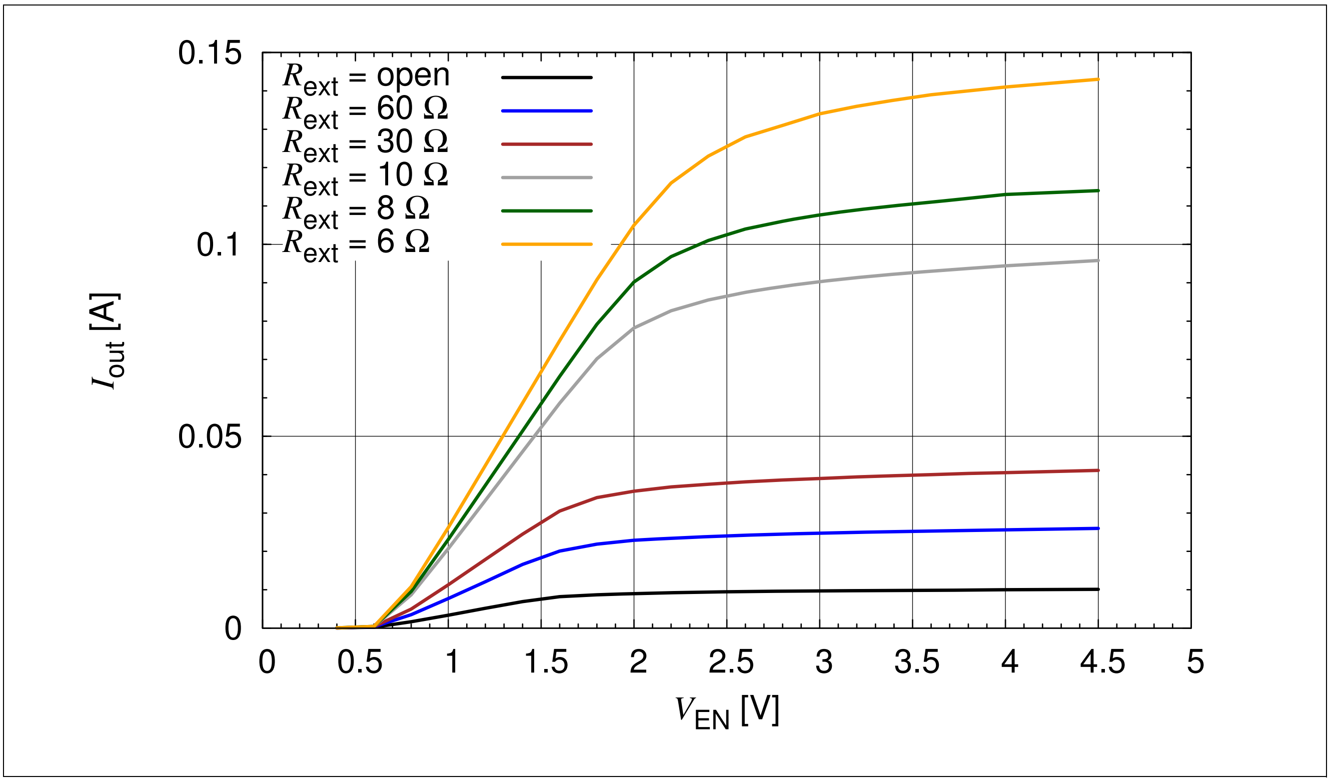


Figure 3-22 BCR421U: Output Current versus V_{EN} $I_{out} = f(V_{EN})$, V_{out} = 2 V, R_{ext} = Parameter

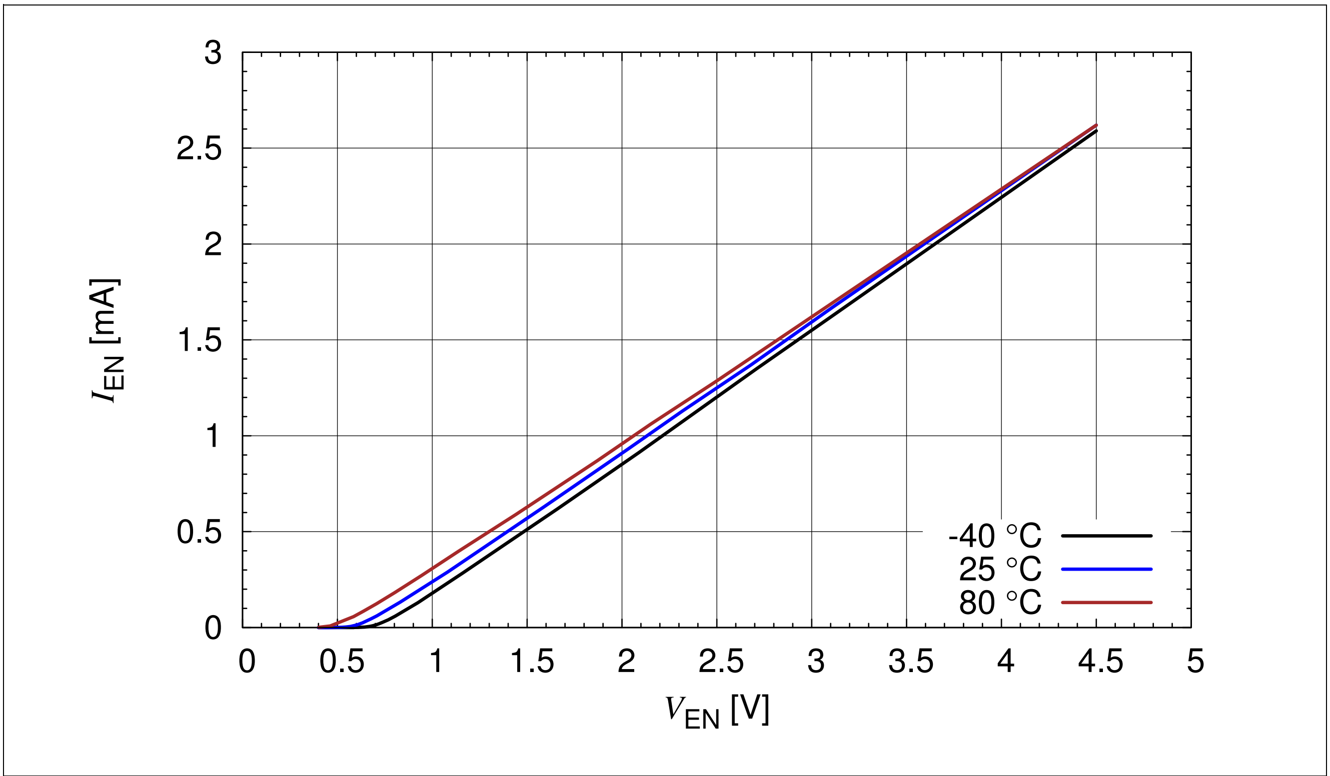


Figure 3-23 BCR421U: Enable Current versus V_{EN} $I_{EN} = f(V_{EN})$, R_{ext} = open, I_{out} = 0 A, T_A = Parameter

4 Application hints

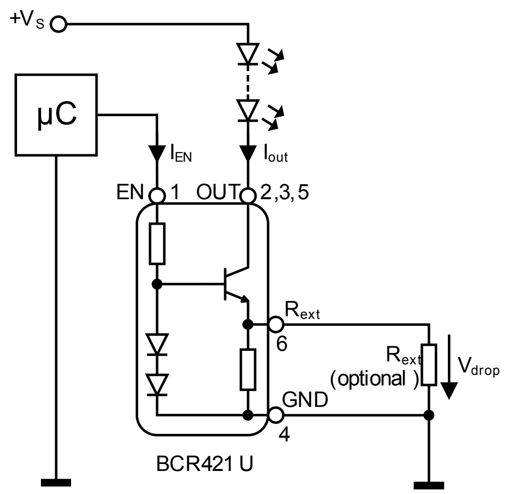


Figure 4-1 Application Circuit: Enabling / PWM by Micro Controller

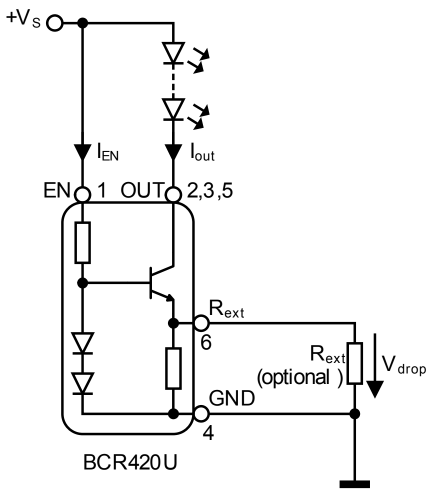


Figure 4-2 Application Circuit: Enabling by Connecting to V_S

Application hints

BCR420U / BCR421U serve as an easy to use constant current sources for LEDs. In stand alone application an external resistor can be connected to adjust the current from 10 mA to 250 mA. R_{ext} can be determined by using **Figure 3-5** or **Figure 3-15**. 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.

Please visit our web site **www.infineon.com/lowcostleddriver** for application notes and for up-to-date application information.

5 Package

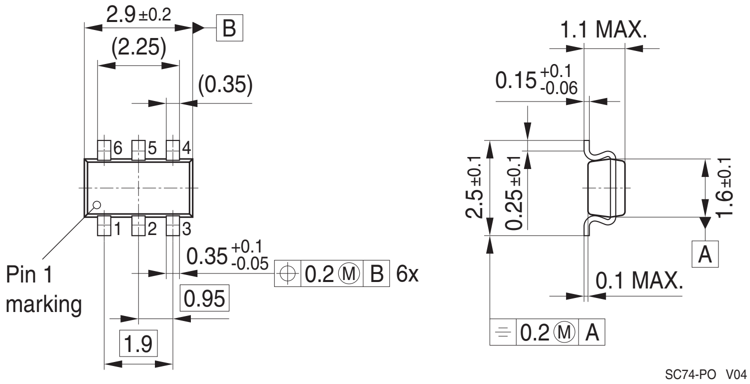


Figure 5-1 Package Outline for SC74 (dimensions in mm)

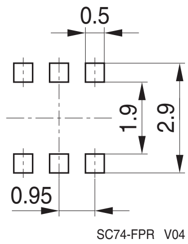


Figure 5-2 Package Footprint for SC74 (dimensions in mm)

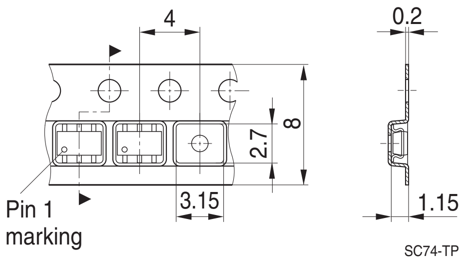


Figure 5-3 Tape and Reel Information for SC74 (dimensions in mm)

Terminology

$\Delta I_{out}/I_{out}$	Output current change
h_{FE}	DC current gain
I_{EN}	Enable current
I_{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

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG