

## Description

The BCR402U monolithically integrates a transistor, diodes and resistors to function as a Constant Current Regulator (CCR) for LED driving. The device regulates with a preset 20mA nominal that can be adjusted with an external resistor up to 100mA. It is designed for driving LEDs in strings and will reduce current at increasing temperatures to self-protect. Operating as a series linear CCR for LED string current control, it can be used in applications with supply voltages up to 40V.

With no need for additional external components, this CCR is fully integrated into a SOT26 minimizing PCB area and component count.

## Applications

Constant current regulation (CCR) in:

- Emergency lighting
- Signage, advertising, decorative and architectural lighting
- Retail lighting in fridge, freezer case and vending machines

## Features

- LED Constant Current Regulator Using PNP Emitter-Follower with Emitter Resistor to Current Limit
- $I_{OUT} = 20\text{mA} \pm 10\%$  constant current (Preset)
- $I_{OUT}$  up to 100mA adjustable with an external resistor
- Negative temperature coefficient (NTC) reduces  $I_{out}$  with increasing temperature
- Parallel devices to increase regulated current
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

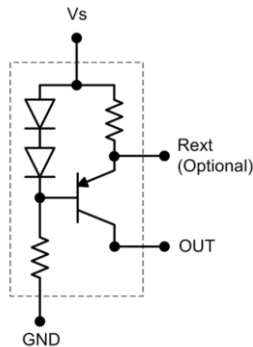
## Mechanical Data

- Case: SOT26 (SC-74)
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.018 grams (Approximate)

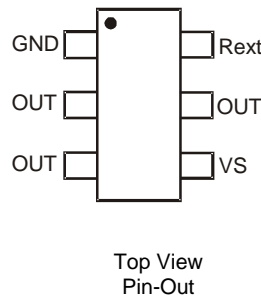
SOT26 (SC-74)



Top View



Internal Device Schematic



Top View Pin-Out

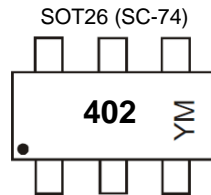
Pin Name	Pin Function
$V_S$	Supply Voltage
OUT	Regulated Output Current
Rext	External resistor for adjusting Output Current
GND	Power Ground

## Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
BCR402UW6-7	402	7	8	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



402 = Part Marking (See Ordering Information)  
 YM = Date Code Marking  
 Y = Year (ex: D = 2016)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022
Code	D	E	F	G	H	I	J

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

## Absolute Maximum Ratings (Voltage relative to GND, @T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Supply Voltage	V <sub>S</sub>	40	V
Output Current	I <sub>OUT</sub>	100	mA
Output Voltage	V <sub>OUT</sub>	40	V
Reverse voltage between all terminals	V <sub>R</sub>	0.5	V

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5)	1,190
		(Note 6)	912
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5)	105
		(Note 6)	137
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	50	°C/W
Recommended Operating Junction Temperature Range	T <sub>J</sub>	-55 to +150	
Maximum Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	

## ESD Ratings (Note 8)

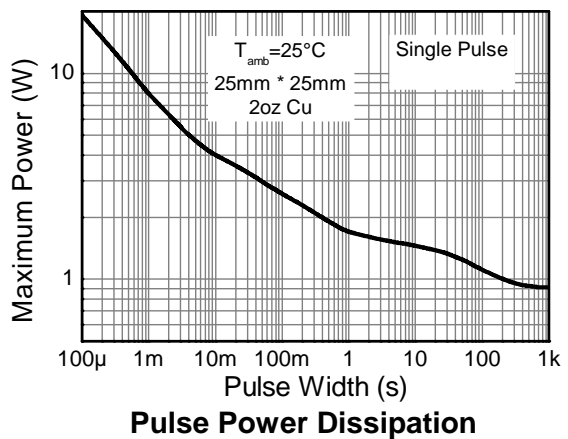
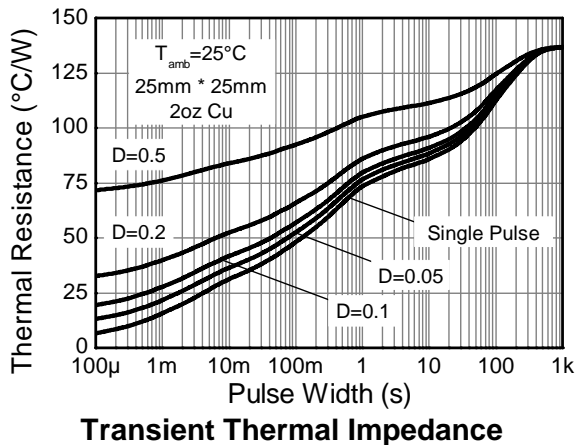
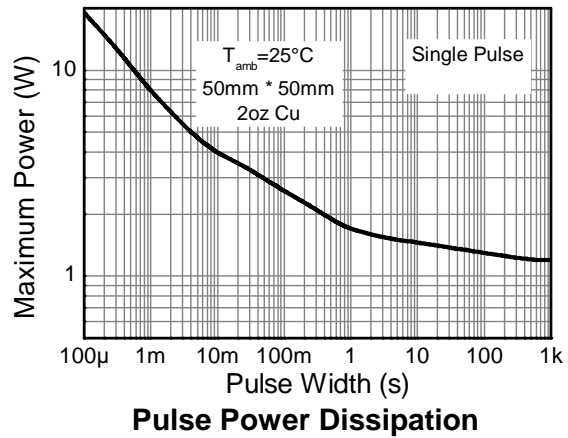
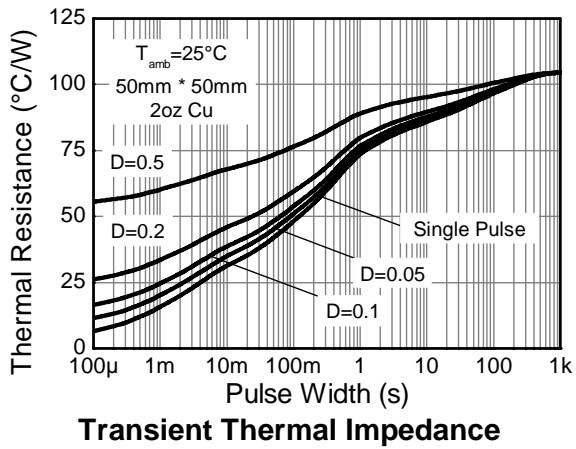
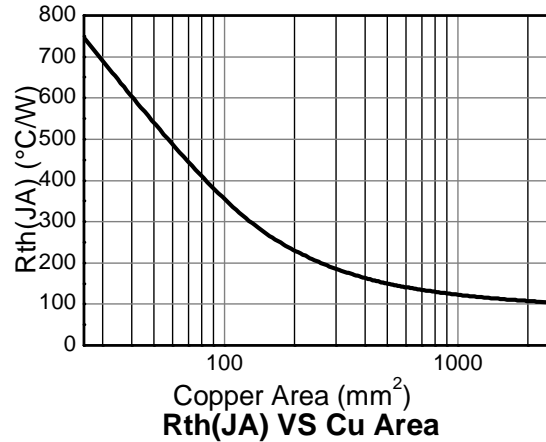
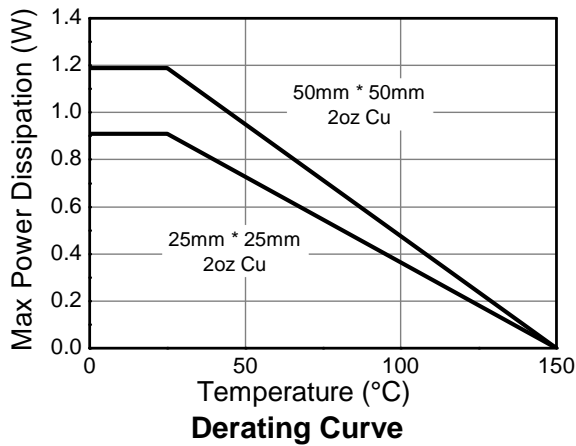
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	800	V	1B
Electrostatic Discharge – Machine Model	ESD MM	300	V	B

- Notes:
- For a device mounted with the OUT leads on 50mm x 50mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions while operating in steady-state.
  - Same as Note 5, except mounted on 15mm x 15mm 1oz copper.
  - R<sub>θJL</sub> = Thermal resistance from junction to solder-point (at the end of the OUT leads).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

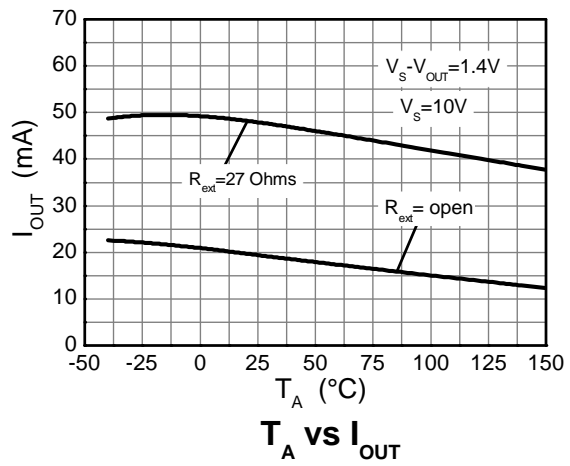
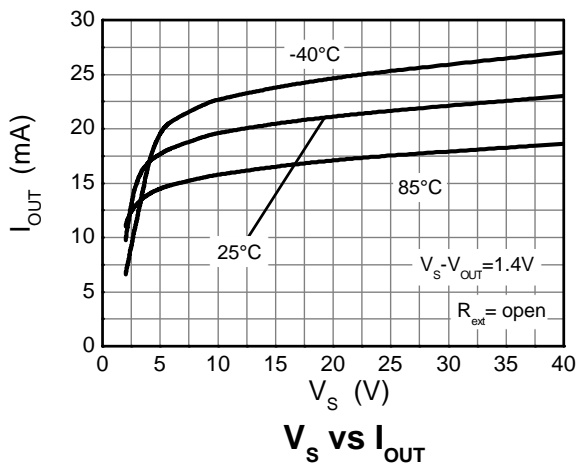
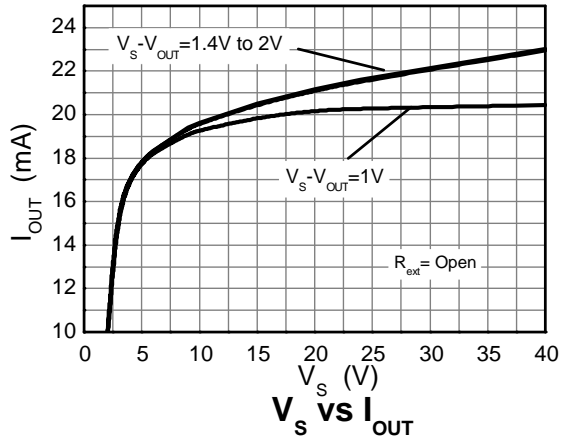
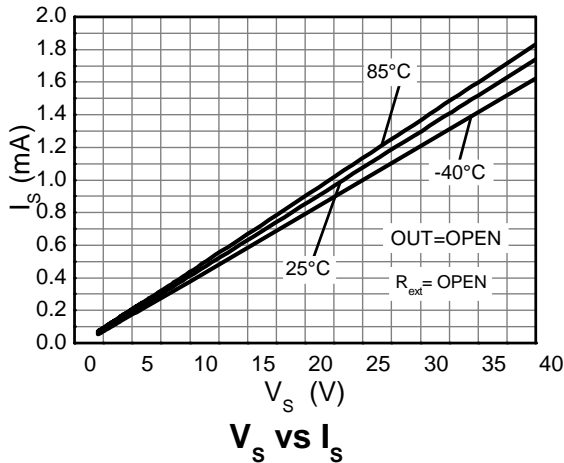
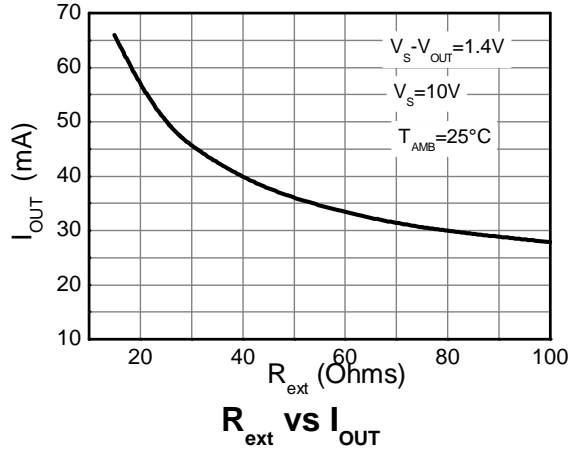
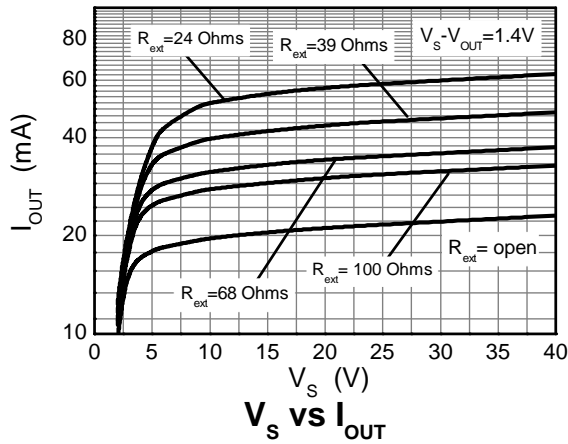
**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	40	-	-	V	I <sub>C</sub> = 1mA
GND (Enable) Current	I <sub>GND</sub>	340	420	500	μA	V <sub>S</sub> = 10V; V <sub>OUT</sub> = open
GND (Enable) Current	I <sub>GND</sub>	-	380	-	μA	V <sub>S</sub> = 10V; V <sub>OUT</sub> = 8.6V
DC Current Gain	h <sub>FE</sub>	100	220	470	-	I <sub>C</sub> = 50mA; V <sub>CE</sub> = 1V
Internal Resistor	R <sub>int</sub>	38	44	52	Ω	I <sub>Rint</sub> = 20mA
Output Current (nominal)	I <sub>OUT</sub>	18	20	22	mA	V <sub>OUT</sub> = 8.6V; V <sub>S</sub> = 10V
Voltage Drop (V <sub>Rext</sub> )	V <sub>drop</sub>	-	0.88	-	V	I <sub>OUT</sub> = 20mA
Lowest Sufficient Supply Voltage (V <sub>S</sub> -V <sub>OUT</sub> )	V <sub>Smin</sub>	-	1.4	-	V	I <sub>OUT</sub> > 18mA
Output Current Change vs. Temperature	ΔI <sub>OUT</sub> /I <sub>OUT</sub>	-	-0.25	-	%/°C	V <sub>S</sub> = 10V
Output Current Change vs. Supply Voltage	ΔI <sub>OUT</sub> /I <sub>OUT</sub>	-	1	-	%/V	V <sub>S</sub> = 10V

**Typical Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



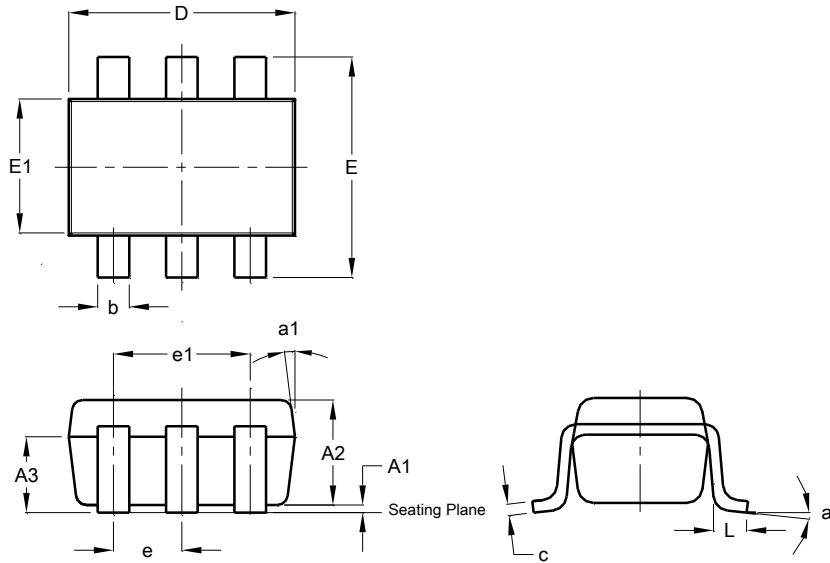
**Typical Electrical Characteristics** (continued) (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### SOT26 (SC74R)

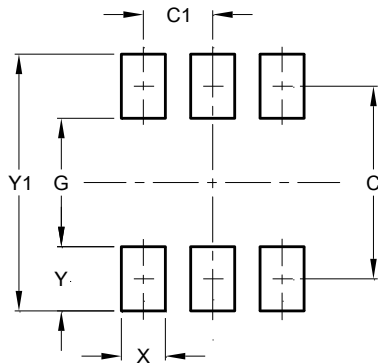


SOT26 (SC74R)			
Dim	Min	Max	Typ
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### SOT26 (SC74R)



Dimensions	Value (in mm)
C	2.40
C1	0.95
G	1.60
X	0.55
Y	0.80
Y1	3.20

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