

## Description

This linear LED driver is designed to meet the stringent requirements of automotive applications.

The BCR430U is a monolithically integrated linear LED controller designed to function as a Constant Current Regulator (CCR) for linear LED driving. The device operates over a voltage range from 5V to 42V and regulates the output LED current up to 100mA, set by an external resistor. It is designed for driving LEDs in strings and will reduce current at increasing temperatures to self-protect. The low voltage drop during current regulation allows efficient driving of LED strings with a range of forward voltages and supply voltage tolerances.

## Applications

- Automotive Lighting

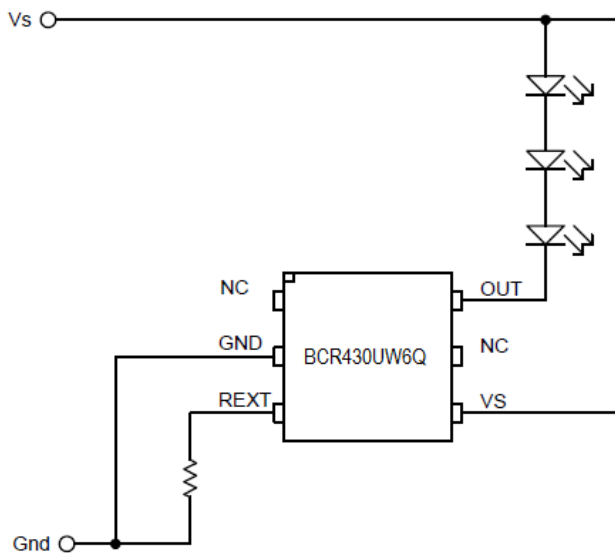
## Features

- LED Current Tolerance of  $\pm 5\%$  at 95mA Output Current
- Thermal Protection Reduces LED Current at Elevated Temperature
- Low Typical Saturation Voltage of 115mV at 50mA
- 5mA to 100mA Adjustable LED Current with an External Resistor
- 5V to 42V Supply Voltage
- High Power 1W Dissipation in SOT26
- No External Capacitor is Required for Stable Operation
- LED Dimming Using PWM
- Parallel Devices to Increase Regulated Current
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- The BCR430UW6Q is suitable for automotive applications requiring specific change control; this part is AEC-Q100 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

- Case: SOT26
- 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
- Weight: 0.018 grams (Approximate)



Typical Configuration



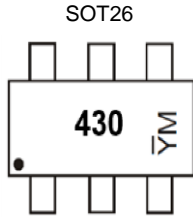
SOT26

## Ordering Information (Note 4)

Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
BCR430UW6Q-7	Automotive	430	7	8	3,000

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  - See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

**Marking Information**

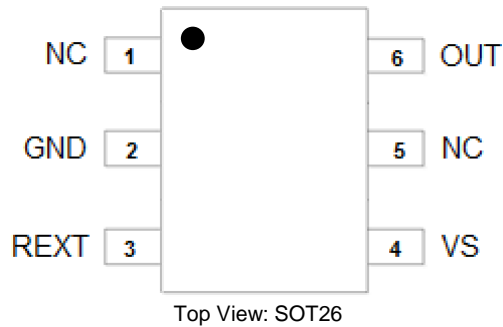


430 = Part Marking (See Ordering Information)  
 YM = Date Code Marking  
 Y = Year (ex: 1 = 2021)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Code	H	I	J	K	L	M	N	O	P	R	S	T
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

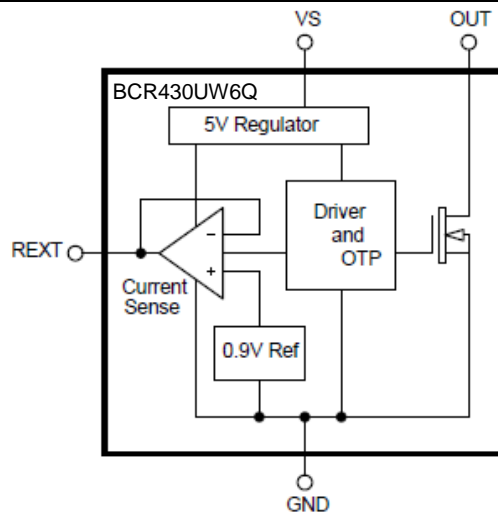
**Pinout Diagram**



**Pin Description**

Pin Number	Pin Name	Function
1	NC	Not Connected
2	GND	Power Ground
3	REXT	External Resistor for Adjusting Output Current
4	VS	Supply Voltage
5	NC	Not Connected
6	OUT	I <sub>OUT</sub> - Regulated Output Current

**Functional Block Diagram**



### Absolute Maximum Ratings (Voltage relative to GND, @ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Parameter	Symbol	Min	Max	Unit
Supply Voltage	$V_S$	-0.5	45	V
Output Current	$I_{OUT}$	0	100	mA
Output Voltage	$V_{OUT}$	-0.5	42	V
$R_{EXT}$ Current	$I_{REXT}$	0	0.3	mA
$R_{EXT}$ Voltage	$V_{REXT}$	-0.5	5	V

### Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	$V_S$	5	42	V
OUT Pin Voltage Range	$V_{OUT}$	0.5	40	V
Output Current (Note 6)	$I_{OUT}$	5	100	mA
Ambient Temperature Range (Notes 5 & 6)	$T_A$	-40	+125	$^\circ\text{C}$
Normal Operation Junction Temperature Range (Note 7)	$T_J$	-40	+125	$^\circ\text{C}$

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

Characteristic	Symbol	Value	Unit
Power Dissipation	(Note 7)	735	mW
	(Note 8)	793	
Thermal Resistance, Junction to Ambient	(Note 7)	136	$^\circ\text{C}/\text{W}$
	(Note 8)	126	
Thermal Resistance, Junction to Lead	(Note 9)	88.5	
Operating Junction Temperature	$T_J$	-40 to +125	$^\circ\text{C}$
Recommended Storage Temperature	$T_S$	-55 to +165	$^\circ\text{C}$

### ESD Ratings (Note 10)

Characteristics	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	HBM	2000	V	2
Charge Device Model	CDM	1000	V	C5

- Notes:
- Subject to the device junction temperature not exceeding the onset point of Over Temperature Protection (OTP) operation. The OTP operation typically starts at  $+125^\circ\text{C}$ , but can start as low as  $+100^\circ\text{C}$  or as high as  $+140^\circ\text{C}$ .
  - A typical device will operate at its defined output current (set by  $R_{EXT}$ ) up to a junction temperature of  $+125^\circ\text{C}$ . However, if the combination of power dissipation and ambient temperature drives  $T_J$  above  $+125^\circ$ , the output current will be reduced linearly with temperature, reaching zero output current at  $+150^\circ\text{C}$ .
  - For a device mounted on MRP FR4-PCB; device is measured under still air conditions whilst operating in a steady-state.
  - Same as Note 7, except the device is mounted on  $25\text{mm} \times 25\text{mm}$  2oz copper.
  - $R_{\theta JL}$  = Thermal resistance from junction to solder-point (at the end of the OUT leads).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

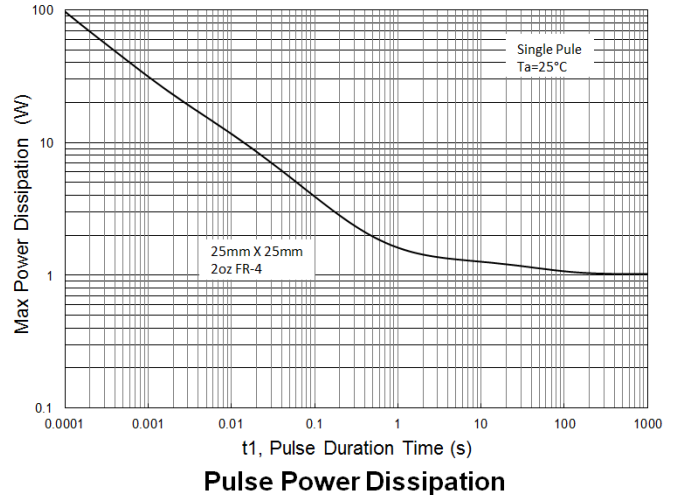
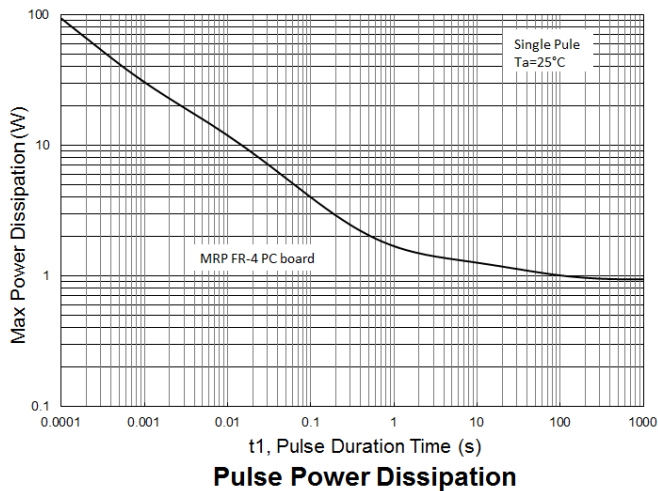
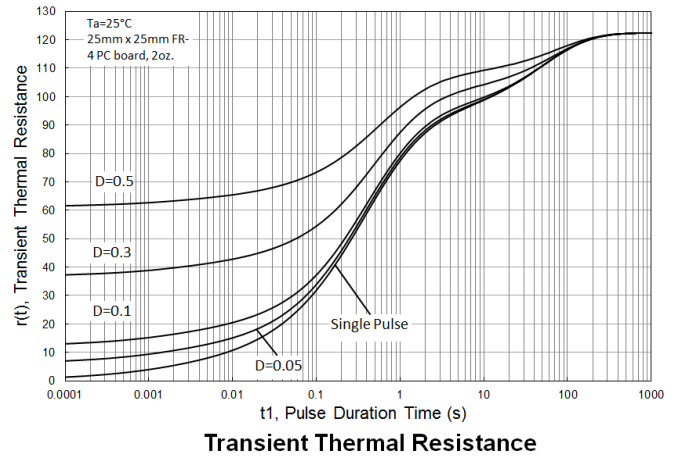
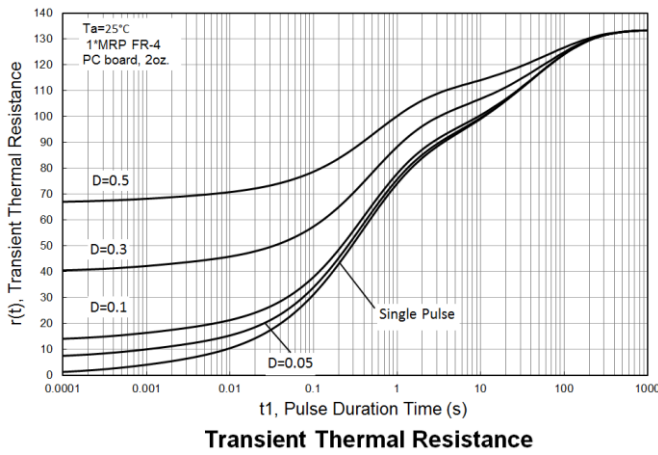
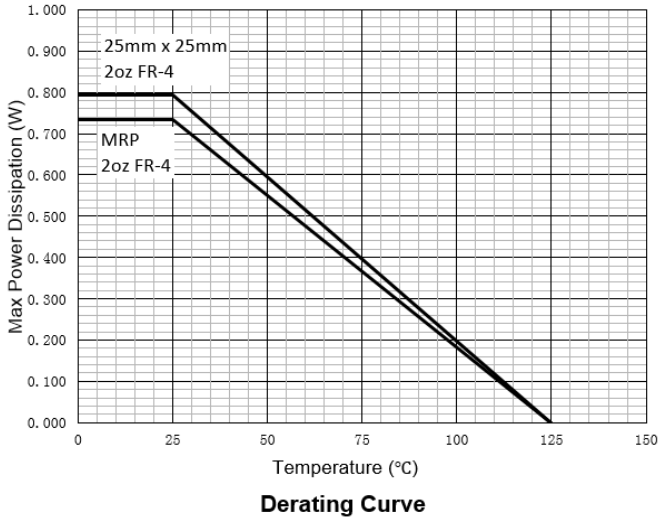
**Electrical Characteristics** (@ T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Voltage	V <sub>S</sub>	5	—	42	V	—
Supply Current (Note 11)	I <sub>S</sub>	180	261	400	μA	I <sub>OUT</sub> = 50mA, V <sub>S</sub> = 5V
		—	285	500	μA	I <sub>OUT</sub> = 50mA, V <sub>S</sub> = 42V
Quiescent Current	I <sub>Q</sub>	40	67	100	μA	V <sub>S</sub> = 42V; R <sub>EXT</sub> = open
Output Current Range	I <sub>OUT</sub>	5	—	100	mA	—
Output Current, Set by R <sub>EXT</sub> (Note 11)	I <sub>OUT</sub>	18	20.8	22.7	mA	R <sub>EXT</sub> = 30kΩ
		45.7	49.1	52.3	mA	R <sub>EXT</sub> = 12.7kΩ
		90	95.3	100	mA	R <sub>EXT</sub> = 6.49kΩ
Driver Voltage Drop (Note 11)	V <sub>OUT-MIN</sub>	50	115	200	mV	I <sub>OUT</sub> = 50mA
		0.880	0.903	0.960	V	R <sub>EXT</sub> = 300kΩ
R <sub>EXT</sub> Pin Voltage (Note 11)	V <sub>R<sub>EXT</sub></sub>	0.875	0.892	0.955	V	R <sub>EXT</sub> = 6.49kΩ
		—	+125	—	°C	—
Thermal Knee Junction Temperature (Note 12)	T <sub>K</sub>	—	+125	—	°C	—
Output Current Change vs. Temperature	(ΔI <sub>OUT</sub> /I <sub>OUT</sub> ) / ΔT <sub>J</sub>	—	0.0032	—	%/°C	T <sub>J</sub> > -40°C; T <sub>J</sub> = +120°C; I <sub>OUT</sub> = 50mA
Output Current Change vs. Supply Voltage or Output Voltage	(ΔI <sub>OUT</sub> /I <sub>OUT</sub> ) / ΔV	—	0.0055	—	%/V	I <sub>OUT</sub> = 50mA; 5V < V <sub>S</sub> < 42V or 1V < V <sub>OUT</sub> < 40V

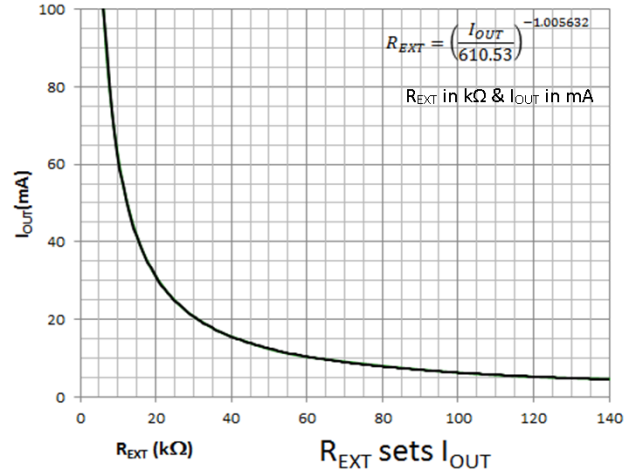
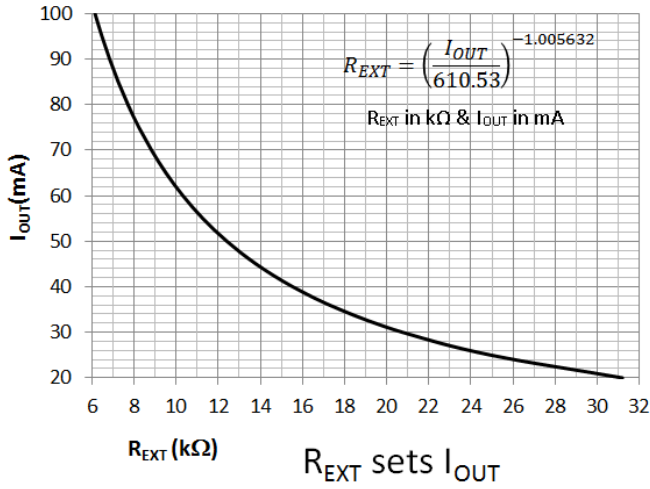
Notes: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

12. Thermal Knee Junction Temperature is defined as the asymptotic intersection of the +25°C temperature I<sub>OUT</sub> current and the I<sub>OUT</sub> current in over-temperature protection mode.

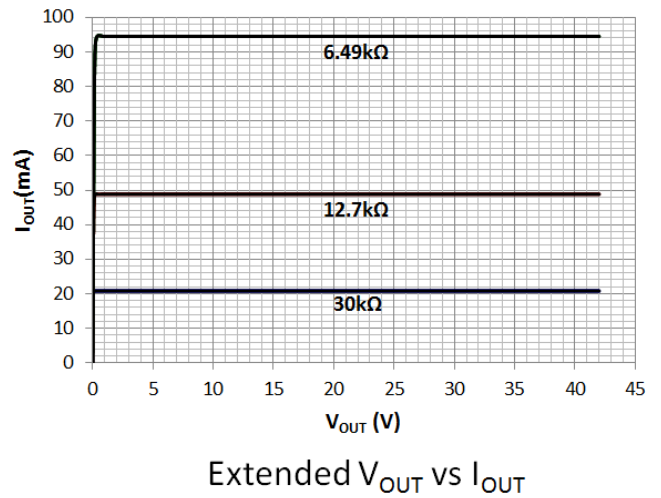
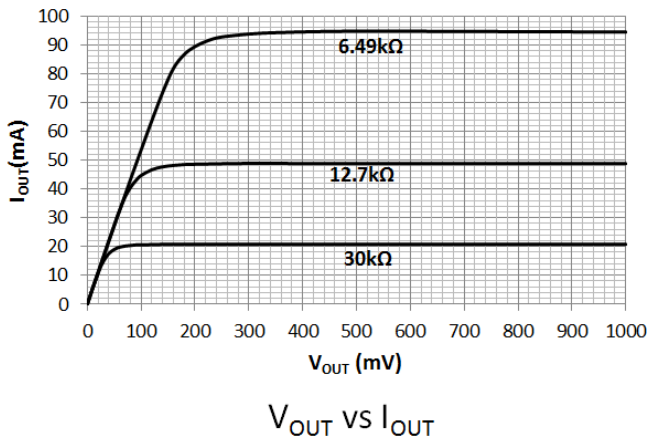
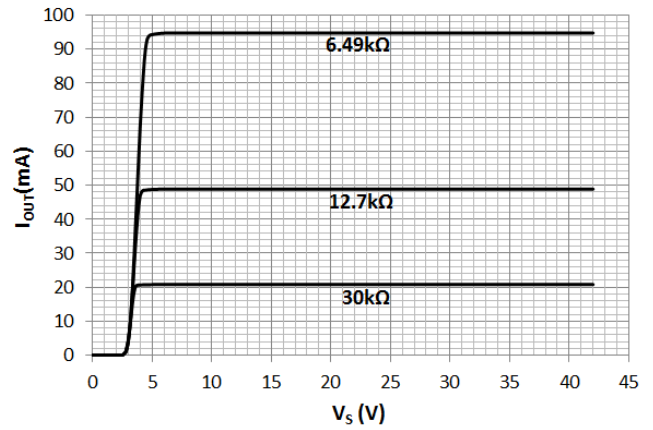
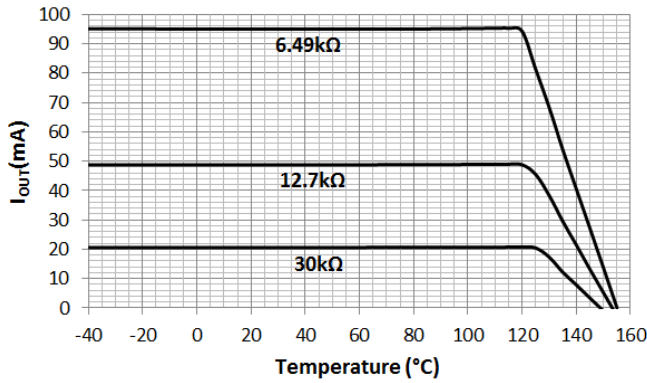
**Typical Thermal Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



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

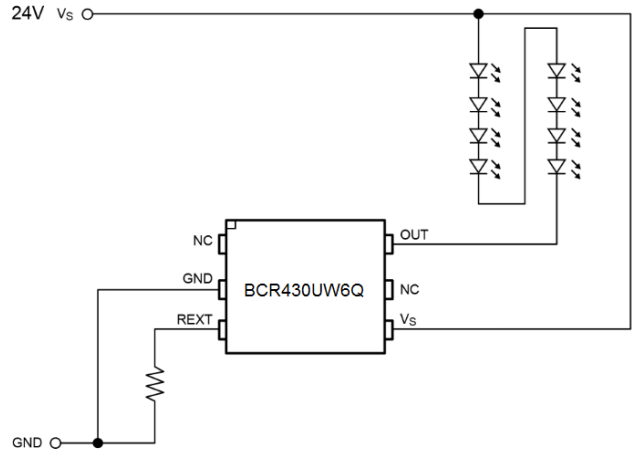


The LED current is set according to the resistor value which is connected to the REXT pin.



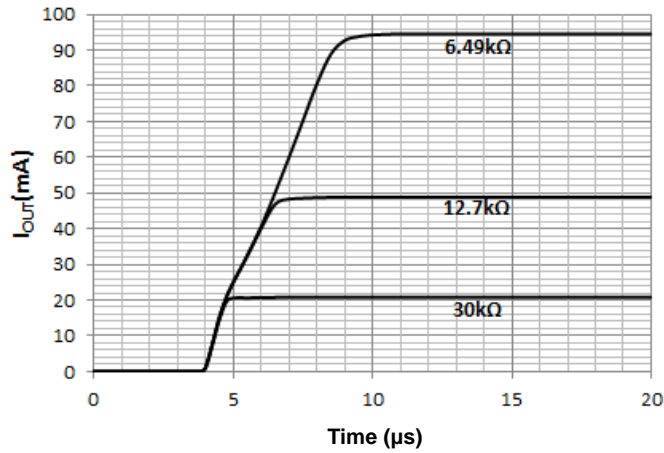
**Application Information**

**Typical Application Circuit**

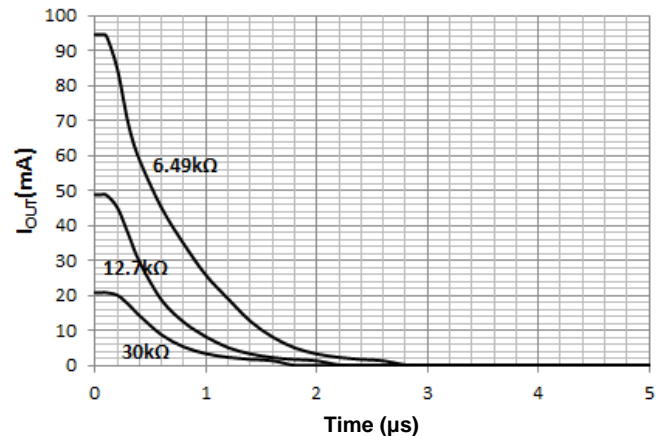


No external capacitor is required for stable operation. Suitable for dimming with VS or REXT pin modulation.

**Switching / Timing Information** (@ $V_S = 10V$ ,  $V_{OUT} = 1V$ , 1kHz, 50% Mark-Space ratio,  $R_{EXT}$  modulation.)



For  $R_{EXT} = 6.49k\Omega$ ,  $t_R = 14\mu s$  at  $-40^\circ C$ ,  $9\mu s$  at  $+25^\circ C$  and  $7\mu s$  at  $+110^\circ C$ .  
Rise time does not change significantly with LED loads (delay increases by less than  $2\mu s$ ).

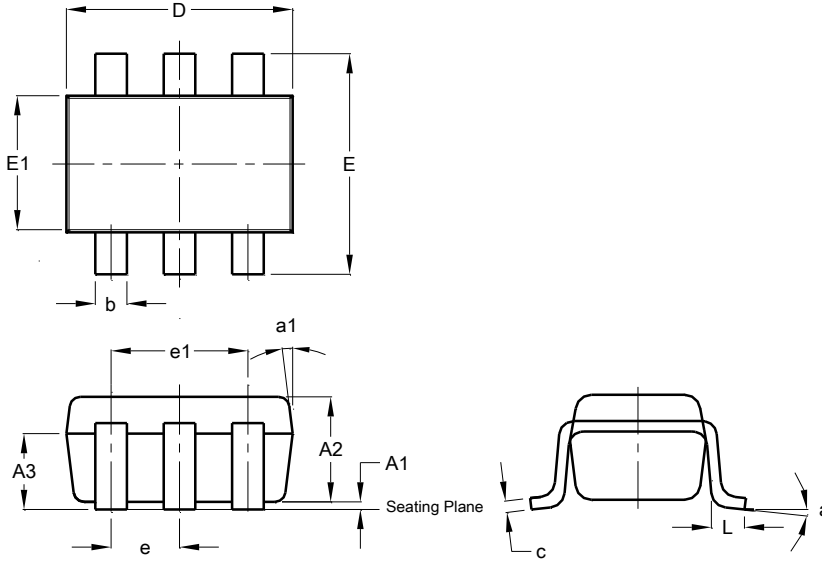


Fall time is independent of temperature.  
Fall time does not change significantly with LED loads.

**Package Outline Dimensions**

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

**SOT26**

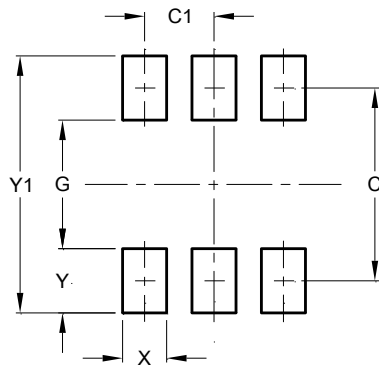


SOT26			
Dim	Min	Max	Typ
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

**Suggested Pad Layout**

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

**SOT26**



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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