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## 90V 20 mA Simple Temperature-Compensated Constant-Current LED Driver IC

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### Features

- 5V-to-90V Operating Range ( $V_{A-B}$ )
- 20 mA  $\pm 5\%$  at 45V ( $V_{A-B}$ )
- $-8.5 \mu A/^{\circ}C$  Typical Temperature Coefficient
- No External Components (Two-Terminal Device)
- Can be Paralleled for Higher Current

### Applications

- LED Driver
- Industrial Lamp Indicators
- Signage
- Accent Lighting
- Automotive
- Constant-Current Source
- Constant-Current Sink

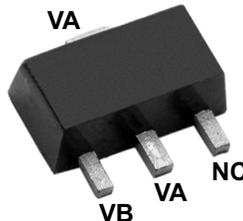
### General Description

The CL1 is a high-voltage temperature-compensated, constant-current source. The device is trimmed to provide a constant current of 20 mA  $\pm 5\%$  at an input voltage of 45V. No external components are required. This device can be used as a two-terminal constant-current source or constant-current sink.

A typical application for the CL1 is to drive LEDs with a constant current of 20 mA. Multiple CL1s can also be used in parallel to provide higher currents, such as 40 mA, 60 mA and 80 mA. The device is available in SOT-89 packages.

### Package Type

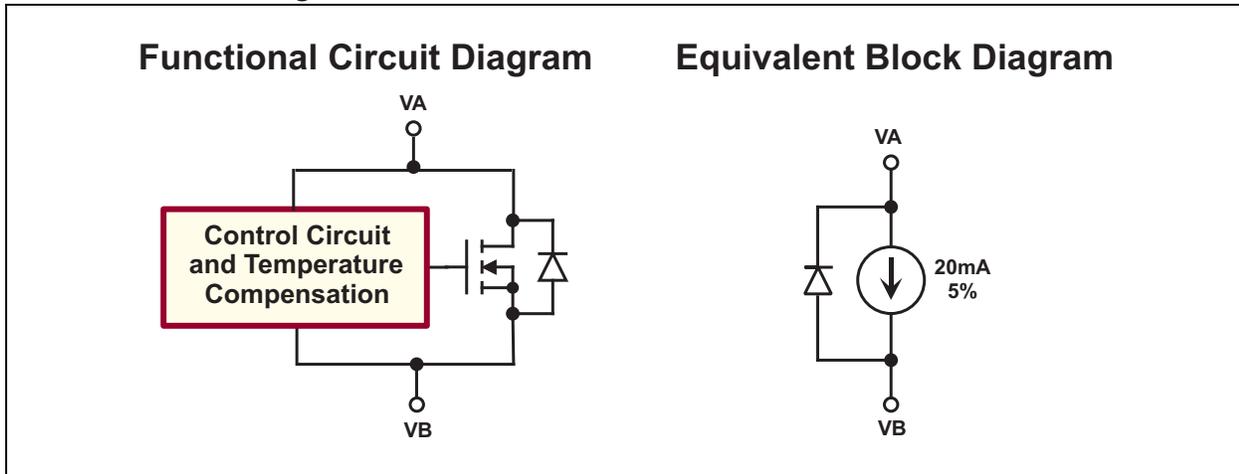
**3-lead SOT-89**  
(Top view)



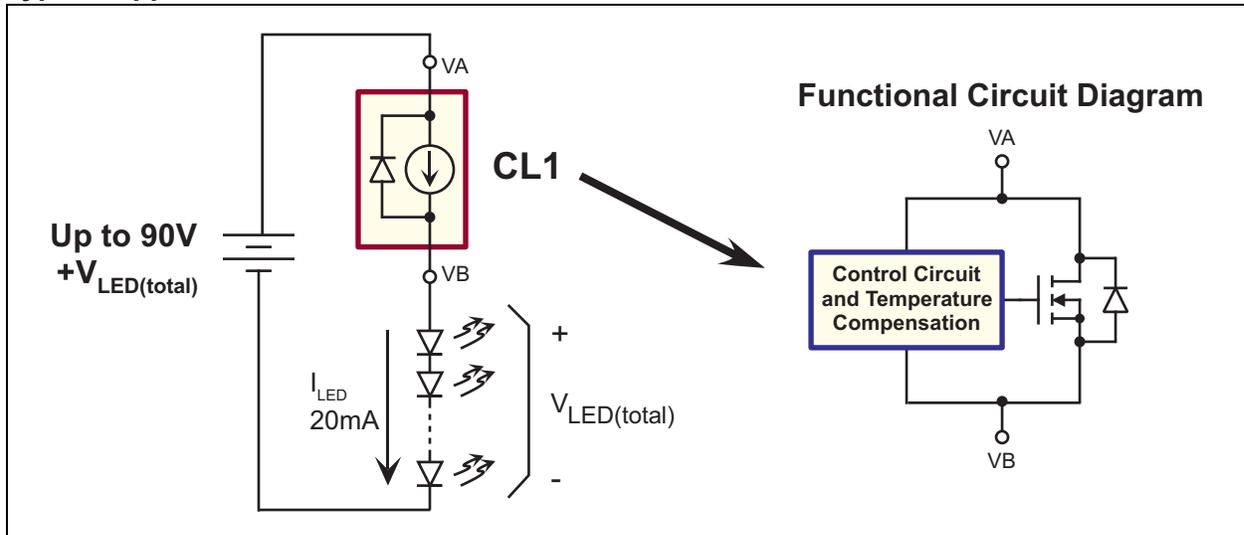
See [Table 2-1](#) for pin information.

# CL1

## Functional Block Diagram



## Typical Application Circuit



# CL1

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings†

Operating Voltage, $V_{A-B}$ .....	+100V
Junction Temperature, $T_J$ .....	-40°C to +135°C
Storage Temperature, $T_S$ .....	-55°C to +150°C
Power Dissipation (at $T_A = 25^\circ\text{C}$ ).....	1.3W

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

### DC ELECTRICAL CHARACTERISTICS

**Electrical Specifications:**  $T_A = 25^\circ\text{C}$  unless otherwise specified.

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Maximum Operating Voltage	$V_{A-B}$	—	—	90	V	
Current Regulation	$I_{A-B}$	17.1	18	18.9	mA	$V_{A-B} = 5\text{V}$
		19	20	21	mA	$V_{A-B} = 45\text{V}$
		19	22	24.2	mA	$V_{A-B} = 90\text{V}$
$I_{A-B}$ Temperature Coefficient	$\Delta I_{A-B}/\Delta T$	—	-8.5	—	$\mu\text{A}/^\circ\text{C}$	$V_{A-B} = 45\text{V}$ , $T_J = 0^\circ\text{C}$ to $100^\circ\text{C}$
Operating Junction Temperature	$T_J$	-40	—	125	$^\circ\text{C}$	
Dynamic Resistance	$R_{A-B}$	—	17	—	k $\Omega$	$V_{A-B} = 5\text{V}$ to $90\text{V}$

### TEMPERATURE SPECIFICATIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
<b>TEMPERATURE RANGE</b>						
Operating Junction Temperature	$T_J$	-40	—	+125	$^\circ\text{C}$	
Maximum Junction Temperature	$T_{J(\text{ABSMAX})}$	—	—	+135	$^\circ\text{C}$	
Storage Temperature	$T_S$	-55	—	+150	$^\circ\text{C}$	
<b>PACKAGE THERMAL RESISTANCE</b>						
3-lead SOT-89	$\theta_{JA}$	—	133	—	$^\circ\text{C}/\text{W}$	<a href="#">Note 1</a>

**Note 1:** Mounted on FR4 board; 25 mm x 25 mm x 1.57 mm

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## 2.0 PIN DESCRIPTION

The details on the pins of CL1 are listed in [Table 2-1](#). Refer to [Package Type](#) for the location of pins.

**TABLE 2-1: PIN FUNCTION TABLE**

Pin Number	Pin Name	Description
1	VB	Constant-current source
2	VA	Supply voltage and constant-current sink
3	NC	No connection
4	VA	Supply voltage and constant-current sink

# CL1

## 3.0 APPLICATION INFORMATION

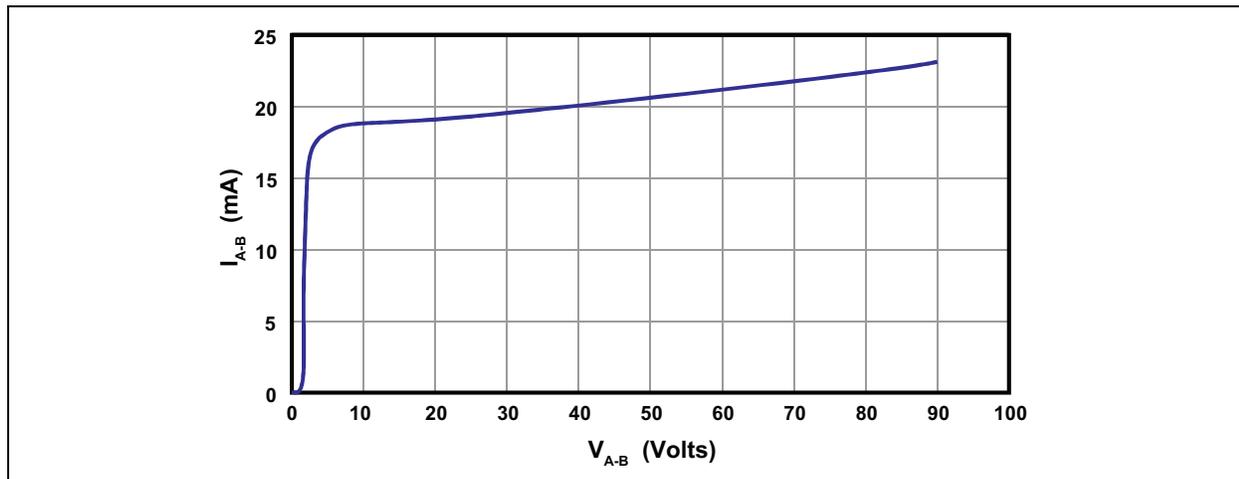


FIGURE 3-1: Output Current vs. Voltage.

## 3.1 Application Circuits

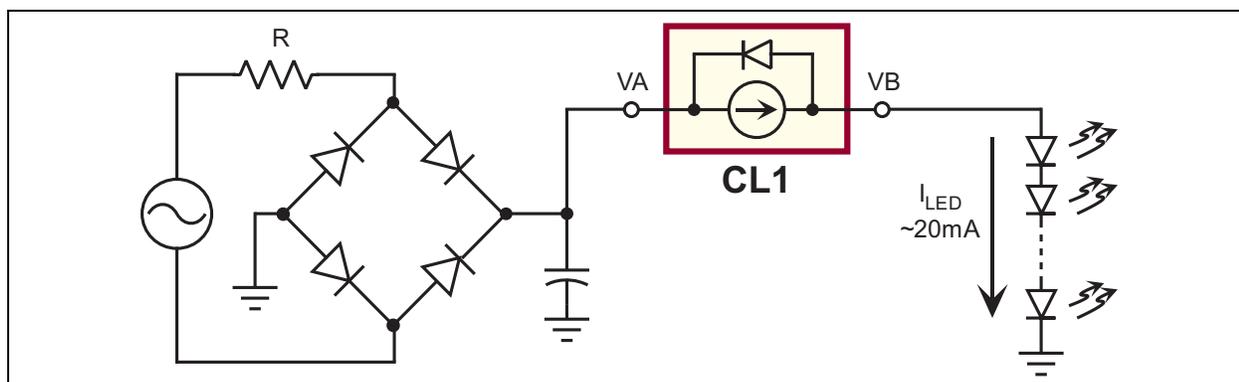
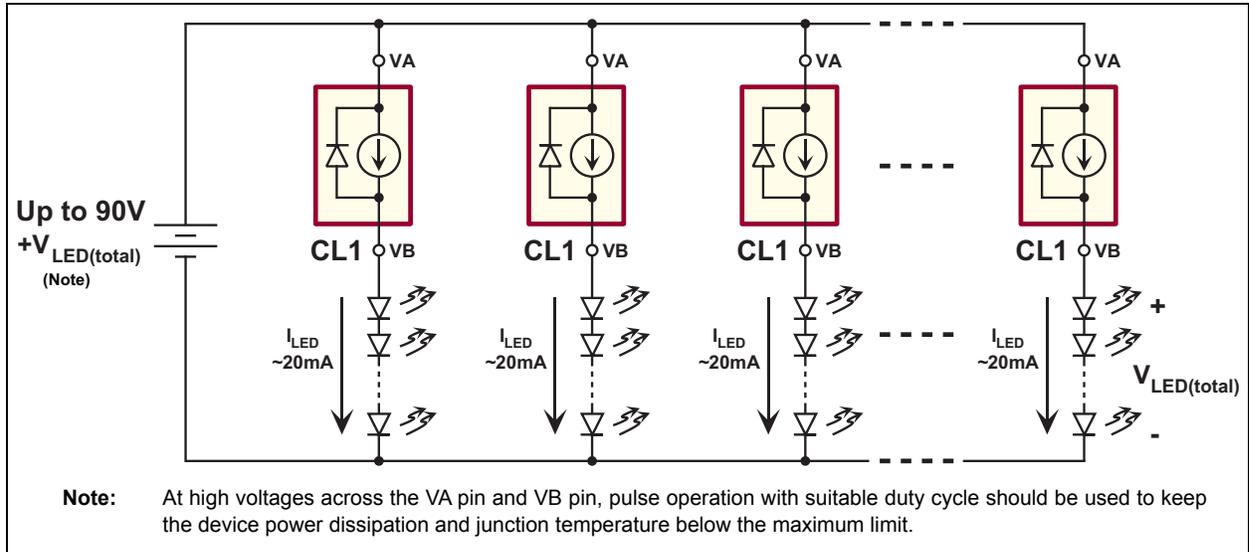
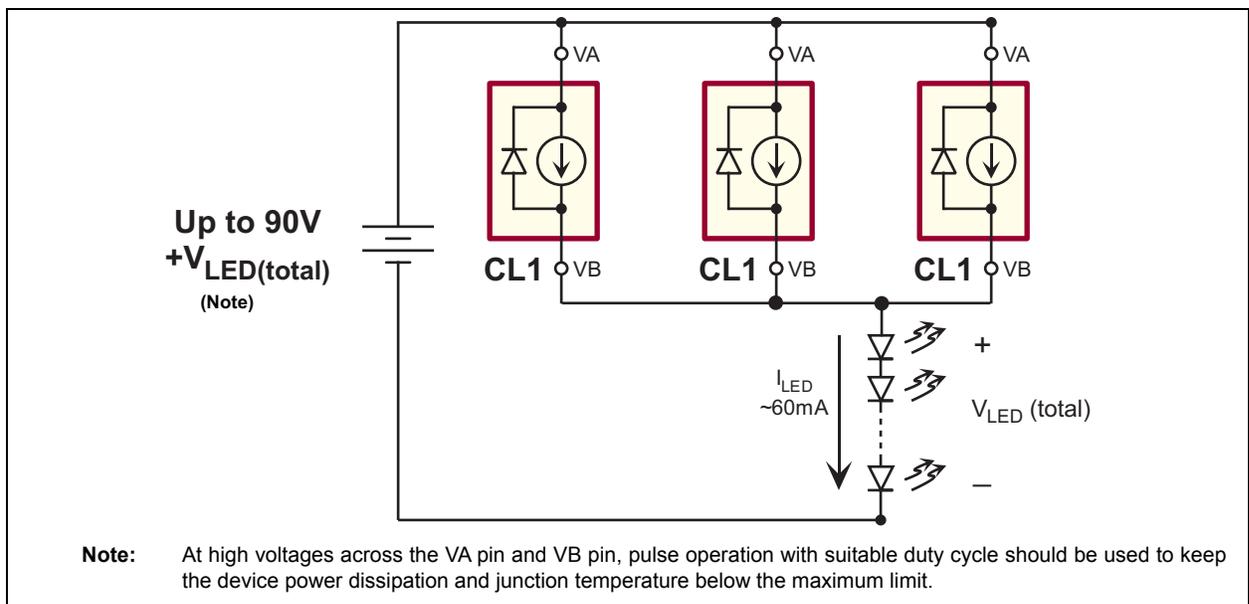


FIGURE 3-2: CL1 for 120V Offline LED Driver.



**FIGURE 3-3:** CL1 for Multiple LED Strings.



**FIGURE 3-4:** Higher Current with Multiple CL1 Devices.

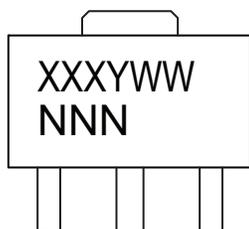
# CL1

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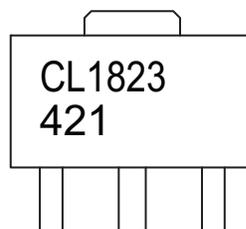
## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information

3-lead SOT-89

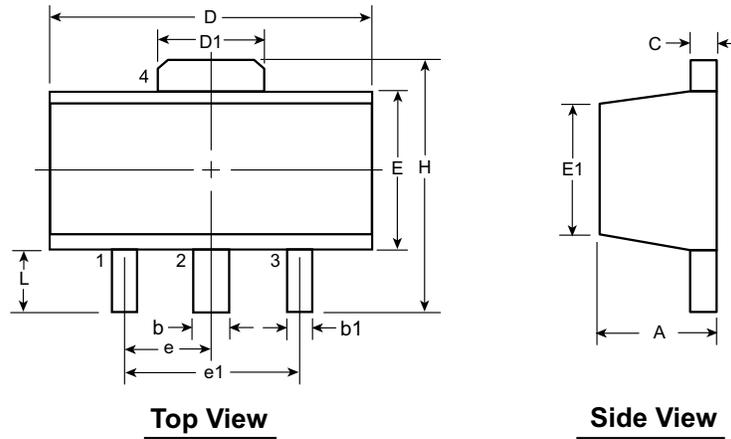


Example



<b>Legend:</b>	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC <sup>®</sup> designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.
<b>Note:</b>	In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for product code or customer-specific information. Package may or not include the corporate logo.	

## 3-Lead TO-243AA (SOT-89) Package Outline (N8)



Note: For the most current package drawings, see the Microchip Packaging Specification at [www.microchip.com/packaging](http://www.microchip.com/packaging).

Symbol	A	b	b1	C	D	D1	E	E1	e	e1	H	L		
Dimensions (mm)	MIN	1.40	0.44	0.36	0.35	4.40	1.62	2.29	2.00†	1.50 BSC	3.00 BSC	3.94	0.73†	
	NOM	-	-	-	-	-	-	-	-			-	-	-
	MAX	1.60	0.56	0.48	0.44	4.60	1.83	2.60	2.29			4.25	1.20	

JEDEC Registration TO-243, Variation AA, Issue C, July 1986.

† This dimension differs from the JEDEC drawing

Drawings not to scale.

# CL1

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NOTES:

## **APPENDIX A: REVISION HISTORY**

### **Revision A (December 2018)**

- Converted Supertex Doc# DSFP-CL1 to Microchip DS20006072A
- Removed the 3-lead TO-252 K4 and 3-lead TO-92 N3 packages
- Changed the package marking format
- Added new sections to comply with the standard Microchip format
- Made minor text changes throughout the document

# CL1

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<u>PART NO.</u>	<u>XX</u>	-	<u>X</u>	-	<u>X</u>
Device	Package Options		Environmental		Media Type
Device:	CL1	=	90V 20 mA Simple Temperature-Compensated Constant-Current LED Driver IC		
Package:	N8	=	3-lead SOT-89		
Environmental:	G	=	Lead (Pb)-free/RoHS-compliant Package		
Media Type:	(blank)	=	2000/Reel for an SOT-89 Package		

**Example:**

a) CL1N8-G: 90V 20 mA Simple Temperature-Compensated Constant-Current LED Driver IC, 3-lead SOT-89 Package, 2000/Reel

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