CL1

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

Features

- 5V-to-90V Operating Range ($V_{A–B}$)
- 20 mA ±5% at 45V ($V_{A–B}$)
- –8.5 µA/°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

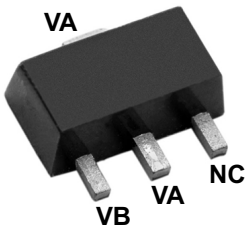
General Description

The CL1 is a high-voltage temperature-compensated, constant-current source. The device is trimmed to provide a constant current of 20 mA ±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.

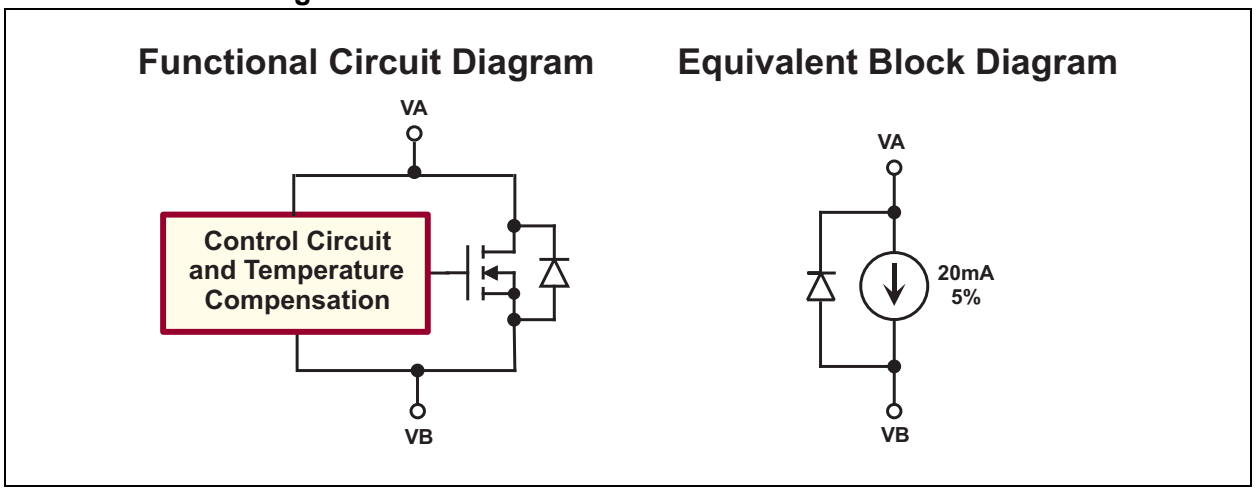
Package Type

3-lead SOT-89
(Top view)

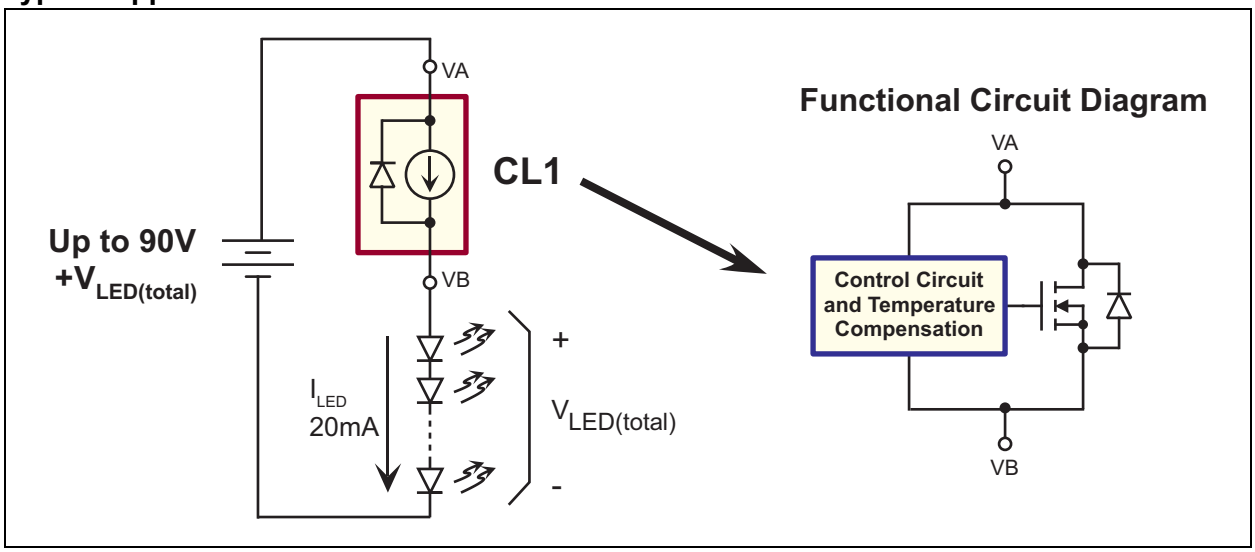


See Table 2-1 for pin information.

Functional Block Diagram



Typical Application Circuit



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°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°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	$V_{A–B}$ = 5V
		19	20	21	mA	$V_{A–B}$ = 45V
		19	22	24.2	mA	$V_{A–B}$ = 90V
$I_{A–B}$ Temperature Coefficient	$\Delta I_{A–B}/\Delta T$	—	–8.5	—	µA/°C	$V_{A–B}$ = 45V, T_J = 0°C to 100°C
Operating Junction Temperature	T_J	–40	—	125	°C	
Dynamic Resistance	$R_{A–B}$	—	17	—	kΩ	$V_{A–B}$ = 5V to 90V

TEMPERATURE SPECIFICATIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
TEMPERATURE RANGE						
Operating Junction Temperature	T_J	–40	—	+125	°C	
Maximum Junction Temperature	$T_{J(ABSMAX)}$	—	—	+135	°C	
Storage Temperature	T_S	–55	—	+150	°C	
PACKAGE THERMAL RESISTANCE						
3-lead SOT-89	θ_{JA}	—	133	—	°C/W	**Note 1**

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

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

3.0 APPLICATION INFORMATION

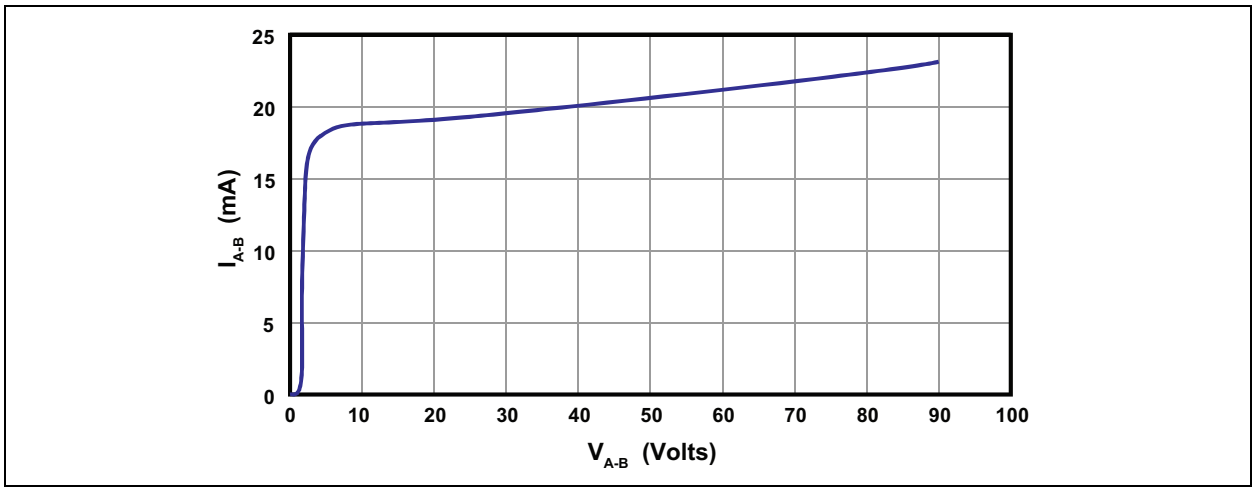


FIGURE 3-1: *Output Current vs. Voltage.*

3.1 Application Circuits

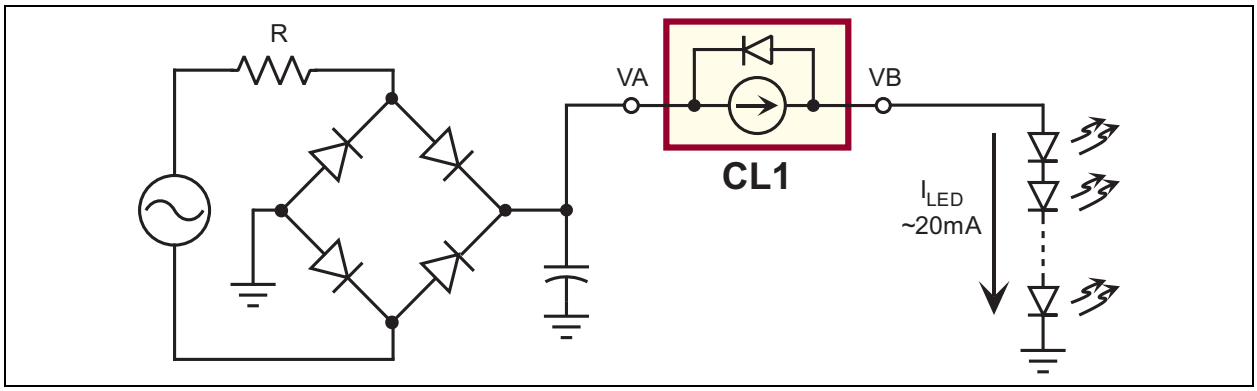
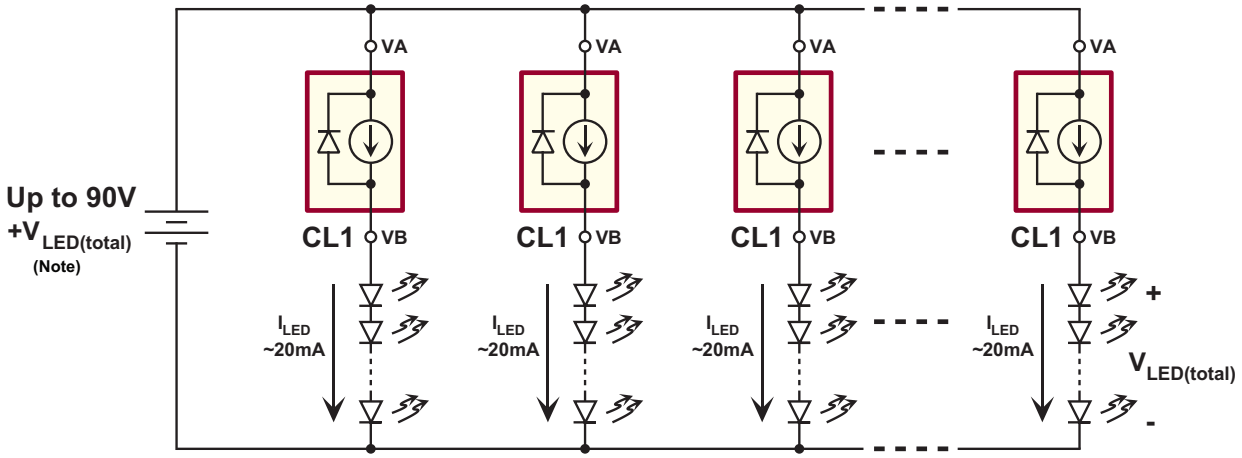
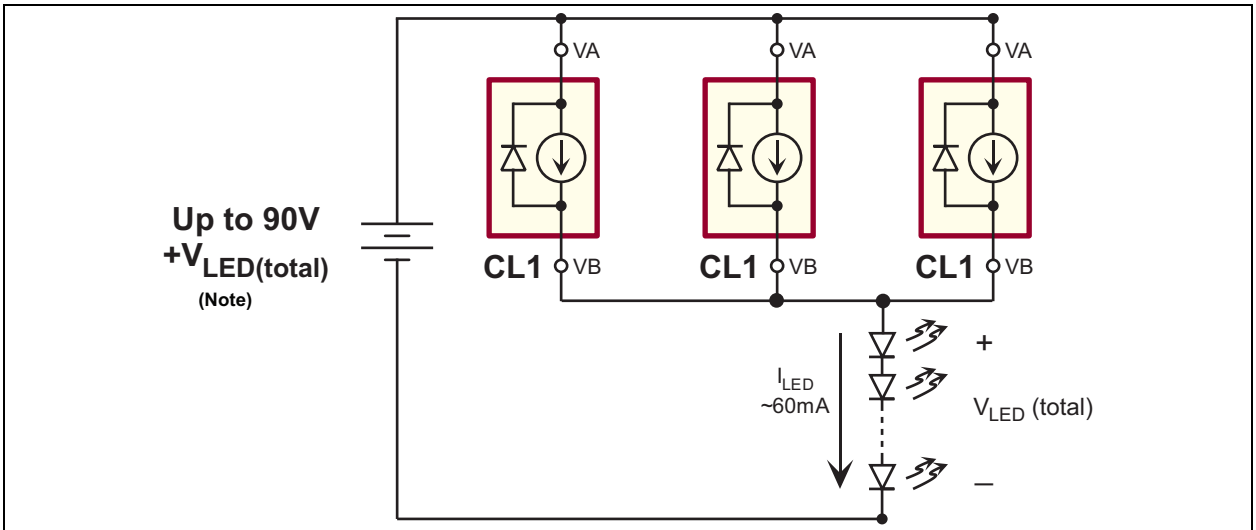


FIGURE 3-2: *CL1 for 120V Offline LED Driver.*



Note: At high voltages across the VA pin and VB pin, pulse operation with suitable duty cycle should be used to keep the device power dissipation and junction temperature below the maximum limit.

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



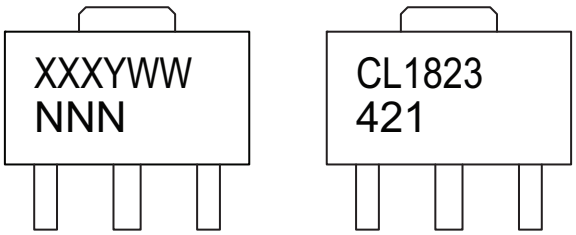
Note: At high voltages across the VA pin and VB pin, pulse operation with suitable duty cycle should be used to keep the device power dissipation and junction temperature below the maximum limit.

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

4.0 PACKAGING INFORMATION

4.1 Package Marking Information

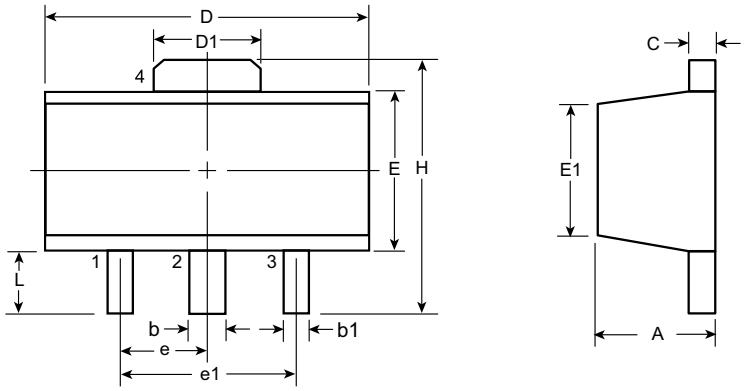
3-lead SOT-89 Example



Legend:	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® 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.

Note: 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)



Top View **Side View**

Note: For the most current package drawings, see the Microchip Packaging Specification at 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.

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

PRODUCT IDENTIFICATION SYSTEM

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

PART NO.	XX	-	X	-	X
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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