CL7

100 mA Constant-Current Linear LED Driver with Enable Input

Features

- 100 mA ±5% Constant-current Driver
- Built-in Reverse Polarity Protection
- Logic-level Enable
- Dimmable via $\overline{EN}$ Pin
- Overtemperature Protection
- 90V Maximum Rating for Transient Immunity

Applications

- Flashlights
- Specialty Lighting
- Low-voltage Signage
- Low-voltage Lighting

General Description

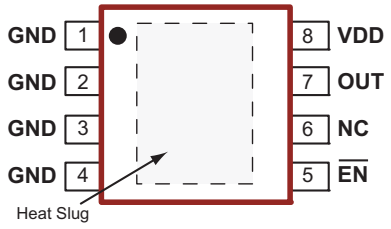
The CL7 is a fixed-current linear regulator designed for driving high-brightness LEDs at 100 mA from nominal 12V, 24V and 48V power supplies. With a maximum rating of 90V, it is able to withstand transients without the need for additional transient protection circuitry. The CL7 is offered in the 8-lead SOIC (with heat slug) package.

An active-low enable input ($\overline{EN}$) allows logic-level control of the LED for on/off control or PWM dimming. The enable input has 100 kΩ pull-down resistance. For applications not needing an enable input, refer to the CL6 data sheet.

Overtemperature protection circuitry shuts down all three channels when the nominal die temperature reaches 135°C. Normal operation resumes when the die temperature falls below 105 °C.

Package Type

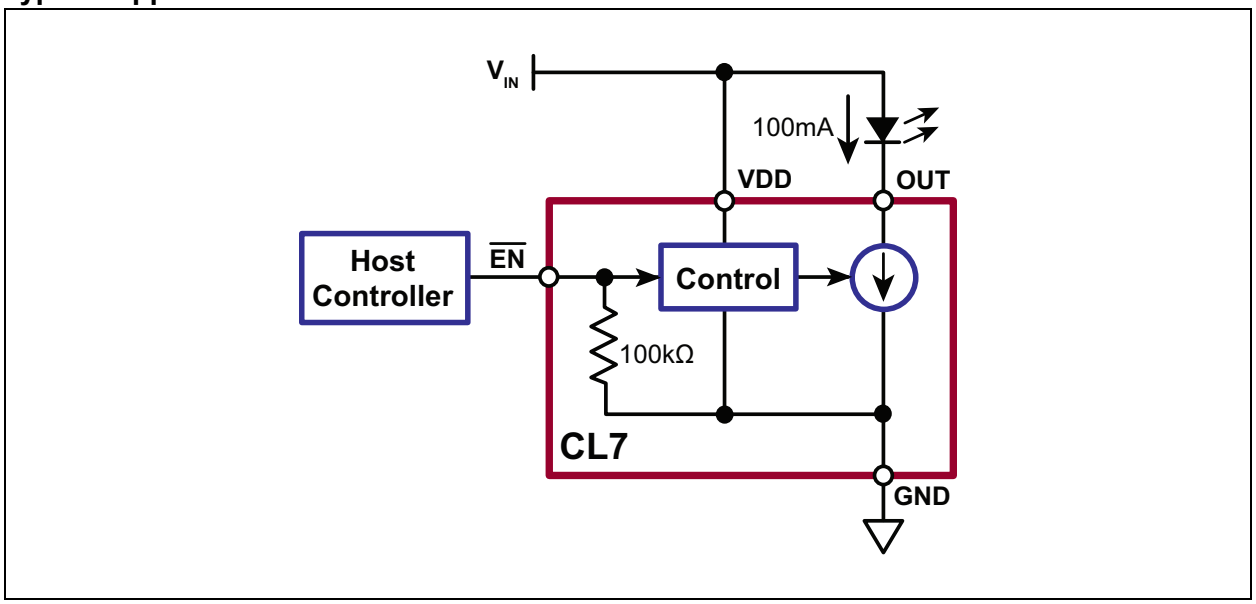
8-lead SOIC
(with Heat Slug)
(Top view)



See Table 2-1 for pin information.

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Typical Application Circuit



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1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Supply Voltage, V_{DD} ..... –25V to +100V
Output Voltage, V_{OUT} ..... –25V to +100V
Enable Voltage, V_{EN} ..... –0.5V to +6.5V
Minimum Operating Junction Temperature, T_J (**Note 1**) ..... –40°C
Storage Temperature, T_S ..... –65°C to +150°C

† 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.

Note 1: Maximum junction temperature internally limited

RECOMMENDED OPERATING CONDITIONS

Electrical Specifications: All voltages with respect to GND pin

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	V_{DD}	6.5	—	28	V	Normal
				90		Extended
Voltage at OUT Pin	V_{OUT}	4	—	28	V	Normal (**Note 1**)
				90		Extended (**Note 1**)
Junction temperature	T_J	–40	—	119	°C	**Note 2**

Note 1: Continuous operation at high V_{OUT} voltages may result in activation of overtemperature protection. Use appropriate heat sinking.
2: Maximum junction temperature internally limited

ELECTRICAL CHARACTERISTICS

Electrical Specifications: Over normal recommended operating conditions unless otherwise specified. All voltages with respect to GND pin.

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Current into V_{DD} Pin	I_{DD}	3	5	10	mA	
Current into OUT Pin1	I_{OUT}	95	100	105	mA	Normal conditions, 25°C (**Note 1**)
		90	100	110		Normal conditions, full temperature (**Note 3**)
		50	—	120		Extended conditions (See **Recommended Operating Conditions.**)
Current into $\overline{OUT}$ Pin with V_{DD} Pin Open or $\overline{EN}$ = 1	$I_{OUT(OFF)}$	—	—	10	µA	V_{DD} = open
Enable Voltage, On	$V_{EN(ON)}$	—	—	0.8	V	
Enable Voltage, Off	$V_{EN(OFF)}$	2.4	—	—	V	
Enable Pull-down Resistance	R_{EN}	—	100	—	kΩ	

Note 1: Continuous operation at high V_{OUT} voltages may result in activation of overtemperature protection. Use appropriate heat sinking.
2: Maximum junction temperature internally limited
3: Limits obtained by characterization and not 100% tested in production.
4: For design guidance only

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ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Specifications: Over normal recommended operating conditions unless otherwise specified. All voltages with respect to GND pin.

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Voltage at V_{DD} to Shut off LED Current	V_{OFF}	—	—	1	V	I_{OUT} < 10 µA
On Delay, $\overline{EN}$ to OUT	t_{ON}	—	3	—	µs	$\overline{EN}$ = 0V (**Note 4**)
Off Delay, $\overline{EN}$ to OUT	t_{OFF}	—	0.1	—	µs	$\overline{EN}$ = 5V (**Note 4**)
Current Rise Time, $\overline{EN}$ to OUT	t_{RISE}	—	4	—	µs	$\overline{EN}$ = 0V (**Note 4**)
Current Fall Time, $\overline{EN}$ to OUT	t_{FALL}	—	0.3	—	µs	$\overline{EN}$ = 5V (**Note 4**)

Note 1: Continuous operation at high V_{OUT} voltages may result in activation of overtemperature protection. Use appropriate heat sinking.

2: Maximum junction temperature internally limited

3: Limits obtained by characterization and not 100% tested in production.

4: For design guidance only

TEMPERATURE SPECIFICATIONS

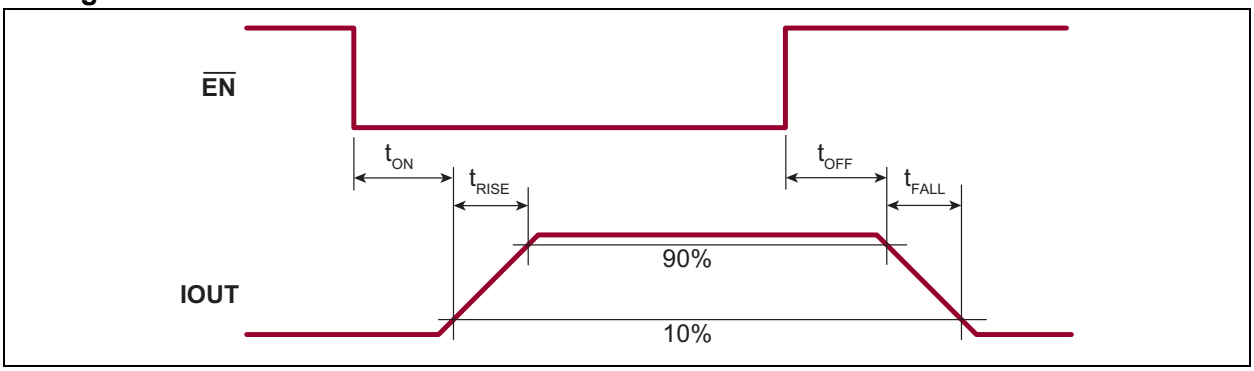
Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
TEMPERATURE RANGE						
Operating Junction Temperature	T_J	–40	—	—	°C	
Storage Temperature	T_S	–65	—	+150	°C	
Overtemperature Limit	T_{LIM}	120	135	150	°C	**Note 1**
Overtemperature Hysteresis	T_{HYS}	—	30	—	°C	**Note 1**
PACKAGE THERMAL RESISTANCE						
8-lead SOIC (with Heat Slug)	θ_{JA}	—	84	—	°C/W	**Note 2**

Note 1: For design guidance only

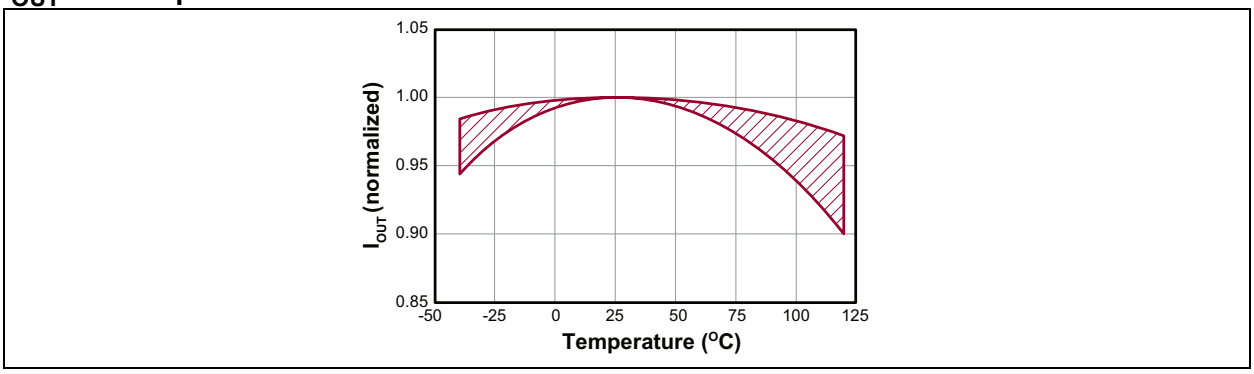
2: Mounted on JEDEC test PCB (2s 2p)

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Timing Waveforms



I_{OUT} vs. Temperature



2.0 PIN DESCRIPTION

The details on the pins of CL7 are listed on Table 2-1.
Refer to **Package Type** for the location of pins.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1, 2, 3, 4	GND	Circuit common
5	$\overline{EN}$	Active-low enable input. This input has an internal 100 kΩ pull-down resistance.
6	NC	No connection
7	OUT	Connect the LED between this pin and the supply voltage.
8	V_{DD}	Supply voltage for the CL7

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3.0 APPLICATION INFORMATION

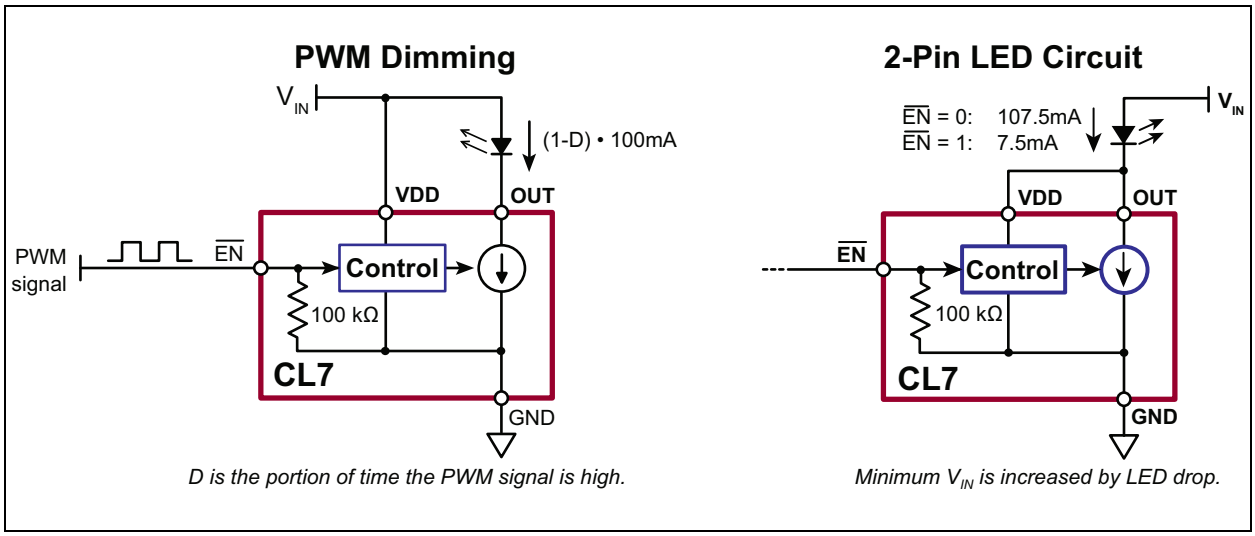
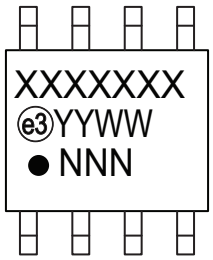


FIGURE 3-1: *Application Circuits.*

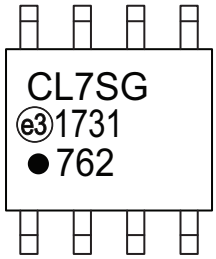
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

8-lead SOIC



Example



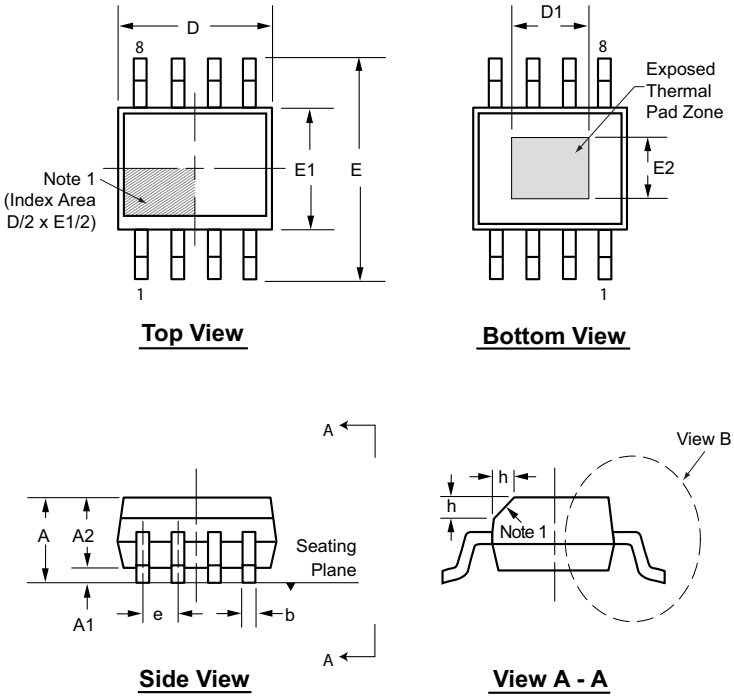
Legend:	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package 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.

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8-Lead SOIC (Narrow Body w/Heat Slug) Package Outline (SG)

4.90x3.90mm body, 1.70mm height (max), 1.27mm pitch



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

Note:

1. *If optional chamfer feature is not present, a Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/ identifier; an embedded metal marker; or a printed indicator.*

Symbol		A	A1	A2	b	D	D1	E	E1	E2	e	h	L	L1	L2	θ	θ1
Dimension (mm)	MIN	1.25*	0.00	1.25	0.31	4.80*	3.30†	5.80*	3.80*	2.29†	1.27 BSC	0.25	0.40	1.04 REF	0.25 BSC	0°	5°
	NOM	-	-	-	-	4.90	-	6.00	3.90	-		-	-			-	-
	MAX	1.70	0.15	1.55*	0.51	5.00*	3.81†	6.20*	4.00*	2.79†		0.50	1.27			8°	15°

JEDEC Registration MS-012, Variation BA, Issue E, Sept. 2005.
** This dimension is not specified in the JEDEC drawing.*
† This dimension differs from the JEDEC drawing.
Drawings not to scale.

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NOTES:

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APPENDIX A: REVISION HISTORY

Revision A (February 2017)

- Converted Supertex Doc# DSFP-CL7 to Microchip DS20005600A
- Changed the quantity of the SG package from 2500/Reel to 3300/Reel
- 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:	CL7	=	100 mA Constant-Current Linear LED Driver with Enable Input
Package:	SG	=	8-lead SOIC (with Heat Slug)
Environmental:	G	=	Lead (Pb)-free/RoHS-compliant Package
Media Type:	(blank)	=	3300/Reel for an SG Package

Example:

a) CL7SG-G: 100 mA Constant-Current Linear LED Driver with Enable Input, 8-lead SOIC Package (with Heat Slug), 3300/Reel

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