CL6

100 mA Fixed Constant-Current Linear LED Driver

Features

- 100 mA ±5% Constant-Current Driver
- Built-In Reverse Polarity Protection
- Dimmable via PWM Supply
- Overtemperature Protection
- Tab Ground allows Direct Heatsinking to Chassis
- 90V Maximum Rating for Transient Immunity

Applications

- Flashlights
- Specialty Lighting
- Low-Voltage Signage
- Low-Voltage Lighting

General Description

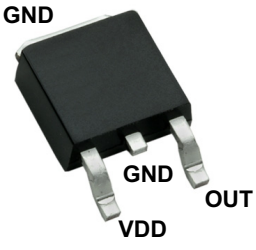
The CL6 is a fixed-current linear regulator designed for driving high-brightness LEDs at 100 mA from nominal 12V, 24V and 48V power supplies. With a maximum rating of 90V, it is able to withstand transients without the need for additional transient protection circuitry.

The CL6 is offered in both TO-252 (D-PAK) and TO-220 packages. The tab on the TO-220 is ground, allowing heatsinking directly to a chassis without the need for electrically insulating spacers.

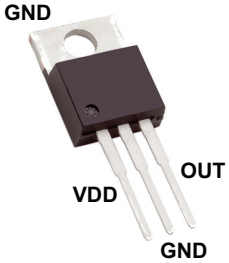
Overtemperature protection circuitry shuts off the LED current when the die temperature reaches 135°C (typical). Full LED current resumes when the die temperature falls below 105°C (typical).

Package Types

TO-252 (DPAK)
(Top view)



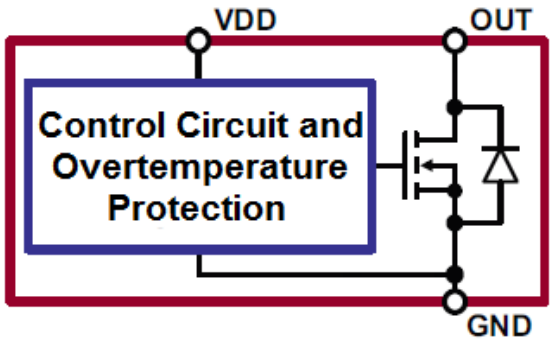
TO-220
(Top view)



See Table 2-1 and Table 2-2 for pin information.

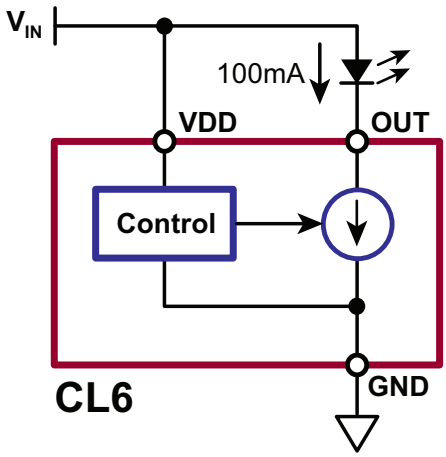
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Functional Block Diagram



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Typical Application Circuit



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Supply Voltage, V_{DD} .....–25V to +100V
Output Voltage, V_{OUT} .....–25V to +100V
Junction Temperature, T_J (**Note 1**) ..... –40°C to +135°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**)
Operating 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

DC 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 Pin	I_{OUT}	95	100	105	mA	Normal conditions, 25°C (**Note 1**)
		90	100	110		Normal conditions, full temperature (**Note 1**, **Note 2**)
		50	—	120		Extended conditions (See **Recommended Operating Conditions.**) (**Note 1**)
Current into OUT Pin with V_{DD} Pin Open	$I_{OUT(OFF)}$	—	—	10	µA	V_{DD} = open
Voltage at V_{DD} to Shut off LED Current	V_{OFF}	—	—	1	V	I_{OUT} < 10 µA
V_{DD} Applied On Delay	t_{ON}	—	—	100	µs	
V_{DD} Removed Off Delay	t_{OFF}	—	—	100	µs	

Note 1: Continuous operation at high V_{OUT} voltages may result in activation of overtemperature protection. Use appropriate heat sinking.
2: Limits obtained by characterization and not 100% tested in production.

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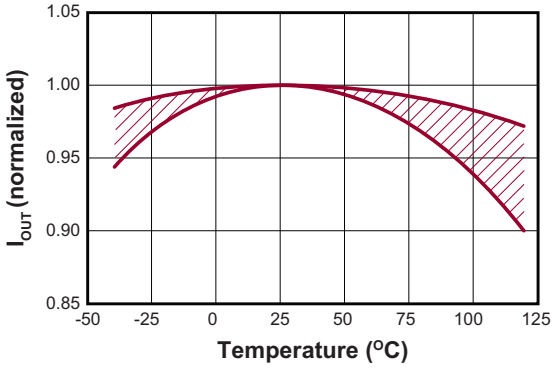
TEMPERATURE SPECIFICATIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
TEMPERATURE RANGE						
Operating Junction Temperature	T_J	–40	—	119	°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						
3-lead TO-252 (D-PAK)	θ_{JA}	—	81	—	°C/W	**Note 2**
3-lead TO-220	θ_{JA}	—	29	—	°C/W	

Note 1: For design guidance only

2: Soldered to 2 cm^2 exposed copper area

I_{OUT} vs. Temperature



2.0 PIN DESCRIPTION

The details on the pins of CL6 are listed in Table 2-1 and Table 2-2. Refer to **Package Types** for the location of pins.

TABLE 2-1: TO-252 (DPAK) PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	VDD	Supply voltage for the CL6
3	OUT	Constant-current sink. Connect the LED between this pin and the supply voltage.
4	GND	Circuit common ground
2	GND	Circuit common ground (not for external connection)

TABLE 2-2: TO-220 PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	VDD	Supply voltage for CL6
2	GND	Circuit common ground
3	OUT	Constant current sink. Connect the LED between this pin and the supply voltage.
4	GND	Circuit common ground (tab for mounting to external heatsink)

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3.0 APPLICATION INFORMATION

3.1 Application Circuits

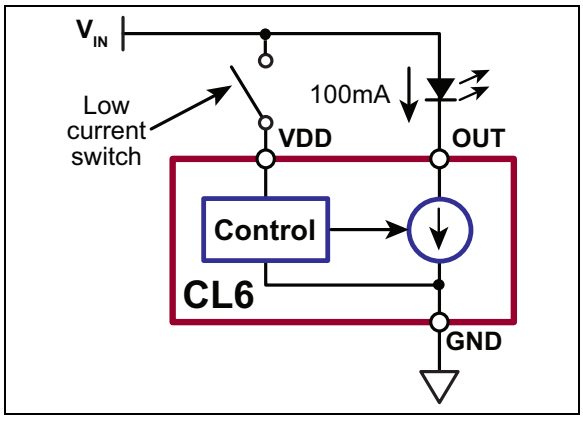


FIGURE 3-1: *Low-Current On/Off Control.*

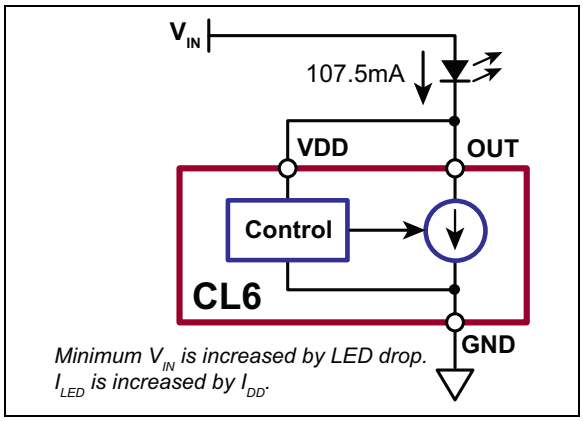
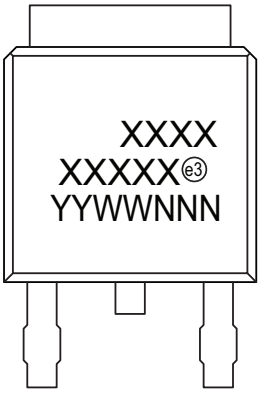


FIGURE 3-2: *Two-Terminal Operation.*

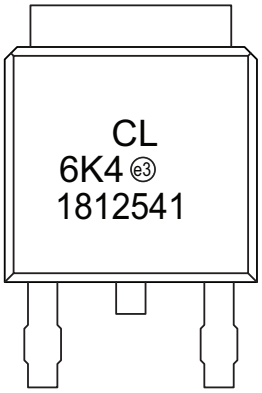
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

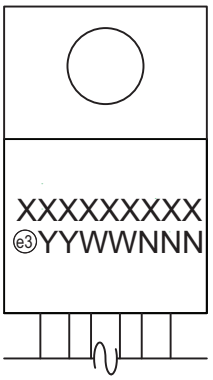
TO-252 (D-PAK)



Example



3-lead TO-220



Example

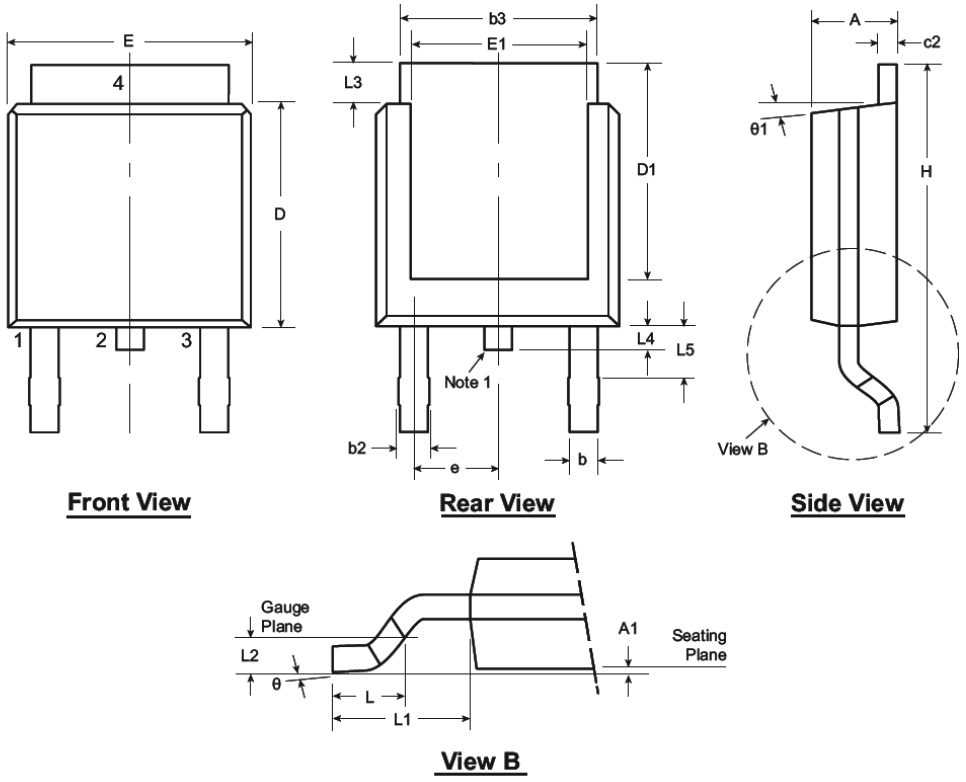


Legend:	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package 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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3-Lead TO-252 (D-PAK) Package Outline (K4)



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

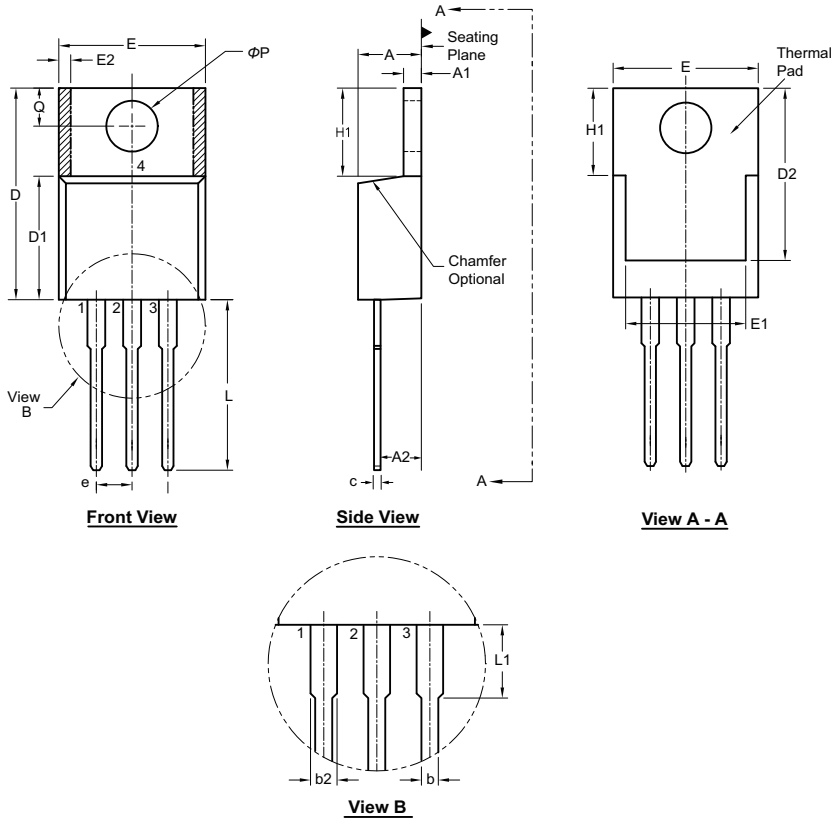
Note:

1. Although 4 terminal locations are shown, only 3 are functional. Lead number 2 was removed.

Symbol		A	A1	b	b2	b3	c2	D	D1	E	E1	e	H	L	L1	L2	L3	L4	L5	θ	θ1
Dimension (inches)	MIN	.086	.000*	.025	.030	.195	.018	.235	.205	.250	.170	.090 BSC	.370	.055	.108 REF	.020 BSC	.035	.025*	.035†	0º	0º
	NOM	-	-	-	-	-	-	.240	-	-	-		-	.060			-	-	-	-	-
	MAX	.094	.005	.035	.045	.215	.035	.245	.217*	.265	.200*		.410	.070			.050	.040	.060	10º	15º

JEDEC Registration TO-252, Variation AA, Issue E, June 2004.
** This dimension is not specified in the JEDEC drawing.*
† This dimension differs from the JEDEC drawing.
Drawings not to scale.

3-Lead TO-220 Package Outline (N5)



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

Symbol		A	A1	A2	b	b2	c	D	D1	D2	E	E1	E2	e	H1	L	L1	Q	ΦP
Dimension (inches)	MIN	.140	.020	.080	.015	.045	.012†	.560	.326†	.474†	.380	.270	0.20*	.100 BSC	.230	.500	.200*	.100	.139
	NOM	-	-	-	.027	.057	-	-	-	-	-	-	-		-	-	-	-	-
	MAX	.190	.055	.120†	.040	.070	.024	.650	.361†	.507	.420	.350	.030		.270	.580	.250	.135	.161

JEDEC Registration TO-220, Variation AB, Issue K, April 2002.
** This dimension is not specified in the JEDEC drawing.*
† This dimension differs from the JEDEC drawing.
Drawings not to scale.

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APPENDIX A: REVISION HISTORY

Revision A (November 2018)

- Converted Supertex Doc# DSFP-CL6 to Microchip DS20005809A
- Changed the maximum junction temperature from 150°C to 135°C in the Absolute Maximum Ratings section and added a maximum operating junction temperature of 119°C to the Temperature Specifications table
- Changed the package marking format
- Made new sections to comply with the standard Microchip document 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:	CL6	=	100 mA Fixed Constant-Current Linear LED Driver
Packages:	K4	=	3-lead TO-252 (D-PAK)
	N5	=	3-lead TO-220
Environmental:	G	=	Lead (Pb)-free/RoHS-compliant Package
Media Types:	(blank)	=	2000/Reel for a TO-252 (D-PAK) Package
	(blank)	=	50/Tube for a TO-220 Package

Examples:

a) CL6K4-G:	100 mA Fixed Constant-Current Linear LED Driver, 3-lead TO-252 (D-PAK) Package, 2000/Reel
b) CL6N5-G:	100 mA Fixed Constant-Current Linear LED Driver, 3-lead TO-220 Package, 50/Tube

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