

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

Features

- 5.0 to 90V operating range (V_{A-B})
- 20 mA $\pm 10\%$ at 5.0 - 90V
- 0.01%/°C typical temperature coefficient
- Available in TO-243AA (SOT-89), TO-252(D-PAK), & TO-92 packages
- Can be paralleled for higher current

Applications

- LED driver
- Industrial lamp indicators
- Signage
- Accent lighting
- Automotive
- Constant current source
- Constant current sink

Description

CL2 is a high voltage, temperature compensated, constant-current source. The device is trimmed to provide a constant current of 20 mA $\pm 10\%$ at an input voltage of 5–90V. The device can be used as a two-terminal, constant-current source or constant-current sink.

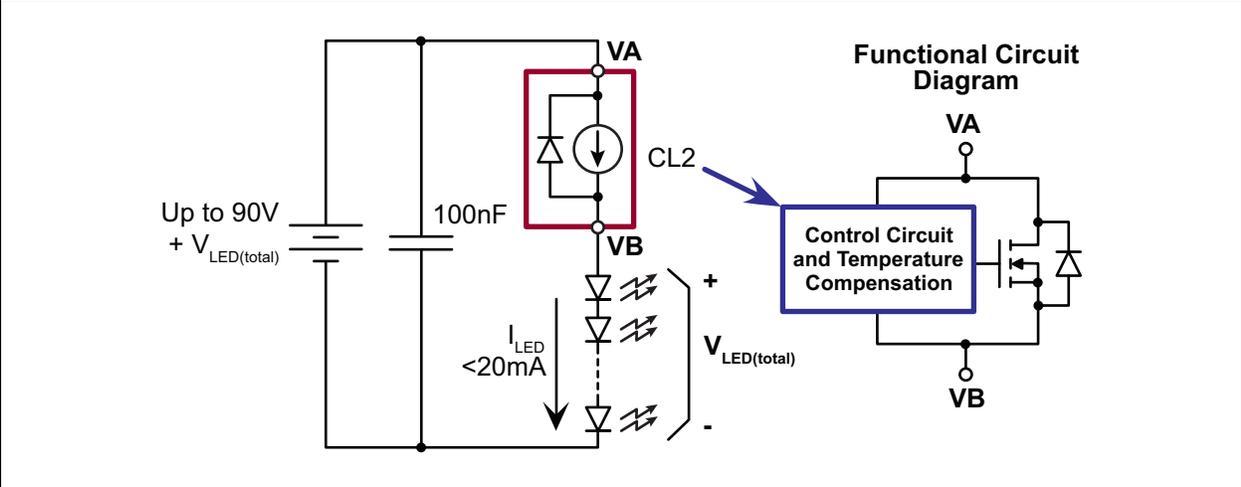
A typical application for the CL2 is to drive LEDs with a constant current of 20 mA. Multiple CL2s can also be used in parallel to provide higher currents such as 40 mA, 60 mA or 80 mA. The device is available in TO-243AA (SOT-89), TO-252 (D-PAK), and TO-92 packages.

Package Type



CL2

Typical Application Circuit



1.0 ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS†

| | |
|---|----------------|
| Operating voltage, V_{A-B} | 100V |
| Operating junction temperature, T_j | -40 to +125 °C |
| Storage Temperature, T_s | -55 to +150 °C |

† **Notice:** Stresses above those listed under “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 listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

DC AND AC CHARACTERISTICS

| Electrical Specifications: Unless otherwise specified, for all specifications $T_A = +25^\circ\text{C}$ | | | | | | |
|---|---------------------------|------|------|-----|-------|--|
| Parameter | Symbol | Min | Typ | Max | Units | Conditions |
| Operating voltage | V_{A-B} | 5.0 | - | 90 | V | --- |
| Current regulation | I_{A-B} | 18.0 | 20 | 22 | mA | $V_{A-B} = 5.0\text{V} - 90\text{V}$ |
| I_{A-B} temperature coefficient | $\Delta I_{A-B}/\Delta T$ | - | 0.01 | - | %/°C | $V_{A-B} = 45\text{V}, T_j = -40^\circ\text{C} \text{ to } +100^\circ\text{C}$ |
| Operating junction temperature | T_j | -40 | - | 125 | °C | --- |
| Dynamic resistance | R_{A-B} | - | 300 | - | kΩ | --- |

TEMPERATURE SPECIFICATIONS

| Parameter | Symbol | Min | Typ | Max | Units | Conditions |
|------------------------------------|---------------|-----|-----|-----|-------|------------|
| Temperature Ranges | | | | | | |
| Operating Junction Temperature | T_j | -40 | - | 125 | °C | |
| Storage Temperature | T_s | -55 | - | 150 | °C | |
| Package Thermal Resistances | | | | | | |
| Thermal Resistance, TO-92 | θ_{ja} | - | 132 | - | °C/W | |
| Thermal Resistance, TO-252 | θ_{ja} | - | 81 | - | °C/W | Note 1 |
| Thermal Resistance, TO-243AA | θ_{ja} | - | 133 | - | °C/W | Note 1 |

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

TABLE 1-1: THERMAL CHARACTERISTICS

| Package | Power Dissipation @ $T_A = 2.5^\circ\text{C}$ (W) | Conditions |
|----------|--|------------|
| TO-92 | 0.6 | |
| TO-252 | 2.0 | Note 1 |
| TO-243AA | 1.3 | Note 1 |

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

CL2

2.0 PIN DESCRIPTION

The locations of the pins are listed in [Package Type](#) and [Packaging Information](#).

TABLE 2-1: PIN DESCRIPTION

| Pin # TO-92 | Pin # TO-252 | Pin # To-243AA | Symbol | Function |
|-------------|--------------|----------------|--------|-------------|
| 1 | 1 | 1 | VA | Current in |
| 2 | 3 | 3 | NC | No connect |
| 3 | 4 | 2,4 | VB | Current out |

3.0 FUNCTIONAL DESCRIPTION

Figure 3-1 provides the Functional Circuit diagram and its equivalent block diagram for CL2. Performance information is available in Figure 3-2 and Figure 3-3. Figure 3-4 and Figure 3-5 provide example schematics.

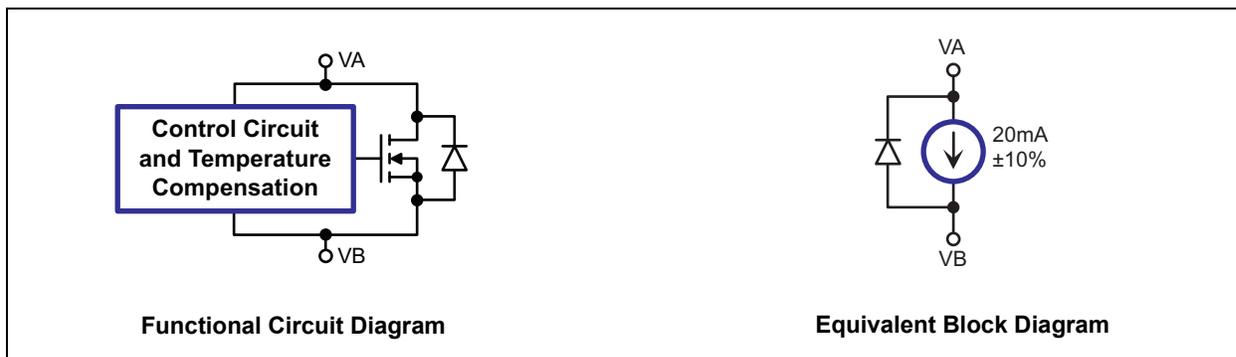


FIGURE 3-1: Functional Circuit Diagram and Equivalent Block Diagram

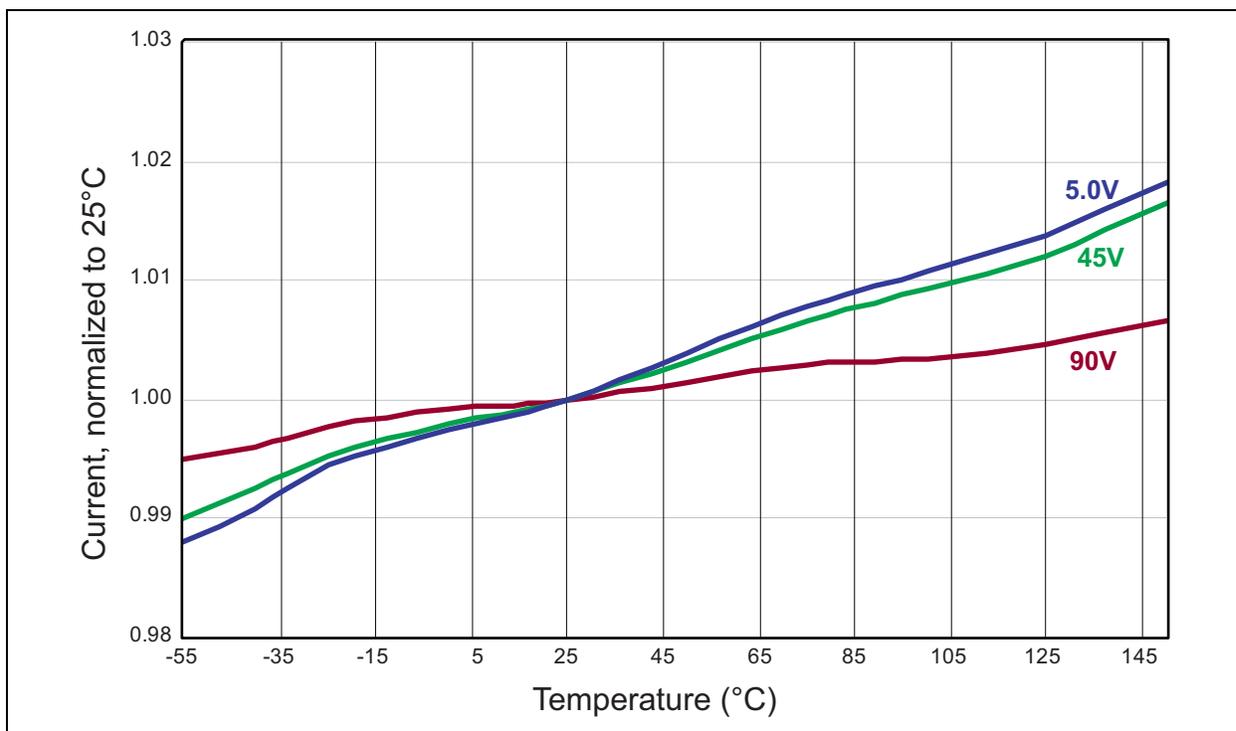


FIGURE 3-2: Temperature Characteristics

CL2

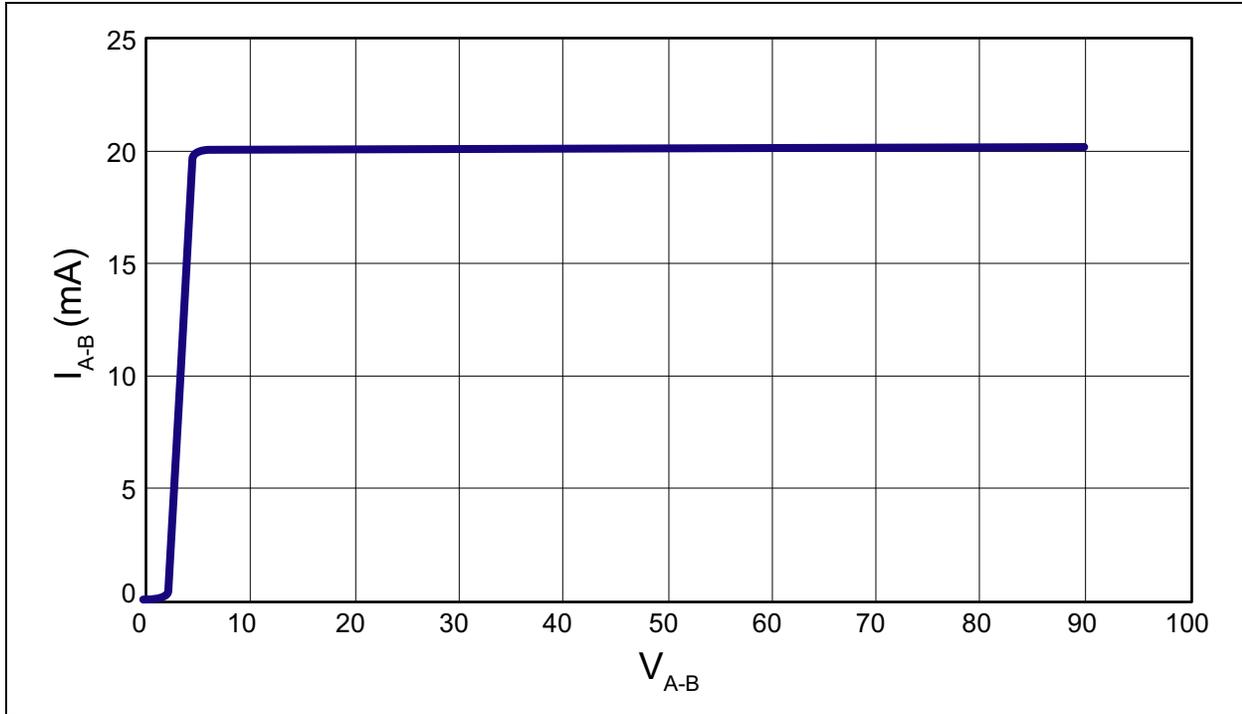


FIGURE 3-3: Output Current vs Voltage

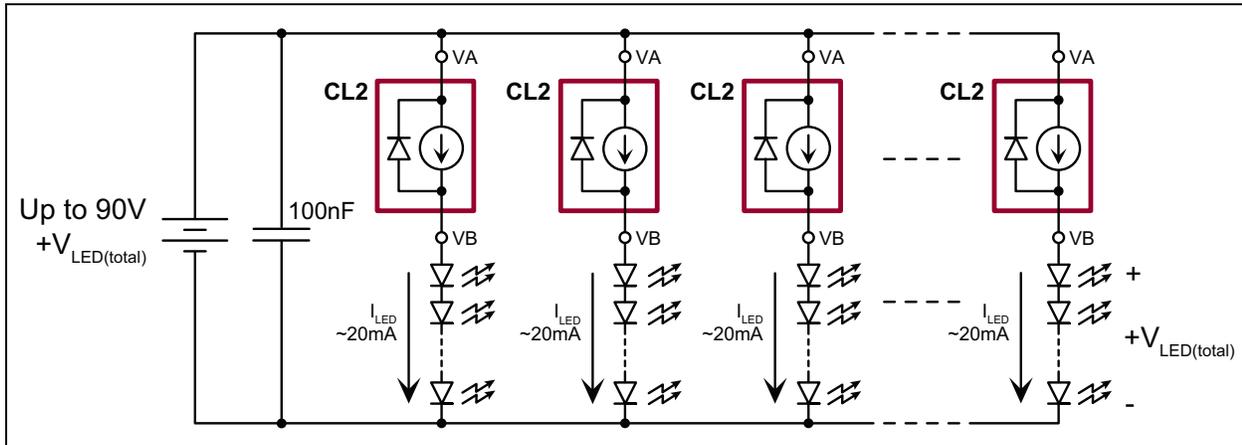


FIGURE 3-4: CL2 for Multiple LED Strings

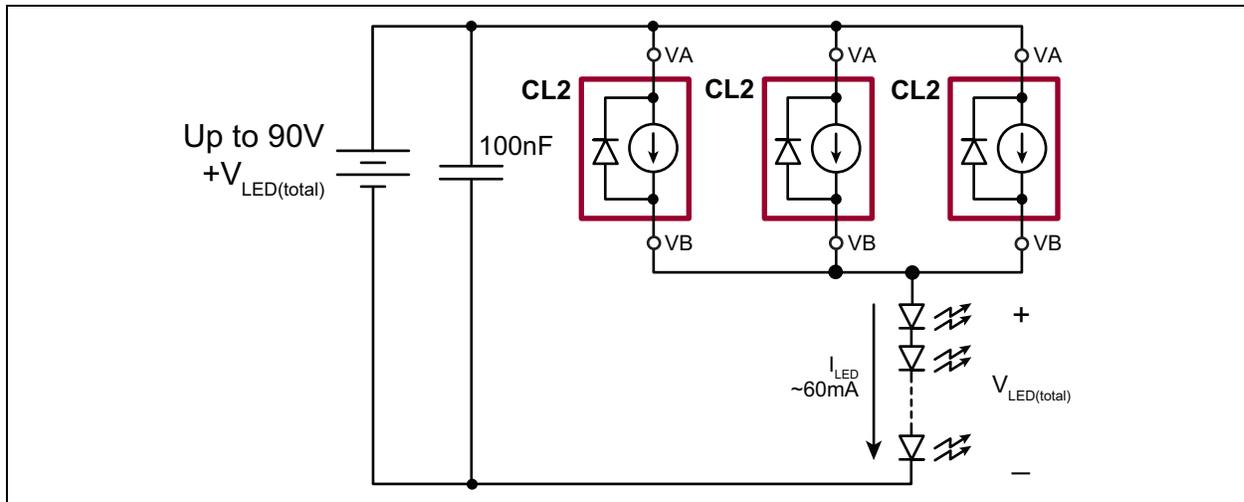


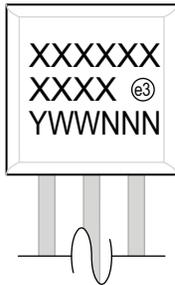
FIGURE 3-5: CL2 for Higher Current

CL2

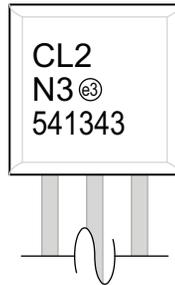
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

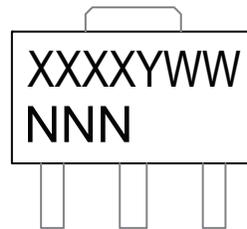
3-lead TO-92



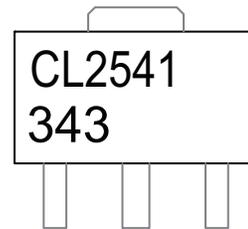
Example



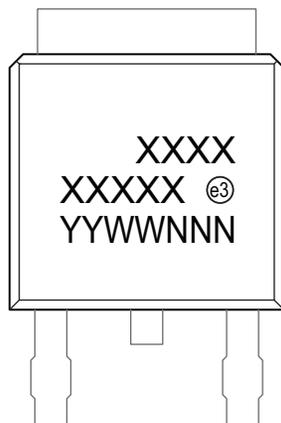
3-lead TO-243AA *
(SOT-89)



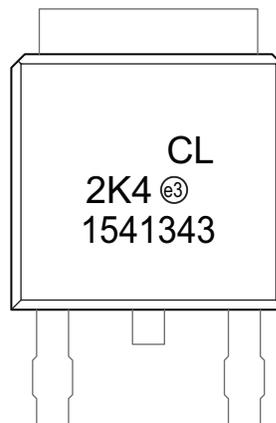
Example



TO-252 (D-PAK)



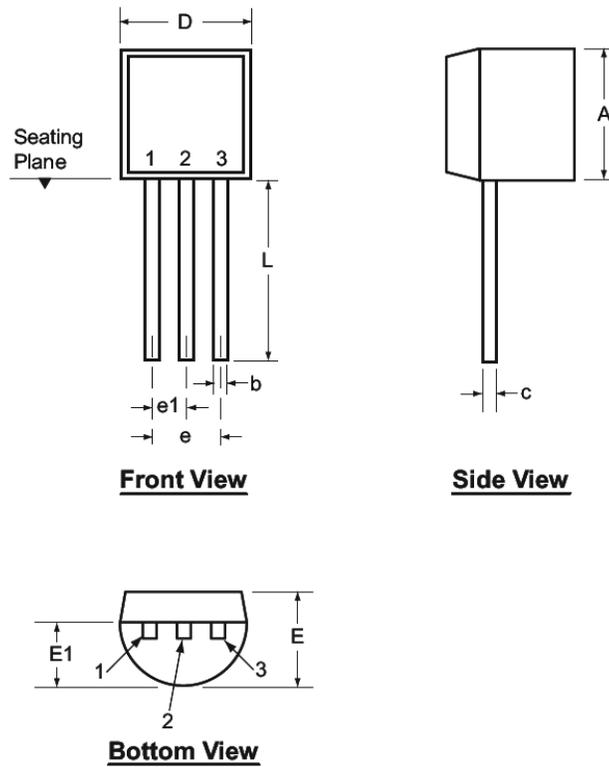
Example



| | | |
|----------------|--------|--|
| 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-92 Package Outline (L/LL/N3)



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

| Symbol | A | b | c | D | E | E1 | e | e1 | L | |
|---------------------|-----|------|-------------------|-------------------|------|------|------|------|------|-------|
| Dimensions (inches) | MIN | .170 | .014 [†] | .014 [†] | .175 | .125 | .080 | .095 | .045 | .500 |
| | NOM | - | - | - | - | - | - | - | - | - |
| | MAX | .210 | .022 [†] | .022 [†] | .205 | .165 | .105 | .105 | .055 | .610* |

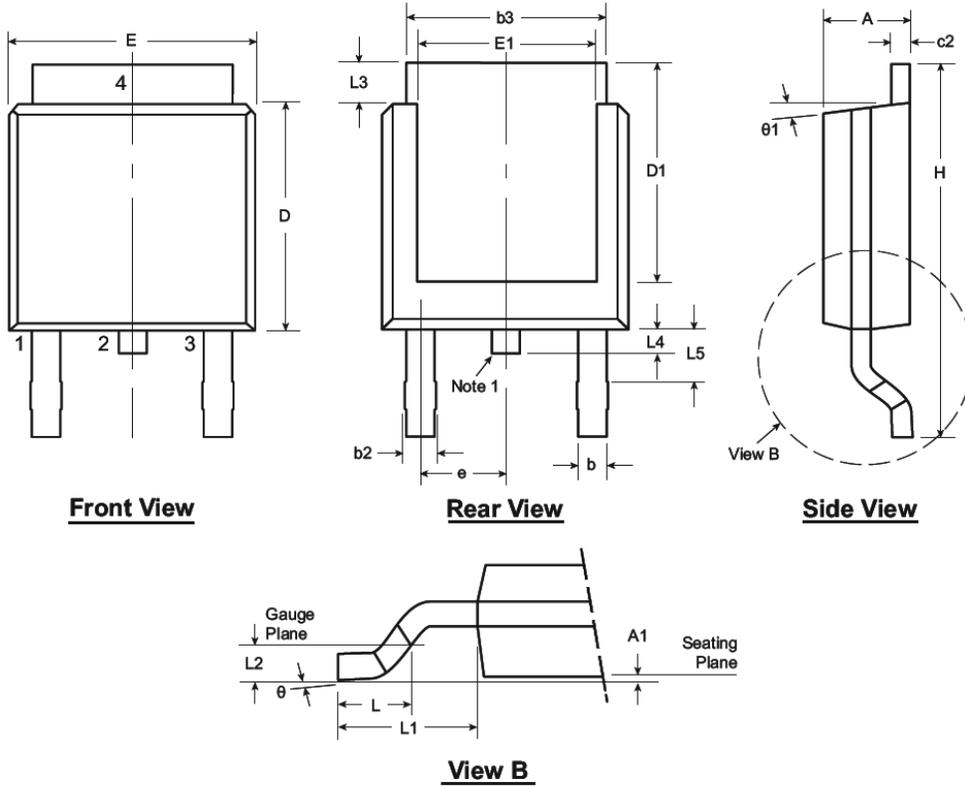
JEDEC Registration TO-92.

* This dimension is not specified in the JEDEC drawing.

† This dimension differs from the JEDEC drawing.

Drawings not to scale.

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:

- 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 | θ_1 | | |
|--------------------|-----|------|-------|------|------|------|------|------|-------|------|----------|------|------|----------|----------|------|-------|-------|----------|------------|-----|---|
| Dimension (inches) | MIN | .086 | .000* | .025 | .030 | .195 | .018 | .235 | .205 | .250 | .170 | .370 | .055 | .108 REF | .020 BSC | .035 | .025* | .035† | 0° | 0° | | |
| | NOM | - | - | - | - | - | - | .240 | - | - | .090 BSC | - | .060 | | | - | - | - | - | - | - | - |
| | MAX | .094 | .005 | .035 | .045 | .215 | .035 | .245 | .217* | .265 | .200* | .410 | .070 | | | - | .050 | .040 | .060 | 10° | 15° | |

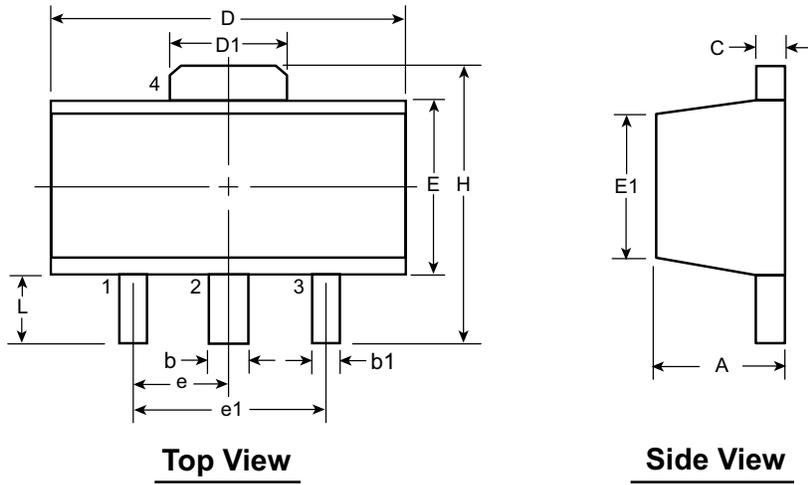
JEDEC Registration TO-252, Variation AA, Issue E, June 2004.

* This dimension is not specified in the JEDEC drawing.

† This dimension differs from the JEDEC drawing.

Drawings not to scale.

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



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.

APPENDIX A: REVISION HISTORY

Revision A (November 2015)

- Updated file to Microchip format

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| <u>PART NO.</u> | <u>XX</u> | - | <u>X</u> | - | <u>X</u> |
|-----------------|-----------------|---|--|---|------------|
| Device | Package Options | | Environmental | | Media Type |
| Device: | CL2 | = | Simple 90V, 20 mA, Temperature-Compensated, Constant-Current LED Driver IC | | |
| Package: | N3 | = | TO-92, 3-lead | | |
| | K4 | = | TO-252 (D-PAK), 3-lead | | |
| | N8 | = | TO-243AA (SOT-89), 3-lead | | |
| Environmental | G | = | Lead (Pb)-free/ROHS-compliant package | | |
| Media Type: | (blank) | = | 1000/Bag for N3 packages | | |
| | | = | 2000/Reel for K4 packages | | |
| | | = | 2000/Reel for N8 packages | | |
| | P002 | = | 2000/Reel for N3 | | |

Examples:

| | |
|-----------------|-----------------------------|
| a) CL2N3-G | TO-92 package, 1000/Bag |
| b) CL2K4-G | TO-252 package, 2000/Reel |
| c) CL2N8-G | TO-243AA package, 2000/Reel |
| d) CL2N3-G-P002 | TO-92 package, 2000/Reel |

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