

High Efficiency Regulator Controller

FEATURES

- Complete Control for a High Current, Low Dropout, Linear Regulator
- Fixed 5V or Adjustable Output Voltage
- Accurate 2.5A Current Limiting with Foldback
- Internal Current Sense Resistor
- Remote Sense for Improved Load Regulation
- External Shutdown
- Under-Voltage Lockout and Reverse Voltage Protection
- Thermal Shutdown Protection
- 8 Pin Mini-Dip Package (Surface Mount also Available)

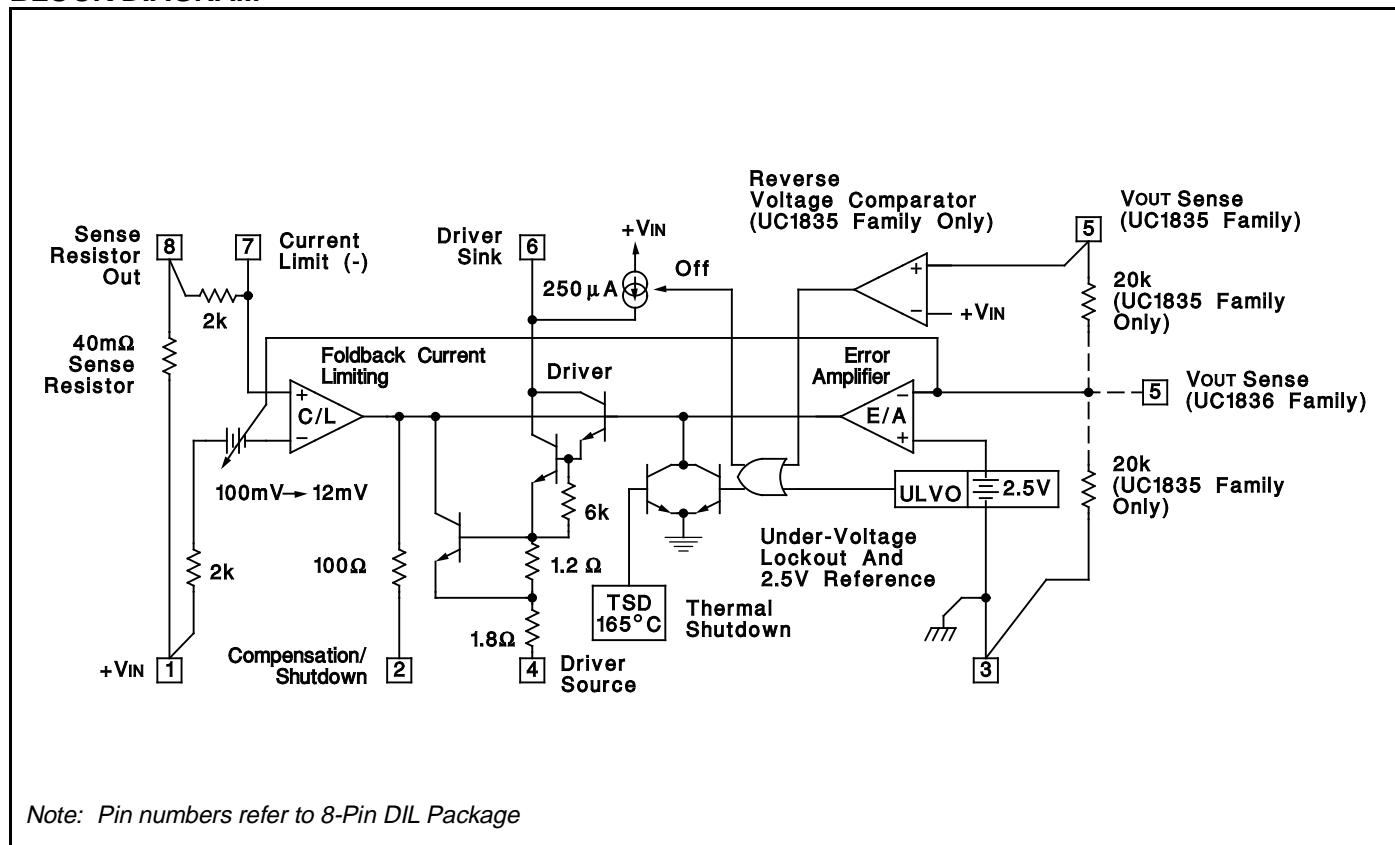
DESCRIPTION

The UC1835/6 families of linear controllers are optimized for the design of low cost, low dropout, linear regulators. Using an external pass element, dropout voltages of less than 0.5V are readily obtained. These devices contain a high gain error amplifier, a 250mA output driver, and a precision reference. In addition, current sense with fold-back provides for a 2.5A peak output current dropping to less than 0.5A at short circuit.

These devices are available in fixed, 5V, (UC1835), or adjustable, (UC1836), versions. In the fixed 5 volt version, the only external parts required are an external pass element, an output capacitor, and a compensation capacitor. On the adjustable version the output voltage can be set anywhere from 2.5V to 35V with two external resistors.

Additional features of these devices include under-voltage lockout for predictable start-up, thermal shutdown and short circuit current limiting to protect the driver device. On the fixed voltage version, a reverse voltage comparator minimizes reverse load current in the event of a negative input to output differential.

BLOCK DIAGRAM



**UC1835 UC1836
UC2835 UC2836
UC3835 UC3836**

ABSOLUTE MAXIMUM RATINGS (Note 1)

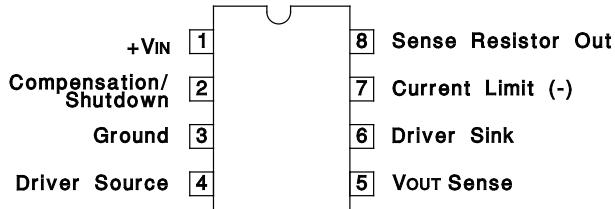
| | |
|---|----------------|
| Input Supply Voltage (+VIN) | -1.0V to + 40V |
| Driver Output Current (Sink or Source) | 600mA |
| Driver Source to Sink Voltage | + 40V |
| Maximum Current Through Sense Resistor. | 4A |
| VOUT Sense Input Voltage | -3V to + 40V |
| Power Dissipation at TA = 25°C (Note 2) | 1000mW |
| Power Dissipation at Tc = 25°C (Note 2) | 2000mW |

Operating Junction Temperature -55°C to +150°C
 Storage Temperature -65°C to +150°C
 Lead Temperature (Soldering, 10 Seconds) 300°C

Note 1: Voltages are referenced to ground, (Pin 3). Currents are positive into, negative out of, the specified terminals.
Consult Packaging Section of Databook for thermal considerations and limitations of packages.

CONNECTION DIAGRAMS

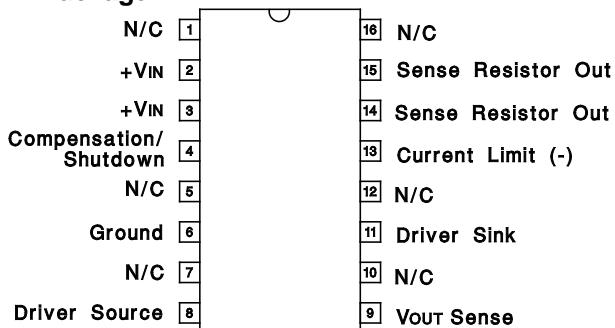
DIL-8, SOIC-8 (TOP VIEW) N or J Package, D Package



**PLCC-20, LCC-20
(TOP VIEW)
Q, L Packages**

| PACKAGE PIN FUNCTION | |
|---------------------------|-----|
| FUNCTION | PIN |
| N/C | 1 |
| +VIN | 2 |
| +VIN | 3 |
| N/C | 4 |
| Compensation/ Shutdown | 5 |
| N/C | 6 |
| Ground | 7 |
| N/C | 8 |
| N/C | 9 |
| Driver Source | 10 |
| N/C | 11 |
| VOUT Sense | 12 |
| N/C | 13 |
| N/C | 14 |
| Driver Sink | 15 |
| N/C | 16 |
| Current Limit (-) | 17 |
| N/C | 18 |
| Sense Resistor Out | 19 |
| Sense Resistor Out | 20 |

SOIC-16 (TOP VIEW) DW Package



ELECTRICAL CHARACTERISTICS: Unless otherwise stated, specifications hold for $TA = 0^\circ\text{C}$ to $+70^\circ\text{C}$ for the UC3835/6, -25°C to $+85^\circ\text{C}$ for the UC2835/6, and -55°C to $+125^\circ\text{C}$ for the UC1835/6, $+\text{VIN} = 6\text{V}$, Driver Source = 0V , Driver Sink = 5V , $TA = TJ$.

| PARAMETER | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--|-------------------------------------|------|------|------|-------|
| Input Supply | | | | | |
| Supply Current | +VIN = 6V | | 2.75 | 4.0 | mA |
| | +VIN = 40V | | 3.75 | 6.0 | mA |
| UVLO Threshold | +VIN Low to High, VOUT Sense = 0V | 3.9 | 4.4 | 4.9 | V |
| Threshold Hysteresis | | | 0.1 | 0.35 | V |
| Reverse Current | +VIN = -1.0V, Driver Sink Open | | 6.0 | 20 | mA |
| Regulating Voltage and Error Amplifier (UC1835 Family Only) | | | | | |
| Regulating Level at VOUT Sense (VREG) | Driver Current = 10mA, TJ = 25°C | 4.94 | 5.0 | 5.06 | V |
| | Over Temperature | 4.9 | | 5.1 | V |
| Line Regulation | +VIN = 5.2V + 35V | | 15 | 40 | mV |
| Load Regulation | Driver Current = 0 to 250mA | | 6.0 | 25 | mV |
| Bias Current at VOUT Sense | VOUT Sense = 5.0V | 75 | 125 | 210 | µA |
| Error Amp Transconductance | ±100µA at Compensation/Shutdown Pin | 0.8 | 1.3 | 2.0 | µS |
| Maximum Compensation Output Current | Sink or Source, Driver Source Open | 90 | 200 | 260 | µA |

UC1835 UC1836
UC2835 UC2836
UC3835 UC3836

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, specifications hold for $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ for the UC3835/6, -25°C to $+85^\circ\text{C}$ for the UC2835/6, and -55°C to $+125^\circ\text{C}$ for the UC1835/6, $+V_{IN} = 6\text{V}$, Driver Source = 0V, Driver Sink = 5V, $T_A = T_J$.

| PARAMETER | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--|--|------|------|------|------------------|
| Regulating Voltage and Error Amplifier (UC1836 Family Only) | | | | | |
| Regulating Level at V_{OUT} Sense (V _{REG}) | Driver Current = 10mA, $T_J = 25^\circ\text{C}$ | 2.47 | 2.5 | 2.53 | V |
| | Over Temperature | 2.45 | | 2.55 | V |
| Line Regulation | $+V_{IN} = 5.2\text{V}$ to 35V | | 6.0 | 20 | mV |
| Load Regulation | Driver Current = 0 to 250mA | | 3.0 | 15 | mV |
| Bias Current at V_{OUT} Sense | V_{OUT} Sense = 2.5V | -1.0 | -0.2 | | μA |
| Error Amp Transconductance | $\pm 100\mu\text{A}$ at Compensation/Shutdown Pin | 0.8 | 1.3 | 2.0 | mS |
| Maximum Compensation Output Current | Sink or Source, Driver Source Open | 90 | 200 | 260 | μA |
| Driver | | | | | |
| Maximum Current | | 250 | 500 | | mA |
| Saturation Voltage | Driver Current = 250mA, Driver Sink | | 2.0 | 2.8 | V |
| Pull-Up Current at Driver Sink | Compensation/Shutdown=0.45V | 140 | 250 | 300 | μA |
| Driver Sink Leakage | In UVLO | | 10 | | μA |
| | In Reverse Voltage (UC1835 Family Only) | | 10 | | μA |
| Thermal Shutdown | | | 165 | | $^\circ\text{C}$ |
| Foldback Current Limit | | | | | |
| Current Limit Levels at Sense Resistor Out | V_{OUT} Sense = (0.99) V _{REG} | 2.2 | 2.5 | 2.8 | A |
| | V_{OUT} Sense = (0.5) V _{REG} | 1.3 | 1.5 | 1.7 | A |
| | V_{OUT} Sense = 0V | 0.25 | 0.4 | 0.55 | A |
| Current Limit Amp Tansconductance | $\pm 100\mu\text{A}$ at Compensation/Shutdown, V_{OUT} Sense = (0.9) V _{REG} | 12 | 24 | 42 | mS |
| Limiting Voltage at Current Limit (-) (Note 2) | V_{OUT} Sense = (0.9) V _{REG} Volts Below $+V_{IN}$, $T_J = 25^\circ\text{C}$ | 80 | 100 | 140 | mV |
| Sense Resistor Value (Note 3) | V_{OUT} Sense = (0.9) V _{REG} , $I_{OUT} = I_A$, $T_J = 25^\circ\text{C}$ | | 40 | | $\text{m}\Omega$ |

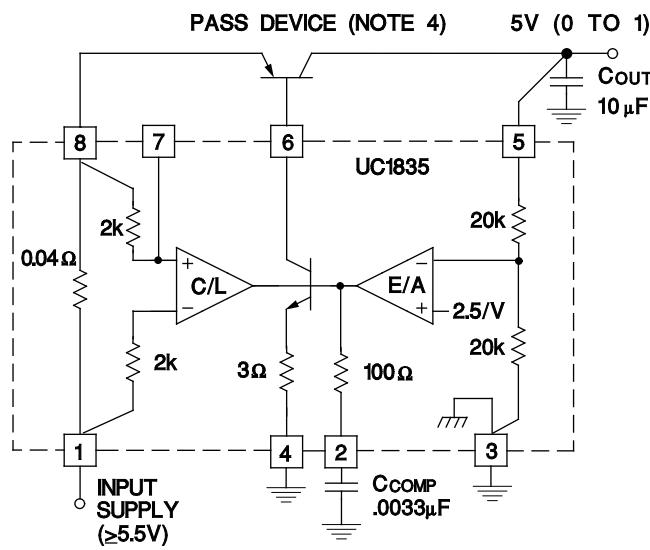
Note 2: This voltage has a positive temperature coefficient of approximately 3500ppm/ $^\circ\text{C}$.

Note 3: This resistance has a positive temperature coefficient of approximately 3500ppm/ $^\circ\text{C}$.

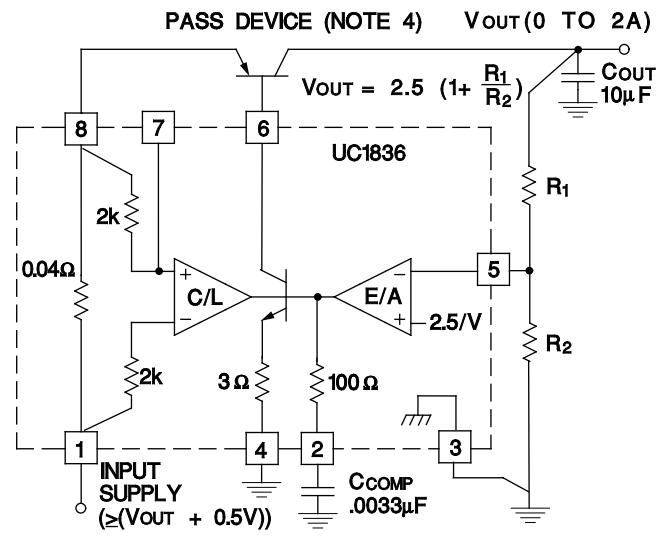
The total resistance from Pin 1 to Pin 8 will include an additional 60 to 100m Ω of package resistance.

APPLICATION AND OPERATION INFORMATION

UC 1835 – Typical configurations for a 2A, Low Dropout 5V Regulator



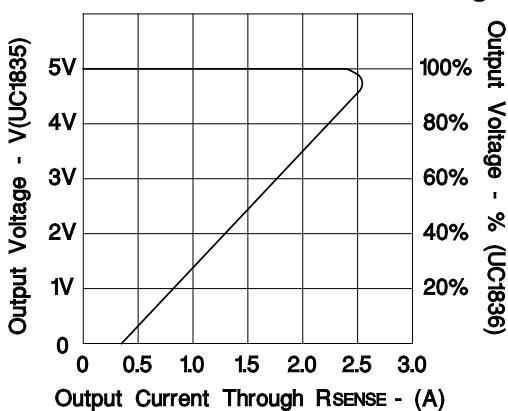
UC1836 – Typical Configuration for a 2A, Low Dropout Adjustable Regulator



Note 4: Suggested Pass devices are TIP 32B. (Dropout Voltage $\leq 0.75\text{V}$) or, D45H, (Dropout Voltage $\leq 0.5\text{V}$), or equivalents.

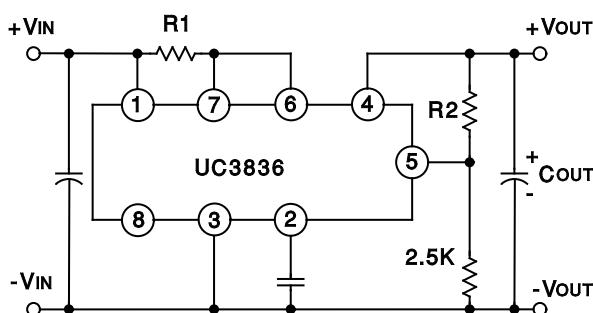
APPLICATION AND OPERATION INFORMATION (cont.)

UC1835/6 Foldback Current Limiting



UC3835/36 TYPICAL APPLICATIONS

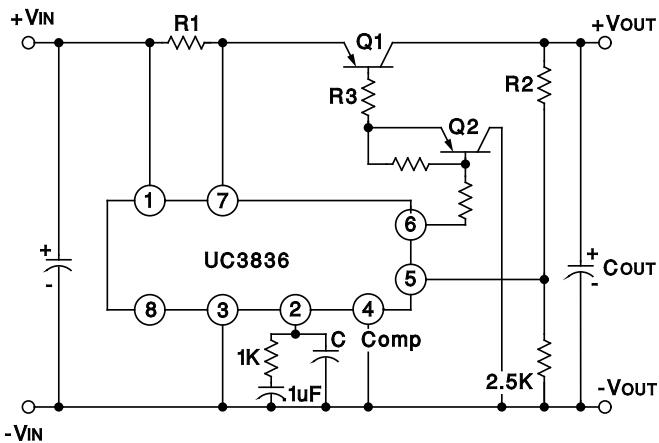
Low Current Application
 using the UC3836 internal drive transistor



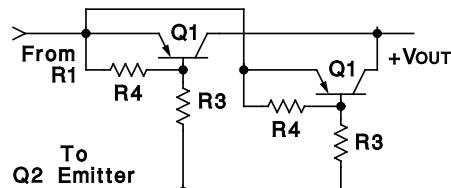
Typical Output Current vs VIN and VOUT
 of the UC3836 internal drive transistor
 for PDISS = 0.5W (approx.)

| VOUT | VIN | | | | |
|------|---------------|-----|-----|-----|----|
| | 5 | 9 | 12 | 15 | 18 |
| 2 | 150 | 60 | 40 | 30 | 20 |
| 5 | | 105 | 55 | 35 | 25 |
| 9 | | | 130 | 60 | 35 |
| 12 | | | | 120 | 55 |
| 15 | | | | | 25 |
| | Current in mA | | | | |
| | | | | 110 | 30 |

High Current Application
 using drive transistor Q2 to increase Q1 base drive
 and reduce UC3836 power dissipation



Parallel Pass Transistors
 can be added for high current or
 high power dissipation applications



EQUATIONS:

$$R1 = 0.100 \text{ V/IOUT (MAX)}$$

$$R2 = (VOUT - 2.5V/1mA)$$

$$R3 = ((VIN - VBE - VSAT)*BETA(min))/IOUT (max)$$

PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|-----------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| 5962-9065002PA | Active | Production | CDIP (JG) 8 | 50 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 9065002PA UC1836 |
| UC1836J | Active | Production | CDIP (JG) 8 | 50 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | UC1836J |
| UC1836J.A | Active | Production | CDIP (JG) 8 | 50 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | UC1836J |
| UC1836J883B | Active | Production | CDIP (JG) 8 | 50 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 9065002PA UC1836 |
| UC1836J883B.A | Active | Production | CDIP (JG) 8 | 50 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 9065002PA UC1836 |
| UC2835D | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | -25 to 85 | UC2835D |
| UC2835D.A | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | -25 to 85 | UC2835D |
| UC2836D | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | -25 to 85 | UC2836D |
| UC2836D.A | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | See UC2836D | UC2836D |
| UC2836DG4 | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | -25 to 85 | UC2836D |
| UC3836D | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | 0 to 70 | UC3836D |
| UC3836D.A | Active | Production | SOIC (D) 8 | 75 TUBE | Yes | NIPDAU | Level-2-260C-1 YEAR | 0 to 70 | UC3836D |

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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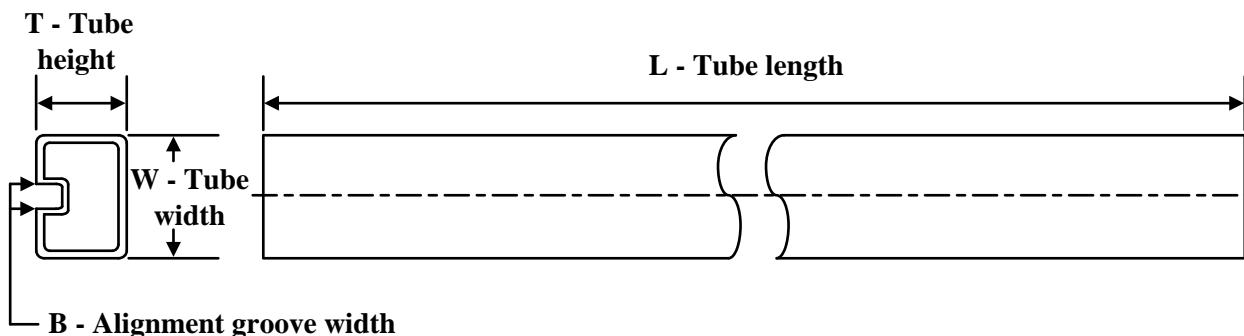
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OTHER QUALIFIED VERSIONS OF UC1836, UC3836 :

- Catalog : [UC3836](#)
- Military : [UC1836](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------|--------------|--------------|------|-----|--------|--------|--------|--------|
| UC2835D | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| UC2835D.A | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| UC2836D | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| UC2836D.A | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| UC2836DG4 | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| UC3836D | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| UC3836D.A | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |

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