

# Improved Current Mode PWM Controller

## FEATURES

- Pin-for-Pin Compatible With the UC3846
- 65ns Typical Delay From Shutdown to Outputs, and 50ns Typical Delay From Sync to Outputs
- Improved Current Sense Amplifier With Reduced Noise Sensitivity
- Differential Current Sense with 3V Common Mode Range
- Trimmed Oscillator Discharge Current for Accurate Deadband Control
- Accurate 1V Shutdown Threshold
- High Current Dual Totem Pole Outputs (1.5A peak)
- TTL Compatible Oscillator SYNC Pin Thresholds
- 4kV ESD Protection

## DESCRIPTION

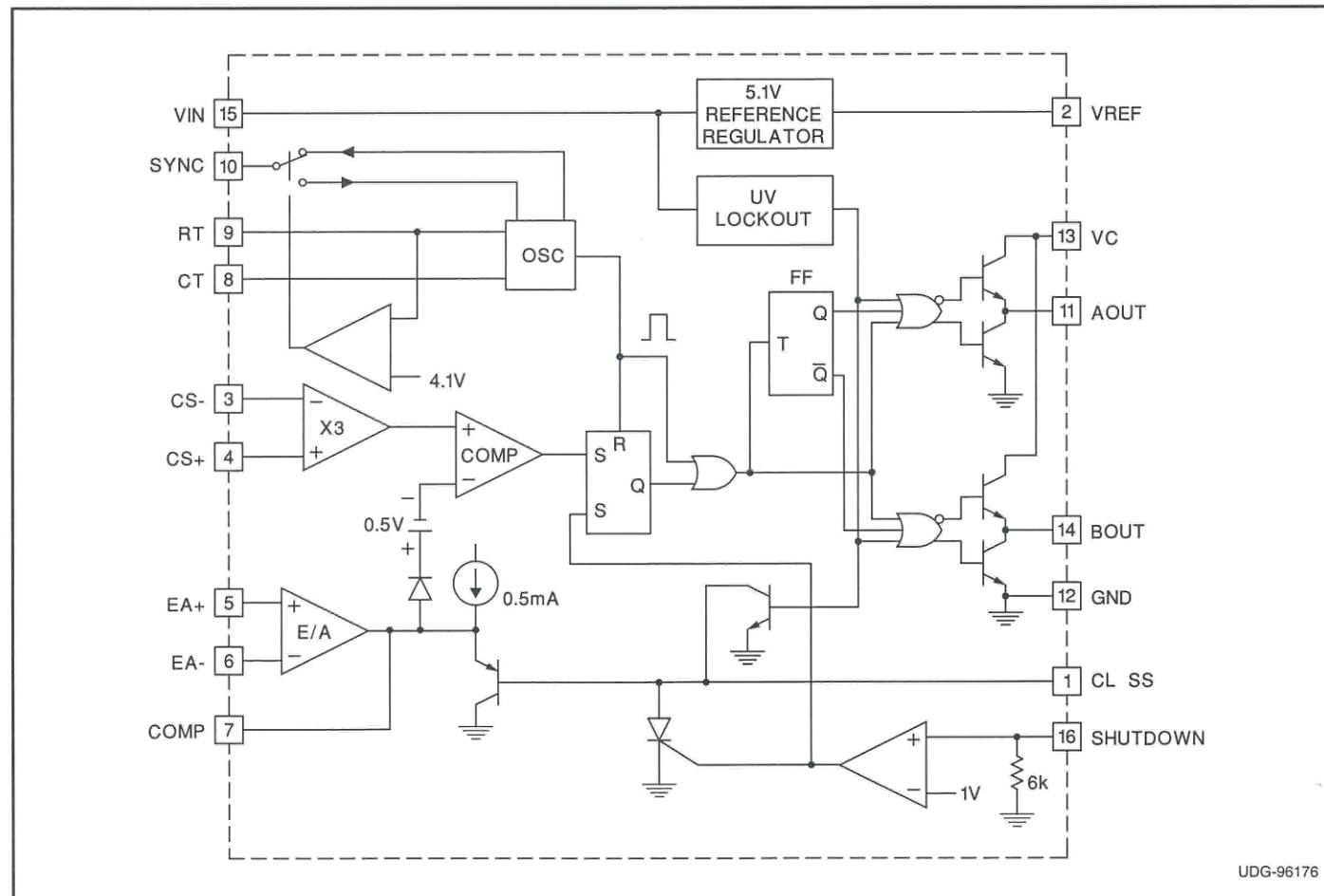
The UC3856 is a high performance version of the popular UC3846 series of current mode controllers, and is intended for both design upgrades and new applications where speed and accuracy are important. All input to output delays have been minimized, and the current sense output is slew rate limited to reduce noise sensitivity. Fast 1.5A peak output stages have been added to allow rapid switching of power FETs.

A low impedance TTL compatible sync output has been implemented with a tri-state function when used as a sync input.

Internal chip grounding has been improved to minimize internal "noise" caused when driving large capacitive loads. This, in conjunction with the improved differential current sense amplifier results in enhanced noise immunity.

Other features include a trimmed oscillator current (8%) for accurate frequency and dead time control; a 1V, 5% shutdown threshold; and 4kV minimum ESD protection on all pins.

## BLOCK DIAGRAM



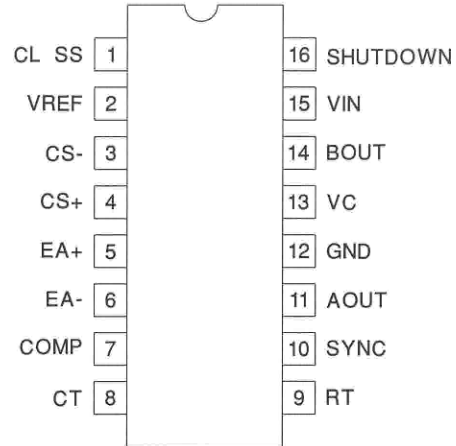
## ABSOLUTE MAXIMUM RATINGS

|                                                     |                                |
|-----------------------------------------------------|--------------------------------|
| Supply Voltage                                      | .....+40V                      |
| Collector Supply Voltage                            | .....+40V                      |
| Output Current, Source or Sink                      |                                |
| DC                                                  | .....0.5A                      |
| Pulse (0.5μs)                                       | .....2.0A                      |
| Error Amp Inputs                                    | .....-0.3V to +V <sub>IN</sub> |
| Shutdown Input                                      | .....-0.3V to +10V             |
| Current Sense Inputs                                | .....-0.3V to +3V              |
| SYNC Output Current                                 | .....±10mA                     |
| Error Amplifier Output Current                      | .....-5mA                      |
| Soft Start Sink Current                             | .....50mA                      |
| Oscillator Charging Current                         | .....5mA                       |
| Power Dissipation at T <sub>A</sub> = 25°C (Note 2) | .....1000mW                    |
| Power Dissipation at T <sub>C</sub> = 25°C (Note 2) | .....2000mW                    |
| Junction Temperature                                | .....-55°C to +150°C           |
| Storage Temperature Range                           | .....-65°C to +150°C           |
| Lead Temperature (Soldering, 10 sec.)               | .....+300°C                    |

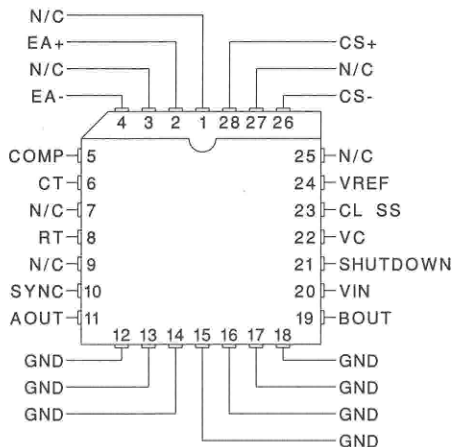
*All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal. Consult packaging section of databook for thermal limitations and considerations of package.*

## CONNECTION DIAGRAMS

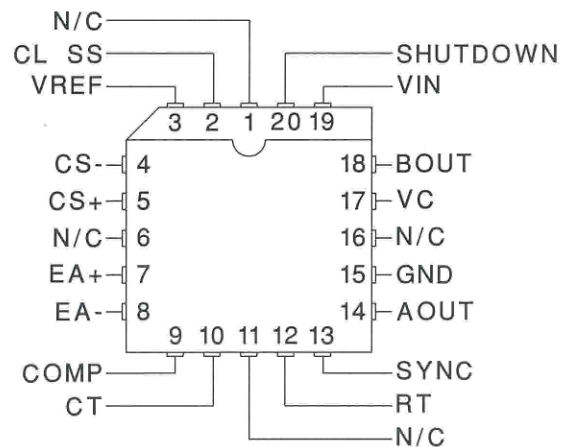
**DIL-16, SOIC-16 (Top View)  
J or N, DW PACKAGE**



**PLCC-28 (Top View)  
QP PACKAGE**



**PLCC-20 (Top View)  
Q PACKAGE**



**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, these specifications apply for T<sub>A</sub> = -55°C to +125°C for UC1856; -40°C to +85°C for the UC2856; and 0°C to +70°C for the UC3856, V<sub>IN</sub> = 15V, R<sub>T</sub> = 10k, C<sub>T</sub> = 1nF, T<sub>A</sub> = T<sub>J</sub>.

| PARAMETER              | TEST CONDITIONS                             | UC1856/UC2856 |      |      | UC3856 |      |      | UNITS |
|------------------------|---------------------------------------------|---------------|------|------|--------|------|------|-------|
|                        |                                             | MIN           | TYP  | MAX  | MIN    | TYP  | MAX  |       |
| Reference Section      |                                             |               |      |      |        |      |      |       |
| Output Voltage         | T <sub>J</sub> = 25°C, I <sub>O</sub> = 1mA | 5.05          | 5.10 | 5.15 | 5.00   | 5.10 | 5.20 | V     |
| Line Regulation        | V <sub>IN</sub> = 8V to 40V                 |               |      | 20   |        |      | 20   | mV    |
| Load Regulation        | I <sub>O</sub> = -1mA to -10mA              |               |      | 15   |        |      | 15   | mV    |
| Total Output Variation | Line, Load, and Temperature                 | 5.00          |      | 5.20 | 4.95   |      | 5.25 | V     |
| Output Noise Voltage   | 10Hz < f < 10kHz, T <sub>J</sub> = 25°C     |               | 50   |      |        | 50   |      | μV    |
| Long Term Stability    | T <sub>J</sub> = 125°C, 1000 Hrs (Note 2)   |               | 5    | 25   |        | 5    | 25   | mV    |
| Short Circuit Current  | VREF = 0V                                   | -25           | -45  | -65  | -25    | -45  | -65  | mA    |
| Oscillator Section     |                                             |               |      |      |        |      |      |       |
| Initial Accuracy       | T <sub>J</sub> = 25°C                       | 180           | 200  | 220  | 180    | 200  | 220  | kHz   |
|                        | Over Operating Range                        | 170           |      | 230  | 170    |      | 230  | kHz   |

**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, these specifications apply for  $T_A = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  for UC1856;  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  for the UC2856; and  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  for the UC3856,  $V_{IN} = 15\text{V}$ ,  $R_T = 10\text{k}$ ,  $C_T = 1\text{nF}$ ,  $T_A = T_J$ .

| PARAMETER                                       | TEST CONDITIONS                                 | UC1856/UC2856 |      |       | UC3856 |      |       | UNITS |
|-------------------------------------------------|-------------------------------------------------|---------------|------|-------|--------|------|-------|-------|
|                                                 |                                                 | MIN           | TYP  | MAX   | MIN    | TYP  | MAX   |       |
| Oscillator Section (cont.)                      |                                                 |               |      |       |        |      |       |       |
| Voltage Stability                               | VIN = 8V to 40V                                 |               |      | 2     |        |      | 2     | %     |
| Discharge Current                               | TJ = 25°C, VCT = 2V                             | 7.5           | 8.0  | 8.8   | 7.5    | 8.0  | 8.8   | mA    |
|                                                 | VCT = 2V                                        | 6.7           | 8.0  | 8.8   | 6.7    | 8.0  | 8.8   | mA    |
| Sync Output High Level                          | IO = −1mA                                       | 2.4           | 3.6  |       | 2.4    | 3.6  |       | V     |
| Sync Output Low Level                           | IO = +1mA                                       |               | 0.2  | 0.4   |        | 0.2  | 0.4   | V     |
| Sync Input High Level                           | CT = 0V, RT = VREF                              | 2.0           | 1.5  |       | 2.0    | 1.5  |       | V     |
| Sync Input Low Level                            | CT = 0V, RT = VREF                              |               | 1.5  | 0.8   |        | 1.5  | 0.8   | V     |
| Sync Input Current                              | CT = 0V, RT = VREF VSYNC = 5V                   |               | 1    | 10    |        | 1    | 10    | μA    |
| Sync Delay to Outputs                           | CT = 0V, RT = VREF VSYNC = 0.8V to 2V           |               | 50   | 100   |        | 50   | 100   | ns    |
| Error Amplifier Section                         |                                                 |               |      |       |        |      |       |       |
| Input Offset Voltage                            | VCM = 2V                                        |               |      | 5     |        |      | 10    | mV    |
| Input Bias Current                              |                                                 |               |      | −1    |        |      | −1    | μA    |
| Input Offset Current                            |                                                 |               |      | 500   |        |      | 500   | nA    |
| Common Mode Range                               | VIN = 8V to 40V                                 | 0             |      | VIN-2 | 0      |      | VIN-2 | V     |
| Open Loop Gain                                  | VO = 1.2V to 3V                                 | 80            | 100  |       | 80     | 100  |       | dB    |
| Unity Gain Bandwidth                            | TJ = 25°C                                       | 1             | 1.5  |       | 1      | 1.5  |       | MHz   |
| CMRR                                            | VCM = 0V to 38V, VIN = 40V                      | 75            | 100  |       | 75     | 100  |       | dB    |
| PSRR                                            | VIN = 8V to 40V                                 | 80            | 100  |       | 80     | 100  |       | dB    |
| Output Sink Current                             | VID = −15mV, VCOMP = 1.2V                       | 5             | 10   |       | 5      | 10   |       | mA    |
| Output Source Current                           | VID = 15mV, VCOMP = 2.5V                        | −0.4          | −0.5 |       | −0.4   | −0.5 |       | mA    |
| Output High Level                               | VID = 50mV, RL (COMP) = 15k                     | 4.3           | 4.6  | 4.9   | 4.3    | 4.6  | 4.9   | V     |
| Output Low Level                                | VID = −50mV, RL (COMP) = 15k                    |               | 0.7  | 1     |        | 0.7  | 1     | V     |
| Current Sense Amplifier Section                 |                                                 |               |      |       |        |      |       |       |
| Amplifier Gain                                  | VCS− = 0V, CL SS Open (Notes 3,4)               | 2.5           | 2.75 | 3.0   | 2.5    | 2.75 | 3.0   | V/V   |
| Maximum Differential Input Signal (VCS+ - VCS−) | CL SS Open (Note 3)<br>RL (COMP) = 15k          | 1.1           | 1.2  |       | 1.1    | 1.2  |       | V     |
| Input Offset Voltage                            | VCL SS = 0.5VCOMP Open (Note 3)                 |               | 5    | 35    |        | 5    | 35    | mV    |
| CMRR                                            | VCM = 0V to 3V                                  | 60            |      |       | 60     |      |       | dB    |
| PSRR                                            | VIN = 8V to 40V                                 | 60            |      |       | 60     |      |       | dB    |
| Input Bias Current                              | VCL SS = 0.5V, COMP Open (Note 3)               | −1            |      | 1     | −1     |      | 1     | μA    |
| Input Offset Current                            | VCL SS = 0.5V, COMP Open (Note 3)               | −1            |      | 1     | −1     |      | 1     | μA    |
| Input Common Mode Range                         |                                                 | 0             |      | 3     | 0      |      | 3     | V     |
| Delay to Outputs                                | VEA+ = VREF, EA− = 0V<br>CS+ − CS− = 0V to 1.5V |               | 120  | 250   |        | 120  | 250   | ns    |
| Current Limit Adjust Section                    |                                                 |               |      |       |        |      |       |       |
| Current Limit Offset                            | VCS− = 0V VCS+ = 0V,<br>COMP = Open (Note 3)    | 0.43          | 0.5  | 0.57  | 0.43   | 0.5  | 0.57  | V     |
| Input Bias Current                              | VEA+ = VREF, VEA− = 0V                          |               | −10  | −30   |        | −10  | −30   | μA    |
| Shutdown Terminal Section                       |                                                 |               |      |       |        |      |       |       |
| Threshold Voltage                               |                                                 | 0.95          | 1.00 | 1.05  | 0.95   | 1.00 | 1.05  | V     |
| Input Voltage Range                             |                                                 | 0             |      | 5     | 0      |      | 5     | V     |

**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, these specifications apply for  $T_A = -55^\circ\text{C}$  to  $+125^\circ\text{C}$  for UC1856;  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  for the UC2856; and  $0^\circ\text{C}$  to  $+70^\circ\text{C}$  for the UC3856,  $V_{IN} = 15\text{V}$ ,  $R_T = 10\text{k}$ ,  $C_T = 1\text{nF}$ ,  $T_A = T_J$ .

| PARAMETER                                          | TEST CONDITIONS                               | UC1856/UC2856 |      |     | UC3856 |      |     | UNITS |
|----------------------------------------------------|-----------------------------------------------|---------------|------|-----|--------|------|-----|-------|
|                                                    |                                               | MIN           | TYP  | MAX | MIN    | TYP  | MAX |       |
| Shutdown Terminal Section (cont.)                  |                                               |               |      |     |        |      |     |       |
| Minimum Latching Current (I <sub>CL SS</sub> )     | (Note 5)                                      | 3             | 1.5  |     | 3      | 1.5  |     | mA    |
| Maximum Non-Latching Current (I <sub>CL SS</sub> ) | (Note 6)                                      |               | 1.5  | 0.8 |        | 1.5  | 0.8 | mA    |
| Delay to Outputs                                   | V <sub>SHUTDOWN</sub> = 0 to 1.3V             |               | 65   | 110 |        | 65   | 110 | ns    |
| Output Section                                     |                                               |               |      |     |        |      |     |       |
| Collector-Emitter Voltage                          |                                               | 40            |      |     | 40     |      |     | V     |
| Off-State Bias Current                             | V <sub>C</sub> = 40V                          |               |      | 250 |        |      | 250 | μA    |
| Output Low Level                                   | I <sub>OUT</sub> = 20mA                       |               | 0.1  | 0.5 |        | 0.1  | 0.5 | V     |
|                                                    | I <sub>OUT</sub> = 200mA                      |               | 0.5  | 2.6 |        | 0.5  | 2.6 | V     |
| Output High Level                                  | I <sub>OUT</sub> = −20mA                      | 12.5          | 13.2 |     | 12.5   | 13.2 |     | V     |
|                                                    | I <sub>OUT</sub> = −200mA                     | 12            | 13.1 |     | 12     | 13.1 |     | V     |
| Rise Time                                          | C1 = 1nF                                      |               | 40   | 80  |        | 40   | 80  | ns    |
| Fall Time                                          | C1 = 1nF                                      |               | 40   | 80  |        | 40   | 80  | ns    |
| UVLO Low Saturation                                | V <sub>IN</sub> = 0V, I <sub>OUT</sub> = 20mA |               | 0.8  | 1.5 |        | 0.8  | 1.5 | V     |
| PWM Section                                        |                                               |               |      |     |        |      |     |       |
| Maximum Duty Cycle                                 |                                               | 45            | 47   | 50  | 45     | 47   | 50  | %     |
| Minimum Duty Cycle                                 |                                               |               |      | 0   |        |      | 0   | %     |
| Undervoltage Lockout Section                       |                                               |               |      |     |        |      |     |       |
| Startup Threshold                                  |                                               |               | 7.7  | 8.0 |        | 7.7  | 8.0 | V     |
| Threshold Hysteresis                               |                                               |               | 0.7  |     |        | 0.7  |     | V     |
| Total Standby Current                              |                                               |               |      |     |        |      |     |       |
| Supply Current                                     |                                               |               | 18   | 23  |        | 18   | 23  | mA    |

Note 1: All voltages are with respect to GND. Currents are positive into, negative out of the specified terminal.

Note 2: This parameter, although guaranteed over the recommended operating conditions is not 100% tested in production.

Note 3: Parameter measured at trip point of latch with  $V_{EA+} = V_{REF}$ ,  $V_{EA-} = 0\text{V}$ .

Note 4: Amplifier gain defined as:

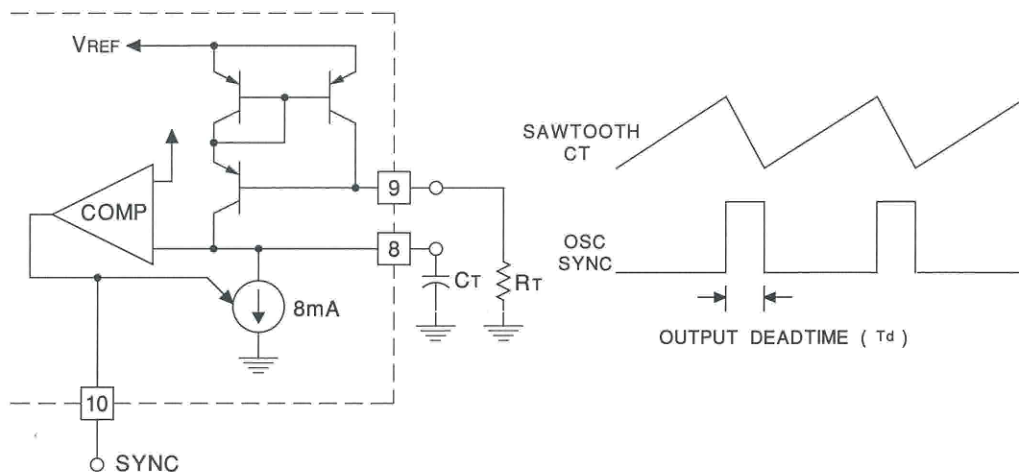
$$G = \frac{\Delta V_{COMP}}{\Delta V_{CS+}}; \quad \Delta V_{CS-} = 0\text{V TO } 1.0\text{V}$$

Note 5: Current into CL SS guaranteed to latch circuit into shutdown state.

Note 6: Current into CL SS guaranteed not to latch circuit into shutdown state.

## APPLICATIONS INFORMATION

### Oscillator Circuit



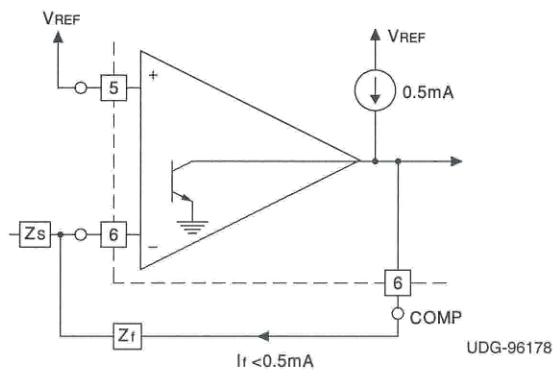
Output deadtime is determined by size of the external capacitor,  $C_T$ , according to the formula:  $T_d = \frac{2C_T}{8mA - \frac{3.6}{R_T}}$

For large values of  $R_T$ :  $T_d = 250C_T$

Oscillator frequency is approximated by the formula:  $f_T = \frac{2}{R_T C_T}$

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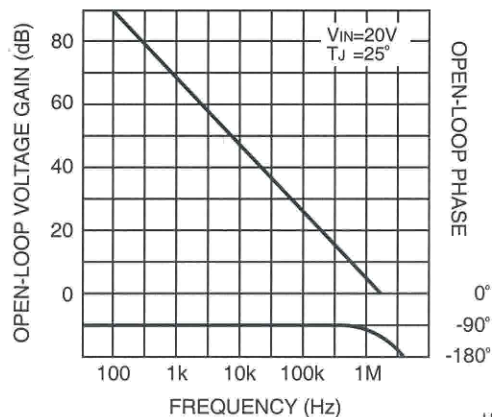
### Error Amplifier Output Configuration



Error Amplifier can source up to 0.5mA.

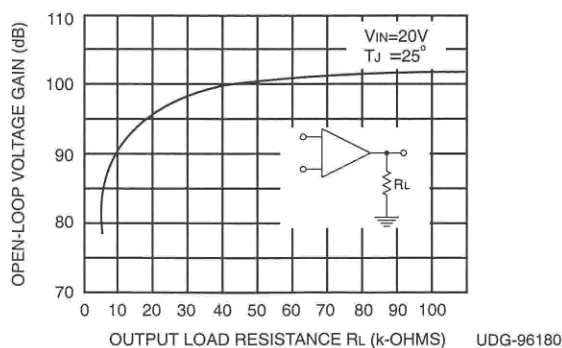
UDG-96178

### Error Amplifier Gain and Phase vs Frequency



UDG-96179

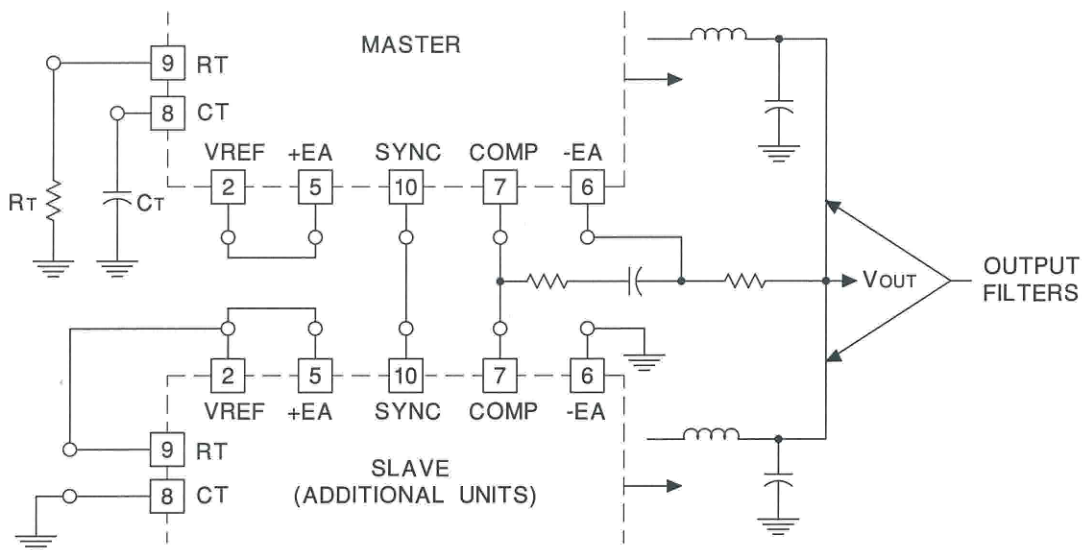
### Error Amplifier Open-Loop D.C. Gain vs Load Resistance



UDG-96180

## APPLICATIONS INFORMATION (cont.)

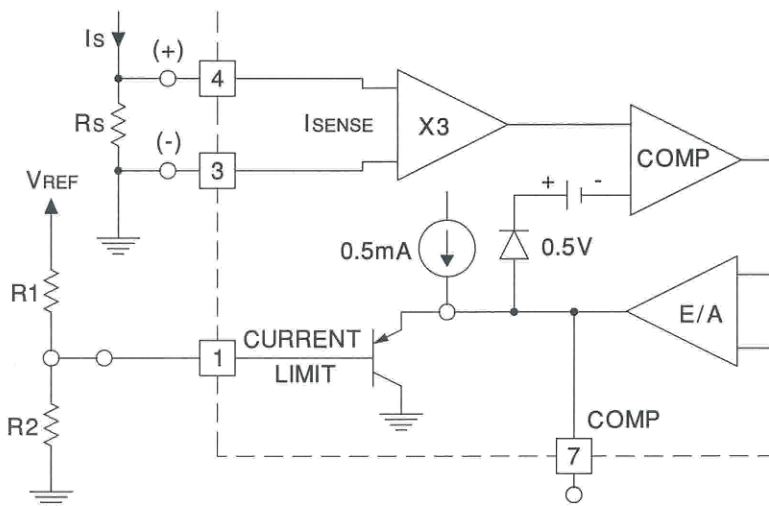
### Parallel Operation



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Slaving allows parallel operation of two or more units with equal current sharing.

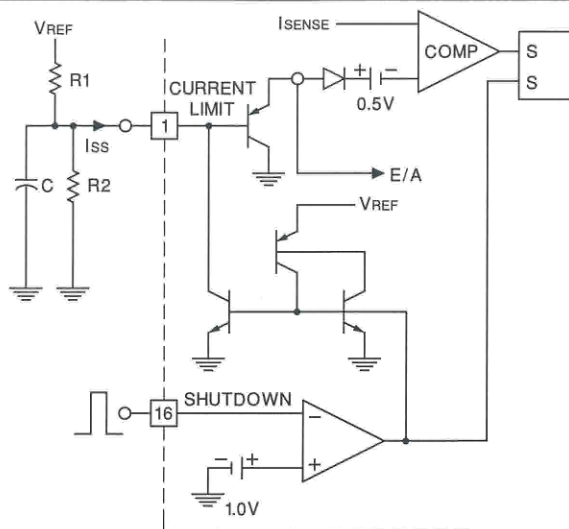
### Pulse by Pulse Current Limiting



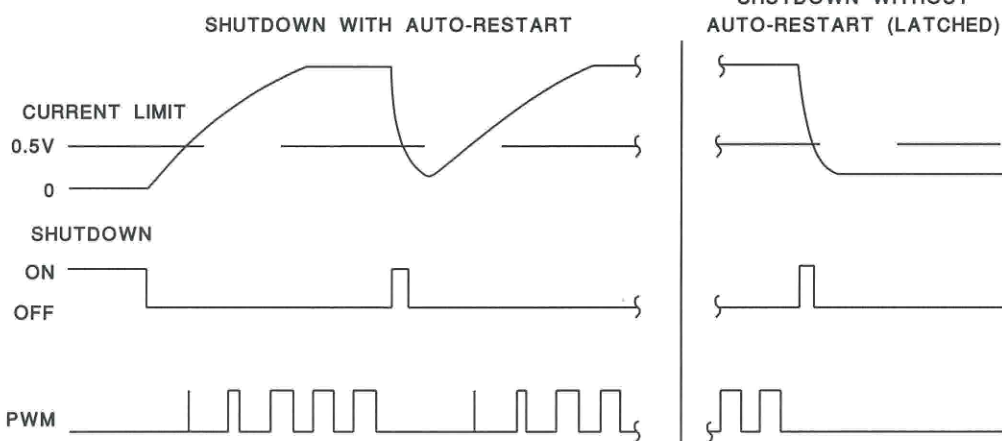
UDG-96182

Peak current ( $I_s$ ) is determined by the formula: 
$$I_s = \frac{\left( \frac{R_2 V_{REF}}{R_1 + R_2} \right) - 0.5}{3R_s}$$

## APPLICATIONS INFORMATION (cont.)



UDG-96183

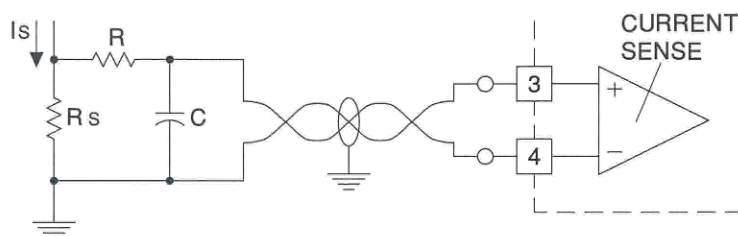


UDG-96184

If  $\frac{V_{REF}}{R1} < 0.8\text{mA}$ , the shutdown latch will commutate when  $I_{ss} = 0.8\text{mA}$  and a restart cycle will be initiated.

If  $\frac{V_{REF}}{R1} > 3\text{mA}$ , the device will latch off until power is recycled.

## Current Sense Amplifier Connections

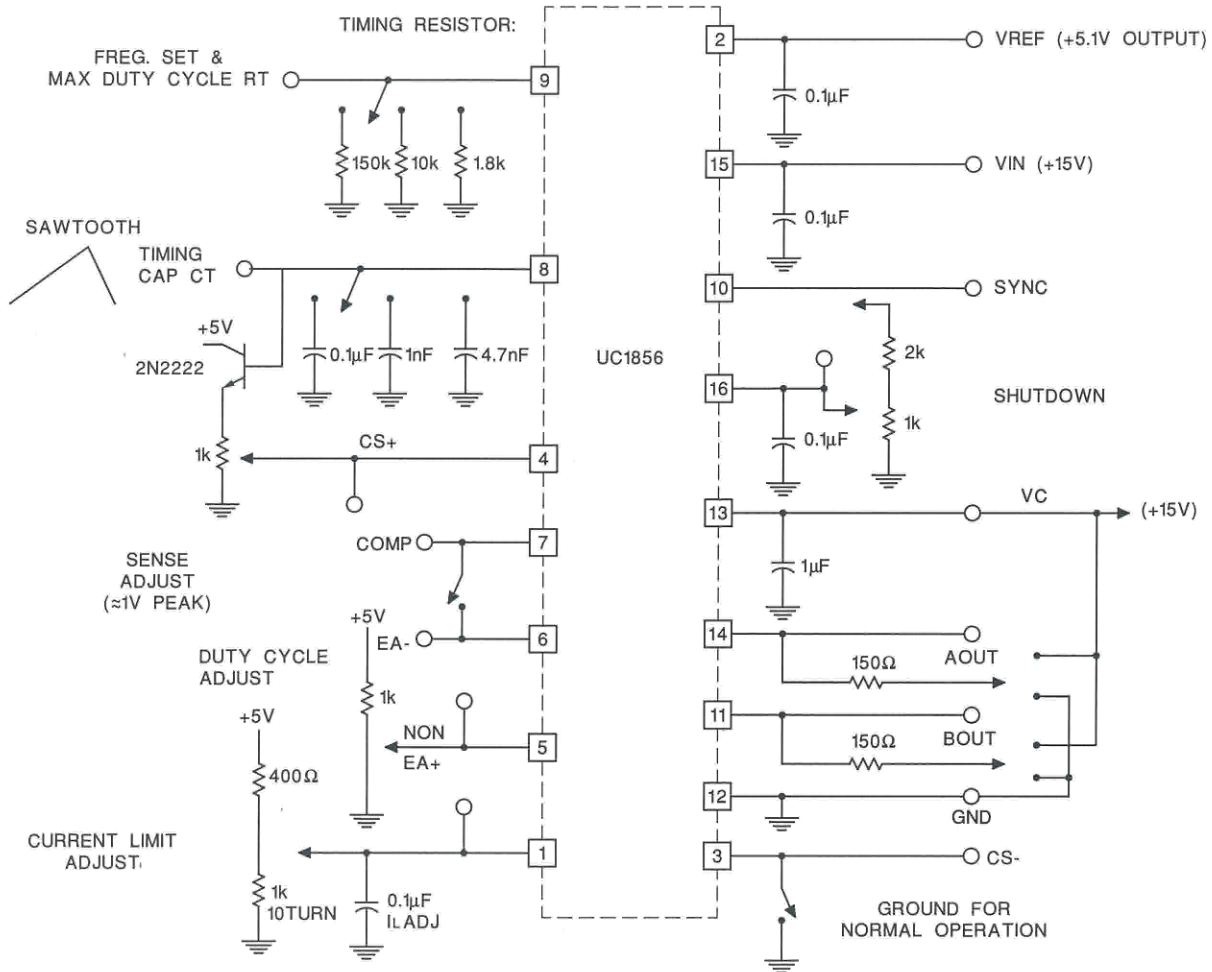


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A small RC filter may be required in some applications to reduce switch transients. Differential input allows remote, noise sensing.

# APPLICATIONS INFORMATION (cont.)

## UC1856 Open Loop Test Circuit



- BYPASS CAPS SHOULD BE LOW ESR & ESL TYPE

- SHORT E/A- & COMP FOR UNITY GAIN TESTING

**THE USE OF A GROUND PLANE IS HIGHLY RECOMMENDED**

UDG-96186

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| 5962-9453001M2A  | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| 5962-9453001MEA  | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| UC1856J          | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| UC1856J883B      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| UC1856L          | OBSOLETE              | TO/SOT       | L               | 28   |             | TBD                        | Call TI              | Call TI                      |                             |
| UC1856L20        | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           |                             |
| UC1856L20883B    | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           |                             |
| UC1856L883B      | OBSOLETE              | TO/SOT       | L               | 28   |             | TBD                        | Call TI              | Call TI                      |                             |
| UC2856DW         | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC2856DWG4       | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC2856DWTR       | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC2856DWTRG4     | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC2856J          | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| UC2856N          | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| UC2856NG4        | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| UC3856DW         | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC3856DWG4       | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC3856DWTR       | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC3856DWTRG4     | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| UC3856N          | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| UC3856NG4        | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| UC3856Q          | ACTIVE                | PLCC         | FN              | 20   | 46          | Green (RoHS<br>& no Sb/Br) | CU SN                | Level-2-260C-1 YEAR          |                             |
| UC3856QG3        | ACTIVE                | PLCC         | FN              | 20   | 46          | Green (RoHS<br>& no Sb/Br) | CU SN                | Level-2-260C-1 YEAR          |                             |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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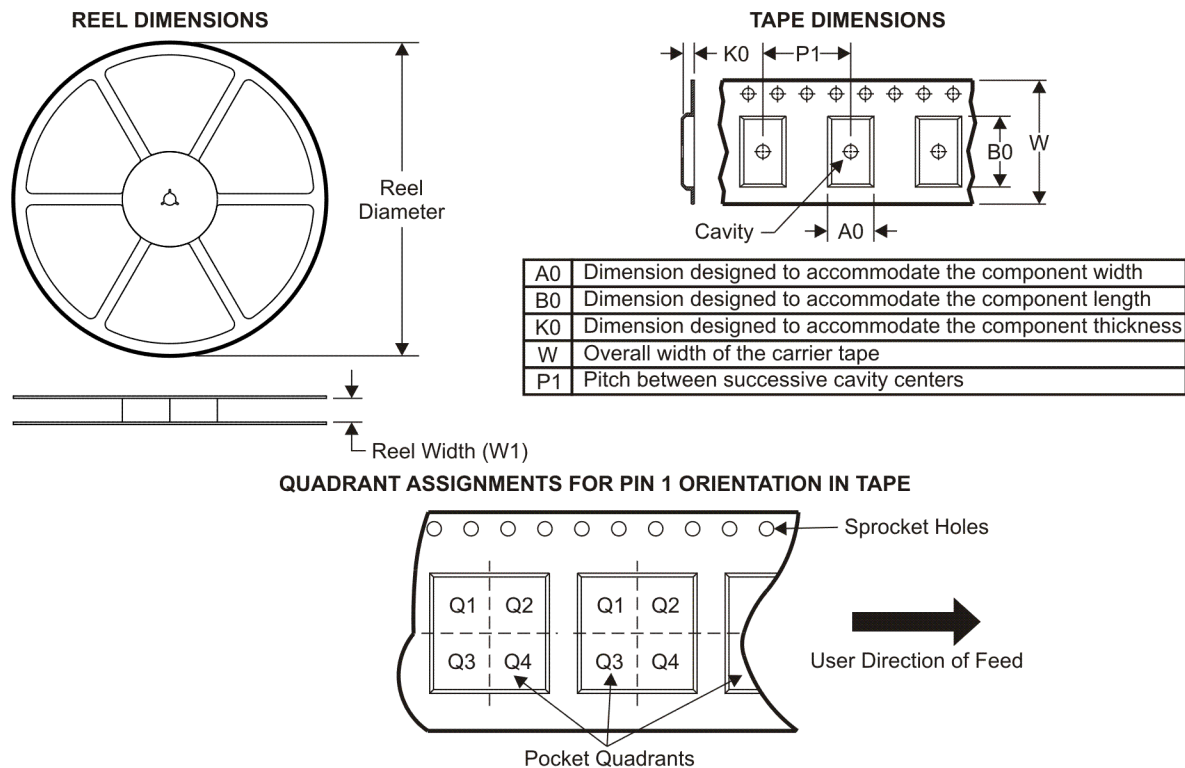
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#### OTHER QUALIFIED VERSIONS OF UC1856, UC2856, UC2856M, UC3856 :

- Catalog: [UC3856](#), [UC2856](#)
- Automotive: [UC2856-Q1](#), [UC2856-Q1](#)
- Military: [UC2856M](#), [UC1856](#)

NOTE: Qualified Version Definitions:

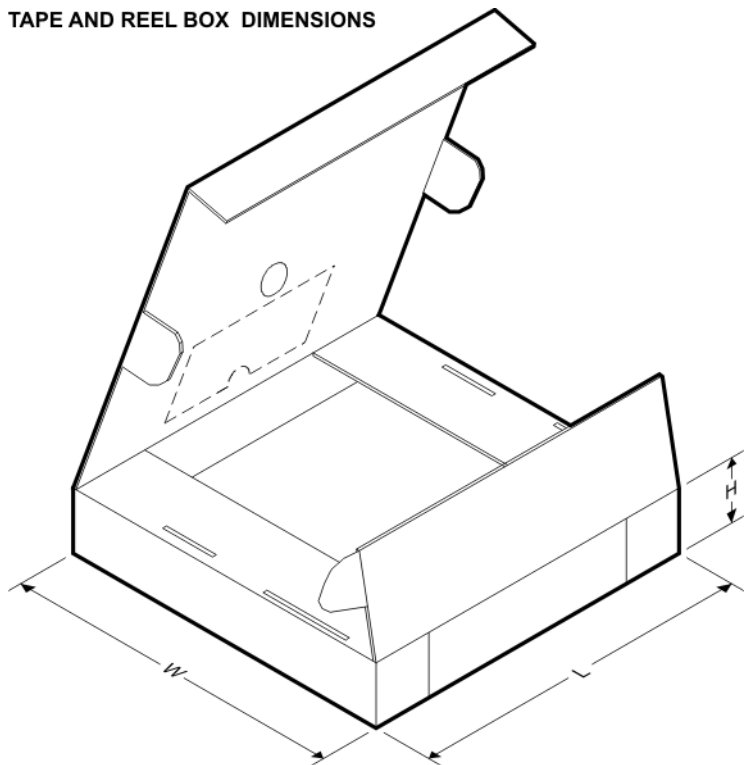
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| UC2856DWTR | SOIC         | DW              | 16   | 2000 | 330.0              | 16.4               | 10.85   | 10.8    | 2.7     | 12.0    | 16.0   | Q1            |
| UC3856DWTR | SOIC         | DW              | 16   | 2000 | 330.0              | 16.4               | 10.85   | 10.8    | 2.7     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| UC2856DWTR | SOIC         | DW              | 16   | 2000 | 346.0       | 346.0      | 33.0        |
| UC3856DWTR | SOIC         | DW              | 16   | 2000 | 346.0       | 346.0      | 33.0        |

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|                               |                                                                                          |
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