

# Advanced Regulating Pulse Width Modulators

## FEATURES

- Fully Interchangeable with Standard UC1524 Family
- Precision Reference Internally Trimmed to  $\pm 1\%$
- High-Performance Current Limit Function
- Under-Voltage Lockout with Hysteretic Turn-on
- Start-Up Supply Current Less Than 4mA
- Output Current to 200mA
- 60V Output Capability
- Wide Common-Mode Input Range for both Error and Current Limit Amplifiers
- PWM Latch Insures Single Pulse per Period
- Double Pulse Suppression Logic
- 200ns Shutdown through PWM Latch
- Ensured Frequency Accuracy
- Thermal Shutdown Protection

## DESCRIPTION

The UC1524A family of regulating PWM ICs has been designed to retain the same highly versatile architecture of the industry standard UC1524 (SG1524) while offering substantial improvements to many of its limitations. The UC1524A is pin compatible with "non-A" models and in most existing applications can be directly interchanged with no effect on power supply performance. Using the UC1524A, however, frees the designer from many concerns which typically had required additional circuitry to solve.

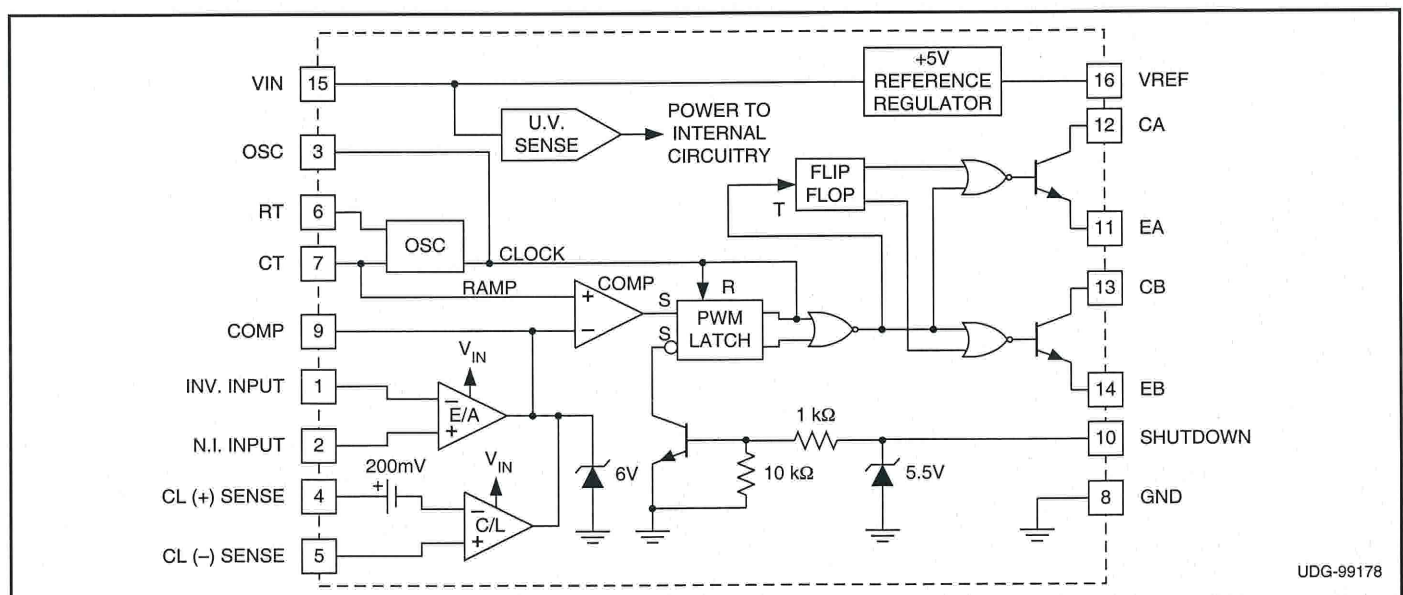
The UC1524A includes a precise 5V reference trimmed to  $\pm 1\%$  accuracy, eliminating the need for potentiometer adjustments; an error amplifier with an input range which includes 5V, eliminating the need for a reference divider; a current sense amplifier useful in either the ground or power supply output lines; and a pair of 60V, 200mA uncommitted transistor switches which greatly enhance output versatility.

An additional feature of the UC1524A is an under-voltage lockout circuit which disables all the internal circuitry, except the reference, until the input voltage has risen to 8V. This holds standby current low until turn-on, greatly simplifying the design of low power, off-line supplies. The turn-on circuit has approximately 600mV of hysteresis for jitter-free activation.

Other product enhancements included in the UC1524A's design include a PWM latch which insures freedom from multiple pulsing within a period, even in noisy environments, logic to eliminate double pulsing on a single output, a 200ns external shutdown capability, and automatic thermal protection from excessive chip temperature. The oscillator circuit of the UC1524A is usable beyond 500kHz and is now easier to synchronize with an external clock pulse.

The UC1524A is packaged in a hermetic 16-pin DIP and is rated for operation from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . The UC2524A and 3524A are available in either ceramic or plastic packages and are rated for operation from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  and  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ , respectively. Surface mount devices are also available.

## BLOCK DIAGRAM



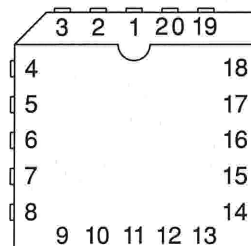
### ABSOLUTE MAXIMUM RATINGS

|   |                 |
|---|-----------------|
| Supply Voltage (V <sub>IN</sub> )           | 40V             |
| Collector Supply Voltage (V <sub>C</sub> )  | 60V             |
| Output Current (each Output)                | 200mA           |
| Maximum Forced Voltage (Pin 9, 10)          | -3 to +5V       |
| Maximum Forced Current (Pin 9, 10)          | ±10mA           |
| Reference Output Current                    | 50mA            |
| Oscillator Charging Current                 | 5mA             |
| Power Dissipation at T <sub>A</sub> = +25°C | 1000mW          |
| Power Dissipation at T <sub>C</sub> = +25°C | 2000mW          |
| Operating Temperature Range                 | -55°C to +125°C |
| Storage Temperature Range                   | -65°C to +150°C |
| Lead Temperature, (Soldering, 10 seconds)   | +300°C          |

Note: Consult packaging section of Databook for thermal limitations and considerations of package.

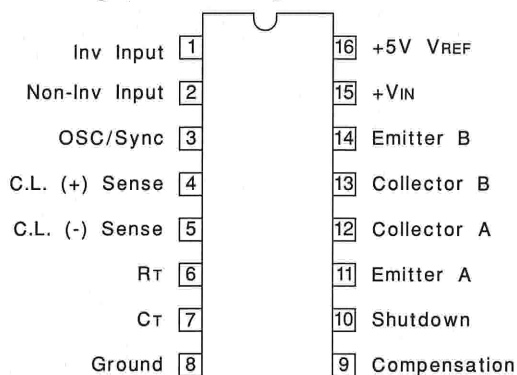
### CONNECTION DIAGRAMS

PLCC-20, LCC-20 (TOP VIEW)  
Q or L Package



| PACKAGE PIN FUNCTION |     |
|----------------------|-----|
| FUNCTION             | PIN |
| N/C                  | 1   |
| Inv. Input           | 2   |
| Non-Inv. Input       | 3   |
| OSC/SYNC             | 4   |
| C.L. (+) sense       | 5   |
| N/C                  | 6   |
| C.L. (-) sense       | 7   |
| R <sub>T</sub>       | 8   |
| C <sub>T</sub>       | 9   |
| Ground               | 10  |
| N/C                  | 11  |
| Compensation         | 12  |
| Shutdown             | 13  |
| Emitter A            | 14  |
| Collector A          | 15  |
| N/C                  | 16  |
| Collector B          | 17  |
| Emitter B            | 18  |
| +V <sub>IN</sub>     | 19  |
| +5V V <sub>REF</sub> | 20  |

DIL-16, SOIC-16 (TOP VIEW)  
J or N Package, DW Package



**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, these specifications apply for T<sub>A</sub> = -55°C to +125°C for the UC1524A, -40° to +85°C for the UC2524A, and 0°C to +70°C for the UC3524A; V<sub>IN</sub> = V<sub>C</sub> = 20V, T<sub>A</sub> = T<sub>J</sub>.

| PARAMETER                      | TEST CONDITIONS                                     | UC1524A / UC2524A |      |      | UC3524A |      |      | UNITS             |
|--------------------------------|---|-------------------|------|------|---------|------|------|-------------------|
|                                |   | MIN               | TYP  | MAX  | MIN     | TYP  | MAX  |                   |
| <b>Turn-on Characteristics</b> |   |                   |      |      |         |      |      |                   |
| Input Voltage                  | Operating Range after Turn-on                       | 8                 |      | 40   | 8       |      | 40   | V                 |
| Turn-on Threshold              |   | 6.5               | 7.5  | 8.5  | 6.5     | 7.5  | 8.5  | V                 |
| Turn-on Current                | V <sub>IN</sub> = 6V                                |                   | 2.5  | 4    |         | 2.5  | 4    | mA                |
| Operating Current              | V <sub>IN</sub> = 8 to 40V                          |                   | 5    | 10   |         | 5    | 10   | mA                |
| Turn-on Hysteresis*            |   |                   | 0.5  |      |         | 0.5  |      | V                 |
| <b>Reference Section</b>       |   |                   |      |      |         |      |      |                   |
| Output Voltage                 | T <sub>J</sub> = 25°C                               | 4.95              | 5.00 | 5.05 | 4.90    | 5.00 | 5.10 | V                 |
|                                | Over Operating Range                                | 4.9               |      | 5.1  | 4.85    |      | 5.15 | V                 |
| Line Regulation                | V <sub>IN</sub> = 10 to 40V                         |                   | 10   | 20   |         | 10   | 30   | mV                |
| Load Regulation                | I <sub>L</sub> = 0 to 20 mA                         |                   | 20   | 25   |         | 20   | 35   | mV                |
| Temperature Stability*         | Over Operating Range*                               |                   | 20   | 25   |         | 20   | 35   | mV                |
| Short Circuit Current          | V <sub>REF</sub> = 0, 25°C ≤ T <sub>J</sub> ≤ 125°C |                   | 80   | 100  |         | 80   | 100  | mA                |
| Output Noise Voltage*          | 10Hz ≤ f ≤ 10kHz, T <sub>J</sub> = 25°C             |                   | 40   |      |         | 40   |      | μV <sub>rms</sub> |
| Long Term Stability*           | T <sub>J</sub> = 125°C, 1000 Hrs.                   |                   | 20   | 50   |         | 20   | 50   | mV                |

\* These parameters are ensured by design but not 100% tested in production.

**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, these specifications apply for  $T_A = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  for the UC1524A,  $-40^{\circ}$  to  $+85^{\circ}\text{C}$  for the UC2524A, and  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  for the UC3524A;  $V_{IN} = V_C = 20\text{V}$ ,  $T_A = T_J$ .

| PARAMETER   | TEST CONDITIONS   | UC1524A / UC2524A |      |      | UC3524A |      |      | UNITS                        |
|---|---|-------------------|------|------|---------|------|------|------------------------------|
|   |   | MIN               | TYP  | MAX  | MIN     | TYP  | MAX  |                              |
| <b>Oscillator Section</b> (Unless otherwise specified, $R_T = 2700\Omega$ , $C_T = 0.01\text{ mfd}$ ) |   |                   |      |      |         |      |      |                              |
| Initial Accuracy  | $T_J = 25^{\circ}\text{C}$  | 41                | 43   | 45   | 39      | 43   | 47   | kHz                          |
|   | Over Operating Range  | 40.2              |      | 45.9 | 38.2    |      | 47.9 | kHz                          |
| Temperature Stability*  | Over Operating Temperature Range  |                   | 1    | 2    |         | 1    | 2    | %                            |
| Minimum Frequency   | $R_T = 150\text{k}\Omega$ , $C_T = 0.1\text{ mfd}$                            |                   |      | 140  |         |      | 120  | Hz                           |
| Maximum Frequency   | $R_T = 2.0\text{k}\Omega$ , $C_T = 470\text{pF}$                              | 500               |      |      | 500     |      |      | kHz                          |
| Output Amplitude*   |   | 3                 | 3.5  |      | 3       | 3.5  |      | V                            |
| Output Pulse Width*   |   | 0.29              | 0.5  | 1.0  | 0.3     | 0.5  | 1.0  | $\mu\text{s}$                |
| Ramp Peak   |   | 3.3               | 3.5  | 3.7  | 3.3     | 3.5  | 3.7  | V                            |
| Ramp Valley   | $T_J = 25^{\circ}\text{C}$  | 0.7               | 0.8  | 0.9  | 0.7     | 0.8  | 0.9  | V                            |
| Ramp Valley T.C.  |   |                   | -1.0 |      |         | -1.0 |      | $\text{mV}/^{\circ}\text{C}$ |
| <b>Error Amplifier Section</b> (Unless otherwise specified, $V_{CM} = 2.5\text{V}$ )                  |   |                   |      |      |         |      |      |                              |
| Input Offset Voltage  |   |                   | 0.5  | 5    |         | 2    | 10   | mV                           |
| Input Bias Current  |   |                   | 1    | 5    |         | 1    | 10   | $\mu\text{A}$                |
| Input Offset Current  |   |                   | .05  | 1    |         | 0.5  | 1    | $\mu\text{A}$                |
| Common Mode Rejection Ratio   | $V_{CM} = 1.5$ to $5.5\text{V}$   | 70                | 80   |      | 70      | 80   |      | dB                           |
| Power Supply Rejection Ratio  | $V_{IN} = 10$ to $40\text{V}$   | 70                | 80   |      | 70      | 80   |      | dB                           |
| Output Swing (Note 1)   |   | 5.0               |      | 0.5  | 5.0     |      | 0.5  | V                            |
| Open Loop Voltage Gain  | $\Delta V_O = 1$ to $4\text{V}$ , $R_L \geq 10\text{M}\Omega$                 | 72                | 80   |      | 64      | 80   |      | dB                           |
| Gain-Bandwidth*   | $T_J = 25^{\circ}\text{C}$ , $A_V = 0\text{dB}$                               | 1                 | 3    |      | 1       | 3    |      | MHz                          |
| DC Transconductance*§   | $T_J = 25^{\circ}\text{C}$ , $30\text{k}\Omega \leq R_L \leq 1\text{M}\Omega$ | 1.7               | 2.3  |      | 1.7     | 2.3  |      | mS                           |
| <b>P.W.M. Comparator</b> ( $R_T = 2\text{k}\Omega$ , $C_T = 0.01\text{ mfd}$ )                        |   |                   |      |      |         |      |      |                              |
| Minimum Duty Cycle  | $V_{COMP} = 0.5\text{V}$  |                   |      | 0    |         |      | 0    | %                            |
| Maximum Duty Cycle  | $V_{COMP} = 3.8\text{V}$  | 45                |      |      | 45      |      |      | %                            |
| <b>Current Limit Amplifier</b> (Unless otherwise specified, $\text{Pin } 5 = 0\text{V}$ )             |   |                   |      |      |         |      |      |                              |
| Input Offset Voltage  | $T_J = 25^{\circ}\text{C}$ , E/A Set for Maximum Output                       | 190               | 200  | 210  | 180     | 200  | 220  | mV                           |
|   | Over Operating Temperature Range  | 180               |      | 220  | 170     |      | 230  | mV                           |
| Input Bias Current  |   |                   | -1   | -10  |         | -1   | -10  | $\mu\text{A}$                |
| Common Mode Rejection Ratio   | $V_{(\text{pin } 5)} = -0.3\text{V}$ to $+5.5\text{V}$                        | 50                | 60   |      | 50      | 60   |      | dB                           |
| Power Supply Rejection Ratio  | $V_{IN} = 10$ to $40\text{V}$   | 50                | 60   |      | 50      | 60   |      | dB                           |
| Output Swing (Note 1)   | Minimum Total Range   | 5.0               |      | 0.5  | 5.0     |      | 0.5  | V                            |
| Open-Loop Voltage Gain  | $\Delta V_O = 1$ to $4\text{V}$ , $R_L \geq 10\text{M}\Omega$                 | 70                | 80   |      | 70      | 80   |      | dB                           |
| Delay Time*   | $\text{Pin } 4$ to $\text{Pin } 9$ , $\Delta V_{IN} = 300\text{mV}$           |                   | 300  |      |         | 300  |      | ns                           |
| <b>Output Section</b> (Each Output)   |   |                   |      |      |         |      |      |                              |
| Collector Emitter Voltage   | $I_C = 100\mu\text{A}$  | 60                | 80   |      | 60      | 80   |      | V                            |
| Collector Leakage Current   | $V_{CE} = 50\text{V}$   |                   | .1   | 20   |         | .1   | 20   | $\mu\text{A}$                |

\* These parameters are ensured by design but not 100% tested in production.

§ DC transconductance ( $gm$ ) relates to DC open-loop voltage gain according to the following equation:  $A_V = gmR_L$  where  $R_L$  is the resistance from pin 9 to the common mode voltage.

The minimum  $gm$  specification is used to calculate minimum  $A_V$  when the error amplifier output is loaded.

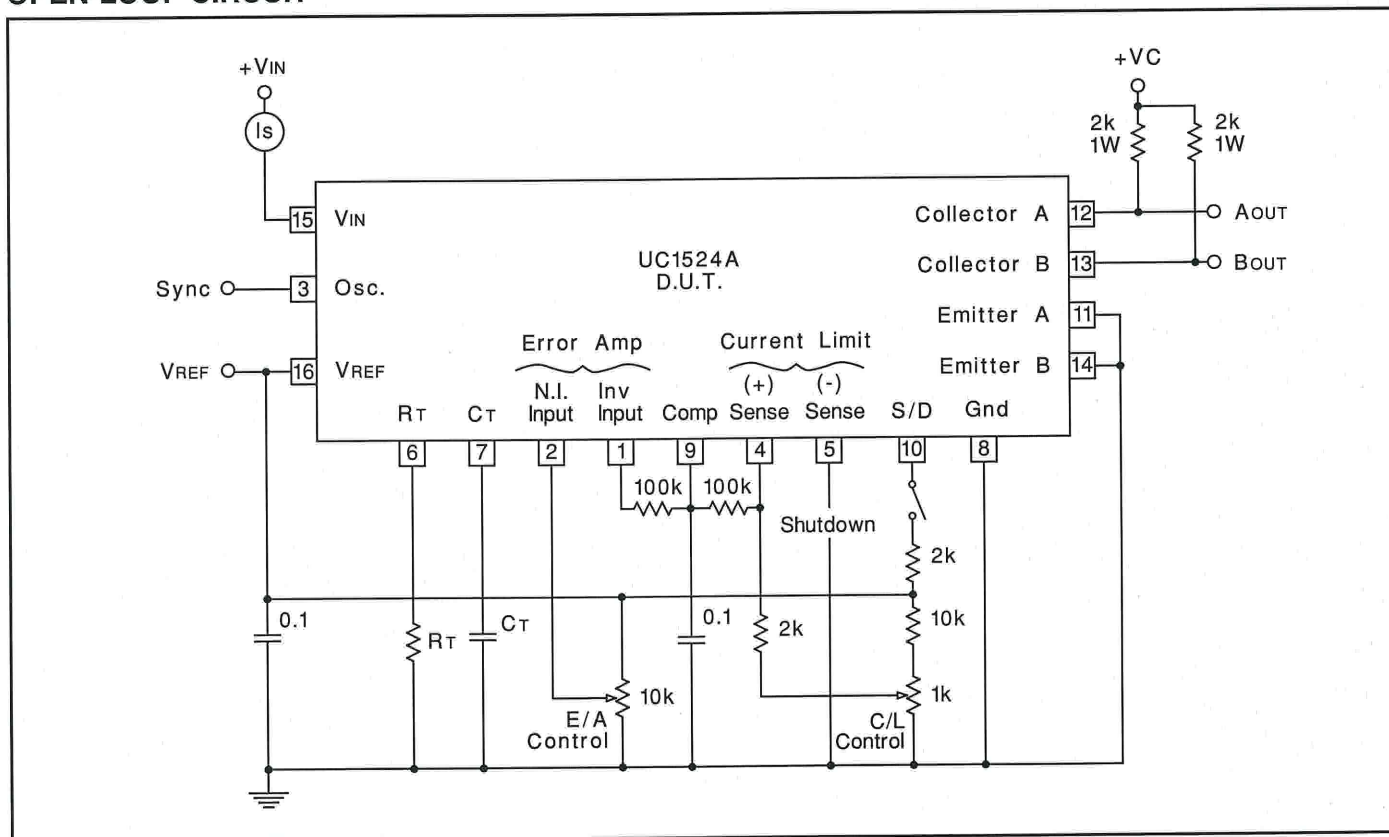
Note 1: Min Limit applies to output high level, max limit applies to output low level.

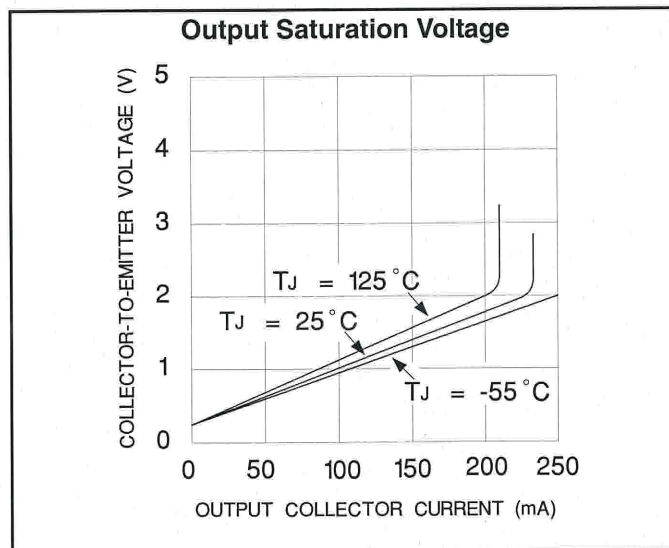
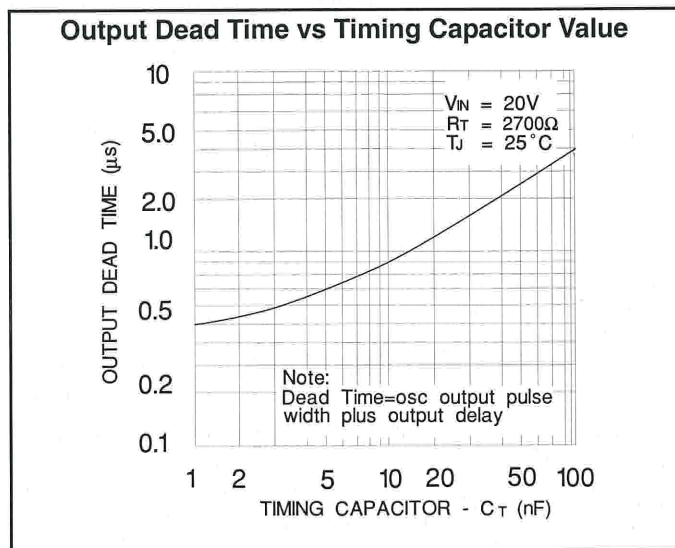
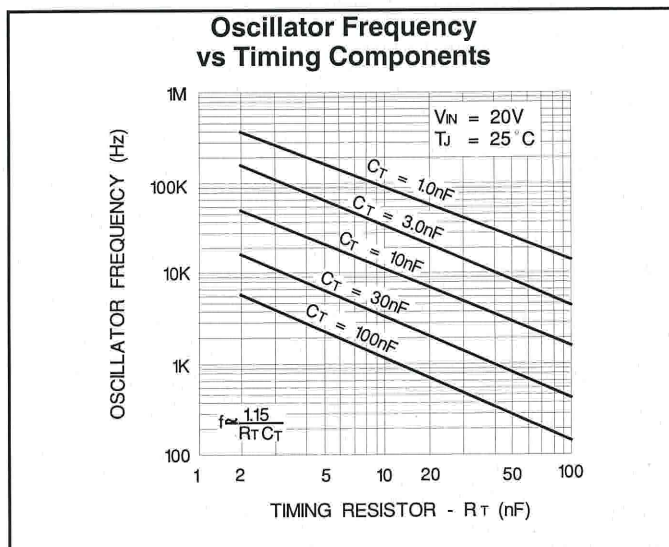
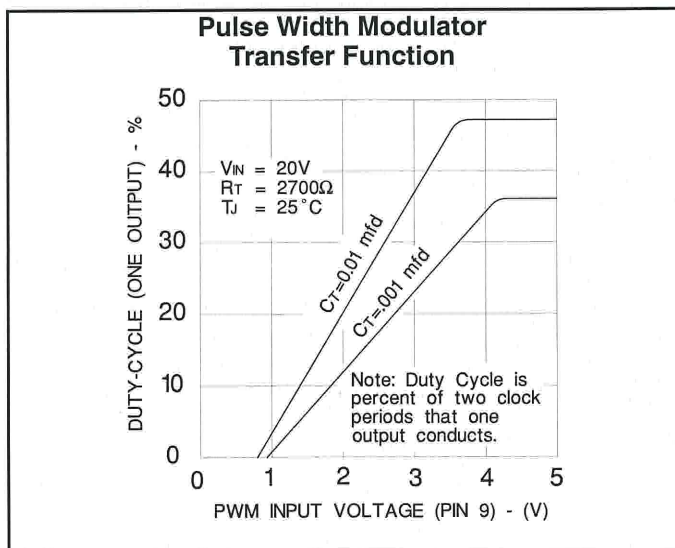
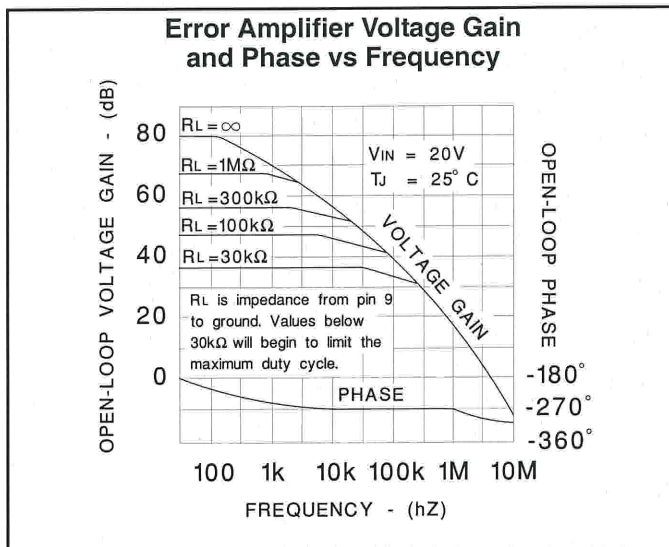
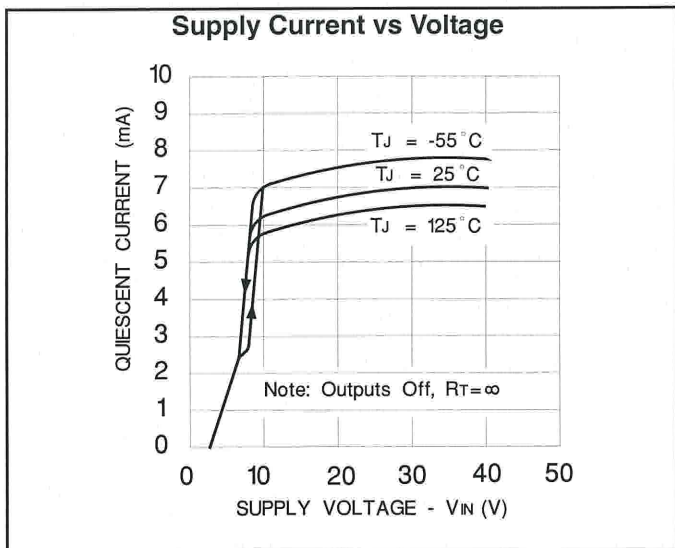
**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, these specifications apply for  $T_A = -55^\circ\text{C}$  to  $+125^\circ\text{C}$  for the UC1524A,  $-40^\circ$  to  $+85^\circ\text{C}$  for the UC2524A, and  $0^\circ\text{C}$  to  $+70^\circ\text{C}$  for the UC3524A;  $V_{IN} = V_C = 20\text{V}$ .  $T_A = T_J$ .

| PARAMETER                                    | TEST CONDITIONS                                    | UC1524A / UC2524A |     |     | UC3524A |     |     | UNITS            |
|--|--|-------------------|-----|-----|---------|-----|-----|------------------|
|  |  | MIN               | TYP | MAX | MIN     | TYP | MAX |                  |
| <b>Output Section ( cont.) (Each Output)</b> |  |                   |     |     |         |     |     |                  |
| Saturation Voltage                           | $I_C = 20\text{mA}$                                |                   | .2  | .4  |         | .2  | .4  | V                |
|  | $I_C = 200\text{mA}$                               |                   | 1   | 2.2 |         | 1   | 2.2 | V                |
| Emitter Output Voltage                       | $I_E = 50\text{mA}$                                | 17                | 18  |     | 17      | 18  |     | V                |
| Rise Time*                                   | $T_J = 25^\circ\text{C}$ , $R = 2\text{k}\Omega$   |                   | 120 | 400 |         | 120 | 400 | ns               |
| Fall Time*                                   | $T_J = 25^\circ\text{C}$ , $R = 2\text{k}\Omega$   |                   | 25  | 200 |         | 25  | 200 | ns               |
| Comparator Delay*                            | $T_J = 25^\circ\text{C}$ , Pin 9 to output         |                   | 300 |     |         | 300 |     | ns               |
| Shutdown Delay*                              | $T_J = 25^\circ\text{C}$ , Pin 10 to output        |                   | 200 |     |         | 200 |     | ns               |
| Shutdown Threshold                           | $T_J = 25^\circ\text{C}$ , $R_C = 2\text{k}\Omega$ | 0.6               | .7  | 1.0 | 0.6     | .7  | 1.0 | V                |
| S/D Threshold Over Temp.                     | Over Operating Temperature Range                   | 0.4               |     | 1.2 | 0.4     |     | 1.0 | V                |
| Thermal Shutdown*                            |  |                   | 165 |     |         | 165 |     | $^\circ\text{C}$ |

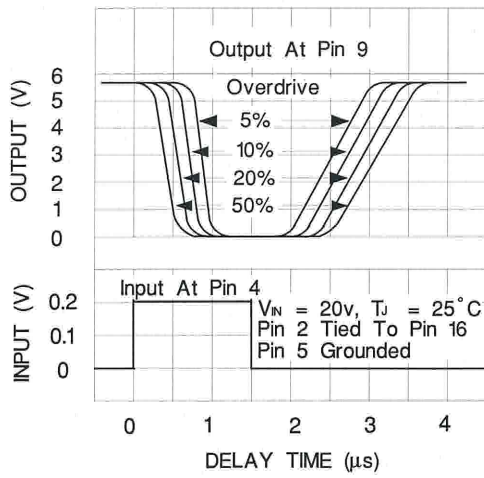
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### OPEN-LOOP CIRCUIT

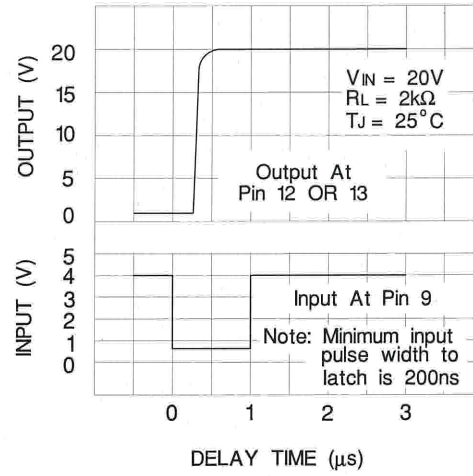




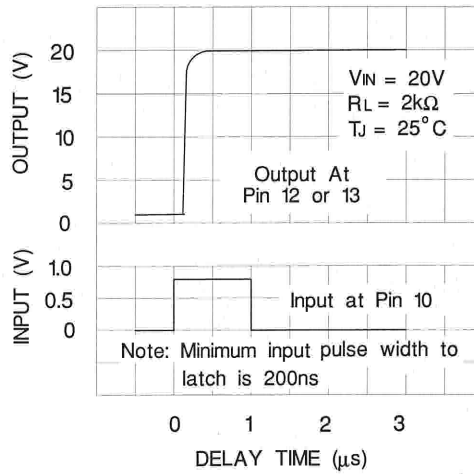
**Current Limit Amplifier Delay**



**Shutdown Delay From PWM Comparator - Pin 9**



**Turn-Off Delay From Shutdown - Pin 10**



**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) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| 5962-8764502EA   | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC1524AJ         | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC1524AJ883B     | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC1524AL         | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC1524AL883B     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC2524ADW        | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC2524ADWG4      | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC2524ADWTR      | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC2524ADWTRG4    | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC2524AJ         | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC2524AN         | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC2524ANG4       | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC3524ADW        | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC3524ADWG4      | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC3524ADWTR      | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC3524ADWTRG4    | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          | <a href="#">Add to cart</a> |
| UC3524AJ         | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                        | A42                  | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC3524AN         | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           | <a href="#">Add to cart</a> |
| UC3524ANG4       | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           | <a href="#">Add to cart</a> |

<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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**OTHER QUALIFIED VERSIONS OF UC1524A, UC2524A, UC2524AM, UC3524A, UC3524AM :**

● Catalog: [UC3524A](#), [UC2524A](#), [UC3524AM](#), [UC3524A](#)

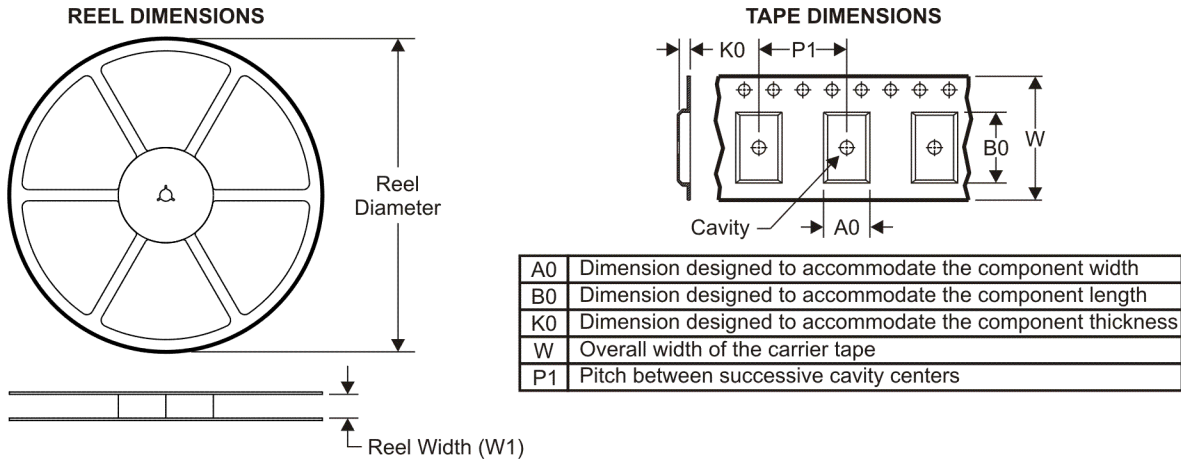
● Military: [UC2524AM](#), [UC1524A](#), [UC1524A](#)

NOTE: Qualified Version Definitions:

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



**TAPE AND REEL INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| UC2524ADWTR | SOIC         | DW              | 16   | 2000 | 330.0              | 16.4               | 10.85   | 10.8    | 2.7     | 12.0    | 16.0   | Q1            |
| UC3524ADWTR | 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) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| UC2524ADWTR | SOIC         | DW              | 16   | 2000 | 346.0       | 346.0      | 33.0        |
| UC3524ADWTR | SOIC         | DW              | 16   | 2000 | 346.0       | 346.0      | 33.0        |

# J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14                     | 16                     | 18                     | 20                     |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A             | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX         | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN         | —                      | —                      | —                      | —                      |
| C MAX         | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN         | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF TERMINALS ** | A                |                  | B                |                  |
|---------------------|------------------|------------------|------------------|------------------|
|                     | MIN              | MAX              | MIN              | MAX              |
| 20                  | 0.342<br>(8,69)  | 0.358<br>(9,09)  | 0.307<br>(7,80)  | 0.358<br>(9,09)  |
| 28                  | 0.442<br>(11,23) | 0.458<br>(11,63) | 0.406<br>(10,31) | 0.458<br>(11,63) |
| 44                  | 0.640<br>(16,26) | 0.660<br>(16,76) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 52                  | 0.740<br>(18,78) | 0.761<br>(19,32) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 68                  | 0.938<br>(23,83) | 0.962<br>(24,43) | 0.850<br>(21,6)  | 0.858<br>(21,8)  |
| 84                  | 1.141<br>(28,99) | 1.165<br>(29,59) | 1.047<br>(26,6)  | 1.063<br>(27,0)  |



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

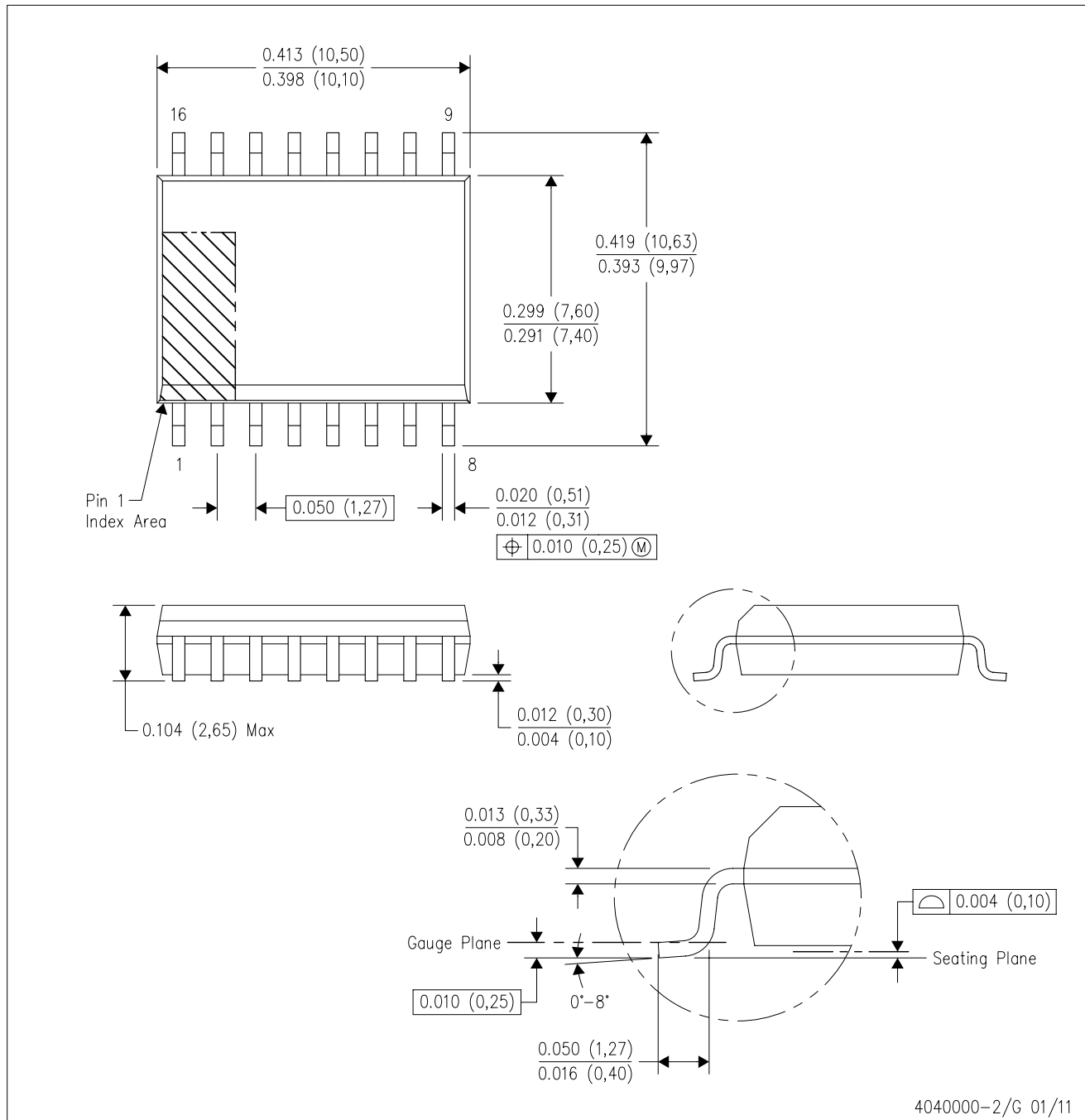
16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G16)

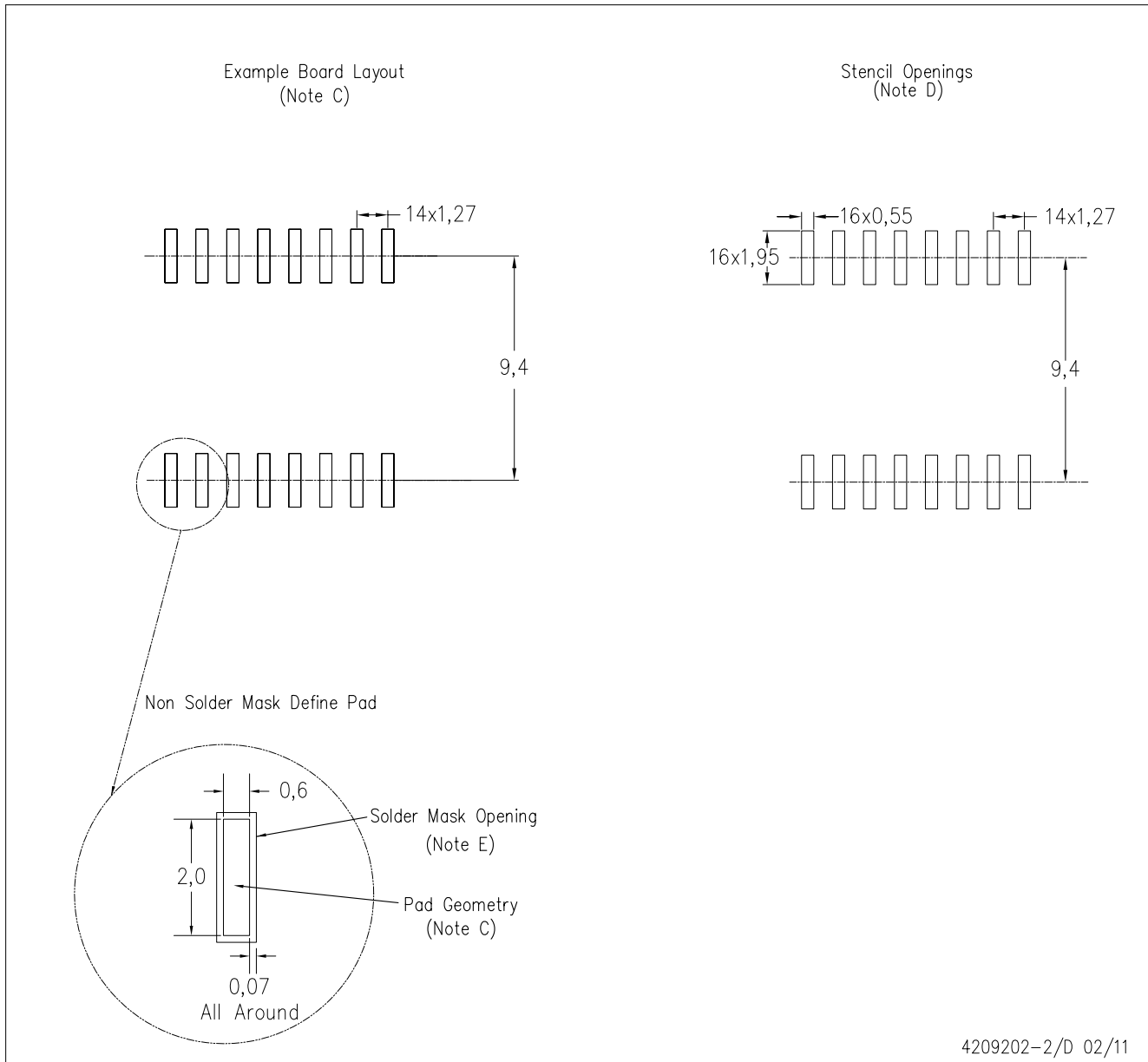
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AA.

DW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4209202-2/D 02/11

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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