

## Dual Non-Inverting Power Driver

### FEATURES

- 3.0A Peak Current Totem Pole Output
- 5 to 35V Operation
- 25ns Rise and Fall Times
- 25ns Propagation Delays
- Thermal Shutdown and Under-Voltage Protection
- High-Speed, Power MOSFET Compatible
- Efficient High Frequency Operation
- Low Cross-Conduction Current Spike
- Enable and Shutdown Functions
- Wide Input Voltage Range
- ESD Protection to 2kV

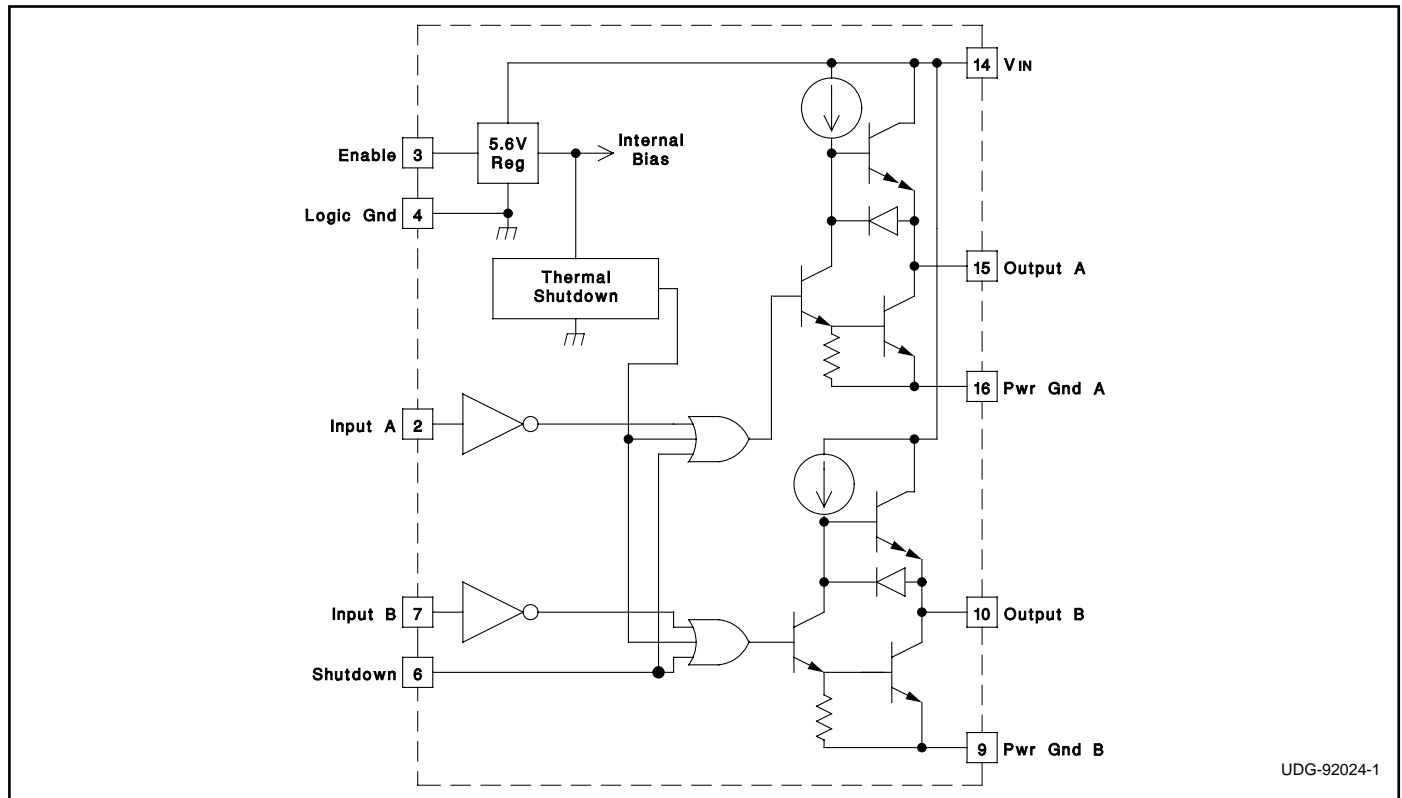
### DESCRIPTION

The UC1708 family of power drivers is made with a high-speed, high-voltage, Schottky process to interface control functions and high-power switching devices – particularly power MOSFETs. Operating over a 5 to 35 volt supply range, these devices contain two independent channels. The A and B inputs are compatible with TTL and CMOS logic families, but can withstand input voltages as high as  $V_{IN}$ . Each output can source or sink up to 3A as long as power dissipation limits are not exceeded.

Although each output can be activated independently with its own inputs, they can be forced low in common through the action of either a digital high signal at the Shutdown terminal or by forcing the Enable terminal low. The Shutdown terminal will only force the outputs low, it will not effect the behavior of the rest of the device. The Enable terminal effectively places the device in under-voltage lockout, reducing power consumption by as much as 90%. During under-voltage and disable (Enable terminal forced low) conditions, the outputs are held in a self-biasing, low-voltage, state.

The UC3708 and UC2708 are available in plastic 8-pin MINI DIP and 16-pin “bat-wing” DIP packages for commercial operation over a  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  temperature range and industrial temperature range of  $-25^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  respectively. For operation over a  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range, the UC1708 is available in hermetically sealed 8-pin MINI CDIP, 16 pin CDIP and 20 pin CLCC packages. Surface mount devices are also available.

### BLOCK DIAGRAM



Note: Shutdown feature is not available in J or N packages only.

## ABSOLUTE MAXIMUM RATINGS (Note 1)

|  |                           |
|--|---------------------------|
| Supply Voltage $V_{IN}$                      | 35V                       |
| Output Current (Each Output, Source or Sink) |                           |
| Steady-State                                 | 0.5A                      |
| Peak Transient                               | 3A                        |
| Output Voltage                               | -0.3 to $(V_{IN} + 0.3)V$ |
| Enable and Shutdown Inputs                   | -0.3 to 6.2V              |
| A and B Inputs                               | -0.3 to $(V_{IN} + 0.3)V$ |
| Operating Junction Temperature (Note 2)      | 150°C                     |
| Storage Temperature Range                    | -65° to 150°C             |
| Lead Temperature (Soldering, 10 Seconds)     | 300°C                     |

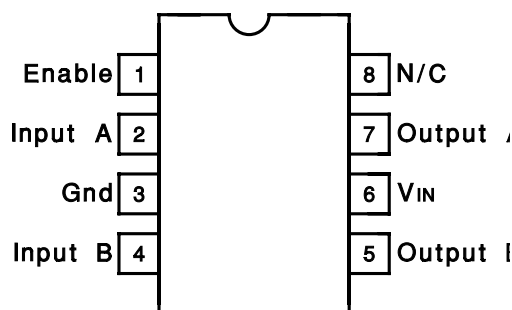
NOTE 1: All voltages are with respect to Logic Gnd pin. All currents are positive into, negative out of, device terminals.

NOTE 2: Consult Unitorde Integrated Circuits databook for information regarding thermal specifications and limitations of packages.

## CONNECTION DIAGRAMS

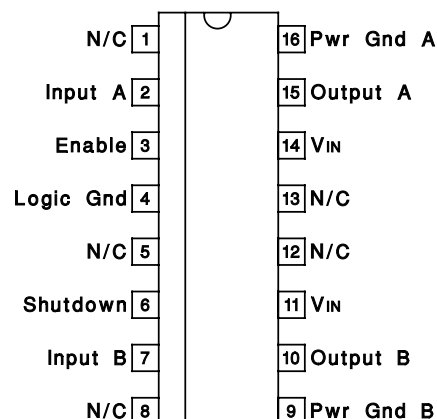
**DIL-8 (Top View)**

**J Or N Package**



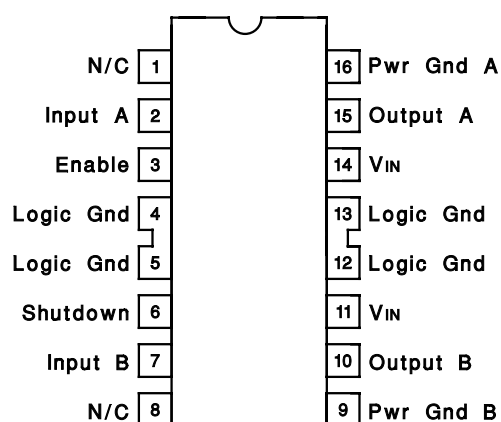
**SOIC-16 (Top View)**

**DW Package**



**DIL-16 (Top View)**

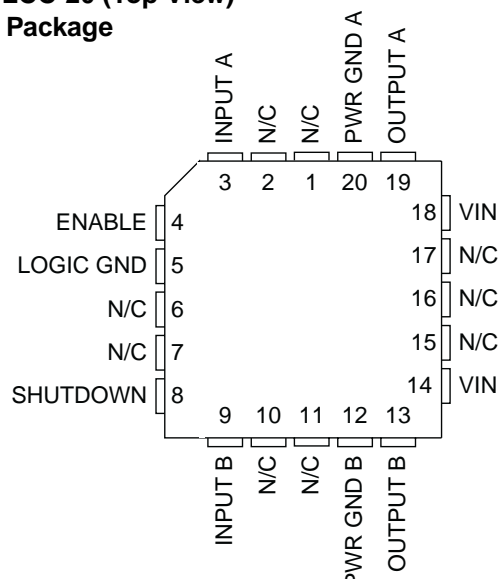
**JE or NE Package**



Note: In JE package Pin 4 is logic ground. Pins 5, 12, and 13 are N/C.

**CLCC-20 (Top View)**

**L Package**



**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated,  $V_{IN}=10V$  to  $35V$ , and these specifications apply for:  $-55^{\circ}C < T_A < 125^{\circ}C$  for the UC1708,  $-25^{\circ}C < T_A < +85^{\circ}C$  for the UC2708, and  $0^{\circ}C < T_A < 70^{\circ}C$  for the UC3708.  $T_A = T_J$ .

| PARAMETER                            | TEST CONDITIONS       | MIN  | TYP  | MAX | UNITS       |
|--------------------------------------|-----------------------|------|------|-----|-------------|
| VIN Supply Current                   | Outputs Low           |      | 18   | 26  | mA          |
|                                      | Outputs High          |      | 14   | 18  | mA          |
|                                      | Enable = 0V           |      | 1    | 4   | mA          |
| A, B and Shutdown Inputs Low Level   |                       |      |      | 0.8 | V           |
| A, B and Shutdown Inputs High Level  |                       | 2.0  |      |     | V           |
| A, B Input Current Low               | $V_{A,B} = 0.4V$      | -1   | -0.6 |     | mA          |
| A, B Input Current High              | $V_{A,B} = 2.4V$      | -200 |      | 50  | $\mu A$     |
| A, B Input Leakage Current High      | $V_{A,B} = 35.3V$     |      |      | 200 | $\mu A$     |
| Shutdown Input Current Low           | $V_{SHUTDOWN} = 0.4V$ |      | 20   | 100 | $\mu A$     |
| Shutdown Input Current High          | $V_{SHUTDOWN} = 2.4V$ |      | 170  | 500 | $\mu A$     |
|                                      | $V_{SHUTDOWN} = 6.2V$ |      | 0.6  | 1.5 | mA          |
| Enable Input Current Low             | $V_{ENABLE} = 0V$     | -600 | -460 | 200 | $\mu A$     |
| Enable Input Current High            | $V_{ENABLE} = 6.2V$   |      |      | 200 | $\mu A$     |
| Enable Threshold Rising              |                       |      | 2.8  | 3.6 | V           |
| Enable Threshold Falling             |                       | 1.0  | 2.4  | 3.4 | V           |
| Output High Sat., $V_{IN} - V_{OUT}$ | $I_{OUT} = -50mA$     |      |      | 2.0 | V           |
|                                      | $I_{OUT} = -500mA$    |      |      | 2.5 | V           |
| Output Low Sat., $V_{OUT}$           | $I_{OUT} = 50mA$      |      |      | 0.5 | V           |
|                                      | $I_{OUT} = 500mA$     |      |      | 2.5 | V           |
| Thermal Shutdown                     |                       |      | 155  |     | $^{\circ}C$ |

**SWITCHING CHARACTERISTICS (Figure 1),** ( $V_{IN} = 20V$ , delays measured to 10% output change.)

| PARAMETER                        | TEST CONDITIONS        | MIN | TYP | MAX | UNITS |
|----------------------------------|------------------------|-----|-----|-----|-------|
| <b>From A,B Input to Output:</b> |                        |     |     |     |       |
| Rise Time Delay (TPLH)           | $CL = 0pF$             |     | 25  | 40  | ns    |
|                                  | $CL = 1000pF$ (Note 3) |     | 25  | 40  | ns    |
|                                  | $CL = 2200pF$          |     | 30  | 45  | ns    |
| 10% to 90% Rise (TTLH)           | $CL = 0pF$             |     | 55  | 75  | ns    |
|                                  | $CL = 1000pF$ (Note 3) |     | 25  | 50  | ns    |
|                                  | $CL = 2200pF$          |     | 40  | 55  | ns    |
| Fall Time Delay (TPHL)           | $CL = 0pF$             |     | 25  | 40  | ns    |
|                                  | $CL = 1000pF$ (Note 3) |     | 25  | 45  | ns    |
|                                  | $CL = 2200pF$          |     | 35  | 50  | ns    |
| 90% to 10% Fall (TTHL)           | $CL = 0pF$             |     | 15  | 20  | ns    |
|                                  | $CL = 1000pF$ (Note 3) |     | 25  | 45  | ns    |
|                                  | $CL = 2200pF$          |     | 40  | 55  | ns    |

**NOTE 3:** These parameters, specified at 1000pF, although ensured over recommended operating conditions, are not tested in production.

**SWITCHING CHARACTERISTICS (Figure 1),** ( $V_{IN} = 20V$ , delays measured to 10% output change.)

| From Shutdown Input to Output |  |  |    |    |    |
|-------------------------------|--|--|----|----|----|
| Rise Time Delay (TPLH)        | CL = 0pF   |  | 25 | 75 | ns |
|                               | CL = 1000pF (Note 3)                                   |  | 30 | 75 | ns |
|                               | CL = 2200pF  |  | 35 | 75 | ns |
| 10% to 90% Rise (TTLH)        | CL = 0pF   |  | 50 | 75 | ns |
|                               | CL = 1000pF (Note 3)                                   |  | 25 | 50 | ns |
|                               | CL = 2200pF  |  | 40 | 55 | ns |
| Fall Time Delay (TPHL)        | CL = 0pF   |  | 25 | 45 | ns |
|                               | CL = 1000pF (Note 3)                                   |  | 30 | 50 | ns |
|                               | CL = 2200pF  |  | 35 | 55 | ns |
| 90% to 10% Fall (TTHL)        | CL = 0pF   |  | 25 | 20 | ns |
|                               | CL = 1000pF (Note 3)                                   |  | 25 | 45 | ns |
|                               | CL = 2200pF  |  | 40 | 55 | ns |
| Total Supply Current          | F = 200kHz, 50% duty cycle, both channels; CL = 0pF    |  | 23 | 25 | mA |
|                               | F = 200kHz, 50% duty cycle, both channels; CL = 2200pF |  | 38 | 45 | mA |

**NOTE 3:** These parameters, specified at 1000pF, although ensured over recommended operating conditions, are not tested in production.

Figure 1: AC Test Circuit and Switching Time Waveforms

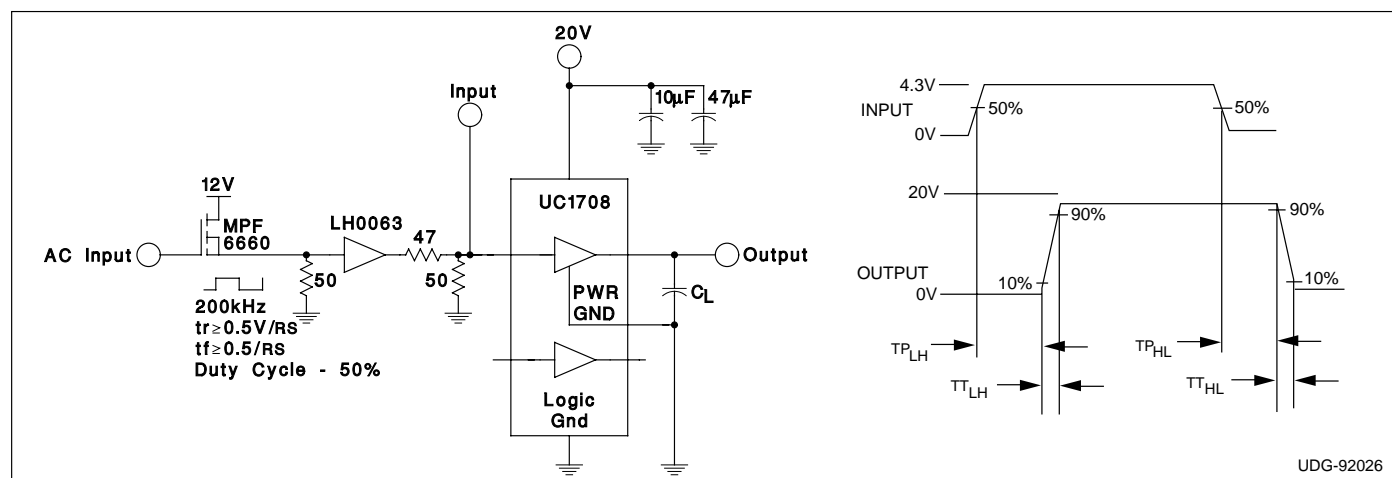
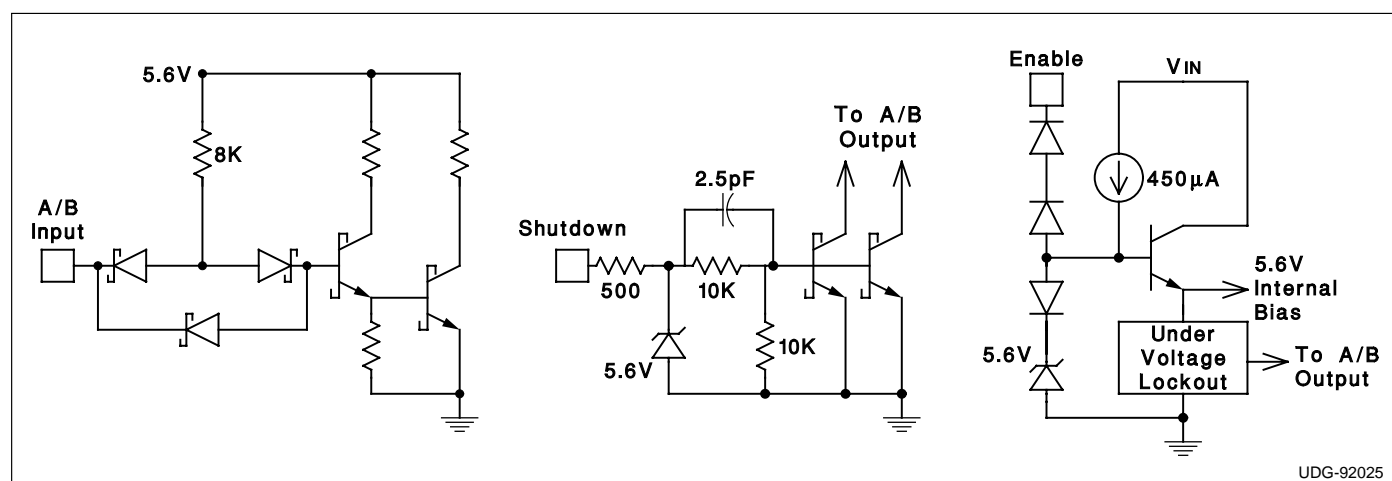


Figure 2: Equivalent Input Circuits



Note: Shutdown feature available only in JE, NE or DW Packages.

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-0051401Q2A  | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | Level-NC-NC-NC               |
| 5962-0051401QEA  | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| 5962-0051401QPA  | ACTIVE                | CDIP         | JG              | 8    | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| 5962-0051401V2A  | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-0051401VEA  | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-0051401VPA  | ACTIVE                | CDIP         | JG              | 8    | 1           | TBD                     | A42              | Level-NC-NC-NC               |
| UC1708J          | ACTIVE                | CDIP         | JG              | 8    | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| UC1708J883B      | ACTIVE                | CDIP         | JG              | 8    | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| UC1708JE         | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| UC1708JE883B     | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| UC1708L883B      | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | Level-NC-NC-NC               |
| UC2708D          | OBSOLETE              |              | UTR             |      |             | TBD                     | Call TI          | Call TI                      |
| UC2708DW         | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC2708DWG4       | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC2708DWTR       | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC2708DWTRG4     | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC2708J          | OBSOLETE              |              | UTR             |      |             | TBD                     | Call TI          | Call TI                      |
| UC2708JE         | OBSOLETE              |              | UTR             |      |             | TBD                     | Call TI          | Call TI                      |
| UC2708N          | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-NC-NC-NC               |
| UC2708NE         | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS & no Sb/Br) | Call TI          | Level-NC-NC-NC               |
| UC2708NG4        | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-NC-NC-NC               |
| UC2708Q          | OBSOLETE              |              | UTR             |      |             | TBD                     | Call TI          | Call TI                      |
| UC3708DW         | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC3708DWG4       | ACTIVE                | SOIC         | DW              | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC3708DWTR       | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC3708DWTRG4     | ACTIVE                | SOIC         | DW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| UC3708J          | ACTIVE                | CDIP         | JG              | 8    | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| UC3708JE         | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | A42 SNPB         | Level-NC-NC-NC               |
| UC3708N          | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-NC-NC-NC               |
| UC3708NE         | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS & no Sb/Br) | Call TI          | Level-NC-NC-NC               |
| UC3708NEG4       | ACTIVE                | PDIP         | N               | 16   | 25          | Green (RoHS & no Sb/Br) | Call TI          | Level-NC-NC-NC               |
| UC3708NG4        | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-NC-NC-NC               |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| no Sb/Br)        |                       |              |                 |      |             |                         |                  |                              |
| UC3708Q          | OBSOLETE              |              | UTR             |      |             | TBD                     | Call TI          | Call TI                      |

<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) 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.

**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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## JG (R-GDIP-T8)

## CERAMIC DUAL-IN-LINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification.
  - E. Falls within MIL STD 1835 GDIP1-T8

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

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 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

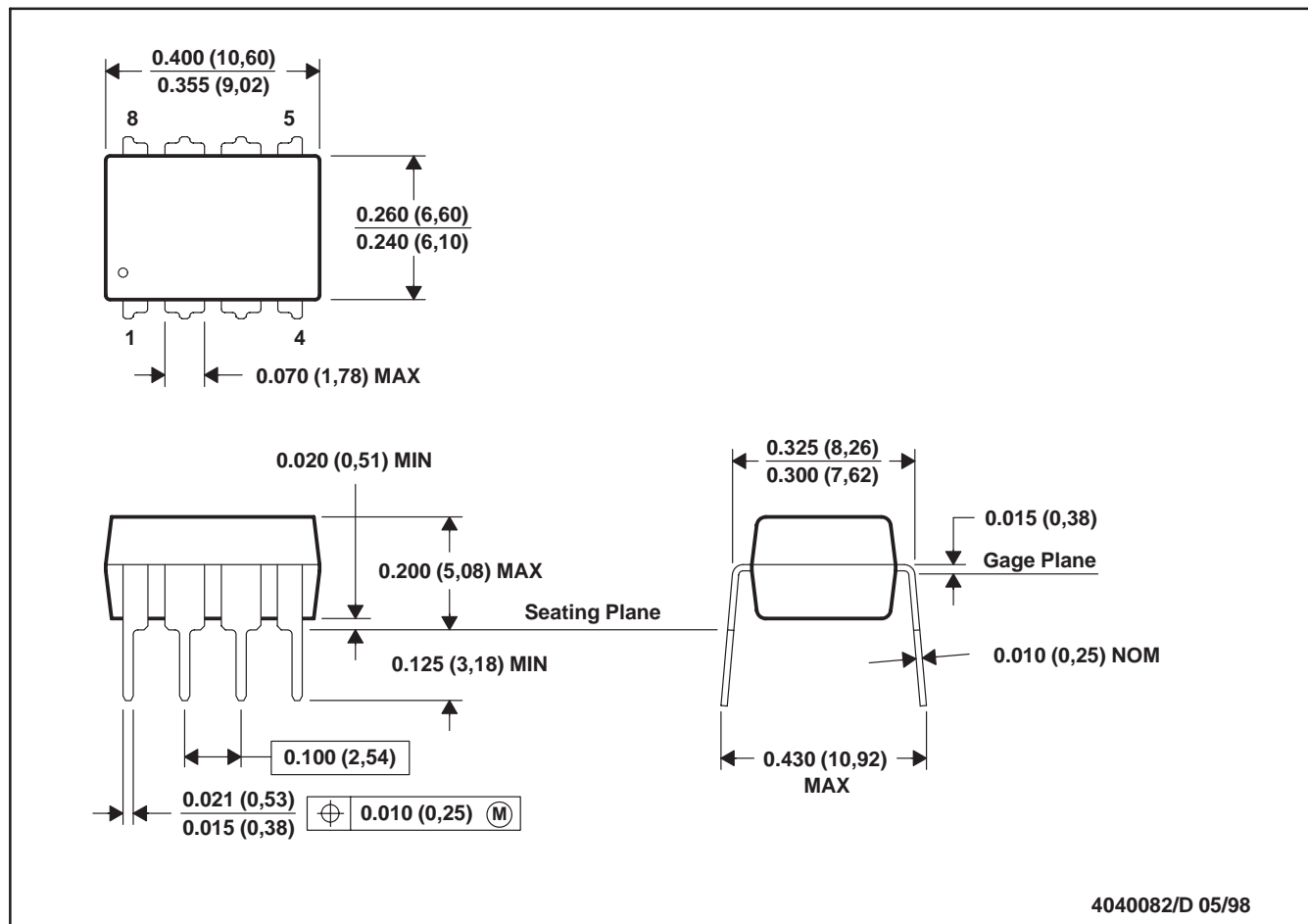
28 TERMINAL SHOWN



- 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.
  - The terminals are gold plated.
  - Falls within JEDEC MS-004

## P (R-PDIP-T8)

## PLASTIC DUAL-IN-LINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001

For the latest package information, go to [http://www.ti.com/sc/docs/package/pkg\\_info.htm](http://www.ti.com/sc/docs/package/pkg_info.htm)

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

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



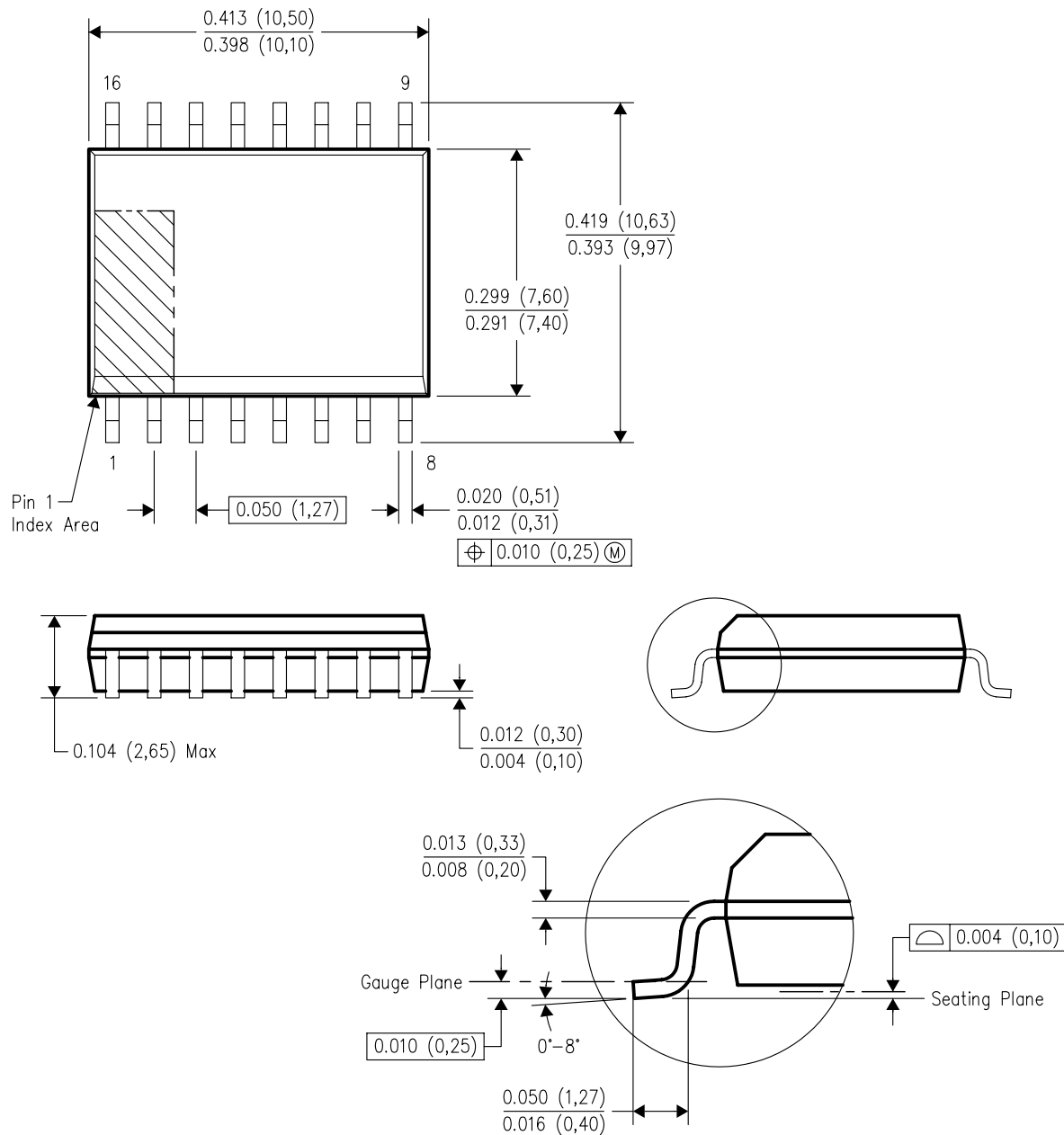
14/18 Pin Only  
20 Pin vendor option

4040049/E 12/2002

- 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 PACKAGE



4040000-2/F 06/2004

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| DSP              | <a href="http://dsp.ti.com">dsp.ti.com</a>                         | Broadband           | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Interface        | <a href="http://interface.ti.com">interface.ti.com</a>             | Digital Control     | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Logic            | <a href="http://logic.ti.com">logic.ti.com</a>                     | Military            | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Power Mgmt       | <a href="http://power.ti.com">power.ti.com</a>                     | Optical Networking  | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a> |
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