



## LOW-VOLTAGE DIFFERENTIAL SCSI (LVD) 27-LINE REGULATOR SET

### FEATURES

- SCSI SPI-2, SPI-3 and SPI-4 LVD SCSI 27-Line, Low-Voltage Differential Regulator
- 2.7-V to 5.25-V Operation
- Integrated Regulator Set for LVD SCSI
- Differential Failsafe Bias

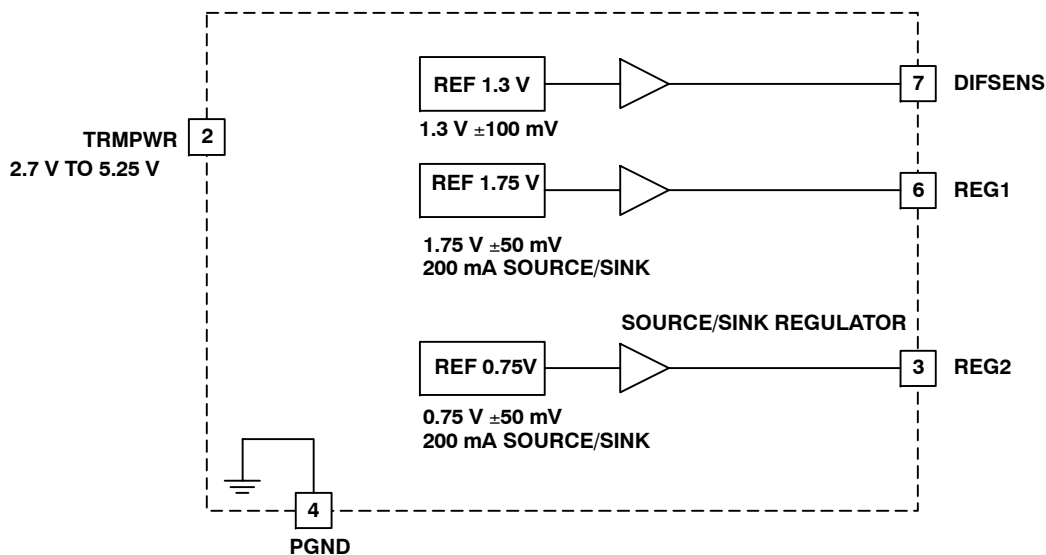
### APPLICATIONS

- Servers
- Workstations
- RAID Boxes

### DESCRIPTION

The UCC561 low-voltage differential (LVD) regulator set is designed to provide the correct reference voltages and bias currents for LVD termination resistor networks (475 Ω, 121 Ω, and 475 Ω). The device also provides a 1.3-V output for “diff sense” signaling. With the proper resistor network, the UCC561 solution meets the common mode bias impedance, differential bias, and termination impedance requirements of SPI-2 (Ultra2), SPI-3 (Ultra3/Ultra160) and SPI-4 (Ultra320). The UCC561 is not intended for SPI-5 applications.

This device incorporates into a single monolith, two sink/source reference voltage regulators, a 1.3-V buffered output and protection features. The protection features include thermal shutdown and active current-limiting circuitry. The UCC561 is offered in 16-pin SOIC (DP) package.



UDG-98093



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This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

**ORDERING INFORMATION**

| PRODUCT | PACKAGE-LEAD | PACKAGE DESIGNATOR | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | TRANSPORT MEDIA, QUANTITY |
|---------|--------------|--------------------|-----------------------------|-----------------|---------------------------|
| UCC561  | SOIC-16      | DP                 | 0°C to 70°C                 | UCC561DP        | Rail, 70                  |

(1) For the most current specification and package information, refer to our web site at [www.ti.com](http://www.ti.com).

**ABSOLUTE MAXIMUM RATINGS**

over operating free-air temperature range unless otherwise noted<sup>(1)(2)</sup>

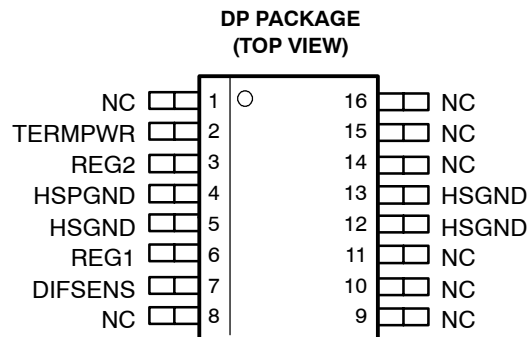
|                                       | UCC561     | UNIT |
|---------------------------------------|------------|------|
| TERMPWR                               | 6          | V    |
| Package dissipation                   | 1.2        | W    |
| Junction temperature, T <sub>J</sub>  | -55 to 150 | °C   |
| Storage temperature, T <sub>stg</sub> | -65 to 150 | °C   |

(1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) Currents are positive into and negative out of the specified terminals.

**RECOMMENDED OPERATING CONDITIONS**

|  | MIN  | NOM | MAX  | UNIT |
|--|------|-----|------|------|
| V <sub>TERMPWR</sub> , TermPower voltage | 2.70 |     | 5.25 | V    |



NC = No connection

**ELECTRICAL CHARACTERISTICS**
 $T_J = 0^\circ\text{C to } 70^\circ\text{C}$ ,  $V_{\text{TEMPWR}} = 3.3\text{ V}$  unless otherwise noted<sup>(1)</sup>

| PARAMETER  | TEST CONDITIONS   | MIN  | TYP  | MAX  | UNIT          |
|--|---|------|------|------|---------------|
| <b>TERMPWR Supply Current</b>                        |   |      |      |      |               |
| TERMPWR supply current                               | No load   |      |      | 40   | mA            |
| TERMPWR voltage                                      |   | 2.70 |      | 5.25 | V             |
| <b>Regulator</b>                                     |   |      |      |      |               |
| 1.75-V regulator                                     | REG1 ( $\pm 125\text{ mA}$ )                                | 1.70 | 1.75 | 1.80 | V             |
| 1.3-V regulator                                      | $-5\text{ mA} \leq I_{\text{DIFSENS}} \leq 50\ \mu\text{A}$ | 1.2  | 1.3  | 1.4  |               |
| 0.75-V regulator                                     | REG2 ( $\pm 125\text{ mA}$ )                                | 0.70 | 0.75 | 0.80 |               |
| 1.75-V regulator source current                      | $V_O = 1.25\text{ V}$                                       | -200 |      |      | mA            |
| 1.75-V regulator sink current                        | $V_O = 2.25\text{ V}$                                       | 200  |      |      |               |
| 1.75-V regulator source current limit <sup>(1)</sup> |   | -200 |      | -700 |               |
| 1.75-V regulator sink current limit <sup>(1)</sup>   |   | 200  |      | 700  |               |
| 1.3-V regulator source current                       | $V_{\text{DIFSENS}} = 0\text{ V}$                           | -5   |      | -15  | $\mu\text{A}$ |
| 1.3-V regulator sink current                         | $V_{\text{DIFSENS}} = 2.4\text{ V}$                         | 50   |      | 200  |               |
| 0.75-V regulator source current                      | $V_O = 0.25\text{ V}$                                       | -200 |      |      | mA            |
| 0.75-V regulator sink current                        | $V_O = 1.25\text{ V}$                                       | 200  |      |      |               |
| 0.75-V regulator source current limit <sup>(1)</sup> |   | -200 |      | -700 |               |
| 0.75-V regulator sink current limit <sup>(1)</sup>   |   | 200  |      | 700  |               |

<sup>(1)</sup> Ensured by design. Not production tested.

**TERMINAL FUNCTIONS**

| TERMINAL |           | I/O | DESCRIPTION   |
|----------|-----------|-----|---|
| NAME     | NO.       |     |   |
| HSPGND   | 4         | -   | Heat sink power ground pin.   |
| HSGND    | 5, 12, 13 | -   | Heat sink ground pin which should be attached to the ground plane on a multilayer board or large copper area on a 2 layer board.  |
| REG1     | 6         | O   | 1.75-V source/sink regulated output voltage pin. The part is internally current limited for both sinking and sourcing current to prevent damage. For best performance, a 4.7- $\mu\text{F}$ low-ESR capacitor is recommended. Lead lengths should be kept to a minimum. |
| REG2     | 3         | O   | 0.75-V source/sink regulated output voltage pin. The part is internally current limited for both sinking and sourcing current to prevent damage. For best performance, a 4.7- $\mu\text{F}$ low-ESR capacitor is recommended. Lead lengths should be kept to a minimum. |
| DIFSENS  | 7         | O   | 1.3-V source/sink regulated output voltage pin. The part is internally current limited to the SCSI SPI-2 through SPI-4 standards for both sinking and sourcing current to prevent damage.   |
| TERMPWR  | 2         | I   | Supply voltage pin. The pin should be decoupled with at least a 2.2- $\mu\text{F}$ low-ESR capacitor. For best performance, a 4.7- $\mu\text{F}$ low-ESR capacitor is recommended. Lead lengths should be kept to a minimum.  |

APPLICATION INFORMATION

The resistor stack with the 1.75-V and 0.75-V reference gives the correct differential impedance, bias voltage, common mode differential impedance, and common mode voltage as show in Table 1.

Table 1. UCC561 Resistor Stack vs. Standard (SPI-2 through SPI-4)

| PARAMETER                          | UCC561 | STANDARD   | UNITS    |
|------------------------------------|--------|------------|----------|
| Differential Impedance             | 107.3  | 100 to 110 | $\Omega$ |
| Differential bias voltage          | 112.9  | 100 to 125 | mV       |
| Common-mode differential impedance | 237    | 100 to 300 | $\Omega$ |
| Common-mode voltage                | 1.25   | 1.2 to 1.3 | V        |

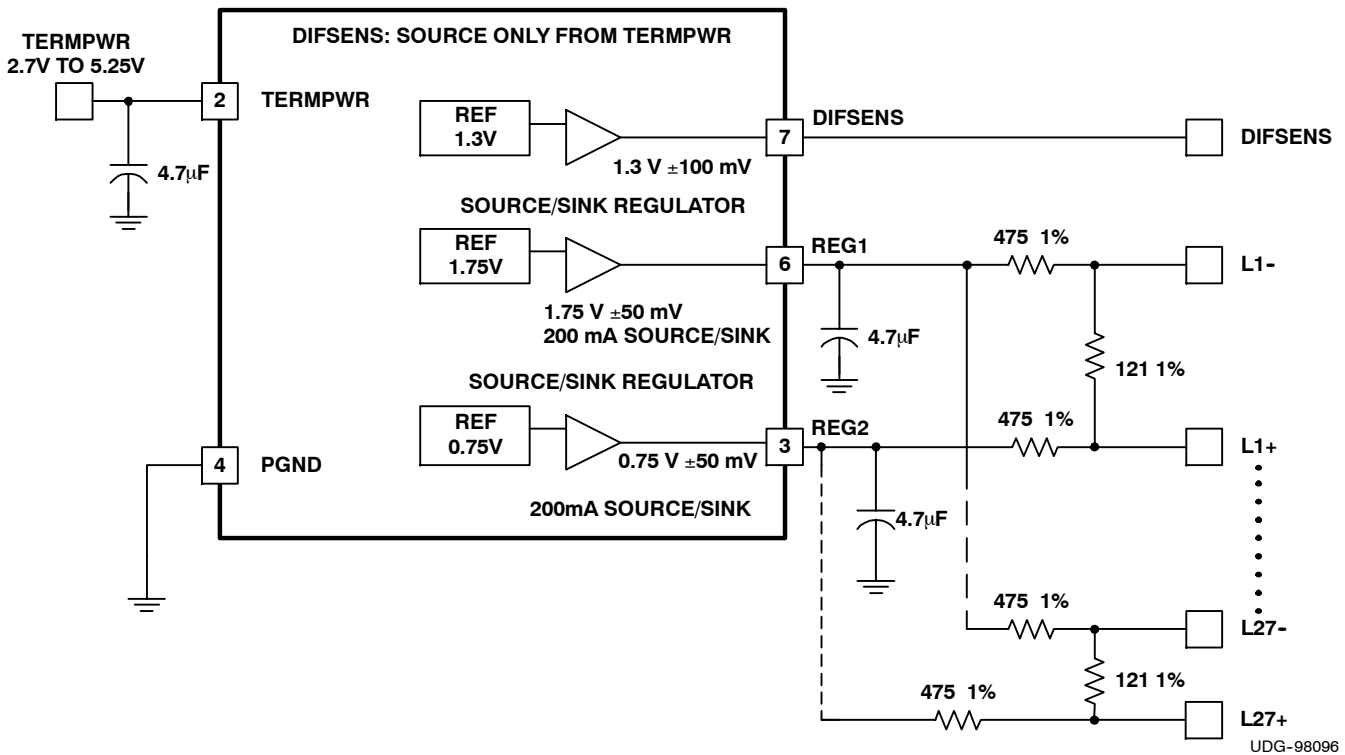


Figure 1. Low-Voltage Differential Discrete Resistor Stack

**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> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| UCC561DP         | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| UCC561DPG4       | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| UCC561DPTR       | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| UCC561DPTRG4     | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| UCC561TD         | OBSOLETE              | TO-220       | KC              | 5    |             | 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), 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.

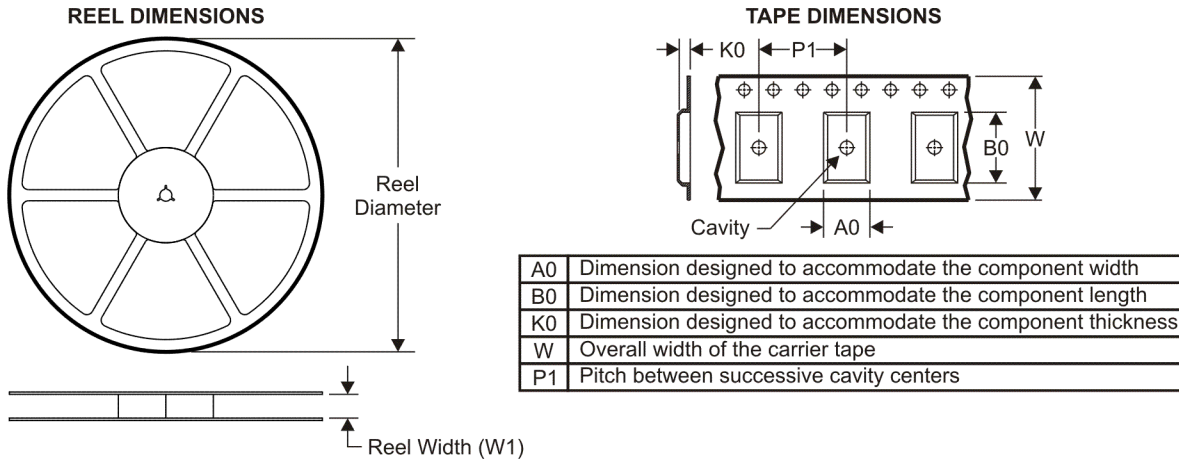
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

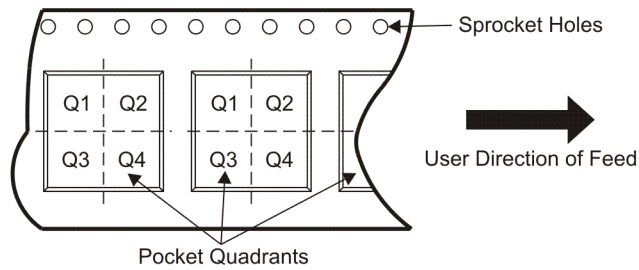
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**TAPE AND REEL INFORMATION**



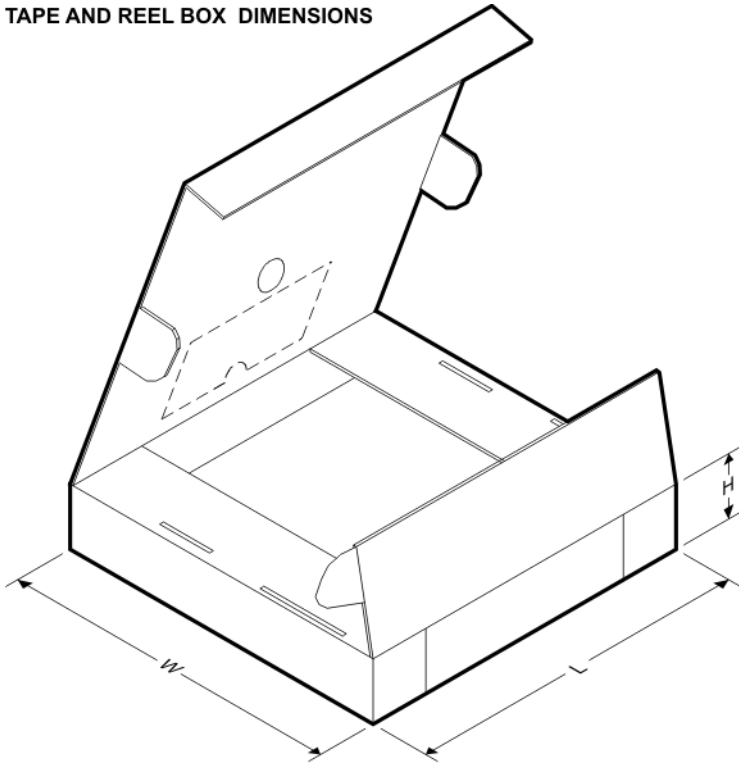
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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 |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| UCC561DPTR | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**

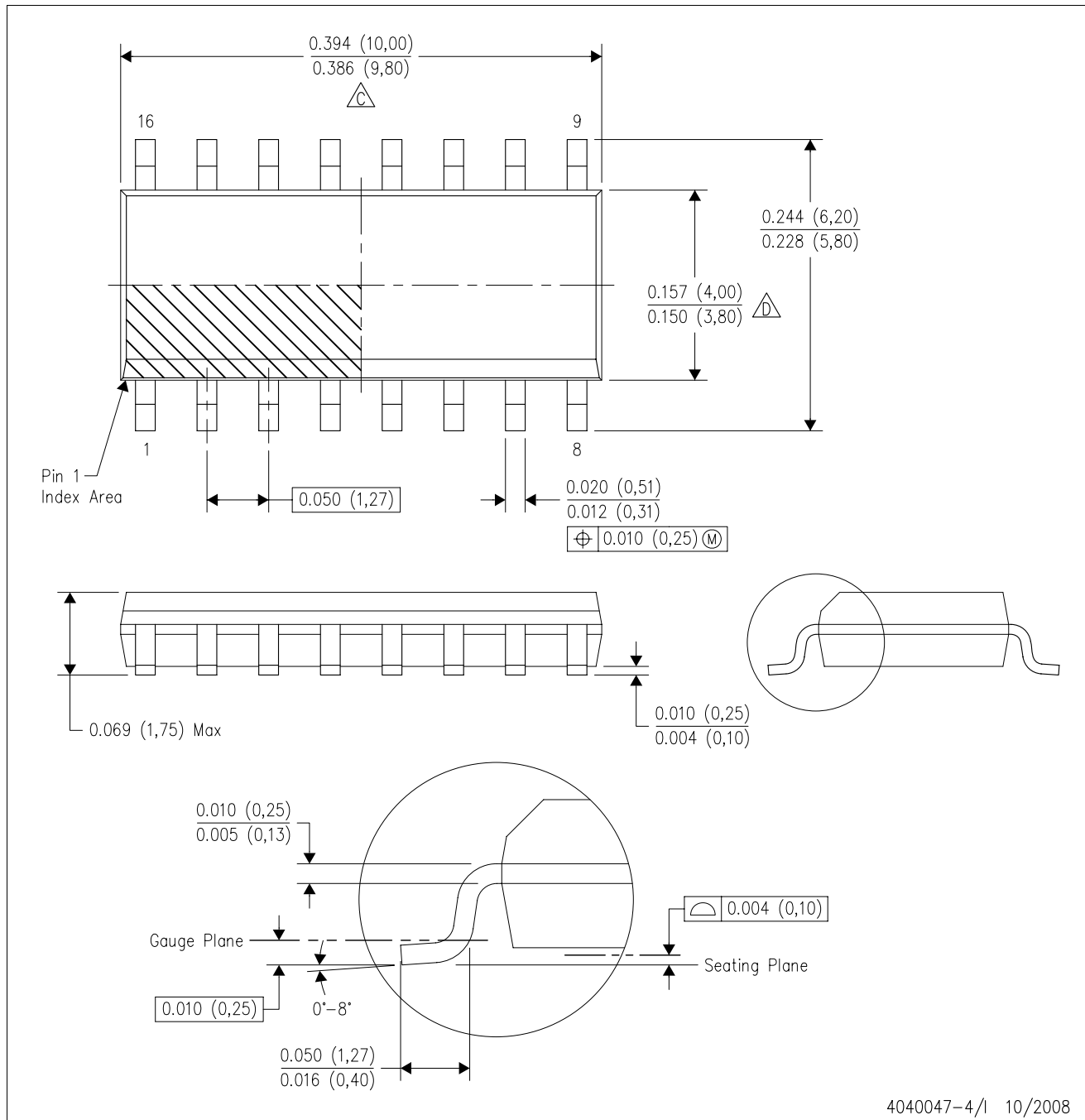


\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| UCC561DPTR | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE

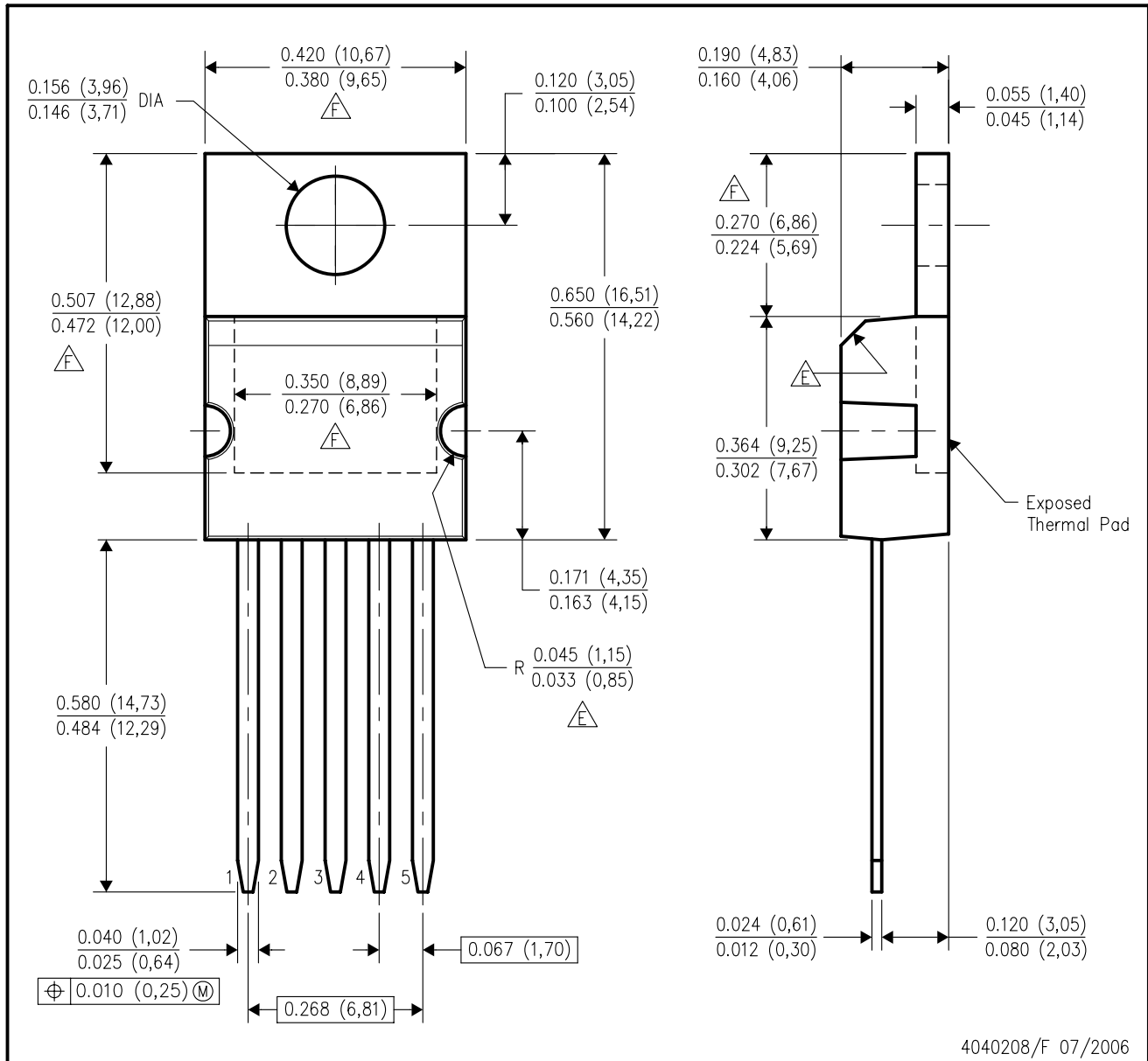




- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AC.



KC (R-PSFM-T5)

PLASTIC FLANGE-MOUNT PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. All lead dimensions apply before solder dip.
  - D. The center lead is in electrical contact with the mounting tab.
  -  These features are optional.
  -  Thermal pad contour optional within these dimensions.

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|                    |  |
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