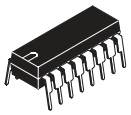


SLUS349B − DECEMBER 1994 − REVISED APRIL 2005

# 9-LINE 3 TO 5 VOLT LOW CAPACITANCE SCSI ACTIVE TERMINATOR

## FEATURES

- **Complies with SCSI, SCSI−2 and SPI−2 Single Ended Standards**
- **2.7-V to 5.25-V Operation**
- **1.8-pF Channel Capacitance during Disconnect**
- **0.5-μA Supply Current in Disconnect Mode**
- **110-Ω/2.5-kΩ Programmable Termination**
- **Completely Meets SCSI Hot Plugging**
- **−400-mA Sourcing Current for Termination**
- **+400-mA Sinking Current for Active Negation Drivers**
- **Trimmed Termination Current to 4%**
- **Trimmed Impedance to 7%**
- **Current Limit and Thermal Shutdown Protection**

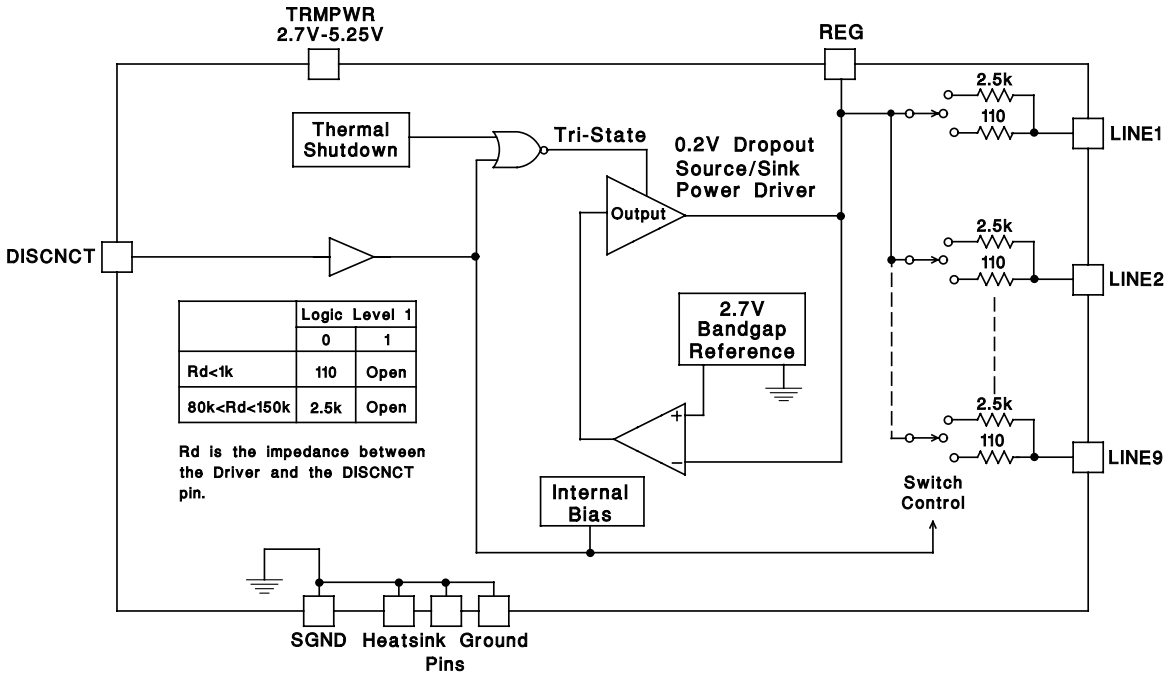
## DESCRIPTION

The UCC5614 provides 9 lines of active termination for a small computer system's interface (SCSI) parallel bus. The SCSI standard recommends active termination at both ends of the cable segment.

The UCC5614 is ideal for high performance 3.3-V SCSI systems. The key features contributing to such low operating voltage are the 0.1-V drop-out regulator and the 2.7-V reference. During disconnect the supply current is typically only 0.5 μA, which makes the device attractive for battery powered systems.

The UCC5614 is designed with an ultra low channel capacitance of 1.8 pF, which eliminates effects on signal i cted terminators at interim points on the bus.

## BLOCK DIAGRAM



## DESCRIPTION (CONTINUED)

The UCC5614 can be programmed for either a 110-Ω or 2.5-kΩ termination. The 110-Ω termination is used for standard SCSI bus lengths and the 2.5-kΩ termination is typically used in short bus applications. When driving the TTL compatible DISCNCT pin directly, the 110-Ω termination is connected when the DISCNCT pin is driven low, and disconnected when driven high. When the DISCNCT pin is driven through an impedance between 80 kΩ and 150 kΩ, the terminator is in short bus mode. The 2.5-kΩ termination is connected when the DISCNCT pin is driven low and disconnected when driven high.

The power amplifier output stage allows the UCC5614 to source full termination current and sink active negation current when all termination lines are actively negated.

The UCC5614 is pin for pin compatible with Unitrode's other 9-line SCSI terminators, allowing lower capacitance and lower voltage upgrades to existing systems. The UCC5614, as with all Unitrode terminators, is completely hot pluggable and appears as high impedance at the terminating channels with VTRMPWR = 0 V or open.

Internal circuit trimming is utilized, first to trim the 110-Ω termination impedance to a 7% tolerance, and then most importantly, to trim the output current to a 4% tolerance, as close to the max SCSI specification as possible, which maximizes noise margin in fast SCSI operation.

Other features include thermal shutdown and current limit.

This device is offered in low thermal resistance versions of the industry standard 16-pin narrow body SOIC, 16-pin N and 24-pin TSSOP.

## ORDERING INFORMATION

| $T_A$ | PACKAGED DEVICE | | |
|---|---|---|---|
| | **SOIC-16 (DP)†** | **DIL-16 (N)** | **TSSOP-24 (PW)‡** |
| 0°C to 70°C | UCC5614DP | UCC5614N | UCC5614PW |

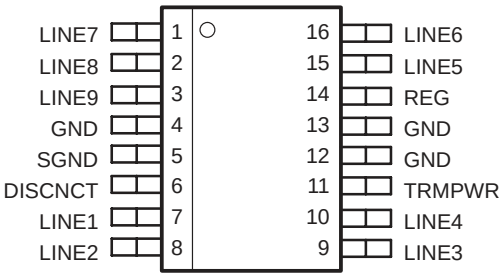
†

† The DP package is available taped and reeled in quanities of 2,500. Add TR suffix to device type (e.g. UCC5614DPTR) to order quantities of 2,500 devices per reel.

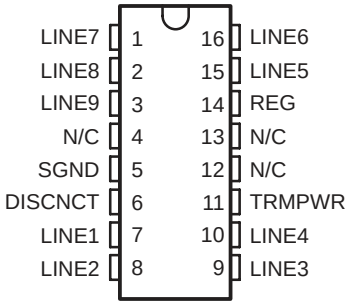
‡ The PW package is available taped and reeled in quanities of 2,000. Add TR suffix to device type (e.g. UCC5614PWTR) to order quantities of 2,000 devices per reel.

## CONNECTION DIAGRAMS

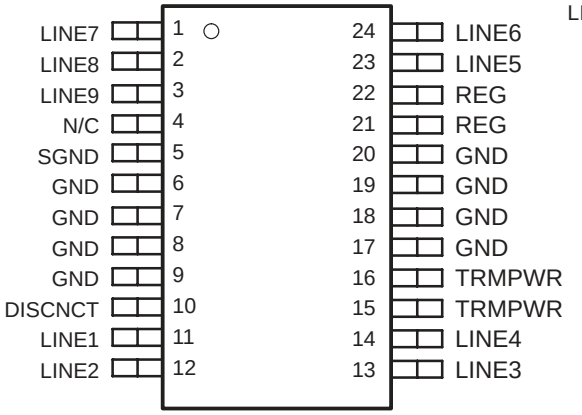
**SOIC−16 (Top View)**
**DP Package (1) (2)**




**DIL−16 (Top View)**
**N Package (1)**




**TSSOP−24 (Top View)**
**PW Package (1) (3)**




NOTES: (1). Drawings are not to scale.
(2). DP package pin 5 serves as ground and pins 4,12 and 13 serve as heatsink ground.
(3). PW package pin 5 serves as ground and pins 6,7,8,9,17,18,19 and 20 serve as heatsink ground.

## ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range unless otherwise noted†‡

| | UCC5629 | UNIT |
|---|---|---|
| TRMPWR voltage | 6 | V |
| Input voltage | 0 to 7 | |
| Regulator output current | 2 | W |
| Storage temperature, $T_{stg}$ | −65 to 150 | °C |
| Operating junction temperature, $T_J$ | –55 to 150 | |
| Lead temperature (soldering, 10 sec.) | 300 | |

† 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. All voltages are with respect to GND. Currents are positive into and negative out of, the specified terminal.

‡ Currents are positive into, negative out of the specified terminal. Consult Packaging Section of Databook for thermal limitations and considerations of packages. All voltages are referenced to GND.

## RECOMMENDED OPERATING CONDITIONS

| | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|
| TRMPWR voltage | 2.7 | | 5.25 | V |
| Temperature ranges | 0 | | 70 | °C |
| Signal line voltage | 0 | | 5 | V |
| DISCNCT input voltage | 0 | | TRMPWR | |

## ELECTRICAL CHARACTERISTICS

$T_A$ = 0°C to 70°C, TRMPWR = 3.3 V, DISCNCT = 0 V, $R_{DISCNCT}$ = 0 Ω, $T_A$ = $T_J$, (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| **Supply Current Section** | | | | | |
| Termpwr supply current | All termination lines = Open | | 1 | 2 | mA |
| | All termination lines = 0.2 V | | 210 | 218 | |
| Power down mode | DISCNCT = Trmpwr | | 0.5 | 5 | µA |
| **Output Section (110 Ω − Terminator Lines)** | | | | | |
| Terminator impedance | | 102.3 | 110 | 117.7 | Ohms |
| Output high voltage | (Note 1) | 2.5 | 2.7 | 3.0 | V |
| Max output current | VLINE = 0.2 V TJ = 25°C | −22.1 | −23 | −24 | mA |
| | VLINE = 0.2 V | −21 | −23 | −24 | |
| | VLINE = 0.2 , TRMPWR = 3 V, TJ = 25°C (Note 1) | −20.2 | −23 | −24 | |
| | VLINE = 0.2 V, TRMPWR = 3 V (Note 1) | −19 | −23 | −24 | |
| | VLINE = 0.5 V | | | −22.4 | |
| Output leakage | DISCNCT = 2.4 V, TRMPWR = 0 V to 5.25 V | | 10 | 400 | nA |
| Output capacitance | DISCNCT = 2.4 V (Note 2) (DP Package) | | 1.8 | 2.5 | pF |
| **Output Section (2.5 kΩ − Terminator Lines) (RDISCNCT = 80 kΩ)** | | | | | |
| Terminator impedance | | 2 | 2.5 | 3 | kΩ |
| Output high voltage | TRMPWR = 3 V (Note 1) | 2.5 | 2.7 | 3.0 | V |
| Max output current | VLINE = 0.2 V | −0.7 | −1 | −1.4 | mA |
| | VLINE = 0.2 V, TRMPWR = 3 V (Note 1) | −0.6 | −1 | −1.5 | |
| Output leakage | DISCNCT = 2.4 V, TRMPWR = 0 to 5.25 V | | 10 | 400 | nA |
| Output capacitance | DISCNCT = 2.4 V (Note 2) (DP Package) | | 1.8 | 2.5 | pF |
| **Regulator Section** | | | | | |
| Regulator output voltage | 5.25 V > TRMPWR > 3 V | 2.5 | 2.7 | 3.0 | V |
| Drop out voltage | All Termination Lines = 0.2 V | | 0.1 | 0.2 | |
| Short circuit current | VREG = 0 V | −200 | −400 | −800 | mA |
| Sinking current capability | VREG = 3 V | 200 | 400 | 800 | |
| Thermal shutdown | (Note 2) | | 170 | | °C |
| Thermal shutdown hysteresis | (Note 2) | | 10 | | |
| **Disconnect Section** | | | | | |
| Disconnect threshold | RDISCNCT = 0 & 80 kΩ | 0.8 | 1.5 | 2.0 | V |
| Input current | DISCNCT = 0 V | | 30 | 50 | mA |

NOTES: 1. Measuring each termination line while other eight are low (0.2 V).
2. Ensured by design. Not production tested.

## Terminal Functions

| TERMINAL NAME | TERMINAL NO. | I/O | DESCRIPTION |
|---|---|---|---|
| DISCNCT | 7 | I | Taking this pin high causes the 9 channels to become high impedance and the chip to go into low power mode. In short laptop buses an 80-kΩ to 150-kΩ resister to ground terminates the bus at 2.5 kΩ. Less than 110 Ω to ground enables the terminator. |
| GND | 9 | | Ground reference for the device |
| LINE1 TO LINE9 | 4 | I | 110-Ω termination channels |
| REG | 9 | o | Output of the internal 2.7-V regulator |
| TRMPWR | 4 | I | Power for the device |

## APPLICATION INFORMATION

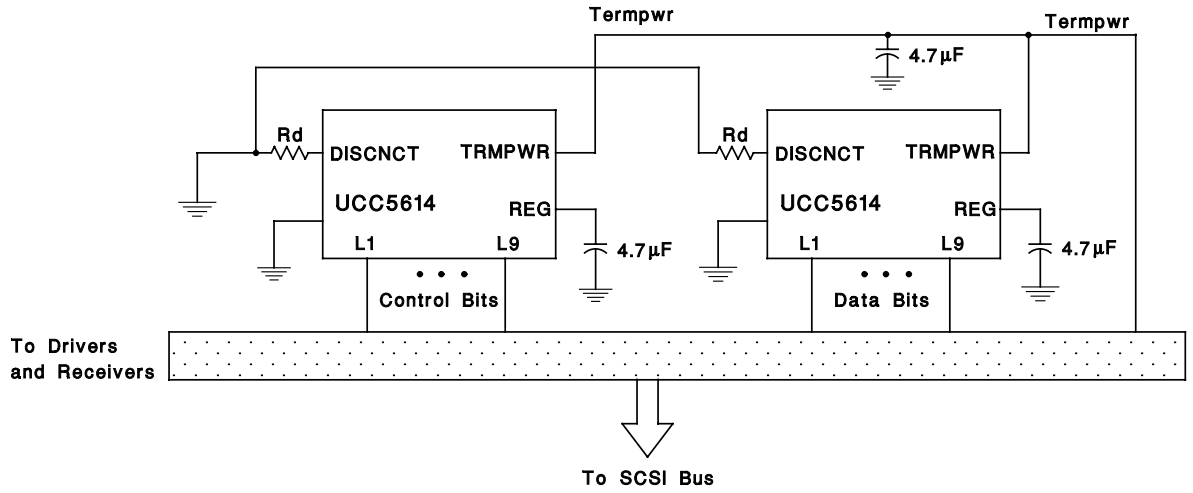



**Figure 1. Typical SCSI Bus Configuration Utilizing two UCC5614 Devices**

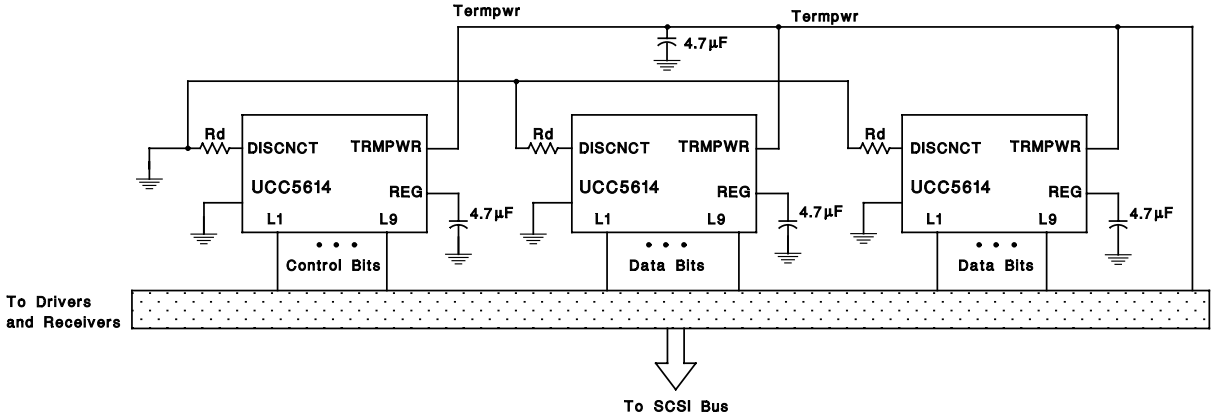



**Figure 2. Typical Wide SCSI Bus Configuration Utilizing three UCC5614 Devices**

## PACKAGING INFORMATION

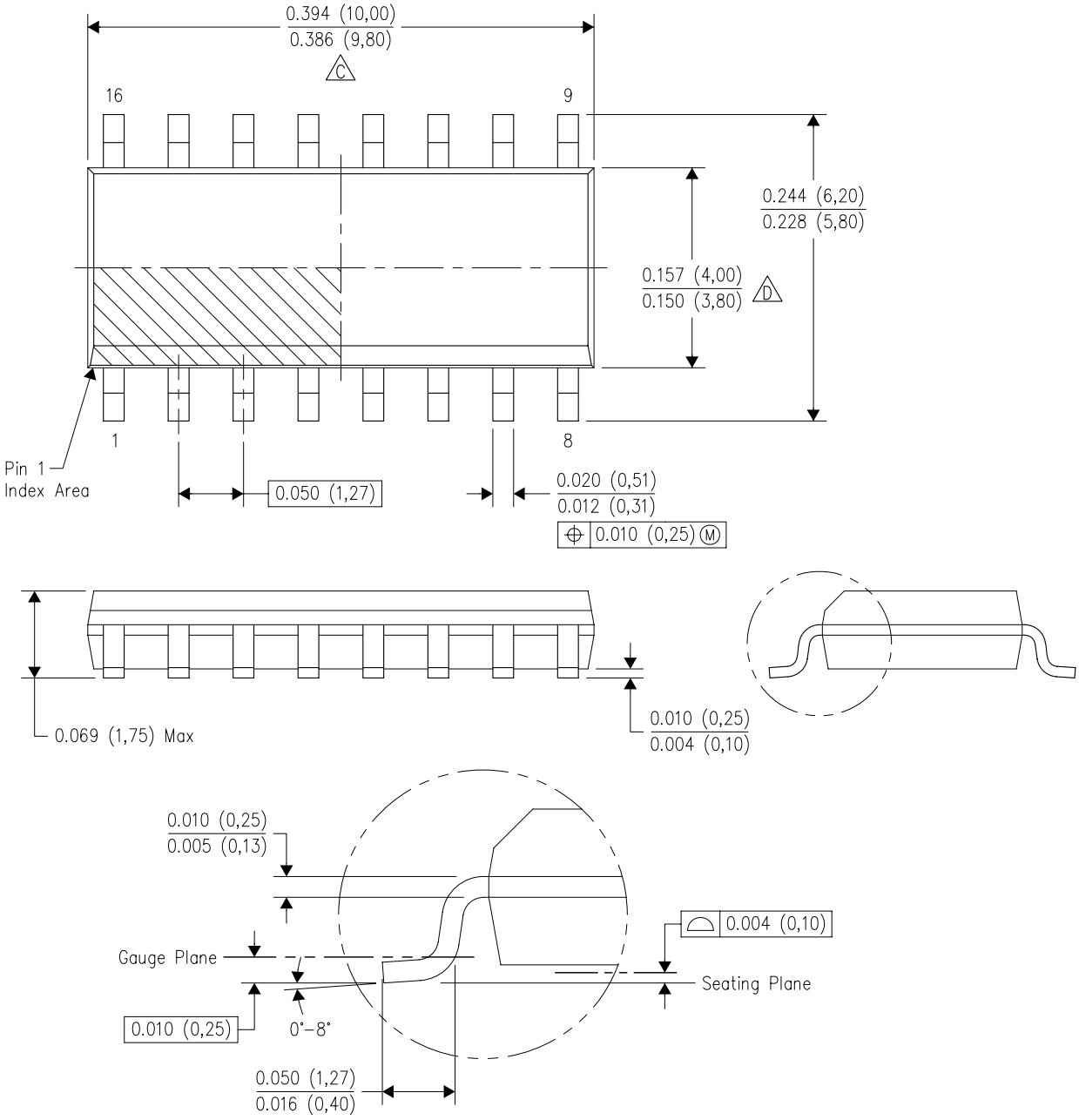
| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/ Ball Finish | MSL Peak Temp (3) | Samples (Requires Login) |
|---|---|---|---|---|---|---|---|---|---|
| UCC5614DP | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | |
| UCC5614DPG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | |
| UCC5614PWP | ACTIVE | TSSOP | PW | 24 | 60 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | |
| UCC5614PWPG4 | ACTIVE | TSSOP | PW | 24 | 60 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | |
| UCC5614Z | OBSOLETE | | UTR | 16 | | TBD | Call TI | Call TI | |

(1) 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.

(2) 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)

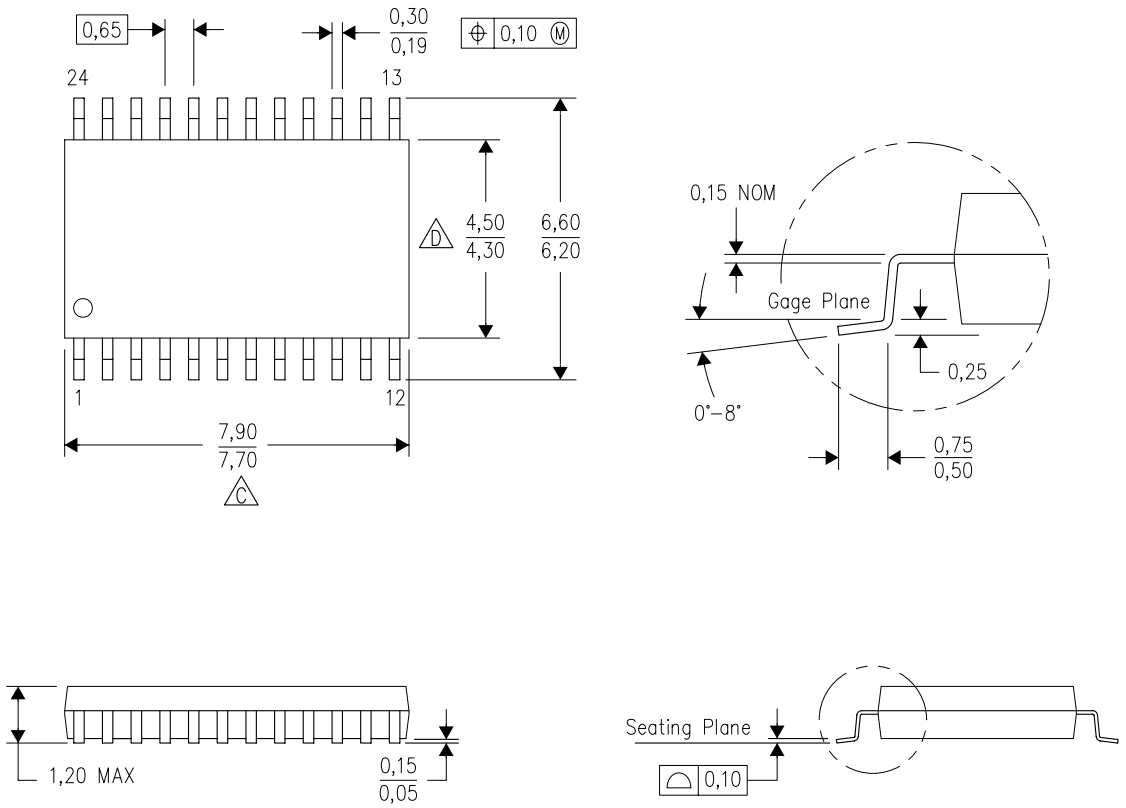
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE




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 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS–012 variation AC.

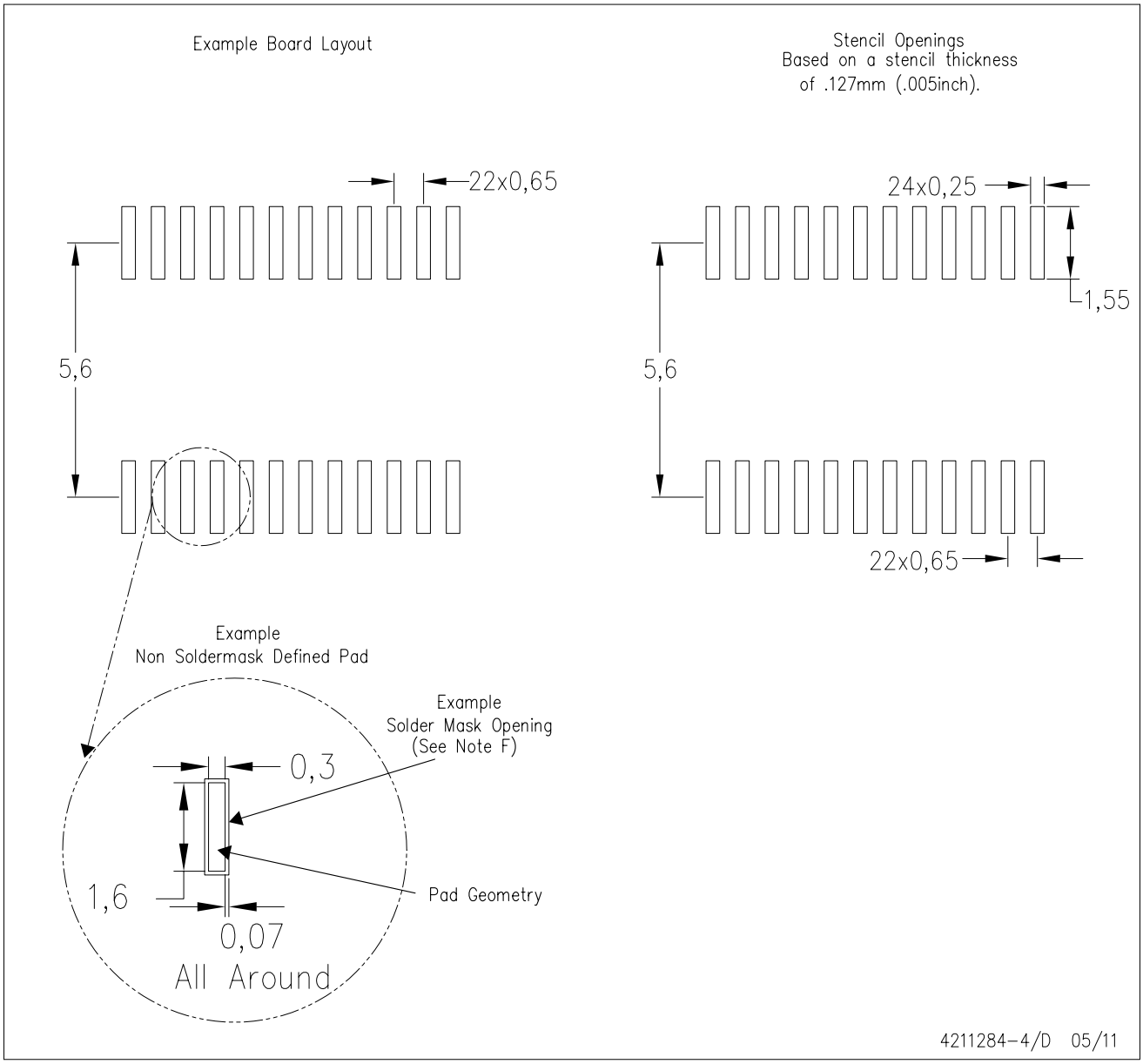
PW (R–PDSO–G24) PLASTIC SMALL OUTLINE




4040064–6/G 02/11

NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
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 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO–153

PW (R–PDSO–G24) PLASTIC SMALL OUTLINE




NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate 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 for other stencil recommendations.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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