

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- μ A Supply Current in Disconnect Mode
- 110- Ω /2.5-k Ω 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

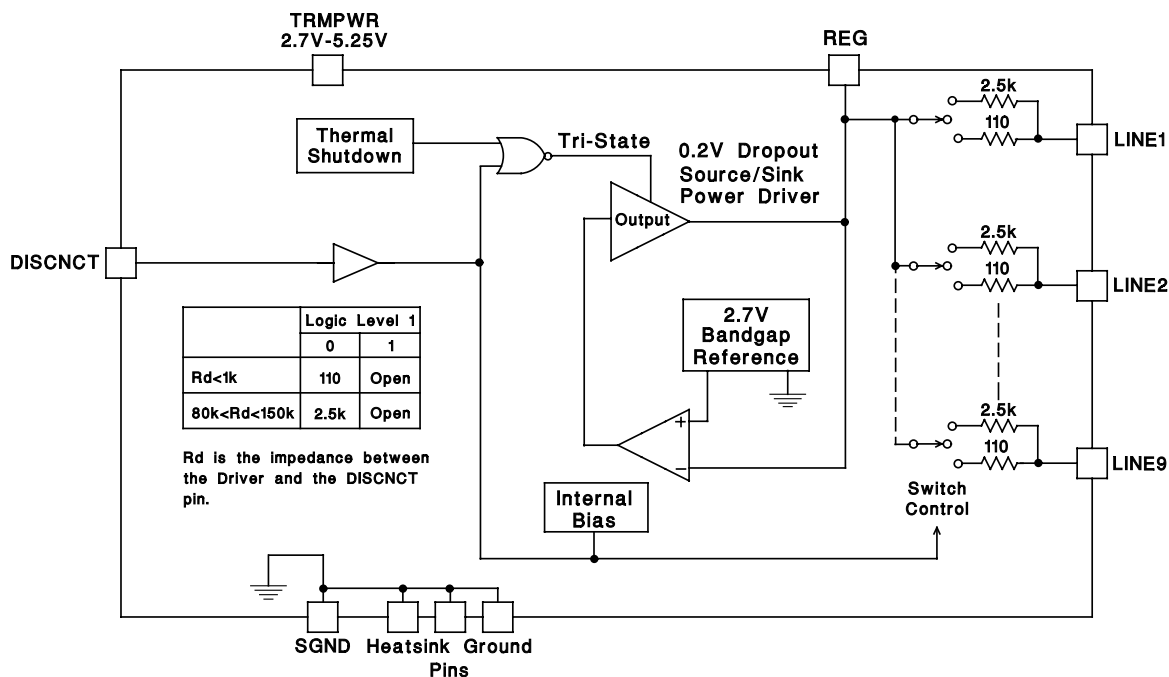
DESCRIPTION

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 μ A, 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 integrity caused by distributed terminators at interim points on the bus.

BLOCK DIAGRAM



PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

DESCRIPTION (CONTINUED)

The UCC5614 can be programmed for either a 110- Ω or 2.5-k Ω termination. The 110- Ω termination is used for standard SCSI bus lengths and the 2.5-k Ω 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 k Ω and 150 k Ω , the terminator is in short bus mode. The 2.5-k Ω 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

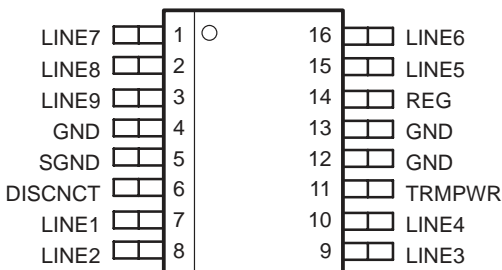
T_A	PACKAGED DEVICE		
	SOIC-16 (DP) [†]	DIL-16 (N)	TSSOP-24 (PW) [‡]
0°C to 70°C	UCC5614DP	UCC5614N	UCC5614PW

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

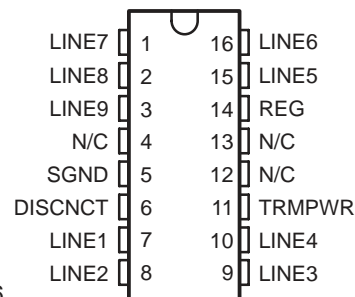
[‡] The PW package is available taped and reeled in quantities of 2,000. Add TR suffix to device type (e.g. UCC5614PWTR) to order quantities of 2,000 devices per reel.

CONNECTION DIAGRAMS

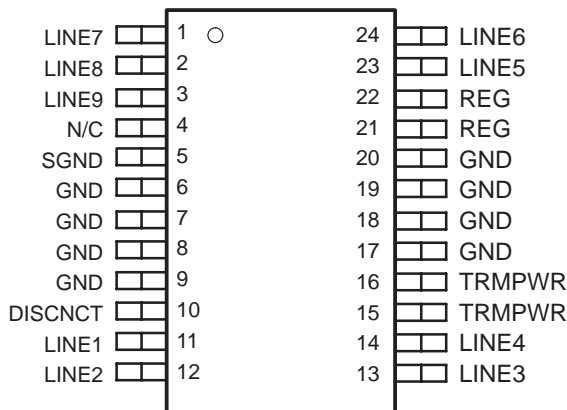
SOIC-16 (Top View)
DP Package (1) (2)



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
 $T_A = 0^\circ\text{C}$ to 70°C , $\text{TRMPWR} = 3.3\text{ V}$, $\text{DISCNCT} = 0\text{ V}$, $R_{\text{DISCNCT}} = 0\ \Omega$, $T_A = T_J$, (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current Section					
Tempwr 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 $T_J = 25^\circ\text{C}$	-22.1	-23	-24	mA
	VLINE = 0.2 V	-21	-23	-24	
	VLINE = 0.2 V, TRMPWR = 3 V, $T_J = 25^\circ\text{C}$ (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	k Ω
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		$^\circ\text{C}$
Thermal shutdown hysteresis	(Note 2)		10		
Disconnect Section					
Disconnect threshold	RDISCNCT = 0 & 80 k Ω	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	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 resistor 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

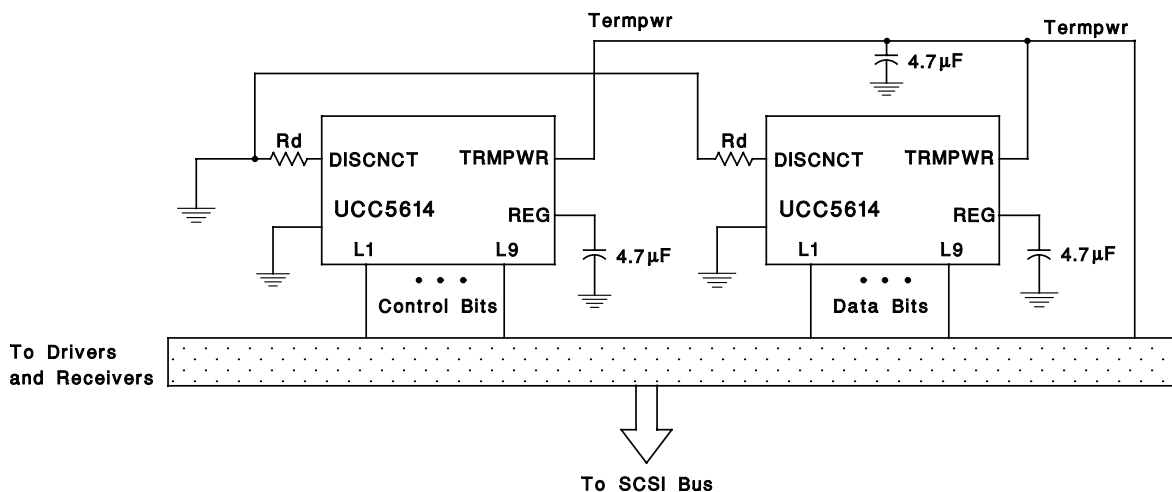


Figure 1. Typical SCSI Bus Configuration Utilizing two UCC5614 Devices

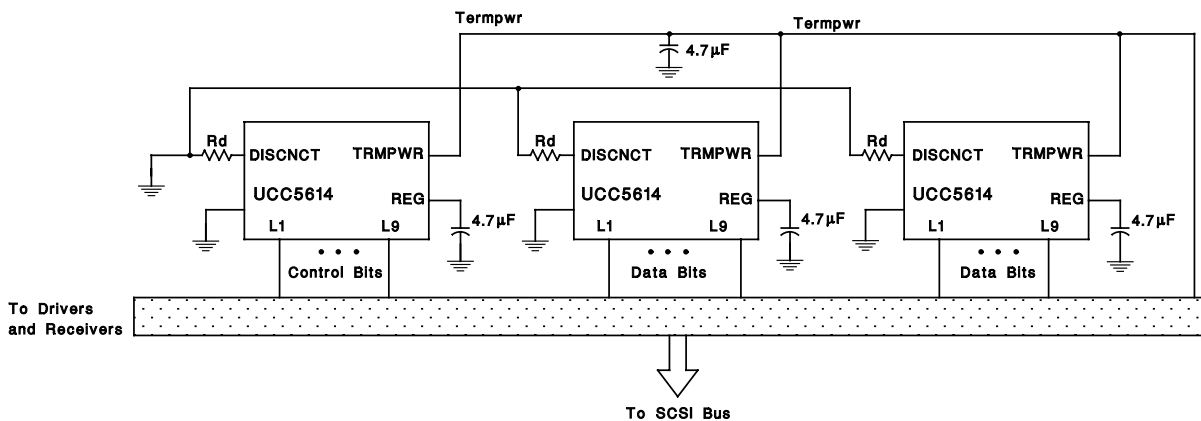


Figure 2. Typical Wide SCSI Bus Configuration Utilizing three UCC5614 Devices

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
UCC5614DP	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70	UCC5614DP	
UCC5614DPG4	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70	UCC5614DP	
UCC5614PWP	OBSOLETE	TSSOP	PW	24		TBD	Call TI	Call TI	0 to 70	UCC5614PWP	
UCC5614Z	OBSOLETE		UTR	16		TBD	Call TI	Call TI	0 to 70		

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

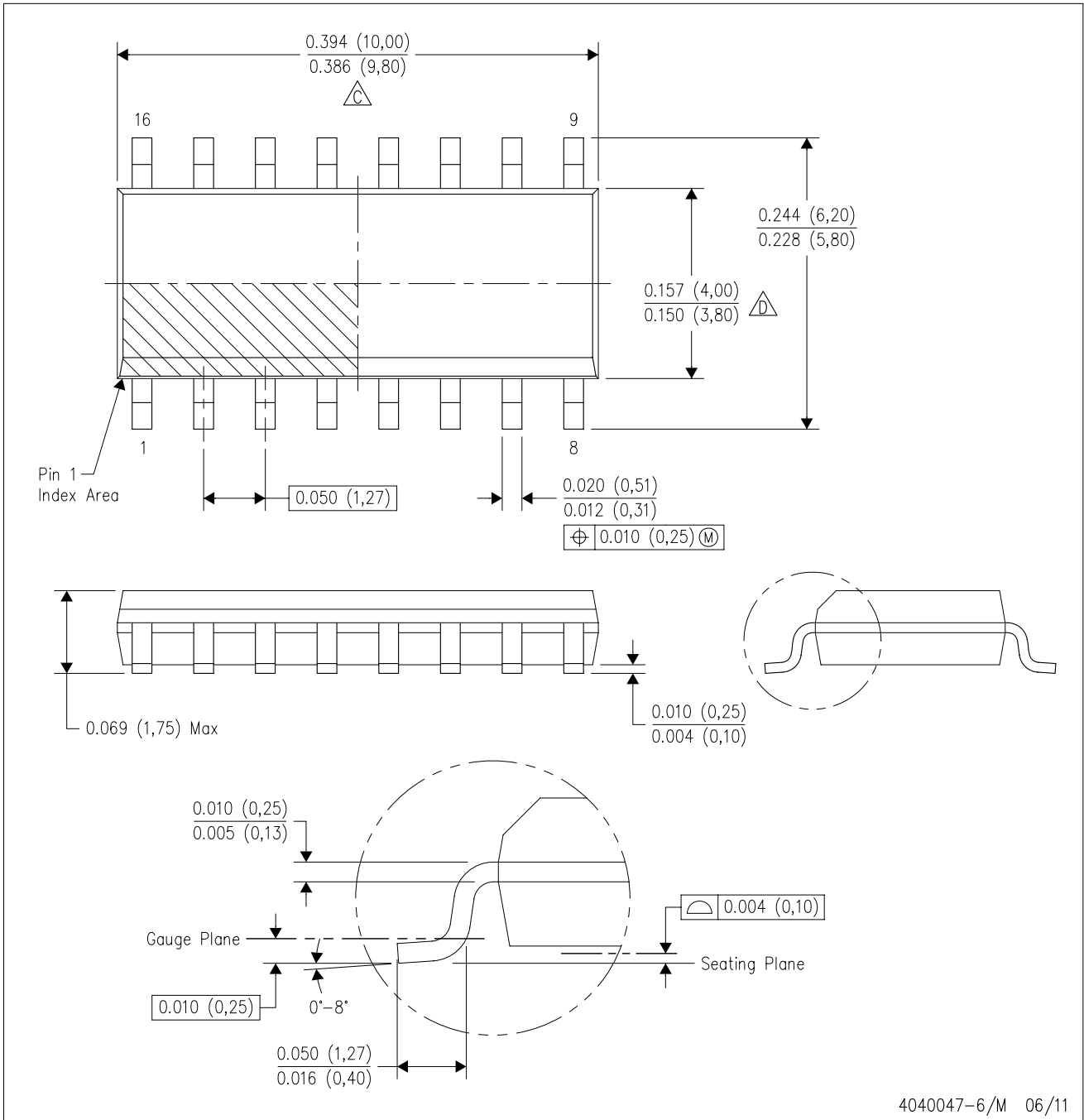
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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D (R-PDSO-G16)

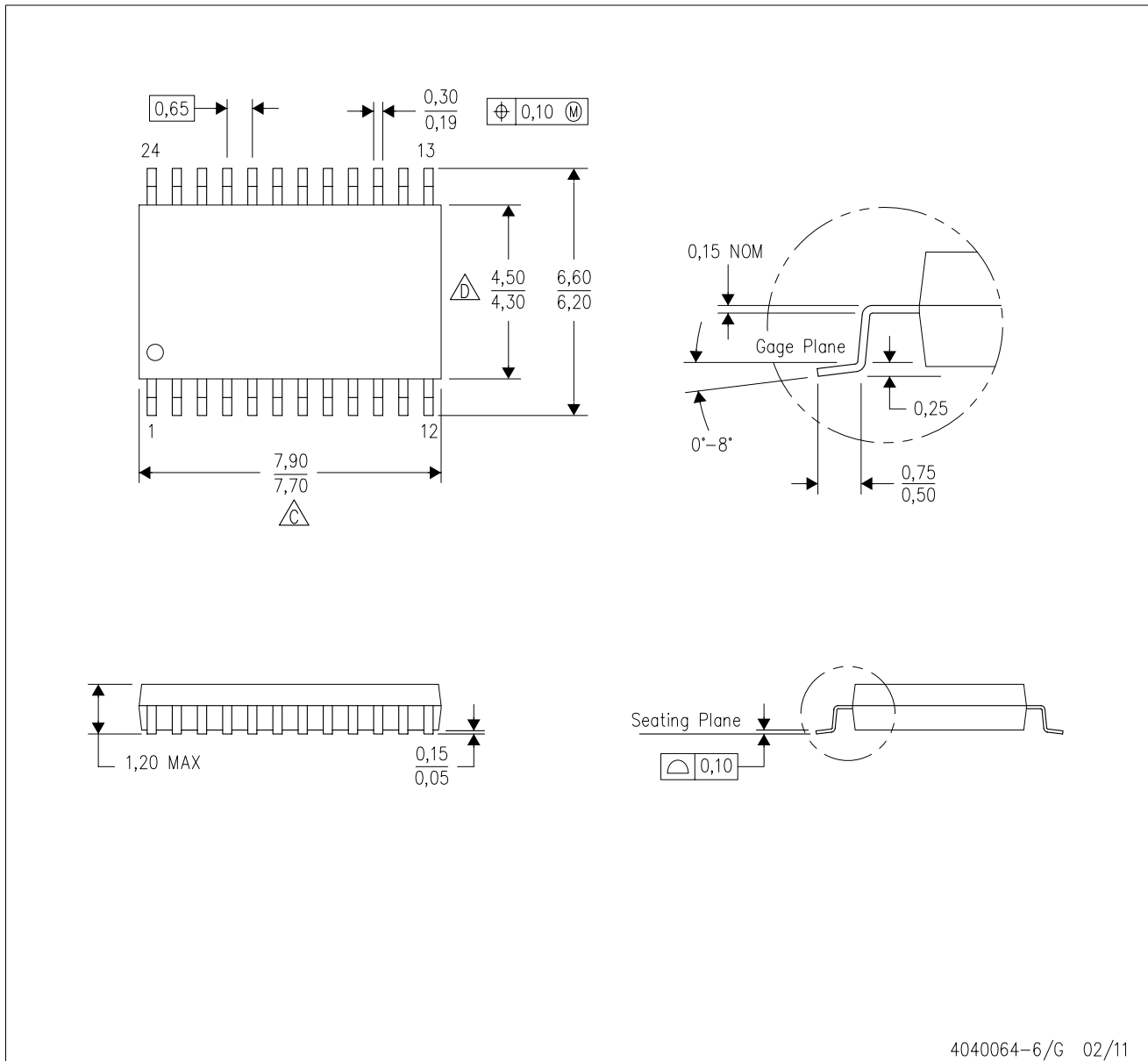
PLASTIC SMALL OUTLINE





- 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



- 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.
 -  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 -  Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

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