

9-LINE 3 TO 5 VOLT SCSI ACTIVE TERMINATOR, REVERSE DISCONNECT

FEATURES

- Complies with SCSI, SCSI-2 and SPI-2 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

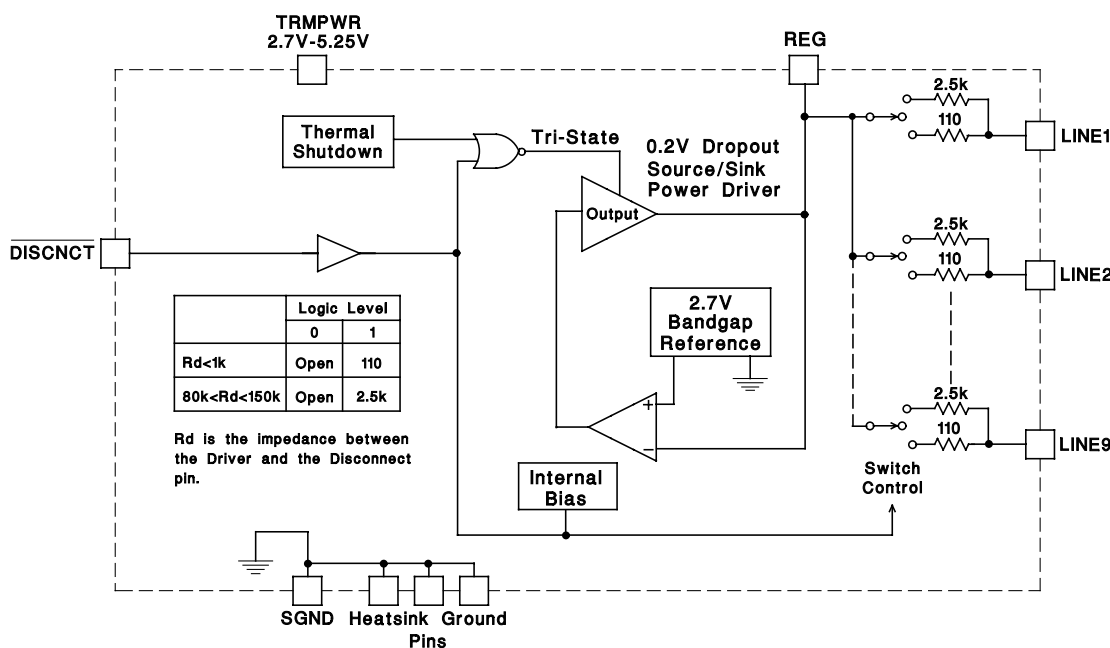
DESCRIPTION

The UCC5606 provides 9 lines of active termination for a small computer systems interface (SCSI) parallel bus. The SCSI standard recommends active termination at both ends of the cable segment.

The UCC5606 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 UCC5606 is designed with an ultra-low channel capacitance of 1.8 pF, which eliminates effects on signal integrity from disconnected terminators at interim points on the bus.

BLOCK DIAGRAM



UDG-94067-1



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

DESCRIPTION (CONTINUED)

The UCC5606 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 $\overline{\text{DISCNCT}}$ pin directly, the 110- Ω termination is connected when the $\overline{\text{DISCNCT}}$ pin is driven high, and disconnected when low. When the $\overline{\text{DISCNCT}}$ pin is driven through an impedance between 80 k Ω and 150 k Ω , the 2.5-k Ω termination is connected when the $\overline{\text{DISCNCT}}$ pin is driven high, and disconnected when driven low.

The power amplifier output stage allows the UCC5606 to source full termination current and sink active negation current when all termination lines are actively negated.

The UCC5606 is pin-for-pin compatible with Unitrode's other 9-line single-ended SCSI terminators, except that $\overline{\text{DISCNCT}}$ is now active low, allowing lower capacitance and lower voltage upgrades to existing systems. The UCC5606 is completely hot pluggable and appears as high impedance at the terminating channels with $V_{\text{TRMPWR}} = 0$ 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 maximum 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.

ABSOLUTE MAXIMUM RATINGS

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

	UCC5606	UNIT
TRMPWR voltage	7	V
Signal line voltage	0 to 7	
Regulator output current	0.6	A
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

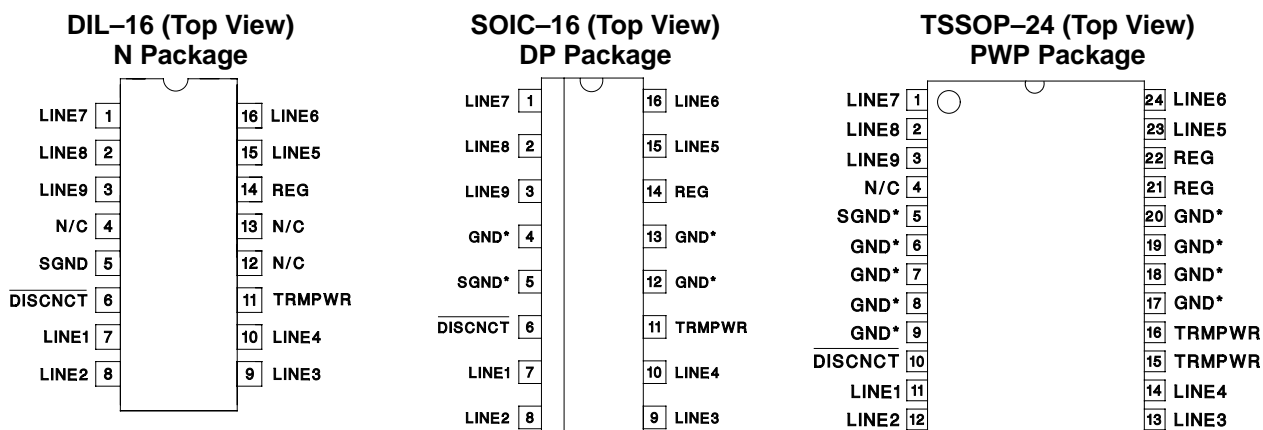
	MIN	NOM	MAX	UNIT
TRMPWR voltage	2.7		5.25	V
Signal line voltage	0		5	V
Disconnect input voltage	0	TRMPWR		°C

ORDERING INFORMATION

T_A	DISCONNECT STATUS	PACKAGED DEVICE†		
		DIL-16 (N)	SOIC-16 (DP)	TSSOP-24 (PWP)
0°C to 70°C		UCC5606N	UCC5606DP	UCC5606PWP

† The LQFP packages are available taped and reeled. Add TR suffix to device type (e.g. UCC5606PWPTR) to order quantities of 2,500 devices per reel.

CONNECTION DIAGRAM



NOTE: GND* serves as a heat sink ground which must be tied to a large copper area or the grounding plate.

ELECTRICAL CHARACTERISTICS

$T_A = 0^\circ\text{C}$ to 70°C , TRMPWR = 3.3 V, $\overline{\text{DISCNCT}} = 3.3$ 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	$\overline{\text{DISCNCT}} = 0$ V		0.5	5.0	μA
Output Section (110 ohms – Terminator Lines)					
Terminator impedance		102.3	110.0	117.7	Ohms
Output high voltage	TRMPWR = 3 V (1)	2.5	2.7	3.0	V
Max output current	$V_{\text{LINE}} = 0.2$ V, $T_J = 25^\circ\text{C}$	-22.1	-23.0	-24.0	mA
	$V_{\text{LINE}} = 0.2$ V	-21	-23	-24	
	$V_{\text{LINE}} = 0.2$ V, TRMPWR = 3 V, $T_J = 25^\circ\text{C}$ (1)	-20.2	-23.0	-24.0	
	$V_{\text{LINE}} = 0.2$ V, TRMPWR = 3 V (1)	-19	-23	-24	
	$V_{\text{LINE}} = 0.5$ V			-22.4	
Output leakage	$\overline{\text{DISCNCT}} = 0$ V, TRMPWR = 0 V to 5.25 V		10	400	nA
Output capacitance	$\overline{\text{DISCNCT}} = 0$ V, DP package (2)		1.8	2.5	pF
Output Section (2.5 kΩ – Terminator Lines) ($R_{\text{DISCNCT}} = 80$ kΩ)					
Terminator impedance		2.0	2.5	3.0	k Ω
Output high voltage	TRMPWR = 3 V (1)	2.5	2.7	3.0	V
Max output current	$V_{\text{LINE}} = 0.2$ V	-0.7	-1.0	-1.4	mA
	$V_{\text{LINE}} = 0.2$ V, TRMPWR = 3 V (1)	-0.6	-1.0	-1.5	
Output leakage	$\overline{\text{DISCNCT}} = 0$ V, TRMPWR = 0 to 5.25 V		10	400	nA
Output capacitance	$\overline{\text{DISCNCT}} = 0$ V, DP package (2)		1.8	2.5	pF

ELECTRICAL CHARACTERISTICS

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

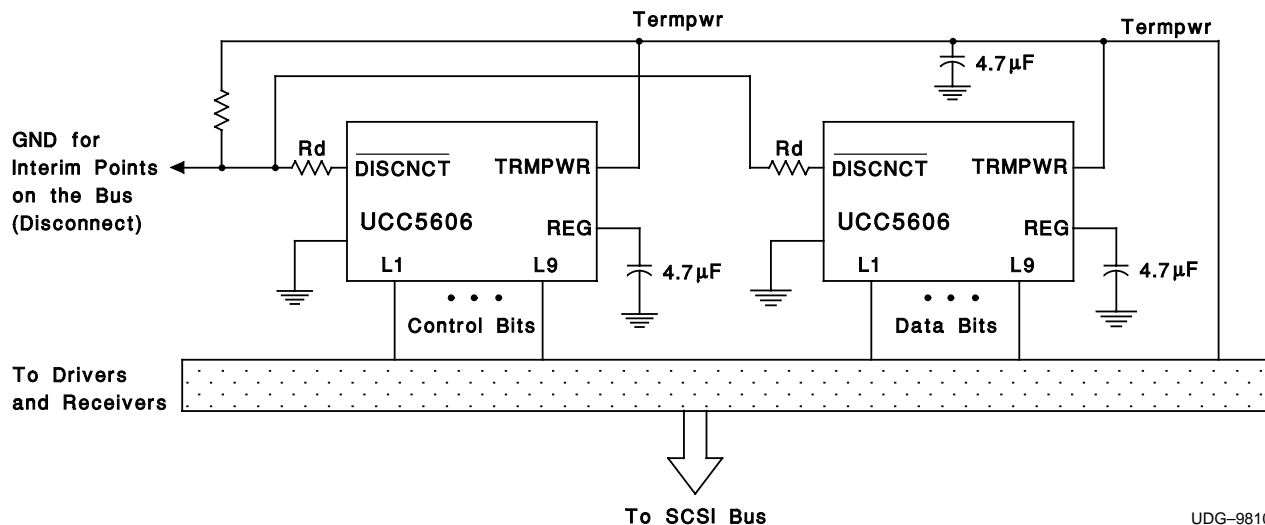
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Regulator Section					
Regulator output voltage	$5.25\text{ V} > \text{TRMPWR} > 3\text{ V}$	2.5	2.7	3.0	V
Drop-out voltage	All termination lines = 0.2 V		0.1	0.2	
Short circuit current	$V_{\text{REG}} = 0\text{ V}$	-200	-400	-800	mA
Sinking current capability	$V_{\text{REG}} = 3\text{ V}$	200	400	800	
Thermal shutdown	(2)		170		$^\circ\text{C}$
Thermal shutdown hysteresis	(2)		10		
Disconnect Section					
Disconnect threshold	$R_{\text{DISCNCT}} = 0\text{ k}\Omega$ to $80\text{ k}\Omega$	0.8	1.5	2.0	V
Input current	$\overline{\text{DISCNCT}} = 3.3\text{ V}$		30	50	μA

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

TERMINAL FUNCTIONS

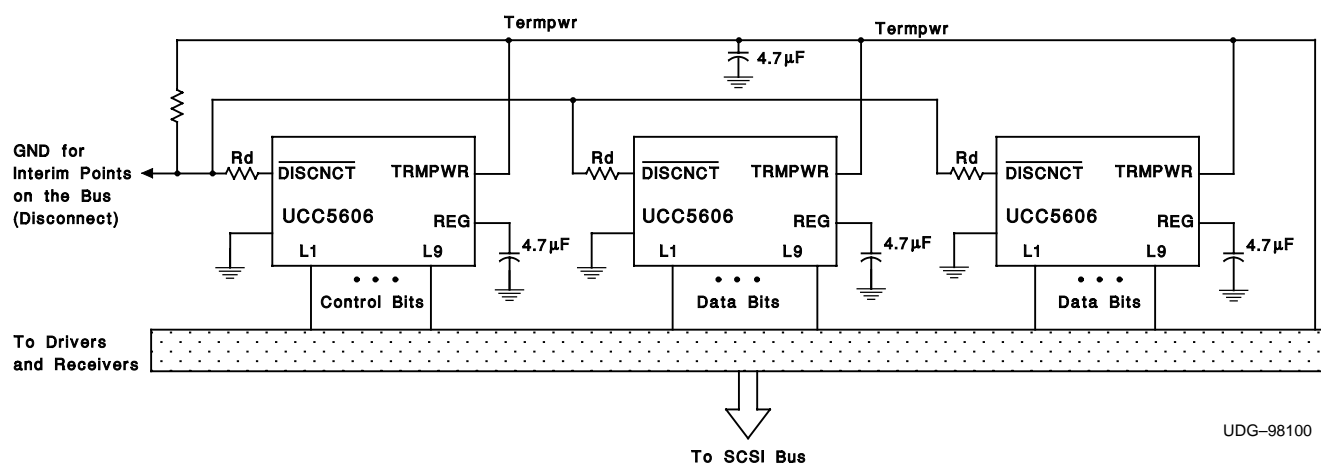
TERMINAL		I/O	DESCRIPTION
NAME	NO.		
$\overline{\text{DISCNCT}}$	7	I	Taking this pin low causes the 9 channels to become high impedance and the chip to go into low power mode. In short laptop buses an $80\text{-k}\Omega$ to $150\text{-k}\Omega$ resistor to TERPWR terminates the bus at $2.5\text{ k}\Omega$. Less than $110\ \Omega$ to TERPWR enables the terminator.
GND	9		Ground reference for the device
LINE1 TO LINE9	4	I	$110\text{-}\Omega$ termination channels
REG	9	I	Output of the internal 2.7-V regulator
TRMPWR	4		Power for the device
GND*			Heat sink ground, must be tied to a large copper area or the grounding plate.

APPLICATION INFORMATION



UDG-98100

Figure 1. Typical SCSI Bus Configurations Utilizing two UCC5606 Devices



UDG-98100

Figure 2. Typical Wide SCSI Bus Configurations Utilizing three UCC5606 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
UCC5606PWPTR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	UCC5606PWP	Samples

(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.

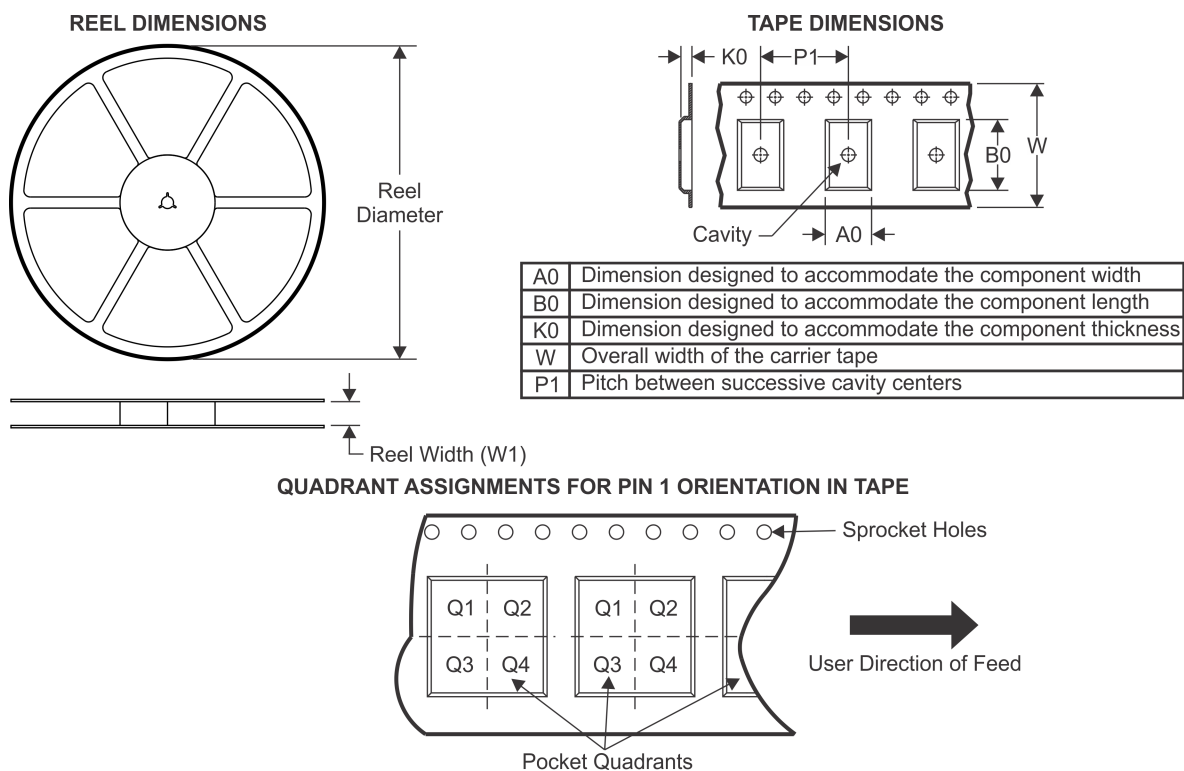
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION


*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
UCC5606PWPTR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS

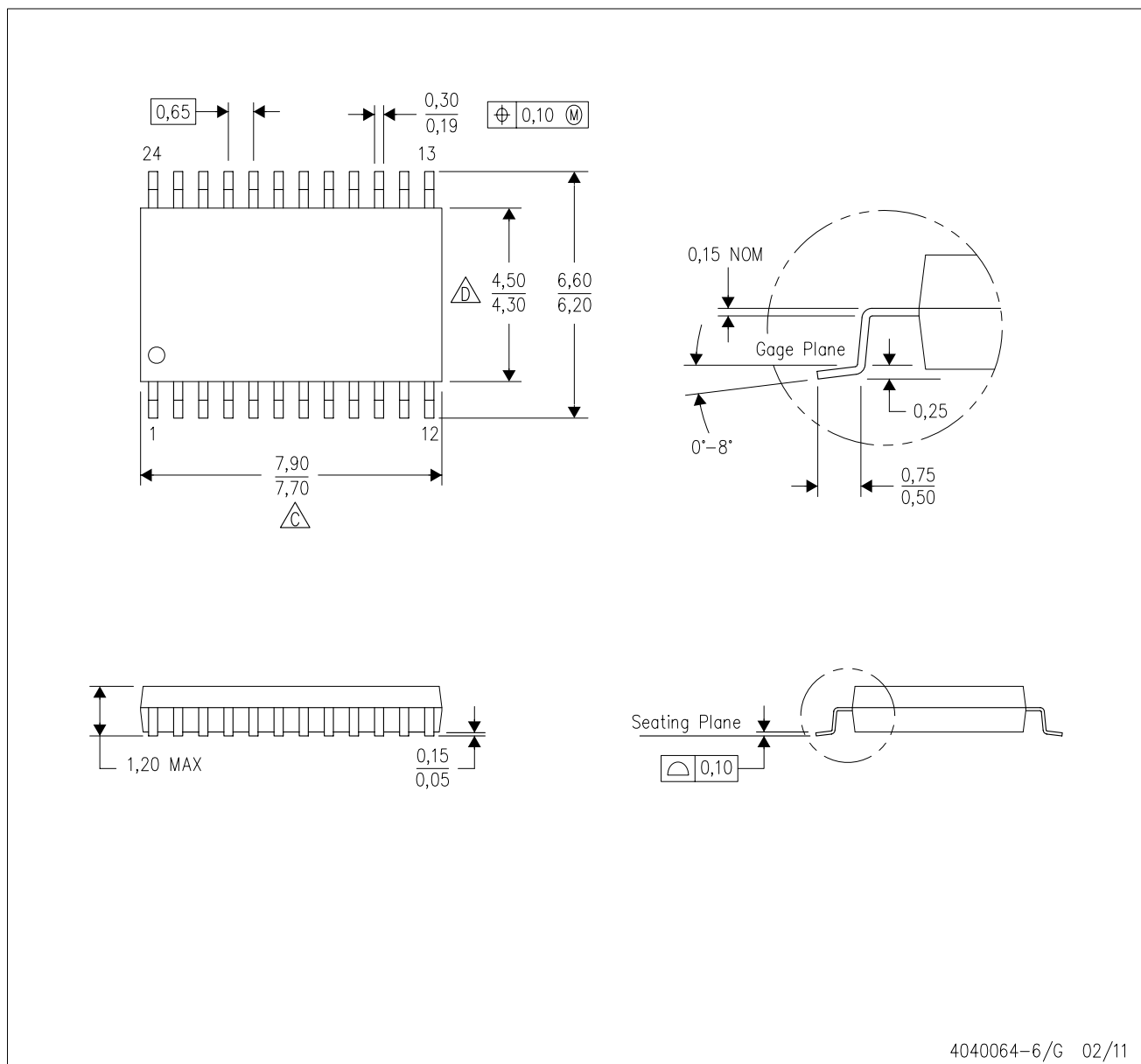


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UCC5606PWPTR	TSSOP	PW	24	2000	367.0	367.0	38.0

PW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

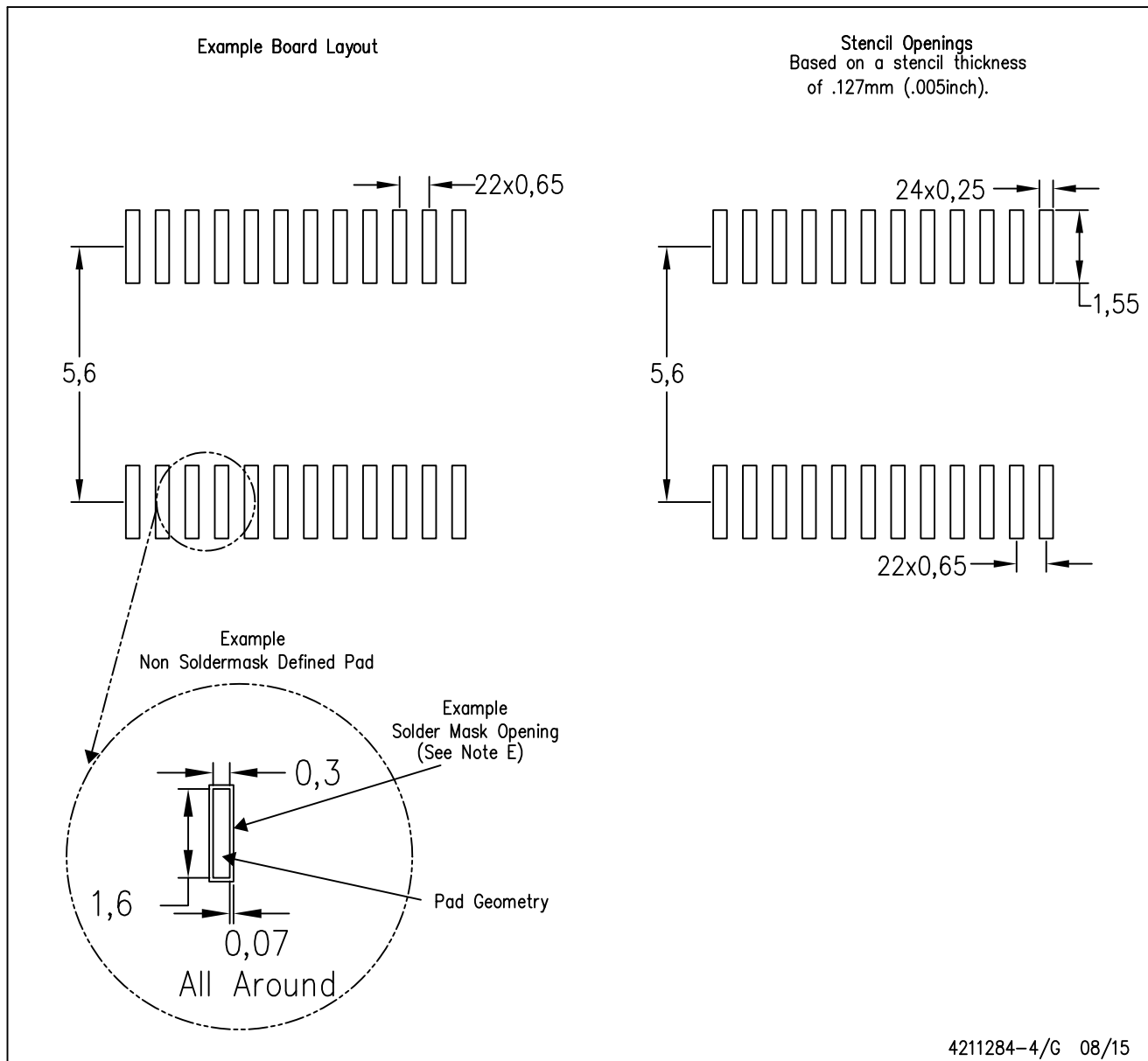


4040064-6/G 02/11

- 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.

IMPORTANT NOTICE

Texas Instruments Incorporated (TI) reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

TI's published terms of sale for semiconductor products (<http://www.ti.com/sc/docs/stdterms.htm>) apply to the sale of packaged integrated circuit products that TI has qualified and released to market. Additional terms may apply to the use or sale of other types of TI products and services.

Reproduction of significant portions of TI information in TI data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such reproduced documentation. Information of third parties may be subject to additional restrictions. Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyers and others who are developing systems that incorporate TI products (collectively, "Designers") understand and agree that Designers remain responsible for using their independent analysis, evaluation and judgment in designing their applications and that Designers have full and exclusive responsibility to assure the safety of Designers' applications and compliance of their applications (and of all TI products used in or for Designers' applications) with all applicable regulations, laws and other applicable requirements. Designer represents that, with respect to their applications, Designer has all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. Designer agrees that prior to using or distributing any applications that include TI products, Designer will thoroughly test such applications and the functionality of such TI products as used in such applications.

TI's provision of technical, application or other design advice, quality characterization, reliability data or other services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using TI Resources in any way, Designer (individually or, if Designer is acting on behalf of a company, Designer's company) agrees to use any particular TI Resource solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

Designer is authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY DESIGNER AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Unless TI has explicitly designated an individual product as meeting the requirements of a particular industry standard (e.g., ISO/TS 16949 and ISO 26262), TI is not responsible for any failure to meet such industry standard requirements.

Where TI specifically promotes products as facilitating functional safety or as compliant with industry functional safety standards, such products are intended to help enable customers to design and create their own applications that meet applicable functional safety standards and requirements. Using products in an application does not by itself establish any safety features in the application. Designers must ensure compliance with safety-related requirements and standards applicable to their applications. Designer may not use any TI products in life-critical medical equipment unless authorized officers of the parties have executed a special contract specifically governing such use. Life-critical medical equipment is medical equipment where failure of such equipment would cause serious bodily injury or death (e.g., life support, pacemakers, defibrillators, heart pumps, neurostimulators, and implantables). Such equipment includes, without limitation, all medical devices identified by the U.S. Food and Drug Administration as Class III devices and equivalent classifications outside the U.S.

TI may expressly designate certain products as completing a particular qualification (e.g., Q100, Military Grade, or Enhanced Product). Designers agree that it has the necessary expertise to select the product with the appropriate qualification designation for their applications and that proper product selection is at Designers' own risk. Designers are solely responsible for compliance with all legal and regulatory requirements in connection with such selection.

Designer will fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of Designer's non-compliance with the terms and provisions of this Notice.