

# 9-Line Low Capacitance SCSI Active Terminator

## FEATURES

- Complies with SCSI, SCSI-2 Standards
- 9pF Channel Capacitance during Disconnect
- 100µA Supply Current in Disconnect Mode
- Meets SCSI Hot Plugging Capability
- -300mA Sourcing Current for Termination
- +40mA Sinking Current for Active Negation
- Logic Command Disconnects all Termination Lines
- Trimmed Termination Current to 7%
- Trimmed Impedance to 7%
- Current Limit and Thermal Shutdown Protection

## DESCRIPTION

The UC5604 provides 9 lines of active termination for a SCSI (Small Computer Systems Interface) parallel bus. The SCSI standard recommends active termination at both ends of the cable segment.

The UC5604 provides a disconnect feature which, when opened or driven high, will disconnect all terminating resistors and disable the regulator, greatly reducing standby power. The output channels remain high impedance even without *Tempwr* applied.

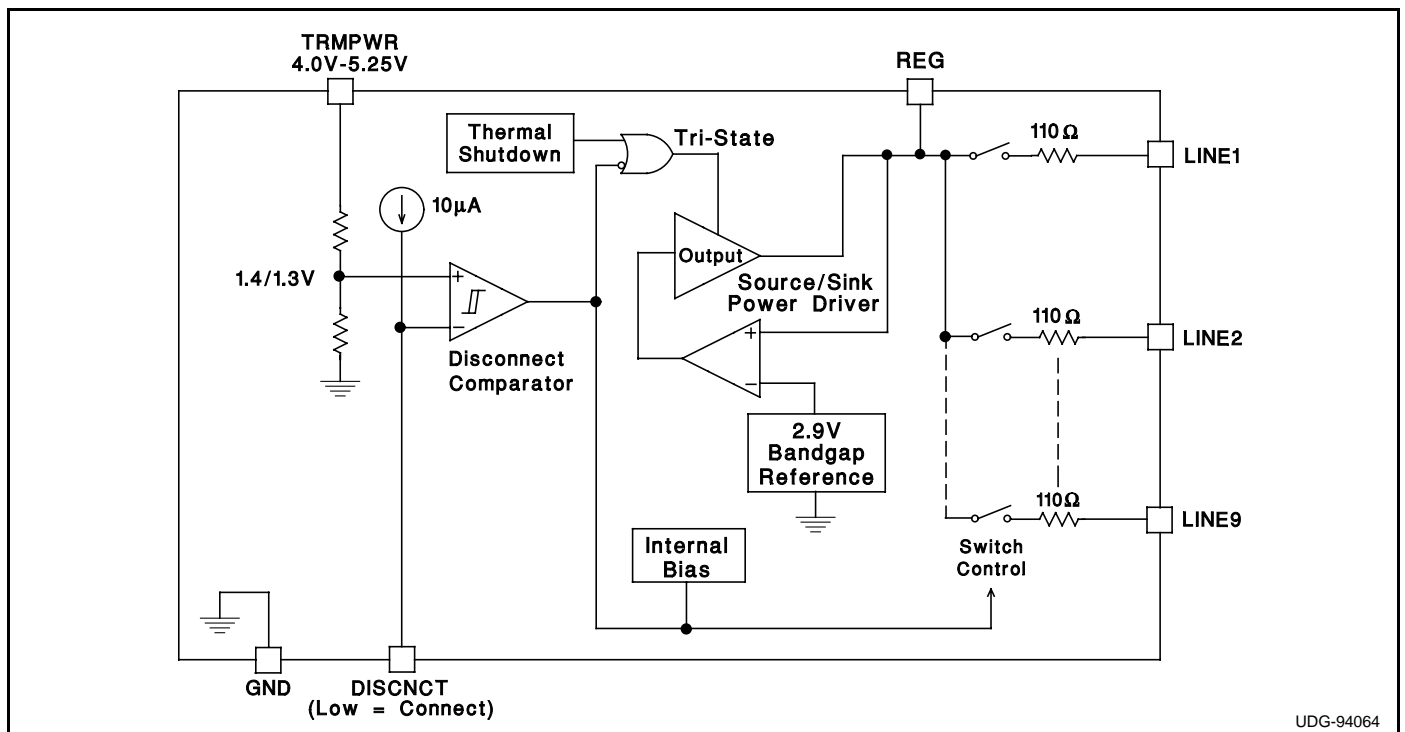
The UC5604 is pin-for-pin compatible with its predecessor, the UC5603 - 9 line Active Terminator. The only functional difference between the UC5604 and UC5603 is the absence of the negative clamps. Parametrically, the UC5604 has a 7% tolerance on impedance and current compared to a 3% tolerance on the UC5603 and the sink current is reduced from 300mA to 40mA. Custom power packages are utilized to allow normal operation at full power conditions (1.2 watts).

Internal circuit trimming is utilized, first to trim the impedance to a 7% tolerance, and then most importantly, to trim the output current to a 7% tolerance, as close to the max SCSI spec 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 ZIP (zig-zag in line package) and 24 pin TSSOP.

## BLOCK DIAGRAM



Circuit Design Patented

**ABSOLUTE MAXIMUM RATINGS**

Tempwr Voltage .....	+7V
Signal Line Voltage .....	0V to +7V
Regulator Output Current .....	0.5A
Storage Temperature .....	-65°C to +150°C
Operating Temperature .....	-55°C to +150°C
Lead Temperature (Soldering, 10 Sec.) .....	+300°C

Unless otherwise specified all voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

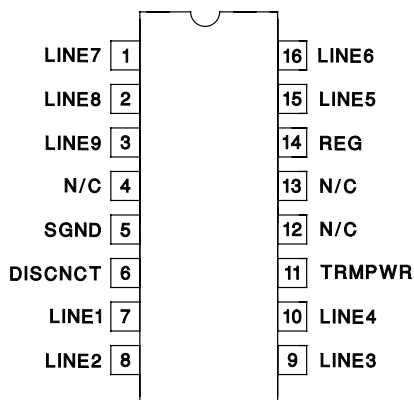
Consult Packaging Section of Unitrode Integrated Circuits databook for thermal limitations and considerations of packages.

**RECOMMENDED OPERATING CONDITIONS**

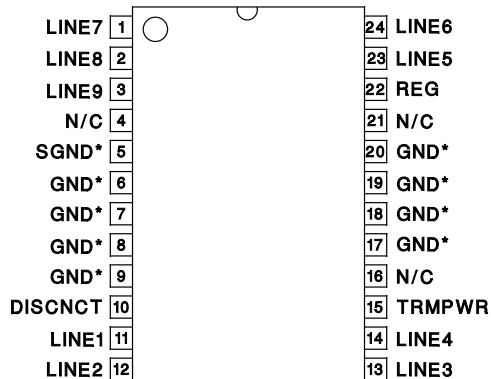
Tempwr Voltage .....	3.8V to 5.25V
Signal Line Voltage .....	0V to +5V
Disconnect Input Voltage .....	0V to Tempwr

**CONNECTION DIAGRAMS**

**DIL-16 (Top View)  
N or J Package**

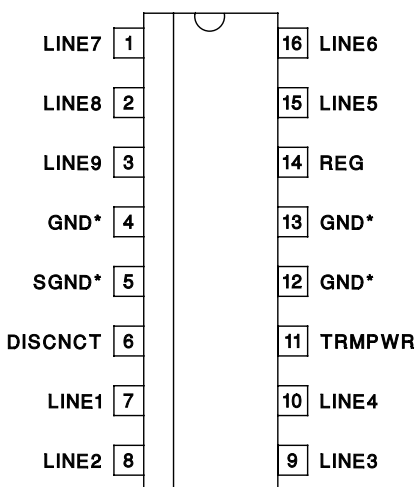


**TSSOP-24 (Top View)  
PWP Package**



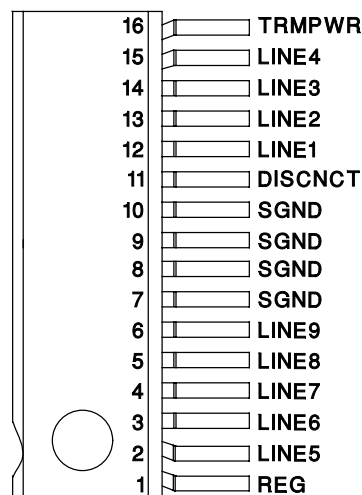
\* PWP package pin 5 serves as signal ground; pins 6, 7, 8, 9, 17, 18, 19, and 20 serve as heatsink/ground.

**SOIC-16 (Top View)  
DP Package**



\* DP package pin 5 serves as signal ground; pins 4, 12, 13 serve as heatsink/ground.

**ZIP-16 (Top View)  
Z Package**



Note: Drawings are not to scale.

**ELECTRICAL CHARACTERISTICS** Unless otherwise stated, these specifications apply for TA = 0°C to 70°C.  
 TRMPWR = 4.75V, DISCNCT = 0V. TA = TJ.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS	
<b>Supply Current Section</b>						
Tempwr Supply Current	All termination lines = Open		14	20	mA	
	All termination lines = 0.5V		200	220	mA	
Power Down Mode	DISCNCT = Open		100	150	μA	
<b>Output Section (Terminator Lines)</b>						
Terminator Impedance	ΔLINE = -5mA to -15mA	97	110	129	Ohms	
Output High Voltage	TRMPWR = 4V (Note 1)	0°C < TJ < 70°C	2.55		3.2	V
		TJ = 25°C	2.6	2.9	3.1	V
Max Output Current	VLINE = 0.5V	TJ = 25°C	-19.5	-21.9	-22.4	mA
		0°C < TJ < 70°C	-18.5	-21.9	-22.4	mA
Max Output Current	VLINE = 0.5V, TRMPWR = 4V (Note 1)	TJ = 25°C	-18.0	-21.9	-22.4	mA
		0°C < TJ < 70°C	-17.0	-21.9	-22.4	mA
Output Clamp Level	ILINE = -30mA	-0.2	-0.05	0.1	V	
Output Leakage	DISCNCT = 4V	TRMPWR = 0V to 5.25V REG = 0V		10	400	nA
		VLINE = 0 to 4V			100	μA
		VLINE = 5.25V			100	μA
		TRMPWR = 0V to 5.25V, REG = Open VLINE = 0V to 5.25V		10	400	nA
Output Capacitance	DISCNCT = Open (Note 2)		9	12	pF	
<b>Regulator Section</b>						
Regulator Output Voltage		2.5	2.9	3.2	V	
Regulator Output Voltage	All Termination Lines = 5V	2.55	2.9	3.1	V	
Line Regulation	TRMPWR = 4V to 6V		10	20	mV	
Load Regulation	I <sub>REG</sub> = +100mA to -100mA		20	50	mV	
Drop Out Voltage	All Termination Lines = 0.5V		1.0	1.2	V	
Short Circuit Current	V <sub>REG</sub> = 0V	-200	-400	-600	mA	
Sinking Current Capability	V <sub>REG</sub> = 3.5V	20	40		mA	
Thermal Shutdown			170		°C	
Thermal Shutdown Hysteresis			10		°C	
<b>Disconnect Section</b>						
Disconnect Threshold		1.1	1.4	1.7	V	
Threshold Hysteresis			100		mV	
Input Current	DISCNCT = 0V		150	200	μA	

Note 1: Measuring each termination line while other 8 are low (0.5V).

Note 2: Guaranteed by design. Not 100% tested in production.

**APPLICATION INFORMATION**

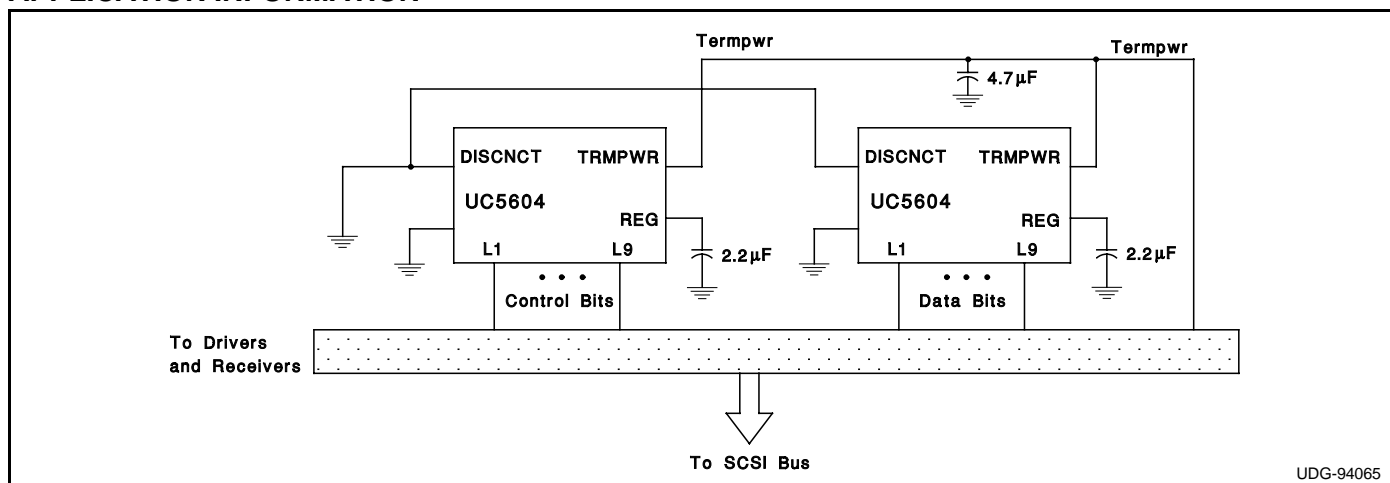


Figure 1: Typical SCSI Bus Configurations Utilizing 2 UC5604 Devices

APPLICATION INFORMATION (cont.)

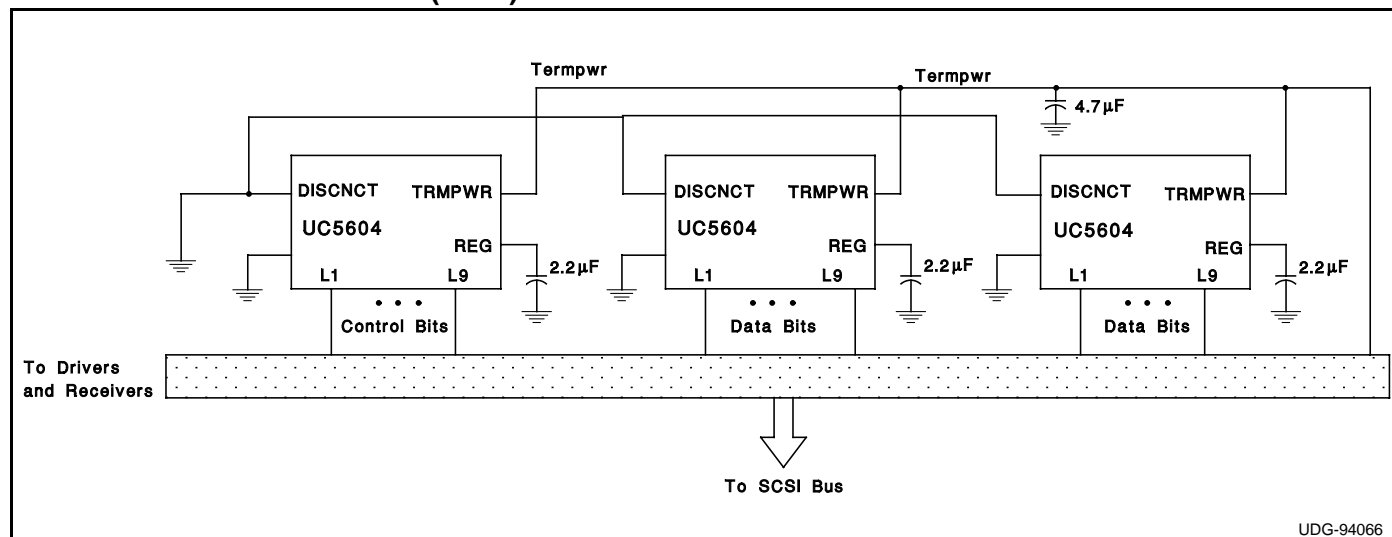


Figure 2: Typical Wide SCSI Bus Configurations Utilizing 3 UC5604 Devices.

UDG-94066

**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>
UC5604DP	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
UC5604DPTR	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
UC5604J	OBSOLETE		UTR	16		TBD	Call TI	Call TI
UC5604N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
UC5604QP	OBSOLETE	PLCC	FN	28		TBD	Call TI	Call TI
UC5604QPTR	OBSOLETE	PLCC	FN	28		TBD	Call TI	Call TI
UC5604Z	OBSOLETE		UTR	16		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.

**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.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information 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.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

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.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
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>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
		Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
		Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2005, Texas Instruments Incorporated