SCSI Active Terminator

FEATURES

- Complies with SCSI, SCSI-2 Standards
- 10pF Channel Capacitance During Disconnect
- Active Termination for 18 Lines
- Logic Command Disconnects all Termination Lines
- Low Supply Current in Disconnect Mode
- Trimmed Regulator for Accurate Termination Current
- Current Limit and Thermal Shutdown Protection
- 110 Ohm Termination
- Meets SCSI Hot Plugging

DESCRIPTION

The UC5601 provides precision resistive pull-up to a 2.9V reference for all 18 lines in a Small Computer Systems Interface (SCSI) bus cable. The SCSI-2 standard recommends active termination at both ends of every cable segment utilizing single ended drivers and receivers.

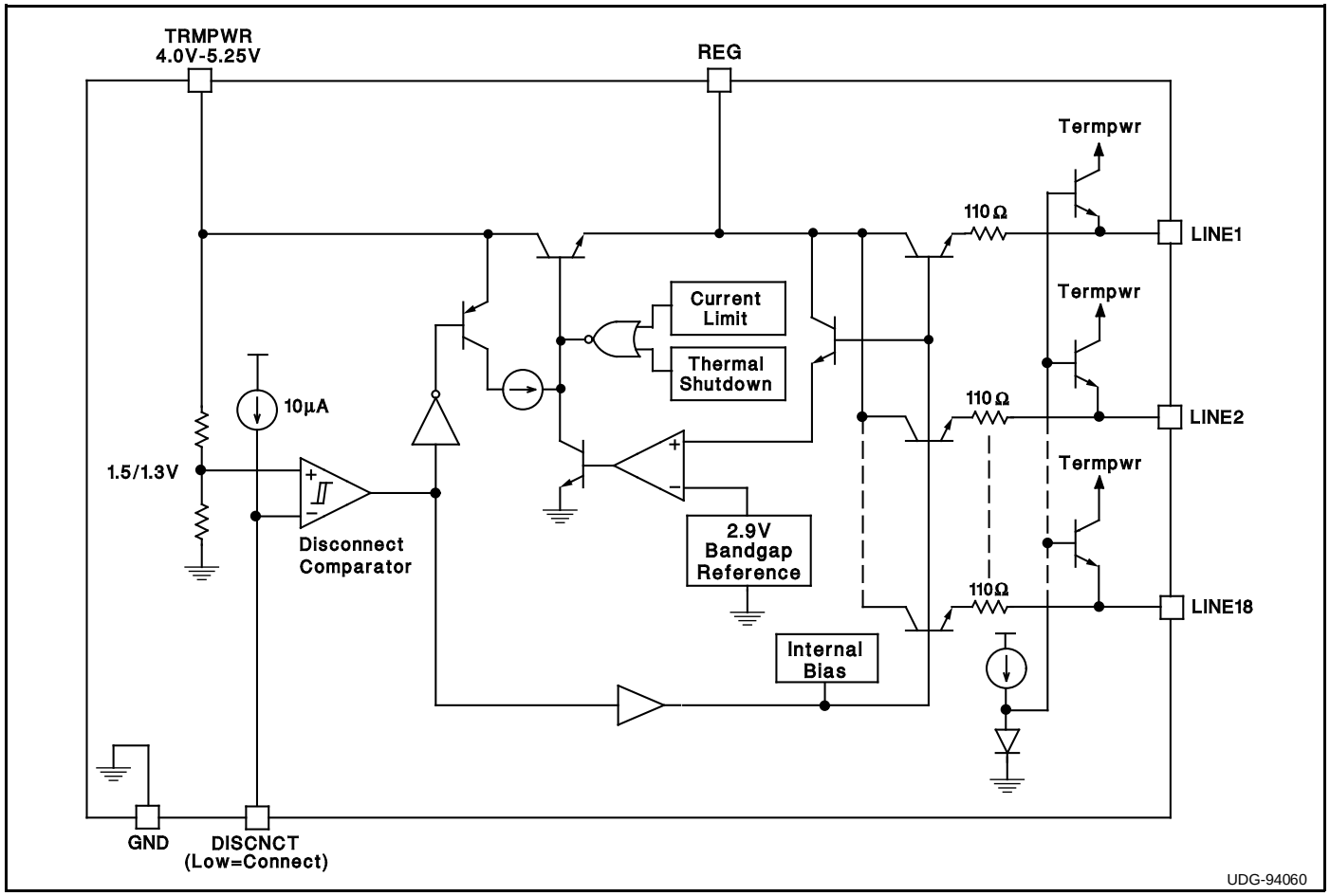
Internal circuit trimming is utilized, first to reduce resistor tolerances to ±3% and then to adjust the regulator's output voltage to insure termination current accuracy of ±3%.

The UC5601 provides a disconnect feature which, upon a logic command, disconnects all terminating resistors, and turns off the regulator; greatly reducing standby power.

Other features include negative clamping on all signal lines, 20mA of active negation sink current capability, regulator current limiting, and thermal shutdown protection.

This device is offered in low thermal resistance versions of the industry standard 28 pin wide body SOIC and PLCC, as well as a 24 pin DIL plastic package.

BLOCK DIAGRAM



Circuit Design Patented

ABSOLUTE MAXIMUM RATINGS

Termpwr Voltage . . . . . +7V
Signal Line Voltage . . . . . 0V to +7V
Regulator Output Current 1A
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.

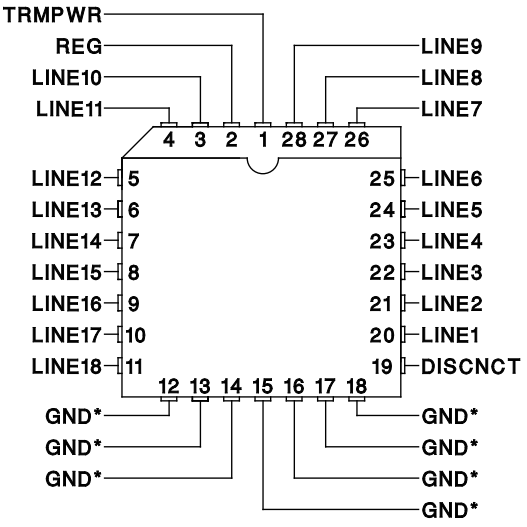
Consult Packaging Section of Unitrode Integrated Circuits databook for thermal limitations and considerations of packages.

RECOMMENDED OPERATING CONDITIONS

Termpwr Voltage . . . . . 4.0V to 5.25V
Signal Line Voltage . . . . . 0V to +3V
Disconnect Input Voltage . . . . . 0V to Termpwr

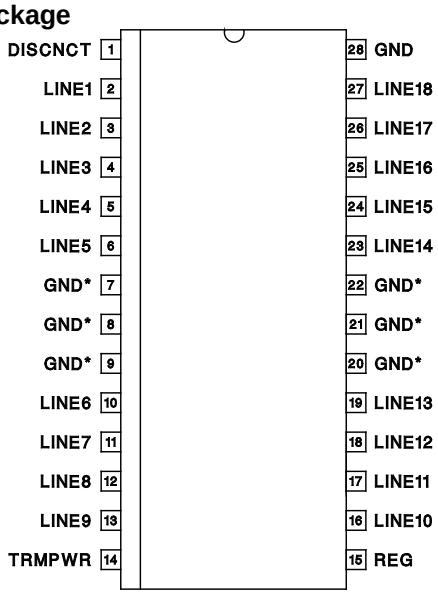
CONNECTION DIAGRAMS

PLCC-28 (Top View)
QP Package



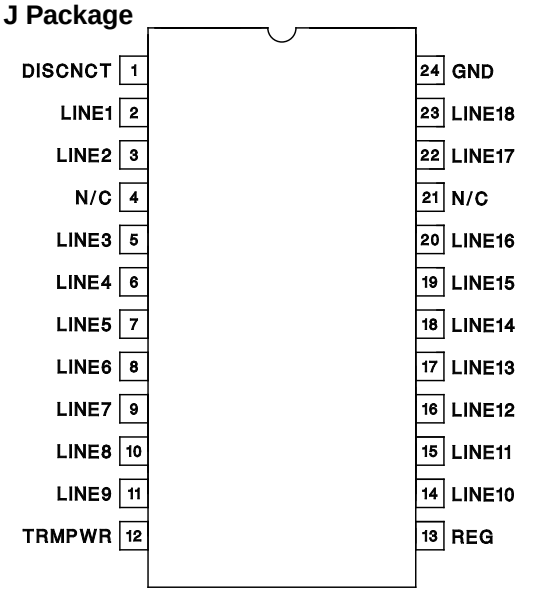
** QP package pins 12 - 18 serve as both heatsink and signal ground.*

SOIC-28 (Top View)
DWP Package



** DWP package pin 28 serves as signal ground; pins 7, 8, 9, 20, 21, 22 serve as heatsink/ground.*

DIL-24 (Top View)
N or J Package



Note: Drawings are not to scale.

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

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNITS
Supply Current Section							
Termpwr Supply Current	All termination lines = Open				17	25	mA
	All termination lines = 0.5V				400	430	mA
Power Down Mode	DISCNCT = Open				100	150	µA
Output Section (Termination Lines)							
Termination Impedance	ΔI_{LINE} = -5mA to -15mA			107	110	113	Ω
Output High Voltage	V_{TRMPWR} = 4V (Note 1)			2.65	2.9		V
Max Output Current	V_{LINE} = 0.5V			-21.1	-21.7	-22.4	mA
	V_{LINE} = 0.5V, TRMPWR = 4V (Note 1)			-19.8	-21.7	-22.4	mA
Output Clamp Level	I_{LINE} = -30mA			-0.2	-0.05	0.1	V
Output Leakage	DISCNCT = 4V	TRMPWR = 0V to 5.25V REG = 0V	V_{LINE} = 0 to 4V		10	400	nA
			V_{LINE} = 5.25V			100	µA
		TRMPWR = 0V to 5.25V, REG = Open V_{LINE} = 0V to 5.25V			10	400	nA
Output Capacitance	DISCNCT = Open (Note 2)				10	12	pF
Regulator Section							
Regulator Output Voltage				2.8	2.9	3.0	V
Line Regulation	TRMPWR = 4V to 6V				10	20	mV
Load Regulation	I_{REG} = 0 to -400mA				20	50	mV
Drop Out Voltage	All Termination Lines = 0.5V				1.0	1.2	V
Short Circuit Current	V_{REG} = 0V			-450	-650	-850	mA
Current Sink Capability	V_{REG} = 3.5V			8	20	25	mA
Thermal Shutdown					170		°C
Disconnect Section							
Disconnect Threshold				1.3	1.5	1.7	V
Threshold Hysteresis				100	160	250	mV
Input Current	DISCNCT = 0V				10	15	µA

Note 1: Measuring each termination line while other 17 are low (0.5V).
Note 2: Guaranteed by design. Not 100% tested in production.

THERMAL DATA

QP package: (see packaging section of UICC data book for more details on thermal performance)

Thermal Resistance Junction to Leads, θjL . . . . . 15°C/W
Thermal Resistance Junction to Ambient, θja . . . . . 30°-40°C/W

DWP package:

Thermal Resistance Junction to Leads, θjL . . . . . 18°C/W
Thermal Resistance Junction to Ambient, θja . . . . . 33°-43°C/W

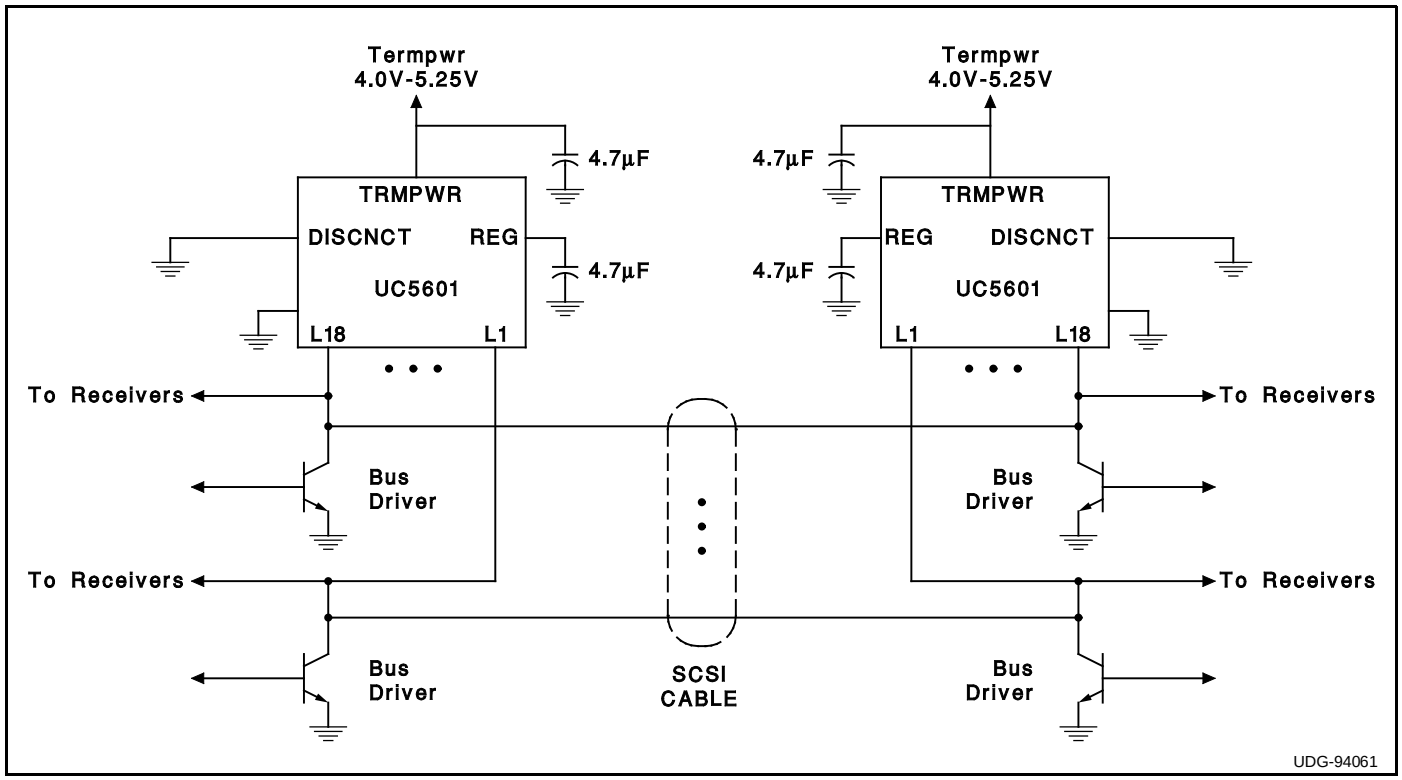
J package:

Thermal Resistance Junction to Leads, θjL . . . . . 40°C/W
Thermal Resistance Junction to Ambient, θja . . . . . 75°-85°C/W

N package:

Thermal Resistance Junction to Leads, θjL . . . . . 50°C/W
Thermal Resistance Junction to Ambient, θja . . . . . 95°-105°C/W

Note: The above numbers for θjL are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The θja numbers are meant to be guidelines for the thermal performance of the device/pc-board system. All of the above numbers assume no ambient airflow.



Typical SCSI Bus Configuration Using the UC5601

A Look at the Response of a SCSI-2 Cable

Figure 1 shows a single line of a SCSI cable. The driver is an open colletor type which when asserted pulls low, and when negated the termination resistance serves as the pull-up.

Figure 2 shows a worst case scenario of mid cable de-assertion with a close proximity receiver. The voltage V_{STEP} is defined as:

$$V_{STEP} = V_{OL} + I_O Z_0$$

V_{OL} = Driver Output Low Voltage
I_O = Current from Receiving Terminator
Z_0 = Cable Characteristic Impedance

$$I_O = \frac{V_{REG} - V_{OL}}{110}$$

In the pursuit of higher data rates, sampling culd occur during this step portion, therefore it is important to ensure that the step is as high as possible to get the most noise margin. For this reason the UC5601 is trimmed so that the output current (I_O) is as close as possible to the SCSI max current spec of 22.4mA. The Termination impedance is initially trimmed on the IC to 110 ohms typical, then the regulator voltage is trimmed for the highest output current to within 22.4mA.

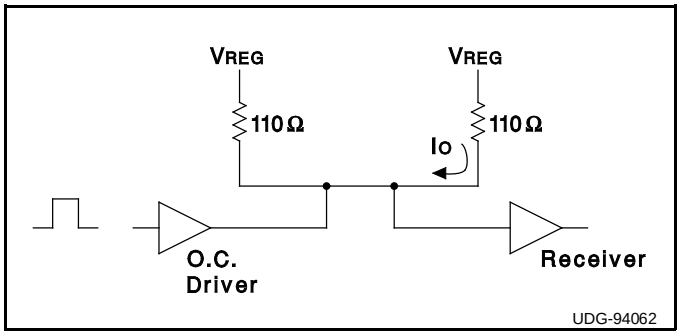


Figure 1. A Single Line of a SCSI Cable

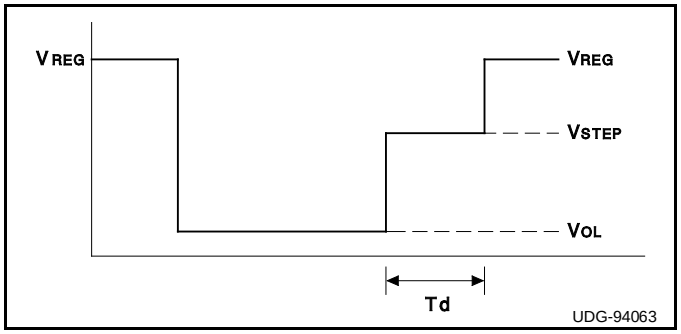


Figure 2. A Typical Response of a SCSI Cable

UNITRODE INTEGRATED CIRCUITS
7 CONTINENTAL BLVD. • MERRIMACK, NH 03054
TEL. (603) 424-2410 • FAX (603) 424 3460

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

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

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.