

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.

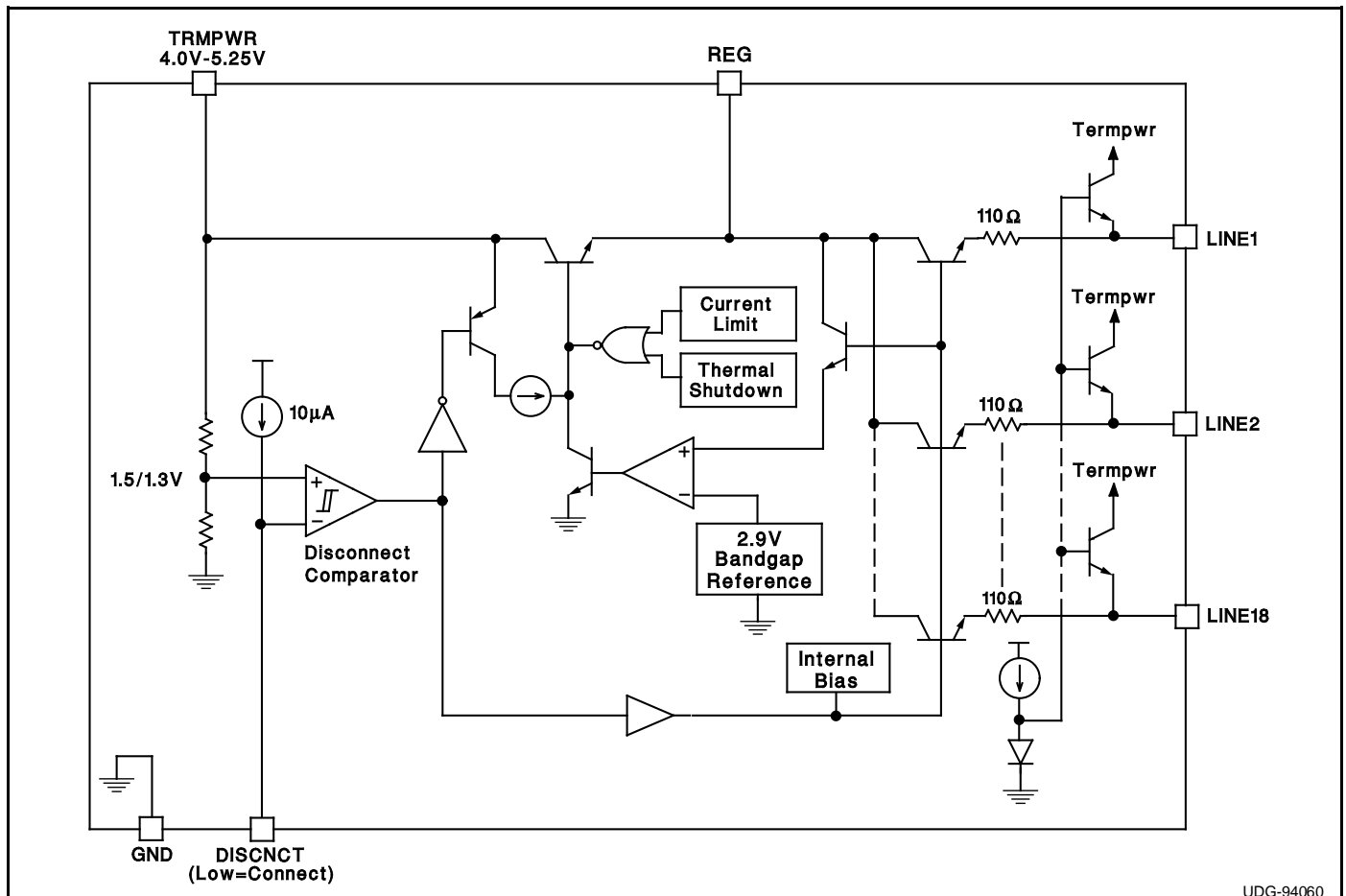
Internal circuit trimming is utilized, first to reduce resistor tolerances to $\pm 3\%$ and then to adjust the regulator's output voltage to insure termination current accuracy of $\pm 3\%$.

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 shut-down 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



UDG-94060

Circuit Design Patented

ABSOLUTE MAXIMUM RATINGS

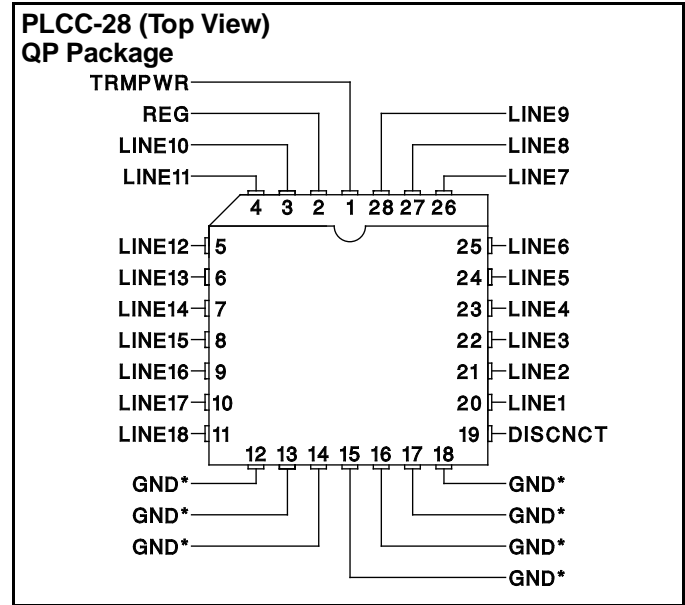
Tempwr Voltage	+7V
Signal Line Voltage.....	0V to +7V
Regulator Output Current	1A
Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +150°C
Lead Temperature (Soldering, 10 Sec.).....	+300°C

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.

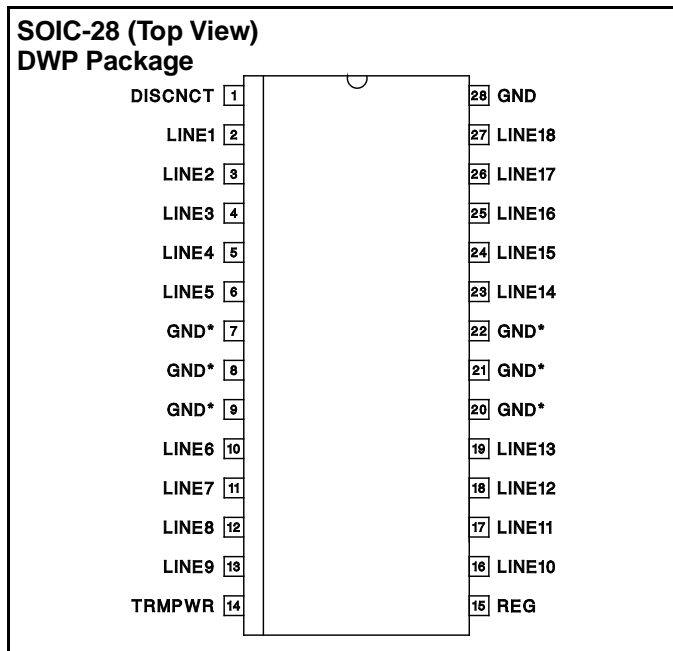
RECOMMENDED OPERATING CONDITIONS

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

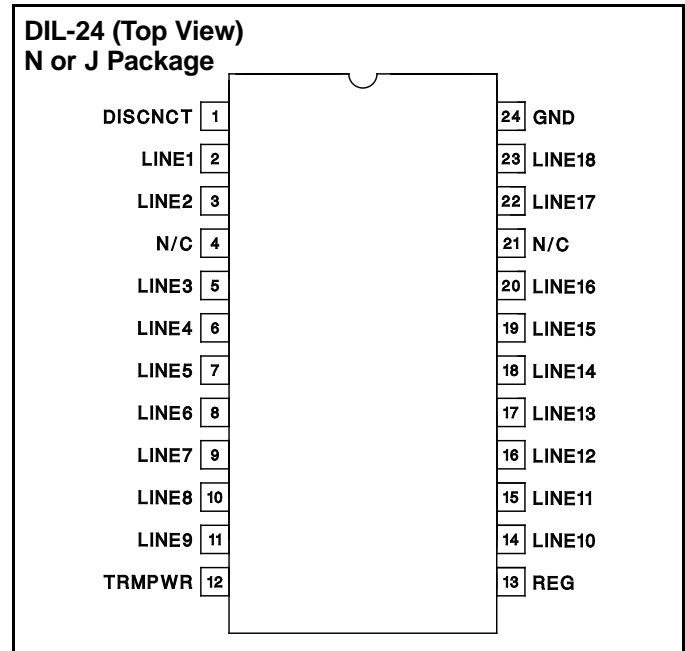
CONNECTION DIAGRAMS



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



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



Note: Drawings are not to scale.

ELECTRICAL CHARACTERISTICS Unless otherwise stated, these specifications apply for $T_A = 0^\circ\text{C}$ 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	$\Delta\text{LINE} = -5\text{mA}$ to -15mA	107	110	113	Ω	
Output High Voltage	$V_{\text{TRMPWR}} = 4\text{V}$ (Note 1)	2.65	2.9		V	
Max Output Current	$V_{\text{LINE}} = 0.5\text{V}$	-21.1	-21.7	-22.4	mA	
	$V_{\text{LINE}} = 0.5\text{V}$, TRMPWR = 4V (Note 1)	-19.8	-21.7	-22.4	mA	
Output Clamp Level	$I_{\text{LINE}} = -30\text{mA}$	-0.2	-0.05	0.1	V	
Output Leakage	DISCNCT = 4V	TRMPWR = 0V to 5.25V REG = 0V	$V_{\text{LINE}} = 0$ to 4V	10	400	nA
			$V_{\text{LINE}} = 5.25\text{V}$		100	μA
		TRMPWR = 0V to 5.25V, REG = Open $V_{\text{LINE}} = 0\text{V}$ 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	$I_{\text{REG}} = 0$ to -400mA		20	50	mV	
Drop Out Voltage	All Termination Lines = 0.5V		1.0	1.2	V	
Short Circuit Current	$V_{\text{REG}} = 0\text{V}$	-450	-650	-850	mA	
Current Sink Capability	$V_{\text{REG}} = 3.5\text{V}$	8	20	25	mA	
Thermal Shutdown			170		$^\circ\text{C}$	
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, θ_{jL} 15 $^\circ\text{C}/\text{W}$

Thermal Resistance Junction to Ambient, θ_{ja} 30 $^\circ$ -40 $^\circ\text{C}/\text{W}$

DWP package:

Thermal Resistance Junction to Leads, θ_{jL} 18 $^\circ\text{C}/\text{W}$

Thermal Resistance Junction to Ambient, θ_{ja} 33 $^\circ$ -43 $^\circ\text{C}/\text{W}$

J package:

Thermal Resistance Junction to Leads, θ_{jL} 40 $^\circ\text{C}/\text{W}$

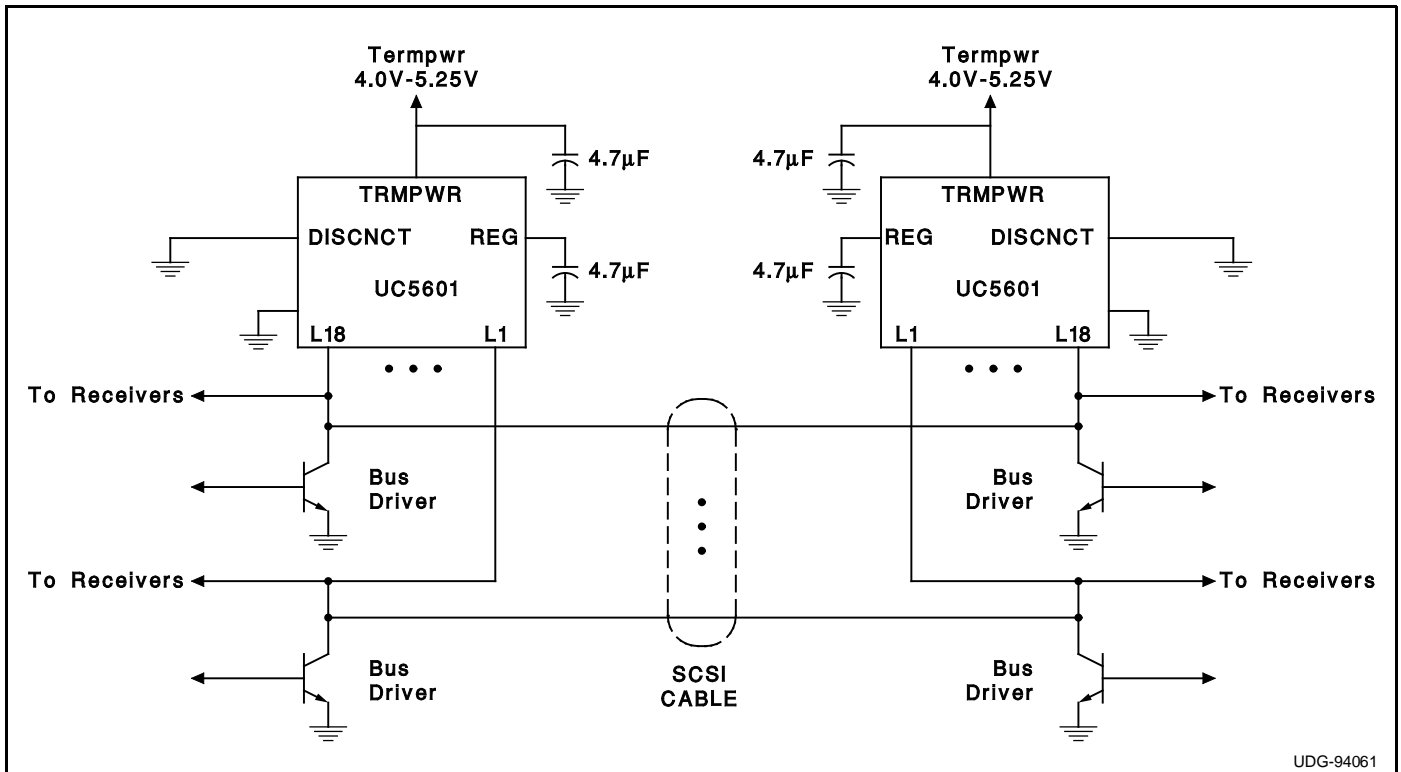
Thermal Resistance Junction to Ambient, θ_{ja} 75 $^\circ$ -85 $^\circ\text{C}/\text{W}$

N package:

Thermal Resistance Junction to Leads, θ_{jL} 50 $^\circ\text{C}/\text{W}$

Thermal Resistance Junction to Ambient, θ_{ja} 95 $^\circ$ -105 $^\circ\text{C}/\text{W}$

Note: The above numbers for θ_{jL} are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The θ_{ja} 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 collector 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 could 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.

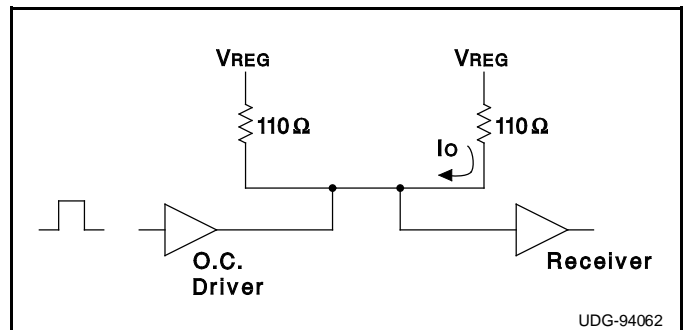


Figure 1. A Single Line of a SCSI Cable

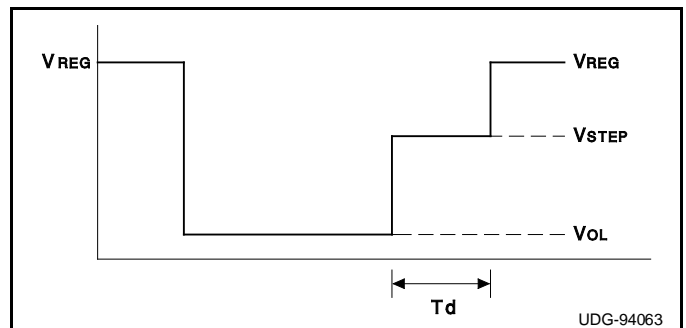


Figure 2. A Typical Response of a SCSI Cable