

S1011 ACTIVE ECL TERMINATOR

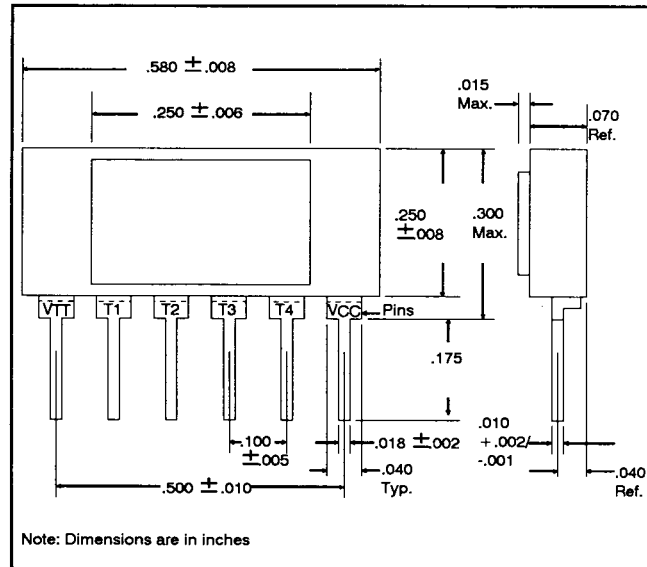
FEATURES

- Effectively Eliminates Reflections and Ringing
- Self-Adjusting Impedance Range from 50 to 150 Ohms
- Easy To Use 6-pin SIP
- On-Chip VBB To Eliminate Oscillations
- Compatible With All ECL Families
- Matched Impedance Lines Not Required
- Low 0.2 mW Signal Termination Power

GENERAL DESCRIPTION

The S1011 is a voltage compensated ECL circuit that contains active ECL terminators and an internally generated VBB source. Compatible with all ECL families, it provides four termination pins in a 6-pin SIP and operates from a standard -2.0 VDC termination voltage. Each terminator pin consists of 2 Schottky Diodes connected back-to-back, with one side tied to the internal VBB generator and the other brought out to the package pin (Figure 1). Each diode pair forms a bilateral clamp, acting as a low impedance source which sinks current at the VOH level and sources current at the VOL level. In the transition regions between VOH and VOL, a termination pin has a high impedance and thus has minimal effect on signal rise and fall times. The clamping action limits overshoot and ringing in situations where wiring impedance is not controlled or where other types of termination are not practical.

Typical applications include the elimination of spot ringing problems; self-adjusting termination where line impedance is not well defined; or displacing stripline or other precise, but more costly, transmission line solutions. The S1011 can be used to replace discrete diode clamping circuits, and provides an alternative to using passive resistors in terminating transmission lines in the 50 to 150 ohm range.



6 Pin Single In-Line Package

Package	Part number and Suffix
6 pin ceramic SIP	S1011A

Ordering Information

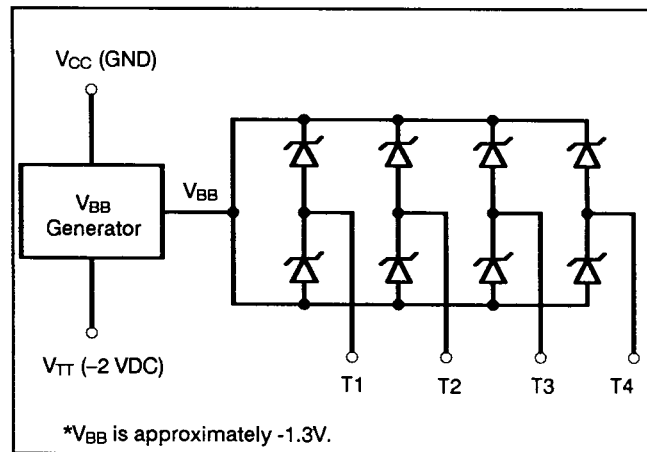


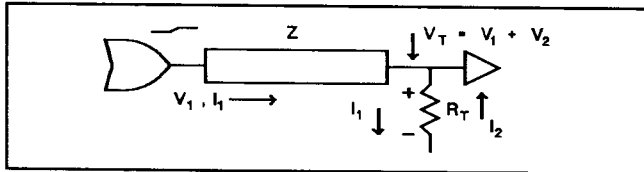
FIGURE 1. FUNCTIONAL DIAGRAM

APPLICATION

S1011 ACTIVE ECL TERMINATOR

CLAMPING REFLECTIONS

The clamping action is more easily understood by first looking at how reflections are generated. Consider the effect of a positive voltage step (V_1) on a simple net with the signal path treated as a transmission line. At this instant, the driver responds to an initial current demand (I_1) based on the impedance of the line being driven (V_1/Z). The initial current and voltage wave are then sent down the line. When they reach the end of that line segment, if the IR drop across the load (or terminator) does not match the initial voltage step, another voltage and current wave must be generated (V_2, I_2) such that the combined waves satisfy Ohm's law ($V_1 + V_2/I_1 + I_2 = R_L$). The new wave is sent back down the line towards the driver resulting in a voltage reflection proportional to the mismatch in the range of $\pm V_1$. For example, if the load is higher than the line impedance, too much initial current is provided to satisfy Ohm's law and a positive voltage is fed back to the driver. The delta current generated will be in the opposite direction as the initial current wave.



Reflections normally occur on an unterminated line because the line impedance will be much less than the input impedance of the receiver. They can also occur on a parallel resistor terminated line if the characteristic impedance of the line segment is not matched exactly by the terminator. This can be simply due to selecting the wrong value resistor, or it can often be due to the inability to predict the line impedance. Line impedances can vary due to any number of reasons including distributive loading along the line, a mismatch in line segments or transmission media (sharp angles on PC traces, connectors, etc.), moderate length stubs, variations in wire-over ground parameters (distance of the wire from ground plane, angle of the wire or proximity to adjacent wires), or even bends in coax cables.

The S1011 active terminator, when placed at the point of these reflections, uses the forward conduction characteristic of the Schottky barrier diode to selectively match the line impedance (Figure 2). This

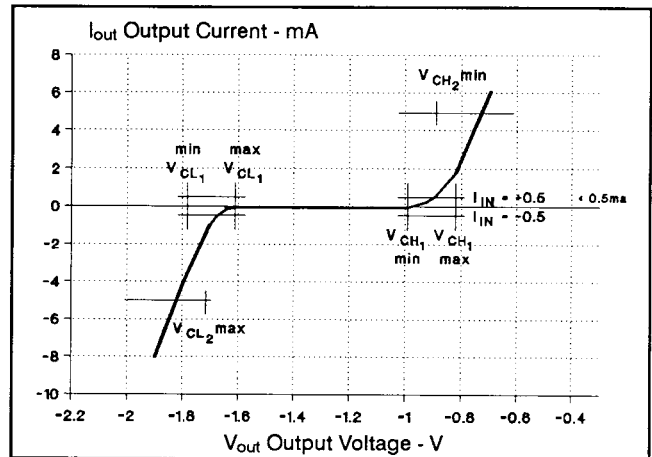
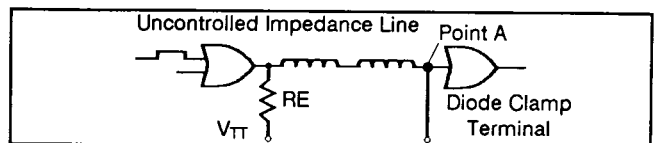


FIGURE 2

variable conduction curve allows each diode to effectively absorb the initial current wave (I_1) providing a clamping action that helps eliminate reflections and external noise in excess of logic 1 or 0 limits. This action provides a variable impedance with a practical range of from 50 to 150 ohms. For instance, at a forward voltage of 0.6V the diode will momentarily sink 6 mA yielding an impedance of $0.6/0.006 = 100$ ohms. Two diodes are used to limit overshoot on both the positive-going and negative-going edges of the signal. By having the VBB on chip, any concern over oscillations is eliminated.

The interconnection between the receiver and the active terminator represents an unterminated line. To prevent reflections at the receiver, the terminator should be placed within an acceptable stub length for the type of line used. The low signal termination power (0.2 mW typ) allows more than one terminator to be used along a net to terminate any star routes or long stubs. Often, the main path is adequately terminated but problems are caused by stubs or when coming on and off PC boards. The S1011 can usually be added into the same net as a resistor terminator, helping to eliminate spot ringing problems. Resistor R_E provides the pull down current necessary to generate the negative signal swing when the driver goes to a logic 0. Its value is calculated as $R_E < [(VOH - V_{TT} - 0.6) * Z]/0.6$ to establish an initial voltage step of 0.6V across the estimated line impedance.



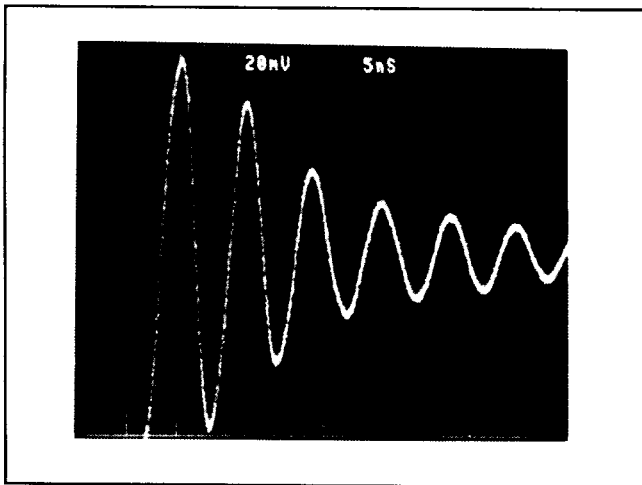
S1011 ACTIVE ECL TERMINATOR

TABLE 1. DC CHARACTERISTICS

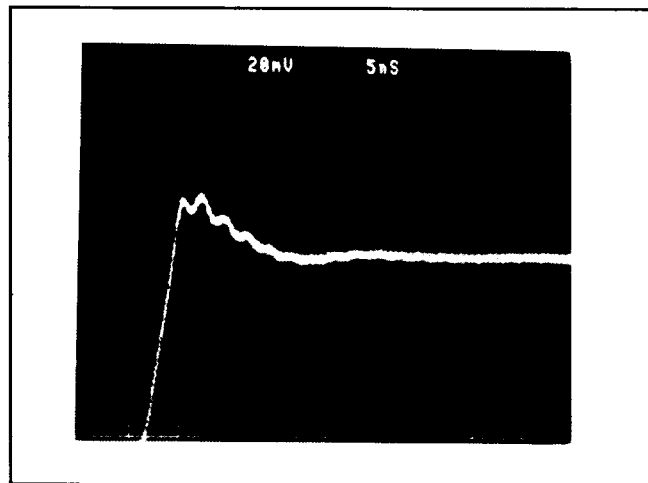
Parameter	Test Conditions (mA)	TA	Limit	
		Deg. C	Min. (mV)	Max. (mV)
V _{CH1} (Clamp voltage high)	I _{IN} = +0.5	0	-1000	-810
		+25	-980	-830
		+75	-1020	-790
V _{CL1} (Clamp voltage low)	I _{IN} = -0.5	0	-1870	-1650
		+25	-1800	-1650
		+75	-1800	-1550
V _{CH2}	I _{IN} = +5.0	+25	-890	
V _{CL2}	I _{IN} = -5.0	+25	-1740
I _{TT} (Power Supply Current)	Terminals Open	+25	175 (mA)

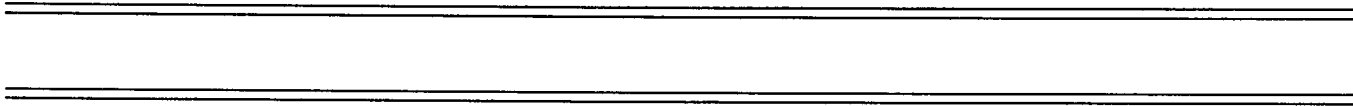
Note: V_{IH} > V_{CHI}(max) or V_{IL} < V_{CLI}(min) would have current flow. V_{TT} = -2.0V.
 Input Capacitance shall be 10pF, maximum.

POINT A WITHOUT TERMINATOR

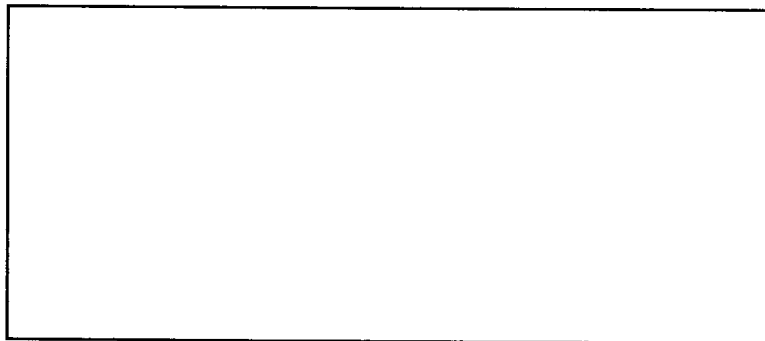


POINT A WITH TERMINATOR





REPRESENTED BY:



AMCC

Applied Micro Circuits Corporation
6195 Lusk Blvd • San Diego, CA 92121 • (619) 450-9333
AMCC reserves the right to change specifications for this product in any manner without notice.

AMCC is a registered trademark of Applied Micro Circuits Corporation

Copyright 1990 Applied Micro Circuits Corporation
PRINTED IN U.S.A. F0411-0290

4

02.88: / - R