

## 2.5 GBIT 2 X 2 DUAL CROSSPOINT SWITCH

**S3054**

### FEATURES

- Supports 2.5 Gbit/sec Data Rates
- Fully differential for minimum jitter accumulation
- High speed 50Ω source terminated outputs
- 0.83 W Typical power dissipation
- 3.3 V power supply
- 52 Pin TQFP/TEP

### GENERAL DESCRIPTION

The S3054 is a high performance 2 x 2 crosspoint switch. It is designed to minimize jitter accumulation by providing a high bandwidth fully differential signal path. A 2 x 2 crosspoint can be used to switch OC-48 data signals in Dense Wavelength Division Multiplexer designs and other high speed serial switch designs.

The 2 x 2 crosspoint is designed using two 2:1 multiplexers. It can be used to fan out and/or multiplex

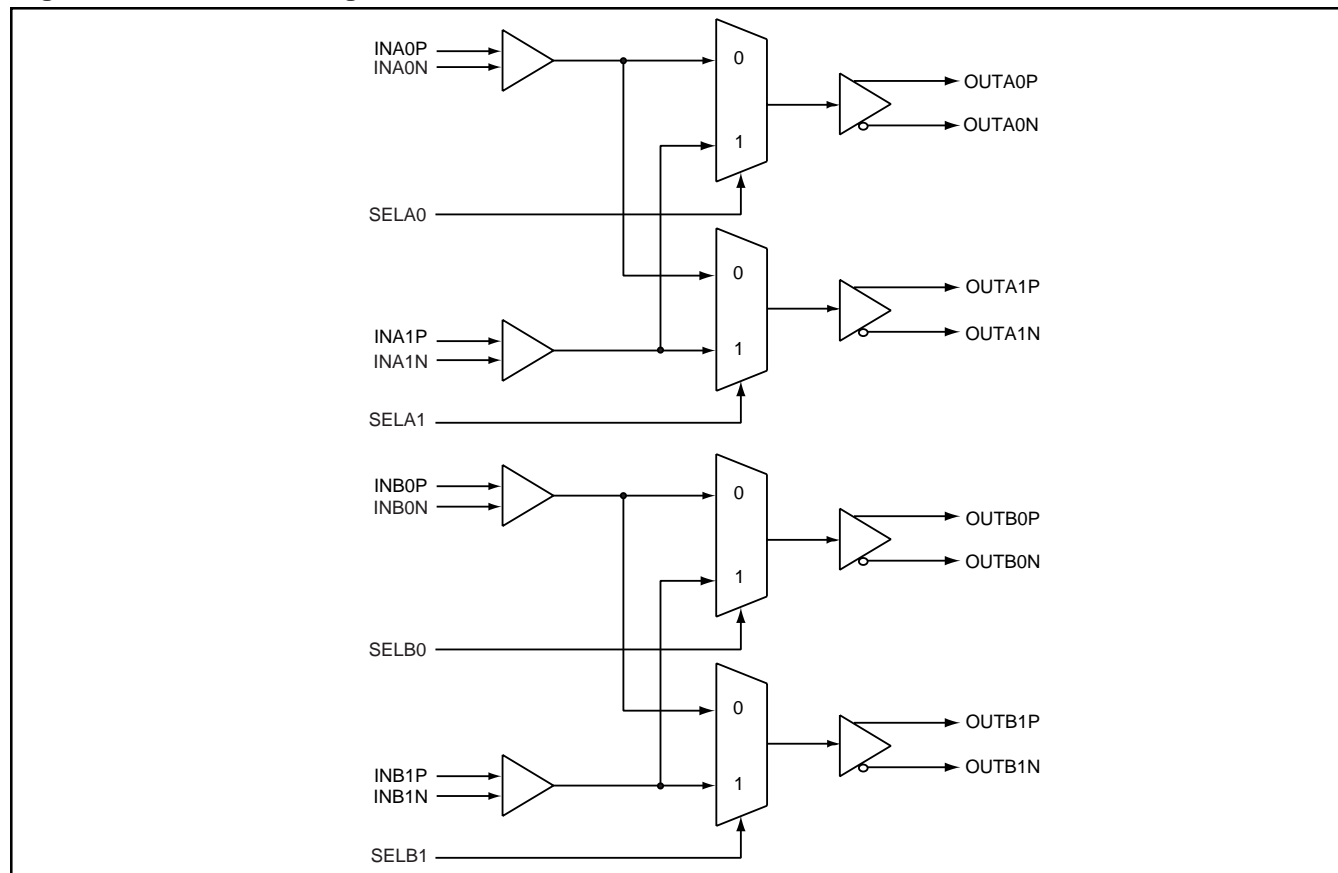
high speed data signals. The S3054 is compatible with the AMCC OC-48 clock recovery, MUX/DEMUX and Crosspoint Switch products. This allows signal integrity to be maintained throughout the system design.

Table 1 is a truth table detailing the control of flow through the S3054. The primary AC parameter of importance is the deterministic jitter or data eye degradation inserted by the crosspoint. The design minimizes jitter accumulation by using high bandwidth, low skew fully differential circuits. This provides for symmetric rise and fall delays as well as noise rejection.

**Table 1. Truth Table**

SELA0/B0	SELA1/B1	OUTA0/B0	OUTA1/B1
0	0	INA0/B0	INA0/B0
0	1	INA0/B0	INA1/B1
1	0	INA1/B1	INA0/B0
1	1	INA1/B1	INA1/B1

**Figure 1. S3054 Block Diagram**

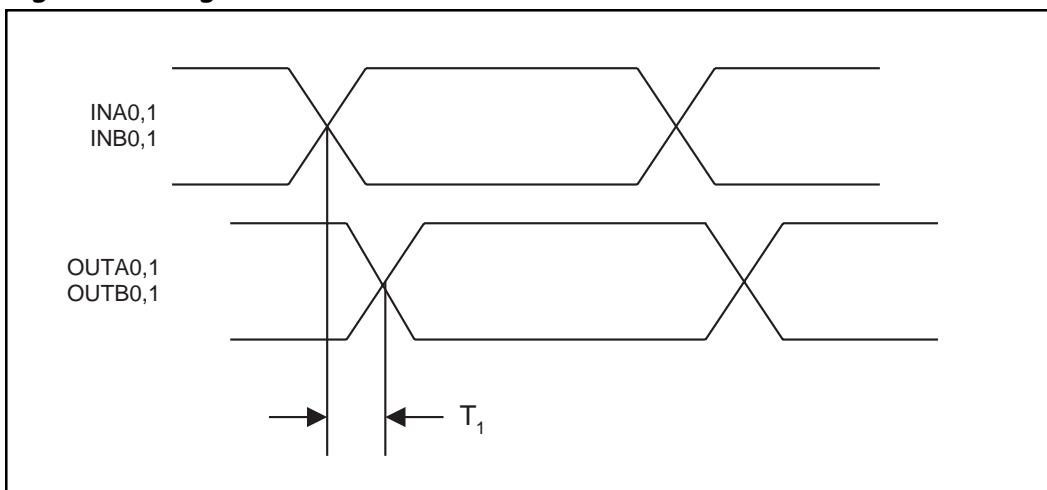


### Programable Swing Control

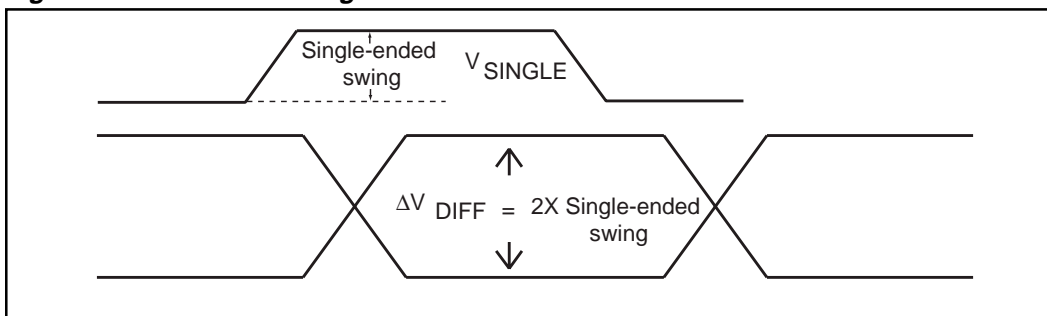
An external resistor can be connected across adjacent pins, VSWx to VEE<sub>x</sub>, where x is A0, A1, B0 and B1. This will result in a decreased V<sub>swing</sub> for the specified output and a decrease in chip power dissipation. For example, if a 700 Ohm resistor is used, the V<sub>swing</sub> will decrease from its full scale swing of approximately 570mV to 250mV and that specific output will draw approximately 13mA less. All four outputs can be independently set. If no external resistor is used, the output swing will default to its full scale value.

The 700 Ohm value is only used as an example. The power conscious user could use as small a resistor value as the application can handle.

**Figure 2. Timing Waveforms**



**Figure 3. Differential Voltage**



## 2.5 GBIT 2 X 2 DUAL CROSSPOINT SWITCH

**S3054**

**Table 2. Pin Assignment and Descriptions**

Pin Name	Level	I/O	Pin#	Description
INA0P INA0N	Diff. LVPECL	I	42 41	Differential input from the downstream PBC port.
INA1P INA1N	Diff. LVPECL	I	50 51	Serial input from the local disk drive.
INB0P INB0N	Diff. LVPECL	I	37 38	Differential input from the downstream PBC port.
INB1P INB1N	Diff. LVPECL	I	29 28	Serial input from the local disk drive.
SELA0	LVTTL	I	43	A Low level selects INA0P/N.
SELA1	LVTTL	I	49	A High level selects INA1P/N.
SELB0	LVTTL	I	36	A Low level selects INB0P/N.
SELB1	LVTTL	I	30	A High level selects INB1P/N.
OUTA0P OUTA0N	Diff. CML	O	23 22	Channel A0 serial output.
OUTA1P OUTA1N	Diff. CML	O	17 18	Channel A1 serial output.
OUTB0P OUTB0N	Diff. CML	O	4 5	Channel B0 serial output.
OUTB1P OUTB1N	Diff. CML	O	10 9	Channel B1 serial output.
VCC			6,8,19 20,21,32 34,45,46 47	Power Supply, 3.3V Nominal.

**Table 2. Pin Assignment and Descriptions (Continued)**

Pin Name	Level	I/O	Pin#	Description
VSWA0 VSWA1 VSWB0 VSWB1	Analog	I	25 15 2 12	Voltage Swing Control.
VEE			1 7 13 14 26 27 31 33 35 39 40 44 48 52	Ground.
VEEA0	Output GND		24	Ground for A0.
VEEA1	Output GND		16	Ground for A1.
VEEB0	Output GND		3	Ground for B0.
VEEB1	Output GND		11	Ground for B1.

**Figure 4. S3054 Pinout Package**

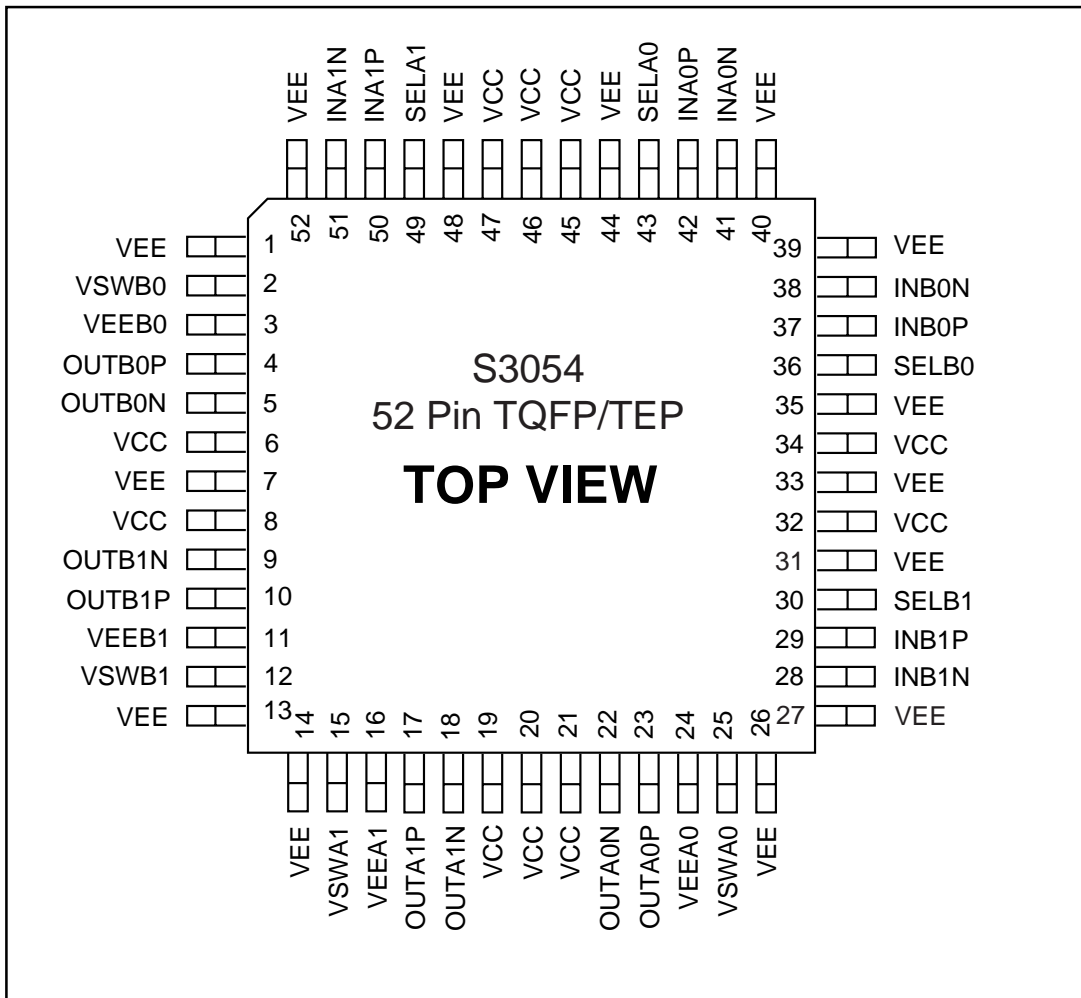
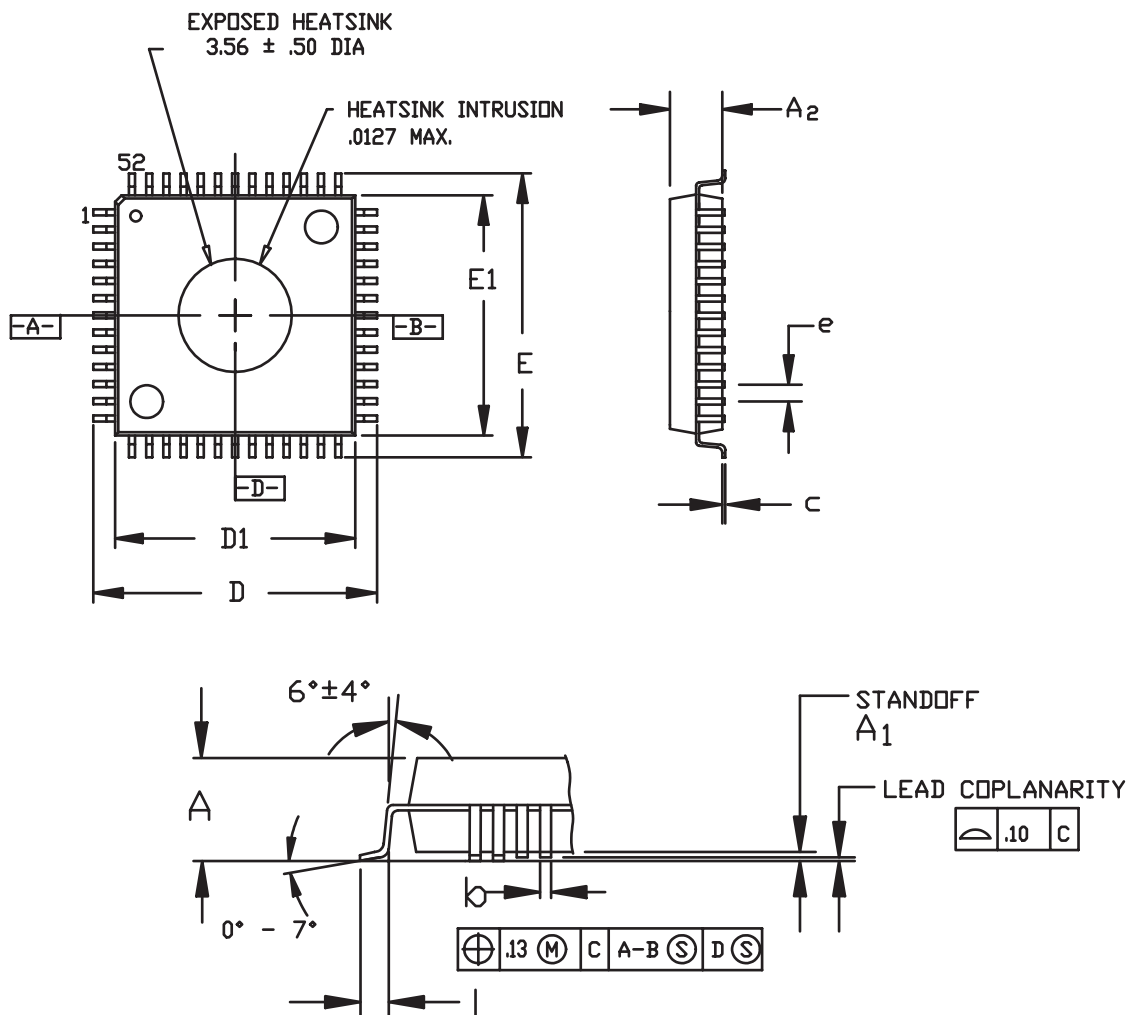


Figure 5. S3054 52 Pin TQFP/TEP Package



DIMENSIONS (are in millimeters)

UNIT	A	A <sub>1</sub>	A <sub>2</sub>	D	D <sub>1</sub>	E	E <sub>1</sub>	L	e	b	c
MIN		0.05	1.35	11.75	9.90	11.75	9.90	0.50	0.65 BSC.	0.25	0.127
NOM			1.40	12.00	10.00	12.00	10.00	0.60		0.30	
MAX	1.60	0.15	1.45	12.25	10.10	12.25	10.10	0.75		0.35	0.17

Table 3. Thermal Management

Device	Power	θ <sub>ja</sub> Still Air	θ <sub>jc</sub> Still Air
S3054	1.1W	45.6° C/W	4.2° C/W

## 2.5 GBIT 2 X 2 DUAL CROSSPOINT SWITCH

**S3054**
**Table 4. AC Characteristics** (Over recommended operating conditions.)

Parameter	Description	Min	Typ	Max	Units	Conditions
$T_R$	Serial Data rise and fall time. (OUT0, OUT1).			175	ps	20% to 80% tested on a sample basis. (100Ω line-to-line.)
$T_F$				150	ps	
$T_1$	Flow through propagation delay IN to OUT.			2.0	ns	100Ω line-to-line.
$R_J$	Random jitter		2	4	ps	
$D_J$	Deterministic jitter		20		ps	
	Output skew		25		ps	

**Table 5. Internally Biased LVPECL Input DC Characteristics**

Symbol	Description	Min	Typ	Max	Units	Conditions
$\Delta V_{INDIFF}$	Differential Input Voltage Swing	300		1200	mV	See Figure 3.
$\Delta V_{INSINGLE}$	Single-ended Input Voltage Swing	150		600	mV	See Figure 3.
$R_{DIFF}$	Differential Input Resistance	75	100	125	Ω	

**Table 6. LVTTTL Input DC Characteristics**

Symbol	Description	Min	Typ	Max	Units	Conditions
$V_{IH}$	Input High Voltage	2.0			V	$V_{CC} = \text{Max}$
$V_{IL}$	Input Low Voltage	0.0		0.8	V	$V_{CC} = \text{Max}$
$I_{IH}$	Input High Current			50	μA	$V_{IN} = 2.4V$
$I_{IL}$	Input Low Current	-500			μA	$V_{IN} = 0.5V$

**Table 7. CML Output DC Characteristics**

Symbol	Description	Min	Typ	Max	Units	Conditions
$V_{OL}$	Output Low Voltage	$V_{CC} - 1.0$		$V_{CC} - .55$	V	100Ω line-to-line.
$V_{OH}$	Output High Voltage	$V_{CC} - .35$		$V_{CC} - .1$	V	100Ω line-to-line.
$\Delta V_{out\ Diff}$	Output Diff Voltage Swing	900		1460	mV	100Ω line-to-line. See Figure 3. Rext = open.
$\Delta V_{out\ Single}$	Output Single Ended Voltage Swing	450		730	mV	100Ω line-to-line. See Figure 3. Rext = open.

**Table 8. Absolute Maximum Ratings<sup>1</sup>**

Parameter	Min	Typ	Max	Units
Power Supply Voltage ( $V_{CC}$ )	0.5		+4	V
Voltage on any LVPECL Input Pin	0		$V_{CC}$	V
Voltage on any TTL Input Pin	-0.5		$V_{CC}+0.5$	V
Case Temperature Under Bias ( $T_C$ )	-55		125	C°
Storage Temperature ( $T_{STG}$ )	-65		150	C°
Static Discharge Voltage		500		V

1. CAUTION: Stresses listed under "Absolute Maximum Ratings" may be applied to devices one at a time without causing permanent damage. Functionality at or above the values listed is not implied. Exposure to these values for extended periods may affect device reliability.

**Table 9. Recommended Operating Conditions<sup>1</sup>**

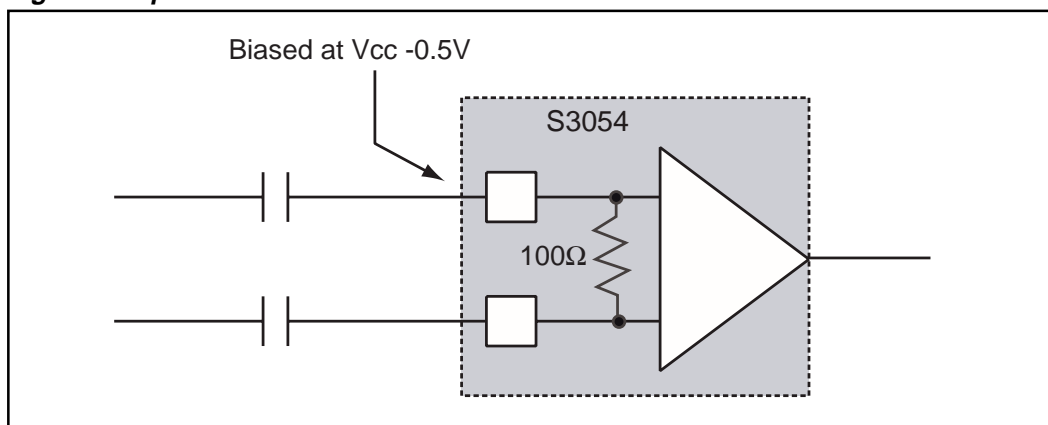
Parameter	Min	Typ	Max	Units
Power Supply Voltage ( $V_{CC}$ )	+3.14	3.3	+3.47	V
Ambient Operating Temperature Range (T)	-40		+85	C°
Voltage on any LVPECL Input Pin	$V_{CC}-2$		$V_{CC}$	V
ICC Supply Current		260	330	mA

1. AMCC guarantees the functional and parametric operation of the part under "Recommended Operating Conditions" (except where specifically noted in the AC and DC Parametric tables).

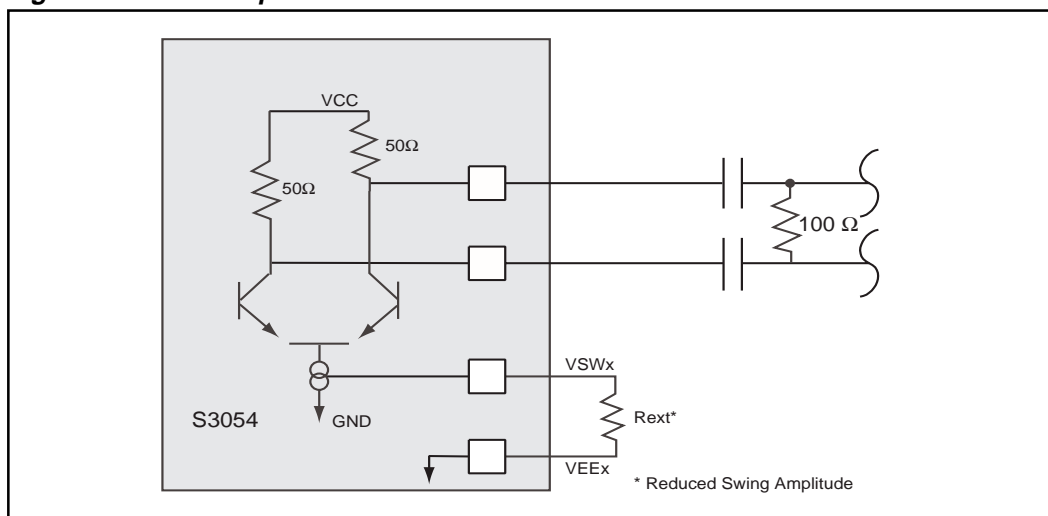
## Input Structures

Two input structures exist in this part; TTL and High Speed, Differential Inputs. The LVTTTL Inputs will interface with any LVTTTL outputs. The High Speed, Differential Inputs can be AC Coupled. Therefore, the High Speed, differential Input buffers are biased at  $V_{cc} - 0.5V$ . Refer to Figure 6 for High Speed Differential Input termination.

**Figure 6. Input Termination**



**Figure 7. S3054 Output Termination**



**Ordering Information**

PREFIX	DEVICE	PACKAGE	GRADE
S- Integrated Circuit	3054	TT – 52 TQFP/TEP	(blank) – Commercial I – Industrial

**X**  
Prefix

**XXXX**  
Device

**XX**  
Package

**X**  
Grade



**Applied Micro Circuits Corporation • 6290 Sequence Dr., San Diego, CA 92121**

**Phone: (619) 450-9333 • (800) 755-2622 • Fax: (619) 450-9885**

**<http://www.amcc.com>**

AMCC reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AMCC does not assume any liability arising out of the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.

AMCC reserves the right to ship devices of higher grade in place of those of lower grade.

AMCC SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

AMCC is a registered trademark of Applied Micro Circuits Corporation.  
Copyright © 2001 Applied Micro Circuits Corporation

D432/R624