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INNOVATORS IN INTEGRATION

SSI 32R104C, 32R104CL, 32R104CM, 32R104CLM, 32R108, 32R122
4-Channel Thin Film
Read/Write Device

August, 1988

DESCRIPTION

The SSI 32R104 is a monolithic bipolar integrated circuit for use in high performance disk drive systems where it is desirable to locate the control circuitry directly on the data arm. Each circuit controls four heads and has three modes of operation: Read, Write and Idle.

The SSI 32R104L is a low-noise version of the SSI 32R104 with all other parameters identical. Both are available in 24-pin flatpack, and 24-pin small outline (SOL) packages.

The SSI 32R108 and SSI 32R122 are identical in performance to the SSI 32R104. The SSI 32R108 is packaged in a 24-pin DIP package, while the SSI 32R122 is packaged in a 22-pin DIP.

The "M" version is functionally identical to the standard SOL device, except that the pinout is the mirror image to simplify multi-chip layouts.
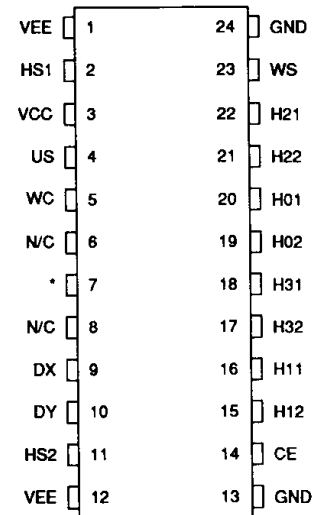
FEATURES

• IBM 3350 compatible performance

• IBM compatible power supply voltages and logic levels

• Four read/write channels

• Safety circuits

BLOCK DIAGRAM
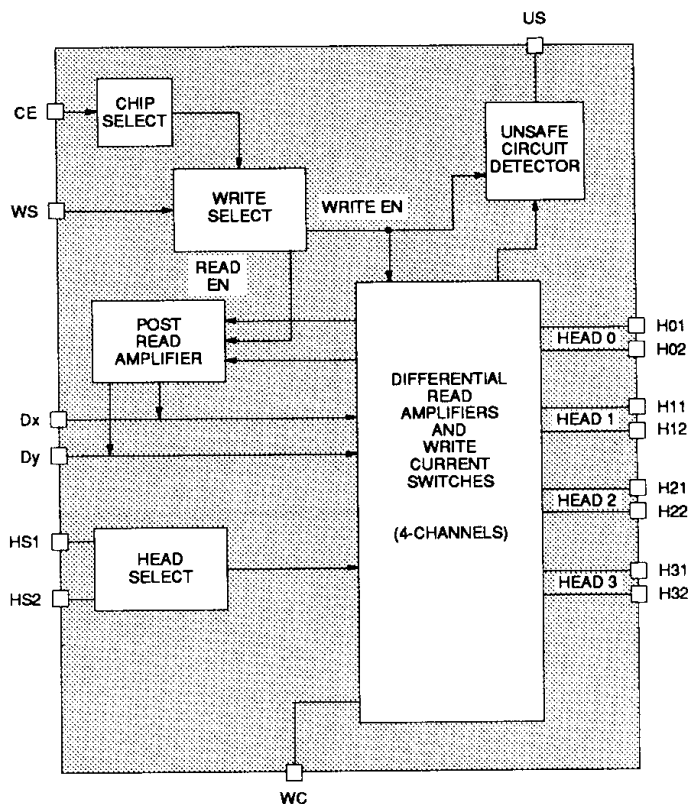
PIN DIAGRAM

* MUST NOT CONNECT

32R104, 32R108 Pinout

CAUTION: Use handling procedures necessary for a static sensitive component.

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CIRCUIT OPERATION

WRITE MODE

In the write mode, the circuit functions as a current gate. Externally supplied write current is gated by the state of the head select and data inputs to one side of one head. Head voltage swings are monitored by the head transition detect circuit. Absence of proper head voltage swings, indicating an open or short on either side of the head or absence of write current, will cause a fault current to flow into the unsafe pin.

READ MODE

In the read mode, the circuit functions as a low noise differential amplifier. The state of the head select inputs determines which amplifier is active. Data is differentially read from one of four heads and an open collector differential signal is put across the Data X and Data Y pins. If a fault condition exists such that write current is applied to the chip when the chip is in read mode, the write current will be drawn from the unsafe pin and the fault will be detected.

HEAD SELECT TABLE

HEAD SELECTED	HS2	HS1
0	1	1
1	1	0
2	0	1
3	0	0

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $5.7 \leq VCC \leq 6.7$, $-4.2 \leq VEE \leq -3.8$, $0° \leq Tj, \leq 110$ °C.

ABSOLUTE MAXIMUM RATINGS

Operation above absolute maximum ratings may permanently damage the device.

PARAMETER	RATING	UNIT
Positive Supply Voltage VCC	7.0	V
Negative Supply Voltage, VEE	-5.5	V
Storage Temperature	-65 to 150	°C
Input Voltages		
Head Select (HS)	VEE -0.3 to + 0.3	V
Unsafe (US)	-0.3 to VCC +0.5	V
Write Current (WC)	VEE -2 to + 0.3	V
Data (Dx, Dy)	VEE -0.3 to + 0.3	V
Chip Enable (CE)	VEE -0.3 to VCC +0.5	V
Write Select (WS)	-0.3 to VCC + 0.3	V

POWER SUPPLY

PARAMETER	CONDITIONS	MIN	NOM	MAX	UNIT
Positive Supply Current (ICC)	Read/Write	11.5		23	mA
Positive Supply Current (ICC)	Idle			75 + ICE	mA
Negative Supply Current (IEE)	Read/Write			70	mA
Negative Supply Current (IEE)	Idle			52	mA

LOGIC SIGNALS

PARAMETER	CONDITIONS	MIN	NOM	MAX	UNIT
Chip Enable Low voltage (VLCE)	Read/Write	0.0		0.7	V
Chip Enable High Voltage (VHCE)	Idle	VCC –1.0		VCC +0.3	V
Chip Enable Low Current (ILCE)	VCE = 0.0V	-1.45		-0.47	mA
Chip Enable High Current (IHCE1)	VCE = VCC – 1.0	-350		-100	µA
Chip Enable High Current (IHCE2)	VCE = VCC + .3V			+100	µA
Write Select High Voltage (VHWS)	Write/Idle	3.2		3.8	V
Write Select Low Voltage (VLWS)	Read/Idle	-0.1		0.1	V
Write Select High Current (IHWS)	Write/Idle, VWS = 3.8V				
	Transition unsafe current off	0.6		3.2	mA
	Transition unsafe on	0.6		4.2	mA
Write Select Low Current (ILWS)	Read/Idle, VWS = 3.8V			0.1	mA
Head Select High Voltage (VHHS)		-1.12		-0.72	V
Head Select Low Voltage (VLHS)		-2.38		-1.51	V
Head Select High Current (IHHS)				240	µA
Head Select Low Current (ILHS)				60	µA
Total Head Input Current	Sum of all head input currents with IWC = 0				
	Write, VCT = 3.5V			3.7	mA
	Read, VCT = 0.0V			0.16	mA
	Idle			1.25	mA

READ MODE

PARAMETER	CONDITIONS	MIN	NOM	MAX	UNIT
Differential Gain	Vin = ImV p-p, 0VDC, f = 300 KHz				
	Tj = 22 °C	28		43	V/V
	Tj = 0 °C	28		46	V/V
	Tj = 110 °C	22.2		43	V/V
Common Mode Rejection Ratio	Vin = 100 mVpp, 0VDC, f ≤ 5 MHz	45			dB
Power Supply Rejection Ratio	Vin = 0V, f ≤ 5 MHz ΔVCC or ΔVEE = 100 mVpp	45			dB
Bandwidth	Zin = 0Ω, Vin = 1 mVPP, f midband = 300 KHz	30			MHz
Input Noise	Vin = 0V, Zin = 0Ω, Power Bandwidth = 15 MHz			9.3	μVRMS
Input Noise (SSI 32R104L)	Vin = 0V, Zin = 0Ω, Power Bandwidth = 15 MHz			6.6	μVRMS
Input Current	Vin = 0V			26	μA
Differential Input Capacitance	Vin = 0V			23.5	pF
Differential Input Resistance	Vin = 0V				
	Tj = 22 °C	585		915	Ω
	Tj = 0 °C	565		915	Ω
	Tj = 110 °C	585		1070	Ω
Output Offset Voltage	Zin = 0			120	mV
Common Mode Output Voltage	Vin = 0	-0.78		-0.32	V
Unsafe Current	Write Current = 0 mA			0.1	mA
	Write Current = -45 mA	40		45	mA
Dynamic Range	DC input voltage where AC gain falls to 90% of 0VDC input value. Measured with 0.5 mVpp AC input, Tj = 30 °C	2.0			mVp
Channel Separation	Vin = 1 mVpp, 0VDC, f = 5 MHz 3 channels driven	40			dB

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WRITE MODE

PARAMETER	CONDITIONS	MIN	NOM	MAX	UNIT
Differential Input Voltage		0.175			V
Single Ended Input voltage		-0.68		-0.45	V
Write Current		-45			mA
Current Gain	IWC = -45 mA	0.95		1.0	
Write Current Voltage	IWC = -45 mA	VEE+0.25		VEE+1.0V	V
Unsafe Voltage	IUS = +45 mA	4		VCC +.3	V
Head Center Tap Voltage		3.2		3.8	V
Differential Head Voltage	IWC = -45 mA, Lh = 10 µH	5.7		7.2	Vp
Single Ended Head Voltage	IWC = -45 mA, unselected heads at 3.5V Selected Side of Selected Head Current = 0 mA	0.0		0.9	V
	= 90 mA	1.4+VCC		3.7+VCC	V
Unsafe Current	IWC = -30 mA, f = 2 MHz:			1.0	mA
	Lh = 9 µH, VUS = 5.0V – 6.3V,	15		45	mA
	Lh = 0, IWC = 45 mA, Rh = ∞ one side of head only	15		45	mA
Unselected Head Current	IWC = -45 mA, f = 2 MHz, Lh = 9.5 µH			2.0	mAp
DX DY Input Current		-2.0		2.0	mA

SWITCHING CHARACTERISTICS

PARAMETER	CONDITIONS	MIN	NOM	MAX	UNIT
Idle to Read/Write Transition Time				0.5	µs
Read/Write to Idle Transition Time				0.5	µs
Read to Write Transition Time				0.5	µs
Write To Read Transition Time				0.5	µs
Head Select Switching Delay				50.0	ns
Head Current Transition Time	IWC = -45 mA, Lh = 0, f = 5 MHz			15	ns
Head Current Switching Delay Time	IWC = -45 mA, Lh = 0, f = 5 MHz			15	ns
Head Current Switching Hysteresis	IWC = -45 mA, Lh = 0, f = 5 MHz Data rise and fall time ≤ 1 nSec			2	ns
Unsafe Switching Delay Time Delay Time	IWC = -30 mA, f = 2 MHz; Lh = 9 µH			1	µs
	Lh = 0 µH	0.8		5.1	µs

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4-Channel Thin Film Read/Write Device

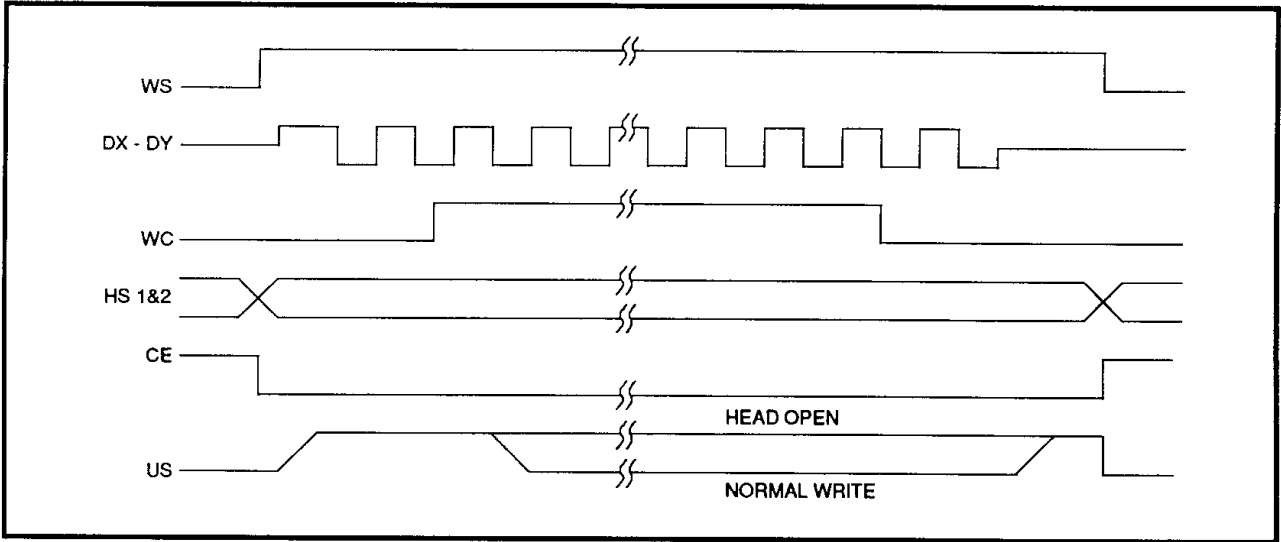**FIGURE 1: Write Mode Timing System**

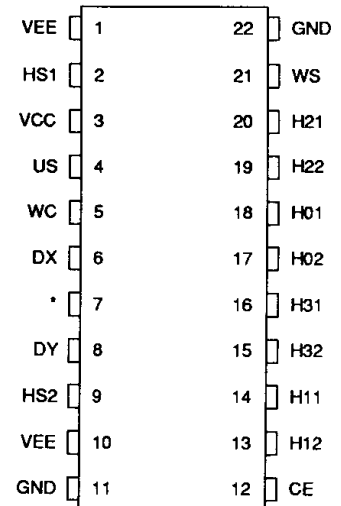## PACKAGE PIN DESIGNATIONS
(TOP VIEW)

VEE	1	24	GND
HS1	2	23	WS
VCC	3	22	H21
US	4	21	H22
WC	5	20	H01
N/C	6	19	H02
*	7	18	H31
N/C	8	17	H32
DX	9	16	H11
DY	10	15	H12
HS2	11	14	CE
VEE	12	13	GND

* MUST NOT CONNECT

**32R104, 32R108
24-Pin**

GND	1	24	VEE
WS	2	23	HS1
H21	3	22	VCC
H22	4	21	US
H01	5	20	WC
H02	6	19	N/C
H31	7	18	*
H32	8	17	N/C
H11	9	16	DX
H12	10	15	DY
CE	11	14	HS2
GND	12	13	VEE
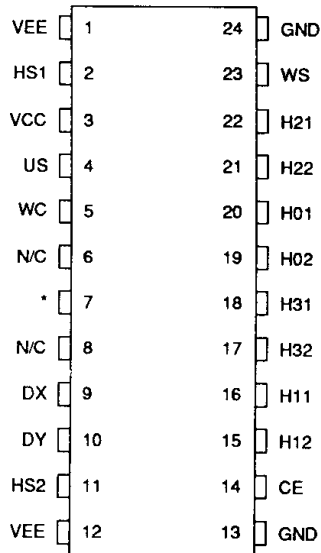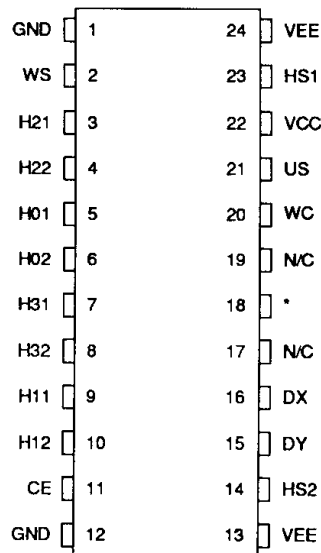
* MUST NOT CONNECT

**32R104M
24-Pin SOL**

VEE	1	22	GND
HS1	2	21	WS
VCC	3	20	H21
US	4	19	H22
WC	5	18	H01
DX	6	17	H02
*	7	16	H31
DY	8	15	H32
HS2	9	14	H11
VEE	10	13	H12
GND	11	12	CE

* MUST NOT CONNECT

**32R122
22-Pin PDIP**

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THERMAL CHARACTERISTICS: Ø ja

22-Lead	PDIP	65°C/W
24-Lead	PDIP	115°C/W
24-Lead	SOL	80°C/W
24-Lead	Flatpack	105°C/W

ORDERING INFORMATION

PART DESCRIPTION	ORDERING NUMBER	PACKAGE MARK
SSI 32R104C Read/Write IC		
24-Lead Flatpack	SSI 32R104C-F	SSI 32R104C-F
24-Lead SOL	SSI 32R104C-CL	SSI 32R104C-CL
SSI 32R104CL Low Noise Read/Write IC		
24-Lead Flatpack	SSI 32R104CL-F	SSI 32R104CL-F
SSI 32R104CM Mirror Image Read/Write IC		
24-Lead SOL	SSI 32R104CM-CL	SSI 32R104CM-CL
SSI 32R108 Read/Write IC		
24-Lead PDIP	SSI 32R108C-P	SSI 32R108C-P
SSI 32R122 Read/Write IC		
22-Lead PDIP	SSI 32R122B-P	SSI 32R122B-P

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