SYNERGY SEMICONDUCTOR

LOW POWER 16K x 4 ECL RAM

SY10L494-7/8/10
SY100L494-7/8/10
SY101L494-7/8/10

T-46-23-10

FEATURES

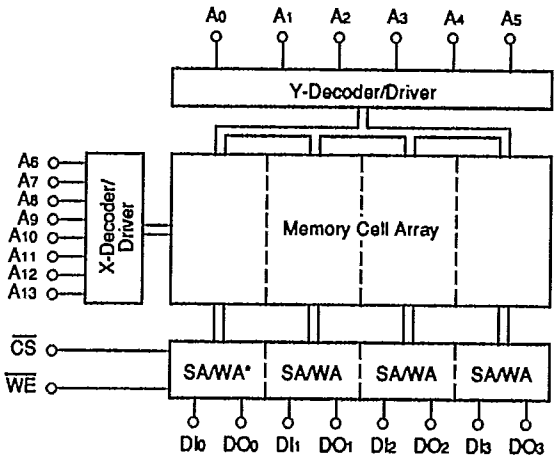
- Address access time, t_{AA}: 7/8/10ns max.
- Chip select access time, t_{AC}: 3/4/5ns max.
- Eliminates write recovery glitch found on competitors' ECL RAMs
- Low power supply current, I_{EE}: –180mA min.
- Designed for alpha particle immunity
- Built with advanced ASSET™ I technology
- Fully compatible with industry standard 10K/100K/101K ECL I/O levels
- Improved noise margins with on-chip voltage and temperature compensation
- Open emitter output for easy memory expansion
- Available in plastic DIP, SOJ and ceramic Flatpack

DESCRIPTION

The Synergy SY10L/100L/101L494 are low-power versions of Synergy's ultra-high-speed 65,536-bit Random Access Memories (RAMs), designed with advanced Emitter Coupled Logic (ECL) circuitry. The SY10L/100L/101L494 are organized as 16,384-words-by-4-bits, meets the standard 10/100/101K family signal and supply levels, and features on-chip voltage compensation for improved noise margin.

The SY10L/100L/101L494 employs proprietary circuit design techniques and Synergy's proprietary ASSET I advanced bipolar technology to achieve extremely fast access, write pulse width and write recovery times. ASSET I uses proprietary technology concepts to achieve significant reduction in parasitic capacitance while improving device packing density. Synergy's circuit design techniques, coupled with ASSET I, result not only in ultra-fast performance, but also allow device operation with virtually no soft error sensitivity and with outstanding device reliability in volume production.

BLOCK DIAGRAM



* SA = Sense Amplifier
WA = Write Amplifier

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PIN CONFIGURATIONS

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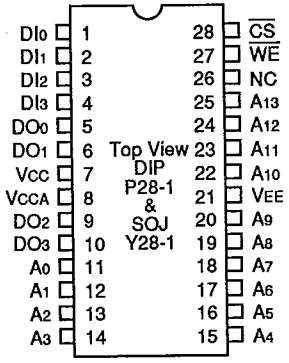

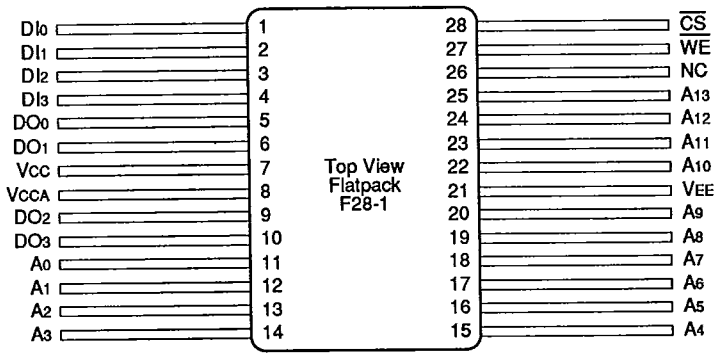

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PIN NAMES

Label	Function
A0 - A13	Address Inputs
$\overline{CS}$	Chip Select
$\overline{WE}$	Write Enable
DI0 - DI3	Data Input (DIN)
DO0 - DO3	Data Output (DOUT)
VCC	GND (0V)
VCCA	Output GND (0V)
VEE	Supply Voltage
NC	No Connect

TRUTH TABLE

Input			Output	Mode
$\overline{CS}$	$\overline{WE}$	DIN		
H	X	X	L	Disabled
L	L	H	L	Write "H"
L	L	L	L	Write "L"
L	H	X	DOUT	Read

NOTE:
H = High Voltage Level
L = Low Voltage Level
X = Don't Care

FUNCTIONAL DESCRIPTION

The Synergy SY10L/100L/101L494 are 65,536-bit RAMs organized as 16,384-words-by-4-bits. Memory cell selection is achieved by using the 14 address bits designated as A0 through A13. Each of the 2^{14} possible input address combinations corresponds to a unique word location in memory. The active low Chip Select ($\overline{CS}$) is provided for memory expansion. The active low Write Enable ($\overline{WE}$) controls the read and write operation. Data resident on the DIN inputs (DI0 through DI3) is written into the addressed location only when $\overline{WE}$ and $\overline{CS}$ are held low. In order to perform a read operation, $\overline{WE}$ is held high, $\overline{CS}$ is held low and the non-inverted output data at the addressed location is transferred to DOUT (DO0 through DO3) to be read out. Open emitter outputs are provided for maximum flexibility and memory expansion by allowing output wire-OR connections. External termination of 50Ω to –2.0V or an equivalent circuit must be used to provide the specified output levels.

The outputs are brought to a logical low level when the RAM is being written into ($\overline{WE}$ = LOW) or when the device is deselected via the active low chip select pin ($\overline{CS}$ = HIGH).

10K ABSOLUTE MAXIMUM RATINGS(1)

Rating	Symbol	Value	Unit
VEE Pin Potential to VCC Pin	VEE	+0.5 to −7.0	V
Input Voltage	VIN	+0.5 to VEE	V
DC Output Current (Output High)	IOUT	−30	mA
Temperature Under Bias	TC	−55 to +125	°C
Storage Temperature	Tstore	−65 to +150	°C

NOTE:

1. Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to ABSOLUTE MAXIMUM RATING conditions for extended periods may affect device reliability.

10K GUARANTEED OPERATING

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage(1)	VEE	−5.46	−5.2	−4.94	V
Case Temperature	TC	0	25	75	°C

NOTE:

1. Referenced to VCC

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10K DC ELECTRICAL CHARACTERISTICS

VCC = 0V; TC = 0°C to 75°C; VEE = −5.2V; Airflow > 2.5m/s; Output Load = 50Ω to −2.0V

Symbol	Parameter	TC	Min.	Max.	Unit	Condition
VOH	Output High Voltage	0°C 25°C 75°C	−1000 −960 −900	−840 −810 −720	mV	VIN = VIH Max. or VIL Min.
VOL	Output Low Voltage	0°C 25°C 75°C	−1870 −1850 −1830	−1665 −1650 −1625	mV	VIN = VIH Max. or VIL Min.
VOHC	Output High Voltage	0°C 25°C 75°C	−1020 −980 −920	— — —	mV	VIN = VIH Min. or VIL Max.
VOLC	Output Low Voltage	0°C 25°C 75°C	— — —	−1645 −1630 −1605	mV	VIN = VIH Min. or VIL Max.
VIH	Input High Voltage	0°C 25°C 75°C	−1145 −1105 −1045	−840 −810 −720	mV	Guaranteed Input Voltage High for All Inputs
VIL	Input Low Voltage	0°C 25°C 75°C	−1870 −1850 −1830	−1490 −1475 −1450	mV	Guaranteed Input Voltage Low for All Inputs
IIH	Input High Current	0°C to 75°C	0.0	20	µA	VIN = VIH Max.
IIL	Input Low Current	0°C to 75°C	−2	2	µA	VIN = VIL Min.
IIL	$\overline{BS}$ Input Low Current	0°C to 75°C	30	170	µA	VIN = VIL Min.
IIH	$\overline{BS}$ Input High Current	0°C to 75°C	40	220	µA	VIN = VIH Max.
IIL	$\overline{WE}$ Input Low Current	0°C to 75°C	−2	35	µA	VIN = VIL Min.
IIH	WEInput High Current	0°C to 75°C	0.0	60	µA	VIN = VIH Max.
IEE	Power Supply Current	0°C to 75°C	−180	—	mA	All Inputs and Outputs Open

100K ABSOLUTE MAXIMUM RATINGS(1)

Rating	Symbol	Value	Unit
VEE Pin Potential to VCC Pin	VEE	+0.5 to –6.0	V
Input Voltage	VIN	+0.5 to –2.0	V
DC Output Current (Output High)	IOUT	–30	mA
Temperature Under Bias	TC	–55 to +125	°C
Storage Temperature	Tstore	–65 to +150	°C

NOTE:

1. Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to ABSOLUTE MAXIMUM RATING conditions for extended periods may affect device reliability.

100K GUARANTEED OPERATING

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage(1)	VEE	–4.8	–4.5	–4.2	V
Case Temperature	TC	0	25	85	°C

NOTE:

1. Referenced to VCC.

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100K DC ELECTRICAL CHARACTERISTICS

VCC = 0V, VCCA = 0V, VEE = –4.5V, TC = 0°C to 85°C, Airflow > 2.5m/s, Output Load = 50Ω to –2.0V

Symbol	Parameter	Min.	Max.	Unit	Condition
VOH	Output High Voltage	–1025	–880	mV	VIN = VIH Max. or VIL Min.
VOL	Output Low Voltage	–1810	–1620	mV	VIN = VIH Max. or VIL Min.
VOHC	Output High Voltage	–1035	—	mV	VIN = VIH Min. or VIL Max.
VOLC	Output Low Voltage	—	–1610	mV	VIN = VIH Min. or VIL Max.
VIH	Input High Voltage	–1165	–880	mV	Guaranteed Input Voltage High for All Inputs
VIL	Input Low Voltage	–1810	–1475	mV	Guaranteed Input Voltage Low for All Inputs
IIH	Input High Current	0.0	20	µA	VIN = VIH Max.
IIL	Input Low Current	–2	2	µA	VIN = VIL Min.
IIL	$\overline{BS}$ Input Low Current	30	170	µA	VIN = VIL Min.
IIH	$\overline{BS}$ Input High Current	40	220	µA	VIN = VIH Max.
IIL	$\overline{WE}$ Input Low Current	–2	35	µA	VIN = VIL Min.
IIH	$\overline{WE}$ Input High Current	0.0	60	µA	VIN = VIH Max.
IEE	Power Supply Current	–180	—	mA	All Inputs and Outputs Open

101K ABSOLUTE MAXIMUM RATINGS[1]

Rating	Symbol	Value	Unit
V_{EE} Pin Potential to V_{CC} Pin	V_{EE}	+0.5 to −7.0	V
Input Voltage	V_{IN}	+0.5 to V_{EE}	V
DC Output Current (Output High)	I_{OUT}	−30	mA
Temperature Under Bias	T_C	−55 to +125	°C
Storage Temperature	T_{STORE}	−65 to +150	°C

NOTE:

1. Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to ABSOLUTE MAXIMUM RATING conditions for extended periods may affect device reliability.

101K GUARANTEED OPERATING

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage[1]	V_{EE}	−5.46	−5.2	−4.94	V
Case Temperature	T_C	0	25	85	°C

NOTE:

1. Referenced to V_{CC}.

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101K DC ELECTRICAL CHARACTERISTICS

V_{CC} = 0V, V_{CCA} = 0V, V_{EE} = −5.2V, T_C = 0°C to 85°C, Airflow > 2.5m/s, Output Load = 50Ω to −2.0V

Symbol	Parameter	Min.	Max.	Unit	Condition
V_{OH}	Output High Voltage	−1025	−880	mV	V_{IN} = V_{IH} Max. or V_{IL} Min.
V_{OL}	Output Low Voltage	−1810	−1620	mV	V_{IN} = V_{IH} Max. or V_{IL} Min.
V_{OHC}	Output High Voltage	−1035	—	mV	V_{IN} = V_{IH} Min. or V_{IL} Max.
V_{OLC}	Output Low Voltage	—	−1610	mV	V_{IN} = V_{IH} Min. or V_{IL} Max.
V_{IH}	Input High Voltage	−1165	−880	mV	Guaranteed Input Voltage High for All Inputs
V_{IL}	Input Low Voltage	−1810	−1475	mV	Guaranteed Input Voltage Low for All Inputs
I_{IH}	Input High Current	0.0	20	µA	V_{IN} = V_{IH} Max.
I_{IL}	Input Low Current	−2	2	µA	V_{IN} = V_{IL} Min.
I_{IL}	$\overline{BS}$ Input Low Current	30	170	µA	V_{IN} = V_{IL} Min.
I_{IH}	$\overline{BS}$ Input High Current	40	220	µA	V_{IN} = V_{IH} Max.
I_{IL}	$\overline{WE}$ Input Low Current	−2	35	µA	V_{IN} = V_{IL} Min.
I_{IH}	$\overline{WE}$ Input High Current	0.0	60	µA	V_{IN} = V_{IH} Max.
I_{EE}	Power Supply Current	−180	—	mA	All Inputs and Outputs Open

AC ELECTRICAL CHARACTERISTICS

AC TEST CONDITIONS

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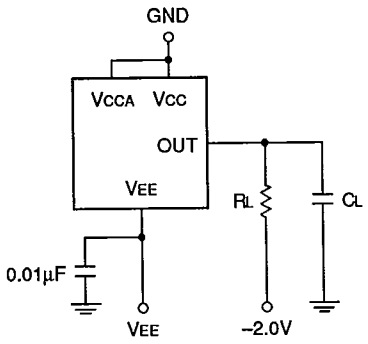
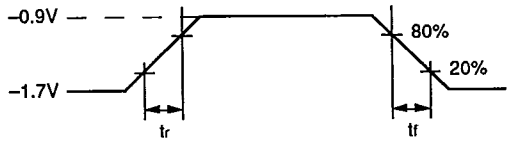
$V_{CC} = V_{CCA} = 0V$	Output Load = 50Ω to –2.0V
$V_{EE} = -5.2V \pm 5\%$ (10K)	T_C = 0°C to 75°C (10K)
$V_{EE} = -4.5V \pm 0.3V$ (100K)	T_C = 0°C to 85°C (100K/101K)
$V_{EE} = -5.2V \pm 0.52V$ (101K)	Airflow > 2.5m/s

Loading Condition



Input Pulse



$t_r = t_f$ = 1.0ns typ.

OUTPUT LOAD: R_L = 50Ω
C_L = 5pF* (typ.)
* (Modeled as 50Ω transmission line terminated to –2V.)

NOTE: All timing measurements referenced to 50% input levels.

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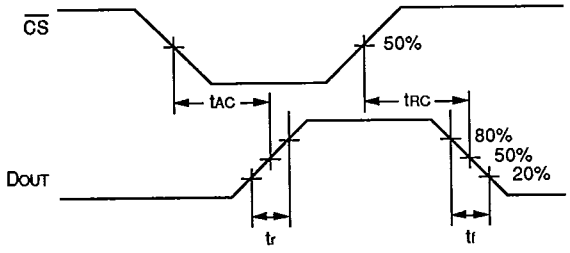
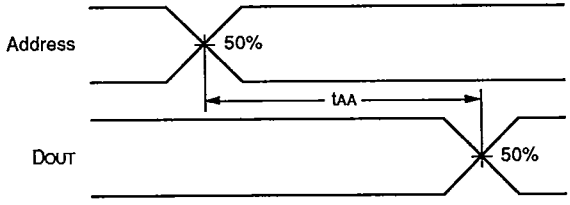
READ CYCLE

Symbol	Parameter	SY10L494-7 SY100L494-7 SY101L494-7 Min.	SY10L494-7 SY100L494-7 SY101L494-7 Max.	SY10L494-8 SY100L494-8 SY101L494-8 Min.	SY10L494-8 SY100L494-8 SY101L494-8 Max.	SY10L494-10 SY100L494-10 SY101L494-10 Min.	SY10L494-10 SY100L494-10 SY101L494-10 Max.	Unit
t_{AA}	Address AccessTime	—	7	—	8	—	10	ns
t_{AB}	Block Select AccessTime	—	3	—	4	—	5	ns
t_{RB}	Block Select Recovery Time	—	3	—	4	—	5	ns

READ CYCLE TIMING DIAGRAM





WRITE CYCLE

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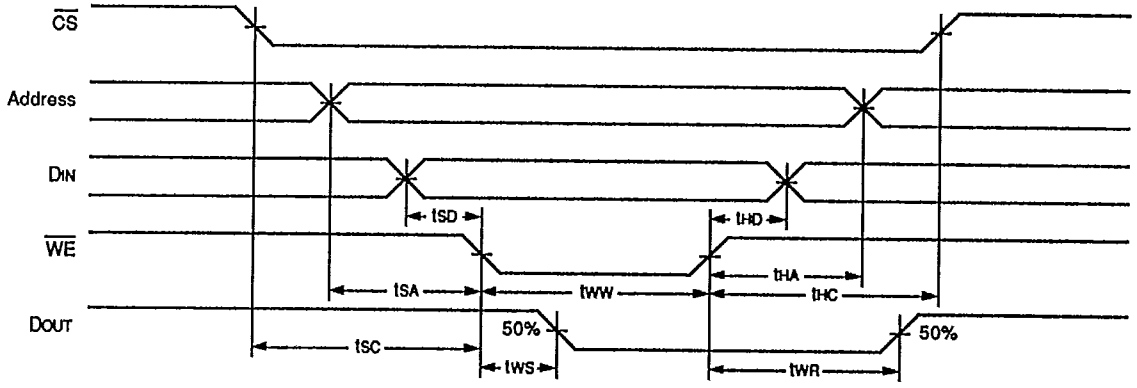
Symbol	Parameter	SY10L494-7 SY100L494-7 SY101L494-7		SY10L494-8 SY100L494-8 SY101L494-8		SY10L494-10 SY100L494-10 SY101L489-10		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
tWW	Write Pulse Width	7	—	8	—	8	—	ns
tWS	Write Disable Time	—	3	—	3	—	3	ns
tWR	Write Recovery Time	—	5	—	5	—	6	ns
tSA	Address Set-up Time	1	—	1	—	1	—	ns
tSB	Block Select Set-up Time	1	—	1	—	1	—	ns
tSD	Data Set-up Time	1	—	1	—	1	—	ns
tHA	Address Hold Time	1	—	1	—	1	—	ns
tHB	Block Select Hold Time	1	—	1	—	1	—	ns
tHD	Data Hold Time	1	—	1	—	1	—	ns

WRITE CYCLE TIMING DIAGRAM



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RISE AND FALL TIME

Parameter	Code(1)	Symbol	Min.	Typ.	Max.	Unit
Output Rise Time	S	tr	—	1500	—	ps
Output Fall Time	S	tf	—	1500	—	ps

NOTE:
1. F = Fast Edge Rate
   S = Standard Edge Rate

PRODUCT ORDERING CODE

Speed (ns)	Ordering Code(1)	Edge Rate	Package Type	Operating Range
7	SY10L/100L/101L494-7PCS	Standard	P28-1	Commercial
	SY10L/100L/101L494-7FCS	Standard	F28-1	Commercial
	SY10L/100L/101L494-7YCS	Standard	Y28-1	Commercial
8	SY10L/100L/101L494-8PCS	Standard	P28-1	Commercial
	SY10L/100L/101L494-8FCS	Standard	F28-1	Commercial
	SY10L/100L/101L494-8YCS	Standard	Y28-1	Commercial
10	SY10L/100L/101L494-10PCS	Standard	P28-1	Commercial
	SY10L/100L/101L494-10FCS	Standard	F28-1	Commercial
	SY10L/100L/101L494-10YCS	Standard	Y28-1	Commercial

NOTE:
1. Device marking will not include "SY" prefix.

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