128Kx32 3.3V SRAM MODULE *PRELIMINARY**

FEATURES

- Access Times of 15**, 17, 20, 25, 35ns
- MIL-STD-883 Compliant Devices Available
- Low Voltage Operation
- Packaging
  - 66-pin, PGA Type, 1.075 inch square Hermetic Ceramic HIP (Package 400)
  - 68 lead, Hermetic CQFP (G2U), 22.4mm (0.880 inch) square (Package 510), 3.56mm (0.140 inch) high.
  - 68 lead, Hermetic CQFP (G1U)[1], 23.9mm (0.940 inch) square (Package 519), 3.56mm (0.140 inch) high.
  - 68 lead, Hermetic CQFP (G1T), 23.9mm (0.940 inch) square (Package 524), 4.06mm (0.160 inch) high.
- Organized as 128Kx32; User Configurable as 256Kx16 or 512Kx8
- Commercial, Industrial and Military Temperature Ranges
- 3.3 Volt Power Supply
- Low Power CMOS
- TTL Compatible Inputs and Outputs
- Built-in Decoupling Caps and Multiple Ground Pins for Low Noise Operation
- Weight
  WS128K32V-XG2UX - 8 grams typical
  WS128K32NV-XH1X - 13 grams typical
  WS128K32V-XG1UX[1] - 5 grams typical
  WS128K32V-XG1TX - 5 grams typical

**This data sheet describes a product under development, not fully characterized, and is subject to change without notice.*
***Commercial and Industrial only.*
Note 1: Package Not Recommended For New Design

FIG. 1 **PIN CONFIGURATION FOR WS128K32NV-XH1X**

TOP VIEW

1	12	23	34	45	56
I/O8	$\overline{WE}_2$	I/O15	I/O24	VCC	I/O31
I/O9	$\overline{CS}_2$	I/O14	I/O25	$\overline{CS}_4$	I/O30
I/O10	GND	I/O13	I/O26	$\overline{WE}_4$	I/O29
A13	I/O11	I/O12	A6	I/O27	I/O28
A14	A10	$\overline{OE}$	A7	A3	A0
A15	A11	NC	NC	A4	A1
A16	A12	$\overline{WE}_1$	A8	A5	A2
NC	VCC	I/O7	A9	$\overline{WE}_3$	I/O23
I/O0	$\overline{CS}_1$	I/O6	I/O16	$\overline{CS}_3$	I/O22
I/O1	NC	I/O5	I/O17	GND	I/O21
I/O2	I/O3	I/O4	I/O18	I/O19	I/O20
11	22	33	44	55	66

PIN DESCRIPTION

I/O0-31	Data Inputs/Outputs
A0-16	Address Inputs
$\overline{WE}_{1-4}$	Write Enables
$\overline{CS}_{1-4}$	Chip Selects
$\overline{OE}$	Output Enable
VCC	Power Supply
GND	Ground
NC	Not Connected

BLOCK DIAGRAM

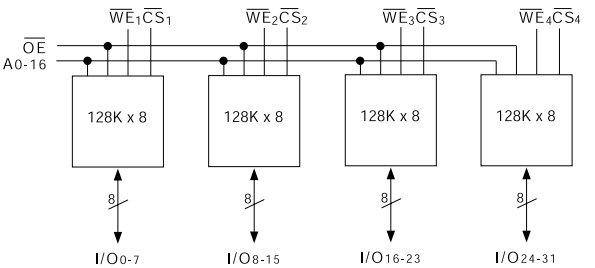
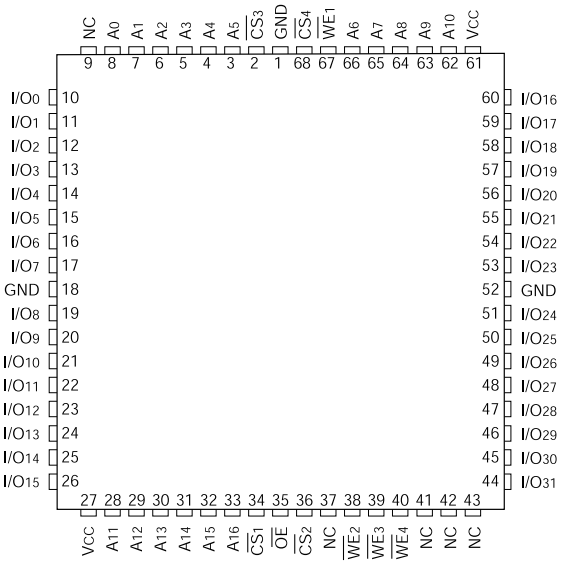


FIG. 2 PIN CONFIGURATION FOR WS128K32V-XG1TX, WS128K32V-XG2UX AND WS128K32V-XG1UX[1]

TOP VIEW



PIN DESCRIPTION

I/O0-31	Data Inputs/Outputs
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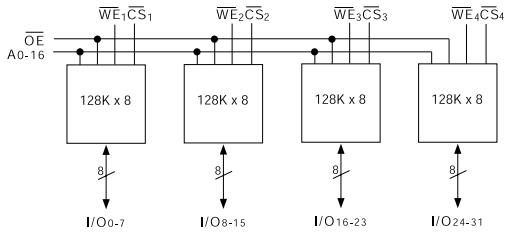
$\overline{WE}_{1-4}$	Write Enables
$\overline{CS}_{1-4}$	Chip Selects
$\overline{OE}$	Output Enable
VCC	Power Supply
GND	Ground
NC	Not Connected

BLOCK DIAGRAM



Note 1: Package Not Recommended For New Design

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-55	+125	°C
Storage Temperature	T_{STG}	-65	+150	°C
Signal Voltage Relative to GND	V_G	-0.5	4.6	V
Junction Temperature	T_J		150	°C
Supply Voltage	V_{CC}	-0.5	5.5	V

TRUTH TABLE

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	Mode	Data I/O	Power
H	X	X	Standby	High Z	Standby
L	L	H	Read	Data Out	Active
L	X	L	Write	Data In	Active
L	H	H	Out Disable	High Z	Active

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	3.0	3.6	V
Input High Voltage	V_{IH}	2.2	V_{CC} + 0.3	V
Input Low Voltage	V_{IL}	-0.3	+0.8	V

CAPACITANCE
(TA = +25°C)

Parameter	Symbol	Conditions	Max	Unit
$\overline{OE}$ capacitance	C_{OE}	V_{IN} = 0 V, f = 1.0 MHz	50	pF
$\overline{WE}_{1-4}$ capacitance	C_{WE}	V_{IN} = 0 V, f = 1.0 MHz		pF
HIP (PGA)			20	
CQFP G2U/G1U/G1T			20	
$\overline{CS}_{1-4}$ capacitance	C_{CS}	V_{IN} = 0 V, f = 1.0 MHz	20	pF
Data I/O capacitance	$C_{I/O}$	$V_{I/O}$ = 0 V, f = 1.0 MHz	20	pF
Address input capacitance	C_{AD}	V_{IN} = 0 V, f = 1.0 MHz	50	pF

This parameter is guaranteed by design but not tested.

DC CHARACTERISTICS
(V_{CC} = 3.3V ±0.3V, V_{SS} = 0V, T_A = -55°C TO +125°C)

Parameter	Sym	Conditions	Min	Max	Units
Input Leakage Current	I_{LI}	V_{IN} = GND to V_{CC}		10	µA
Output Leakage Current	I_{LO}	$\overline{CS}$ = V_{IH}, $\overline{OE}$ = V_{IH}, V_{OUT} = GND to V_{CC}		10	µA
Operating Supply Current (x 32 Mode)	I_{CC} x 32	$\overline{CS}$ = V_{IL}, $\overline{OE}$ = V_{IH}, f = 5MHz		500	mA
Standby Current	I_{SB}	$\overline{CS}$ = V_{IH}, $\overline{OE}$ = V_{IH}, f = 5MHz		32	mA
Output Low Voltage	V_{OL}	I_{OL} = 8mA		0.4	V
Output High Voltage	V_{OH}	I_{OH} = -4.0mA	2.4		V

AC CHARACTERISTICS
(V_{CC} = 3.3V, T_A = -55°C TO +125°C)

Parameter	Symbol	-15*		-17		-20		-25		-35		Units
Read Cycle		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Read Cycle Time	t_{RC}	15		17		20		25		35		ns
Address Access Time	t_{AA}		15		17		20		25		35	ns
Output Hold from Address Change	t_{OH}	0		0		0		0		0		ns
Chip Select Access Time	t_{ACS}		15		17		20		25		35	ns
Output Enable to Output Valid	t_{OE}		10		11		12		15		20	ns
Chip Select to Output in Low Z	t_{CLZ}[1]	5		5		5		5		5		ns
Output Enable to Output in Low Z	t_{OLZ}[1]	5		5		5		5		5		ns
Chip Disable to Output in High Z	t_{CHZ}[1]		8		9		10		12		15	ns
Output Disable to Output in High Z	t_{OHZ}[1]		8		9		10		12		15	ns

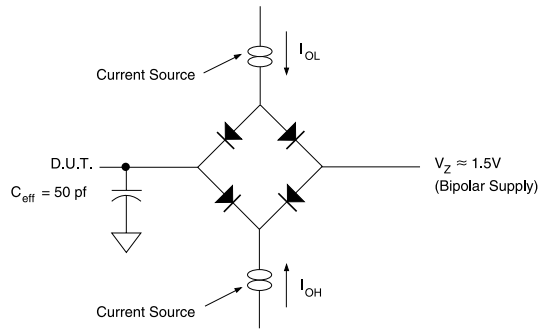
1. This parameter is guaranteed by design but not tested.
** Commercial and Industrial only.*

AC CHARACTERISTICS
(V_{CC}= 3.3V, T_A = -55°C TO +125°C)

Parameter	Symbol	-15*		-17		-20		-25		-35		Units
Write Cycle		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Write Cycle Time	t_{WC}	15		17		20		25		35		ns
Chip Select to End of Write	t_{CW}	13		14		15		20		30		ns
Address Valid to End of Write	t_{AW}	13		14		15		20		30		ns
Data Valid to End of Write	t_{DW}	10		11		12		15		18		ns
Write Pulse Width	t_{WP}	13		14		15		20		30		ns
Address Setup Time	t_{AS}	0		0		0		0		0		ns
Address Hold Time	t_{AH}	0		0		0		0		0		ns
Output Active from End of Write	t_{OW}[1]	5		5		5		5		5		ns
Write Enable to Output in High Z	t_{WHZ}[1]		8		9		10		10		15	ns
Data Hold Time	t_{DH}	0		0		0		0		0		ns

1. This parameter is guaranteed by design but not tested.
** Commercial and Industrial only.*

FIG. 3 AC TEST CIRCUIT

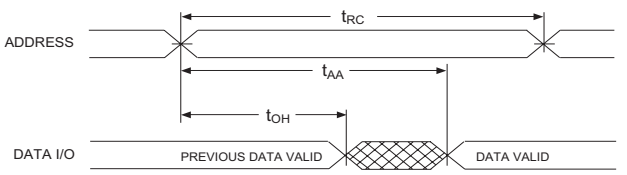


AC TEST CONDITIONS

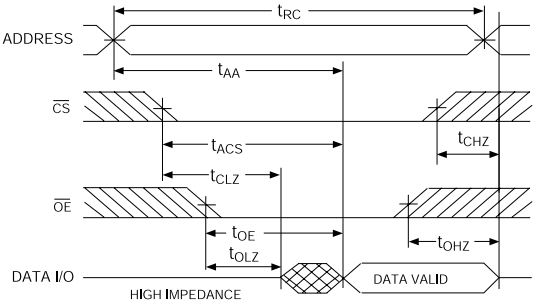
Parameter	Typ	Unit
Input Pulse Levels	V_{IL} = 0, V_{IH} = 3.0	V
Input Rise and Fall	5	ns
Input and Output Reference Level	1.5	V
Output Timing Reference Level	1.5	V

Notes:
V_Z is programmable from -2V to +7V.
I_{OL} & I_{OH} programmable from 0 to 16mA.
Tester Impedance Z_0 = 75Ω.
V_Z is typically the midpoint of V_{OH} and V_{OL}.
I_{OL} & I_{OH} are adjusted to simulate a typical resistive load circuit.
ATE tester includes jig capacitance.

FIG. 4 TIMING WAVEFORM - READ CYCLE

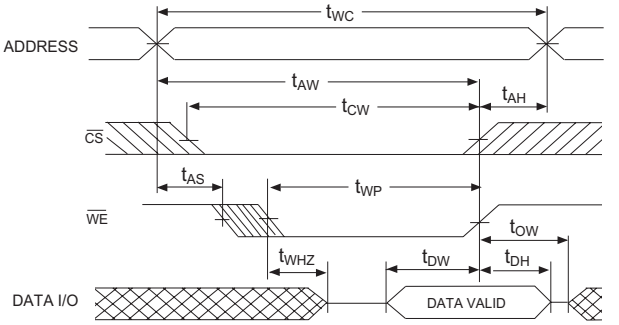


READ CYCLE 1 ($\overline{CS}$ = $\overline{OE}$ = V_{IL}, $\overline{WE}$ = V_{IH})



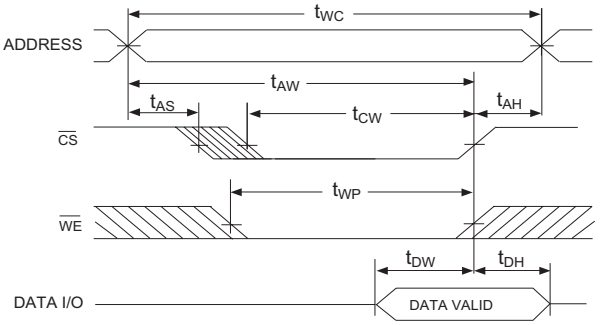
READ CYCLE 2 ($\overline{WE}$ = V_{IH})

FIG. 5 WRITE CYCLE - $\overline{WE}$ CONTROLLED



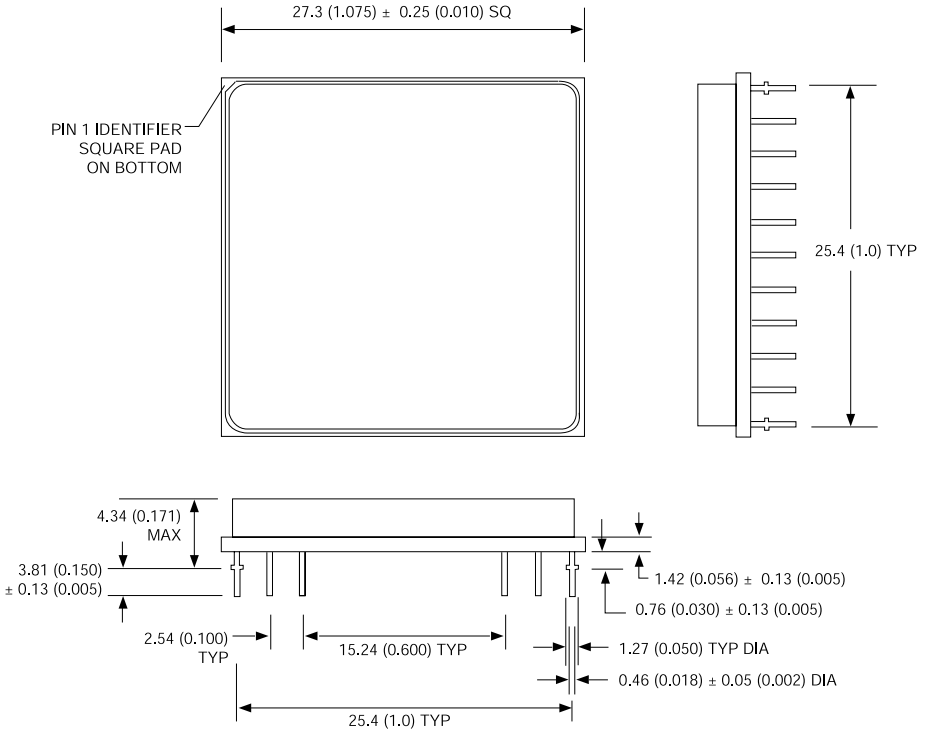
WRITE CYCLE 1, $\overline{WE}$ CONTROLLED

FIG. 6 WRITE CYCLE - $\overline{CS}$ CONTROLLED



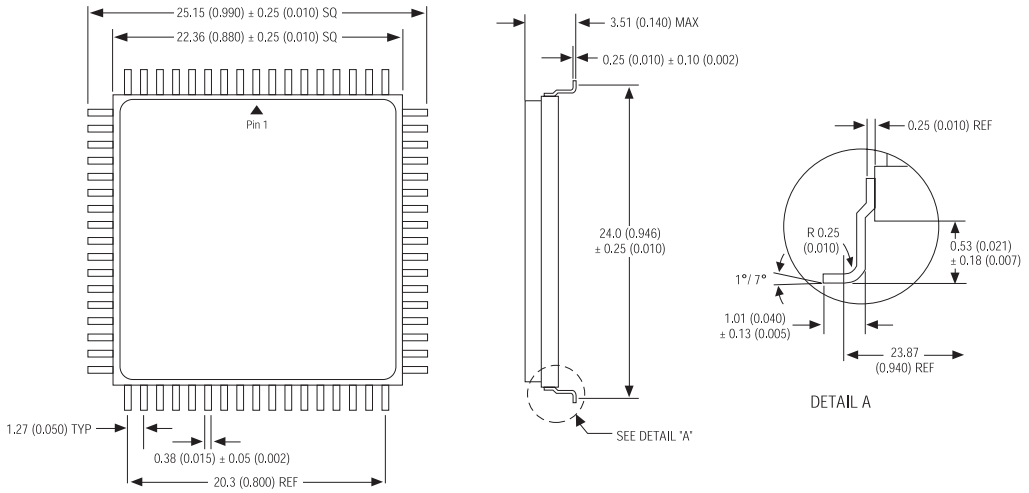
WRITE CYCLE 2, $\overline{CS}$ CONTROLLED

PACKAGE 400: 66 PIN, PGA TYPE, CERAMIC HEX-IN-LINE PACKAGE, HIP (H1)



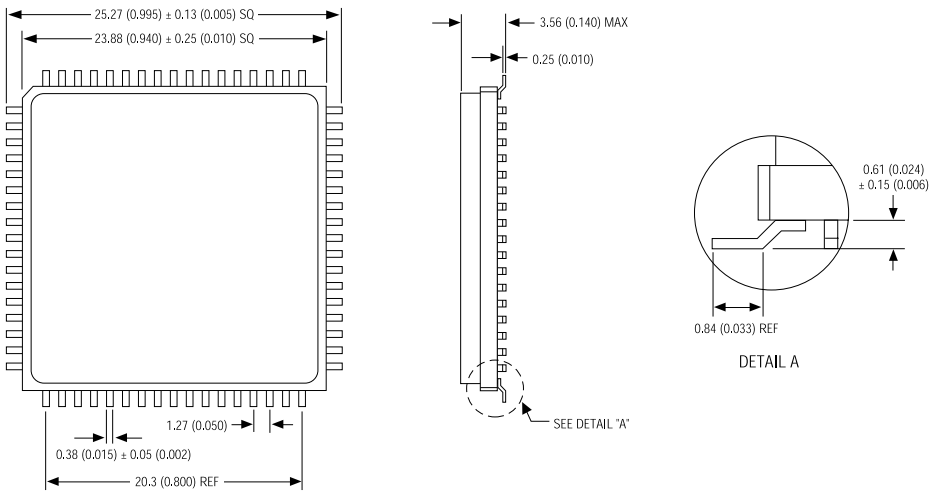
ALL LINEAR DIMENSIONS ARE MILLIMETERS AND PARENTHETICALLY IN INCHES

PACKAGE 510: 68 LEAD, LOW PROFILE CERAMIC QUAD FLAT PACK, CQFP (G2U)



ALL LINEAR DIMENSIONS ARE MILLIMETERS AND PARENTHETICALLY IN INCHES

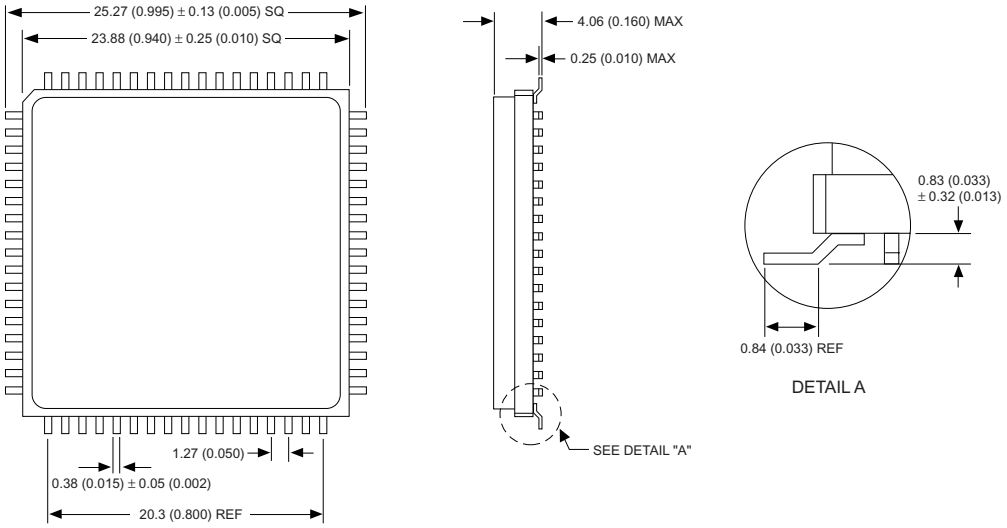
PACKAGE 519: 68 LEAD, CERAMIC QUAD FLAT PACK, CQFP (G1U)[1]



ALL LINEAR DIMENSIONS ARE MILLIMETERS AND PARENTHETICALLY IN INCHES

Note 1: Package Not Recommended For New Design

PACKAGE 524: 68 LEAD, CERAMIC QUAD FLAT PACK, LOW PROFILE CQFP (G1T)



ALL LINEAR DIMENSIONS ARE MILLIMETERS AND PARENTHETICALLY IN INCHES

ORDERING INFORMATION

W S 128K 32 X V - XXX X X X

LEAD FINISH:
- Blank = Gold plated leads
- A = Solder dip leads

DEVICE GRADE:
- M = Military Screened -55°C to +125°C
- I = Industrial -40°C to +85°C
- C = Commercial 0°C to +70°C

PACKAGE TYPE:
- H1 = Ceramic Hex-In-line Package, HIP (Package 400)
- G2U = 22.4mm Ceramic Quad Flat Pack, Low Profile CQFP (Package 510)
- G1U[1] = 23.9mm Ceramic Quad Flat Pack, Low Profile CQFP (Package 519)
- G1T = 23.9mm Ceramic Quad Flat Pack, Low Profile CQFP (Package 524)

ACCESS TIME (ns)

LOW VOLTAGE SUPPLY 3.3V ± 10%

IMPROVEMENT MARK:
- N = No Connect at pins 8, 21, 28, 39 in HIP for upgrade. (H1 only)

ORGANIZATION, 128Kx32
- User configurable as 256Kx16 or 512Kx8

SRAM

WHITE ELECTRONIC DESIGNS CORP.

Note 1: Package Not Recommended For New Design