PRODUCT SPECIFICATION



Integrated Circuits Group

LH28F128BFHT-PTTL75A Flash Memory 128M (8Mb x 16)

(Model Number: LHF12F16)

Spec. Issue Date: June 7, 2004 Spec No: FM046010

	SPEC No. F M 0 4 6 0 1 0			
	ISSUE: Jun. 7, 2004			
To;				
	ELIMINARY FICATIONS			
Product Type <u>128 M</u>	bit Flash Memory			
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Model No. (L H F 1 2 F 1 6)				
This device specification is subject to change without notice. * This specifications contains <u>32</u> pages including the cover and appendix.				
CUSTOMERS ACCEPTANCE				
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	SHARP CORPORATION			

LHF12F16

- SHARP
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 - When using the products covered herein, please observe the conditions written herein and the precautions outlined in the following paragraphs. In no event shall the company be liable for any damages resulting from failure to strictly adhere to these conditions and precautions.
 - The products covered herein are designed and manufactured for the following application areas. When using the products covered herein for the equipment listed in Paragraph (2), even for the following application areas, be sure to observe the precautions given in Paragraph (2). Never use the products for the equipment listed in Paragraph (3).
 - Office electronics
 - Instrumentation and measuring equipment
 - Machine tools
 - Audiovisual equipment
 - Home appliance
 - Communication equipment other than for trunk lines
 - (2) Those contemplating using the products covered herein for the following equipment <u>which demands high</u> <u>reliability</u>, should first contact a sales representative of the company and then accept responsibility for incorporating into the design fail-safe operation, redundancy, and other appropriate measures for ensuring reliability and safety of the equipment and the overall system.
 - Control and safety devices for airplanes, trains, automobiles, and other transportation equipment
 - Mainframe computers
 - Traffic control systems
 - Gas leak detectors and automatic cutoff devices
 - Rescue and security equipment
 - Other safety devices and safety equipment, etc.
 - (3) Do not use the products covered herein for the following equipment which demands extremely high performance in terms of functionality, reliability, or accuracy.
 - Aerospace equipment
 - Communications equipment for trunk lines
 - Control equipment for the nuclear power industry
 - Medical equipment related to life support, etc.
 - (4) Please direct all queries and comments regarding the interpretation of the above three Paragraphs to a sales representative of the company.

• Please direct all queries regarding the products covered herein to a sales representative of the company.



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LH28F128BFHT-PTTL75A 128Mbit (8Mbit×16) Page Mode Dual Work Flash MEMORY

■ 128-M density with 16-bit I/O Interface

- High Performance Reads
 - 75/25ns 8-Word Page Mode
- 6-Plane Dual Work Operation
 - Read operations are available during Block Erase or (Page Buffer) Program between two different Planes
 Plane Architecture:
 - 16M, 24M, 24M, 24M, 24M, 16M
- Low Power Operation
 - 2.7V Read and Write Operations
 - \bullet V_{CCQ} for Input/Output Power Supply Isolation
 - Automatic Power Savings Mode reduces I_{CCR} in Static Mode
- Enhanced Code + Data Storage
 5µs Typical Erase/Program Suspends
- OTP (One Time Program) Block
 - 4-Word Factory-Programmed Area
 - 4-Word User-Programmable Area
- High Performance Program with Page Buffer
 - 16-Word Page Buffer
 - 5µs/Word (Typ.) at WP#/ACC=9.5V
- Operating Temperature -40° C to $+85^{\circ}$ C
- CMOS Process (P-type silicon substrate)

- Flexible Blocking Architecture
 - Eight 4-Kword Parameter Blocks
 - Two-hundred and fifty-five 32-Kword Main Blocks
 - Top Parameter Location
- Enhanced Data Protection Features
 - Individual Block Lock and Block Lock-Down with Zero-Latency
 - All blocks are locked at power-up or device reset.
 - Block Erase, Full Chip Erase, (Page Buffer) Word Program Lockout during Power Transitions
- Automated Erase/Program Algorithms
 - 3.0V Low-Power 11µs/Word (Typ.) Programming
 - 9.5V No Glue Logic 9µs/Word (Typ.) Production Programming and 0.8s Erase (Typ.)
- Cross-Compatible Command Support
 - Basic Command Set
 - Common Flash Interface (CFI)
- Extended Cycling Capability
 Minimum 100,000 Block Erase Cycles
- 56-Lead TSOP (Normal Bend)
- ETOX^{TM*} Flash Technology
- Not designed or rated as radiation hardened

The product, which is 6-Plane Page Mode Dual Work (Simultaneous Read while Erase/Program) Flash memory, is a low power, high density, low cost, nonvolatile read/write storage solution for a wide range of applications. The product can operate at $V_{CC}=2.7V-3.3V$. Its low voltage operation capability greatly extends battery life for portable applications.

The product provides high performance asynchronous page mode. It allows code execution directly from Flash, thus eliminating time consuming wait states.

The memory array block architecture utilizes Enhanced Data Protection features, and provides separate Parameter and Main Blocks that provide maximum flexibility for safe nonvolatile code and data storage.

Fast program capability is provided through the use of high speed Page Buffer Program.

Special OTP (One Time Program) block provides an area to store permanent code such as an unique number.

* ETOX is a trademark of Intel Corporation.



$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	56-LEAD TSOP STANDARD PINOUT 14mm x 20mm TOP VIEW	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
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Figure 1. 56-Lead TSOP (Normal Bend) Pinout

Table 1. Pin Descriptions			
Symbol	Туре	Name and Function	
A ₂₂ -A ₀	INPUT	ADDRESS INPUTS: Inputs for addresses.	
DQ ₁₅ -DQ ₀	INPUT/ OUTPUT	DATA INPUTS/OUTPUTS: Inputs data and commands during CUI (Command User Interface) write cycles, outputs data during memory array, status register, query code and identifier code reads. Data pins float to high-impedance (High Z) when the chip or outputs are deselected. Data is internally latched during an erase or program cycle.	
CE#	INPUT	CHIP ENABLE: Activates the device's control logic, input buffers, decoders and sense amplifiers. CE#-high (V_{IH}) deselects the device and reduces power consumption to standby levels.	
RST#	INPUT	RESET: When low (V_{IL}), RST# resets internal automation and inhibits write operations which provides data protection. RST#-high (V_{IH}) enables normal operation. After power-up or reset mode, the device is automatically set to read array mode. RST# must be low during power-up/down.	
OE#	INPUT	OUTPUT ENABLE: Gates the device's outputs during a read cycle.	
WE#	INPUT	WRITE ENABLE: Controls writes to the CUI and array blocks. Addresses and data are latched on the rising edge of CE# or WE# (whichever goes high first).	
WP#/ACC	INPUT/ SUPPLY	WRITE PROTECT: When WP#/ACC is V_{IL} , locked-down blocks cannot be unlocked. Erase or program operation can be executed to the blocks which are not locked and not locked-down. When WP#/ACC is V_{IH} , lock-down is disabled. Applying 9.5V±0.5V to WP#/ACC provides fast erasing or fast programming mode. In this mode, WP#/ACC is power supply pin. Applying 9.5V±0.5V to WP#/ACC during erase/program can only be done for a maximum of 1,000 cycles on each block. WP#/ ACC may be connected to 9.5V±0.5V for a total of 80 hours maximum. Use of this pin at 9.5V+0.5V beyond these limits may reduce block cycling capability or cause permanent damage.	
RY/BY#	OPEN DRAIN OUTPUT	READY/BUSY#: Indicates the status of the internal WSM (Write State Machine). When low, WSM is performing an internal operation (block erase, full chip erase, (page buffer) program or OTP program). RY/BY#-High Z indicates that the WSM is ready for new commands, block erase is suspended and (page buffer) program is inactive, (page buffer) program is suspended, or the device is in reset mode.	
V _{CC}	SUPPLY	DEVICE POWER SUPPLY (2.7V-3.3V): With $V_{CC} \leq V_{LKO}$, all write attempts to the flash memory are inhibited. Device operations at invalid V_{CC} voltage (see DC Characteristics) produce spurious results and should not be attempted.	
V _{CCQ}	SUPPLY	INPUT/OUTPUT POWER SUPPLY (2.7V-3.3V): Power supply for all input/output pins.	
GND	SUPPLY	GROUND: Do not float any ground pins.	
NC		NO CONNECT: Lead is not internally connected; it may be driven or floated.	

				-							
			THEN	N THE M	IODES AI	LOWED	IN THE O	THER P	LANE IS:		
IF ONE PLANE IS:	Read Array	Read ID/OTP	Read Status	Read Query	Word Program	Page Buffer Program	OTP Program	Block Erase	Full Chip Erase	Program Suspend	Block Erase Suspend
Read Array	Х	X	Х	Х	Х	Х		Х		Х	Х
Read ID/OTP	Х	X	Х	Х	X	X		Х		X	Х
Read Status	Х	X	Х	Х	Х	Х	Х	Х	X	Х	Х
Read Query	Х	X	Х	Х	Х	Х		Х		Х	Х
Word Program	Х	X	Х	Х							Х
Page Buffer Program	Х	X	Х	Х							Х
OTP Program			Х								
Block Erase	Х	X	Х	Х							
Full Chip Erase			Х								
Program Suspend	Х	X	Х	Х							Х
Block Erase Suspend	Х	X	Х	Х	Х	Х				Х	

Table 2	Simultaneous C	Operation Modes Allowed with 6 Plan	es (1, 2)
1000 2.	Simultaneous	Just allow while the second se	63

NOTES:

1. "X" denotes the operation available.

2. Dual Work Restrictions:

Status register reflects WSM (Write State Machine) state.

Only one plane can be erased or programmed at a time - no command queuing. Commands must be written to an address within the block targeted by that command.

 $[A_{22}-A_0]$

32-Kword Block 79 278000H - 27FFFFH 32-Kword Block 78 270000H - 277FFFH 32-Kword Block 77 268000H - 267FFFH 32-Kword Block 77 268000H - 267FFFH 32-Kword Block 73 248000H - 257FFFH 32-Kword Block 73 248000H - 247FFFH 32-Kword Block 72 240000H - 247FFFH 32-Kword Block 72 230000H - 237FFFH 32-Kword Block 70 230000H - 237FFFH 32-Kword Block 69 228000H - 227FFFH 32-Kword Block 66 210000H - 217FFFH 32-Kword Block 66 210000H - 217FFFH 32-Kword Block 66 208000H - 207FFFH 32-Kword Block 66 100000H - 17FFFH 32-Kword Block 61 158000H - 107FFFH 32-Kword Block 51 188000H - 107FFFH 32-Kword Block 55 188000H - 107FFFH 32-Kword Block 55 188000H - 107FFFH 32-Kword Block 51 198000H - 107FFFH 32-Kword Block 52 1A0000H - 177FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 52 1A0000H - 177FFFH 32-Kword Block 41 180000H - 177FFFH <th></th> <th></th> <th>-</th>			-
32-Kword Block 77 268000H - 26FFFFH 32-Kword Block 75 258000H - 267FFFH 32-Kword Block 75 258000H - 257FFFH 32-Kword Block 73 250000H - 257FFFH 32-Kword Block 72 240000H - 247FFFH 32-Kword Block 70 238000H - 237FFFH 32-Kword Block 70 230000H - 237FFFH 32-Kword Block 69 228000H - 237FFFH 32-Kword Block 69 228000H - 227FFFH 32-Kword Block 67 218000H - 217FFFH 32-Kword Block 66 210000H - 277FFFH 32-Kword Block 66 208000H - 207FFFH 32-Kword Block 61 180000H - 107FFFH 32-Kword Block 62 160000H - 107FFFH 32-Kword Block 61 188000H - 107FFFH 32-Kword Block 55 108000H - 107FFFH 32-Kword Block 55 188000H - 187FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 41 148000H - 147FFFH <td></td> <td>32-Kword Block 79</td> <td>278000H - 27FFFFH</td>		32-Kword Block 79	278000H - 27FFFFH
32-Kword Block 7/ 260000H - 267FFFH 32-Kword Block 75 258000H - 257FFFH 32-Kword Block 72 248000H - 257FFFH 32-Kword Block 73 248000H - 247FFFH 32-Kword Block 71 238000H - 247FFFH 32-Kword Block 70 230000H - 247FFFH 32-Kword Block 69 228000H - 247FFFH 32-Kword Block 69 228000H - 247FFFH 32-Kword Block 69 228000H - 247FFFH 32-Kword Block 62 20000H - 247FFFH 32-Kword Block 62 210000H - 247FFFH 32-Kword Block 64 20000H - 27FFFH 32-Kword Block 65 218000H - 17FFFH 32-Kword Block 61 1F8000H - 1F7FFFH 32-Kword Block 62 1F8000H - 1F7FFFH 32-Kword Block 59 1D8000H - 1D7FFFH 32-Kword Block 50 1D0000H - 1D7FFFH 32-Kword Block 55 1B8000H - 1DFFFFH 32-Kword Block 55 1B8000H - 1DFFFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 50 190000H - 1A7FFFH 32-Kword Block 41 148000H - 1A7FFFH		32-Kword Block 78	270000H - 277FFFH
32-Kword Block 75 258000H - 25FFFFH 32-Kword Block 73 248000H - 24FFFFH 32-Kword Block 72 240000H - 24FFFFH 32-Kword Block 71 238000H - 23FFFFH 32-Kword Block 71 238000H - 23FFFFH 32-Kword Block 69 230000H - 23FFFFH 32-Kword Block 69 230000H - 23FFFFH 32-Kword Block 68 20000H - 23FFFFH 32-Kword Block 66 210000H - 21FFFFH 32-Kword Block 66 208000H - 207FFFH 32-Kword Block 65 208000H - 17FFFH 32-Kword Block 64 200000H - 17FFFH 32-Kword Block 59 158000H - 1F7FFFH 32-Kword Block 59 158000H - 1DFFFFH 32-Kword Block 59 158000H - 1DFFFFH 32-Kword Block 55 158000H - 1DFFFFH 32-Kword Block 55 188000H - 1DFFFFH 32-Kword Block 55 188000H - 1BFFFFH 32-Kword Block 51 198000H - 137FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 42 150000H - 177FFFH 32-Kword Block 44 160000H - 187FFFH	1	32-Kword Block 77	268000H - 26FFFFH
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32-Kword Block 66 210000H - 217FFFH 32-Kword Block 65 208000H - 207FFFH 32-Kword Block 65 208000H - 207FFFH 32-Kword Block 63 1F8000H - 1FFFFFH 32-Kword Block 61 1F8000H - 1FFFFFH 32-Kword Block 60 1E0000H - 1F7FFFH 32-Kword Block 50 1D8000H - 1D7FFFH 32-Kword Block 57 1C8000H - 1D7FFFH 32-Kword Block 57 1C8000H - 1D7FFFH 32-Kword Block 55 1B8000H - 1D7FFFH 32-Kword Block 55 1B8000H - 1B7FFFH 32-Kword Block 51 198000H - 1B7FFFH 32-Kword Block 50 190000H - 197FFFH 32-Kword Block 41 148000H - 187FFFH 32-Kword Block 42 150000H - 187FFFH 32-Kword Block 43 158000H - 167FFFH 32-Kword Block 44 160000H - 167FFFH 32-Kword Block 45 158000H - 157FFFH 32-Kword Block 44 160000H - 147FFFH 32-Kword Block 43 158000H - 157FFFH <td>1</td> <td></td> <td>218000H - 21FFFFH</td>	1		218000H - 21FFFFH
32-Kword Block 65 208000H - 20FFFFH 32-Kword Block 63 1F8000H - 10FFFFH 32-Kword Block 63 1F8000H - 10FFFFH 32-Kword Block 61 1E8000H - 10FFFFH 32-Kword Block 60 10000H - 10FFFFH 32-Kword Block 59 1D8000H - 10FFFFH 32-Kword Block 59 1D8000H - 10FFFFH 32-Kword Block 57 1C8000H - 10FFFFH 32-Kword Block 57 1C8000H - 10FFFFH 32-Kword Block 55 1B8000H - 10FFFFH 32-Kword Block 55 1B8000H - 10FFFFH 32-Kword Block 51 198000H - 107FFFH 32-Kword Block 51 198000H - 107FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 51 198000H - 197FFFH 32-Kword Block 51 198000H - 197FFFH 32-Kword Block 40 190000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 42 150000H - 177FFFH <td>1</td> <td></td> <td>210000H - 217FFFH</td>	1		210000H - 217FFFH
32-Kword Block 64 200000H - 207FFFH 32-Kword Block 63 1F8000H - 1F7FFH 32-Kword Block 62 1F0000H - 1F7FFH 32-Kword Block 61 1E8000H - 1E7FFFH 32-Kword Block 62 1E8000H - 1E7FFFH 32-Kword Block 50 1D8000H - 1E7FFFH 32-Kword Block 57 1C8000H - 1D7FFFH 32-Kword Block 57 1C8000H - 1C7FFFH 32-Kword Block 56 1C0000H - 1C7FFFH 32-Kword Block 55 1B8000H - 1FFFFH 32-Kword Block 51 1B8000H - 1FFFFH 32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 51 198000H - 197FFFH 32-Kword Block 51 198000H - 197FFFH 32-Kword Block 45 168000H - 187FFFH 32-Kword Block 45 168000H - 187FFFH 32-Kword Block 45 168000H - 187FFFH 32-Kword Block 45 168000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 147FFFH 32-Kword Block 32 138000H - 147FFFH			
32-Kword Block 63 1F8000H - 1FFFFFH 32-Kword Block 61 1F8000H - 1FFFFH 32-Kword Block 61 1E8000H - 1EFFFFH 32-Kword Block 50 1E8000H - 1EFFFFH 32-Kword Block 59 1D8000H - 1DFFFFH 32-Kword Block 57 1C8000H - 1DFFFFH 32-Kword Block 56 1D0000H - 1D7FFFH 32-Kword Block 56 1C0000H - 1C7FFFH 32-Kword Block 56 1C0000H - 1C7FFFH 32-Kword Block 56 1C0000H - 1C7FFFH 32-Kword Block 51 1B8000H - 1BFFFFH 32-Kword Block 51 188000H - 1AFFFFH 32-Kword Block 51 198000H - 197FFFH 32-Kword Block 51 198000H - 187FFFH 32-Kword Block 48 180000H - 187FFFH 32-Kword Block 47 178000H - 187FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 158000H - 157FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 43 158000H - 157FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 38 130000H - 137FFFH <td></td> <td></td> <td>200000H - 207FFFH</td>			200000H - 207FFFH
32-Kword Block 62 1F0000H - 1F7FFFH 32-Kword Block 61 1E8000H - 1E7FFFH 32-Kword Block 50 1E8000H - 1E7FFFH 32-Kword Block 59 1D8000H - 1D7FFFH 32-Kword Block 59 1D8000H - 1D7FFFH 32-Kword Block 57 1C8000H - 1D7FFFH 32-Kword Block 56 1C0000H - 1D7FFFH 32-Kword Block 56 1C0000H - 1C7FFFH 32-Kword Block 55 1B8000H - 1BFFFFH 32-Kword Block 51 1B8000H - 1BFFFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1FFFFH 32-Kword Block 45 198000H - 1FFFFH 32-Kword Block 47 178000H - 1FFFFH 32-Kword Block 46 170000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 158000H - 167FFFH 32-Kword Block 41 148000H - 167FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 43 158000H - 157FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 37 138000H - 137FFFH 32-Kword Block 36 120000H - 137FFFH			1F8000H - 1FFFFFH
Image: Solution of the second state in the			1F0000H - 1F7FFFH
32-Kword Block 60 1E0000H - 1E7FFFH 32-Kword Block 59 1D8000H - 1DFFFFH 32-Kword Block 59 1D8000H - 1DFFFFH 32-Kword Block 57 1C8000H - 1C7FFFH 32-Kword Block 55 1D8000H - 1C7FFFH 32-Kword Block 55 1B8000H - 1C7FFFH 32-Kword Block 55 1B8000H - 1B7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1FFFH 32-Kword Block 51 198000H - 1FFFH 32-Kword Block 51 198000H - 1FFFFH 32-Kword Block 40 180000H - 1FFFFH 32-Kword Block 47 178000H - 1FFFFH 32-Kword Block 47 178000H - 1FFFFH 32-Kword Block 45 168000H - 1FFFFH 32-Kword Block 42 150000H - 17FFFH 32-Kword Block 43 158000H - 167FFFH 32-Kword Block 43 158000H - 167FFFH 32-Kword Block 42 150000H - 147FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 37 128000H - 127FFFH <tr< td=""><td></td><td></td><td></td></tr<>			
12 101 102			
Image: Second Block S			
32-Kword Block 57 1C8000H - 1CFFFFH 32-Kword Block 55 1B8000H - 1BFFFFH 32-Kword Block 55 1B8000H - 1BFFFFH 32-Kword Block 55 1B8000H - 1BFFFFH 32-Kword Block 52 1A8000H - 1B7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 50 190000H - 197FFFH 32-Kword Block 49 188000H - 187FFFH 32-Kword Block 49 188000H - 187FFFH 32-Kword Block 44 180000H - 187FFFH 32-Kword Block 45 168000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 158000H - 167FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 31 138000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 36 120000H - 117FFFH <td></td> <td></td> <td></td>			
32-Kword Block 56 1C0000H - 1C7FFFH 32-Kword Block 55 1B8000H - 1BFFFFH 32-Kword Block 53 1A8000H - 1BFFFFH 32-Kword Block 53 1A8000H - 1AFFFFH 32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 49 188000H - 187FFFH 32-Kword Block 47 178000H - 17FFFH 32-Kword Block 46 170000H - 177FFFH 32-Kword Block 42 160000H - 167FFFH 32-Kword Block 42 150000H - 15FFFFH 32-Kword Block 42 150000H - 15FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 31 138000H - 137FFFH 32-Kword Block 37 128000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 37 128000H - 127FFFH			
32-Kword Block 55 1B8000H - 1BFFFFH 32-Kword Block 54 1B0000H - 1B7FFFH 32-Kword Block 53 1A8000H - 1AFFFFH 32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 51 198000H - 1A7FFFH 32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 50 199000H - 197FFFH 32-Kword Block 49 188000H - 187FFFH 32-Kword Block 47 178000H - 187FFFH 32-Kword Block 47 178000H - 187FFFH 32-Kword Block 47 178000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 42 150000H - 167FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 150000H - 147FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 37 128000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH <td></td> <td></td> <td></td>			
Biologic Block 52 180000H - 187FFFH 32-Kword Block 53 1A8000H - 1A7FFFH 32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 51 198000H - 197FFFH 32-Kword Block 50 198000H - 197FFFH 32-Kword Block 49 188000H - 197FFFH 32-Kword Block 49 188000H - 197FFFH 32-Kword Block 47 178000H - 177FFFH 32-Kword Block 46 170000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 44 160000H - 167FFFH 32-Kword Block 43 158000H - 157FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 30 130000H - 137FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH 32-Kword Block 35 118000H - 107FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 107FFFH <td></td> <td></td> <td></td>			
32-Kword Block 53 1A8000H - 1AFFFFH 32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 51 198000H - 19FFFFH 32-Kword Block 50 190000H - 19FFFFH 32-Kword Block 49 188000H - 18FFFFH 32-Kword Block 48 180000H - 18FFFFH 32-Kword Block 47 178000H - 18FFFFH 32-Kword Block 46 170000H - 17FFFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 158000H - 157FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 32 138000H - 137FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 36 120000H - 117FFFH 32-Kword Block 36 120000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 36 120000H - 117FFFH <td></td> <td></td> <td></td>			
32-Kword Block 52 1A0000H - 1A7FFFH 32-Kword Block 51 198000H - 19FFFFH 32-Kword Block 50 190000H - 197FFFH 32-Kword Block 49 188000H - 187FFFH 32-Kword Block 49 188000H - 187FFFH 32-Kword Block 47 178000H - 187FFFH 32-Kword Block 46 170000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 42 150000H - 167FFFH 32-Kword Block 31 138000H - 137FFFH 32-Kword Block 36 120000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 36 120000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH			
32-Kword Block 51 198000H - 19FFFFH 32-Kword Block 50 190000H - 197FFFH 32-Kword Block 49 188000H - 18FFFFH 32-Kword Block 49 188000H - 18FFFFH 32-Kword Block 47 178000H - 17FFFH 32-Kword Block 45 168000H - 187FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 41 148000H - 167FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 31 148000H - 147FFFH 32-Kword Block 39 138000H - 137FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH 32-Kword Block 34 108000H - 117FFFH			
32-Kword Block 50 190000H - 197FFFH 32-Kword Block 49 188000H - 18FFFFH 32-Kword Block 49 188000H - 18FFFFH 32-Kword Block 48 180000H - 187FFFH 32-Kword Block 47 178000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 44 160000H - 167FFFH 32-Kword Block 42 150000H - 167FFFH 32-Kword Block 42 150000H - 167FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 107FFFH 32-Kword Block 35 118000H - 107FFFH			
HTT 32-Kword Block 49 188000H - 18FFFFH 32-Kword Block 47 178000H - 187FFFH 32-Kword Block 47 178000H - 177FFFH 32-Kword Block 47 178000H - 177FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 45 168000H - 167FFFH 32-Kword Block 43 158000H - 167FFFH 32-Kword Block 43 158000H - 167FFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 40 140000H - 147FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 107FFFH	_		
32-Kword Block 45 168000H - 16FFFFH 32-Kword Block 44 160000H - 167FFFH 32-Kword Block 43 158000H - 15FFFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 148000H - 147FFFH 32-Kword Block 39 138000H - 137FFFH 32-Kword Block 37 128000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH	E		
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32-Kword Block 45 168000H - 16FFFFH 32-Kword Block 44 160000H - 167FFFH 32-Kword Block 43 158000H - 15FFFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 148000H - 147FFFH 32-Kword Block 39 138000H - 137FFFH 32-Kword Block 37 128000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH	A.		
32-Kword Block 45 168000H - 16FFFFH 32-Kword Block 44 160000H - 167FFFH 32-Kword Block 43 158000H - 15FFFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 42 148000H - 147FFFH 32-Kword Block 39 138000H - 137FFFH 32-Kword Block 37 128000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH	L.		
32-Kword Block 44 160000H - 167FFFH 32-Kword Block 43 158000H - 15FFFFH 32-Kword Block 42 150000H - 15FFFFH 32-Kword Block 41 148000H - 147FFFH 32-Kword Block 40 140000H - 147FFFH 32-Kword Block 39 138000H - 137FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 33 108000H - 107FFFH	-		
32-Kword Block 43 158000H - 15FFFFH 32-Kword Block 42 150000H - 157FFFH 32-Kword Block 41 148000H - 14FFFFH 32-Kword Block 40 140000H - 14FFFFH 32-Kword Block 30 130000H - 14FFFFH 32-Kword Block 38 130000H - 13FFFFH 32-Kword Block 36 120000H - 13FFFFH 32-Kword Block 36 120000H - 12FFFFH 32-Kword Block 35 118000H - 11FFFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 10FFFFH			
32-Kword Block 42 150000H - 157FFFH 32-Kword Block 41 148000H - 14FFFFH 32-Kword Block 40 140000H - 147FFFH 32-Kword Block 39 138000H - 137FFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH			
32-Kword Block 41 148000H - 14FFFFH 32-Kword Block 40 140000H - 147FFFH 32-Kword Block 39 138000H - 13FFFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFFH 32-Kword Block 33 108000H - 117FFFFH			
32-Kword Block 40 140000H - 147FFFH 32-Kword Block 39 138000H - 13FFFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 37 128000H - 127FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 33 108000H - 117FFFH			
32-Kword Block 39 138000H - 13FFFFH 32-Kword Block 38 130000H - 137FFFH 32-Kword Block 37 128000H - 12FFFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 33 108000H - 10FFFFH			
32-Kword Block 38 130000H - 137FFFH 32-Kword Block 37 128000H - 12FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 117FFFH 32-Kword Block 34 110000H - 117FFFH 32-Kword Block 34 108000H - 107FFFH			
32-Kword Block 37 128000H - 12FFFH 32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 11FFFFH 32-Kword Block 34 110000H - 117FFFH 32-Kword Block 33 108000H - 10FFFFH			
32-Kword Block 36 120000H - 127FFFH 32-Kword Block 35 118000H - 11FFFFH 32-Kword Block 34 110000H - 117FFFH 32-Kword Block 33 108000H - 10FFFFH			
32-Kword Block 35 32-Kword Block 34 32-Kword Block 34 10000H - 11FFFH 32-Kword Block 33 108000H - 10FFFFH			
32-Kword Block 34 110000H - 117FFFH 32-Kword Block 33 108000H - 10FFFFH			
32-Kword Block 33 108000H - 10FFFFH			
52-KWOTA BIOCK 52 100000H - 10/FFFH			
		52-KWORD BLOCK 32	100000H - 10/FFFH

SHARP

PLANE1 : 24 Mbit

PLANE0: 16 Mbit

Figure 2.1. Memory Map (Top Parameter, Plane 0 and Plane 1)

		$[A_{22}-A_0]$
	32-Kword Block 31	0F8000H - 0FFFFFH
	32-Kword Block 30	0F0000H - 0F7FFFH
	32-Kword Block 29	0E8000H - 0EFFFFH
	32-Kword Block 28	0E0000H - 0E7FFFH
	32-Kword Block 27	0D8000H - 0DFFFFH
	32-Kword Block 26	0D0000H - 0D7FFFH
	32-Kword Block 25	0C8000H - 0CFFFFH
	32-Kword Block 24	0C0000H - 0C7FFFH
	32-Kword Block 23	0B8000H - 0BFFFFH
	32-Kword Block 22	0B0000H - 0B7FFFH
	32-Kword Block 21	0A8000H - 0AFFFFH
	32-Kword Block 20	0A0000H - 0A7FFFH
	32-Kword Block 19	098000H - 09FFFFH
0	32-Kword Block 18	090000H - 097FFFH
ШШГ	32-Kword Block 17	088000H - 08FFFFH
PLANE0	32-Kword Block 16	080000H - 087FFFH
	32-Kword Block 15	078000H - 07FFFFH
a –	32-Kword Block 14	070000H - 077FFFH
	32-Kword Block 13	068000H - 06FFFFH
	32-Kword Block 12	060000H - 067FFFH
	32-Kword Block 11	058000H - 05FFFFH
	32-Kword Block 10	050000H - 057FFFH
	32-Kword Block 9	048000H - 04FFFFH
	32-Kword Block 8	040000H - 047FFFH
	32-Kword Block 7	038000H - 03FFFFH
	32-Kword Block 6	030000H - 037FFFH
	32-Kword Block 5	028000H - 02FFFFH
	32-Kword Block 4	020000H - 027FFFH
	32-Kword Block 3	018000H - 01FFFFH
	32-Kword Block 2	010000H - 017FFFH
	32-Kword Block 1	008000H - 00FFFFH
	32-Kword Block 0	000000H - 007FFFH
	52-Itword DIOCK 0	

6

$[A_{22}-A_0]$		[A ₂₂ ·	$-A_0$]
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32-Kword Block 174 570000H - 577FFFH 32-Kword Block 173 568000H - 56FFFH 32-Kword Block 171 560000H - 567FFFH 32-Kword Block 170 550000H - 557FFFH 32-Kword Block 170 550000H - 557FFFH 32-Kword Block 169 548000H - 54FFFH 32-Kword Block 169 548000H - 54FFFH 32-Kword Block 165 538000H - 537FFFH 32-Kword Block 165 538000H - 537FFFH 32-Kword Block 165 528000H - 527FFFH 32-Kword Block 165 528000H - 527FFFH 32-Kword Block 165 518000H - 517FFFH 32-Kword Block 161 508000H - 507FFFH 32-Kword Block 161 508000H - 507FFFH 32-Kword Block 159 4F8000H - 4F7FFFH 32-Kword Block 159 4F8000H - 4F7FFFH 32-Kword Block 155 4D8000H - 4E7FFFH 32-Kword Block 154 4D0000H - 4D7FFFH 32-Kword Block 154 4D0000H - 4D7FFFH 32-Kword Block 154 4D8000H - 4D7FFFH 32-Kword Block 151 4B8000H - 4AFFFFH 32-Kword Block 145 48000H - 4AFFFFH 32-Kword Block 144 48000H - 4A			_
32-Kword Block 173 568000H - 56FFFH 32-Kword Block 171 568000H - 567FFFH 32-Kword Block 171 558000H - 557FFFH 32-Kword Block 170 550000H - 557FFFH 32-Kword Block 169 548000H - 547FFFH 32-Kword Block 169 548000H - 547FFFH 32-Kword Block 167 538000H - 537FFFH 32-Kword Block 166 530000H - 537FFFH 32-Kword Block 165 528000H - 527FFFH 32-Kword Block 165 528000H - 527FFFH 32-Kword Block 165 518000H - 517FFFH 32-Kword Block 162 510000H - 507FFFH 32-Kword Block 162 500000H - 507FFFH 32-Kword Block 152 458000H - 457FFFH 32-Kword Block 157 4E8000H - 4FFFFH 32-Kword Block 155 4D8000H - 4FFFFH 32-Kword Block 155 4D8000H - 4D7FFFH 32-Kword Block 154 4D0000H - 4D7FFFH 32-Kword Block 154 4D8000H - 4AFFFFH 32-Kword Block 154 4B8000H - 4AFFFFH 32-Kword Block 150 4B8000H - 4AFFFFH 32-Kword Block 144 480000H - 4AFFFFH 32-Kword Block 144 48000H - 4		32-Kword Block 175	578000H - 57FFFFH
32.Kword Block 172 560000H - 567FFFH 32.Kword Block 171 558000H - 557FFFH 32.Kword Block 170 550000H - 557FFFH 32.Kword Block 168 540000H - 547FFFH 32.Kword Block 167 538000H - 547FFFH 32.Kword Block 166 530000H - 547FFFH 32.Kword Block 166 530000H - 537FFFH 32.Kword Block 165 528000H - 527FFFH 32.Kword Block 165 528000H - 527FFFH 32.Kword Block 163 518000H - 517FFFH 32.Kword Block 161 508000H - 507FFFH 32.Kword Block 161 508000H - 507FFFH 32.Kword Block 161 508000H - 457FFFH 32.Kword Block 159 4F8000H - 4F7FFFH 32.Kword Block 156 4E0000H - 4F7FFFH 32.Kword Block 156 4E0000H - 4D7FFFH 32.Kword Block 155 4D8000H - 4D7FFFH 32.Kword Block 151 4B8000H - 4D7FFFH 32.Kword Block 151 4B8000H - 4A7FFFH 32.Kword Block 151 4B8000H - 4A7FFFH 32.Kword Block 141 480000H - 4A7FFFH 32.Kword Block 144 480000H - 4A7FFFH 32.Kword Block 144 480000H		32-Kword Block 174	570000H - 577FFFH
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Image: Second			
32-Kword Block 155 4D8000H - 4DFFFFH 32-Kword Block 154 4D0000H - 4D7FFFH 32-Kword Block 153 4C8000H - 4D7FFFH 32-Kword Block 153 4C8000H - 4D7FFFH 32-Kword Block 151 4B8000H - 4B7FFFH 32-Kword Block 150 4B8000H - 4B7FFFH 32-Kword Block 150 4B8000H - 4B7FFFH 32-Kword Block 150 4B8000H - 4B7FFFH 32-Kword Block 149 4A8000H - 4A7FFFH 32-Kword Block 144 498000H - 497FFFH 32-Kword Block 147 498000H - 497FFFH 32-Kword Block 144 480000H - 487FFFH 32-Kword Block 143 478000H - 477FFFH 32-Kword Block 143 478000H - 477FFFH 32-Kword Block 143 478000H - 477FFFH 32-Kword Block 142 470000H - 477FFFH 32-Kword Block 139 458000H - 457FFFH 32-Kword Block 139 458000H - 457FFFH 32-Kword Block 139 458000H - 457FFFH 32-Kword Block 137 448000H - 447FFFH 32-Kword Block 137 448000H - 447FFFH 32-Kword Block 136 4400000H - 437FFFH 32-Kword Block 135 438000			
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32-Kword Block 143 488000H - 487FFFH 32-Kword Block 144 48000H - 487FFFH 32-Kword Block 143 478000H - 47FFFH 32-Kword Block 142 470000H - 47FFFH 32-Kword Block 141 468000H - 467FFFH 32-Kword Block 140 460000H - 467FFFH 32-Kword Block 139 458000H - 45FFFFH 32-Kword Block 138 450000H - 45FFFFH 32-Kword Block 137 448000H - 45FFFFH 32-Kword Block 137 448000H - 447FFFH 32-Kword Block 136 440000H - 447FFFH 32-Kword Block 135 438000H - 43FFFFH	Ш		
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32-Kword Block 143 488000H - 487FFFH 32-Kword Block 144 48000H - 487FFFH 32-Kword Block 143 478000H - 47FFFH 32-Kword Block 142 470000H - 47FFFH 32-Kword Block 141 468000H - 467FFFH 32-Kword Block 140 460000H - 467FFFH 32-Kword Block 139 458000H - 45FFFFH 32-Kword Block 138 450000H - 45FFFFH 32-Kword Block 137 448000H - 45FFFFH 32-Kword Block 137 448000H - 447FFFH 32-Kword Block 136 440000H - 447FFFH 32-Kword Block 135 438000H - 43FFFFH	 ₹		
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<u>32-Kword Block 136</u> <u>32-Kword Block 135</u> <u>438000H - 447FFFH</u> <u>438000H - 43FFFFH</u>			
32-Kword Block 135 438000H - 43FFFFH			
32-Kword Block 134 430000H - 437FFFH			
		32-Kword Block 134	
32-Kword Block 133 428000H - 42FFFFH			
32-Kword Block 132 420000H - 427FFFH			
32-Kword Block 131 418000H - 41FFFFH			
32-Kword Block 130 410000H - 417FFFH			
32-Kword Block 129 408000H - 40FFFFH			
32-Kword Block 128 400000H - 407FFFH		32-Kword Block 128	400000H - 407FFFH

PLANE3 : 24 Mbit

		-
	32-Kword Block 127	3F8000H - 3FFFFFH
	32-Kword Block 126	3F0000H - 3F7FFFH
	32-Kword Block 125	3E8000H - 3EFFFFH
	32-Kword Block 124	3E0000H - 3E7FFFH
	32-Kword Block 123	3D8000H - 3DFFFFH
	32-Kword Block 122	3D0000H - 3D7FFFH
	32-Kword Block 121	3C8000H - 3CFFFFH
	32-Kword Block 120	3C0000H - 3C7FFFH
	32-Kword Block 119	3B8000H - 3BFFFFH
	32-Kword Block 118	3B0000H - 3B7FFFH
	32-Kword Block 117	3A8000H - 3AFFFFH
	32-Kword Block 116	3A0000H - 3A7FFFH
	32-Kword Block 115	398000H - 39FFFFH
	32-Kword Block 114	390000H - 397FFFH
	32-Kword Block 113	388000H - 38FFFFH
	32-Kword Block 112	380000H - 387FFFH
	32-Kword Block 112 32-Kword Block 111	378000H - 37FFFFH
	32-Kword Block 111 32-Kword Block 110	370000H - 377FFFH
	32-Kword Block 109	368000H - 36FFFFH
	32-Kword Block 109 32-Kword Block 108	360000H - 367FFFH
	32-Kword Block 108	358000H - 35FFFFH
	32-Kword Block 107 32-Kword Block 106	350000H - 357FFFH
	32-Kword Block 100	348000H - 34FFFFH
	32-Kword Block 103	340000H - 347FFFH
-	32-Kword Block 104 32-Kword Block 103	338000H - 33FFFFH
	32-Kword Block 103	330000H - 337FFFH
\sim	32-Kword Block 102 32-Kword Block 101	328000H - 32FFFFH
PLANE2	32-Kword Block 100	320000H - 327FFFH
Z	32-Kword Block 99	318000H - 31FFFFH
Ą	32-Kword Block 99 32-Kword Block 98	310000H - 317FFFH
Ы	32-Kword Block 98	308000H - 30FFFFH
	32-Kword Block 97 32-Kword Block 96	
		300000H - 307FFFH
	32-Kword Block 95	2F8000H - 2FFFFFH
	32-Kword Block 94	2F0000H - 2F7FFFH
	32-Kword Block 93	2E8000H - 2EFFFFH
	32-Kword Block 92	2E0000H - 2E7FFFH
	32-Kword Block 91	2D8000H - 2DFFFFH
	32-Kword Block 90	2D0000H - 2D7FFFH
	32-Kword Block 89	2C8000H - 2CFFFFH
	32-Kword Block 88	2C0000H - 2C7FFFH
	32-Kword Block 87	2B8000H - 2BFFFFH
	32-Kword Block 86	2B0000H - 2B7FFFH
	32-Kword Block 85	2A8000H - 2AFFFFH
	32-Kword Block 84	_2A0000H - 2A7FFFH
	32-Kword Block 83	298000H - 29FFFFH
	32-Kword Block 82	290000H - 297FFFH
	32-Kword Block 81	288000H - 28FFFFH
	32-Kword Block 80	280000H - 287FFFH

 $[A_{22}-A_0]$

PLANE2 : 24 Mbit



7

					$[A_{22}-A_0]$
					6F8000H - 6FFFF
				32-Kword Block 223 32-Kword Block 222	6F0000H - 6F7FF
				32-Kword Block 222 32-Kword Block 221	6E8000H - 6EFFF
				32-Kword Block 220	6E0000H - 6E7FF
				32-Kword Block 219	6D8000H - 6DFF
				32-Kword Block 218	6D0000H - 6D7F
				32-Kword Block 217	6C8000H - 6CFF
		[A ₂₂ -A ₀]		32-Kword Block 216	6C0000H - 6C7F
		- 22 0-		32-Kword Block 215	6B8000H - 6BFF
	4-Kword Block 262	7FF000H - 7FFFFFH		32-Kword Block 214	6B0000H - 6B7F
	4-Kword Block 261	7FE000H - 7FEFFFH		32-Kword Block 213	6A8000H - 6AFF
-	4-Kword Block 260	7FD000H - 7FDFFFH		32-Kword Block 212 32-Kword Block 211	6A0000H - 6A7F 698000H - 69FFF
-	4-Kword Block 259	7FC000H - 7FCFFFH		32-Kword Block 211 32-Kword Block 210	690000H - 697FF
-	4-Kword Block 258 4-Kword Block 257	7FB000H - 7FBFFFH 7FA000H - 7FAFFFH		32-Kword Block 209	688000H - 68FFF
F	4-Kword Block 257	7F9000H - 7F9FFFH		32-Kword Block 208	680000H - 687FF
	4-Kword Block 255	7F8000H - 7F8FFFH		32-Kword Block 207	678000H - 67FFF
	32-Kword Block 254	7F0000H - 7F7FFFH		32-Kword Block 206	670000H - 677FF
	32-Kword Block 253	7E8000H - 7EFFFFH		32-Kword Block 205	668000H - 66FFI
	32-Kword Block 252	7E0000H - 7E7FFFH		32-Kword Block 204	660000H - 667FF
	32-Kword Block 251	7D8000H - 7DFFFFH		32-Kword Block 203	658000H - 65FFF
L	32-Kword Block 250	7D0000H - 7D7FFFH		32-Kword Block 202 32-Kword Block 201	650000H - 657FF 648000H - 64FFF
-	32-Kword Block 249	7C8000H - 7CFFFFH 7C0000H - 7C7FFFH		32-Kword Block 201 32-Kword Block 200	640000H - 647FF
-	32-Kword Block 248 32-Kword Block 247	7B8000H - 7BFFFFH		32-Kword Block 199	638000H - 63FFI
F	32-Kword Block 246	7B0000H - 7B7FFFH		32-Kword Block 198	630000H - 637FF
	32-Kword Block 245	7A8000H - 7AFFFFH		32-Kword Block 197	628000H - 62FFI
	32-Kword Block 244	7A0000H - 7A7FFFH		32-Kword Block 196	620000H - 627FF
	32-Kword Block 243	798000H - 79FFFFH		32-Kword Block 195	618000H - 61FFI
S	32-Kword Block 242	790000H - 797FFFH	4	32-Kword Block 194	610000H - 617FH
₽⊦	32-Kword Block 241	788000H - 78FFFFH	lË	32-Kword Block 193	608000H - 60FFI 600000H - 607FF
PLANE5	32-Kword Block 240	780000H - 787FFFH	PLANE4	32-Kword Block 192 32-Kword Block 191	5F8000H - 5FFFI
러	32-Kword Block 239 32-Kword Block 238	778000H - 77FFFFH 770000H - 777FFFH	님	32-Kword Block 191 32-Kword Block 190	5F0000H - 5F7FE
- F	32-Kword Block 238	768000H - 76FFFFH		32-Kword Block 190	5E8000H - 5EFFI
F	32-Kword Block 236	760000H - 767FFFH		32-Kword Block 188	5E0000H - 5E7FI
	32-Kword Block 235	758000H - 75FFFFH		32-Kword Block 187	5D8000H - 5DFF
	32-Kword Block 234	750000H - 757FFFH		32-Kword Block 186	5D0000H - 5D7F
	32-Kword Block 233	748000H - 74FFFFH		32-Kword Block 185	5C8000H - 5CFF
L	32-Kword Block 232	740000H - 747FFFH		32-Kword Block 184	5C0000H - 5C7F
-	32-Kword Block 231	738000H - 73FFFFH		32-Kword Block 183	5B8000H - 5BFF
-	32-Kword Block 230	730000H - 737FFFH		32-Kword Block 182 32-Kword Block 181	5B0000H - 5B7F 5A8000H - 5AFF
-	32-Kword Block 229	728000H - 72FFFFH		32-Kword Block 181 32-Kword Block 180	5A0000H - 5A7F
\vdash	32-Kword Block 228 32-Kword Block 227	720000H - 727FFFH 718000H - 71FFFFH		32-Kword Block 180	
F	32-Kword Block 227	710000H - 717FFFH		32-Kword Block 179	590000H - 597FF
	32-Kword Block 225	708000H - 70FFFFH		32-Kword Block 177	588000H - 58FFF
	32-Kword Block 224	700000H - 707FFFH		32-Kword Block 176	580000H - 587FF

PLANE5 : 16 Mbit

PLANE4 : 24 Mbit

Figure 2.3. Memory Map (Top Parameter, Plane 4 and Plane 5)

	Table 3. Identifier Codes and OTP Address for	Read Operation		
	Code	Address [A ₁₅ -A ₀]	Data [DQ ₁₅ -DQ ₀]	Notes
Manufacturer Code	Manufacturer Code	0000H	00B0H	1
Device Code	Device Code	0001H	0010H	1
Block Lock Configuration	Block is Unlocked		$DQ_0 = 0$	2, 3
Code	Block is Locked	Block	$DQ_0 = 1$	2, 3
	Block is not Locked-Down	Address + 2	$DQ_1 = 0$	2, 3
	Block is Locked-Down		$DQ_1 = 1$	2, 3
OTP	OTP Lock	0080H	OTP-LK	1, 4
	OTP	0081-0088H	OTP	1, 5

Table 2 Id ..:r

NOTES:

1. A_{22} - A_{16} must be the address within the plane to which the Read Identifier Codes/OTP command (90H) has been written.

2. Block Address = The beginning location of a block address within the plane to which the Read Identifier Codes/OTP command (90H) has been written.

3. DQ_{15} - DQ_2 are reserved for future implementation.

4. OTP-LK=OTP Block Lock configuration.

5. OTP=OTP Block data.

$[A_{22}-A_0]$						
000088H						
	Customer Programmable Area					
000085H						
000084H						
	Factory Programmed Area					
000081H						
000080H	Reserved for Future Implementation (DQ15-DQ2)					
Customer Programmable Area Lock Bit (DQ ₁) Factory Programmed Area Lock Bit (DQ ₀)						

Figure 3. OTP Block Address Map for OTP Program (The area outside 80H~88H cannot be used.)

Mode	Notes	RST#	CE#	OE#	WE#	Address	DQ ₁₅₋₀	RY/BY# ⁽⁸⁾
Read Array	6	V _{IH}	V _{IL}	V _{IL}	V _{IH}	Х	D _{OUT}	High Z
Output Disable		V _{IH}	V _{IL}	V _{IH}	V _{IH}	Х	High Z	X
Standby		V _{IH}	V _{IH}	Х	Х	Х	High Z	X
Reset	3	V _{IL}	Х	Х	Х	Х	High Z	High Z
Read Identifier Codes/OTP	6	V _{IH}	V _{IL}	V _{IL}	V _{IH}	See Table 3	See Table 3	High Z
Read Query	6,7	V _{IH}	V _{IL}	V _{IL}	V _{IH}	Х	D _{OUT}	High Z
Read Status Register	6	V _{IH}	V _{IL}	V _{IL}	V _{IH}	Х	D _{OUT}	X
Write	4,5,6	V _{IH}	V _{IL}	V _{IH}	V _{IL}	Х	D _{IN}	X

Table 4. Bus $Operation^{(1,2)}$

NOTES:

1. Refer to DC Characteristics for V_{IL} or V_{IH} voltages.

2. X can be V_{IL} or V_{IH} for control pins and addresses. 3. RST# at GND±0.2V ensures the lowest power consumption.

4. Command writes involving block erase, full chip erase, (page buffer) program or OTP program are reliably executed when V_{CC}=2.7V-3.3V. 5. Refer to Table 5 for valid D_{IN} during a write operation.

6. Never hold OE# low and WE# low at the same timing.

7. Query code = Common Flash Interface (CFI) code.

8. RY/BY# is VOL when the WSM (Write State Machine) is executing internal block erase, full chip erase, (page buffer) program or OTP program algorithms. It is High Z during when the WSM is not busy, in block erase suspend mode (with program and page buffer program inactive), (page buffer) program suspend mode, or reset mode.

	Bus		First Bus Cycle			Second Bus Cycle		
Command	Cycles Req'd	Notes	Oper ⁽¹⁾	Addr ⁽²⁾	Data	Oper ⁽¹⁾	Addr ⁽²⁾	Data ⁽³⁾
Read Array	1		Write	PA	FFH			
Read Identifier Codes/OTP	≥2	4	Write	PA	90H	Read	IA or OA	ID or OD
Read Query	≥ 2	4	Write	PA	98H	Read	QA	QD
Read Status Register	2		Write	PA	70H	Read	PA	SRD
Clear Status Register	1		Write	PA	50H			
Block Erase	2	5	Write	BA	20H	Write	BA	D0H
Full Chip Erase	2	5,9	Write	Х	30H	Write	Х	D0H
Program	2	5,6	Write	WA	40H or 10H	Write	WA	WD
Page Buffer Program	≥4	5,7	Write	WA	E8H	Write	WA	N-1
Block Erase and (Page Buffer) Program Suspend	1	8,9	Write	PA	B0H			
Block Erase and (Page Buffer) Program Resume	1	8,9	Write	PA	D0H			
Set Block Lock Bit	2		Write	BA	60H	Write	BA	01H
Clear Block Lock Bit	2	10	Write	BA	60H	Write	BA	D0H
Set Block Lock-down Bit	2		Write	BA	60H	Write	BA	2FH
OTP Program	2	9	Write	OA	СОН	Write	OA	OD

Table 5. Command Definitions⁽¹¹⁾

NOTES:

1. Bus operations are defined in Table 4.

2. All addresses which are written at the first bus cycle should be the same as the addresses which are written at the second bus cycle.

X=Any valid address within the device.

PA=Address within the selected plane.

IA=Identifier codes address (See Table 3).

QA=Query codes address.

BA=Address within the block being erased, set/cleared block lock bit or set block lock-down bit.

WA=Address of memory location for the Program command or the first address for the Page Buffer Program command. OA=Address of OTP block to be read or programmed (See Figure 3).

3. ID=Data read from identifier codes. (See Table 3).

QD=Data read from query database.

SRD=Data read from status register. See Table 9.1, Table 9.2 for a description of the status register bits.

WD=Data to be programmed at location WA. Data is latched on the rising edge of WE# or CE# (whichever goes high first) during command write cycles.

OD=Data within OTP block. Data is latched on the rising edge of WE# or CE# (whichever goes high first) during command write cycles.

N-1=N is the number of the words to be loaded into a page buffer.

4. Following the Read Identifier Codes/OTP command, read operations access manufacturer code, device code, block lock configuration code and the data within OTP block (See Table 3).

The Read Query command is available for reading CFI (Common Flash Interface) information.

5. Block erase, full chip erase or (page buffer) program cannot be executed when the selected block is locked. Unlocked block can be erased or programmed when RST# is V_{IH}.

6. Either 40H or 10H are recognized by the CUI (Command User Interface) as the program setup.



- 7. Following the third bus cycle, input the program sequential address and write data of "N" times. Finally, input the any valid address within the target block to be programmed and the confirm command (D0H).
- 8. If the program operation in one plane is suspended and the erase operation in other plane is also suspended, the suspended program operation will be resumed first.
- 9. Full chip erase and OTP program operations can not be suspended. The OTP Program command can not be accepted while the block erase operation is being suspended.
- 10. Following the Clear Block Lock Bit command, block which is not locked-down is unlocked when WP#/ACC is V_{IL}. When WP#/ACC is V_{IH}, lock-down bit is disabled and the selected block is unlocked regardless of lock-down configuration.
- 11. Commands other than those shown above are reserved by SHARP for future device implementations and should not be used.

		(2)			
State	WP#/ACC	$\mathrm{DQ}_1^{(1)}$	$\mathrm{DQ}_{0}^{(1)}$	State Name	Erase/Program Allowed ⁽²⁾
[000]	0	0	0	Unlocked	Yes
[001] ⁽³⁾	0	0	1	Locked	No
[011]	0	1	1	Locked-down	No
[100]	1	0	0	Unlocked	Yes
[101] ⁽³⁾	1	0	1	Locked	No
[110] ⁽⁴⁾	1	1	0	Lock-down Disable	Yes
[111]	1	1	1	Lock-down Disable	No

Table 6. Functions of Block Lo	ock ⁽⁵⁾ and Block Lock-Down
--------------------------------	--

NOTES:

1. $DQ_0=1$: a block is locked; $DQ_0=0$: a block is unlocked.

- $DQ_1=1$: a block is locked-down; $DQ_1=0$: a block is not locked-down.
- 2. Erase and program are general terms, respectively, to express: block erase, full chip erase and (page buffer) program operations.
- 3. At power-up or device reset, all blocks default to locked state and are not locked-down, that is, [001] (WP#/ACC=0) or [101] (WP#/ACC=1), regardless of the states before power-off or reset operation.
- 4. When WP#/ACC is driven to V_{IL} in [110] state, the state changes to [011] and the blocks are automatically locked.
- 5. OTP (One Time Program) block has the lock function which is different from those described above.

	Current S	State		Result after Lock Command Written (Next State)			
State	WP#/ACC	DQ_1	DQ ₀	Set Lock ⁽¹⁾	Clear Lock ⁽¹⁾	Set Lock-down ⁽¹⁾	
[000]	0	0	0	[001]	No Change	[011] ⁽²⁾	
[001]	0	0	1	No Change ⁽³⁾	[000]	[011]	
[011]	0	1	1	No Change	No Change	No Change	
[100]	1	0	0	[101]	No Change	[111] ⁽²⁾	
[101]	1	0	1	No Change	[100]	[111]	
[110]	1	1	0	[111]	No Change	[111] ⁽²⁾	
[111]	1	1	1	No Change	[110]	No Change	

Table 7. Block Locking State Transitions upon Command Write⁽⁴⁾

NOTES:

- 1. "Set Lock" means Set Block Lock Bit command, "Clear Lock" means Clear Block Lock Bit command and "Set Lock-down" means Set Block Lock-Down Bit command.
- 2. When the Set Block Lock-Down Bit command is written to the unlocked block ($DQ_0=0$), the corresponding block is locked-down and automatically locked at the same time.
- 3. "No Change" means that the state remains unchanged after the command written.
- 4. In this state transitions table, assumes that WP#/ACC is not changed and fixed V_{IL} or V_{IH} .

		Current Sta	te		Result after WP#/ACC Transition (Next State)		
Previous State	State	WP#/ACC	DQ ₁	DQ ₀	WP#/ACC= $0 \rightarrow 1^{(1)}$	WP#/ACC= $1 \rightarrow 0^{(1)}$	
-	[000]	0	0	0	[100]	-	
-	[001]	0	0	1	[101]	-	
[110] ⁽²⁾					[110]	-	
Other than [110] ⁽²⁾	[011]	0	1	1	[111]	-	
-	[100]	1	0	0	-	[000]	
-	[101]	1	0	1	-	[001]	
-	[110]	1	1	0	-	[011] ⁽³⁾	
-	[111]	1	1	1	-	[011]	

Table 8	Block Locking St	tate Transitions upon	WP#/ACC Transition ⁽⁴⁾
rable 0.	DIOCK LOCKING DI	and manismons upon	

NOTES:

1. "WP#/ACC=0 \rightarrow 1" means that WP#/ACC is driven to V_{IH} and "WP#/ACC=1 \rightarrow 0" means that

WP#/ACC is driven to V_{IL} . 2. State transition from the current state [011] to the next state depends on the previous state. 3. When WP#/ACC is driven to V_{IL} in [110] state, the state changes to [011] and the blocks are automatically locked.

4. In this state transitions table, assumes that lock configuration commands are not written in previous, current and next state.

		Tal	ble 9.1. Status	Register Definiti	on			
GWSMS	GBESS	GBEFCES	GPBPOPS	GWPACCS	GPBPSS	GDPS	R	
15	14	13	12	11	10	9	8	
PWSMS	GBESS	GBEFCES	GPBPOPS	GWPACCS	GPBPSS	GDPS	R	
7	6	5	4	3	2	1	0	
	E WRITE STAT	E MACHINE S	TATUS	Status Register		tatus of the WS		
(PWS) 1 = Ready 0 = Busy				Machine). How each plane. Ev occupied by the	ven if the SR.			
(GBE) 1 = Block	AL BLOCK EF SS) Erase Suspende Erase in Progres	d	D STATUS	In the plane to RY/BY# to de buffer) program invalid while SI	termine block or OTP progra	erase, full chi	p erase, (page	
FULI 1 = Error i	AL BLOCK EF CHIP ERASE n Block Erase o sful Block Eras	STATUS (GBE r Full Chip Eras	se	If both SR.5 and SR.4 are "1"s after a block erase, full chip erase, (page buffer) program, set/clear block lock bit, set block lock-down bit attempt, an improper command sequence was entered.				
OTH 1 = Error i	AL (PAGE BU PROGRAM S n (Page Buffer) ssful (Page Buff	TATUS (GPBP Program or OT	OPS) P Program					
$1 = V_{CCQ}$	AL WP#/ACC -0.4V < WP#/A tion Abort ACC OK			SR.3 does not provide a continuous indication of WP#/ACC level. The WSM interrogates and indicates the WP#/ACC level only after Block Erase, Full Chip Erase, (Page Buffer) Program or OTP Program command sequences. SR.3 is not guaranteed to report accurate feedback when WP#/ ACC \neq V _{ACCH} .				
 SR.2 = GLOBAL (PAGE BUFFER) PROGRAM SUSPEND STATUS (GPBPSS) 1 = (Page Buffer) Program Suspended 0 = (Page Buffer) Program in Progress/Completed 				SR.1 does not p bit. The WSM i				
SR.1 = GLOBAL DEVICE PROTECT STATUS (GDPS) 1 = Erase or Program Attempted on a Locked Block, Operation Abort 0 = Unlocked				Erase, Full Ch Program comm depending on th set. Reading the the Read Ident lock bit status.	nand sequence the attempted op block lock co	es. It information, if the biguration, if the biguration cod	s the system block lock bit is es after writing	
SR.0 = RESEI	RVED FOR FU	ΓURE ENHAN	CEMENTS (R)	SR.0 is reserve when polling th	ed for future u e status register	se and should r.	be masked out	

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 Table 9.2.
 Status Register Definition (Continued)

	NOTES:
SR.15 = GLOBAL WRITE STATE MACHINE STATUS (GWSMS)	Status Register SR.15-SR.9 indicates the status of the WSM.
1 = Ready $0 = Busy$	Check SR.15 or RY/BY# to determine block erase, full chip erase, (page buffer) program or OTP program completion. SR.14 - SR.9 are invalid while SR.15="0".
SR.14 = GLOBAL BLOCK ERASE SUSPEND STATUS (GBESS) 1 = Block Erase Suspended	
0 = Block Erase in Progress/Completed	
 SR.13 = GLOBAL BLOCK ERASE AND FULL CHIP ERASE STATUS (GBEFCES) 1 = Error in Block Erase or Full Chip Erase 0 = Successful Block Erase or Full Chip Erase 	If both SR.13 and SR.12 are "1"s after a block erase, full chip erase, (page buffer) program, set/clear block lock bit, set block lock-down bit attempt, an improper command sequence was entered.
 SR.12 = GLOBAL (PAGE BUFFER) PROGRAM AND OTP PROGRAM STATUS (GPBPOPS) 1 = Error in (Page Buffer) Program or OTP Program 0 = Successful (Page Buffer) Program or OTP Program 	
SR.11 = GLOBAL WP#/ACC STATUS (GWPACCS) $1 = V_{CCQ}+0.4V < WPP#/ACC < 9.0V$ Detect, Operation Abort 0 = WP#/ACC OK	SR.11 does not provide a continuous indication of WP#/ACC level. The WSM interrogates and indicates the WP#/ACC level only after Block Erase, Full Chip Erase, (Page Buffer) Program or OTP Program command sequences. SR.11 is not guaranteed to report accurate feedback when WP#/ACC \neq V _{ACCH} .
SR.10 = GLOBAL (PAGE BUFFER) PROGRAM SUSPEND STATUS (GPBPSS) 1 = (Page Buffer) Program Suspended	
0 = (Page Buffer) Program in Progress/Completed	SR.9 does not provide a continuous indication of block lock bit. The WSM interrogates the block lock bit only after Block Erase, Full Chip Erase, (Page Buffer) Program or OTP
SR.9 = GLOBAL DEVICE PROTECT STATUS (GDPS) 1 = Erase or Program Attempted on a Locked Block, Operation Abort 0 = Unlocked	Program command sequences. It informs the system, depending on the attempted operation, if the block lock bit is set. Reading the block lock configuration codes after writing the Read Identifier Codes/OTP command indicates block lock bit status.
SR.8 = RESERVED FOR FUTURE ENHANCEMENTS (R	SR.8 is reserved for future use and should be masked out when polling the status register.

		Table 1	0. Extended Sta	atus Register De	efinition			
R	R	R	R	R	R	R	R	
15	14	13	12	11	10	9	8	
SMS	R	R	R	R	R	R	R	
7	6	5	4	3	2	1	0	
XSR.15-8 = RESERVED FOR FUTURE ENHANCEMENTS (R) XSR.7 = STATE MACHINE STATUS (SMS)			NOTES: After issue a Page Buffer Program command (E8I XSR.7="1" indicates that the entered command is accepted If XSR.7 is "0", the command is not accepted and a next Pa Buffer Program command (E8H) should be issued again check if page buffer is available or not.					
XSR.6-0 = RESERVED FOR FUTURE ENHANCEMENTS (R)					XSR.6-0 are sked out when			

HARP

1 Electrical Specifications	*WA1
1.1 Absolute Maximum Ratings [*]	
Operating Temperature	
During Read, Erase and Program40°C to +85°C $^{(1)}$	
Storage Temperature	NOT 1. O
During under Bias40°C to +85°C	pro
During non Bias65°C to +125°C	2. A Mi -0.
Voltage On Any Pin (except V_{CC} , V_{CCQ} and WP#/ACC)	tra
0.5V to V_{CCQ}+0.5V $^{(2)}$	pin
V_{CC} and V_{CCQ} Supply Voltage0.2V to +3.7V $^{(2)}$	3. Ma +1 4. W 3.3
WP#/ACC Supply Voltage0.2V to +10.3V $^{(2, 3, 4)}$	pro on blo
Output Short Circuit Current 100mA ⁽⁵⁾	a to 5. Ou tha

RNING: Stressing the device beyond the "Absolute Maximum Ratings" may cause permanent damage. These are stress ratings only. Operation beyond the "Operating Conditions" is not recommended and extended exposure beyond the "Operating Conditions" may affect device reliability.

ES:

- perating temperature is for extended temperature oduct defined by this specification.
- ll specified voltages are with respect to GND. nimum DC voltage is -0.5V on input/output pins and 2V on $V_{CC},\ V_{CCQ}$ and WP#/ACC pins. During nsitions, this level may undershoot to -2.0V for riods <20ns. Maximum DC voltage on input/output is is V_{CC} +0.5V which, during transitions, may ershoot to V_{CC} +2.0V for periods <20ns.
- aximum DC voltage on WP#/ACC may overshoot to 1.0V for periods <20ns.
- P#/ACC erase/program voltage is normally 2.7V-3V. Applying 9.0V-10.0V to WP#/ACC during erase/ ogram can be done for a maximum of 1,000 cycles the main blocks and 1,000 cycles on the parameter ocks. WP#/ACC may be connected to 9.0V-10.0V for otal of 80 hours maximum.
- tput shorted for no more than one second. No more in one output shorted at a time.

Parameter	Symbol	Min.	Тур.	Max.	Unit	Notes
Operating Temperature	T _A	-40	+25	+85	°C	
V _{CC} Supply Voltage	V _{CC}	2.7	3.0	3.3	V	1
I/O Supply Voltage	V _{CCQ}	2.7	3.0	3.3	V	1
	V _{IL}	-0.2		0.4	V	
WP#/ACC Voltage when Used as a Logic Control	V _{IH}	2.4		V _{CCQ} + 0.4	V	1
WP#/ACC Supply Voltage	V _{ACCH}	9.0	9.5	10.0	V	1, 2
Main Block Erase Cycling: WP#/ACC=V _{IL} or V _{IH}		100,000			Cycles	
Parameter Block Erase Cycling: WP#/ACC= V_{IL} or V_{IH}		100,000			Cycles	
Main Block Erase Cycling: WP#/ACC=V _{ACCH} , 80 hrs.				1,000	Cycles	
Parameter Block Erase Cycling: WP#/ACC=V _{ACCH} , 80 hrs.				1,000	Cycles	
Maximum WP#/ACC hours at V _{ACCH}				80	Hours	

1.2 Operating Conditions

NOTES:

1. See DC Characteristics tables for voltage range-specific specification.

2. Applying WP#/ACC=9.0V-10.0V during a erase or program can be done for a maximum of 1,000 cycles on the main blocks and 1,000 cycles on the parameter blocks. A permanent connection to WP#/ACC=9.0V-10.0V is not allowed and can cause damage to the device.

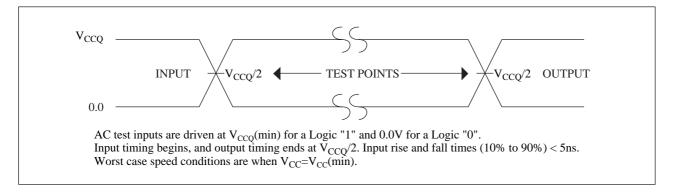
1.2.1 Capacitance ⁽¹⁾ (T_A =+25°C, f=1MHz)

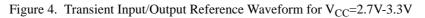
Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
Input Capacitance	C _{IN}	V _{IN} =0.0V		4	7	pF
WP#/ACC Input Capacitance	C _{IN}	V _{IN} =0.0V		18	22	pF
Output Capacitance	C _{OUT}	V _{OUT} =0.0V		6	10	pF

NOTE:

1. Sampled, not 100% tested.

1.2.2 AC Input/Output Test Conditions





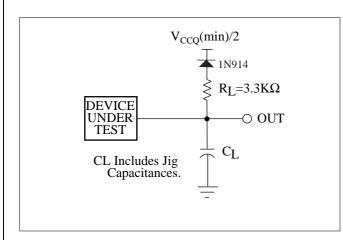


Figure 5. Transient Equivalent Testing Load Circuit

Table 11. Test Configuration Capacitance Loading Value

Test Configuration	C _L (pF)
V _{CC} =2.7V-3.3V	50

1.2.3 DC Characteristics

				2./V-3.3	1			
Symbol	Param	eter	Notes	Min.	Тур.	Max.	Unit	Test Conditions
I _{LI}	Input Load Current		1	-1.0		+1.0	μA	V _{CC} =V _{CC} Max.,
I _{LO}	Output Leakage Curr	rent	1	-1.0		+1.0	μΑ	V _{CCQ} =V _{CCQ} Max., V _{IN} /V _{OUT} =V _{CCQ} or GND
I _{CCS}	V _{CC} Standby Curren	t	1,7,8		9	40	μΑ	$V_{CC}=V_{CC}Max.,$ $CE\#=RST\#=$ $V_{CCQ}\pm0.2V,$ $WP\#/ACC=V_{CCQ} \text{ or }$ GND
I _{CCAS}	V _{CC} Automatic Current	Power Savings	1,3,7		9	40	μΑ	V _{CC} =V _{CC} Max., CE#=GND±0.2V, WP#/ACC=V _{CCQ} or GND
I _{CCD}	V _{CC} Reset Current		1,7		9	40	μΑ	RST#=GND±0.2V
I	Average V _{CC} Read Current Normal Mode		1,6,7		20	30	mA	V _{CC} =V _{CC} Max., CE#=V _{IL} ,
I _{CCR}	Average V _{CC} Read Current Page Mode	8 Word Read	1,6,7		5	10	mA	OE#=V _{IH} , f=5MHz
т	V (Do co Duffor) D	no anom Cumont	1,4,6,7		20	60	mA	WP#/ACC=V _{IL} or V _{IH}
I _{CCW}	V _{CC} (Page Buffer) P		1,4,6,7		10	20	mA	WP#/ACC=V _{ACCH}
т	V _{CC} Block Erase,		1,4,6,7		10	30	mA	WP#/ACC=V _{IL} or V _{IH}
I _{CCE}	Full Chip Erase Curr	ent	1,4,6,7		4	10	mA	WP#/ACC=V _{ACCH}
I _{CCWS} I _{CCES}	V _{CC} (Page Buffer) P Block Erase Suspend	-	1,2,6,7		10	200	μΑ	CE#=V _{IH}
I _{ACCS} I _{ACCR}	WP#/ACC Standby of	or Read Current	1,5,6,7		2	5	μΑ	WP#/ACC≤V _{CC}
Learn	WP#/ACC (Page	Buffer) Program	1,4,5,6,7		2	5	μΑ	WP#/ACC= V_{IL} or V_{IH}
I _{ACCW}	Current		1,4,5,6,7		10	30	mA	WP#/ACC=V _{ACCH}
I	WP#/ACC Block Era	ase,	1,4,5,6,7		2	5	μΑ	WP#/ACC=V _{IL} or V _{IH}
I _{ACCE}	Full Chip Erase Curr	ent	1,4,5,6,7		5	15	mA	WP#/ACC=V _{ACCH}
T	WP#/ACC (Page Bu	ffer) Program	1,5,6,7		2	5	μΑ	WP#/ACC=V _{IL} or V _{IH}
I _{ACCWS}	Suspend Current		1,5,6,7		10	200	μΑ	WP#/ACC=V _{ACCH}
T	WP#/ACC Block	Erase Suspend	1,5,6,7		2	5	μA	WP#/ACC=V _{IL} or V _{IH}
I _{ACCES}	Current	-	1,5,6,7		10	200	μA	WP#/ACC=V _{ACCH}

V_{CC}=2.7V-3.3V

DC Characteristics (Continued)

* 7	0 711 0 011	
VCC	=2.7V-3.3V	
· U.		

Symbol	Parameter	Notes	Min.	Тур.	Max.	Unit	Test Conditions
V _{IL}	Input Low Voltage	5	-0.4		0.4	V	
V _{IH}	Input High Voltage	4	2.4		V _{CCQ} + 0.4	V	
V _{OL}	Output Low Voltage	4,8			0.2	V	$\begin{array}{l} V_{CC} = V_{CC} Min., \\ V_{CCQ} = V_{CCQ} Min., \\ I_{OL} = 100 \mu A \end{array}$
V _{OH}	Output High Voltage	4	V _{CCQ} -0.2			V	$\begin{array}{l} V_{CC} = V_{CC} Min., \\ V_{CCQ} = V_{CCQ} Min., \\ I_{OH} = -100 \mu A \end{array}$
V _{ACCH}	WP#/ACC during Block Erase, Full Chip Erase, (Page Buffer) Program or OTP Program Operations		9.0	9.5	10.0	V	
V _{LKO}	V _{CC} Lockout Voltage		1.5			V	

NOTES:

1. All currents are in RMS unless otherwise noted. Typical values are the reference values at V_{CC} =3.0V, V_{CCQ} =3.0V and T_A =+25°C unless V_{CC} is specified.

2. I_{CCWS} and I_{CCES} are specified with the device de-selected. If read or (page buffer) program is executed while in block erase suspend mode, the device's current draw is the sum of I_{CCES} and I_{CCR} or I_{CCW} . If read is executed while in (page buffer) program suspend mode, the device's current draw is the sum of I_{CCWS} and I_{CCR} .

The Automatic Power Savings (APS) feature automatically places the device in power save mode after read cycle completion. Standard address access timings (t_{AVQV}) provide new data when addresses are changed.
 Samulad net 100% total

4. Sampled, not 100% tested.

5. Applying 9.5V±0.5V to WP#/ACC provides fast erasing or fast programming mode. In this mode, WP#/ACC is power supply pin and supplies the memory cell current for block erasing and (page buffer) programming. Use similar power supply trace widths and layout considerations given to the V_{CC} power bus.

Applying 9.5V±0.5V to WP#/ACC during erase/program can only be done for a maximum of 1,000 cycles on each block. WP#/ACC may be connected to 9.5V±0.5V for a total of 80 hours maximum.

6. The operating current in dual work is the sum of the operating current (read, erase, program) in each plane.

7. For all pins other than those shown in test conditions, input level is V_{CCO} or GND.

8. Includes RY/BY#.

1.2.4 AC Characteristics - Read-Only Operations⁽¹⁾

Symbol	Parameter	Notes	Min.	Max.	Unit
t _{AVAV}	Read Cycle Time		75		ns
t _{AVQV}	Address to Output Delay			75	ns
t _{ELQV}	CE# to Output Delay	3		75	ns
t _{APA}	Page Address Access Time			25	ns
t _{GLQV}	OE# to Output Delay	3		20	ns
t _{PHQV}	RST# High to Output Delay			150	ns
t _{EHQZ} , t _{GHQZ}	CE# or OE# to Output in High Z, Whichever Occurs First	2		20	ns
t _{ELQX}	CE# to Output in Low Z	2	0		ns
t _{GLQX}	OE# to Output in Low Z	2	0		ns
t _{OH}	Output Hold from First Occurring Address, CE# or OE# change	2	0		ns
t _{AVEL} , t _{AVGL}	Address Setup to CE#, OE# Going Low for Reading Status Register	4, 6	10		ns
$t_{\rm ELAX}, t_{\rm GLAX}$	Address Hold from CE#, OE# Going Low for Reading Status Register	5, 6	10		ns
t _{EHEL} , t _{GHGL}	CE#, OE# Pulse Width High for Reading Status Register	6	20		ns

$V_{CC}=2.7V-3.3V$, $T_{A}=-40^{\circ}C$ to $+85^{\circ}C$

NOTES:

1. See AC input/output reference waveform for timing measurements and maximum allowable input slew rate.

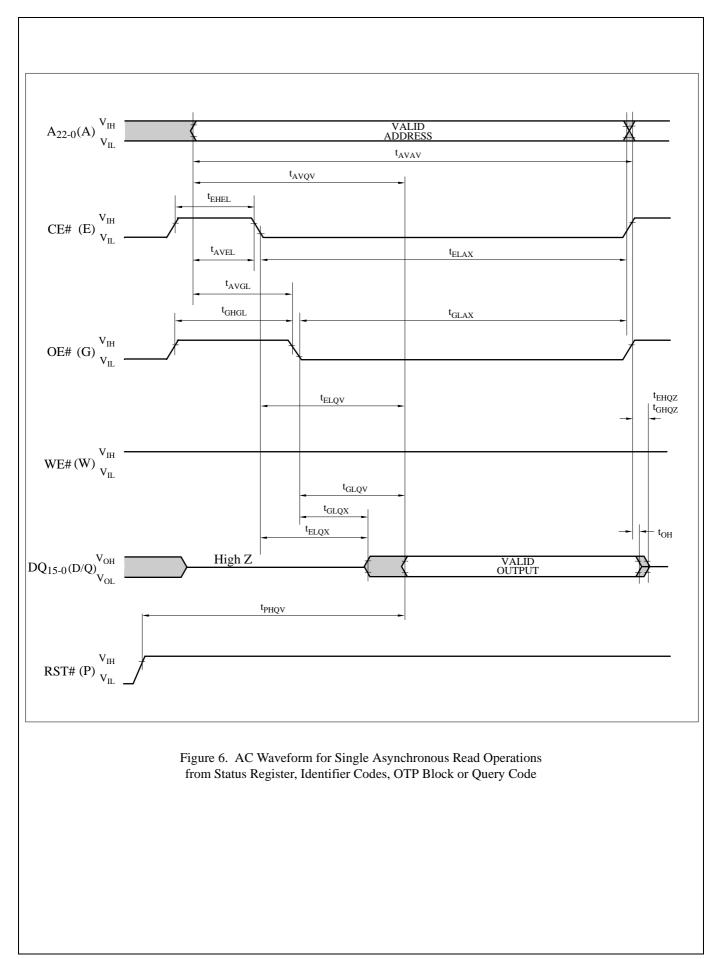
2. Sampled, not 100% tested.

3. OE# may be delayed up to t_{ELQV} — t_{GLQV} after the falling edge of CE# without impact to t_{ELQV} . 4. Address setup time (t_{AVEL} , t_{AVGL}) is defined from the falling edge of CE# or OE# (whichever goes low last). 5. Address hold time (t_{ELAX} , t_{GLAX}) is defined from the falling edge of CE# or OE# (whichever goes low last).

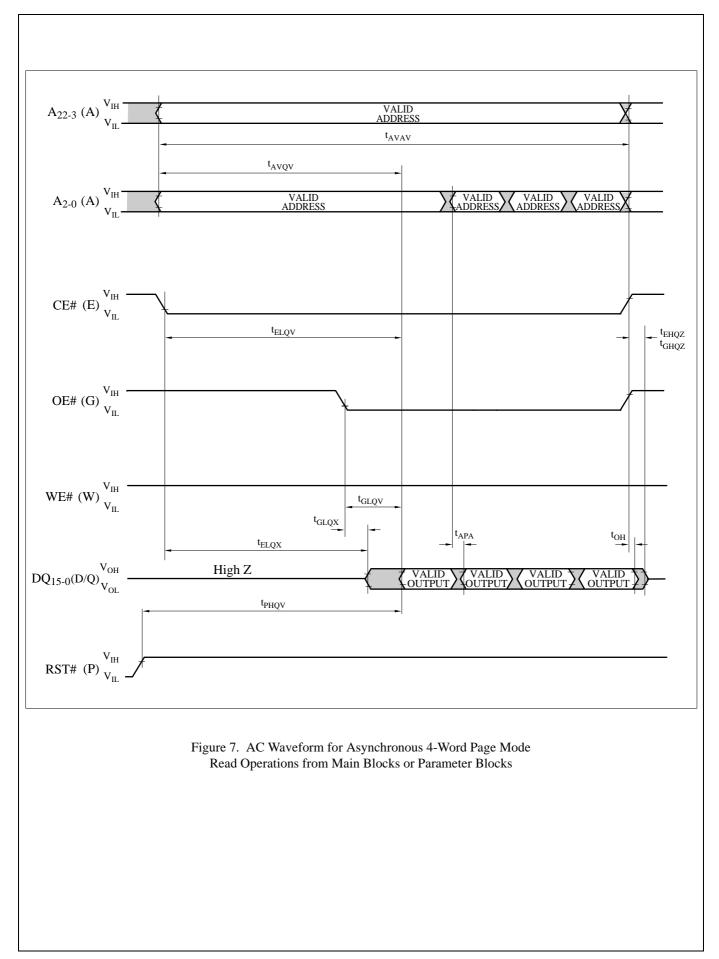
6. Specifications t_{AVEL} , t_{AVGL} , t_{ELAX} , t_{GLAX} and t_{EHEL} , t_{GHGL} for read operations apply to only status register read operations.



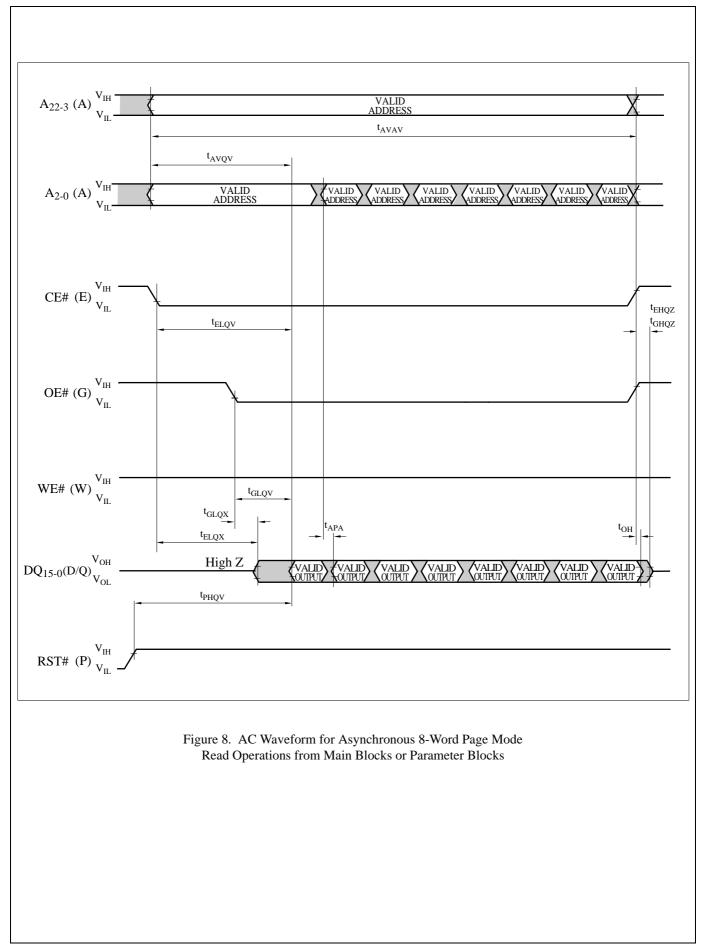
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1.2.5 AC Characteristics - Write Operations^{(1), (2)}

Symbol	Parameter	Notes	Min.	Max.	Unit
t _{AVAV}	Write Cycle Time		75		ns
$t_{PHWL} (t_{PHEL})$	RST# High Recovery to WE# (CE#) Going Low	3	150		ns
$t_{ELWL} (t_{WLEL})$	CE# (WE#) Setup to WE# (CE#) Going Low		0		ns
$t_{WLWH}(t_{ELEH})$	WE# (CE#) Pulse Width	4	50		ns
t _{DVWH} (t _{DVEH})	Data Setup to WE# (CE#) Going High	7	40		ns
$t_{AVWH} (t_{AVEH})$	Address Setup to WE# (CE#) Going High	7	40		ns
$t_{WHEH} (t_{EHWH})$	CE# (WE#) Hold from WE# (CE#) High		0		ns
$t_{WHDX} (t_{EHDX})$	Data Hold from WE# (CE#) High		0		ns
$t_{WHAX} (t_{EHAX})$	Address Hold from WE# (CE#) High		0		ns
$t_{WHWL} (t_{EHEL})$	WE# (CE#) Pulse Width High	5	25		ns
t (t)	WP#/ACC High Setup to WE# (CE#) WP#/ACC=VIH	3	0		
t _{SHWH} (t _{SHEH})	Going High WP#/ACC=V _{ACCH}	3	200	Max.	ns
t_{WHGL} (t_{EHGL})	Write Recovery before Read		30		ns
t _{QVSL}	WP#/ACC High Hold from Valid SRD, RY/BY# High Z		0		ns
t _{WHR0} (t _{EHR0})	WE# (CE#) High to SR.7 Going "0"	3, 6		-	ns
t _{WHRL} (t _{EHRL})	WE# (CE#) High to RY/BY# Going Low	3		100	ns

$V_{CC}=2.7V-3.3V$, $T_{A}=-40^{\circ}C$ to $+85^{\circ}C$

NOTES:

1. The timing characteristics for reading the status register during block erase, full chip erase, (page buffer) program and OTP program operations are the same as during read-only operations. Refer to AC Characteristics for read-only operations.

2. A write operation can be initiated and terminated with either CE# or WE#.

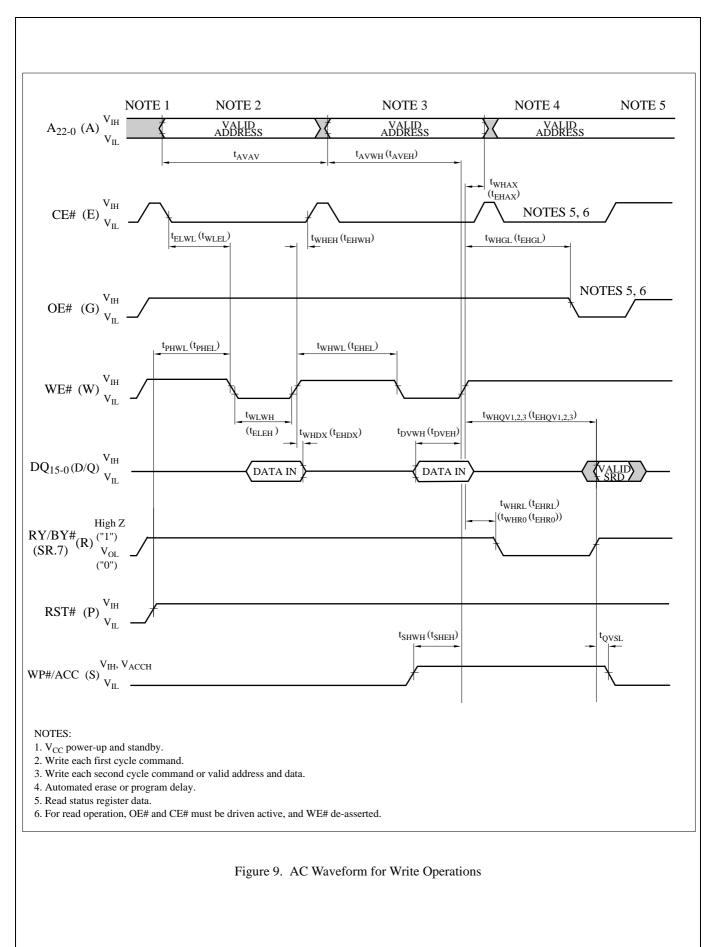
3. Sampled, not 100% tested.

4. Write pulse width (twp) is defined from the falling edge of CE# or WE# (whichever goes low last) to the rising edge of CE# or WE# (whichever goes high first). Hence, $t_{WP}=t_{WLWH}=t_{ELEH}=t_{WLEH}=t_{ELWH}$.

5. Write pulse width high (t_{WPH}) is defined from the rising edge of CE# or WE# (whichever goes high first) to the falling edge of CE# or WE# (whichever goes low last). Hence, $t_{WPH}=t_{WHWL}=t_{EHEL}=t_{WHEL}=t_{EHWL}$. 6. t_{WHR0} (t_{EHR0}) after the Read Query or Read Identifier Codes/OTP command= $t_{AVQV}+100$ ns.

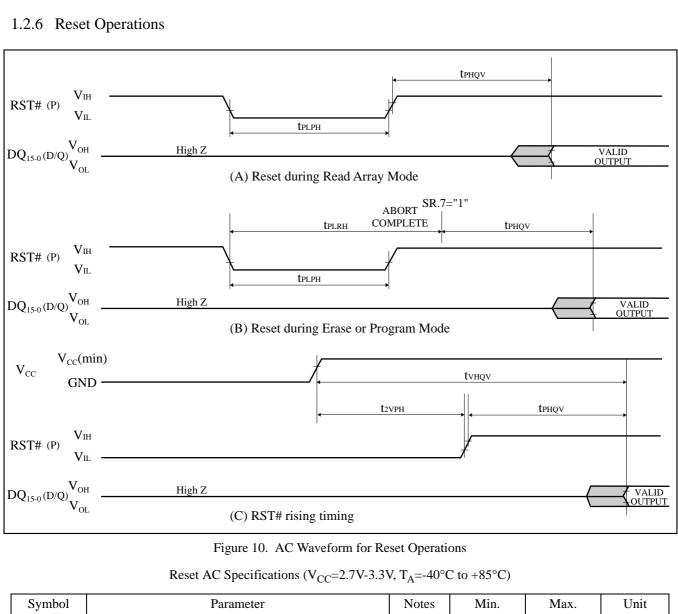
7. Refer to Table 5 for valid address and data for block erase, full chip erase, (page buffer) program, OTP program or lock bit configuration.





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Symbol	Parameter	Notes	Min.	Max.	Unit
t _{PLPH}	RST# Low to Reset during Read (RST# should be low during power-up.)	1, 2, 3	100		ns
t _{PLRH}	RST# Low to Reset during Erase or Program	1, 3, 4		22	μs
t _{2VPH}	V _{CC} 2.7V to RST# High	1, 3, 5	100		ns
t _{VHQV}	V _{CC} 2.7V to Output Delay	3		1	ms
MOTEC					

NOTES:

1. A reset time, t_{PHQV}, is required from the later of SR.7 (RY/BY#) going "1" (High Z) or RST# going high until outputs are valid. Refer to AC Characteristics - Read-Only Operations for t_{PHQV}.

2. t_{PLPH} is <100ns the device may still reset but this is not guaranteed.

3. Sampled, not 100% tested.

4. If RST# asserted while a block erase, full chip erase, (page buffer) program or OTP program operation is not executing, the reset will complete within 100ns.

5. When the device power-up, holding RST# low minimum 100ns is required after V_{CC} has been in predefined range and also has been in stable there.

1.2.7 Block Erase, Full Chip Erase, (Page Buffer) Program and OTP Program Performance⁽³⁾

Symbol	Parameter	Notes	Notes Page Buffer Command is		WP#/ACC=V _{IL} or V _{IH} (In System)			WP#/ACC=V _{ACCH} (In Manufacturing)		
			Used or not Used	Min.	Тур. ⁽¹⁾	Max. ⁽²⁾	Min.	Тур. ⁽¹⁾	Max. ⁽²⁾	
t	4-Kword Parameter Block	2	Not Used		0.05	0.3		0.04	0.12	s
t _{WPB}	Program Time	2	Used		0.03	0.12		0.02	0.06	S
tun m	32-Kword Main Block	2	Not Used		0.38	2.4		0.31	1.0	s
t _{WMB}	VMB Program Time	2	Used		0.24	1.0		0.17	0.5	s
t _{WHQV1} /	Word Program Time	2	Not Used		11	200		9	185	μs
t _{EHQV1}	Word Program Time	2	Used		7	100		5	90	μs
t _{WHOV1} / t _{EHOV1}	OTP Program Time	2	Not Used		36	400		27	185	μs
t _{WHQV2} / t _{EHQV2}	4-Kword Parameter Block Erase Time	2	-		0.5	4		0.4	4	s
t _{WHQV3} / t _{EHQV3}	32-Kword Main Block Erase Time	2	-		0.9	5		0.8	5	s
	Full Chip Erase Time	2			240	1400		200	1400	S
t _{WHRH1} / t _{EHRH1}	(Page Buffer) Program Suspend Latency Time to Read	4	-		5	10		5	10	μs
t _{WHRH2} / t _{EHRH2}	Block Erase Suspend Latency Time to Read	4	-		5	20		5	20	μs
t _{ERES}	Latency Time from Block Erase Resume Command to Block Erase Suspend Command	5	-	500			500			μs

 V_{CC} =2.7V-3.3V, T_{A} =-40°C to +85°C

NOTES:

1. Typical values measured at V_{CC} =3.0V, WP#/ACC=3.0V or 9.5V, and T_A =+25°C. Assumes corresponding lock bits are not set. Subject to change based on device characterization.

2. Excludes external system-level overhead.

3. Sampled, but not 100% tested.

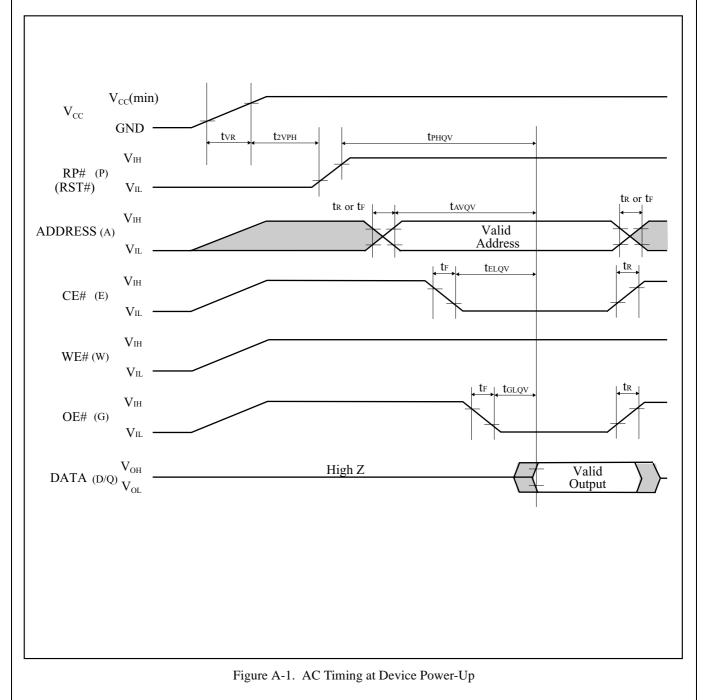
4. A latency time is required from writing suspend command (WE# or CE# going high) until SR.7 going "1" or RY/BY# going High Z.

5. If the interval time from a Block Erase Resume command to a subsequent Block Erase Suspend command is shorter than t_{ERES} and its sequence is repeated, the block erase operation may not be finished.

A-1 RECOMMENDED OPERATING CONDITIONS

A-1.1 At Device Power-Up

AC timing illustrated in Figure A-1 is recommended for the supply voltages and the control signals at device power-up. If the timing in the figure is ignored, the device may not operate correctly.



For the AC specifications t_{VR} , t_R , t_F in the figure, refer to the next page. See the "ELECTRICAL SPECIFICATIONS" described in specifications for the supply voltage range, the operating temperature and the AC specifications not shown in the next page.

A-1.1.1 Rise and Fall Time

Symbol	Parameter	Notes	Min.	Max.	Unit
t _{VR}	V _{CC} Rise Time	1	0.5	30000	μs/V
t _R	Input Signal Rise Time	1, 2		1	μs/V
t _F	Input Signal Fall Time	1, 2		1	μs/V

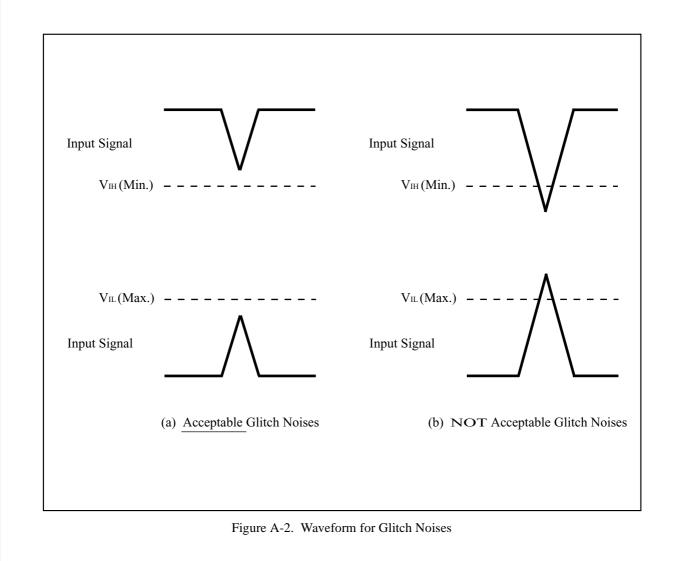
NOTES:

1. Sampled, not 100% tested.

2. This specification is applied for not only the device power-up but also the normal operations.

A-1.2 Glitch Noises

Do not input the glitch noises which are below V_{IH} (Min.) or above V_{IL} (Max.) on address, data, reset, and control signals, as shown in Figure A-2 (b). The acceptable glitch noises are illustrated in Figure A-2 (a).



See the "DC CHARACTERISTICS" described in specifications for V_{IH} (Min.) and V_{IL} (Max.).

A-2 RELATED DOCUMENT INFORMATION⁽¹⁾

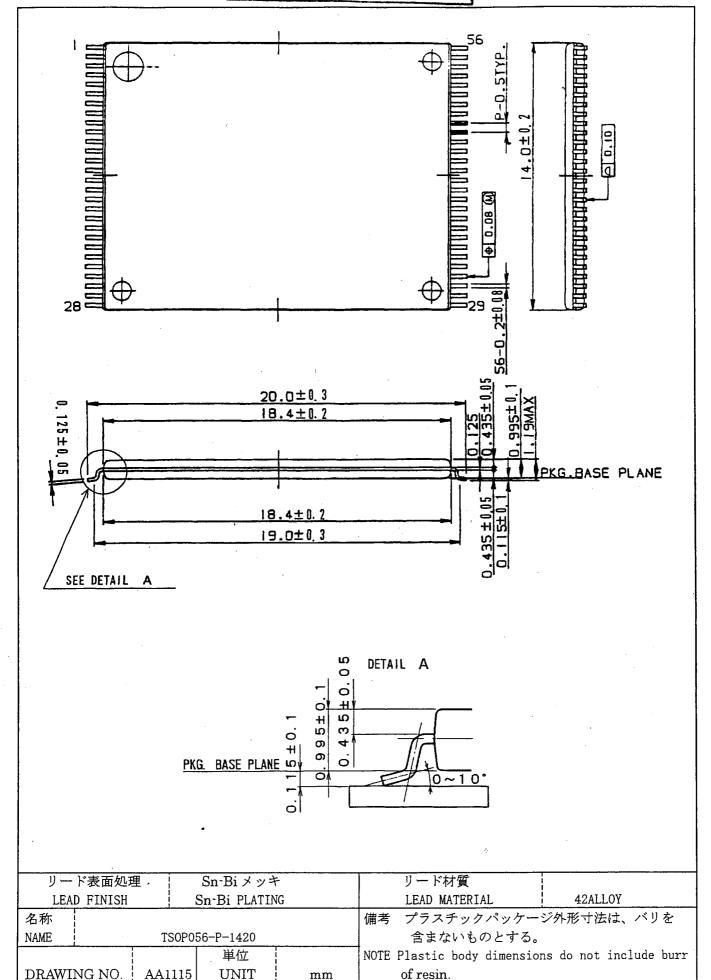
Document No.	Document Name	
AP-001-SD-E	Flash Memory Family Software Drivers	
AP-006-PT-E	Data Protection Method of SHARP Flash Memory	
AP-007-SW-E	RP#, V _{PP} Electric Potential Switching Circuit	

NOTE:

1. International customers should contact their local SHARP or distribution sales office.



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