

32M X 72 Bits (256MB) SDRAM Unbuffered DIMM with ECC (PC133)

FEATURES

- PC133 Compliant
(Option A: $t_{CYC}=7.5ns@CL=3$)
(Option D: $t_{CYC}=7.5ns@CL=2,3$)
- Burst Mode Operation
- Auto and self refresh capability
(8192 cycles/64ms refresh)
- LVTTTL compatible inputs and outputs
- $+3.3V \pm 0.3V$ power supply
- MRS cycle with address key programs
 - Latency (access from column address)
 - Burst Length (1, 2, 4, 8)
 - Data scramble (sequential and interleave)
- All inputs are sampled at the positive going edge of the system clock
- ECC Optimized
- Serial Presence Detect with EEPROM

GENERAL DESCRIPTION

This SimpleTech product is a 32M x 72 bits Synchronous Dynamic RAM (SDRAM) Dual In-line Memory Module (DIMM). This module consists of nine CMOS 8M x 8 bits x 4 banks SDRAMs in 54-pin 400-mil TSOP-II packages mounted on a 168-pin glass epoxy substrate. A serial EEPROM using the two pin I²C protocol is also mounted to provide for the Serial Presence Detects (SPD). Decoupling capacitors of 0.1 μ F are also mounted. Damping resistors are added to all the data lines.

The module has gold edge connections and is intended for mounting into 168-pin DIMM edge connector sockets keyed for unbuffered signals and 3.3V power supply.

PIN CONFIGURATION

Pin Symbols

Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol
1	VSS	25	NC	49	VDD	73	VDD	97	DQ41	121	A9	145	NC
2	DQ0	26	VDD	50	NC	74	DQ28	98	DQ42	122	BA0	146	VREF*
3	DQ1	27	$\overline{WE}$	51	NC	75	DQ29	99	DQ43	123	A11	147	NC
4	DQ2	28	DQM0	52	CB2	76	DQ30	100	DQ44	124	VDD	148	VSS
5	DQ3	29	DQM1	53	CB3	77	DQ31	101	DQ45	125	CLK1**	149	DQ53
6	VDD	30	$\overline{CS}_0$	54	VSS	78	VSS	102	VDD	126	A12	150	DQ54
7	DQ4	31	DU	55	DQ16	79	CLK2	103	DQ46	127	VSS	151	DQ55
8	DQ5	32	VSS	56	DQ17	80	NC	104	DQ47	128	CKE0	152	VSS
9	DQ6	33	A0	57	DQ18	81	NC	105	CB4	129	$\overline{CS}_3^*$	153	DQ56
10	DQ7	34	A2	58	DQ19	82	SDA	106	CB5	130	DQM6	154	DQ57
11	DQ8	35	A4	59	VDD	83	SCL	107	VSS	131	DQM7	155	DQ58
12	VSS	36	A6	60	DQ20	84	VDD	108	NC	132	A13*	156	DQ59
13	DQ9	37	A8	61	NC	85	VSS	109	NC	133	VDD	157	VDD
14	DQ10	38	A10/AP	62	VREF*	86	DQ32	110	VDD	134	NC	158	DQ60
15	DQ11	39	BA1	63	CKE1*	87	DQ33	111	$\overline{CAS}$	135	NC	159	DQ61
16	DQ12	40	VDD	64	VSS	88	DQ34	112	DQM4	136	CB6	160	DQ62
17	DQ13	41	VDD	65	DQ21	89	DQ35	113	DQM5	137	CB7	161	DQ63
18	VDD	42	CLK0	66	DQ22	90	VDD	114	$\overline{CS}_1^*$	138	VSS	162	VSS
19	DQ14	43	VSS	67	DQ23	91	DQ36	115	$\overline{RAS}$	139	DQ48	163	CLK3**
20	DQ15	44	DU	68	VSS	92	DQ37	116	VSS	140	DQ49	164	NC
21	CB0	45	$\overline{CS}_2$	69	DQ24	93	DQ38	117	A1	141	DQ50	165	SA0
22	CB1	46	DQM2	70	DQ25	94	DQ39	118	A3	142	DQ51	166	SA1
23	VSS	47	DQM3	71	DQ26	95	DQ40	119	A5	143	VDD	167	SA2
24	NC	48	DU	72	DQ27	96	VSS	120	A7	144	DQ52	168	VDD

*These pins are not used in this module. **Unused CLKs are terminated.

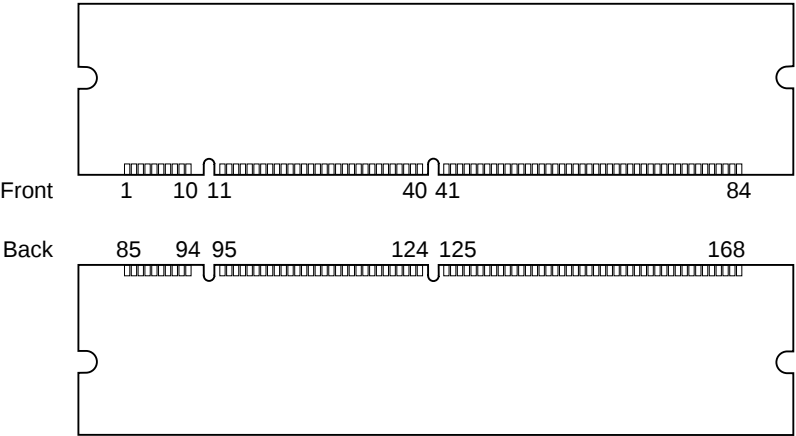
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PIN CONFIGURATION *(continued)*

Pin Functions

Pin Symbol	Pin Function
A0-A10/AP, A11, A12	Address Input
BA0, BA1	Select Bank
DQ0-DQ63	Data In/Out
CB0-CB7	Check Bit
$\overline{WE}$	Write Enable
CLK0, CLK2	Clock Input
CKE0	Clock Enable Input
$\overline{RAS}$	Row Address Strobe
$\overline{CAS}$	Column Address Strobe
DQM0-DQM7	Data Input/Output Mask
$\overline{CS}0, \overline{CS}2$	Chip Select Input
SDA	Serial Data I/O
SCL	Serial Clock
SA0-SA2	Address in EEPROM
VDD	Power (+3.3V)
VSS	Ground
NC	No Connection
DU	Don't Use

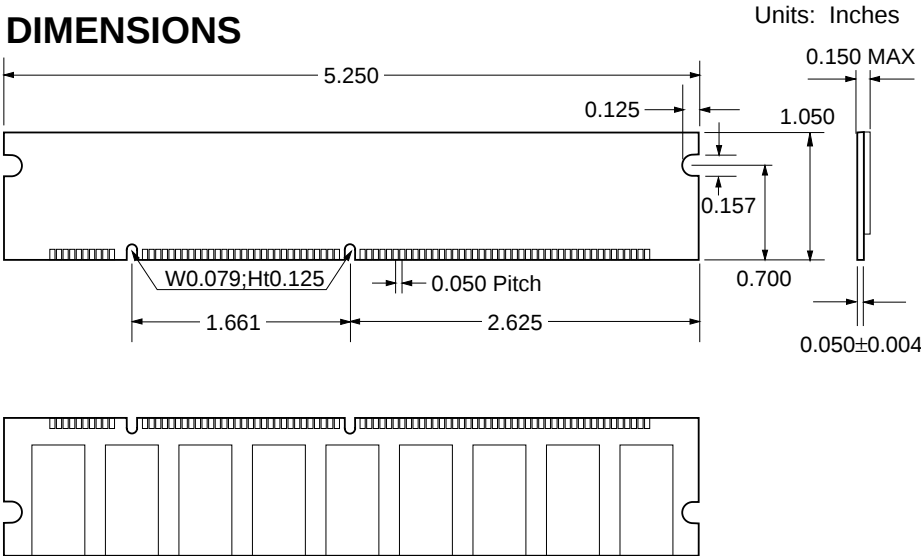
Pin Arrangement



ORDERING INFORMATION

SimpleTech Part Number	PC133 133MHz Parameters				
	CL	tRCD	tRP	tRC	Comment
SL72U8F32M8H-A75AV	3clks	20ns	20ns	67.5ns	Refer to option A in this specification
SL72U8F32M8H-A75DV	2clks	15ns	15ns	67.5ns	Refer to option D in this specification

PACKAGE DIMENSIONS



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TOLERANCES: ±0.005 UNLESS OTHERWISE SPECIFIED

SERIAL PRESENCE DETECTS

Serial PD Interface Protocol: I²C; Current sink capability of SDA driver ≤3mA; Maximum clock frequency: 100 KHz

Byte #	Function Described	Function Supported		Hex Value	
		Option A	Option D	Option A	Option D
0	# of bytes written into serial memory at module manufacturer	128 bytes		80h	
1	Total # of bytes of SPD memory device	256Bytes (2K-bit)		08h	
2	Fundamental memory type	SDRAM		04h	
3	# of row addresses on this assembly	13		0Dh	
4	# of column addresses on this assembly	10		0Ah	
5	# of module banks on this assembly	1 bank		01h	
6	Data width of this assembly	72 bits		48h	
7	...Data width of this assembly (continued)	—		00h	
8	Voltage interface standard of this assembly	LVTTL		01h	
9	SDRAM cycle time at CL=3 (tCYC)	7.5ns	7.5ns	75h	75h
10	SDRAM access time from clock at CL=3 (tAC)	5.4ns	5.4ns	54h	54h
11	DIMM configuration type	ECC		02h	
12	Refresh rate/type	7.8μs, Self-refresh		82h	
13	SDRAM width	8 bits		08h	
14	Error Checking DRAM data width	8 bits		08h	
15	Min. CLK delay for back-to-back rand. col. addr.	tCCD=1 CLK		01h	
16	SDRAM device attributes: burst lengths supported	1,2,4,8		0Fh	
17	SDRAM device attributes: # of banks on SDRAM device	4 banks		04h	
18	SDRAM device attributes: CAS latency	CAS latency = 2,3		06h	
19	SDRAM device attributes: CS latency	CS latency = 0		01h	
20	SDRAM device attributes: Write latency	Write Latency = 0		01h	
21	SDRAM module attributes	Non-PLL,Non-Reg.,Non-Buff.		00h	
22	SDRAM device attributes: general	VCC10%, B/R, S/W, P/A, A/P		0Eh	
23	Minimum clock cycle time at CL=2 (tCYC)	10ns	75ns	A0h	75h
24	Max. data access time form clock at CL=2 (tAC)	6ns	5.4ns	60h	54h
25	Minimum clock cycle time at CL=1 (tCYC)	—	—	00h	00h
26	Max. data access time from clock at CL=1 (tAC)	—	—	00h	00h
27	Minimum row precharge time (tRP)	20ns	15ns	14h	0Fh
28	Minimum row active to row active delay (tRRD)	15ns	15ns	0Fh	0Fh
29	Minumum RAS to CAS (tRCD)	20ns	15ns	14h	0Fh
30	Minumum RAS pulse width (tRAS)	45ns	45ns	2Dh	2Dh
31	Module bank density	256MB		40h	
32	Min. command and address signal setup time (tAS)	1.5ns		15h	
33	Min. command and address signal hold time (tAH)	0.8ns		08h	
34	Min. data signal input setup time (tDS)	1.5ns		15h	
35	Min. data signal input hold time (tDH)	0.8ns		08h	
36-61	Superset information (may be used in future)	—		00h	
62	SPD revision	2		02h	
63	Checksum for bytes 0-62	JEDEC calc		xxh	
64	Manufacturer's JEDEC ID code per JEP-106E	Continuation code		7Fh	

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SERIAL PRESENCE DETECTS *(continued)*

Byte #	Function Described	Function Supported		Hex Value	
		Option A	Option D	Option A	Option D
65	Man. JEDEC ID code (continued)	SimpleTech's ID		A8h	
66-71	—	—		00h	
72	Manufacturing location	SimpleTech USA (1)		01h	
73-90	Manufacturer's part number			xxh	
91	PCB Revision code	Eng(00), RevA(01), RevB(02)		01h	
92	—	—		00h	
93	Manufacturing date	Year(BCD format)		yyh	
94	—	Calender Week(BCD format)		wwh	
95	Assembly serial number	Tester Number		ssh	
96	—	serial#(bits7-0)		ssh	
97	—	serial#(bits15-8)		ssh	
98	—	serial#(bits23-16)		ssh	
99-125	Manufacturer's specific data			xxh	
126	Intel specification frequency	100MHz		64h	
127	Intel specification details	CLK0,2; junc temp.TBD; CL2,CL3; concurrent AP		AFh	
128+	—			FFh	

FUNCTIONAL BLOCK DIAGRAM

