

64M X 72 Bits (512MB) SDRAM 168-Pin Registered DIMM ECC (PC133)**FEATURES**

- PC133 Compliant (t_{CYC}=7.5ns@CL=3)
- Burst Mode Operation
- Auto and self refresh capability (8192 cycles/64ms refresh)
- LVTTTL compatible inputs and outputs
- +3.3V ± 0.3V power supply
- MRS cycle with address key programs
 - CAS Latency (CL=2 or 3)
 - Burst Length (1, 2, 4, 8)
 - Data Type (sequential and interleave)
- All inputs are sampled at the positive going edge of the system clock
- Serial Presence Detect with 256 Byte EEPROM
- ECC

GENERAL DESCRIPTION

The SimpleTech INT72R8F64M8H-A75AV is a 64M x 72 bits Synchronous Dynamic RAM (SDRAM) Dual In-line Memory Module (DIMM).

This module consists of eighteen CMOS 8M x 8 bits x 4 banks SDRAMs in 54-pin 400-mil TSOP-II packages. The SDRAMs are 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). PLL circuits supply clocks to the SDRAMs. Decoupling capacitors are also mounted. Damping resistors are added to the data signals. Control and address signals are registered.

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

The module is PC133 compliant.

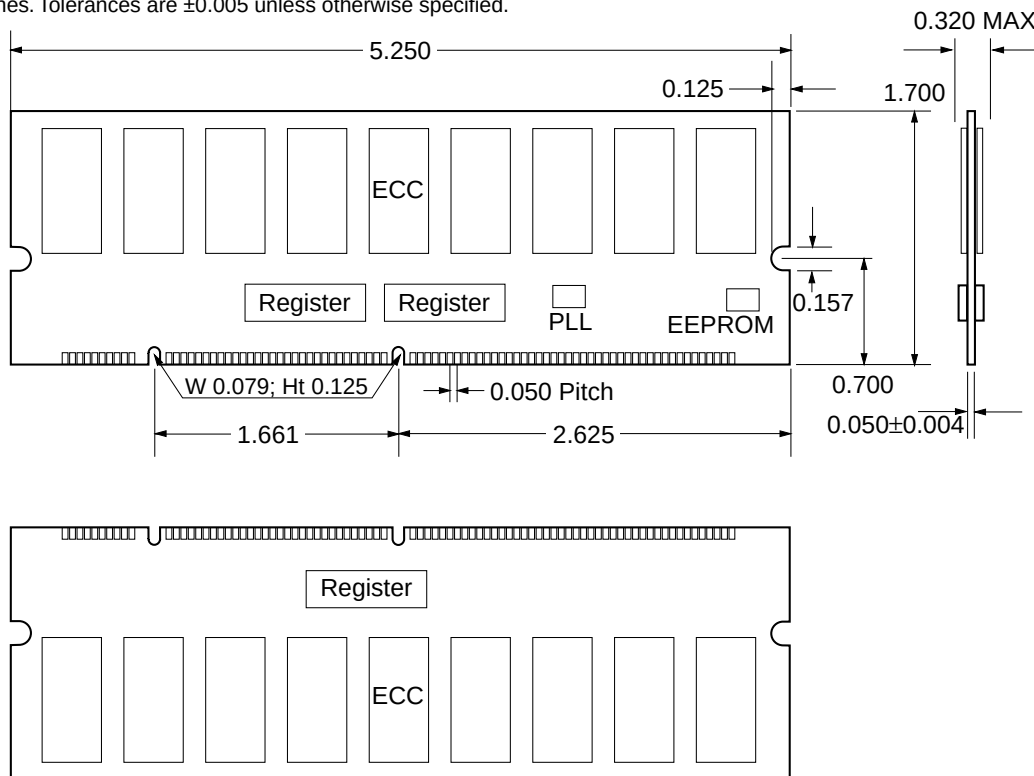
This specification is prepared for the Intel qualification of the module.

ORDERING INFORMATION

SimpleTech Part Number	Performance				
	CL	t _{RCD}	t _{RP}	t _{RC}	Comment
INT72R8F64M8H-A75AV	3clks	20ns	20ns	67.5ns	PC133 133MHz Parameters

MODULE DIMENSIONS

Units are in inches. Tolerances are ±0.005 unless otherwise specified.



PIN CONFIGURATION

Pin Symbols

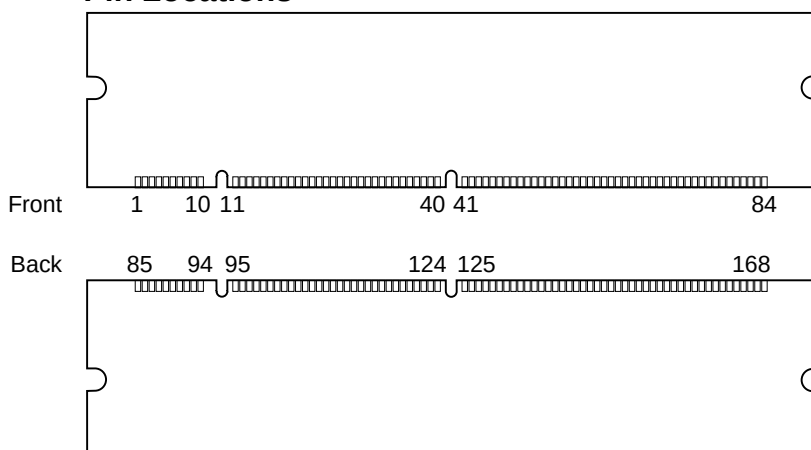
Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol
1	VSS	25	NC	49	VDD	73	VDD	97	DQ41	121	A9
2	DQ0	26	VDD	50	NC	74	DQ28	98	DQ42	122	BA0
3	DQ1	27	$\overline{WE}$	51	NC	75	DQ29	99	DQ43	123	A11
4	DQ2	28	DQMB0	52	CB2	76	DQ30	100	DQ44	124	VDD
5	DQ3	29	DQMB1	53	CB3	77	DQ31	101	DQ45	125	CK1
6	VDD	30	$\overline{S_0}$	54	VSS	78	VSS	102	VDD	126	A12
7	DQ4	31	NC	55	DQ16	79	CK2	103	DQ46	127	VSS
8	DQ5	32	VSS	56	DQ17	80	NC	104	DQ47	128	CKE0
9	DQ6	33	A0	57	DQ18	81	NC	105	CB4	129	$\overline{S_3}$
10	DQ7	34	A2	58	DQ19	82	SDA	106	CB5	130	DQMB6
11	DQ8	35	A4	59	VDD	83	SCL	107	VSS	131	DQMB7
12	VSS	36	A6	60	DQ20	84	VDD	108	NC	132	A13*
13	DQ9	37	A8	61	NC	85	VSS	109	NC	133	VDD
14	DQ10	38	A10/AP	62	NC	86	DQ32	110	VDD	134	NC
15	DQ11	39	BA1	63	CKE1	87	DQ33	111	$\overline{CAS}$	135	NC
16	DQ12	40	VDD	64	VSS	88	DQ34	112	DQMB4	136	CB6
17	DQ13	41	VDD	65	DQ21	89	DQ35	113	DQMB5	137	CB7
18	VDD	42	CK0	66	DQ22	90	VDD	114	$\overline{S_1}$	138	VSS
19	DQ14	43	VSS	67	DQ23	91	DQ36	115	$\overline{RAS}$	139	DQ48
20	DQ15	44	NC	68	VSS	92	DQ37	116	VSS	140	DQ49
21	CB0	45	$\overline{S_2}$	69	DQ24	93	DQ38	117	A1	141	DQ50
22	CB1	46	DQMB2	70	DQ25	94	DQ39	118	A3	142	DQ51
23	VSS	47	DQMB3	71	DQ26	95	DQ40	119	A5	143	VDD
24	NC	48	NC	72	DQ27	96	VSS	120	A7	144	DQ52
										145	NC
										146	NC
										147	REGE
										148	VSS
										149	DQ53
										150	DQ54
										151	DQ55
										152	VSS
										153	DQ56
										154	DQ57
										155	DQ58
										156	DQ59
										157	VDD
										158	DQ60
										159	DQ61
										160	DQ62
										161	DQ63
										162	VSS
										163	CK3
										164	NC
										165	SA0
										166	SA1
										167	SA2
										168	VDD

(Asterisk (*) indicates that the pin is not used in this module.)

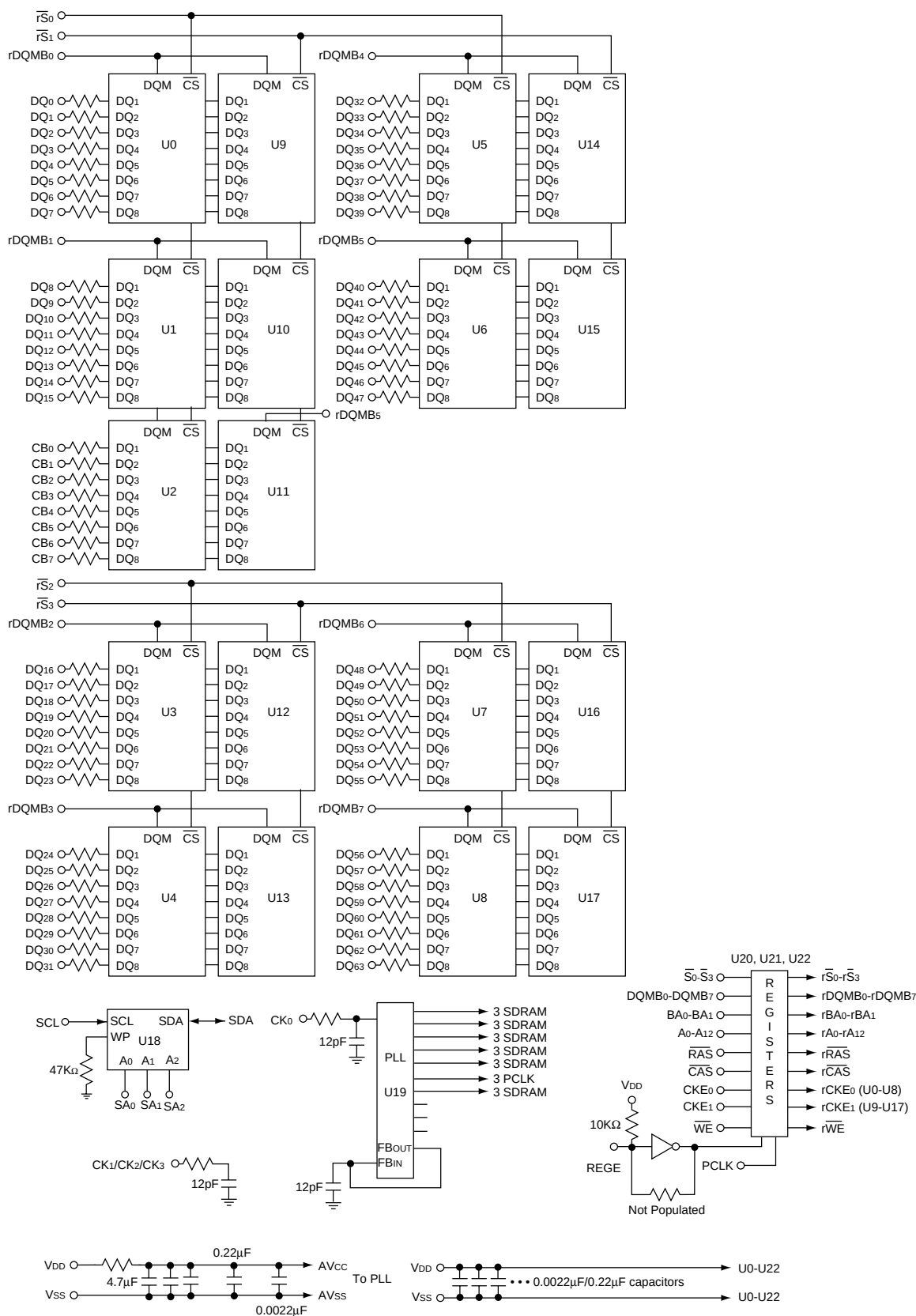
Pin Functions

Pin Symbol	Pin Function
A0-A9, A11, A12	Address Inputs
A10/AP	Address/Autoprecharge
BA0, BA1	SDRAM Bank Address
DQ0-DQ63	Data Inputs/Outputs
CB0-CB7	Check Bits Inputs/Outputs
$\overline{WE}$	Write Enable
CK0-CK3	Clock Inputs
CKE0, CKE1	Clock Enables
$\overline{RAS}$	Row Address Strobe
$\overline{CAS}$	Column Address Strobe
DQMB0-DQMB7	Data Mask
$\overline{S_0}$ - $\overline{S_3}$	Chip Selects
REGE	Register Enable
SDA	SPD Data Input/Output
SCL	SPD Clock Input
SA0-SA2	SPD Address Input
VDD	Power (+3.3V)
VSS	Ground
NC	No Connection

Pin Locations



FUNCTIONAL BLOCK DIAGRAM



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
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	2 banks	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	75h
10	SDRAM access time from clock at CL=3 (tAC)	5.4ns	54h
11	DIMM configuration type	ECC	02h
12	Refresh rate/type	8.7μs, 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	Registered/Buffered/PLL	1Fh
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	A0h
24	Max. data access time form clock at CL=2 (tAC)	6ns	60h
25	Minimum clock cycle time at CL=1 (tCYC)	N/A	00h
26	Max. data access time from clock at CL=1 (tAC)	N/A	00h
27	Minimum row precharge time (tRP)	20ns	14h
28	Minimum row active to row active delay (tRRD)	15ns	0Fh
29	Minimum RAS to CAS (tRCD)	20ns	14h
30	Minimum RAS pulse width (tRAS)	45.0ns	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
65	Man. JEDEC ID code (continued)	SimpleTech's ID	A8h
66-71	—	—	00h
72	Manufacturing location	SimpleTech USA (1)	01h

continued on the next page

SERIAL PRESENCE DETECTS *(continued)*

Byte #	Function Described	Function Supported	Hex Value
73	Manufacturer's part number	S	53h
74		L	4Ch
75		7	37h
76		2	32h
77		R	52h
78		8	38h
79		F	46h
80		6	36h
81		4	34h
82		M	4Dh
83		8	38h
84		H	48h
85		-	2Dh
86		A	41h
87		7	37h
88		5	35h
89		A	41h
90	—	V	56h
91	PCB Revision code	Eng(00), RevA(01), RevB(02)	01h
92	—	—	FFh
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; junc temp.TBD; CL2,CL3; concurrent AP	8Fh
128+	—		00h