Approval Sheet

Customer	
Product Number	**M4RS-AGS1DC0J-B**
Module speed	**PC4-2400**
Pin	**288pin**
Cl-tRCD-tRP	**17-17-17**
Operating Temp	**0℃~85℃**
Date	**13rd November 2018**

The Total Solution For Industrial Flash Storage

Rev 1.1

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1. Features

- 288-pin Registered Dual Inline Memory Module (RDIMM)
- Organization: 2Gx72 based on 1Gx8 * (18 components) / 2 Ranks
- CL-tRCD-tRP : 17-17-17
- JEDEC standard 1.2V (± 0.06V) Power Supply
- VDDQ = 1.2V (± 0.06V)
- 16 Banks (4 Bank Groups)
- Programmable CAS Latency: 10,11,12,13,14,15,16,17,18
- Burst Length: 8(Interleave/nibble sequential)
- Bi-directional Differential Data-Strobe
- On Die Termination (ODT)
- Average Refresh Period 7.8us at lower than a T_{CASE} 85°C, 3.9us at 85°C < TCASE < 95 °C
- RoHS Compliant
- Asynchronous Reset
- PCB Height 18.75mm

2. Address Configuration

Module Organization	Row address	Column Address	Bank Address	BG Address	Auto Precharge
2Gx72	A0-A15	A0-A9	BA0-BA1	BG0-BG1	A10/AP

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3. Pin Description

Pin Name	Description	Pin Name	Description
A0–A17[1]	Register address input	SCL	I^2C serial bus clock for SPD/TSE and register
BA0, BA1	Register bank select input	SDA	I^2C serial bus data line for SPD/TSE and register
BG0, BG1	Register bank group select input	SA0–SA2	I^2C slave address select for SPD/TSE and register
RAS_n[2]	Register row address strobe input	PAR	Register parity input
CAS_n[3]	Register column address strobe input	VDD	SDRAM core power supply
WE_n[4]	Register write enable input	C0, C1,C2	Chip ID lines for SDRAMs
CS0_n, CS1_n CS2_n, CS3_n	DIMM Rank Select Lines input	12 V	Optional power Supply on socket but not used on RDIMM
CKE0, CKE1	Register clock enable lines input	VREFCA	SDRAM command/address reference supply
ODT0, ODT1	Register on-die termination control lines input	VSS	Power supply return (ground)
ACT_n	Register input for activate input	VDDSPD	Serial SPD-TSE positive power supply
DQ0–DQ63	DIMM memory data bus	ALERT_n	Register ALERT_n output
CB0–CB7	DIMM ECC check bits	VPP	SDRAM Supply
TDQS0_t-TDQS17_t TDQS0_c-TDQS17_c	Dummy loads formixed populations of x4 based and x8 based RDIMMs.		
DQS0_t–DQS17_t	Data Buffer data strobes (positive line of differential pair)	DM0_n-DM8_n	Data Mask
DQS0_c–DQS17_c	Data Buffer data strobes (negative line of differential pair)	RESET_n	Set Register and SDRAMs to a Known State
DBI0_n-DBI8_n	Data Bus Inversion	EVENT_n	SPD signals a thermal event has occurred.
CK0_t, CK1_t	Register clock input (positive line of differential pair)	VTT	SDRAM I/O termination supply
CK0_c, CK1_c	Register clocks input (negative line of differential pair)	RFU	Reserved for future use

Note 1 Address A17 is only valid for 16 Gb x4 based SDRAMs.
Note 2 RAS_n is a multiplexed function with A16.
Note 3 CAS_n is a multiplexed function with A15.
Note 4 WE_n is a multiplexed function with A14.

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4. Pin Configuration (Front side/Back side)

Pin	Front	Pin	Back	Pin	Front	Pin	Back	Pin	Front	Pin	Back	Pin	Front	Pin	Back
1	NC	145	NC	37	VSS	181	DQ29	73	VDD	217	VDD	109	VSS	253	DQ41
2	VSS	146	VREFCA	38	DQ24	182	VSS	74	CK0_t	218	CK1_t	110	DQS14_t/ TDQS14_t	254	VSS
3	DQ4	147	VSS	39	VSS	183	DQ25	75	CK0_c	219	CK1_c	111	DQS14_c/ TDQS14_c	255	DQS5_c
4	VSS	148	DQ5	40	DQS12_t/ TDQS12_t	184	VSS	76	VDD	220	VDD	112	VSS	256	DQS5_t
5	DQ0	149	VSS	41	DQS12_c/ TDQS12_c	185	DQS3_c	77	VTT	221	VTT	113	DQ46	257	VSS
6	VSS	150	DQ1	42	VSS	186	DQS3_t	78	EVENT_n	222	PARITY	114	VSS	258	DQ47
7	DQS9_t/ TDQS9_t	151	VSS	43	DQ30	187	VSS	79	A0	223	VDD	115	DQ42	259	VSS
8	DQS09_c/ TDQS9_c	152	DQS0_c	44	VSS	188	DQ31	80	VDD	224	BA1	116	VSS	260	DQ43
9	VSS	153	DQS0_t	45	DQ26	189	VSS	81	BA0	225	A10/AP	117	DQ52	261	VSS
10	DQ6	154	VSS	46	VSS	190	DQ27	82	RAS_n /A16	226	VDD	118	VSS	262	DQ53
11	VSS	155	DQ7	47	CB4	191	VSS	83	VDD	227	RFU	119	DQ48	263	VSS
12	DQ2	156	VSS	48	VSS	192	CB5	84	CS0_n	228	WE_n/ A14	120	VSS	264	DQ49
13	VSS	157	DQ3	49	CB0	193	VSS	85	VDD	229	VDD	121	DQS15_t/ TDQS15_t	265	VSS
14	DQ12	158	VSS	50	VSS	194	CB1	86	CAS_n/ A15	230	NC	122	DQS15_c/ TDQS15_c	266	DQS6_c
15	VSS	159	DQ13	51	TDQS17_t/ TDQS17_t	195	VSS	87	ODT0	231	VDD	123	VSS	267	DQS6_t
16	DQ8	160	VSS	52	DQS17_c/ TDQS17_c	196	DQS8_c	88	VDD	232	A13	124	DQ54	268	VSS
17	VSS	161	DQ9	53	VSS	197	DQS8_t	89	CS1_n	233	VDD	125	VSS	269	DQ55
18	DQS10_t/ TDQS10_t	162	VSS	54	CB6	198	VSS	90	VDD	234	A17	126	DQ50	270	VSS
19	DQS10_c/ TDQS10_c	163	DQS1_c	55	VSS	199	CB7	91	ODT1	235	NC/C2	127	VSS	271	DQ51
20	VSS	164	DQS1_t	56	CB2	200	VSS	92	VDD	236	VDD	128	DQ60	272	VSS
21	DQ14	165	VSS	57	VSS	201	CB3	93	CS2_n/C0,NC	237	CS3_n C1,NC	129	VSS	273	DQ61
22	VSS	166	DQ15	58	RESET_n	202	VSS	94	VSS	238	SA2	130	DQ56	274	VSS
23	DQ10	167	VSS	59	VDD	203	CKE1	95	DQ36	239	VSS	131	VSS	275	DQ57
24	VSS	168	DQ11	60	CKE0	204	VDD	96	VSS	240	DQ37	132	DQS16_t/ TDQS16_t	276	VSS
25	DQ20	169	VSS	61	VDD	205	RFU	97	DQ32	241	VSS	133	DQS16_c /TDQS16_c	277	DQS7_c
26	VSS	170	DQ21	62	ACT_n	206	VDD	98	VSS	242	DQ33	134	VSS	278	DQS7_t
27	DQ16	171	VSS	63	BG0	207	BG1	99	DQS13_t/ TDQ13_t	243	VSS	135	DQ62	279	VSS
28	VSS	172	DQ17	64	VDD	208	ALERT_n	100	DQS13_c/ TDQS13_c	244	DQS4_c	136	VSS	280	DQ63
29	DQS11_t/ TDQS11_t	173	VSS	65	A12/BC_n	209	VDD	101	VSS	245	DQS4_t	137	DQ58	281	VSS
30	DQS11_c/ TDQS11_c	174	DQS2_c	66	A9	210	A11	102	DQ38	246	VSS	138	VSS	282	DQ59
31	VSS	175	DQS2_t	67	VDD	211	A7	103	VSS	247	DQ39	139	SA0	283	VSS
32	DQ22	176	VSS	68	A8	212	VDD	104	DQ34	248	VSS	140	SA1	284	VDDSPD
33	VSS	177	DQ23	69	A6	213	A5	105	VSS	249	DQ35	141	SCL	285	SDA
34	DQ18	178	VSS	70	VDD	214	A4	106	DQ44	250	VSS	142	VPP	286	VPP
35	VSS	179	DQ19	71	A3	215	VDD	107	VSS	251	DQ45	143	VPP	287	VPP
36	DQ28	180	VSS	72	A1	216	A2	108	DQ40	252	VSS	144	RFU	288	VPP

Note:
1. NC = No Connect, RFU = Reserved for Future Use
2. Address A17 is only valid for 16 Gb x4 based SDRAMs.
3. RAS_n is a multiplexed function with A16.
4. CAS_n is a multiplexed function with A15.
5. WE_n is a multiplexed function with A14.

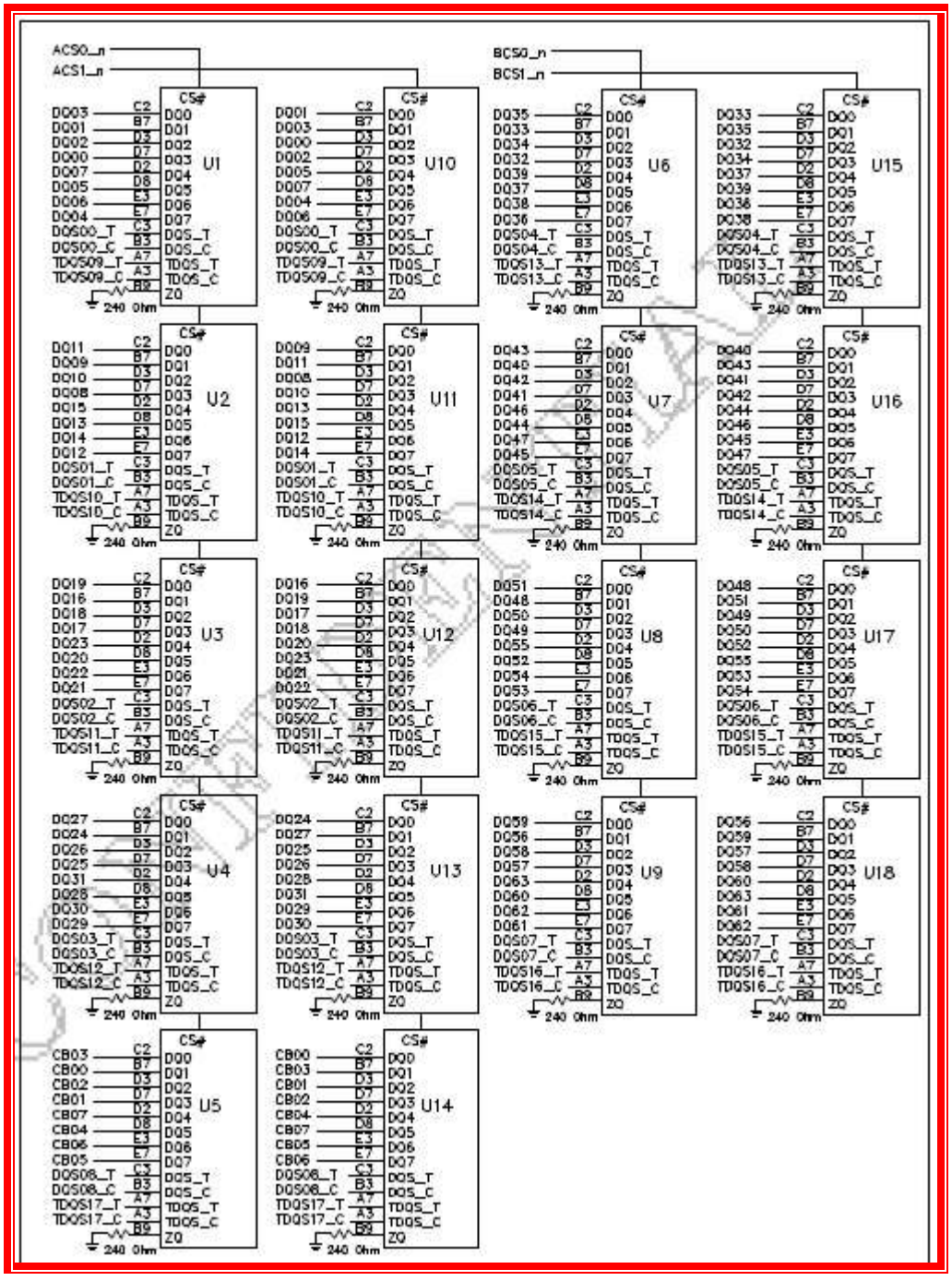
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Ordering Information

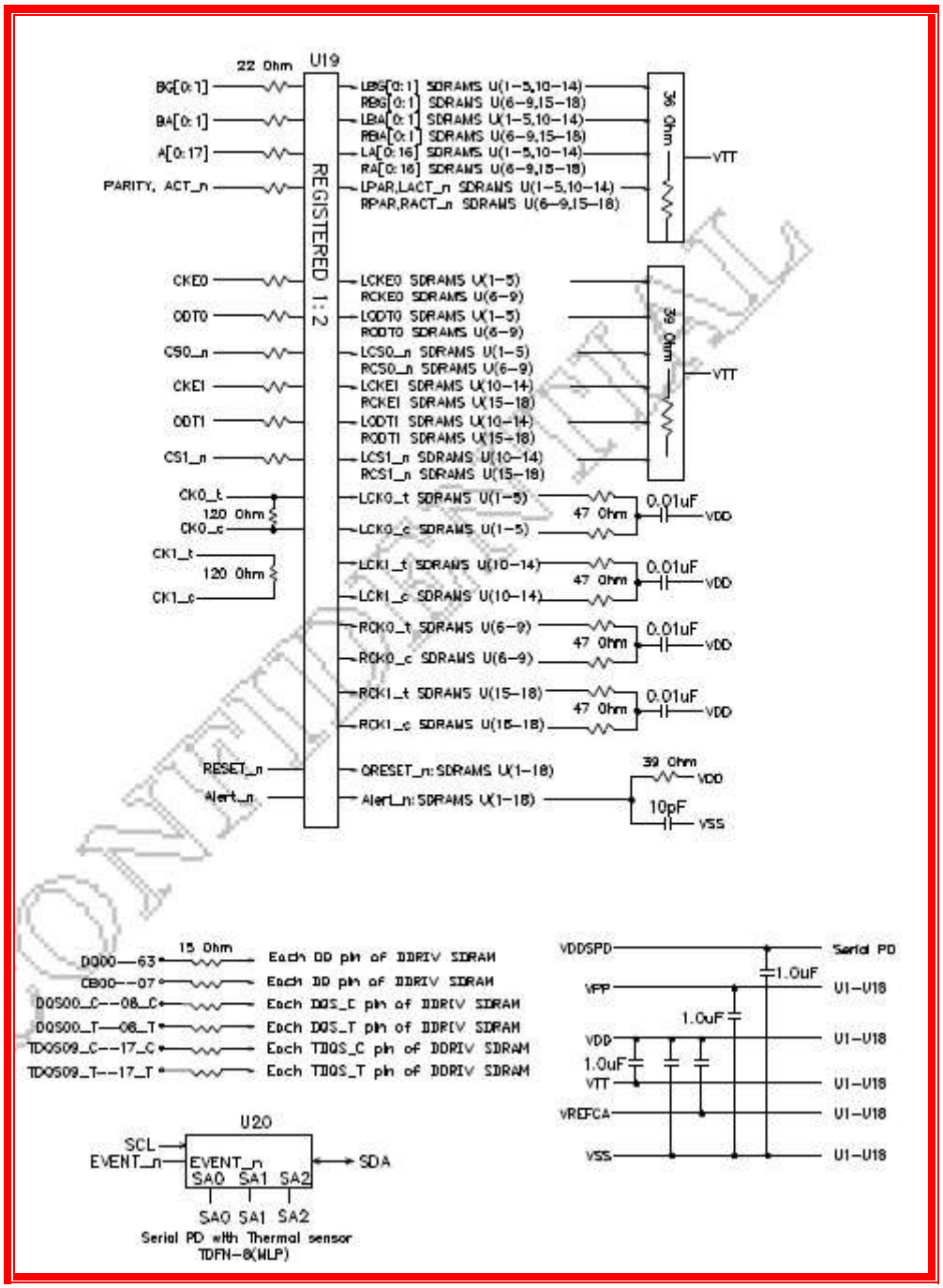
DDR4 VLP RDIMM						
Part Number	Density	Speed	DIMM Organization	Number of DRAM	Number of rank	ECC
M4RS-AGS1DC0J-B	16GB	PC4-2400	2Gx72	18	2	Y

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5. Block Diagram



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6. IDD Specification Parameter

(IDD values are for full operating range of Voltage and Temperature)

Symbol	Proposed Conditions	Value	Units
IDD0	Operating One Bank Active-Precharge Current (AL=0)CKE: High; External clock: On; tCK, nRC, nRAS, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: Highbetween ACT and PRE; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling; Data IO: VDDQ; DM_n:stable at 1; Bank Activity: Cycling with one bank active at a time: 0,0,1,1,2,2,... ; Output Buffer and RTT: Enabled in Mode Registers2;ODT Signal: stable at 0; Pattern Details: Refer to Component Datasheet for detail pattern	953	mA
IDD0A	Operating One Bank Active-Precharge Current (AL=CL-1) AL = CL-1, Other conditions: see IDD0	999	mA
IDD1	Operating One Bank Active-Read-Precharge Current (AL=0)CKE: High; External clock: On; tCK, nRC, nRAS, nRCD, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: Highbetween ACT, RD and PRE; Command, Address, Bank Group Address, Bank Address Inputs, Data IO: partially toggling; DM_n: stableat 1; Bank Activity: Cycling with one bank active at a time: 0,0,1,1,2,2,... ; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0; Pattern Details: Refer to Component Datasheet for detail pattern	1246	mA
IDD1A	Operating One Bank Active-Read-Precharge Current (AL=CL-1) AL = CL-1, Other conditions: see IDD1	1292	mA
IDD2N	Precharge Standby Current (AL=0)CKE: High; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: stable at 1; Command,Address, Bank Group Address, Bank Address Inputs: partially toggling ; Data IO: VDDQ; DM_n: stable at 1; Bank Activity: all banksclosed; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0; Pattern Details: Refer to Component Datasheet for detail pattern	749	mA
IDD2NA	Precharge Standby Current (AL=CL-1) AL = CL-1, Other conditions: see IDD2N	806	mA
IDD2NT	Precharge Standby ODT Current CKE: High; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: stable at 1; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling ; Data IO: VSSQ; DM_n: stable at 1; Bank Activity: all banks closed; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: toggling according ; Pattern Details: Refer to Component Datasheet for detail pattern	793	mA
IDD2NL	Precharge Standby Current with CAL enabled Same definition like for IDD2N, CAL enabled3	656	mA
IDD2NG	Precharge Standby Current with Gear Down mode enabled Same definition like for IDD2N, Gear Down mode enabled3	754	mA
IDD2ND	Precharge Standby Current with DLL disabled Same definition like for IDD2N, DLL disabled3	722	mA
IDD2N_par	Precharge Standby Current with CA parity enabled Same definition like for IDD2N, CA parity enabled3	785	mA
IDD2P	Precharge Power-Down Current CKE: Low; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL:0; CS_n: stable at 1; Command, Address, Bank Group Address, Bank Address Inputs: stable at 0; Data IO: VDDQ; DM_n: stable at 1; Bank Activity: all banks closed; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0	492	mA
IDD2Q	Precharge Quiet Standby Current CKE: High; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: stable at 1; Command, Address, Bank Group Address, Bank Address Inputs: stable at 0; Data IO: VDDQ; DM_n: stable at 1;Bank Activity: all banks closed; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0	723	mA

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IDD3N	Active Standby Current CKE: High; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: stable at 1; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling ; Data IO: VDDQ; DM_n: stable at 1;Bank Activity: all banks open; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0; Pattern Details:Refer to Component Datasheet for detail pattern	928	mA
IDD3NA	Active Standby Current (AL=CL-1) AL = CL-1, Other conditions: see IDD3N	972	mA
IDD3P	Active Power-Down Current CKE: Low; External clock: On; tCK, CL: sRefer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: stable at 1; Command, Address, Bank Group Address, Bank Address Inputs: stable at 0; Data IO: VDDQ; DM_n: stable at 1; Bank Activity: all banks open; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0	586	mA
IDD4R	Operating Burst Read Current CKE: High; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 82; AL: 0; CS_n: High between RD; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling ; Data IO: seamless read data burst with different data between one burst and the next one according ; DM_n: stable at 1; Bank Activity: all banks open, RD commands cycling through banks: 0,0,1,1,2,2,... ; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0; Pattern Details: Refer to Component Datasheet for detail pattern	2041	mA
IDD4RA	Operating Burst Read Current (AL=CL-1) AL = CL-1, Other conditions: see IDD4R	2110	mA
IDD4RB	Operating Burst Read Current with Read DBI Read DBI enabled3, Other conditions: see IDD4R	2067	mA
IDD4W	Operating Burst Write Current CKE: High; External clock: On; tCK, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: High between WR; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling ; Data IO: seamless write data burst with different data between one burst and the next one ; DM_n: stable at 1; Bank Activity: all banks open, WR commands cycling through banks: 0,0,1,1,2,2,... ; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at HIGH; Pattern Details: Refer to Component Datasheet for detail pattern	1959	mA
IDD4WA	Operating Burst Write Current (AL=CL-1) AL = CL-1, Other conditions: see IDD4W	2031	mA
IDD4WB	Operating Burst Write Current with Write DBI Write DBI enabled3, Other conditions: see IDD4W	1960	mA
IDD4WC	Operating Burst Write Current with Write CRC Write CRC enabled3, Other conditions: see IDD4W	1852	mA
IDD4W_par	Operating Burst Write Current with CA Parity CA Parity enabled3, Other conditions: see IDD4W	2132	mA
IDD5B	Burst Refresh Current (1X REF) CKE: High; External clock: On; tCK, CL, nRFC: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n: High between REF; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling ; Data IO: VDDQ; DM_n: stable at 1; Bank Activity: REF command every nRFC ; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0; Pattern Details: Refer to Component Datasheet for detail pattern	3782	mA

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IDD5F2	Burst Refresh Current (2X REF) tRFC=tRFC_x2, Other conditions: see IDD5B	2818	mA
IDD5F4	Burst Refresh Current (4X REF) tRFC=tRFC_x4, Other conditions: see IDD5B	2445	mA
IDD6N	Self Refresh Current: Normal Temperature Range TCASE: 0 - 85°C; Low Power Array Self Refresh (LP ASR) : Normal4; CKE: Low; External clock: Off; CK_t and CK_c#: LOW; CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n#, Command, Address, Bank Group Address, Bank Address, Data IO: High; DM_n: stable at 1; Bank Activity: Self-Refresh operation; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: MIDLEVEL	404	mA
IDD6E	Self-Refresh Current: Extended Temperature Range) TCASE: 0 - 95°C; Low Power Array Self Refresh (LP ASR) : Extended4; CKE: Low; External clock: Off; CK_t and CK_c: LOW; CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n, Command, Address, Bank Group Address, Bank Address, Data IO: High; DM_n:stable at 1; Bank Activity: Extended Temperature Self-Refresh operation; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: MID-LEVEL	596	mA
IDD6R	Self-Refresh Current: Reduced Temperature Range TCASE: 0 - 45°C; Low Power Array Self Refresh (LP ASR) : Reduced4; CKE: Low; External clock: Off; CK_t and CK_c#: LOW; CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n#, Command, Address, Bank Group Address, Bank Address, Data IO: High; DM_n:stable at 1; Bank Activity: Extended Temperature Self-Refresh operation; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: MID-LEVEL	308	mA
IDD6A	Auto Self-Refresh Current TCASE: 0 - 95°C; Low Power Array Self Refresh (LP ASR) : Auto4; CKE: Low; External clock: Off; CK_t and CK_c#: LOW; CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: 0; CS_n#, Command, Address, Bank Group Address, Bank Address, Data IO: High; DM_n:stable at 1; Bank Activity: Auto Self-Refresh operation; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: MID-LEVEL	388	mA
IDD7	Operating Bank Interleave Read Current CKE: High; External clock: On; tCK, nRC, nRAS, nRCD, nRRD, nFAW, CL: Refer to Component Datasheet for detail pattern; BL: 81; AL: CL-1; CS_n: High between ACT and RDA; Command, Address, Bank Group Address, Bank Address Inputs: partially toggling ; DataIO: read data bursts with different data between one burst and the next one ; DM_n: stable at 1; Bank Activity: two times interleaved cycling through banks (0, 1, ...7) with different addressing; Output Buffer and RTT: Enabled in Mode Registers2; ODT Signal: stable at 0; Pattern Details: Refer to Component Datasheet for detail pattern	3648	mA
IDD8	Maximum Power Down Current TBD	181	mA

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7. Absolute Maximum DC ratings

Symbol	Parameter	Rating	Units	Notes
VDD	Voltage on VDD pin relative to Vss	-0.3 ~ 1.5	V	1,3
VDDQ	Voltage on VDDQ pin relative to Vss	-0.3 ~ 1.5	V	1,3
VPP	Voltage on VPP pin relative to Vss	-0.3 ~ 3.0	V	4
V_{IN}, V_{OUT}	Voltage on any pin except VREFCA to Vss	-0.3 ~ 1.5	V	1
T_{STG}	Storage Temperature	-55 to +100	^{0}C	1,2

NOTE :
1. Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability
2. Storage Temperature is the case surface temperature on the center/top side of the DRAM. For the measurement conditions, please refer to JESD51-2 standard.
3. VDD and VDDQ must be within 300 mV of each other at all times; and VREFCA must be not greater than 0.6 x VDDQ, When VDD and VDDQ are less than 500 mV; VREFCA may be equal to or less than 300 mV
4. VPP must be equal or greater than VDD/VDDQ at all times.

8. AC and DC Operating Conditions

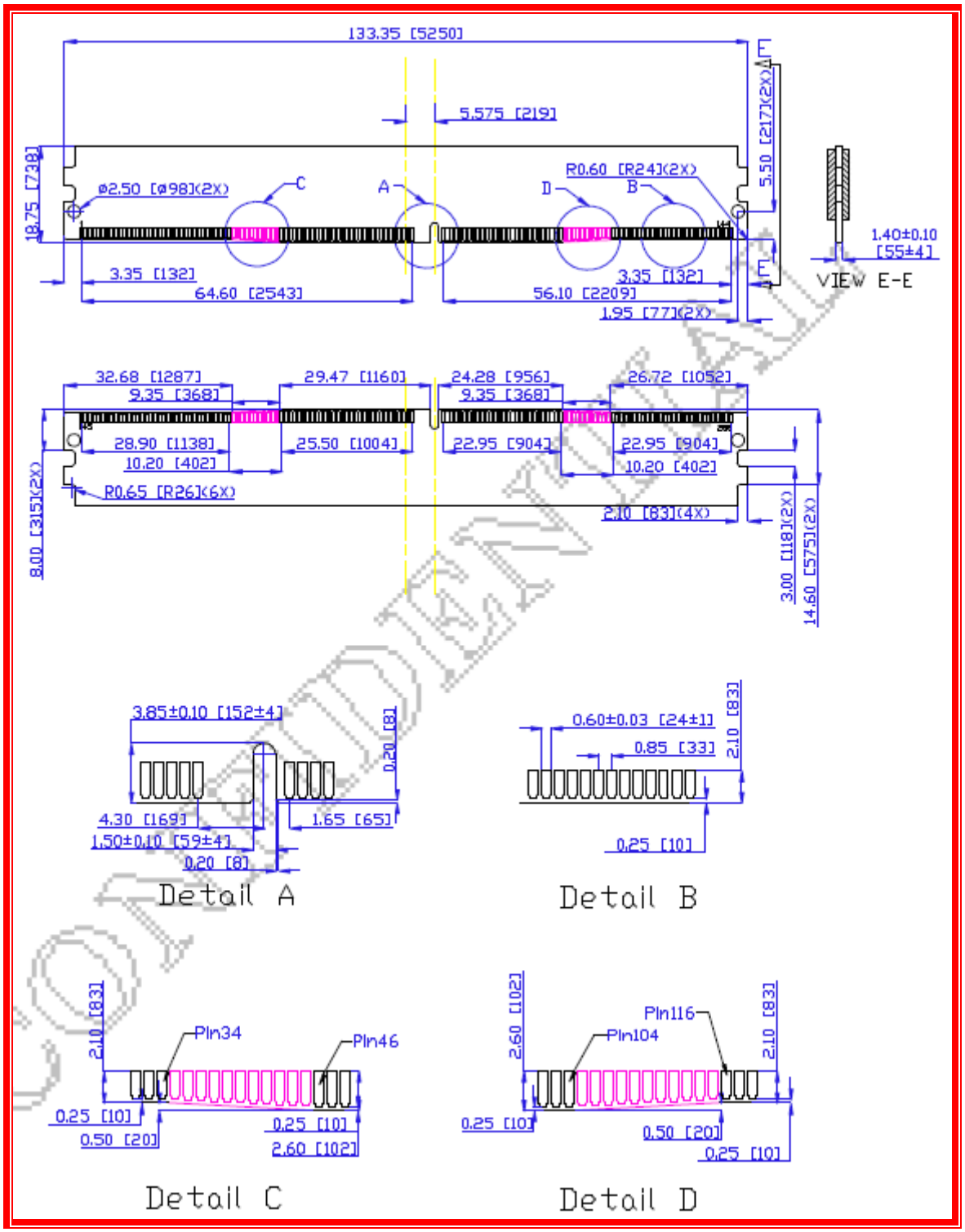
Recommended DC Operating Conditions

Symbol	Parameter	Rating			Units	Notes
		Min.	Typ.	Max.		
V_{DD}	Supply Voltage	1.14	1.2	1.26	V	1,2,3
V_{DDQ}	Supply Voltage for Output	1.14	1.2	1.26	V	1,2,3
V_{PP}		2.375	2.5	2.75	V	3

NOTE:
1. Under all conditions VDDQ must be less than or equal to VDD.
2. VDDQ tracks with VDD. AC parameters are measured with VDD and VDDQ tied together.
3. DC bandwidth is limited to 20MHz.

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9. Physical Dimension (drawing not in scale) Units : in Millimeters



Note: All dimensions are in millimeters (mils) and should be kept within a tolerance of ±0.15 (6), unless otherwise specified.

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10. RoHS Declaration

innodisk

宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Fax:(02) 7703-3555 Internet: http://www.innodisk.com/

RoHS 自我宣告書(RoHS Declaration of Conformity)

Manufacturer Product: All Innodisk EM Flash and Dram products

一、 宜鼎國際股份有限公司（以下稱本公司）特此保證售予貴公司之所有產品，皆符合歐盟 2011/65/EU 及(EU) 2015/863 關於 RoHS 之規範要求。

Innodisk Corporation declares that all products sold to the company, are complied with European Union RoHS Directive (2011/65/EU) and (EU) 2015/863 requirement.

二、 本公司同意因本保證書或與本保證書相關事宜有所爭議時，雙方宜友好協商，達成協議。

Innodisk Corporation agrees that both parties shall settle any dispute arising from or in connection with this Declaration of Conformity by friendly negotiations.

Name of hazardous substance	Limited of RoHS ppm (mg/kg)
鉛 (Pb)	< 1000 ppm
汞 (Hg)	< 1000 ppm
鎘 (Cd)	< 100 ppm
六價鉻 (Cr 6+)	< 1000 ppm
多溴聯苯 (PBBs)	< 1000 ppm
多溴二苯醚 (PBDEs)	< 1000 ppm
鄰苯二甲酸二(2-乙基己基)酯 (DEHP)	< 1000 ppm
鄰苯二甲酸丁酯苯甲酯 (BBP)	< 1000 ppm
鄰苯二甲酸二丁酯 (DBP)	< 1000 ppm
鄰苯二甲酸二異丁酯 (DIBP)	< 1000 ppm

立 保 證 書 人 (Guarantor)

Company name 公司名稱： Innodisk Corporation 宜鼎國際股份有限公司

Company Representative 公司代表人： Randy Chien 簡川勝

Company Representative Title 公司代表人職稱： Chairman 董事長

Date 日期： 2017 / 01 / 18

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Revision Log

Rev	Date	Modification
0.1	13rd January 2017	Preliminary Edition
1.0	13rd January 2017	Official released.
1.1	13rd November 2018	Updated RoHS

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