innodisk

The Total Solution For Industrial Flash Storage

Approval Sheet

Customer	
Product Number	**M5R0-BGM2DCZQ**
Data Rate	**5600 MT/s**
Pin	**288 pin**
Cl-tRCD-tRP	**46-45-45**
Operating temperature	**Tc=0 to 95°C**
Date	**20th August 2024**

Rev 1.0

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

1. Features

- JEDEC Standard 288-pin Registered Dual In-Line Memory Module
- VDD=VDDQ= 1.1V (1.067V ~ 1.166V)
- VPP=1.8V (1.746V ~ 1.908V)
- VDDSPD= 1.8V
- On-die, internal, adjustable VREF generation for DQ,CA,CS
- 16n-bit prefetch
- Two independent I/O sub channels
- Programmable /CAS Latency: 22,26,28,30,32,36,40,42,46,50
- tREFI 3.9us for 0°C ≤Tcase < 85°C, tREFI 1.95us for 85°C < Tcase ≤ 95°C
- On-Die ECC
- PMIC on DIMM, nominal supply 12V/2.5A, VIN_Bulk input supply range: 4.25 V to 15 V
- Fly-by topology
- I3C/I2C support
- Terminated control and C/A bus
- SPD EEPROM Hub and Integrated Thermal Sensor
- Halogen-free

Specification

Density	Data Rate	IC Configuration	DIMM Organization	Number of IC	Number of rank	Side	ECC
32GB	5600 MT/s	2Gx8 (16Gb)	4Gx80	20	2	2	Y

Key timing parameters

tCK (ns)	tRCD (ns)	tRP (ns)	tRAS (ns)	tRC (ns)
0.357	16.00	16.00	32	48.00

tRFC parameter by IC Configuration

Parameter	IC Configuration				Unit
	8Gb	16Gb	24Gb	32Gb	
tRFC1,min	195	295	TBD	TBD	ns
tRFC2,min	130	160	TBD	TBD	ns
tRFCsb,min	115	130	TBD	TBD	ns

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

2. Pin Assignments

288-Pin DDR5 RDIMM Front								288-Pin DDR5 RDIMM Back							
Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol
1	VIN_BULK	37	Vss	73	Vss	109	DQ5_B	145	VIN_BULK	181	DQ22_A	217	CK_t	253	Vss
2	RFU	38	DQ21_A	74	PAR_A	110	Vss	146	VIN_BULK	182	Vss	218	CK_c	254	DQ7_B
3	VIN_MGMT	39	Vss	75	Vss	111	DQ8_B	147	PWR_GOOD/FAIL_n	183	DQ23_A	219	Vss	255	Vss
4	SCL	40	DQ24_A	76	CA0_B	112	Vss	148	SAA	184	Vss	220	RFU	256	DQ10_B
5	SDA	41	Vss	77	Vss	113	DQ9_B	149	RFU	185	DQ26_A	221	CA1_B	257	Vss
6	Vss	42	DQ25_A	78	CA2_B	114	Vss	150	RFU	186	Vss	222	Vss	258	DQ11_B
7	DQ0_A	43	Vss	79	Vss	115	DQS1_B_t	151	Vss	187	DQ27_A	223	CA3_B	259	Vss
8	Vss	44	DQS3_A_t	80	CA4_B	116	DQS1_B_c	152	DQ2_A	188	Vss	224	Vss	260	DQS6_B_c, TDQS6_B_c
9	DQ1_A	45	DQS3_A_c	81	Vss	117	Vss	153	Vss	189	DQS8_A_c, TDQS8_A_c	225	CA5_B	261	DQS6_B_t, TDQS6_B_t
10	Vss	46	Vss	82	CA6_B	118	DQ12_B	154	DQ3_A	190	DQS8_A_t, TDQS8_A_t	226	Vss	262	Vss
11	DQS0_A_t	47	DQ28_A	83	Vss	119	Vss	155	Vss	191	Vss	227	PAR_B	263	DQ14_B
12	DQS0_A_c	48	Vss	84	CS0_B_n	120	DQ13_B	156	DQS5_A_c, TDQS5_A_c DQS5_A_t, TDQS5_A_t	192	DQ30_A	228	Vss	264	Vss
13	Vss	49	DQ29_A	85	Vss	121	Vss	157	DQS5_A_t, TDQS5_A_t	193	Vss	229	CS1_B_n	265	DQ15_B
14	DQ4_A	50	Vss	86	LBD,RSP_A_n	122	DQ16_B	158	Vss	194	DQ31_A	230	Vss	266	Vss
15	Vss	51	CB0_A	87	LBS,RSP_B_n	123	Vss	159	DQ6_A	195	Vss	231	RFU	267	DQ18_B
16	DQ5_A	52	Vss	88	Vss	124	DQ17_B	160	Vss	196	CB2_A	232	RFU	268	Vss
17	Vss	53	CB1_A	89	CB4_B	125	Vss	161	DQ7_A	197	Vss	233	Vss	269	DQ19_B
18	DQ8_A	54	Vss	90	Vss	126	DQS2_B_t	162	Vss	198	CB3_A	234	CB6_B	270	Vss
19	Vss	55	DQS4_A_t	91	CB5_B	127	DQS2_B_c	163	DQ10_A	199	Vss	235	Vss	271	DQS7_B_c, TDQS7_B_c
20	DQ9_A	56	DQS4_A_c	92	Vss	128	Vss	164	Vss	200	DQS9_A_c, TDQS9_A_c	236	CB7_B	272	DQS7_B_t, TDQS7_B_t
21	Vss	57	Vss	93	DQS9_B_t, TDQS9_B_t , DBI4_B_n	129	DQ20_B	165	DQ11_A	201	DQS9_A_t, TDQS9_A_t	237	Vss	273	Vss
22	DQS1_A_t	58	CB4_A	94	DQS9_B_c, TDQS9_B_c	130	Vss	166	Vss	202	Vss	238	DQS4_B_c	274	DQ22_B
23	DQS1_A_c	59	Vss	95	Vss	131	DQ21_B	167	DQS6_A_c, TDQS6_A_c DQS6_A_t, TDQS6_A_t	203	CB6_A	239	DQS4_B_t	275	Vss
24	Vss	60	CB5_A	96	CB0_B	132	Vss	168	DQS6_A_t, TDQS6_A_t	204	Vss	240	Vss	276	DQ23_B
25	DQ12_A	61	Vss	97	Vss	133	DQ24_B	169	Vss	205	CB7_A	241	CB2_B	277	Vss
26	Vss	62	ALERT_n	98	CB1_B	134	Vss	170	DQ14_A	206	Vss	242	Vss	278	DQ26_B
27	DQ13_A	63	Vss	99	Vss	135	DQ25_B	171	Vss	207	RESET_n	243	CB3_B	279	Vss
28	Vss	64	CS0_A_n	100	DQ0_B	136	Vss	172	DQ15_A	208	Vss	244	Vss	280	DQ27_B
29	DQ16_A	65	Vss	101	Vss	137	DQS3_B_t	173	Vss	209	CS1_A_n	245	DQ2_B	281	Vss
30	Vss	66	CA0_A	102	DQ1_B	138	DQS3_B_c	174	DQ18_A	210	Vss	246	Vss	282	DQS8_B_c, TDQS8_B_c
31	DQ17_A	67	Vss	103	Vss	139	Vss	175	Vss	211	CA1_A	247	DQ3_B	283	DQS8_B_t, TDQS8_B_t
32	Vss	68	CA2_A	104	DQS0_B_t	140	DQ28_B	176	DQ19_A	212	Vss	248	Vss	284	Vss
33	DQS2_A_t	69	Vss	105	DQS0_B_c	141	Vss	177	Vss	213	CA3_A	249	DQS5_B_c, TDQS5_B_c	285	DQ30_B
34	DQS2_A_c	70	CA4_A	106	Vss	142	DQ29_B	178	DQS7_A_c, TDQS7_A_c	214	Vss	250	DQS5_B_t, TDQS5_B_t	286	Vss
35	Vss	71	Vss	107	DQ4_B	143	Vss	179	DQS7_A_t, TDQS7_A_t	215	CA5_A	251	Vss	287	DQ31_B
36	DQ20_A	72	CA6_A	108	Vss	144	RFU	180	Vss	216	Vss	252	DQ6_B	288	Vss

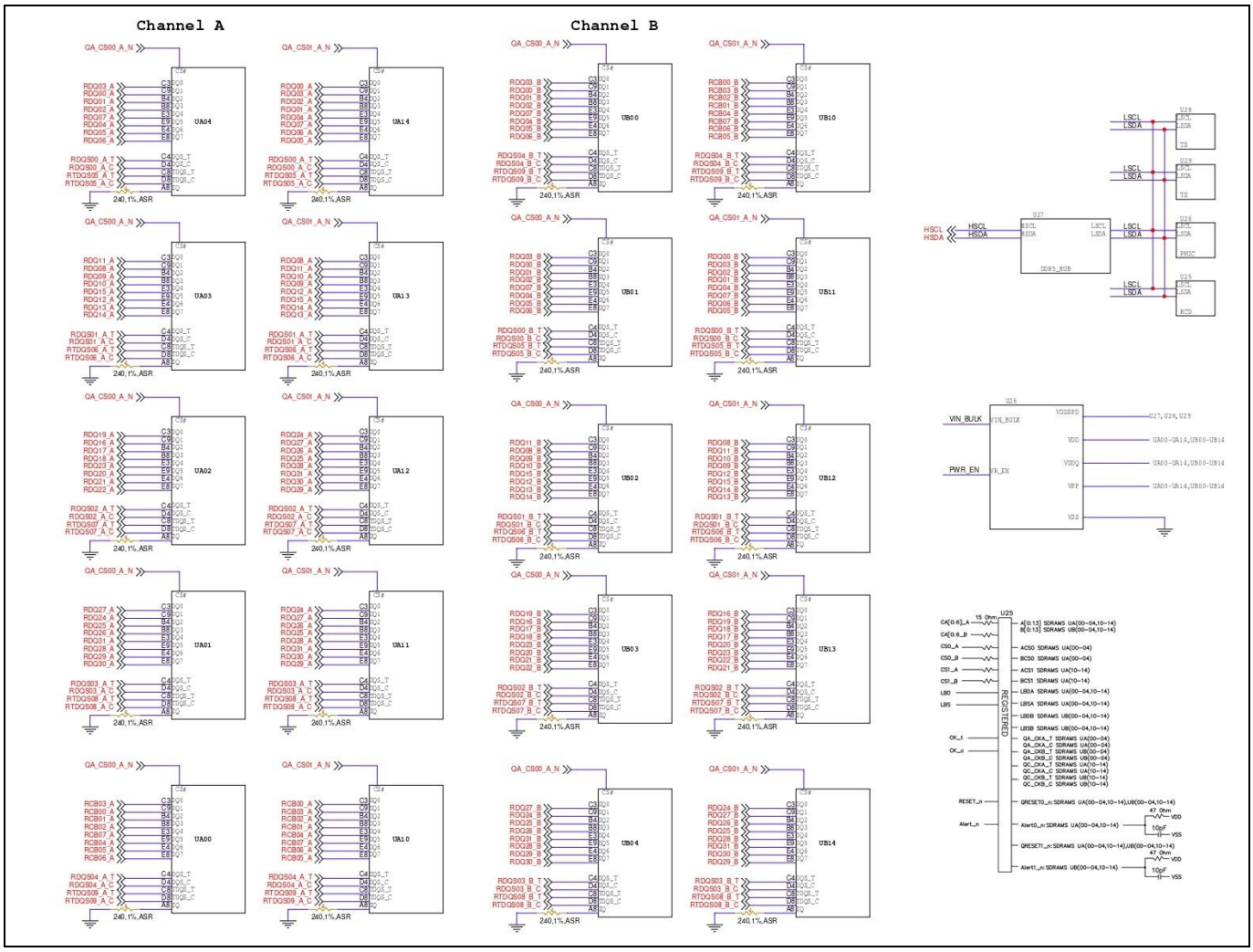
2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

3. Pin Descriptions

Symbol	Type	I/O Level	Description	Symbol	Type	I/O Level	Description
CK_t, CK_c	Input	VDDQ	Clock	DQ[31:0]_A DQ[31:0]_B	Input/ Output	VDDQ	Data Input/Output
CA[6:0]_A CA[6:0]_B	Input	VDDQ	Command/Address Inputs	CB[7:0]_A CB[7:0]_B	Input/ Output	VDDQ	ECC Check Bits Input/Output
CS[1:0]_A CS[1:0]_B	Input	VDDQ	Chip Select	DQS[9:0]_A_t DQS[9:0]_B_t	Input/ Output	VDDQ	Data Strobe
PAR_A PAR_B	Input	VDDQ	Command and Address Parity Input	DQS[9:0]_A_c DQS[9:0]_B_c	Input/ Output	VDDQ	Data Strobe
ALERT_n	Output	VDDQ	Alert	TDQS[9:0]_A_t TDQS[9:0]_B_t	Input/ Output	VDDQ	Termination Data Strobe
RESET_n	CMOS Input	VDDQ	Active Low Asynchronous Reset	TDQS[9:0]_A_c TDQS[9:0]_B_c	Input/ Output	VDDQ	Termination Data Strobe
PWR_GOOD/FAI L_n	Input/ Output	VDDQ	Power Good Indicator	VIN_BULK	Supply		External Power Supply
DM[3:0]_A_n DM[3:0]_B_n	Input	VDDQ	Input Data Mask	VIN_MGMT	Supply		External Power Supply
HSCL	Input	VOUT	Host Sideband Bus Clock	LBD RSP_A_n	Output	VDDQ	Loopback data output
HSDA	nput/Output	VOUT	Host Sideband Bus Data	LBS	Output	VDDQ	Loopback data strobe output
HSA	Input	GND	Host Sideband Bus Device ID	VSS	Supply		Ground
RFU			Reserved for future use				

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

4. Function Block Diagram



2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

5. Thermal Characteristics

Symbol	Parameter		Rating	Units	Note
T_C	Operation Temperature	Normal Operating Temp.	0 to 85	°C	1,2,3
		Extended Temp.	85 to 95	°C	1,2,3,4
T_{STG}	Storage Temperature		-55 to 100	°C	5

Note:

1. Maximum operating case temperature; Tc is measured in the center of the package.
2. A thermal solution must be designed to ensure the DRAM device does not exceed the maximum Tc during operation.
3. Device functionality is not guaranteed if the DRAM device exceeds the maximum Tc during operation.
4. If Tc exceeds 85°C, the DRAM must be refreshed externally at 2X refresh, which is a 1.95μs interval refresh rate.
5. Storage temperature is defined as the temperature of the top/center of the DRAM and does not reflect the storage temperatures of shipping trays.

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

6. IDD, IDDQ and IPP Specifications

Symbol	Description	Value		Units
		IDD Max.	IPP Max.	
IDD0	Operating One Bank Active-Precharge Current	1020	160	mA
IDD0F	Operating Four Bank Active-Precharge Current	1390	180	mA
IDD2N	Precharge Standby Current	980	140	mA
IDD2P	Precharge Power-Down Current	940	140	mA
IDD3N	Active Standby Current	2220	160	mA
IDD3P	Active Power-Down Current	2200	160	mA
IDD4R	Operating Burst Read Current	3120	170	mA
IDD4W	Operating Burst Write Current	3180	300	mA
IDD5B	Burst Refresh Current (Normal Refresh Mode)	4810	400	mA
IDD5C	Burst Refresh Current (Same Bank Refresh Mode)	1970	210	mA
IDD6N	Self Refresh Current: Normal Temperature Range	2240	300	mA
IDD6E	Self Refresh Current: Extended Temperature Range	3720	400	mA
IDD7	Operating Bank Interleave Read Current	4350	310	mA
IDD8	Maximum Power Saving Deep Power Down Current	840	140	mA

The above information may be change due to the update of the device specifications and is for reference only.

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

7. Timing Parameters

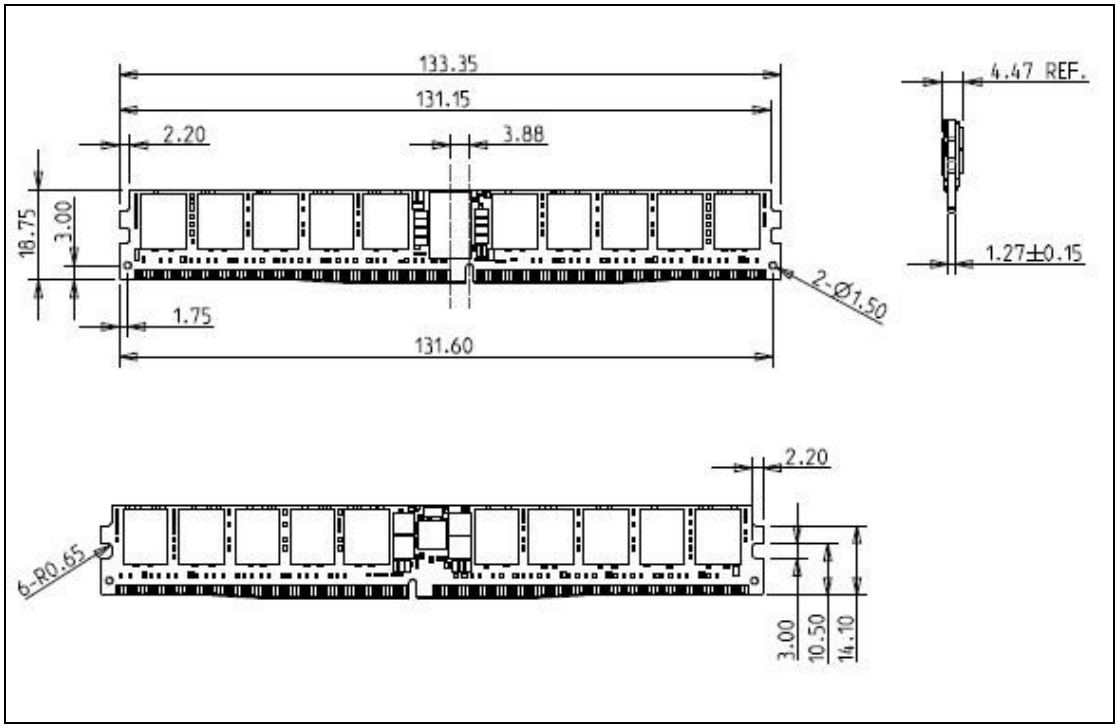
Parameter	Symbol	5600		6000		6400		Unit
		Min	Max	Min	Max	Min	Max	
Clock Timing								
Average clock period	tCK,AVG	0.357		0.333		0.312		ns
Command and Address Timing								
Read to Read command delay for same bank group	tCCD_L	8nCK,5ns (MAX)		8nCK,5ns (MAX)		8nCK,5ns (MAX)		nCK
WRITE to WRITE command delay for same bank group	tCCD_L_WR	32nCK, 20ns (MAX)		32nCK, 20ns (MAX)		32nCK, 20ns (MAX)		nCK
WRITE to WRITE command delay for same bank group, second WRITE not RMW	tCCD_L_WR2	16nCK, 10ns (MAX)		16nCK, 10ns (MAX)		16nCK, 10ns (MAX)		nCK
Read to Read or Write to Write command delay for different bank group for BL16, BC8 OTF	tCCD_S	8		8		8		nCK
ACTIVATE to ACTIVATE command delay to different bank group for 2KB page size	tRRD_S,2K	8		8		8		nCK
ACTIVATE to ACTIVATE command delay to different bank group for 1KB page size	tRRD_S,1K	8		8		8		nCK
ACTIVATE to ACTIVATE command delay to same bank group for 2KB page size	tRRD_L,2K	8nCK,5ns (MAX)		8nCK,5ns (MAX)		8nCK,5ns (MAX)		nCK
ACTIVATE to ACTIVATE command delay to same bank group for 1KB page size	tRRD_L,1K	8nCK,5ns (MAX)		8nCK,5ns (MAX)		8nCK,5ns (MAX)		nCK
Four activate window for	tFAW,2K	40nCK,		40nCK,		40nCK,		ns

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

2KB page size		14.280ns (MAX)		13.333ns (MAX)		12.500ns (MAX)		
Four activate window for 1KB page size	tFAW,1K	32nCK, 11.428ns (MAX)		32nCK, 10.666ns (MAX)		32nCK, 10.000ns (MAX)		ns
Delay from start of internal WRITE transaction to internal READ command for different bank group	tWTR_S	2.5		2.5		2.5		ns
Delay from start of internal WRITE transaction to internal READ command for same bank group	tWTR_L	10		10		10		ns
Delay from start of internal WRITE transaction to internal READ with AUTO PRECHARGE command for same bank	tWTRA	tWR-tRTP		tWR-tRTP		tWR-tRTP		ns
Internal READ command to PRECHARGE command delay	tRTP	7.5		7.5		7.5		ns
PRECHARGE to PRECHARGE delay	tPPD	2		2		2		nCK
WRITE recovery time	tWR	30		30		30		ns

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

8. Module Dimensions



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

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

9. RoHS Declaration

innodisk

宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Internet: https://www.innodisk.com/

RoHS 自我宣告書(RoHS Declaration of Conformity)

Manufacturer Products: All Innodisk EM FLASH, DRAM and EP 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.

三、 本公司聲明我們的產品符合 RoHS 指令的附件中 7(a)、7(c)-I、6(c)允許豁免。
We declare, our products permitted by the following exemptions specified in the Annex of the RoHS directive.

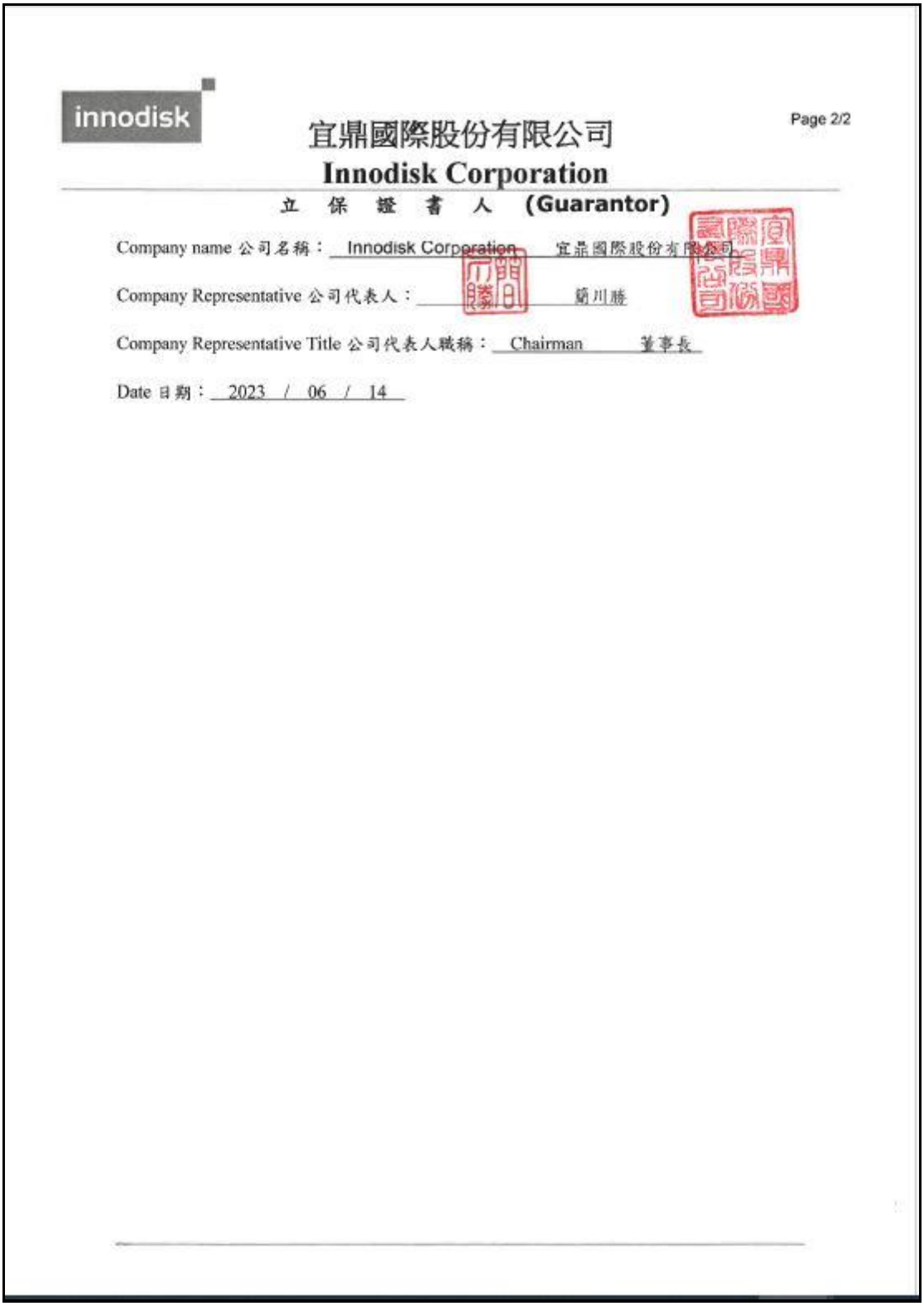
※ 7(a) Lead in high melting temperature type solders(i.e. lead-based alloys containing 85% by weight or more lead).

※ 7(c)-I Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectric devices, or in a glass or ceramic matrix compound.

※ 6(c) Copper alloy containing up to 4% lead by weight. (This exemption applies to products that use antennas)

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

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.



innodisk

宜鼎國際股份有限公司

Innodisk Corporation

Page 2/2

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： 簡川勝

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

Date 日期： 2023 / 06 / 14

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

10. REACH Declaration

innodisk

宜鼎國際股份有限公司
Innodisk Corporation
REACH Declaration

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

Innodisk Corporation pursues its social responsibility for global environmental preservation by committing to be compliant with REACH regulation (REGULATION (EC) No 1907/2006).
We hereby confirm that the product(s),

Scope: Flash Memory, DRAM Module and Embedded Peripherals Products.

■ The standard products of **not listed in** the ***Appendix2*** meet the requirements of REACH SVHC regulations(SVHCs < 0.1% in Article), as described in the candidate list table currently including 240 substances (release date: 23-JAN-2024) and shown on the ECHA website. https://echa.europa.eu/candidate-list-table

■ The standard products listed in the ***Appendix2*** contain(s) one or more hazardous substances or constituents exceeding 0.1 % by weight in article if not otherwise specified in candidate list table.
Where the threshold value is exceeded, the substances in question are to be declared in accompanying. (SVHCs > 0.1% in Article).

■ Comply with REACH Annex XVII.

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： Yichuan Chen 陳怡全

Company Representative Title 公司代表人職稱：Quality Assurance Div. SR. Manager 品保處經理

Date 日期：2024 / 02 / 19

1

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.

Revision Log

Rev	Date	Modification
0.1	20th August 2024	Preliminary Edition
1.0	20th August 2024	Official released

2017©Innodisk Corp. All rights reserved
Innodisk Corp. reserves the right to change the Products and Specification without notices.