innodisk

The Total Solution For Industrial Flash Storage

Approval Sheet

Customer	
Product Number	M3DW-2GMJ2W0C-K
Module speed	**PC3-12800**
Pin	**204pin**
Cl-tRCD-tRP	11-11-11
SDRAM Operating Temp	**-40℃~85℃**
Date	**14th May 2014**

Approval by Customer

P/N:

Signature:

Date:

Sales: **Sr. Technical Manager: John Hsieh**

Rev 1.0

1. Features

Key Parameter

Industry Nomenclature	Speed Grade	Data Rate MT/s			tAA (ns)	tRCD (ns)	tRP (ns)
		CL=7	CL=9	CL=11			
PC3-12800	**P**	1066	1333	1600	13.125	13.125	13.125

- JEDEC Standard 204-pin Dual In-Line Memory Module
- Intend for PC3-12800 applications
- Inputs and Outputs are SSTL-15 compatible
- VDD=VDDQ= 1.5 Volt (- 0.075/+0.075V)
- Bi-directional Differential Data Strobe
- DLL aligns DQ and DQS transition with CK transition
- SDRAMs have 8 internal banks for concurrent operation
- Normal and Dynamic On-Die Termination support.
- SDRAMs are 78-ball BGA Package
- On-Board Thermal Sensor (Optional)
- Golden Connector (Au: 30u")
- 8 bit pre-fetch
- Two different termination values (Rtt_Nom & Rtt_WR)
- Auto & self refresh 7.8μs ($T_A \leq +85°C$)
- 15/10/1 Addressing (row/column/rank)-2GB
- SDRAM operating temperature range

  $-40°C \leq T_A \leq +85°C$
- Programmable Device Operation:
  - Burst Type: Sequential or Interleave
  - Device CAS# Latency: 7, 9 ,11
  - Burst Length: switch on-the-fly: BL=8 or BC 4
- RoHS Compliant *(Section 14)*

2. Environmental Requirements

iDIMM is intended for use in standard office environments that have limited capacity for heating and air conditioning.

Symbol	Parameter	Rating	Units	Notes
T_{OPR}	SDRAM Operating Temperature (ambient)	-40 to +85	°C	1
T_{STG}	Storage Temperature	-50 to +100	°C	
H_{OPR}	Operating Humidity (relative)	10 to 90	%	
H_{STG}	Storage Humidity (without condensation)	5 to 95	%	
P_{BAR}	Barometric Pressure (operating & storage)	105 to 69	K Pascal	1,2

1. The component maximum case temperature (Tcase) shall not exceed the value specified in the DDR DRAM component specification.
2. Up to 9850 ft.

3. SDRAM Parameters by device density

RTT_Nom Setting	Parameter		2Gb	Units
tRFC	REF command ACT or REF command time		160	ns
tREFI	Average periodic refresh interval	0°C≦T_{CASE}≦85°C	7.8	µs
		85°C≦T_{CASE}≦95°C	3.9	µs

4. Ordering Information

W/T DDR3 ECCSODIMM							
Part Number	Density	Speed	Organization	Number of DRAM	Number of rank	ECC	Thermal Sensor
M3DW-2GMJ2W0C-K	2GB	PC3-12800	256Mx72	9	1	Y	Y

5. Pin Configurations (Front side/Back side)

X72 SODIMM

204-Pin DDR3 SO-UDIMM

FRONT								BACK							
Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name
1	VREFDQ	53	VSS	105	A1	157	DM5	2	VSS	54	DQ28	106	A2	158	VSS
3	VSS	55	DQ24	107	A0	159	DQ42	4	DQ4	56	DQ29	108	BA1	160	DQ46
5	DQ0	57	DQ25	109	VDD	161	DQ43	6	DQ5	58	VSS	110	VDD	162	DQ47
7	DQ1	59	DM3	111	CK0	163	VSS	8	VSS	60	DQS3#	112	ParIn/NC/ CK1	164	VSS
9	VSS	61	VSS	113	CK0#	165	DQ48	10	DQS0#	62	DQS3	114	ErrOut/NC/ CK1#	166	DQ52
11	DM0	63	DQ26	115	VDD	167	DQ49	12	DQS0	64	VSS	116	VDD	168	DQ53
13	DQ2	65	DQ27	117	A10/AP	169	VSS	14	VSS	66	DQ30	118	NC/CS3#	170	VSS
15	DQ3	67	VSS	119	BA0	171	DQS6#	16	DQ6	68	DQ31	120	NC/CS2#	172	DM6
17	VSS	69	CS0	121	WE#	173	DQS6	18	DQ7	70	VSS	122	RAS#	174	DQ54
19	DQ8	71	CB1	123	VDD	175	VSS	20	VSS	72	CB4	124	VDD	176	DQ55
21	DQ9	73	VSS	125	CAS#	177	DQ50	22	DQ12	74	CB5	126	ODT0	178	VSS
23	VSS	75	DQS8#	127	CS0#	179	DQ51	24	DQ13	76	DM8	128	NC/ODT1	180	DQ60
25	DQS1#	77	DQS8	129	NC/CS1#	181	VSS	26	VSS	78	VSS	130	A13	182	DQ61
27	DQS1	79	VSS	131	VDD	183	DQ56	28	DM1	80	CB6	132	VDD	184	VSS
29	VSS	81	CB2	133	DQ32	185	DQ57	30	RESET#	82	CB7	134	DQ36	186	DQS7#
31	DQ10	83	CB3	135	DQ33	187	VSS	32	VSS	84	VREFCA	136	DQ37	188	DQS7
33	DQ11	85	VDD	137	VSS	189	DM7	34	DQ14	86	VDD	138	VSS	190	VSS
35	VSS	87	CKE0	139	DQS4#	191	DQ58	36	DQ15	88	A15*	140	DM4	192	DQ62
37	DQ16	89	NC/CKE1#	141	DQS4	193	DQ59	38	VSS	90	A14*	142	DQ38	194	DQ63
39	DQ17	91	BA2	143	VSS	195	VSS	40	DQ20	92	A9	144	DQ39	196	VSS
41	VSS	93	VDD	145	DQ34	197	BA0	42	DQ21	94	VDD	146	VSS	198	EVENT#
43	DQS2#	95	A12/BC#	147	DQ35	199	VDDSPD	44	DM2	96	A11	148	DQ44	200	SDA
45	DQS2	97	A8	149	VSS	201	SA1	46	VSS	98	A7	150	DQ45	202	SCL
47	VSS	99	A5	151	DQ40	203	VTT	48	DQ22	100	A6	152	VSS	204	VTT
49	DQ18	101	VDD	153	DQ41			50	DQ23	102	VDD	154	DQS5#		
51	DQ19	103	A3	155	VSS			52	VSS	104	A4	156	DQS5		

Notes:
* These pins are not used in this module.
CS2#, CS3# (pin 120, 118) are used for a 4 rank module.

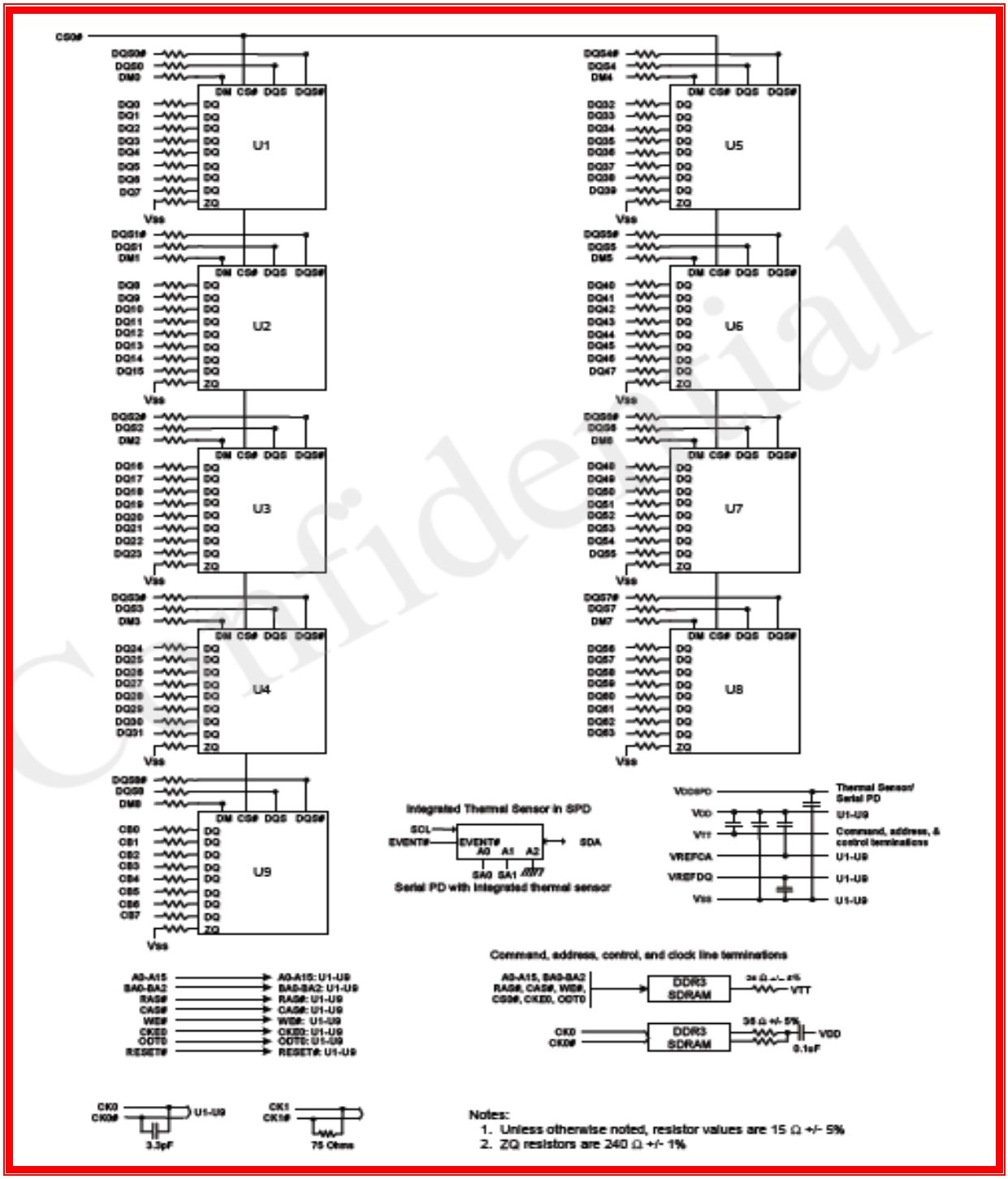
6. Architecture

Pin Definition

Pin Name	Description	Pin Name	Description
A0 - A13 (A14 or A15)	SDRAM address bus	SCL	Serial Presence Detect Clock Input
BA0 - BA1 (or BA2)	SDRAM Bank Address Inputs	SDA	Serial Presence Detect Data input/output
/RAS	SDRAM row address strobe	SA0 – SA2	Serial Presence Detect Address Inputs
/CAS	SDRAM column address strobe	V_{DD}	Power Supply
/WE	SDRAM write enable	V_{DDID}	V_{DD} Identification Flag
/S0 - /S1	DIMM Rank Select Lines	V_{DDQ}	SDRAM I/O Driver power supply
CK0 – CKE1	SDRAM clock enable lines	V_{REFDQ}	SDRAM I/O Reference supply
DQ0 – DQ63	DIMM memory data bus	V_{REFCA}	SDRAM Command/address reference supply.
CB0 – CB7	DIMM ECC check bit	V_{SS}	Ground
DQS0 – DQS8 /DQS0-/DQS8	SDRAM data strobes	V_{DDSPD}	Serial EEPROM positive power supply
DM0 – DM8	SDRAM data masks	NC	Spare Pin
ODT0-ODT1	Spare Pin	/Reset	Reset enable
CK0 – CK1 /CK0 - /CK1	Differential SDRAM Clocks	Event#	Reserved for optional temperature-sensing hardware
RSVD	Reserved for future use.	V_{TT}	SDRAM I/O termination supply.

7. Function Block Diagram:

- (2GB, 1 Ranks, 256Mx72 DDR3 SDRAMs)



Note: Temperature sensor accuracy (max):

– ± 1 °C from +75 °C to +95 °C

– ± 2 °C from +40 °C to +125 °C

– ± 3 °C from –40 °C to +125 °C

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8. SDRAM Absolute Maximum Ratings

Symbol	Parameter		Rating	Units	Note
T_{OPER}	Operation Temperature	Normal Operating Temp.	-40 to 85	°C	1,2
		Extended Temp.(optional)	85 to 95	°C	1,3
T_{STG}	Storage Temperature		-55 to 100	°C	4,5
V_{IN}, V_{OUT}	Voltage on any pins relative to Vss		-0.4 to +1.975	V	4
V_{DD}	Voltage on VDD supply relative to Vss		-0.4 to +1.975	V	4,6
V_{DDQ}	Voltage on VDDQ supply relative to Vss		-0.4 to +1.975	V	4,6

Note:

1. Operating Temperature TOPER is the case surface temperature on the center / top side of the DRAM.
For measurement conditions, please refer to the JEDEC document JESD51-2.
2. The Normal Temperature Range specifies the temperatures where all DRAM specifications will be supported. During operation, the DRAM case temperature must be maintained between 0 to 85 °C under
all operating conditions.
3. Some applications require operation of the DRAM in the Extended Temperature Range between 85 °C and 95 ℃ case temperature. Full specifications are supported in this range, but the following additional
conditions apply:
   a) Refresh commands must be doubled in frequency, therefore reducing the Refresh interval tREFI to 3.9 µs. It is also possible to specify a component with 1X refresh (tREFI to 7.8µs) in the Extended Temperature Range. Please refer to supplier data sheet and/or the DIMM SPD for option availability.
   b) If Self-Refresh operation is required in the Extended Temperature Range, then it is mandatory to either use the Manual Self-Refresh mode with Extended Temperature Range capability (MR2 A6 =0b and MR2 A7 = 1b) or enable the optional Auto Self-Refresh mode (MR2 A6 = 1b and MR2 A7 =0b). Please refer to the supplier data sheet and/or the DIMM SPD for Auto Self-Refresh option availability, Extended Temperature Range support and tREFI requirements in the Extended Temperature Range.
4. Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is 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.
5. 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.
6. VDD and VDDQ must be within 300 mV of each other at all times;and VREF must be not greater than 0.6 x VDDQ, When VDD and VDDQ are less than 500 mV; VREF may be equal to or less than 300 mV

9. DRAM AC & DC Operating

Symbol	Parameter	Min	Typ.	Max	Units	Notes
Recommended DC Operating Conditions						
V_{DD}	Supply Voltage	1.425	1.5	1.575	V	1,2
V_{DDQ}	Supply Voltage	1.425	1.5	1.575	V	1,2
Single Ended AC/DC Input Levels						
$V_{IH\ (DC)}$	DC Input High (Logic1) Voltage	V_{REF} + 0.1	-	V_{DD}	V	3
$V_{IL\ (DC)}$	DC Input Low (Logic 0) Voltage	V_{SS}	-	V_{REF} - 0.1	V	3
$V_{IH\ (AC)}$	AC Input High (Logic1) Voltage	V_{REF}+ 0.175	-	-	V	3
$V_{IL\ (AC)}$	AC Input Low (Logic 0) Voltage	-	-	V_{REF} - 0.175	V	3
$V_{REFDQ\ (DC)}$	Reference Voltage for DQ, DM inputs	0.49V_{DDQ}	0.5V_{DDQ}	0.51V_{DDQ}	V	4,5
$V_{REFCA\ (DC)}$	Reference Voltage for ADD,CMD inputs	0.49V_{DDQ}	0.5V_{DDQ}	0.51V_{DDQ}	V	4,5
Single Ended AC/DC output Levels						
$V_{OH\ (DC)}$	DC output high measurement level (for IV curve linearity)	-	0.8 x VDDQ	-	V	
$V_{OM\ (DC)}$	DC output mid measurement level (for IV curve linearity)	-	0.5 x VDDQ	-	V	
$V_{OL\ (DC)}$	DC output low measurement level (for IV curve linearity)	-	0.2 x VDDQ	-	V	
$V_{OH\ (AC)}$	AC output high measurement level (for output SR)	-	VTT + 0.1 x VDDQ	-	V	6
$V_{OL\ (AC)}$	AC output low measurement level (for output SR)		VTT - 0.1 x VDDQ	-	V	6

Symbol	Parameter	Min	Typ.	Max	Units	Notes
Differential AC/DC Input Levels						
V_{IHdiff}	Differential Input high	+0.2	-	Note 9	V	7
V_{ILdiff}	Differential Input logic Low	Note 9	-	-0.2	V	7
$V_{IHdiff(ac)}$	Differential Input high ac	2* ($V_{IH\ (AC)}$-V_{REF})	-	Note 9	V	8
$V_{ILdiff(ac)}$	Differential Input logic Low ac	Note 9	-	2* (V_{REF}-$V_{IL\ (AC)}$)	V	8
Differential AC and DC Output Levels						
$V_{OHdiff(AC)}$	AC differential output high measurement level (for output SR)	-	+ 0.2 x VDDQ	-	V	10
$V_{OLdiff(AC)}$	AC differential output low measurement level (for output SR)	-	- 0.2 x VDDQ	-	V	10

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. For DQ and DM, Vref = VrefDQ. For input ony pins except RESET#, Vref = VrefCA.
4. The ac peak noise on VRef may not allow VRef to deviate from VRef(DC) by more than +/-1% VDD (for reference: approx. +/- 15 mV).
5. For reference: approx. VDD/2 +/- 15 mV.
6. The swing of ± 0.1 × V_{DDQ} is based on approximately 50% of the static single-ended output high or low swing with a driver impedance of 40 Ω and an effective test load of 25 Ω to V_{TT} = V_{DDQ}/2
7. Used to define a differential signal slew-rate.
8. For CK - CK# use VIH/VIL(ac) of ADD/CMD and VREFCA; for DQS - DQS#, DQSL, DQSL#, DQSU , DQSU# use VIH/VIL(ac) of DQs and VREFDQ; if a reduced ac-high or ac-low level is used for a signal group, then the reduced level applies also here.
9. These values are not defined, however the single-ended signals CK, CK#, DQS, DQS#, DQSL, DQSL#, DQSU, DQSU# need to be within the respective limits (VIH(dc) max, VIL(dc)min) for single- ended signals as well as the limitations for overshoot and undershoot.
10. The swing of ± 0.2 × V_{DDQ} is based on approximately 50% of the static single-ended output high or low swing with a driver impedance of 40 Ω and an effective test load of 25 Ω to V_{TT} = V_{DDQ}/2 at each of the differential outputs.

10. Operating, Standby, and Refresh Currents

- 2GB SODIMM (1 Rank, 256Mx8 DDR3 SDRAMs T_{CASE} =-40 °C ~ 85 °C)

Symbol	Parameter/Condition		12800	Unit
I DD0	One bank; Active - Precharge		351	mA
I DD1	One bank; Active - Read - Precharge		468	mA
I DD2N	Precharge Standby Current		189	mA
IDD2NT	Precharge Standby ODT Current		279	mA
I DD2P	Precharge Power Down Current	Fast Mode	126	mA
	Precharge Power Down Current	Slow Mode	108	mA
I DD2Q	Pecharge Quiet Standby Current		180	mA
I DD3N	Active Standby Current		288	mA
I DD3P	Active Power-Down Current		189	mA
I DD4R	Operating Current Burst Read		846	mA
I DD4W	Operating Current Burst Write		873	mA
I DD5B	Burst Refresh Current		1620	mA
I DD6	Self-Refresh Current: Normal Temperature Range		108	mA
I DD6ET	Self-Refresh Current: Extended Temperature Range		135	mA
I DD7	Operating Bank Interleave Read Current		1404	mA
I DD8	Low precharge current		126	mA

11. Timing Parameters

(T_{CASE} = -40 °C ~ 85 °C; V_{DDQ} = V_{DD} , See AC Characteristics)

Symbol	Parameter	PC3-12800		Unit
		Min.	Max.	
Clock Timing				
tCK (DLL-Off)	Minimum Clock Cycle Time	8	-	ns
tCK (avg)	Average Clock Period	1.5	3.3	ns
tCH (avg)	Average high pulse width	0.47	0.53	tCK (avg)
tCL (avg)	Average low pulse width	0.47	0.53	tCK (avg)
tCK (abs)	Absolute Clock Period	tCK(avg) min + tJIT(per) min	tCK(avg) max + tJIT(per) max -	Ps
tCH (abs)	Absolute high pulse width	0.43	-	tCK (avg)
tCL (abs)	Absolute low pulse width	0.43	-	tCK (avg)
JIT (per)	Clock Period Jitter	-70	70	Ps
TJIT (per, lck)	Clock Period Jitter during DLL locking period.	-60	60	Ps
JIT (CC)	Cycle to Cycle Period Jitter	140		Ps
TJIT (CC, lck)	Cycle to Cycle Period Jitter during DLL locking period.	120		Ps
TJIT (duty)		-	-	Ps
TERR (2per)	Cumulative error across 2 cycle	-103	-103	Ps
TERR (3per)	Cumulative error across 3 cycle	-122	-122	Ps
TERR (4per)	Cumulative error across 4 cycle	-136	-136	Ps
TERR (5per)	Cumulative error across 5 cycle	-147	-147	Ps
TERR (6per)	Cumulative error across 6 cycle	-155	-155	Ps
TERR (7per)	Cumulative error across 7 cycle	-163	-163	Ps
TERR (8per)	Cumulative error across 3 cycle	-169	-169	Ps
TERR (9per)	Cumulative error across 4 cycle	-175	-175	Ps
TERR (10per)	Cumulative error across 5 cycle	-180	-180	Ps

TERR (11per)	Cumulative error across 6 cycle	-184	-184	Ps
TERR (12per)	Cumulative error across 7 cycle	-188	-188	Ps
TERR (nper)	Cumulative error across 13~50 cycle	$t_{ERR(nper)min} = (1 + 0.68ln(n)) * t_{JIT(per)min}$ $t_{ERR(nper)max} = (1 + 0.68ln(n)) * t_{JIT(per)max}$		Ps
Data Timing				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tDSQ	DQS, DQS# to DQ skew, per group, per access	-	100	Ps
tQH	DQ output hold time from DQS, DQS#	0.38	-	tCK(avg)
tLZ (DQ)	DQ low-impedance time from CK, CK#	-450	225	Ps
tHZ(DQ)	DQ high impedance time from CK, CK#	-	225	Ps
tDS(base) AC150	Data setup time to DQS, DQS# referenced to Vih(ac) / Vil(ac) levels	25	-	Ps
tDH(base) DC 100	Data hold time from DQS, DQS# referenced to Vih(dc) / Vil(dc) levels	55	-	Ps
Data Strobe Timing				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tRPRE	DQS,DQS# differential READ Preamble	0.9		tCK(avg)
tRPST	DQS, DQS# differential READ Postamble	0.3		tCK(avg)
tQSH	DQS, DQS# differential output high time	0.4		tCK(avg)
tQSL	DQS, DQS# differential output low time	0.4		tCK(avg)
tWPRE	DQS, DQS# differential WRITE Preamble	0.9		tCK(avg)
tWPST	DQS, DQS# differential WRITE Postamble	0.3		tCK(avg)
tDQSCK	DQS, DQS# rising edge output access time from rising CK, CK#	-225	225	Ps

tLZ(DQS)	DQS and DQS# low-impedance time (Referenced from RL - 1)	-450	225	Ps
tHZ(DQS)	DQS and DQS# high-impedance time (Referenced from RL + BL/2)	-	225	Ps
tDQSL	DQS, DQS# differential input low pulse width	0.45	0.55	tCK(avg)
tDQSH	DQS, DQS# differential input high pulse width	0.45	0.55	tCK(avg)
tDQSS	DQS, DQS# rising edge to CK, CK# rising edge	-0.27	0.27	tCK(avg)
tDSS	DQS, DQS# falling edge setup time to CK, CK# rising edge	0.18	-	tCK(avg)
tDSH	DQS, DQS# falling edge hold time from CK, CK# rising edge	0.18	-	tCK(avg)
Command and Address Timing				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tDLLK	DLL locking time	512	-	nCK
tRTP	Internal READ Command to PRECHARGE Command delay	max(4nCK, 7.5ns)	-	
tWTR	Delay from start of internal write transaction to Internal read command	max(4nCK, 7.5ns)	-	
tWR	WRITE recovery time	15	-	ns
tMRD	Mode Register Set command cycle time	4	-	nCK
tMOD	Mode Register Set command update delay	max(12nCK, 15ns)	-	
tRCD	Refer to Section 1 Feature			
tRP	Refer to Section 1 Feature			
tRC	Refer to Section 1 Feature			
tCCD	CAS# to CAS# command delay	4	-	nCK

tDAL (min)	Auto precharge write recovery + precharge time	WR + roundup(tRP / tCK(avg))		nCK
tMPRR	Multi-Purpose Register Recovery Time	1	-	nCK
tRAS	ACTIVE to PRECHARGE command period	36	9 tREFI	ns
tRRD	ACTIVE to ACTIVE command period for 1KB page size	max(4nCK, 6ns)	-	
tRRD	ACTIVE to ACTIVE command period for 2KB page size	max(4nCK, 7.5ns)	-	
tFAW	Four activate window for 1KB page size	30	-	ns
tFAW	Four activate window for 2KB page size	40	-	ns
tIS (base)	Command and Address setup time to CK, CK#, referenced to Vih(ac) / Vil(ac) levels.	65		ns
tIH(base)	Command and Address hold time from CK, CK# referenced to Vih(dc) / Vil(dc) levels	130		ps
tIS(base) AC150	Command and Address setup time to CK, CK# referenced to Vih(ac) / Vil(ac) levels	65+125		ps
Calibration Timing				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tZQinit	Power-up and RESET calibration time	512	-	nCK
tZQoper	Normal operation Full calibration time	256	-	nCK
tZQCS	Normal operation Short calibration time	64	-	nCK
Reset Timing				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tXPR	Exit Reset from CKE HIGH to a valid command	max(5nCK,tRFC(min) +10ns)	-	

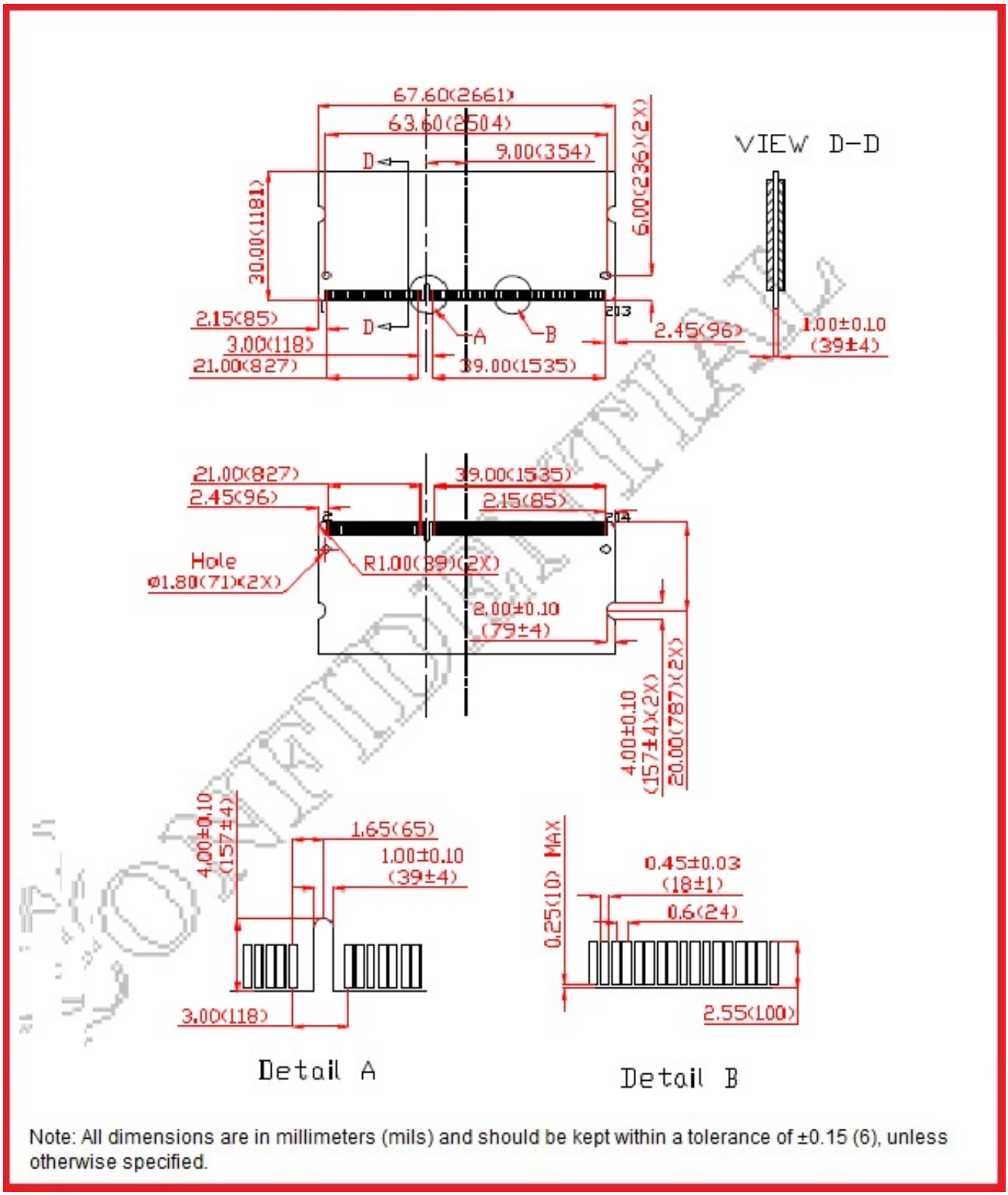
Self Refresh Timings				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tXS	Exit Self Refresh to commands not requiring a locked DLL	Max(5nCK), tRFC(min) +10ns)		
tXSDLL	Exit Self Refresh to commands requiring a locked DLL.	tDLL(min)	-	nCK
tCKESR	Minimum CKE low width for Self Refresh entry to exit timing.	tCKE9min) +1nCK	-	
tCKSRE	Valid Clock Requirement after Self Refresh Entry (SRE) or Power-Down Entry (PDE)	Max(5nCK ,10ns)	-	
tCKSRX	Valid Clock Requirement before Self Refresh Exit (SRX) or Power-Down Exit (PDX) or Reset Exit	Max(5nCK ,10ns)	-	
Power Down Timings				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tXP	Exit Power Down with DLL on to any valid command; Exit Precharge Power Down with DLL frozen to commands not requiring a locked DLL	max(3nCK, 6ns)	-	
tXPDLL	Exit Precharge Power Down with DLL frozen to commands requiring a locked DLL	max(10nCK, 24ns)	-	
tCKE	CKE minimum pulse width	max(3nCK,5.625ns)	-	
tCPDED	Command pass disable delay	1	-	nCK
tPD	Power Down Entry to Exit Timing	tCK(min)	9*tREFI	
tACTPDEN	Timing of ACT command to Power Down entry	1	-	nCK

tPRPDEN	Timing of PRE or PREA command to Power Down entry	1	-	nCK
tRDPDEN	Timing of RD/RDA command to Power Down entry	RL+4+1	-	nCK
tWRPDEN	Timing of WR command to Power Down entry (BL8OTF, BL8MRS, BC4OTF)	WL + 4 + (tWR / tCK(avg))	-	nCK
tWRAPDEN	Timing of WRA command to Power Down entry (BL8OTF, BL8MRS, BC4OTF)	WL + 4 + WR + 1	-	nCK
tWRPDEN	Timing of WR command to Power Down entry (BC4MRS)	WL + 2 + (tWR / tCK(avg))	-	nCK
tWRAPDEN	Timing of WRA command to Power Down entry (BC4MRS)	WL + 2 + WR + 1	-	nCK
tREFPDEN	Timing of REF command to Power Down entry	1	-	nCK
tMRSPDEN	Timing of MRS command to Power Down entry	tMOD(min)	-	nCK
ODT Timings				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
ODTH4	ODT high time without write command or with write command and BC4	4	-	nCK
ODTH8	ODT high time with Write command and BL8	6	-	nCK
tAONPD	Asynchronous RTT turn-on delay (Powe-Down with DLL frozen)	2	8.5	ns
tAOFPD	Asynchronous RTT turn-off delay (Power-Down with DLL frozen)	2	8.5	ns
tAON	RTT-turn-on	-225	225	ps
tAOF	RTT_Nom and RTT_WR turn-off time from ODTLoff reference	0.3	0.7	tCK(avg)
tADC	RTT dynamic change skew	0.3	0.7	tCK(avg)

White Leveling Timing				
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
tWLMRD	First DQS/DQS# rising edge after write leveling mode is programmed	40	-	nCK
tWLDQSEN	DQS/DQS# delay after write leveling mode is programmed	25	-	nCK
tWLS	Write leveling setup time from rising CK, CK# crossing to rising DQS, DQS# crossing	165	-	ps
tWLH	Write leveling hold time from rising DQS, DQS# crossing to rising CK, CK# crossing	165	-	ps
tWLO	Write leveling output delay	0	7.5	ns
tWLOE	Write leveling output error	0	2	ns

12. PACKAGE DIMENSION

- (2GB, 1 Rank, 256Mx8 DDR3 base ECCSODIMM)



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

13. RoHS Declaration

Declaration of Conformity

We, InnoDisk Co., Ltd, here declare the product M3DW-2GMJ2W0C-(X)complies with the requirement of RoHS directives 2002/95/EC and 2006/122/EC.

Innodisk ensures the above product meets RoHS requirements of six restricted substances. This declaration is based on vendor supplied analysis/MSDS, material certifications, and/ or 3rd party test reports of the component/ raw materials used in the manufacture of products.

Name of hazardous substance	**Limited of RoHS ppm（mg/kg）**
Cd	＜ 100 ppm
Pb	＜ 1000 ppm
Hg	＜ 1000 ppm
Chromium VI（Cr+6）	＜ 1000 ppm
Polybromodiphenyl ether（PBDE）	＜ 1000 ppm
Polybrominated Biphenyls（PBB）	＜ 1000 ppm
Perfluorooctane Sulfonate (PFOS)	Not Contained

Date issued : 2014/01/01

Manufacturer: ：InnoDisk Co., Ltd.
Address：9F, No. 100, Sec.1 Xintai 5th Rd., Xizhi City, Taipei 221, Taiwan

Authorized Signature：

QA Dept. Director – *Ryan Tsai*

Revision Log

Rev	Date	Modification
0.1	14th **May 2014**	Preliminary Edition
1.0	14th **May 2014**	Official released.