

#### Innostor Technology Corp.

2012 / 0809



#### TLC ready for USB-3.0 Market

**USB-3.0 COB Readiness** 

**Market Segment from Performance vs. Cost** 

WTG (Windows To Go) vs. NAND Technology

**User Experience Enhanced w/o extra cost** 

# **Sweet Point of U3 Pen drive**



# 1xnm / 2ynm TLC (1CH)

Capacity	4GB	8GB	16	GB	32	GB	64	128GB		
32Gb die	SDP x1									
64Gb die	SDP DDP SDP x1 x1 x2		QDP DDP x1 x2		QDP x2					
128Gb die			SDP x1		DDP x1	SDP x2	QDP x1	DDP x2	QDP x2	
Seq. R	> 60 MB/s	> 60 MB/s	> 80	MB/s	<b>&gt; 80</b>	MB/s	> 80 MB/s			
Seq. W	~ 7 MB/s	~ 6 MB/s	~ 10	MB/s	~ 20	MB/s	~ <b>30</b> MB/s			

# Mostly USB-2.0 Controllers ( 3xnm , 2xnm flash )
deliver around :

Seq. Read	20 ~ 25 MB/s
Seq. Write	3 ~ 7 MB/s

# **Flexible 1 Channel Configuration**





Most popular USB-2.0 Compatible 14 x 33mm PCB

BOM Cost is close to U2 Sweet Point :  $\triangle$  USD 0.6

# **Flexible 1 Channel Configuration**





	1 v 100MB	E: 0% (0/16GB)	~
All	Read [MB/	s] Write	[MB/s]
Seq	64.0	5 10	.28
512K	60.4	7 5.0	98
4K	6.50	6 0.1	.65
4K	5.35	8 0.1	13







📑 CrystalDis	kMark 3.0		
交件(E) 編輯	(E) 主題(I) 幫助(H) Lar	iguage	
	1 🖌 100MB 🖌 E:	0% (0/63GB)	~
	Read [MB/s]	Write []	MB/s]
Seq	83.62	35.	39
8			

CrystalDiskMark 3.0

916EN K9CFGD8U1A

512K

文件(E) 編輯(E) 主題(E) 帮助(H) Language

Read [MB/s]

66.81

1 - 100MB - F: 0% (0/60GB)

60.59 9.070

4.516 0.255

3.711 0.249

- - X

Write [MB/s]

35.05

512K	<b>75.</b> 73	10.17
4K	5.870	0.188
4K QD32	5.002	0.184
7T2J >	4	

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#### **USB-3.0 COB at Computex 2012**



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## USB-3.0 COB vs. USB-2.0 COB



- 1. USB-3.0 COB connectors detail spec depends on vendors
- 2. USB-3.0 COB size is the same with USB-2.0
- 3. It is exactly the same by iron shell

# **USB-3.0 COB Host Compliance**

		USB3.0 PORTO			USB3.0 PORT1					
		Idenfify	Format	H2 Test	CDM 1G	Idenfify	Format	H2 Test	CDM 1G	
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
		PASS	PASS	PASS	PASS		1	NA		
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Host platform	USB 3.0 Host	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
MSI / H77MA-G43	H77 ( built-in U3 )	PASS	PASS	PASS PASS	PASS PASS	PASS	PASS PASS	PASS PASS	PASS	
MSI / A75A-G55	A75 ( built-in U3 )	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
,		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
ASUS M4A88TD-M EVO/USB3 NEC uPD720200			IS916EN + TLC *2 die							
ECS P55H-AK	NEC uPD720200F1	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
ASRock D55 Extreme/		PASS	PASS	PASS	PASS	NA			DASS	
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
ASUS P8H67	Asmedia ASM1042	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Gigabyte GA-Z68X-UD3H-B3	Etron EJ168	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
ASRock G41MH/USB3	Fresco FL-1000G	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
i			IS916EN + TLC *4 die							
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
		PASS	PASS	PASS	PASS		1	NA		
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	

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## **USB-3.0 COB Ready Status**

Modu 🔻			Substrate		Connector			Module	a las		Substrate	
Vendor	- PPA	Length	Flash support list	SBT model	Layer	Туре		Vendor	- epa	Length	Flash support list	SBT model
			1.K9G BG DS UDA				1					
			2.K9GBGDGUOB								1.H9 A BE DO UDB	
	15914	24.0 mm	A.DU BO BD BUDA		,	Me inSuper &			15914	24.0 mm	2.19 A CE DE UDM	
			4.K9/6/05 D8 U01//		-	Octect Coleyout					S. H9 G BGCC UDA	INTERACION I
			5.178A								4.K9G BG DS UDA	
			6.TSB 24nm 826 D2				4					
			1.485									
	15916	24.8 mm	2.403	311759933103547753	2	Me inSuper &			15916	24.8 mm	1. Hynix 26 nm	1112101000000
			8.683			Octect Coleyout					2.55 21nm	
			4.505				-					
											1 1784	
	15916	24.8 mm		<	,	POLognaector			15914	24.8 mm	2 1744	
			1 / M (874)	-	-						8.1844	
			6.1/M(0754)									
			7 PSI DK40									
			1.K9ABSDSUOB (TLC)				1					
	10010	24.0 mm	2.19G CS DS UCA. (MLC)			TO I an out the s			10010	24.0 mm	1.054	
	12270	24.0100	8.1 / M (874)		-	ru) connector			13520	24.0100	2.044	
			4. Hynix 26 nm								5.04×	
	15914		1. TS B 19 nm/24 nm TLC									
	ISPIAEN	24.8 mm	2.55 21nm/27 nm TLC	5	4	POJ connector						
			8. IM 25nm 74A TLC				-					
			1. TS B 19 nm									
			2.75824nm						15916		1. TS 8 24 nm TLC	
			3. Sandisk: 19 nm TLC ED8						15916EN	24.8 mm	2 . TS B 19 nm TLC	
	13910	24.8 mm	4. Sendis 19 nm MLC ED2	s	4	POJ connector						
	15916EN											
			盖抗1000800061									
			董慎1000800061-1: modify PAD byout									
			check is fine				-					
	15914	24.0 mm	1.55 21nm 10.52/646			PDI concector			15916	24.0 mm	1. U74A	
			2. Ini 194	-	-	r cy connector			15916EN		2. L78A	
			5. H) H2 20111 929 0				1				1	
	15916	24.8 mm	1.K9/G/GS DS UDA (MLC)	5	2	ні Тор					2CH COB Subst	rate List
							1					
	15916EN	24.8 mm	1. TS 8 24 nm MLC	-	2	TBD			159028	30m m	1. L74A	1.000-000000000
			2. Sen Disk 24nm MLC	2								
	15916	24.8 mm	1. 55 27 nm (TLC)		2	TBD			159028	24.8 mm	1. IZBA	111111111111111111111111111111111111111
			2. TSB /Sendisk 24nm TLC/MLC									
							-					
	15916EN	24.8 mm	1. TSB /Sendisk 19 nm TLC ABL DB/EDB		2	TBD			15902	30.5mm	1. L74A	100.00-000000-00
							-		12403			
	IS914EN	24.8 mm	1 TSB /Secticity 19 cm TIC ABL DR /EDR		,	TED			15902	24.8 mm	1. Hynx H27 083612C	
				S	-				15903		2,000	
							1					
			1.KSAGS DE UDM (TLC)				1				1. TS B 19 nm MLC	
	15916	24.8 mm	2.K9 A BG DG UOB (TLC)	TITLE - UPD DARDONA	4	POJ connector			15902	24.8 mm	2. TS 8 24 nm MLC	1
	15916EN		S. HAIG BE DE LOA (MILE)						15903		8.L84A	
			4. KHIG BIS DO LLOB (MILC)									
	15914		1. TSB 24nm TLC				1				1 TSB 18 nm MIC	
	1001001	24.8 mm	2. TSB 19 nm TLC	A COGIO-BRE CREEK	2	Hitop	1		15903	24.8 mm	2 TSP 24 nm b40C	
	ANY ADDIN		8. SenDick 24nm HBL				-					
			1. K9AC3D8x01427 nm Togg le TLC				1					
			2.K9GO5D8UDA 21nm Toggie MLC									
	15916	24.8 mm	8. K9AAGDEUDA 21nm TLC		2	ні Тор	1		15903	24.8 mm	1. TS 8 19 nm MLC	:
	13916EN		4. NEACEDEUCA 21nm TLC				1				2. 15 8 24 nm MUC	
			5. TS B 24 nm / 19 nm TLC & MLC				1					
		-	6. SenDick 24nm / 19nm Tút & Mút		-		-	-	-	-		
	15916		2. 13 8 24 nm TU2								1.154.184	
	15916	24.8 mm	2.158 19 mm 10.		2	OCTek (元件外露)			15903	24.8 mm	2. Hunix 20nm	111021-010003
	13910EN		S. NO BOLGOUR (MIL)									
							1	-	-	-	1. TS B 19 nm	
							1				2. TSB 24 nm	
	15916	24.8 mm	NA		4	POI connector	1		15903	24.8 mm	3. 184A	
	13916EN						1				4. Hynix 20nm	
-							1					

1 channel For TLC / MLC Valued product

2 channel For MLC high-performance

More than 30+ substrates with Innostor solution ready for various flash

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0.0Tek

**TLC ready for USB-3.0 Market** 

**USB-3.0 COB Readiness** 

#### **Market Segment from Performance vs. Cost**

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### Flash Performance (Seq. DDR)

- 1CH MLC
  - > Read as 70 ~ 110 MB/s , Write as ~12 \* CE #
- 1CH TLC
  - Read as 55 ~ 100 MB/s , Write as ~5 \* CE #
- 2CH MLC
  - Read as 150 ~ 280 MB/s , Write as ~12/20 \* CE # \* 2ch
- 2CH TLC
  - Read as 140 ~ 220 MB/s , Write as ~5/7 \* CE # \* 2ch
- **#** USB-3.0 Flash Controller can leverage max. bandwidth of NAND .
- # Large page/plane deliver better sequential write performance .
- **#** Write performance is more concerned than read performance .
- # Higher DDR clock does improve read performance , but also raise power consumption . Balanced trade-off is chosen .

#### **USB-3.0 Cost vs. Performance**



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## **USB-3.0 Market Segment**



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### **USB : Window To Go**



# Window To Go Application



# Window To Go Criteria (Microsoft)

USB boot devices must also:

- Include in the MS OS Descriptor extended property the value "WindowsBootCapable" DWORD value -1
- Be at least 32GB in size (20 GB usable)
- Support Trim/unmap command (Rotational drives exempt)
- Provide unique, consistent product identification
  - USB VID/PID
  - Inquiry Serial Number
  - Inquiry Model Number
- Device must report FIXED (RMB=0)
- Device must not implement IEEE-1667
- Device must not expose more than one LUN during boot
- Device must not be a composite USB device
- Device must not support the USB Attached SCSI (UAS) protocol
- Support the following mode pages
  - Mode page code: 0x08 Mode subpage code: 00
- Meet the following performance requirements:
  - Random 4 KB Write IOPs >= 200 (Rotational drives exempt)
  - Random 4 KB Read IOPs >= 2000 (Rotational drives exempt)

Random IOPS is the key of user operating experience

## **NAND Enhance Sequential Perf.**



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# **User Experience vs. Benchmark**

USB-3.0 , 32GB density , Sequential Write performance up to 40 ~ 100 MB/ss In real user experience ( MP3 files ) , deliver only 15 ~ 24MB/s





For low cost pen drive architecture, random performance suffer is common; If expensive solution like SSD is adopted, random file access can be improved.

How many extra cost can be accepted ?

ANOD5-146-COV 1468 USB 2.0

**Plot Source :** 

http://www.tomshardware.com/charts/usb-thumb-drive-charts/Copy-Benchmark-MP3s-Write,2303.html

# **Innostor SW Enhance**



# Window To Go: Real Operating



## Innostor SW Enhance on WTG



# Deliver Best USB-3.0 Flash Disk

Thank you