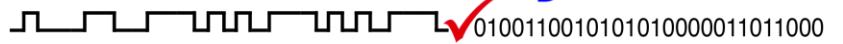


# DDR Detective® Probing



# FuturePlus Systems



Power Tools for Bus Analysis

For use with the FS2800A DDR Detective®

- DIMM and SODIMM
- Midbus Footprint
- Flying Lead
- BGA interposer

DDR4



LPDDR4/X

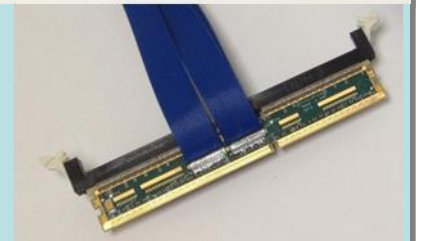
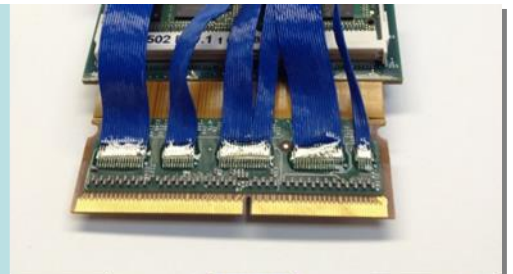
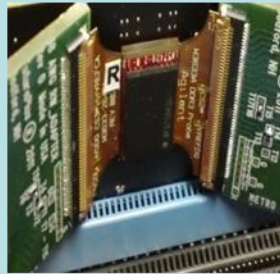
DDR3

LPDDR5

LPDDR3

All 5 technologies DDR3, DDR4, LPDDR3, LPDDR4/X and LPDDR5 in one box with interchangeable probing choices!

*The DDR Detective® gives the phrase 'cost effective' new meaning!*



[www.FuturePlus.com](http://www.FuturePlus.com)  
[www.DDRDetective.com](http://www.DDRDetective.com)

# DIMM and SODIMM Interposers

- DDR3
- DDR4
- LPDDR4 on an SODIMM
- Second slot interposers also available

## **Specifications:**

### **DDR4 DIMM Interposer:**

- JEDEC Compliant 288 pin
- Interposer design saves a slot
- Operation up to 2666MT/s
- All signals are probed passively
- Electrically extends the bus approximately 1.0 inch
- 72 bit operation supported
- UDIMM, RDIMM, and LRDIMM supported
- Simultaneous connection to Keysight Logic Analyzer available

### **DDR4 SODIMM Interposer:**

- JEDEC Compliant 260 pin
- Operation up to 2400MT/s
- Interposer design saves a slot.
- Rigid/flex design allows for use in both RVS and STD connectors.
- All signals are probed passively
- Electrically extends the bus approximately 2.0 inch
- 72 bit operation supported
- UDIMM, RDIMM, and LRDIMM supported
- Simultaneous connection to Keysight Logic Analyzer available

# Specifications:

## **DDR3 DIMM:**

- JEDEC Compliant 240 pin.
- Interposer design saves a slot.
- Operation up to 2133MT/s
- All signals are probed passively
- Electrically extends the bus approximately 1.0 inch
- 72 bit operation supported
- UDIMM, RDIMM, and LRDIMM supported
- Simultaneous connection to Keysight Logic Analyzer available

## **DDR3 SODIMM:**

- JEDEC Compliant 204 pin.
- Operation up to and including 1867MT/s
- Interposer design saves a slot.
- Rigid/flex design allows for use in both RVS and STD connectors.
- All signals are probed passively
- Electrically extends the bus approximately 2.0 inch
- 64 or 72 bit (ECC) versions available
- UDIMM, RDIMM, and LRDIMM supported
- Simultaneous connection to Keysight Logic Analyzer available

## **LPDDR4/LPDDR3 SODIMM:**

- Single x64 or dual x32 support (DDR Detective can be connected to only one A/C/C bus at a time)
- Uses JEDEC DDR4 SODIMM mechanical design
- Same Characteristics as the DDR4 SODIMM

# LPDDR4 SO-DIMM 260 pin Connector Assignment

LPDDR4 SO-DIMM 260-pin Connector Assignment

Item 2253.02

direct match to DDR4 260 pin USODIMM

LPDDR4 2x32 2R (No ECC)											
Pin#	Front Side	Pin#	Back Side	Pin#	Front Side	Pin#	Back Side	Pin#	Front Side	Pin#	Back Side
1	VSS	2	VSS	91	NC	92	NC	173	DCB1 D33	174	DCB0 D34
3	DQA5	4	DQA4	93	VSS	94	VSS	175	VSS	176	VSS
5	VSS	6	VSS	95	NC	96	NC	177	DCB80 DS4	178	DMB0 DM4
7	DQA1	8	DQA0	97	NC	98	VSS	179	DCB80 +-	180	VSS
9	VSS	10	VSS	99	VSS	100	NC	181	VSS	182	DCB7 D39
11	DCSA0_c	12	DMIA0	101	NC	102	VSS	183	DCB6 D38	184	VSS
13	DCSA0_t	14	VSS	103	VSS	104	CKEB1 CB7	185	VSS	186	DCB3 D35
15	VSS	16	DQA6	105 CB3	CKEB0	106	VSS	187	DCB2 D34	188	VSS
17	DQA7	18	VSS	107	VSS	108	RESET_n	189	VSS	190	DCB13 D45
19	VSS	20	DQA2	109	CKEA0	110	CKEA1	191	DCB12 D44	192	VSS
21	DQA3	22	VSS	111	VDD	112	VDD	193	VSS	194	DCB9 D41
23	VSS	24	DQA12	113 BG1	NC	114	NC ACT	195	DCB8 D40	196	VSS
25	DQA13	26	VSS	115 BG0	CAA05	116	NC ALT	197	VSS	198	DCB81 DS5
27	VSS	28	DQA8	117	VDD	118	VDD	199	DMB1 DM5	200	DCB81 +-
29	DQA9	30	VSS	119 A12	NC	120	NC A11	201	VSS	202	VSS
31	VSS	32	DCSA1_c	121 A9	CAA01	122	CAA04 A7	203	DCB14 D46	204	DCB15 D47
33	DMIA1	34	DCSA1_t	123	VDD	124	VDD	205	VSS	206	VSS
35	VSS	36	VSS	125 A8	CAA03	126	CAA00 A5	207	DCB10 D42	208	DCB11 D43
37	DQA15	38	DQA14	127 A6	CAA02	128	NC A4	209	VSS	210	VSS
39	VSS	40	VSS	129	VDD	130	VDD	211	DCB20 D52	212	DCB21 D53
41	DQA10	42	DQA11	131 A3	NC	132	CAB05 A2	213	VSS	214	VSS
43	VSS	44	VSS	133 A1	NC	134	EVENT_n	215	DCB17 D49	216	DCB16 D48
45	DQA21	46	DQA20	135	VDD	136	VDD	217	VSS	218	VSS
47	VSS	48	VSS	137	CLKA_t	138	CLKB_t	219	DCB82 DS6	220	DMB2 DM6
49	DQA17	50	DQA16	139	CLKA_c	140	CLKB_c	221	DCB82 +-	222	VSS
51	VSS	52	VSS	141	VDD	142	VDD	223	VSS	224	DCB22 D54
53	DCSA2_c	54	DMIA2	143 PAR	NC	144	NC A0	225	DCB23 D55	226	VSS
55	DCSA2_t	56	VSS					227	VSS	228	DCB18 D50
57	VSS	58	DQA22					229	DCB19 D51	230	VSS
59	DQA23	60	VSS	KEY		KEY		231	VSS	232	DCB28 D60
61	VSS	62	DQA18					233	DCB29 D61	234	VSS
63	DQA19	64	VSS	145 BA1	NC	146	NC A10	235	VSS	236	DCB25 D57
65	VSS	66	DQA28	147	VDD	148	VDD	237	DCB24 D56	238	VSS
67	DQA29	68	VSS	149	CSA0_n	150	CAB04 BA0	239	VSS	240	DCB83 DS7
69	VSS	70	DQA24	151 A14	CAB02	152	CAB03 A16	241	DMB3 DM7	242	DCB83 +-
71	DQA25	72	VSS	153	VDD	154	VDD	243	VSS	244	VSS
73	VSS	74	DCSA3_c	155 OD0	NC	156	CAB01 A15	245	DCB30 D62	246	DCB31 D63
75	DMIA3	76	DCSA3_t	157 CS1	CSB1_n	158	CAB00 A13	247	VSS	248	VSS
77	VSS	78	VSS	159	VDD	160	VDD	249	DCB26 D58	250	DCB27 D59
79	DQA30	80	DQA31	161 OD1	NC	162	CSA1_n CS2	251	VSS	252	VSS
81	VSS	82	VSS	163	VDD	164	NC Vrefca	253	SCL	254	SDA
83	DQA26	84	DQA27	165 CS3	CSB0_n	166	SA2	255	VDD_SPD	256	SA0
85	VSS	86	VSS	167	VSS	168	VSS	257	VPP	258	NC VTT
87	NC	88	NC	169 D37	DCB5	170	DCB4 D36	259	VPP	260	SA1
89	VSS	90	VSS	171	VSS	172	VSS				

# LPDDR3 SO-DIMM 260 pin Connector Assignment

LPDDR3 SO-DIMM 260-pin Connector Assignment

Item 2253.01

direct match to DDR4 260 pin USODIMM

LPDDR3 2x32 2R (No ECC)											
Pin#	Front Side	Pin#	Back Side	Pin#	Front Side	Pin#	Back Side	Pin#	Front Side	Pin#	Back Side
1	VSS	2	VSS	91	NC	92	NC	173	DCB1 D33	174	DCB0 D32
3	DQA5	4	DQA4	93	VSS	94	VSS	175	VSS	176	VSS
5	VSS	6	VSS	95	NC	96	VREF M8	177	DCSB0 DS4	178	DMB0 DM4
7	DQA1	8	DQA0	97	NC	98	VSS	179	DCSB0 +-	180	VSS
9	VSS	10	VSS	99	VSS	100	NC	181	VSS	182	DCB7 D39
11	DCSA0 c	12	DMA0	101	NC	102	VSS	183	DCB6 D38	184	VSS
13	DCSA0 t	14	VSS	103	VSS	104	GKEB1 CB7	185	VSS	186	DCB3 D35
15	VSS	16	DQA6	105	CB3 CEB0	106	VSS	187	DCB2 D34	188	VSS
17	DQA7	18	VSS	107	VSS	108	NC RST	189	VSS	190	DCB13 D45
19	VSS	20	DQA2	109	CKEA0	110	GKEA1	191	DCB12 D44	192	VSS
21	DQA3	22	VSS	111	VDD	112	VDD	193	VSS	194	DCB9 D41
23	VSS	24	DQA12	113	BG1 CAA09	114	CAA08 ACT	195	DCB8 D40	196	VSS
25	DQA13	26	VSS	115	BG0 CAA05	116	NC ALT	197	VSS	198	DCSB1 DS4
27	VSS	28	DQA8	117	VDD	118	VDD	199	DMB1 DM5	200	DCSB1 +-
29	DQA9	30	VSS	119	A12 CAA06	120	CAA07 A11	201	VSS	202	VSS
31	VSS	32	DCSA1 c	121	A9 CAA01	122	CAA04 A7	203	DCB14 D46	204	DCB15 D47
33	DMA1	34	DCSA1 t	123	VDD	124	VDD	205	VSS	206	VSS
35	VSS	36	VSS	125	A8 CAA03	126	CAA00 A5	207	DCB10 D42	208	DCB11 D43
37	DQA15	38	DQA14	127	A6 CAA02	128	NC A4	209	VSS	210	VSS
39	VSS	40	VSS	129	VDD	130	VDD	211	DCB20 D52	212	DCB21 D53
41	DQA10	42	DQA11	131	A3 NC	132	CAB05 A2	213	VSS	214	VSS
43	VSS	44	VSS	133	A1 CAB08	134	EVENT n	215	DCB17 D49	216	DCB16 D48
45	DQA21	46	DQA20	135	VDD	136	VDD	217	VSS	218	VSS
47	VSS	48	VSS	137	CLKA_t	138	CLKB_t	219	DCSB2 DS6	220	DMB2 DM6
49	DQA17	50	DQA16	139	CLKA_c	140	CLKB_c	221	DCSB2 +-	222	VSS
51	VSS	52	VSS	141	VDD	142	VDD	223	VSS	224	DCB22 D54
53	DCSA2 c	54	DMA2	143	PAR NC	144	CAB09 A0	225	DCB23 D55	226	VSS
55	DCSA2 t	56	VSS					227	VSS	228	DCB18 D50
57	VSS	58	DQA22					229	DCB19 D51	230	VSS
59	DQA23	60	VSS	KEY		KEY		231	VSS	232	DCB28 D60
61	VSS	62	DQA18					233	DCB29 D61	234	VSS
63	DQA19	64	VSS	145	BA1 CAB06	146	CAB07 A10	235	VSS	236	DCB25 D57
65	VSS	66	DQA28	147	VDD	148	VDD	237	DCB24 D56	238	VSS
67	DQA29	68	VSS	149	CSA0_n	150	CAB04 BA0	239	VSS	240	DCSB3 DS7
69	VSS	70	DQA24	151	A14 CAB02	152	CAB03 A16	241	DMB3 DM7	242	DCSB3 +-
71	DQA25	72	VSS	153	VDD	154	VDD	243	VSS	244	VSS
73	VSS	74	DCSA3 c	155	ODT0	156	CAB01 A15	245	DCB30 D62	246	DCB31 D63
75	DMA3	76	DCSA3 t	157	CS1 CSB1_n	158	CAB00 A13	247	VSS	248	VSS
77	VSS	78	VSS	159	VDD	160	VDD	249	DCB26 D58	250	DCB27 D59
79	DQA30	80	DQA31	161	ODT1	162	CSA1_n CS2	251	VSS	252	VSS
81	VSS	82	VSS	163	VDD	164	VREF CA	253	SCL	254	SDA
83	DQA26	84	DQA27	165	CS3 CSB0_n	166	SA2	255	VDD_SPD	256	SA0
85	VSS	86	VSS	167	VSS	168	VSS	257	VPP	258	VTT
87	NC	88	NC	169	D37 DCB5	170	DCB4 D36	259	VPP	260	SA1
89	VSS	90	VSS	171	VSS	172	VSS				

# Slot Interposer

## Ordering Information

**FS2363** DDR3 DIMM A/C/C Interposer for DDR Detective  
**FS2424** DDR3 SO-DIMM A/C/C Interposer for DDR Detective  
**FS2367** DDR3 DIMM Satellite\* Interposer for DDR Detective  
**FS2422** DDR3 SO-DIMM Satellite\* Interposer for DDR Detective

**FS2823** DDR4 DIMM A/C/C Interposer for DDR Detective  
**FS2824** DDR4 SO-DIMM A/C/C Interposer for DDR Detective  
**FS2853** DDR4 DIMM Satellite\* Interposer for DDR Detective  
**FS2854** DDR4 SO-DIMM Satellite\* Interposer for DDR Detective

**FS2824** DDR4 SODIMM A/C/C Interposer for FS2800 (supports LPDIMM)

\* Satellite gives Slot 2 Probing of Clock and Control signals for same channel

**Probing Options that include U4154A/B and U4164A Logic Analyzer connections**

**FS2362** DDR3 DIMM Interposer A/C/C/DQ FS280x and LA  
**FS2436** DDR3 SO-DIMM Interposer A/C/C/DQ FS280x and LA  
**FS2835** DDR4 DIMM Interposer A/C/C/DQ FS280x and LA  
**FS2836** DDR4 SO-DIMM Interposer A/C/C/DQ FS280x and LA



# Midbus Probing

Single, dual and 3 head configurations available

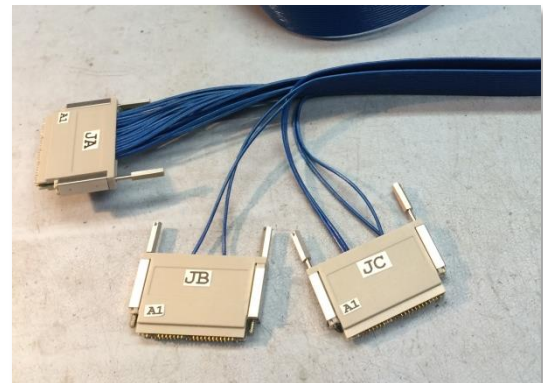
- DDR3
- DDR4
- LPDDR3
- LPDDR4
- LPDDR5



Single Head Midbus Cable



2 Head Midbus Cable



3 Head Midbus Cable

Midbus probing is ideal for embedded applications where no DIMM or SODIMM slot is present. The connector-less midbus footprint can remain as part of the design throughout production thus giving manufacturing and field service a probe point for identifying failures. For ease of layout and to accommodate multiple LPDDR3/4/5 busses multiple head cable sets are supported.

# FS2826 Single Head Flexible Midbus Footprint Pinout

LPDDR3 A/C/C Signals
CS0
CS1
CS2
CS3
ODT0
ODT1
CA0
CA1
CA2
CA3
CA4
CA5
CA6
CA7
CA8
CA9
CKE0
CKE1
CLK+
CLK-

Signal	A1	B1	GND
Signal	A2	B2	Signal
GND	A3	B3	Signal
Signal	A4	B4	GND
Signal	A5	B5	Signal
GND	A6	B6	Signal
CLK +	A7	B7	GND
CLK -	A8	B8	Signal
GND	A9	B9	Signal
Signal	A10	B10	GND
Signal	A11	B11	Signal
GND	A12	B12	Signal
Signal	A13	B13	GND
Signal	A14	B14	Signal
GND	A15	B15	Signal
Signal	A16	B16	GND
Signal	A17	B17	Signal
GND	A18	B18	Signal
Signal	A19	B19	GND
Signal	A20	B20	CLK -
GND	A21	B21	CLK +
Signal	A22	B22	GND
Signal	A23	B23	Signal
GND	A24	B24	Signal
Signal	A25	B25	GND
Signal	A26	B26	Signal
GND	A27	B27	Signal

*For footprint compatibility with the Keysight U4154A/B and U4164A. CKE must be routed to a SIGNAL pin for the DDR Detective and a CLK + pin for the U4154A/B and U4164A. Contact the factory for additional details.*

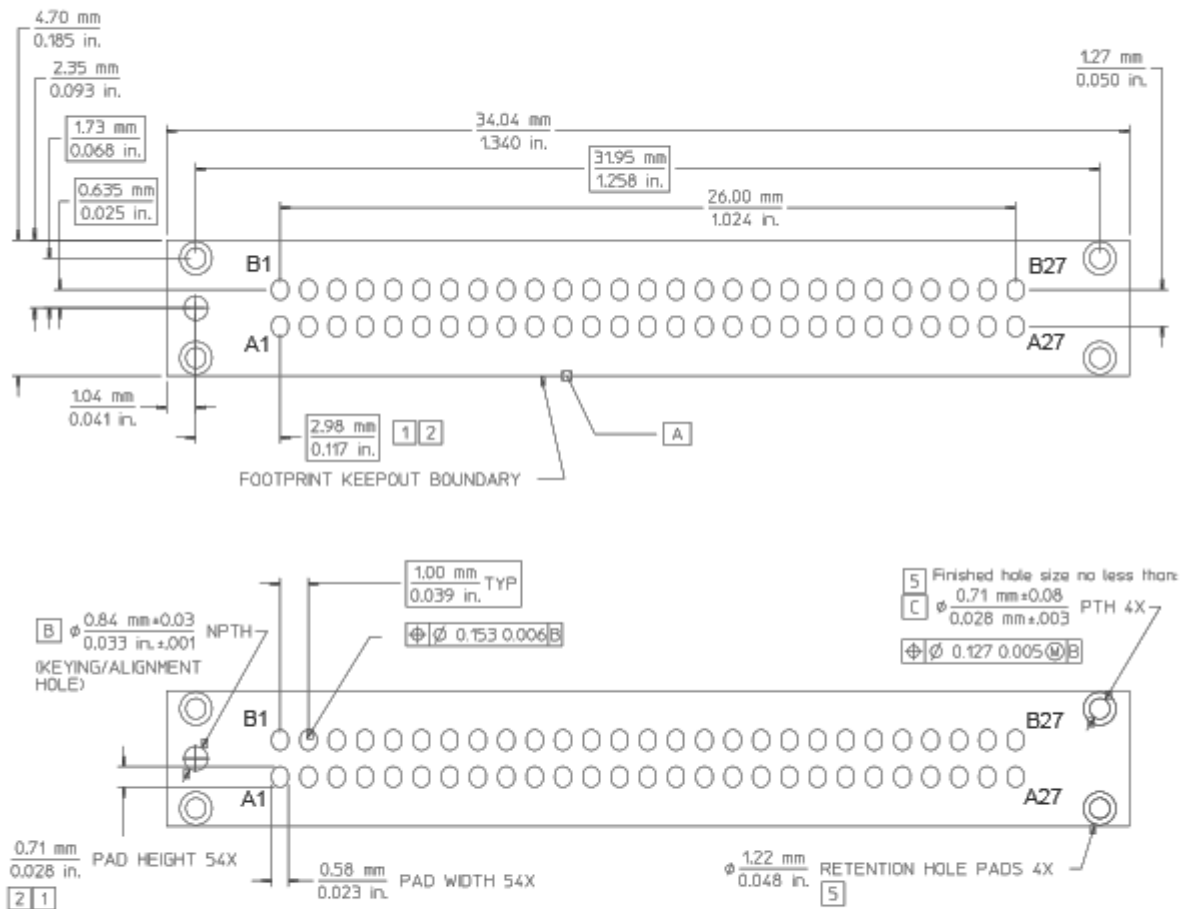
A single footprint can contain two, 2 Rank, LPDDR3/4/5 busses and the DDR Detective can analyze one at a time without removing the FS2826x midbus cable header. Only one clock per LPDDR3/4/5 bus needed. Clock must be routed to A7/A8 or B20/21 and only clocks may appear on these pins. Differential clock required and specified polarity cannot be reversed.

FuturePlus Systems does not assume any responsibility for use of any circuitry described, and reserves the right to change said circuitry and specifications at any time without notice.



## Footprint Dimensions

The retention module alignment is symmetrical around the pad footprint.



**Figure 14** Top view footprint dimensions (drawing notes next page).

### NOTE

The above view is looking down onto the footprint on the printed-circuit board.

Drawing courtesy of Keysight Technologies

## Midbus Ordering Information

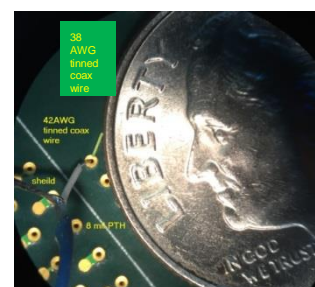
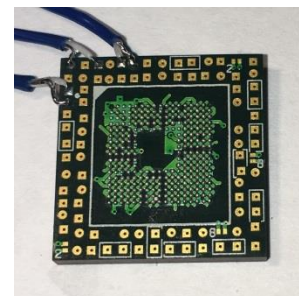
**FS2826** Midbus single head Soft Touch Pro adapter for the FS2800

**FS2828** Midbus two head Soft Touch Pro adapter for the FS2800

**FS2829** Midbus three head Soft Touch Pro adapter for the FS2800

# Flying Lead Set

- LPDDR3
- LPDDR4
- LPDDR5
- Quick and easy connection to Keysight Scope Chip Interposers
- 38 AWG wire



# BGA Interposer

- DDR3
- DDR4



- Quick and easy connection to most Keysight logic analyzer Chip Interposers

# Flying Lead Set Ordering Information

**FS2827** Flying Lead for use with Keysight scope interposers and FS2800A

# BGA Cable Adapter Ordering Information

**FS2425** DDR3 BGA Cable Adapter and SW upgrade to support BGA

**FS2852** DDR4 BGA Cable Adapter and SW upgrade to support BGA

## FuturePlus Systems Corporation

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*The DDR Detective® is a product so versatile it has an entire website dedicated to it!*

[www.DDRDetective.com](http://www.DDRDetective.com)

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