ECC UDIMM
DDR4 3200 16GB
Datasheet

(SQR-UD4N16G3K2SECB)

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Revision History

Rev	Date	Modification
1.0	27th Aug., 2020	Official released

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1. Description

DDR4 UDIMM ECC						
Part Number	Density	Speed	DIMM Organization	Number of DRAM	Number of rank	ECC
SQR-UD4N16G3K2SECB	16GB	PC4-3200	2Gx72	18	2	Y

- **SDRAM Information Samsung 1Gx8 C-DIE**

2. Features

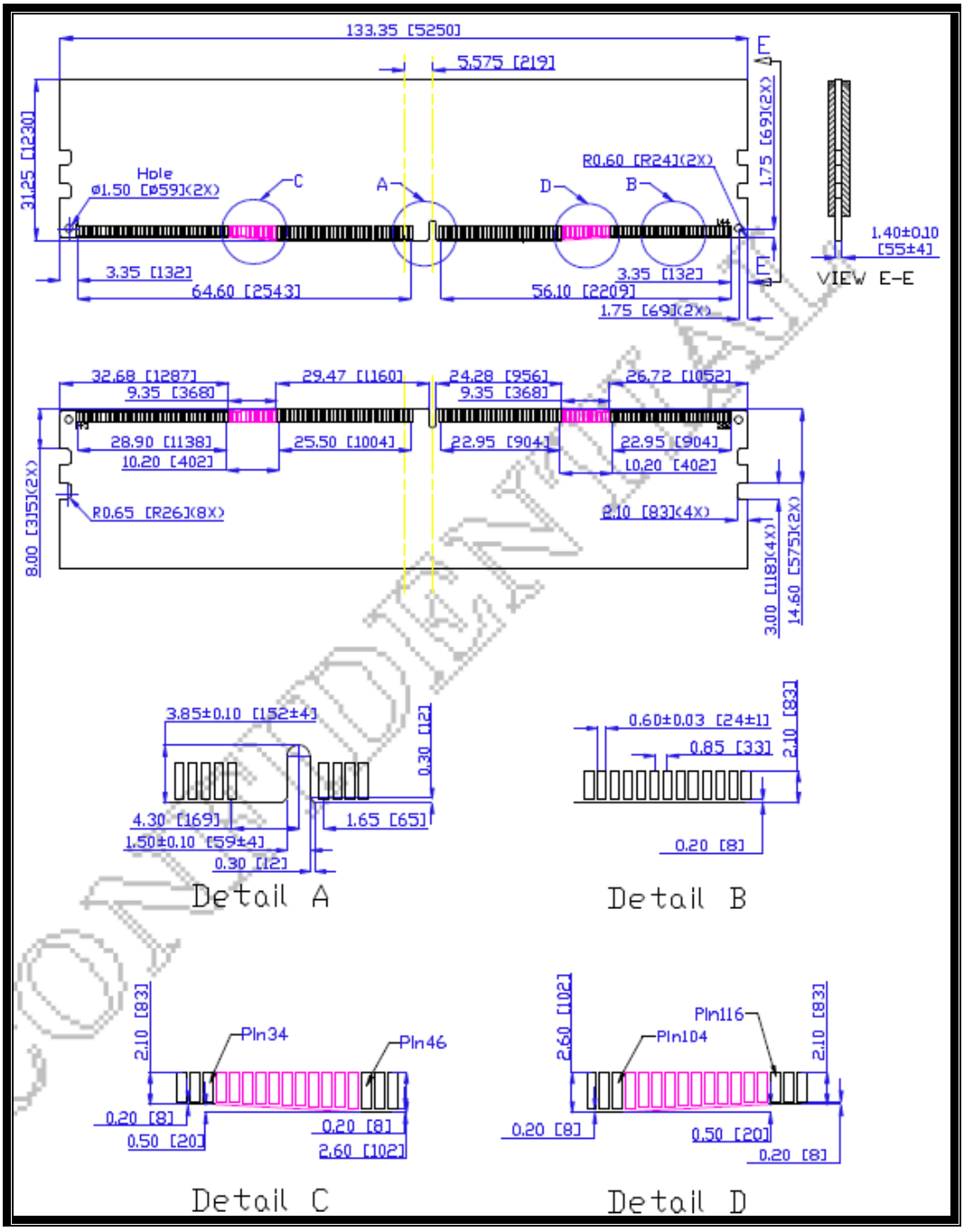
- Key Parameter

Industry Nomenclature	Data Rate MT/s			tRCD (ns)	tRP (ns)	tRC (ns)
	CL=19	**CL=21**	**CL=22**			
PC4-3200	2666	2933	3200	13.75	13.75	13.75

- JEDEC Standard 288-pin Dual In-Line Memory Module
- Intend for PC4-3200 applications
- Inputs and Outputs are SSTL-12 compatible
- Cl-tRCD-tRP: 19-19-19
- VDD=VDDQ= 1.2 Volt (1.14V~1.26V)
- VPP=2.5 Volt (2.375V~2.75V)
- VDDSPD=2.2-3.6V
- Low-Power auto self-refresh (LPASR)
- SDRAMs have 16 internal banks for concurrent operation (4 Bank Group of 4 banks each)
- Normal and Dynamic On-Die Termination for data, strobe and mask signals.
- Data bus inversion (DBI) for data bus
- Fixed burst chop (BC) of 4 and burst length (BL) of 8 via the MRS
- Selectable BC4 or BL8 on-the fly (OTF)
- Golden Connector 30u”
- Fly-By topology
- Temperature Sensor with SPD EEPROM
- Terminated control, command and address bus
- Programmable /CAS Latency: 10,11,12,13,14,15,16,17,18,19,20, 22, 24
- Operation temperature –Tcase (0°C~85 °C)
- On-die VREFDQ generation and Calibration
- Support ECC Function

3. Dimension

- (16GB, 2 Ranks 1Gx8 DDR4 base ECC UDIMM)



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

4. Pin Identification

Pin Definition

Pin Name	Description	Pin Name	Description
A0–A17[1]	SDRAM address bus	SCL	I^2C serial bus clock for SPD/TSE
BA0, BA1	SDRAM bank select	SDA	I^2C serial bus data line for SPD/TSE
BG0, BG1	SDRAM bank group select	SA0–SA2	I^2C slave address select for SPD/TSE
RAS_n[2]	SDRAM row address strobe	PARITY	SDRAM parity input
CAS_n[3]	SDRAM column address strobe	VDD	SDRAM I/O & core power supply
WE_n[4]	SDRAM write enable	C0, C1,C2	Chip ID lines
CS0_n, CS1_n	DIMM Rank Select Lines	12 V	Optional power Supply on socket but not used on UDIMM
CKE0, CKE1	SDRAM clock enable lines	VREFCA	SDRAM command/address reference supply
ODT0, ODT1	SDRAM on-die termination control lines	VSS	Power supply return (ground)
ACT_n	SDRAM activate	VDDSPD	Serial SPD-TSE positive power supply
DQ0–DQ63	DIMM memory data bus	ALERT_n	SDRAM ALERT_n
CB0–CB7	DIMM ECC check bits (for x72 module)	VPP	SDRAM Supply
TDQS0_t-TDQS8_t TDQS0_c-TDQS8_c	Dummy loads for mixed populations of x4 based and x8 based RDIMMs. Not used on UDIMMs.		
DQS0_t–DQS8_t	SDRAM data strobes (positive line of differential pair)		
DQS0_c–DQS8_c	SDRAM data strobes (negative line of differential pair)	RESET_n	Set DRAMs to a Known State
DM0_n–DM8_n, DBI0_n-DBI8_n	SDRAM data masks/data bus inversion (x8-based x72 DIMMs)	EVENT_n	SPD signals a thermal event has occurred.
CK0_t, CK1_t	SDRAM clocks (positive line of differential pair)	VTT	SDRAM I/O termination supply
CK0_c, CK1_c	SDRAM clocks (negative line of differential pair)	RFU	Reserved for future use

Note 1 Address A17 is not valid for x8 and x16 based SDRAMs. For UDIMMs this connection pin is NC.

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.

5. Pin Configurations

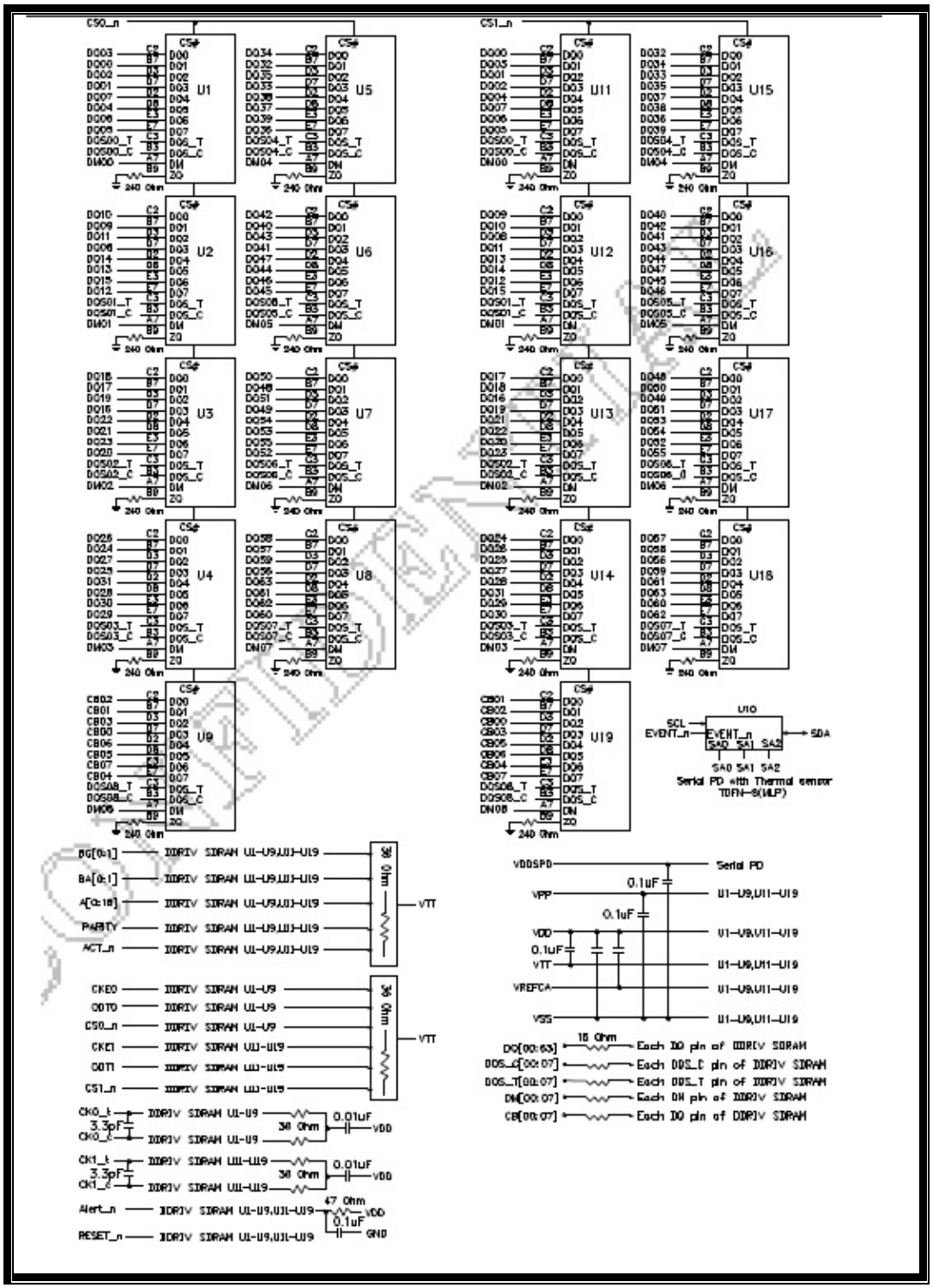
DDR4 ECC UDIMM

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	DM5_n/ DBI5_n,NC	254	VSS
3	DQ4	147	VSS	39	VSS	183	DQ25	75	CK0_c	219	CK1_c	111	NC	255	DQS5_c
4	VSS	148	DQ5	40	DM3_n/ DBI3_n,NC	184	VSS	76	VDD	220	VDD	112	VSS	256	DQS5_t
5	DQ0	149	VSS	41	NC	185	DQS3_c	77	VTT	221	VTT	113	DQ46	257	VSS
6	VSS	150	DQ1	42	VSS	186	DQS3_t	78	EVENT_n,NF	222	PARITY	114	VSS	258	DQ47
7	DM0_n/ DBI0_n	151	VSS	43	DQ30	187	VSS	79	A0	223	VDD	115	DQ42	259	VSS
8	NC	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/NC	191	VSS	83	VDD	227	NC	119	DQ48	263	VSS
12	DQ2	156	VSS	48	VSS	192	CB5,NC	84	CS0_n	228	WE_n/ A14	120	VSS	264	DQ49
13	VSS	157	DQ3	49	CB0/NC	193	VSS	85	VDD	229	VDD	121	DM6_n/ DBI6_n	265	VSS
14	DQ12	158	VSS	50	VSS	194	CB1,NC	86	CAS_n/ A15	230	NC	122	NC	266	DQS6_c
15	VSS	159	DQ13	51	DM8_n/ DBI8_n.NC	195	VSS	87	ODT0	231	VDD	123	VSS	267	DQS6_t
16	DQ8	160	VSS	52	NC	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	DM1_n/ DBI1_n,NC	162	VSS	54	CB6 DBI8_n,NC	198	VSS	90	VDD	234	NC	126	DQ50	270	VSS
19	NC	163	DQS1_c	55	VSS	199	CB7,NC	91	ODT1	235	NC	127	VSS	271	DQ51
20	VSS	164	DQS1_t	56	CB2/NC	200	VSS	92	VDD	236	VDD	128	DQ60	272	VSS
21	DQ14	165	VSS	57	VSS	201	CB3,NC	93	NC	237	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	DM7_n/ DBI7_n,NC	276	VSS
25	DQ20	169	VSS	61	VDD	205	NC	97	DQ32	241	VSS	133	NC	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	DM4_n/ DBI4_n,NC	243	VSS	135	DQ62	279	VSS
28	VSS	172	DQ17	64	VDD	208	ALERT_n	100	NC	244	DQS4_c	136	VSS	280	DQ63
29	DM2_n/ DBI2_n,NC	173	VSS	65	A12/BC_n	209	VDD	101	VSS	245	DQS4_t	137	DQ58	281	VSS
30	NC	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	VSSSPD
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	NC	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.

6. Block Diagram

- (16GB, 1 Rank 1Gx8 DDR4 SDRAMs)



Note: 1. The ZQ ball on each DDR4 component is connected to an external 240Ω ±1% resistor that is tied to ground. It is used for the calibration of the component's ODT and output driver.

7. Environmental Requirements

DDR4 UDIMMs are intended for use in standard office environments that have limited capacity for heating and air conditioning.

Symbol	Parameter	Rating	Units	Notes
TOPR	Operating Temperature (ambient)	0 to +85	˚C	3
HOPR	Operating Humidity (relative)	10 to 90	%	
TOPR	Storage Temperature	-50 to +100	˚C	1
HSTG	Storage Humidity (without condensation)	5 to 95	%	1
PBAR	Barometric Pressure (operating & storage)	105 to 69	K Pascal	1,2

1. Stresses greater than those listed may cause permanent damage to the device. This is a stress rating only, and device functional operation at or above the conditions indicated is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. Up to 9850 ft.
3. The component maximum case temperature (TCASE) shall not exceed the value specified in the DDR4 DRAM component specification. JESD79-4
Follow JEDEC spec.

8. SDRAM Parameters by device density

RTT_Nom Setting	Parameter		8Gb	Units
tREFI	Average periodic refresh interval	0°C≦**TCASE**≦**85**°C	7.8	µs
		85°C<**TCASE**≦**95**°C	3.9	µs

9. Parameter & Operating Conditions

Operating Temperature Condition

Symbol	Parameter		Rating	Units	Note
T_{OPER}	Operation Temperature	Normal Operating Temp.	0 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		-0.3 to +1.5	V	4
V_{DD}	Voltage on VDD supply relative to Vss		-0.3 to +1.5	V	4,6
V_{DDQ}	Voltage on VDDQ supply relative to Vss		-0.3 to +1.5	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 °C 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

Operating Condition

Parameter	Symbol	Min	Nom	Max	Units	Notes
Supply Voltage	**VDD**	1.14	1.2	1.26	V	1
DRAM activating power supply	**VPP**	2.375	2.5	2.75	V	2
Input reference voltage command/ address bus	**VREFCA(DC)**	0.49 x VDD	0.5 x VDD	0.51 x VDD	V	3
Termination Voltage	**VTT**	0.49 × VDD	0.5 × VDD	0.51 × VDD	V	4

Note:
1. VDDQ tracks with VDD; VDDQ and VDD are tied together.
2. VPP must be greater than or equal to VDD at all times.
3. VREFCA must not be greater than 0.6 x VDD. When VDD is less than 500mV, VREF may be less than or equal to 300mV.
4. VTT termination voltages in excess of the specification limit adversely affect the voltage margins of command and address signals and reduce timing margins.

Operating, Standby, and Refresh Currents

	Proposed Conditions	Value		Units
		IDD Max.	IPP Max.	
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	558	72	mA
IDD0A	Operating One Bank Active-Precharge Current (AL=CL-1) AL = CL-1, Other conditions: see IDD0	594	72	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	612	72	mA
IDD1A	Operating One Bank Active-Read-Precharge Current (AL=CL-1) AL = CL-1, Other conditions: see IDD1	738	72	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	360	54	mA
IDD2NA	Precharge Standby Current (AL=CL-1) AL = CL-1, Other conditions: see IDD2N	396	54	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	396	54	mA

IDD2NL	Precharge Standby Current with CAL enabled Same definition like for IDD2N, CAL enabled3	306	54	mA
IDD2NG	Precharge Standby Current with Gear Down mode enabled Same definition like for IDD2N, Gear Down mode enabled3	378	54	mA
IDD2ND	Precharge Standby Current with DLL disabled Same definition like for IDD2N, DLL disabled3	342	54	mA
IDD2N_par	Precharge Standby Current with CA parity enabled Same definition like for IDD2N, CA parity enabled3	378	54	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	234	72	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	360	72	mA
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	540	72	mA
IDD3NA	Active Standby Current (AL=CL-1) AL = CL-1, Other conditions: see IDD3N	378	72	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	2052	72	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	2196	72	mA

	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			
IDD4RA	Operating Burst Read Current (AL=CL-1) AL = CL-1, Other conditions: see IDD4R	2088	72	mA
IDD4RB	Operating Burst Read Current with Read DBI Read DBI enabled3, Other conditions: see IDD4R	1908	72	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	2034	72	mA
IDD4WA	Operating Burst Write Current (AL=CL-1) AL = CL-1, Other conditions: see IDD4W	1926	72	mA
IDD4WB	Operating Burst Write Current with Write DBI Write DBI enabled3, Other conditions: see IDD4W	1764	72	mA
IDD4WC	Operating Burst Write Current with Write CRC Write CRC enabled3, Other conditions: see IDD4W	2142	72	mA
IDD4W_par	Operating Burst Write Current with CA Parity CA Parity enabled3, Other conditions: see IDD4W	4140	450	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	2916	324	mA
IDD5F2	Burst Refresh Current (2X REF) tRFC=tRFC_x2, Other conditions: see IDD5B	2610	306	mA
IDD5F4	Burst Refresh Current (4X REF) tRFC=tRFC_x4, Other conditions: see IDD5B	378	72	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	576	90	mA

	Buffer and RTT: Enabled in Mode Registers2; ODT Signal: MIDLEVEL			
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	378	72	mA
IDD6R	Self-Refresh Current: Reduced Temperature Range TCASE: 0 - TBD (~35-45)°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	252	90	mA
IDD6A	Auto Self-Refresh Current TCASE: 0 - 95°C; Low Power Array Self Refresh (LP ASR) : Auto4;Partial Array Self-Refresh (PASR): Full Array; 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	360	90	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	2844	198	mA
IDD8	Maximum Power Down Current TBD	198	54	mA

10. Serial Presence Detect

Byte	Description	Function Supported	Hex Value
0	Number of Bytes Used / Number of Bytes in SPD Device / CRC Coverage	512B Total, 384B Used	23
1	SPD Revision	Ver 1.1	11
2	Key Byte / DRAM Device Type	DDR4 SDRAM	0C
3	Key Byte / Module Type	UDIMM	02
4	SDRAM Density and Banks	8Gb, 4BG&4Banks	85
5	SDRAM Addressing	Row : 16, Column :10	21
6	SDRAM Device Type	Monolithinc Device	00
7	SDRAM Optional Features	Unlimited MAC	08
8	SDRAM Thermal and Refresh Option	Reserved	00
9	Other SDRAM Optional Features	sPPR supported	60
10	Reserved	Reserved	00
11	Module Nominal Voltage, VDD	1.2V	03
12	Module Organization	2Rx8	09
13	Module Memory Bus Width	64bit, ECC	0B
14	Module Thermal Sensor	With TS	80
15~16	Reserved	Reserved	00
17	Timebases	MTB 125ps, FTB 1ps	00
18	SDRAM Minimum Cycle Time(tckavg min)	0.750ns	06
19	SDRAM Minimum Cycle Time(tckavg max)	1.6ns	0D
20	Cas Latency Supported, First Byte	10,11,12,13,14,15,16,17,18,19,20	F8
21	Cas Latency Supported, Second Byte	10,11,12,13,14,15,16,17,18,19,20	3F
22	Cas Latency Supported, Third Byte	10,11,12,13,14,15,16,17,18,19,20	00
23	Cas Latency Supported, Fourth Byte	10,11,12,13,14,15,16,17,18,19,20	00
24	Minimum Cas Latency Time (tAAmin)	13.75ns	6E
25	Minimum RAS to CAS Delay Time(tRCD min)	13.75ns	6E
26	Minimum Raw Precharge Delay Time(tRP min)	13.75ns	6E
27	Upper Nibbles for tRASmin and tRCmin	tRAS=32ns, tRC=45.75ns	11
28	Minimum Active to Precharge Delay Time (tRASmin), Least Significant Byte	tRAS=32ns	00
29	Minimum Active to Active/Refresh Delay Time (tRCmin), Least Significant Byte	tRC=45.75ns	6E

30	Minimum Refresh Recovery Delay Time (tRFC1min), LSB	350ns	F0
31	Minimum Refresh Recovery Delay Time (tRFC1min), MSB	350ns	0A
32	Minimum Refresh Recovery Delay Time (tRFC2min), LSB	260ns	20
33	Minimum Refresh Recovery Delay Time (tRFC2min), MSB	260ns	08
34	Minimum Refresh Recovery Delay Time (tRFC4min), LSB	160ns	00
35	Minimum Refresh Recovery Delay Time (tRFC4min), MSB	160ns	05
36	Minimum Four Active Window Time (tFAWmin), Most Significant Nibble	21ns	00
37	Minimum Four Activate Window Time (tFAWmin), Least Significant Byte	21ns	A8
38	Minimum Active to Active Delay Time (tRRD_smin), different Bank Group	2.5ns	14
39	Minimum Active to Active Delay Time (tRRD_Lmin), Same Bank Group	4.9ns	28
40	Minimum CAS to CAS Delay Time(tCCD_Lmin), same bank group	5.0ns	28
41	Upper Nibble for tWRmin	15ns	00
42	Minimum Write Recovery Time(tWRmin)	15ns	78
43	Upper Nibbles for tWTRmin	2.5ns	00
44	Minimum Write to Read Time(tWTR_smin), different bank group	2.5ns	14
45	Minimum Write to Read Time(tWTR_Lmin), same bank group	7.5ns	3C
46~59	Reserved	Reserved	00
60	Connector to SDRAM Bit Mapping		0C
61	Connector to SDRAM Bit Mapping		2C
62	Connector to SDRAM Bit Mapping		15
63	Connector to SDRAM Bit Mapping		35
64	Connector to SDRAM Bit Mapping		15
65	Connector to SDRAM Bit Mapping		35
66	Connector to SDRAM Bit Mapping		0B
67	Connector to SDRAM Bit Mapping		2C
68	Connector to SDRAM Bit Mapping		15
69	Connector to SDRAM Bit Mapping		35
70	Connector to SDRAM Bit Mapping		0B
71	Connector to SDRAM Bit Mapping		35
72	Connector to SDRAM Bit Mapping		0B
73	Connector to SDRAM Bit Mapping		2C

74	Connector to SDRAM Bit Mapping		0B
75	Connector to SDRAM Bit Mapping		35
76	Connector to SDRAM Bit Mapping		15
77	Connector to SDRAM Bit Mapping		36
78~116	Reserved	Reserved	00
117	Fine Offset for Minimum CAS to CAS Delay Time(tCCD_Lmin), same bank group	5.0ns	00
118	Fine Offset for Minimum Activate to Acticate Delay Time(tRRD_L_min), Same Bank Group	4.9ns	9C
119	Fine Offset for Minimum Activate to Acticate Delay Time(tRRD_Smin), Different Bank Group	3.0ns	00
120	Fine Offset for Minimum Activate to Acticate/Refresh Delay Time(tRCmin)	45.75ns	00
121	Fine Offset for Minimum Row Precharge Delay Time(tRPmin)	13.75ns	00
122	Fine Offset for Minimum RAS to CAS Delay Time(tRCD_min)	13.75ns	00
123	Fine Offset for Minimum CAS Latency Delay Time(tAA_min)	13.75ns	00
124	Fine Offset for DRAM Maximum Cycle Time(tCKAVG_max)	1.6ns	E7
125	Fine Offset for DRAM Minimum Cycle Time(tCKAVG_min)	0.750ns	00
126	Cyclical Redundancy Code	-	3E
127	Cyclical Redundancy Code	-	46
128	Raw Card Extension, Module Nominal Height	31 < height<= 32 mm	11
129	Module Maximum Thickness		11
130	Reference Raw Card Used	R/C G REV1	24
131	DIMM Module Attributes		01
132	RDIMM Thermal Heat Spreader Solution		00
133	Register Manufacturer ID Code, Least Signficant Byte		00
134	Register Manufacturer ID Code, Most Signficant Byte		00
135	Register Revision Number		00
136	Address Mapping from Register to DRAM		00
137	Register Ouput Drive Strength for Control		00
138	Register Output Strength for CK		00
139~253	Reserved	Reserved	00
254	Cyclical Redundancy Code	-	A6
255	Cyclical Redundancy Code	-	D6
256~319	Reserved	Reserved	00
320	Module Manufacturer's ID Code, Least Significant Byte	Advantech	8A

321	Module Manufacturer's ID Code, Most Significant Byte	Advantech	C8
322	Module Manufactoring Location	-	-
323	Module Manufactoring Date	Year	-
324	Module Manufactoring Date	Week	-
325~328	Module Serial Number	-	-
329~348	Module Part Number	SQR-UD4N16G3K2SECB	53 51 52 2D 55 44 34 4E 31 36 47 33 4B 32 53 45 43 42 20 20
349	Module Revision Code	-	00
350	DRAM Manufacturer's ID Code, Least Sgnificant Byte	Samsung	80
351	DRAM Manufacturer's ID Code, Most Sgnificant Byte	Samsung	CE
352	DRAM Stepping	Ver 0.0	00
353~380	Module Manufacturer's Specific Data	Reserved	00
381	Module Manufacturer's Specific Data	Reserved	00
382~383	Reserved	Reserved	00
384~511	End User Programmable	Reserved	00

Appendix: Part Number Table

Product	Advantech PN
SQRAM 16GB ECC U-DDR4-3200 1Gx8 (0~85) SAM C die	SQR-UD4N16G3K2SECB