



# Product Specifications

PART NO:

**VL470L2925F-B3S**

REV: 1.0

## General Information

### 1GB 128MX64 DDR SDRAM UNBUFFERED 200 PIN SODIMM

**Description** The VL470L2925F is a 128Mx64 Double Data Rate SDRAM high density unbuffered SODIMM. This memory module consists of sixteen CMOS 64Mx8 bit with 4 banks DDR Synchronous DRAMs in BGA packages and a 2K EEPROM in an 8-pin TSSOP package. This module is a 200-pin dual in-line memory module and is intended for mounting into a connector socket. Decoupling capacitors are mounted on the printed circuit board for each DDR SDRAM.

## Features

- Power supply: VDD: 2.5V +/- 0.2V, VDDQ: 2.5V +/- 0.2V
- Two data transfers per clock cycle
- Bi-directional data strobe (DQS)
- Differential clock inputs (CK and CK#)
- DLL aligns DQ and DQS transition with CK transition
- Programmable Read latency: DDR333(2.5 clock)
- Programmable burst; length (2, 4, 8)
- Programmable burst (sequential & interleave)
- Auto & self refresh, (8K/64ms refresh)
- Serial presence detect (SPD) with EEPROM
- PCB: Height 26.67mm (1.050"), double sided components

Pin Name	Function
A0~A12	Address Inputs
BA0, BA1	Bank Select Address
DQ0~DQ63	Data Inputs/Outputs
DQS0~DQS7	Data Strobe Inputs/Outputs
CK0, CK0# ~ CK1, CK1#	Clock Inputs
CKE0~CKE1	Clock Enable Inputs
CS0#~CS1#	Chip Select Inputs
RAS#	Row Address Strobes
CAS#	Column Address Inputs
WE#	Write Enable
DM0~DM7	Data Masks
VDD	Power Supply
VDDQ	Power Supply for DQS
VSS	Ground
VREF	Power Supply for Reference
VDDSPD	SPD Power Supply (2.3V-3.6V)
SDA	Serial Data Input/Output
SCL	SPD Clock Input
SA0~SA2	SPD Address
NC	No Connect

## Order Information

**VL470L2925F-B3 S X**

DRAM DIE (Option)

DRAM MANUFACTURER  
S - SAMSUNG

MODULE SPEED  
B3: PC2700 @ CL2.5

VL : Lead-free/RoHS



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## Pin Configuration

200-PIN DDR SODIMM FRONT								200-PIN DDR SODIMM BACK							
Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name		
1	VREF	51	VSS	101	A9	151	DQ42	2	VREF	52	VSS	102	A8	152	DQ46
3	VSS	53	DQ19	103	VSS	153	DQ43	4	VSS	54	DQ23	104	VSS	154	DQ47
5	DQ0	55	DQ24	105	A7	155	VDD	6	DQ4	56	DQ28	106	A6	156	VDD
7	DQ1	57	VDD	107	A5	157	VDD	8	DQ5	58	VDD	108	A4	158	CK1#
9	VDD	59	DQ25	109	A3	159	VSS	10	VDD	60	DQ29	110	A2	160	CK1
11	DQS0	61	DQS3	111	A1	161	VSS	12	DM0	62	DM3	112	A0	162	VSS
13	DQ2	63	VSS	113	VDD	163	DQ48	14	DQ6	64	VSS	114	VDD	164	DQ52
15	VSS	65	DQ26	115	A10	165	DQ49	16	VSS	66	DQ30	116	BA1	166	DQ53
17	DQ3	67	DQ27	117	BA0	167	VDD	18	DQ7	68	DQ31	118	RAS#	168	VDD
19	DQ8	69	VDD	119	WE#	169	DQS6	20	DQ12	70	VDD	120	CAS#	170	DM6
21	VDD	71	CB0*	121	CS0#	171	DQ50	22	VDD	72	CB4*	122	CS1#	172	DQ54
23	DQ9	73	CB1*	123	NC	173	VSS	24	DQ13	74	CB5*	124	NC	174	VSS
25	DQS1	75	VSS	125	VSS	175	DQ51	26	DM1	76	VSS	126	VSS	176	DQ55
27	VSS	77	DQS8*	127	DQ32	177	DQ56	28	VSS	78	DM8*	128	DQ36	178	DQ60
29	DQ10	79	CB2*	129	DQ33	179	VDD	30	DQ14	80	CB6*	130	DQ37	180	VDD
31	DQ11	81	VDD	131	VDD	181	DQ57	32	DQ15	82	VDD	132	VDD	182	DQ61
33	VDD	83	CB3*	133	DQS4	183	DQS7	34	VDD	84	CB7*	134	DM4	184	DM7
35	CK0	85	NC	135	DQ34	185	VSS	36	VDD	86	NC	136	DQ38	186	VSS
37	CK0#	87	VSS	137	VSS	187	DQ58	38	VSS	88	VSS	138	VSS	188	DQ62
39	VSS	89	CK2*	139	DQ35	189	DQ59	40	VSS	90	VSS	140	DQ39	190	DQ63
41	DQ16	91	CK2#*	141	DQ40	191	VDD	42	DQ20	92	VDD	142	DQ44	192	VDD
43	DQ17	93	VDD	143	VDD	193	SDA	44	DQ21	94	VDD	144	VDD	194	SA0
45	VDD	95	CKE1	145	DQ41	195	SCL	46	VDD	96	CKE0	146	DQ45	196	SA1
47	DQS2	97	NC	147	DQS5	197	VDDSPD	48	DM2	98	NC	148	DM5	198	SA2
49	DQ18	99	A12	149	VSS	199	NC	50	DQ22	100	A11	150	VSS	200	NC

Note: \*: These pins are not used in this modules.



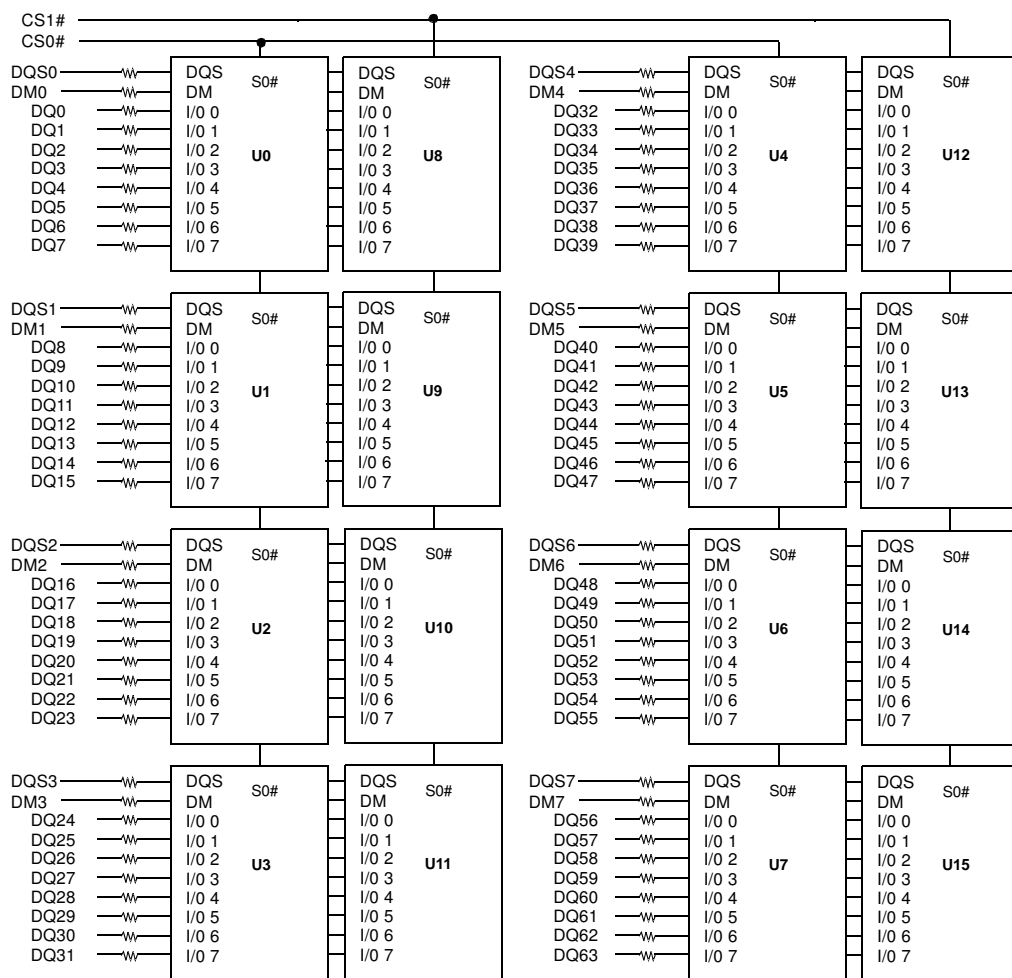
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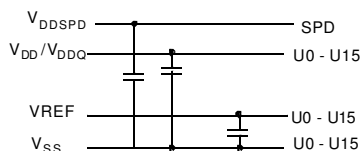
VL470L2925F-B3S

REV: 1.0

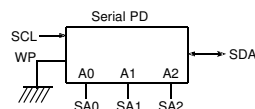
## Functional Block Diagram



- BA0 - BA1 → SDRAMs U0 - U15
- A0 - A12 → SDRAMs U0 - U15
- CKE0 → SDRAMs U0 - U7
- CKE1 → SDRAMs U8 - U15
- RAS# → SDRAMs U0 - U15
- CAS# → SDRAMs U0 - U15
- WE# → SDRAMs U0 - U15



Clock Wiring	
Clock Input	SDRAMs
CK0/CK0#	8 SDRAMs
CK1/CK1#	8 SDRAMs





# Product Specifications

PART NO:

VL470L2925F-B3S

REV: 1.0

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Voltage on any pin relative to Vss	V <sub>IN</sub> , V <sub>OUT</sub>	-0.5 ~ 3.6	V
Voltage on V <sub>DD</sub> & V <sub>DDQ</sub> supply relative to Vss	V <sub>DD</sub> , V <sub>DDQ</sub>	-1.0 ~ 3.6	V
Storage temperature	T <sub>STG</sub>	-55 ~ +150	°C
Operating temperature	T <sub>A</sub>	0 ~ 70	°C
Power Dissipation	P <sub>d</sub>	16	W
Short circuit output current	I <sub>OS</sub>	50	mA

Note: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to recommended operating condition. Exposing to higher than recommended voltage for extended periods of time could affect device reliability.

## DC Operating Conditions

T<sub>A</sub> = 0°C to 70°C

Parameter	Symbol	Min	Max	Unit	Note	
Supply voltage DDR333 (nominal V <sub>DD</sub> 2.5V)	V <sub>DD</sub>	2.3	2.7	V		
IO Supply voltage DDR333 (nominal V <sub>DD</sub> 2.5V)	V <sub>DDQ</sub>	2.3	2.7	V		
IO Reference voltage	V <sub>REF</sub>	0.49 * V <sub>DDQ</sub>	0.51 * V <sub>DDQ</sub>	V	1	
IO Termination voltage	V <sub>TT</sub>	V <sub>REF</sub> -0.04	V <sub>REF</sub> +0.04	V	2	
Input logic high voltage	V <sub>IH</sub> (DC)	V <sub>REF</sub> +0.15	V <sub>DDQ</sub> +0.30	V		
Input logic low voltage	V <sub>IL</sub> (DC)	-0.3	V <sub>REF</sub> -0.15	V		
Input voltage level, CK and CK#	V <sub>IN</sub> (DC)	-0.3	V <sub>DDQ</sub> +0.30	V		
Input differential voltage, CK and CK#	V <sub>ID</sub> (DC)	0.3	V <sub>DDQ</sub> +0.60	V	3	
Input crossing point voltage, CK and CK#	V <sub>IX</sub> (DC)	0.3	V <sub>DDQ</sub> +0.60	V		
Input leakage current	Addr, CAS#,RAS#,WE#	I <sub>I</sub>	-32	32	µA	
	CS#, CKE		-16	16	µA	
	CK, CK#		-16	16	µA	
	DM		-4	4	µA	
Output leakage current	I <sub>OZ</sub>	-10	10	µA		
Output high current(normal strength) V <sub>OUT</sub> = v + 0.84V	I <sub>OH</sub>	-16.8	-	mA		
Output high current(normal strength) V <sub>OUT</sub> = V <sub>TT</sub> - 0.84V	I <sub>OL</sub>	16.8	-	mA		
Output high current(half strength) V <sub>OUT</sub> = V <sub>TT</sub> + 0.45V	I <sub>OH</sub>	-9	-	mA		
Output high current(half strength) V <sub>OUT</sub> = V <sub>TT</sub> - 0.45V	I <sub>OL</sub>	9	-	mA		

Notes:

- V<sub>REF</sub> is expected to be equal to 0.5\*V<sub>DDQ</sub> of the transmitting device, and to track variations in the DC level of the same. Peak to peak noise on V<sub>REF</sub> may not exceed +/- 2% of the DC value.
- V<sub>TT</sub> is not applied directly to the device. V<sub>TT</sub> is a system supply for signal termination resistors, is expected to be set equal to V<sub>REF</sub>, and must track variations in the DC level of V<sub>REF</sub>.
- V<sub>ID</sub> is the magnitude of the difference between the input level on CK and the input level of CK#.



# Product Specifications

PART NO:

VL470L2925F-B3S

REV: 1.0

## AC Operating Conditions

Parameter	Symbol	Min	Max	Unit	Notes
Input High (Logic1) Voltage	V <sub>IH</sub> (AC)	V <sub>REF</sub> +0.31		V	1
Input Low (Logic0) Voltage	V <sub>IL</sub> (AC)		V <sub>REF</sub> -0.31	V	1
Input Differential Voltage, CK and CK# Inputs	V <sub>ID</sub> (AC)	0.7	V <sub>DDQ</sub> +0.6	V	
Input Crossing Point Voltage, CK and CK# Inputs	V <sub>IX</sub> (AC)	0.5*V <sub>DDQ</sub> -0.2	0.5*V <sub>DDQ</sub> +0.2	V	

Notes: 1. V<sub>IH</sub> overshoot: V<sub>IH</sub> = V<sub>DDQ</sub> + 1.5V for a pulse width <= 3ns and the pulse can not be greater than 1/3 of the cycle rate.  
V<sub>IL</sub> undershoot: V<sub>IL</sub> = - 1.5V for a pulse width <= 3ns and the pulse can not be greater than 1/3 of the cycle rate.

## Input/Output Capacitance

TA=25°C, f=100MHz

Parameter	Symbol	Min	Max	Unit
Input capacitance (A0~A12, BA0~BA1, RAS#, CAS#, WE#)	C <sub>IN1</sub>	28	44	pF
Input capacitance (CKE0, CKE1)	C <sub>IN2</sub>	16	24	pF
Input capacitance (CS0#, CS1#)	C <sub>IN3</sub>	16	24	pF
Input capacitance (CK0, CK0#, CK1, CK1#)	C <sub>IN4</sub>	16	24	pF
Input/Output capacitance (DQ, DQS, DM)	C <sub>IO</sub>	11	13	pF



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PART NO:

VL470L2925F-B3S

REV: 1.0

## IDD Specification

Condition	Symbol	-B3	Unit
OPERATING CURRENT: One device bank active; Active-Precharge; $t_{RC}=t_{RC(MIN)}$ ; $t_{CK}=t_{CK(MIN)}$ ; DQ,DM and DQS inputs change once per clock cycle; Address and control inputs change once every two clock cycles	IDD0*	880	mA
OPERATING CURRENT: One device bank; Active-Read-Precharge; BL=4; $t_{RC}=t_{RC(MIN)}$ ; $t_{CK}=t_{CK(MIN)}$ ; $I_{OUT}=0mA$ ; Address and control inputs change once per clock cycle	IDD1*	1120	mA
PRECHARGE POWER-DOWN STANDBY CURRENT: All device banks are idle; Power-down mode; $t_{CK}=t_{CK(MIN)}$ ; CKE=LOW	IDD2P**	80	mA
IDLE STANDBY CURRENT: CS#=HIGH; All device banks are idle; $t_{CK}=t_{CK(MIN)}$ ; CKE=HIGH; Address and other control inputs changing once per clock cycle. $V_{IN}=V_{REF}$ for DQ,DQS and DM	IDD2F**	480	mA
ACTIVE POWER-DOWN STANDBY CURRENT: One device bank active; Power-down mode; $t_{CK}=t_{CK(MIN)}$ ; CKE=LOW	IDD3P**	480	mA
ACTIVE STANDBY CURRENT: CS#=HIGH; CKE=HIGH; One device bank active; $t_{RC}=t_{RAS(MAX)}$ ; $t_{CK}=t_{CK(MIN)}$ ; DQ,DM and DQS inputs change twice per clock cycle; Address and other control inputs changing once per clock cycle	IDD3N**	720	mA
OPERATING CURRENT: Burst = 2; Reads; Continuous burst; One device bank active; Address and other control inputs changing once per clock cycle; $t_{CK}=t_{CK(MIN)}$ ; $I_{OUT}=0mA$	IDD4R*	1160	mA
OPERATING CURRENT: Burst = 2; Writes; Continuous burst; One device bank active; Address and other control inputs changing once per clock cycle; $t_{CK}=t_{CK(MIN)}$ ; DQ,DM and DQS inputs change twice per clock cycle	IDD4W*	1240	mA
AUTO REFRESH CURRENT: $T_{RC}=T_{RFC(MIN)}$	IDD5**	3280	mA
SELF-REFRESH CURRENT: CKE < 0.2V	IDD6**	80	mA
OPERATING CURRENT: Four device bank interleaving Reads Burst=4 with auto precharge; $t_{RC}=t_{RC(MIN)}$ ; $t_{CK}=t_{CK(MIN)}$ ; Address and control inputs change only during Active READ, or WRITE commands	IDD7*	2920	mA
<p>Note:            IDD specification is based on Samsung F-die components.            *: Value calculated as one module rank in this operation condition, and other module rank in IDD2P (CKE LOW) mode.            **: Value calculated as all module ranks in this operation condition.</p>			



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VL470L2925F-B3S

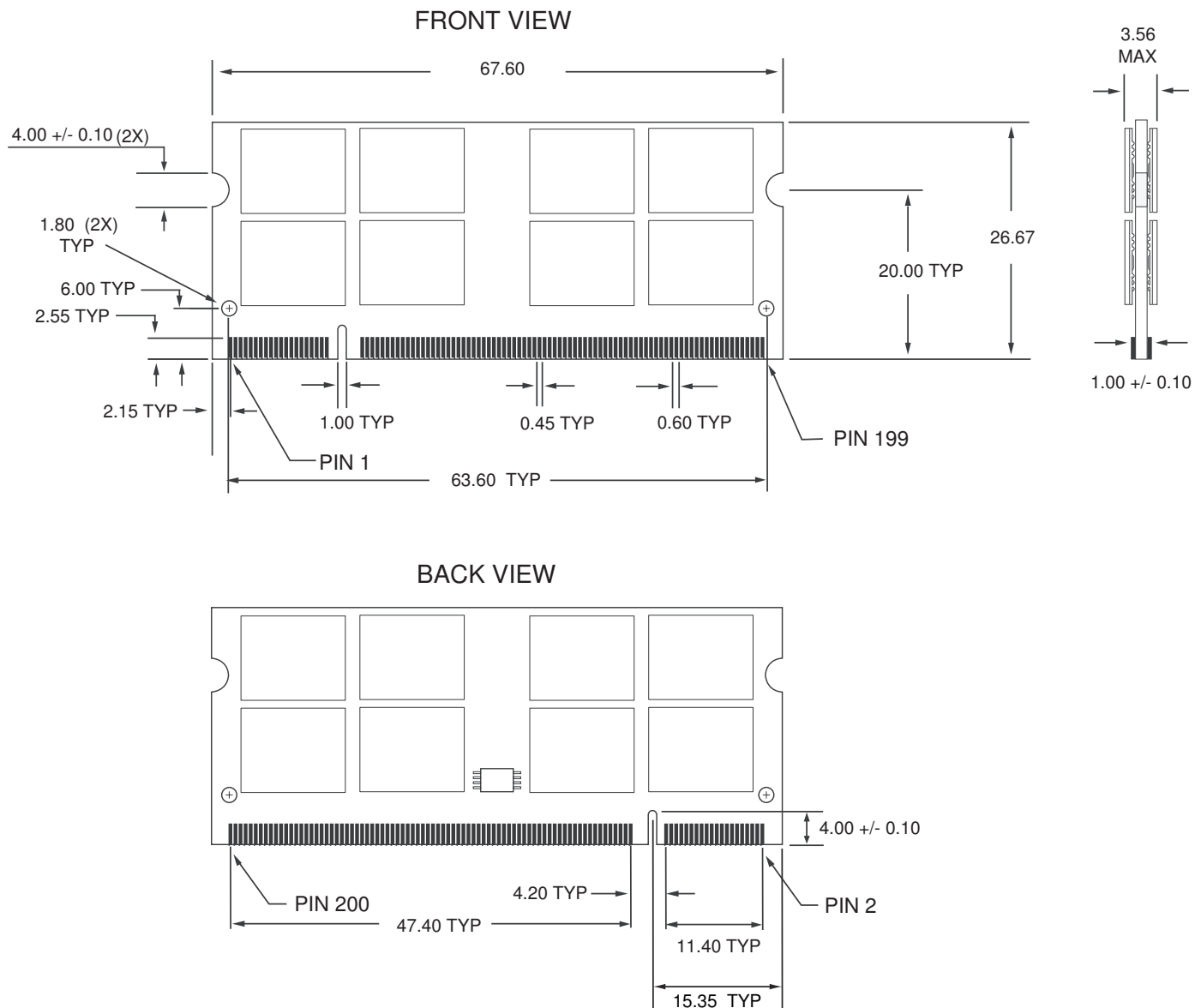
REV: 1.0

## AC Timing Parameters & Specifications

Parameter	Symbol	-B3		Unit
		MIN	MAX	
Row Cycle Time	tRC	60		ns
Refresh row cycle time	tRFC	72		ns
Row active	tRAS	42	70K	ns
RAS# to CAS# delay	tRCD	18		ns
Row precharge time	tRP	18		ns
Row active to row active delay	tRRD	12		ns
Write recovery time	tWR	15		ns
Last data in to READ command	tWTR	1		tCK
Clock cycle time	CL=2	-	-	ns
	CL=2.5	6	12	ns
	CL=3	-	-	ns
Clock high level width	tCH	0.45	0.55	tCK
Clock low level width	tCL	0.45	0.55	tCK
DQS-out access time from CK/CK#	tDQSK	-0.6	+0.6	ns
Output data access time from CK/CK#	tAC	-0.7	+0.7	ns
Data strobe edge to output data edge	tDQSQ	-	0.4	ns
Read preamble	tRPRE	0.9	1.1	tCK
Read postamble	tRPST	0.4	0.6	tCK
CK to valid DQS-in	tDQSS	0.75	1.25	tCK
DQS-in setup time	tWPRES	0		ns
DQS-in hold time	tWPRE	0.25		tCK
DQS falling edge to CK rising-setup time	tDSS	0.2		tCK
DQS falling edge to CK rising-hold time	tDSH	0.2		tCK
DQS-in high level width	tDQSH	0.35		tCK
DQS-in low level width	TDQSL	0.35		tCK
Address and control input setup time (fast)	tISf	0.75		ns
Address and control input hold time (fast)	tIHf	0.75		ns
Address and control input setup time (slow)	tISs	0.8		ns
Address and control input hold time (slow)	tIHs	0.8		ns
Data-out high impedance time from CK/CK#	tHZ	-0.7	+0.7	ns
Data-out low impedance time from CK/CK#	tLZ	-0.7	+0.7	ns
Mode register set cycle	tMRD	12		ns
DQ & DM setup time to DQS	tDS	0.45		ns
DQ & DM hold time to DQS	tDH	0.45		ns
Control & address input pulse width	tIPW	2.2		ns
DQ & DM input pulse width	tDIPW	1.75		ns
Exit self refresh to non-Read command	tXSNR	75		ns
Exit self refresh to Read command	tXSRD	200		tCK
Refresh interval time	tREFI		7.8	us
Output DQS valid window	tQH	tHP -tQHS	-	ns
Clock half period	tHP	tCLmin or tCHmin	-	ns
Data hold skew factor	tQHS		0.5	ns
DQS write postamble	tWPST	0.4	0.6	tCK
Active Read with auto precharge command	tRAP	18		
Auto precharge Write recovery + Precharge time	tDAL	tWR/tCK + tRP/tCK		tCK

<h1>Product Specifications</h1>		
PART NO:	VL470L2925F-B3S	REV: 1.0

## Package Dimensions



NOTE:  
 All dimension are in millimeters with tolerance +/- 0.15mm unless otherwise specified.



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<b>PART NO:</b>	<b>VL470L2925F-B3S</b>	<b>REV: 1.0</b>

**Revision History:**

<b>Date</b>	<b>Rev.</b>	<b>Page</b>	<b>Changes</b>
04/02/09	1.0	All	Spec release