M36L0R7040T0
M36L0R7040B0

128 Mbit (Multiple Bank, Multi-Level, Burst) Flash Memory and 16 Mbit PSRAM, 1.8V Supply, Multi-Chip Package

FEATURES SUMMARY

- MULTI-CHIP PACKAGE
  - 1 die of 128 Mbit (8Mb x16, Multiple Bank, Multi-level, Burst) Flash Memory
  - 1 die of 16 Mbit (1Mb x16) Pseudo SRAM
- SUPPLY VOLTAGE
  - $V_{DDF} = V_{DDP} = V_{DDQ} = 1.7$ to 1.95V
  - $V_{PP} = 9V$ for fast program (12V tolerant)
- ELECTRONIC SIGNATURE
  - Manufacturer Code: 20h
  - Device Code (Top Flash Configuration) M36L0R7040T0: 88C4h
  - Device Code (Bottom Flash Configuration) M36L0R7040B0: 88C5h
- PACKAGE
  - Compliant with Lead-Free Soldering Processes
  - Lead-Free Versions

FLASH MEMORY

- SYNCHRONOUS / ASYNCHRONOUS READ
  - Synchronous Burst Read mode: 54MHz
  - Asynchronous Page Read mode
  - Random Access: 85ns
- SYNCHRONOUS BURST READ SUSPEND
- PROGRAMMING TIME
  - 10µs typical Word program time using Buffer Program
- MEMORY ORGANIZATION
  - Multiple Bank Memory Array: 8 Mbit Banks
  - Parameter Blocks (Top or Bottom location)
- DUAL OPERATIONS
  - program/erase in one Bank while read in others
  - No delay between read and write operations
- SECURITY
  - 64 bit unique device number
  - 2112 bit user programmable OTP Cells

Figure 1. Package

TFBGA88 (ZAQ)
8 x 10mm
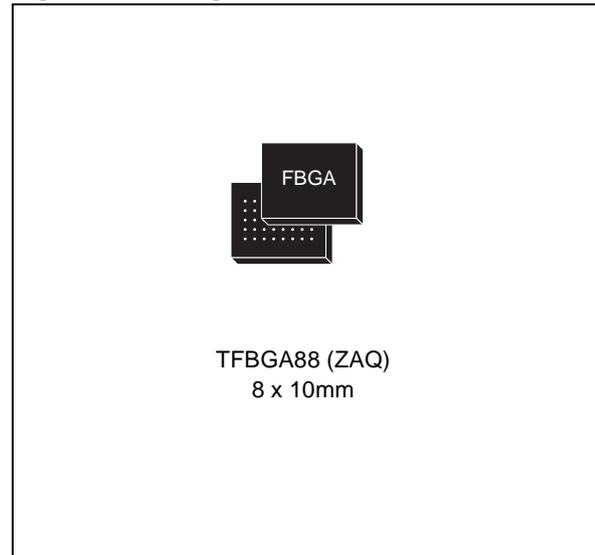
- BLOCK LOCKING
  - All blocks locked at power-up
  - Any combination of blocks can be locked with zero latency
  - $\overline{WP}_F$ for Block Lock-Down
  - Absolute Write Protection with $V_{PP} = V_{SS}$
- COMMON FLASH INTERFACE (CFI)
- 100,000 PROGRAM/ERASE CYCLES per BLOCK

PSRAM

- ACCESS TIME: 70ns
- LOW STANDBY CURRENT: 110µA
- DEEP POWER DOWN CURRENT: 10µA

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M36L0R7040T0, M36L0R7040B0

SUMMARY DESCRIPTION

The M36L0R7040T0 and M36L0R7040B0 combine two memory devices in a Multi-Chip Package: a 128-Mbit, Multiple Bank Flash memory, the M30L0R7000T0 or M30L0R7000B0, and a 16-Mbit PseudoSRAM, the M69AR024B. Recommended operating conditions do not allow more than one memory to be active at the same time.

The memory is offered in a Stacked TFBGA88 (8x10mm, 8x10 ball array, 0.8mm pitch) package.

In addition to the standard version, the packages are also available in Lead-free version, in compliance with JEDEC Std J-STD-020B, the ST ECO-PACK 7191395 Specification, and the RoHS (Restriction of Hazardous Substances) directive.

All packages are compliant with Lead-free soldering processes.

The memory is supplied with all the bits erased (set to '1').

Figure 2. Logic Diagram
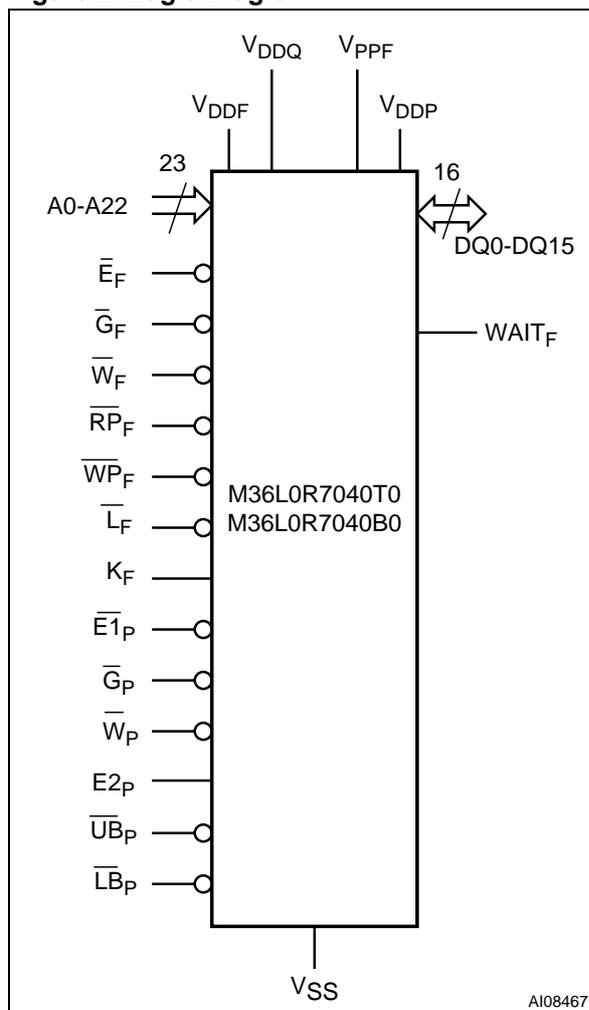
Table 1. Signal Names

A0-A22 [1]	Address Inputs
DQ0-DQ15	Common Data Input/Output
V_{DDF}	Power Supply for Flash Memory
V_{DDQ}	Flash Memory Power Supply for I/O Buffers
V_{PPF}	Flash Optional Supply Voltage for Fast Program and Erase
V_{SS}	Ground
V_{DDP}	PSRAM Power Supply
NC	Not Connected Internally
DU	Do Not Use as Internally Connected
Flash Memory Control Functions	
$\overline{L}_F$	Latch Enable Input
$\overline{E}_F$	Chip Enable Input
$\overline{G}_F$	Output Enable Input
$\overline{W}_F$	Write Enable Input
$\overline{RP}_F$	Reset Input
$\overline{WP}_F$	Write Protect Input
K_F	Burst Clock
$WAIT_F$	Wait Data in Burst Mode
PSRAM Control Functions	
$\overline{E1}_P$	Chip Enable Input
$\overline{G}_P$	Output Enable Input
$\overline{W}_P$	Write Enable Input
$E2_P$	Power-down Input
$\overline{UB}_P$	Upper Byte Enable Input
$\overline{LB}_P$	Lower Byte Enable Input

Note: 1. A22-A20 are not connected to the PSRAM component.

Figure 3. TFBGA Connections (Top view through package)

	1	2	3	4	5	6	7	8
A	DU	DU					DU	DU
B	A4	A18	A19	V_{SS}	V_{DDF}	NC	A21	A11
C	A5	$\overline{LB}_P$	NC	V_{SS}	NC	K_F	A22	A12
D	A3	A17	NC	V_{PPF}	$\overline{W}_P$	$\overline{E}_P$	A9	A13
E	A2	A7	NC	$\overline{WP}_F$	$\overline{L}_F$	A20	A10	A15
F	A1	A6	$\overline{UB}_P$	$\overline{RP}_F$	$\overline{W}_F$	A8	A14	A16
G	A0	DQ8	DQ2	DQ10	DQ5	DQ13	$WAIT_F$	NC
H	$\overline{G}_P$	DQ0	DQ1	DQ3	DQ12	DQ14	DQ7	NC
J	NC	$\overline{G}_F$	DQ9	DQ11	DQ4	DQ6	DQ15	V_{DDQ}
K	$\overline{E}_F$	DU	DU	NC	V_{DDP}	NC	V_{DDQ}	E2$_P$
L	V_{SS}	V_{SS}	V_{DDQ}	V_{DDF}	V_{SS}	V_{SS}	V_{SS}	V_{SS}
M	DU	DU					DU	DU

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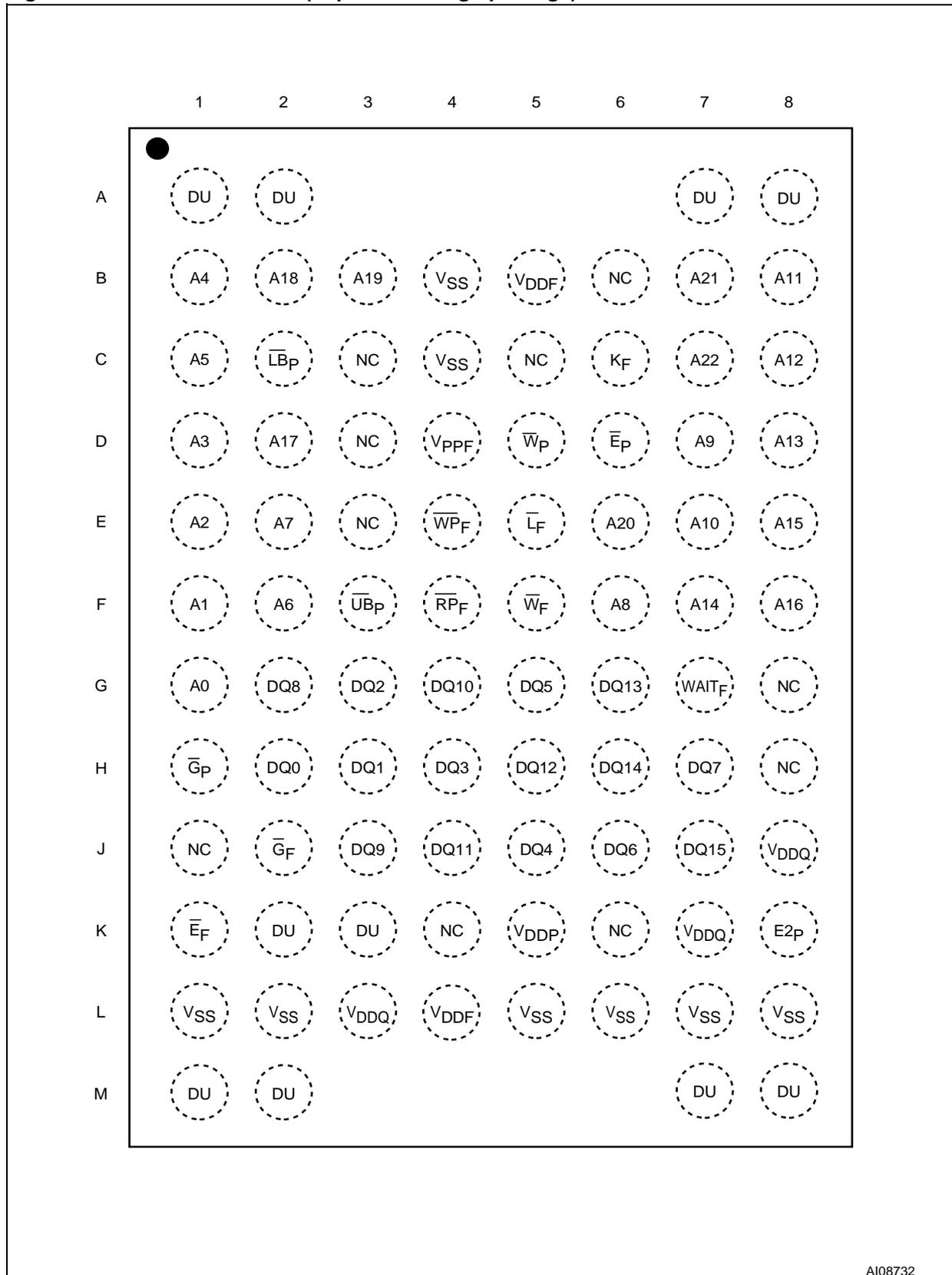
SIGNAL DESCRIPTIONS

See Figure 2., Logic Diagram and Table 1., Signal Names, for a brief overview of the signals connected to this device.

Address Inputs (A0-A22). Addresses A0-A19 are common inputs for the Flash memory and the PSRAM components. The other lines (A20-A22) are inputs for the Flash memory component only.

The Address Inputs select the cells in the memory array to access during Bus Read operations. During Bus Write operations they control the commands sent to the Command Interface of the Flash memory Program/Erase Controller or they select the cells to access in the PSRAM.

The Flash memory component is accessed through the Chip Enable signal ($\overline{E}_F$) and through the Write Enable ($\overline{W}_F$) signal, while the PSRAM is accessed through two Chip Enable signals ($\overline{E1}_P$ and $E2_P$) and the Write Enable signal ($\overline{W}_P$).

Data Input/Output (DQ0-DQ15). In the Flash memory, the Data I/O outputs the data stored at the selected address during a Bus Read operation or inputs a command or the data to be programmed during a Write Bus operation.

In the PSRAM the Upper Byte Data Inputs/Outputs, DQ8-DQ15, carry the data to or from the upper part of the selected address during a Write or Read operation, when Upper Byte Enable ($\overline{UB}_P$) is driven Low.
The Lower Byte Data Inputs/Outputs, DQ0-DQ7, carry the data to or from the lower part of the selected address during a Write or Read operation, when Lower Byte Enable ($\overline{LB}_P$) is driven Low

Flash Chip Enable ($\overline{E}_F$). The Chip Enable input activates the memory control logic, input buffers, decoders and sense amplifiers. When Chip Enable is Low, $V_{IL,}$ and Reset is High, V_{IH}, the device is in active mode. When Chip Enable is at V_{IH} the Flash memory is deselected, the outputs are high impedance and the power consumption is reduced to the standby level.

Flash Output Enable ($\overline{G}_F$). The Output Enable input controls data output during Flash memory Bus Read operations.

Flash Write Enable ($\overline{W}_F$). The Write Enable controls the Bus Write operation of the Flash memories' Command Interface. The data and address inputs are latched on the rising edge of Chip Enable or Write Enable whichever occurs first.

Flash Write Protect ($\overline{WP}_F$). Write Protect is an input that gives an additional hardware protection for each block. When Write Protect is Low, V_{IL}, Lock-Down is enabled and the protection status of the Locked-Down blocks cannot be changed. When Write Protect is at High, V_{IH}, Lock-Down is disabled and the Locked-Down blocks can be locked or unlocked. (See the Lock Status Table in the M30L0R7000T0 datasheet).

Flash Reset ($\overline{RP}_F$). The Reset input provides a hardware reset of the memory. When Reset is at V_{IL}, the memory is in Reset mode: the outputs are high impedance and the current consumption is reduced to the Reset Supply Current I_{DD2}. Refer to Table 6., Flash Memory DC Characteristics - Currents, for the value of I_{DD2}. After Reset all blocks are in the Locked state and the Configuration Register is reset. When Reset is at V_{IH}, the device is in normal operation. Exiting Reset mode the device enters Asynchronous Read mode, but a negative transition of Chip Enable or Latch Enable is required to ensure valid data outputs.

The Reset pin can be interfaced with 3V logic without any additional circuitry. It can be tied to V_{RPH} (refer to Table 7., Flash Memory DC Characteristics - Voltages).

Flash Latch Enable ($\overline{L}_F$). Latch Enable latches the address bits on its rising edge. The address latch is transparent when Latch Enable is Low, V_{IL}, and it is inhibited when Latch Enable is High, V_{IH}. Latch Enable can be kept Low (also at board level) when the Latch Enable function is not required or supported.

Flash Clock (K_F). The Clock input synchronizes the Flash memory to the microcontroller during synchronous read operations; the address is latched on a Clock edge (rising or falling, according to the configuration settings) when Latch Enable is at V_{IL}. Clock is don't care during Asynchronous Read and in write operations.

Flash Wait ($WAIT_F$). $WAIT_F$ is a Flash output signal used during Synchronous Read to indicate whether the data on the output bus are valid. This output is high impedance when Flash Chip Enable is at V_{IH} or Flash Reset is at V_{IL}. It can be configured to be active during the wait cycle or one clock cycle in advance. The $WAIT_F$ signal is not gated by Output Enable.

PSRAM Chip Enable ($\overline{E1}_P$). When asserted (Low), the Chip Enable, $\overline{E1}_P$, activates the memory state machine, address buffers and decoders, allowing Read and Write operations to be performed. When de-asserted (High), all other pins are ignored, and the device is put, automatically, in low-power Standby mode.

It is not allowed to set $\overline{E}_F$ at $V_{IL,}$ $\overline{E1}_P$ at V_{IL} and $E2_P$ at V_{IH} at the same time.

PSRAM Chip Enable ($E2_P$). The Chip Enable, $E2_P$, puts the device in Deep Power-down mode when it is driven Low. This is the lowest power mode.

It is not allowed to set $\overline{E}_F$ at V_{IL}, $\overline{E1}_P$ at V_{IL} and $E2_P$ at V_{IH} at the same time.

PSRAM Write Enable ($\overline{W}_P$). The Write Enable input controls writing to the PSRAM memory array. $\overline{W}_P$ is active low.

PSRAM Output Enable ($\overline{G}_P$). The Output Enable gates the outputs through the data buffers during a Read operation of the PSRAM memory. $\overline{G}_P$ is active low.

PSRAM Upper Byte Enable ($\overline{UB}_P$). The Upper Byte Enable input enables the upper byte for PSRAM (DQ8-DQ15). $\overline{UB}_P$ is active low.

PSRAM Lower Byte Enable ($\overline{LB}_P$). The Lower Byte Enable input enables the lower byte for PSRAM (DQ0-DQ7). $\overline{LB}_P$ is active low.

V_{DDF} Supply Voltage. V_{DDF} provides the power supply to the internal cores of the Flash memory component. It is the main power supply for all Flash operations (Read, Program and Erase).

V_{DDP} Supply Voltage. V_{DDP} provides the power supply to the internal core of the PSRAM device. It is the main power supply for all PSRAM operations.

V_{DDQ} Supply Voltage. V_{DDQ} provides the power supply for the Flash Memory I/O pins. This allows all Outputs to be powered independently of the Flash Memory core power supply, V_{DDF}.

V_{PPF} Program Supply Voltage. V_{PPF} is both a Flash control input and a Flash power supply pin. The two functions are selected by the voltage range applied to the pin.

If V_{PPF} is kept in a low voltage range (0V to V_{DDQ}) V_{PPF} is seen as a control input. In this case a voltage lower than V_{PPLKF} gives an absolute protection against Program or Erase, while $V_{PPF} > V_{PP1F}$ enables these functions (see Tables 6 and 7, DC Characteristics for the relevant values). V_{PPF} is only sampled at the beginning of a Program or Erase; a change in its value after the operation has started does not have any effect and Program or Erase operations continue.

If V_{PPF} is in the range of V_{PPHF} it acts as a power supply pin. In this condition V_{PPF} must be stable until the Program/Erase algorithm is completed.

V_{SS} Ground. V_{SS} is the common ground reference for all voltage measurements in the Flash (core and I/O Buffers) and PSRAM chips.

Note: Each Flash memory device in a system should have their supply voltage (V_{DDF}) and the program supply voltage V_{PPF} decoupled with a 0.1µF ceramic capacitor close to the pin (high frequency, inherently low inductance capacitors should be as close as possible to the package). See Figure 6., AC Measurement Load Circuit. The PCB track widths should be sufficient to carry the required V_{PPF} program and erase currents.

FUNCTIONAL DESCRIPTION

The PSRAM and Flash memory components have separate power supplies but share the same grounds. They are distinguished by three Chip Enable inputs: $\overline{E}_F$ for the Flash memory and $\overline{E1}_P$ and $E2_P$ for the PSRAM.

Recommended operating conditions do not allow more than one device to be active at a time. The most common example is simultaneous read operations in the Flash memory and the PSRAM which would result in a data bus contention. Therefore it is recommended to put the other device in the high impedance state when reading the selected device.
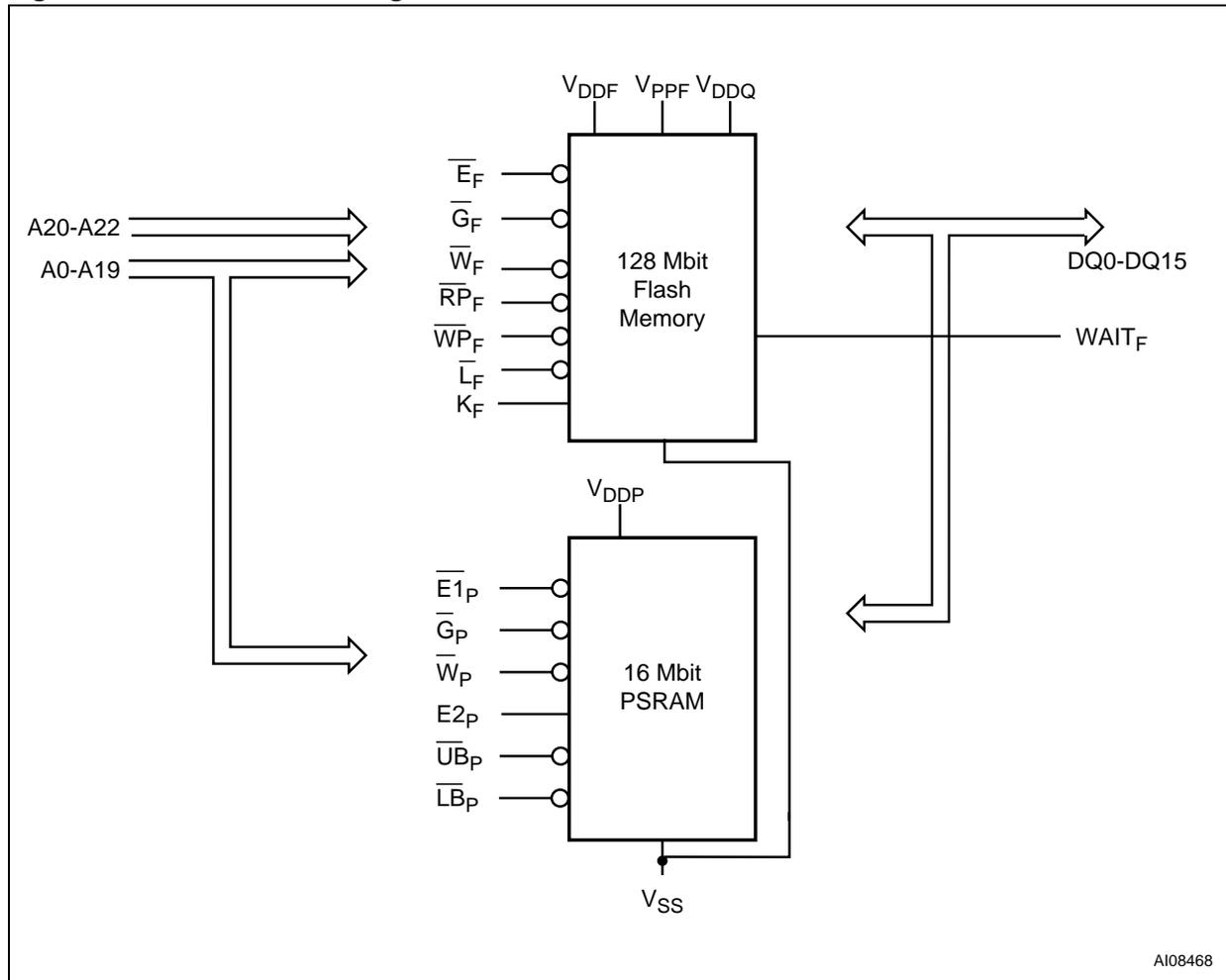
Figure 4. Functional Block Diagram

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Table 2. Main Operating modes

Operation	$\overline{E}_F$	$\overline{G}_F$	$\overline{W}_F$	$\overline{L}_F$	$\overline{RP}_F$	WAIT$_F$(4)	$\overline{E1}_P$	$\overline{E2}_P$	$\overline{G}_P$	$\overline{W}_P$	$\overline{LB}_P,\overline{UB}_P$	DQ15-DQ0
Flash Read	V_{IL}	V_{IL}	V_{IH}	$V_{IL(2)}$	V_{IH}							Flash Data Out
Flash Write	V_{IL}	V_{IH}	V_{IL}	$V_{IL(2)}$	V_{IH}		PSRAM must be disabled					Flash Data In
Flash Address Latch	V_{IL}	X	V_{IH}	V_{IL}	V_{IH}							Flash Data Out or Hi-Z [3]
Flash Output Disable	V_{IL}	V_{IH}	V_{IH}	X	V_{IH}							Hi-Z
Flash Standby	V_{IH}	X	X	X	V_{IH}	Hi-Z	Any PSRAM mode is allowed					Hi-Z
Flash Reset	X	X	X	X	V_{IL}	Hi-Z						Hi-Z
PSRAM Read							V_{IL}	V_{IH}	V_{IL}	V_{IH}	V_{IL}	PSRAM data out
PSRAM Write	Flash Memory must be disabled						V_{IL}	V_{IH}	V_{IH}	V_{IL}	V_{IL}	PSRAM data in
Output Disable							V_{IL}	V_{IH}	V_{IH}	V_{IH}	X	Hi-Z
PSRAM Standby	Any Flash mode is allowed						V_{IH}	V_{IH}	X	X	X	Hi-Z
PSRAM Deep Power-Down							X	V_{IL}	X	X	X	Hi-Z

Note: 1. X = Don't care.
2. $\overline{L}_F$ can be tied to V_{IH} if the valid address has been previously latched.
3. Depends on $\overline{G}_F$.
4. WAIT signal polarity is configured using the Set Configuration Register command. See the M30L0R7000T0 datasheet for details.

FLASH MEMORY COMPONENT

The M36L0R7040T0 and M36L0R7040B0 contain a 128 Mbit Flash memory. For detailed information on how to use the devices, see the M30L0R7000(T/B)0 datasheet which is available from the internet site *http://www.st.com* or from your local STMicroelectronics distributor.

PSRAM COMPONENT

The M36L0R7040T0 and M36L0R7040B0 contain a 16 Mbit PSRAM. For detailed information on how to use the device, see the M69AR024B datasheet which is available from the internet site *http://www.st.com* or from your local STMicroelectronics distributor.

MAXIMUM RATING

Stressing the device above the rating listed in the Absolute Maximum Ratings table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the Operating sections of this specification is not im-plied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics SURE Program and other relevant quality documents.

Table 3. Absolute Maximum Ratings

Symbol	Parameter	Value		Unit
		Min	Max	
T_A	Ambient Operating Temperature	−25	85	°C
T_{BIAS}	Temperature Under Bias	−25	85	°C
T_{STG}	Storage Temperature	−65	125	°C
T_{LEAD}	Lead Temperature during Soldering		(1)	°C
V_{IO}	Input or Output Voltage	−0.2	3.3	V
V_{DDF}, V_{DDQ}, V_{DDP}	Core and Input/Output Supply Voltages	−0.2	2.5	V
V_{PPF}	Flash Program Voltage	−0.2	14	V
I_O	Output Short Circuit Current		100	mA
t_{VPPFH}	Time for V_{PPF} at V_{PPFH}		100	hours

Note: 1. Compliant with the JEDEC Std J-STD-020B (for small body, Sn-Pb or Pb assembly), the ST ECOPACK® 7191395 specification, and the European directive on Restrictions on Hazardous Substances (RoHS) 2002/95/EU.

DC AND AC PARAMETERS

This section summarizes the operating measurement conditions, and the DC and AC characteristics of the device. The parameters in the DC and AC characteristics Tables that follow, are derived from tests performed under the Measurement Conditions summarized in Table 4., Operating and AC Measurement Conditions. Designers should check that the operating conditions in their circuit match the operating conditions when relying on the quoted parameters.

Table 4. Operating and AC Measurement Conditions

Parameter	Flash Memory		PSRAM		Unit
	Min	Max	Min	Max	
V_{DDF} Supply Voltage	1.7	1.95	–	–	V
V_{DDP} Supply Voltage	–	–	1.7	1.95	V
V_{DDQF} Supply Voltage	1.7	1.95	–	–	V
V_{PPF} Supply Voltage (Factory environment)	8.5	12.6	–	–	V
V_{PPF} Supply Voltage (Application environment)	–0.4	V_{DDQ} +0.4	–	–	V
Ambient Operating Temperature	–25	85	–25	85	°C
Load Capacitance (C_L)	30		50		pF
Output Circuit Resistors (R_1, R_2)	16.7		16.7		kΩ
Input Rise and Fall Times		5	5		ns
Input Pulse Voltages	0 to V_{DDQ}		0 to V_{DDQ}		V
Input and Output Timing Ref. Voltages	V_{DDQ}/2		V_{DDQ}/2		V

Figure 5. AC Measurement I/O Waveform

Figure 6. AC Measurement Load Circuit

C_L includes JIG capacitance
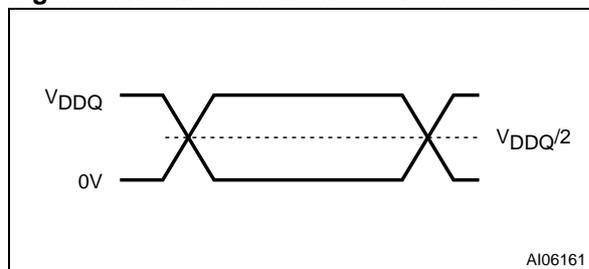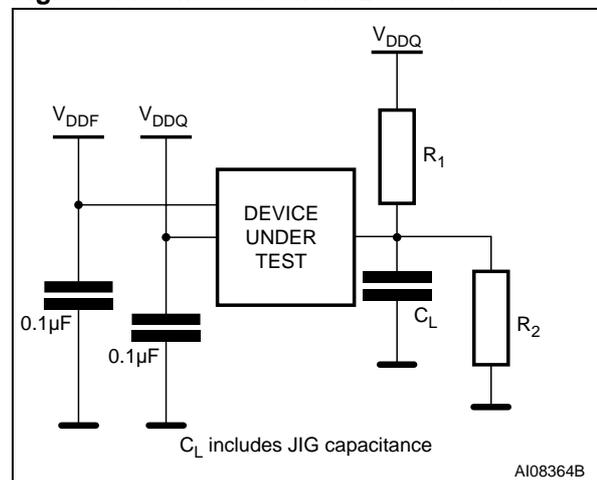
Table 5. Device Capacitance

Symbol	Parameter	Test Condition	Min	Max	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V		12	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V		15	pF

Note: Sampled only, not 100% tested.

Table 6. Flash Memory DC Characteristics - Currents

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
I_{LI}	Input Leakage Current	$0V \le V_{IN} \le V_{DDQ}$			±1	μA
I_{LO}	Output Leakage Current	$0V \le V_{OUT} \le V_{DDQ}$			±1	μA
I_{DD1}	Supply Current Asynchronous Read (f=6MHz)	$\overline{E}_F = V_{IL}, \overline{G}_F = V_{IH}$		10	15	mA
	Supply Current Synchronous Read (f=40MHz)	4 Word		7	16	mA
		8 Word		10	18	mA
		16 Word		13	20	mA
		Continuous		18	25	mA
	Supply Current Synchronous Read (f=54MHz)	4 Word		16	18	mA
		8 Word		18	20	mA
		16 Word		21	25	mA
		Continuous		22	27	mA
I_{DD2}	Supply Current (Reset)	$\overline{RP}_F = V_{SS} \pm 0.2V$		25	70	μA
I_{DD3}	Supply Current (Standby)	$\overline{E}_F = V_{DDF} \pm 0.2V$		25	70	μA
I_{DD4}	Supply Current (Automatic Standby)	$\overline{E}_F = V_{IL}, \overline{G}_F = V_{IH}$		25	70	μA
I_{DD5} [1]	Supply Current (Program)	$V_{PPF} = V_{PPH}$		8	15	mA
		$V_{PPF} = V_{DDF}$		10	20	mA
	Supply Current (Erase)	$V_{PPF} = V_{PPH}$		8	15	mA
		$V_{PPF} = V_{DDF}$		10	20	mA
I_{DD6} [1,2]	Supply Current (Dual Operations)	Program/Erase in one Bank, Asynchronous Read in another Bank		20	35	mA
		Program/Erase in one Bank, Synchronous Read in another Bank		32	47	mA
I_{DD7} [1]	Supply Current Program/ Erase Suspended (Standby)	$\overline{E}_F = V_{DDF} \pm 0.2V$		25	70	μA
I_{PP1} [1]	V_{PPF} Supply Current (Program)	$V_{PPF} = V_{PPH}$		2	5	mA
		$V_{PPF} = V_{DDF}$		0.2	5	μA
	V_{PPF} Supply Current (Erase)	$V_{PPF} = V_{PPH}$		2	5	mA
		$V_{PPF} = V_{DDF}$		0.2	5	μA
I_{PP2}	V_{PPF} Supply Current (Read)	$V_{PPF} \le V_{DDF}$		0.2	5	μA
I_{PP3} [1]	V_{PPF} Supply Current (Standby)	$V_{PPF} \le V_{DDF}$		0.2	5	μA

Note: 1. Sampled only, not 100% tested.
2. V_{DDF} Dual Operation current is the sum of read and program or erase currents.

Table 7. Flash Memory DC Characteristics - Voltages

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{IL}	Input Low Voltage		−0.5		0.4	V
V_{IH}	Input High Voltage		V_{DDQ} −0.4		V_{DDQ} + 0.4	V
V_{OL}	Output Low Voltage	I_{OL} = 100µA			0.1	V
V_{OH}	Output High Voltage	I_{OH} = −100µA	V_{DDQ} −0.1			V
V_{PP1}	V_{PPF} Program Voltage-Logic	Program, Erase	1.1	1.8	3.3	V
V_{PPH}	V_{PPF} Program Voltage Factory	Program, Erase	8.5	9.0	12.6	V
V_{PPLK}	Program or Erase Lockout				0.4	V
V_{LKO}	V_{DDF} Lock Voltage		1			V
V_{RPH}	$\overline{RP}_F$ pin Extended High Voltage				3.3	V

Table 8. PSRAM DC Characteristics

Symbol	Parameter	Test Condition		Min	Max	Unit
I_{CC1}	V_{CC} Active Current	V_{DDP} = 1.95V, V_{IN} = V_{IH} or V_{IL}, $\overline{E1}_P$ = V_{IL} and E2$_P$ = V_{IH}, I_{OUT} = 0mA	t_{AVAV} Read / t_{AVAV} Write = minimum		20	mA
I_{CC2}			t_{AVAV} Read / t_{AVAV} Write = maximum		3	mA
I_{LI}	Input Leakage Current	0V ≤ V_{IN} ≤ V_{DDP}		−1	1	µA
I_{LO}	Output Leakage Current	0V ≤ V_{OUT} ≤ V_{DDP}		−1	1	µA
I_{PD}	Deep Power Down Current	V_{DDP} = 1.95V, $\overline{E1}_P$ ≥ V_{DDP} − 0.2V or $\overline{E1}_P$ ≤ V_{IL}, V_{IN} ≥ V_{DDP} − 0.2V or V_{IN} ≤ 0.2V			10	µA
I_{SB}	Standby Supply Current CMOS	V_{DDP} = 1.95V, $\overline{E1}_P$ = E2$_P$ ≥ V_{DDP} − 0.2V, I_{OUT} = 0mA			110	µA
V_{IH} [1]	Input High Voltage			0.8V_{DDP}	V_{DDP} + 0.2	V
V_{IL} [2]	Input Low Voltage			−0.3	0.4	V
V_{OH}	Output High Voltage	I_{OH} = −0.5mA		V_{DDP} − 0.2		V
V_{OL}	Output Low Voltage	I_{OL} = 1mA			0.2	V

Note: 1. Average AC current, cycling at t_{AVAV} minimum.
2. $\overline{E1}_P$ = V_{IL}, E2$_P$ = V_{IH}, $\overline{UB}_P$ OR/AND $\overline{LB}_P$ = V_{IL}, V_{IN} = V_{IH} OR V_{IL}.
3. $\overline{E1}_P$ ≤ 0.2V or E2$_P$ ≥ V_{DDQ} −0.2V, $\overline{UB}_P$ OR/AND $\overline{LB}_P$ ≤ 0.2V, V_{IN} ≤ 0.2V or V_{IN} ≥ V_{DDQ} −0.2V.
4. Output disabled.

PACKAGE MECHANICAL

Figure 7. Stacked TFBGA88 8x10mm - 8x10 active ball array, 0.8mm pitch, Bottom View Outline

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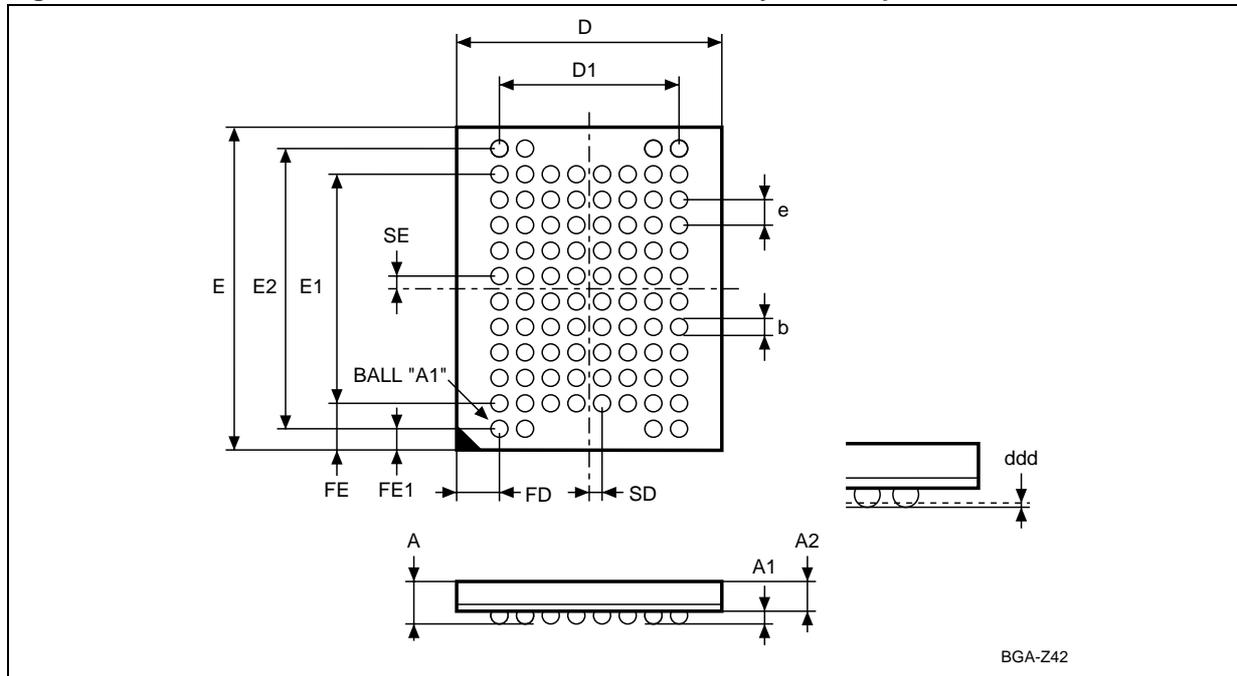
Note: Drawing is not to scale.

Table 9. Stacked TFBGA88 8x10mm - 8x10 active ball array, 0.8mm pitch, Package Data

Symbol	millimeters			inches		
	Typ	**Min**	**Max**	**Typ**	**Min**	**Max**
A			1.200			0.0472
A1		0.200			0.0079	
A2	0.850			0.0335		
b	0.350	0.300	0.400	0.0138	0.0118	0.0157
D	8.000	7.900	8.100	0.3150	0.3110	0.3189
D1	5.600			0.2205		
ddd			0.100			0.0039
E	10.000	9.900	10.100	0.3937	0.3898	0.3976
E1	7.200			0.2835		
E2	8.800			0.3465		
e	0.800	–	–	0.0315	–	–
FD	1.200			0.0472		
FE	1.400			0.0551		
FE1	0.600			0.0236		
SD	0.400			0.0157		
SE	0.400			0.0157		

PART NUMBERING

Table 10. Ordering Information Scheme

Example: M36 L 0 R 7 0 4 0 T 0 ZAQ T

Device Type
M36 = Multi-Chip Package (Flash + RAM)

Flash 1 Architecture
L = Multilevel, Multiple Bank, Burst mode

Flash 2 Architecture
0 = No Die

Operating Voltage
R = V_{DDF} = V_{DDP} = V_{DDQ} = 1.7 to 1.95V

Flash 1 Density
7 = 128 Mbit

Flash 2 Density
0 = No Die

RAM 1 Density
4 = 16 Mbit

RAM 0 Density
0 = No Die

Parameter Blocks Location
T = Top Boot Block Flash
B = Bottom Boot Block Flash

Product Version
0 = 0.13μm Flash technology, 85ns speeds;
0.18μm RAM, 70ns speed

Package
ZAQ = Stacked TFBGA88 8x10mm - 8x10 active ball array, 0.8mm pitch

Option
Blank = Standard Packing
T = Tape & Reel Packing
E = Lead-free and RoHS package, standard packing
F= Lead-free and RoHS package, tape and reel packing

Devices are shipped from the factory with the memory content bits erased to '1'. For a list of available options (Speed, Package, etc.) or for further information on any aspect of this device, please contact the ST-Microelectronics Sales Office nearest to you.

REVISION HISTORY

Table 11. Document Revision History

Date	Version	Revision Details
19-Nov-2003	1.0	First Issue
06-Dec-2004	2.0	TFBGA88 package specifications updated. TFBGA88 package fully compliant with the ST ECOPACK specification. Flash memory and PSRAM data updated to revision 1.0 of M30L0R7000x0 datasheet and revision 6.0 of M69AR024B datasheet. Document status promoted from Target Specification to full Datasheet.