

ACT-S128K32 High Speed 4 Megabit SRAM Multichip Module

Features

- 4 Low Power CMOS 128K x 8 SRAMs in one MCM
- Overall configuration as 128K x 32
- Input and Output TTL Compatible
- 17, 20, 25, 35, 45 & 55ns Access Times, 15ns Available by Special Order
- Full Military (-55°C to +125°C) Temperature Range
- +5V Power Supply
- Choice of 7 Hermetically sealed Co-fired Packages:
 - 68-Lead, Low Profile CQFP (F1), 1.56"SQ x .140"max
 - 68-Lead, Dual-Cavity CQFP (F2), .88"SQ x .20"max (.18"max thickness available, contact factory for details) (*Drops into the 68 Lead JEDEC .99"SQ CQFJ footprint*)
 - 68-Lead, Single-Cavity CQFP (F18), .94"SQ x .140"max (*Drops into the 68 Lead JEDEC .99"SQ CQFJ footprint*)
 - 66-Lead, PGA-Type (P2,P6 with/without shoulders), 1.185"SQ x .245"max
 - 66-Lead, PGA-Type (P7,P3 with/without shoulders), 1.08"SQ x .160"max
- Internal Decoupling Capacitors
- DESC SMD# 5962-93187 Released (P2,P3,P6,P7)
5962-95595 Released (F1,F2,F18)



General Description

The ACT-S128K32 is a High Speed 4 megabit CMOS SRAM Multichip Module (MCM) designed for full temperature range, military, space, or high reliability mass memory and fast cache applications.

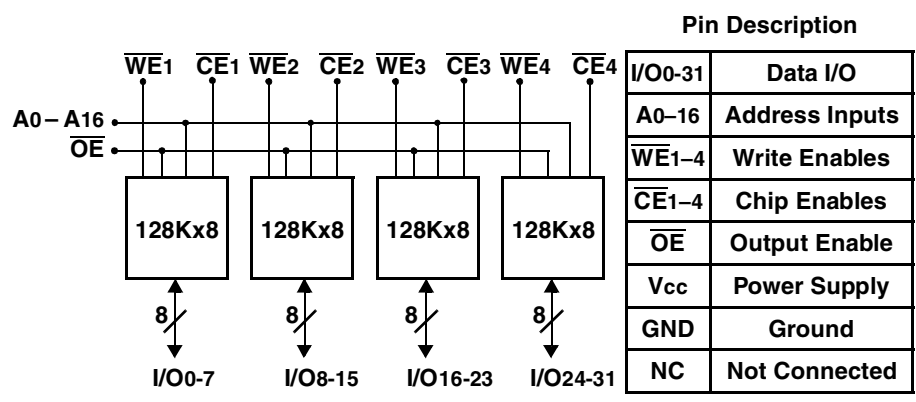
The MCM can be organized as a 128K x 32 bits, 256K x 16 bits or 512k x 8 bits device and is input and output TTL compatible. Writing is executed when the write enable (\overline{WE}) and chip enable (\overline{CE}) inputs are low. Reading is accomplished when \overline{WE} is high and \overline{CE} and output enable (\overline{OE}) are both low. Access time grades of 17ns, 20ns, 25ns, 35ns, 45ns and 55ns maximum are standard.

The +5 Volt power supply version is standard and the +3.3 Volt low power model is available (See ACT-S128K32V data sheet).

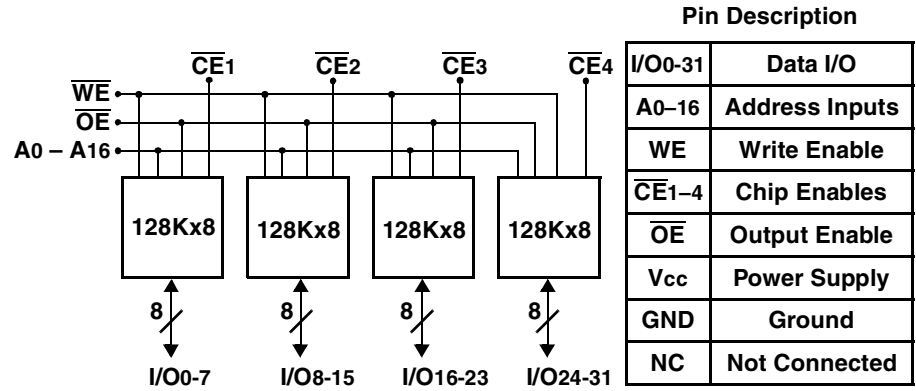
The products are designed for operation over the temperature range of -55°C to +125°C and screened under the full military environment. DESC Standard Military Drawing (SMD) part numbers are released and available.

The ACT-S128K32 is manufactured in Aeroflex's 80,000ft² MIL-PRF-38534 certified facility in Plainview, N.Y.

Block Diagram – PGA Type Package(P2,P7) & CQFP(F2,F18)



Block Diagram – CQFP(F1)



Absolute Maximum Ratings

Symbol	Rating	Range	Units
T_C	Case Operating Temperature	-55 to +125	°C
T_{STG}	Storage Temperature	-65 to +150	°C
P_D	Maximum Package Power Dissipation		
	F1, P2/P6, P3/P7 Packages	4.4	W
	F2,F18 Package	3.3	W
θ_{J-C}	Hottest Die, Max Thermal Resistance - Junction to Case		
	F1, P2/P6, P3/P7 Packages	2.0	°C/W
	F2,F18 Package	8.0	°C/W
V_G	Maximum Signal Voltage to Ground	-0.5 to +7	V
T_L	Maximum Lead Temperature (10 seconds)	300	°C

Normal Operating Conditions

Symbol	Parameter	Minimum	Maximum	Units
V_{CC}	Power Supply Voltage	+4.5	+5.5	V
V_{IH}	Input High Voltage	+2.2	$V_{CC} + 0.3$	V
V_{IL}	Input Low Voltage	-0.5	+0.8	V

Truth Table

Mode	CE	OE	WE	Data I/O	Power
Standby	H	X	X	High Z	Standby (deselect/power down)
Read	L	L	H	Data Out	Active
Read	L	H	H	High Z	Active (deselected)
Write	L	X	L	Data In	Active

Capacitance

(f = 1MHz, $T_C = 25^\circ\text{C}$)

Symbol	Parameter	Maximum	Units
C_{AD}	A ₀ – A ₁₆ Capacitance	50	pF
C_{OE}	\overline{OE} Capacitance	50	pF
C_{WE}	CQFP(F1) Package	50	pF
	PGA(P2,P3,P6,P7) and CQFP(F2,F18) Packages	20	pF
C_{CE}	Chip Enable Capacitance	20	pF
$C_{I/O}$	I/O ₀ – I/O ₃₁ Capacitance	20	pF

Capacitance is guaranteed by design but not tested.

DC Characteristics

(4.5Vdc ≤ V_{CC} ≤ 5.5Vdc, V_{SS} = 0V, T_C = -55°C to +125°C, Unless otherwise specified)

Parameter	Sym	Conditions	-017 & -020		-025 & -035		-045 & -055		Units
			Min	Max	Min	Max	Min	Max	
Input Leakage Current	I_{LI}	V _{CC} = Max, V _{IN} = 0 or V _{CC}		10		10		10	μA
Output Leakage Current	I_{LO}	$\overline{CE} = V_{IH}, \overline{OE} = V_{IH},$ V _{OUT} = 0 or V _{CC}		10		10		10	μA
Operating Supply Current 32 Bit Mode	$I_{CC \times 32}$	$\overline{CE} = V_{IL}, \overline{OE} = V_{IH},$ f = 5 MHz, V _{CC} = Max, CMOS Compatible		600		600		600	mA

DC Characteristics (Continued)

(4.5Vdc ≤ V_{CC} ≤ 5.5Vdc, V_{SS} = 0V, T_C = -55°C to +125°C, Unless otherwise specified)

Parameter	Sym	Conditions	-017 & -020		-025 & -035		-045 & -055		Units
			Min	Max	Min	Max	Min	Max	
Standby Current	I _{SB}	$\overline{CE} = V_{IH}, \overline{OE} = V_{IH},$ f = 5 MHz, V _{CC} = Max, CMOS Compatible		80		60		60	mA
Output Low Voltage	V _{OL}	I _{OL} = 8 mA, V _{CC} = Min		0.4		0.4		0.4	V
Output High Voltage	V _{OH}	I _{OH} = -4.0 mA, V _{CC} = Min	2.4		2.4		2.4		V

AC Characteristics

(V_{CC} = 5.0V, V_{SS} = 0V, T_C = -55°C to +125°C)

Read Cycle

Parameter	Sym	-017		-020		-025		-035		-045		-055		Units
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Read Cycle Time	t _{RC}	17		20		25		35		45		55		ns
Address Access Time	t _{AA}		17		20		25		35		45		55	ns
Chip Enable Access Time	t _{ACE}		17		20		25		35		45		55	ns
Output Hold from Address Change	t _{OH}	0		0		0		0		0		0		ns
Output Enable to Output Valid	t _{OE}		9		12		15		20		25		30	ns
Chip Enable to Output in Low Z*	t _{CLZ}	3		3		3		3		3		3		ns
Output Enable to Output in Low Z*	t _{OLZ}	0		0		0		0		0		0		ns
Chip Deselect to Output in High Z*	t _{CHZ}		12		12		12		15		20		20	ns
Output Disable to Output in High Z*	t _{OHZ}		10		11		12		15		20		20	ns

* Parameters guaranteed by design but not tested

Write Cycle

Parameter	Sym	-017		-020		-025		-035		-045		-055		Units
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Write Cycle Time	t _{WC}	17		20		25		35		45		55		ns
Chip Enable to End of Write	t _{CW}	12		15		20		25		30		40		ns
Address Valid to End of Write	t _{AW}	12		15		20		25		30		40		ns
Data Valid to End of Write	t _{DW}	10		12		15		18		20		20		ns
Write Pulse Width	t _{WP}	13		15		20		25		30		40		ns
Address Setup Time	t _{AS}	0		0		0		0		0		0		ns
Output Active from End of Write *	t _{OW}	3		3		3		4		4		4		ns
Write to Output in High Z *	t _{WHZ}		10		10		10		15		15		15	ns
Data Hold from Write Time	t _{DH}	0		0		0		0		0		0		ns
Address Hold Time	t _{AH}	0		0		0		0		0		0		ns

* Parameters guaranteed by design but not tested

Data Retention Electrical Characteristics (Special Order Only)

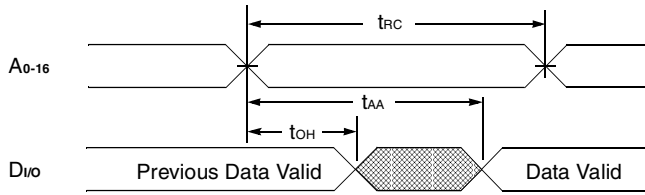
(T_C = -55°C to +125°C)

Parameter	Sym	Test Conditions	All Speeds		Units
			Min	Max	
V _{CC} for Data Retention	V _{DR}	$\overline{CE} \geq V_{CC} - 0.2V$	2	5.5	V
Data Retention Current	I _{CCDR1}	V _{CC} = 3V, 17-55ns		11.6	mA

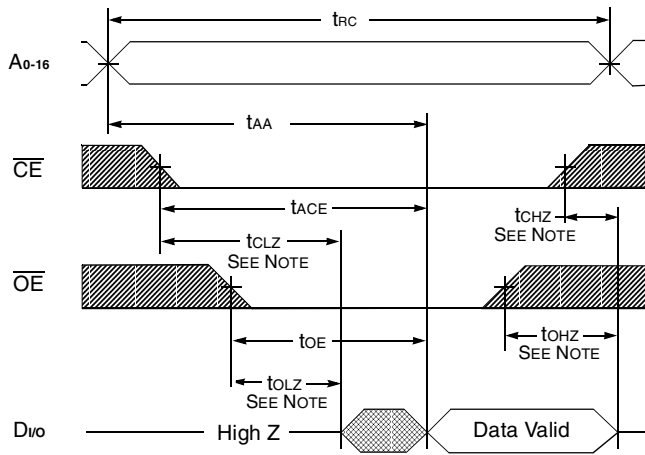
Timing Diagrams

Read Cycle Timing Diagrams

Read Cycle 1 ($\overline{CE} = \overline{OE} = V_{IL}, \overline{WE} = V_{IH}$)



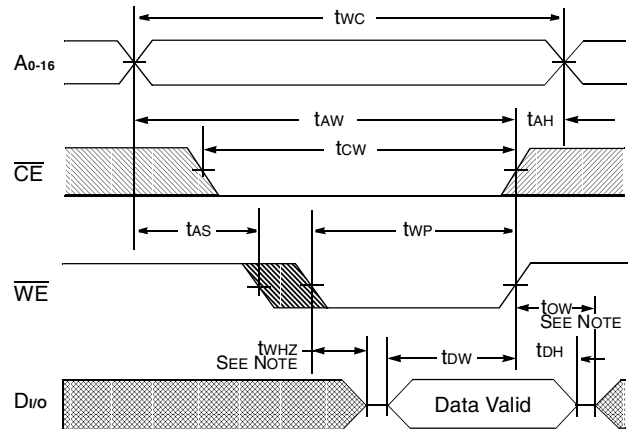
Read Cycle 2 ($\overline{WE} = V_{IH}$)



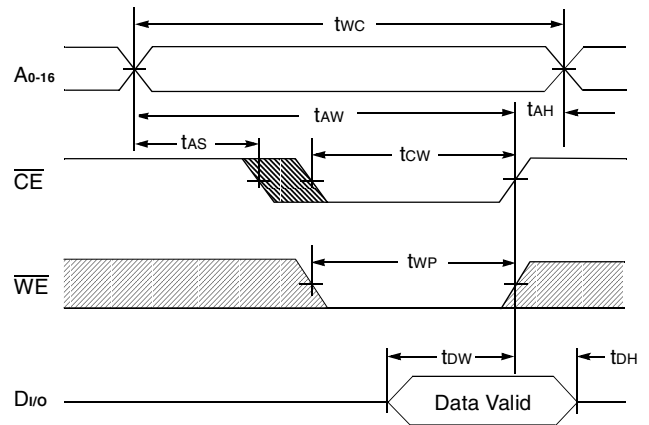
Note: Guaranteed by design, but not tested.

Write Cycle Timing Diagrams

Write Cycle 1 (\overline{WE} Controlled, $\overline{OE} = V_{IL}$)

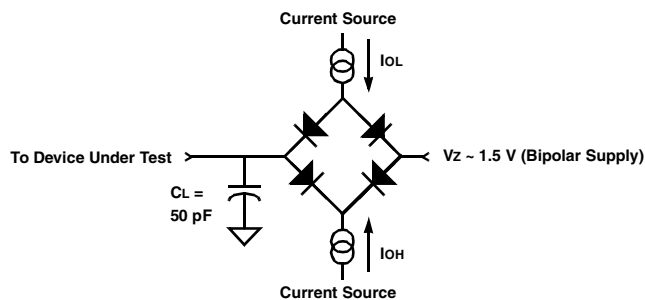


Write Cycle 2 (\overline{CE} Controlled, $\overline{OE} = V_{IH}$)



Note: Guaranteed by design, but not tested.

AC Test Circuit



Notes:

- 1) V_Z is programmable from -2V to +7V. 2) I_{OL} and I_{OH} programmable from 0 to 16 mA. 3) Tester Impedance $Z_O = 75\Omega$. 4) V_Z is typically the midpoint of V_{OH} and V_{OL} . 5) I_{OL} and I_{OH} are adjusted to simulate a typical resistance load circuit. 6) ATE Tester includes jig capacitance.

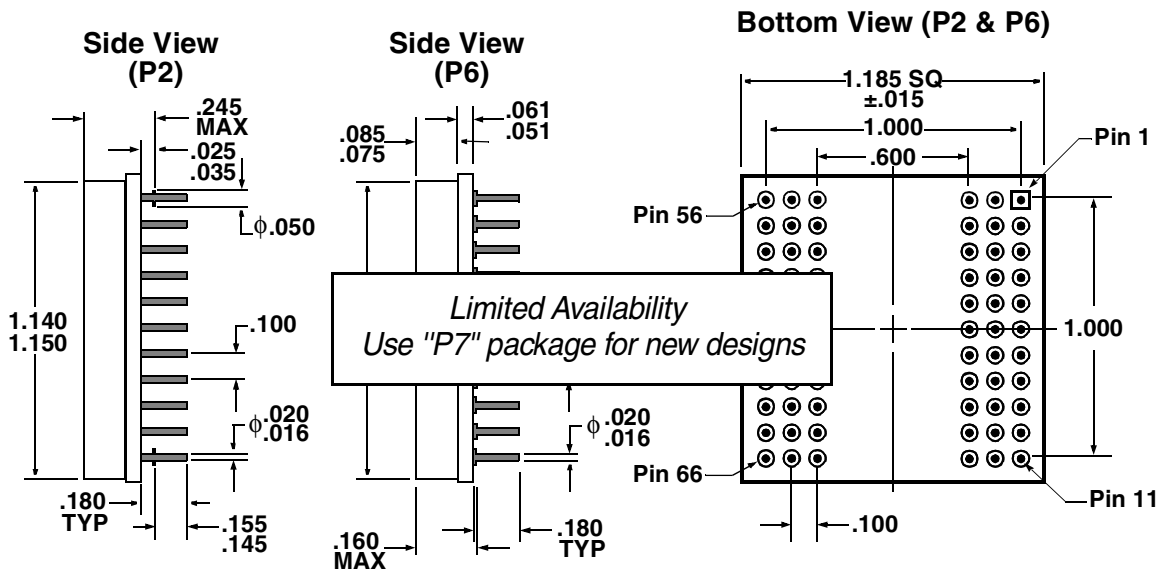
Parameter	Typical	Units
Input Pulse Level	0 – 3.0	V
Input Rise and Fall	5	ns
Input and Output Timing Reference Level	1.5	V
Output Lead Capacitance	50	pF

Pin Numbers & Functions

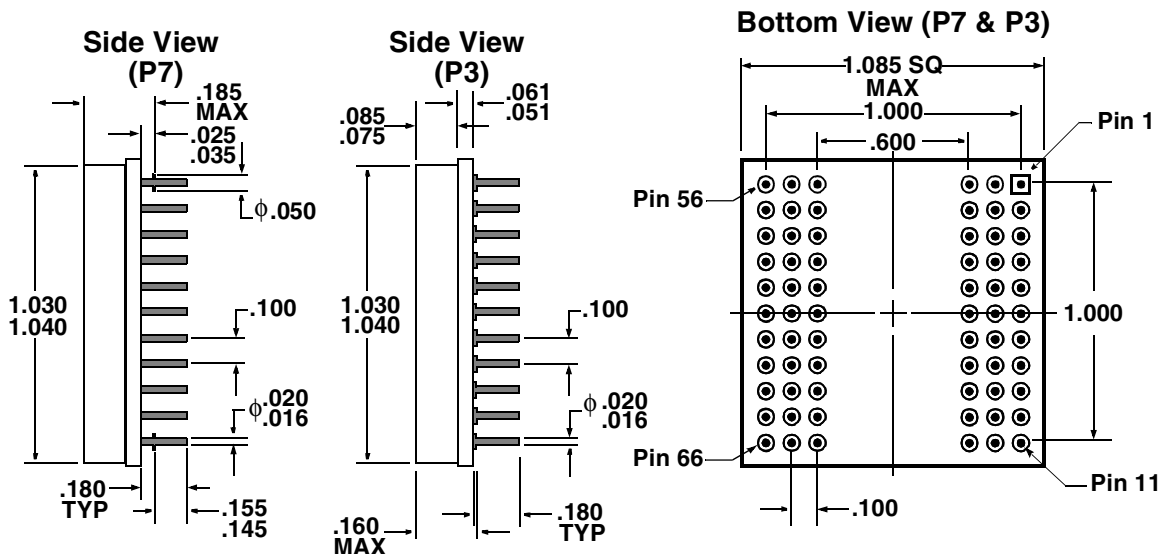
66 Pins — PGA-Type													
Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
1	I/O8	11	I/O2	21	NC	31	I/O6	41	A9	51	A5	61	A1
2	I/O9	12	\overline{WE}_2	22	I/O3	32	I/O5	42	I/O16	52	\overline{WE}_3	62	A2
3	I/O10	13	\overline{CE}_2	23	I/O15	33	I/O4	43	I/O17	53	\overline{CE}_3	63	I/O23
4	A13	14	GND	24	I/O14	34	I/O24	44	I/O18	54	GND	64	I/O22
5	A14	15	I/O11	25	I/O13	35	I/O25	45	V _{CC}	55	I/O19	65	I/O21
6	A15	16	A10	26	I/O12	36	I/O26	46	\overline{CE}_4	56	I/O31	66	I/O20
7	A16	17	A11	27	OE	37	A6	47	\overline{WE}_4	57	I/O30		
8	NC	18	A12	28	NC	38	A7	48	I/O27	58	I/O29		
9	I/O0	19	V _{CC}	29	\overline{WE}_1	39	NC	49	A3	59	I/O28		
10	I/O1	20	\overline{CE}_1	30	I/O7	40	A8	50	A4	60	A0		

Note: Pins 8, 21, 28, & 39 normally not connected, and can be connected to ground by specifying pinout Option "C".

"P2" — 1.185" SQ PGA Type Package Standard (with shoulders on Pins 1, 11, 56 & 66)
"P6" — 1.185" SQ PGA Type Special Order Package (without shoulders)



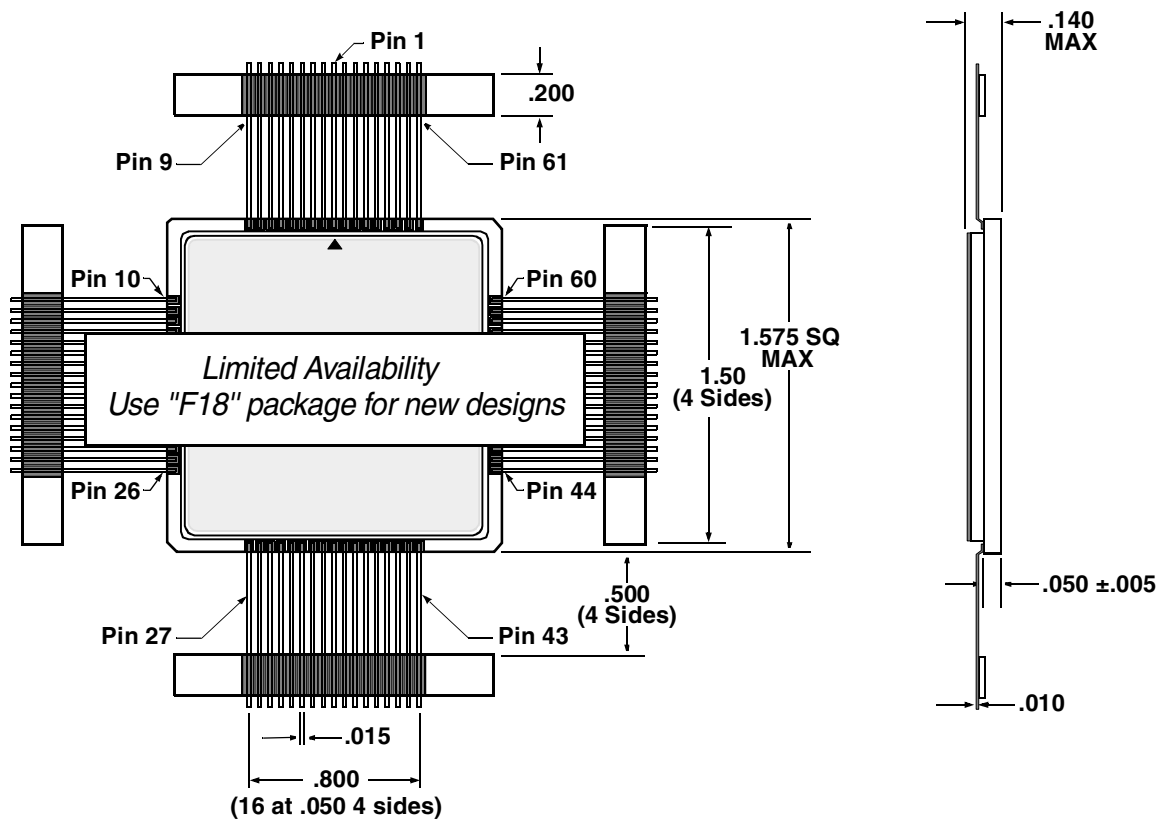
"P7" — 1.08" SQ PGA Type Package Standard (with shoulders on Pins 1, 11, 56 & 66)
"P3" — 1.08" SQ PGA Type Special Order Package (without shoulders)



Pin Numbers & Functions

68 Pins — CQFP							
Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
1	GND	18	GND	35	\overline{OE}	52	GND
2	\overline{CE}_1	19	I/O8	36	\overline{CE}_4	53	I/O23
3	A5	20	I/O9	37	NC	54	I/O22
4	A4	21	I/O10	38	NC	55	I/O21
5	A3	22	I/O11	39	NC	56	I/O20
6	A2	23	I/O12	40	NC	57	I/O19
7	A1	24	I/O13	41	NC	58	I/O18
8	A0	25	I/O14	42	NC	59	I/O17
9	NC	26	I/O15	43	NC	60	I/O16
10	I/O0	27	V _{CC}	44	I/O31	61	V _{CC}
11	I/O1	28	A11	45	I/O30	62	A10
12	I/O2	29	A12	46	I/O29	63	A9
13	I/O3	30	A13	47	I/O28	64	A8
14	I/O4	31	A14	48	I/O27	65	A7
15	I/O5	32	A15	49	I/O26	66	A6
16	I/O6	33	A16	50	I/O25	67	\overline{WE}
17	I/O7	34	\overline{CE}_2	51	I/O24	68	\overline{CE}_3

Package Outline — CQFP "F1"



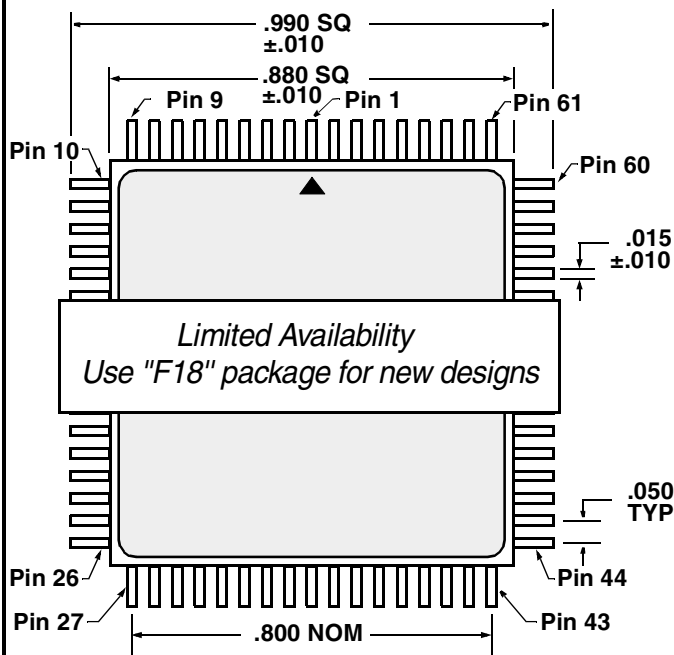
All dimensions in inches

Pin Numbers & Functions

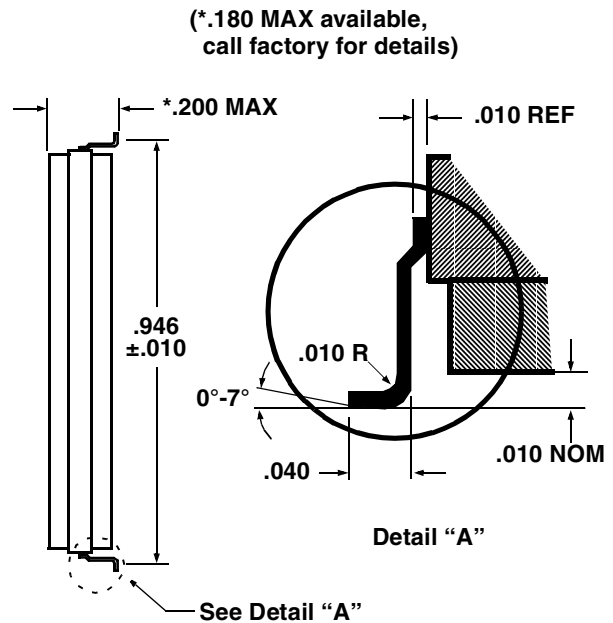
68 Pins — Dual-Cavity CQFP							
Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
1	GND	18	GND	35	\overline{OE}	52	GND
2	\overline{CE}_3	19	I/O ₈	36	\overline{CE}_2	53	I/O ₂₃
3	A ₅	20	I/O ₉	37	NC	54	I/O ₂₂
4	A ₄	21	I/O ₁₀	38	\overline{WE}_2	55	I/O ₂₁
5	A ₃	22	I/O ₁₁	39	\overline{WE}_3	56	I/O ₂₀
6	A ₂	23	I/O ₁₂	40	\overline{WE}_4	57	I/O ₁₉
7	A ₁	24	I/O ₁₃	41	NC	58	I/O ₁₈
8	A ₀	25	I/O ₁₄	42	NC	59	I/O ₁₇
9	NC	26	I/O ₁₅	43	NC	60	I/O ₁₆
10	I/O ₀	27	V _{CC}	44	I/O ₃₁	61	V _{CC}
11	I/O ₁	28	A ₁₁	45	I/O ₃₀	62	A ₁₀
12	I/O ₂	29	A ₁₂	46	I/O ₂₉	63	A ₉
13	I/O ₃	30	A ₁₃	47	I/O ₂₈	64	A ₈
14	I/O ₄	31	A ₁₄	48	I/O ₂₇	65	A ₇
15	I/O ₅	32	A ₁₅	49	I/O ₂₆	66	A ₆
16	I/O ₆	33	A ₁₆	50	I/O ₂₅	67	\overline{WE}_1
17	I/O ₇	34	\overline{CE}_1	51	I/O ₂₄	68	\overline{CE}_4

Package Outline "F2" — Dual-Cavity CQFP

Top View



All dimensions in inches

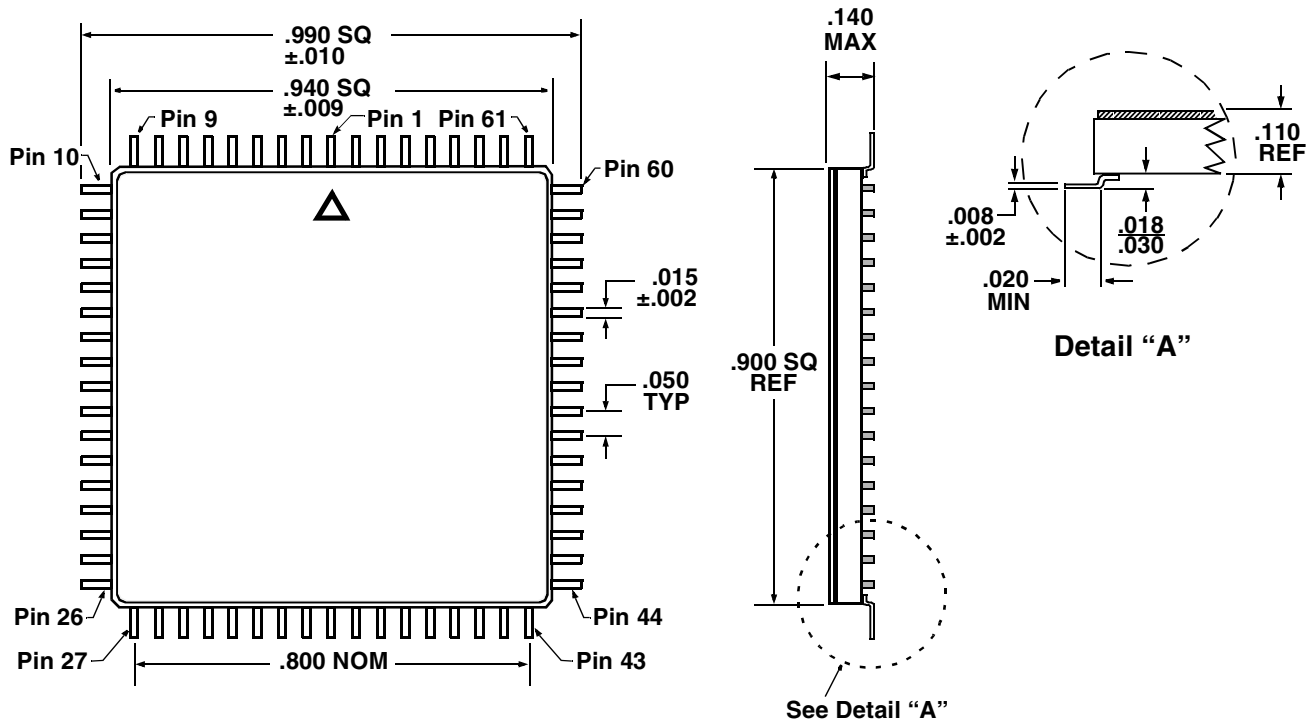


Note: Metallic lids and walls – both sides

Pin Numbers & Functions

68 Pins — Single-Cavity CQFP							
Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
1	GND	18	GND	35	\overline{OE}	52	GND
2	\overline{CE}_3	19	I/O ₈	36	\overline{CE}_2	53	I/O ₂₃
3	A ₅	20	I/O ₉	37	NC	54	I/O ₂₂
4	A ₄	21	I/O ₁₀	38	\overline{WE}_2	55	I/O ₂₁
5	A ₃	22	I/O ₁₁	39	\overline{WE}_3	56	I/O ₂₀
6	A ₂	23	I/O ₁₂	40	\overline{WE}_4	57	I/O ₁₉
7	A ₁	24	I/O ₁₃	41	NC	58	I/O ₁₈
8	A ₀	25	I/O ₁₄	42	NC	59	I/O ₁₇
9	NC	26	I/O ₁₅	43	NC	60	I/O ₁₆
10	I/O ₀	27	V _{CC}	44	I/O ₃₁	61	V _{CC}
11	I/O ₁	28	A ₁₁	45	I/O ₃₀	62	A ₁₀
12	I/O ₂	29	A ₁₂	46	I/O ₂₉	63	A ₉
13	I/O ₃	30	A ₁₃	47	I/O ₂₈	64	A ₈
14	I/O ₄	31	A ₁₄	48	I/O ₂₇	65	A ₇
15	I/O ₅	32	A ₁₅	49	I/O ₂₆	66	A ₆
16	I/O ₆	33	A ₁₆	50	I/O ₂₅	67	\overline{WE}_1
17	I/O ₇	34	\overline{CE}_1	51	I/O ₂₄	68	\overline{CE}_4

Package Outline — CQFP Single Cavity "F18"



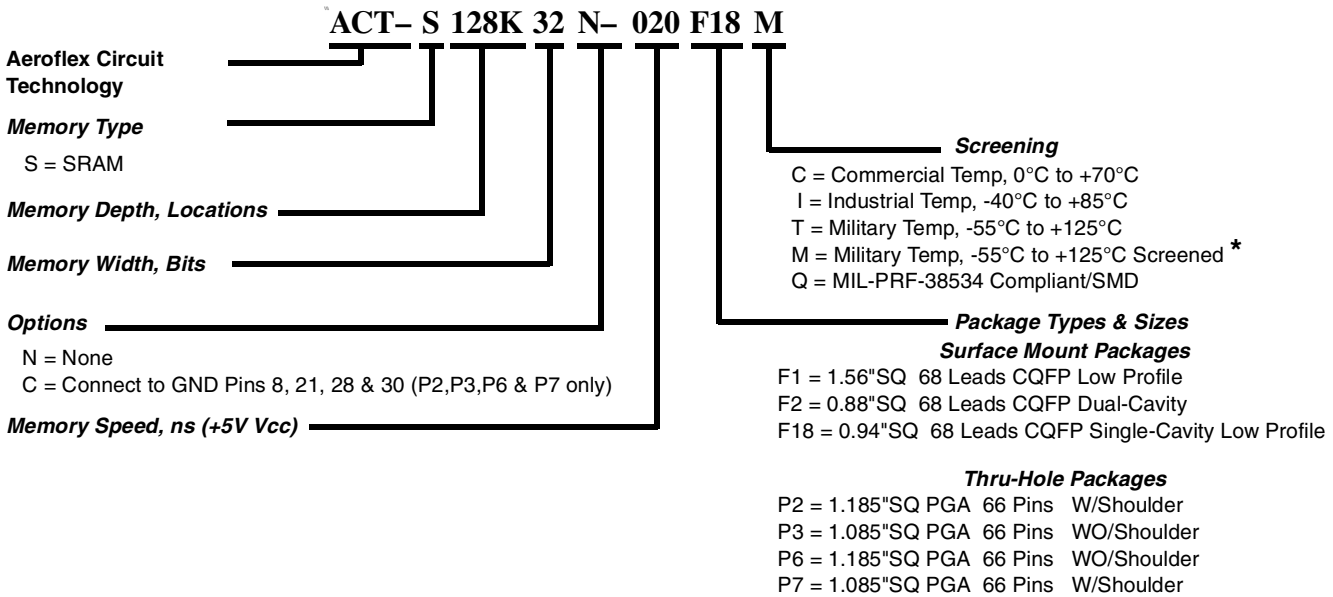
All dimensions in inches

DESC Ordering Information

Model Number	DESC Part Number	Speed	Package
ACT-S128K32N-017F1Q	5962-9559510HYX	17ns	1.56"sq CQFP
ACT-S128K32N-020F1Q	5962-9559509HYX	20ns	1.56"sq CQFP
ACT-S128K32N-025F1Q	5962-9559508HYX	25ns	1.56"sq CQFP
ACT-S128K32N-035F1Q	5962-9559507HYX	35ns	1.56"sq CQFP
ACT-S128K32N-045F1Q	5962-9559506HYX	45ns	1.56"sq CQFP
ACT-S128K32N-055F1Q	5962-9559505HYX	55ns	1.56"sq CQFP
ACT-S128K32N-017F2Q	5962-9559510HMX	17ns	.88"sq CQFP
ACT-S128K32N-020F2Q	5962-9559509HMX	20ns	.88"sq CQFP
ACT-S128K32N-025F2Q	5962-9559508HMX	25ns	.88"sq CQFP
ACT-S128K32N-035F2Q	5962-9559507HMX	35ns	.88"sq CQFP
ACT-S128K32N-045F2Q	5962-9559506HMX	45ns	.88"sq CQFP
ACT-S128K32N-055F2Q	5962-9559505HMX	55ns	.88"sq CQFP
ACT-S128K32N-017F2Q	5962-9559510HZX	17ns	.88"sq CQFP
ACT-S128K32N-020F2Q	5962-9559509HZX	20ns	.88"sq CQFP
ACT-S128K32N-025F2Q	5962-9559508HZX	25ns	.88"sq CQFP
ACT-S128K32N-035F2Q	5962-9559507HZX	35ns	.88"sq CQFP
ACT-S128K32N-045F2Q	5962-9559506HZX	45ns	.88"sq CQFP
ACT-S128K32N-055F2Q	5962-9559505HZX	55ns	.88"sq CQFP
ACT-S128K32N-017F18Q	5962-9559510H9X	17ns	.94"sq CQFP
ACT-S128K32N-020F18Q	5962-9559509H9X	20ns	.94"sq CQFP
ACT-S128K32N-025F18Q	5962-9559508H9X	25ns	.94"sq CQFP
ACT-S128K32N-035F18Q	5962-9559507H9X	35ns	.94"sq CQFP
ACT-S128K32N-045F18Q	5962-9559506H9X	45ns	.94"sq CQFP
ACT-S128K32N-055F18Q	5962-9559505H9X	55ns	.94"sq CQFP
ACT-S128K32N-017P2Q	5962-9318710HTX	17ns	1.185"sq PGA-Type
ACT-S128K32N-020P2Q	5962-9318709HTX	20ns	1.185"sq PGA-Type
ACT-S128K32N-025P2Q	5962-9318708HTX	25ns	1.185"sq PGA-Type
ACT-S128K32N-035P2Q	5962-9318707HTX	35ns	1.185"sq PGA-Type
ACT-S128K32N-045P2Q	5962-9318706HTX	45ns	1.185"sq PGA-Type
ACT-S128K32N-055P2Q	5962-9318705HTX	55ns	1.185"sq PGA-Type
ACT-S128K32C-017P2Q	5962-9318710HTX	17ns	1.185"sq PGA-Type
ACT-S128K32C-020P2Q	5962-9318709HTX	20ns	1.185"sq PGA-Type
ACT-S128K32C-025P2Q	5962-9318708HTX	25ns	1.185"sq PGA-Type
ACT-S128K32C-035P2Q	5962-9318707HTX	35ns	1.185"sq PGA-Type
ACT-S128K32C-045P2Q	5962-9318706HTX	45ns	1.185"sq PGA-Type
ACT-S128K32C-055P2Q	5962-9318705HTX	55ns	1.185"sq PGA-Type
ACT-S128K32N-017P7Q	5962-9318710H4X	17ns	1.085"sq PGA-Type
ACT-S128K32N-020P7Q	5962-9318709H4X	20ns	1.085"sq PGA-Type
ACT-S128K32N-025P7Q	5962-9318708H4X	25ns	1.085"sq PGA-Type
ACT-S128K32N-035P7Q	5962-9318707H4X	35ns	1.085"sq PGA-Type
ACT-S128K32N-045P7Q	5962-9318706H4X	45ns	1.085"sq PGA-Type
ACT-S128K32N-055P7Q	5962-9318705H4X	55ns	1.085"sq PGA-Type
ACT-S128K32C-017P7Q	5962-9318710H5X	17ns	1.085"sq PGA-Type
ACT-S128K32C-020P7Q	5962-9318709H5X	20ns	1.085"sq PGA-Type
ACT-S128K32C-025P7Q	5962-9318708H5X	25ns	1.085"sq PGA-Type
ACT-S128K32C-035P7Q	5962-9318707H5X	35ns	1.085"sq PGA-Type
ACT-S128K32C-045P7Q	5962-9318706H5X	45ns	1.085"sq PGA-Type
ACT-S128K32C-055P7Q	5962-9318705H5X	55ns	1.085"sq PGA-Type



Part Number Breakdown



* Screened to the individual test methods of MIL-STD-883

Specifications subject to change without notice

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