FOR PUBLIC RELEASE

128Kx32 SRAM MODULE

Features

- Access Times of 15, 17, 20, 25, 35, 45, 55ns
- MIL-STD-883 M5004 Available
- Packaging
  - 66 pin, PGA Type (H1), 1.075" square, Hermetic Ceramic HIP (Package A100)
  - 68 lead, 22.4mm CQFP (H2), 3.56mm (0.140"), (Package C100)
  - 68 lead, 22.4mm (0.880") square, CQFP (H3), 5.08mm (0.200") high, (Package B100)
- Organised as 128Kx32; User Configurable as 256Kx16 or 512Kx8
- Commercial, Industrial and Military Temperature Ranges
- 5 Volt Power Supply
- Low Power CMOS
- TTL Compatible Inputs and Outputs
- Built-in Decoupling Caps and Multiple Ground Pins for Low Noise Operation

FIGURE 1 – PIN CONFIGURATION FOR FTS128K32N-XH1X

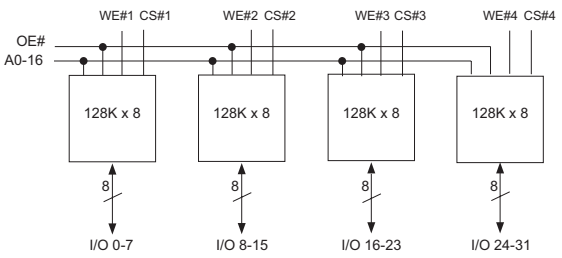
Top View

1	12	23		34	45	56
I/O_8	WE_2#	I/O_{15}		I/O_{24}	V_{CC}	I/O_{31}
I/O_9	CS_2#	I/O_{14}		I/O_{25}	CS_4#	I/O_{30}
I/O_{10}	GND	I/O_{13}		I/O_{26}	WE_4#	I/O_{29}
A_{13}	I/O_{11}	I/O_{12}		A_6	I/O_{27}	I/O_{28}
A_{14}	A_{10}	OE#		A_7	A_3	A_0
A_{15}	A_{11}	NC		NC	A_4	A_1
A_{16}	A_{12}	WE_1#		A_8	A_5	A_2
NC	V_{CC}	I/O_7		A_9	WE_3#	I/O_{23}
I/O_0	CS_1#	I/O_6		I/O_{16}	CS_3#	I/O_{22}
I/O_1	NC	I/O_5		I/O_{17}	GND	I/O_{21}
I/O_2	I/O_3	I/O_4		I/O_{18}	I/O_{19}	I/O_{20}
11	22	33		44	55	66

Pin Description

I/O_{0-31}	Data Inputs/Outputs
A_{0-16}	Address Inputs
WE_{1-4}#	Write Enables
CS_{1-4}#	Chip Selects
OE#	Output Enable
V_{CC}	Power Supply
GND	Ground
NC	Not Connected

Block Diagram



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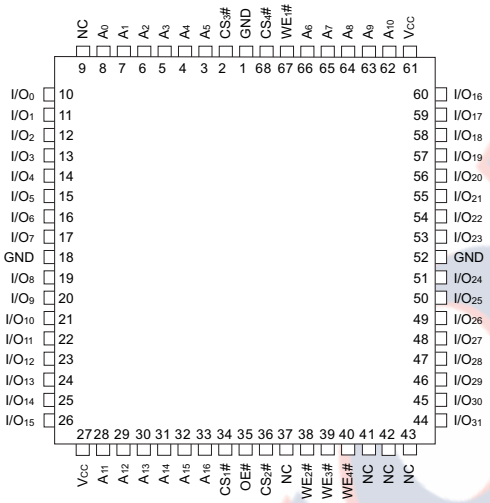
Rev 1

Figure 2 - PIN CONFIGURATION FOR FTS128K32-XH2X AND FTS128K32 - XH3X

Top View



Pin Description

I/O_{0-31}	Data Inputs/Outputs
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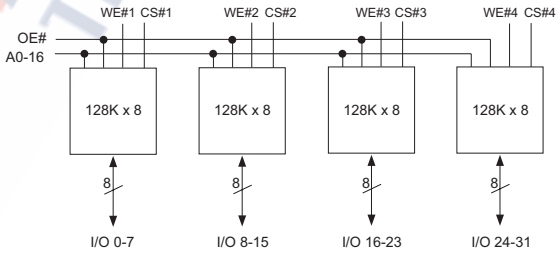
Block Diagram



Note 1: Package Not Recommended For New Design

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-55	+125	°C
Storage Temperature	T_{STG}	-65	+150	°C
Signal Voltage Relative to GND	V_G	-0.5	V_{CC}+0.5	V
Junction Temperature	T_J		150	°C
Supply Voltage	V_{CC}	-0.5	7.0	V

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	4.5	5.5	V
Input High Voltage	V_{IH}	2.2	V_{CC} + 0.3	V
Input Low Voltage	V_{IL}	-0.5	+0.8	V
Operating Temp (Mil)	T_A	-55	+125	°C

TRUTH TABLE

CS	OE	WE	Mode	Data I/O	Power
H	X	X	Standby	High Z	Standby
L	L	H	Read	Data Out	Active
L	X	L	Write	Data In	Active
L	H	H	Out Disable	High Z	Active

CAPACITANCE

T_A = +25°C

Parameter	Symbol	Conditions	Max	Unit
OE# capacitance	C_{OE}	V_{IN} = 0V, f = 1.0 MHz	50	pF
WE_{1-4}# capacitance	C_{WE}	V_{IN} = 0V, f = 1.0 MHz		pF
HIP (PGA) H1			20	
CQFP G4T			50	
CQFP G2U/G2L			20	
CS_{1-4}# capacitance	C_{CS}	V_{IN} = 0V, f = 1.0 MHz	20	pF
Data# I/O capacitance	$C_{I/O}$	$V_{I/O}$ = 0V, f = 1.0 MHz	20	pF
Address input capacitance	C_{AD}	V_{IN} = 0V, f = 1.0 MHz	50	pF

This parameter is guaranteed by design but not tested.

DC CHARACTERISTICS

V_{CC} = 5.0V, V_{SS} = 0V, -55°C ≤ T_A ≤ +125°C

Parameter	Sym	Conditions	-15		-17		-20		-25		Units
			Min	Max	Min	Max	Min	Max	Min	Max	
Input Leakage Current	I_{LI}	V_{CC} = 5.5, V_{IN} = GND to V_{CC}		10		10		10		10	µA
Output Leakage Current	I_{LO}	CS# = V_{IH}, OE# = V_{IH}, V_{OUT} = GND to V_{CC}		10		10		10		10	µA
Operating Supply Current	I_{CC}	CS# = V_{IL}, OE# = V_{IH}, f = 5MHz, V_{CC} = 5.5		600		600		600		600	mA
Standby Current	I_{SB}	CS# = V_{IH}, OE# = V_{IH}, f = 5MHz, V_{CC} = 5.5		80		80		80		60	mA
Output Low Voltage	V_{OL}	I_{OL} = 8mA, V_{CC} = 4.5		0.4		0.4		0.4		0.4	V
Output High Voltage	V_{OH}	I_{OH} = -4.0mA, V_{CC} = 4.5	2.4		2.4		2.4		2.4		V

Parameter	Sym	Conditions	-35		-45		-55		Units
			Min	Max	Min	Max	Min	Max	
Input Leakage Current	I_{LI}	V_{CC} = 5.5, V_{IN} = GND to V_{CC}		10		10		10	µA
Output Leakage Current	I_{LO}	CS# = V_{IH}, OE# = V_{IH}, V_{OUT} = GND to V_{CC}		10		10		10	µA
Operating Supply Current	I_{CC}	CS# = V_{IL}, OE# = V_{IH}, f = 5MHz, V_{CC} = 5.5		600		600		600	mA
Standby Current	I_{SB}	CS# = V_{IH}, OE# = V_{IH}, f = 5MHz, V_{CC} = 5.5		60		60		60	mA
Output Low Voltage	V_{OL}	I_{OL} = 8mA, V_{CC} = 4.5		0.4		0.4		0.4	V
Output High Voltage	V_{OH}	I_{OH} = -4.0mA, V_{CC} = 4.5	2.4		2.4		2.4		V

NOTE: DC test conditions: V_{IH} = V_{CC} -0.3V, V_{IL} = 0.3V

DATA RETENTION CHARACTERISTICS (For FTS128K32L-XXX Only)

-55°C ≤ T_A ≤ +125°C, -40°C ≤ T_A ≤ +85°C

Characteristic	Sym	Conditions	Min	Typ	Max	Units
Data Retention Voltage	V_{CC}	V_{CC} = 2.0V	2	-	-	V
Data Retention Quiescent Current	I_{CCDR}	CS ³ V_{CC} -0.2V	-	1	2	mA
Chip Disable to Data Retention Time (1)	T_{CDR}	V_{IN} ³ V_{CC} -0.2V	0	-	-	ns
Operation Recovery Time (1)	T_R	or V_{IN} 0.2V	TRC		-	ns

NOTE: Parameter guaranteed, but not tested.

AC CHARACTERISTICS

V_{CC} = 5.0V, GND = 0V, -55°C ≤ T_A ≤ +125°C

Parameter Read Cycle	Symbol	-15		-17		-20		-25		-35		-45		-55		Units
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Read Cycle Time	t_{RC}	15		17		20		25		35		45		55		ns
Address Access Time	t_{AA}		15		17		20		25		35		45		55	ns
Output Hold from Address Change	t_{OH}	0		0		0		0		0		0		0		ns
Chip Select Access Time	t_{ACS}		15		17		20		25		35		45		55	ns
Output Enable to Output Valid	t_{OE}		10		10		12		15		20		25		30	ns
Chip Select to Output in Low Z	t_{CLZ}[1]	3		3		3		3		3		3		3		ns
Output Enable to Output in Low Z	t_{OLZ}[1]	0		0		0		0		0		0		0		ns
Chip Disable to Output in High Z	t_{CHZ}[1]		12		12		12		12		15		20		20	ns
Output Disable to Output in High Z	t_{OHZ}[1]		12		12		12		12		15		20		20	ns

1. This parameter is guaranteed by design but not tested.

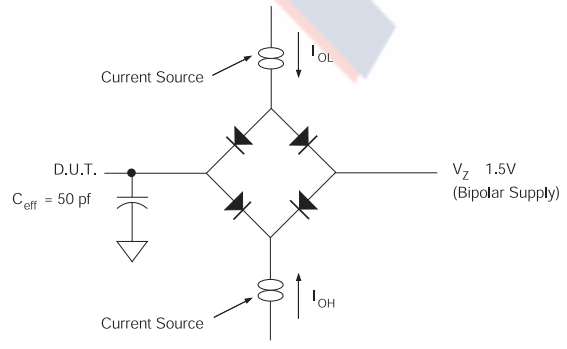
AC CHARACTERISTICS

V_{CC} = 5.0V, GND = 0V, -55°C ≤ T_A ≤ +125°C

Parameter Write Cycle	Symbol	-15		-17		-20		-25		-35		-45		-55		Units
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Write Cycle Time	t_{WC}	15		17		20		25		35		45		55		ns
Chip Select to End of Write	t_{CW}	14		14		15		20		25		30		45		ns
Address Valid to End of Write	t_{AW}	14		15		15		20		25		30		45		ns
Data Valid to End of Write	t_{DW}	10		10		12		15		20		25		25		ns
Write Pulse Width	t_{WP}	14		14		15		20		25		30		45		ns
Address Setup Time	t_{AS}	0		0		0		0		0		0		0		ns
Address Hold Time	t_{AH}	0		0		0		0		0		0		0		ns
Output Active from End of Write	t_{OW}[1]	3		3		3		3		4		4		4		ns
Write Enable to Output in High Z	t_{WHZ}[1]		10		10		12		15		20		25		25	ns
Data Hold Time	t_{DH}	0		0		0		0		0		0		0		ns

1. This parameter is guaranteed by design but not tested.

FIGURE. 4 – AC TEST CIRCUIT



AC Test Conditions

Parameter	Typ	Unit
Input Pulse Levels	V_{IL} = 0, V_{IH} = 3.0	V
Input Rise and Fall	5	ns
Input and Output Reference Level	1.5	V
Output Timing Reference Level	1.5	V

Notes:
V_Z is programmable from -2V to +7V.
I_{OL} & I_{OH} programmable from 0 to 16mA.
Tester Impedance Z0 = 75 ý.
V_Z is typically the midpoint of V_{OH} and V_{OL}.
I_{OL} & I_{OH} are adjusted to simulate a typical resistive load circuit.
ATE tester includes jig capacitance.

FIGURE 5 – TIMING WAVEFORM - READ CYCLE

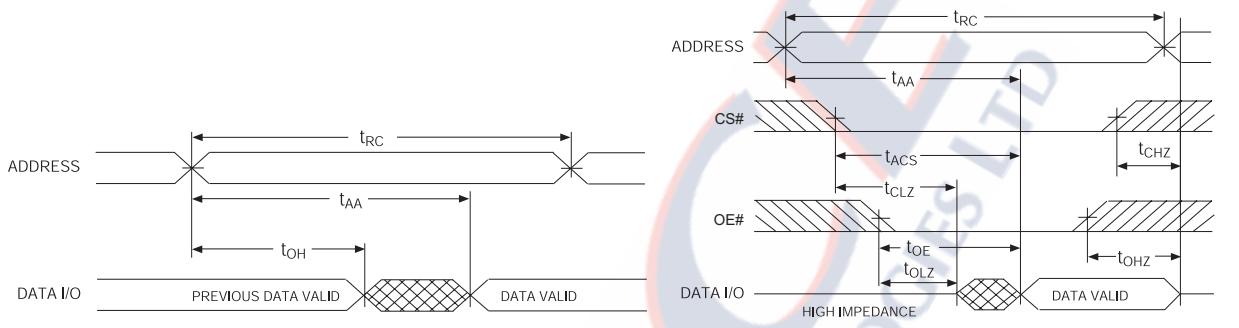


FIGURE 6 – WRITE CYCLE - WE# CONTROLLED

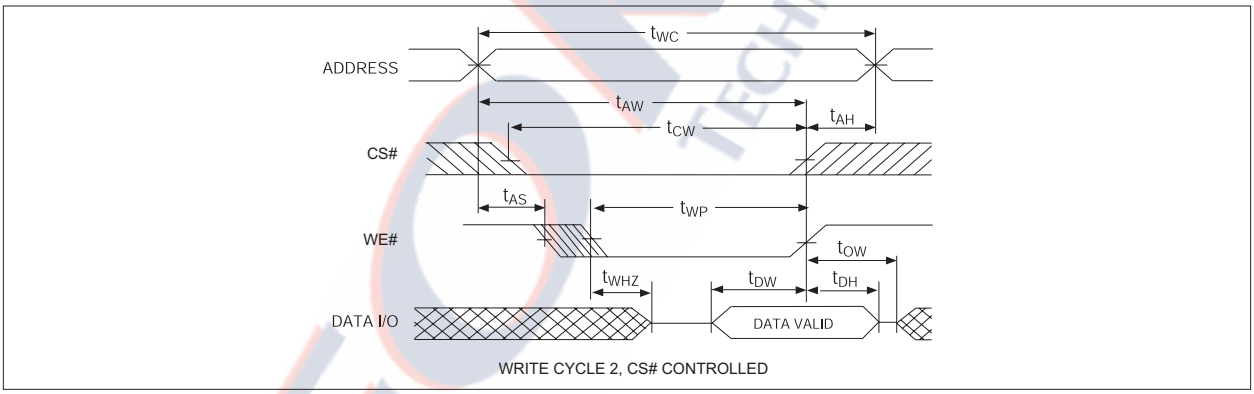
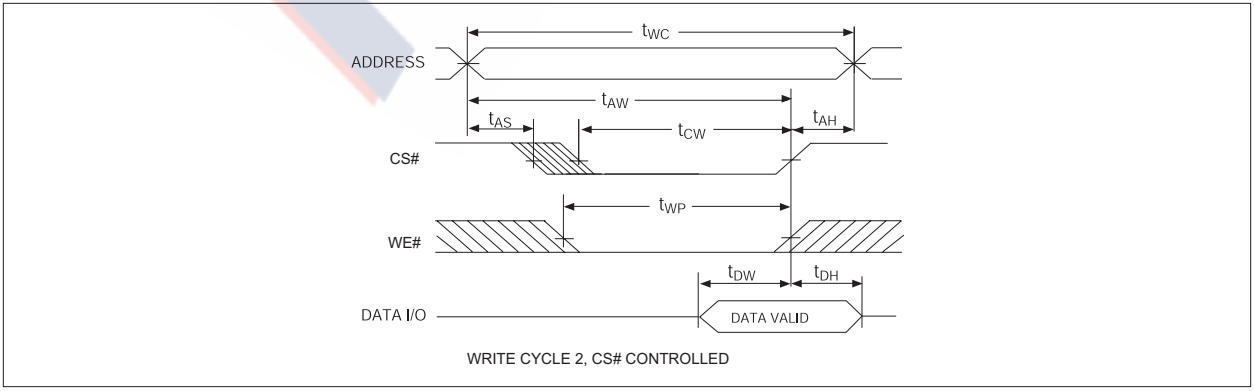
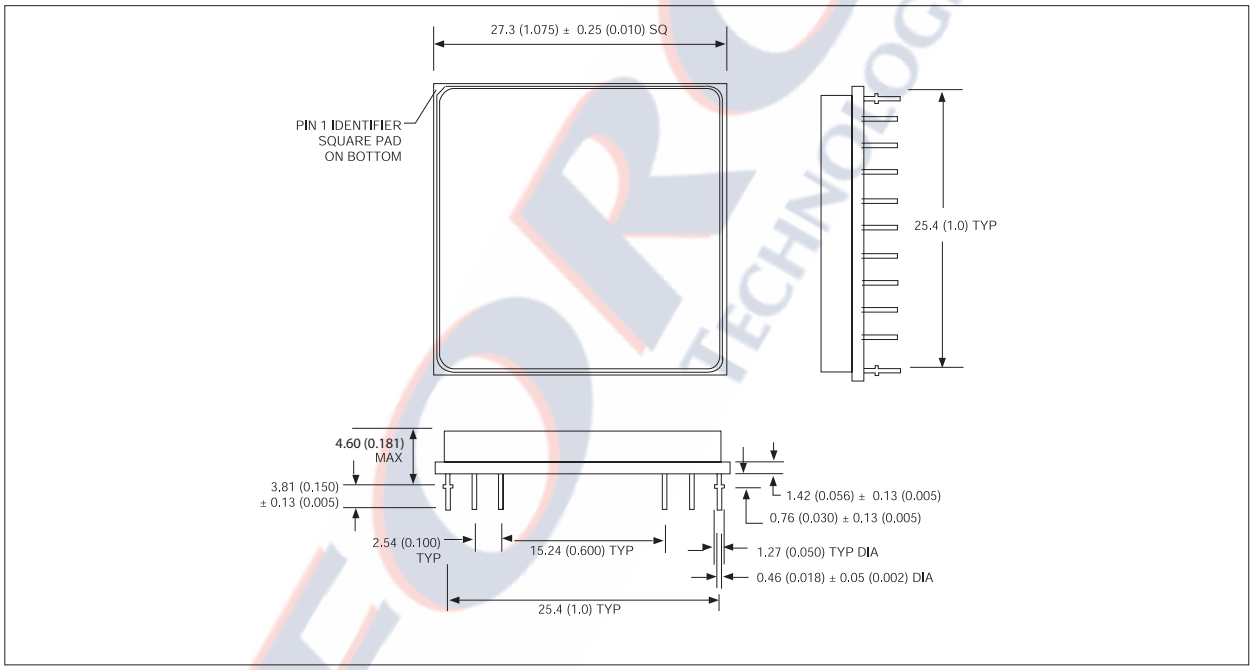


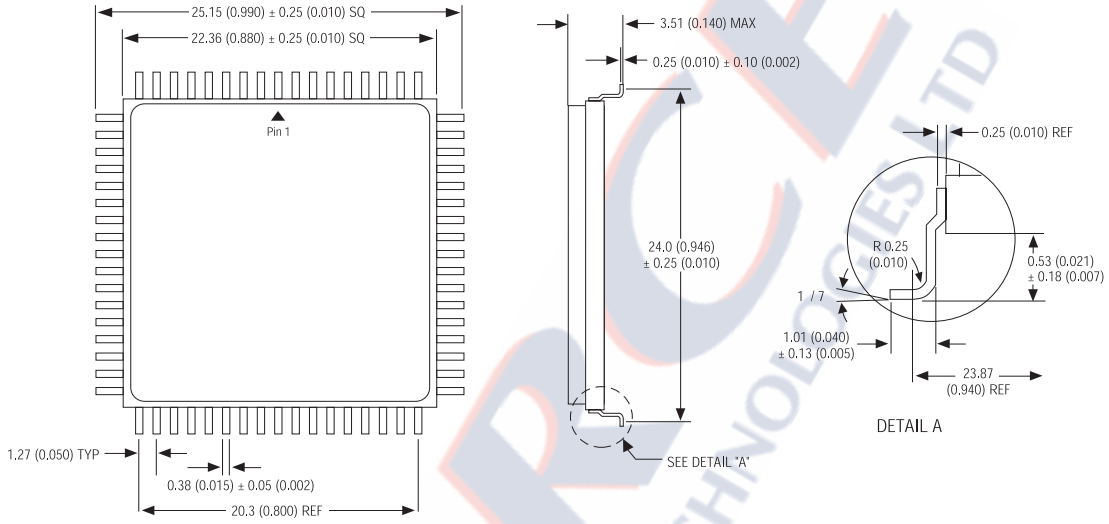
FIGURE 7 – WRITE CYCLE - CS# CONTROLLED



PACKAGE A100: 66 PIN, PGA TYPE, CERAMIC HEX-IN-LINE PACKAGE, HIP (H1)

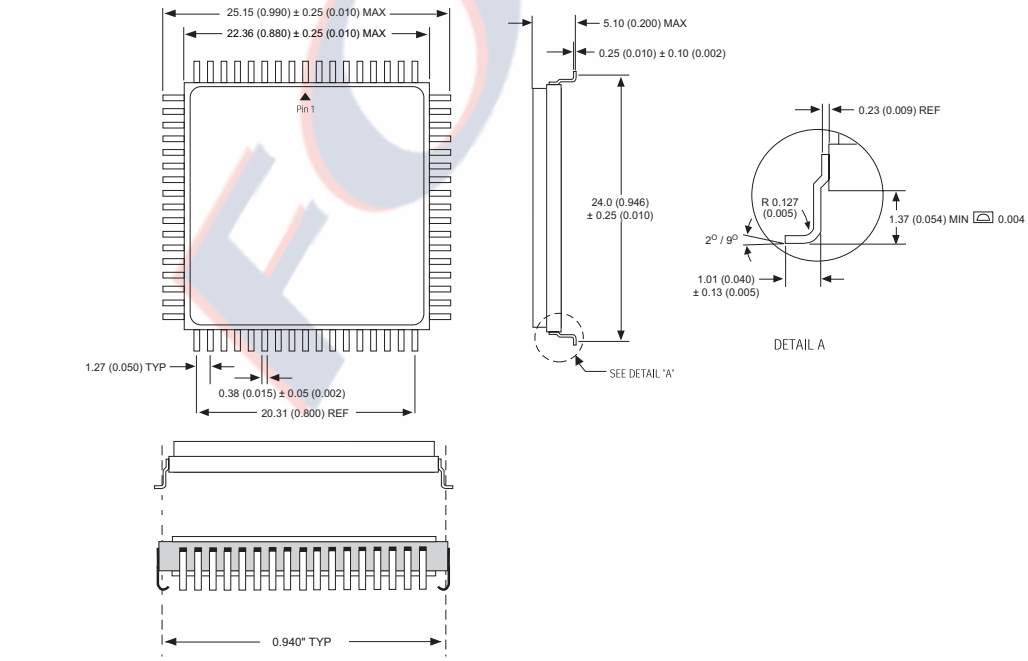


PACKAGE C100: 68 LEAD, CERAMIC QUAD FLAT PACK, CQFP (H2)



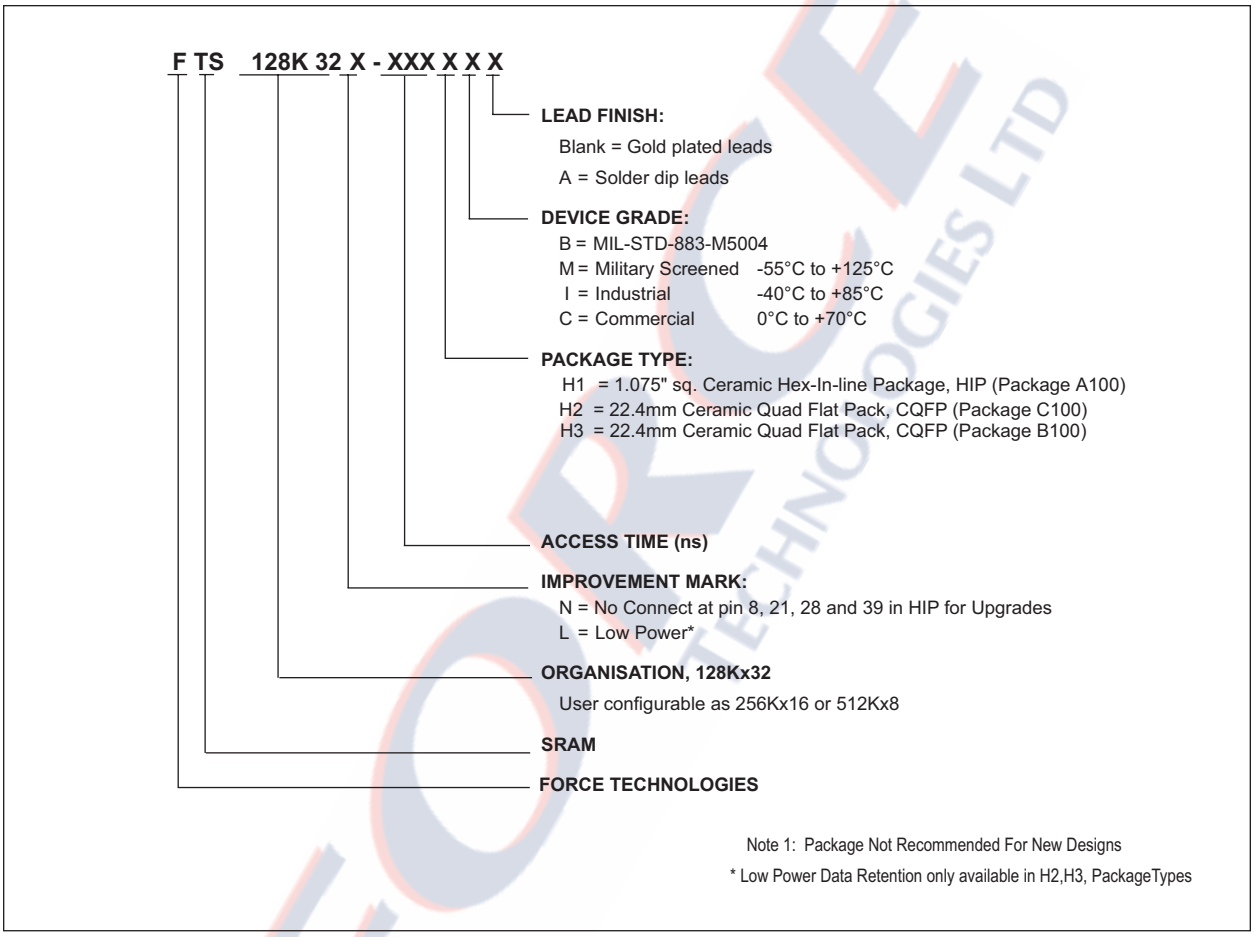
ALL LINEAR DIMENSIONS ARE MILLIMETERS AND PARENTHETICALLY IN INCHES

PACKAGE B100: 68 LEAD, CERAMIC QUAD FLAT PACK, CQFP (H3)



ALL LINEAR DIMENSIONS ARE MILLIMETERS AND PARENTHETICALLY IN INCHES

ORDERING INFORMATION



Note 1: Package Not Recommended For New Designs

* Low Power Data Retention only available in H2,H3, PackageTypes

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