DATASHEET

REV C: 08/11/22

SCD8523

Dual 16-Channel Analog Multiplexer Module Radiation Tolerant & ESD Protected

MUX8523

Features

- 32-Channels provided by two independent 16-channel multiplexers
- Radiation performance
  - Total dose: 300 krads(Si), Dose rate = 50 - 300 rads(Si)/s
  - SEU: Immune up to 120 MeV-cm^2/mg
  - SEL: Immune by process design
- Full military temperature range
- Low power consumption < 30mW
- Separate address bus and enable for (CH0-CH15) and (CH16-CH31).
- Fast access time 1500ns typical
- All channel inputs protected by ±20V nominal Transorbs.
- Input over voltage protection (power on or off)
- Break-Before-Make switching
- High analog input impedance (power on or off)
- Designed for aerospace and high reliability space applications
- Packaging – Hermetic ceramic
  - 56 leads, 0.80"Sq x 0.20"Ht quad flat pack
  - Typical Weight 6 grams
- CAES Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.

General Description

CAES MUX8523 is a radiation tolerant, dual 16 channel multiplexer MCM (multi-chip module) with electrostatic discharge (ESD) protection on all channel inputs.

The MUX8523 has been specifically designed to meet exposure to radiation environments. It is available in a 56 lead High Temperature Co-Fired Ceramic (HTCC) Quad Flatpack (CQFP). It is guaranteed operational from -55°C to +125°C. Available screened in accordance with MIL-PRF-38534, the MUX8523 is ideal for demanding military and space applications.

Organization and Application

The MUX8523 consists of two independent 16 channel multiplexers arranged as shown in the Block Diagram.

A Section

Sixteen (16) channels addressable by bus A_0~A_3, enabled by $\overline{EN}_{(0\text{-}15)}$ and outputted on Output1$_{(0\text{-}15)}$.

B Section

Sixteen (16) channels addressable by bus B_0~B_3, enabled by $\overline{EN}_{(16\text{-}31)}$ and outputted on Output2$_{(16\text{-}31)}$.

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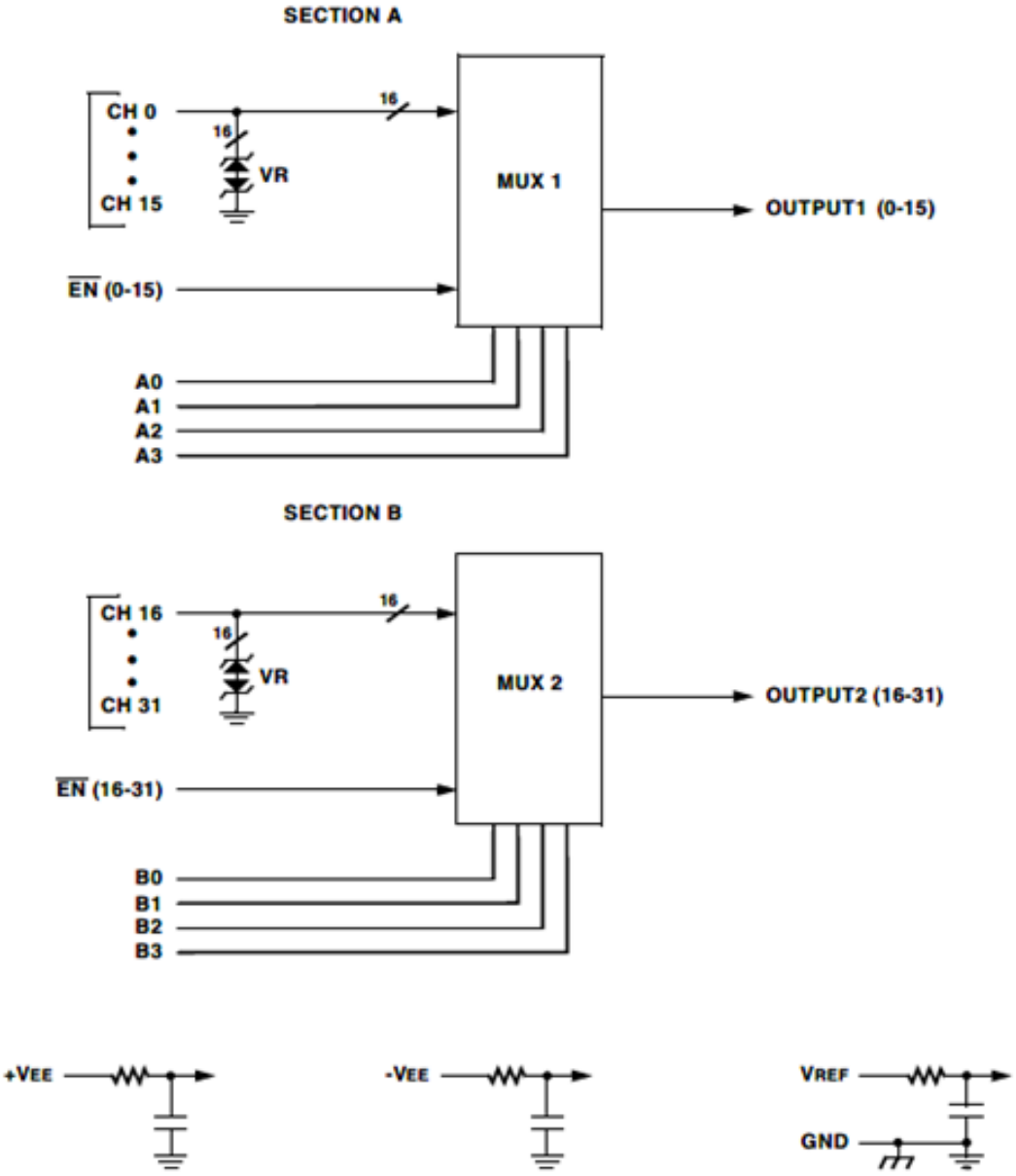

MUX8523 Dual 16-channel Analog MUX Block Diagram

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Absolute Maximum Ratings 1/

Parameter	Range	Units
Case Operating Temperature Range	-55 to +125	°C
Storage Temperature Range	-65 to +150	°C
Supply Voltage $+V_{EE}$ (Pin 18) $-V_{EE}$ (Pin 46) V_{REF} (Pin 39)	 +16.5 -16.5 +16.5	 V V V
Digital Input Overvoltage V_{EN0-15} (Pin 13), $V_{EN16-31}$ (Pin 44), V_A (Pins 14, 15, 16, 17), V_B (Pins 40, 41, 42, 43)	< V_{REF} +4 > GND -4	V V
Analog Input Over Voltage V_{IN}	±18V	V

Note:

1) All measurements are made with respect to ground.

NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only; functional operation beyond the "Operation Conditions" is not recommended and extended exposure beyond the "Operation Conditions" may affect device reliability.

Recommended Operating Conditions 1/

Symbol	Parameter	Typical	Units
$+V_{EE}$	+15V Power Supply Voltage	+15.0	V
$-V_{EE}$	-15V Power Supply Voltage	-15.0	V
V_{REF}	Reference Voltage	+5.00	V
V_{AL}	Logic Low Level	+0.8	V
V_{AH}	Logic High Level	+4.0	V

Note:

1) Power Supply turn-on sequence shall be as follows: $+V_{EE}$, $-V_{EE}$, followed by V_{REF}.

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DC Electrical Performance Characteristics 1/

(Tc = -55°C to +125°C, $+V_{EE}$ = +15V, $-V_{EE}$ = -15V, V_{REF} = 5.0V - Unless otherwise specified)

Parameter	Symbol	Conditions	MIN	MAX	Units
Supply Current	$+I_{EE}$	$V_{EN}(0\text{-}15) = V_{EN}(16\text{-}31) = V_A(0\text{-}3) = V_B(0\text{-}3) = 0$	0.1	1	mA
	$-I_{EE}$		-1	-0.1	mA
	$+I_{SBY}$	$V_{EN}(0\text{-}15) = V_{EN}(16\text{-}31) = 4V, V_A(0\text{-}3) = V_B(0\text{-}3) = 0$ 6/	0.1	1	mA
	$-I_{SBY}$		-1	-0.1	mA
Address Input Current	$I_{AL}(0\text{-}3)_A$	V_A = 0V 1/, 7/	-1	1	µA
	$I_{AH}(0\text{-}3)_A$	V_A = 5V 1/, 7/	-1	1	µA
	$I_{AL}(0\text{-}3)_B$	V_B = 0V 1/, 7/	-1	1	µA
	$I_{AH}(0\text{-}3)_B$	V_B = 5V 1/, 7/	-1	1	µA
Enable Input Current	$I_{ENL}(0\text{-}15)$	$V_{EN}(0\text{-}15)$ = 0V 7/	-1	1	µA
	$I_{ENH}(0\text{-}15)$	$V_{EN}(0\text{-}15)$ = 5V 7/	-1	1	µA
	$I_{ENL}(16\text{-}31)$	$V_{EN}(16\text{-}31)$ = 0V 7/	-1	1	µA
	$I_{ENH}(16\text{-}31)$	$V_{EN}(16\text{-}31)$ = 5V 7/	-1	1	µA
Positive Input Leakage Current (CH0-CH31)	$+I_{SOFFOUTPUT(ALL)}$	V_{IN} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 2/, 3/, 7/	-100	+700	nA
Negative Input Leakage Current (CH0-CH31)	$-I_{SOFFOUTPUT(ALL)}$	V_{IN} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 2/, 3/, 7/	-100	+700	nA
Positive Output Leakage Current OUTPUTS (pins 12,45)	$+I_{DOFFOUTPUT(ALL)}$	V_{OUT} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 3/, 4/, 7/	-100	+100	nA
Negative Output Leakage Current OUTPUTS (pins 12,45)	$-I_{DOFFOUTPUT(ALL)}$	V_{OUT} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 3/, 4/, 7/	-100	+100	nA

DC Electrical Performance Characteristics 1/ (continued)

(Tc = -55°C to +125°C, $+V_{EE}$ = +15V, $-V_{EE}$ = -15V, V_{REF} = 5.0V - Unless otherwise specified)

Parameter	Symbol	Conditions		MIN	MAX	Units
Input Clamped Voltage (CH0–CH31)	$+V_{CLMP}$	V_{EN} = 4V, all unused MUX inputs under test are open. 3/	+25°C +125°C -55°C	18.0 18.0 17.5	23.0 23.5 22.5	V V V
Input Clamped Voltage (CH0–CH31)	$-V_{CLMP}$		+25°C +125°C -55°C	-23.0 -23.5 -22.5	-18.0 -18.0 -17.5	V V V
Switch ON Resistance OUTPUTS (pins 12,45)	$R_{DS(ON)(0-31)_A}$	V_{IN} = +15V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		500	3000	Ω
	$R_{DS(ON)(0-31)_B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		500	3000	Ω
	$R_{DS(ON)(0-31)_C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/		500	3000	Ω

Notes:

1/ Measure inputs sequentially. Ground all unused inputs of the device under test. V_A is the applied input voltage to the address lines A(0-3). V_B is the applied input voltage to the address lines B(0-3).

2/ V_{IN} is the applied input voltage to the input channels (CH0-CH31).

3/ V_{EN} is the applied input voltage to the enable lines $\overline{EN}$(0-15) and $\overline{EN}$(16-31)

4/ V_{OUT} is the applied input voltage to the output lines OUTPUT1(0-15), OUTPUT2(16-31).

5/ Negative current is the current flowing out of each of the MUX pins. Positive current is the current flowing into each MUX pin.

6/ If not tested, shall be guaranteed to the specified limits.

7/ These parameters for Tc = -55°C are guaranteed by design, characterization, or correlation to other test parameters but not production tested.

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Switching Characteristics

(Tc = -55°C to +125°C, $+V_{EE}$ = +15V, $-V_{EE}$ = -15V, V_{REF} = 5.0V -- Unless otherwise specified)

Parameter	Symbol	Conditions	MIN	MAX	Units
Switching Test MUX	t_AHL	R_L = 10KΩ, C_L = 50pF Tc = +25°C, +125°C Tc = -55°C 1/	 10 10	 2000 5000	 ns ns
	t_ALH	R_L = 10KΩ, C_L = 50pF Tc = +25°C, +125°C Tc = -55°C	 10 10	 2000 5000	 ns ns
	$t_{ON}EN$	R_L = 1KΩ, C_L = 50pF	10	1500	ns
	$t_{OFF}EN$		10	1000	ns

1/ This parameters for Tc = -55°C is guaranteed with R_L = 10kΩ, but production tested with No Load.

Truth Table (CH0 – CH15)

A3	A2	A1	A0	EN(0-15)	"ON" CHANNEL 1/ (OUTPUT1)
X	X	X	X	H	NONE
L	L	L	L	L	CH0
L	L	L	H	L	CH1
L	L	H	L	L	CH2
L	L	H	H	L	CH3
L	H	L	L	L	CH4
L	H	L	H	L	CH5
L	H	H	L	L	CH6
L	H	H	H	L	CH7
H	L	L	L	L	CH8
H	L	L	H	L	CH9
H	L	H	L	L	CH10
H	L	H	H	L	CH11
H	H	L	L	L	CH12
H	H	L	H	L	CH13
H	H	H	L	L	CH14
H	H	H	H	L	CH15

1) Between (CH0-CH15) and OUTPUT1(0-15)

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Truth Table (CH16 – CH31)

B3	B2	B1	B0	EN(16-31)	"ON" CHANNEL 1/ (OUTPUT2)
X	X	X	X	H	NONE
L	L	L	L	L	CH16
L	L	L	H	L	CH17
L	L	H	L	L	CH18
L	L	H	H	L	CH19
L	H	L	L	L	CH20
L	H	L	H	L	CH21
L	H	H	L	L	CH22
L	H	H	H	L	CH23
H	L	L	L	L	CH24
H	L	L	H	L	CH25
H	L	H	L	L	CH26
H	L	H	H	L	CH27
H	H	L	L	L	CH28
H	H	L	H	L	CH29
H	H	H	L	L	CH30
H	H	H	H	L	CH31

1) Between (CH16-CH31) and OUTPUT2(16-31)

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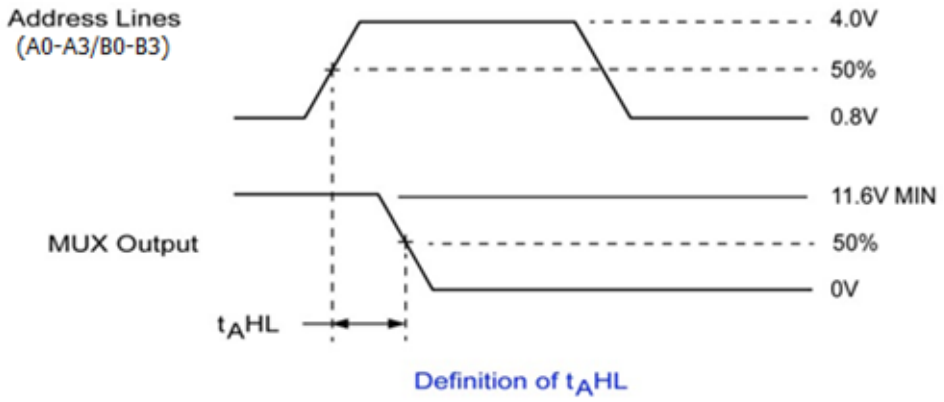
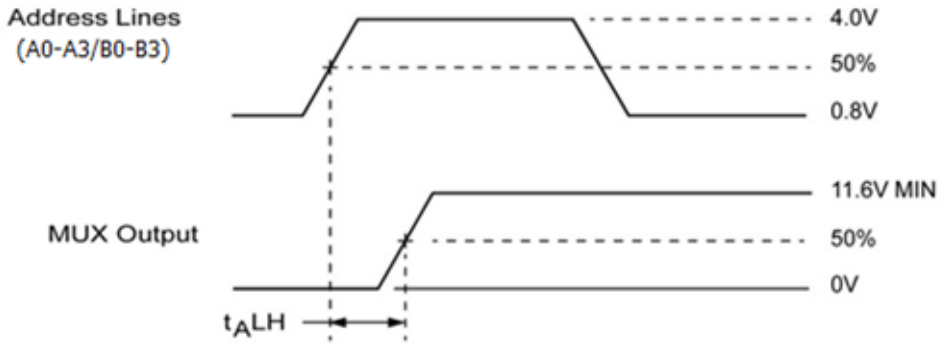
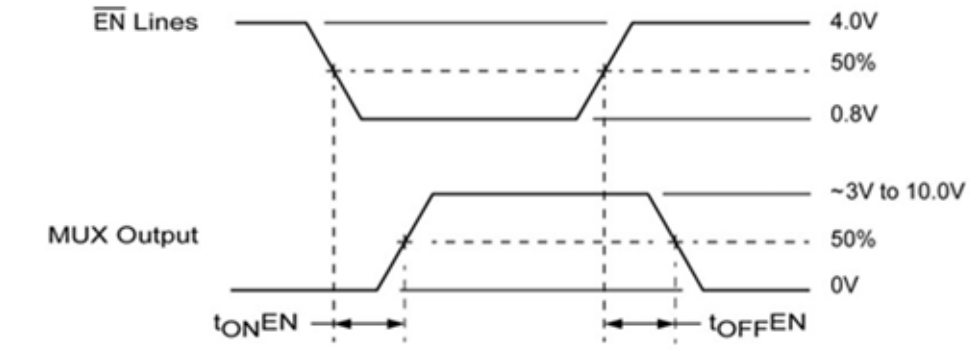
MUX8523 Switching Diagrams



Definition of t_AHL



Definition of t_ALH



Definition of $t_{ON}EN$ and $t_{OFF}EN$

Note: f = 10KHz, Duty cycle = 50%.

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Pin Numbers & Functions

MUX8523 – 56 Leads Ceramic QUAD Flat Pack			
Pin #	**Function**	**Pin #**	**Function**
1	CH0	29	CH31
2	CH1	30	CH30
3	CH2	31	CH29
4	CH3	32	CH28
5	CH4	33	CH27
6	CH5	34	CH26
7	GND	35	GND
8	GND	36	GND
9	CH6	37	CH25
10	CH7	38	CH24
11	CASE GND	39	V_{REF}
12	Output1(0-15)	40	B3
13	$\overline{EN}$(0-15)	41	B2
14	A0	42	B1
15	A1	43	B0
16	A2	44	$\overline{EN}$(16-31)
17	A3	45	Output2(16-31)
18	$+V_{EE}$	46	$-V_{EE}$
19	CH15	47	CH16
20	CH14	48	CH17
21	GND	49	GND
22	GND	50	GND
23	CH13	51	CH18
24	CH12	52	CH19
25	CH11	53	CH20
26	CH10	54	CH21
27	CH9	55	CH22
28	CH8	56	CH23

Note:

1) It is recommended that all "NC" or "no connect pins", be grounded. This eliminates or minimizes and ESD or static buildup.
2) Package lid is internally connected to circuit ground (Pins 7,8,11,21,22,35,36,49,50).

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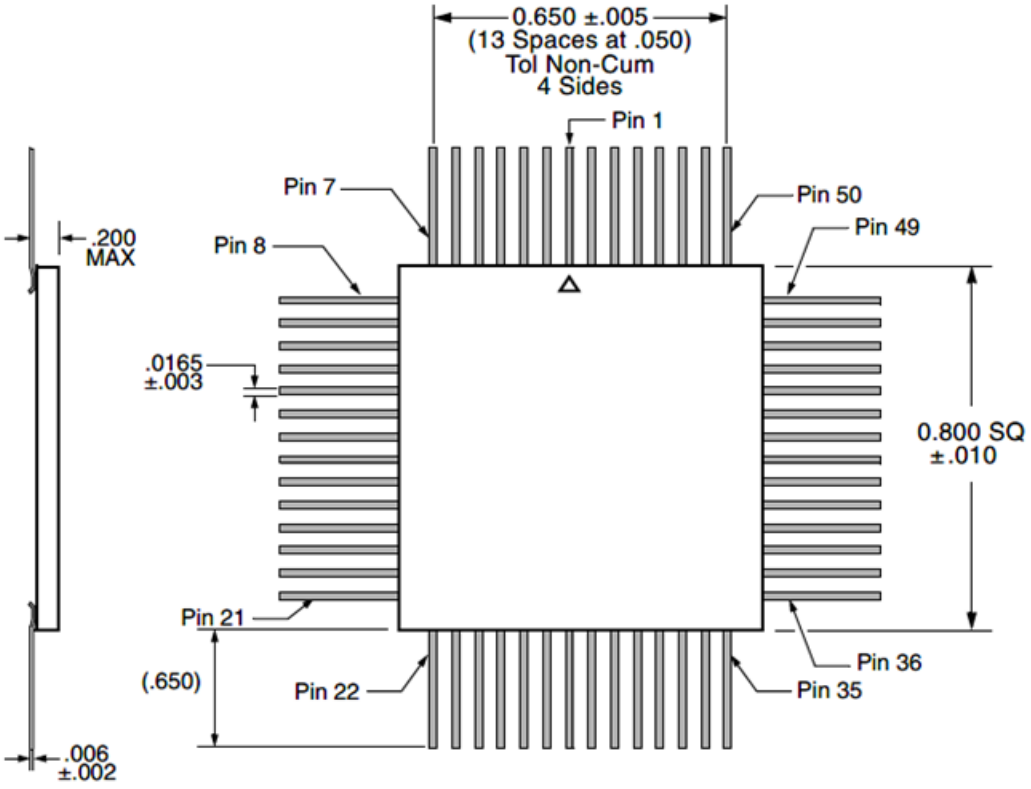
Ordering Information

Model Number	DLA SMD #	Screening	Package
MUX8523-7	-	Commercial Flow, +25°C testing only	QUAD Flat Pack
MUX8523-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
MUX8523-201-1S	5962-0923102KXC	In accordance with DLA SMD.	
MUX8523-901-1S	5962F0923102KXC	In accordance with DLA Certified RHA Program Plan to RHA Level "F", 300krads(Si)	

Package Outline



Note:

1) Outside ceramic tie bars not shown for clarity. Contact factory for details.

Revision History

Date	Rev. #	Change Description	Initials
06/24/11	B	REVISED PER ECN 8523-4	KM
08/11/22	C	REVISED PER ECN 24327	

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Datasheet Definitions

	DEFINITION
Advanced Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the datasheet **is subject to change**. Specifications can be **TBD** and the part package and pinout are **not final**.
Preliminary Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available.
Datasheet	Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes.

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