DATASHEET

RELEASED 5/5/14

64-Channel Analog Multiplexer Module Radiation Tolerant

MUX8507

Features

- 64-Channels provided by six 16-channel multiplexers- 32 Kelvin measurement configured channels
- 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 < 90mW
- Two address buses (A0-3 & B0-3) and four enable lines afford flexible organization.
- Fast access time 1500ns typical
- Break-Before-Make switching
- Same *Form / Fit / Function* as ACT8500 minus channel input transorbs
- High analog input impedance (power on or off) ?
- Designed for aerospace and high reliability space applications
- Packaging – Hermetic ceramic
  - 96 leads, 1.32"Sq x 0.20"Ht quad flat pack
  - Typical Weight 15 grams
- **CAES Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.**

General Description

CAES MUX8507 is a radiation tolerant, 64 channel multiplexer MCM (multi-chip module).

The MUX8507 has been specifically designed to meet exposure to radiation environments. It is available in a 96 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 MUX8507 is ideal for demanding military and space applications.

Organization and Application

The MUX8507 consists of six 16 channel multiplexers arranged as shown in the Block Diagram. The MUX8507 design is inherently radiation tolerant.

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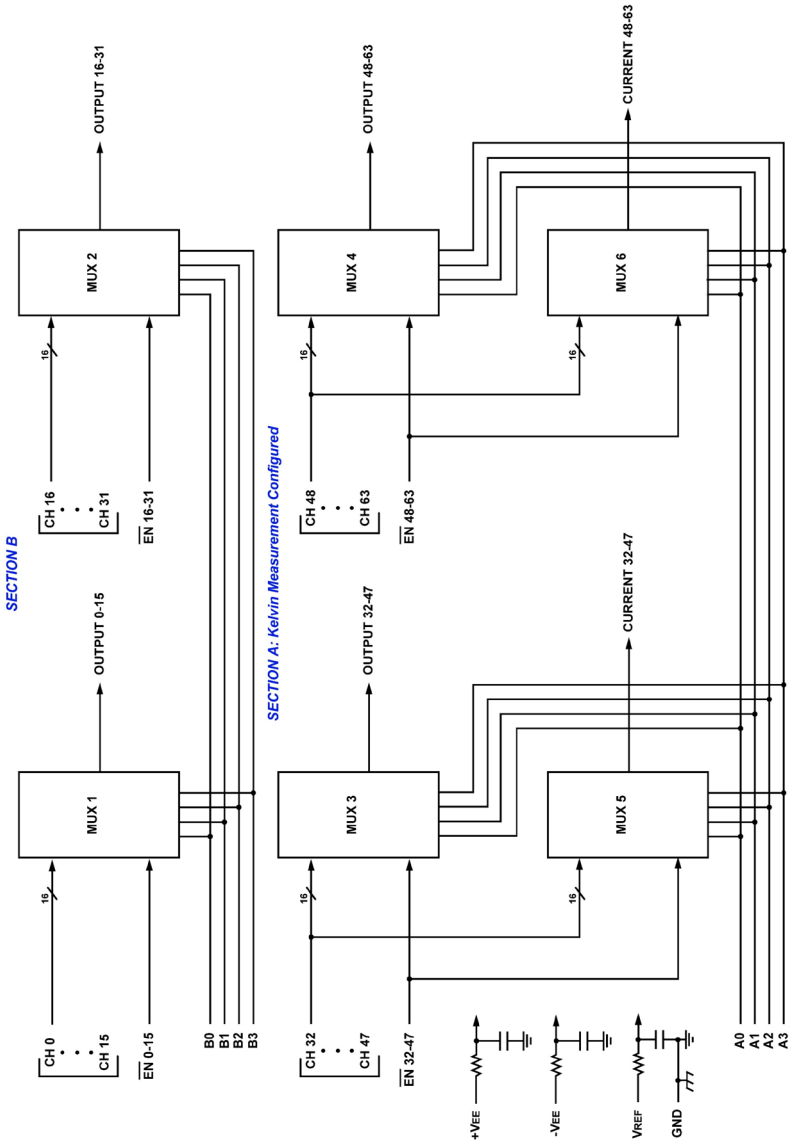
A Section

Thirty-two (32) Kelvin measurement channels addressable by bus A_0~A_3, in two 16 channel blocks, each block enabled separately. Each block connects the addressed channel to two outputs, "Output" and "Current". This technique enables selecting and reading a remote resistive sensor without the multiplexer resistance being part of the measurement. For grounded sensors, this is done by passing current to the sensor by means of the "Current" pin and reading the resultant voltage (proportional to the sensor resistance) at the "Output" pin.

B Section

Thirty-two (32) channels addressable by bus B_0~B_3, in two 16 channel blocks, each block enabled separately. Each block connects the addressed channel to one output. By paralleling the channel inputs and enables, this section can be converted to act like one of the 16 channel blocks of the A section.



MUX8507 64 –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 44) $-V_{EE}$ (Pin 46) V_{REF} (Pin 48)	 +16.5 -16.5 +16.5	 V V V
Digital Input Overvoltage V_{EN} (Pins 5, 6, 91, 92), V_A (Pins 1, 3, 93, 95), V_B (Pins 2, 4, 94, 96)	< V_{REF} +4 > GND -4	V V
Analog Input Over Voltage V_{IN}	±35	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
$+V_{EE}$	Positive Power Supply Voltage	+12.0 to +15.0 dc ± 5%	V
$-V_{EE}$	Negative Power Supply Voltage	-12.0 to -15.0 dc ± 5%	V
V_{REF}	Reference Voltage	+5.0	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}.

DC Electrical Performance Characteristics 1/

(T_C = -55°C to +125°C, $+V_{EE}$ = +15.75V, $-V_{EE}$ = -15.75V, V_{REF} = +5.0V, Unless otherwise specified)

Parameter	Symbol	Conditions	MIN	MAX	Units
Supply Current	$+I_{EE}$	$V_{EN}(0\text{-}63) = V_A(0\text{-}3)_A = V_A(0\text{-}3)_B = 0$	0	3	mA
	$-I_{EE}$		-3	0	mA
	$+I_{SBY}$	$V_{EN}(0\text{-}63) = 4V$, $V_A(0\text{-}3)_A = V_A(0\text{-}3)_B = 0$ 6/	0	3	mA
	$-I_{SBY}$		-3	0	mA
Address Input Current	$I_{AL}(0\text{-}3)_A$	V_A = 0V 8/	-4	4	µA
	$I_{AH}(0\text{-}3)_A$	V_A = 5V 8/	-4	4	µA
	$I_{AL}(0\text{-}3)_B$	V_B = 0V 8/	-2	2	µA
	$I_{AH}(0\text{-}3)_B$	V_B = 5V 8/	-2	2	µA
Enable Input Current	$I_{ENL}(0\text{-}15)$	$V_{EN}(0\text{-}15)$ = 0V 8/	-1	1	µA
	$I_{ENH}(0\text{-}15)$	$V_{EN}(0\text{-}15)$ = 5V 8/	-1	1	µA
	$I_{ENL}(16\text{-}31)$	$V_{EN}(16\text{-}31)$ = 0V 8/	-1	1	µA
	$I_{ENH}(16\text{-}31)$	$V_{EN}(16\text{-}31)$ = 5V 8/	-1	1	µA
	$I_{ENL}(32\text{-}47)$	$V_{EN}(32\text{-}47)$ = 0V 8/	-2	2	µA
	$I_{ENH}(32\text{-}47)$	$V_{EN}(32\text{-}47)$ = 5V 8/	-2	2	µA
	$I_{ENL}(48\text{-}63)$	$V_{EN}(48\text{-}63)$ = 0V 8/	-2	2	µA
	$I_{ENH}(48\text{-}63)$	$V_{EN}(48\text{-}63)$ = 5V 8/	-2	2	µA

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DC Electrical Performance Characteristics 1/ (continued)

(T_C = -55°C to +125°C, $+V_{EE}$ = +15.75V, $-V_{EE}$ = -15.75V, V_{REF} =+ 5.0V, Unless otherwise specified)

Parameter	Symbol	Conditions		MIN	MAX	Units
Positive Input Leakage Current CH0-CH31	$+I_{SOFFOUTPUT(0-31)}$	V_{IN} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 2/, 3/, 8/	+25°C	-10	+10	nA
			-	-100	+100	nA
Positive Input Leakage Current CH32-CH63	$+I_{SOFFOUTPUT(32-63)}$	V_{IN} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 2/, 3/, 8/	+25°C	-20	+20	nA
	$+I_{SOFFCURRENT(32-63)}$		-	-200	+200	nA
Negative Input Leakage Current CH0-CH31	$-I_{SOFFOUTPUT(0-31)}$	V_{IN} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 2/, 3/, 8/	+25°C	-10	+10	nA
			-	-100	+100	nA
Negative Input Leakage Current CH32-CH63	$-I_{SOFFOUTPUT(32-63)}$	V_{IN} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 2/, 3/, 8/	+25°C	-20	+20	nA
	$-I_{SOFFCURRENT(32-63)}$		-	-200	+200	nA
Output Leakage Current OUTPUTS (pins 25, 26, 68 & 70) CURRENTS (pins 67 & 69)	$+I_{DOFFOUTPUT}$	V_{OUT} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 3/, 4/, 8/		-100	+100	nA
	$+I_{DOFFCURRENT}$			-100	+100	nA
Output Leakage Current OUTPUTS (pins 25, 26, 68 & 70) CURRENTS (pins 67 & 69)	$-I_{DOFFOUTPUT}$	V_{OUT} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 3/, 4/, 8/		-100	+100	nA
	$-I_{DOFFCURRENT}$			-100	+100	nA
Switch ON Resistance OUTPUTS (pins 25, 26, 68 & 70)	$R_{DS(ON)(0-63)A}$	V_{IN} = +15.75V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		500	3000	Ω
	$R_{DS(ON)(0-63)B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		500	3000	Ω
	$R_{DS(ON)(0-63)C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/		500	3000	Ω
Switch ON Resistance CURRENTS (pins 67 & 69)	$R_{DS(ON)(0-63)_A}$	V_{IN} = +15.75V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		500	3000	Ω
	$R_{DS(ON)(0-63)_B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		500	3000	Ω
	$R_{DS(ON)(0-63)_C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/		500	3000	Ω
Switch ON Resistance OUTPUTS (pins 25, 26, 68 & 70)	$R_{DS(ON)(0-63)_A}$	V_{IN} = +11.4V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/, 7/		500	3200	Ω
	$R_{DS(ON)(0-63)_B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/, 7/		500	3000	Ω
	$R_{DS(ON)(0-63)_C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/, 7/		500	3000	Ω
Switch ON Resistance CURRENTS (pins 67 & 69)	$R_{DS(ON)(32-63)_A}$	V_{IN} = +11.4V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/, 7/		500	3200	Ω
	$R_{DS(ON)(32-63)_B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/, 7/		500	3000	Ω
	$R_{DS(ON)(32-63)_C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/, 7/		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-CH63.
3) V_{EN} is the applied input voltage to the enable lines EN (0-15), EN (16-31) EN (32-47) and EN (48-63).
4) V_{OUT} is the applied input voltage to the output lines OUTPUT(0-15), OUTPUT(16-31), OUTPUT(32-47), OUTPUT(48-63), CURRENT(32-47) and CURRENT(48-63).
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) Not tested, guaranteed to the specified limits.
7) $+V_{EE}$ = +11.4 Vdc, $-V_{EE}$ = -11.4 Vdc and V_{REF} = 5.0 V
8) These parameters for Tc = -55°C are guaranteed by design, characterization, or correlation to other test parameters but not production tested.

Switching Characteristics

(T_C = -55°C to +125°C, $+V_{EE}$ = +15.75V, $-V_{EE}$ = -15.75V, V_{REF} = +5.0V, Unless otherwise specified)

Parameter	Symbol	Conditions		MIN	MAX	Units
Switching Test MUX	t_AHL	R_L = 10KΩ, C_L = 50pF	T_C = +25°C, +125°C	10	1500	ns
			T_C = -55°C	10	3500	ns
	t_ALH	R_L = 10KΩ, C_L = 50pF	T_C = +25°C, +125°C	10	2000	ns
			T_C = -55°C	10	5000	ns
	t_{ON}EN	R_L = 1KΩ, C_L = 50pF		10	1500	ns
	t_{OFF}EN	R_L = 1KΩ, C_L = 50pF 1/		10	1000	ns

Note:

1) $+V_{EE}$ = +11.4 Vdc, $-V_{EE}$ = -11.4 Vdc and V_{REF} = 5.0 V

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Truth Table (CH0 – CH15)

B3	B2	B1	B0	EN(0-15)	"ON" CHANNEL 1/
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 CH0-15 and OUTPUT (0-15)

Truth Table (CH16 – CH31)

B3	B2	B1	B0	EN(16-31)	"ON" CHANNEL 1/
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 CH16-31 and OUTPUT (16-31)

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Truth Table (CH32 – CH47)

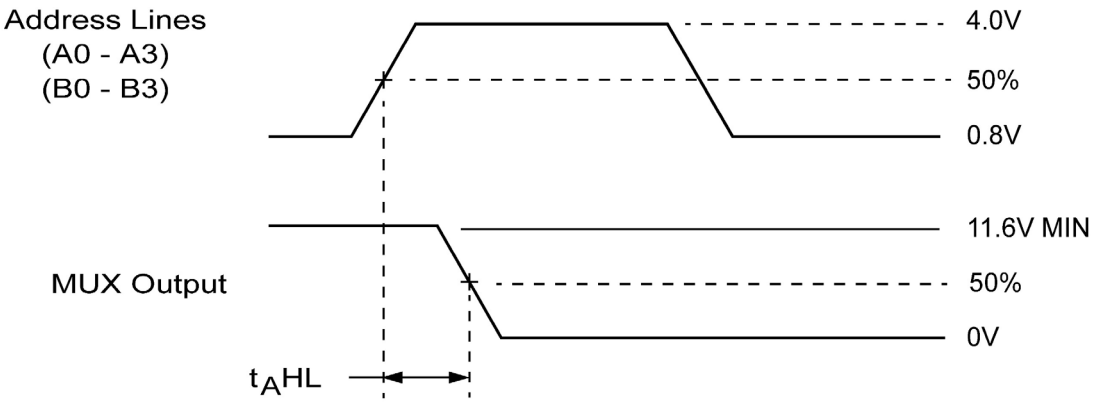
A3	A2	A1	A0	EN(32-47)	"ON" CHANNEL 1/
X	X	X	X	H	NONE
L	L	L	L	L	CH32
L	L	L	H	L	CH33
L	L	H	L	L	CH34
L	L	H	H	L	CH35
L	H	L	L	L	CH36
L	H	L	H	L	CH37
L	H	H	L	L	CH38
L	H	H	H	L	CH39
H	L	L	L	L	CH40
H	L	L	H	L	CH41
H	L	H	L	L	CH42
H	L	H	H	L	CH43
H	H	L	L	L	CH44
H	H	L	H	L	CH45
H	H	H	L	L	CH46
H	H	H	H	L	CH47

1/ Between CH32-47 and OUTPUT (32-47) and CURRENT (32-47)

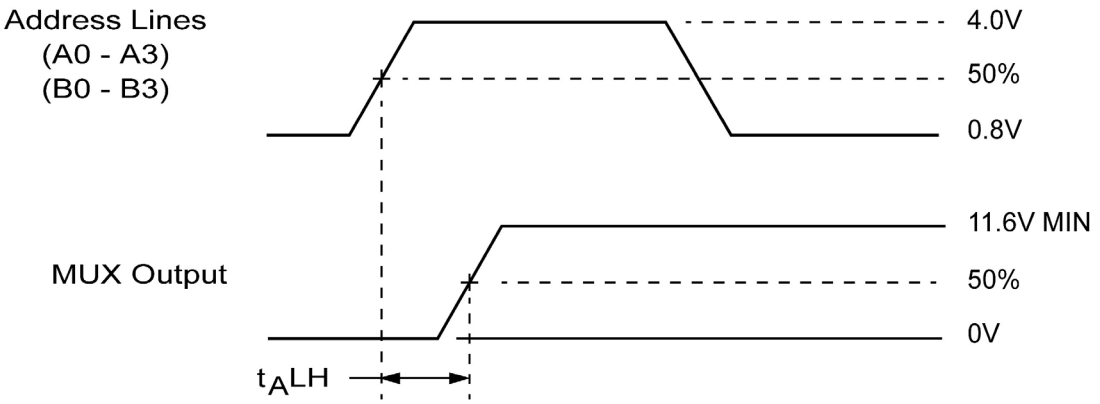
Truth Table (CH48 – CH63)

A3	A2	A1	A0	EN(48-63)	"ON" CHANNEL 1/
X	X	X	X	H	NONE
L	L	L	L	L	CH48
L	L	L	H	L	CH49
L	L	H	L	L	CH50
L	L	H	H	L	CH51
L	H	L	L	L	CH52
L	H	L	H	L	CH53
L	H	H	L	L	CH54
L	H	H	H	L	CH55
H	L	L	L	L	CH56
H	L	L	H	L	CH57
H	L	H	L	L	CH58
H	L	H	H	L	CH59
H	H	L	L	L	CH60
H	H	L	H	L	CH61
H	H	H	L	L	CH62
H	H	H	H	L	CH63

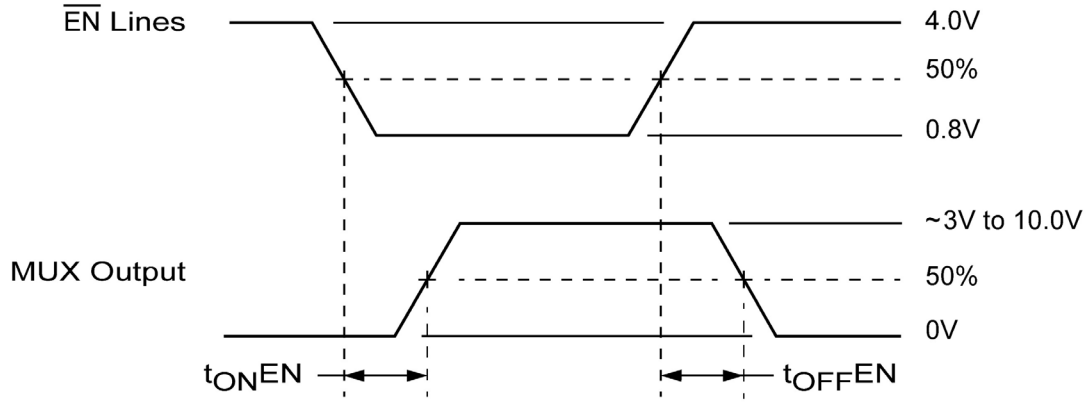
1/ Between CH48-63 and OUTPUT (48-63) and CURRENT (48-63)



Definition of t_AHL



Definition of t_ALH



Definition of $t_{ON}EN$ and $t_{OFF}EN$
MUX8507 switching diagrams

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

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Pin Numbers & Functions

MUX8507 – 96 Leads Ceramic QUAD Flat Pack

Pin #	Function	Pin #	Function	Pin #	Function
1	A2	33	CH11	65	CH49
2	B2	34	CH27	66	CH48
3	A3	35	CH12	67	Output I (48-63)
4	B3	36	CH28	68	Output V (48-63)
5	$\overline{EN}$ 0-15	37	CH13	69	Output I (32-47)
6	$\overline{EN}$ 16-31	38	CH29	70	Output V (32-47)
7	CH0	39	CH14	71	GND
8	CH16	40	CH30	72	GND
9	CH1	41	CH15	73	CH47
10	CH17	42	CH31	74	CH46
11	CH2	43	NC	75	CH45
12	CH18	44	$+V_{EE}$	76	CH44
13	CH3	45	NC	77	CH43
14	CH19	46	$-V_{EE}$	78	CH42
15	CH4	47	NC	79	CH41
16	CH20	48	V_{REF}	80	CH40
17	CH5	49	NC	81	CH39
18	CH21	50	CASE GND	82	CH38
19	CH6	51	CH63	83	CH37
20	CH22	52	CH62	84	CH36
21	CH7	53	CH61	85	CH35
22	CH23	54	CH60	86	CH34
23	GND	55	CH59	87	CH33
24	GND	56	CH58	88	CH32
25	Output V(0-15)	57	CH57	89	GND
26	Output V(16-31)	58	CH56	90	GND
27	CH8	59	CH55	91	$\overline{EN}$ 48-63
28	CH24	60	CH54	92	$\overline{EN}$ 32-47
29	CH9	61	CH53	93	A0
30	CH25	62	CH52	94	B0
31	CH10	63	CH51	95	A1
32	CH26	64	CH50	96	B1

Notes:

1) It is recommended that all "NC or "no connect pin" be grounded. This eliminates or minimizes any ESD or static buildup.
2) Package lid is internally connected to circuit ground (Pins 23, 24, 50, 71, 72, 89 & 90)

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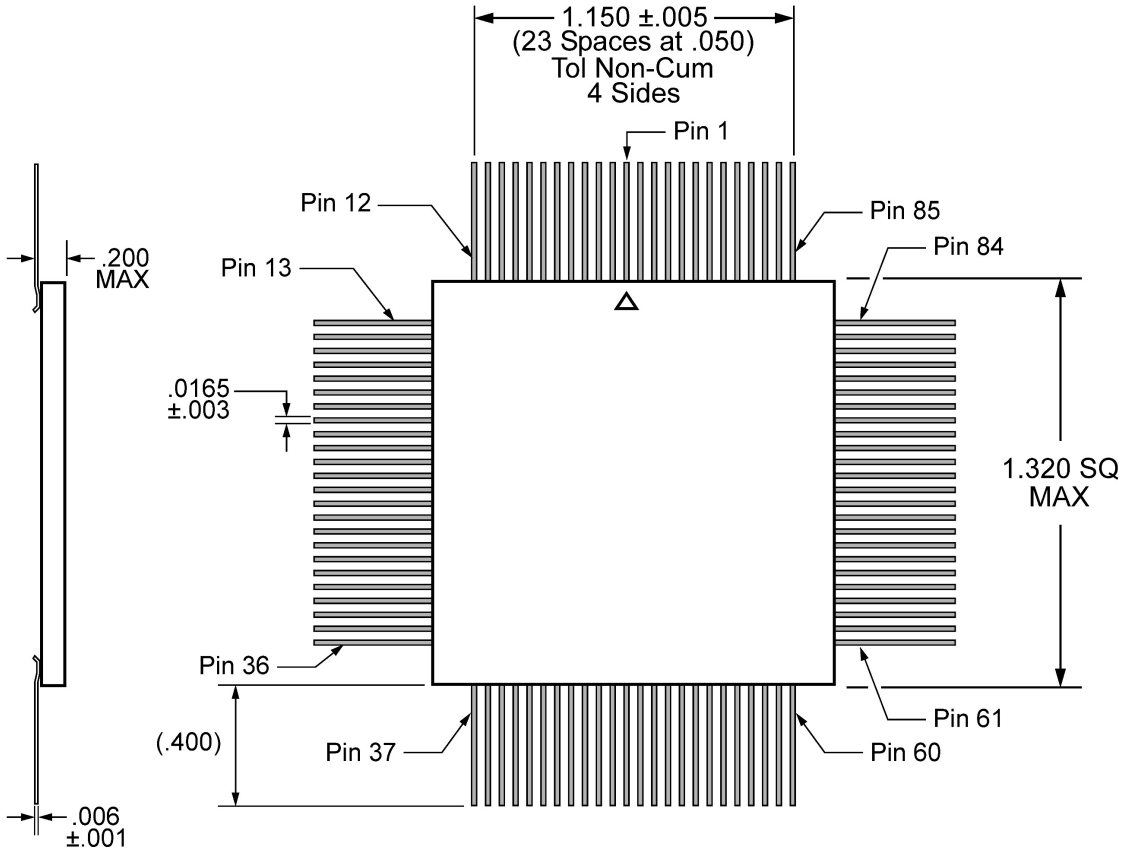
Ordering Information

Model	DLA SMD #	Screening	Package
MUX8507-7	-	Commercial Flow, +25°C testing only	QUAD Flat Pack
MUX8507-201-1S	5962-1021201KXC	In accordance with DLA SMD	
MUX8507-901-1S	5962F1021201KXC	In accordance with DLA Certified RHA Program Plan to RHA Level "F", 300krad(Si)	



Flat Package Outline

Note: Outside ceramic tie bars not shown for clarity. Contact factory for details.

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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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