

**SCOPE: PRECISION 8-CHANNEL/DUAL 4-CHANNEL LOW-VOLTAGE
CMOS ANALOG MULTIPLEXER**

<u>Device Type</u>	<u>Generic Number</u>	<u>Circuit Function</u>
01	MAX398M(x)/883B	8-Channel Analog Multiplexer
02	MAX399M(x)/883B	Dual 4-Channel Analog Multiplexer

Case Outline(s). The case outlines shall be designated in Mil-Std-1835 and as follows:

<u>Outline Letter</u>	<u>Mil-Std-1835</u>	<u>Case Outline</u>	<u>Package Code</u>
JE	GDIP1-T16 or CDIP2-T16	16 LEAD Cerdip	J16

Absolute Maximum Ratings

Voltage Referenced to V⁻

V ⁺	-0.3V to +17V
V ⁻	+0.3V to -17V
V ⁺ to V ⁻	-0.3V to +17V
Voltage into any terminal 1/	(V ⁻ -2V) to (V ⁺ +2V) or 30mA whichever occurs first
Current, Any terminal	30mA
Peak Current, Any terminal (Pulsed at 1ms, 10% duty cycle max)	40mA
Lead Temperature (soldering, 10 seconds)	+300°C
Storage Temperature	-65°C to +150°C

Continuous Power Dissipation	T _A =+70°C
16 lead Cerdip(derate 10.0mW/°C above +70°C)	800mW
Junction Temperature T _J	+150°C
Thermal Resistance, Junction to Case, θ_{JC} :	
Case Outline 16 lead Cerdip.....	50°C/W
Thermal Resistance, Junction to Ambient, θ_{JA} :	
Case Outline 16 lead Cerdip.....	100°C/W

Recommended Operating Conditions

Ambient Operating Range (T _A)	-55°C to +125°C
Positive Supply Voltage (V ⁺)	+15V
Negative Supply Voltage (V ⁻)	-15V
V _{AL} (max)	0.8V
V _{AH} (min)	2.4V

- 1/ Signals on any terminal exceeding V⁺ or V⁻ will be clamped by internal diodes.
Limit forward current to the maximum current ratings.

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TABLE 1. ELECTRICAL TESTS: DUAL SUPPLIES

TEST	Symbol	CONDITIONS -55 °C ≤T _A ≤ +125°C 6/ Unless otherwise specified	Group A Subgroup	Device type	Limits Min 2/	Limits Max 2/	Units
SWITCH							
Analog-Signal Range	V _{ANALOG}	NOTE 3	1,2,3	All	V-	V+	V
Channel ON Resistance	r _{DS(ON)}	I _{NO} =1mA, V _{COM} =±3.5V	1 2,3	All		100 125	Ω
On-resistance Matching between Channels NOTE 4	Δr _{DS(ON)}	I _{NO} =1mA, V _{COM} =±3.5V V ₊ =+5V, V ₋ =-5V	1 2,3	All		4 6	Ω
On-resistance Flatness NOTE 5	r _{FLAT}	I _{NO} =1mA, V _{COM} =±3V V ₊ =+5V, V ₋ =-5V	1 2,3	All		10 13	Ω
NO- OFF Leakage Current	I _{NO(OFF)}	V _{NO} =±4.5V V _{COM} =±4.5V V ₊ =+5.5V, V ₋ =-5.5V	1 2,3	All	-0.1 -10	0.1 10	nA
COM-OFF Leakage Current	I _{COM(OFF)}	V _{NO} =±4.5V V _{COM} =±4.5V V ₊ =+5.5V, V ₋ =-5.5V	1 2,3	01	-0.2 -20	0.2 20	nA
			1 2,3	02	-0.1 -10	0.1 10	
COM-On Leakage Current	I _{COM(ON)}	V _{NO} =±4.5V V _{COM} =±4.5V	1 2,3	01	-0.4 -40	0.4 40	nA
			1 2,3	02	-0.2 -20	0.2 20	
INPUT							
Input Current/Voltage High	I _{AH} , I _{ENH}	V _A =V _{EN} =2.4V	1,2,3	All	-0.1	0.1	μA
Input Current/Voltage Low	I _{AL} , I _{ENL}	V _A =V _{EN} =0.8V	1,2,3	All	-0.1	0.1	μA
SUPPLY							
Power Supply Range			1,2,3	All	±3	±8	V
Positive Supply Current	I ₊	V _{EN} =V _A =0V or V ₊ V ₊ =+5.5V, V ₋ =-5.5V	1	All	-1	1	μA
Negative Supply Current	I ₋	V _{EN} =V _A =0V or V ₊ V ₊ =+5.5V, V ₋ =-5.5V	1,2,3	All	-1	1	μA
Ground Current	I _{GND}	V _{EN} =V _A =0V or V ₊ V ₊ =+5.5V, V ₋ =-5.5V	1,2,3	All	-1	1	μA
DYNAMIC							
Transition Time	t _{TRANS}	Figure 2	9,10,11	All		150	ns
Break-Before- Make interval	t _{OPEN}	Figure 4	9	All	0		ns
Enable Turn-On Time	t _{ON(EN)}	Figure 3	9 10,11	All		150 250	ns
Enable Turn-Off Time	t _{OFF(EN)}	Figure 3	9 10,11	All		150 200	ns
Charge Injection	Q	C _L =10nF, V _S =0V, R _S =0Ω NOTE 3	9	All		5	pC

TABLE 1. ELECTRICAL TESTS: SINGLE 5V SUPPLY

TEST	Symbol	CONDITIONS	Group A Subgroup	Device type	Limits Min 2/	Limits Max 2/	Units
		-55 °C <=T _A <= +125°C 7/ Unless otherwise specified					
SWITCH							
Analog Signal Range NOTE 3	V _{ANALOG}	V _{COM} , V _{NO}	1,2,3	All	V+	V-	V
On-Resistance	r _{DS(ON)}	I _{NO} =1mA, V _{COM} =3.5V, V+=4.5V	1 2,3	All		225 280	Ω
On-resistance Matching between Channels NOTE 4	Δr _{DS(ON)}	I _{NO} =1mA, V _{COM} =3.5V V+=+4.5V	1 2,3	All		10 12	Ω
On-resistance Flatness	r _{FLAT}	I _{NO} =1mA, V _{COM} =3V, 2V, 1V V+=+5V	1 2,3	All		16 20	Ω
NO- OFF Leakage Current NOTE 8	I _{NO(OFF)}	V _{NO} =4.5V V _{COM} =0V V+=+5.5V	1 2,3	All	-0.1 -10	0.1 10	nA
COM-OFF Leakage Current NOTE 8	I _{COM(OFF)}	V _{NO} =0V, V _{COM} =4.5V V+=+5.5V	1 2,3	01	-0.2 -20	0.2 20	nA
			1 2,3	02	-0.1 -10	0.1 10	
COM-On Leakage Current NOTE 8	I _{COM(ON)}	V _{NO} =4.5V V _{COM} =4.5V V+=+5.5V	1 2,3	01	-0.4 -40	0.4 40	nA
			1 2,3	02	-0.2 -20	0.2 20	
INPUT							
Input Current/Voltage High	I _{AH} , I _{ENH}	V _A =V _{EN} =2.4V	1,2,3	All	-1.0	1.0	μA
Input Current/Voltage Low	I _{AL} , I _{ENL}	V _A =0V, V _{EN} =0.8V	1,2,3	All	-1.0	1.0	μA
SUPPLY							
Power Supply Range			1,2,3	All	3	15	V
Positive Supply Current	I+	V _{EN} =V _A =0V or V+ V+=+5.5V, V-=0V	1	All	-1	1	μA
Negative Supply Current	I-	V _{EN} =V _A =0V or V+ V+=+5.5V, V-=0V	1,2,3	All	-1	1	μA
Ground Current	I _{GND}	V _{EN} = V+, 0V; V _A =0V V+=+5.5V, V-=0V	1,2,3	All	-1	1	μA
DYNAMIC							
Transition Time	t _{TRANS}	V _{NO} =3V	9,10,11	All		245	ns
Break-Before-Make interval	t _{OPEN}		9	All	10		ns
Enable Turn-On Time	t _{ON(EN)}		9 10,11	All		200 275	ns
Enable Turn-Off Time	t _{OFF(EN)}		9 10,11	All		125 200	ns
Charge Injection	Q	C _L =10nF, V _S =0V, R _S =0Ω NOTE 3	9	All		5	pC

TABLE 1. ELECTRICAL TESTS: SINGLE 3V SUPPLY

TEST	Symbol	CONDITIONS -55 °C ≤ T _A ≤ +125 °C V ⁺ = +3V ± 10%, V ⁻ = 0V, GND = 0V, V _{AH} = V _{ENH} = +2.4V, V _{AL} = V _{ENL} = +0.8V Unless otherwise specified	Group A Subgroup	Device type	Limits Min 2/	Limits Max 2/	Units
SWITCH							
Analog Signal Range	V _{ANALOG}	V _{COM} , V _{NO} NOTE 3	1,2,3	All	V+	V-	V
On-Resistance	r _{DS(ON)}	I _{NO} = 1mA, V _{COM} = 1.5V, V ⁺ = 3V	1 2,3	All		375 425	Ω
DYNAMIC							
Transition Time	t _{TRANS}	V _{NO1} = 1.5V, V _{NO8} = 0V, V _{IN} = 2.4V Figure 2 NOTE 3	9	All		575	ns
Enable Turn-On Time	t _{ON(EN)}	V _{NO1} = 1.5V, V _{INL} = 0V, V _{INH} = 2.4V Figure 3 NOTE 3	9	All		500	ns
Enable Turn-Off Time	t _{OFF(EN)}	V _{NO1} = 1.5V, V _{INL} = 0V, V _{INH} = 2.4V Figure 3 NOTE 3	9	All		400	ns
Charge Injection	Q	C _L = 10nF, V _S = 0V, R _S = 0Ω NOTE 3	9	All		5	pC

NOTE 2: The algebraic convention where the most negative value is a minimum and the most positive value a maximum is used in this data sheet.

NOTE 3: Guaranteed by design.

NOTE 4: Δr_{DS(ON)} = r_{DS(ON)max} - r_{DS(ON)min}.

NOTE 5: Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured at the extremes of the specified analog signal range.

NOTE 6: V⁺ = +5V ± 10%, V⁻ = -5V ± 10%, GND = 0V, V_{AH} = V_{ENH} = +2.4V, V_{AL} = V_{ENL} = +0.8V.

NOTE 7: V⁺ = +5V ± 10%, V⁻ = 0V, GND = 0V, V_{AH} = V_{ENH} = +2.4V, V_{AL} = V_{ENL} = +0.8V.

NOTE 8: Leakage testing at single supply is guaranteed by correlation testing with dual supplies.

FIGURE 2: Transition Time Diagrams: See Commercial Data Sheet

FIGURE 3: Enable Switching Time Diagrams: See Commercial Data Sheet

FIGURE 4: Break-Before-Make Interval Diagrams: See Commercial Data Sheet

FIGURE 5: Charge Injection Diagrams: See Commercial Data Sheet

TRUTH TABLE
TERMINAL CONNECTION

A2	A1	A0	EN	MAX398 ON SWITCH	TERMINAL NUMBER	01 MAX398	02 MAX399
X	X	X	0	None		J16	J16
0	0	0	1	1	1	A0	A0
1	0	0	1	2	2	EN	EN
0	1	0	1	3	3	V-	V-
1	1	0	1	4	4	NO1	NO1A
0	0	1	1	5	5	NO2	NO2A
1	0	1	1	6	6	NO3	NO3A
0	1	1	1	7	7	NO4	NO4A
1	1	1	1	8	8	COM	COMA
					9	NO8	COMB
				MAX399	10	NO7	NO4B
A2	A1	A0		ON SWITCH	11	NO6	NO3B
0	X	X		None	12	NO5	NO2B
1	0	0		1	13	V+	NO1B
1	1	0		2	14	GND	V+
1	0	1		3	15	A2	GND
1	1	1		4	16	A1	A1

ORDERING		INFORMATION:	
MAX398MJE/883B	16 CDIP	MAX399MJE/883B	16 CDIP

QUALITY ASSURANCE

Sampling and inspection procedures shall be in accordance with MIL-Prf-38535, Appendix A as specified in Mil-Std-883.

Screening shall be in accordance with Method 5004 of Mil-Std-883. Burn-in test Method 1015:

1. Test Condition, A, B, C, or D.
2. TA = +125°C minimum.
3. Interim and final electrical test requirements shall be specified in Table 2.

Quality conformance inspection shall be in accordance with Method 5005 of Mil-Std-883, including Groups A, B, C, and D inspection.

Group A inspection:

1. Tests as specified in Table 2.
2. Selected subgroups in Table 1, Method 5005 of Mil-Std-883 shall be omitted.

Group C and D inspections:

- a. End-point electrical parameters shall be specified in Table 1.
- b. Steady-state life test, Method 1005 of Mil-Std-883:
 1. Test condition A, B, C, D.
 2. TA = +125°C, minimum.
 3. Test duration, 1000 hours, except as permitted by Method 1005 of Mil-Std-883.

TABLE 2. ELECTRICAL TEST REQUIREMENTS

Mil-Std-883 Test Requirements	Subgroups per Method 5005, Table 1
Interim Electric Parameters Method 5004	1
Final Electrical Parameters Method 5005	1*, 2, 3, 9
Group A Test Requirements Method 5005	1, 2, 3, 9, 10, 11
Group C and D End-Point Electrical Parameters Method 5005	1

* PDA applies to Subgroup 1 only.