SCOPE: PRECISION QUAD SPST ANALOG SWITCH

Device Type	Generic Number
01	MAX391MJE/883B
02	MAX392MJE/883B
03	MAX393MJE/883B

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

Outline Letter	Mil-Std-1835	Case Outline	Package Code
JE	GDIP1-T16 or CDIP2-T16	16 LEAD CERDIP	J16

Absolute Maximum Ratings

Voltage Referenced to V^-
- V^+ ..... -0.3V to +17V
- GND ..... -0.3V to +17V
- GND ..... -0.3V to (V^+ +0.3V)
- V_{IN}, V_{COM}, V_{NC}, V_{NO} 1/ ..... V- to V+
- Current, Any terminal 30mA
- Peak Current, COM, NO, NC (Pulsed at 1ms, 10% duty cycle max) 100mA

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, ΘJC:
Case Outline 16 lead CERDIP..... 50°C/W
Thermal Resistance, Junction to Ambient, ΘJA:
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^+) ..... +5V
Negative Supply Voltage (V^-) ..... -5V
V_{INL} (max) 0.8V
V_{INH} (min) 2.4V

1/ Signals on NC, NO, COM or IN exceeding V^+ or V^- are clamped by internal diodes. Limit forward current to 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 V^+=+5V ±10%, V^-=-5V ±10%, GND=0V,V_{INH}=2.4V, V_{INL}=0.8V Unless otherwise specified	Group A Subgroup	Device type	Limits Min 2/	Limits Max 2/	Units
SWITCH							
Analog-Signal Range	$V_{COM,}$ $V_{NO,}$ V_{NC}	3/	1,2,3	All	V-	V+	V
On-Resistance	$r_{DS(ON)}$	V^+=+4.5V, V^-=-4.5V, I_{COM}=-10mA, V_{NO} or V_{NC}=±3.5V	1 2,3	All		30 45	Ω
On-Resistance Matching between Channels 4/	Δr_{DS} (ON)	V^+=+5V, V^-=-5V, I_{COM}=-10mA, V_{NO} or V_{NC}=±3.0V	1 2,3	All		2.0 4.0	Ω
On-Resistance Flatness 5/	$r_{FLAT(ON)}$	V^+=+5V, V^-=-5V, I_{COM}=-10mA, V_{NO} or V_{NC}=±3.0V	1 2,3	All		4.0 6.0	Ω
NO or NC Off Leakage Current	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	V^+=+5.5V, V^-=-5.5V, V_{COM}=±4.5V, V_{NO} or V_{NC}=±4.5V	1 2,3	All	-0.1 -5.0	0.1 5.0	nA
COM Off Leakage Current	I_{COM} (OFF)	V^+=+5.5V, V^-=-5.5V, V_{COM}=±4.5V, V_{NO} or V_{NC}=±4.5V	1 2,3	All	-0.1 -5.0	0.1 5.0	nA
COM On Leakage Current	I_{COM} (ON)	V^+=+5.5V, V^-=-5.5V, V_{COM}=±4.5V, V_{NO} or V_{NC}=±4.5V	1 2,3	All	-0.2 -20.0	0.2 20.0	nA
INPUT							
Input Current/Voltage High	I_{INH}	V_{IN}= 2.4V, all others = 0.8V	1,2,3	All	-0.5	0.5	µA
Input Current/Voltage Low	I_{INL}	V_{IN}= 0.8V, all others = 2.4V	1,2,3	All	0.5	0.5	µA
SUPPLY							
Power-Supply Range			1,2,3		±8.0	±8.0	V
Positive Supply Current	I+	All channels on or off, V^+=+5.5V, V^-=-5.5V, V_{IN}=0V or V+	1,2,3	All	-1.0	1.0	µA
Negative Supply Current	I-	All channels on or off, V^+=+5.5V, V^-=-5.5V, V_{IN}=0V or V+	1,2,3	All	-1.0	1.0	µA
DYNAMIC							
Turn-On Time	t_{ON}	V_{COM}±3V, Figure 2	9 10,11	All		130 175	ns
Turn-Off Time	t_{OFF}	V_{COM}±3V, Figure 2	9 10,11	All		75 100	ns
Break-Before-Make Delay 3/	t_D	MAX393 only, Figure 3 R_L=300Ω, C_L=35pF	9	03	5		ns
Charge Injection 3/	Q	C_L=1.0nF, V_{GEN}=0V, R_{GEN}=0Ω Figure 4	9	All		5	pC

TABLE 2. ELECTRICAL TESTS: SINGLE +5V SUPPLY

TEST	Symbol	CONDITIONS -55 °C <=T_A<= +125°C V^+=+5V ±10%, V^-=-0V ±10%, GND=0V, V_{INH}=2.4V, V_{INL}=0.8V Unless otherwise specified	Group A Subgroup	Device type	Limits Min 3/	Limits Max 3/	Units
SWITCH							
Analog-Signal Range	V_{COM}, V_{NO}, V_{NC}	3/	1,2,3	All	0	V+	V
On-Resistance	$r_{DS(ON)}$	V^+=+4.5V, I_{COM}=-10mA, V_{NO} or V_{NC}=3.5V	1 2,3	All		60 75	Ω
On-Resistance Matching between Channels 4/	Δr_{DS} (ON)	V^+=+5V, I_{COM}=-1.0mA, V_{NO} or V_{NC}=3.0V	1 2,3	All		2.0 4.0	Ω
On-Resistance Flatness 3/, 5/	$r_{FLAT(ON)}$	V^+=+5V, I_{COM}=-1.0mA, V_{NO} or V_{NC}=1V, 3V	1 2,3	All		6.0 8.0	Ω
NO or NC Off Leakage Current	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	V^+=+5.5V, V_{COM}=0V, V_{NO} or V_{NC}=4.5V	1 2,3	All	-0.25 -2.5	0.25 2.5	nA
COM Off Leakage Current	$I_{COM (OFF)}$	V^+=+5.5V, V_{COM}=0V, V_{NO} or V_{NC}=4.5V	1 2,3	All	-0.1 -5.0	0.1 5.0	nA
COM On Leakage Current	$I_{COM (ON)}$	V^+=+5.5V, V_{COM}=5V, V_{NO} or V_{NC}=4.5V	1 2,3	All	-0.2 -20.0	0.2 20.0	nA
SUPPLY							
Positive Supply Current	I+	All channels on or off, V^+ =+5.5V, V_{IN}=0V or V+	1,2,3	All	-1.0	1.0	µA
Negative Supply Current	I-	All channels on or off, V^+ =+5.5V, V_{IN}=0V or V+	1,2,3	All	-1.0	1.0	µA
DYNAMIC							
Turn-On Time	t_{ON}	V_{NO} or V_{NC}=3V	9 10,11	All		170 240	ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC}=3V	9 10,11	All		50 100	ns
Break-Before-Make Delay 3/	t_D	MAX393 only, R_L=300Ω, C_L=35pF	9	03	10		ns
Charge Injection 3/	Q	C_L=1.0nF, V_{GEN}=0V, R_{GEN}=0Ω Figure 4	9	All		5	pC

NOTE 2: This data sheet uses the algebraic convention, where the most negative value is a minimum and the most positive value is a maximum.
NOTE 3: Guaranteed by design at 25°C
NOTE 4: $\Delta r_{ON}=\Delta r_{ON}(max)-\Delta r_{ON}(min)$.
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: Leakage testing at single supply is guaranteed by testing with dual supplies.

FIGURE 2: SWITCHING TIME TEST CIRCUIT: See Commercial Data Sheet
FIGURE 3: BREAK-BEFORE-MAKE INTERVAL: See Commercial Data Sheet
FIGURE 4: CHARGE INJECTION: See Commercial Data Sheet

TABLE 3. ELECTRICAL TESTS: SINGLE +3.3V SUPPLY

TEST	Symbol	CONDITIONS -55 °C <=T_A<= +125°C V^+=+5V ±10%, V^-=-0V ±10%, GND=0V, V_{INH}=2.4V, V_{INL}=0.8V Unless otherwise specified	Group A Subgroup	Device type	Limits Min 2/	Limits Max 2/	Units
SWITCH							
Analog-Signal Range	$V_{COM,}$ $V_{NO,}$ V_{NC}	3/	1,2,3	All	0	V+	V
Channel On-Resistance	$r_{DS(ON)}$	V^+=+3V, I_{COM}=-1.0mA, V_{NO} or V_{NC}=1.5V	1 2,3	All		175 275	Ω
SUPPLY							
Positive Supply Current	I+	All channels on or off, V^+=+3.6V, V_{IN}=0V or V+	1,2,3	All	-1.0	1.0	µA
Negative Supply Current	I-	All channels on or off, V^+=+3.6V, V_{IN}=0V or V+	1,2,3	All	-1.0	1.0	µA
DYNAMIC							
Turn-On Time 3/	t_{ON}	V_{NO} or V_{NC}=1.5V	9 10,11	All		400 500	ns
Turn-Off Time 3/	t_{OFF}	V_{NO} or V_{NC}=1.5V	9 10,11	All		125 175	ns
Break-Before-Make Delay 3/	t_D	MAX393 only, R_L=300Ω, C_L=35pF	9	03	20		ns
Charge Injection 3/	Q	C_L=1.0nF, V_{GEN}=0V, R_{GEN}=0Ω Figure 4	9	All		5	pC

TRUTH TABLES:

MAX391	MAX391	MAX392	MAX392		MAX393	MAX393
LOGIC	SWITCH	LOGIC	SWITCH	LOGIC	SWITCHES 1,4	SWITCHES 2,3
0	ON	0	OFF	0	OFF	ON
1	OFF	1	ON	1	ON	OFF

TERMINAL CONNECTIONS:

	MAX391	MAX392	MAX393
	J16	J16	
1	IN1	IN1	IN1
2	COM1	COM1	COM1
3	NC1	NO1	NO1
4	V-	V-	V-
5	GND	GND	GND
6	NC4	NO4	NO4
7	COM4	COM4	COM4
8	IN4	IN4	IN4
9	IN3	IN3	IN3
10	COM3	COM3	COM3
11	NC3	NO3	NC3
12	NC	NC	NC
13	V+	V+	V+
14	NC2	NO2	NC2
15	COM2	COM2	COM2
16	IN2	IN2	IN2

	ORDERING INFORMATION:	
01	MAX391MJE/883B	16 CDIP
02	MAX392MJE/883B	16 CDIP
03	MAX393MJE/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 4.

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 4.
2. Selected subgroups in Tables 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 1,2,3.
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 4. 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, 10, 11
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.