

MP7510DI, MP7511DI, MP7512DI

CMOS QUAD SPST ANALOG SWITCHES (MP7510DI, MP7511DI)

CMOS DUAL SPDT ANALOG SWITCH (MP7512DI)

FEATURES

- Latch-Proof
- Overvoltage Protected
- Low R_{ON} : 75 Ω
- Low Dissipation: 3 mW
- TTL/CMOS Direct Interface
- Silicon-Nitride Passivated
- Monolithic Dielectrically-Isolated CMOS

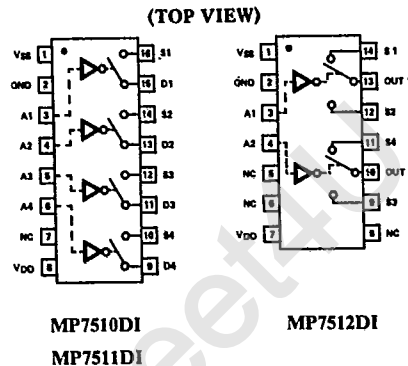
GENERAL DESCRIPTION

The MP7510DI, MP7511DI and MP7512DI are a family of latch proof dielectrically isolated CMOS switches featuring overvoltage protection up to $\pm 25V$ above the power supplies. These benefits are obtained without sacrificing the low "ON" resistance (75 Ω) or low leakage current (400pA), the main features of an analog switch.

The MP7510DI and MP7511DI consist of four independent SPST analog switches packaged in a 16-pin DIP. They differ only in that the digital control logic is inverted. The MP7512DI has two independent SPDT switches packaged in a 14-pin DIP.

Very low power dissipation, overvoltage protection and TTL/CMOS direct interfacing are achieved by combining a unique circuit design and a dielectrically isolated CMOS process. Silicon nitride passivation ensures long term stability while monolithic construction provides reliability.

PIN CONFIGURATIONS



CONTROL LOGIC

- MP7510DI: Switch "ON" for Address "HIGH"
- MP7511DI: Switch "ON" for Address "LOW"
- MP7512DI: Address "HIGH" makes S1 to Out-1 and S3 to Out-2

See Section 7 for Ordering Information

MP7510DI, MP7511DI, MP7512DISPECIFICATIONS ($V_{DD} = +15V$, $V_{SS} = -15V$ unless otherwise noted)

COMMERCIAL VERSIONS (J, K)

| PARAMETER ⁴ | MODEL | VERSION | 25°C | 0°C to 70°C (N) -25°C to +85°C (D) | | UNITS | TEST CONDITIONS |
|---|----------------------|--------------|--------------------|---------------------------------------|------|----------|---|
| | | | | MIN | MAX | | |
| ANALOG SWITCH | | | | | | | |
| R_{ON} ¹ | All | J, K | 100 max | | 175 | Ω | $-10V \leq V_D \leq +10V$ $I_{DS} = 1.0 \text{ mA}$ |
| R_{ON} vs V_D (V_S) | All | J, K | 20 typ | | | % | |
| R_{ON} Drift | All | J, K | +0.5 typ | | | %/°C | |
| R_{ON} Match | All | J, K | 1 typ | | | % | $V_D = 0$, $I_{DS} = 1.0 \text{ mA}$ |
| R_{ON} Drift Match | All | J, K | 0.01 typ | | | %/°C | |
| I_D (I _S)OFF ¹ | All | J, K | 5 max | | 500 | nA | $V_D = -10V$, $V_S = +10V$ and $V_D = +10V$, $V_S = -10V$ |
| I_D (I _S)ON ² | All | J, K | 10 max | | | nA | $V_S = V_D = +10V$ $V_S = V_D = -10V$ |
| I_{OUT} ¹ | MP7512DI | J, K | 15 max | | 1500 | nA | $V_{S1} = V_{OUT} = \pm 10V$, $V_{S2} = \mp 10V$ and $V_{S2} = V_{OUT} = \pm 10V$, $V_{S1} = \mp 10V$ |
| DIGITAL CONTROL | | | | | | | |
| V_{INL} ¹ | All | J, K | | | 0.8 | V | |
| V_{INH} ¹ | All | K | | 2.4 | | V | |
| C_{IN} | All | J, K | 3 typ | | | pF | |
| I_{INH} ¹ | All | J, K | 10 max | | | nA | $V_{IN} = V_{DD}$ |
| I_{INL} ¹ | All | J, K | 10 max | | | nA | $V_{IN} = 0$ |
| DYNAMIC CHARACTERISTICS | | | | | | | |
| t_{ON} | MP7510DI MP7511DI | J, K J, K | 180 typ 350 typ | | | ns | $V_{IN} = 0$ to +3.0V |
| t_{OFF} | MP7510DI MP7511DI | J, K J, K | 350 typ 180 typ | | | ns | |
| $t_{TRANSITION}$ | MP7512DI | J, K | 300 typ | | | ns | |
| C_S (C _D)OFF | All | J, K | 8 typ | | | pF | |
| C_S (C _D)ON | All | J, K | 17 typ | | | pF | |
| C_{DS} (C _S -OUT) | All | J, K | 1 typ | | | pF | V_D (V_S) = 0V |
| C_{DD} (C _{SS}) | All | J, K | 0.5 typ | | | pF | |
| C_{OUT} | MP7512DI | J, K | 17 typ | | | pF | |
| Q_{INJ} | All | J, K | 30 typ | | | pC | Measured at S or D terminal. $C_L = 1000 \text{ pF}$, $V_{IN} = 0$ to 3V, V_D (V_S) = +10V to -10V |
| POWER SUPPLY | | | | | | | |
| I_{DD} ¹ | All | J, K | 800 max | | 800 | μA | All digital inputs = V_{INH} |
| I_{SS} ¹ | All | J, K | 800 max | | 800 | μA | |
| I_{DD} ¹ | All | J, K | 500 max | | 500 | μA | All digital inputs = V_{INL} |
| I_{SS} ¹ | All | J, K | 500 max | | 500 | μA | |

Notes

- ¹ 100% tested.
- ² Guaranteed, not production tested.
- ³ A pullup resistor, typically 1-2 k Ω is required to make "J" versions TTL compatible.
- ⁴ Specifications subject to change without notice.

CAUTION: The digital control inputs are zener protected; however, permanent damage may occur on unconnected units under high electrostatic fields. Keep unused units in conductive foam at all times. Prior to pulling the devices from the conductive foam, ground the foam to deplete any accumulated charge.

MP7510DI, MP7511DI, MP7512DI

SPECIFICATIONS ($V_{DD} = +15V$, $V_{SS} = -15V$ unless otherwise noted)

MILITARY VERSIONS (S, T)

| PARAMETER ⁴ | MODEL | VERSION | 25°C MAX | -55°C to +125°C | | UNITS | TEST CONDITIONS |
|--------------------------------|----------------------|---------|-------------|-----------------|-----|----------|--|
| | | | | MIN | MAX | | |
| ANALOG SWITCH R_{ON}^1 | All | S, T | 100 | | 175 | Ω | $-10V \leq V_D \leq +10V$ $I_{DS} = 1 \text{ mA}$ |
| I_D (IS)OFF ¹ | All | S, T | 3 | | 200 | nA | $V_D = -10V, V_S = +10V$ and $V_D = +10V, V_S = -10V$ |
| I_D (IS)ON ² | All | S, T | 10 | | 600 | nA | $V_S = V_D = +10V$ and $V_S = V_D = -10V$ |
| I_{OUT}^1 | MP7512DI | S, T | 9 | | 600 | nA | $V_{S1} = V_{OUT} = \pm 10V$ $V_{S2} = \mp 10V$ and $V_{S2} = V_{OUT} = \pm 10V$ $V_{S1} = \mp 10V$ |
| DIGITAL CONTROL V_{INL}^1 | All | S, T | | | 0.8 | V | |
| $V_{INH}^{1,3}$ | MP7510DI | S | | 2.4 | | V | |
| | MP7511DI | T | | 2.4 | | V | |
| | MP7512DI | | | | | | |
| | MP7511DI MP7512DI | S | | 3.0 | | V | |
| I_{INH}^1 | All | S, T | 10 | | | nA | $V_{IN} = V_{DD}$ |
| I_{INL}^1 | All | S, T | 10 | | | nA | $V_{IN} = 0$ |
| DYNAMIC CHARACTERISTICS | | | | | | | |
| t_{ON}^2 | MP7510DI MP7511DI | S, T | 1.0 | | | μs | $V_{IN} = 0 \text{ to } +3V$ |
| t_{OFF}^2 | MP7510DI MP7511DI | S, T | 1.0 | | | μs | |
| $t_{TRANSITION}^2$ | MP7512DI | S, T | 1.0 | | | μs | |
| POWER SUPPLY | | | | | | | |
| I_{DD}^1 | All | S, T | | | 800 | μA | All digital inputs = V_{INH} |
| I_{SS}^1 | All | S, T | | | 800 | μA | |
| I_{DD}^1 | All | S, T | | | 500 | μA | All digital inputs = V_{INL} |
| I_{SS}^1 | All | S, T | | | 500 | μA | |

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ABSOLUTE MAXIMUM RATINGS

V_{DD} to Gnd. +17V
 V_{SS} to Gnd -17V
 Overvoltage at V_D (V_S)
 (1 second surge) $V_{DD}+25V$
 or $V_{SS}-25V$
 (Continuous) $V_{DD}+20V$
 or $V_{SS}-20V$
 Switch Current (I_{DS} , Continuous) 50 mA
 Switch Current (I_{DS} , Surge)
 1 ms Duration, 10% Duty Cycle 150 mA

Digital Input Voltage Range 0V to V_{DD}
 Power Dissipation (Package)
 Up to +75°C 450 mW
 Derates above +75°C by 6 mW/°C
 Storage Temperature -65°C to +150°C
 Operating Temperature
 Plastic (J, K Versions) 0°C to +70°C
 Ceramic (J, K Versions) -25°C to +85°C
 Ceramic (S, T Versions) -55°C to +125°C

Notes

- 1 100% tested.
- 2 Guaranteed, not production tested.
- 3 A pullup resistor, typically 1-2 k Ω is required to make the MP7511DISD and MP7512DISD TTL compatible.
- 4 Specifications subject to change without notice.