General Description

The AOZ1334DI-01 is a single channel load switch with very low on-resistance in a small package. It contains an n-channel MOSFET for up to V_{BIAS}-1.5V input voltage operation and 10A current channel with 3.2V to 5.5V bias supply. The load switch is controlled by a low voltage control signal through ON pin.

The AOZ1334DI-01 integrates an internal 220Ω load resistor for quick output discharge when load switch is off.

The AOZ1334DI-01 is available in a 3mm x 3mm DFN-8L package with bottom thermal pad and is rated over a -40°C to +85°C ambient temperature range.

Features

- 0.8V to V_{BIAS}-1.5V input voltage range
- 10A continuous current
- Low R_{DS(ON)} internal NFETs
  - 5mΩ at V_{BIAS} = 5V, V_{IN} = 1.05V, T_A = 85°C
- 35µA low quiescent current
- 10µs turn on rise time
- 3.2V to 5.5V bias voltage
- Integrated quick output discharge resistor
- Thermally enhanced 3mm x 3mm DFN-8L package

Applications

- Portable computers
- Ultrabooks
- Tablet PCs
- Set top boxes
- LCD TVs
- Telecom/Networking/Datacom equipment
- SSD
- Consumer electronics

Typical Application

![Typical Application Diagram]

- VIN
- CIN
- VBIAS
- CBIAS
- IN
- OUT
- CL
- VOUT
- ON
- OFF
- GND

AOZ1334DI-01
Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOZ1334DI-01</td>
<td>-40°C to +85°C</td>
<td>3mm x 3mm DFN-8L</td>
<td>Green</td>
</tr>
</tbody>
</table>

All AOS products are offered in packages with Pb-free plating and compliant to RoHS standards. Please visit www.aosmd.com/media/AOSGreenPolicy.pdf for additional information.

Pin Configuration

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Pin Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, EPAD</td>
<td>IN</td>
<td>Load Switch Input. Bypass capacitor is recommended to minimize input voltage dip. Recommended voltage range of this pin is 0.8V to VBIAS-1.5V to obtain optimal RON.</td>
</tr>
<tr>
<td>3</td>
<td>VBIAS</td>
<td>Bias Voltage. Power supply input for the device. Recommended voltage range is 3.2V to 5.5V.</td>
</tr>
<tr>
<td>4</td>
<td>ON</td>
<td>Enable Input. Load switch is on when ON is pulled high. Load switch is off when ON is pulled low. Do not leave floating.</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground.</td>
</tr>
<tr>
<td>6, 7, 8</td>
<td>OUT</td>
<td>Load switch output.</td>
</tr>
</tbody>
</table>
**Functional Block Diagram**

```
IN          VBIAS          OUT
IN          ON         Control
Logic
VBIAS
ON         OUT         GND
```

**Absolute Maximum Ratings**

Exceeding the Absolute Maximum ratings may damage the device.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN, ON, VBIAS, OUT to GND</td>
<td>-0.3V to 6V</td>
</tr>
<tr>
<td>Junction Temperature (T_J)</td>
<td>+150°C</td>
</tr>
<tr>
<td>Storage Temperature (T_S)</td>
<td>-65°C to +150°C</td>
</tr>
<tr>
<td>ESD Rating HBM/CDM</td>
<td>2kV/1kV</td>
</tr>
</tbody>
</table>

**Recommend Operating Ratings**

The device is not guaranteed to operate beyond the Maximum Operating Ratings.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage (V_IN)</td>
<td>V_BIAS-1.5V</td>
</tr>
<tr>
<td>Ambient Temperature (T_A)</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Package Thermal Resistance</td>
<td></td>
</tr>
<tr>
<td>3x3 DFN-8 (Θ_JC)</td>
<td>8°C/W</td>
</tr>
<tr>
<td>3x3 DFN-8 (Θ_JA)</td>
<td>60°C/W</td>
</tr>
</tbody>
</table>

**Electrical Characteristics**

\( T_A = 25°C, V_{B)=='BIAS} = 5V, V_{IN} = 1.05V, \) unless otherwise specified. Specifications in **BOLD** indicate a temperature range of -40°C to +85°C.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIN</td>
<td>IN Supply Voltage</td>
<td>( V_{ON} = 5V )</td>
<td>0.8</td>
<td>1.05</td>
<td>V_BIAS-1.5V</td>
<td>V</td>
</tr>
<tr>
<td>VBIAS</td>
<td>VBIAS Supply Voltage</td>
<td></td>
<td>3.2</td>
<td>5</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>I_D</td>
<td>Maximum Continuous Current</td>
<td>( V_{ON} = 5V )</td>
<td>3.2</td>
<td>5</td>
<td>5.5</td>
<td>A</td>
</tr>
<tr>
<td>I_PLS</td>
<td>Maximum Pulsed Switch Current</td>
<td>( V_{IN} = V_{ON} = 5V ) Pulse &lt; 300µs, 2% Duty Cycle</td>
<td>12</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>I_q</td>
<td>Quiescent Supply Current of V_BIAS</td>
<td>( I_{OUT} = 0V, V_{ON} = 5V )</td>
<td>35</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>I_OFF</td>
<td>VBIAS Shutdown Supply Current</td>
<td>( V_{ON} = 0V, V_{OUT} = 0V )</td>
<td>2</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>I_INOFF</td>
<td>IN Shutdown Supply Current</td>
<td>( V_{ON} = 0V, V_{OUT} = 0V )</td>
<td>2</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>I_ON</td>
<td>ON Leakage Current</td>
<td>( V_{ON} = 5V )</td>
<td>1</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>V_ONH</td>
<td>ON High Level Voltage</td>
<td></td>
<td>1.2</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>V_ONL</td>
<td>ON Low Level Voltage</td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

**Switching ON Resistance**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_ON</td>
<td>Switch ON-State Resistance</td>
<td>( I_{OUT} = -200mA, V_{ON} = 5V, V_{B))==BIAS = 5V )</td>
<td>3.9</td>
<td>6.3</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_{OUT} = -200mA, V_{ON} = 5V, V_{B)=='BIAS = 3.3V )</td>
<td>4.6</td>
<td>7.6</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td>R_PD</td>
<td>Output Pull-Down Resistance</td>
<td>( I_{OUT} = 15mA, V_{ON} = 0V )</td>
<td>220</td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
</tbody>
</table>
Switching Characteristics

Test conditions: $T_A = 25^\circ C$, $C_{IN} = 1\mu F$, $C_L = 0.1\mu F$, $R_L = 10\Omega$ (unless otherwise specified).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$V_{IN} = 1.5V$, $V_{BIAS} = V_{ON} = 5V$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{ON}$</td>
<td>Turn-ON Time</td>
<td>8.5</td>
<td></td>
<td></td>
<td>(\mu s)</td>
</tr>
<tr>
<td>$t_{D-ON}$</td>
<td>Turn-ON Delay time</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{R}$</td>
<td>Turn-ON Rise Time</td>
<td>9.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{OFF}$</td>
<td>Turn-OFF Time</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{F}$</td>
<td>Turn-OFF Fall Time</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{IN} = 1.05V$, $V_{BIAS} = V_{ON} = 5V$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{ON}$</td>
<td>Turn-ON Time</td>
<td>8</td>
<td></td>
<td></td>
<td>(\mu s)</td>
</tr>
<tr>
<td>$t_{D-ON}$</td>
<td>Turn-ON Delay time</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{R}$</td>
<td>Turn-ON Rise Time</td>
<td>8.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{OFF}$</td>
<td>Turn-OFF Time</td>
<td>3.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{F}$</td>
<td>Turn-OFF Fall Time</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Typical Characteristics

- **Quiescent Current vs. VBIAS**
  - (VIN=VBIAS=VON=5V)

- **RDSON vs. VINC**
  - (VBIAS=5.5V, IOUT=-200mA)

- **VOUT vs. VON**
  - (TA=25°C, VIN=2V)
Typical Characteristics (Continued)

- **tON vs. VIN**
  - (VBIAS=3.2V)
  - (VBIAS=5.5V)

- **tD-ON vs. VIN**
  - (VBIAS=5.5V)

- **tR vs. VIN**
  - (VBIAS=3.2V)
  - (VBIAS=5.5V)
Typical Characteristics (Continued)

- **tOFF vs. VIN** (VBIAS=3.2V)
  - 25ºC
  - 70ºC
  - 85ºC

- **tOFF vs. VIN** (VBIAS=5.5V)
  - 25ºC
  - 70ºC
  - 85ºC

- **tF vs. VIN** (VBIAS=3.2V)
  - 25ºC
  - 70ºC
  - 85ºC

- **tF vs. VIN** (VBIAS=5.5V)
  - 25ºC
  - 70ºC
  - 85ºC
Functional Characteristics

Turn-ON & Turn-ON Rise Times
(V_{INX}=1.05V, V_{BIAS}=5V, C_{IN}=1\mu F, C_{L}=0.1\mu F, R_{L}=10\Omega)

Turn-ON & Turn-ON Rise Times
(V_{INX}=1.05V, V_{BIAS}=3.2V, C_{IN}=1\mu F, C_{L}=0.1\mu F, R_{L}=10\Omega)

Turn-OFF & Turn-OFF Fall Times
(V_{INX}=1.05V, V_{BIAS}=5V, C_{IN}=1\mu F, C_{L}=0.1\mu F, R_{L}=10\Omega)

Turn-OFF & Turn-OFF Fall Times
(V_{INX}=1.05V, V_{BIAS}=3.2V, C_{IN}=1\mu F, C_{L}=0.1\mu F, R_{L}=10\Omega)

Turn-ON & Turn-OFF at I_{OUT}=-10A
(V_{INX}=1.05V, V_{BIAS}=5V, C_{IN}=1\mu F, C_{L}=0.1\mu F, R_{L}=0.1\Omega)

Turn-ON & Turn-OFF at I_{OUT}=-10A
(V_{INX}=1.05V, V_{BIAS}=3.2V, C_{IN}=1\mu F, C_{L}=0.1\mu F, R_{L}=0.1\Omega)
Detailed Description

ON/OFF Control
The AOZ1334DI-01 is enabled when the ON pin is on active high with 1.2V or above voltage. The device is disabled when the ON pin voltage is 0.5V or lower. The EN input is compatible with both TTL and CMOS logic.

VBIAS Voltage Range
For optimal on-resistance of load switch, make sure $V_{IN} \leq 1.5V + V_{BIAS}$ and $V_{BIAS}$ is within the voltage range from 3.2V to 5.5V. On-resistance of load switch will be higher if $V_{IN} + 1.5V > V_{BIAS}$. Resistance curves of a typical sample device at different $V_{BIAS} = V_{IN}$ at $I_{OUT} = -200mA$ are shown as below.

Applications Information

The basic AOZ1334DI-01 application circuit is shown in the first page. Component selection is explained below.

Input Capacitor
A capacitor of 10μF or higher value is recommended to be place close to the IN pins of AOZ1334DI-01. This capacitor can reduce the voltage drop caused by the in-rush current during the turn-on transient of the load switch. A higher value capacitor can be used to further reduce the voltage drop during high-current application.

Output Capacitor
A capacitor of 0.1μF or higher value is recommended to be place between the OUT pins and GND. The switching times are affected by the capacitance. A larger capacitor makes the initial turn-on transient smoother. This capacitor must be large enough to supply a fast transient load in order to prevent the output from dropping.

Thermal Considerations
To ensure proper operation, the maximum junction temperature of the AOZ1334DI-01 should not exceed 150°C. Several factors attribute to the junction temperate rise: load current, MOSFET on-resistance, junction-to-ambient thermal resistance, and ambient temperature. The maximum load current can be determined by:

$$I_{LOAD(MAX)} = \frac{T_{J(MAX)} - T_C}{\Theta_{JC} \times R_{DS(OFF)}}$$

It is noted that the maximum continuous load current is 10A.

Layout Guidelines
Good PCB is important for improving the thermal performance of AOZ1334DI-01. Place the input and output bypass capacitors close to the IN and OUT pins. The input and output PCB traces should be as wide as possible for the given PCB space. Use a ground plane to enhance the power dissipation capability of the device.
Package Dimensions, DFN3x3_8L, EP1_S

Notes:
2. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.
3. Dimension b applies to metallized terminal and is measured between 0.15mm and 0.30mm from the terminal tip. If the terminal has the optional radius on the other end of the terminal, dimension b should not be measured in that radius area.
4. Coplanarity ddd applies to the terminals and all other bottom surface metallization.
Tape and Reel Dimensions, DFN3x3_8L, EP1_S

Carrier Tape

Reel

Leader / Trailer & Orientation

Unit Per Reel: 5000pcs

<table>
<thead>
<tr>
<th>Package</th>
<th>A0</th>
<th>B0</th>
<th>K0</th>
<th>D0</th>
<th>D1</th>
<th>E</th>
<th>E1</th>
<th>E2</th>
<th>P0</th>
<th>P1</th>
<th>P2</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFN 3x3_EP</td>
<td>3.40 ±0.10</td>
<td>3.35 ±0.10</td>
<td>1.10 ±0.10</td>
<td>1.50 +0.10/-0.0</td>
<td>1.50 +0.10/-0.0</td>
<td>12.00 ±0.30</td>
<td>1.75 ±0.10</td>
<td>5.50 ±0.05</td>
<td>8.00 ±0.10</td>
<td>4.00 ±0.10</td>
<td>2.00 ±0.05</td>
<td>0.30 ±0.05</td>
</tr>
</tbody>
</table>

Tape Size | Reel Size | M | N | W | W1 | H | K | S | G | R | V |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>12mm</td>
<td>Φ330</td>
<td>Φ330.00 ±0.50</td>
<td>Φ97.00 ±0.10</td>
<td>13.00 ±0.30</td>
<td>17.40 ±1.00</td>
<td>Φ13.00 +0.5/-0.2</td>
<td>10.60 ±0.50</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
Package Marking

AOZ1334DI-01
(DFN3x3-8)

Part Number Code
Extension Code
Option Code
Assembly Lot Code
Year & Week Code
Assembly Location Code

1334
XOAW
LT

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