

High bandwidth analog switch with 16-to-8 bit MUX/DEMUX

Features

- Low R_{ON} : 5.5 Ω typical
- V_{CC} operating range: 3.0 to 3.6 V
- Low current consumption: 20 μ A
- ESD HBM model: > 2 kV
- Channel on capacitance: 7.5 pF typical
- Switching time speed: 9 ns
- Near to zero propagation delay: 250 ps
- Very low cross talk: -40 db at 250 MHz
- Bit-to-bit skew: 200 ps
- > 450 MHz -3 db typical bandwidth
- Package: QFN56
- Lead-free

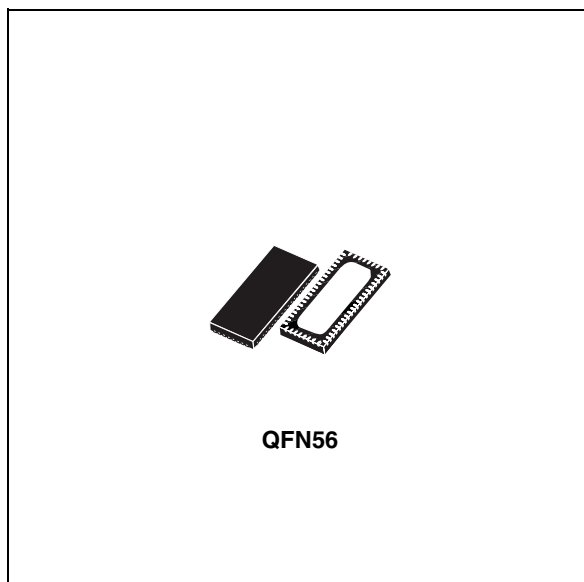


Table 1. Device summary

| Order code | Package | Packing |
|-------------|---------|---------------|
| ST3DV520QTR | QFN56 | Tape and reel |

1 Description

The ST3DV520 is a 16- to 8-bit bidirectional multiplexer/demultiplexer low R_{ON} and high bandwidth switch suitable for analog video applications.

The ST3DV520 supports high definition (HD) analog video switching standards and is also suitable for general purpose switching that requires high signal integrity.

The device is designed for very low crosstalk, low bit-to-bit skew and low I/O capacitance. The signal from each input is multiplexed into one of two selected outputs while the unselected switch goes to HI-Z status.

2 Pin description

Figure 1. Pin connection (top through view)

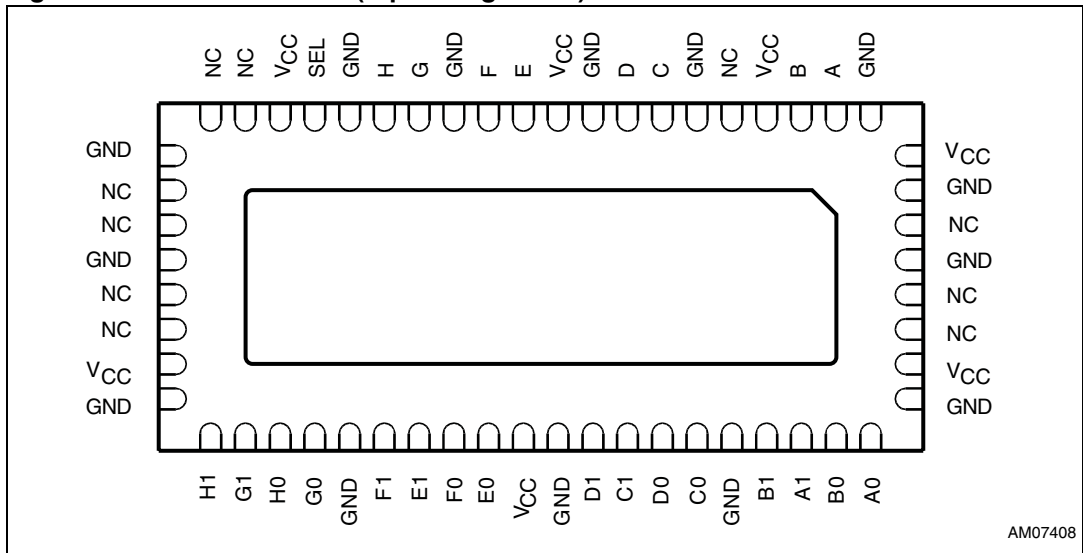


Table 2. Pin description

| Pin number | Symbol | Name and function |
|---|--------------------------------|----------------------------|
| 2, 3, 7, 8, 11, 12, 14, 15 | A, B, C, D, E, F, G, H | 8-bit bus |
| 31, 32, 36, 37, 42, 43, 47, 48 | A0, B0, C0, D0, E0, F0, G0, H0 | 8-bit multiplexed to bus 0 |
| 29, 30, 35, 40, 41, 45, 46 | A1, B1, C1, D1, E1, F1, G1, H1 | 8-bit multiplexed to bus 1 |
| 17 | SEL | Bus switch selection |
| 5, 19, 20, 22, 23, 25, 26, 51, 52, 54 | NC | Not connected |
| 4, 10, 18, 27, 38, 50, 56 | V _{CC} | Supply voltage |
| 1, 6, 9, 13, 16, 21, 24, 28, 33, 39, 44, 49, 53, 55 | GND | Ground |

Figure 2. Input equivalent circuit

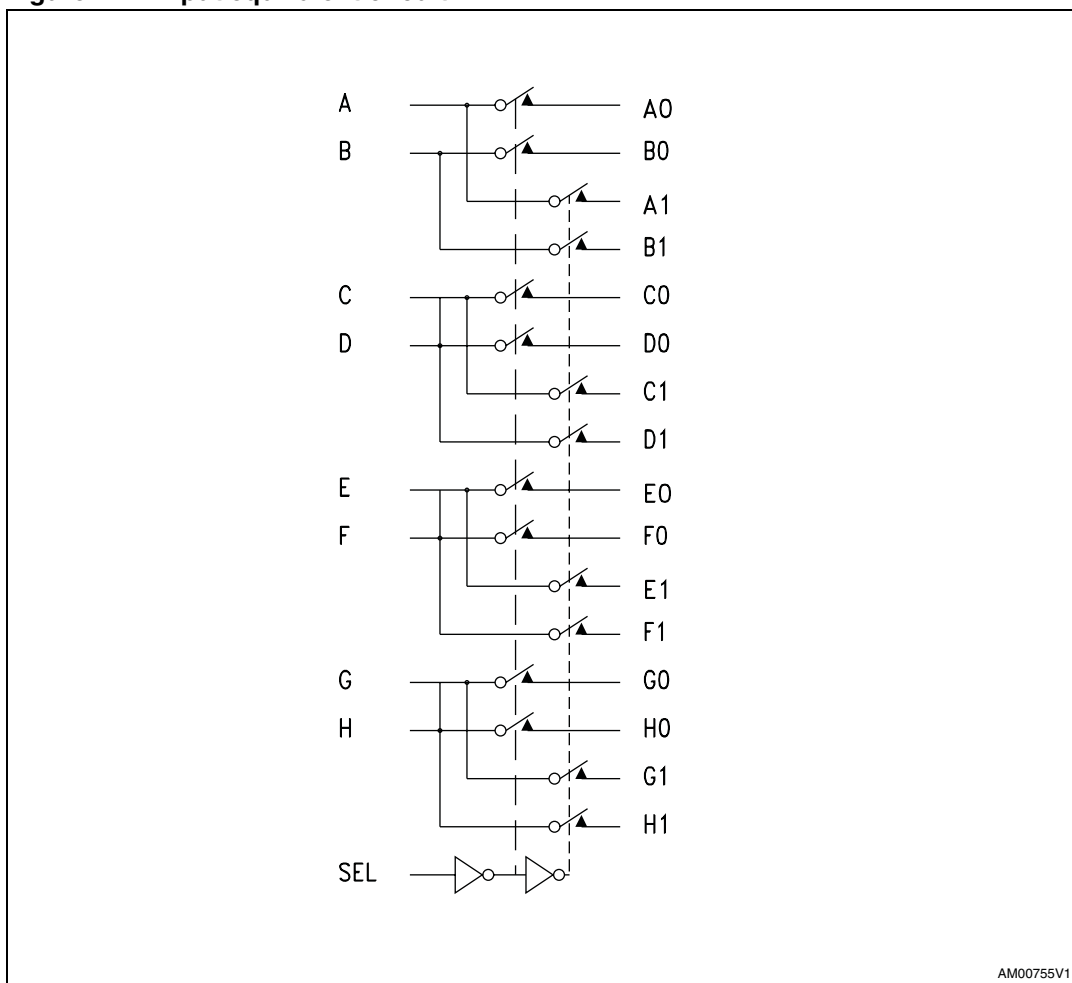


Table 3. Switch function table

| SE | Function |
|----|--------------------------------------|
| L | 8-bit bus to 8-bit multiplexed bus 0 |
| H | 8-bit bus to 8-bit multiplexed bus 1 |

3 Maximum ratings

Stressing the device above the rating listed in the “Absolute Maximum Ratings” table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the Operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics™ SURE program and other relevant quality documents.

3.1 Absolute maximum ratings

Table 4. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|----------------------------------|------------|------|
| V_{CC} | Supply voltage to ground | -0.5 to 4 | V |
| V_I | DC input voltage | -0.5 to 4 | V |
| V_{IC} | DC control input voltage | -0.5 to 4 | V |
| I_O | DC output current ⁽¹⁾ | 120 | mA |
| P_D | Power dissipation | 0.5 | W |
| T_{stg} | Storage temperature | -65 to 150 | °C |
| T_L | Lead temperature (10 sec) | 300 | °C |

1. If $V_{IO} \times I_O$ does not exceed the maximum limit of P_D .

Table 5. DC electrical characteristics ($T_A = -40$ to 85 °C, $V_{CC} = 3.3$ V \pm 10%)

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|-----------------|--|--|------|------|---------|----------|
| V_{IH} | Voltage input high | High level guaranteed | 2 | | | V |
| V_{IL} | Voltage input low | Low level guaranteed | -0.5 | | 0.8 | V |
| V_{IK} | Clamp diode voltage | $V_{CC} = 3.6$ V, $I_{IN} = -18$ mA | | -0.8 | -1.2 | V |
| I_{IH} | Input high current | $V_{CC} = 3.6$ V, $V_{IN} = V_{CC}$ | | | ± 5 | μ A |
| I_{IL} | Input low current | $V_{CC} = 3.6$ V, $V_{IN} = GND$ | | | ± 5 | μ A |
| I_{OFF} | Power down leakage current | $V_{CC} = 0$ V, A to H $V = 0$ V, A0 to H0 and A1 to H1 ≤ 3.6 V | | | ± 5 | μ A |
| R_{ON} | Switch ON resistance ⁽¹⁾ | $V_{CC} = 3.0$ V, $V_{IN} = 1.5$ to V_{CC} $I_{IN} = -40$ mA | | 5.5 | 7.5 | Ω |
| R_{FLAT} | ON resistance flatness ⁽¹⁾⁽²⁾ | $V_{CC} = 3.0$ V, V_{IN} at 1.5 and V_{CC} $I_{IN} = -40$ mA | | 0.8 | | Ω |
| ΔR_{ON} | ON resistance match between channel $\Delta R_{ON} = R_{ONMAX} - R_{ONMIN}$ ⁽¹⁾⁽³⁾ | $V_{CC} = 3.0$ V, $V_{IN} = 1.5$ to V_{CC} $I_{IN} = -40$ mA | | 0.5 | 1 | Ω |

1. Measured by voltage drop between channels at indicated current through the switch. ON resistance is determined by the lower of the voltage.
2. Flatness is defined as the difference between the R_{ONMAX} and R_{ONMIN} of ON resistance over the specified range.
3. ΔR_{ON} measured at same V_{CC} , temperature and voltage level.

Table 6. Capacitance specifications ($T_A = 25$ °C, $f = 1$ MHz)

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|-----------|---|-----------------|-----|-----|-----|------|
| C_{IN} | Input capacitance ⁽¹⁾ | $V_{IN} = 0$ V | | 2 | 3 | pF |
| C_{OFF} | Port x0 to port x1, switch off | $V_{IN} = 0$ V | | 4 | 6 | pF |
| C_{ON} | Capacitance switch on (x to x0 or x to x1) | $V_{IN} = 0$ V | | 7.5 | 11 | pF |

1. x = A to H, x0 = A0 to H0, x1 = A1 to H1.

Table 7. Power supply characteristics ($T_A = -40$ to 85 °C)

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|----------|------------------------|--|-----|-----|-----|---------|
| I_{CC} | Quiescent power supply | $V_{CC} = 3.6$ V $V_{IN} = V_{CC}$ or GND | | 150 | 500 | μ A |

Table 8. Dynamic electrical characteristics ($T_A = -40$ to 85 °C, $V_{CC} = 3.3$ V \pm 10%)

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|------------|-----------------|--------------------------------------|-----|-----|-----|------|
| X_{talk} | Crosstalk | $R_L = 100$ Ω , $f = 250$ MHz | | -40 | | dB |
| O_{IRR} | Off isolation | $R_L = 100$ Ω , $f = 250$ MHz | | -36 | | dB |
| BW | -3 dB bandwidth | $R_L = 100$ Ω | | 450 | | MHz |

Table 9. Switching characteristics ($T_A = -40$ to $85\text{ }^\circ\text{C}$, $V_{CC} = 3.3\text{ V} \pm 10\%$)

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|--------------------|--|---------------------------------------|-----|------|-----|------|
| t_{PD} | Propagation delay | $V_{CC} = 3\text{ V to }3.6\text{ V}$ | | 0.25 | | ns |
| t_{PZH}, t_{PZL} | Line enable time, SE to x to x0 or x to x1 | $V_{CC} = 3\text{ V to }3.6\text{ V}$ | 0.5 | 6.5 | 9 | ns |
| t_{PHZ}, t_{PLZ} | Line disable time, SE to x to x0 or x to x1 | $V_{CC} = 3\text{ V to }3.6\text{ V}$ | 0.5 | 6.5 | 8.5 | ns |
| $t_{SK(O)}$ | Output skew between center port to any other port | $V_{CC} = 3\text{ V to }3.6\text{ V}$ | | 0.1 | 0.2 | ns |
| $t_{SK(P)}$ | Skew between opposite transition of the same output (t_{PHL}, t_{PLH}) | $V_{CC} = 3\text{ V to }3.6\text{ V}$ | | 0.1 | 0.2 | ns |

Figure 3. Bandwidth

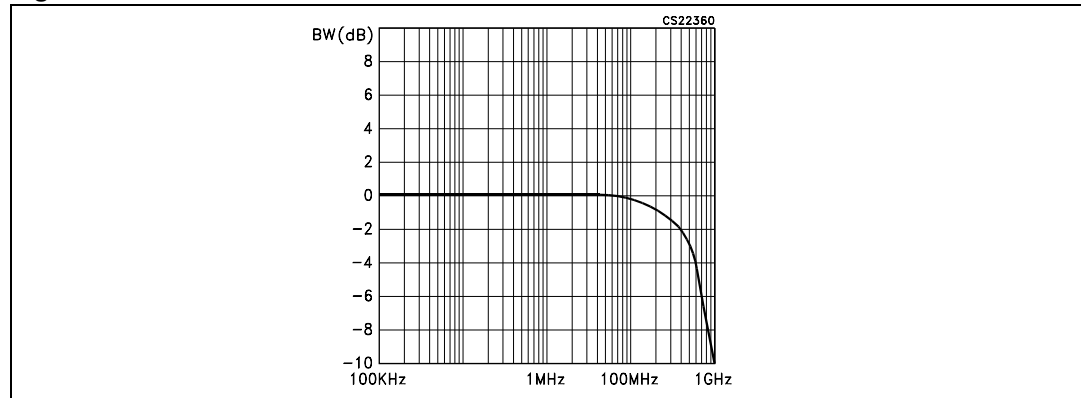
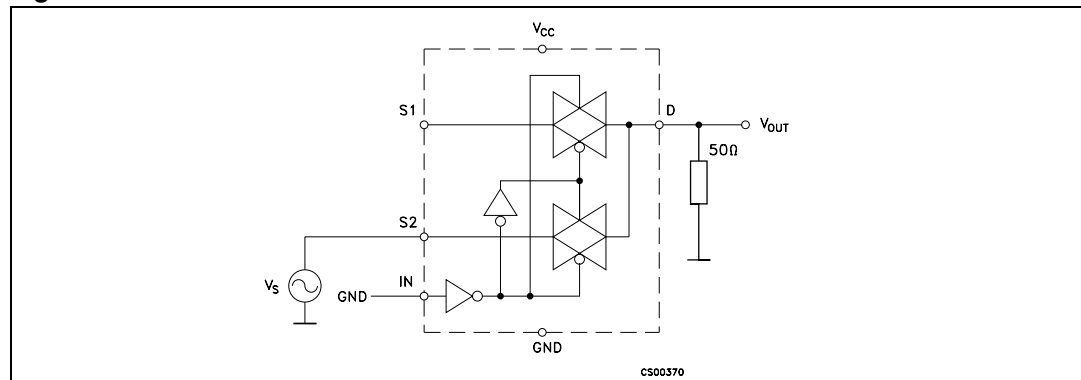


Figure 4. Schematic bandwidth



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Figure 5. QFN56 (11 x 5 mm) package outline

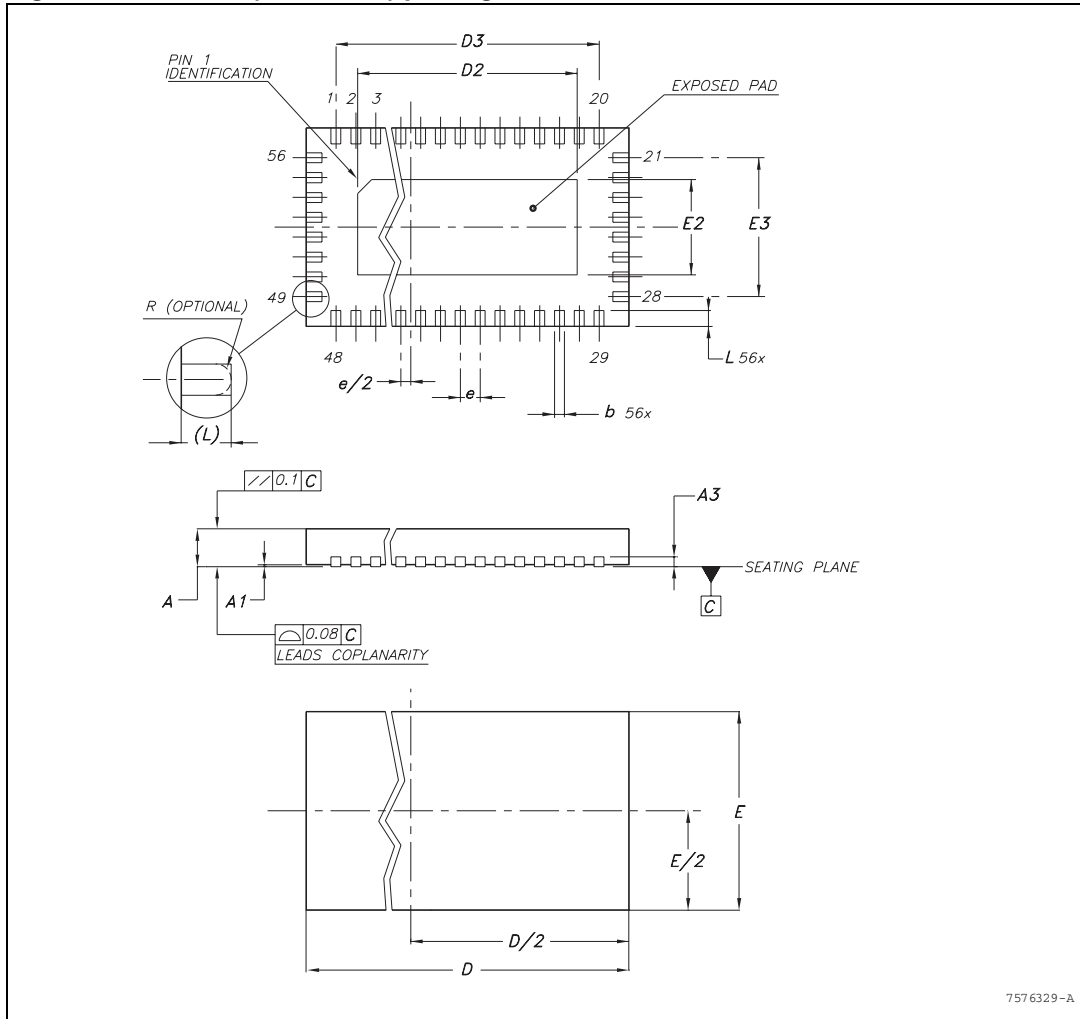
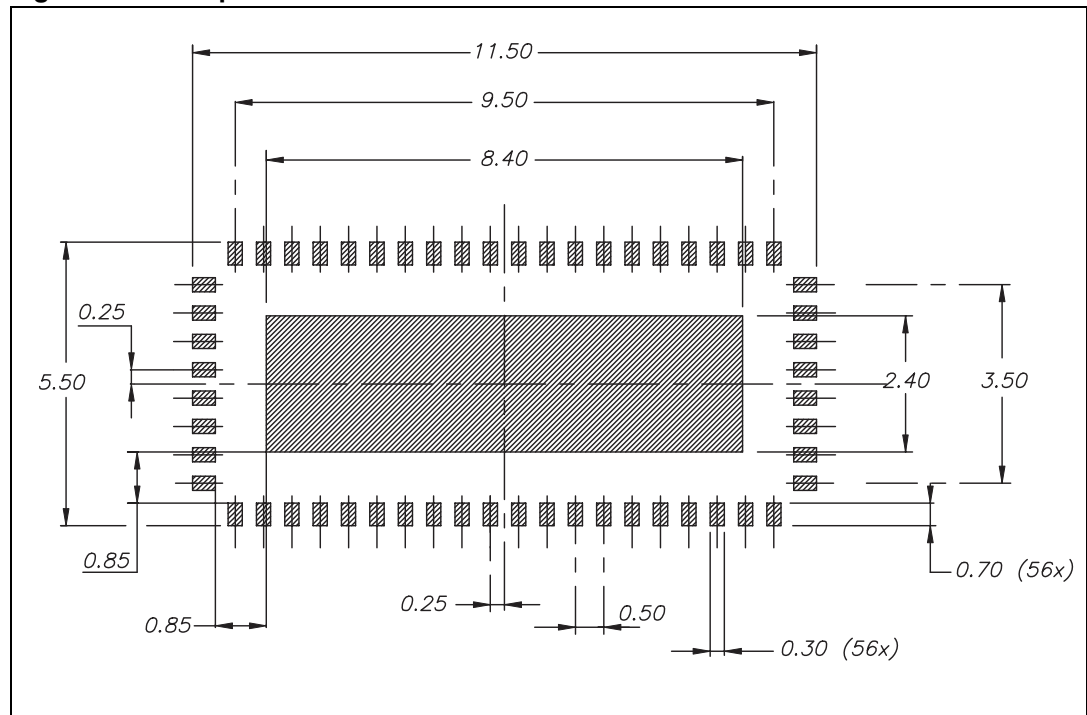


Table 10. QFN56 (11 x 5 mm) mechanical data

| Symbol | millimeters | | | inches | | |
|--------|-------------|-------|-------|--------|-------|-------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.70 | 0.75 | 0.80 | 0.028 | 0.030 | 0.031 |
| A1 | | | 0.05 | | | 0.002 |
| A3 | | 0.20 | | | 0.008 | |
| b | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |
| D | 10.90 | 11.00 | 11.10 | 0.429 | 0.433 | 0.437 |
| D2 | 8.30 | 8.40 | 8.50 | 0.327 | 0.331 | 0.335 |
| D3 | | 9.50 | | | 0.374 | |
| E | 4.90 | 5.00 | 5.10 | 0.193 | 0.197 | 0.201 |
| E2 | 2.30 | 2.40 | 2.50 | 0.091 | 0.094 | 0.098 |
| E3 | | 3.50 | | | 0.138 | |
| e | | 0.50 | | | 0.020 | |
| L | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |

Figure 6. Footprint recommendation



5 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 12-Jun-2007 | 1 | Initial release. |
| 9-Oct-2008 | 2 | Modified: title and pinout configuration. Added: Figure 6: Footprint recommendation on page 8 . |
| 30-Nov-2010 | 3 | Removed status "Preliminary Data", document reformatted, replaced V_{DD} by V_{CC} in Figure 1 , Table 2 , updated text ECOPACK [®] in Section 4 , corrected typo in Features , Description , Table 2 , Table 3 , Table 5 to Table 9 , removed note below Table 9 . |

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