

Low-Power, Dual SIM Card Analog Switch

FSA2567

Description

The FSA2567 is a bi-directional, low-power, dual double-pole, double-throw (4PDT) analog switch targeted at dual SIM card multiplexing. It is optimized for switching the WLAN-SIM data and control signals and dedicates one channel as a supply-source switch.

The FSA2567 is compatible with the requirements of SIM cards and features a low on capacitance (C_{ON}) of 10 pF to ensure high-speed data transfer. The V_{SIM} switch path has a low R_{ON} characteristic to ensure minimal voltage drop in the dual SIM card supply paths.

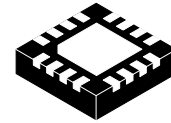
The FSA2567 contains special circuitry that minimizes current consumption when the control voltage applied to the SEL pin is lower than the supply voltage (V_{CC}). This feature is especially valuable in ultra-portable applications, such as cell phones; allowing direct interface with the general-purpose I/Os of the baseband processor. Other applications include switching and connector sharing in portable cell phones, PDAs, digital cameras, printers, and notebook computers.

Features

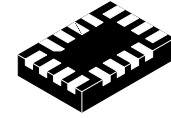
- Low On Capacitance for Data Path: 10 pF Typical
- Low On Resistance for Data Path: 6 Ω Typical
- Low On Resistance for Supply Path: 0.4 Ω Typical
- Wide V_{CC} Operating Range: 1.65 V to 4.3 V
- Low Power Consumption: 1 μ A Maximum
 - ◆ 15 μ A Maximum I_{CCT} Over Expanded Voltage Range ($V_{IN} = 1.8$ V, $V_{CC} = 4.3$ V)
- Wide -3 db Bandwidth: >160 MHz
- Packaged in:
 - ◆ Pb-free 16-Lead MLP & 16-Lead UMLP
- 3 kV ESD Rating, >12 kV Power/GND ESD Rating

Applications

- Cell Phone, PDA, Digital Camera, and Notebook
- LCD Monitor, TV, and Set-Top Box

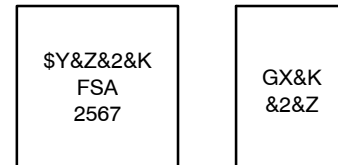


WQFN16 3x3, 0.5P
CASE 510BS



UQFN16 1.8x2.6, 0.4P
CASE 523BF

MARKING DIAGRAM



GX, FSA2567 = Device Code
 \$Y = onsemi Logo
 &Z = Assembly Plant Code
 &2 = 2-Digit Date Code
 &K = 2-Digits Lot Run Traceability Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

FSA2567

ORDERING INFORMATION

| Part Number | Top Mark | Operating Temperature Range | Package | Shipping† |
|-------------|----------|-----------------------------|--|--------------------|
| FSA2567MPX | FSA2567 | -40 to +85°C | 16-Lead, Molded Leadless Package (MLP) Quad, JEDEC MO-220, 3 mm Square | 3000 / Tape & Reel |
| FSA2567UMX | GX | | 16-Lead, Quad, Ultrathin Molded Leadless Package (UMLP), 1.8 x 2.6 mm | 5000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

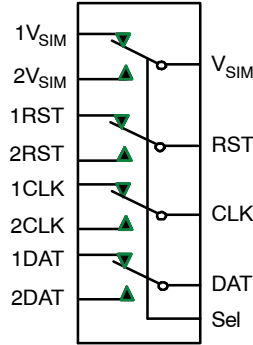


Figure 1. Analog Symbol

PIN ASSIGNMENTS

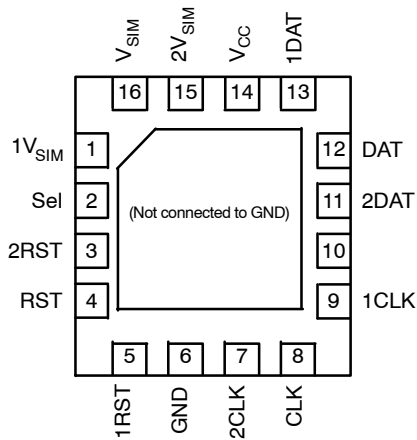


Figure 2. Pad Assignment MLP16 (Top Through View)

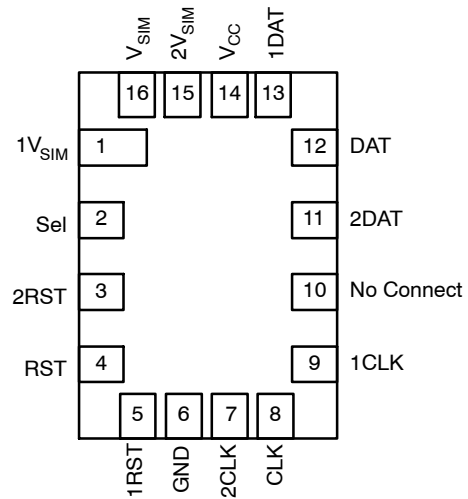


Figure 3. Pad Assignment UMLP16 (Top Through View)

PIN DESCRIPTION

| Pin No. | Description |
|----------------------------------|--------------------------------|
| nDAT, nRST, nCLK | Multiplexed Data Source Inputs |
| nV _{SIM} | Multiplexed SIM Supply Inputs |
| V _{SIM} , DAT, RST, CLK | Common SIM Ports |
| Sel | Switch Select |

FSA2567

TRUTH TABLE

| Sel | Function |
|------------|--|
| Logic LOW | 1DAT = DAT, 1RST = RST, 1CLK = CLK, 1V _{SIM} = V _{SIM} |
| Logic HIGH | 2DAT = DAT, 2RST = RST, 2CLK = CLK, 2V _{SIM} = V _{SIM} |

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Min | Max | Unit | |
|--------------------|--|------------|-----------------------|------|----|
| V _{CC} | Supply Voltage | -0.5 | +5.5 | V | |
| V _{CNTRL} | DC Input Voltage (Sel) (Note 1) | -0.5 | V _{CC} | V | |
| V _{SW} | DC Switch I/O Voltage (Note 1) | -0.5 | V _{CC} + 0.3 | V | |
| I _{IK} | DC Input Diode Current | -50 | - | mA | |
| I _{SIM} | DC Output Current – V _{SIM} | - | 350 | mA | |
| I _{OUT} | DC Output Current – DAT, CLK, RST | - | 35 | mA | |
| T _{STG} | Storage Temperature | -65 | +150 | °C | |
| ESD | Human Body Model, JEDEC: JESD22-A114 | All Pins | - | 3 | kV |
| | | I/O to GND | - | 12 | |
| | Charged Device Model, JEDEC: JESD22-C101 | | - | 2 | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|--------------------|--------------------------------------|------|-----------------|------|
| V _{CC} | Supply Voltage | 1.65 | 4.30 | V |
| V _{CNTRL} | Control Input Voltage (Sel) (Note 2) | 0 | V _{CC} | V |
| V _{SW} | Switch I/O Voltage | -0.5 | V _{CC} | V |
| I _{SIM} | DC Output Current – V _{SIM} | - | 150 | mA |
| I _{OUT} | DC Output Current – DAT, CLK, RST | - | 25 | mA |
| TA | Operating Temperature | -40 | +85 | °C |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

2. The control input must be held HIGH or LOW; it must not float.

FSA2567

DC ELECTRICAL CHARACTERISTICS (All typical values are at 25°C, 3.3 V V_{CC} unless otherwise specified.)

| Symbol | Parameter | Conditions | V_{CC} (V) | $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ | | | Unit |
|----------------------------------|--|--|--------------|--|-----|------|---------------|
| | | | | Min | Typ | Max | |
| V_{IK} | Clamp Diode Voltage | $I_{IN} = -18 \text{ mA}$ | 2.7 | - | - | -1.2 | V |
| V_{IH} | Input Voltage High | | 1.65 to 2.3 | 1.1 | - | - | V |
| | | | 2.7 to 3.6 | 1.3 | - | - | |
| | | | 4.3 | 1.7 | - | - | |
| V_{IL} | Input Voltage Low | | 1.65 to 2.3 | - | - | 0.4 | V |
| | | | 2.7 to 3.6 | - | - | 0.5 | |
| | | | 4.3 | - | - | 0.7 | |
| I_{IN} | Control Input Leakage | $V_{SW} = 0 \text{ to } V_{CC}$ | 4.3 | -1 | - | 1 | μA |
| $I_{nc(off)}$, $I_{no(off)}$ | Off State Leakage | nRST, nDAT, nCLK, $nV_{SIM} = 0.3 \text{ V}$ or 3.6 V Figure 10 | 4.3 | -60 | - | 60 | nA |
| R_{OND} | Data Path Switch On Resistance (Note 3) | $V_{SW} = 0, 1.8 \text{ V}, I_{ON} = -20 \text{ mA}$ Figure 9 | 1.8 | - | 7.0 | 12.0 | Ω |
| | | $V_{SW} = 0, 2.3 \text{ V}, I_{ON} = -20 \text{ mA}$ Figure 9 | 2.7 | - | 6.0 | 10.0 | |
| R_{ONV} | V_{SIM} Switch On Resistance (Note 3) | $V_{SW} = 0, 1.8 \text{ V}, I_{ON} = -100 \text{ mA}$ Figure 9 | 1.8 | - | 0.5 | 0.7 | Ω |
| | | $V_{SW} = 0, 2.3 \text{ V}, I_{ON} = -100 \text{ mA}$ Figure 9 | 2.7 | - | 0.4 | 0.6 | |
| ΔR_{OND} | Data Path Delta On Resistance (Note 4) | $V_{SW} = 0 \text{ V}, I_{ON} = -20 \text{ mA}$ | 2.7 | - | 0.2 | - | Ω |
| I_{CC} | Quiescent Supply Current | $V_{CNTRL} = 0 \text{ or } V_{CC}, I_{OUT} = 0$ | 4.3 | - | - | 1.0 | μA |
| I_{CCT} | Increase in I_{CC} Current Per Control Voltage and V_{CC} | $V_{CNTRL} = 2.6 \text{ V}, V_{CC} = 4.3 \text{ V}$ | 4.3 | - | 5.0 | 10.0 | μA |
| | | $V_{CNTRL} = 1.8 \text{ V}, V_{CC} = 4.3 \text{ V}$ | 4.3 | - | 7.0 | 15.0 | μA |

3. Measured by the voltage drop between nDAT, nRST, nCLK and relative common port pins at the indicated current through the switch. On resistance is determined by the lower of the voltage on the relative ports.
4. Guaranteed by characterization.

FSA2567

AC ELECTRICAL CHARACTERISTICS (All typical values are for $V_{CC} = 3.3\text{ V}$ at 25°C unless otherwise specified.)

| Symbol | Parameter | Conditions | V_{CC} (V) | $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ | | | Unit |
|------------|--|--|--------------|--|------|-----|------|
| | | | | Min | Typ | Max | |
| t_{OND} | Turn-On Time Sel to Output (DAT, CLK, RST) | $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$ $V_{SW} = 1.5\ \text{V}$ Figure 11, Figure 12 | 1.8 (Note 5) | - | 65 | 95 | ns |
| | | | 2.7 to 3.6 | - | 42 | 60 | ns |
| t_{OFFD} | Turn-Off Time Sel to Output (DAT, CLK, RST) | $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$ $V_{SW} = 1.5\ \text{V}$ Figure 11, Figure 12 | 1.8 (Note 5) | - | 30 | 50 | ns |
| | | | 2.7 to 3.6 | - | 20 | 40 | ns |
| t_{ONV} | Turn-On Time Sel to Output (V_{SIM}) | $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$ $V_{SW} = 1.5\ \text{V}$ Figure 11, Figure 12 | 1.8 (Note 5) | - | 55 | 80 | ns |
| | | | 2.7 to 3.6 | - | 35 | 55 | ns |
| t_{OFFV} | Turn-Off Time Sel to Output (V_{SIM}) | $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$ $V_{SW} = 1.5\ \text{V}$ Figure 11, Figure 12 | 1.8 (Note 5) | - | 35 | 50 | |
| | | | 2.7 to 3.6 | - | 22 | 40 | ns |
| t_{PD} | Propagation Delay (Note 5) (DAT, CLK, RST) | $C_L = 35\ \text{pF}$, $R_L = 50\ \Omega$ Figure 11, Figure 13 | 3.3 | - | 0.25 | - | ns |
| t_{BBMD} | Break-Before-Make (Note 5) (DAT, CLK, RST) | $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$ $V_{SW1} = V_{SW2} = 1.5\ \text{V}$ Figure 15 | 2.7 to 3.6 | 3 | 18 | - | ns |
| t_{BBMV} | Break-Before-Make (Note 5) (V_{SIM}) | $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$ $V_{SW1} = V_{SW2} = 1.5\ \text{V}$ Figure 15 | 2.7 to 3.6 | 3 | 12 | - | ns |
| Q | Charge Injection (DAT, CLK, RST) | $C_L = 50\ \text{pF}$, $R_{GEN} = 0\ \Omega$, $V_{GEN} = 0\ \text{V}$ | 2.7 to 3.6 | - | 10 | - | pC |
| O_{IRR} | Off Isolation (DAT, CLK, RST) | $R_L = 50\ \Omega$, $f = 10\ \text{MHz}$ Figure 17 | 2.7 to 3.6 | - | -60 | - | dB |
| Xtalk | Non-Adjacent Channel Crosstalk (DAT, CLK, RST) | $R_L = 50\ \Omega$, $f = 10\ \text{MHz}$ Figure 18 | 2.7 to 3.6 | - | -60 | - | dB |
| BW | -3 db Bandwidth (DAT, CLK, RST) | $R_L = 50\ \Omega$, $C_L = 5\ \text{pF}$ Figure 16 | 2.7 to 3.6 | - | 475 | - | MHz |

5. Guaranteed by characterization.

CAPACITANCE

| Symbol | Parameter | Conditions | $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ | | | Unit |
|------------|---------------------------------------|--|--|-----|-----|------|
| | | | Min | Typ | Max | |
| C_{IN} | Control Pin Input Capacitance | $V_{CC} = 0\ \text{V}$ | - | 1.5 | - | pF |
| C_{OND} | RST, CLK, DAT On Capacitance (Note 6) | $V_{CC} = 3.3\ \text{V}$, $f = 1\ \text{MHz}$, Figure 20 | - | 10 | 12 | |
| C_{ONV} | V_{SIM} On Capacitance (Note 6) | $V_{CC} = 3.3\ \text{V}$, $f = 1\ \text{MHz}$, Figure 20 | - | 110 | 150 | |
| C_{OFFD} | RST, CLK, DAT Off Capacitance | $V_{CC} = 3.3\ \text{V}$, Figure 19 | - | 3 | - | |
| C_{OFFV} | V_{SIM} Off Capacitance | $V_{CC} = 3.3\ \text{V}$, Figure 19 | - | 40 | - | |

6. Guaranteed by characterization.

TYPICAL PERFORMANCE CHARACTERISTICS

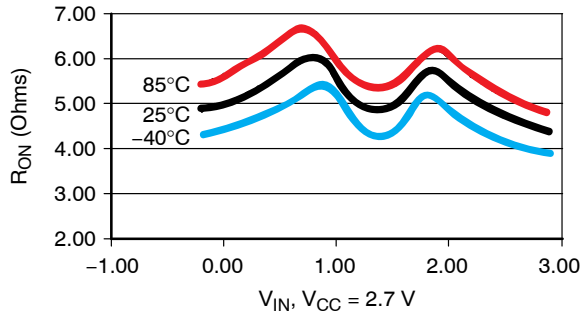


Figure 4. R_{ON} Data Path

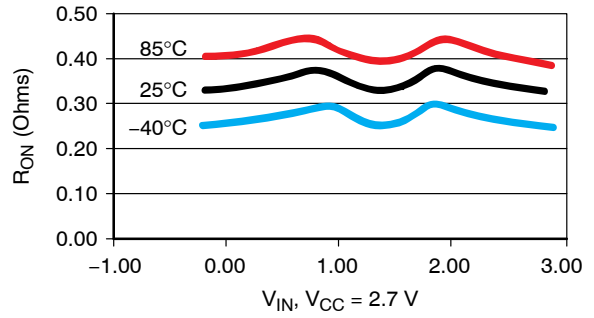


Figure 5. R_{ON} VSIM

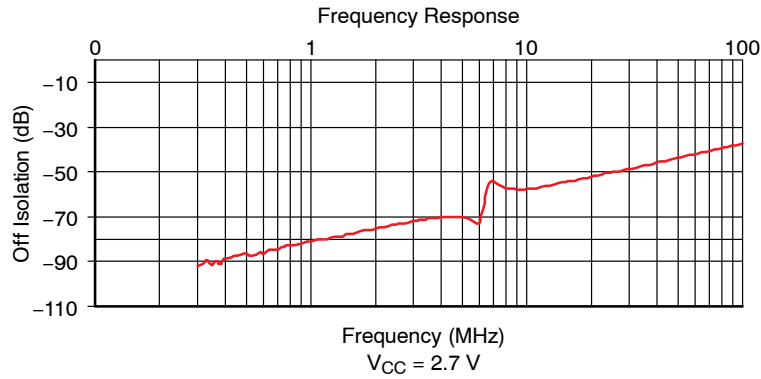


Figure 6. Off Isolation

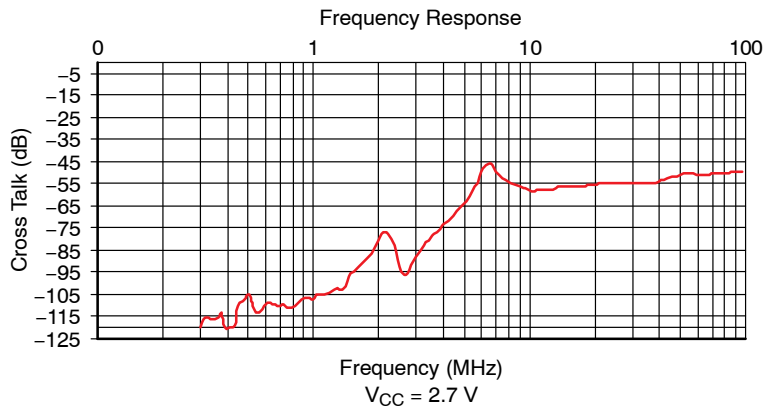


Figure 7. Crosstalk

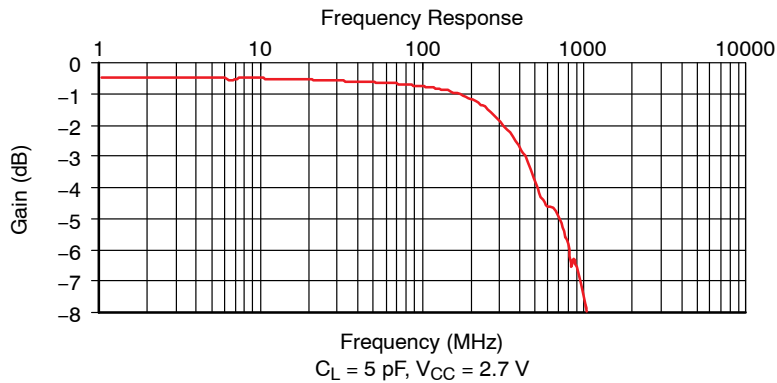


Figure 8. Bandwidth

TEST DIAGRAMS

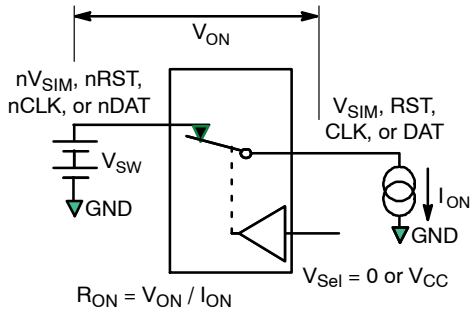


Figure 9. On Resistance

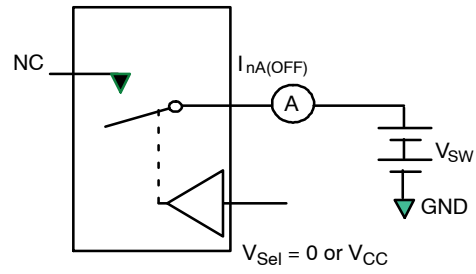
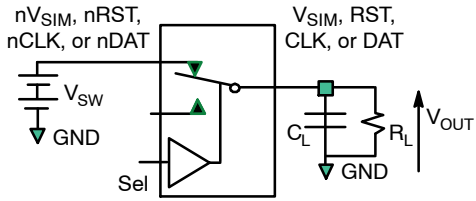


Figure 10. Off Leakage



R_L and C_L are functions of the application environment (see tables for specific values). C_L includes test fixture and stray capacitance.

Figure 11. AC Test Circuit Load

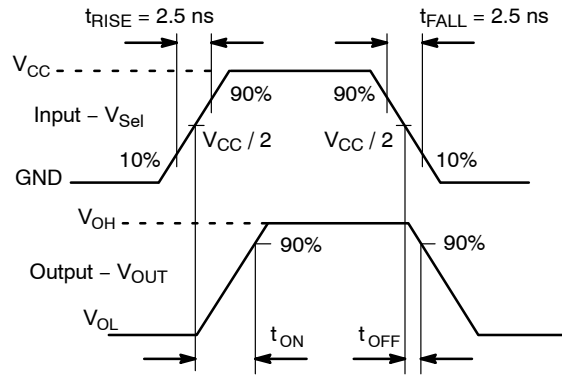


Figure 12. Turn-On / Turn-Off Waveforms

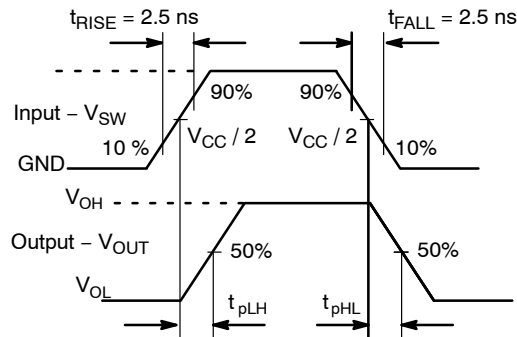


Figure 13. Propagation Delay

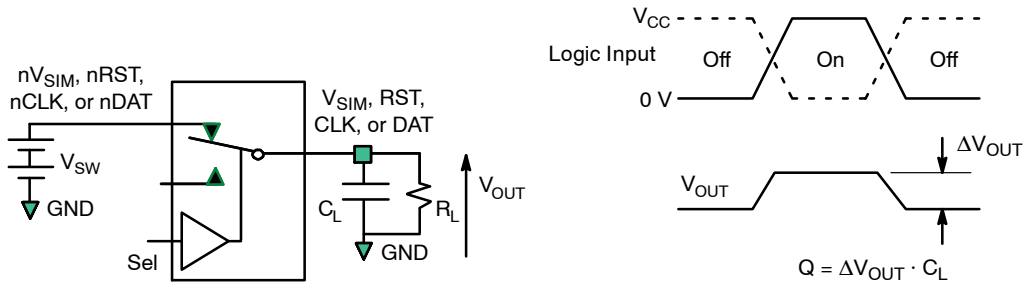


Figure 14. Charge Injection

TEST DIAGRAMS (Continued)

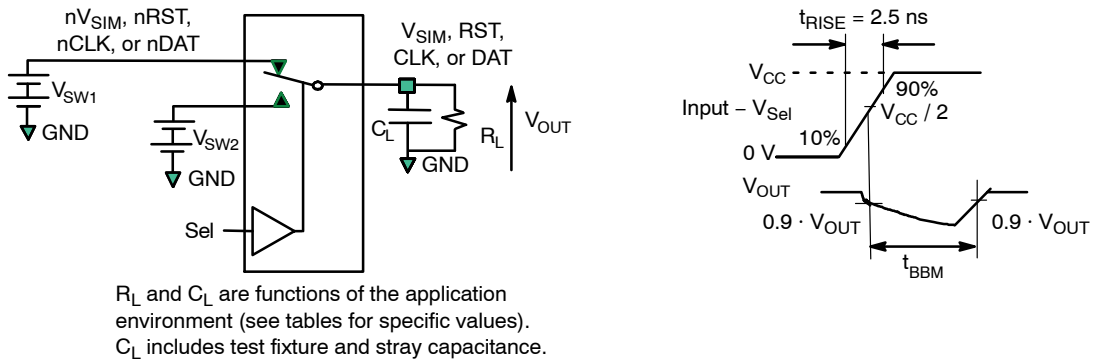


Figure 15. Break-Before-Make Interval Timing

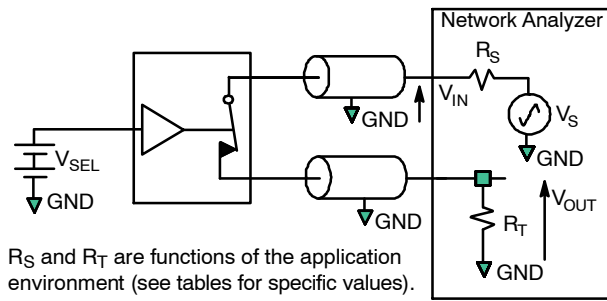
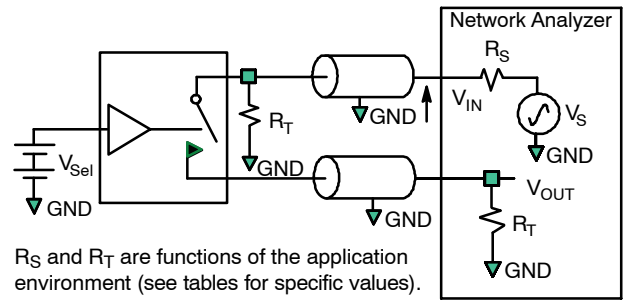
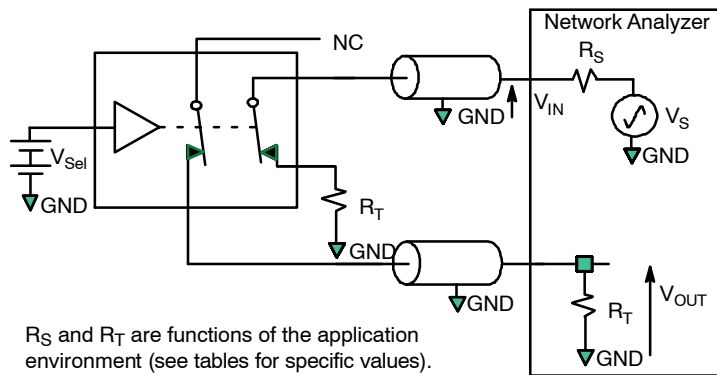


Figure 16. Bandwidth



Off isolation = $20 \text{ Log } (V_{OUT} / V_{IN})$

Figure 17. Channel Off Isolation



Crosstalk = $20 \text{ Log } (V_{OUT} / V_{IN})$

Figure 18. Non-Adjacent Channel-to-Channel Crosstalk

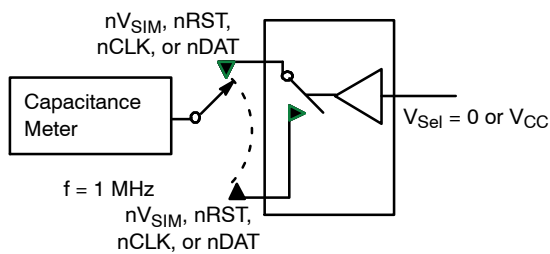


Figure 19. Channel Off Capacitance

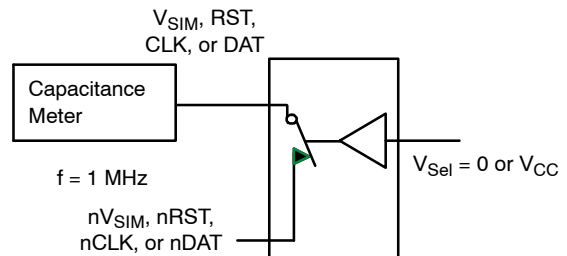


Figure 20. Channel On Capacitance

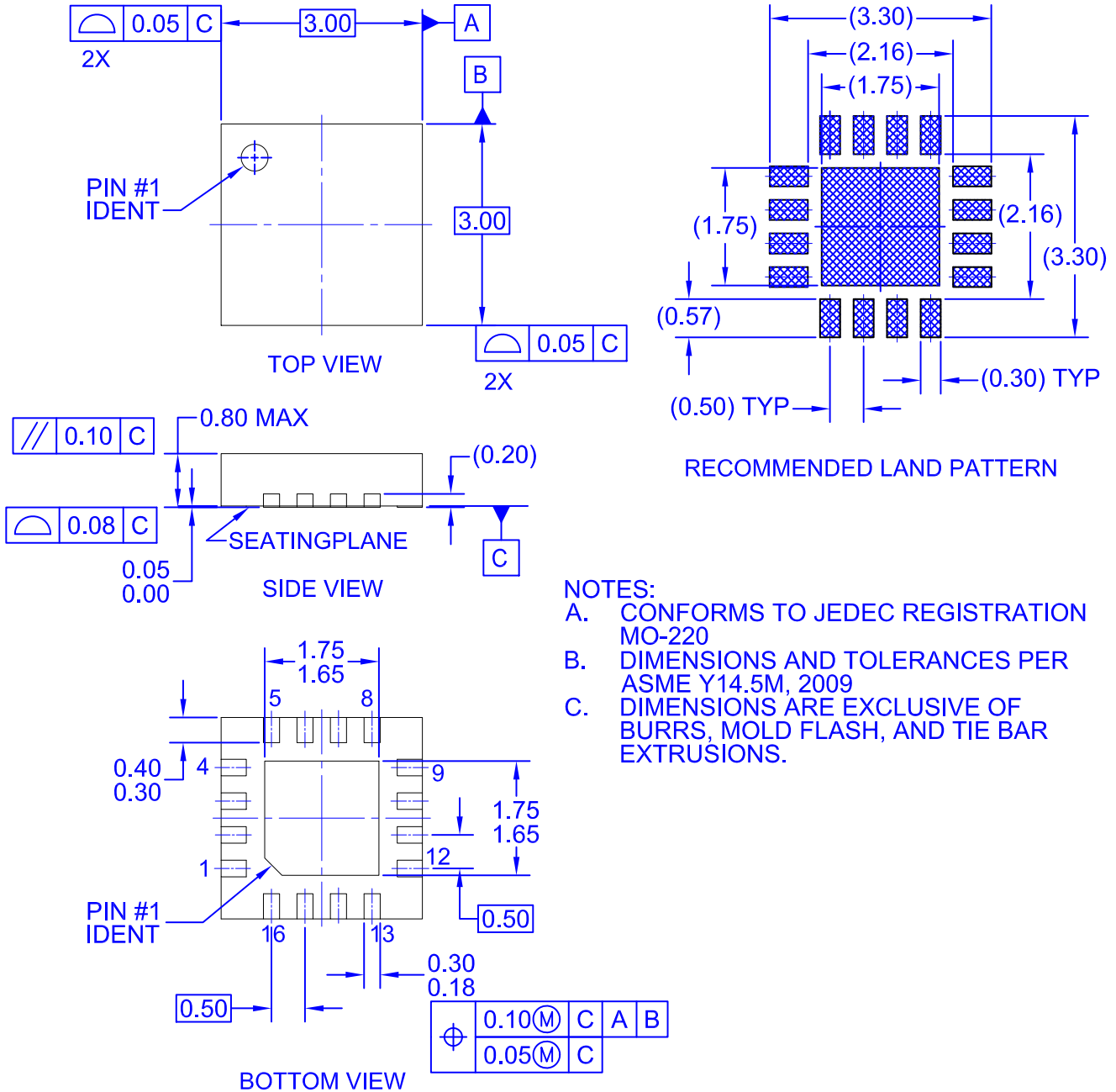
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®



WQFN16 3x3, 0.5P
CASE 510BS
ISSUE O

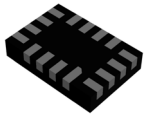
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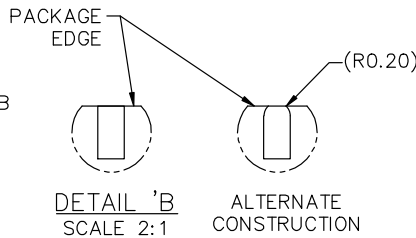
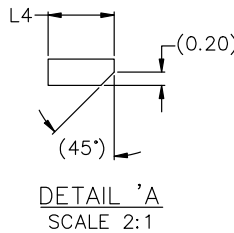
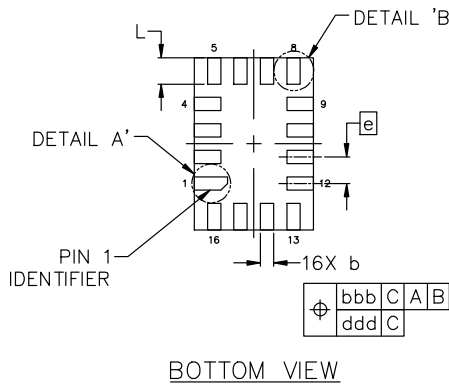
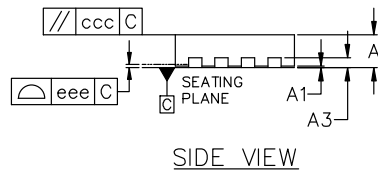
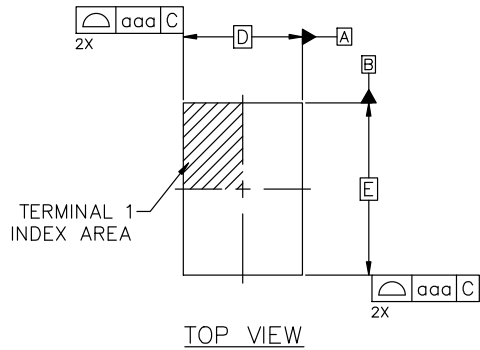
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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



UQFN16 1.80x2.60x0.50, 0.40P
CASE 523BF
ISSUE A

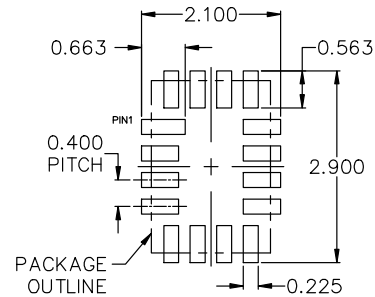
DATE 06 MAY 2024



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS, DEGREES IN ANGLE.
3. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
4. TERMINAL SHAPE MAY VARY ACCORDING TO PACKAGE SUPPLIER, SEE TERMINAL SHAPE VARIANTS.

| DIM | MILLIMETERS | | |
|--------------------------------------|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.45 | 0.50 | 0.55 |
| A1 | 0.00 | --- | 0.05 |
| A3 | 0.10 | 0.15 | 0.20 |
| b | 0.15 | 0.20 | 0.25 |
| D | 1.80 BSC | | |
| E | 2.60 BSC | | |
| e | 0.40 BSC | | |
| L | 0.35 | 0.40 | 0.45 |
| L4 | 0.45 | 0.50 | 0.55 |
| TOLERANCES FOR FEATURE CONTROL FRAME | | | |
| aaa | 0.05 | | |
| bbb | 0.10 | | |
| ccc | 0.10 | | |
| ddd | 0.05 | | |
| eee | 0.05 | | |



*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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