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FSAV430

Low Voltage 1.1GHz, 4-Channel, 2:1 Video Switch

Features

- -40dB Off Isolation at 30MHz
- -60dB Non-Adjacent Channel Crosstalk at 30MHz
- 3dB Bandwidth: 1.1GHz
- On Resistance: 4.5Ω (Typical)
- Low Power Consumption: 1μA (Maximum)
- Control Input TTL Compatible
- Bidirectional Operation

Description

The FSAV430 is a high performance Quad Single-Pole, Double Throw (SPDT) (2-to-1 multiplexer / demultiplexer) video switch designed specifically for switching high definition YPbPr and computer RGB (up to UXGA) signals. The bandwidth of this device is 1.1GHz (typical) which allows signals to pass with minimal edge and phase distortion. Image integrity is maintained with low crosstalk, high off-isolation and low differential gain and phase. The low on resistance (4.5Ω typical) minimizes signal insertion loss. Low voltage operation (3V), low power consumption (1μA maximum) and small scale packaging make this device ideal for a broad range of applications.

Applications

- RGB Video Switch in LCD, Plasma and Projector Displays
- DVD-RW

Ordering Information

| Part Number | Operating Temperature Range | Package | Packing Method |
|-------------|-----------------------------|--|----------------|
| FSAV430MTCX | -40 to +85°C | 16-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide | Tape and Reel |
| FSAV430QSCX | -40 to +85°C | 16-Lead, Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150 inch Wide | Tape and Reel |

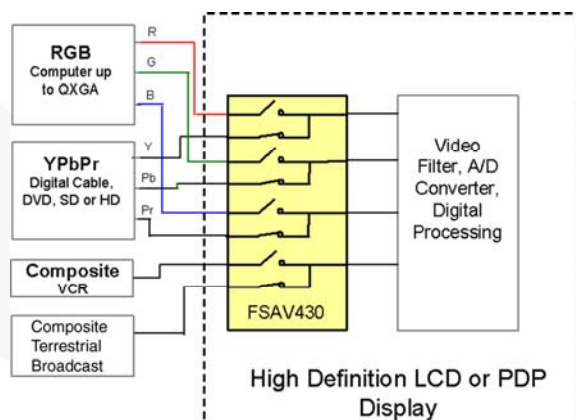


Figure 1. Typical Application Diagram

Pin Configurations

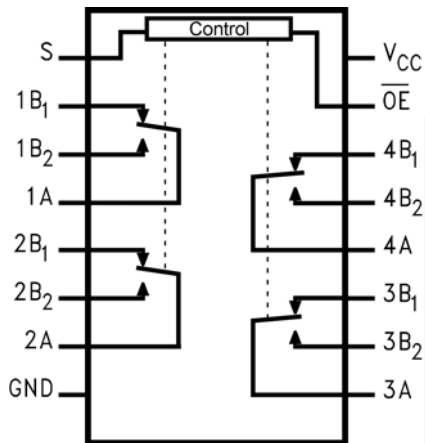


Figure 2. Analog Symbol

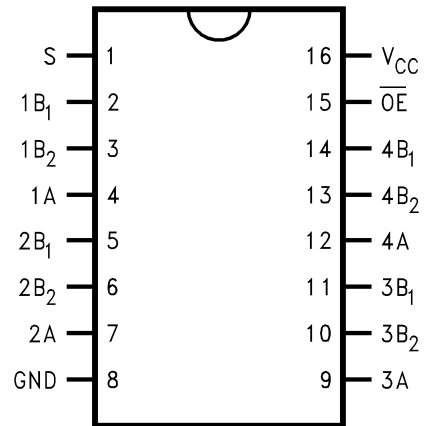


Figure 3. QSOP and TSSOP Pin Assignments

Pin Descriptions

| Pin # | Name | Description |
|----------------------------|--------------------------------|--------------------|
| 15 | /OE | Bus Switch Enabled |
| 1 | S | Select Input |
| 4, 7, 9, 12 | A | Bus A |
| 2, 3, 5, 6, 10, 11, 13, 14 | B ₁ -B ₂ | Bus B |
| 8 | GND | Ground |
| 16 | V _{CC} | Supply Voltage |

Truth Table

| S | /OE | Function |
|------------|------|------------------|
| Don't Care | HIGH | Disconnected |
| LOW | LOW | A=B ₁ |
| HIGH | LOW | A=B ₂ |

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Min. | Max. | Unit |
|------------------|---------------------------------------|------|--------------|------|
| V_{CC} | Supply Voltage | -0.5 | +4.6 | V |
| V_S | DC Switch Voltage | -0.5 | $V_{CC}+0.5$ | V |
| V_{IN} | DC Input Voltage ⁽¹⁾ | -0.5 | +4.6 | V |
| I_{IK} | DC Input Diode Current, $V_{IN} < 0V$ | -50 | | mA |
| I_{OUT} | DC Output Sink Current | | 128 | mA |
| I_{CC}/I_{GND} | DC V_{CC} / GND Current | | ± 100 | mA |
| T_{STG} | Storage Temperature Range | -65 | +150 | °C |
| ESD | Human Body Model, JESD22-A114 | | 4000 | V |

Note:

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

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol | Parameter | Min. | Max. | Unit | |
|------------|---------------------------------|----------------------|----------|------|------|
| V_{CC} | Power Supply | 3.0 | 3.6 | V | |
| V_{IN} | Input Voltage | 0 | V_{CC} | V | |
| V_{OUT} | Output Voltage | 0 | V_{CC} | V | |
| t_r, t_f | Input Rise and Fall Time | Switch Control Input | 0 | 5 | ns/V |
| | | Switch I/O | 0 | DC | |
| T_A | Operating Temperature, Free Air | -40 | +85 | °C | |

Note:

- Unused control inputs must be held HIGH or LOW; they may not float.

DC Electrical Characteristics

Typical values are at $T_A = +25^\circ\text{C}$.

| Symbol | Parameter | Conditions | V_{CC} (V) | $T_A = -40$ to $+85^\circ\text{C}$ | | | Units |
|-----------------|---------------------------------------|--|--------------|------------------------------------|------|-----------|---------------|
| | | | | Min. | Typ. | Max. | |
| V_{ANALOG} | Analog Signal Range | | | 0 | | 2 | V |
| V_{IK} | Clamp Diode Voltage | $I_{IN} = -18\text{mA}$ | 3.0 | | | -1.2 | V |
| V_{IH} | High-Level Input Voltage | | 3.0 to 3.6 | 2.0 | | | V |
| V_{IL} | Low-Level Input Voltage | | 3.0 to 3.6 | | | 0.8 | V |
| I_I | Input Leakage Current | $0 \leq V_{IN} \leq 3.6\text{V}$ | 3.6 | | | ± 1.0 | μA |
| I_{OFF} | Off-State Leakage Current | $0 \leq A, B \leq V_{CC}$ | 3.6 | | | ± 1.0 | μA |
| R_{ON} | Switch On Resistance ⁽³⁾ | $V_{IN} = 1.0\text{V}, R_I = 75\Omega, I_{ON} = 13\text{mA}$ | 3.0 | | 5.0 | 7.0 | Ω |
| | | $V_{IN} = 2.0\text{V}, R_I = 75\Omega, I_{ON} = 26\text{mA}$ | 3.0 | | 4.5 | 6.0 | |
| $R_{FLAT(ON)}$ | On Resistance Flatness ⁽⁴⁾ | $I_{OUT} = 13\text{mA}, V_{IN} = 0$ to V_{CC} | 3.0 | | 1 | | |
| I_{CC} | Quiescent Supply Current | $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$ | 3.6 | | | 1 | μA |
| ΔI_{CC} | Increase in I_{CC} per Input | One Input at 3.0V Other Inputs at V_{CC} or GND | 3.6 | | | 30 | mA |

Notes:

- Measured by the voltage drop between the A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the A or B pins.
- Flatness is defined as the difference between the maximum and minimum value on resistance over the specified range of conditions.

AC Electrical Characteristics

Typical values are at $V_{CC} = 3.3\text{V}$ and $T_A = +25^\circ\text{C}$.

| Symbol | Parameter | Conditions | V_{CC} | $T_A = -40$ to $+85^\circ\text{C}$ | | | Units | Figure |
|------------|-----------------------------------|--------------------------------------|------------|------------------------------------|------|------|-------|-------------------------|
| | | | | Min. | Typ. | Max. | | |
| t_{ON} | Turn On Time S to Bus A | $B_n = 2\text{V}$ | 3.0 to 3.6 | | 4.8 | 7.0 | ns | Figure 11, Figure 12 |
| | Output Enable Time OE to A | | | | 4.5 | 6.8 | | |
| t_{OFF} | Turn Off Time S to Bus A | $B_n = 2\text{V}$ | 3.0 to 3.6 | | 2.2 | 4.0 | ns | Figure 11, Figure 12 |
| | Output Disable Time OE to A | | | | 2.2 | 3.5 | | |
| D_G | Differential Gain | $R_L = 75\Omega, f = 3.58\text{MHz}$ | 3.0 to 3.6 | | 0.2 | | % | Figure 5, Figure 6 |
| D_P | Differential Phase | $R_L = 75\Omega, f = 3.58\text{MHz}$ | 3.0 to 3.6 | | 0.1 | | ° | Figure 5, Figure 6 |
| O_{IRR} | Non-Adjacent Off Isolation | $R_L = 75\Omega, f = 30\text{MHz}$ | 3.0 to 3.6 | | -40 | | dB | Figure 7, Figure 13 |
| X_{TALK} | Non-Adjacent Channel Crosstalk | $R_L = 75\Omega, f = 30\text{MHz}$ | 3.0 to 3.6 | | -60 | | dB | Figure 8, Figure 14 |
| B_W | -3dB Bandwidth | $R_L = 50\Omega$ | 3.0 to 3.6 | | 800 | | | Figure 4, Figure 15 |
| | | $R_L = 75\Omega$ | | | 600 | | | |

Capacitance

Typical values are at $V_{CC} = 3.3\text{V}$ and $T_A = +25^\circ\text{C}$.

| Symbol | Parameter | Conditions | Typ. | Units |
|-----------|-------------------------------|---|------|-------|
| C_{IN} | Control Pin Input Capacitance | $V_{CC} = 0\text{V}$ | 2.5 | pF |
| C_{ON} | A/B On Capacitance | $V_{CC} = 3.3\text{V}, /OE = 0\text{V}$ | 12.0 | pF |
| C_{OFF} | Port B Off Capacitance | $V_{CC} = /OE = 3.3\text{V}$ | 4.0 | pF |

AC Characteristics

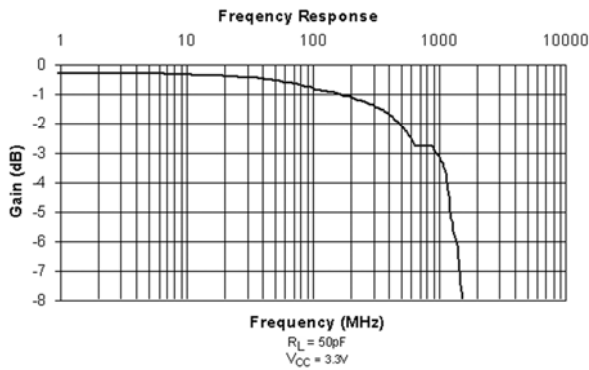


Figure 4. Gain vs. Frequency

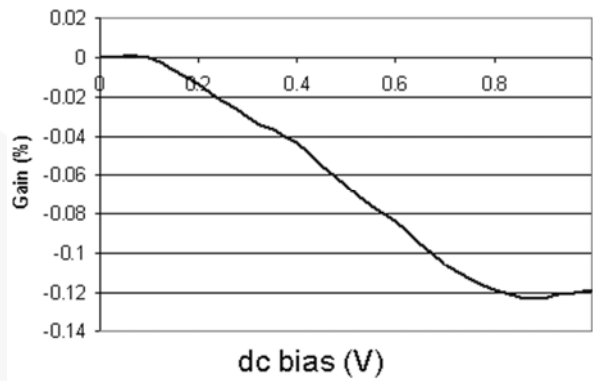


Figure 5. Differential Gain vs. DC Bias

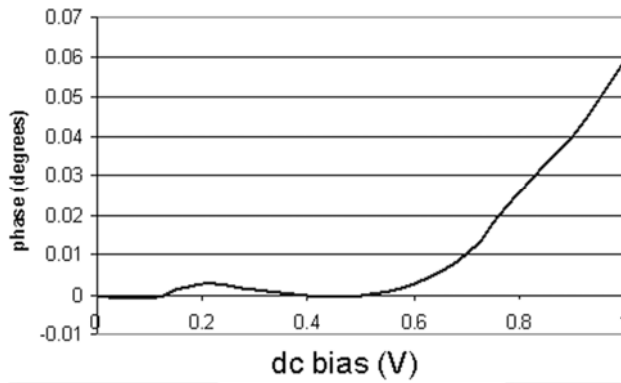


Figure 6. Differential Phase vs. DC Bias

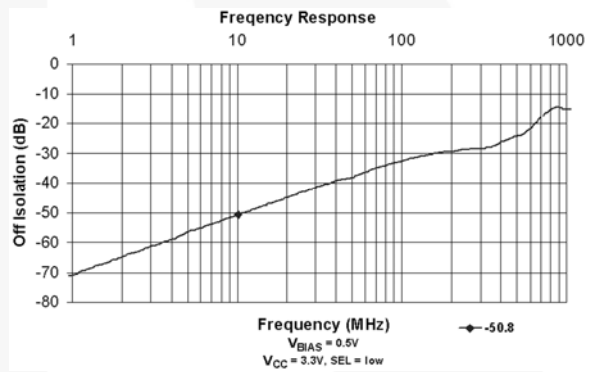


Figure 7. Off Isolation

AC Characteristics

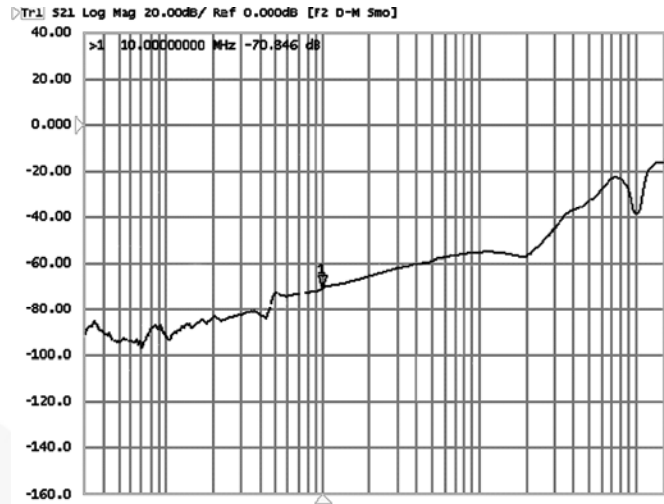


Figure 8. Off Crosstalk vs. Frequency

R_{ON} Switch Characteristics

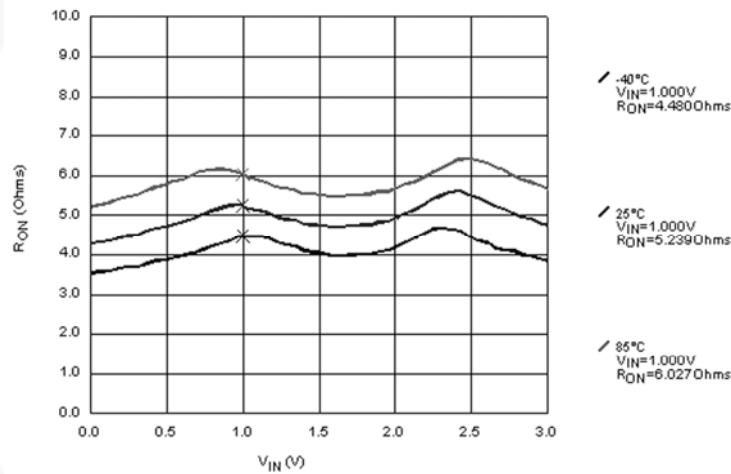


Figure 9. R_{ON} Switch On Resistance, I_{ON}=13mA, V_{CC}=3.0V

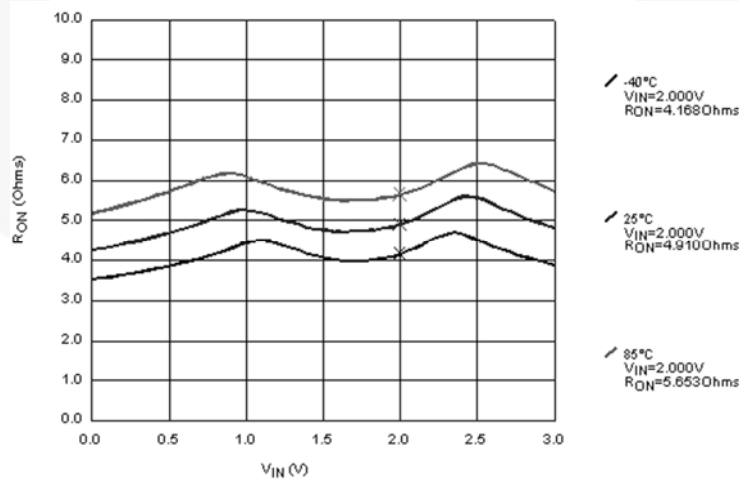
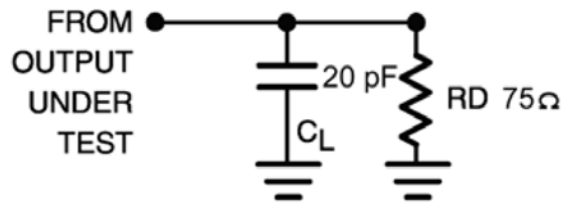


Figure 10. R_{ON} Switch On Resistance, I_{ON}=26mA, V_{CC}=3.0V

AC Loadings and Waveforms



Notes:

- 5. Input drive by 50Ω source terminated in 50Ω.
- 6. C_L includes load and stray capacitance.
- 7. Input PRR=1.0MHz, $t_W=500ns$.

Figure 11. AC Test Circuit

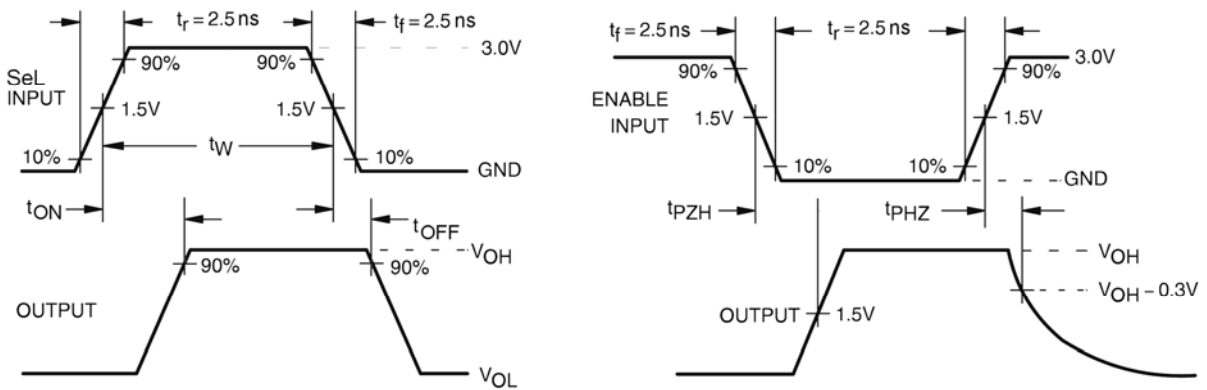


Figure 12. AC Waveforms

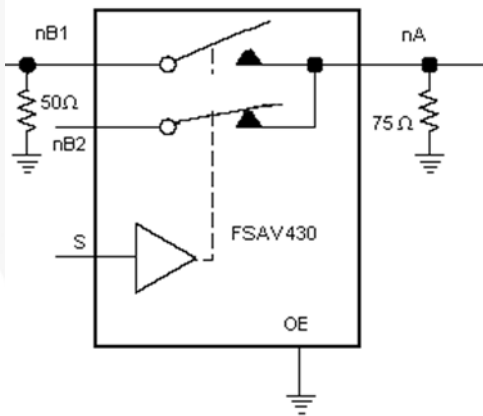


Figure 13. Off Isolation Test

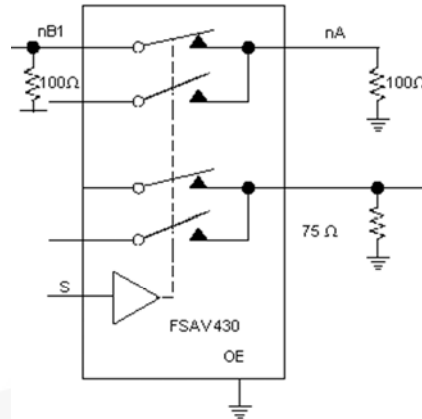


Figure 14. Crosstalk

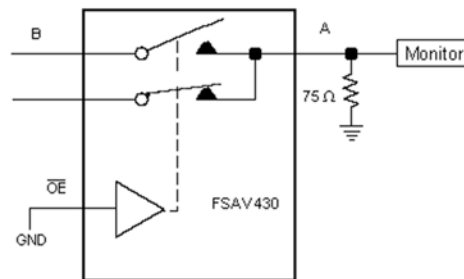
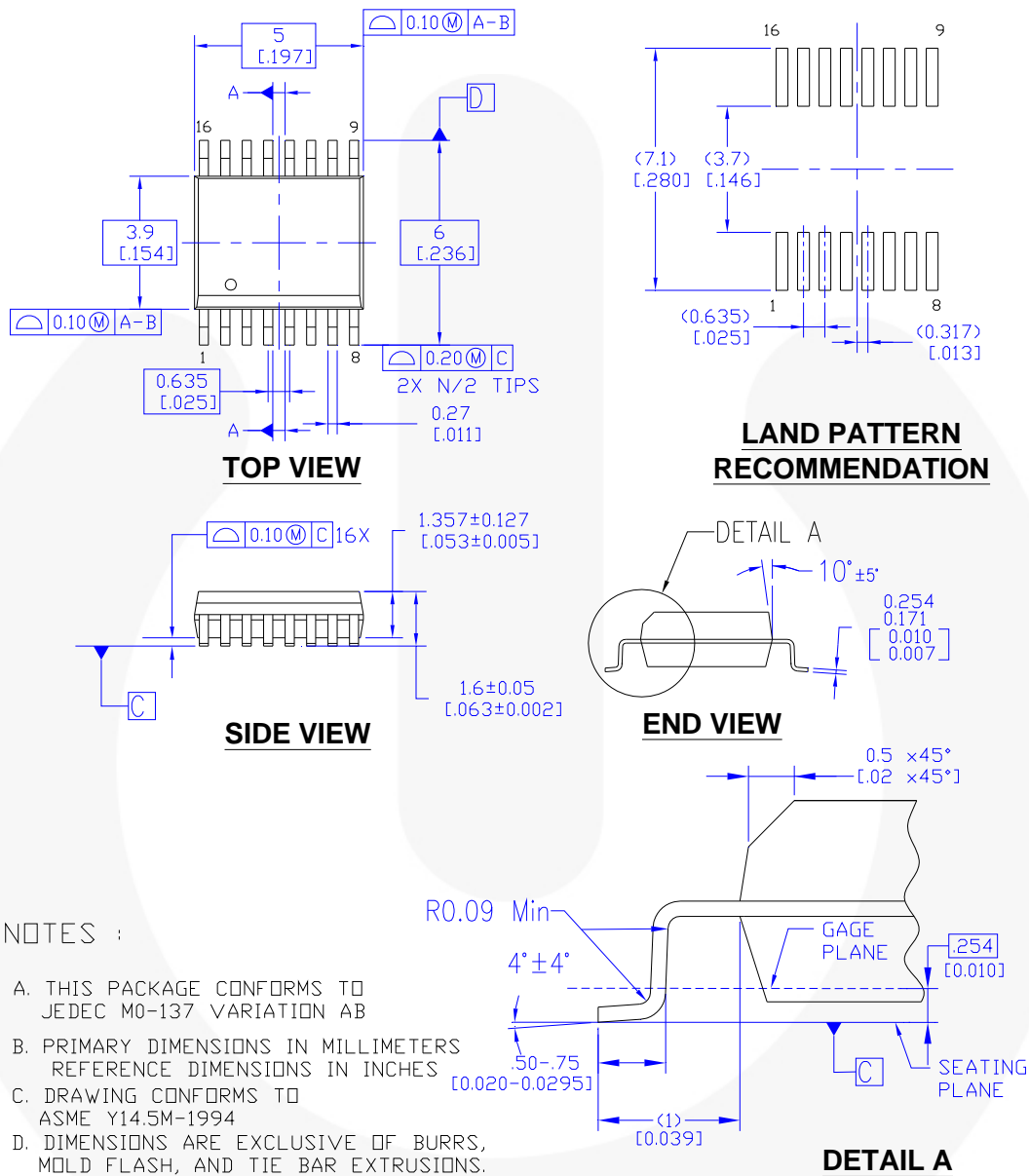


Figure 15. Bandwidth

Physical Dimensions



MQA16AREVB

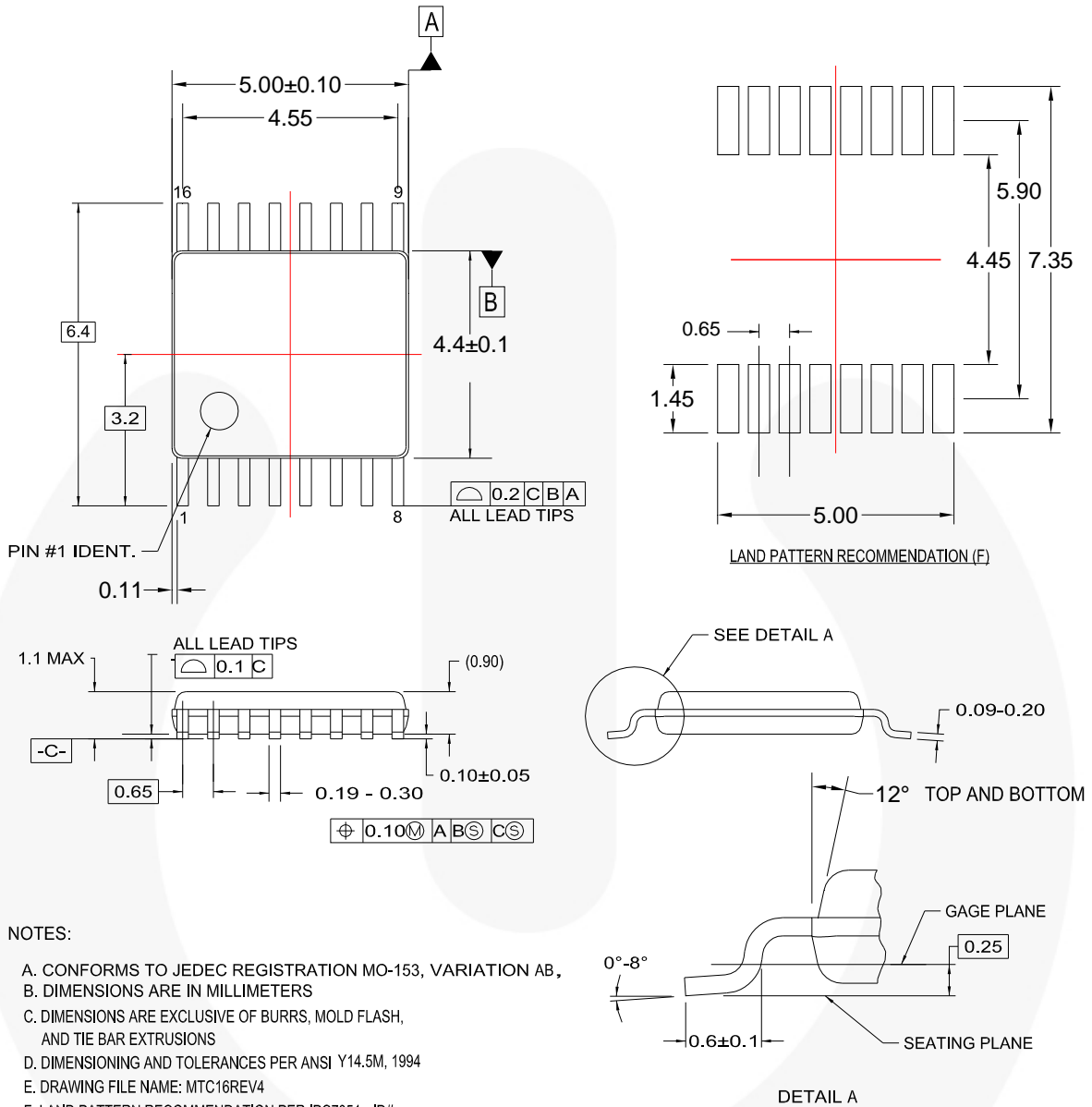
Figure 16. 16-Lead, Quarter Size Outline Package (QSOP)

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- F. LAND PATTERN RECOMMENDATION PER IPC7351 - ID# TSOP65P640X110-16N

MTC16rev4

Figure 17. 16-Lead, Thin Shrink Small Outline Package (TSSOP)

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