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FFB3906 / FMB3906 / MMPQ3906 PNP Multi-Chip General-Purpose Amplifier

Description

This device is designed for general-purpose amplifier and switching applications at collector currents of 10 μ A to 100 mA. Sourced from Process 66.

Block Diagram

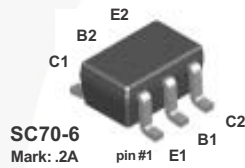


Figure 1. FFB3906 Device Package

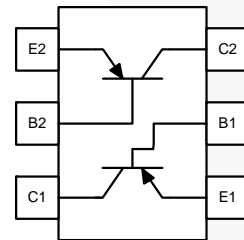


Figure 2. FFB3906 Internal Connections

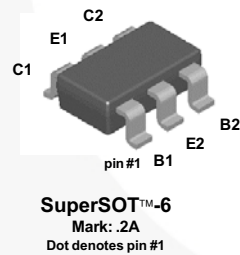


Figure 3. FMB3906 Device Package

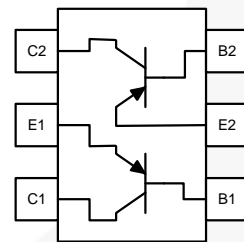


Figure 4. FMB3906 Internal Connections

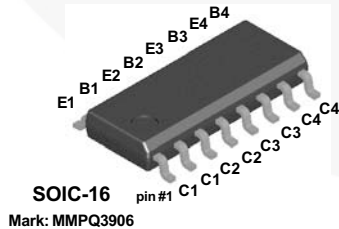


Figure 5. MMPQ3906 Device Package

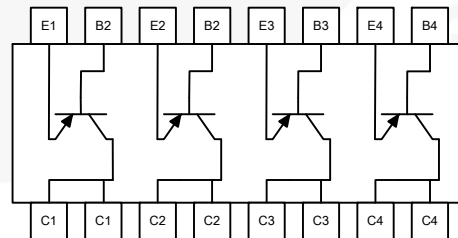


Figure 6. MMPQ3906 Internal Connections

Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|----------|----------------|
| FFB3906 | .2A | SC70 6L | Tape and Reel |
| FMB3906 | .2A | SSOT 6L | Tape and Reel |
| MMPQ3906 | MMPQ3906 | SOIC 16L | Tape and Reel |

Absolute Maximum Ratings⁽¹⁾

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. Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Value | Unit |
|----------------|--|-------------|------------------|
| V_{CEO} | Collector-Emitter Voltage | -40 | V |
| V_{CBO} | Collector-Base Voltage | -40 | V |
| V_{EBO} | Emitter-Base Voltage | -5 | V |
| I_C | Collector Current - Continuous | -200 | mA |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

Note:

- These ratings are based on a maximum junction temperature of 150°C . These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty cycle operations.

Thermal Characteristics⁽²⁾

Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Max. | | | Unit |
|-----------------|--|---------|---------|----------|---------------------------|
| | | FFB3906 | FMB3906 | MMPQ3906 | |
| P_D | Total Device Dissipation | 300 | 700 | 1,000 | mW |
| | Derate Above 25°C | 2.4 | 5.6 | 8.0 | mW/ $^\circ\text{C}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 415 | 180 | | $^\circ\text{C}/\text{W}$ |
| | Thermal Resistance, Junction to Ambient, Effective 4 Die | | | 125 | $^\circ\text{C}/\text{W}$ |
| | Thermal Resistance, Junction to Ambient, Each Die | | | 240 | $^\circ\text{C}/\text{W}$ |

Note:

- PCB size: FR-4 76 x 114 x 0.6T mm³ (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

Electrical Characteristics

Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|--|---|--|------|-------|------|
| Off Characteristics | | | | | | |
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage ⁽³⁾ | $I_C = -1.0\text{ mA}, I_B = 0$ | -40 | | | V |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C = -10\ \mu\text{A}, I_E = 0$ | -40 | | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E = -10\ \mu\text{A}, I_C = 0$ | -5.0 | | | V |
| I_{BL} | Base Cut-Off Current | $V_{CE} = -30\text{ V}, V_{BE} = 3.0\text{ V}$ | | | -50 | nA |
| I_{CEX} | Collector Cut-Off Current | $V_{CE} = -30\text{ V}, V_{BE} = 3.0\text{ V}$ | | | -50 | nA |
| On Characteristics | | | | | | |
| h_{FE} | DC Current Gain ⁽³⁾ | FFB3906, FMB3906 | $I_C = -0.1\text{ mA}, V_{CE} = -1.0\text{ V}$ | 60 | | |
| | | MMPQ3906 | | 40 | | |
| | | FFB3906, FMB3906 | $I_C = -1.0\text{ mA}, V_{CE} = -1.0\text{ V}$ | 80 | | |
| | | MMPQ3906 | | 60 | | |
| | | FFB3906, FMB3906 | $I_C = 10\text{ mA}, V_{CE} = -1.0\text{ V}$ | 100 | | 300 |
| | | MMPQ3906 | | 75 | | |
| | | All Devices | $I_C = -50\text{ mA}, V_{CE} = -1.0\text{ V}$ | 60 | | |
| | | All Devices | $I_C = -100\text{ mA}, V_{CE} = -1.0\text{ V}$ | 30 | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = -10\text{ mA}, I_B = -1.0\text{ mA}$ | | | -0.25 | V |
| | | $I_C = -50\text{ mA}, I_B = -5.0\text{ mA}$ | | | -0.40 | |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage | $I_C = -10\text{ mA}, I_B = -1.0\text{ mA}$ | -0.65 | | -0.85 | V |
| | | $I_C = -50\text{ mA}, I_B = -5.0\text{ mA}$ | | | -0.95 | |
| Small-Signal Characteristics (MMPQ3906 Only) | | | | | | |
| f_T | Current Gain-Bandwidth Product | $I_C = -10\text{ mA}, V_{CE} = -20\text{ V},$ $f = 100\text{ MHz}$ | | 200 | | MHz |
| C_{ob} | Output Capacitance | $V_{CB} = -5.0\text{ V}, I_E = 0,$ $f = 140\text{ kHz}$ | | 4.5 | | pF |
| C_{ib} | Input Capacitance | $V_{EB} = -0.5\text{ V}, I_C = 0,$ $f = 140\text{ kHz}$ | | 10 | | pF |

Note:

3. Pulse test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2.0\%$.

Typical Performance Characteristics

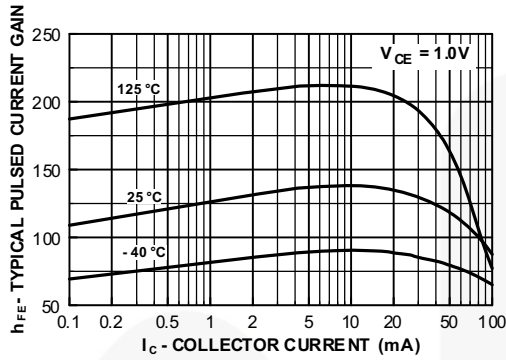


Figure 7. Typical Pulsed Current Gain vs. Collector Current

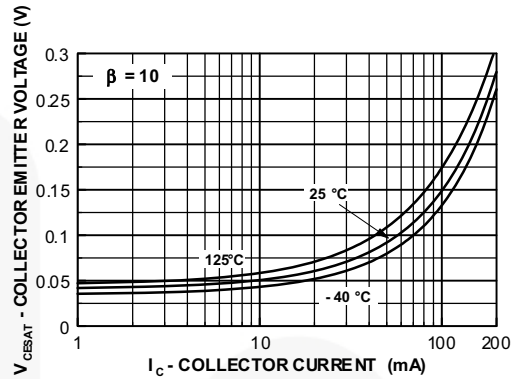


Figure 8. Collector-Emitter Saturation Voltage vs. Collector Current

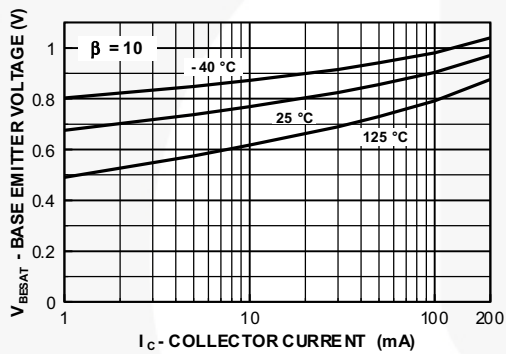


Figure 9. Base-Emitter Saturation Voltage vs. Collector Current

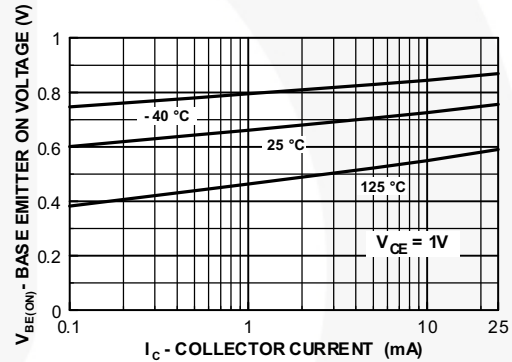


Figure 10. Base-Emitter On Voltage vs. Collector Current

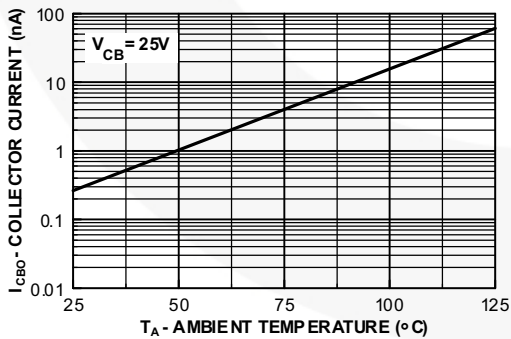


Figure 11. Collector Cut-Off Current vs. Ambient Temperature

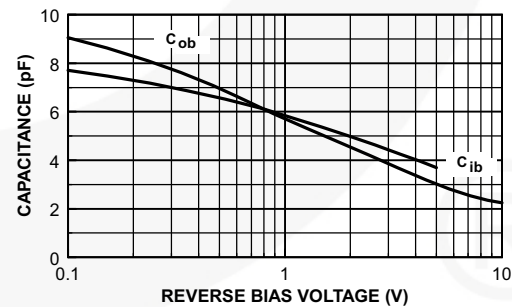


Figure 12. Common-Base Open Circuit Input and Output Capacitance vs. Reverse Bias Voltage

Typical Performance Characteristics (Continued)

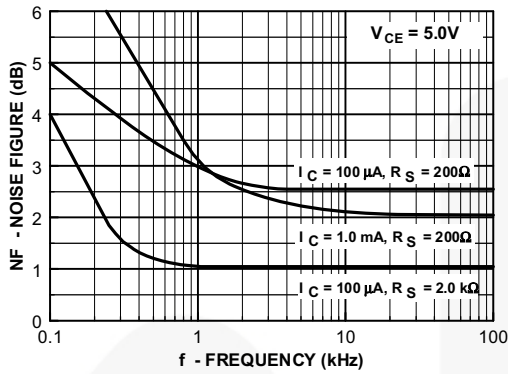


Figure 13. Noise Figure vs. Frequency

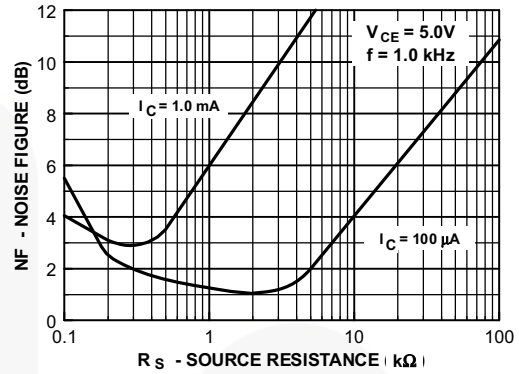


Figure 14. Noise Figure vs. Source Resistance

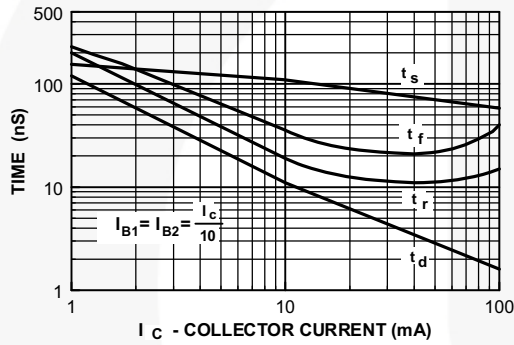


Figure 15. Switching Times vs. Collector Current

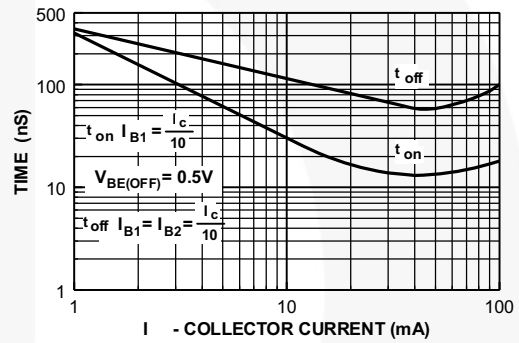


Figure 16. Turn-On and Turn-Off Times vs. Collector Current

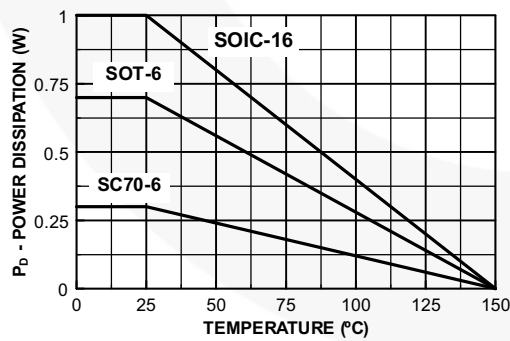


Figure 17. Power Dissipation vs. Ambient Temperature

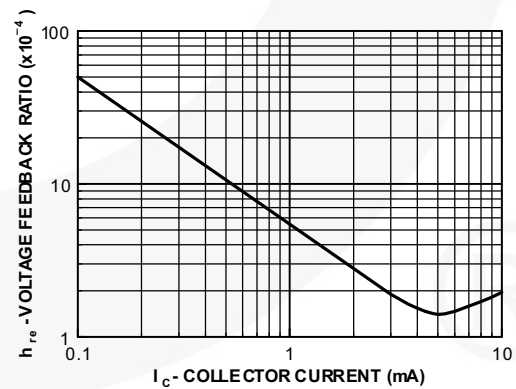


Figure 18. Voltage Feedback Ratio

Typical Performance Characteristics (Continued)

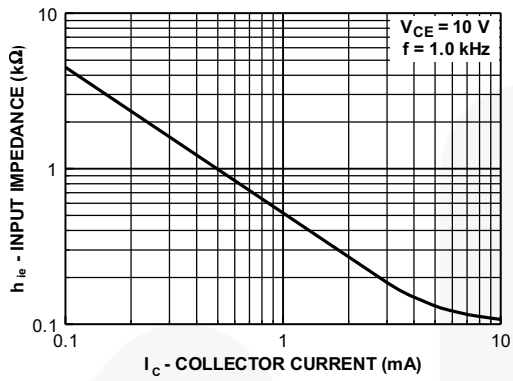


Figure 19. Input Impedance

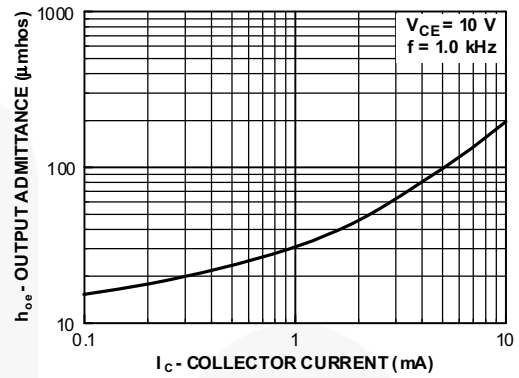


Figure 20. Output Admittance

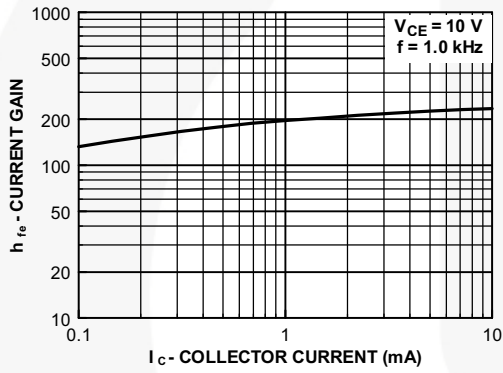


Figure 21. Current Gain

Physical Dimensions

SC70 6L

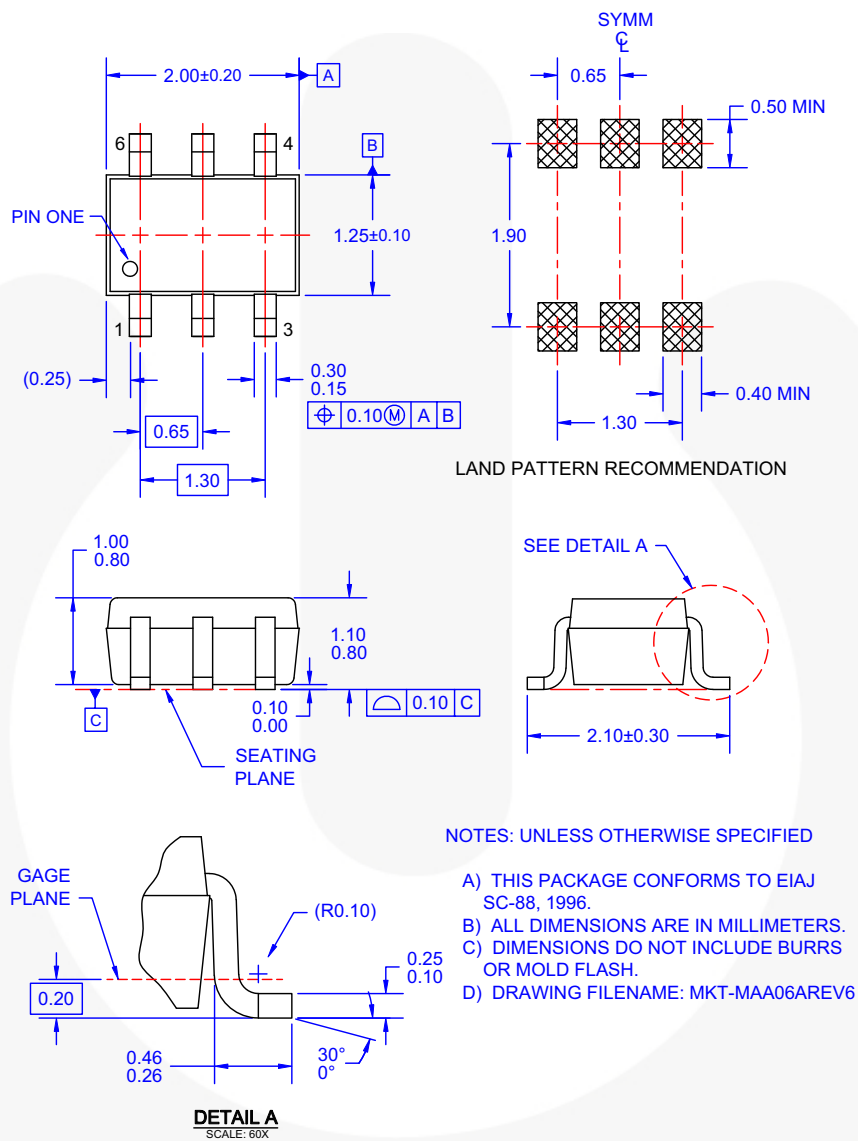


Figure 22. 6-LEAD, SC70, EIAJ SC-88, 1.25 MM WIDE (ACTIVE)

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Physical Dimensions (Continued)

SSOT 6L

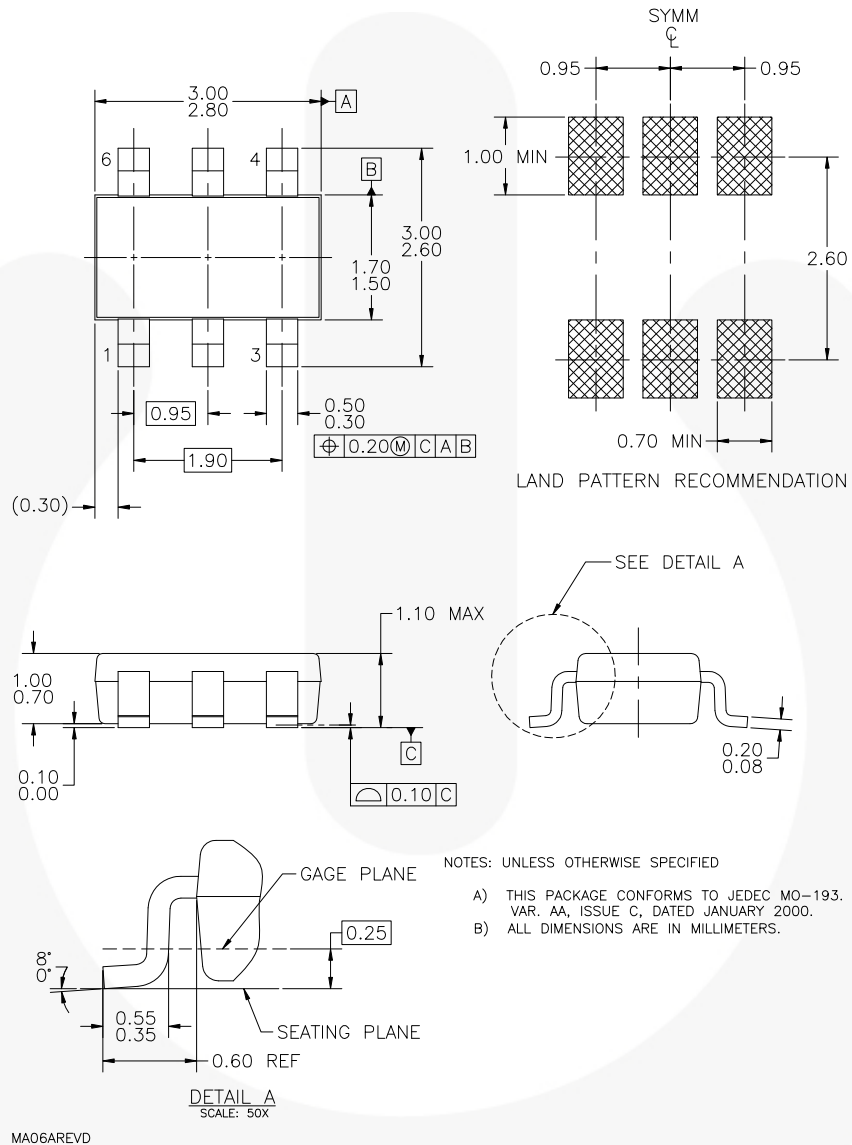


Figure 23. 6-LEAD, SUPERSOT-6, JEDEC MO-193, 1.6 MM WIDE (ACTIVE)

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Physical Dimensions (Continued)

SO 16L NB

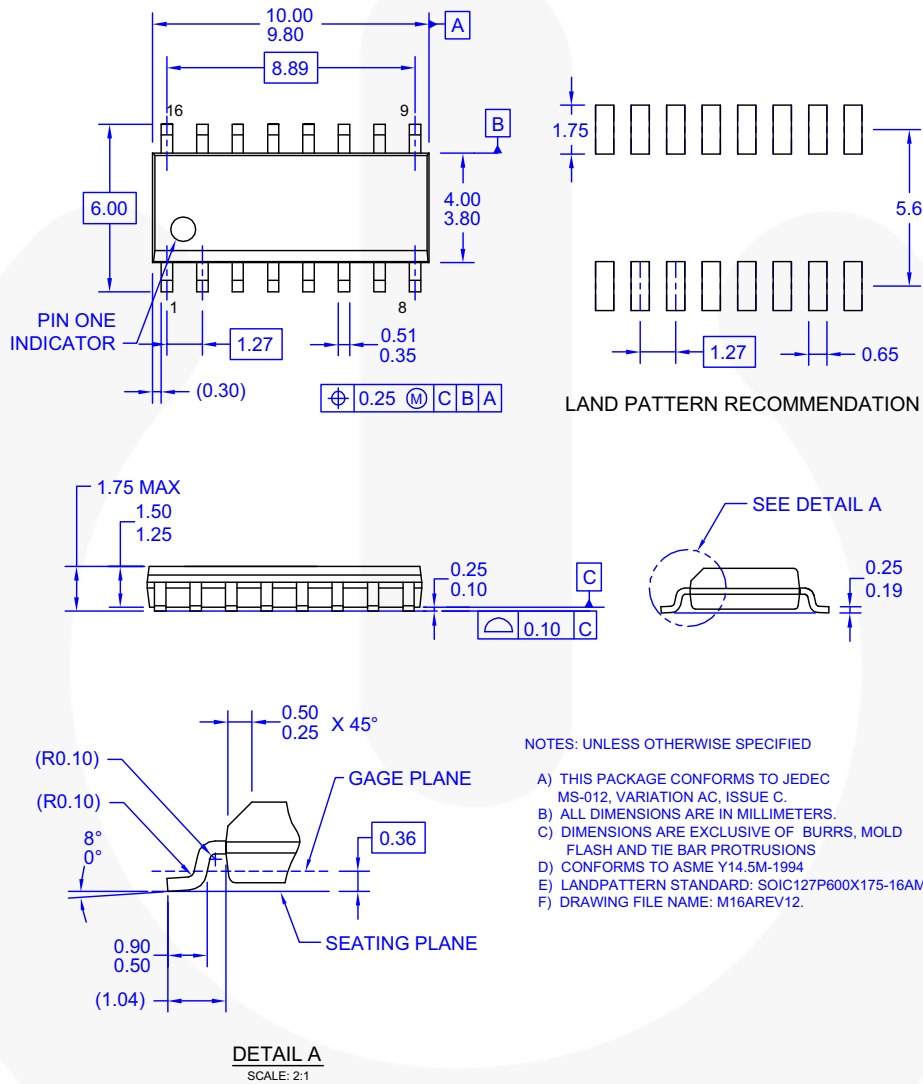


Figure 24. 16-LEAD, SOIC, JEDEC MS-012, 0.150 inch, NARROW BODY (ACTIVE)

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