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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  $\mu$ A to 100 mA. Sourced from Process 66.

## Block Diagram

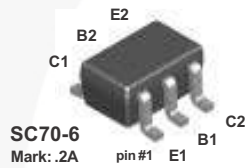


Figure 1. FFB3906 Device Package

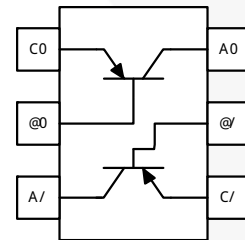


Figure 2. FFB3906 Internal Connections

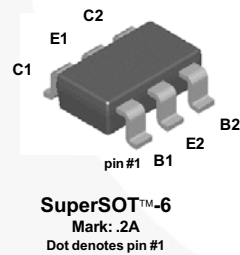


Figure 3. FMB3906 Device Package

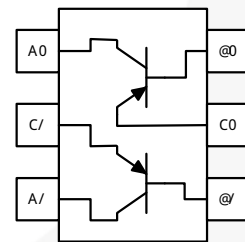


Figure 4. FMB3906 Internal Connections

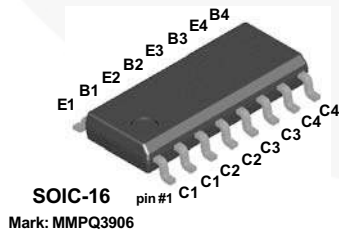


Figure 5. MMPQ3906 Device Package

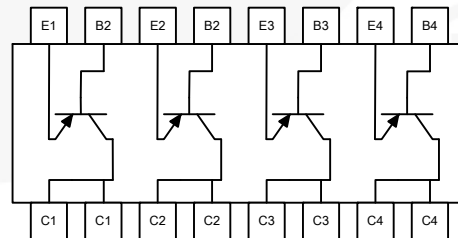


Figure 6. MMPQ3906 Internal Connections

## 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<sup>(1)</sup>

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  $150^\circ\text{C}$ . These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty cycle operations.

## Thermal Characteristics<sup>(2)</sup>

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 $25^\circ\text{C}$	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 mm<sup>3</sup> (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
<b>Off Characteristics</b>						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage <sup>(3)</sup>	$I_C = -1.0\text{ mA}, I_B = 0$	-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
<b>On Characteristics</b>						
$h_{FE}$	DC Current Gain <sup>(3)</sup>	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	
<b>Small-Signal Characteristics (MMPQ3906 Only)</b>						
$f_T$	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

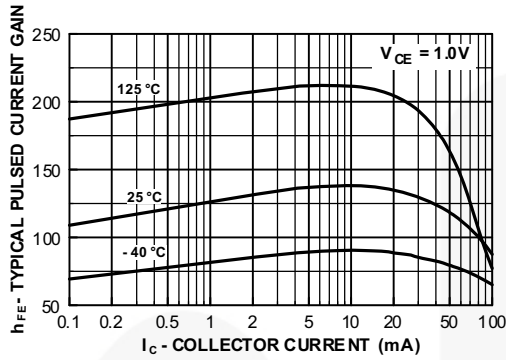


Figure 7. Typical Pulsed Current Gain vs. Collector Current

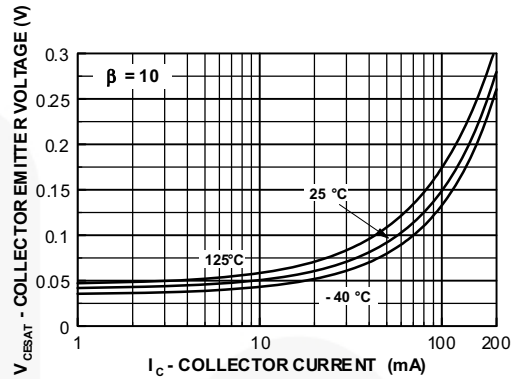


Figure 8. Collector-Emitter Saturation Voltage vs. Collector Current

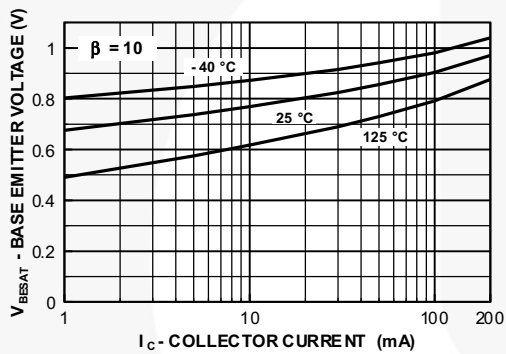


Figure 9. Base-Emitter Saturation Voltage vs. Collector Current

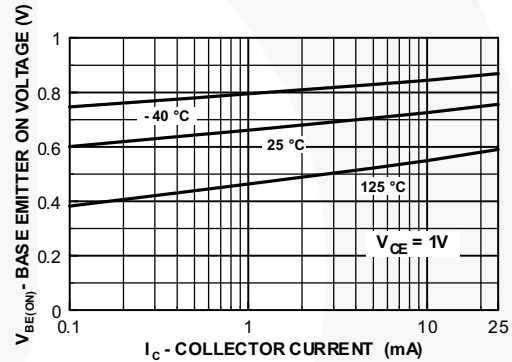


Figure 10. Base-Emitter On Voltage vs. Collector Current

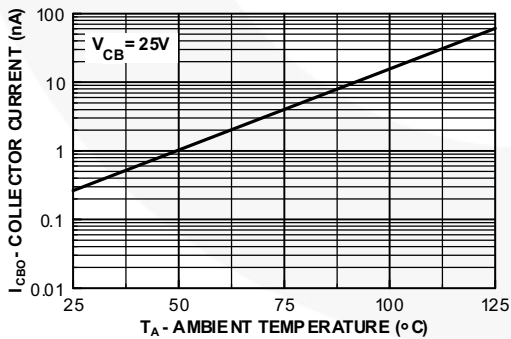


Figure 11. Collector Cut-Off Current vs. Ambient Temperature

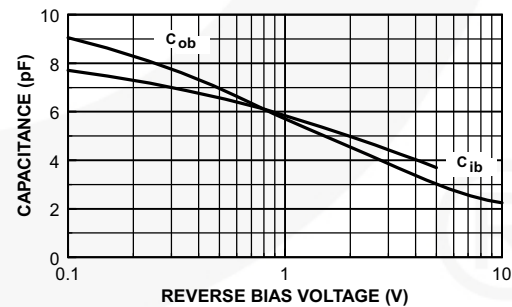
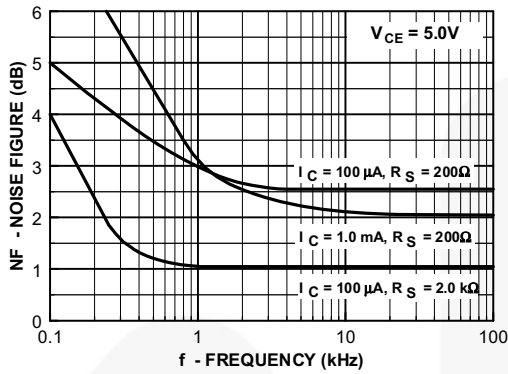
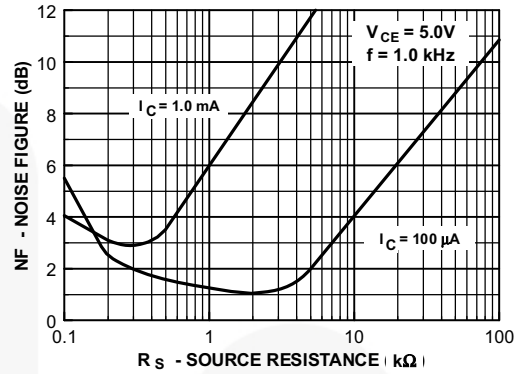


Figure 12. Common-Base Open Circuit Input and Output Capacitance vs. Reverse Bias Voltage

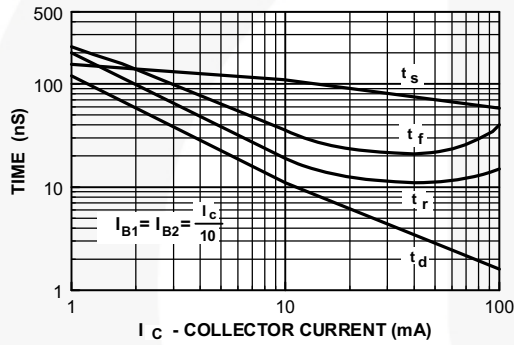
**Typical Performance Characteristics (Continued)**



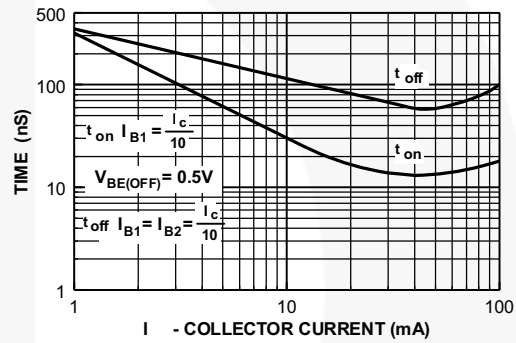
**Figure 13. Noise Figure vs. Frequency**



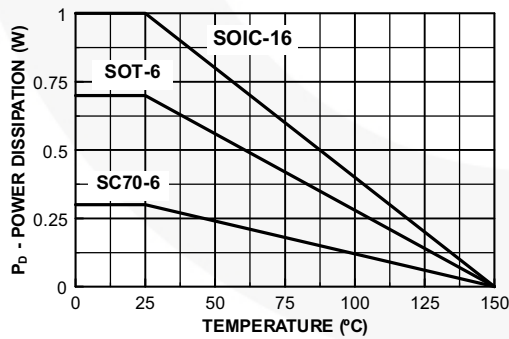
**Figure 14. Noise Figure vs. Source Resistance**



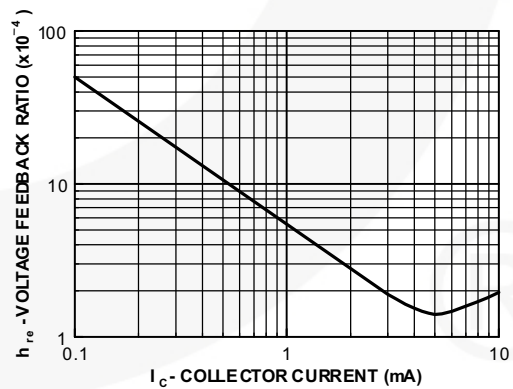
**Figure 15. Switching Times vs. Collector Current**



**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)

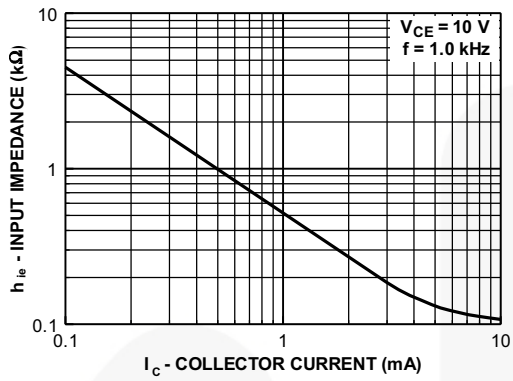


Figure 19. Input Impedance

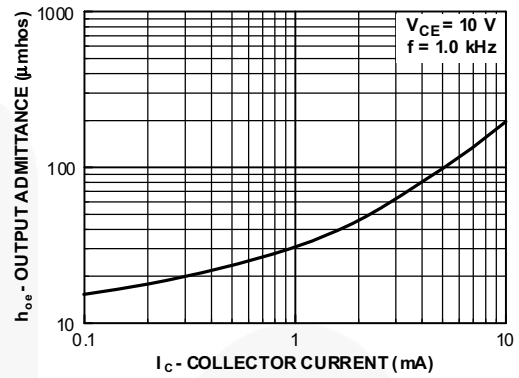


Figure 20. Output Admittance

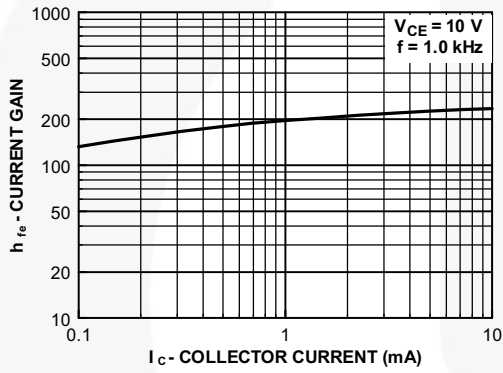
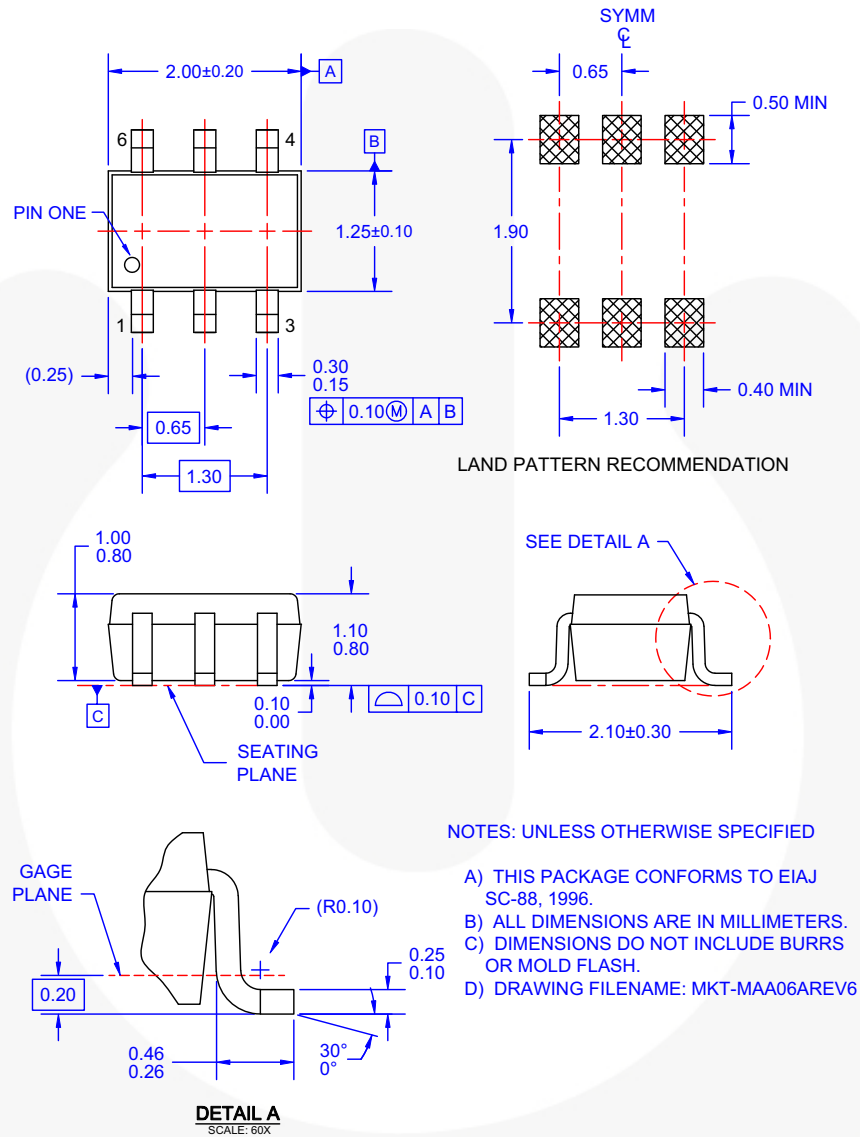


Figure 21. Current Gain

## Physical Dimensions

### SC70 6L



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

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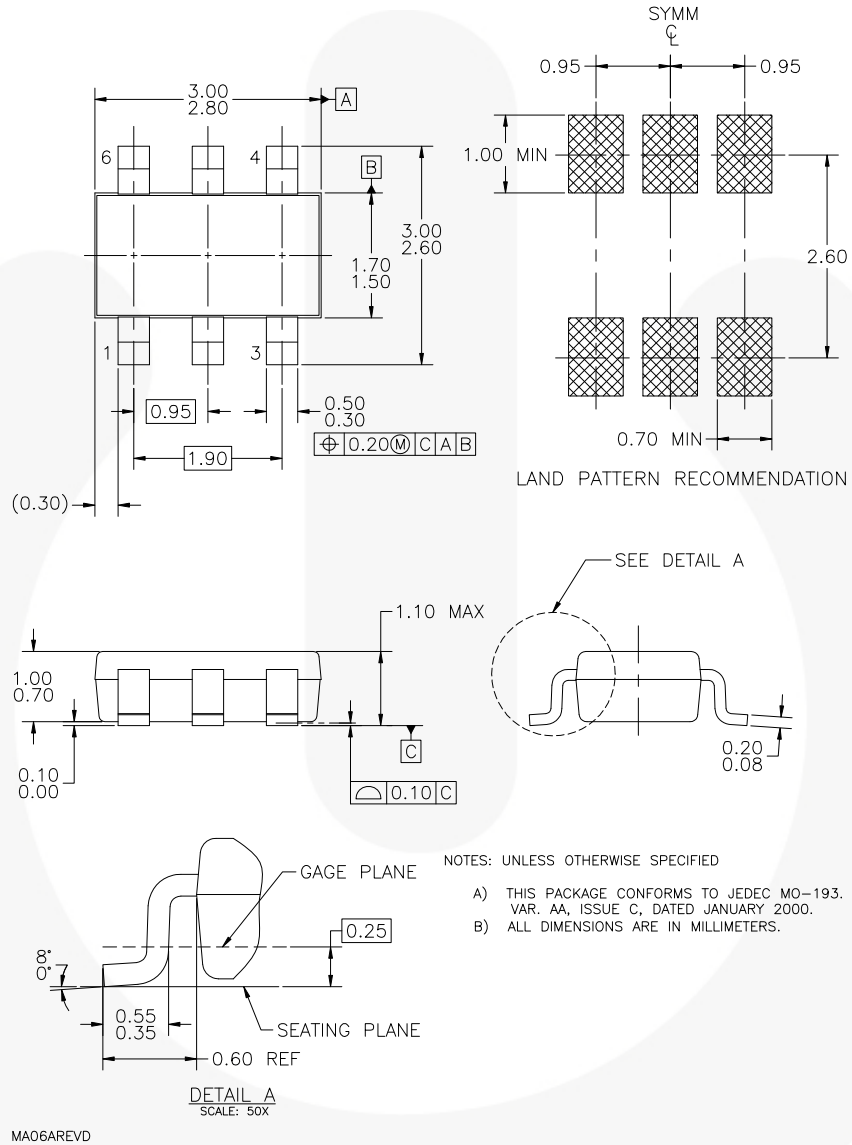
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**Physical Dimensions** (Continued)

**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

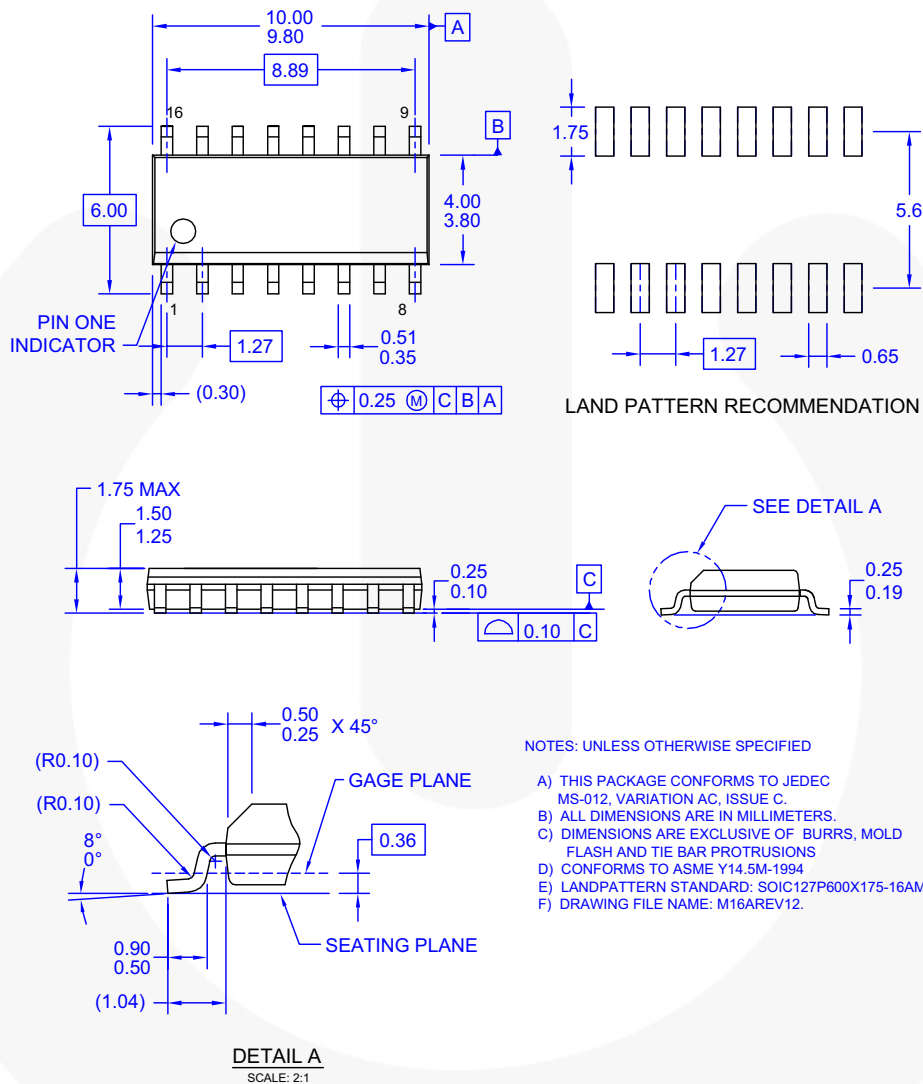


Figure 24. 16-LEAD, SOIC, JEDEC MS-012, 0.150 inch, NARROW BODY (ACTIVE)

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