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October 2015

# FFB2222A / FMB2222A / MMPQ2222A NPN Multi-Chip General-Purpose Amplifier

## Description

This device is for use as a medium power amplifier and switch requiring collector currents up to 500 mA. Sourced from process 19.

## Block Diagram

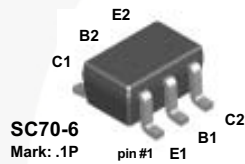


Figure 1. FFB2222A Device Package

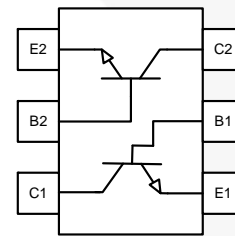


Figure 2. FFB2222A Internal Connection

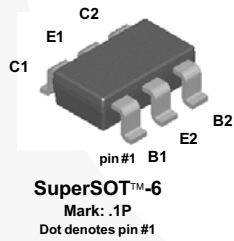


Figure 3. FMB2222A Device Package

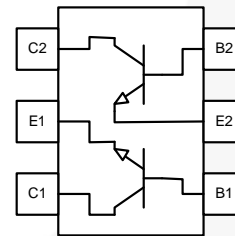


Figure 4. FMB2222A Internal Connection

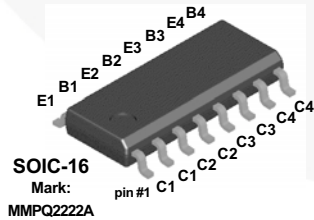


Figure 5. MMPQ2222A Device Package

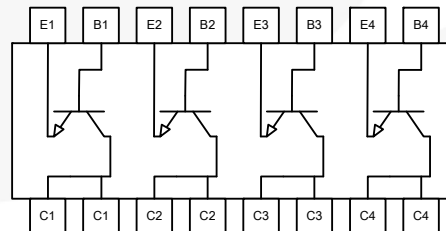


Figure 6. MMPQ2222A Internal Connection

FFB2222A / FMB2222A / MMPQ2222A — NPN Multi-Chip General-Purpose Amplifier

## Ordering Information

Part Number	Top Mark	Package	Packing Method
FFB2222A	.1P	SC70 6L	Tape and Reel
FMB2222A	.1P	SSOT 6L	Tape and Reel
MMPQ2222A	MMPQ2222A	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	45	V
$V_{CBO}$	Collector-Base Voltage	75	V
$V_{EBO}$	Emitter-Base Voltage	5.0	V
$I_C$	Collector Current - Continuous	500	mA
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Note:

1. 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
		FFB2222A	FMB2222A	MMPQ2222A	
$P_D$	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 Dies			125	
	Thermal Resistance, Junction-to-Ambient, Each Die			240	

### Note:

2. PCB size: FR-4, 76 mm x 114 mm x 1.57 mm (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
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage <sup>(3)</sup>	$I_C = 10\text{ mA}, I_B = 0$	40			V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\text{ }\mu\text{A}, I_E = 0$	75			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_C = 0$	5.0			V
$I_{CBO}$	Collector Cut-Off Current	$V_{CB} = 60\text{ V}, I_E = 0$			10	nA
$I_{EBO}$	Emitter Cut-Off Current	$V_{EB} = 3.0\text{ V}, I_C = 0$			10	nA
$h_{FE}$	DC Current Gain	$I_C = 0.1\text{ mA}, V_{CE} = 10\text{ V}$	35			
		$I_C = 1.0\text{ mA}, V_{CE} = 10\text{ V}$	50			
		$I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$	75			
		$I_C = 150\text{ mA}, V_{CE} = 10\text{ V}^{(3)}$	100		300	
		$I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}^{(3)}$	50			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage <sup>(3)</sup>	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$			0.3	V
		$I_C = 500\text{ mA}, I_B = 50\text{ mA}$			1.0	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage <sup>(3)</sup>	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$			1.2	V
		$I_C = 500\text{ mA}, I_B = 50\text{ mA}$			2.0	
$f_T$	Current Gain - Bandwidth Product	$I_C = 20\text{ mA}, V_{CE} = 20\text{ V},$ $f = 100\text{ MHz}$		300		MHz
$C_{obo}$	Output Capacitance	$V_{CB} = 10\text{ V}, I_E = 0,$ $f = 100\text{ kHz}$		4.0		pF
$C_{ibo}$	Input Capacitance	$V_{EB} = 0.5\text{ V}, I_C = 0,$ $f = 100\text{ kHz}$		20		pF
NF	Noise Figure	$I_C = 100\text{ }\mu\text{A}, V_{CE} = 10\text{ V},$ $R_S = 1.0\text{ k}\Omega, f = 1.0\text{ kHz}$		2.0		dB
$t_d$	Delay Time	$V_{CC} = 30\text{ V}, V_{BE(OFF)} = 0.5\text{ V},$ $I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}$		8		ns
$t_r$	Rise Time			20		ns
$t_s$	Storage Time	$V_{CC} = 30\text{ V}, I_C = 150\text{ mA},$ $I_{B1} = I_{B2} = 15\text{ mA}$		180		ns
$t_f$	Fall Time			40		ns

### Note:

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

## Typical Performance Characteristics

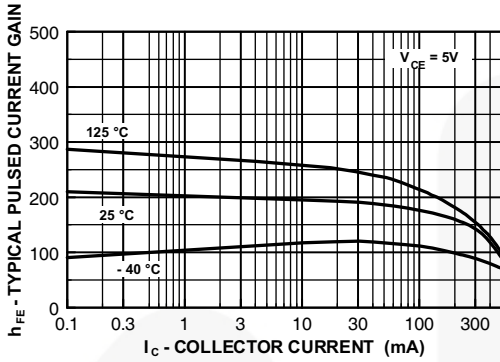


Figure 7. Typical Pulsed Current Gain vs. Collector Current

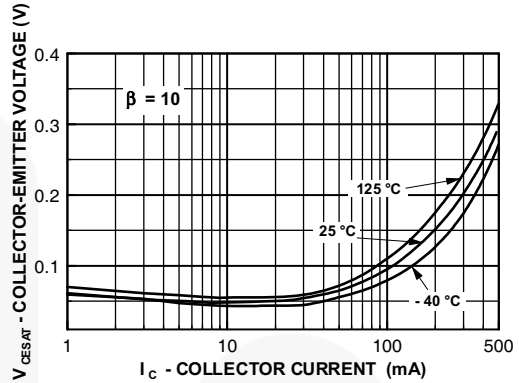


Figure 8. Collector-Emitter Saturation Voltage vs. Collector Current

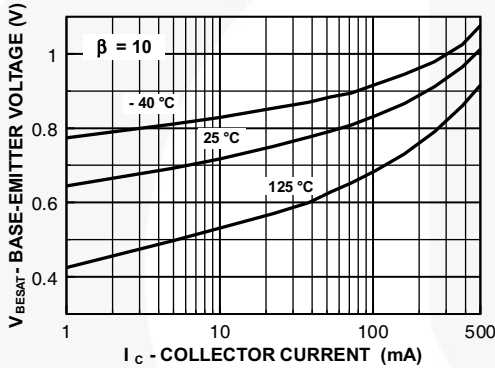


Figure 9. Base-Emitter Saturation Voltage vs. Collector Current

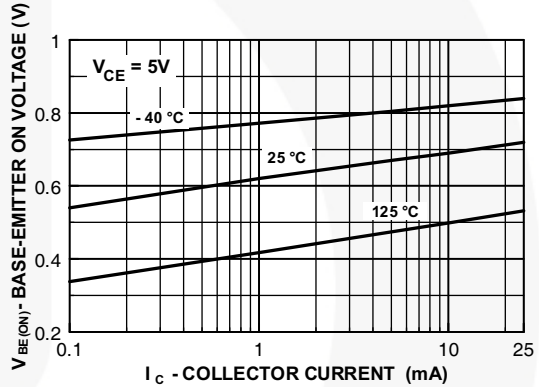


Figure 10. Base-Emitter On Voltage vs. Collector Current

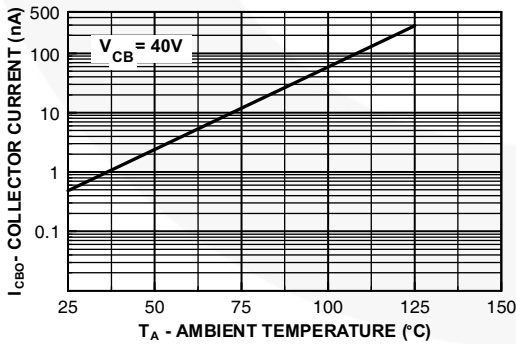


Figure 11. Collector Cut-Off Current vs. Ambient Temperature

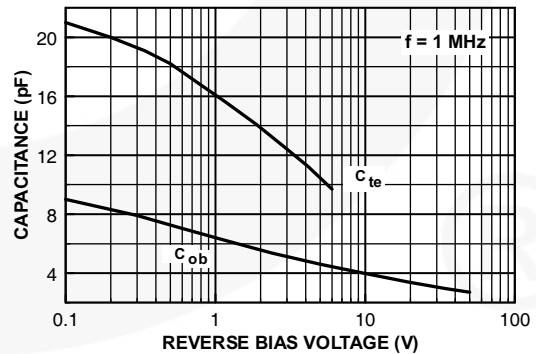
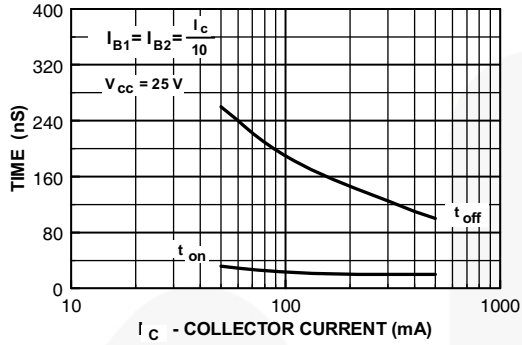
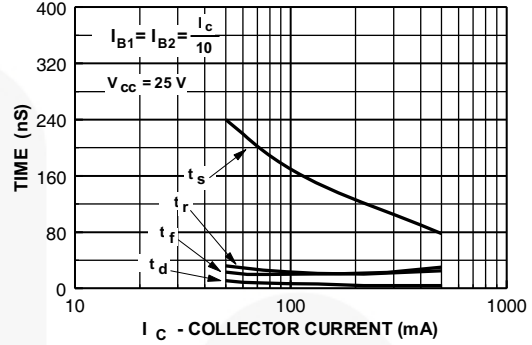


Figure 12. Emitter Transition and Output Capacitance vs. Reverse Bias Voltage

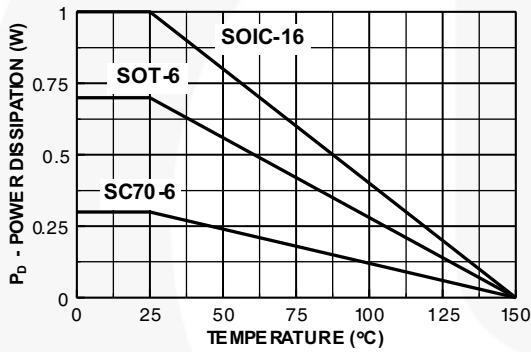
**Typical Performance Characteristics** (Continued)



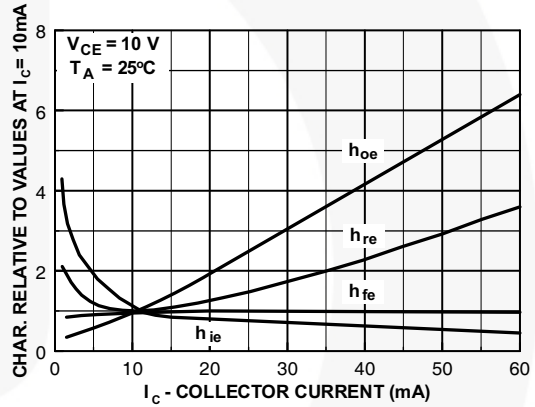
**Figure 13. Turn-On and Turn-Off Times vs. Collector Current**



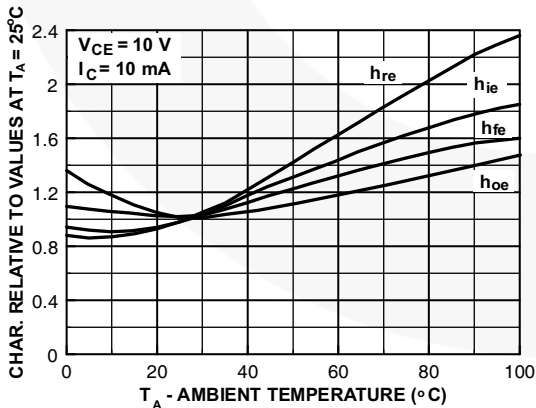
**Figure 14. Switching Time vs. Collector Current**



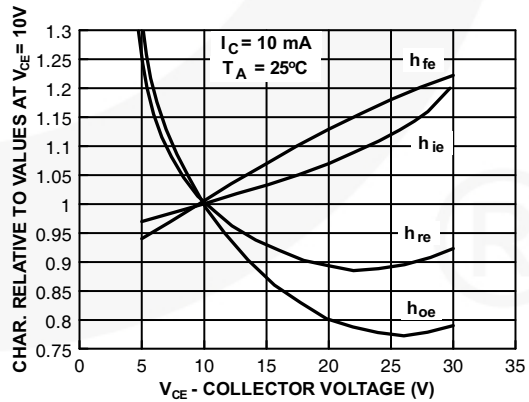
**Figure 15. Power Dissipation vs. Ambient Temperature**



**Figure 16. Common Emitter Characteristics**



**Figure 17. Common Emitter Characteristics**



**Figure 18. Common Emitter Characteristics**

Test Circuits

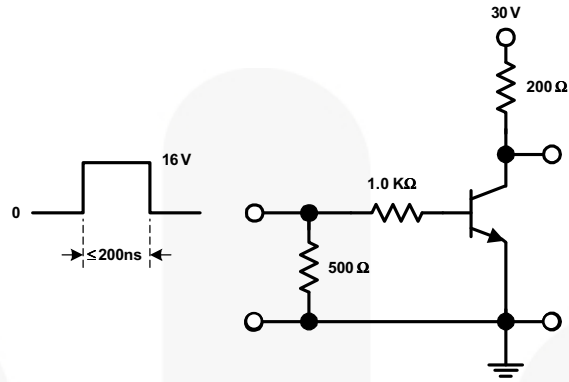


Figure 19. Saturated Turn-On Switching Time

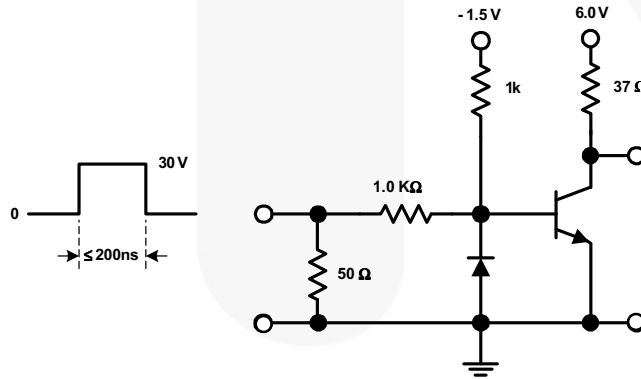
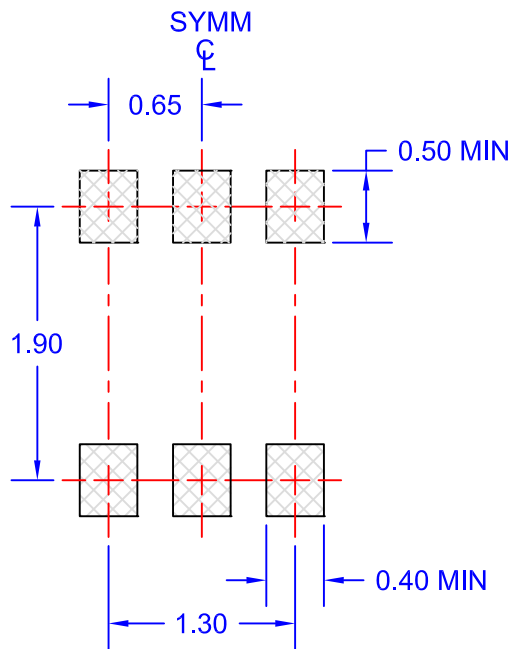
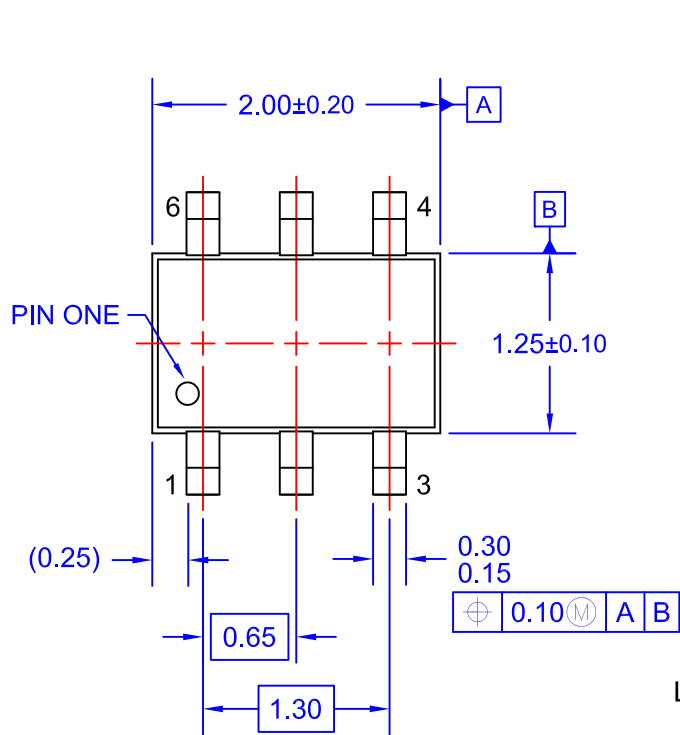
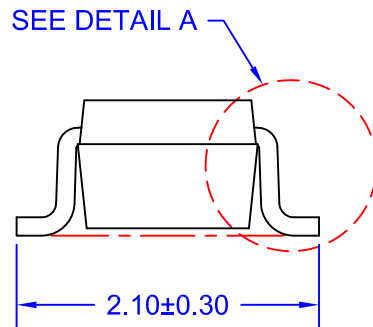
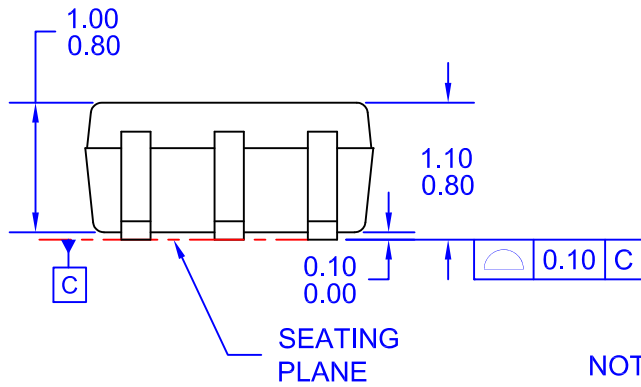


Figure 20. Saturated Turn-Off Switching Time





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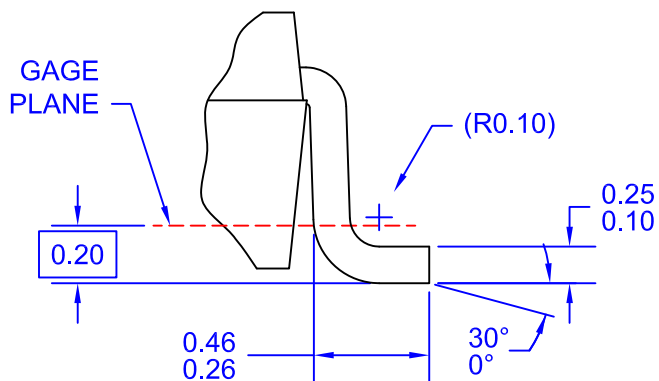


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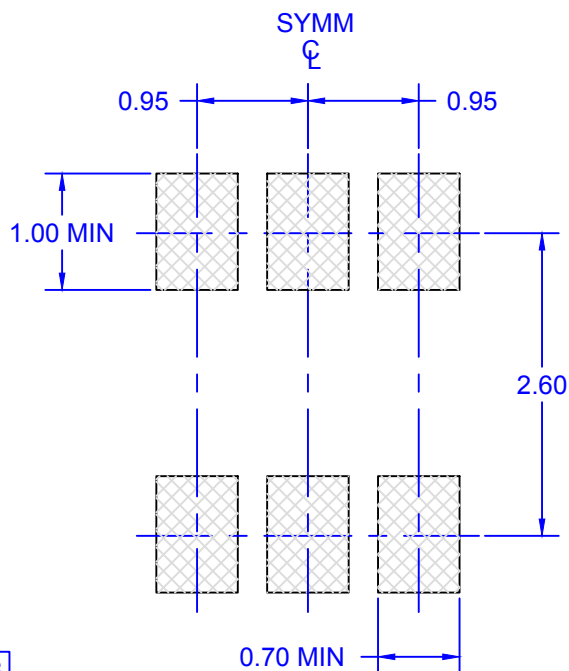
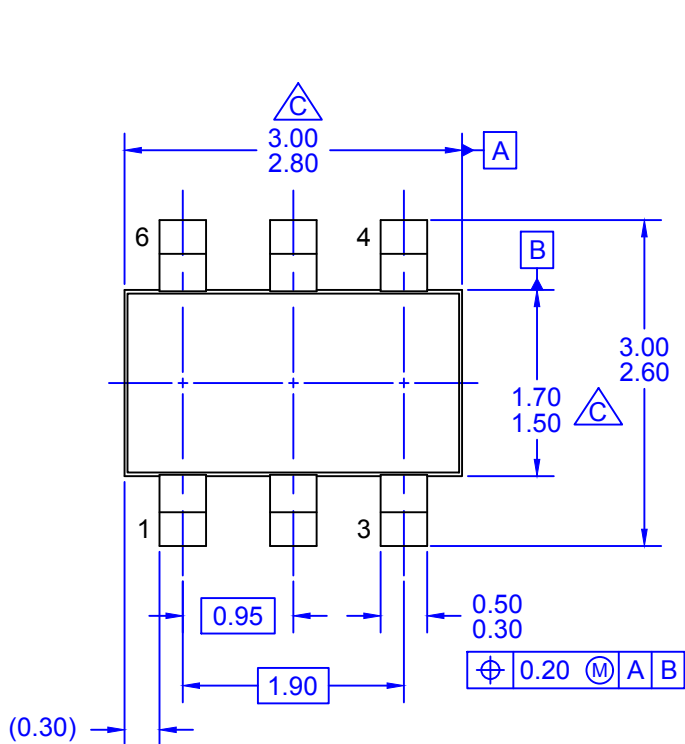
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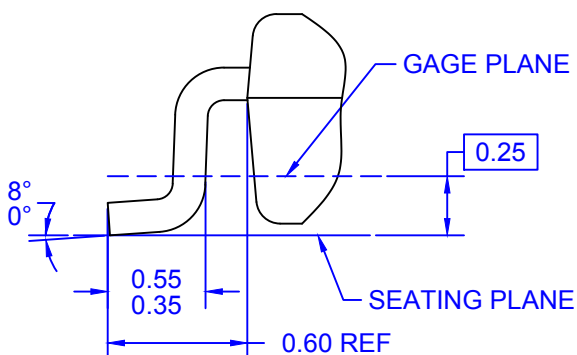
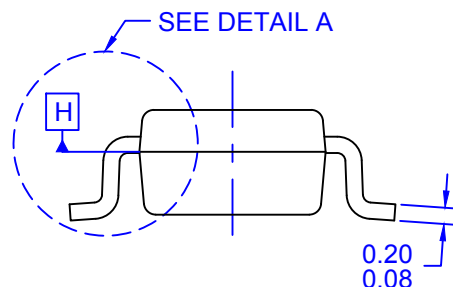
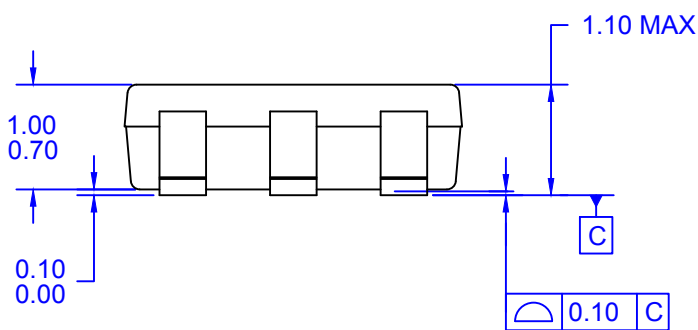
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LAND PATTERN RECOMMENDATION

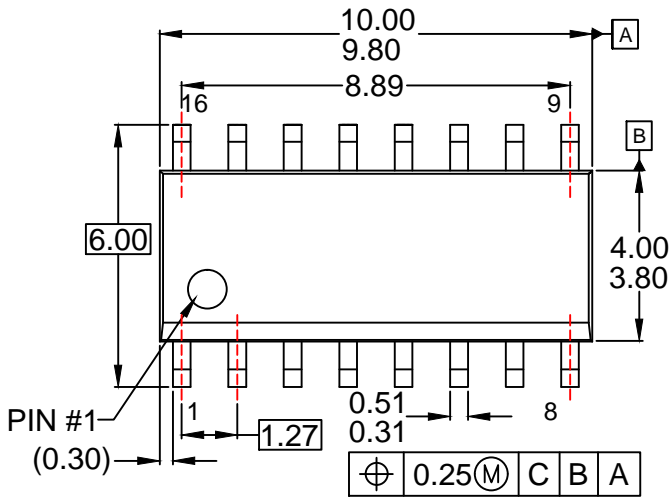


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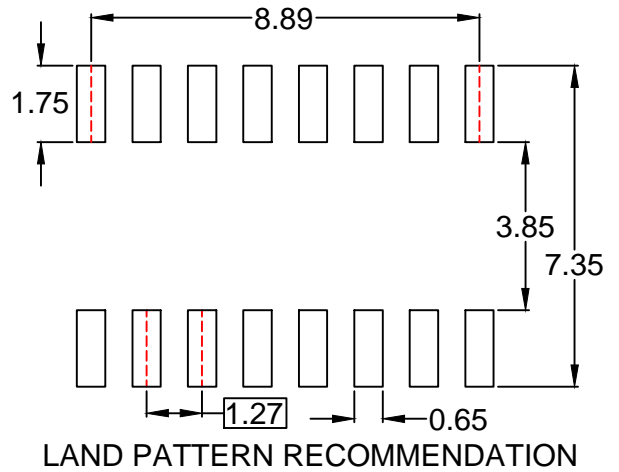
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  - D) DRAWING FILE NAME: MKT-MA06AREVF

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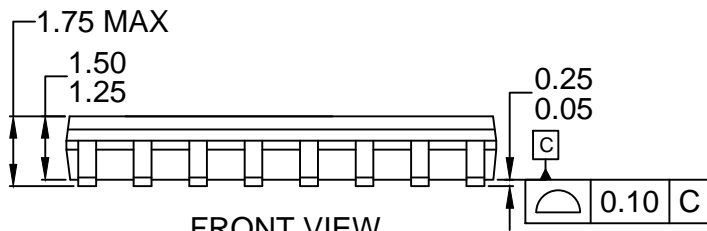




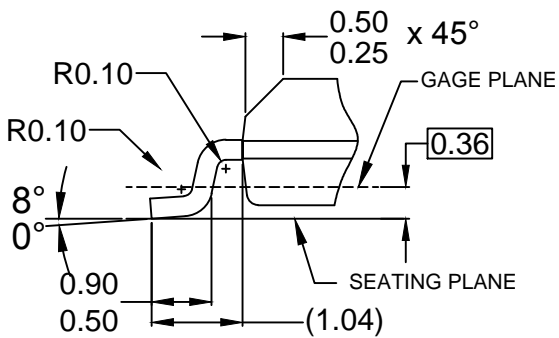
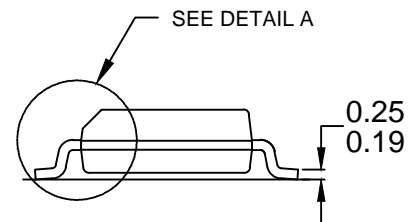
TOP VIEW



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FRONT VIEW



DETAIL A

SCALE: 2:1

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