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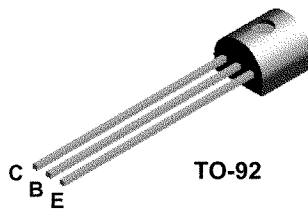
福 靈 有 限 公 司

FLAT P, 3/F, EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,  
KWUN TONG, KOWLOON, HONG KONG.  
TEL: 2790-0314 FAX: 2790-0206

2N3906 / MMBT3906 / PZT3906

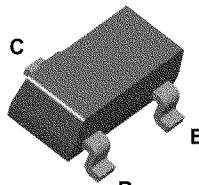


**2N3906**



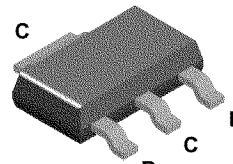
TO-92

**MMBT3906**



SOT-23  
Mark: 2A

**PZT3906**



SOT-223

**PNP General Purpose Amplifier**

This device is designed for general purpose amplifier and switching applications at collector currents of 10  $\mu$ A to 100 mA.

**Absolute Maximum Ratings\***  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Value	Units
$V_{CEO}$	Collector-Emitter Voltage	40	V
$V_{CBO}$	Collector-Base Voltage	40	V
$V_{EBO}$	Emitter-Base Voltage	5.0	V
$I_C$	Collector Current - Continuous	200	mA
$T_J, T_{stg}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

\* These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

**NOTES:**

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- 3) All voltages (V) and currents (A) are negative polarity for PNP transistors.

**Thermal Characteristics**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Characteristic	Max			Units
		2N3906	*MMBT3906	**PZT3906	
$P_D$	Total Device Dissipation	625	350	1,000	mW
	Derate above 25 $^\circ\text{C}$	5.0	2.8	8.0	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3			$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	125	$^\circ\text{C}/\text{W}$

\* Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

\*\* Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm<sup>2</sup>.



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**PNP General Purpose Amplifier**

(continued)

**Electrical Characteristics**

$T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
<b>OFF CHARACTERISTICS</b>					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 1.0\text{ mA}, I_B = 0$	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 Cutoff Current	$V_{CE} = 30\text{ V}, V_{BE} = 3.0\text{ V}$		50	nA
$I_{CEX}$	Collector Cutoff Current	$V_{CE} = 30\text{ V}, V_{BE} = 3.0\text{ V}$		50	nA

**ON CHARACTERISTICS**

$h_{FE}$	DC Current Gain *	$I_C = 0.1\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 1.0\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 50\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 100\text{ mA}, V_{CE} = 1.0\text{ V}$	60 80 100 60 30	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$		0.25 0.4	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$	0.65	0.85 0.95	V V

**SMALL SIGNAL CHARACTERISTICS**

$f_r$	Current Gain - Bandwidth Product	$I_C = 10\text{ mA}, V_{CE} = 20\text{ V},$ $f = 100\text{ MHz}$	250		MHz
$C_{obo}$	Output Capacitance	$V_{CB} = 5.0\text{ V}, I_E = 0,$ $f = 100\text{ kHz}$		4.5	pF
$C_{ibo}$	Input Capacitance	$V_{EB} = 0.5\text{ V}, I_C = 0,$ $f = 100\text{ kHz}$		10.0	pF
NF	Noise Figure	$I_C = 100\ \mu\text{A}, V_{CE} = 5.0\text{ V},$ $R_S = 1.0\text{ k}\Omega, f = 10\text{ Hz to } 15.7\text{ kHz}$		4.0	dB

**SWITCHING CHARACTERISTICS**

$t_d$	Delay Time	$V_{CC} = 3.0\text{ V}, V_{BE} = 0.5\text{ V},$		35	ns
$t_r$	Rise Time	$I_C = 10\text{ mA}, I_{B1} = 1.0\text{ mA}$		35	ns
$t_s$	Storage Time	$V_{CC} = 3.0\text{ V}, I_C = 10\text{ mA}$		225	ns
$t_f$	Fall Time	$I_{B1} = I_{B2} = 1.0\text{ mA}$		75	ns

\*Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

**NOTE:** All voltages (V) and currents (A) are negative polarity for PNP transistors.

**Spice Model**

PNP (Is=1.41f Xti=3 Eg=1.11 Vaf=18.7 Bf=180.7 Ne=1.5 Ise=0 Ikf=80m Xtb=1.5 Br=4.977 Nc=2 Isc=0 Ikr=0 Rc=2.5 Cjc=9.728p Mjc=.5776 Vjc=.75 Fc=.5 Cje=8.063p Mje=.3677 Vje=.75 Tr=33.42n Tf=179.3p Itf=.4 Vtf=4 Xtf=6 Rb=10)



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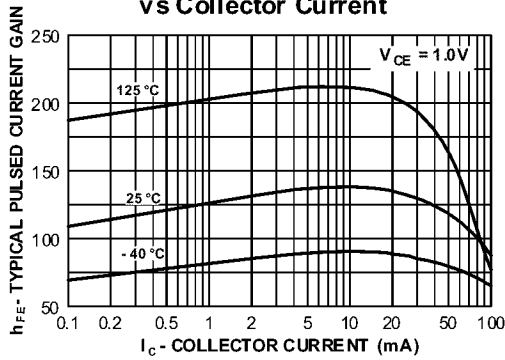
PNP General Purpose Amplifier

(continued)

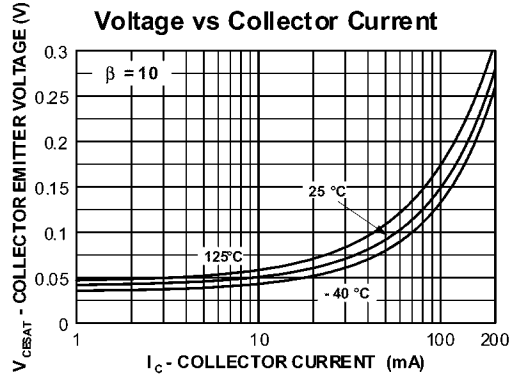
2N3906 / MMBT3906 / PZT3906

Typical Characteristics

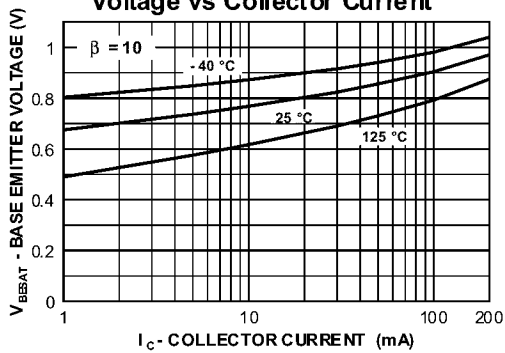
Typical Pulsed Current Gain vs Collector Current



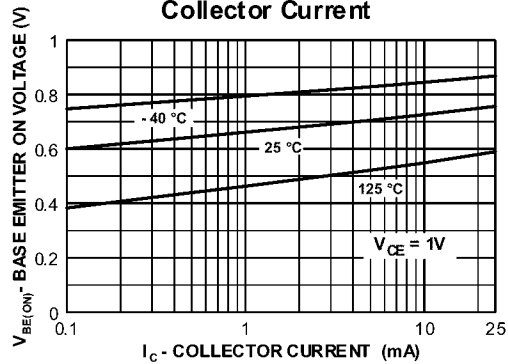
Collector-Emitter Saturation Voltage vs Collector Current



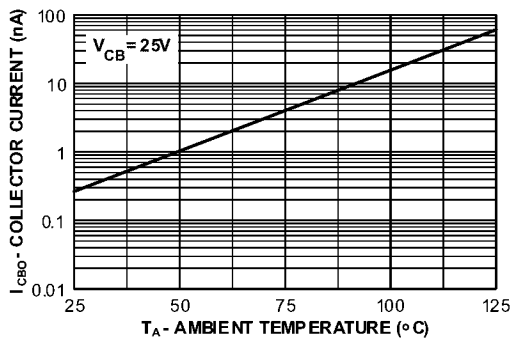
Base-Emitter Saturation Voltage vs Collector Current



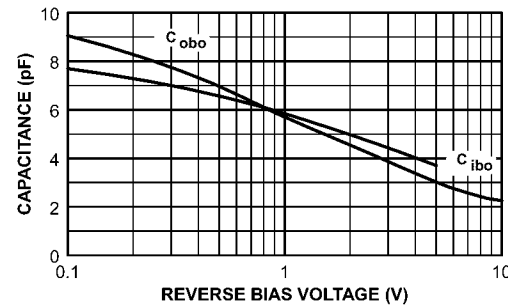
Base Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature



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





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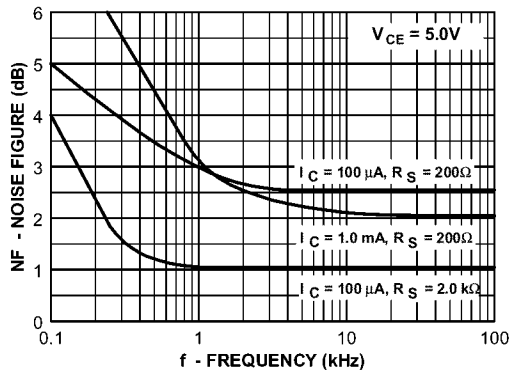
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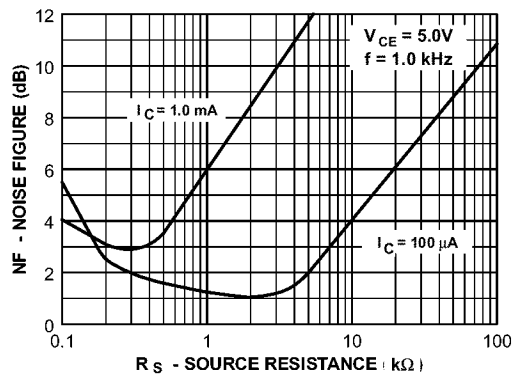
**PNP General Purpose Amplifier**  
 (continued)

**Typical Characteristics** (continued)

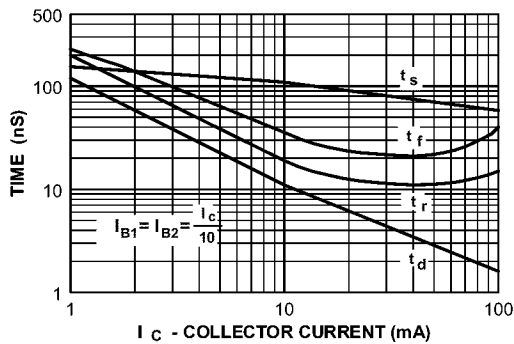
**Noise Figure vs Frequency**



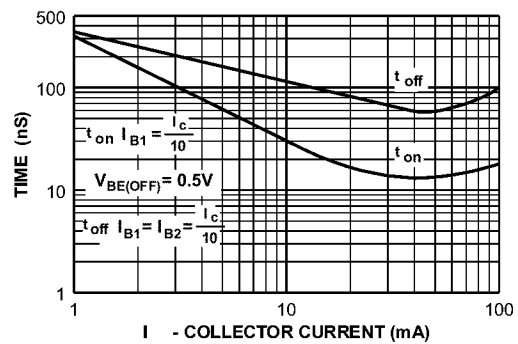
**Noise Figure vs Source Resistance**



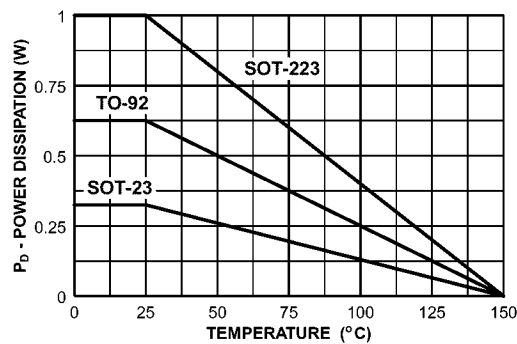
**Switching Times vs Collector Current**



**Turn On and Turn Off Times vs Collector Current**



**Power Dissipation vs Ambient Temperature**





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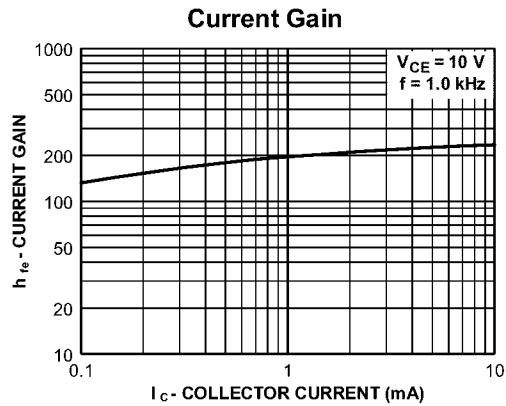
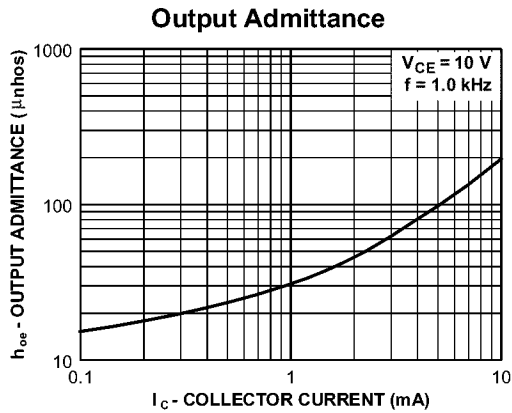
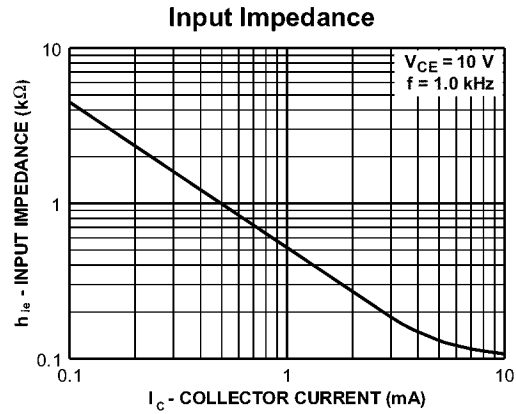
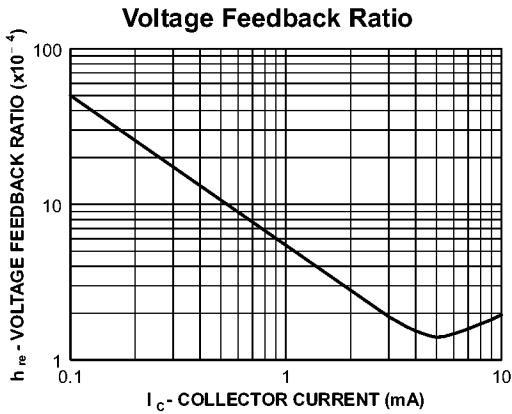
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PNP General Purpose Amplifier  
(continued)

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Typical Characteristics (continued)





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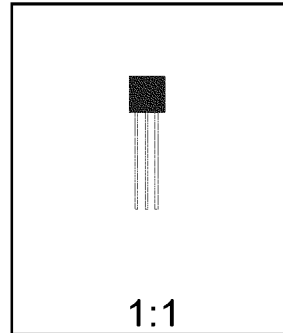
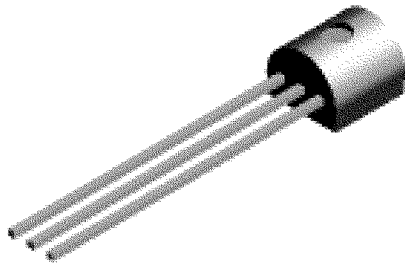
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TO-92 Package Dimensions



TO-92 (FS PKG Code 92, 94, 96)



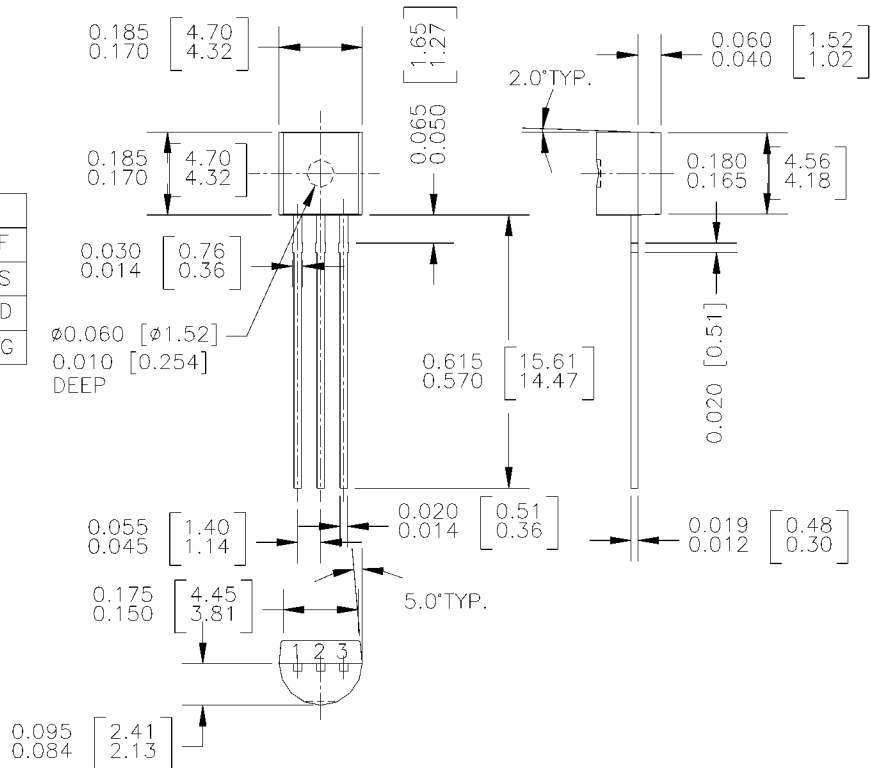
Scale 1:1 on letter size paper

Dimensions shown below are in:  
 inches [millimeters]

Part Weight per unit (gram): 0.1977

TO-92 (92,94,96)

PIN	92		94		96	
	B	F	B	F	B	F
1	E	D	E	D	B	S
2	B	S	C	G	E	D
3	C	G	B	S	C	G





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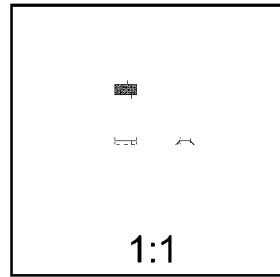
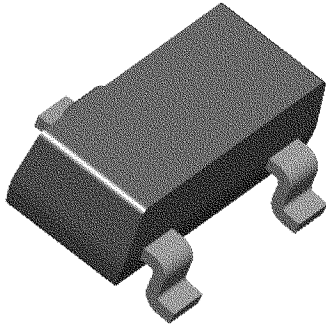
FLAT P, 3/F., EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,  
KWUN TONG, KOWLOON, HONG KONG.

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SOT-23 Package Dimensions



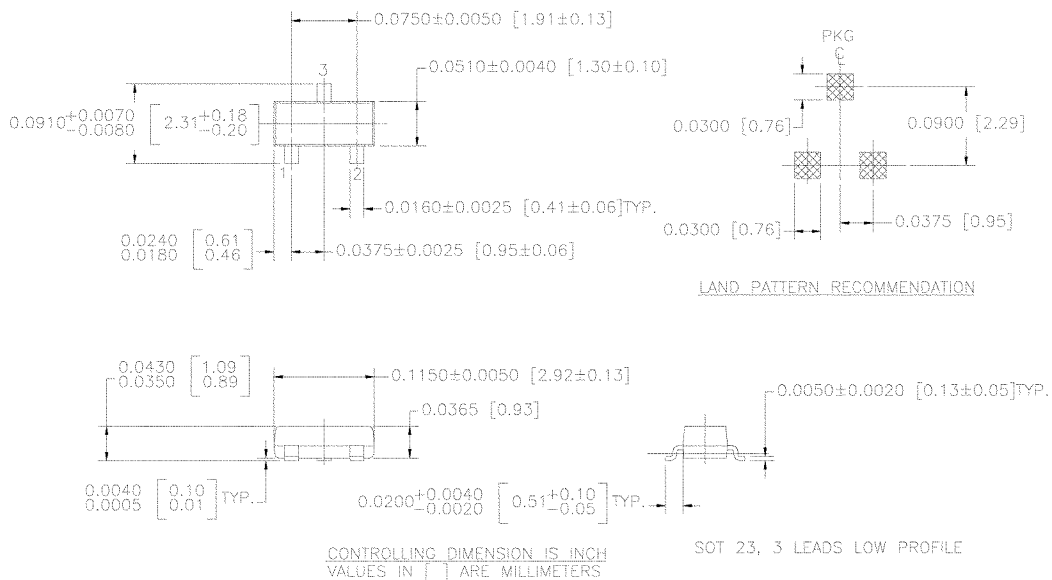
SOT-23 (FS PKG Code 49)



Scale 1:1 on letter size paper

Dimensions shown below are in:  
inches [millimeters]

Part Weight per unit (gram): 0.0082



NOTE : UNLESS OTHERWISE SPECIFIED

- STANDARD LEAD FINISH 150 MICROINCHES / 3.81 MICROMETERS  
MINIMUM TIN / LEAD (SOLDER) ON ALLOY 42
- REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE G, DATED JUL 1993



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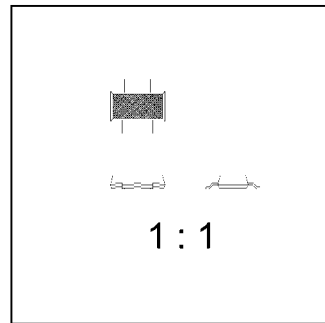
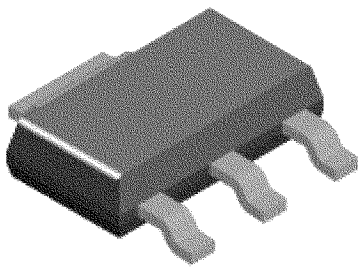
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KWUN TONG, KOWLOON, HONG KONG.

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### SOT-223 Package Dimensions

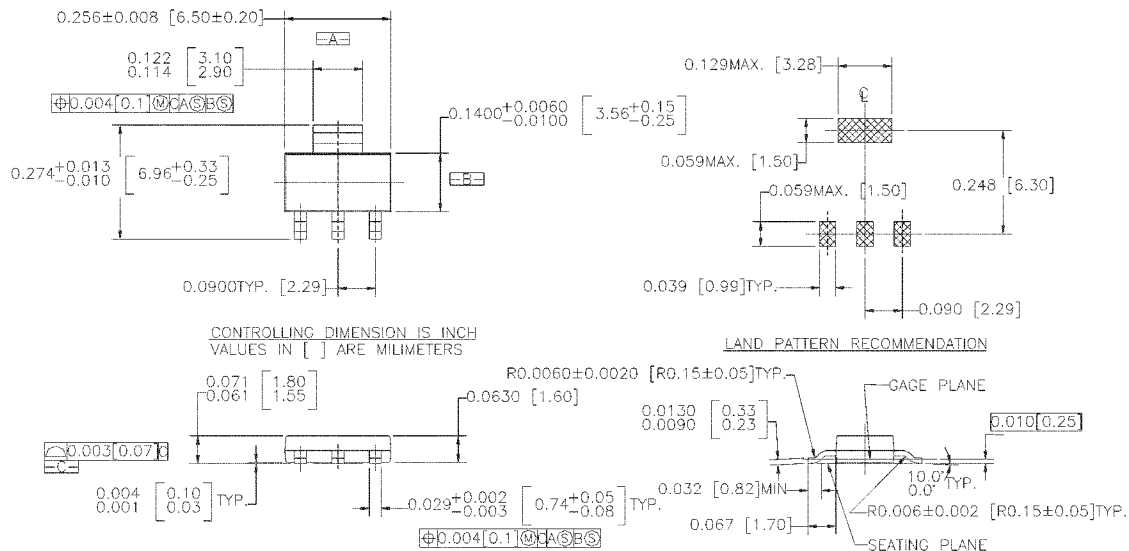


## SOT-223 (FS PKG Code 47)



Scale 1:1 on letter size paper

Part Weight per unit (gram): 0.1246



- NOTES : UNLESS OTHERWISE SPECIFIED
- STANDARD LEAD FINISH TO BE 150 MICRONS/ 3.81 MICROMETERS MINIMUM TIN/LEAD (SOLDER) ON COPPER.
  - REFERENCE JEDEC REGISTRATION TO-261, VARIATION AA, ISSUE A, DATED JAN 1990