

# MMJT9410

## Bipolar Power Transistors

### NPN Silicon

#### Features

- SOT-223 Surface Mount Packaging
- Epoxy Meets UL 94 V-0 @ 0.125 in
- These Devices are Pb-Free and are RoHS Compliant

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector – Emitter Voltage	$V_{CEO}$	30	Vdc
Collector – Base Voltage	$V_{CB}$	45	Vdc
Emitter – Base Voltage	$V_{EB}$	$\pm 6.0$	Vdc
Base Current – Continuous	$I_B$	1.0	Adc
Collector Current – Continuous	$I_C$	3.0	Adc
Collector Current – Peak	$I_{CM}$	5.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 1" sq. (645 sq. mm) Collector pad on FR-4 bd material Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 bd material	$P_D$	3.0 24 1.7  0.75	W mW/ $^\circ\text{C}$ W
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	$-55$ to $+150$	$^\circ\text{C}$
ESD – Human Body Model	HBM	3B	V
ESD – Machine Model	MM	C	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	42	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient on 1" sq. (645 sq. mm) Collector pad on FR-4 bd material	$R_{\theta JA}$	75	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 bd material	$R_{\theta JA}$	165	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	$T_L$	260	$^\circ\text{C}$



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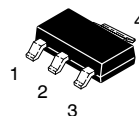
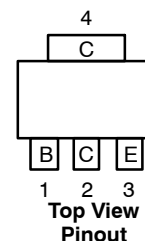
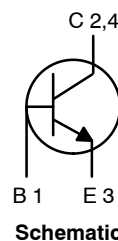
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#### POWER BJT

$I_C = 3.0$  AMPERES

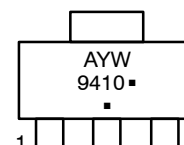
$BV_{CEO} = 30$  VOLTS

$V_{CE(sat)} = 0.2$  VOLTS



SOT-223  
CASE 318E  
STYLE 1

#### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
9410 = Device Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

Device	Package	Shipping†
MMJT9410G	SOT-223 (Pb-Free)	1000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MMJT9410

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0 Adc)	V <sub>CE(sus)</sub>	30	–	–	Vdc
Emitter-Base Voltage (I <sub>E</sub> = 50 μAdc, I <sub>C</sub> = 0 Adc)	V <sub>EBO</sub>	6.0	–	–	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 25 Vdc, R <sub>BE</sub> = 200 Ω) (V <sub>CE</sub> = 25 Vdc, R <sub>BE</sub> = 200 Ω, T <sub>J</sub> = 125°C)	I <sub>CER</sub>	– –	– –	20 200	μAdc
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 Vdc)	I <sub>EBO</sub>	–	–	10	μAdc

### ON CHARACTERISTICS (Note 1)

Collector-Emitter Saturation Voltage (I <sub>C</sub> = 0.8 Adc, I <sub>B</sub> = 20 mAdc) (I <sub>C</sub> = 1.2 Adc, I <sub>B</sub> = 20 mAdc) (I <sub>C</sub> = 3.0 Adc, I <sub>B</sub> = 0.3 Adc)	V <sub>CE(sat)</sub>	– – –	0.105 0.150 –	0.150 0.200 0.450	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 3.0 Adc, I <sub>B</sub> = 0.3 Adc)	V <sub>BE(sat)</sub>	–	–	1.25	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 1.2 Adc, V <sub>CE</sub> = 4.0 Vdc)	V <sub>BE(on)</sub>	–	–	1.10	Vdc
DC Current Gain (I <sub>C</sub> = 0.8 Adc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 1.2 Adc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 3.0 Adc, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	85 80 60	200 – –	– – –	–

### DYNAMIC CHARACTERISTICS

Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0 Adc, f = 1.0 MHz)	C <sub>ob</sub>	–	85	135	pF
Input Capacitance (V <sub>EB</sub> = 8.0 Vdc)	C <sub>ib</sub>	–	200	–	pF
Current-Gain – Bandwidth Product (Note 2) (I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 Vdc, F <sub>test</sub> = 1.0 MHz)	f <sub>T</sub>	–	72	–	MHz

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

2. f<sub>T</sub> = |h<sub>FE</sub>| • f<sub>test</sub>

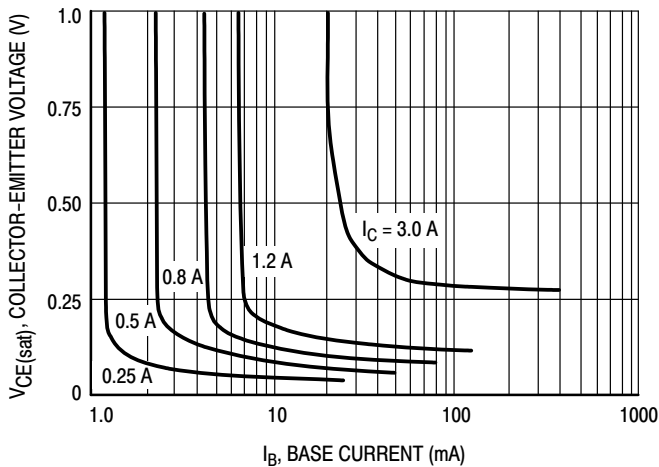


Figure 1. Collector Saturation Region

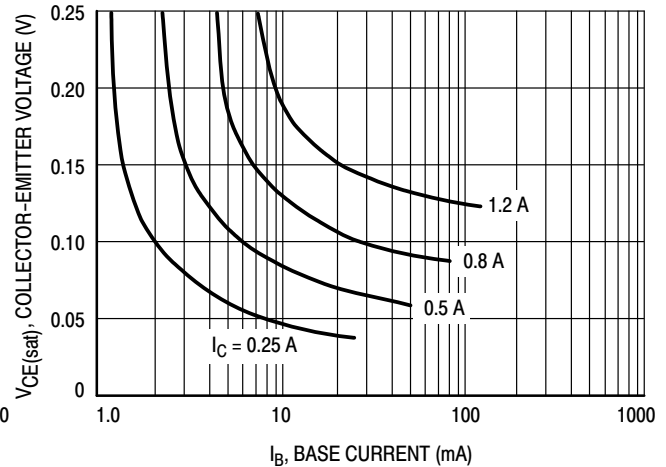


Figure 2. Collector Saturation Region

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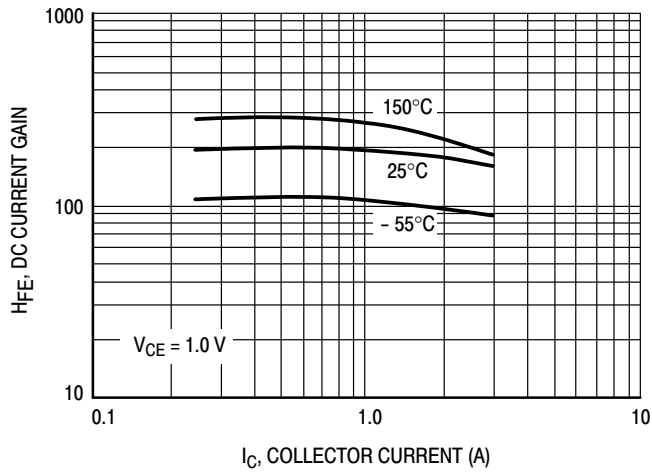


Figure 3. DC Current Gain

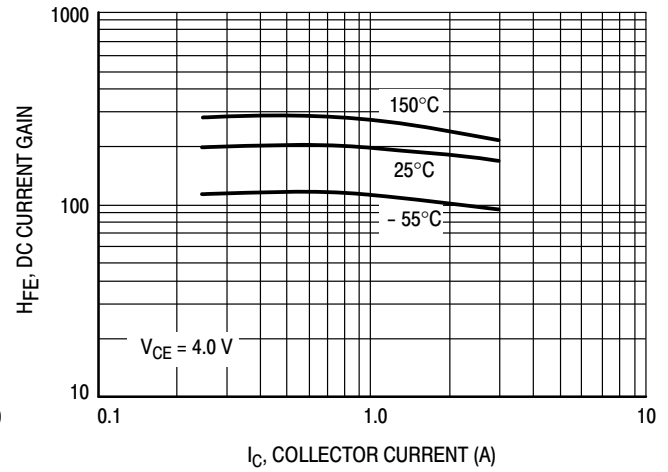


Figure 4. DC Current Gain

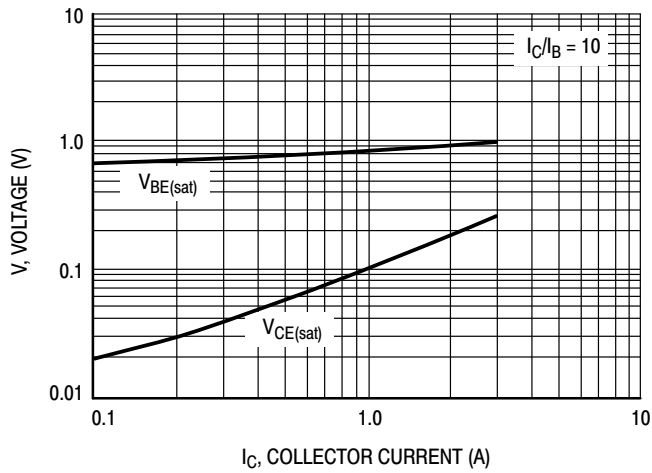


Figure 5. "On" Voltages

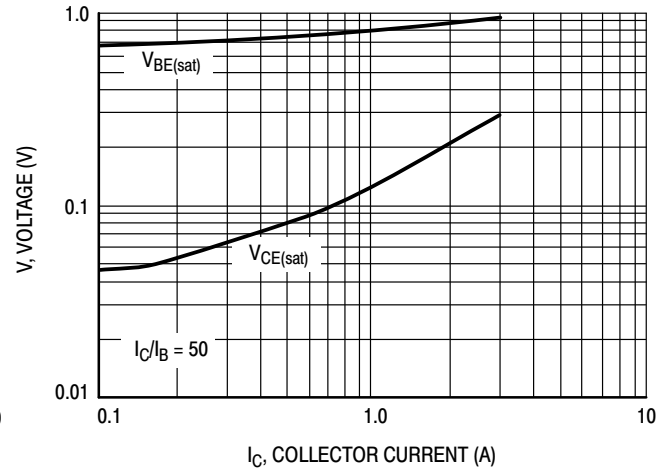


Figure 6. "On" Voltages

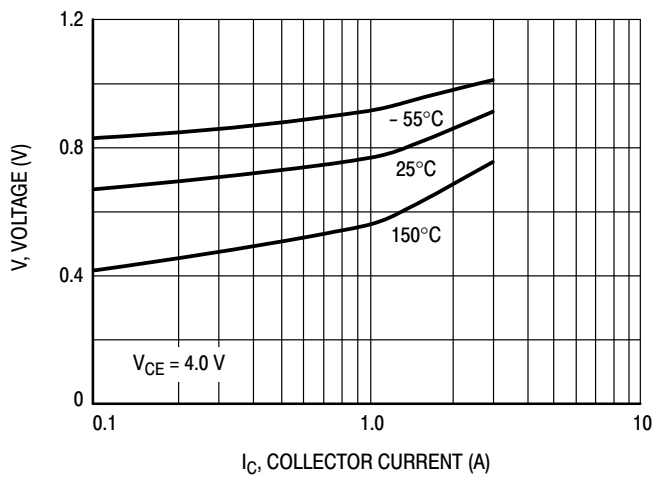


Figure 7.  $V_{BE(on)}$  Voltage

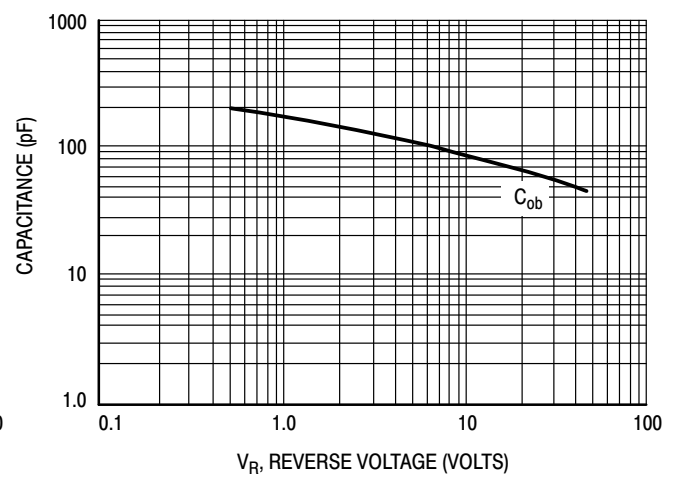


Figure 8. Capacitance

# MMJT9410

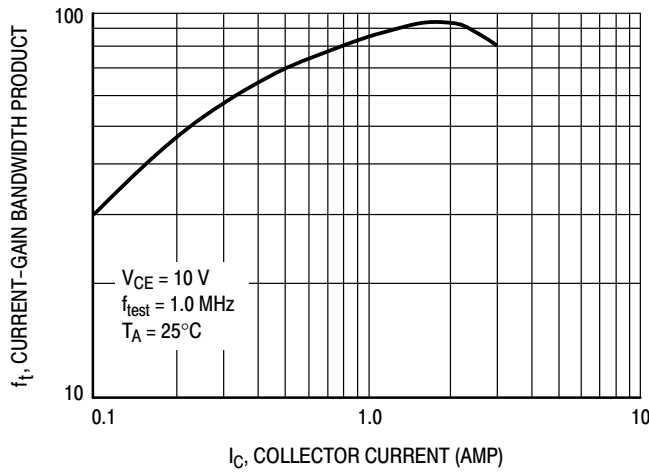


Figure 9. Current-Gain Bandwidth Product

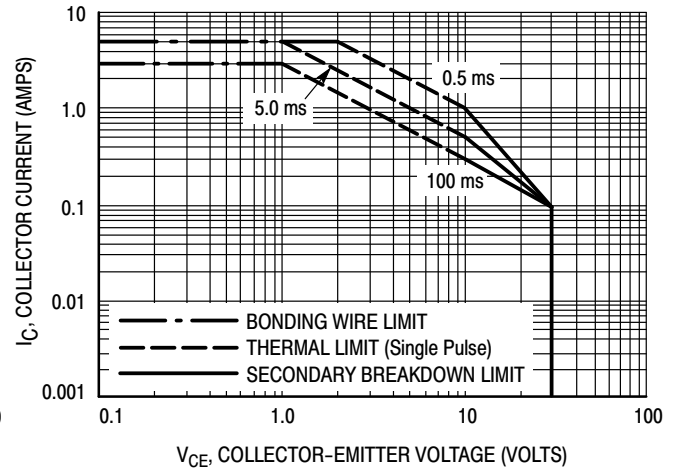


Figure 10. Active Region Safe Operating Area

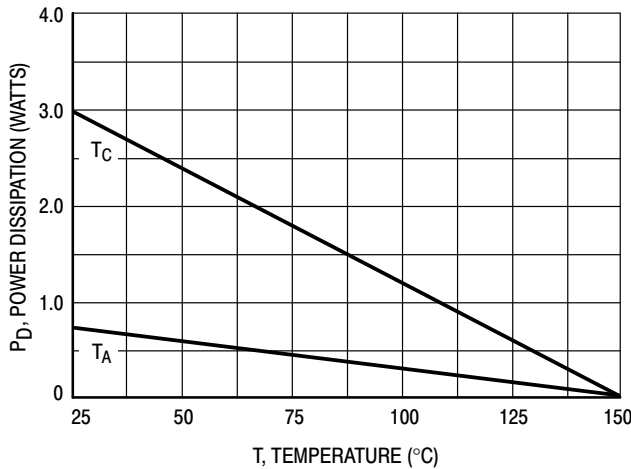


Figure 11. Power Derating

There are two limitations on the power handling ability of a transistor: average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 10 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Secondary breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 12. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

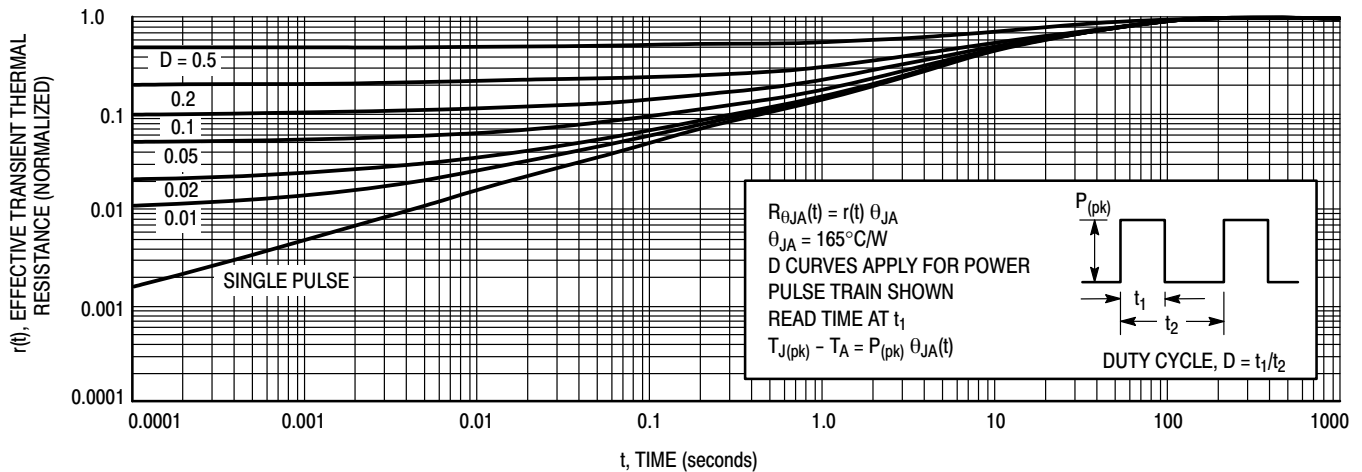


Figure 12. Thermal Response

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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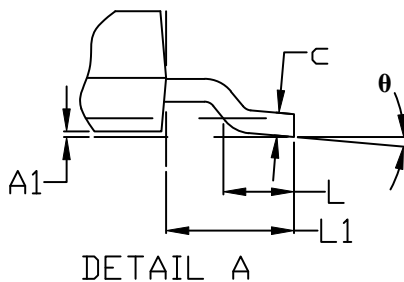
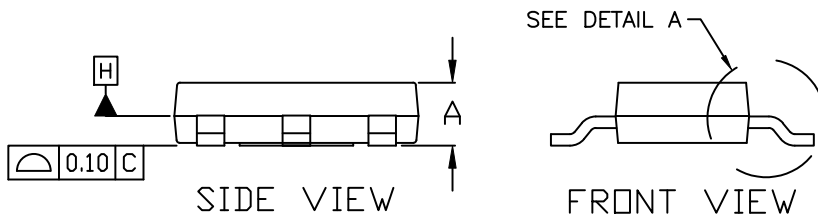
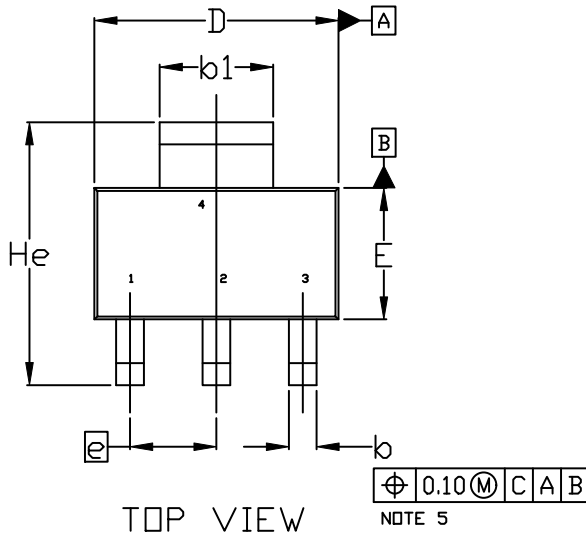
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SCALE 1:1

SOT-223 (TO-261)  
CASE 318E-04  
ISSUE R

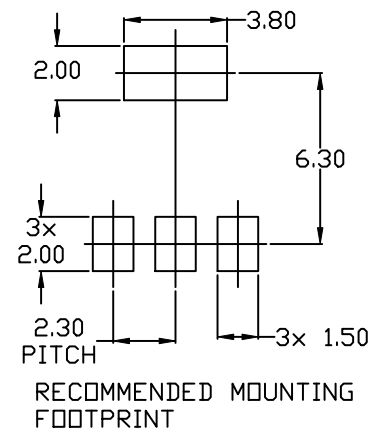
DATE 02 OCT 2018



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.200MM PER SIDE.
4. DATUMS A AND B ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
6. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

MILLIMETERS			
DIM	MIN.	NOM.	MAX.
A	1.50	1.63	1.75
A1	0.02	0.06	0.10
b	0.60	0.75	0.89
b1	2.90	3.06	3.20
c	0.24	0.29	0.35
D	6.30	6.50	6.70
E	3.30	3.50	3.70
e	2.30 BSC		
L	0.20	---	---
L1	1.50	1.75	2.00
He	6.70	7.00	7.30
θ	0°	---	10°



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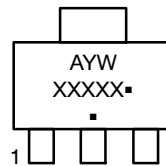
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**SOT-223 (TO-261)**  
**CASE 318E-04**  
**ISSUE R**

DATE 02 OCT 2018

<b>STYLE 1:</b> PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR	<b>STYLE 2:</b> PIN 1. ANODE 2. CATHODE 3. NC 4. CATHODE	<b>STYLE 3:</b> PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN	<b>STYLE 4:</b> PIN 1. SOURCE 2. DRAIN 3. GATE 4. DRAIN	<b>STYLE 5:</b> PIN 1. DRAIN 2. GATE 3. SOURCE 4. GATE
<b>STYLE 6:</b> PIN 1. RETURN 2. INPUT 3. OUTPUT 4. INPUT	<b>STYLE 7:</b> PIN 1. ANODE 1 2. CATHODE 3. ANODE 2 4. CATHODE	<b>STYLE 8:</b> CANCELLED	<b>STYLE 9:</b> PIN 1. INPUT 2. GROUND 3. LOGIC 4. GROUND	<b>STYLE 10:</b> PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE
<b>STYLE 11:</b> PIN 1. MT 1 2. MT 2 3. GATE 4. MT 2	<b>STYLE 12:</b> PIN 1. INPUT 2. OUTPUT 3. NC 4. OUTPUT	<b>STYLE 13:</b> PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR		


**GENERIC  
MARKING DIAGRAM\***



- A = Assembly Location
- Y = Year
- W = Work Week
- XXXXX = Specific Device Code
- = Pb-Free Package

(Note: Microdot may be in either location)  
 \*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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