

## 350mW, PNP Small Signal Transistor

### FEATURES

- AEC-Q101 qualified
- Low power loss, high efficiency
- Ideal for automated placement
- Moisture sensitivity level: level 1, per J-STD-020
- RoHS Compliant
- Halogen-free

### APPLICATIONS

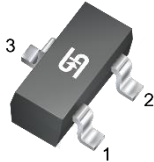
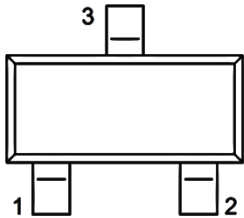
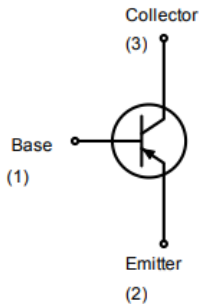
- General switching and amplification

### MECHANICAL DATA

- Case: SOT-23
- Molding compound meets UL 94V-0 flammability rating
- Terminal: Matte tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Weight: 8.00mg (approximately)



| KEY PARAMETERS |            |      |
|----------------|------------|------|
| PARAMETER      | VALUE      | UNIT |
| $V_{CBO}$      | -40        | V    |
| $V_{CEO}$      | -40        | V    |
| $V_{EBO}$      | -5         | V    |
| $I_C$          | -200       | mA   |
| $h_{FE}$       | 300        |      |
| Configuration  | Single die |      |

| PACKAGE: SOT-23                                                                     | PIN CONFIGURATION                                                                   | CIRCUIT DIAGRAM                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |           |             |                  |
|-----------------------------------------------------------------------------|-----------|-------------|------------------|
| PARAMETER                                                                   | SYMBOL    | VALUE       | UNIT             |
| Power dissipation <sup>(1)</sup>                                            | $P_D$     | 350         | mW               |
| Collector-base voltage                                                      | $V_{CBO}$ | -40         | V                |
| Collector-emitter voltage                                                   | $V_{CEO}$ | -40         | V                |
| Emitter-base voltage                                                        | $V_{EBO}$ | -5          | V                |
| Collector current                                                           | $I_C$     | -200        | mA               |
| Junction temperature                                                        | $T_J$     | -55 to +150 | $^\circ\text{C}$ |
| Storage temperature                                                         | $T_{STG}$ | -55 to +150 | $^\circ\text{C}$ |

#### Note:

1. Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint

**THERMAL PERFORMANCE**

| PARAMETER                                             | SYMBOL          | TYP | UNIT |
|-------------------------------------------------------|-----------------|-----|------|
| Junction-to-ambient thermal resistance <sup>(1)</sup> | $R_{\theta JA}$ | 357 | °C/W |

**Thermal Performance Note:**

1. Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint

**ELECTRICAL SPECIFICATIONS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| PARAMETER                            | CONDITIONS                                                                             | SYMBOL        | MIN   | TYP | MAX   | UNIT          |
|--------------------------------------|----------------------------------------------------------------------------------------|---------------|-------|-----|-------|---------------|
| Collector-base breakdown voltage     | $I_C = -10\mu\text{A}, I_E = 0\text{A}$                                                | $V_{(BR)CBO}$ | -40   | -   | -     | V             |
| Collector-emitter breakdown voltage  | $I_C = -1\text{mA}, I_B = 0\text{A}$                                                   | $V_{(BR)CEO}$ | -40   | -   | -     | V             |
| Emitter-base breakdown voltage       | $I_E = -10\mu\text{A}, I_C = 0\text{A}$                                                | $V_{(BR)EBO}$ | -5    | -   | -     | V             |
| Collector-base cut-off current       | $V_{CB} = -40\text{V}, I_E = 0\text{A}$                                                | $I_{CBO}$     | -     | -   | -0.1  | $\mu\text{A}$ |
| Collector cut-off current            | $V_{CE} = -30\text{V}, V_{EB(off)} = -3\text{V}$                                       | $I_{CEX}$     | -     | -   | -50   | nA            |
| Emitter-base cut-off current         | $V_{EB} = -5\text{V}, I_C = 0\text{A}$                                                 | $I_{EBO}$     | -     | -   | -0.1  | $\mu\text{A}$ |
| DC current gain                      | $V_{CE} = -1\text{V}, I_C = -0.1\text{mA}$                                             | $h_{FE}$      | 60    | -   | -     | -             |
|                                      | $V_{CE} = -1\text{V}, I_C = -1\text{mA}$                                               |               | 80    | -   | -     |               |
|                                      | $V_{CE} = -1\text{V}, I_C = -10\text{mA}$                                              |               | 100   | -   | 300   |               |
|                                      | $V_{CE} = -1\text{V}, I_C = -50\text{mA}$                                              |               | 60    | -   | -     |               |
|                                      | $V_{CE} = -1\text{V}, I_C = -100\text{mA}$                                             |               | 30    | -   | -     |               |
| Collector-emitter saturation voltage | $I_C = -10\text{mA}, I_B = -1\text{mA}$                                                | $V_{CE(sat)}$ | -     | -   | -0.25 | V             |
|                                      | $I_C = -50\text{mA}, I_B = -5\text{mA}$                                                |               | -     | -   | -0.40 |               |
| Base-emitter saturation voltage      | $I_C = -10\text{mA}, I_B = -1\text{mA}$                                                | $V_{BE(sat)}$ | -0.65 | -   | -0.85 | V             |
|                                      | $I_C = -50\text{mA}, I_B = -5\text{mA}$                                                |               | -     | -   | -0.95 |               |
| Transition frequency                 | $V_{CE} = -20\text{V}, I_C = -10\text{mA}, f = 100\text{MHz}$                          | $f_T$         | 250   | -   | -     | MHz           |
| Output capacitance                   | $V_{CB} = -5\text{V}, I_E = 0\text{A}, f = 1\text{MHz}$                                | $C_{obo}$     | -     | -   | 4.5   | pF            |
| Input capacitance                    | $V_{EB} = -0.5\text{V}, I_C = 0\text{A}, f = 1\text{MHz}$                              | $C_{ibo}$     | -     | -   | 10    | pF            |
| Delay time                           | $V_{CC} = -3\text{V}, V_{BE} = -0.5\text{V}, I_C = -10\text{mA}, I_{B1} = -1\text{mA}$ | $t_d$         | -     | -   | 35    | ns            |
| Rise time                            |                                                                                        | $t_r$         | -     | -   | 35    | ns            |
| Storage time                         | $V_{CC} = -3\text{V}, I_C = -10\text{mA}, I_{B1} = I_{B2} = -1\text{mA}$               | $t_s$         | -     | -   | 225   | ns            |
| Fall time                            |                                                                                        | $t_f$         | -     | -   | 75    | ns            |

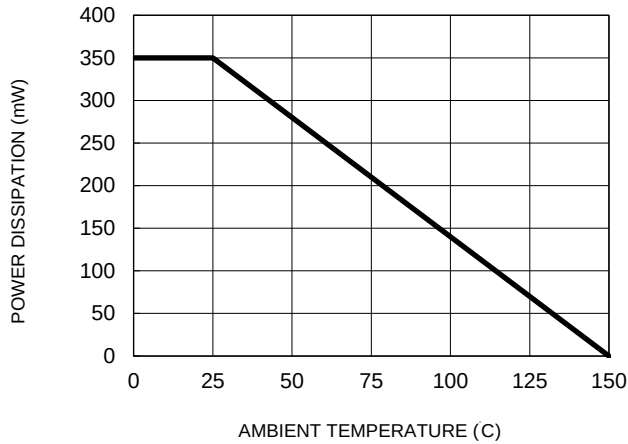
**ORDERING AND MARKING INFORMATION**

| ORDERING CODE | PACKAGE | PACKING                |
|---------------|---------|------------------------|
| MMBT3906H RFG | SOT-23  | 3,000 / 7" Tape & Reel |

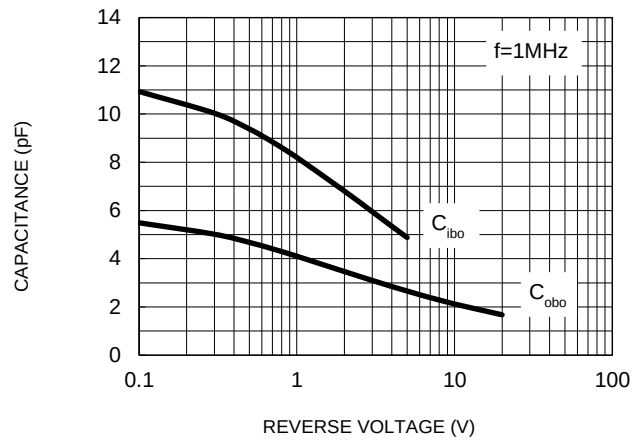
## CHARACTERISTICS CURVES

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

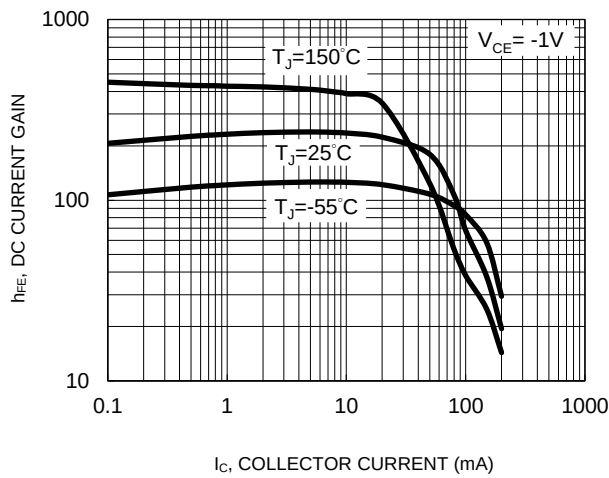
**Fig.1 Power Dissipation Curve**



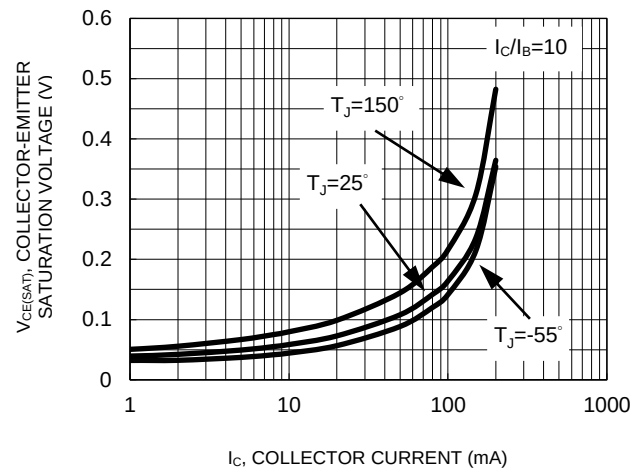
**Fig.2 Typical Capacitance Characteristics**



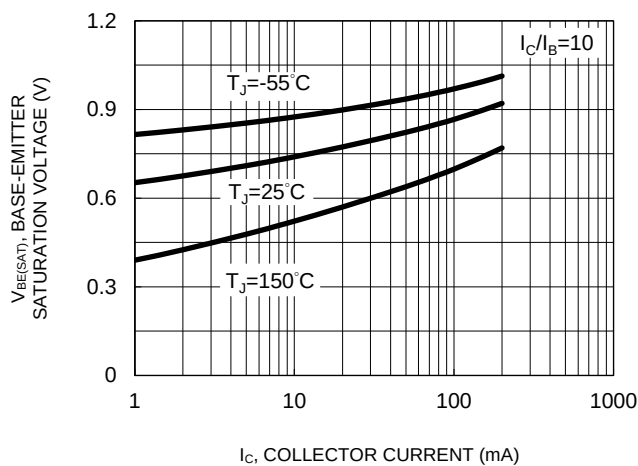
**Fig.3 DC Current Gain vs. Collector Current**



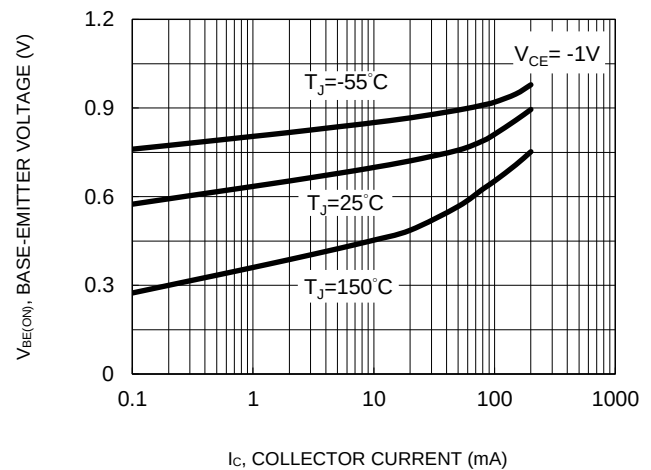
**Fig.4 Collector-Emitter Saturation Voltage vs. Collector Current**



**Fig.5 Base-Emitter Saturation Voltage vs. Collector Current**

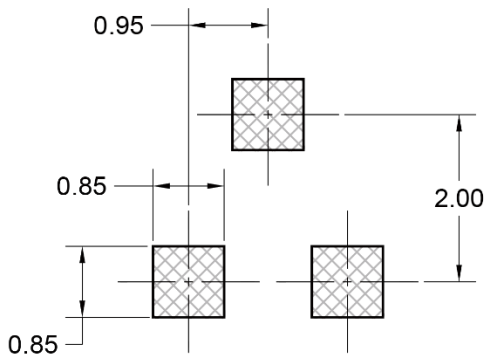
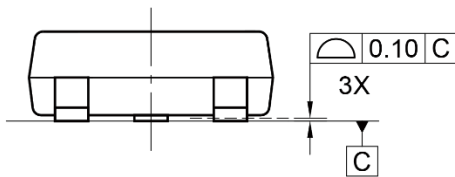
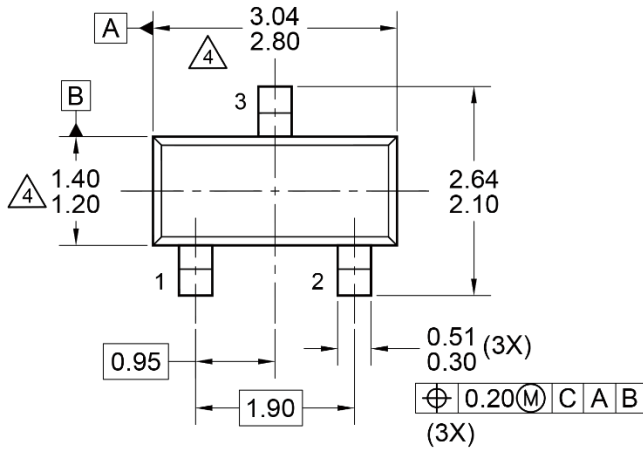


**Fig.6 Base-Emitter Voltage vs. Collector Current**

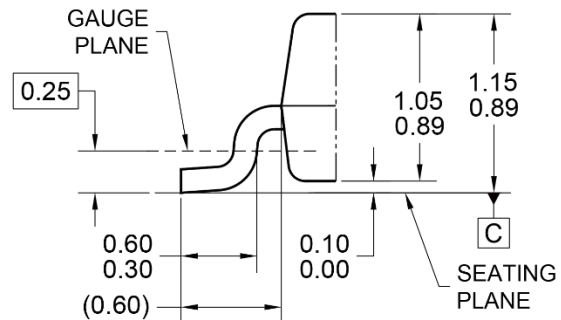
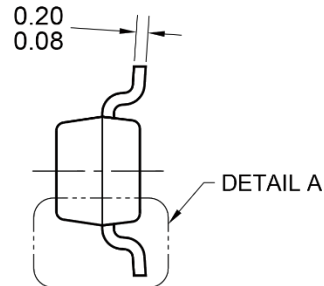


## PACKAGE OUTLINE DIMENSIONS

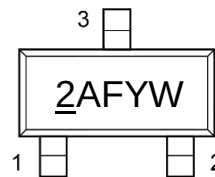
### SOT-23



SUGGESTED PAD LAYOUT



DETAIL A, ROTATED -90°  
(SCALE 2:1)



MARKING DIAGRAM

#### NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEDEC TO-236, ISSUE H, VARIATION AA.

4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

5. DWG NO. REF: HQ2SD07-SOT23JEDEC-104 REV B.

2A = Device marking  
F = Factory code  
Y = Year code  
W = Bi-Week code (A~Z)

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