

# MSKSEMI

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT

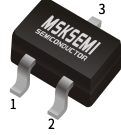
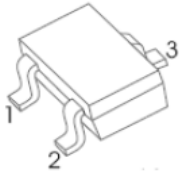


PLED

Product data sheet  
Product data sheet

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## NPN Silicon Epitaxial Planar Transistor



for switching and amplifier applications

- 1. BASE
- 2. EMITTER
- 3. COLLECTOR

SOT-323

### Absolute Maximum Ratings ( $T_a = 25\text{ }^\circ\text{C}$ )

| Parameter                 | Symbol    | Value         | Unit             |
|---------------------------|-----------|---------------|------------------|
| Collector Base Voltage    | $V_{CBO}$ | 60            | V                |
| Collector Emitter Voltage | $V_{CEO}$ | 40            | V                |
| Emitter Base Voltage      | $V_{EBO}$ | 6             | V                |
| Collector Current         | $I_C$     | 200           | mA               |
| Total Power Dissipation   | $P_{tot}$ | 200           | mW               |
| Junction Temperature      | $T_j$     | 150           | $^\circ\text{C}$ |
| Storage Temperature Range | $T_{stg}$ | - 55 to + 150 | $^\circ\text{C}$ |

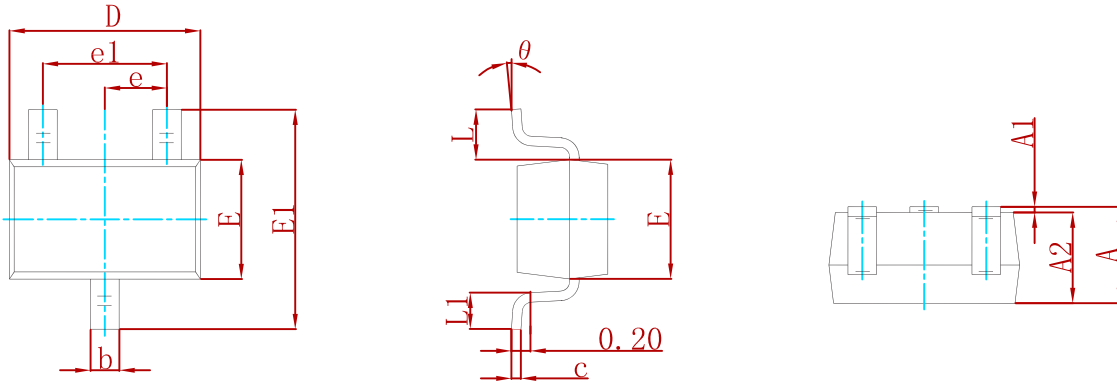
### CLASSIFICATION OF $h_{FE}$

|                |           |
|----------------|-----------|
| <b>RANGE</b>   | 100-300   |
| <b>MARKING</b> | <b>AM</b> |
|                |           |

**Characteristics at  $T_a = 25\text{ }^\circ\text{C}$** 

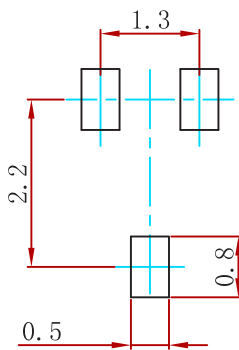
| Parameter  | Symbol        | Min.      | Max.         | Unit |
|--|---------------|-----------|--------------|------|
| DC Current Gain  |               |           |              |      |
| at $V_{CE} = 1\text{ V}$ , $I_C = 0.1\text{ mA}$   | $h_{FE}$      | 40        | -            | -    |
| at $V_{CE} = 1\text{ V}$ , $I_C = 1\text{ mA}$   | $h_{FE}$      | 70        | -            | -    |
| at $V_{CE} = 1\text{ V}$ , $I_C = 10\text{ mA}$  | $h_{FE}$      | 100       | 300          | -    |
| at $V_{CE} = 1\text{ V}$ , $I_C = 50\text{ mA}$  | $h_{FE}$      | 60        | -            | -    |
| at $V_{CE} = 1\text{ V}$ , $I_C = 100\text{ mA}$   | $h_{FE}$      | 30        | -            | -    |
| Collector Emitter Cutoff Current<br>at $V_{CE} = 30\text{ V}$  | $I_{CES}$     | -         | 50           | nA   |
| Emitter Base Cutoff Current<br>at $V_{EB} = 3\text{ V}$  | $I_{EBO}$     | -         | 50           | nA   |
| Collector Base Breakdown Voltage<br>at $I_C = 10\text{ }\mu\text{A}$   | $V_{(BR)CBO}$ | 60        | -            | V    |
| Collector Emitter Breakdown Voltage<br>at $I_C = 1\text{ mA}$  | $V_{(BR)CEO}$ | 40        | -            | V    |
| Emitter Base Breakdown Voltage<br>at $I_E = 10\text{ }\mu\text{A}$   | $V_{(BR)EBO}$ | 6         | -            | V    |
| Collector Emitter Saturation Voltage<br>at $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$<br>at $I_C = 50\text{ mA}$ , $I_B = 5\text{ mA}$ | $V_{CE(sat)}$ | -<br>-    | 0.2<br>0.3   | V    |
| Base Emitter Saturation Voltage<br>at $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$<br>at $I_C = 50\text{ mA}$ , $I_B = 5\text{ mA}$      | $V_{BE(sat)}$ | 0.65<br>- | 0.85<br>0.95 | V    |
| Transition Frequency<br>at $V_{CE} = 20\text{ V}$ , $-I_E = 10\text{ mA}$ , $f = 100\text{ MHz}$                                       | $f_T$         | 300       | -            | MHz  |
| Collector Output Capacitance<br>at $V_{CB} = 10\text{ V}$ , $f = 100\text{ KHz}$   | $C_{ob}$      | -         | 4            | pF   |
| Delay Time<br>at $V_{CC} = 3\text{ V}$ , $V_{BE(OFF)} = 0.5\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = 1\text{ mA}$                  | $t_d$         | -         | 35           | ns   |
| Rise Time<br>at $V_{CC} = 3\text{ V}$ , $V_{BE(OFF)} = 0.5\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = 1\text{ mA}$                   | $t_r$         | -         | 35           | ns   |
| Storage Time<br>at $V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = -I_{B2} = 1\text{ mA}$                                     | $t_{stg}$     | -         | 200          | ns   |
| Fall Time<br>at $V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = -I_{B2} = 1\text{ mA}$  | $t_f$         | -         | 50           | ns   |

**PACKAGE MECHANICAL DATA**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.100 | 0.035                | 0.043 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.000 | 0.035                | 0.039 |
| b      | 0.200                     | 0.400 | 0.008                | 0.016 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 2.000                     | 2.200 | 0.079                | 0.087 |
| E      | 1.150                     | 1.350 | 0.045                | 0.053 |
| E1     | 2.150                     | 2.450 | 0.085                | 0.096 |
| e      | 0.650 TYP                 |       | 0.026 TYP            |       |
| e1     | 1.200                     | 1.400 | 0.047                | 0.055 |
| L      | 0.525 REF                 |       | 0.021 REF            |       |
| L1     | 0.260                     | 0.460 | 0.010                | 0.018 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

**Suggested Pad Layout**



Note:  
 1. Controlling dimension: in millimeters.  
 2. General tolerance: ±0.05mm.  
 3. The pad layout is for reference purposes only.

**REEL SPECIFICATION**

| P/N       | PKG     | QTY  |
|-----------|---------|------|
| MMBT3904W | SOT-323 | 3000 |

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