



**SO2222A**

## SMALL SIGNAL NPN TRANSISTOR

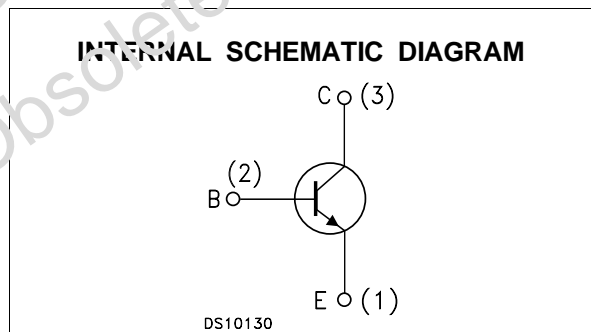
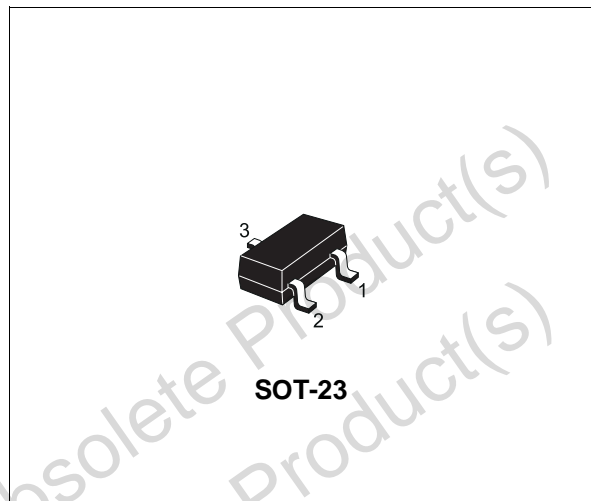
PRELIMINARY DATA

| Type    | Marking |
|---------|---------|
| SO2222A | N20     |

- SILICON EPITAXIAL PLANAR NPN TRANSISTOR
- MINIATURE SOT-23 PLASTIC PACKAGE FOR SURFACE MOUNTING CIRCUITS
- TAPE & REEL PACKING
- THE PNP COMPLEMENTARY TYPE IS SO2907A

### APPLICATIONS

- WELL SUITABLE FOR PORTABLE EQUIPMENT
- SMALL LOAD SWITCH TRANSISTOR WITH HIGH GAIN AND LOW SATURATION VOLTAGE



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                               | Value      | Unit |
|-----------|---|------------|------|
| $V_{CBO}$ | Collector-Emitter Voltage ( $I_E = 0$ ) | 75         | V    |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B = 0$ ) | 40         | V    |
| $V_{EBO}$ | Emitter-Base Voltage ( $I_C = 0$ )      | 6          | V    |
| $I_C$     | Collector Current                       | 0.6        | A    |
| $I_{CM}$  | Collector Peak Current ( $t_p < 5$ ms)  | 0.8        | A    |
| $P_{tot}$ | Total Dissipation at $T_{amb} = 25$ °C  | 350        | mW   |
| $T_{stg}$ | Storage Temperature                     | -65 to 150 | °C   |
| $T_j$     | Max. Operating Junction Temperature     | 150        | °C   |

# SO2222A

## THERMAL DATA

|                        |                                     |     |       |      |
|------------------------|-------------------------------------|-----|-------|------|
| R <sub>thj-amb</sub> • | Thermal Resistance Junction-Ambient | Max | 357.1 | °C/W |
|------------------------|-------------------------------------|-----|-------|------|

• Device mounted on a PCB area of 1 cm<sup>2</sup>.

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

| Symbol                 | Parameter  | Test Conditions  | Min.                              | Typ. | Max.       | Unit                                 |
|------------------------|--|--|-----------------------------------|------|------------|--------------------------------------|
| I <sub>CEX</sub>       | Collector Cut-off Current (V <sub>BE</sub> = -3 V)       | V <sub>CE</sub> = 60 V   |                                   |      | 10         | nA                                   |
| I <sub>BEX</sub>       | Base Cut-off Current (V <sub>BE</sub> = -3 V)            | V <sub>CE</sub> = 60 V   |                                   |      | 20         | nA                                   |
| I <sub>CBO</sub>       | Collector Cut-off Current (I <sub>E</sub> = 0)           | V <sub>CB</sub> = 75 V<br>V <sub>CB</sub> = 75 V<br>T <sub>j</sub> = 150 °C  |                                   |      | 10<br>10   | nA<br>μA                             |
| I <sub>EBO</sub>       | Emitter Cut-off Current (I <sub>C</sub> = 0)             | V <sub>EB</sub> = 3 V  |                                   |      | 15         | nA                                   |
| V <sub>(BR)CEO</sub> * | Collector-Emitter Breakdown Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 10 mA   | 40                                |      |            | V                                    |
| V <sub>(BR)CBO</sub>   | Collector-Base Breakdown Voltage (I <sub>E</sub> = 0)    | I <sub>C</sub> = 10 μA   | 75                                |      |            | V                                    |
| V <sub>(BR)EBO</sub>   | Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)      | I <sub>E</sub> = 10 μA   | 6                                 |      |            | V                                    |
| V <sub>CE(sat)</sub> * | Collector-Emitter Saturation Voltage                     | I <sub>C</sub> = 150 mA I <sub>B</sub> = 15 mA<br>I <sub>C</sub> = 500 mA I <sub>B</sub> = 50 mA   |                                   |      | 0.3<br>1   | V<br>V                               |
| V <sub>BE(sat)</sub> * | Collector-Base Saturation Voltage                        | I <sub>C</sub> = 150 mA I <sub>B</sub> = 15 mA<br>I <sub>C</sub> = 500 mA I <sub>B</sub> = 50 mA   | 0.6                               |      | 1.2<br>2   | V<br>V                               |
| h <sub>FE</sub> *      | DC Current Gain  | I <sub>C</sub> = 0.1 mA V <sub>CE</sub> = 10 V<br>I <sub>C</sub> = 1 mA V <sub>CE</sub> = 10 V<br>I <sub>C</sub> = 10 mA V <sub>CE</sub> = 10 V<br>I <sub>C</sub> = 150 mA V <sub>CE</sub> = 10 V<br>I <sub>C</sub> = 150 mA V <sub>CE</sub> = 1 V<br>I <sub>C</sub> = 500 mA V <sub>CE</sub> = 10 V | 35<br>50<br>75<br>100<br>50<br>40 |      | 300        |                                      |
| f <sub>T</sub>         | Transition Frequency                                     | I <sub>C</sub> = 20 mA V <sub>CE</sub> = 20V f = 100MHz  |                                   | 270  |            | MHz                                  |
| C <sub>CB0</sub>       | Collector-Base Capacitance                               | I <sub>E</sub> = 0 V <sub>CB</sub> = 10 V f = 1 MHz  |                                   | 4    | 8          | pF                                   |
| C <sub>EBO</sub>       | Emitter-Base Capacitance                                 | I <sub>C</sub> = 0 V <sub>EB</sub> = 0.5 V f = 1MHz  |                                   | 20   | 25         | pF                                   |
| NF                     | Noise Figure   | I <sub>C</sub> = 0.1 mA V <sub>CE</sub> = 10 V f = 1 KHz<br>Δf = 200 Hz R <sub>G</sub> = 1 KΩ  |                                   | 4    |            | dB                                   |
| h <sub>ie</sub> *      | Input Impedance  | V <sub>CE</sub> = 10 V I <sub>C</sub> = 1 mA f = 1 KHz<br>V <sub>CE</sub> = 10 V I <sub>C</sub> = 10 mA f = 1 KHz  | 2<br>0.25                         |      | 8<br>1.25  | KΩ<br>KΩ                             |
| h <sub>re</sub> *      | Reverse Voltage Ratio                                    | V <sub>CE</sub> = 10 V I <sub>C</sub> = 1 mA f = 1 KHz<br>V <sub>CE</sub> = 10 V I <sub>C</sub> = 10 mA f = 1 KHz  |                                   |      | 8<br>4     | 10 <sup>-4</sup><br>10 <sup>-4</sup> |
| h <sub>fe</sub> *      | Small Signal Current Gain                                | V <sub>CE</sub> = 10 V I <sub>C</sub> = 1 mA f = 1 KHz<br>V <sub>CE</sub> = 10 V I <sub>C</sub> = 10 mA f = 1 KHz  | 50<br>75                          |      | 300<br>375 |                                      |
| h <sub>oe</sub> *      | Output Admittance  | V <sub>CE</sub> = 10 V I <sub>C</sub> = 1 mA f = 1 KHz<br>V <sub>CE</sub> = 10 V I <sub>C</sub> = 10 mA f = 1 KHz  | 5<br>25                           |      | 35<br>200  | μS<br>μS                             |

\* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

**ELECTRICAL CHARACTERISTICS** (Continued)

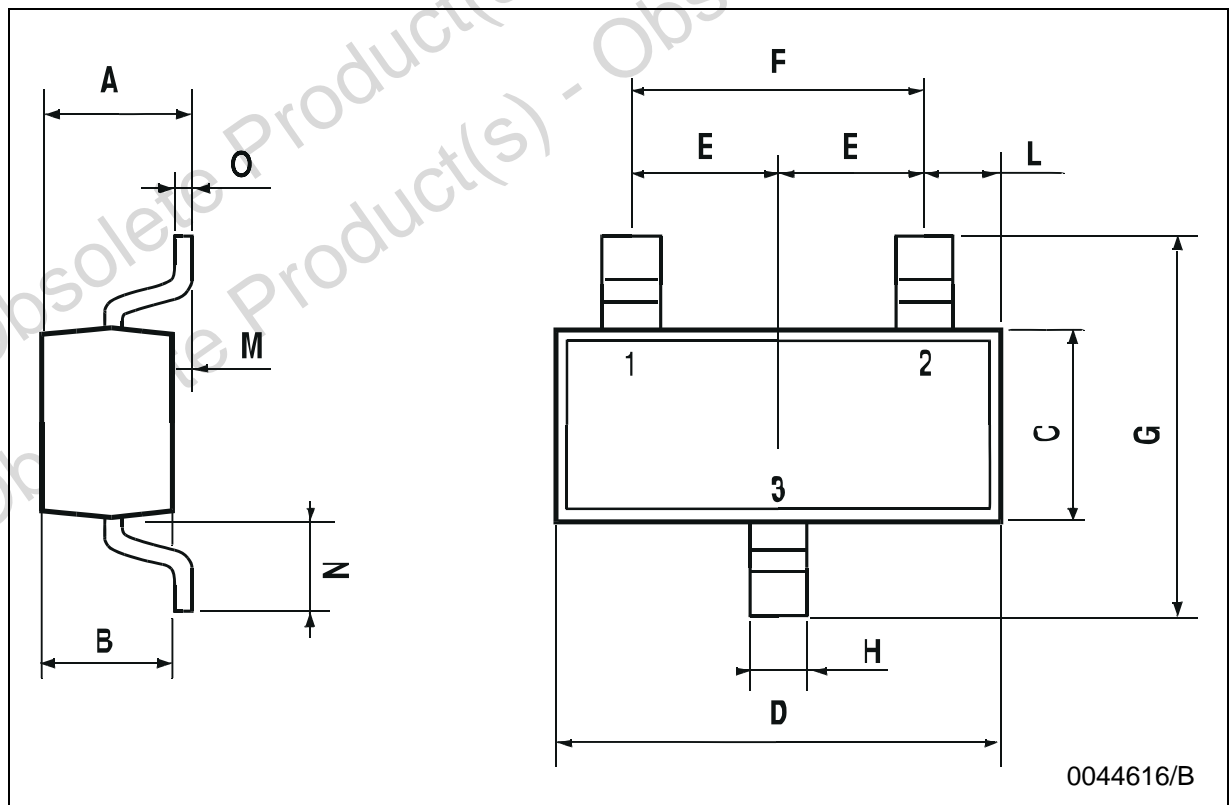
| Symbol | Parameter    | Test Conditions  | Min. | Typ. | Max. | Unit |
|--------|--------------|--|------|------|------|------|
| $t_d$  | Delay Time   | $I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$               |      | 5    | 10   | ns   |
| $t_r$  | Rise Time    | $V_{CC} = 30 \text{ V}$                                    |      | 12   | 25   | ns   |
| $t_s$  | Storage Time | $I_C = 150 \text{ mA}$ $I_{B1} = - I_{B2} = 15 \text{ mA}$ |      | 185  | 225  | ns   |
| $t_f$  | Fall Time    | $V_{CC} = 30 \text{ V}$                                    |      | 24   | 60   | ns   |

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2 \%$

Obsolete Product(s) - Obsolete Product(s)  
 Obsolete Product(s) - Obsolete Product(s)

**SOT-23 MECHANICAL DATA**

| DIM. | mm   |      |      | mils  |      |      |
|------|------|------|------|-------|------|------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP. | MAX. |
| A    | 0.85 |      | 1.1  | 33.4  |      | 43.3 |
| B    | 0.65 |      | 0.95 | 25.6  |      | 37.4 |
| C    | 1.20 |      | 1.4  | 47.2  |      | 55.1 |
| D    | 2.80 |      | 3    | 110.2 |      | 118  |
| E    | 0.95 |      | 1.05 | 37.4  |      | 41.3 |
| F    | 1.9  |      | 2.05 | 74.8  |      | 80.7 |
| G    | 2.1  |      | 2.5  | 82.6  |      | 98.4 |
| H    | 0.38 |      | 0.48 | 14.9  |      | 18.8 |
| L    | 0.3  |      | 0.6  | 11.8  |      | 23.6 |
| M    | 0    |      | 0.1  | 0     |      | 3.9  |
| N    | 0.3  |      | 0.65 | 11.8  |      | 25.6 |
| O    | 0.09 |      | 0.17 | 3.5   |      | 6.7  |



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