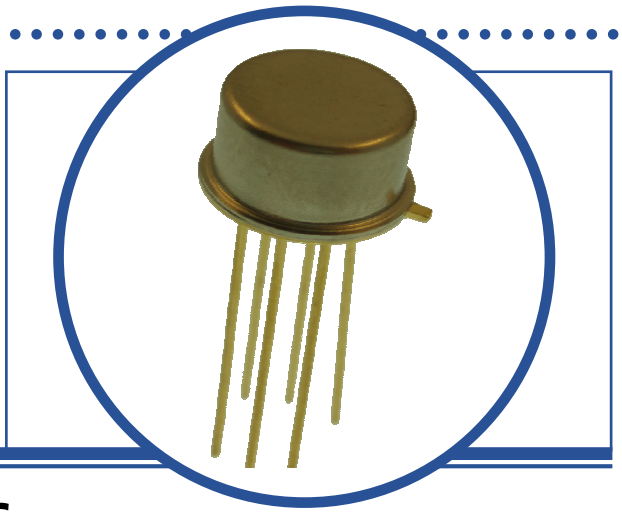
# SILICON DUAL MATCHED PNP TRANSISTORS

TT electronics
Semelab Limited

## 2N3810

- Matched Dual Transistor.
- Hermetic Metal TO78 Package.
- Suitable For High Gain, Low Noise, Differential Amplifier, Applications.
- Screening Options Available



## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise stated)

| | | | Each Side | Total Device |
|---|---|---|---|---|
| $V_{CBO}$ | Collector – Base Voltage | | -60V | |
| $V_{CEO}$ | Collector – Emitter Voltage | | -60V | |
| $V_{EBO}$ | Emitter – Base Voltage | | -5V | |
| $I_C$ | Continuous Collector Current | | -50mA | |
| $P_D$ | Total Power Dissipation at | $T_A$ = 25°C | 500mW | 600mW(1) |
| | | Derate Above 25°C | 2.86mW/°C | 3.43mW/°C |
| $T_J$ | Junction Temperature Range | | -65 to +200°C | |
| $T_{stg}$ | Storage Temperature Range | | -65 to +200°C | |

### THERMAL PROPERTIES (Each Side)

| Symbols | Parameters | Min. | 1Typ. | Max. | Units |
|---|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction To Ambient | | | 350 | °C/W |

Notes
(1) Total device power dissipation limited by package.



SEMELAB
A subsidiary of TT electronics plc.

**Semelab Limited** Coventry Road, Lutterworth, Leicestershire, LE17 4JB
Telephone +44 (0) 1455 556565 Fax +44 (0) 1455 552612 Email: sales@semelab-tt.com Website: http://www.semelab-tt.com

# SILICON DUAL MATCHED PNP TRANSISTORS 2N3810

TT electronics
Semelab Limited

## ELECTRICAL CHARACTERISTICS (Each Side, $T_A$ = 25°C unless otherwise stated)

| Symbols | Parameters | Test Conditions | | Min. | Typ | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C$ = -10µA | $I_E$ = 0 | -60 | | | V |
| $V_{(BR)CEO}$ (2) | Collector-Emitter Breakdown Voltage | $I_C$ = -10mA | $I_B$ = 0 | -60 | | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E$ = -10µA | $I_C$ = 0 | -5 | | | V |
| $I_{CBO}$ | Collector-Cut-Off Current | $V_{CB}$ = -50V | $I_E$ = 0 | | | -10 | nA |
| | | | $T_A$ = 150°C | | | -10 | µA |
| $I_{EBO}$ | Emitter-Cut-Off Current | $V_{EB}$ = -4V | $I_C$ = 0 | | | -20 | nA |
| $h_{FE}$ (2) | Forward-current transfer ratio | $I_C$ = -10µA | $V_{CE}$ = -5V | 100 | | | |
| | | $I_C$ = -100µA | $V_{CE}$ = -5V | 150 | | 450 | |
| | | | $T_A$ = -55°C | 60 | | | |
| | | $I_C$ = -500µA | $V_{CE}$ = -5V | 150 | | 450 | |
| | | $I_C$ = -1.0mA | $V_{CE}$ = -5V | 150 | | 450 | |
| | | $I_C$ = -10mA | $V_{CE}$ = -5V | 125 | | | |
| $V_{BE}$ (2) | Base-Emitter Voltage | $I_C$ = -100µA | $V_{CE}$ = -5V | | | -0.7 | V |
| $V_{BE(sat)}$ (2) | Base-Emitter Saturation Voltage | $I_C$ = -100µA | $I_B$ = -10µA | | | -0.7 | V |
| | | $I_C$ = -1.0mA | $I_B$ = = -100µA | | | -0.8 | V |
| $V_{CE(sat)}$ (2) | Collector-Emitter Saturation Voltage | $I_C$ = -100µA | $I_B$ = -10µA | | | -0.2 | |
| | | $I_C$ = -1.0mA | $I_B$ = = -100µA | | | -0.25 | |

## ELECTRICAL MATCHING CHARACTERISTICS ($T_A$ = 25°C unless otherwise stated)

| Symbols | Parameters | Test Conditions | | Min. | Typ | Max. | Units |
|---|---|---|---|---|---|---|---|
| $\frac{h_{FE1}}{h_{FE2}}$ (3) | Forward-current transfer ratio (gain ratio) | $I_C$ = -100µA | $V_{CE}$ = -5V | 0.9 | | 1.0 | |
| $\lvert V_{BE1}\text{-}V_{BE2}\rvert$ | Base-Emitter Voltage Differential | $V_{CE}$ = -5V<br>$I_C$ = -10µA to -10mA | | | | 5 | mV |
| | | $V_{CE}$ = -5V | $I_C$ = -100µA | | | 3 | mV |
| $\lvert\Delta(V_{BE1}\text{-}V_{BE2})\Delta T_A\rvert$ | Base-Emitter Voltage Differential Change Due To Temperature | $V_{CE}$ = -5V<br>$T_{A1}$ = 25°C | $I_C$ = -100µA<br>$T_{A2}$ = -55°C | | | 0.8 | mV |
| | | $V_{CE}$ = -5V<br>$T_{A1}$ = 25°C | $I_C$ = -100µA<br>$T_{A2}$ = 125°C | | | 1.0 | mV |

**Notes**
(2) Pulse Width ≤ 300us, δ ≤ 2%
(3) The lower of the two readings is taken as $h_{FE1}$

# SILICON DUAL MATCHED PNP TRANSISTORS 2N3810

TT electronics
Semelab Limited

## DYNAMIC CHARACTERISTICS

| Symbols | Parameters | Test Conditions | | Min. | Typ | Max. | Units |
|---|---|---|---|---|---|---|---|
| $\|h_{fe}\|$ | Small signal forward-current transfer ratio | $I_C$ = -500µA $V_{CE}$ = -5V<br>f = 30MHz | | 1.0 | | | |
| | | $I_C$ = -1.0mA $V_{CE}$ = -5V<br>f = 100MHz | | 1.0 | | 5 | |
| $C_{obo}$ | Output Capacitance | $I_E$ = 0 $V_{CB}$ = -5V<br>f = 1.0MHz | | | | 4 | pF |
| $C_{ibo}$ | Input Capacitance | $I_C$ = 0 $V_{EB}$ = -0.5V<br>f = 1.0MHz | | | | 15 | |
| $h_{ie}$ (4) | Input Impedance | $I_C$ = -1.0mA $V_{CE}$ = -10V<br>f = 1.0KHz | | 3 | | 30 | KΩ |
| $h_{oe}$ (4) | Output Admittance | | | 5 | | 60 | µhmos |
| $h_{re}$ (4) | Voltage Feedback Ratio | | | | | 25 | x $10^{-4}$ |
| $h_{fe}$ | Small Signal Current Gain | | | 150 | | 600 | |
| $N_F$ (4) | Noise Figure | $V_{CE}$ = -10V<br>$I_C$ = -100µA<br>$R_G$ = 3KΩ | f=100Hz<br>BW=20Hz | | | 7 | dB |
| | | | f=1.0KHz<br>BW=200Hz | | | 3 | |
| | | | f=10KHz<br>BW=2KHz | | | 2.5 | |
| | Noise Figure (Broadband) | | f=10Hz to 15.7KHz | | | 3.5 | |

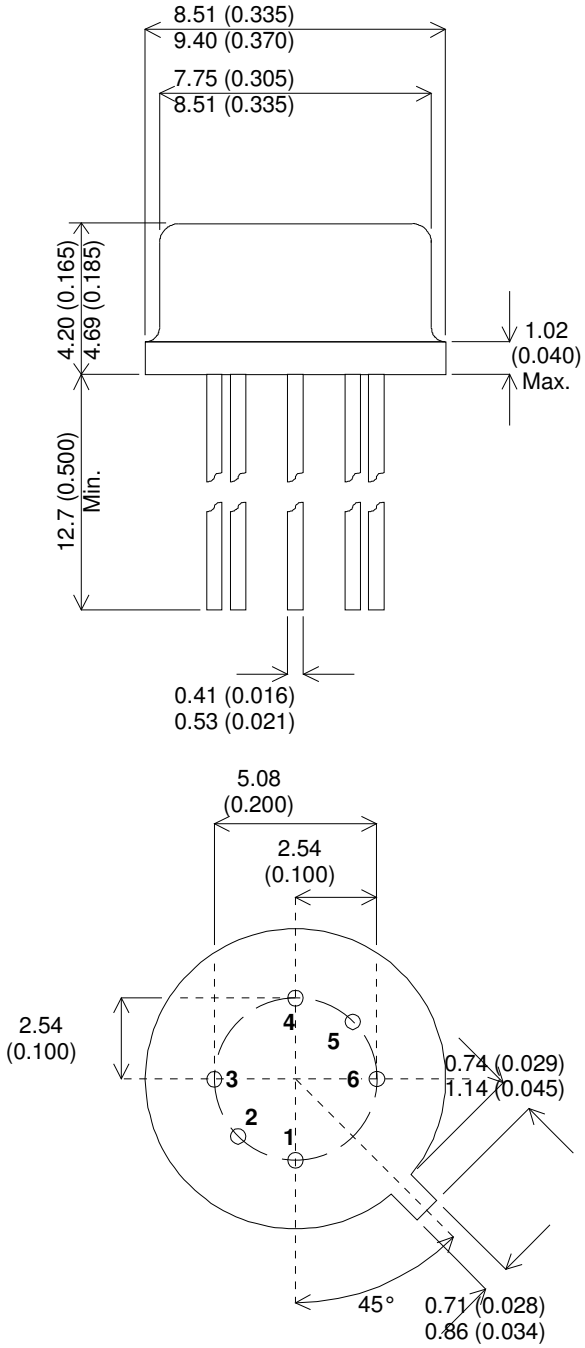
**Notes**
(4) By design only, not a production test.

# SILICON DUAL MATCHED PNP TRANSISTORS 2N3810

Semelab Limited

## MECHANICAL DATA

Dimensions in mm (inches)




**TO-78 (MO-002AG)**

**Underside View**

| | |
|---|---|
| Pin 1 – Collector 1 | Pin 4 – Emitter 2 |
| Pin 2 – Base 1 | Pin 5 – Base 2 |
| Pin 3 – Emitter 1 | Pin 6 – Collector 2 |