

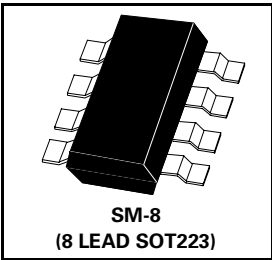
SM-8 BIPOLAR TRANSISTOR H-BRIDGE

ZHB6792

PRELIMINARY DATA SHEET ISSUE A MAY 1998

FEATURES

- * Compact package
- * Low on state losses
- * Low drive requirements
- * Operates up to 70V supply
- * 1 Amp continuous rating

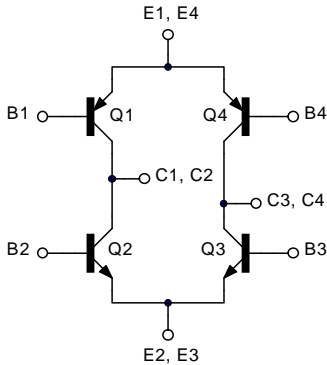


PARTMARKING DETAIL – ZHB6792

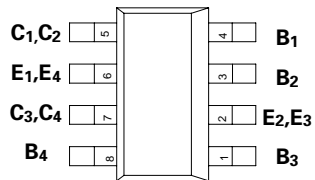
ABSOLUTE MAXIMUM RATINGS.

| PARAMETER | SYMBOL | NPNs | PNPs | UNIT |
|---|----------------|-------------|------|------|
| Collector-Base Voltage | V_{CBO} | 70 | -70 | V |
| Collector-Emitter Voltage | V_{CEO} | 70 | -70 | V |
| Emitter-Base Voltage | V_{EBO} | 5 | -5 | V |
| Peak Pulse Current | I_{CM} | 2 | -2 | A |
| Continuous Collector Current | I_C | 1 | -1 | A |
| Operating and Storage Temperature Range | $T_j; T_{stg}$ | -55 to +150 | | °C |

SCHEMATIC DIAGRAM



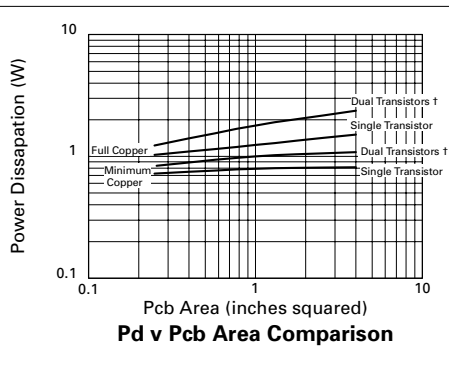
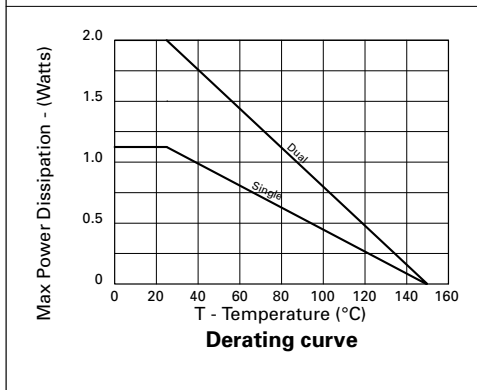
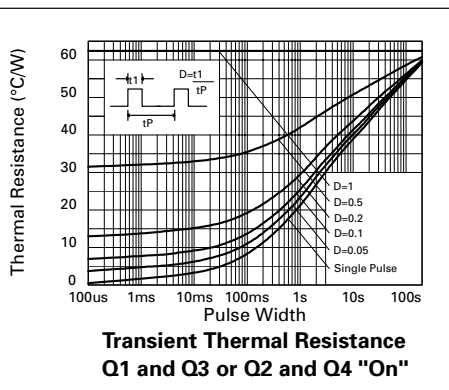
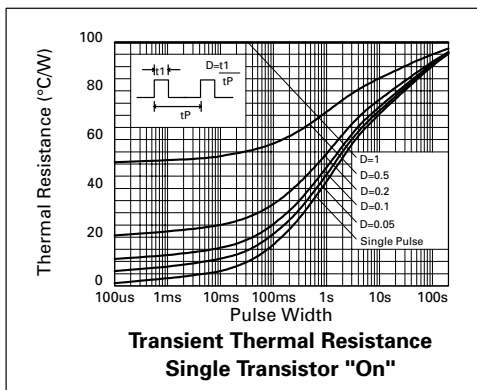
CONNECTION DIAGRAM



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THERMAL CHARACTERISTICS

| PARAMETER | SYMBOL | VALUE | UNIT |
|---|-----------|-------------|--|
| Total Power Dissipation at $T_{amb} = 25^{\circ}\text{C}^*$ Any single transistor "on" Q1 and Q3 "on" or Q2 and Q4 "on" equally | P_{tot} | 1.25 2 | W W |
| Derate above 25°C^* Any single transistor "on" Q1 and Q3 "on" or Q2 and Q4 "on" equally | | 10 16 | mW/ $^{\circ}\text{C}$ mW/ $^{\circ}\text{C}$ |
| Thermal Resistance - Junction to Ambient* Any single transistor "on" Q1 and Q3 "on" or Q2 and Q4 "on" equally | | 100 62.5 | $^{\circ}\text{C}/\text{W}$ $^{\circ}\text{C}/\text{W}$ |



* The power which can be dissipated assuming the device is mounted in a typical manner on a PCB with copper equal to 2 inches square.

† "Two devices on" is the standard operating condition for the bridge. Eg. opposing NPN/PNP pairs turned on.

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NPN TRANSISTORS ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS. |
|---------------------------------------|---------------|-------------------|------|-------------|---------------|---|
| Breakdown Voltages | $V_{(BR)CBO}$ | 70 | | | V | $I_C = 100\mu\text{A}$ |
| | $V_{(BR)CEO}$ | 70 | | | V | $I_C = 10\text{mA}^*$ |
| | $V_{(BR)EBO}$ | 5 | | | V | $I_E = 100\mu\text{A}$ |
| Cut-Off Currents | I_{CBO} | | | 0.1 | μA | $V_{CB} = 55\text{V}$ |
| | I_{EBO} | | | 0.1 | μA | $V_{EB} = 4\text{V}$ |
| Saturation Voltages | $V_{CE(sat)}$ | | | 0.15 0.5 | V V | $I_C = 0.1\text{A}, I_B = 0.5\text{mA}^*$ $I_C = 1\text{A}, I_B = 10\text{mA}^*$ |
| | $V_{BE(sat)}$ | | | 0.9 | V | $I_C = 1\text{A}, I_B = 10\text{mA}^*$ |
| Base-Emitter Turn-On Voltage | $V_{BE(on)}$ | | | 0.9 | V | $I_C = 1\text{A}, V_{CE} = 2\text{V}^*$ |
| Static Forward Current Transfer Ratio | h_{FE} | 500 400 150 | | | | $I_C = 100\text{mA}, V_{CE} = 2\text{V}^*$ $I_C = 500\text{mA}, V_{CE} = 2\text{V}^*$ $I_C = 1\text{A}, V_{CE} = 2\text{V}^*$ |
| Transition Frequency | f_T | 150 | | | MHz | $I_C = 50\text{mA}, V_{CE} = 5\text{V}, f = 50\text{MHz}$ |
| Input Capacitance | C_{ibo} | | 200 | | pF | $V_{EB} = 0.5\text{V}, f = 1\text{MHz}$ |
| Output Capacitance | C_{obo} | | 12 | | pF | $V_{CB} = 10\text{V}, f = 1\text{MHz}$ |
| Switching Times | t_{on} | | 46 | | ns | $I_C = 500\text{mA}, I_{B1} = 50\text{mA}$ $I_{B2} = 50\text{mA}, V_{CC} = 10\text{V}$ |
| | t_{off} | | 1440 | | ns | |

*Measured under pulsed conditions. Pulse width=300 μs . Duty cycle $\leq 2\%$

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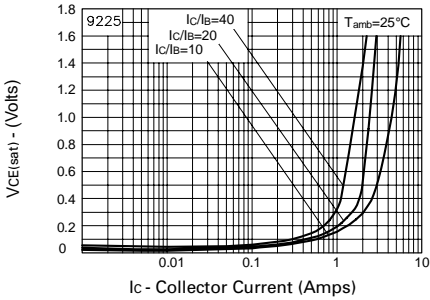
PNP TRANSISTORS ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS. |
|--------------------------------------|-----------------------|-------------------|-----------|---------------|---------------|--|
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | -75 | | | V | $I_C = -100\mu\text{A}$ |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | -70 | | | V | $I_C = -10\text{mA}^*$ |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | -5 | | | V | $I_E = -100\mu\text{A}$ |
| Collector Cut-Off Current | I_{CBO} | | | -0.1 | μA | $V_{CB} = -40\text{V}$ |
| Emitter Cut-Off Current | I_{EBO} | | | -0.1 | μA | $V_{EB} = -4\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | | | -0.45 -0.5 | V V | $I_C = -500\text{mA}, I_B = -5\text{mA}^*$ $I_C = -1\text{A}, I_B = -25\text{mA}^*$ |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | | | -0.95 | V | $I_C = -1\text{A}, I_B = -25\text{mA}^*$ |
| Base-Emitter Turn-On Voltage | $V_{BE(on)}$ | | -0.75 | | V | $I_C = -1\text{A}, V_{CE} = -2\text{V}^*$ |
| Static Forward Current Transfer | h_{FE} | 300 250 200 | | 800 | | $I_C = -10\text{mA}, V_{CE} = -2\text{V}^*$ $I_C = -500\text{mA}, V_{CE} = -2\text{V}^*$ $I_C = -1\text{A}, V_{CE} = -2\text{V}^*$ |
| Transition Frequency | f_T | 100 | | | MHz | $I_C = -50\text{mA}, V_{CE} = -5\text{V}$ $f = 50\text{MHz}$ |
| Input Capacitance | C_{ibo} | | 225 | | pF | $V_{EB} = -0.5\text{V}, f = 1\text{MHz}$ |
| Output Capacitance | C_{obo} | | 22 | | pF | $V_{CB} = -10\text{V}, f = 1\text{MHz}$ |
| Switching Times | t_{on} t_{off} | | 35 750 | | ns ns | $I_C = -500\text{mA},$ $I_{B1} = -50\text{mA}$ $I_{B2} = -50\text{mA}, V_{CC} = -10\text{V}$ |

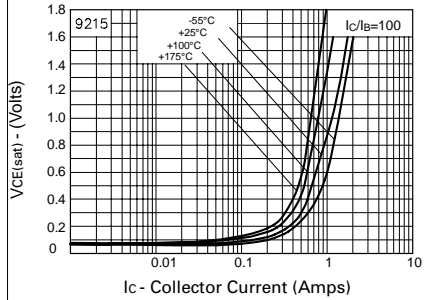
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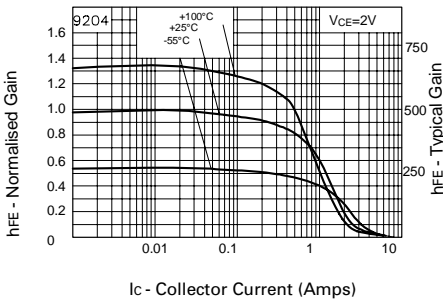
**PNP TRANSISTOR
TYPICAL CHARACTERISTICS**



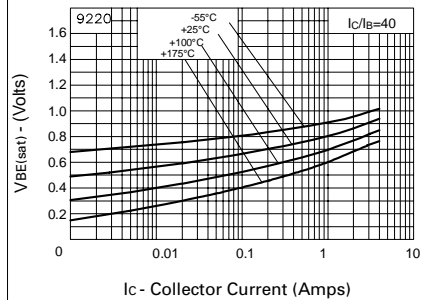
$V_{CE(sat)}$ v I_C



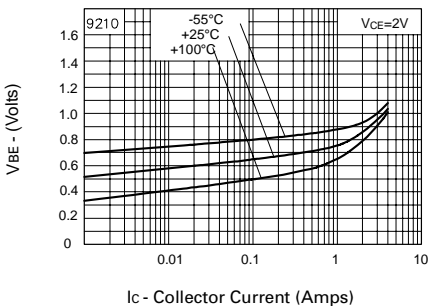
$V_{CE(sat)}$ v I_C



h_{FE} v I_C



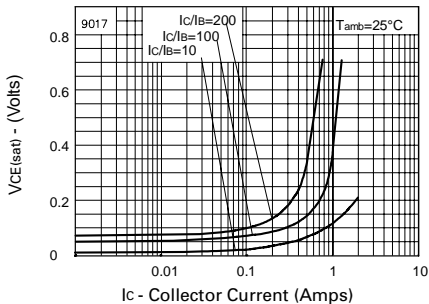
$V_{BE(sat)}$ v I_C



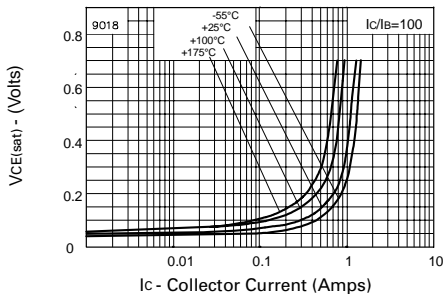
$V_{BE(on)}$ v I_C

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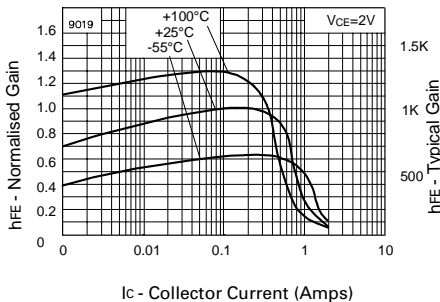
NPN TRANSISTOR TYPICAL CHARACTERISTICS



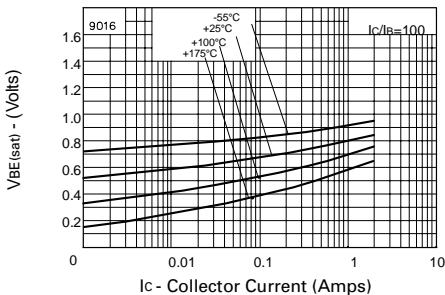
VCE(sat) v IC



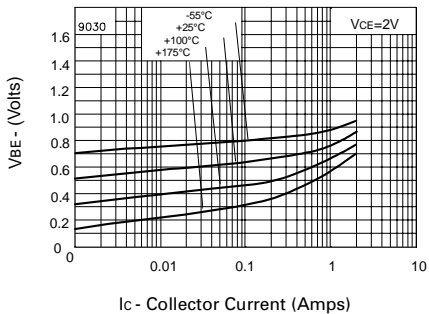
VCE(sat) v IC



hFE v IC

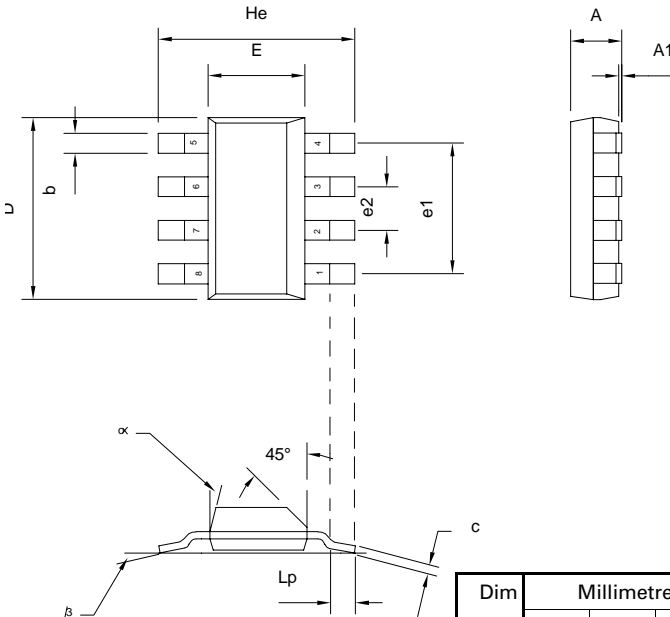


VBE(sat) v IC



VBE(on) v IC

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| Dim | Millimetres | | | Inches | | |
|-----|-------------|------|------|--------|-------|-------|
| | Min | Typ | Max | Min | Typ | Max |
| A | - | - | 1.7 | - | - | 0.067 |
| A1 | 0.02 | - | 0.1 | 0.0008 | - | 0.004 |
| b | - | 0.7 | - | - | 0.028 | - |
| c | 0.24 | - | 0.32 | 0.009 | - | 0.013 |
| D | 6.3 | - | 6.7 | 0.248 | - | 0.264 |
| E | 3.3 | - | 3.7 | 0.130 | - | 0.145 |
| e1 | - | 4.59 | - | - | 0.180 | - |
| e2 | - | 1.53 | - | - | 0.060 | - |
| He | 6.7 | - | 7.3 | 0.264 | - | 0.287 |
| Lp | 0.9 | - | - | 0.035 | - | - |

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