

**COMPLEMENTARY DUAL 40V HIGH PERFORMANCE TRANSISTOR**

**Features**

- NPN Transistor
  - $V_{CEO} = 40$
  - $R_{SAT} = 195\text{ m}\Omega$
  - $I_C = 2.5\text{A}$
- PNP Transistor
  - $V_{CEO} = -40\text{V}$
  - $R_{SAT} = 350\text{ m}\Omega$
  - $I_C = -2\text{A}$
- Low Saturation Voltage (500mV max @ 1A)
- $I_C = 2.5\text{A}$  Continuous Collector Current
- $h_{FE}$  characterized up to 2A

**Mechanical Data**

- Case: DFN3020B-8
- UL Flammability Rating 94V-0
- Terminals: Pre-Plated NiPdAu leadframe
- Nominal package height: 0.8mm
- Moisture Sensitivity: Level 1 per J-STD-020
- Solderable per MIL-STD-202, Method 208
- Weight: 0.013 grams (approximate)

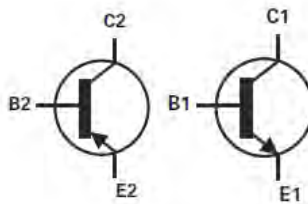
**Applications**

- DC – DC Converters
- Power switches
- Motor control
- LED Backlighting circuits

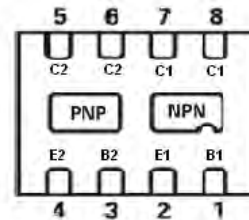
DFN3020B-8



TOP VIEW



Device Symbol



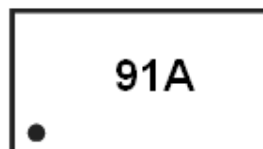
Pin Configuration

**Ordering Information**

| Product       | Status | Package    | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---------------|--------|------------|---------|--------------------|-----------------|-------------------|
| ZXTC4591AMCTA | Active | DFN3020B-8 | 91A     | 7                  | 8               | 3000              |

Notes: 1. No purposefully added lead. Halogen and Antimony Free.  
2. Diodes Inc's "Green" Policy can be found on our website at <http://www.diodes.com>

**Marking Information**



91A = Product type Marking Code  
Dot denotes Pin 1

## Maximum Ratings

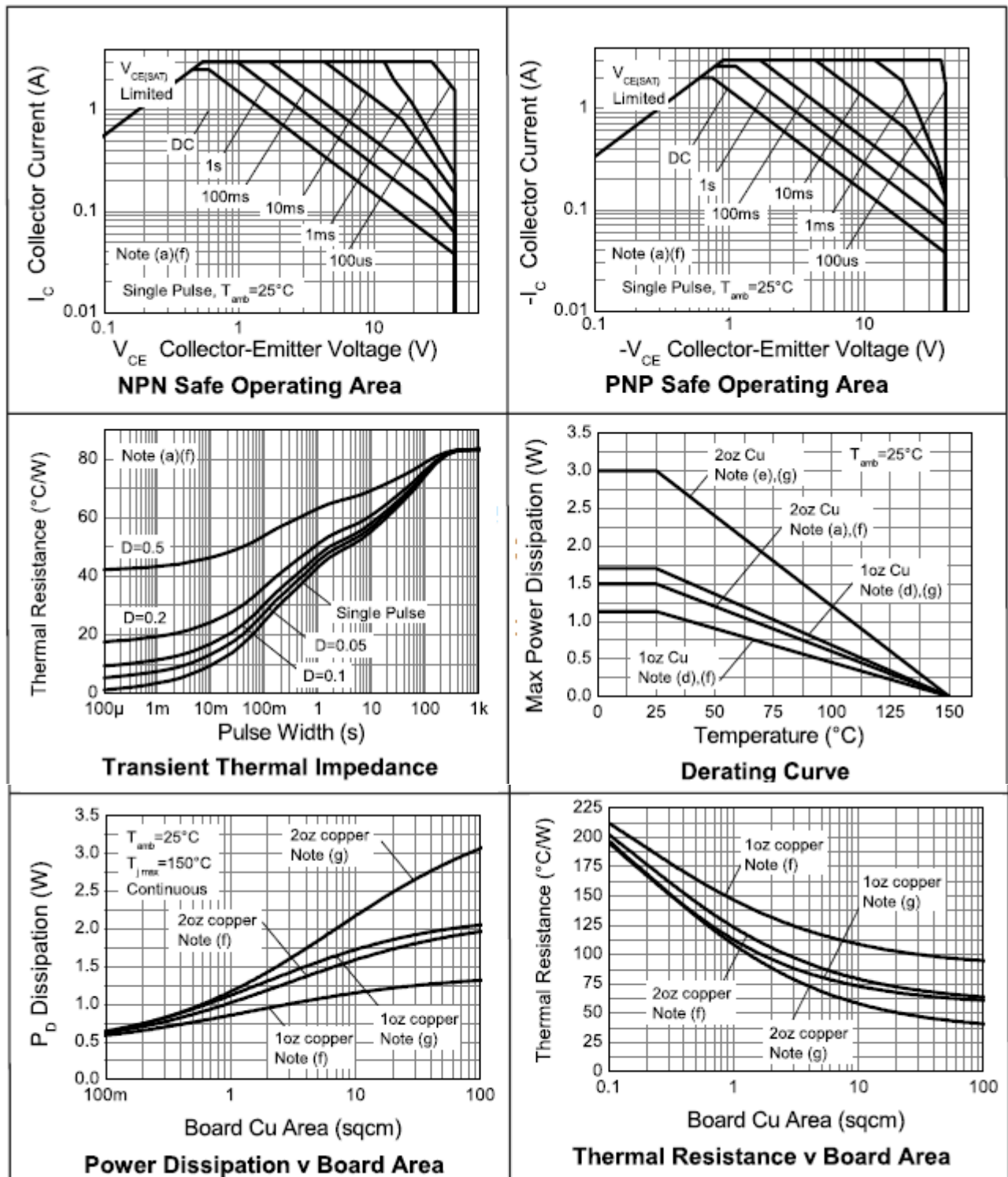
| Parameter                          | Symbol    | NPN | PNP  | Unit |
|------------------------------------|-----------|-----|------|------|
| Collector-Base Voltage             | $V_{CBO}$ | 40  | -40  | V    |
| Collector-Emitter Voltage          | $V_{CEO}$ | 40  | -40  | V    |
| Emitter-Base Voltage               | $V_{EBO}$ | 5   | -5   | V    |
| Peak Pulse Current                 | $I_{CM}$  | 3   | -3   | A    |
| Continuous Collector Current(a)(f) | $I_C$     | 2   | -1.5 | A    |
| Continuous Collector Current(b)(f) | $I_C$     | 2.5 | -2.0 | A    |
| Base Current                       | $I_B$     | 300 |      | mA   |

## Thermal Characteristics

| Characteristic                                        | Symbol          | Value       | Unit                 |
|-------------------------------------------------------|-----------------|-------------|----------------------|
| Power Dissipation at $T_A = 25^\circ\text{C}$ (a) (f) | $P_D$           | 1.5         | W                    |
| Linear Derating Factor                                |                 | 12          | mW/ $^\circ\text{C}$ |
| Power Dissipation at $T_A = 25^\circ\text{C}$ (b) (f) | $P_D$           | 2.45        | W                    |
| Linear Derating Factor                                |                 | 19.6        | mW/ $^\circ\text{C}$ |
| Power Dissipation at $T_A = 25^\circ\text{C}$ (c) (f) | $P_D$           | 1           | W                    |
| Linear Derating Factor                                |                 | 8           | mW/ $^\circ\text{C}$ |
| Power Dissipation at $T_A = 25^\circ\text{C}$ (d) (f) | $P_D$           | 1.13        | W                    |
| Linear Derating Factor                                |                 | 9           | mW/ $^\circ\text{C}$ |
| Power Dissipation at $T_A = 25^\circ\text{C}$ (d) (g) | $P_D$           | 1.7         | W                    |
| Linear Derating Factor                                |                 | 13.6        | mW/ $^\circ\text{C}$ |
| Power Dissipation at $T_A = 25^\circ\text{C}$ (e) (g) | $P_D$           | 3           | W                    |
| Linear Derating Factor                                |                 | 24          | mW/ $^\circ\text{C}$ |
| Junction to Ambient (a) (f)                           | $R_{\theta JA}$ | 83.3        | $^\circ\text{C/W}$   |
| Junction to Ambient (b) (f)                           | $R_{\theta JA}$ | 51          | $^\circ\text{C/W}$   |
| Junction to Ambient (c) (f)                           | $R_{\theta JA}$ | 125         | $^\circ\text{C/W}$   |
| Junction to Ambient (d) (f)                           | $R_{\theta JA}$ | 111         | $^\circ\text{C/W}$   |
| Junction to Ambient (d) (g)                           | $R_{\theta JA}$ | 73.5        | $^\circ\text{C/W}$   |
| Junction to Ambient (e) (g)                           | $R_{\theta JA}$ | 41.7        | $^\circ\text{C/W}$   |
| Junction Temperature                                  | $T_J$           | 150         | $^\circ\text{C}$     |
| Storage Temperature Range                             | $T_{STG}$       | -55 to +150 | $^\circ\text{C}$     |

- Notes:
- For a dual device surface mounted on 8 sq cm single sided 2 oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
  - Measured at  $t < 5$  secs for a dual device surface mounted on 8 sq cm single sided 2 oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
  - For a dual device surface mounted on 8 sq cm single sided 2 oz copper on FR4 PCB, in still air conditions **with minimal lead connections only**.
  - For a dual device surface mounted on 10 sq cm single sided 1 oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
  - For a dual device surface mounted on 85 sq cm single sided 2 oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
  - For a dual device with one active die.
  - For dual device with 2 active die running at equal power.

## Thermal Characteristics and Derating information

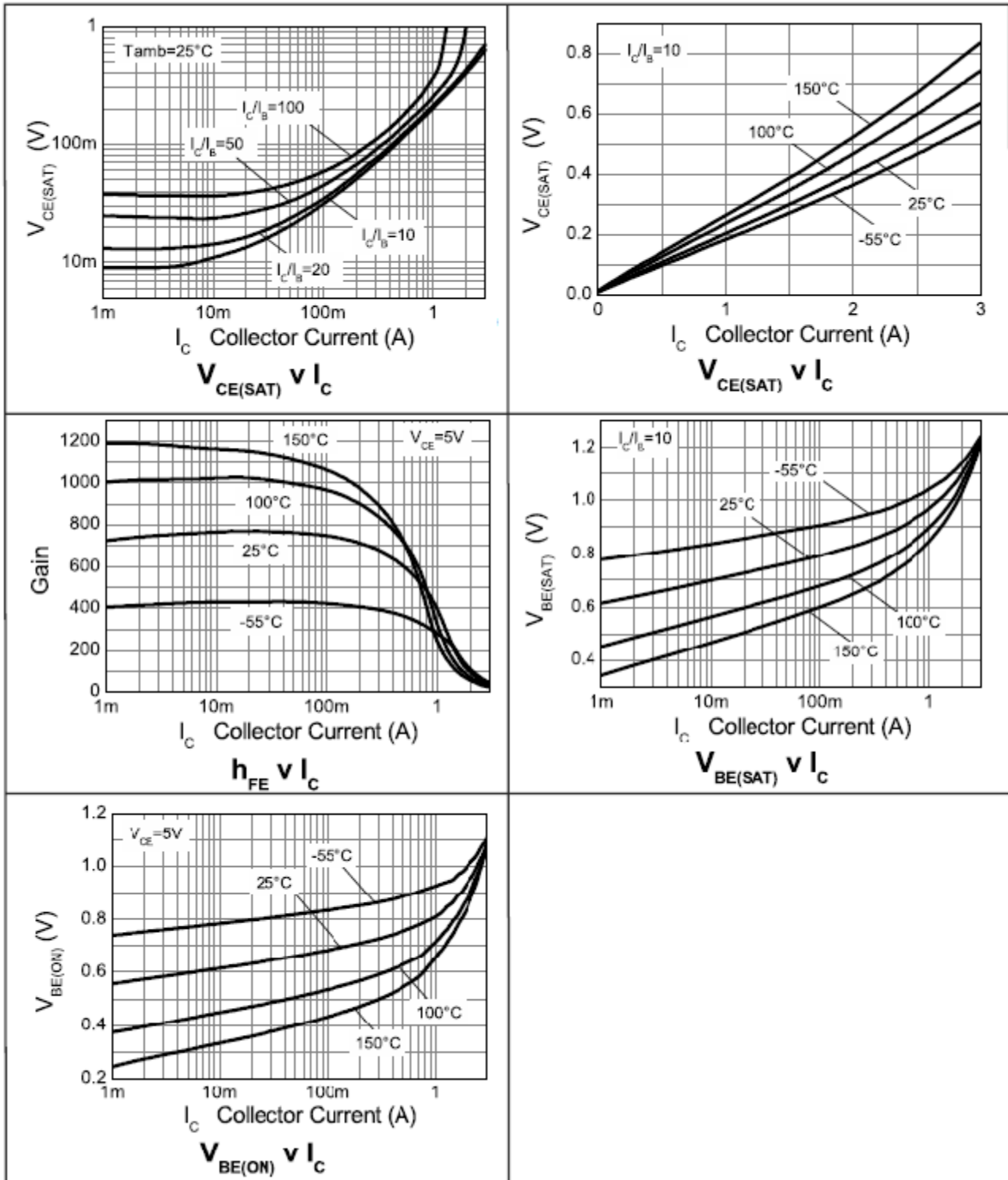


**Electrical Characteristics, NPN Transistor** (at  $T_A = 25^\circ\text{C}$  unless otherwise specified)

| Characteristic                                 | Symbol        | Min                     | Typ              | Max                | Unit | Test Condition                                                                                                                                                       |
|------------------------------------------------|---------------|-------------------------|------------------|--------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage               | $V_{(BR)CBO}$ | 40                      | -                | -                  | V    | $I_C = 100\mu\text{A}$                                                                                                                                               |
| Collector-Emitter Breakdown Voltage (Note 3)   | $V_{(BR)CEO}$ | 40                      | -                | -                  | V    | $I_C = 10\text{mA}$                                                                                                                                                  |
| Emitter-Base Breakdown Voltage                 | $V_{(BR)EBO}$ | 5                       | -                | -                  | V    | $I_E = 100\mu\text{A}$                                                                                                                                               |
| Collector Cutoff Current                       | $I_{CBO}$     | -                       | -                | 100                | nA   | $V_{CB} = 30\text{V}$                                                                                                                                                |
| Emitter Cutoff Current                         | $I_{EBO}$     | -                       | -                | 100                | nA   | $V_{EB} = 4\text{V}$                                                                                                                                                 |
| Collector Emitter Cutoff Current               | $I_{CES}$     | -                       | -                | 100                | nA   | $V_{CE} = 30\text{V}$                                                                                                                                                |
| Static Forward Current Transfer Ratio (Note 3) | $h_{FE}$      | 300<br>300<br>200<br>35 | -<br>-<br>-<br>- | -<br>900<br>-<br>- | -    | $I_C = 1\text{mA}, V_{CE} = 5\text{V}$<br>$I_C = 500\text{mA}, V_{CE} = 5\text{V}$<br>$I_C = 1\text{A}, V_{CE} = 5\text{V}$<br>$I_C = 2\text{A}, V_{CE} = 5\text{V}$ |
| Collector-Emitter Saturation Voltage (Note 3)  | $V_{CE(sat)}$ | -<br>-                  | -<br>-           | 300<br>500         | mV   | $I_C = 0.5\text{A}, I_B = 50\text{mA}$<br>$I_C = 1\text{A}, I_B = 100\text{mA}$                                                                                      |
| Base-Emitter Turn-On Voltage (Note 3)          | $V_{BE(on)}$  | -                       | -                | 1.0                | V    | $I_C = 1\text{A}, V_{CE} = 5\text{V}$                                                                                                                                |
| Base-Emitter Saturation Voltage (Note 3)       | $V_{BE(sat)}$ | -                       | -                | 1.1                | V    | $I_C = 1\text{A}, I_B = 100\text{mA}$                                                                                                                                |
| Output Capacitance                             | $C_{obo}$     | -                       | -                | 10                 | pF   | $V_{CB} = -10\text{V}, f = 1\text{MHz}$                                                                                                                              |
| Transition Frequency                           | $f_T$         | 150                     | -                | -                  | MHz  | $V_{CE} = -10\text{V}, I_C = -50\text{mA}, f = 100\text{MHz}$                                                                                                        |

Notes: 3. Measured under pulsed conditions.

## NPN Characteristics

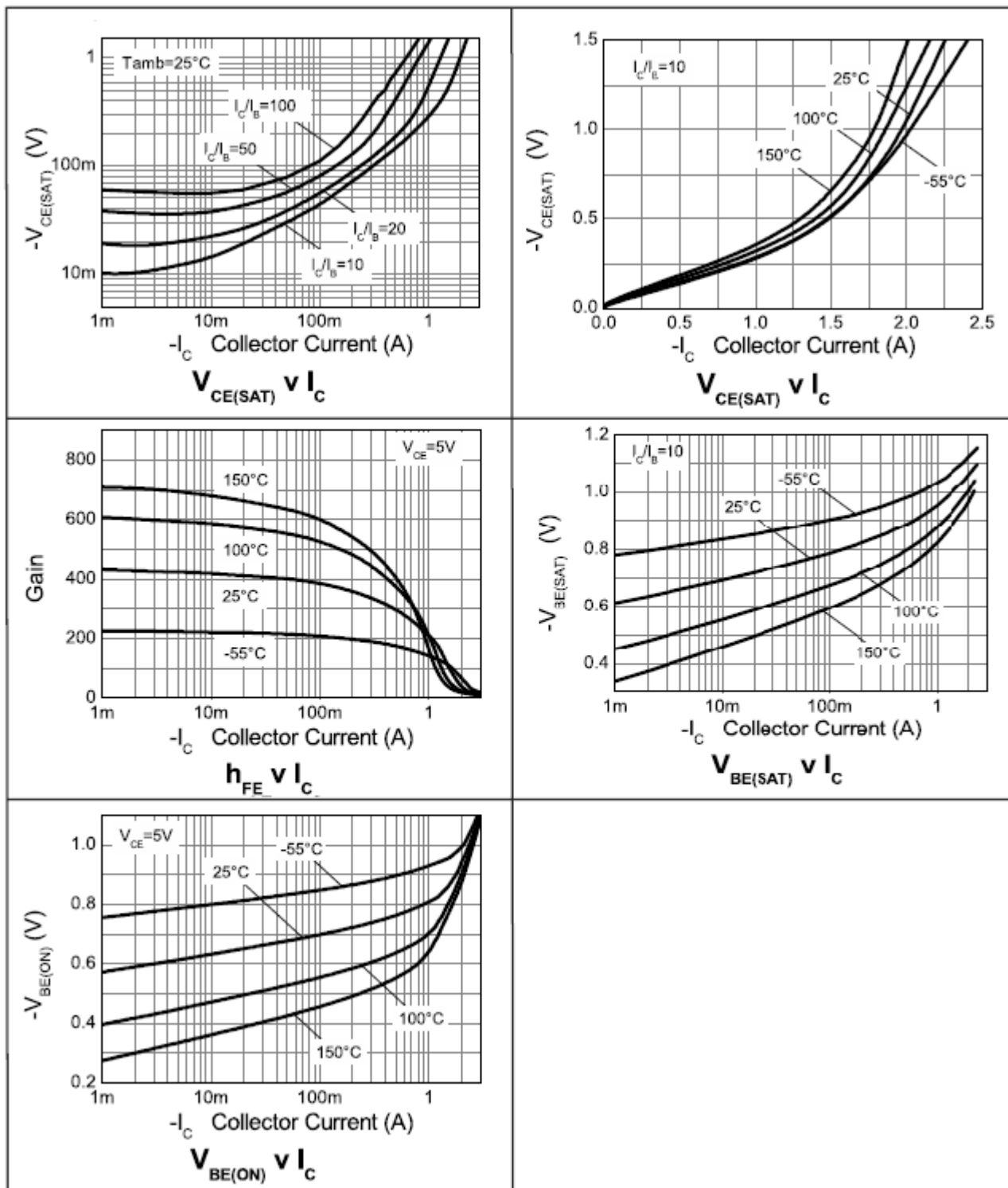


**Electrical Characteristics, PNP Transistor** @T<sub>A</sub> = 25°C unless otherwise specified

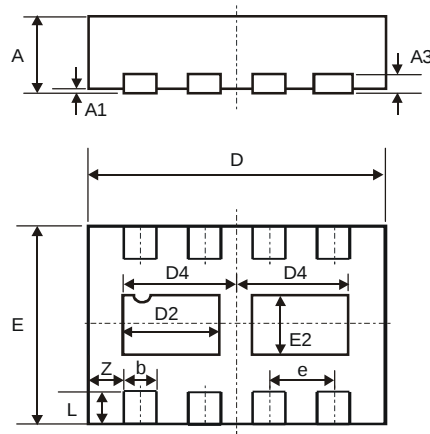
| Characteristic                                 | Symbol               | Min                            | Typ                   | Max                     | Unit | Test Condition                                                                                                                                                                                                                                 |
|------------------------------------------------|----------------------|--------------------------------|-----------------------|-------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage               | V <sub>(BR)CBO</sub> | -40                            | -                     | -                       | V    | I <sub>C</sub> = -100μA                                                                                                                                                                                                                        |
| Collector-Emitter Breakdown Voltage (Note 4)   | V <sub>(BR)CEO</sub> | -40                            | -                     | -                       | V    | I <sub>C</sub> = -10mA                                                                                                                                                                                                                         |
| Emitter-Base Breakdown Voltage                 | V <sub>(BR)EBO</sub> | 5                              | -                     | -                       | V    | I <sub>E</sub> = -100μA                                                                                                                                                                                                                        |
| Collector Cutoff Current                       | I <sub>CBO</sub>     | -                              | -                     | -100                    | nA   | V <sub>CB</sub> = -30V                                                                                                                                                                                                                         |
| Emitter Cutoff Current                         | I <sub>EBO</sub>     | -                              | -                     | -100                    | nA   | V <sub>EB</sub> = -4V                                                                                                                                                                                                                          |
| Collector Emitter Cutoff Current               | I <sub>CES</sub>     | -                              | -                     | -100                    | nA   | V <sub>CE</sub> = -30V                                                                                                                                                                                                                         |
| Static Forward Current Transfer Ratio (Note 4) | h <sub>FE</sub>      | 300<br>300<br>250<br>160<br>30 | -<br>-<br>-<br>-<br>- | -<br>800<br>-<br>-<br>- | -    | I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V<br>I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V<br>I <sub>C</sub> = -500mA, V <sub>CE</sub> = -5V<br>I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V<br>I <sub>C</sub> = -2A, V <sub>CE</sub> = -5V |
| Collector-Emitter Saturation Voltage (Note 4)  | V <sub>CE(sat)</sub> | -<br>-<br>-                    | -<br>-<br>-           | -200<br>-350<br>-500    | mV   | I <sub>C</sub> = -0.1A, I <sub>B</sub> = -1mA<br>I <sub>C</sub> = -0.5A, I <sub>B</sub> = -20mA<br>I <sub>C</sub> = -1A, I <sub>B</sub> = -100mA                                                                                               |
| Base-Emitter Turn-On Voltage(Note 4)           | V <sub>BE(on)</sub>  | -                              | -                     | -1.0                    | V    | I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V                                                                                                                                                                                                    |
| Base-Emitter Saturation Voltage(Note 4)        | V <sub>BE(sat)</sub> | -                              | -                     | -1.1                    | V    | I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA                                                                                                                                                                                                   |
| Output Capacitance                             | C <sub>obo</sub>     | -                              | -                     | 10                      | pF   | V <sub>CB</sub> = -10V, f = 1MHz                                                                                                                                                                                                               |
| Transition Frequency                           | f <sub>T</sub>       | 150                            | -                     | -                       | MHz  | V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA,<br>f = 100MHz                                                                                                                                                                                  |

Notes: 4. Measured under pulsed conditions.

## PNP Characteristics

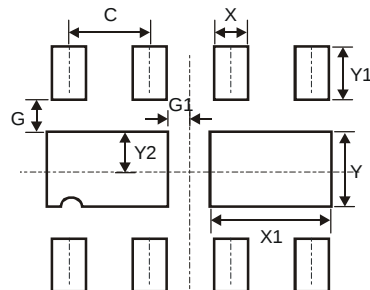


## Package Outline Dimensions



| DFN3020B-8           |      |       |       |
|----------------------|------|-------|-------|
| Dim                  | Min  | Max   | Typ   |
| A                    | 0.77 | 0.83  | 0.80  |
| A1                   | 0    | 0.05  | 0.02  |
| A3                   | -    | -     | 0.15  |
| b                    | 0.25 | 0.35  | 0.30  |
| D                    | 2.95 | 3.075 | 3.00  |
| D2                   | 0.82 | 1.02  | 0.92  |
| D4                   | 1.01 | 1.21  | 1.11  |
| e                    | -    | -     | 0.65  |
| E                    | 1.95 | 2.075 | 2.00  |
| E2                   | 0.43 | 0.63  | 0.53  |
| L                    | 0.25 | 0.35  | 0.30  |
| Z                    | -    | -     | 0.375 |
| All Dimensions in mm |      |       |       |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 0.285         |
| G1         | 0.090         |
| X          | 0.400         |
| X1         | 1.120         |
| Y          | 0.730         |
| Y1         | 0.500         |
| Y2         | 0.365         |

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