# THE DATASHEET OF

# ZDT694TA

# 120V DUAL NPN MEDIUM POWER HIGH GAIN TRANSISTOR IN SM-8

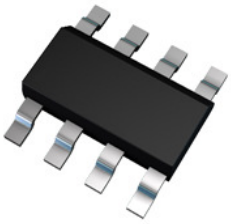
## Features

- $BV_{CEO}$ > 120V
- $I_C$ = 0.5A High Continuous Current
- High Gain > 400 @ 200mA
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

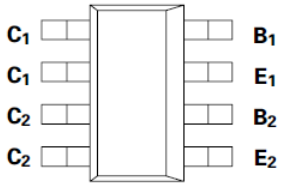
## Mechanical Data

- Case: SM-8 (8 LEAD SOT223)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.117 grams (Approximate)

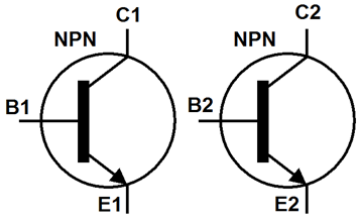
SM-8



Top View




Top View
Pin Out




Equivalent Circuit

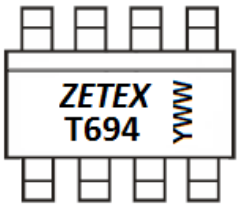
## Ordering Information (Notes 4 and 5)

| Part Number | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|---|
| ZDT694TA | AEC-Q101 | T694 | 7 | 12 | 1,000 |
| ZDT694QTA | Automotive | T694 | 7 | 12 | 1,000 |

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## Marking Information

SM-8




T694 = Product Type Marking Code
YWW = Date Code Marking
Y = Last Digit of Year (ex: 4 = 2014)
WW = Week Code 01-52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## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | NPN | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 120 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 120 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 7 | V |
| Continuous Collector Current | $I_C$ | 0.5 | A |
| Peak Pulse Current (Note 5) | $I_{CM}$ | 1 | A |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector Power Dissipation | (Note 5) | $P_D$ | 2.25 | W |
| | (Note 6) | | 2.75 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 55.6 | °C/W |
| | (Note 6) | | 45.5 | |
| Thermal Resistance, Junction to Leads | (Note 7) | $R_{\theta JL}$ | 30.7 | °C/W |
| Operating and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 8)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

Notes:
5. For a device with any single die active and mounted with the collector lead on 25mm x 25mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
6. Same as Note 5, except both die are active and equally sharing power.
7. Thermal resistance from junction to solder-point (at the end of the collector lead).
8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.


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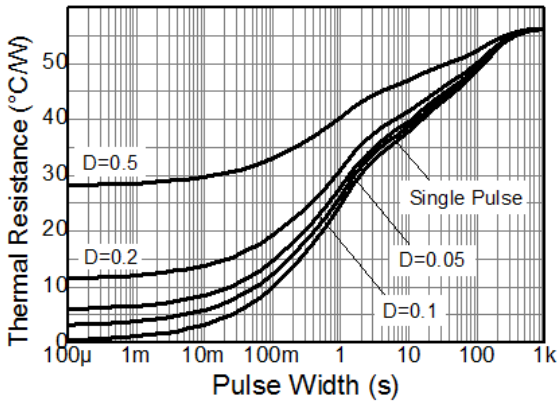
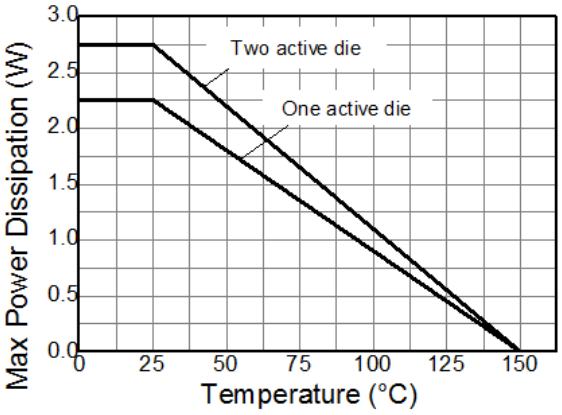
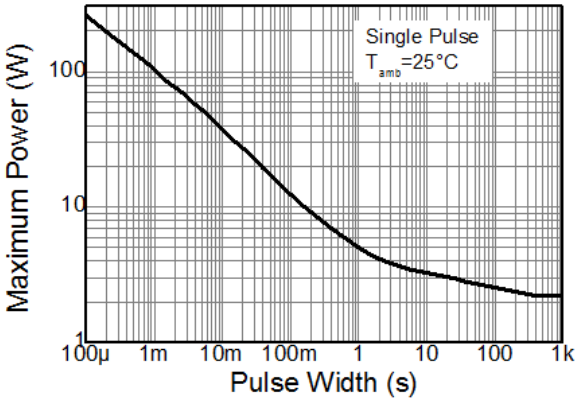
## Thermal Characteristics and Derating Information




**Transient Thermal Impedance**




**Derating Curve**




**Pulse Power Dissipation**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## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 120 | — | — | V | $I_C$ = 100µA |
| Collector-Emitter Breakdown Voltage (Note 9) | $BV_{CEO}$ | 120 | — | — | V | $I_C$ = 10mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 7 | — | — | V | $I_E$ = 100µA |
| Collector Cutoff Current | $I_{CBO}$ | — | — | 0.1 | µA | $V_{CB}$ = 100V |
| Emitter Cutoff Current | $I_{EBO}$ | — | — | 0.1 | µA | $V_{EB}$ = 5.6V |
| DC current transfer Static ratio (Note 8) | $h_{FE}$ | 500 | — | — | — | $I_C$ = 150mA, $V_{CE}$ = 2V |
| | | 400 | — | — | | $I_C$ = 200mA, $V_{CE}$ = 2V |
| | | 150 | — | — | | $I_C$ = 400mA, $V_{CE}$ = 2V |
| Collector-Emitter Saturation Voltage (Note 9) | $V_{CE(sat)}$ | — | — | 0.25 | V | $I_C$ = 0.1A, $I_B$ = 0.5mA |
| | | — | — | 0.50 | | $I_C$ = 0.4A, $I_B$ = 5mA |
| Base-Emitter Saturation Voltage (Note 9) | $V_{BE(sat)}$ | — | — | 0.9 | V | $I_C$ = 1A, $I_B$ = 10mA |
| Base-Emitter Turn-on Voltage (Note 9) | $V_{BE(on)}$ | — | — | 0.9 | V | $I_C$ = 1A, $V_{CE}$ = 2V |
| Transitional Frequency | $f_T$ | 130 | — | — | MHz | $I_C$ = 50mA, $V_{CE}$ = 5V, f = 50MHz |
| Input Capacitance | $C_{ibo}$ | — | 200 | — | pF | $V_{EB}$ = 0.5V, f = 1MHz, |
| Output Capacitance | $C_{obo}$ | — | 9 | — | pF | $V_{EB}$ = 10V, f = 1MHz, |
| Switching Time | $t_{on}$ | — | 80 | — | ns | $V_{CC}$ = 50V, $I_C$ = 100mA, |
| | $t_{off}$ | | 2900 | | ns | $I_{B1}$ = -$I_{B2}$ = 10mA |

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.


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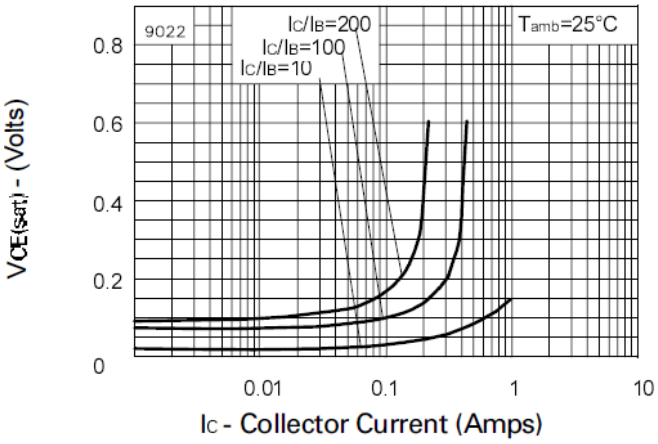
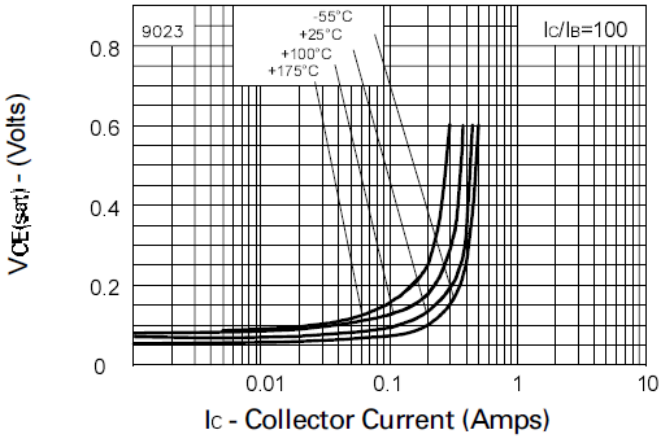
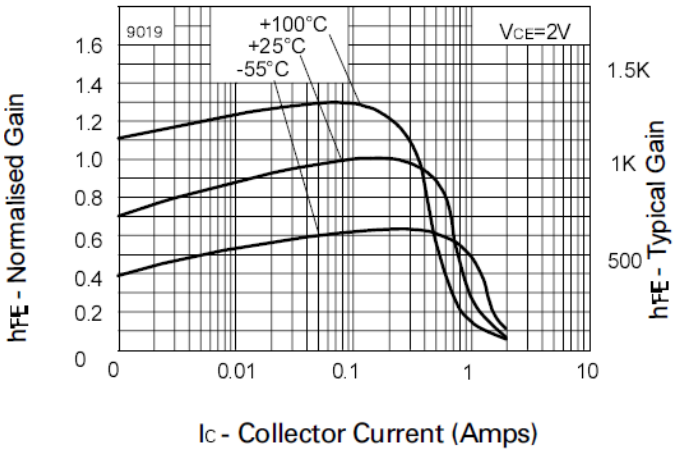
## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



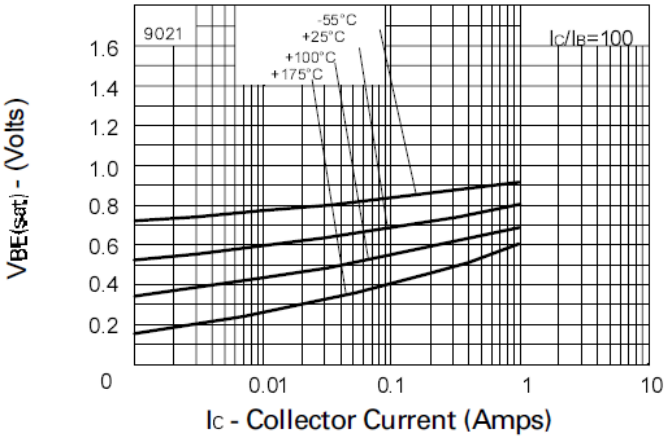

**VCE(sat) v IC**



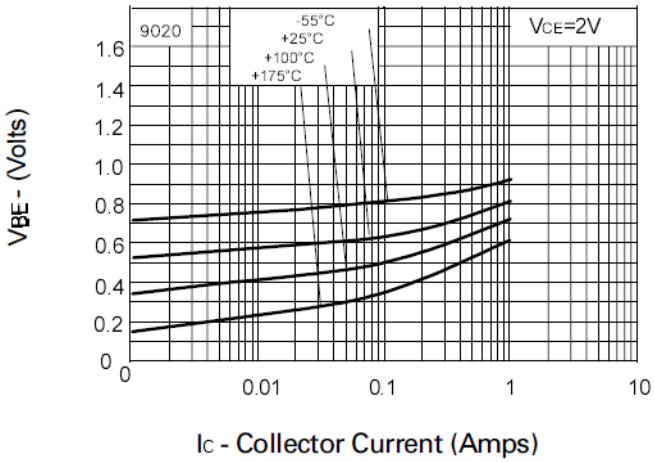

**VCE(sat) v IC**




**hFE v IC**




**VBE(sat) v IC**




**VBE(on) v IC**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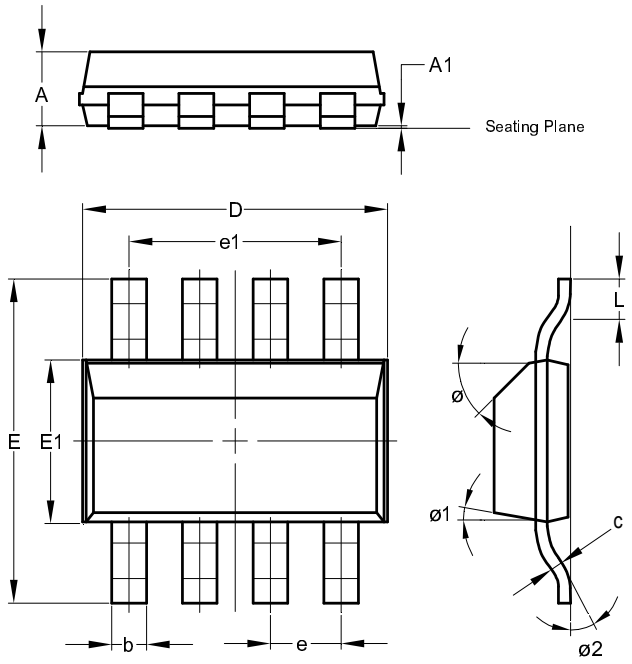
## Package Outline Dimensions

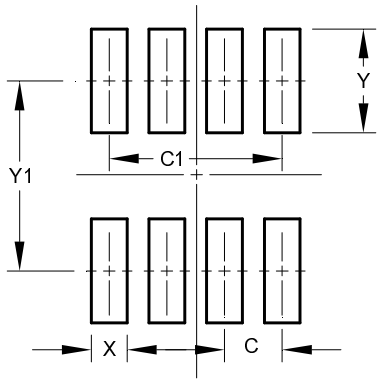
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| SM-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | -- | 1.70 | 1.60 |
| **A1** | 0.02 | 0.10 | 0.04 |
| **b** | 0.70 | 0.90 | 0.80 |
| **c** | 0.24 | 0.32 | 0.28 |
| **D** | 6.30 | 6.70 | 6.60 |
| **e** | 1.53 REF | | |
| **e1** | 4.59 REF | | |
| **E** | 6.70 | 7.30 | 7.00 |
| **E1** | 3.30 | 3.70 | 3.50 |
| **L** | 0.75 | 1.00 | 0.90 |
| **Ø** | -- | -- | 45° |
| **Ø1** | -- | 15° | -- |
| **Ø2** | -- | -- | 10° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.52 |
| **C1** | 4.6 |
| **X** | 0.95 |
| **Y** | 2.80 |
| **Y1** | 6.80 |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