

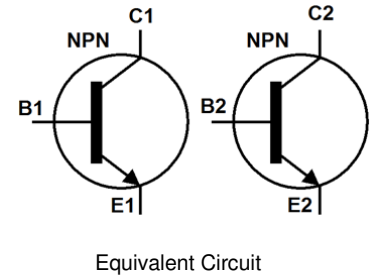
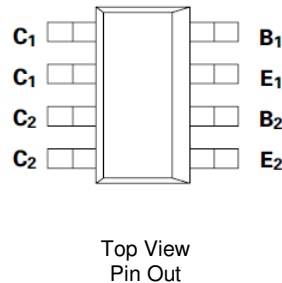
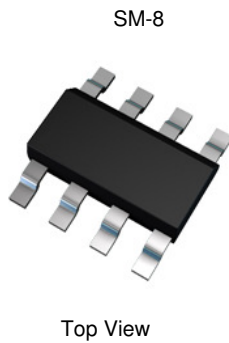
**120V DUAL NPN MEDIUM POWER HIGH GAIN TRANSISTOR IN SM-8**

**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  $\text{③}$
- Weight: 0.117 grams (Approximate)

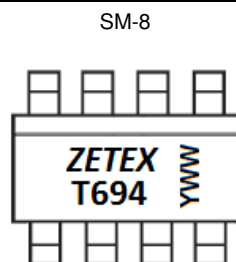


**Ordering Information** (Notes 4 and 5)

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](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**



T694 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y = Last Digit of Year (ex: 4 = 2014)  
 WW = Week Code 01-52

### Absolute Maximum Ratings (@T<sub>A</sub> = +25 °C, unless otherwise specified.)

Characteristic	Symbol	NPN	Unit
Collector-Base Voltage	V <sub>CBO</sub>	120	V
Collector-Emitter Voltage	V <sub>CEO</sub>	120	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	0.5	A
Peak Pulse Current (Note 5)	I <sub>CM</sub>	1	A

### Thermal Characteristics (@T<sub>A</sub> = +25 °C, unless otherwise specified.)

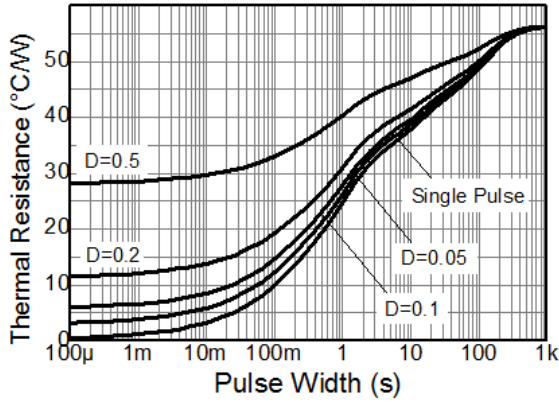
Characteristic	Symbol	Value	Unit
Collector Power Dissipation	P <sub>D</sub>	(Note 5)	2.25
		(Note 6)	2.75
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5)	55.6
		(Note 6)	45.5
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	30.7	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

### ESD Ratings (Note 8)

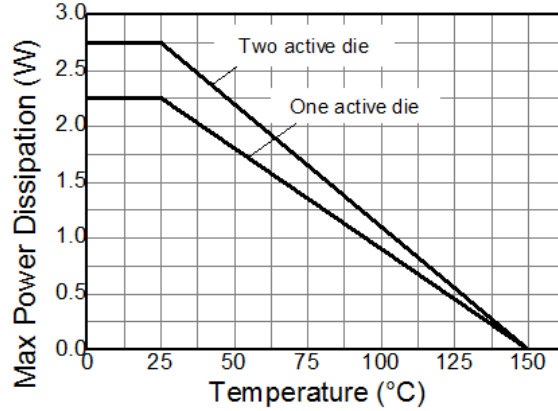
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- 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.

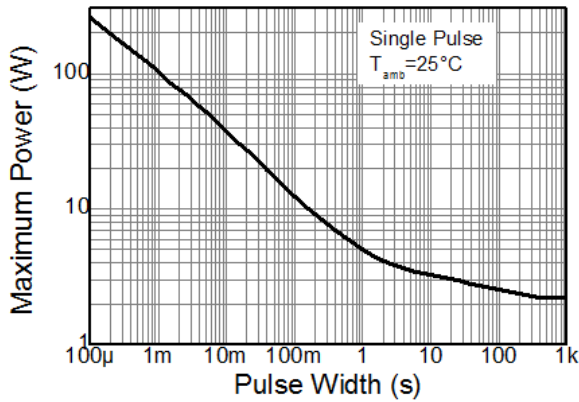
**Thermal Characteristics and Derating Information**



**Transient Thermal Impedance**



**Derating Curve**



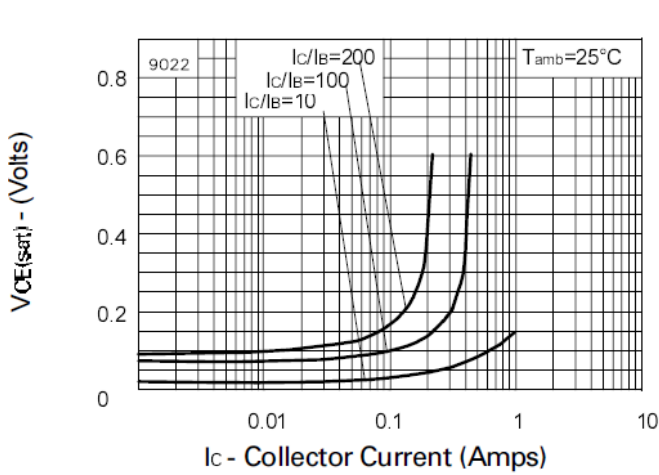
**Pulse Power Dissipation**

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

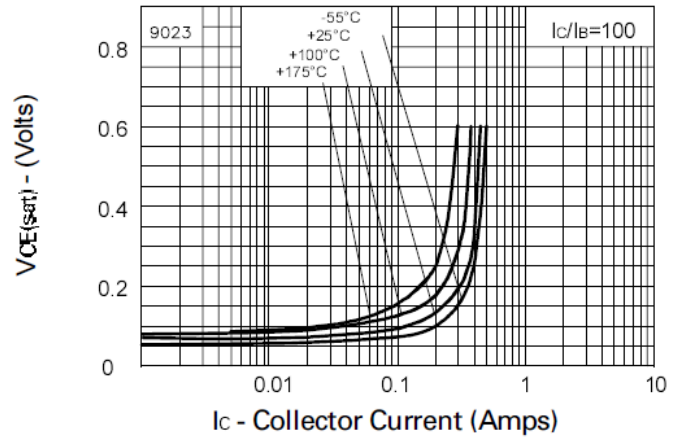
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	120	—	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Note 9)	BV <sub>CEO</sub>	120	—	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	—	—	V	I <sub>E</sub> = 100μA
Collector Cutoff Current	I <sub>CBO</sub>	—	—	0.1	μA	V <sub>CB</sub> = 100V
Emitter Cutoff Current	I <sub>EBO</sub>	—	—	0.1	μA	V <sub>EB</sub> = 5.6V
DC current transfer Static ratio (Note 8)	h <sub>FE</sub>	500	—	—	—	I <sub>C</sub> = 150mA, V <sub>CE</sub> = 2V
		400	—	—		I <sub>C</sub> = 200mA, V <sub>CE</sub> = 2V
		150	—	—		I <sub>C</sub> = 400mA, V <sub>CE</sub> = 2V
Collector-Emitter Saturation Voltage (Note 9)	V <sub>CE(sat)</sub>	—	—	0.25	V	I <sub>C</sub> = 0.1A, I <sub>B</sub> = 0.5mA
		—	—	0.50		I <sub>C</sub> = 0.4A, I <sub>B</sub> = 5mA
Base-Emitter Saturation Voltage (Note 9)	V <sub>BE(sat)</sub>	—	—	0.9	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 10mA
Base-Emitter Turn-on Voltage (Note 9)	V <sub>BE(on)</sub>	—	—	0.9	V	I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V
Transitional Frequency	f <sub>T</sub>	130	—	—	MHz	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 5V, f = 50MHz
Input Capacitance	C <sub>ibo</sub>	—	200	—	pF	V <sub>EB</sub> = 0.5V, f = 1MHz,
Output Capacitance	C <sub>obo</sub>	—	9	—	pF	V <sub>EB</sub> = 10V, f = 1MHz,
Switching Time	t <sub>on</sub>	—	80	—	ns	V <sub>CC</sub> = 50V, I <sub>C</sub> = 100mA, I <sub>B1</sub> = -I <sub>B2</sub> = 10mA
	t <sub>off</sub>		2900		ns	

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

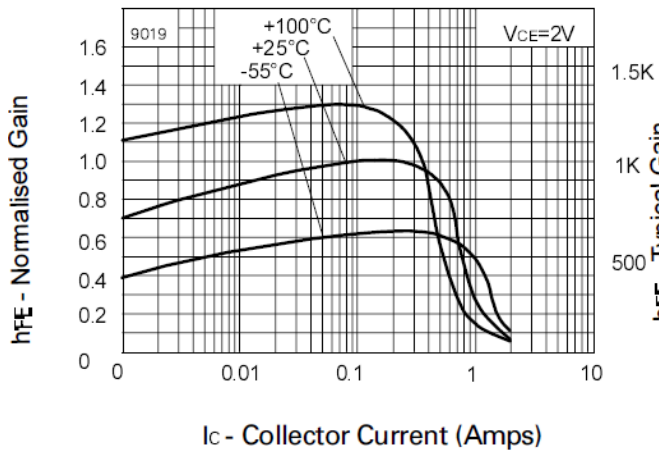
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



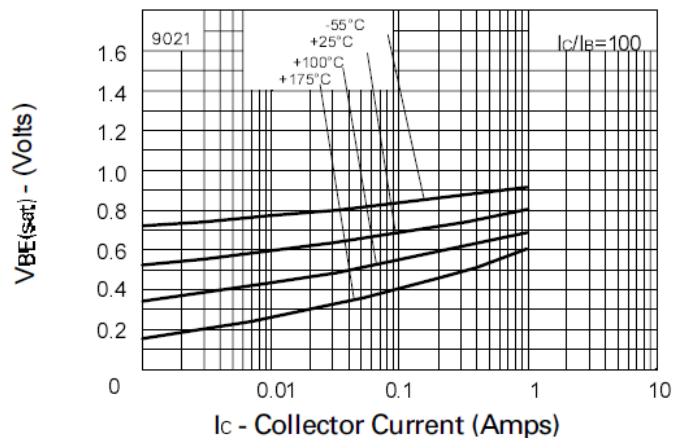
**VCE(sat) v IC**



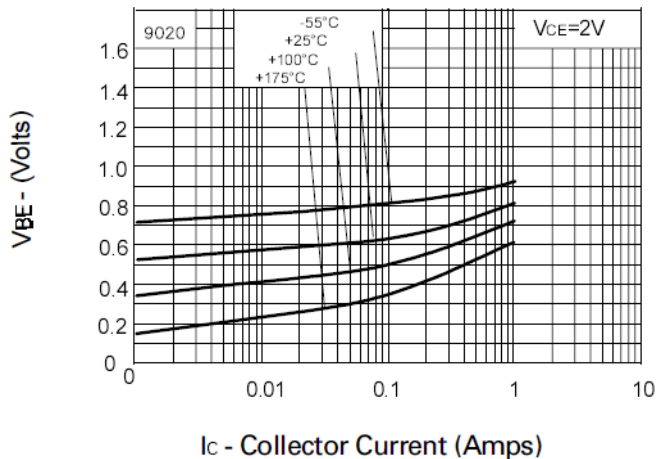
**VCE(sat) v IC**



**hFE v IC**



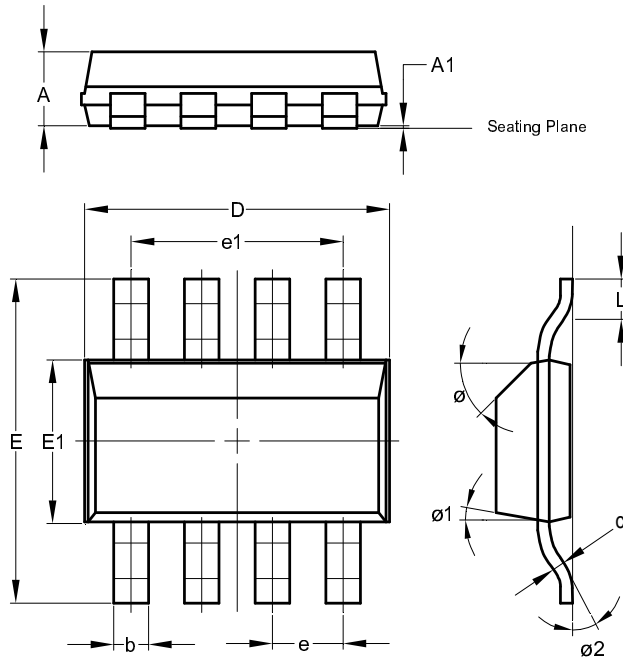
**VBE(sat) v IC**



**VBE(on) v IC**

## Package Outline Dimensions

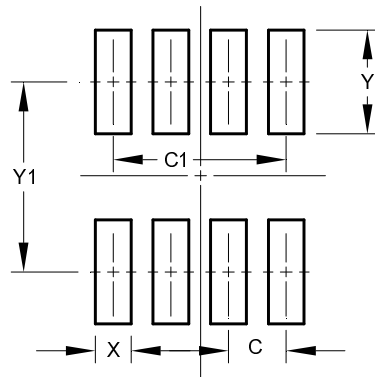
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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