

**60V NPN MEDIUM POWER TRANSISTOR IN E-LINE**

**Features**

- $BV_{CEO} > 60V$
- $I_C = 2A$  High Continuous Collector Current
- $I_{CM} = 6A$  Peak Pulse Current
- $T_J$  up to  $+200^{\circ}C$  for High Temperature Operation
- Low Saturation Voltage  $< 300mV @ 1A$
- $P_D = 1W$  Power dissipation
- **Totally Lead-Free & Fully 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)**

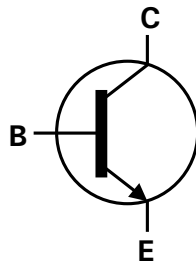
**Mechanical Data**

- Case: E-Line (TO-92 Compatible)
- Case Material: molded plastic, "Green" Molding Compound
- UL Flammability Classification Rating 94V-0
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 0.159 grams (approximate)

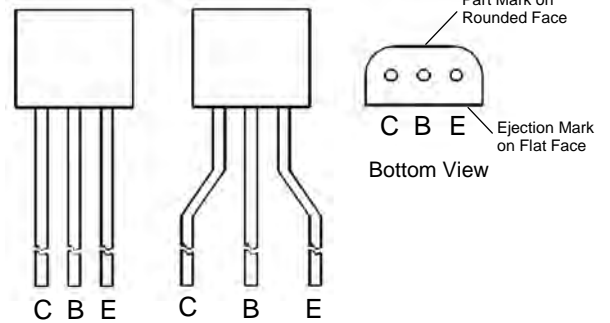
E-Line  
(TO-92 Compatible)



Flat Face View

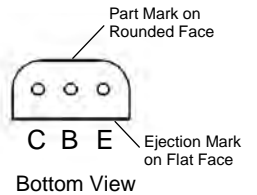


Device Symbol



Rounded Face View

Pin-Out Configuration



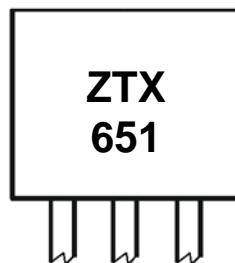
Bottom View

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

Part Number	Compliance	Marking	Case	Leads	Quantity
ZTX651	AEC-Q101	ZTX651	E-Line	Straight	4,000 loose in a Box
ZTX651Q	Automotive	ZTX651	E-Line	Straight	4,000 loose in a Box
ZTX651STZ	AEC-Q101	ZTX651	E-Line	Joggled	2,000 taped per Ammo Box
ZTX651QSTZ	Automotive	ZTX651	E-Line	Joggled	2,000 taped per Ammo Box

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  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. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**



Rounded Face View

ZTX651 = Product type Marking Code

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	80	V
Collector-Emitter Voltage	V <sub>CEO</sub>	60	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	2	A
Peak Pulse Current	I <sub>CM</sub>	6	A

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

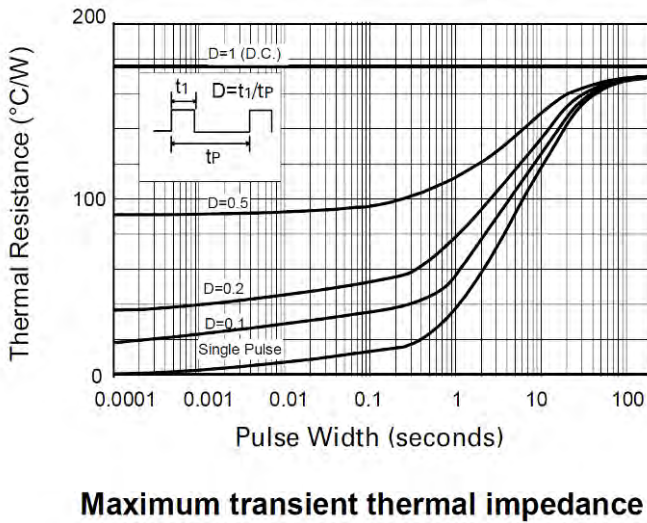
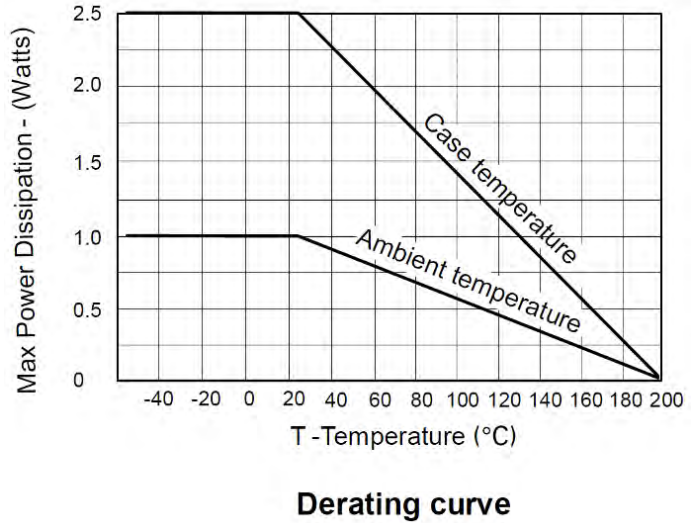
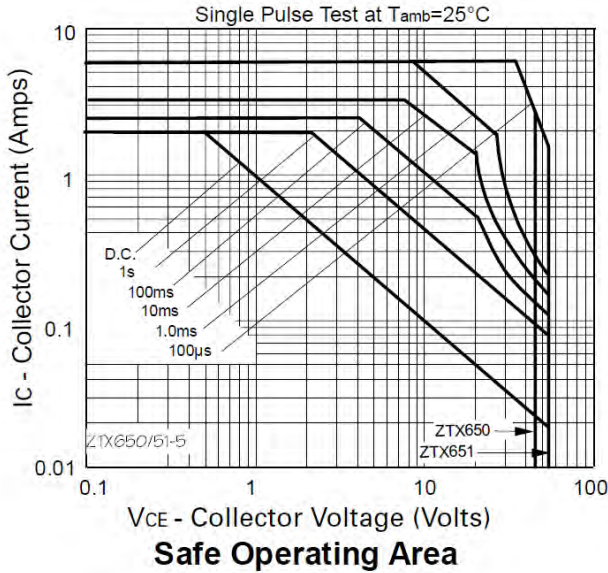
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	1.5	W
Power Dissipation (Note 7)	P <sub>D</sub>	1	W
Thermal Resistance Junction to Ambient (Note 6)	R <sub>θJA</sub>	116	°C/W
Thermal Resistance Junction to Ambient (Note 7)	R <sub>θJA</sub>	175	°C/W
Thermal Resistance Junction to Lead (Note 8)	R <sub>θJL</sub>	70	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +200	°C

### ESD Ratings (Note 9)

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:
6. For a through-hole device mounted at the seating plane (2.5mm lead length) with the collector lead on 25mm x 25mm 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as note (5), except the device is mounted on minimum recommended pad layout with 12mm lead length from the bottom of package to the board.
  8. Thermal resistance from junction to solder-point at the seating plane (2.5mm from the bottom of package along the collector lead).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**

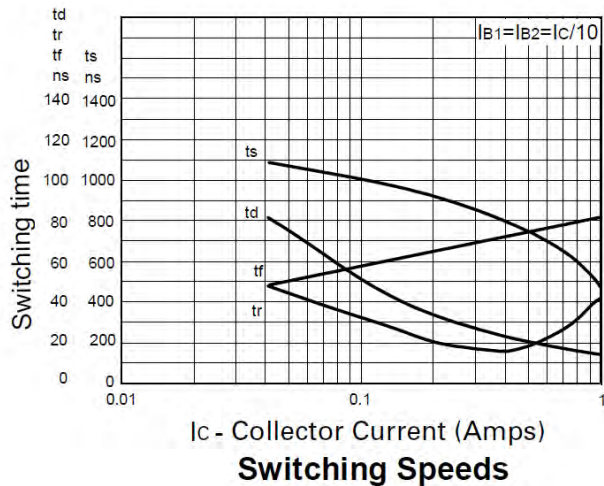
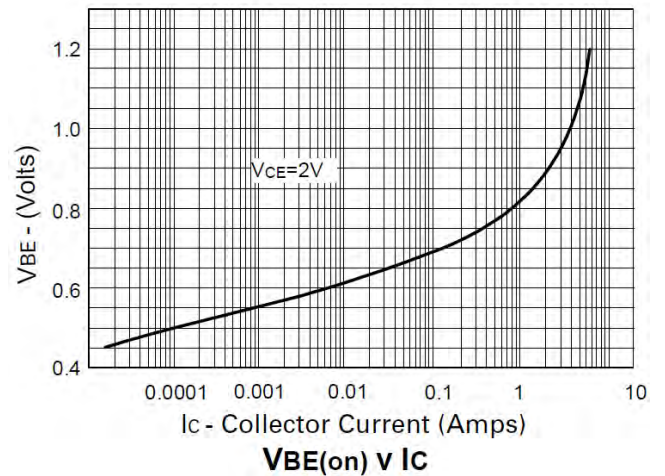
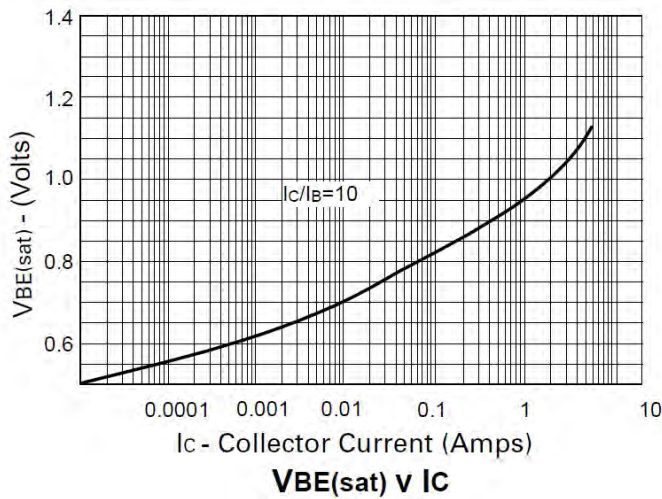
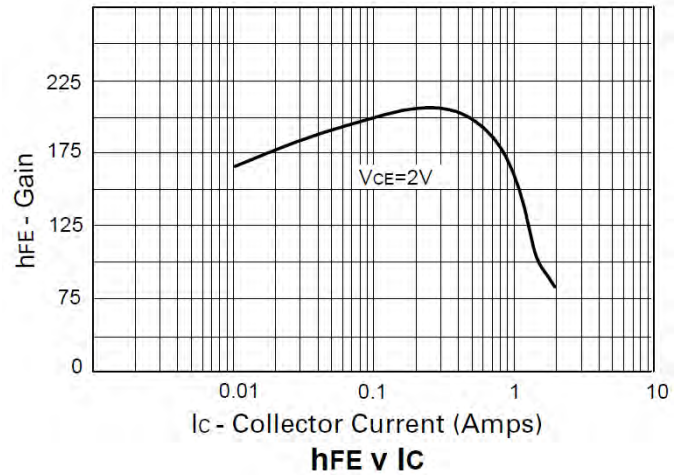
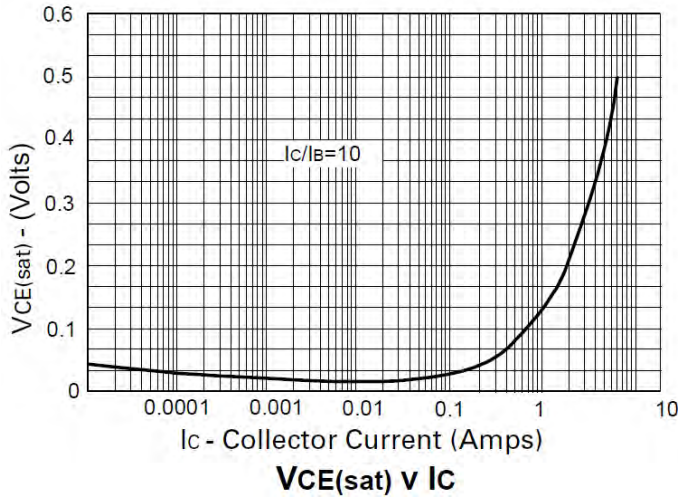


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	80	—	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Note 10)	BV <sub>CEO</sub>	60	—	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	—	—	V	I <sub>E</sub> = 100μA
Collector Cut-off Current	I <sub>CBO</sub>	—	—	0.1 10	μA μA	V <sub>CB</sub> = 60V V <sub>CB</sub> = 60V, T <sub>amb</sub> = 100°C
Emitter Cut-off Current	I <sub>EBO</sub>	—	—	0.1	μA	V <sub>EB</sub> = 6V
Collector-Emitter Saturation Voltage (Note 10)	V <sub>CE(sat)</sub>	—	120 230	300 500	mV	I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA I <sub>C</sub> = 2A, I <sub>B</sub> = 200mA
Base-Emitter Saturation Voltage (Note 10)	V <sub>BE(sat)</sub>	—	0.9	1.25	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA
Base-Emitter Turn-On Voltage (Note 10)	V <sub>BE(on)</sub>	—	0.8	1	V	I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V
DC Current Gain (Note 10)	h <sub>FE</sub>	70 100 80 40	200 200 170 80	— 300 — —	—	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 2V I <sub>C</sub> = 500mA, V <sub>CE</sub> = 2V I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V
Current Gain-Bandwidth Product (Note 10)	f <sub>T</sub>	140	175	—	MHz	V <sub>CE</sub> = 5V, I <sub>C</sub> = 100mA f = 100MHz
Output Capacitance (Note 10)	C <sub>obo</sub>	—	—	30	pF	V <sub>CB</sub> = 10V, f = 1MHz
Turn-On Times	t <sub>on</sub>	—	45	—	ns	I <sub>C</sub> = 500mA, I <sub>B1</sub> = I <sub>B2</sub> = 50mA,
Turn-Off Times	t <sub>off</sub>	—	800	—	ns	V <sub>CC</sub> = 10V

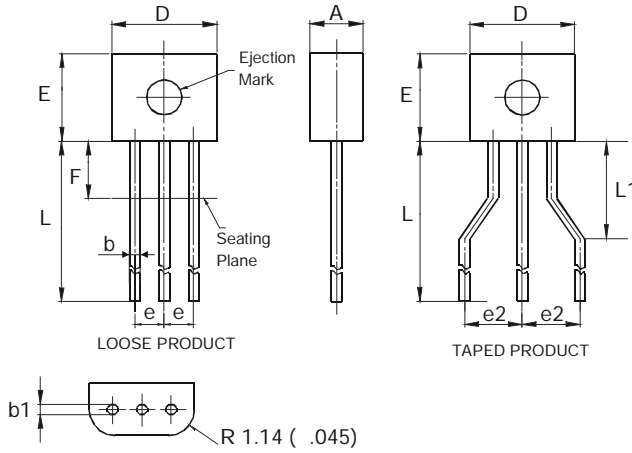
Notes: 10. Measured under pulsed conditions. Pulse width ≤ 300 μs. Duty cycle ≤ 2%

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



**Package Outline Dimensions**

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



E-Line			
Dim	Min	Max	Typ
A	2.16	2.41	-
b	0.41	0.495	-
b1	0.41	0.495	-
D	4.37	4.77	-
E	3.61	4.01	-
e	-	-	1.27
e2	-	-	2.54
F	-	2.50	-
L	13.00	13.97	-
L1	2.50	3.50	-
<b>All Dimensions in mm</b>			



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