

**120V NPN MEDIUM POWER DARLINGTON TRANSISTOR IN TO252**

**Features**

- $BV_{CEO} > 120V$
- $BV_{CBO} > 140V$
- $I_C = 1.5A$  High Continuous current
- $h_{FE} > 2k$  for High Gain @ 1A
- **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**

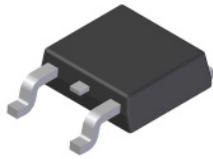
**Mechanical Data**

- Case: TO252 (DPAK)
- 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: 0.34 grams (approximate)

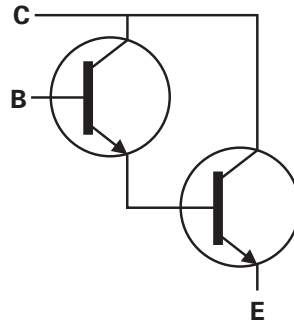
**Applications**

- DC Fans
- Regulator Transistors
- Relays
- Solenoid Driving

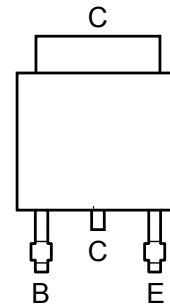
TO252 (DPAK)



Top View



Equivalent Circuit



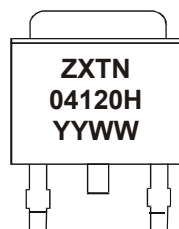
Top View  
Pin-Out

**Ordering Information** (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTN04120HKTC	TO252 (DPAK)	ZXTN04120H	13	16	2,500

- 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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

**Marking Information**



ZXTN04120H = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year, (ex: 13 = 2013)  
 WW = Week Code 01 - 52

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	140	V
Collector-Emitter Voltage	V <sub>CEO</sub>	120	V
Emitter-Base Voltage	V <sub>EBO</sub>	14	V
Continuous Collector Current	I <sub>C</sub>	1.5	A
Peak Pulse Current	I <sub>CM</sub>	4	A

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

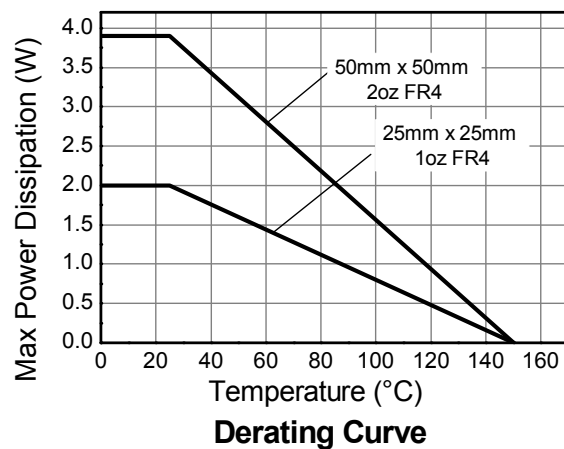
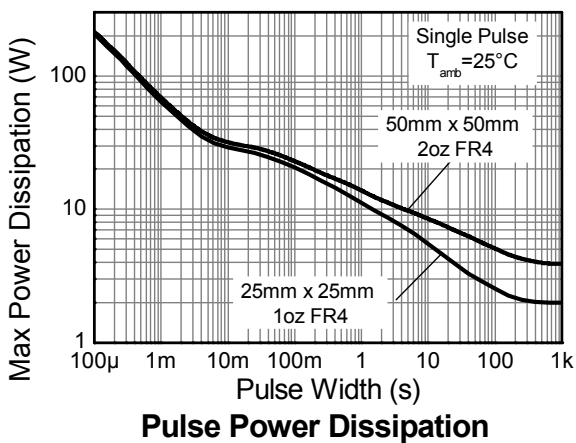
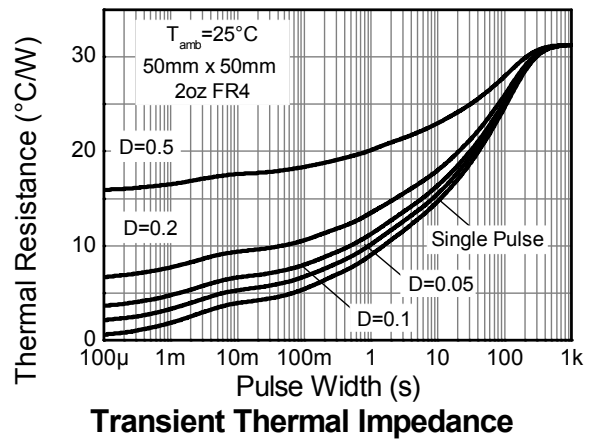
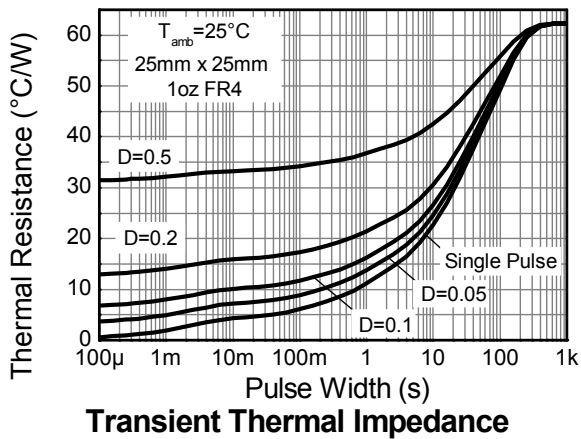
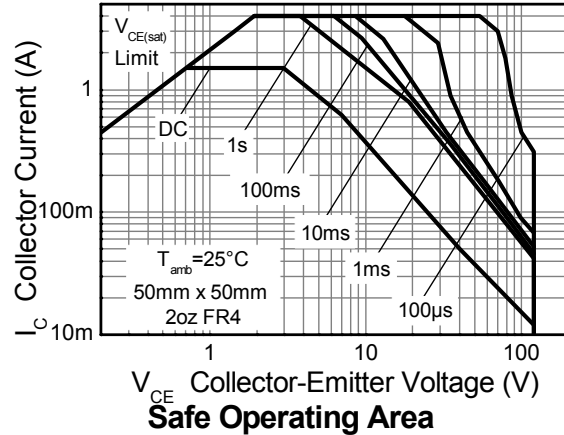
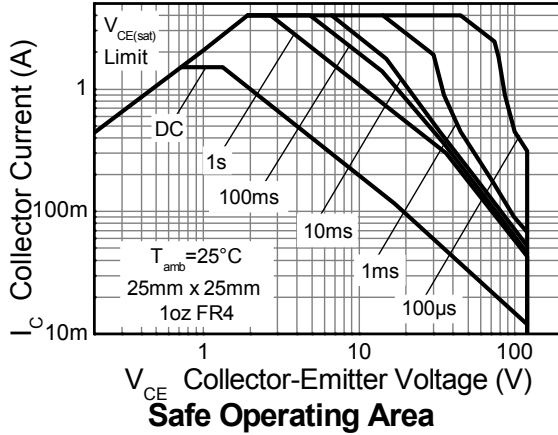
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5)	3.9
		(Note 6)	2
		(Note 7)	1.5
Thermal Resistance, Junction to Ambient Air	R <sub>θJA</sub>	(Note 5)	32
		(Note 6)	62.5
		(Note 7)	80
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	9	°C/W
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	11	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 10)

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:
- For a device mounted with the exposed collector pad on 50mm x 50mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  - Same as note (5), except mounted on 25mm x 25mm 1oz copper.
  - Same as note (5), except mounted on minimum recommended pad (MRP) layout.
  - Thermal resistance from junction to solder-point (on the exposed collector pad).
  - Thermal resistance from junction to the top of the case.
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**

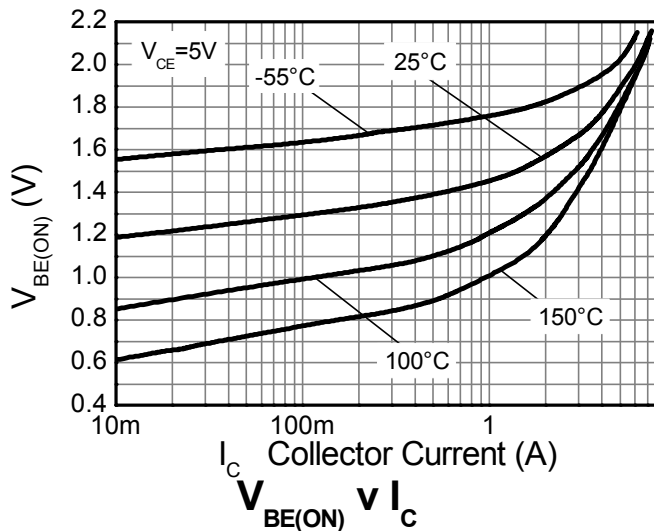
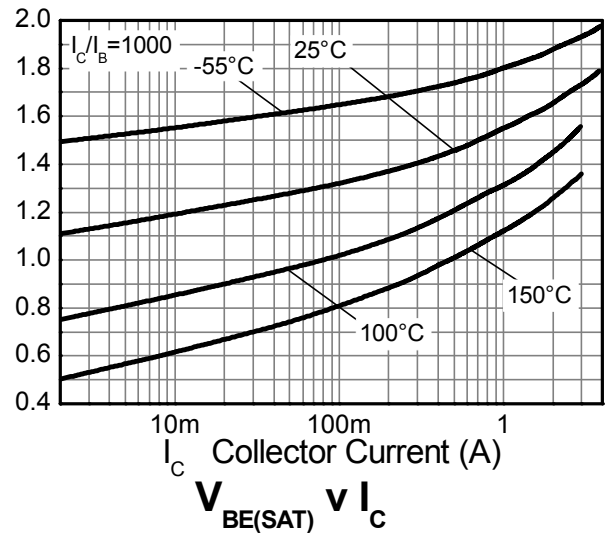
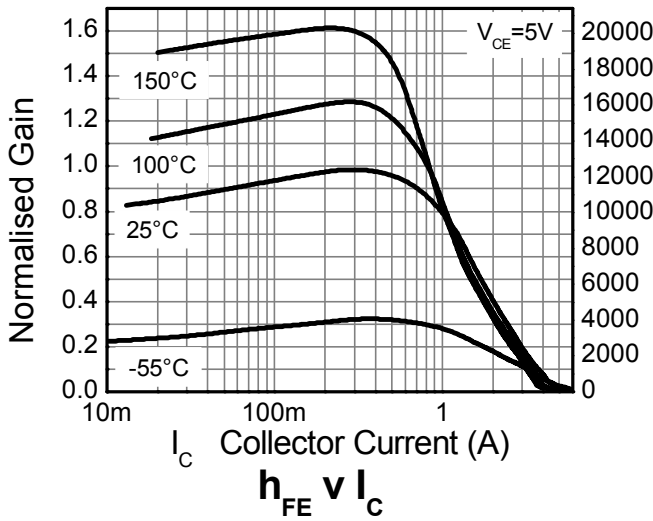
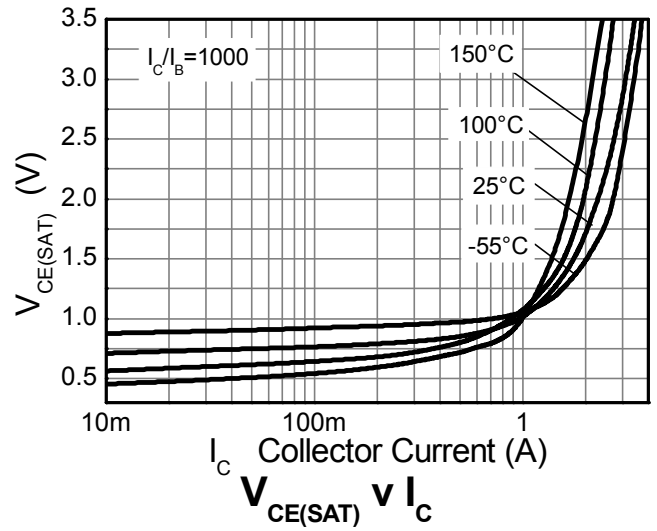
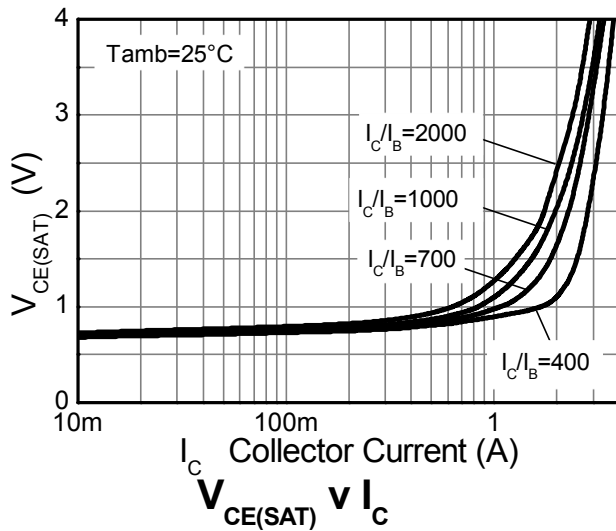


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	140	—	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 11)	$BV_{CEO}$	120	—	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	14	—	—	V	$I_E = 100\mu\text{A}$
Collector-Base Cutoff Current	$I_{CBO}$	—	—	100 10	nA $\mu\text{A}$	$V_{CB} = 120\text{V}$ $V_{CB} = 120\text{V}, T_A = +120^\circ\text{C}$
Collector-Emitter Cutoff Current	$I_{CES}$	—	—	100	nA	$V_{CE} = 120\text{V}$
Emitter Cutoff Current	$I_{EBO}$	—	—	100	nA	$V_{EB} = 8\text{V}$
DC Current Gain (Note 11)	$h_{FE}$	2,000 5,000 2,000 500	— — — —	— — 100,000 —	—	$I_C = 50\text{mA}, V_{CE} = 5\text{V}$ $I_C = 500\text{mA}, V_{CE} = 5\text{V}$ $I_C = 1\text{A}, V_{CE} = 5\text{V}$ $I_C = 2\text{A}, V_{CE} = 5\text{V}$
Collector-Emitter Saturation Voltage (Note 11)	$V_{CE(sat)}$	— —	— —	1 1.5	V	$I_C = 250\text{mA}, I_B = 0.25\text{mA}$ $I_C = 1\text{A}, I_B = 1\text{mA}$
Base-Emitter Saturation Voltage (Note 11)	$V_{BE(sat)}$	—	—	1.8	V	$I_C = 1\text{A}, I_B = 1\text{mA}$
Base-Emitter Turn-On Voltage (Note 11)	$V_{BE(on)}$	—	—	1.7	V	$I_C = 1\text{A}, V_{CE} = 5\text{V}$
Input Capacitance (Note 11)	$C_{ibo}$	—	90	—	pF	$V_{EB} = 0.5\text{V}, f = 1\text{MHz}$
Output Capacitance (Note 11)	$C_{obo}$	—	15	—	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$
Current Gain-Bandwidth Product (Note 11)	$f_T$	150	—	—	MHz	$V_{CE} = 10\text{V}, I_C = 100\text{mA}, f = 20\text{MHz}$
Turn-On Time	$t_{on}$	—	0.5	—	$\mu\text{s}$	$V_{CC} = 10\text{V}, I_C = 500\text{mA}$
Turn-Off Time	$t_{off}$	—	1.6	—	$\mu\text{s}$	$I_{B1} = -I_{B2} = 0.5\text{mA}$

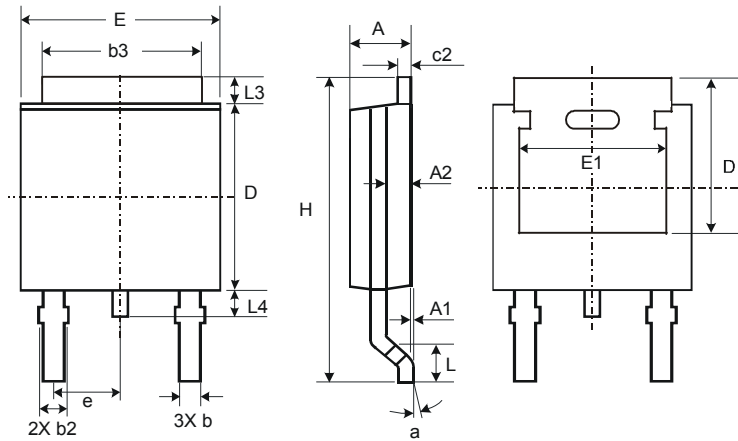
Note: 11. Measured under pulsed conditions. Pulse width  $\leq 300 \mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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



## Package Outline Dimensions

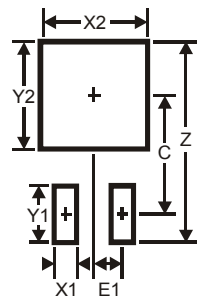
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



TO252			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
<b>All Dimensions in mm</b>			

## Suggested Pad Layout

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



Dimensions	Value (in mm)
Z	11.6
X1	1.5
X2	7.0
Y1	2.5
Y2	7.0
C	6.9
E1	2.3

Note: 12. For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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