

**120V NPN MEDIUM POWER DARLINGTON TRANSISTOR IN POWERDI®5**

**Features**

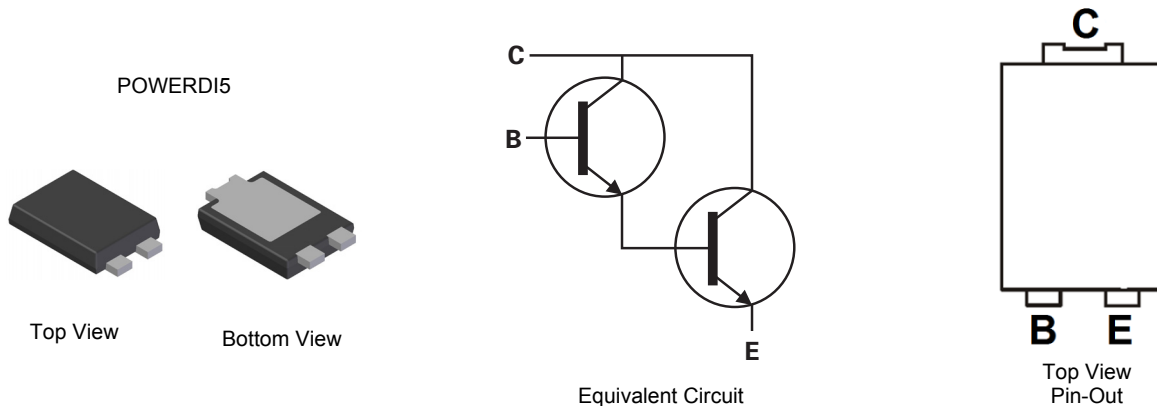
- $BV_{CEO} > 120V$
- $BV_{CBO} > 140V$
- $I_C = 1.5A$  High Continuous current
- $hFE > 2k$  for High Gain @ 1A
- 43% smaller than SOT223; 60% smaller than TO252
- Maximum Height Just 1.1mm
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

- Case: POWERDI5
- 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 @3
- Weight: 0.093 grams (approximate)

**Applications**

- DC Fans
- Regulator Transistors
- Relays
- Solenoid Driving

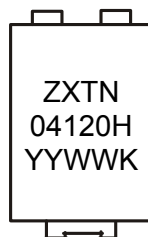


**Ordering Information** (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTN04120HP5TC	POWERDI5	ZXTN04120H	13	16	5,000

- 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  
 K = Factory Designator  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 13 for 2013)  
 WW = Week code (01 to 53)

**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.)

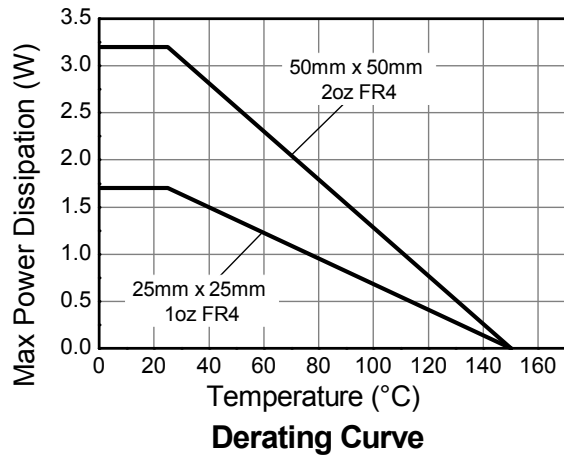
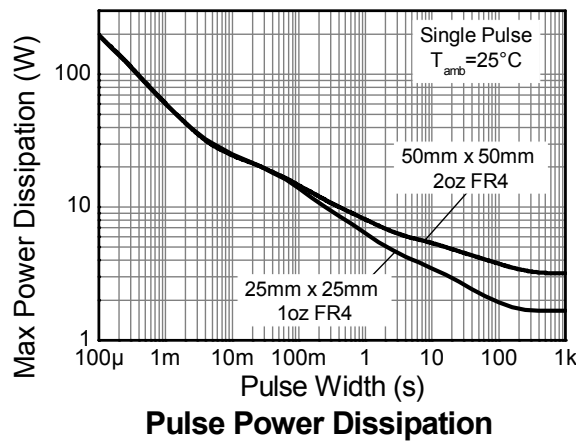
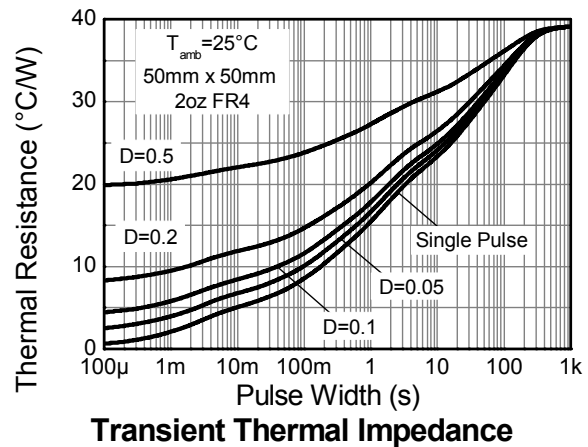
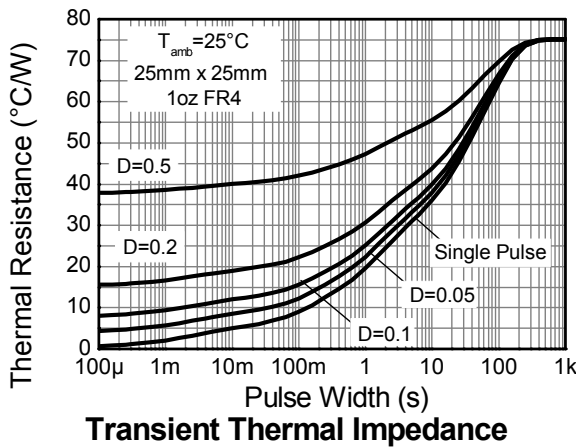
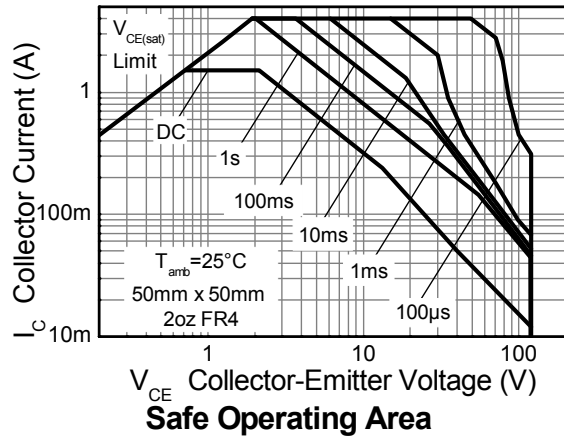
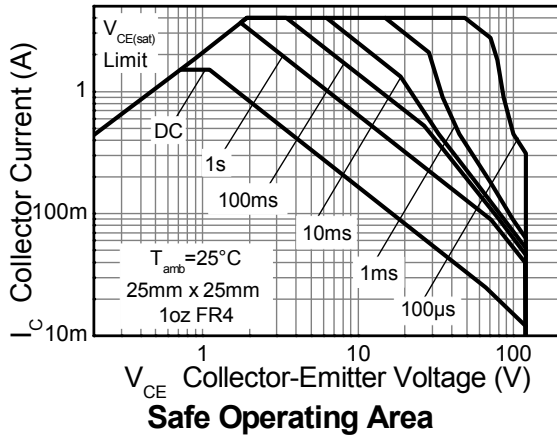
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5) 3.2	W
		(Note 6) 1.7	
		(Note 7) 0.74	
Thermal Resistance, Junction to Ambient Air	R <sub>θJA</sub>	(Note 5) 39	°C/W
		(Note 6) 75	
		(Note 7) 169	
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	9	
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	10	
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**

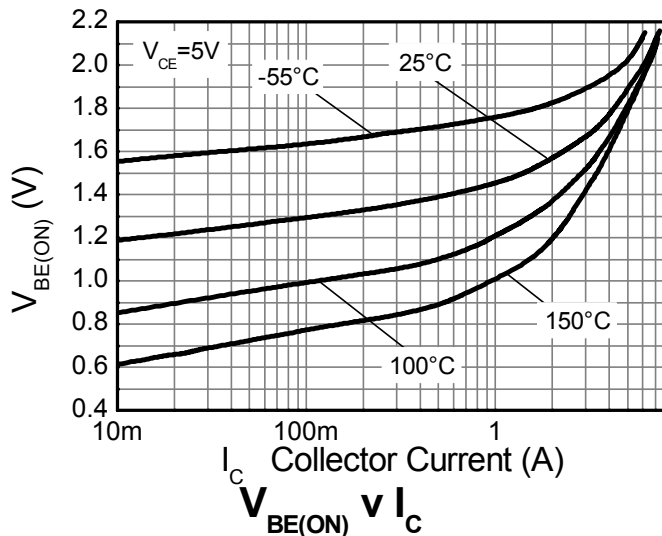
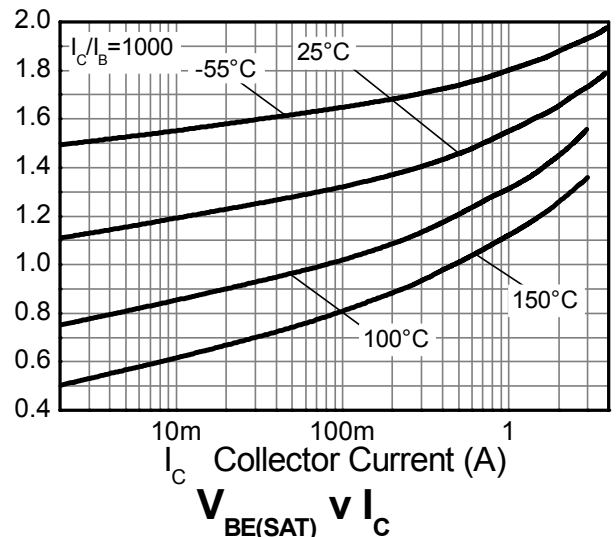
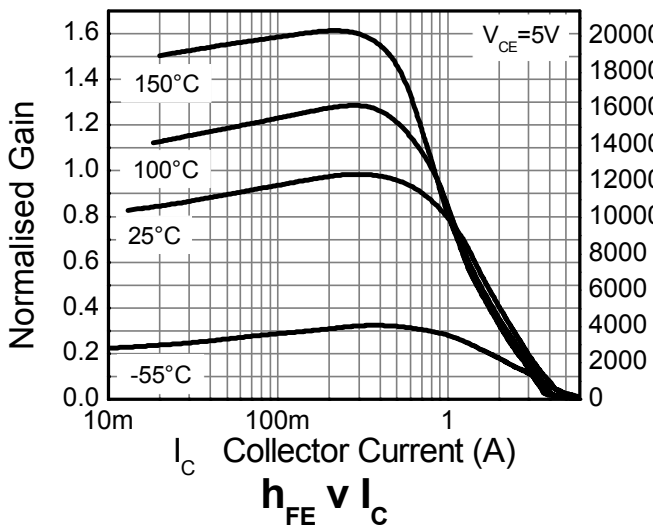
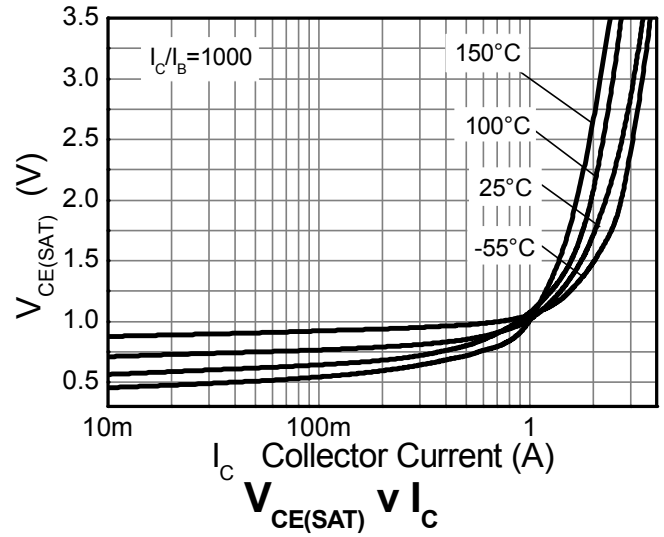
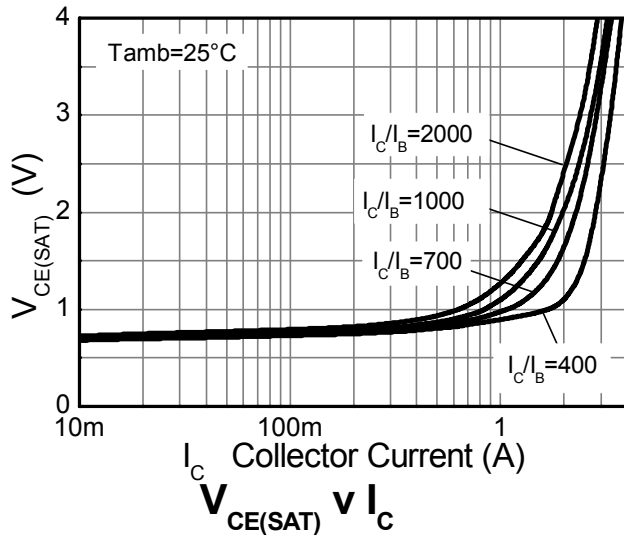


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	140	—	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Note 11)	BV <sub>CEO</sub>	120	—	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	14	—	—	V	I <sub>E</sub> = 100μA
Collector-Base Cutoff Current	I <sub>CBO</sub>	—	—	100 10	nA μA	V <sub>CB</sub> = 120V V <sub>CB</sub> = 120V, T <sub>A</sub> = +120°C
Collector-Emitter Cutoff Current	I <sub>CES</sub>	—	—	100	nA	V <sub>CE</sub> = 120V
Emitter Cutoff Current	I <sub>EBO</sub>	—	—	100	nA	V <sub>EB</sub> = 8V
DC Current Gain (Note 11)	h <sub>FE</sub>	2,000 5,000 2,000 500	— — — —	— — 100,000 —	—	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 5V I <sub>C</sub> = 500mA, V <sub>CE</sub> = 5V I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V I <sub>C</sub> = 2A, V <sub>CE</sub> = 5V
Collector-Emitter Saturation Voltage (Note 11)	V <sub>CE(sat)</sub>	— —	— —	1 1.5	V	I <sub>C</sub> = 250mA, I <sub>B</sub> = 0.25mA I <sub>C</sub> = 1A, I <sub>B</sub> = 1mA
Base-Emitter Saturation Voltage (Note 11)	V <sub>BE(sat)</sub>	—	—	1.8	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 1mA
Base-Emitter Turn-On Voltage (Note 11)	V <sub>BE(on)</sub>	—	—	1.7	V	I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V
Input Capacitance (Note 11)	C <sub>ibo</sub>	—	90	—	pF	V <sub>EB</sub> = 0.5V, f = 1MHz
Output Capacitance (Note 11)	C <sub>obo</sub>	—	15	—	pF	V <sub>CB</sub> = 10V, f = 1MHz
Current Gain-Bandwidth Product (Note 11)	f <sub>T</sub>	150	—	—	MHz	V <sub>CE</sub> = 10V, I <sub>C</sub> = 100mA, f = 20MHz
Turn-On Time	t <sub>on</sub>	—	0.5	—	μs	V <sub>CC</sub> = 10V, I <sub>C</sub> = 500mA
Turn-Off Time	t <sub>off</sub>	—	1.6	—	μs	I <sub>B1</sub> = -I <sub>B2</sub> = 0.5mA

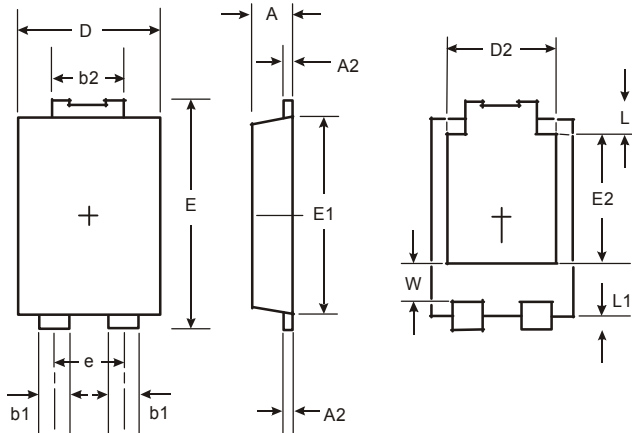
Note: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



## Package Outline Dimensions

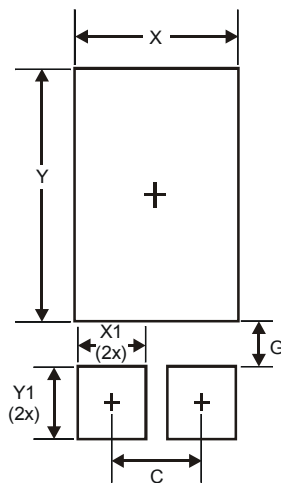
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



POWERDI5		
Dim	Min	Max
A	1.05	1.15
A2	0.33	0.43
b1	0.80	0.99
b2	1.70	1.88
D	3.90	4.05
D2	3.054 Typ	
E	6.40	6.60
e	1.84 Typ	
E1	5.30	5.45
E2	3.549 Typ	
L	0.75	0.95
L1	0.50	0.65
W	1.10	1.41
<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)
C	1.840
G	0.852
X	3.360
X1	1.390
Y	4.860
Y1	1.400

Note: 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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**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.