A Product Line of
Diodes Incorporated

Lead-free Green

**DXT2010P5**

# 60V NPN MEDIUM POWER TRANSISTOR
# PowerDI®5

## Features

- 43% smaller than SOT223; 60% smaller than TO252
- Maximum height just 1.1mm
- Rated up to 3.2W
- $V_{CEO}$ = 60V
- $I_C$ = 6A; $I_{CM}$ = 20A
- Low Saturation voltage
- **Lead, Halogen and Antimony Free, RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**

## Mechanical Data

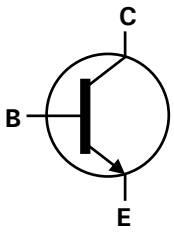
- Case: PowerDI®5
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.093 grams (approximate)

## Applications

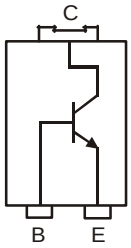
- Motor driver
- Regulator circuit

Top View

Bottom View




Device Schematic



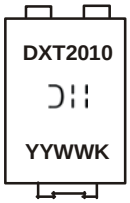

Pin-out diagram

## Ordering Information (Note 3)

| Part Number | Case | Packaging |
|---|---|---|
| DXT2010P5-13 | PowerDI®5 | 5000/Tape & Reel |

Notes:
1. No purposefully added lead. Halogen and Antimony Free.
2. Diodes Inc's "Green" Policy can be found on our website at http://www.diodes.com
3. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

## Marking Information




DXT2010 = Product Type Marking Code
= Manufacturers' Code Marking
K = Factory Designator
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 09 for 2009)
WW = Week code (01 to 53)

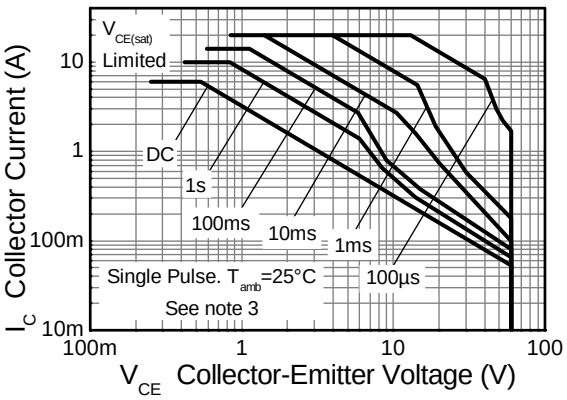
## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 150 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 60 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 7 | V |
| Continuous Collector Current | $I_C$ | 6 | A |
| Peak Pulse Current | $I_{CM}$ | 20 | A |

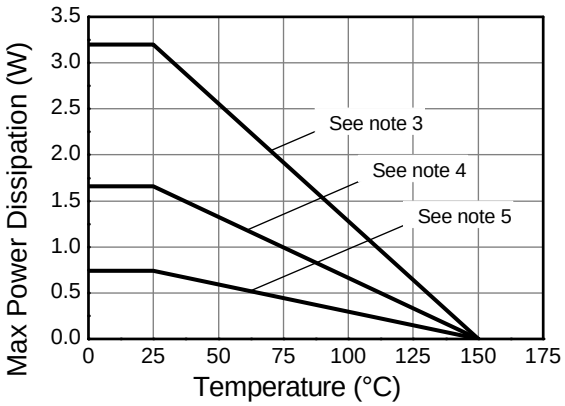
## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation @ $T_A$ = 25°C (Note 4) | $P_D$ | 3.2 | W |
| Thermal Resistance, Junction to Ambient Air (Note 4) @$T_A$ = 25°C | $R_{\theta JA}$ | 39 | °C/W |
| Power Dissipation @ $T_A$ = 25°C (Note 5) | $P_D$ | 1.7 | W |
| Thermal Resistance, Junction to Ambient Air (Note 5) @$T_A$ = 25°C | $R_{\theta JA}$ | 75 | °C/W |
| Power Dissipation @ $T_A$ = 25°C (Note 6) | $P_D$ | 0.74 | W |
| Thermal Resistance, Junction to Ambient Air (Note 6) @$T_A$ = 25°C | $R_{\theta JA}$ | 169 | °C/W |
| Thermal Resistance, Junction to Collector Terminal | $R_{\theta JT}$ | 5.6 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

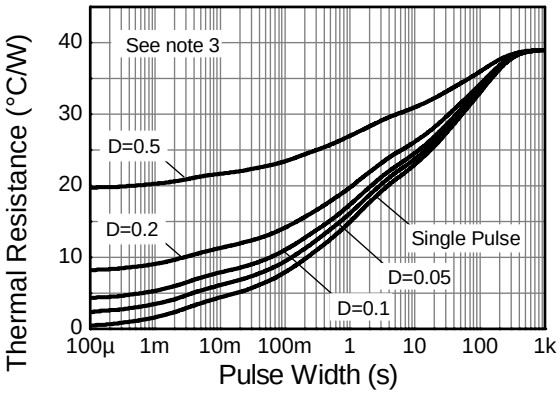
Notes: 4. Device mounted on FR-4 PCB, single sided 2 oz. copper, collector pad dimensions 25mm x 25mm.
5. Device mounted on FR-4 PCB, single sided 1 oz. copper, collector pad dimensions 50mm x 50mm.
6. Device mounted on FR-4 PCB, single sided 1 oz. copper, minimum recommended pad layout.



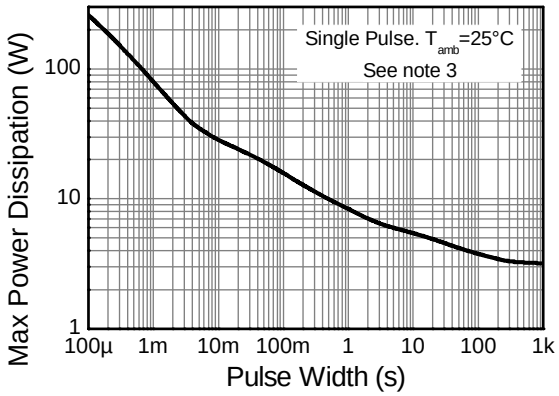

**Safe Operating Area**



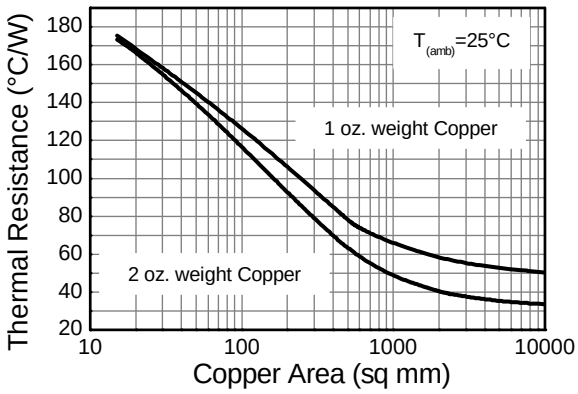

**Derating Curve**



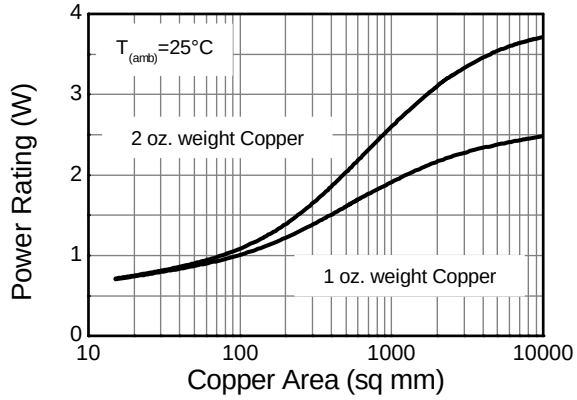

**Transient Thermal Impedance**




**Pulse Power Dissipation**




**Thermal Resistance vs. Cu Area**



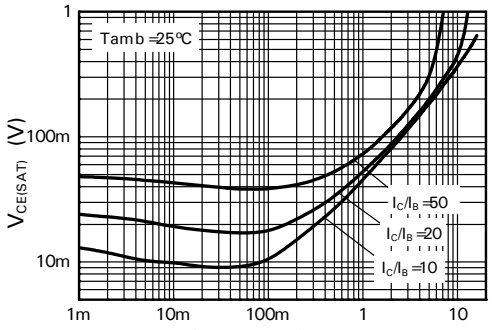

**Power Rating vs. Cu Area**

## Electrical Characteristics @$T_A$ = 25°C unless otherwise specified

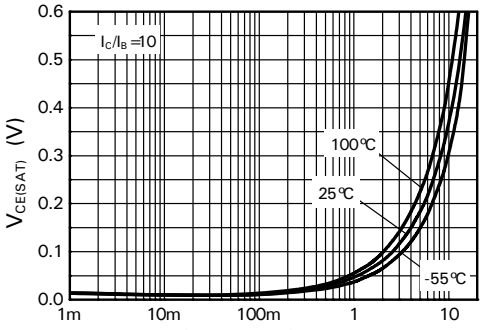
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | 150 | 190 | — | V | $I_C$ = 100μA |
| Collector-Emitter Breakdown Voltage (Note 7) | $V_{(BR)CEO}$ | 60 | 80 | — | V | $I_C$ = 10mA |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | 7.0 | 8.1 | — | V | $I_E$ = 100μA |
| Collector Cutoff Current | $I_{CBO}$ | — | — | 20<br>0.5 | nA<br>μA | $V_{CB}$ = 120V<br>$V_{CB}$ = 120V, $T_{amb}$ = 100 °C |
| Collector Cutoff Current | $I_{CER}$<br>R≤1kΩ | — | — | 20<br>0.5 | nA<br>μA | $V_{CB}$ = 120V<br>$V_{CB}$ = 120V, $T_{amb}$ = 100 °C |
| Emitter Cutoff Current | $I_{EBO}$ | — | — | 10 | nA | $V_{EB}$ = 6V |
| Collector-Emitter Saturation Voltage (Note 7) | $V_{CE(sat)}$ | — | 20<br>45<br>50<br>100<br>210 | 30<br>60<br>70<br>135<br>260 | mV | $I_C$ = 100mA, $I_B$ = 5mA<br>$I_C$ = 1A, $I_B$ = 100mA<br>$I_C$ = 1A, $I_B$ = 50mA<br>$I_C$ = 2A, $I_B$ = 50mA<br>$I_C$ = 6A, $I_B$ = 300mA |
| Base-Emitter Saturation Voltage (Note 7) | $V_{BE(sat)}$ | — | 1000 | 1100 | mV | $I_C$ = 6A, $I_B$ = 300mA |
| Base-Emitter Turn-On Voltage (Note 7) | $V_{BE(on)}$ | — | 940 | 1050 | mV | $V_{CE}$ = 1V, $I_C$ = 6A |
| DC Current Gain (Note 6) | $h_{FE}$ | 100<br>100<br>55<br>20 | 200<br>200<br>105<br>40 | —<br>300<br>—<br>— | — | $I_C$ = 10mA, $V_{CE}$ = 1V<br>$I_C$ = 2A, $V_{CE}$ = 1V<br>$I_C$ = 5A, $V_{CE}$ = 1V<br>$I_C$ = 10A, $V_{CE}$ = 1V |
| Transition Frequency | $f_T$ | — | 130 | — | MHz | $I_C$ = 100mA, $V_{CE}$ = 10V<br>f = 50MHz |
| Output Capacitance (Note 7) | $C_{obo}$ | — | 31 | — | pF | $V_{CB}$ = -10A, f = 1MHz |
| Switching Times | $t_{on}$<br>$t_{off}$ | —<br>— | 42<br>760 | —<br>— | ns<br>ns | $I_C$ = 1A, $V_{CC}$ = 10V,<br>$I_{B1}$ = $I_{B2}$ = 100mA |

Notes: 7. Pulse Test: Pulse width ≤300μs. Duty cycle ≤2.0%.

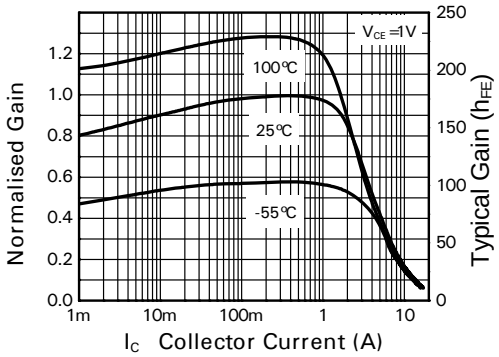
## Typical Characteristic



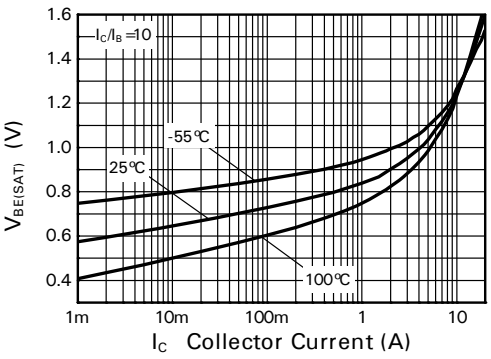

$V_{CE(SAT)}$ v $I_C$



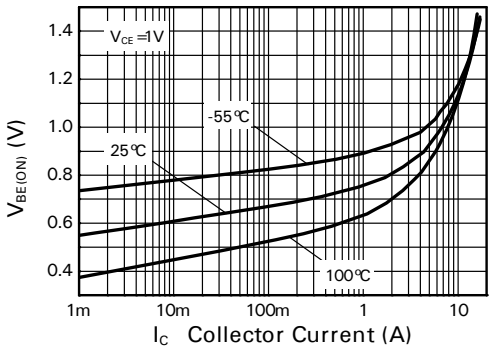

$V_{CE(SAT)}$ v $I_C$




$h_{FE}$ v $I_C$

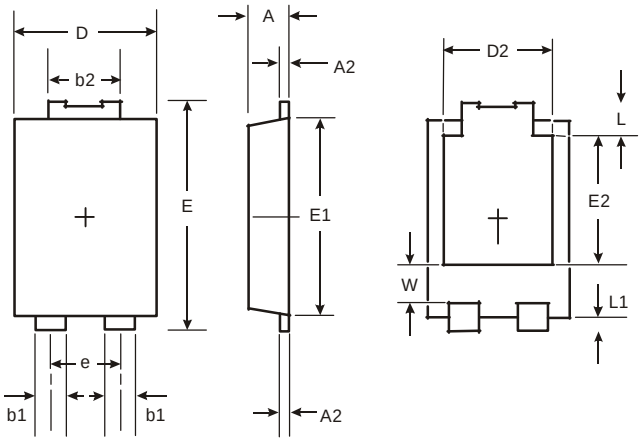



$V_{BE(SAT)}$ v $I_C$



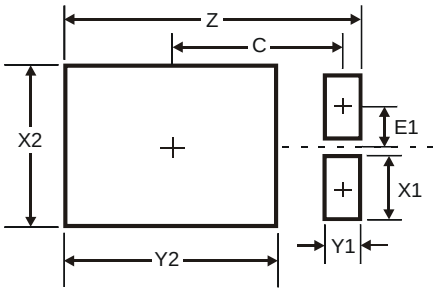

$V_{BE(ON)}$ v $I_C$

## Package Outline Dimensions




| PowerDI®5 | | |
|---|---|---|
| **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 |
| **All Dimensions in mm** | | |

## Suggested Pad Layout




| Dimensions | Value (in mm) |
|---|---|
| **Z** | 6.6 |
| **X1** | 1.4 |
| **X2** | 3.6 |
| **Y1** | 0.8 |
| **Y2** | 4.7 |
| **C** | 3.87 |
| **E1** | 0.9 |

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