# ZXTP19060CG

## 60V PNP MEDIUM POWER TRANSISTOR IN SOT223

## Features

- $BV_{CEO}$ > -60V
- $BV_{ECO}$ > -7V
- $I_C$ = 5A High Continuous Current
- Low Saturation Voltage $V_{CE(sat)}$ < -80mV @ 1A
- $R_{CE(sat)}$ = 50mΩ
- Complementary PNP Type: ZXTN19060CG
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

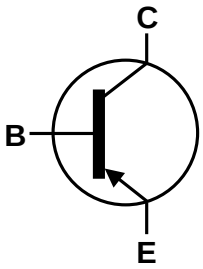
- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.112 grams (Approximate)

## Applications

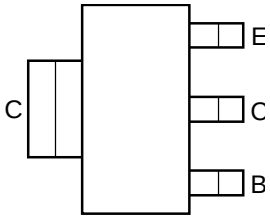
- Motor Drive
- High Side Driver

SOT223

Top View




Device Symbol




Top View
Pin-Out

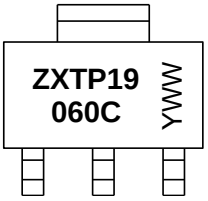
## Ordering Information (Note 4)

| Product | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|---|
| ZXTP19060CGTA | AEC-Q101 | ZXTP19060C | 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 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

SOT223




ZXTP19060C = Product Type Marking Code
YWW = Date Code Marking
Y or $\overline{Y}$ = Last Digit of Year (ex: 5= 2015)
WW or $\overline{WW}$ = Week Code (01~53)

## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -60 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -60 | V |
| Emitter-Collector Voltage (reverse blocking) | $V_{ECX}$ | -7 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -7 | V |
| Continuous Collector Current | $I_C$ | -5 | A |
| Base Current | $I_B$ | -1 | A |
| Peak Pulse Current | $I_{CM}$ | -7 | A |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

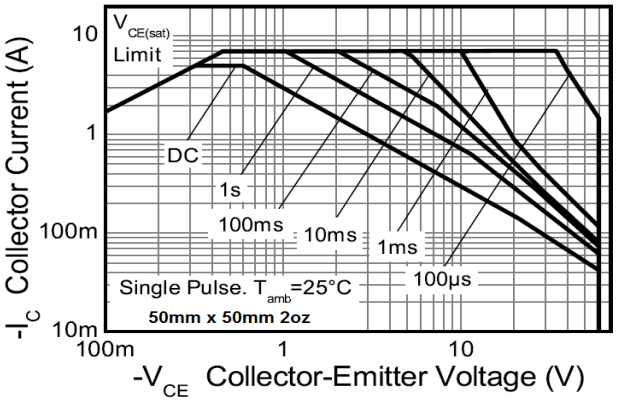
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation<br>Linear Derating Factor | (Note 5) | $P_D$ | 1.2<br>9.6 | W<br>mW/°C |
| | (Note 6) | | 1.6<br>12.8 | |
| | (Note 7) | | 3<br>24 | |
| | (Note 8) | | 5.3<br>42 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 104 | °C/W |
| | (Note 6) | | 78 | |
| | (Note 7) | | 42 | |
| | (Note 8) | | 23.5 | |
| Thermal Resistance, Junction to Lead | (Note 9) | $R_{\theta JL}$ | 16 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 10)

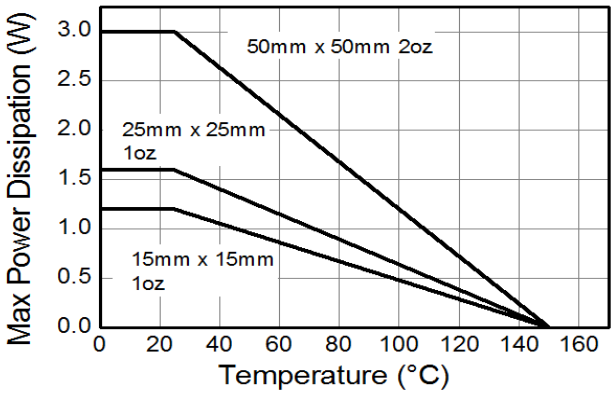
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

Notes:
5. For a device mounted with the collector lead on 15mm x 15mm 1oz 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 6, except the device is mounted on 25mm x 25mm 1oz copper.
7. Same as Note 6, except the device is mounted on 50mm x 50mm 2oz copper.
8. Same as Note 8 measured at t<5 seconds.
9. Thermal resistance from junction to solder-point (at the end of the collector lead).
10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

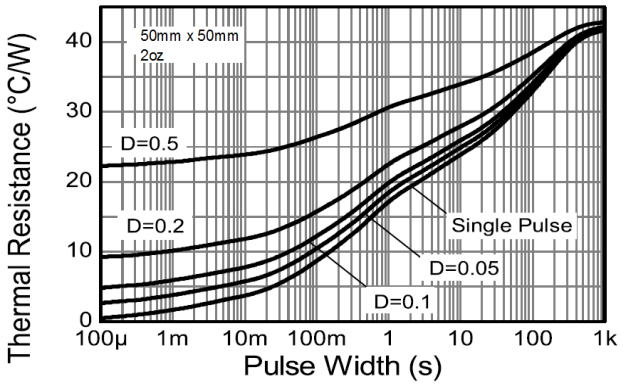
## Thermal Characteristics and Derating Information (@$T_A$ = +25°C, unless otherwise specified.)



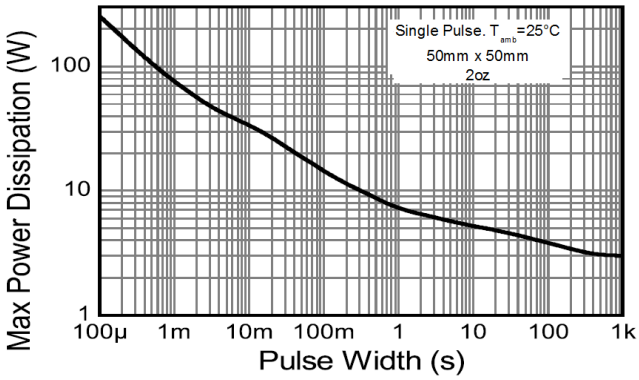

**Safe Operating Area**




**Derating Curve**




**Transient Thermal Impedance**



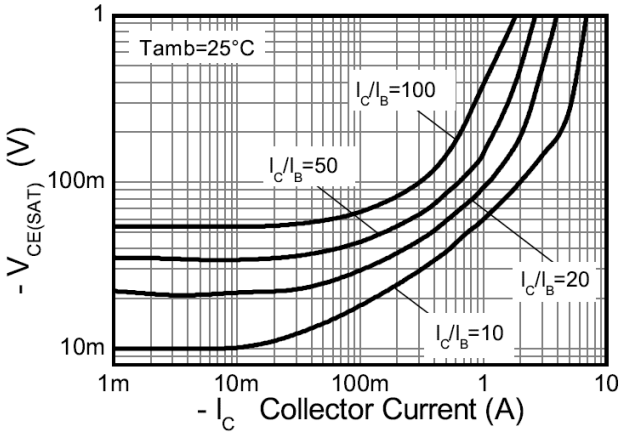

**Pulse Power Dissipation**

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

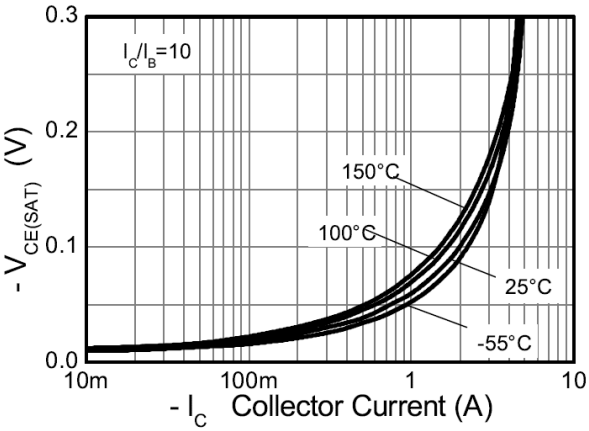
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -60 | -110 | – | V | $I_C$ = -100µA |
| Collector-Emitter Breakdown Voltage (Note 11) | $BV_{CEO}$ | -60 | -90 | – | V | $I_C$ = -10mA |
| Emitter-Collector Breakdown Voltage (reverse blocking) | $BV_{ECX}$ | -7 | -8.4 | – | V | $I_C$ = -100µA, $R_{BC}$ <1kΩor 0.25V< $V_{BC}$ > -0.25V |
| Emitter-Collector Breakdown Voltage (reverse blocking) | $BV_{ECO}$ | -7 | -8.8 | – | V | $I_E$ = -100µA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -7 | -8.4 | – | V | $I_E$ = -100µA |
| Collector Cut-Off Current | $I_{CBO}$ | – | < 1 | -50 | nA | $V_{CB}$ = -60V |
| | | – | – | -0.5 | µA | $V_{CB}$ = -60V, $T_A$ = +100°C |
| Emitter Cut-Off Current | $I_{EBO}$ | – | < 1 | -50 | nA | $V_{EB}$ = -5.6V |
| Collector-Emitter Saturation Voltage (Note 11) | $V_{CE(sat)}$ | – | -62 | -80 | mV | $I_C$ = -1A, $I_B$ = -100mA |
| | | – | -145 | -205 | mV | $I_C$ = -1A, $I_B$ = -20mA |
| | | – | -500 | -750 | mV | $I_C$ = -2A, $I_B$ = -40mA |
| | | – | -105 | -165 | mV | $I_C$ = -2A, $I_B$ = -200mA |
| | | – | -145 | -200 | mV | $I_C$ = -3A, $I_B$ = -300mA |
| | | – | -300 | -500 | mV | $I_C$ = -5A, $I_B$ = -500mA |
| Base-Emitter Saturation Voltage (Note 11) | $V_{BE(sat)}$ | – | -975 | -1050 | mV | $I_C$ = -5A, $I_B$ = -500mA |
| Base-Emitter Turn-On Voltage (Note 11) | $V_{BE(on)}$ | – | -890 | -1000 | mV | $I_C$ = -5A, $V_{CE}$ = -2V |
| DC Current Gain (Note 11) | $h_{FE}$ | 200 | 330 | 500 | – | $I_C$ = -100mA, $V_{CE}$ = -2V |
| | | 160 | 260 | – | – | $I_C$ = -1A, $V_{CE}$ = -2V |
| | | 20 | 40 | – | – | $I_C$ = -5A, $V_{CE}$ = -2V |
| Current Gain-Bandwidth Product (Note 11) | $f_T$ | – | 180 | – | MHz | $V_{CE}$ = -10V, $I_C$ = -50mA, f = 50MHz |
| Input Capacitance (Note 11) | $C_{ibo}$ | – | 280 | 400 | pF | $V_{EB}$ = -0.5V, f = 1MHz |
| Output Capacitance (Note 11) | $C_{obo}$ | – | 29.5 | 40 | pF | $V_{CB}$ = -10V, f = 1MHz |
| Delay Time | $t_d$ | – | 24.3 | – | ns | $I_C$ = -500mA, $V_{CC}$ = -10V, $I_{B1}$ = -$I_{B2}$ = -50mA |
| Rise Time | $t_r$ | – | 13.2 | – | ns | |
| Storage Time | $t_s$ | – | 456 | – | ns | |
| Fall Time | $t_f$ | – | 68.2 | – | ns | |

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

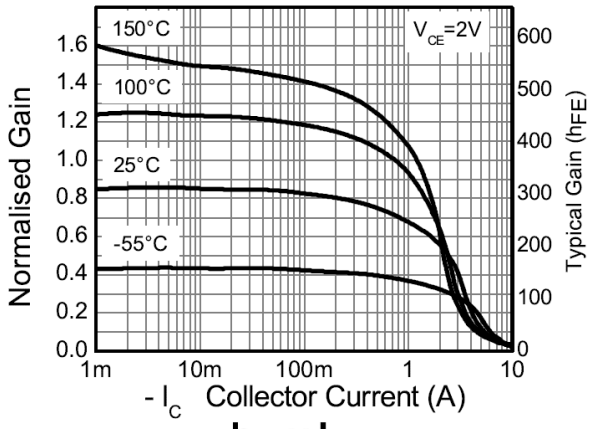
## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



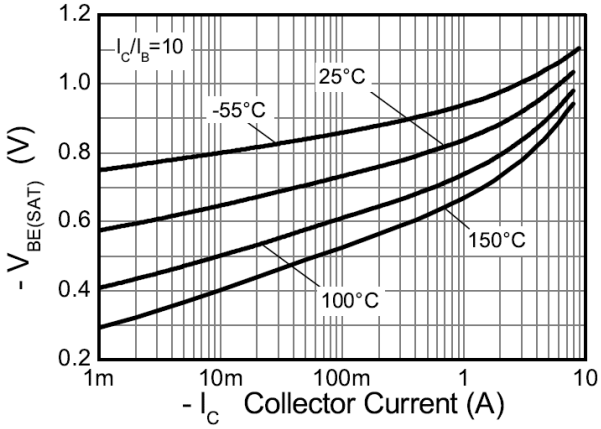

$V_{CE(SAT)}$ v $I_C$



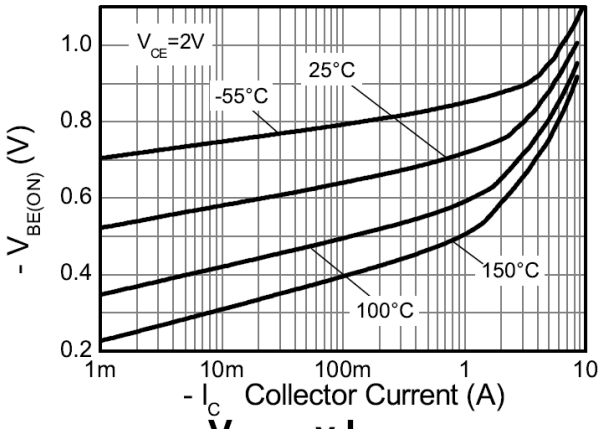

$V_{CE(SAT)}$ v $I_C$



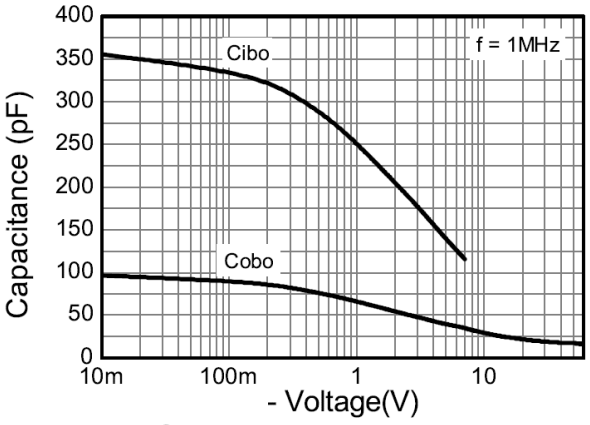

$h_{FE}$ v $I_C$




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



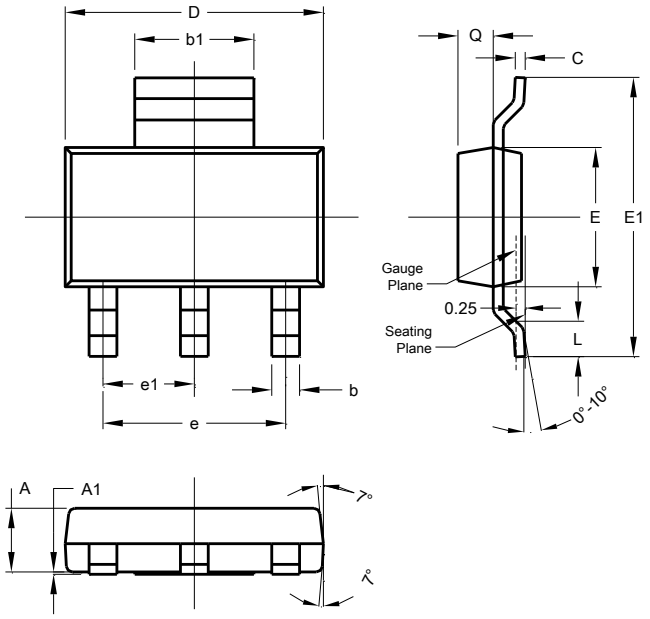

$V_{BE(ON)}$ v $I_C$




**Capacitance v Voltage**

## Package Outline Dimensions

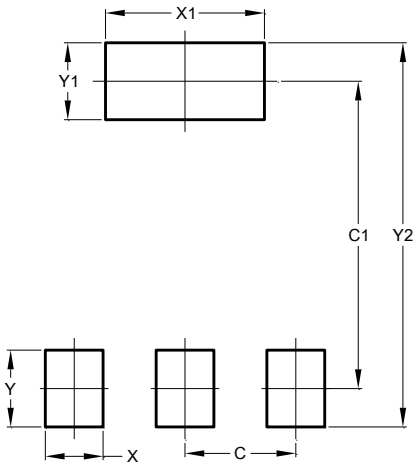
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| SOT223 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.55 | 1.65 | 1.60 |
| **A1** | 0.010 | 0.15 | 0.05 |
| **b** | 0.60 | 0.80 | 0.70 |
| **b1** | 2.90 | 3.10 | 3.00 |
| **C** | 0.20 | 0.30 | 0.25 |
| **D** | 6.45 | 6.55 | 6.50 |
| **E** | 3.45 | 3.55 | 3.50 |
| **E1** | 6.90 | 7.10 | 7.00 |
| **e** | - | - | 4.60 |
| **e1** | - | - | 2.30 |
| **L** | 0.85 | 1.05 | 0.95 |
| **Q** | 0.84 | 0.94 | 0.89 |
| **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** | 2.30 |
| **C1** | 6.40 |
| **X** | 1.20 |
| **X1** | 3.30 |
| **Y** | 1.60 |
| **Y1** | 1.60 |
| **Y2** | 8.00 |

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