# 200V PNP HIGH VOLTAGE TRANSISTOR IN SOT23

## Features

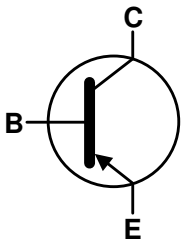
- $BV_{CEO}$ > -200V
- $I_C$ = -0.3A Continuous Collector Current
- $I_{CM}$ = -1A Peak Pulse Current
- 500mW power dissipation
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The FMMT596Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  **https://www.diodes.com/quality/product-definitions/**

## Mechanical Data

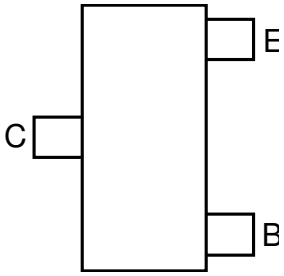
- Package: SOT23
- Package Material: Molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight 0.008 grams (Approximate)

SOT23

Top View




Device Symbol




Top View
Pin-Out

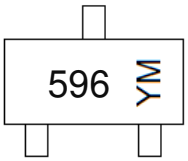
## Ordering Information (Note 4)

| Product | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|---|
| FMMT596QTA | Automotive | 596 | 7 | 8 | 3,000 |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information

SOT23




596 = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: I = 2021)
M or $\overline{M}$ = Month (ex: 9 = September)

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -220 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -200 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -7 | V |
| Continuous Collector Current | $I_C$ | -0.3 | A |
| Peak Pulse Current | $I_{CM}$ | -1 | A |
| Base Current | $I_B$ | -200 | mA |

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

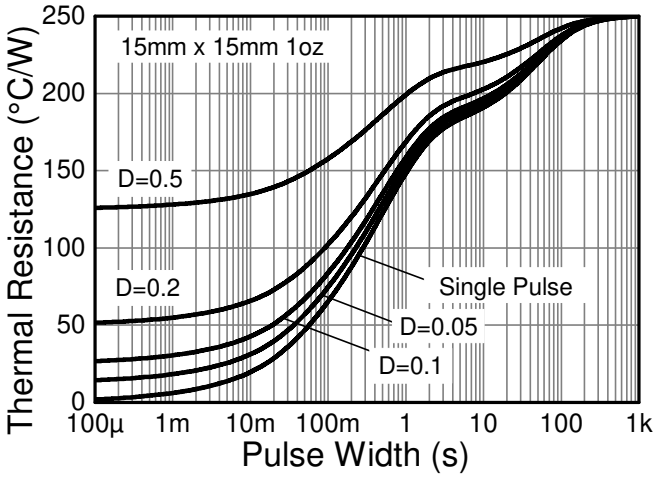
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 5) | $P_D$ | 500 | mW |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 250 | °C/W |
| Thermal Resistance, Junction to Leads (Note 6) | $R_{\theta JL}$ | 197 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 7)

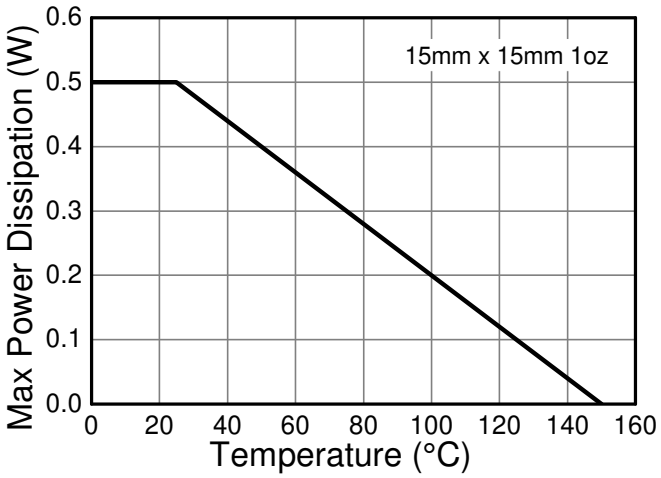
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 2,000 | V | 2 |
| Electrostatic Discharge - Charged Device Model | ESD CDM | 1,000 | V | C3 |

Notes:
5. For a device mounted with the collector lead on 15mm x 15mm 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
6. Thermal resistance from junction to solder-point (at the end of the collector lead).
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

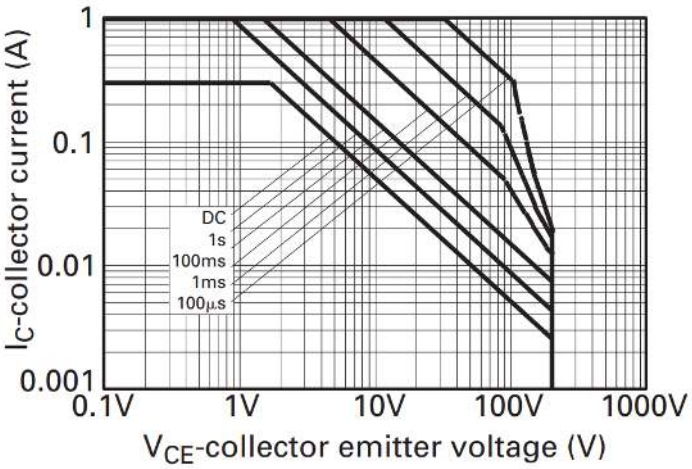
## Thermal Characteristics and Derating information



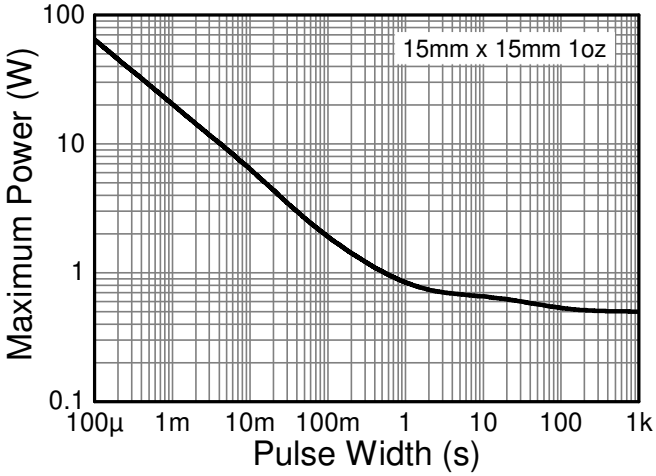

**Transient Thermal Impedance**




**Derating Curve**




**Safe operating area**



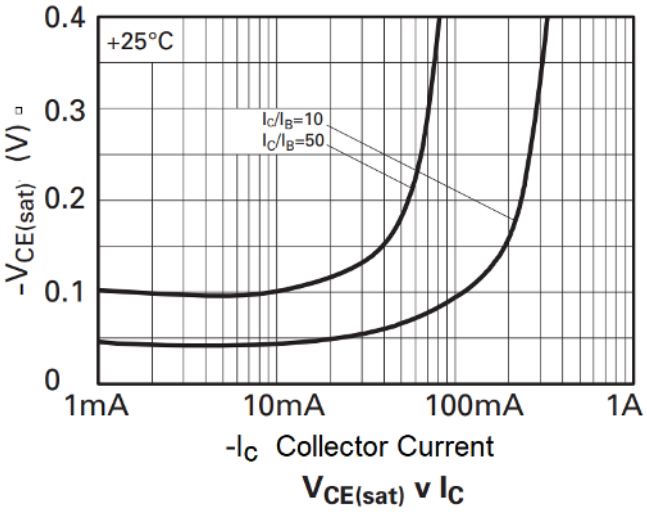

**Pulse Power Dissipation**

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

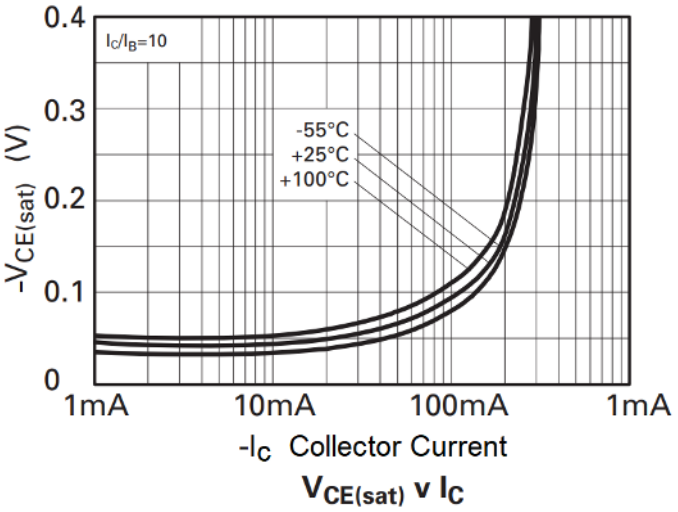
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -220 | - | - | V | $I_C$ = -100µA |
| Collector-Emitter Breakdown Voltage (Note 8) | $BV_{CEO}$ | -200 | - | - | V | $I_C$ = -10mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -7 | - | - | V | $I_E$ = -100µA |
| Collector Cutoff Current | $I_{CBO}$ | - | - | -100 | nA | $V_{CB}$ = -200V |
| Emitter Cutoff Current | $I_{EBO}$ | - | - | -100 | nA | $V_{EB}$ = -5V |
| Collector Emitter Cutoff Current | $I_{CES}$ | - | - | -100 | nA | $V_{CES}$= -200V |
| Static Forward Current Transfer Ratio (Note 8) | $h_{FE}$ | 100 | - | - | - | $I_C$ = -1mA, $V_{CE}$ = -10V |
| | | 100 | - | - | | $I_C$ = -100mA, $V_{CE}$ = -10V |
| | | 85 | - | 300 | | $I_C$ = -250mA, $V_{CE}$ = -10V |
| | | 35 | - | - | | $I_C$ = -400mA, $V_{CE}$ = -10V |
| Collector-Emitter Saturation Voltage (Note 8) | $V_{CE(sat)}$ | - | - | -0.2 | V | $I_C$ =- 100mA, $I_B$ = -10mA |
| | | - | - | -0.35 | V | $I_C$ = -250mA, $I_B$ = -25mA |
| Base-Emitter Turn-On Voltage(Note 8) | $V_{BE(on)}$ | - | - | -0.9 | V | $I_C$ = -250mA, $V_{CE}$ = -10V |
| Base-Emitter Saturation Voltage(Note 8) | $V_{BE(sat)}$ | - | - | -1.0 | V | $I_C$ = -250mA, $I_B$ = -25mA |
| Output Capacitance | $C_{obo}$ | - | - | 10 | pF | $V_{CB}$ = -10V, f = 1MHz |
| Transition Frequency | $f_T$ | 150 | - | - | MHz | $V_{CE}$ = -10V, $I_C$ = -50mA, f = 100MHz |
| Switching Times | $t_d$ | - | 22 | - | ns | $V_{CC}$ = -80V, $I_C$ = -200mA $I_{B1}$ = -$I_{B2}$ = -20mA |
| | $t_r$ | - | 19 | - | | |
| | $t_s$ | - | 472 | - | | |
| | $t_f$ | - | 70 | - | | |
| Switching Times | $t_d$ | - | 44 | - | ns | $V_{CC}$ = -80V, $I_C$ = -100mA $I_{B1}$ = -$I_{B2}$ = -10mA |
| | $t_r$ | - | 31 | - | | |
| | $t_s$ | - | 665 | - | | |
| | $t_f$ | - | 76 | - | | |

Notes: 8. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%

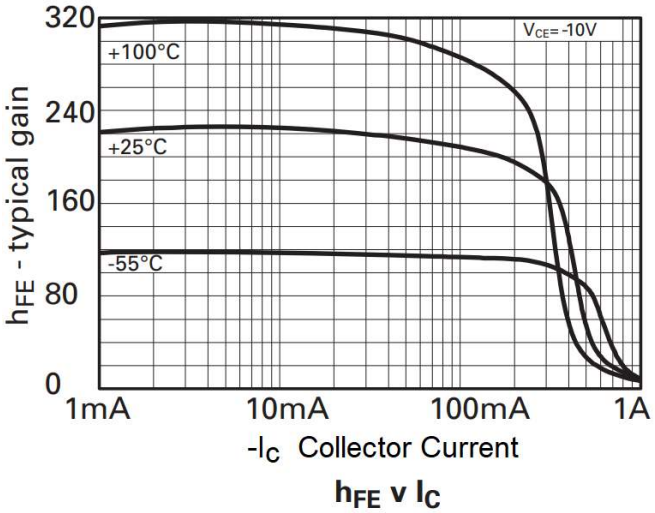
## Typical Electrical Characteristics (@ $T_A$ = +25°C, unless otherwise specified.)



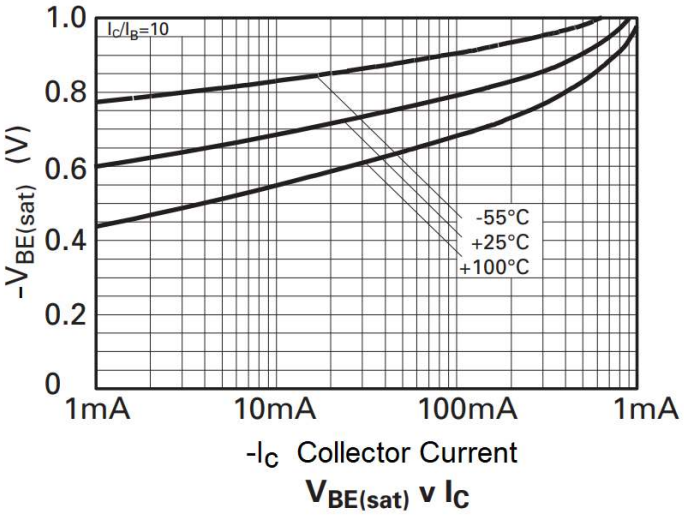

$V_{CE(sat)}$ v $I_C$



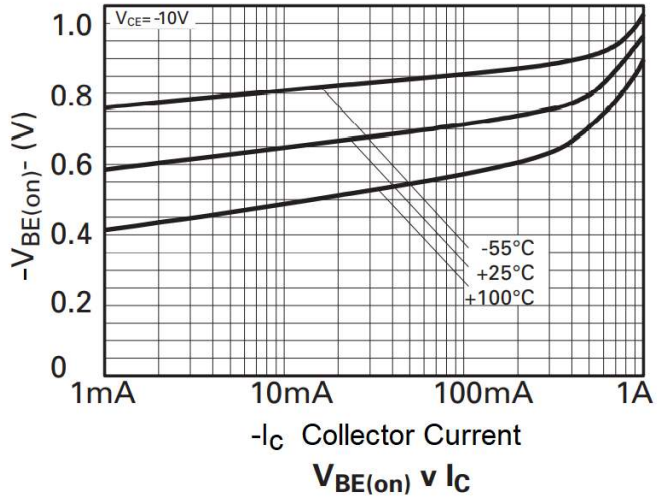

$V_{CE(sat)}$ v $I_C$




$h_{FE}$ v $I_C$




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

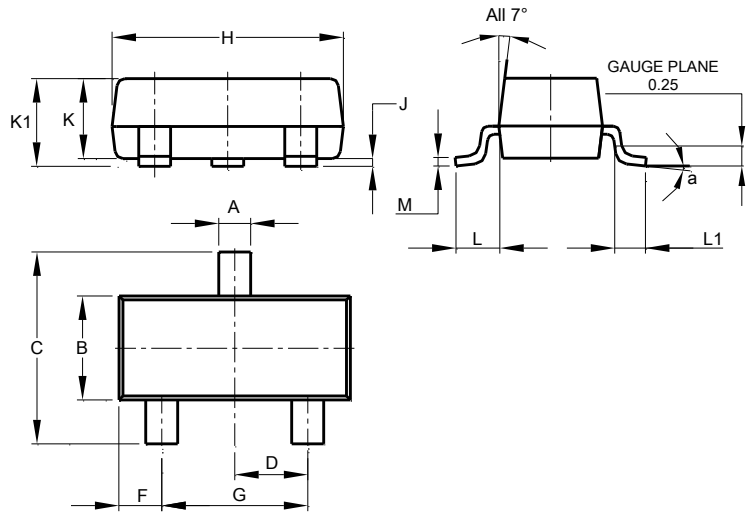



$V_{BE(on)}$ v $I_C$

## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SOT23**

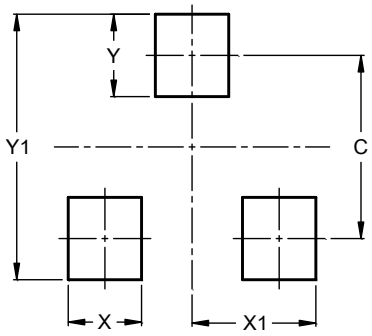



| SOT23 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.37 | 0.51 | 0.40 |
| **B** | 1.20 | 1.40 | 1.30 |
| **C** | 2.30 | 2.50 | 2.40 |
| **D** | 0.89 | 1.03 | 0.915 |
| **F** | 0.45 | 0.60 | 0.535 |
| **G** | 1.78 | 2.05 | 1.83 |
| **H** | 2.80 | 3.00 | 2.90 |
| **J** | 0.013 | 0.10 | 0.05 |
| **K** | 0.890 | 1.00 | 0.975 |
| **K1** | 0.903 | 1.10 | 1.025 |
| **L** | 0.45 | 0.61 | 0.55 |
| **L1** | 0.25 | 0.55 | 0.40 |
| **M** | 0.085 | 0.150 | 0.110 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SOT23**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 2.0 |
| **X** | 0.8 |
| **X1** | 1.35 |
| **Y** | 0.9 |
| **Y1** | 2.9 |

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