

**Features**

- $BV_{CEO} > 450V$
- $BV_{CES} > 700V$
- $BV_{EBO} > 9V$
- $I_C = 4A$  high Collector Current
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

**Applications**

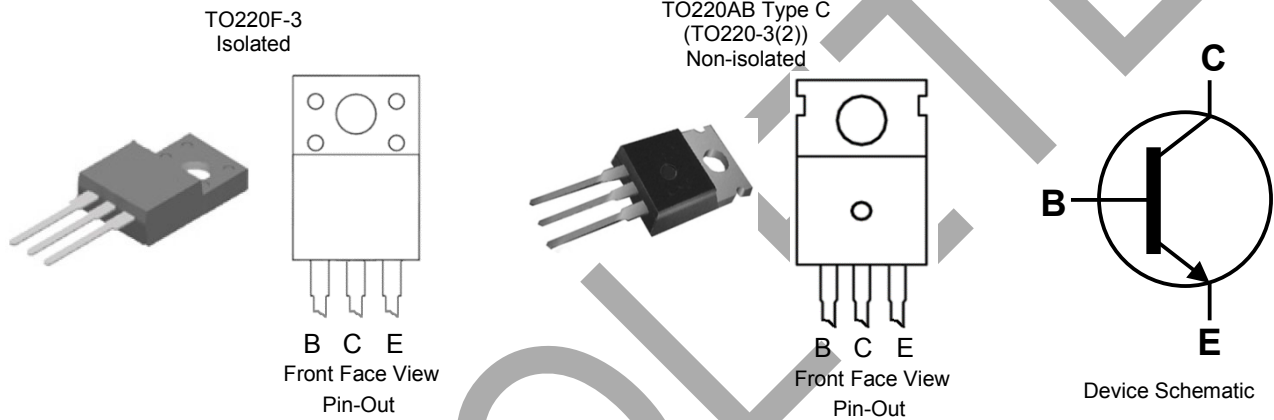
Low power AC-DC SMPS for:

- Battery Chargers for Mobile Phone / Tablets / Smartphones
- Power Supply for DVD / STB
- LED lighting

**Mechanical Data**

- Case: TO220F-3, TO220AB Type C
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208
- Weight: TO220F-3: 1500mg (Approximate)  
TO220AB Type C : 2000mg (Approximate)

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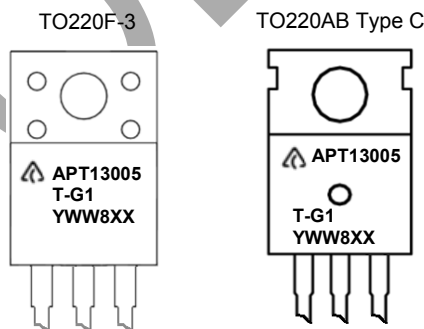


**Ordering Information** (Note 4)

| Product       | Package                     | Marking       | Quantity               |
|---------------|-----------------------------|---------------|------------------------|
| APT13005TF-G1 | TO220F-3                    | APT13005TF-G1 | 1,000 per Box in Tubes |
| APT13005T-G1  | TO220AB Type C (TO220-3(2)) | APT13005T-G1  | 1,000 per Box in Tubes |

- 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](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**



- = Manufacturers' code marking
- For TO220F-3, APT13005TF-G1 = Product Type Marking ID
- For TO220AB Type C, APT13005T-G1 = Product Type Marking ID
- YWW = Date Code Marking  
e.g. 312 = Year 2013, Week 12.
- 8 = Assembly site code
- XX = Batch Number

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

| Characteristic            | Symbol           | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Emitter Voltage | V <sub>CES</sub> | 700   | V    |
| Collector-Emitter Voltage | V <sub>CEO</sub> | 450   | V    |
| Emitter-Base Voltage      | V <sub>EBO</sub> | 9     | V    |
| Collector Current         | I <sub>C</sub>   | 4     | A    |
| Peak Collector Current    | I <sub>CM</sub>  | 8     | A    |
| Base Current              | I <sub>B</sub>   | 2     | A    |
| Peak Base Current         | I <sub>BM</sub>  | 4     | A    |

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

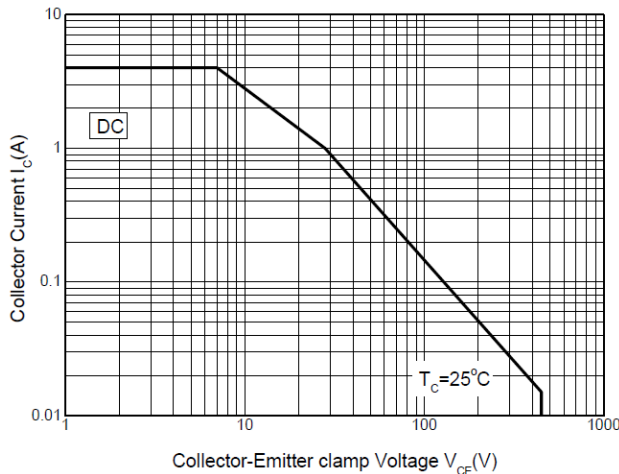
| Characteristic                            | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation @T <sub>C</sub> = +25°C | For TO220F-3                      | 28          | W    |
|   | For TO220AB Type C                | 75          |      |
| Thermal Resistance, Junction to Case      | For TO220F-3                      | 4.5         | °C/W |
|   | For TO220AB Type C                | 1.67        |      |
| Operating and Storage Temperature Range   | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 | °C   |

**ESD Ratings** (Note 6)

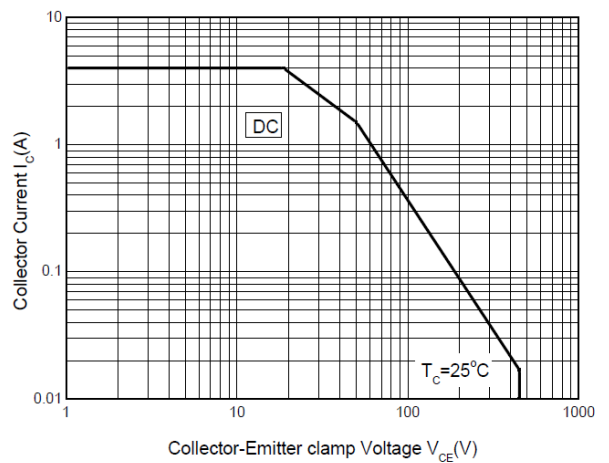
| Characteristic                             | Symbol  | Value   | Unit | JEDEC Class |
|--|---------|---------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | ≥ 8,000 | V    | 3B          |
| Electrostatic Discharge - Machine Model    | ESD MM  | ≥ 400   | V    | C           |

Note: 6. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

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



Safe Operating Areas (TO-220F-3 Package)



Safe Operating Areas (TO-220-3/TO-220-3(2) Package)

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

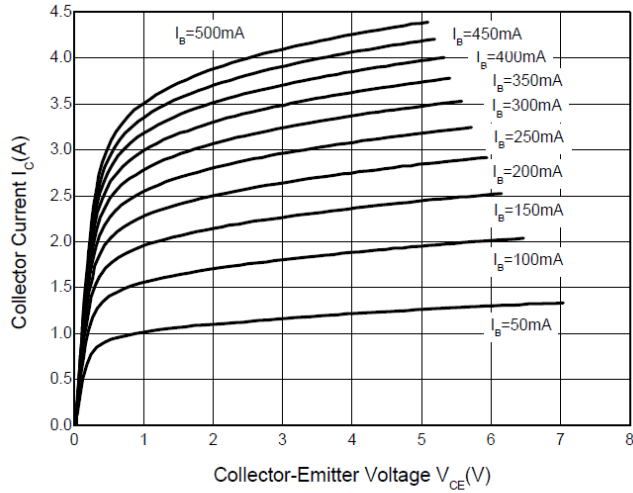
| Characteristic                                | Symbol        | Min | Typ | Max | Unit          | Test Condition   |
|---|---------------|-----|-----|-----|---------------|--|
| Collector-Emitter Breakdown Voltage           | $BV_{CES}$    | 700 | —   | —   | V             | $I_C = 100\mu\text{A}$ , $V_{BE} = 0\text{V}$                                  |
| Collector-Emitter Breakdown Voltage           | $BV_{CEO}$    | 450 | —   | —   | V             | $I_C = 100\mu\text{A}$   |
| Emitter-Base Breakdown Voltage                | $BV_{EBO}$    | 9   | —   | —   | V             | $I_E = 100\mu\text{A}$   |
| Collector Cutoff Current                      | $I_{CEV}$     | —   | —   | 10  | $\mu\text{A}$ | $V_{CE} = 700\text{V}$ , $V_{BE} = -1.5\text{V}$                               |
| DC current transfer Static ratio (Note 5)     | $h_{FE}$      | 15  | —   | 35  | —             | $I_C = 1\text{A}$ , $V_{CE} = 5\text{V}$                                       |
|   |               | 8   | —   | 35  | —             | $I_C = 2\text{A}$ , $V_{CE} = 5\text{V}$                                       |
| Collector-Emitter Saturation Voltage (Note 5) | $V_{CE(sat)}$ | —   | —   | 0.3 | V             | $I_C = 1\text{A}$ , $I_B = 0.2\text{A}$  |
|   |               | —   | —   | 0.6 |               | $I_C = 2\text{A}$ , $I_B = 0.5\text{A}$  |
|   |               | —   | —   | 0.9 |               | $I_C = 4\text{A}$ , $I_B = 1\text{A}$  |
| Base-Emitter Saturation Voltage (Note 5)      | $V_{BE(sat)}$ | —   | —   | 1.1 | V             | $I_C = 1\text{A}$ , $I_B = 0.2\text{A}$  |
|   |               | —   | —   | 1.3 |               | $I_C = 2\text{A}$ , $I_B = 0.5\text{A}$  |
| Output Capacitance                            | $C_{ob}$      | —   | 45  | —   | pF            | $V_{CB} = 10\text{V}$ , $f = 0.1\text{MHz}$                                    |
| Transition Frequency                          | $f_T$         | 4   | —   | —   | MHz           | $I_C = 0.5\text{A}$ , $V_{CE} = 10\text{V}$                                    |
| Turn-on Time with Resistive Load              | $t_{on}$      | —   | —   | 0.8 | $\mu\text{s}$ | $I_C = 2\text{A}$ , $V_{CC} = 125\text{V}$<br>$I_{B1} = -I_{B2} = 0.4\text{A}$ |
| Storage Time with Resistive Load              | $t_s$         | —   | —   | 4.5 |               |  |
| Fall Time with Resistive Load                 | $t_f$         | —   | —   | 0.9 |               |  |

 Note: 5. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

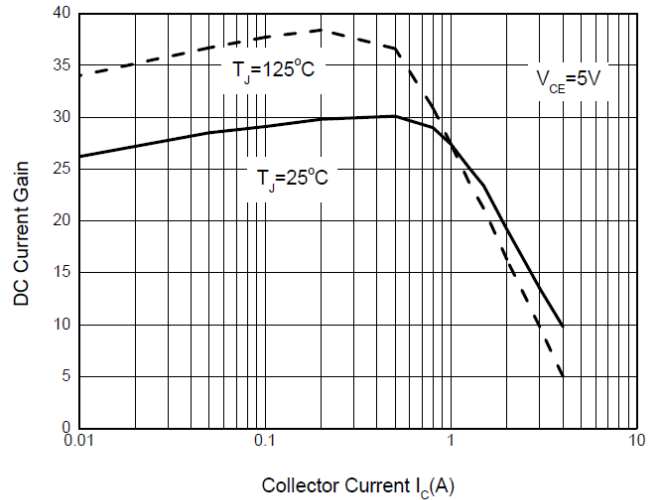
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**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

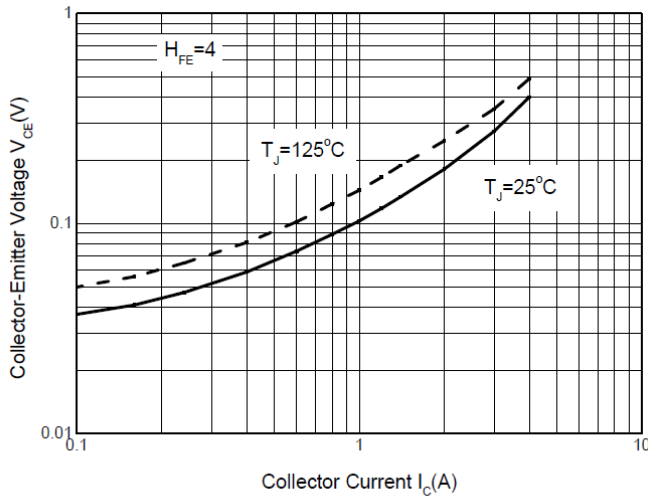
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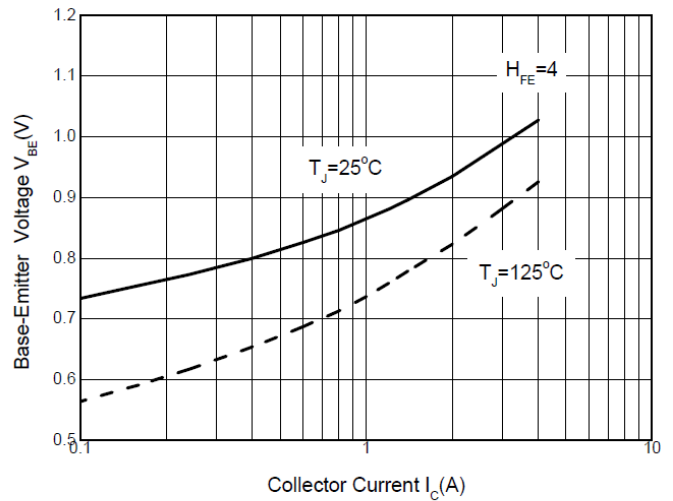
Static Characteristics



DC Current Gain



Collector-Emitter Saturation Region



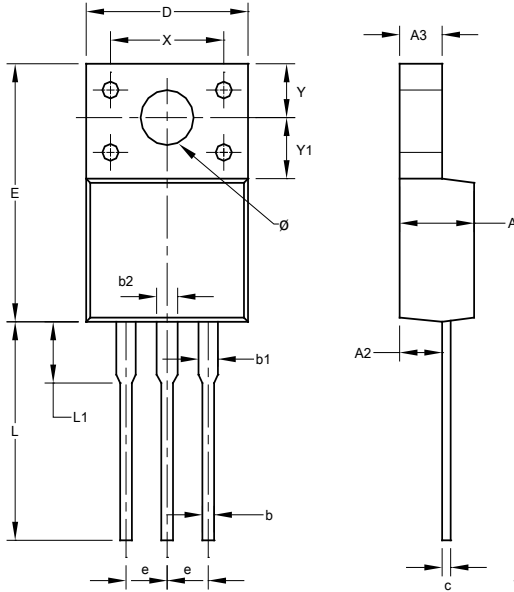
Base-Emitter Saturation Voltage



**Package Outline Dimensions**

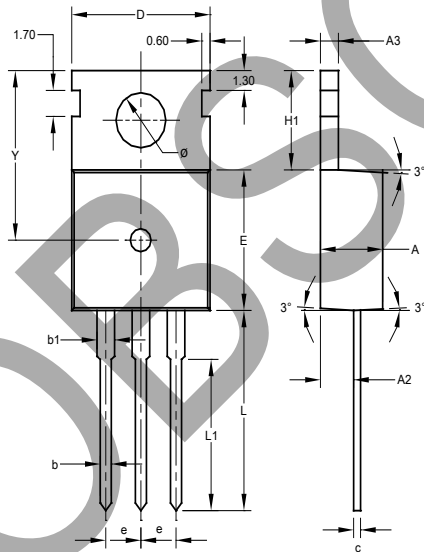
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**TO220F-3**



| TO220F-3             |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 4.300 | 4.900 | -     |
| A2                   | 2.520 | 2.920 | -     |
| A3                   | 2.350 | 2.900 | -     |
| b                    | 0.550 | 0.900 | -     |
| b1                   | 1.000 | 1.400 | -     |
| b2                   | 1.100 | 1.500 | -     |
| c                    | 0.450 | 0.600 | -     |
| D                    | 9.70  | 10.30 | -     |
| E                    | 14.70 | 16.00 | -     |
| e                    | -     | -     | 2.540 |
| L                    | 12.50 | 13.50 | -     |
| L1                   | 2.790 | 4.500 | -     |
| X                    | 6.90  | 7.10  | -     |
| Y                    | 3.000 | 3.400 | -     |
| Y1                   | 3.370 | 3.900 | -     |
| Ø                    | 3.000 | 3.550 | -     |
| All Dimensions in mm |       |       |       |

**TO220AB Type C (TO220-3(2))**



| TO220AB<br>Type C    |        |        |        |
|----------------------|--------|--------|--------|
| Dim                  | Min    | Max    | Typ    |
| A                    | -      | -      | 4.500  |
| A2                   | -      | -      | 2.400  |
| A3                   | -      | -      | 1.300  |
| b                    | 0.700  | 0.900  | -      |
| b1                   | -      | -      | 1.270  |
| c                    | 0.400  | 0.600  | -      |
| D                    | 9.800  | 10.200 | -      |
| E                    | 9.000  | 9.400  | -      |
| e                    | -      | -      | 2.54   |
| H1                   | 6.300  | 6.700  | -      |
| L                    | 12.600 | 13.600 | -      |
| L1                   | 9.600  | 10.600 | -      |
| Y                    | -      | -      | 11.100 |
| Ø                    | 3.560  | 3.640  | -      |
| All Dimensions in mm |        |        |        |

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to voltage spacing between terminals.

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