

**450V NPN HIGH VOLTAGE POWER TRANSISTOR**

**Features**

- $BV_{CEO} > 450V$
- $BV_{CES} > 700V$
- $BV_{EBO} > 9V$
- $I_C = 4A$  High Collector Current
- Integrated Anti-Parallel Diode to act as free-wheeling diode
- Anti-Saturation feature
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

**Applications**

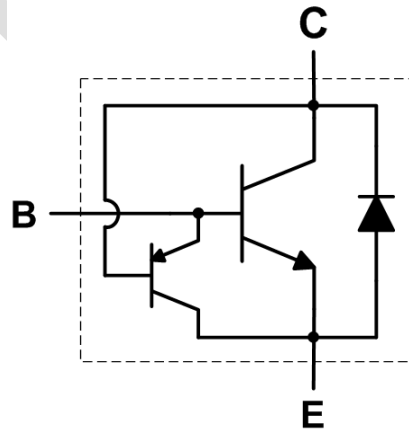
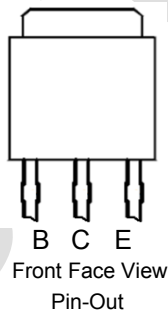
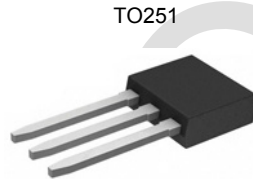
Low power AC-DC SMPS for:

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

**Mechanical Data**

- Case: TO251
- Case Material: Molded Plastic, "Green" Molding Compound  
UL Flammability Classification Rating 94V-0
- Terminals: Finish - Matte Tin Finish Leads, Solderable per MIL-STD-202, Method 208 (3)
- Weight: 340mg (Approximate)

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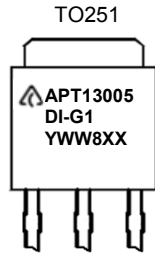
Device Schematic


**Ordering Information (Note 4)**

Product	Package	Marking	Quantity
APT13005DI-G1	TO251	APT13005DI-G1	3600 per Box in Tubes

- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  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 <http://www.diodes.com/products/packages.html>.

## Marking Information



 = Manufacturers' code marking  
 APT13005DI-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	P <sub>D</sub>	25	W
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	5.0	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

## ESD Ratings (Note 5)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	8000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

Note: 5. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

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

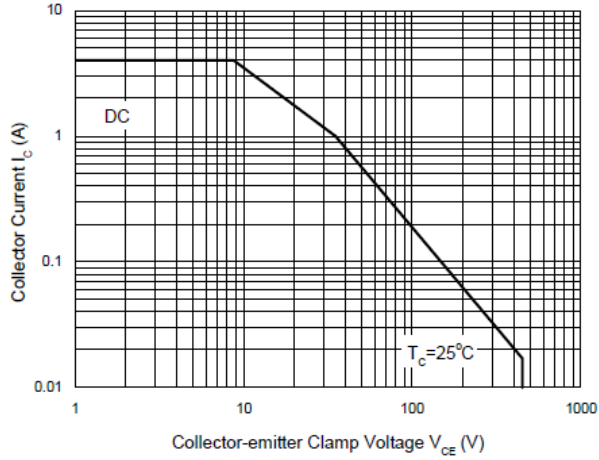


Figure 6. Safe Operating Areas (TO-251 Package)

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

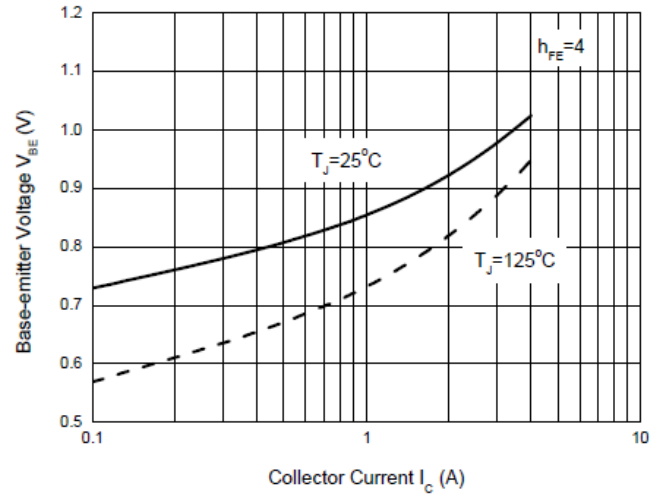
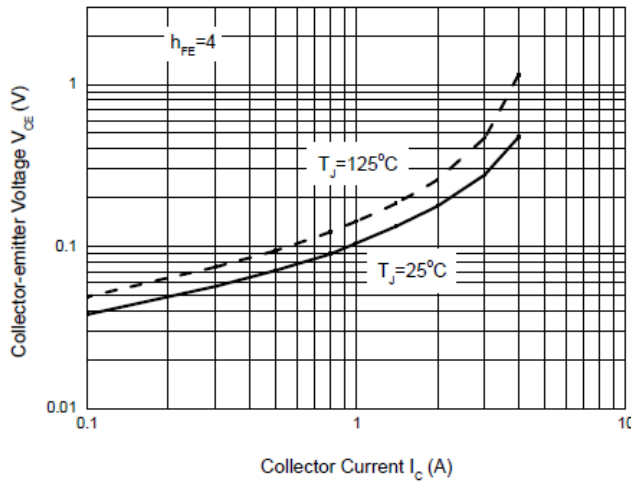
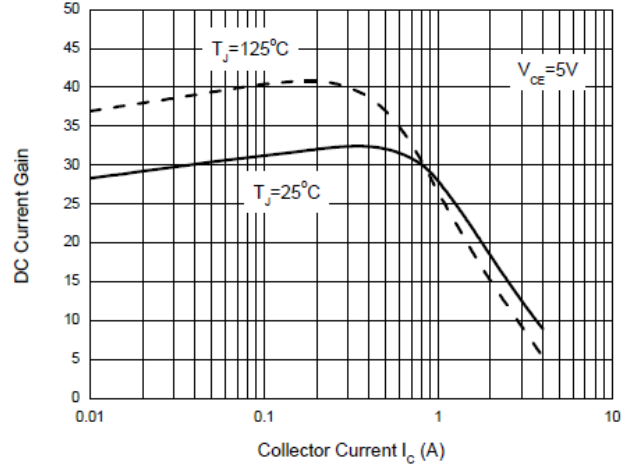
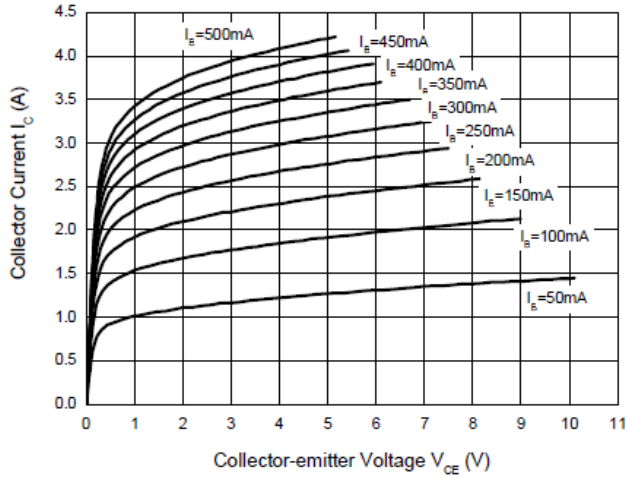
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	$BV_{CES}$	700	—	—	V	$I_C = 100\mu\text{A}$ , $V_{BE} = 0\text{V}$
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	450	—	—	V	$I_C = 100\mu\text{A}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	9	—	—	V	$I_E = 100\mu\text{A}$
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 6)	$h_{FE}$	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 6)	$V_{CE(sat)}$	—	—	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 6)	$V_{BE(sat)}$	—	—	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	$t_{on}$	—	—	0.7	$\mu\text{s}$	$I_C = 2\text{A}$ , $V_{CC} = 125\text{V}$ $I_{B1} = -I_{B2} = 0.4\text{A}$
Storage Time with Resistive Load	$t_s$	—	—	4.0		
Fall Time with Resistive Load	$t_f$	—	—	0.8		

 Note: 6. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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OBSOLETE – PART DISCONTINUED

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

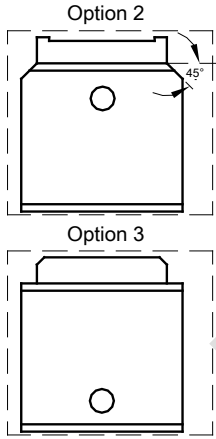
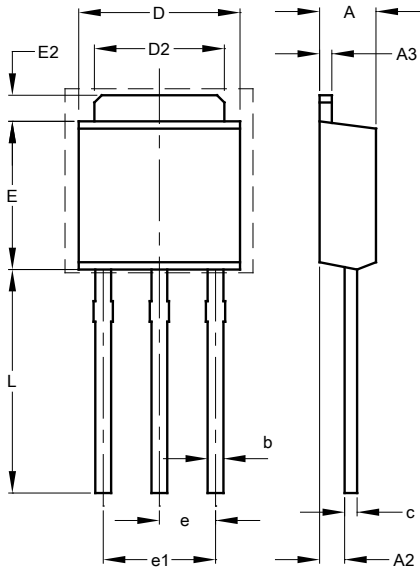


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**Package Outline Dimensions**

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

**TO251**



TO251		
Dim	Min	Max
A	2.200	2.400
A2	0.890	1.150
A3	0.450	0.550
b	0.550	0.740
c	0.450	0.570
D	6.400	6.750
D2	5.200	5.400
E	5.950	6.250
E2	0.900	1.250
e	2.240	2.340
e1	4.430	4.730
L	8.900	9.500
All Dimensions in mm		

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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