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With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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**450V NPN HIGH VOLTAGE POWER TRANSISTOR**
**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)**

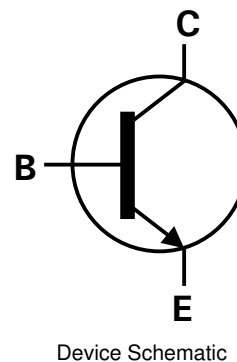
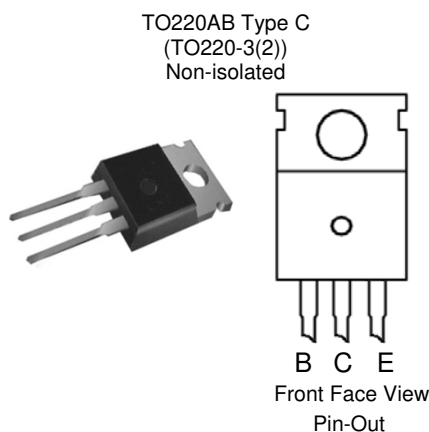
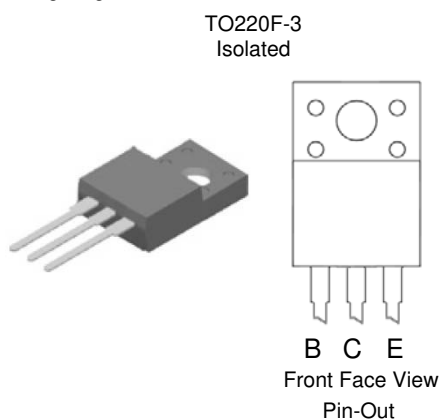
**Applications**

Low power AC-DC SMPS for:

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

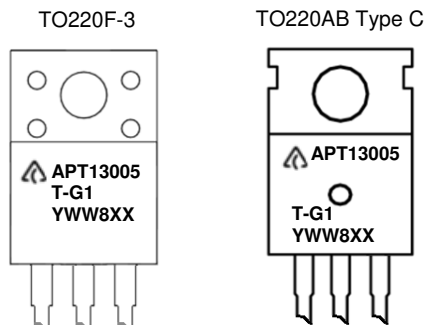
**Mechanical Data**


- 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)


**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

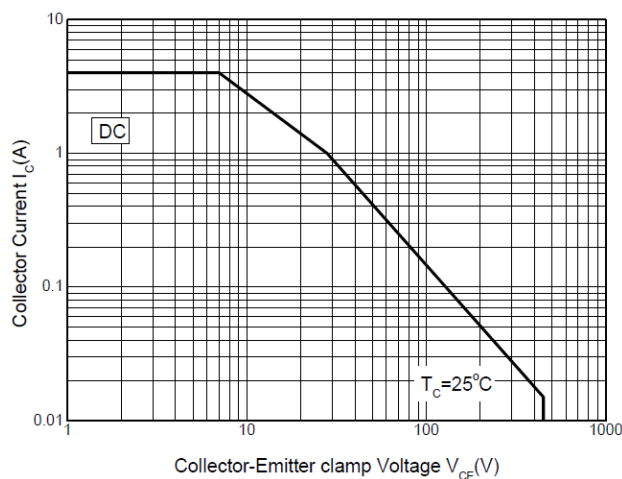
**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation @T <sub>C</sub> = +25°C	P <sub>D</sub>	28	W
		75	
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	4.5	°C/W
		1.67	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

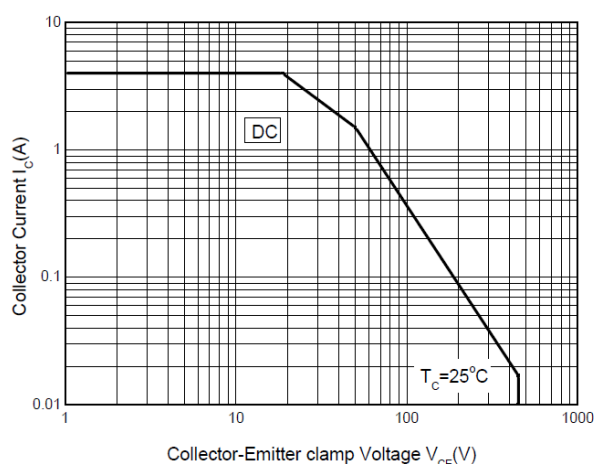
**ESD Ratings** (Note 6)

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)

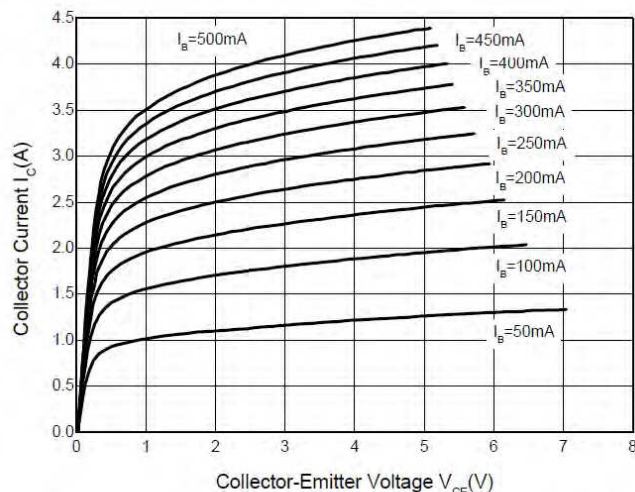

 Safe Operating Areas  
 (TO-220-3/TO-220-3(2) Package)

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

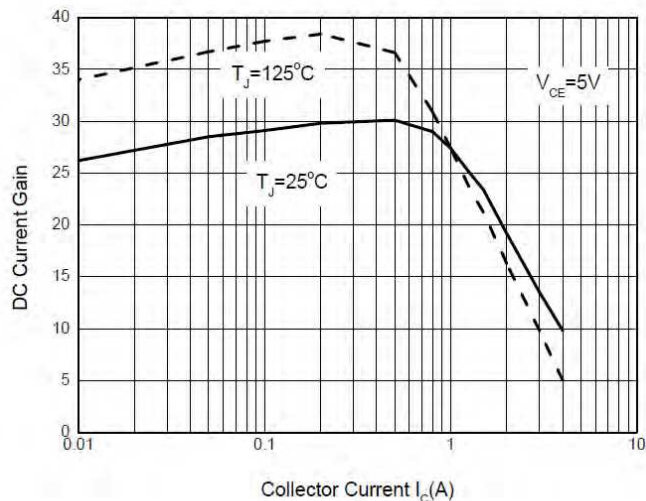
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	700	—	—	V	I <sub>C</sub> = 100μA, V <sub>BE</sub> = 0V
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	450	—	—	V	I <sub>C</sub> = 100μA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	9	—	—	V	I <sub>E</sub> = 100μA
Collector Cutoff Current	I <sub>CEV</sub>	—	—	10	μA	V <sub>CE</sub> = 700V, V <sub>BE</sub> = -1.5V
DC current transfer Static ratio (Note 5)	h <sub>FE</sub>	15 8	—	35 35	— —	I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V I <sub>C</sub> = 2A, V <sub>CE</sub> = 5V
Collector-Emitter Saturation Voltage (Note 5)	V <sub>CE(sat)</sub>	— — —	— — —	0.3 0.6 0.9	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 0.2A I <sub>C</sub> = 2A, I <sub>B</sub> = 0.5A I <sub>C</sub> = 4A, I <sub>B</sub> = 1A
Base-Emitter Saturation Voltage (Note 5)	V <sub>BE(sat)</sub>	— —	— —	1.1 1.3	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 0.2A I <sub>C</sub> = 2A, I <sub>B</sub> = 0.5A
Output Capacitance	C <sub>ob</sub>	—	45	—	pF	V <sub>CB</sub> = 10V, f = 0.1MHz
Transition Frequency	f <sub>T</sub>	4	—	—	MHz	I <sub>C</sub> = 0.5A, V <sub>CE</sub> = 10V
Turn-on Time with Resistive Load	t <sub>on</sub>	—	—	0.8	μs	I <sub>C</sub> = 2A, V <sub>CC</sub> = 125V I <sub>B1</sub> = -I <sub>B2</sub> = 0.4A
Storage Time with Resistive Load	t <sub>s</sub>	—	—	4.5		
Fall Time with Resistive Load	t <sub>f</sub>	—	—	0.9		

Note: 5. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

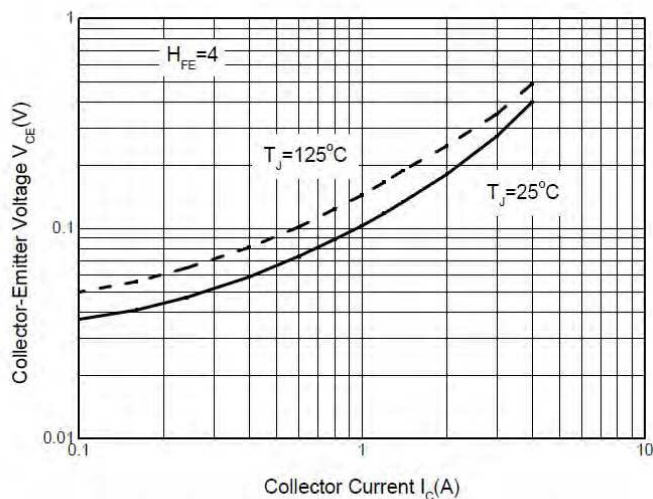
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



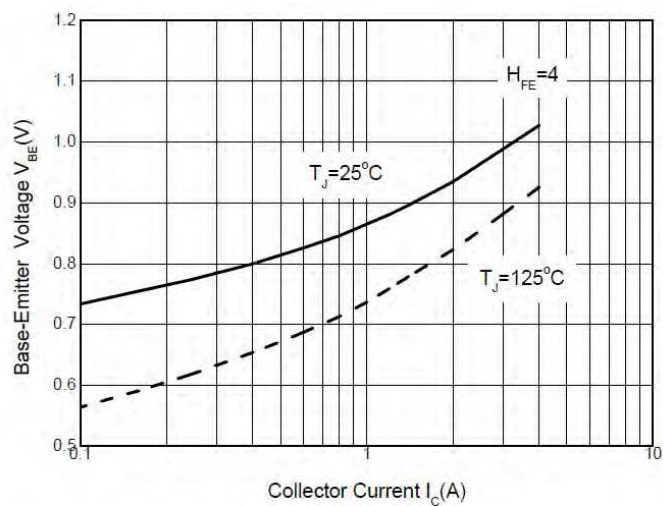
Static Characteristics



DC Current Gain



Collector-Emitter Saturation Region

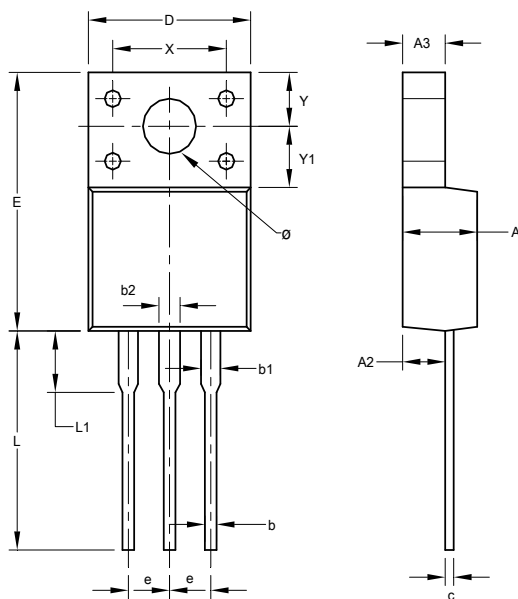


Base-Emitter Saturation Voltage

## Package Outline Dimensions

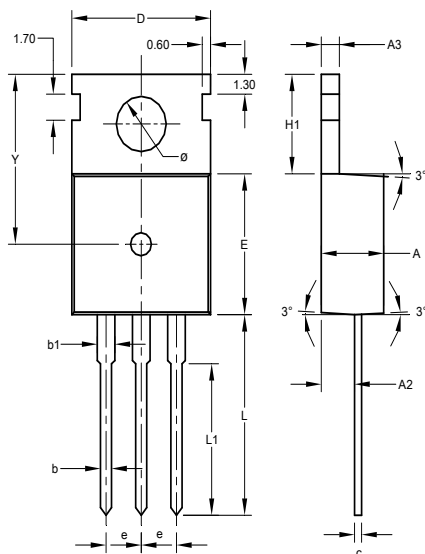
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

### 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 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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