







#### **465V NPN HIGH VOLTAGE POWER TRANSISTOR**

#### **Features**

- BV<sub>CEO</sub> > 465V
- BV<sub>CES</sub> > 800V
- BV<sub>EBO</sub> > 9V
- I<sub>C</sub> = 1.5A High Continuous Collector Current
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

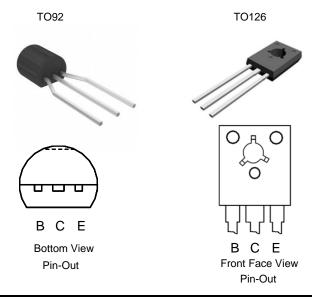
### **Applications**

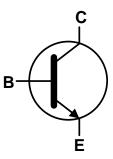
Low Power AC-DC SMPS for:

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

### **Mechanical Data**

- Case: TO92 or TO126
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208 63
- Weight: TO92: 200mg (Approximate)
   TO126: 400mg (Approximate)





Device Schematic

### Ordering Information (Note 4)

Product	Package	Marking	Quantity
APT13003HZTR-G1	TO92 (Joggled Legs)	13003HZ-G1	2,000 Taped, per Ammo Box
APT13003HU-G1	TO126	GU13003H	4,000 Bulk, Loose per Box

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





= Manufacturers' code marking
For TO92: 13003HZ-G1= Product Type Marking ID
For TO126: GU13003H = Product Type Marking ID
YWW = Date Code Marking
e.g. 312 = Year 2013, Week 12.

8 = Assembly site code XX = Batch Number





**APT13003H** 

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

Characteristic	Symbol	Value	Unit
Collector-Emitter Voltage (V <sub>BE</sub> = 0V)	V <sub>CES</sub>	800	V
Collector-Emitter Voltage	V <sub>CEO</sub>	465	V
Emitter-Base Voltage	V <sub>EBO</sub>	9	V
Continuous Collector Current	Ic	1.5	Α
Peak Pulse Collector Current (Note 5)	I <sub>CM</sub>	3	Α
Continuous Base Current	I <sub>B</sub>	0.75	Α
Peak Pulse Base Current (Note 5)	I <sub>BM</sub>	1.5	Α

Note:

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

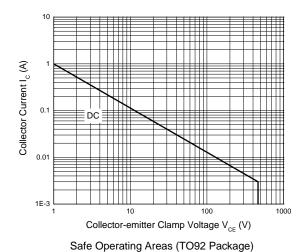
Characteristic	Symbol	Value	Unit		
Power Dissipation	For TO92		1.1	W	
	For TO126 @ T <sub>C</sub> = +25°C	$P_D$	20		
Thermal Resistance, Junction to Ambient Air	For TO92	$R_{ heta JA}$	113.6	°C/W	
	For TO126		96	C/VV	
annual Basistanas Ilunation to Cons	For TO92	Б	83.3	°C/W	
Thermal Resistance, Junction to Case	For TO126	$R_{ heta JC}$	6.25	C/VV	
Operating and Storage Temperature Range		$T_{J_i}T_{STG}$	-65 to +150	°C	

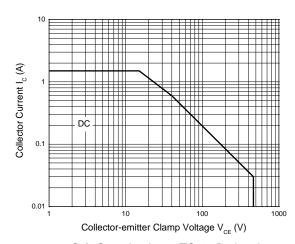
# ESD Ratings (Note 6)

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	С

Note:

# Safe Operating Area and Derating Information (@TA = +25°C, unless otherwise specified.)





Safe Operating Areas (TO126 Package)

<sup>5.</sup> Pulse test for pulse width < 5ms, duty cycle ≤ 10%.

<sup>6.</sup> Refer to JEDEC specification JESD22-A114 and JESD22-A115.





**APT13003H** 

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

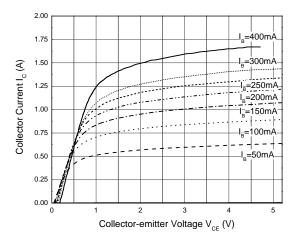
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	800	_	_	V	$I_C = 100 \mu A, V_{BE} = 0 V$
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	465	_	_	V	I <sub>C</sub> = 100μA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	9	_	_	V	I <sub>E</sub> = 100μA
Collector Cutoff Current	I <sub>CEV</sub>		_	10	μA	V <sub>CE</sub> = 800V, V <sub>BE</sub> = -1.5V
DC Current Transfer Static Ratio (Note 7)	h <sub>FE</sub>	15 13 5	17 —	— 30 25	_ _ _	$I_C = 0.3A$ , $V_{CE} = 2V$ $I_C = 0.5A$ , $V_{CE} = 2V$ $I_C = 1.0A$ , $V_{CE} = 2V$
Collector-Emitter Saturation Voltage (Note 7)	V <sub>CE(sat)</sub>	_	0.17 0.29	0.3 0.4	V	$I_C = 0.5A, I_B = 0.1A$ $I_C = 1A, I_B = 0.25A$
Base-Emitter Saturation Voltage (Note 7)	V <sub>BE(sat)</sub>		_	1.0 1.2	V	$I_C = 0.5A, I_B = 0.1A$ $I_C = 1A, I_B = 0.25A$
Output Capacitance	Cob	_	16	_	pF	V <sub>CB</sub> = 10V, f = 0.1MHz
Transition Frequency	f <sub>T</sub>	4	_	_	MHz	I <sub>C</sub> = 0.1A, V <sub>CE</sub> = 10V
Turn-on Time with Resistive Load	ton	_	0.3	1		
Storage Time with Resistive Load	ts	_	1.8	3	μs	$I_{C} = 1A$ , $V_{CC} = 125V$ , $I_{B1} = 0.2A$ , $I_{B2} = -0.2A$ , $I_{D} = 25\mu s$
Fall Time with Resistive Load	t <sub>f</sub>	_	0.28	0.4		$_{182} = -0.2\pi$ , $_{19} = 20\mu s$

Note:

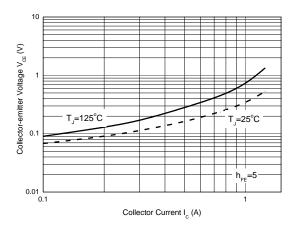
7. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.



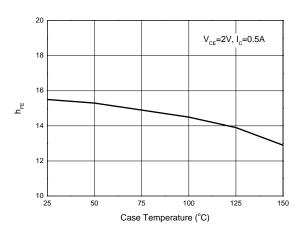
# Typical Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)



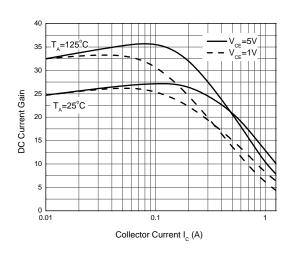
Static Characteristics



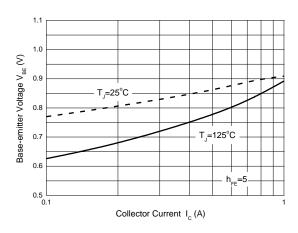
Collector-emitter Saturation Voltage



 $h_{\text{FE}}$  vs. Case Temperature



DC Current Gain vs. Collector Current



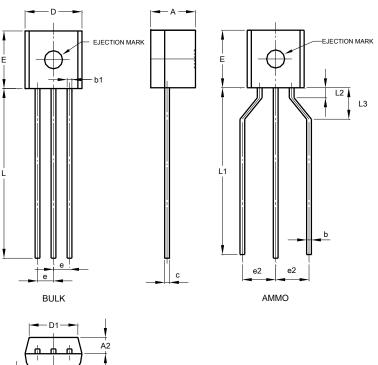
Base-emitter Saturation Voltage



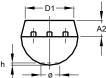
# **Package Outline Dimensions**

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

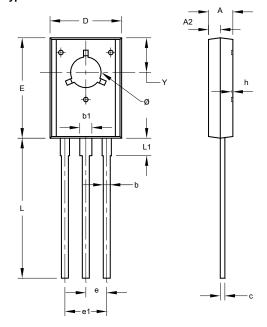
#### (1) Package Type: TO92 Type C



TO92 Type C						
Dim	Min	Max	Тур			
Α	3.30	3.70	-			
A2	1.10	1.40	-			
b	0.38	0.55	-			
C	0.36	0.51	-			
D	4.40	4.70	-			
D1	3.430	-	-			
Е	4.30	4.70	-			
е	-	-	1.27			
e2	2.440	2.640	-			
h	0.00	0.38	-			
L	14.10	14.50	-			
L1	12.50	14.50	-			
L3	<b>L3</b> 2.50		-			
Ø	-	1.60	-			
All Dimensions in mm						



#### (2) Package Type: TO126



TO126						
Dim	Min	Max	Тур			
Α	2.400	2.900	-			
A2	1.060	1.500	-			
b	0.660	0.860	-			
b1	1.170	1.470	-			
С	0.400	0.600	-			
D	7.400	8.200	-			
Е	10.60	11.20	-			
е	-	-	2.280			
e1	-	-	4.560			
h	0.00	0.30	-			
L	14.50	15.90	-			
L1	1.700	2.100	-			
Υ	3.600	3.900	-			
Ø	3.100	3.550	-			
All Dimensions in mm						

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



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