APT13003D

450V NPN HIGH VOLTAGE POWER TRANSISTOR

Features

- BV_{CEO} > 450V
- BV_{CES} > 700V
- BV_{EBO} > 9V
- I_C = 1.5A high Continuous Collector Current
- Integrated Collector-Emitter Diode to act as free-wheeling diode
- Anti-saturation for faster switching
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Mechanical Data

- Case: TO92, TO126 or TO251
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208 e3
- Weight: TO92: 200mg (Approximate)
  TO126: 400mg (Approximate)
  TO251: 340mg (Approximate)

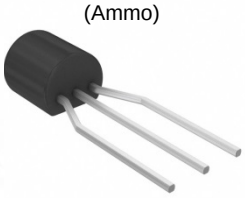
Applications

Low power AC-DC SMPS for:

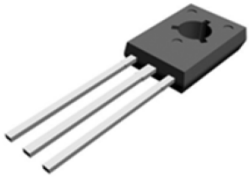
- Battery Chargers for Mobile Phone / Tablets / Smartphones
- Power Supply for DVD / STB
- LED lighting

TO92 (Bulk)

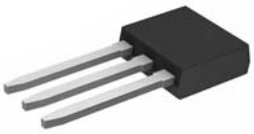
TO92 (Ammo)

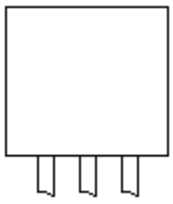


TO126



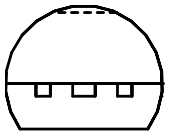
TO251





E C B

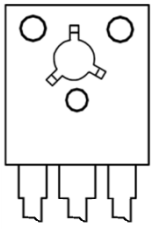
Flat Face View



B C E

Bottom View

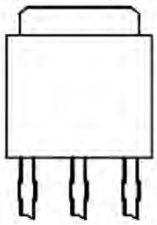
Pin-Out



B C E

Front Face View

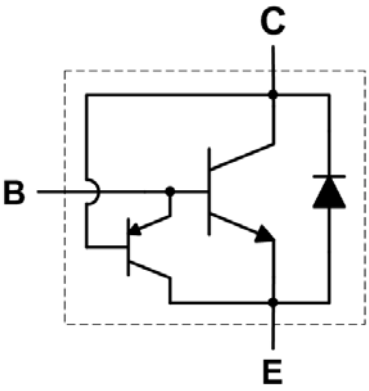
Pin-Out



B C E

Front Face View

Pin-Out



Device Schematic

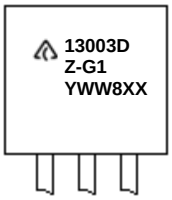
Ordering Information (Note 4)

Product	Package	Marking	Quantity
APT13003DZ-G1	TO92 (Straight Legs)	13003DZ-G1	10,000 Bulk, Loose per Box
APT13003DZTR-G1	TO92 (Joggled Legs)	13003DZ-G1	2,000 Taped, per Ammo Box
APT13003DU-G1	TO126	GU13003D	4,000 Bulk, Loose per Box
APT13003DI-G1	TO251	APT13003DI-G1	3,600 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 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

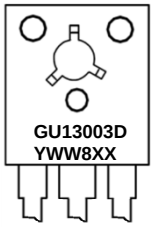
Marking Information

TO92



Flat Face View

TO126



Front Face View

TO251

Front Face View

= Manufacturers' code marking
For TO92, 13003DZ-G1 = Product Type Marking ID
For TO126, GU13003D = Product Type Marking ID
For TO251, APT13003DI-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_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Emitter Voltage (V_{BE} = 0V)	V_{CES}	700	V
Collector-Emitter Voltage	V_{CEO}	450	V
Emitter-Base Voltage	V_{EBO}	9	V
Continuous Collector Current	I_C	1.5	A
Peak Pulse Collector Current	I_{CM}	3	A
Continuous Base Current	I_B	0.75	A
Peak Pulse Base Current	I_{BM}	1.5	A

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

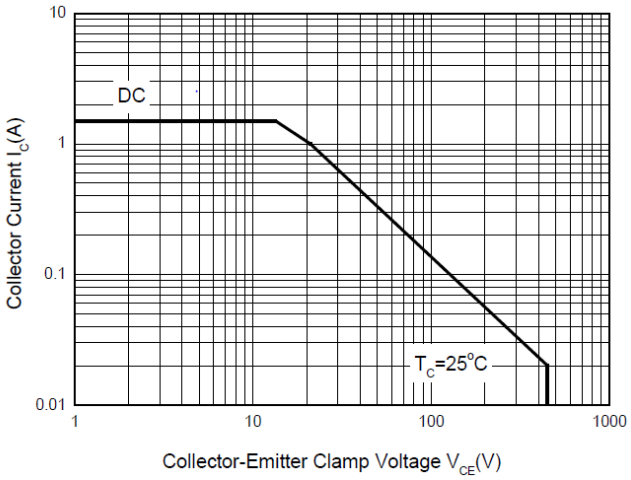
Characteristic		Symbol	Value	Unit
Power Dissipation	For TO92	P_D	1.1	W
	For TO126@ T_C = +25°C		20	
	For TO251@ T_C = +25°C		24	
Thermal Resistance, Junction to Ambient Air	For TO92	$R_{\theta JA}$	113.6	°C/W
	For TO126		96	
	For TO251		110	
Thermal Resistance, Junction to Case	For TO92	$R_{\theta JC}$	83.3	°C/W
	For TO126		6.25	
	For TO251		5.0	
Operating and Storage Temperature Range		T_J,T_{STG}	-65 to +150	°C

ESD Ratings (Note 6)

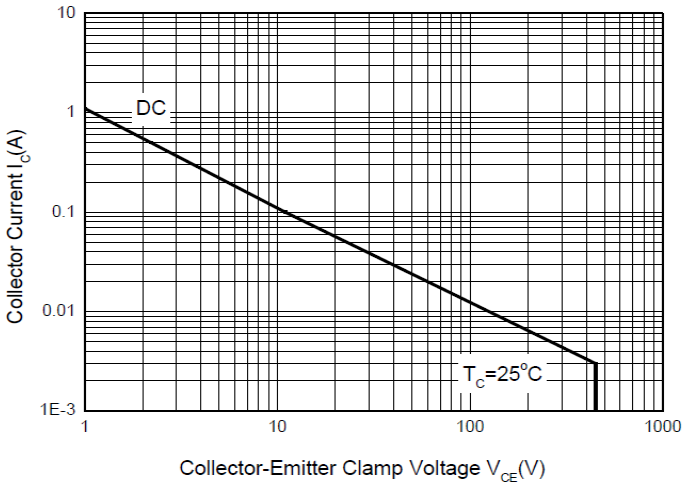
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	≥ 8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	C

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

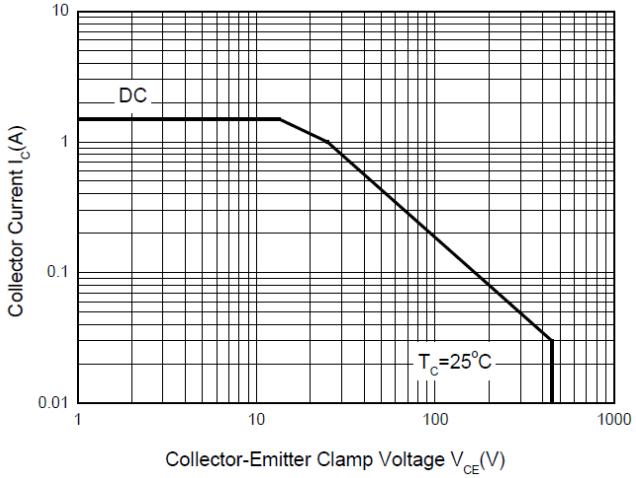
Safe Operating Areas and Derating Information (@T_A = +25°C, unless otherwise specified.)



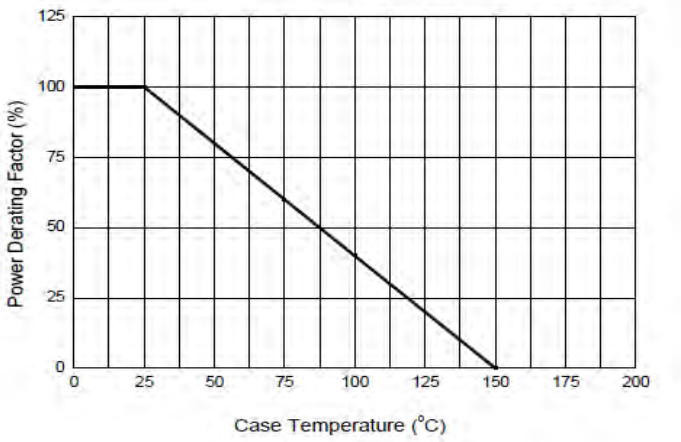
Safe Operating Areas
(TO-126 Package)



Safe Operating Areas
(TO-92 Package)



Safe Operating Areas
(TO-251 Package)



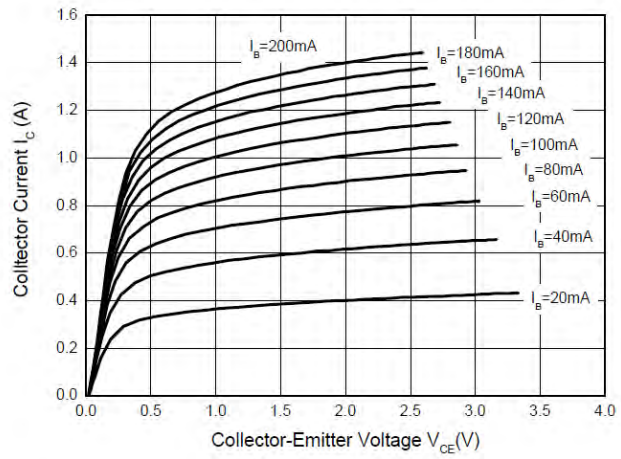
Power Derating Curve

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

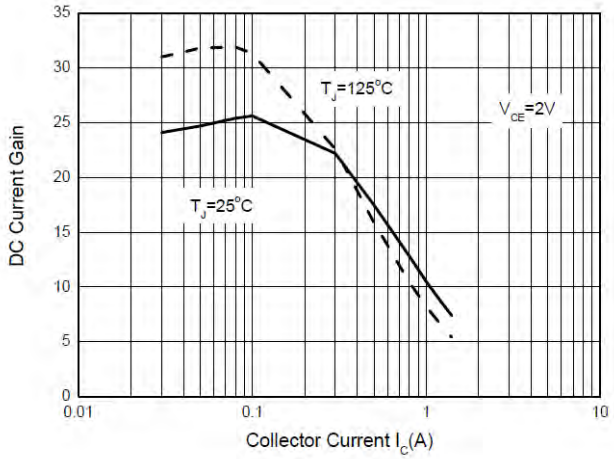
Characteristic	Symbol	Min	Typ.	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	BV_{CES}	700	–	–	V	I_C = 100μA, V_{BE} = 0V
Collector-Emitter Breakdown Voltage	BV_{CEO}	450	–	–	V	I_C = 100μA
Emitter-Base Breakdown Voltage	BV_{EBO}	9	–	–	V	I_E = 100μA
Collector Cutoff Current	I_{CEV}	–	–	10	μA	V_{CE} = 700V, V_{BE} = -1.5V
DC current transfer Static ratio (Note 7)	h_{FE}	16 5.0	– –	30 25	–	I_C = 0.5A, V_{CE} = 2V I_C = 1.0A, V_{CE} = 2V
Collector-Emitter Saturation Voltage (Note 7)	$V_{CE(sat)}$	– –	– –	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)	$V_{BE(sat)}$	– –	– –	1.0 1.2	V	I_C = 0.5A, I_B = 0.1A I_C = 1A, I_B = 0.25A
Output Capacitance	C_{ob}	–	18	–	pF	V_{CB} = 10V, f = 0.1MHz
Transition Frequency	f_T	4	–	–	MHz	I_C = 0.1A, V_{CE} = 10V
Turn-on Time with Resistive Load	t_{on}	–	–	0.7	μs	I_C = 1A,V_{CC} = 125V, I_{B1} = 0.2A, I_{B2} = -0.2A
Storage Time with Resistive Load	t_s	–	–	3.0		
Fall Time with Resistive Load	t_f	–	–	0.35		

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

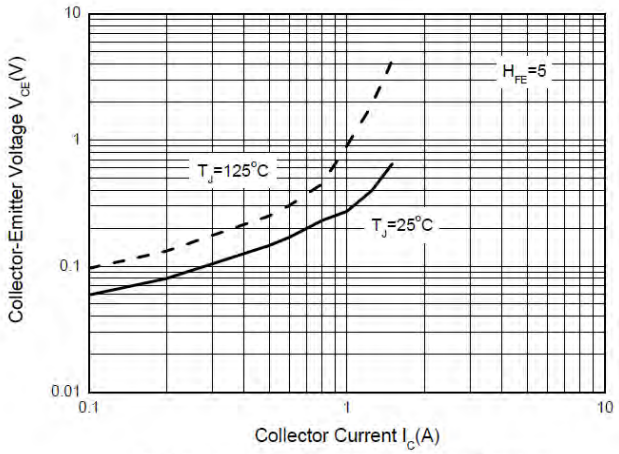
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



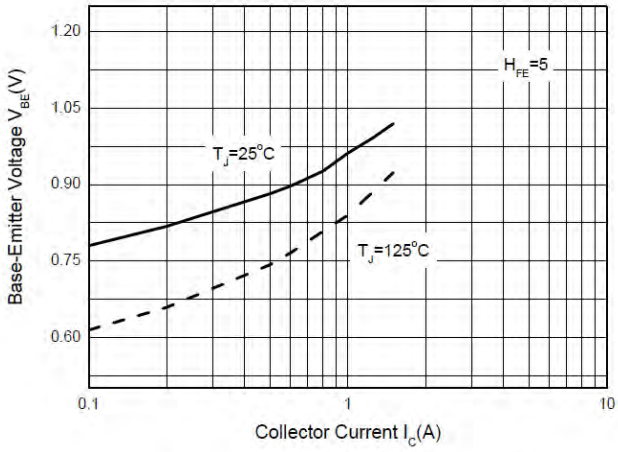
Static Characterstics



DC Current Gain



Collector-Emitter Saturation Region

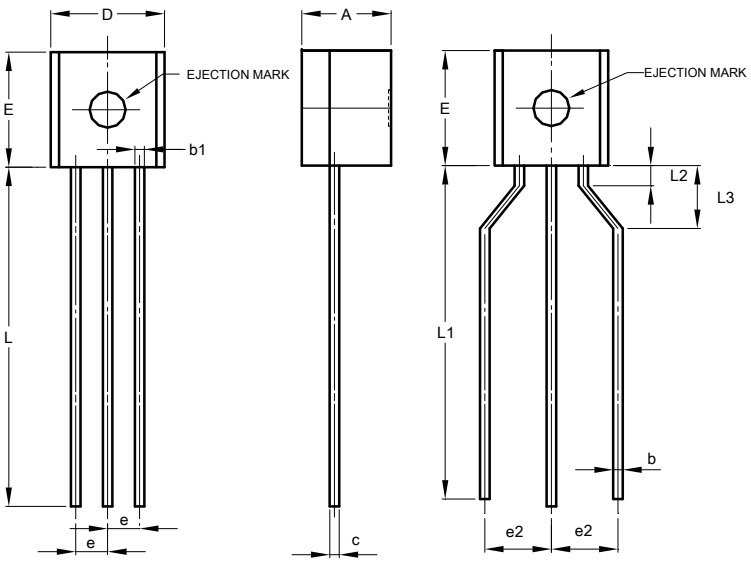


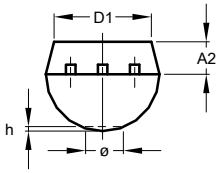
Base-Emitter Saturation Voltage

Package Outline Dimensions

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

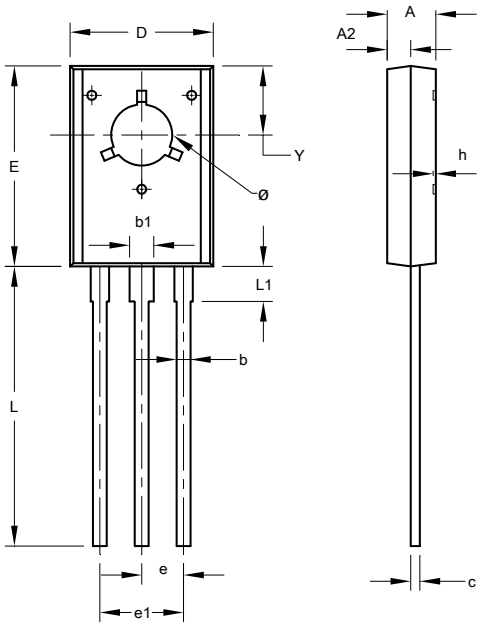
TO92 Type C





TO92 Type C			
Dim	**Min**	**Max**	**Typ**
A	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	-	-
E	4.30	4.70	-
e	-	-	1.27
e2	2.440	2.640	-
h	0.00	0.38	-
L	14.10	14.50	-
L1	12.50	14.50	-
L3	2.50	3.50	-
ø	-	1.60	-
All Dimensions in mm			

TO126

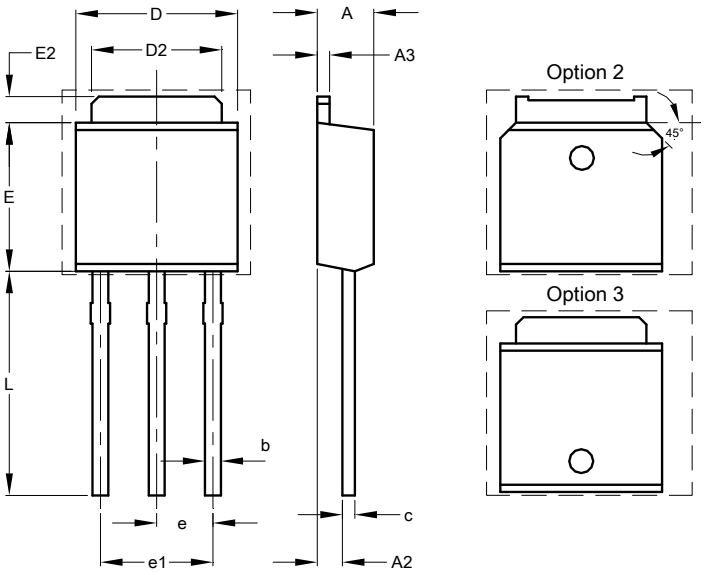


TO126			
Dim	**Min**	**Max**	**Typ**
A	2.400	2.900	-
A2	1.060	1.500	-
b	0.660	0.860	-
b1	1.170	1.470	-
c	0.400	0.600	-
D	7.400	8.200	-
E	10.60	11.20	-
e	-	-	2.280
e1	-	-	4.560
h	0.00	0.30	-
L	14.50	15.90	-
L1	1.700	2.100	-
Y	3.600	3.900	-
ø	3.100	3.550	-
All Dimensions in mm			

Package Outline Dimensions (cont.)

Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for 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 voltage spacing between terminals.

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