

465V NPN HIGH VOLTAGE POWER TRANSISTOR

Features

- $BV_{CEO} > 465V$
- $BV_{CES} > 700V$
- $BV_{EBO} > 9V$
- $I_C = 1.5A$ 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

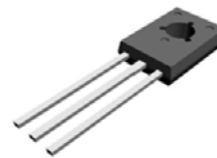
- Case: TO92 or TO126
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208 **e3**
- Weight: TO92: 200mg (Approximate)
TO126: 400mg (Approximate)



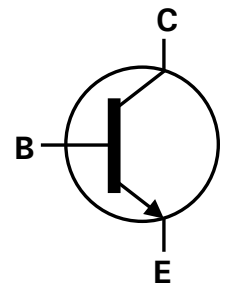
TO92
(Bulk)



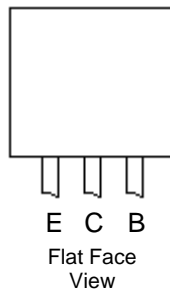
TO92
(Ammo)



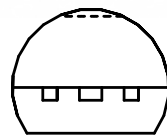
TO126



Device Schematic

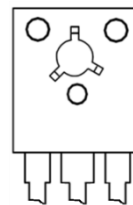


E C B
Flat Face
View



B C E
Bottom View

Pin-Out



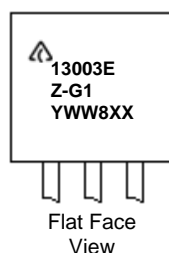
B C E
Front Face View
Pin-Out

Ordering Information (Note 4)

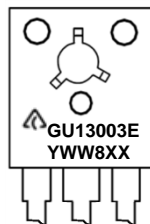
Product	Package	Marking	Quantity
APT13003EZ-G1	TO92 (Straight Legs)	13003EZ-G1	10,000 Bulk, Loose per Box
APT13003EZTR-G1	TO92 (Joggled Legs)	13003EZ-G1	2,000 Taped, per Ammo Box
APT13003EU-G1	TO126	GU13003E	4,000 Bulk, Loose per Box

- 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



Flat Face
View



Front Face View

- ▲ = Manufacturers' code marking
- For TO92: 13003EZ-G1 = Product Type Marking ID
- For TO126: GU13003E = 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}	465	V
Emitter-Base Voltage	V _{EBO}	9	V
Continuous Collector Current	I _C	1.5	A
Peak Pulse Collector Current(Note 5)	I _{CM}	3	A
Continuous Base Current	I _B	0.75	A
Peak Pulse Base Current(Note 5)	I _{BM}	1.5	A

Note: 5. Pulse test for pulse width < 5ms, duty cycle ≤ 10%.

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

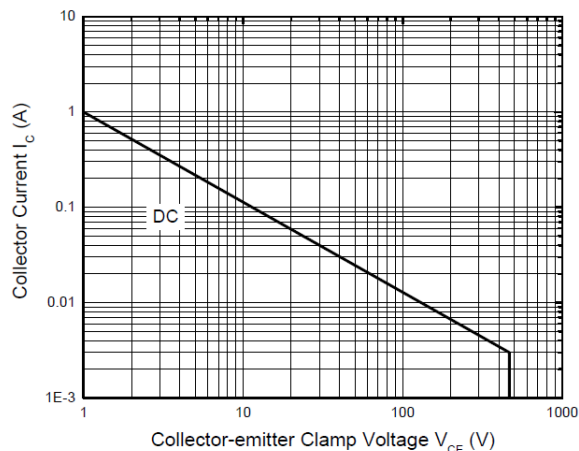
Characteristic	Symbol	Value	Unit
Power Dissipation	P _D	For TO-92	1.1
		For TO126 @ T _C = +25°C	20
Thermal Resistance, Junction to Ambient Air	R _{θJA}	For TO-92	113.6
		For TO-126	96
Thermal Resistance, Junction to Case	R _{θJC}	For TO-92	83.3
		For TO-126	6.25
Operating and Storage Temperature Range	T _J , T _{STG}	-65 to +150	°C

ESD Ratings (Note 6)

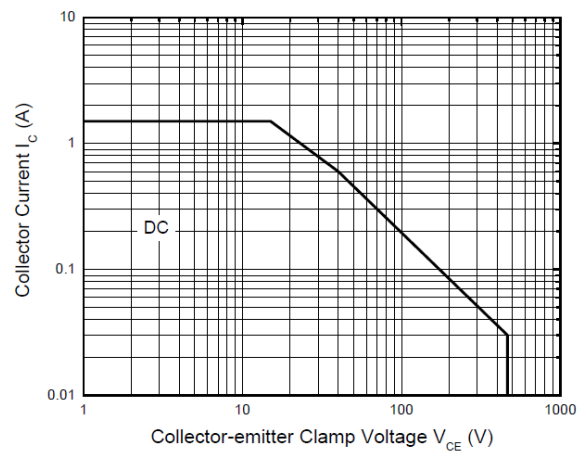
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	≥ 8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	C

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

Safe Operating Area (@T_A = +25°C, unless otherwise specified.)



Safe Operating Areas (TO-92 Package)



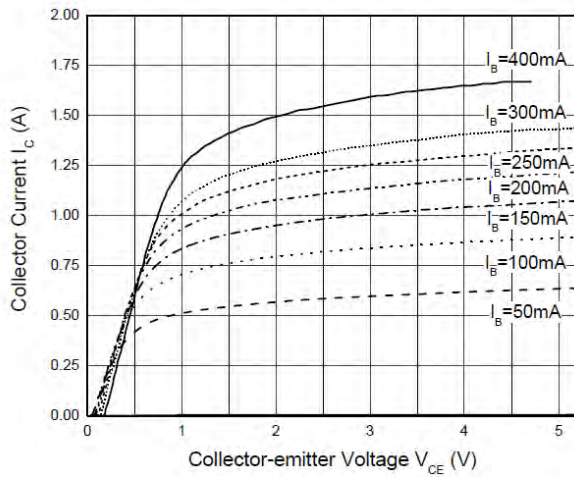
Safe Operating Areas (TO-126 Package)

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

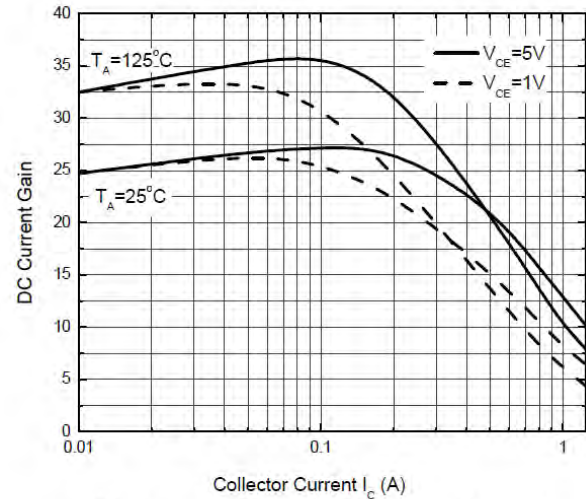
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	BV _{CES}	700	—	—	V	I _C = 100μA, V _{BE} = 0V
Collector-Emitter Breakdown Voltage	BV _{CEO}	465	—	—	V	I _C = 100μA
Emitter-Base Breakdown Voltage	BV _{EBO}	9	—	—	V	I _E = 100μA
Collector Cutoff Current	I _{CEV}	—	—	10	μA	V _{CE} = 700V, V _{BE} = -1.5V
DC current transfer Static ratio (Note 7)	h _{FE}	15	—	—	—	I _C = 0.3A, V _{CE} = 2V
		13	17	30	—	I _C = 0.5A, V _{CE} = 2V
		5	—	25	—	I _C = 1.0A, V _{CE} = 2V
Collector-Emitter Saturation Voltage (Note 7)	V _{CE(sat)}	—	0.17	0.3	V	I _C = 0.5A, I _B = 0.1A
		—	0.29	0.4		I _C = 1A, I _B = 0.25A
Base-Emitter Saturation Voltage (Note 7)	V _{BE(sat)}	—	—	1.0	V	I _C = 0.5A, I _B = 0.1A
		—	—	1.2		I _C = 1A, I _B = 0.25A
Output Capacitance	C _{ob}	—	16	—	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}	—	0.3	1	μs	I _C = 1A, V _{CC} = 125V, I _{B1} = 0.2A, I _{B2} = -0.2A, t _p = 25μs
Storage Time with Resistive Load	t _s	—	1.8	3		
Fall Time with Resistive Load	t _f	—	0.28	0.4		

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

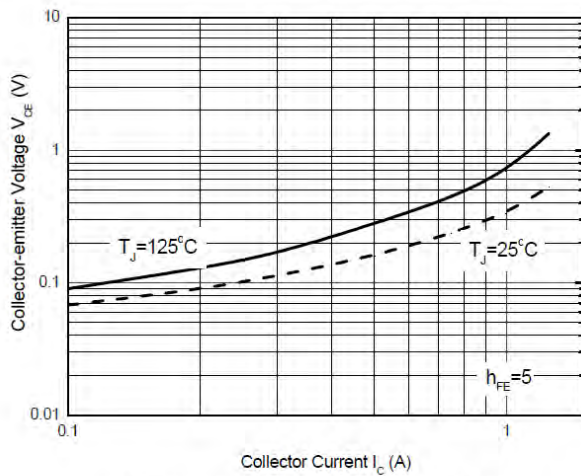
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



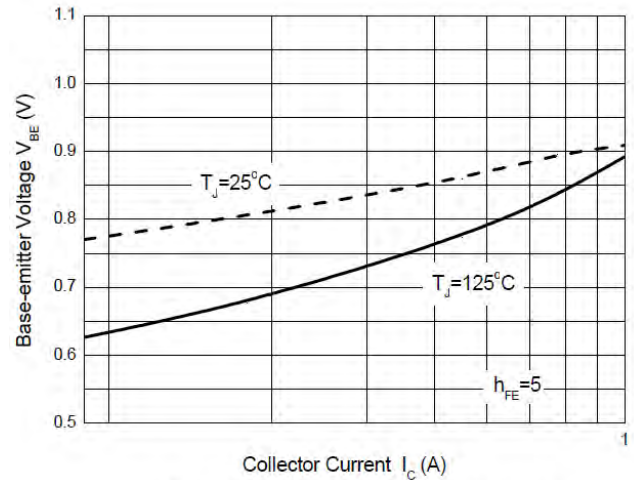
Static Characteristics



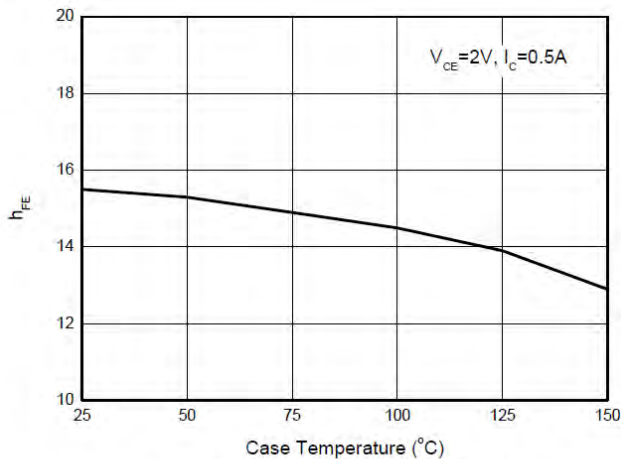
DC Current Gain vs. Collector Current



Collector-emitter Saturation Voltage



Base-emitter Saturation Voltage

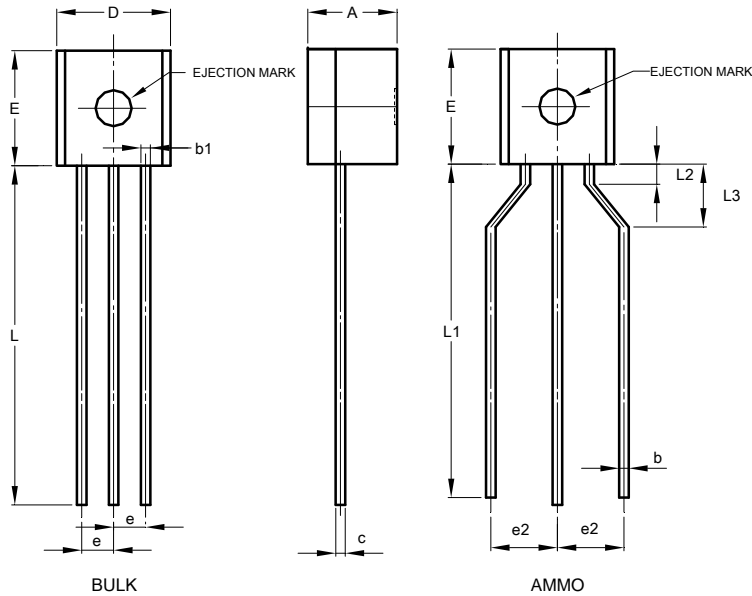


h_{FE} vs. Case Temperature

Package Outline Dimensions

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

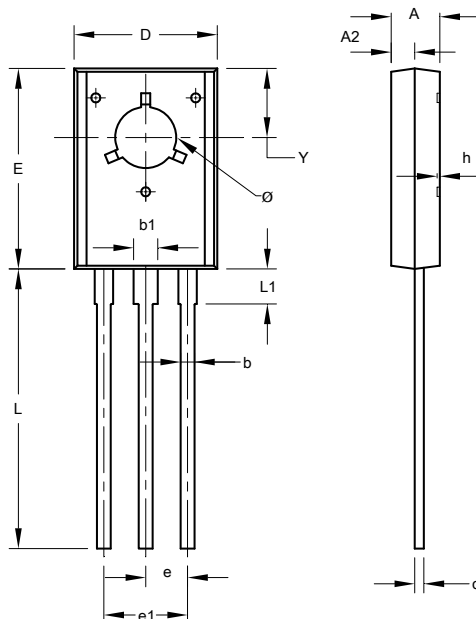
TO92 Type C



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	-
ϕ	-	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	-
ϕ	3.100	3.550	-

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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