



Data Sheet

HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR

APT13003E

General Description

The APT13003E series are high voltage, high speed switching NPN Power transistors specially designed for off-line switch mode power supplies with low output power.

The APT13003E series are available in TO-92 and TO-126 packages.

Features

- High Switching Speed
- High Collector-Emitter Voltage
- Low Cost
- Bulk and Ammo Packing TO-92 Package and TO-126 Package

Applications

- Battery Chargers for Mobile Phone of BCD Solution
- Power Supply for DVD/STB of BCD Solution



Figure 1. Package Types of APT13003E

Pin Configuration

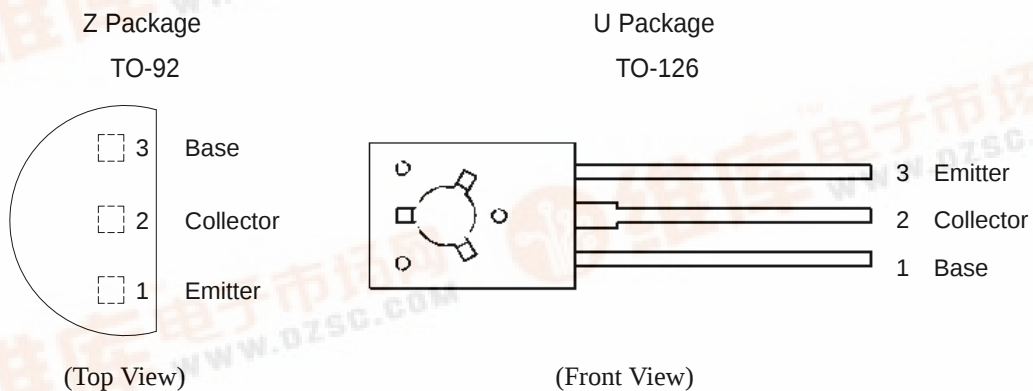
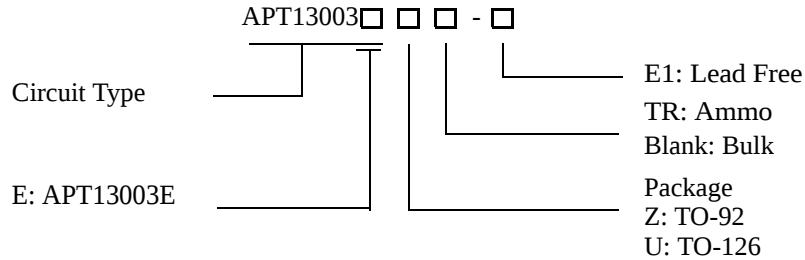


Figure 2. Pin Configurations of APT13003E

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003E****Ordering Information**

Package	Part Number	Marking ID	Packing Type
TO-92	APT13003EZ-E1	13003EZ-E1	Bulk
	APT13003EZTR-E1	13003EZ-E1	Ammo
TO-126	APT13003EU-E1	EU13003E	Bulk

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

Absolute Maximum Ratings (Note 1)

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage ($V_{BE}=0$)		V_{CES}	700	V
Collector-Emitter Voltage ($I_B=0$)		V_{CEO}	465	V
Emitter-Base Voltage ($I_C=0$)		V_{EBO}	9	V
Collector Current		I_C	1.5	A
Collector Peak Current (Pulse) (Note 2)		I_{CM}	3	A
Base Current		I_B	0.75	A
Base Peak Current (Pulse) (Note 2)		I_{BM}	1.5	A
Power Dissipation, $T_A=25^{\circ}\text{C}$	For TO-92	P_{TOT}	1.1	W
Power Dissipation, $T_C=25^{\circ}\text{C}$	For TO-126	P_{TOT}	20	W
Operating Junction Temperature		T_J	150	$^{\circ}\text{C}$
Storage Temperature Range		T_{STG}	-65 to 150	$^{\circ}\text{C}$

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: Pulse test for Pulse Width < 5ms, Duty Cycle ≤ 10%.

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003E****Thermal Characteristics**

Parameter		Symbol	Value	Unit
Thermal Resistance (Junction-to-Case)	For TO-92	$R_{\theta JC}$	83.3	$^{\circ}\text{C}/\text{W}$
	For TO-126		6.25	
Thermal Resistance (Junction-to-Ambient)	For TO-92	$R_{\theta JA}$	113.6	$^{\circ}\text{C}/\text{W}$
	For TO-126		96	

Electrical Characteristics($T_C=25^{\circ}\text{C}$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector Cut-off Current ($V_{BE}=-1.5\text{V}$)	I_{CEV}	$V_{CE}=700\text{V}$			10	μA
Collector-Emitter Sustaining Voltage ($I_B=0$)	$V_{CEO}(\text{sus})$	$I_C=100\mu\text{A}$	465			V
Collector-Emitter Saturation Voltage (Note 3)	$V_{CE}(\text{sat})$	$I_C=0.5\text{A}, I_B=0.1\text{A}$		0.17	0.3	V
		$I_C=1.0\text{A}, I_B=0.25\text{A}$		0.29	0.4	
Base-Emitter Saturation Voltage (Note 3)	$V_{BE}(\text{sat})$	$I_C=0.5\text{A}, I_B=0.1\text{A}$			1.0	V
		$I_C=1.0\text{A}, I_B=0.25\text{A}$			1.2	
DC Current Gain (Note 3)	h_{FE}	$I_C=0.3\text{A}, V_{CE}=2\text{V}$	15			
		$I_C=0.5\text{A}, V_{CE}=2\text{V}$	13	17	30	
		$I_C=1.0\text{A}, V_{CE}=2\text{V}$	5		25	
Output Capacitance	C_{ob}	$V_{CB}=10\text{V}, f=0.1\text{MHz}$		16		pF
Current Gain Bandwidth Product	f_T	$V_{CE}=10\text{V}, I_C=0.1\text{A}$	4			MHz
Turn-on Time with Resistive Load	t_{on}	$I_C=1\text{A}, V_{CC}=125\text{V}, I_{B1}=0.2\text{A}, I_{B2}=-0.2\text{A}, T_P=25\mu\text{S}$		0.3	1	μs
Storage Time with Resistive Load	t_s			1.8	3	
Fall Time with Resistive Load	t_f			0.28	0.4	

Note 3: Pulse test for Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.



Typical Performance Characteristics

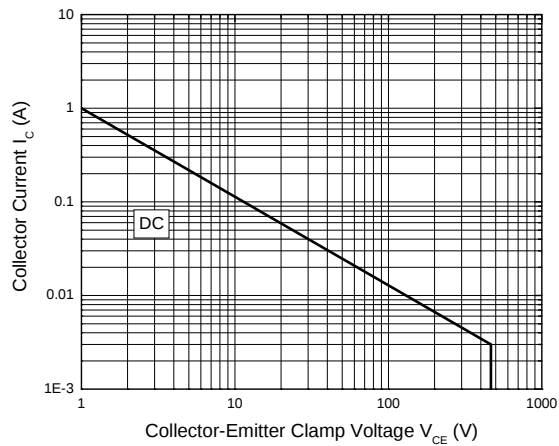


Figure 3. Safe Operating Areas (TO-92 Package)

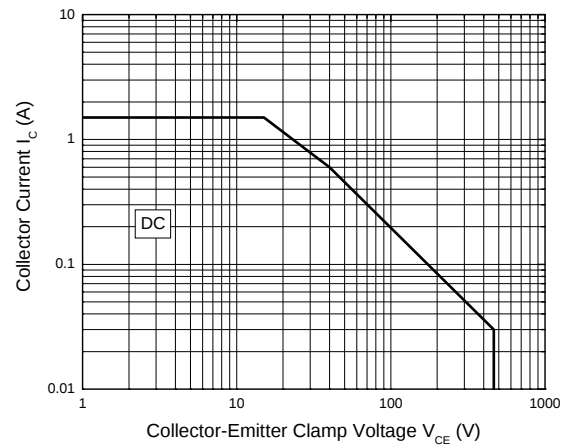


Figure 4. Safe Operating Areas (TO-126 Package)

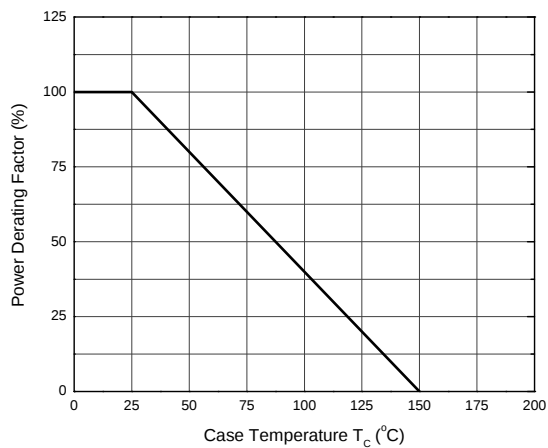


Figure 5. Power Derating Curve

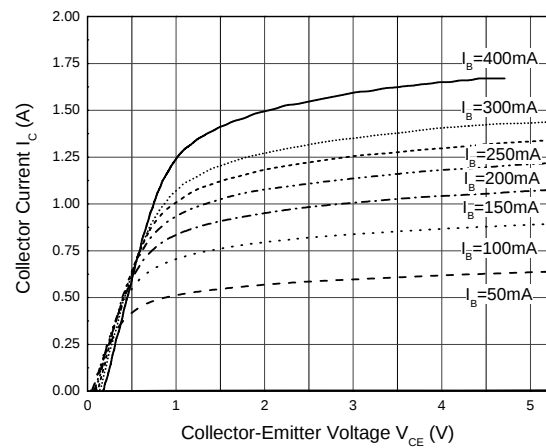


Figure 6. Static Characteristics



Typical Performance Characteristics (Continued)

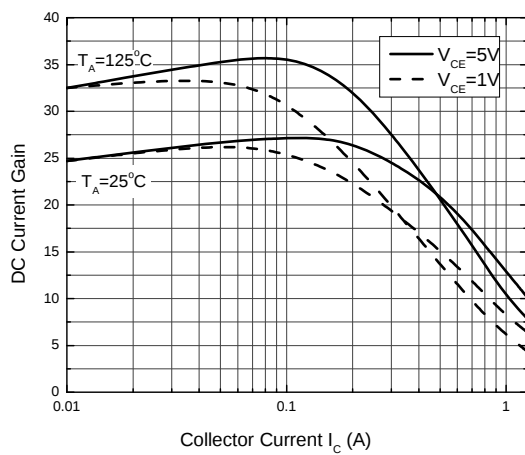


Figure 7. DC Current Gain

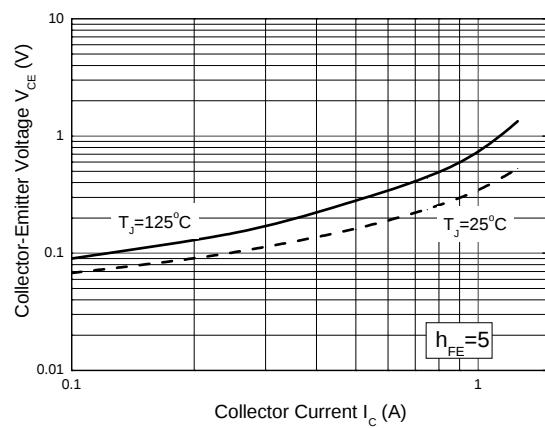


Figure 8. Collector-Emitter Saturation Voltage

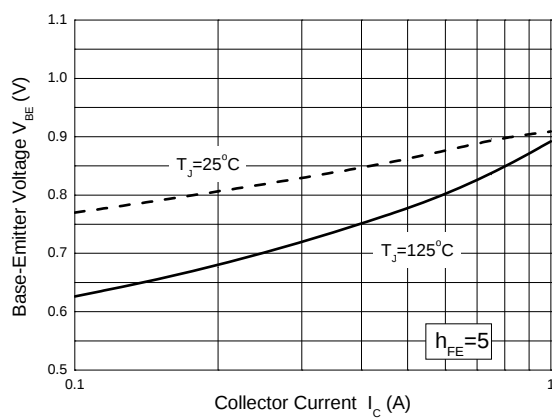
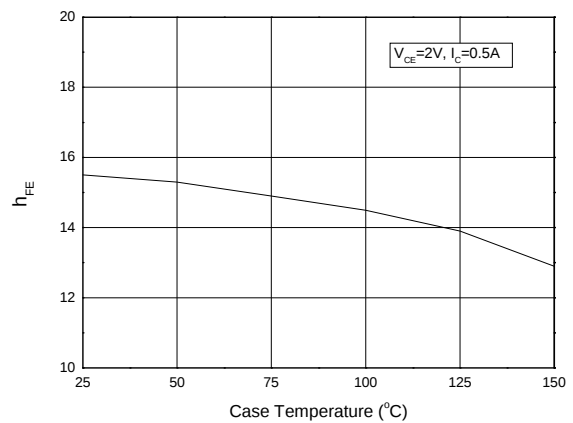


Figure 9. Base-Emitter Saturation Voltage

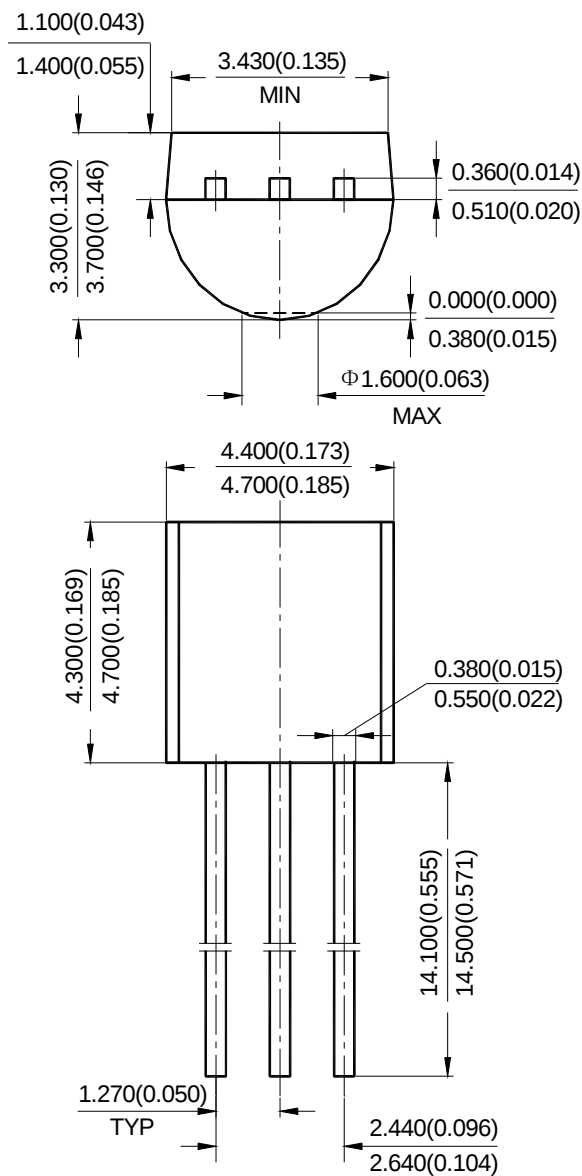
Figure 10. h_{FE} vs. Case Temperature



Mechanical Dimensions

TO-92 (Bulk Packing)

Unit: mm(inch)

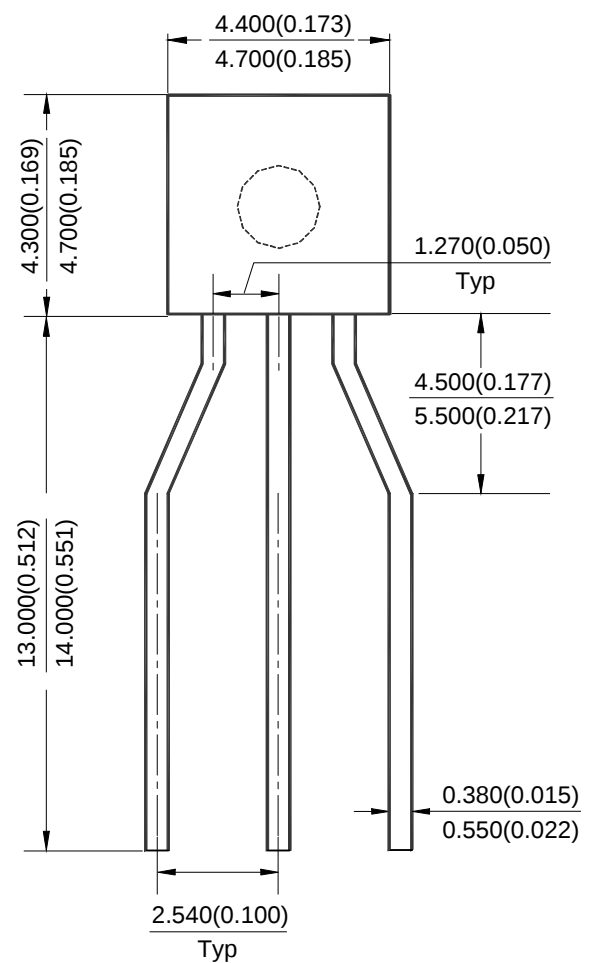
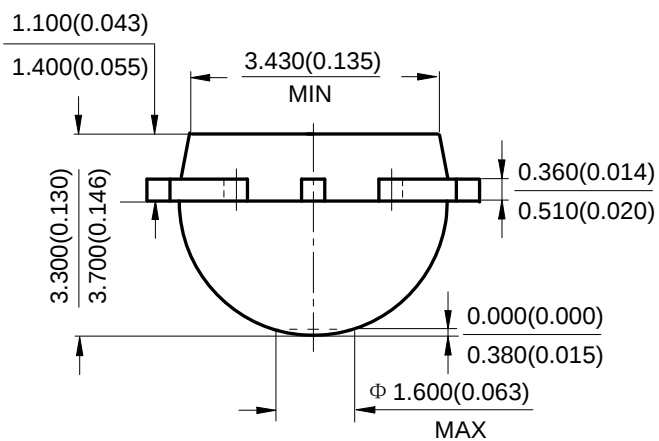




Mechanical Dimensions (Continued)

TO-92 (Ammo Packing)

Unit: mm(inch)

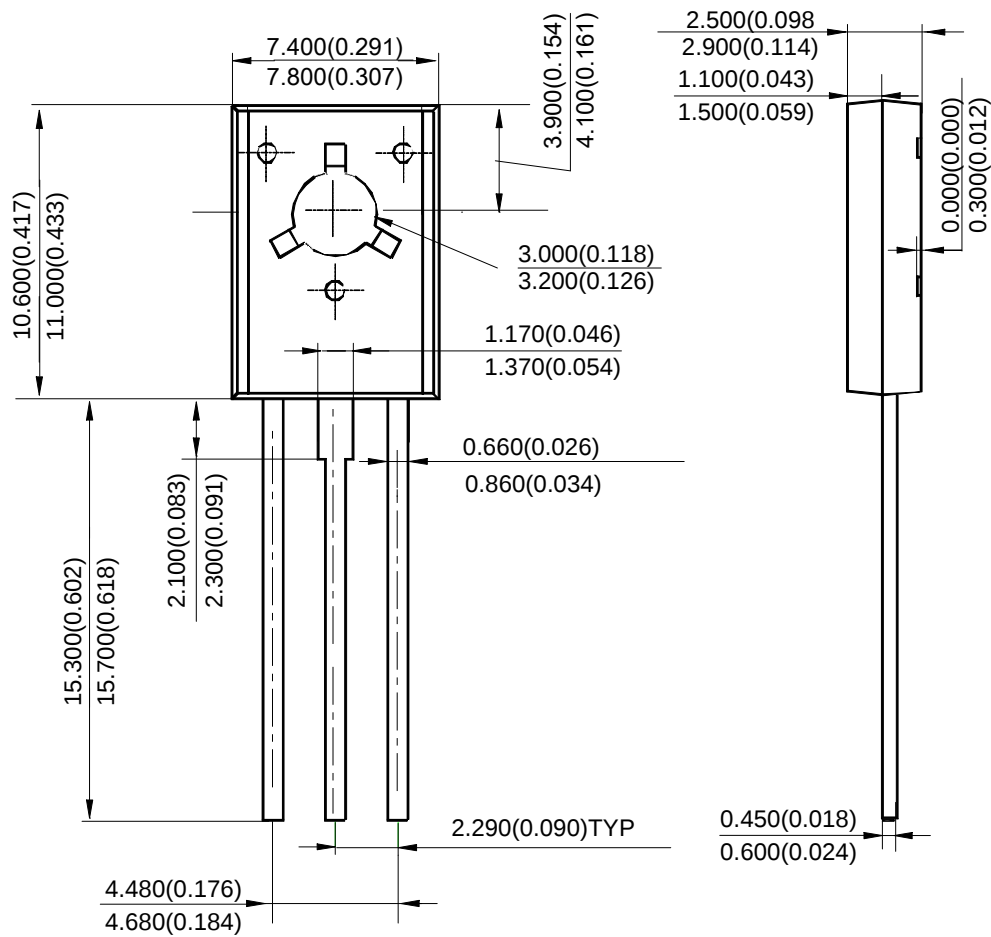




Mechanical Dimensions (Continued)

TO-126

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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MAIN SITE

- Headquarters

BCD Semiconductor Manufacturing Limited

No. 1600, Zi Xing Road, Shanghai ZiZhu Science-based Industrial Park, 200241, China
Tel: +86-21-24162266, Fax: +86-21-24162277

- Wafer Fab

Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.

800 Yi Shan Road, Shanghai 200233, China
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

REGIONAL SALES OFFICE

Shenzhen Office

Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office
Room E, 5F, Noble Center, No.1006, 3rd Fuzhong Road, Futian District, Shenzhen, 518026, China
Tel: +86-755-8826 7951
Fax: +86-755-8826 7865

Taiwan Office

BCD Semiconductor (Taiwan) Company Limited
4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan
Tel: +886-2-2656 2808
Fax: +886-2-2656 2806

USA Office

BCD Semiconductor Corp.
30920 Huntwood Ave. Hayward, CA 94544, USA
Tel : +1-510-324-2988
Fax: +1-510-324-2788