

HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR

APT13003D

General Description

The APT13003D is a high voltage, high speed, high efficiency switching transistor, and it is specially designed for off-line switch mode power supplies with low output power.

The APT13003D is available in TO-92 (bulk or ammo packing), TO-126 and TO-251 packages.

Features

- High Switching Speed
- High Collector-Emitter Voltage: 700V
- Low Cost
- High Efficiency

Applications

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

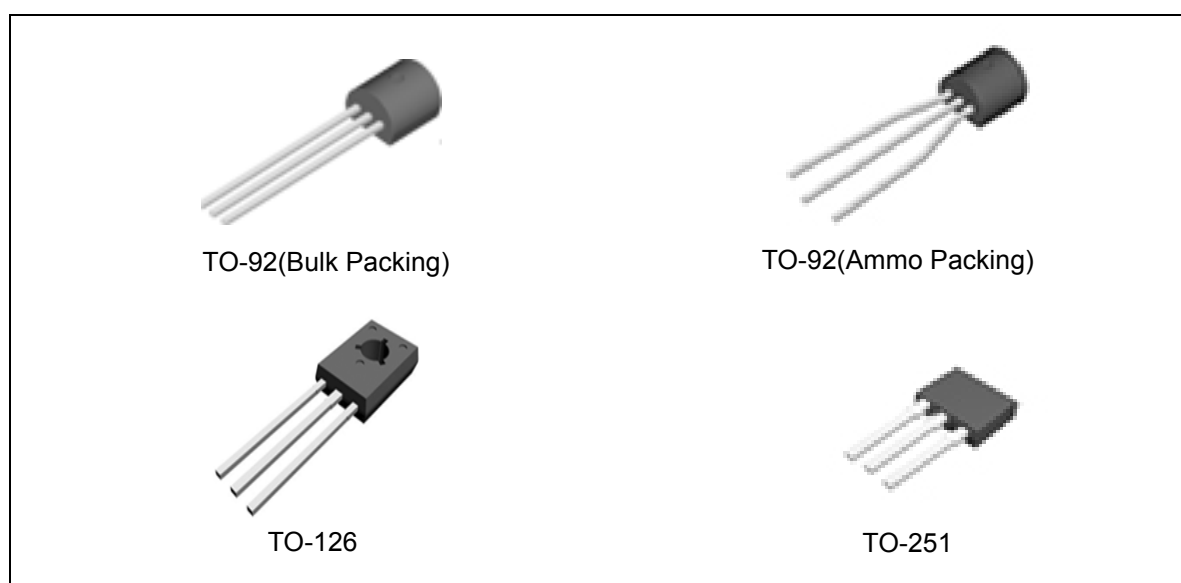


Figure 1. Package Types of APT13003D

HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR

APT13003D

Pin Configuration

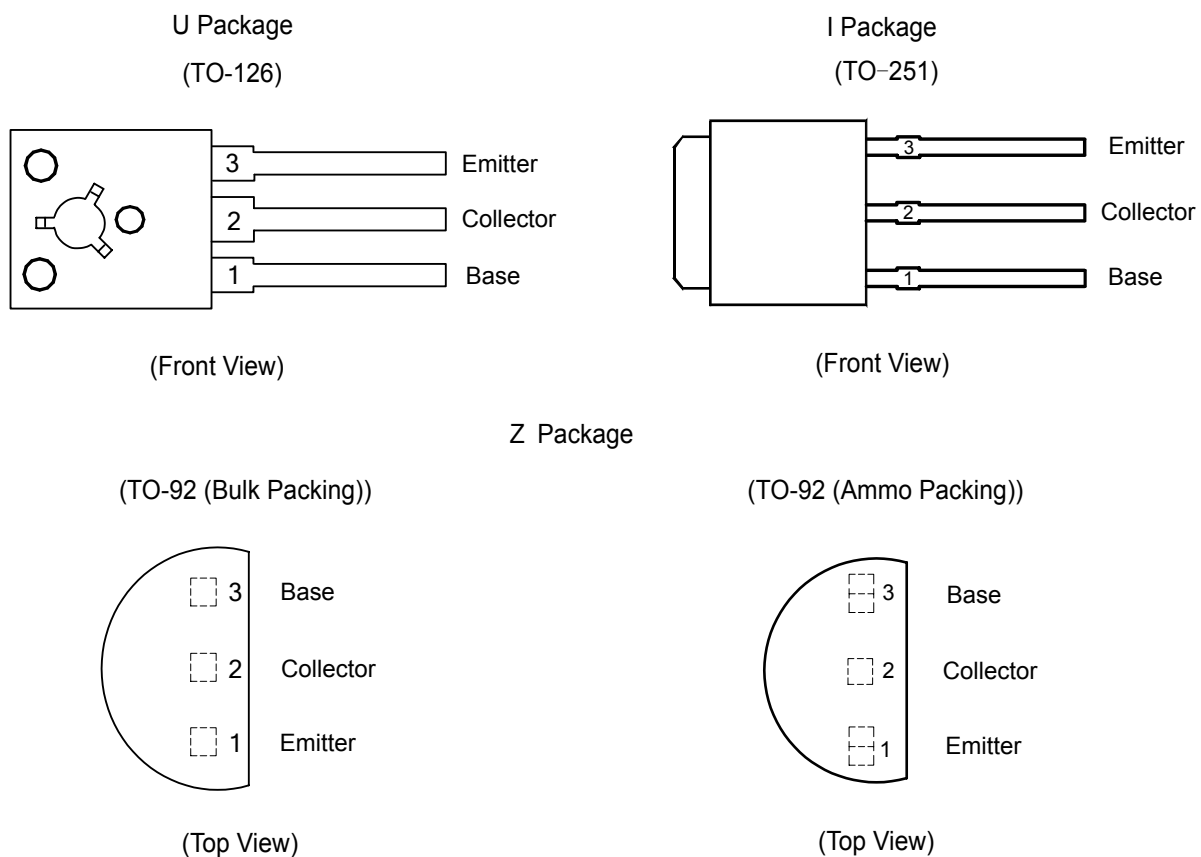


Figure 2. Pin Configuration of APT13003D

Internal Structure

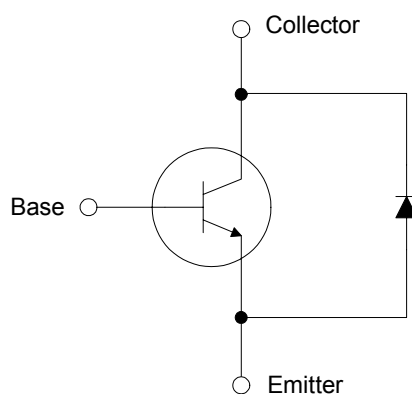
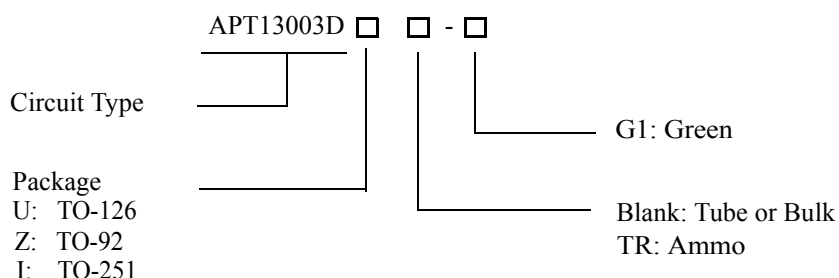


Figure 3. Internal Structure of APT13003D

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR APT13003D****Ordering Information**

Package	Part Number	Marking ID	Packing Type
TO-126	APT13003DU-G1	GU13003D	Bulk
TO-92	APT13003DZ-G1	13003DZ-G1	Bulk
	APT13003DZTR-G1	13003DZ-G1	Ammo
TO-251	APT13003DI-G1	APT13003DI-G1	Tube

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

Absolute Maximum Ratings (Note 1)

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage ($V_{BE}=0$)		V_{CES}	700	V
Collector-Emitter Voltage ($I_B=0$)		$V_{CEO(sus)}$	450	V
Emitter-Base Breakdown Voltage ($I_C=0$)		V_{EBO}	9	V
Collector Current		I_C	1.5	A
Collector Peak Current		I_{CM}	3.0	A
Base Current		I_B	0.75	A
Base Peak Current		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-251		24	
	For TO-126		20	
Operating Junction Temperature		T_J	150	$^{\circ}\text{C}$
Storage Temperature Range		T_{STG}	-55 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.

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR APT13003D****Thermal Characteristics**

Parameter		Symbol	Value	Unit
Maximum Thermal Resistance (Junction to Case)	For TO-126	θ_{JC}	6.25	$^{\circ}\text{C/W}$
	For TO-251		5.0	
	For TO-92		83.3	
Maximum Thermal Resistance (Junction to Ambient)	For TO-126	θ_{JA}	96	$^{\circ}\text{C/W}$
	For TO-251		110	
	For TO-92		113.6	

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

Parameter	Symbol	Condition	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 ($I_B=0$)	$V_{CEO}(\text{sus})$	$I_C=100\mu\text{A}$	450			V
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$I_C=0.5\text{A}, I_B=0.1\text{A}$			0.3	V
		$I_C=1.0\text{A}, I_B=0.25\text{A}$			0.4	
Base-Emitter Saturation Voltage	$V_{BE}(\text{sat})$	$I_C=0.5\text{A}, I_B=0.1\text{A}$			1.0	V
		$I_C=1.0\text{A}, I_B=0.25\text{A}$			1.2	
DC Current Gain (Note 2)	h_{FE}	$I_C=0.5\text{A}, V_{CE}=2.0\text{V}$	16		30	
		$I_C=1.0\text{A}, V_{CE}=2.0\text{V}$	5.0		25	
Turn-on Time with Resistive Load	t_{on}	$I_C=1.0\text{A}, V_{CC}=125\text{V}$ $I_{B1}=0.2\text{A}, I_{B2}=-0.2\text{A}$			0.7	μs
Storage Time with Resistive Load	t_s				3.0	μs
Fall Time with Resistive Load	t_f				0.35	μs
Output Capacitance	C_{OB}	$V_{CB}=10\text{V}, f=0.1\text{MHz}$		18		pF
Current Gain Bandwidth Product	f_T	$V_{CE}=10\text{V}, I_C=0.1\text{A}$	4			MH

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

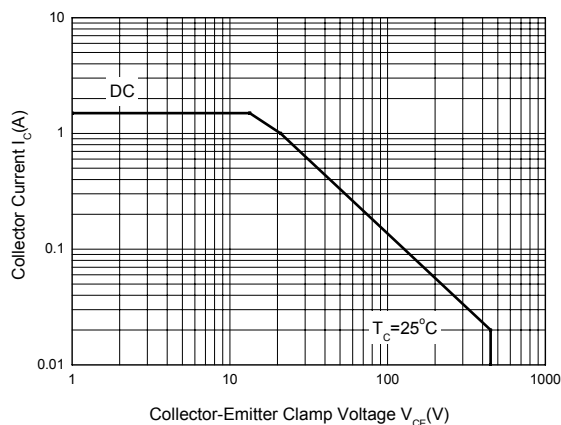
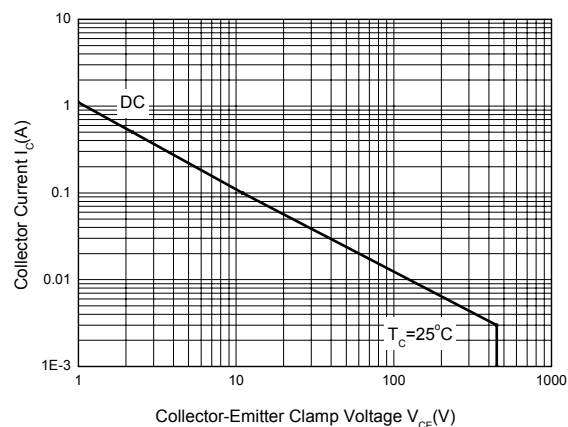
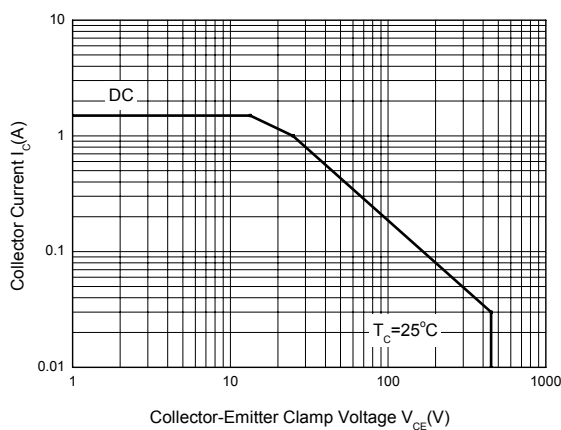
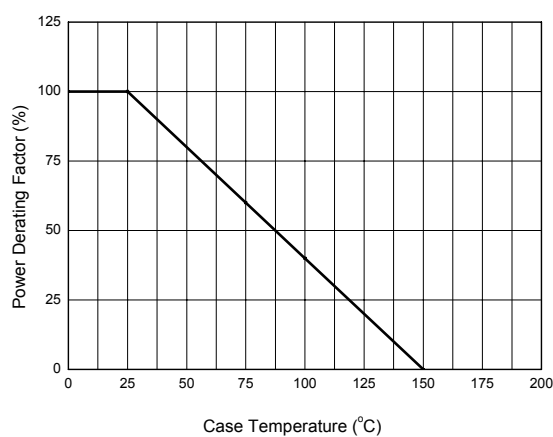
**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003D****Typical Performance Characteristics**Figure 4. Safe Operating Areas
(TO-126 Package)Figure 5. Safe Operating Areas
(TO-92 Package)Figure 6. Safe Operating Areas
(TO-251 Package)

Figure 7. Power Derating Curve

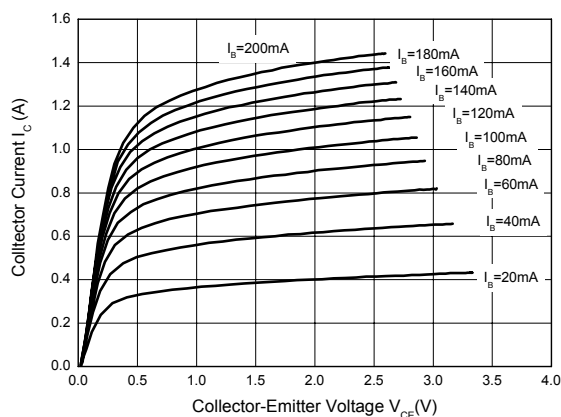
**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003D****Typical Performance Characteristics (Continued)**

Figure 8. Static Characteristics

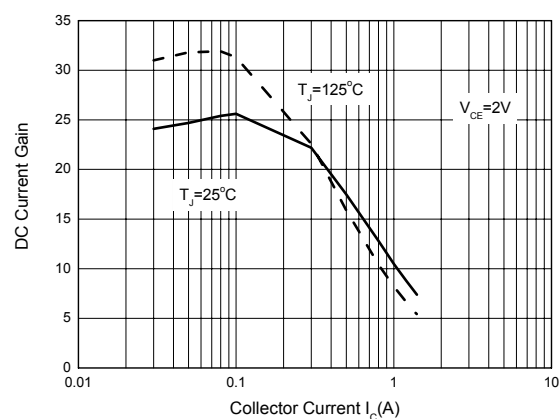


Figure 9. DC Current Gain

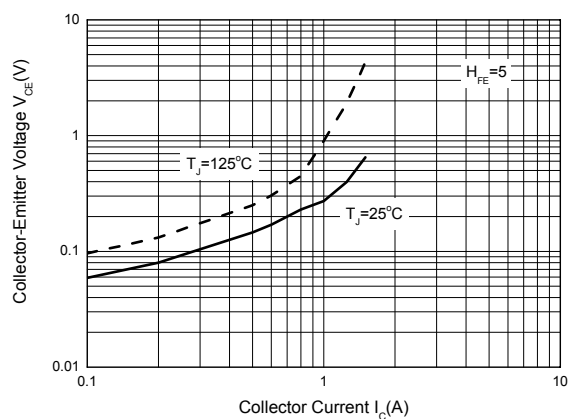


Figure 10. Collector-Emitter Saturation Region

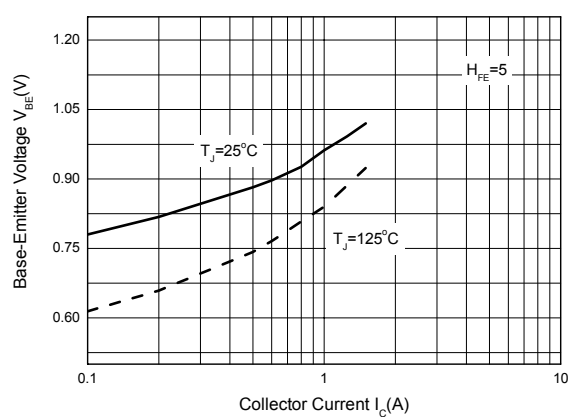
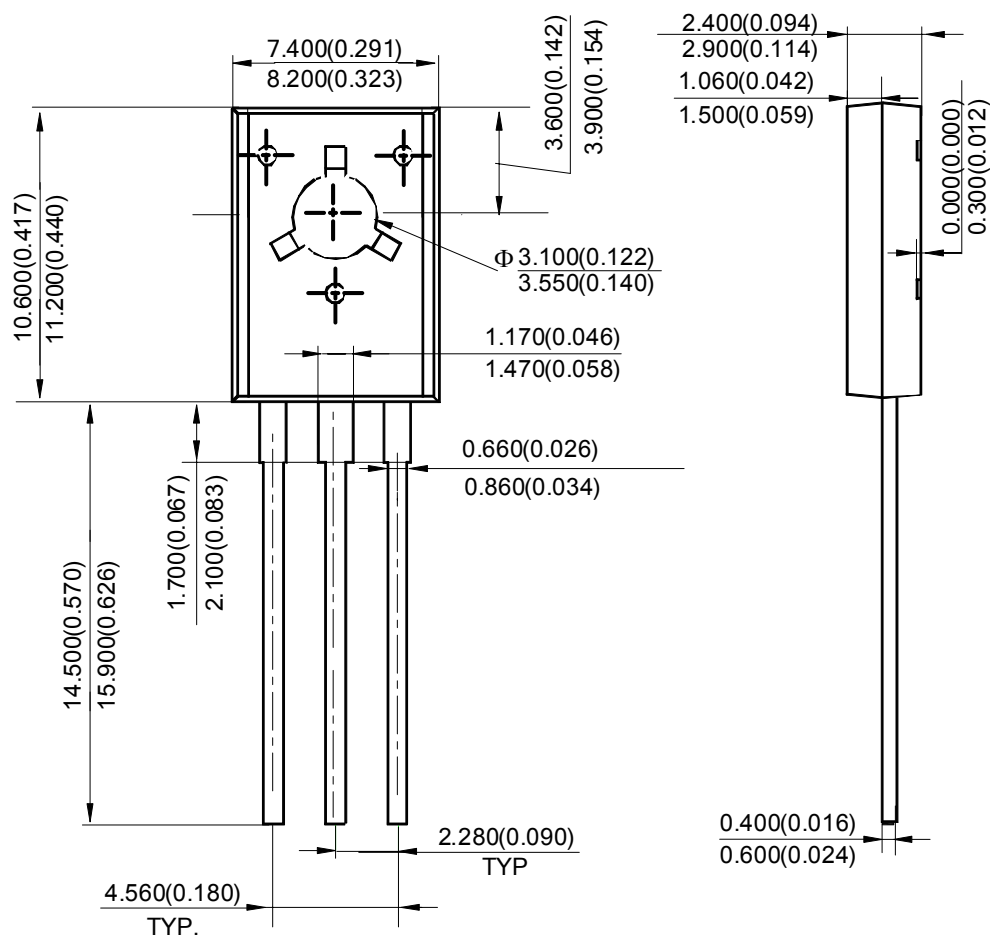
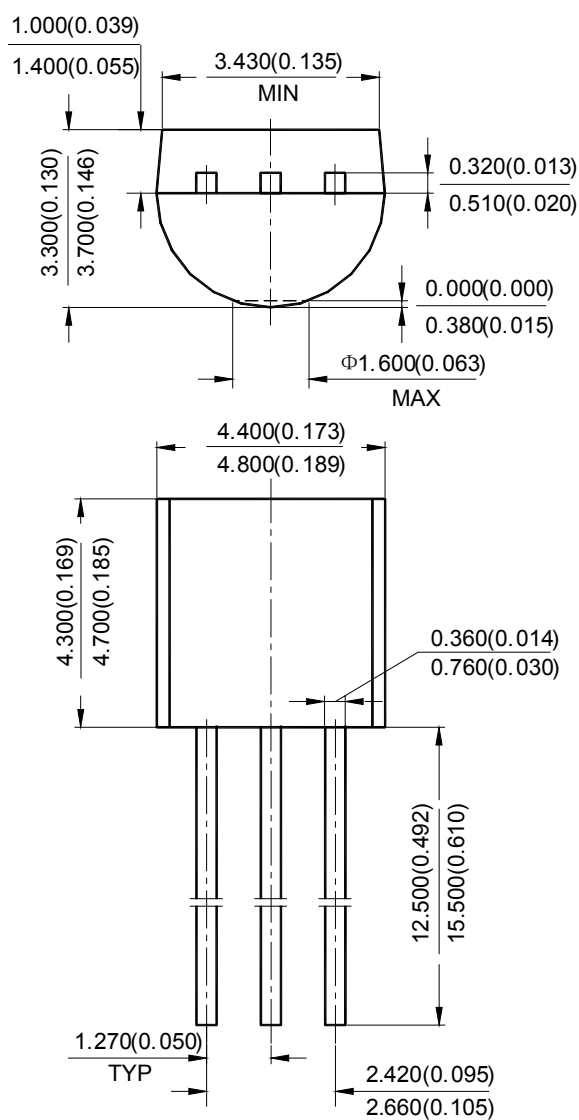
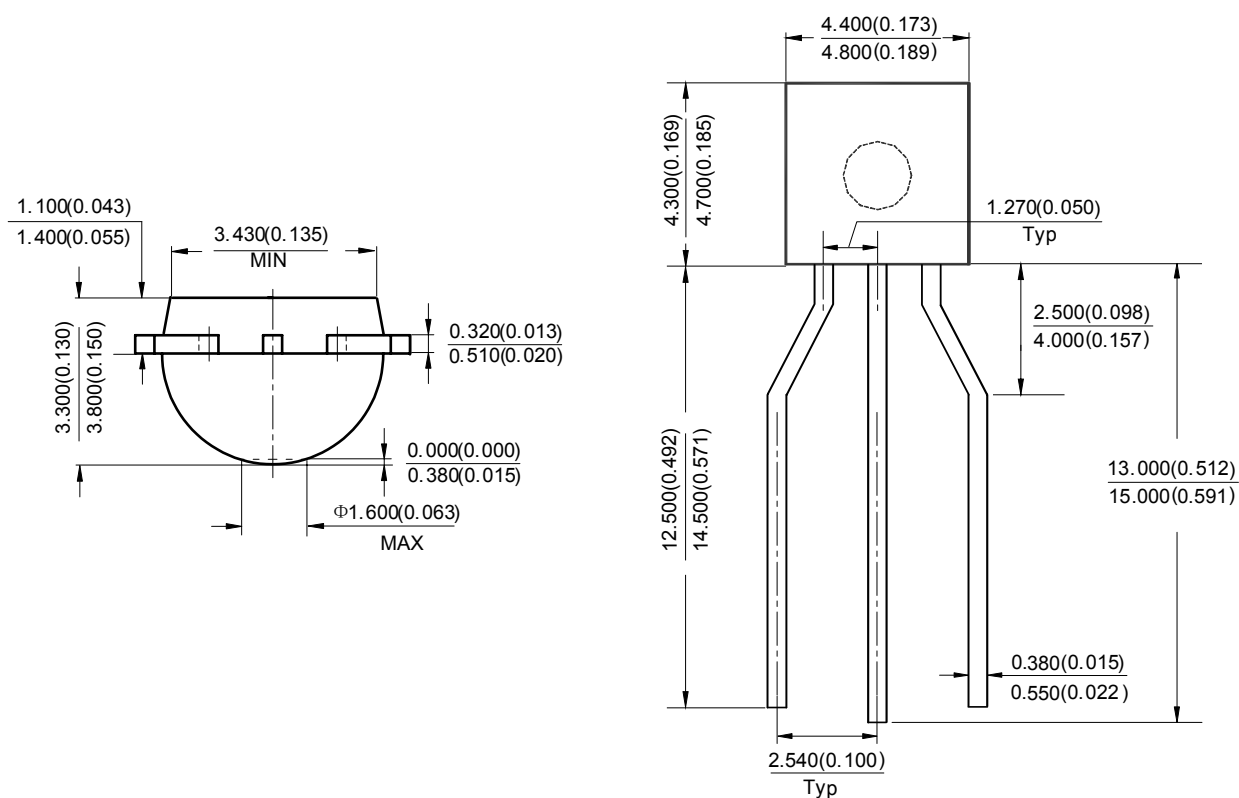
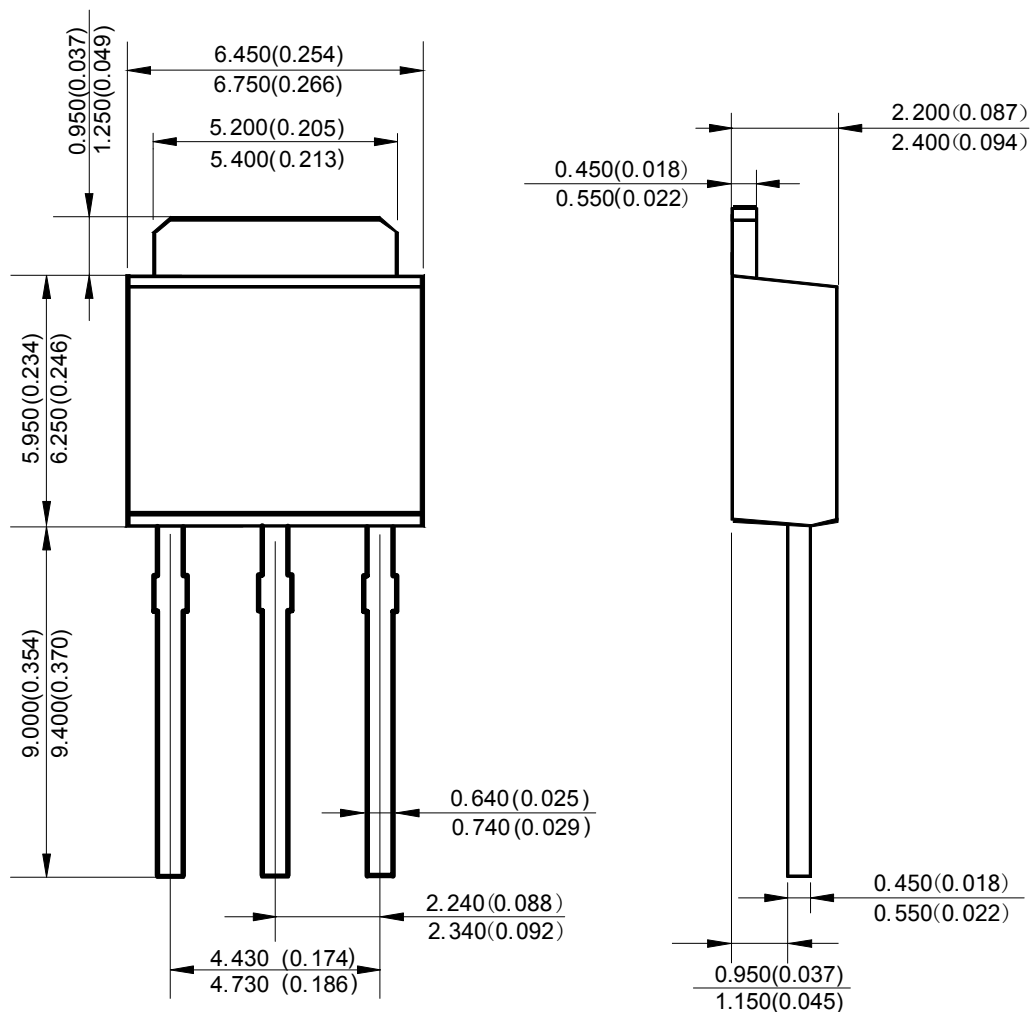


Figure 11. Base-Emitter Saturation Voltage

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003D****Mechanical Dimensions****TO-126****Unit: mm(inch)**

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003D****Mechanical Dimensions (Continued)****TO-92 (Bulk Packing)****Unit: mm(inch)**

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003D****Mechanical Dimensions (Continued)****TO-92 (Ammo Packing)****Unit: mm(inch)**

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13003D****Mechanical Dimensions (Continued)****TO-251****Unit: mm(inch)**



BCD Semiconductor Manufacturing Limited

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