

HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR

APT13005S

General Description

The APT13005S 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 APT13005S is available in TO-220F-3, 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
- Driver for LED Lighting of BCD Solution

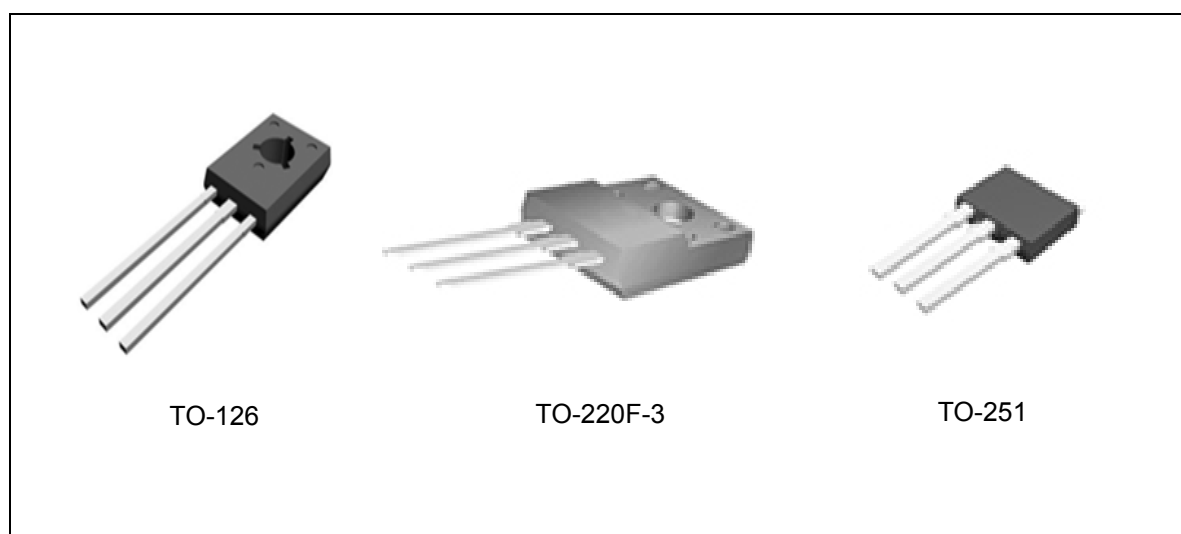


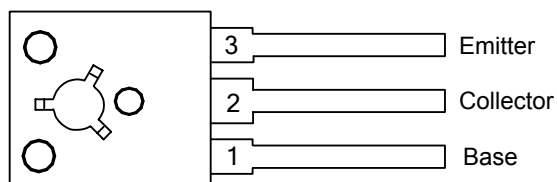
Figure 1. Package Types of APT13005S

HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR

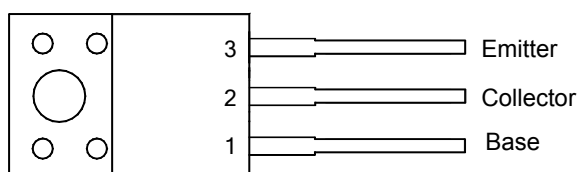
APT13005S

Pin Configuration

U Package
(TO-126)



TF Package
(TO-220F-3)



I Package
(TO-251)

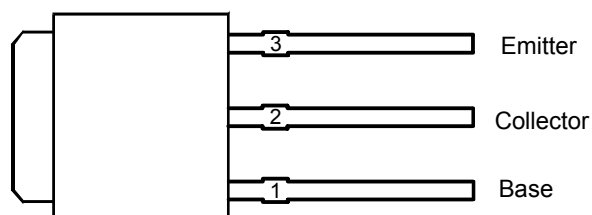
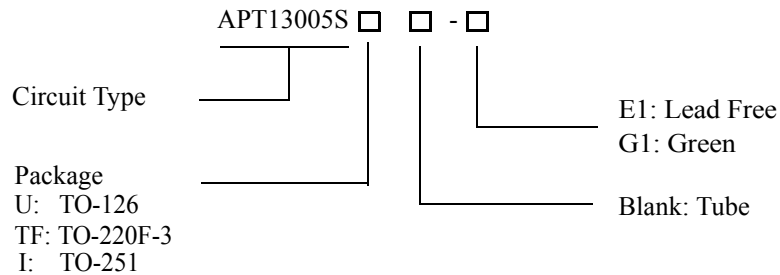


Figure 2. Pin Configuration of APT13005S (Front View)

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005S****Ordering Information**

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-126	APT13005SU-E1	APT13005SU-G1	EU13005S	GU13005S	Tube
TO-220F-3	APT13005STF-E1	APT13005STF-G1	APT13005STF-E1	APT13005STF-G1	Tube
TO-251	APT13005SI-E1	APT13005SI-G1	APT13005SI-E1	APT13005SI-G1	Tube

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

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}	450	V
Emitter-Base Breakdown Voltage ($I_C=0$)		V_{EBO}	9	V
Collector Current		I_C	3.2	A
Collector Peak Current		I_{CM}	6.4	A
Base Current		I_B	1.6	A
Base Peak Current		I_{BM}	3.2	A
Power Dissipation, $T_C=25^{\circ}\text{C}$	TO-220F-3	P_{TOT}	28	W
	TO-251		25	
	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****APT13005S****Thermal Characteristics**

Parameter	Symbol	Condition		Value	Unit
Maximum Thermal Resistance	θ_{JC}	Junction to Case	TO-220F-3	4.5	$^{\circ}\text{C/W}$
			TO-251	5.0	
			TO-126	6.25	

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 Voltage ($I_B=0$) (Note 2)	$V_{CEO}(\text{sus})$	$I_C=100\mu\text{A}$	450			V
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$I_C=1.0\text{A}, I_B=0.2\text{A}$			0.3	V
		$I_C=2.0\text{A}, I_B=0.5\text{A}$			0.6	
		$I_C=3.0\text{A}, I_B=0.75\text{A}$			1.0	
Base-Emitter Saturation Voltage	$V_{BE}(\text{sat})$	$I_C=1.0\text{A}, I_B=0.2\text{A}$			1.2	V
		$I_C=2.0\text{A}, I_B=0.5\text{A}$			1.4	
DC Current Gain (Note 2)	h_{FE}	$I_C=1.0\text{A}, V_{CE}=5.0\text{V}$	15		35	
		$I_C=2.0\text{A}, V_{CE}=5.0\text{V}$	8		35	
Turn-on Time with Resistive Load	t_{on}	$I_C=2.0\text{A}, V_{CC}=125\text{V}$ $I_{B1}=0.4\text{A}, I_{B2}=-0.4\text{A}$			0.7	μs
Storage Time with Resistive Load	t_s				4.5	μs
Fall Time with Resistive Load	t_f				0.8	μs
Output Capacitance	C_{OB}	$V_{CB}=10\text{V}, f=0.1\text{MHz}$		35		pF
Current Gain Bandwidth Product	f_T	$V_{CE}=10\text{V}, I_C=0.5\text{A}$	4			MHz

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

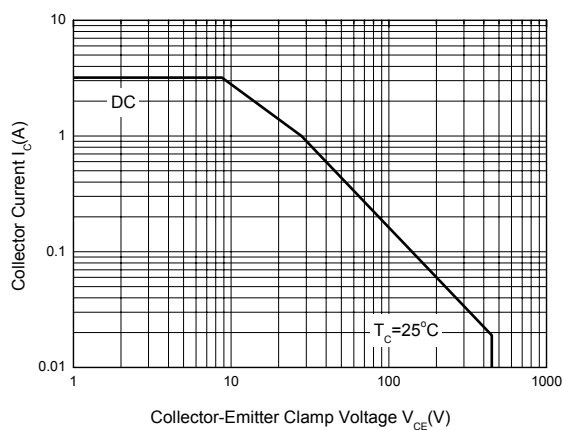
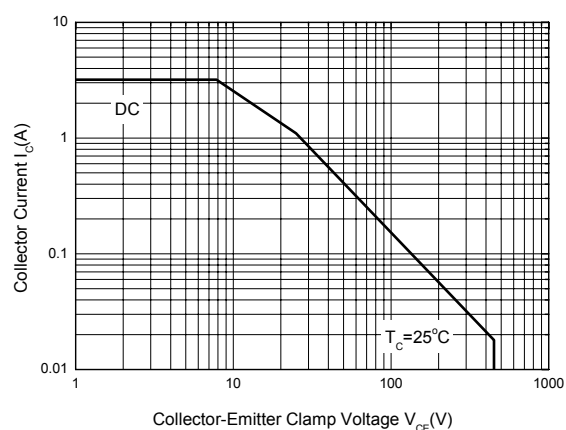
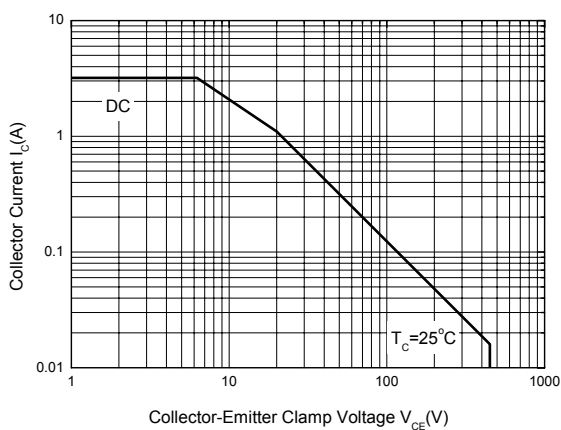
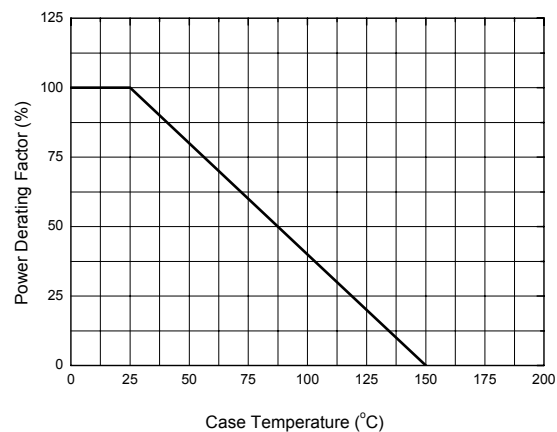
**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005S****Typical Performance Characteristics**Figure 3. Safe Operating Areas
(TO-220F-3 Package)Figure 4. Safe Operating Areas
(TO-251 Package)Figure 5. Safe Operating Areas
(TO-126 Package)

Figure 6. Power Derating Curve

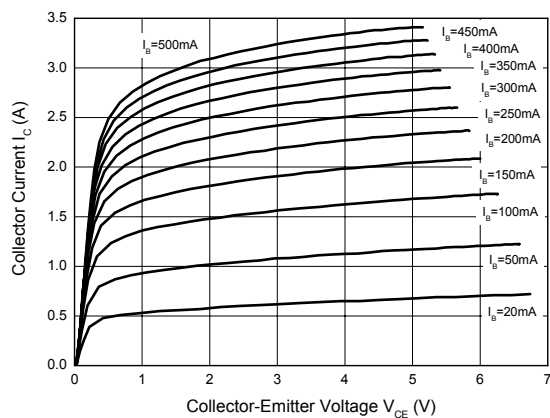
**Typical Performance Characteristics (Continued)**

Figure 7. Static Characteristics

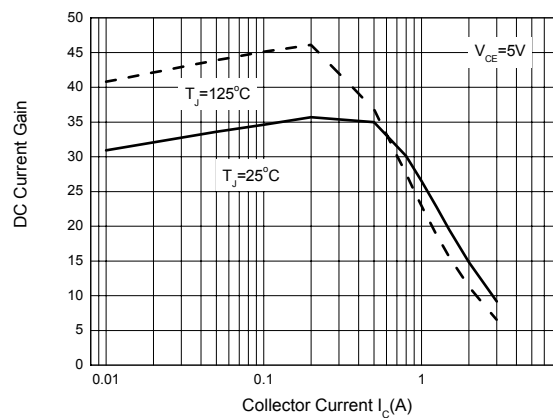


Figure 8. DC Current Gain

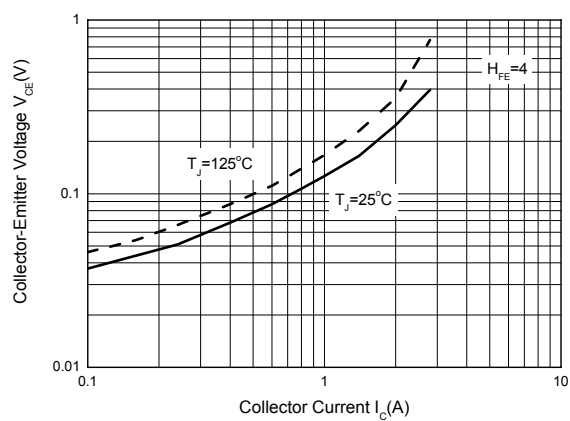


Figure 9. Collector-Emitter Saturation Region

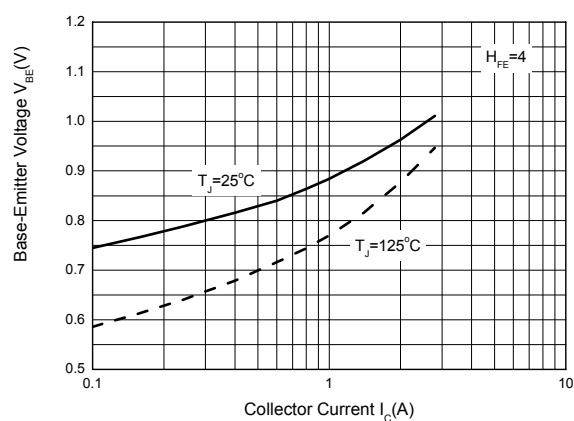
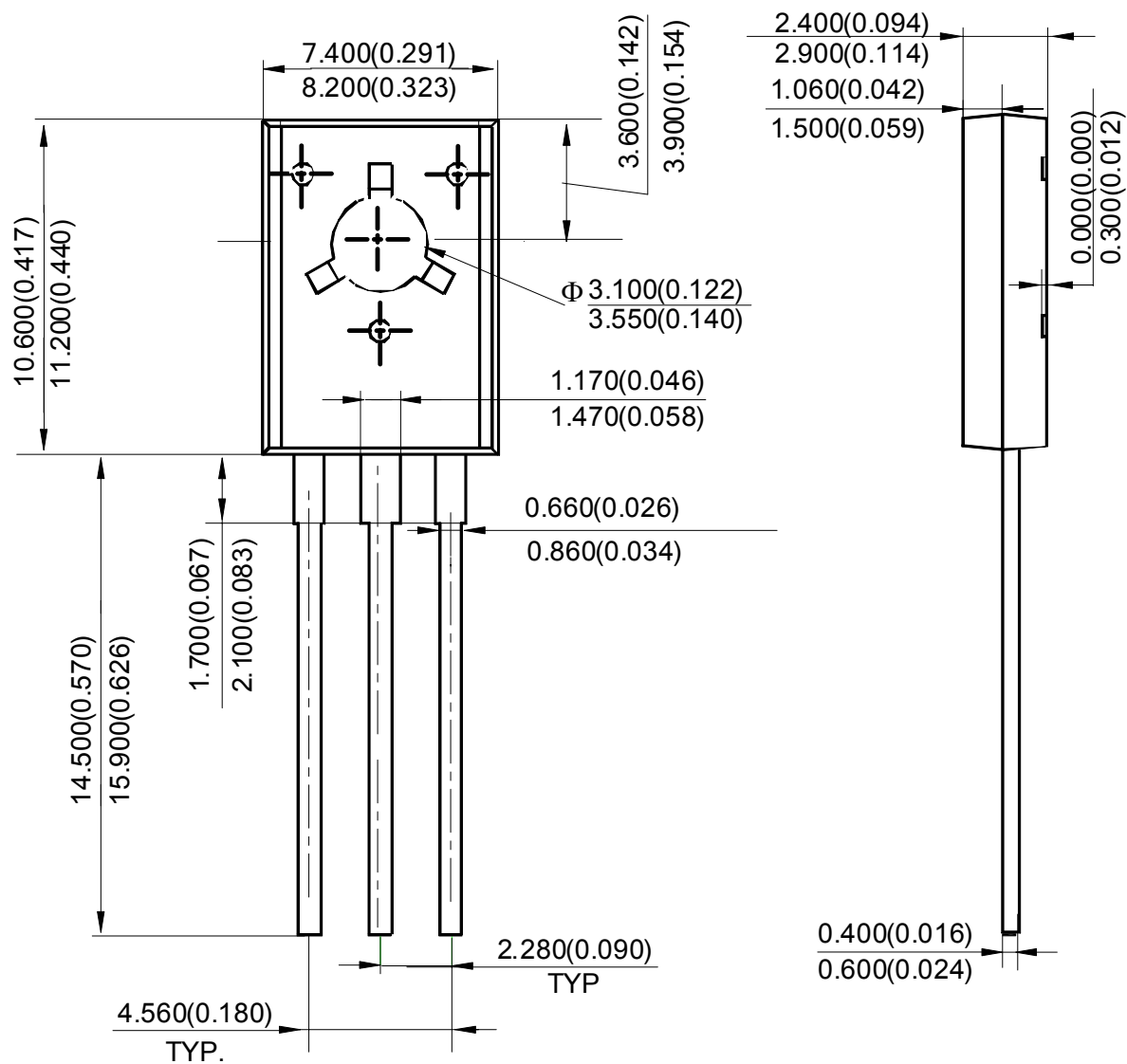
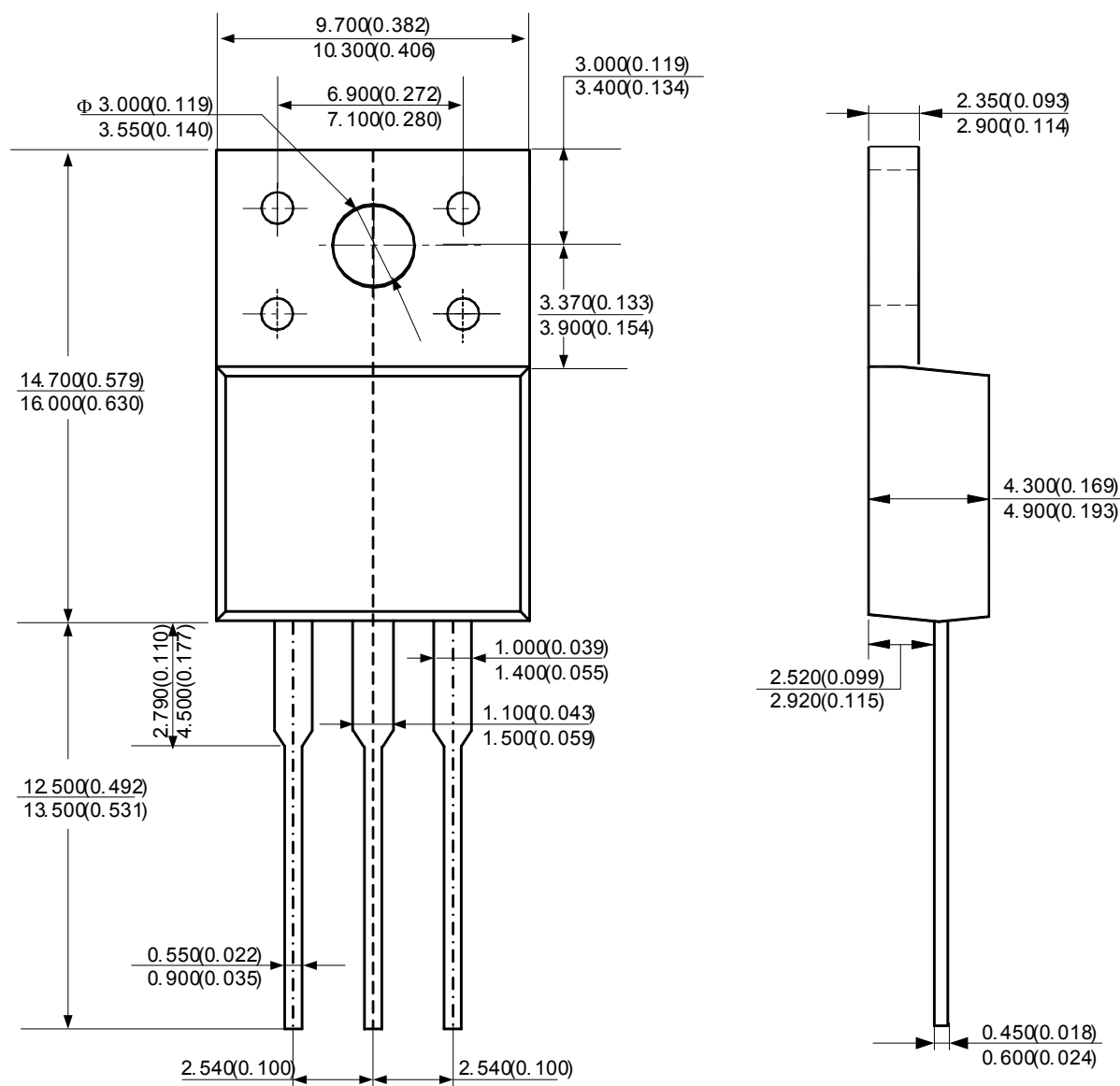
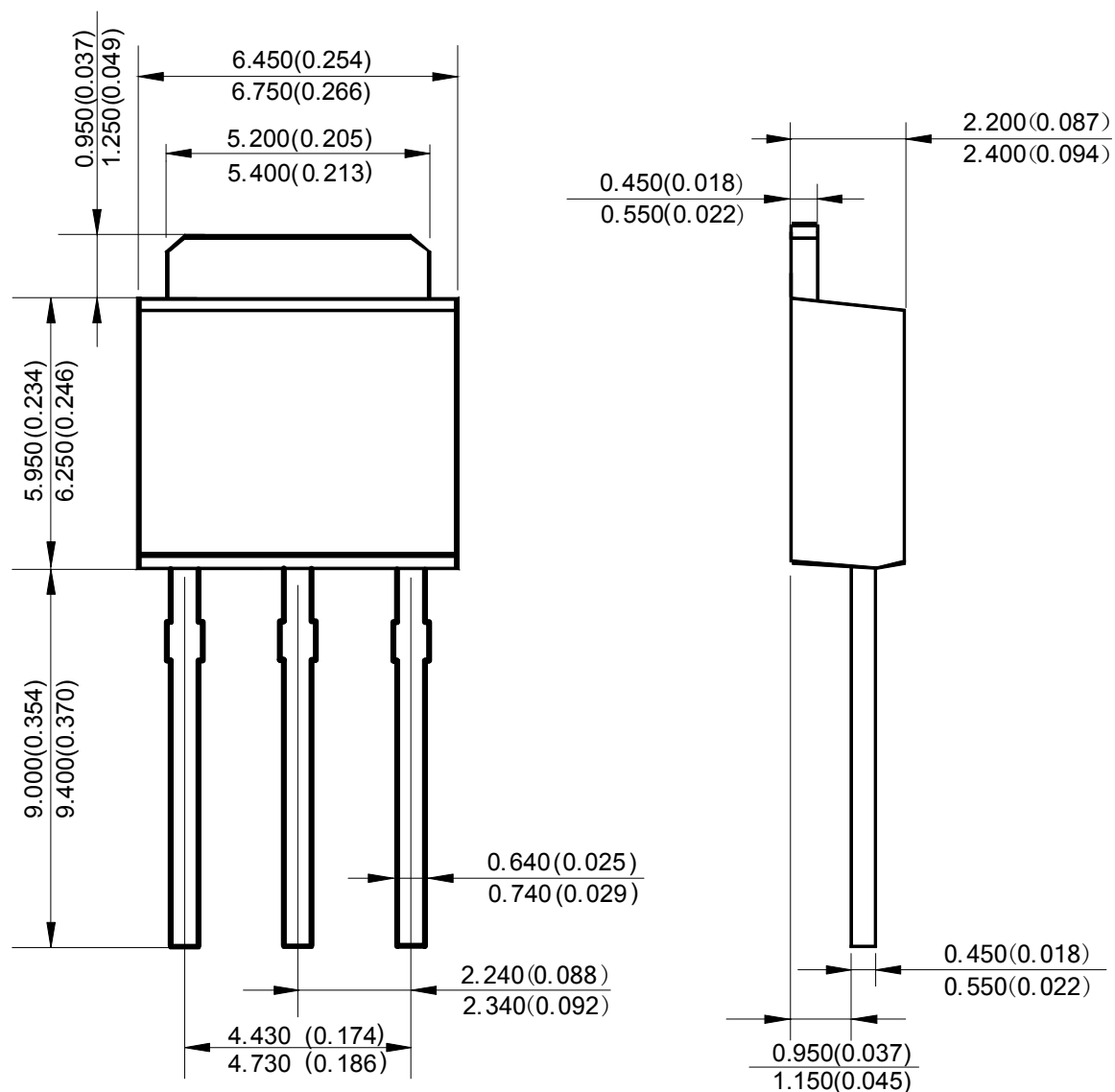


Figure 10. Base-Emitter Saturation Voltage

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005S****Mechanical Dimensions****TO-126****Unit: mm(inch)**

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005S****Mechanical Dimensions (Continued)****TO-220F-3****Unit: mm(inch)**

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005S****Mechanical Dimensions (Continued)****TO-251****Unit: mm(inch)**



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