

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005****General Description**

The APT13005 series are 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 APT13005 series is available in TO-220-3, TO-220-3(2), and TO-220F-3 packages.

Features

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

Applications

- Battery Chargers for Mobile Phone
- Power Supply for DVD/STB

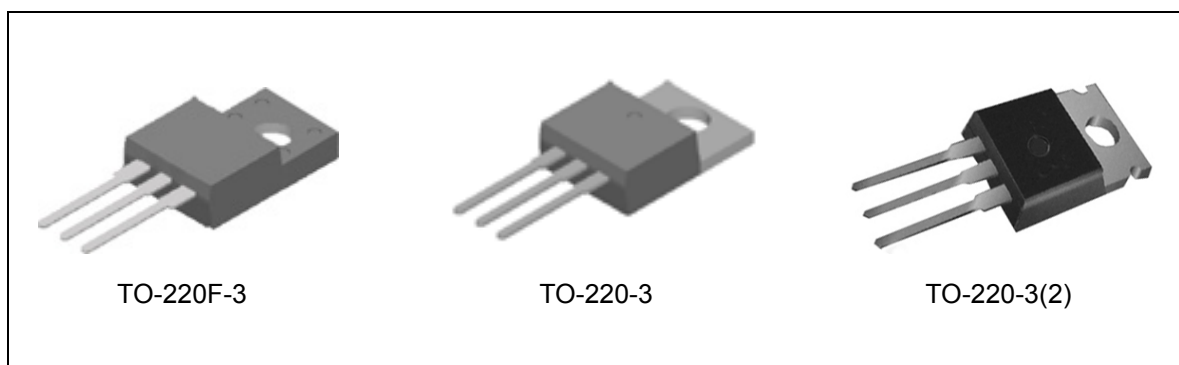


Figure 1. Package Types of APT13005

HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR

APT13005

Pin Configuration

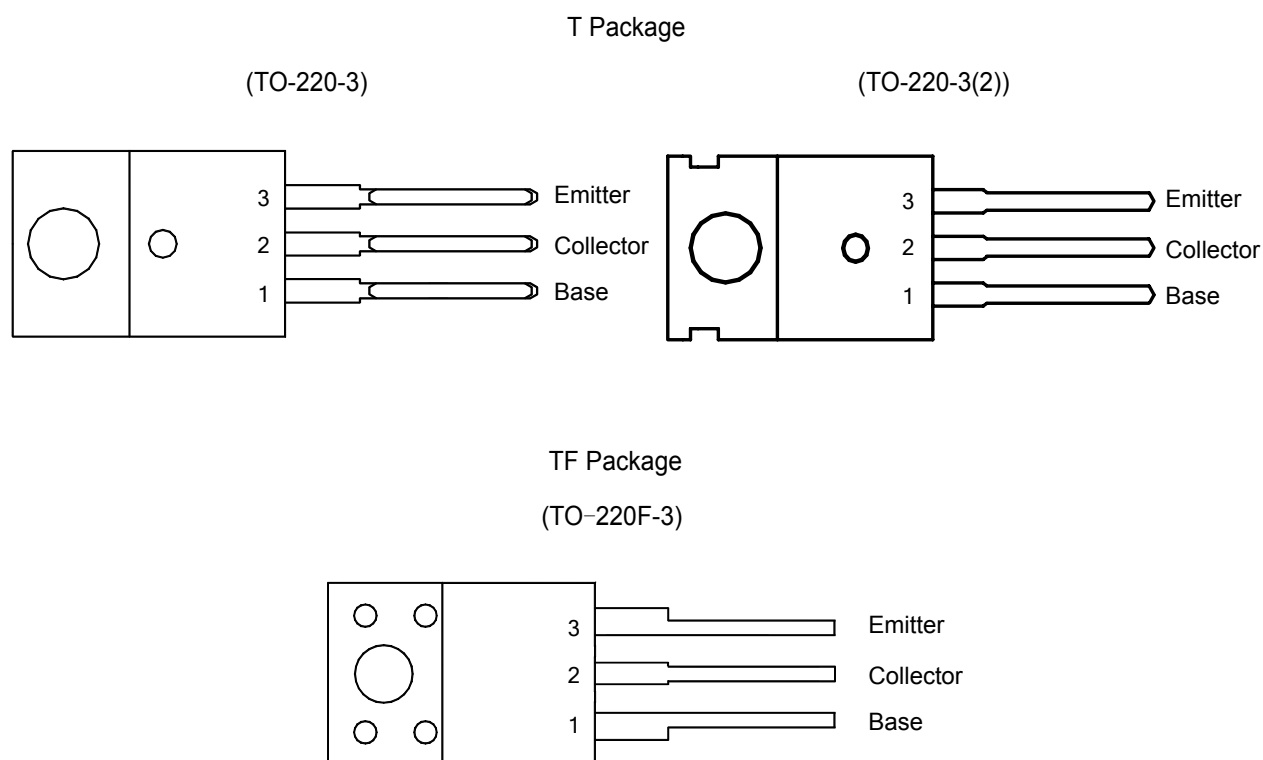


Figure 2. Pin Configuration of APT13005(front view)

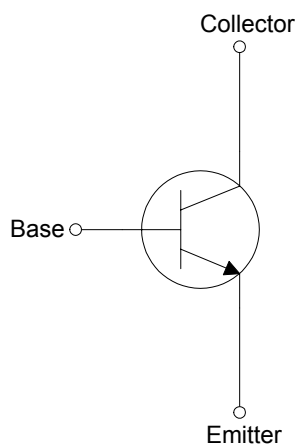
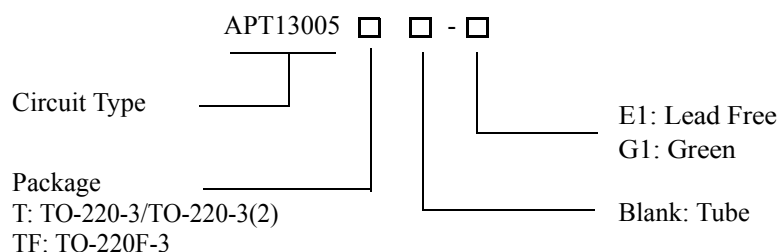


Figure 3. Internal Structure of APT13005

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005****Ordering Information**

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-220-3/ TO-220-3(2)	APT13005T-E1	APT13005T-G1	APT13005T-E1	APT13005T-G1	Tube
TO-220F-3	APT13005TF-E1	APT13005TF-G1	APT13005TF-E1	APT13005TF-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	4	A
Collector Peak Current		I_{CM}	8	A
Base Current		I_B	2	A
Base Peak Current		I_{BM}	4	A
Power Dissipation, $T_C=25^{\circ}\text{C}$	TO-220-3/ TO-220-3 (2)	P_{TOT}	75	W
	TO-220F-3		28	
Operating Junction Temperature			150	$^{\circ}\text{C}$
Storage Temperature Range			-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.

**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005****Thermal Characteristics**

Parameter	Symbol	Condition		Value	Unit
Maximum Thermal Resistance	θ_{JC}	Junction to Case	TO-220-3/ TO-220-3(2)	1.67	$^{\circ}\text{C/W}$
			TO-220F-3	4.5	

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 ($I_B=0$) (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	
		$I_C=4.0\text{A}, I_B=1.0\text{A}$			0.9	
Base-Emitter Saturation Voltage	$V_{BE}(\text{sat})$	$I_C=1.0\text{A}, I_B=0.2\text{A}$			1.1	V
		$I_C=2.0\text{A}, I_B=0.5\text{A}$			1.3	
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}	$I_C=2\text{A}, V_{CC}=125\text{V}$ $I_{B1}=0.4\text{A}, I_{B2}=-0.4\text{V}$			0.8	μs
Storage Time with Resistive Load	t_s				4.5	μs
Fall Time with Resistive Load	t_f				0.9	μs
Output Capacitance	C_{OB}	$V_{CB}=10\text{V}, f=0.1\text{MHz}$		45		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 $\leq 2\%$.



Typical Performance Characteristics

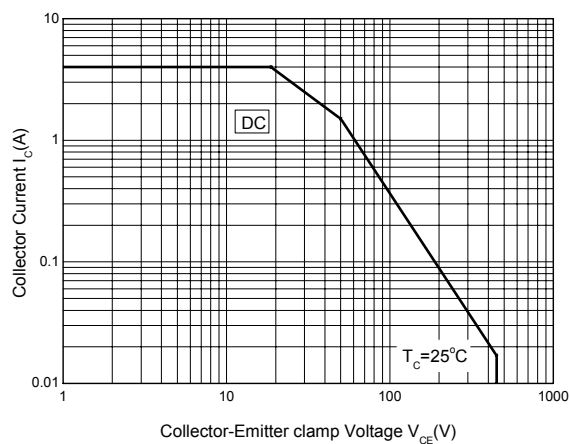
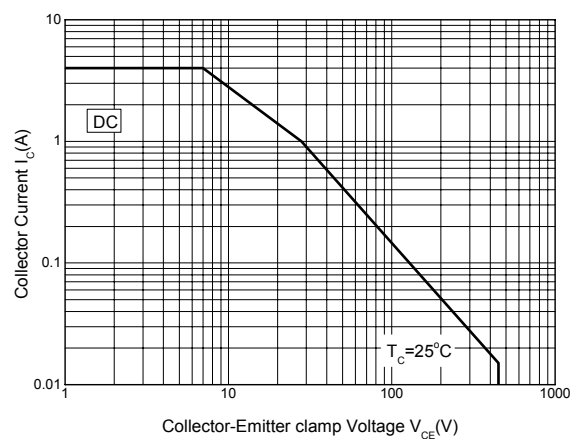
Figure 4. Safe Operating Areas
(TO-220-3/TO-220-3(2) Package)

Figure 5. Safe Operating Areas (TO-220F-3 Package)

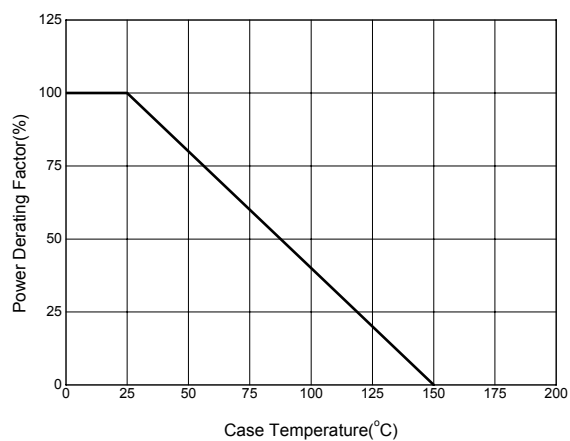


Figure 6. Power Derating Curve

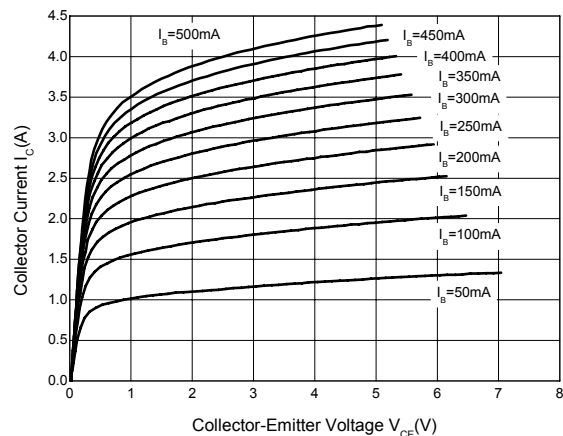


Figure 7. Static Characteristics



Typical Performance Characteristics (Continued)

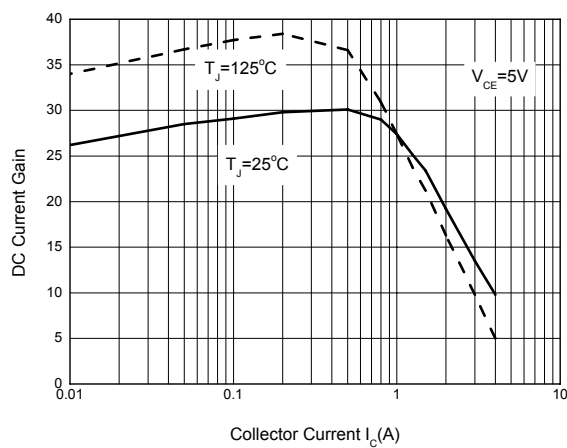


Figure 8. DC Current Gain

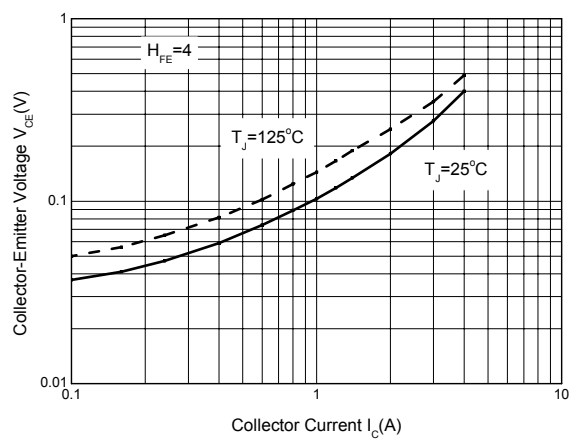


Figure 9. Collector-Emitter Saturation Region

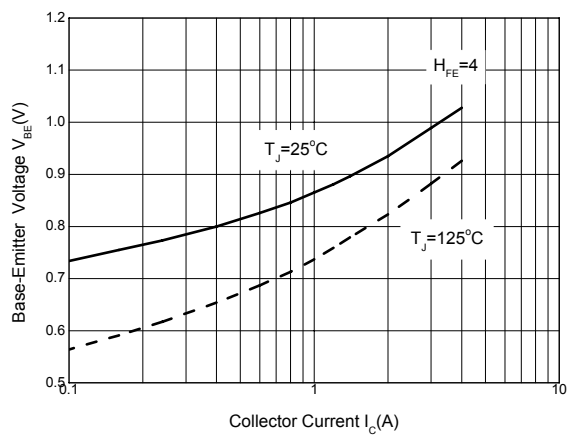
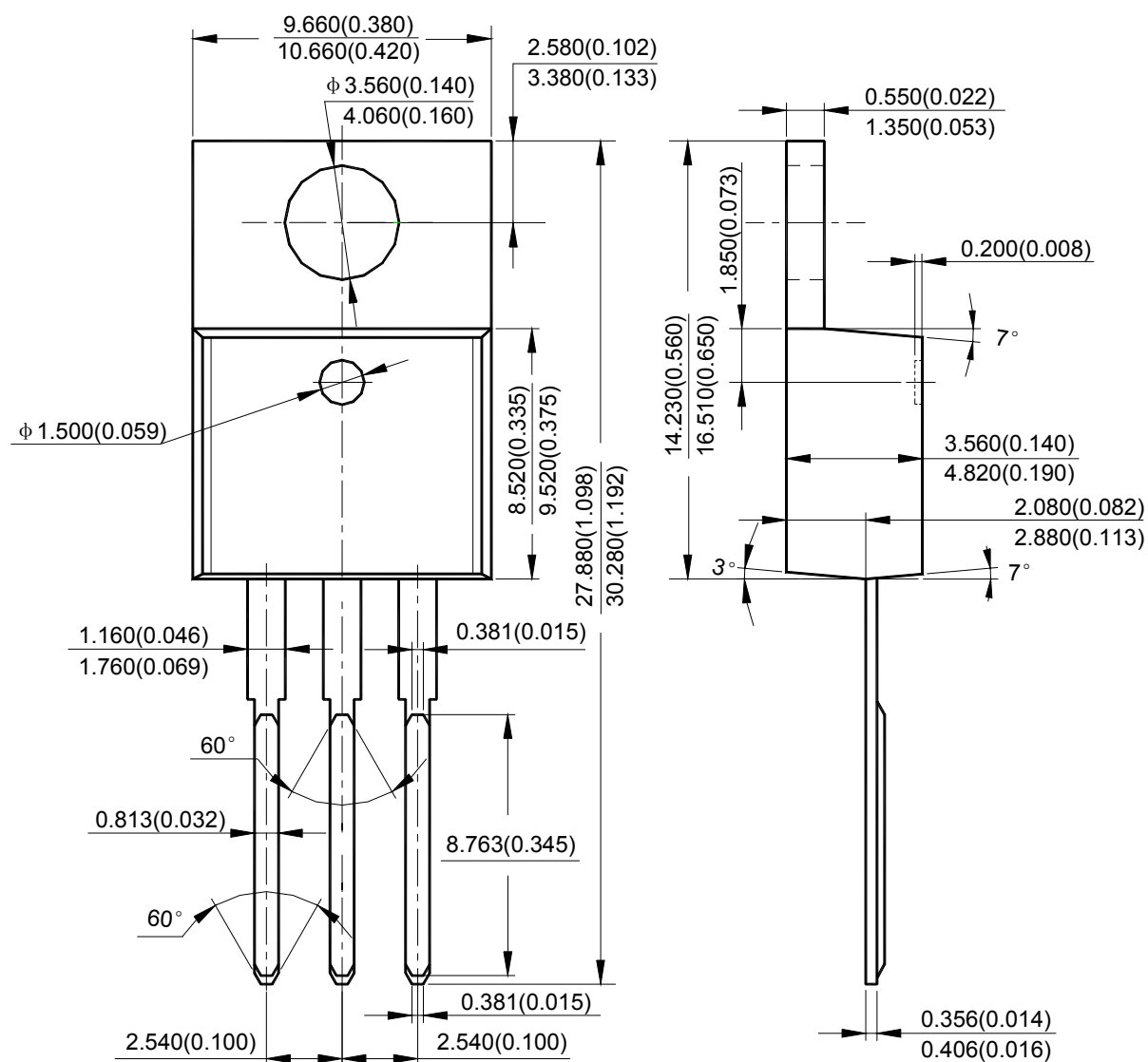


Figure 10. Base-Emitter Saturation Voltage



APT13005

Unit: mm(inch)

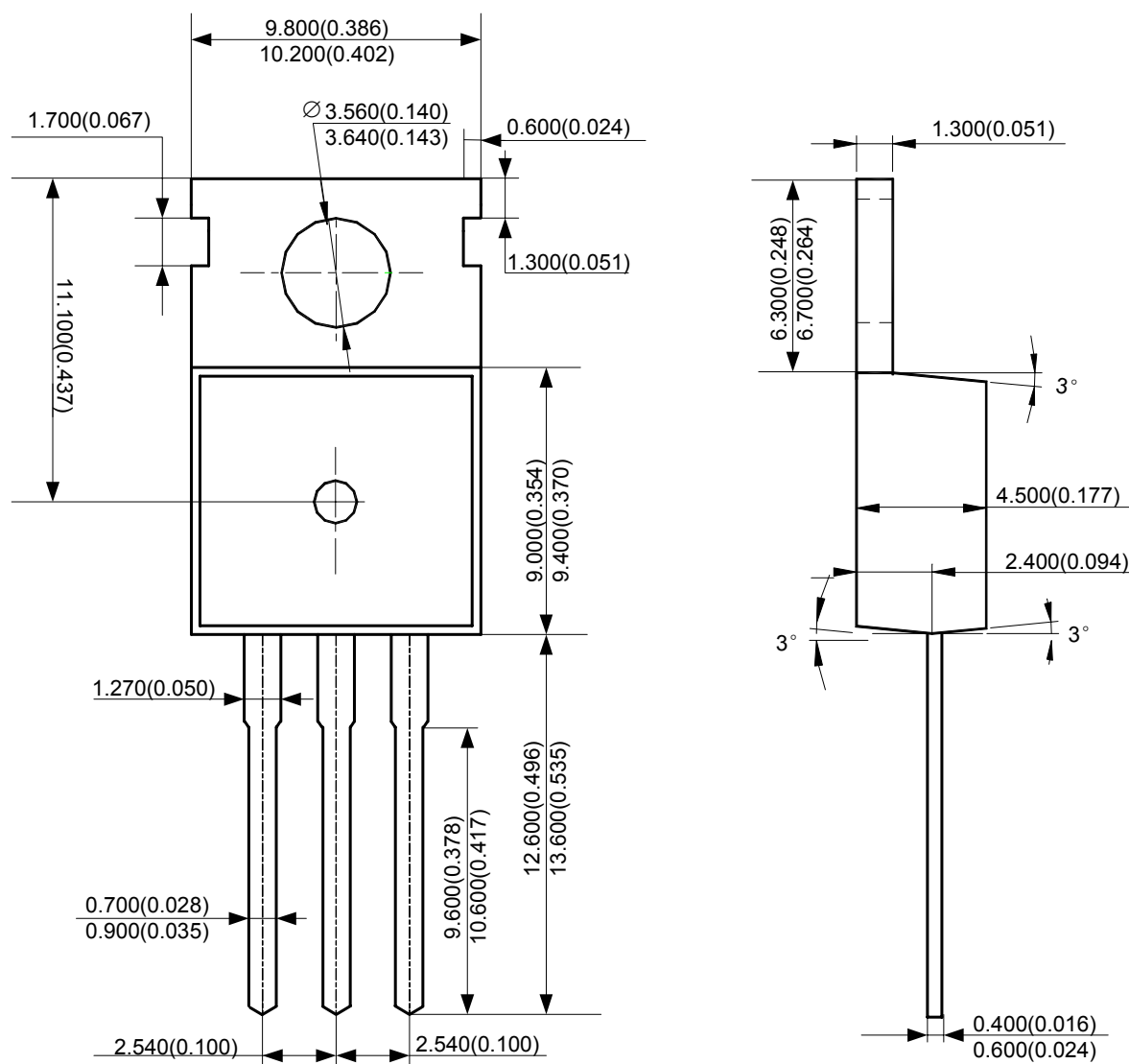


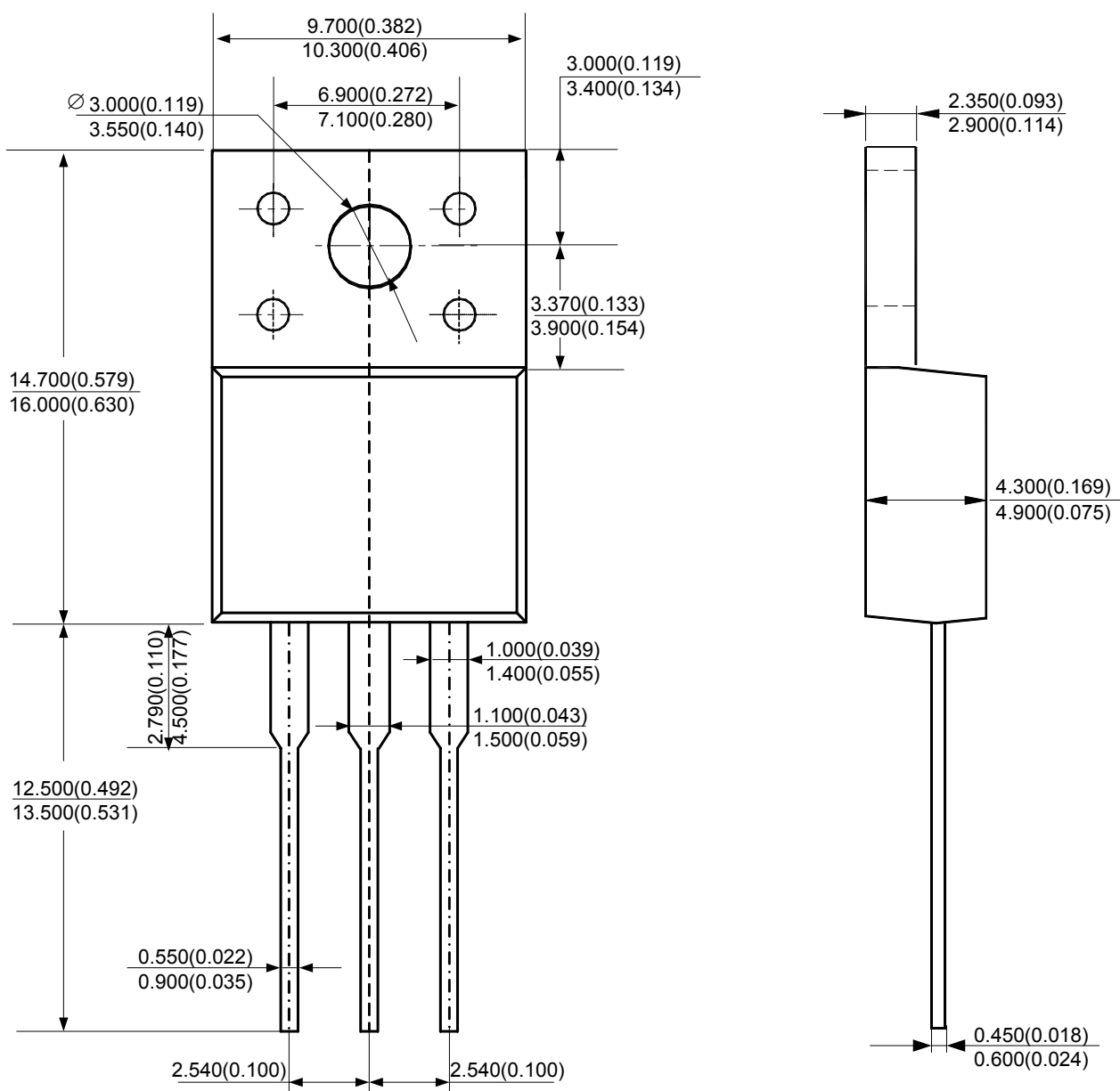


Mechanical Dimensions (Continued)

TO-220-3 (2)

Unit: mm(inch)



**HIGH VOLTAGE FAST SWITCHING NPN POWER TRANSISTOR****APT13005****Mechanical Dimensions (Continued)****TO-220F-3****Unit: mm(inch)**



BCD Semiconductor Manufacturing Limited

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