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September 2014

# FJP13009

## High-Voltage Fast-Switching NPN Power Transistor

### Features

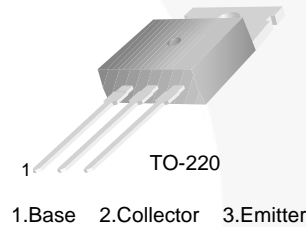
- High-Voltage Capability
- High Switching Speed

### Applications

- Electronic Ballast
- Switching Regulator
- Motor Control
- Switched Mode Power Supply

### Description

The FJP13009 is a 700 V, 12 A NPN silicon epitaxial planar transistor. The FJP13009 is available with multiple  $h_{FE}$  bin classes for ease of design use. The FJP13009 is designed for high speed switching applications which utilizes the industry standard TO-220 package offering flexibility in design and excellent power dissipation.



### Ordering Information

Part Number <sup>(1)</sup>	Top Mark	Package	Packing Method
FJP13009TU	J13009	TO-220 3L	Rail
FJP13009H2TU	J13009-2	TO-220 3L	Rail

#### Notes:

1. The affix "-H2" means the  $h_{FE}$  classification. The suffix "-TU" means the tube packing method.

FJP13009 — High-Voltage Fast-Switching NPN Power Transistor

## Absolute Maximum Ratings<sup>(2)</sup>

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage	700	V
$V_{CEO}$	Collector-Emitter Voltage	400	V
$V_{EBO}$	Emitter-Base Voltage	9	V
$I_C$	Collector Current (DC)	12	A
$I_{CP}$	Collector Current (Pulse)	24	A
$I_B$	Base Current	6	A
$P_D$	Total Device Dissipation ( $T_C = 25^\circ\text{C}$ )	100	W
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-65 to +150	$^\circ\text{C}$

### Note:

2. These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ . These are steady-state limits. Fairchild Semiconductor should be consulted on application involving pulsed or low-duty-cycle operations.

## Electrical Characteristics

Values are at  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage	$I_C = 10\text{ mA}, I_B = 0$	400			V
$I_{EBO}$	Emitter Cut-Off Current	$V_{EB} = 9\text{ V}, I_C = 0$			1	mA
$h_{FE1}$	DC Current Gain <sup>(3)</sup>	$V_{CE} = 5\text{ V}, I_C = 5\text{ A}$	8		40	
$h_{FE2}$		$V_{CE} = 5\text{ V}, I_C = 8\text{ A}$	6		30	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage <sup>(3)</sup>	$I_C = 5\text{ A}, I_B = 1\text{ A}$			1.0	V
		$I_C = 8\text{ A}, I_B = 1.6\text{ A}$			1.5	
		$I_C = 12\text{ A}, I_B = 3\text{ A}$			3.0	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage <sup>(3)</sup>	$I_C = 5\text{ A}, I_B = 1\text{ A}$			1.2	V
		$I_C = 8\text{ A}, I_B = 1.6\text{ A}$			1.6	
$C_{ob}$	Output Capacitance	$V_{CB} = 10\text{ V}, f = 0.1\text{ MHz}$		180		pF
$f_T$	Current Gain Bandwidth Product	$V_{CE} = 10\text{ V}, I_C = 0.5\text{ A}$	4			MHz
$t_{ON}$	Turn-On Time	$V_{CC} = 125\text{ V}, I_C = 8\text{ A},$ $I_{B1} = -I_{B2} = 1.6\text{ A},$ $R_L = 15.6\ \Omega$			1.1	$\mu\text{s}$
$t_{STG}$	Storage Time				3.0	
$t_F$	Fall Time				0.7	

### Note:

3. Pulse test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$

## $h_{FE}$ Classification

Classification	H1	H2
$h_{FE1}$	8 ~ 17	15 ~ 28

## Typical Performance Characteristics

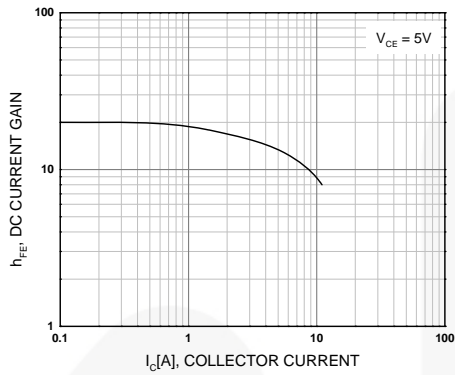


Figure 1. DC Current Gain

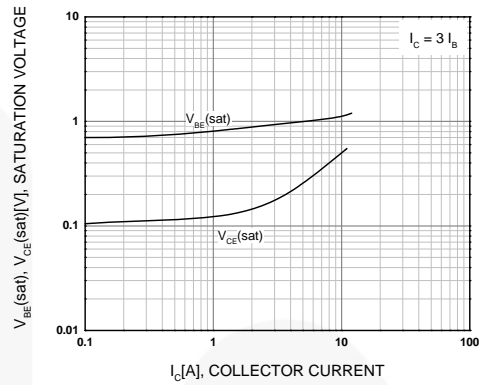


Figure 2. Base-Emitter Saturation Voltage and Collector-Emitter Saturation Voltage

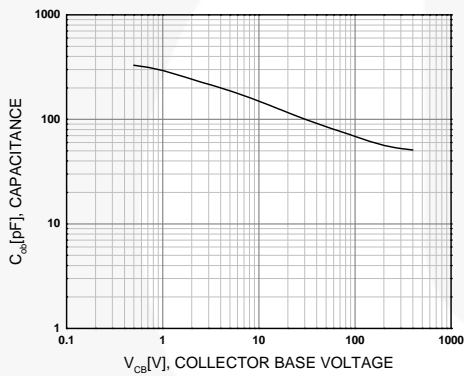


Figure 3. Collector Output Capacitance

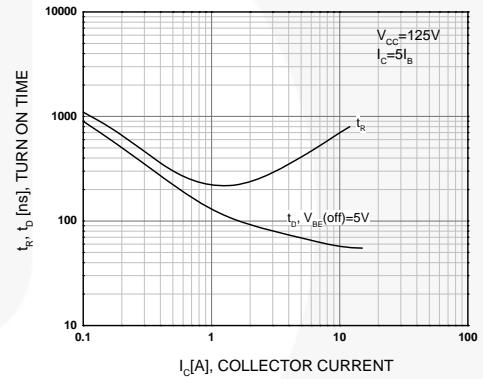


Figure 4. Turn-On Time

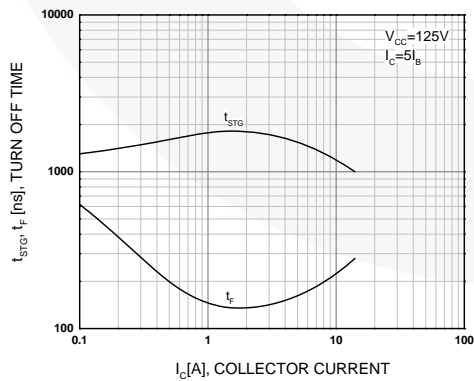


Figure 5. Turn-Off Time

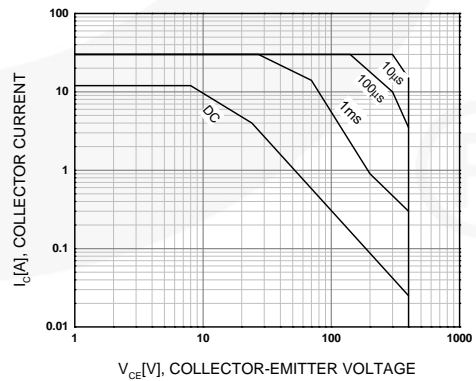
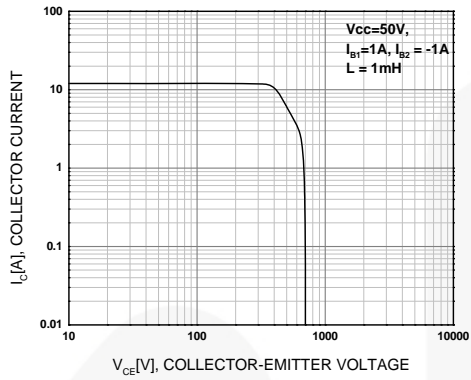
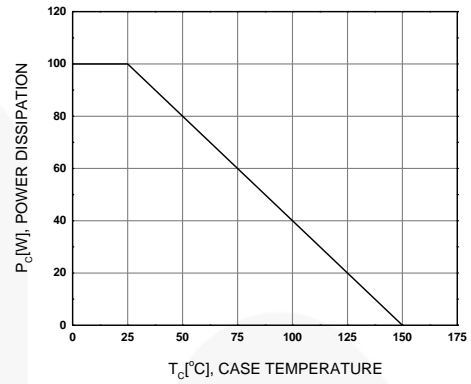


Figure 6. Forward Bias Safe Operating Area

**Typical Performance Characteristics** (Continued)



**Figure 7. Reverse Bias Safe Operating Area**



**Figure 8. Power Derating**





- NOTES:
- A) REFERENCE JEDEC, TO-220, VARIATION AB
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [ ].
  - D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
  - E) DOES NOT COMPLY JEDEC STANDARD VALUE.
  - F) "A1" DIMENSIONS AS BELOW:  
 SINGLE GAUGE = 0.51 - 0.61  
 DUAL GAUGE = 1.10 - 1.45
  - G) DRAWING FILE NAME: TO220B03REV9
  - H) PRESENCE IS SUPPLIER DEPENDENT
  - I) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.



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