



September 2014

FJP13009

High-Voltage Fast-Switching NPN Power Transistor

Features

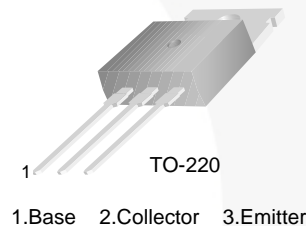
- High-Voltage Capability
- High Switching Speed

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 ⁽¹⁾	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⁽²⁾

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°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 ⁽³⁾	$V_{CE} = 5\text{ V}, I_C = 5\text{ A}$	8		40	
h_{FE2}		$V_{CE} = 5\text{ V}, I_C = 8\text{ A}$	6		30	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ⁽³⁾	$I_C = 5\text{ A}, I_B = 1\text{ A}$			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 ⁽³⁾	$I_C = 5\text{ A}, I_B = 1\text{ A}$			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	μs
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

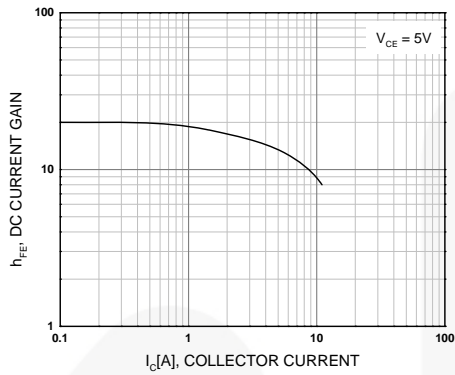


Figure 1. DC Current Gain

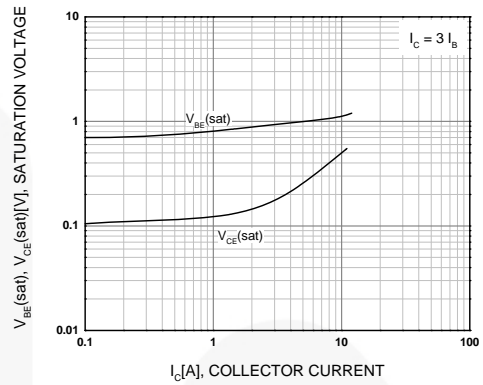


Figure 2. Base-Emitter Saturation Voltage and Collector-Emitter Saturation Voltage

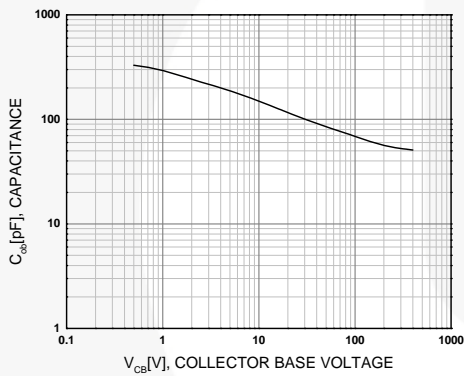


Figure 3. Collector Output Capacitance

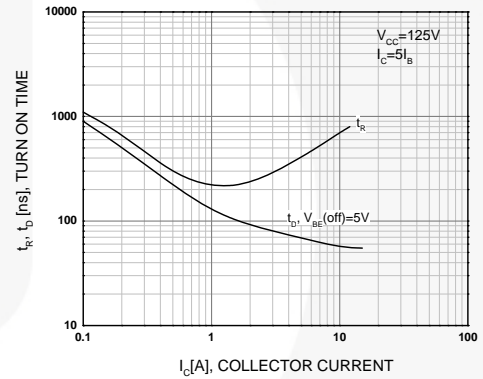


Figure 4. Turn-On Time

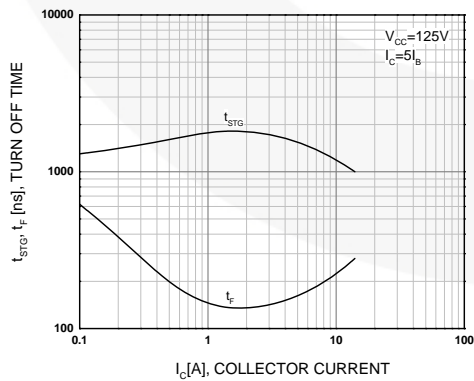


Figure 5. Turn-Off Time

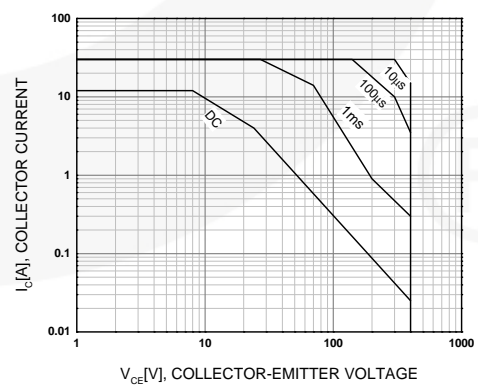


Figure 6. Forward Bias Safe Operating Area

Typical Performance Characteristics (Continued)

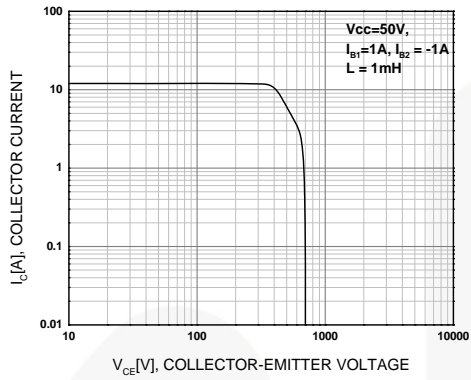


Figure 7. Reverse Bias Safe Operating Area

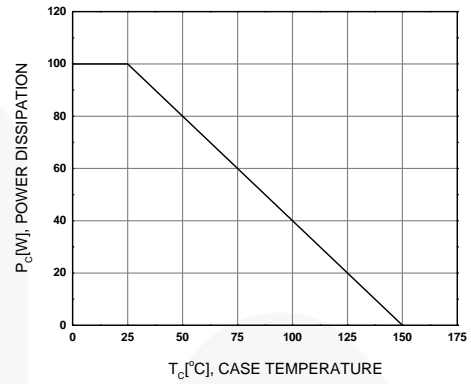


Figure 8. Power Derating



Physical Dimensions

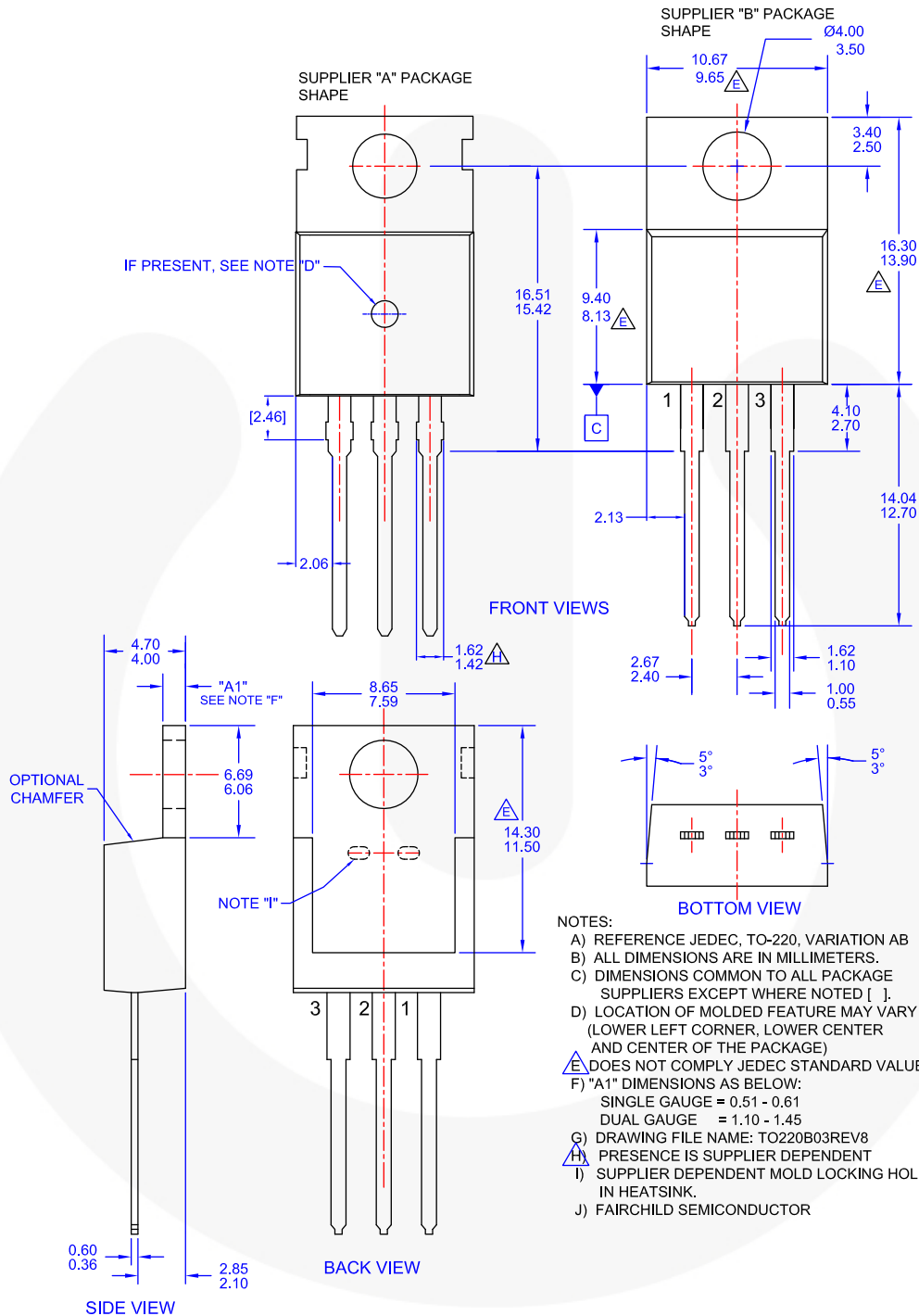


Figure 9. TO220, MOLDED, 3-LEAD, JEDEC VARIATION AB





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
 Awinda®
 AX-CAP®
 BitSiC™
 Build it Now™
 CorePLUS™
 CorePOWER™
 CROSSVOLT™
 CTL™
 Current Transfer Logic™
 DEUXPEED®
 Dual Cool™
 EcoSPARK®
 EfficientMax™
 ESBC™

 Fairchild®
 Fairchild Semiconductor®
 FACT Quiet Series™
 FACT®
 FAST®
 FastvCore™
 FETBench™
 FPS™

F-PFS™
 FRFET®
 Global Power ResourceSM
 GreenBridge™
 Green FPS™
 Green FPS™ e-Series™
 Gmax™
 GTO™
 IntelliMAX™
 ISOPLANAR™
 Making Small Speakers Sound Louder and Better™
 MegaBuck™
 MICROCOPPLER™
 MicroFET™
 MicroPak™
 MicroPak2™
 MillerDrive™
 MotionMax™
 MotionGrid®
 MTi®
 MTx®
 MVN®
 mWSaver®
 OptoHiT™


 PowerTrench®
 PowerXS™
 Programmable Active Droop™
 QFET®
 QS™
 Quiet Series™
 RapidConfigure™

 Saving our world, 1mW/W/kW at a time™
 SignalWise™
 SmartMax™
 SMART START™
 Solutions for Your Success™
 SPM®
 STEALTH™
 SuperFET®
 SuperSOT™-3
 SuperSOT™-6
 SuperSOT™-8
 SupreMOS®
 SyncFET™
 Sync-Lock™

 SYSTEM GENERAL®
 TinyBoost®
 TinyBuck®
 TinyCalc™
 TinyLogic®
 TINYOPTO™
 TinyPower™
 TinyPWM™
 TinyWire™
 TranSiC™
 TriFault Detect™
 TRUECURRENT®*
 μSerDes™

 UHC®
 Ultra FRFET™
 UniFET™
 VCX™
 VisualMax™
 VoltagePlus™
 XS™
 Xsens™
 仙童™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. 171