

# FJI5603D

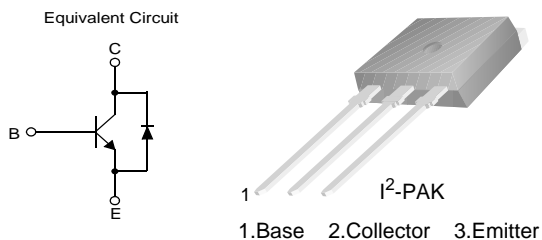
## NPN Silicon Transistor

### Applications

- High Voltage and High Speed Power Switch Application
- Electronic Ballast Application

### Features

- Wide Safe Operating Area
- Small Variance in Storage Time
- Built-in Free Wheeling Diode



### Absolute Maximum Ratings\* $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$BV_{CBO}$	Collector-Base Voltage	1600	V
$BV_{CEO}$	Collector-Emitter Voltage	800	V
$BV_{EBO}$	Emitter-Base Voltage	12	V
$I_C$	Collector Current(DC)	3	A
$I_{CP}$	Collector Current(Pulse)**	6	A
$I_B$	Base Current	2	A
$I_{BP}$	Base Current(Pulse)**	4	A
$P_D$	Power Dissipation( $T_C=25^\circ\text{C}$ )	100	W
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Junction Temperature Range	- 65 ~ +150	$^\circ\text{C}$
EAS	Avalanche Energy( $T_J=25^\circ\text{C}$ , 8mH)	3.5	mJ

\* These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

\*\* Pulse Test : Pulse Width = 5ms, Duty Cycle  $\leq$  10%

### Thermal Characteristics\* $T_a=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$R_{\theta jc}$	Thermal Resistance, Junction to Case	1.25	$^\circ\text{C/W}$
$R_{\theta ja}$	Thermal Resistance, Junction to Ambient	80	$^\circ\text{C/W}$

\* Device mounted on minimum pad size

### Ordering Information

Part Number	Marking	Package	Packing Method	Remarks
FJI5603DTU	J5603D	I2PAK	TUBE	

**Electrical Characteristics\***  $T_a=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units	
$BV_{CBO}$	Collector-Base Breakdown Voltage	$I_C=0.5\text{mA}, I_E=0$	1600	1689		V	
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C=5\text{mA}, I_B=0$	800	870		V	
$BV_{EBO}$	Emitter-Base Breakdown Voltage	$I_E=0.5\text{mA}, I_C=0$	12	14.8		V	
$I_{CES}$	Collector Cut-off Current	$V_{CES}=1600\text{V}, I_E=0$	$T_C=25^\circ\text{C}$	0.01	100	$\mu\text{A}$	
			$T_C=125^\circ\text{C}$		1000		
$I_{CEO}$	Collector Cut-off Current	$V_{CE}=800\text{V}, V_{BE}=0$	$T_C=25^\circ\text{C}$	0.01	100	$\mu\text{A}$	
			$T_C=125^\circ\text{C}$		1000		
$I_{EBO}$	Emitter Cut-off Current	$V_{EB}=12\text{V}, I_C=0$		0.05	500	$\mu\text{A}$	
$h_{FE}$	DC Current Gain	$V_{CE}=3\text{V}, I_C=0.4\text{A}$	$T_C=25^\circ\text{C}$	20	29	35	
			$T_C=125^\circ\text{C}$	6	15		
		$V_{CE}=10\text{V}, I_C=5\text{mA}$	$T_C=25^\circ\text{C}$	20	43		
			$T_C=125^\circ\text{C}$	20	46		
$V_{CE}(\text{sat})$	Collector-Emitter Saturation Voltage	$I_C=250\text{mA}, I_B=25\text{mA}$	$T_C=25^\circ\text{C}$	0.5	1.25	V	
		$I_C=500\text{mA}, I_B=50\text{mA}$	$T_C=25^\circ\text{C}$	1.5	2.5	V	
		$I_C=1\text{A}, I_B=0.2\text{A}$	$T_C=25^\circ\text{C}$	1.2	2.5	V	
$V_{BE}(\text{sat})$	Base-Emitter Saturation Voltage	$I_C=500\text{mA}, I_B=50\text{mA}$	$T_C=25^\circ\text{C}$	0.74	1.2	V	
			$T_C=125^\circ\text{C}$	0.61	1.1		
		$I_C=2\text{A}, I_B=0.4\text{A}$	$T_C=25^\circ\text{C}$	0.85	1.2	V	
			$T_C=125^\circ\text{C}$	0.74	1.1		
$C_{ib}$	Input Capacitance	$V_{EB}=10\text{V}, I_C=0, f=1\text{MHz}$		745	1000	pF	
$C_{ob}$	Output Capacitance	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$		56	500	pF	
$f_T$	Current Gain Bandwidth Product	$I_C=0.1\text{A}, V_{CE}=10\text{V}$		5		MHz	
$V_F$	Diode Forward Voltage	$I_F=0.4\text{A}$		0.76	1.2	V	
		$I_F=1\text{A}$		0.83	1.5	V	

\* Pulse Test: Pulse Width=20 $\mu\text{s}$ , Duty Cycle $\leq$ 10%

**Electrical Characteristics**  $T_C=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Condition	Min	Typ.	Max.	Units
RESISTIVE LOAD SWITCHING (D.C $\leq$ 10%, Pulse Width=20 $\mu$ s)						
$t_{ON}$	Turn On Time	$I_C=0.3\text{A}$ , $I_{B1}=50\text{mA}$ , $I_{B2}=150\text{mA}$ $V_{CC}=125\text{V}$ $R_L = 416\Omega$		400	600	ns
$t_{STG}$	Storage Time		1.9	2.1	2.3	$\mu$ s
$t_F$	Fall Time			310	1000	ns
$t_{ON}$	Turn On Time	$I_C=0.5\text{A}$ , $I_{B1}=50\text{mA}$ , $I_{B2}=250\text{mA}$ $V_{CC}=125\text{V}$ , $R_L = 250\Omega$		600	1100	ns
$t_{STG}$	Storage Time			1.3	1.5	$\mu$ s
$t_F$	Fall Time			180	350	ns
INDUCTIVE LOAD SWITCHING ( $V_{CC}=15\text{V}$ )						
$t_{STG}$	Storage Time	$I_C=0.3\text{A}$ , $I_{B1}=50\text{mA}$ , $I_{B2}=150\text{mA}$ , $V_Z=300\text{V}$ , $L_C=200\text{H}$	0.8	-	1.2	$\mu$ s
$t_F$	Fall Time			170	250	ns
$t_C$	Cross-over Time			180	250	ns
$t_{STG}$	Storage Time	$I_C=0.5\text{A}$ , $I_{B1}=50\text{mA}$ , $I_{B2}=250\text{mA}$ , $V_Z=300\text{V}$ , $L_C=200\text{H}$	0.8	-	1.2	$\mu$ s
$t_F$	Fall Time			140	175	ns
$t_C$	Cross-over Time			170	200	ns

# Typical Characteristics

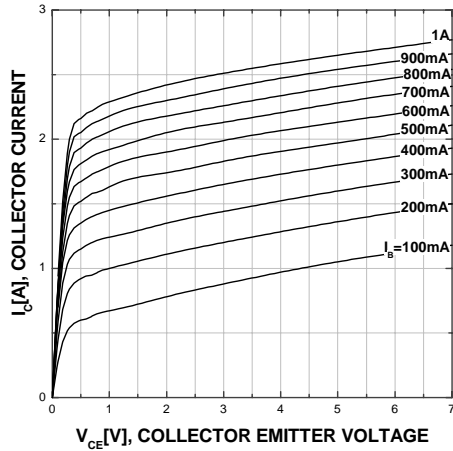


Figure 1. Static Characteristic

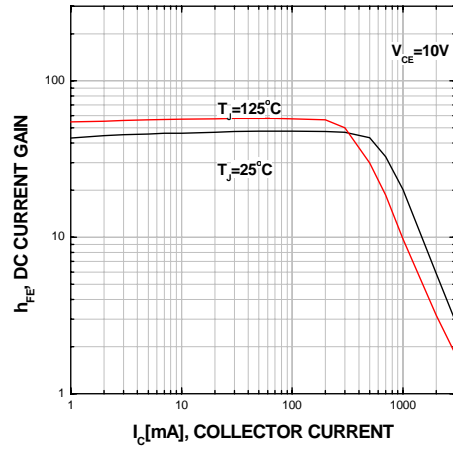


Figure 2. DC current Gain

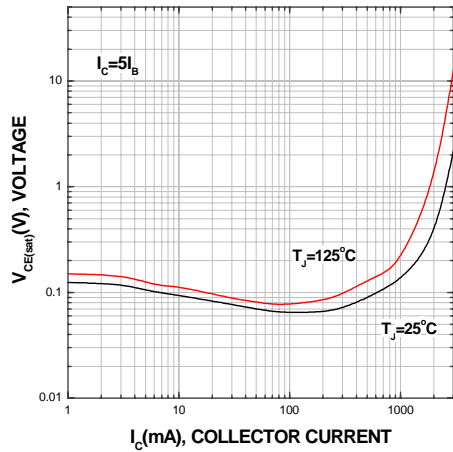


Figure 3. Collector-Emitter Saturation Voltage

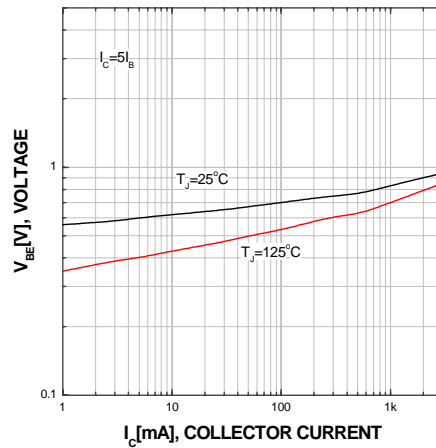


Figure 4. Base-Emitter Saturation Voltage

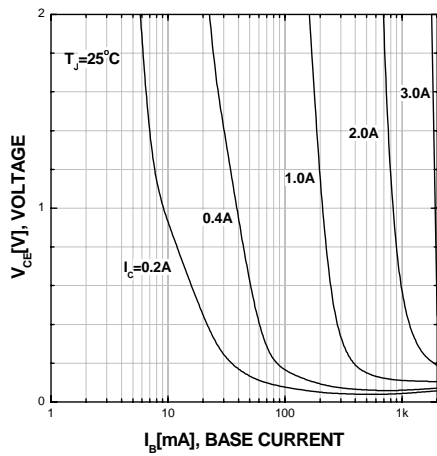


Figure 5. Typical Collector Saturation Voltage

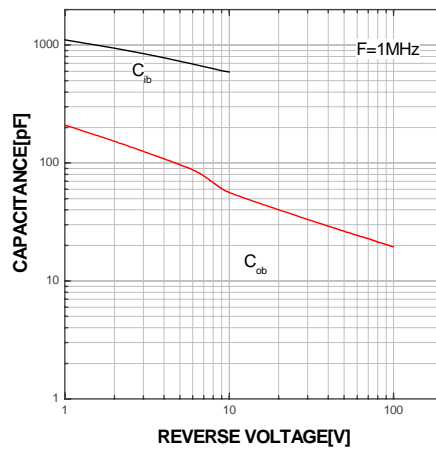


Figure 6. Capacitance

## Typical Characteristics (Continued)

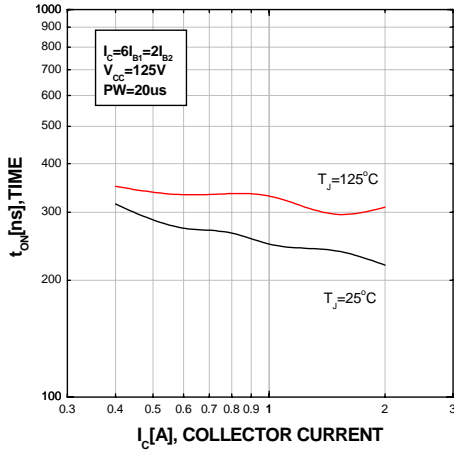


Figure 7. Resistive Switching Time,  $t_{on}$

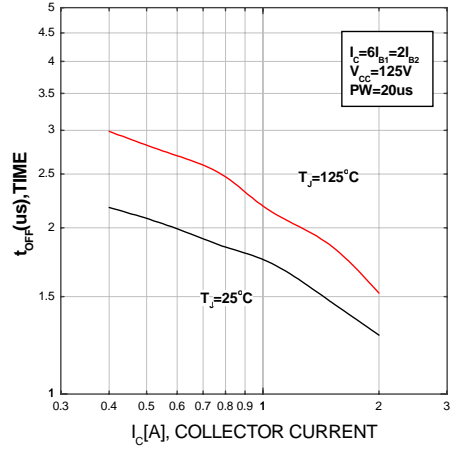


Figure 8. Resistive Switching Time,  $t_{off}$

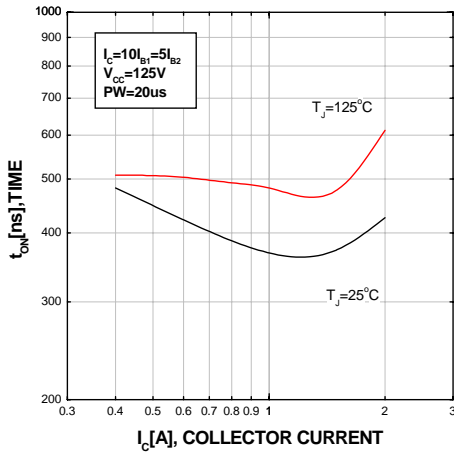


Figure 9. Resistive Switching Time,  $t_{on}$

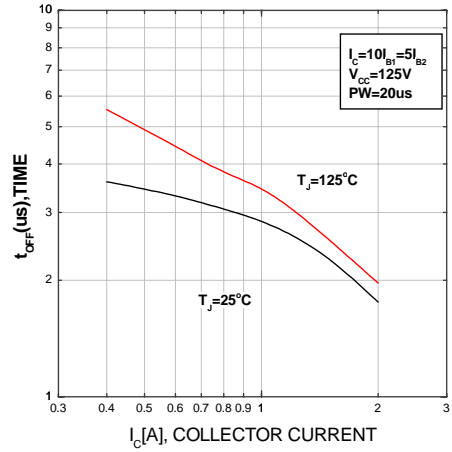


Figure 10. Resistive Switching Time,  $t_{off}$

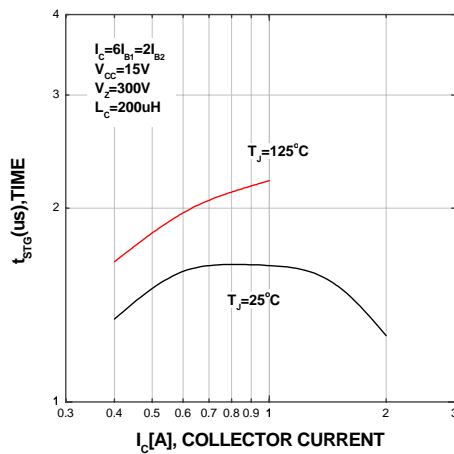


Figure 11. Inductive Switching Time,  $t_{STG}$

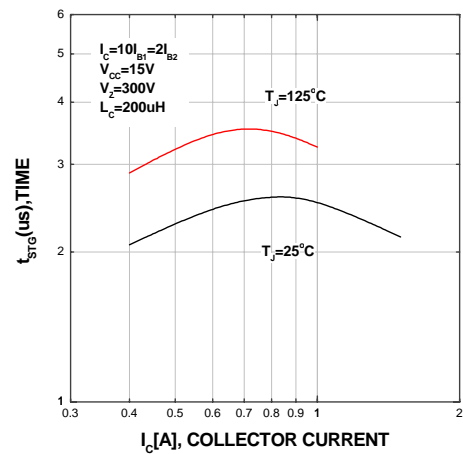


Figure 12. Inductive Switching Time,  $t_{STG}$

## Typical Characteristics (Continued)

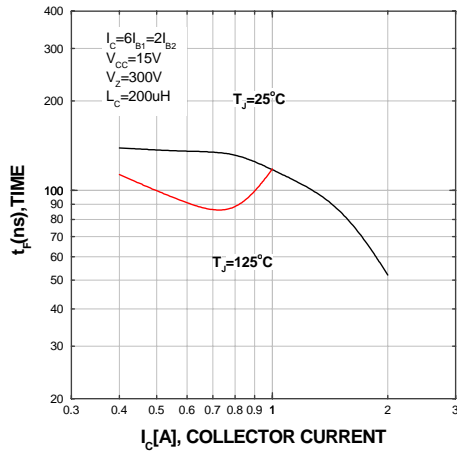


Figure 13. Inductive Switching Time,  $t_f$

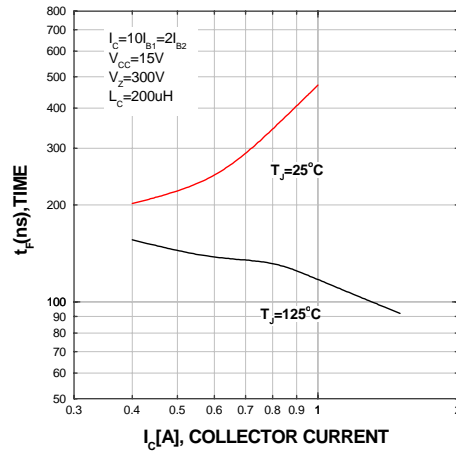


Figure 14. Inductive Switching Time,  $t_f$

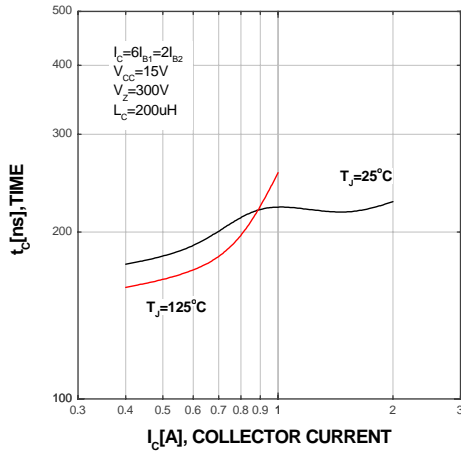


Figure 15. Inductive Switching Time,  $t_c$

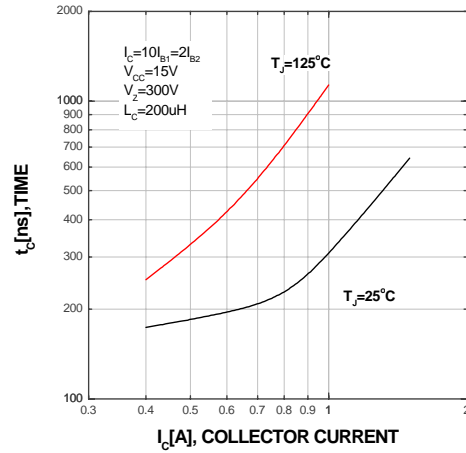


Figure 16. Inductive Switching Time,  $t_c$

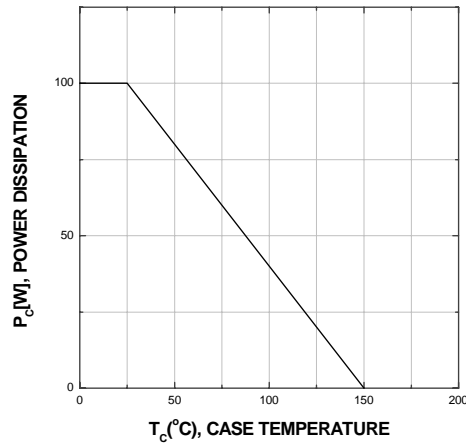


Figure 17. Power Derating



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