BUF410A

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

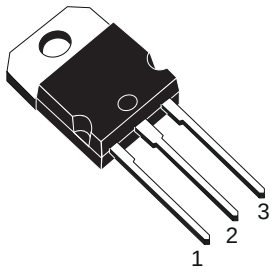
- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS

APPLICATIONS:
- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

DESCRIPTION

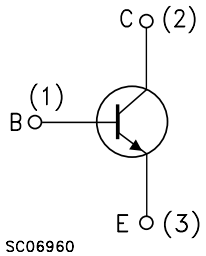
The BUF410A is manufactured using High Voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capacity. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

The BUF series is designed for use in high-frequency power supplies and motor control applications.



TO-218

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage (V_{BE} = -1.5 V)	1000	V
V_{CEO}	Collector-Emitter Voltage (I_B = 0)	450	V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	7	V
I_C	Collector Current	15	A
I_{CM}	Collector Peak Current (t_p < 5 ms)	30	A
I_B	Base Current	3	A
I_{BM}	Base Peak Current (t_p < 5 ms)	4.5	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	W
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max Operation Junction Temperature	150	°C

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-Case	Max	1	$^oC/W$

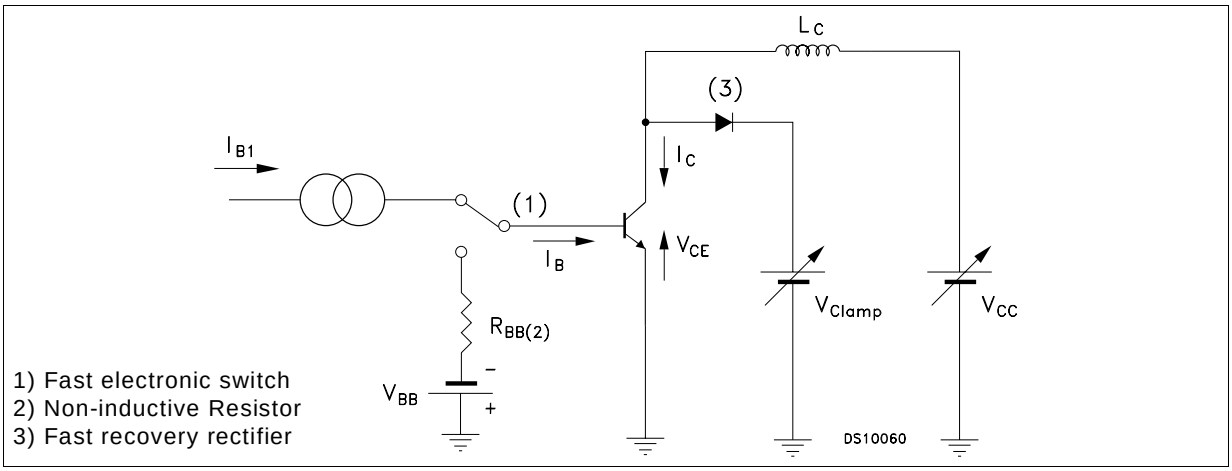
ELECTRICAL CHARACTERISTICS (T_{case} = 25 ^oC unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER}	Collector Cut-off Current (R_{BE} = 10 Ω)	V_{CE} = 1000 V V_{CE} = 1000 V T_C = 100 ^oC			0.2 1	mA mA
I_{CEV}	Collector Cut-off Current (V_{BE} = -1.5 V)	V_{CE} = 1000 V V_{CE} = 1000 V T_C =100 ^oC			0.2 1	mA mA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	V_{EB} = 5 V			1	mA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage (I_B = 0)	I_C = 200 mA L = 25 mH	450			V
V_{EBO}	Emitter Base Voltage (I_C = 0)	I_E = 50 mA	7			V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 5 A I_B = 0.5 A I_C = 5 A I_B = 0.5 A T_C =100^oC I_C =10 A I_B = 2 A I_C =10 A I_B = 2 A T_C =100^oC		0.8 0.5 	 2.8 2	V V V V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 5 A I_B = 0.5 A I_C = 5 A I_B = 0.5 A T_C =100^oC I_C =10 A I_B = 2 A I_C =10 A I_B = 2 A T_C =100^oC		0.9 1.1 	 1.5 1.5	V V V V
di_c/dt	Rate of rise on-state Collector Current	V_{CC} = 300 V R_C = 0 t_p= 3 µs I_{B1} = 0.75 A T_C =25^oC I_{B1} = 0.75 A T_C =100^oC I_{B1} = 3 A T_C =100^oC	 45 100	 60 	 	 A/µs A/µs A/µs
V_{CE}(3µs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 60 Ω I_{B1} = 0.75 A T_C =25^oC I_{B1} = 0.75 A T_C =100^oC		 2.1 	 8	 V V
V_{CE}(5µs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 60 Ω I_{B1} = 0.75 A T_C =25^oC I_{B1} = 0.75 A T_C =100^oC		 1.1 	 4	 V V
 t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	I_C = 5 A V_{CC} = 50 V V_{BB} = - 5 V R_{BB} = 1.2 Ω V_{clamp} = 400 V I_{B1} = 0.5 A L = 0.5 mH		 0.8 0.05 0.08	 	 µs µs µs
 t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	I_C = 5 A V_{CC} = 50 V V_{BB} = - 5 V R_{BB} = 1.2 Ω V_{clamp} = 400 V I_{B1} = 0.5 A L = 0.5 mH T_C =100^oC		 	 1.8 0.1 0.18	 µs µs µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_C = 5 A V_{CC} = 50 V V_{BB} = - 5 V R_{BB} = 1.2 Ω I_{B1} = 0.5 A L = 0.5 mH T_C = 125^oC	500			V
 t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	I_C = 5 A V_{CC} = 50 V V_{BB} = 0 R_{BB} = 0.3 Ω V_{clamp} = 400 V I_{B1} = 0.5 A L = 0.5 mH		 1.5 0.04 0.07	 	 µs µs µs

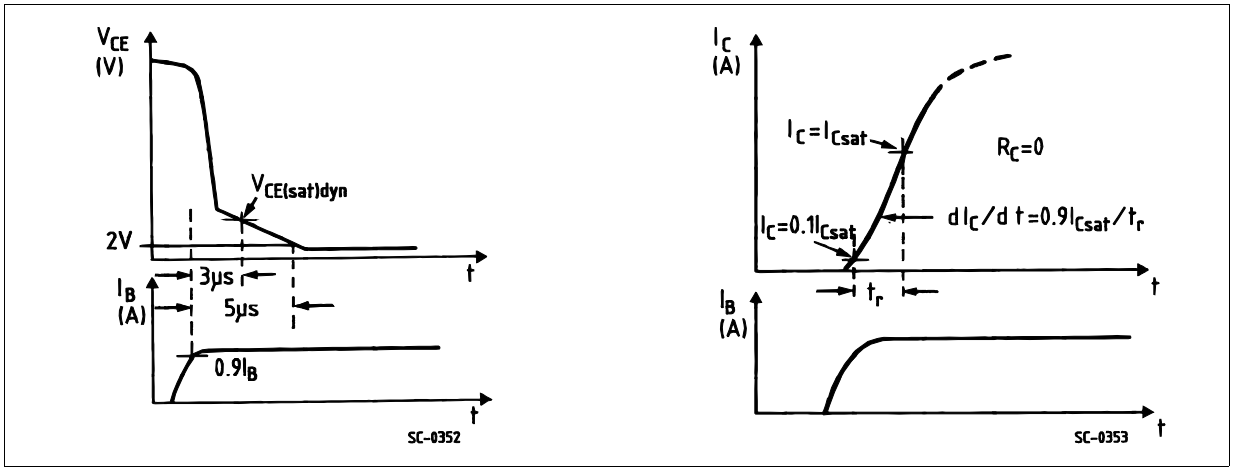
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
	INDUCTIVE LOAD	I_C = 5 A	V_{CC} = 50 V				
t_s	Storage Time	V_{BB} = 0	R_{BB} = 0.3 Ω			3	µs
t_f	Fall Time	V_{clamp} = 400 V	I_{B1} = 0.5 A			0.15	µs
t_c	Cross Over Time	L = 0.5 mH	T_C =100°C			0.25	µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_C = 5 A V_{BB} = 0 I_{B1} = 0.5 A T_C = 125°C	V_{CC} = 50 V R_{BB} = 0.3 Ω L = 0.5 mH	500			V
	INDUCTIVE LOAD	I_C = 10 A	V_{CC} = 50 V				
t_s	Storage Time	V_{BB} = -5 V	R_{BB} =1.2 Ω		1.9		µs
t_f	Fall Time	V_{clamp} = 400 V	I_{B1} = 2 A		0.06		µs
t_c	Cross Over Time	L = 0.25 mH			0.12		µs
	INDUCTIVE LOAD	I_C = 10 A	V_{CC} = 50 V				
t_s	Storage Time	V_{BB} = - 5 V	R_{BB} =1.2 Ω			3.2	µs
t_f	Fall Time	V_{clamp} = 400 V	I_{B1} = 2 A			0.12	µs
t_c	Cross Over Time	L = 0.25 mH	T_C =100°C			0.3	µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_{CWoff} = 15 A V_{BB} = - 5 V L = 0.1 mH T_C =125°C	V_{CC} = 50 V R_{BB} = 1.2 Ω I_{B1} = 3 A	400			V

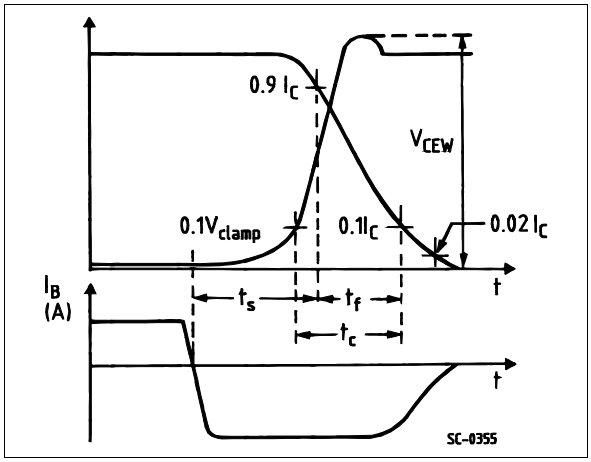
Inductive Load Switching Test Circuit



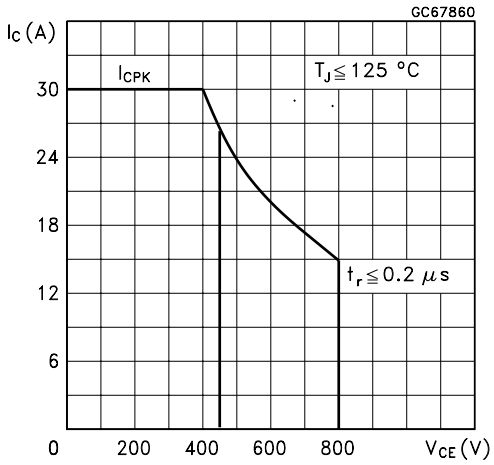
Turn-on Switching Test Waveforms.



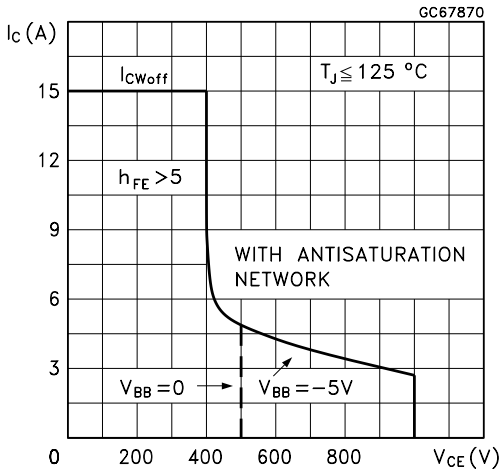
Turn-off SwitchingTest Waveforms (inductive load).



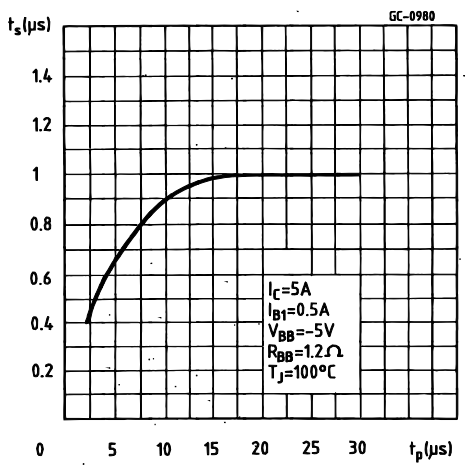
Forward Biased Safe Operating Areas.



Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.



TO-218 (SOT-93) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		4.9	0.185		0.193
C	1.17		1.37	0.046		0.054
D		2.5			0.098	
E	0.5		0.78	0.019		0.030
F	1.1		1.3	0.043		0.051
G	10.8		11.1	0.425		0.437
H	14.7		15.2	0.578		0.598
L2	–		16.2	–		0.637
L3		18			0.708	
L5	3.95		4.15	0.155		0.163
L6		31			1.220	
R	–		12.2	–		0.480
Ø	4		4.1	0.157		0.161