



# BUF410A

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

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

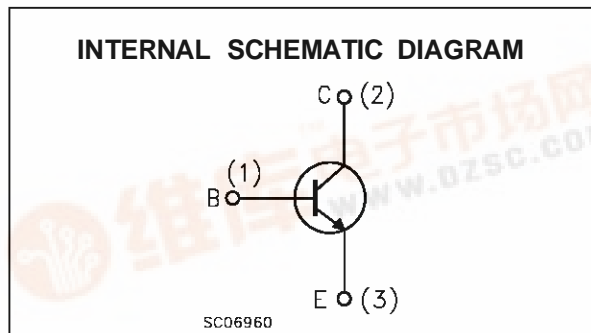
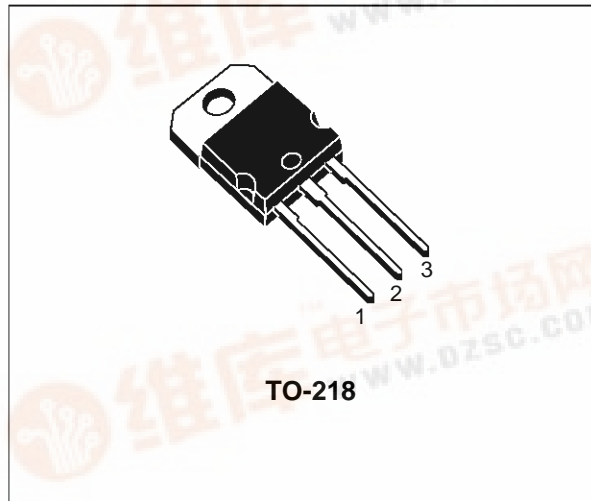
**APPLICATIONS:**

- 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. They use 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.



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CEV}$	Collector-Emitter Voltage ( $V_{BE} = -1.5\text{ V}$ )	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 ( $t_p < 5\text{ ms}$ )	30	A
$I_B$	Base Current	3	A
$I_{BM}$	Base Peak Current ( $t_p < 5\text{ ms}$ )	4.5	A
$P_{tot}$	Total Dissipation at $T_c = 25\text{ }^\circ\text{C}$	125	W
$T_{stg}$	Storage Temperature	-65 to 150	$^\circ\text{C}$
$T_j$	Max Operation Junction Temperature	150	$^\circ\text{C}$



## BUF410A

### THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-Case	Max	1	°C/W
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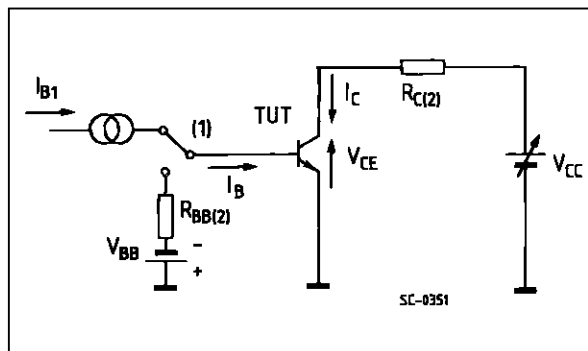
### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25\text{ °C}$ unless otherwise specified)

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

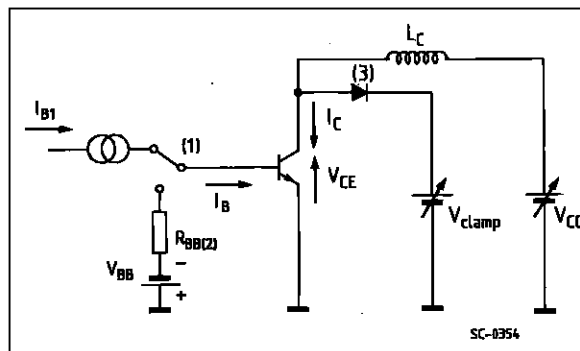
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_s$ $t_f$ $t_c$	Storage Time Fall Time Cross Over Time	$I_C = 5\text{ A}$ $V_{BB} = 0$ $V_{clamp} = 400\text{ V}$ $L = 0.5\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 0.3\ \Omega$ $I_{B1} = 0.5\text{ A}$ $T_j = 100^\circ\text{C}$		3 0.15 0.25	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$V_{CEW}$	Maximum Collector Emitter Voltage without Snubber	$I_C = 5\text{ A}$ $V_{BB} = 0$ $V_{clamp} = 400\text{ V}$ $L = 0.5\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 0.3\ \Omega$ $I_{B1} = 0.5\text{ A}$ $T_j = 125^\circ\text{C}$	500		V
$t_s$ $t_f$ $t_c$	Storage Time Fall Time Cross Over Time	$I_C = 10\text{ A}$ $V_{BB} = -5\text{ V}$ $V_{clamp} = 400\text{ V}$ $L = 0.25\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 1.2\ \Omega$ $I_{B1} = 2\text{ A}$		1.9 0.06 0.12	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_s$ $t_f$ $t_c$	Storage Time Fall Time Cross Over Time	$I_C = 10\text{ A}$ $V_{BB} = -5\text{ V}$ $V_{clamp} = 400\text{ V}$ $L = 0.25\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 1.2\ \Omega$ $I_{B1} = 2\text{ A}$ $T_j = 100^\circ\text{C}$		3.2 0.12 0.3	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$V_{CEW}$	Maximum Collector Emitter Voltage without Snubber	$I_{C\text{Woff}} = 15\text{ A}$ $V_{BB} = -5\text{ V}$ $L = 0.17\text{ mH}$ $T_j = 125^\circ\text{C}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 1.2\ \Omega$ $I_{B1} = 3\text{ A}$	400		V

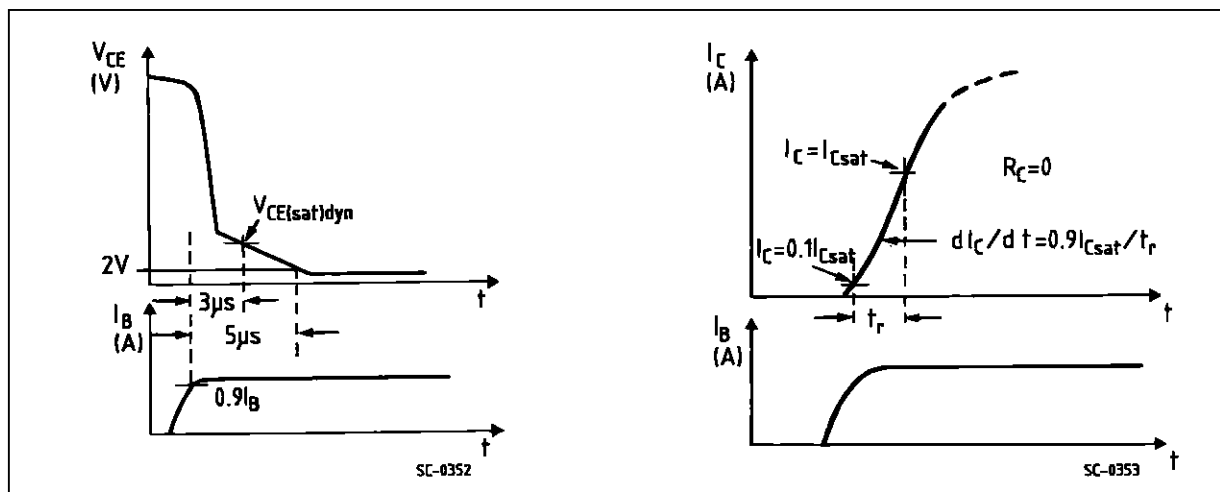
Turn-on Switching Test Circuit



Turn-off Switching Test Circuit

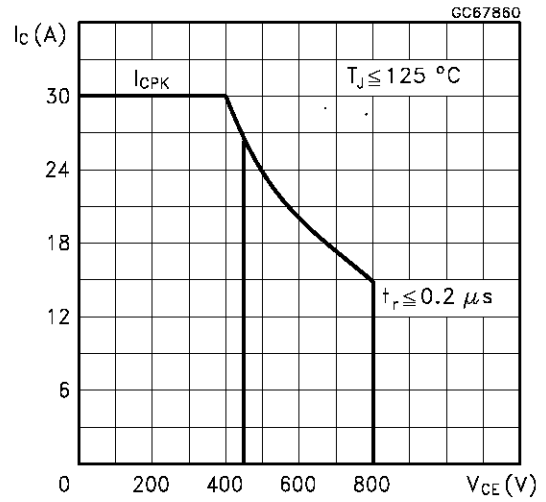
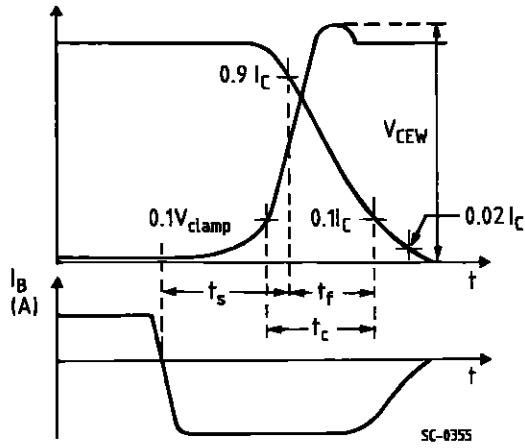


Turn-on Switching Test Waveforms.



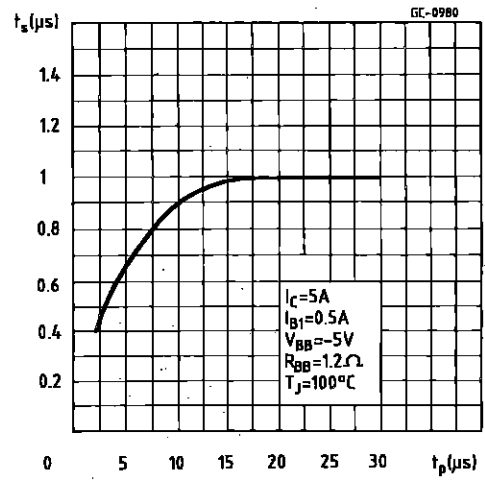
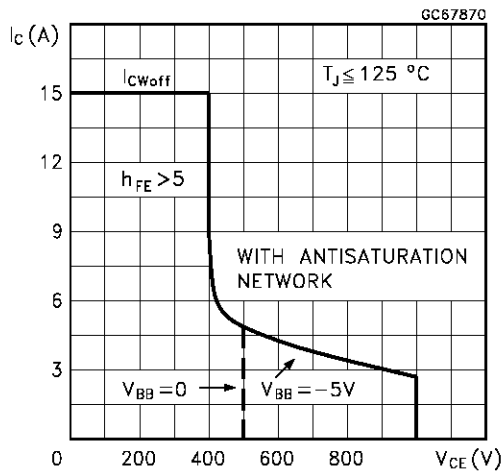
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Turn-off Switching Test Waveforms (inductive load). Forward Biased Safe Operating Areas.



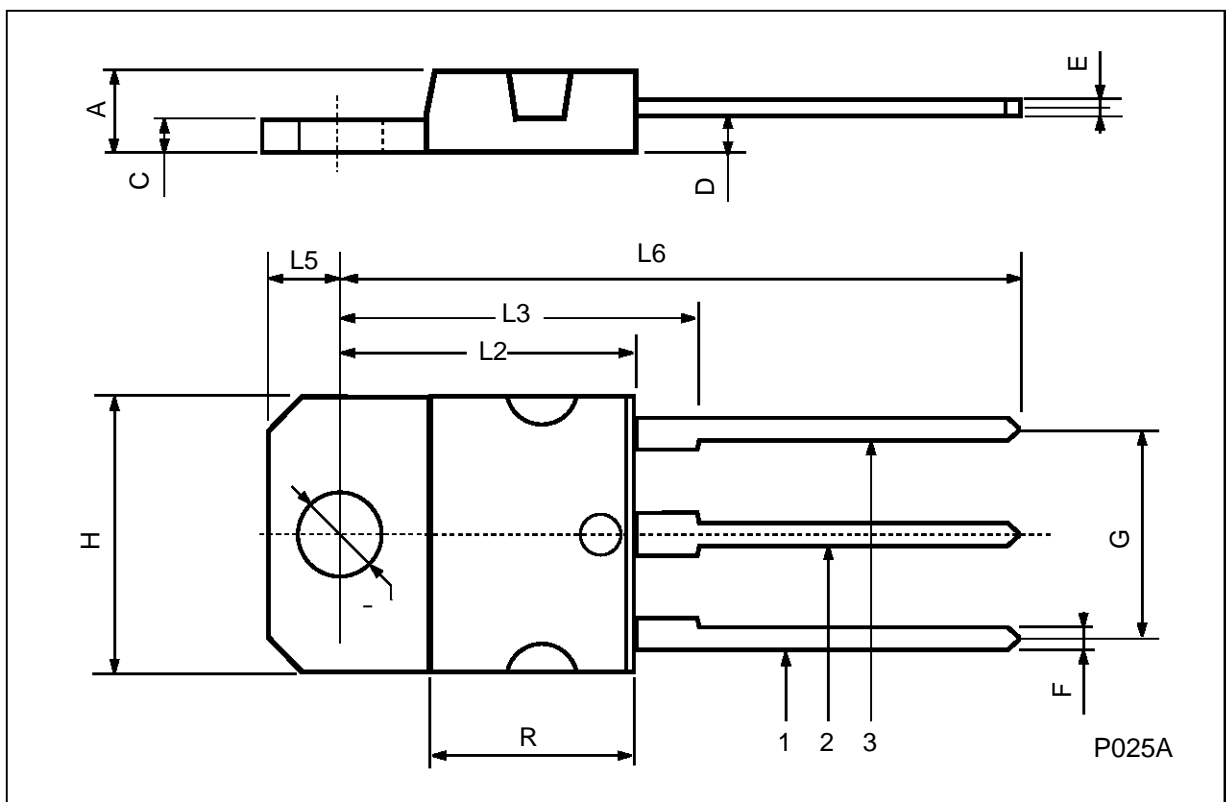
Reverse Biased Safe Operating Area

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



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