

## 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

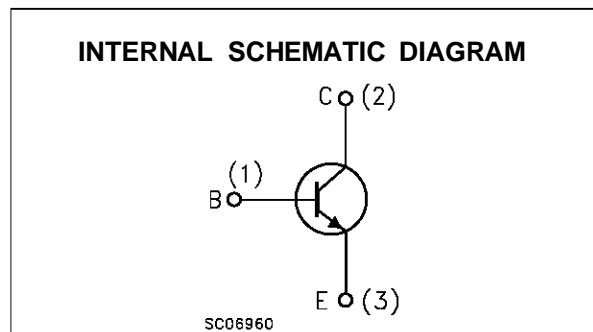
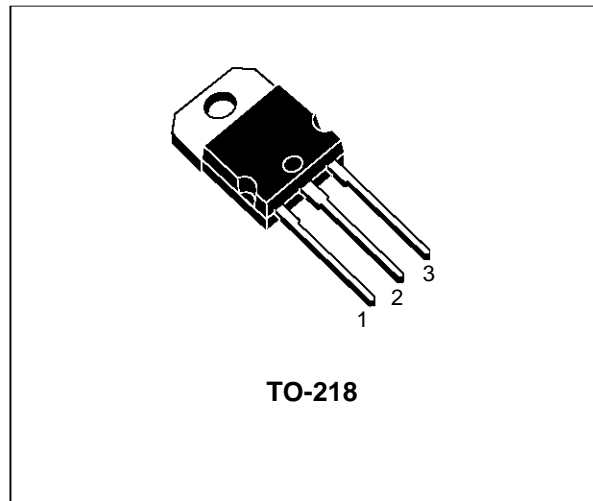
### APPLICATIONS:

- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

### DESCRIPTION

The BUF410 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 ( $V_{BE} = -1.5\text{ V}$ )	850	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	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150	$^\circ\text{C}$

# BUF410

## THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-Case	Max	1	°C/W
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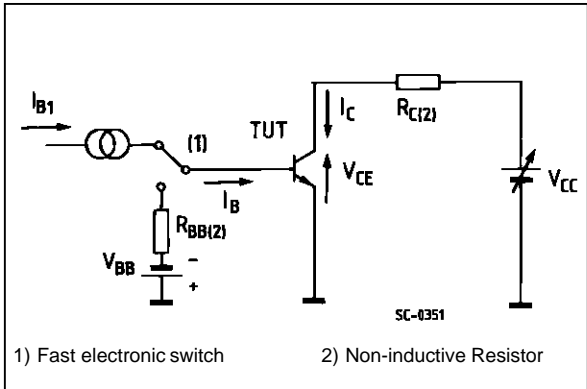
## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CER</sub>	Collector Cut-off Current (R <sub>BE</sub> = 100 Ω)	V <sub>CE</sub> = V <sub>CEV</sub> V <sub>CE</sub> = V <sub>CEV</sub> T <sub>c</sub> = 100 °C			0.2 1	mA mA
I <sub>CEV</sub>	Collector Cut-off Current (I <sub>B</sub> = 0)	V <sub>CE</sub> = V <sub>CEV</sub> V <sub>BE</sub> = -1.5 V V <sub>CE</sub> = V <sub>CEV</sub> V <sub>BE</sub> = -1.5 V T <sub>c</sub> = 100 °C			0.2 1	mA mA
I <sub>EBO</sub>	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>BE</sub> = 5 V			1	mA
V <sub>CEO(sus)*</sub>	Collector-Emitter Sustaining Voltage	I <sub>C</sub> = 200 mA L = 25 mH	450			V
V <sub>EBO</sub>	Emitter Base Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 50 mA	7			V
V <sub>CE(sat)*</sub>	Collector-Emitter Saturation Voltage	I <sub>C</sub> = 5 A I <sub>B</sub> = 0.5 A I <sub>C</sub> = 5 A I <sub>B</sub> = 0.5 A T <sub>c</sub> = 100 °C I <sub>C</sub> = 10 A I <sub>B</sub> = 2 A I <sub>C</sub> = 10 A I <sub>B</sub> = 2 A T <sub>c</sub> = 100 °C		0.8 0.5	2.8 2	V V V V
V <sub>BE(sat)*</sub>	Base-Emitter Saturation Voltage	I <sub>C</sub> = 5 A I <sub>B</sub> = 0.5 A I <sub>C</sub> = 5 A I <sub>B</sub> = 0.5 A T <sub>c</sub> = 100 °C I <sub>C</sub> = 10 A I <sub>B</sub> = 2 A I <sub>C</sub> = 10 A I <sub>B</sub> = 2 A T <sub>c</sub> = 100 °C		0.9 1.1	1.5 1.5	V V V V
di <sub>c</sub> /dt	Rate of rise on-state Collector Current	V <sub>CC</sub> = 300 V R <sub>C</sub> = 0 t <sub>p</sub> = 3 μs I <sub>B1</sub> = 0.75 A T <sub>J</sub> = 25 °C I <sub>B1</sub> = 0.75 A T <sub>J</sub> = 100 °C I <sub>B1</sub> = 3 A T <sub>J</sub> = 100 °C	45 100	60		A/μs A/μs A/μs
V <sub>CE(3μs)</sub>	Collector-Emitter Dynamic Voltage	V <sub>CC</sub> = 300 V R <sub>C</sub> = 60 Ω I <sub>B1</sub> = 0.75 A T <sub>J</sub> = 25 °C I <sub>B1</sub> = 0.75 A T <sub>J</sub> = 100 °C		2.1	8	V V
V <sub>CE(5μs)</sub>	Collector-Emitter Dynamic Voltage	V <sub>CC</sub> = 300 V R <sub>C</sub> = 60 Ω I <sub>B1</sub> = 0.75 A T <sub>J</sub> = 25 °C I <sub>B1</sub> = 0.75 A T <sub>J</sub> = 100 °C		1.1	4	V V
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	Storage Time Fall Time Cross Over Time	I <sub>C</sub> = 5 A V <sub>CC</sub> = 50 V V <sub>BB</sub> = -5 V R <sub>BB</sub> = 1.2 Ω V <sub>clamp</sub> = 400 V I <sub>B1</sub> = 0.5 A L = 0.5 mH		0.8 0.05 0.08		μs μs μs
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	Storage Time Fall Time Cross Over Time	I <sub>C</sub> = 5 A V <sub>CC</sub> = 50 V V <sub>BB</sub> = -5 V R <sub>BB</sub> = 1.2 Ω V <sub>clamp</sub> = 400 V I <sub>B1</sub> = 0.5 A L = 0.5 mH T <sub>J</sub> = 100 °C			1.8 0.1 0.18	μs μs μs
V <sub>CEW</sub>	Maximum Collector Emitter Voltage without Snubber	I <sub>C</sub> = 5 A V <sub>CC</sub> = 50 V V <sub>BB</sub> = -5 V R <sub>BB</sub> = 1.2 Ω V <sub>clamp</sub> = 400 V I <sub>B1</sub> = 0.5 A L = 0.5 mH T <sub>J</sub> = 125 °C	500			V
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	Storage Time Fall Time Cross Over Time	I <sub>C</sub> = 5 A V <sub>CC</sub> = 50 V V <sub>BB</sub> = 0 R <sub>BB</sub> = 0.3 Ω V <sub>clamp</sub> = 400 V I <sub>B1</sub> = 0.5 A L = 0.5 mH		1.5 0.04 0.07		μs μs μs

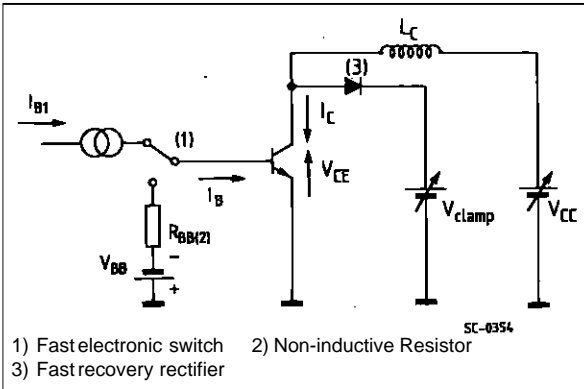
ELECTRICAL CHARACTERISTICS (continued)

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

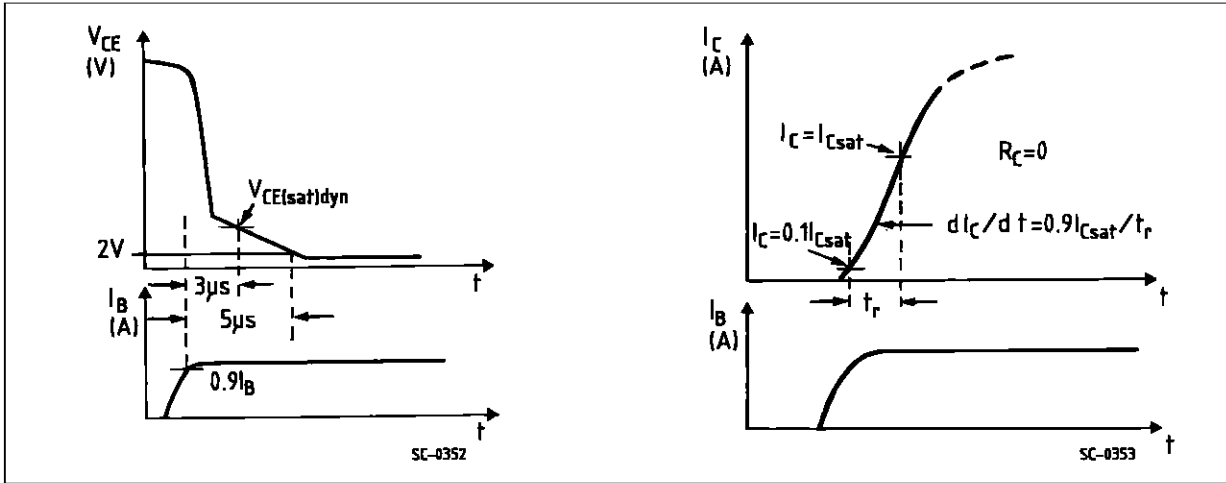
Turn-on Switching Test Circuit



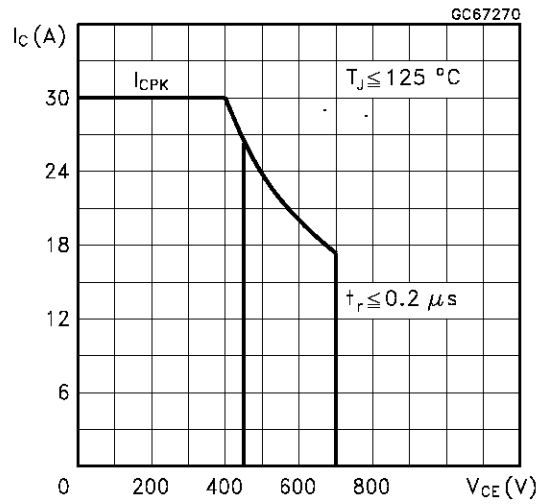
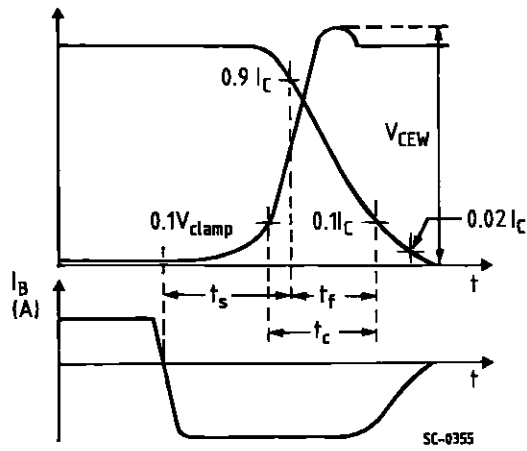
Turn-off Switching Test Circuit



Turn-on Switching Test Waveforms.

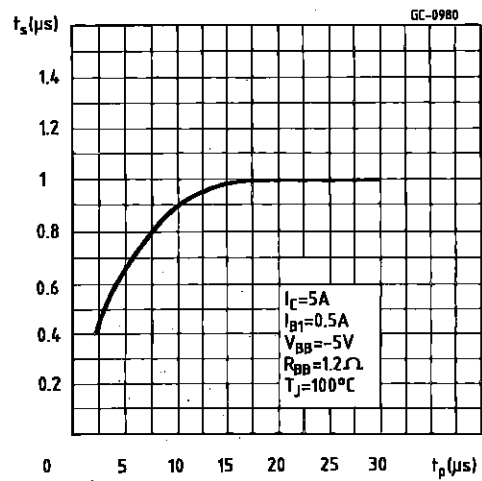
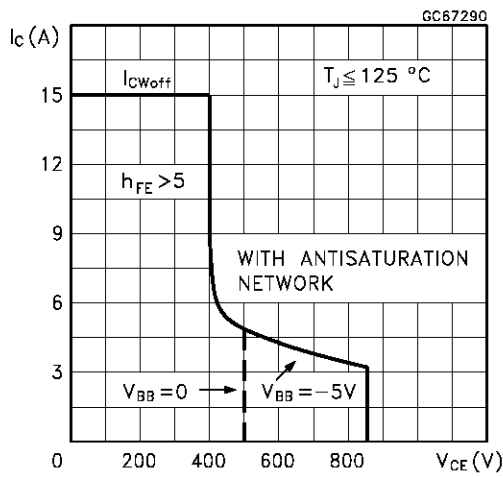


Turn-off Switching Test Waveforms (inductive load). Forward Biased Safe Operating Areas.



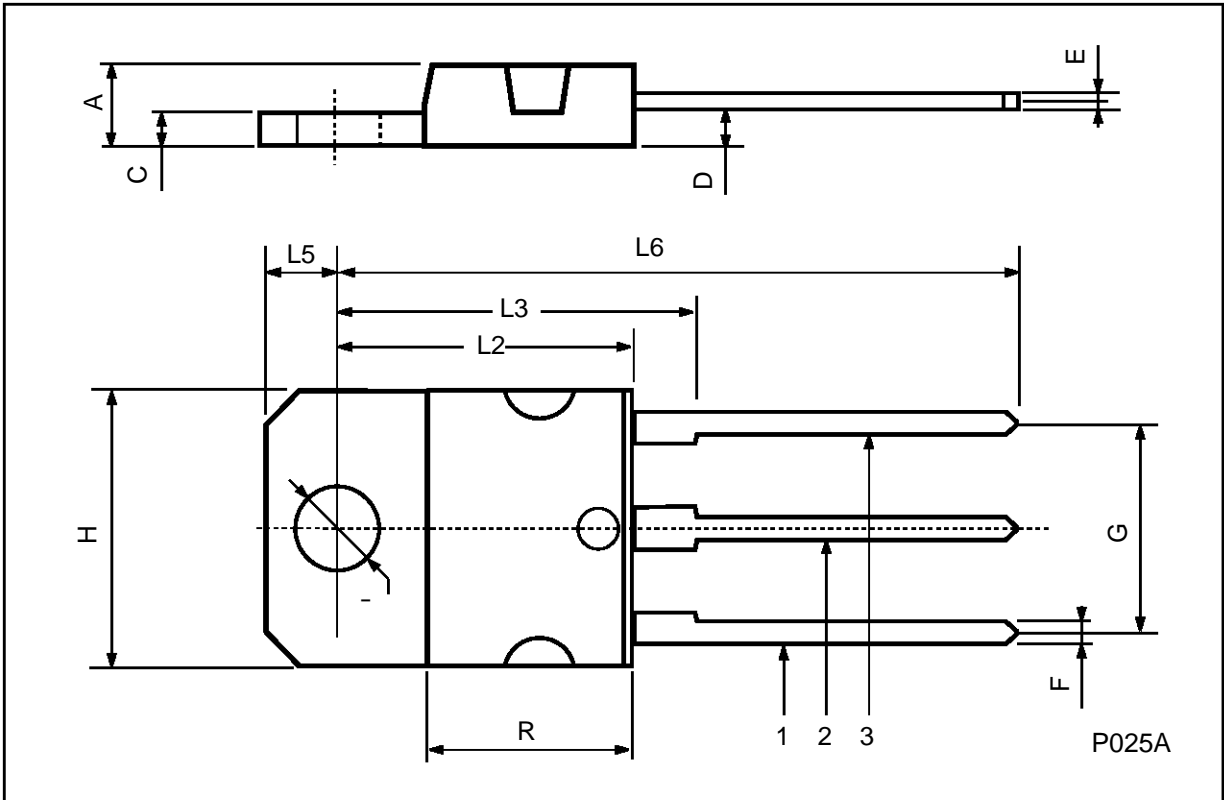
Reverse Biased Safe Operating Area

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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