BUF410A

High voltage fast-switching NPN power transistor

Features

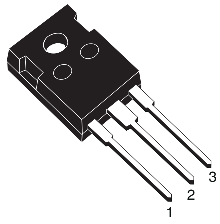
- High voltage capability
- Very high switching speed
- Minimum lot-to-lot spread for reliable operation
- Low base-drive requirements

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.



TO-247

Figure 1. Internal schematic diagram

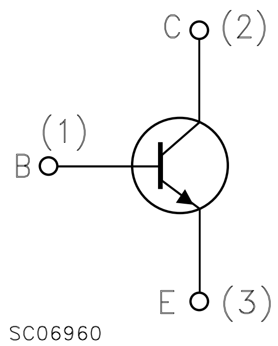


Table 1. Device summary

Order code	Marking	Package	Packaging
BUF410A	BUF410A	TO-247	Tube

1 Electrical ratings

Table 2. 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. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter		Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	max	1	°C/W

2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 4. Electrical characteristics

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 °C			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 °C			0.2 1	mA mA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 5 V			1	mA
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C = 200 mA	450			V
V_{EBO}	Emitter-base voltage (I_C = 0)	I_E = 50 mA	7			V
$V_{CE(sat)}$ (1)	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 °C I_C = 10 A I_B = 2 A I_C = 10 A I_B = 2 A T_C = 100 °C		0.8 0.5 	 2.8 2	V V V V
$V_{BE(sat)}$ (1)	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 °C I_C = 10 A I_B = 2 A I_C = 10 A I_B = 2 A T_C = 100 °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 V R_C = 0 t_p = 3 µs I_{B1} = 0.75 A T_C = 25 °C I_{B1} = 0.75 A T_C = 100 °C I_{B1} = 3 A T_C = 100 °C	 45 100	 60 		 A/µs A/µs A/µs
$V_{CE(dyn)}$	Collector-emitter dynamic voltage (3 µs)	V_{CC} = 300 V R_C = 60 Ω I_{B1} = 0.75 A T_C = 25 °C I_{B1} = 0.75 A T_C = 100 °C		 2.1 	 8	 V V
$V_{CE(dyn)}$	Collector-emitter dynamic voltage (5 µs)	V_{CC} = 300 V R_C = 60 Ω I_{B1} = 0.75 A T_C = 25 °C I_{B1} = 0.75 A T_C = 100 °C		 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

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
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 $R_{BB} = 1.2\ \Omega$ $V_{Clamp} = 400$ V $I_{B1} = 0.5$ A L = 0.5 mH $T_C = 100$ °C			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 $R_{BB} = 1.2\ \Omega$ $I_{B1} = 0.5$ A L = 0.5 mH $T_C = 125$ °C	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 $V_{BB} = 0$ $R_{BB} = 0.3\ \Omega$ $V_{Clamp} = 400$ V $I_{B1} = 0.5$ A L = 0.5 mH		1.5 0.04 0.07		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 $V_{BB} = 0$ $R_{BB} = 0.3\ \Omega$ $V_{Clamp} = 400$ V $I_{B1} = 0.5$ A L = 0.5 mH $T_C = 100$ °C			3 0.15 0.25	μs μs μs
V_{CEW}	Maximum collector emitter voltage without snubber	$I_C = 5$ A $V_{CC} = 50$ V $V_{BB} = 0$ $R_{BB} = 0.3\ \Omega$ $I_{B1} = 0.5$ A L = 0.5 mH $T_C = 125$ °C	500			V
t_s t_f t_c	Inductive load Storage time Fall time Cross over time	$I_C = 10$ A $V_{CC} = 50$ V $V_{BB} = -5$ V $R_{BB} = 1.2\ \Omega$ $V_{Clamp} = 400$ V $I_{B1} = 2$ A L = 0.25 mH		1.9 0.06 0.12		μs μs μs
t_s t_f t_c	Inductive load Storage time Fall time Cross over time	$I_C = 10$ A $V_{CC} = 50$ V $V_{BB} = -5$ V $R_{BB} = 1.2\ \Omega$ $V_{Clamp} = 400$ V $I_{B1} = 2$ A L = 0.25 mH $T_C = 100$ °C			3.2 0.12 0.3	μs μs μs
V_{CEW}	Maximum collector emitter voltage without snubber	$I_C = 15$ A $V_{CC} = 50$ V $V_{BB} = -5$ V $R_{BB} = 1.2\ \Omega$ $I_{B1} = 3$ A L = 0.1 mH $T_C = 125$ °C	400			V

1. *Pulse duration = 300 μs, duty cycle $\leq$ 1.5%*

2.1 Electrical characteristics (curves)

Figure 2. Forward biased safe operating area

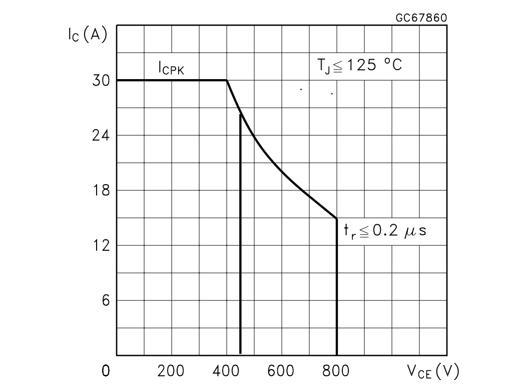
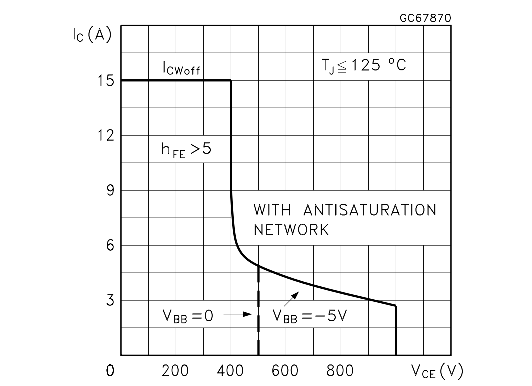
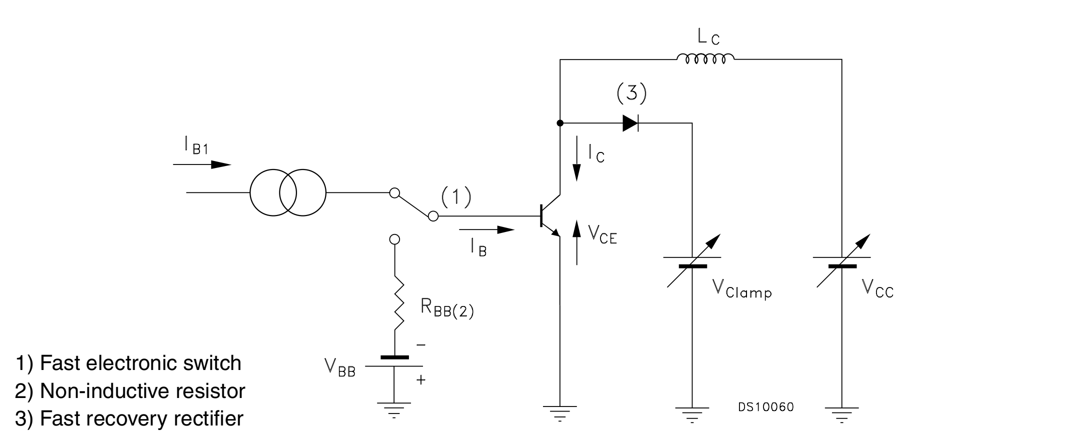


Figure 3. Reverse biased safe operating area



2.2 Test circuit

Figure 4. Inductive load switching test circuit

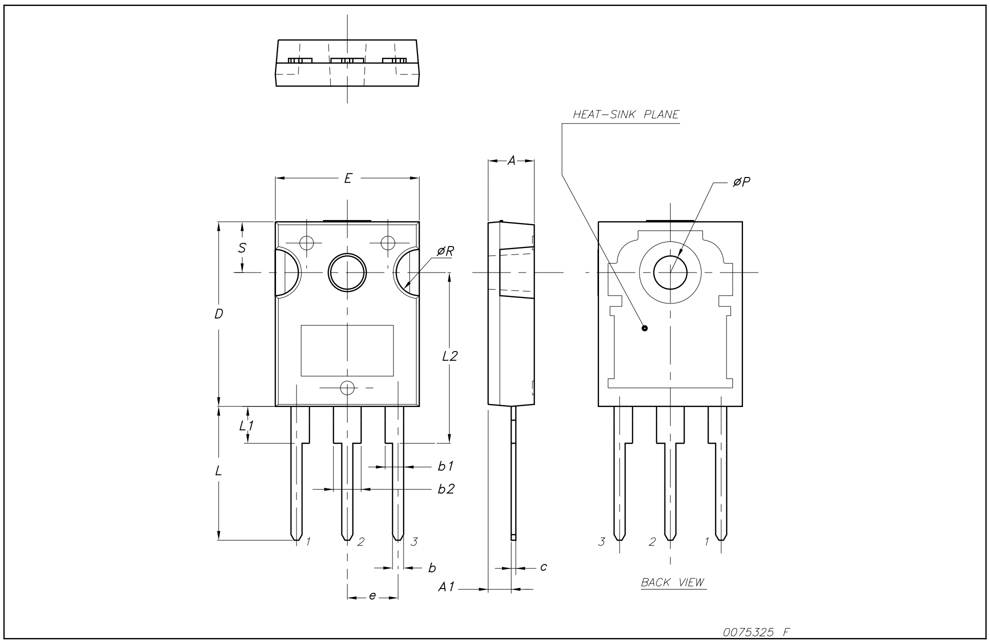


3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

TO-247 Mechanical data

Dim.	mm.		
	Min.	Typ	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
18-Mar-2002	2	
13-Mar-2008	3	Package change from TO-218 to TO-247.