SGS-THOMSON MICROELECTRONICS

BUF410/410I BUF410A/410AI

FASTSWITCH EASY-TO-DRIVE (ETD) NPN TRANSISTORS

PRELIMINARY DATA

- HIGH SWITCHING SPEED NPN POWER TRANSISTOR
- EASY TO DRIVE
- HIGH VOLTAGE FOR OFF-LINE APPLICATIONS
- 100KHz SWITCHING SPEED
- LOW COST DRIVE CIRCUITS
- LOW DYNAMIC SATURATION

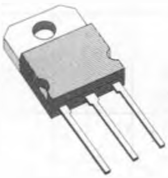
APPLICATIONS

- SMPS
- MOTOR DRIVES

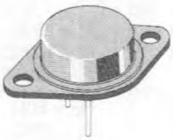
DESCRIPTION

These Easy-to-Drive FASTSWITCH NPN power transistors are specially designed for high reliability industrial and professional power driving applications such as motor drives and off-line switching power supplies. ETD transistors will operate using easy drive circuits at up to 100KHz ; this helps to simplify designs and improve reliability. The superior switching performance and low crossover losses reduce dissipation and consequently lower the equipment operating temperature. These ETD transistors are suitable for applications in high reliability medium power motors drives and half bridge and full bridge converters.

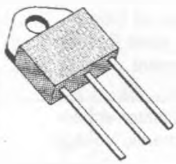
These Easy-to-Drive FASTSWITCH transistors are available in TO-218 and TO-3 packages. Additionally, the alumina isolated version is available in the TOP-3I package.



TO-218



TO-3



TOP-3I

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
	TO-218 TOP-3I	BUF410 BUF410I	BUF410A BUF410AI	
V_{CEV}	Collector-emitter Voltage (V_{BE} = – 1.5V)	850	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	30		A
I_B	Base Current	3		A
I_{BM}	Base Peak Current	4.5		A
		TO-218	TOP-3I	
P_{tot}	Total Dissipation at T_c < 25°C	125	85	W
T_{stg}	Storage Temperature	– 65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

THERMAL DATA

			TO-218	TOP-3I	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1	1.47	°C/W

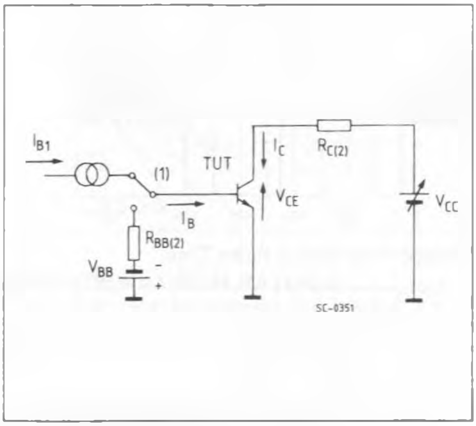
ELECTRICAL CHARACTERISTICS (T_j = 25°C unless otherwise specified)

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

ELECTRICAL CHARACTERISTICS (continued)

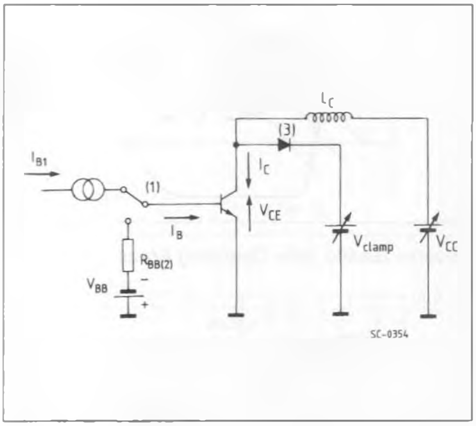
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
t_s t_f t_c	Storage Time Fall Time Cross Over Time	I_C = 5A V_{BB} = 0 V_{clamp} = 400V L = 0.5mH	V_{CC} = 50V R_{BB} = 0.3Ω I_{B1} = 0.5A T_j = 100°C			3 0.15 0.25	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_C = 5A V_{BB}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

Turn-on Switching Test Circuit.



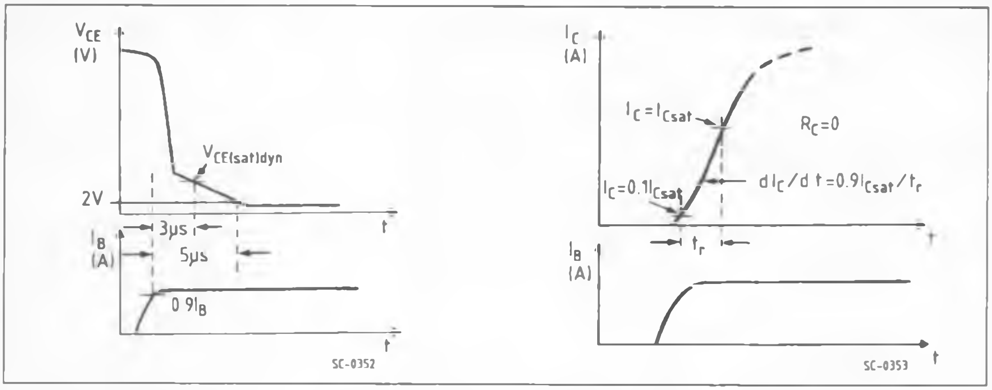
(1) Fast electronic switch
(2) Non-inductive Resistor

Turn-off Switching Test Circuit.

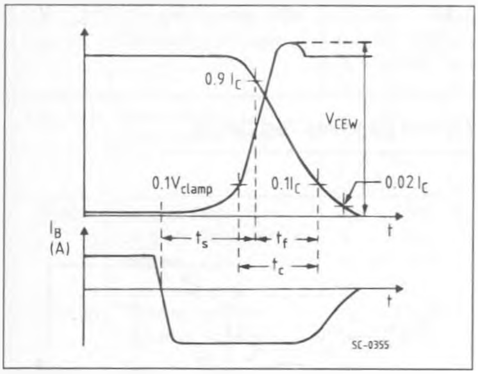


(1) Fast electronic switch
(2) Non-inductive Resistor
(3) Fast recovery rectifier

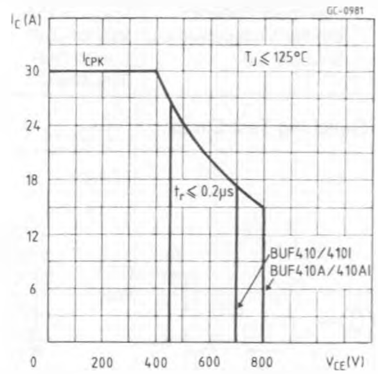
Turn-on Switching Test Waveforms.



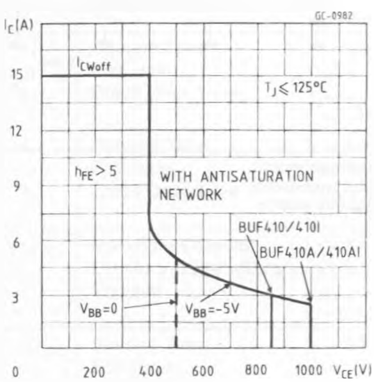
Turn-off Switching Waveforms (inductive load).



Forward Biased Safe Operating Areas.



Reverse Biased Safe Operating Areas.



Storage Time Versus Pulse Time.