SGS-THOMSON MICROELECTRONICS

BUF410/410FI

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- SGS-THOMSON PREFERRED SALESTYPES
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS
- U.L. RECOGNISED ISOWATT218 PACKAGE (U.L. FILE # E81734 (N)).

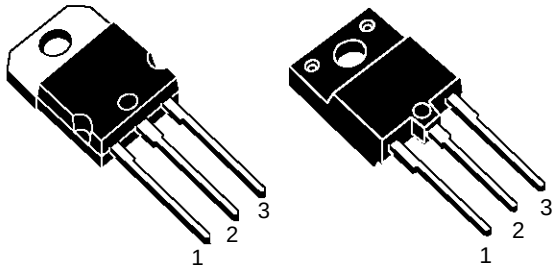
APPLICATIONS:

- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

DESCRIPTION

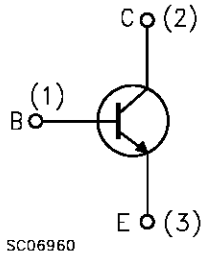
The BUF410 and BUF410FI are manufactured using High Voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capacity. They use a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

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



TO-218 **ISOWATT218**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
V_{CEV}	Collector-Emitter Voltage (V_{BE} = -1.5 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 ms)	30		A
I_B	Base Current	3		A
I_{BM}	Base Peak Current (t_p < 5 ms)	4.5		A
		TO-218	**ISOWATT218**	
P_{tot}	Total Dissipation at T_c = 25 °C	125	55	W
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max Operation Junction Temperature	150		°C

THERMAL DATA

		TO-218	ISO218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-Case Max	1	2.27	°C/W

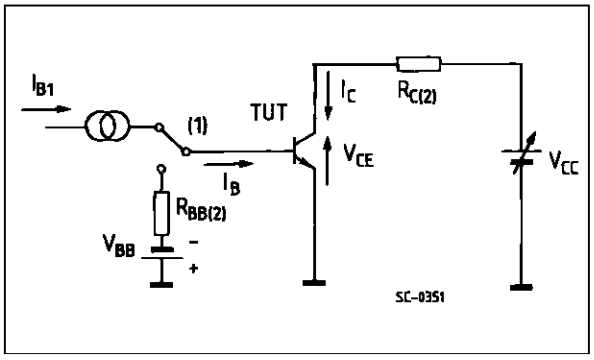
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER}	Collector Cut-off Current (R_{BE} = 100 Ω)	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ T_c = 100 °C			0.2 1	mA mA
I_{CEV}	Collector Cut-off Current (I_B = 0)	$V_{CE} = V_{CEV}$ V_{BE} = -1.5 V $V_{CE} = V_{CEV}$ V_{BE} = -1.5 V T_c =100°C			0.2 1	mA mA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	V_{BE} = 5 V			1	mA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage	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°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
$V_{BE(sat)}$*	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_j =25°C I_{B1} = 0.75 A T_j =100°C I_{B1} = 3 A T_j =100°C	 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_j =25°C I_{B1} = 0.75 A T_j =100°C		 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_j =25°C I_{B1} = 0.75 A T_j =100°C		 1.1 	 4	 V V
t_s t_f t_c	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	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_j =100°C			1.8 0.1 0.18	µs µs µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	IC = 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_j =125°C	500			V
t_s t_f t_c	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

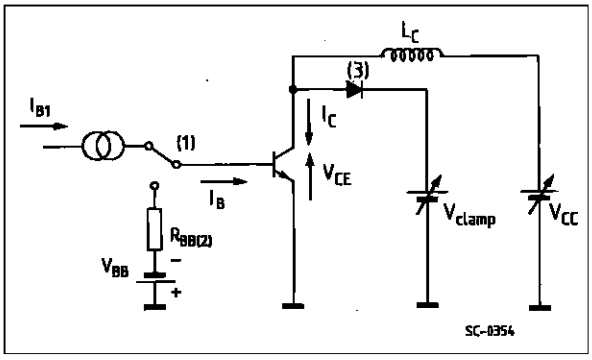
ELECTRICAL CHARACTERISTICS (continued)

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

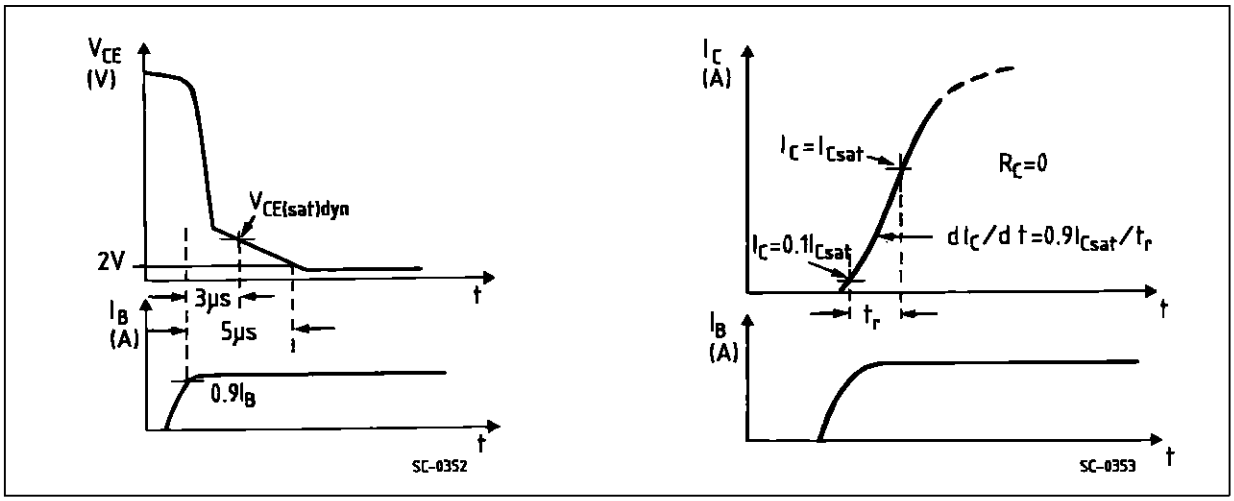
Turn-on Switching Test Circuit



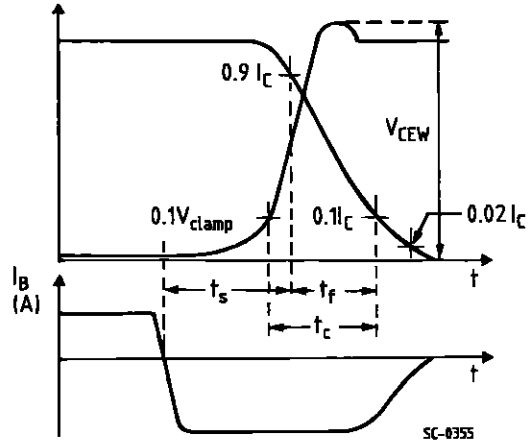
Turn-off Switching Test Circuit



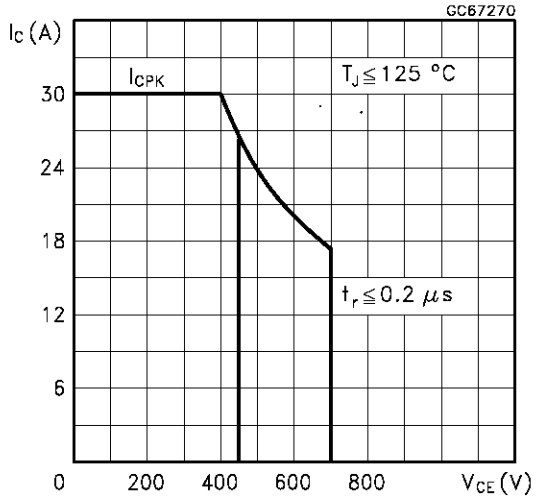
Turn-on SwitchingTest Waveforms.



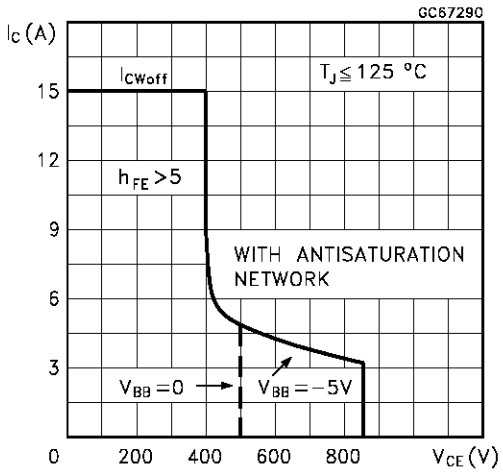
Turn-off SwitchingTest Waveforms (inductive load).



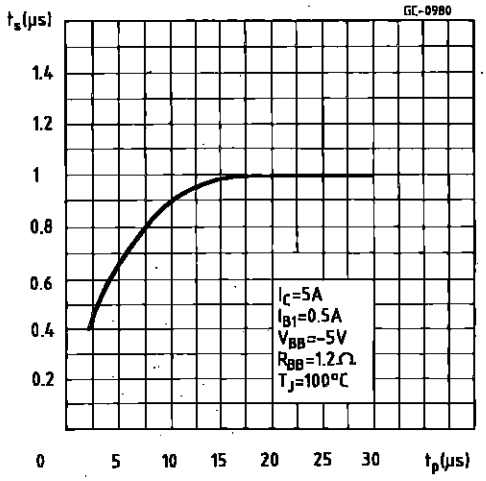
Forward Biased Safe Operating Areas.



Reverse Biased Safe Operating Area

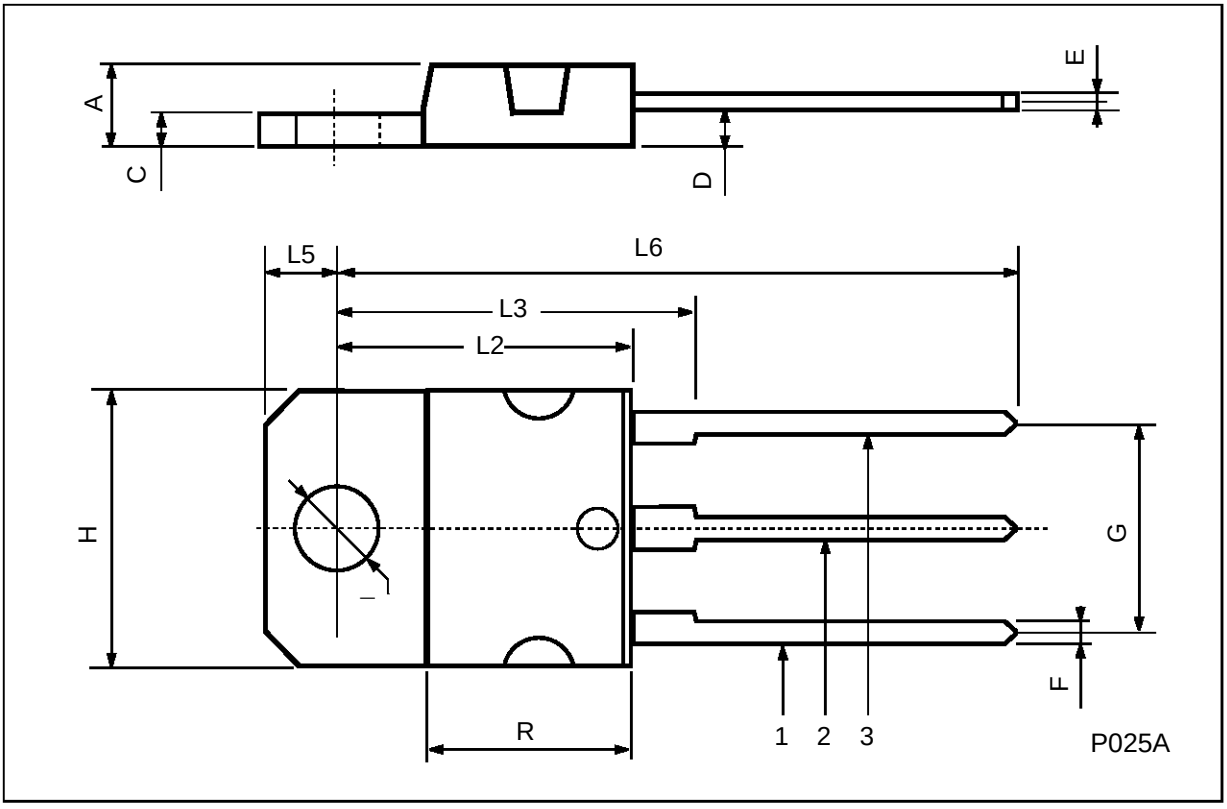


Storage Time Versus Pulse Time.



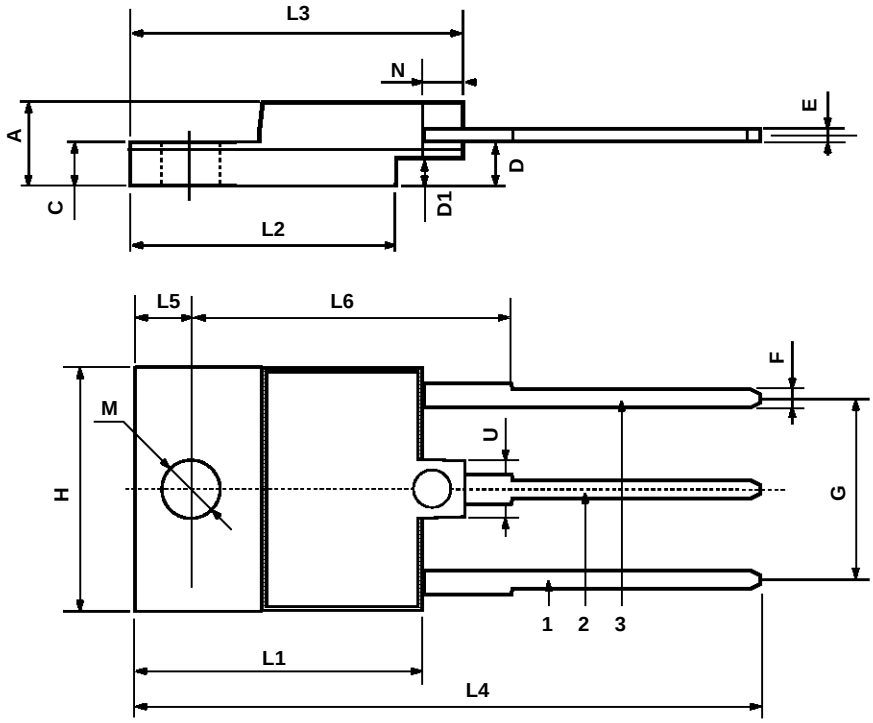
TO-218 (SOT-93) MECHANICAL DATA

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



ISOWATT218 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	5.35		5.65	0.210		0.222
C	3.3		3.8	0.130		0.149
D	2.9		3.1	0.114		0.122
D1	1.88		2.08	0.074		0.081
E	0.45		1	0.017		0.039
F	1.05		1.25	0.041		0.049
G	10.8		11.2	0.425		0.441
H	15.8		16.2	0.622		0.637
L1	20.8		21.2	0.818		0.834
L2	19.1		19.9	0.752		0.783
L3	22.8		23.6	0.897		0.929
L4	40.5		42.5	1.594		1.673
L5	4.85		5.25	0.190		0.206
L6	20.25		20.75	0.797		0.817
M	3.5		3.7	0.137		0.145
N	2.1		2.3	0.082		0.090
U		4.6			0.181	



P025C