BUF420M

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

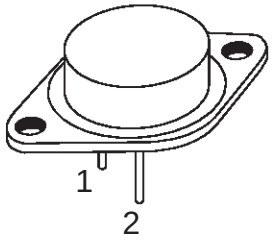
- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS

APPLICATIONS:
- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

DESCRIPTION

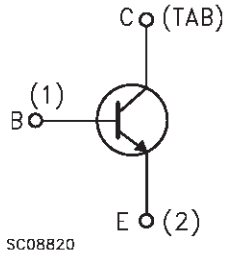
The BUF420M is manufactured using High Voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capacity. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

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



TO-3
(version "R")

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage (V_{BE} = -1.5V)	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	30	A
I_{CM}	Collector Peak Current (t_p < 5 ms)	60	A
I_B	Base Current	6	A
I_{BM}	Base Peak Current (t_p < 5 ms)	9	A
P_{tot}	Total Dissipation at T_c = 25 °C	275	W
T_{stg}	Storage Temperature	-65 to 200	°C
T_j	Max. Operating Junction Temperature	200	°C

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-Case	Max	0.63	°C/W

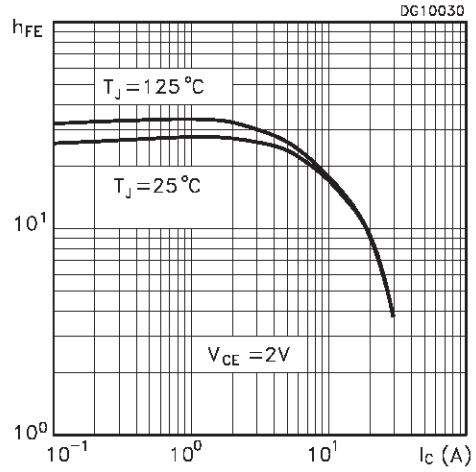
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER}	Collector Cut-off Current (R_{BE} = 5 Ω)	V_{CE} = 850 V V_{CE} = 850 V T_C = 100 °C			0.2 1	mA mA
I_{CEV}	Collector Cut-off Current (V_{BE} = -1.5V)	V_{CE} = 850 V V_{CE} = 850 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
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage (I_B = 0)	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 = 10A I_B = 1 A I_C = 10 A I_B = 1 A T_C =100°C I_C = 20 A I_B = 4 A I_C = 20 A I_B = 4 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 = 10A I_B = 1 A I_C = 10 A I_B = 1 A T_C =100°C I_C = 20 A I_B = 4 A I_C = 20 A I_B = 4 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} = 1.5 A T_C =25°C I_{B1} = 1.5 A T_C =100°C I_{B1} = 6 A T_C =100°C	 70 150	 100 	 	 A/µs A/µs A/µs
V_{CE}(3µs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 60 Ω I_{B1} = 1.5 A T_C =25°C I_{B1} = 1.5 A T_C =100°C		 2.1 	 8	 V V
V_{CE}(5µs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 60 Ω I_{B1} = 1.5 A T_C =25°C I_{B1} = 1.5 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 = 10 A V_{CC} = 50 V V_{BB} = - 5 V R_{BB} = 0.6 Ω V_{clamp} = 400 V I_{B1} = 1 A L = 0.25 mH		 1 0.05 0.08	 	 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} = 0.6 Ω V_{clamp} = 400 V I_{B1} = 1 A L = 0.25 mH T_C =100°C			 2 0.1 0.18	 µs µs µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_C = 10 A V_{CC} = 50 V V_{BB} = - 5 V R_{BB} = 0.6 Ω I_{B1} = 1 A L = 0.25 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} = 0 R_{BB} = 0.15 Ω V_{clamp} = 400 V I_{B1} = 1 A L = 0.25 mH		 1.5 0.04 0.07	 	 µs µs µs

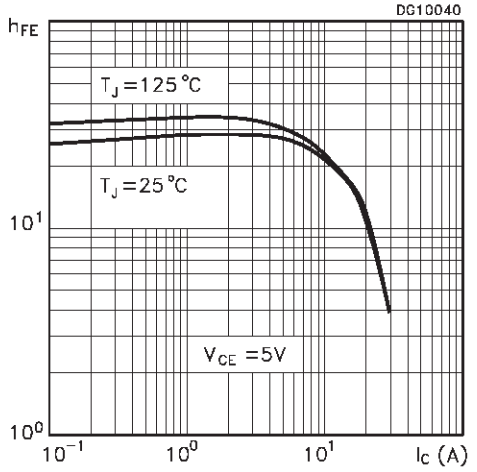
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
	INDUCTIVE LOAD	I_C = 10 A	V_{CC} = 50 V				
t_s	Storage Time	V_{BB} = 0	R_{BB} = 0.15 Ω			3	µs
t_f	Fall Time	V_{clamp} = 400 V	I_{B1} = 1 A			0.15	µs
t_c	Cross Over Time	L = 0.25 mH	T_C =100°C			0.25	µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_C = 10 A V_{BB} = 0 I_{B1} = 1 A T_C =125°C	V_{CC} = 50 V R_{BB} = 0.15 Ω L = 0.25 mH	500			V
	INDUCTIVE LOAD	I_C = 20 A	V_{CC} = 50 V				
t_s	Storage Time	V_{BB} = -5 V	R_{BB} =0.6 Ω		2.2		µs
t_f	Fall Time	V_{clamp} = 400 V	I_{B1} = 4 A		0.06		µs
t_c	Cross Over Time	L = 0.12 mH			0.12		µs
	INDUCTIVE LOAD	I_C = 20 A	V_{CC} = 50 V				
t_s	Storage Time	V_{BB} = - 5 V	R_{BB} = 0.6 Ω			3.5	µs
t_f	Fall Time	V_{clamp} = 400 V	I_{B1} = 4 A			0.12	µs
t_c	Cross Over Time	L = 0.12 mH	T_C =125°C			0.3	µs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	I_{CWoff} = 30 A V_{BB} = - 5 V L = 0.12 mH T_C =125°C	V_{CC} = 50 V R_{BB} = 0.6 Ω I_{B1} = 6 A	400			V

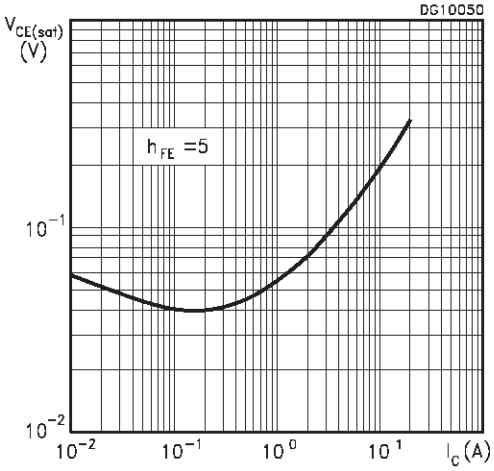
DC Current Gain



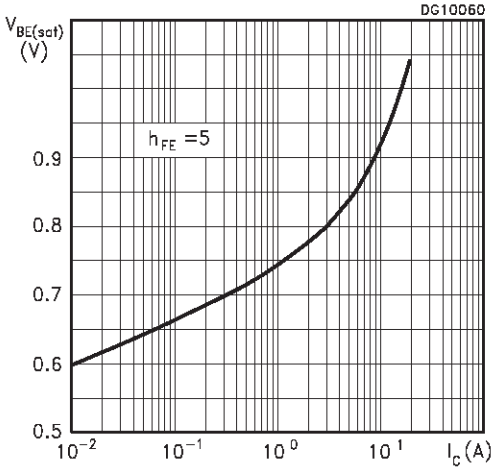
DC Current Gain



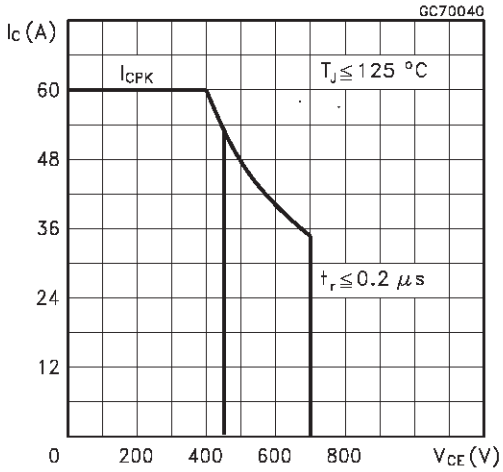
Collector Emitter Saturation Voltage



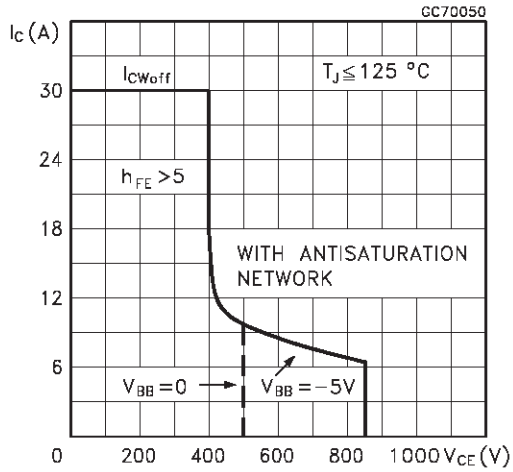
Base Emitter Saturation Voltage



Forward Biased Safe Operating Area



Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.

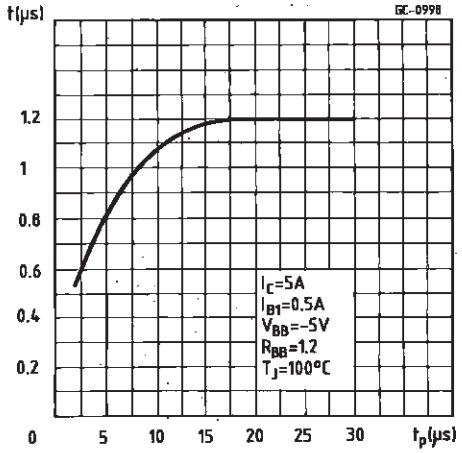
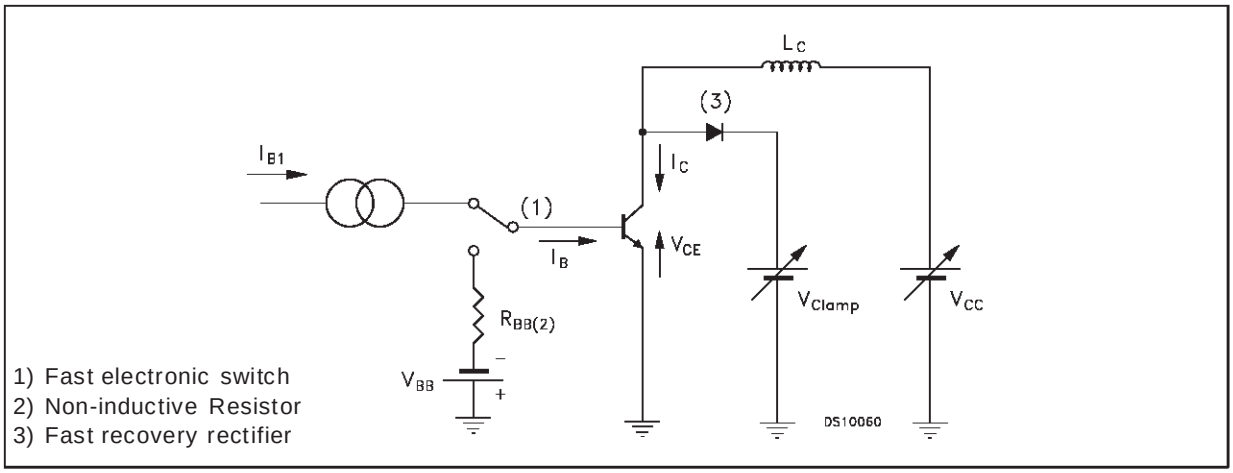
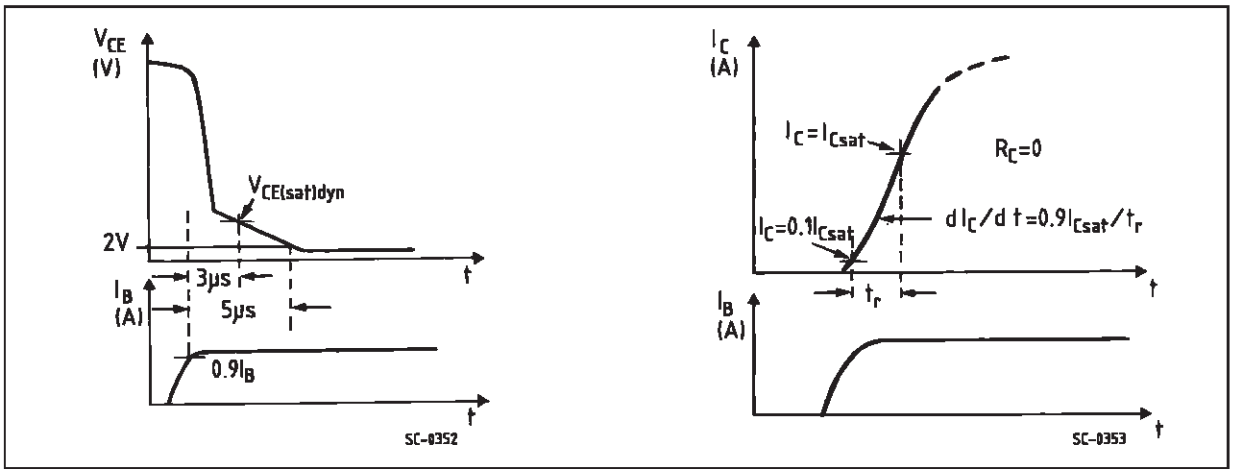


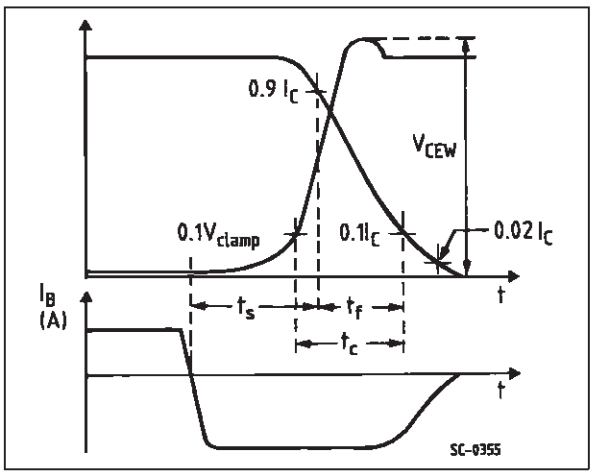
Figure 1: Inductive Load Switching Test Circuit.



Turn-on Switching Test Waveforms.

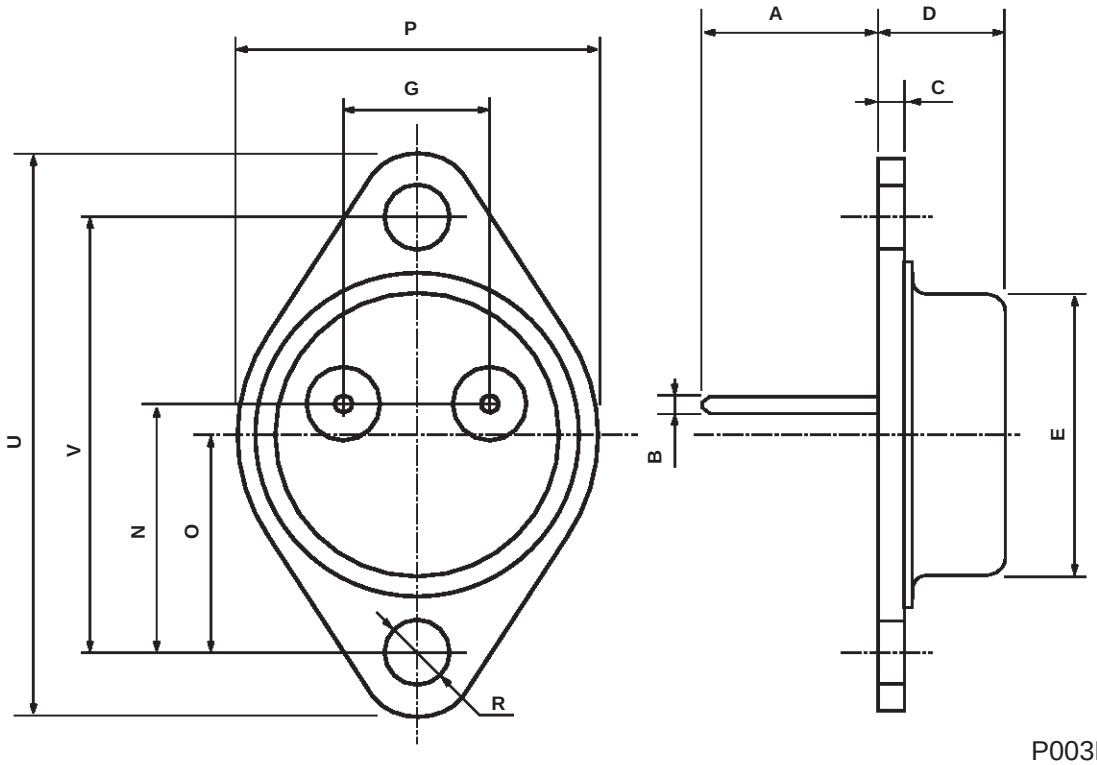


Turn-off Switching Test Waveforms (inductive load).



TO-3 (version R) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		11.7			0.460	
B	0.96		1.10	0.037		0.043
C			1.70			0.066
D			8.7			0.342
E			20.0			0.787
G		10.9			0.429	
N		16.9			0.665	
P			26.2			1.031
R	3.88		4.09	0.152		0.161
U			39.50			1.555
V		30.10			1.185	



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