



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

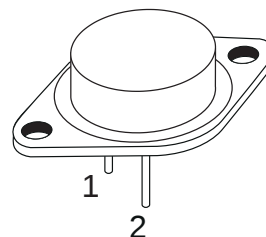
APPLICATIONS:

- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

DESCRIPTION

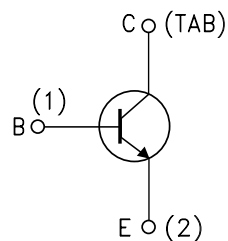
The BUF420M is manufactured using High Voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capacity. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

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-case}	Thermal Resistance Junction-Case	Max	0.63	°C/W
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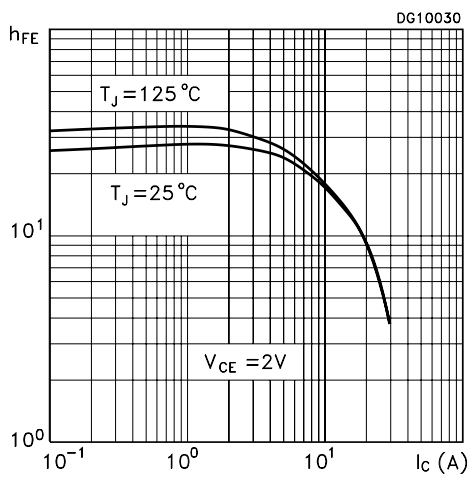
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

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 = 10 A 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 = 10 A 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

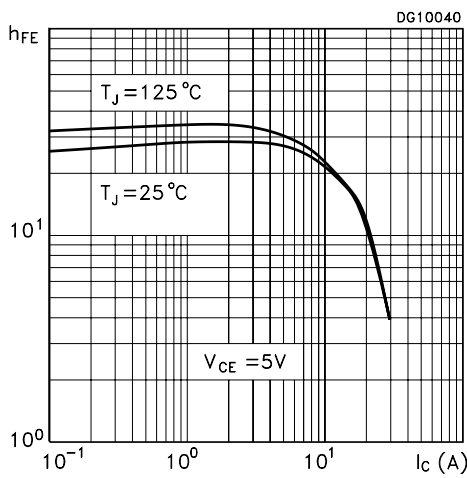
ELECTRICAL CHARACTERISTICS (continued)

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

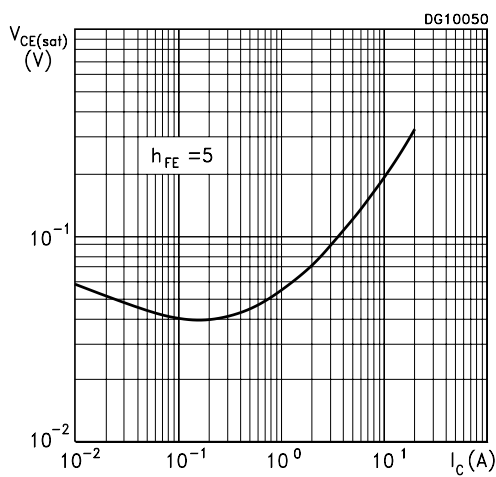
DC Current Gain



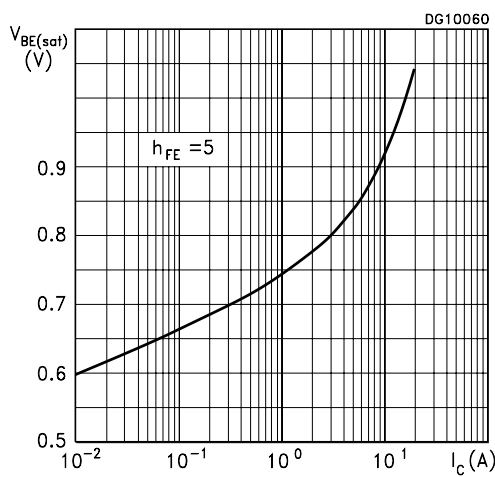
DC Current Gain



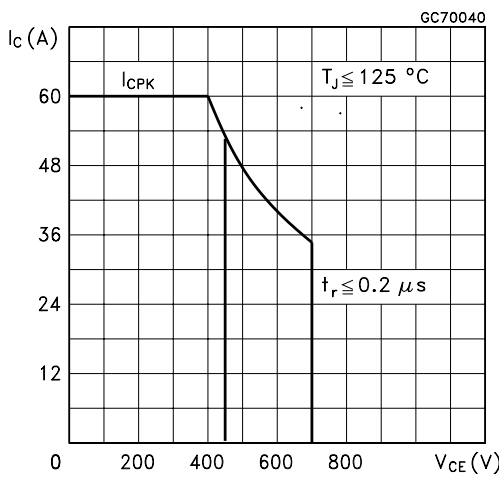
Collector Emitter Saturation Voltage



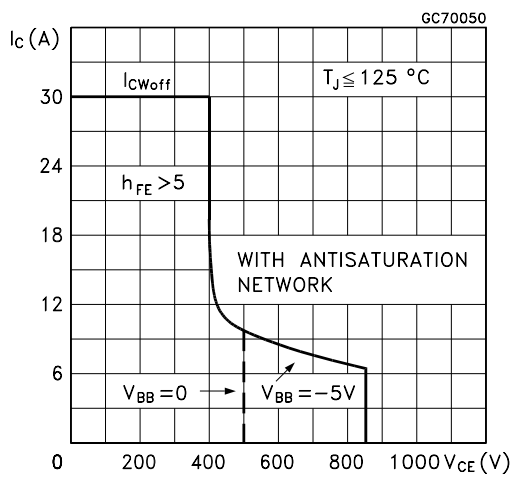
Base Emitter Saturation Voltage



Forward Biased Safe Operating Area



Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.

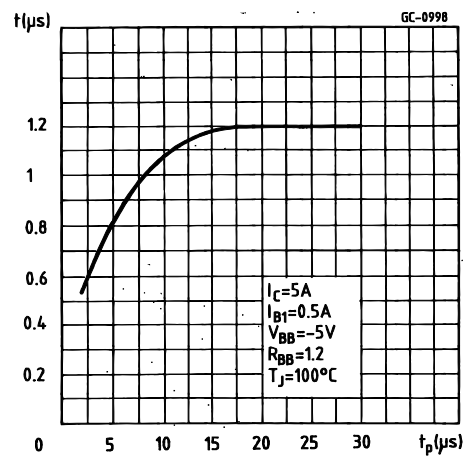
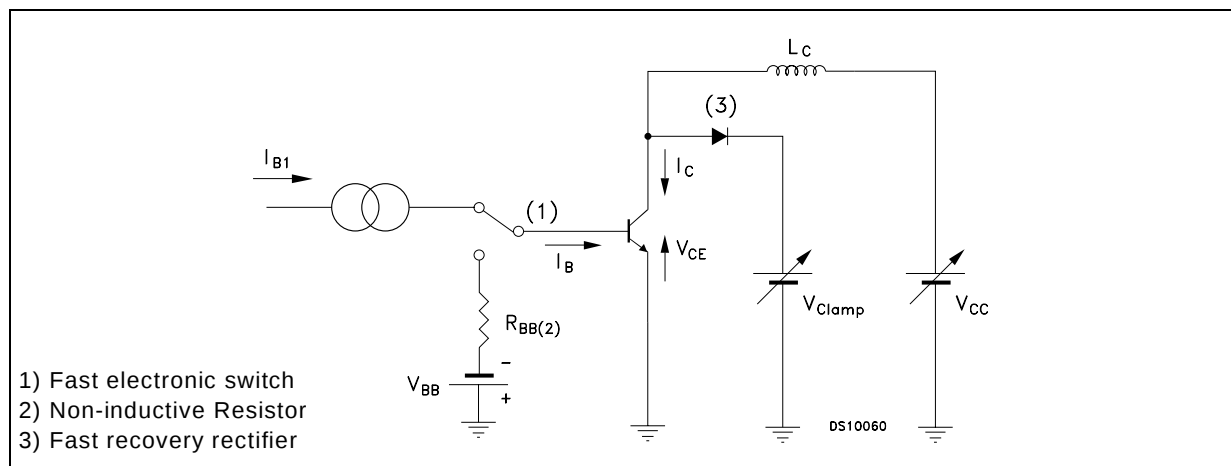
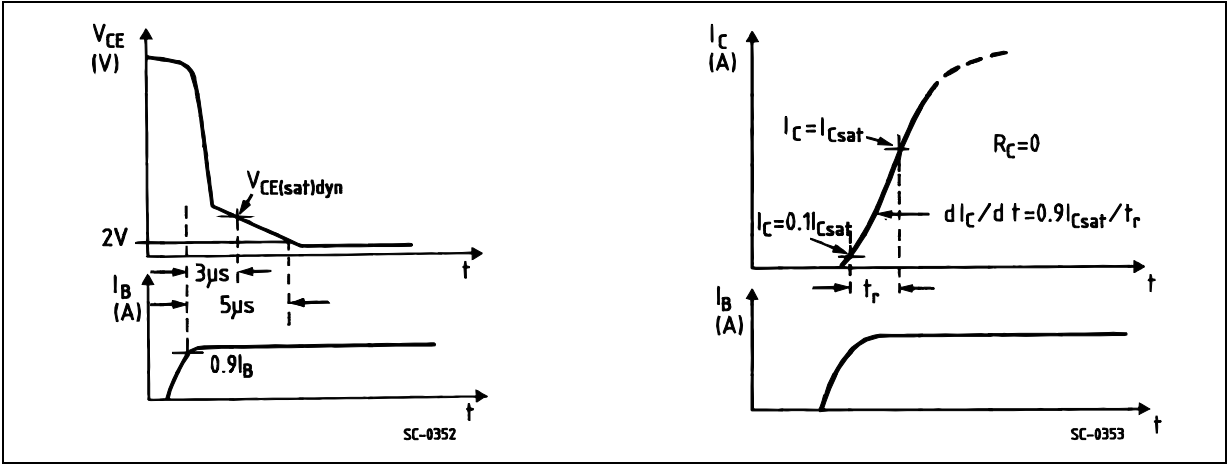


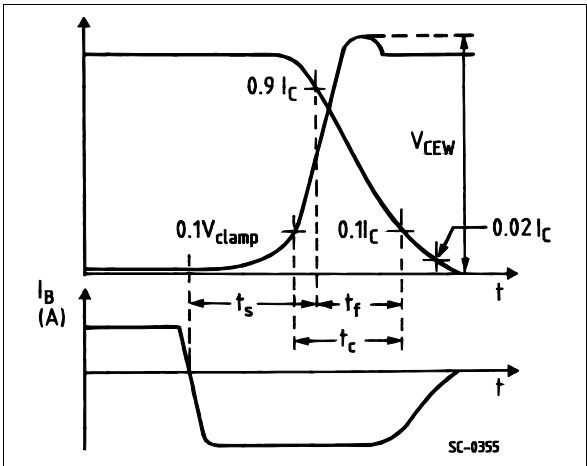
Figure 1: Inductive Load Switching Test Circuit.



Turn-on Switching Test Waveforms.

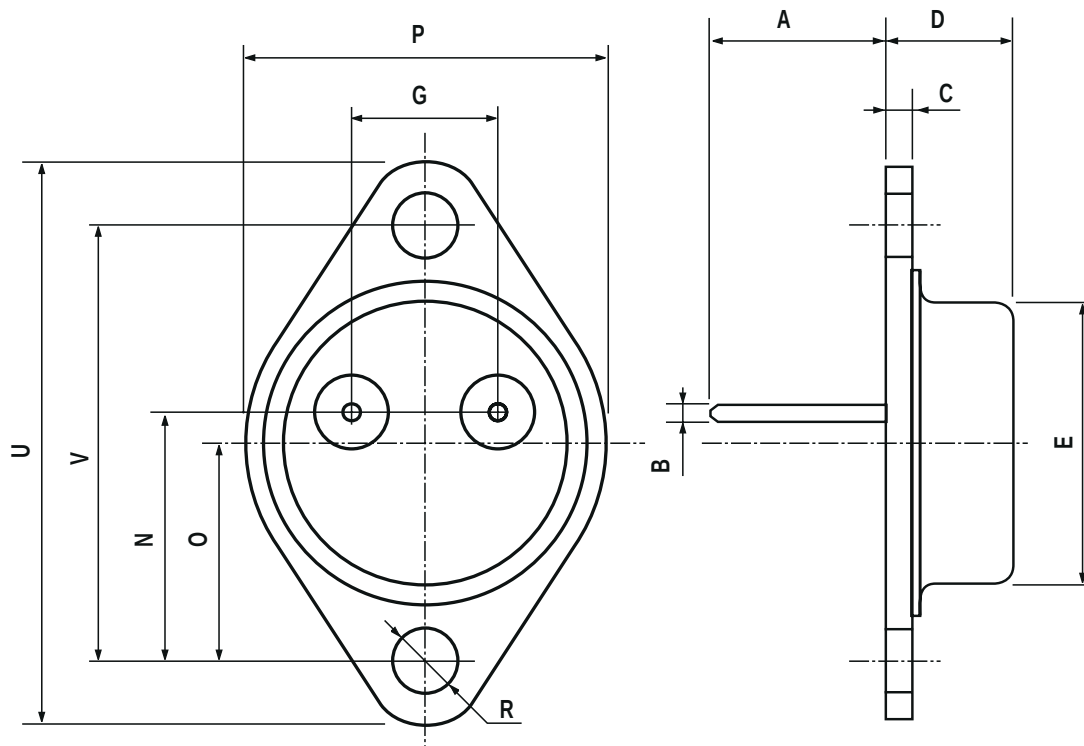


Turn-off Switching Test Waveforms (inductive load).



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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