



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

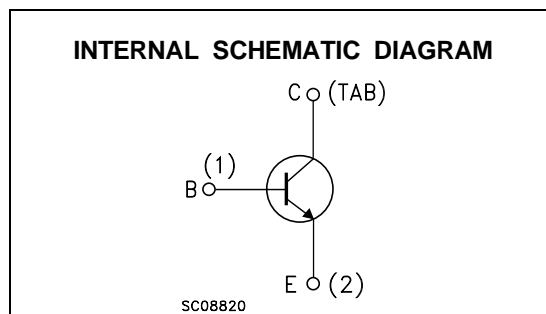
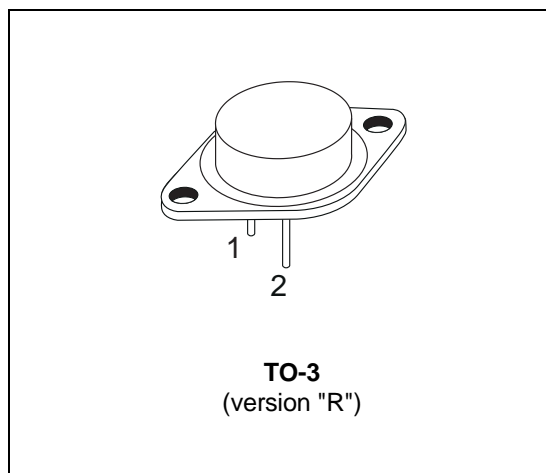
APPLICATIONS:

- 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.



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

BUF420M

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-Case	Max	0.63	$^{\circ}\text{C}/\text{W}$
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ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

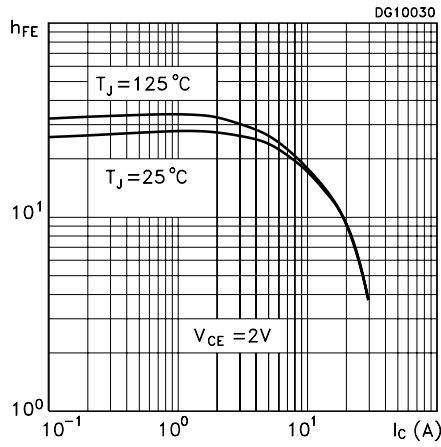
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER}	Collector Cut-off Current ($R_{BE} = 5 \Omega$)	$V_{CE} = 850 \text{ V}$ $V_{CE} = 850 \text{ V}$ $T_C = 100^{\circ}\text{C}$			0.2 1	mA mA
I_{CEV}	Collector Cut-off Current ($V_{BE} = -1.5\text{V}$)	$V_{CE} = 850 \text{ V}$ $V_{CE} = 850 \text{ V}$ $T_C = 100^{\circ}\text{C}$			0.2 1	mA mA
I_{EBO}	Emitter Cut-off Current ($I_C = 0$)	$V_{EB} = 5 \text{ V}$			1	mA
$V_{CEO(sus)*}$	Collector-Emitter Sustaining Voltage ($I_B = 0$)	$I_C = 200 \text{ mA}$ $L = 25 \text{ mH}$	450			V
V_{EBO}	Emitter Base Voltage ($I_C = 0$)	$I_E = 50 \text{ mA}$	7			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ A}$ $I_B = 1 \text{ A}$ $I_C = 10 \text{ A}$ $I_B = 1 \text{ A}$ $T_C = 100^{\circ}\text{C}$ $I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $T_C = 100^{\circ}\text{C}$		0.8 0.5	2.8 2	V V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 10 \text{ A}$ $I_B = 1 \text{ A}$ $I_C = 10 \text{ A}$ $I_B = 1 \text{ A}$ $T_C = 100^{\circ}\text{C}$ $I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $T_C = 100^{\circ}\text{C}$		0.9 1.1	1.5 1.5	V V V V
di_c/dt	Rate of rise on-state Collector Current	$V_{CC} = 300 \text{ V}$ $R_C = 0$ $t_p = 3 \mu\text{s}$ $I_{B1} = 1.5 \text{ A}$ $T_C = 25^{\circ}\text{C}$ $I_{B1} = 1.5 \text{ A}$ $T_C = 100^{\circ}\text{C}$ $I_{B1} = 6 \text{ A}$ $T_C = 100^{\circ}\text{C}$	70 150	100		A/ μs A/ μs A/ μs
$V_{CE(3\mu\text{s})}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 \text{ V}$ $R_C = 60 \Omega$ $I_{B1} = 1.5 \text{ A}$ $T_C = 25^{\circ}\text{C}$ $I_{B1} = 1.5 \text{ A}$ $T_C = 100^{\circ}\text{C}$		2.1	8	V V
$V_{CE(5\mu\text{s})}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 \text{ V}$ $R_C = 60 \Omega$ $I_{B1} = 1.5 \text{ A}$ $T_C = 25^{\circ}\text{C}$ $I_{B1} = 1.5 \text{ A}$ $T_C = 100^{\circ}\text{C}$		1.1	4	V V
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10 \text{ A}$ $V_{CC} = 50 \text{ V}$ $V_{BB} = -5 \text{ V}$ $R_{BB} = 0.6 \Omega$ $V_{clamp} = 400 \text{ V}$ $I_{B1} = 1 \text{ A}$ $L = 0.25 \text{ mH}$		1 0.05 0.08		μs μs μs
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10 \text{ A}$ $V_{CC} = 50 \text{ V}$ $V_{BB} = -5 \text{ V}$ $R_{BB} = 0.6 \Omega$ $V_{clamp} = 400 \text{ V}$ $I_{B1} = 1 \text{ A}$ $L = 0.25 \text{ mH}$ $T_C = 100^{\circ}\text{C}$			2 0.1 0.18	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_C = 10 \text{ A}$ $V_{CC} = 50 \text{ V}$ $V_{BB} = -5 \text{ V}$ $R_{BB} = 0.6 \Omega$ $I_{B1} = 1 \text{ A}$ $L = 0.25 \text{ mH}$ $T_C = 125^{\circ}\text{C}$	500			V
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10 \text{ A}$ $V_{CC} = 50 \text{ V}$ $V_{BB} = 0$ $R_{BB} = 0.15 \Omega$ $V_{clamp} = 400 \text{ V}$ $I_{B1} = 1 \text{ A}$ $L = 0.25 \text{ mH}$		1.5 0.04 0.07		μs μs μs

ELECTRICAL CHARACTERISTICS (continued)

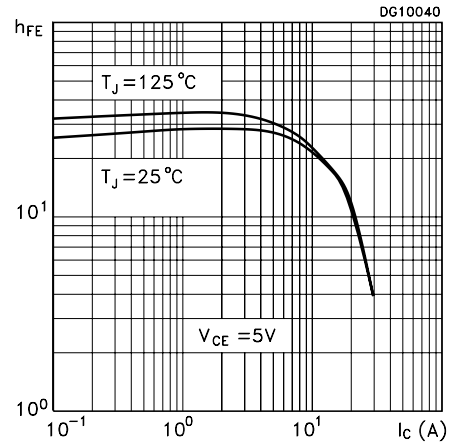
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10\text{ A}$ $V_{BB} = 0$ $V_{clamp} = 400\text{ V}$ $L = 0.25\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 0.15\ \Omega$ $I_{B1} = 1\text{ A}$ $T_C = 100^\circ\text{C}$			3 0.15 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

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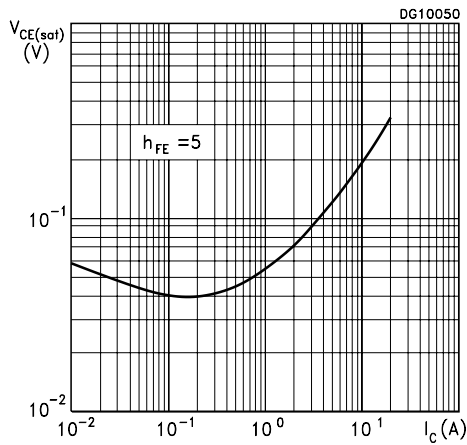
DC Current Gain



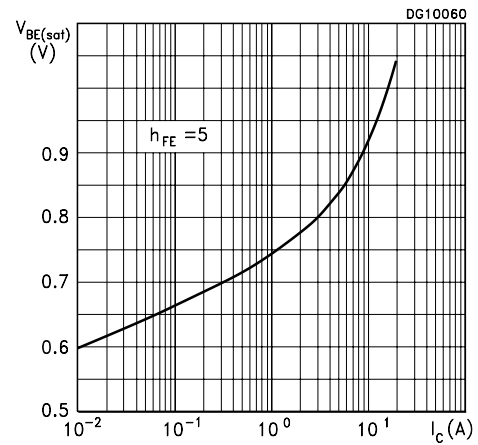
DC Current Gain



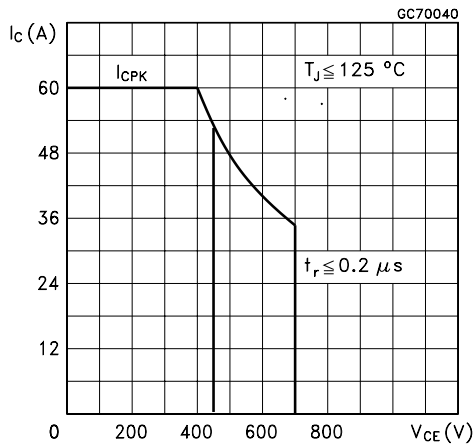
Collector Emitter Saturation Voltage



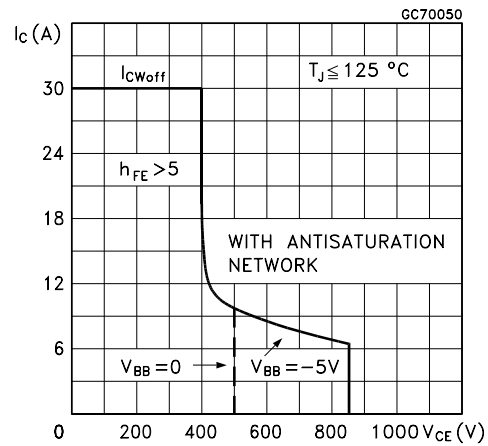
Base Emitter Saturation Voltage



Forward Biased Safe Operating Area



Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.

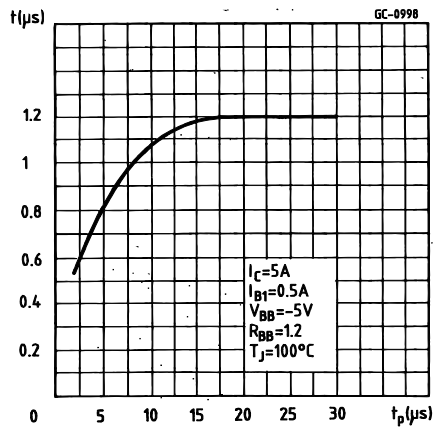
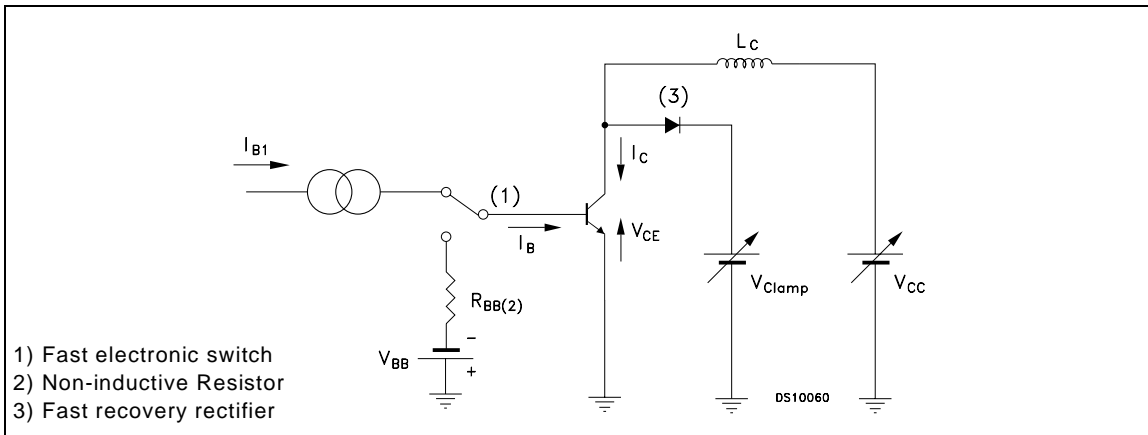
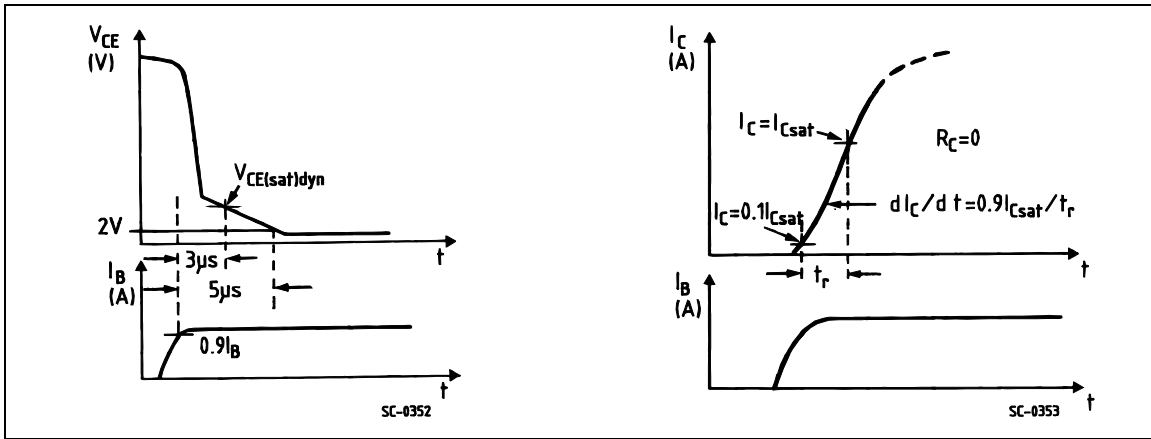


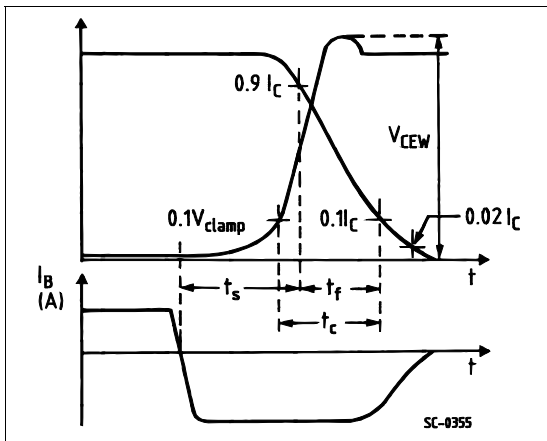
Figure 1: Inductive Load Switching Test Circuit.



Turn-on Switching Test Waveforms.

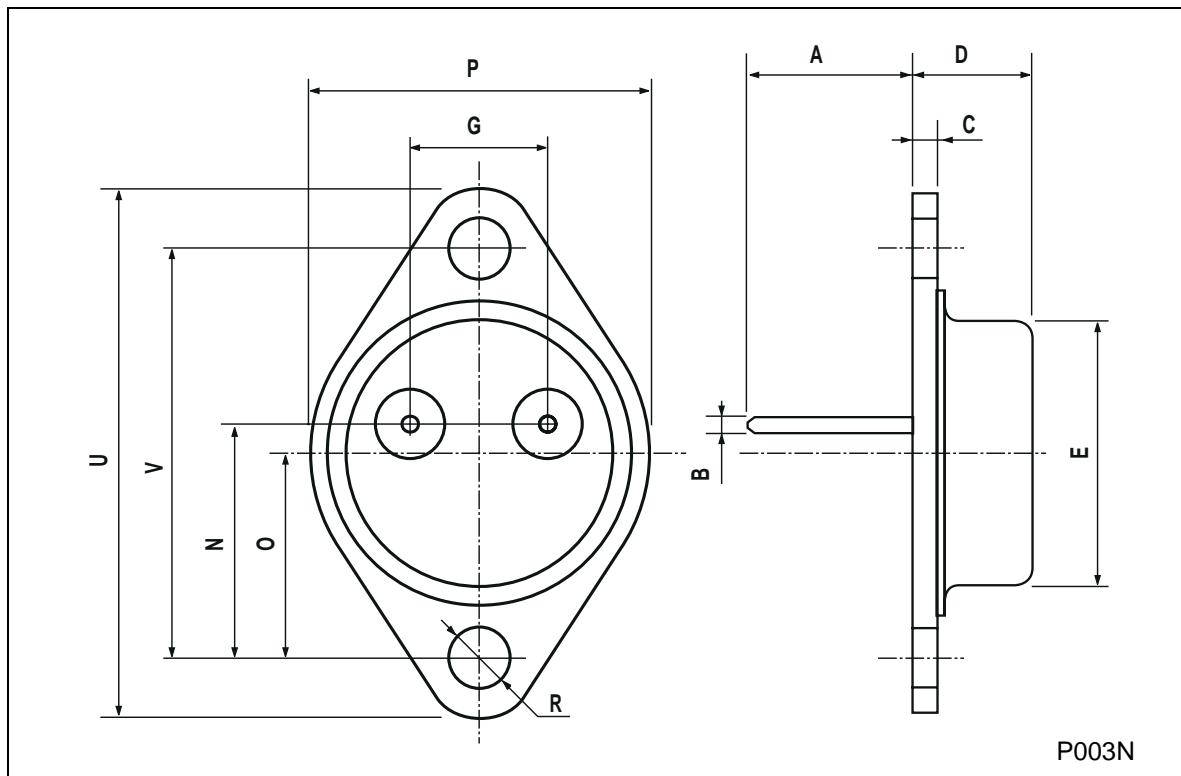


Turn-off Switching Test Waveforms (inductive load).



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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