



## BUF420AW

### 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

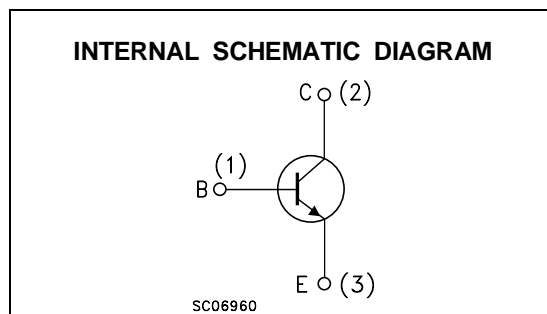
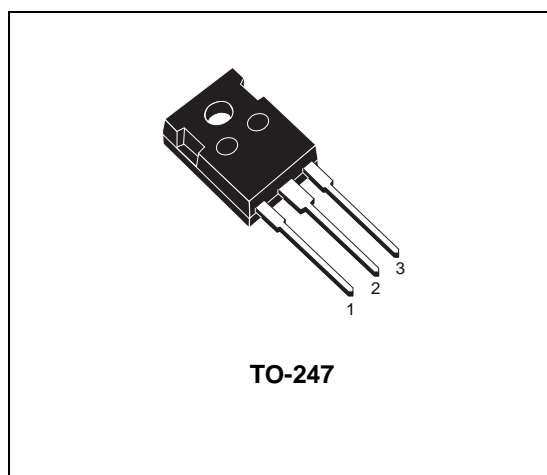
#### APPLICATIONS:

- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

#### DESCRIPTION

The BUF420AW 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 ( $V_{BE} = -1.5V$ )	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	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	200	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C

## BUF420AW

### THERMAL DATA

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

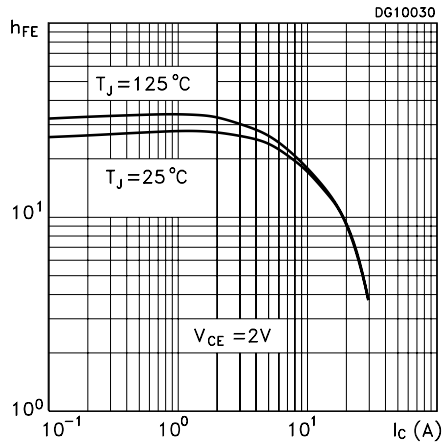
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CER}$	Collector Cut-off Current ( $R_{BE} = 5\ \Omega$ )	$V_{CE} = 1000\text{ V}$ $V_{CE} = 1000\text{ V}$ $T_C = 100\text{ °C}$			0.2 1	mA mA
$I_{CEV}$	Collector Cut-off Current ( $V_{BE} = -1.5\text{ V}$ )	$V_{CE} = 1000\text{ V}$ $V_{CE} = 1000\text{ V}$ $T_C = 100\text{ °C}$			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	$I_C = 10\text{ A}$ $I_B = 1\text{ A}$ $I_C = 10\text{ A}$ $I_B = 1\text{ A}$ $T_C = 100\text{ °C}$ $I_C = 20\text{ A}$ $I_B = 4\text{ A}$ $I_C = 20\text{ A}$ $I_B = 4\text{ A}$ $T_C = 100\text{ °C}$		0.8 0.5	2.8 2	V V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 10\text{ A}$ $I_B = 1\text{ A}$ $I_C = 10\text{ A}$ $I_B = 1\text{ A}$ $T_C = 100\text{ °C}$ $I_C = 20\text{ A}$ $I_B = 4\text{ A}$ $I_C = 20\text{ A}$ $I_B = 4\text{ A}$ $T_C = 100\text{ °C}$		0.9 1.1	1.5 1.5	V V V V
$di_C/dt$	Rate of rise on-state Collector Current	$V_{CC} = 300\text{ V}$ $R_C = 0$ $t_p = 3\ \mu\text{s}$ $I_{B1} = 1.5\text{ A}$ $T_C = 25\text{ °C}$ $I_{B1} = 1.5\text{ A}$ $T_C = 100\text{ °C}$ $I_{B1} = 6\text{ A}$ $T_C = 100\text{ °C}$	70 150	100		A/ $\mu\text{s}$ A/ $\mu\text{s}$ A/ $\mu\text{s}$
$V_{CE(3\mu\text{s})}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300\text{ V}$ $R_C = 60\ \Omega$ $I_{B1} = 1.5\text{ A}$ $T_C = 25\text{ °C}$ $I_{B1} = 1.5\text{ A}$ $T_C = 100\text{ °C}$		2.1	8	V V
$V_{CE(5\mu\text{s})}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300\text{ V}$ $R_C = 60\ \Omega$ $I_{B1} = 1.5\text{ A}$ $T_C = 25\text{ °C}$ $I_{B1} = 1.5\text{ A}$ $T_C = 100\text{ °C}$		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		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_s$ $t_f$ $t_c$	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10\text{ A}$ $V_{CC} = 50\text{ V}$ $V_{BB} = -5\text{ V}$ $R_{BB} = 0.6\ \Omega$ $V_{clamp} = 400\text{ V}$ $I_{B1} = 1\text{ A}$ $L = 0.25\text{ mH}$ $T_C = 100\text{ °C}$			2 0.1 0.18	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$V_{CEW}$	Maximum Collector Emitter Voltage without Snubber	$I_C = 10\text{ A}$ $V_{CC} = 50\text{ V}$ $V_{BB} = -5\text{ V}$ $R_{BB} = 0.6\ \Omega$ $I_{B1} = 1\text{ A}$ $L = 0.25\text{ mH}$ $T_C = 125\text{ °C}$	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		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$

**ELECTRICAL CHARACTERISTICS** (continued)

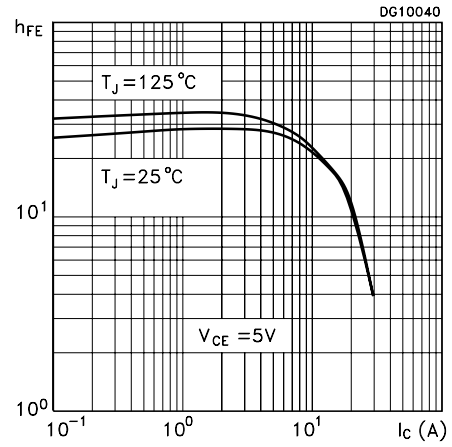
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$t_s$ $t_f$ $t_c$	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10\text{ A}$ $V_{BB} = 0$ $V_{clamp} = 400\text{ V}$ $L = 0.25\text{ mH}$	$V_{CC} = 50\text{ V}$ $R_{BB} = 0.15\ \Omega$ $I_{B1} = 1\text{ A}$ $T_C = 100^\circ\text{C}$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

# BUF420AW

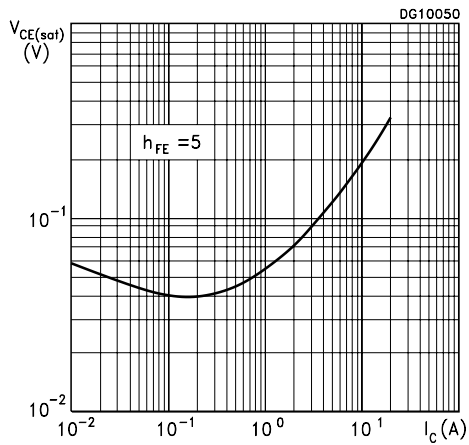
DC Current Gain



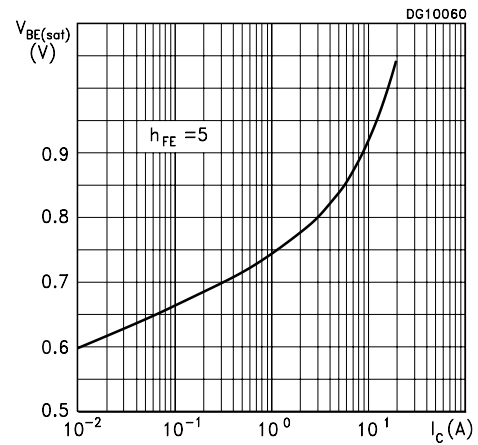
DC Current Gain



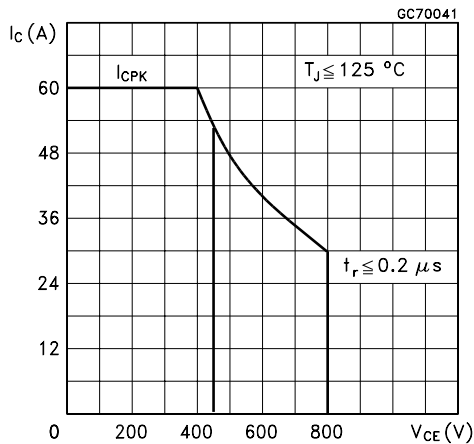
Collector Emitter Saturation Voltage



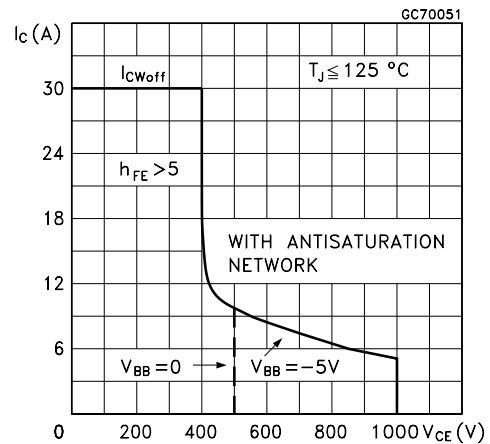
Base Emitter Saturation Voltage



Forward Biased Safe Operating Area



Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.

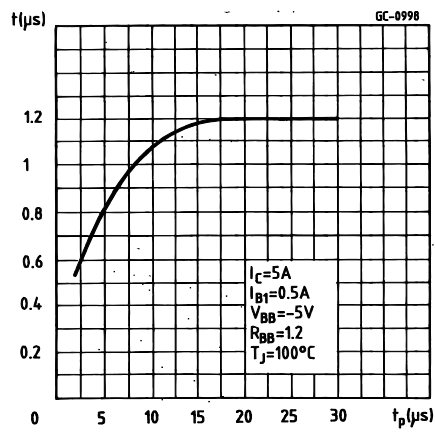
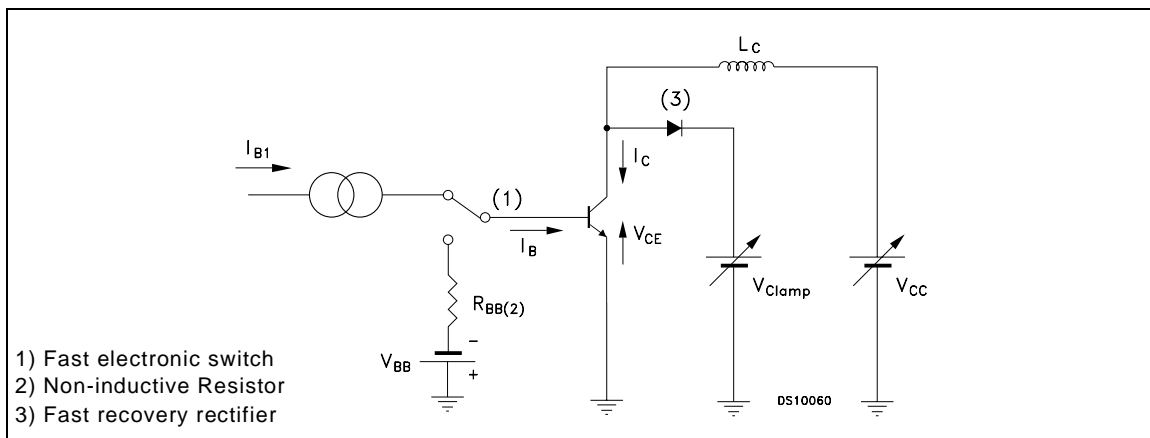
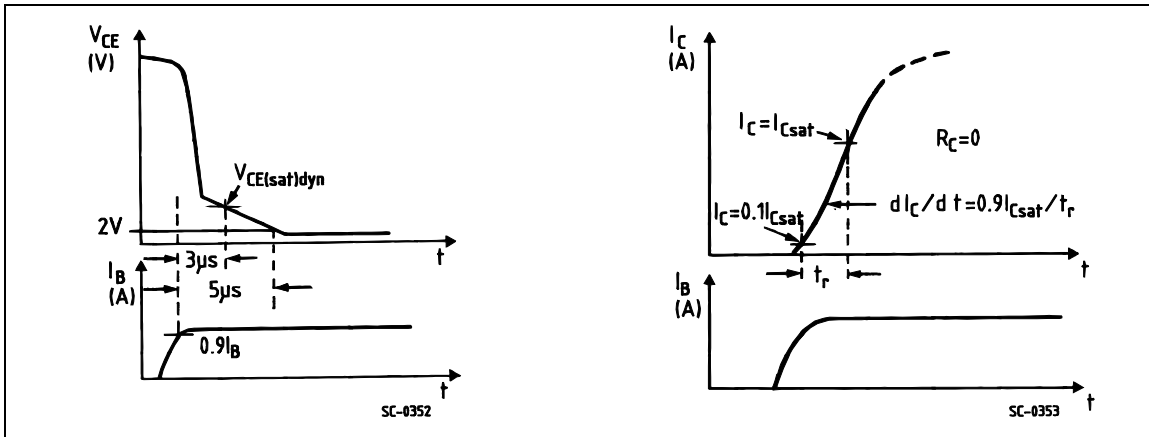


Figure 1: Inductive Load Switching Test Circuit.

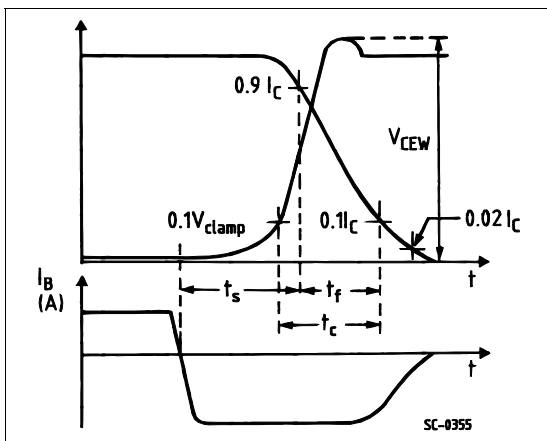


## BUF420AW

Turn-on Switching Test Waveforms.

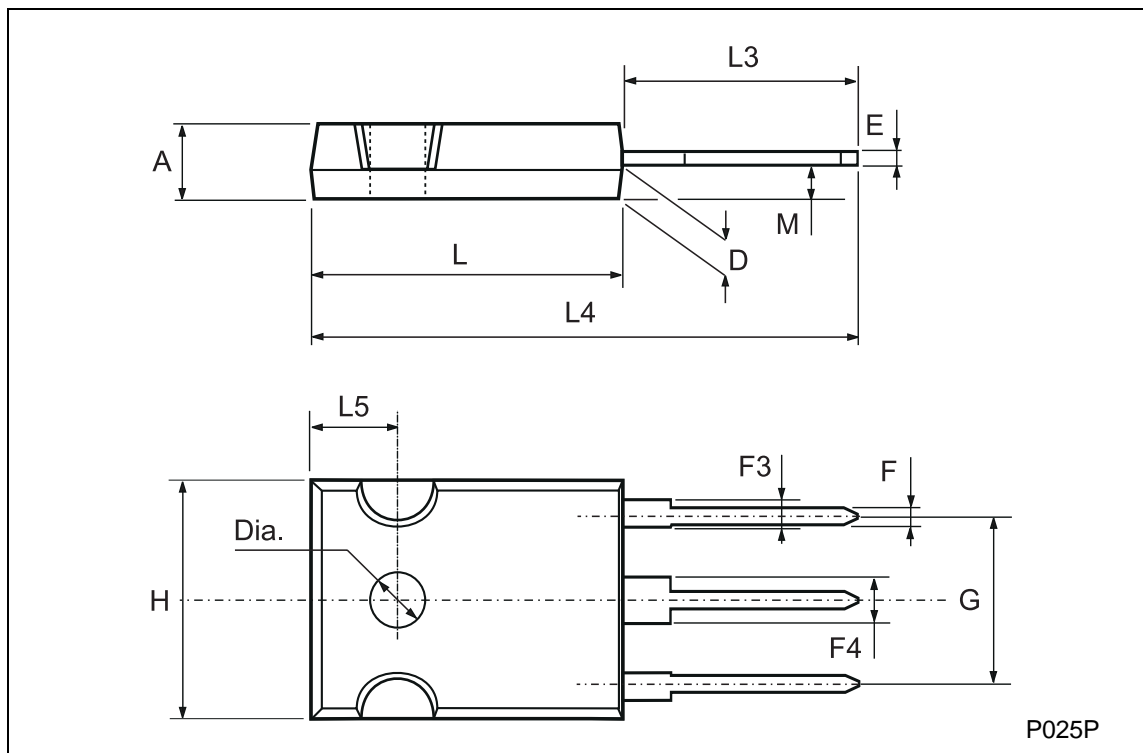


Turn-off Switching Test Waveforms  
(inductive load).



**TO-247 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
H	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559		0.582
L4		34.6			1.362	
L5		5.5			0.217	
M	2		3	0.079		0.118



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