

# **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

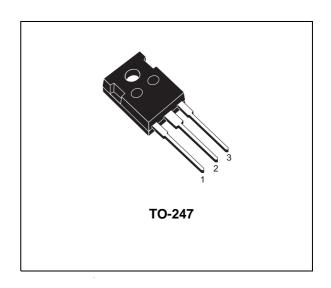
#### **APPLICATIONS:**

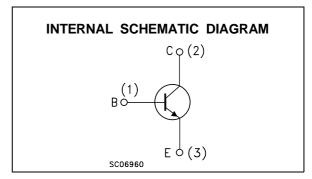
- SWITCH MODE POWER SUPPLIES
- MOTOR CONTROL

#### **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 <sub>CEV</sub>	Collector-Emitter Voltage (V <sub>BE</sub> = -1.5V)	1000	V
V <sub>CEO</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	450	V
V <sub>EBO</sub>	Emitter-Base Voltage (I <sub>C</sub> = 0)	7	V
Ic	Collector Current	30	А
I <sub>CM</sub>	Collector Peak Current (t <sub>p</sub> < 5 ms)	60	А
I <sub>B</sub>	Base Current	6	А
I <sub>BM</sub>	Base Peak Current (t <sub>p</sub> < 5 ms)	9	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	200	W
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
Tj	Max. Operating Junction Temperature	150	°C

March 2002 1/8

## THERMAL DATA

R <sub>thj-case</sub> Thermal Resistance Junction-Case	Max	0.63	°C/W	
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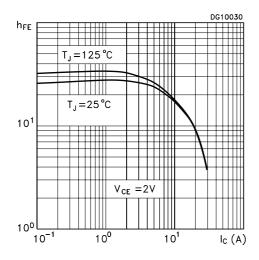
# **ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25$ $^{o}C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I <sub>CER</sub>	Collector Cut-off Current ( $R_{BE} = 5 \Omega$ )	V <sub>CE</sub> = 1000 V V <sub>CE</sub> = 1000 V T <sub>C</sub> = 100 °C			0.2 1	mA mA
I <sub>CEV</sub>	Collector Cut-off Current (V <sub>BE</sub> = -1.5V)	V <sub>CE</sub> = 1000 V V <sub>CE</sub> = 1000 V T <sub>C</sub> = 100 °C			0.2 1	mA mA
I <sub>EBO</sub>	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 5 V			1	mA
V <sub>CEO(sus)</sub> *	Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 200 mA L = 25 mH	450			V
V <sub>EBO</sub>	Emitter Base Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 50 mA	7			V
V <sub>CE(sat)</sub> *	Collector-Emitter Saturation Voltage			0.8	2.8	V V V
		$I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $T_C = 100^{\circ}\text{C}$			2	V
V <sub>BE(sat)</sub> *	Base-Emitter Saturation Voltage	$I_C = 10A$ $I_B = 1 A$ $I_C = 100 ^{\circ}C$		0.9	1.5	V
		$I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$ $I_C = 100^{\circ}\text{C}$		1.1	1.5	V
di <sub>c</sub> /dt	Rate of rise on-state Collector Current	$\begin{array}{llllllllllllllllllllllllllllllllllll$	70 150	100		A/μs A/μs A/μs
V <sub>CE</sub> (3μs)	Collector-Emitter Dynamic Voltage	$ \begin{array}{llllllllllllllllllllllllllllllllllll$		2.1	8	V
V <sub>CE</sub> (5μs)	Collector-Emitter Dynamic Voltage	$ \begin{array}{llllllllllllllllllllllllllllllllllll$		1.1	4	V
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$\begin{array}{lll} I_{C} = 10 \; A & & V_{CC} = 50 \; V \\ V_{BB} = -5 \; V & & R_{BB} = 0.6 \; \; \Omega \\ V_{clamp} = 400 \; V & & I_{B1} = 1 \; A \\ L = 0.25 \; mH & & & \end{array}$		1 0.05 0.08		μs μs μs
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$\begin{array}{lll} I_{C} = 10 \; A & & V_{CC} = 50 \; V \\ V_{BB} = -5 \; V & & R_{BB} = 0.6 \; \Omega \\ V_{clamp} = 400 \; V & & I_{B1} = 1 \; A \\ L = 0.25 \; mH & & T_{C} = 100 ^{\circ} C \end{array}$			2 0.1 0.18	μs μs μs
V <sub>CEW</sub>	Maximum Collector Emitter Voltage without Snubber	$\begin{array}{lll} I_{C} = 10 \; A & & V_{CC} = 50 \; V \\ V_{BB} = -5 \; V & & R_{BB} = 0.6 \; \Omega \\ I_{B1} = 1 \; A & & L = 0.25 \; mH \\ T_{C} = 125 ^{\circ} C & & & \end{array}$	500			V
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$\begin{array}{ll} I_{C} = 10 \; A & V_{CC} = 50 \; V \\ V_{BB} = 0 & R_{BB} = 0.15 \; \Omega \\ V_{clamp} = 400 \; V & I_{B1} = 1 \; A \\ L = 0.25 \; mH & \end{array}$		1.5 0.04 0.07		μs μs μs

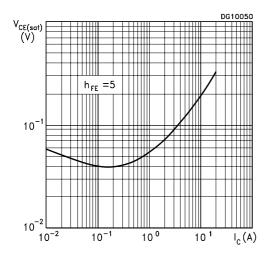
## **ELECTRICAL CHARACTERISTICS** (continued)

Symbol	Parameter	Test Conditions		Min.	Тур.	Max.	Unit
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	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 <sub>CEW</sub>	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 V $R_{BB}$ = 0.15 $\Omega$ L = 0.25 mH	500			V
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	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 V $R_{BB}$ =0.6 $\Omega$ $I_{B1}$ = 4 A		2.2 0.06 0.12		μs μs μs
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	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 <sub>CEW</sub>	Maximum Collector Emitter Voltage without Snubber	$I_{CWoff} = 30 \text{ A}$ $V_{BB} = -5 \text{ V}$ $L = 0.12 \text{ mH}$ $T_C = 125^{\circ}\text{C}$	$V_{CC} = 50 \text{ V}$ $R_{BB} = 0.6 \Omega$ $I_{B1} = 6 \text{ A}$	400			V

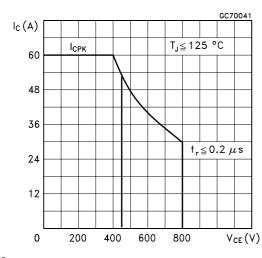
#### DC Current Gain



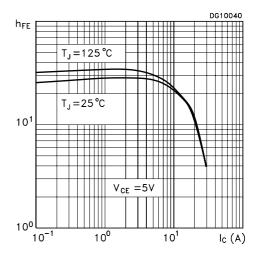
#### Collector Emitter Saturation Voltage



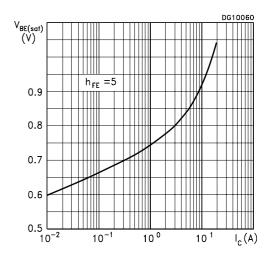
### Forward Biased Safe Operating Area



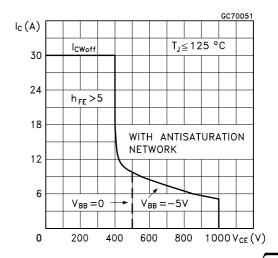
#### DC Current Gain



#### Base Emitter Saturation Voltage



#### Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.

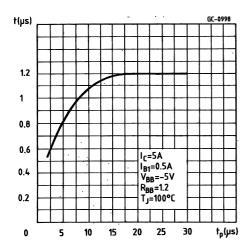
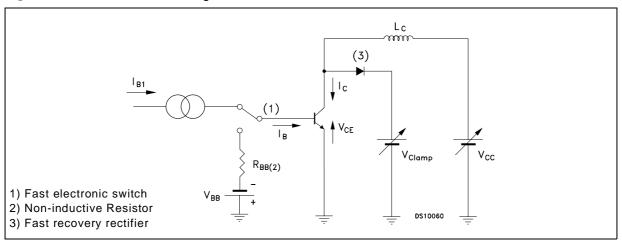
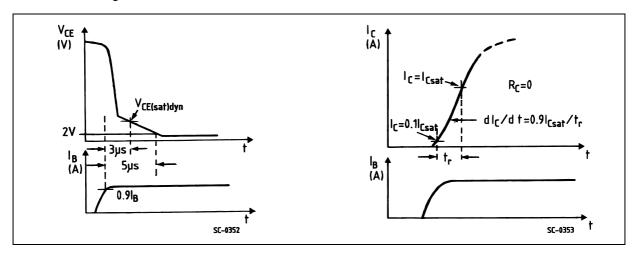


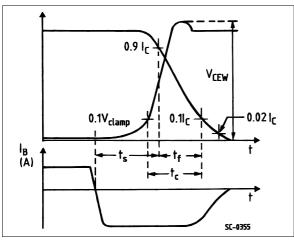
Figure 1: Inductive Load Switching Test Circuit.



Turn-on Switching Test Waveforms.

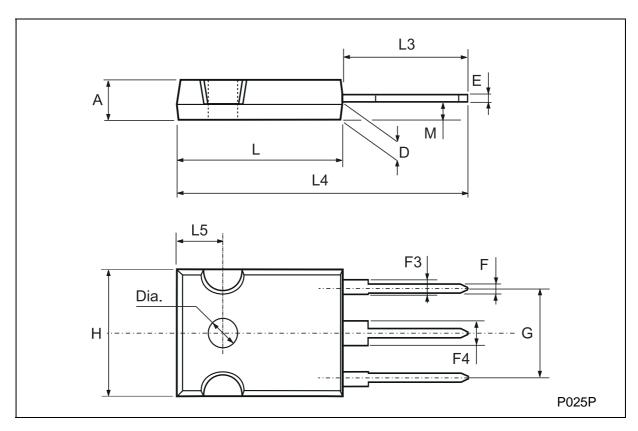


Turn-off Switching Test Waveforms (inductive load).



## **TO-247 MECHANICAL DATA**

DIM.	mm			inch			
Diwi.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
А	4.7		5.3	0.185		0.209	
D	2.2		2.6	0.087		0.102	
Е	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		
Н	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		
М	2		3	0.079		0.118	



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