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.

TO-247
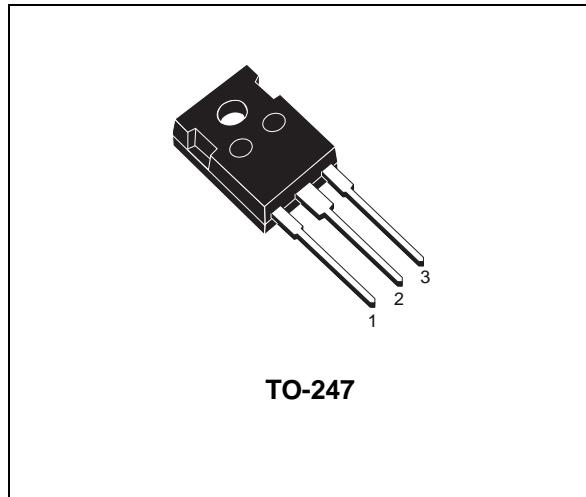
INTERNAL SCHEMATIC DIAGRAM

SC06960
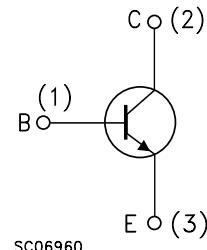
ABSOLUTE MAXIMUM RATINGS

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 ^{o}C	200	W
T_{stg}	Storage Temperature	-65 to 150	^{o}C
T_j	Max. Operating Junction Temperature	150	^{o}C

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-Case	Max	0.63	^{o}C/W

ELECTRICAL CHARACTERISTICS $(T_{case} = 25\ ^oC$ unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_{CER}	Collector Cut-off Current $(R_{BE} = 5\ \Omega)$	$V_{CE} = 1000\ V$ $V_{CE} = 1000\ V$	$T_C = 100\ ^oC$			0.2 1	mA mA
I_{CEV}	Collector Cut-off Current $(V_{BE} = -1.5V)$	$V_{CE} = 1000\ V$ $V_{CE} = 1000\ V$	$T_C = 100\ ^oC$			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	$I_C = 10A$ $\quad I_B = 1\ A$ $I_C = 10\ A$ $\quad I_B = 1\ A$ $\ T_C = 100^oC$ $I_C = 20\ A$ $\quad I_B = 4\ A$ $I_C = 20\ A$ $\quad I_B = 4\ A$ $\ T_C = 100^oC$			0.8 0.5	 2.8 2	V V V V
$V_{BE(sat)}*$	Base-Emitter Saturation Voltage	$I_C = 10A$ $\quad I_B = 1\ A$ $I_C = 10\ A$ $\quad I_B = 1\ A$ $\ T_C = 100^oC$ $I_C = 20\ A$ $\quad I_B = 4\ A$ $I_C = 20\ A$ $\quad I_B = 4\ A$ $\ T_C = 100^oC$			0.9 1.1	 1.5 1.5	V V V V
di_C/dt	Rate of rise on-state Collector Current	$V_{CC} = 300\ V$ $\ R_C = 0$ $\quad t_p = 3\ \mu s$ $I_{B1} = 1.5\ A$ $\ T_C = 25^oC$ $I_{B1} = 1.5\ A$ $\ T_C = 100^oC$ $I_{B1} = 6\ A$ $\quad T_C = 100^oC$		 70 150	100		 A/μs A/μs A/μs
$V_{CE}(3\mu s)$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300\ V$ $\qquad R_C = 60\ \Omega$ $I_{B1} = 1.5\ A$ $\qquad T_C = 25^oC$ $I_{B1} = 1.5\ A$ $\qquad T_C = 100^oC$			 2.1	 8	 V V
$V_{CE}(5\mu s)$	Collector-Emitter Dynamic Voltage	$V_{CC} = 300\ V$ $\qquad R_C = 60\ \Omega$ $I_{B1} = 1.5\ A$ $\qquad T_C = 25^oC$ $I_{B1} = 1.5\ A$ $\qquad T_C = 100^oC$			 1.1	 4	 V V
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10\ A$ $\qquad V_{CC} = 50\ V$ $V_{BB} = -5\ V$ $\qquad R_{BB} = 0.6\ \Omega$ $V_{clamp} = 400\ V$ $\quad I_{B1} = 1\ A$ $L = 0.25\ mH$			1 0.05 0.08		μs μs μs
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10\ A$ $\qquad V_{CC} = 50\ V$ $V_{BB} = -5\ V$ $\qquad R_{BB} = 0.6\ \Omega$ $V_{clamp} = 400\ V$ $\quad I_{B1} = 1\ A$ $L = 0.25\ mH$ $\qquad T_C = 100^oC$				2 0.1 0.18	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_C = 10\ A$ $\qquad V_{CC} = 50\ V$ $V_{BB} = -5\ V$ $\qquad R_{BB} = 0.6\ \Omega$ $I_{B1} = 1\ A$ $\qquad L = 0.25\ mH$ $T_C = 125^oC$		500			V
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 10\ A$ $\qquad V_{CC} = 50\ V$ $V_{BB} = 0$ $\qquad R_{BB} = 0.15\ \Omega$ $V_{clamp} = 400\ V$ $\quad I_{B1} = 1\ A$ $L = 0.25\ mH$			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	$I_C = 10$ A $V_{BB} = 0$ $V_{clamp} = 400$ V $L = 0.25$ mH	$V_{CC} = 50$ V $R_{BB} = 0.15$ Ω $I_{B1} = 1$ A $T_C = 100^o$C			3 0.15 0.25	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_C = 10$ A $V_{BB} = 0$ $I_{B1} = 1$ A $T_C = 125^o$C	$V_{CC} = 50$ V $R_{BB} = 0.15$ Ω $L = 0.25$ mH	500			V
t_s t_f t_c	INDUCTIVE LOAD Storage Time Fall Time Cross Over Time	$I_C = 20$ A $V_{BB} = -5$ V $V_{clamp} = 400$ V $L = 0.12$ mH	$V_{CC} = 50$ V $R_{BB} = 0.6$ Ω $I_{B1} = 4$ 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	$I_C = 20$ A $V_{BB} = -5$ V $V_{clamp} = 400$ V $L = 0.12$ mH	$V_{CC} = 50$ V $R_{BB} = 0.6$ Ω $I_{B1} = 4$ A $T_C = 125^o$C			3.5 0.12 0.3	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_{CWoff} = 30$ A $V_{BB} = -5$ V $L = 0.12$ mH $T_C = 125^o$C	$V_{CC} = 50$ V $R_{BB} = 0.6$ Ω $I_{B1} = 6$ A	400			V
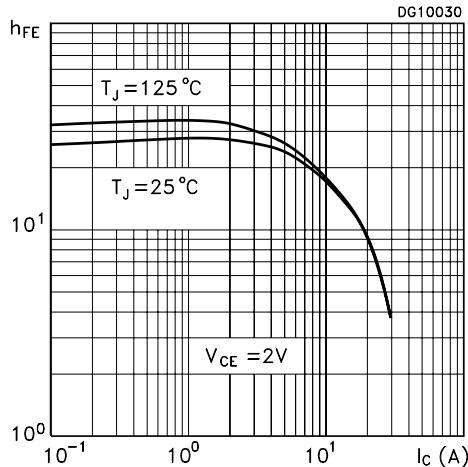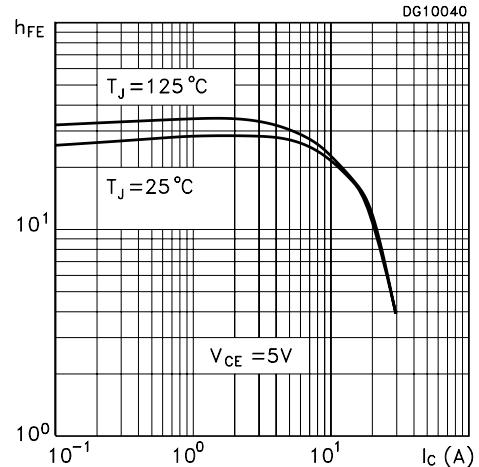
DC Current Gain

DG10030

hFE

$T_J = 125\,°C$

$T_J = 25\,°C$

10^1

$V_{CE} = 2V$

10^0

10^{-1} 10^0 10^1 I_C (A)

DC Current Gain

DG10040

hFE

$T_J = 125\,°C$

$T_J = 25\,°C$

10^1

$V_{CE} = 5V$

10^0

10^{-1} 10^0 10^1 I_C (A)

Collector Emitter Saturation Voltage

DG10050

$V_{CE(sat)}$ (V)

$h_{FE} = 5$

10^{-1}

10^{-2}

10^{-2} 10^{-1} 10^0 10^1 I_C (A)

Base Emitter Saturation Voltage

DG10060

$V_{BE(sat)}$ (V)

$h_{FE} = 5$

0.9

0.8

0.7

0.6

0.5

10^{-2} 10^{-1} 10^0 10^1 I_C (A)
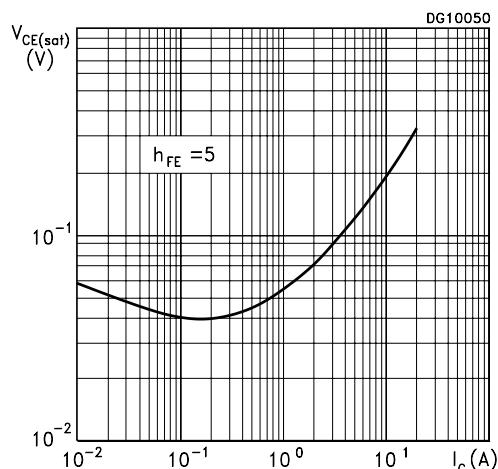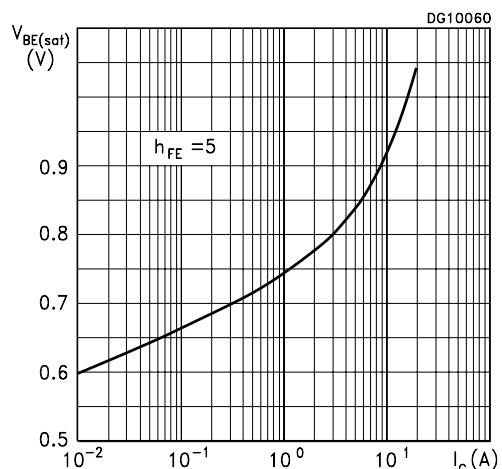
Forward Biased Safe Operating Area

GC70041

I_C (A)

I_{CPK} $T_J \leqq 125\,°C$

60

48

36

24

12

$t_r \leqq 0.2\,\mu s$

0   200   400   600   800 V_{CE} (V)
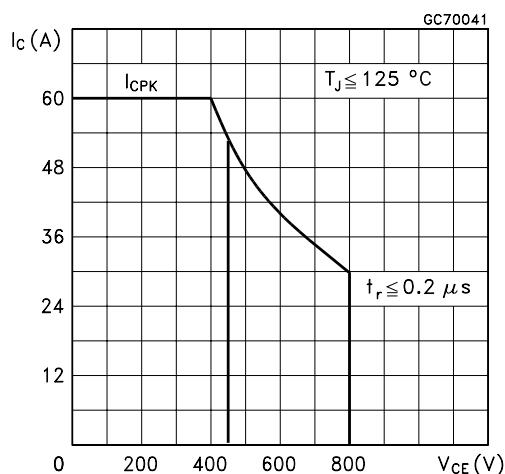
Reverse Biased Safe Operating Area

GC70051

I_C (A)

I_{CWoff} $T_J \leqq 125\,°C$

30

24

$h_{FE} > 5$

18

WITH ANTISATURATION NETWORK

12

6

$V_{BB} = 0$ $V_{BB} = -5V$

0   200   400   600   800   1000 V_{CE} (V)
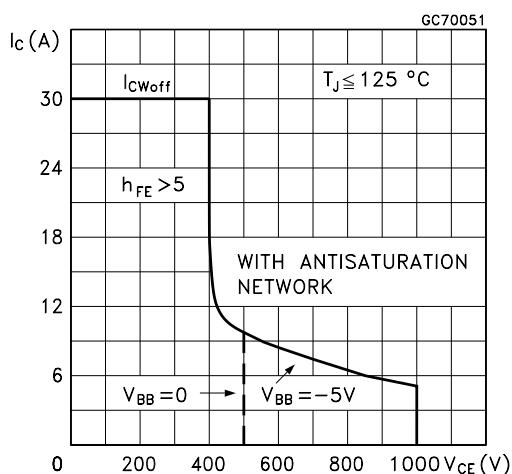
Storage Time Versus Pulse Time.
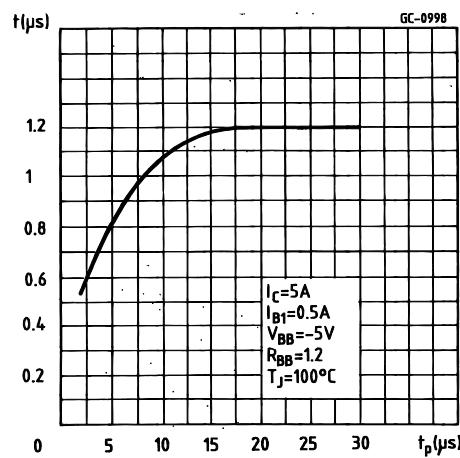
Figure 1: Inductive Load Switching Test Circuit.

1) Fast electronic switch
2) Non-inductive Resistor
3) Fast recovery rectifier
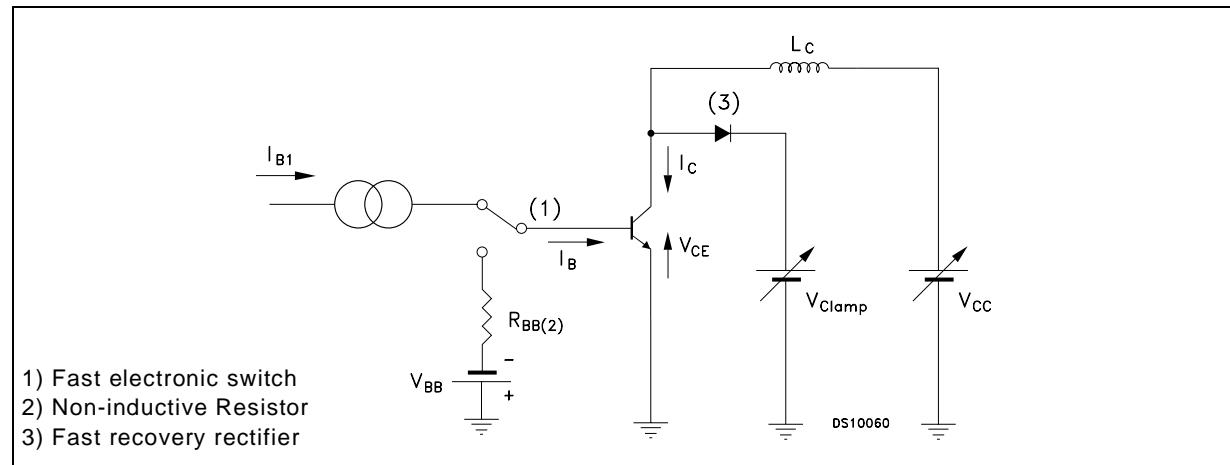
Turn-on Switching Test Waveforms.
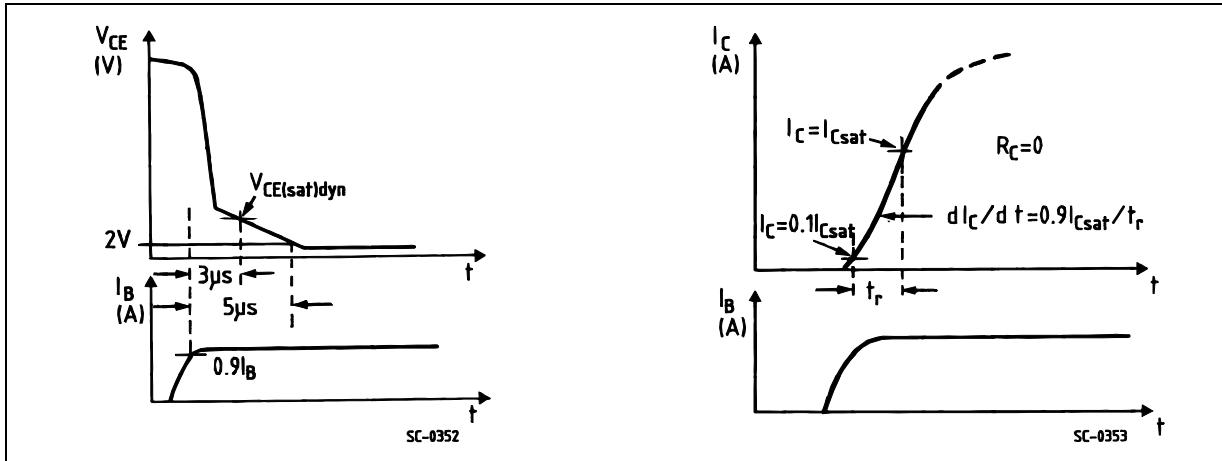
Turn-off Switching Test Waveforms
(inductive load).
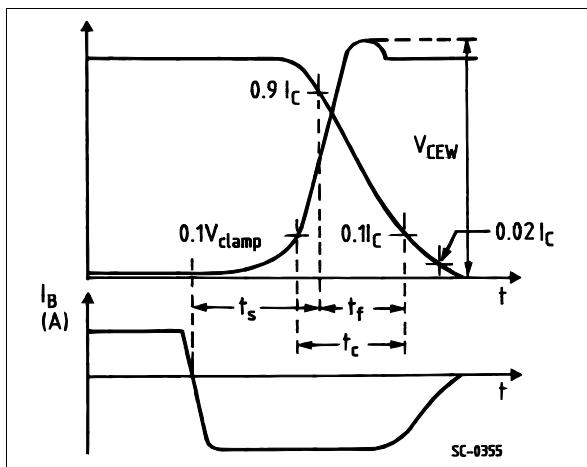
TO-247 MECHANICAL DATA

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

P025P