



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

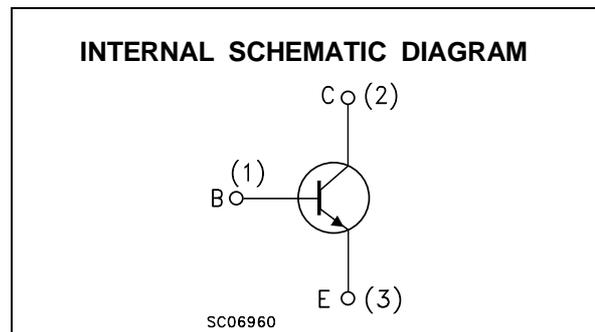
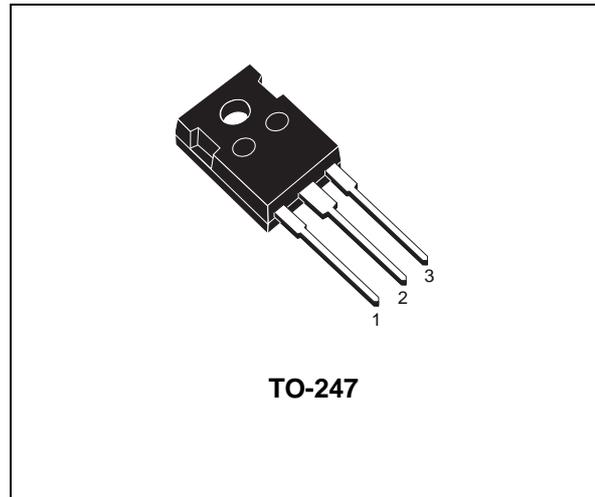
APPLICATIONS:

- 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 |
|-----------------------|----------------------------------|-----|------|------|

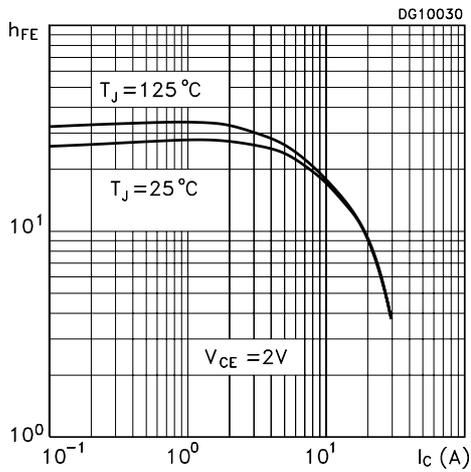
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--|--|--|-----------|---------------------|------------------|----------------------|
| I _{CEr} | Collector Cut-off Current (R _{BE} = 5 Ω) | V _{CE} = 1000 V V _{CE} = 1000 V T _C = 100 °C | | | 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 °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 _{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 |
| 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 |

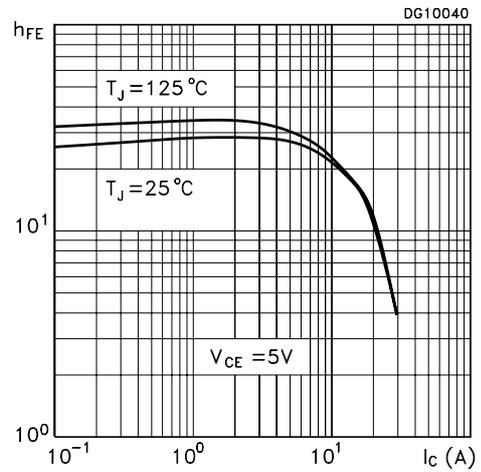
ELECTRICAL CHARACTERISTICS (continued)

| 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 |

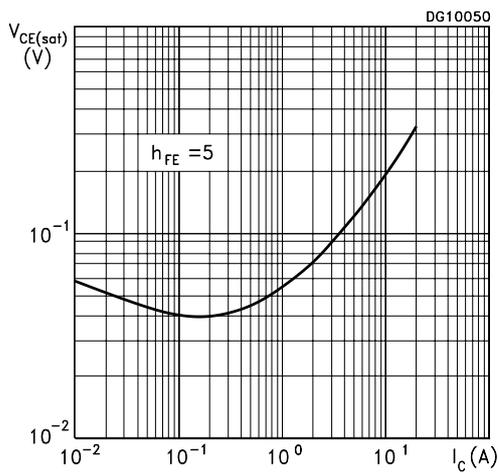
DC Current Gain



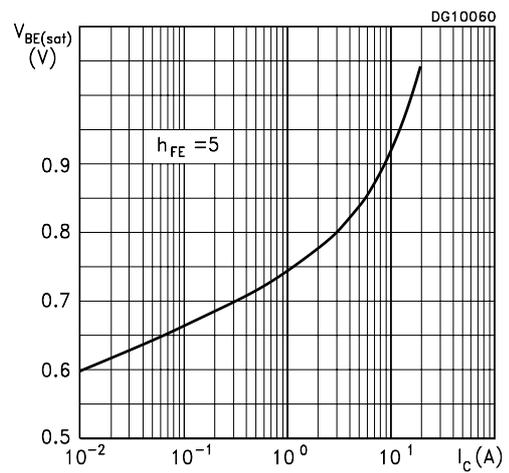
DC Current Gain



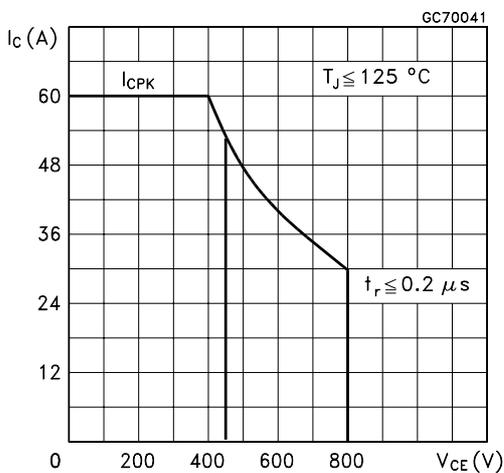
Collector Emitter Saturation Voltage



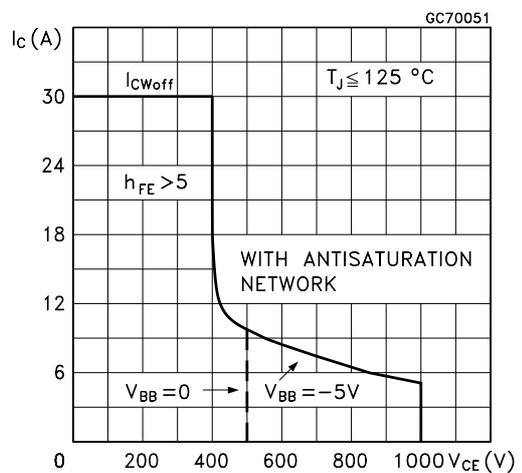
Base Emitter Saturation Voltage



Forward Biased Safe Operating Area



Reverse Biased Safe Operating Area



Storage Time Versus Pulse Time.

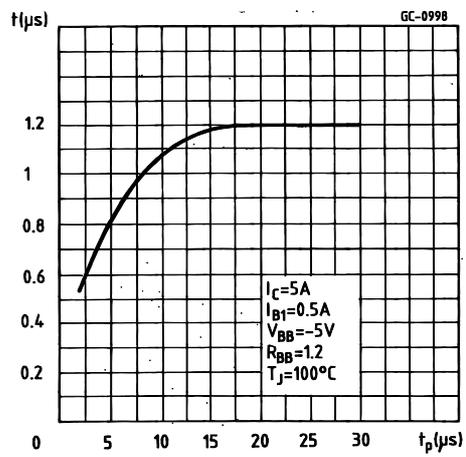
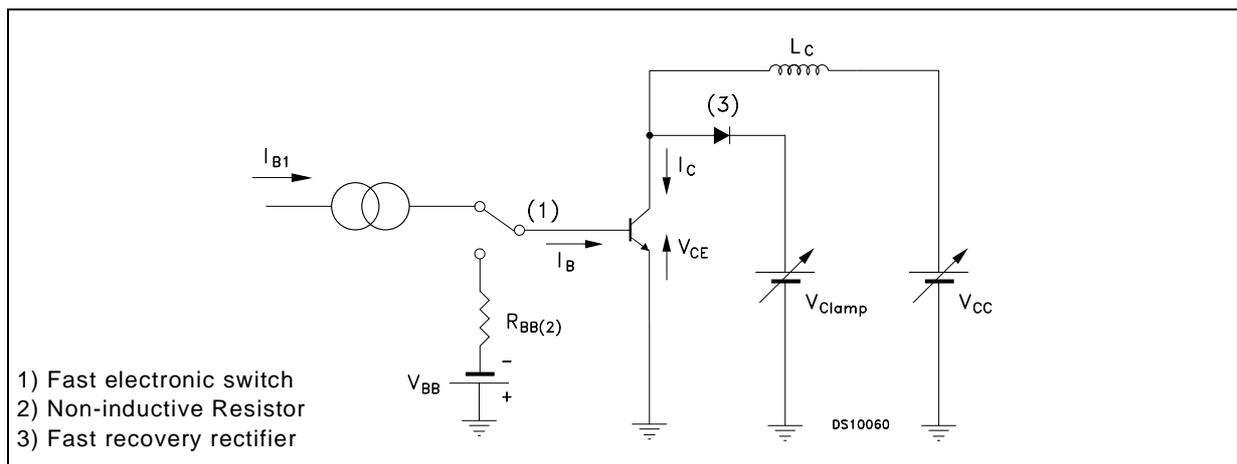
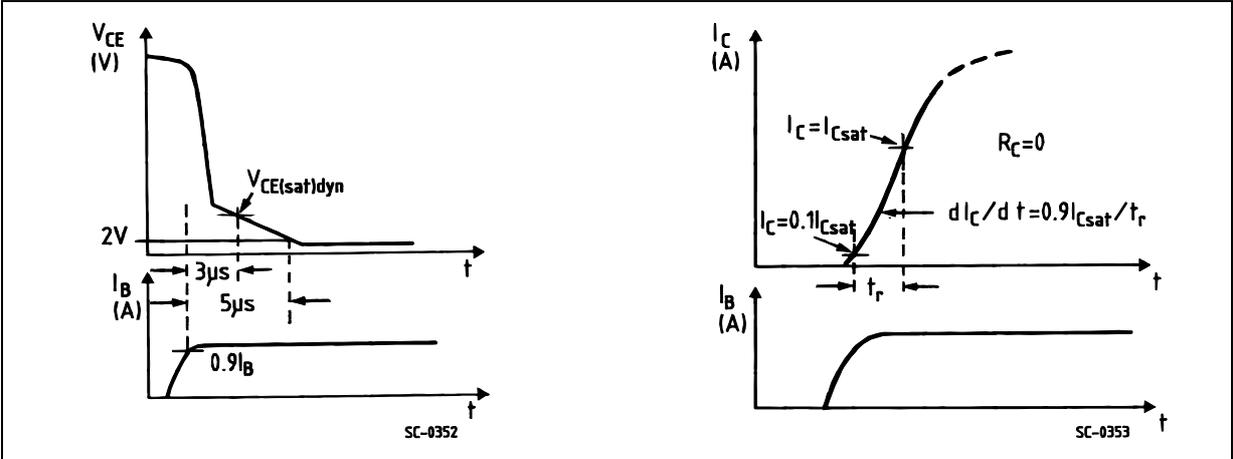


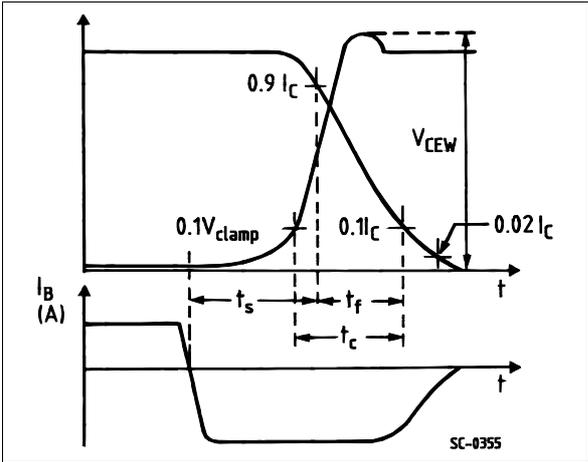
Figure 1: Inductive Load Switching Test Circuit.



Turn-on Switching Test Waveforms.

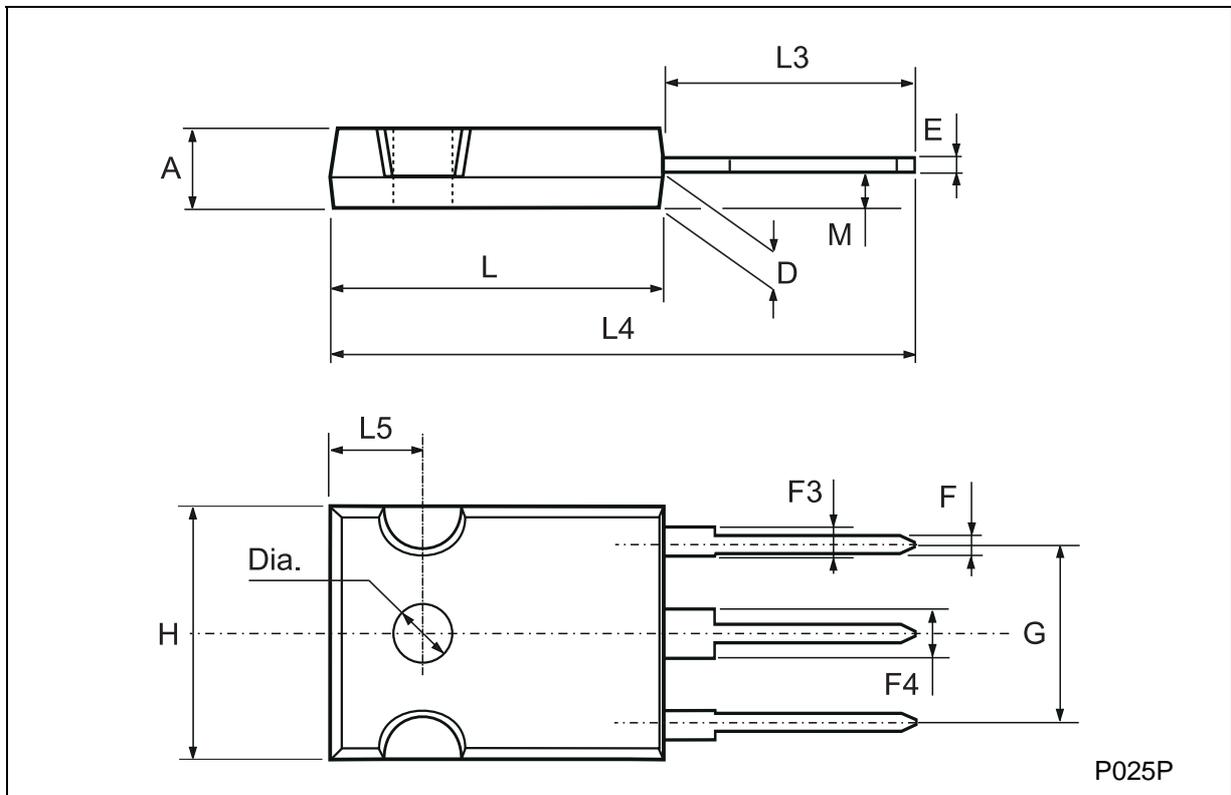


Turn-off Switching Test Waveforms (inductive load).



TO-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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