



# VB921ZVFI VB921ZVSP

## HIGH VOLTAGE IGNITION COIL DRIVER POWER I.C.

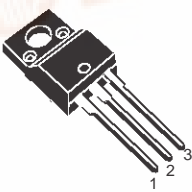
### ADVANCED DATA

| TYPE      | $V_{cl}$ | $I_{cl}$ | $V_{cg(sat)}$ |
|-----------|----------|----------|---------------|
| VB921ZVFI | 340V     | 7.5A     | 2.5V          |
| VB921ZVSP |          |          |               |

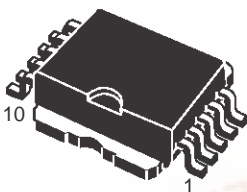
- NO EXTERNAL COMPONENT REQUIRED
- INTEGRATED HIGH VOLTAGE CLAMP
- COIL CURRENT LIMIT INTERNALLY SET
- HIGH RUGGEDNESS

### DESCRIPTION

The VB921ZVFI, VB921ZVSP is a monolithic high voltage integrated circuit made using the STMicroelectronics VIPower™ technology, which combines a vertical current flow power trilinear with a coil current limiting circuit and a collector voltage clamping. The device is particularly suitable for application in high performance electronic car ignition, where coil current limitation and voltage clamping are required.



**ISOWATT220**

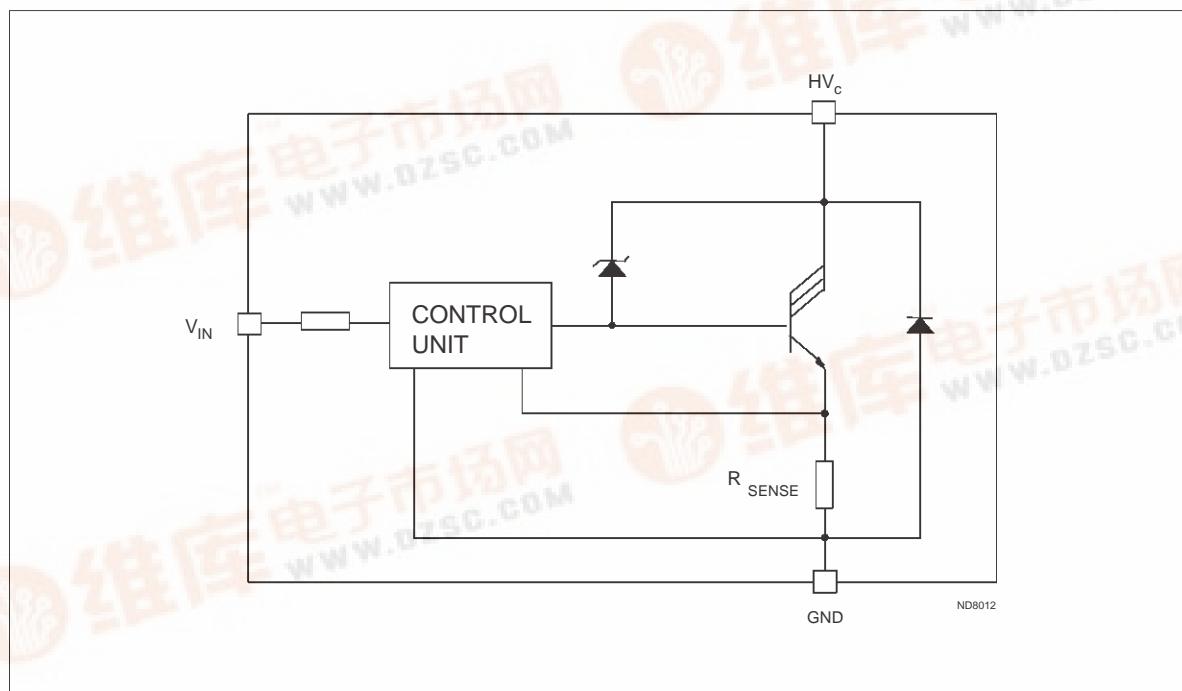


**PowerSO-10™**

**ORDER CODES:**

|             |           |
|-------------|-----------|
| ISOWATT220  | VB921ZVFI |
| POWERSO-10™ | VB921ZVSP |

### BLOCK DIAGRAM



## VB921ZVFI / VB921ZVSP

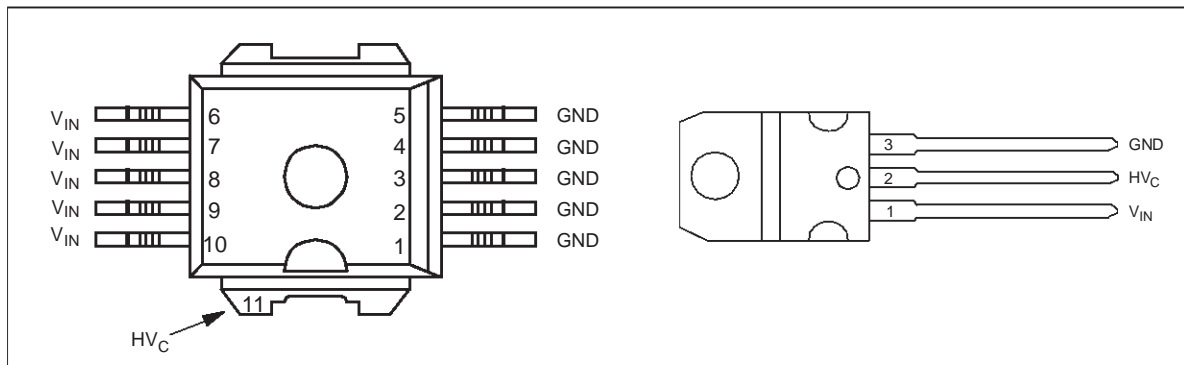
### ABSOLUTE MAXIMUM RATING

| Symbol    | Parameter                                   | Value              |            | Unit             |
|-----------|---|--------------------|------------|------------------|
|           |   | ISOWATT220         | PowerSO-10 |                  |
| $HV_C$    | Collector Voltage                           | Internally limited |            | V                |
| $I_C$     | Collector Current                           | Internally limited |            | A                |
| $V_{IN}$  | Maximum Input Voltage                       | 8                  |            | V                |
| $I_{IN}$  | Input current                               | 10                 |            | mA               |
| $P_{tot}$ | Total dissipation at $T_C=25^\circ\text{C}$ | 40                 | 100        | W                |
| $T_j$     | Junction operating temperature              | - 40 to 150        |            | $^\circ\text{C}$ |
| $T_{stg}$ | Storage temperature                         | - 40 to 150        |            | $^\circ\text{C}$ |

### THERMAL DATA

| Symbol         | Parameter                           |       | Value      |            | Unit               |
|----------------|-------------------------------------|-------|------------|------------|--------------------|
|                |                                     |       | ISOWATT220 | PowerSO-10 |                    |
| $R_{thj-case}$ | Thermal resistance junction-case    | (MAX) | 3.12       | 1.25       | $^\circ\text{C/W}$ |
| $R_{thj-amb}$  | Thermal resistance junction-ambient | (MAX) | 62.5       | 62.5       | $^\circ\text{C/W}$ |

### CONNECTION DIAGRAM (TOP VIEW)



### ELECTRICAL CHARACTERISTICS ( $V_{CC}=12\text{V}$ ; $T_{case}=25^\circ\text{C}$ unless otherwise specified)

| Symbol          | Parameter   | Test Conditions  | Min      | Typ | Max     | Unit          |
|-----------------|---|--|----------|-----|---------|---------------|
| $V_{IN}$        | Input Voltage   |  | 4.2      |     | 5.5     | V             |
| $I_{IN}$        | Input Current   | $V_{IN}=4.2\text{V}$ ; $I_C=5\text{A}$ (See test circuit)<br>$V_{IN}=5\text{V}$ ; $I_C=5\text{A}$  |          |     | 5<br>10 | mA<br>mA      |
| $I_{cgo}$       | Collector Cut-off Current                               | $V_{IN}=0\text{V}$ ; $HV_C=250\text{V}$  |          |     | 250     | $\mu\text{A}$ |
| $V_{cl} (*)$    | High voltage clamp                                      | $-40^\circ\text{C} < T_j < 125^\circ\text{C}$  | 340      |     | 440     | V             |
| $I_{cl} (*)$    | Coil Current Limit                                      | $V_{IN}=4.2\text{V}$ ; $-40^\circ\text{C} < T_j < 125^\circ\text{C}$<br>$V_{IN}=5\text{V}$ ; $-40^\circ\text{C} < T_j < 125^\circ\text{C}$<br>(See note 1) | 6<br>6.5 |     | 7.5     | A<br>A        |
| $V_{cg(sat)}$   | Power Stage Saturation Voltage                          | $I_C=5\text{A}$ ; $I_{IN}=10\text{mA}$   |          |     | 2.5     | V             |
| $V_f (**)$      | Diode Forward Voltage                                   | $I_f=10\text{A}$   |          |     | 3.5     | V             |
| $\Delta I_{cl}$ | Coil current variation in respect to $V_{IN}=5\text{V}$ | $V_{IN}=4.5 \div 5.5\text{V}$  |          |     | 200     | mA            |

(\*) Coil data: primary resistance  $R_C=0.4 \div 0.8\Omega$ , primary inductance  $L_C=6 \div 8\text{mH}$

(\*\*) Pulsed: pulse duration= 300 $\mu\text{s}$ , duty cycle=1.5%

NOTE 1:  $I_{cl}$  is also controlled in respect to the variation of  $V_{IN}$  between 4.5 and 5.5V

FIGURE 1: Delay-off time Vs Temperature

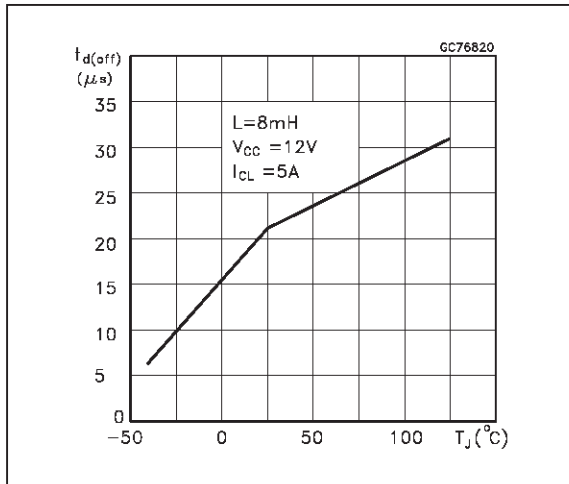


FIGURE 2: Input current Vs Temperature

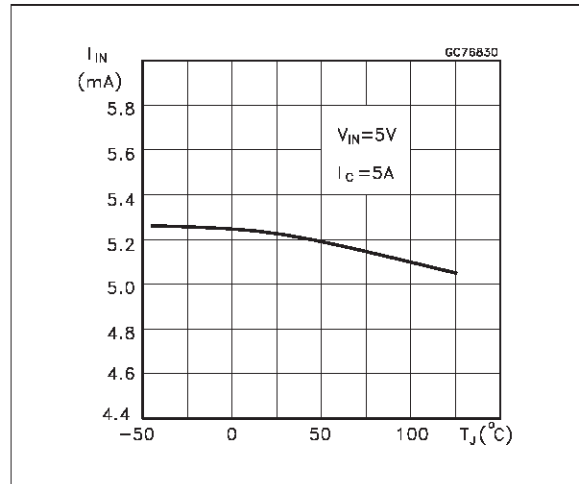


FIGURE 3: Saturation Voltage VS Collector Current

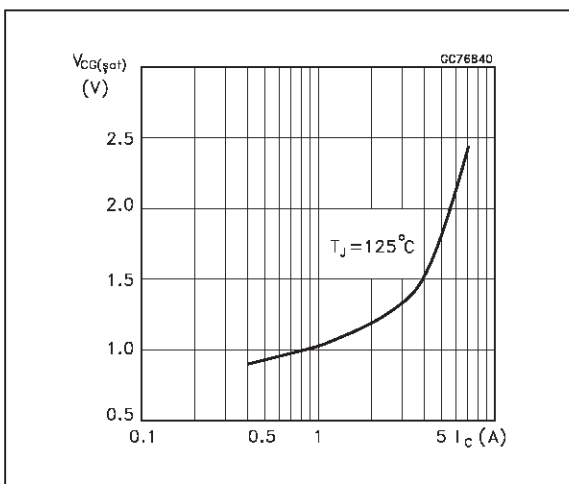


FIGURE 4: Diode Forward Voltage VS Temperature

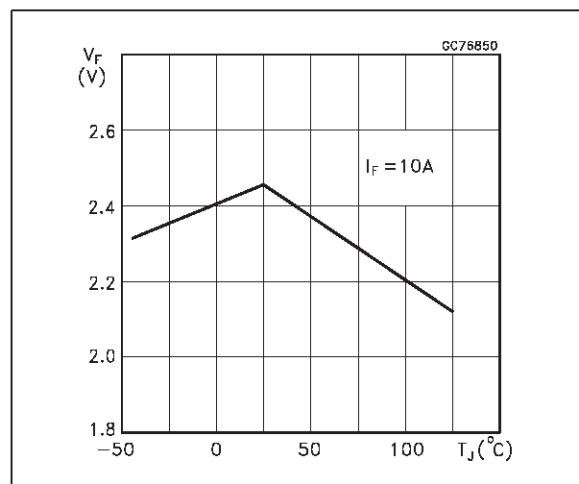


FIGURE 5: Coil Current Limit Vs Temperature

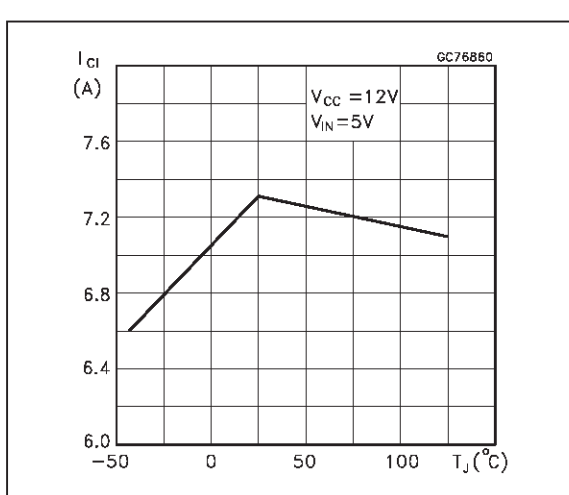
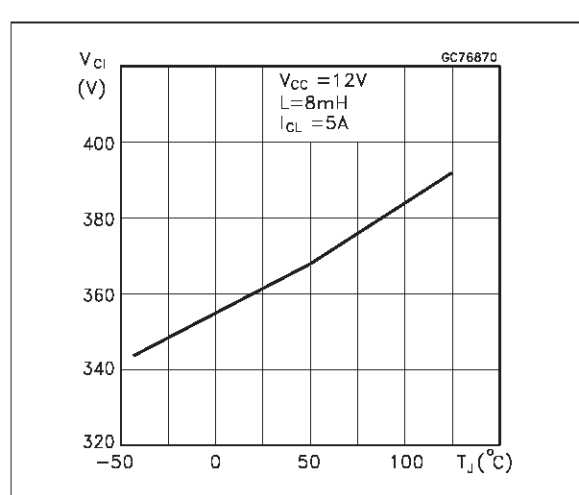
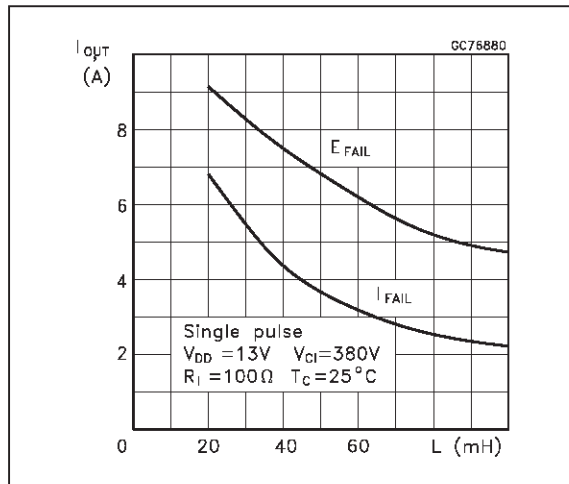


FIGURE 6: Clamping Voltage VS Temperature



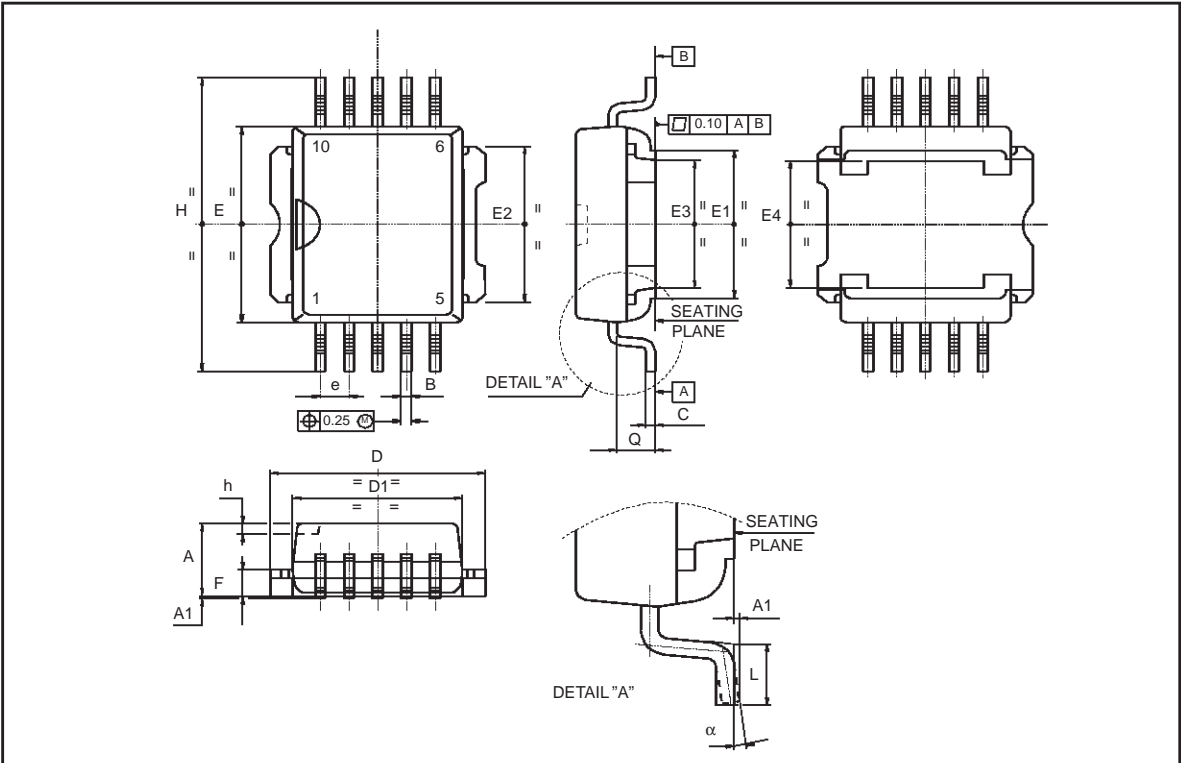
## VB921ZVFI / VB921ZVSP

**FIGURE 7:** Maximum Energy and Output Current Unclamped



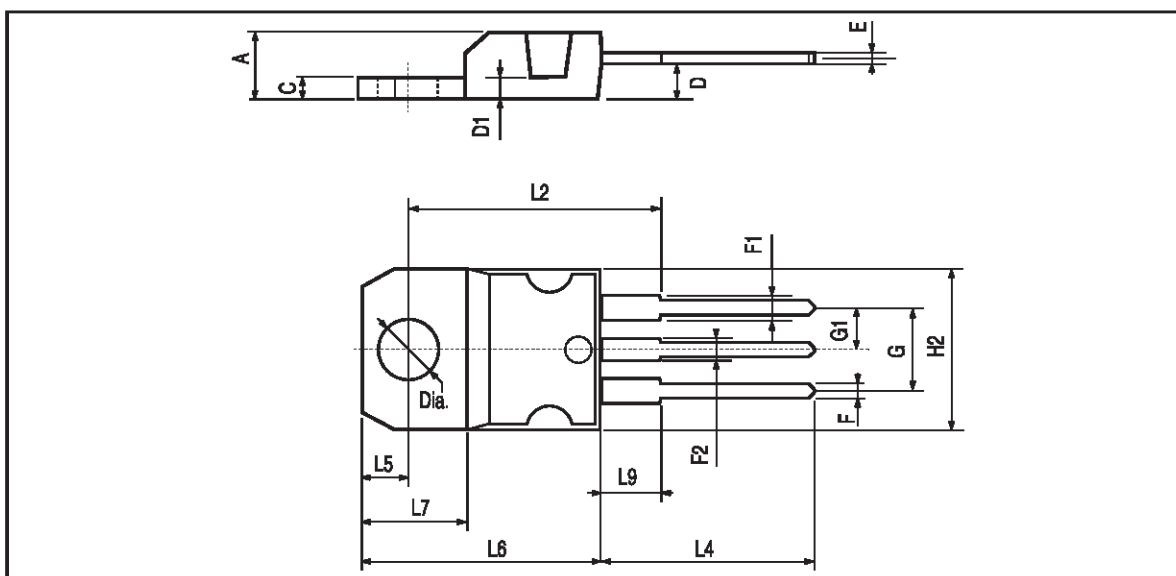
**PowerSO-10™ MECHANICAL DATA**

| DIM.     | mm.   |      |       | inch  |       |       |
|----------|-------|------|-------|-------|-------|-------|
|          | MIN.  | TYP  | MAX.  | MIN.  | TYP.  | MAX.  |
| A        | 3.35  |      | 3.65  | 0.132 |       | 0.144 |
| A1       | 0.00  |      | 0.10  | 0.000 |       | 0.004 |
| B        | 0.40  |      | 0.60  | 0.016 |       | 0.024 |
| c        | 0.35  |      | 0.55  | 0.013 |       | 0.022 |
| D        | 9.40  |      | 9.60  | 0.370 |       | 0.378 |
| D1       | 7.40  |      | 7.60  | 0.291 |       | 0.300 |
| E        | 9.30  |      | 9.50  | 0.366 |       | 0.374 |
| E1       | 7.20  |      | 7.40  | 0.283 |       | 0.291 |
| E2       | 7.20  |      | 7.60  | 0.283 |       | 300   |
| E3       | 6.10  |      | 6.35  | 0.240 |       | 0.250 |
| E4       | 5.90  |      | 6.10  | 0.232 |       | 0.240 |
| e        |       | 1.27 |       |       | 0.050 |       |
| F        | 1.25  |      | 1.35  | 0.049 |       | 0.053 |
| H        | 13.80 |      | 14.40 | 0.543 |       | 0.567 |
| h        |       | 0.50 |       |       | 0.002 |       |
| Q        |       | 1.70 |       |       | 0.067 |       |
| $\alpha$ | 0°    |      | 8°    |       |       |       |



**TO-220 MECHANICAL DATA**

| DIM. | mm.   |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 | 0.154 |       |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



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