

## STGW30H65FB-VB Datasheet

### 600V Trench and Fieldstop IGBT

| PRODUCT SUMMARY           |                            |                             |
|---------------------------|----------------------------|-----------------------------|
| V <sub>CE</sub> (V)       | 600                        |                             |
| I <sub>C</sub> (A)        | 60 (T <sub>C</sub> =25 °C) | 30 (T <sub>C</sub> =100 °C) |
| V <sub>CE (sat)</sub> (V) | 1.8                        |                             |
| I <sub>CM</sub> (A)       | 90                         |                             |

#### FEATURES

- Very Low V<sub>CEsat</sub>
- Low turn-off losses
- High speed switching
- Maximum junction temperature 175°C
- Ultra low gate charge (Q<sub>g</sub>)
- Avalanche energy rated (UIS)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

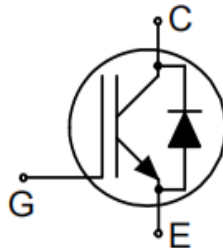
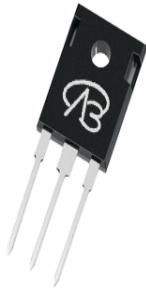
#### APPLICATIONS

- Telecommunications
  - Server and telecom power supplies
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Consumer and computing
  - ATX power supplies
- Industrial
  - Welding
  - Battery chargers
- Renewable energy
  - Solar (PV inverters)
- Switch mode power supplies (SMPS)

#### Package pin definition

- Pin1 G - Gate
- Pin2 C & backside - Collector
- Pin3 E - Emitter

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Top View

| ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted) |                                   |   |      |
|---|-----------------------------------|---|------|
| PARAMETER   | SYMBOL                            | LIMIT                                       | UNIT |
| Collector-Emitter Voltage   | V <sub>CE</sub>                   | 600   | V    |
| Gate-Emitter Voltage  | V <sub>GE</sub>                   | ±30   |      |
| Continuous Collector Current (T <sub>J</sub> = 150 °C)                    | V <sub>GE</sub> at 15 V           | T <sub>C</sub> = 25 °C                      | 60   |
|   |                                   | T <sub>C</sub> = 100 °C                     | 30   |
| Pulsed Collector Current <sup>a</sup>                                     | I <sub>CM</sub>                   | 90  | A    |
| Diode Forward Current <sup>b</sup>  | I <sub>F</sub>                    | 30  | A    |
| Maximum Power Dissipation   | P <sub>D</sub>                    | T <sub>C</sub> = 25 °C                      | 310  |
|   |                                   | T <sub>C</sub> = 100 °C                     | 168  |
| Operating Junction and Storage Temperature Range                          | T <sub>J</sub> , T <sub>stg</sub> | -55 to +175                                 | °C   |
| Short Circuit Withstand Time <sup>TC=150</sup>                            | tsc                               | V <sub>GE</sub> = 15V, V <sub>CE</sub> 400V | 3    |
| Short Circuit Withstand Time <sup>TC=100</sup>                            |                                   | V <sub>GE</sub> = 15V, V <sub>CE</sub> 330V | 5    |
| Soldering Recommendations (Peak Temperature) <sup>c</sup>                 |                                   | for 10 s                                    | 260  |
|   |                                   |   | °C   |

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- Current limited by maximum junction temperature.
- 1.6 mm from case.

| THERMAL RESISTANCE RATINGS  |            |      |      |      |
|-----------------------------|------------|------|------|------|
| PARAMETER                   | SYMBOL     | TYP. | MAX. | UNIT |
| Maximum Junction-to-Ambient | $R_{thJA}$ | -    | 40   | °C/W |
| Maximum Junction-to-Case    | $R_{thJC}$ | -    | 0.5  |      |

| SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |               |  |  |            |        |        |               |
|---|---------------|--|--|------------|--------|--------|---------------|
| PARAMETER   | SYMBOL        | TEST CONDITIONS  |  | MIN.       | TYP.   | MAX.   | UNIT          |
| <b>Static</b>   |               |  |  |            |        |        |               |
| Collector-Emitter Breakdown Voltage   | $BV_{CE}$     | $V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$<br>$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$                |  | 600<br>600 | -<br>- | -<br>- | V             |
| Gate-Source Threshold Voltage (N)   | $V_{GE(th)}$  | $V_{CE} = V_{GE}, I_D = 250\text{ }\mu\text{A}$  |  | 4          | 5      | 6      | V             |
| Zero Gate Voltage Collector Current   | $I_{CES}$     | $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$                                   |  | -          | 1      | 20     | $\mu\text{A}$ |
|   |               | $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$                                  |  | -          | 1000   | -      | $\mu\text{A}$ |
| Gate-Emitter Leakage Current  | $I_{GES}$     | $V_{CE} = 0\text{ V}, V_{GS} = \pm 2.0\text{ V}$   |  | -          | -      | 100    | nA            |
| Collector-Emitter Saturation Voltage  | $V_{CE(sat)}$ | $V_{GE} = 15\text{ V}$   | $I_C = 30\text{ A}$                        | -          | 1.8    | 2.1    | V             |
| Forward Transconductance  | $g_{fs}$      | $V_{CE} = 20\text{ V}, I_C = 30\text{ A}$  |  | -          | 17     | -      | S             |
| <b>Dynamic</b>  |               |  |  |            |        |        |               |
| Input Capacitance   | $C_{ies}$     | $V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V},$<br>$f = 500\text{ KHz}$   |  | -          | 3390   | -      | pF            |
| Output Capacitance  | $C_{oes}$     |  |  | -          | 176    | -      |               |
| Reverse Transfer Capacitance  | $C_{res}$     |  |  | -          | 132    | -      |               |
| Turn-on Energy  | $E_{on}$      | $V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{V},$<br>$I_C = 30\text{ A}, R_g = 10\Omega$                         |  | -          | 18     | -      | nJ            |
| Turn-off Energy   | $E_{off}$     |  |  | -          | 0.3    | -      |               |
| Total Gate Charge   | $Q_g$         | $V_{GE} = 20\text{ V}$   | $I_C = 30\text{ A}, V_{CE} = 400\text{ V}$ | -          | 215    | -      | nC            |
| Gate-Emitter Charge   | $Q_{ge}$      |  |  | -          | 59     | -      |               |
| Gate to Collector Charge  | $Q_{gc}$      |  |  | -          | 116    | -      |               |
| Turn-On Delay Time  | $t_{d(on)}$   | $V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{V},$<br>$I_C = 30\text{ A}, R_g = 10\Omega$                         |  | -          | 51     | -      | ns            |
| Rise Time   | $t_r$         |  |  | -          | 48     | -      |               |
| Turn-Off Delay Time   | $t_{d(off)}$  |  |  | -          | 156    | -      |               |
| Fall Time   | $t_f$         |  |  | -          | 34     | -      |               |
| Internal emitter inductance measured 5 mm                                   | $L_E$         |  |  | -          | 13     | -      |               |
| <b>Diode Characteristics</b>  |               |  |  |            |        |        |               |
| Diode Forward Current   | $I_F$         | IGBT symbol showing the<br>integral reverse junction diode   |  | -          | -      | 30     | A             |
| Pulsed Diode Forward Current  | $I_{FM}$      |  |  | -          | -      | 90     |               |
| Diode Forward Voltage   | $V_F$         | $I_F = 30\text{ A}$  |  | -          | 1.86   | 2.0    | V             |
| Reverse Recovery Time   | $t_{rr}$      | $T_J = 25\text{ }^\circ\text{C}, I_F = 30\text{ A},$<br>$di/dt = 200\text{ A}/\mu\text{s}, V_R = 400\text{ V}$ |  | -          | 71     | -      | ns            |
| Reverse Recovery Charge   | $Q_{rr}$      |  |  | -          | 0.46   | -      | $\mu\text{C}$ |
| Reverse Recovery Current  | $I_{RRM}$     |  |  | -          | 10.5   | -      | A             |



Figure 1. **Forward bias safe operating area**  
( $D=0$ ,  $T_C=25^\circ\text{C}$ ,  $T_{vj}\leq 175^\circ\text{C}$ ;  $V_{GE}=15\text{V}$ .  
Recommended use at  $V_{GE}\geq 7.5\text{V}$ )



Figure 2. **Power dissipation as a function of case temperature**  
( $T_{vj}\leq 175^\circ\text{C}$ )



Figure 3. **Collector current as a function of case temperature**



Figure 4. **Typical output characteristic**



Figure 5. Typical output characteristic ( $T_{vj}=150^{\circ}\text{C}$ )

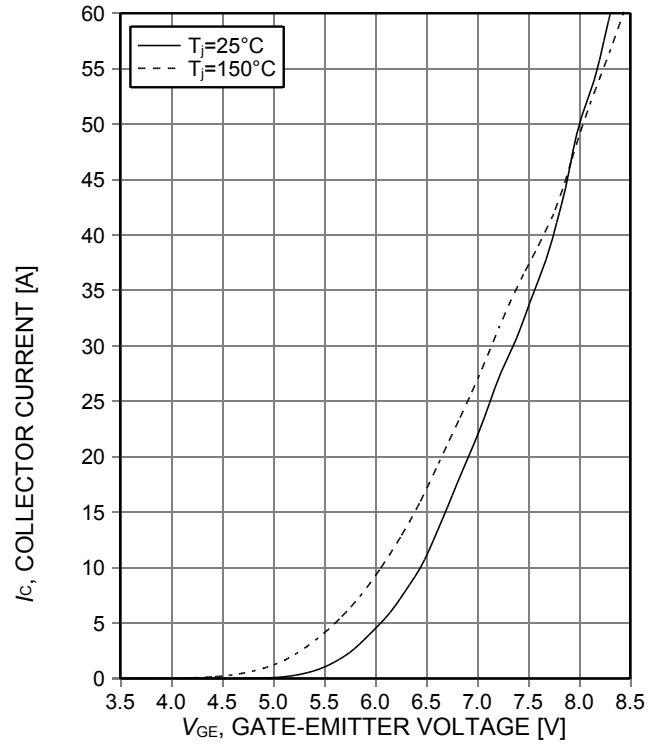


Figure 6. Typical transfer characteristic ( $V_{ce}=20\text{V}$ )



Figure 7. Typical collector-emitter saturation voltage as a function of junction temperature



Figure 8. Typical switching times as a function of collector current



Figure 9. Typical switching times as a function of gate resistor



Figure 10. Typical switching times as a function of junction temperature



Figure 11. Gate-emitter threshold voltage as a function of junction temperature



Figure 12. Typical switching energy losses as a function of collector current

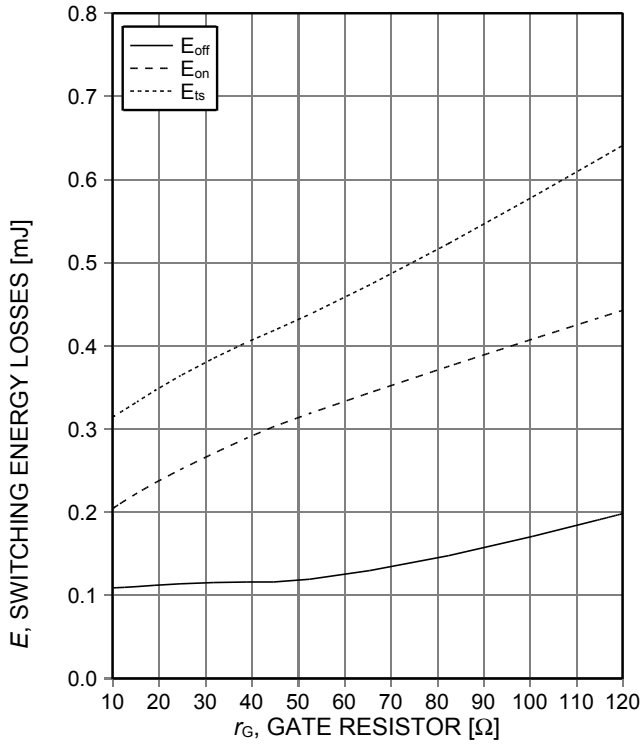


Figure 13. Typical switching energy losses as a function of gate resistor

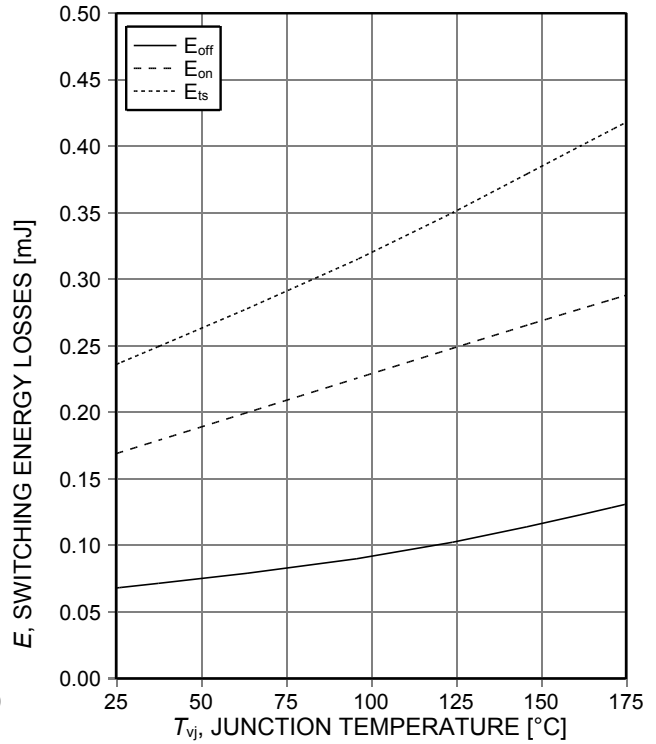


Figure 14. Typical switching energy losses as a function of junction temperature

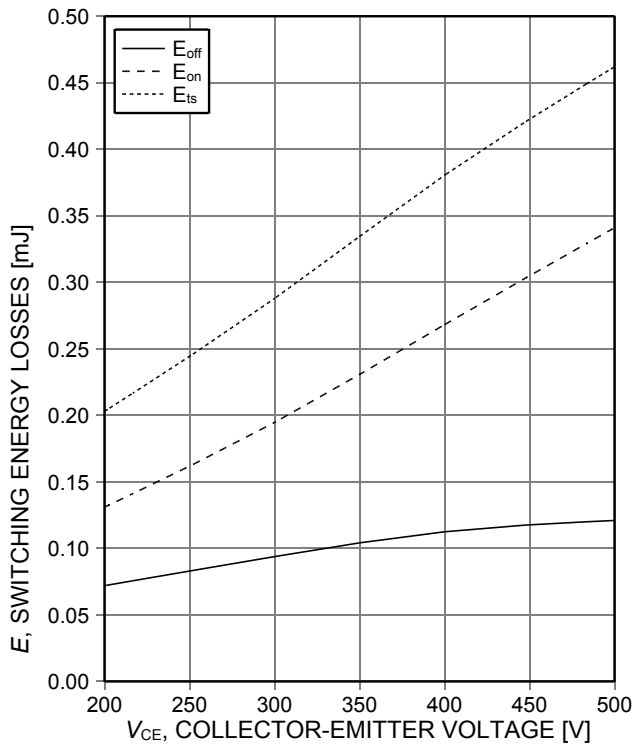


Figure 15. Typical switching energy losses as a function of collector emitter voltage

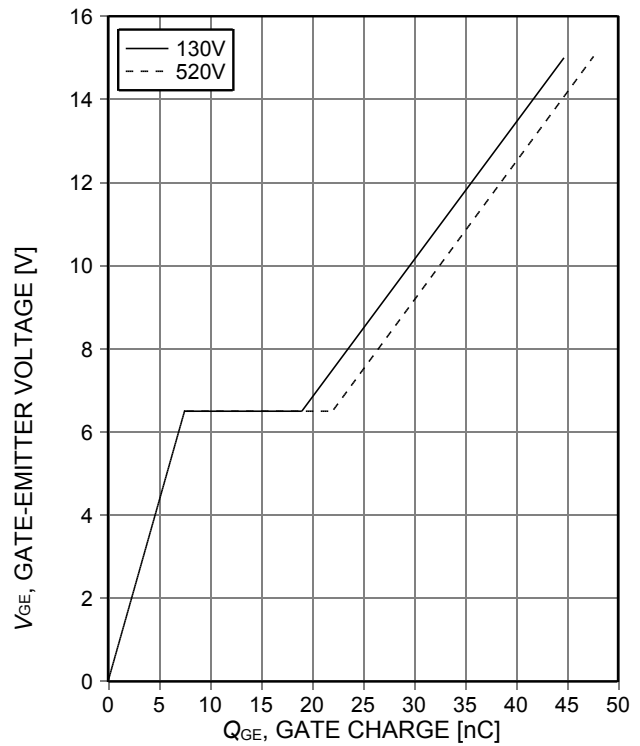


Figure 16. Typical gate charge



Figure 17. Typical capacitance as a function of collector-emitter voltage



Figure 18. IGBT transient thermal impedance



Figure 19. Diode transient thermal impedance as a function of pulse width



Figure 20. Typical reverse recovery time as a function of diode current slope

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| DIM.            | MILLIMETERS |       | INCHES    |       |
|-----------------|-------------|-------|-----------|-------|
|                 | MIN.        | MAX.  | MIN.      | MAX.  |
| A               | 4.70        | 5.31  | 0.185     | 0.209 |
| A1              | 2.21        | 2.59  | 0.087     | 0.102 |
| A2              | 1.50        | 2.49  | 0.059     | 0.098 |
| b               | 0.99        | 1.40  | 0.039     | 0.055 |
| b2              | 1.65        | 2.41  | 0.065     | 0.095 |
| b4              | 2.59        | 3.43  | 0.102     | 0.135 |
| c               | 0.61 BSC    |       | 0.024 BSC |       |
| D               | 20.80       | 21.46 | 0.819     | 0.845 |
| D1              | 3.68        | 5.49  | 0.145     | 0.216 |
| (e)             | 5.46 BSC    |       | 0.215 BSC |       |
| E               | 15.49       | 16.26 | 0.610     | 0.640 |
| L               | 19.81       | 20.32 | 0.780     | 0.800 |
| L1              | 4.06        | 4.50  | 0.160     | 0.177 |
| $\varnothing p$ | 3.51        | 3.66  | 0.138     | 0.144 |

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