



# STGD7NB120S-1

N-CHANNEL 7A - 1200V - IPAK

PowerMESH™ IGBT

PRELIMINARY DATA

| TYPE          | V <sub>CES</sub> | V <sub>CE(sat)</sub> | I <sub>C</sub> |
|---------------|------------------|----------------------|----------------|
| STGD7NB120S-1 | 1200 V           | < 2.1 V              | 7 A            |

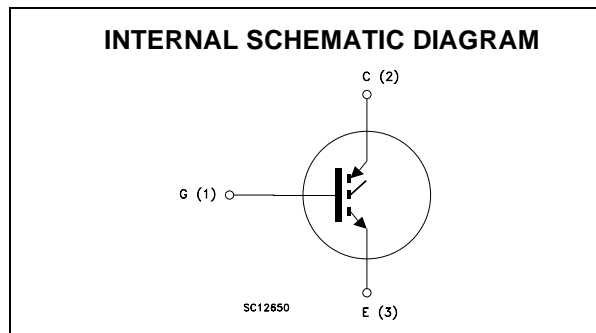
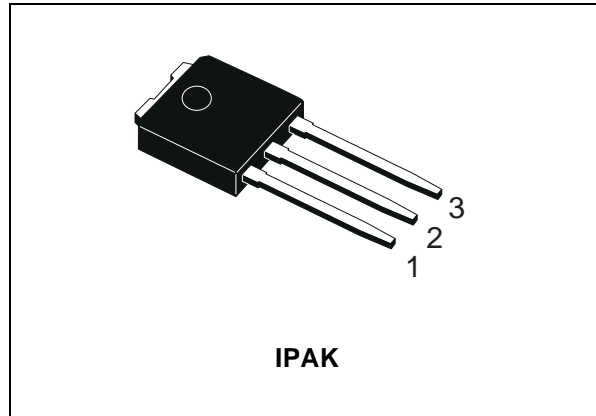
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- OFF LOSSES INCLUDE TAIL CURRENT
- HIGH CURRENT CAPABILITY

## DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized achieve minimum on-voltage drop for low frequency applications (<1kHz).

## APPLICATIONS

- MOTOR CONTROL
- LIGHT DIMMER
- INTRUSH CURRENT LIMITATION



## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter  | Value      | Unit |
|---------------------|--|------------|------|
| V <sub>CES</sub>    | Collector-Emitter Voltage (V <sub>GS</sub> = 0)          | 1200       | V    |
| V <sub>ECR</sub>    | Reverse Battery Protection                               | 20         | V    |
| V <sub>GE</sub>     | Gate-Emitter Voltage                                     | ±20        | V    |
| I <sub>C</sub>      | Collector Current (continuous) at T <sub>C</sub> = 25°C  | 10         | A    |
| I <sub>C</sub>      | Collector Current (continuous) at T <sub>C</sub> = 100°C | 7          | A    |
| I <sub>CM</sub> (■) | Collector Current (pulsed)                               | 20         | A    |
| P <sub>TOT</sub>    | Total Dissipation at T <sub>C</sub> = 25°C               | 55         | W    |
|                     | Derating Factor  | 0.4        | W/°C |
| T <sub>stg</sub>    | Storage Temperature                                      | -65 to 150 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                      | 150        | °C   |

(●) Pulse width limited by safe operating area

## STGD7NB120S-1

### THERMAL DATA

|           |   |      |      |
|-----------|---|------|------|
| Rthj-case | Thermal Resistance Junction-case Max    | 2.27 | °C/W |
| Rthj-amb  | Thermal Resistance Junction-ambient Max | 100  | °C/W |
| Rthc-h    | Thermal Resistance Case-heatsink Typ    | 0.5  | °C/W |

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

| Symbol        | Parameter                                     | Test Conditions   | Min. | Typ. | Max.      | Unit               |
|---------------|---|---|------|------|-----------|--------------------|
| $V_{BR(CES)}$ | Collectro-Emitter Breakdown Voltage           | $I_C = 250 \mu A, V_{GE} = 0$   | 1200 |      |           | V                  |
| $V_{BR(ECR)}$ | Emitter-Collectro Breakdown Voltage           | $I_C = 10 mA, V_{GE} = 0$   | 20   |      |           | V                  |
| $I_{CES}$     | Collector cut-off ( $V_{GE} = 0$ )            | $V_{CE} = \text{Max Rating}, T_C = 25 \text{ }^\circ\text{C}$<br>$V_{CE} = \text{Max Rating}, T_C = 125 \text{ }^\circ\text{C}$ |      |      | 50<br>250 | $\mu A$<br>$\mu A$ |
| $I_{GES}$     | Gate-Emitter Leakage Current ( $V_{CE} = 0$ ) | $V_{GE} = \pm 20V, V_{CE} = 0$  |      |      | $\pm 100$ | nA                 |

ON (1)

| Symbol        | Parameter                            | Test Conditions  | Min. | Typ. | Max.       | Unit   |
|---------------|--------------------------------------|--|------|------|------------|--------|
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{CE} = V_{GE}, I_C = 250 \mu A$   | 3    |      | 5          | V      |
| $V_{GE}$      | Gate Emitter Voltage                 | $V_{CE} = 2.5V, I_C = 2A,$<br>$T_J = 25 \div 125 \text{ }^\circ\text{C}$               |      |      | 6.5        | V      |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE} = 15V, I_C = 3.5 A$<br>$V_{GE} = 15V, I_C = 7 A$<br>$V_{GE} = 15V, I_C = 10 A$ |      | 1.7  | 1.6<br>2.1 | V<br>V |

### DYNAMIC

| Symbol    | Parameter                    | Test Conditions  | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|--|------|------|------|------|
| $g_{fs}$  | Forward Transconductance     | $V_{CE} = 25 V, I_C = 7 A$   | 2.5  | 4.5  |      | S    |
| $C_{ies}$ | Input Capacitance            | $V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$                            |      | 430  |      | pF   |
| $C_{oes}$ | Output Capacitance           |  |      | 40   |      | pF   |
| $C_{res}$ | Reverse Transfer Capacitance |  |      | 7    |      | pF   |
| $Q_g$     | Gate Charge                  | $V_{CE} = 960V, I_C = 7 A,$<br>$V_{GE} = 15V$                            |      | 29   |      | nC   |
| $I_{CL}$  | Latching Current             | $V_{clamp} = 960V, T_J = 150 \text{ }^\circ\text{C}$<br>$R_G = 1K\Omega$ | 10   |      |      | A    |

### SWITCHING ON

| Symbol         | Parameter                | Test Conditions  | Min. | Typ. | Max. | Unit       |
|----------------|--------------------------|--|------|------|------|------------|
| $t_{d(on)}$    | Turn-on Delay Time       | $V_{CC} = 960 V, I_C = 7 A$<br>$R_G = 1K\Omega, V_{GE} = 15 V$                                   |      | 570  |      | ns         |
| $t_r$          | Rise Time                |  |      | 270  |      | ns         |
| $(di/dt)_{on}$ | Turn-on Current Slope    | $V_{CC} = 960 V, I_C = 7 A, R_G = 1K\Omega$<br>$V_{GE} = 15 V, T_J = 125 \text{ }^\circ\text{C}$ |      | 800  |      | A/ $\mu s$ |
| $E_{on}$       | Turn-on Switching Losses |  |      | 3.2  |      | $\mu J$    |

**ELECTRICAL CHARACTERISTICS (CONTINUED)****SWITCHING OFF**

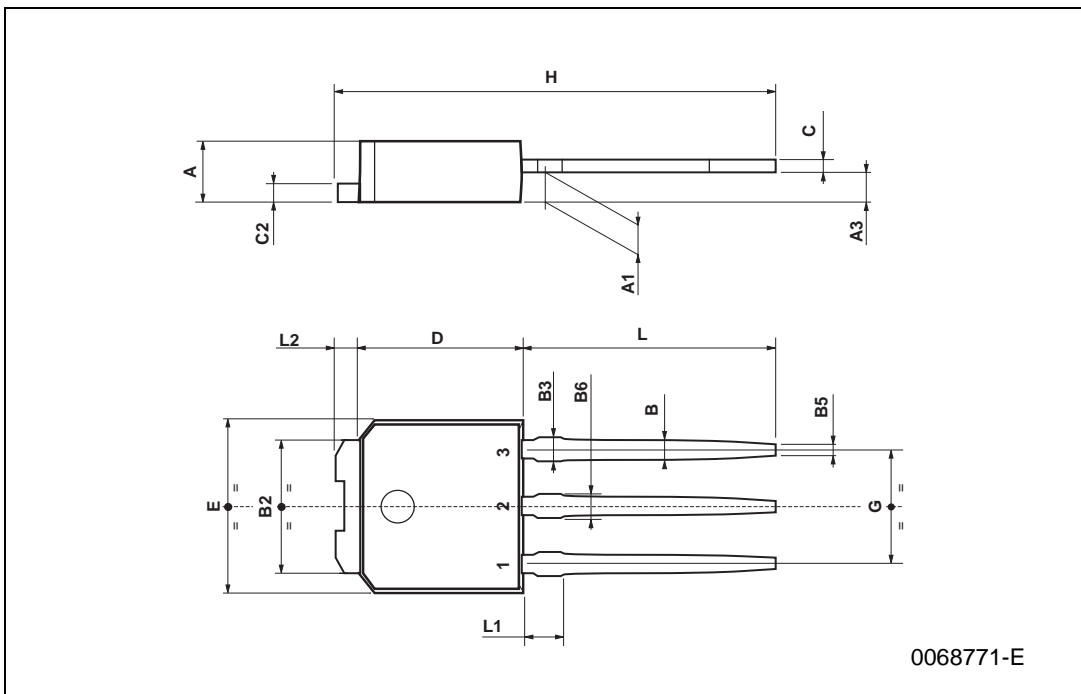
| Symbol         | Parameter               | Test Conditions  | Min. | Typ. | Max. | Unit          |
|----------------|-------------------------|--|------|------|------|---------------|
| $t_c$          | Cross-over Time         | $V_{CC} = 960 \text{ V}$ , $I_C = 7 \text{ A}$ ,<br>$R_{GE} = 1 \text{ K}\Omega$ , $V_{GE} = 15 \text{ V}$                                       |      | 4.9  |      | $\mu\text{s}$ |
| $t_r(V_{off})$ | Off Voltage Rise Time   |  |      | 2.9  |      | $\mu\text{s}$ |
| $t_f$          | Fall Time               |  |      | 3.3  |      | $\mu\text{s}$ |
| $E_{off(**)}$  | Turn-off Switching Loss |  |      | 15   |      | mJ            |
| $t_c$          | Cross-over Time         | $V_{CC} = 960 \text{ V}$ , $I_C = 7 \text{ A}$ ,<br>$R_{GE} = 1 \text{ K}\Omega$ , $V_{GE} = 15 \text{ V}$<br>$T_j = 125 \text{ }^\circ\text{C}$ |      | 7.5  |      | $\mu\text{s}$ |
| $t_r(V_{off})$ | Off Voltage Rise Time   |  |      | 5.5  |      | $\mu\text{s}$ |
| $t_f$          | Fall Time               |  |      | 6.2  |      | $\mu\text{s}$ |
| $E_{off(**)}$  | Turn-off Switching Loss |  |      | 22   |      | mJ            |

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 2. Pulse width limited by max. junction temperature.  
 (\*\*))Losses include Also the Tail (Jedec Standardization)



**TO-251 (IPAK) MECHANICAL DATA**

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 2.2  |      | 2.4  | 0.086 |       | 0.094 |
| A1   | 0.9  |      | 1.1  | 0.035 |       | 0.043 |
| A3   | 0.7  |      | 1.3  | 0.027 |       | 0.051 |
| B    | 0.64 |      | 0.9  | 0.025 |       | 0.031 |
| B2   | 5.2  |      | 5.4  | 0.204 |       | 0.212 |
| B3   |      |      | 0.85 |       |       | 0.033 |
| B5   |      | 0.3  |      |       | 0.012 |       |
| B6   |      |      | 0.95 |       |       | 0.037 |
| C    | 0.45 |      | 0.6  | 0.017 |       | 0.023 |
| C2   | 0.48 |      | 0.6  | 0.019 |       | 0.023 |
| D    | 6    |      | 6.2  | 0.236 |       | 0.244 |
| E    | 6.4  |      | 6.6  | 0.252 |       | 0.260 |
| G    | 4.4  |      | 4.6  | 0.173 |       | 0.181 |
| H    | 15.9 |      | 16.3 | 0.626 |       | 0.641 |
| L    | 9    |      | 9.4  | 0.354 |       | 0.370 |
| L1   | 0.8  |      | 1.2  | 0.031 |       | 0.047 |
| L2   |      | 0.8  | 1    |       | 0.031 | 0.039 |



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