



# HIGH-VOLTAGE POWER MOSFETs

SiHP12N50C, SiHB12N50C, SiHF12N50C



## 500-V N-Channel Power MOSFETs in TO-220AB, TO-220 FULLPAK, and D<sup>2</sup>PAK Packages

### FEATURES

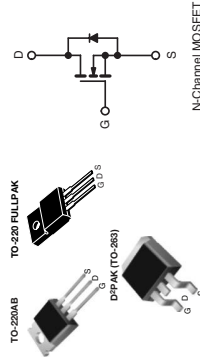
- Maximum  $R_{DS(on)}$  of  $0.555 \Omega$  at  $V_{GS} = 10 V$
- Low gate charge,  $Q_g \text{ max} = 48 \text{ nC}$
- $R_{DS(on)} * Q_g$  FOM of  $26.64 \Omega\text{-nC}$
- 100 % avalanche tested
- Improved  $T_{rr} / Q_{rr}$
- Compliant to RoHS Directive 2002/95/EC

### APPLICATIONS

- PFC boost circuit
- PWM half-bridge
- LLC topology

## Power MOSFET

| PRODUCT SUMMARY                            |                               |
|--|-------------------------------|
| V <sub>DS</sub> (V) at T <sub>J</sub> max. | 560 V                         |
| R <sub>DS(on)</sub> (Ω)                    | V <sub>GS</sub> = 10 V, 0.555 |
| Q <sub>g</sub> (Max.) (nC)                 | 48                            |
| Q <sub>gs</sub> (nC)                       | 12                            |
| Q <sub>gd</sub> (nC)                       | 15                            |
| Configuration                              | Single                        |



N-Channel MOSFET

### FEATURES

- Low Figure-of-Merit R<sub>DS(on)</sub> × Q<sub>g</sub>
- 100 % Avalanche Tested
- Gate Charge Improved
- T<sub>rr</sub>/Q<sub>rr</sub> Improved
- Compliant to RoHS Directive 2002/95/EC



| THERMAL RESISTANCE RATINGS       |                   |                                      |                |      |
|----------------------------------|-------------------|--------------------------------------|----------------|------|
| PARAMETER                        | SYMBOL            | TO220-AB D <sup>2</sup> PAK (TO-263) | TO-220 FULLPAK | UNIT |
| Maximum Junction-to-Ambient      | R <sub>thJA</sub> | 62                                   | 65             | °C/W |
| Maximum Junction-to-Case (Drain) | R <sub>thJC</sub> | 0.6                                  | 3.5            |      |
| Junction-to-Ambient (PCB mount)* | R <sub>thJA</sub> | 40                                   | -              |      |

### Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

| SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted) |                                  |   |      |      |       |      |
|---|----------------------------------|---|------|------|-------|------|
| PARAMETER   | SYMBOL                           | TEST CONDITIONS   | MIN. | TYP. | MAX.  | UNIT |
| <b>Static</b>   |                                  |   |      |      |       |      |
| Drain-Source Breakdown Voltage                                  | V <sub>DS</sub>                  | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                          | 500  | -    | -     | V    |
| V <sub>DS</sub> Temperature Coefficient                         | ΔV <sub>DS</sub> /T <sub>J</sub> | Reference to 25 °C, I <sub>D</sub> = 1 mA                               | -0.6 | -    | -     | V/°C |
| Gate-Source Threshold Voltage (N)                               | V <sub>GS(th)</sub>              | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA             | 3.0  | -    | 5.0   | V    |
| Gate-Source Leakage   | I <sub>GSS</sub>                 | V <sub>GS</sub> = ±30 V   | -    | -    | ±100  | nA   |
| Zero Gate Voltage Drain Current                                 | I <sub>DSS</sub>                 | V <sub>GS</sub> = 500 V, V <sub>DS</sub> = 0 V                          | -    | -    | 50    | μA   |
| Drain-Source On-State Resistance                                | R <sub>DS(on)</sub>              | V <sub>GS</sub> = 400 V, V <sub>DS</sub> = 0 V, T <sub>J</sub> = 125 °C | -    | -    | 280   | Ω    |
| Forward Transconductance  | g <sub>fs</sub>                  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A                            | -    | 0.46 | 0.555 | Ω    |
| <b>Dynamic</b>  |                                  |   |      |      |       |      |
| Input Capacitance   | C <sub>iss</sub>                 | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1.0 MHz              | -    | 1375 | -     | pF   |
| Output Capacitance  | C <sub>oss</sub>                 |   | -    | 165  | -     | pF   |
| Reverse Transfer Capacitance                                    | C <sub>res</sub>                 |   | -    | 17   | -     | pF   |
| Total Gate Charge   | Q <sub>g</sub>                   | I <sub>D</sub> = 10 A, V <sub>DS</sub> = 400 V                          | -    | 32   | 48    | nC   |
| Gate-Source Charge  | Q <sub>gs</sub>                  |   | -    | 12   | -     | nC   |
| Gate-Drain Charge   | Q <sub>gd</sub>                  |   | -    | 15   | -     | nC   |
| Turn-On Delay Time  | t <sub>don</sub>                 |   | -    | 18   | -     | ns   |
| Rise Time   | t <sub>r</sub>                   | V <sub>GS</sub> = 250 V, I <sub>D</sub> = 10 A                          | -    | 35   | -     | ns   |
| Turn-Off Delay Time   | t <sub>doff</sub>                | R <sub>g</sub> = 4.3 Ω, V <sub>GS</sub> = 10 V                          | -    | 23   | -     | ns   |
| Fall Time   | t <sub>f</sub>                   |   | -    | 6    | -     | ns   |
| Gate Input Resistance   | R <sub>g</sub>                   | f = 1 MHz, open drain   | -    | 1.1  | -     | Ω    |

| ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted) |                                   |                                      |                |      |
|---|-----------------------------------|--------------------------------------|----------------|------|
| PARAMETER   | SYMBOL                            | TO220-AB D <sup>2</sup> PAK (TO-263) | TO-220 FULLPAK | UNIT |
| Drain-Source Voltage  | V <sub>DS</sub>                   | 500                                  | 500            | V    |
| Gate-Source Voltage   | V <sub>GS</sub>                   | ±30                                  | ±30            | V    |
| Continuous Drain Current  | I <sub>D</sub>                    | 12                                   | 12             | A    |
| Pulsed Drain Current <sup>c</sup>   | I <sub>DM</sub>                   | 28                                   | 28             | A    |
| Linear Derating Factor  |                                   | 1.67                                 | 0.28           | W/°C |
| Single Pulse Avalanche Energy <sup>b</sup>                                | E <sub>AS</sub>                   | 180                                  | 180            | mJ   |
| Maximum Power Dissipation   | P <sub>D</sub>                    | 208                                  | 36             | W    |
| Operating Junction and Storage Temperature Range                          | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150                          | -55 to +150    | °C   |
| Soldering Recommendations (Peak Temperature) <sup>d</sup>                 |                                   | for 10 s                             | 300            |      |

- Notes**
- Limited by maximum junction temperature.
  - V<sub>DD</sub> = 50 V, starting T<sub>J</sub> = 25 °C, L<sub>g</sub> = 2.5 mH, R<sub>g</sub> = 25 Ω, I<sub>AS</sub> = 12 A.
  - Repetitive rating; pulse width limited by maximum junction temperature.
  - 1.6 mm from case.

\* Pb containing terminations are not RoHS compliant, exemptions may apply

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