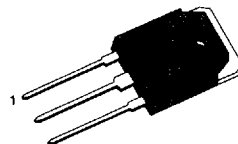


## FEATURES

- Lower  $R_{DS(on)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

TO-3P



1. Gate 2. Drain 3. Source

## PRODUCT SUMMARY

| Part Number | BV <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-------------|-------------------|---------------------|----------------|
| SSH40N20    | 200V              | 0.080 $\Omega$      | 40A            |
| SSH40N15    | 150V              | 0.080 $\Omega$      | 40A            |

## ABSOLUTE MAXIMUM RATINGS

| Characteristic                                                             | Symbol                            | SSH40N20    | SSH40N15 | Unit            |
|----------------------------------------------------------------------------|-----------------------------------|-------------|----------|-----------------|
| Drain-Source Voltage (1)                                                   | V <sub>DSS</sub>                  | 200         | 150      | V <sub>dc</sub> |
| Drain-Gate Voltage (R <sub>GS</sub> =1.0M $\Omega$ )(1)                    | V <sub>DGR</sub>                  | 200         | 150      | V <sub>dc</sub> |
| Gate-Source Voltage                                                        | V <sub>GS</sub>                   | $\pm 20$    |          | V <sub>dc</sub> |
| Continuous Drain Current T <sub>C</sub> =25 °C                             | I <sub>D</sub>                    | 40          |          | A <sub>dc</sub> |
| Continuous Drain Current T <sub>C</sub> =100 °C                            | I <sub>D</sub>                    | 28          |          | A <sub>dc</sub> |
| Drain Current - Pulsed (3)                                                 | I <sub>DM</sub>                   | 160         |          | A <sub>dc</sub> |
| Gate Current - Pulsed                                                      | I <sub>GM</sub>                   | $\pm 1.5$   |          | A <sub>dc</sub> |
| Single Pulsed Avalanche Energy (4)                                         | E <sub>AS</sub>                   | 840         |          | mJ              |
| Avalanche Current                                                          | I <sub>AS</sub>                   | 40          |          | A               |
| Total Power Dissipation at T <sub>C</sub> =25 °C                           | P <sub>D</sub>                    | 230         |          | Watts           |
| Derate above 25 °C                                                         |                                   | 1.82        |          | W/°C            |
| Operating and Storage<br>Junction Temperature Range                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 |          | °C              |
| Maximum Lead Temp. for Soldering<br>Purposes, 1/8" from case for 5 seconds | T <sub>L</sub>                    | 300         |          | °C              |

Notes : (1) T<sub>J</sub>=25°C to 150°C(2) Pulse test : Pulse width < 300 $\mu$ s, Duty Cycle < 2%

(3) Repetitive rating : Pulse width limited by junction temperature

(4) L=1mH, V<sub>dd</sub>= 50V, R<sub>G</sub>=25 $\Omega$ , Starting T<sub>J</sub>=25°C

## ELECTRICAL CHARACTERISTICS (Tc=25°C unless otherwise specified)

| Symbol              | Characteristic                                     | Min | Typ  | Max   | Units | Test Conditions                                                                                                                                                     |
|---------------------|----------------------------------------------------|-----|------|-------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                     |     |      |       |       |                                                                                                                                                                     |
|                     | SSH40N20                                           | 100 | -    | -     | V     | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                                                                                          |
|                     | SSH40N15                                           | 150 | -    | -     | V     |                                                                                                                                                                     |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                             | 2.0 | -    | 4.5   | V     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                                                                                            |
| I <sub>GSS</sub>    | Gate-Source Leakage Forward                        | -   | -    | 100   | nA    | V <sub>GS</sub> =20V                                                                                                                                                |
| I <sub>GSS</sub>    | Gate-Source Leakage Reverse                        | -   | -    | -100  | nA    | V <sub>GS</sub> =-20V                                                                                                                                               |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current                    | -   | -    | 250   | μA    | V <sub>DS</sub> =Max. Rating, V <sub>GS</sub> =0V                                                                                                                   |
|                     |                                                    | -   | -    | 1000  | μA    | V <sub>DS</sub> =0.8 Max. Rating, V <sub>GS</sub> =0V, Tc=150°C                                                                                                     |
| R <sub>DS(on)</sub> | Static Drain-Source On-Resistance(2)               | -   | -    | 0.080 | Ω     | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                                                                                                           |
| g <sub>fs</sub>     | Forward Transconductance (2)                       | 10  | -    | -     | Ω     | V <sub>DS</sub> ≥ 50V, I <sub>D</sub> =20A                                                                                                                          |
| C <sub>iss</sub>    | Input Capacitance                                  | -   | 4440 | -     | pF    | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz                                                                                                                   |
| C <sub>oss</sub>    | Output Capacitance                                 | -   | 770  | -     | pF    |                                                                                                                                                                     |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                       | -   | 300  | -     | pF    |                                                                                                                                                                     |
| t <sub>d(on)</sub>  | Turn-On Delay Time                                 | -   | -    | 130   | ns    | V <sub>DD</sub> =0.5 BV <sub>DSS</sub> , I <sub>D</sub> =40A, Z <sub>o</sub> =9.1Ω<br>(MOSFET switching times are essentially independent of operating temperature) |
| t <sub>r</sub>      | Rise Time                                          | -   | -    | 280   | ns    |                                                                                                                                                                     |
| t <sub>d(off)</sub> | Turn-Off Delay Time                                | -   | -    | 630   | ns    |                                                                                                                                                                     |
| t <sub>f</sub>      | Fall Time                                          | -   | -    | 210   | ns    |                                                                                                                                                                     |
| Q <sub>g</sub>      | Total Gate Charge<br>(Gate-Source Plus Gate-Drain) | -   | -    | 160   | nC    | V <sub>GS</sub> =10V, I <sub>D</sub> =40A, V <sub>DS</sub> =0.8 Max. Rating<br>(Gate charge is essentially independent of operating temperature)                    |
| Q <sub>gs</sub>     | Gate-Source Charge                                 | -   | 27   | -     | nC    |                                                                                                                                                                     |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge                       | -   | 66   | -     | nC    |                                                                                                                                                                     |

## THERMAL RESISTANCE

| Symbol            | Characteristics     |     | All  | Units | Remark                |
|-------------------|---------------------|-----|------|-------|-----------------------|
| R <sub>thJC</sub> | Junction-to-Case    | MAX | 0.55 | K/W   |                       |
| R <sub>thCS</sub> | Case-to-Sink        | TYP | 0.24 | K/W   | Mounting surface flat |
| R <sub>thJA</sub> | Junction-to-Ambient | MAX | 40   | K/W   | Free Air Operation    |

Notes : (1) T<sub>J</sub>=25°C to 150°C

(2) Pulse test : Pulse width &lt; 300μs, Duty Cycle &lt; 2%

(3) Repetitive rating : Pulse width limited by junction temperature

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol   | Characteristic                            | Min | Typ | Max | Units | Test Conditions                                                                     |
|----------|-------------------------------------------|-----|-----|-----|-------|-------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | -   | -   | 40  | A     | Modified MOSFET<br>symbol showing the<br>integral reverse<br>P-N junction rectifier |
| $I_{SM}$ | Pulse Source Current<br>(Body Diode) (3)  | -   | -   | 160 | A     |                                                                                     |
| $V_{SD}$ | Diode Forward Voltage (2)                 | -   | -   | 2.5 | V     | $T_J = 25^\circ\text{C}$ , $I_S = 40\text{A}$ , $V_{GS} = 0\text{V}$                |
| $t_{rr}$ | Reverse Recovery Time                     | -   | 900 | -   | ns    | $T_J = 25^\circ\text{C}$ , $I_F = 40\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{S}$ |

Notes : (1)  $T_J = 25^\circ\text{C}$  to  $150^\circ\text{C}$ (2) Pulse test : Pulse width  $< 300\mu\text{s}$ , Duty Cycle  $< 2\%$ 

(3) Repetitive rating : Pulse width limited by junction temperature

