

**MSAFX24N50A**

**Features**

- Ultrafast body diode
- Rugged polysilicon gate cell structure
- Increased Unclamped Inductive Switching (UIS) capability
- Hermetically sealed, surface mount power package
- Low package inductance
- Very low thermal resistance
- Reverse polarity available upon request

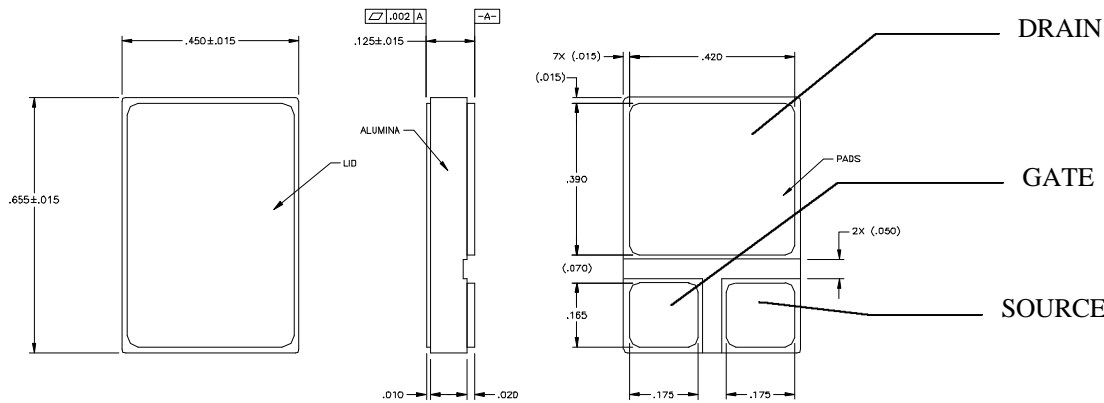
**500 Volts**  
**24 Amps**  
**230 mΩ**

**N-CHANNEL**  
**ENHANCEMENT MODE**  
**POWER MOSFET**

**Maximum Ratings @ 25°C (unless otherwise specified)**

| DESCRIPTION  | SYMBOL                                | MAX.        | UNIT  |
|--|---------------------------------------|-------------|-------|
| Drain-to-Source Breakdown Voltage (Gate Shorted to Source)<br>@ T <sub>J</sub> ≥ 25°C  | BV <sub>DSS</sub>                     | 500         | Volts |
| Drain-to-Gate Breakdown Voltage @ T <sub>J</sub> ≥ 25°C, R <sub>GS</sub> = 1 MΩ  | BV <sub>DGR</sub>                     | 500         | Volts |
| Continuous Gate-to-Source Voltage  | V <sub>GS</sub>                       | +/-20       | Volts |
| Transient Gate-to-Source Voltage   | V <sub>GSM</sub>                      | +/-30       | Volts |
| Continuous Drain Current<br>100°C  | I <sub>D25</sub><br>I <sub>D100</sub> | 24<br>20    | Amps  |
| Peak Drain Current, pulse width limited by T <sub>Jmax</sub>   | I <sub>DM</sub>                       | 96          | Amps  |
| Repetitive Avalanche Current   | I <sub>AR</sub>                       | 24          | Amps  |
| Repetitive Avalanche Energy  | E <sub>AR</sub>                       | 30          | mJ    |
| Single Pulse Avalanche Energy  | E <sub>AS</sub>                       | tbd         | mJ    |
| Voltage Rate of Change of the Recovery Diode<br>@ I <sub>S</sub> ≤ I <sub>DM</sub> , di/dt ≤ 100 A/μs, V <sub>DD</sub> ≤ V <sub>DSS</sub> , T <sub>J</sub> ≤ 150°C | dv/dt                                 | 5.0         | V/ns  |
| Power Dissipation  | P <sub>D</sub>                        | 300         | Watts |
| Junction Temperature Range   | T <sub>J</sub>                        | -55 to +150 | °C    |
| Storage Temperature Range  | T <sub>stg</sub>                      | -55 to +150 | °C    |
| Continuous Source Current (Body Diode)   | I <sub>S</sub>                        | 24          | Amps  |
| Pulse Source Current (Body Diode)  | I <sub>SM</sub>                       | 96          | Amps  |
| Thermal Resistance, Junction to Case   | θ <sub>JC</sub>                       | 0.25        | °C/W  |

**Mechanical Outline**



## Electrical Parameters @ 25°C (unless otherwise specified)

| DESCRIPTION   | SYMBOL  | CONDITIONS   | MIN | TYP.                 | MAX                    | UNIT          |
|---|---|--|-----|----------------------|------------------------|---------------|
| Drain-to-Source Breakdown Voltage<br>(Gate Shorted to Source)               | $BV_{DSS}$                                    | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$  | 500 |                      |                        | V             |
| Temperature Coefficient of the Drain-to-Source Breakdown Voltage            | $\Delta BV_{DSS}/\Delta T_J$                  |  |     | 5.4                  |                        | V/°C          |
| Gate Threshold Voltage  | $V_{GS(th)}$                                  | $V_{DS} = V_{GS}, I_D = 4\text{ mA}$   | 2.0 |                      | 4.0                    | V             |
| Gate-to-Source Leakage Current  | $I_{GSS}$                                     | $V_{GS} = \pm 20V_{DC}, V_{DS} = 0\text{ V}, T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$  |     |                      | $\pm 100$<br>$\pm 200$ | nA            |
| Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current)           | $I_{DSS}$                                     | $V_{DS} = 0.8 \cdot BV_{DSS}, T_J = 25^\circ\text{C}$<br>$V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$  |     |                      | 200<br>1000            | $\mu\text{A}$ |
| Static Drain-to-Source On-State Resistance (1)                              | $R_{DS(on)}$                                  | $V_{GS} = 10\text{ V}, I_D = 12\text{ A}, T_J = 25^\circ\text{C}$<br>$I_D = 24\text{ A}, T_J = 25^\circ\text{C}$<br>$I_D = 12\text{ A}, T_J = 125^\circ\text{C}$ |     | 0.45                 | 0.23<br>0.27           | $\Omega$      |
| Forward Transconductance (1)  | $g_{fs}$                                      | $V_{DS} \geq 10\text{ V}, I_D = 24\text{ A}$   | 15  | 21                   |                        | S             |
| Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance     | $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$           | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$  |     | 4200<br>450<br>135   |                        | pF            |
| Turn-on Delay Time<br>Rise Time<br>Turn-off Delay Time<br>Fall Time         | $T_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | $V_{GS} = 10\text{ V}, V_{DS} = 250\text{ V},$<br>$I_D = 12\text{ A}, R_G = 2.00\ \Omega$  |     | 16<br>33<br>65<br>30 | 25<br>45<br>80<br>40   | ns            |
| Total Gate Charge<br>Gate-to-Source Charge<br>Gate-to-Drain (Miller) Charge | $Q_{g(on)}$<br>$Q_{gs}$<br>$Q_{gd}$           | $V_{GS} = 10\text{ V}, V_{DS} = 250\text{ V}, I_D = 12\text{ A}$   |     | 135<br>30<br>65      | 160<br>40<br>85        | nC            |
| Body Diode Forward Voltage (1)  | $V_{SD}$                                      | $I_F = I_S, V_{GS} = 0\text{ V}$   |     |                      | 1.5                    | V             |
| Reverse Recovery Time (Body Diode)  | $t_{rr}$                                      | $I_F = 10\text{ A}, 25\text{ C}$<br>$-di/dt = 100\text{ A}/\mu\text{s}, 125\text{ C}$  |     |                      | 250<br>400             | ns            |
| Reverse Recovery Charge   | $Q_{rr}$                                      | $I_F = 10\text{ A}, 25\text{ C}$<br>$di/dt = 100\text{ A}/\mu\text{s}, 125\text{ C}$   |     |                      | 1.0<br>2.0             | $\mu\text{C}$ |

### Notes

- (1) Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $\delta \leq 2\%$
- (2) Microsemi Corp. does not manufacture the mosfet die; contact company for details.