Microsemi
Santa Ana, CA
Progress Powered by Technology

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# MSAEZ33N20A
# MSAFZ33N20A

**200 Volts**
**33 Amps**
**70 mΩ**

**N-CHANNEL ENHANCEMENT MODE POWER MOSFET**

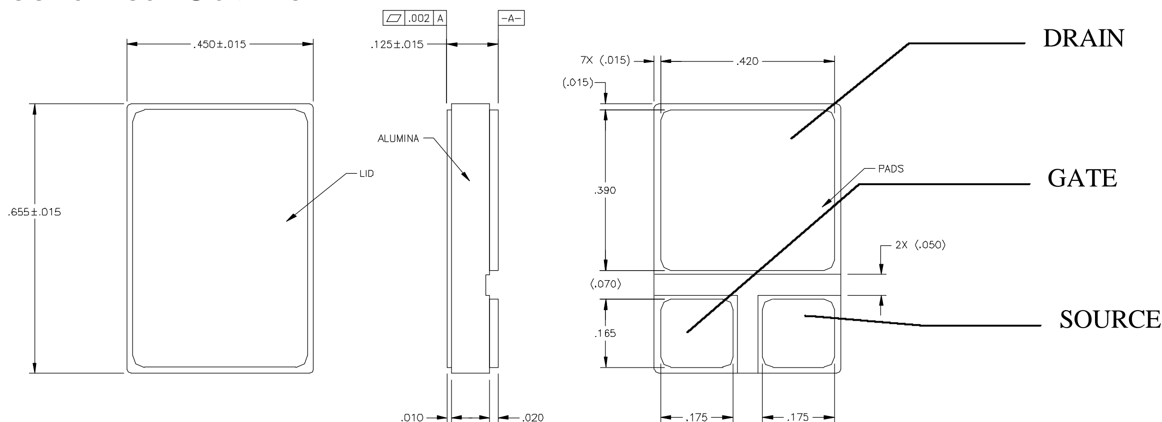
## Features

- Ultrafast rectifier in parallel with the body diode (MSAE type only)
- 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

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

| DESCRIPTION | SYMBOL | MAX. | UNIT |
|---|---|---|---|
| Drain-to-Source Breakdown Voltage (Gate Shorted to Source) @ $T_J \geq 25°C$ | $BV_{DSS}$ | 200 | Volts |
| Drain-to-Gate Breakdown Voltage @ $T_J \geq 25°C$, $R_{GS}$= 1 MΩ | $BV_{DGR}$ | 200 | Volts |
| Continuous Gate-to-Source Voltage | $V_{GS}$ | +/-20 | Volts |
| Transient Gate-to-Source Voltage | $V_{GSM}$ | +/-30 | Volts |
| Continuous Drain Current Tj= 25°C<br>Tj= 100°C | $I_{D25}$<br>$I_{D100}$ | 33<br>20 | Amps |
| Peak Drain Current, pulse width limited by $T_{Jmax}$ | $I_{DM}$ | 132 | Amps |
| Repetitive Avalanche Current | $I_{AR}$ | 33 | Amps |
| Repetitive Avalanche Energy | $E_{AR}$ | 16 | mJ |
| Single Pulse Avalanche Energy | $E_{AS}$ | 790 | mJ |
| Voltage Rate of Change of the Recovery Diode @ $I_S \leq I_{DM}$, di/dt ≤ 100 A/µs, $V_{DD} \leq V_{DSS}$, $T_J \leq 150°C$ | dv/dt | TBD | V/ns |
| Power Dissipation | $P_D$ | 300 | Watts |
| Junction Temperature Range | $T_j$ | -55 to +150 | °C |
| Storage Temperature Range | $T_{stg}$ | -55 to +150 | °C |
| Continuous Source Current (Body Diode) | $I_S$ | 33 | Amps |
| Pulse Source Current (Body Diode) | $I_{SM}$ | 132 | Amps |
| Thermal Resistance, Junction to Case | $\theta_{JC}$ | 0.4 | °C/W |

## Mechanical Outline



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

| DESCRIPTION | SYMBOL | CONDITIONS | MIN | TYP. | MAX | UNIT |
|---|---|---|---|---|---|---|
| Drain-to-Source Breakdown Voltage (Gate Shorted to Source) | $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 200 | | | V |
| Temperature Coefficient of the Drain-to-Source Breakdown Voltage | $\Delta BV_{DSS}/\Delta T_J$ | | | TBD | | V/°C |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 1 mA | 2.0 | 3.0 | 4.0 | V |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{GS}$ = ± 20$V_{DC}$, $V_{DS}$ = 0 $T_J$ = 25°C<br>$T_J$ = 125°C | | | ±100<br>±200 | nA |
| Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current) | $I_{DSS}$ | $V_{DS}$ =0.8•$BV_{DSS}$ $T_J$ = 25°C<br>$V_{GS}$ = 0 V $T_J$ = 125°C | | | 25<br>250 | µA |
| Static Drain-to-Source On-State Resistance (1) | $R_{DS(on)}$ | $V_{GS}$= 10V, $I_D$= 21A $T_J$ = 25°C<br>$I_D$= 33A $T_J$ = 25°C<br>$I_D$= 21A $T_J$ = 125°C | | 0.06<br>TBD<br>0.11 | 0.07 | Ω |
| Forward Transconductance (1) | $g_{fs}$ | $V_{DS}$ ≥ 15 V; $I_D$ = 21 A | 15 | 23 | | S |
| Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | | 2600<br>500<br>230 | 3900<br>750<br>350 | 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 V, $V_{DS}$ = 30 V,<br>$I_D$ = 3 A, $R_G$ = 50 Ω | | 40<br>110<br>450<br>160 | 60<br>170<br>680<br>240 | 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 V, $V_{DS}$ = 160V, $I_D$ = 50A | | 120<br>10<br>70 | | nC |
| Body Diode Forward Voltage (1) | $V_{SD}$ | $I_F = I_S$, $V_{GS}$ = 0 V MSAE<br>MSAF | | <br>1.3 | 1.2<br>1.6 | V |
| Reverse Recovery Time (Body Diode) | $t_{rr}$ | $I_F$ = 10 A, MSAE<br>-di/dt = 100 A/µs, MSAF | | | 50<br>230 | ns |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$ = 10 A, MSAE<br>di/dt = 100 A/µs, MSAF | | | tbd<br>1.8 | µC |

**Notes**

**(1) Pulse test, t ≤ 300 µs, duty cycle δ ≤ 2%**

**(2) Microsemi Corp. does not manufacture the mosfet die; contact company for details.**