

**MSAER12N50A**  
**MSAFR12N50A**

## 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

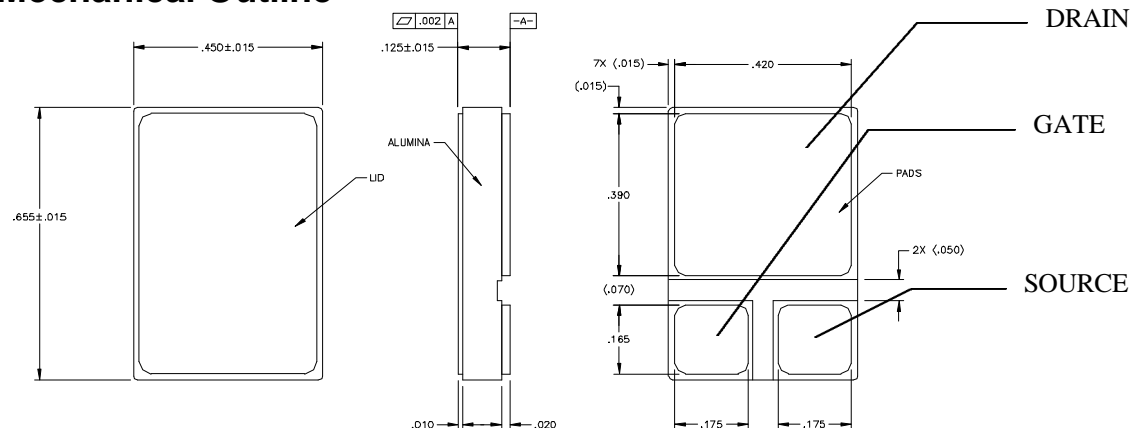
**500 Volts**  
**12 Amps**  
**400 mΩ**

**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) @ $T_J \geq 25^\circ\text{C}$	$BV_{DSS}$	500	Volts
Drain-to-Gate Breakdown Voltage @ $T_J \geq 25^\circ\text{C}$ , $R_{GS} = 1\text{ M}\Omega$	$BV_{DGR}$	500	Volts
Continuous Gate-to-Source Voltage	$V_{GS}$	+/-20	Volts
Transient Gate-to-Source Voltage	$V_{GSM}$	+/-30	Volts
Continuous Drain Current 100°C	$I_{D25}$ $I_{D100}$	12 8	Amps
Peak Drain Current, pulse width limited by $T_{Jmax}$	$I_{DM}$	48	Amps
Repetitive Avalanche Current	$I_{AR}$	12	Amps
Repetitive Avalanche Energy	$E_{AR}$	tbd	mJ
Single Pulse Avalanche Energy	$E_{AS}$	8	mJ
Voltage Rate of Change of the Recovery Diode @ $I_S \leq I_{DM}$ , $di/dt \leq 100\text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$	$dv/dt$	3.5	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)	$I_S$	12	Amps
Pulse Source Current (Body Diode)	$I_{SM}$	48	Amps
Thermal Resistance, Junction to Case	$\theta_{JC}$	0.4	°C/W

## Mechanical Outline



# MSAER12N50A MSAFR12N50A

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

DESCRIPTION	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT
Drain-to-Source Breakdown Voltage (Gate Shorted to Source)	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 1000\ \mu\text{A}$	500			V
Temperature Coefficient of the Drain-to-Source Breakdown Voltage	$\Delta BV_{DSS}/\Delta T_J$			0.78		V/°C
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\ \text{mA}$	2.0		4.0	V
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{V}_{DC}, V_{DS} = 0\ \text{T}_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			$\pm 100$ $\pm 200$	nA
Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current)	$I_{DSS}$	$V_{DS} = 0.8 \cdot BV_{DSS}\ \text{T}_J = 25^\circ\text{C}$ $V_{GS} = 0\ \text{T}_J = 125^\circ\text{C}$			25 250	$\mu\text{A}$
Static Drain-to-Source On-State Resistance (1)	$R_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 8\ \text{T}_J = 25^\circ\text{C}$ $I_D = 12\ \text{T}_J = 25^\circ\text{C}$ $I_D = 8\ \text{T}_J = 125^\circ\text{C}$		0.800	0.400 0.500	$\Omega$
Forward Transconductance (1)	$g_{fs}$	$V_{DS} \geq 15\ \text{V}; I_D = 8\ \text{A}$	5.5			S
Input Capacitance Output Capacitance Reverse Transfer Capacitance	$C_{iss}$ $C_{oss}$ $C_{rss}$	$V_{GS} = 0\ \text{V}, V_{DS} = 25\ \text{V}, f = 1\ \text{MHz}$		2700 600 240		pF
Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time	$T_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$	$V_{GS} = 10\ \text{V}, V_{DS} = 250\ \text{V},$ $I_D = 12\ \text{A}, R_G = 2.35\ \Omega$			35 190 170 130	ns
Total Gate Charge Gate-to-Source Charge Gate-to-Drain (Miller) Charge	$Q_{g(on)}$ $Q_{gs}$ $Q_{gd}$	$V_{GS} = 10\ \text{V}, V_{DS} = 250\text{V}, I_D = 12\text{A}$	55 5 27		120 19 70	nC
Body Diode Forward Voltage (1)	$V_{SD}$	$I_F = I_S, V_{GS} = 0\ \text{V}$ MSAE MSAF			1.2 1.7	V
Reverse Recovery Time (Body Diode)	$t_{rr}$	$I_F = 10\ \text{A},$ $-di/dt = 100\ \text{A}/\mu\text{s},$ MSAE MSAF			70 1600	ns
Reverse Recovery Charge	$Q_{rr}$	$I_F = 10\ \text{A},$ $di/dt = 100\ \text{A}/\mu\text{s},$ MSAE MSAF			tbd 14	$\mu\text{C}$

### 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 factory for details