

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

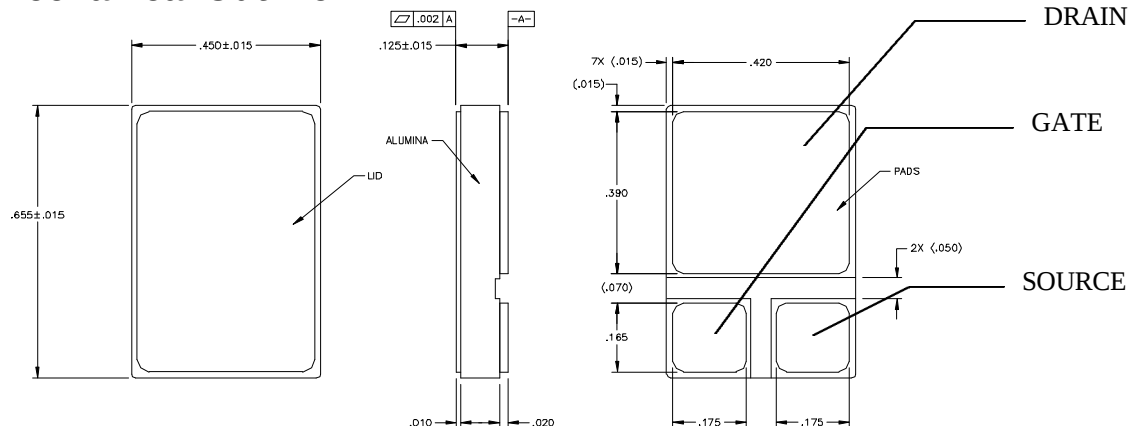
500 Volts
12 Amps
400 mΩ

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 $T_J = 25^\circ\text{C}$ $T_J =$	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	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$
Continuous Source Current (Body Diode)	I_S	12	Amps
Pulse Source Current (Body Diode)	I_{SM}	48	Amps
Thermal Resistance, Junction to Case	θ_{JC}	0.4	$^\circ\text{C}/\text{W}$

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}	$V_{GS} = 0\text{ V}, I_D = 1000\text{ }\mu\text{A}$	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}	$V_{GS} = \pm 20\text{ V}_{DC}, V_{DS} = 0\text{ V}, T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			± 100 ± 200	nA
Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current)	I_{DSS}	$V_{DS} = 0.8 \cdot BV_{DSS}, T_J = 25^\circ\text{C}$ $V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$			25 250	μA
Static Drain-to-Source On-State Resistance (1)	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 8\text{ A}, T_J = 25^\circ\text{C}$ $I_D = 12\text{ A}, T_J = 25^\circ\text{C}$ $I_D = 8\text{ A}, T_J = 125^\circ\text{C}$		0.800	0.400 0.500	Ω
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	$V_{GS} = 10\text{ V}, V_{DS} = 250\text{ V},$ $I_D = 12\text{ A}, R_G = 2.35\text{ }\Omega$			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	μC

Notes

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