

## N-Channel Enhancement Mode Power Mosfet

### DEVICES

**MSAFX50N20A**

**200 Volts  
50 Amps  
45 mΩ**

### 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

**Table 1 – ABSOLUTE MAXIMUM RATINGS** ( $T_c = +25^{\circ}\text{C}$  unless otherwise noted)

Parameters / Test Conditions	Symbol	Max.	Unit
Drain-to-Source Breakdown Voltage (Gate Shorted to Source) @ $T_J \geq 25^{\circ}\text{C}$	$BV_{DSS}$	200	V
Drain-to-Gate Breakdown Voltage @ $T_J \geq 25^{\circ}\text{C}$ , $R_{GS} = 1\text{M}\Omega$	$BV_{DGR}$	200	V
Continuous Gate-to-Source Voltage	$V_{GS}$	+/-20	V
Transient Gate-to-Source Voltage	$V_{GSM}$	+/-30	V
Continuous Drain Current	$I_{D25}$ $I_{D100}$	50 40	A
Peak Drain Current, pulse width limited by $T_{Jmax}$	$I_{DM}$	200	A
Repetitive Avalanche Current	$I_{AR}$	50	A
Repetitive Avalanche Energy	$E_{AR}$	30	mJ
Single Pulse Avalanche Energy	$E_{AS}$	TBD	mJ
Voltage Rate of Change of the Recovery Diode @ $I_S \leq I_{DM}$ , $di/dt \leq 100\text{A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^{\circ}\text{C}$	$dv/dt$	5.0	V/ns
Power Dissipation	$P_D$	300	W
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)	$I_S$	50	A
Pulse Source Current (Body Diode)	$I_{SM}$	200	A
Thermal Resistance, Junction to Case	$\theta_{JC}$	0.25	$^{\circ}\text{C}/\text{W}$

**Table 2 – ELECTRICAL CHARACTERISTICS** ( $T_c = +25^\circ\text{C}$  unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Typ	Max.	Unit
Drain-to-Source Breakdown Voltage (Gate Shorted to Source) $V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$	$BV_{DSS}$	200			V
Temperature Coefficient of the Drain-to-Source - Breakdown Voltage	$\Delta BV_{DSS} / \Delta T_J$		TBD		
Gate Threshold Voltage $V_{DS} = V_{GS}$ , $I_D = 4\text{mA}$	$V_{GS(th)}$	2.0		4.0	
Gate-to-Source Leakage Current $V_{GS} = \pm 20\text{Vdc}$ , $V_{DS} = 0$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	$I_{GSS}$			$\pm 100$ $\pm 200$	nA
Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current) $V_{DS} = 0.8 BV_{DSS}$ , $T_J = 25^\circ\text{C}$ $V_{GS} = 0\text{V}$ , $T_J = 125^\circ\text{C}$	$I_{DSS}$			200 1000	$\mu\text{A}$
Static Drain-to-Source On-State Resistance (1) $V_{GS} = 10\text{V}$ , $I_D = 25\text{A}$ , $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{V}$ , $I_D = 50\text{A}$ , $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{V}$ , $I_D = 25\text{A}$ , $T_J = 125^\circ\text{C}$	$R_{DS(on)}$		0.09	0.045 0.055	$\Omega$
Forward Transconductance (1) $V_{DS} \geq 10\text{V}$ , $I_D = 50\text{A}$	$g_{fs}$	26	32		S
Input Capacitance $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	$C_{iss}$		4400		pF
Output Capacitance $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	$C_{oss}$		500		pF
Reverse Transfer Capacitance $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	$C_{rss}$		285		pF
Turn-on Delay Time	$t_{d(on)}$		20	25	nS
Rise Time	$t_r$		45	50	nS
Turn-off Delay Time	$t_{d(off)}$		75	90	nS
Fall Time	$t_f$		20	25	nS
Total Gate Charge	$Q_{g(on)}$		190	220	nC
Gate-to-Source Charge	$Q_{gs}$		35	50	nC
Gate-to-Drain (Miller) Charge	$Q_{gd}$		95	110	nC
Body Diode Forward Voltage (1) $I_F = I_S$ , $V_{GS} = 0\text{V}$	$V_{SD}$			1.5	V
Reverse Recovery Time (Body Diode) $I_F = 10\text{A}$ , $T_J = 25^\circ\text{C}$ $-di/dt = 100\text{A} / \mu\text{s}$ , $T_J = 125^\circ\text{C}$	$t_{rr}$			200 300	nS
Reverse Recovery Charge $I_F = 10\text{A}$ , $T_J = 25^\circ\text{C}$ $di/dt = 100\text{A} / \mu\text{s}$ , $T_J = 125^\circ\text{C}$	$Q_{rr}$			1.5 2.6	$\mu\text{C}$

**PACKAGE DIMENSIONS**

