

MSAFA1N100D
Fast MOSFET Die for
Implantable Cardio Defibrillator
Applications

DESCRIPTION:

- N-Channel enhancement mode high density MOSFET die
- Passivation: oxynitride, 4um
- Frontside (top) Metallization: Al/1%Cu for aluminum wire bonding, 9 um typical.
- Backside Metallization: Ti – Ni (1 um) – Ag (0.2 um) for soft solder attach

FEATURES:

- Low On-state resistance
- Avalanche and Surge Rated
- High Freq. Switching
- Ultra Low Leakage Current
- UIS rated
- Available with Lot Acceptance Testing Spec MSAFA1N100DL, "-L" Suffix

MAXIMUM RATINGS:

SYMBOL	PARAMETER	VALUE	UNIT
V _{DSS}	Drain - Source Voltage	1000	Volts
V _{GS}	Gate - Source Voltage	±20	Volts
I _{D1}	Continuous Drain Current @ T _C = 25°C	1	Amps
I _{D2}	Continuous Drain Current @ T _C = 100°C	.8	Amps
I _{DM1}	Pulsed Drain Current ① @ T _C = 25°C	4	Amps
I _{AR}	Avalanche Current	1	Amps
E _{AR}	Repetitive Avalanche Energy	TBD	mJ
E _{AS}	Single Pulse Avalanche Energy	TBD	mJ
T _J , T _{STG}	Operating and Storage: Junction Temperature Range	-55 to 150	°C

STATIC ELECTRICAL CHARACTERISTICS:

SYMBOL	CHARACTERISTIC / TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV _{DSS}	Drain - Source Breakdown Voltage (V _{GS} = 0V, I _D = 0.25mA)	1000			Volts
V _{GS(TH)2}	Gate Threshold Voltage (V _{GS} = V _{DS} , I _D = 1 mA, T _J = 37°C)		3.4		Volts
V _{GS(TH)1}	Gate Threshold Voltage (V _{GS} = V _{DS} , I _D = 1 mA, T _J = 25°C)	2	3.5	4.5	Volts
R _{DS(ON)1}	Drain – Source On-State Resistance (V _{GS} = 10V, I _D = I _{D1} , T _J = 25°C)		12.5	13.5	ohm
R _{DS(ON)2}	Drain – Source On-State Resistance (V _{GS} = 7V, I _D = 5...150 mA, T _J = 37°C)		12.5		ohm
R _{DS(ON)3}	Drain – Source On-State Resistance (V _{GS} = 7V, I _D = 5...150 mA, T _J = 25°C)		11.5		ohm
R _{DS(ON)4}	Drain – Source On-State Resistance (V _{GS} = 7V, I _D = 5...150 mA, T _J = 60°C)		15		ohm
R _{DS(ON)5}	Drain – Source On-State Resistance (V _{GS} = 7V, I _D = I _{D1} , T _J = 125°C)		23.5		ohm
I _{DSS1}	Zero Gate Voltage Drain Current (V _{DS} = 80%BV _{DSS} , V _{GS} = 0V, T _J = 25°C)			10	uA
I _{DSS2}	Zero Gate Voltage Drain Current (V _{DS} = 80%BV _{DSS} , V _{GS} = 0V, T _J = 37°C)		1		uA
I _{DSS3}	Zero Gate Voltage Drain Current (V _{DS} = 80%BV _{DSS} , V _{GS} = 0V, T _J = 125°C)			100	uA
I _{GSS1}	Gate-Source Leakage Current (V _{GS} = ±20V, V _{CE} = 0V)			±100	nA
I _{GSS2}	Gate-Source Leakage Current (V _{GS} = ±20V V _{CE} = 0V), T _J = 37°C		10		nA
I _{GSS3}	Gate-Source Leakage Current (V _{GS} = ±20V V _{CE} = 0V), T _J = 125°C			500	nA

DYNAMIC CHARACTERISTICS:

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$		290	350	pF
C_{oss}	Output Capacitance	$V_{DS} = 25V$		36	45	pF
C_{rss}	Reverse Transfer Capacitance	$f = 1 \text{ MHz}$		15	25	pF
Q_g	Total Gate Charge ④	$V_{GS} = 10V$		20		nC
Q_{gs}	Gate-Source Charge	$V_{DS} = 0.5BV_{DSS}$		1		nC
Q_{gd}	Gate-Drain ("Miller") Charge	$I_C = 20 \text{ mA}$		10		nC
$t_d(\text{on})$	Turn-on Delay Time	Resistive Switching (25°C)		6.3		ns
t_r	Rise Time	$V_{GS} = 10V, V_{DS} = 0.5BV_{DSS}$		5.9		ns
$t_d(\text{off})$	Turn-off Delay Time	$I_D = 20 \text{ mA}$		315		ns
t_f	Fall Time	$R_g = 1.6\Omega$		2.6		us
$t_d(\text{on})$	Turn-On Delay Time	Resistive Switching (25°C)		6.3		ns
t_r	Rise Time	$V_{GS} = 10V, V_{DS} = 0.5BV_{DSS}$		5.8		ns
$t_d(\text{off})$	Turn-off Delay Time	$I_D = 100 \text{ mA}$		76		ns
t_f	Fall Time	$R_g = 1.6\Omega$		470		ns
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = 1 \text{ A}$			1	V
t_{rr}	Reverse Recovery Time	$I_S = 1 \text{ A}, dI_S/dt = 100 \text{ A/us}$		300	400	ns
Q_{rr}	Reverse Recovery Charge	$I_S = 1 \text{ A}, dI_S/dt = 100 \text{ A/us}$		700	1200	uC

① Repetitive Rating: Pulse width limited by maximum junction temperature.

② $I_C = I_{C2}, V_{CC} = 50V, R_{CE} = 25\Omega, L = 300\mu\text{H}, T_J = 25^\circ\text{C}$

③ $T_J = 150^\circ\text{C}$

④ See MIL-STD-750 Method 3471

DIE PROBE PARAMETERS (100% TESTS):

SYMBOL	CHARACTERISTIC / TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_C = 0.25\text{mA}$)	1000			Volts
$V_{GS(TH)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_C = 1000\mu\text{A}, T_J = 25^\circ\text{C}$)	2		4.5	
$R_{DS(ON)}$	Drain-Source On-Resistance ($V_{GS} = 10V, I_C = 1 \text{ A}, T_J = 25^\circ\text{C}$)			14	ohm
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 800 \text{ V}, V_{GS} = 0V, T_J = 25^\circ\text{C}$)			25	uA
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 20 \text{ V}, V_{DS} = 0V$)			±100	nA

MECHANICAL CHARACTERISTICS

