

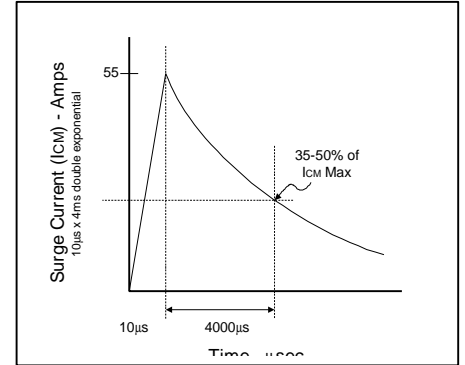
MSAGA11F120D
Fast IGBT Die for Implantable
Cardio Defibrillator
Applications

DESCRIPTION:

- N-Channel enhancement mode high density IGBT die
- Passivation: Polyimide, 20 um, over Silicon Nitride, .8um
- Emitter Metallization: Al/1%Si for aluminum wire bonding, 3.2 um typical.
- Collector/Gate Metallization: Ti – Ni (1 um) – Ag (0.2 um) for soft solder attach

FEATURES:

- Low Forward Voltage Drop, Low Tail Current
- Avalanche and Surge Rated
- High Freq. Switching to 20KHz
- Ultra Low Leakage Current
- RBSOA and SCSOA Rated
- Available with Lot Acceptance Testing Spec MSAGA11F120DL, "-L" Suffix



MAXIMUM RATINGS:

SYMBOL	PARAMETER	VALUE	UNIT
V _{CES}	Collector-Emitter Voltage	1200	Volts
V _{CGR}	Collector-Gate Voltage (R _{GE} = 20KW)	1200	Volts
V _{EG}	Emitter-Collector Voltage	15	Volts
V _{GE}	Gate-Emitter Voltage	±20	Volts
I _{C1}	Continuous Collector Current @ T _C = 25°C	22	Amps
I _{C2}	Continuous Collector Current @ T _C = 110°C	11	Amps
I _{CM}	Surge Current (10ms x 4ms double exponential, see figure 2)	55	Amps
I _{CM1}	Pulsed Collector Current ① @ T _C = 25°C	44	Amps
I _{CM2}	Pulsed Collector Current ① @ T _C = 110°C	22	Amps
I _{Csurge2}	Surge Current: tp= 2 us (ton= 1.5 ms; toff= 0.5 ms to 50% decay), 10 pulses, duty cycle= 1:2,500,000 (12 pulses/minute)	400	Apk
E _{AS}	Single Pulse Avalanche Energy ②	10	mJ
P _D	Total Power Dissipation	125	Watts
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 _{CES}	Collector-Emitter Breakdown Voltage (V _{GE} = 0V, I _C = 0.5mA)	1200			Volts
RBV _{CES}	Collector-Emitter Reverse Breakdown Voltage③ (V _{GE} = 20V, I _C = 10mA)	-15			Volts
	Gate Threshold Voltage (V _{CE} = V _{GE} , I _C = 350mA, T _J = 37°C)		5.7		Volts
V _{GE(TH)}	Gate Threshold Voltage (V _{CE} = V _{GE} , I _C = 350mA, T _J = 25°C)	4.5	5.5	6.5	Volts
V _{CE(ON)}	Collector-Emitter On Voltage (V _{GE} = 15V, I _C = I _{C2} , T _J = 25°C)		3.1	3.5	Volts
	Collector-Emitter On Voltage (V _{GE} = 15V, I _C = I _{C2} , T _J = 37°C)		3.5		Volts
	Collector-Emitter On Voltage (V _{GE} = 15V, I _C = I _{C2} , T _J = 125°C)		4	4.5	Volts
I _{CES}	Collector Cut-off Current (V _{CE} = 80%V _{CES} , V _{GE} = 0V, T _J = 25°C)		0.02	10	uA
	Collector Cut-off Current (V _{CE} = 80%V _{CES} , V _{GE} = 0V, T _J = 37°C)		0.07		uA
	Collector Cut-off Current (V _{CE} = 80%V _{CES} , V _{GE} = 0V, T _J = 125°C)			1000	uA
	Gate-Emitter Leakage Current (V _{GE} = ±25V, V _{CE} = 0V)		2	±100	nA
I _{GES}	Gate-Emitter Leakage Current (V _{GE} = ±25V, V _{CE} = 0V), T _J = 37°C		4		nA

DYNAMIC CHARACTERISTICS:

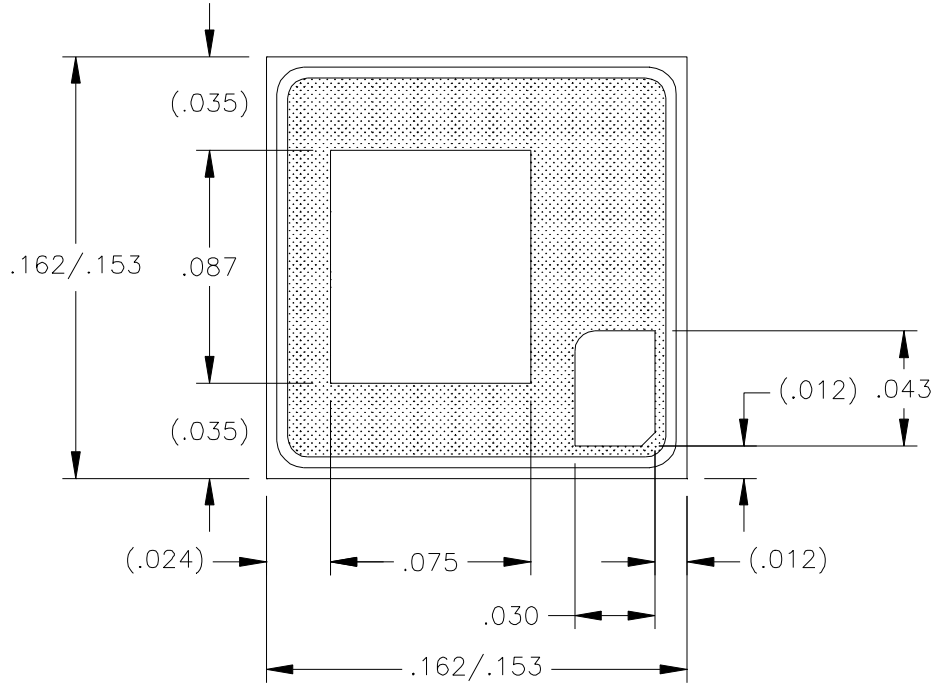
SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	$V_{GE} = 0V$		600	720	pF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		60	120	pF
C_{ros}	Reverse Transfer Capacitance	$f = 1 \text{ MHz}$		38	55	pF
Q_g	Total Gate Charge	$V_{GE} = 15V$		60		nC
Q_{ge}	Gate-Emitter Charge	$V_{CC} = 0.5V_{CES}$		4		nC
Q_{gc}	Gate-Collector ("Miller") Charge	$I_C = I_{C2}$		36		nC
$t_d \text{ (on)}$	Turn-on Delay Time	Resistive Switching (25°C)		35		ns
t_r	Rise Time	$V_{GE} = 15V, V_{CC} = 0.5V_{CES}$		120		ns
$t_d \text{ (off)}$	Turn-off Delay Time	$I_C = I_{C2}$		580		ns
t_f	Fall Time	$R_e = 150W$		260		ns
$t_d \text{ (on)}$	Turn-On Delay Time	Inductive Switching (25°C)		55	110	ns
t_r	Rise Time	$V_{CLAMP(PEAK)} = 0.5V_{CES}$		50	100	ns
$t_d \text{ (off)}$	Turn-off Delay Time	$V_{GE} = 15V, I_C = I_{C2}$		380	570	ns
t_f	Fall Time	$R_G = 150W, T_J = +25^\circ C$		80	120	ns
$t_d \text{ (on)}$	Turn-off Delay Time	Inductive Switching (125°C)		40		ns
t_r	Rise Time	$V_{CLAMP(PEAK)} = 0.5V_{CES}$		100		ns
$t_d \text{ (off)}$	Turn-off Delay Time (tsv)	$V_{GE} = 15V, I_C = I_{C2}$		550 700		ns
t_f	Fall Time (tfv)	$R_G = 150W, T_J = +125^\circ C$		160 40		ns
t_f	Fall Time (tfi)					ns
E_{off}	Turn-off Switching Energy			1		mJ
g_{fe}	Forward Transconductance	$V_{CE} = 20V, I_C = I_{C2}$	4.5	5		S

① Repetitive Rating: Pulse width limited by maximum junction temperature.
 ② $I_C = I_{C2}, V_{CC} = 50V, R_{CE} = 25W, L = 300nH, T_J = 25^\circ C$
 ③ $T_J = 150^\circ C$
 ④ See MIL-STD-750 Method 3471

DIE PROBE PARAMETERS (100% TESTS):

SYMBOL	CHARACTERISTIC / TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage ($V_{GE} = 0V, I_C = 0.5mA$)	1200	1400		Volts
RBV_{CES}	Collector-Emitter Reverse Breakdown Voltage ③ ($V_{GE} = 15V, I_C = 10mA$)	-15	30		
$V_{GE(TH)}$	Gate Threshold Voltage ($V_{CE} = 6.5V, I_C = 350mA, T_J = 25^\circ C$)	4.6	5.5	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 12V, I_C = 1A, T_J = 25^\circ C$)		1.45	2.0	
I_{CES}	Collector Cut-off Current ($V_{CE} = 1200V, V_{GE} = 0V, T_J = 25^\circ C$)		0.15	400	uA
I_{GES}	Gate-Emitter Leakage Current ($V_{GE} = \pm 20V, V_{CE} = 0V$)		5	±120	nA

MECHANICAL CHARACTERISTICS



DIE THICKNESS: $.00725 / .00850$

TYPICAL SURGE PERFORMANCE

