

MSAGX60F60A
MSAHX60F60A

Features

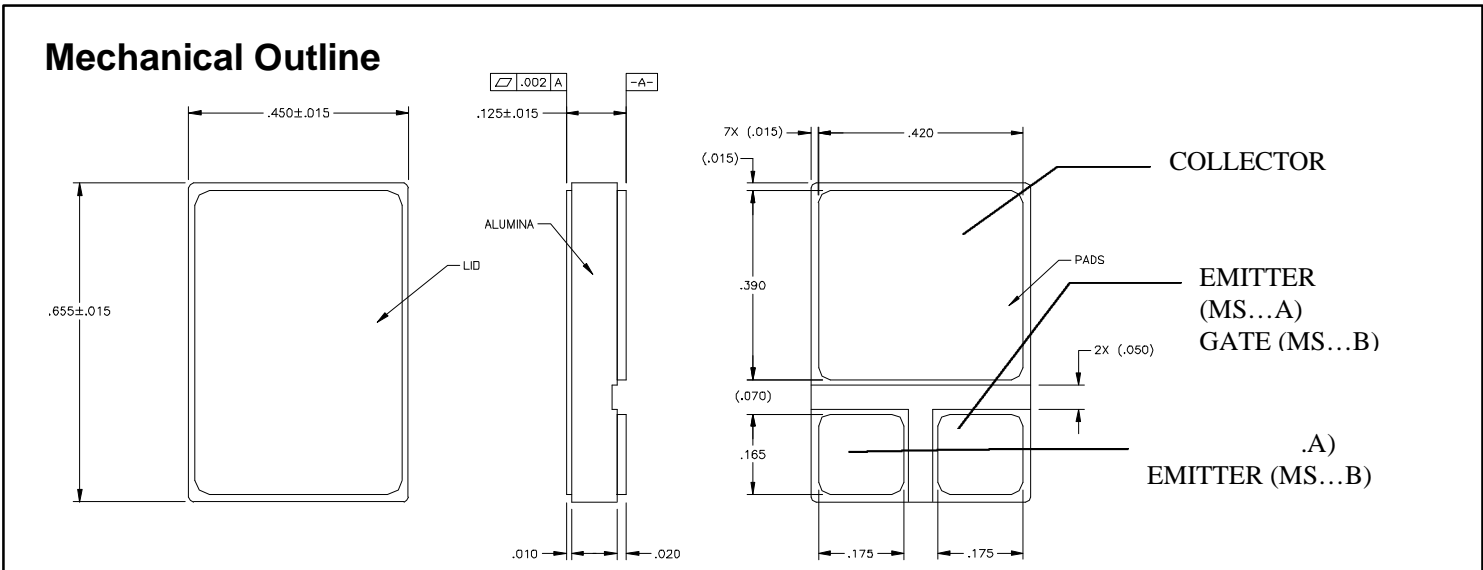
- Rugged polysilicon gate cell structure
- high current handling capability, latch-proof
- Hermetically sealed, surface mount power package
- Low package inductance
- Very low thermal resistance
- Reverse polarity available upon request: MSAH(G)60F60B
- high frequency IGBT, low switching losses
- anti-parallel FREDiode (MSAHX60F60A only)

600 Volts
60 Amps
2.9 Volts vce(sat)

N-CHANNEL
INSULATED GATE
BIPOLAR TRANSISTOR

Maximum Ratings @ 25°C (unless otherwise specified)

DESCRIPTION	SYMBOL	MAX.	UNIT
Collector-to-Emitter Breakdown Voltage (Gate Shorted to Emitter) @ $T_J \geq 25^\circ\text{C}$	BV_{CES}	600	Volts
Collector-to-Gate Breakdown Voltage @ $T_J \geq 25^\circ\text{C}$, $R_{GS} = 1\text{ M}\Omega$	BV_{CGR}	600	Volts
Continuous Gate-to-Emitter Voltage	V_{GES}	+/-20	Volts
Transient Gate-to-Emitter Voltage	V_{GEM}	+/-30	Volts
Continuous Collector Current $T_J = 25^\circ\text{C}$	I_{C25}	60	Amps
90°C	I_{C90}	32	
Peak Collector Current, pulse width limited by T_{jmax}	I_{CM}	120	Amps
Safe Operating Area (RBSOA) @ $V_{GE} = 15\text{V}$, $L = 100\mu\text{H}$ (clamped inductive load), $R_G = 4.7\Omega$, $T_J = 125^\circ\text{C}$, $V_{CE} = 0.8 \times V_{CES}$	I_{max}	64	Amps
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, MSAHX60F60A only)	I_S	32	Amps
Pulse Source Current (Body Diode, MSAHX60F60A only)	I_{SM}	100	Amps
Thermal Resistance, Junction to Case	θ_{JC}	0.4	$^\circ\text{C/W}$



MSAGX60F60A MSAHX60F60A

Electrical Parameters @ 25°C (unless otherwise specified)

DESCRIPTION	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT
Collector-to-Emitter Breakdown Voltage (Gate Shorted to Emitter)	BV_{CES}	$V_{GS} = 0\text{ V}, I_C = 250\ \mu\text{A}$	600			V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\ \mu\text{A}$	2.5		5.0	V
Gate-to-Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 20V_{DC}, V_{CE} = 0$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			± 100 ± 200	nA
Collector-to-Emitter Leakage Current (Zero Gate Voltage Collector Current)	I_{CES}	$V_{CE} = 0.8 \cdot BV_{CES}$ $V_{GE} = 0\text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			200 1000	μA
Collector-to-Emitter Saturation Voltage (1)	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $I_C = 60\text{ A}$ $I_C = 30\text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$		2.2 3.5 2.2	2.9	V
Forward Transconductance (1)	g_{fs}	$V_{CE} \geq 10\text{ V}; I_C = 30\text{ A}$	15	20		S
Input Capacitance	C_{ies}	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1\text{ MHz}$		2500		pF
Output Capacitance	C_{oes}			230		
Reverse Transfer Capacitance	C_{res}			70		
INDUCTIVE LOAD, $T_J = 25^\circ\text{C}$						
Turn-on Delay Time	$t_{d(on)}$	$V_{GE} = 15\text{ V}, V_{CE} = 480\text{ V},$ $I_C = 30\text{ A}, R_G = 4.7\ \Omega,$ $L = 100\ \mu\text{H}$ note 2, 3		25		ns
Rise Time	t_{ri}			30		ns
Turn-off Delay Time	$t_{d(off)}$			175		ns
Fall Time	t_{fi}			125	175	ns
Off Energy	E_{off}			1.3		mJ
INDUCTIVE LOAD, $T_J = 125^\circ\text{C}$						
Turn-on Delay Time	$t_{d(on)}$	$V_{GE} = 15\text{ V}, V_{CE} = 480\text{ V},$ $I_C = 30\text{ A}, R_G = 4.7\ \Omega,$ $L = 100\ \mu\text{H}$ note 2, 3		25		ns
Rise Time	t_{ri}			35		ns
On Energy	E_{on}			1		mJ
Turn-off Delay Time	$t_{d(off)}$			250		ns
Fall Time	t_{fi}			260		ns
Off Energy	E_{off}		4		mJ	
Total Gate Charge	Q_g	$V_{GE} = 15\text{ V}, V_{CE} = 300\text{ V}, I_C = 30\text{ A}$		125	150	nC
Gate-to-Emitter Charge	Q_{ge}			23	35	
Gate-to-Collector (Miller) Charge	Q_{gc}			50	75	
Antiparallel diode forward voltage (MSAHX60F60A only)	V_F	$I_E = 15\text{ A}$ $I_E = 15\text{ A}$ $I_E = 30\text{ A}$ $I_E = 50\text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 25^\circ\text{C}$			1.5 1.3	V V
Antiparallel diode reverse recovery time (MSAHX60F60A only)	t_{rr}	$I_E = 10\text{ A}, di_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$ $I_E = 30\text{ A}, di_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$		140	100	ns ns
Antiparallel diode reverse recovery charge (MSAHX60F60A only)	Q_{rr}	$I_E = 10\text{ A}, di_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$ $I_E = 30\text{ A}, di_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$		160 320		nC nC
Antiparallel diode peak recovery current (MSAHX60F60A only)	I_{RM}	$I_E = 10\text{ A}, di_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$ $I_E = 30\text{ A}, di_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$		3 4.2		A A

Notes

- (1) Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $\delta \leq 2\%$
- (2) switching times and losses may increase for larger V_{CE} and/or R_G values or higher junction temperatures.
- (3) switching losses include "tail" losses
- (4) Microsemi Corp. does not manufacture the igbt die; contact company for details.