

**MSAGZ52F120A**  
**MSAHZ52F120A**

**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)Z52F120B
- high frequency IGBT, low switching losses
- anti-parallel FREDiode (MSAHZ52F120A only)

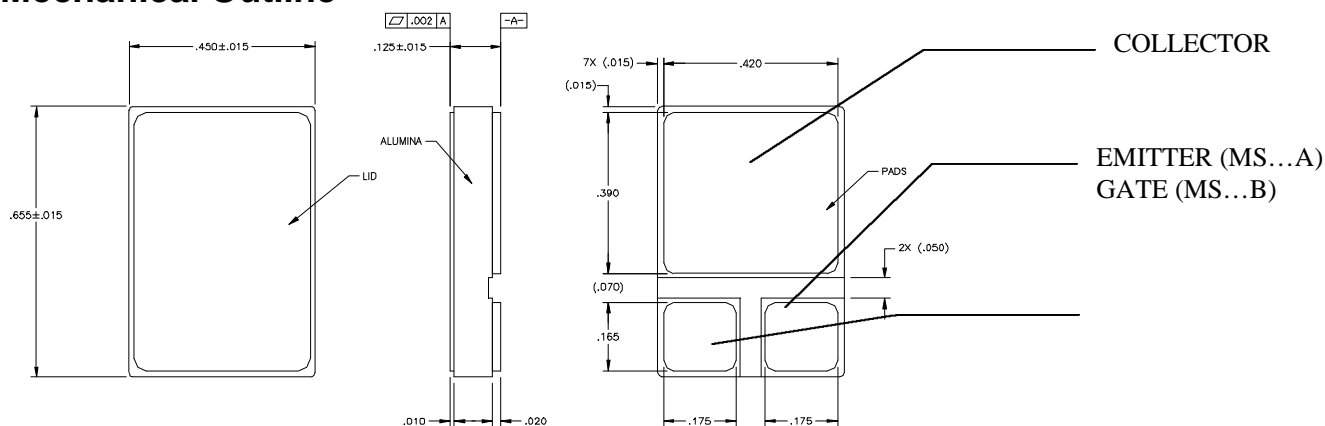
**1200 Volts**  
**52 Amps**  
**3.2 Volts vce(sat)**

**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) @ $T_J \geq 25^\circ\text{C}$		$BV_{CES}$	1200	Volts
Collector-to-Gate Breakdown Voltage @ $T_J \geq 25^\circ\text{C}$ , $R_{GS} = 1\text{ M}\Omega$		$BV_{CGR}$	1200	Volts
Continuous Gate-to-Emitter Voltage		$V_{GES}$	+/-20	Volts
Transient Gate-to-Emitter Voltage		$V_{GEM}$	+/-30	Volts
Continuous Collector Current	$T_J = 25^\circ\text{C}$ $T_J = 90^\circ\text{C}$	$I_{C25}$ $I_{C90}$	52 33	Amps
Peak Collector Current (pulse width limited by $T_{Jmax1}$ )	$T_J = 25^\circ\text{C}$ $T_J = 90^\circ\text{C}$	$I_{CM(25)}$ $I_{CM(90)}$	104 66	Amps
Avalanche energy (single pulse) @ $I_C = 25\text{A}$ , $V_{CC} = 50\text{V}$ , $L = 200\mu\text{H}$ , $R_G = 25\Omega$ , $T_J = 25^\circ\text{C}$		$E_{AS}$	65	mJ
Short circuit current (SOA), $V_{CE} \leq 1200\text{V}$ , $T_J = 150^\circ\text{C}$ , $t_{sc} \leq 10\mu\text{s}$		$I_{C(sc)}$	260	A
Short circuit (reverse) current (RBSOA), $V_{CE} \leq 1200\text{V}$ , $T_J = 150^\circ\text{C}$		$I_{C(sc)RBSOA}$	66	A
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, MSAHZ52F120A only)		$I_S$	50	Amps
Pulse Source Current (Body Diode, MSAHZ52F120A only)		$I_{SM}$	100	Amps

**Mechanical Outline**



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**Electrical Parameters @ 25°C (unless otherwise specified)**

DESCRIPTION	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT	
Collector-to-Emitter Breakdown Voltage (Gate Shorted to Emitter)	$BV_{CES}$	$V_{GS} = 0\text{ V}, I_C = 250\ \mu\text{A}$	1200			V	
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 350\ \mu\text{A}$	4.5	5.5	6.5	V	
Gate-to-Emitter Leakage Current	$I_{GES}$	$V_{GE} = \pm 20V_{DC}, V_{CE} = 0$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			$\pm 100$ $\pm 200$	nA	
Collector-to-Emitter Leakage Current (Zero Gate Voltage Collector Current)	$I_{CES}$	$V_{CE} = 0.8 \cdot BV_{CES}$ $V_{GE} = 0\text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			250 1000	$\mu\text{A}$	
Collector-to-Emitter Saturation Voltage (1)	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}, I_C = 25\text{ A}$ $I_C = 25\text{ A}$ $I_C = 60\text{ A}$ $I_C = 30\text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$		2.7 3.3 3.4 4.3	3.2 3.9	V	
Forward Transconductance (1)	$g_{fs}$	$V_{CE} = 20\text{ V}; I_C = 25\text{ A}$	8.5	20		S	
Input Capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1\text{ MHz}$		1650	2200	$\mu\text{F}$	
Output Capacitance	$C_{oes}$			250	380		
Reverse Transfer Capacitance	$C_{res}$			110	160		
<b>INDUCTIVE LOAD, <math>T_J = 125^\circ\text{C}</math></b>							
Turn-on Delay Time	$t_{d(on)}$	$V_{GE} = 15\text{ V}, V_{CE} = 600\text{ V},$ $I_C = 25\text{ A}, R_G = 47\ \Omega,$ $L = 100\ \mu\text{H}$ note 2, 3		75	110	ns	
Rise Time	$t_{ri}$			65	100	ns	
On Energy	$E_{on}$				3.6	mJ	
Turn-off Delay Time	$t_{d(off)}$				420	560	ns
Fall Time	$t_{fi}$				45	60	ns
Off Energy	$E_{off}$				2.4		mJ
<b>INDUCTIVE LOAD, <math>T_J = 125^\circ\text{C}</math></b>							
Turn-on Delay Time	$t_{d(on)}$	$V_{GE} = 15\text{ V}, V_{CE} = 600\text{ V},$ $I_C = 50\text{ A}, R_G = 47\ \Omega,$ $L = 100\ \mu\text{H}$ note 2, 3		95		ns	
Rise Time	$t_{ri}$			90		ns	
On Energy	$E_{on}$			10		mJ	
Turn-off Delay Time	$t_{d(off)}$			420		ns	
Fall Time	$t_{fi}$			45		ns	
Off Energy	$E_{off}$			4.2		mJ	
Total Gate Charge	$Q_g$	$V_{GE} = 15\text{ V}, V_{CE} = 600\text{ V}, I_C = 25\text{ A}$		160		nC	
Gate-to-Emitter Charge	$Q_{ge}$			20			
Gate-to-Collector (Miller) Charge	$Q_{gc}$			75			
Antiparallel diode forward voltage (MSAHZ52F120A only)	$V_F$	$I_E = 10\text{ A}$ $I_E = 10\text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 100^\circ\text{C}$		2.4 2	3	V V	
Antiparallel diode reverse recovery time (MSAHZ52F120A only)	$t_{rr}$	$I_E = 10\text{ A}, dI_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$ $I_E = 10\text{ A}, dI_E/dt = 800\text{ A/us}, T_J = 125^\circ\text{C}$		60	TBD	ns ns	
Antiparallel diode reverse recovery charge (MSAHZ52F120A only)	$Q_{rr}$	$I_E = 10\text{ A}, dI_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$ $I_E = 10\text{ A}, dI_E/dt = 800\text{ A/us}, T_J = 125^\circ\text{C}$		800	TBD	nC nC	
Antiparallel diode peak recovery current (MSAHZ52F120A only)	$I_{RM}$	$I_E = 10\text{ A}, dI_E/dt = 100\text{ A/us}, T_J = 25^\circ\text{C}$ $I_E = 10\text{ A}, dI_E/dt = 800\text{ A/us}, T_J = 125^\circ\text{C}$		22	TBD	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.