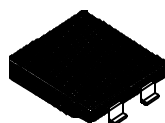


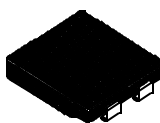
**MX043J**  
**MX043G**

## Features

- Harris FSC260R die
- total dose: 100 kRAD(Si) within pre-radiation parameter limits
- dose rate:  $3 \times 10^9$  RAD(Si)/sec @ 80% $V_{DSS}$  typical
- dose rate:  $2 \times 10^{12}$  RAD(Si)/sec @  $I_D \leq I_{DM}$  typical
- neutron:  $10^{13}$  neutrons/cm<sup>2</sup> within pre-radiation parameter limits
- photocurrent: 17 nA/RAD(Si)/sec typical
- rated Safe Operating Area Curve for Single event Effects
- rugged polysilicon gate cell structure with ultrafast body diode
- low inductance surface mount power package available with "J-leads" (MX043J) or "gullwing-leads" (MX043G)
- very low thermal resistance
- reverse polarity available upon request add suffix "R" st



MX043G



MX043J

**200 Volts**  
**44 Amps**  
**50 mW**

**RADIATION  
 HARDENED  
 SEGR-RESISTANT  
 N-CHANNEL  
 ENHANCEMENT  
 MODE  
 POWER MOSFET**

## Maximum Ratings @ 25°C (unless otherwise)

DESCRIPTION	SYMBOL	MAX.	UNIT
Drain-to-Source Breakdown Voltage (Gate Shorted to Source) @ $T_J \geq 25^\circ\text{C}$	$BV_{DSS}$	200	Volts
Drain-to-Gate Breakdown Voltage @ $T_J \geq 25^\circ\text{C}$ , $R_{GS} = 1 \text{ M}\Omega$	$BV_{DGR}$	200	Volts
Continuous Gate-to-Source Voltage	$V_{GS}$	+/-20	Volts
Transient Gate-to-Source Voltage	$V_{GSM}$	+/-30	Volts
Continuous Drain Current	$I_{D25}$ $I_{D100}$	44 28	Amps
		$T_J = 25^\circ\text{C}$ $T_J = 100^\circ\text{C}$	
Peak Drain Current, pulse width limited by $T_{Jmax}$	$I_{DM}$	132	Amps
Repetitive Avalanche Current	$I_{AR}$	44	Amps
Repetitive Avalanche Energy	$E_{AR}$	tbd	mJ
Single Pulse Avalanche Energy	$E_{AS}$	tbd	mJ
Power Dissipation	$P_D$	300	Watts
Junction Temperature Range	$T_J$	-55 to +125	°C
Storage Temperature Range	$T_{stg}$	-55 to +125	°C
Continuous Source Current (Body Diode)	$I_S$	44	Amps
Pulse Source Current (Body Diode)	$I_{SM}$	132	Amps
Thermal Resistance, Junction to Case	$\theta_{JC}$	0.25	°C/W
Weight	-		grams

### SINGLE EVENT EFFECTS SAFE OPERATING AREA (SEESO)

Ion Species	typical LET (MeV/mg/cm)	typical range ( $\mu$ )	VGS	VDSmax
Ni	26	43	-20V	200V
Br	37	36	-5V	200V
Br	37	36	-10V	160V
Br	37	36	-15V	100V
Br	37	36	-20V	40V

#### Notes

- (1) Pulse test,  $t \leq 300 \text{ ms}$ , duty cycle  $\leq 2\%$
- (2) Microsemi Corp. does not manufacture the mosfet die; contact company for details.

Datasheet# MSC0857

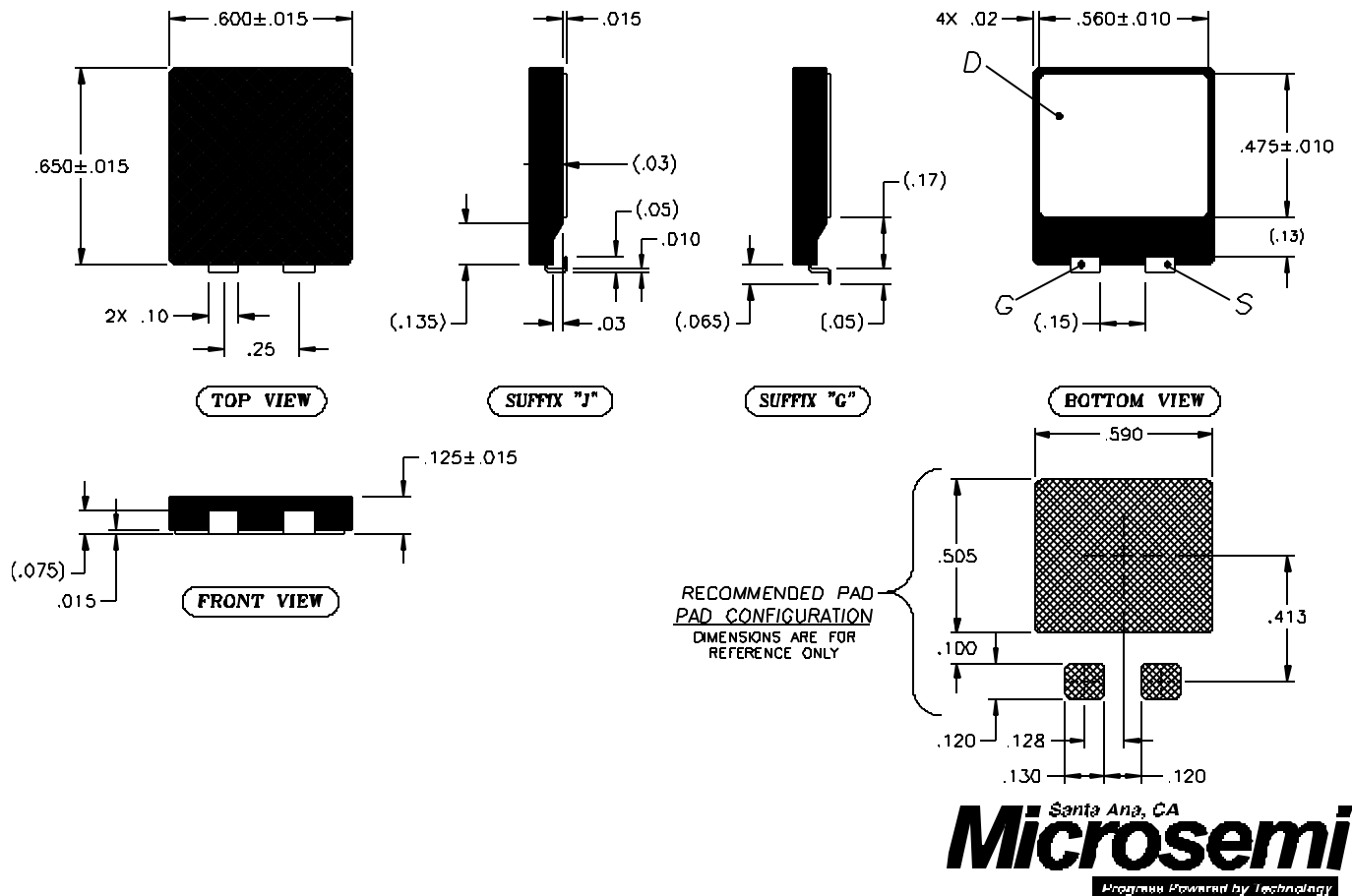
**MX043J**  
**MX043G**

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

DESCRIPTION	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT
Drain-to-Source Breakdown Voltage (Gate Shorted to Source)	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	200			V
Temperature Coefficient of the Drain-to-Source Breakdown Voltage	$\Delta BV_{DSS}/\Delta T_J$			tbd		V/°C
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\text{ mA},$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = -55^\circ\text{C}$	1.5 0.5 -		4.0 - 5.0	V V V
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}_{DC}, V_{DS} = 0$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			$\pm 100$ $\pm 200$	nA
Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current)	$I_{DSS}$	$V_{DS} = 0.8 \cdot BV_{DSS}$ $V_{GS} = 0\text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			25 250	$\mu\text{A}$ $\mu\text{A}$
Static Drain-to-Source On-State Resistance (1)	$R_{DS(on)}$	$V_{GS} = 12\text{ V}, I_D = 28\text{ A}$ $I_D = 25\text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$		0.043 -	0.050 0.093	$\Omega$ $\Omega$
Forward Transconductance (1)	$g_{fs}$	$V_{DS} \geq 10\text{ V}; I_D = 50\text{ A}$	26	32		S
Input Capacitance Output Capacitance Reverse Transfer Capacitance	$C_{iss}$ $C_{oss}$ $C_{rss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		4400 900 280		pF
Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time	$T_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$	$V_{GS} = 12\text{ V}, V_{DS} = 100\text{ V},$ $I_D = 44\text{ A}, R_G = 2.35\ \Omega$			40 95 100 25	ns
Total Gate Charge Gate-to-Source Charge Gate-to-Drain (Miller) Charge	$Q_{g(on)}$ $Q_{gs}$ $Q_{gd}$	$V_{GS} = 12\text{ V}, V_{DS} = 100\text{ V}, I_D = 44\text{ A}$		160 30 83	180 38 93	nC
Body Diode Forward Voltage (1)	$V_{SD}$	$I_F = I_S, V_{GS} = 0\text{ V}$	0.6	-	1.8	V
Reverse Recovery Time (Body Diode)	$t_{rr}$	$I_F = 10\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}, T_J = 25^\circ\text{C}$			560	ns

**Mechanical Outline**

**ShelfFit™**



### 100% KND (Known-Good-Die) SCREENING

- 100% die probe at  $T_{\text{ambient}} = 25^{\circ}\text{C}$  for BVDSS,  $V_{\text{GS}_{\text{th}}}$ , IDSS, IGSS, VSD,  $R_{\text{DS}_{\text{on}}}$
- 100% Visual Inspection i.a.w. method 2072 of MIL-STD-750

### DIE ELEMENT EVALUATION

- Wafer Lot Evaluation Testing (WLAT) i.a.w. method 5001 of MIL-STD-750, including SEM
- Unclamped Inductive Switching ( $I_{\text{AS}}$ ) i.a.w. method 3470 of MIL-STD-750 at  $V_{\text{GS}_{\text{peak}}} = 15\text{ V}$ ,  $L = 100\mu\text{H}$ ,  $I_{\text{AS}} = 132\text{ A}$
- Gate Stress Test for  $250\mu\text{s}$  at  $V_{\text{GS}} = 30\text{ Vdc}$ .
- Safe Operating Area i.a.w. method 3474 of MIL-STD-750 at  $V_{\text{DS}} = 160\text{ V}$ ,  $I_{\text{D}} = 2.8\text{ A}$  for 10 ms
- High Temperature Gate Bias i.a.w. method 1042 cond.B of MIL-STD-750: 48 hrs at  $T_{\text{ambient}} = 150^{\circ}\text{C}$ , Drain shorted to Source and  $V_{\text{GS}} = 16\text{ V}$
- High Temperature Reverse Bias i.a.w. method 1042 cond.A of MIL-STD-750: 240 hrs at  $T_{\text{ambient}} = 150^{\circ}\text{C}$ , Gate shorted to Source and  $V_{\text{DS}} = 160\text{ V}$
- Final DC Electrical Testing at  $T_{\text{ambient}} = 25^{\circ}\text{C}$ ,  $125^{\circ}\text{C}$  and  $-55^{\circ}\text{C}$
- Temperature Cycling i.a.w. method 1051 of MIL-STD-750, 100 cycles,  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Group A Electrical Testing including dynamic parameters
- Steady State Operational Life Bias i.a.w. method 1042 cond.A of MIL-STD-750: 1000 hrs at  $T_{\text{ambient}} = 150^{\circ}\text{C}$ , Gate shorted to Source and  $V_{\text{DS}} = 160\text{ V}$
- Final DC Electrical Testing at  $T_{\text{ambient}} = 25^{\circ}\text{C}$ ,  $125^{\circ}\text{C}$  and  $-55^{\circ}\text{C}$
- Die Attach Evaluation i.a.w. method 2017 of MIL-STD-750
- Bond Strength Evaluation i.a.w. 2037 of MIL-STD-750

### RADIATION EVALUATION

Total Dose Irradiation i.a.w. method 1019 of MIL-STD-750, dose= 100 kRAD, Drain shorted to Source,  $V_{\text{GS}} = 10\text{V}$

Total Dose Irradiation i.a.w. method 1019 of MIL-STD-750, dose= 100 kRAD, Gate shorted to Source,  $V_{\text{DS}} = 160\text{V}$

Evaluation criteria: no degradation of the DC electrical parameters exceeding the data sheet limits allowed after total dose irradiation.

## 100% SCREENING

- a. Internal Visual (Precap) Inspection i.a.w. method 2069 and 2072 of MIL-STD-750
- b. Temperature Cycling i.a.w. method 1051 of MIL-STD-750, 10 cycles, -55°C to +125°C
- c. Thermal Response i.a.w. method 3161 of MIL-STD-750
- d. High Temperature Gate Bias i.a.w. method 1042 cond.B of MIL-STD-750: 24 hrs at  $T_{\text{ambient}} = 125^{\circ}\text{C}$ , Drain shorted to Source and  $V_{\text{GS}} = 16\text{ V}$
- e. High Temperature Reverse Bias i.a.w. method 1042 cond.A of MIL-STD-750: 24 hrs at  $T_{\text{ambient}} = 125^{\circ}\text{C}$ , Gate shorted to Source and  $V_{\text{DS}} = 160\text{ V}$
- f. Final electrical Testing i.a.w. this data sheet (100% DC parameters @ 25°C and sample (22/0) testing for dynamic parameters and DC parameters @ temperature extremes)

## QUALIFICATION INSPECTION

- a. Thermal Resistance i.a.w. method 3161 of MIL-STD-750 - sample size= 10 devices/0 rejects
- b. Solderability i.a.w. method 2026 of MIL-STD-750 - sample size= 10 devices/0 rejects
- c. Temperature Cycling i.a.w. method 1051 of MIL-STD-750, 200 cycles, -55°C to +125°C - sample size 10 devices/0 rejects
- d. Intermittent Operation Life i.a.w. method 1042D of MIL-STD-750 with  $\Delta T_j = 75^{\circ}\text{C}$  for 2000 cycles (monitoring thermal response shift) - sample= 25 devices/0 rejects
- e. Steady State Operation Life i.a.w. method 1042A of MIL-STD-750 at  $T_j = 115^{\circ}\text{C}$  min. for 1000 hrs - sample= 25 devices/0 rejects
- f. Steady state Gate Life i.a.w. method 1042B of MIL-STD-750 at  $T_j = 115^{\circ}\text{C}$  min. for 1000 hrs. - sample= 25 devices/0 rejects
- g. Safe Operating Area i.a.w. method 3474 of MIL-STD-750 (monitoring thermal response shift) - sample size= 10 devices/0 rejects
- h. Shock i.a.w. method 2016 of MIL-STD-750 - sample size= 10 devices/0 rejects
- i. Vibration i.a.w. method 2056 of MIL-STD-750 - sample size= 10 devices/0 rejects
- j. Acceleration i.a.w. method 2006 of MIL-STD-750 - sample size= 10 devices/0 rejects
- k. X-ray, one view of the die attach area (Oz axis) - sample= 10 devices/0 rejects
- l. Humidity ????? - sample size= 5 devices/0 rejects