Microsemi
Santa Ana, CA
Progress Powered by Technology

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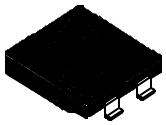
MX043J
MX043G

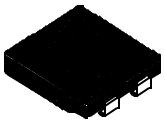
Features

- Harris FSC260R die
- total dose: 100 kRAD(Si) within pre-radiation parameter limits
- dose rate: 3×10^9 RAD(Si)/sec @ 80%BV_{DSS} typical
- dose rate: 2×10^{12} RAD(Si)/sec @ ID ≤ IDM typical
- neutron: 10^{13} neutrons/cm^2 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

200 Volts
44 Amps
50 mW

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


MX043G


MX043J

Maximum Ratings @ 25 °C (unless otherwise

DESCRIPTION	SYMBOL	MAX.	UNIT
Drain-to-Source Breakdown Voltage (Gate Shorted to Source) @ $T_J \geq 25°C$	BV_{DSS}	200	Volts
Drain-to-Gate Breakdown Voltage @ $T_J \geq 25°C$, R_{GS}= 1 MΩ	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 Tj= 25°C Tj= 100°C	I_{D25} I_{D100}	44 28	Amps
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	θ_{JC}	0.25	°C/W
Weight	-		grams

SINGLE EVENT EFFECTS SAFE OPERATING AREA (SEESOA)

Ion Species	typical LET (MeV/mg/cm)	typical range (μ)	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 £ 300 ms, duty cycle d £ 2%
(2) Microsemi Corp. does not manufacture the mosfet die; contact company for details.

MX043J
MX043G

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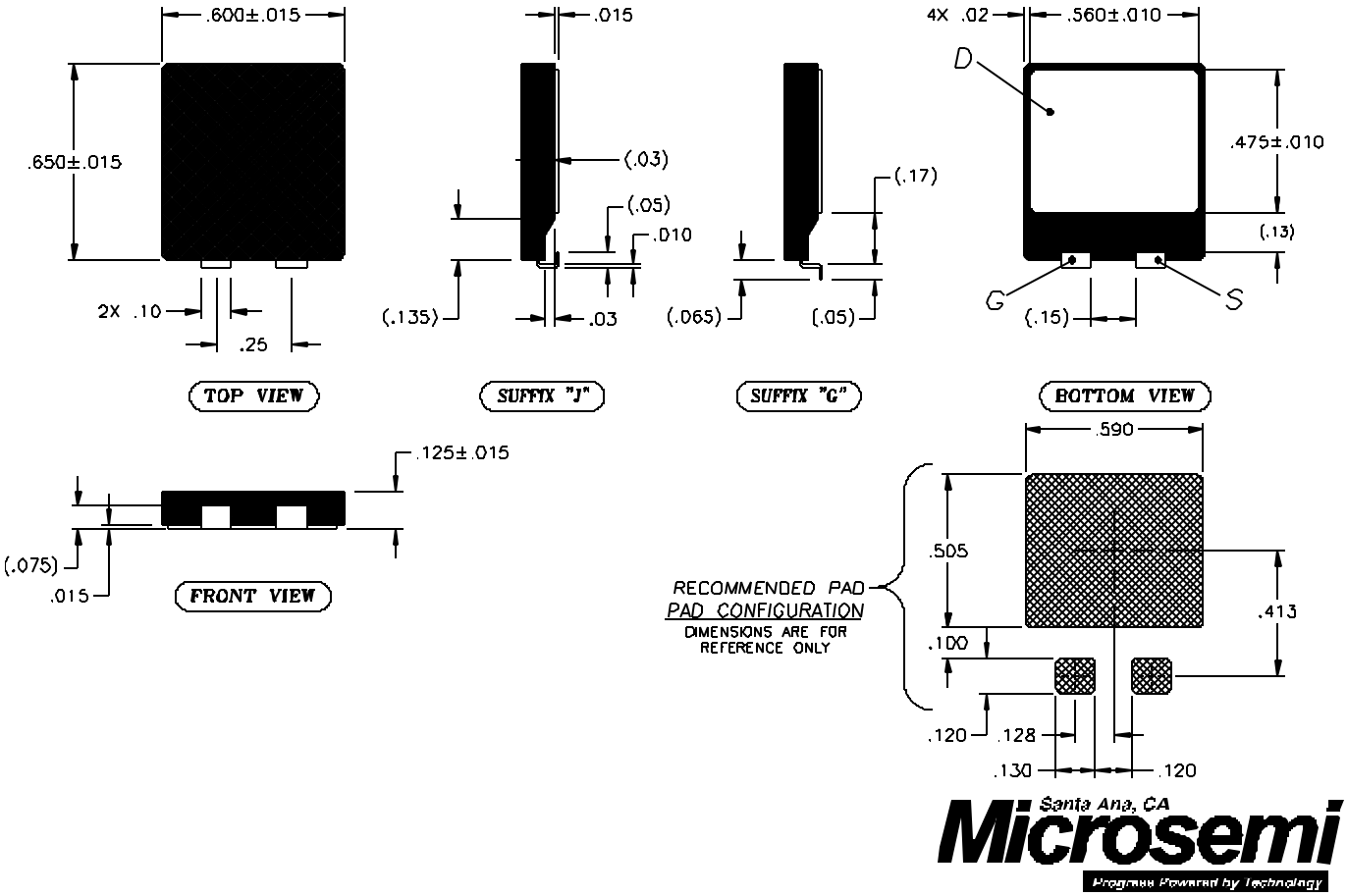
Electrical Parameters @ 25 °C (unless otherwise specified)

DESCRIPTION	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT
Drain-to-Source Breakdown Voltage (Gate Shorted to Source)	BV_{DSS}	V_{GS} = 0 V, I_D = 1 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 mA, T_J = 25°C T_J = 125°C T_J = -55°C	1.5 0.5 -		4.0 - 5.0	V V V
Gate-to-Source Leakage Current	I_{GSS}	V_{GS} = ± 20 V_{DC}, V_{DS} = 0 T_J = 25°C T_J = 125°C			±100 ±200	nA
Drain-to-Source Leakage Current (Zero Gate Voltage Drain Current)	I_{DSS}	V_{DS} =0.8•BV_{DSS} T_J = 25°C V_{GS} = 0 V T_J = 125°C			25 250	µA µA
Static Drain-to-Source On-State Resistance (1)	$R_{DS(on)}$	V_{GS}= 12V, I_D= 28A T_J = 25°C I_D= 25A T_J = 125°C		0.043 -	0.050 0.093	Ω Ω
Forward Transconductance (1)	g_{fs}	V_{DS} ≥ 10 V; I_D = 50 A	26	32		S
Input Capacitance Output Capacitance Reverse Transfer Capacitance	C_{iss} C_{oss} C_{rss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 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 V, V_{DS} = 100 V, I_D = 44 A, R_G = 2.35 Ω			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 V, V_{DS} = 100V, I_D = 44 A		160 30 83	180 38 93	nC
Body Diode Forward Voltage (1)	V_{SD}	I_F = I_S, V_{GS} = 0 V	0.6	-	1.8	V
Reverse Recovery Time (Body Diode)	t_{rr}	I_F = 10 A, -di/dt = 100 A/µs, T_J =25 °C			560	ns

Mechanical Outline

ShelFit™



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Programs Powered by Technology

100% KND (Known-Good-Die) SCREENING

a. 100% die probe at $T_{ambient}$= 25°C for BVDSS, VGS_{th}, IDSS, IGSS, VSD, RDS_{on}
b. 100% Visual Inspection i.a.w. method 2072 of MIL-STD-750

DIE ELEMENT EVALUATION

a. Wafer Lot Evaluation Testing (WLAT) i.a.w. method 5001 of MIL-STD-750, including SEM
b. Unclamped Inductive Switching (I_{AS}) i.a.w. method 3470 of MIL-STD-750 at VGS_{peak}= 15 V, L= 100µH, I_{AS}= 132 A
c. Gate Stress Test for 250 µs at VGS= 30 Vdc.
d. Safe Operating Area i.a.w. method 3474 of MIL-STD-750 at VDS= 160 V, ID= 2.8 A for 10 ms
e. High Temperature Gate Bias i.a.w. method 1042 cond.B of MIL-STD-750: 48 hrs at $T_{ambient}$= 150°C, Drain shorted to Source and V_{GS}= 16 V
f. High Temperature Reverse Bias i.a.w. method 1042 cond.A of MIL-STD-750: 240 hrs at $T_{ambient}$= 150°C, Gate shorted to Source and V_{DS}= 160 V
g. Final DC Electrical Testing at $T_{ambient}$= 25°C, 125°C and -55°C
h. Temperature Cycling i.a.w. method 1051 of MIL-STD-750, 100 cycles, -55°C to +150°C
i. Group A Electrical Testing including dynamic parameters
j. Steady State Operational Life Bias i.a.w. method 1042 cond.A of MIL-STD-750: 1000 hrs at $T_{ambient}$= 150°C, Gate shorted to Source and V_{DS}= 160 V
k. Final DC Electrical Testing at $T_{ambient}$= 25°C, 125°C and -55°C
l. Die Attach Evaluation i.a.w. method 2017 of MIL-STD-750
m. 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, VGS= 10V
Total Dose Irradiation i.a.w. method 1019 of MIL-STD-750, dose= 100 kRAD, Gate shorted to Source, VDS= 160V
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 $T_{ambient}$= 125°C, Drain shorted to Source and V_{GS}= 16 V
e. High Temperature Reverse Bias i.a.w. method 1042 cond.A of MIL-STD-750: 24 hrs at $T_{ambient}$= 125°C, Gate shorted to Source and V_{DS}= 160 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 ΔTj= 75°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 Tj= 115°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 Tj= 115°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