

# RAD7230-NCx Power MOSFET Die

## Datasheet

August, 2012

[www.aeroflex.com/MOSFETS](http://www.aeroflex.com/MOSFETS)

### FEATURES

- ❑ 200V breakdown voltage
- ❑ 12 A current rating
- ❑  $0.22\Omega$   $R_{DS(on)}$
- ❑ 160nC gate charge
- ❑  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range
- ❑ Operational Environment radiation testing to MIL-STD-750
  - Total-dose: 100 krad(Si)
  - SEGR/SEB immune to Xe at full rated drain potential
- ❑ Bare Die
  - Prototypes, EMs and Class S
- ❑ Die performance compatible with industry standards
- ❑ Class K equivalent

### INTRODUCTION

Aeroflex RAD's new radiation tolerant power MOSFETs are now available in die, seven standard package options and custom packaging for HiRel environments. Applications within military, aerospace, medical, nuclear power generation, high energy physics research laboratories can benefit from the use of this new series of MOSFETs. Aeroflex's Power MOSFETs are radiation tolerant to 100 krad(Si) and SEGR/SEB immune to their full rated breakdown potential.

Operational power losses are minimized by Aeroflex's ideal combination of low  $R_{DS(on)}$  and gate charge. Die size is optimized for maximum current rating while meeting industry norms. These units are suitable for standalone and hybrid applications.

The RAD7230-NCx Die are well suited for low loss switching applications, such as DC-to-DC Converters and solid-state relays. Die performance is drop-in compatible with industry standards.

### ELECTRICAL CHARACTERISTICS (Case temperature ( $T_c$ ) = $25^{\circ}\text{C}$ unless otherwise specified)

CHARACTERISTICS	TEST CONDITIONS	LIMITS			UNITS		
		MIN	TYP	MAX			
Drain-Source Breakdown Voltage	$BV_{dss}$	$V_{gs} = 0V, I_d = 1mA$		200	-	-	V
Gate-Threshold Voltage	$V_{gs(th)}$	$V_{ds} = V_{gs}, I_d = 1.0mA$		2.0	-	4.0	V
Gate-Body Leakage	$I_{gss}$	$V_{gs} = \pm 20V$		-	-	100	nA
Zero-Gate Leakage	$I_{dss1}$	$V_{ds} = 160V, V_{gs} = 0V$		-	-	25	$\mu A$
Drain Current	$I_{dss2}$	$V_{ds} = 160V, V_{gs} = 0V, T_c = 125^{\circ}\text{C}$		-	-	250	
Drain-Source On Resistance	$R_{DS(on)}$	$V_{gs} = 12V, I_d = 9.6A$		-	-	0.22	ohms
Gate to Source Charge	$Q_{gs}$	$V_{gs} = 0V$ to $12V$	$I_d = 12A$ $V_{dd} = 125V$	-	-	10	nC
Diode Forward Voltage	$V_{sd}$	$I_d = 12A, V_{gd} = 0V$		0.6	-	1.8	V
Continuous source current (body diode)	$I_s$			-	-	-	A

## POST-RADIATION ELECTRICAL CHARACTERISTICS

CHARACTERISTICS	TEST CONDITIONS	LIMITS		UNITS	
		MIN	MAX		
Drain-Source Breakdown Voltage <sup>3,4</sup>	Bvdss	Vgs = 0V, Id = 1mA	200	-	V
Gate-Source Threshold Voltage <sup>3,4</sup>	Vgs(th)	Vgs = Vds, Id = 1.0mA	1.5	4.0	V
Gate-Body Leakage Forward <sup>2,3,4</sup>	Igss	Vgs = ±20, Vds = 0V	-	100	nA
Zero-Gate Voltage Drain Current <sup>3,4</sup>	Idss	Vgs = 0V, Vds = 160V	-	25	μA
Drain-Source On-Resistance <sup>1,3,4</sup>	R <sub>DS(on)</sub>	Vgs = 12V, Ids = 9.6A	-	0.22	ohms

Notes:\* for die products, the maximum current may be limited by packaging

1. Pulse test, 300us max
2. Absolute value
3. Gamma = 100 krad(Si)
4. Gamma irradiation bias at both Vgs = 12V, Vds = 0V and Vgs = 0V, Vds = 80% BVdss

## SEE (SINGLE-EVENT-EFFECTS)

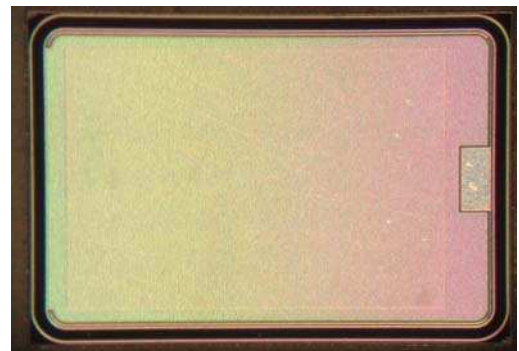
CHARACTERISTICS	SYMBOL	ENVIRONMENT <sup>1</sup>				MAX VDS BIAS (V) <sup>2</sup>
		ENERGY (MeV)	TYPICAL LET (MEV/MG/CM2)	TYPICAL RANGE (u)	APPLIED VGS BIAS (V)	
Single Event Effects - Safe Operating Area	Kr	906	30	113	-10	200
	Xe	1232	59	99	-5	200

Notes:

1. Fluence = 1E6 ions/cm<sup>2</sup> (typical), T = 25°C
2. Does not exhibit Single Event Burnout (SEB) or Single Event Gate Rupture (SEGR).

## DIE FEATURES

- Die Size
  - 126mils ± 2mils x 182mils ± 2mils
- Gate Pad
  - .011" ± 1mil x 0.25 ± 1.5mils
- Die Thickness
  - 14 mils ± 1mils
- Top Metal
  - 40kA (±10%) Al 1% Si
- Back Metal
  - Ti(2kA)NiV(10kA)Ag(2kA) (±10%)



**ELECTRICAL TESTING AT WAFER PROBE:**

ITEM	VOLTAGE	CURRENT	LOWER LIMIT	UPPER LIMIT	LOWER SPEC	UPPER SPEC	UNIT
igss	Vgs=5V			100			uA
igss	Vgs=20V			100		100	nA
igss	Vgs=30V			1			uA
idss	Vds=160V			2		25	uA
idss	Vds=200V			10		1000	uA
bvdss		Ids=1mA	200		200		V
R <sub>DS(on)</sub>	Vgs=12V	Ids=0.5A		220		220	mΩ
R <sub>DS(on)</sub>	Vgs=12V	Ids=2A		220		220	mΩ
vsd		Isd=2A	0.6	1.2	0.6	1.8	V
vth		Ids=250μA	2.7	3.9	2.00	4.00	V
igssr	Vgs=-20V			100		100	nA
igssr	Vgs=-30V			1			uA
idss	Vds=200V			10			uA
igss	Vgs=20V			100		100	nA

**AEROFLEX RAD RAD7230-NCx PART NUMBERING:**

PART #	BREAKDOWN POTENTIAL (V)	R <sub>DS(on)</sub> (mΩ)	DRAIN CURRENT (A)	GATE CHARGE (nC)	TID LEVEL (krad(SI))	SEE	Die size	PKG	SCREENING
RAD7230-NCP	200	220	12	10	100	Xe	3	Bare die	Prototype
RAD7230-NCE	200	220	12	10	100	Xe	3	Bare die	EM
RAD7230-NCS	200	220	12	10	100	Xe	3	Bare die	Space

## ***Aeroflex RAD- Datasheet Definition***

**Advanced Datasheet - Product In Development**

**Preliminary Datasheet - Shipping Prototypes**

**Datasheet - Class S Compliant, QML or JAN**

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