

# RAD7160-NCx Power MOSFET Die

## Data Sheet

September, 2012

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

- ❑ 100V breakdown voltage
- ❑ 60 A current rating
- ❑  $0.01\Omega$   $R_{DS(on)}$
- ❑ 150nC 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
  - Prototype, EMs and Class S
- ❑ Drop-in compatible with industry standards
- ❑ Class S MOSFETs built to your custom flow

**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 RAD7160-NCx Die are well suited for low loss switching applications, such as DC-to-DC Converters and solid-state relays. They are 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	$BV_{dss}$	$V_{gs} = 0V, I_d = 1mA$		100	-	-	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	$I_{dss1}$	$V_{ds} = 80V, V_{gs} = 0V$		-	-	25	$\mu\text{A}$
Drain Current	$I_{dss2}$	$V_{ds} = 80V, V_{gs} = 0V, T_c = 125^{\circ}\text{C}$		-	-	250	
Drain-Source On Resistance	$R_{DS(on)}$	$V_{gs} = 12V, I_d = 48A$		-	-	0.01	ohms
Gate Charge at 12V	$Q_g(12)$	$V_{gs} = 12V$	$I_d = 60A$ $V_{dd} = 50V$	-	-	150	nC
Diode Forward Voltage	$V_{sd}$	$I_d = 60A, V_{gs} = 0V$		0.6	-	1.2	V
Junction-to-Case	$R_{\theta jc}$	NA/Die		-	-	-	$^{\circ}\text{C/W}$

## POST-RADIATION ELECTRICAL CHARACTERISTICS

CHARACTERISTICS	TEST CONDITIONS	LIMITS		UNITS	
		MIN	MAX		
Drain-Source Breakdown Voltage <sup>3,4</sup>	Bvdss	Vgs = 0V, Id = 1mA	100	-	V
Gate-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 = 80V	-	25	μA
Drain-Source On-Resistance <sup>1,3,4</sup>	R <sub>DS(on)</sub>	Vgs = 12V, Ids = 48A	-	0.01	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>
		ION SPECIES	ENERGY (MeV)	TYPICAL LET (MEV/MG/CM2)	TYPICAL RANGE (u)	
Single Event Effects - Safe Operating Area	Kr	906	30	113	-10	100
	Xe	1232	59	99	-5	100

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  
- 0.279" x 0.324" Nominal
- Gate Pad  
- .010" x 0.22" Nominal
- Source Pad  
- 0.109" x 0.270" Nominal
- Die Thickness  
- 14 mils
- 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=80V			2		25	uA
idss	Vds=100V			10		1000	uA
bvdss		Ids=1mA	100		100		V
r <sub>don</sub>	Vgs=12V	Ids=0.5A		.01		.01	mΩ
r <sub>don</sub>	Vgs=12V	Ids=2A		.01		.01	mΩ
v <sub>sd</sub>		Isd=2A	0.6	1.2	0.6	1.8	V
v <sub>th</sub>		Ids=250μA	2.7	3.9	2.00	4.00	V
igssr	Vgs=-20V			100		100	nA
igssr	Vgs=-30V			1			uA
idss	Vds=100V			10			uA
igss	Vgs=20V			100		100	nA

**AEROFLEX RAD RAD7160-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
<b>RAD7160-NCP</b>	<b>100</b>	<b>10</b>	<b>60</b>	<b>150</b>	<b>100</b>	<b>Xe</b>	<b>6</b>	<b>Bare Die</b>	<b>Prototype</b>
<b>RAD7160-NCE</b>	<b>100</b>	<b>10</b>	<b>60</b>	<b>150</b>	<b>100</b>	<b>Xe</b>	<b>6</b>	<b>Bare Die</b>	<b>EM</b>
<b>RAD7160-NCS</b>	<b>100</b>	<b>10</b>	<b>60</b>	<b>150</b>	<b>100</b>	<b>Xe</b>	<b>6</b>	<b>Bare Die</b>	<b>Space</b>

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

**Advanced Datasheet - Product In Development**

**Preliminary Datasheet - Shipping Prototypes**

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

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