

**Radiation Hardened,  
Solid-State Relay**

**RDHA720SF06A1NK  
60V, 20A**

**Product Summary ③**

Part Number	Breakdown Voltage	Current	tr / tf
RDHA720SF06A1NK	60V	20A	Fast



**Description**

The RDHA720SF06A1NK is a radiation hardened solid-state relay in a hermetic package. It is configured as a single-pole-single-throw (SPST) normally open relay. This device is characterized for 100 krad(Si) total ionizing dose. The RDHA720SF06A1NK is optically coupled and actuated by an input current.

**Features:**

- Total Dose Capability to 100krad(Si)
- Optically Coupled
- 1000V<sub>DC</sub> Input to Output Isolation
- Hermetically Sealed Package

**Absolute Maximum Ratings @ T<sub>j</sub>=25°C (unless otherwise specified)**

Parameter	Symbol	Value	Units
Output Supply Voltage ③	V <sub>S</sub>	60	V
Output Current ②,③	I <sub>O</sub>	20	A
Input Supply Current	I <sub>DD</sub>	50	mA
Peak Input Supply Current (t ≤ 1ms)	I <sub>DD pk</sub>	100	
Power Dissipation ②,③	P <sub>DISS</sub>	150	W
Operating Temperature Range	T <sub>J</sub>	-55 to +125	°C
Storage Temperature Range	T <sub>S</sub>	-65 to +150	
Lead Temperature	T <sub>L</sub>	300	

For notes, please refer to page 3

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**General Characteristics @  $-55^{\circ}\text{C} \leq T_{\text{C}} \leq +125^{\circ}\text{C}$  (Unless Otherwise Specified)**

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Input Supply Current ①		$I_{\text{O}} = 20\text{A}$	$I_{\text{DD}}$	12	20	40	mA
Input Voltage Drop	1	$I_{\text{IN}} = 10\text{mA}$	$V_{\text{L}}$	4.0	5.2	6.8	V
Input-to-Output Leakage Current	1	$V_{\text{I-O}} = 1.0\text{KVdc}$ , dwell = 5.0s	$I_{\text{I-O}}$	--	--	1.0	$\mu\text{A}$
Output Capacitance①		$I_{\text{DD}} \leq 0.5\text{mA}$ , $f = 1.0\text{MHz}$ , $V_{+} = 25\text{V}$ $T_{\text{C}} = 25^{\circ}\text{C}$	$C_{\text{OSS}}$	--	2000	--	pF
Thermal Resistance①,②		$I_{\text{DD}} = 20\text{mA}$	$R_{\text{THJC}}$	--	--	0.65	$^{\circ}\text{C/W}$
MTBF		MIL-HDBK-217F, SF@ $T_{\text{C}} = 25^{\circ}\text{C}$		4.4	--	--	MHrs

**Pre-Irradiation****Electrical Characteristics @  $-55^{\circ}\text{C} \leq T_{\text{C}} \leq +125^{\circ}\text{C}$  (Unless Otherwise Specified)**

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output On-Resistance	1	$I_{\text{DD}} = 20\text{mA}$ , $I_{\text{O}} = 20\text{A}$	$R_{\text{DS(ON)}}$	--	0.030	0.040	$\Omega$
	2			--	0.045	0.078	
Output Leakage Current	1	$I_{\text{DD}} \leq 0.5\text{mA}$ , $V_{\text{OUT}} = 60\text{V}$	$I_{\text{O}}$	--	--	25	$\mu\text{A}$
	2	$I_{\text{DD}} \leq 0.5\text{mA}$ , $V_{\text{OUT}} = 48\text{V}$		--	--	250	
Turn-On Delay ④	1,2,3	$I_{\text{DD}} = 20\text{mA}$ , $V_{\text{S}} = 40\text{V}$ , $I_{\text{O}} = 20\text{A}$ $\text{PW} = 4.0\text{ms}$ , $D \leq 1\%$	$t_{\text{on}}$	--	0.65	1.25	ms
Turn-Off Delay ④	1,2,3	$V_{\text{S}} = 40\text{V}$ , $I_{\text{O}} = 20\text{A}$ $\text{PW} = 4.0\text{ms}$ , $D \leq 1\%$	$t_{\text{off}}$	--	0.2	0.5	
Rise Time ④	1,2,3	$I_{\text{DD}} = 20\text{mA}$ , $V_{\text{S}} = 40\text{V}$ , $I_{\text{O}} = 20\text{A}$ $\text{PW} = 4.0\text{ms}$ , $D \leq 1\%$	$t_{\text{r}}$	--	0.85	1.65	
Fall Time ④	1,2,3	$V_{\text{S}} = 40\text{V}$ , $I_{\text{O}} = 20\text{A}$ $\text{PW} = 4.0\text{ms}$ , $D \leq 1\%$	$t_{\text{f}}$	--	0.06	0.15	

For notes, please refer to page 3

## Post Total Dose Irradiation

### Electrical Characteristics @ 25°C (Unless Otherwise Specified) ①,②,③

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output On-Resistance	1	$I_{DD} = 20\text{mA}$ , $I_O = 20\text{A}$	$R_{DS(ON)}$	--	0.03	0.040	$\Omega$
Output Leakage Current	1	$I_{DD} \leq 0.5\text{mA}$ , $V_{OUT} = 60\text{V}$	$I_O$	--	--	25	$\mu\text{A}$
Turn-On Delay ④	1	$I_{DD} = 20\text{mA}$ , $V_S = 40\text{V}$ , $I_O = 20\text{A}$ $PW = 4.0\text{ms}$ , $D \leq 1\%$	$t_{on}$	--	0.8	1.6	ms
Turn-Off Delay ④	1	$V_S = 40\text{V}$ , $I_O = 20\text{A}$ $PW = 4.0\text{ms}$ , $D \leq 1\%$	$t_{off}$	--	0.05	0.13	
Rise Time ④	1	$I_{DD} = 20\text{mA}$ , $V_S = 40\text{V}$ , $I_O = 20\text{A}$ $PW = 4.0\text{ms}$ , $D \leq 1\%$	$t_r$	--	1.1	2.2	
Fall Time ④	1	$V_S = 40\text{V}$ , $I_O = 20\text{A}$ $PW = 4.0\text{ms}$ , $D \leq 1\%$	$t_f$	--	0.06	0.15	

### Notes for Maximum Rating, Electrical and General Characteristic Tables

- ① Specification is guaranteed by design
- ② Optically coupled Solid State Relays (SSRs) have relatively slow turn on and turn off times. Care must be taken to insure that transient currents do not cause violation of SOA. If transient conditions are present, IR recommends a complete simulation to be performed by the end user to ensure compliance with SOA requirements as specified in the IRHN7054 data sheet
- ③ While the SSR design meets the design requirements specified in MIL-PRF-38534, the end user is responsible for product derating, as required for the application
- ④ Reference Figures 3 & 4 for Switching Test Circuit and Wave Form
- ⑤ Total Dose Irradiation with Input Bias 20mA  $I_{DD}$  applied and  $V_{DS} = 0$  during Irradiation
- ⑥ Total Dose Irradiation with Output Bias 48 Volts  $V_{DS}$  applied and  $I_{DD} = 0$  during Irradiation
- ⑦ International Rectifier does not currently have a DSCC certified Radiation Hardness Assurance Program

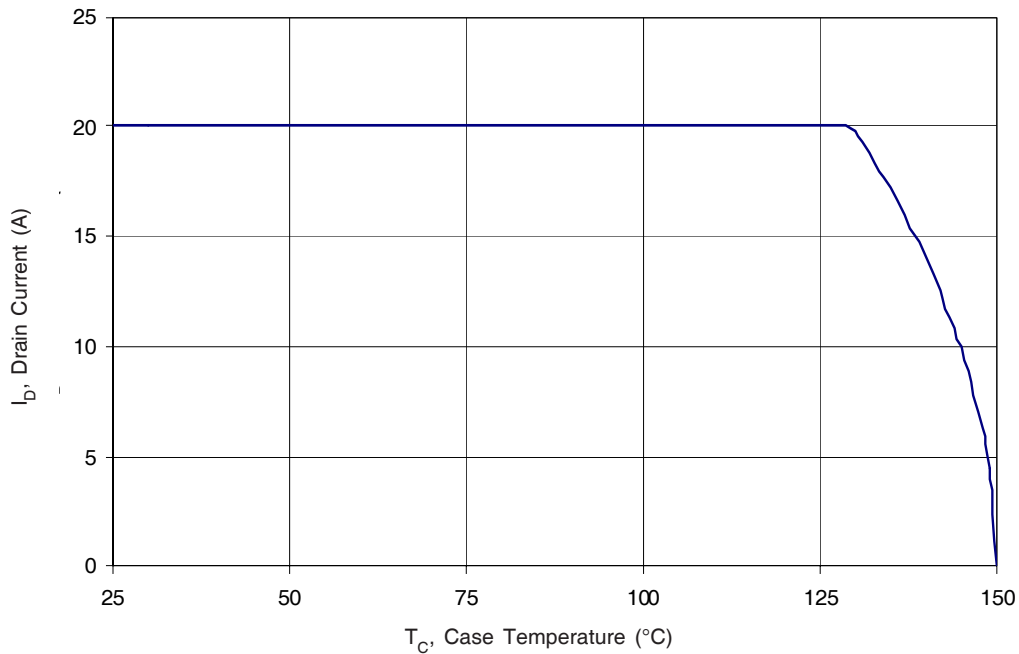


Fig 1: Maximum Drain Current Vs Case Temperature

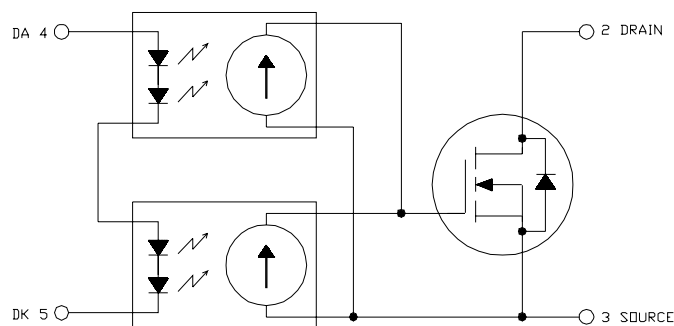
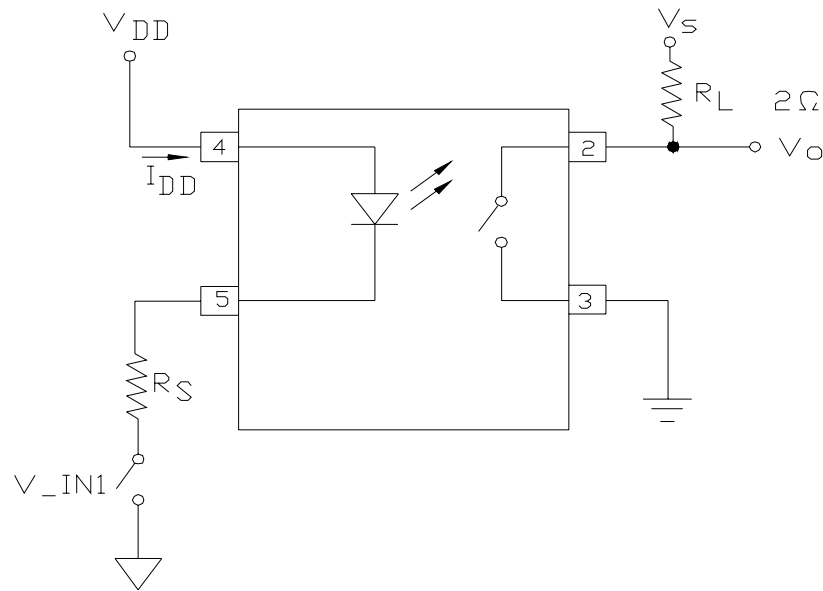


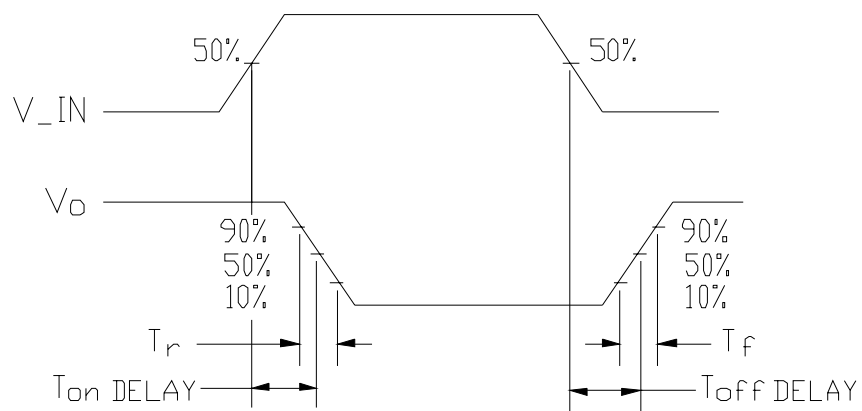
Fig 2: Typical Application

### Radiation Performance

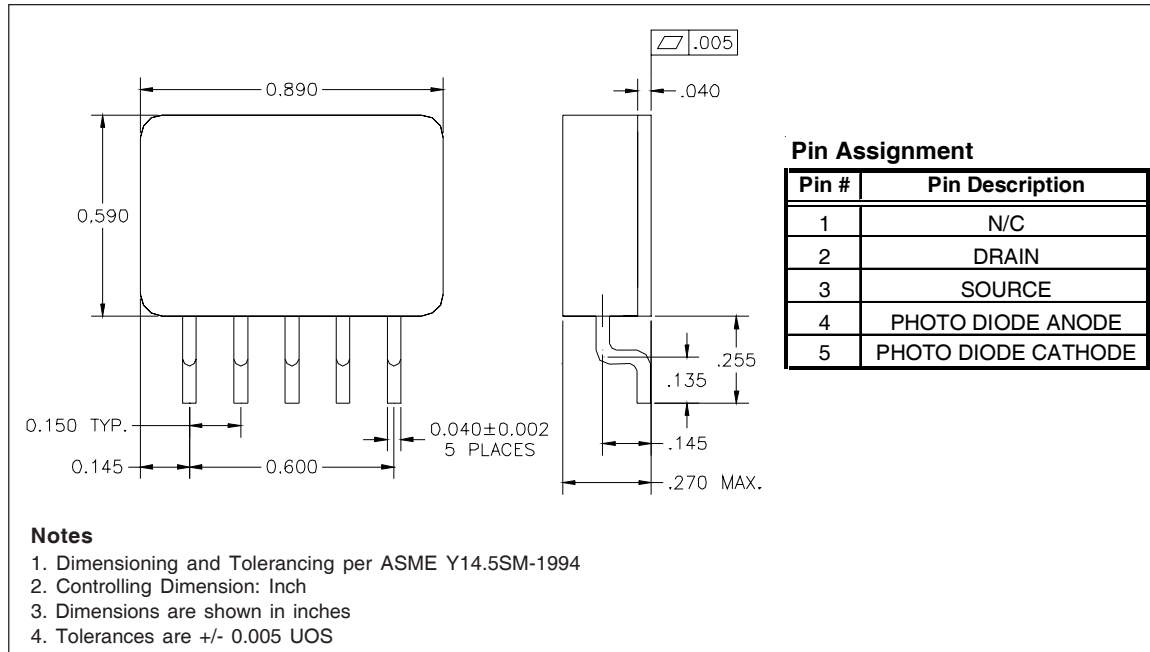
International Rectifier Radiation Hardened SSRs are tested to verify their hardness capability. The hardness assurance program at IR uses a Cobalt-60 (<sup>60</sup>Co) Source and heavy ion irradiation. Both pre- and post-irradiation performance are tested and specified using the same drive circuitry and test conditions to provide a direct comparison.



**Fig 3: Switching Test Circuit**



**Fig 4: Switching Test Waveform**

**Case Outline and Dimensions — 5 Pin Surface Mount Package**

## Part Numbering Nomenclature

