

RDHA710SE10A2FK

PD-96983A

Radiation Hardened Dual Solid-State Relay with Buffered Inputs 100V, 10A, R5 Technology

Features

- Total dose capability to 100kRads(Si)
- Neutron fluence level of $1.8E^{12}$ n/cm²
- Optically coupled
- 1000V_{DC} input to output isolation
- Buffered Input Stage
- 3.3V Compatible Logic Level Input
- Controlled Switching Times
- Hermetically sealed package

Typical applications

- Solar array management, heater controls, bus switching, ground power isolation, generic load switching

Product validation

Screened to MIL-PRF-38534, and meets Qualification Conformance Inspection per MIL-PRF-38534 for Class K product

Description

The RDHA710SE10A2FK is a radiation hardened dual Solid-State Relay in a hermetic package. It is configured as dual single pole single throw (SPST) normally open relay with common input supply. This device is characterized for 100KRad (Si) total ionizing dose. The input and output MOSFET utilize IR HiRel R5 technology. The RDHA710SE10A2FK is optically coupled and actuated by standard logic inputs.

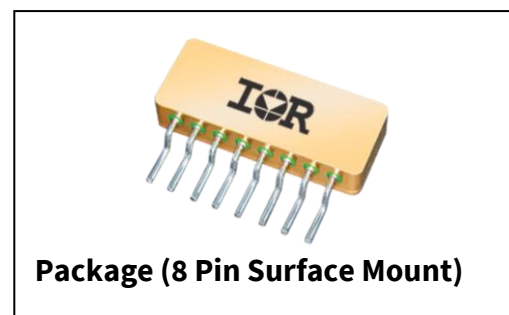
Ordering Information

Table 1 Ordering options

Part number	Package	Screening Level	TID Level
RDHA710SE10A2SK	8 Pin Surface Mount	Class K	100krad(Si)

Product Summary ¹

- **Part number:** RDHA701SE10A2FK
- **Radiation level:** 100 kRads (Si)
- **tr /tf:** Fast
- **Logic drive voltage:** 3.3V
- **Voltage:** 100V
- **I_D:** 10A



¹ While the SSR design meets the design, requirements specified in MIL-PRF-38534, the end user is responsible for product derating as applicable for the application.

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Absolute Maximum Ratings

1 Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings @ $T_j = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Value	Unit
Output Maximum Voltage ¹	V_S	100	V
Output Current ^{1,2}	I_O	12	A
Input Buffer Voltage- (pins 4 & 6) ³	V_{IN}	± 7.5	V
Input Buffer Current	I_{IN}	± 10	mA
Input Supply Voltage (pin 5) ⁴	V_{DD}	5.25	V
Input Supply Current ⁴	I_{DD}	25	mA
Power Dissipation ^{1,2}	P_{DISS}	60	W
Operating Temperature Range	T_J	-55 to +125	$^\circ\text{C}$
Storage Temperature Range	T_S	-65 to +150	
Lead Temperature (soldering $\leq 10\text{sec}$)	T_L	300	

¹ While the SSR design meets the design, requirements specified in MIL-PRF-38534, the end user is responsible for product derating as applicable for the application.

² Optically coupled Solid State Relays (SSRs) have relatively slow turn on and turn off times. Care must be taken to ensure that transient currents do not cause violation of SOA. If transient conditions are present, IRHirel recommends a complete simulation to be performed by the end user to ensure compliance with SOA requirements as specified in the IRHNJ57130 data sheet.

³ Inputs protected for $V_{IN} < 1.0\text{V}$ and $V_{IN} > 7.5\text{V}$

⁴ Input Supply voltage shall not exceed 5.25V @ $T_c \geq 70^\circ\text{C}$

Device Characteristics

2 Device Characteristics

2.1 General Characteristics (Per Channel)

Table 3 General Characteristics per Channel @ $-55^{\circ}\text{C} \leq T_c \leq +125^{\circ}\text{C}$ (Unless Otherwise Specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Input Buffer Threshold Voltage ^{1,2}		$V_{DD} = 5.0\text{V}$, $I_O = 10\text{A}$	$V_{IN(TH)}$	3.0	—	—	V
Input-to-Output Leakage Current	1	$V_{I-O} = 1.0\text{KVdc}$, $\text{dwell} = 5.0\text{s}$	I_{I-O}	—	—	1.0	μA
Output Capacitance ¹		$V_{IN} = 0.1\text{V}$, $f = 1.0\text{MHz}$, $V_S = 25\text{V}$, $T_C = 25^{\circ}\text{C}$	C_{OSS}	—	365	—	pF
Thermal Resistance ¹		$V_{IN} = 3.3\text{V}$, $V_{DD} = 5.0\text{V}$ ^{1,3}	R_{THJC}	—	—	1.7	$^{\circ}\text{C/W}$
MTBF (Per Channel)		MIL-HDBK-217F, SF@ $T_C = 25^{\circ}\text{C}$		6.0	—	—	MHrs

2.2 Pre-Irradiation

Table 4 Electrical Characteristics per Channel @ $-55^{\circ}\text{C} \leq T_c \leq +125^{\circ}\text{C}$ (Unless Otherwise Specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Output On-Resistance	1	$V_{IN} = 3.3\text{V}$	$R_{DS(ON)}$	—	0070	0.100	Ω
	2	$V_{DD} = 5.0\text{V}$, $I_O = 10\text{A}$		—	0.125	0.165	
Output Leakage Current	1	$V_{IN} = 0.1\text{V}$, $V_S = 100\text{V}$	I_O	—	—	25	μA
	2	$V_{IN} = 0.1\text{V}$, $V_S = 80\text{V}$		—	—	250	
Input Supply Current	1,2,3	$V_{DD} = 5.0\text{V}$, $I_O = 10\text{A}$	I_{DD}	—	18	25	mA
Input Buffer Current	1	$V_{IN} = 3.3\text{V}$	I_{IN}	—	—	1.0	μA
	2,3			—	—	3.0	
Turn-On Delay ⁶	1,2,3	$V_{IN} = 3.3\text{V}$, $V_{DD} = 5.0\text{V}$, $V_S = 30\text{V}$, $RC = 7.0\Omega/100\mu\text{F}$, $PW = 50\text{ms}$	t_{on}	—	0.18	0.45	ms
Turn-Off Delay ⁶	1,2,3	$V_{IN} = 0.1\text{V}$, $V_{DD} = 5.0\text{V}$, $V_S = 30\text{V}$, $RC = 7.0\Omega/100\mu\text{F}$, $PW = 50\text{ms}$	t_{off}	—	0.50	0.75	
Rise Time ^{4,5}	1,2,3	$V_{IN} = 3.3\text{V}$, $V_{DD} = 5.0\text{V}$, $V_S = 30\text{V}$, $RC = 7.0\Omega/100\mu\text{F}$, $PW = 50\text{ms}$	t_r	—	0.25	0.40	
Fall Time ^{4,5}	1,2,3	$V_{IN} = 0.1\text{V}$, $V_{DD} = 5.0\text{V}$, $V_S = 30\text{V}$, $RC = 7.0\Omega/100\mu\text{F}$, $PW = 50\text{ms}$	t_f	—	1.50	1.80	

¹ Specification is guaranteed by design.² Inputs protected for $V_{IN} < 1.0\text{V}$ and $V_{IN} > 7.5\text{V}$ ³ 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 IRHNJ57130 data sheet.⁴ Rise and fall times are controlled internally.⁵ Reference Figures 3 & 4 for Switching Test Circuits and Wave Form.

Device Characteristics

2.3 Post Total Dose Irradiation ^{1, 2, 3}Table 5 Electrical Characteristics per Channel @ -55°C ≤ T_c ≤ +125°C (Unless Otherwise Specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Output On-Resistance	1	V _{IN} = 3.3V, V _{DD} = 5.0V, I _O = 10A	R _{DS(ON)}	—	0.070	0.100	Ω
Input Supply Current	1	V _{DD} = 5.0V, I _O = 10A	I _{DD}	—	18	25	mA
Output Leakage Current	1	V _{IN} = 0.1V, V _S = 100V	I _O	—	—	25	μA
Input Buffer Current	1	V _{IN} = 3.3V	I _{IN}	—	—	1.0	
Turn-On Delay ⁵	1	V _{IN} = 3.3V, V _{DD} = 5.0V, V _S = 30V, RC = 7.0Ω/100μF, PW = 50ms	t _{on}	—	0.18	0.45	ms
Turn-Off Delay ⁵	1	V _{IN} = 0.1V, V _{DD} = 5.0V, V _S = 30V, RC = 7.0Ω/100μF, PW = 50ms	t _{off}	—	0.50	0.75	
Rise Time ^{4, 5}	1	V _{IN} = 3.3V, V _{DD} = 5.0V, V _S = 30V, RC = 7.0Ω/100μF, PW = 50ms	t _r	—	0.25	0.40	
Fall Time ^{4, 5}	1	V _{IN} = 0.1V, V _{DD} = 5.0V, V _S = 30V, RC = 7.0Ω/100μF, PW = 50ms	t _f	—	1.50	1.80	

¹Total Dose Irradiation with Input Bias. 10mA I_{DD} applied and V_{DS} = 0 during Irradiation.²Total Dose Irradiation with Output Bias. 80 Volts V_{DS} applied and I_{DD} = 0 during Irradiation.³IR Hirel does not currently have a DSCC certified Radiation Hardness Assurance Program⁴Rise and fall times are controlled internally.⁵Reference Figures 3 & 4 for Switching Test Circuits and Wave Form.

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Electrical Characteristics Curves (Pre-irradiation)

3 Electrical Characteristics Curves (Pre-irradiation)

Figure 1 Maximum Drain Current Vs Case Temperature

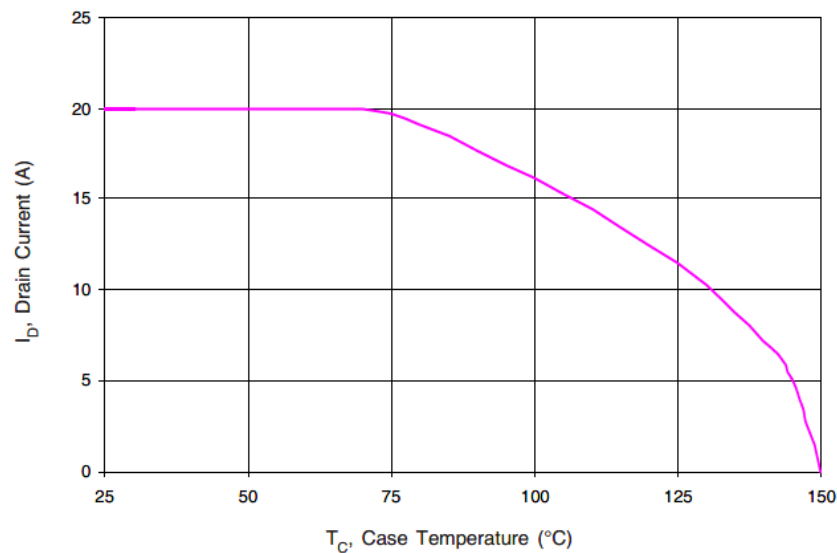
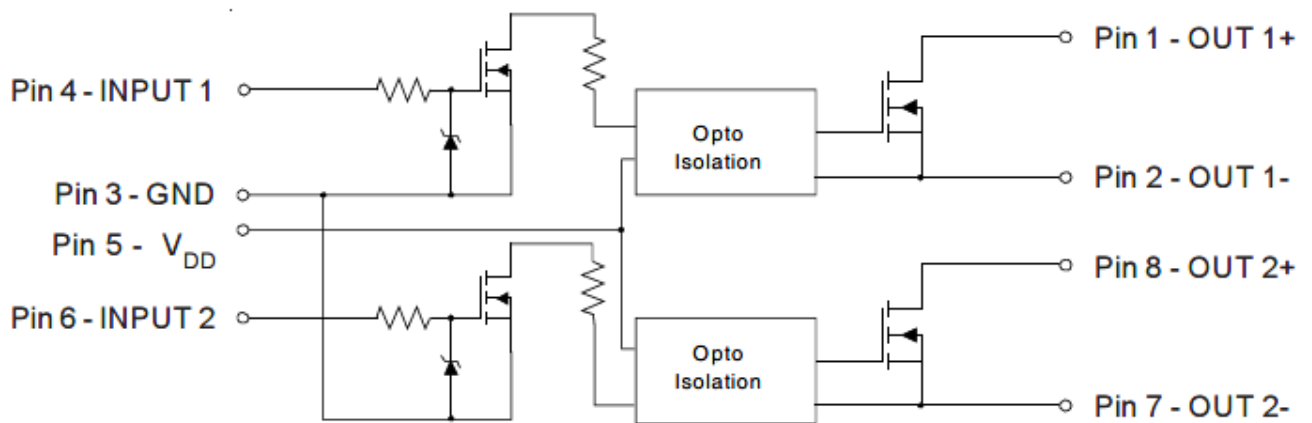


Figure 2 Typical Application



Radiation Performance

IR Hirel Radiation Hardened Solid State Relays are tested to verify their hardness capability.

The hardness assurance program at IR uses a Cobalt-60 (60Co) Source and heavy ion irradiation. Both preand post- irradiation performance are tested and specified using the same drive circuitry and test conditions to provide a direct comparison.

Test Circuits

4 Test Circuits

Figure 3 Switching Test Circuit (Only one Chnnel shown)

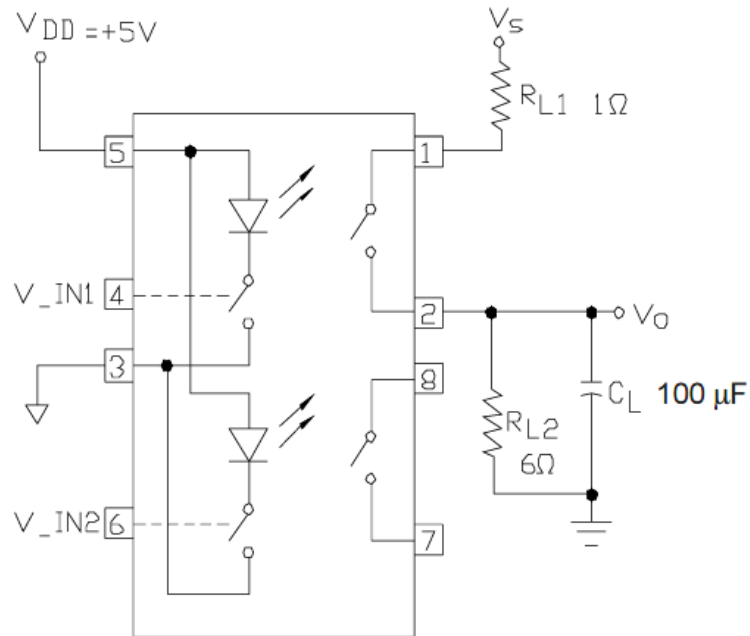
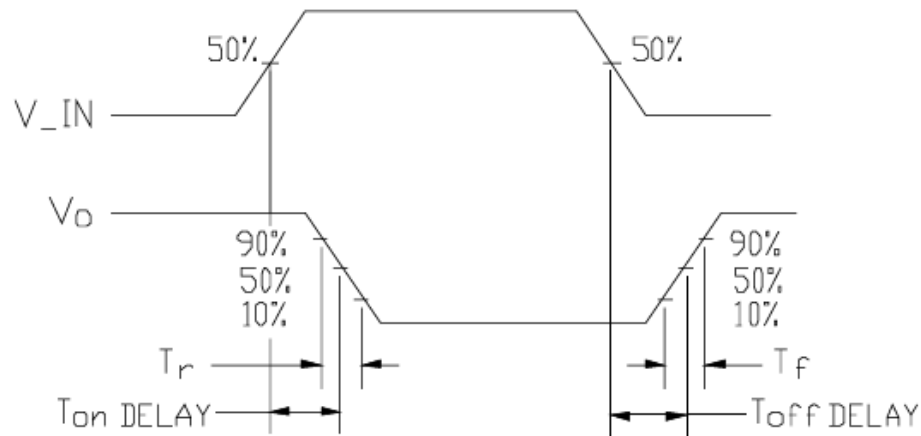


Figure 4 Switching Waveforms



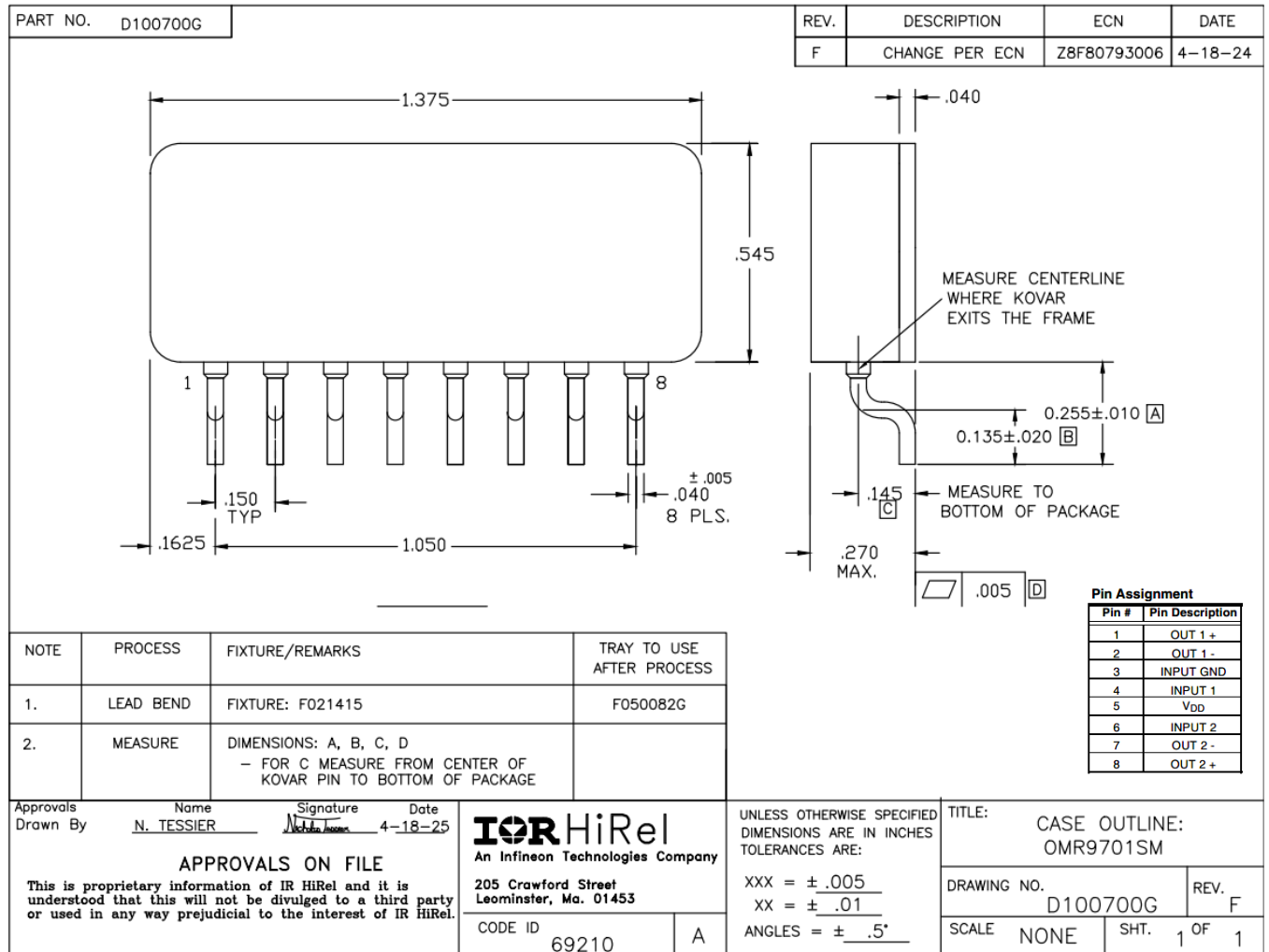
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Package Outline

5 Package Outline

Note: For the most updated package outline, please see the website: [Package \(8 Pin Surface Mount\)](#)

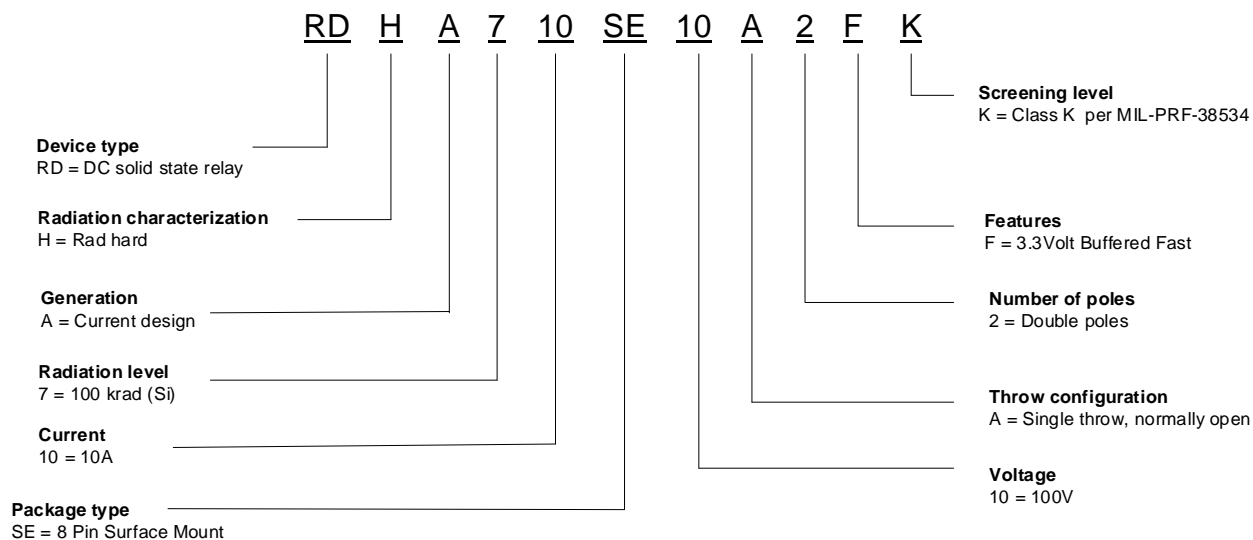


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Part Numbering Nomenclature

6 Part Numbering Nomenclature



Revision history**Revision history**

Document version	Date of release	Description of changes
	03/29/2006	Final datasheet PD # 96983
Rev A	08/15/2025	Updated per ECN- Z8F80793006

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