RDHA710SE10A2QK

PD-95876B

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

Features

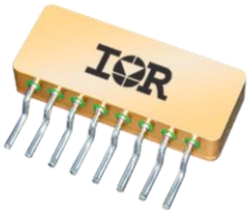
- Total dose capability to 100kRads(Si)
- Optically coupled
- 1000V_{DC} input to output isolation
- Buffered Input Stage
- 5.0V Compatible Logic Level Input
- Controlled Swithcing Times
- Hermetically sealed package

Typical applications

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

Product Summary [1]

- **Part number:** RDHA701SE10A2QK
- **Radiation level:** 100 kRads (Si)
- **tr /tf:** Controlled
- **Logic drive voltage:** 5.0V
- **Voltage**: 100V
- **I_D:** 10A



Package (8 Pin Surface Mount)

Product validation

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

Description

The RDHA710SE10A2QK 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 RDHA710SE10A2QK is optically coupled and actuated by standard logic inputs.

Ordering Information

Table 1 Ordering options

Part number	Package	Screening Level	TID Level
RDHA710SE10A2QK	8 Pin Surface Mount	Class K	100krad(Si)

[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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1 Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings @ T_j =25°C (unless otherwise specified)

Parameter	Symbol	Value	Unit
Output Supply Voltage [1]	V_S	100	V
Output Current [1,2]	I_O	20	A
Input Buffer Voltage- (pins 4 & 6)[3]	V_{IN}	± 10	V
Input Buffer Current	I_{IN}	± 10	mA
Input Supply Voltage (pin 5)[4]	V_{DD}	10	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	°C
Storage Temperature Range	T_S	-65 to +150	
Lead Temperature (soldering ≤ 10sec)	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 VIN < 1.0V and VIN > 7.5V
[4] Input Supply voltage shall not exceed 5.25V @ Tc ≥ 70°C

2 Device Characteristics

2.1 General Characteristics (Per Channel)

Table 3 General Characteristics per Channel @ -55°C ≤ T_C ≤ +125°C (Unless Otherwise Specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Input Buffer Threshold Voltage [1,2]		V_{DD} = 5.0V, I_O = 10A	$V_{IN(TH)}$	4.5	—	—	V
Input Supply Current[1]		V_{DD} = 5.0V, I_O = 10A	I_{DD}	—	10	15	mA
		V_{DD} = 10V, I_O = 10A[3]		—	—	25	
Input-to-Output Leakage Current	1	V_{I-O} = 1.0KVdc, dwell = 5.0s	I_{I-O}	—	—	1.0	µA
Output Capacitance[1]		V_{IN} = 0.8V, f = 1.0MHz, V_S =25V, T_C = 25°C	C_{OSS}	—	365	—	pF
Thermal Resistance[1]		V_{IN} = 5.0V, V_{DD} = 5.0V [1, 4]	R_{THJC}	—	—	1.7	°C/W
MTBF (Per Channel)		MIL-HDBK-217F, SF@ T_C=25°C		6.0	—	—	MHrs

2.2 Pre-Irradiation

Table 4 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} = 5.0V, V_{DD} = 5.0V, I_O = 10A	$R_{DS(ON)}$	—	0070	0.100	Ω
	2			—	0.115	0.145	
Output Leakage Current	1	V_{IN} = 0.8V, V_S =100V	I_O	—	—	25	µA
	2	V_{IN} = 0.8V, V_S =80V		—	—	250	
Input Buffer Current	1	V_{IN} = 5.0V	I_{IN}	—	—	1.0	µA
	2,3			—	—	3.0	
Turn-On Delay [6]	1,2,3	V_{IN} = 5.0V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_{on}	—	6.5	25	ms
Turn-Off Delay [6]	1,2,3	V_{IN} = 0.8V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_{off}	—	26	50	
Rise Time [5, 6]	1,2,3	V_{IN} = 5.0V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_r	—	1.3	5.5	
Fall Time [5, 6]	1,2,3	V_{IN} = 0.8V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_f	—	6.0	10	

[1] Specification is guaranteed by design.
[2] Inputs protected for V_{IN} < 1.0V and V_{IN} > 7.5V
[3] Input Supply voltage shall not exceed 5.25V @ Tc ≥ 70°C
[4] 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.
[5] Rise and fall times are controlled internally.
[6] Reference Figures 3 & 4 for Switching Test Circuits and Wave Form.

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} = 5.0V, V_{DD} =5.0V, I_O = 10A	$R_{DS(ON)}$	—	0.070	0.40	Ω
Output Leakage Current	1	V_{IN} = 0.8V, V_S = 100V	I_O	—	—	25	µA
Input Buffer Current	1	V_{IN} = 5.0V	I_{IN}	—	—	1.0	
Turn-On Delay [5]	1	V_{IN} = 5.0V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_{on}	—	6.5	25	ms
Turn-Off Delay [5]	1	V_{IN} = 0.8V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_{off}	—	26	50	
Rise Time [4, 5]	1	V_{IN} = 5.0V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_r	—	1.3	5.5	
Fall Time [4, 5]	1	V_{IN} = 0.8V, V_{DD} =5.0V, V_S = 30V, RC =7.0Ω/100µF, PW =50ms	t_f	—	6.0	10	

[1] Total Dose Irradiation with Input Bias. 10mA I_{DD} applied and V_{DS} = 0 during Irradiation.

[2] Total Dose Irradiation with Output Bias. 80 Volts V_{DS} applied and I_{DD} = 0 during Irradiation.

[3] IR Hirel does not currently have a DSCC certified Radiation Hardness Assurance Program

[4] Rise and fall times are controlled internally.

[5] Reference Figures 3 & 4 for Switching Test Circuits and Wave Form.

3 Electrical Characteristics Curves (Pre-irradiation)

Figure 1 Maximum Drain Current Vs Case Temperature

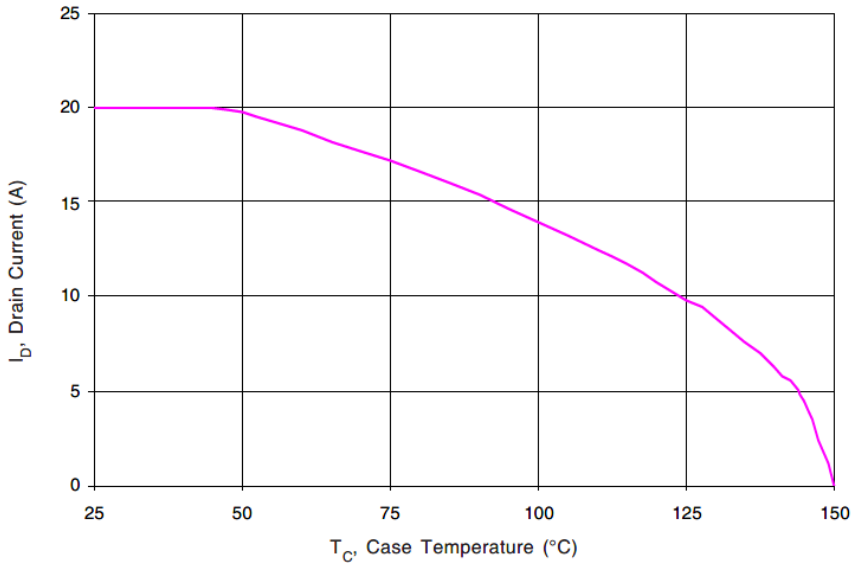
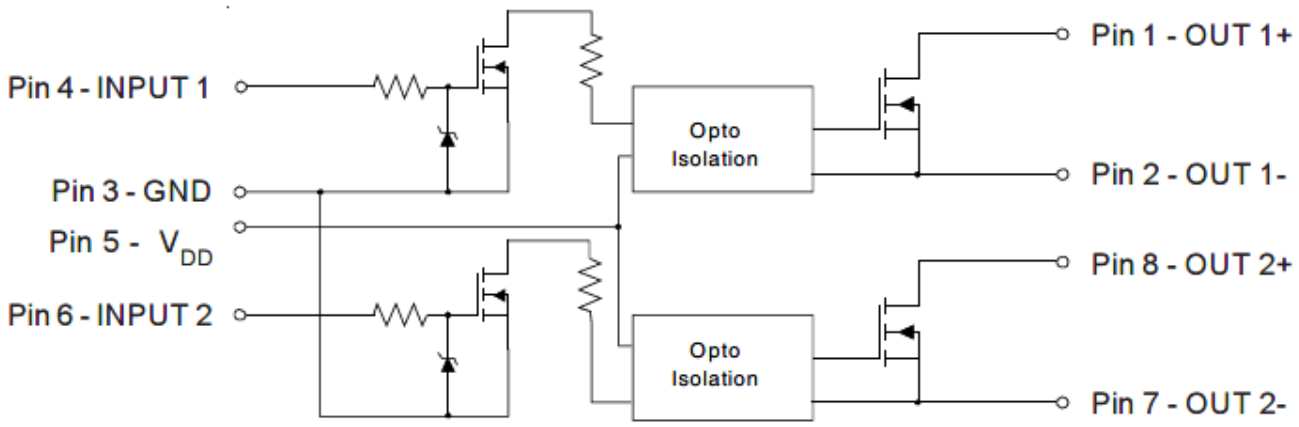


Figure 2 Typical Application



Radiation Performance

IR Hirel Radiation Hardened MOSFETs are tested to verify their hardness capability. The hardness assurance program at IR uses a Cobalt-60 (60Co) 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 comparision

4 Test Circuits

Figure 3 Switching Test Circuit (Only one Chnnel shown)

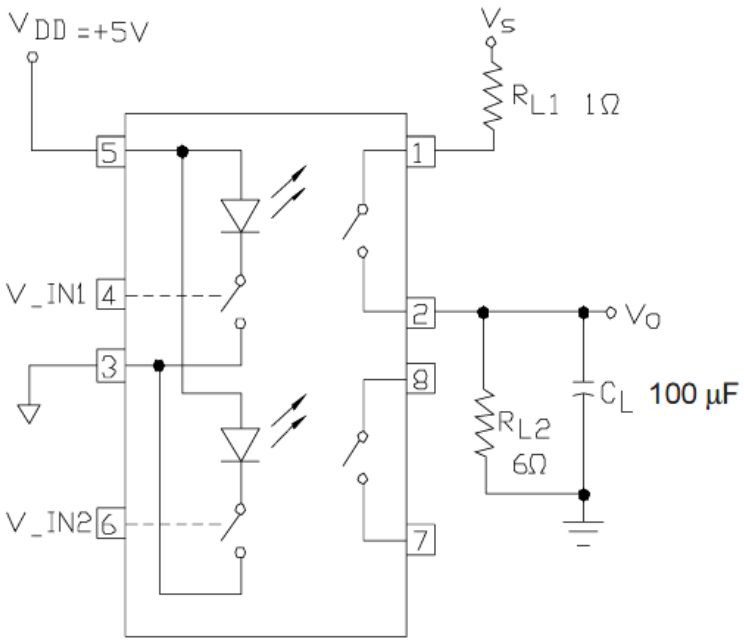
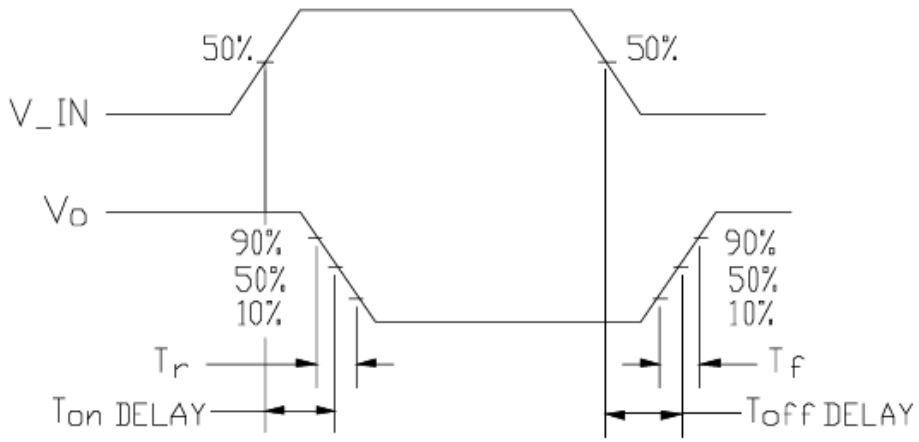
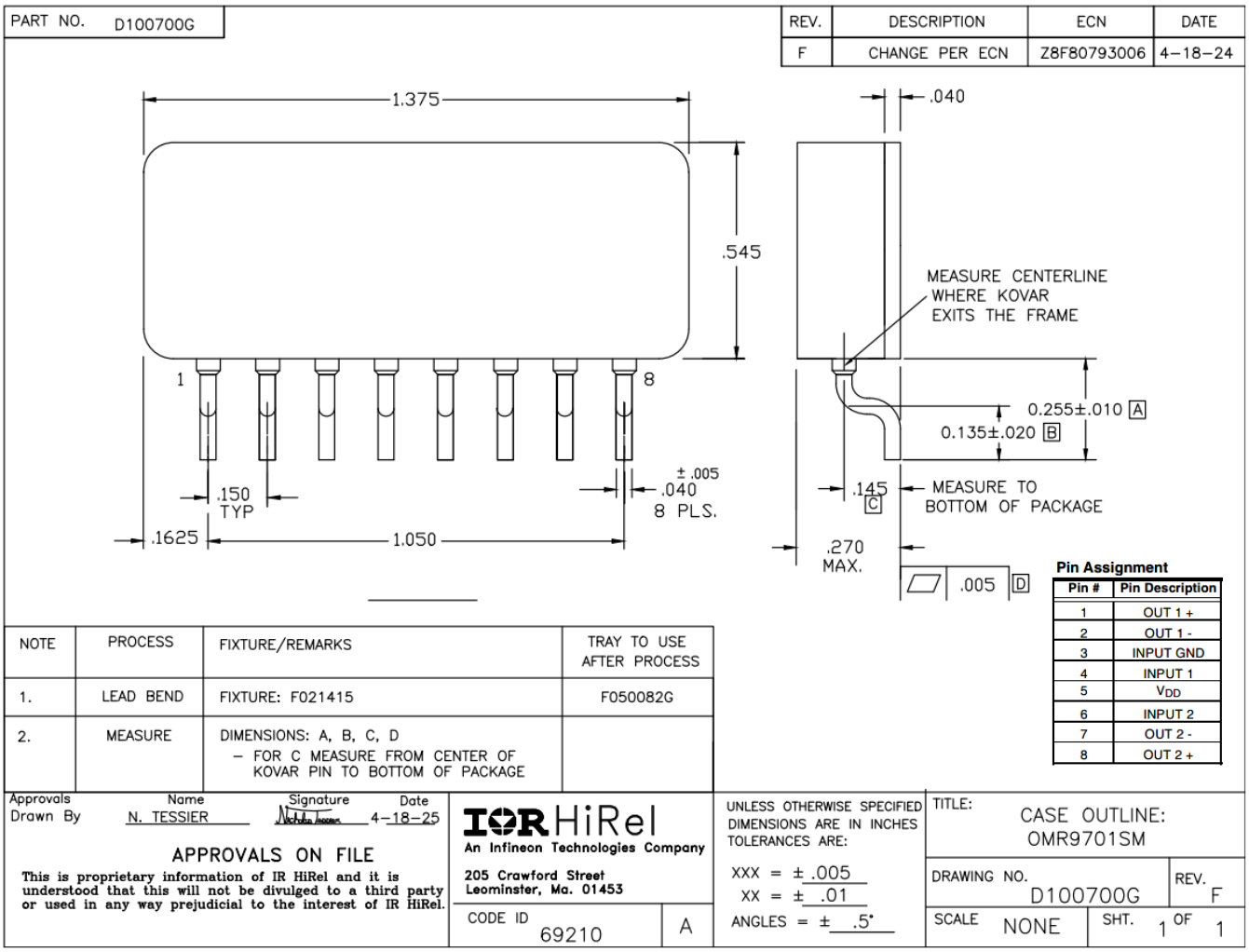


Figure 4 Switching Waveforms

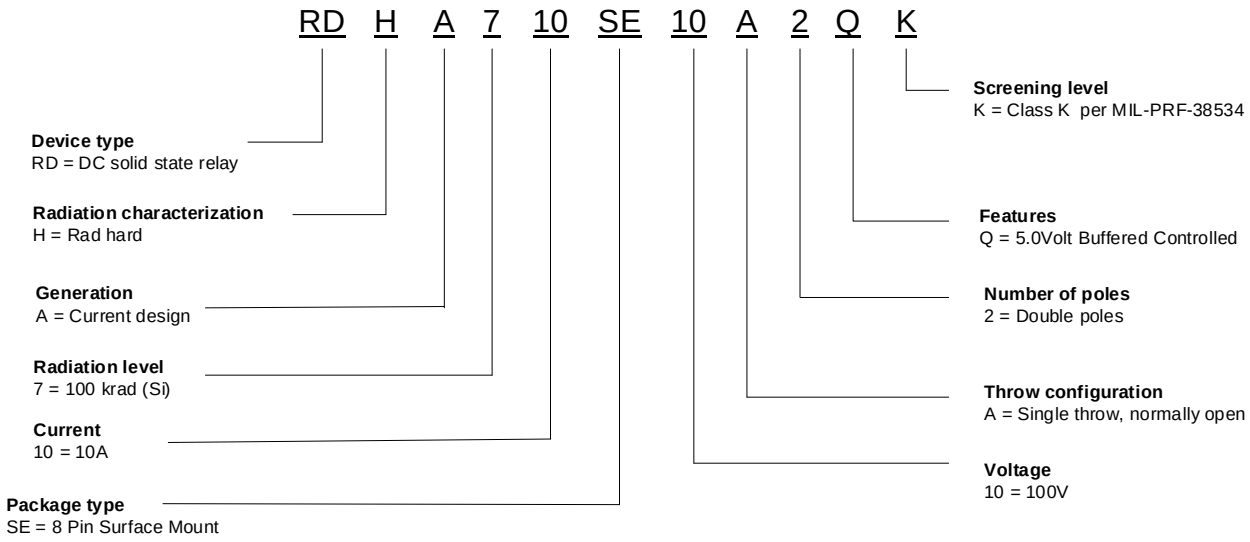


5 Package Outline

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



6 Part Numbering Nomenclature



Revision history

Document version	Date of release	Description of changes
	10/12/2004	Final datasheet PD # 95876
Rev A	3/29/2006	Updated per ECN-13802
Rev B	08/15/2025	Updated per ECN- Z8F80793006

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