International
IOR Rectifier

PD-97808

Radiation Hardended, Solid-State Relay with Buffered Inputs

RDHB710SE20A2SX
Dual, 200V, 10A

Product Summary [5]

Part Number	Breakdown Voltage	Current	tr / tf	Logic Drive Voltage
RDHB710SE20A2SX	200V	10A	Controlled	3.3V

8-PIN SURFACE MOUNT

Description

The RDHB710SE20A2SX is a radiation hardened dual solid-state relay in a hermetic package. It is configured as a dual, single-pole-single-throw (SPST) normally open relay with common input supply. This device is characterized for 100 Krad(Si) total ionizing dose, and neutron fluence level of $1.8E^{12}$ n/cm^2. The input and output MOSFETs utilize International Rectifier's R6 technology. The RDHB710SE20A2SX is optically coupled and actuated by standard logic inputs.

Features:

- Total Dose Capability to 100 Krad (Si)
- Neutron Fluence Level of $1.8E^{12}$ n/cm^2
- Optically Coupled
- 1000VDC Input to Output Isolation
- Buffered Input Stage
- 3.3V Compatible Logic Level Input
- Controlled Switching Times
- Hermetically Sealed Package

Absolute Maximum Ratings per Channel @ T_J = 25°C (unless otherwise specified)

Parameter	Symbol	Value	Units
Output Voltage [5, 8]	V_S	200	V
Output Current [4, 5]	I_O	10	A
Input Buffer Voltage - (Pins 4 & 6) [3]	V_{IN}	±7.0	V
Input Buffer Current	I_{IN}	±10	mA
Input Supply Voltage (Pin 5) [7]	V_{DD}	10	V
Input Supply Current [7]	I_{DD}	25	mA
Power Dissipation [4, 5]	P_{DISS}	73	W
Operating Temperature Range	T_J	-55 to +150	°C
Storage Temperature Range	T_S	-65 to +150	
Lead Temperature	T_L	300	

For Notes, please refer to page 3

General Characteristics per Channel @ -55°C ≤ Tc ≤ +125°C (unless otherwise specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Input Buffer Threshold Voltage 1, 3		V_{DD} = 5.0V, I_O = 10A	$V_{IN(TH)}$	3.0			V
Input-to-Output Leakage Current	1	V_{I-O} = 1.0KVdc, dwell = 5.0s T_C = 25°C	I_{I-O}			1.0	µA
Output Capacitance 1		V_{IN} = 0.1V, f = 1.0MHz, V_S = 25V, T_C = 25°C	C_{OSS}		210		pF
Thermal Resistance 1		V_{IN} = 3.3V, V_{DD} = 5.0V 1, 4	R_{THJC}			1.4	°C/W
MTBF (Per Channel)		MIL-HDBK-217F, SF@Tc= 25°C		6.0			MHrs
Weight			W			25	gms

Pre-Irradiation

Electrical Characteristics per Channel @ -55°C ≤ Tc ≤ +125°C (unless otherwise specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output On-Resistance	1	V_{IN} = 3.3V	$R_{DS(ON)}$			0.15	Ω
	2	V_{DD} = 5.0V, I_O= 10A				0.29	
Output Leakage Current	1	V_{IN} = 0.1V, V_S = 200V	I_O			25	µA
	2	V_{IN} = 0.1V, V_S = 150V				250	
Input Supply Current	1, 2, 3	V_{DD} = 5.0V, I_O= 10A	I_{DD}		10	15	mA
		V_{DD} = 10V, I_O= 10A 1, 7				25	
Input Buffer Current	1	V_{IN} = 3.3V	I_{IN}			1.0	µA
	2, 3					3.0	
Turn-On Delay 6	1, 2, 3	V_{IN} = 3.3V, V_{DD} = 5.0V, V_S = 50V R_L = 5Ω, PW = 50ms	t_{on}			1.5	ms
Turn-Off Delay 6	1, 2, 3	V_{IN} = 0.1V, V_{DD} = 5.0V, V_S = 50V R_L = 5Ω, PW = 50ms	t_{off}			10	
Rise Time 2, 6	1, 2, 3	V_{IN} = 3.3V, V_{DD} = 5.0V, V_S = 50V R_L = 5Ω, PW = 50ms	t_r			0.5	
Fall Time 2, 6	1, 2, 3	V_{IN} = 0.1V, V_{DD} = 5.0V, V_S = 50V R_L = 5Ω, PW = 50ms	t_f			2.5	

For Notes, please refer to page 3

Post Total Dose Irradiation 9, 10, 11

Electrical Characteristics per Channel @ 25°C (unless otherwise specified)

Parameter	Group A Subgroups	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output On-Resistance	1	V_{IN} = 3.3V, V_{DD} = 5.0V, I_O= 10A	$R_{DS(ON)}$			0.15	Ω
Input Supply Current	1	V_{IN} = 3.3V, V_{DD} = 5.0V, I_O= 10A	I_{DD}		10	15	mA
Output Leakage Current	1	V_{IN} = 0.1V, V_S = 200V	I_O			25	µA
Input Buffer Current	1	V_{IN} = 3.3V	I_{IN}			1.0	
Turn-On Delay 6	1	V_{IN} = 3.3V, V_{DD} = 5.0V, V_S = 50V RL = 5Ω, PW = 50ms	t_{on}			1.5	ms
Turn-Off Delay 6	1	V_{IN} = 0.1V, V_{DD} = 5.0V, V_S = 50V RL = 5Ω, PW = 50ms	t_{off}			10	
Rise Time 2, 6	1	V_{IN} = 3.3V, V_{DD} = 5.0V, V_S = 50V RL = 5Ω, PW = 50ms	t_r			0.5	
Fall Time 2, 6	1	V_{IN} = 0.1V, V_{DD} = 5.0V, V_S = 50V RL = 5Ω, PW = 50ms	t_f			2.5	

Notes for Maximum Ratings and Electrical Characteristic Tables

1. Specification is guaranteed by design.
2. Rise and fall times are controlled internally.
3. Inputs protected for V_{IN} < 1.0V and V_{IN} > 7.0V.
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 insure compliance with SOA requirements as specified in the IRHNJ67230 data sheet.
5. 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.
6. Reference Figures 3 & 4 for Switching Test Circuits and Wave Form; Output Voltage (V_O) of Figure 4, Switching Test Wave Form is representative of the Output MOSFET and Drain-to-Source.
7. Input Supply voltage shall not exceed 5.25V@Tc ≥ 70°C.
8. Breakdown voltage (BV_{DSS}) of Output MOSFET, @ -55°C, shall be derated to 80% of Maximum Rated Voltage.
9. Total Dose Irradiation with Input Bias. 10mA I_{DD} applied and V_{DS} = 0 during Irradiation.
10. Total Dose Irradiation with Output Bias. 160Volts V_{DS} applied and I_{DD} = 0 during Irradiation.
11. International Rectifier does not currently have a DLA certified Radiation Hardness.

Radiation Performance

International Rectifier Radiation Hardened Solid State Relays are tested to verify their hardness capability. The hardness assurance program at IR uses a Cobalt-60 (^{60}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 comparision.

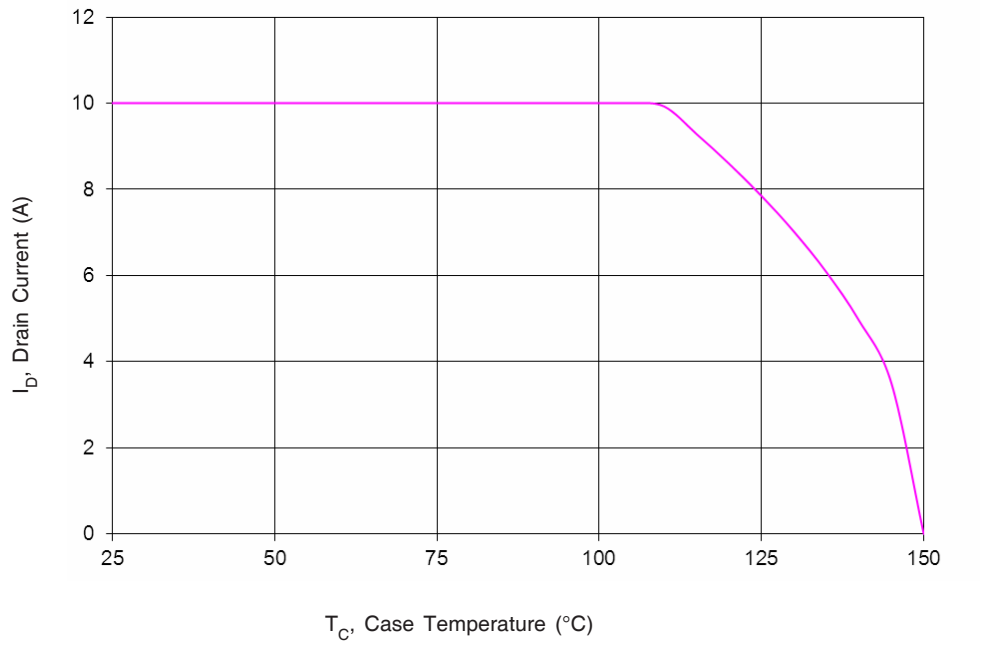


Figure 1: Maximum Drain Current Vs Case Temperature per Channel

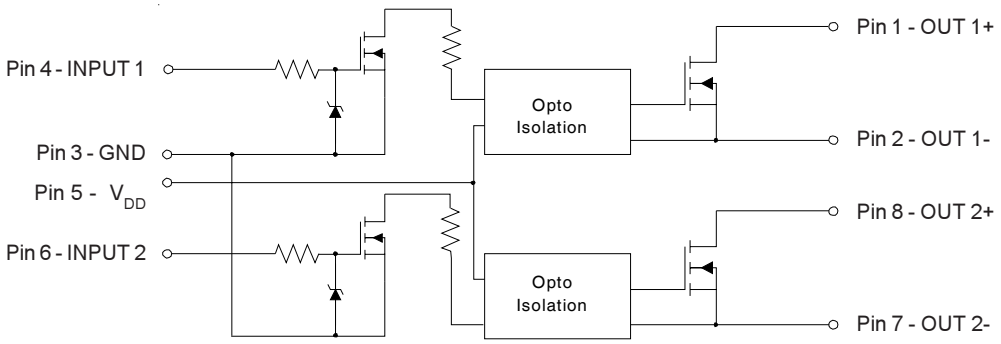


Figure 2: Typical Application

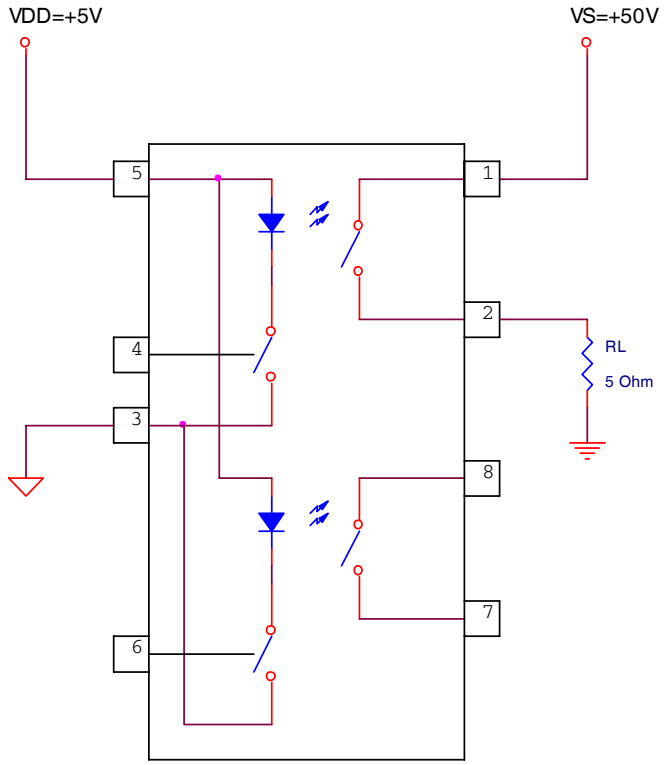


Figure 3: Switching Test Circuit (Only one channel shown)

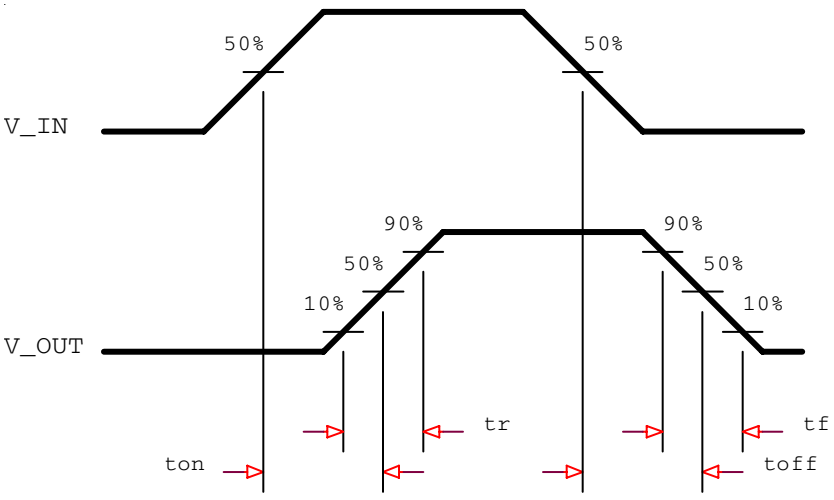
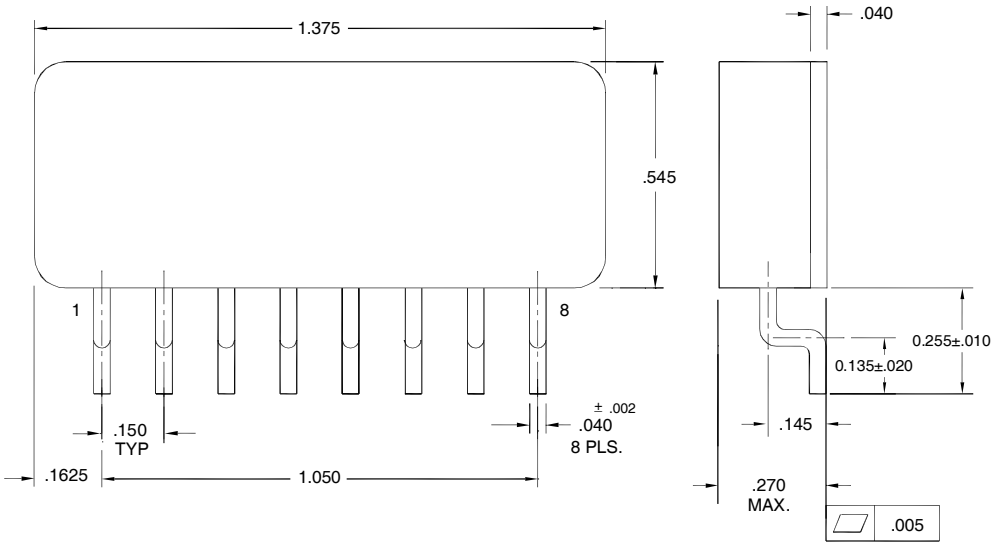


Figure 4: Switching Test Waveform

Case Outline and Dimensions — 8-Pin Surface Mount Package



NOTES:

1. Dimensioning and Tolerancing per ASME Y14.53M-1994
2. Controlling Dimension: Inch
3. Dimensions are shown in inches
4. Tolerances are ±0.005 UOS
5. Lead Dimensions are prior to Hot Solder Dip
6. Lead Finish per MIL-PRF-38534, Finish A, Hot Solder Dip (Sn63Pb37)

Pin Designation

Pin #	Pin Description
1	OUT 1 +
2	OUT 1 -
3	INPUT GND
4	INPUT 1
5	V_{DD}
6	INPUT 2
7	OUT 2 -
8	OUT 2 +

Part Numbering Nomenclature

RD H B 7 10 SE 20 A 2 S X

Device Type
RD = DC Solid State Relay

Radiation Characteriization
H = RAD Hard

Generation
A = Current Design
B = R6 Generation

Radiation Level
7 = 100 Krad (Si)

Current
10 = 10A

Package
SE = 8-Pin Surface Mount

Voltage
10 =100 Volts
20 = 200 Volts

Throw Configuration
A = Single Throw, Normally Open

Number of Poles
1 = Single Pole
2 = Dual Poles

Features
N = Non Buffered Fast
S = Buffer Controlled Input

Screening Level
P = Unscreened, 25°C Electrical Test (Not for Qualification)
X = Class K per MIL-PRF-38534 (Fully compliant Class K is presently pending DLA Approval)

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