ASSR-322R

Low C x R, Form A, Solid State Relay (250V/8.5Ω/60pF)

AVAGO TECHNOLOGIES

Data Sheet

Lead (Pb) Free
RoHS 6 fully compliant

RoHS 6 fully compliant options available;
-xxxE denotes a lead-free product

Description

The ASSR-322R is specifically designed for fast switching applications, commonly found in the test and measurement systems. The low C x R and low output off-state leakage current provide higher system throughput and reduce system errors.

The dual channel configuration of ASSR-322R is equivalent to 2 Form A Electromechanical Relays (EMR). One channel of the relay consists of an AlGaAs infrared light-emitting diode (LED) input stage optically coupled to a high-voltage output detector circuit. The detector consists of a high-speed photovoltaic diode array and driver circuitry to switch on/off two discrete high voltage MOSFETs. The relay turns on (contact closes) with a minimum input current of 3mA through the input LED. The relay turns off (contact opens) with an input voltage of 0.8V or less.

ASSR-322R is available in 8-pin DIP and Gull Wing Surface Mount packages. Their electrical and switching characteristics are specified over the temperature range of -40°C to +85°C.

Applications

- Automatic Test Equipment
- Data Acquisition System
- Measuring Instrument
- EMR / Reed Relay Replacement

Features

- Compact Solid-State Bi-directional Signal Switch
- Dual Channel Normally-off Single-Pole-Single-Throw (SPST) Relay
- 250V Output Withstand Voltage
- 0.2A Current Rating
- Low Input Current: CMOS Compatibility
- Low C x R: 340pF•Ω typical
- Low Output Off-state Leakage Current: 30pA typical
- Fast Speed Switching: 0.2ms (Ton), 0.02ms (Toff) typical
- High Transient Immunity: >1kV/µs
- High Input-to-Output Insulation Voltage (Safety and Regulatory Approvals Pending)
  - 3750 Vrms for 1 min per UL1577
  - CSA Component Acceptance

CAUTION: It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD.

Ordering Information

ASSR-xxxx is UL Recognized with 3750 Vrms for 1 minute per UL1577 and is approved under CSA Component Acceptance Notice #5.

Part number	Option RoHS Compliant	Package	Surface Mount	Gull Wing	Tape & Reel	Quantity
ASSR-322R	-002E	300 mil DIP-8				50 units per tube
	-302E		X	X		50 units per tube
	-502E		X	X	X	1000 units per reel

To order, choose a part number from the part number column and combine with the desired option from the option column to form an order entry.

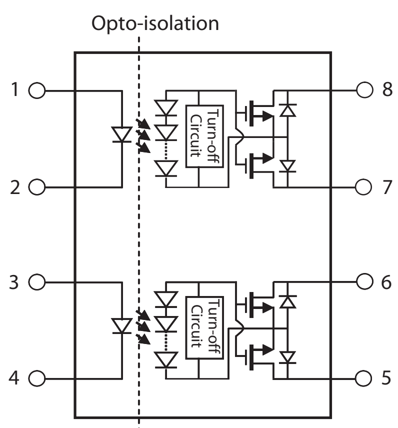
Example 1:

ASSR-322R-002E to order product of 300mil DIP-8 package in tube packaging and RoHS Compliant.

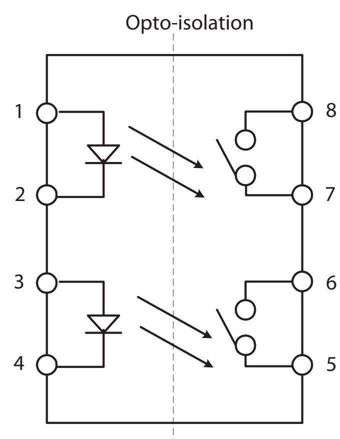
Option datasheets are available. Contact your Avago sales representative or authorized distributor for information.

Schematic

ASSR-322R

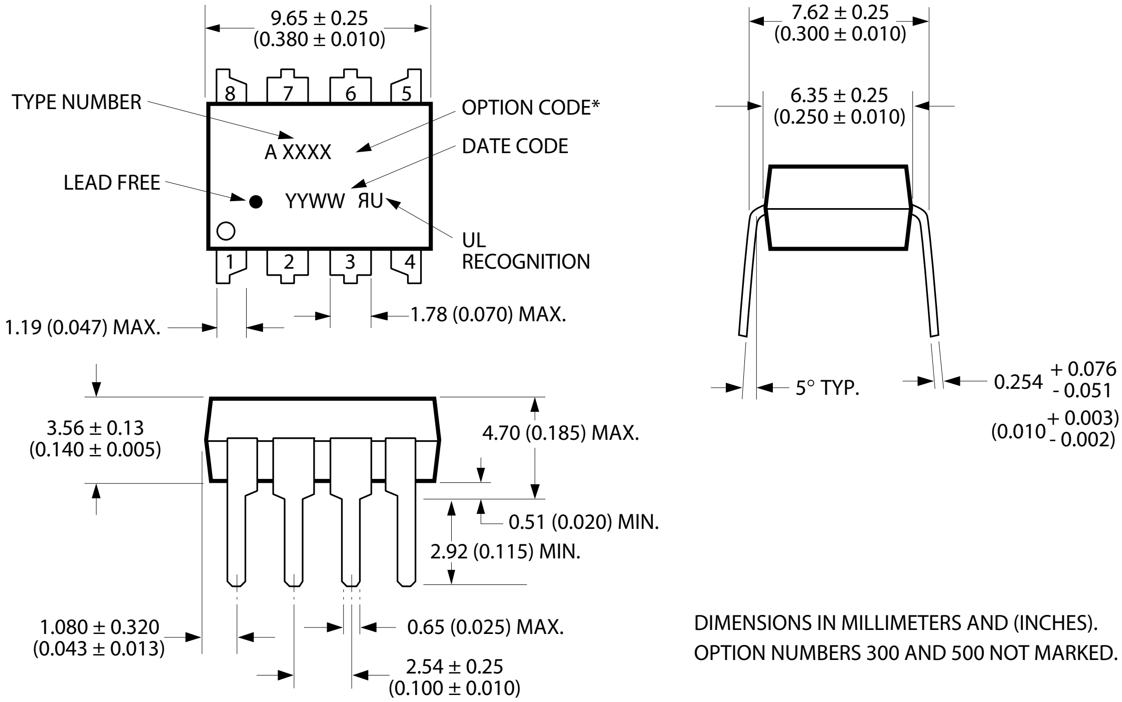


Equivalent Relay Diagram



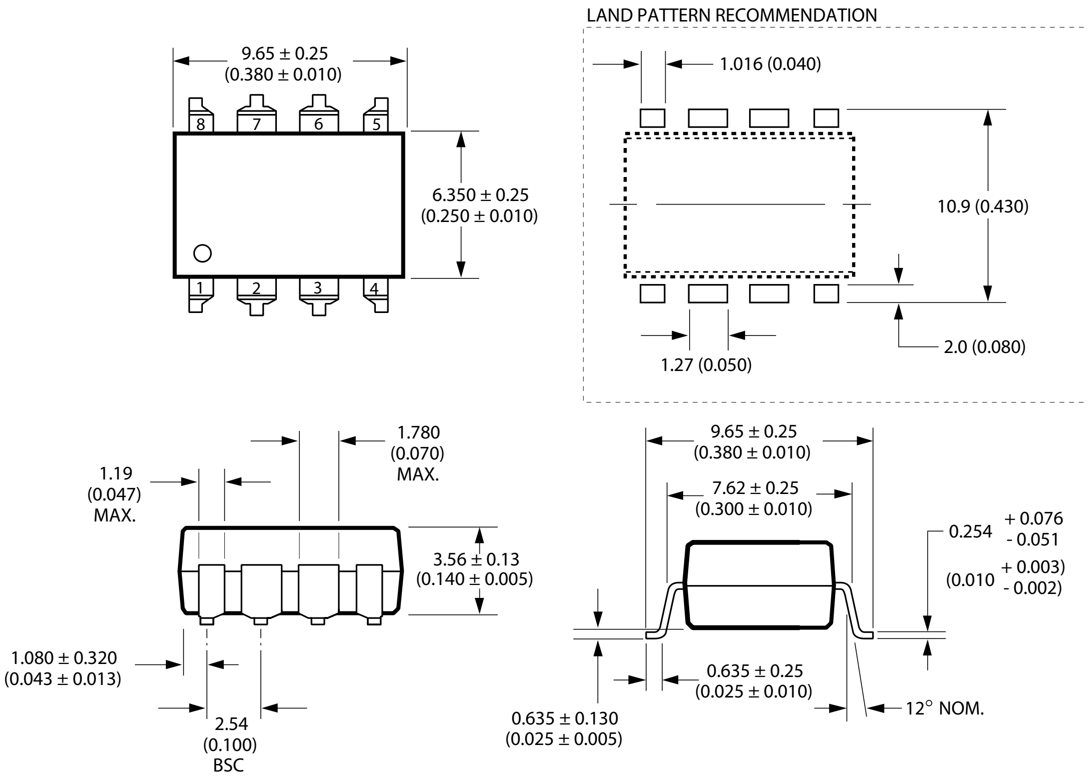
Package Outline Drawings

ASSR-322R 8-Pin DIP Package



DIMENSIONS IN MILLIMETERS AND (INCHES).
OPTION NUMBERS 300 AND 500 NOT MARKED.

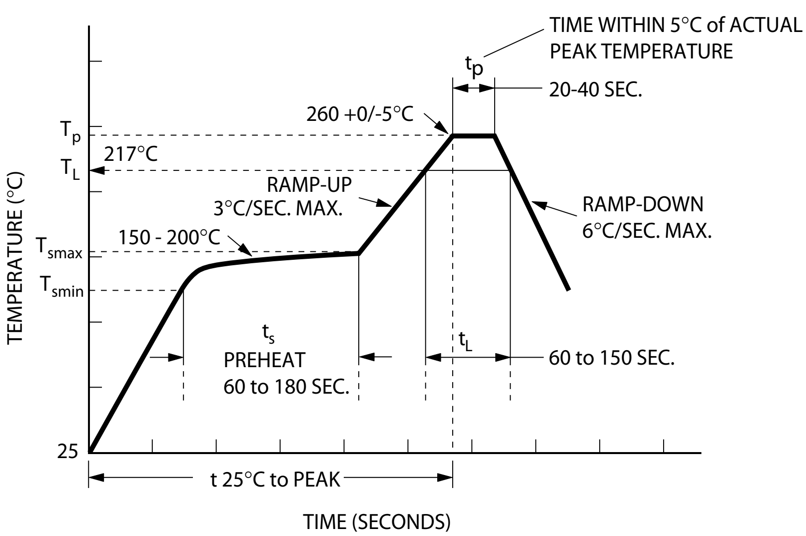
ASSR-322R 8-Pin DIP Package with Gull Wing Surface Mount Option 300



DIMENSIONS IN MILLIMETERS (INCHES).
LEAD COPLANARITY = 0.10 mm (0.004 INCHES).

NOTE: FLOATING LEAD PROTRUSION IS 0.25 mm (10 mils) MAX.

Lead Free IR Profile



NOTES:
THE TIME FROM 25°C to PEAK TEMPERATURE = 8 MINUTES MAX.
T_{smax} = 200°C, T_{smin} = 150°C

Use of non-chlorine-activated fluxes is highly recommended.

Regulatory Information

The ASSR-322R is approved by the following organizations:

UL

Approved under UL 1577, component recognition program up to V_{ISO} = 3750 V_{RMS}

CSA

Approved under CSA Component Acceptance Notice #5.

Insulation and Safety Related Specifications

Parameter	Symbol	ASSR-322R	Units	Conditions
Minimum External Air Gap (Clearance)	L(101)	7.1	mm	Measured from input terminals to output terminals, shortest distance through air.
Minimum External Tracking (Creepage)	L(102)	7.4	mm	Measured from input terminals to output terminals, shortest distance path along body.
Minimum Internal Plastic Gap (Internal Clearance)		0.08	mm	Through insulation distance conductor to conductor, usually the straight line distance thickness between the emitter and detector.
Tracking Resistance (Comparative Tracking Index)	CTI	175	V	DIN IEC 112/VDE 0303 Part 1
Isolation Group (DIN VDE0109)		IIIa		Material Group (DIN VDE0109)

Absolute Maximum Ratings

Parameter		Symbol	Min.	Max.	Units	Note
Storage Temperature		T_S	-55	125	°C	
Operating Temperature		T_A	-40	85	°C	
Junction Temperature		T_J		150	°C	
Lead Soldering Cycle	Temperature Time			260 10	°C s	
Input Current	Average Surge Transient	I_F		25 50 1000	mA	
Reversed Input Voltage		V_R		5	V	
Input Power Dissipation		P_{IN}		80	mW	
Output Power Dissipation		P_O		680	mW	
Average Output Current (T_A = 25°C, $T_C \leq$ 100°C)		I_O		0.2	A	1
Output Voltage (T_A = 25°C)		V_O	-250	250	V	
Solder Reflow Temperature Profile		See Lead Free IR Profile				

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	Note
Input Current (ON)	$I_{F(ON)}$	3	20	mA	2
Input Voltage (OFF)	$V_{F(OFF)}$	0	0.8	V	
Operating Temperature	T_A	-40	+85	°C	

Package Characteristics

Unless otherwise specified, T_A = 25°C.

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions	Fig.	Note
Input-Output Momentary Withstand Voltage	V_{ISO}	3750			Vrms	RH ≤ 50%, t = 1 min		3, 4
Input-Output Resistance	R_{I-O}		10^{12}		Ω	V_{I-O} = 500 Vdc		
Input-Output Capacitance	C_{I-O}		0.8		pF	f = 1 MHz; V_{I-O} = 0 Vdc		3

Electrical Specifications (DC)

Over recommended operating T_A = -40°C to 85°C, I_F = 5mA to 10mA, unless otherwise specified.

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions	Fig.	Note
Output Withstand Voltage	$\|V_{O(OFF)}\|$	250	280		V	V_F =0.8V, I_O=250 µA, T_A=25°C		
		230			V	V_F =0.8V, I_O=250 µA	3	
Output Leakage Current	$I_{O(OFF)}$		0.03	1	nA	V_F =0.8V, V_O=250V, T_A=25°C		5
				1	µA	V_F =0.8V, V_O=250V	4	5
Output Off-Capacitance	$C_{(OFF)}$		45	60	pF	V_F =0.8V, V_O=0V, Freq=1 MHz	5	
Output Offset Voltage	$\|V_{(OS)}\|$		1		µV	I_F =5mA, I_O=0mA		
Input Reverse Breakdown Voltage	V_R	5			V	I_R =10 µA		
Input Forward Voltage	V_F	1.1	1.3	1.65	V	I_F =5mA	6, 7	
Output On-resistance	$R_{(ON)}$		7.5	8.5	Ω	I_F =5mA, I_O=200mA, Pulse ≤30ms, T_A=25°C	8, 9	6

Switching Specifications (AC)

Over recommended operating T_A = -40°C to 85°C, I_F = 5mA to 10mA, unless otherwise specified.

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions	Fig.	Note
Turn On Time	T_{ON}		0.25	0.5	ms	I_F =5mA, I_O=200mA, T_A=25°C	10, 14	
				1.0	ms	I_F =5mA, I_O=200mA	11	
Turn Off Time	T_{OFF}		0.02	0.2	ms	I_F =5mA, I_O=200mA, T_A=25°C	12, 14	
				0.5	ms	I_F =5mA, I_O=200mA	13	
Output Transient Rejection	dV_O/dt	1	7		kV/μs	ΔV_O=250V, T_A=25°C	15	
Input-Output Transient Rejection	dV_{I-O}/dt	1	≥10		kV/μs	ΔV_{I-O}=1000V, T_A=25°C	16	

Notes:

1. For derating, refer to Figure 1 and 2.
2. Threshold to switch device is $I_F \geq$ 0.5mA, however, for qualified device performance over temperature range, it is recommended to operate at I_F =5mA. Refer to application information in next section of this datasheet.
3. Device is considered as a two terminal device: pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.
4. The Input-Output Momentary Withstand Voltage is a dielectric voltage rating that should not be interpreted as an input-output continuous voltage rating. For the continuous voltage rating refer to the IEC/EN/DIN EN 60747-5-2 Insulation Characteristics Table (if applicable), your equipment level safety specification, or Avago Technologies Application Note 1074, "Optocoupler Input-Output Endurance Voltage."
5. The PCB design and environmental conditions are taken into consideration when measuring the $I_{O(OFF)}$ performance.
6. During the pulsed $R_{(ON)}$ measurement (I_O duration ≤30ms), ambient (T_A) and case temperature (T_C) are equal.

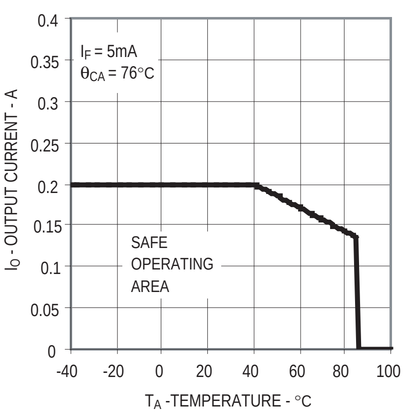


Figure 1. Maximum Average Output Current Rating vs Ambient Temperature

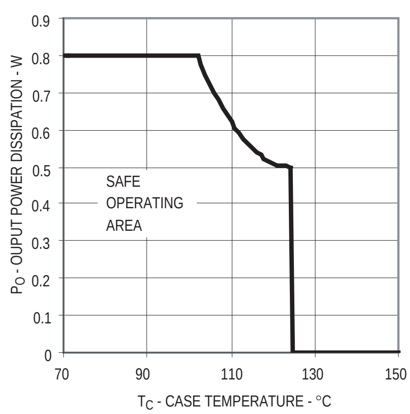


Figure 2. Output Power Derating vs Case Temperature

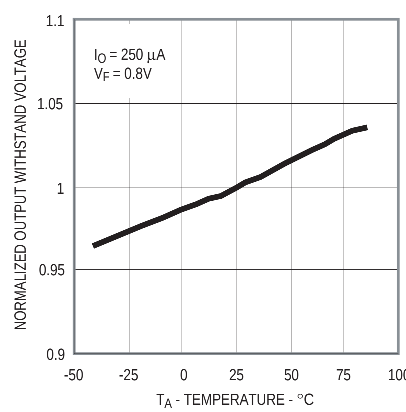


Figure 3. Normalized Typical Output Withstand Voltage vs. Temperature

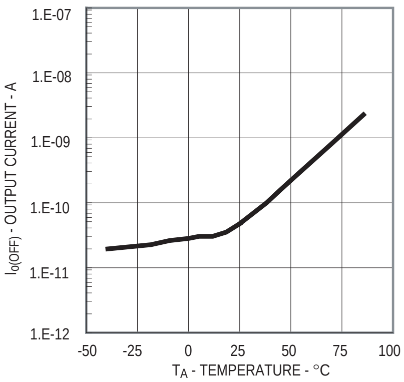


Figure 4. Typical Output Leakage Current vs. Temperature

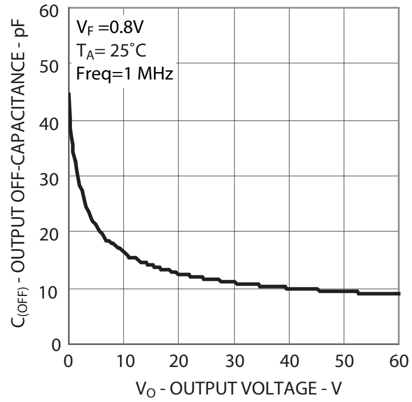


Figure 5. Typical Output Off- Capacitance vs. Output Voltage

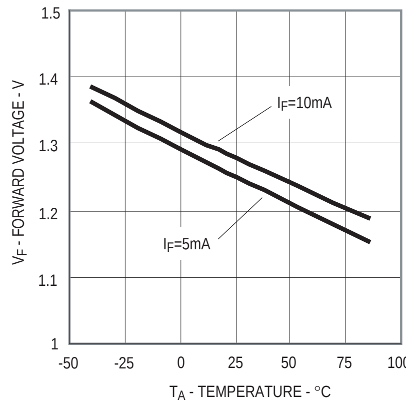


Figure 6. Typical Forward Voltage vs. Temperature

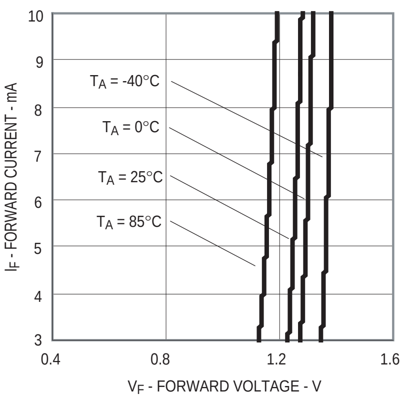


Figure 7. Typical Forward Current vs. Forward Voltage

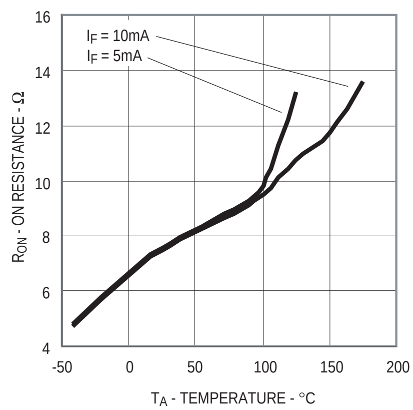


Figure 8. Typical On Resistance vs. Temperature

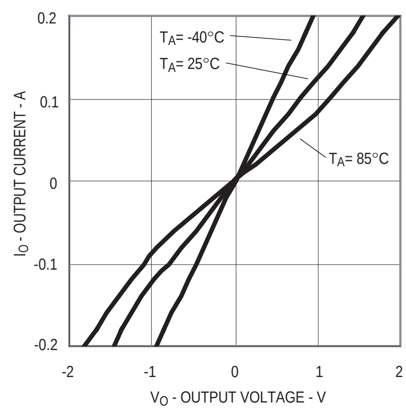


Figure 9. Typical Output Current vs. Output Voltage

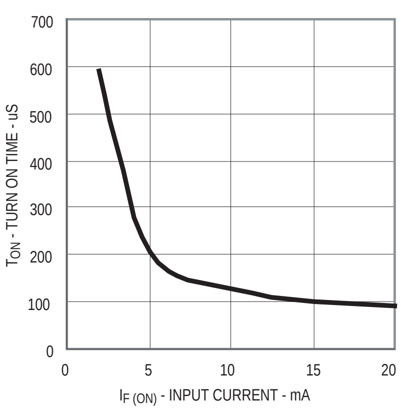


Figure 10. Typical Turn On Time vs. Input Current

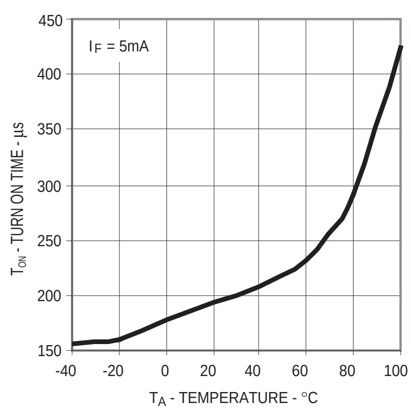


Figure 11. Typical Turn On Time vs. Temperature

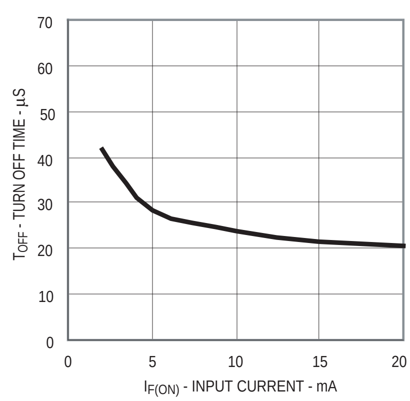


Figure 12. Typical Turn Off Time vs. Input Current

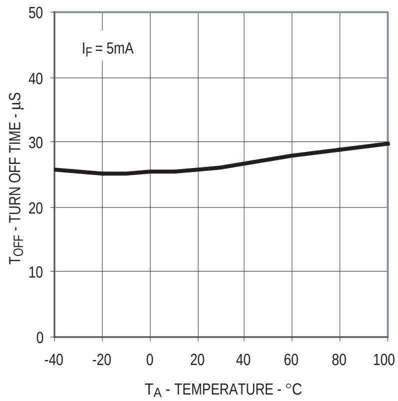


Figure 13. Typical Turn Off Time vs. Temperature

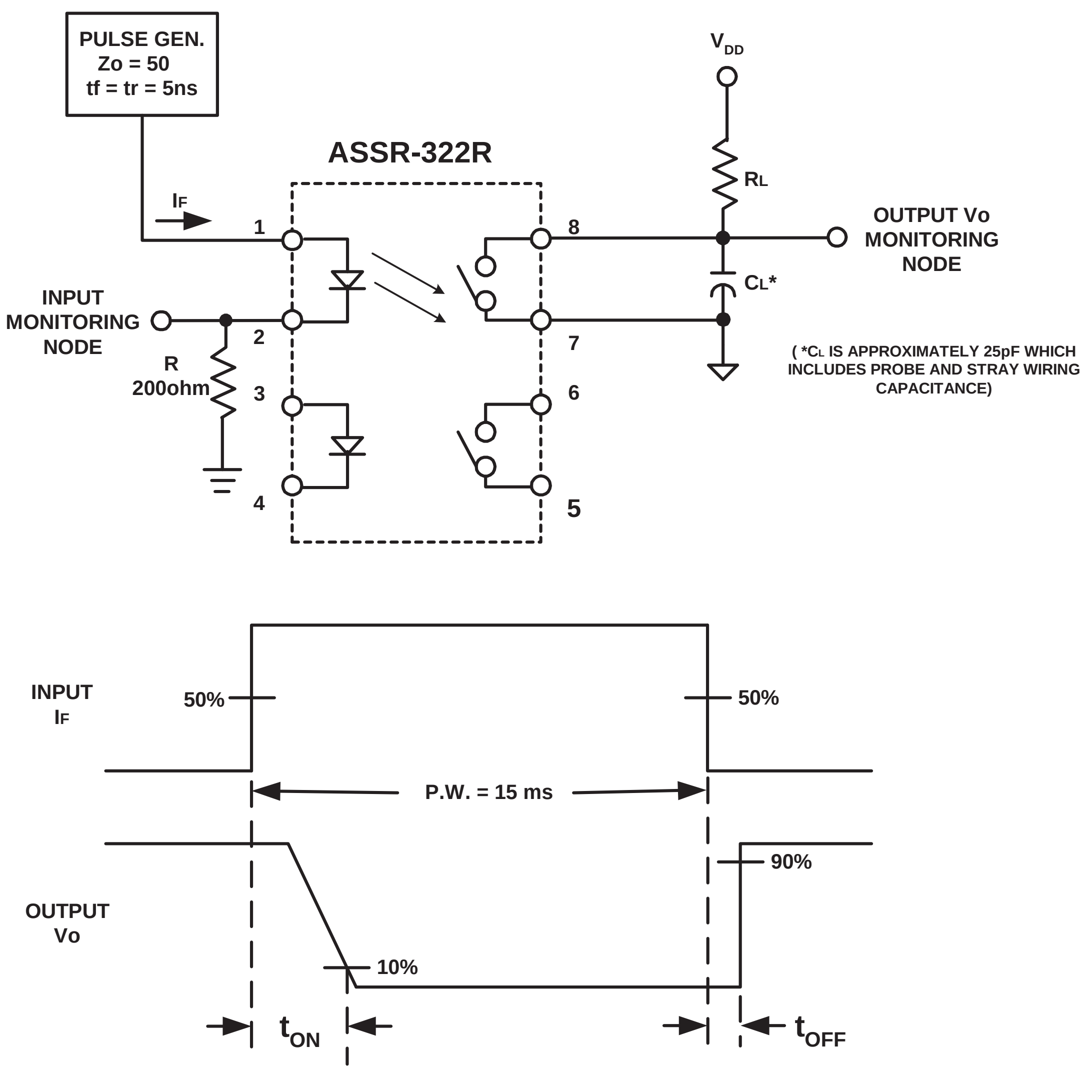
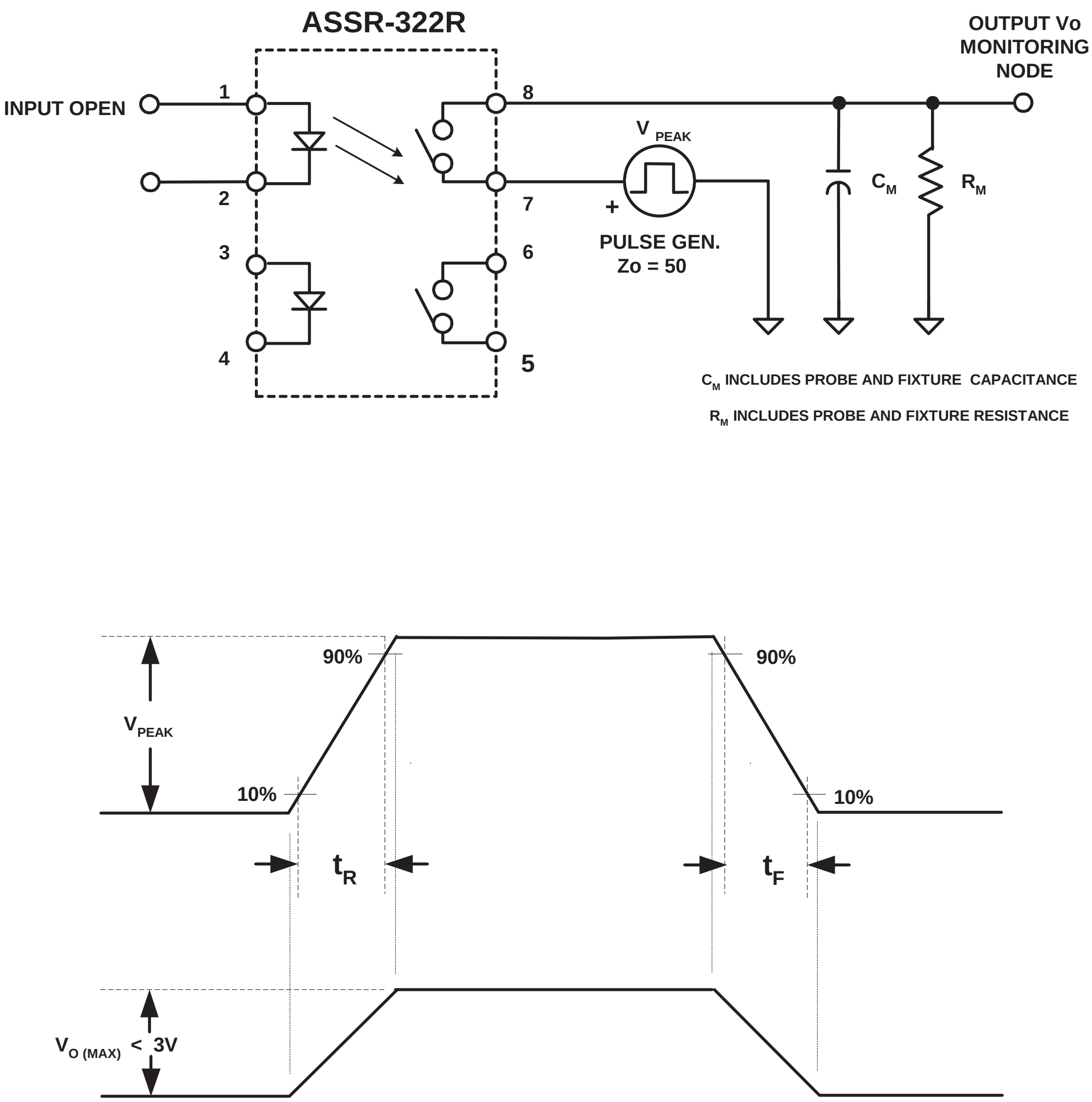


Figure. 14 Switching Test Circuit for TON, TOFF



$$\frac{dV_0}{dt} = \frac{(0.8)V_{PEAK}}{t_R} \text{ OR } \frac{(0.8)V_{PEAK}}{t_F}$$

OVER SHOOT ON V_{PEAK} IS TO BE 10%

Figure. 15. Output Transient Rejection Test Circuit

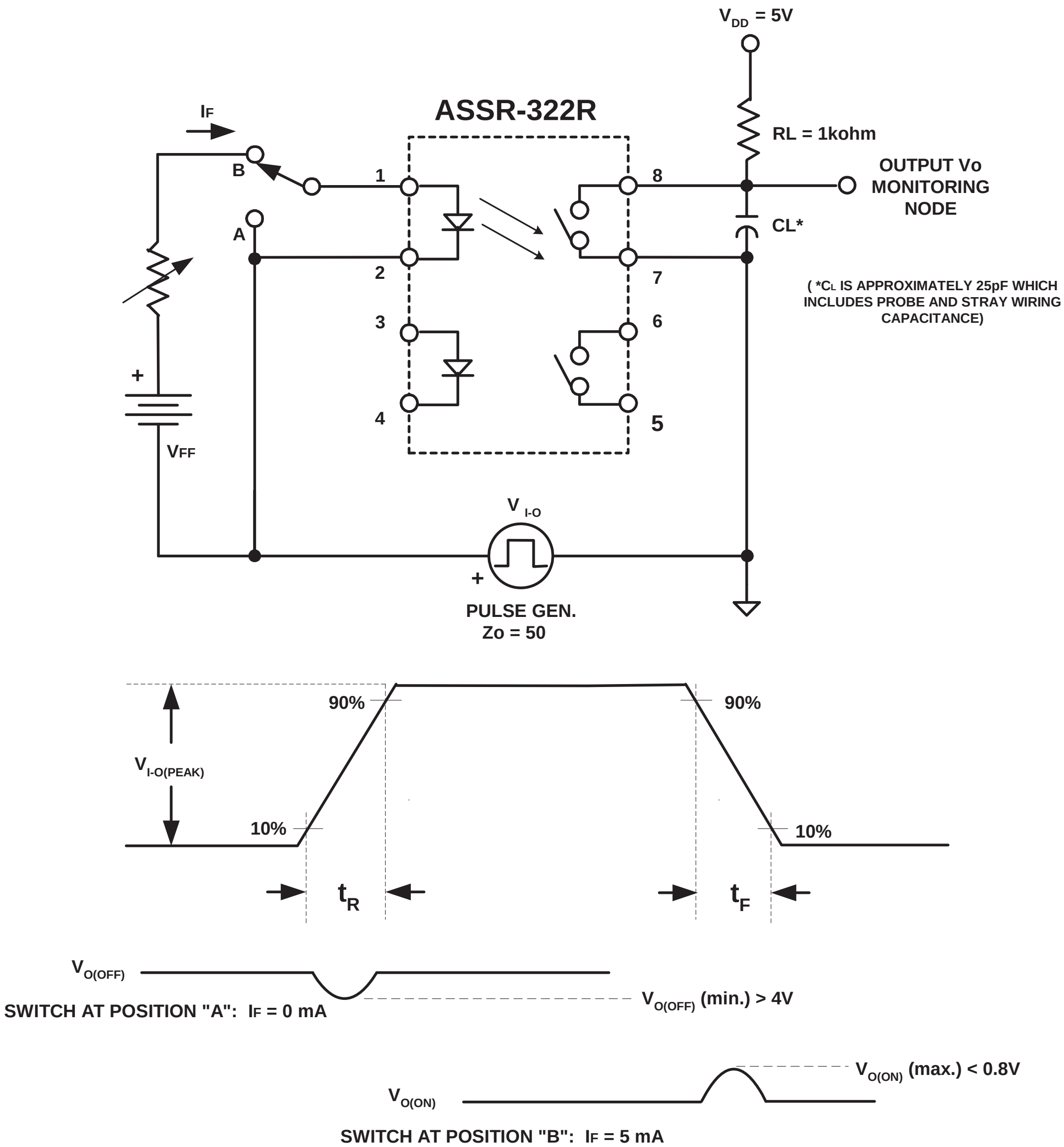


Figure 16. Input-Output Transient Rejection Test Circuit

Applications Information

On-Resistance and Derating Curves

The Output On-Resistance, $R_{(ON)}$, specified in this data sheet, is the resistance measured across the output contact when a pulsed current signal (Io=200mA) is applied to the output pins. The use of a pulsed signal (≤ 30ms) implies that each junction temperature is equal to the ambient and case temperatures. The steady-state resistance, Rss, on the other hand, is the value of the resistance measured across the output contact when a DC current signal is applied to the output pins for a duration sufficient to reach thermal equilibrium. Rss includes the effects of the temperature rise in the device.

Derating curves are shown in Figures 1 and 2. Figure 1 specifies the maximum average output current allowable for a given ambient temperature. Figure 2 specifics the output power dissipation allowable for a given case temperature. Above a case temperature 102°C, the maximum allowable output current and power dissipation are related by the expression $Rss=Po(max)/(Io(max))^2$ from which Rss can be calculated. Staying within the safe area assures that the steady state MOSFET junction temperature remains less than 150°C.

Turn On Time and Turn Off Time Variation

The ASSR-322R exhibits a very fast turn on and turn off time. Both the turn on and turn off time can be adjusted by choosing proper forward current as depicted in Figures 10 and 12. The changes of the turn on and turn off time with ambient temperature are also shown in Figures 11 and 13.

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

AV01-0125EN - March 19, 2012

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