

Precision Quad SPDT Analog Switch

DESCRIPTION

The DG333A, DG333AL consist of four independently controlled single-pole double-throw analog switches. These monolithic switch is designed to control analog signals with a high degree of accuracy. The DG333A, DG333AL minimize measurement errors by offering low on-resistance ($25\ \Omega$ typ), low leakage ($20\ \text{pA}$ typ.) and low charge injection performance. The DG333AL features micro-power operation ($< 1\ \mu\text{W}$ typ.). This is ideal for battery operated systems. Pin 15 is not connected on the DG333A.

An improved charge injection compensation design minimizes switching transients. These switches can handle up to $\pm 22\ \text{V}$ signals and have an improved continuous current of $30\ \text{mA}$.

The DG333A, DG333AL is fabricated in Vishay Siliconix's proprietary HVSG-2 CMOS process, resulting in higher speed and lower power consumption. An epitaxial layer prevents latchup. Each switch conducts equally well in both directions when on. When off, they block voltages up to the power-supply levels.

FEATURES

- $\pm 22\ \text{V}$ supply voltage range
- TTL and CMOS compatible logic
- Low on-resistance ($25\ \Omega$)
- On-resistance matched between channels ($< 2\ \Omega$)
- Flat on-resistance over analog signal range ($\Delta < 3\ \Omega$)
- Low charge injection ($1\ \text{pC}$)
- Low leakage ($0.2\ \text{nA}$)
- Fast switching ($175\ \text{ns}$)
- Single-supply operation ($5\ \text{V}$ to $40\ \text{V}$)
- ESD tolerance $> 2\ \text{kV}$ per 3015.x
- Low power ($< 1\ \mu\text{A}$) - DG333A, DG333AL

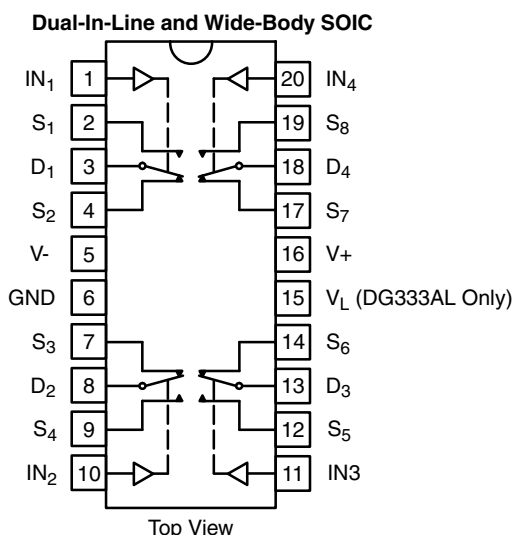
BENEFITS

- Rail-to-rail analog signal range
- Simple logic interface
- High precision and accuracy
- Minimal transients
- Low distortion
- Reduced power consumption
- Improved reliability
- Break-before-make switching action

APPLICATIONS

- Audio switching
- Test equipment
- Portable instrumentation
- Communication systems
- PBX, PABX
- Computer peripherals
- Mass storage systems
- Switched-capacitor networks
- Battery-powered systems

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



TRUTH TABLE

Logic	SW1, 4, 5, 8 Normally Open	SW2, 3, 6, 7 Normally Closed
0	OFF	ON
1	ON	OFF

Logic "0" $\leq 0.8\ \text{V}$

Logic "1" $\geq 2.4\ \text{V}$

ORDERING INFORMATION

Temp. Range	Package	Part Number ^a
- 40 °C to 85 °C	20-Pin Plastic DIP	DG333ADJ-E3
		DG333ALDJ-E3
	20-Pin Wide-Body SOIC (shipped in tubes)	DG333ADW-E3
		DG333ALDW-E3
	20-Pin Wide-Body SOIC (shipped in tape and reel)	DG333ADW-T1-E3
		DG333ALDW-T1-E3
	20-Pin TSSOP (shipped in tape and reel)	DG333ADQ-T1-E3
		DG333ALDQ-T1-E3

Note:

a. For standard tin/lead external termination, remove the "-E3" from the ordering part number.

ABSOLUTE MAXIMUM RATINGS			
Parameter		Limit	Unit
Voltages Referenced V ₊ to V ₋		44	V
GND		30	
V ₊ to GND		30	
Digital Inputs ^a V _S , V _D		(V ₋) - 2 to (V ₊) + 2 or 30 mA, whichever occurs first	
Current, Any Terminal		30	mA
Peak Current S or D (Pulsed at 1 ms, 10 % Duty Cycle Max.)		100	
Storage Temperature		- 65 to 125	°C
Power Dissipation (Package) ^b	20-Pin Plastic DIP ^c	890	mW
	20-Pin Wide SOIC ^d	800	

Notes:

a. Signals on S_X, D_X, or IN_X exceeding V₊ or V₋ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

b. All leads welded or soldered to PC board.

c. Derate 12 mW/°C above 75 °C.

d. Derate 10 mW/°C above 75 °C.

SCHEMATIC DIAGRAM (Typical Channel)

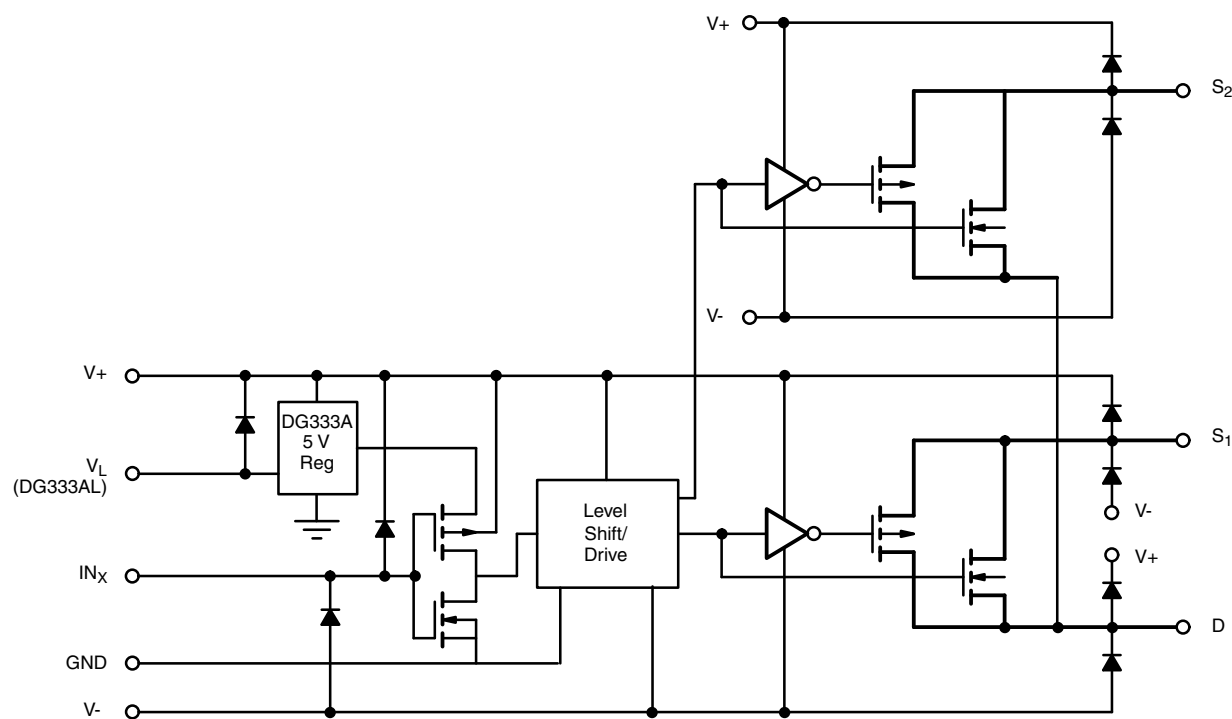


Figure 1.

**SPECIFICATIONS**

Parameter	Symbol	Test Conditions Unless Otherwise Specified V ₊ = 15 V, V ₋ = - 15 V V _{IN} = 2.4 V or 0.8 V ^e	Temp. ^a	Limits D Suffix - 40 °C to 85 °C			Unit
				Min. ^b	Typ. ^c	Max. ^b	
Analog Switch							
Analog Signal Range ^d	V _{ANALOG}		Full	V-		V+	V
Channel On-Resistance	R _{DS(on)}	I _S = - 10 mA, V _D = ± 10 V	Room Full		25	45 90	Ω
On-Resistance Flatness		I _S = - 10 mA, V _D = ± 5 V V ₊ = 16.5 V, V ₋ = - 16.5 V	Room Full			3 5	
R _{DS(on)} Match Between Channels ^f	ΔR _{DS(on)}	I _S = - 10 mA, V _D = ± 10 V	Room Full			2 4	
Source Off Leakage Current	I _{S(off)}	V _D = 15.5 V, V _S = 15.5 V V ₊ = 16.5 V, V ₋ = - 16.5 V	Room Hot	- 0.25 - 20		0.25 20	nA
Channel On Leakage Current	I _{D(on)}	V _D = ± 15.5 V, V _{S(open)} = ± 15.5 V V ₊ = 16.5 V, V ₋ = - 16.5 V	Room Hot	- 0.75 - 60		0.75 60	
Digital Control							
Input Voltage High	V _{INH}		Full	2.4			V
Input Voltage Low	V _{INL}		Full			0.8	
Input Current	I _{INL} or I _{INH}	V _{INH} or V _{INL}	Full	- 1		1	μA
Dynamic Characteristics							
Turn-On Time	t _{ON}	See switching time test circuit see figure 2	Room			175	ns
Turn-Off Time	t _{OFF}		Room			145	
Break-Before-Make Time Delay	t _D	See figure 3	Room	5			
Charge Injection ^d	Q	C _L = 10 nF, V _{gen} = 0 V, R _{gen} = 0 Ω	Room			10	pC
Off-Isolation	OIRR	R _L = 75 Ω, C _L = 5 pF	Room		72		dB
Channel-to-Channel Crosstalk	X _{TALK}	V _D = 2.3 V _{RMS} , f = 1 MHz	Room		80		
Off Capacitance	C _{OFF}	f = 1 MHz, V _S = 0 V	Room		8		pF
Channel On Capacitance	C _{ON}		Room		12		
Power Supplies							
Positive Supply Current	I ₊	DG333A: V _{IN} = 0 or 5 V	Room			200	μA
Negative Supply Current	I ₋		Room	- 1			
Positive Supply Current	I ₊	DG333AL: V _{IN} = 0 or 5 V, V _L = 5 V	Room			1	
Logic Supply Current	I _L		Room			1	
Negative Supply Current	I ₋		Room	- 1			
Supply Voltage Range	V ₊ /V ₋		Full	± 4		± 22	

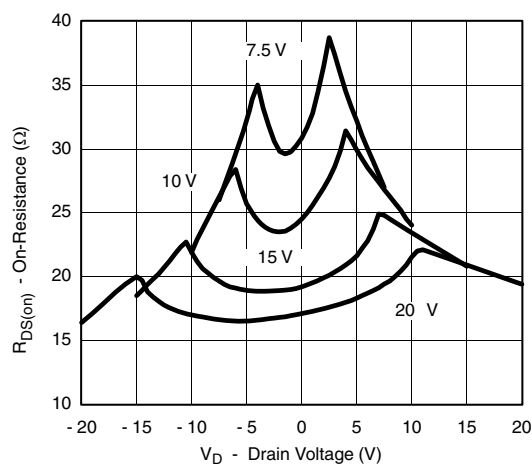
SPECIFICATIONS (Unipolar Supplies)							
Parameter	Symbol	Test Conditions Unless Otherwise Specified V ₊ = 12 V, V ₋ = 0 V T _A = 25°C	Temp. ^a	Limits D Suffix - 40 °C to 85°C			Unit
				Min. ^b	Typ. ^c	Max. ^b	
Analog Switch							
Analog Signal Range ^d	V _{ANALOG}		Full	V-		V+	V
Channel On-Resistance	R _{DS(on)}	I _S = - 10 mA, V _D = 10, 1 V	Room		35	75	Ω
Source Off Leakage Current	I _{S(off)}	V _D = 11 V, V _{S(open)} = 1 V	Room			0.25	nA
Channel On Leakage Current	I _{D(on)}	V _D = 11 V, V _{S(open)} = 0 V V _D = 1 V, V _{S(open)} = V ₊	Room			0.75	
Dynamic Characteristics							
Turn-On Time	t _{ON}	See switching time test circuit see figure 2	Room		90		ns
Turn-Off Time	t _{OFF}		Room		45		
Break-Before-Make Time Delay	t _D	See figure 3	Room	5	10		
Power Supplies							
Positive Supply Current	I ₊	DG333A: V _{IN} = 0 or 5 V	Room			200	μA
			Room			1	
Positive Supply Current	I ₊	DG333AL: V _{IN} = 0 or 5 V, V _L = 5 V	Room			1	
Logic Supply Current	I _L		Room			1	
Positive Supply Range	V ₊		Room	5		40	V

Notes:

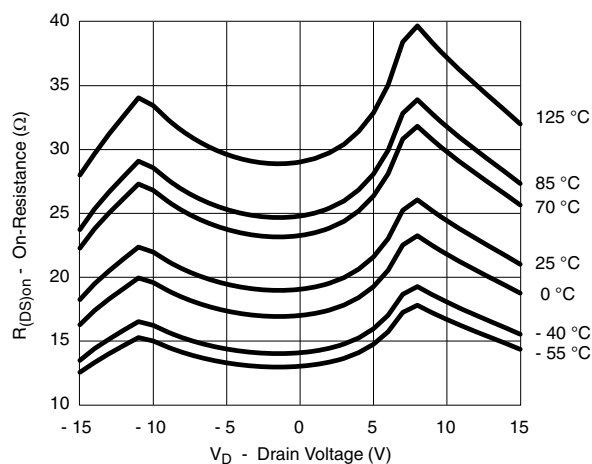
- Room = 25 °C, Full = as determined by the operating temperature suffix.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this datasheet.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- Guaranteed by design, not subject to production test.
- V_{IN} = input voltage to perform proper function.
- On-resistance match and flatness are guaranteed only for bipolar supply operation.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

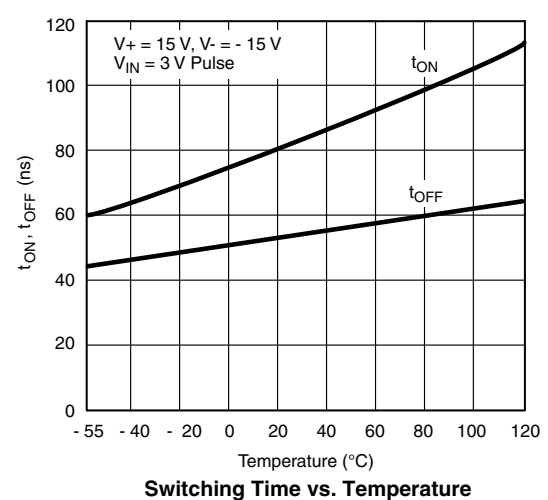
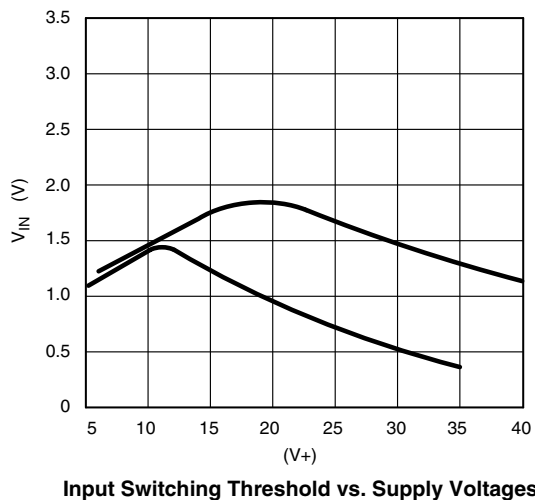
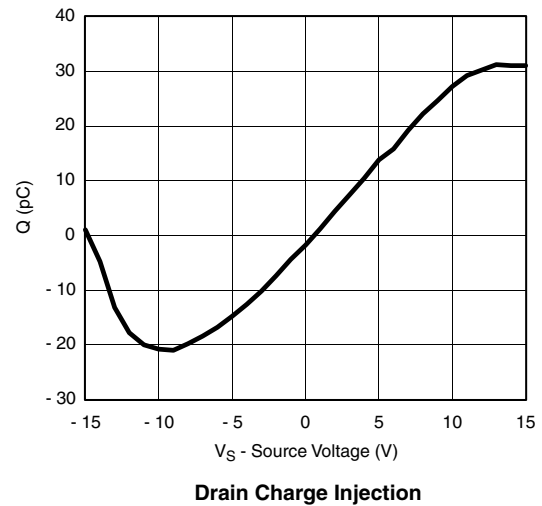
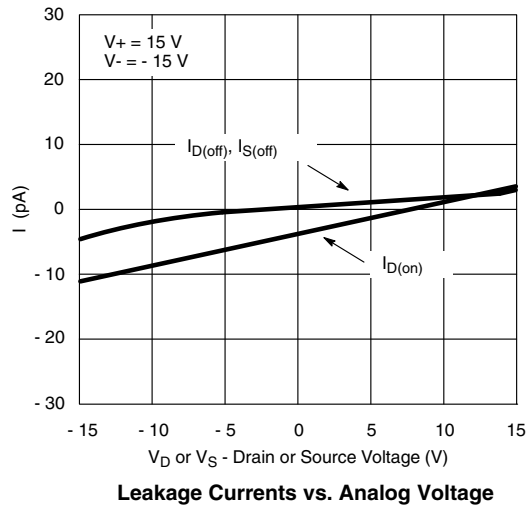
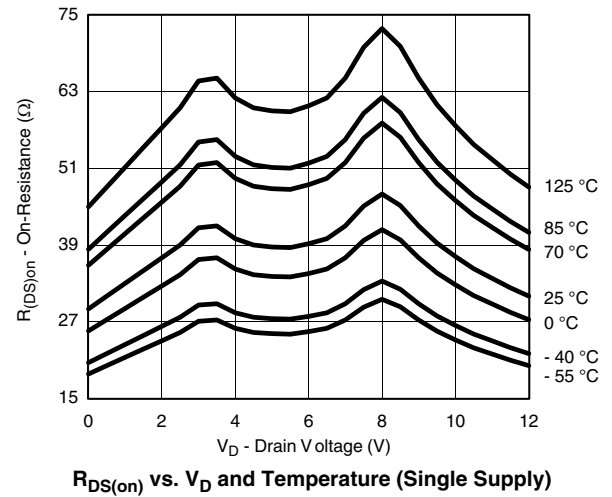
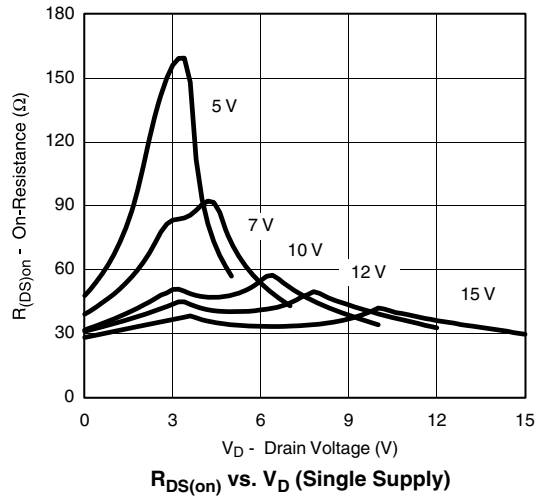
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



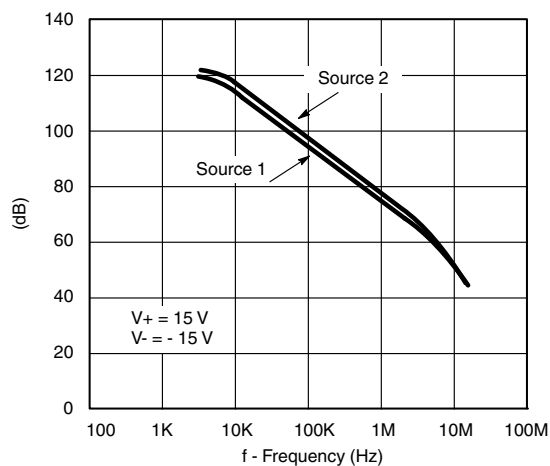
$R_{\text{DS(on)}} \text{ vs. } V_D \text{ (Dual Supply)}$



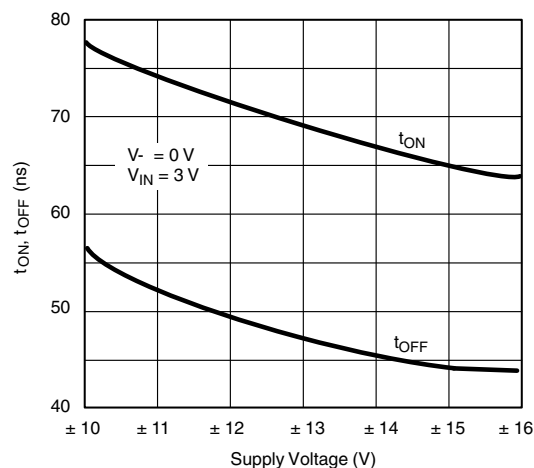
$R_{\text{DS(on)}} \text{ vs. } V_D \text{ and Temperature (Dual Supply)}$

TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)


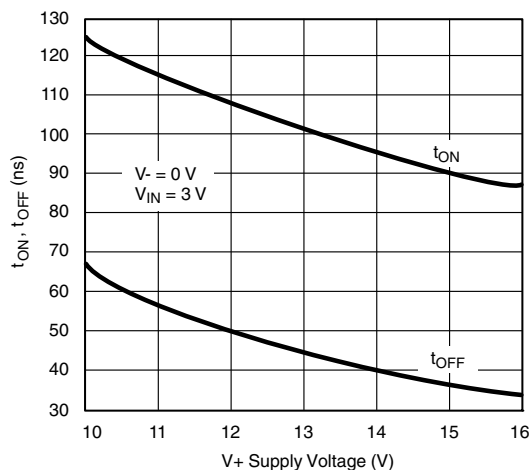
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



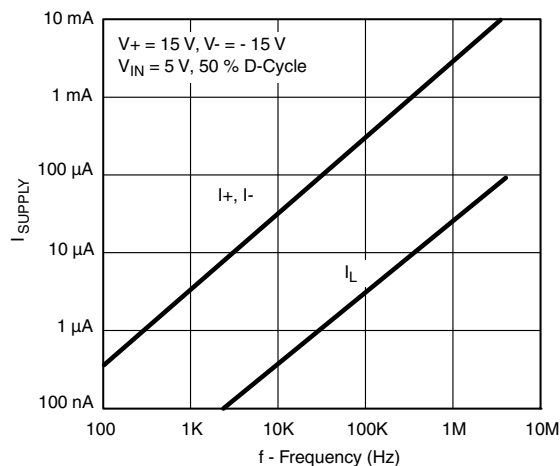
Crosstalk and Off Isolation vs. Frequency



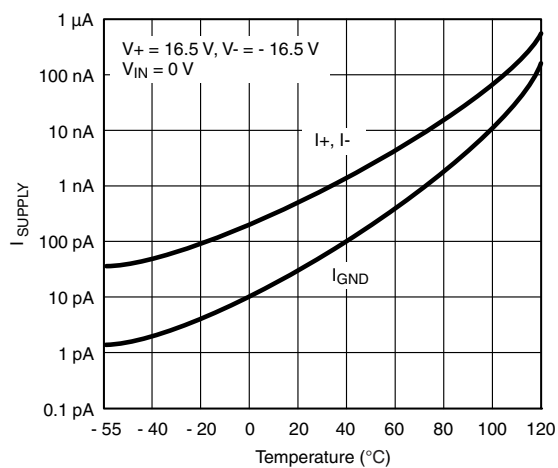
Switching Time vs. Supply Voltages



Switching Time vs. V_+



Power Supply Currents vs. Switching Frequency



Supply Current vs. Temperature

TEST CIRCUITS

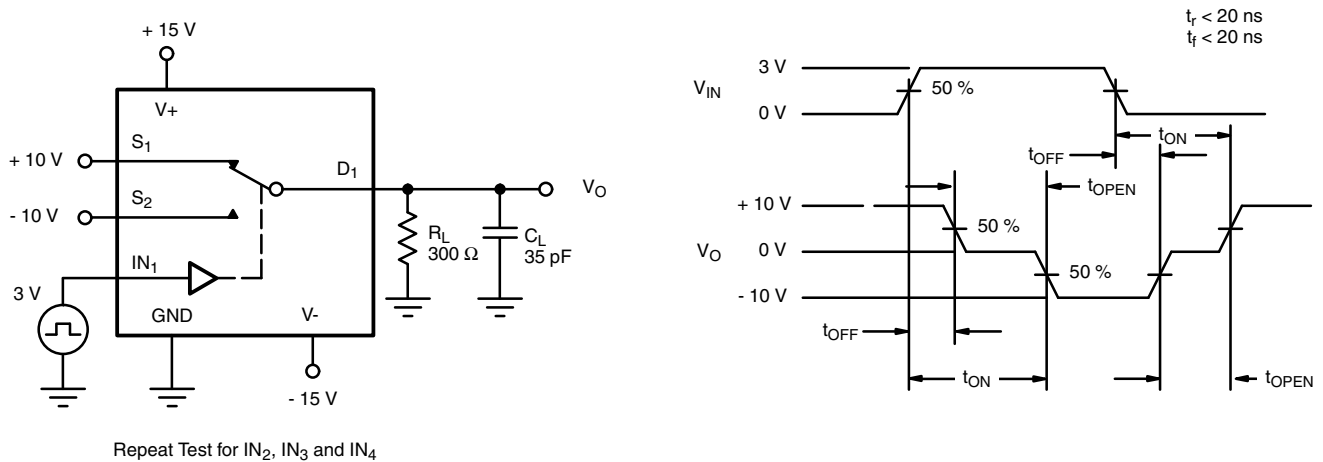


Figure 2. Switching Time

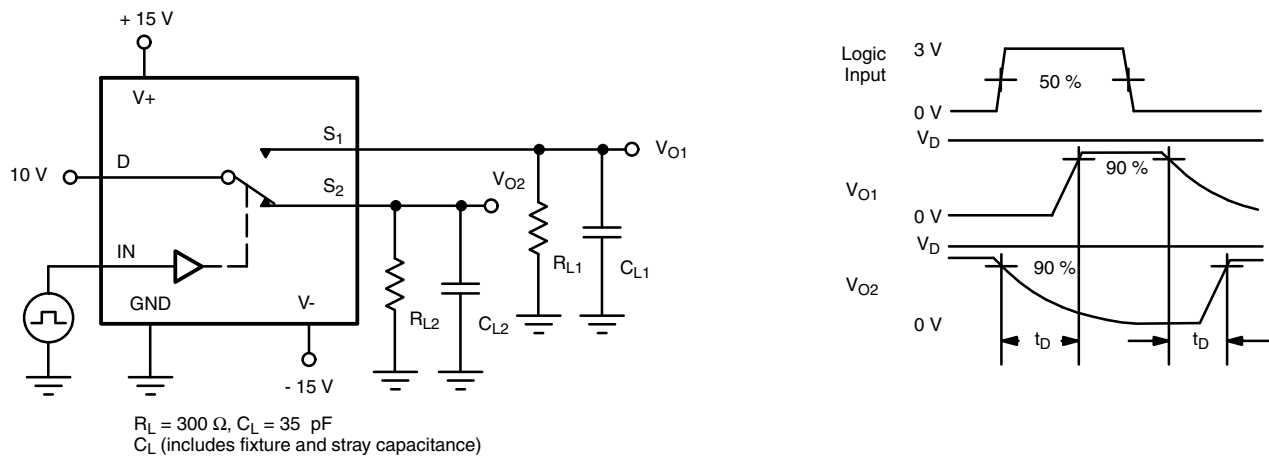


Figure 3. Break-Before-Make

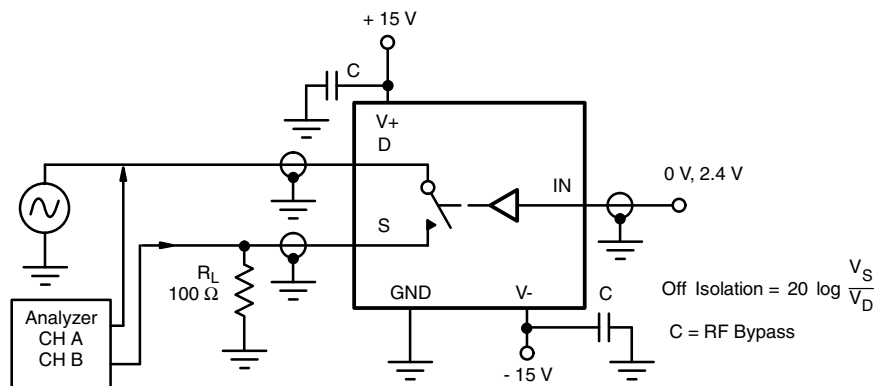


Figure 4. Off Isolation

TEST CIRCUITS

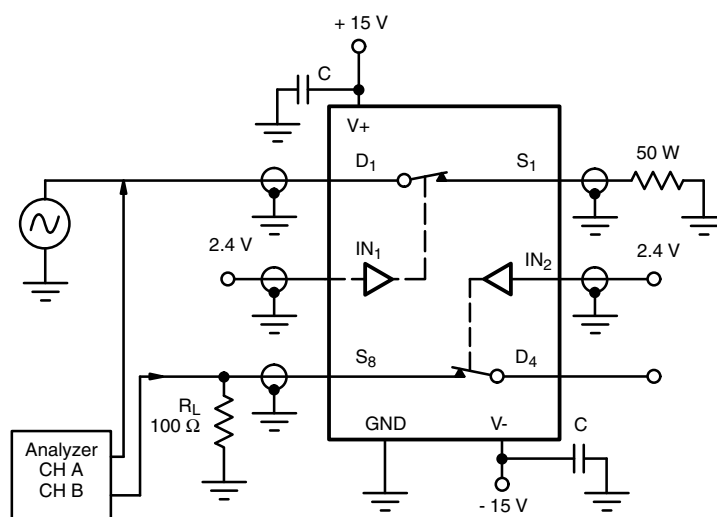


Figure 5. Crosstalk

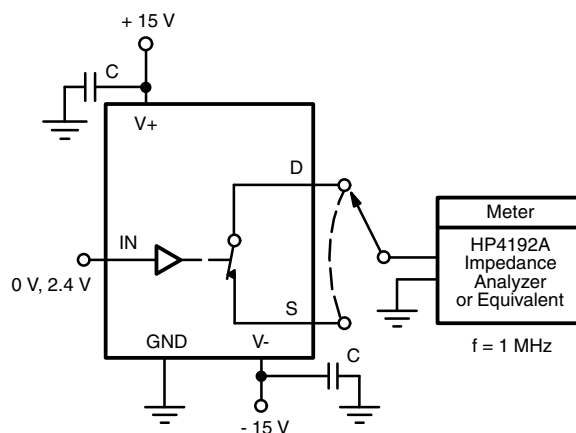


Figure 6. Capacitances

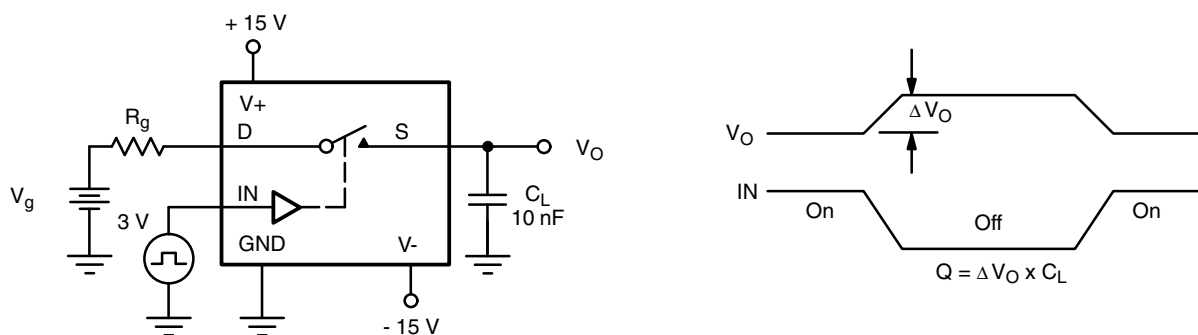


Figure 7. Charge Injection

APPLICATIONS

Band-Pass Switched Capacitor Filter

Single-pole double-throw switches are a common element for switched capacitor networks and filters. The fast switching times and low leakage of the DG333A, DG333AL allow for higher clock rates and consequently higher filter operating frequencies. Figure 8 shows two capacitors being switched.

The DG333A, DG333AL is capable of switching four capacitors.

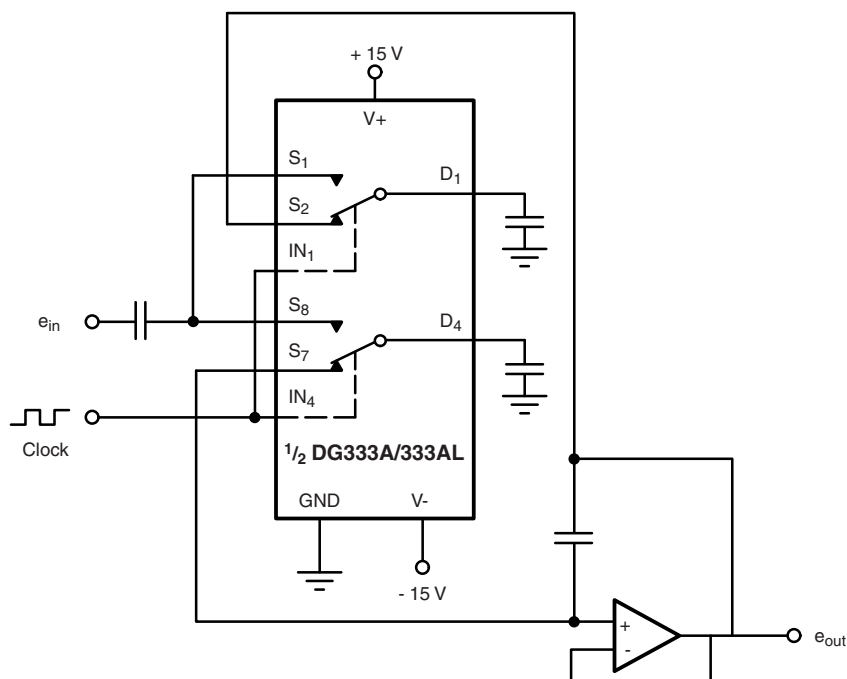
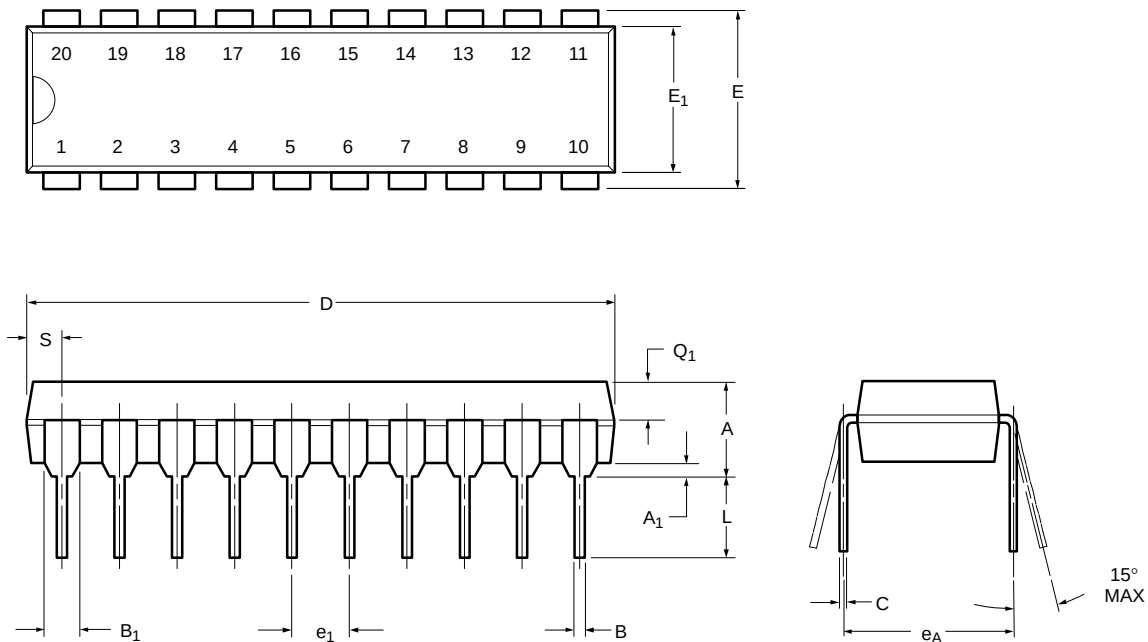


Figure 8. Band-Pass Switched Capacitor Filter

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?70803.



PDIP: 20-LEAD

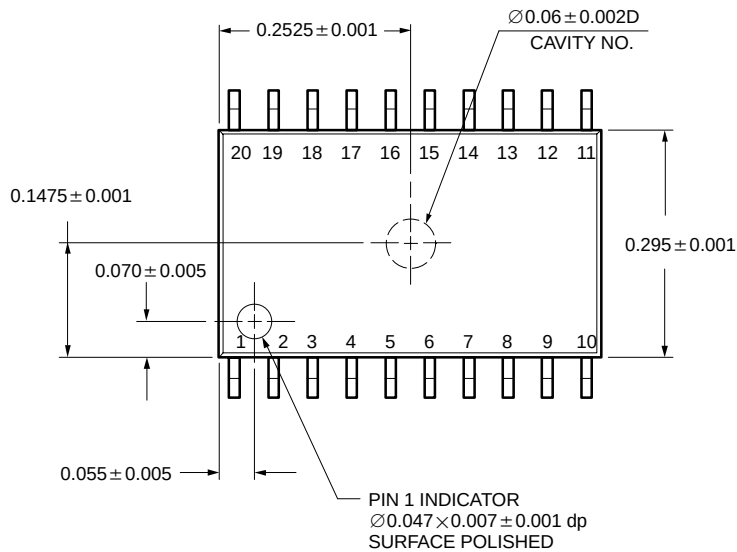


Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	3.81	5.08	0.150	0.200
A ₁	0.38	1.27	0.015	0.050
B	0.38	0.51	0.015	0.020
B ₁	0.89	1.65	0.035	0.065
C	0.20	0.30	0.008	0.012
D	24.89	26.92	0.980	1.060
E	7.62	8.26	0.300	0.325
E ₁	5.59	7.11	0.220	0.280
e ₁	2.29	2.79	0.090	0.110
e _A	7.37	7.87	0.290	0.310
L	3.175	3.81	0.123	0.150
Q ₁	1.27	2.03	0.050	0.080
S	1.02	2.03	0.040	0.080

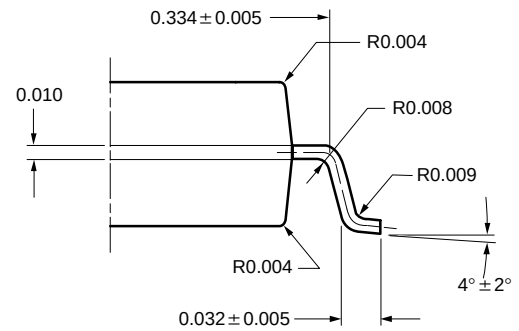
ECN: S-03946—Rev. B, 09-Jul-01
DWG: 5484



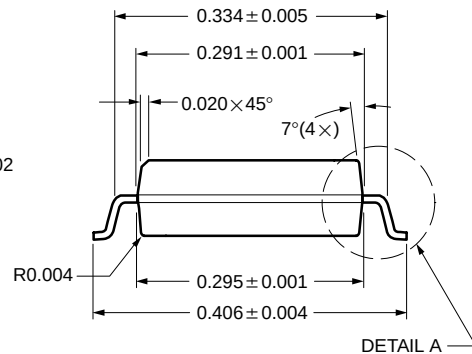
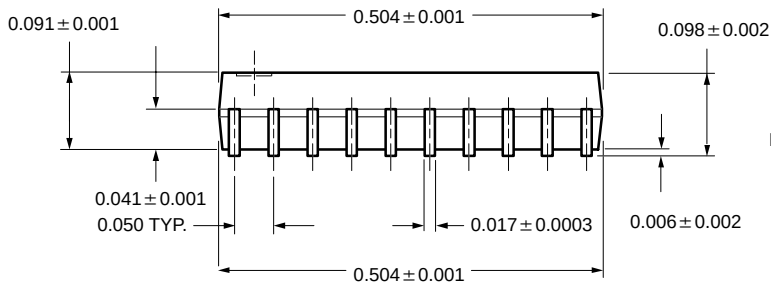
SOIC (WIDE-BODY): 20-LEAD



ECN: S-03946—Rev. C, 09-Jul-01
DWG: 5848



DETAIL A



All Dimensions In Inches.



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9