

High-Speed Drivers and Dual DPST JFET Switches

FEATURES

- Constant On-Resistance Over Entire Analog Range
- Low Leakage
- Low Crosstalk
- Break-Before-Make Switching
- Rad Hardness

BENEFITS

- Low Distortion
- Eliminates Large Signal Errors
- High Precision
- Improved Channel Isolation
- Eliminates Inadvertent Shorting Between Channels
- Fault Protection

APPLICATIONS

- Audio Switching
- Precision Switching
- Video Switching
- Video Routing
- Sample/Hold
- Aerospace

DESCRIPTION

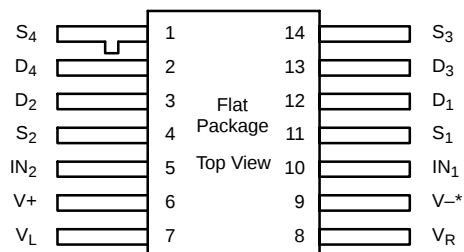
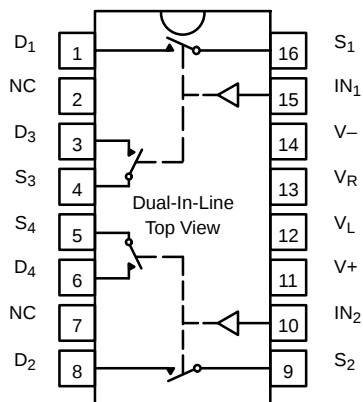
The DG183/184/185 are precision dual double-pole, single-throw (DPST) analog switches designed to provide accurate switching of video and audio signals. This series is ideally suited for applications requiring a constant on-resistance over the entire analog range.

The major difference in the devices is the on-resistance (DG183—10 Ω , DG184—30 Ω , DG185—75 Ω). Reduced errors are achieved through low leakage current ($I_{D(on)}$

< 2 nA). Applications which benefit from the flat JFET on-resistance include audio switching, video switching, and data acquisition.

To achieve fast and accurate switch performance, each device comprises four n-channel JFET transistors and a TTL compatible bipolar driver. In the on state, each switch conducts current equally well in either direction. In the off condition, the switches will block up to 20 V peak-to-peak, with feedthrough of less than -60 dB at 10 MHz.

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Refer to JAN38510 Information, Military Section
*Common to Substrate and Case

TRUTH TABLE	
Logic	Switch
0	OFF
1	ON

Logic "0" $\leq$ 0.8 V
Logic "1" $\geq$ 2.0 V

ORDERING INFORMATION		
Temp Range	Package	Part Number
-25 to 85°C	16-Pin Sidebraz	DG183BP
		DG184BP
-55 to 125°C	16-Pin Sidebraz	DG183AP/883
		DG184AP/883, JM38510/11103BEA
		DG185AP/883, JM38510/11104BEA
	14-Pin Flat Pack	JM38510/11103BXA
		JM38510/11104BXA

ABSOLUTE MAXIMUM RATINGS

V_+ to V_-	36 V
V_+ to V_D	33 V
V_D to V_-	33 V
V_D to V_D	± 22 V
V_L to V_-	36 V
V_L to V_{IN}	8 V
V_L to V_R	8 V
V_{IN} to V_R	8 V
V_R to V_-	27 V
V_R to V_{IN}	2 V
Current (S or D) DG183	200 mA

Current (S or D) DG184, DG185	30 mA
Current (All Other Pins)	30 mA
Storage Temperature	-65 to 150°C
Power Dissipation ^a	
16-Pin Sidebraz ^b	900 mW
14-Pin Flat Pack ^c	900 mW

Notes:

- All leads welded or soldered to PC Board.
- Derate 12 mW/°C above 75°C
- Derate 10 mW/°C above 75°C

SCHEMATIC DIAGRAM (TYPICAL CHANNEL)

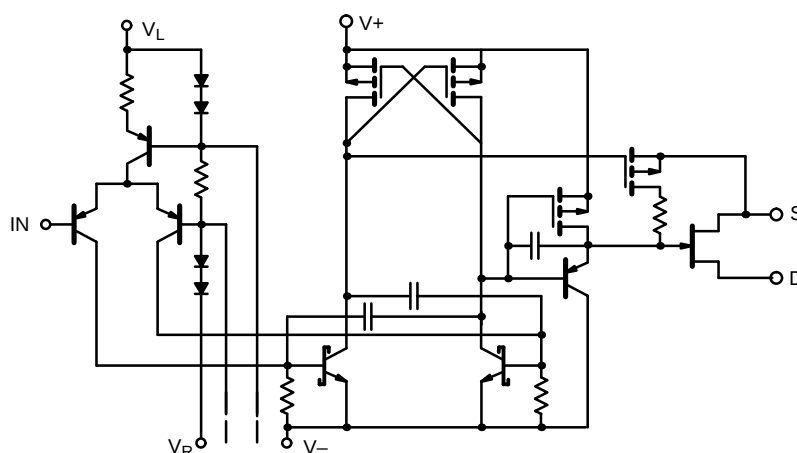


FIGURE 1.

**SPECIFICATIONS^a FOR DG183**

Parameter	Symbol	Test Conditions Unless Specified V+ = 15 V, V− = −15 V, VL = 5 V VR = 0 V, VIN = 0.8 V or 2 V ^f		Temp ^b	Typ ^c	A Suffix −55 to 125°C		B Suffix −25 to 85°C		Unit
						Min ^d	Max ^d	Min ^d	Max ^d	
Analog Switch										
Analog Signal Range ^e	VANALOG			Full		−7.5	15	−7.5	15	V
Drain-Source On-Resistance	rDS(on)	IS = −10 mA, VD = −7.5 V		Room Full	7.5		10 20		15 25	Ω
Source Off Leakage Current	IS(off)	VS = ±10 V, VD = ∓10 V V+ = 10 V, V− = −20 V		Room Hot	0.05		10 1000		15 300	nA
		VS = ±7.5 V, VD = ∓7.5 V		Room Hot	0.05		10 1000		15 300	
Drain Off Leakage Current	ID(off)	VS = ±10 V, VD = ∓10 V V+ = 10 V, V− = −20 V		Room Hot	0.04		10 1000		15 300	
		VS = ±7.5 V, VD = ∓7.5 V		Room Hot	0.03		10 1000		15 300	
Channel On Leakage Current	ID(on)	VD = VS = ±7.5 V		Room Hot	−0.1	−2 −200		−10 −200		
Saturation Drain Current	IDSS	2 ms Pulse Duration		Room	300					mA
Digital Input										
Input Current with Input Voltage High	IINH	VIN = 5 V		Room Hot	<0.01		10 20		10 20	μA
Input Current with Input Voltage Low	IINL	VIN = 0 V		Full	−30	−250		−250		
Dynamic Characteristics										
Turn-On Time	ton	See Switching Time Test Circuit		Room	240		400		600	ns
Turn-Off Time	toff			Room	140		200		220	
Source-Off Capacitance	CS(off)	f = 1 MHz	VS = −5 V, ID = 0	Room	21					pF
Drain-Off Capacitance	CD(off)		VD = −5 V, IS = 0	Room	17					
Channel-On Capacitance	CD(on)		VD = VS = 0 V	Room	17					
Off Isolation	OIRR	f = 1 MHz, RL = 75 Ω		Room	>55					dB
Power Supplies										
Positive Supply Current	I+	VIN = 0 V, or 5 V		Room	0.6		1.5		1.5	mA
Negative Supply Current	I−			Room	−2.7	−5		−5		
Logic Supply Current	IL			Room	3.1		4.5		4.5	
Reference Supply Current	IR			Room	−1	−2		−2		

Notes:

- Refer to PROCESS OPTION FLOWCHART.
- Room = 25°C, Full = as determined by the operating temperature suffix.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Guaranteed by design, not subject to production test.
- V_{IN} = input voltage to perform proper function.

**SPECIFICATIONS^a FOR DG184**

Parameter	Symbol	Test Conditions Unless Specified V ⁺ = 15 V, V [−] = −15 V, V _L = 5 V V _R = 0 V, V _{IN} = 0.8 V or 2 V ^f	Temp ^b	Typ ^c	A Suffix −55 to 125°C		B Suffix −25 to 85°C		Unit	
					Min ^d	Max ^d	Min ^d	Max ^d		
Analog Switch										
Analog Signal Range ^e	V _{ANALOG}		Full		−7.5	15	−7.5	15	V	
Drain-Source On-Resistance	r _{DS(on)}	I _S = −10 mA, V _D = −7.5 V	Room Full	22		30 60		50 75	Ω	
Source Off Leakage Current	I _{S(off)}	V _S = ±10 V, V _D = ∓10 V V ⁺ = 10 V, V [−] = −20 V	Room Hot	0.06		1 100		5 100	nA	
		V _S = ±7.5 V, V _D = ∓7.5 V	Room Hot	0.05		1 100		5 100		
Drain Off Leakage Current	I _{D(off)}	V _S = ±10 V, V _D = ∓10 V V ⁺ = 10 V, V [−] = −20 V	Room Hot	0.4		1 100		5 100		
		V _S = ±7.5 V, V _D = ∓7.5 V	Room Hot	0.3		1 100		5 100		
Channel On Leakage Current	I _{D(on)}	V _D = V _S = ±7.5 V	Room Hot	−0.02	−2 −200		−10 −200			
Digital Input										
Input Current with Input Voltage High	I _{INH}	V _{IN} = 5 V	Room Hot	<0.01		10 20		10 20	μA	
Input Current with Input Voltage Low	I _{INL}	V _{IN} = 0 V	Full	−30	−250		−250			
Dynamic Characteristics										
Turn-On Time	t _{on}	See Switching Time Test Circuit		Room	85		150		180	ns
Turn-Off Time	t _{off}			Room	95		130		150	
Source-Off Capacitance	C _{S(off)}	f = 1 MHz	V _S = −5 V, I _D = 0	Room	9				pF	
Drain-Off Capacitance	C _{D(off)}		V _D = −5 V, I _S = 0	Room	6					
Channel-On Capacitance	C _{D(on)}		V _D = V _S = 0 V	Room	14					
Off Isolation	OIRR	f = 1 MHz, R _L = 75 Ω		Room	>50				dB	
Power Supplies										
Positive Supply Current	I ⁺	V _{IN} = 0 V, or 5 V		Room	0.6		3		3	mA
Negative Supply Current	I [−]			Room	−2.7	−5.5		−5.5		
Logic Supply Current	I _L			Room	3.1		4.5		4.5	
Reference Supply Current	I _R			Room	−1	−2		−2		

Notes:

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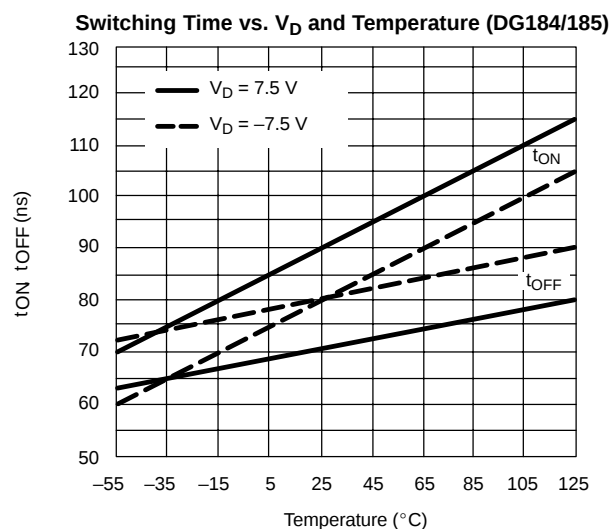
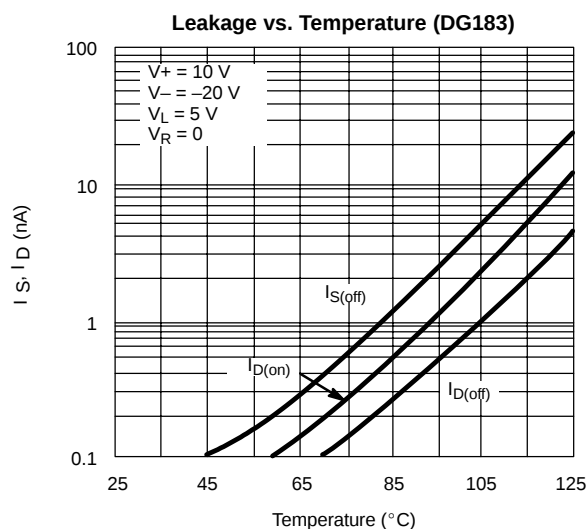
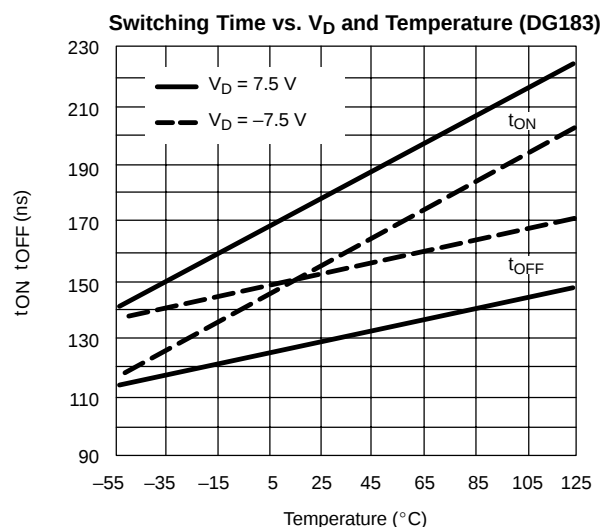
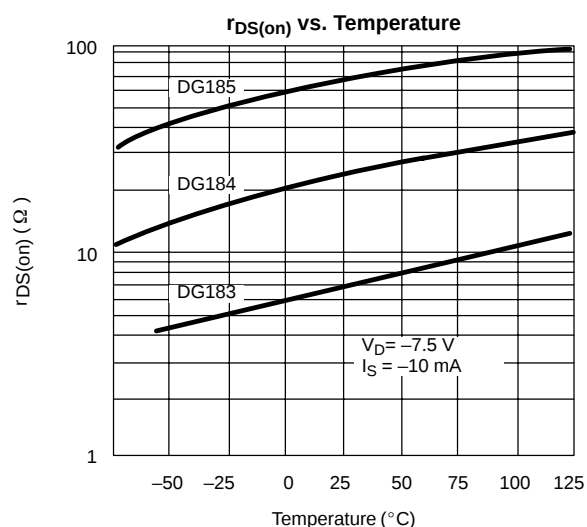
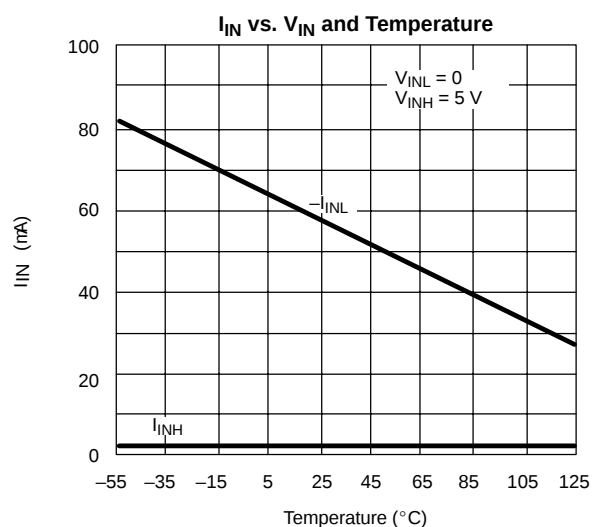
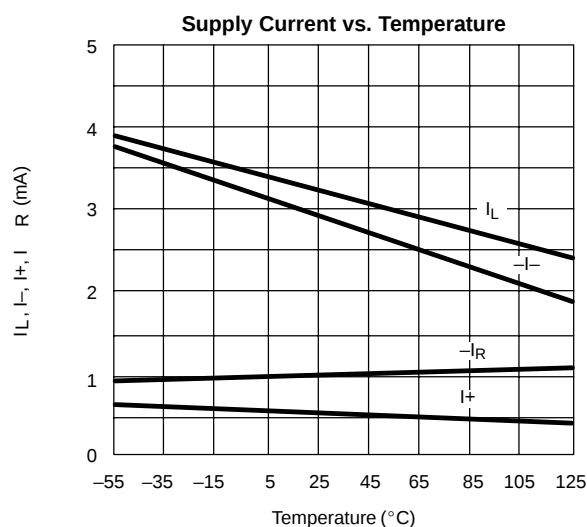
**SPECIFICATIONS^a FOR DG185**

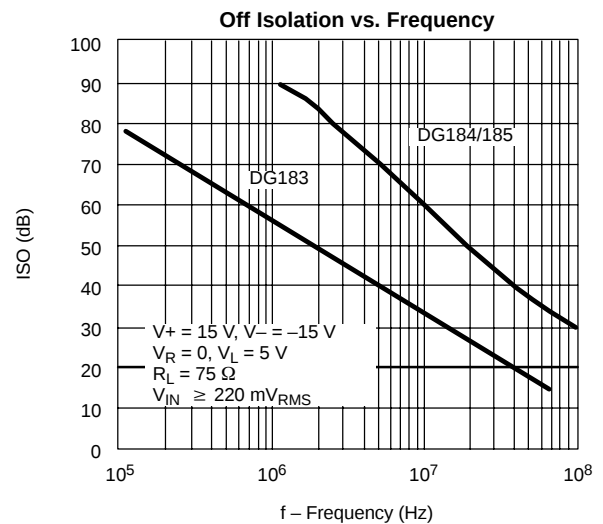
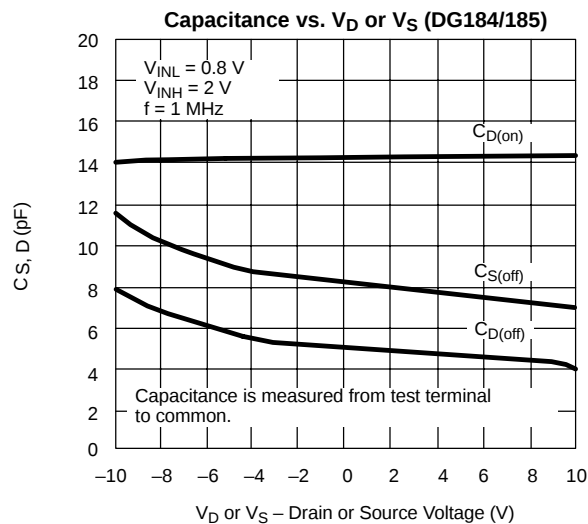
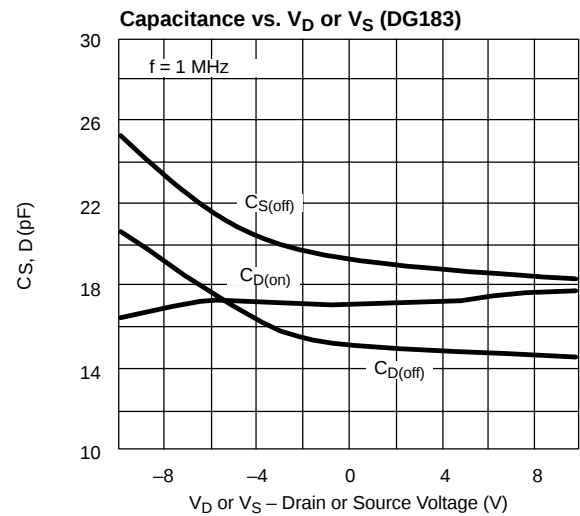
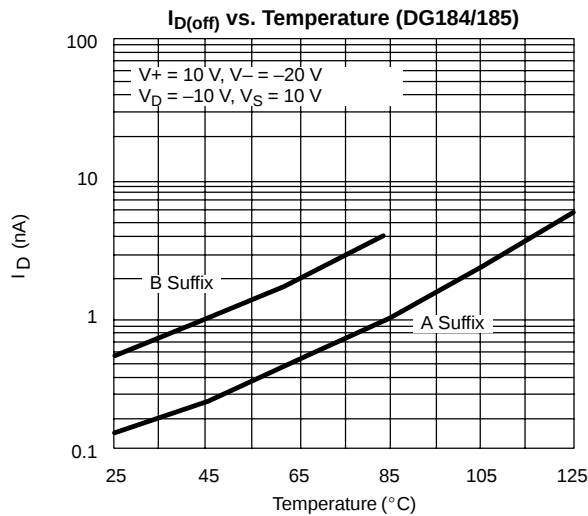
Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 15 V, V− = −15 V, VL = 5 V VR = 0 V, VIN = 0.8 V or 2 V ^f	Temp ^b	Typ ^c	A Suffix −55 to 125°C		B Suffix −25 to 85°C		Unit	
					Min ^d	Max ^d	Min ^d	Max ^d		
Analog Switch										
Analog Signal Range ^e	VANALOG		Full		−10	15	−10	15	V	
Drain-Source On-Resistance	rDS(on)	IS = −10 mA, VD = −7.5 V	Room Full	35		75 150		100 150	Ω	
Source Off Leakage Current	IS(off)	VS = ± 10 V, VD = ∓ 10 V V+ = 10 V, V− = −20 V	Room Hot	0.05		1 100		5 100	nA	
		VS = ± 10 V, VD = ∓ 10 V	Room Hot	0.07		1 100		5 100		
Drain Off Leakage Current	ID(off)	VS = ± 10 V, VD = ∓ 10 V V+ = 10 V, V− = −20 V	Room Hot	0.4		1 100		5 100		
		VS = ± 10 V, VD = ∓ 10 V	Room Hot	0.3		1 100		5 100		
Channel On Leakage Current	ID(on)	VD = VS = ± 10 V	Room Hot	−0.03	−2 −200		−10 −200			
Digital Input										
Input Current with Input Voltage High	IINH	VIN = 5 V	Room Hot	<0.01		10 20		10 20	μA	
Input Current with Input Voltage Low	IINL	VIN = 0 V	Full	−30	−250		−250			
Dynamic Characteristics										
Turn-On Time	ton	See Switching Time Test Circuit		Room	120		250	300	ns	
Turn-Off Time	toff			Room	100		130			150
Source-Off Capacitance	CS(off)	f = 1 MHz	VS = −5 V, ID = 0	Room	9				pF	
Drain-Off Capacitance	CD(off)		VD = −5 V, IS = 0	Room	6					
Channel-On Capacitance	CD(on)		VD = VS = 0 V	Room	14					
Off Isolation	OIRR	f = 1 MHz, RL = 75 Ω		Room	>50				dB	
Power Supplies										
Positive Supply Current	I+	VIN = 0 V, or 5 V		Room	0.6		3	3	mA	
Negative Supply Current	I−			Room	−2.7	−5.5		−5.5		
Logic Supply Current	IL			Room	3.1		4.5			4.5
Reference Supply Current	IR			Room	−1	−2		−2		

Notes:

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TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)


TEST CIRCUITS

Feedthrough due to charge injection may result in spikes at the leading and trailing edge of the output waveform.

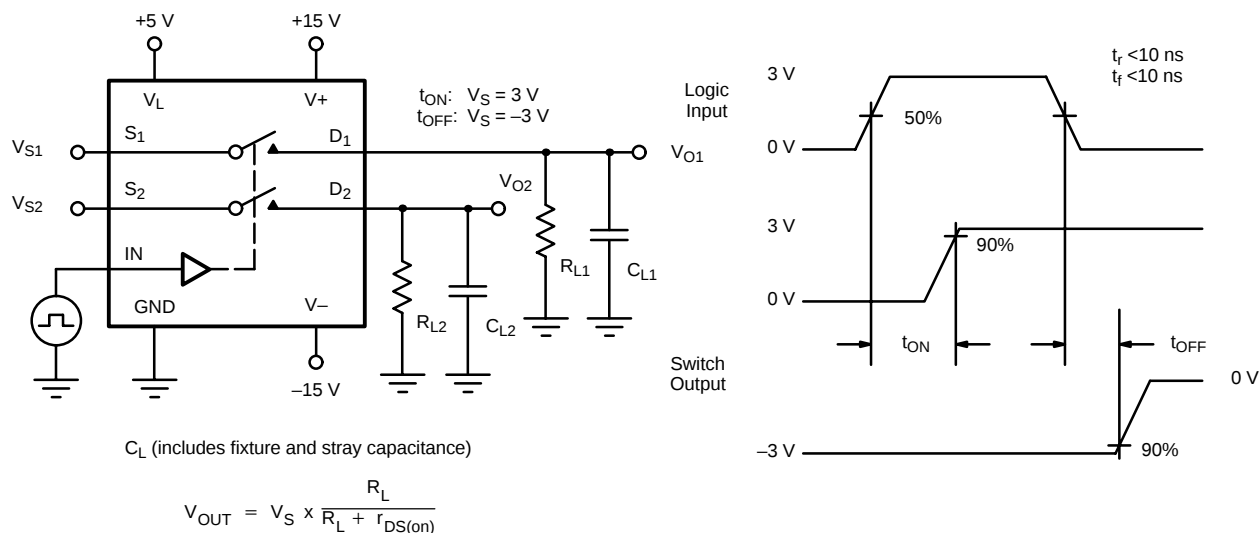


FIGURE 2. Switching Time

APPLICATION HINTS^a

Switch	V+ Positive Supply Voltage (V)	V− Negative Supply Voltage (V)	V _L Logic Supply Voltage (V)	V _R Reference Supply Voltage (V)	V _{IN} Logic Input Voltage V _{INH(min)} /V _{INL(max)} (V)	V _S Analog Voltage Range (V)
DG183 DG184	15 ^b	−15	5	GND	2.0/0.8	−7.5 to 15
	10	−20	5	GND	2.0/0.8	−12.5 to 10
	12	−12	5	GND	2.0/0.8	−4.5 to 12
DG185	15 ^b	−15	5	GND	2.0/0.8	−10 to 15
	10	−20	5	GND	2.0/0.8	−15 to 10
	12	−12	5	GND	2.0/0.8	−7 to 12

Notes:

- a. Application Hints are for DESIGN AID ONLY, not guaranteed and not subject to production testing.
b. Electrical Parameter Chart based on $V_+ = 15\text{ V}$, $V_L = 5\text{ V}$, $V_R = \text{GND}$.