

DGM181-185, DGM190-191

High Reliability High-Speed CMOS Analog Switch

GENERAL DESCRIPTION

The DGM181 family of CMOS monolithic switches utilizes Intersil's latch-free junction isolated processing to combine the speed of the hybrid DG181 family with the reliability and low power consumption of a monolithic CMOS construction. These devices, therefore, are a cost effective replacement for the DG181 family.

The DGM181 family has a high state threshold of 2.4V; and a low state of +0.8V.

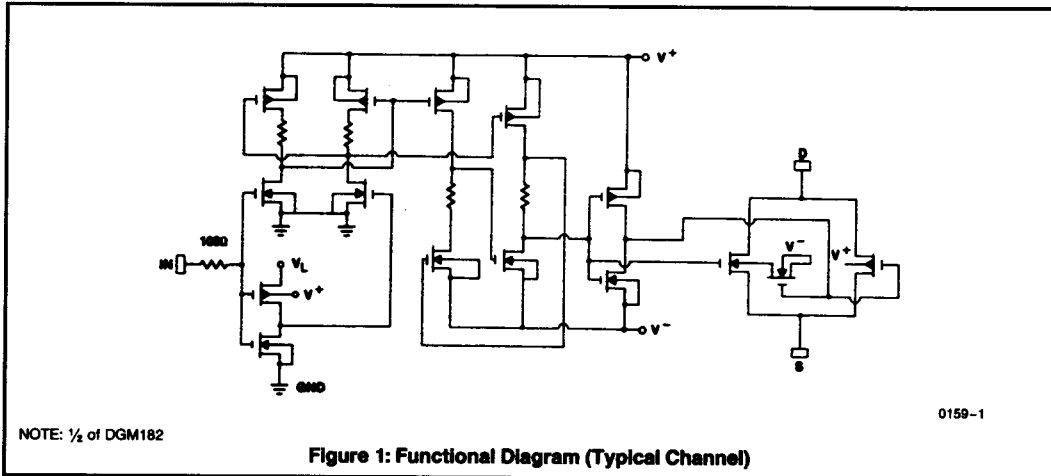
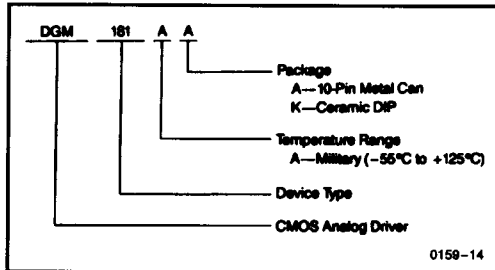
Very low quiescent power is dissipated in either the ON or OFF state of the switch. Maximum power supply current is 10 μ A from any supply, and typical quiescent currents are in the 10nA range. OFF leakages are typically less than 200pA at 25°C.

ORDERING INFORMATION

Type	Standard Part Number	$r_{DS(on)}$ Max at 25°C
Dual SPST	DGM181AK	50
	DGM182AK	50
Dual DPST	DGM184AK	50
	DGM185AK	50
Dual SPDT	DGM190AK	50
	DGM191AK	50

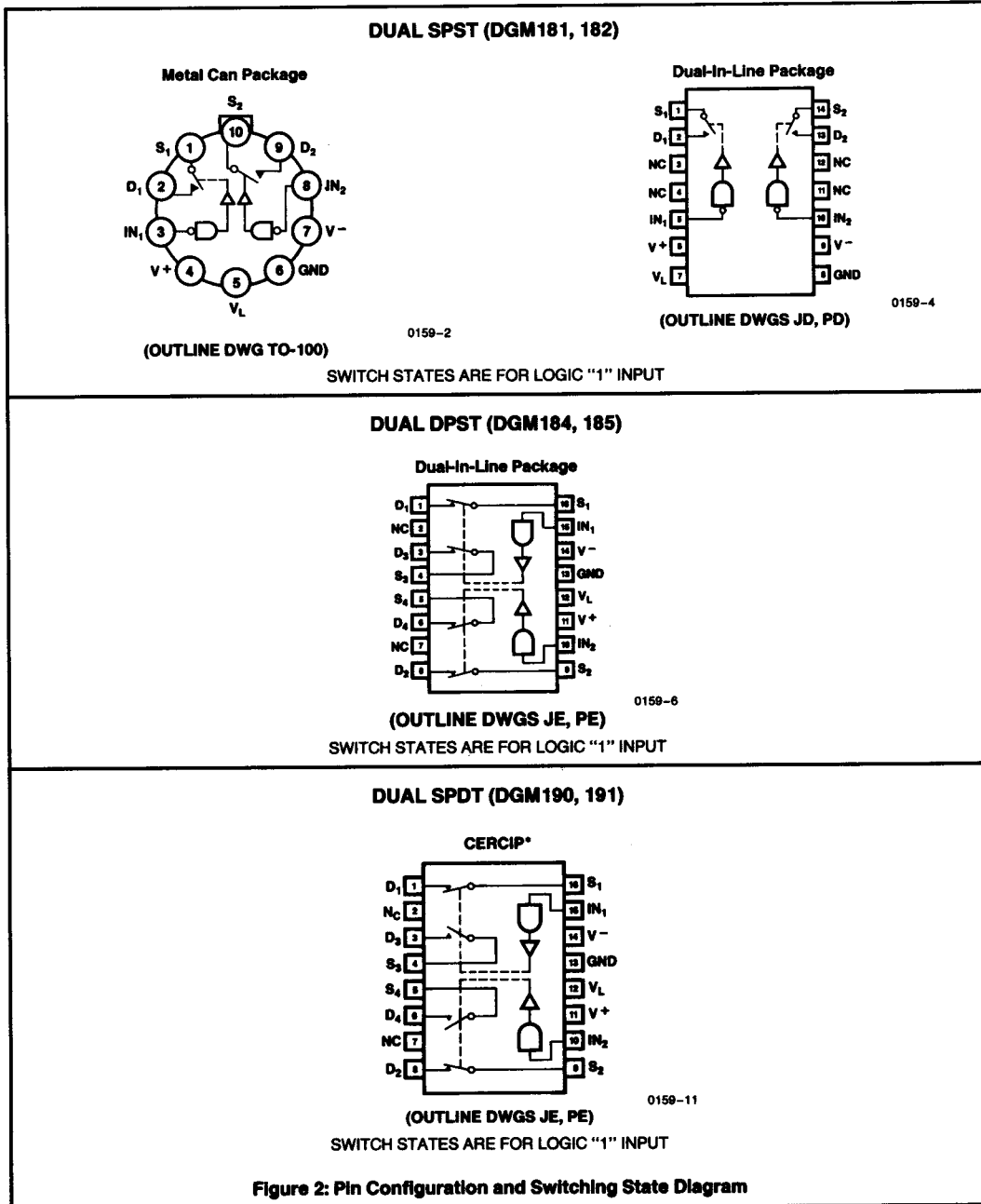
FEATURES

- Pin and Function Replacement for DG181 Family
- Meets or Exceeds All DG181 Family Specifications With Monolithic Reliability
- Low Power Consumption
- 1nA Leakage From Signal Channel in Both ON and OFF States
- TTL, DTL, RTL Direct Drive Capability
- $t_{on}, t_{off} < 150ns$, Break-Before-Make Action
- Crosstalk and Open Load Switch Isolation $> 50dB$ at 10MHz (75 Ω Load)



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ABSOLUTE MAXIMUM RATINGS

V+ - V-	36V
V- - VD	33V
VD - V-	33V
VD - VS	28V
VL - V-	36V
VL - VIN	30V
VL - VGND	20V
VIN - VGND	20V
GND - V-	27V

GND - VIN	20V
Current (Any Terminal)	30mA
Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +125°C
Lead Temperature (Soldering, 10sec)	300°C
Power Dissipation*	450 (TW), 750 (FLAT), 825 (DIP)mW

* Device mounted with all leads welded or soldered to PC board. Derate 6mW/°C (TW); 10mW/°C (FLAT); 11mW/°C (DIP) above 75°C.

NOTE: Stresses above 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 above 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.

ELECTRICAL CHARACTERISTICS (V+ = +15V, V- = -15V, VL = 5V, unless noted)

Parameter	Device No.	Test Conditions (Note 1)	A Series			Units
			-55°C	+25°C	+125°C	
SWITCH						
IS(off)	DGM181, 184, 190	VS = 7.5V, VD = -7.5V VIN = "OFF"		±1	100	nA
	DGM182, 185, 191	VS = 10V, VD = -10V VIN = "OFF"		±1	100	nA
ID(off)	DGM181, 184, 190	VS = 7.5V, VD = -7.5V VIN = "OFF"		±1	100	nA
	DGM182, 185, 191	VS = 10V, VD = -10V VIN = "OFF"		±1	100	nA
ID(on) + IS(on)	DGM181, 184, 190	VD = VS = -7.5V, VIN = "ON"		±2	±200	nA
	DGM182, 185, 191	VD = VS = -10V, VIN = "ON"		±2	±200	nA
INPUT						
IINL	ALL	VIN = 0V		±1.0	20	µA
IINH	ALL	VIN = 5V		±1.0	20	µA
DYNAMIC						
ton	DGM181, 184, 190 DGM182, 185, 191	See switching time test circuit		450		ns
toff	ALL			250		
CS(off)	DGM181, 182, 184, 185, 190, 191	VS = -5V, ID = 0, f = 1MHz	5pF typical			pF
CD(off)		VD = +5V, IS = 0, f = 1MHz	6pF typical			
CD(on) + CS(on)		VD = VS = 0, f = 1MHz	11pF typical			
OFF Isolation		RL = 75Ω, CL = 3pF	Typically > 50dB at 10MHz			
SUPPLY						
I+	ALL	VIN = 5V	10	10	100	µA
I-	ALL		10	10	100	
IL	ALL		10	10	100	
IGND	ALL		10	10	100	
I+	ALL	VIN = 0V	10	10	100	
I-	ALL		10	10	100	
IL	ALL		10	10	100	
IGND	ALL		10	10	100	

Note: 1. See Switching State Diagrams for VIN and VIN "OFF" Test Conditions.

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ELECTRICAL CHARACTERISTICS MAXIMUM RESISTANCES $r_{DS(ON)}$

Device Number	Conditions (Note 1) $V^+ = 15V, V^- = -15V, V_L = 5V$		Military Temperature			Units
			-55°C	+25°C	+125°C	
DGM181	$V_D = -7.5V$	$I_S = -10mA$	-	-	-	Ω
DGM182	$V_D = -10V$		50	50	75	Ω
DGM184	$V_D = -7.5V$		30	30	60	Ω
DGM185	$V_D = -10V$		50	50	75	Ω
DGM190	$V_D = -7.5V$		30	30	60	Ω
DGM191	$V_D = -10V$		50	50	75	Ω

APPLICATION COMMENT: The charge injection in these switches is of opposite polarity to that of the standard DG180 family, but considerably smaller.

SWITCHING TIME TEST CIRCUIT

Switch output waveform shown for $V_S = \text{constant}$ with logic input waveform as shown. Note that V_S may be + or - as per switching time test circuit. V_O is the steady state

output with switch on. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.

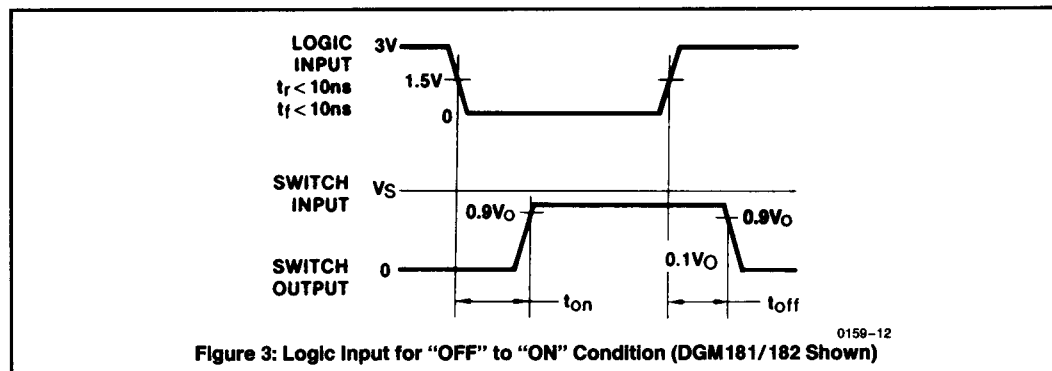


Figure 3: Logic Input for "OFF" to "ON" Condition (DGM181/182 Shown)

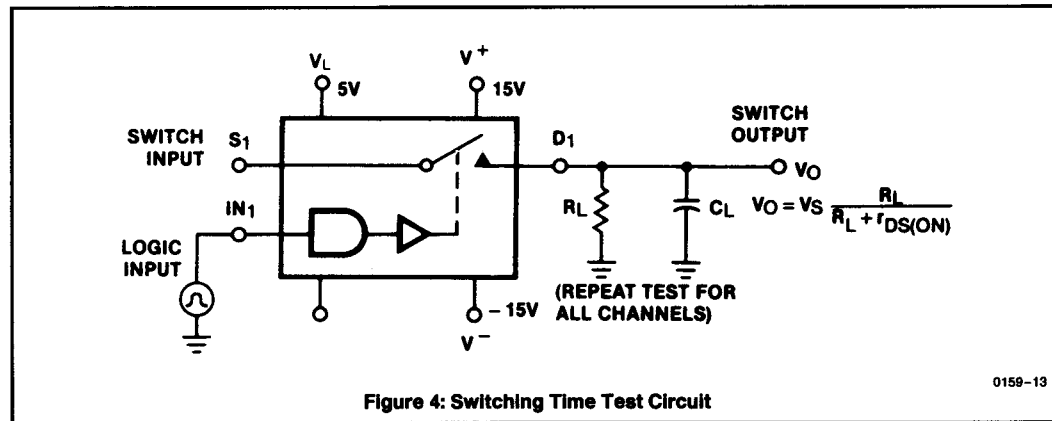


Figure 4: Switching Time Test Circuit

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SWITCH STATES

DUAL SPST DGM181/182

Test Conditions

DGM181/182	
V_{IN} "ON" = 0.8V	All Channels
V_{IN} "OFF" = 2.4V	All Channels

DUAL DPST DGM184/185

Test Conditions

DGM184/185	
V_{IN} "ON" = 2.4V	All Channels
V_{IN} "OFF" = 0.8V	All Channels

DUAL SPDT DGM190/191

Test Conditions

DGM190/191	
V_{IN} "ON" = 2.4V	Channels 1 & 2
V_{IN} "ON" = 0.8V	Channels 3 & 4
V_{IN} "OFF" = 2.4V	Channels 3 & 4
V_{IN} "OFF" = 0.8V	Channels 1 & 2