Data Sheet June 1999 File Number 3118.2

SPST 4-Channel Analog Switches

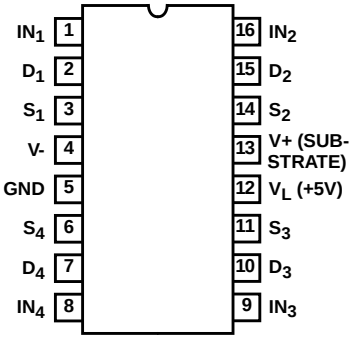
The DG211 and DG212 are low cost, CMOS monolithic, Quad SPST analog switches. These can be used in general purpose switching applications for communications, instrumentation, process control and computer peripheral equipment. Both devices provide true bidirectional performance in the ON condition and will block signals to $30V_{P-P}$ in the OFF condition. The DG211 and DG212 differ only in that the digital control logic is inverted, as shown in the truth table.

Ordering Information

PART NUMBER	TEMP. RANGE (^oC)	PACKAGE	PKG. NO.
DG211CJ	0 to 70	16 Ld PDIP	E16.3
DG212CJ	0 to 70	16 Ld PDIP	E16.3
DG211CY	0 to 70	16 Ld SOIC	M16.15
DG212CY	0 to 70	16 Ld SOIC	M16.15

Pinout

DG211, DG212
(PDIP, SOIC)
TOP VIEW

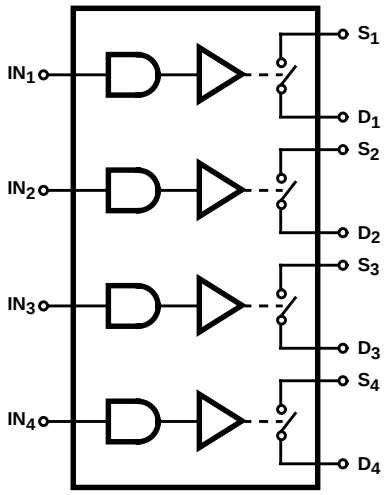


Features

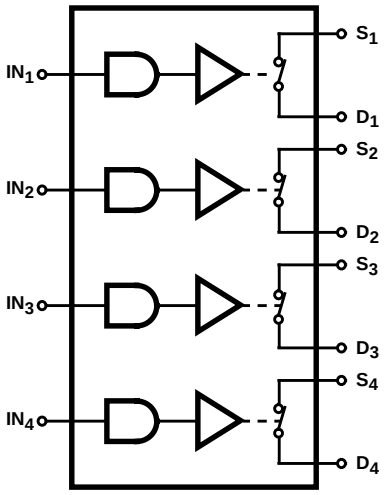
- Switches ±15V Analog Signals
- TTL Compatibility
- Logic Inputs Accept Negative Voltages
- r_{ON} (Max) 175Ω

Functional Block Diagrams

DG211



DG212



SWITCHES SHOWN FOR LOGIC "1" INPUT

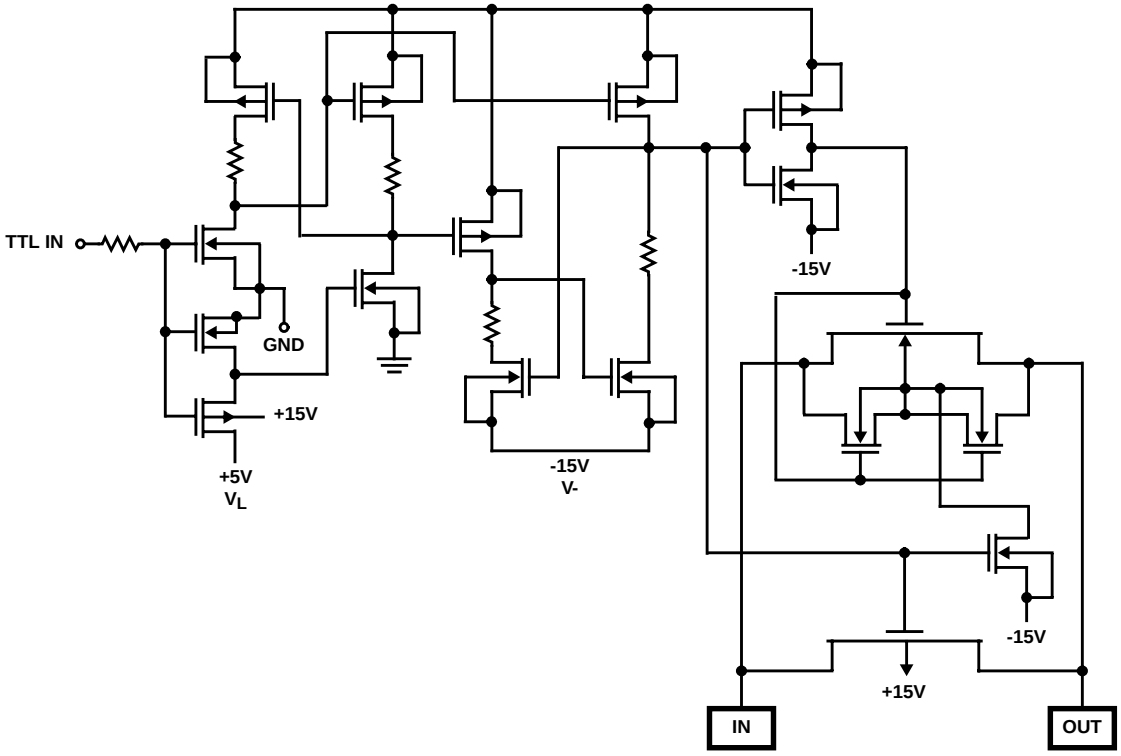
TRUTH TABLE

LOGIC	DG211	DG212
0	ON	OFF
1	OFF	ON

Logic "0" ≤0.8V, Logic "1" ≥ 2.4V

Schematic Diagram

DG211 ($^1/_4$ AS SHOWN)



Absolute Maximum Ratings

V+ to V- 44V
V_{IN} to Ground . . . . . V- to V+
V_L to Ground . . . . . -0.3V to 25V
V_S or V_D to V+ . . . . . 0 to -36V
V_S or V_D to V- . . . . . 0 to 36V
V+ to Ground 25V
V- to Ground . . . . . -25V
Current, any Terminal Except S or D 30mA
Continuous Current, S or D 20mA
Peak Current, S or D (Pulsed 1ms, 10% Duty Cycle Max) 70mA

Thermal Information

Thermal Resistance (Typical, Note 1) θ_{JA} ($^oC/W$)
PDIP Package 100
SOIC Package 120
Maximum Junction Temperature . . . . . 150^oC
Maximum Storage Temperature Range . . . . . -65^oC to 150^oC
Maximum Lead Temperature (Soldering 10s) . . . . . 300^oC
(SOIC - Lead Tips Only)

Operating Conditions

Temperature Range . . . . . 0^oC to 70^oC

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications

$V+ = +15V$, $V- = -15V$, $V_L = +5V$, GND, $T_A = 25^oC$

PARAMETER	TEST CONDITIONS		(NOTE 2) MIN	(NOTE 3) TYP	MAX	UNITS
DYNAMIC CHARACTERISTICS						
Turn-ON Time, t_{ON}	See Figure 1 $V_S = 10V$, $R_L = 1k\Omega$, $C_L = 35pF$		-	460	-	ns
Turn-OFF Time, t_{OFF1}			-	360	-	ns
t_{OFF2}			-	450	-	ns
OFF Isolation, OIRR (Note 5)	$V_{IN} = 5V$, $R_L = 1k\Omega$, $C_L = 15pF$, $V_S = 1V_{RMS}$, f = 100kHz		-	70	-	dB
Crosstalk (Channel to Channel), CCRR			-	-90	-	dB
Source OFF Capacitance, $C_{S(OFF)}$	$V_D = V_S = 0V$, $V_{IN} = 5V$, f = 1MHz		-	5	-	pF
Drain OFF Capacitance, $C_{D(OFF)}$			-	5	-	pF
Channel ON Capacitance, $C_{D(ON)} + C_{S(ON)}$			-	16	-	pF
DIGITAL INPUT CHARACTERISTICS						
Input Current with Voltage High, I_{IH}	$V_{IN} = 2.4V$		-1.0	-0.0004	-	µA
	$V_{IN} = 15V$		-	0.003	1.0	µA
Input Current with Voltage Low, I_{IL}	$V_{IN} = 0V$		-1.0	-0.0004	-	µA
ANALOG SWITCH CHARACTERISTICS						
Analog Signal Range, V_{ANALOG}			-15	-	15	V
Drain-Source ON Resistance, $r_{DS(ON)}$	$V_D = \pm10V$, $V_{IN} = 2.4V$ (DG212) $I_S = 1mA$, $V_{IN} = 0.8V$ (DG211)		-	150	175	Ω
Source OFF Leakage Current, $I_{S(OFF)}$	$V_{IN} = 2.4V$ (DG211) $V_{IN} = 0.8V$ (DG212)	$V_S = 14V$, $V_D = -14V$	-	0.01	5.0	nA
		$V_S = -14V$, $V_D = 14V$	-5.0	-0.02	-	nA
Drain OFF Leakage Current, $I_{D(OFF)}$		$V_S = -14V$, $V_D = 14V$	-	0.01	5.0	nA
		$V_S = 14V$, $V_D = -14V$	-5.0	-0.02	-	nA
Drain ON Leakage Current, $I_{D(ON)}$ (Note 4)	$V_{IN} = 0.8V$ (DG211) $V_{IN} = 2.4V$ (DG212)	$V_S = V_D = 14V$	-	0.1	5.0	nA
		$V_S = V_D = -14V$	-5.0	-0.15	-	nA

Electrical Specifications V+ = +15V, V- = -15V, V_L = +5V, GND, $T_A = 25^oC$ **(Continued)**

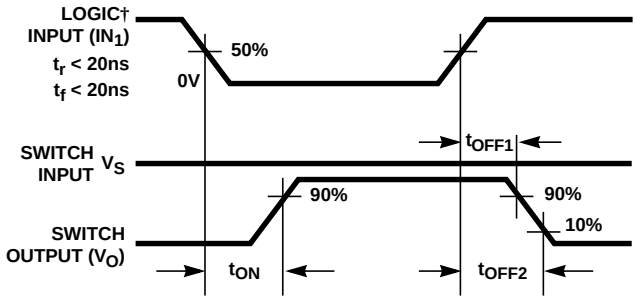
PARAMETER	TEST CONDITIONS	(NOTE 2) MIN	(NOTE 3) TYP	MAX	UNITS
POWER SUPPLY CHARACTERISTICS					
Positive Supply Current, I+	V_{IN} = 0V or 2.4V	-	0.1	10	µA
Negative Supply Current, I-		-	0.1	10	µA
Logic Supply Current, I_L		-	0.1	10	µA

NOTES:

2. The algebraic convention whereby the most negative value is a minimum, and the most positive is a maximum, is used in this data sheet.
3. For design reference only, not 100% tested.
4. $I_{D(ON)}$ is leakage from driver into ON switch.
5. OFF Isolation $= 20\log\frac{V_S}{V_D}$, V_S = Input to OFF switch, V_D = output .

Test Circuits and Waveforms

Switch output waveform shown for V_S = constant with logic input waveform as shown. Note the 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.



† Logic shown for DG211. Invert for DG212.

FIGURE 1. SWITCHING TIME MEASUREMENT POINTS

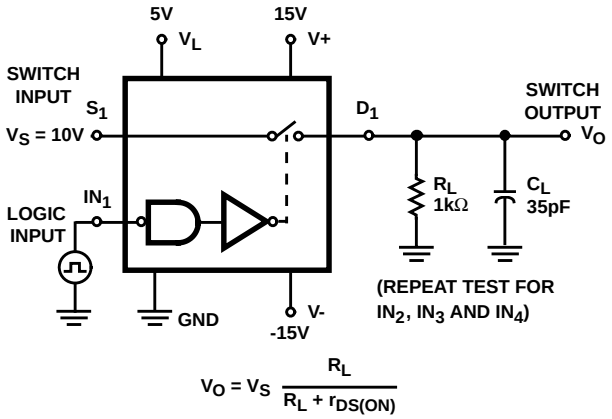


FIGURE 2. SWITCHING TIME TEST CIRCUIT

Die Characteristics

DIE DIMENSIONS:

2159µm x 2235µm

METALLIZATION:

Type: Al
Thickness: 10kÅ ±1kÅ

PASSIVATION:

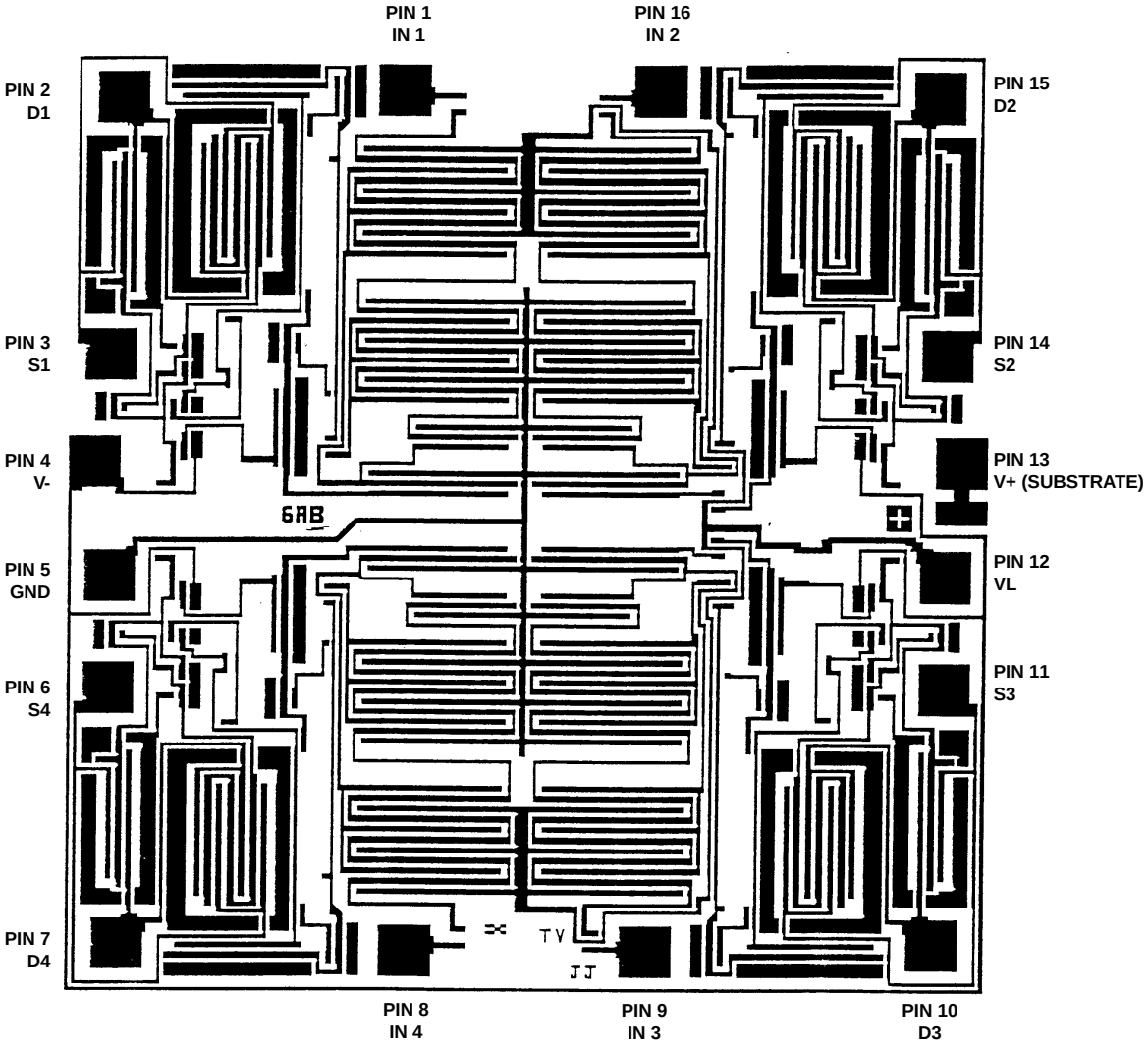
Type: PSG/Nitride
PSG Thickness: 7kÅ ±1.4kÅ
Nitride Thickness: 8kÅ ±1.2kÅ

WORST CASE CURRENT DENSITY:

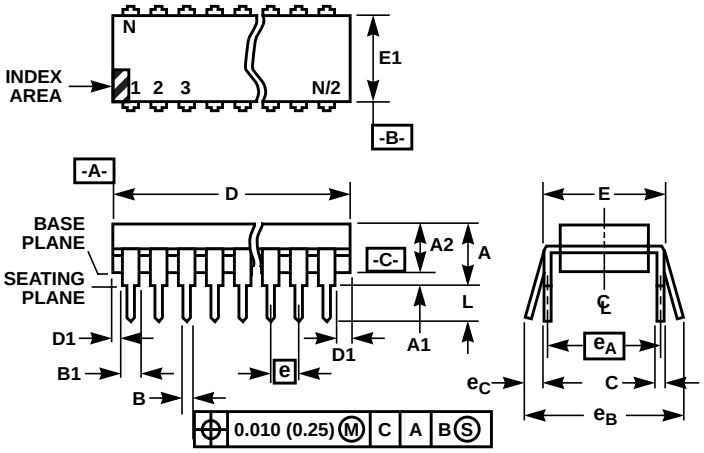
9.1×10^4 A/cm^2

Metallization Mask Layout

DG211, DG212



Dual-In-Line Plastic Packages (PDIP)



NOTES:

1. Controlling Dimensions: INCH. In case of conflict between English and Metric dimensions, the inch dimensions control.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Symbols are defined in the “MO Series Symbol List” in Section 2.2 of Publication No. 95.
4. Dimensions A, A1 and L are measured with the package seated in JEDEC seating plane gauge GS-3.
5. D, D1, and E1 dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 inch (0.25mm).
6. E and e_A are measured with the leads constrained to be perpendicular to datum -C-.
7. e_B and e_C are measured at the lead tips with the leads unconstrained. e_C must be zero or greater.
8. B1 maximum dimensions do not include dambar protrusions. Dambar protrusions shall not exceed 0.010 inch (0.25mm).
9. N is the maximum number of terminal positions.
10. Corner leads (1, N, N/2 and N/2 + 1) for E8.3, E16.3, E18.3, E28.3, E42.6 will have a B1 dimension of 0.030 - 0.045 inch (0.76 - 1.14mm).

E16.3 (JEDEC MS-001-BB ISSUE D)
16 LEAD DUAL-IN-LINE PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	-	0.210	-	5.33	4
A1	0.015	-	0.39	-	4
A2	0.115	0.195	2.93	4.95	-
B	0.014	0.022	0.356	0.558	-
B1	0.045	0.070	1.15	1.77	8, 10
C	0.008	0.014	0.204	0.355	-
D	0.735	0.775	18.66	19.68	5
D1	0.005	-	0.13	-	5
E	0.300	0.325	7.62	8.25	6
E1	0.240	0.280	6.10	7.11	5
e	0.100 BSC		2.54 BSC		-
e_A	0.300 BSC		7.62 BSC		6
e_B	-	0.430	-	10.92	7
L	0.115	0.150	2.93	3.81	4
N	16		16		9

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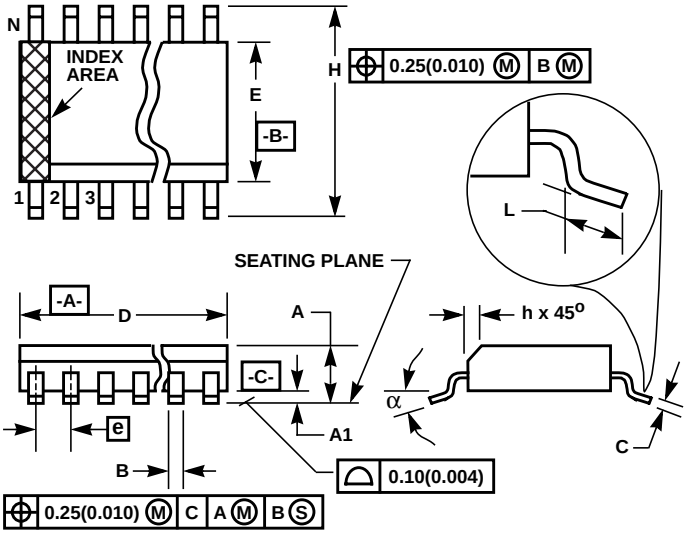
Small Outline Plastic Packages (SOIC)



NOTES:

1. Symbols are defined in the “MO Series Symbol List” in Section 2.2 of Publication Number 95.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold flash, protrusion and gate burrs shall not exceed 0.15mm (0.006 inch) per side.
4. Dimension “E” does not include interlead flash or protrusions. Interlead flash and protrusions shall not exceed 0.25mm (0.010 inch) per side.
5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
6. “L” is the length of terminal for soldering to a substrate.
7. “N” is the number of terminal positions.
8. Terminal numbers are shown for reference only.
9. The lead width “B”, as measured 0.36mm (0.014 inch) or greater above the seating plane, shall not exceed a maximum value of 0.61mm (0.024 inch).
10. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.

M16.15 (JEDEC MS-012-AC ISSUE C)
16 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.0532	0.0688	1.35	1.75	-
A1	0.0040	0.0098	0.10	0.25	-
B	0.013	0.020	0.33	0.51	9
C	0.0075	0.0098	0.19	0.25	-
D	0.3859	0.3937	9.80	10.00	3
E	0.1497	0.1574	3.80	4.00	4
e	0.050 BSC		1.27 BSC		-
H	0.2284	0.2440	5.80	6.20	-
h	0.0099	0.0196	0.25	0.50	5
L	0.016	0.050	0.40	1.27	6
N	16		16		7
α	0^o	8^o	0^o	8^o	-

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