

**OBSOLETE PRODUCT
POSSIBLE SUBSTITUTE PRODUCT
HI1-0506(CERDIP), DG406(PLASTIC),
HI1-0507(CERDIP), DG407(PLASTIC),
HI-0509, DG409**

CMOS Analog Multiplexers

The DG506A, DG507A and DG509A are CMOS Monolithic 16-Channel/Dual 8-Channel and Dual 4-Channel Analog Multiplexers, which can also be used as demultiplexers. An enable input is provided. When the enable input is high, a channel is selected by the address inputs, and when low, all channels are off.

A channel in the ON state conducts current equally well in both directions. In the OFF state each channel blocks voltages up to the supply rails. The address inputs and the enable input are TTL and CMOS compatible over the full specified operating temperature range.

The DG506A, DG507A and DG509A are pinout compatible with the industry standard devices.

Features

- Low Power Consumption
- TTL and CMOS-Compatible Address and Enable Inputs
- 44V Maximum Power Supply Rating
- High Latch-Up Immunity
- Break-Before-Make Switching
- Alternate Source

Applications

- Data Acquisition Systems
- Communication Systems
- Signal Multiplexing/Demultiplexing
- Audio Signal Multiplexing

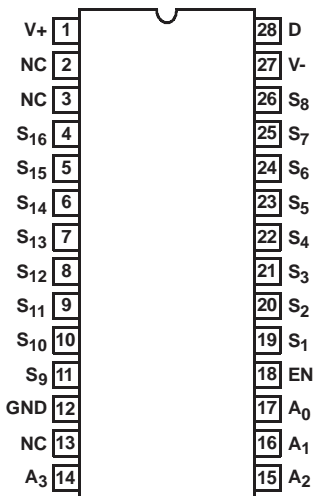
Part Number Information

| PART NUMBER | TEMP. RANGE (°C) | PACKAGE | PKG. NO. |
|-------------|------------------|--------------|----------|
| DG506AAK | -55 to 125 | 28 Ld CERDIP | F28.6 |
| DG506ACJ | 0 to 70 | 28 Ld PDIP | E28.6 |
| DG506ACY | 0 to 70 | 28 Ld SOIC | M28.3 |
| DG507ABK | -25 to 85 | 28 Ld CERDIP | F28.6 |

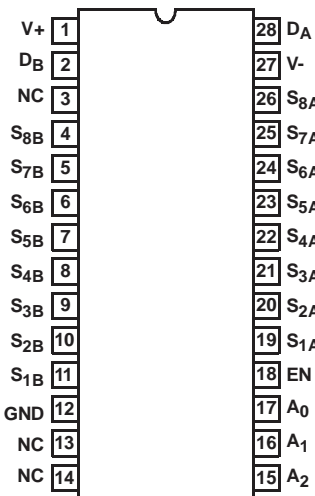
| PART NUMBER | TEMP. RANGE (°C) | PACKAGE | PKG. NO. |
|-------------|------------------|------------|----------|
| DG507ACJ | 0 to 70 | 28 Ld PDIP | E28.6 |
| DG507ACY | 0 to 70 | 28 Ld SOIC | M28.3 |
| DG509ACJ | 0 to 70 | 16 Ld PDIP | E16.3 |
| DG509ACY | 0 to 70 | 16 Ld SOIC | M16.3 |

Pinouts

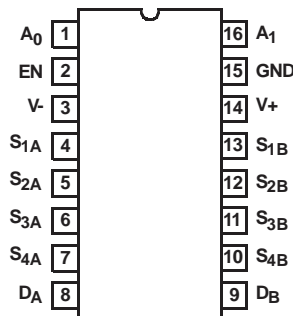
**DG506A (PDIP, CERDIP, SOIC)
TOP VIEW**



**DG507A (PDIP, CERDIP, SOIC)
TOP VIEW**



**DG509A (PDIP, SOIC)
TOP VIEW**



Truth Tables

DG506A

| A ₃ | A ₂ | A ₁ | A ₀ | EN | ON SWITCH |
|----------------|----------------|----------------|----------------|----|-----------|
| X | X | X | X | 0 | None |
| 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 1 | 2 |
| 0 | 0 | 1 | 0 | 1 | 3 |
| 0 | 0 | 1 | 1 | 1 | 4 |
| 0 | 1 | 0 | 0 | 1 | 5 |
| 0 | 1 | 0 | 1 | 1 | 6 |
| 0 | 1 | 1 | 0 | 1 | 7 |
| 0 | 1 | 1 | 1 | 1 | 8 |
| 1 | 0 | 0 | 0 | 1 | 9 |
| 1 | 0 | 0 | 1 | 1 | 10 |
| 1 | 0 | 1 | 0 | 1 | 11 |
| 1 | 0 | 1 | 1 | 1 | 12 |
| 1 | 1 | 0 | 0 | 1 | 13 |
| 1 | 1 | 0 | 1 | 1 | 14 |
| 1 | 1 | 1 | 0 | 1 | 15 |
| 1 | 1 | 1 | 1 | 1 | 16 |

Logic "0" = V_{AL}, V_{ENL} ≤ 0.8V, Logic "1" = V_{AH}, V_{ENH} ≥ 2.4V.

DG507A

| A ₂ | A ₁ | A ₀ | EN | ON SWITCHES |
|----------------|----------------|----------------|----|-------------|
| X | X | X | 0 | None |
| 0 | 0 | 0 | 1 | 1A, 1B |
| 0 | 0 | 1 | 1 | 2A, 2B |
| 0 | 1 | 0 | 1 | 3A, 3B |
| 0 | 1 | 1 | 1 | 4A, 4B |
| 1 | 0 | 0 | 1 | 5A, 5B |
| 1 | 0 | 1 | 1 | 6A, 6B |
| 1 | 1 | 0 | 1 | 7A, 7B |
| 1 | 1 | 1 | 1 | 8A, 8B |

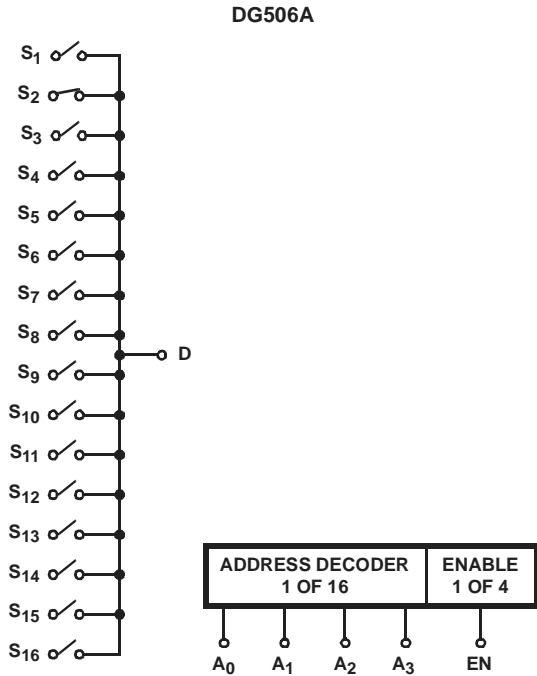
Logic "0" = V_{AL}, V_{ENL} ≤ 0.8V, Logic "1" = V_{AH}, V_{ENH} ≥ 2.4V.

DG509A

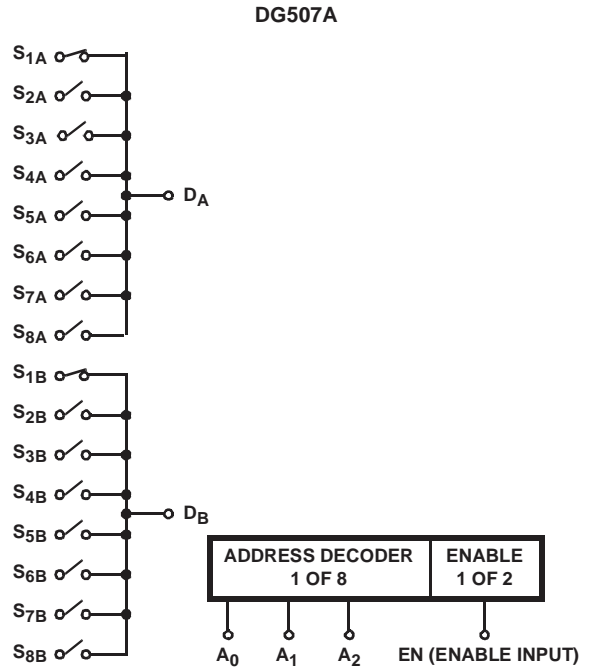
| A ₁ | A ₀ | EN | ON SWITCHES |
|----------------|----------------|----|-------------|
| X | X | 0 | None |
| 0 | 0 | 1 | 1A, 1B |
| 0 | 1 | 1 | 2A, 2B |
| 1 | 0 | 1 | 3A, 3B |
| 1 | 1 | 1 | 4A, 4B |

A₀, A₁, EN
Logic "1" = V_{AH} ≥ 2.4V, Logic "0" = V_{AL} ≤ 0.8V.

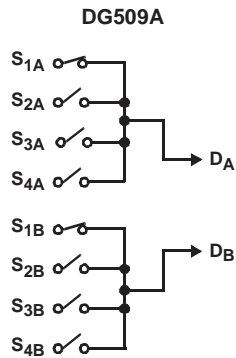
Functional Diagrams



4 Line Binary Address Inputs
(0 0 0 1) and EN = 5V
Above example shows channel 2 turned ON.

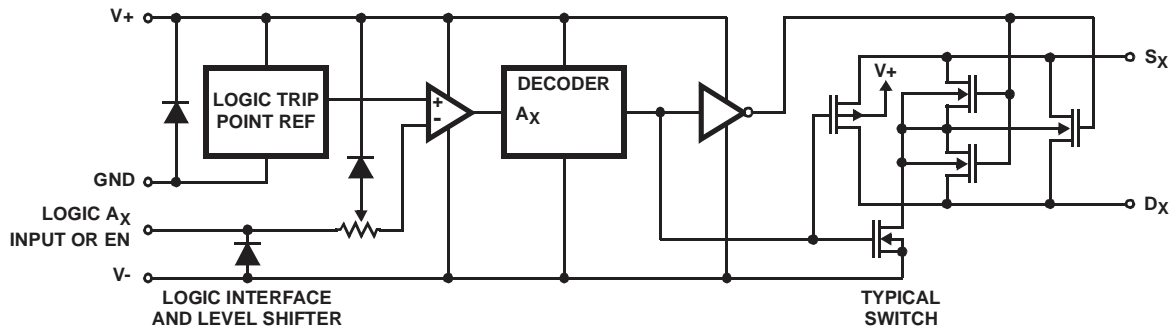


3 Line Binary Address Inputs
(0 0 0) and EN = 5V
Above example shows channels 1_A and 1_B turned ON.



2 Line Binary Address Inputs
(0 0) and EN = 1
Above example shows channels 1_A and 1_B turned ON.

Schematic Diagram



DG506A, DG507A, DG509A

Absolute Maximum Ratings

| | |
|--|----------------------|
| V+ to V- | 44V |
| V- to Ground | 25V |
| Digital Inputs, V _S , V _D (Note 1) | (V- -2V) To (V+ +2V) |
| Continuous 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) | 40mA |

Operating Conditions

| | |
|-------------------|----------------|
| Temperature Range | |
| "A" Suffix | -55°C to 125°C |
| "B" Suffix | -25°C to 85°C |
| "C" Suffix | 0°C to 70°C |

Thermal Information

| | | |
|--|----------------------|----------------------|
| Thermal Resistance (Typical, Note 2) | θ_{JA} (°C/W) | θ_{JC} (°C/W) |
| 28 Ld CERDIP Package | 55 | 18 |
| 16 Ld PDIP Package | 90 | N/A |
| 28 Ld PDIP Package | 55 | N/A |
| 16 Ld SOIC Package | 100 | N/A |
| 28 Ld SOIC Package | 70 | N/A |
| Maximum Junction Temperature | | |
| CERDIP Package | 175°C | |
| PDIP Package | 150°C | |
| Maximum Storage Temperature | | |
| "A" and "B" Suffix | -65°C to 150°C | |
| "C" Suffix | -65°C to 125°C | |
| Maximum Lead Temperature (Soldering 10s) | 300°C | |
| (SOIC - Lead Tips Only) | | |

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.

NOTES:

1. Signals on S_X, D_X, E_N, or A_X exceeding V+ or V- are clamped by internal diodes. Limit diode current to maximum current ratings.
2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications $T_A = 25^\circ\text{C}$, V+ = +15V, V- = -15V, GND = 0V, V_{EN} = 2.4V, Unless Otherwise Specified

| PARAMETER | TEST CONDITIONS | "A" SUFFIX | | | "B" AND "C" SUFFIX | | | UNITS |
|--|---|-----------------|-----------------|-----------------|--------------------|-----------------|-----------------|-------|
| | | (NOTE 4) MIN | (NOTE 3) TYP | (NOTE 4) MAX | (NOTE 4) MIN | (NOTE 3) TYP | (NOTE 4) MAX | |
| DYNAMIC CHARACTERISTICS | | | | | | | | |
| Switching Time of Multiplexer, t _{TRANSITION} | See Figure 1 | - | 0.6 | 1 | - | 0.6 | - | μs |
| Break-Before-Make Interval, t _{OPEN} | See Figure 3 | - | 0.2 | - | - | 0.2 | - | μs |
| Enable Turn-ON Time, t _{ON(EN)} | See Figure 2 | - | 1 | 1.5 | - | 1 | - | μs |
| Enable Turn-OFF Time, t _{OFF(EN)} | See Figure 2 | - | 0.4 | 1.0 | - | 0.4 | - | μs |
| OFF Isolation, OIRR | V _{EN} = 0V, R _L = 1kΩ, C _L = 15pF, V _S = 7V _{RMS} , f = 500kHz (Note 5) | - | 68 | - | - | 68 | - | dB |
| Source OFF Capacitance, C _{S(OFF)} | V _S = 0V, V _{EN} = 0V, f = 140kHz | | | | | | | |
| DG506A, DG507A | | - | 6 | - | - | 6 | - | pF |
| DG509A | | - | 5 | - | - | 5 | - | pF |
| Drain OFF Capacitance, C _{D(OFF)} | V _D = 0V, V _{EN} = 0V, f = 140kHz | | | | | | | |
| DG506A | | - | 45 | - | - | 45 | - | pF |
| DG507A | | - | 23 | - | - | 23 | - | pF |
| DG509A | | - | 12 | - | - | 12 | - | pF |
| Charge Injection, Q | See Figure 4 | | | | | | | |
| DG506A, DG507A | | - | 6 | - | - | 6 | - | pC |
| DG509A | | - | 4 | - | - | 4 | - | pC |
| DIGITAL INPUT CHARACTERISTICS | | | | | | | | |
| Address Input Current, Input Voltage High, I _{AH} | V _A = 2.4V | -10 | -0.002 | - | -10 | -0.002 | - | μA |
| | V _A = 15V | - | 0.006 | 10 | - | 0.006 | 10 | μA |
| Address Input Current Input Voltage Low, I _{AL} | V _{EN} = 2.4V | -10 | -0.002 | - | -10 | -0.002 | - | μA |
| | V _A = 0V | | | | | | | |
| | V _{EN} = 0V | -10 | -0.002 | - | -10 | -0.0002 | - | μA |

DG506A, DG507A, DG509A

Electrical Specifications $T_A = 25^\circ\text{C}$, $V_+ = +15\text{V}$, $V_- = -15\text{V}$, $\text{GND} = 0\text{V}$, $V_{\text{EN}} = 2.4\text{V}$, Unless Otherwise Specified **(Continued)**

| PARAMETER | TEST CONDITIONS | "A" SUFFIX | | | "B" AND "C" SUFFIX | | | UNITS | |
|--|---|---|-----------------|-----------------|--------------------|-----------------|-----------------|-------|----------|
| | | (NOTE 4) MIN | (NOTE 3) TYP | (NOTE 4) MAX | (NOTE 4) MIN | (NOTE 3) TYP | (NOTE 4) MAX | | |
| ANALOG SWITCH CHARACTERISTICS | | | | | | | | | |
| Analog Signal Range, V_{ANALOG} | (Note 7) | -15 | - | +15 | -15 | - | +15 | V | |
| Drain-Source ON Resistance, $r_{\text{DS(ON)}}$ | Sequence Each Switch ON $V_{\text{AL}} = 0.8\text{V}$ $V_{\text{AH}} = 2.4\text{V}$ | $I_{\text{S}} = -200\mu\text{A}$, $V_{\text{D}} = +10\text{V}$ | - | 270 | 400 | - | 270 | 450 | Ω |
| | | $I_{\text{S}} = -200\mu\text{A}$, $V_{\text{D}} = -10\text{V}$ | - | 230 | 400 | - | 230 | 450 | Ω |
| $r_{\text{DS(ON)}}$ Matching Between Channels | $-10\text{V} \leq V_{\text{S}} \leq +10\text{V}$ $\Delta r_{\text{DS(ON)}} = \frac{r_{\text{DS(ON)MAX}} - r_{\text{DS(ON)MIN}}}{r_{\text{DS(ON)AVG}}}$ | - | 6 | - | - | 6 | - | % | |
| Source OFF Leakage Current, $I_{\text{S(OFF)}}$ | $V_{\text{EN}} = 0\text{V}$ | $V_{\text{S}} = +10\text{V}$, $V_{\text{D}} = -10\text{V}$ | -1 | 0.002 | 1 | -5 | 0.002 | 5 | nA |
| | | $V_{\text{S}} = -10\text{V}$, $V_{\text{D}} = +10\text{V}$ | -1 | -0.005 | 1 | -5 | -0.005 | 5 | nA |
| Drain OFF Leakage Current, $I_{\text{D(OFF)}}$ DG506A DG507A DG509A | $V_{\text{EN}} = 0\text{V}$ | $V_{\text{S}} = -10\text{V}$, $V_{\text{D}} = +10\text{V}$ | -10 | 0.02 | 10 | -20 | 0.02 | 20 | nA |
| | | $V_{\text{S}} = +10\text{V}$, $V_{\text{D}} = -10\text{V}$ | -10 | -0.03 | 10 | -20 | -0.03 | 20 | nA |
| | | $V_{\text{S}} = -10\text{V}$, $V_{\text{D}} = +10\text{V}$ | -5 | 0.007 | 5 | -10 | 0.007 | 10 | nA |
| | | $V_{\text{S}} = +10\text{V}$, $V_{\text{D}} = -10\text{V}$ | -5 | -0.015 | 5 | -10 | -0.015 | 10 | nA |
| | | $V_{\text{S}} = -10\text{V}$, $V_{\text{D}} = +10\text{V}$ | - | 0.005 | 10 | - | 0.005 | 20 | nA |
| | | $V_{\text{S}} = +10\text{V}$, $V_{\text{D}} = -10\text{V}$ | -10 | -0.008 | - | -20 | -0.008 | - | nA |
| Drain ON Leakage Current, $I_{\text{D(ON)}}$ DG506A DG507A DG509A | (Note 6) Sequence Each Switch ON $V_{\text{AL}} = 0.8\text{V}$ $V_{\text{AH}} = 2.4\text{V}$ | $V_{\text{D}} = V_{\text{S(ALL)}} = +10\text{V}$ | -10 | 0.03 | 10 | -20 | 0.03 | 20 | nA |
| | | $V_{\text{D}} = V_{\text{S(ALL)}} = -10\text{V}$ | -10 | -0.06 | 10 | -20 | -0.06 | 20 | nA |
| | | $V_{\text{D}} = V_{\text{S(ALL)}} = +10\text{V}$ | -5 | 0.015 | 5 | -10 | 0.015 | 10 | nA |
| | | $V_{\text{D}} = V_{\text{S(ALL)}} = -10\text{V}$ | -5 | -0.03 | 5 | -10 | -0.03 | 10 | nA |
| | | $V_{\text{D}} = V_{\text{S(ALL)}} = +10\text{V}$ | - | 0.007 | 10 | - | 0.007 | 20 | nA |
| | | $V_{\text{D}} = V_{\text{S(ALL)}} = -10\text{V}$ | -10 | -0.015 | - | -20 | -0.015 | - | nA |
| POWER SUPPLY CHARACTERISTICS | | | | | | | | | |
| Positive Supply Current, I_+ | $V_{\text{EN}} = 5.0\text{V}$, $V_{\text{A}} = 0\text{V}$ (Enabled) | - | 1.3 | 2.4 | - | 1.3 | 2.4 | mA | |
| Negative Supply Current, I_- | | -1.5 | -0.7 | - | -1.5 | -0.7 | - | mA | |
| Positive Supply Current, I_+ Standby | $V_{\text{EN}} = 0\text{V}$, $V_{\text{A}} = 0\text{V}$ (Standby) | - | 1.3 | 2.4 | - | 1.3 | 2.4 | mA | |
| Negative Supply Current, I_- Standby | | -1.5 | -0.7 | - | -1.5 | -0.7 | - | mA | |

DG506A, DG507A, DG509A

Electrical Specifications T_A = Over Operating Temperature Range, $V_+ = +15V$, $V_- = -15V$, $GND = 0V$, $V_{EN} = 2.4V$,
Unless Otherwise Specified

| PARAMETER | TEST CONDITIONS | "A" SUFFIX | | | "B" AND "C" SUFFIX | | | UNITS | |
|---|---|----------------------------------|-----------------|-----|--------------------|-----------------|-----|----------|----|
| | | MIN | (NOTE 3) TYP | MAX | MIN | (NOTE 3) TYP | MAX | | |
| DIGITAL INPUT CHARACTERISTICS | | | | | | | | | |
| Address Input Current, Input Voltage High, I_{AH} | $V_A = 2.4V$ | -30 | - | - | - | - | - | μA | |
| | $V_A = 15V$ | - | - | 30 | - | - | - | μA | |
| Address Input Current Input Voltage Low, I_{AL} | $V_{EN} = 2.4V$ | $V_A = 0V$ | -30 | - | - | - | - | μA | |
| | $V_{EN} = 0V$ | | -30 | - | - | - | - | μA | |
| ANALOG SWITCH CHARACTERISTICS | | | | | | | | | |
| Analog Signal Range, V_{ANALOG} | (Note 7) | -15 | - | +15 | - | - | - | V | |
| Drain-Source ON Resistance, $r_{DS(ON)}$ | Sequence Each Switch ON $V_{AL} = 0.8V$ $V_{AH} = 2.4V$ | $I_S = -200\mu A$, $V_D = +10V$ | - | - | 500 | - | - | Ω | |
| | | $I_S = -200\mu A$, $V_D = -10V$ | - | - | 500 | - | - | Ω | |
| Source OFF Leakage Current, $I_{S(OFF)}$ | $V_{EN} = 0V$ | $V_S = +10V$, $V_D = -10V$ | - | - | 50 | - | - | nA | |
| | | $V_S = -10V$, $V_D = +10V$ | -50 | - | - | - | - | nA | |
| Drain OFF Leakage Current, $I_{D(OFF)}$ DG506A DG507A DG509A | $V_{EN} = 0V$ | $V_S = -10V$, $V_D = +10V$ | - | - | 300 | - | - | nA | |
| | | $V_S = +10V$, $V_D = -10V$ | -300 | - | - | - | - | nA | |
| | | $V_S = -10V$, $V_D = +10V$ | - | - | 200 | - | - | - | nA |
| | | $V_S = +10V$, $V_D = -10V$ | -200 | - | - | - | - | - | nA |
| | | $V_S = -10V$, $V_D = +10V$ | - | - | 100 | - | - | - | nA |
| | | $V_S = +10V$, $V_D = -10V$ | -100 | - | - | - | - | - | nA |
| Drain ON Leakage Current, $I_{D(ON)}$ DG506A DG507A DG509A | (Note 6) Sequence Each Switch ON $V_{AL} = 0.8V$ $V_{AH} = 2.4V$ | $V_D = V_{S(ALL)} = +10V$ | - | - | 300 | - | - | nA | |
| | | $V_D = V_{S(ALL)} = -10V$ | -300 | - | - | - | - | nA | |
| | | $V_D = V_{S(ALL)} = +10V$ | - | - | 200 | - | - | - | nA |
| | | $V_D = V_{S(ALL)} = -10V$ | -200 | - | - | - | - | - | nA |
| | | $V_D = V_{S(ALL)} = +10V$ | - | - | 100 | - | - | - | nA |
| | | $V_D = V_{S(ALL)} = -10V$ | -100 | - | - | - | - | - | nA |
| POWER SUPPLY CHARACTERISTICS | | | | | | | | | |
| Positive Supply Current, I_+ | $V_{EN} = 5.0V$, $V_A = 0V$ | -3.2 | - | 4.5 | - | - | - | mA | |
| Negative Supply Current, I_- | | -3.2 | - | 4.5 | - | - | - | mA | |
| Positive Standby Supply Current, I_+ | $V_{EN} = 0V$, $V_A = 0V$ | -3.2 | - | 4.5 | - | - | - | mA | |
| Negative Standby Supply Current, I_- | | -3.2 | - | 4.5 | - | - | - | mA | |

NOTES:

3. Typical values are for design aid only, not guaranteed and not subject to production testing.
4. The algebraic convention whereby the most negative value is a minimum, and the most positive value is a maximum, is used in this data sheet.
5. Off isolation = $20\log |V_S|/|V_D|$, where V_S = input to Off switch, and V_D = output due to V_S .
6. $I_{D(ON)}$ is leakage from driver into "ON" switch.
7. Parameter not tested. Parameter guaranteed by design or characterization.

Test Circuits and Waveforms

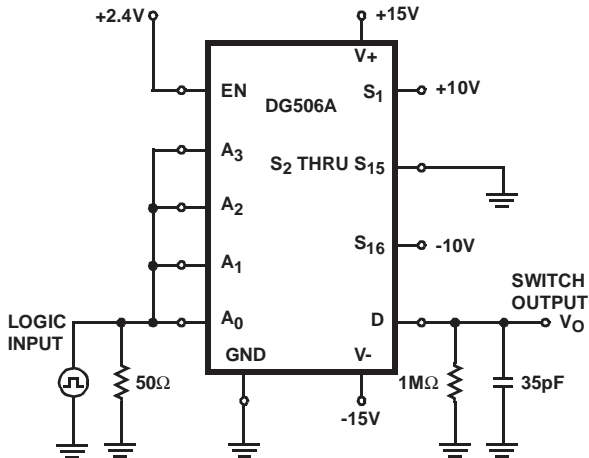


FIGURE 1A. DG506A TEST CIRCUIT

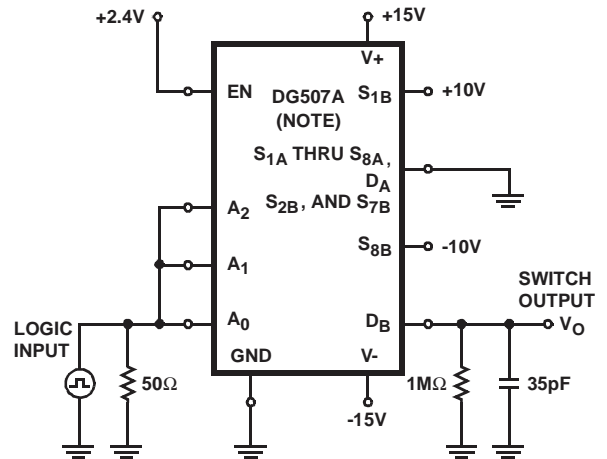


FIGURE 1B. DG507A TEST CIRCUIT

NOTE: Similar connections for DG509A.

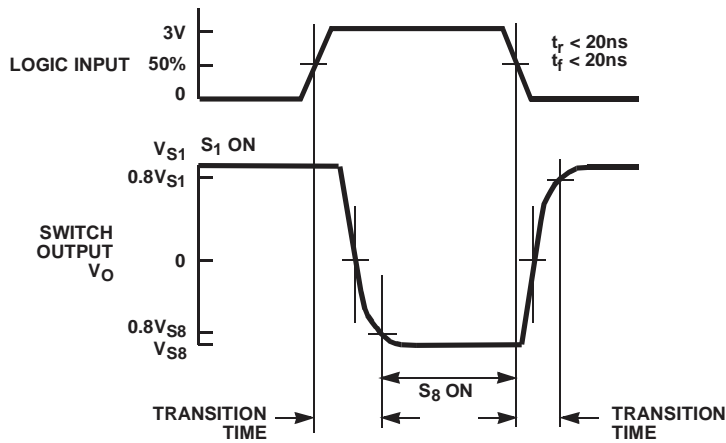


FIGURE 1C. MEASUREMENT POINTS
FIGURE 1. SWITCHING TIME

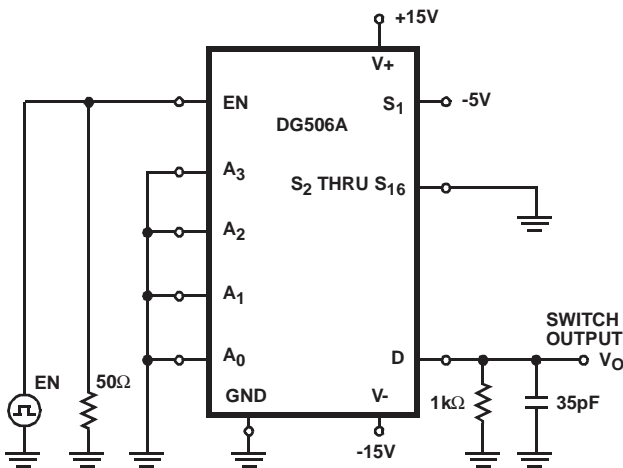


FIGURE 2A. DG506A TEST CIRCUIT

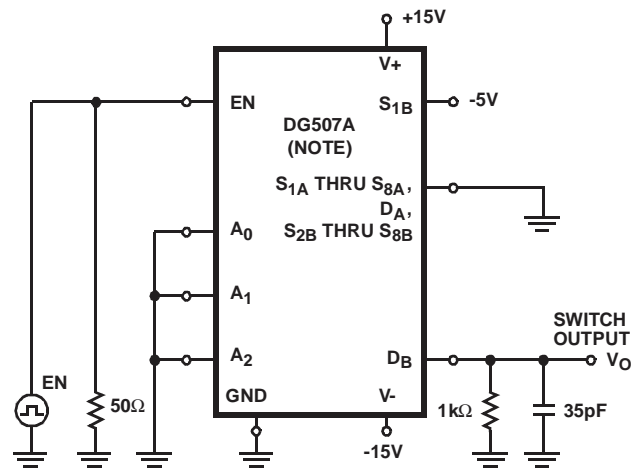


FIGURE 2B. DG507A TEST CIRCUIT

NOTE: Similar connections for DG509A.

Test Circuits and Waveforms (Continued)

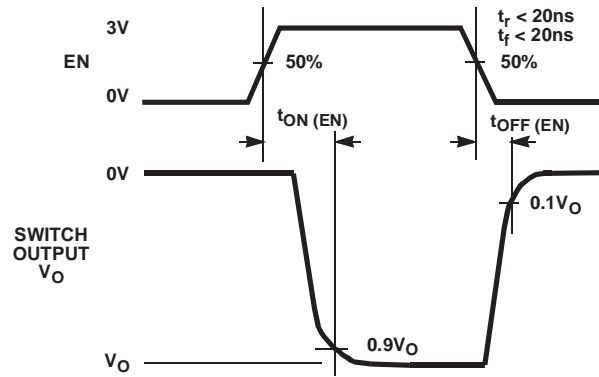
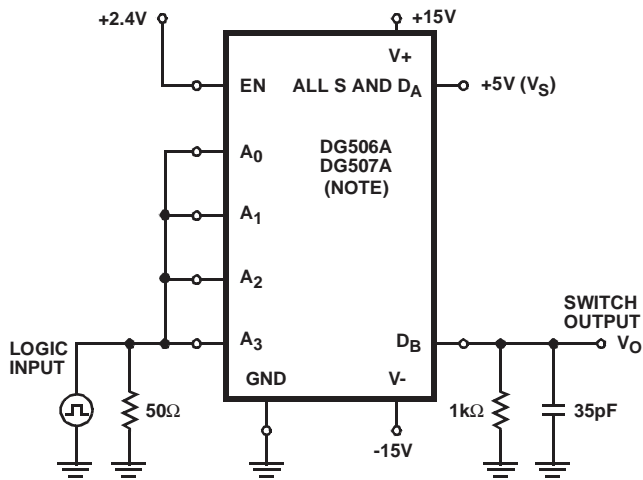


FIGURE 2C. MEASUREMENT POINTS
FIGURE 2. ENABLE TIMES



NOTE: Similar connections for DG509A.

FIGURE 3A. TEST CIRCUIT

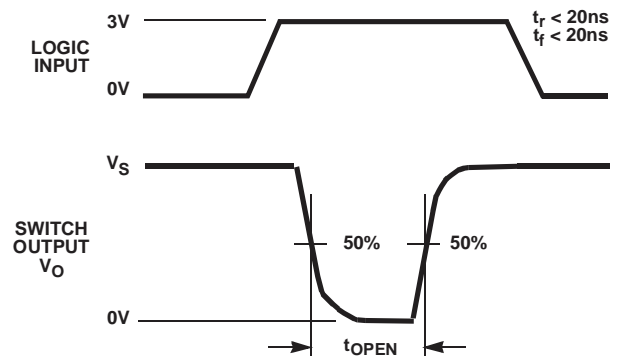


FIGURE 3B. MEASUREMENT POINTS

FIGURE 3. BREAK-BEFORE-MAKE INTERVAL

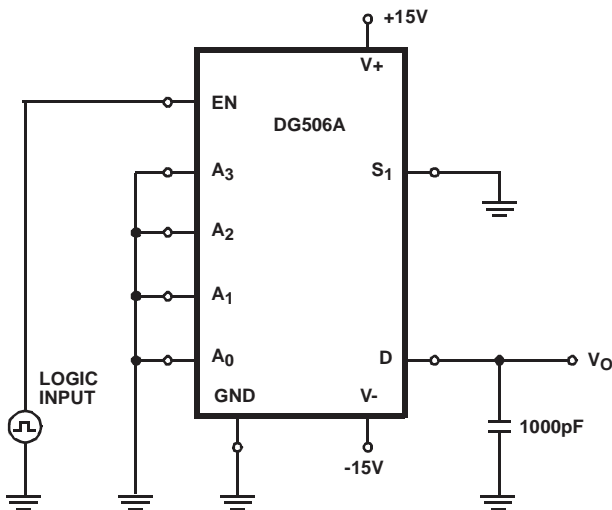
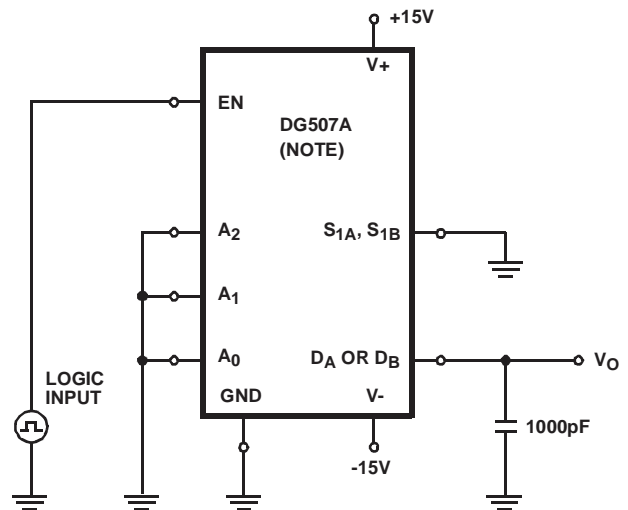


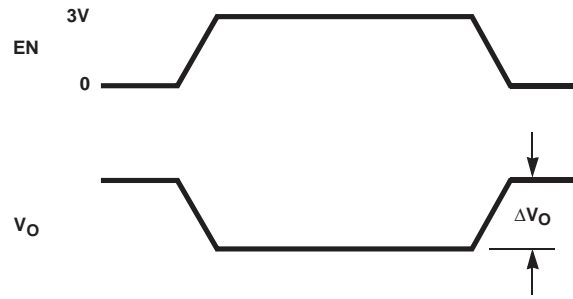
FIGURE 4A. DG506A TEST CIRCUIT



NOTE: Similar connections for DG509A.

FIGURE 4B. DG507A TEST CIRCUIT

Test Circuits and Waveforms (Continued)



ΔV_O is the measured voltage error due to charge injection. The charge transfer error in Coulombs is $Q = C_L \times \Delta V_O$.

FIGURE 4C. CHARGE INJECTION WAVEFORMS

FIGURE 4. CHARGE INJECTION

Typical Performance Curves

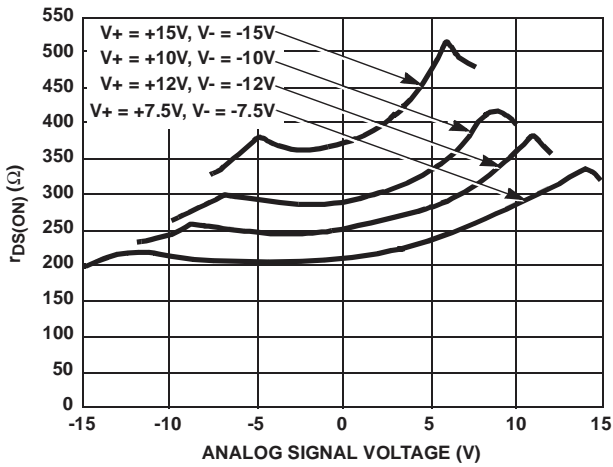


FIGURE 5. $r_{DS(ON)}$ vs ANALOG SIGNAL VOLTAGE vs SUPPLY VOLTAGE

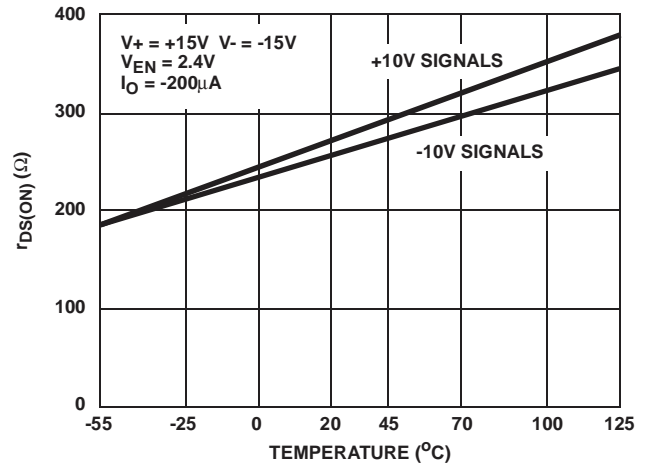


FIGURE 6. TYPICAL $r_{DS(ON)}$ VARIATION WITH TEMPERATURE

Die Characteristics

DIE DIMENSIONS:

3810 μ m x 2770 μ m

METALLIZATION:

Type: Al
Thickness: 10k \AA \pm 1k \AA

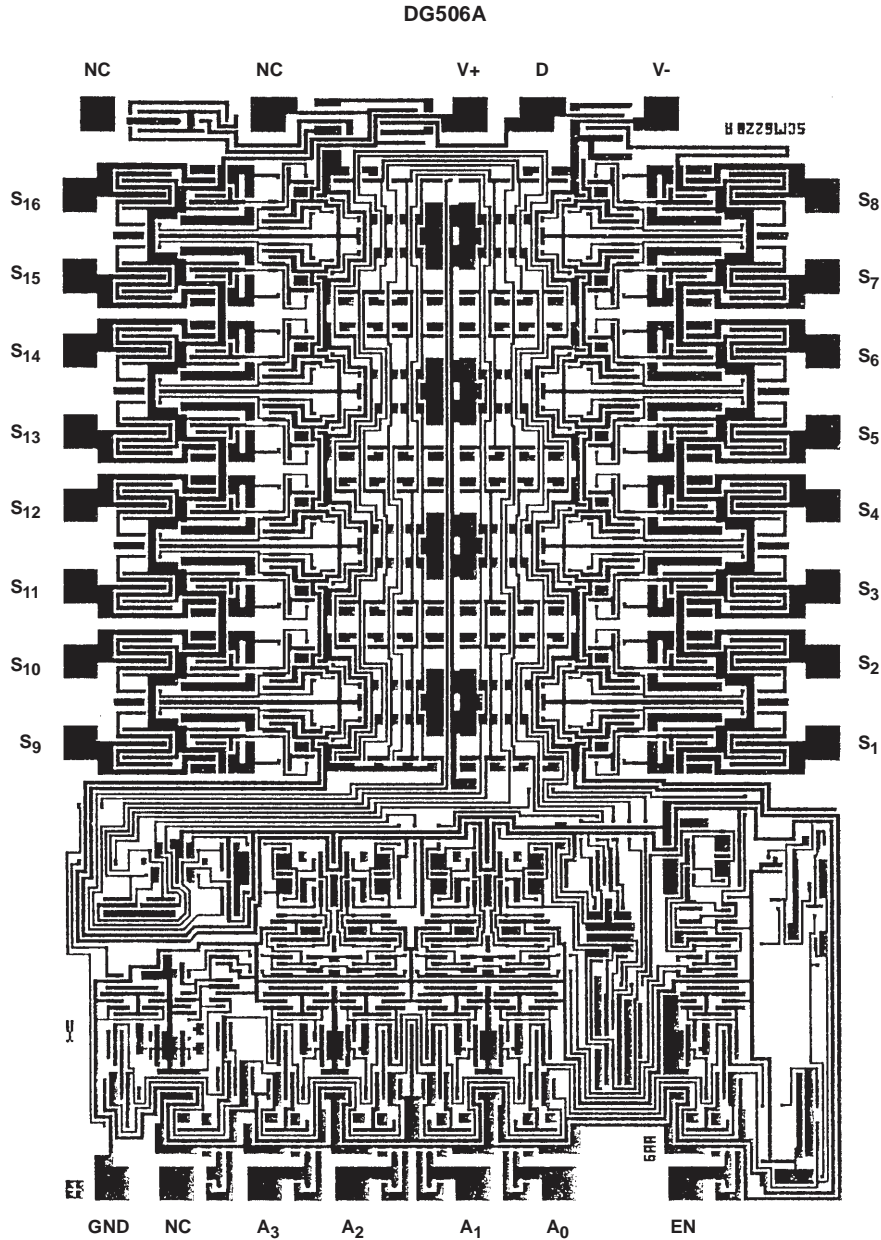
PASSIVATION:

Type: PSG/Nitride
Thickness: PSG: 7k \AA \pm 1.4k \AA
Nitride: 8k \AA \pm 1.2k \AA

WORST CASE CURRENT DENSITY:

9.1 x 10⁴ A/cm²

Metallization Mask Layout



Die Characteristics

DIE DIMENSIONS:

3810 μ m x 2770 μ m

METALLIZATION:

Type: Al

Thickness: 10k \AA \pm 1k \AA

PASSIVATION:

Type: PSG/Nitride

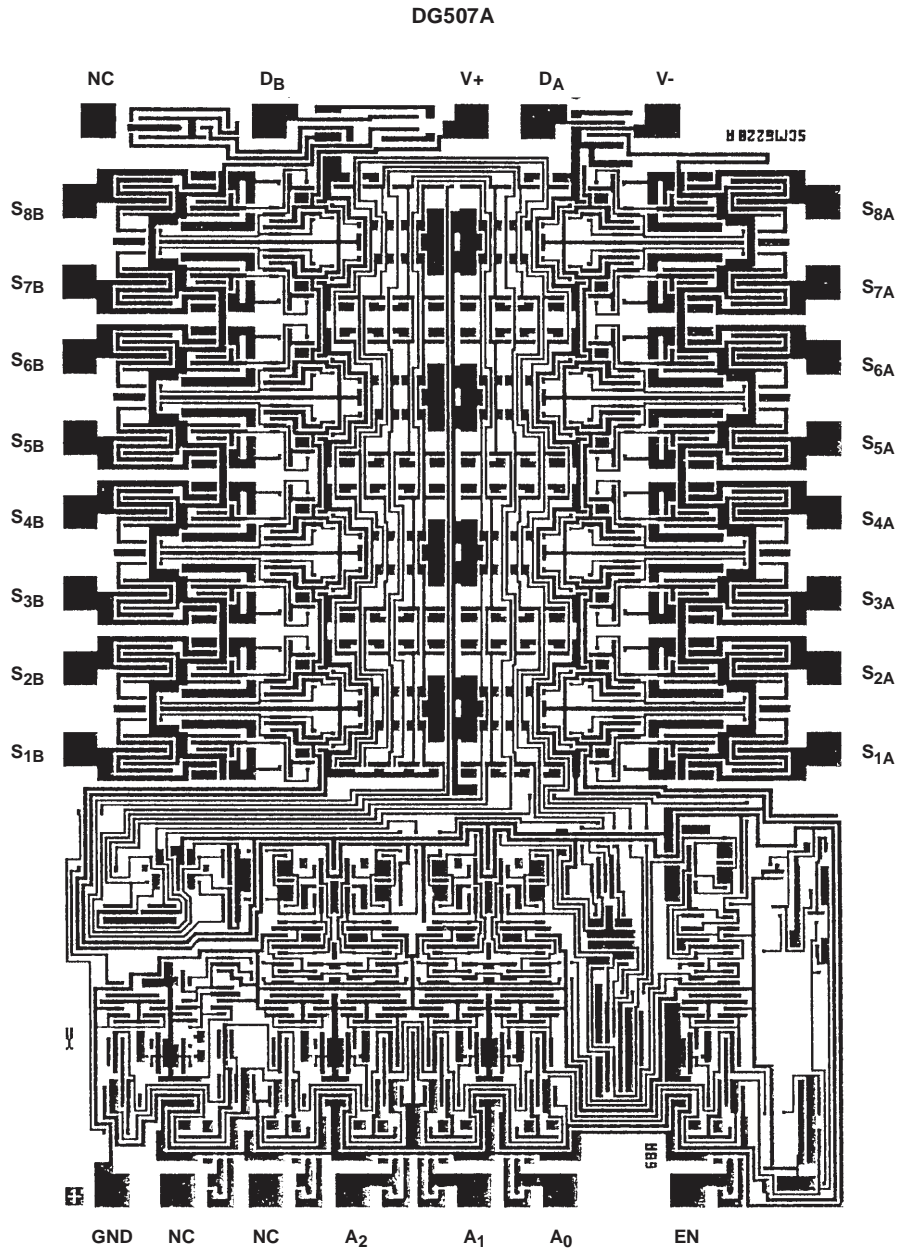
Thickness: PSG: 7k \AA \pm 1.4k \AA

Nitride: 8k \AA \pm 1.2k \AA

WORST CASE CURRENT DENSITY:

9.1 x 10⁴ A/cm²

Metallization Mask Layout



Die Characteristics

DIE DIMENSIONS:

3100 μ m x 2083 μ m

METALLIZATION:

Type: Al

Thickness: 10k \AA \pm 1k \AA

PASSIVATION:

Type: PSG/Nitride

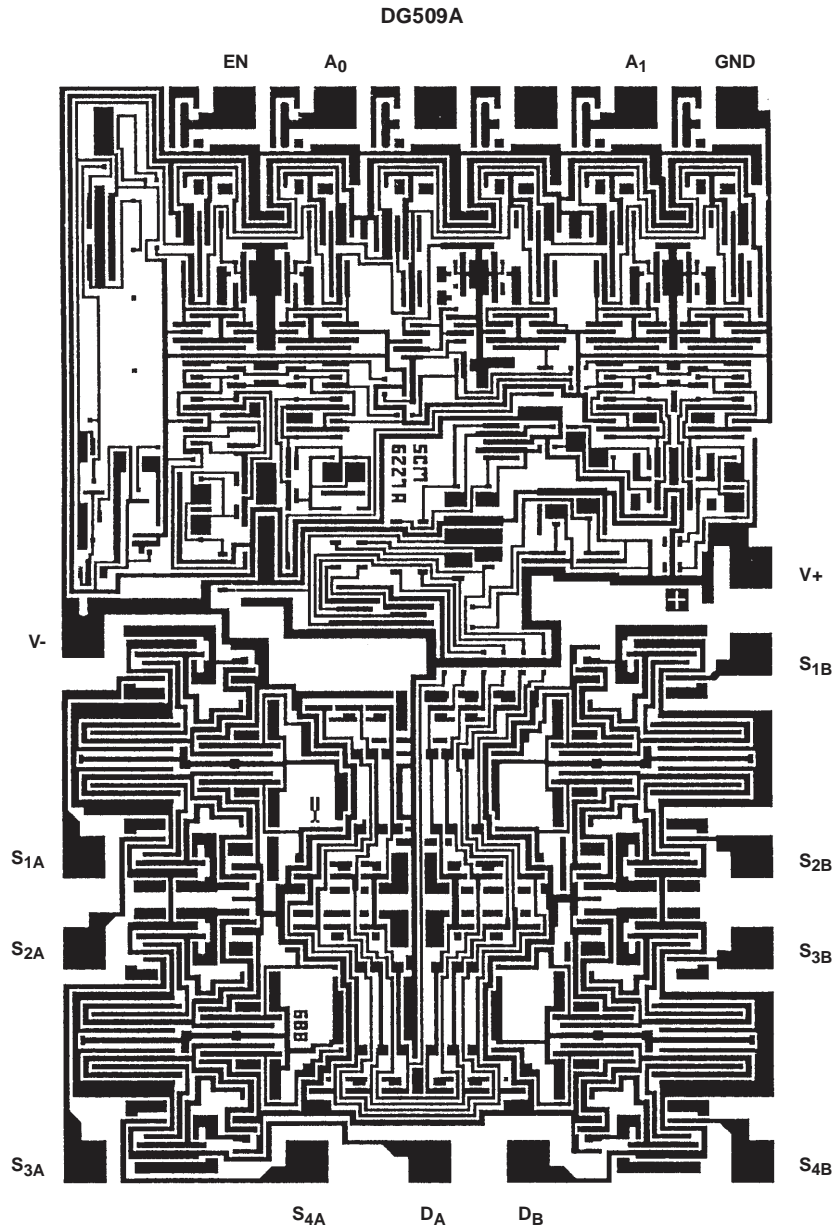
Thickness: PSG: 7k \AA \pm 1.4k \AA

Nitride: 8k \AA \pm 1.2k \AA

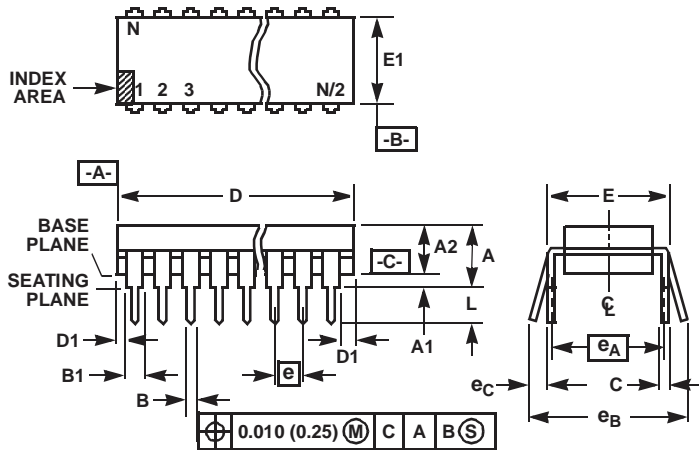
WORST CASE CURRENT DENSITY:

9.1 x 10⁴ A/cm²

Metallization Mask Layout



Dual-In-Line Plastic Packages (PDIP)



NOTES:

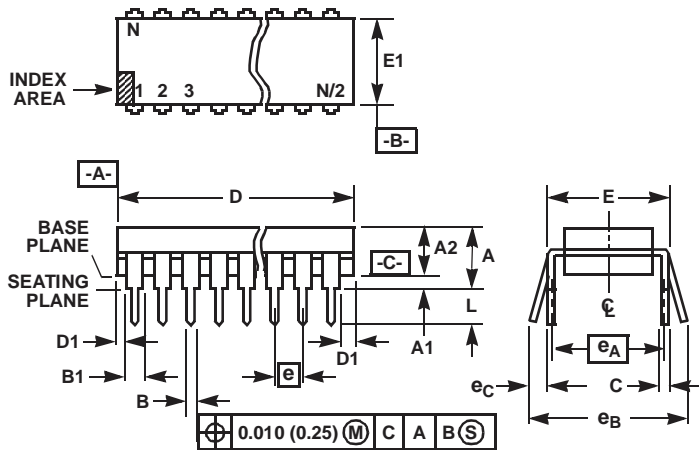
1. Controlling Dimensions: INCH. In case of conflict between English and Metric dimensions, the inch dimensions control.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Symbols are defined in the "MO Series Symbol List" in Section 2.2 of Publication No. 95.
4. Dimensions A, A1 and L are measured 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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Dual-In-Line Plastic Packages (PDIP)



NOTES:

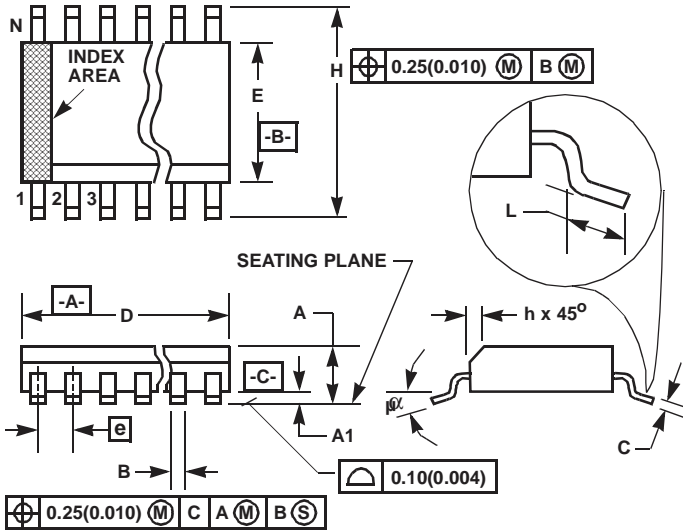
- Controlling Dimensions: INCH. In case of conflict between English and Metric dimensions, the inch dimensions control.
- Dimensioning and tolerancing per ANSI Y14.5M-1982.
- Symbols are defined in the "MO Series Symbol List" in Section 2.2 of Publication No. 95.
- Dimensions A, A1 and L are measured with the package seated in JEDEC seating plane gauge GS-3.
- D, D1, and E1 dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 inch (0.25mm).
- E and e_A are measured with the leads constrained to be perpendicular to datum $-C-$.
- e_B and e_C are measured at the lead tips with the leads unconstrained. e_C must be zero or greater.
- B1 maximum dimensions do not include dambar protrusions. Dambar protrusions shall not exceed 0.010 inch (0.25mm).
- N is the maximum number of terminal positions.
- 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).

E28.6 (JEDEC MS-001-BF ISSUE D)
28 LEAD NARROW BODY DUAL-IN-LINE PLASTIC PACKAGE

| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|--------|-----------|-------|-------------|-------|-------|
| | MIN | MAX | MIN | MAX | |
| A | - | 0.250 | - | 6.35 | 4 |
| A1 | 0.015 | - | 0.39 | - | 4 |
| A2 | 0.125 | 0.195 | 3.18 | 4.95 | - |
| B | 0.014 | 0.022 | 0.356 | 0.558 | - |
| B1 | 0.030 | 0.070 | 0.77 | 1.77 | 8 |
| C | 0.008 | 0.015 | 0.204 | 0.381 | - |
| D | 1.380 | 1.565 | 35.1 | 39.7 | 5 |
| D1 | 0.005 | - | 0.13 | - | 5 |
| E | 0.600 | 0.625 | 15.24 | 15.87 | 6 |
| E1 | 0.485 | 0.580 | 12.32 | 14.73 | 5 |
| e | 0.100 BSC | | 2.54 BSC | | - |
| e_A | 0.600 BSC | | 15.24 BSC | | 6 |
| e_B | - | 0.700 | - | 17.78 | 7 |
| L | 0.115 | 0.200 | 2.93 | 5.08 | 4 |
| N | 28 | | 28 | | 9 |

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Small Outline Plastic Packages (SOIC)



M16.3 (JEDEC MS-013-AA ISSUE C)
16 LEAD WIDE BODY SMALL OUTLINE PLASTIC PACKAGE

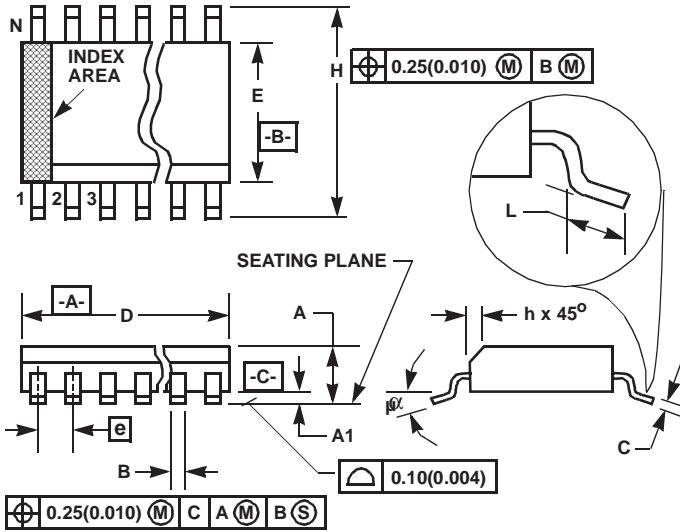
| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|----------|-----------|--------|-------------|-------|-------|
| | MIN | MAX | MIN | MAX | |
| A | 0.0926 | 0.1043 | 2.35 | 2.65 | - |
| A1 | 0.0040 | 0.0118 | 0.10 | 0.30 | - |
| B | 0.013 | 0.0200 | 0.33 | 0.51 | 9 |
| C | 0.0091 | 0.0125 | 0.23 | 0.32 | - |
| D | 0.3977 | 0.4133 | 10.10 | 10.50 | 3 |
| E | 0.2914 | 0.2992 | 7.40 | 7.60 | 4 |
| e | 0.050 BSC | | 1.27 BSC | | - |
| H | 0.394 | 0.419 | 10.00 | 10.65 | - |
| h | 0.010 | 0.029 | 0.25 | 0.75 | 5 |
| L | 0.016 | 0.050 | 0.40 | 1.27 | 6 |
| N | 16 | | 16 | | 7 |
| α | 0° | 8° | 0° | 8° | - |

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.

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Small Outline Plastic Packages (SOIC)



M28.3 (JEDEC MS-013-AE ISSUE C)
28 LEAD WIDE BODY SMALL OUTLINE PLASTIC PACKAGE

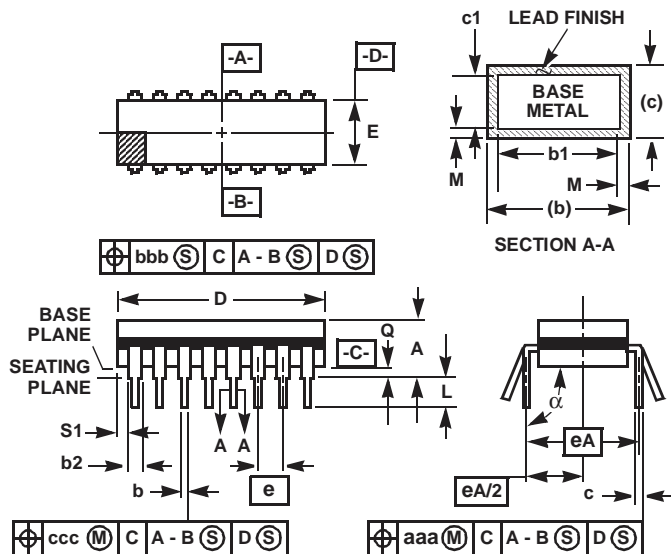
| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|----------|----------|--------|-------------|-------|-------|
| | MIN | MAX | MIN | MAX | |
| A | 0.0926 | 0.1043 | 2.35 | 2.65 | - |
| A1 | 0.0040 | 0.0118 | 0.10 | 0.30 | - |
| B | 0.013 | 0.0200 | 0.33 | 0.51 | 9 |
| C | 0.0091 | 0.0125 | 0.23 | 0.32 | - |
| D | 0.6969 | 0.7125 | 17.70 | 18.10 | 3 |
| E | 0.2914 | 0.2992 | 7.40 | 7.60 | 4 |
| e | 0.05 BSC | | 1.27 BSC | | - |
| H | 0.394 | 0.419 | 10.00 | 10.65 | - |
| h | 0.01 | 0.029 | 0.25 | 0.75 | 5 |
| L | 0.016 | 0.050 | 0.40 | 1.27 | 6 |
| N | 28 | | 28 | | 7 |
| α | 0° | 8° | 0° | 8° | - |

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.

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Ceramic Dual-In-Line Frit Seal Packages (CERDIP)



**F28.6 MIL-STD-1835 GDIP1-T28 (D-10, CONFIGURATION A)
28 LEAD CERAMIC DUAL-IN-LINE FRIT SEAL PACKAGE**

| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|----------|-----------|--------|-------------|-------|-------|
| | MIN | MAX | MIN | MAX | |
| A | - | 0.232 | - | 5.92 | - |
| b | 0.014 | 0.026 | 0.36 | 0.66 | 2 |
| b1 | 0.014 | 0.023 | 0.36 | 0.58 | 3 |
| b2 | 0.045 | 0.065 | 1.14 | 1.65 | - |
| b3 | 0.023 | 0.045 | 0.58 | 1.14 | 4 |
| c | 0.008 | 0.018 | 0.20 | 0.46 | 2 |
| c1 | 0.008 | 0.015 | 0.20 | 0.38 | 3 |
| D | - | 1.490 | - | 37.85 | 5 |
| E | 0.500 | 0.610 | 12.70 | 15.49 | 5 |
| e | 0.100 BSC | | 2.54 BSC | | - |
| eA | 0.600 BSC | | 15.24 BSC | | - |
| eA/2 | 0.300 BSC | | 7.62 BSC | | - |
| L | 0.125 | 0.200 | 3.18 | 5.08 | - |
| Q | 0.015 | 0.060 | 0.38 | 1.52 | 6 |
| S1 | 0.005 | - | 0.13 | - | 7 |
| α | 90° | 105° | 90° | 105° | - |
| aaa | - | 0.015 | - | 0.38 | - |
| bbb | - | 0.030 | - | 0.76 | - |
| ccc | - | 0.010 | - | 0.25 | - |
| M | - | 0.0015 | - | 0.038 | 2, 3 |
| N | 28 | | 28 | | 8 |

NOTES:

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark.
2. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
3. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness.
4. Corner leads (1, N, N/2, and N/2+1) may be configured with a partial lead paddle. For this configuration dimension b3 replaces dimension b2.
5. This dimension allows for off-center lid, meniscus, and glass overrun.
6. Dimension Q shall be measured from the seating plane to the base plane.
7. Measure dimension S1 at all four corners.
8. N is the maximum number of terminal positions.
9. Dimensioning and tolerancing per ANSI Y14.5M - 1982.
10. Controlling dimension: INCH.

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