

# NLAST44599

## Low Voltage Single Supply Dual DPDT Analog Switch

The NLAST44599 is an advanced CMOS dual-independent DPDT (double pole-double throw) analog switch, fabricated with silicon gate CMOS technology. It achieves high-speed propagation delays and low ON resistances while maintaining CMOS low-power dissipation. This DPDT controls analog and digital voltages that may vary across the full power-supply range (from  $V_{CC}$  to GND).

The device has been designed so the ON resistance ( $R_{ON}$ ) is much lower and more linear over input voltage than  $R_{ON}$  of typical CMOS analog switches.

The channel-select input structure provides protection when voltages between 0 V and 5.5 V are applied, regardless of the supply voltage. This input structure helps prevent device destruction caused by supply voltage – input/output voltage mismatch, battery backup, hot insertion, etc.

The NLAST44599 can also be used as a quad 2-to-1 multiplexer-demultiplexer analog switch with two Select pins that each controls two multiplexer-demultiplexers.

- Select Pins Compatible with TTL Levels
- Channel Select Input Over-Voltage Tolerant to 5.5 V
- Fast Switching and Propagation Speeds
- Break-Before-Make Circuitry
- Low Power Dissipation:  $I_{CC} = 2 \mu A$  (Max) at  $T_A = 25^\circ C$
- Diode Protection Provided on Channel Select Input
- Improved Linearity and Lower ON Resistance over Input Voltage
- Latch-up Performance Exceeds 300 mA
- ESD Performance: HBM > 2000 V; MM > 200 V
- Chip Complexity: 158 FETs



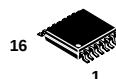
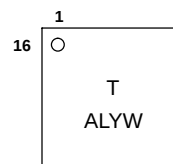
**ON Semiconductor®**

<http://onsemi.com>

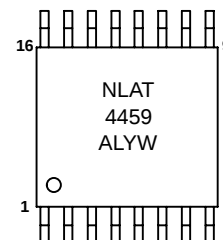
### MARKING DIAGRAMS



**QFN-16**  
**MN SUFFIX**  
**CASE 485G**



**TSSOP-16**  
**DT SUFFIX**  
**CASE 948F**

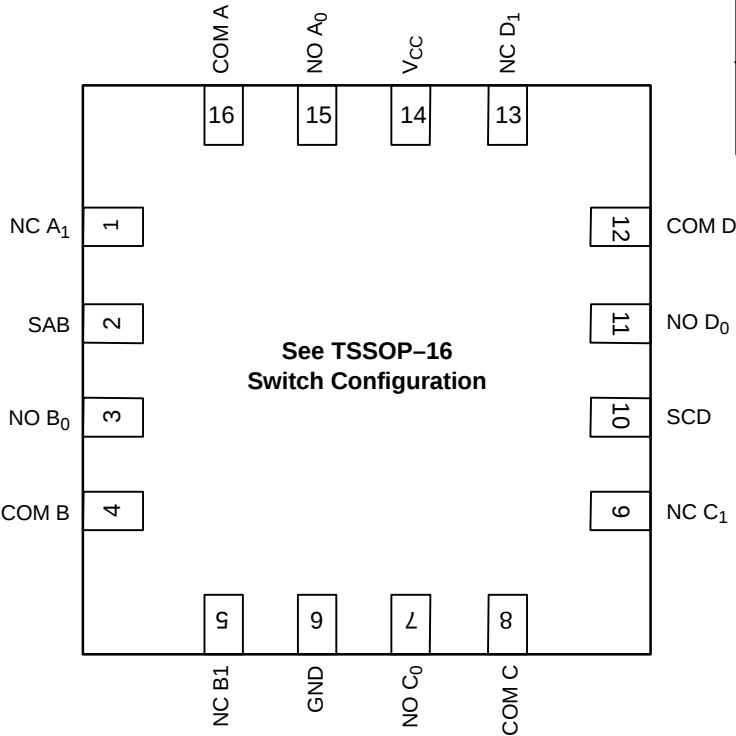


A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 10 of this data sheet.

QFN-16 PACKAGE



FUNCTION TABLE

| Select XY | ON Channel | Select AB or CD | ON Channel |
|-----------|------------|-----------------|------------|
| L         | NC to COM  | L               | NC to COM  |
| H         | NO to COM  | H               | NO to COM  |

TSSOP-16 PACKAGE

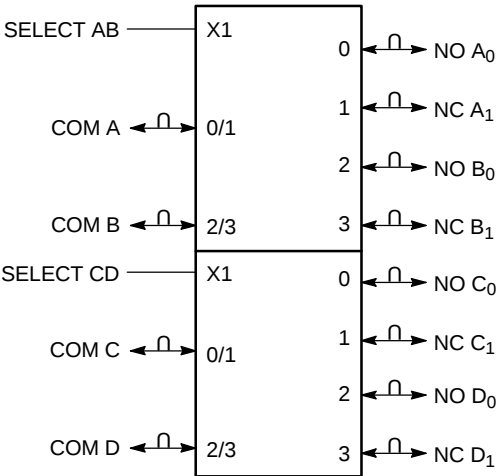
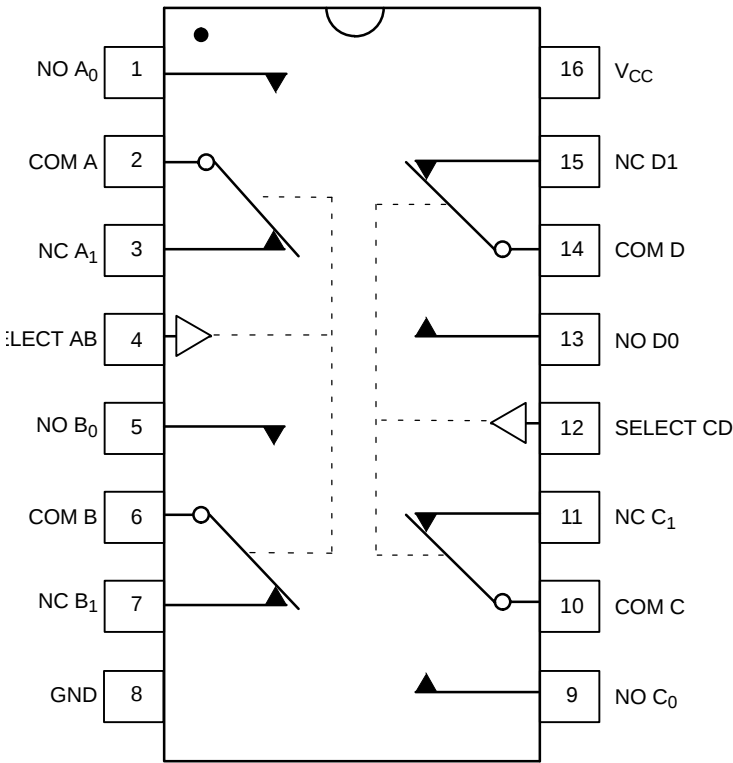


Figure 2. IEC Logic Symbol

Figure 1. Logic Diagram

# MAXIMUM RATINGS

| Symbol                | Parameter                                                   | Value                                                                                                       | Unit |
|-----------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------|
| V <sub>CC</sub>       | Positive DC Supply Voltage                                  | − 0.5 to + 7.0                                                                                              | V    |
| V <sub>IS</sub>       | Analog Input Voltage (V <sub>NO</sub> or V <sub>COM</sub> ) | − 0.5 ≤ V <sub>IS</sub> ≤ V <sub>CC</sub> + 0.5                                                             | V    |
| V <sub>IN</sub>       | Digital Select Input Voltage                                | − 0.5 ≤ V <sub>I</sub> ≤ + 7.0                                                                              | V    |
| I <sub>IK</sub>       | DC Current, Into or Out of Any Pin                          | ± 50                                                                                                        | mA   |
| P <sub>D</sub>        | Power Dissipation in Still Air                              | TSSOP–16<br>450                                                                                             | mW   |
| T <sub>STG</sub>      | Storage Temperature Range                                   | − 65 to + 150                                                                                               | °C   |
| T <sub>L</sub>        | Lead Temperature, 1 mm from Case for 10 Seconds             | 260                                                                                                         | °C   |
| T <sub>J</sub>        | Junction Temperature Under Bias                             | 150                                                                                                         | °C   |
| MSL                   | Moisture Sensitivity                                        | Level 1                                                                                                     |      |
| F <sub>R</sub>        | Flammability Rating                                         | Oxygen Index: 30% – 35%<br>UL–94–VO (0.125 in)                                                              |      |
| V <sub>ESD</sub>      | ESD Withstand Voltage                                       | Human Body Model (Note 1)<br>Machine Model (Note 2)<br>Charged Device Model (Note 3)<br>2000<br>200<br>1000 | V    |
| I <sub>LATCH-UP</sub> | Latch-Up Performance                                        | Above V <sub>CC</sub> and Below GND at 125°C (Note 4)<br>± 300                                              | mA   |
| θ <sub>JA</sub>       | Thermal Resistance                                          | TSSOP–16<br>164                                                                                             | °C/W |

Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Extended exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1. Tested to EIA/JESD22–A114–A.
2. Tested to EIA/JESD22–A115–A.
3. Tested to JESD22–C101–A.
4. Tested to EIA/JESD78.

# RECOMMENDED OPERATING CONDITIONS

| Symbol                          | Parameter                          | Min                                                                          | Max             | Unit |
|---------------------------------|------------------------------------|------------------------------------------------------------------------------|-----------------|------|
| V <sub>CC</sub>                 | DC Supply Voltage                  | 2.0                                                                          | 5.5             | V    |
| V <sub>IN</sub>                 | Digital Select Input Voltage       | GND                                                                          | 5.5             | V    |
| V <sub>IS</sub>                 | Analog Input Voltage (NC, NO, COM) | GND                                                                          | V <sub>CC</sub> | V    |
| T <sub>A</sub>                  | Operating Temperature Range        | − 55                                                                         | + 125           | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise or Fall Time, SELECT    | V <sub>CC</sub> = 3.3 V ± 0.3 V<br>V <sub>CC</sub> = 5.0 V ± 0.5 V<br>0<br>0 | 100<br>20       | ns/V |

# DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

| Junction Temperature °C | Time, Hours | Time, Years |
|-------------------------|-------------|-------------|
| 80                      | 1,032,200   | 117.8       |
| 90                      | 419,300     | 47.9        |
| 100                     | 178,700     | 20.4        |
| 110                     | 79,600      | 9.4         |
| 120                     | 37,000      | 4.2         |
| 130                     | 17,800      | 2.0         |
| 140                     | 8,900       | 1.0         |

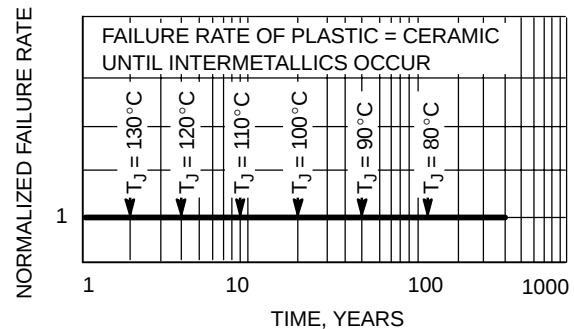


Figure 3. Failure Rate vs. Time Junction Temperature

**DC CHARACTERISTICS – Digital Section** (Voltages Referenced to GND)

| Symbol           | Parameter                                       | Condition                                           | V <sub>CC</sub> | Guaranteed Limit |        |         | Unit |
|------------------|-------------------------------------------------|-----------------------------------------------------|-----------------|------------------|--------|---------|------|
|                  |                                                 |                                                     |                 | – 55°C to 25°C   | < 85°C | < 125°C |      |
| V <sub>IH</sub>  | Minimum High–Level Input Voltage, Select Inputs |                                                     | 3.0             | 2.0              | 2.0    | 2.0     | V    |
|                  |                                                 |                                                     | 4.5             | 2.0              | 2.0    | 2.0     |      |
|                  |                                                 |                                                     | 5.5             | 2.0              | 2.0    | 2.0     |      |
| V <sub>IL</sub>  | Maximum Low–Level Input Voltage, Select Inputs  |                                                     | 3.0             | 0.5              | 0.5    | 0.5     | V    |
|                  |                                                 |                                                     | 4.5             | 0.8              | 0.8    | 0.8     |      |
|                  |                                                 |                                                     | 5.5             | 0.8              | 0.8    | 0.8     |      |
| I <sub>IN</sub>  | Maximum Input Leakage Current, Select Inputs    | V <sub>IN</sub> = 5.5 V or GND                      | 5.5             | ± 0.2            | ± 2.0  | ± 2.0   | µA   |
| I <sub>OFF</sub> | Power Off Leakage Current                       | V <sub>IN</sub> = 5.5 V or GND                      | 0               | ± 10             | ± 10   | ± 10    | µA   |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current                | Select and V <sub>IS</sub> = V <sub>CC</sub> or GND | 5.5             | 4.0              | 4.0    | 8.0     | µA   |

**DC ELECTRICAL CHARACTERISTICS – Analog Section**

| Symbol                                       | Parameter                                 | Condition                                                                                                                                                                                                                    | V <sub>CC</sub> | Guaranteed Limit |        |         | Unit |
|----------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|--------|---------|------|
|                                              |                                           |                                                                                                                                                                                                                              |                 | – 55°C to 25°C   | < 85°C | < 125°C |      |
| R <sub>ON</sub>                              | Maximum “ON” Resistance (Figures 17 – 23) | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>IS</sub> = GND to V <sub>CC</sub><br> I <sub>IN</sub>   ≤ 10.0 mA                                                                                             | 2.5             | 85               | 95     | 105     | Ω    |
|                                              |                                           |                                                                                                                                                                                                                              | 3.0             | 45               | 50     | 55      |      |
|                                              |                                           |                                                                                                                                                                                                                              | 4.5             | 30               | 35     | 40      |      |
|                                              |                                           |                                                                                                                                                                                                                              | 5.5             | 25               | 30     | 35      |      |
| R <sub>FLAT</sub> (ON)                       | ON Resistance Flatness (Figures 17 – 23)  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br> I <sub>IN</sub>   ≤ 10.0 mA<br>V <sub>IS</sub> = 1 V, 2 V, 3.5 V                                                                                                    | 4.5             | 4                | 4      | 5       | Ω    |
| I <sub>NC(OFF)</sub><br>I <sub>NO(OFF)</sub> | NO or NC Off Leakage Current (Figure 9)   | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>NO</sub> or V <sub>NC</sub> = 1.0 V <sub>COM</sub> 4.5 V                                                                                                      | 5.5             | 1                | 10     | 100     | nA   |
| I <sub>COM(ON)</sub>                         | COM ON Leakage Current (Figure 9)         | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>NO</sub> 1.0 V or 4.5 V with V <sub>NC</sub> floating or<br>V <sub>NO</sub> 1.0 V or 4.5 V with V <sub>NO</sub> floating<br>V <sub>COM</sub> = 1.0 V or 4.5 V | 5.5             | 1                | 10     | 100     | nA   |

**AC ELECTRICAL CHARACTERISTICS** (Input  $t_r = t_f = 3.0$  ns)

| Symbol           | Parameter                            | Test Conditions                                                                      | V <sub>CC</sub><br>(V) | V <sub>IS</sub><br>(V) | Guaranteed Maximum Limit |      |     |        |     |         |     | Unit |
|------------------|--------------------------------------|--------------------------------------------------------------------------------------|------------------------|------------------------|--------------------------|------|-----|--------|-----|---------|-----|------|
|                  |                                      |                                                                                      |                        |                        | – 55°C to 25°C           |      |     | < 85°C |     | < 125°C |     |      |
|                  |                                      |                                                                                      |                        |                        | Min                      | Typ* | Max | Min    | Max | Min     | Max |      |
| t <sub>ON</sub>  | Turn–On Time<br>(Figures 12 and 13)  | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>(Figures 5 and 6)                  | 2.5                    | 2.0                    | 5                        | 23   | 35  | 5      | 38  | 5       | 41  | ns   |
|                  |                                      |                                                                                      | 3.0                    | 2.0                    | 5                        | 16   | 24  | 5      | 27  | 5       | 30  |      |
|                  |                                      |                                                                                      | 4.5                    | 3.0                    | 2                        | 11   | 16  | 2      | 19  | 2       | 22  |      |
|                  |                                      |                                                                                      | 5.5                    | 3.0                    | 2                        | 9    | 14  | 2      | 17  | 2       | 20  |      |
| t <sub>OFF</sub> | Turn–Off Time<br>(Figures 12 and 13) | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>(Figures 5 and 6)                  | 2.5                    | 2.0                    | 1                        | 7    | 12  | 1      | 15  | 1       | 18  | ns   |
|                  |                                      |                                                                                      | 3.0                    | 2.0                    | 1                        | 5    | 10  | 1      | 13  | 1       | 16  |      |
|                  |                                      |                                                                                      | 4.5                    | 3.0                    | 1                        | 4    | 6   | 1      | 9   | 1       | 12  |      |
|                  |                                      |                                                                                      | 5.5                    | 3.0                    | 1                        | 3    | 5   | 1      | 8   | 1       | 11  |      |
| t <sub>BBM</sub> | Minimum Break–Before–Make<br>Time    | V <sub>IS</sub> = 3.0 V (Figure 4)<br>R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF | 2.5                    | 2.0                    | 1                        | 12   |     | 1      |     | 1       |     | ns   |
|                  |                                      |                                                                                      | 3.0                    | 2.0                    | 1                        | 11   |     | 1      |     | 1       |     |      |
|                  |                                      |                                                                                      | 4.5                    | 3.0                    | 1                        | 6    |     | 1      |     | 1       |     |      |
|                  |                                      |                                                                                      | 5.5                    | 3.0                    | 1                        | 5    |     | 1      |     | 1       |     |      |

\*Typical Characteristics are at 25°C.

|                                    |                                         | Typical @ 25, VCC = 5.0 V | pF |
|------------------------------------|-----------------------------------------|---------------------------|----|
| C <sub>IN</sub>                    | Maximum Input Capacitance, Select Input | 8                         |    |
| C <sub>NO</sub> or C <sub>NC</sub> | Analog I/O (Switch Off)                 | 10                        |    |
| C <sub>COM</sub>                   | Common I/O (Switch Off)                 | 10                        |    |
| C <sub>(ON)</sub>                  | Feedthrough (Switch On)                 | 20                        |    |

**ADDITIONAL APPLICATION CHARACTERISTICS** (Voltages Referenced to GND Unless Noted)

| Symbol           | Parameter                                                                           | Condition                                                                                                                                                                                                            | V <sub>CC</sub><br>V | Typical | Unit |
|------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|------|
|                  |                                                                                     |                                                                                                                                                                                                                      |                      | 25°C    |      |
| BW               | Maximum On-Channel – 3 dB Bandwidth or<br>Minimum Frequency Response<br>(Figure 11) | V <sub>IN</sub> = 0 dBm<br>V <sub>IN</sub> centered between V <sub>CC</sub> and GND<br>(Figure 7)                                                                                                                    | 3.0                  | 145     | MHz  |
|                  |                                                                                     |                                                                                                                                                                                                                      | 4.5                  | 170     |      |
|                  |                                                                                     |                                                                                                                                                                                                                      | 5.5                  | 175     |      |
| V <sub>ONL</sub> | Maximum Feedthrough On Loss                                                         | V <sub>IN</sub> = 0 dBm @ 100 kHz to 50 MHz<br>V <sub>IN</sub> centered between V <sub>CC</sub> and GND<br>(Figure 7)                                                                                                | 3.0                  | –3      | dB   |
|                  |                                                                                     |                                                                                                                                                                                                                      | 4.5                  | –3      |      |
|                  |                                                                                     |                                                                                                                                                                                                                      | 5.5                  | –3      |      |
| V <sub>ISO</sub> | Off-Channel Isolation<br>(Figure 10)                                                | f = 100 kHz; V <sub>IS</sub> = 1 V RMS<br>V <sub>IN</sub> centered between V <sub>CC</sub> and GND<br>(Figure 7)                                                                                                     | 3.0                  | –93     | dB   |
|                  |                                                                                     |                                                                                                                                                                                                                      | 4.5                  | –93     |      |
|                  |                                                                                     |                                                                                                                                                                                                                      | 5.5                  | –93     |      |
| Q                | Charge Injection Select Input to Common I/O<br>(Figure 15)                          | V <sub>IN</sub> = V <sub>CC</sub> to GND, F <sub>IS</sub> = 20 kHz<br>t <sub>r</sub> = t <sub>f</sub> = 3 ns<br>R <sub>IS</sub> = 0 Ω, C <sub>L</sub> = 1000 pF<br>Q = C <sub>L</sub> * ΔV <sub>OUT</sub> (Figure 8) | 3.0                  | 1.5     | pC   |
|                  |                                                                                     |                                                                                                                                                                                                                      | 5.5                  | 3.0     |      |
| THD              | Total Harmonic Distortion<br>THD + Noise<br>(Figure 14)                             | F <sub>IS</sub> = 20 Hz to 100 kHz, R <sub>L</sub> = R <sub>gen</sub> = 600 Ω,<br>C <sub>L</sub> = 50 pF<br>V <sub>IS</sub> = 5.0 V <sub>PP</sub> sine wave                                                          | 5.5                  | 0.1     | %    |
| VCT              | Channel to Channel Crosstalk                                                        | f = 100 kHz; V <sub>IS</sub> = 1 V RMS<br>V <sub>IN</sub> centered between V <sub>CC</sub> and GND<br>(Figure 7)                                                                                                     | 5.5                  | –90     | dB   |
|                  |                                                                                     |                                                                                                                                                                                                                      | 3.0                  | –90     |      |

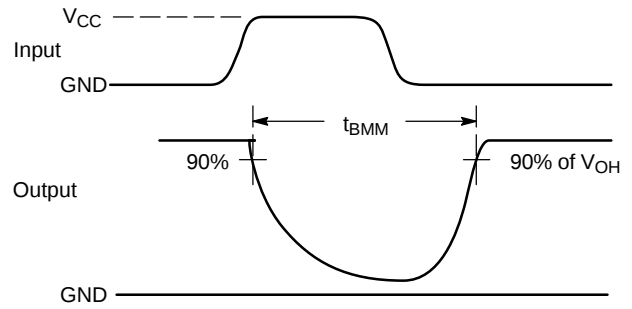
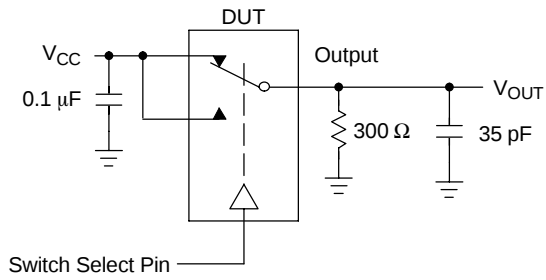


Figure 4.  $t_{BMM}$  (Time Break-Before-Make)

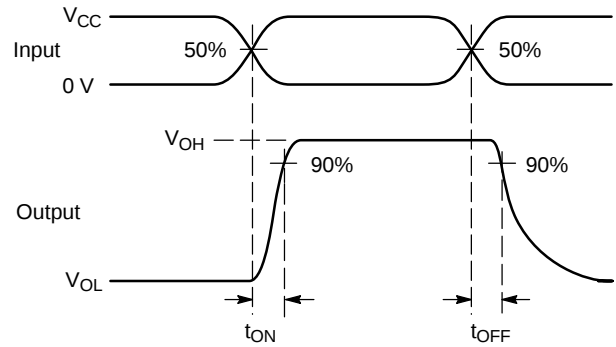
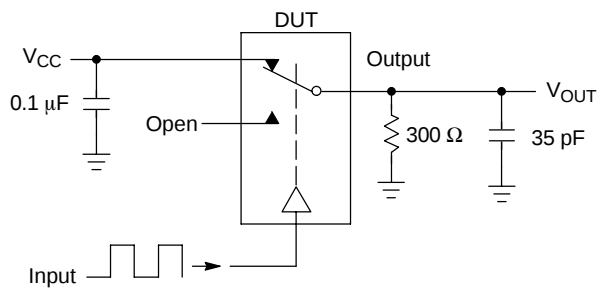


Figure 5.  $t_{ON}/t_{OFF}$

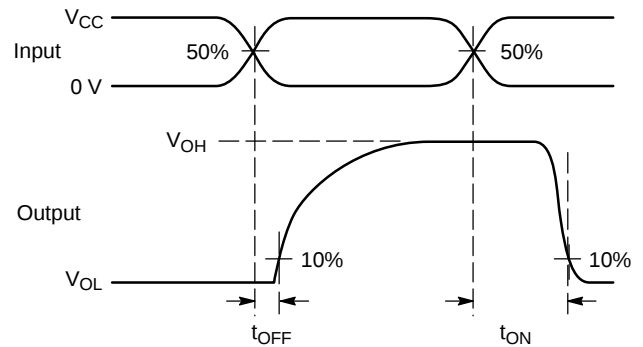
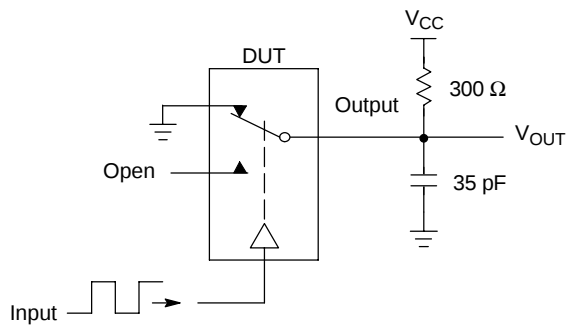
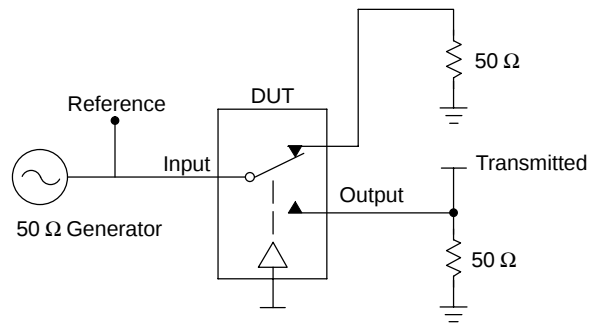


Figure 6.  $t_{ON}/t_{OFF}$



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch.  $V_{ISO}$ , Bandwidth and  $V_{ONL}$  are independent of the input signal direction.

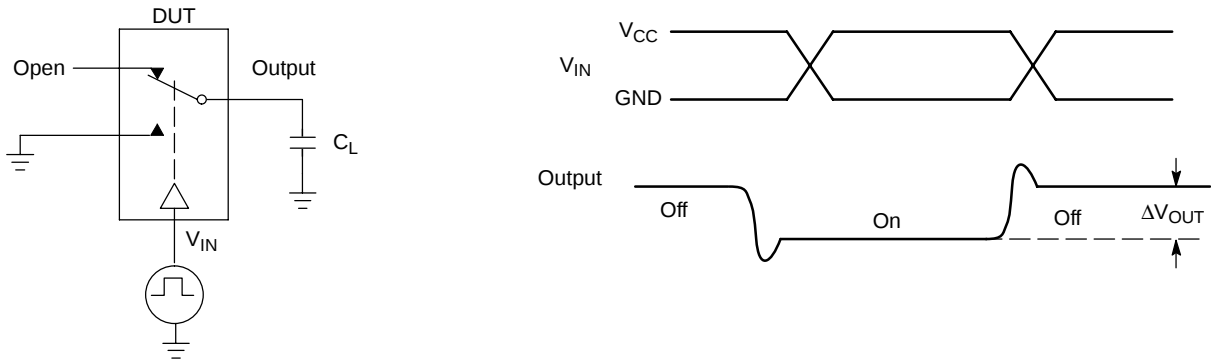
$$V_{ISO} = \text{Off Channel Isolation} = 20 \text{ Log } \left( \frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz}$$

$$V_{ONL} = \text{On Channel Loss} = 20 \text{ Log } \left( \frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz to } 50 \text{ MHz}$$

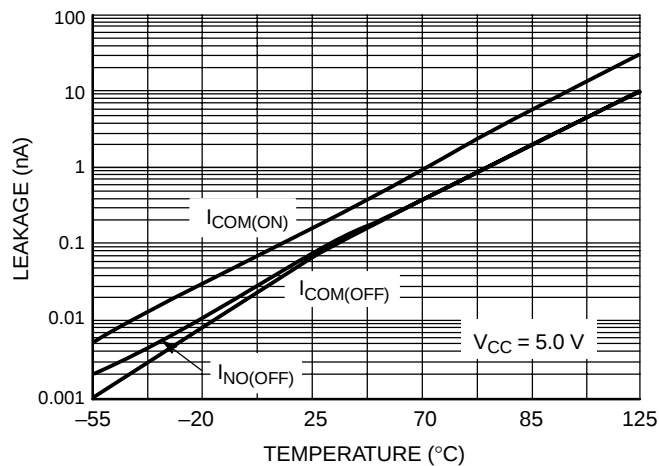
Bandwidth (BW) = the frequency 3 dB below  $V_{ONL}$

$V_{CT}$  = Use  $V_{ISO}$  setup and test to all other switch analog input/outputs terminated with 50 Ω

**Figure 7. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/ $V_{ONL}$**



**Figure 8. Charge Injection: (Q)**



**Figure 9. Switch Leakage vs. Temperature**

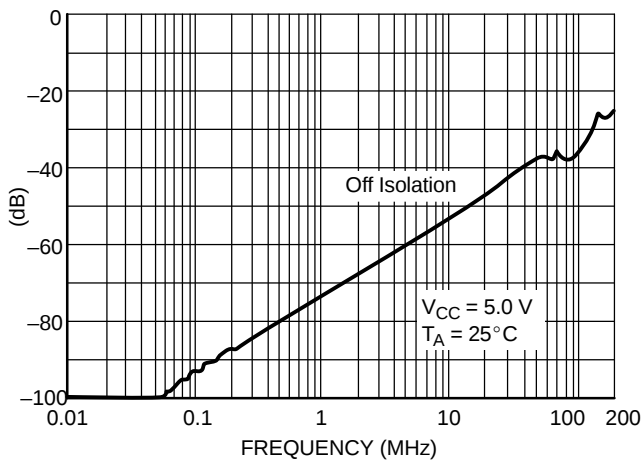


Figure 10. Off-Channel Isolation

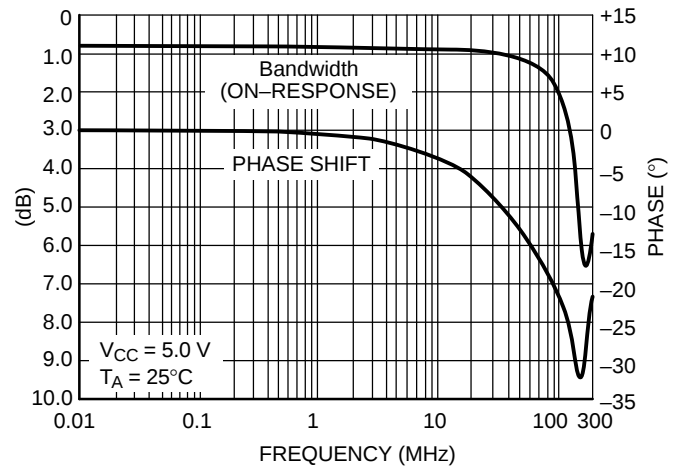


Figure 11. Typical Bandwidth and Phase Shift

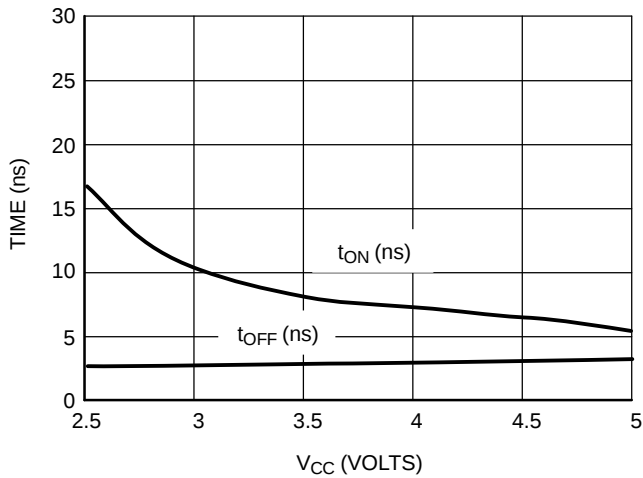


Figure 12.  $t_{ON}$  and  $t_{OFF}$  vs.  $V_{CC}$  at  $25^\circ\text{C}$

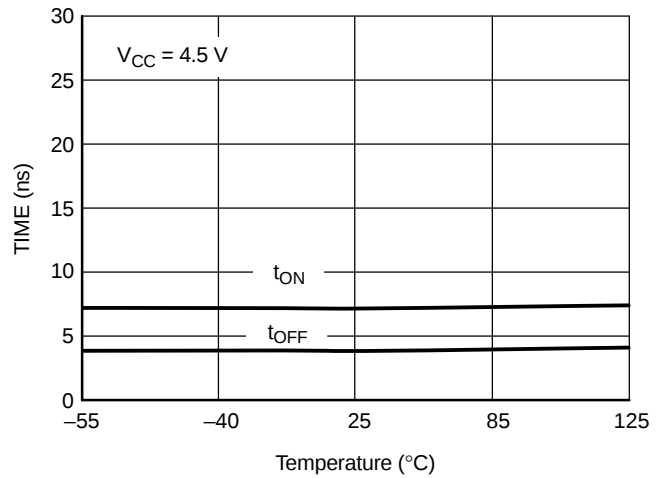


Figure 13.  $t_{ON}$  and  $t_{OFF}$  vs. Temp

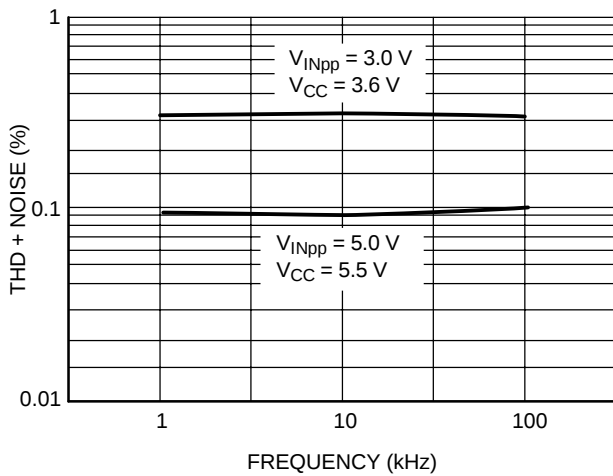


Figure 14. Total Harmonic Distortion Plus Noise vs. Frequency

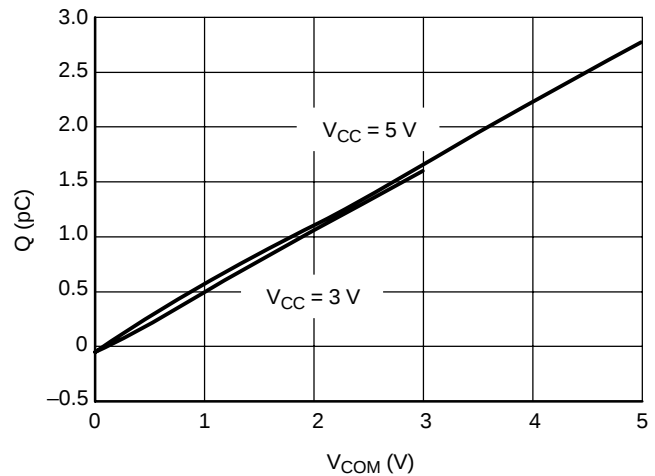


Figure 15. Charge Injection vs. COM Voltage

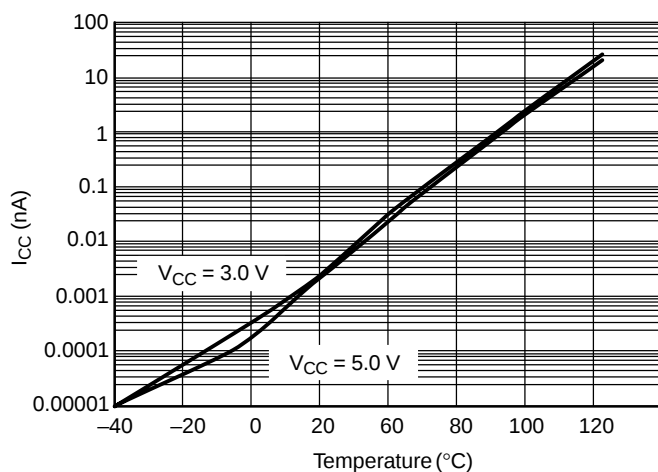


Figure 16.  $I_{CC}$  vs. Temp,  $V_{CC} = 3\text{ V}$  and  $5\text{ V}$

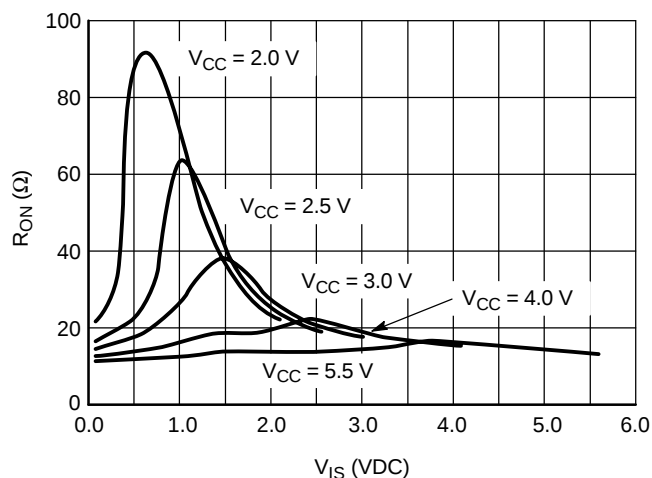


Figure 17.  $R_{ON}$  vs.  $V_{CC}$ , Temp =  $25^{\circ}\text{C}$

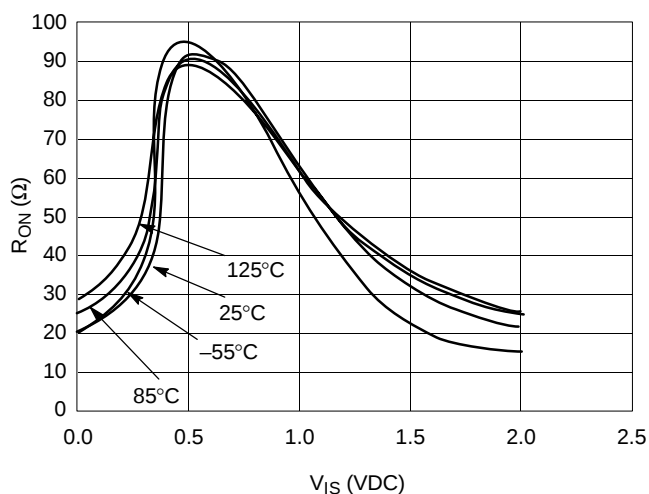


Figure 18.  $R_{ON}$  vs Temp,  $V_{CC} = 2.0\text{ V}$

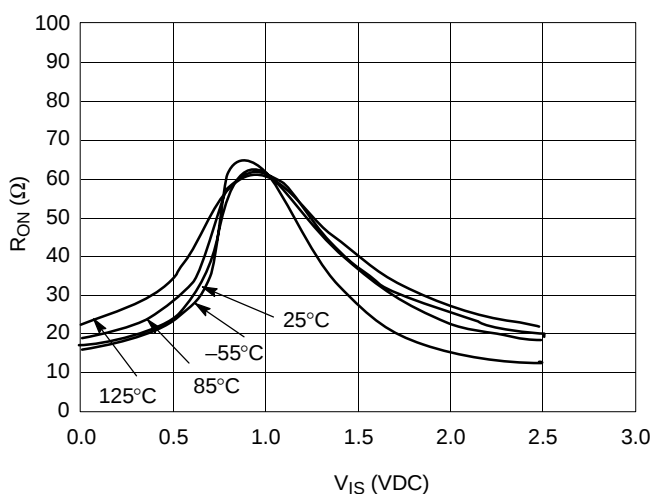


Figure 19.  $R_{ON}$  vs. Temp,  $V_{CC} = 2.5\text{ V}$

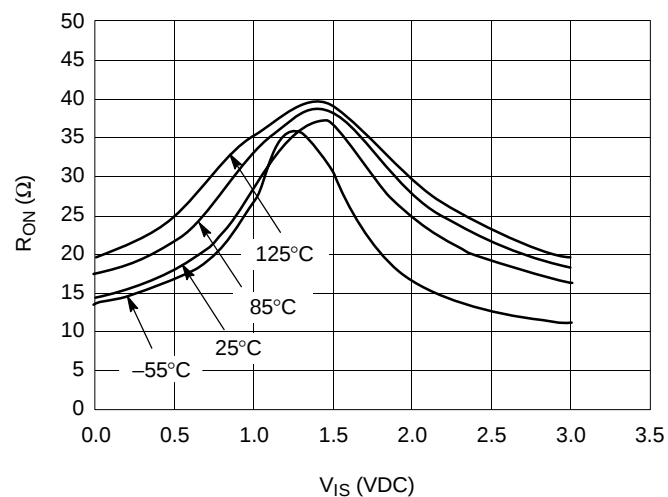


Figure 20.  $R_{ON}$  vs. Temp,  $V_{CC} = 3.0\text{ V}$

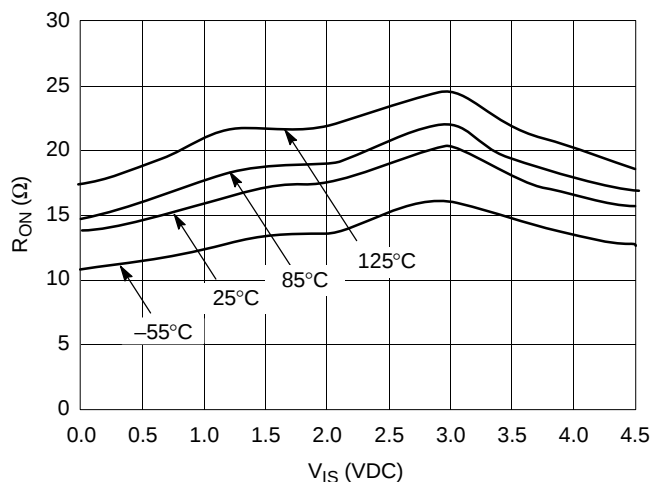


Figure 21.  $R_{ON}$  vs. Temp,  $V_{CC} = 4.5\text{ V}$

# NLAST44599

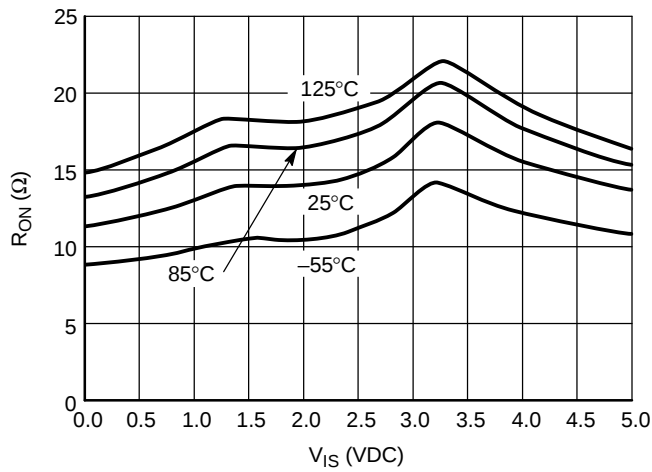


Figure 22.  $R_{ON}$  vs. Temp,  $V_{CC} = 5.0$  V

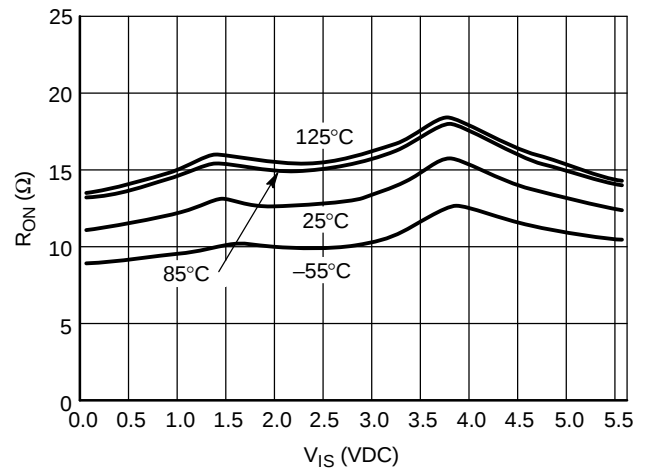


Figure 23.  $R_{ON}$  vs. Temp,  $V_{CC} = 5.5$  V

## DEVICE ORDERING INFORMATION

| Device Order Number | Device Nomenclature |            |                 |                |                      | Package Type | Tape and Reel Size |
|---------------------|---------------------|------------|-----------------|----------------|----------------------|--------------|--------------------|
|                     | Circuit Indicator   | Technology | Device Function | Package Suffix | Tape and Reel Suffix |              |                    |
| NLAST44599MNR2      | NL                  | AS         | 44599           | MN             | R2                   | QFN          | 7-inch/2500 Unit   |
| NLAST44599DTR2      | NL                  | AS         | 44599           | DT             | R2                   | TSSOP        | 13-inch/2500 Unit  |
| NLAST44599MN        | NL                  | AS         | 44599           | MN             |                      | QFN          | 124 Unit Rail      |
| NLAST44599DT        | NL                  | AS         | 44599           | DT             |                      | TSSOP        | 96 Unit Rail       |

## PIN1/PRODUCT ORIENTATION CARRIER TAPE

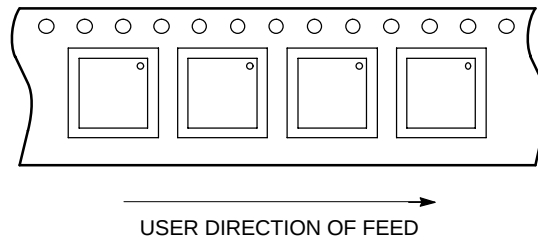
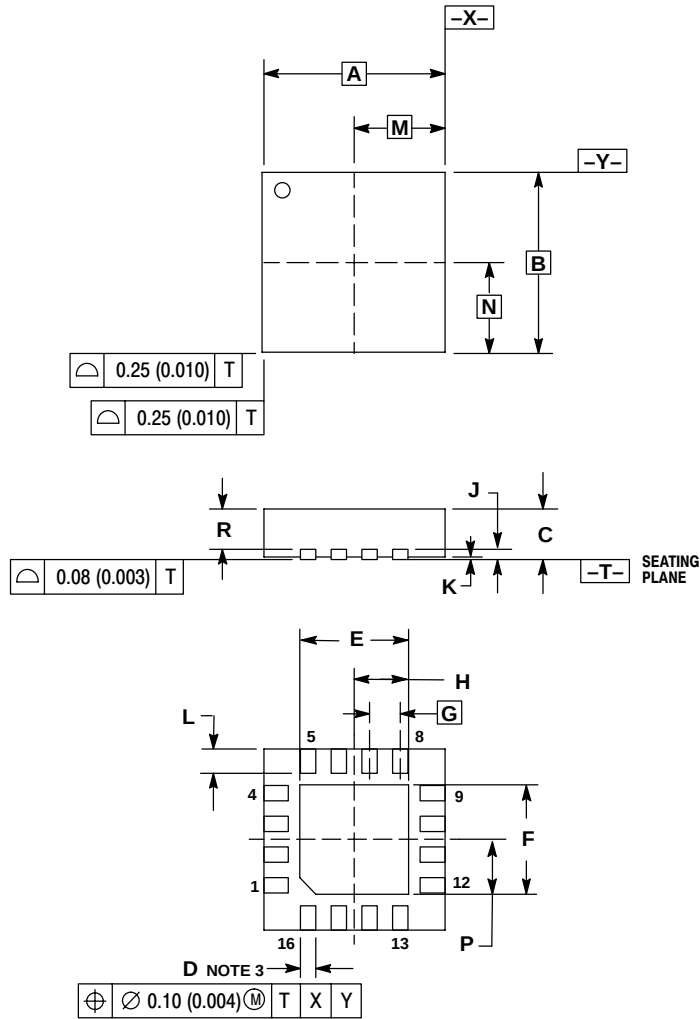


Figure 24.

PACKAGE DIMENSIONS

QFN-16  
MN SUFFIX  
CASE 485G-01  
ISSUE O



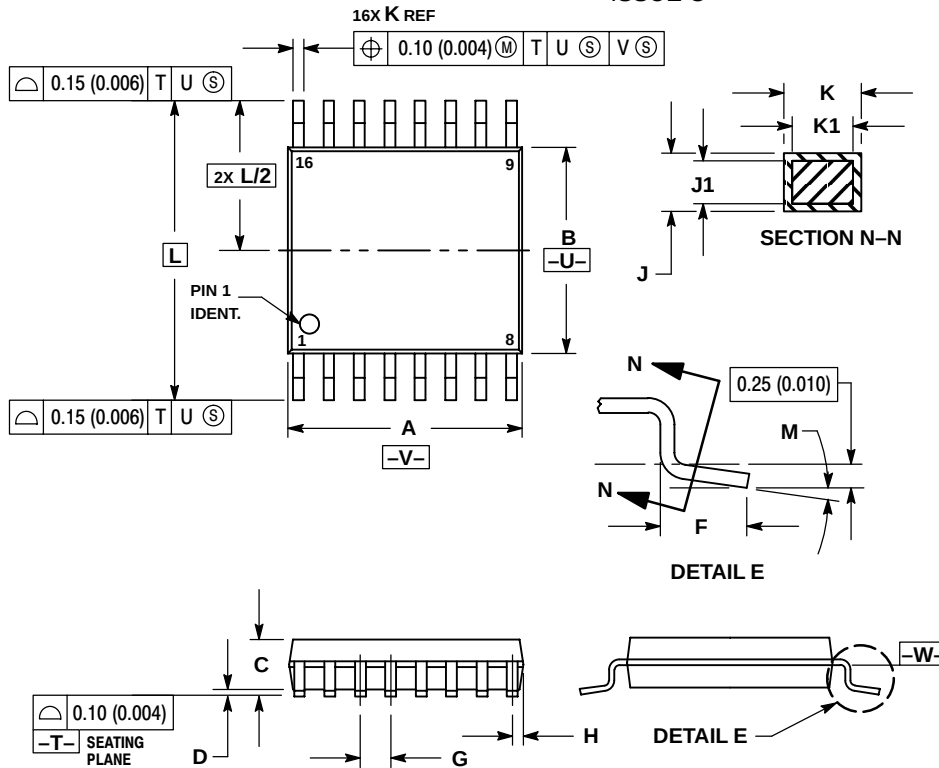
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 3.00 BSC    |       | 0.118 BSC |       |
| B   | 3.00 BSC    |       | 0.118 BSC |       |
| C   | 0.80        | 1.00  | 0.031     | 0.039 |
| D   | 0.23        | 0.28  | 0.009     | 0.011 |
| E   | 1.75        | 1.85  | 0.069     | 0.073 |
| F   | 1.75        | 1.85  | 0.069     | 0.073 |
| G   | 0.50 BSC    |       | 0.020 BSC |       |
| H   | 0.875       | 0.925 | 0.034     | 0.036 |
| J   | 0.20 REF    |       | 0.008 REF |       |
| K   | 0.00        | 0.05  | 0.000     | 0.002 |
| L   | 0.35        | 0.45  | 0.014     | 0.018 |
| M   | 1.50 BSC    |       | 0.059 BSC |       |
| N   | 1.50 BSC    |       | 0.059 BSC |       |
| P   | 0.875       | 0.925 | 0.034     | 0.036 |
| R   | 0.60        | 0.80  | 0.024     | 0.031 |

## PACKAGE DIMENSIONS

TSSOP-16  
DT SUFFIX  
CASE 948F-01  
ISSUE O



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS |           | INCHES |       |
|-----|-------------|-----------|--------|-------|
|     | MIN         | MAX       | MIN    | MAX   |
| A   | 4.90        | 5.10      | 0.193  | 0.200 |
| B   | 4.30        | 4.50      | 0.169  | 0.177 |
| C   | ---         | 1.20      | ---    | 0.047 |
| D   | 0.05        | 0.15      | 0.002  | 0.006 |
| F   | 0.50        | 0.75      | 0.020  | 0.030 |
| G   | 0.65 BSC    | 0.026 BSC |        |       |
| H   | 0.18        | 0.28      | 0.007  | 0.011 |
| J   | 0.09        | 0.20      | 0.004  | 0.008 |
| J1  | 0.09        | 0.16      | 0.004  | 0.006 |
| K   | 0.19        | 0.30      | 0.007  | 0.012 |
| K1  | 0.19        | 0.25      | 0.007  | 0.010 |
| L   | 6.40 BSC    | 0.252 BSC |        |       |
| M   | 0°          | 8°        | 0°     | 8°    |

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

## PUBLICATION ORDERING INFORMATION

## Literature Fulfillment:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: ONlit@hibbertco.com

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

JAPAN: ON Semiconductor, Japan Customer Focus Center  
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031  
Phone: 81-3-5740-2700  
Email: r14525@onsemi.com

ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local Sales Representative.