

NLHV1T0434

48 V RF Antenna Switch Driver

The NLHV1T0434 MiniGate™ is an advanced high-voltage CMOS RF Antenna Switch Driver in ultra-small footprint.

Features

- Single Channel/High-Drive
- High-Speed/Low-Power
- Wide Operating V_{DD} Range: 3.0 V to 5.5 V
- Wide Output V_{CC} Range: 16 V to 50 V
- Low R_{DSon} :
 - NMOS = 10 Ω Max
 - PMOS = 200 Ω Max
- High output DC current: $I_{OL} \geq 130$ mA
- Max input frequency: 2 MHz minimum
- Low Static Current: I_{DDmax} , $I_{CCmax} = 100$ μ A
- Low Dynamic Current @ 100 kHz:
 - $I_{DDdynmax} = 0.2$ mA, $I_{CCdynmax} = 1.0$ mA
- Available in MSOP8-EP
- These Devices are Pb-Free, Halogen-Free/BFR-Free and are RoHS-Compliant



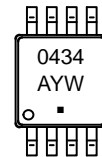
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MARKING DIAGRAM



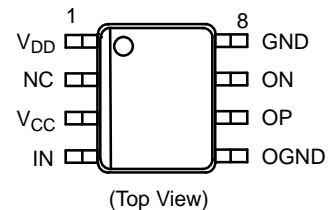
MSOP-8
Z SUFFIX
CASE 846AM



0434 = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS



ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|-----------------------|-----------------------|
| NLHV1T0434ZR2G | MSOP8-EP (Pb-Free) | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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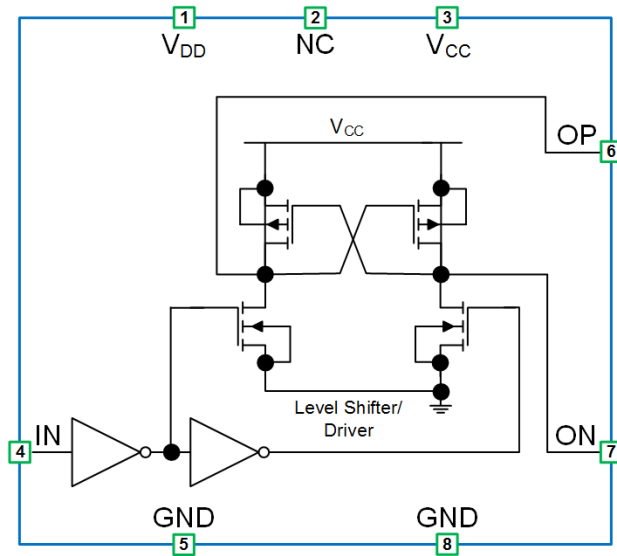


Figure 1. Block Diagram

Table 1. PIN ASSIGNMENT

| Pin | Pin Name | Description |
|-----|----------|----------------------|
| 1 | V_{DD} | Digital Power Supply |
| 2 | NC | No Connect |
| 3 | V_{CC} | High Voltage Supply |
| 4 | IN | Input |
| 5 | GND | Ground |
| 6 | OP | Non-Inverted Output |
| 7 | ON | Inverted Output |
| 8 | GND | Ground |

Table 2. FUNCTION TABLE

| Input | Output | |
|-------|--------|----|
| | OP | ON |
| A | | |
| L | L | H |
| H | H | L |

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Table 3. MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|----------------------|--|-------------------------------|------|
| V _{DD} | Digital Supply Voltage | -0.5 to +7.0 | V |
| V _{CC} | High-Voltage Supply Voltage | -0.5 to +55.0 | V |
| V _{IN} | DC Input Voltage | -0.5 to +7.0 | V |
| V _{OUT} | DC Output Voltage | -0.5 to V _{CC} + 0.5 | V |
| I _{IK} | DC Input Diode Current V _{IN} < GND | -20 | mA |
| I _{OK} | DC Output Diode Current V _{OUT} > V _{CC} , V _{OUT} < GND | ±200 | mA |
| I _O | DC Output Source/Sink Current | ±200 | mA |
| I _{CC} | DC Supply Current Per Supply Pin | ±200 | mA |
| I _{GND} | DC Ground Current per Ground Pin | ±200 | mA |
| T _{STG} | Storage Temperature Range | -65 to +150 | °C |
| T _L | Lead Temperature, 1 mm from Case for 10 Seconds | 260 | °C |
| T _J | Junction Temperature Under Bias | 150 | °C |
| MSL | Moisture Sensitivity | Level 1 | |
| F _R | Flammability Rating Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in | |
| V _{ESD} | ESD Withstand Voltage Human Body Mode (Note 2) Charged Device Model (Note 3) | > 4 > 2 | kV |
| I _{LATCHUP} | Latchup Performance Above V _{CC} and Below GND at 125°C (Note 4) | ±100 | mA |
| SR _{VCC} | Minimum V _{CC} Rise Rate (Note 5) | 5 | µs/V |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow.
2. Tested to EIA / JESD22-A114-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA / JESD78.
5. A faster V_{CC} rise rate could damage the output of the device.

Table 4. RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|------------------|------------------------------------|-----|-----------------|------|
| V _{DD} | Digital Supply Voltage | 3.0 | 5.5 | V |
| V _{CC} | High Voltage Supply Voltage | 16 | 50 | V |
| V _{IN} | Digital Input Voltage | 0 | 5.5 | V |
| V _{OUT} | Output Voltage | 0 | V _{CC} | V |
| T _A | Operating Free-Air Temperature | -55 | +125 | °C |
| Δt / ΔV | Input Transition Rise or Fall Rate | 0 | 20 | nS/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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Table 5. DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{DD} (V) | V _{CC} (V) | T _A = 25°C | | | T _A = -55°C to +125°C | | Unit |
|----------------------|------------------------------------|---|---------------------|---------------------|-----------------------|-----------------|-----|----------------------------------|-----|------|
| | | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | | 3.0 to 5.5 | 16 to 50 | 1.7 | - | - | 1.7 | - | V |
| V _{IL} | Low-Level Input Voltage | | 3.0 to 5.5 | 16 to 50 | - | - | 0.4 | - | 0.4 | V |
| V _{OH} | High-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} , I _{OH} = -100 μA | 3.0 to 5.5 | 16 to 50 | V _{CC} - 0.5 | V _{CC} | | V _{CC} - 0.5 | | V |
| V _{OL} | Low-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} , I _{OL} = 10 mA | 3.0 to 5.5 | 16 to 50 | - | 0.04 | 0.2 | GND | 0.2 | V |
| I _{IN} | Input Leakage Current | V _{IN} = 0 to 5.5 V | 3.0 to 5.5 | 16 to 50 | - | - | ±10 | - | ±10 | μA |
| I _{DD} | Quiescent Supply Current | V _{IN} = V _{DD} or GND | 3.0 to 5.5 | 16 to 50 | - | 50 | 100 | - | 100 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{DD} or GND | 3.0 to 5.5 | 16 to 50 | - | 50 | 100 | - | 100 | μA |
| R _{ONN} | Output NMOS ON Resistance | I _{OL} = 130 mA | 3.0 to 5.5 | 16 to 50 | - | 4 | 10 | - | 10 | Ω |
| R _{ONNFLAT} | Output NMOS ON Resistance Flatness | I _{OL} = 130 mA | 3.0 to 5.5 | 16 to 50 | - | 0.4 | 2 | - | 3 | Ω |
| R _{ONP} | Output PMOS ON Resistance | I _{OH} = -100 μA | 3.0 to 5.5 | 16 to 50 | - | 60 | 200 | - | 200 | Ω |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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Table 6. AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

| Symbol | Parameter | Test Condition | V_{DD} (V) | V_{CC} (V) | $T_A = 25^\circ\text{C}$ | | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ | | Unit |
|--------------|---|----------------------------|--------------|--------------|--------------------------|-------|------|--|------|------|
| | | | | | Min | Typ | Max | Min | Max | |
| t_{PHL} | High to Low Propagation Delay, IN to OP, ON | $C_L = 1$ nF | 3.0 to 5.5 | 50 | – | 38 | 100 | – | 100 | ns |
| | | | | 48 | – | 38 | 100 | – | 100 | |
| | | | | 28 | – | 31 | 100 | – | 100 | |
| | | | | 18 | – | 28 | 100 | – | 100 | |
| | | $C_L = 10$ pF | 3.0 to 5.5 | 50 | – | 21 | 80 | – | 80 | |
| | | | | 48 | – | 21 | 80 | – | 80 | |
| | | | | 28 | – | 21 | 80 | – | 80 | |
| | | | | 18 | – | 20 | 80 | – | 80 | |
| t_{PLH} | Low to High Propagation Delay, IN to OP, ON | $C_L = 1$ nF | 3.0 to 5.5 | 50 | – | 159 | 400 | – | 400 | ns |
| | | | | 48 | – | 159 | 400 | – | 400 | |
| | | | | 28 | – | 95 | 400 | – | 400 | |
| | | | | 18 | – | 69 | 400 | – | 400 | |
| | | $C_L = 10$ pF | 3.0 to 5.5 | 50 | – | 16 | 60 | – | 60 | |
| | | | | 48 | – | 16 | 60 | – | 60 | |
| | | | | 28 | – | 13 | 60 | – | 60 | |
| | | | | 18 | – | 12 | 60 | – | 60 | |
| t_F | Output Fall Time | $C_L = 1$ nF | 3.0 to 5.5 | 50 | – | 28.5 | 100 | – | 100 | ns |
| | | | | 48 | – | 28.5 | 100 | – | 100 | |
| | | | | 28 | – | 19.3 | 100 | – | 100 | |
| | | | | 18 | – | 14.5 | 100 | – | 100 | |
| | | $C_L = 10$ pF | 3.0 to 5.5 | 50 | – | 4.1 | 50 | – | 50 | |
| | | | | 48 | – | 4.1 | 50 | – | 50 | |
| | | | | 28 | – | 3.0 | 50 | – | 50 | |
| | | | | 18 | – | 2.1 | 50 | – | 50 | |
| t_R | Output Rise Time | $C_L = 1$ nF | 3.0 to 5.5 | 50 | – | 285.7 | 1000 | – | 1000 | ns |
| | | | | 48 | – | 285.7 | 1000 | – | 1000 | |
| | | | | 28 | – | 182.6 | 1000 | – | 1000 | |
| | | | | 18 | – | 144.4 | 1000 | – | 1000 | |
| | | $C_L = 10$ pF | 3.0 to 5.5 | 50 | – | 8.6 | 50 | – | 50 | |
| | | | | 48 | – | 8.6 | 50 | – | 50 | |
| | | | | 28 | – | 5.1 | 50 | – | 50 | |
| | | | | 18 | – | 4.4 | 50 | – | 50 | |
| I_{DD-DYN} | Dynamic Current at V_{DD} | $f = 100$ kHz; ON, OP open | 3.0 to 5.5 | 16 to 50 | | 0.1 | 0.2 | | 0.2 | mA |
| I_{CC-DYN} | Dynamic Current at V_{CC} | $f = 100$ kHz; ON, OP open | 3.0 to 5.5 | 16 to 50 | | 0.5 | 1.0 | | 1.0 | mA |
| f | Maximum Input Frequency | ON, OP open | 3.0 to 5.5 | 16 to 50 | 2 | | | 2 | | MHz |

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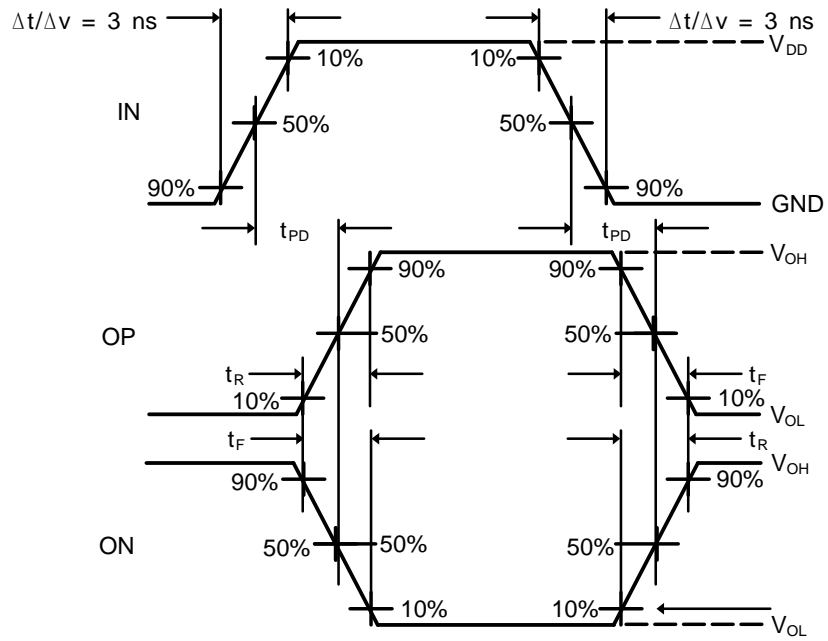


Figure 2. Switching Waveforms

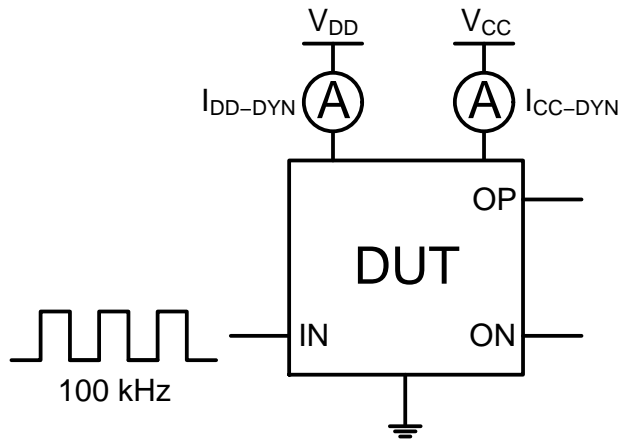


Figure 3. Test Set-up for Dynamic Current

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

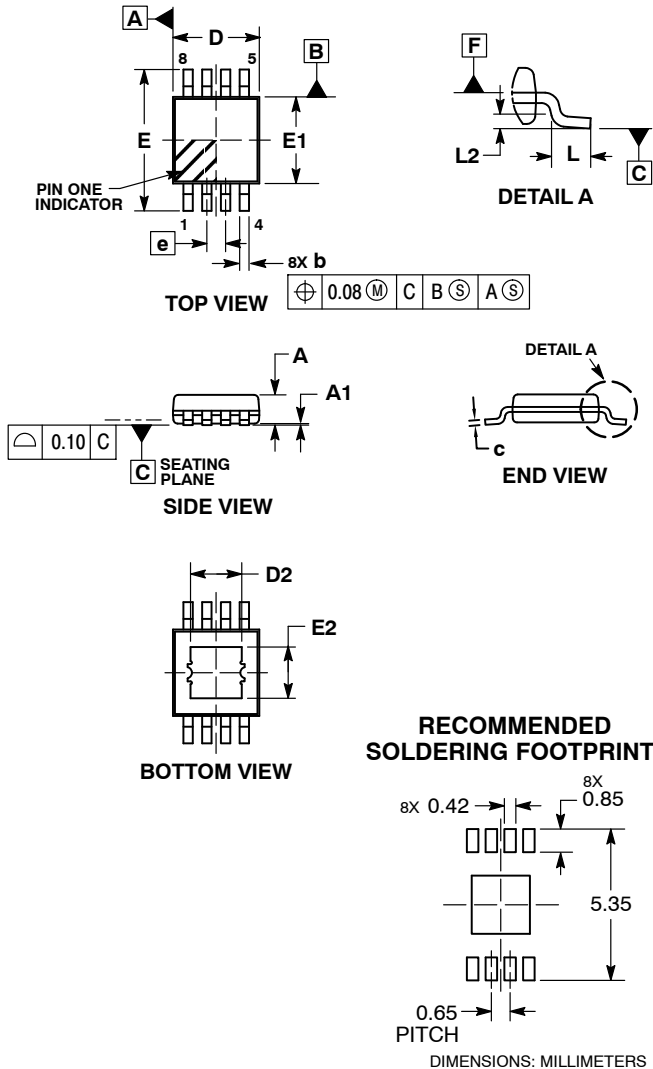
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SCALE 1:1

MSOP8 EP, 3x3
CASE 846AM
ISSUE O

DATE 27 FEB 2014

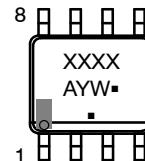


NOTES:

1. DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.10 MM IN EXCESS OF MAXIMUM MATERIAL CONDITION.
4. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 MM PER SIDE. DIMENSION E DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 MM PER SIDE. DIMENSIONS D AND E ARE DETERMINED AT DATUM F.
5. DATUMS A AND B TO BE DETERMINED AT DATUM F.
6. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS | |
|-----|-------------|------|
| | MIN | MAX |
| A | --- | 1.10 |
| A1 | 0.05 | 0.15 |
| b | 0.25 | 0.40 |
| c | 0.13 | 0.23 |
| D | 2.90 | 3.10 |
| D2 | 1.78 | REF |
| E | 4.75 | 5.05 |
| E1 | 2.90 | 3.10 |
| E2 | 1.42 | REF |
| e | 0.65 | BSC |
| L | 0.40 | 0.70 |
| L2 | 0.254 | BSC |

GENERIC MARKING DIAGRAM*



- XXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)
*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "▪", may or may not be present and may be in either location.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

| | | |
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