

# 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  $\Omega$  Max
  - PMOS = 200  $\Omega$  Max
- High output DC current:  $I_{OL} \geq 130$  mA
- Max input frequency: 2 MHz minimum
- Low Static Current:  $I_{DDmax}$ ,  $I_{CCmax} = 100$   $\mu$ 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



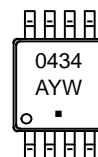
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### MARKING DIAGRAM



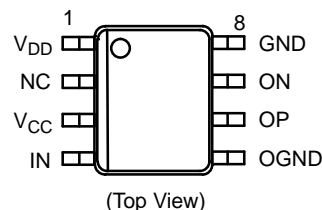
**MSOP-8  
Z SUFFIX  
CASE 846AM**



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.

# NLHV1T0434

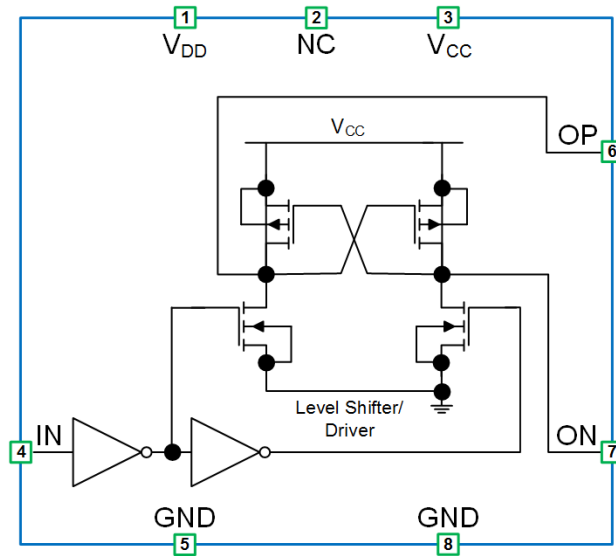


Figure 1. Block Diagram

Table 1. PIN ASSIGNMENT

Pin	Pin Name	Description
1	V <sub>DD</sub>	Digital Power Supply
2	NC	No Connect
3	V <sub>CC</sub>	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	
A	OP	ON
L	L	H
H	H	L

**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	Digital Supply Voltage	−0.5 to +7.0	V
V <sub>CC</sub>	High-Voltage Supply Voltage	−0.5 to +55.0	V
V <sub>IN</sub>	DC Input Voltage	−0.5 to +7.0	V
V <sub>OUT</sub>	DC Output Voltage	−0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current V <sub>IN</sub> < GND	−20	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>OUT</sub> > V <sub>CC</sub> , V <sub>OUT</sub> < GND	±200	mA
I <sub>O</sub>	DC Output Source/Sink Current	±200	mA
I <sub>CC</sub>	DC Supply Current Per Supply Pin	±200	mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	±200	mA
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: 28 to 34	UL 94 V−0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage Human Body Mode (Note 2) Charged Device Model (Note 3)	> 4 > 2	kV
I <sub>LATCHUP</sub>	Latchup Performance Above V <sub>CC</sub> and Below GND at 125°C (Note 4)	±100	mA
SR <sub>VCC</sub>	Minimum V <sub>CC</sub> 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<sub>CC</sub> rise rate could damage the output of the device.

**Table 4. RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>DD</sub>	Digital Supply Voltage	3.0	5.5	V
V <sub>CC</sub>	High Voltage Supply Voltage	16	50	V
V <sub>IN</sub>	Digital Input Voltage	0	5.5	V
V <sub>OUT</sub>	Output Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	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.

Table 5. DC ELECTRICAL CHARACTERISTICS

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

# NLHV1T0434

**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

## NLHV1T0434

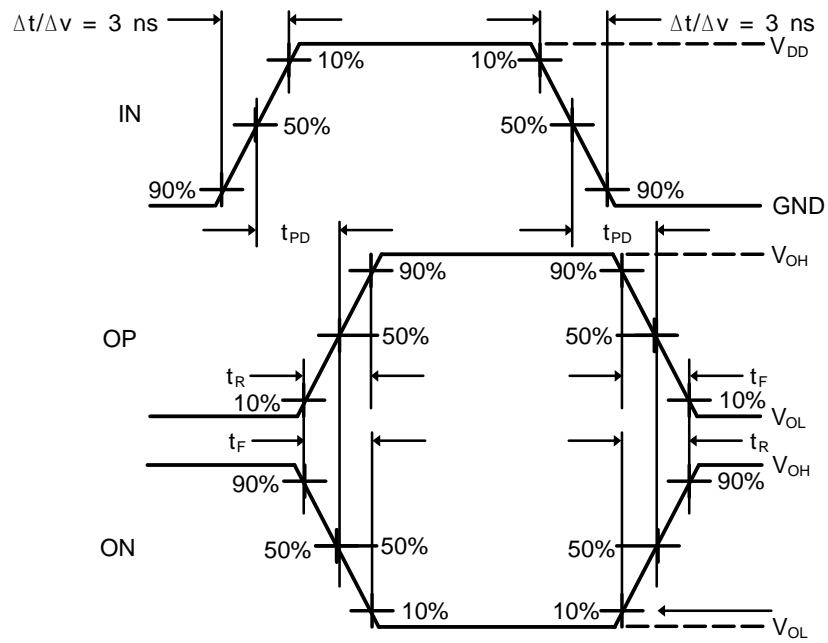


Figure 2. Switching Waveforms

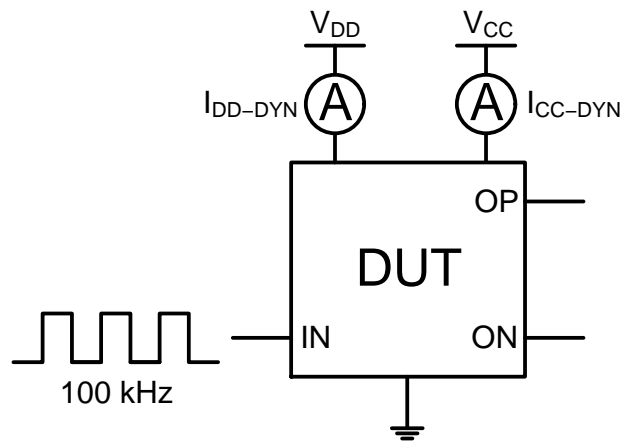
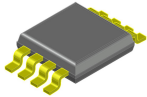
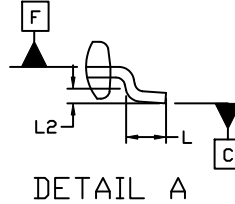
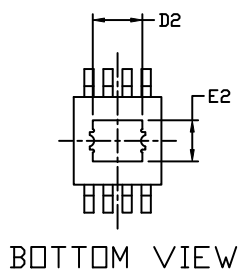
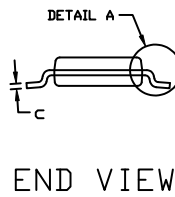
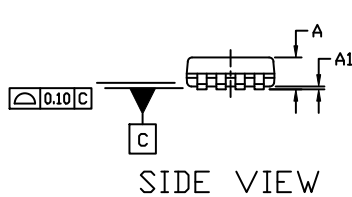
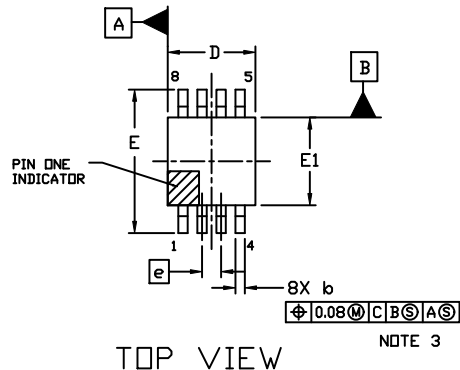


Figure 3. Test Set-up for Dynamic Current


**MSOP8 EP, 3x3**  
**CASE 846AM**  
**ISSUE B**

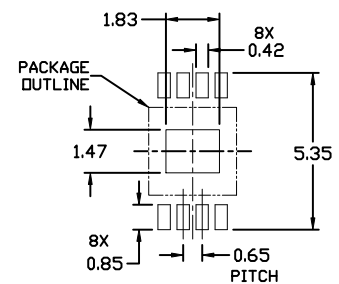
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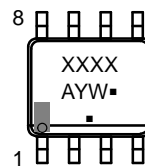
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE 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 ARE 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	1.73	1.83
E	4.75	5.05
E1	2.90	3.10
E2	1.37	1.47
e	0.65 BSC	
L	0.40	0.70
L2	0.254 BSC	



\* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**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. Some products may not follow the Generic Marking.

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