# onsemi

# 8-Input Data Selector/ Multiplexer with 3-State Outputs

# High-Performance Silicon-Gate CMOS

# **MC74HC251A**

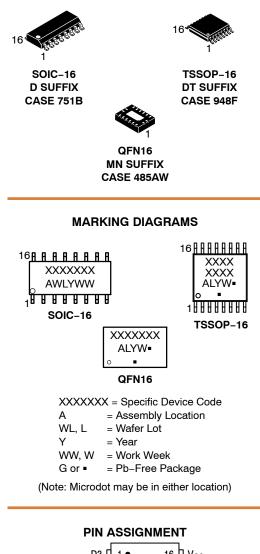
The MC74HC251 is identical in pinout to the LS251. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

This device selects one of the eight binary Data Inputs, as determined by the Address Inputs. The Output Enable pin must be a low level for the selected data to appear at the outputs. If Output Enable is high, both the Y and the  $\overline{Y}$  outputs are in the high-impedance state. This 3-state feature allows the HC251 to be used in bus-oriented systems.

The HC251 is similar in function to the HC251 which does not have 3-state outputs.

# Features

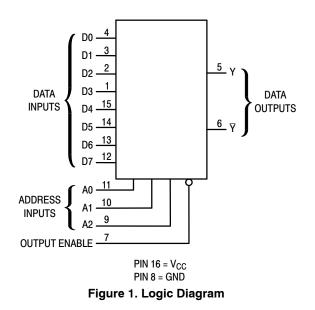
- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μA
- High Noise Immunity Characteristic of CMOS Devices
- –Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



D3 [	1●	16	] v <sub>cc</sub>
D2 [	2	15	] D4
D1 [	3	14	] D5
D0 [	4	13	] D6
ΥC	5	12	] D7
ΥC	6	11	] A0
	7	10	] A1
GND [	8	9	] A2

# **ORDERING INFORMATION**

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.



# MAXIMUM RATINGS

#### **FUNCTION TABLE**

	Inputs				outs
A2	A2 A1 A0 Output Enabled		Y	¥	
X L L L H H H H H	X L L H H L L H H	X L H L H L H L H	H L L L L L L	Z D0 D1 D2 D3 D4 D5 D6 D7	Z D0 D1 D2 D3 D4 D5 D6 D7

Z = high impedance

D0, D1, ..., D7 = the level of the respective D input.

Symbol	Parameter		Value	Unit
V <sub>CC</sub>	DC Supply Voltage		–0.5 to +6.5	V
V <sub>IN</sub>	DC Input Voltage		–0.5 to V <sub>CC</sub> +0.5	V
V <sub>OUT</sub>	DC Output Voltage		–0.5 to V <sub>CC</sub> +0.5	V
I <sub>IN</sub>	DC Input Diode Current, per Pin		±20	mA
I <sub>OUT</sub>	DC Input Diode Current, Per Pin		±25	mA
I <sub>CC</sub>	DC Supply Current, V <sub>CC</sub> and GND Pins		±50	mA
I <sub>IK</sub>	Input Clamp Current ( $V_{IN} < 0$ or $V_{IN} > V_{CC}$ )		±20	mA
Ι <sub>ΟΚ</sub>	Output Clamp Current (V <sub>OUT</sub> < 0 or V <sub>OUT</sub> > V <sub>CC</sub> )		±20	mA
T <sub>STG</sub>	Storage Temperature Range		–65 to +150	°C
ΤL	Lead Temperature, 1 mm from Case for 10 secs		260	°C
TJ	Junction Temperature Under Bias		+150	°C
$\theta_{JA}$	Thermal Resistance (Note 1)	SOIC-16 QFN16 TSSOP-16	126 118 159	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 25°C	SOIC-16 QFN16 TSSOP-16	995 1062 787	mW
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 (Note 2)	Human Body Model Charged Device Model	2000 N/A	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality Measured with minimum pad spacing on an FR4 board, using 76mm-by-114mm, 2-ounce copper trace no air flow per JESD51-7.
HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A

(Machine Model) be discontinued.

## **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage	2.0	6.0	V
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Note 3)	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, All Package Types	55	+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time $V_{CC} = 2.0 \text{ V} \\ V_{CC} = 4.5 \text{ V} \\ V_{CC} = 6.0 \text{ V} $	0	1000 500 400	ns

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.

3. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

				Gu	aranteed Li	mit	
Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	- 55 to 25°C	≤ 85°C	≤ 125°C	Unit
V <sub>IH</sub>	Minimum High-Level Input Voltage	$\begin{array}{l} V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V} \\  I_{out}  \leq 20 \ \mu\text{A} \end{array}$	2.0 4.5 6.0	1.5 3.15 4.2	1.5 3.15 4.2	1.5 3.15 4.2	V
V <sub>IL</sub>	Maximum Low-Level Input Voltage	$\begin{array}{l} V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V} \\  I_{out}   \leq  20 \; \mu\text{A} \end{array}$	2.0 4.5 6.0	0.3 0.9 1.2	0.3 0.9 1.2	0.3 0.9 1.2	V
V <sub>OH</sub>	Minimum High-Level Output Voltage		2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
		$\begin{array}{ll} V_{in} = V_{IH} \text{ or } V_{IL} & \left I_{out}\right  \leq 4.0 \text{ mA} \\ \left I_{out}\right  \leq 5.2 \text{ mA} \end{array}$	4.5 6.0	3.98 5.48	3.84 5.34	3.70 5.20	
V <sub>OL</sub>	Maximum Low-Level Output Voltage		2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	~
		$\begin{array}{ll} V_{in} = V_{IH} \text{ or } V_{IL} & \left  I_{out} \right  \leq 4.0 \text{ mA} \\ \left  I_{out} \right  \leq 5.2 \text{ mA} \end{array}$	4.5 6.0	0.26 0.26	0.33 0.33	0.40 0.40	
l <sub>in</sub>	Maximum Input Leakage Current	V <sub>in</sub> = V <sub>CC</sub> or GND	6.0	± 0.1	±1.0	± 1.0	μΑ
I <sub>OZ</sub>	Maximum Three-State Leakage Current	Output in High–Impedance State $V_{in} = V_{IL} \text{ or } V_{IH}$ $V_{out} = V_{CC} \text{ or GND}$	6.0	± 0.5	±5.0	± 10	μΑ
ICC	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC}$ or GND $I_{out} = 0 \ \mu A$	6.0	8	80	160	μΑ

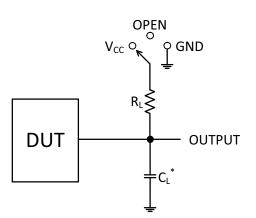
### DC ELECTRICAL CHARACTERISTICS

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.

## AC ELECTRICAL CHARACTERISTICS

			Guaranteed Limit			
Symbol	Parameter	V <sub>CC</sub> V	– 55 to 25°C	≤ 85°C	≤ 125°C	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Input D to Output Y or Y (Figures 2, 3, 4)	2.0 4.5 6.0	185 37 31	230 46 39	280 56 48	ns
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Input A to Output Y or ▼ (Figures 2, 5)	2.0 4.5 6.0	205 41 35	255 51 43	310 62 53	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Output Y (Figures 5, 7)	2.0 4.5 6.0	195 39 33	245 49 42	295 59 50	ns
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Output Y (Figures 2, 6)	2.0 4.5 6.0	145 29 25	180 36 31	220 44 38	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Output ▼ (Figures 2, 6)	2.0 4.5 6.0	220 44 37	275 55 47	330 66 56	ns
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Output ₹ (Figures 2, 6)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, Any Output (Figures 2, 3, 4)	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	ns
C <sub>in</sub>	Maximum Input Capacitance	-	10	10	10	pF
C <sub>out</sub>	Maximum Three-State Output Capacitance (Output in High-Impedance State)	-	15	15	15	pF

		Typical @ 25°C, V <sub>CC</sub> = 5.0 V	
C <sub>PD</sub>	Power Dissipation Capacitance (Per Package)	36	pF



Test	Switch Position	CL	RL
t <sub>PLH</sub> / t <sub>PHL</sub>	Open	50 pF	1 k $\Omega$
t <sub>PLZ</sub> / t <sub>PZL</sub>	V <sub>CC</sub>		
t <sub>PHZ</sub> / t <sub>PZH</sub>	GND		

\*C<sub>L</sub> Includes probe and jig capacitance

Figure 2. Test Circuit

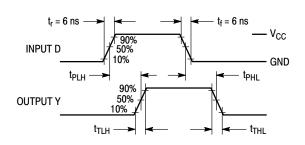
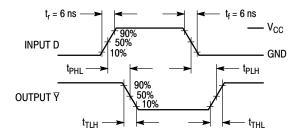


Figure 3.







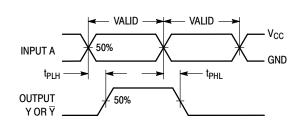


Figure 5.

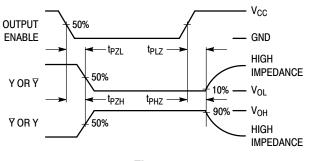


Figure 6.

# **PIN DESCRIPTIONS**

# ADDRESS INPUTS

# A0, A1, A2 (Pins 1, 2, 3)

Address inputs. These inputs, when the chip is selected, determine which of the eight outputs is active–low.

# CONTROL INPUTS

# CS1, CS2, CS3 (Pins 6, 4, 5)

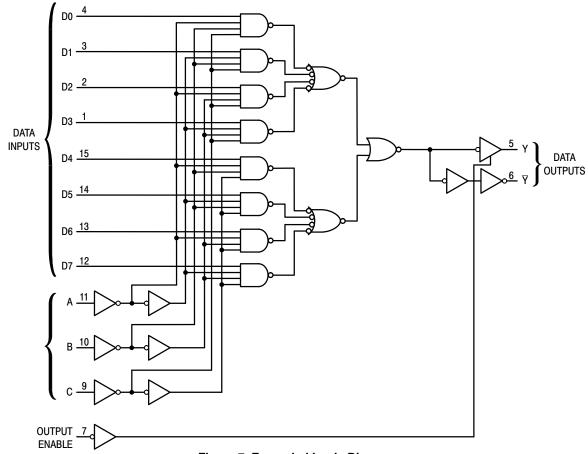
Chip select inputs. For CS1 at a high level and CS2, CS3 at a low level, the chip is selected and the outputs follow the

Address inputs. For any other combination of CS1, CS2, and CS3, the outputs are at a logic low.

# OUTPUTS

# Y0 - Y7 (Pins 15, 14, 13, 12, 11, 10, 9, 7)

Active-high Decoded outputs. These outputs assume a high level when addressed and the chip is selected. These outputs remain low when not addressed or the chip is not selected.





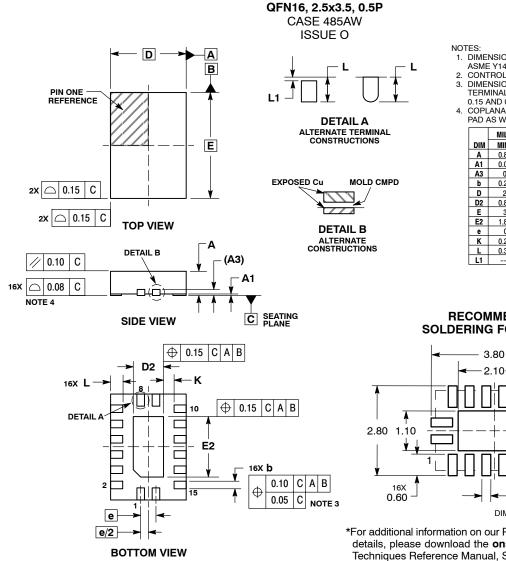
### **ORDERING INFORMATION**

Device	Marking	Package	Shipping <sup>†</sup>
MC74HC251ADG	HC251AG	SOIC-16	48 Units / Rail
MC74HC251ADR2G	HC251AG	SOIC-16	2500 Units / Tape & Reel
MC74HC251ADR2G-Q*	HC251AG	SOIC-16	2500 Units / Tape & Reel
MC74HC251ADTG	HC 251A	TSSOP-16	96 Units / Rail
MC74HC251ADTR2G	HC 251A	TSSOP-16	2500 Units / Tape & Reel

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

\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

## PACKAGE DIMENSIONS

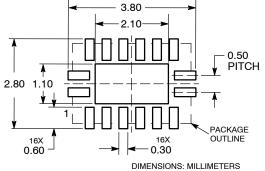


NOTES: 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. 2. CONTROLLING DIMENSION: MILLIMETERS.

- CONTROLLING DIMENSION: MILLIMETERS. DIMENSIONS & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS				
DIM	MIN	MAX			
Α	0.80	1.00			
A1	0.00	0.05			
A3	0.20 REF				
b	0.20	0.30			
D	2.50	BSC			
D2	0.85	1.15			
Е	3.50	BSC			
E2	1.85	2.15			
е	0.50	BSC			
K	0.20				
L	0.35	0.45			
L1		0 15			

#### RECOMMENDED SOLDERING FOOTPRINT\*



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



MILLIMETERS

NOM

1.55

0.18

1.37

0.42

0.22

9.90 BSC

MIN

1.35

0.10

1.25

0.35

0.19

DIM

А

Α1

A2

b

С

D

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#### DATE 18 OCT 2024

MAX

1.75

0.25

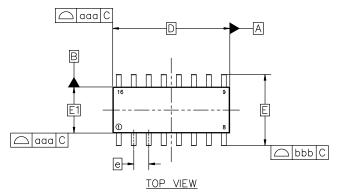
1.50

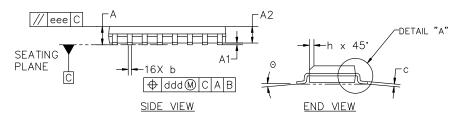
0.49

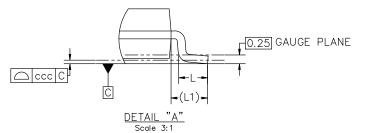
0.25

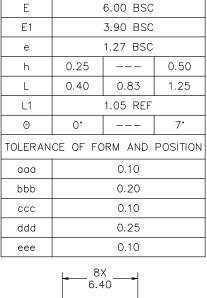
NOTES:

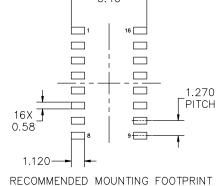
- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
- 2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
- 3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
- 4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
- DIMENSION & DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm TOTAL IN EXCESS OF THE & DIMENSION AT MAXIMUM MATERIAL CONDITION.











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

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DESCRIPTION:	SOIC-16 9.90X3.90X1.37 1.27P		PAGE 1 OF 2	

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#### SOIC-16 9.90x3.90x1.37 1.27P CASE 751B ISSUE M

#### DATE 18 OCT 2024

## GENERIC MARKING DIAGRAM\*

16	A	H	A.	- A	- A	A	A.	Æ
		XX)						
		XX	XX	XX	XX	XX)	ΧX	x
	0			NĽ				
1	H	H	Н	Н	Н	Н	Н	Ъ

XXXXX = Specific Device Code

A = Assembly Location

- WL = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

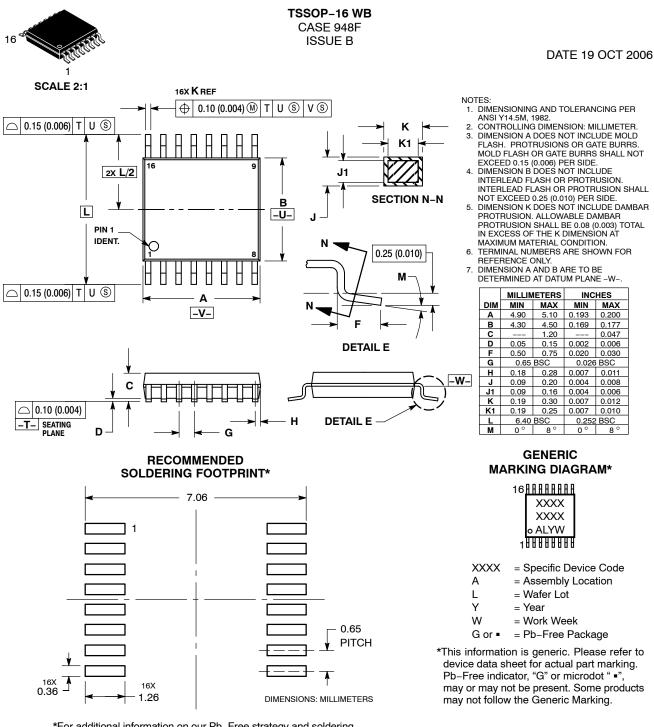
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:		STYLE 2:		STYLE 3:	c	STYLE 4:	
PIN 1.	COLLECTOR	PIN 1.	CATHODE	PIN 1.	COLLECTOR, DYE #1	PIN 1.	COLLECTOR, DYE #1
2.		2.	ANODE	2.	BASE, #1	2.	,
3.	EMITTER	3.	NO CONNECTION	3.	EMITTER, #1	3.	
4.	NO CONNECTION	4.	CATHODE	4.	COLLECTOR, #1	4.	,
	EMITTER		CATHODE		COLLECTOR, #2		COLLECTOR, #3
5. 6.		5. 6.	NO CONNECTION	5. 6.	BASE. #2	5. 6.	COLLECTOR, #3
0. 7.		0. 7.		7.	- ,	7.	
8.		8.	CATHODE	8.		8.	,
	BASE	9.	CATHODE		COLLECTOR, #2	9.	,
10.	EMITTER	•.	ANODE		BASE, #3	10.	- ,
	NO CONNECTION	11.	NO CONNECTION		EMITTER, #3	11.	
	EMITTER	12.	CATHODE		COLLECTOR, #3	12.	
	BASE	13.	CATHODE	13.		13.	, .
14.		14.	NO CONNECTION		BASE, #4	14.	
15.	EMITTER	15.	ANODE	15.		15.	BASE, #1
16.		16.	CATHODE	16.		16.	EMITTER, #1
STYLE 5:		STYLE 6:		STYLE 7:			
STYLE 5: PIN 1.	DRAIN, DYE #1	STYLE 6: PIN 1.	CATHODE	STYLE 7: PIN 1.	SOURCE N-CH		
	DRAIN, DYE #1 DRAIN, #1		CATHODE CATHODE	••••	SOURCE N-CH COMMON DRAIN (OUTPUT)	1	
PIN 1.	,	PIN 1.		PIN 1.			
PIN 1. 2.	DRAIN, #1	PIN 1. 2.	CATHODE	PIN 1. 2.	COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT		
PIN 1. 2. 3.	DRAIN, #1 DRAIN, #2	PIN 1. 2. 3.	CATHODE CATHODE	PIN 1. 2. 3.	COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT		
PIN 1. 2. 3. 4.	DRAIN, #1 DRAIN, #2 DRAIN, #2	PIN 1. 2. 3. 4.	CATHODE CATHODE CATHODE	PIN 1. 2. 3. 4.	COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) GATE P-CH		
PIN 1. 2. 3. 4. 5.	DRAIN, #1 DRAIN, #2 DRAIN, #2 DRAIN, #3	PIN 1. 2. 3. 4. 5.	CATHODE CATHODE CATHODE CATHODE CATHODE	PIN 1. 2. 3. 4. 5.	COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT GATE P-CH COMMON DRAIN (OUTPUT		
PIN 1. 2. 3. 4. 5. 6.	DRAIN, #1 DRAIN, #2 DRAIN, #2 DRAIN, #3 DRAIN, #3	PIN 1. 2. 3. 4. 5. 6.	CATHODE CATHODE CATHODE CATHODE CATHODE	PIN 1. 2. 3. 4. 5. 6.	COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT GATE P-CH COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT		
PIN 1. 2. 3. 4. 5. 6. 7.	DRAIN, #1 DRAIN, #2 DRAIN, #2 DRAIN, #3 DRAIN, #3 DRAIN, #4 DRAIN, #4	PIN 1. 2. 3. 4. 5. 6. 7.	CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE	PIN 1. 2. 3. 4. 5. 6. 7.	COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT GATE P-CH COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT		
PIN 1. 2. 3. 4. 5. 6. 7. 8.	DRAIN, #1 DRAIN, #2 DRAIN, #2 DRAIN, #3 DRAIN, #4 DRAIN, #4	PIN 1. 2. 3. 4. 5. 6. 7. 8. 9.	CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE	PIN 1. 2. 3. 4. 5. 6. 7. 8.	COMMON DRAIN (OUTPUT, COMMON DRAIN (OUTPUT, GATE P-CH COMMON DRAIN (OUTPUT, COMMON DRAIN (OUTPUT, COMMON DRAIN (OUTPUT, SOURCE P-CH SOURCE P-CH		
PIN 1. 2. 3. 4. 5. 6. 7. 8. 9.	DRAIN, #1 DRAIN, #2 DRAIN, #2 DRAIN, #3 DRAIN, #3 DRAIN, #4 DRAIN, #4 GATE, #4	PIN 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE ANODE	PIN 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	COMMON DRAIN (OUTPUT, COMMON DRAIN (OUTPUT) GATE P-CH COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) SOURCE P-CH SOURCE P-CH		
PIN 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	DRAIN, #1 DRAIN, #2 DRAIN, #2 DRAIN, #3 DRAIN, #3 DRAIN, #4 DRAIN, #4 GATE, #4 SOURCE, #4 GATE, #3	PIN 1. 2. 3. 4. 5. 6. 7. 8. 9. 9. 10.	CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE CATHODE ANODE ANODE	PIN 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT GATE P-CH COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT SOURCE P-CH SOURCE P-CH COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT COMMON DRAIN (OUTPUT		
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