MC1413, MC1413B, NCV1413B

High Voltage, High Current Darlington Transistor Arrays

The seven NPN Darlington connected transistors in these arrays are well suited for driving lamps, relays, or printer hammers in a variety of industrial and consumer applications. Their high breakdown voltage and internal suppression diodes insure freedom from problems associated with inductive loads. Peak inrush currents to 500 mA permit them to drive incandescent lamps.

The MC1413, B with a 2.7 kΩ series input resistor is well suited for systems utilizing a 5.0 V TTL or CMOS Logic.

Features

- Pb−Free Packages are Available*
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes

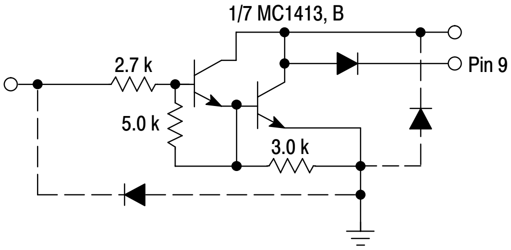
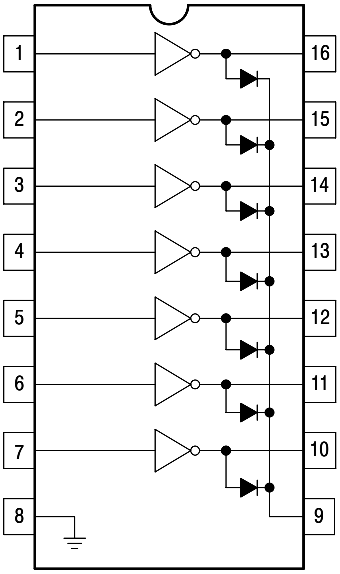


Figure 1. Representative Schematic Diagram



(Top View)

Figure 2. PIN CONNECTIONS

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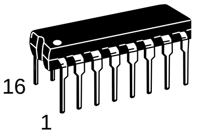
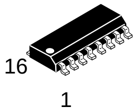
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor®

http://onsemi.com



PDIP−16
P SUFFIX
CASE 648



SOIC−16
D SUFFIX
CASE 751B

ORDERING INFORMATION

Device	Package	Shipping†
MC1413D	SOIC−16	48 Units/Rail
MC1413DG	SOIC−16 (Pb−Free)	48 Units/Tube
MC1413DR2	SOIC−16	2500 Tape & Reel
MC1413DR2G	SOIC−16 (Pb−Free)	2500 Tape & Reel
MC1413P	PDIP−16	25 Units/Rail
MC1413PG	PDIP−16 (Pb−Free)	25 Units/Rail
MC1413BD	SOIC−16	48 Units/Rail
MC1413BDG	SOIC−16 (Pb−Free)	48 Units/Rail
MC1413BDR2	SOIC−16	2500 Tape & Reel
MC1413BDR2G	SOIC−16 (Pb−Free)	2500 Tape & Reel
MC1413BP	PDIP−16	25 Units/Rail
MC1413BPG	PDIP−16 (Pb−Free)	25 Units/Rail
NCV1413BDR2	SOIC−16	2500 Tape & Reel
NCV1413BDR2G	SOIC−16 (Pb−Free)	2500 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.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 5 of this data sheet.

July, 2006 − Rev. 8

MAXIMUM RATINGS (T_A = 25°C, and rating apply to any one device in the package, unless otherwise noted.)

Rating	Symbol	Value	Unit
Output Voltage	V_O	50	V
Input Voltage	V_I	30	V
Collector Current − Continuous	I_C	500	mA
Base Current − Continuous	I_B	25	mA
Operating Ambient Temperature Range	T_A		°C
MC1413		−20 to +85	
MC1413B		−40 to +85	
NCV1413B		−40 to +125	
Storage Temperature Range	T_{stg}	−55 to +150	°C
Junction Temperature	T_J	150	°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$		°C/W
Case 648, P Suffix		67	
Case 751B, D Suffix		100	
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$		°C/W
Case 648, P Suffix		22	
Case 751B, D Suffix		20	
Electrostatic Discharge Sensitivity (ESD)	ESD		V
Human Body Model (HBM)		2000	
Machine Model (MM)		400	
Charged Device Model (CDM)		1500	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Output Leakage Current		I_{CEX}				μA
(V_O = 50 V, T_A = +85°C)	All Types		−	−	100	
(V_O = 50 V, T_A = +25°C)	All Types		−	−	50	
Collector−Emitter Saturation Voltage		$V_{CE(sat)}$				V
(I_C = 350 mA, I_B = 500 μA)	All Types		−	1.1	1.6	
(I_C = 200 mA, I_B = 350 μA)	All Types		−	0.95	1.3	
(I_C = 100 mA, I_B = 250 μA)	All Types		−	0.85	1.1	
Input Current − On Condition		$I_{I(on)}$				mA
(V_I = 3.85 V)	MC1413, B		−	0.93	1.35	
Input Voltage − On Condition		$V_{I(on)}$				V
(V_{CE} = 2.0 V, I_C = 200 mA)	MC1413, B		−	−	2.4	
(V_{CE} = 2.0 V, I_C = 250 mA)	MC1413, B		−	−	2.7	
(V_{CE} = 2.0 V, I_C = 300 mA)	MC1413, B		−	−	3.0	
Input Current − Off Condition (I_C = 500 μA, T_A = 85°C)	All Types	$I_{I(off)}$	50	100	−	μA
DC Current Gain (V_{CE} = 2.0 V, I_C = 350 mA)		h_{FE}	1000	−	−	−
Input Capacitance		C_I	−	15	30	pF
Turn−On Delay Time (50% E_I to 50% E_O)		t_{on}	−	0.25	1.0	μs
Turn−Off Delay Time (50% E_I to 50% E_O)		t_{off}	−	0.25	1.0	μs
Clamp Diode Leakage Current	T_A = +25°C	I_R	−	−	50	μA
(V_R = 50 V)	T_A = +85°C		−	−	100	
Clamp Diode Forward Voltage (I_F = 350 mA)		V_F	−	1.5	2.0	V

NOTE: NCV1413B T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

TYPICAL PERFORMANCE CURVES − T_A = 25°C

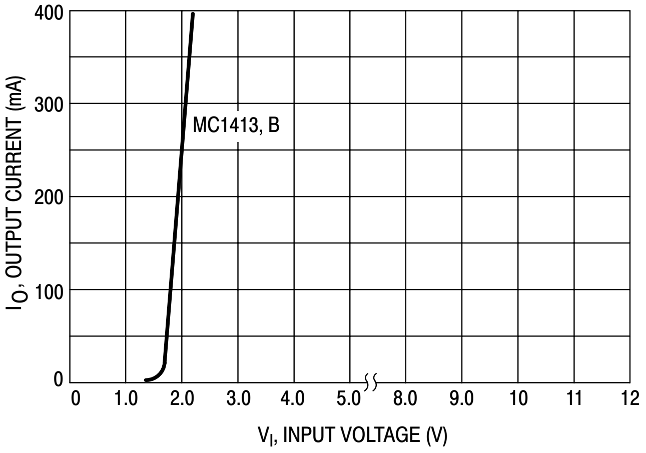


Figure 3. Output Current versus Input Voltage

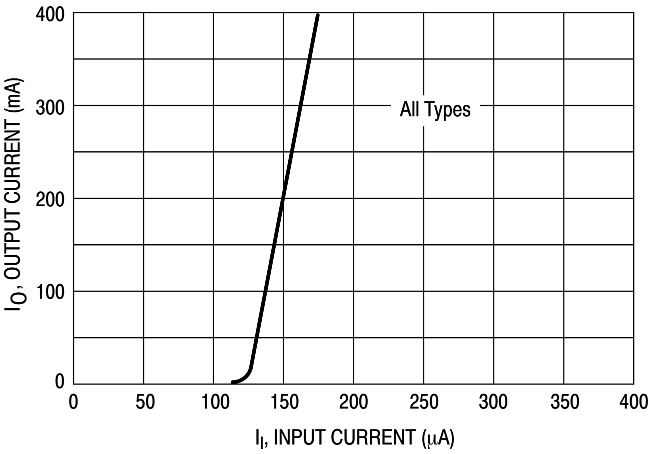


Figure 4. Output Current versus Input Current

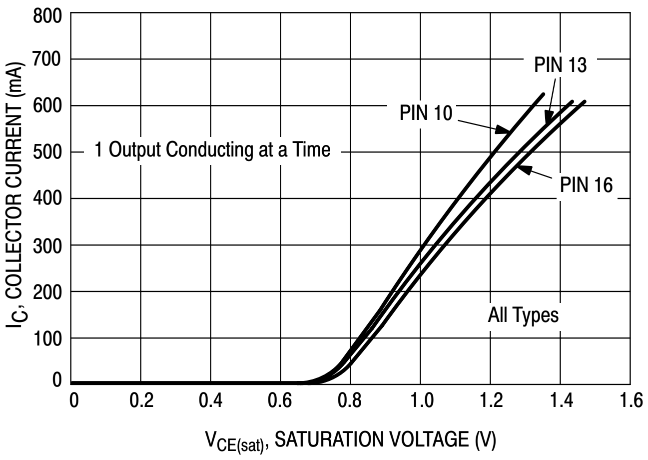


Figure 5. Typical Output Characteristics

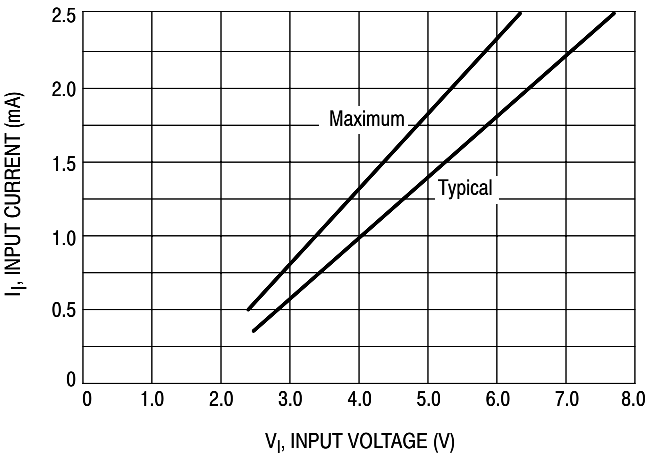


Figure 6. Input Characteristics − MC1413, B

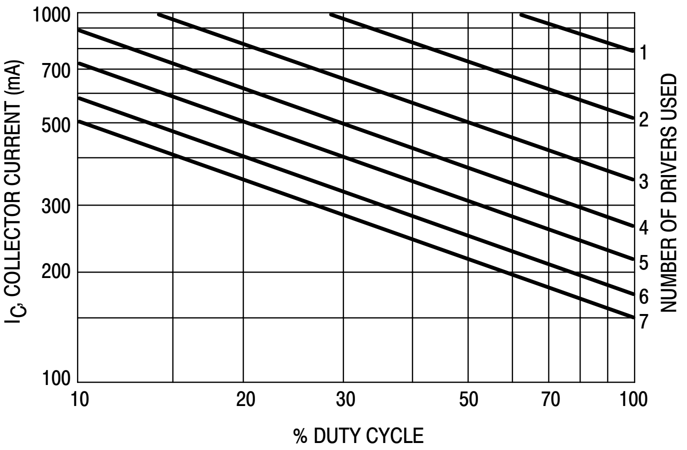
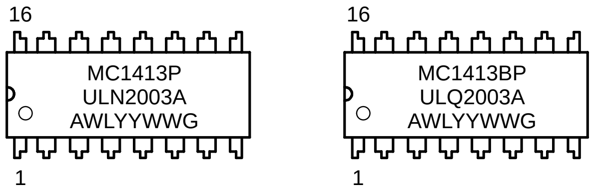


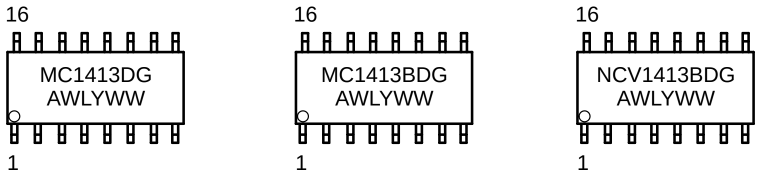
Figure 7. Maximum Collector Current versus Duty Cycle (and Number of Drivers in Use)

MARKING DIAGRAMS

PDIP−16
P SUFFIX
CASE 648

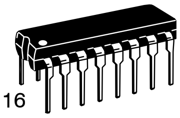


SOIC−16
D SUFFIX
CASE 751B



A = Assembly Location
WL = Wafer Lot
YY, Y = Year
WW = Work Week
G = Pb−Free Package

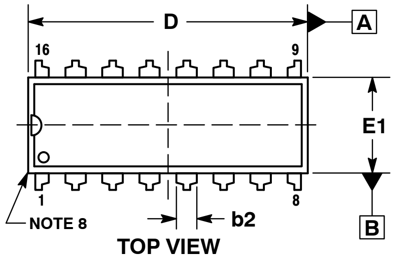
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



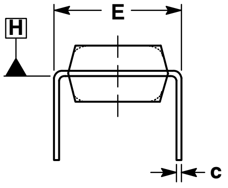
SCALE 1:1

PDIP−16
CASE 648−08
ISSUE V

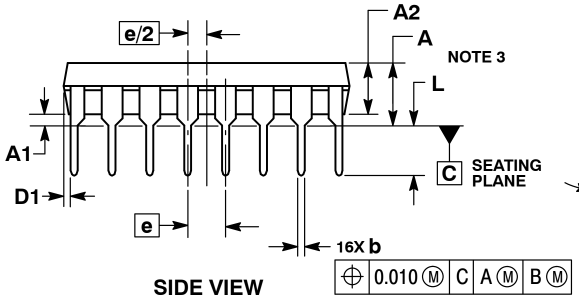
DATE 22 APR 2015



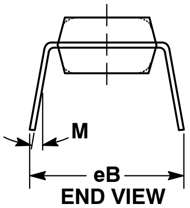
TOP VIEW



END VIEW
WITH LEADS CONSTRAINED
NOTE 5



SIDE VIEW



END VIEW
NOTE 6

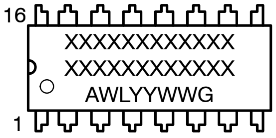
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS−3.
4. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 0.10 INCH.
5. DIMENSION E IS MEASURED AT A POINT 0.015 BELOW DATUM PLANE H WITH THE LEADS CONSTRAINED PERPENDICULAR TO DATUM C.
6. DIMENSION eB IS MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
7. DATUM PLANE H IS COINCIDENT WITH THE BOTTOM OF THE LEADS, WHERE THE LEADS EXIT THE BODY.
8. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	----	0.210	---	5.33
A1	0.015	----	0.38	---
A2	0.115	0.195	2.92	4.95
b	0.014	0.022	0.35	0.56
b2	0.060 TYP		1.52 TYP	
C	0.008	0.014	0.20	0.36
D	0.735	0.775	18.67	19.69
D1	0.005	----	0.13	---
E	0.300	0.325	7.62	8.26
E1	0.240	0.280	6.10	7.11
e	0.100 BSC		2.54 BSC	
eB	----	0.430	---	10.92
L	0.115	0.150	2.92	3.81
M	----	10°	---	10°

STYLE 1:
PIN 1. CATHODE
2. CATHODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE
7. CATHODE
8. CATHODE
9. ANODE
10. ANODE
11. ANODE
12. ANODE
13. ANODE
14. ANODE
15. ANODE
16. ANODE

STYLE 2:
PIN 1. COMMON DRAIN
2. COMMON DRAIN
3. COMMON DRAIN
4. COMMON DRAIN
5. COMMON DRAIN
6. COMMON DRAIN
7. COMMON DRAIN
8. COMMON DRAIN
9. GATE
10. SOURCE
11. GATE
12. SOURCE
13. GATE
14. SOURCE
15. GATE
16. SOURCE

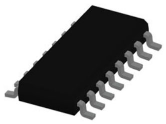
GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
YY = 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.

DOCUMENT NUMBER:	**98ASB42431B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**PDIP−16**	**PAGE 1 OF 1**



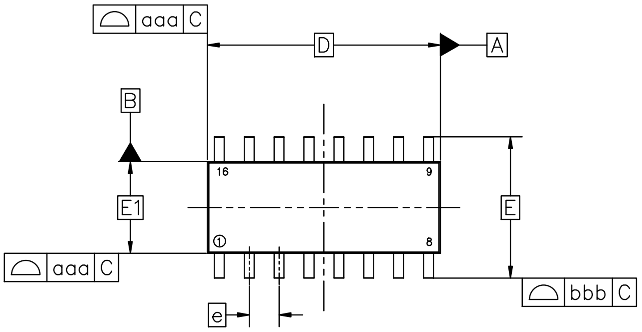
SOIC−16 9.90x3.90x1.50 1.27P
CASE 751B
ISSUE L

DATE 29 MAY 2024

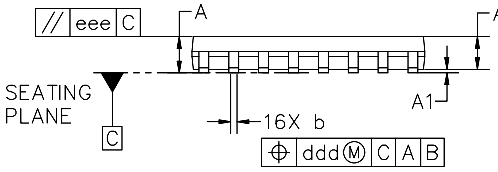
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm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

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.00	0.05	0.10
A2	1.35	1.50	1.65
b	0.35	0.42	0.49
c	0.19	0.22	0.25
D		9.90 BSC	
E		6.00 BSC	
E1		3.90 BSC	
e		1.27 BSC	
h	0.25	−−−	0.50
L	0.40	0.83	1.25
L1		1.05 REF	
Θ	0°	−−−	7°

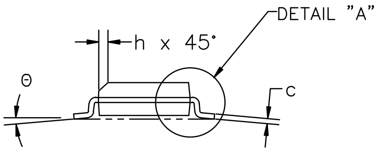
TOLERANCE OF FORM AND POSITION	
aaa	0.10
bbb	0.20
ccc	0.10
ddd	0.25
eee	0.10



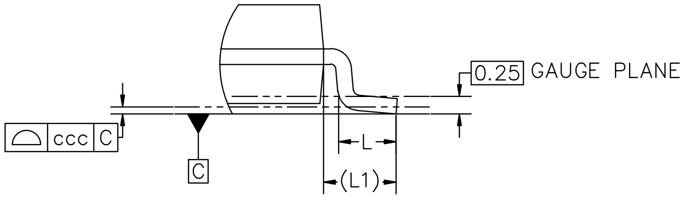
TOP VIEW



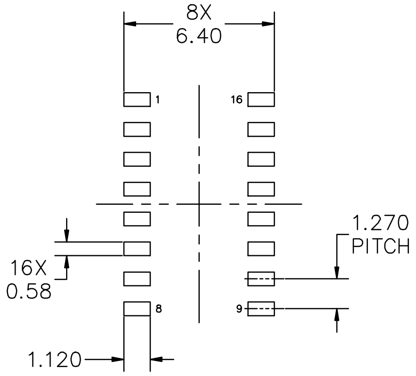
SIDE VIEW



END VIEW



DETAIL "A"
Scale 3:1



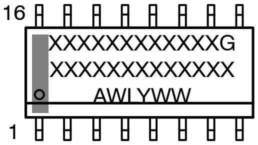
RECOMMENDED MOUNTING FOOTPRINT

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

SOIC−16 9.90x3.90x1.50 1.27P
CASE 751B
ISSUE L

DATE 29 MAY 2024

GENERIC MARKING DIAGRAM*



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.

PIN	STYLE 1:	STYLE 2:	STYLE 3:	STYLE 4:
1.	COLLECTOR	CATHODE	COLLECTOR, DYE #1	COLLECTOR, DYE #1
2.	BASE	ANODE	BASE, #1	COLLECTOR, #1
3.	EMITTER	NO CONNECTION	EMITTER, #1	COLLECTOR, #2
4.	NO CONNECTION	CATHODE	COLLECTOR, #1	COLLECTOR, #2
5.	EMITTER	CATHODE	COLLECTOR, #2	COLLECTOR, #3
6.	BASE	NO CONNECTION	BASE, #2	COLLECTOR, #3
7.	COLLECTOR	ANODE	EMITTER, #2	COLLECTOR, #4
8.	COLLECTOR	CATHODE	COLLECTOR, #2	COLLECTOR, #4
9.	BASE	CATHODE	COLLECTOR, #3	BASE, #4
10.	EMITTER	ANODE	BASE, #3	EMITTER, #4
11.	NO CONNECTION	NO CONNECTION	EMITTER, #3	BASE, #3
12.	EMITTER	CATHODE	COLLECTOR, #3	EMITTER, #3
13.	BASE	CATHODE	COLLECTOR, #4	BASE, #2
14.	COLLECTOR	NO CONNECTION	BASE, #4	EMITTER, #2
15.	EMITTER	ANODE	EMITTER, #4	BASE, #1
16.	COLLECTOR	CATHODE	COLLECTOR, #4	EMITTER, #1

PIN	STYLE 5:	STYLE 6:	STYLE 7:
1.	DRAIN, DYE #1	CATHODE	SOURCE N-CH
2.	DRAIN, #1	CATHODE	COMMON DRAIN (OUTPUT)
3.	DRAIN, #2	CATHODE	COMMON DRAIN (OUTPUT)
4.	DRAIN, #2	CATHODE	GATE P-CH
5.	DRAIN, #3	CATHODE	COMMON DRAIN (OUTPUT)
6.	DRAIN, #3	CATHODE	COMMON DRAIN (OUTPUT)
7.	DRAIN, #4	CATHODE	COMMON DRAIN (OUTPUT)
8.	DRAIN, #4	CATHODE	SOURCE P-CH
9.	GATE, #4	ANODE	SOURCE P-CH
10.	SOURCE, #4	ANODE	COMMON DRAIN (OUTPUT)
11.	GATE, #3	ANODE	COMMON DRAIN (OUTPUT)
12.	SOURCE, #3	ANODE	COMMON DRAIN (OUTPUT)
13.	GATE, #2	ANODE	GATE N-CH
14.	SOURCE, #2	ANODE	COMMON DRAIN (OUTPUT)
15.	GATE, #1	ANODE	COMMON DRAIN (OUTPUT)
16.	SOURCE, #1	ANODE	SOURCE N-CH

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