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

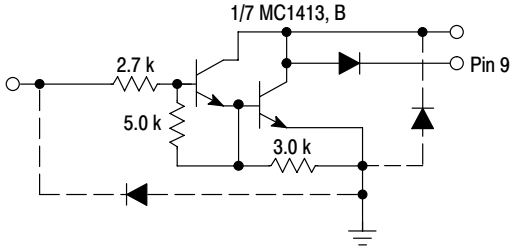
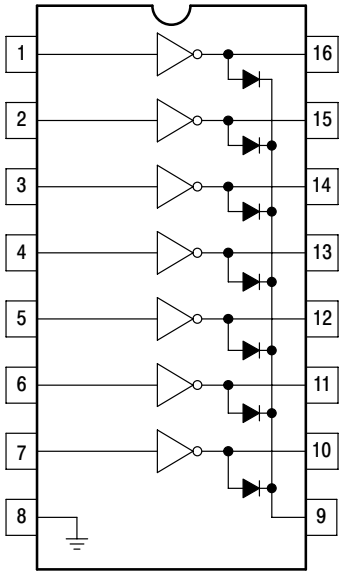


Figure 1. Representative Schematic Diagram



(Top View)

Figure 2. PIN CONNECTIONS

*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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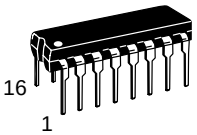
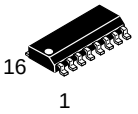


PDIP−16
P SUFFIX
CASE 648



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.

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 MC1413 MC1413B NCV1413B	T_A	 −20 to +85 −40 to +85 −40 to +125	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Junction Temperature	T_J	150	°C
Thermal Resistance, Junction−to−Ambient Case 648, P Suffix Case 751B, D Suffix	$R_{\theta JA}$	 67 100	°C/W
Thermal Resistance, Junction−to−Case Case 648, P Suffix Case 751B, D Suffix	$R_{\theta JC}$	 22 20	°C/W
Electrostatic Discharge Sensitivity (ESD) Human Body Model (HBM) Machine Model (MM) Charged Device Model (CDM)	ESD	 2000 400 1500	V

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

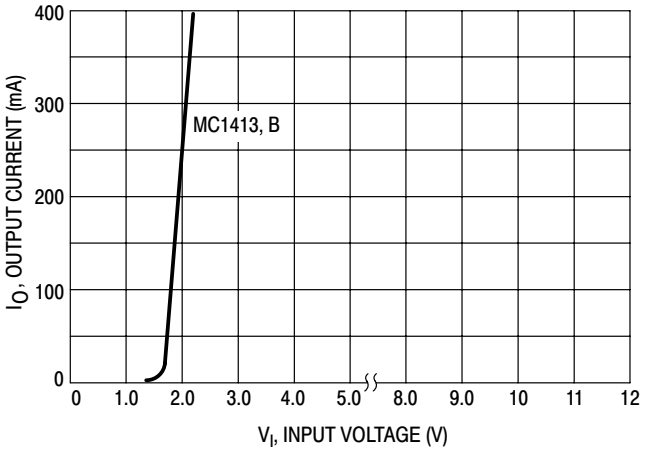


Figure 3. Output Current versus Input Voltage

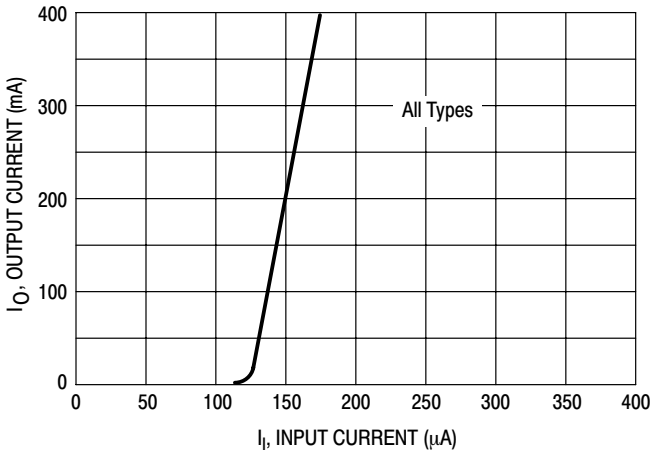


Figure 4. Output Current versus Input Current

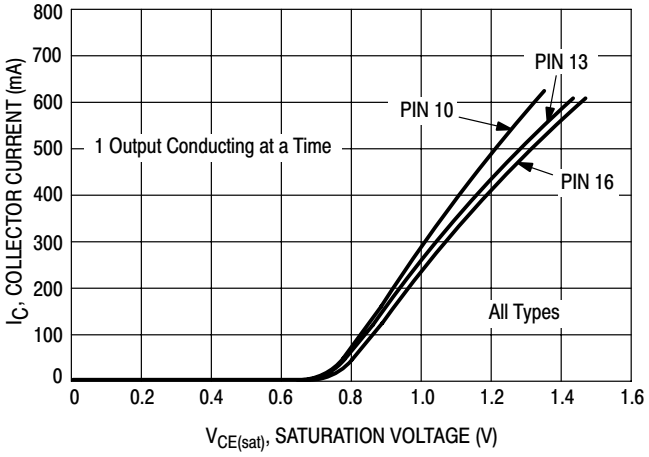


Figure 5. Typical Output Characteristics

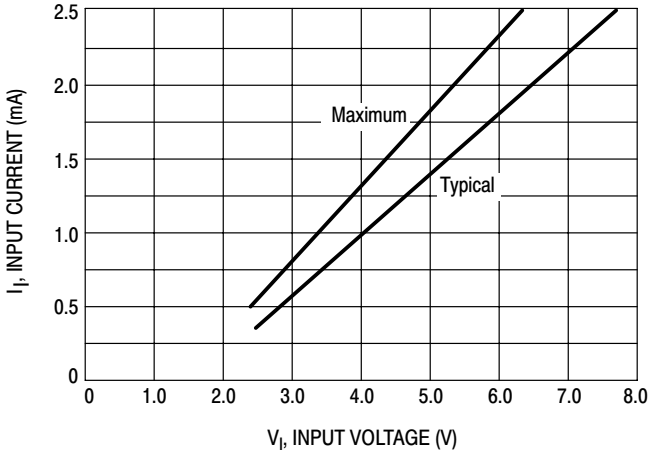


Figure 6. Input Characteristics − MC1413, B

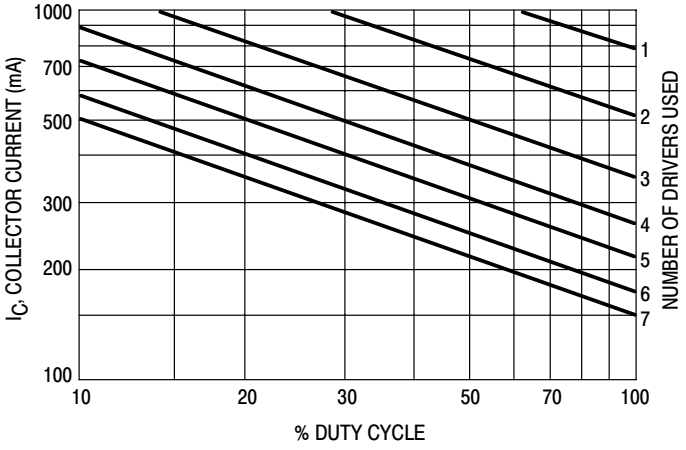
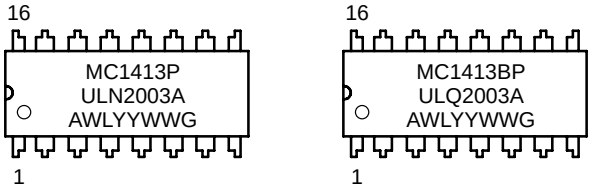


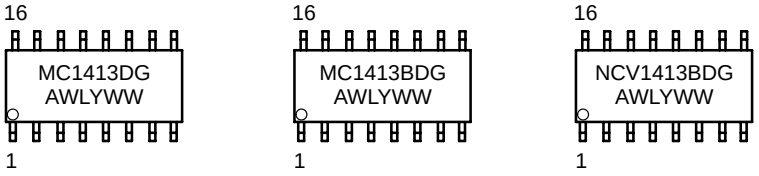
Figure 7. Maximum Collector Current versus Duty Cycle (and Number of Drivers in Use)

MARKING DIAGRAMS

PDIP−16
P SUFFIX
CASE 648



SOIC−16
D SUFFIX
CASE 751B



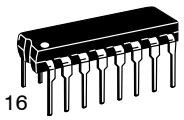
A = Assembly Location
WL = Wafer Lot
YY, Y = Year
WW = Work Week
G = Pb−Free Package

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

PDIP−16
CASE 648−08
ISSUE V

DATE 22 APR 2015



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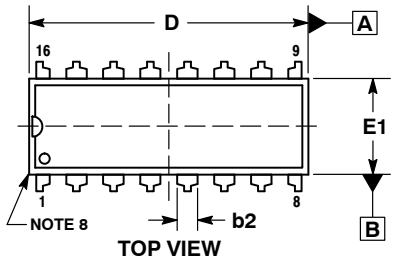
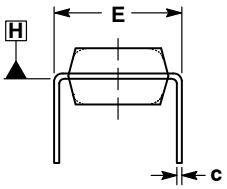
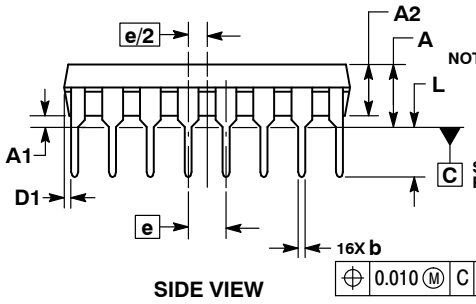


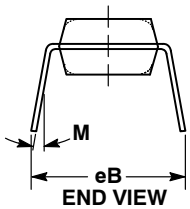
TOP VIEW



END VIEW
WITH LEADS CONSTRAINED
NOTE 5



SIDE VIEW



END VIEW
NOTE 6

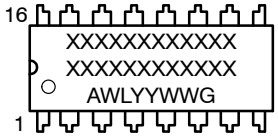
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS−3.
4. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 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.

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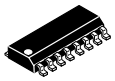
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

SOIC−16
CASE 751B−05
ISSUE K

DATE 29 DEC 2006



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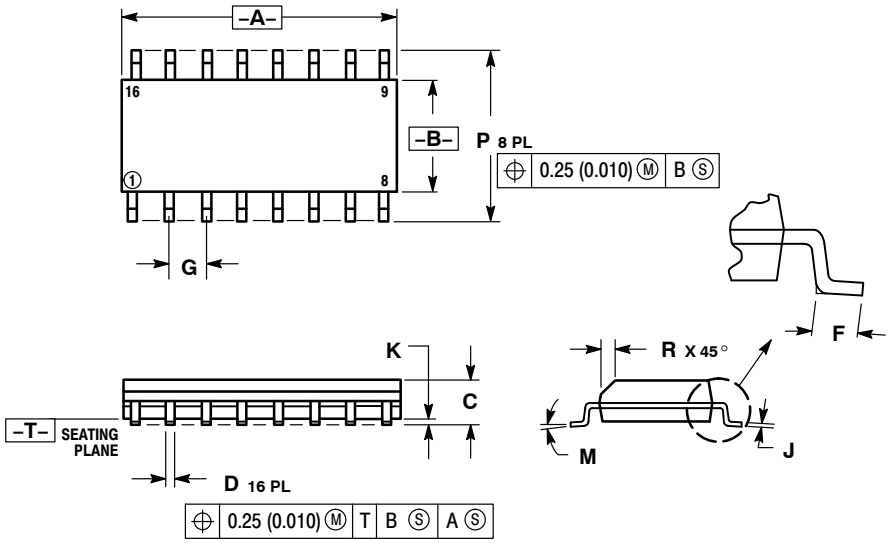


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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

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

STYLE 3:
PIN 1.	COLLECTOR, DYE #1
2.	BASE, #1
3.	EMITTER, #1
4.	COLLECTOR, #1
5.	COLLECTOR, #2
6.	BASE, #2
7.	EMITTER, #2
8.	COLLECTOR, #2
9.	COLLECTOR, #3
10.	BASE, #3
11.	EMITTER, #3
12.	COLLECTOR, #3
13.	COLLECTOR, #4
14.	BASE, #4
15.	EMITTER, #4
16.	COLLECTOR, #4

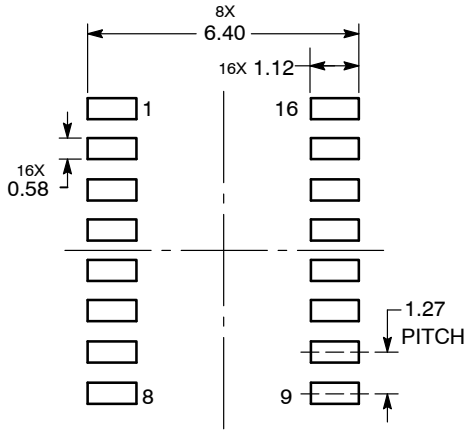
STYLE 4:
PIN 1.	COLLECTOR, DYE #1
2.	COLLECTOR, #1
3.	COLLECTOR, #2
4.	COLLECTOR, #2
5.	COLLECTOR, #3
6.	COLLECTOR, #3
7.	COLLECTOR, #4
8.	COLLECTOR, #4
9.	BASE, #4
10.	EMITTER, #4
11.	BASE, #3
12.	EMITTER, #3
13.	BASE, #2
14.	EMITTER, #2
15.	BASE, #1
16.	EMITTER, #1

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

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

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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