# 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 k $\Omega$  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

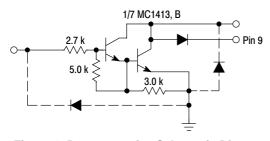


Figure 1. Representative Schematic Diagram

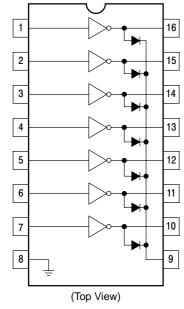


Figure 2. PIN CONNECTIONS



### ON Semiconductor®

http://onsemi.com



PDIP-16 P SUFFIX CASE 648



SOIC-16 D SUFFIX CASE 751B

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
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

<sup>†</sup>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.

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

**MAXIMUM RATINGS** ( $T_A = 25^{\circ}C$ , and rating apply to any one device in the package, unless otherwise noted.)

Rating	Symbol	Value	Unit
Output Voltage	Vo	50	V
Input Voltage	VI	30	V
Collector Current – Continuous	I <sub>C</sub>	500	mA
Base Current – Continuous	Ι <sub>Β</sub>	25	mA
Operating Ambient Temperature Range MC1413 MC1413B NCV1413B	T <sub>A</sub>	-20 to +85 -40 to +85 -40 to +125	ů
Storage Temperature Range	T <sub>stg</sub>	-55 to +150	°C
Junction Temperature	TJ	150	°C
Thermal Resistance, Junction-to-Ambient Case 648, P Suffix Case 751B, D Suffix	$R_{ heta JA}$	67 100	°C/W
Thermal Resistance, Junction-to-Case Case 648, P Suffix Case 751B, D Suffix	$R_{ heta JC}$	22 20	°C/W
Electrostatic Discharge Sensitivity (ESD) Human Body Model (HBM) Machine Model (MM) Charged Device Model (CDM)	ESD	2000 400 1500	V

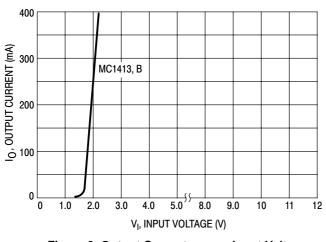
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

# **ELECTRICAL CHARACTERISTICS** ( $T_A = 25^{\circ}C$ , unless otherwise noted)

Characteristic	Symbol	Min	Тур	Max	Unit
Output Leakage Current $ (V_O = 50 \text{ V}, T_A = +85^{\circ}\text{C}) $ All Type $ (V_O = 50 \text{ V}, T_A = +25^{\circ}\text{C}) $ All Type		- -	- -	100 50	μА
Collector-Emitter Saturation Voltage	es .	- - -	1.1 0.95 0.85	1.6 1.3 1.1	V
Input Current – On Condition (V <sub>I</sub> = 3.85 V) MC1413,	B I <sub>I(on)</sub>	-	0.93	1.35	mA
	В	- - -	- - -	2.4 2.7 3.0	V
Input Current – Off Condition All Type $(I_C = 500 \mu A, T_A = 85^{\circ}C)$	s I <sub>I(off)</sub>	50	100	_	μΑ
DC Current Gain $(V_{CE} = 2.0 \text{ V}, I_C = 350 \text{ mA})$	h <sub>FE</sub>	1000	_	_	-
Input Capacitance	C <sub>I</sub>	_	15	30	pF
Turn–On Delay Time (50% E <sub>I</sub> to 50% E <sub>O</sub> )	t <sub>on</sub>	-	0.25	1.0	μS
Turn-Off Delay Time (50% E <sub>I</sub> to 50% E <sub>O</sub> )	t <sub>off</sub>	-	0.25	1.0	μS
Clamp Diode Leakage Current $T_A = +25^{\circ}$ ( $V_R = 50 \text{ V}$ ) $T_A = +85^{\circ}$			- -	50 100	μΑ
Clamp Diode Forward Voltage (I <sub>F</sub> = 350 mA)	V <sub>F</sub>	-	1.5	2.0	V

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

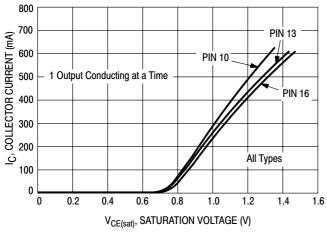
#### TYPICAL PERFORMANCE CURVES - T<sub>A</sub> = 25°C

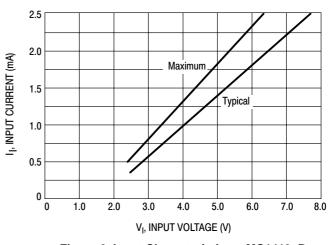


400 All Types — Al

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

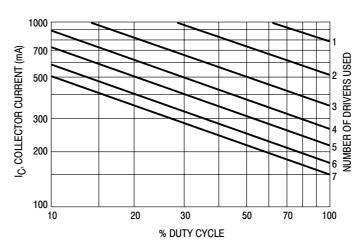
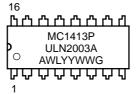
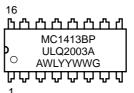


Figure 7. Maximum Collector Current versus Duty Cycle (and Number of Drivers in Use)

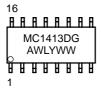
#### **MARKING DIAGRAMS**

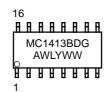
PDIP-16 P SUFFIX CASE 648

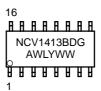




SOIC-16 D SUFFIX CASE 751B







A = Assembly Location

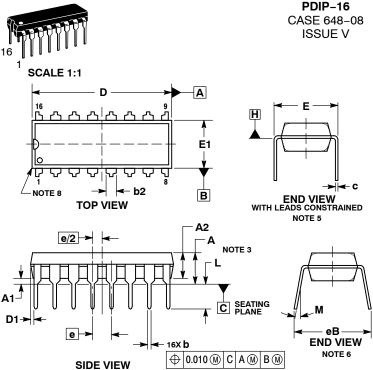
WL = Wafer Lot

YY, Y = Year

WW = Work Week

G = Pb-Free Package

# **MECHANICAL CASE OUTLINE**



PDIP-16

**DATE 22 APR 2015** 

#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

- DIMENSIONING AND TOLERANGING FER ASME 114-3M, 1994
  CONTROLLING DIMENSION: INCHES.

  DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-3.

  DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH
  OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE
  NOT TO EXCEED 0.10 INCH.
- DIMENSION E IS MEASURED AT A POINT 0.015 BELOW DATUM PLANE H WITH THE LEADS CONSTRAINED PERPENDICULAR
- DIMENSION eB IS MEASURED AT THE LEAD TIPS WITH THE
- DATUM PLANE H IS COINCIDENT WITH THE BOTTOM OF THE
- LEADS, WHERE THE LEADS EXIT THE BODY.

  PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).

	INC	HES	MILLIM	ETERS	
DIM	MIN	MAX	MIN	MAX	
Α		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		
С	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	
е	0.100	BSC	2.54 BSC		
eB		0.430		10.92	
L	0.115	0.150	2.92	3.81	
M		10°		10°	

#### **GENERIC MARKING DIAGRAM\***



XXXXX = Specific Device Code

= Assembly Location

WL = Wafer Lot YY = Year

WW = Work Week G

= Pb-Free Package

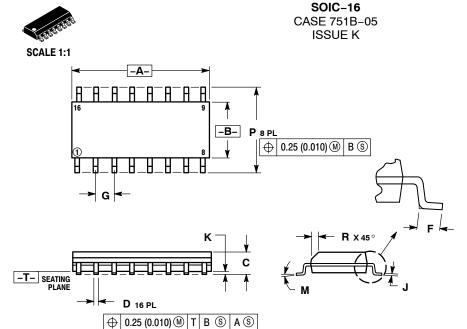
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot " ■", may or may not be present.

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

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# **MECHANICAL CASE OUTLINE**



**DATE 29 DEC 2006** 

- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI
- THE NOTION AND TOLETANOING FER ANSI'Y 14.5M, 1982.
  CONTROLLING DIMENSION: MILLIMETER.
  DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
- PHOI HUSION.

  MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.

  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.

	MILLIN	IETERS	INC	HES	
DIM	MIN	MAX	MIN	MAX	
Α	9.80	10.00	0.386	0.393	
В	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°	
Р	5.80	6.20	0.229	0.244	
R	0.25	0.50	0.010	0.019	

2. 3.	COLLECTOR BASE EMITTER NO CONNECTION EMITTER BASE COLLECTOR COLLECTOR BASE EMITTER NO CONNECTION EMITTER BASE EMITTER BASE EMITTER BASE	2. 3. 4. 5. 6. 7. 8. 9. 10.	CATHODE ANODE	2. 3. 4. 5. 6. 7. 8. 9. 10.	COLLECTOR, DYE #1 BASE, #1 EMITTER, #1 COLLECTOR, #1 COLLECTOR, #2 BASE, #2 EMITTER, #2 COLLECTOR, #2 COLLECTOR, #2 COLLECTOR, #3	STYLE 4: PIN 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COLLECTOR, DYN COLLECTOR, #1 COLLECTOR, #2 COLLECTOR, #3 COLLECTOR, #3 COLLECTOR, #4 COLLECTOR, #4 BASE, #4 EMITTER, #4 BASE, #3 EMITTER, #3 BASE, #2		
14.	COLLECTOR		NO CONNECTION	14.		14.		SOLDERING	FOOTPRINT
15.	EMITTER		ANODE	15.		15.	BASE, #1	8	X
16.	COLLECTOR	16.	CATHODE	16.	COLLECTOR, #4	16.	EMITTER, #1		^ 40 <del></del>
					,		,		6X 1.12
STYLE 5:	DDAIN DVE #4	STYLE 6:	OATHODE	STYLE 7:	COURCE N OU			'	0.1.12
PIN 1.	DRAIN, DYE #1	PIN 1.		PIN 1.	SOURCE N-CH	Τ\		<u></u>	16
2.	DRAIN, #1	2. 3.	CATHODE CATHODE	2.	COMMON DRAIN (OUTPU			↓ └──	10
3. 4.	DRAIN, #2 DRAIN, #2	3. 4.	CATHODE	3. 4.	COMMON DRAIN (OUTPU' GATE P-CH	1)		<u>*</u>	
4. 5.	DRAIN, #2 DRAIN, #3	4. 5.	CATHODE	4. 5.	COMMON DRAIN (OUTPU	Τ\			
5. 6.	DRAIN, #3	5. 6.	CATHODE	6.	COMMON DRAIN (OUTPU		1	.58 <b>∱</b>	
7.	DRAIN, #4	7.		7.	COMMON DRAIN (OUTPU		U.	.58	
8.	DRAIN, #4	8.	CATHODE	8.	SOURCE P-CH	.,			
9.	GATE, #4	9.	ANODE	9.	SOURCE P-CH				
10.	SOURCE, #4	10.	ANODE	10.	COMMON DRAIN (OUTPU	T)			
11.	,	11.		11.	COMMON DRAIN (OUTPU				
12.	SOURCE, #3	12.	ANODE	12.	COMMON DRAIN (OUTPU	T)			
13.	GATE, #2	13.	ANODE	13.	GATE N-CH				
14.	SOURCE, #2	14.	ANODE	14.	COMMON DRAIN (OUTPU	T)			—— ↓ PITCH
15.	GATE, #1	15.	ANODE	15.	COMMON DRAIN (OUTPU	T)			<u>+-+</u> -
16.	SOURCE, #1	16.	ANODE	16.	SOURCE N-CH				
								8	9 ++ 7
								,	DIMENSIONS: MILLIMETERS

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