# 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



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http://onsemi.com



#### **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

+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.

\*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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**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	Ι <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	°C
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	$R_{ extsf{ heta}JC}$	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.

Characteristic	Symbol	Min	Тур	Max	Unit
Output Leakage Current $(V_O = 50 \text{ V}, T_A = +85^{\circ}\text{C})$ $(V_O = 50 \text{ V}, T_A = +25^{\circ}\text{C})$ All Types	I <sub>CEX</sub>			100 50	μΑ
	V <sub>CE(sat)</sub>	_ _ _	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
	V <sub>I(on)</sub>	_ _ _	- - -	2.4 2.7 3.0	V
$ \begin{array}{ll} \mbox{Input Current} - \mbox{Off Condition} & \mbox{All Types} \\ \mbox{(I}_C = 500 \ \mu \mbox{A}, \ T_A = 85^{\circ} \mbox{C}) \end{array} $	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	CI	-	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
	I <sub>R</sub>			50 100	μΑ
Clamp Diode Forward Voltage (I <sub>F</sub> = 350 mA)	V <sub>F</sub>	-	1.5	2.0	V

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

NOTE: NCV1413B T<sub>low</sub> = -40°C, T<sub>high</sub> = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

#### TYPICAL PERFORMANCE CURVES – $T_A = 25^{\circ}C$





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

#### MARKING DIAGRAMS





SOIC-16 D SUFFIX CASE 751B



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

#### PACKAGE DIMENSIONS

PDIP-16 **P SUFFIX** CASE 648-08 ISSUE T



NOTES:
 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: INCH.
 DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 ROUNDED CORNERS OPTIONAL.

	INC	HES	MILLIMETERS		
DIM	MIN	MAX	MIN	MAX	
Α	0.740	0.770	18.80	19.55	
В	0.250	0.270	6.35	6.85	
С	0.145	0.175	3.69	4.44	
D	0.015	0.021	0.39	0.53	
F	0.040	0.70	1.02	1.77	
G	0.100	BSC	2.54	BSC	
н	0.050	BSC	1.27	BSC	
J	0.008	0.015	0.21	0.38	
ĸ	0.110	0.130	2.80	3.30	
L	0.295	0.305	7.50	7.74	
М	0 °	10 °	0 °	10 °	
S	0.020	0.040	0.51	1.01	

#### PACKAGE DIMENSIONS



NOTES:

- NOTES:
  DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  CONTROLLING DIMENSION: MILLIMETER.
  DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
  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.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α	9.80	10.00	0.386	0.393
В	3.80	4.00	0.150	0.157
С	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
М	0 °	7°	0°	7°
Ρ	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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