

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

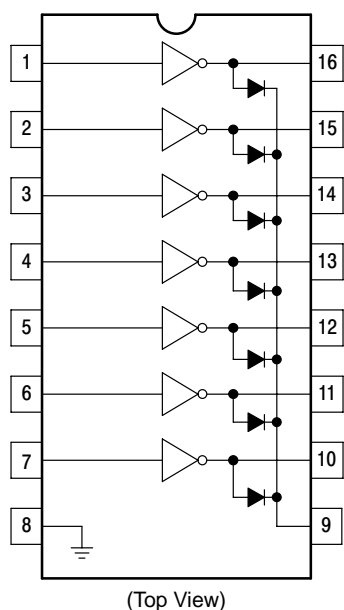


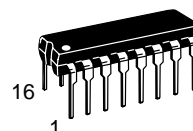
Figure 2. PIN CONNECTIONS

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

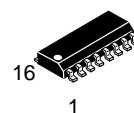


ON Semiconductor®

<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.

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MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, 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 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Junction Temperature | T_J | 150 | $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient Case 648, P Suffix Case 751B, D Suffix | $R_{\theta JA}$ | 67 100 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case Case 648, P Suffix Case 751B, D Suffix | $R_{\theta JC}$ | 22 20 | $^\circ\text{C}/\text{W}$ |
| 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.

MC1413, MC1413B, NCV1413B

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

| Characteristic | | Symbol | Min | Typ | 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 All Types | I_{CEX} | – – | – – | 100 50 | μA |
| Collector–Emitter Saturation Voltage ($I_C = 350\text{ mA}$, $I_B = 500\text{ }\mu\text{A}$) ($I_C = 200\text{ mA}$, $I_B = 350\text{ }\mu\text{A}$) ($I_C = 100\text{ mA}$, $I_B = 250\text{ }\mu\text{A}$) | All Types All Types All Types | $V_{CE(sat)}$ | – – – | 1.1 0.95 0.85 | 1.6 1.3 1.1 | V |
| Input Current – On Condition ($V_I = 3.85\text{ V}$) | MC1413, B | $I_{I(on)}$ | – | 0.93 | 1.35 | mA |
| Input Voltage – On Condition ($V_{CE} = 2.0\text{ V}$, $I_C = 200\text{ mA}$) ($V_{CE} = 2.0\text{ V}$, $I_C = 250\text{ mA}$) ($V_{CE} = 2.0\text{ V}$, $I_C = 300\text{ mA}$) | MC1413, B MC1413, B MC1413, B | $V_{I(on)}$ | – – – | – – – | 2.4 2.7 3.0 | V |
| Input Current – Off Condition ($I_C = 500\text{ }\mu\text{A}$, $T_A = 85^\circ\text{C}$) | All Types | $I_{I(off)}$ | 50 | 100 | – | μA |
| DC Current Gain ($V_{CE} = 2.0\text{ V}$, $I_C = 350\text{ mA}$) | | 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 ($V_R = 50\text{ V}$) | $T_A = +25^\circ\text{C}$ $T_A = +85^\circ\text{C}$ | I_R | – – | – – | 50 100 | μA |
| Clamp Diode Forward Voltage ($I_F = 350\text{ mA}$) | | V_F | – | 1.5 | 2.0 | V |

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

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TYPICAL PERFORMANCE CURVES - $T_A = 25^\circ\text{C}$



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

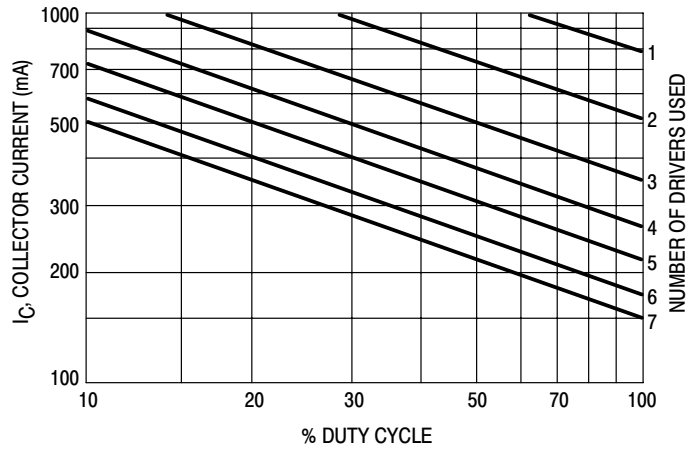


Figure 7. Maximum Collector Current versus Duty Cycle (and Number of Drivers in Use)

MC1413, MC1413B, NCV1413B

MARKING DIAGRAMS

PDIP-16 P SUFFIX CASE 648



SOIC-16 D SUFFIX CASE 751B

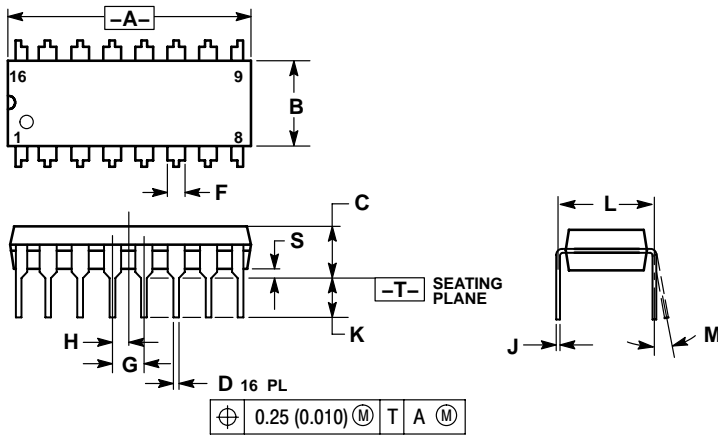


A = Assembly Location
WL = Wafer Lot
YY, Y = Year
WW = Work Week
G = Pb-Free Package

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PACKAGE DIMENSIONS

PDIP-16
P SUFFIX
CASE 648-08
ISSUE T



NOTES:

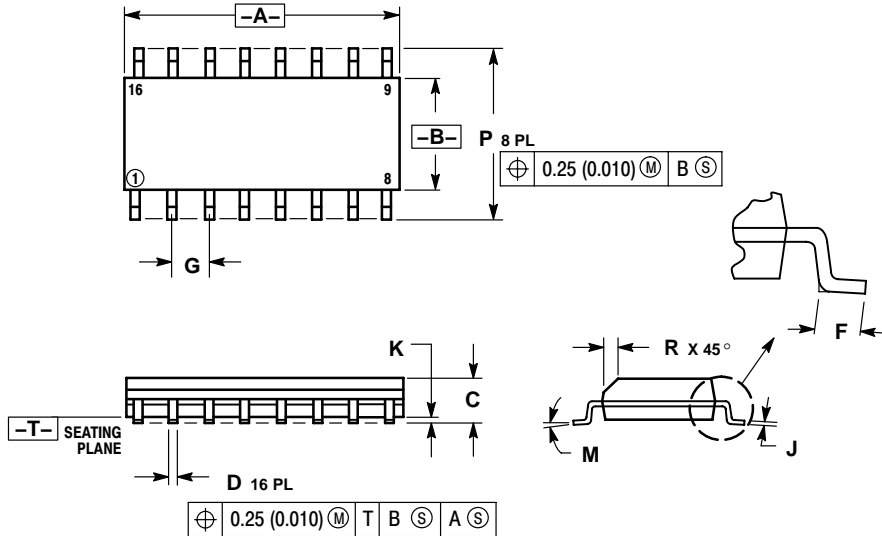
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.740 | 0.770 | 18.80 | 19.55 |
| B | 0.250 | 0.270 | 6.35 | 6.85 |
| C | 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 | |
| H | 0.050 BSC | | 1.27 BSC | |
| J | 0.008 | 0.015 | 0.21 | 0.38 |
| K | 0.110 | 0.130 | 2.80 | 3.30 |
| L | 0.295 | 0.305 | 7.50 | 7.74 |
| M | 0° | 10° | 0° | 10° |
| S | 0.020 | 0.040 | 0.51 | 1.01 |

MC1413, MC1413B, NCV1413B

PACKAGE DIMENSIONS

SOIC-16
D SUFFIX
CASE 751B-05
ISSUE J



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.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | 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 |

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